AMITY UNIVERSITY
HARYANA
Established vide Government of Haryana Act No.10 of 2010

(Accredited with Grade 'A' by NAAC)

Supporting Document of Metric No. 1.1.3

1.1.3 Total number of courses having focus on employability/ entrepreneurship/ skill development offered by the University during the year.

1.1.3.1 - Number of courses having focus on employability/ entrepreneurship/ skill development during the year

Following are Appended:

- Mapping of the course to Employability/ Entrepreneurship/ Skill development.
- Syllabus copies of the course highlighting the focus on employability/ Entrepreneurship / Skill Development along their course outcomes are provided.
- List of MOU's focusing on Employability/ Entrepreneurship/ Skill Development
- List of courses (Additional Information)

1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1	Financial and Corporate Accounting	DMGT2101	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
2	Cost and Management Accounting	DMGT2201	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
3	Analytical Decision Making	DMGT2301	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
4	Advanced Excel for Managers	SMGT2301	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
5	Community Engagement Services	NMGT2335	Bachelor of Business Administration (Honors/ Honors with Research)	Project writing, Presentation, Viva-Voce	2010
6	Financial Management	DMGT2451	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
7	Legal Aspects of Business	DMGT2401	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
8	Data Interpretations and Visualisation	SMGT2401	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
9	Statistics in Research	DMGT2501	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
10	Advertising & Sales Promotion	DMKT2501	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
11	International Marketing	DMKT2502	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
12	Organizational Development and Change	DHRM2501	Bachelor of Business Administration (Honors/ Honors	Quiz, Presentation, Group Discussion, Viva-Voce	2010
13	Principles of Investment Management	DFIN2501	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
14	Financial Services	DFIN2502	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
15	SIP/Internship/ Project/ Dissertation/Field Visit	NMGT2537	Bachelor of Business Administration (Honors/ Honors with Research)	Project writing, Presentation, Viva-Voce	2010
16	Entrepreneurship Development	DMGT2601	Bachelor of Business Administration (Honors/ Honors	Quiz, Presentation, Group Discussion, Viva-Voce	2010
17	Retail Management	DMKT2602	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
18	Distribution and Logistics Management	DMKT2603	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
19	Industrial Relations & Labour Codes	DHRM2601	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
20	HR Analytics	DHRM2603	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
21	Corporate Tax Planning	DFIN2601	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
22	Corporate Financial Reporting & Analysis	DFIN2603	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
23	Artificial Intelligence in Management	DMGT2702	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
24	Sustainability Management	DMGT2703	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
25	Digital Marketing	DMKT2702	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
26	Direct Marketing	DMKT2703	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
27	Manpower Planning	DHRM2702	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
28	Recent Trends in HRM	DHRM2703	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
29	Financial Engineering	DFIN2701	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
30	Financial Modelling with MS Excel	DFIN2702	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
31	Basics of Research Methodology, Ethics and Research Communication	DMGT2739	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
32	SIP/Internship/ Project/ Dissertation/Field Visit	NMGT2737	Bachelor of Business Administration (Honors/ Honors with Research)	Project writing, Presentation, Viva-Voce	2010
33	Strategic Leadership	DMGT2801	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
34	Business Analytics	DMGT2802	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
35	Talent Management	DHRM2801	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
36	Sustainable HRM	DHRM2803	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
37	Financial Statement Analysis	DFIN2802	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
38	Fintech- Technology Innovation in Financial Services	DFIN2803	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
39	Behavioural Finance	DFIN2804	Bachelor of Business Administration (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2010
40	SIP/Internship/ Project/ Dissertation/Field Visit	NMGT2837	Bachelor of Business Administration (Honors/ Honors with Research)	Project writing, Presentation, Viva-Voce	2010
41	Data Analysis & Visualisation using Software	DMGT2839	Bachelor of Business Administration (Honors/ Honors with Research)	Project writing, Presentation, Viva-Voce	2010
42	Principles of Banking	DMBF2101	Bachelor of Business Administration- Banking & Finance (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2013
43	Retail Banking	DMBF2201	Bachelor of Business Administration- Banking & Finance (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2013
44	Advanced Excel for Managers	SMGT2301	Bachelor of Business Administration- Banking & Finance (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2013
45	Community Engagement Services	NMBF2335	Bachelor of Business Administration- Banking & Finance (Honors/ Honors with Research)	Project writing, Presentation, Viva-Voce	2013
46	Data Interpretations and Visualisation	SMGT2401	Bachelor of Business Administration- Banking & Finance (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2013
47	Principles of Investment Management	DMBF2501	Bachelor of Business Administration- Banking & Finance (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2013
48	SIP/Internship/ Project/ Dissertation/Field Visit	NMBF2537	Bachelor of Business Administration- Banking & Finance (Honors/ Honors with Research)	Project writing, Presentation, Viva-Voce	2013
49	E- Banking	DMBF2601	Bachelor of Business Administration- Banking & Finance (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2013
50	Advanced Corporate Finance	DMBF2602	Bachelor of Business Administration- Banking & Finance (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2013

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
51	Financial Engineering	DMBF2701	Bachelor of Business Administration- Banking & Finance (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2013
52	Basics of Research Methodology, Ethics and Research Communication	DMBF2739	Bachelor of Business Administration- Banking & Finance (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2013
53	SIP/Internship/ Project/ Dissertation/Field Visit	NMBF2737	Bachelor of Business Administration- Banking & Finance (Honors/ Honors with Research)	Project writing, Presentation, Viva-Voce	2013
54	Financial Market & Institutions	DMBF2801	Bachelor of Business Administration- Banking & Finance (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2013
55	General Banking Operations	DMBF2802	Bachelor of Business Administration- Banking & Finance (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2013
56	SIP/Internship/ Project/ Dissertation/Field Visit	NMBF2837	Bachelor of Business Administration- Banking & Finance (Honors/ Honors with Research)	Project writing, Presentation, Viva-Voce	2013
57	Data Analysis & Visualisation Using Software	DMBF2839	Bachelor of Business Administration- Banking & Finance (Honors/ Honors with Research)	Written Test, Presentation, Viva-Voce	2013
58	Introduction to Business Analytics	DBUA2101	Bachelor of Business Administration- Business Analytics (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2023
59	Analytical Techniques for Decision Making	DBUA2102	Bachelor of Business Administration- Business Analytics (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2023
60	Statistical Techniques in Research	DBUA2201	Bachelor of Business Administration- Business Analytics (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2023
61	Advance Statistical Techniques	DBUA2301	Bachelor of Business Administration- Business Analytics (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2023
62	Data Privacy and Data Security Laws	DBUA2302	Bachelor of Business Administration- Business Analytics (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2023

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63	Natural Language Processing	SBUA2301	Bachelor of Business Administration- Business Analytics (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2023
64	Community Engagement Services	NBUA2335	Bachelor of Business Administration- Business Analytics (Honors/ Honors with Research)	Project writing, Presentation, Viva-Voce	2023
65	Introduction to Advanced Excel	DBUA2401	Bachelor of Business Administration- Business Analytics (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2023
66	Big Data Analytics	SBUA2401	Bachelor of Business Administration- Business Analytics (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2023
67	SQL & Datamining	DBUA2501	Bachelor of Business Administration- Business Analytics (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2023
68	Programming for Business Analytics using R	DBUA2502	Bachelor of Business Administration- Business Analytics (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2023
69	SIP/Internship/ Project/ Dissertation/Field Visit	NBUA2537	Bachelor of Business Administration- Business Analytics (Honors/ Honors with Research)	Project writing, Presentation, Viva-Voce	2023
70	Introduction to Machine Learning & AI	DBUA2601	Bachelor of Business Administration- Business Analytics (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2023
71	Programming for Business Analytics using Python	DBUA2602	Bachelor of Business Administration- Business Analytics (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2023
72	Data Visualization-Tableau & Power BI	DBUA2603	Bachelor of Business Administration- Business Analytics (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2023
73	Text Analytics	DBUA2701	Bachelor of Business Administration- Business Analytics (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2023
74	Basics of Research Methodology, Ethics and Research Communication	DBUA2739	Bachelor of Business Administration- Business Analytics (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2023

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
75	SIP/Internship/ Project/ Dissertation/Field Visit	NBUA2737	Bachelor of Business Administration- Business Analytics (Honors/ Honors with Research)	Project writing, Presentation, Viva-Voce	2023
76	Business Research Methods	DBUA2801	Bachelor of Business Administration- Business Analytics (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2023
77	Econometrics	DBUA2802	Bachelor of Business Administration- Business Analytics (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2023
78	Social Media Analysis	DBUA2803	Bachelor of Business Administration- Business Analytics (Honors/ Honors with Research)	Quiz, Presentation, Group Discussion, Viva-Voce	2023
79	SIP/Internship/ Project/ Dissertation/Field Visit	NBUA2837	Bachelor of Business Administration- Business Analytics (Honors/ Honors with Research)	Project writing, Presentation, Viva-Voce	2023
80	Data Analysis & Visualisation Using Software	DBUA2839	Bachelor of Business Administration- Business Analytics (Honors/ Honors with Research)	Written Test, Presentation, Viva-Voce	2023
81	Accounting for Management	MGT4102	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
82	Quantitative Techniques in Management	MGT4106	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
83	Information Technology & E-Commerce	MGT4109	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
84	Business Research Methods	MGT4203	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
85	Management Science	MGT4207	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
86	Business Analytics	MGT4210	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
87	Excel for Managers	MGT4211	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
88	Corporate Financial Reporting & Analysis	FIN4201	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
89	Financial Statement Analysis	FIN4203	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
90	Web Design using HTML	ITM4204	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
91	Marketing Research	MKT4201	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
92	Web Design using HTML	ECM4204	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
93	Summer Internship Evaluation	MGT4335	Master of Business Administration	Report Writing, Presentation	2010

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
94	Business Valuation	FIN4302	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
95	Financial Modeling with MS-Excel	FIN4306	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
96	Training & Development	HRM4305	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
97	Database Management Systems	ITM4302	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
98	Digital Marketing	ITM4303	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
99	Introduction to Cloud Computing	ITM4304	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
100	System Analysis & Design	ITM4305	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
101	Dynamic Web Design & Development	ITM4306	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
102	Advertising & Sales Promotion	MKT4301	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
103	Digital Marketing	MKT4303	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
104	Direct Marketing	MKT4305	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
105	Retail Management	MKT4306	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
106	Sales Management	MKT4307	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
107	Consumer Behaviour	MKT4308	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
108	Digital Marketing	ECM4301	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
109	Database Management Systems	ECM4302	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
110	Dynamic Web Design & Development	ECM4307	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
111	Entrepreneurship Development	MGT4429	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
112	Dissertation	MGT4437	Master of Business Administration	Report Writing, Presentation, Viva-Voce	2010
113	Private Equity and Entrepreneurial Finance	FIN4405	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
114	Compensation & Reward Management	HRM4401	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
115	Psychological Testing	HRM4402	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
116	Managerial Counselling	HRM4406	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
117	International Trade Procedures & Documentation	IBM4407	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
118	Data Warehousing & Data Mining	ITM4401	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
119	Search Engine Optimization	ITM4405	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
120	Tools for Business Intelligence	ITM4406	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
121	Social Media Analytics	ECM4401	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
122	Tools for Business Intelligence	ECM4404	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
123	Search Engine Optimization	ECM4406	Master of Business Administration	Industry Guest Talk, Class Test, Presentation, Report Writing	2010
124	Accounting for Management	MBF4102	Master of Business Administration (Banking & Finance)	Industry Guest Talk, Class Test, Presentation, Report Writing	2012
125	Quantitative Techniques in Management	MBF4106	Master of Business Administration (Banking & Finance)	Industry Guest Talk, Class Test, Presentation, Report Writing	2012
126	Information Technology & E-Commerce	MBF4109	Master of Business Administration (Banking & Finance)	Industry Guest Talk, Class Test, Presentation, Report Writing	2012
127	Business Research Methods	MBF4203	Master of Business Administration (Banking & Finance)	Industry Guest Talk, Class Test, Presentation, Report Writing	2012
128	Business Analytics	MBF4210	Master of Business Administration (Banking & Finance)	Industry Guest Talk, Class Test, Presentation, Report Writing	2012
129	Excel for Managers	MBF4211	Master of Business Administration (Banking & Finance)	Industry Guest Talk, Class Test, Presentation, Report Writing	2012
130	Summer Internship Evaluation	MBF4335	Master of Business Administration (Banking & Finance)	Report Writing, Presentation, Viva-Voce	2012
131	Security Analysis & Portfolio Management	MBF4308	Master of Business Administration (Banking & Finance)	Industry Guest Talk, Class Test, Presentation, Report Writing	2012
132	Business Valuation	MBF4311	Master of Business Administration (Banking & Finance)	Industry Guest Talk, Class Test, Presentation, Report Writing	2012
133	Financial Modeling using MS-Excel	MBF4313	Master of Business Administration (Banking & Finance)	Industry Guest Talk, Class Test, Presentation, Report Writing	2012
134	Financial Risk Management	MBF4314	Master of Business Administration (Banking & Finance)	Industry Guest Talk, Class Test, Presentation, Report Writing	2012
135	Fixed Income Securities Analysis	MBF4315	Master of Business Administration (Banking & Finance)	Industry Guest Talk, Class Test, Presentation, Report Writing	2012
136	Entrepreneurship Development	MBF4413	Master of Business Administration (Banking & Finance)	Industry Guest Talk, Class Test, Presentation, Report Writing	2012

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137	Dissertation	MBF4437	Master of Business Administration (Banking & Finance)	Report Writing, Presentation, Viva-Voce	2012
138	Corporate Tax Planning	MBF4408	Master of Business Administration (Banking & Finance)	Industry Guest Talk, Class Test, Presentation, Report Writing	2012
139	Private Equity & Entrepreneurial Finance	MBF4412	Master of Business Administration (Banking & Finance)	Industry Guest Talk, Class Test, Presentation, Report Writing	2012
140	Business Statistics	MWP4106	Master of Business Administration (Executive for Working Professionals)	Industry Guest Talk, Class Test, Presentation, Report Writing	2014
141	Information Technology for Managers	MWP4109	Master of Business Administration (Executive for Working Professionals)	Industry Guest Talk, Class Test, Presentation, Report Writing	2014
142	Workshop	MWP4133	Master of Business Administration (Executive for Working Professionals)	Report Writing, Presentation, Viva-Voce	2014
143	Research Methodology & Report Preparation	MWP4204	Master of Business Administration (Executive for Working Professionals)	Class Test, Presentation, Report Writing	2014
144	Fundamentals of Data Analytics	MWP4205	Master of Business Administration (Executive for Working Professionals)	Industry Guest Talk, Class Test, Presentation, Report Writing	2014
145	Term Paper	MWP4231	Master of Business Administration (Executive for Working Professionals)	Academic writing, Presentation	2014
146	Workshop	MWP4233	Master of Business Administration (Executive for Working Professionals)	Report Writing, Presentation, Viva-Voce	2014
147	MOOC Course	MWP4209	Master of Business Administration (Executive for Working Professionals)	Industry Guest Talk, Class Test, Presentation, Report Writing	2014
148	Innovation and Entrepreneurship	MWP4311	Master of Business Administration (Executive for Working Professionals)	Industry Guest Talk, Class Test, Presentation, Report Writing	2014
149	Project-I	MWP4337	Master of Business Administration (Executive for Working Professionals)	Report Writing, Presentation, Viva-Voce	2014
150	Database Management System for Business	MWP4322	Master of Business Administration (Executive for Working Professionals)	Industry Guest Talk, Class Test, Presentation, Report Writing	2014
151	E-Commerce Fundamentals	MWP4323	Master of Business Administration (Executive for Working Professionals)	Industry Guest Talk, Class Test, Presentation, Report Writing	2014
152	Programming for Analytics using R	MWP4326	Master of Business Administration (Executive for Working Professionals)	Industry Guest Talk, Class Test, Presentation, Report Writing	2014
153	Programming for Analytics using Python	MWP4327	Master of Business Administration (Executive for Working Professionals)	Industry Guest Talk, Class Test, Presentation, Report Writing	2014

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
154	Visual Analytics Tableau/ Power BI	MWP4328	Master of Business Administration (Executive for Working Professionals)	Industry Guest Talk, Class Test, Presentation, Report Writing	2014
155	Environmental Governance and Sustainability	MWP4411	Master of Business Administration (Executive for Working Professionals)	Industry Guest Talk, Class Test, Presentation, Report Writing	2014
156	E-Business Essentials	MWP4412	Master of Business Administration (Executive for Working Professionals)	Industry Guest Talk, Class Test, Presentation, Report Writing	2014
157	Project-II	MWP4437	Master of Business Administration (Executive for Working Professionals)	Report Writing, Presentation, Viva-Voce	2014
158	ERP for Businesses	MWP4425	Master of Business Administration (Executive for Working Professionals)	Industry Guest Talk, Class Test, Presentation, Report Writing	2014
159	Digital Marketing	MWP4426	Master of Business Administration (Executive for Working Professionals)	Industry Guest Talk, Class Test, Presentation, Report Writing	2014
160	Predictive Analytics-I Machine Learning using R	MWP4428	Master of Business Administration (Executive for Working Professionals)	Industry Guest Talk, Class Test, Presentation, Report Writing	2014
161	Predictive Analytics-II Machine Learning using Python	MWP4429	Master of Business Administration (Executive for Working Professionals)	Industry Guest Talk, Class Test, Presentation, Report Writing	2014
162	Accounting for Management	HHM4102	Master of Business Administration (Hospital & Healthcare Management)	Industry Guest Talk, Class Test, Presentation, Report Writing	2011
163	Biostatistics	HHM4104	Master of Business Administration (Hospital & Healthcare Management)	Industry Guest Talk, Class Test, Presentation, Report Writing	2011
164	Information Technology and E-Commerce	HHM4109	Master of Business Administration (Hospital & Healthcare Management)	Industry Guest Talk, Class Test, Presentation, Report Writing	2011
165	Research Methodology	HHM4203	Master of Business Administration (Hospital & Healthcare Management)	Class Test, Presentation, Report Writing	2011
166	Hospital Planning	HHM4205	Master of Business Administration (Hospital & Healthcare Management)	Industry Guest Talk, Class Test, Presentation, Report Writing	2011
167	Hospital Materials Management	HHM4206	Master of Business Administration (Hospital & Healthcare Management)	Industry Guest Talk, Class Test, Presentation, Report Writing	2011
168	Excel for Managers	HHM4209	Master of Business Administration (Hospital & Healthcare Management)	Industry Guest Talk, Class Test, Presentation, Report Writing	2011
169	Term Paper	HHM4231	Master of Business Administration (Hospital & Healthcare Management)	Academic writing, Presentation	2011
170	Management of Clinical Services	HHM4303	Master of Business Administration (Hospital & Healthcare Management)	Industry Guest Talk, Class Test, Presentation, Report Writing	2011

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
171	Operations Research	HHM4305	Master of Business Administration (Hospital & Healthcare Management)	Industry Guest Talk, Class Test, Presentation, Report Writing	2011
172	Management of Support & Utility Services	HHM4308	Master of Business Administration (Hospital & Healthcare Management)	Industry Guest Talk, Class Test, Presentation, Report Writing	2011
173	Summer Internship Evaluation	HHM4335	Master of Business Administration (Hospital & Healthcare Management)	Report Writing, Presentation, Viva-Voce	2011
174	Hospital Management Information System	HHM4401	Master of Business Administration (Hospital & Healthcare Management)	Industry Guest Talk, Class Test, Presentation, Report Writing	2011
175	Entrepreneurship and Consultancy in Healthcare	HHM4406	Master of Business Administration (Hospital & Healthcare Management)	Industry Guest Talk, Class Test, Presentation, Report Writing	2011
176	Disaster Management	HHM4408	Master of Business Administration (Hospital & Healthcare Management)	Industry Guest Talk, Class Test, Presentation, Report Writing	2011
177	Dissertation	HHM4437	Master of Business Administration (Hospital & Healthcare Management)	Report Writing, Presentation, Viva-Voce	2011
178	Accounting for Management	BUA4102	Master of Business Administration (Business Analytics)	Industry Guest Talk, Class Test, Presentation, Report Writing	2019
179	Statistical Techniques	BUA4104	Master of Business Administration (Business Analytics)	Industry Guest Talk, Class Test, Presentation, Report Writing	2019
180	Excel for Decision Making	BUA4105	Master of Business Administration (Business Analytics)	Industry Guest Talk, Class Test, Presentation, Report Writing	2019
181	Optimization Techniques	BUA4106	Master of Business Administration (Business Analytics)	Industry Guest Talk, Class Test, Presentation, Report Writing	2019
182	Database Management System	BUA4107	Master of Business Administration (Business Analytics)	Industry Guest Talk, Class Test, Presentation, Report Writing	2019
183	Business Research Methods	BUA4204	Master of Business Administration (Business Analytics)	Industry Guest Talk, Class Test, Presentation, Report Writing	2019
184	Programming for Analytics using R	BUA4206	Master of Business Administration (Business Analytics)	Industry Guest Talk, Class Test, Presentation, Report Writing	2019
185	Programming for Analytics using Python	BUA4207	Master of Business Administration (Business Analytics)	Industry Guest Talk, Class Test, Presentation, Report Writing	2019
186	Datamining	BUA4302	Master of Business Administration (Business Analytics)	Industry Guest Talk, Class Test, Presentation, Report Writing	2019
187	Predictive Analytics-I Machine Learning using R	BUA4303	Master of Business Administration (Business Analytics)	Industry Guest Talk, Class Test, Presentation, Report Writing	2019

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
188	Predictive Analytics-II Machine Learning using Python	BUA4304	Master of Business Administration (Business Analytics)	Industry Guest Talk, Class Test, Presentation, Report Writing	2019
189	Big Data Analytics- Hadoop	BUA4305	Master of Business Administration (Business Analytics)	Industry Guest Talk, Class Test, Presentation, Report Writing	2019
190	Financial Decision Analysis	BUA4306	Master of Business Administration (Business Analytics)	Industry Guest Talk, Class Test, Presentation, Report Writing	2019
191	Visual Analytics- Tablue/ Power BI	BUA4307	Master of Business Administration (Business Analytics)	Industry Guest Talk, Class Test, Presentation, Report Writing	2019
192	Summer Internship Evaluation	BUA4335	Master of Business Administration (Business Analytics)	Report Writing, Presentation, Viva-Voce	2019
193	Financial Analytics	BUA4402	Master of Business Administration (Business Analytics)	Industry Guest Talk, Class Test, Presentation, Report Writing	2019
194	Supply Chain Analytics	BUA4403	Master of Business Administration (Business Analytics)	Industry Guest Talk, Class Test, Presentation, Report Writing	2019
195	HR Analytics	BUA4404	Master of Business Administration (Business Analytics)	Industry Guest Talk, Class Test, Presentation, Report Writing	2019
196	Marketing Analytics	BUA4405	Master of Business Administration (Business Analytics)	Industry Guest Talk, Class Test, Presentation, Report Writing	2019
197	Data Privacy and Data Security Laws	BUA4406	Master of Business Administration (Business Analytics)	Industry Guest Talk, Class Test, Presentation, Report Writing	2019
198	Dissertation (Analytics Project)	BUA4437	Master of Business Administration (Business Analytics)	Report Writing, Presentation, Viva-Voce	2019
199	Sustainable Marketing Concepts	MSP4101	Executive - Master of Business Administration (Sustainability Management)	Industry Guest Talk, Class Test, Presentation, Report Writing	2021
200	Business Statistics	MSP4103	Executive - Master of Business Administration (Sustainability Management)	Industry Guest Talk, Class Test, Presentation, Report Writing	2021
201	Application of Disruptive Technologies in Business	MSP4106	Executive - Master of Business Administration (Sustainability Management)	Industry Guest Talk, Class Test, Presentation, Report Writing	2021
202	Workshop	MSP4133	Executive - Master of Business Administration (Sustainability Management)	Academic writing, Presentation	2021
203	Fundamentals of Data Analytics	MSP4201	Executive - Master of Business Administration (Sustainability Management)	Industry Guest Talk, Class Test, Presentation, Report Writing	2021
204	Sustainable Development & Sustainability	MSP4202	Executive - Master of Business Administration (Sustainability Management)	Industry Guest Talk, Class Test, Presentation, Report Writing	2021

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
205	Research Methodology & Report Preparation	MSP4205	Executive - Master of Business Administration (Sustainability Management)	Industry Guest Talk, Class Test, Presentation, Report Writing	2021
206	Term Paper	MSP4231	Executive - Master of Business Administration (Sustainability Management)	Academic writing, Presentation	2021
207	Workshop	MSP4233	Executive - Master of Business Administration (Sustainability Management)	Academic writing, Presentation	2021
208	MOOC Course	MSP4206	Executive - Master of Business Administration (Sustainability Management)	Class Test, Academic writing, Presentation	2021
209	Social Entrepreneurship	MSP4302	Executive - Master of Business Administration (Sustainability Management)	Industry Guest Talk, Class Test, Presentation, Report Writing	2021
210	Project-I	MSP4337	Executive - Master of Business Administration (Sustainability Management)	Report Writing, Presentation, Viva-Voce	2021
211	Sustainability: Measurement & Reporting	MSP4304	Executive - Master of Business Administration (Sustainability Management)	Industry Guest Talk, Class Test, Presentation, Report Writing	2021
212	Human Dimensions of Sustainability	MSP4305	Executive - Master of Business Administration (Sustainability Management)	Industry Guest Talk, Class Test, Presentation, Report Writing	2021
213	Environmental Governance and Sustainability	MSP4401	Executive - Master of Business Administration (Sustainability Management)	Industry Guest Talk, Class Test, Presentation, Report Writing	2021
214	E-Business Essentials	MSP4402	Executive - Master of Business Administration (Sustainability Management)	Industry Guest Talk, Class Test, Presentation, Report Writing	2021
215	Project-II	MSP4437	Executive - Master of Business Administration (Sustainability Management)	Report Writing, Presentation, Viva-Voce	2021
216	Creativity and Innovation in Designing Sustainable Solutions	MSP4404	Executive - Master of Business Administration (Sustainability Management)	Industry Guest Talk, Class Test, Presentation, Report Writing	2021
217	Green Marketing & Environmental Product Design	MSP4405	Executive - Master of Business Administration (Sustainability Management)	Industry Guest Talk, Class Test, Presentation, Report Writing	2021
218	Mathematical Methods for Economics	DECO2101	Bachelor of Arts (Honors/ Honors with Research) in Economics	Quiz, Case Discussion, Report Writing, Class Performance	2010
219	Statistical Methods in Economics	DECO2251	Bachelor of Arts (Honors/ Honors with Research) in Economics	Quiz, Case Discussion, Report Writing, Class Performance	2010
220	Indian Economy	DECO2201	Bachelor of Arts (Honors/ Honors with Research) in Economics	Quiz, Case Discussion, Report Writing, Class Performance	2010
221	Agricultural Economics	DECO2301	Bachelor of Arts (Honors/ Honors with Research) in Economics	Quiz, Case Discussion, Report Writing, Class Performance	2010

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
222	Advanced Excel for Managers	SMGT2301	Bachelor of Arts (Honors/ Honors with Research) in Economics	Quiz, Case Discussion, Report Writing, Class Performance	2010
223	Community Engagement Services	NECO2335	Bachelor of Arts (Honors/ Honors with Research) in Economics	Project writing, Presentation, Viva-Voce	2010
224	Research Methodology	DECO2401	Bachelor of Arts (Honors/ Honors with Research) in Economics	Quiz, Case Discussion, Report Writing, Class Performance	2010
225	Data Interpretation & Visualisation	SMGT2401	Bachelor of Arts (Honors/ Honors with Research) in Economics	Quiz, Case Discussion, Report Writing, Class Performance	2010
226	Advanced Statistical Methods in Economics	DECO2501	Bachelor of Arts (Honors/ Honors with Research) in Economics	Quiz, Case Discussion, Report Writing, Class Performance	2010
227	SIP/Internship/ Project/ Dissertation/Field Visit	NECO2537	Bachelor of Arts (Honors/ Honors with Research) in Economics	Project writing, Presentation, Viva-Voce	2010
228	Monetary Economics	DECO2601	Bachelor of Arts (Honors/ Honors with Research) in Economics	Quiz, Case Discussion, Report Writing, Class Performance	2010
229	Industrial Economics	DECO2603	Bachelor of Arts (Honors/ Honors with Research) in Economics	Quiz, Case Discussion, Report Writing, Class Performance	2010
230	Advanced Microeconomics Theory & Applications	DECO2701	Bachelor of Arts (Honors/ Honors with Research) in Economics	Quiz, Case Discussion, Report Writing, Class Performance	2010
231	Advanced Macroeconomics Theory & Applications	DECO2702	Bachelor of Arts (Honors/ Honors with Research) in Economics	Quiz, Case Discussion, Report Writing, Class Performance	2010
232	Environment, Sustainability & Resource Economics	DECO2703	Bachelor of Arts (Honors/ Honors with Research) in Economics	Quiz, Case Discussion, Report Writing, Class Performance	2010
233	Basics of Research Methodology, Ethics and Research Communication	DECO2739	Bachelor of Arts (Honors/ Honors with Research) in Economics	Quiz, Case Discussion, Report Writing, Class Performance	2010
234	SIP/Internship/ Project/ Dissertation/Field Visit	NECO2737	Bachelor of Arts (Honors/ Honors with Research) in Economics	Project writing, Presentation, Viva-Voce	2010
235	Advanced Econometrics	DECO2801	Bachelor of Arts (Honors/ Honors with Research) in Economics	Quiz, Case Discussion, Report Writing, Class Performance	2010
236	Data Analysis Using Statistical Software	DECO2802	Bachelor of Arts (Honors/ Honors with Research) in Economics	Quiz, Case Discussion, Report Writing, Class Performance	2010
237	Health and Gender Economics	DECO2804	Bachelor of Arts (Honors/ Honors with Research) in Economics	Quiz, Case Discussion, Report Writing, Class Performance	2010
238	SIP/Internship/ Project/ Dissertation/Field Visit	NECO2837	Bachelor of Arts (Honors/ Honors with Research) in Economics	Project writing, Presentation, Viva-Voce	2010

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
239	Data Analysis & Visualisation using Software	DECO2839	Bachelor of Arts (Honors/ Honors with Research) in Economics	Written Test, Presentation, Viva-Voce	2010
240	Computer Application in Economic Analysis	ECO4103	Master of Arts (Economics)	Quiz, Case Discussion, Report Writing, Class Performance	2012
241	Indian Economy-Issues & Policy	ECO4105	Master of Arts (Economics)	Quiz, Case Discussion, Report Writing, Class Performance	2012
242	Term Paper/Review of Dissertation-I	ECO4231	Master of Arts (Economics)	Academic writing, Presentation, Viva-Voce	2012
243	Fundamentals of Econometrics	ECO4301	Master of Arts (Economics)	Quiz, Case Discussion, Report Writing, Class Performance	2012
244	Research Methods in Economics	ECO4303	Master of Arts (Economics)	Quiz, Case Discussion, Report Writing, Class Performance	2012
245	Term Paper/Review of Dissertation-II	ECO4331	Master of Arts (Economics)	Academic writing, Presentation, Viva-Voce	2012
246	Summer Internship Evaluation	ECO4335	Master of Arts (Economics)	Report Writing, Presentation, Viva-Voce	2012
247	Environmental Economics	ECO4309	Master of Arts (Economics)	Quiz, Case Discussion, Report Writing, Class Performance	2012
248	Dissertation	ECO4437	Master of Arts (Economics)	Report Writing, Presentation, Viva-Voce	2012
249	Entrepreneurship & Small Scale Business	ECO4404	Master of Arts (Economics)	Quiz, Case Discussion, Report Writing, Class Performance	2012
250	Management Foundations	MGT2151	Management (OE)	Quiz, Presentation, Group Discussion	2013
251	Marketing Management	MGT2251	Management (OE)	Quiz, Presentation, Group Discussion	2013
252	Organizational Behaviour	MGT2351	Management (OE)	Quiz, Presentation, Group Discussion	2013
253	Business Environment	MGT2451	Management (OE)	Quiz, Presentation, Group Discussion	2013
254	Operations Research	MGT2551	Management (OE)	Quiz, Presentation, Group Discussion	2013
255	Business Law	MGT2651	Management (OE)	Quiz, Presentation, Group Discussion	2013
256	Orientation Programme in Entrepreneurship	MGT2152	Entrepreneurship (OE)	Quiz, Presentation, Group Discussion	2018
257	Exploring Business Opportunity	MGT2252	Entrepreneurship (OE)	Quiz, Presentation, Group Discussion	2018
258	Developing a Business Model	MGT2352	Entrepreneurship (OE)	Quiz, Presentation, Group Discussion	2018
259	Translating Business Model into Startup	MGT2452	Entrepreneurship (OE)	Quiz, Presentation, Group Discussion	2018
260	Advanced Programme in Entrepreneurship: Growth	MGT2552	Entrepreneurship (OE)	Quiz, Presentation, Group Discussion	2018
261	Advanced Programme in Entrepreneurship: Expansion	MGT2652	Entrepreneurship (OE)	Quiz, Presentation, Group Discussion	2018
262	Micro Economics-I	ECO2151	Economics (OE)	Quiz, Case Discussion, Report Writing, Class Performance	2013
263	Indian Economy	ECO2251	Economics (OE)	Quiz, Case Discussion, Report Writing, Class Performance	2013

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
264	Macro Economics –I	ECO2351	Economics (OE)	Quiz, Case Discussion, Report Writing, Class Performance	2013
265	Public Finance	ECO2451	Economics (OE)	Quiz, Case Discussion, Report Writing, Class Performance	2013
266	Statistical Methods in Economics	ECO2552	Economics (OE)	Quiz, Case Discussion, Report Writing, Class Performance	2013
267	Money, Banking & Financial Markets	ECO2651	Economics (OE)	Quiz, Case Discussion, Report Writing, Class Performance	2016
268	Military Training Foundation	GEN2051	Military Training Foundation (OE)	Quiz, Group Discussion, Group Presentation, Viva-Voce	2015
269	Business and Economic Laws	DCOM2201	Bachelor of Commerce (Honors/ Honors with Research)	Quiz, Case Discussion, Report Writing, Class Performance	2010
270	Corporate Accounting	DCOM2351	Bachelor of Commerce (Honors/ Honors with Research)	Quiz, Case Discussion, Report Writing, Class Performance	2010
271	Advanced Excel for Managers	SMGT2301	Bachelor of Commerce (Honors/ Honors with Research)	Quiz, Case Discussion, Report Writing, Class Performance	2010
272	Community Engagement Services	NCOM2335	Bachelor of Commerce (Honors/ Honors with Research)	Report Writing, Presentation, Viva-Voce	2010
273	Income Tax Law and Practice	DCOM2401	Bachelor of Commerce (Honors/ Honors with Research)	Quiz, Case Discussion, Report Writing, Class Performance	2010
274	Data Interpretation and Visualisation	SMGT2401	Bachelor of Commerce (Honors/ Honors with Research)	Quiz, Case Discussion, Report Writing, Class Performance	2010
275	Auditing	DCOM2501	Bachelor of Commerce (Honors/ Honors with Research)	Quiz, Case Discussion, Report Writing, Class Performance	2010
276	Principles of Marketing	DCOM2502	Bachelor of Commerce (Honors/ Honors with Research)	Quiz, Case Discussion, Report Writing, Class Performance	2010
277	SIP/Internship/ Project/ Dissertation/Field Visit	NCOM2537	Bachelor of Commerce (Honors/ Honors with Research)	Report Writing, Presentation, Viva-Voce	2010
278	Management Accounting	DCOM2651	Bachelor of Commerce (Honors/ Honors with Research)	Quiz, Case Discussion, Report Writing, Class Performance	2010
279	Business Mathematics	DCOM2701	Bachelor of Commerce (Honors/ Honors with Research)	Quiz, Case Discussion, Report Writing, Class Performance	2010
280	Advance Accounting	DCOM2704	Bachelor of Commerce (Honors/ Honors with Research)	Quiz, Case Discussion, Report Writing, Class Performance	2010
281	Business Taxation	DCOM2705	Bachelor of Commerce (Honors/ Honors with Research)	Quiz, Case Discussion, Report Writing, Class Performance	2010

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
282	Corporate Tax Law & Practice	DCOM2706	Bachelor of Commerce (Honors/ Honors with Research)	Quiz, Case Discussion, Report Writing, Class Performance	2010
283	Basics of Research Methodology, Ethics and Research Communication	DCOM2739	Bachelor of Commerce (Honors/ Honors with Research)	Quiz, Case Discussion, Report Writing, Class Performance	2010
284	SIP/Internship/ Project/ Dissertation/Field Visit	NCOM2737	Bachelor of Commerce (Honors/ Honors with Research)	Report Writing, Presentation, Viva-Voce	2010
285	Statistical Methods in Research	DCOM2801	Bachelor of Commerce (Honors/ Honors with Research)	Quiz, Case Discussion, Report Writing, Class Performance	2010
286	Entrepreneurship Development	DCOM2802	Bachelor of Commerce (Honors/ Honors with Research)	Quiz, Case Discussion, Report Writing, Class Performance	2010
287	Advanced Cost Accounting	DCOM2803	Bachelor of Commerce (Honors/ Honors with Research)	Quiz, Case Discussion, Report Writing, Class Performance	2010
288	Recent Trends in Accounting	DCOM2804	Bachelor of Commerce (Honors/ Honors with Research)	Quiz, Case Discussion, Report Writing, Class Performance	2010
289	Indirect Taxes with GST	DCOM2805	Bachelor of Commerce (Honors/ Honors with Research)	Quiz, Case Discussion, Report Writing, Class Performance	2010
290	Public Finance & Tax Practices	DCOM2806	Bachelor of Commerce (Honors/ Honors with Research)	Quiz, Case Discussion, Report Writing, Class Performance	2010
291	SIP/Internship/ Project/ Dissertation/Field Visit	NCOM2837	Bachelor of Commerce (Honors/ Honors with Research)	Report Writing, Presentation, Viva-Voce	2010
292	Data Analysis & Visualisation using Software	DCOM2839	Bachelor of Commerce (Honors/ Honors with Research)	Written Test, Presentation, Viva-Voce	2010
293	Quantitative Techniques for Business Decisions	COM4102	Master of Commerce	Quiz, Group Discussion, Presentation, Viva Voce	2013
294	Auditing	COM4105	Master of Commerce	Quiz, Group Discussion, Presentation, Viva Voce	2013
295	Computer Applications in Business	COM4106	Master of Commerce	Quiz, Group Discussion, Presentation, Viva Voce	2013
296	Managerial Accounting	COM4201	Master of Commerce	Quiz, Group Discussion, Presentation, Viva Voce	2013
297	Corporate Accounting	COM4203	Master of Commerce	Quiz, Group Discussion, Presentation, Viva Voce	2013
298	E-Commerce	COM4205	Master of Commerce	Quiz, Group Discussion, Presentation, Viva Voce	2013
299	Corporate Law	COM4301	Master of Commerce	Quiz, Group Discussion, Presentation, Viva Voce	2013
300	Cost Accounting	COM4302	Master of Commerce	Quiz, Group Discussion, Presentation, Viva Voce	2013
301	Advance Business Statistics & Research Methodology	COM4303	Master of Commerce	Quiz, Group Discussion, Presentation, Viva Voce	2013

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
302	Income Tax Law & Practice	COM4304	Master of Commerce	Quiz, Group Discussion, Presentation, Viva Voce	2013
303	Summer Internship Evaluation	COM4335	Master of Commerce	Report Writing, Presentation, Viva-Voce	2013
304	Tax Planning & Tax Management	COM4305	Master of Commerce	Quiz, Group Discussion, Presentation, Viva Voce	2013
305	Advertising and Sales Management	COM4310	Master of Commerce	Quiz, Group Discussion, Presentation, Viva Voce	2013
306	Corporate Tax Planning	COM4402	Master of Commerce	Quiz, Group Discussion, Presentation, Viva Voce	2013
307	Industrial Law	COM4404	Master of Commerce	Quiz, Group Discussion, Presentation, Viva Voce	2013
308	Dissertation	COM4437	Master of Commerce	Report Writing, Presentation, Viva-Voce	2013
309	International Accounting	COM4405	Master of Commerce	Quiz, Group Discussion, Presentation, Viva Voce	2013
310	Principles & Practice of Taxation & Indian Tax System	COM4406	Master of Commerce	Quiz, Group Discussion, Presentation, Viva Voce	2013
311	International Financial Management	COM4408	Master of Commerce	Quiz, Group Discussion, Presentation, Viva Voce	2013
312	Marketing Research	COM4409	Master of Commerce	Quiz, Group Discussion, Presentation, Viva Voce	2013
313	Financial Accounting-I	COM2151	Accounting (OE)	Quiz, Group Discussion, Presentation, Viva Voce	2013
314	Financial Accounting-II	COM2251	Accounting (OE)	Quiz, Group Discussion, Presentation, Viva Voce	2013
315	Corporate Accounting	COM2351	Accounting (OE)	Quiz, Group Discussion, Presentation, Viva Voce	2013
316	Financial Management	COM2451	Accounting (OE)	Quiz, Group Discussion, Presentation, Viva Voce	2013
317	Cost Accounting	COM2551	Accounting (OE)	Quiz, Group Discussion, Presentation, Viva Voce	2013
318	Management Accounting	COM2651	Accounting (OE)	Quiz, Group Discussion, Presentation, Viva Voce	2013
319	Food Production Foundation-I	HMC2101	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
320	Food & Beverage Service Foundation-I	HMC2102	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
321	Front Office Foundation	HMC2103	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
322	Housekeeping Foundation	HMC2104	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
323	Application of Computers	HMC2105	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
324	Food Production Foundation Lab-I	HMC2106	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
325	Food & Beverage Service Foundation Lab-I	HMC2107	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
326	Front Office Foundation Lab	HMC2108	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015

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327	Housekeeping Foundation Lab	HMC2109	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
328	Application of Computers Lab	HMC2110	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
329	Field Work Project-I	HMC2111	Bachelor of Hotel Management	Field work, Report writing, Presentation	2015
330	Food Production Foundation-II	HMC2201	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
331	Food & Beverage Service Foundation-II	HMC2202	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
332	Front Office Operation-I	HMC2203	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
333	Housekeeping Operation-I	HMC2204	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
334	Food Science & Nutrition	HMC2205	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
335	Fundamentals of Accounting-I	HMC2206	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
336	Food Production Foundation Lab-II	HMC2207	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
337	Food & Beverage Service Foundation Lab-II	HMC2208	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
338	Front Office Operation Lab-I	HMC2209	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
339	Housekeeping Operation Lab-I	HMC2210	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
340	Field Work Project-II	HMC2211	Bachelor of Hotel Management	Field work, Report writing, Presentation	2015
341	Food Production Operations-I	HMC2301	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
342	Food & Beverage Service Operations-I	HMC2302	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
343	Front Office Operation-II	HMC2303	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
344	Housekeeping Operation-II	HMC2304	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
345	Food Production Operations Lab-I	HMC2308	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
346	Food & Beverage Service Operations Lab-I	HMC2309	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
347	Front Office Operation Lab-II	HMC2310	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
348	Housekeeping Operation Lab-II	HMC2311	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
349	Food Production Operations-II	HMC2401	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
350	Food & Beverage Service Operations-II	HMC2402	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
351	Front Office Management-I	HMC2403	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
352	Housekeeping Management-I	HMC2404	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
353	Food Production Operations Lab-II	HMC2408	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
354	Food & Beverage Service Operations Lab-II	HMC2409	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
355	Front Office Management Lab	HMC2410	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
356	Housekeeping Management Lab	HMC2411	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
357	Food Production Training Report	HMC2501	Bachelor of Hotel Management	Field work, Industrial Training, Report Writing, Presentation	2015
358	Food & Beverage Service Training Report	HMC2502	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
359	Front Office Management Training Report	HMC2503	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
360	Housekeeping Management Training Report	HMC2504	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
361	Advanced Food Production Operations-I	HMC2601	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
362	Advanced Food & Beverage Service Operations-I	HMC2602	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
363	Front Office Management-II	HMC2603	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
364	Housekeeping Management-II	HMC2604	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
365	Advanced Food Production Operations Lab-I	HMC2608	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
366	Advanced Food & Beverage Service Operations Lab-I	HMC2609	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
367	Front Office Management Lab-II	HMC2610	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
368	Housekeeping Management Lab-II	HMC2611	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
369	Advanced Food Production-II	HMC2701	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
370	Advanced Food & Beverage Service –II	HMC2702	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
371	Advanced Front Office Management	HMC2703	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
372	Accommodation Management	HMC2704	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
373	Facility Management, Planning & Design	HMC2705	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
374	Entrepreneurship Development	HMC2708	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
375	Event Management	HMC2709	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
376	Advanced Food Production Operations Lab-II	HMC2710	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
377	Advanced Food & Beverage Service Operations Lab-II	HMC2711	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
378	Research Methodology	HMC2803	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
379	Specialization Course Lab	HMC2804	Bachelor of Hotel Management	Practical Classes, Field work, ODC, Industrial Training	2015
380	GDPI Sessions	HMC2805	Bachelor of Hotel Management	Group Discussion, Quiz, Presentation	2015
381	Research Project	HMC2837	Bachelor of Hotel Management	Report Writing, Presentation, Viva-Voce	2015
382	Application of Computers	TRM2106	Bachelor of Tourism & Travel Management	Practical Classes, Field work, ODC, Industrial Training	2015
383	Application of Computers Lab	TRM2107	Bachelor of Tourism & Travel Management	Practical Classes, Field work, ODC, Industrial Training	2015
384	Field Work Project-I	TRM2108	Bachelor of Tourism & Travel Management	Field work, Industrial Training, Report Writing, Presentation	2015
385	Field Work Project-II	TRM2208	Bachelor of Tourism & Travel Management	Field work, Industrial Training, Report Writing, Presentation	2015
386	Tourism Trends in India	TRM2301	Bachelor of Tourism & Travel Management	Practical Classes, Field work, ODC, Industrial Training	2015
387	Transport Management	TRM2302	Bachelor of Tourism & Travel Management	Practical Classes, Field work, ODC, Industrial Training	2015
388	Hospitality Management in Tourism	TRM2303	Bachelor of Tourism & Travel Management	Practical Classes, Field work, ODC, Industrial Training	2015
389	Travel Documentation	TRM2304	Bachelor of Tourism & Travel Management	Practical Classes, Field work, ODC, Industrial Training	2015
390	Tour Packaging Management	TRM2305	Bachelor of Tourism & Travel Management	Practical Classes, Field work, ODC, Industrial Training	2015
391	Automation in Travel and Tourism	TRM2306	Bachelor of Tourism & Travel Management	Practical Classes, Field work, ODC, Industrial Training	2015
392	Itinerary Designing Management	TRM2403	Bachelor of Tourism & Travel Management	Practical Classes, Field work, ODC, Industrial Training	2015
393	Airline Operation Management	TRM2404	Bachelor of Tourism & Travel Management	Practical Classes, Field work, ODC, Industrial Training	2015
394	Industrial Training Project & Practicum	TRM2535	Bachelor of Tourism & Travel Management	Practical Classes, Field work, ODC, Industrial Training	2015
395	DMC Integrated Project	TRM2632	Bachelor of Tourism & Travel Management	Practical Classes, Field work, ODC, Industrial Training	2015
396	Entrepreneurship Development	TRM2707	Bachelor of Tourism & Travel Management	Practical Classes, Field work, ODC, Industrial Training	2015
397	Research Methodology	TRM2802	Bachelor of Tourism & Travel Management	Practical Classes, Field work, ODC, Industrial Training	2015
398	Ethics in Hospitality & Tourism	TRM2803	Bachelor of Tourism & Travel Management	Practical Classes, Field work, ODC, Industrial Training	2015
399	GDPI Sessions	TRM2804	Bachelor of Tourism & Travel Management	Group Discussion, Quiz, Presentation	2015
400	Research Project	TRM2837	Bachelor of Tourism & Travel Management	Report Writing, Presentation, Viva-Voce	2015
401	Basics of Food Service	VHM2152	Food & Beverage Service (OE)	Practical Classes, Field work, ODC, Industrial Training	2016

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
402	Advanced Food Service	VHM2252	Food & Beverage Service (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
403	Beverage Studies- Basic	VHM2352	Food & Beverage Service (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
404	Beverage Studies-Advanced	VHM2452	Food & Beverage Service (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
405	F&B Service Supervisory Skills	VHM2552	Food & Beverage Service (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
406	F&B Management Skills	VHM2652	Food & Beverage Service (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
407	Basics of Food Production	VHM2151	Food Production Techniques (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
408	Food Production Skills	VHM2251	Food Production Techniques (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
409	Food Production Operations	VHM2351	Food Production Techniques (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
410	Advanced Food Production	VHM2451	Food Production Techniques (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
411	Food Production Supervisory Skills	VHM2551	Food Production Techniques (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
412	Food Production Management	VHM2651	Food Production Techniques (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
413	Fundamentals of Front Office Operations	VHM2153	Front Office Operations (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
414	Handling Reception	VHM2253	Front Office Operations (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
415	Check-in & Check-out Process	VHM2353	Front Office Operations (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
416	Front Office Supervisory Skills	VHM2453	Front Office Operations (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
417	Front Office Yield Management	VHM2553	Front Office Operations (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
418	Managing Front Office	VHM2653	Front Office Operations (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
419	Basics of Housekeeping	VHM2154	Housekeeping Functions (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
420	Rules for Cleaning	VHM2254	Housekeeping Functions (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
421	Laundry Operations	VHM2354	Housekeeping Functions (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
422	Maintaining Guest Room	VHM2454	Housekeeping Functions (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
423	Housekeeping Supervisory Skills	VHM2554	Housekeeping Functions (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
424	Housekeeping Management Skills	VHM2654	Housekeeping Functions (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
425	Fundamentals of Tourism	VTM2151	Tourism Operations (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
426	Tour Operations & Tourist Guidance	VTM2251	Tourism Operations (OE)	Practical Classes, Field work, ODC, Industrial Training	2016

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
427	Handling Travel Agency	VTM2351	Tourism Operations (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
428	Coordinating Tour Transportations	VTM2451	Tourism Operations (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
429	Tourism Management	VTM2551	Tourism Operations (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
430	Event Planning	VTM2651	Tourism Operations (OE)	Practical Classes, Field work, ODC, Industrial Training	2016
431	Introduction to Hospitality & Tourism-I	DHMC2151	Hospitality & Tourism (OE)	Practical Classes, Field work, ODC, Industrial Training	2023
432	Introduction to Hospitality & Tourism-II	DHMC2251	Hospitality & Tourism (OE)	Practical Classes, Field work, ODC, Industrial Training	2023
433	Supervising Hotel Operations	DHMC2351	Hospitality & Tourism (OE)	Practical Classes, Field work, ODC, Industrial Training	2023
434	Managing Tourism Operations	DHMC2451	Hospitality & Tourism (OE)	Practical Classes, Field work, ODC, Industrial Training	2023
435	Food & Beverage Division Management	DHMC2551	Hospitality & Tourism (OE)	Practical Classes, Field work, ODC, Industrial Training	2023
436	Revenue & Yield Management	DHMC2501	Hospitality & Tourism (OE)	Practical Classes, Field work, ODC, Industrial Training	2023
437	Rooms Division Management	DHMC2651	Hospitality & Tourism (OE)	Practical Classes, Field work, ODC, Industrial Training	2023
438	MICE Management	DHMC2601	Hospitality & Tourism (OE)	Practical Classes, Field work, ODC, Industrial Training	2023
439	Customer Delight & Entrepreneurship Management	DHMC2602	Hospitality & Tourism (OE)	Practical Classes, Field work, ODC, Industrial Training	2023
440	Introduction to Psychology	DPSY2151	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
441	Experimental Psychology	DPSY2101	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
442	Practicals-I	DPSY2102	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Practical, Presentation, Class Performance, Lab Report,	2011
443	Social Psychology	DPSY2251	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
444	Elementary Statistics	DPSY2201	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
445	Practicals-II	DPSY2202	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Practical, Presentation, Class Performance, Lab Report,	2011
446	Cognitive Psychology	DPSY2351	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
447	Research Methods & Advanced Statistics	DPSY2301	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
448	Practicals-III	DPSY2302	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Practical, Presentation, Class Performance, Lab Report,	2011
449	Psychometric Testing	SPSY2301	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
450	Community Engagement Services	NPSY2335	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Project writing, Presentation, Viva-Voce	2011
451	Abnormal Psychology	DPSY2451	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
452	Personality	DPSY2401	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
453	Practicals-IV	DPSY2402	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Practical, Presentation, Class Performance, Lab Report,	2011
454	Psychological Tools Development for Clinical Psychology	SPSY2401	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
455	Developmental Psychology	DPSY2551	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
456	Health Psychology	DPSY2501	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
457	Practicals-V	DPSY2502	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Practical, Presentation, Class Performance, Lab Report,	2011
458	Positive Psychology	DPSY2503	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
459	Physiological Psychology	DPSY2504	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
460	SIP/Internship/ Project/ Dissertation/Field Visit	NPSY2537	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Project writing, Presentation, Viva-Voce	2011
461	Clinical Psychology	DPSY2601	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
462	Gender Psychology	DPSY2602	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
463	Guidance & Counselling Psychology	DPSY2651	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
464	Artificial Intelligence & Cyber Psychology	DPSY2604	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
465	Advanced Statistics (Parametric + Non Parametric)	DPSY2701	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
466	SIP/Internship/ Project/ Dissertation/Field Visit	NPSY2737	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Project writing, Presentation, Viva-Voce	2011
467	Psychological Assessment and Diagnosis	DPSY2702	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
468	Practicals-VII	DPSY2703	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Practical, Presentation, Class Performance, Lab Report,	2011
469	Neuropsychology	DPSY2704	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
470	Forensic Psychology	DPSY2705	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
471	Psychotherapy	DPSY2706	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
472	Basics of Research Methodology, Ethics and Research Communication	DPSY2739	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
473	Differential Diagnostic Technique	DPSY2801	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
474	Practicals-VIII	DPSY2802	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Practical, Presentation, Class Performance, Lab Report,	2011
475	Rehabilitation Psychology	DPSY2803	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
476	Neurodevelopmental Disabilities	DPSY2804	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
477	Childhood Pathology and Exceptional Children	DPSY2805	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
478	Academic Writings & Research Skills	DPSY2806	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Academic Writing, Presentation, Quiz	2011
479	SIP/Internship/ Project/ Dissertation/Field Visit	NPSY2837	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Project writing, Presentation, Viva-Voce	2011
480	Data Analysis & Visualisation using Software	DPSY2839	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	Written Test, Presentation, Viva-Voce	2011
481	Introduction to Psychology	DPSY2151	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
482	Experimental Psychology	DPSY2101	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
483	Practicals-I	DPSY2102	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Practical, Presentation, Class Performance, Lab Report,	2013
484	Social Psychology	DPSY2251	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
485	Elementary Statistics	DPSY2201	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
486	Practicals-II	DPSY2202	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Practical, Presentation, Class Performance, Lab Report,	2013
487	Cognitive Psychology	DPSY2351	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
488	Research Methods & Advanced Statistics	DPSY2301	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
489	Practicals-III	DPSY2302	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Practical, Presentation, Class Performance, Lab Report,	2013
490	Psychometric Testing	SPSY2301	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
491	Community Engagement Services	NPSY2335	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Project writing, Presentation, Viva-Voce	2013
492	Abnormal Psychology	DPSY2451	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
493	Personality	DPSY2401	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
494	Practicals-IV	DPSY2402	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Practical, Presentation, Class Performance, Lab Report,	2013
495	Psychological Tools Development for Clinical Psychology	SPSY2401	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
496	Developmental Psychology	DPSY2551	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
497	Health Psychology	DPSY2501	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
498	Practicals-V	DPSY2502	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Practical, Presentation, Class Performance, Lab Report,	2013

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
499	Positive Psychology	DPSY2503	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
500	Physiological Psychology	DPSY2504	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
501	SIP/Internship/ Project/ Dissertation/Field Visit	NPSY2537	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Project writing, Presentation, Viva-Voce	2013
502	Clinical Psychology	DPSY2601	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
503	Gender Psychology	DPSY2602	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
504	Guidance & Counselling Psychology	DPSY2651	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
505	Artificial Intelligence & Cyber Psychology	DPSY2604	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
506	Advanced Statistics (Parametric + Non Parametric)	DPSY2701	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
507	SIP/Internship/ Project/ Dissertation/Field Visit	NPSY2737	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Project writing, Presentation, Viva-Voce	2013
508	Psychological Assessment and Diagnosis	DPSY2702	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
509	Practicals-VII	DPSY2703	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Practical, Presentation, Class Performance, Lab Report,	2013
510	Neuropsychology	DPSY2704	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
511	Forensic Psychology	DPSY2705	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
512	Psychotherapy	DPSY2706	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
513	Basics of Research Methodology, Ethics and Research Communication	DPSY2739	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
514	Differential Diagnostic Technique	DPSY2801	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
515	Practicals-VIII	DPSY2802	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Practical, Presentation, Class Performance, Lab Report,	2013

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
516	Rehabilitation Psychology	DPSY2803	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
517	Neurodevelopmental Disabilities	DPSY2804	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
518	Childhood Pathology and Exceptional Children	DPSY2805	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
519	Academic Writings & Research Skills	DPSY2806	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Academic Writing, Presentation, Quiz	2013
520	SIP/Internship/ Project/ Dissertation/Field Visit	NPSY2837	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Project writing, Presentation, Viva-Voce	2013
521	Data Analysis & Visualisation using Software	DPSY2839	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	Written Test, Presentation, Viva-Voce	2013
522	Cognitive Psychology	PSY4102	Master of Arts (Counselling Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2012
523	Parametric Statistical Method	PSY4105	Master of Arts (Counselling Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2012
524	Practicum - I	PSY4106	Master of Arts (Counselling Psychology)	Practical, Presentation, Class Performance, Lab Report,	2012
525	Field Practice-I	PSY4107	Master of Arts (Counselling Psychology)	Practical, Presentation, Class Performance, Lab Report,	2012
526	Psychopathology	PSY4201	Master of Arts (Counselling Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2012
527	Psychological Assessment and Diagnosis	PSY4202	Master of Arts (Counselling Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2012
528	Non-Parametric Statistical Method	PSY4204	Master of Arts (Counselling Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2012
529	Positive Psychology	PSY4206	Master of Arts (Counselling Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2012
530	Practicum - II	PSY4207	Master of Arts (Counselling Psychology)	Practical, Presentation, Class Performance, Lab Report,	2012
531	Field Practice-II	PSY4208	Master of Arts (Counselling Psychology)	Practical, Presentation, Class Performance, Lab Report,	2012
532	Scientific Research Paper	PSY4209	Master of Arts (Counselling Psychology)	Report Writing, Presentation, Viva-Voce	2012
533	Research Methods: Experimental Design	PSY4301	Master of Arts (Counselling Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2012

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
534	Psychotherapy	PSY4302	Master of Arts (Counselling Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2012
535	Counseling Psychology	PSY4304	Master of Arts (Counselling Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2012
536	Practicum-III	PSY4308	Master of Arts (Counselling Psychology)	Practical, Presentation, Class Performance, Lab Report,	2012
537	Field Practice-III	PSY4309	Master of Arts (Counselling Psychology)	Practical, Presentation, Class Performance, Lab Report,	2012
538	Summer Internship Evaluation	PSY4335	Master of Arts (Counselling Psychology)	Report Writing, Presentation, Viva-Voce	2012
539	Clinical Psychology	PSY4303	Master of Arts (Counselling Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2012
540	Developmental Psychology	PSY4305	Master of Arts (Counselling Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2012
541	Research Methods: Non-Experimental Design	PSY4401	Master of Arts (Counselling Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2012
542	Advance and Applied Counselling Skills	PSY4403	Master of Arts (Counselling Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2012
543	Practicum-IV	PSY4412	Master of Arts (Counselling Psychology)	Practical, Presentation, Class Performance, Lab Report,	2012
544	Field Practice-IV	PSY4413	Master of Arts (Counselling Psychology)	Practical, Presentation, Class Performance, Lab Report,	2012
545	Dissertation	PSY4437	Master of Arts (Counselling Psychology)	Report Writing, Presentation, Viva-Voce	2012
546	Mental Retardation	PSY4402	Master of Arts (Counselling Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2012
547	Childhood Pathology and Exceptional Children	PSY4405	Master of Arts (Counselling Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2012
548	Employee Counselling and Empowerment	PSY4409	Master of Arts (Counselling Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2012
549	Organizational Behaviour and Industrial Relations	PSY4410	Master of Arts (Counselling Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2012
550	Psychological Practices in Personnel & Human Resource Management	PSY4411	Master of Arts (Counselling Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2012
551	Parametric Statistical Method	PSY4105	Master of Arts (Applied Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
552	Practicum-I	PSY4106	Master of Arts (Applied Psychology)	Practical, Presentation, Class Performance, Lab Report,	2016

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
553	Field Practice-I	PSY4107	Master of Arts (Applied Psychology)	Practical, Presentation, Class Performance, Lab Report,	2016
554	Psychopathology	PSY4201	Master of Arts (Applied Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
555	Psychological Assessment & Diagnosis	PSY4202	Master of Arts (Applied Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
556	Non-Parametric Statistical Methods	PSY4204	Master of Arts (Applied Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
557	Practicum-II	PSY4207	Master of Arts (Applied Psychology)	Practical, Presentation, Class Performance, Lab Report,	2016
558	Field Practice-II	PSY4208	Master of Arts (Applied Psychology)	Practical, Presentation, Class Performance, Lab Report,	2016
559	Scientific Research Paper	PSY4209	Master of Arts (Applied Psychology)	Report Writing, Presentation, Viva-Voce	2016
560	Applied Psychotherapy	PSY4310	Master of Arts (Applied Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
561	Research Methods in Applied Psychology	PSY4311	Master of Arts (Applied Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
562	Interviewing & Counselling Skills	PSY4312	Master of Arts (Applied Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
563	Practicum-III	PSY4308	Master of Arts (Applied Psychology)	Practical, Presentation, Class Performance, Lab Report,	2016
564	Field Practice-III	PSY4309	Master of Arts (Applied Psychology)	Practical, Presentation, Class Performance, Lab Report,	2016
565	Summer Internship Evaluation	PSY4335	Master of Arts (Applied Psychology)	Report Writing, Presentation, Viva-Voce	2016
566	Applied Psychophysiology & Biofeedback	PSY4313	Master of Arts (Applied Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
567	Human Factors Psychology & Ergonomics	PSY4314	Master of Arts (Applied Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
568	Forensic & Legal Psychology	PSY4315	Master of Arts (Applied Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
569	Community Psychology	PSY4316	Master of Arts (Applied Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
570	Psychological Practices in Personnel & Human Resource Management	PSY4317	Master of Arts (Applied Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
571	Rehabilitation Psychology	PSY4404	Master of Arts (Applied Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016

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572	Psychometrics	PSY4415	Master of Arts (Applied Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
573	Practicum-IV	PSY4412	Master of Arts (Applied Psychology)	Practical, Presentation, Class Performance, Lab Report,	2016
574	Field Practice-IV	PSY4413	Master of Arts (Applied Psychology)	Practical, Presentation, Class Performance, Lab Report,	2016
575	Dissertation	PSY4437	Master of Arts (Applied Psychology)	Report Writing, Presentation, Viva-Voce	2016
576	Employee Counselling & Empowerment	PSY4409	Master of Arts (Applied Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
577	Psychology of Selling, Marketing & Advertising	PSY4416	Master of Arts (Applied Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
578	Psychology of Criminal Behaviour & Criminal Profiling	PSY4417	Master of Arts (Applied Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
579	Guidance & Counselling	PSY4419	Master of Arts (Applied Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
580	Parametric Statistical Method	PSY4105	Master of Science (Clinical Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
581	Practicum-I	PSY4106	Master of Science (Clinical Psychology)	Practical, Presentation, Class Performance, Lab Report,	2011
582	Field Practice-I	PSY4107	Master of Science (Clinical Psychology)	Practical, Presentation, Class Performance, Lab Report,	2011
583	Psychopathology	PSY4201	Master of Science (Clinical Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
584	Psychological Assessment and Diagnosis	PSY4202	Master of Science (Clinical Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
585	Non-Parametric Statistical Method	PSY4204	Master of Science (Clinical Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
586	Health Psychology	PSY4205	Master of Science (Clinical Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
587	Practicum-II	PSY4207	Master of Science (Clinical Psychology)	Practical, Presentation, Class Performance, Lab Report,	2011
588	Field Practice-II	PSY4208	Master of Science (Clinical Psychology)	Practical, Presentation, Class Performance, Lab Report,	2011
589	Scientific Research Paper	PSY4209	Master of Science (Clinical Psychology)	Report Writing, Presentation, Viva-Voce	2011
590	Research Methods: Experimental Design	PSY4301	Master of Science (Clinical Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
591	Psychotherapy	PSY4302	Master of Science (Clinical Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
592	Clinical Psychology	PSY4303	Master of Science (Clinical Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
593	Practicum – III	PSY4308	Master of Science (Clinical Psychology)	Practical, Presentation, Class Performance, Lab Report,	2011
594	Field Practice-III	PSY4309	Master of Science (Clinical Psychology)	Practical, Presentation, Class Performance, Lab Report,	2011
595	Summer Internship Evaluation	PSY4335	Master of Science (Clinical Psychology)	Report Writing, Presentation, Viva-Voce	2011
596	Counselling Psychology	PSY4304	Master of Science (Clinical Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
597	Neuro Psychology	PSY4306	Master of Science (Clinical Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
598	Research Methods: Non-Experimental Design	PSY4401	Master of Science (Clinical Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
599	Mental Retardation	PSY4402	Master of Science (Clinical Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
600	Practicum-IV	PSY4412	Master of Science (Clinical Psychology)	Practical, Presentation, Class Performance, Lab Report,	2011
601	Field Practice-IV	PSY4413	Master of Science (Clinical Psychology)	Practical, Presentation, Class Performance, Lab Report,	2011
602	Dissertation	PSY4437	Master of Science (Clinical Psychology)	Report Writing, Presentation, Viva-Voce	2011
603	Rehabilitation Psychology	PSY4404	Master of Science (Clinical Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
604	Childhood Pathology and Exceptional Children	PSY4405	Master of Science (Clinical Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
605	Psychotherapeutic Intervention in Clinical setting	PSY4406	Master of Science (Clinical Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
606	Differential Diagnostic Techniques	PSY4407	Master of Science (Clinical Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
607	Community Psychology and Intervention	PSY4408	Master of Science (Clinical Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2011
608	Basics of Social Work	SCW4102	Master of Social Work	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
609	Work with Individuals & Families: Social Case Work	SCW4103	Master of Social Work	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
610	Working with Groups: Social Group Work	SCW4104	Master of Social Work	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
611	Research Methods in Social Work: Quantitative Approach	SCW4105	Master of Social Work	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
612	Field Work Practicum-I	SCW4107	Master of Social Work	Practical, Presentation, Class Performance, Lab Report,	2016
613	Social Policy & Social Welfare Administration	SCW4201	Master of Social Work	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
614	Social Work with Communities	SCW4202	Master of Social Work	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
615	Community Organization & Social Action	SCW4204	Master of Social Work	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
616	Research Methods in Social Work: Qualitative Approach	SCW4205	Master of Social Work	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
617	Skill Based Project	SCW4206	Master of Social Work	Report Writing, Presentation, Viva-Voce	2016
618	Field Work Practicum-II	SCW4207	Master of Social Work	Practical, Presentation, Class Performance, Lab Report,	2016
619	Social Justice & Empowerment	SCW4302	Master of Social Work	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
620	Communication & Counselling	SCW4303	Master of Social Work	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
621	Field Work Practicum-III	SCW4304	Master of Social Work	Practical, Presentation, Class Performance, Lab Report,	2016
622	Summer Internship Evaluation	SCW4335	Master of Social Work	Report Writing, Presentation, Viva-Voce	2016
623	Human Resource Development & Employee Wellness	SCW4305	Master of Social Work	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
624	Mental Health & Psychiatric Social Work	SCW4306	Master of Social Work	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
625	Social Work with Families & Children	SCW4307	Master of Social Work	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
626	Correctional Administration & Services	SCW4308	Master of Social Work	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
627	Management of Development & Welfare Services	SCW4310	Master of Social Work	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016

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628	Human Rights & Social Work Practice	SCW4401	Master of Social Work	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
629	Social Work with Urban, Rural & Tribal Communities	SCW4403	Master of Social Work	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
630	Field Work Practicum-IV	SCW4404	Master of Social Work	Practical, Presentation, Class Performance, Lab Report,	2016
631	Dissertation	SCW4437	Master of Social Work	Report Writing, Presentation, Viva-Voce	2016
632	Social Work with PWD	SCW4407	Master of Social Work	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
633	Social Work with HIV/AIDS	SCW4408	Master of Social Work	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
634	Disaster Management	SCW4410	Master of Social Work	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
635	Psychosocial Foundation of Behaviour & Psychopathology	PSY5101	M.Phil (Clinical Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
636	Psychiatry	PSY5103	M.Phil (Clinical Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
637	Practical: Psychological Assessment including Viva-Voce	PSY5104	M.Phil (Clinical Psychology)	Practical, Presentation, Class Performance, Lab Report,	2016
638	Statistics & Research Methodology	PSY5106	M.Phil (Clinical Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
639	Submission of Psychodiagnostic Records	PSY5105	M.Phil (Clinical Psychology)	Report Writing, Presentation, Viva-Voce	2016
640	Psychotherapy & Counselling	PSY5301	M.Phil (Clinical Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
641	Behavioural Medicine	PSY5302	M.Phil (Clinical Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
642	Practical: Psychological Therapies including Viva-Voce	PSY5304	M.Phil (Clinical Psychology)	Practical, Presentation, Class Performance, Lab Report,	2016
643	Biological Foundation of Behaviour	PSY5306	M.Phil (Clinical Psychology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2016
644	Submission of Psychotherapy Records	PSY5305	M.Phil (Clinical Psychology)	Report Writing, Presentation, Viva-Voce	2016
645	Dissertation	PSY5337	M.Phil (Clinical Psychology)	Report Writing, Presentation, Viva-Voce	2016
646	Psychosocial Perspectives of Mental Disorders	PCP3101	Professional Diploma in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2022

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
647	Counseling and Therapy	PCP3102	Professional Diploma in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2022
648	Psychiatry	PCP3103	Professional Diploma in Clinical Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2022
649	Practical-I: Psychological Assessment including Viva-Voce	PCP3104	Professional Diploma in Clinical Psychology	Practical, Presentation, Class Performance, Lab Report,	2022
650	Practical-II: Psychological Interventions including Viva-Voce	PCP3105	Professional Diploma in Clinical Psychology	Practical, Presentation, Class Performance, Lab Report,	2022
651	Submission-I: Psychodiagnostic Records	PCP3106	Professional Diploma in Clinical Psychology	Report Writing, Presentation, Viva-Voce	2022
652	Submission-II: Psychotherapy Records	PCP3107	Professional Diploma in Clinical Psychology	Report Writing, Presentation, Viva-Voce	2022
653	Disability and Rehabilitation	PRP3101	Postgraduate Diploma in Rehabilitation Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2023
654	Psychosocial Issues in Disability	PRP3102	Postgraduate Diploma in Rehabilitation Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2023
655	Rehabilitation Assessment and Counseling	PRP3103	Postgraduate Diploma in Rehabilitation Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2023
656	Community Based Rehabilitation	PRP3104	Postgraduate Diploma in Rehabilitation Psychology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2023
657	Practical: Rehabilitation Interventions and Viva-voce	PRP3105	Postgraduate Diploma in Rehabilitation Psychology	Practical, Presentation, Class Performance, Lab Report,	2023
658	Submission of five fully worked-out Rehabilitation Counseling Records	PRP3106	Postgraduate Diploma in Rehabilitation Psychology	Report Writing, Presentation, Viva-Voce	2023
659	Understanding Self for Effectiveness	BEH2151	Behavioural Science (OE)	Social Awareness Programme (SAP), Journal for Success, Quiz, Presentation	2010
660	Problem Solving and Creative Thinking	BEH2251	Behavioural Science (OE)	Social Awareness Programme (SAP), Journal for Success, Quiz, Presentation	2010
661	Group Dynamics and Team Building	BEH2351	Behavioural Science (OE)	Social Awareness Programme (SAP), Journal for Success, Quiz, Presentation	2010
662	Stress and Coping Strategies	BEH2451	Behavioural Science (OE)	Social Awareness Programme (SAP), Journal for Success, Quiz, Presentation	2010
663	Individual, Society and Nations	BEH2551	Behavioural Science (OE)	Social Awareness Programme (SAP), Journal for Success, Quiz, Presentation	2010
664	Interpersonal Communication and Relationship Management	BEH2651	Behavioural Science (OE)	Social Awareness Programme (SAP), Journal for Success, Quiz, Presentation	2010
665	Personality, Nationalism and Human Values	BEH2552	Behavioural Science (OE)	Social Awareness Programme (SAP), Journal for Success, Quiz, Presentation	2010

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666	Interpersonal Communication	BEH2652	Behavioural Science (OE)	Social Awareness Programme (SAP), Journal for Success, Quiz, Presentation	2010
667	Relationship Management	BEH2751	Behavioural Science (OE)	Social Awareness Programme (SAP), Journal for Success, Quiz, Presentation	2010
668	Personal & Professional Excellence	BEH2851	Behavioural Science (OE)	Social Awareness Programme (SAP), Journal for Success, Quiz, Presentation	2010
669	Self-Development and Interpersonal Skills	BEH4151	Behavioural Science (OE)	Social Awareness Programme (SAP), Journal for Success, Quiz, Presentation	2010
670	Behavioural Communication and Relationship Management	BEH4251	Behavioural Science (OE)	Social Awareness Programme (SAP), Journal for Success, Quiz, Presentation	2010
671	Leading Through Teams	BEH4351	Behavioural Science (OE)	Social Awareness Programme (SAP), Journal for Success, Quiz, Presentation	2010
672	Professional Excellence	BEH4451	Behavioural Science (OE)	Social Awareness Programme (SAP), Journal for Success, Quiz, Presentation	2010
673	Introductory Psychology	PSY2151	Psychology (OE)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
674	Abnormal Psychology	PSY2251	Psychology (OE)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
675	Basic Cognitive Psychology	PSY2351	Psychology (OE)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
676	Life Span Development	PSY2451	Psychology (OE)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
677	Psychometric Testing	PSY2551	Psychology (OE)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
678	Counselling Psychology	PSY2651	Psychology (OE)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2013
679	The Science of Happiness	PSY2152	Positive Psychology (OE)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2017
680	Optimism and Success	PSY2252	Positive Psychology (OE)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2017
681	Resilience and Well Being	PSY2352	Positive Psychology (OE)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2017
682	Positive Psychology & Work Life	PSY2452	Positive Psychology (OE)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2017

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
683	Creativity & Problem Solving	PSY2552	Positive Psychology (OE)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2017
684	Positive Leadership & Competency Development	PSY2652	Positive Psychology (OE)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2017
685	Introduction to Social Work	SCW2151	Social Work (OE)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2023
686	Working with Individual Social Casework	SCW2251	Social Work (OE)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2023
687	Working with Groups- Social Group Work	SCW2351	Social Work (OE)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2023
688	Community Organization & Development	SCW2451	Social Work (OE)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2023
689	Social Action & Social Movements	SCW2551	Social Work (OE)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2023
690	Social Welfare Administration & Social Work Research	SCW2651	Social Work (OE)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2023
691	Introduction to Computers & Programming in C	ASE2105	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
692	Programming in C Lab	ASE2110	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
693	Workshop Technology	ASE2215	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
694	Engineering Graphics Lab	ASE2212	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
695	Engineering Mechanics Lab	ASE2218	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
696	Strength of Materials	ASE2315	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
697	Fluid Mechanics and Dynamics	ASE2322	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
698	Strength of Materials Lab	ASE2317	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
699	Fluid Mechanics and Dynamics Lab	ASE2323	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
700	Aircraft Manufacturing Processes	ASE2324	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
701	Numerical Analysis and Programming	ASE2412	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
702	Aircraft Propulsion	ASE2416	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
703	Aerospace Structures-I	ASE2417	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
704	Low Speed Aerodynamics Lab	ASE2419	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
705	Aircraft Propulsion Lab	ASE2420	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
706	Numerical Analysis and Programming Lab using MATLAB	ASE2421	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
707	Fuels & Combustion	ASE2422	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
708	Control Systems	ASE2423	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
709	Mechatronics	ASE2424	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
710	Turbomachinery	ASE2510	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
711	High Speed Aerodynamics	ASE2511	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
712	Aerospace Structures-II	ASE2512	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
713	Flight Mechanics	ASE2513	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
714	Computer Aided Drafting Lab	ASE2514	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
715	Structural Analysis Lab	ASE2515	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
716	Summer Internship Evaluation-I	ASE2535	Bachelor of Technology (Aerospace Engineering)	Report Writing, Presentation, Viva-Voce	2011
717	Aircraft Systems and Instrumentation	ASE2517	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
718	Aircraft Maintenance & Quality Assurance	ASE2609	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
719	Computational Fluid Dynamics	ASE2613	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
720	Aerospace Materials	ASE2614	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
721	Aircraft Stability & Control	ASE2651	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
722	Computational Fluid Dynamics Lab	ASE2612	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
723	Aeromodelling Lab	ASE2615	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
724	Minor Project	ASE2637	Bachelor of Technology (Aerospace Engineering)	Project writing, Presentation, Viva-Voce	2011
725	Finite Element Method	ASE2618	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
726	Flight Dynamics	ASE2702	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
727	Aircraft Design	ASE2709	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
728	Vibration Engineering	ASE2713	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011

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729	Vibration Engineering Lab	ASE2714	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
730	Summer Internship Evaluation-II	ASE2735	Bachelor of Technology (Aerospace Engineering)	Report Writing, Presentation, Viva-Voce	2011
731	Major Project	ASE2737	Bachelor of Technology (Aerospace Engineering)	Report Writing, Presentation, Viva-Voce	2011
732	Aerospace Navigation, Guidance and Control	ASE2812	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
733	Project-Dissertation	ASE2837	Bachelor of Technology (Aerospace Engineering)	Report Writing, Presentation, Viva-Voce	2011
734	Aeroelasticity	ASE2813	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
735	Aerospace Industrial Management	ASE2814	Bachelor of Technology (Aerospace Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
736	Introduction to Computers & Programming in C	CIV2105	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
737	Basics of Electrical & Electronics Engineering	CIV2116	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
738	Programming in C Lab	CIV2110	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
739	Basics of Electrical & Electronics Engineering Lab	CIV2117	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
740	Engineering Mechanics	CIV2204	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
741	Workshop Technology	CIV2211	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
742	Engineering Mechanics Lab	CIV2207	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
743	Workshop Practice	CIV2212	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
744	Engineering Graphics Lab	CIV2213	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
745	Surveying-I	CIV2305	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
746	Strength of Materials	CIV2312	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
747	Concrete Technology and Construction	CIV2322	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
748	Strength of Materials Lab	CIV2314	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
749	Surveying Lab-I	CIV2319	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
750	Materials Testing Lab	CIV2320	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
751	Disaster Management & Mitigation	CIV2316	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
752	Engineering Geology	CIV2321	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
753	Introduction to Smart Infrastructure	CIV2323	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010

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754	Transportation Planning and Utility	CIV2324	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
755	Numerical Analysis & Programming	CIV2401	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
756	Structural Analysis-I	CIV2402	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
757	Surveying-II	CIV2411	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
758	Surveying Lab-II	CIV2407	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
759	Hydrology & Flood Control	CIV2415	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
760	Remote Sensing & Geographic Information Systems	CIV2416	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
761	Infrastructure Planning and Management	CIV2419	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
762	Transportation and Environment	CIV2420	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
763	Transportation Engineering-I	CIV2514	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
764	Transportation Engineering Lab	CIV2509	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
765	Structural Analysis Lab	CIV2516	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
766	Summer Internship Evaluation-I	CIV2535	Bachelor of Technology (Civil Engineering)	Report Writing, Presentation, Viva-Voce	2010
767	Sustainable Development in Civil Engineering	CIV2510	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
768	Air and Water Pollution & Control	CIV2511	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
769	Computer Application in Hydro Engineering	CIV2512	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
770	Design of Formwork	CIV2517	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
771	Highway Materials and Construction	CIV2518	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
772	Environmental Engineering-I	CIV2601	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
773	Water Resource Engineering-I	CIV2610	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
774	Concrete Structural Design-II	CIV2612	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
775	Transportation Engineering-II	CIV2613	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
776	Minor Project Work	CIV2637	Bachelor of Technology (Civil Engineering)	Report Writing, Presentation, Viva-Voce	2010
777	Traffic Engineering & Management	CIV2608	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
778	Structural Steel Design	CIV2701	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010

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779	Environmental Engineering-II	CIV2702	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
780	Water Resources Engineering-II	CIV2711	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
781	Environmental Engineering Lab	CIV2704	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
782	Summer Internship Evaluation-II	CIV2735	Bachelor of Technology (Civil Engineering)	Report Writing, Presentation, Viva-Voce	2010
783	Project Work	CIV2737	Bachelor of Technology (Civil Engineering)	Report Writing, Presentation, Viva-Voce	2010
784	Industrial Waste Engineering	CIV2714	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
785	Basics of Optimization Techniques and Mathematical Modeling	CIV2715	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
786	Road Safety Engineering	CIV2717	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
787	Estimation and Costing	CIV2810	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
788	Project-Dissertation	CIV2837	Bachelor of Technology (Civil Engineering)	Report Writing, Presentation, Viva-Voce	2010
789	Solid Waste Management & Recycling	CIV2808	Bachelor of Technology (Civil Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
790	Introduction to Computers & Programming in C	CSE2104	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
791	Programming in C Lab	CSE2107	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
792	Engineering Mechanics	CSE2216	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
793	Basics of Electrical & Electronics Engineering	CSE2217	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
794	Object Oriented Programming using C++	CSE2204	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
795	Object Oriented Programming using C++ Lab	CSE2208	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
796	Basics of Electrical & Electronics Engineering Lab	CSE2218	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
797	Engineering Graphics Lab	CSE2219	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
798	Database Management Systems	CSE2302	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
799	Data Structures using C	CSE2304	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
800	Digital Electronics	CSE2314	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
801	Data Structures Using C Lab	CSE2305	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
802	Database Management Systems Lab	CSE2307	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
803	UNIX Programming Lab	CSE2308	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
804	Digital Electronics Lab	CSE2315	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
805	E-Commerce & ERP	CSE2312	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
806	Software Vulnerability Analysis #	CSE2317	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
807	Basic Network Concepts & Computing Architecture $	CSE2318	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
808	Fundamentals of Blockchain Technology %	CSE2319	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
809	Introduction to IoT @	CSE2320	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
810	Artificial Intelligence	CSE2412	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
811	Artificial Intelligence Lab	CSE2413	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
812	Communication Systems	CSE2414	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
813	Communication Systems Lab	CSE2415	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
814	Web Designing Technologies	CSE2422	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
815	Web Designing Technologies Lab	CSE2423	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010

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816	Distributed System **$**	CSE2426	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
817	Ethereum and Solidity Programming **%**	CSE2427	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
818	Ethereum and Solidity Programming Lab **%**	CSE2428	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
819	IoT Platforms and System Design **@**	CSE2429	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
820	Computer Architecture	CSE2502	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
821	Java Programming	CSE2503	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
822	Java Programming Lab	CSE2505	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
823	Microprocessor Lab	CSE2517	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
824	Summer Internship Evaluation-I	CSE2535	Bachelor of Technology (Computer Science & Engineering)	Report Writing, Presentation, Viva-Voce	2010
825	VHDL Programming Lab	CSE2507	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
826	Advanced Web Designing Technologies	CSE2518	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
827	Advanced Web Designing Technologies Lab	CSE2519	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
828	Big Data with Hadoop Lab #	CSE2520	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
829	High Performance Computing **$**	CSE2521	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
830	Security, Cryptography & Cryptocurrencies **%**	CSE2522	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
831	Introduction to Raspberry Pi **@**	CSE2523	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
832	Introduction to Raspberry Pi Lab **@**	CSE2524	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
833	Advanced Java Programming	CSE2604	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
834	Software Engineering	CSE2613	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
835	Data Mining	CSE2618	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
836	Advanced Java Programming Lab	CSE2608	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
837	Software Engineering Lab	CSE2615	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
838	Minor Project-I	CSE2637	Bachelor of Technology (Computer Science & Engineering)	Report Writing, Presentation, Viva-Voce	2010
839	Internet of Things & Wireless Sensor Networks	CSE2614	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
840	Development of Decentralized Application **%**	CSE2621	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
841	Development of Decentralized Application Lab **%**	CSE2622	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
842	Introduction to Arduino **@**	CSE2623	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
843	Introduction to Arduino Lab **@**	CSE2624	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
844	Computer Graphics	CSE2710	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
845	Computer Graphics Lab	CSE2712	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
846	System Programming & Compiler Lab	CSE2716	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
847	Summer Internship Evaluation-II	CSE2735	Bachelor of Technology (Computer Science & Engineering)	Report Writing, Presentation, Viva-Voce	2010
848	Minor Project-II	CSE2737	Bachelor of Technology (Computer Science & Engineering)	Report Writing, Presentation, Viva-Voce	2010
849	Mobile Computing	CSE2707	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
850	Robotic Process Automation Design & Development	CSE2717	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
851	Responsive Web Design	CSE2718	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
852	Responsive Web Design Lab	CSE2719	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
853	Learning with Bayesian Networks #	CSE2720	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
854	Interfacing with Virtualization **$**	CSE2721	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
855	Hyperledger Technology **%**	CSE2722	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
856	Hyperledger Technology Lab **%**	CSE2723	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
857	IoT Application Development Design Services **@**	CSE2724	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
858	IoT Application Development Design Services Lab **@**	CSE2725	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
859	Project-Dissertation	CSE2837	Bachelor of Technology (Computer Science & Engineering)	Report Writing, Presentation, Viva-Voce	2010
860	Digital Image Processing	CSE2803	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
861	Digital Image Processing Lab	CSE2805	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
862	Dot Net Programming	CSE2804	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
863	Dot Net Programming Lab	CSE2806	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
864	Advance Robotic Process Automation Design & Development	CSE2812	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
865	Intrusion Detection & Prevention System #	CSE2813	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
866	Cloud Computing Tools and Techniques **$**	CSE2814	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
867	Blockchain Applications in Real World & the Legal Aspects **%**	CSE2815	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
868	Data Management in IoT **@**	CSE2816	Bachelor of Technology (Computer Science & Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
869	Introduction to Computers & Programming in C	ECE2105	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
870	Basics of Electrical & Electronics Engineering	ECE2117	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
871	Programming in C Lab	ECE2110	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
872	Basics of Electrical & Electronics Engineering Lab	ECE2118	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
873	Object Oriented Programming using C++	ECE2203	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
874	Engineering Mechanics	ECE2204	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
875	Object Oriented Programming using C++ Lab	ECE2206	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
876	Engineering Graphics Lab	ECE2208	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
877	Data Structure using C	ECE2311	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
878	Data Structure using C Lab	ECE2312	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
879	Virtual Instrumentation Lab	ECE2314	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
880	Measurement & Measuring Instruments	ECE2315	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
881	Measurement & Measuring Instruments Lab	ECE2316	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
882	Clean Room Technologies **%**	ECE2319	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
883	Introduction to IOT **#**	ECE2320	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
884	Digital Electronics	ECE2411	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
885	Signals & Systems	ECE2417	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
886	Digital Electronics Lab	ECE2412	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
887	Electronic Workshop & PCB Lab	ECE2418	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
888	Java Programming	ECE2419	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
889	Java Programming Lab	ECE2420	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
890	Synthesis and Characterisation of Nanomaterials	ECE2423	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
891	Semiconductor Technology Equipment Maintenance **%**	ECE2424	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
892	IOT Platforms and System Design **#**	ECE2425	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
893	Digital Circuits & Systems	ECE2501	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
894	Digital Communications	ECE2502	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
895	Digital Circuits & Systems Lab	ECE2504	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
896	Summer Internship Evaluation-I	ECE2535	Bachelor of Technology (Electronics & Communication Engineering)	Report Writing, Presentation, Viva-Voce	2010
897	Computer Architecture	ECE2508	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
898	Application of Nanomaterials	ECE2515	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
899	Vacuum Technology **%**	ECE2516	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
900	Introduction to Raspberry pi **#**	ECE2517	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
901	Introduction to Raspberry pi Lab #	ECE2518	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
902	VLSI Design	ECE2601	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
903	Digital Signal Processing	ECE2602	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
904	VLSI Design Lab	ECE2605	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
905	Digital Signal Processing Lab	ECE2609	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
906	Minor Project	ECE2637	Bachelor of Technology (Electronics & Communication Engineering)	Report Writing, Presentation, Viva-Voce	2010
907	Advanced Java Programming	ECE2607	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
908	Advanced Java Programming Lab	ECE2610	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
909	IOT and Wireless Sensor Network	ECE2617	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
910	Data Mining	ECE2618	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
911	Nanomaterials and Clean Energy Systems	ECE2619	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
912	Semiconductor Packaging, Testing and Assembly %	ECE2620	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
913	Radar & Satellite Communication	ECE2719	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
914	Advanced Mobile Communication	ECE2720	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
915	Embedded System with ARM Processors	ECE2721	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
916	Radar & Satellite Communication Lab	ECE2722	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010
917	Python Lab	ECE2723	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2010

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
918	Summer Internship Evaluation-II	ECE2735	Bachelor of Technology (Electronics & Communication Engineering)	Report Writing, Presentation, Viva-Voce	2010
919	Digital Image Processing	ECE2712	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
920	Robotic Process Automation Design & Development #	ECE2724	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
921	Nano Electronics	ECE2727	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
922	Introduction to MEMS %	ECE2728	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
923	Independent Study	ECE2718	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Written Test	2010
924	Term Paper	ECE2731	Bachelor of Technology (Electronics & Communication Engineering)	Academic Writing, Presentation	2010
925	Project (With Presentation & Evaluation)	ECE2732	Bachelor of Technology (Electronics & Communication Engineering)	Report Writing, Presentation, Viva-Voce	2010
926	Project (Dissertation)	ECE2837	Bachelor of Technology (Electronics & Communication Engineering)	Report Writing, Presentation, Viva-Voce	2010
927	RTOS Programming	ECE2805	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
928	Advanced VLSI Design	ECE2812	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
929	Power Electronics	ECE2814	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
930	Information Theory and Coding	ECE2815	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
931	Advanced Robotic Process Automation Design & Development #	ECE2816	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
932	Wireless Communication	ECE2818	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
933	Quantum Computation	ECE2819	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010
934	Electronic System Assembly %	ECE2820	Bachelor of Technology (Electronics & Communication Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2010

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935	Introduction to Computers & Programming in C	BME2104	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
936	Programming in C Lab	BME2109	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
937	Elements of Mechanical Engineering Lab	BME2111	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
938	Object Oriented Programming using C++	BME2205	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
939	Engineering Graphics Lab	BME2208	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
940	Object Oriented Programming using C++ Lab	BME2209	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
941	Analog Electronics-I	BME2302	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
942	Circuits & Systems	BME2303	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
943	Medical Imaging Techniques-I	BME2314	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
944	Human Anatomy and Physiology	BME2351	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
945	Analog Electronics Lab-I	BME2306	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
946	Computer Aided Graphic Design Lab	BME2315	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
947	Measurement & Measuring Instruments	BME2316	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
948	Measurement & Measuring Instruments Lab	BME2317	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
949	Virtual Instrumentation	BME2318	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
950	Virtual Instrumentation Lab	BME2319	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
951	Digital Electronics	BME2408	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
952	Biomaterials	BME2412	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
953	Signals and Systems	BME2413	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
954	Bio-Instrumentation	BME2451	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
955	Bio-Instrumentation Lab	BME2403	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
956	Digital Electronics Lab	BME2409	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
957	Signals and Systems Lab	BME2414	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
958	Analog Electronics-II	BME2407	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
959	Analog Electronics Lab-II	BME2417	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011

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960	Medical Imaging Techniques-II	BME2416	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
961	Artificial Neural Network	BME2418	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
962	Artificial Neural Network Lab	BME2419	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
963	Microprocessor Systems	BME2501	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
964	Medical Image Processing	BME2513	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
965	Machine Learning	BME2514	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
966	Microprocessor Systems Lab	BME2504	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
967	Machine Learning Lab	BME2515	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
968	Medical Image Processing Lab	BME2516	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
969	Summer Internship Evaluation-I	BME2535	Bachelor of Technology (Biomedical Engineering)	Report Writing, Presentation, Viva-Voce	2011
970	Control Systems	BME2503	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
971	Control Systems Lab	BME2512	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
972	Digital Circuits and Systems	BME2507	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
973	Digital Circuits and Systems Lab	BME2509	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
974	Data Structure with C++	BME2517	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
975	Data Structure with C++ Lab	BME2518	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
976	Fuzzy Logic and Genetic Algorithm	BME2519	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
977	Microcontroller and its Biomedical Applications	BME2601	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
978	Biomechanics	BME2651	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
979	Clinical Need Assessment and Mini Project	BME2609	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Project writing, Lab Records	2011
980	Medical Imaging and Reconstruction Algorithms Lab	BME2610	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
981	Hospital Management System	BME2607	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
982	Therapeutic and Surgical Equipment	BME2611	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
983	Data Mining	BME2612	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
984	Embedded System with Recent Technology	BME2710	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011

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985	Artificial Organs and Rehabilitation Engineering	BME2711	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
986	Clinical Electrical Safety Hazards	BME2712	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
987	Biomechanics Simulation Lab	BME2713	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
988	Embedded System with Recent Technology Lab	BME2714	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Practical, Lab Records	2011
989	Summer Internship Evaluation-II	BME2735	Bachelor of Technology (Biomedical Engineering)	Report Writing, Presentation, Viva-Voce	2011
990	Project Dissertation-I	BME2737	Bachelor of Technology (Biomedical Engineering)	Report Writing, Presentation, Viva-Voce	2011
991	Clinical Sciences	BME2715	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
992	Neural Network and Fuzzy Logic	BME2716	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
993	Virtual Reality	BME2717	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
994	Robotic Process Automation Design & Development	BME2718	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
995	Project Dissertation-II	BME2837	Bachelor of Technology (Biomedical Engineering)	Report Writing, Presentation, Viva-Voce	2011
996	Medical Informatics	BME2803	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
997	Recent Advancement in Biomedical Modalities	BME2804	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
998	Advanced Robotic Process Automation Design & Development	BME2805	Bachelor of Technology (Biomedical Engineering)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2011
999	Introduction to Computers & Programming in C	AIE6104	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1000	Programming in C Lab	AIE6106	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1001	Object Oriented Programming using C++	AIE6204	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1002	Object Oriented Programming using C++ Lab	AIE6208	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1003	Engineering Graphics Lab	AIE6211	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1004	Basics of Electrical & Electronics Engineering Lab	AIE6213	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1005	Database Management Systems	AIE6302	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1006	Operating Systems	AIE6303	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1007	Data Structures using C	AIE6304	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1008	Digital Electronics	AIE6313	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1009	Data Structures using C Lab	AIE6305	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1010	Database Management System Lab	AIE6307	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1011	UNIX Programming Lab	AIE6308	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1012	Digital Electronics Lab	AIE6314	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1013	E-Commerce & ERP	AIE6310	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1014	Electronic Devices and Circuits	AIE6311	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1015	Electronic Devices and Circuits Lab	AIE6312	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1016	Artificial Intelligence	AIE6404	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1017	Data Communication & Computer Networks	AIE6414	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1018	Artificial Intelligence Lab	AIE6406	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1019	Data Communication & Computer Networks Lab	AIE6415	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1020	Communication Systems	AIE6407	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1021	Communication Systems Lab	AIE6408	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1022	Artificial Neural Network	AIE6411	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1023	Artificial Neural Network Lab	AIE6412	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1024	Web Designing Technologies	AIE6417	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1025	Web Designing Technologies Lab	AIE6418	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1026	Computer Architecture	AIE6502	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1027	Java Programming	AIE6503	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1028	Microprocessor	AIE6515	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1029	Java Programming Lab	AIE6507	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1030	Python Programming Lab	AIE6508	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1031	Advance Data Structures & Algorithm Lab	AIE6509	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1032	Microprocessor Lab	AIE6517	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1033	Summer Internship Evaluation-I	AIE6535	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Report Writing, Presentation, Viva-Voce	2017
1034	VHDL Programming	AIE6512	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1035	VHDL Programming Lab	AIE6513	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1036	Advanced Web Designing Technologies	AIE6518	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1037	Advanced Web Designing Technologies Lab	AIE6519	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1038	Advanced Java Programming	AIE6603	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1039	Advance Database Management System	AIE6604	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017

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1040	Digital Computer Organization	AIE6605	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1041	Software Engineering	AIE6614	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1042	Internet of Things & Wireless Sensor Networks	AIE6615	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1043	Advanced Java Programming Lab	AIE6608	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1044	Advance Database Management System Lab	AIE6609	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1045	Software Engineering Lab	AIE6616	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1046	Minor Project-I	AIE6637	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Report Writing, Presentation, Viva-Voce	2017
1047	VLSI Design	AIE6612	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1048	VLSI Design Lab	AIE6613	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1049	Open Source Technologies	AIE6617	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1050	Open Source Technologies Lab	AIE6618	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1051	Data Mining	AIE6619	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1052	Computer Graphics	AIE6702	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1053	Advanced Computer Networks	AIE6704	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1054	Cryptography & Network Security	AIE6713	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1055	System Programming & Compiler Construction	AIE6714	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1056	Computer Graphics Lab	AIE6706	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1057	Advanced Computer Networks Lab	AIE6707	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1058	MATLAB Programming	AIE6708	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1059	Network Security Lab	AIE6715	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1060	System Programming & Compiler Construction Lab	AIE6716	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1061	Summer Internship Evaluation-II	AIE6735	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Report Writing, Presentation, Viva-Voce	2017
1062	Minor Project-II	AIE6737	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Report Writing, Presentation, Viva-Voce	2017
1063	Mobile Computing	AIE6710	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1064	Robotic Process Automation Design & Development	AIE6717	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1065	Responsive Web Design	AIE6718	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1066	Responsive Web Design Lab	AIE6719	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1067	Research Methodology & Technical Report Writing	AIE6809	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Report Writing	2017
1068	Major Project	AIE6837	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Report Writing, Presentation, Viva-Voce	2017
1069	Fundamental of Robotics System & Robot Programming	RBE6801	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1070	Advanced Control Systems & Drives for Robots	RBE6802	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1071	Microprocessor and Interfacing	RBE6803	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1072	Kinematics & Dynamics of Robots	RBE6804	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1073	Fundamental of Robotics System & Robot Programming Lab	RBE6806	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017

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1074	Advanced Control Systems & Drives for Robots Lab	RBE6807	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1075	Microprocessor and Interfacing Lab	RBE6808	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1076	Digital Image Processing	RBE6809	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1077	Digital Image Processing Lab	RBE6810	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1078	Dot Net Programming	RBE6811	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1079	Dot Net Programming Lab	RBE6812	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1080	Advance Robotic Process Automation Design & Development	RBE6813	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1081	Data Mining & Predictive Analysis	MLE6802	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1082	Data Warehousing and Multi-dimensional Modelling	MLE6803	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1083	Big Data Technologies	MLE6804	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1084	Data Mining & Predictive Analysis Lab	MLE6806	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1085	Data Warehousing and Multi-dimensional Modelling Lab	MLE6807	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1086	R-Programming Lab	MLE6808	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1087	Digital Image Processing	MLE6809	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1088	Digital Image Processing Lab	MLE6810	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1089	Dot Net Programming	MLE6811	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1090	Dot Net Programming Lab	MLE6812	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017

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1091	Advance Robotic Process Automation Design & Development	MLE6813	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1092	Summer Internship Evaluation-III	AIE6935	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Report Writing, Presentation, Viva-Voce	2017
1093	Project-Dissertation-I	AIE6937	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Report Writing, Presentation, Viva-Voce	2017
1094	Automation in Manufacturing Systems	RBE6901	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1095	Robotic Sensors, Vision and Hardware Implementation	RBE6902	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1096	Pattern Recognition & Image Processing	RBE6903	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1097	Robotic Sensors, Vision and Hardware Implementation Lab	RBE6904	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1098	Pattern Recognition & Image Processing Lab	RBE6905	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1099	Optimization Techniques	RBE6906	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1100	CNC Machines & Adaptive Control	RBE6907	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1101	Neural Network and Fuzzy Logic	RBE6908	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1102	Neural Network and Fuzzy Logic Lab	RBE6909	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1103	Decision Making Systems	RBE6910	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1104	Decision Making Systems Lab	RBE6911	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1105	Pattern Recognition and Image Processing	MLE6901	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1106	Neural Network and Fuzzy Logic	MLE6902	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1107	Natural Language Processing	MLE6903	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017

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1108	Pattern Recognition and Image Processing Lab	MLE6904	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1109	Neural Network and Fuzzy Logic Lab	MLE6905	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1110	Hadoop Lab	MLE6906	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Practical, Lab Records	2017
1111	Descriptive Analysis	MLE6907	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1112	Optimization Techniques	MLE6908	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1113	Social Network Data Analytics	MLE6909	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1114	Agent Based Intelligent Systems	MLE6910	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1115	Project-Dissertation-II	AIE6037	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	Report Writing, Presentation, Viva-Voce	2017
1116	Introduction to Computers & Programming in C	NCE6104	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1117	Programming in C Lab	NCE6106	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1118	Object Oriented Programming using C++	NCE6204	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1119	Object Oriented Programming using C++ Lab	NCE6208	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1120	Engineering Graphics Lab	NCE6211	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1121	Basics of Electrical & Electronics Engineering Lab	NCE6213	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1122	Database Management Systems	NCE6302	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1123	Operating Systems	NCE6303	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1124	Data Structures using C	NCE6304	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1125	Digital Electronics	NCE6313	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1126	Data Structures using C Lab	NCE6305	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1127	Database Management System Lab	NCE6307	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1128	UNIX Programming Lab	NCE6308	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017

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1129	Digital Electronics Lab	NCE6314	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1130	E-Commerce & ERP	NCE6310	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1131	Electronic Devices and Circuits	NCE6311	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1132	Electronic Devices and Circuits Lab	NCE6312	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1133	Artificial Intelligence	NCE6404	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1134	Data Communication & Computer Networks	NCE6414	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1135	Artificial Intelligence Lab	NCE6406	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1136	Data Communication & Computer Networks Lab	NCE6415	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1137	Communication Systems	NCE6407	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1138	Communication Systems Lab	NCE6408	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1139	Artificial Neural Network	NCE6411	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1140	Artificial Neural Network Lab	NCE6412	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1141	Web Designing Technologies	NCE6417	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1142	Web Designing Technologies Lab	NCE6418	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1143	Computer Architecture	NCE6502	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1144	Java Programming	NCE6503	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1145	Microprocessor	NCE6515	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1146	Java Programming Lab	NCE6507	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1147	Python Programming Lab	NCE6508	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1148	Microprocessor Lab	NCE6517	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1149	Summer Internship Evaluation-I	NCE6535	B.Tech. + M.Tech. Network & Cyber Security	Report Writing, Presentation, Viva-Voce	2017
1150	VHDL Programming	NCE6512	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1151	VHDL Programming Lab	NCE6513	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1152	Advanced Web Designing Technologies	NCE6518	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1153	Advanced Web Designing Technologies Lab	NCE6519	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1154	Advanced Java Programming	NCE6603	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1155	Advance Database Management System	NCE6604	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1156	Digital Computer Organization	NCE6605	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1157	Software Engineering	NCE6614	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1158	Internet of Things & Wireless Sensor Networks	NCE6615	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1159	Advanced Java Programming Lab	NCE6608	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1160	Advance Database Management System Lab	NCE6609	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1161	Software Engineering Lab	NCE6619	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1162	Minor Project-I	NCE6637	B.Tech. + M.Tech. Network & Cyber Security	Report Writing, Presentation, Viva-Voce	2017
1163	VLSI Design	NCE6612	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1164	VLSI Design Lab	NCE6613	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1165	Open Source Technologies	NCE6616	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1166	Open Source Technologies Lab	NCE6617	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1167	Data Mining	NCE6618	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1168	Computer Graphics	NCE6702	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1169	Advanced Computer Networks	NCE6704	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1170	Cryptography & Network Security	NCE6713	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1171	System Programming & Compiler Construction	NCE6714	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1172	Computer Graphics Lab	NCE6706	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1173	Advanced Computer Networks Lab	NCE6707	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1174	MATLAB Programming	NCE6708	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1175	System Programming & Compiler Construction Lab	NCE6715	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1176	Network Security Lab	NCE6718	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1177	Summer Internship Evaluation-II	NCE6735	B.Tech. + M.Tech. Network & Cyber Security	Report Writing, Presentation, Viva-Voce	2017
1178	Minor Project-II	NCE6737	B.Tech. + M.Tech. Network & Cyber Security	Report Writing, Presentation, Viva-Voce	2017

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1179	Mobile Computing	NCE6710	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1180	Robotic Process Automation Design & Development	NCE6716	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1181	Responsive Web Design	NCE6717	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1182	Responsive Web Design Lab	NCE6719	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1183	Network and Wireless Security	NCE6802	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1184	Cyber Crime and IT Law	NCE6803	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1185	Cyber Crime Investigation & Forensics	NCE6804	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1186	Intrusion Detection & Prevention System	NCE6805	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1187	Cryptography Foundation Lab	NCE6806	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1188	Web Security Lab	NCE6807	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1189	Network & Wireless Security Lab	NCE6808	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1190	Research Methodology & Technical Report Writing	NCE6809	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Report Writing	2017
1191	Major Project	NCE6837	B.Tech. + M.Tech. Network & Cyber Security	Report Writing, Presentation, Viva-Voce	2017
1192	Digital Image Processing	NCE6812	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1193	Digital Image Processing Lab	NCE6813	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1194	Dot Net Programming	NCE6814	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1195	Dot Net Programming Lab	NCE6815	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1196	Advance Robotic Process Automation Design & Development	NCE6816	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1197	Biometric Systems & Biometric Image Processing	NCE6901	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1198	Software Vulnerability Analysis	NCE6902	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1199	Applied Cryptography	NCE6903	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1200	Biometric Image Processing Lab	NCE6904	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1201	Applied Cryptography Lab	NCE6905	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Practical, Lab Records	2017
1202	Summer Internship Evaluation-III	NCE6935	B.Tech. + M.Tech. Network & Cyber Security	Report Writing, Presentation, Viva-Voce	2017
1203	Project-Dissertation-I	NCE6937	B.Tech. + M.Tech. Network & Cyber Security	Report Writing, Presentation, Viva-Voce	2017

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1204	Web Application & Penetration Testing	NCE6906	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1205	Malware Analysis in Network Security	NCE6907	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1206	Web Security	NCE6908	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1207	Digital Watermarking & Steganography	NCE6909	B.Tech. + M.Tech. Network & Cyber Security	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1208	Project-Dissertation-II	NCE6037	B.Tech. + M.Tech. Network & Cyber Security	Report Writing, Presentation, Viva-Voce	2017
1209	Introduction to Computers & Programming in C	DSE6104	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1210	Programming in C Lab	DSE6106	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1211	Object Oriented Programming using C++	DSE6204	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1212	Object Oriented Programming using C++ Lab	DSE6208	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1213	Engineering Graphics Lab	DSE6211	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1214	Basics of Electrical & Electronics Engineering Lab	DSE6213	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1215	Database Management Systems	DSE6302	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1216	Operating Systems	DSE6303	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1217	Data Structures using C	DSE6304	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1218	Digital Electronics	DSE6313	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1219	Data Structures using C Lab	DSE6305	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1220	Database Management System Lab	DSE6307	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1221	UNIX Programming Lab	DSE6308	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1222	Digital Electronics Lab	DSE6314	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1223	E-Commerce & ERP	DSE6310	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1224	Electronic Devices and Circuits	DSE6311	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1225	Artificial Intelligence	DSE6404	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1226	Data Communication & Computer Networks	DSE6414	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1227	Artificial Intelligence Lab	DSE6406	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1228	Data Communication & Computer Networks Lab	DSE6415	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1229	Communication Systems	DSE6407	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1230	Communication Systems Lab	DSE6408	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1231	Artificial Neural Network	DSE6411	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1232	Artificial Neural Network Lab	DSE6412	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1233	Web Designing Technologies	DSE6417	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1234	Web Designing Technologies Lab	DSE6418	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1235	Computer Architecture	DSE6502	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1236	Java Programming	DSE6503	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1237	Microprocessor	DSE6515	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1238	Java Programming Lab	DSE6507	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1239	Python Programming Lab	DSE6508	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1240	Advance Data Structures & Algorithm Lab	DSE6509	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1241	Microprocessor Lab	DSE6517	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1242	Summer Internship Evaluation-I	DSE6535	B.Tech. + M.Tech. Data Science	Report Writing, Presentation, Viva-Voce	2017
1243	VHDL Programming	DSE6512	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1244	VHDL Programming Lab	DSE6513	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1245	Advanced Web Designing Technologies	DSE6518	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1246	Advanced Web Designing Technologies Lab	DSE6519	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1247	Advanced Java Programming	DSE6603	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1248	Advance Database Management System	DSE6604	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1249	Digital Computer Organization	DSE6605	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1250	Software Engineering	DSE6614	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1251	Internet of Things & Wireless Sensor Networks	DSE6615	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1252	Advanced Java Programming Lab	DSE6608	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1253	Advance Database Management System Lab	DSE6609	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017

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1254	Software Engineering Lab	DSE6616	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1255	Minor Project-I	DSE6637	B.Tech. + M.Tech. Data Science	Report Writing, Presentation, Viva-Voce	2017
1256	VLSI Design	DSE6612	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1257	VLSI Design Lab	DSE6613	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1258	Open Source Technologies	DSE6617	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1259	Open Source Technologies Lab	DSE6618	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1260	Data Mining	DSE6619	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1261	Computer Graphics	DSE6702	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1262	Advanced Computer Networks	DSE6704	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1263	Cryptography & Network Security	DSE6713	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1264	System Programming & Compiler Construction	DSE6714	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1265	Computer Graphics Lab	DSE6706	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1266	Advanced Computer Networks Lab	DSE6707	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1267	MATLAB Programming	DSE6708	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1268	Network Security Lab	DSE6715	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1269	System Programming & Compiler Construction Lab	DSE6716	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1270	Summer Internship Evaluation-II	DSE6735	B.Tech. + M.Tech. Data Science	Report Writing, Presentation, Viva-Voce	2017
1271	Minor Project-II	DSE6737	B.Tech. + M.Tech. Data Science	Report Writing, Presentation, Viva-Voce	2017
1272	Mobile Computing	DSE6710	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1273	Robotic Process Automation Design & Development	DSE6717	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1274	Responsive Web Design	DSE6718	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1275	Responsive Web Design Lab	DSE6719	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1276	Data Mining & Predictive Analytics	DSE6802	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1277	Data Warehousing & Multi-dimensional Modelling	DSE6803	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1278	Database & Knowledge Base Systems	DSE6804	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017

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1279	Big Data Technologies	DSE6805	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1280	Applied Statically Analysis Lab	DSE6806	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1281	Data Mining & Predictive Analytics Lab	DSE6807	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1282	Data Warehousing & Multi-dimensional Modelling Lab	DSE6808	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1283	Research Methodology & Technical Report Writing	DSE6809	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Report Writing	2017
1284	Major Project	DSE6837	B.Tech. + M.Tech. Data Science	Report Writing, Presentation, Viva-Voce	2017
1285	Digital Image Processing	DSE6812	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1286	Dot Net Programming	DSE6814	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1287	Dot Net Programming Lab	DSE6815	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1288	Advance Robotic Process Automation Design & Development	DSE6816	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1289	Descriptive Analysis	DSE6901	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1290	Learning & Reasoning with Bayesian Networks	DSE6902	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1291	Social Network Data Analytics	DSE6903	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1292	R-Programming Lab	DSE6904	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1293	Hadoop Lab	DSE6905	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Practical, Lab Records	2017
1294	Summer Internship Evaluation-III	DSE6935	B.Tech. + M.Tech. Data Science	Report Writing, Presentation, Viva-Voce	2017
1295	Project-Dissertation-I	DSE6937	B.Tech. + M.Tech. Data Science	Report Writing, Presentation, Viva-Voce	2017
1296	Web Technology	DSE6906	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1297	Service Oriented Architecture	DSE6907	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1298	Natural Language Processing	DSE6908	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1299	Agent Based Intelligent Systems	DSE6909	B.Tech. + M.Tech. Data Science	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2017
1300	Project-Dissertation-II	DSE6037	B.Tech. + M.Tech. Data Science	Report Writing, Presentation, Viva-Voce	2017
1301	Advanced Database Management Systems	DSE4102	Master of Technology (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1302	Digital Computer Organization	DSE4103	Master of Technology (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1303	Advanced Computer Networks	DSE4104	Master of Technology (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1304	Advanced Database Management Systems Lab	DSE4106	Master of Technology (Data Science)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017
1305	Advanced Computer Networks Lab	DSE4107	Master of Technology (Data Science)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017
1306	MATLAB Programming	DSE4108	Master of Technology (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1307	Python Programming Lab	DSE4109	Master of Technology (Data Science)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017
1308	Data Mining & Predictive Analytics	DSE4202	Master of Technology (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1309	Data Warehousing & Multi-dimensional Modeling	DSE4203	Master of Technology (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1310	Database & Knowledge Base Systems	DSE4204	Master of Technology (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1311	Big Data Technologies	DSE4205	Master of Technology (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1312	Research Methodology & Technical Report Writing	DSE4206	Master of Technology (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1313	Data Mining & Predictive Analytics Lab	DSE4208	Master of Technology (Data Science)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017
1314	Data Warehousing & Multi-dimensional Modeling Lab	DSE4209	Master of Technology (Data Science)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017
1315	Information Management System	DSE4210	Master of Technology (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1316	Information System Security	DSE4211	Master of Technology (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1317	Descriptive Analysis	DSE4301	Master of Technology (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1318	Learning and Reasoning with Bayesian Networks	DSE4302	Master of Technology (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1319	Social Network Data Analytics	DSE4303	Master of Technology (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1320	R-Programming Lab	DSE4304	Master of Technology (Data Science)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017
1321	Hadoop Lab	DSE4305	Master of Technology (Data Science)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1322	Summer Internship Evaluation	DSE4335	Master of Technology (Data Science)	Report Writing, Presentation, Viva-Voce	2017
1323	Project Dissertation-I	DSE4337	Master of Technology (Data Science)	Report Writing, Presentation, Viva-Voce	2017
1324	Web Technology	DSE4306	Master of Technology (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1325	Service Oriented Architecture	DSE4307	Master of Technology (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1326	Natural Language Processing	DSE4308	Master of Technology (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1327	Agent Based Intelligent Systems	DSE4309	Master of Technology (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1328	Project Dissertation-II	DSE4437	Master of Technology (Data Science)	Report Writing, Presentation, Viva-Voce	2017
1329	Advanced Database Management Systems	AIE4102	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1330	Digital Computer Organization	AIE4103	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1331	Advanced Computer Networks	AIE4104	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1332	Advanced Database Management Systems Lab	AIE4106	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017
1333	Advanced Computer Networks Lab	AIE4107	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017
1334	MATLAB Programming	AIE4108	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1335	Python Programming Lab	AIE4109	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017
1336	Research Methodology & Technical Report Writing	AIE4206	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1337	Fundamental of Robotics System & Robot Programming	RBE4201	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1338	Advanced Control Systems and Drives for Robots	RBE4202	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1339	Microprocessor and Interfacing	RBE4203	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1340	Kinematics & Dynamics of Robots	RBE4204	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1341	Fundamental of Robotics System & Robot Programming Lab	RBE4206	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017
1342	Advanced Control Systems & Drives for Robots Lab	RBE4207	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017
1343	Microprocessor and Interfacing Lab	RBE4208	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017
1344	Fundamentals of Artificial Intelligence for Robotics	RBE4209	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1345	Robotic Simulation & Simultaneous Localization Mapping	RBE4210	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1346	Data Mining and Predictive Analysis	MLE4202	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1347	Data Warehousing and Multi-dimensional Modeling	MLE4203	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1348	Big Data Technologies	MLE4204	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1349	Data Mining and Predictive Analysis Lab	MLE4206	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017
1350	Data Warehousing and Multi-dimensional Modeling Lab	MLE4207	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017
1351	R-Programming Lab	MLE4208	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017
1352	Database and Knowledge Base Systems	MLE4209	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1353	Information Management System	MLE4210	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1354	Fundamental of Artificial Intelligence	MLE4211	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1355	Summer Internship Evaluation	AIE4335	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Report Writing, Presentation, Viva-Voce	2017
1356	Project Dissertation-I	AIE4337	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Report Writing, Presentation, Viva-Voce	2017
1357	Automation in Manufacturing Systems	RBE4301	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1358	Robotic Sensors, Vision and Hardware Implementation	RBE4302	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1359	Pattern Recognition & Image Processing	RBE4303	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1360	Robotic Sensors, Vision and Hardware Implementation Lab	RBE4304	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1361	Pattern Recognition & Image Processing Lab	RBE4305	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017
1362	Optimization Techniques	RBE4306	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1363	CNC Machines & Adaptive Control	RBE4307	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1364	Neural Network and Fuzzy Logic	RBE4308	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1365	Neural Network and Fuzzy Logic Lab	RBE4309	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017
1366	Decision Making Systems	RBE4310	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1367	Decision Making Systems Lab	RBE4311	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017
1368	Pattern Recognition and Image Processing	MLE4301	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1369	Neural Network and Fuzzy Logic	MLE4302	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1370	Pattern Recognition and Image Processing Lab	MLE4304	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017
1371	Neural Network and Fuzzy Logic Lab	MLE4305	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017
1372	Hadoop Lab	MLE4306	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1373	Optimization Techniques	MLE4308	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1374	Social Network Data Analytics	MLE4309	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1375	Agent Based Intelligent Systems	MLE4310	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1376	Project Dissertation-II	AIE4437	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	Report Writing, Presentation, Viva-Voce	2017
1377	Advanced Database Management Systems	NCE4102	Master of Technology (Network & Cyber Security)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1378	Digital Computer Organization	NCE4103	Master of Technology (Network & Cyber Security)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1379	Advanced Computer Networks	NCE4104	Master of Technology (Network & Cyber Security)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1380	Advanced Database Management Systems Lab	NCE4106	Master of Technology (Network & Cyber Security)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017
1381	Advanced Computer Networks Lab	NCE4107	Master of Technology (Network & Cyber Security)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017
1382	MATLAB Programming	NCE4108	Master of Technology (Network & Cyber Security)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1383	Python Programming Lab	NCE4109	Master of Technology (Network & Cyber Security)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017
1384	Network and Wireless Security	NCE4202	Master of Technology (Network & Cyber Security)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1385	Cyber Crime and IT Law	NCE4203	Master of Technology (Network & Cyber Security)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1386	Cyber Crime Investigation & Forensics	NCE4204	Master of Technology (Network & Cyber Security)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1387	Intrusion Detection & Prevention System	NCE4205	Master of Technology (Network & Cyber Security)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1388	Research Methodology & Technical Report Writing	NCE4206	Master of Technology (Network & Cyber Security)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1389	Cryptography Foundation Lab	NCE4207	Master of Technology (Network & Cyber Security)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017

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1390	Web Security Lab	NCE4208	Master of Technology (Network & Cyber Security)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017
1391	Network Security Lab	NCE4209	Master of Technology (Network & Cyber Security)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017
1392	Big Data Systems	NCE4210	Master of Technology (Network & Cyber Security)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1393	Distributed System Security	NCE4211	Master of Technology (Network & Cyber Security)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1394	Block Chain Technology	NCE4212	Master of Technology (Network & Cyber Security)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1395	Biometric Systems & Biometric Image Processing	NCE4301	Master of Technology (Network & Cyber Security)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1396	Software Vulnerability Analysis	NCE4302	Master of Technology (Network & Cyber Security)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1397	Applied Cryptography	NCE4303	Master of Technology (Network & Cyber Security)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1398	Biometric Image Processing Lab	NCE4304	Master of Technology (Network & Cyber Security)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017
1399	Applied Cryptography Lab	NCE4305	Master of Technology (Network & Cyber Security)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2017
1400	Summer Internship Evaluation	NCE4335	Master of Technology (Network & Cyber Security)	Report Writing, Presentation, Viva-Voce	2017
1401	Project Dissertation-I	NCE4337	Master of Technology (Network & Cyber Security)	Report Writing, Presentation, Viva-Voce	2017
1402	Web Application & Penetration Testing	NCE4306	Master of Technology (Network & Cyber Security)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1403	Malware Analysis in Network Security	NCE4307	Master of Technology (Network & Cyber Security)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1404	Web Security	NCE4308	Master of Technology (Network & Cyber Security)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1405	Digital Watermarking & Stagenography	NCE4309	Master of Technology (Network & Cyber Security)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2017
1406	Project Dissertation-II	NCE4437	Master of Technology (Network & Cyber Security)	Report Writing, Presentation, Viva-Voce	2017
1407	Computer Programming with C Language	DIFT2151	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Class Performance, Group Discussion, Viva-Voce	2011
1408	Computer Programming with C Language Lab	DIFT2152	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2011

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1409	Computer Fundamentals	DIFT2101	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Class Performance, Group Discussion, Viva-Voce	2011
1410	Computer Fundamentals Lab	DIFT2102	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2011
1411	Digital Electronics	DIFT2103	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Class Performance, Group Discussion, Viva-Voce	2011
1412	Java Programming	DIFT2201	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Class Performance, Group Discussion, Viva-Voce	2011
1413	Java Programming Lab	DIFT2202	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2011
1414	Robotic Process Automation	SIFT2301	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Class Performance, Group Discussion, Viva-Voce	2011
1415	Community Engagement Services	NIFT2335	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Report Writing, Presentation, Viva-Voce	2011
1416	Introduction to Database Management System	DIFT2451	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Class Performance, Group Discussion, Viva-Voce	2011
1417	Introduction to Database Management System Lab	DIFT2452	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2011
1418	Network Design and Management	SIFT2401	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Class Performance, Group Discussion, Viva-Voce	2011
1419	Data Communication & Computer Network	DIFT2551	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Class Performance, Group Discussion, Viva-Voce	2011
1420	Data Communication & Computer Network Lab	DIFT2552	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2011
1421	Software Engineering	DIFT2501	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Class Performance, Group Discussion, Viva-Voce	2011
1422	Software Engineering Lab	DIFT2502	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2011
1423	Web Technology	DIFT2503	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Class Performance, Group Discussion, Viva-Voce	2011
1424	Web Technology Lab	DIFT2504	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2011
1425	Internet of Things	DIFT2505	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Class Performance, Group Discussion, Viva-Voce	2011

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1426	Internet of Things Lab	DIFT2506	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2011
1427	SIP/Internship/ Project/ Dissertation/Field Visit	NIFT2537	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Report Writing, Presentation, Viva-Voce	2011
1428	Artificial Intelligence & Expert System	DIFT2651	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Class Performance, Group Discussion, Viva-Voce	2011
1429	Artificial Intelligence & Expert System Lab	DIFT2652	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2011
1430	Data Warehousing & Data Mining	DIFT2601	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Class Performance, Group Discussion, Viva-Voce	2011
1431	Data Warehousing & Data Mining Lab	DIFT2602	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2011
1432	Computer Graphics	DIFT2603	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Class Performance, Group Discussion, Viva-Voce	2011
1433	Computer Graphics Lab	DIFT2604	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2011
1434	Web Technology using Node JS and Mongo DB	DIFT2607	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Class Performance, Group Discussion, Viva-Voce	2011
1435	Web Technology using Node JS and Mongo DB Lab	DIFT2608	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2011
1436	Cloud Computing	DIFT2701	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Class Performance, Group Discussion, Viva-Voce	2011
1437	Cloud Computing Lab	DIFT2702	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2011
1438	Blockchain Technology	DIFT2703	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Class Performance, Group Discussion, Viva-Voce	2011
1439	Blockchain Technology Lab	DIFT2704	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2011
1440	Mobile Computing	DIFT2705	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Class Performance, Group Discussion, Viva-Voce	2011
1441	Multimedia	DIFT2706	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Class Performance, Group Discussion, Viva-Voce	2011
1442	Basics of Research Methodology, Ethics and Research Communication	DIFT2739	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Class Performance, Group Discussion, Viva-Voce	2011

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1443	SIP/Internship/ Project/ Dissertation/Field Visit	NIFT2737	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Report Writing, Presentation, Viva-Voce	2011
1444	Data Science	DIFT2801	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Class Performance, Group Discussion, Viva-Voce	2011
1445	Data Science Lab	DIFT2802	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2011
1446	Machine Learning	DIFT2803	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Class Performance, Group Discussion, Viva-Voce	2011
1447	Machine Learning Lab	DIFT2804	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2011
1448	Cyber Security	DIFT2805	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Quiz, Class Performance, Group Discussion, Viva-Voce	2011
1449	SIP/Internship/ Project/ Dissertation/Field Visit	NIFT2837	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Report Writing, Presentation, Viva-Voce	2011
1450	Data Analysis & Visualisation using Software	DIFT2839	Bachelor of Science (Honors/ Honors with Research) in Information Technology	Written Test, Presentation, Viva-Voce	2011
1451	Computer Programming with C Language	DIFT2151	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1452	Computer Programming with C Language Lab	DIFT2152	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2010
1453	Computer Fundamentals	DIFT2101	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1454	Computer Fundamentals Lab	DIFT2102	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2010
1455	Digital Electronics	DIFT2103	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1456	Introduction to Database Management System	DIFT2203	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1457	Introduction to Database Management System Lab	DIFT2204	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2010
1458	Linux Administration	DIFT2304	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1459	Linux Administration Lab	DIFT2305	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2010

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1460	Robotic Process Automation	SIFT2301	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1461	Community Engagement Services	NIFT2335	Bachelor of Computer Application (Honors/ Honors with Research)	Report Writing, Presentation, Viva-Voce	2010
1462	Android Programming	SIFT2402	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1463	Internet of Things and Wireless Sensor Network	DIFT2553	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1464	Internet of Things and Wireless Sensor Network Lab	DIFT2554	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2010
1465	Web Technology	DIFT2503	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1466	Web Technology Lab	DIFT2504	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2010
1467	Software Engineering	DIFT2501	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1468	Software Engineering Lab	DIFT2502	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2010
1469	SIP/Internship/ Project/ Dissertation/Field Visit	NIFT2537	Bachelor of Computer Application (Honors/ Honors with Research)	Report Writing, Presentation, Viva-Voce	2010
1470	Artificial Intelligence & Expert System	DIFT2651	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1471	Artificial Intelligence & Expert System Lab	DIFT2652	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2010
1472	Data Warehousing & Data Mining	DIFT2601	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1473	Data Warehousing & Data Mining Lab	DIFT2602	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2010
1474	Relational Database Management System	DIFT2605	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1475	Relational Database Management System Lab	DIFT2606	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2010
1476	Mobile App Development	DIFT2611	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Class Performance, Group Discussion, Viva-Voce	2010

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1477	Mobile App Development Lab	DIFT2612	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2010
1478	Cloud Computing	DIFT2701	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1479	Cloud Computing Lab	DIFT2702	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2010
1480	Blockchain Technology	DIFT2703	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1481	Blockchain Technology Lab	DIFT2704	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2010
1482	Mobile Computing	DIFT2705	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1483	Multimedia	DIFT2706	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1484	Basics of Research Methodology, Ethics and Research Communication	DIFT2739	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1485	SIP/Internship/ Project/ Dissertation/Field Visit	NIFT2737	Bachelor of Computer Application (Honors/ Honors with Research)	Report Writing, Presentation, Viva-Voce	2010
1486	Data Science	DIFT2801	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1487	Data Science Lab	DIFT2802	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2010
1488	Machine Learning	DIFT2803	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1489	Machine Learning Lab	DIFT2804	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2010
1490	Cyber Security	DIFT2805	Bachelor of Computer Application (Honors/ Honors with Research)	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1491	SIP/Internship/ Project/ Dissertation/Field Visit	NIFT2837	Bachelor of Computer Application (Honors/ Honors with Research)	Report Writing, Presentation, Viva-Voce	2010
1492	Data Analysis & Visualisation using Software	DIFT2839	Bachelor of Computer Application (Honors/ Honors with Research)	Written Test, Presentation, Viva-Voce	2010
1493	Data Communication and Computer Networks	IFT4101	Master of Computer Application	Quiz, Class Performance, Group Discussion, Viva-Voce	2010

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1494	Software Engineering	IFT4103	Master of Computer Application	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1495	Computer Graphics and Multimedia Systems	IFT4104	Master of Computer Application	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1496	Data Communication and Computer Networks Lab	IFT4105	Master of Computer Application	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2010
1497	Computer Graphics and Multimedia Systems Lab	IFT4107	Master of Computer Application	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2010
1498	Mobile Computing	IFT4201	Master of Computer Application	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1499	Programming with Java	IFT4202	Master of Computer Application	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1500	Software Project Management	IFT4203	Master of Computer Application	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1501	Artificial Intelligence	IFT4204	Master of Computer Application	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1502	Programming with Java Lab	IFT4205	Master of Computer Application	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2010
1503	Software Project Management Lab	IFT4206	Master of Computer Application	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2010
1504	Artificial Intelligence Lab	IFT4207	Master of Computer Application	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2010
1505	Seminar	IFT4238	Master of Computer Application	Quiz, Written Test	2010
1506	Data Warehousing & Data Mining	IFT4301	Master of Computer Application	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1507	Programming with dot NET Framework	IFT4302	Master of Computer Application	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1508	Network Security & Cryptography	IFT4303	Master of Computer Application	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1509	Soft Computing	IFT4304	Master of Computer Application	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1510	Data Warehousing & Data Mining Lab	IFT4305	Master of Computer Application	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2010
1511	Programming with dot NET Framework Lab	IFT4306	Master of Computer Application	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2010
1512	Soft Computing Lab	IFT4307	Master of Computer Application	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2010
1513	Term Paper	IFT4331	Master of Computer Application	Academic writing, Presentation	2010
1514	Summer Internship Evaluation	IFT4335	Master of Computer Application	Report Writing, Presentation, Viva-Voce	2010
1515	Android Programming	IFT4308	Master of Computer Application	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1516	Android Programming Lab	IFT4309	Master of Computer Application	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2010
1517	Digital Image Processing	IFT4310	Master of Computer Application	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1518	Digital Image Processing Lab	IFT4311	Master of Computer Application	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2010

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1519	Big Data	IFT4312	Master of Computer Application	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1520	Big Data Lab	IFT4313	Master of Computer Application	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2010
1521	Machine Learning using Python	IFT4401	Master of Computer Application	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1522	Cloud Computing	IFT4402	Master of Computer Application	Quiz, Class Performance, Group Discussion, Viva-Voce	2010
1523	Machine Learning using Python Lab	IFT4403	Master of Computer Application	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2010
1524	Major Project / Dissertation	IFT4437	Master of Computer Application	Report Writing, Presentation, Viva-Voce	2010
1525	Renewable Energy Conversion Systems	RWP4101	Master of Science (Renewable Energy) Part-Time	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2016
1526	Introduction to Solar Thermal Technology	RWP4103	Master of Science (Renewable Energy) Part-Time	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2016
1527	Solar Radiation Measurement & Analysis Lab	RWP4104	Master of Science (Renewable Energy) Part-Time	Practical Lab, Report Writing, Presentation, Viva-Voce	2016
1528	Field Work-I/ Seminar-I	RWP4105	Master of Science (Renewable Energy) Part-Time	Report Writing, Presentation, Viva-Voce	2016
1529	Fabrication of Solar Cells: Material & Designing Aspects	RWP4202	Master of Science (Renewable Energy) Part-Time	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2016
1530	Solar Photovoltaic & Thermal Lab	RWP4205	Master of Science (Renewable Energy) Part-Time	Practical Lab, Report Writing, Presentation, Viva-Voce	2016
1531	Risk Management in Renewable Energy Projects	RWP4206	Master of Science (Renewable Energy) Part-Time	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2016
1532	Wind Energy	RWP4207	Master of Science (Renewable Energy) Part-Time	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2016
1533	Modelling and Simulation of Solar Thermal Systems	RWP4301	Master of Science (Renewable Energy) Part-Time	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2016
1534	Biomass	RWP4303	Master of Science (Renewable Energy) Part-Time	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2016
1535	Summer Internship Evaluation-I	RWP4335	Master of Science (Renewable Energy) Part-Time	Report Writing, Presentation, Viva-Voce	2016
1536	Designing of Solar Projects	RWP4305	Master of Science (Renewable Energy) Part-Time	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2016
1537	Large Scale Grid Integration of Renewable Energy Sources	RWP4306	Master of Science (Renewable Energy) Part-Time	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2016
1538	Wind Energy: Energy Conversion and Design of Turbines	RWP4307	Master of Science (Renewable Energy) Part-Time	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2016

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1539	Energy Storage	RWP4408	Master of Science (Renewable Energy) Part-Time	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2016
1540	Field Work-II/ Minor Project/ Seminar-II	RWP4404	Master of Science (Renewable Energy) Part-Time	Report Writing, Presentation, Viva-Voce	2016
1541	Designing of Solar Rooftop PV System	RWP4505	Master of Science (Renewable Energy) Part-Time	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2016
1542	Solar Power Generation Lab	RWP4503	Master of Science (Renewable Energy) Part-Time	Practical Lab, Report Writing, Presentation, Viva-Voce	2016
1543	Summer Internship Evaluation-II	RWP4535	Master of Science (Renewable Energy) Part-Time	Report Writing, Presentation, Viva-Voce	2016
1544	Biofuels and Biomethanation	RWP4502	Master of Science (Renewable Energy) Part-Time	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2016
1545	Energy Policy	RWP4601	Master of Science (Renewable Energy) Part-Time	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2016
1546	Energy Management	RWP4602	Master of Science (Renewable Energy) Part-Time	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2016
1547	Green Buildings	RWP4603	Master of Science (Renewable Energy) Part-Time	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2016
1548	Dissertation / Seminar & Progress Report / Comprehensive Viva	RWP4637	Master of Science (Renewable Energy) Part-Time	Report Writing, Presentation, Viva-Voce	2016
1549	Elements of Aeronautics	ASE2153	Aerospace Engineering (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1550	Elements of Astronautics	ASE2253	Aerospace Engineering (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1551	Theory of Flight	ASE2353	Aerospace Engineering (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1552	Principles of Stability & Control	ASE2453	Aerospace Engineering (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1553	Introduction to Flight Vehicle Design	ASE2553	Aerospace Engineering (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1554	Principles of Aerospace Propulsion	ASE2653	Aerospace Engineering (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1555	Basics of Artificial Intelligence	CSE2351	Artificial Intelligence (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1556	Artificial Neural Networks	CSE2451	Artificial Intelligence (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1557	Fuzzy Logic	CSE2551	Artificial Intelligence (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1558	Introduction to Genetic Algorithm	CSE2651	Artificial Intelligence (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1559	Soft Computing	CSE2751	Artificial Intelligence (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1560	Project (Artificial Intelligence)	CSE2851	Artificial Intelligence (OE)	Report Writing, Viva-Voce, Presentation	2013

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1561	Human Anatomy and Physiology-I	BME2351	Biomedical (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1562	Bioinstrumentation	BME2451	Biomedical (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1563	Tissue Engineering	BME2551	Biomedical (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1564	Biomechanic	BME2651	Biomedical (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1565	Medical Image Processing	BME2751	Biomedical (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1566	Seminar-Biomedical Engineering	BME2851	Biomedical (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1567	Computer Networks	CSE2353	Cloud Computing (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1568	Distributed System	CSE2453	Cloud Computing (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1569	High Performance Computing	CSE2553	Cloud Computing (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1570	Information Storage Management	CSE2653	Cloud Computing (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1571	Interfacing with Virtualization	CSE2753	Cloud Computing (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1572	Cloud Computing Tools & Techniques	CSE2853	Cloud Computing (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1573	Systems and Warfare Platforms	DTE2151	Defence Technology (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2023
1574	Combat System Engineering	DTE2251	Defence Technology (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2023
1575	Combat Vehicle Dynamics	DTE2351	Defence Technology (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2023
1576	Warfare Simulations & Strategies	DTE2451	Defence Technology (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2023
1577	Digital & Satellite Communication and Navigation from Space	DTE2551	Defence Technology (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2023
1578	Aerospace System Configuration Design & Simulation	DTE2651	Defence Technology (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2023
1579	Introduction to Microprocessor System	ECE2352	Embedded System (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1580	Microcontroller	ECE2452	Embedded System (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1581	PCB Fabrication	ECE2552	Embedded System (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1582	Robotics and Automation	ECE2652	Embedded System (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1583	Simulation and Modeling	ECE2752	Embedded System (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1584	Project (Embedded System)	ECE2852	Embedded System (OE)	Report Writing, Viva-Voce, Presentation	2013
1585	Engineering Geology	CIV2351	Geotechnical Engineering (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1586	Geo informatics	CIV2451	Geotechnical Engineering (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1587	Geotechnical Engineering-I	CIV2551	Geotechnical Engineering (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1588	Geotechnical Engineering-II	CIV2651	Geotechnical Engineering (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1589	Project (Geotechnical Engineering)	CIV2751	Geotechnical Engineering (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1590	Seminar-Geotechnical Engineering	CIV2851	Geotechnical Engineering (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1591	Basic Electronics	ECE2153	IC Manufacturing (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2023
1592	VLSI Fabrication	ECE2253	IC Manufacturing (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2023
1593	Clean Room Technologies	ECE2353	IC Manufacturing (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2023
1594	Semiconductor Technology Equipment Maintenance	ECE2453	IC Manufacturing (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2023
1595	Vacuum Technology	ECE2553	IC Manufacturing (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2023
1596	Semiconductor Packaging, Testing and Assembly	ECE2653	IC Manufacturing (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2023
1597	Basic Instrumentation	ECE2351	Instrumentation Engineering (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1598	Virtual Instrumentation	ECE2451	Instrumentation Engineering (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1599	Biomedical Instrumentation	ECE2551	Instrumentation Engineering (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1600	Analytical Instrumentation	ECE2651	Instrumentation Engineering (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1601	Industrial Process Control	ECE2751	Instrumentation Engineering (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1602	Project (Instrumentation Engineering)	ECE2851	Instrumentation Engineering (OE)	Report Writing, Viva-Voce, Presentation	2013
1603	Basics of Lasers	LOE2351	Laser System (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion	2013
1604	Laser Technology & Applications	LOE2451	Laser System (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion	2013
1605	Laser Systems & Devices	LOE2551	Laser System (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion	2013
1606	Lasers in Defense Applications	LOE2651	Laser System (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion	2013
1607	Lasers in Industrial Applications	LOE2751	Laser System (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion	2013
1608	Lasers in Atmospheric Studies	LOE2851	Laser System (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion	2013
1609	Thermodynamics	MAE2352	Mechanical Engineering (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1610	Fluid Power Systems	MAE2452	Mechanical Engineering (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1611	KOM	MAE2552	Mechanical Engineering (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1612	DOM	MAE2652	Mechanical Engineering (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1613	Meteorology	MAE2752	Mechanical Engineering (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2013
1614	Project (Mechanical Engineering)	MAE2852	Mechanical Engineering (OE)	Report Writing, Viva-Voce, Presentation	2013
1615	Basics of Nanoscience	NAT2152	Nanotechnology (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion	2013
1616	Properties of Nanomaterials	NAT2251	Nanotechnology (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion	2013
1617	Synthesis of Nanomaterials	NAT2353	Nanotechnology (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion	2013
1618	Characterization Techniques	NAT2453	Nanotechnology (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion	2013
1619	Vacuum Science & Clean Room Technology	NAT2553	Nanotechnology (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion	2013
1620	Industrial Applications of Nanomaterials	NAT2652	Nanotechnology (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion	2013
1621	Fundamental of Solar Photovoltaic, Battery & Inverter	SAE2152	Renewable Energy (OE)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2015
1622	Solar PV Installation	SAE2252	Renewable Energy (OE)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2015
1623	Solar PV Design	SAE2352	Renewable Energy (OE)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2015
1624	Solid Waste Management and Power Generation	SAE2452	Renewable Energy (OE)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2015
1625	Solar Thermal Systems	SAE2552	Renewable Energy (OE)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2015
1626	Energy Audit and Energy Management	SAE2651	Renewable Energy (OE)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2015
1627	Introduction to UAVs and Applications	ASE2352	Unmanned Aerial Vehicles (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2021
1628	Principles of UAV's Flight	ASE2452	Unmanned Aerial Vehicles (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2021
1629	Aerial Imagery: Hardware & Software	ASE2552	Unmanned Aerial Vehicles (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2021
1630	Embedded Systems for UAVs	ASE2652	Unmanned Aerial Vehicles (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2021
1631	Research Project-I Drone Development	ASE2752	Unmanned Aerial Vehicles (OE)	Report Writing, Viva-Voce, Presentation	2021
1632	Research Project-II Drone Troubleshooting, Testing & Deployment	ASE2852	Unmanned Aerial Vehicles (OE)	Report Writing, Viva-Voce, Presentation	2021

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1633	Basic Electronics	VDE2151	VLSI Design (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2023
1634	VLSI Design	VDE2251	VLSI Design (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2023
1635	Analog IC Design	VDE2351	VLSI Design (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2023
1636	Verilog Programming	VDE2451	VLSI Design (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2023
1637	RTL Design and Verification	VDE2551	VLSI Design (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2023
1638	VLSI Testing	VDE2651	VLSI Design (OE)	Quiz, Viva-Voce, Presentation, Case-Discussion, Simulation	2023
1639	Inorganic Chemistry Lab-I	DCHY2152	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014
1640	Green Chemistry	DCHY2101	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1641	Green Chemistry Lab	DCHY2102	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014
1642	Analytical Chemistry	DCHY2301	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1643	Analytical Chemistry Lab	DCHY2302	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014
1644	Rubber Technology	SCHY2301	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1645	Community Engagement Services	NCHY2335	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Project writing, Presentation, Viva-Voce	2014
1646	Industrial Application of Carbon Nano Composites	SCHY2401	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1647	Introduction to Lab Safety & Training	DCHY2551	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1648	Agriculture Chemistry	DCHY2506	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1649	Material Chemistry	DCHY2507	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1650	SIP/Internship/ Project/ Dissertation/Field Visit	NCHY2537	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Project writing, Presentation, Viva-Voce	2014
1651	Basics of Polymer Chemistry	DCHY2651	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Class Performance, Group Discussion, Viva-Voce	2014

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1652	Industrially Relevant Inorganic Materials	DCHY2605	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1653	Advanced Inorganic Chemistry Lab	DCHY2702	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014
1654	Advanced Organic Chemistry	DCHY2703	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1655	Advanced Organic Chemistry Lab	DCHY2704	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014
1656	Chemistry: Statistical Method & Data Analysis	DCHY2705	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1657	Chemistry of Medicines in Daily Life	DCHY2708	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1658	Advanced Polymer Chemistry	DCHY2709	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1659	Radiochemistry in Energy, Medicine & Environment	DCHY2710	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1660	Role of Metals in Medicines	DCHY2712	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1661	Energy & Environment	DCHY2713	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1662	Chemistry of Heterocycles	DCHY2714	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1663	Basics of Research Methodology, Ethics and Research Communication	DCHY2739	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1664	SIP/Internship/ Project/ Dissertation/Field Visit	NCHY2737	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Project writing, Presentation, Viva-Voce	2014
1665	Solutions, Colligative Properties, Phase Equillibria & Adsorption	DCHY2805	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1666	Application of Computers in Chemistry	DCHY2806	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1667	Industrial Chemistry	DCHY2809	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1668	Quantum Chemistry	DCHY2810	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Class Performance, Group Discussion, Viva-Voce	2014

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1669	Green Chemistry in Organic Synthesis	DCHY2811	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1670	Natural Product Chemistry	DCHY2812	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1671	SIP/Internship/ Project/ Dissertation/Field Visit	NCHY2837	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Project writing, Presentation, Viva-Voce	2014
1672	Data Analysis & Visualisation using Software	DCHY2839	Bachelor of Science (Honors/ Honors with Research) in Chemistry	Written Test, Presentation, Viva-Voce	2014
1673	Mathematical Methods	DMTH2301	Bachelor of Science (Honors/ Honors with Research) in Mathematics	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1674	Fundamentals of C Programming	SMTH2301	Bachelor of Science (Honors/ Honors with Research) in Mathematics	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1675	C Programming Lab	SMTH2302	Bachelor of Science (Honors/ Honors with Research) in Mathematics	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014
1676	Community Engagement Services	NMTH2335	Bachelor of Science (Honors/ Honors with Research) in Mathematics	Project writing, Presentation, Viva-Voce	2014
1677	Optimization Techniques	DMTH2451	Bachelor of Science (Honors/ Honors with Research) in Mathematics	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1678	Optimization Techniques Lab	DMTH2452	Bachelor of Science (Honors/ Honors with Research) in Mathematics	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014
1679	Programming with MATLAB	SMTH2401	Bachelor of Science (Honors/ Honors with Research) in Mathematics	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014
1680	SIP/Internship/ Project/ Dissertation/Field Visit	NMTH2537	Bachelor of Science (Honors/ Honors with Research) in Mathematics	Project writing, Presentation, Viva-Voce	2014
1681	Statistics Based Lab	DMTH2652	Bachelor of Science (Honors/ Honors with Research) in Mathematics	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014
1682	Financial Mathematics	DMTH2602	Bachelor of Science (Honors/ Honors with Research) in Mathematics	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1683	Scientific Tools for Research	DMTH2708	Bachelor of Science (Honors/ Honors with Research) in Mathematics	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1684	Statistics inference with Lab	DMTH2710	Bachelor of Science (Honors/ Honors with Research) in Mathematics	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014
1685	Basics of Research Methodology, Ethics and Research Communication	DMTH2739	Bachelor of Science (Honors/ Honors with Research) in Mathematics	Quiz, Class Performance, Group Discussion, Viva-Voce	2014

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1686	SIP/Internship/ Project/ Dissertation/Field Visit	NMTH2737	Bachelor of Science (Honors/ Honors with Research) in Mathematics	Project writing, Presentation, Viva-Voce	2014
1687	SIP/Internship/ Project/ Dissertation/Field Visit	NMTH2837	Bachelor of Science (Honors/ Honors with Research) in Mathematics	Project writing, Presentation, Viva-Voce	2014
1688	Data Analysis & Visualisation using Software	DMTH2839	Bachelor of Science (Honors/ Honors with Research) in Mathematics	Written Test, Presentation, Viva-Voce	2014
1689	Mechanics	DPHY2151	Bachelor of Science (Honors/ Honors with Research) in Physics	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1690	Demonstrative Aspects in Mechanics	DPHY2152	Bachelor of Science (Honors/ Honors with Research) in Physics	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014
1691	Thermodynamics	DPHY2251	Bachelor of Science (Honors/ Honors with Research) in Physics	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1692	Demonstrative Aspects in Thermodynamics	DPHY2252	Bachelor of Science (Honors/ Honors with Research) in Physics	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014
1693	Waves and Optics	DPHY2351	Bachelor of Science (Honors/ Honors with Research) in Physics	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1694	Demonstrative Aspects in Waves and Optics	DPHY2352	Bachelor of Science (Honors/ Honors with Research) in Physics	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014
1695	Classical Mechanics	DPHY2301	Bachelor of Science (Honors/ Honors with Research) in Physics	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1696	Statistical Mechanics	DPHY2302	Bachelor of Science (Honors/ Honors with Research) in Physics	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1697	Fundamentals of C Programming	SPHY2301	Bachelor of Science (Honors/ Honors with Research) in Physics	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1698	C Programming Lab	SPHY2302	Bachelor of Science (Honors/ Honors with Research) in Physics	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014
1699	Community Engagement Services	NPHY2335	Bachelor of Science (Honors/ Honors with Research) in Physics	Project Writing, Presentation, Quiz	2014
1700	Demonstrative Aspects in Electronics	DPHY2452	Bachelor of Science (Honors/ Honors with Research) in Physics	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014
1701	Instrumentation Physics	SPHY2401	Bachelor of Science (Honors/ Honors with Research) in Physics	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1702	Renewable Energy Resources	DPHY2504	Bachelor of Science (Honors/ Honors with Research) in Physics	Quiz, Class Performance, Group Discussion, Viva-Voce	2014

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1703	Scientific Computing OR MATLAB	DPHY2507	Bachelor of Science (Honors/ Honors with Research) in Physics	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014
1704	SIP/Internship/ Project/ Dissertation/Field Visit	NPHY2537	Bachelor of Science (Honors/ Honors with Research) in Physics	Project Writing, Presentation, Quiz	2014
1705	Materials Science	DPHY2651	Bachelor of Science (Honors/ Honors with Research) in Physics	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1706	Digital Electronics & Microprocessor	DPHY2704	Bachelor of Science (Honors/ Honors with Research) in Physics	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1707	Vacuum Technology	DPHY2710	Bachelor of Science (Honors/ Honors with Research) in Physics	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1708	Basics of Research Methodology, Ethics and Research Communication	DPHY2739	Bachelor of Science (Honors/ Honors with Research) in Physics	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1709	SIP/Internship/ Project/ Dissertation/Field Visit	NPHY2737	Bachelor of Science (Honors/ Honors with Research) in Physics	Project Writing, Presentation, Quiz	2014
1710	Thin Film Technology	DPHY2803	Bachelor of Science (Honors/ Honors with Research) in Physics	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1711	Group Theory & Crystallography	DPHY2808	Bachelor of Science (Honors/ Honors with Research) in Physics	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1712	SIP/Internship/ Project/ Dissertation/Field Visit	NPHY2837	Bachelor of Science (Honors/ Honors with Research) in Physics	Project Writing, Presentation, Quiz	2014
1713	Data Analysis & Visualisation using Software	DPHY2839	Bachelor of Science (Honors/ Honors with Research) in Physics	Written Test, Presentation, Quiz	2014
1714	Crime Scene Management Lab	DFCH2152	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014
1715	Physical Evidences	DFCH2101	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1716	Physical Evidences Lab	DFCH2102	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014
1717	Fingerprint Science	DFCH2251	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1718	Fingerprint Science Lab	DFCH2252	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014
1719	Instrumentation Biological	DFCH2301	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Quiz, Class Performance, Group Discussion, Viva-Voce	2014

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1720	Crime Scene Investigation Techniques	SFCH2301	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1721	Community Engagement Services	NFCH2335	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Project writing, Presentation, Viva-Voce	2014
1722	DNA Fingerprinting	DFCH2451	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1723	DNA Fingerprinting Lab	DFCH2452	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014
1724	Cyber Forensics	SFCH2401	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1725	Computer Forensics	DFCH2551	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1726	Forensic Medicine	DFCH2502	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1727	Criminology, Criminal Law and Police Administration	DFCH2503	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1728	SIP/Internship/ Project/ Dissertation/Field Visit	NFCH2537	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Project writing, Presentation, Viva-Voce	2014
1729	Biometric Technology and MATLAB	DFCH2651	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014
1730	Forensic Psychology	DFCH2701	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1731	Digital Forensics	DFCH2702	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1732	Advanced Forensic Chemistry & Toxicology	DFCH2703	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1733	Quality Management & Accreditation in Forensic Science Laboratories	DFCH2704	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014
1734	Forensic Genetics	DFCH2705	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1735	Introduction to Lab Safety & Training	DFCH2706	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1736	Basics of Research Methodology, Ethics and Research Communication	DFCH2739	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Quiz, Class Performance, Group Discussion, Viva-Voce	2014

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1737	SIP/Internship/ Project/ Dissertation/Field Visit	NFCH2737	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Project writing, Presentation, Viva-Voce	2014
1738	Wild Life Forensic and Entomology	DFCH2801	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1739	Cyber Security	DFCH2802	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1740	Arson and Explosives	DFCH2803	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Quiz, Class Performance, Group Discussion, Viva-Voce	2014
1741	SIP/Internship/ Project/ Dissertation/Field Visit	NFCH2837	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Project writing, Presentation, Viva-Voce	2014
1742	Data Analysis & Visualisation using Software	DFCH2839	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	Written Test, Presentation, Viva-Voce	2014
1743	Physical Chemistry Lab	CHY4105	Master of Science (Chemistry)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2013
1744	Organic Chemistry Lab	CHY4106	Master of Science (Chemistry)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2013
1745	Cheminformatics & Biochemistry Lab	CHY4112	Master of Science (Chemistry)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2013
1746	Research Seminar	CHY4108	Master of Science (Chemistry)	Quiz, Written Test	2013
1747	Analytical Chemistry	CHY4201	Master of Science (Chemistry)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1748	Industrial Chemistry	CHY4202	Master of Science (Chemistry)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1749	Organometallic Chemistry	CHY4211	Master of Science (Chemistry)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1750	Introduction to Laboratory Safety	CHY4212	Master of Science (Chemistry)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1751	Spectroscopy	CHY4213	Master of Science (Chemistry)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1752	Analytical Chemistry Lab	CHY4206	Master of Science (Chemistry)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2013
1753	Industrial Chemistry Lab	CHY4207	Master of Science (Chemistry)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2013
1754	Term Paper	CHY4231	Master of Science (Chemistry)	Academic Writing, Presentation, Quiz	2013
1755	Inorganic Chemistry Lab	CHY4324	Master of Science (Chemistry)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2013
1756	Natural Products & Heterocyclic Chemistry	CHY4325	Master of Science (Chemistry)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1757	Summer Internship Evaluation/ Study Abroad Programme	CHY4335	Master of Science (Chemistry)	Report Writing, Presentation, Viva-Voce	2013
1758	Drugs and Dyes	CHY4304	Master of Science (Chemistry)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1759	Advanced Natural Products Chemistry	CHY4305	Master of Science (Chemistry)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1760	Advanced Nanochemistry	CHY4308	Master of Science (Chemistry)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1761	Medicinal Chemistry	CHY4310	Master of Science (Chemistry)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1762	Polymer Technology	CHY4311	Master of Science (Chemistry)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1763	Non-Conventional Energy Sources	CHY4312	Master of Science (Chemistry)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1764	Industrial Waste and Water Treatment	CHY4313	Master of Science (Chemistry)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1765	Nuclear Chemistry	CHY4314	Master of Science (Chemistry)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1766	Food Technology	CHY4315	Master of Science (Chemistry)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1767	Environmental Chemistry	CHY4321	Master of Science (Chemistry)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1768	Renewable Energy Conversion Systems	CHY4322	Master of Science (Chemistry)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1769	Introduction to Polymeric Materials	CHY4405	Master of Science (Chemistry)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1770	Chemistry of Nanomaterials	CHY4407	Master of Science (Chemistry)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1771	Good Laboratory Practices Seminar	CHY4408	Master of Science (Chemistry)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2013
1772	Major Project	CHY4437	Master of Science (Chemistry)	Report Writing, Presentation, Viva-Voce	2013
1773	Computing and C Programming	MTH4105	Master of Science (Mathematics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1774	C Programming Lab	MTH4106	Master of Science (Mathematics)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2013

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1775	Topology	MTH4205	Master of Science (Mathematics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1776	Statistics Based Lab-I	MTH4206	Master of Science (Mathematics)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2013
1777	Introduction to MATLAB	MTH4215	Master of Science (Mathematics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1778	MATLAB Programming Lab	MTH4216	Master of Science (Mathematics)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2013
1779	Operations Research	MTH4217	Master of Science (Mathematics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1780	Numerical Analysis	MTH4325	Master of Science (Mathematics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1781	Numerical Analysis Lab	MTH4327	Master of Science (Mathematics)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2013
1782	Summer Workshop/ Study Abroad Programme	MTH4335	Master of Science (Mathematics)	Report Writing, Presentation, Viva-Voce	2013
1783	Number Theory & Cryptography	MTH4329	Master of Science (Mathematics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1784	Fluid Dynamics	MTH4409	Master of Science (Mathematics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1785	Workshop	MTH4433	Master of Science (Mathematics)	Quiz, Written Test	2013
1786	Project	MTH4437	Master of Science (Mathematics)	Project Writing, Presentation, Viva-Voce	2013
1787	Classical Mechanics	MTH4410	Master of Science (Mathematics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1788	Biomechanics	MTH4412	Master of Science (Mathematics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1789	Stochastic Processes	MTH4414	Master of Science (Mathematics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1790	Statistical Inference	MTH4415	Master of Science (Mathematics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1791	Numerical Solutions to ODE and PDEs	MTH4416	Master of Science (Mathematics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2013
1792	Classical Mechanics	PHY4102	Master of Science (Physics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2012
1793	Electronics	PHY4103	Master of Science (Physics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2012

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1794	Quantum Mechanics-I	PHY4109	Master of Science (Physics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2012
1795	Computational Physics	PHY4110	Master of Science (Physics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2012
1796	Integrated Physics Lab-I	PHY4111	Master of Science (Physics)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2012
1797	Statistical Mechanics	PHY4202	Master of Science (Physics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2012
1798	Quantum Mechanics-II	PHY4208	Master of Science (Physics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2012
1799	Electrodynamics	PHY4215	Master of Science (Physics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2012
1800	Atomic and Molecular Physics	PHY4216	Master of Science (Physics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2012
1801	Integrated Physics Lab-II	PHY4212	Master of Science (Physics)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2012
1802	Nuclear & Particle Physics	PHY4321	Master of Science (Physics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2012
1803	Laser Physics	PHY4322	Master of Science (Physics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2012
1804	Integrated Physics Lab-III	PHY4316	Master of Science (Physics)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2012
1805	Summer Internship Evaluation/ Study Abroad Programme	PHY4335	Master of Science (Physics)	Report Writing, Presentation, Viva-Voce	2012
1806	Digital Electronics & Microprocessors	PHY4306	Master of Science (Physics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2012
1807	Renewable Energy Resources	PHY4317	Master of Science (Physics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2012
1808	Introduction to Astrophysics	PHY4318	Master of Science (Physics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2012
1809	Experimental Techniques	PHY4410	Master of Science (Physics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2012
1810	Nano-Science & Technology	PHY4404	Master of Science (Physics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2012
1811	Atmospheric Physics	PHY4405	Master of Science (Physics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2012

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1812	General Relativity & Cosmology	PHY4406	Master of Science (Physics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2012
1813	Optical Fibers & Communications	PHY4407	Master of Science (Physics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2012
1814	Physics of Solar Photovoltaics	PHY4408	Master of Science (Physics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2012
1815	Biophysics	PHY4409	Master of Science (Physics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2012
1816	Radiation Physics	PHY4411	Master of Science (Physics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2012
1817	High Energy Physics	PHY4413	Master of Science (Physics)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2012
1818	Forensic Physics	FCH4103	Master of Science (Forensic Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2014
1819	Forensic Ballistics	FCH4106	Master of Science (Forensic Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2014
1820	Forensic Physics Lab	FCH4107	Master of Science (Forensic Science)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014
1821	Crime Scene Investigation (CSI) Lab	FCH4108	Master of Science (Forensic Science)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014
1822	Forensic and Criminal Investigation	FCH4111	Master of Science (Forensic Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2014
1823	Instrumentation (Chemical)	FCH4112	Master of Science (Forensic Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2014
1824	Research Seminar	FCH4110	Master of Science (Forensic Science)	Academic Writing, Presentation, Quiz	2014
1825	Forensic Photography	FCH4201	Master of Science (Forensic Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2014
1826	Elements of Forensic Medicine and Odontology	FCH4202	Master of Science (Forensic Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2014
1827	Questioned Documents	FCH4205	Master of Science (Forensic Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2014
1828	Forensic Medicine & Odontology Lab	FCH4206	Master of Science (Forensic Science)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014
1829	Questioned Documents & Fingerprints Lab	FCH4208	Master of Science (Forensic Science)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1830	Instrumentation (Biological)	FCH4209	Master of Science (Forensic Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2014
1831	Fingerprint Science	FCH4210	Master of Science (Forensic Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2014
1832	Term Paper	FCH4231	Master of Science (Forensic Science)	Academic Writing, Presentation, Quiz	2014
1833	Forensic Chemistry, Toxicology & Pharmacology	FCH4301	Master of Science (Forensic Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2014
1834	Forensic Biology & Serology	FCH4302	Master of Science (Forensic Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2014
1835	Forensic Biology and Serology Lab	FCH4304	Master of Science (Forensic Science)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014
1836	Forensic Chemistry & Toxicology Lab	FCH4305	Master of Science (Forensic Science)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2014
1837	Statistics & Research Methodology	FCH4315	Master of Science (Forensic Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2014
1838	Instrumentation (Physical)	FCH4316	Master of Science (Forensic Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2014
1839	Instrumentation Workshop	FCH4318	Master of Science (Forensic Science)	Academic Writing, Presentation, Quiz	2014
1840	Summer Internship Evaluation/ Study Abroad Programme	FCH4335	Master of Science (Forensic Science)	Report Writing, Presentation, Viva-Voce	2014
1841	Advanced Forensic Biology & Anthropology	FCH4306	Master of Science (Forensic Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2014
1842	Cyber Forensic & Computer Application	FCH4317	Master of Science (Forensic Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2014
1843	Forensic Genetics	FCH4319	Master of Science (Forensic Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2014
1844	Advanced Questioned Documents & Fingerprint Examination	FCH4310	Master of Science (Forensic Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2014
1845	Advanced Forensic Chemistry and Toxicology	FCH4320	Master of Science (Forensic Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2014
1846	Forensic Wildlife and Entomology	FCH4321	Master of Science (Forensic Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2014
1847	Quality Management & Accreditation in Forensic Science Laboratories	FCH4405	Master of Science (Forensic Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2014

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1848	Forensic Psychology	FCH4408	Master of Science (Forensic Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2014
1849	Good Laboratory Practices Seminar	FCH4409	Master of Science (Forensic Science)	Academic Writing, Presentation, Quiz	2014
1850	Major Project	FCH4437	Master of Science (Forensic Science)	Report Writing, Presentation, Viva-Voce	2014
1851	Computer Forensics	FCH2151	Computer Forensics & Cyber Security (OE)	Quiz, Class Performance, Group Discussion, Viva-Voce	2015
1852	Ethics, Policies and the IT Act	FCH2251	Computer Forensics & Cyber Security (OE)	Quiz, Class Performance, Group Discussion, Viva-Voce	2015
1853	Biometric Technology	FCH2352	Computer Forensics & Cyber Security (OE)	Quiz, Class Performance, Group Discussion, Viva-Voce	2015
1854	Implementation Practical on MATLAB	FCH2451	Computer Forensics & Cyber Security (OE)	Lab Record, Quiz, Class Performance, Group Discussion, Viva-Voce	2015
1855	Cyber Security	FCH2551	Computer Forensics & Cyber Security (OE)	Quiz, Class Performance, Group Discussion, Viva-Voce	2015
1856	Incident Response Management	FCH2651	Computer Forensics & Cyber Security (OE)	Quiz, Class Performance, Group Discussion, Viva-Voce	2015
1857	Optimization Techniques	MTH2151	Data Analytics (OE)	Quiz, Class Performance, Group Discussion, Viva-Voce	2013
1858	Statistics	MTH2251	Data Analytics (OE)	Quiz, Class Performance, Group Discussion, Viva-Voce	2013
1859	Data Mining	MTH2351	Data Analytics (OE)	Quiz, Class Performance, Group Discussion, Viva-Voce	2013
1860	Database Management System	MTH2451	Data Analytics (OE)	Quiz, Class Performance, Group Discussion, Viva-Voce	2013
1861	Introduction to Financial Modeling	MTH2551	Data Analytics (OE)	Quiz, Class Performance, Group Discussion, Viva-Voce	2013
1862	Statistical Quality Control	MTH2651	Data Analytics (OE)	Quiz, Class Performance, Group Discussion, Viva-Voce	2013
1863	Fundamentals of Materials Science	PHY2151	Materials Science & Technology (OE)	Quiz, Class Performance, Group Discussion, Viva-Voce	2019
1864	Classification & Selection of Materials	PHY2251	Materials Science & Technology (OE)	Quiz, Class Performance, Group Discussion, Viva-Voce	2019
1865	Properties of Materials	PHY2351	Materials Science & Technology (OE)	Quiz, Class Performance, Group Discussion, Viva-Voce	2019
1866	Manufacturing Processes for Materials	PHY2451	Materials Science & Technology (OE)	Quiz, Class Performance, Group Discussion, Viva-Voce	2019
1867	Materials Testing & Characterization	PHY2551	Materials Science & Technology (OE)	Quiz, Class Performance, Group Discussion, Viva-Voce	2019
1868	Materials at Nanoscale	PHY2651	Materials Science & Technology (OE)	Quiz, Class Performance, Group Discussion, Viva-Voce	2019
1869	Cosmetic Formulation	CHY2152	Pharmaceuticals (OE)	Quiz, Class Performance, Group Discussion, Viva-Voce	2013
1870	Industrial Management and Safety Process	CHY2252	Pharmaceuticals (OE)	Quiz, Class Performance, Group Discussion, Viva-Voce	2013
1871	Drug Design	CHY2352	Pharmaceuticals (OE)	Quiz, Class Performance, Group Discussion, Viva-Voce	2013

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1872	Application of Nanotechnology in Medicine	CHY2452	Pharmaceuticals (OE)	Quiz, Class Performance, Group Discussion, Viva-Voce	2013
1873	Intellectual Property Rights and Quality Assurance	CHY2552	Pharmaceuticals (OE)	Quiz, Class Performance, Group Discussion, Viva-Voce	2013
1874	Pharmaceutical and Cosmetics Sciences Lab	CHY2652	Pharmaceuticals (OE)	Lab Record, Quiz, Group Discussion, Viva-Voce	2013
1875	Polymerization	PTE2151	Polymer Technology (OE)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
1876	Waste Plastic Recycling	PTE2251	Polymer Technology (OE)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
1877	Polymer Technology	PTE2351	Polymer Technology (OE)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
1878	Rubber & Tyre Technology	PTE2451	Polymer Technology (OE)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
1879	Polymeric Nano Composites	PTE2551	Polymer Technology (OE)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
1880	Bio-Medical Plastics	PTE2651	Polymer Technology (OE)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
1881	Earth System Sciences	DESC2151	Bachelor of Science (Honors/ Honors with Research) in Earth Science	Hands on Training, Institute & Industry visit, Laboratory Training	2014
1882	Earth Surface Features & Processes	DESC2101	Bachelor of Science (Honors/ Honors with Research) in Earth Science	Hands on Training, Institute & Industry visit, Laboratory Training	2014
1883	Petrology + Field	DESC2251	Bachelor of Science (Honors/ Honors with Research) in Earth Science	Hands on Training, Institute & Industry visit, Laboratory Training	2014
1884	Structural Geology + Field	DESC2351	Bachelor of Science (Honors/ Honors with Research) in Earth Science	Hands on Training, Institute & Industry visit, Laboratory Training	2014
1885	Geophysics & Engineering Geology + Lab	DESC2301	Bachelor of Science (Honors/ Honors with Research) in Earth Science	On site validation, Hands on Training, Institute & Industry visit, Laboratory Training	2014
1886	Remote Sensing and GIS	SESC2301	Bachelor of Science (Honors/ Honors with Research) in Earth Science	Hands on Training, Institute & Industry visit, Laboratory Training	2014
1887	Community Engagement Services	NESC2335	Bachelor of Science (Honors/ Honors with Research) in Earth Science	Report Writing, Presentation, Viva-Voce	2014
1888	Mineralogy + Lab	DESC2451	Bachelor of Science (Honors/ Honors with Research) in Earth Science	On site validation, Hands on Training, Institute & Industry visit, Laboratory Training	2014
1889	Exploration & Economic Geology + Field	DESC2401	Bachelor of Science (Honors/ Honors with Research) in Earth Science	Hands on Training, Institute & Industry visit, Laboratory Training	2014

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1890	Surveying and Mapping	SESC2401	Bachelor of Science (Honors/ Honors with Research) in Earth Science	Hands on Training, Institute & Industry visit, Laboratory Training	2014
1891	Hydrology + Lab	DESC2501	Bachelor of Science (Honors/ Honors with Research) in Earth Science	On site validation, Hands on Training, Institute & Industry visit, Laboratory Training	2014
1892	Planetory Science + Lab	DESC2502	Bachelor of Science (Honors/ Honors with Research) in Earth Science	On site validation, Hands on Training, Institute & Industry visit, Laboratory Training	2014
1893	SIP/Internship/ Project/ Dissertation/Field Visit	NESC2537	Bachelor of Science (Honors/ Honors with Research) in Earth Science	Report Writing, Presentation, Viva-Voce	2014
1894	Oceanography & Atmospheric Science + Lab	DESC2601	Bachelor of Science (Honors/ Honors with Research) in Earth Science	On site validation, Hands on Training, Institute & Industry visit, Laboratory Training	2014
1895	Environmental Geology & Natural Hazards + Field	DESC2602	Bachelor of Science (Honors/ Honors with Research) in Earth Science	Hands on Training, Institute & Industry visit, Laboratory Training	2014
1896	Hydrogeology	DESC2704	Bachelor of Science (Honors/ Honors with Research) in Earth Science	Hands on Training, Institute & Industry visit, Laboratory Training	2014
1897	Basics of Research Methodology, Ethics and Research Communication	DESC2739	Bachelor of Science (Honors/ Honors with Research) in Earth Science	Hands on Training, Institute & Industry visit, Laboratory Training	2014
1898	SIP/Internship/ Project/ Dissertation/Field Visit	NESC2737	Bachelor of Science (Honors/ Honors with Research) in Earth Science	Report Writing, Presentation, Viva-Voce	2014
1899	Co-evolution of Earth & Life + Field	DESC2803	Bachelor of Science (Honors/ Honors with Research) in Earth Science	Hands on Training, Institute & Industry visit, Laboratory Training	2014
1900	SIP/Internship/ Project/ Dissertation/Field Visit	NESC2837	Bachelor of Science (Honors/ Honors with Research) in Earth Science	Report Writing, Presentation, Viva-Voce	2014
1901	Data Analysis & Visualisation using Software	DESC2839	Bachelor of Science (Honors/ Honors with Research) in Earth Science	Written Test, Presentation, Viva-Voce	2014
1902	Environmental Studies	ENV2152/ ENV2252	Environmental Studies (OE)	Quiz, Viva-Voce, Presentation, Project Report	2013
1903	Basics of Climate Science	AST2151	Climate Science (OE)	Hands on Training, Institute & Industry visit, Laboratory Training	2014
1904	Introduction to Earth System Science	AST2251	Climate Science (OE)	Hands on Training, Institute & Industry visit, Laboratory Training	2014
1905	Cloud Microphysics and Chemistry	AST2351	Climate Science (OE)	Hands on Training, Institute & Industry visit, Laboratory Training	2014
1906	Climate Change: Impact, Vulnerability and Adaption	AST2451	Climate Science (OE)	Hands on Training, Institute & Industry visit, Laboratory Training	2014

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1907	Primer of Oceanography	AST2551	Climate Science (OE)	Hands on Training, Institute & Industry visit, Laboratory Training	2014
1908	Fundamentals of Climate Variability and Modeling	AST2651	Climate Science (OE)	Hands on Training, Institute & Industry visit, Laboratory Training	2014
1909	Environmental Pollution and Waste Management	ENV2351	Environmental Management (OE)	Quiz, Viva-Voce, Presentation, Project Report	2013
1910	Environmental Management and Industrial Safety	ENV2451	Environmental Management (OE)	Quiz, Viva-Voce, Presentation, Project Report	2013
1911	Environmental Economics and Globalization	ENV2551	Environmental Management (OE)	Quiz, Viva-Voce, Presentation, Project Report	2013
1912	Sustainable Development Practices	ENV2651	Environmental Management (OE)	Quiz, Viva-Voce, Presentation, Project Report	2013
1913	Linkages between Environment and Health	AST2152	Environmental Health & Climate (OE)	Hands on Training, Institute & Industry visit, Laboratory Training	2021
1914	Climate Change and Implications on Public Health	AST2252	Environmental Health & Climate (OE)	Hands on Training, Institute & Industry visit, Laboratory Training	2021
1915	Diseases in Contemporary Society	AST2352	Environmental Health & Climate (OE)	Hands on Training, Institute & Industry visit, Laboratory Training	2021
1916	Air, Water and Soil Pollution, Environmental Health Professions	AST2452	Environmental Health & Climate (OE)	Hands on Training, Institute & Industry visit, Laboratory Training	2021
1917	Ground-based and Satellite Remote Sensing	AST2552	Environmental Health & Climate (OE)	Hands on Training, Institute & Industry visit, Laboratory Training	2021
1918	Instrumentation Lab	AST2652	Environmental Health & Climate (OE)	Hands on Training, Institute & Industry visit, Laboratory Training	2021
1919	Fundamentals of Sustainability	DESC2153	Sustainability Science (OE)	Hands on Training, Institute & Industry visit, Laboratory Training	2023
1920	Ecosystem & Natural Capital	DESC2253	Sustainability Science (OE)	Hands on Training, Institute & Industry visit, Laboratory Training	2023
1921	Ecological Economics	DESC2353	Sustainability Science (OE)	Hands on Training, Institute & Industry visit, Laboratory Training	2023
1922	Sustainability: Institutions & Governance	DESC2453	Sustainability Science (OE)	Hands on Training, Institute & Industry visit, Laboratory Training	2023
1923	Environment & Social Governance (ESG)	DESC2553	Sustainability Science (OE)	Hands on Training, Institute & Industry visit, Laboratory Training	2023
1924	Approaches to Sustainability	DESC2503	Sustainability Science (OE)	Hands on Training, Institute & Industry visit, Laboratory Training	2023

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1925	Sustainability: Case Study	DESC2653	Sustainability Science (OE)	Hands on Training, Institute & Industry visit, Laboratory Training	2023
1926	Sustainability Reporting	DESC2604	Sustainability Science (OE)	Hands on Training, Institute & Industry visit, Laboratory Training	2023
1927	Climate Change: Adaptation & Resilience	DESC2605	Sustainability Science (OE)	Hands on Training, Institute & Industry visit, Laboratory Training	2023
1928	Plant and Animal Diversity	DBTH2101	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
1929	Plant and Animal Diversity Lab	DBTH2102	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Practical, Lab Visit, Lab Record, Class Performance	2010
1930	Microbiology	DBTH2201	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
1931	Microbiology Lab	DBTH2202	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Practical, Lab Visit, Lab Record, Class Performance	2010
1932	Cell Biology & Genetics	DBTH2203	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
1933	Cell Biology & Genetics Lab	DBTH2204	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Practical, Lab Visit, Lab Record, Class Performance	2010
1934	Computer Applications for Biologists	SBTH2301	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
1935	Community Engagement Services	NBTH2335	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Project writing, Presentation, Viva-Voce	2010
1936	Recombinant DNA Technology Lab	DBTH2402	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Practical, Lab Visit, Lab Record, Class Performance	2010
1937	Introduction to Bioinformatics	SBTH2401	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
1938	Plant and Animal Biotechnology	DBTH2501	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
1939	Plant and Animal Biotechnology Lab	DBTH2502	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Practical, Lab Visit, Lab Record, Class Performance	2010
1940	Computational Biology and Molecular Modelling	DBTH2505	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
1941	Computational Biology and Molecular Modelling Lab	DBTH2506	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Practical, Lab Visit, Lab Record, Class Performance	2010

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1942	Bioethics, Biosafety and IPR	DBTH2507	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
1943	SIP/Internship/ Project/ Dissertation/Field Visit	NBTH2537	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Project writing, Presentation, Viva-Voce	2010
1944	Bioprocess, & Industrial Biotechnology	DBTH2601	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
1945	Bioprocess, & Industrial Biotechnology Lab	DBTH2602	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Practical, Lab Visit, Lab Record, Class Performance	2010
1946	Pharmaceutical Biotechnology and Drug Design	DBTH2605	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
1947	Introduction to Neuroscience and Information Flow	DBTH2606	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
1948	Advanced Cell Biology	DBTH2705	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
1949	Ecology and Evolution	DBTH2706	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
1950	Genetics	DBTH2707	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
1951	Basics of Research Methodology, Ethics and Research Communication	DBTH2739	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
1952	SIP/Internship/ Project/ Dissertation/Field Visit	NBTH2737	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Project writing, Presentation, Viva-Voce	2010
1953	Introduction to Developmental Biology	DBTH2802	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
1954	Methods in Biology	DBTH2803	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
1955	Genetic Engineering	DBTH2804	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
1956	Genetics Engineering Lab	DBTH2805	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Practical, Lab Visit, Lab Record, Class Performance	2010
1957	Environmental Biotechnology	DBTH2807	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
1958	SIP/Internship/ Project/ Dissertation/Field Visit	NBTH2837	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Project writing, Presentation, Viva-Voce	2010

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1959	Data Analysis & Visualisation using Software	DBTH2839	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	Written Test, Presentation, Viva-Voce	2010
1960	Animal Diversity	DBLS2103	Bachelor of Science (Honors/ Honors with Research) in Biological Science	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2014
1961	Animal Diversity Lab	DBLS2104	Bachelor of Science (Honors/ Honors with Research) in Biological Science	Practical, Lab Visit, Lab Record, Class Performance	2014
1962	Plant Anatomy & Physiology Lab	DBLS2202	Bachelor of Science (Honors/ Honors with Research) in Biological Science	Practical, Lab Visit, Lab Record, Class Performance	2014
1963	Animal Anatomy & Physiology Lab	DBLS2204	Bachelor of Science (Honors/ Honors with Research) in Biological Science	Practical, Lab Visit, Lab Record, Class Performance	2014
1964	Computer Applications for Biologists	SBLS2301	Bachelor of Science (Honors/ Honors with Research) in Biological Science	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2014
1965	Community Engagement Services	NBLS2335	Bachelor of Science (Honors/ Honors with Research) in Biological Science	Project writing, Presentation, Viva-Voce	2014
1966	Microbiology Lab	DBLS2402	Bachelor of Science (Honors/ Honors with Research) in Biological Science	Practical, Lab Visit, Lab Record, Class Performance	2014
1967	Introduction to Bioinformatics	SBLS2401	Bachelor of Science (Honors/ Honors with Research) in Biological Science	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2014
1968	Bioanalytical & Biophysical Instrumentation	DBLS2501	Bachelor of Science (Honors/ Honors with Research) in Biological Science	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2014
1969	Bioanalytical & Biophysical Instrumentation Lab	DBLS2502	Bachelor of Science (Honors/ Honors with Research) in Biological Science	Practical, Lab Visit, Lab Record, Class Performance	2014
1970	Bioethics, Biosafety and IPR	DBLS2506	Bachelor of Science (Honors/ Honors with Research) in Biological Science	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2014
1971	SIP/Internship/ Project/ Dissertation/Field Visit	NBLS2537	Bachelor of Science (Honors/ Honors with Research) in Biological Science	Project writing, Presentation, Viva-Voce	2014
1972	Genomics & Proteomics Lab	DBLS2603	Bachelor of Science (Honors/ Honors with Research) in Biological Science	Practical, Lab Visit, Lab Record, Class Performance	2014
1973	Emerging fields: Nanobiotechnology & Stem-cells Biology	DBLS2604	Bachelor of Science (Honors/ Honors with Research) in Biological Science	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2014
1974	Introduction to Neuroscience and Information Flow	DBLS2605	Bachelor of Science (Honors/ Honors with Research) in Biological Science	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2014
1975	Advanced Microbiology Lab	DBLS2704	Bachelor of Science (Honors/ Honors with Research) in Biological Science	Practical, Lab Visit, Lab Record, Class Performance	2014

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1976	Genetics	DBLS2707	Bachelor of Science (Honors/ Honors with Research) in Biological Science	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2014
1977	Basics of Research Methodology, Ethics and Research Communication	DBLS2739	Bachelor of Science (Honors/ Honors with Research) in Biological Science	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2014
1978	SIP/Internship/ Project/ Dissertation/Field Visit	NBLS2737	Bachelor of Science (Honors/ Honors with Research) in Biological Science	Project writing, Presentation, Viva-Voce	2014
1979	Methods in Biology	DBLS2803	Bachelor of Science (Honors/ Honors with Research) in Biological Science	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2014
1980	Genetic Engineering	DBLS2804	Bachelor of Science (Honors/ Honors with Research) in Biological Science	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2014
1981	Genetics Engineering Lab	DBLS2805	Bachelor of Science (Honors/ Honors with Research) in Biological Science	Practical, Lab Visit, Lab Record, Class Performance	2014
1982	Environmental Biotechnology	DBLS2807	Bachelor of Science (Honors/ Honors with Research) in Biological Science	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2014
1983	SIP/Internship/ Project/ Dissertation/Field Visit	NBLS2837	Bachelor of Science (Honors/ Honors with Research) in Biological Science	Project writing, Presentation, Viva-Voce	2014
1984	Data Analysis & Visualisation using Software	DBLS2839	Bachelor of Science (Honors/ Honors with Research) in Biological Science	Written Test, Presentation, Viva-Voce	2014
1985	Introduction to Computers & Programming in 'C'	BTE2104	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
1986	Electrical Science	BTE2106	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
1987	Programming in C Lab	BTE2108	Bachelor of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
1988	Electrical Science Lab	BTE2110	Bachelor of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
1989	Engineering Chemistry Lab	BTE2113	Bachelor of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
1990	Object Oriented Programming in C++	BTE2203	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
1991	Object Oriented Programming in C++ Lab	BTE2205	Bachelor of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
1992	Engineering Graphics Lab	BTE2206	Bachelor of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
1993	Life Sciences	BTE2210	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
1994	Cell Biology & Genetics	BTE2301	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
1995	Biostatistics	BTE2303	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
1996	Database Management System	BTE2304	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
1997	Cell Biology & Genetics Lab	BTE2307	Bachelor of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
1998	Database Management System Lab	BTE2308	Bachelor of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
1999	Industrial Biotechnology	BTE2309	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2000	Fermentation Technology	BTE2310	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2001	Drug Design and Development	BTE2311	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2002	Recombinant DNA Technology	BTE2312	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2003	Term Paper	BTE2331	Bachelor of Technology (Biotechnology)	Academic Writing, Presentation, Quiz	2010
2004	Project (with Presentation & Evaluation)	BTE2332	Bachelor of Technology (Biotechnology)	Project writing, Presentation, Viva-Voce	2010
2005	Workshop / Certification (Discipline Specific)	BTE2333	Bachelor of Technology (Biotechnology)	Quiz, Written Test	2010
2006	Study Abroad	BTE2334	Bachelor of Technology (Biotechnology)	Written Test, Country Report	2010
2007	Microbiology	BTE2401	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2008	Enzymology & Enzyme Technology	BTE2403	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2009	Chemical Engineering Principles	BTE2404	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2010	Methods and Instrumentation in Biotechnology	BTE2405	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2011	Microbiology Lab	BTE2406	Bachelor of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2012	Enzymology & Enzyme Technology Lab	BTE2408	Bachelor of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2013	Methods and Instrumentation in Biotechnology Lab	BTE2409	Bachelor of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2014	Marine Biotechnology	BTE2410	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2015	Vaccine Development	BTE2411	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2016	Agricultural Biotechnology	BTE2412	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2017	Natural products and medicinal chemistry	BTE2413	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2018	Stem cell Technology	BTE2414	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2019	Term Paper	BTE2431	Bachelor of Technology (Biotechnology)	Academic Writing, Presentation, Quiz	2010
2020	Project (with Presentation & Evaluation)	BTE2432	Bachelor of Technology (Biotechnology)	Project writing, Presentation, Viva-Voce	2010
2021	Workshop / Certification (Discipline Specific)	BTE2433	Bachelor of Technology (Biotechnology)	Quiz, Written Test	2010
2022	Study Abroad	BTE2434	Bachelor of Technology (Biotechnology)	Written Test, Country Report	2010
2023	Molecular Biology	BTE2501	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2024	Bioinformatics	BTE2504	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2025	Molecular Biology Lab	BTE2505	Bachelor of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2026	Animal Biotechnology Lab	BTE2506	Bachelor of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2027	Plant Biotechnology Lab	BTE2507	Bachelor of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2028	Bioinformatics Lab	BTE2508	Bachelor of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2029	Summer Internship Evaluation-I	BTE2535	Bachelor of Technology (Biotechnology)	Report Writing, Presentation, Viva-Voce	2010
2030	Biofuels & Green Technology	BTE2509	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2031	Stem Cells and Tissue Engineering	BTE2510	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2032	Java-I	BTE2511	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2033	Term Paper	BTE2531	Bachelor of Technology (Biotechnology)	Academic Writing, Presentation, Quiz	2010

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2034	Project (with Presentation & Evaluation)	BTE2532	Bachelor of Technology (Biotechnology)	Project writing, Presentation, Viva-Voce	2010
2035	Workshop / Certification (Discipline Specific)	BTE2533	Bachelor of Technology (Biotechnology)	Quiz, Written Test	2010
2036	Study Abroad	BTE2534	Bachelor of Technology (Biotechnology)	Written Test, Country Report	2010
2037	Recombinant DNA Technology	BTE2601	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2038	Bioprocess Technology	BTE2602	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2039	Immunology & Immunotechnology	BTE2603	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2040	Fundamentals of Biochemical Engineering	BTE2604	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2041	Recombinant DNA Technology Lab	BTE2605	Bachelor of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2042	Bioprocess Technology Lab	BTE2606	Bachelor of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2043	Immunology & Immunotechnology Lab	BTE2607	Bachelor of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2044	Pharmaceutical Biotechnology	BTE2608	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2045	JAVA –II	BTE2611	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2046	RNA Biology	BTE2612	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2047	Term Paper	BTE2631	Bachelor of Technology (Biotechnology)	Academic Writing, Presentation, Quiz	2010
2048	Project (with Presentation & Evaluation)	BTE2632	Bachelor of Technology (Biotechnology)	Project writing, Presentation, Viva-Voce	2010
2049	Workshop / Certification (Discipline Specific)	BTE2633	Bachelor of Technology (Biotechnology)	Quiz, Written Test	2010
2050	Study Abroad	BTE2634	Bachelor of Technology (Biotechnology)	Written Test, Country Report	2010
2051	Genomics & Proteomics	BTE2701	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2052	IPR, Biosafety & Bioethics	BTE2702	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2053	Research Methodology & Report Writing	BTE2703	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2054	Genomics & Proteomics Lab	BTE2704	Bachelor of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2055	Summer Internship Evaluation-II	BTE2735	Bachelor of Technology (Biotechnology)	Report Writing, Presentation, Viva-Voce	2010
2056	Molecular Medicine & Diagnosis	BTE2706	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2057	Applications of Plant Biotechnology	BTE2707	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2058	Bioenergy Engineering	BTE2708	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2059	Advanced Nanobiotechnology	BTE2709	Bachelor of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2060	Term Paper	BTE2731	Bachelor of Technology (Biotechnology)	Academic Writing, Presentation, Quiz	2010
2061	Project (with Presentation & Evaluation)	BTE2732	Bachelor of Technology (Biotechnology)	Project writing, Presentation, Viva-Voce	2010
2062	Workshop/ Certification (Discipline Specific)	BTE2733	Bachelor of Technology (Biotechnology)	Quiz, Written Test	2010
2063	Study Abroad	BTE2734	Bachelor of Technology (Biotechnology)	Written Test, Country Report	2010
2064	Dissertation / Project Report Presentation / Viva Voce	BTE2837	Bachelor of Technology (Biotechnology)	Report Writing, Presentation, Viva-Voce	2010
2065	Microbiology Lab	BTH4109	Master of Science (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2066	Biochemistry and Analytical Techniques Lab	BTH4115	Master of Science (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2067	Plant & Animal Biotechnology Lab	BTH4116	Master of Science (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2068	Research Methodology & Scientific Communication Skills	BTH4214	Master of Science (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2069	Immunology Lab	BTH4209	Master of Science (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2070	Molecular Biology and Genetic Engineering Lab	BTH4215	Master of Science (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2071	Seminar	BTH4238	Master of Science (Biotechnology)	Quiz, Written Test	2010
2072	Environmental Biotechnology	BTH4204	Master of Science (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2073	RNA Biology	BTH4219	Master of Science (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2074	Bioentrepreneurship, IPR, Biosafety & Bioethics	BTH4306	Master of Science (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2075	Bioprocess Engineering & Technology Lab	BTH4323	Master of Science (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2076	Bioinformatics Lab	BTH4324	Master of Science (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2077	Project Proposal Preparation & Presentation	BTH4332	Master of Science (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2078	Seminar	BTH4338	Master of Science (Biotechnology)	Quiz, Written Test	2010
2079	Summer Internship Evaluation	BTH4335	Master of Science (Biotechnology)	Report Writing, Presentation, Viva-Voce	2010
2080	Vaccines	BTH4327	Master of Science (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2081	Cancer Biology	BTH4328	Master of Science (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2082	Dissertation	BTH4437	Master of Science (Biotechnology)	Report Writing, Presentation, Viva-Voce	2010
2083	Instrumentation & Research Methodology	BTE4103	Master of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2084	Microbial Technology	BTE4104	Master of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2085	Biostatistics	BTE4105	Master of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2086	Biochemistry & Metabolic Regulation Lab	BTE4106	Master of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2087	Genetics & Molecular Biology Lab	BTE4107	Master of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2088	Microbial Technology Lab	BTE4108	Master of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2089	Plant Cell, Tissue & Organ Culture	BTE4112	Master of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2090	Animal Biotechnology Lab	BTE4113	Master of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2091	Plant Cell, Tissue & Organ Culture Lab	BTE4114	Master of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2092	Recombinant DNA Technology	BTE4201	Master of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2093	Bioinformatics & Computational Biology	BTE4202	Master of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2094	Biochemical Engineering	BTE4203	Master of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2095	Environmental Biotechnology	BTE4204	Master of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2096	IPR & Bioethics	BTE4205	Master of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2097	Molecular Cell Biology	BTE4206	Master of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2098	Recombinant DNA Technology Lab	BTE4207	Master of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2099	Bioinformatics & Computational Biology Lab	BTE4208	Master of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2100	Environmental Biotechnology Lab	BTE4209	Master of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2101	Molecular Cell Biology Lab	BTE4210	Master of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2102	Immunology	BTE4211	Master of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2103	Immunology Lab	BTE4212	Master of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2104	Term Paper	BTE4231	Master of Technology (Biotechnology)	Academic Writing, Presentation, Quiz	2010
2105	Enzyme technology	BTE4301	Master of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2106	Genomics & Proteomics	BTE4302	Master of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2107	Structural Biology	BTE4303	Master of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2108	Downstream Processing & Fermentation Biotechnology	BTE4304	Master of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2109	Enzyme Technology Lab	BTE4305	Master of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2110	Genomics & Proteomics Lab	BTE4306	Master of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2111	Structural Biology Lab	BTE4307	Master of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2112	Fermentation Biotechnology & Downstream Processing Lab	BTE4308	Master of Technology (Biotechnology)	Practical, Lab Visit, Lab Record, Class Performance	2010
2113	Summer Internship Evaluation	BTE4335	Master of Technology (Biotechnology)	Report Writing, Presentation, Viva-Voce	2010
2114	Industrial Management	BTE4309	Master of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2115	Immunotechnology	BTE4310	Master of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2116	Agri-Food Biotechnology	BTE4311	Master of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2117	Biofuels & green technology	BTE4312	Master of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2118	Stem Cells and Gene Therapy	BTE4313	Master of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2119	Drug design & Pharmaceutical Biotechnology	BTE4314	Master of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2120	New Generation Sequencing Analysis	BTE4316	Master of Technology (Biotechnology)	Quiz, Group Discussion, Presentation, Class Performance, Report Writing	2010
2121	Dissertation / Project Report Presentation / Viva Voce	BTE4437	Master of Technology (Biotechnology)	Report Writing, Presentation, Viva-Voce	2010
2122	Machine Learning-I	DSC4102	Master of Science (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
2123	Statistics & Exploratory Data Analysis	DSC4103	Master of Science (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
2124	Database Management System-I	DSC4104	Master of Science (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
2125	Programming Toolbox I-R	DSC4105	Master of Science (Data Science)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2019
2126	Programming ToolBox II- Python	DSC4106	Master of Science (Data Science)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2019
2127	Big Data Tools & Technologies-I	DSC4107	Master of Science (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
2128	Introduction to Linux	DSC4108	Master of Science (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
2129	Machine Learning-I Lab	DSC4109	Master of Science (Data Science)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2019
2130	Statistics & Exploratory Data Analysis Lab	DSC4110	Master of Science (Data Science)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2019
2131	Machine Learning-II	DSC4201	Master of Science (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
2132	Regression Theory & Analysis	DSC4202	Master of Science (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2133	Database Management System-II	DSC4204	Master of Science (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
2134	Spark	DSC4205	Master of Science (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
2135	Data Visualization	DSC4206	Master of Science (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
2136	Big Data Tools & Technologies-II	DSC4207	Master of Science (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
2137	Machine Learning-II Lab	DSC4208	Master of Science (Data Science)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2019
2138	Regression Theory & Analysis Lab	DSC4209	Master of Science (Data Science)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2019
2139	Data Structure & Algorithm Design Lab	DSC4210	Master of Science (Data Science)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2019
2140	Pattern Recognition	DSC4211	Master of Science (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
2141	Next Generation Sequencing Analysis	DSC4212	Master of Science (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
2142	Association Rule Mining	DSC4213	Master of Science (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
2143	Generalized & Linear Modeling	DSC4301	Master of Science (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
2144	Deep Learning & Neural Networks	DSC4302	Master of Science (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
2145	Time Series	DSC4303	Master of Science (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
2146	Graph & Social Network Analysis	DSC4304	Master of Science (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
2147	Natural Language Processing	DSC4305	Master of Science (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
2148	Graph & Social Network Analysis Lab	DSC4306	Master of Science (Data Science)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2019
2149	Big Data Tools & Technologies-III	DSC4307	Master of Science (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
2150	Generalized & Linear Modeling Lab	DSC4308	Master of Science (Data Science)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2019
2151	Time Series Lab	DSC4309	Master of Science (Data Science)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2019

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2152	Deep Learning & Neural Networks Lab	DSC4310	Master of Science (Data Science)	Quiz, Viva-Voce, Practical, Lab Records, Class Performance	2019
2153	Summer Internship Evaluation	DSC4335	Master of Science (Data Science)	Report Writing, Presentation, Viva-Voce	2019
2154	Weather Prediction	DSC4311	Master of Science (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
2155	Disease Classification	DSC4312	Master of Science (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
2156	Customer Behaviour Analysis	DSC4313	Master of Science (Data Science)	Quiz, Class Performance, Group Discussion, Report Writing, Viva-Voce	2019
2157	Dissertation / Project Report Presentation / Viva Voce	DSC4437	Master of Science (Data Science)	Report Writing, Presentation, Viva-Voce	2019
2158	Still Photography and Image Editing	DJRN2101	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	Group Discussion, Presentation, Class Performance, Report Writing	2010
2159	Print Media Reporting and Editing	DJRN2251	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	Group Discussion, Presentation, Class Performance, Report Writing	2010
2160	Electronic Communication: Radio & TV	DJRN2351	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	Group Discussion, Presentation, Class Performance, Report Writing	2010
2161	Graphics & Basic Animation	SJRN2301	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	Group Discussion, Presentation, Class Performance, Report Writing	2010
2162	Community Engagement Services	NJRN2335	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	Report Writing, Presentation, Viva-Voce	2010
2163	Digital Media	DJRN2451	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	Group Discussion, Presentation, Class Performance, Report Writing	2010
2164	Advertising Principles & Practice	DJRN2401	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	Group Discussion, Presentation, Class Performance, Report Writing	2010
2165	Media Entrepreneurship	SJRN2401	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	Group Discussion, Presentation, Class Performance, Report Writing	2010
2166	Corporate Communication	DJRN2502	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	Group Discussion, Presentation, Class Performance, Report Writing	2010

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2167	SIP/Internship/ Project/ Dissertation/Field Visit	NJRN2537	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	Report Writing, Presentation, Viva-Voce	2010
2168	Communication for Social Change	DJRN2651	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	Group Discussion, Presentation, Class Performance, Report Writing	2010
2169	Introduction to Communication Research	DJRN2602	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	Group Discussion, Presentation, Class Performance, Report Writing	2010
2170	Film Theory & Appreciation	DJRN2603	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	Group Discussion, Presentation, Class Performance, Report Writing	2010
2171	Media Laws & Ethics	DJRN2604	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	Group Discussion, Presentation, Class Performance, Report Writing	2010
2172	Print Media	DJRN2704	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	Group Discussion, Presentation, Class Performance, Report Writing	2010
2173	Advertising	DJRN2705	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	Group Discussion, Presentation, Class Performance, Report Writing	2010
2174	Still Photography	DJRN2706	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	Group Discussion, Presentation, Class Performance, Report Writing	2010
2175	Electronic Media (TV/ Radio)	DJRN2707	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	Group Discussion, Presentation, Class Performance, Report Writing	2010
2176	Digital Media	DJRN2708	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	Group Discussion, Presentation, Class Performance, Report Writing	2010
2177	Basics of Research Methodology, Ethics and Research Communication	DJRN2739	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	Group Discussion, Presentation, Class Performance, Report Writing	2010
2178	SIP/Internship/ Project/ Dissertation/Field Visit	NJRN2737	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	Report Writing, Presentation, Viva-Voce	2010

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2179	Public Relations: Concepts and Practice	DJRN2801	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	Group Discussion, Presentation, Class Performance, Report Writing	2010
2180	New Journalism: Concepts and Practice	DJRN2802	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	Group Discussion, Presentation, Class Performance, Report Writing	2010
2181	Event Management	DJRN2810	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	Group Discussion, Presentation, Class Performance, Report Writing	2010
2182	SIP/Internship/ Project/ Dissertation/Field Visit	NJRN2837	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	Report Writing, Presentation, Viva-Voce	2010
2183	Data Analysis & Visualisation using Software	DJRN2839	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	Written Test, Presentation, Viva-Voce	2010
2184	Basics of Art History and Sketching and Drawing	DANI2102	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012
2185	Post-Production	DANI2251	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012
2186	2D Animation	DANI2201	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012
2187	Scripting and Storyboarding	DANI2202	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012
2188	3D Fundamentals	DANI2351	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012
2189	UI and UX Design	DANI2301	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012
2190	Sound Design	DANI2302	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012
2191	Media Entrepreneurship	SANI2301	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012
2192	Community Engagement Services	NANI2335	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Report writing, Presentation, Viva-Voce	2012
2193	Basics of Digital Compositing & VFX	DANI2451	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2194	Rigging and Animation	DANI2401	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012
2195	Design Thinking	DANI2402	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012
2196	Portfolio Via Web Design	SANI2401	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012
2197	Maya Fundamentals	DANI2551	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012
2198	Introduction to Game Design & Development	DANI2501	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012
2199	Animation Production	DANI2502	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012
2200	SIP/Internship/ Project/ Dissertation/Field Visit	NANI2537	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Report writing, Presentation, Viva-Voce	2012
2201	Basics of AR/VR	DANI2651	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012
2202	Advanced Compositing & VFX	DANI2601	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012
2203	Maya Rigging and Animation	DANI2602	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012
2204	Web Design & Development	DANI2603	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012
2205	Film Making Process	DANI2701	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012
2206	Maya Particles and Dynamics	DANI2702	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012
2207	2D Animation	DANI2703	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012
2208	3D Animation	DANI2704	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012
2209	Digital Compositing & VFX	DANI2705	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012
2210	Game Design & Development	DANI2706	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012

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2211	UI & UX Design	DANI2707	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012
2212	Basics of Research Methodology, Ethics and Research Communication	DANI2739	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012
2213	SIP/Internship/ Project/ Dissertation/Field Visit	NANI2737	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Report writing, Presentation, Viva-Voce	2012
2214	Motion Graphics	DANI2801	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012
2215	FX & Simulations	DANI2802	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2012
2216	SIP/Internship/ Project/ Dissertation/Field Visit	NANI2837	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Report writing, Presentation, Viva-Voce	2012
2217	Data Analysis & Visualisation using Software	DANI2839	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	Written Test, Presentation, Viva-Voce	2012
2218	Media Arts - I: Radio & TV	JRN4103	Master of Arts (Journalilsm & Mass Communication)	Group Discussion, Presentation, Class Performance, Report Writing	2010
2219	Advertising : Concepts & Principles	JRN4104	Master of Arts (Journalilsm & Mass Communication)	Group Discussion, Presentation, Class Performance, Report Writing	2010
2220	Design Software	JRN4106	Master of Arts (Journalilsm & Mass Communication)	Group Discussion, Presentation, Class Performance, Report Writing	2010
2221	Print Design & Visualization	JRN4202	Master of Arts (Journalilsm & Mass Communication)	Group Discussion, Presentation, Class Performance, Report Writing	2010
2222	Specialized Reporting & Feature Writing	JRN4203	Master of Arts (Journalilsm & Mass Communication)	Group Discussion, Presentation, Class Performance, Report Writing	2010
2223	Media Arts - II: Radio & TV	JRN4204	Master of Arts (Journalilsm & Mass Communication)	Group Discussion, Presentation, Class Performance, Report Writing	2010
2224	Advanced Photography	JRN4207	Master of Arts (Journalilsm & Mass Communication)	Group Discussion, Presentation, Class Performance, Report Writing	2010
2225	Media Planning & Brand Management	JRN4209	Master of Arts (Journalilsm & Mass Communication)	Group Discussion, Presentation, Class Performance, Report Writing	2010
2226	Media Arts-III: Film	JRN4301	Master of Arts (Journalilsm & Mass Communication)	Group Discussion, Presentation, Class Performance, Report Writing	2010
2227	Media Laws & Ethics	JRN4304	Master of Arts (Journalilsm & Mass Communication)	Group Discussion, Presentation, Class Performance, Report Writing	2010

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2228	Digital Media Production	JRN4306	Master of Arts (Journalilsm & Mass Communication)	Group Discussion, Presentation, Class Performance, Report Writing	2010
2229	Mass Media & Industry	JRN4307	Master of Arts (Journalilsm & Mass Communication)	Group Discussion, Presentation, Class Performance, Report Writing	2010
2230	Communication Research	JRN4308	Master of Arts (Journalilsm & Mass Communication)	Group Discussion, Presentation, Class Performance, Report Writing	2010
2231	Summer Internship Evaluation	JRN4335	Master of Arts (Journalilsm & Mass Communication)	Report writing, Presentation, Viva-Voce	2010
2232	Media Arts - IV: Cyber Media	JRN4402	Master of Arts (Journalilsm & Mass Communication)	Group Discussion, Presentation, Class Performance, Report Writing	2010
2233	Internship	JRN4435	Master of Arts (Journalilsm & Mass Communication)	Report writing, Presentation, Viva-Voce	2010
2234	Dissertation/ Professional Project	JRN4437	Master of Arts (Journalilsm & Mass Communication)	Report writing, Presentation, Viva-Voce	2010
2235	Introduction to Multimedia and its Application	ANI2152	Animation (OE)	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2013
2236	Creating 2D Animation	ANI2252	Animation (OE)	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2013
2237	3D Modeling & Texturing	ANI2352	Animation (OE)	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2013
2238	Maya Modeling & Texturing	ANI2452	Animation (OE)	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2013
2239	Scripting & Storyboarding	ANI2552	Animation (OE)	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2013
2240	VFX	ANI2652	Animation (OE)	Practical Sessions in Lab, Class Performance, Presentation, Assignment	2016
2241	Print Media: Reporting & Editing	JRN2151	Journalism (OE)	Group Discussion, Presentation, Class Performance, Report Writing	2013
2242	Basic Photography	JRN2251	Journalism (OE)	Group Discussion, Presentation, Class Performance, Report Writing	2013
2243	TV Journalism	JRN2351	Journalism (OE)	Group Discussion, Presentation, Class Performance, Report Writing	2013
2244	TV Production & Presentation	JRN2451	Journalism (OE)	Group Discussion, Presentation, Class Performance, Report Writing	2013
2245	New Media	JRN2551	Journalism (OE)	Group Discussion, Presentation, Class Performance, Report Writing	2013

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2246	Media Analysis	JRN2651	Journalism (OE)	Group Discussion, Presentation, Class Performance, Report Writing	2016
2247	Indo-Islamic Polity and Culture in Medieval India-I	DHIS2301	Bachelor of Arts (Honors/ Honors with Research) in History	Quiz, Group Discussion, Presentation, Class Performance	2013
2248	An Introduction to Archaeology	SHIS2301	Bachelor of Arts (Honors/ Honors with Research) in History	Quiz, Group Discussion, Presentation, Class Performance	2013
2249	Community Engagement Services	NHIS2335	Bachelor of Arts (Honors/ Honors with Research) in History	Project writing, Presentation, Viva-Voce	2013
2250	Indo-Islamic Polity and Culture in Medieval India-II	DHIS2401	Bachelor of Arts (Honors/ Honors with Research) in History	Quiz, Group Discussion, Presentation, Class Performance	2013
2251	Understanding Culture, Heritage and Tourism	SHIS2401	Bachelor of Arts (Honors/ Honors with Research) in History	Quiz, Group Discussion, Presentation, Class Performance	2013
2252	Environmental History	DHIS2503	Bachelor of Arts (Honors/ Honors with Research) in History	Quiz, Group Discussion, Presentation, Class Performance	2013
2253	SIP/Internship/ Project/ Dissertation/Field Visit	NHIS2537	Bachelor of Arts (Honors/ Honors with Research) in History	Project writing, Presentation, Viva-Voce	2013
2254	Exploring Realms: Narratives of Urban and Rural India through Fiction, Fieldwork, Film & History	DHIS2604	Bachelor of Arts (Honors/ Honors with Research) in History	Quiz, Group Discussion, Presentation, Class Performance	2013
2255	Migration and History	DHIS2705	Bachelor of Arts (Honors/ Honors with Research) in History	Quiz, Group Discussion, Presentation, Class Performance	2013
2256	Basics of Research Methodology, Ethics and Research Communication	DHIS2739	Bachelor of Arts (Honors/ Honors with Research) in History	Quiz, Group Discussion, Presentation, Class Performance	2013
2257	SIP/Internship/ Project/ Dissertation/Field Visit	NHIS2737	Bachelor of Arts (Honors/ Honors with Research) in History	Project writing, Presentation, Viva-Voce	2013
2258	The Popular Culture	DHIS2801	Bachelor of Arts (Honors/ Honors with Research) in History	Quiz, Group Discussion, Presentation, Class Performance	2013
2259	Gender and History	DHIS2802	Bachelor of Arts (Honors/ Honors with Research) in History	Quiz, Group Discussion, Presentation, Class Performance	2013
2260	Gender in Indian History	DHIS2805	Bachelor of Arts (Honors/ Honors with Research) in History	Quiz, Group Discussion, Presentation, Class Performance	2013
2261	SIP/Internship/ Project/ Dissertation/Field Visit	NHIS2837	Bachelor of Arts (Honors/ Honors with Research) in History	Project writing, Presentation, Viva-Voce	2013
2262	Data Analysis & Visualisation using Software	DHIS2839	Bachelor of Arts (Honors/ Honors with Research) in History	Written Test, Presentation, Viva-Voce	2013

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2263	Indian Nationalism	DPOL2151	Bachelor of Arts (Honors/ Honors with Research) in Political Science	Quiz, Group Discussion, Presentation, Class Performance	2013
2264	State Politics in India	DPOL2301	Bachelor of Arts (Honors/ Honors with Research) in Political Science	Quiz, Group Discussion, Presentation, Class Performance	2013
2265	Political Leadership & Communication	SPOL2301	Bachelor of Arts (Honors/ Honors with Research) in Political Science	Quiz, Group Discussion, Presentation, Class Performance	2013
2266	Community Engagement Services	NPOL2335	Bachelor of Arts (Honors/ Honors with Research) in Political Science	Project writing, Presentation, Viva-Voce	2013
2267	Public Administration	DPOL2451	Bachelor of Arts (Honors/ Honors with Research) in Political Science	Quiz, Group Discussion, Presentation, Class Performance	2013
2268	Social Movements in India	DPOL2401	Bachelor of Arts (Honors/ Honors with Research) in Political Science	Quiz, Group Discussion, Presentation, Class Performance	2013
2269	Basics of Debunking Fake News and Dis-information	SPOL2401	Bachelor of Arts (Honors/ Honors with Research) in Political Science	Quiz, Group Discussion, Presentation, Class Performance	2013
2270	Public Administration in India	DPOL2551	Bachelor of Arts (Honors/ Honors with Research) in Political Science	Quiz, Group Discussion, Presentation, Class Performance	2013
2271	India's Foreign Policy	DPOL2502	Bachelor of Arts (Honors/ Honors with Research) in Political Science	Quiz, Group Discussion, Presentation, Class Performance	2013
2272	SIP/Internship/ Project/ Dissertation/Field Visit	NPOL2537	Bachelor of Arts (Honors/ Honors with Research) in Political Science	Project writing, Presentation, Viva-Voce	2013
2273	Comparative Government and Politics	DPOL2651	Bachelor of Arts (Honors/ Honors with Research) in Political Science	Quiz, Group Discussion, Presentation, Class Performance	2013
2274	Religion and Politics in India	DPOL2605	Bachelor of Arts (Honors/ Honors with Research) in Political Science	Quiz, Group Discussion, Presentation, Class Performance	2013
2275	Debates in Political Theory	DPOL2701	Bachelor of Arts (Honors/ Honors with Research) in Political Science	Quiz, Group Discussion, Presentation, Class Performance	2013
2276	Politics in India	DPOL2704	Bachelor of Arts (Honors/ Honors with Research) in Political Science	Quiz, Group Discussion, Presentation, Class Performance	2013
2277	Basics of Research Methodology, Ethics and Research Communication	DPOL2739	Bachelor of Arts (Honors/ Honors with Research) in Political Science	Quiz, Group Discussion, Presentation, Class Performance	2013
2278	SIP/Internship/ Project/ Dissertation/Field Visit	NPOL2737	Bachelor of Arts (Honors/ Honors with Research) in Political Science	Project writing, Presentation, Viva-Voce	2013
2279	Key Texts in Political Philosophy	DPOL2804	Bachelor of Arts (Honors/ Honors with Research) in Political Science	Quiz, Group Discussion, Presentation, Class Performance	2013

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2280	SIP/Internship/ Project/ Dissertation/Field Visit	NPOL2837	Bachelor of Arts (Honors/ Honors with Research) in Political Science	Project writing, Presentation, Viva-Voce	2013
2281	Data Analysis & Visualisation using Software	DPOL2839	Bachelor of Arts (Honors/ Honors with Research) in Political Science	Written Test, Presentation, Viva-Voce	2013
2282	Introduction to Linguistics	DENG2201	Bachelor of Arts (Honors/ Honors with Research) in English	Quiz, Group Discussion, Presentation, Class Performance	2012
2283	Academic Writing and Composition	SENG2301	Bachelor of Arts (Honors/ Honors with Research) in English	Quiz, Group Discussion, Presentation, Class Performance	2012
2284	Community Engagement Services	NENG2335	Bachelor of Arts (Honors/ Honors with Research) in English	Report Writing, Presentation, Viva-Voce	2012
2285	Literary Criticism	DENG2451	Bachelor of Arts (Honors/ Honors with Research) in English	Quiz, Group Discussion, Presentation, Class Performance	2012
2286	Media and Communication	SENG2401	Bachelor of Arts (Honors/ Honors with Research) in English	Quiz, Group Discussion, Presentation, Class Performance	2012
2287	Indian Women Writing	DENG2503	Bachelor of Arts (Honors/ Honors with Research) in English	Quiz, Group Discussion, Presentation, Class Performance	2012
2288	SIP/Internship/ Project/ Dissertation/Field Visit	NENG2537	Bachelor of Arts (Honors/ Honors with Research) in English	Report Writing, Presentation, Viva-Voce	2012
2289	Literature and Society	DENG2601	Bachelor of Arts (Honors/ Honors with Research) in English	Quiz, Group Discussion, Presentation, Class Performance	2012
2290	Contemporary Literature	DENG2701	Bachelor of Arts (Honors/ Honors with Research) in English	Quiz, Group Discussion, Presentation, Class Performance	2012
2291	Basics of Research Methodology, Ethics and Research Communication	DENG2739	Bachelor of Arts (Honors/ Honors with Research) in English	Quiz, Group Discussion, Presentation, Class Performance	2012
2292	SIP/Internship/ Project/ Dissertation/Field Visit	NENG2737	Bachelor of Arts (Honors/ Honors with Research) in English	Report Writing, Presentation, Viva-Voce	2012
2293	Theoretical Linguistics	DENG2803	Bachelor of Arts (Honors/ Honors with Research) in English	Quiz, Group Discussion, Presentation, Class Performance	2012
2294	SIP/Internship/ Project/ Dissertation/Field Visit	NENG2837	Bachelor of Arts (Honors/ Honors with Research) in English	Report Writing, Presentation, Viva-Voce	2012
2295	Data Analysis & Visualisation using Software	DENG2839	Bachelor of Arts (Honors/ Honors with Research) in English	Written Test, Presentation, Viva-Voce	2012
2296	Research Methodology-I	ENG4206	Master of Arts (English)	Quiz, Group Discussion, Presentation, Class Performance	2012

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2297	Research Methodology-II	ENG4305	Master of Arts (English)	Quiz, Group Discussion, Presentation, Class Performance	2012
2298	Summer Project Evaluation	ENG4335	Master of Arts (English)	Report Writing, Presentation, Viva-Voce	2012
2299	Dissertation	ENG4437	Master of Arts (English)	Report Writing, Presentation, Viva-Voce	2012
2300	Linguistics and English Language Teaching	ENG4406	Master of Arts (English)	Quiz, Group Discussion, Presentation, Class Performance	2012
2301	Debates in Political Theory	POL4101	Master of Arts (Political Science)	Quiz, Group Discussion, Presentation, Class Performance	2023
2302	Politics in India	POL4103	Master of Arts (Political Science)	Quiz, Group Discussion, Presentation, Class Performance	2023
2303	Administrative Theory	POL4201	Master of Arts (Political Science)	Quiz, Group Discussion, Presentation, Class Performance	2023
2304	Interpreting Modern India	POL4301	Master of Arts (Political Science)	Quiz, Group Discussion, Presentation, Class Performance	2023
2305	Public Policy	POL4302	Master of Arts (Political Science)	Quiz, Group Discussion, Presentation, Class Performance	2023
2306	India and World	POL4303	Master of Arts (Political Science)	Quiz, Group Discussion, Presentation, Class Performance	2023
2307	Foreign Policy of Major Powers	POL4304	Master of Arts (Political Science)	Quiz, Group Discussion, Presentation, Class Performance	2023
2308	Summer Project Evaluation	POL4335	Master of Arts (Political Science)	Project writing, Presentation, Viva-Voce	2023
2309	Social Exclusion: Theory and Practice	POL4401	Master of Arts (Political Science)	Quiz, Group Discussion, Presentation, Class Performance	2023
2310	Research Methodology	POL4402	Master of Arts (Political Science)	Quiz, Group Discussion, Presentation, Class Performance	2023
2311	Dissertation	POL4437	Master of Arts (Political Science)	Project writing, Presentation, Viva-Voce	2023
2312	Religion, Reform and Nationalism	POL4404	Master of Arts (Political Science)	Quiz, Group Discussion, Presentation, Class Performance	2023
2313	State and Politics in India	POL4405	Master of Arts (Political Science)	Quiz, Group Discussion, Presentation, Class Performance	2023
2314	Collaborative Governance	POL4406	Master of Arts (Political Science)	Quiz, Group Discussion, Presentation, Class Performance	2023
2315	Environmental Policies and Politics	POL4407	Master of Arts (Political Science)	Quiz, Group Discussion, Presentation, Class Performance	2023
2316	Written Expression-1	DFRE2151	Bachelor of Arts (Honors/ Honors with Research) in French	Quiz, Class Performance, Report Writing	2014
2317	Oral Expression-1	DFRE2101	Bachelor of Arts (Honors/ Honors with Research) in French	Quiz, Class Performance, Report Writing	2014
2318	Life in France and Francophone Countries-1	DFRE2102	Bachelor of Arts (Honors/ Honors with Research) in French	Quiz, Class Performance, Report Writing	2014
2319	Written Expression-2	DFRE2251	Bachelor of Arts (Honors/ Honors with Research) in French	Quiz, Class Performance, Report Writing	2014

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2320	Oral Expression-2	DFRE2201	Bachelor of Arts (Honors/ Honors with Research) in French	Quiz, Class Performance, Report Writing	2014
2321	Life in France and Francophone Countries-2	DFRE2202	Bachelor of Arts (Honors/ Honors with Research) in French	Quiz, Class Performance, Report Writing	2014
2322	Written Expression-3	DFRE2351	Bachelor of Arts (Honors/ Honors with Research) in French	Quiz, Class Performance, Report Writing	2014
2323	Oral Expression-3	DFRE2301	Bachelor of Arts (Honors/ Honors with Research) in French	Quiz, Class Performance, Report Writing	2014
2324	Advanced Writing Skills	SFRE2301	Bachelor of Arts (Honors/ Honors with Research) in French	Quiz, Class Performance, Report Writing	2014
2325	Community Engagement Services	NFRE2335	Bachelor of Arts (Honors/ Honors with Research) in French	Report Writing, Presentation, Viva-Voce	2014
2326	Written Expression-4	DFRE2451	Bachelor of Arts (Honors/ Honors with Research) in French	Quiz, Class Performance, Report Writing	2014
2327	Oral Expression-4	DFRE2401	Bachelor of Arts (Honors/ Honors with Research) in French	Quiz, Class Performance, Report Writing	2014
2328	Introduction to Translation Theory	SFRE2401	Bachelor of Arts (Honors/ Honors with Research) in French	Quiz, Class Performance, Report Writing	2014
2329	Introduction to French Literature-1	DFRE2551	Bachelor of Arts (Honors/ Honors with Research) in French	Quiz, Class Performance, Report Writing	2014
2330	Introduction to Linguistics	DFRE2502	Bachelor of Arts (Honors/ Honors with Research) in French	Quiz, Class Performance, Report Writing	2014
2331	SIP/Internship/ Project/ Dissertation/Field Visit	NFRE2537	Bachelor of Arts (Honors/ Honors with Research) in French	Report Writing, Presentation, Viva-Voce	2014
2332	French Through Activities	DFRE2651	Bachelor of Arts (Honors/ Honors with Research) in French	Quiz, Class Performance, Report Writing	2014
2333	Introduction to French Literature-2	DFRE2601	Bachelor of Arts (Honors/ Honors with Research) in French	Quiz, Class Performance, Report Writing	2014
2334	Introduction to Translation	DFRE2603	Bachelor of Arts (Honors/ Honors with Research) in French	Quiz, Class Performance, Report Writing	2014
2335	Translation: Theory & Practice-1	DFRE2703	Bachelor of Arts (Honors/ Honors with Research) in French	Quiz, Class Performance, Report Writing	2014
2336	Basics of Research Methodology, Ethics and Research Communication	DFRE2739	Bachelor of Arts (Honors/ Honors with Research) in French	Quiz, Class Performance, Report Writing	2014

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2337	SIP/Internship/ Project/ Dissertation/Field Visit	NFRE2737	Bachelor of Arts (Honors/ Honors with Research) in French	Report Writing, Presentation, Viva-Voce	2014
2338	Introduction to Media Studies	DFRE2801	Bachelor of Arts (Honors/ Honors with Research) in French	Quiz, Class Performance, Report Writing	2014
2339	Translation: Theory & Practice-2	DFRE2804	Bachelor of Arts (Honors/ Honors with Research) in French	Quiz, Class Performance, Report Writing	2014
2340	SIP/Internship/ Project/ Dissertation/Field Visit	NFRE2837	Bachelor of Arts (Honors/ Honors with Research) in French	Report Writing, Presentation, Viva-Voce	2014
2341	Data Analysis & Visualisation using Software	DFRE2839	Bachelor of Arts (Honors/ Honors with Research) in French	Written Test, Presentation, Viva-Voce	2014
2342	Written Expression-1	DGER2151	Bachelor of Arts (Honors/ Honors with Research) in German	Quiz, Class Performance, Report Writing	2017
2343	Oral Expression-1	DGER2101	Bachelor of Arts (Honors/ Honors with Research) in German	Quiz, Class Performance, Report Writing	2017
2344	Written Expression-2	DGER2251	Bachelor of Arts (Honors/ Honors with Research) in German	Quiz, Class Performance, Report Writing	2017
2345	Oral Expression-2	DGER2201	Bachelor of Arts (Honors/ Honors with Research) in German	Quiz, Class Performance, Report Writing	2017
2346	German through Activities	DGER2202	Bachelor of Arts (Honors/ Honors with Research) in German	Quiz, Class Performance, Report Writing	2017
2347	Written Expression-3	DGER2351	Bachelor of Arts (Honors/ Honors with Research) in German	Quiz, Class Performance, Report Writing	2017
2348	Oral Expression-3	DGER2301	Bachelor of Arts (Honors/ Honors with Research) in German	Quiz, Class Performance, Report Writing	2017
2349	Advanced Writing Skills	SGER2301	Bachelor of Arts (Honors/ Honors with Research) in German	Quiz, Class Performance, Report Writing	2017
2350	Community Engagement Services	NGER2335	Bachelor of Arts (Honors/ Honors with Research) in German	Report Writing, Presentation, Viva-Voce	2017
2351	Written Expression-4	DGER2451	Bachelor of Arts (Honors/ Honors with Research) in German	Quiz, Class Performance, Report Writing	2017
2352	Oral Expression-4	DGER2401	Bachelor of Arts (Honors/ Honors with Research) in German	Quiz, Class Performance, Report Writing	2017
2353	Enhancing Language Proficiency	DGER2402	Bachelor of Arts (Honors/ Honors with Research) in German	Quiz, Class Performance, Report Writing	2017

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2354	Basics of Translation	SGER2401	Bachelor of Arts (Honors/ Honors with Research) in German	Quiz, Class Performance, Report Writing	2017
2355	Written Expression-5	DGER2551	Bachelor of Arts (Honors/ Honors with Research) in German	Quiz, Class Performance, Report Writing	2017
2356	Oral Expression-5	DGER2501	Bachelor of Arts (Honors/ Honors with Research) in German	Quiz, Class Performance, Report Writing	2017
2357	Introduction to Literature	DGER2502	Bachelor of Arts (Honors/ Honors with Research) in German	Quiz, Class Performance, Report Writing	2017
2358	Introduction to Linguistics	DGER2503	Bachelor of Arts (Honors/ Honors with Research) in German	Quiz, Class Performance, Report Writing	2017
2359	SIP/Internship/ Project/ Dissertation/Field Visit	NGER2537	Bachelor of Arts (Honors/ Honors with Research) in German	Report Writing, Presentation, Viva-Voce	2017
2360	Written Expression-6	DGER2651	Bachelor of Arts (Honors/ Honors with Research) in German	Quiz, Class Performance, Report Writing	2017
2361	Introduction to Translation	DGER2603	Bachelor of Arts (Honors/ Honors with Research) in German	Quiz, Class Performance, Report Writing	2017
2362	Women's Writing in German Speaking Countries	DGER2701	Bachelor of Arts (Honors/ Honors with Research) in German	Quiz, Class Performance, Report Writing	2017
2363	Translation: Theory & Practice-1	DGER2703	Bachelor of Arts (Honors/ Honors with Research) in German	Quiz, Class Performance, Report Writing	2017
2364	Basics of Research Methodology, Ethics and Research Communication	DGER2739	Bachelor of Arts (Honors/ Honors with Research) in German	Quiz, Class Performance, Report Writing	2017
2365	SIP/Internship/ Project/ Dissertation/Field Visit	NGER2737	Bachelor of Arts (Honors/ Honors with Research) in German	Report Writing, Presentation, Viva-Voce	2017
2366	Cultural History of German Speaking Countries	DGER2801	Bachelor of Arts (Honors/ Honors with Research) in German	Quiz, Class Performance, Report Writing	2017
2367	Translation: Theory & Practice-2	DGER2802	Bachelor of Arts (Honors/ Honors with Research) in German	Quiz, Class Performance, Report Writing	2017
2368	Study of Genre (Theatre)	DGER2803	Bachelor of Arts (Honors/ Honors with Research) in German	Quiz, Class Performance, Report Writing	2017
2369	Study of Genre (Poetry)	DGER2804	Bachelor of Arts (Honors/ Honors with Research) in German	Quiz, Class Performance, Report Writing	2017
2370	SIP/Internship/ Project/ Dissertation/Field Visit	NGER2837	Bachelor of Arts (Honors/ Honors with Research) in German	Report Writing, Presentation, Viva-Voce	2017

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2371	Data Analysis & Visualisation using Software	DGER2839	Bachelor of Arts (Honors/ Honors with Research) in German	Written Test, Presentation, Viva-Voce	2017
2372	Written Expression-1	DSPA2151	Bachelor of Arts (Honors/ Honors with Research) in Spanish	Quiz, Class Performance, Report Writing	2018
2373	Oral Expression-1	DSPA2101	Bachelor of Arts (Honors/ Honors with Research) in Spanish	Quiz, Class Performance, Report Writing	2018
2374	Grammar and Communicative Spanish-1	DSPA2102	Bachelor of Arts (Honors/ Honors with Research) in Spanish	Quiz, Class Performance, Report Writing	2018
2375	Written Expression-2	DSPA2251	Bachelor of Arts (Honors/ Honors with Research) in Spanish	Quiz, Class Performance, Report Writing	2018
2376	Oral Expression-2	DSPA2201	Bachelor of Arts (Honors/ Honors with Research) in Spanish	Quiz, Class Performance, Report Writing	2018
2377	Grammar and Communicative Spanish-2	DSPA2202	Bachelor of Arts (Honors/ Honors with Research) in Spanish	Quiz, Class Performance, Report Writing	2018
2378	Written Expression-3	DSPA2351	Bachelor of Arts (Honors/ Honors with Research) in Spanish	Quiz, Class Performance, Report Writing	2018
2379	Oral Expression-3	DSPA2301	Bachelor of Arts (Honors/ Honors with Research) in Spanish	Quiz, Class Performance, Report Writing	2018
2380	Advanced Writing Skills	SSPA2301	Bachelor of Arts (Honors/ Honors with Research) in Spanish	Quiz, Class Performance, Report Writing	2018
2381	Community Engagement Services	NSPA2335	Bachelor of Arts (Honors/ Honors with Research) in Spanish	Report Writing, Presentation, Viva-Voce	2018
2382	Written Expression-4	DSPA2451	Bachelor of Arts (Honors/ Honors with Research) in Spanish	Quiz, Class Performance, Report Writing	2018
2383	Oral Expression-4	DSPA2401	Bachelor of Arts (Honors/ Honors with Research) in Spanish	Quiz, Class Performance, Report Writing	2018
2384	Introduction to Translation Theory	SSPA2401	Bachelor of Arts (Honors/ Honors with Research) in Spanish	Quiz, Class Performance, Report Writing	2018
2385	Spanish Through Activities	DSPA2551	Bachelor of Arts (Honors/ Honors with Research) in Spanish	Quiz, Class Performance, Report Writing	2018
2386	Oral Expression-5	DSPA2502	Bachelor of Arts (Honors/ Honors with Research) in Spanish	Quiz, Class Performance, Report Writing	2018
2387	SIP/Internship/ Project/ Dissertation/Field Visit	NSPA2537	Bachelor of Arts (Honors/ Honors with Research) in Spanish	Report Writing, Presentation, Viva-Voce	2018

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2388	Introduction to Spanish Literature	DSPA2651	Bachelor of Arts (Honors/ Honors with Research) in Spanish	Quiz, Class Performance, Report Writing	2018
2389	Introduction to Translation	DSPA2601	Bachelor of Arts (Honors/ Honors with Research) in Spanish	Quiz, Class Performance, Report Writing	2018
2390	Introduction to Linguistics	DSPA2603	Bachelor of Arts (Honors/ Honors with Research) in Spanish	Quiz, Class Performance, Report Writing	2018
2391	Translation: Theory & Practice-1	DSPA2703	Bachelor of Arts (Honors/ Honors with Research) in Spanish	Quiz, Class Performance, Report Writing	2018
2392	Basics of Research Methodology, Ethics and Research Communication	DSPA2739	Bachelor of Arts (Honors/ Honors with Research) in Spanish	Quiz, Class Performance, Report Writing	2018
2393	SIP/Internship/ Project/ Dissertation/Field Visit	NSPA2737	Bachelor of Arts (Honors/ Honors with Research) in Spanish	Report Writing, Presentation, Viva-Voce	2018
2394	Translation: Theory & Practice-2	DSPA2802	Bachelor of Arts (Honors/ Honors with Research) in Spanish	Quiz, Class Performance, Report Writing	2018
2395	SIP/Internship/ Project/ Dissertation/Field Visit	NSPA2837	Bachelor of Arts (Honors/ Honors with Research) in Spanish	Report Writing, Presentation, Viva-Voce	2018
2396	Data Analysis & Visualisation using Software	DSPA2839	Bachelor of Arts (Honors/ Honors with Research) in Spanish	Written Test, Presentation, Viva-Voce	2018
2397	General Business Communication-Foundation	AECS2101	Communication Skills (OE)	Quiz, Group Discussion, Group Presentation	2023
2398	General Business Communication-Intermediate	AECS2201	Communication Skills (OE)	Quiz, Group Discussion, Group Presentation	2023
2399	General Business Communication-Advanced	AECS2202	Communication Skills (OE)	Quiz, Group Discussion, Group Presentation	2023
2400	Workplace Communication	AECS2301	Communication Skills (OE)	Quiz, Group Discussion, Group Presentation	2023
2401	Public Speaking	AECS2401	Communication Skills (OE)	Quiz, Group Discussion, Group Presentation	2023
2402	Employability Skills	AECS2501	Communication Skills (OE)	Quiz, Group Discussion, Group Presentation	2023
2403	Effective Listening	CSS2151	Communication Skills (OE)	Quiz, Group Discussion, Group Presentation	2010
2404	Presentation Skills	CSS2251	Communication Skills (OE)	Quiz, Group Discussion, Group Presentation	2010
2405	Reading and Comprehension	CSS2351	Communication Skills (OE)	Quiz, Group Discussion, Group Presentation	2010
2406	Corporate Communication	CSS2451	Communication Skills (OE)	Quiz, Group Discussion, Group Presentation	2010
2407	Employability Skills	CSS2551	Communication Skills (OE)	Quiz, Group Discussion, Group Presentation	2010
2408	Workplace Communication	CSS2651	Communication Skills (OE)	Quiz, Group Discussion, Group Presentation	2010

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2409	English-I	CSS2152	Communication Skills (OE)	Quiz, Group Discussion, Group Presentation	2010
2410	English-II	CSS2252	Communication Skills (OE)	Quiz, Group Discussion, Group Presentation	2010
2411	Basics of Communication	CSS4151	Communication Skills (OE)	Quiz, Group Discussion, Group Presentation	2010
2412	Corporate Communication	CSS4251	Communication Skills (OE)	Quiz, Group Discussion, Group Presentation	2010
2413	Interpersonal Communication	CSS4351	Communication Skills (OE)	Quiz, Group Discussion, Group Presentation	2010
2414	Cross Cultural Communication	CSS4451	Communication Skills (OE)	Quiz, Group Discussion, Group Presentation	2010
2415	Managerial Communication	CSS4152	Communication Skills (OE)	Quiz, Group Discussion, Group Presentation	2010
2416	Shakespearean Comedy	ENG2151	English Literature (OE)	Quiz, Group Discussion, Presentation, Class Performance	2013
2417	Romantic Poetry	ENG2251	English Literature (OE)	Quiz, Group Discussion, Presentation, Class Performance	2013
2418	The Novels of England	ENG2351	English Literature (OE)	Quiz, Group Discussion, Presentation, Class Performance	2013
2419	The English Novels of India	ENG2451	English Literature (OE)	Quiz, Group Discussion, Presentation, Class Performance	2013
2420	Genre Fiction	ENG2551	English Literature (OE)	Quiz, Group Discussion, Presentation, Class Performance	2013
2421	Contemporary Literature	ENG2651	English Literature (OE)	Quiz, Group Discussion, Presentation, Class Performance	2013
2422	History of Ancient India	HIS2151	History (OE)	Quiz, Group Discussion, Presentation, Class Performance	2016
2423	History of Medieval India	HIS2251	History (OE)	Quiz, Group Discussion, Presentation, Class Performance	2016
2424	History of Modern India	HIS2351	History (OE)	Quiz, Group Discussion, Presentation, Class Performance	2016
2425	The Ancient World	HIS2451	History (OE)	Quiz, Group Discussion, Presentation, Class Performance	2016
2426	Rise of the Modern West	HIS2551	History (OE)	Quiz, Group Discussion, Presentation, Class Performance	2016
2427	History of the World from Mid 20th Century to the 21st Century	HIS2651	History (OE)	Quiz, Group Discussion, Presentation, Class Performance	2016
2428	Health Education and Sports	PED2151	Physical Education and Sports Management (OE)	Quiz, Class Performance, Fitness Assignment, Presentation	2014
2429	Human Anatomy and Exercise	PED2251	Physical Education and Sports Management (OE)	Quiz, Class Performance, Fitness Assignment, Presentation	2014
2430	Sports Training and Conditioning	PED2351	Physical Education and Sports Management (OE)	Quiz, Class Performance, Fitness Assignment, Presentation	2014
2431	Basics of Sports Management	PED2451	Physical Education and Sports Management (OE)	Quiz, Class Performance, Fitness Assignment, Presentation	2014
2432	Sports Psychology	PED2551	Physical Education and Sports Management (OE)	Quiz, Class Performance, Fitness Assignment, Presentation	2014
2433	Sports Medicine	PED2651	Physical Education and Sports Management (OE)	Quiz, Class Performance, Fitness Assignment, Presentation	2014

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2434	Indian National Movement	POL2151	Political Studies (OE)	Quiz, Group Discussion, Presentation, Class Performance	2014
2435	Indian State and Politics after Independence	POL2251	Political Studies (OE)	Quiz, Group Discussion, Presentation, Class Performance	2014
2436	State Politics in India	POL2351	Political Studies (OE)	Quiz, Group Discussion, Presentation, Class Performance	2014
2437	Politics and Media	POL2451	Political Studies (OE)	Quiz, Group Discussion, Presentation, Class Performance	2014
2438	South Asia: Political Perspectives	POL2551	Political Studies (OE)	Quiz, Group Discussion, Presentation, Class Performance	2014
2439	Post-Cold War World Politics	POL2651	Political Studies (OE)	Quiz, Group Discussion, Presentation, Class Performance	2014
2440	Introduction to Performing Arts	PAR2151	Performing Arts (OE)	Quiz, Report Writing, Class Performance, Presentation, Viva-Voce	2019
2441	Dynamics of Dance, Music & Theatre	PAR2251	Performing Arts (OE)	Quiz, Report Writing, Class Performance, Presentation, Viva-Voce	2019
2442	Social relevance of Dance, Music & Drama in Contemporary Indian Scene	PAR2351	Performing Arts (OE)	Quiz, Report Writing, Class Performance, Presentation, Viva-Voce	2019
2443	Indian Folk Arts	PAR2451	Performing Arts (OE)	Quiz, Report Writing, Class Performance, Presentation, Viva-Voce	2019
2444	Modern Indian Performing Arts	PAR2551	Performing Arts (OE)	Quiz, Report Writing, Class Performance, Presentation, Viva-Voce	2019
2445	Arts, Aesthetic & Society	PAR2651	Performing Arts (OE)	Quiz, Report Writing, Class Performance, Presentation, Viva-Voce	2019
2446	Introduction to Sanskrit Language	SKT2151	Sanskrit (OE)	Quiz, Report Writing, Class Performance, Presentation, Viva-Voce	2019
2447	General Introduction to Vedic Literature & Conversational Sanskrit	SKT2251	Sanskrit (OE)	Quiz, Report Writing, Class Performance, Presentation, Viva-Voce	2019
2448	General Introduction to Sanskrit Literature & Sanskrit Conversation	SKT2351	Sanskrit (OE)	Quiz, Report Writing, Class Performance, Presentation, Viva-Voce	2019
2449	Sanskrit Language & Indian Culture	SKT2451	Sanskrit (OE)	Quiz, Report Writing, Class Performance, Presentation, Viva-Voce	2019
2450	Introduction to Sanskrit Linguistics	SKT2551	Sanskrit (OE)	Quiz, Report Writing, Class Performance, Presentation, Viva-Voce	2019
2451	General Introduction to Indian Philosophy & Sanskrit Grammar	SKT2651	Sanskrit (OE)	Quiz, Report Writing, Class Performance, Presentation, Viva-Voce	2019
2452	Rabindranath Tagore in the 21st Century	ENG2152	Tagore Studies (OE)	Quiz, Report Writing, Presentation, Viva-Voce	2017

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2453	Tagore- Autobiographies & Biographical Sketches	ENG2252	Tagore Studies (OE)	Quiz, Report Writing, Presentation, Viva-Voce	2017
2454	Tagore as a Cultural Icon – Tagore as a Painter & Performer	ENG2352	Tagore Studies (OE)	Quiz, Report Writing, Presentation, Viva-Voce	2017
2455	Tagore as a Poet	ENG2452	Tagore Studies (OE)	Quiz, Report Writing, Presentation, Viva-Voce	2017
2456	Tagore as a Fiction Writer	ENG2552	Tagore Studies (OE)	Quiz, Report Writing, Presentation, Viva-Voce	2017
2457	Tagore and Mass Media	ENG2652	Tagore Studies (OE)	Quiz, Report Writing, Presentation, Viva-Voce	2017
2458	Introduction to Foreign Language	AEFL2101	Foreign Language (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023
2459	Speaking About Yourself (French)	AEFL2251	French (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023
2460	Exchange (French)	AEFL2351	French (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023
2461	Communication in a Given Situation (French)	AEFL2451	French (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023
2462	Situating Yourself in Past (French)	AEFL2551	French (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023
2463	French-I	LAN2151	French (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2464	French-II	LAN2251	French (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2465	French-III	LAN2351	French (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2466	French-IV	LAN2451	French (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2467	French-V	LAN2551	French (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2468	French-VI	LAN2651	French (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2469	French-VII	LAN2751	French (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2470	French-VIII	LAN2851	French (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2471	French-IX	LAN2951	French (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2472	French for Technology-I	LAN2170	French (OE)	Quiz, Project Report, Presentation, Viva-Voce	2015
2473	French for Technology-II	LAN2270	French (OE)	Quiz, Project Report, Presentation, Viva-Voce	2015
2474	French for Technology-III	LAN2370	French (OE)	Quiz, Project Report, Presentation, Viva-Voce	2015
2475	French for Technology-IV	LAN2470	French (OE)	Quiz, Project Report, Presentation, Viva-Voce	2015
2476	French for Technology-V	LAN2570	French (OE)	Quiz, Project Report, Presentation, Viva-Voce	2015
2477	French for Technology-VI	LAN2670	French (OE)	Quiz, Project Report, Presentation, Viva-Voce	2015

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2478	French for Technology-VII	LAN2770	French (OE)	Quiz, Project Report, Presentation, Viva-Voce	2015
2479	French-I	LAN4151	French (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2480	French-II	LAN4251	French (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2481	French-III	LAN4351	French (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2482	French-IV	LAN4451	French (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2483	French-V	LAN4551	French (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2484	I and My Family (German)	AEFL2252	German (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023
2485	My City, My Home (German)	AEFL2352	German (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023
2486	Occupation and Life (German)	AEFL2452	German (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023
2487	Free Time Activities (German)	AEFL2552	German (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023
2488	German-I	LAN2152	German (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2489	German-II	LAN2252	German (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2490	German-III	LAN2352	German (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2491	German-IV	LAN2452	German (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2492	German-V	LAN2552	German (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2493	German-VI	LAN2652	German (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2494	German-VII	LAN2752	German (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2495	German-VIII	LAN2852	German (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2496	German-IX	LAN2952	German (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2497	German-I	LAN4152	German (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2498	German-II	LAN4252	German (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2499	German-III	LAN4352	German (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2500	German-IV	LAN4452	German (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2501	German-V	LAN4552	German (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2502	Elementary Grammar & Vocabulary (Spanish)	AEFL2253	Spanish (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023

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2503	My World and I (Spanish)	AEFL2353	Spanish (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023
2504	Day to day Activities (Spanish)	AEFL2453	Spanish (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023
2505	Professional Life and Past Experiences (Spanish)	AEFL2553	Spanish (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023
2506	Spanish-I	LAN2153	Spanish (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2507	Spanish-II	LAN2253	Spanish (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2508	Spanish-III	LAN2353	Spanish (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2509	Spanish-IV	LAN2453	Spanish (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2510	Spanish-V	LAN2553	Spanish (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2511	Spanish-VI	LAN2653	Spanish (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2512	Spanish-VII	LAN2753	Spanish (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2513	Spanish-VIII	LAN2853	Spanish (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2514	Spanish-IX	LAN2953	Spanish (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2515	Spanish-I	LAN4153	Spanish (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2516	Spanish-II	LAN4253	Spanish (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2517	Spanish-III	LAN4353	Spanish (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2518	Spanish-IV	LAN4453	Spanish (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2519	Spanish-V	LAN4553	Spanish (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2520	Alphabet, Acquaintance & Profession (Russian)	AEFL2254	Russian (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023
2521	My Family, My City and My Country (Russian)	AEFL2354	Russian (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023
2522	Action Words, Day-to-day Conversations and Shopping (Russian)	AEFL2454	Russian (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023
2523	Hobbies and Festivals (Russian)	AEFL2554	Russian (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023
2524	Russian-I	LAN2154	Russian (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2525	Russian-II	LAN2254	Russian (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2526	Russian-III	LAN2354	Russian (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2527	Russian-IV	LAN2454	Russian (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010

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2528	Russian-V	LAN2554	Russian (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2529	Russian-VI	LAN2654	Russian (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2530	Russian-VII	LAN2754	Russian (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2531	Russian-VIII	LAN2854	Russian (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2532	Russian-IX	LAN2954	Russian (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2533	Russian-I	LAN4154	Russian (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2534	Russian-II	LAN4254	Russian (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2535	Russian-III	LAN4354	Russian (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2536	Russian-IV	LAN4454	Russian (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2537	Russian-V	LAN4554	Russian (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2538	Elementary Chinese (Chinese)	AEFL2255	Chinese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023
2539	Comprehensive Chinese Lesson-I (Chinese)	AEFL2355	Chinese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023
2540	Comprehensive Chinese Lesson-II (Chinese)	AEFL2455	Chinese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023
2541	Business Chinese (Chinese)	AEFL2555	Chinese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023
2542	Chinese-I	LAN2155	Chinese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2543	Chinese-II	LAN2255	Chinese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2544	Chinese-III	LAN2355	Chinese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2545	Chinese-IV	LAN2455	Chinese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2546	Chinese-V	LAN2555	Chinese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2547	Chinese-VI	LAN2655	Chinese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2548	Chinese-VII	LAN2755	Chinese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2549	Chinese-VIII	LAN2855	Chinese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2550	Chinese-IX	LAN2955	Chinese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2551	Chinese-I	LAN4155	Chinese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2552	Chinese-II	LAN4255	Chinese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010

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2553	Chinese-III	LAN4355	Chinese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2554	Chinese-IV	LAN4455	Chinese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2555	Chinese-V	LAN4555	Chinese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2010
2556	Introduction to Hangeul and Basic Grammar (Korean)	AEFL2257	Korean (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023
2557	Introducing Self and Surroundings (Korean)	AEFL2357	Korean (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023
2558	Conversational Korean (Korean)	AEFL2457	Korean (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023
2559	Introducing Business/ Professional Korean (Korean)	AEFL2557	Korean (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023
2560	Korean-I	LAN2157	Korean (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2561	Korean-II	LAN2257	Korean (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2562	Korean-III	LAN2357	Korean (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2563	Korean-IV	LAN2457	Korean (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2564	Korean-V	LAN2557	Korean (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2565	Korean-VI	LAN2657	Korean (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2566	Korean-VII	LAN2757	Korean (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2567	Korean-VIII	LAN2857	Korean (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2568	Korean-IX	LAN2957	Korean (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2569	Korean-I	LAN4157	Korean (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2570	Korean-II	LAN4257	Korean (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2571	Korean-III	LAN4357	Korean (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2572	Korean-IV	LAN4457	Korean (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2573	Korean-V	LAN4557	Korean (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2574	An Overview to Kana & Kanji (Japanese)	AEFL2258	Japanese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023
2575	Elementary Text & Oral Expression (Japanese)	AEFL2358	Japanese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023
2576	Adavance Text & Oral Expression (Japanese)	AEFL2458	Japanese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023
2577	Japanese History, Culture & Business Japanese (Japanese)	AEFL2558	Japanese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2023

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2578	Japanese-I	LAN2158	Japanese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2579	Japanese-II	LAN2258	Japanese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2580	Japanese-III	LAN2358	Japanese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2581	Japanese-IV	LAN2458	Japanese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2582	Japanese-V	LAN2558	Japanese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2583	Japanese-VI	LAN2658	Japanese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2584	Japanese-VII	LAN2758	Japanese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2585	Japanese-VIII	LAN2858	Japanese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2586	Japanese-IX	LAN2958	Japanese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2587	Japanese-I	LAN4158	Japanese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2588	Japanese-II	LAN4258	Japanese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2589	Japanese-III	LAN4358	Japanese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2590	Japanese-IV	LAN4458	Japanese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2591	Japanese-V	LAN4558	Japanese (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2592	Hindi-I	LAN2159	Hindi (OE)	Quiz, Project Report, Presentation, Viva-Voce	2017
2593	Hindi-II	LAN2259	Hindi (OE)	Quiz, Project Report, Presentation, Viva-Voce	2017
2594	Hindi-III	LAN2359	Hindi (OE)	Quiz, Project Report, Presentation, Viva-Voce	2017
2595	Hindi-IV	LAN2459	Hindi (OE)	Quiz, Project Report, Presentation, Viva-Voce	2017
2596	Hindi-V	LAN2559	Hindi (OE)	Quiz, Project Report, Presentation, Viva-Voce	2017
2597	Hindi-VI	LAN2659	Hindi (OE)	Quiz, Project Report, Presentation, Viva-Voce	2017
2598	Hindi-VII	LAN2759	Hindi (OE)	Quiz, Project Report, Presentation, Viva-Voce	2017
2599	Hindi-VIII	LAN2859	Hindi (OE)	Quiz, Project Report, Presentation, Viva-Voce	2017
2600	Hindi-IX	LAN2959	Hindi (OE)	Quiz, Project Report, Presentation, Viva-Voce	2017
2601	Hindi-I	LAN4159	Hindi (OE)	Quiz, Project Report, Presentation, Viva-Voce	2017
2602	Hindi-II	LAN4259	Hindi (OE)	Quiz, Project Report, Presentation, Viva-Voce	2017

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2603	Hindi-III	LAN4359	Hindi (OE)	Quiz, Project Report, Presentation, Viva-Voce	2017
2604	Hindi-IV	LAN4459	Hindi (OE)	Quiz, Project Report, Presentation, Viva-Voce	2017
2605	Hindi-V	LAN4559	Hindi (OE)	Quiz, Project Report, Presentation, Viva-Voce	2017
2606	Professional French for Business-1	LAN2161	French Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2013
2607	Professional French for Business-2	LAN2261	French Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2013
2608	Professional French for Business-3	LAN2361	French Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2013
2609	Professional French for Business-4	LAN2461	French Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2013
2610	Introduction to French Literature & select socio-cultural aspects of France	LAN2561	French Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2013
2611	French through activities	LAN2661	French Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2013
2612	Professional German for Business-1	LAN2162	German Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2013
2613	Professional German for Business-2	LAN2262	German Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2013
2614	Professional German for Business-3	LAN2362	German Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2013
2615	Professional German for Business-4	LAN2462	German Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2013
2616	Introduction to German Literature & select socio-cultural aspects of Germany	LAN2562	German Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2013
2617	German through activities	LAN2662	German Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2013
2618	Introduction to Korean History & Geography	LAN2165	Korean Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2018
2619	Korean Cultural Perspectives	LAN2265	Korean Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2018
2620	Modern History of Korea & Introduction to Korean Language	LAN2365	Korean Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2018
2621	Contemporary Korea	LAN2465	Korean Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2018
2622	Polity & Economy of Korea	LAN2565	Korean Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2018
2623	Themes in Korean Literature	LAN2665	Korean Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2018
2624	Introduction to the French North America- a short history of Quebec	LAN2164	Quebec Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2018
2625	Quebec Society Culture & Language	LAN2264	Quebec Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2018
2626	Quebec in the World Affairs	LAN2364	Quebec Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2018

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2627	Political Economy of Quebec	LAN2464	Quebec Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2018
2628	Introduction to Major Literary Movements in Quebec-I	LAN2564	Quebec Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2018
2629	Introduction to Major Literary Movements in Quebec-II	LAN2664	Quebec Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2018
2630	EFE Professional Spanish for Business-I	LAN2163	Spanish Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2631	EFE Professional Spanish for Business-II	LAN2263	Spanish Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2632	EFE Professional Spanish for Business-III	LAN2363	Spanish Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2633	EFE Professional Spanish for Business-IV	LAN2463	Spanish Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2634	Introduction to Spanish Literature & select socio-cultural aspects of Spain	LAN2563	Spanish Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2635	Spanish through activities	LAN2663	Spanish Studies (OE)	Quiz, Project Report, Presentation, Viva-Voce	2014
2636	Computer Applications	FST2103	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2637	Pattern Making & Drafting-II	FST2202	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2638	Garment Construction-I	FST2203	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2639	Computer Aided Design-I	FST2204	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2640	Fabric Artistry & Embroidery	FST2205	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2641	Fashion-Business Laws, Ethics & Communication	FST2208	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2642	Fashion Art Illustration & Model Drawing-III	FST2301	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2643	Advance Pattern Making-I	FST2302	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2644	Garment Construction-II	FST2303	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2645	Apparel Production	FST2306	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2646	Computer Aided Manufacturing	FST2309	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2647	Project Presentation	FST2332	Bachelor of Design in Fashion Design	Report Writing, Viva-Voce, Presentation	2015
2648	Fashion Art Illustration & Model Drawing-IV	FST2401	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2649	Advance Pattern Making-II	FST2402	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2650	Garment Construction-III	FST2403	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2651	Computer Aided Design-III	FST2404	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015

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2652	Visual Merchandising	FST2408	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2653	Term Paper	FST2431	Bachelor of Design in Fashion Design	Quiz, Written Test	2015
2654	Workshops / Certification (Discipline specific)	FST2433	Bachelor of Design in Fashion Design	Quiz, Written Test	2015
2655	Fashion Art Illustration and Model Drawing-V	FST2501	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2656	Garment Construction-IV	FST2502	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2657	Computer Aided Design-IV	FST2503	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2658	Pattern Draping	FST2504	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2659	Pattern Grading	FST2505	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2660	Fashion Merchandizing-II	FST2506	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2661	Quality Control & Production Management-II	FST2507	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2662	Fashion Forecasting	FST2508	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2663	Craft Documentation (Market Visit, Field Trip, Documentation & Presentation, Scope & Final Presentation)	FST2535	Bachelor of Design in Fashion Design	Report Writing, Viva-Voce, Presentation	2015
2664	Fashion Promotion	FST2512	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2665	The Business of Luxury Fashion	FST2513	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2666	Couture Design	FST2514	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2667	Retail Merchandising and Management	FST2601	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2668	Entrepreneurship	FST2604	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2669	Designing and Development of Fashion Accessories	FST2606	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2670	Sportswear Design & Development	FST2607	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2671	Costume Design Pertaining to Performing Arts	FST2608	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2672	Functions of Indian Buying Houses / Agents - A Study	FST2609	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2673	Field Trip / Visit Documentation Evaluation	FST2702	Bachelor of Design in Fashion Design	Report Writing, Viva-Voce, Presentation	2015
2674	Computer Aided Design-V	FST2703	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015
2675	Graduate Design Collection	FST2704	Bachelor of Design in Fashion Design	Quiz, Class Performance, Report Writing, Presentation	2015

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2676	Graduation Project	FST2837	Bachelor of Design in Fashion Design	Report Writing, Viva-Voce, Presentation	2015
2677	Fashion Art Illustration and Model Drawing	FDT2151	Fashion Management (OE)	Quiz, Class Performance, Report Writing, Presentation	2013
2678	Fashion Theory	FDT2251	Fashion Management (OE)	Quiz, Class Performance, Report Writing, Presentation	2013
2679	Computer Aided Manufacturing	FDT2351	Fashion Management (OE)	Quiz, Class Performance, Report Writing, Presentation	2013
2680	Fashion Management	FDT2451	Fashion Management (OE)	Quiz, Class Performance, Report Writing, Presentation	2013
2681	Fashion Forecasting	FDT2551	Fashion Management (OE)	Quiz, Class Performance, Report Writing, Presentation	2013
2682	Fashion Retailing & Visual Merchandising	FDT2651	Fashion Management (OE)	Quiz, Class Performance, Report Writing, Presentation	2016
2683	Introduction to Apparel Merchandising	VFD2151	Apparel Merchandising (OE)	Quiz, Class Performance, Report Writing, Presentation	2016
2684	Apparel Market Research & Product Analysis	VFD2251	Apparel Merchandising (OE)	Quiz, Class Performance, Report Writing, Presentation	2016
2685	Vendor Management & Product Evaluation	VFD2351	Apparel Merchandising (OE)	Quiz, Class Performance, Report Writing, Presentation	2016
2686	Prototype Preparation & Merchandise Plan	VFD2451	Apparel Merchandising (OE)	Quiz, Class Performance, Report Writing, Presentation	2016
2687	Pre-Production Management	VFD2551	Apparel Merchandising (OE)	Quiz, Class Performance, Report Writing, Presentation	2016
2688	Shipment & Documentation Management	VFD2651	Apparel Merchandising (OE)	Quiz, Class Performance, Report Writing, Presentation	2016
2689	Design Eco-System	VFD2152	Fashion Design (OE)	Quiz, Class Performance, Report Writing, Presentation	2016
2690	Fashion Design Research	VFD2252	Fashion Design (OE)	Report Writing, Viva-Voce, Presentation	2016
2691	Design Preparatory Process	VFD2352	Fashion Design (OE)	Quiz, Class Performance, Report Writing, Presentation	2016
2692	Prototype Garment Development	VFD2452	Fashion Design (OE)	Quiz, Class Performance, Report Writing, Presentation	2016
2693	Design Development	VFD2552	Fashion Design (OE)	Quiz, Class Performance, Report Writing, Presentation	2016
2694	Health & Safety Equilibrium	VFD2652	Fashion Design (OE)	Quiz, Class Performance, Report Writing, Presentation	2016
2695	Drawing-I	FNA2101	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2696	Geometrical Drawing & Perspective-I	FNA2102	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2697	Design-I	FNA2103	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2698	Painting-I	FNA2104	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2699	Sculpture-I	FNA2105	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2700	Print Making-I	FNA2106	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011

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2701	Visual Graphics-I	FNA2108	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2702	Photography-I	FNA2109	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2703	Drawing-II	FNA2201	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2704	Geometrical Drawing & Perspective-II	FNA2202	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2705	Design-II	FNA2203	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2706	Painting-II	FNA2204	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2707	Sculpture-II	FNA2205	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2708	Print Making-II	FNA2206	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2709	Visual Graphics-II	FNA2208	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2710	Photography-II	FNA2209	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2711	Summer Project Evaluation-I	FNA2335	Bachelor of Fine Arts	Report Writing, Presentation, Viva-Voce	2011
2712	Composition -I	FNA2304	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2713	Carving-I	FNA2305	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2714	Mural-I	FNA2306	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2715	Photography-I	FNA2307	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2716	Ceramics-I	FNA2308	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2717	Assemblage-I	FNA2309	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2718	Sculpture Methods & Materials - I	FNA2310	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2719	Drawing & Illustration-I	FNA2311	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2720	Design-III	FNA2312	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2721	Lettering & Typography-I	FNA2313	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2722	Photography-III	FNA2314	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2723	Printing Techniques-I	FNA2315	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2724	Computer Graphic-I	FNA2316	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2725	Drawing-III	FNA2318	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011

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2726	Painting-III	FNA2319	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2727	Composition-I	FNA2320	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2728	Photography-III	FNA2321	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2729	Print Making-III	FNA2322	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2730	Computer Graphic-I	FNA2323	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2731	Painting Methods & Materials-I	FNA2324	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2732	Composition- II	FNA2404	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2733	Carving- II	FNA2405	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2734	Mural - II	FNA2406	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2735	Photography - II	FNA2407	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2736	Ceramics - II	FNA2408	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2737	Assemblage - II	FNA2409	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2738	Sculpture Methods & Materials - II	FNA2410	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2739	Drawing & Illustration - II	FNA2411	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2740	Design - IV	FNA2412	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2741	Lettering & Typography - II	FNA2413	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2742	Computer Graphics - II	FNA2414	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2743	Printing Techniques - II	FNA2415	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2744	Drawing - IV	FNA2417	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2745	Painting - IV	FNA2418	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2746	Composition - II	FNA2419	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2747	Mural - I	FNA2420	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2748	Print Making - II	FNA2421	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2749	Painting Methods & Materials - II	FNA2422	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2750	Practical Training - I (Evaluation)	FNA2535	Bachelor of Fine Arts	Report Writing, Presentation, Viva-Voce	2011

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2751	Study from Life - III	FNA2503	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2752	Composition - III	FNA2504	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2753	Metal Casting - I	FNA2505	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2754	Mural - III	FNA2506	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2755	Photography - III	FNA2507	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2756	Ceramics - III	FNA2508	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2757	Assemblage - III	FNA2509	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2758	Sculpture Methods & Materials - III	FNA2510	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2759	Drawing & Illustration - III	FNA2511	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2760	Design - V	FNA2512	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2761	Packaging - I	FNA2513	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2762	Computer Graphics - III	FNA2514	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2763	Printing Techniques - III	FNA2515	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2764	Textile Design - I	FNA2516	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2765	Drawing - V	FNA2518	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2766	Painting - V	FNA2519	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2767	Composition - III	FNA2520	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2768	Photography - III	FNA2521	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2769	Print Making - III	FNA2522	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2770	Traditional Painting - I	FNA2523	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2771	Painting Methods & Materials - III	FNA2524	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2772	Study Abroad	FNA2534	Bachelor of Fine Arts	Written Test, Country Report	2011
2773	Project - I	FNA2532	Bachelor of Fine Arts	Project writing, Presentation, Viva-Voce	2011
2774	Dissertation-I	FNA2637	Bachelor of Fine Arts	Report Writing, Presentation, Viva-Voce	2011
2775	Composition - IV	FNA2604	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2776	Metal Casting - II	FNA2605	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2777	Mural - IV	FNA2606	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2778	Photography - IV	FNA2607	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2779	Ceramics - IV	FNA2608	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2780	Assemblage - IV	FNA2609	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2781	Sculpture Methods & Materials - IV	FNA2610	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2782	Drawing & Illustration - IV	FNA2611	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2783	Design-VI	FNA2612	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2784	Packaging-II	FNA2613	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2785	Printing Techniques-IV	FNA2614	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2786	Computer Graphics - IV	FNA2615	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2787	Textile Design - II	FNA2616	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2788	Drawing - VI	FNA2618	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2789	Painting - VI	FNA2619	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2790	Composition - IV	FNA2620	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2791	Mural - II	FNA2621	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2792	Print Making - II	FNA2622	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2793	Painting Methods & Materials - IV	FNA2623	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2794	Study Abroad	FNA2634	Bachelor of Fine Arts	Written Test, Country Report	2011
2795	Traditional Artwork	FNA2630	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2796	Practical Training Evaluation-II	FNA2735	Bachelor of Fine Arts	Report Writing, Presentation, Viva-Voce	2011
2797	Composition - V	FNA2703	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2798	Metal Casting - III	FNA2704	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2799	Mural - V	FNA2705	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2800	Photography -V	FNA2706	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2801	Ceramics - V	FNA2707	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2802	Assemblage - V	FNA2708	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2803	Sculpture Methods & Materials - V	FNA2709	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2804	Design - VII	FNA2710	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2805	Packaging - III	FNA2711	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2806	Drawing & Illustration - V	FNA2712	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2807	Computer Graphics - V	FNA2713	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2808	Photography - V	FNA2714	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2809	Drawing - VII	FNA2716	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2810	Painting & Composition - I	FNA2717	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2811	Mural - III	FNA2718	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2812	Print Making - III	FNA2719	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2813	Painting Methods & Materials - V	FNA2720	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2814	Project- II	FNA2732	Bachelor of Fine Arts	Project writing, Presentation, Viva-Voce	2011
2815	Workshops/Certification/Exhibition (Discipline specific)	FNA2733	Bachelor of Fine Arts	Quiz, Written Test	2011
2816	Portfolio Development & Presentation with exhibitions	FNA2837	Bachelor of Fine Arts	Report Writing, Presentation, Viva-Voce	2011
2817	Composition - VI	FNA2803	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2818	Metal Casting - IV	FNA2804	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2819	Mural - IV	FNA2805	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2820	Photography – IV	FNA2806	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2821	Ceramics - IV	FNA2807	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2822	Assemblage - IV	FNA2808	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2823	Sculpture Methods & Materials - IV	FNA2809	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2824	Design - VIII	FNA2810	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2825	Packaging - IV	FNA2811	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2826	Drawing & Illustration - VI	FNA2812	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2827	Computer Graphics - VI	FNA2813	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2828	Photography - VI	FNA2814	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2829	Drawing - VIII	FNA2816	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2830	Painting & Composition - II	FNA2817	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2831	Mural - IV	FNA2818	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2832	Print Making - IV	FNA2819	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2833	Painting Methods & Materials - VI	FNA2820	Bachelor of Fine Arts	Practical, Report Writing, Class Performance	2011
2834	Visualization - I	FNA4101	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2835	Graphic Designing – I	FNA4102	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2836	TV Graphics – I	FNA4103	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2837	Illustration - I	FNA4104	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2838	Drawing - I	FNA4106	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2839	Creative Painting - I	FNA4107	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2840	Mural (Painting) - I	FNA4108	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2841	Portraiture - I	FNA4109	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2842	Creative Drawing - I	FNA4111	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2843	Portraiture Sculpture- I	FNA4113	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2844	Mural (Sculpture)- I	FNA4114	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2845	Creative Sculpture-I	FNA4115	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2846	Report & Viva (Specialization Specific)	FNA4237	Master of Fine Arts	Report Writing, Presentation, Viva-Voce	2011
2847	Visualization - II	FNA4201	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2848	Graphic Designing - II	FNA4202	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2849	TV Graphics - II	FNA4203	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2850	Illustration - II	FNA4204	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2851	Drawing -II	FNA4206	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2852	Creative Painting - II	FNA4207	Master of Fine Arts	Practical, Report Writing, Class Performance	2011

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2853	Mural (Painting) - II	FNA4208	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2854	Portraiture - II	FNA4209	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2855	Creative Drawing -II	FNA4211	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2856	Portraiture Sculpture- II	FNA4212	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2857	Mural (Sculpture) - II	FNA4213	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2858	Creative Sculpture- II	FNA4214	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2859	Dissertation & Viva (Specialization Specific)-I	FNA4337	Master of Fine Arts	Report Writing, Presentation, Viva-Voce	2011
2860	Visualization - III	FNA4301	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2861	Graphic Designing-III	FNA4302	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2862	TV Graphics - III	FNA4303	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2863	Illustration - III	FNA4304	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2864	Drawing – III	FNA4306	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2865	Creative Painting - III	FNA4307	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2866	Mural Painting - III	FNA4308	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2867	Portraiture - III	FNA4309	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2868	Art Criticism (Painting) - I	FNA4310	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2869	Creative Sculpture - III	FNA4311	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2870	Portraiture Sculpture - III	FNA4312	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2871	Mural (Sculpture) - III	FNA4313	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2872	Art Criticism (Sculpture) - I	FNA4315	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2873	Dissertation & Viva (Specialization Specific) - II	FNA4437	Master of Fine Arts	Report Writing, Presentation, Viva-Voce	2011
2874	Visualization - IV	FNA4401	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2875	Graphic Designing - IV	FNA4402	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2876	TV Graphics - IV	FNA4403	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2877	Illustration - IV	FNA4404	Master of Fine Arts	Practical, Report Writing, Class Performance	2011

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2878	Drawing - IV	FNA4406	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2879	Creative Painting - IV	FNA4407	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2880	Mural (Painting) - IV	FNA4408	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2881	Portraiture - IV	FNA4409	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2882	Art Criticism (Painting) - II	FNA4410	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2883	Creative Drawing - IV	FNA4411	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2884	Portraiture Sculpture - IV	FNA4412	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2885	Mural (Sculpture) - IV	FNA4413	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2886	Creative Sculpture - II	FNA4414	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2887	Art Criticism (Sculpture) - II	FNA4415	Master of Fine Arts	Practical, Report Writing, Class Performance	2011
2888	Basics of Drawing and Asian Landscape	FNA2151	Painting Arts (OE)	Practical, Report Writing, Class Performance	2013
2889	Basics of Drawing and Monochrome Folk Composition	FNA2251	Painting Arts (OE)	Practical, Report Writing, Class Performance	2013
2890	Advanced Drawing and Illustration of Indian Temple Sculpture	FNA2351	Painting Arts (OE)	Practical, Report Writing, Class Performance	2013
2891	Advanced Drawing with Ink with brush Illustration	FNA2451	Painting Arts (OE)	Practical, Report Writing, Class Performance	2013
2892	Advanced Drawing and Illustration with Mural Art	FNA2551	Painting Arts (OE)	Practical, Report Writing, Class Performance	2013
2893	Advanced Drawing and Illustration with Visual Design	FNA2651	Painting Arts (OE)	Practical, Report Writing, Class Performance	2013
2894	Legal Method	LAW2104	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2895	Law of Contract-I	LAW2105	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2896	Micro Economics-I	LAW2106	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2897	Law of Contract-II	LAW2204	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2898	Micro Economics-II	LAW2205	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2899	Macro Economics-I	LAW2302	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2900	Constitutional Law-I	LAW2303	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2901	Law of Crimes-I (Indian Penal Code Section-1 to 120B)	LAW2304	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2902	Family Law-I	LAW2305	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012

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2903	Code of Criminal Procedure	LAW2311	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2904	Summer Internship Evaluation-I	LAW2335	B.A., LLB (Hons.)	Report Writing, Presentation, Viva-Voce	2012
2905	Macro Economics-II	LAW2402	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2906	Constitutional Law-II	LAW2403	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2907	Administrative Law	LAW2404	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2908	Family Law-II	LAW2405	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2909	Law of Crimes-II (Indian Penal Code Section 121-511)	LAW2406	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2910	Law of Evidence	LAW2502	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2911	Code of Civil Procedure	LAW2503	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2912	Labour Law-I	LAW2504	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2913	Property Law	LAW2505	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2914	Summer Internship Evaluation-II	LAW2535	B.A., LLB (Hons.)	Report Writing, Presentation, Viva-Voce	2012
2915	Company Law	LAW2603	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2916	Law of Torts (Motor Vehicles Act & Consumer Protection Act, 1986)	LAW2604	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2917	Labour Law - II	LAW2605	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2918	Cyber Laws	LAW2606	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2919	Environmental Law	LAW2702	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2920	Jurisprudence	LAW2703	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2921	Public International Law	LAW2704	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2922	Arbitration & Alternate Dispute Resolution	LAW2705	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2923	Summer Internship Evaluation-III	LAW2735	B.A., LLB (Hons.)	Report Writing, Presentation, Viva-Voce	2012
2924	Human Rights Law	LAW2701	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2925	Forensic Science-I	LAW2707	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2926	Offences against Child & Juvenile Offence Human Rights Law	LAW2708	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2927	Law and Medicine-I	LAW2709	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012

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2928	Military Law	LAW2710	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2929	Taxation Law	LAW2802	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2930	Interpretation of Statutes	LAW2803	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2931	International Trade Law	LAW2804	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2932	Land Laws	LAW2805	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2933	Women & Criminal Law	LAW2806	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2934	Probation & Parole	LAW2807	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2935	Forensic Science-II	LAW2808	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2936	Law and Medicine-II	LAW2809	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2937	Medical Jurisprudence	LAW2810	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2938	Intellectual Property Rights	LAW2902	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2939	Law Poverty & Development	LAW2903	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2940	Professional Ethics	LAW2904	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2941	Summer Internship Evaluation-IV	LAW2935	B.A., LLB (Hons.)	Report Writing, Presentation, Viva-Voce	2012
2942	Private International Law	LAW2905	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2943	Election Law	LAW2906	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2944	Banking & Insurance Laws	LAW2907	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2945	International Humanitarian & Refugee Law	LAW2908	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2946	Corruption Laws	LAW2911	B.A., LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2947	Moot Court / Internship	LAW2003	B.A., LLB (Hons.)	Report Writing, Presentation, Viva-Voce	2012
2948	Dissertation	LAW2037	B.A., LLB (Hons.)	Report Writing, Presentation, Viva-Voce	2012
2949	Legal Method	LAW2104	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2950	Law of Contract-I	LAW2105	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2951	Financial Accounting-I	LAW2107	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2952	Readings in Management	MGT2130	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2953	Term Paper	COM2131	B.Com, LLB (Hons.)	Academic Writing, Presentation	2012

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2954	Project (with Presentation & Evaluation)	COM2132	B.Com, LLB (Hons.)	Project writing, Presentation, Viva-Voce	2012
2955	Workshop / Certification (Discipline Specific) (1credit per workshop)	COM2133	B.Com, LLB (Hons.)	Quiz, Written Test	2012
2956	Study Abroad	COM2134	B.Com, LLB (Hons.)	Written Test, Country Report	2012
2957	Law of Contract-II	LAW2204	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2958	Financial Accounting-II	LAW2206	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2959	Computer Applications in Business	COM2204	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2960	Human Values & Professional Ethics	MGT2206	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2961	Readings in Management	MGT2230	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2962	Term Paper	COM2231	B.Com, LLB (Hons.)	Academic Writing, Presentation	2012
2963	Project(with Presentation &Evaluation)	COM2232	B.Com, LLB (Hons.)	Project writing, Presentation, Viva-Voce	2012
2964	Workshop/ Certification (Discipline Specific) *(1credit per workshop)*	COM2233	B.Com, LLB (Hons.)	Quiz, Written Test	2012
2965	Study Abroad	COM2234	B.Com, LLB (Hons.)	Written Test, Country Report	2012
2966	Constitutional Law-I	LAW2303	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2967	Law of Crimes-I (Indian Penal Code Section-1 to 120B)	LAW2304	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2968	Family Law-I	LAW2305	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2969	Corporate Accounting	LAW2307	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2970	Statistical Methods in Research-I	LAW2308	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2971	Code of Criminal Procedure	LAW2311	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2972	Summer Internship Evaluation-I	LAW2335	B.Com, LLB (Hons.)	Report Writing, Presentation, Viva-Voce	2012
2973	Constitutional Law-II	LAW2403	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2974	Administrative Law	LAW2404	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2975	Family Law-II	LAW2405	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2976	Law of Crimes-II (Indian Penal Code Section 121-511)	LAW2406	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2977	Statistical Methods in Research-II	LAW2408	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2978	Law of Evidence	LAW2502	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2979	Code of Civil Procedure	LAW2503	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
2980	Labour Law-I	LAW2504	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2981	Property Law	LAW2505	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2982	Cost Accounting	LAW2507	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2983	Macro Economics	LAW2508	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2984	Summer Internship Evaluation-II	LAW2535	B.Com, LLB (Hons.)	Report Writing, Presentation, Viva-Voce	2012
2985	Advanced Corporate Accounting	COM2503	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2986	Corporate Tax Law and Practice	COM2504	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2987	Business Taxation	COM2505	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2988	Company Law	LAW2603	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2989	Law of Torts (Motor Vehicles Act & Consumer Protection Act, 1986)	LAW2604	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2990	Labour Law-II	LAW2605	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2991	Cyber Laws	LAW2606	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2992	Management Accounting	LAW2607	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2993	Advanced Cost Accounting	COM2603	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2994	Indirect Taxes including GST	COM2604	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2995	Public Finance and Tax Practices	COM2605	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2996	Environmental Law	LAW2702	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2997	Jurisprudence	LAW2703	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2998	Public International Law	LAW2704	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
2999	Summer Internship Evaluation-III	LAW2735	B.Com, LLB (Hons.)	Report Writing, Presentation, Viva-Voce	2012
3000	Human Rights Law	LAW2701	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3001	Forensic Science-I	LAW2707	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3002	Offences against Child & Juvenile Offence Human Rights Law	LAW2708	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3003	Law and Medicine-I	LAW2709	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3004	Military Law	LAW2710	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012

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3005	Taxation Law	LAW2802	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3006	Land Laws	LAW2805	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3007	Investment & Competition Law	LAW2801	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3008	Women & Criminal Law	LAW2806	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3009	Probation & Parole	LAW2807	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3010	Forensic Science-II	LAW2808	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3011	Law and Medicine-II	LAW2809	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3012	Medical Jurisprudence	LAW2810	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3013	Intellectual Property Rights	LAW2902	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3014	Law Poverty & Development	LAW2903	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3015	Professional Ethics	LAW2904	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3016	Summer Internship Evaluation-IV	LAW2935	B.Com, LLB (Hons.)	Report Writing, Presentation, Viva-Voce	2012
3017	Private International Law	LAW2905	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3018	Election Law	LAW2906	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3019	Banking & Insurance Laws	LAW2907	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3020	International Humanitarian & Refugee Law	LAW2908	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3021	Criminology & Victimology	LAW2909	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3022	Corruption Laws	LAW2911	B.Com, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3023	Moot Court / Internship	LAW2003	B.Com, LLB (Hons.)	Report Writing, Presentation, Viva-Voce	2012
3024	Dissertation	LAW2037	B.Com, LLB (Hons.)	Report Writing, Presentation, Viva-Voce	2012
3025	Legal Methods	LAW2104	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3026	Law of Contract-I	LAW2105	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3027	Financial Accounting	LAW2110	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3028	E-Commerce	COM2103	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3029	Economic System and Society	ECO2104	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
3030	Readings in Management	MGT2130	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3031	Term Paper	MGT2131	BBA, LLB (Hons.)	Academic Writing, Presentation	2012
3032	Project (with Presentation & Evaluation)	MGT2132	BBA, LLB (Hons.)	Project writing, Presentation, Viva-Voce	2012
3033	Workshop / Certification (Discipline Specific) (1credit per workshop)	MGT2133	BBA, LLB (Hons.)	Quiz, Written Test	2012
3034	Study Abroad	MGT2134	BBA, LLB (Hons.)	Written Test, Country Report	2012
3035	Law of Contract-II	LAW2204	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3036	Analysis & Design of Business System	MGT2204	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3037	Innovation & Creativity Management	MGT2205	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3038	Human Values & Professional Ethics	MGT2206	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3039	Readings in Management	MGT2230	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3040	Term Paper	MGT2231	BBA, LLB (Hons.)	Academic Writing, Presentation	2012
3041	Project (with Presentation & Evaluation)	MGT2232	BBA, LLB (Hons.)	Project writing, Presentation, Viva-Voce	2012
3042	Workshop / Certification (Discipline Specific) (1credit per workshop)	MGT2233	BBA, LLB (Hons.)	Quiz, Written Test	2012
3043	Study Abroad	MGT2234	BBA, LLB (Hons.)	Written Test, Country Report	2012
3044	Constitutional Law-I	LAW2303	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3045	Law of Crimes - I (Indian Penal Code Section-1 to 120B)	LAW2304	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3046	Family Law-I	LAW2305	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3047	Code of Criminal Procedure	LAW2311	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3048	Summer Internship Evaluation-I	LAW2335	BBA, LLB (Hons.)	Report Writing, Presentation, Viva-Voce	2012
3049	Industrial Psychology	MGT2305	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3050	Term Paper	MGT2331	BBA, LLB (Hons.)	Academic Writing, Presentation	2012
3051	Project (with Presentation & Evaluation)	MGT2332	BBA, LLB (Hons.)	Project writing, Presentation, Viva-Voce	2012
3052	Workshop / Certification (Discipline Specific) (1credit per workshop)	MGT2333	BBA, LLB (Hons.)	Quiz, Written Test	2012
3053	Study Abroad	MGT2334	BBA, LLB (Hons.)	Written Test, Country Report	2012
3054	Constitutional Law – II	LAW2403	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3055	Administrative Law	LAW2404	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012

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3056	Family Law - II	LAW2405	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3057	Law of Crimes - II (Indian Penal Code Section 121-511)	LAW2406	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3058	Research Methodology & Report Preparation	LAW2410	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3059	Business Information & Database System	MGT2404	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3060	Personal Financial Planning	MGT2405	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3061	Term Paper	MGT2431	BBA, LLB (Hons.)	Academic Writing, Presentation	2012
3062	Project (with Presentation & Evaluation)	MGT2432	BBA, LLB (Hons.)	Project writing, Presentation, Viva-Voce	2012
3063	Workshop / Certification (Discipline Specific) (1credit per workshop)	MGT2433	BBA, LLB (Hons.)	Quiz, Written Test	2012
3064	Study Abroad	MGT2434	BBA, LLB (Hons.)	Written Test, Country Report	2012
3065	Law of Evidence	LAW2502	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3066	Code of Civil Procedure	LAW2503	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3067	Labour Law - I	LAW2504	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3068	Property Law	LAW2505	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3069	Summer Internship Evaluation-II	LAW2535	BBA, LLB (Hons.)	Report Writing, Presentation, Viva-Voce	2012
3070	Term Paper	MGT2531	BBA, LLB (Hons.)	Academic Writing, Presentation	2012
3071	Project (with Presentation & Evaluation)	MGT2532	BBA, LLB (Hons.)	Project writing, Presentation, Viva-Voce	2012
3072	Workshop / Certification (Discipline Specific) (1credit per workshop)	MGT2533	BBA, LLB (Hons.)	Quiz, Written Test	2012
3073	Study Abroad	MGT2534	BBA, LLB (Hons.)	Written Test, Country Report	2012
3074	Training & Development	MGT2510	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3075	Company Law	LAW2603	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3076	Law of Torts (Motor Vehicles Act & Consumer Protection Act, 1986)	LAW2604	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3077	Labour Law -II	LAW2605	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3078	Cyber Laws	LAW2606	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3079	Brand Management	MGT2602	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3080	Advertising & Sales Promotion	MGT2603	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3081	Term Paper	MGT2631	BBA, LLB (Hons.)	Academic Writing, Presentation	2012

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3082	Project (with Presentation & Evaluation)	MGT2632	BBA, LLB (Hons.)	Project writing, Presentation, Viva-Voce	2012
3083	Workshop / Certification (Discipline Specific) (1credit per workshop)	MGT2633	BBA, LLB (Hons.)	Quiz, Written Test	2012
3084	Corporate Tax Planning	MGT2605	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3085	Banking & Financial Institutions	MGT2606	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3086	Advanced Corporate Finance	MGT2607	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3087	Industrial Relations & Labour Law	MGT2608	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3088	Performance Management System	MGT2609	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3089	Compensation & Reward Management	MGT2610	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3090	Environmental Law	LAW2702	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3091	Jurisprudence	LAW2703	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3092	Public International Law	LAW2704	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3093	Summer Internship Evaluation-III	LAW2735	BBA, LLB (Hons.)	Report Writing, Presentation, Viva-Voce	2012
3094	Human Rights Law	LAW2701	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3095	Forensic Science-I	LAW2707	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3096	Offences against Child & Juvenile Offence Human Rights Law	LAW2708	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3097	Law and Medicine-I	LAW2709	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3098	Military Law	LAW2710	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3099	Taxation Law	LAW2802	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3100	Interpretation of Statutes	LAW2803	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3101	International Trade Law	LAW2804	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3102	Land Laws	LAW2805	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3103	Investment & Competition Law	LAW2801	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3104	Women & Criminal Law	LAW2806	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3105	Probation & Parole	LAW2807	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3106	Forensic Science-II	LAW2808	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012

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3107	Law and Medicine-II	LAW2809	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3108	Medical Jurisprudence	LAW2810	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3109	Intellectual Property Rights	LAW2902	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3110	Law Poverty & Development	LAW2903	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3111	Professional Ethics	LAW2904	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3112	Summer Internship Evaluation-IV	LAW2935	BBA, LLB (Hons.)	Report Writing, Presentation, Viva-Voce	2012
3113	Private International Law	LAW2905	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3114	Election Law	LAW2906	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3115	Banking & Insurance Law	LAW2907	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3116	International Humanitarian & Refugee Law	LAW2908	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3117	Criminology & Victimology	LAW2909	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3118	Corruption Laws	LAW2911	BBA, LLB (Hons.)	Quiz, Project, Presentation, Viva-Voce	2012
3119	Moot Court / Internship	LAW2003	BBA, LLB (Hons.)	Report Writing, Presentation, Viva-Voce	2012
3120	Dissertation	LAW2037	BBA, LLB (Hons.)	Report Writing, Presentation, Viva-Voce	2012
3121	Research Method & Legal Writing	LAW4101	Master of Law (LLM)	Quiz, Project, Presentation, Viva-Voce	2011
3122	Comparative Public Law/ System of Governance	LAW4102	Master of Law (LLM)	Quiz, Project, Presentation, Viva-Voce	2011
3123	Intellectual Property Law	LAW4105	Master of Law (LLM)	Quiz, Project, Presentation, Viva-Voce	2011
3124	Fundamental Rights & Directive Principles	LAW4106	Master of Law (LLM)	Quiz, Project, Presentation, Viva-Voce	2011
3125	International and Regional Instruments on Child Protection	LAW4113	Master of Law (LLM)	Quiz, Project, Presentation, Viva-Voce	2022
3126	National and State Policies for Child Protection and Development	LAW4114	Master of Law (LLM)	Quiz, Project, Presentation, Viva-Voce	2022
3127	Dissertation	LAW4237	Master of Law (LLM)	Report Writing, Presentation, Viva-Voce	2011
3128	Competition Law	LAW4202	Master of Law (LLM)	Quiz, Project, Presentation, Viva-Voce	2011
3129	International Trade Law	LAW4203	Master of Law (LLM)	Quiz, Project, Presentation, Viva-Voce	2011
3130	Banking & Insurance Law	LAW4205	Master of Law (LLM)	Quiz, Project, Presentation, Viva-Voce	2011
3131	Administrative Law	LAW4206	Master of Law (LLM)	Quiz, Project, Presentation, Viva-Voce	2011

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
3132	Religion Diversity & Law	LAW4207	Master of Law (LLM)	Quiz, Project, Presentation, Viva-Voce	2011
3133	Media Law	LAW4208	Master of Law (LLM)	Quiz, Project, Presentation, Viva-Voce	2011
3134	International Criminal Law	LAW4209	Master of Law (LLM)	Quiz, Project, Presentation, Viva-Voce	2011
3135	Police Law and Administration	LAW4210	Master of Law (LLM)	Quiz, Project, Presentation, Viva-Voce	2011
3136	Corporate Crimes/ White Collar Crimes	LAW4211	Master of Law (LLM)	Quiz, Project, Presentation, Viva-Voce	2011
3137	Civil Laws for Child Rights	LAW4212	Master of Law (LLM)	Quiz, Project, Presentation, Viva-Voce	2022
3138	Crimes against Children	LAW4213	Master of Law (LLM)	Quiz, Project, Presentation, Viva-Voce	2022
3139	Concept and Theoretical Understanding of Human Rights	LAW2152	Human Rights (OE)	Quiz, Project, Presentation, Viva-Voce	2013
3140	Systems, Organizations and Instruments of Human Rights	LAW2252	Human Rights (OE)	Quiz, Project, Presentation, Viva-Voce	2013
3141	Contemporary Human Rights Situations and Issues	LAW2352	Human Rights (OE)	Quiz, Project, Presentation, Viva-Voce	2013
3142	Specific Themes in Human Rights	LAW2452	Human Rights (OE)	Quiz, Project, Presentation, Viva-Voce	2013
3143	Legislation Themes in Human Rights	LAW2552	Human Rights (OE)	Quiz, Project, Presentation, Viva-Voce	2013
3144	Report Writing and Thesis Preparation (Human Rights)	LAW2652	Human Rights (OE)	Report Writing, Viva-Voce, Presentation	2013
3145	Principles of IPR	LAW2151	Intellectual Property Rights (OE)	Quiz, Project, Presentation, Viva-Voce	2013
3146	Patent Law and Practices	LAW2251	Intellectual Property Rights (OE)	Quiz, Project, Presentation, Viva-Voce	2013
3147	Copyright Law and Practices	LAW2351	Intellectual Property Rights (OE)	Quiz, Project, Presentation, Viva-Voce	2013
3148	Trademark Law and Practices	LAW2451	Intellectual Property Rights (OE)	Quiz, Project, Presentation, Viva-Voce	2013
3149	Emerging Legal Issues and Challenges	LAW2551	Intellectual Property Rights (OE)	Quiz, Project, Presentation, Viva-Voce	2013
3150	Future Aspects of Intellectual Property Rights	LAW2651	Intellectual Property Rights (OE)	Quiz, Project, Presentation, Viva-Voce	2016
3151	Law of Contract-I	DLAW2151	Business and Labour Legislations (OE)	Quiz, Project, Presentation, Viva-Voce	2023
3152	Law of Contract-II	DLAW2251	Business and Labour Legislations (OE)	Quiz, Project, Presentation, Viva-Voce	2023
3153	Arbitration & Alternate Dispute Resolution	DLAW2351	Business and Labour Legislations (OE)	Quiz, Project, Presentation, Viva-Voce	2023
3154	Consumer Protection Act, 2019	DLAW2451	Business and Labour Legislations (OE)	Quiz, Project, Presentation, Viva-Voce	2023
3155	Labour Law-I	DLAW2551	Business and Labour Legislations (OE)	Quiz, Project, Presentation, Viva-Voce	2023
3156	Intellectual Property Rights	DLAW2501	Business and Labour Legislations (OE)	Quiz, Project, Presentation, Viva-Voce	2023

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
3157	Labour Law - II	DLAW2651	Business and Labour Legislations (OE)	Quiz, Project, Presentation, Viva-Voce	2023
3158	Cyber Laws	DLAW2601	Business and Labour Legislations (OE)	Quiz, Project, Presentation, Viva-Voce	2023
3159	Negotiable Instruments Act, 1881	DLAW2602	Business and Labour Legislations (OE)	Quiz, Project, Presentation, Viva-Voce	2023
3160	Principles of Nutrition	DDAN2151	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Quiz, Presentation, Group Discussion, Class Performance	2011
3161	Food Science	DDAN2101	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Quiz, Presentation, Group Discussion, Class Performance	2011
3162	Family Meal Management	DDAN2251	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Quiz, Presentation, Group Discussion, Class Performance	2011
3163	Nutrition for Special Needs	DDAN2301	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Quiz, Presentation, Group Discussion, Class Performance	2011
3164	Clinical Nutrition	DDAN2302	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Practical, Lab Record, Presentation, Class Performance	2011
3165	Healthy and Sustainable Food Choices	SDAN2301	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Quiz, Presentation, Group Discussion, Class Performance	2011
3166	Community Engagement Services	NDAN2335	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Report Writing, Presentation, Viva-Voce	2011
3167	Food Service Management	DDAN2451	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Quiz, Presentation, Group Discussion, Class Performance	2011
3168	Community Nutrition	DDAN2401	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Quiz, Presentation, Group Discussion, Class Performance	2011
3169	Utilization of Food Waste Management	SDAN2401	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Quiz, Presentation, Group Discussion, Class Performance	2011
3170	Human Nutrition for Life Span	DDAN2551	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Quiz, Presentation, Group Discussion, Class Performance	2011
3171	Advanced Dietetics-I	DDAN2502	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Quiz, Presentation, Group Discussion, Class Performance	2011
3172	Nutraceuticals and Functional Foods	DDAN2504	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Quiz, Presentation, Group Discussion, Class Performance	2011
3173	Internship	NDAN2537	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Report Writing, Presentation, Viva-Voce	2011
3174	Exercise Physiology and Metabolism	DDAN2651	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Quiz, Presentation, Group Discussion, Class Performance	2011

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
3175	Quantity Food Production	DDAN2601	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Quiz, Presentation, Group Discussion, Class Performance	2011
3176	Principles of Therapeutic Nutrition	DDAN2602	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Quiz, Presentation, Group Discussion, Class Performance	2011
3177	Principles of Therapeutic Nutrition Lab	DDAN2603	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Practical, Lab Record, Presentation, Class Performance	2011
3178	Human Nutrition	DDAN2701	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Quiz, Presentation, Group Discussion, Class Performance	2011
3179	Public Health Nutrition	DDAN2702	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Quiz, Presentation, Group Discussion, Class Performance	2011
3180	Advanced Dietetics-II	DDAN2703	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Quiz, Presentation, Group Discussion, Class Performance	2011
3181	Food Laws and Safety	DDAN2704	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Quiz, Presentation, Group Discussion, Class Performance	2011
3182	Basics of Research Methodology, Ethics and Research Communication	DDAN2739	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Quiz, Presentation, Group Discussion, Class Performance	2011
3183	Field Visit	NDAN2737	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Report Writing, Presentation, Viva-Voce	2011
3184	Critical Care Nutrition	DDAN2801	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Quiz, Presentation, Group Discussion, Class Performance	2011
3185	Food Quality Analysis	DDAN2802	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Quiz, Presentation, Group Discussion, Class Performance	2011
3186	Entrepreneurship	DDAN2804	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Quiz, Presentation, Group Discussion, Class Performance	2011
3187	Project/ Dissertation	NDAN2837	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Report Writing, Presentation, Viva-Voce	2011
3188	Data Analysis & Visualisation using Software	DDAN2839	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	Written Test, Presentation, Viva-Voce	2011
3189	Anatomy and Physiology	DMLT2151	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	Quiz, Presentation, Group Discussion, Class Performance	2014
3190	Basic Clinical Biochemistry	DMLT2251	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	Practical, Lab Record, Presentation, Class Performance	2014
3191	Basic Haematology	DMLT2201	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	Quiz, Presentation, Group Discussion, Class Performance	2014

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
3192	Systemic Bacteriology	DMLT2301	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	Quiz, Presentation, Group Discussion, Class Performance	2014
3193	Laboratory Management	SMLT2301	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	Practical, Lab Record, Presentation, Class Performance	2014
3194	Community Engagement Services	NMLT2335	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	Report Writing, Presentation, Viva-Voce	2014
3195	Analytical Clinical Biochemistry	DMLT2451	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	Practical, Lab Record, Presentation, Class Performance	2014
3196	Immunohematology and Blood Transfusion	DMLT2401	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	Quiz, Presentation, Group Discussion, Class Performance	2014
3197	Clinical Visit	SMLT2401	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	Report Writing, Presentation, Viva-Voce	2014
3198	Immunology and Serology	DMLT2501	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	Quiz, Presentation, Group Discussion, Class Performance	2014
3199	Applied Clinical Biochemistry	DMLT2502	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	Practical, Lab Record, Presentation, Class Performance	2014
3200	SIP/Internship/ Project/ Dissertation/Field Visit	NMLT2537	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	Report Writing, Presentation, Viva-Voce	2014
3201	Clinical Parasitology and Entomology	DMLT2651	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	Practical, Lab Record, Presentation, Class Performance	2014
3202	Clinical Cytopathology	DMLT2601	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	Practical, Lab Record, Presentation, Class Performance	2014
3203	Immunopathology and Molecular Biology	DMLT2602	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	Quiz, Presentation, Group Discussion, Class Performance	2014
3204	Clinical Mycology & Virology	DMLT2603	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	Practical, Lab Record, Presentation, Class Performance	2014
3205	Fundamentals of Medical Lab Technology	DMLT2701	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	Practical, Lab Record, Presentation, Class Performance	2014
3206	Advanced Laboratory Techniques	DMLT2702	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	Practical, Lab Record, Presentation, Class Performance	2014
3207	Biomedical Waste Management	DMLT2703	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	Quiz, Presentation, Group Discussion, Class Performance	2014
3208	Medical Terminology	DMLT2704	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	Quiz, Presentation, Group Discussion, Class Performance	2014

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
3209	Medical Law & Ethics	DMLT2705	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	Quiz, Presentation, Group Discussion, Class Performance	2014
3210	Basics of Research Methodology, Ethics and Research Communication	DMLT2739	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	Quiz, Presentation, Group Discussion, Class Performance	2014
3211	SIP/Internship/ Project/ Dissertation/Field Visit	NMLT2737	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	Report Writing, Presentation, Viva-Voce	2014
3212	Internship	NMLT2837	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	Report Writing, Presentation, Viva-Voce	2014
3213	Physical Optics	OPT2104	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3214	Geometrical Optics-I	OPT2105	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3215	Optometric Procedures-I	OPT2106	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3216	Basics in Computers and PC package	OPT2107	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3217	Geometrical Optics-II	OPT2204	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3218	Optometric Procedures-II	OPT2205	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3219	Clinics-I	OPT2206	Bachelor of Optometry	Practical, Report Writing, Class Performance	2012
3220	Nutrition	OPT2207	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3221	Project (with Presentation & Evaluation)	OPT2232	Bachelor of Optometry	Project writing, Presentation, Viva-Voce	2012
3222	Ocular Microbiology	OPT2301	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3223	Applied Optics-I (Optometric Optics)	OPT2302	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3224	Visual Optics-I (Visual Perception & Neurophysiology)	OPT2303	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3225	Clinical Optometric Procedures	OPT2306	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3226	Clinics-II	OPT2307	Bachelor of Optometry	Practical, Report Writing, Class Performance	2012
3227	Term Paper	OPT2331	Bachelor of Optometry	Academic Writing, Presentation	2012
3228	Project (with Presentation & Evaluation)	OPT2332	Bachelor of Optometry	Project writing, Presentation, Viva-Voce	2012
3229	Workshop / Certification (1credit per workshop)	OPT2333	Bachelor of Optometry	Quiz, Written Test	2012
3230	Medical Law and Ethics	OPT2310	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3231	Applied Optics-II (Dispensing Optics)	OPT2401	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3232	Visual Optics-II	OPT2402	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
3233	Ocular Diseases-II	OPT2403	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3234	Clinics-III	OPT2406	Bachelor of Optometry	Practical, Report Writing, Class Performance	2012
3235	Ophthalmic Electrodiagnostic Procedures	OPT2408	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3236	Perimetry	OPT2409	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3237	Term Paper	OPT2431	Bachelor of Optometry	Academic Writing, Presentation	2012
3238	Project (with Presentation & Evaluation)	OPT2432	Bachelor of Optometry	Project writing, Presentation, Viva-Voce	2012
3239	Workshop / Certification (1credit per workshop)	OPT2433	Bachelor of Optometry	Quiz, Written Test	2012
3240	Contact Lens-I	OPT2501	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3241	Low Vision Care	OPT2502	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3242	Binocular Vision-I	OPT2504	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3243	Diseases of the Eye and Clinical Medicine	OPT2505	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3244	Clinics-IV	OPT2507	Bachelor of Optometry	Practical, Report Writing, Class Performance	2012
3245	Summer Internship Evaluation-I	OPT2535	Bachelor of Optometry	Report Writing, Presentation, Viva-Voce	2012
3246	Ocular Prosthesis	OPT2508	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3247	Refractive Surgery	OPT2509	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3248	Research Methodology	OPT2510	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3249	Term Paper	OPT2531	Bachelor of Optometry	Academic Writing, Presentation	2012
3250	Project (with Presentation & Evaluation)	OPT2532	Bachelor of Optometry	Project writing, Presentation, Viva-Voce	2012
3251	Workshop / Certification (1credit per workshop)	OPT2533	Bachelor of Optometry	Quiz, Written Test	2012
3252	Contact Lens-II	OPT2601	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3253	Binocular Vision-II	OPT2602	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3254	Clinic-V	OPT2605	Bachelor of Optometry	Practical, Report Writing, Class Performance	2012
3255	Visual Rehabilitation	OPT2606	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3256	Vision Therapy and Learning Disabilities	OPT2607	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3257	Eye Banking	OPT2608	Bachelor of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2012
3258	Project (with Presentation & Evaluation)	OPT2632	Bachelor of Optometry	Project writing, Presentation, Viva-Voce	2012

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3259	(Clinics-VI A.) Retina, Glaucoma, Low Vision	OPT2701	Bachelor of Optometry	Practical, Report Writing, Class Performance	2012
3260	(Clinics-VI B.) Pediatric & Binocular Vision	OPT2702	Bachelor of Optometry	Practical, Report Writing, Class Performance	2012
3261	(Clinics-VI C.) Cornea and Contact Lenses	OPT2703	Bachelor of Optometry	Practical, Report Writing, Class Performance	2012
3262	(Clinics-VI D.) Primary Eye Care	OPT2704	Bachelor of Optometry	Practical, Report Writing, Class Performance	2012
3263	Summer Internship Evaluation-II	OPT2735	Bachelor of Optometry	Report Writing, Presentation, Viva-Voce	2012
3264	Research Project (Mid-Term Evaluation)	OPT2737	Bachelor of Optometry	Report Writing, Presentation, Viva-Voce	2012
3265	Clinics VII (Comprehensive Eye Care and Refraction)	OPT2801	Bachelor of Optometry	Practical, Report Writing, Class Performance	2012
3266	Clinics VIII (Optometric Procedures and Instruments)	OPT2802	Bachelor of Optometry	Practical, Report Writing, Class Performance	2012
3267	Project - Dissertation	OPT2837	Bachelor of Optometry	Report Writing, Presentation, Viva-Voce	2012
3268	Anatomy and Physiology of Speech & Hearing	ASL2107	Bachelor of Audiology & Speech Language Pathology	Quiz, Presentation, Group Discussion, Class Performance	2014
3269	Clinical Psychology	ASL2108	Bachelor of Audiology & Speech Language Pathology	Quiz, Presentation, Group Discussion, Class Performance	2014
3270	Linguistics and Phonetics	ASL2109	Bachelor of Audiology & Speech Language Pathology	Quiz, Presentation, Group Discussion, Class Performance	2014
3271	Electronics and Acoustics	ASL2110	Bachelor of Audiology & Speech Language Pathology	Quiz, Presentation, Group Discussion, Class Performance	2014
3272	Research Methods and Statistics	ASL2111	Bachelor of Audiology & Speech Language Pathology	Quiz, Presentation, Group Discussion, Class Performance	2014
3273	Clinical Practicum	ASL2105	Bachelor of Audiology & Speech Language Pathology	Practical, Report Writing, Class Performance, Presentation	2014
3274	Speech Language Pathology	ASL2208	Bachelor of Audiology & Speech Language Pathology	Quiz, Presentation, Group Discussion, Class Performance	2014
3275	Audiology	ASL2209	Bachelor of Audiology & Speech Language Pathology	Quiz, Presentation, Group Discussion, Class Performance	2014
3276	Practicals in Speech Language Pathology	ASL2210	Bachelor of Audiology & Speech Language Pathology	Practical, Report Writing, Class Performance, Presentation	2014
3277	Practicals in Audiology	ASL2211	Bachelor of Audiology & Speech Language Pathology	Practical, Report Writing, Class Performance, Presentation	2014
3278	Voice and its Disorders	ASL2307	Bachelor of Audiology & Speech Language Pathology	Quiz, Presentation, Group Discussion, Class Performance	2014
3279	Speech Sound Disorders	ASL2308	Bachelor of Audiology & Speech Language Pathology	Quiz, Presentation, Group Discussion, Class Performance	2014
3280	Diagnostic Audiology Behavioral Test	ASL2309	Bachelor of Audiology & Speech Language Pathology	Quiz, Presentation, Group Discussion, Class Performance	2014
3281	Amplification Devices	ASL2310	Bachelor of Audiology & Speech Language Pathology	Quiz, Presentation, Group Discussion, Class Performance	2014
3282	Clinicals in Speech Language Pathology-I	ASL2311	Bachelor of Audiology & Speech Language Pathology	Practical, Report Writing, Class Performance, Presentation	2014
3283	Clinicals in Audiology-I	ASL2312	Bachelor of Audiology & Speech Language Pathology	Practical, Report Writing, Class Performance, Presentation	2014

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3284	Summer Internship Evaluation-I (Community Outreach Programs)	ASL2335	Bachelor of Audiology & Speech Language Pathology	Report Writing, Presentation, Viva-Voce	2014
3285	Motor Speech Disorders in Children	ASL2402	Bachelor of Audiology & Speech Language Pathology	Quiz, Presentation, Group Discussion, Class Performance	2014
3286	Diagnostic Audiology – Physiological Tests	ASL2407	Bachelor of Audiology & Speech Language Pathology	Quiz, Presentation, Group Discussion, Class Performance	2014
3287	Implantable Hearing Devices	ASL2408	Bachelor of Audiology & Speech Language Pathology	Quiz, Presentation, Group Discussion, Class Performance	2014
3288	Clinicals in Speech Language Pathology-II	ASL2409	Bachelor of Audiology & Speech Language Pathology	Practical, Report Writing, Class Performance, Presentation	2014
3289	Clinicals in Audiology-II	ASL2410	Bachelor of Audiology & Speech Language Pathology	Practical, Report Writing, Class Performance, Presentation	2014
3290	Fluency and its Disorders	ASL2501	Bachelor of Audiology & Speech Language Pathology	Quiz, Presentation, Group Discussion, Class Performance	2014
3291	Structural Anomalies & Speech Disorders	ASL2507	Bachelor of Audiology & Speech Language Pathology	Quiz, Presentation, Group Discussion, Class Performance	2014
3292	Pediatric Audiology	ASL2508	Bachelor of Audiology & Speech Language Pathology	Quiz, Presentation, Group Discussion, Class Performance	2014
3293	Aural Rehabilitation in Children	ASL2509	Bachelor of Audiology & Speech Language Pathology	Quiz, Presentation, Group Discussion, Class Performance	2014
3294	Clinicals in Speech Language Pathology-III	ASL2510	Bachelor of Audiology & Speech Language Pathology	Practical, Report Writing, Class Performance, Presentation	2014
3295	Clinicals in Audiology-III	ASL2511	Bachelor of Audiology & Speech Language Pathology	Practical, Report Writing, Class Performance, Presentation	2014
3296	Summer Internship Evaluation-II (Outreach Program)	ASL2535	Bachelor of Audiology & Speech Language Pathology	Report Writing, Presentation, Viva-Voce	2014
3297	Motor Speech Disorders in Adults	ASL2606	Bachelor of Audiology & Speech Language Pathology	Quiz, Presentation, Group Discussion, Class Performance	2014
3298	Audiology in Practice	ASL2609	Bachelor of Audiology & Speech Language Pathology	Quiz, Presentation, Group Discussion, Class Performance	2014
3299	Clinicals in Speech Language Pathology-IV	ASL2610	Bachelor of Audiology & Speech Language Pathology	Practical, Report Writing, Class Performance, Presentation	2014
3300	Clinicals in Audiology-IV	ASL2611	Bachelor of Audiology & Speech Language Pathology	Practical, Report Writing, Class Performance, Presentation	2014
3301	Clinicals in Speech Language Pathology and Audiology-I	ASL2701	Bachelor of Audiology & Speech Language Pathology	Practical, Report Writing, Class Performance, Presentation	2014
3302	Clinicals in Speech Language Pathology and Audiology-II	ASL2801	Bachelor of Audiology & Speech Language Pathology	Practical, Report Writing, Class Performance, Presentation	2014
3303	Nutritional Biochemistry-I	DAN4102	Master of Science (Dietetics & Applied Nutrition)	Quiz, Presentation, Group Discussion, Class Performance	2012
3304	Food Science-I	DAN4104	Master of Science (Dietetics & Applied Nutrition)	Quiz, Presentation, Group Discussion, Class Performance	2012
3305	Nutritional Biochemistry Lab-I	DAN4106	Master of Science (Dietetics & Applied Nutrition)	Practical, Report Writing, Class Performance, Presentation	2012
3306	Food Science Lab-I	DAN4107	Master of Science (Dietetics & Applied Nutrition)	Practical, Report Writing, Class Performance, Presentation	2012
3307	Therapeutic Nutrition Lab-I	DAN4108	Master of Science (Dietetics & Applied Nutrition)	Practical, Report Writing, Class Performance, Presentation	2012
3308	Advanced Nutrition-II	DAN4201	Master of Science (Dietetics & Applied Nutrition)	Quiz, Presentation, Group Discussion, Class Performance	2012

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
3309	Nutritional Biochemistry-II	DAN4202	Master of Science (Dietetics & Applied Nutrition)	Quiz, Presentation, Group Discussion, Class Performance	2012
3310	Research Methodology	DAN4203	Master of Science (Dietetics & Applied Nutrition)	Quiz, Presentation, Group Discussion, Class Performance	2012
3311	Dietetic Technique and Patient Counseling	DAN4205	Master of Science (Dietetics & Applied Nutrition)	Quiz, Presentation, Group Discussion, Class Performance	2012
3312	Nutritional Biochemistry Lab-II	DAN4206	Master of Science (Dietetics & Applied Nutrition)	Practical, Report Writing, Class Performance, Presentation	2012
3313	Advanced Nutrition Lab-II	DAN4207	Master of Science (Dietetics & Applied Nutrition)	Practical, Report Writing, Class Performance, Presentation	2012
3314	Therapeutic Nutrition Lab-II	DAN4208	Master of Science (Dietetics & Applied Nutrition)	Practical, Report Writing, Class Performance, Presentation	2012
3315	Institutional Food Administration	DAN4302	Master of Science (Dietetics & Applied Nutrition)	Quiz, Presentation, Group Discussion, Class Performance	2012
3316	Community Nutrition Lab-I	DAN4305	Master of Science (Dietetics & Applied Nutrition)	Practical, Report Writing, Class Performance, Presentation	2012
3317	Food Science Lab-II	DAN4306	Master of Science (Dietetics & Applied Nutrition)	Practical, Report Writing, Class Performance, Presentation	2012
3318	Food Microbiology Lab	DAN4307	Master of Science (Dietetics & Applied Nutrition)	Practical, Report Writing, Class Performance, Presentation	2012
3319	Summer Internship Evaluation	DAN4335	Master of Science (Dietetics & Applied Nutrition)	Report Writing, Presentation, Viva-Voce	2012
3320	Food Processing & Technology	DAN4402	Master of Science (Dietetics & Applied Nutrition)	Quiz, Presentation, Group Discussion, Class Performance	2012
3321	Nutrition for Health and Fitness	DAN4403	Master of Science (Dietetics & Applied Nutrition)	Quiz, Presentation, Group Discussion, Class Performance	2012
3322	Community Nutrition Lab-II	DAN4404	Master of Science (Dietetics & Applied Nutrition)	Practical, Report Writing, Class Performance, Presentation	2012
3323	Food Processing & Technology Lab	DAN4405	Master of Science (Dietetics & Applied Nutrition)	Practical, Report Writing, Class Performance, Presentation	2012
3324	Dissertation	DAN4437	Master of Science (Dietetics & Applied Nutrition)	Report Writing, Presentation, Viva-Voce	2012
3325	Epidemiology Public Health & Community Optometry	OPT4101	Master of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2011
3326	Clinic-I (General)	OPT4105	Master of Optometry	Practical, Report Writing, Class Performance, Presentation	2011
3327	Research Methodology & Biostatistics-I	OPT4106	Master of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2011
3328	Applied Optics	OPT4110	Master of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2011
3329	Advanced Contact Lens-I	OPT4204	Master of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2011
3330	Clinics-II (Specialty)	OPT4205	Master of Optometry	Practical, Report Writing, Class Performance, Presentation	2011
3331	Research Methodology & Biostatistics-II	OPT4212	Master of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2011
3332	Project (Research)	OPT4232	Master of Optometry	Report Writing, Presentation, Viva-Voce	2011
3333	Advanced Contact Lens-II	OPT4303	Master of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2011

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
3334	Clinics-III (Specialty)	OPT4305	Master of Optometry	Practical, Report Writing, Class Performance, Presentation	2011
3335	Environmental Optometry	OPT4306	Master of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2011
3336	Teaching Methodology	OPT4307	Master of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2011
3337	Project	OPT4332	Master of Optometry	Report Writing, Presentation, Viva-Voce	2011
3338	Clinical Optometry (General)	OPT4401	Master of Optometry	Practical, Report Writing, Class Performance, Presentation	2011
3339	Clinical Internship-Dissertation	OPT4437	Master of Optometry	Report Writing, Presentation, Viva-Voce	2011
3340	Advance Applied Optics	OPT4409	Master of Optometry	Quiz, Presentation, Group Discussion, Class Performance	2011
3341	Laboratory Management & Quality Control	MLT4108	Master of Science (Medical Lab Technology)	Quiz, Presentation, Group Discussion, Class Performance	2015
3342	Clinical Immunology	MLT4113	Master of Science (Medical Lab Technology)	Quiz, Presentation, Group Discussion, Class Performance	2015
3343	Advanced Laboratory Technique	MLT4114	Master of Science (Medical Lab Technology)	Quiz, Presentation, Group Discussion, Class Performance	2015
3344	Lab Course	MLT4105	Master of Science (Medical Lab Technology)	Quiz, Presentation, Group Discussion, Class Performance	2015
3345	Clinical Training	MLT4112	Master of Science (Medical Lab Technology)	Practical, Lab Record, Presentation, Class Performance	2015
3346	Molecular Diagnostics	MLT4208	Master of Science (Medical Lab Technology)	Quiz, Presentation, Group Discussion, Class Performance	2015
3347	Research Methodology & Biostatistics	MLT4211	Master of Science (Medical Lab Technology)	Quiz, Presentation, Group Discussion, Class Performance	2015
3348	Clinical Nutrition	MLT4213	Master of Science (Medical Lab Technology)	Practical, Lab Record, Presentation, Class Performance	2015
3349	Clinical Biochemistry Lab Course-I	MLT4215	Master of Science (Medical Lab Technology)	Practical, Lab Record, Presentation, Class Performance	2015
3350	Clinical Biochemistry Clinical Training-I	MLT4216	Master of Science (Medical Lab Technology)	Practical, Lab Record, Presentation, Class Performance	2015
3351	General Microbiology	MLT4217	Master of Science (Medical Lab Technology)	Quiz, Presentation, Group Discussion, Class Performance	2015
3352	Clinical Bacteriology	MLT4219	Master of Science (Medical Lab Technology)	Practical, Lab Record, Presentation, Class Performance	2015
3353	Clinical Microbiology Lab Course-I	MLT4220	Master of Science (Medical Lab Technology)	Practical, Lab Record, Presentation, Class Performance	2015
3354	Clinical Microbiology Clinical Training-I	MLT4221	Master of Science (Medical Lab Technology)	Practical, Lab Record, Presentation, Class Performance	2015
3355	Summer Project Evaluation	MLT4335	Master of Science (Medical Lab Technology)	Report Writing, Presentation, Viva-Voce	2015
3356	Clinical Endocrinology	MLT4307	Master of Science (Medical Lab Technology)	Quiz, Presentation, Group Discussion, Class Performance	2015
3357	Clinical Enzymology	MLT4308	Master of Science (Medical Lab Technology)	Quiz, Presentation, Group Discussion, Class Performance	2015
3358	Advanced Chemical Pathology	MLT4313	Master of Science (Medical Lab Technology)	Quiz, Presentation, Group Discussion, Class Performance	2015

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
3359	Clinical Biochemistry Lab Course-II	MLT4314	Master of Science (Medical Lab Technology)	Practical, Lab Record, Presentation, Class Performance	2015
3360	Clinical Biochemistry Clinical Training-II	MLT4315	Master of Science (Medical Lab Technology)	Practical, Lab Record, Presentation, Class Performance	2015
3361	Clinical Virology	MLT4317	Master of Science (Medical Lab Technology)	Practical, Lab Record, Presentation, Class Performance	2015
3362	Clinical Mycology	MLT4318	Master of Science (Medical Lab Technology)	Practical, Lab Record, Presentation, Class Performance	2015
3363	Clinical Parasitology	MLT4319	Master of Science (Medical Lab Technology)	Practical, Lab Record, Presentation, Class Performance	2015
3364	Pharmaceutical Microbiology	MLT4320	Master of Science (Medical Lab Technology)	Quiz, Presentation, Group Discussion, Class Performance	2015
3365	Clinical Microbiology Lab Course-II	MLT4321	Master of Science (Medical Lab Technology)	Practical, Lab Record, Presentation, Class Performance	2015
3366	Clinical Microbiology Clinical Training-II	MLT4322	Master of Science (Medical Lab Technology)	Practical, Lab Record, Presentation, Class Performance	2015
3367	On Job Training	MLT4401	Master of Science (Medical Lab Technology)	Report Writing, Presentation, Viva-Voce	2015
3368	Dissertation-Clinical Research	MLT4437	Master of Science (Medical Lab Technology)	Report Writing, Presentation, Viva-Voce	2015
3369	Research Methods, Epidemiology and Statistics	SLP4101	Master of Science (Speech Language Pathology)	Quiz, Presentation, Group Discussion, Class Performance	2022
3370	Speech Science and Speech Production	SLP4102	Master of Science (Speech Language Pathology)	Quiz, Presentation, Group Discussion, Class Performance	2022
3371	Clinical (Internal)	SLP4106	Master of Science (Speech Language Pathology)	Practical, Report Writing, Class Performance, Presentation	2022
3372	Advanced in Speech Sound Disorder	SLP4201	Master of Science (Speech Language Pathology)	Quiz, Presentation, Group Discussion, Class Performance	2022
3373	Voice Science and Disorder	SLP4202	Master of Science (Speech Language Pathology)	Quiz, Presentation, Group Discussion, Class Performance	2022
3374	Disorder of Fluency	SLP4203	Master of Science (Speech Language Pathology)	Quiz, Presentation, Group Discussion, Class Performance	2022
3375	Clinical (External)	SLP4205	Master of Science (Speech Language Pathology)	Practical, Report Writing, Class Performance, Presentation	2022
3376	Neurogenic Speech Disorder	SLP4301	Master of Science (Speech Language Pathology)	Quiz, Presentation, Group Discussion, Class Performance	2022
3377	Language and Literacy Disorder	SLP4304	Master of Science (Speech Language Pathology)	Quiz, Presentation, Group Discussion, Class Performance	2022
3378	Cognitive Communication Disorder	SLP4305	Master of Science (Speech Language Pathology)	Quiz, Presentation, Group Discussion, Class Performance	2022
3379	Clinical (Internal)	SLP4306	Master of Science (Speech Language Pathology)	Practical, Report Writing, Class Performance, Presentation	2022
3380	Practices in Speech-Language Pathology	SLP4401	Master of Science (Speech Language Pathology)	Practical, Report Writing, Class Performance, Presentation	2022
3381	Dissertation	SLP4437	Master of Science (Speech Language Pathology)	Report Writing, Presentation, Viva-Voce	2022
3382	Clinical (External)	SLP4403	Master of Science (Speech Language Pathology)	Practical, Report Writing, Class Performance, Presentation	2022

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
3383	Biochemistry	DSCT2151	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Quiz, Presentation, Group Discussion, Class Performance	2019
3384	Cell Biology & Genetics	DSCT2251	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Quiz, Presentation, Group Discussion, Class Performance	2019
3385	MB & rDNA T	DSCT2201	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Quiz, Presentation, Group Discussion, Class Performance	2019
3386	MB & rDNA T Lab	DSCT2202	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Practical, Lab Record, Presentation, Class Performance	2019
3387	Nano Technology and Nano Medicine	DSCT2203	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Quiz, Presentation, Group Discussion, Class Performance	2019
3388	Human Developmental Biology	DSCT2351	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Quiz, Presentation, Group Discussion, Class Performance	2019
3389	Bioinformatics	DSCT2301	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Quiz, Presentation, Group Discussion, Class Performance	2019
3390	Bioinformatics Lab	DSCT2302	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Practical, Lab Record, Presentation, Class Performance	2019
3391	Bioinstrumentation in Molecular Medicine & Stem Cell Biology	SSCT2301	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Quiz, Presentation, Group Discussion, Class Performance	2019
3392	Community Engagement Services	NSCT2335	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Report Writing, Presentation, Viva-Voce	2019
3393	Human Pluripotent Stem Cell Based Therapeutics	DSCT2401	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Quiz, Presentation, Group Discussion, Class Performance	2019
3394	Good Laboratory Practices	SSCT2401	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Practical, Lab Record, Presentation, Class Performance	2019

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
3395	Fundamentals of Immunology Lab	DSCT2552	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Practical, Lab Record, Presentation, Class Performance	2019
3396	Cancer Biology & Cancer Therapeutics	DSCT2501	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Quiz, Presentation, Group Discussion, Class Performance	2019
3397	Translational Medicine	DSCT2502	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Quiz, Presentation, Group Discussion, Class Performance	2019
3398	Human Anatomy and Physiology	DSCT2503	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Quiz, Presentation, Group Discussion, Class Performance	2019
3399	Molecular Diagnostics in Health Care	DSCT2504	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Quiz, Presentation, Group Discussion, Class Performance	2019
3400	SIP/Internship/ Project/ Dissertation/Field Visit	NSCT2537	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Report Writing, Presentation, Viva-Voce	2019
3401	Stem Cell & Regenerative Medicine	DSCT2651	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Quiz, Presentation, Group Discussion, Class Performance	2019
3402	Precision and Personalized Medicine	DSCT2602	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Quiz, Presentation, Group Discussion, Class Performance	2019
3403	Ethics and Intellectual Property Right	DSCT2603	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Quiz, Presentation, Group Discussion, Class Performance	2019
3404	Application of Plant Biotechnology in Molecular Medicine	DSCT2702	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Quiz, Presentation, Group Discussion, Class Performance	2019
3405	Molecular Modelling and Drug Development	DSCT2703	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Quiz, Presentation, Group Discussion, Class Performance	2019
3406	Fermentation Technology	DSCT2704	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Quiz, Presentation, Group Discussion, Class Performance	2019

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
3407	Basics of Research Methodology, Ethics and Research Communication	DSCT2739	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Quiz, Presentation, Group Discussion, Class Performance	2019
3408	SIP/Internship/ Project/ Dissertation/Field Visit	NSCT2737	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Report Writing, Presentation, Viva-Voce	2019
3409	Systems Biology	DSCT2801	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Quiz, Presentation, Group Discussion, Class Performance	2019
3410	Integrative Omics	DSCT2802	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Quiz, Presentation, Group Discussion, Class Performance	2019
3411	Clinical Trial Design	DSCT2803	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Practical, Lab Record, Presentation, Class Performance	2019
3412	SIP/Internship/ Project/ Dissertation/Field Visit	NSCT2837	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Report Writing, Presentation, Viva-Voce	2019
3413	Data Analysis & Visualisation using Software	DSCT2839	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	Written Test, Presentation, Viva-Voce	2019
3414	Microbiology & Virology	SCT4102	Master of Science (Molecular Medicine & Stem Cell Technologies)	Quiz, Presentation, Group Discussion, Class Performance	2019
3415	Molecular Biology & rDNA Technology	SCT4103	Master of Science (Molecular Medicine & Stem Cell Technologies)	Quiz, Presentation, Group Discussion, Class Performance	2019
3416	Bioanalytical Technologies & Instrumentation	SCT4105	Master of Science (Molecular Medicine & Stem Cell Technologies)	Quiz, Presentation, Group Discussion, Class Performance	2019
3417	Biostatistics	SCT4106	Master of Science (Molecular Medicine & Stem Cell Technologies)	Quiz, Presentation, Group Discussion, Class Performance	2019
3418	Biological Programming-I (Bioinformatics)	SCT4107	Master of Science (Molecular Medicine & Stem Cell Technologies)	Quiz, Presentation, Group Discussion, Class Performance	2019
3419	Cell & Molecular Biology Lab	SCT4108	Master of Science (Molecular Medicine & Stem Cell Technologies)	Practical, Lab Record, Presentation, Class Performance	2019
3420	Molecular Biology & rDNA Technology Lab	SCT4109	Master of Science (Molecular Medicine & Stem Cell Technologies)	Practical, Lab Record, Presentation, Class Performance	2019

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
3421	Bioanalytical Technologies & Instrumentation Lab	SCT4110	Master of Science (Molecular Medicine & Stem Cell Technologies)	Practical, Lab Record, Presentation, Class Performance	2019
3422	Research Seminar/ Research Presentation/ Lit. Review & Presentation: Molecular Medicine	SCT4111	Master of Science (Molecular Medicine & Stem Cell Technologies)	Quiz, Presentation, Viva-Voce	2019
3423	Term Paper	SCT4131	Master of Science (Molecular Medicine & Stem Cell Technologies)	Academic Writing, Presentation, Viva-Voce	2019
3424	Stem Cell Technology	SCT4201	Master of Science (Molecular Medicine & Stem Cell Technologies)	Quiz, Presentation, Group Discussion, Class Performance	2019
3425	Biological Programming-II (Bioinformatics)	SCT4204	Master of Science (Molecular Medicine & Stem Cell Technologies)	Quiz, Presentation, Group Discussion, Class Performance	2019
3426	Molecular Medicine: Principles & Application	SCT4205	Master of Science (Molecular Medicine & Stem Cell Technologies)	Quiz, Presentation, Group Discussion, Class Performance	2019
3427	Nano-medicines and Technologies	SCT4206	Master of Science (Molecular Medicine & Stem Cell Technologies)	Quiz, Presentation, Group Discussion, Class Performance	2019
3428	Fermentation Technology & Its Applications in Molecular Medicine	SCT4207	Master of Science (Molecular Medicine & Stem Cell Technologies)	Quiz, Presentation, Group Discussion, Class Performance	2019
3429	Stem Cell Technology Lab	SCT4208	Master of Science (Molecular Medicine & Stem Cell Technologies)	Practical, Lab Record, Presentation, Class Performance	2019
3430	Nano-medicines and Technologies Lab	SCT4209	Master of Science (Molecular Medicine & Stem Cell Technologies)	Practical, Lab Record, Presentation, Class Performance	2019
3431	Fundamental Immunology-I Lab	SCT4210	Master of Science (Molecular Medicine & Stem Cell Technologies)	Practical, Lab Record, Presentation, Class Performance	2019
3432	Biological Programming (Bioinformatics)-II Lab	SCT4211	Master of Science (Molecular Medicine & Stem Cell Technologies)	Practical, Lab Record, Presentation, Class Performance	2019
3433	Cancer Biology & Cancer Therapeutics (T cell & Antibody-based Therapeutics)	SCT4301	Master of Science (Molecular Medicine & Stem Cell Technologies)	Quiz, Presentation, Group Discussion, Class Performance	2019
3434	Vaccines and Preclinical Animal Models	SCT4303	Master of Science (Molecular Medicine & Stem Cell Technologies)	Quiz, Presentation, Group Discussion, Class Performance	2019
3435	Ethics of Biomedical Research Intellectual Property (IP), IP rights (IPR)	SCT4306	Master of Science (Molecular Medicine & Stem Cell Technologies)	Quiz, Presentation, Group Discussion, Class Performance	2019
3436	Plant Biotechnology and Its Applications in Molecular Medicine	SCT4307	Master of Science (Molecular Medicine & Stem Cell Technologies)	Quiz, Presentation, Group Discussion, Class Performance	2019
3437	Fundamental Immunology-II Lab	SCT4308	Master of Science (Molecular Medicine & Stem Cell Technologies)	Practical, Lab Record, Presentation, Class Performance	2019

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
3438	Genomics & Proteomics Lab	SCT4309	Master of Science (Molecular Medicine & Stem Cell Technologies)	Practical, Lab Record, Presentation, Class Performance	2019
3439	Stem Cell Culture Lab	SCT4310	Master of Science (Molecular Medicine & Stem Cell Technologies)	Practical, Lab Record, Presentation, Class Performance	2019
3440	Scientific Communication Skill Development (Seminar/ Workshop)	SCT4311	Master of Science (Molecular Medicine & Stem Cell Technologies)	Quiz, Presentation, Viva-Voce	2019
3441	Summer Internship Evaluation	SCT4335	Master of Science (Molecular Medicine & Stem Cell Technologies)	Report Writing, Presentation, Viva-Voce	2019
3442	Term Paper	SCT4331	Master of Science (Molecular Medicine & Stem Cell Technologies)	Academic Writing, Presentation, Viva-Voce	2019
3443	Analysis of Business of Science & Alternative Careers in Molecular Medicine & Regenerative Medicine (Online Resources)	SCT4401	Master of Science (Molecular Medicine & Stem Cell Technologies)	Quiz, Presentation, Group Discussion, Class Performance	2019
3444	Industry Trends & Campus Recruitment Events & Career Counseling (Online Resources)	SCT4402	Master of Science (Molecular Medicine & Stem Cell Technologies)	Quiz, Presentation, Group Discussion, Class Performance	2019
3445	Dissertation / Project Report Presentation / Viva Voce	SCT4437	Master of Science (Molecular Medicine & Stem Cell Technologies)	Report Writing, Presentation, Viva-Voce	2019
3446	Principles of Nutrition	DAN2151	Dietetics & Nutrition (OE)	Quiz, Presentation, Group Discussion, Class Performance	2013
3447	Family Meal Management	DAN2251	Dietetics & Nutrition (OE)	Quiz, Presentation, Group Discussion, Class Performance	2013
3448	Basics Dietetics	DAN2351	Dietetics & Nutrition (OE)	Quiz, Presentation, Group Discussion, Class Performance	2013
3449	Advanced Dietetics	DAN2451	Dietetics & Nutrition (OE)	Quiz, Presentation, Group Discussion, Class Performance	2013
3450	Community Nutrition	DAN2551	Dietetics & Nutrition (OE)	Quiz, Presentation, Group Discussion, Class Performance	2013
3451	Food Chemistry	DAN2651	Dietetics & Nutrition (OE)	Quiz, Presentation, Group Discussion, Class Performance	2016
3452	Introduction to Stem Cell Technology	SCT2151	Stem Cell Technology (OE)	Quiz, Report Writing, Presentation, Viva-Voce	2018
3453	Fundamental Human Embryology & Developmental Biology	SCT2251	Stem Cell Technology (OE)	Quiz, Report Writing, Presentation, Viva-Voce	2018
3454	Fundamental Cell Biology Human Anatomy & Physiology	SCT2351	Stem Cell Technology (OE)	Quiz, Report Writing, Presentation, Viva-Voce	2018
3455	Human Pluripotent Stem Cell Culture & Differentiation Methods	SCT2451	Stem Cell Technology (OE)	Quiz, Report Writing, Presentation, Viva-Voce	2018
3456	Therapeutic Applications of Human Pluripotent Stem Cells	SCT2551	Stem Cell Technology (OE)	Quiz, Report Writing, Presentation, Viva-Voce	2018
3457	Project & Paper Presentation	SCT2651	Stem Cell Technology (OE)	Quiz, Report Writing, Presentation, Viva-Voce	2018
3458	Introduction to Hospital Management	DMHA2151	Hospital Administration (OE)	Quiz, Presentation, Group Discussion, Class Performance	2023

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
3459	Essentials of Healthcare System	DMHA2251	Hospital Administration (OE)	Quiz, Presentation, Group Discussion, Class Performance	2023
3460	Basic Epidemiology	DMHA2351	Hospital Administration (OE)	Quiz, Presentation, Group Discussion, Class Performance	2023
3461	Introduction to Healthcare Economics	DMHA2451	Hospital Administration (OE)	Quiz, Presentation, Group Discussion, Class Performance	2023
3462	Basics of Quality Management	DMHA2551	Hospital Administration (OE)	Quiz, Presentation, Group Discussion, Class Performance	2023
3463	Introduction to Medical & Health Laws	DMHA2501	Hospital Administration (OE)	Quiz, Presentation, Group Discussion, Class Performance	2023
3464	Basics of Hospital Management Information System	DMHA2651	Hospital Administration (OE)	Quiz, Presentation, Group Discussion, Class Performance	2023
3465	Introduction to Health Insurance and Medical Tourism	DMHA2601	Hospital Administration (OE)	Quiz, Presentation, Group Discussion, Class Performance	2023
3466	Basics of Disaster Management	DMHA2602	Hospital Administration (OE)	Quiz, Presentation, Group Discussion, Class Performance	2023
3467	Communicative English	ENGL101	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3468	Applied Anatomy and Applied Physiology	ANAT105 & PHYS110	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3469	Applied Sociology and Applied Psychology	SOCI115 & PSYC120	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3470	Nursing Foundation-I including First Aid module	N-NF(I) 125	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3471	Self-study/ Co-curricular including First Aid module	SSCC(I) 130	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3472	Applied Biochemistry and Applied Nutrition & Dietetics	BIOC135 & NUTR140	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3473	Nursing Foundation-(I&II) including Health Assessment module	N-NF(II) 125	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3474	Nursing Foundation-(I&II) Practical	N-NF(II)P 125	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3475	Health/ Nursing Informatics & Technology	HNIT145	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3476	Self-study/ Co-curricular	SSCC(II) 130	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3477	Applied Microbiology and Infection Control including Safety	MICR201	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
3478	Pharmacology-I and Pathology-I	PHAR(I) 205 & PATH(I) 210	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3479	Adult Health Nursing-I with integrated pathophysiology including BCLS module	N-AHN(I) 215	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3480	Adult Health Nursing-I Practical	N-AHN (I)P 215	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3481	Self-study/ Co-curricular	SSCC(I) 220	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3482	Human Values	ELEC301	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3483	Diabetes Care	ELEC302	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3484	Soft Skills	ELEC303	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3485	Pharmacology-(I&II) including Fundamentals of prescribing Module and Pathology- (I&II) & Genetics	PHAR(II) 205 & PATH(II) 210	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3486	Adult Health Nursing-II with integrated pathophysiology including Geriatric Nursing + Palliative care module	N-AHN (II) 225	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3487	Adult Health Nursing-II Practical	N-AHN (II)P 225	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3488	Professionalism, Professional Values and Ethics including Bioethics	PROF230	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3489	Self-study/ Co-curricular	SSCC(II) 220	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3490	Child Health Nursing-I including Essential Newborn Care (ENBC), FBNC, IMNCI and PLS, modules	N-CHN(I) 301	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3491	Mental Health Nursing-I	N-MHN (I)305	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3492	Community Health Nursing-I including Environmental Science & Epidemiology	N-COMH (I)310	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3493	Community Health Nursing-I Practical	N-COMH (I)P 310	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
3494	Educational Technology/ Nursing Education	EDUC315	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3495	Introduction to Forensic Nursing and Indian Laws	N-FORN 320	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3496	Self-study/ Co-curricular	SSCC(I) 325	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3497	CBT	ELEC501	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3498	Personality Development	ELEC502	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3499	Addiction Psychiatry	ELEC503	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3500	Adolescent Health	ELEC504	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3501	Sports Health	ELEC505	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3502	Accreditation & Practice Standards	ELEC506	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3503	Developmental Psychology	ELEC507	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3504	Menopausal Health	ELEC508	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3505	Health Economics	ELEC509	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3506	Child Health Nursing-(I&II)	N-CHN (II)301	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3507	Mental Health Nursing-(I&II)	N-MHN (II)305	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3508	Nursing Management & Leadership	NMLE 330	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3509	Midwifery/ Obstetrics and Gynaecology (OBG) Nursing-I including SBA module	N-MIDW (I)/ OBGN 335	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3510	Child Health Nursing-(I&II) Practical	N-CHN (II)P 301	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
3511	Mental Health Nursing-(I&II) Practical	N-MHN (II)P 305	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3512	Community Health Nursing-II	N-COMH (II)401	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3513	Nursing Research & Statistics	NRST405	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3514	Midwifery/ Obstetrics and Gynaecology (OBG) Nursing –II including safe delivery app module	N-MIDW (II)/ OBGN 410	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3515	Community Health Nursing-II Practical	N-COMH (II)P 401	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3516	Midwifery/ Obstetrics and Gynaecology (OBG) Nursing –(I&II) Practical	N-MIDW (II)P / OBGN 410	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3517	Scientific Writing Skills	ELEC701	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3518	Lactation Management	ELEC702	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3519	Sexuality & Health	ELEC703	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3520	Stress Management	ELEC704	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3521	Job Readiness & Employability in Health Care Setting	ELEC705	Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2011
3522	Internship (Intensive Practicum/ Residency Posting)	INTE440	Bachelor of Science (Nursing)	Report Writing, Presentation, Viva-Voce	2011
3523	Nutrition and Dietetics	NUR2106	Post Basic Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2012
3524	Medical Surgical Nursing	NUR2108	Post Basic Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2012
3525	Medical Surgical Nursing (Practical)	NUR2110	Post Basic Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2012
3526	Maternal Nursing	NUR2208	Post Basic Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2012
3527	Pediatric Nursing	NUR2209	Post Basic Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2012

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
3528	Maternal Nursing (Practical)	NUR2211	Post Basic Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2012
3529	Pediatric Nursing (Practical)	NUR2212	Post Basic Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2012
3530	Community Health Nursing (Practical)	NUR2308	Post Basic Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2012
3531	Introduction to Nursing Research and Statistics	NUR2407	Post Basic Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2012
3532	Psychiatric Nursing (Practical)	NUR2408	Post Basic Bachelor of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2012
3533	Dissertation (Nursing Research)	NUR2437	Post Basic Bachelor of Science (Nursing)	Report Writing, Presentation, Viva-Voce	2012
3534	Nursing Education Practical	NUR4102	Master of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2015
3535	Advance Nursing Practice	NUR4201	Master of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2015
3536	Nursing Research & Statistics	NUR4202	Master of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2015
3537	Medical Surgical Nursing CS-I & II Practical	MSN4203	Master of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2015
3538	Community Health Nursing CS-I & II Practical	CHN4203	Master of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2015
3539	Psychiatric Nursing CS-I & II Practical	PSN4203	Master of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2015
3540	Obstetric & Gynaecological Nursing CS-I & II Practical	OGN4203	Master of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2015
3541	Child Health Nursing CS-I & II Practical	PDN4203	Master of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2015
3542	Nursing Research Project	NUR4337	Master of Science (Nursing)	Report Writing, Presentation, Viva-Voce	2015
3543	Nursing Research Dissertation	NUR4437	Master of Science (Nursing)	Report Writing, Presentation, Viva-Voce	2015
3544	Cardiothoracic & Vascular Nursing CS-III & IV Practical	MSN4402	Master of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2015
3545	Critical Care Nursing CS-III & IV Practical	MSN4403	Master of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2015

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
3546	Oncology Nursing CS-III & IV Practical	MSN4404	Master of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2015
3547	Neurosciences Nursing CS-III & IV Practical	MSN4405	Master of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2015
3548	Nephro-Urology Nursing CS-III & IV Practical	MSN4406	Master of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2015
3549	Orthopedic Nursing CS-III & IV Practical	MSN4407	Master of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2015
3550	Gastro Enterology Nursing CS-III & IV Practical	MSN4408	Master of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2015
3551	Community Health Nursing CS-III & IV Practical	CHN4402	Master of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2015
3552	Psychiatric Nursing CS-III & IV Practical	PSN4402	Master of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2015
3553	Obstetric & Gynaecological Nursing CS-III & IV Practical	OGN4402	Master of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2015
3554	Child Health Nursing CS-III & IV Practical	PDN4402	Master of Science (Nursing)	Quiz, Presentation, Practical, Nursing Lab, Report writing, Class performance	2015
3555	Pharmaceutical Analysis	BP102T	Bachelor of Pharmacy	Quiz, Group Discussion, Presentation, Viva-Voce	2018
3556	Communication Skills	BP105T	Bachelor of Pharmacy	Quiz, Viva-Voce, Presentation	2018
3557	Human Anatomy and Physiology Practical-I	BP107P	Bachelor of Pharmacy	Quiz (Practical based), Viva-Voce, Practical, Lab record	2018
3558	Pharmaceutical Analysis Practical	BP108P	Bachelor of Pharmacy	Quiz (Practical based), Viva-Voce, Practical, Lab record	2018
3559	Pharmaceutics-I Practical	BP109P	Bachelor of Pharmacy	Quiz (Practical based), Viva-Voce, Practical, Lab record	2018
3560	Pharmaceutical Inorganic Chemistry Practical	BP110P	Bachelor of Pharmacy	Quiz (Practical based), Viva-Voce, Practical, Lab record	2018
3561	Communication Skills Practical	BP111P	Bachelor of Pharmacy	Quiz, Viva-Voce, Presentation	2018
3562	Remedial Biology Practical	BP112RBP	Bachelor of Pharmacy	Quiz (Practical based), Viva-Voce, Practical, Lab record	2018
3563	Computer Applications in Pharmacy	BP205T	Bachelor of Pharmacy	Quiz, Group Discussion, Presentation, Viva-Voce	2018
3564	Environmental Sciences	BP206T	Bachelor of Pharmacy	Quiz, Group Discussion, Presentation, Viva-Voce	2018
3565	Human Anatomy and Physiology Practical-II	BP207P	Bachelor of Pharmacy	Quiz (Practical based), Viva-Voce, Practical, Lab record	2018
3566	Pharmaceutical Organic Chemistry Practical-I	BP208P	Bachelor of Pharmacy	Quiz (Practical based), Viva-Voce, Practical, Lab record	2018

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3567	Biochemistry Practical	BP209P	Bachelor of Pharmacy	Quiz (Practical based), Viva-Voce, Practical, Lab record	2018
3568	Computer Applications in Pharmacy Practical	BP210P	Bachelor of Pharmacy	Quiz (Practical based), Viva-Voce, Practical, Lab record	2018
3569	Pharmaceutical Microbiology	BP303T	Bachelor of Pharmacy	Quiz, Group Discussion, Presentation, Viva-Voce	2018
3570	Pharmaceutical Engineering	BP304T	Bachelor of Pharmacy	Quiz, Group Discussion, Presentation, Viva-Voce	2018
3571	Pharmaceutical Organic Chemistry Practical-II	BP305P	Bachelor of Pharmacy	Quiz (Practical based), Viva-Voce, Practical, Lab record	2018
3572	Physical Pharmaceutics Practical-I	BP306P	Bachelor of Pharmacy	Quiz (Practical based), Viva-Voce, Practical, Lab record	2018
3573	Pharmaceutical Microbiology Practical	BP307P	Bachelor of Pharmacy	Quiz (Practical based), Viva-Voce, Practical, Lab record	2018
3574	Pharmaceutical Engineering Practical	BP308P	Bachelor of Pharmacy	Quiz (Practical based), Viva-Voce, Practical, Lab record	2018
3575	Medicinal Chemistry Practical-I	BP406P	Bachelor of Pharmacy	Quiz (Practical based), Viva-Voce, Practical, Lab record	2018
3576	Physical Pharmaceutics Practical-II	BP407P	Bachelor of Pharmacy	Quiz (Practical based), Viva-Voce, Practical, Lab record	2018
3577	Pharmacology Practical-I	BP408P	Bachelor of Pharmacy	Quiz (Practical based), Viva-Voce, Practical, Lab record	2018
3578	Pharmacognosy and Phytochemistry Practical-I	BP409P	Bachelor of Pharmacy	Quiz (Practical based), Viva-Voce, Practical, Lab record	2018
3579	Industrial Pharmacy-I	BP502T	Bachelor of Pharmacy	Quiz, Group Discussion, Presentation, Viva-Voce	2018
3580	Pharmaceutical Jurisprudence	BP505T	Bachelor of Pharmacy	Quiz, Group Discussion, Presentation, Viva-Voce	2018
3581	Industrial Pharmacy Practical-I	BP506P	Bachelor of Pharmacy	Quiz (Practical based), Viva-Voce, Practical, Lab record	2018
3582	Pharmacology Practical-II	BP507P	Bachelor of Pharmacy	Quiz (Practical based), Viva-Voce, Practical, Lab record	2018
3583	Pharmacognosy and Phytochemistry Practical-II	BP508P	Bachelor of Pharmacy	Quiz (Practical based), Viva-Voce, Practical, Lab record	2018
3584	Herbal Drug Technology	BP603T	Bachelor of Pharmacy	Quiz, Group Discussion, Presentation, Viva-Voce	2018
3585	Quality Assurance	BP606T	Bachelor of Pharmacy	Quiz, Group Discussion, Presentation, Viva-Voce	2018
3586	Medicinal Chemistry Practical-III	BP607P	Bachelor of Pharmacy	Quiz (Practical based), Viva-Voce, Practical, Lab record	2018
3587	Pharmacology Practical-III	BP608P	Bachelor of Pharmacy	Quiz (Practical based), Viva-Voce, Practical, Lab record	2018
3588	Herbal Drug Technology Practical	BP609P	Bachelor of Pharmacy	Quiz (Practical based), Viva-Voce, Practical, Lab record	2018
3589	Industrial Pharmacy-II	BP702T	Bachelor of Pharmacy	Quiz, Group Discussion, Presentation, Viva-Voce	2018
3590	Pharmacy Practice	BP703T	Bachelor of Pharmacy	Quiz, Group Discussion, Presentation, Viva-Voce	2018
3591	Novel Drug Delivery System	BP704T	Bachelor of Pharmacy	Quiz, Group Discussion, Presentation, Viva-Voce	2018

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3592	Instrumental Methods of Analysis Practical	BP705P	Bachelor of Pharmacy	Quiz (Practical based), Viva-Voce, Practical, Lab record	2018
3593	Practice School	BP706PS	Bachelor of Pharmacy	Quiz (Practical based), Viva-Voce, Practical, Lab record	2018
3594	Biostatistics and Research Methodology	BP801T	Bachelor of Pharmacy	Quiz, Group Discussion, Presentation, Viva-Voce	2018
3595	Social and Preventive Pharmacy	BP802T	Bachelor of Pharmacy	Quiz, Group Discussion, Presentation, Viva-Voce	2018
3596	Project Work	BP813PW	Bachelor of Pharmacy	Report Writing, Viva-Voce, Presentation	2018
3597	Quality Control and Standardization of Herbals	BP806ET	Bachelor of Pharmacy	Quiz, Group Discussion, Presentation, Viva-Voce	2018
3598	Computer Aided Drug Design	BP807ET	Bachelor of Pharmacy	Quiz, Group Discussion, Presentation, Viva-Voce	2018
3599	Cosmetic Science	BP809ET	Bachelor of Pharmacy	Quiz, Group Discussion, Presentation, Viva-Voce	2018
3600	Experimental Pharmacology	BP810ET	Bachelor of Pharmacy	Quiz, Group Discussion, Presentation, Viva-Voce	2018
3601	Advanced Instrumentation Techniques	BP811ET	Bachelor of Pharmacy	Quiz, Group Discussion, Presentation, Viva-Voce	2018
3602	Modern Pharmaceutical Analytical Techniques	MPH101T	Master of Pharmacy (Pharmaceutics)	Quiz, Group Discussion, Presentation, Viva-Voce	2023
3603	Drug Delivery System	MPH102T	Master of Pharmacy (Pharmaceutics)	Quiz, Group Discussion, Presentation, Viva-Voce	2023
3604	Modern Pharmaceutics	MPH103T	Master of Pharmacy (Pharmaceutics)	Quiz, Group Discussion, Presentation, Viva-Voce	2023
3605	Regulatory Affairs	MPH104T	Master of Pharmacy (Pharmaceutics)	Quiz, Group Discussion, Presentation, Viva-Voce	2023
3606	Pharmaceutics Practical-I	MPH105P	Master of Pharmacy (Pharmaceutics)	Quiz (Practical based), Viva-Voce, Practical, Lab record	2023
3607	Seminar/ Assignment-I	PHA4138	Master of Pharmacy (Pharmaceutics)	Report Writing, Viva-Voce, Presentation	2023
3608	Molecular Pharmaceutics (Nano Tech and Targeted DDS)	MPH201T	Master of Pharmacy (Pharmaceutics)	Quiz, Group Discussion, Presentation, Viva-Voce	2023
3609	Advanced Biopharmaceutics & Pharmacokinetics	MPH202T	Master of Pharmacy (Pharmaceutics)	Quiz, Group Discussion, Presentation, Viva-Voce	2023
3610	Computer Aided Drug Delivery System	MPH203T	Master of Pharmacy (Pharmaceutics)	Quiz, Group Discussion, Presentation, Viva-Voce	2023
3611	Cosmetic and Cosmeceuticals	MPH204T	Master of Pharmacy (Pharmaceutics)	Quiz, Group Discussion, Presentation, Viva-Voce	2023
3612	Pharmaceutics Practical-II	MPH205P	Master of Pharmacy (Pharmaceutics)	Quiz (Practical based), Viva-Voce, Practical, Lab record	2023
3613	Seminar/Assignment-II	PHA4238	Master of Pharmacy (Pharmaceutics)	Report Writing, Viva-Voce, Presentation	2023
3614	Research Methodology and Biostatistics	MRM301T	Master of Pharmacy (Pharmaceutics)	Quiz, Group Discussion, Presentation, Viva-Voce	2023
3615	Journal Club-I	PHA4330	Master of Pharmacy (Pharmaceutics)	Report Writing, Viva-Voce, Presentation	2023
3616	Discussion/ Presentation (Proposal Presentation)	PHA4332	Master of Pharmacy (Pharmaceutics)	Report Writing, Viva-Voce, Presentation	2023

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1.1.3 Total number of courses having focus on employability/ entrepreneurship / skill development offered during the year (2023)

Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
3617	Research Work-I	PHA4337	Master of Pharmacy (Pharmaceutics)	Report Writing, Viva-Voce, Presentation	2023
3618	Journal Club-II	PHA4430	Master of Pharmacy (Pharmaceutics)	Report Writing, Viva-Voce, Presentation	2023
3619	Research Work-II	PHA4437	Master of Pharmacy (Pharmaceutics)	Report Writing, Viva-Voce, Presentation	2023
3620	Discussion/ Final Presentation	PHA4432	Master of Pharmacy (Pharmaceutics)	Report Writing, Viva-Voce, Presentation	2023
3621	Architectural Graphics Skills-I	ARC2104	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3622	Visual Arts-I	ARC2105	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3623	Structure-I	ARC2109	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3624	Architectural Graphics Skills-II	ARC2204	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3625	Visual Arts-II	ARC2205	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3626	Structure-II	ARC2209	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3627	Architectural Graphics Skills-III	ARC2304	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3628	Visual Arts-III	ARC2305	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3629	Structure-III	ARC2308	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3630	Surveying & Leveling	ARC2313	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
3631	Structure-IV	ARC2409	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3632	Computer Applications-I	ARC2413	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3633	Visual Arts-IV	ARC2414	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3634	Structure-V	ARC2509	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3635	Computer Applications-II	ARC2513	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3636	People Culture & Built Environment-I	ARC2519	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3637	Ecology, Environment & Sustainable Development-I	ARC2520	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3638	Computer Applications & Advance Technologies-I	ARC2521	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3639	Structure-VI	ARC2609	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3640	Site Planning & Landscape	ARC2617	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3641	People Culture & Built Environment-II	ARC2620	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3642	Ecology, Environment & Sustainable Development-II	ARC2621	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
3643	Computer Applications & Advance Technologies-II	ARC2622	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3644	Structure-VII	ARC2703	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3645	Research Methodology	ARC2705	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3646	LEED Lab-I	ARC2717	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3647	Interior Design	ARC2718	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3648	Specification, Estimation & Valuation	ARC2720	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3649	People Culture & Built Environment-III	ARC2721	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3650	Ecology, Environment & Sustainable Development-III	ARC2722	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3651	Computer Applications & Advance Technologies-III	ARC2723	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3652	Structure-VIII	ARC2815	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3653	Town Planning	ARC2816	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3654	LEED Lab-II	ARC2817	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3655	Dissertation	ARC2837	Bachelor of Architecture	Portfolio, Report Writing, Viva-Voce, Presentation	2012

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
3656	People Culture & Built Environment-IV	ARC2818	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3657	Ecology, Environment & Sustainable Development-IV	ARC2819	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3658	Computer Applications & Advance Technologies-IV	ARC2820	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3659	Practical Training	ARC2937	Bachelor of Architecture	Portfolio, Report Writing, Viva-Voce, Presentation	2012
3660	Architectural Thesis	ARC2037	Bachelor of Architecture	Portfolio, Report Writing, Viva-Voce, Presentation	2012
3661	Professional Practice	ARC2001	Bachelor of Architecture	Portfolio, Report Writing, Viva-Voce, Presentation	2012
3662	Career Development	ARC2002	Bachelor of Architecture	Portfolio, Report Writing, Viva-Voce, Presentation	2012
3663	Understanding Cultural Landscapes for Urban Renewal & Conservation	ARC2003	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3664	Smart Cities and Smart Technologies	ARC2004	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3665	Transit Oriented Development	ARC2005	Bachelor of Architecture	Portfolio, Project Report, Practical Report Writing, Quiz, Viva-Voce, Presentation, Case-Discussion	2012
3666	Interior Design Studio-I	IND2110	Bachelor of Interior Design	Report Writing, Presentation, Viva-Voce	2015
3667	Building Materials & Construction Techniques-I	IND2111	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015
3668	Graphics Skills-I	IND2112	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015
3669	Art and Graphics-I	IND2113	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015
3670	Presentation Techniques	IND2114	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015
3671	Interior Design Studio-II	IND2209	Bachelor of Interior Design	Report Writing, Presentation, Viva-Voce	2015
3672	Building Materials & Construction Techniques-II	IND2210	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015
3673	Graphics Skills-II	IND2211	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015
3674	Art and Graphics-II	IND2212	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
3675	Climate Responsive Interiors	IND2215	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015
3676	Psychology of Living Environments	IND2304	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015
3677	Lighting & Colours in Interiors	IND2307	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015
3678	Interior Design Studio-III	IND2312	Bachelor of Interior Design	Report Writing, Presentation, Viva-Voce	2015
3679	Building Materials & Construction Techniques-III	IND2313	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015
3680	Art and Graphics-III	IND2314	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015
3681	Graphics Skills-III	IND2315	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015
3682	Furniture Design Workshop-I	IND2318	Bachelor of Interior Design	Report Writing, Presentation, Viva-Voce	2015
3683	Interior Design Studio-IV	IND2408	Bachelor of Interior Design	Report Writing, Presentation, Viva-Voce	2015
3684	Building Materials & Construction Techniques-IV	IND2409	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015
3685	Computer Aided Interior Design & Drafting	IND2411	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015
3686	Photography & Videography	IND2412	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015
3687	Furniture Design Workshop-II	IND2413	Bachelor of Interior Design	Report Writing, Presentation, Viva-Voce	2015
3688	Revitalization of Arts & Crafts	IND2502	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015
3689	Textile in Interiors	IND2504	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015
3690	Interior Design Studio-V	IND2509	Bachelor of Interior Design	Report Writing, Presentation, Viva-Voce	2015
3691	Building Materials & Construction Techniques-V	IND2510	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015
3692	Estimation & Specifications	IND2511	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015
3693	Computer Aided Interior Design & Visualization	IND2512	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015
3694	Interior Design Studio-VI	IND2616	Bachelor of Interior Design	Report Writing, Presentation, Viva-Voce	2015
3695	Interior Landscape Design	IND2617	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015
3696	Sustainable Interior Design & Materials	IND2610	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015
3697	Sustainable Interior Renovation	IND2611	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015
3698	Adaptive Reuse & Retrofit	IND2612	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015
3699	Performance Space Design	IND2613	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015

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Sl. No.	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of Introduction
3700	Public Art	IND2614	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015
3701	Public Space Design	IND2615	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015
3702	Design Research Methods & Presentation Techniques	IND2702	Bachelor of Interior Design	Quiz, Class Performance, Report Writing, Presentation	2015
3703	Professional Practice	IND2703	Bachelor of Interior Design	Report Writing, Presentation, Viva-Voce	2015
3704	Interior Thesis Project	IND2737	Bachelor of Interior Design	Report Writing, Presentation, Viva-Voce	2015
3705	Professional Training	IND2837	Bachelor of Interior Design	Report Writing, Presentation, Viva-Voce	2015
3706	Planning Techniques and Computer Applications	PLN4103	Master of Planning (Urban & Regional)	Project Report, Quiz, Viva-Voce, Presentation, Case-Discussion	2011
3707	Infrastructure Planning and Management	PLN4104	Master of Planning (Urban & Regional)	Project Report, Quiz, Viva-Voce, Presentation, Case-Discussion	2011
3708	Housing and Environmental Planning	PLN4105	Master of Planning (Urban & Regional)	Project Report, Quiz, Viva-Voce, Presentation, Case-Discussion	2011
3709	Planning Studio-I (i) Area Planning (ii) Village Development Plan	PLN4108	Master of Planning (Urban & Regional)	Project Report, Quiz, Viva-Voce, Presentation, Case-Discussion	2011
3710	Eco-Tourism	PLN4111	Master of Planning (Urban & Regional)	Project Report, Quiz, Viva-Voce, Presentation, Case-Discussion	2011
3711	Demography and Quantitative Analysis	PLN4212	Master of Planning (Urban & Regional)	Project Report, Quiz, Viva-Voce, Presentation, Case-Discussion	2011
3712	Planning Studio-II Urban Planning	PLN4206	Master of Planning (Urban & Regional)	Project Report, Quiz, Viva-Voce, Presentation, Case-Discussion	2011
3713	Special Area Planning	PLN4213	Master of Planning (Urban & Regional)	Project Report, Quiz, Viva-Voce, Presentation, Case-Discussion	2011
3714	Big Data and Data Analytics	PLN4216	Master of Planning (Urban & Regional)	Project Report, Quiz, Viva-Voce, Presentation, Case-Discussion	2011
3715	Research Methodology and Thesis Planning	PLN4310	Master of Planning (Urban & Regional)	Project Report, Quiz, Viva-Voce, Presentation, Case-Discussion	2011
3716	Planning Studio-III Regional Planning	PLN4307	Master of Planning (Urban & Regional)	Project Report, Quiz, Viva-Voce, Presentation, Case-Discussion	2011
3717	Smart Cities and Advanced Technologies for Emerging Planning Issues	PLN4312	Master of Planning (Urban & Regional)	Project Report, Quiz, Viva-Voce, Presentation, Case-Discussion	2011
3718	Sustainable Cities and Regions	PLN4315	Master of Planning (Urban & Regional)	Project Report, Quiz, Viva-Voce, Presentation, Case-Discussion	2011
3719	Planning Legislation and Professional Practice	PLN4403	Master of Planning (Urban & Regional)	Project Report, Quiz, Viva-Voce, Presentation, Case-Discussion	2011
3720	Planning Thesis	PLN4437	Master of Planning (Urban & Regional)	Project Report, Quiz, Viva-Voce, Presentation, Case-Discussion	2011
3721	Principles & Elements of Design	DIND2151	Interior Design (OE)	Quiz, Class Performance, Report Writing, Presentation	2023
3722	Anthropometry & Furniture Design	DIND2251	Interior Design (OE)	Quiz, Class Performance, Report Writing, Presentation	2023
3723	Vernacular Art and Designs	DIND2351	Interior Design (OE)	Quiz, Class Performance, Report Writing, Presentation	2023
3724	Computer Applications-I	DIND2451	Interior Design (OE)	Quiz, Class Performance, Report Writing, Presentation	2023

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3725	Interior Design Services	DIND2551	Interior Design (OE)	Quiz, Class Performance, Report Writing, Presentation	2023
3726	Computer Applications-II	DIND2501	Interior Design (OE)	Quiz, Class Performance, Report Writing, Presentation	2023
3727	Research in Interior Design	DIND2651	Interior Design (OE)	Quiz, Class Performance, Report Writing, Presentation	2023
3728	Interior Design Project	DIND2601	Interior Design (OE)	Quiz, Class Performance, Report Writing, Presentation	2023
3729	Intelligent Interiors	DIND2602	Interior Design (OE)	Quiz, Class Performance, Report Writing, Presentation	2023
3730	Introduction to Disaster Management	DSM2151	Disaster Management & Sustainable Built Environment (OE)	Quiz, Class Performance, Project, Presentation, Viva-Voce	2021
3731	Resilience Building for Built Environment	DSM2251	Disaster Management & Sustainable Built Environment (OE)	Quiz, Class Performance, Project, Presentation, Viva-Voce	2021
3732	Emergency Management	DSM2351	Disaster Management & Sustainable Built Environment (OE)	Quiz, Class Performance, Project, Presentation, Viva-Voce	2021
3733	Rehabilitation Reconstruction and Recovery	DSM2451	Disaster Management & Sustainable Built Environment (OE)	Quiz, Class Performance, Project, Presentation, Viva-Voce	2021
3734	Climate Change Adaptations and Sustainable Development	DSM2551	Disaster Management & Sustainable Built Environment (OE)	Quiz, Class Performance, Project, Presentation, Viva-Voce	2021
3735	Geoinformatics in Disaster Management	DSM2651	Disaster Management & Sustainable Built Environment (OE)	Quiz, Class Performance, Project, Presentation, Viva-Voce	2021

* OE- Open Electives

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Amity Business School

Bachelor of Business Administration
(Honors/ Honors with Research)

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Curriculum & Scheme of Examination

2023

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Bachelor of Business Administration (Honors/ Honors with Research)
SEMESTER-I

DMGT2151	MANAGEMENT FOUNDATIONS	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Management Foundation is an introductory course on management process from managers' perspective. The course seeks to help students acquire the requisite knowledge, skills and abilities needed to successfully manage the organization.

The course examines the logic and working of organizations and outlines the major functions of management. It details the different functions of management such as planning, organizing, staffing, directing, and controlling. The course also emphasizes on identification of critical issues and framing of strategies and scenarios required to execute management functions. The aim of the course is to orient the students in theories and practices of Management so as to apply the acquired knowledge in actual business practices.

Course Objectives

The objective of this course is to:

Provide a **gateway to the real world of management** and decision-making.
Help the **students gain understanding of the functions and responsibilities of managers**.
Impart **tools and techniques** to be used in the performance of the managerial job.
Enable students to analyse and understand the **environment** of the organization.
Help the students to develop cognizance of the **importance of management principles**

Course Outcomes

On completion of this course, the students will be able to:

CO1: Discuss the concepts related to management of business.
CO2: Demonstrate the roles, skills and functions of management.
CO3: Analyse effective application of MF knowledge to diagnose and solve organizational problems and develop optimal managerial decisions.
CO4: Recognise the complexities associated with management of human resources in the organizations and integrate the learning in handling these complexities.

Modules	Blooms level*	Number of hours
MODULE I- Introduction Concept, Nature, Scope and Functions of Management, Levels of Management, Evolution and Foundations of Management Theories - Classical and Neo - Classical Theories, Systems Approach to organization, Modern Organization Theory.	L1, L2	5
MODULE 2: Management Planning Process Planning objectives and characteristics, Hierarchies of planning, the concept and techniques of forecasting, Decision making – concepts & process, MBO, concept and relevance.	L1, L2, L3	5

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MODULE 3: Organization Meaning, Importance and Principles, Departmentalization, Span of Control, Types of Organization, Authority, Delegation of Authority.	L1, L2, L3	5
MODULE 4: Staffing Meaning, Job analysis, Manpower planning, Recruitment, Transfers and Promotions, Appraisals, Management Development, Job Rotation, Training, Rewards and Recognition.	L1, L2, L3, L4	5
MODULE 5: Directing Motivation, Co-ordination, Communication,	L1, L2, L3 , L4	5
Module VI: Management Control Meaning, Nature, Objectives and Process of Management Control, Techniques and Behavioral Aspects of Management control.	L1, L2, L3	5
P - Project; This would be the field project related to the subject where the student need to work outside the class collect the data and make report .	L3 , L4	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis L5-Synthesis; L6-Evaluation*

Text Books

1. Koontz, H, & Weihrich, H (2016). Essentials of Management: An International Perspective (8th ed.), Tata McGraw Hills, New Delhi.
2. Ghuman, K & Aswathapa, K, (2017). Management concepts and cases (10th ed.), Tata McGraw Hills, New Delhi.
3. Telsan, M.T. (2016). Industrial and Business Management, (4th ed.), S. Chand, New Delhi.

Reference Books

1. Robbins, S. (2017). Management, (13th ed.), Pearson Education, New Delhi.
2. Ramaswamy, I. (2011). Principles of Business Management, (8th ed.), Himalaya Publishing House, New Delhi.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CT**	**HA**	**C**	**V**	**A**	**EE**
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	--	--	--	--	--	--	--	1	--	--	--
CO2	1	--	--	--	--	2	--	--	1	--	--	--
CO3	1	2	--	--	--	--	--	--	1	--	--	--
CO4	1	--	--	--	--	--	--	2	1	--	--	--

1: strongly related, 2: moderately related and 3: weakly related

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DMGT2101	FINANCIAL & CORPORATE ACCOUNTING	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Description

This course intends to introduce basic accounting principles and practices, train students on ledger posting, preparation of trial balance, and final accounts of sole trading business. It also focuses on accounting for shares/debentures issues and redemption apart from the valuation of goodwill and shares. This course would be useful for all those who are desirous of having an understanding and application of the financial dynamics of the business

Course Objectives

The aim of this course is to

1. Provide an understanding of the application of various principles and practices of Accounting.
2. Estimate annual financial statements of sole trading concerns and joint stock companies
3. Do the accounting for the issue and redemption of shares and debentures
4. Find the value of goodwill and calculate the share value

Course Outcomes:

On successful completion of the course, the students should be able to:

CO1: Understand and apply the principles of accounting and accounting standards followed in India and globally.

CO2: Able to prepare subsidiary books and final accounts of sole trading enterprises

CO3: Understand and do the accounting of issue and redemption of shares and debentures.

CO4: Analyse goodwill value under different methods of estimate and valuation of shares

Modules	Blooms level*	Number of hours
Module 1: **Introduction to Accounting** Meaning, need for accounting, users of accounting information, limitations of accounting, accounting concepts and conventions, Generally Accepted Accounting Principles, accounting standards, Indian GAAP vs US GAAP	L1,L2, L3	8
Module 2: **Accounting Process & Subsidiary Books** Double entry system-Rules for debit and credit, preparation of journal- ledger-trial balance. Introduction to subsidiary books-preparation of cash book-single column, double column, and three-columnar cash book	L1, L2, L3	12
Module 3:**Preparation of financial statements(sole trading concerns)** Preparation of trading account, profit and loss account, and balance sheet along with adjustments	L1, L3	10
Module 4: **Accounting for the Issue of shares and Debentures** Special features of joint stock companies, features of Companies Act, 2013, kinds of shares and debentures, accounting for issue and redemption of shares, accounting for issue and redemption of debentures, share buyback, underwriting	L1, L3,L4	7
Module 5:Valuation of goodwill and shares Good will – Meaning, Definition, Elements, Types and Methods of Valuation	L1,L2 L3,L4	8

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of Goodwill, Methods of share valuation (Equity & preference shares)		
Tutorial: **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3,L4	15

**Bloom's Level:L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Theory & Problems proportion: Theory 40% and Problems(60%)

Text Books:

Maheshwari, S.N., Advanced Accountancy Volume-I, Ninth Edition, Vikas Publishing House Pvt. Ltd.

S.Anil Kumar, V Rajesh Kumar and B Mariappa(2014). Corporate Accounting, Himalaya Publishing House, New Delhi.

Gupta, R.L., & Radhaswamy, M(2013). Corporate Accounting. Sultan Chand & Sons, New Delhi

Raman, B. S(2014).Financial Accounting(1st Edition)I & II, New Delhi, United Publishers

Reference Books:

1. Grewal, T. S., Shukla, M .C, Advanced Accountancy, Sixteenth Edition, Sultan Chand and Sons.
2. Tulsian, P.C (2009), Financial Accounting 2nd Edition, Pearson Education.
3. Narayanaswamy, R. Financial Accounting- A Managerial Perspective, Second Edition, Prentice Hall India
4. Monga, J.R(2012).Fundamentals of Corporate Accounting, K.L Malik &Sons Pvt Ltd, New Delhi.

Pedagogy:
Lectures
Cases/Numericals
Field based assignments
Seminars

Examination Scheme:

Components	**CPA**	**TP**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	**5**	**5**	**5**	**5**	**10**	**70**

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	2					1	1	2		
CO2	1	1	2					1	1	2	2	
CO3	1	1	2					1	1			
CO4	1	1	2					1	1			

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SEMESTER-II

DMGT2251	MARKETING MANAGEMENT	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

In this course, the basic concept related to marketing, marketing mix, marketing philosophies, consumer behaviour, segmentation & targeting, positioning strategies, marketing environment analysis are discussed in detail. Various strategies based on marketing mix such as product, price, place and promotion are also discussed in detail. New emerging marketing paradigms are discussed to give students an overview of current marketing situation. The main aim of this course is to give students an elementary knowledge of the fundamentals in the field of marketing.

Course Objectives

The objective of this course is to

1. Develop and help the students imbibe basic marketing principles and establishing an appreciation of contemporary realities.
2. Formulate a marketing plan including marketing objectives, marketing mix, strategies, budgetary considerations, and evaluation criteria.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain various definitions and concepts of marketing.
CO2: Analyse various models of marketing research.
CO3: Identify consumer behaviour and apply the understanding to real life business cases.
CO4: Discuss various steps of product development and pricing approaches.
CO5: Explain and discuss the distribution and logistics decisions in business.
CO6: Aware about changing paradigms and development in marketing concepts and theories.

Modules	Blooms level*	Number of hours
MODULE I- Introduction to Marketing Core concepts of marketing - the production concept, the product concept, selling concept and the marketing concept, societal marketing, relationship marketing.	L1, L2, L3	4
MODULE 2: Marketing Mix- Product & Price Meaning, Elements of Marketing Mix (Four P's); Product-Product Mix, Product Line, Product Lifecycle, New Product Development, Branding, Packing and Packaging, Labeling, Pricing – Objectives, Factors influencing Pricing Policy, Methods of Pricing	L1, L2, L3, L5	8
MODULE 3: Marketing Mix- Place & Promotion Physical Distribution–Meaning, Factors affecting Channel Selection, Types of Marketing Channels. Promotion – Meaning and Significance of Promotion, Personal Selling and Advertising, Public Relations, Publicity, Sales Promotion	L1,	7
MODULE 4: Analysing Market Environment **Market Environment**- Microenvironment – The company, suppliers, marketing intermediaries' competitors, public and customers. Macro Environment- Demographic, Economic, Natural, Technological, Political, Legal, Socio-Cultural Environment.	L1, L2, L3	10

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MODULE 5: Strategic Planning, Market Segmentation and Consumer Behaviour **Market Segmentation**- Bases of Market Segmentation, Targeting and Positioning approaches, **Consumer Behaviour**- Model of Consumer Behavior; Understanding the consumer decision making process & Buying Situations, Factors affecting Buying Behaviour **Strategic Planning in Marketing**- Business Portfolio, BCG matrix, GE 9 cell model; Marketing Research.	L1, L2, L3, L4, L5, L6	8
MODULE 6: Service Marketing Meaning and definition of services, features of services, Seven P's of services marketing, differentiation between goods and services.	L1, L2, L3	4
MODULE 7: Emerging Marketing Paradigms Overview of E-marketing, Global marketing, Mobile marketing, Kiosk marketing, Green marketing, Tele marketing, Multi-level marketing & Rural marketing.	L1, L2. L3	4
Tutorial: **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3, L4	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis; L6-Evaluation*

Textbooks

1. Kotler, Philip & Armstrong, Gray, Principles of Marketing, 10th Edition, Pearson Education.
2. Saxena, Rajan (2008), Marketing Management, 3rd Edition, McGrew Hills Education.

Reference Books

1. Ramaswamy and Namkumar, S (2009), Marketing Management Global Perspective: Indian Context, McMillion, New Delhi.
2. Kumar, Arun and Meenakashi, N (2009), Marketing Management, Vikas Publishing House.
3. Russel, Wines, Marketing Management, 3rd Edition, Pearson Education.
4. Kotler, Koshi Jha (2009), Marketing Management, 13th Edition, Pearson Education.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CT	P	C	A	EE
Weightage (%)	10	10	5	5	70

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	--	--	--	--	--	--	--	1	--	--	--
CO2	--	1	--	--	--	--	--	--	1	--	--	--
CO3	--	--	2	1	--	--	--	--	1	--	--	--
CO4	--	--	--	--	--	--	--	1	1	2	--	--
CO5	1	--	--	--	--	--	2	--	1	--	--	--
CO6	1	--	--	--	--	--	--	--		--	--	--

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DMGT2201	COST & MANAGEMENT ACCOUNTING	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course aims to give an understanding of how management accountants provide information to facilitate decision-making in an organization. It will acquaint students with various concepts of costing and highlight the decision making and control focus of managerial accounting. **Cost Accounting** is concerned with the computation and assessment of costs and expenses incurred in the acquisition or production of anything. It is about calculating the cost per unit using various costing approaches. Its primary goal is to assist managers in making decisions. **Management accounting** is concerned with the provision of relevant information to support decision-making, planning, cost control, and performance evaluation. Management accounting converts data into information, knowledge, and wisdom regarding the activities of a company entity. This is a step beyond cost accounting.

Course Objectives

The objective of this course is to

1. Understand and explain the conceptual framework of Cost Accounting and processes used to determine total and per unit cost.
2. To make known to the students to assess material, labour, and overhead cost
3. To enrich the knowledge of the learners in knowing in applying tools like cash flow statement for analysis of financial statements
4. To make the students in understanding how marginal costing is used in profit planning and management decision-making under different situations.

Course Outcomes to

On completion of this course, the students will be able to

CO1: Identify the principles of cost and management accounting and apply the same for the preparation of cost sheets and quotations

CO2:Assess material, labour and overhead cost of manufacturing firms

CO3: Analyse financial statements using appropriate techniques

CO4: Prepare budgets for business firms.

CO5: Evaluate business options and take informed decisions using marginal costing

Modules	Blooms level*	Number of hours
Module I: Cost Accounting Introduction – Classification of cost, Cost Accounting-Objectives and functions, Comparison of Cost Accounting with Financial Accounting and Management Accounting, Designing and installation of costing system, Uses of Management Accounting, Preparation of cost sheet and quotation	L1,L2,L3	10

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Module II: Material, Labour &Overheads **Material cost**: Direct and Indirect material cost, Techniques of inventory control-stock levels and EOQ, Pricing of material issues-FIFO and LIFO **Labour cost:** Causes of effects of labour turnovers, Methods of wage payment-Halsey and Rowan plans, Taylor's piece rate system **Overheads**: Classification, Allocation and Apportionment, Primary and Secondary distribution(Repeated distribution method and Simultaneous equation method)	L1, L2,L3	12
Module III: Marginal Costing Marginal costing-Meaning and importance-Applications of marginal costing, Cost-volume-profit analysis, Break-even chart, uses and limitations of Break-even analysis, Decision-making areas- product mix, make/ buy, pricing decision.	L1, L2,L3,L6	8
Module IV: Budgetary Control Budget, budgeting and budgetary control-Meaning and objectives of budgetary control, Classification of budgets, Preparation of cash budget and flexible budget	L1,L2,L3	7
Module V: Cash Flow Statement Cashflow and profit, Cash flow statement-uses and limitations- Preparation of cash flow statement (AS 3-Indirect method) .	L1, L2,L4	8
Module VI: Ratios		
Tutorial: **Flip Classroom-** C – Case Discussion/ Presentation; HA – Home Assignment; S – Seminar; V – Viva; Q – Quiz	L3,L4,L6	15

**Bloom's Level: L1-Knowledge;L2-Comprehension;L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Theory & Problems weightage: 40 % Theory & 60% problems

Text Books

1. MaheshwariS.N (2015),Cost Accounting, Mahavir Publications.
2. M Kishore Ravi (2015) ,Taxmann's Cost and Management Accounting,6th Edition.
3. Arora M.N(2019),Cost & Management Accounting, New Delhi. Himalaya Publishing House.

Reference Books

1. Jain & Narang, Cost Accounting (2016), Kalyani Publishers.
2. Shukla M.C.,Grewal T.S. and Gupta M.P.(2013),Cost Accounting Text and Problems: Texts and Problems, S.Chand Publishers.

Pedagogy: Lectures, Cases/Numericals, Field-based assignments

Examination Scheme:

Components	**CT**	**C**	**HA**	**A**	**EE**
Weightage (%)	10	10	5	5	70

C – Case Discussion/ Presentation; HA – Home Assignment; P – Project; S – Seminar; V – Viva; Q – Quiz; CT – Class Test; A – Attendance; EE – End Semester Examination

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	--	--	--	--	2	--	1	2	--	--
CO2	1	1	--	--	--	--	--	1	1	2	--	--
CO3	1	1	--	--	--	--	--	1	1	2	--	--

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CO4	1	1	--	--	--	--	--	1	1	2	--	3
CO5	1	1	--	--	--	--	2	--	1	2	--	--
CO6	1	1	--	--	--	--	--	--	1	2	--	--

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SEMESTER-III

DMGT2351	ORGANIZATIONAL BEHAVIOR AND HUMAN RESOURCE MANAGEMENT	L	T	P	C
Version 1.1	For Approval	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

The course is constructed with an objective to create a deep and nuanced understanding of the behavioural patterns of individual in an organisational setting. Having understood the role of these assumptions, beliefs, values, would enable a leader to be effective and rational decisionmaker. The course is designed to make students interpret the impact of personality and environmental influences on the working of the individual with an organisational setting and equally harness the potentials of human capital with respect to various facets of job and develop his competencies to achieve individual and organisational goals. The focus of the course would be making students understand the motivation, individual differences, group culture and its impact of various functions of HR viz staffing, training & development, career development and appraisals. Thus, this course takes a practical approach that integrates contributions of behavioral sciences with the technical aspects of implementing the HR function in the real world.

Course Objectives

The objectives of this course are to:

1. Appreciate the impact of behavioral sciences on HR management functions.
2. Understand the implications of individual differences on work performance and their group behavior.
3. Understand the dynamics of organizational culture and structure.
4. Get familiarized with various elements of the HR function (e.g. – recruitment, selection, training, and development, etc.)
5. Relate and apply the principles and techniques of human resource management to the real life discussion of critical personnel issues.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Understand the significance of individual attributes in work settings.
CO2: Demonstrate a basic understanding of organizational dynamics, conflicts, and structure.
CO3: Interpret and relate the relationship between various HR functions and personnel growth.
CO4: Understand, analyze, the concepts of basic HR functions and their application in global context.
CO5: Understand the recent advancement in the context of OB and HRM

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Modules	Blooms Level*	Number of hours
Module I: Introduction to OB Introduction to Organizational Behavior – Concept, Definitions, Evolution of OB. Importance of Organizational Behavior – Cross-cultural Dynamics, Creating Ethical Organizational Culture and Climate. Individual and Group Behavior – OB Models and SOBC in Context with Indian OB. Human Relations and Organizational Behaviour.	L1, L2	7
Module II: Foundations of Individual Differences Managing Communication, Perception, Attitude, Personality, Learning, Time Management Strategies. Group: Team Structure and effectiveness, Learning Organization and Organizational Design. Organizational Culture and Change, – Conflict Management Techniques,	L1, L2, L3, L4	14
Module III: Concepts of HRM HRM – Meaning Objectives, Scope, and Functions, HRP – Definition, Objectives, Importance, Factors Affecting HRP, Process of HRP, Strategies of HRM and Global HR Strategies, HRD – Concept, Meaning, Objectives and HRD Functions.	L1, L2,	10
Module IV: Onboarding the talent Recruitment and Selection- factors, methods and process. Induction, Training & Development, Performance & Potential Appraisal – Concept, Process, Methods and Problems, Key Result Area(s)	L1, L2, L3, L4	10
Module V : Wage concepts and Career Planning Compensation – Concept, Components of Pay Structure, Wage and Salary Administration, Incentives and Employee Benefits. Career Planning – Concept of Career Planning, Career Stages and Career Anchors, Succession Planning.	L1, L2, L3, L4, L5	10
Module VI: HRM Trends Rewards and Punishments – Termination, Layoffs, Attrition, Retrenchment, Separation and Downsizing. Industrial Relations, Overview of International and Global HRM, Recent Trends in OB & HRM.	L1, L4, L5,L6	9
Field work	L4, L5,L6	15

***Bloom's Level:**
L1-Knowledge; L2-Comprehension; L3-Application; L4-Anaylysis; L5-Synthesis; L6-Evaluation

Text Books:

- Stephen P. Robbins, Timothy A. Judge (2012), Organisational Behaviour, 15th edition, Prentice Hall.
- David A. Decenzo ,Stephen P. Robbins , Susan L. Verhulst,(2015), Human Resource Management ,eleventh edition , Wiley;
- Prasad. L.M, (2014) Human Resource Management, Third Edition, Sultan Chand & Sons; New Delhi.

Reference Books:

- Chhabra T.N,(2014) Human Resource Management: Concepts and Issues, Edition 2014,Dhanpat Rai & Co
- **Dessler** G (2014) A Framework for Human Resource Management, 7 edition (2014), Pearson Education India;
- Michael Armstrong , Stephen Taylor,(2017), Armstrong's Handbook of Human Resource Management Practice, 14 edition (3 February 2017), Kogan Page

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	Assignment1	Assignment2/live project	Case discussion	Sessional	A	EE
Weightage (%)	5	5	5	10	5	70

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	2	1	2	1	2	1	1	1	3	2	3	2
CO2	2	1	2	1	2	3	1	1	2	2	2	2
CO3	3	1	2	1	2	3	1	1	2	2	2	2
CO4	2	1	2	1	2	2	-1	1	2	2	2	2
CO5	2	1	2	1	2	1	1	1	2	2	2	2

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DMGT2301	ANALYTICAL DECISION MAKING	L	T	P	C
Version	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description
To develop in students skills of analytical and logical reasoning this will be a great asset for them in their future careers. The course covers an array of topics and its content is split across two sections: Arithmetic Ability and Data Interpretation.

Course Objective:
The objective of this course is to
1. Develop in students skills of analytical and logical reasoning this will be a great asset for them in their future careers.

Course Outcomes
On completion of this course, the students will be able to
CO1: Demonstrate his knowledge for competitive exams and job interviews.
CO2: Apply the numerical ability and accuracy in mathematical calculations.
CO3: Explain and Interpret the data in graphical presentation
CO4: Apply logical reasoning to solve problems.
CO5: Apply Communication and writing skills in managerial reporting.
CO6: Demonstrate general knowledge and IQ for a good leader.

Modules	Blooms level*	Number of hours
Module I: Quantitative Reasoning I Number System & Number, Percentage method, Profit & Loss	L3	7
Module II: Quantitative Reasoning II Speed, Time & Distance, Ratio, Proportion, Mixtures & Allegations, Mensuration	L3	8
Module III: Data Interpretation Bar Graph/ Line Graph/ Pie Chart/ Table/ Caselets.	L2, L6	7
Module IV: Data Sufficiency & Logical reasoning Mathematical / reasoning based. Data Decoding: Analytical: Assumption, Courses of Action, Argument, Weak / Strong, Pictorial Analysis	L3	8
Module V: Verbal Ability Vocabulary based questions, English Usage, Grammar Types of statements and their relationship / Reversibility of idea, Re-arranging sentences of a paragraph, Paraphrasing, Fact, Inference, Judgment & deductions. Four types of Passages: The social science passage, The Science passage, the business passage & the entertainment passage.	L3	7
Module VI: General Awareness & Current Affairs Economic, Political, Financial & Social Affairs based on International & Indian Issues.	L3	8
Practice Test		15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

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Text Books

1.Quantitative Aptitude For Competitive Examinations: Abhijit Guha, Tata Mcgraw Hill, 6th edition, 2016

2.A Modern Approach to Verbal & Non-Verbal Reasoning: R. S. Agarwal, S.Chand, 2016

Reference Books

1 Course in Mental Ability and Quantitative Aptitude: Edgar Thorpe, Mcgraw Hill, 1999

2 Ramesh Logical and Analytical Reasoning: A.K. Gupta, 4th edition, 2017

3 Analytical Reasoning: M K Pandey, 3rd edition, 2009

4 The Pearson guide for Data Interpretation & Logical Reasoning for Cat, Nishit k Sinha,2016

5 Arithmetic and Quantitative Aptitude for competitive exams: R. Gopal, J. V. Subrahmanyam, 2009

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	Assignment1	Assignment2/live project	Case discussion	Sessional	A	EE
Weightage (%)	5	5	5	10	5	70

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	--	--	--	--	--	--	1	1	--	--	--
CO2	--	--	--	--	--	--	--	1	1	--	--	--
CO3	--	--	--	--	--	--	2	1	1	--	--	--
CO4	--	--	--	--	--	--	--	1	1	--	--	--
CO5	--	--	1	--	--	--	2	--	1	--	--	--
CO6	--	--	--	--	--	1	--	--	1	--	--	--

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SEMESTER-IV

DMGT2451	FINANCIAL MANAGEMENT	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course focuses on a firm's financial goals and decisions to maximize shareholders' wealth. It examines financial concepts and analytical techniques, financial performance, time value of money, measurement of risk and return, capital budgeting, capital structure, short-term financial planning, working capital management, and international finance.

Course Objectives

The course aims to:

1. Familiar students to take decisions which are effective, a manager in any of the functional areas be it Marketing, HR or IT requires a thorough cost and benefit analysis and a feel for Finance so as to look at the long term implications of his/her decision.
2. An understanding and a feel for Financial decision making.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the theoretical models of financial management in the context of business development.

CO2: Describe and analyse financial decisions made by company managements using accounting and other financial information.

CO3: Analyse and consider time value of money while taking investment decisions.

CO4: Explain theoretical understanding to real life problems, in order to develop possible solutions.

CO5: Identify and apply best investment options estimating future cash flows

CO6: Identify the need of working capital requirement along with inventory management.

CO7: Define the dividend policies and apply theories to practical decisions for dividends.

Modules	Blooms level*	Number of hours
Module I: Introduction to Financial Management Evolution of Financial Management, Key activities of Finance Manager Changing Role of Finance Managers, Key Decision Areas in Financial Management, Objectives of the firm	L1, L2	7
Module II: Financial Statement Analysis Introduction, objectives of financial statement analysis, Techniques-Ratio analysis, Comparative analysis and limitations of financial statement analysis, AS-20 (no numerical)	L1, L2, L4	8
Module III: Valuation Concepts Concept of Time value of Money, Process of Compounding and Discounting, Future Value of a Single amount, Future Value of an Annuity, Present Value of a Single Amount, Present Value of an Annuity, Cost of capital, Weighted average cost of capital, Leverage Analysis	L2,L3	8
Module IV: Financing Decision Capital structure, Factors affecting Capital Structure decisions, Theory of Capital Structure Decisions, MM Theory, NI, NOI and Traditional theory, Pecking order theory.	L2	6

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Module V: Investment Decision Basics of Capital Budgeting, Types of capital budgeting decisions, Estimating cash flows for project appraisal, Green capital budgeting, Non-discounted Cash Flow Techniques: Payback Period, ARR, Discounted Cash Flow Techniques: NPV, IRR, PI. Risk Analysis of Capital Budgeting: Risk adjusted discount rate, Certainty Equivalent Approach.	L2,L4	6
Module VI: Working Capital Management Meaning and importance of adequate working capital, Excess or Inadequate working capital, Determinants of working capital requirement, Cash management, Receivable management and Inventory management – Sources of working capital.	L1,L2, L3	5
Module VII: Dividend Decisions Importance of dividend decisions, Theories of Dividend decisions: Irrelevance theory, Optimal dividend decision, Relevance theory, Determinants of dividend policy: Bonus Shares, Stock Splits & Buyback of shares. Tax considerations.	L1,L2	4
Fieldwork		15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Book

Pandey, I. M, (2010), Financial Management. 10th Edition, Vikas Publishing House Pvt. Ltd.

Reference Books

1. Van Horne, J.C (2008), Financial Management & Policy, 13th Edition, Prentice Hall, 2008
2. Chandra, P., Fundamentals of Financial Management, 7th Edition, Tata McGraw Hill.
3. Brearly R.A. and Myers, S.C. Principles of Corporate Finance,12th Edition, Tata Mc- Graw Hill, 2018

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CT	HA	C	V	Att	EE
Weightage (%)	10	5	5	5	5	70

CT: Class Test, HA: Home Assignment, V: Viva, EE: End Semester Examination; Att: Attendance, C: Case Analysis

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	--	--	--	--	--	--	--	1	--	--	--
CO2	1	2	--	--	--	--	--	--	1	--	--	--
CO3	1	--	--	--	--	--	--	1	1	--	--	--
CO4	1	1	--	--	--	--	--	--	1	--	--	--
CO5	1	1	--	--	--	--	--	--	1	--	--	--
CO6	1	1	--	--	--	--	--	--	1	--	--	--
CO7	1	1	--	--	--	--	--	--	1	--	--	--

1: strongly related, 2: moderately related and 3: weakly related

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DMGT2401	LEGAL ASPECTS OF BUSINESS	2	0	0	2
Version 1.1	Latest Approved				
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course introduces the student to the legal and ethical framework of business. Contracts, negotiable instruments, the law of sales, torts, crimes, constitutional law, and companies act. Upon completion the student should be able to identify legal and ethical issues that arise in business decisions and the laws that apply to them.

Course Objectives:

The objective of the course is to:

1. Understand introduces the student to the legal and ethical framework of business
2. Understand Contracts, negotiable instruments, the law of sales, torts, crimes, constitutional law, and companies act.

Course Outcomes

On completion of this course, the students will be able to

CO1: Describe the importance of law and legal environment of business.
CO2: Explain Indian Contract Act, 1872 and its main provisions.
CO3:Explain Indian Sale of Goods Act, 1930 and its main provisions.
CO4: Explain Negotiable Instruments Act, 1881 and its main provisions.
CO5: Explain Elements of Company Law and its main provisions.
CO6: Explain Consumer Protection Act 1986 and its main provisions

Modules	Blooms level*	Number of hours
Module I: Legal Environment of Business Importance of Law, Legal environment of business, Sources of law, Function of law**.**	L1, L2	7
Module II: Indian Contract Act, 1872 Nature and kinds of Contracts, Concepts related to offer, Acceptance and Consideration, Principles Governing Capacity of Parties and Free Consent, Legality of Objects, Performance and Discharge of Contract, Breach of Contract and its Remedies, Basic Elements of Law Relating to Agency, Guarantee and Pledge	L1, L2	7
Module III: Indian Sale of Goods Act, 1930 Sale and Agreement to Sell, Hire Purchase, Pledge, Mortgage, Hypothecation Lease, Goods, Different types of Goods, Passing of Property in Goods, Conditions and Warranties, Doctrine of Caveat emptor, Rights of an unpaid Seller.	L1, L2	8
Module IV: Negotiable Instruments Act, 1881 Meaning of Negotiability and Definition of Negotiable Instruments, Features, Cheques, Bill of Exchange and Promissory Note, Holder in Due Course, Crossing of Cheques, Endorsement and Dishonour of Cheques	L1,L2	8

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Module V: Elements of Company Law Meaning and types of companies, Formation of a company, Memorandum and Articles of Association, Prospectus and Issue of Shares, Share Capital and Shareholders, Company Meetings and Proceedings, Powers and Liabilities of Directors, meeting, Managerial Remuneration and Winding up of Company	L1, L2	7
Module VI: Consumer Protection Act 1986 and Torts Need for Consumer Protection, Meaning of Consumer, Different Redressal Forums for Consumers, Rights of Consumers, Unfair Trade Practices, and Procedure for Filing Complaints, Meaning of tort, Application of Tortuous Liability in Business Situations**.**	L1, L2	8
Field work	L1,L2,L3,L4,L5	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books:

1.Kapoor, N.D. Business Law (2019) , Sultan Chand & Sons (P) Ltd. (20 July 2019)
2.P.K Goel, (2006) Business Law for managers Wiley

Reference Books:

1.Shukla, S.M. and Gupta, (2015)O P, Mercantile Law.(Sahitya Bhawan Publishers & Distributors Pvt. Ltd.
2.S. S. Gulshan Mercantile Law, (2019)New Age International
3.Maheshwari & Maheshwari Business Law. (2014)Himalaya Pub. House-New Delhi

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CPA**	**TP**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	5	5	5	5	10	70

C - Case Discussion/ Presentation; HA - Home Assignment; V - Viva; CT- Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	PSO1	PSO2	PSO3	PSO4
CO1	1	1	-	-	-	-	-	-	1	-	-	-
CO2	1	1	-	-	-	-	-	-	1	-	-	-
CO3	1	1	-	-	-	-	-	-	1	-	-	-
CO4	1	1	-	-	-	-	-	-	1	-	-	-
CO5	1	1	-	-	-	-	-	-	1	-	-	-
CO6	1	1	-	-	-	-	-	-	1	-	-	-

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DMGT2402	MANAGERIAL ECONOMICS	L	T	P	C
Version 1.1	Latest Approved	2	0	0	2
Pre-requisites/Exposure	Basic knowledge of economic science preferred but not compulsory				
Co-requisites					

Catalog Description

In this course the students are introduced with various basic concepts of managerial economics to make them familiarize with undergraduate level working knowledge. To begin with, introductory concepts of economics, consumer behavior and utility theory are discussed. Thereafter concepts related to demand analysis, demand forecasting, supply analysis, and equilibrium market conditions are discussed in detail. The next phase deals extensively concepts related to production theory, cost theory and revenue aspects. Following that various macroeconomic concepts and business phases along with their implications are analyzed in detail. Finally, various concepts related to market structure are discussed in detail. The overall aim of this course is to make the students familiar with working knowledge of the fundamentals of managerial economics as part of rational choice decision science.

Course Objectives:

The objective of this course is to:

1. Make students aware of theoretical concepts of economic science so that they can analyze situations and improve upon their managerial decision process.
2. Provide students with extensive exposure about the micro and macro level variables that influence business and managerial strategies of the firm and business cycles under which they operate.

Course Outcomes:

On completion of this course, the students will be able to:

CO1: Explain basic concepts of economic analysis, utility theory, demand and supply dynamics, demand forecasting techniques and their application, and analyze the working of free market mechanism.

CO2: Analyze the relevant production and cost concepts along with revenue in managerial decision process.

CO3: Describe the various forms of market structure and their implications in economy.

CO4: Discuss holistically the various macroeconomic aspects of business decision process along with complexities of business phases.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Managerial Economics Nature, Scope, Definitions of Managerial Economics, Application of Managerial Economics to Business, Micro Vs. Macro Economics, Opportunity Costs, Time Value of Money, Marginalism, Incrementalism, Market Forces and Equilibrium.	L1, L2, L4	7
MODULE 2: Consumer Behaviour and Demand Analysis Cardinal Utility Approach: Diminishing Marginal Utility, Law of Equi-Marginal Utility, Ordinal Utility Approach: Indifference Curves, Marginal Rate of Substitution, Budget Line and Consumer Equilibrium, Theory of Demand, Law of Demand, Movement along vs. Shift in Demand Curve, Concept of Measurement of Elasticity of Demand, Factors Affecting Elasticity of Demand, Income Elasticity of Demand, Cross Elasticity of Demand. Production with one variable input, Production and optimal input proportions, two variable inputs, Law of variable proportions and law of return to scale, Cost Concepts, Theory of costs in short run and long run.	L1, L2, L4, L5	12

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MODULE 3: Theory of Production, Cost and Firm's Behaviour Meaning and concept of Production, Factors of Production and Production Function, Fixed and Variable Factors, Law of Variable Proportion (Short Run Production Analysis), Law of Returns to a Scale (Long Analysis), Concept of Cost, Cost Function, Short Run Cost, Long Run Cost, Economics and Diseconomies of Scale, Explicit cost and Implicit Cost, Private and Social Cost	L1, L2, L4, L5	9
MODULE 4: Macro Economics and Business Decisions Phases of Business cycle - Evil effects of cyclical fluctuations on business firms - Minimizing effects of Business cycles, Economic and Business forecasting - uses of economic forecasts - Methods of economic forecasting - selecting a forecast - evaluating forecasts.	L1, L2, L4	9
MODULE 5: Price and Output Decisions under Different Market Structures Price and Output Decisions under Perfect Competition, Monopoly and Monopolistic Competition - Pricing under Oligopoly - Kinked Demand Curve - Price Leadership - Pricing under Collusion.	L1, L2, L4	8
Field work	L1,L2,L3,L4,L5	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. Dwivedi, D. N., Managerial Economics, 7th Edition, Vikas Publishing House.
2. Gould John P. and Edward P. Lazear Micro Economic Theory, All India Traveller Book-seller, New Delhi.
3. Koutsoyiannis Modern Micro Economics, Macmillan Press Limited, New Delhi.
4. Dewett. K.K. Micro Economics, S. Chand &Co, New Delhi

Reference Books

1. Ahuja, H.L. Advanced Economic Theory (Micro Economics), S. Chand & Co, New Delhi
2. Browning Edgar K. & Jacquel Line M. Browning, Micro Economics and Application, Kalyani Publishers, New Delhi.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	1	--	--	--	--	--	--	1	--	--	--
CO2	1	1	--	--	--	--	--	--	1	--	--	--
CO3	1	1	--	--	--	--	--	--	1	2	2	2
CO4	1	1	--	--	--	--	--	--	1	2	1	1

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SEMESTER-V

DMGT2551	OPERATIONS AND SUPPLY CHAIN MANAGEMENT	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description
Operations and Supply chain are an integral contributor to an organisation's top and bottom line success. This course is based on a foundation in the theories and practice of management in businesses where operations and supply chain management are critical to success. These include product and process design, choosing appropriate technology, adopting efficient work methods, planning (including location and facilities layout), streamlining the flow of people and materials, and continuously improving the quality of the final product, in order to create internal and external customer value.

Course Objectives:
The objectives of this course are to:
1. Provide and practice of management in businesses.
2. Make them aware regarding planning.
3. Know product and process design, appropriate technology, adopting efficient work methods

Course Outcomes
On completion of this course, the students will be able to:
CO1: Demonstrate ability to systematically analyse operational and supply chain strategies in the light of the emerging supply chain frameworks and business models;
CO2: Develop business, operations and supply chain management strategies using strategic alignment model;
CO3: Effectively apply the alignment model and assess the strategic needs of business and supply chain networks;
CO4: Evaluate emerging operations initiatives for supply chain collaboration and their strategic implication;
CO5: Integrate organisational changes related to supply chain strategy implementation

Modules	Blooms level*	Number of hours
Module I: Introduction, Significance of POM in business, POM model and its elements, Scope of POM, History of POM.	L1, L2	2
Module II: **Competitive Advantage through operations management** Competitive Advantage through POM, Critical factors for gaining competitive advantage,Operations models, Operations strategy Case discussion	L1, L2, L3	3
Module III: **Product** Product – levels, types, categories Product design and development Commercial production and launch Support and up-gradation	L1, L2, L3	5

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Module IV:Processes and Technology Types of productive systems Types of production processes Comparison of production processes Case discussion	L1,L2	5
Module V: Forecasting Significance of forecasting for operations management Forecasting techniques Mathematical models and their practical applications Forecasting errors. Laws of forecasting and how they affect operations	L1, L2	5
Module VI: Planning and Scheduling Operations Planning and Scheduling Long range and aggregate output planning Master production schedules Functional planning and production control Operations scheduling Case discussion **Module VII: Quality Management** Quality management SQT, AS, SQC, SPC and practical applications Case discussion	L1,L3,L6	5
Module VIII: Performance improvement in operations Latest techniques in operations management Just-In-Time technique Ergonomics and work study Case discussion **Module IX: Operations Management in the Indian context** Implementation of operations management techniques by Indian companies Case discussion	L1, l2	5
Module X: Supply Chain Management Operations capacity Capacity measures Capacity planning process Evaluation of alternatives for capacity expansion	L1, L2, L6	5
Module XI: Site Location and Layout Planning Factors affecting site location decisions Evaluation of site location options Objectives of layout planning Types of layouts Designing of layouts	L1, l2	5
Module XII: Supply Chain Management Basic Concepts Characteristics of business partners of a supply chain. Elements of supply chain management systems Demand management, customer service management Procurement, Outsourcing, supplier relationship management Physical distribution management, returns management	L1, l2	5

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

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Text Books:

Norman Gaither & Greg Frazier, 2005, Operations Management - Thomson , South Western

Reference Books:

1. E Adam and Ronald J Ebert, 2005, Production and Operations Management, Prentice Hall of India
2. Cecil Bozarth and Robert B. Handfield, Introduction to Operations and Supply Chain Management 2nd Edition, 2007Roberta (Robin) Russell and Bernard W. Taylor, Operations Management: Creating value along the Supply Chain, 2007
3. Roberta (Robin) Russell and Bernard W. Taylor, Operations Management: Creating value along the Supply Chain, 6th Edition , Loose Leaf, 2008
4. Terry P. Harrison, Hau L. Lee, and John J. Neale, The Practice of Supply Chain Management: Where theory and application converge (International Series in Operations Research & Management Science),2005
5. Sunil Chopra and Peter Meindl, Supply Chain Management: Strategy, Planning and Operations, 2000
6. David L. Taylor and David Brunt, Manufacturing Operations and Supply Chain Management: The LEAN Approach, 2000
7. John Tom Mentzer, Matthew B. Myers, and Theodore P. Handbook of Global Supply Chain Management,2006

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

CPA: Case Discussion/Presentation/Analysis V: Viva A: Attendance CT: Class Test EE: End Term Examination

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO1	1	1	-	-	-	-	-	-	-	1	-	2
CO2	1	1	-	-	-	-	-	-	-	1	-	2
CO3	1	1	-	-	-	-	-	-	-	1	-	2
CO4	1	1	-	-	-	-	-	-	-	2	-	2
CO5	1	1	-	-	-	-	-	-	-	1	-	1

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DMGT2501	STATISTICS IN RESEARCH	L	T	P	C
Version 1.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description
The course teaches students the basics of descriptive statistics. It sets a necessary foundation for the study of inferential statistics in the programme.

Course Objective:
1. This course will deal with all fundamental statistical methods of tools that the students have to use in economic analysis and decision-making problems.
2. The student will understand the concepts in descriptive statistics and be familiar with some commonly used statistical techniques like correlation, regression, index numbers and time series analysis.

Course Outcome:
Upon successful completion of the course, a student will be able to:
CO1: Define statistical methods and provide an insight into their uses in economics
CO2: Demonstrate the application of a range of statistical techniques to economic problems
CO3: Apply Skills in describing, analysing and interpreting statistical data
CO4: Comprehend the principles and assumptions on which these procedures are based
CO5: Apply the ability to analyse statistical data using MS Excel
CO6: Apply the ability to relate statistical methodology to economic enquiry

Modules	Blooms level*	Number of hours
Module I : Introduction: Basic concepts: Population, Sample, Parameter, Statistic, Frequency distribution, Cumulative frequency distribution; Graphic and diagrammatic representation of data; Techniques of data collection. Sampling vs. Population, primary and secondary data.	L1, L2, L3, L4, L5, L6	15
Module II: Central Tendency and Dispersion: Measures of Central Tendency: Mean, Median, Mode, Geometric mean, Harmonic mean; Measures of Dispersion; Range, Quartile deviation Mean deviation, Standard deviation; Skewness and Kurtosis, Moments.	L1, L2, L3, L4, L5, L6	12
Module III: Correlation and Regression: Correlation: Simple; Coefficient of correlation; Karl Pearson and Rank correlation; Partial and Multiple Correlation analysis; Regression analysis – Estimation of a regression line in a bivariate distribution, Least squares method; Interpretation of correlation and regression coefficients; Coefficient of determination.	L1, L2, L3, L4, L5, L6	12
Module IV: Time Series: Time Series Analysis - concept and components, determination of trend (Linear, Quadratic and Exponential) and seasonal indices	L1, L2, L3, L4, L5, L6	12

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Module V: Index Numbers Concept of an index number; Laspeyer's, Paasche's and Fisher's Index Numbers; Chain base index; Problems in the Construction of an index number; splicing; base shifting and use of index number for deflating other series.	L1, L2, L3, L4, L5, L6	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

References

Main text

1. Anderson David R, Sweeny Dennis J, Williams Thomas A. (2022) *Statistics for Business and Economics* (11th edition), Centage Learning**:** Delhi

Additional Texts:

2. Keller Gerald, Warrack Brian, (2013), *Statistics for Management and Economics*, Thomson: Singapore.
3. Douglas A. Lind, William G. Marchal, Samuel A.Wathen, (2012) *Statistical Techniques in Business & Economics*, (15th Edition), McGraw-Hill: New York
4. David M. Levine, David F. Stephan, Kathryn A. Szabat, (2017). *Statistics for Managers Using Microsoft® Excel*, (8th Edition), Pearson: Edinburg
5. **George Argyrous**, (2012). *Statistics for Research: With a Guide to SPSS.* (3rd Edition), Sage: New Delhi

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	1	3	1	1	2	2	2	3	3	--	--
CO2	1	2	--	1	1	2	2	1	2	--	--	--
CO3	1	2	-	1	1	3	3	3	-	--	--	--
CO4	2	1	--	1	1	--	2	--	--	--	3	--
CO5	2	2	-	1	1	--	--	--	--	--	2	--
CO6	2	2	--	1	1	--	--	--	--	-	--	--

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DMKT2501	ADVERTISING & SALES PROMOTION	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

In this course, the concept of advertisement management, advertising objectives & budget setting, message and media tactics, and sales promotion are discussed in detail. Various relevant concepts such as creative approaches, copywriting, illustrations, understanding consumer behaviour are also discussed in detail. The aim of the course is to familiarize students with advertising concepts and strategies, the methods and tools used. and

Course Objectives

The objective of this course is to

1. Enable the students to develop advertising strategies and plans.
2. Develop the judgment parameters required in product management, to evaluate advertising effectiveness.

Course Outcomes

On completion of this course, the students will be able to

CO1: Analyse the expanding environment of media and communication techniques.

CO2: Assess the strengths, weaknesses, opportunities and threats (SWOT) of different kinds of promotional campaigns.

CO3: Examine the importance of market segmentation, position and action objectives to the development of an advertising and promotion program.

CO4: Develop creative strategies for advertising.

CO5: Plan media strategy, scheduling, and vehicle selection.

CO6: Assess strategic uses of sales promotions.

Modules	Blooms level*	Number of hours
MODULE I- Introduction Promotion Mix – Promotion & Its objectives; Role of Promotion in Marketing Mix; Components of promotion mix viz Advertising Publicity, Personal selling, Public relations and Sales promotion, Concept of integrated marketing communication.	L1, L2 ,L3,L4	5
MODULE 2: Advertising Need, scope objectives and importance of advertising, Strengths and Weaknesses of Advertising as a Promotion Tool, role of advertising in current market, advertising and society- latest trends in advertisements different types of advertisements.	L1, L2, L3	6
MODULE 3: Advertising Campaign Planning Setting advertising goals and objectives- The DAGMAR Approach, Message strategies and tactics- Creative approaches, Copywriting and testing, Advertising copy design, Copy layout, Advertising appeals and themes, Classification of advertisement copies-Essentials of a good copy Ethics in advertising.	L1, L2, L3, L4, L5	12
MODULE 4: Advertising Media and Agencies Types of media, media planning and scheduling, Advertising budgets, Approaches to advertising budgeting, Measuring advertising effectiveness, Advertising business in India, Rural advertising, Legal and ethical aspects of advertising, Advertising in international perspective.	L1, L2, L3,L6	12
MODULE 5: Sales Promotion Need, Scope, Objectives and Importance of sales promotion, Management of sales	L1, L2, L4	5

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Promotion at the consumer, Trade and sales force levels, Strengths and weaknesses of Sales Promotion.		
Module VI: Sales Promotion Strategy Planning and designing sales promotion programme with specific reference to sales contest, Trade in discount coupons etc. Sales display and merchandising, Latest trends in sales promotion.	L1,L2, L3	5
Tutorial: **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3 , L4	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis; L6-Evaluation*

Text Books

1.Belch and Belch, Advertising and Promotion, Sixth Edition, Tata McGraw Hill .

2.Arens, W. F. (2008). *Contemporary advertising*. New Delhi: Prentice Hall.

Reference Books

1. Batra Rajeev, Aaker, David A and Myere John G. Advertising Management, Fifth Edition, Pearson Education
2. Advertising Management – Chunawalla

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CT**	**HA**	**C**	**V**	**A**	**EE**
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	--	--	--	1	--	--	1	1	--	1	1
CO2	1	--	--	--	--	--	--	1	1	--	1	1
CO3	1	--	--	--	--	--	--	1	1	--	1	1
CO4	1	--	--	--	--	--	1	1	1	--	1	1
CO5	1	1	1	--	--	--	---	1	1	--	1	1
CO6	1	1	1	--	--	--	---	1	1	--	1	1

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DMKT2502	INTERNATIONAL MARKETING	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

In today's dynamic global scenario people who succeed will have to learn the art of managing functions across domestic borders. Thus the course aims at exposing the students to the international business activities. The course would develop a general perspective about managing international business both in operational as well as strategic context.

Course Objectives

The objective of this course is to

1. Provide an overview of International Marketing Environment and marketing strategies for entering into international markets and managing overseas operations.
2. Explore all aspects of marketing from a global perspective to better respond to international opportunities and competitive situations.
3. Comprehend the International Marketing Decisions, based upon the combination of pricing, branding, promotion, and distribution elements.

Course Outcomes

On completion of this course, the students will be able to

CO1: Apply basic international marketing concept, theories and understand the business environment.
CO2: Appraise strategic business analysis in order to develop appropriate international marketing objectives and strategies.
CO3: Identify, analyze, and evaluate data, information and evidence related to international business opportunities and threats relevant in the current world.
CO4: Develop a marketing mix suitable to a variety of international markets.
CO5: Prepare an international marketing plan.

Modules	Blooms level*	Number of hours
Module I: Introduction to International Marketing Concept of International Marketing, Domestic vs. International marketing, International trade theories of: absolute advantage, comparative advantage and IPLC; Importance of International Marketing, International marketing orientations, Internationalization of Indian Firms Framework.	L2,L3	9
Module II: International Marketing Environment & Business Strategies International Marketing Environment-Economic Environment, Social & Cultural environment, Political &Legal Environment. International Business Strategies- International Market Entry& Expansion Strategies, Stages of Development Models.	L2, L6	9

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Module III: Product& Price Strategy for International Market Product Strategy for International Market -Identification of products for International Markets, Product Standardization vs Adaptation in International Markets, New product launch for International Markets, Concept of International Product Life cycle theory, Role of Services in International Market. Pricing Strategy for International Market- Pricing Approaches for International Markets, Terms of delivery & payment in International Transactions, Counter Trade, Dumping, Grey Marketing, Transfer Pricing.	L2, L4,L6	9
Module IV: Distribution &Promotion Strategy for International Market Distribution strategy for International Market- Concept of International distribution, Types of distribution Channels, Channel Intermediaries in International Markets, Structure of Distribution Channels in International Markets. Promotion Strategy for International Market- International Marketing Communication Mix, Tools for International Communication, International Trade Fairs & Exhibitions.	L2,L5	9
Module V- Contemporary Issues in International Marketing Global E- Marketing, Emerging issues in International Marketing, Ethical Issues in International Marketing, India: Emerges at the Global Stage	L5, L6	9
Field work	L1,L2,L3,L4,L5	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books:

1. Keegan Warren & Bhargava Naval (2011), Global Marketing Management, Pearson
2. Cateora Philip, Graham John & Salwan Prashant (2010), International Marketing, Mc Graw Hill
3. Paul Justin & Kapoor Ramneek (2010), International Marketing, Mc Graw Hill

Reference Books:

1. Joshi Rakesh Mohan (2009), International Business, Oxford Higher Education
2. Vasudeva PK (2010), International Marketing, Excel Books
3. Harvard Business Review, Global Business Review (Sage Publications), Global Forum – ITC Geneva

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CPA**	**TP**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	5	5	5	5	10	70

CPA: Case Discussion/Presentation/Analysis, TP: Project, Q/S:Quiz/Seminar
A: Attendance, ME: Mid Term Exam, EE: End Term Examination

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DHRM2501	ORGANISATIONAL DEVELOMENT AND CHANGE	L	T	P	C
Version 1.1	Latest approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This subject aims to provide a conceptual understanding of organizational change and development its meaning, characteristics, process and influences of organizational development and change process in organization. It gives comprehensive overview of human capital from the prospective of organizational excellence in the light of transitional phase of Indian Industries. It gives the imperatives, assumptions, role and skills of O.D. specialists through experiential learning methods. It facilitates teamwork, team building and the concepts of transformational Leadership.

Course Objectives

The objective of this course is to

1. Provide an overview of need of organizational change and development in changing business environment.
2. Understand and apply the scientific approach of organizational development interventions in bringing change in working of individuals, team, process, structure and strategies of the organization, to maximize the output from individual and group members

Course Outcomes

On completion of this course, the students will be able to

CO1: Define the various basics of organizational change and development,

CO2: Discuss OD its process, and Role & styles of OD practitioners.

CO3: Describe the need for the change, Factors causing change, Models and Techniques involved in change management.

CO4*:* Discuss the different OD interventions institutionalization of interventions.

CO5: evaluate the use OD interventions in organizational settings.

Modules	Blooms level*	Number of hours
Module I: Organizational Development Nature, Assumptions, Characteristics & Importance, Values and assumption.	L1, L2	5
Module II: Organizational Development Process Steps involved in OD, Role of Managers, Factors affecting OD	L1, L2	5
Module III: Implementation of Change Models Lewin's force field analysis, Kotler's eight step model, action research model	L1, L2	5
Module IV: Structural and Comprehensive OD Interventions Classification of OD interventions: Human Process, Techno structural, HRM, Strategic interventions, Evaluation and institutionalization of interventions	L1,L2,L6	12
Module V: Change Management Need for the change, Factors causing change, environmental, Technological, Legal, Political, Social and cultural factors of change, Models and Techniques involved in change management, Total Quality Management, Business Process Reengineering, Learning Organization.	L1, L2	10

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Module VI: OD Process (3) OD process, Role & styles of OD practitioners, contemporary OD issues for today's managers.	L1, L2	8
Tutorial': Flip Classes/Field projects/Assignments/Presentations	L4,L5	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text Books:

1.*Thomas G. Cummings and Christopher G. Worley (2008), Organization Development and Change, 9th Edition, Cengage Learning.*

2.*French W L & Bell, Organizational Development, Prentice Hall of India*

Reference Books:

1.*Ravishankar S & Mishra R.K., Organizational Development, Visison Books Pvt. Ltd.*

2.*Pereek U &Rao T V, Designing &Managing HR System, Oxford &IBH Publishing company*

3.*Pereek U & Rao T V, Making Organization Roles Effective, TATA McGraw Hill*

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CPA**	**TP**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	5	5	5	5	10	70

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	PSO1	PSO2	PSO3	PSO4
CO1	1	-	-	-	-	-	-	-	-	1	-	-
CO2	1	-	-	-	-	-	-	-	-	1	-	-
CO3	1	-	-	-	-	-	-	-	-	1	-	-
CO4	1	2	-	-	-	-	-	-	-	1	-	-
CO5	1	2	-	-	-	-	-	-	-	1	-	-

1: strongly related, 2: moderately related and 3: weakly related

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DHRM2502	PERFORMANCE AND COMPETENCY MANAGEMENT	L	T	P	C
Version 1.1	Latest Approved	3	0	1	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description
This course will help students to understand the significance of appraisal for an Organization and Individual. It will develop an understanding of various appraisal methods and measurements to manage the performances of employees. It would also provide an insight into the fundamentals of competency management

Course Objectives
This course will help students to:

1. Understand the significance of appraisal for an Organization and Individual.
2. Develop an understanding of various appraisal methods and measurements to manage the performances of employees.
3. Provide an insight into the fundamentals of competency management.

Course Outcomes
On completion of this course, the students will be able to:
CO1: Identify performance aims, objectives, priorities and targets.
CO2: Explain effective performance management practices and policies to improve organizational and employee performance
CO3: Describe the importance of defining roles, identifying competencies, and hiring, training, coaching and counselling for skills needed for successful job performance.
CO4 :Describe an organization's performance management process that is compliant with law and supports organizational mission and strategy

Modules	Blooms level*	Number of hours
Module I: Introduction to Performance Management Conceptual Approach to Performance Management, Determinants of Job Performance: Person and System Factor, Components of Effective Performance Management, Performance Management Cycle Linkage of performance management system with HR Practices.	L1, L2	9
Module II: Process of Performance Appraisal Need And Methods for Performance Appraisal, RSDQ Model, Performance Review - Reengineering Performance Appraisal System, Performance Analysis, Performance Review Discussion, Performance Monitoring and Feedback. Linkage pays with performance	L1, L2	9
Module III: Competency Mapping Concept and Definition of Role and Competency, Characteristics of Competency, Competency Versus Competence, Performance Versus Competency, Types of Competencies, Context and Relevance of Competencies in Modern Organizations.	L1, L2	9
Module IV: Competency Management Framework Macro View of Competency Management Framework, Strategic Framework, Lancaster Model of Managerial Competence, Competency Modeling Framework	L1,L2	9

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Module V: **Competency Mapping as a Performance Management Tool** Building Competency Models, TheMcBer Generic Managerial Competency Model, Competency Causal Flow Model, Factors Affecting The Human Performance System, Profiling Competency Framework for a Particular Role, Competency Gap	L1, L2	9
P - Project; This would be the field project related to the subject where the student need to work outside the class collect the data and make report	L3 L4	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text & Reference Books:

1. Armstrong, Michael and Berron, Angela (2008), Performance Management and Development, Jaico Publications,1st edition.
2. Rao T V (2008), Performance Management and Appraisal Systems-HR Tools for Global Competitiveness, Response Books
3. Cardy Robert L. (2008), Performance Management Concepts, Skills and Exercises, Prentice Hall India
4. Sahu R K (2007), Performance Management System, Excel Books
5. Sanghi, Seema, The Handbook of Competency Mapping,2016, Sage Publications India Pvt. Ltd.
6. Sharma, Radha, 360 degree feedback, competency mapping and assessment centres, TMH, 2003

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CPA**	**TP**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	5	5	5	5	10	70

CT: Class Test; HA: Home Assignment ; Q: Quiz; V: Viva-voce; A: Attendance ; EE: End Semester Examination

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	-	-	-	-	-	-	-	-	-	1	--	--
CO2	1	-	-	-	-	-	-	-	-	-	1	--	--
CO3	1	-	-	-	-	-	-	-	-	-	1	--	--
CO4	1	-	-	-	-	-	-	-	-	-	1	--	--

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DFIN2501	PRINCIPLES OF INVESTMENT MANAGEMENT	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Investment management is all about investment decisions and asset allocation. This means coming up with investment strategies and directing funds to property, equities, or debt securities on behalf of clients. Investment bankers, by contrast, are deal-makers. They work as high-level consultants and analysts for large companies to help with capital raising strategies.

Course Objectives

The aim of the course is to

1. Quip students with financial tools, which help in making decisions for investment in financial securities.
2. Impart a basic understanding of the influence of changing economic scenario on the decisions and important theories and models, techniques and regulations underlying these decisions.

Course Outcomes:

On successful completion of this module a student should be able to:

CO1: Name different financial market structures, players including their roles and respective stakeholders

CO2: Develop a basic knowledge of key financial markets, major product types, and the scope for misconduct, agency failures and moral hazard

CO3: Identify the aims, role and structures to provide financial markets supervision including their limitations and recent criticisms

CO4: Identify the key theories for corporate governance and risk governance practices for financial institutions, and how governance mechanism may interact to impact performance or risk-taking

CO5: Examine the potential for ethical behaviour and improved conduct to fill the void where law and regulations fail to succeed

Modules	Blooms level*	Number of hours
Module I: Introduction to Investments Investments: Introduction, Avenues for Investment including introduction to derivatives, Investments and Speculation, Features of a Good Investment programme, Process of Investment Decision Making, Risks involved in Investments including the concept of beta, Principle of Dominance.	L1,L2, L3	10
Module II: The Stock Markets in India Nature and Functions of the Stock Market, OTCEI & BSE, NSE & Role of Depositories, Market Indices, Brokerage Business	L1, L2, L3	10
Module III: Valuation of Securities Bond Valuation and Analysis, Preference share Valuation and Analysis, Equity Share Valuation	L1, L3,L4	10
Module IV:Security Analysis Fundamental Security Analysis, Technical Security Analysis	L1, L3,L4	10
Module V: Portfolio Analysis and Management	L1,L	5

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Portfolio Analysis: Risk and Return, Portfolio Choice: Utility Theory and Indifference Curves, Markowitz: Portfolio Selection Model, Capital Asset Pricing Model, Sharpe's Single Index Model and Portfolio Evaluation Treynor, Sharpe and Jensen		
Tutorial': Flip Classes/Field projects/Assignments/Presentations	L4,L5,L6	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Book

Sharpe, William F. Alexander and Bailey, Investments, Sixth Edition, Prentice - Hall, India

Reference Books:

1. Fisher, Donald E & Jordan, Ronald., Securities Analysis & Portfolio Management:, Sixth Edition, Prentice Hall
2. Haugen, Robert. Modern Investment Theory, Fifth Edition, Prentice Hall
3. Bhalla, V. K. Investment Management, S. Chand & Co. New Delhi.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CPA**	**TP**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	**5**	**5**	**5**	**5**	**10**	**70**

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	2					1	1	2		
CO2	1	1	2					1	1	2	2	
CO3	1	1	2					1	1			
CO4	1	1	2					1	1			
CO5	1	1	2					1	1			

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DFIN2502	FINANCIAL SERVICES	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Financial services are the economic services provided by the finance industry, which encompasses a broad range of businesses that manage money, including credit unions , banks leasing, hire purchase and consumer credit companies, stock brokerages, unions, banks, leasing, hire purchase and consumer credit insurance companies, accountancy companies, consumer-finance companies, stock brokerages, investment funds, individual managers and some government-sponsored enterprises.

Course Objectives

The objective of this course is to

1. Understand role of financial services in producing and maximizing value.
2. Understand the basic financial services and their needs and factors determining dynamism in the financial services industry.
3. Understand the interface of regulators and managers for quantifying and dealing with critical factors affecting the financial services industry.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Outline the Indian Financial systems with various financial instruments.

CO2: Comparing the various investment avenues with risk and return trade off.

CO3: Analyse the various instruments traded in capital markets, merchant & Investment Banking and apply stock trading techniques.

CO4. Review the process of leasing, hire purchase and consumer credit.

CO5: Analyse the workings of financial markets , financial instruments and financial services with the respective regulatory frame work.

Modules	Blooms level*	Number of hours
Module I: Introduction Financial services and Value production, Value added in Financial Services, ROI in Financial Services, Elements in the Financial Services value chain, Role of Financial Services in Economic Development .	L1,L2,L4	4
Module II: Merchant & Investment Banking Meaning, Importance & Role in the Indian Financial System, Corporate Counselling, Project Counselling and Appraisal, Loan Syndication and Accessing Debt and Capital Markets, Procedural aspects of public issues, bought out deals, Book Building, Pre-Issue Decision; Post Issue Management and related provisions of Companies Act and SEBI guidelines for Protection of Interests of Investors, New Products in Capital Markets.	L1, L2, L4	9
Module III: Leasing Hire Purchase and Consumer Credit Development of Leasing Hire Purchase and Consumer Credit, Types of Leasing, Pricing Methodology and Financial Analysis, Taxation, Legal Framework for Leasing and Hire Purchase Companies, Leasing Vs. Buying-NPV, Securitization, Banking Services related to leasing.	L1, L2,L6	6

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Module IV: Venture Capital Financing International Experiences in Venture Capital Financing, Venture Capital Financing in India, Pitfalls to be Avoided, Private Equity and growth of Entrepreneurship.	L1, L2, L4	5
Module V: Mutual Funds Mutual Funds types, Exchange Traded Funds, Fund of Funds, Organization and Management, Regulations of Mutual Funds .	L1, L2, L4	6
Module VI: Other Financial services Factoring Services - Features, Merits and Demerits, Cost Benefit Analysis, Forfeiting – Features, Merits and Demerits, Credit Rating: Concept of Credit Rating, Types of Credit Rating, Advantages and Disadvantages of Credit Rating, Credit Rating Agencies and Their Methodology and Process, Individual Credit Rating, Sovereign Credit Rating Practices, Indian Experience up to now, Housing Finance, Custodial Services	L1, L2,L4	8
Module VII: An introduction to marketing of Financial Services Features Marketing Of Financial Services, Cross Selling of Banking Services, Up-Selling, Wealth Management.	L1,L2,L4	7
Field work	L1,L2,L3,L4,L5	15

**Bloom's Level: L1-Knowledge;L2-Comprehension;L3-Application;L4:Analysis; L5:Synthesis, L6:Evaluation*

Text & Reference Books:

1.Khan M Y, (1999), Indian Financial System, Tata McGraw Hill

2.Chandra, P.(1999), Financial Management: Theory and Practice, Tata McGraw Hill.

1. Dietrich J KiMGTll,(1996), Financial Services & Financial Institutions, Value Creation in theory and Practice, Prentice Hall
2. Pandey, I.M. (1999), Financial Management, Vikas Publishing House
3. Sriram, K. (1996), Handbook of Leasing, Hire Purchase and Factoring, ICFAI.

Examination Scheme:

Components	**CPA**	**TP**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	5	5	5	5	10	70

(C - **Case Discussion/ Presentation;** HA - **Home Assignment;** V - **Viva;** CT - **Class Test;** A - **Attendance;** EE - **End Semester Examination)**

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	--	--	--	--	--	--	--	1	2	--	--
CO2	1	1	2	--	--	--	2	--	--	1	2	--	3
CO3	1	1	--	--	--	--	--	--	--	1	2	--	3
CO4	1	1	--	--	--	--	--	2	--	1	2	--	--
CO5	1	1	--	--	--	--	--	--	--	1	2	--	--

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SEMESTER-VI

DMGT2651	BUSINESS POLICY AND STRATEGIC MANAGEMENT	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description
This course introduce to the students theories and practices of Strategic Management acquired knowledge in formulation and implementation of strategies for better decision-making.

Course Objectives
The objective of this course is to
1.Orient the students in theories and practices of Strategic Management.
2. Apply the acquired knowledge in formulation and implementation of strategies for better decision-making.

Course Outcomes
On completion of this course, the students will be able to:
CO1: Define the basic concepts and principles of strategic management and define the internal and external environment of business.
CO2: Recognize organizational strategies that will be effective for the current business environment.
CO3: Illustrate strategic approaches to managing a business successfully in a global context.
CO4: Analyze and evaluate critically real life company situations and develop creative solutions, using a strategic management perspective.

Modules	Blooms level*	Number of hours
Module I: Introduction Planning, Evolution of strategic management, Concept of Corporate Strategy: Intended & Emergent, Patterns of Strategy Development, Levels of strategy	L1, L2	8
Module II: Mission & Vision Concept of Strategic Intent, Vision and Mission, Formulation of Vision and Mission Statements, Different Perspectives on Vision and Mission, Business Definition and concept of a Business Model**.**	L1, L2	7
Module III: Strategic Analysis Industry Analysis, Competitor Analysis using Porter's 5-Forces model, Market Analysis, Environmental Threat and Opportunity Profile (ETOP), Internal Analysis: Building Organization Capability Profile and Strategic Advantage Profile (SAP), Building competencies using Value chain Analysis, Environmental Analysis and dealing with uncertainty, Scenario Analysis, SWOT Analysis	L1, L2	8
Module IV: Strategic Choice Strategic alternatives at corporate level: Expansion, Stability, Retrenchment and Combination, Strategic choice models for dominant single- Business companies- Strickland's Grand Strategy Selection Matrix, Model of Grand Strategy Clusters, Strategic choice models for multi-business companies- BCG, GE Nine Cell Matrix, Hofer's Model, Coevolving, Patching, Strategy as simple rules, Strategic alternatives at business level: Michael Porter's Generic competitive strategies, Building	L1,L2	7

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Sustainable Competitive Advantage		
Module V: Strategic Implementation Operationalizing strategy and Institutionalizing strategy- Developing short-term objectives and policies, Functional tactics, and Rewards, Structural Implementation, Strategic Control, Mc Kinsey 7-S Framework. **Module VI**: Recent Developments Recent Developments in the Field of Strategy: Use of Balanced Scorecard approach, Corporate Governance and Corporate Social Responsibility, Corporate sustainability**.**	L1, L2	10 5
Tutorial: Flip Classes/Presentation/Assignments/Discussions	L3,L4,L5	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Book:

1. Jauch & Glueck,1998, Business Policy and Strategic Management.
2. Pearce & Robinson,2012, Strategic Management Formulation Implementation & Control, 12th Edition, McGraw Hill.

Reference Books:

1. Lynch,2006, Corporate Strategy, 4th Edition, Pearson.
2. Ramaswamy & Namakumari, 1996, Strategic Planning for corporate success, Sage Publications.
3. Michael E. Porter, 1998, Competitive Advantage, Crafting & Executing Strategy, Free press.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

C - Case Discussion/ Presentation; HA - Home Assignment; V - Viva; CT- Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	3	-	-	-	-	-	3	-	-	1	-	1
CO2	1	2	1	-	-	-	3	3	-	1	-	1
CO3	1	1	1	-	-	2	1	3	-	1	-	1
CO4	1	1	3	2	2	1	1	3	-	1	-	1

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DMGT2601	ENTREPRENEURSHIP DEVELOPMENT	L	T	P	C
Course Code	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description:
The objective of the course is to provide students an understanding of entrepreneurship & the process of creating and grooving a new venture. The subject will focus on idea generation, team formation and testing key assumptions of a business idea. Through this 'launch-pad' course students will determine if their ideas are unique, relevant, profitable, and sustainable. The course also focuses on giving the students the concept of an entrepreneur who is willing to accept all the risks & put forth the effort necessary to create a new venture.

Course Objectives :
The objectives of this course are to
1: Understand the concepts and theories related to entrepreneurship.
2: Understanding of the field in regard to the process of assessing the commercial potential of new markets.
3: Identify opportunities and challenges associated with the organization and financing of new initiatives such as new business ventures.
4: Aware the students to various Acts related to enterprises.

Course Outcomes (CO):
On completion of this course, the students will be able to-
CO1: Apply the various principles of entrepreneurship;
CO2: Apply the theories of viability of businesses, new business proposals, and opportunities within existing businesses;
CO3: Apply the principles of entrepreneurial management and growth with the help of strategic plans;
CO4: Define, identify and evaluate the principles of developing pro forma financial statements;

Modules	Blooms level*	Number of hours
Module I: Basic Concepts Qualities, Characteristics of an entrepreneur, Venture idea generation, Ideas and the entrepreneurship, Women entrepreneurs, Preliminary Screening, Drawbacks or Problems of entrepreneurship, Reasons of failure, Overview of setting up an enterprise with organizational forms – MSMED Act and SMERA Overview.	L1, L2	10
Module II: Project Appraisal Pre-feasibility Report, Project Report, Comparative Rating of Product ideas, Cash Flow, Financial Analysis and Planning, Sources of Finance, Stages of Project Feasibility Analysis-Market, Technical, Financial, Social Analysis, Project Implementation Stages	L1, L2,L3,L4, L6	10
Module III: Financial Analysis Financing the project, Sources of finance, Venture Capital Sources, What Investor looks in the Investment Proposal, Outline for a Venture Capital Proposal, Sources of finance from different banks, Proposal with IDBI etc	L1, L2,L3,L4,L6	10
Module IV: Market and Materials Management Analysis Vendor development, vendor selection decision factors, methods of price determination, direct and hidden cost in material management, market development, market feasibility, activities and decisions in materials management – International Markets.	L1,L2,L3,L4	10

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Module V: Project Management Steps and procedure for setting up small scale, Role of Banks and Financial Institutions in Development, E-Commerce, E-Business, E-Auction, Project management problems. SEZ, Cluster Development.	LI,L2	5
Tutorial: Flip Classes/Presentation/Assignments/Discussions	L3,L4,L5	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books:

1**.** Udai Pareek , Sanjeev & Rao T.V , *Developing Entrepreneurship*, Sanjeev & Rao T.V Publications , Ahmedabad

2. Robert D. Hisrich, Michael P. Peters, Dean A Shepherd, *Entrepreneurship*, 6th edition, Tata McGraw-Hill Publishing company Ltd. New Delhi

Reference Book/s:

1. Barringer, Bruce R. &Ireland, R. D. (2012).*Entrepreneurship: Successfully Launching New Venture,4th edition.* New Jersey.USA: Pearson Education

2.M.J.Dollinger (2003), *Entrepreneurship: Strategies and Resources*, 3rd edition, Delhi: Pearson Education

3.Clifton, Davis S and Fyffe, David E, "Project Feasibility Analysis", 1977 John Wiley, New York.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CT**	**HA**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	5	5	5	5	10	70

CT: Class Test, HA: Home Assignment, Q/S: Seminar/Viva/Quiz, ME: Mid Term Exam EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	3	3	2	--	--	--	1	1	1	1	--
CO2	1	1	-	--	--	1	--		1	1	1	--
CO3	1	3	--	2	--	--	--	--	1	2	2	1
CO4	1	2	--	--	--	--	--	--	1	1	1	--

1: strongly related, 2: moderately related and 3: weakly related

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DMKT2601	CONSUMER BEHAVIOR	L	T	P	C
Course Version	Latest Approved	2	1	2	4
Pre-requisites/Exposure	Basic Marketing concept				
Co-requisites	NA				

Catalog Description:

The field of consumer behavior attempts to explain and predict the ways in which consumers think and behave in given situations. It answers questions like how does consumer interpret any piece of information, why does anyone buy, how can marketers predict consumer behaviours from their attitudes. For it, consumer behavior takes support from areas like psychology, economics, sociology and anthropology. This course emphasizes the on the understanding, application, and generalization of the elements of behaviour that influence the thoughts of a consumer, how he evaluates and how he acts.

Course Objectives :

The objectives of this course are to-

1: Make the student understand the concepts/theories pertaining to consumer behaviour and reveal its importance in the context of marketing.

2: Make the student well versed with the various factors that influence consumer behaviour.

3: Enable the student to examine the consumer decision-making process.

4: Provide with knowledge to the student so that he may describe the target market and determine the positioning strategy according to consumer characteristics and behaviour.

Course Outcomes (CO):

On completion of this course, the students will be able to-

CO1: Classify the dynamics related to human behavior and the elementary factors those influence the consumer's decision making process.

CO2: Identify and explain factors which influence consumer behaviour inclusive of society and culture.

CO3: Memorize the various concepts and discuss the rationale for studying consumer behaviour.

CO4: Demonstrate how concepts may be applied in formulating the marketing strategies.

Modules	Blooms level*	Number of hours
Module I: Introduction Consumer Behaviour: Definition and significance, Understanding consumer and market, Difference in individual buyer behaviour and organizational buyer behaviour, Market segmentation: lifestyle and demographic segmentation, usage segmentation, benefit segmentation, Product positioning.	L1, L2 ,L3	7
Module II: Environmental influences Culture: Meaning and Characteristics, Cross Cultural understanding of Consumer Behaviour, Subculture, Social Groups: Meaning and formation of a group, Reference groups, Influence of reference groups on consumer behaviour, Family: Lifecycle and it's significance on consumer behaviour, Family purchase decision process.	L1, L2,L3,	10

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Module III: Personal influence and Diffusion of Innovation Concept, nature and significance of personal influence, Opinion leadership and its role in consumer behaviour, Concept of product adoption and adoption process, Diffusion of innovation and process of diffusion.	L1, L2,L3	10
Module IV: Individual determinants of Consumer Behaviour Personality and self concept and it's relevance in consumer behaviour, Motivation: Nature and role of motives and their significance in marketing, Information processing: Concept and Process, Attitudes: Characteristics, functions and it's importance in buyer behaviour.	L1,L2,L3,L4	8
Module V: Consumer Decision process Consumer decision process model, Problem Recognition, Search and Evaluation, Purchasing Process, Post-purchase Behaviour: Post Purchase evaluation and Product disposition.	L1,L2,L3,L4,L5	5
Module VI: Organizational Buyer Behaviour Nature of Organizational Buying Behaviour, Factors influencing organizational buyer behaviour, Types of decision situations, Organizational buyers decision process.	L1,L2	5
Tutorial: **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3 , L4	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books:

1. Schiffman, L.G., Wisenblit,J, J.& Kumar, S.R.(2016). *Consumer Behavior* (11th ed.). Noida, India: Pearson
2. Loudon, D. L. & Bitta, A. J.(2002). *Consumer Behavior*. N. Delhi, India: Tata-McGraw-Hill
3. Gupta, S.L. & Pal, S (2006).*Consumer Behavior*. N. Delhi, India: Sultan Chand &Sons.

Reference Book:

Blackwell, R.D., Miniard, P.W. &.Engel, J.F.(2007). *Consumer Behavior.* Kundli, India
Thomsons South-Western.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CT**	**HA**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	5	5	5	5	10	70

CT: Class Test, HA: Home Assignment, Q/S: Seminar/Viva/Quiz, ME: Mid Term Exam EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	3	--	-	--	--	--	--	2	1	--	--
CO2	1	3	3	--	--	--	--	--	2	1	--	--
CO3	1	-	--	-	--	--	--	--	1	1	-	-
CO4	3	3	--	-	--	--	2	--	3	1	2	2

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DMKT2602	RETAIL MANAGEMENT	L	T	P	C
Version 1.1	Latest Approved:	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

In this course, the concept related to retail management process, retail theories, consumer behaviour in retail, Merchandise management are discussed in detail. Various relevant concepts such as store management, visual merchandising are also discussed in detail. An overview of rural retailing is also given to students to make them understand rural markets. The main aim of this course is to familiarize students with the basics of retail industry and give them an overview about rural marketing practices.

Course Objectives

The objective of this course is to

1. Provide the student with a comprehensive view of retailing, an analysis of the retail environment and exposure to issues and developments in the industry.
2. Familiarize students with the decisions involved in running a retail firm and the concepts and principles for making those decisions.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the central role of retail in industrialised societies, and the impact of key market/retail trends upon this sector in the local and global contexts.

CO2: Identify the key stakeholders and the roles/responsibilities of retail towards these stakeholders

CO3: Apply appropriate frameworks to develop high level retail marketing strategy, and identify the role of marketing strategies in the building of brand equity and shareholder value in the retail industry

CO4: Evaluate the implementation of marketing strategy through the retail mix – including product and merchandise mix, pricing, location and store- design, promotions, and store management - to improve the total customer experience and retailer market competitiveness.

CO5: Interpret retail problems and be capable of critically evaluating and applying appropriate retail management models and theories to generate strategic and tactical solutions

Modules	Blooms level*	Number of hours
MODULE I- Introduction Nature, Scope and Importance of retailing, Retail competition theories, Retail management process, Influence of changing environment on retailing viz demographic changes, lifestyle changes, technology changes (e-business), Retail Environment.	L1, L2 ,L3,L4	6
MODULE 2: Consumer Behavior in Retailing Consumer Behavior in retailing, Buying decision process in retailing, Types of buying decision, Market segmentation for retailing, Generational cohorts	L1, L2,L3 L4	6
MODULE 3: Retail Marketing Strategy& Customer Service Types of retailers, Multichannel retailing, Retail strategy concept & its elements, Strategic retail planning process, Retail Pricing, Retail Promotion tool, Customer Loyalty Programme, Global retailing growth strategies & international market entry strategies, Advantages through customer service, Customer evaluation of service quality, GAP model for improving service.	L1, L2, L3, L4, L5,L6	10

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MODULE 4: Merchandise Management Retail Information system & supply chain management, Concept of merchandise management. Planning Merchandise – organizing buying process, Developing an assortment plan, Allocating merchandise to stores meeting vendors and establishing strategic relations with them, Branding strategies for retail (e.g., private labels).	L1, L2, L3, L5	10
MODULE 5: Store Management & Visual Merchandising Store layout & space planning, Atmospherics, Choosing store location, Visual merchandising, Recruitment, Selection, Training, Motivation, Compensation and Control of store employees.	L1, L2, L3	8
Module VI: Rural Retailing Introduction to rural retailing, Relevance, Importance and the Emerging Scenario of Rural markets, Major problem areas in rural retailing, Strategies for Rural Retailing, Social and sustainability aspects of rural retailing.	L1, L2, L3	5
Tutorial: **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3, L4	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis; L6-Evaluation*

Text Books

1. Levy & Weitz (2004), Retailing Management, Fifth edition, Tata McGraw Hill.
2. Kashyap Pradeep, Raut Siddhartha(2006); The Rural Marketing Book; Biztantra.

Reference Books

1. Retailing management, Swapna Pradhan (2009), 3rd edition ,Tata McGrawhill.
2. Barry Berman & Joel R. Evans(2004); Retail Management- A Strategic Approach, Ninth Edition, Pearson Education.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO and PO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	--	2	--	--	--	--	--	--	1	--	--
CO2	--	--	--	--	--	--	1	--	--	1	2	--
CO3	2	--	--	--	--	--	--	1	--	1	--	--
CO4	--	--	--	1	--	--	--	--	--	1	--	--
CO5	--	1	--	2	--	--	--	--	--	1	--	--

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DMKT2603	DISTRIBUTION AND LOGISTICS MANAGEMENT	L	T	P	C
Version 1.1	Latest Approved	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Distribution and logistics management is a critical company function. Professionals in this field play a key role in fulfilling customer demands, ordering and managing inventory, controlling inbound and outbound shipments, reducing costs, saving time, and meeting company objectives. This course will show you how to create and operate a logistics function along with how to achieve success through a combination of strategies and tactics.

This course will cover physical distribution, warehouse selection, material handling, packaging, order fulfillment, customer service, inventory management, receiving, production stores, and returned goods. The course will also address key technology issues such as enterprise resource planning (ERP), bar coding, electronic data interchange (EDI), electronic commerce (e-commerce), and distribution resource planning (DRP).

Course Objective

The objectives of this course are to:

1. Provide detailed knowledge and understanding of logistics and distribution management.
2. Gain knowledge about channel management issues and helps the students in understanding the company's route to markets and the downstream part of value chain.
3. Explain the overall skill set and understanding to contribute to better and seamless logistics and distribution management within the organisation, thereby demonstrating talent and potential and increasing opportunities for growth and progression
4. Helps to integrate the channel flows into the channel design.
5. Explains the process of designing a customer-oriented marketing channel and develop the levels of service outputs to be delivered by a marketing channel.
6. Describe the logistics planning and strategy.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Outline the knowledge about roles and functions of distribution system.
CO2: Design and implement distribution channel strategy.
CO3: Describe the nature and degree of channel conflicts.
CO4: Describe the nature of logistics, review its history, and examine how it's currently used.
CO5: Explain how to set and manage an inventory budget system.

Modules	Blooms Level*	Number of hours
Module I: Introduction to Distribution Distribution System- Role, Scope, Functions & Structure, Types of channels, Levels of channels, Cost, Control and Customer service, Selection of Channels, partners, Motivation of channels, Factors affecting channel design. Channel Design and Implementation – segmenting, targeting, gap analysis, establishment of new channels or refining existing channels, Recent developments in information technology.	L1, L2	8

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Module II: Channel Flows and Concepts Channel Flows – definition and concepts, Relevance of channel structure on Membership Issues. Vertical Integration of Marketing Channels – costs, benefits, and need.	L1, L2, L5	7
Module III: Channel Institutions Retailing: Strategic Issues in Retailing. Merchandising Techniques: Franchising; nature and scope, Wholesaling, Assorting, Distribution of supplementary services, and Intermediaries for service delivery. New age technologies: SAP, ERP and Electronic channels. Vendor rating and Management.	L1, L2	7
Module IV: Power, Conflict & Controlling Channel Conflict – nature and degree, sources, consequences, conflict resolution strategies, Channel Performance: Monitoring & evaluation, identifying power sources, and channel coordination.	L1, L2, L5	7
Module V: Logistics System Logistics System – concept, objective and scope, the system elements, transportation, warehousing, inventory management, packing and unitization, communication and control, importance, Strategic Logistics Planning – logistics strategy, implementation and management. Containerization and Chartering Containerization	L1, L2, L5	7

Bloom's Level* *L1-Knowledge; L2-Comprehension; L3-Application; L4-Anaylysis; L5-Synthesis; L6-Evaluation*

Text Book

1. Bert Rosenbloom.(2008), Marketing Channels. South Western Cengage Learning.

Reference Books

1. DK Agrawal.(2008), Logistics and Supply Chain Management. Macmillan India.
2. Havaldar and Cavale.(2008), Sales and Distribution Management- Text and Cases. T ataMcGraw Hill.
3. Stern & El-Ansary. (2009), Marketing channels. Pearson PHI Publication.
4. V.V. Sople. (2010), Logistics Management.Pearson Publication.

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance.

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	--	--	1	1	--	1	1	--	1	1	--	--
CO2	1	--	--	1	1	--	1	1	--	1	1	--	--
CO3	1	--	--	1	1	--	1	1	--	1	1	--	--
CO4	1	--	--	1	1	--	1	1	--	1	1	--	--
C05	1	--	--	1	1	--	1	1	--	1	1	--	--

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DHRM2601	INDUSTRIAL RELATIONS AND LABOUR CODES	L	T	P	C
Version 1.1	Latest Updated	3	0	1	4
Pre requisites exposure					
Co-prerequisites					

Catalogues Description:
In this course, the concept and theoretical perspectives, approaches and structure of industrial relations are discussed. The issues related to industrial disputes, trade unions, collective bargaining, discipline, grievance handling, industrial democracy, ILO, and labour policy and administration are discussed.

Course objectives:
The objectives of this course are to:

1. Equip the students with the autonomy of industrial relations
2. Equip the students with the mechanism involved is dealing with various facets of industrial relations

Course outcomes:
CO1: Explain the concept, theoretical perspectives, approaches, structure, etc. of IR's to the students
CO2: Explain the concept and the issue related to industrial relations and industrial disputes.
CO3: Describe the functioning and other issues related to trade unions and collective bargaining
CO4: Explain the concept, approaches and other related issues related to discipline and grievance handling
CO5: Describe the concept and working of industrial democracy, ILO , labour policy and administration

Modules	Blooms level	Number of arts
Module I: Fundamentals of IR & The Industrial Relations Code,2020 Industrial Relations: approaches, Evolution & Industrial revolution, Constitution, Indian IR framework, and role of state in IR regulative. IR in the emerging scenario- Sources of Labor legislations, Principles & Classifications of labor law, The IR Code: Preliminary bipartite forums, trade unions, standing orders, ID dispute resolution, strike, lockouts, layoff, retrenchment, closure, unfair labour practices, offences & penalties. Trade Unions	L1,L2	12
Module II: The Code on Wages,2019 Preliminary, Minimum wages, Payment of wages, Payment of Bonus, Dues, claims, audit, inspector, offences & penalties.	L1,L2	09
Module III: The Code on Social Security, 2020 Preliminary, Social security organizations, employees PF, Employee state Insurance Corporation, gratuity, maternity benefit, employee compensation, social security for unorganized workers, gig & platform workers, authorities, offence & penalties	L1,L2	12
Module IV: The Occupational Safety, Health & Working Conditions Code,2020 Preliminary & registration**,** duties of employer & employees, health, safety & working conditions, welfare provisions, hours of work and annual leaves with wages, registers & records, inspector, employment related to women, contract labour, migrant workers, audio-visual workers, beedi & cigar workers, mines, construction workers, factories, plantations, offence & penalties.	L1,L2	12

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P - Project; This would be the field project related to the subject where the student need to work outside the class collect the data and make report	L3 L4	15

Bloom's Level:L1- Knowledge ; L2- Comprehension; L3- Application; L4- Analysis; L5- Synthesis; L6- Evaluation

Text Books

1. Sharma, R.C. (2016) Industrial relations and Labour Legistration, PHI Learning Pvt. Ltd., Delhi
2. Ratnam , C.S.V. (2006), Industrial Relations, Oxford Higher Education

Reference Books

1. Kumar H.L (2010 Labour laws – Everybody should know , Universal Law Publishing Company
2. Malhotra , O.P (1985), Law of Industrial Disputes , N.M Tripathi Pvt. Ltd.
3. Malik , P.L (2008) , Industrial Law, Eastern Book Company
4. Mamoria CB(1998) , Dynamics of Industrial Relations, Himalaya Publishing House.
5. Srivastava SC - Industrial Relations and Labour Laws (Vikas, 2000, 4th Ed.).
6. VenkataRatnam – Industrial Relations (Oxford, 2006, 2nd Ed.).

Modes of Evalution: Quiz/ Assignment/ Seminar/ Written Examination

Examination Scheme:

Components	A	CT	Q	HA	V	EE
Weightage (%)	5	10	5	5	5	70

CT: Class Test; HA: Home Assignment ; Q: Quiz; V: Viva-voce; A: Attendance ; EE: End Semester Examination

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	3								2	2		
CO2	1	3								2	2		
CO3	1	3								2	2		
CO4	1	3								2	2		

1: Strongly related, 2: Moderately related and 3: Weakly related

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DHRM2602	COMPENSATION AND REWARD MANAGEMENT	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course examines the full range of compensation topics with emphasis on how compensation systems will likely impact productivity, equity, and the firm's ability to recruit and keep highly skilled and motivated employees. Topics include: job descriptiO4:on, analysis and evaluation systems; equity issues and requirements; design and use of wage and salary surveys; performance, merit and incentive pay systems; statutory and no- statutory employee benefit packages and systems; and administration of compensation systems.

Course Objectives

The objective of this course is to

1. Make you learn basic compensation concepts and the context of compensation practice
2. Familiarize students with the dynamics of wage and salary administration and current trends in India.
3. Highlights the importance of maintaining the capable education qualification, the value of developing their skills, and the significance of providing the appropriate atmosphere for them.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define and design compensation system.

CO2: Report on knowledge on Economic and Behavioural Dimensions of Compensation Management

CO3: Develop competitive compensation programs

CO4: Apply appropriate compensable factors to determine rates of pay.

Modules	Blooms level*	Number of hours
Module I:Introduction Overview of Compensation Management, Wage and Salary Administration – Nature, Importance, Philosophy, Objectives**,** Definition,Goals Role of various parties – Employees, Employers, Unions & Government and Legislations for compensation.	L1, L2	5
Module II: Developing Compensation Programs Job Evaluation, Basic systems Time wage, Piece wage, Incentives, Wage payments and Total Salary Structure, Compensation Surveys, Hay Plan, Developing Competitive Compensation Programs, Developing Salary Structures	L1, L2 ,L3	10
Module III: Derivatives of Compensation Pay for Performance, Merit pay and Performance Appraisal, Performance based rewards, Performance Criteria Choices, and Competency Mapping & Developing Performance Matrix, Performance based Compensation Schemes	L1, L2,l3	7
Module IV: Incentive Plans Incentive Plans: individual and group incentive plans, Productivity Gain sharing plans, Profit Sharing Plans, Non - Financial and Financial incentives, Measuring Cost- to – Company (CTC)	L1,L2	8

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Module V: **Employee Benefits** Employee Benefits: Supplemented Pay benefits (pay for time not worked) insurance benefits, Retirement benefits, Employees' service benefits, Introduction to ESOPs, Flexible benefits and Benefit Surveys. **Module VI**: **Current Trends** Current Trends in Compensation and Reward Management	L1, L2	10 5
Tutorial: **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3,L4,L5	15

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books:

1. Garry Dressler, "Personnel / Human Resource Management", London, Prentice Hall.
2. William B. Werther Jr. and Keith Davis "Human Resource Management". New Jersey: McGraw Hill.
3. Milkovich & Newman, Compensation, Irwin/McGraw-Hill 8th Ed.

Reference Books:

1. Frans Poets, The Art of HRD – Job Evaluation & Remuneration, Crest Publishing, Volume7 1st Edition
2. Michael Armstrong, Helen Murlis, The Art of HRD – Reward Management, Crest Publishing
3. Michael Armstrong, Employee Reward, (University Press)
4. P. Zingheim, The New Pay, Linking Employee & Organization Performance, Schuster, (Jossey-Bass)
5. Sara Rynes, Compensation in Organization, Gerhart (Jossey BASS)
6. Wendell L French, "Human Resource Management", USA, Houghton Mifflin Company.
7. David D. Decenzo and Stephen P. Robbins, "Human Resource Management", New Delhi, Prentice Hall.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CPA**	**TP**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	**5**	**5**	**5**	**5**	**10**	**70**

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	3	2	3	3	2	3	-	1	-	2
CO2	1	1	2	3	3	2	1	3	-	1	-	2
CO3	1	1	2	2	3	3	1	3	-	1	-	2
CO4	1	1	2	2	3	3	2	3	-	1	-	2

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DHRM2603	HR ANALYTICS	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Description: This course gives a detailed overview of HR Analytics and its applications. This course will enable the learners to bring improvements in the human resource functions in an organization using HR tools and analytics and create value in the business scenario.

Course Objectives:

1. Learn the basics of HR data and analytics in measuring HR's impact on driving business results.
2. Identify the right HR metrics (what to measure, types of measurements etc.,) aligning HR and business goals.
3. Turn metrics into analytics through the development of reports and dashboards, using statistical models and predictive analysis models for effective management decisions.
4. Use data in your day-to-day work and remain relevant in the ever-changing HR landscape.

Course Outcomes: On successful completion of this course students shall be able to:

CO1: Acquire knowledge about HR analytics and its usage and impact on business outcomes and the evolving role of HR as a business partner.
CO2: Learn to use HR data, reports, and metrics to make your day-to-day work more effective and impactful.
CO3: Apply appropriate internal and external HR metrics and indicators for better decision making.
CO4: Develop critical data-driven HR skills and HR Analytics related capabilities.
CO5: Understand the basics of HR analytics and how HR adds value through analytics.
CO6: Convert soft factors in a people management context into measurable variables across various domains.

Course Contents:

Module-I

Data Analytics and its advantages for business, Applications of analytics in HR operations, Introduction to HR Analytics, People Analytics & Workforce Analytics, Importance of HR Analytics, Key objectives of HR Analytics, an eight-step approach to HR analytics, Understanding the characteristics of HR Analytics, Strategic focus for HR Analytics, Critical stages of Talent life cycle, Stages in HR \Analytics - Descriptive, Diagnostic, Predictive and Prescriptive Analytics, Future of HR Analytics Problems faced by HR Analytics.

Module-II

Tools for HR analytics, components of HR analytics, sources of data, common data challenges and solutions, tidying the data, HR analytics modelling, HR analytics practices, HR Maturity Framework: From level 1 to level 5, HR Analytics Frameworks: (a) LAMP framework; (b) HCM: 21 Framework and (c) Talentship Framework, 5 overarching components of an effective Analytics framework.

Module-III

HR Metrics – Meaning , Objectives of HR Metrics , Historical evolution of HR Metrics., Advantages of using HR Metrics , The difference between Metrics and KPIs , HR process Metrics vs. HR outcome Metrics, Types of HR Metrics - Staffing Metrics, Training and Development Metrics, Compensation & Benefits Metrics ,Performance metrics, Employee Relations & Retention Metrics other important HR Metrics, Aligning HR Metrics with organizational Strategies, Goals and Objectives, Journey from HR

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Metrics to Analytics.

Module-IV

HR Charts and Dashboards, Excel Charts, Elements of Charts, Bars and Column Charts, Line Charts, Area Charts, Pie and Doughnut Charts, Scatter Plots or XY Charts, Frequency Distribution and Histograms, Sparklines; Pivot Tables, HR Dashboards. HR Analytics Tools.

Module-V

Statistical Software used for HR Analytics: MS-Excel, IBM- SPSS, IBMAMOS, SAS, and R Programming and Data Visualization Tools such as Tableau, Ploty, Click View and Fusion Charts. Predictive Analytics, Steps in Predictive Analytics.

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

References Books:

1. Diez, F., Bussin, M., & Lee, V. (2019). Fundamentals of HR Analytics: A Manual on Becoming HR Analytical. Emerald Publishing Limited.
2. Gupta, M., Banerjee, P., & Pandey, J. (2019). Practical Applications of HR Analytics: A Step-by-Step Guide. Sage Publications India Pvt. Ltd.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	1	3	2	3	3	2	3	-	1	-	2
CO2	1	1	2	3	3	2	1	3	-	1	-	2
CO3	1	1	2	2	3	3	1	3	-	1	-	2
CO4	1	1	2	2	3	3	2	3	-	1	-	2

1: strongly related, 2: moderately related and 3: weakly related

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DFIN2601	CORPORATE TAX PLANNING	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is designed to make the students aware of the corporate tax laws of India. Understanding the corporate tax laws and use it for tax planning is the basic objective of the course. The course is designed so that the students are aware of what business income is and when it gets taxed. The course also provides students with knowledge the difference between tax avoidance and tax planning and tax evasion.

Course Objectives

The objective of this course is to

1. Outline the corporate tax laws.
2. State the use of deductions of expenses to reduce the taxable income.
3. Apply the relevant sections of the Income Tax Act to compute taxable income and tax payable for a corporation

Course Outcomes

On completion of this course, the students will be able to

CO1: Identify and explain the concept of tax planning, tax evasion and tax avoidance and describe how the provisions in the corporate tax laws can be used for tax planning.
CO2: Determine the residential status of companies and taxable income under business and profession.
CO3: Explain different types of incomes and their taxability and expenses and their deductibility.
CO4: Interpret the foreign financial transactions for taxation purpose.
CO5: Apply the indirect taxation laws and principles.
CO6: Relate the tax planning decisions with financial management decisions.

Modules	Blooms level*	Number of hours
Module I: Introduction to Tax Management Concept of tax planning, Tax avoidance and tax evasions, Corporate taxation.	L1,L2	5
Module II: Income from Business Residential Status of companies, Taxable income under Business and Profession, Computation of Profit and Gains from business profession, Deemed business profits, Assessment of Retail Business, Deemed incomes (cash credit, unexplained investments, un explained money and other assets, unexplained expenditures, investments and valuable articles not fully disclosed in books of accounts).	L1, L2,L3	10
Module III: Deductions Allowed Under Business and Profession Deduction Expressly allowed section 30-35, Depreciation deduction calculation, Setoff and carry forward of unabsorbed depreciation section 32(2). Determining Actual Cost43(1), Set-off and Carry Forward Losses, Bonus or commission to employees section, Interest on borrowed capital, Insurance premium 36(1(i)), Employees contribution to provident fund, Bad debts 36, Revenue expenditure incurred by statutory corporation, Banking transaction tax, Security transaction tax, Commodity transaction tax, provision for adminisibility of general deduction 37(1)	L1, L2	7

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Module IV: International Accounting and Taxation Analysis of foreign financial statement, Accounting standard: US GAAP, Indian GAAP, IAS, IFRS. Transfer Pricing – Meaning, measurement, strategic considerations Norms & Practices, tax havens, Double taxation agreement among countries, Tax implication of activities of foreign enterprise in India: Mode of entry and taxation respectively.	L1,L2,L6	8
Module V: Indirect Tax - Concepts and General Principles Service tax - Charge of service tax and taxable services, Valuation of taxable services, Payment of service tax and filing of returns. VAT – Introduction, Calculation of VAT Liability including input Tax Credits, Small Dealers and Composition Scheme, VAT Procedures, Central Sales Tax.	L1, L2,L3	8
Module VI: Tax Planning and Financial Management Decisions Tax planning relating to capital structure decision, Dividend policy, Inter – corporate, dividends and bonus shares, Tax provisions relating to free trade zones, Infrastructure sector and backward areas, Tax incentives for exports. Tax deductions and collection at source, Advance payment of tax.	L1,L2,L5	7
Tutorial: **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3,L4,L5	15

**Bloom's Level: L1-Knowledge;L2-Comprehension;L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. Ahuja Girish & Gupta Ravi(2018) ,Corporate Tax Planning & Management,19th Edition, CCH Wolter Kluwer Publishers.
2. Singhania Monica & Singhania Vinod K,Corporate Tax Planning & Business Tax Procedures with Case Studies, 22nd Edition, Taxmann Publishers.

Reference Books

1. Lal & Vashisht, Direct Taxes, 29th Edition, Pearson.
2. Mehrotra H.C.& Goyal S.P.(2019),Corporate Tax Planning and Management,17th Edition, Sahitya Bhawan Publications.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CT	C	HA	A	EE
Weightage (%)	**10**	**10**	**5**	**5**	**70**

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	--	--	--	--	--	--	2	1	--	--
CO2	1	1	--	--	--	--	--	--	2	1	--	--
CO3	1	1	--	--	--	--	--	--	2	-	--	3
CO4	1	1	--	--	--	--	--	--	2	1	--	--
CO5	1	1	--	--	--	--	--	1	2	1	--	--
CO6	1	1	--	--	--	--	2	--	2	1	--	--

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DFIN2602	ADVANCE CORPORATE FINANCE	L	T	P	C
Version 1.1	Latest approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

The basic objective of this course is to acquaint the students with the latest developments in the field of corporate finance. This course aims at helping the studentsto learn advanced topics related to behavioral finance, corporate restructuring & corporate governance.

Course Objectives

The objective of this course is to

1. Understand the functions of corporate finance.
2. Gain insight into advancements in the corporate finance field.
3. Learn and integrate the various aspects for the financial decision-making.

Course Outcomes

On completion of this course, the students will be able to

CO1: Identify the key themes in corporate finance.
CO2: Identify and apply the valuation concepts and measures of financial performance.
CO3: Identify and explain the various aspects of Mergers and Acquisitions such as theories, Costs and benefits, Financial synergies and Tax planning.
CO4: Explain and analyse the interrelationship between finance,governance and ethics.
CO5: Apply the main concepts, research tools and methodologies of behavioural finance.
CO6: Analyse the relationship between strategic decision making and corporate financing decisions

Modules	Blooms level*	Number of hours
Module I: Introduction Objectives of Corporate finance,Shareholder wealth maximization, Agency Problems, Management Compensation & measurement of Performance.	L1,L2	8
Module II: Valuation Concepts **Valuation Models**, **Application of Valuation Model**, EVA/MVA, Balanced scorecard and other methods/measures of financial performance.	L1, L2, L3	7
Module III: Corporate restructuring Differential Efficiency & Financial Synergy: Theory of Mergers, Operating Synergy & Pure Diversification: Theory of mergers, Costs and Benefits of Merger, Evaluation of Merger as a Capital Budgeting Decision, Poison Pills, Turnaround Strategies, Tax Planning relating to mergers and Amalgamation	L1, L2	7
Module IV: Corporate Governance& Business Ethics **Implementation of Corporate Governance**, Ethics and finance, Ethical practices in market place, Corporate Responsibility, Social Audit and Ethical Investing	L1, L2, L4	8
Module V: Behavioural Finance Introduction and Expected Utility, Non-Expected Utility Preferences, A review of classical probability theory, Beliefs, Biases and Heuristics, Preferences and Anomalies in the Financial markets.	L1, L2, L3	7

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Module VI: Strategic Cost management Financial aspects of Supply Chain Management, Operations management perspective on Costs, Strategic cost analysis (using activity-based costing, target costing and life cycle costing) and Product pricing at Different stages of product's life cycle.	L1, L2,L4	8
Tutorial: **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3,L4,L5	15

**Bloom's Level: L1-Knowledge; L2-Comprehension;L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. Corporate Finance, by Stephen A. Ross, Randolph W. Westerfield and Jeffrey Jaffe (RWJ), 10th edition, McGraw-Hill 2013.
2. Damodaran Aswath (2018),Applied Corporate Finance,4th Edition, Wiley.

Reference Books

1. Brealey Richard and Myers Stewart (2019), Principles of Corporate Finance, 13th Edition,Tata Mc Graw Hill.
2. International Corporate Finance by Indian Institute of Banking and Finance.
3. Ross, Westerfield and Jordan(2018), Fundamentals of Corporate Finance,12thEdition, Tata McGraw Hill.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

CT: Class Test, HA: Home Assignment, V: Viva, EE: End Semester Examination; Att: Attendance, C: Case Analysis

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	1	--	--	--	--	--	--	1	1	--	--
CO2	1	1	--	--	--	--	--	--	1	1	--	--
CO3	1	1	--	--	--	--	--	--	1	1	--	--
CO4	1	1	--	--	--	--	--	--	2	1	--	--
CO5	1	1	--	--	--	--	--	--	2	1	--	--
CO6	1	1	--	--	--	--	--	--	2	1	--	--

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DFIN2603	CORPORATE FINANCIAL REPORTING & ANALYSIS	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

The International Financial Reporting Standards (IFRS) issued by International Accounting Standards Board (IASB) are gaining recognition as Global Reporting Standards. While appreciating the emerging diversities and complexities in the world of accounting and the need for knowledge of IFRS in relation to the convergence of the Indian Accounting Standards.

Course Objectives

1. To enhance the knowledge of IFRS issued by IASB as well as to provide practical framework to the student in the globalization scenario.
2. To Acquaint with Indian Accounting Standard and different accounting standards at international level

Course Outcomes

On completion of this course, the students will be able to

CO1: Define bookkeeping and accounting.

CO2: Explain the general purposes and functions of accounting and the differences between management and financial accounting.

CO3: Analyze the main elements of financial accounting information – assets, liabilities, revenue and expenses

CO4: Identify the main financial statements and their purposes.

Modules	Blooms level*	Number of hours
Module 1: Brief overview of Indian Accounting Standard and different accounting standards at international level.Rational of Accounting Standards. IFRS Framework, Features of IFRS, Genesis of IFRS, Journey of IAS to IFRS, Advantage of adopting. IFRS.Challenges in Adopting IFRS.Difference between Indian GAAP and IFRS.	L1, L3,L4,	10
Module 2: Concept of Fair Value Accounting Concept of Adoption and convergence. Significant Difference between Ind AS and IFRS. Problem of Carve Out. Timeline for Adoption for Ind- As, Concept of Fair Value Accounting Presentation of Financial Statement as per Ind-AS1, Statement of Change in Equity, Cash Flow Statement and Ind AS 7.	L1, L3,L5	10
Module 3: Treatment of Inventories as per Ind AS 2-; Property plant and equipment- Ind AS 16, recognition, measurement, cost model, revaluation model, depreciation and impairment of assets and related disclosures, Revenue recognition Ind AS 18- scope, revenue from sales of goods, Services, interest royalties and dividends and disclosures, Financial Instruments: Presentation, Recognition and Measurement (Ind AS 32 and 39), Ind AS 33 Earnings per Share .	L1, L3,L6	15
MODULE 4: First time adoption of accounting standard: Recognition and measurement, Presentation and Disclosure	L1, L3	10

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Fieldwork	L1,L2,L3	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. Wiley IFRS: Practical Implementation Guide and Workbook; By Abbas, Graham, Liesel; Wiley publications, 3rd edition
2. Faculty material will be provided
3. International Financial Reporting Standards, Produced and printed on behalf of: The Institute of Chartered Accountants of India, website of Ministry of Corporate Affairs.

Reference Books

1. International Financial Reporting Standards (IFRSs) - published by Taxmann Publications P Ltd.
2. A Guide through International Financial Reporting Standards July 2008 -Published by IASB.
3. IFRS : A Quick Reference Guide by Robert Kirk
   Wiley IFRS: Practical implementation guide and workbook by Abbas Ali Mirza, Graham J. Holt and Magnus Orrell5. Wiley IFRS 2008: Interpretation and application of International Accounting and Financial Reporting Standards 2008 by Eva K. Jermakowic

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CPA**	**TP**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	**5**	**5**	**5**	**5**	**10**	**70**

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	--	1	--	--	--	--	--	1	1	2	--
CO2	1	1	--	1		--	--	--	--	1	1	2	--
CO3	1	1	--	1	--	--	--	--	--	1	1	1	--
CO4	1	1	--	1	--	--	--	--	--	2	1	2	--

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SEMESTER-VII

DMGT2701	DISRUPTIVE MANAGEMENT PRACTICES	L	T	P	C
Version 1.1		2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Description:
Disruptive management practice has upended traditional profitability models of industry after industry. Executives, focused on fine-tuning their current business models, often haven't seen the threats before their business landscapes are suddenly and permanently changed. Data and the increased development of technology have accelerated the rate of these massive changes. No industry is immune from competitors looking to grab market share through disruptive innovation.

Course Objectives:
This course will prepare leaders to harness the power of disruptive innovation before their competitors do. Students will gain a deeper understanding of what disruptive innovation is and will learn how to spot potential threats and opportunities in their own business. The coursework will focus on planning for disruption, using concrete steps to identify potential disruptions in the industry, and building the right culture to implement change. Students will be trained to view their business through a "jobs to be done" framework and use customer-centric problem-solving to discover new ideas and justify business changes.

Course Outcomes:
- Understand the forces of disruption that could impact their business and see how to spot them early
- Uncover a new approach for customer centricity to spot and shape new opportunities by applying the jobs to be done framework
- Learn, through practical examples, how to leverage new business models and potential application for their companies

Modules	Blooms level*	Number of hours
Module 1 - Imperative and Fundamental Concepts- Disruptive Innovation- Complementary Thoughts on Christensen's Theory of Disruptive Innovation, Theory of Disruption Waves or the Modulation of Disruption, Benefit of a Unified View on Disruption, Relativity of Disruption, and Typical Warning Signals for Disruptive Threats. Form Follows Function - Concept and Architecture.	L1, L2, L4	10
Module 2 - Market Understanding - Understanding Your Market, Market Segmentation for Multiple Segmentation Criteria, Identifying a Customers' "Job to Be Done", Differentiating Market Segmentation from Design Thinking, Creating Customer Value Through Design Thinking- Design Thinking, When to Use Design Thinking?, Defining Understanding, The Different Levels of Understanding, Phases of Design Thinking, Empathy for Individuals, Empathy in the B2B Context, Ideation, Prototyping and Testing, Scaling.	L1, L2,L4,L5	10

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Module 3 - Design to Value (DTV) - Defining Value in Product Development, Lifecycle Cost, the Framework and measuring value. Modularization: A Strategic Lever for Innovation, Platform- Core Platform versus Inclusive Platform, Implementing a Modular Platform- Organizational Aspects and Strategic Aspects, Agile – agile project management, frameworks.	L1, L2, L4, L5	10
Module 4 - Requirement Focus - Kano Model, Pair-wise Comparison, Requirements Management, Tree Diagram, Empathy Map, Concept Focus- Functional Modelling, Morphological Matrix/Morphological Box, Modular Function Deployment, Onion Peel Model, Design for Variety, Customer Focus Group, Osborne Checklist. Cost Focus - Target Costing, Measurement Sheet, Lifecycle Cost model, Complexity Cost Calculation for Product Families, Business Plan.	L1, L2,L3, L4	10
Module 5 - General Description of Disruption Management- Approaches to Uncertainties, General Guidance of Disruption Management, Understanding your business needs, Identify data roles in the organization. Challenges: Identify hurdles to becoming a data-driven organization, Disruption vs. Optimization, Disruptive Business Applications.	L1, L2, L3, L4	10
Module 6 - Enterprise Agile- Common Approach to Enterprise Agile Adoption, Building Blocks of Your Lean-Agile Culture Transformation, Base line assessment, Waterfall Training Development, sponsor Agile, Agility in a World of Change and Complexity, Traditional Organization v/s Agile Organizations and challenges in agile.	L1, L2, L4	10

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination Scheme:

Components	**CT**	**HA**	**C**	**V**	**A**	**EE**
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; **HA -** Home Assignment; **P -** Project; **S -** Seminar; **V** - Viva; **Q** - Quiz; **CT** - Class Test; **A** - Attendance; **EE** - End Semester Examination

Text and Reference Books:

- **Disruption Management Framework, Models and Applications (2004) - Gang Yu and Xiangtong Qi,** https://doi.org/10.1142/5632
- **Disruptive Management - Not Playing by the Rules, C. P. Ramchandani.**
- https://www.routledge.com/Emerging-Trends-in-Disruptive-Technology-Management-for-Sustainable-Development/Das-Banerjee-De/p/book/9780367249649#
- https://link.springer.com/book/10.1007/978-3-030-79709-6?page=2#toc

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	2								-	1	--	3
CO2	1	3								-	1	--	3
CO3	1	1								-	1	--	2

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DMGT2702	ARTIFICIAL INTELLIGENCE IN MANAGEMENT	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Description:

This course introduces to the exciting world of Artificial Intelligence (AI) and its transformative impact on business. We will explore the core concepts of AI, delve into the power of Machine Learning and Deep Learning, and discover how AI is revolutionizing various business functions. Through real-world case studies, hands-on activities, and discussions with industry leaders, you will gain the knowledge and skills to leverage AI for strategic decision-making, optimize operations, and gain a competitive edge in the job market.

Course Objectives:

- Understand the fundamentals of Artificial Intelligence and its applications in business.
- Master the key concepts of Machine Learning, including supervised and unsupervised learning algorithms.
- Gain practical experience through case studies, hands-on exercises, and guest lectures.
- Prepare for a successful career in the AI-powered future of business.

Course Outcome

CO-1: Explore the potential of Deep Learning and its impact on various industries.
CO-2: Analyze the ethical considerations and challenges surrounding AI implementation.
CO-3: Develop critical thinking skills to evaluate the business value of AI solutions.
CO-4: Develop a model for decision making for business decision.

Modules	Blooms level*	Number of hours
Module 1: Introduction to AI What is AI?, A brief history of AI, Different types of AI, Applications of AI in business, The impact of AI on jobs and the workforce	L1, L2	9
Module 2: Machine Learning What is machine learning?, Supervised vs. unsupervised learning, Common machine learning algorithms, Applications of machine learning in business, Case studies of companies using machine learning	L1, L2	9
Module 3: Deep Learning What is deep learning?, Neural networks, Convolutional neural networks (CNNs), Recurrent neural networks (RNNs), Applications of deep learning in business, Case studies of companies using deep learning	L1, L2	9
Module 4: AI for Decision Making How can AI be used to improve decision making?, AI-powered analytics and reporting, Predictive modeling and forecasting Optimization and simulation, AI-driven marketing and customer relationship management	L1, L2,L3	9
Module 5: The Future of AI in Management The ethical implications of AI, The challenges of implementing AI The future of work in an AI-powered world,How to prepare for the AI revolution	L1,L2,L5	9
P - Project; This would be the field project related to the subject where the student need to work outside the class collect the data and make report .	L3 , L4	15

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**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis L5-Synthesis; L6-Evaluation*

References

Akerkar, R. (2019). *Artificial intelligence for business*. Springer.

Harmon, P., & King, D. (1985). *Expert systems: Artificial intelligence in business*. John Wiley & Sons, Inc..

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	--	--	--	--	--	--	--	1	--	--	--
CO2	1	--	--	--	--	2	--	--	1	--	--	--
CO3	1	2	--	--	--	--	--	--	1	--	--	--
CO4	1	--	--	--	--	--	--	2	1	--	--	--

1: strongly related, 2: moderately related and 3: weakly related

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DMGT2703	SUSTAINABILITY MANAGEMENT	L	T	P	C
Version 1.1	Latest Updated	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Description: This cross-disciplinary graduate course provides a holistic overview of the environmental, social, economic and governance (ESEG) aspects of sustainability management and how to address them strategically to maximize business and product performance to meet changing stakeholder expectations. You will have the opportunity to learn about a variety of sustainability challenges faced by a variety of industry sectors, such as: mitigation and adaptation to climate change; energy, water, materials and resource management; minimizing supply chain risks that can derail business continuity. Internationally recognized frameworks, best practices, methodologies, tools and standards will be introduced as vehicles to tie the concepts together for practical application of solutions that support leadership in sustainability performance improvement.

Course Objectives: This course is for aspiring sustainability change agents who wish to gain a broader and deeper understanding of business and product strategic sustainability management from multiple stakeholder perspectives that make up the business-to-business value chain. This course is for you--- if you believe that businesses can and should be a thriving force for good in the world with products that do not harm the environment or social wellbeing. As a student, you seek to understand, facilitate and influence how stakeholders can collaborate to lead the development and implementation of transformative management systems and programs for a sustainably prosperous world for all.

Course Outcomes: At the end of this course, you will be able to:

• Identify the drivers, risks, challenges and opportunities associated with addressing sustainability management challenges.

• Apply the guiding principles and values that are a foundation for a holistic mind-set that guides an effective sustainability vision, strategy and implementation plans.

• Identify the factors in developing a credible business case for common sustainability management approaches that deliver actual improvements and breakthrough sustainability performance.

• Navigate common and conflicting needs, perspectives and interests of multiple stakeholder groups, cross-sector, cross-disciplinary, cross-functional and industry-specific perspectives.

• Promote strategic benefits of integrating and engaging the business value chain from suppliers through to end customers for achieving and communicating breakthrough sustainability outcomes.

• Link systems thinking and life cycle thinking to core business strategy and decision-making using product life cycle assessment based on international ISO standards.

Modules	Blooms level*	Number of hours
Module 1- Introduction – Global Challenges (Climate Change, Biodiversity Loss, Rising Inequality, and Resource Depletion), Sustainability- Global Sustainability Initiatives, Sustainable Approaches, SDGs and how are they linked ESG, Requirement of ESG, Value Creation Opportunities and Benefits From ESG, Setting up an ESG Strategy, Sustainable Supply Chain and its Decarbonisation, Sustainable Procurement.	L1, L2, L4	10

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Module 2 Introduction to Decarbonisation- Key terms, Decarbonisation Strategies, Challenges of Decarbonisation, Solutions and Initiatives, Role of Technology in Decarbonisation, Economic Impacts, Societal and Cultural Aspects, Measurement policies, Future prospects. Renewable Energy- Environmental Significance & its role in combating climate change, Sustainability & Resource renewal, Types of Renewable Energy, Importance of Renewable Energy, Challenges and Considerations, Future prospects -The role of Renewable Energy in a sustainable future, Call to action.	L1, L2,L4,L5	10
Module 3 Introduction - green hydrogen, Advantages & Disadvantages, The Impact of Green hydrogen, The Indian scenario, Uses of Green hydrogen. Introduction & history EV- Types of Electric vehicles, Advantages & Challenges, key components, Market trends, Indian Scenario, Future of EVs, Introduction & Types of Sustainable fuels, Advantages & Challenges, Indian Scenario.	L1, L2, L4, L5	10
Module 4 Introduction to Carbon Credits- Definition of Carbon Credits, Purpose and Significance, Historical Background, Types of Carbon Credits, Regulatory Framework, Carbon Credit Standards, Carbon Accounting and Measurement, Project Types Eligible for Carbon Credits, Carbon Credit Certification Process. Carbon Credit Market- Carbon Credit Pricing, Carbon Credit Trading Platforms, Voluntary vs. Compliance Markets, Challenges and Controversies, Benefits of Carbon Credits, Indian Energy Scenario and future outlook.	L1, L2,L3, L4	10
Module 5 ESG reporting- companies' Non- Financial Information report, use ESG reporting, improve your ESG sustainability reporting and score, Benefits of reporting, ESG reports includes, ESG score or rating, ESG regulations, Aligning with NGRBC Principles. BRSR- Nine Principles of BRSR, Key Concepts in BRSR, Frameworks and Guidelines for BRSR, The pillars of BRSR, Alignment of BRSR principles with the SDGs, Implementation and Benefits, Challenges.	L1, L2, L3, L4	10
Module 6 SEBI Circulars related to BRSR- Introduction to Cost of Capital and ESG- the Relationship between Cost of Capital and ESG, Factors Affecting Cost of Capital and ESG Integration, Measurement and Assessment, ESG Risk Management, Challenges and Trade-offs, Future Trends. Green Bonds- Market Growth, Types of Green Bonds, ESG Data Collection- Investor's Perspective on ESG- ESG Risk and Opportunity, GRI-Introduction, Structure, Benefits and Limitations of GRI, TCFD and its mission, Benefits of TCFD, Scenario Analysis, ISSB standards, GHG Emissions and Net Zero.	L1, L2, L4	10

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination Scheme:

Components	**CT**	**HA**	**C**	**V**	**A**	**EE**
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; **HA** - Home Assignment; **P** - Project; **S** - Seminar; **V** - Viva; **Q** - Quiz; **CT** - Class Test; **A** - Attendance; **EE** - End Semester Examination

Text and Reference Books:

1. Steve Cohen, William Eimicke, Alison Miller, Sustainability Policy: Hastening the Transition to a Cleaner Economy.
2. Black and Cherrier (2010). "Anti-consumption as part of living a sustainable lifestyle: Daily practices, contextual motivations and subjective values." Journal of Consumer Behavior.
3. Lueneburger and Goleman (2010). "The Change Leadership Sustainability

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Demands." MIT Sloan Management Review.
4. Weber, Elke (2017). "Breaking cognitive barriers to a sustainable future," Nature Human Behavior.
5. Jose Galan, "How I Did It: The CEO of Iberdrola on Committing to Clean Energy".

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DMKT2701	SERVICE MARKETING	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

The course has been designed to equip students to become more effective managers of any service organization by familiarizing them with the basic characteristics of services, their implications on design and delivery, and the ways to achieve sustainable competitive advantage by managing critical parameters.

Course Objectives

The objective of this course is to

1. Develop blueprint for the services sector and develop a better appreciation of the necessary strategies to create a service excellence.
2. Provide insights about the foundations of services marketing, customer expectations of services and gap existing in the service delivery processes and service Quality.
3. To provide an in-depth appreciation and understanding of the unique challenges inherent in managing and delivering quality services and the successful implementation of a customer focus in service-based businesses.

Course Outcomes

On completion of this course, the students will be able to

CO1: Recognize the challenges faced in services delivery as outlined in the services gap.

CO2: Critically analyze the perceive service shortcomings with reference to ingredients to create service excellence.

CO3: Discuss key linkages between marketing and other business functions in the context of designing and operating an effective service system.

CO4: Provide a theoretical and practical basis for assessing service performance using company examples and report on this in a professional, logical and coherent way.

CO5: Identify and discuss characteristics and challenges of managing service firms in the modern world including cultural implications.

Modules	Blooms level*	Number of hours
Module I: Understanding Service Marketing **Services**- Definition, Nature of services, Goods vs. Services; Service Sector In India- Drivers of Service Sector Growth Tangibility Spectrum; Flower of Service; Categorizing Service Processes; Self Service Technologies; Search, Experience and Credence attributes; Service Encounters/Moments of Truth- Meaning & Types; Expanded Services Mix.	L1,L2 ,L4	11
Module II: Consumer Behaviour, Service Quality & Service Recovery **Consumer Behaviour**- Customers' Expectations of service; Zone of Tolerance- Desired and Adequate service; Managing customer expectations and perceptions in services; **Service Quality**- Service Quality Dimensions; Customer Satisfaction vs. Service Quality; **Service Recovery**- Impact of service failure and recovery, types of Customer Complaint Actions and Complainers, Service Guarantees, Service Recovery Strategies.	L3,L4	12

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Module III: Aligning Strategy, Design and Delivery Service Blueprinting; Operational service product designing and adding value; Servicescape; Service Triangle; Boundary–Spanning Roles; Strategies for closing the delivery gap.	L2,L3	11
Module IV: Service Delivery, Managing Demand & Capacity, Service Pricing Role of Distribution in Services. Channel Conflicts and other key problems. Key Intermediaries for Service Delivery. Understanding Demand and Capacity constraints. Strategies for matching Capacity and Demand. Approaches to Pricing Services	L2, L5, L6	11
Tutorial: **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3 , L4	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books:

1. Valarie A Zeithaml Mary Jo Bitner, **Dwayne Gremler, Ajay Pandit**. (2007), Services Marketing: Integrating customer focus across the firm, Tata McGraw Hill
2. Christopher Lovelock. (2010), Services Marketing: People, Technology, Strategy. Pearson Education, Indian subcontinent adaptation.

Reference Books:

1. RajendraNargundkar, (2006), Services Marketing: Text and Cases. Tata McGraw-Hill Publishing Co. Ltd.
2. Harsh V. Verma, (2010), Services Marketing, Text and Cases. Pearson Education.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CPA**	**TP**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	5	5	5	5	10	70

CPA:Case Discussion/Presentation/Analysis TP:Project Q/S:Quiz/Seminar
A: Attendance ME: Mid Term Exam EE: End Term Examination

CO, PO and PSO mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	2	3	-	-	-	-	-	-	1	1	--	--
CO2	1	3	2	-	-	-	-	2	-	1	1	--	--
CO3	1	2	-	1	--	-	-	-	3	1	1	--	--
CO4	1	3	-	-	-	-	3	-	3	1	1	--	--
C05	1	2	-	-	--	-	-	-	-	1	1	--	--

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DMKT2702	DIGITAL MARKETING	L	T	P	C
Version 1.1	Date of Approval:	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

The course examines digital marketing strategy, implementation and executional considerations for B-to-B and B-to-C brands and provides a detailed understanding of all digital marketing concepts. Students will learn the course with a comprehensive knowledge of and experience with how to develop an integrated digital marketing strategy, from formulation to implementation. Strong focus will be on developing student's business skills and growing real-world experience of the digital media sector to enhance their knowledge to cope with employability demand. The course is an initiative designed to educate students and practitioners in the area of Digital Marketing analytics and make them ready for jobs or prepare them to launch campaign for their own organisations.

Course Objectives

The objectives of this course are to:

1. Understand how and why to use digital marketing for multiple goals within a larger marketing and/or media strategy.
2. Understand the major digital marketing channels – online advertising: Digital display, video, mobile, search engine, and social media.
3. Learn to develop, evaluate, and execute a comprehensive digital marketing strategy and plan.
4. Learn how to measure digital marketing efforts and calculate ROI.
5. Explore the latest digital ad technologies.

Course Outcomes

On completion of this course, the students will be able to:

CO1: State the knowledge about digital marketing strategy and planning.
CO2: Describe and/or improve a strategy for measuring and improving digital media effectiveness
CO3: Describe online advertising including ad networks and behavioral targeting.
CO4: Identify Emerging trends in digital marketing.
CO5: Analyze how to create search engine optimization strategy for own business.

Modules	Blooms Level*	Number of hours
Module 1: Digital Marketing Overview: What is Digital Marketing? Understanding Marketing Process? Why Digital Marketing Wins Over traditional Marketing? Understanding Digital Marketing Process; Digital Marketing Planning and Strategy.	L1, L2	8
Module 2: Website Planning and Creation: Understanding Internet; Difference between Internet & web; Understanding websites; Understanding domain names & domain extensions; What is web server & web hosting? Different types of web servers; Different types of websites; Planning & Conceptualising a Website; Building website using CMS in Class.	L1, L2	8

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Module 3: Digital Advertising (PPC, Digital Display and YouTube): Google AdWords Overview; Understanding Adwords Algorithm; Creating Search Campaigns; Types of Search Campaigns – Standard, All features, dynamic search & product listing. Tracking Performance/Conversion: What is conversion tracking? Why is it important, how to set up conversion tracking. Optimizing Search Campaigns: How to optimize campaigns at the time of creation? Optimizing campaign via adgroups.Creating Display Campaign; Types of display campaigns- All features, Mobile app, Remarketing, Engagement. Optimizing Display Campaign and Re-marketing . What is Online Advertising? Types of Online Advertising, Display Advertising, Contextual advertising, what are Payment Modules?Different Online advertising platforms Creating Banner Ads Using Tools.	L1, L2, L4	8
Module 4: Emerging trends in Digital Marketing: **Affiliate Marketing-** Affiliate marketing history**,** Affiliate marketing scenario in India**,** Different ways to do affiliate marketing. **Email Marketing-** What is email marketing and how it works? Types of email marketing- Opt-in & bulk emailing; Setting up email marketing account, creating a broadcast email. What are auto responders? Setting up auto responders; Tricks to land in inbox instead of spam folder; **Social Media Marketing-**Concept**,** How social media marketing is different than others Forms of Internet marketing, Understanding Facebook marketing, Linkedin Marketing, Twitter Marketing, Video Marketing **and** VIDEO & AUDIO (PODCASTING) marketing; **and Mobile Web Marketing-** Understanding Mobile Devices, Mobile Marketing Measurement and Analytics; Fundamentals of Mobile Marketing, Creating mobile website through wordpress; Using tools to create mobile websites; Using tools to create mobile app Advertising on mobile (App & Web); Content Marketing on mobile. **Content Marketing-**Introduction to content marketing, Objective of content marketing, Content marketing 7 step strategy building process, How to write great compelling content, Optimizing content for search engines, How to increase opt-in email list with content marketing with examples.	L1, L2, L4	7
Module 5: Search Engine Optimization (SEO): What is SEO? Introduction to SERP, What are search engines? How search engines work? Major functions of a search engine; what are keywords? Different types of keywords ; Google keyword planner tool; Keywords research process; Understanding keywords; On page optimization; Off Page optimization; Top tools for SEO; Monitoring SEO process; Preparing SEO reports, How to create SEO Strategy for your business, What is link juice? Importance of domain and page authority?How to optimize exact keywords for your business. What is Google Panda Algorithm, Google Penguin and Google EMD Update. How to save your site from Google Panda, Penguin and EMD Update, How to recover your site from Panda, Penguin and EMD.	L1, L2, L4	7
Module 6: E-Commerce and Payment Gateway: What is ecommerce? Top ecommerce websites around the world & it's scenario in India; Difference between E-Commerce software and Shopping Cart; software Payment Gateways, Merchant Accounts & Logistics for physical goods. Integrating Woo-commerce and setting up an ecommerce store on WordPress. Case studies on ecommerce websites. How to do Google Product Listing Ads (PLA) for ecommerce websites.How to do SEO for an ecommerce website.	L2,L3	7
Tutorial: **Flip Classroom-** C – Case Discussion/ Presentation; HA – Home Assignment; S – Seminar; V – Viva; Q – Quiz	L3 , L4	15

Bloom's Level*

L1-Knowledge; L2-Comprehension; L3-Application; L4-Anaylysis; L5-Synthesis;

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L6-Evaluation

Text Book

1. Marketing 4.0: Moving from Traditional to Digital by P. Kotler. Wiley Publication.

Reference Books

1. The Essentials of E-Marketing, 4th edition by Quirk Education (E-Book)
2. Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, by Damian Ryan and Calvin Jones. KoganPage Publication, 3rd edition.
3. Digital Marketing Insights 2017, Social Beat Digital Marketing LLP, Kindle Edition.
4. Social Media for Business – Stories of Indian Brands, By Sorav Jain
5. Total E-mail Marketing: Maximizing your results from Integrated E-marketing (E-marketing essentials): Dave Chaffey.

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance.

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	--	--	1	1	--	1	1	--	1	1	--	--
CO2	1	--	--	1	1	--	1	1	--	2	1	--	--
CO3	1	--	--	1	2	--	1	1	--	1	1	--	--
CO4	2	--	--	1	1	--	1	2	--	1	1	--	--
C05	1	--	--	1	1	--	1	1	--	1	1	--	--

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DMKT2703	DIRECT MARKETING	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Direct marketing is quickly becoming an integral part of the marketing strategies of general marketing as well as the method of operation of traditional direct marketers. The course focuses on the marketing perspectives and technologies that are distinctly direct marketing and with the interrelationship of direct marketing with the general marketing field. Direct Marketing course provides an introduction to digital and offline direct marketing. The course also covers all major direct marketing media: direct mail, broadcast, print, catalog etc. with a special emphasis on the use of different platforms such as email, SMS text, paid search, Mobile apps and social media.

Course Objectives

The objectives of this course are to:

1. Understand the nature and scope of direct marketing.
2. Provide the students to learn and develop proficiency in marketing directly to the customer.
3. Student will learn how databases to be created and accessed for the direct marketing.
4. Students will learn measurability and accountability of direct marketing and its relationship to the 4P's.
5. Apply strategically direct marketing approaches consumer and business to business market.
6. Focuses on the marketing perspectives and technologies that are distinctly used for direct marketing.
7. Evaluate communications and media strategies.
8. Demonstrate the ability to conceive ideas, manage the creative process, evaluate information and use it to plan and develop campaign strategies.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Understand promotion as an element of marketing and also to recognize the role of various communication tools such as advertising, sales promotion, public relations, publicity, social media marketing in the changing environment.

CO2: Identify managerial issues in Direct Marketing and analyze the offer, list and creative in response rate.

CO3: Apply new media and evaluate the direct marketing efforts for the organization.

CO4: Design a comprehensive direct marketing strategy and improve prospecting skills.

CO5: Apply critical thinking and teamwork, to create, and assess a range of options to exploit market opportunities and solve marketing problems using direct marketing.

CO6: Develop an overall direct marketing plan for an organization and can evaluate the effectiveness of direct marketing.

Modules	Blooms Level*	Number of hours
Module I: Conceptual Framework of Direct Marketing Basics and scope of Direct Marketing, Objectives of Direct Marketing, Advantage & Disadvantage of Direct Marketing, Integrated Direct Marketing, Business, Strategic & Direct Marketing planning, Strengths& weakness of Social Media.	L1, L2	7

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Module II: Analyzing & Encashing Marketing opportunities for Direct Marketing Research design for direct marketers, The Customer Database: Analysis and Application, Consumer & Business mailing list, offer, Media of direct marketing, Telemarketing, Internet E-communications, Managing Direct Sales Force.	L1, L2, L3, L4, L5	8
Module III: Managing the Creativity Process in Direct Marketing Introducing Creative Practices and techniques, Direct Marketing Creativity, Basic Steps of Managing catalogue & print advertising, Innovation through Creativity & testing The Strategic drivers of Creative Practices.	L1, L2, L3	8
Module IV: Direct Marketing into Business B to B Marketing, Making a lead generation programme, Overview of E-commerce, retaining and activating customers	L1, L2, L3	7
Module V: Direct Marketing Implementation and Control Marketing Intelligence- Modeling for business decision support, Mathematics tool for control in Direct marketing, Future of Direct Marketing.	L1, L2	8
Module VI: Emerging Trends Integrating the concepts with other functions of Management. Live project to be undertaken starting with conception of idea to final execution. Case studies, Latest emerging trends and practices.	L1, L2, L3, L4, L5	7
Tutorial: **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3 , L4	15

***Bloom's Level:** *L1-Knowledge; L2-Comprehension; L3-Application; L4-Anaylysis; L5-Synthesis; L6-Evaluation*

Text Books

1. Spiller, l., Baier, M. Contemporary direct and Interactive Marketing. 2nd edition. Pearson Education.
2. Tapp, A. (2005), Principles of Direct and Database Marketing (3rd. ed), London. Prentice Hall.

Reference Books

1. Bob stone & Ron Jacobs, Successful Direct Marketing Methods, Tata McGraw Hill.
2. Nash & Edward L, Direct Marketing Hand Book, Tata McGraw Hill.

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance.

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	1	1	1	--	1	1	--	1	1	1	--	--
CO2	1	1	1	1	--	1	1	--	1	1	1	--	--
CO3	1	1	1	1	--	1	1	--	1	1	1	--	--
CO4	1	1	1	1	--	1	1	--	1	1	1	--	--
C05	1	1	1	1	--	1	1	--	1	1	1	--	--
CO6	1	1	1	1	--	1	1	--	1	1	1	--	--

1: strongly related, 2: moderately related and 3: weakly related

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DMKT2704	MARKETING OF FINANCIAL SERVICES	L	T	P	C
Version	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Marketing of financial services is inimitable in its variety, stringent regulatory compliances and distinctive challenges, even though many of the concepts of marketing in financial services are similar to marketing in other industries. Marketing of financial services can take place at B-2-B, B-2-C level, or both. Marketing often differs in an important way from other financial services functions, in that it is both quantitative and qualitative – it is both creative and analytical.

Course Objectives

This course aim to develop the student's ability to:

1. Explore opportunities in the financial services sector;
2. Develop and implement effective marketing strategies to optimize a company's chance of success in the markets in which it operates;

Course Outcomes

On completion of this course, the students will be able to

CO1: Define the regulations of financial service industry;

CO2: Identify the segmentation and positioning of financial market; and to apply the knowledge of financial product for decision making.

CO3: State decision related to investment keeping in mind pricing, promotion and distribution.

CO4: Define marketing mix to the learning into industry to satisfy customer needs

Modules	Blooms level*	Number of hours
Module-I ***Financial Services:*** The significance and relevance of principles of marketing to financial services organizations (FSOs). Introduction to various theories, nature and characteristics of financial services marketing versus marketing of goods. ***Marketing Environment:*** Analyzing marketing environment of financial services in India. Introduction to basic tools, techniques and models used to analyze the context within which any, FSO, operates.	L1, L2	11
Module-II ***Segmentation and positioning of Financial Market***: Various bases of segmenting the financial services industry; Targeting and positioning of financial market. ***Product Conceptualization:*** Introduction to the idea of financial product, various levels of product; product branding, product mix, PLC & new product development(NPD)	L1, L2	11
Module-III ***Decisions related to pricing, promotion:*** Pricing: Study of various factors and strategies; Promotion: Study of communication process; Promotion mix: Advertising, Publicity, Personal Selling, PR & sales promotion. ***Decisions related to Distribution:*** Analysis of various strategies adopted for channel selection.	L1,L2	11

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Module-IV ***Extended Marketing mix for FSOs:*** Processes: Balancing the demand-supply gap; Peoples-Managing employees and customers; managing Physical Evidence i.e. understanding the image created by tangible items such as décor, etc	L2	12
Tutorial: **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3 , L4	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. Alan Wilson (2006), *Marketing Financial Services*, Chartered Institute of Bankers: Scotland.
2. Dhananjay Bapat (2013), *Marketing of Financial Services*, Biztantra: Delhi.
3. Indian Institute of Banking & Finance (2015), *Managing and Marketing of Financial Services.* Taxman: Delhi

Reference Books

1. Khan, M.Y. Financial Services, Tata McGraw Hill, 9th edition
2. Bhole L.M, Financial Institutions and Markets: Structure, Growth & Innovations, Tata McGraw Hill, 2004

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CT	HA	C	V	Att	EE
Weightage (%)	10	5	5	5	5	70

CT: Class Test, HA: Home Assignment, V: Viva, EE: End Semester Examination; Att: Attendance, C: Case Analysis

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	--	--	2	--	--	--	--	--	--	1	--	--
CO2	1	--	--	--	--	--	--	--	--	--	1	--	--
CO3	1	--	--	--	--	--	--	--	--	--	1	--	--
CO4	1	--	--	--	--	--	2	--	--	--	1	--	--

1: strongly related, 2: moderately related and 3: weakly related

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DHRM2701	STRATEGIC HUMAN RESOURCE MANAGEMENT	L	T	P	C
Version 1.1	Latest Approved	3	0	1	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description:
This subject provides an understanding of the strategic contribution of the Human Resource Management (HRM) function in organisation. This course will place previous studies of human resource management within a strategic, dimension so as to illustrate the concept of competitive advantage applied to human resources. The emphasis will be on the strategic significance of HRM.

Course Objectives:
1. To develop an understanding of the need, process and implication of strategic human resource management in present day organizations.
2. To understand the Integrating the Business and HR Strategies and impact of SHRM on business performance,

Course Outcomes
On completion of this course, the students will be able to
CO1: Define Strategy and process of strategic management.
CO2: Discuss Human capital management and its measurement.
CO3: Explain the evolving strategic role of HR
CO4: Explain the integration of business and HR strategies and impact of SHRM on business performance.
CO5: Evaluate the Impact of SHRM on Business Performance

Modules	Blooms level*	Number of hours
Module I: The Concept of Strategy Strategy Defined, Key Concepts of Strategy, Formulations of Strategy, Strategic Management, the Process of Strategic Management	L1, L2	5
Module II: The Concept of Strategic HRM An Investment Perspective of HRM, Strategic HRM, Human Capital Management Defined, Human Capital Management and HRM, The Concept of Human Capital, Intellectual Capital, Social Capital and Organizational Capital, Human Capital Measurement and Approaches to Measurement. Aims of SHRM, Strategic HR Vs Traditional HR, Challenges in SHRM, Approaches and Models To SHRM and The Evolving Strategic Role of HR, Barriers to Strategic HR. HR Strategy defined Purpose, Types of HR Strategies, Content of HR Strategies, Formulating HR Strategy, Criteria for an Effective HR Strategy, Integrating the Business and HR Strategies	L1, L2	8
Module III: Integrating Strategy and Human Resource Planning - The strategic role of Human Resource Planning, Selecting forecasting techniques, forecasting the supply of human resources, forecasting the demand for human resources, workforce utilization and employment practices	L1,L2	8

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Module IV: Strategy for Employee Development AND Performance Management – Planning and strategizing training- Integrating training with performance management systems and compensation- Developing management training and development for competitive advantage-The strategic training of employees model. Performance Management – Strategically oriented performance measurement systems, strategically oriented compensation systems – High performance practices, Human resource evaluation – Strategic choices in performance management systems	L1, L2	8
Module V: Strategy for Employee separation – Reductions in workforce Lay off, Downsizing, -Strategies for responsible restructuring, Strategic management of turnover and retention, Retirement, Global HRM – Strategic HR Issues in global assignments.	L1, L2	8
Module VI: Impact of SHRM on Business Performance Human Resource Evaluation - Definition and Overview, Rationale for HR Evaluation, Measures Of HRM Performance, Approaches to HR Evaluations, Evaluation of SHRM , Future Trends In Strategic HRM Approaches- Career Management, Mentoring Relationship, Work-Life Integration	L1, L2	8
P - Project; This would be the field project related to the subject where the student need to work outside the class collect the data and make report	L3 L4	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books:

Mello Jeffrey A., (2014), Strategic Human Resource Management,4th edition Thompson Press Publishing.

Reference Books:

1. AgarawalaTanuja (2007)Strategic Human Resource Management, Oxford University Press.
2. Armstrong Michael (2011), Strategic Human Resource Management: Strategy and Action, Kogan Page
3. Mahey C and Salman G., (1996), Strategic Human Resource Management, 5 th edition Oxford Blackwell.
4. Srinivas R. Kandula, (2002), Strategic Human Resource Development, Prentice Hall India.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	1	-	-	-	-	-	1	-	-	1	--	--
CO2	1	1	1	-	-	-	-	1	-	-	1	--	--
CO3	1	1	--	-	-	-	-	1	-	-	1	--	--
CO4	1	1	-	-	-	-	-	-	-	-	1	--	--

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DHRM2702	MANPOWER PLANNING	L	T	P	C
Version 1.1	Latest Approved	3	0	1	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

The course aim is to impart the knowledge and understanding of Manpower Planning its relevance and techniques used in the organization. Manpower planning is a technique of correcting imbalances between manpower demand and manpower supply in the economy. Through planning, the management strives to have the right number and right kind of people. The students will be exposed to theoretical knowledge and practical implications of the subject.

Course Objectives

The main objective of this course is to

1. The primary objective of this course is to enable the students to understand the purpose, process and planning behind various organizational strategies.
2. To create a critical appreciation and knowledge, for bridging the gap between the expected and actual requirement of the organization.
3. To understand the determinants of demand and supply forecasting and its significance in the Human resource planning.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Understand the significance of aligning HR practices with organizational strategy and role of HRP in an overall business outcome.

CO2: Assess & adapt the traditional and contemporary techniques for forecasting HR Demand & Supply and understand the basics of job analysis with all its components.

CO3: Apply various methods of valuation of HR & as a diagnostic tool to gauge the current status of human capital in an organization.

CO4: Critically evaluate the strategic dynamics behind Merger &Acquisition and the crucial HR issues involved in it

Modules	Blooms level*	Number of hours
HRP & Corporate Strategies Introduction of HRP, process(macro,micro) involved in HR planning, SHRP model, Business plan and factors influencing requirements of Human Resources, Linking HR planning to strategic planning, Aligning HR Strategy to Business Strategy, Productivity of people, Work study.	L1.L2	09
Manpower Forecasting, Demand & Supply Manpower profiling and competency profiling, Forecasting HR needs, Forecasting models and applications, Determining HR demand, Ascertaining HR supply: Replacement Analysis, Markov Models, vacancy model, Advanced Manpower Planning - Use and Applicability of Statistical and Mathematical Models in Manpower Planning namely Cohort Analysis & Census Analysis.	L1.L2	12

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Job Analysis, Recruitment & Selection Process Issues in Recruitment and Selection, Vocational choice, Fitment & careers, career anchors, Employee career management. Job analysis: Applications & Employer branding. Selection Measurement: basic concepts, types, applications, Interviewing skills, Assessment and development centers, Best practices in recruitment. Outsourcing-Lepak & Snell's model,	L1.L2	12
Issues in Mergers & Acquisitions Concept of HR accounting and audit, Understanding the Strategic Dynamics of Mergers & Acquisitions, Cultural issues in mergers, HR issues in M&As, HR Competencies in Managing M&A, Recent Trends in HR Planning	L1.L2	12
P - Project; This would be the field project related to the subject where the student need to work outside the class collect the data and make report	L3 L4	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text & Reference Books:

1. Armstrong, Michael and Berron, Angela (2008), Performance Management and Development, Jaico Publications.
2. Rao T V (2004), Performance Management and Appraisal Systems-HR Tools for Global Competitiveness, Sage publications
3. Cardy Robert L. (2008), Performance Management Concepts, Skills and Exercises, Prentice Hall India
4. Sahu R K (2009), Performance Management System, Excel Books
5. Sanghi, Seema,2019, 3rd edition,The Handbook of Competency Mapping, Sage Publication.
6. Sharma, Radha, 2002, 360 degree feedback, competency mapping and assessment centres, TMH.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CPA**	**TP**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	5	5	5	5	10	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	-	-	-	-	-	-	-	-	-	1	--	1
CO2	-	1	-	-	-	-	-	-	-	-	1	--	1
CO3	1	1	-	-	-	-	-	-	-	-	1	--	1
CO4	1	-	1	-	-	-	-	-	-	-	1	--	1

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DHRM2703	RECENT TRENDS IN HUMAN RESOURCE MANAGEMENT	L	T	P	C
Version 1.1	Latest Updated	2	1	2	4
Pre requisites exposure					
Co-prerequisites					

Catalogues Description:
In this course, the concept and theoretical perspectives, approaches and structure of industrial relations are discussed. The issues related to industrial disputes, trade unions, collective bargaining, discipline, grievance handling, industrial democracy, ILO, and labour policy and administration are discussed.

Course objectives: The objective of this course is to
CO-1: Understand and accommodate the recent trends in managing Human Resources.
CO-2: Analyze the developments in the field of Organizational Behaviour and its application at the workplace.
CO -3: Evaluate the concept of Sustainable Human Resources and its practices.
CO-4: Apply the knowledge of HR Analytics in HRM functioning.
Course Outcomes:
At the end of the course, the research scholar will be able to implement his/her aims and objectives of the research to be carried out

Modules	Blooms level	Number of arts
Module -1 Talent Management, Employer Branding, Change Management. Multigenerational Workforce, Employee Engagement, Contingent Workforce, Workforce Diversity, Work-life Balance, Trend in Compensation strategy, Glass Ceiling, Performance Evaluation, Knowledge Management, Succession Planning, Social Media in HRM functions.	L1,L2	9
Module -2 Inclusive Leadership, Pro-Environmental Behaviour, Psychological Contract, Spirituality at Workplace, Organizational Citizenship Behaviour, Resilience and Coping at Work, Psychological Contract, Mindfulness, Happiness and Subjective Well-being, Emotional Intelligence, Humanism at Work, Altruism. **Module -3** Green HRM, Pro-Environmental Behavior, Environmental Leadership, Triple Bottom Line HRM, Equality and Social Sustainability, Competencies required for sustainable HR roles, Sustainable leadership.	L1,L2	9
Module -4 Hybrid Work Model, Future of Work, Inclusive OB (Individual, Group and Technology), Application of HR Analytics and IOT at Workplace, Gamification Techniques, Virtual Training, Digital Culture.	L1,L2	9
Module -5 Layoff, Ergonomics Wellness, Moonlighting, Quiet hiring, great resignation, blind hiring, quiet quitting, loud quitting, AI in recruitment, Millennials and Generation Z, Mobile-friendly recruitment and Soft skills.	L1,L2	9
Tutorial: **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3 , L4	15

Bloom's Level:L1- Knowledge ; L2- Comprehension; L3- Application; L4- Analysis;

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L5- Synthesis; L6- Evaluation

REFERENCES:

1. Strohmeier, S. (2022). Handbook of Research on Artificial Intelligence in Human Resource Management, Edward Elgar Publishing Ltd, U.K.
2. Cantoni, F, Mangia, G, (2019) Fundamentals of Human Resource Management People, Data, and Analytics, SAGE Publications, New Jersey.
3. Bondarouk, T, J. M, H, Ruël, Parry,E, (2017). Electronic HRM in the Smart Era, 2017, Emerald Publishing Limited, UK.
4. **Fulcher**, J, **Cote**, T, **Marasco**, K, (2017). People Operations: Automate HR, design a Great Employee Experience, and Unleash Your Workforce, Publisher: Wiley, Location: Hokoben, New Jersey.

Modes of Evalution: Quiz/ Assignment/ Seminar/ Written Examination

Examination Scheme:

Components	A	CT	Q	HA	V	EE
Weightage (%)	5	10	5	5	5	70

CT: Class Test; HA: Home Assignment ; Q: Quiz; V: Viva-voce; A: Attendance ; EE: End Semester Examination

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	3								2	2		
CO2	1	3								2	2		
CO3	1	3								2	2		
CO4	1	3								2	2		

1: Strongly related, 2: Moderately related and 3: Weakly related

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DFIN2701	FINANCIAL ENGINEERING	L	T	P	C
Version 1.1		2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Finance has evolved as an exciting discipline in terms of innovations it has witnessed in recent past. This aspect known as Financial Engineering starts where financial analysis ends. The objective of the course is to enable the students to think in terms of innovative solutions to financial problems with particular emphasis on understanding new risks, which the changing scenario of finance is creating for individuals and firms and equip them with innovative tools of financial engineering called derivatives and skills to use them in forming effective strategies to cope with the changing environment and hedge against the financial risks

Course Objectives

1. To provide the necessary tools for participants who want to learn about managing corporate's financial risk and trading risk. The main focus will be on effective hedging using derivatives.
2. To gain knowledge on the workings of options, futures, and other derivatives and some structured products.

Course Outcomes

On the successful completion of this course the student will be able to:

CO1: Identify in terms of innovative solutions to financial problems with particular emphasis on understanding new risks,

CO2: Assess the changing scenario of finance is creating for individuals and firms and equip them with innovative tools of financial engineering called derivatives and skills to use them in forming effective strategies to cope with the changing environment and hedge against the financial risks

Modules	Blooms level*	Number of hours
Module I: Introduction Changing Environment and Increasing Price Risks, Financial Engineering as a response to Increased Risks, Types of Risks and Risk Management, Tools of Risk Management, Conceptual and Physical Tools of Financial Engineering, Effect of Speculation and Arbitrage on Market Efficiency, Derivative Market in India	L1,L2, L3	8
Module II: Futures and Forwards The Futures Markets, Buying and Selling Futures, Devising a Hedging Strategy Using Futures, Stock Index Futures, Value at Risk, Short Term and Long Term Interest Rate Futures, Foreign Currency Futures and Commodity Futures	L1, L3,L4	7
Module III: Swaps Structure of a Swap, Interest Rate Swaps, Currency of Swaps, Commodity Swaps, Other Swaps, Credit Risk, Role of a Swap Dealer.	L1, L3,L4	5

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Module IV: Options Options Markets; Properties of Stock Option Prices; Option Pricing Models – Binomial Model, Black-Scholes; Model, Single Period Options – Calls and Puts, Payoff Diagrams of Simple and Complex Option Strategies, Cash Settled Options, Multi-Period Options – Caps, Floors, Collars, Captions, Swaptions and Compound options, Cross-currency Futures and Options.	L1, L3,L5	10
Module V: Other Innovations Debt Market Innovations, Mortgage Backed Securities, Hybrid Securities, Asset-Liability Management	L1, L3	8
Module VI: Recent Trends Exotic Options, Synthetic Instruments, Developments in Equity-Based Strategies, Direct and Cross Hedges, Future Trends and Issues in Financial Engineering.	L1, L3	7
Tutorial: **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3 , L4	15

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Hull, J. C. (1999), Introduction to Futures and Options Markets, Prentice Hall of India.
2. Edwards, F. R. and Ma, C. W. (1992), Futures and Options, McGraw-Hill International.
3. Rebonato, R. (1996), Interest Rate Option Models: Understanding, Analyzing and Using Models for Exotic Interest Rate Options, John Wiley and Sons.

Reference Books

1. Kolb, R. W. (1997), Understanding Futures Markets, Prentice Hall of India.
2. Marshall, J. F. and Bansal, V. K. (2006). Financial Engineering: A Complete Guide to Financial Innovation, Prentice Hall of India.
3. Articles from selected journals and magazines.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CPA**	**TP**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	**5**	**5**	**5**	**5**	**10**	**70**

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	--	1	--	1	2	--	--	1	1	--	--
CO2	1	1	--	1	--	1	2	--	--	1	1	--	--

1: strongly related, 2: moderately related and 3: weakly related

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DFIN2702	FINANCIAL MODELING USING MS-EXCEL	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

The MS-Excel being the basic tool for developing financial models particularly in the areas of derivatives, valuation, project financing and portfolio management; is covered in detail for achieving expertise skill in financial modeling.

Course Objectives

The course aims to:

1. Modeling techniques for accurate financial forecasting are used in many areas of finance, such as derivatives, valuation, project evaluation, deal structuring, portfolio management and the like.
2. In the course, the participants will learn the model building skills required to build powerful models in finance with the help of excel.
3. There are many features of model building that are common irrespective of the final model that one intends to build.
4. The course will also emphasize on the different model building skills that one should have irrespective of the final use that one is going to make of it.

Course Outcomes

On completion of this course, the students will be able to,

CO1: An integrated and application based knowledge of basic features of MS-Excel as is applicable for developing financial models based on financial functions of excel; are developed

CO2: The knowledge and learning of techniques of Simulation methods, number system required for developing Finance Models; are attained

CO3: Development of technique and skill for developing Financial Models for capital budgeting, portfolio construction and Risk Management and to attain command over problem solving through MS-Excel applications.

CO4: Attainment of skills and technique of developing advance Financial models using VBA technique of MS-Excel.

Modules	Blooms level*	Number of hours
Module I: Understanding the Basic Features of Excel : Introduction to Modeling, Introduction to Excel, Database Functions in Excel Creating Charts Using Forms and Control Toolbox Understanding Finance Functions present in Excel Creating Dynamic Models	L1, L2,L3, L5, L5, L6.	13
Module 2:Simulation using Excel : Different Statistical Distributions used in Simulation Generating Random Numbers that follow a particular distribution Building Models in Finance using Simulation	L1, L2,L3, L5, L5, L6.	12

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Module 3: Excel in Capital Budgeting, valuation: Preparing common size statements directly from Trial Balance Forecasting Financial Statements using Excel Analysing Financial Statements by using Spreadsheet Model ; Determining Project Viability Risk Analysis in Project Appraisal Simulation in Project Appraisal; Determination of Value Drivers, DCF Valuation, Risk Analysis in Valuation; Determining Efficient Portfolio, Creating Dynamic Portfolios Portfolio Insurance Fixed Income Portfolio Management using Excel.	L1, L2,L3, L5, L5, L6.	13
Module 4: Understanding Subroutines and Functions and building simple financial models using subroutines and functions Recording and Editing Macros Subroutines and Functions Decision Rules Message Box and Input Box Debugging, **Designing Advanced Financial Models** using VBA User Forms Other Advanced Features Actual Model Building.	L1, L2,L3, L5, L5, L6.	12
Tutorial: **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3 , L4	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Book

2. Benninga, S., 2008, Financial Modeling, The MIT Press, Third Edition

Reference Books

3. J & S: Jackson M. and Staunton M., 2001, Advanced Modelling in Finance using Excel and VBA, John Wiley and Sons Ltd
4. B & M: Brealey R.A. and Myers S., 2003, Principles of Corporate Finance, Seventh Edition, McGraw Hill
5. Financial Analysis and Modeling using Excel and VBA – Chandan Sengupta
6. Building Financial Models, John Tjia

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Tutorials, Interactive sessions, Case studies, Field visits, Management games, Extensive research projects, Seminars, Weekend experience in companies - the course is covered by adopting a combination of lecture methods, class presentation by groups of students, self study sessions. Each student is required to do the back ground reading from the specified chapters of the prescribed book before coming to class. Cases are also to be analyzed, discussed in groups (teams) outside the class as preparatory work.

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

(C - Case Discussion/ Presentation; **HA** - Home Assignment; **Q** – Quiz; **V** - Viva; **CT** - Class Test; A-Attendance; **EE** - End Semester Examination)

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	2	--	--	--	--	--	--	--	1	1	--	--
CO2	1	2	1	--	--	--	--	--	--	2	1	--	--
CO3	1	1	1	--	--	--	--	--	--	2	1	--	--
CO4	1	1	--	--	--	--	2	1	2	2	1	--	--

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DFIN2703	FINANCIAL RISK MANAGEMENT	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course aims at helping the students to understand and apply a range of knowledge and skills necessary to function effectively as a risk manager. It will cover tools such as duration, portfolio beta, factor sensitivities, portfolio distribution analysis, and value at risk (VAR). It will also discuss how risk measurement tools can be used for active management of the risk/return profile of financial institutions.

Course Objectives

The objective of this course is to

- Provide an in-depth knowledge of the most recent risk identification, measurement and management techniques.
- Gain insights into risk management, trading, hedge funds, treasury management, financial corporate strategy, as well as regulatory supervision of financial institutions.

Course Outcomes

On completion of this course, the students will be able to

CO1: Describe different views on risk and explain how risk relates to expected return.
CO2: Apply financial risk management to create firm value.
CO3: Estimate and manage risks using different models.
CO4: Apply integrated risk management across firms and financial institutions.

Modules	Blooms level*	Number of hours
Module I : Foundations of Risk Management Basic risk types, measurement and management tools, Creating value with risk management; The role of risk management in corporate governance; Enterprise Risk Management (ERM); Financial disasters and risk management failures; The Capital Asset Pricing Model (CAPM); Risk-adjusted performance measurement; Multifactor models; Data aggregation and risk reporting; Ethics and the GARP Code of Conduct.	L1, L2,L3	7
Module II: Financial Markets and Products Structures and functions of financial institutions, Structure and mechanics of OTC and exchange markets Structure, mechanics, and valuation of forwards, futures, swaps, and options ; Hedging with derivatives; Interest rates and measures of interest rate sensitivity; Foreign exchange risk; Corporate bonds; Mortgage-backed securities	L1, L2,L3	8
Module III : Valuation and Risk Models Value-at-Risk (VaR)- VaR mapping • Expected shortfall (ES), Stress testing and scenario analysis • Option valuation • Fixed income valuation • Hedging • Country and sovereign risk models and management • External and internal credit ratings • Expected and unexpected losses • Operational risk	L1, L2,L3	7

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Module IV : Basel-I, Basel-II, Solvency-II, Basel 2.5, Basel-III: The reasons for regulating Banks, Bank Regulation Pre-1988, 1988BIS Accord, The G-30 Policy recommendation, Netting, 1996 Amendment, Basel II, Credit Risk capital under Basel II, Operational Risk capital under Basel II, Pillar 2-Supervisory Review, Pillar 3- Market Discipline, Basel 2.5, Basel-III.	L1, L2,L3	8
Module V : Credit Risk Measurement and Management • Credit analysis • Default risk: Quantitative methodologies • Expected and unexpected loss • Credit VaR • Counterparty risk • Credit derivatives • Structured finance and securitization	L1, L2,L3	7
Module VI : Operational and Integrated Risk Management Risk-adjusted return on capital (RAROC) • Economic capital frameworks and capital planning • Liquidity risk measurement and management • Failure mechanics of dealer banks • Stress testing banks • Third-party outsourcing risk • Risks related to money laundering and financing of terrorism • Regulation and the Basel Accords.Banking Resolution and Deposit Insurance Act (BRDI) 2017, Insolvency and Bankruptcy Code (IBC).	L1, L2,L3	8
Tutorial: **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3 , L4	15

**Bloom's Level:*
L1-Knowledge;L2-Comprehension;L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. John C. Hull, Risk Management and Financial Institutions, 4th Edition (Hoboken, NJ: John Wiley & Sons, 2015).
2. James Lam, Enterprise Risk Management: From Incentives to Controls, 2nd Edition (Hoboken, NJ: John Wiley & Sons, 2014)

Reference Books

1. Michel Crouhy, Dan Galai, and Robert Mark, The Essentials of Risk Management, 2nd Edition (New York, NY: McGraw-Hill, 2014).
2. Keep on updating of www.garp.org/frm (Global association of Risk professional)

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CPA**	**TP**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	5	5	5	5	10	70

(C - Case Discussion/ Presentation; **HA** - Home Assignment; **Q** – Quiz; **V** - Viva; **CT** - Class Test; A-Attendance; **EE** - End Semester Examination)

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	--	--	--	--	--	--	--	1	1	--	--
CO2	1	1	--	--	--	--	--	--	--	1	1	--	--
CO3	1	1	--	--	--	--	--	--	--	1	1	--	--
CO4	1	1	--	--	--	--	--	--	--	2	1	--	--

1: strongly related, 2: moderately related and 3: weakly related

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DMGT2739	BASICS OF RESEARCH METHODOLOGY, ETHICS, AND RESEARCH COMMUNICATIONS	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description
This course aims to provide students with a comprehensive understanding of conducting ethical research, utilizing proper research methodologies, and effectively communicating research findings. The course includes a final project where students will write a Literature Review on a topic chosen in consultation with the teacher(s).

This course is designed to equip students with essential skills and knowledge to conduct ethical research, employ proper research methodologies, and effectively communicate scientific information (with focus on writing a literature review). The course will cover topics such as research design, data collection and analysis, research ethics, and science communication strategies. Through a combination of lectures, discussions, case studies, and practical exercises, students will develop a deeper understanding of the research process and its ethical implications.

Course Objectives
The objective of this course is to impart knowledge about various stages of research process, research ethics and different ways of research communication.

The aim of this course is to impart research skills to the beginners and help to improve the quality of research by the existing researchers. It also encompasses the understanding and application of appropriate research design, statistics, and the use of the computer for reference management, report writing, research paper writing and presentation. The course also introduces the key conceptual issues of each research method, as well as giving practical guidance. It covers the series of research methodology contents: from problem formulation, to design, to data collection, analysis, reporting and dissemination. The course has the dual aims of equipping students with conceptual understandings of current academic debates regarding different methods, and the practical skills to put those methods into practice.

Course Outcomes
On completion of this course, the students will be able to
CO1. Define criteria of good research, steps in research process, and data collection.
CO2. Identify different types of sampling and its purpose.
CO3. Conduct hypothesis testing for different types of samples and interpret the results.
CO4: Learn the importance of literature review, write research paper/thesis, use reference management software.

Course Content :

Module	Topic	**Blooms level***	Hours

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1	**Research Methodology** Understanding the research process: From research questions to conclusions Types of research: Qualitative and quantitative research Exploratory, descriptive, experimental, and correlational studies Scientific Thinking: Subjective Vs. Objective Thinking Logical Reasoning: Inductive Vs. Deductive Reasoning Formulating research hypotheses and objectives Purpose of a good research, Criteria of good research	L1, L2	10
2	**Descriptive Statistics** Data, Types of Data, Methods of data collection, Benefits and drawbacks, Graphical representation of data and interpretation. Measures of Central Tendency: Arithmetic Mean, Median, Mode, Measures of Dispersion: Range, Standard Deviation, Variance, Coefficient of Variation.	L1, L2, L3	15
3	**Inferential Statistics** **Sampling:** Basic concepts, Process of Sampling, Sample Size, Types of Samples, Sampling and non- sampling errors, Statistics and Parameters, Sampling Distribution of Means and Proportion, **Hypothesis Testing**, steps in testing of hypothesis, errors in hypothesis testing, z test and t test.	L1, L2, L3	15
4	**Research Ethics** Plagiarism, Fabrication, Falsification, Ethics with respect to human and Animal Research	L1, L2	5
5	**Communication** Characteristics of a good Research paper, Systematics Literature Review (choosing a topic, preparing outline, gathering authentic & appropriate references, avoiding plagiarism, use of reference management systems), Writing a good literature review, Structure of report (Introduction, Methodology, Analysis, Results, Discussions, Conclusions, Recommendations), Writing Quality Research Paper, Publishing Research Work in Quality Journals, Reference Management Software	L1, L2, L3	15

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional Exam	End Term Examination
Weightage (%)	5	10	15	70

Project based assignment: Student teams (2-3 students per team) will write a literature review on a topic of choice, in consultation with the teacher.

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Text books/ Reference books

- Research Methodology for Natural Sciences by Soumitro Banerjee, Publisher: IISc Press (1 January 2022); ISBN-10: 8194835178; ISBN-13: 978-8194835172
- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt. Ltd., New Delhi-110001
- Geode, Millian J.& Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Kothari, C.R.2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.
- Levin R I., Rubin D S. Statistics for Management. Sixth Edition, PHI
- Kapoor & Gupta. Probability & Statistics. S Chand Publishers, New Delhi.
- Montomery, Douglas C.(2007), 5th Ed. Design and Analysis of Experiments, Wiley India.
- Cooper, Donald R. and Pamels Schindler, Business Research Methods, Tata McGraw Hills, New Delhi
- Krishnaswamy, K.N. Sivakumar. Appa lyer and Mathiranjan M. 2006, Management Research Methodology: Integration of Principles, Methods and Techniques, Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Sachdeva, J.K. 2008. Business Research methodology. Himalaya Publishing House, New Delhi.
- Shekharan, Uma, Business Research Methods, Miley Education, Singapore.
- Zikmund, Millian G., Business Research Methods, Thomson Learning, Bombay.

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SEMESTER-VIII

DMGT2801	STRATEGIC LEADERSHIP	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description:
This course introduces the concept of Strategic Leadership. Strategic leadership is a practice in which executives, using different styles of **management**, develop a vision for their organization that enables it to adapt to or remain **competitive** in a changing economic and technological climate. Strategic leaders can use this vision to motivate employees and departments, fostering among them a sense of unity and direction to implement change within their organization. The main objectives of this course is to understand that how strategic leaders streamline processes, boost strategic productivity, promote innovation and cultivate an environment that encourages employees to be productive, independent and to push forward their own ideas and how to manage the make use of reward or incentive programs to encourage employees and help them reach their goals.

Course Objectives
The objective of this course is to:
1. Introduce students to the key concepts, tools and principles of Strategy and leadership and strategic Leadership.
2. Expose the students to the various approaches in crafting business strategy, tools that aid in reasoning carefully about strategic options, and learning how companies use what-if analysis to evaluate action alternatives and make sound strategic decisions.
3. Develop an understanding of the concept of leadership and different styles of leadership and models.
4. Expose the students to the various approaches in crafting business strategy, tools that aid in reasoning carefully about strategic options, and learning how Leadership can be instrumental of achieving these objectives.

Course Outcomes
On completion of this course, the students will be able to
CO1: Identify and determine the concept of strategy, Mission, Vision and Strategic Management Process.
CO2: Analyze and understand the concept Leadership its theories, Styles and Models and Strategic Leadership
CO3: Analyze the concept of how Leadership can be instrumental in Strategic formulation and implementation
CO4: Analyze the concept of Strategic Leadership and Change Management and Agile Leadership and Counseling

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Modules	Blooms level*	Number of hours
MODULE I-Introduction and Purpose of Strategy Concept of Strategy, corporate, Business and Functional Levels of Strategy, Mission, Vision, Objectives, Approaches to four Phases in Strategic Management Process, Stakeholders in business and their roles in strategic management, Strategic decision making	L1, L2	2
MODULE 2: Leadership: Importance of leadership, Roles of a Leader, Overview of Organizational Leadership Major Coursework and Issues in Organizational Leadership Theories of Leadership, Leadership Traits, Leadership Skills, Leadership Styles, Levels of Analysis of Leadership Theory – Leadership Traits and Ethics: Leadership Behavior and Styles, Process Theories: Reinforcement Theory, Contingency Leadership Theories and Models, normative leadership theory,	L1,L2, L3	7
MODULE 3: Introduction To Strategic Leadership Definition and Qualities of a Strategic Leader, Strategic leadership skills and characteristics, How to Become a Strategic Leader Strategic leadership vs. other classifications of leadership, strategic leadership environment challenges of strategic leadership Examples of Strategic Leaders,. Integrating Strategy and Leadership, Mission and Vision: The Heart of Strategic Leadership, Leadership and Systems Thinking, Describe the relationship between strategy and operations	L1, L2, L3	9
MODULE 4: Strategic Leadership Model/TYPES Transactional Leaders, Transformational Leaders Sigruficance of Transformational Leadership Types of Transformational Leaders Intellectual Reforms Revolutionaries Charismatic Role of Transformational Leadership in What Strategies do Transformational Leaders Use ,Charismatic-Visionary Leadership Team Leadership – Strategic Leadership Models	L1, L3,	10
MODULE 5: Strategic Leadership and Change Management, Leading High-performance Teams, Leading organisations into a new paradigm/ growth strategies	L1,L2 L3,	8
Module 6: Agile Leadership and Coaching and counseling Applying positive psychology and positive psychological capital Coaching models & framework, Coaching skills practice, Creating a coaching culture in organizations. Reflection and action planning	L1,L2 L3	10
P - Project; This would be the field project related to the subject where the student need to work outside the class collect the data and make report .	L3 , L4	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis L5-Synthesis; L6-Evaluation*

Text Books

1.Pearce & Robinson,2012, Strategic Management Formulation Implementation & Control, 12th Edition, McGraw Hill

2.Steven J. Stowell (Author), Stephanie S. Mead (Author)**2016 Art Of Strategic Leadership, Wiley; 1st edition**

3. John Adair (Author) **Strategic Leadership: How to Think and Plan Strategically and Provide Direction, Kogan Page Ltd; 1st edition**

Reference Books

1.Lynch,2006, Corporate Strategy, 4th Edition, Pearson.

2. Ramaswamy & Namakumari, 1996, Strategic Planning for corporate success,

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Sage Publications.
3. Michael E. Porter, 1998, Competitive Advantage, Crafting & Executing Strategy, Free press.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	--	--	--	--	--	--	--	1	--	--	--
CO2	1	--	--	--	--	2	--	--	1	--	--	--
CO3	1	2	--	--	--	--	--	--	1	--	--	--
CO4	1	--	--	--	--	--	--	2	1	--	--	--

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DMGT2802	BUSINESS ANALYTICS	L	T	P	C
Version 1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

The course provides an introduction to data analytics to be used in business. The students will learn how data analysts describe, predict and make informed business decisions in various business domains like marketing, human resources, finance and operations. The aim of the course is to develop basic data literacy and an analytic mindset in students that will help them to make strategic decisions based on data.

C**ourse Objective:**

1. To investigate data to establish new relationships and patterns
2. To analyze the correlation between different variables for the predictive analytic and predictive modelling
3. To analyze the possibility of default and generate customer records
4. To understand and explore problems in business
5. To make the use of tools such as Excel and open source to interpret data
6. To use analytics to solve business problems

Course Outcomes

On successful completion of these programs, students will be able to:

CO1. Understand, integrate, and apply relevant knowledge and skills in a global context
CO2. Identify and describe complex business problems in terms of analytical models
CO3. Apply appropriate analytical methods to find solutions to business problems that achieve stated objectives
CO4. Translate results of business analytic projects into effective courses of action
CO5. Communicate technical information to both technical and non-technical audiences in speech, in writing, and graphically

Modules	Blooms level*	Number of hours
Module I: Introduction to Business Analytics Importance and role of data driven decisions. Business Analytics – Definition, Market, Trends; Paradigm Shift from Data to Insight and from Business Intelligence to Business Analytics; Examples and Types of Business Analytics Analysis-Forecasting & Predictive Modeling; Descriptive, Prescriptive and Predictive Analytics. Data Summarization, Data visualization – Various visualization techniques, standardized reporting and Pivot Tables – Using Excel	L1, L2, L3	8
Module II: Data Mining Introduction to Data Mining; Crucial processes in data mining; Data Warehousing; Data Mining Techniques and Exploratory Data Analysis; Data Mining Tool – XL Miner.	L1, L2, L3, L5	8

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Module III: Decision Making & Optimization Decision making under uncertainty – Decision Trees and Risk Profiles; Sensitivity Analysis; Optimizing complex decisions – Optimization of a large number of decisions while accounting for different kinds of physical and business decisions. Introduction to Optimization Techniques –Linear Programming; Optimization – Use of Excel to solve business problems like marketing mix, capital budgeting and portfolio optimization.	L1, L2, L3, L4, L5, L6	9
Module IV: Big Data and Introduction to R Introduction to Big Data, Big Data driven decisions in business organizations – Benefits and Security/Privacy concerns. Building Business and Economic Models –Tools to leverage data for Prediction purposes; Logistic Regression. Introduction to Machine Learning; Statistical Learning vs. Machine Learning; Major classes of Learning Algorithms –Supervised Vs Unsupervised Learning. Introduction to R Programing	L1, L2, L3, L4, L5, L6	10
Module V: Simulation using R and Excel Hands on Regression using R; Introduction to Simulation; Applications of Simulation and Building a Simulation Model. (Using Excel and R)	L1, L2, L3, L4, L5, L6	10
Capstone Project.		15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

- Aczel, D.A., Sounderpandian, J., Saravanan, P. and Joshi, R. (2012). *Complete Business Statistics (7th ed.)*. New Delhi, India: McGraw Hill Education (India) Private Limited
- Cooper, R.D., Schindler, S. P. and Sharma, J.K. (2015). Business Research Methods. New Delhi, India: McGraw Hill Education (India) Private Limited
- Gujrati, Damodar N and Sangeetha (2011). *Basic Econometrics (4th Ed.)*. New Delhi, India: McGraw Hill Education (India) Private Limited
- Beri, C. (2016). *Business Statistics*. New Delhi, India: McGraw Hill Education (India) Private Limited
- Kothari, C.R. (2009). *Research Methodology: Methods and Techniques (2nd revised ed.)*. New Delhi, India: New Age International Publisher
- Sharma, J.K. (2013). *Operation Research: Theory and Applications (5th ed.)*. New Delhi, India: Macmillan Publishers India limited
- Stephen Powell and Ken Baker., "The Art of Modeling with Spreadsheet"
- Data, data everywhere, "Special report on managing information, Economist", February 27th, 2010.
- Liberatore and Luo, "The Analytics Movement, Interfaces, Articles in Advance", pp. 1–12, 2010.
- "Using R for Data Analysis and Graphics". Introduction, Code and Commentary

Reference Books

- Frederick Shiller & Gerald J Liberman. *Introduction to Operation Research*. New Delhi, India: Tata McGraw- Hill Education (India) Private Limited
- Albright and Winston. Business Analytics: Data Analysis and Decision Making, 5th Edition
- Gillet, B.E. *Introduction to Business Research*. Tata McGraw Hill

Modes of Evaluation: Class Test/Assignment /Written Examination

Examination Scheme:

Components	ME	A	Q/S	L	CT	EE
Weightage (%)	10	5	5	5	5	70

ME- Mid Term Examination; A- Attendance; Q/S- Quiz/Seminar; L- Lab, EE- External Examination

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1		1	2	--	--	--	--	--	--	1	1	--	1
CO2	1	1	2	--	--	--	--	--	--	1	2	--	2
CO3	1	1	--	--	--	--	--	--	--	1	2	--	3
CO4	1	1	1	1	--	--	--	--	--	1	3	3	3
CO5	1	--	--	1	--	--	--	--	--	1	3	--	3

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DMKT2801	MARKETING RESEARCH	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

To facilitate the understanding and learning of fundamental concepts in the area of marketing research. To provide the students with research tools and techniques to conduct research and make effective analysis for effective decision making.

Course Objectives

The objective of this course is to

1. Develop understanding of marketing research and its value in analyzing consumers, markets, and the environment.
2. Familiarize students with basic of research and the research process and enable them in conducting research work, formulating research synopsis and report.
3. Familiarize students with Statistical packages such as SPSS/EXCEL and impart knowledge for enabling students to develop data analytics skills and meaningful interpretation to the data sets so as to solve the business/Research problem.

Course Outcomes

On completion of this course, the students will be able to

CO1: Plan and undertake qualitative or quantitative Market Research and demonstrate the ability to appropriately analyze data to resolve marketing issues.

CO2: Develop a market research design; including Identifying appropriate research approaches, preparing measurement instruments and designing a sampling approach and sampling frame

CO3: Create and conduct a small survey, applying a wide range of survey, scale, and questionnaire techniques.

CO4: Use contemporary statistical packages to calculate and report descriptive statistics from quantitative data and Interpret data analysis in the context of the identified business problem

CO5: Write the research results in written report and oral presentation formats

Modules	Blooms level*	Number of hours
Module- I: Introduction and Early Phases of Marketing Research **Introduction to Marketing Research**: Definition of Marketing Research; Classification of Marketing Research; Marketing Research Process; **Early Phases of Marketing Research-** Defining the Marketing Research Problem; Developing an Approach; Importance of Defining the Problem; Components of the Approach.	L2,L4,L5	7

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Module- II: Research Design Formulation **Research Design** : Definition, Exploratory Research, Descriptive Research, Cross-Sectional Designs, Longitudinal Designs, Relative Advantages and Disadvantages of Longitudinal and Cross-Sectional Designs, Causal Research, Relationships Among Exploratory, Descriptive, and Causal Research, Potential Sources of Error, Marketing Research Proposal; **Exploratory Research Design-Secondary Data:** Criteria for Evaluating Secondary Data, Classification of Secondary Data; **Exploratory Research Design- Qualitative Research**: Primary Data: Qualitative Versus Quantitative Research, Rationale for Using Qualitative Research , A Classification of Qualitative Research Procedures; **Descriptive Research Design**: Survey and Observation; **Causal Research Design**: Experimentation; Measurement and Scaling: Fundamentals and Comparative Scaling and non-comparative Scaling Techniques; **Questionnaire:** Preparations and errors; **Sampling:** Design and Procedures , Final and Initial Sample Size Determination.	L2, L3,L5	15
Module III: Data Collection and Preparation Fieldwork, Data Preparation, The Data-Preparation Process, Questionnaire Checking, Editing ,Treatment of Unsatisfactory Responses, Coding, Coding Questions , Developing a Data File, Transcribing, Data Cleaning, Consistency Checks, Treatment of Missing Responses, Statistically Adjusting the Data, Scale Transformation, Selecting a Data Analysis Strategy.	L2,L3, L5	8
Module-IV: Data Analysis Frequency Distribution, Cross-Tabulation, and Hypothesis Testing, Analysis of Variance and Covariance, Correlation and Regression, Discriminant and Logit Analysis, Factor Analysis, Cluster Analysis, Multidimensional Scaling and Conjoint Analysis, Structural Equation Modeling and Path Analysis,	L2,L4,L5	7
Module-V: Reporting Report Preparation and Presentation Process; Importance of the Report and Presentation Process; Report Preparation Format.	L5, L6	8
Tutorial: **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3 , L4	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books:

1. Aaker, D. (2009). *Marketing Research* (9th ed.). San Francisco: Wiley
2. Bradley, N. (2008). *Marketing research: Tools and techniques* (2nd ed.).Delhi: Oxford University Press.
3. Burns, A. C., & Bush, R. F. (2007). *Marketing research* (6th ed.). New Delhi: Prentice Hall.

Reference Books:

1. Churchill, G., Iacobucci, D., & Israel, D. (2009). *Marketing research: A South Asian perspective*. Delhi: Cengage Learning India.
2. Malhotra, N. (2006*). Marketing research: An applied orientation* (6th ed.). New Delhi: Pearson Education.
3. Zikmund, W. G., & Babin, B. J. (2009). Exploring marketing research (10thed.). USA: Cengage South-Western.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CPA**	**TP**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	5	5	5	5	10	70

CPA:Case Discussion/Presentation/Analysis TP:Project Q/S:Quiz/Seminar

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A: Attendance ME: Mid Term Exam EE: End Term Examination

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	2	-	-	-	-	-	-	2	1	1	-	-
CO2	1	1	2	-	-	-	-	-	2	1	1	3	-
CO3	2	1	-	-	-	-	3	-	2	2	1	-	-
CO4	1	1	-	-	-	-	2	3	1	1	1	-	-
CO5	2	1	3	3	-	-	-	-	3	2	1	-	-

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DMKT2802	STRATEGIC BRAND MANAGEMENT	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course will give and in-depth understanding of the development and management of brands. It traces and highlights the intricacies involved in balancing both brand and company strategic objectives. Students will be introduced to the meanings of new brands, why some new brands fail and others succeed, and the problems faced by marketers during the various stages of the development process. Finally, concepts and theories on branding, such as the naming of new brands, brand awareness, brand personality, brand loyalty, and how to build brand equity, will be discussed.

Course Objectives

The objectives of this course are to:

1. Introduce students to fundamental concepts and principles of product and brand Management.
2. Provide the students knowledge about different tools which are available to help managers measure and visualize their brand positions to aid with strategic planning.
3. Explain product and branding strategies which can be applied in the decision making framework and to analyze branding techniques and extension strategies.
4. Provide different concept of strategic branding process, brand equity, identity, personality, etc for effective application in real life business environment.
5. Explain the best practices for brand valuation. It will also discuss how brand portfolio strategy and brand architecture increases the value of a firm's brands.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Define the key components of brand and related concepts involved in formulating both competitive and corporate strategies to enhance brand equity.
CO2: Design branding strategies, tools and techniques to business opportunities and problems.
CO3: Interpret strategically and confidently in making branding decisions..
CO4: Apply practical skills in designing branding strategies, brand portfolio, brand elements, communications etc.
CO5: Analyze different conditions that a firm should pursue a global branding strategy against portfolio of local brands

Modules	Blooms Level*	Number of hours
Module I: Product Strategy Development Elements of Product Strategy, Product Mix and Line decisions. Positioning Strategy, Product Strategy over Life Cycle, New Product Development Process.	L1, L2	4
Module: 2 Introduction to Strategic Brand Management Concept of a brand, Evolution of Brands, Brands & Products, Branding Challenges and Opportunities, Strategic Brand Management Process. Branding Decisions: Brand Name Research, Branding Elements, Options and Tactics for Brand Elements	L1, L2	7

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Module: 3 Measuring the Brand Concept of Brand Equity; David Aaker Brand Equity Model, Customer Based Brand Equity (CBBE) Model, Building a stronger brand, Customer Equity and its relationship to brand equity. Brand Tracking, Brand Audit, Y&R's Brand Asset Valuator (BAV) Model.	L1, L2, L3, L4, L5	7
Module: 4 Connecting with Customers Brand positioning concept, Brand Differentiation, Brand Positioning Strategies, Repositioning/ Rebranding, Benefit Ladder, Perceptual Mapping.	L1, L2, L3	5
Module: 5 Brand Strategies Need for designing branding strategies, Brand extensions, Types of brand extensions, Consumer Evaluation of brand extension, Opportunity analysis for brand extension. Branding and Marketing Communications.	L1, L2, L3, L$, L5	8
Module: 6 Managing Brand Architecture Developing brand architecture; Brand Portfolio, Co-branding, Brand Licensing and Franchising**.** Brand Archetyping: Concept, Role of brand archetyping in brand building, Different types of archetypes and its meaning.	L1, L2	7
Module: 7 Global Branding Managing brand over geographical boundaries, Issues and Strategies in global branding. Brands over Time: Managing brand image and equity over time, Brand sustenance and brand revitalization, contrasting issues of brand development across different sectors.	L1, L2	7
Tutorial: **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3 , L4	15

L1-Knowledge; L2-Comprehension; L3-Application; L4-Anaylysis; L5-Synthesis; L6-Evaluation

Text Book

Keller K.L., Parameswaran, Jacob (2011), Strategic Brand Management: Building, Measuring, and Managing Brand Equity, 3rd edition, Prentice Hall.

Reference Books

Kirti Dutta. (2012), Brand Management: Principles and Practices, Oxford Publication.

Sengupta S. (2010), Brand Positioning, Tata McGraw-Hill

1. Kapferer J. L. (1994), Strategic Brand Management, Free Press

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance.

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	--	--	1	--	--	1	1	1	1	1	--	--
CO2	1	--	--	1	--	--	1	1	1	1	1	--	--
CO3	1	--	--	1	--	--	1	1	1	1	1	--	--
CO4	1	--	--	1	2	--	1	1	1	2	1	--	--
C05	1	--	1	2	2	--	1	1	1	1	1	--	--

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DMKT2803	BUSINESS AT BOTTOM OF PYRAMID	L	T	P	C
Course Version	Latest Approved	2	1	2	4
Pre-requisites/Exposure	Basic Marketing concepts				
Co-requisites	NA				

Catalog Description:
The main aim of the course is to develop a deeper understanding of BOP markets among the students. This course will expose the students to the theoretical concepts and frameworks to better understand opportunities and challenges at the BOP markets. They will be in a position after the course to appreciate various complexities involved in doing business at the BOP

Course Objectives :
The objectives of this course are to-
1: Make the student understand the concepts/theories pertaining to marginalised customers living at the bottom of economy.
2: Make the student well versed with the various challenges that an organisation faces while serving BOP customer.
3: Enable the student to comprehend the process of branding.
4: Provide with knowledge to the student so that he may describe the target market and determine the product development strategy suitable to BOP customer.

Course Outcomes (CO):
On completion of this course, the students will be able to-
CO1: Memorize the cases along with various concepts related to BOP.
CO2: Identify and explain factors which influence organisation decision to enter BOP market.
CO3: Create suitable strategies to succeed in BOP market.

Modules	Blooms level*	Number of hours
Module-1: Introduction The Market at the Bottom of the Pyramid, The Power of Dominant Logic, The Nature of the BOP Market, Potential of BOP market in India ,Challenges offered by Indian BOP market.	L1, L2	9
Module-2: The Fortune at the Bottom of the Pyramid There Is Money at the BOP, Access to BOP Markets, The BOP Markets Are Brand Conscious, The BOP Market Is Connected, BOP Consumers Accept Advanced Technology Readily ;The Market Development Imperative :Create the Capacity to Consume ,The Need for New Goods and Services ,Trust Is a pre-prerequisite ;Benefits to the Private Sector , Developing Products and Services for the BOP, Twelve Principles of Innovation for BOP Markets.	L1, L2,L3	11

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Module-3: BOP: A Global Opportunity? Engaging the BOP , Local Growth Opportunities ,Local Innovations and Global Opportunity ,BOP Solutions for Developed Markets ,Lessons for MNCs from BOP Markets, The Cost of Managing, Learning to Live in a Network of Relationships; The Ecosystem for Wealth Creation, Reducing Corruption.	L1, L2,L3	11
Module-4: Development as Social Transformation Development as Social Transformation ,Breaking Down Barriers to Communication, BOP Consumers Upgrade ,Gaining Access to Knowledge, Identity for the Individual, Women Are Critical for development ,Evolving Checks and Balances	L1,L2,L3	7
Module-5: Innovative Practices at the Bottom of the Pyramid The Market at the Bottom of the Pyramid, Known Problems and Known Solutions: What Is the Missing Link? Known Problems and Unique Solutions, Known Problems and System wide Reform, Scaling Innovations, Creating Enabling Conditions for the Development of the Private Sector	L1,L2,L3,L4,L5	7
Fieldwork: **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3 , L4	15

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Book:
1.Collier, Paul. The Bottom Billion. Why Poor Countries are Failing and What Can Be Done About It(2007). New York: Oxford University Press..

Reference Books:
1.Easterly, William. The White Man's Burden: Why the West's Efforts to Aid the Rest Have Done So Much Ill and So Little Good. (2007) Oxford: Oxford University Press.
2.Yunus, Muhammad. Creating a World without Poverty. Philadelphia: Public Affairs (Perseus Book Group), 2006.
3.C.K. Prahalad, Bottom of Pyramid(2005); Pearsons Publications

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CT**	**HA**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	5	5	5	5	10	70

CT: Class Test, HA: Home Assignment, Q/S: Seminar/Viva/Quiz, ME: Mid Term Exam EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	-	--	1	--	--	--	--	--	-	1	--	--
CO2	1	-	-	--	--	--	--	--	--	-	1	--	--
CO3	2	-	2	2	--	2	--	--	--	-	1	1	1
CO4	-	-	--	--	--	--	--	--	--	-	1	2	--

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DMKT2804	MARKETING OF NON-PROFIT ORGANIZATION	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

In this course, the concepts related to need of marketing for non-profit organizations, Image management, consumer behaviour analysis, Marketing mix strategies keeping in mind NPOs 's need are discussed in detail. Additional concepts based on HR & finance management will also be discussed in detail. The course aims at familiarizing the students with the application of the concept & need of marketing in Non-Profit organizations.

Course Objectives

The objective of this course is to

1. Make students learn the role and application of marketing to promote social change and to achieve social goals for non-profits organizations.
2. Gain practice in applying marketing in a diverse range of non-profit environments including charities, social programs and ideas, health, education, the arts, as well as goods and services.

Course Outcomes

On completion

of this course, the students will be able to

CO1: Explain the scale, scope and significance of the non-profit sector.
CO2: Illustrate the uniqueness of marketing in the non-profit environment.
CO3: Identify relevant stakeholders for diverse non-profit environments.
CO4: Summarize the principles of segmentation, targeting, positioning and competitive advantage for non-profit.
CO5: Develop the marketing process as it relates to the non-profit sector including: performing a situational analysis, developing the marketing mix, managing costs, developing objectives and metrics for gauging success in marketing.

Modules	Blooms level*	Number of hours
MODULE I- Introduction to Non-Profit Organization Concept& Characteristics, Non- Profit Organization in India, Types, Problems, Need of Marketing of Non-Profit Organization.	L1, L2	8
MODULE 2: NPOs and Image Management Differentiation of NPOs: Concept of Responsive Organization- Image management, image causation, image modification, Mission, Exchange, Environment affecting operations of NPOs (Publics), Image & Satisfaction measurement.	L1, L2, L3, L4	11
MODULE 3: Managing Marketing efforts Understanding Consumer Behaviour; Product- Product Mix, Product Mix decisions for Non-profit Organization; Pricing for Non- Profit organizations.	L1, L2, L3, L4, L6	8

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MODULE 4: NPOS Market Segmentation & Promotion Mix Market Segmentation for Non- profit Organization, Target Marketing; **Promotion**: Advertising, personal selling, sales promotion and Public Relations for Non- profit Organization.	L1, L2, L3	9
MODULE 5: Managing Human and Financial Resource **Managing Human Resource**: Attracting People, Analysing people, Recruitment, Members and membership criterion, Volunteers. **Managing Financial Resource**: Donor Marketing, Attracting Funds, Analysing Donor markets, Fund raising goals and strategy.	L1, L2, L3	9
Tutorial: **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3 , L4	15

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis; L6-Evaluation

Text Books

1. Alan R Andreasen & Kotler Philip(2007); *Strategic Marketing for Non-Profit Organizations;* 7th Edition, Pearson.
2. Adrian Sargeant(2009);Marketing Management for Nonprofit organizations; 3rd edition ,Oxford University Press.

Reference Books

1.Kotler, P., & Roberto, E. L. (1989). *Social Marketing: Strategies for Changing Public Behavior*. The Free Press.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	--	--	--	--	--	--	--	--	1	--	--	--
CO2	1	--	--	--	--	--	--	--	--	1	--	--	--
CO3	1	--	--	--	--	--	2	--	--	1	--	--	2
CO4	1	--	--	--	--	--	--	--	--	1	--	1	--
CO5	--	1	--	--	--	--	--	--	--	--	1	--	--

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DHRM2801	TALENT MANAGEMENT	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

In this course a clear understanding of the concepts of recruitment, selection, retention and development of human capital from the perspective of organizational excellence is discussed. The importance of Talent Acquisition, and management from the perspective of competitive business environment is understood and explained .

Course Objectives

The objective of this course is to

- The objective of this course is to understand the concept and process of Talent Acquisition, and management .
- To understated strategies for employee retention, and training and development in modern organizations**.**
- To understand the concept of Group dynamics, managing differences at workplace and effective communication.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain job analysis and human resource planning and forecasting.

CO2**:** Interpret and explain process of recruitment and selection, its traditional and modern methods and talent hunt at local and global level.

CO3: Describe the basics of Absenteeism and Turnover, Retention Management Process, in the organizations.

CO4: Discuss process and evaluation of training and development, training and development for modern organizations

Modules	Blooms level*	Number of hours
Module I Talent Management: Definition, Meaning of Talent Management, Objectives &Role of Talent Management in building sustainable competitive advantage to a firm, Key Processes of Talent Management, Consequences of Failure in Managing Talent, Benefits of Talent Management: How Your Business Can Benefit From it, Responsibilities of Talent Management Manager & Professionals	L1, L2	8
Module II: Talent Management Planning: Understanding the Needs and Mind set of Employee, Steps in Talent Management Process, Knowledge, Values, Beliefs and Skill Implications for Talent Management, Modelling Excellence	L1, L2	8
Module III: Talent Acquisition: Defining Talent Acquisition, Develop high potential employee - High performance workforce, Importance of Talent Development Process, Steps in Developing Talent, Succession Planning, Difference between Talent Acquisition and Recruitment, Current Trends in Talent Acquisition.	L1, L2	8

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Module IV: Talent Development and Retention **"**SMR Model" (Satisfy, Motivate and Reward) – The Formula to Win Your Employees & Retain Them, Employee Retention Programs, Career Planning & Development, Return on Investment (ROI) on Talent Management, Employee Engagement, Best Practices in Employee Retention. Role Development – Talent relationship management – Performance management – Total reward - Learning and development - Career management	L1,L2,	12
Module V: Opportunities and Challenges in Talent Management: Talent Management Challenges, Strategies to Overcome the Challenges, Opportunities in Talent Management, Talent Management in the Digital Era, Current trends in Talent Management.	L1, L2	8
P - Project; This would be the field project related to the subject where the student need to work outside the class collect the data and make report	L3 L4	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text Books:

1. Raymond Noe (2016) Employee Training & Development, McGraw-Hill Education.
2. Dipak Kumar Bhattacharyya (2015), Training and Development: Theories and Applications, Sage Publications Pvt. Limited.

Reference Books

1. Dessler, G. (2011), Human Resource Management, Prentice Hall of India
2. Lynton R.P and Pareek U (2011). Training for Development. SAGE Publications, New Delhi
3. Srivastava, S., (2001), The Employee Recruitment and Retention Handbook, Amacom.
4. Wexley, K & Lathan Gary, (2012), Developing & Training HR in Organization., Prentice Hall India

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CPA**	**TP**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	5	5	5	5	10	70

C - **Case Discussion/ Presentation;** HA - **Home Assignment;** P - **Project;** S - **Seminar;** V - **Viva;** Q - **Quiz;** CT - **Class Test;** A - **Attendance;** EE - **End Semester Examination**

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	-	-	-	-	2	1	-	-	1	--	-
CO2	1	1	1	-	-	-	2-	1	-	-	1	--	-
CO3	1	1	-	-	-	-	2	1	-	-	1	--	-
CO4	1	1	-	-	-	-	-2	1	-	-	1	--	-

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DHRM2802	GLOBAL HUMAN RESOURCE MANAGEMENT	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is designed to provide students with an understanding of three interrelated aspects of managing in the global workplace.

General human resource management (HRM) in the multinational enterprise. Engaging in and supporting global mobility. Building awareness of present and emerging international human resource management trends. The course places equal value on building students' understanding of the theoretical foundations and practical implications of working in a global HRM environment.

Course Objectives

The main objective of this course is to

1. Inculcate deep understanding of International Human Resources and to explore the dynamics of global business development.
2. It also aims at preparing students about examining significant business opportunities and maximization of returns with understanding of cross cultural management,
3. Understanding of the essential differences in managing human Resources, at all levels in foreign environment.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Identify the basic concepts, functions and processes of human resource management

CO2: Describe the role and functioning of human resource department of the organizations.

CO3: Distinguish HRM processes such as Recruitment, Selection, Training, Development, Performance appraisals and Ethical Behaviour.

CO4: Explain the knowledge of current issues in HRM.

Modules	Blooms level*	Number of hours
Module I: **Internationalization** Evolution of International Business, Stages of internationalization, Modes of entering International business Relationship between International Strategy and SIHRM- International Human Resource Management – Competencies for Global Manager	L1, L2	9
Module II: **Organisation Structure, International HRP, Recruitment and Selection** Organisation Structure and HRM, Global Human Resource Planning, Issues in Supply of International Human Resources, Recruitment and Selection	L1, L2	9
Module III: **International Compensation Management** Complexities, Objectives of International Compensation Management, Component and Structure of International Compensation Package, Executive Rewards and Compensation, Approaches to International Compensation Management	L1, L2	9
Module IV: **Human Resource Professional – Molester Navigation** Context for International Perfect Management, Framework for Performance Management, Re-partriation, Cross-Cultural issues across all continents	L1,L2	9

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Module V: **Understanding Cross Culture: Issues & Perspectives** Understanding Culture, Introduction, Key Concepts, Determinants of Cultural Identity,Frameworks for Mapping the Culture, Geert Hoefstede, Clyde Cluckhohn, TE Hall, Fons Trompenaars Studies of National Culture, Managing Workforce Diversity, Adjusting to the New Culture	L1, L2	9
Field work **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3 , L4	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text & Reference Books:

- Armstrong, Michael and Berron, Angela (2008), Performance Management and Development, Jaico Publications.
- Rao T V (2004), Performance Management and Appraisal Systems-HR Tools for Global Competitiveness, Sage publications
- Cardy Robert L. (2008), Performance Management Concepts, Skills and Exercises, Prentice Hall India
- Sahu R K (2009), Performance Management System, Excel Books
- Sanghi, Seema,2019, 3rd edition,The Handbook of Competency Mapping, Sage Publication.
- Sharma, Radha, 2002, 360 degree feedback, competency mapping and assessment centres, TMH.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CPA**	**TP**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	5	5	5	5	10	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	-	-	-	-	-	-	-	-	-	1	--	1
CO2	-	1	-	-	-	-	-	-	-	-	1	--	1
CO3	1	1	-	-	-	-	-	-	-	-	1	--	1
CO4	1	-	1	-	-	-	-	-	-	-	1	--	1

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DHRM2803	SUSTAINABLE HRM	L	T	P	C
Version 1.1		2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Description: This course introduces the academic approach of Sustainability and explores how today's human societies can endure in the face of global change, ecosystem degradation and resource limitations. The course focuses on key knowledge areas of sustainability theory and practice in HRM the course attempts to inspire students to engage in Sustainable HRM theories and practices to strategically achieve corporate sustainability business strategy for the common good of the society. In sustainable HRM, the notion of business success is extended beyond financial performance to simultaneously achieve human/social and ecological sustainability outcomes.

Course Objectives:
Sustainable HRM contributes to developing an influential organizational culture, job security, health promotion, flexibility, participative leadership, sustainable competitive advantage, a value-added economy, self-responsibility, and work-life balance.

Course Outcomes: On successful completion of this course students shall be able to:
CO1: Understand the conceptual foundations and practice of Sustainable Human Resources Management (S-HRM) in contemporary organizations.
CO2: Realize the importance to include nature, people and society in business decision-making.
CO3: Define sustainability from ecological, social, economic and human resource perspective.
CO4: Assess the effectiveness of business strategies and approaches to sustainability.
CO5: Discuss sustainable impacts of performance oriented HRM practices on stakeholders from the corporate social responsibility perspective.
CO6: Get an overview of the main challenges that sustainable development has to face both on its social and environmental aspects.

Modules	Blooms level*	Number of hours
Module-I **An Introduction to Sustainable HRM** An Evolutionary Perspective of HRM- Corporate sustainability and sustainable HRM- Role of HRM in developing sustainable HRM systems; Factors leading towards Sustainability. Scope of Sustainable HRM, Characteristics of Sustainable HRM, Sustainable HRM Outcomes, Benefits of adopting sustainable HRM, Importance of SHRM, Barriers in Adopting Sustainable HRM.	L1, L2	9

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Module-II **Adopting Sustainable HRM Practices** Framing Sustainable HRM- Institutional contexts for developing sustainable HRM- A paradox perspective for sustainable HRM- Developing values and strategies for sustainable HRM- Indicators of Sustainable Human Resource Management, Environmental Sustainability, Social Sustainability, Economic Sustainability, Sustainable HR Practices – role of HRM in environmental management system, Green HRM Practices, framework of synthesis of green HRM for environmental sustainability, Pro-environmental Behavior, Attracting Talent and Being Recognized as an ''Employer of Choice'', Retaining a Motivated and Healthy Workforce, Investing in the Skills of the Current and Future Workforce, Practice-Based Model for the Sustainability HRM Link.	L1, L2	9
Module-III **Sustainable HRM Models and Framework** Theoretical Bases of S-HRM: Stakeholder theory, Corporate Citizenship theory, and Institutional theory, Competitive Advantage through Sustainable-HRM system, ROC –Model Ethical positions of firms (ego, benevolence, principled), Triple top line (TTL)- Corporate Social Responsibility and the Industry 4.0- A Sustainable Human Resource Management Framework.	L1, L2	9
Module-IV Sustainable Leaders and SHRM Trends Competencies required for sustainable HR roles, Sustainable Leadership, Measurements for sustainable HRM Practices, motivating future leaders to assume social responsibility through pro-social behavior, values, ethics and human spirit for responsible management, promoting responsible leadership and sustainability, HRMS relevance on commitment through organizational trust, sustainability reporting and sustainable HRM.	L1, L2, L3, L4, L5, L6	9
Module-V Personal development toward a sustainability, Culture- Climate and sustainability in organizations - Global sustainable HRM Practices. Theory of negative externality of HRM, The theory of harm of work, the costs framework for harm of HRM practices, the theory of synthesis effects of HRM practices. Sustainable return on investment (S-ROI) and Learning for sustainability: Developing personal ethics; Sustainable Knowledge-Sharing; The future of Sustainable HRM, Global sustainable HRM trends and practices.	L1, L2	9
Fieldwork: **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3 , L4	15

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books Recommended:

1. Ehnert, I, Harry, W., Zink, K J. (2014). 'Sustainability and Human Resource Management: Developing sustainable business organizations', Springer, UK, Germany.
2. Sugumar Mariappanadar, (2019). "Sustainable Human Resource Management - Strategies, Practices and Challenges", Macmillan Education, UK.
3. Radha R Sharma (2019), *Human Resource Management for Organizational Sustainability*, Business Expert Press, LLC, New York.

Reference Books

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1. Ehnert, I., & Ehnert, I. (2009). *Sustainable human resource management*. Physica-Verlag.
2. Banyai, T (2018). *Sustainable Human Resource Management*, MDPI.
3. **https://snacknation.com/blog/how-to-retain-employees/**
4. **https://www.google.co.in/books/edition/_/yfZGEAAAQBAJ?hl=en&gbpv=1**

Modes of Evaluation: PPT/Assignment/ Class Test/Written Examination

Examination Scheme:

Components	A	CT	PPT	HA	EE
Weightage (%)	5	10	10	5	70

CT: Class Test, HA: Home Assignment, PPT: Power Point Presentation, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2	2	1	1	1	3	1	1	1	1	2
CO2	1	1	1	1	1	1	1	1	1	1	1	1	3
CO3	1	1	1	1	1	1	1	2	1	1	1	1	1
CO4	1	1	1	1	1	1	1	1	1	1	1	1	2

1: strongly related, 2: moderately related and 3: weakly related

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DFIN2801	FINANCIAL MARKET & INSTITUTIONS	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

A financial market is a **market** in which people **trade** financial **securities** and derivatives at low **transaction costs**. Securities include **stocks** and **bonds**, and precious metals. A financial institution (FI) is a company engaged in the business of dealing with financial and monetary transactions such as deposits, loans, investments, and currency exchange. ... Virtually everyone living in a developed economy has an ongoing or at least periodic need for the services of financial institutions. This course deals with the financial markets and institutions together.

Course Objectives

The objective of this course is to

1. To provide students with an introduction to the theory and practice of financial markets and institutions.
2. To helps students to gain a thorough understanding of the workings of financial markets and of financial instruments
3. To introduce the students to the management of financial markets, services and institutions in Indian context.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Outline the Indian Financial systems with various financial instruments.

CO2: Comparing the various investment avenues with risk and return trade off.

CO3: Recognize various instruments traded in capital markets, merchant & Investment Banking and apply stock trading techniques.

CO4. Review the process of leasing, hire purchase and consumer credit.

CO5: Gain a thorough understanding of the workings of financial markets , financial instruments and financial services.

. Modules	Blooms level*	Number of hours
Module I: Introduction to the Financial System Introduction to Indian Financial System, Assets and liabilities, portfolio, financial instruments, stocks and flows, lending, borrowing, and wealth, weakness of Indian Financial System	L1,	5
Module 2: Money Market Call money market, Treasury bills market, Commercial bills market, Commercial papers and certificates of deposits, Discount and Finance House of India, Government Securities Market, Recent developments.	L1, L2, L3	7
Module 3: Capital Market Impact of monetary policy, Industrial securities market, Primary market and Secondary market. Nature and role of financial system: Financial system and markets, Efficiency and stability, Technology, Government intervention in the financial system, SEBI, Discount market, 'parallel' markets, capital markets, stock markets, bonds, equities, mutual fund, hedge funds, private equity, financial crisis, custodial services, stock exchanges, depository services: NSDL, CDSL.	L1, L2,L3,L4	9

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Module 4: Institutions: Banking Evolution of modern commercial banks, Evolution of bank assets, liabilities and activities; Banking structure, Merchant Banking, Matching revenues and costs, capital adequacy; Accounting policies and related matters, Direct investments, and credit programmes. Central banking and monetary policy: Central banking functions; Money creation, process and control; monetary policy.	L1, L2,L3	9
Module 5: Other Financial Institutions NBFC Evolution and present status. Insurance Companies: Economics of insurance, The insurance industry and its regulation; LIC, GIC. Development finance institutions: Concept, role of DFIs, Sources of funds, DFIs in India, Khan Committee Report and Universal banking; Recent trends. Ministry of Finance-Fiscal Policy, IRDA, NPS.	L1, L2,L3	9
Module 6: International Financial Markets The world capital market, the New Tiger Economics, Trends in the global financial markets.	L1, L2,	6
Fieldwork: **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3 , L4	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. Bhole L.M, Financial Institutions and Markets, Tata McGraw Hill.

References

1. Gordon and Natarajan, Financial Markets and Services, Himalaya Publishing House.
2. Khan, M.Y, Financial Services, Tata McGraw Hill.
3. Jeff Madura, Financial Markets and Institutions, South-Western College Publishing.
4. B.C Vasant Desai, The Indian Financial System, Himalaya Publishing House.

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	**10**	**5**	**5**	**5**	**5**	**70**

(C - Case Discussion/ Presentation; HA - Home Assignment; V - Viva; CT - Class Test; A - Attendance; EE - End Semester Examination)

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	--	--	--	--	--	--		2	1	--	--
CO2	1	1	--	--	--	--	--	--	--	2	1	--	--
CO3	1	1	--	--	--	--	--	--	--	2	1	--	--
CO4	1	1	--	--	--	--	--	--	--	2	1	--	--
CO5	1	1	2						2	2	1	-	-

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DFIN2802	FINANCIAL STATEMENT ANALYSIS	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Financial statement analysis is the process of analyzing a company's financial statements for decision-making purposes. External stakeholders use it to understand the overall health of an organization as well as to evaluate financial performance and business value.

Course Objectives

This course is designed to:

1 Prepare students to interpret and analyze financial statements for tasks such as credit and security analyses, lending and investment decisions, and other decisions that rely on financial data.
2 Explores in greater depth financial reporting from the perspective of financial statement users.
3 Develop a sufficient understanding of the concepts and recording procedures and therefore are able to interpret various disclosures in an informed manner.
4 Learn to compare companies financially, understand cash flow, and grasp basic profitability issues and risk analysis concepts. Ultimately, students who complete this course develop a more efficient and effective approach to researching, interpreting, and analyzing financial statements

Course Outcomes:

On successful completion of the course, the students should be able to:

CO1: Apply the application of quantitative methods can improve the quality of business decisions – enabling decisions that are grounded by data analysis rather than gut feelings or preferences.

CO2: Illustrate between the lines of financial statements – how to identify and evaluate firms' key value drivers, forecast financial information, design valuation techniques based on forecasts, issue an equity investment recommendation, and assess whether companies are appropriately priced by the market.

Modules	Blooms level*	Number of hours
Module1 :Introduction to Financial Statements Income Statement- Introduction, Revenue Recognition, Expense recognition, Comprehensive income, Accrual concept, Balance Sheet-Introduction, Components, measurement base of Balance sheet, Cash Flow statement- Format, Analysis of Cash flow statement.	L1,L2, L3	9
Module 2: **Financial Ratios** Introduction, Financial Analysis tools and techniques, Internal liquidity ratios, operating profitability ratios, Return on investment ratios, financial risk ratios, growth potential ratios, Return on equity and du pont system, Basic earning per share, dilutive earning per share, uses and limitations of ratio analysis.	L1, L2, L3	9
Module 3:Analysis of Assets Investment securities, Inventory analysis- conversion of inventory methods, long term assets- capitalizing vs. expensing, depreciation accounting, capitalizing intangible assets, Asset Impairment, natural assets.	L1, L3,L4	9

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Module 4: Aanlysis of Liabilities Introduction, Income Tax- terminology, Deferred tax accounting, Long term bonds- total interest cost component, retirement or conversion of bonds, interest rate impact on bond value, Leases- operating vs. financing lease, determining the value of lease and lease assets.	L1, L3,L4	9
Module 5: Red Flags Introduction, Accounting shenanigans, causes of accounting shenanigans, finding shenanigans.	L1,L	9
Fieldwork: **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3 , L4	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books:

1. Prescribed Textbook:
2. "The Analysis and use of Financial Statements", (3rd Ed.), Gerald I. White, Ashinpaul C. Sondhi and Dov Fired, Wiley-India.

Reference Book:

1. Financial Reporting and Analysis CFA level 1, latest edition

Examination Scheme:

Components	**CPA**	**TP**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	**5**	**5**	**5**	**5**	**10**	**70**

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	--	--	--	--	--	--	--	1	1	--	--
CO2	1	1	--	--	--	--	--	--	--	1	1	--	--

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DFIN2803	FINTECH: TECHNOLOGY INNOVATION IN FINANCIAL SERVICES	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

F**inancial technology**, also known as **fintech**, is an economic industry composed of companies that use technology to make financial services more efficient. Financial technology companies are generally startups trying to this intermediate incumbent financial systems and challenge traditional corporations that are less reliant on software. The financial technology sector is booming, and entrepreneurs, bankers, consultants, investors and asset managers are scrambling for more information: Who are the key players? What's driving the explosive growth? What are the risks? This course collates insights, knowledge and guidance from industry experts to provide the answers to these questions and more.

Course Objectives

1. To give an insight in the financial technology revolution, and the disruption, innovation and opportunity therein.
2. To aggregate diverse industry expertise into a single informative course.
3. To provide students with the answers they need to capitalize on this lucrative market.

Learning Outcomes:

CO1: Identify latest industry developments and assess market dynamics of the 'fintech revolution
CO2: Evaluate Blockchain projects from the perspective of both the investor and the firm.
CO3: Apply the Modeling skills and emerging technologies to solve complex business issues.
CO4: Identify areas in finance that can benefit from blockchain technology.

Modules	Blooms level*	Number of hours
Module I : Introduction to fintech : **FinTech – Breaking the financial services value chain.** Payments; Deposits and Lending; Capital Raising; Investment Management; Market Provisioning; Insurance **FinTech Hubs** **The history of fintech**	L1,L2, L3	10
Module II: Technology : Blockchain, wearables and other emerging technologies, Financial modeling and Fintech : Big Data 102 and Artificial Intelligence 102	L1, L2, L3	12

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Module III: FinTech Solutions • Robo-Advisors • Rewiring the Deal – The Path Forward for B2B Supply Chains • Payments and Point of Sales (POS) Innovation • Predictive Algorithms – Building Innovative Online Banking Solutions • Big Data is the Cornerstone of Regulatory Compliance Systems • FinTech Solutions in Complex Contracts Optimization • Behavioural Biometrics – A New Era of Security • Ultra-Fast Text Analytics in Trading Strategies • Regulated Crowdfunding Ecosystems • Remittances – International FX Payments at Low Cost • Payment Solutions Including Apple Pay • FinTech Innovation for Wearables	L1, L3,l4	13
Module IV: The future of Fintech • Using emerging technologies • The future of financial services • Innovation through big data The API economy	L1, L3,L4	10
Fieldwork: **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3 , L4	15

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text & Reference Books

1. Feld, Brad and Jason Mendelson. (2011). *Venture Deals.* Wiley & Sons.
2. Damodaran, A. (2009). *The dark side of valuation: Valuing young, distressed, and complex businesses.* Ft Press.
3. Smith, J., Smith, R. L., Smith, R., & Bliss, R. (2011). *Entrepreneurial finance: strategy, valuation, and deal structure*. Stanford University Press.
4. Ries, E. (2011). *The lean startup: How today's entrepreneurs use continuous innovation to create radically successful businesses*. Random House LLC.
5. Metrick, A. and A. Yasuda. (2010). *Venture Capital and the Finance of Innovation.* Wiley.
6. Meyer, M. H., & Crane, F. G. (2010). *Entrepreneurship: An innovator's guide to startups and corporate ventures.* SAGE Publications.
7. Ralston, Geoff. 2015. "A Guide to Seed Fundraising." Online book, http://www.themacro.com/articles/2016/01/how-to-raise-a-seed-round/
8. Lerner, Josh, Ann Leamon, and Felda Hardymon. *Venture Capital, Private Equity, and the Financing of Entrepreneurship.* New York: John Wiley & Sons, 2012.
9. Skinner, Chris. *Digital Bank: Strategies to Launch or Become a Digital Bank.* Marshall Cavendish, 2014.

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; **HA -** Home Assignment; **Q** – Quiz; **V** - Viva; **CT** - Class Test; A-Attendance; **EE** - End Semester Examination

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	1	--	--	--	--	--	--	1	1	1	--	--
CO2	1	1	--	--	--	--	--	--	1	1	1	--	--
CO3	1	1	--	--	--	--	--	--	1	1	1	--	--
CO4	1	1	--	--	--	--	--	--	1	2	1	--	--

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DFIN2804	BEHAVIOURAL FINANCE	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Behavioural Finance aims to: introduce students to behavioural theories of finance and financial decision making. ... extend students' knowledge of finance by demonstrating how "real" investors and markets do not always correspond to the rational agents and outcomes described in standard finance courses.

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Course Objectives

1. To account for this behaviour, and covers the rationality or otherwise of people making **financial** investment decisions.
2. Understanding **Behavioural Finance** helps us to avoid emotion-driven speculation leading to losses, and thus devise an appropriate wealth management strategy
3. **Behavioural Finance** is a relatively new but growing field of **study** that applies **behavioral** psychology to economic decisions to help understand why rational people can often make irrational decisions when it comes to money and investing.
4. It seeks to explain this difference by examining investor behavior.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Identify persistent or systematic behavioural factors that influence investment behaviour

CO2: Understand and critically discuss the differences between a behavioural finance perspective and a traditional finance perspective

CO3: Understand and critically discuss the cognitive biases and errors of judgment that affect financial decisions

CO4: Critically evaluate behavioural influences involving individuals investment decisions

CO5:Critically evaluate behavioural influences involving corporate (executive) financial decisions

CO6:Critically discuss important developments in this new area and the associated practical insights they provide

Modules	Blooms level*	Number of hours
Module I: Psychology & Finance: Behavioral Finance an overview, Traditional vs behavioral finance, Morals & Ethics: why they matter in the business world.	L1,L2,	9
Module II:. Behavioral Corporate Finance: Corporate Governance, Loyalty issues, corporate ethics issues, agency conflicts**,** Behavioral portfolio management.	L1, L2,	9
Module III: Behavioral Biases in Finance: Definition of average investor; Behavioral Biases & corporate decision (valuation, capital budgeting, capital structure, dividend policy and Mergers & Acquisition), Belief biases: Biases of average investor, Forecasting Biases, overconfidence, self control, Limited attention and categorization.	L1, L2,	9
Module IV: Investors Decision: Perceived risk on financial product, Social interactions and positional concerns. The role of advisors, advertising, Emotion & Investment Decision, Investment decision cycle: judgment under uncertainty, group behavior: Conformism, herding, fatal attraction.	L1, L2, L4, L6	9

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Module V: Supply by firms and managerial decisions: Supply of securities and firm investment characteristics (market timing, catering) by rational firms; Associated institutions; Relative horizons and incentives; Biased managers.	L1, L2,L4,L6	9
Fieldwork: **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3 , L4	15

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Book:
Behavioral Finance: Insights into Irrational Minds and Markets, by James Montier

Reference Books:

1. Behavioral Finance: Understanding the Social, Cognitive, and Economic Debates, by Burton and Shah
2. Beyond Greed and Fear: Understanding Behavioral Finance and the Psychology of Investing, by Shefrin
3. Big picture overviews by the giants of the field, each with their own focus:
4. Animal Spirits by Akerlof and Shiller
5. Thinking, Fast and Slow by Daniel Kahneman.
6. Irrational exuberance by Robert Shiller
7. Engaging historical account of how these ideas came about, and their influence to date: The Undoing Project by Michael Lewis
8. Detailed coverage of market anomalies and/or trading strategies based on them:
9. Expected Returns: An Investor's Guide to Harvesting Market Rewards, by Antti Ilmanen
10. Quantitative Value: a Practitioner's Guide to Automating Intelligent Investing and Eliminating Behavioral Errors, by Wesley Gray
11. The Missing Risk Premium: Why Low Volatility Investing Works, by Erik Falkenstein

Examination Scheme:

Components	**CT**	**HA**	**C**	**V**	**A**	**EE**
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; **HA -** Home Assignment; **Q** – Quiz; **V** - Viva; **CT** - Class Test; A-Attendance; **EE** - End Semester Examination

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	--	1	2	--	--	--	1	2	1	--	--
CO2	1	1	--	1	2	--	--	--	1	2	1	--	--
CO3	1	1	--	1	2	--	--	--	1	2	1	--	--
CO4	1	1	--	1	2	--	--	--	1	2	1	--	--
CO5	1	1		2	2				1	2	1	-	-
CO6	1	1		2	2				1	2	1	-	-

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DMGT2839	DATA ANALYSIS & VISUALISATION USING SOFTWARE	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	Class X Mathematics				
Co-requisites					

Catalog Description

The implosion of available data has made visualization more critical but also more challenging. Data analysis and Data Visualization are essential tools for business analysis, engineers, policymakers, and decision-makers. Developed originally for "small data", visualization techniques have been met with varied success in the past centuries and decades. There are a few well-known visualizations that are very effective in capturing the essence of the data, and of course, there are many infamous negative examples of poor visuals. An effective visual is critical for decision making it, but it also requires a lot of work, customization, attention to detail, and refinements.

Course Objectives

The course is designed to help students develop skills and knowledge in the following area(s):

- Develop an understanding of what is a good visualization for a given purpose
- Learn visualization theory & techniques
- Build a substantial data analytic project
- Apply data analysis and visualization with Excel, SPSS, R, Python, NVivo and MATLAB

Course Outcomes

On completion of this course, the students will be able to

CO1. Students will be able to articulate meaningful lines of inquiry that might be explored through the collection, organization, visualization, and analysis of data in a context associated with their primary field of study using (as appropriate) numerical, textual, spatial, and/ or visual data.

CO2. Student will understand what data are, how they are collected, and how to assess the quality/ reliability of data.

CO3. Students will demonstrate intermediate proficiency in the visualization of data to communicate information and patterns that exist in the data.

CO4: Students will be able to use at beginning level of proficiency the tools of statistics and machine learning to ask questions of and explore patterns in data.

Course Content :

Module	Topics Covered	Blooms Level	Contact Hours

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1	**Module-1: Introduction to Excel** Data Analysis using Excel, Curve fitting, Correlation, Linear Regression, Multiple regression, Principal Component Analysis and Factor Analysis, Hypothesis testing **Introduction to Excel and SPSS** Introduction to SPSS and Types of Data, Importing, exporting and data handling in SPSS; Exploratory data analysis using SPSS and data visualization; Introduction to statistical inference and various univariate tests by using SPSS; Analysis of Variance (One Way ANOVA, Two Way ANOVA and ANCOVA); Correlation, Simple and Multiple linear Regression Analysis; Principal Component Analysis and Factor Analysis	L1, L2, L3, L4	20 hours
2	**Module-2: VOS Viewer** **Web of Science, Scopus, Dimensions, Lens, and PubMed.** Co-authorship networks, citation-based networks, and co-occurrence networks can be created based on data downloaded from Web of Science, Scopus, Dimensions, and Lens. Co-authorship networks and co-occurrence networks can also be created based on PubMed data. **Crossref, Europe PMC, and OpenAlex**. Networks can also be created based on data retrieved through the APIs of Crossref, Europe PMC, and OpenAlex, These APIs can be queried interactively in VOS viewer. **Semantic Scholar, Open Citations, and Wiki Data.** For a given set of DOIs, networks can also be created based on data retrieved through the APIs of Semantic Scholar, Open Citations and Wiki Data.	L1, L2, L3, L4	10 Hours

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3	**Faculty of Management Studies & Behavioural Sciences** **Module 3: Domain Specific Software** **- Structural Equation Modelling** **Smart PLS** Introduction to Structural Equation Modelling (SEM), Introduction to the software's AMOS and SPSS, SMART PLS, Testing of Statistical assumptions, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), common method bias (CMB) test, Measurement Model Assessment, Discussing Fit Indices, Reliability and Validity Testing, Structural Model Assessment identifying multivariate outlier, Construct Validity: Convergent and Discriminant Validity, Measurement Model & Structural Equation Modelling, Mediation and Moderation Effects, Multi-Group Analysis.	L1, L2, L3, L4	30 Hours
	Faculty of Arts **N Vivo** 1. Import text, audio, video, emails, images, spreadsheets, online surveys, web content, and social media from various sources into a simple, intuitive interface. 2. Create and NVivo project, import and organise qualitative and quantitative data 3.Manage a literature review in NVivo 4. Autocode structured data deductively and identify themes inductively 5. Generate and falsify hypotheses 6. Combine data in sets for analysis 7. Seek patterns and identify relationships across codes and cases 8. Present findings using visualisations 9. Export data out of NVivo 10. Coordinate teamwork.		

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	Faculty of Science Engineering and Technology **Faculty of Health & Allied Sciences** **R programming / Python/ MATLAB** **R Programming-** Introduction to R, Variables and datatypes in R, Dataframes, Recasting and joining of dataframes, Arithmetic, logical and matrix operations in R, Functions in R, Control structure in R, Data visualization in R. **Python Programming-** Basics of programming, data structure and algorithm using Python, Strings, lists, control, functions, manipulating lists, loops, arrays, selection sort, insertion sort, recursion, sorting, dictionaries, exception handling, file handling, string processing, data analysis using Python **MATLAB Programming-** Introduction, basic features, managing workspace, mathematical functions, basic plotting, Matrices, array operations and linear equations, MATLAB programming- M files script, M-file functions, control flow and operations.		

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional (Theory/ Practical)	End Term Examination
Weightage (%)	5	10	15	70

References:

- David Houcque, 2005. Introduction to MATLAB programming for Engineering students., Northwestern University, E- Book https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf
- Mark Lutz, 2009. Learning Python. O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.
- Emmanuel Paradis, 2005. R for Beginners. E book. https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf
- A Handbook of Statistical Analysis using SPSS by Dr. Brijesh Awasthi, Redshine Publication.

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Amity Business School

Bachelor of Business Administration (Banking & Finance)
(Honors/ Honors with Research)

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Curriculum & Scheme of Examination

2023

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BBA Banking & Finance (Honors/ Honors with Research)
SEMESTER-I

DMGT2151	MANAGEMENT FOUNDATIONS	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Management Foundation is an introductory course on management process from managers' perspective. The course seeks to help students acquire the requisite knowledge, skills and abilities needed to successfully manage the organization.

The course examines the logic and working of organizations and outlines the major functions of management. It details the different functions of management such as planning, organizing, staffing, directing, and controlling. The course also emphasizes on identification of critical issues and framing of strategies and scenarios required to execute management functions. The aim of the course is to orient the students in theories and practices of Management so as to apply the acquired knowledge in actual business practices.

Course Objectives

The objective of this course is to:

Provide a **gateway to the real world of management** and decision-making.

Help the **students gain understanding of the functions and responsibilities of managers**.

Impart **tools and techniques** to be used in the performance of the managerial job.

Enable students to analyse and understand the **environment** of the organization.

Help the students to develop cognizance of the **importance of management principles**

Course Outcomes

On completion of this course, the students will be able to:

CO1: Discuss the concepts related to management of business.

CO2: Demonstrate the roles, skills and functions of management.

CO3: Analyse effective application of MF knowledge to diagnose and solve organizational problems and develop optimal managerial decisions.

CO4: Recognise the complexities associated with management of human resources in the organizations and integrate the learning in handling these complexities.

Modules	Blooms level*	Number of hours
MODULE I- Introduction Concept, Nature, Scope and Functions of Management, Levels of Management, Evolution and Foundations of Management Theories - Classical and Neo - Classical Theories, Systems Approach to organization, Modern Organization Theory.	L1, L2	5

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MODULE 2: Management Planning Process Planning objectives and characteristics, Hierarchies of planning, the concept and techniques of forecasting, Decision making – concepts & process, MBO, concept and relevance.	L1, L2, L3	5
MODULE 3: Organization Meaning, Importance and Principles, Departmentalization, Span of Control, Types of Organization, Authority, Delegation of Authority.	L1, L2, L3	5
MODULE 4: Staffing Meaning, Job analysis, Manpower planning, Recruitment, Transfers and Promotions, Appraisals, Management Development, Job Rotation, Training, Rewards and Recognition.	L1, L2, L3, L4	5
MODULE 5: Directing Motivation, Co-ordination, Communication,	L1, L2, L3 , L4	5
Module VI: Management Control Meaning, Nature, Objectives and Process of Management Control, Techniques and Behavioral Aspects of Management control.	L1, L2, L3	5
P - Project; This would be the field project related to the subject where the student need to work outside the class collect the data and make report .	L3 , L4	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis L5-Synthesis; L6-Evaluation*

Text Books

1. Koontz, H, & Weihrich, H (2016). Essentials of Management: An International Perspective (8th ed.), Tata McGraw Hills, New Delhi.
2. Ghuman, K & Aswathapa, K, (2017). Management concepts and cases (10th ed.), Tata McGraw Hills, New Delhi.
3. Telsan, M.T. (2016). Industrial and Business Management, (4th ed.), S. Chand, New Delhi.

Reference Books

1. Robbins, S. (2017). Management, (13th ed.), Pearson Education, New Delhi.
2. Ramaswamy, I. (2011). Principles of Business Management, (8th ed.), Himalaya Publishing House, New Delhi.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CT**	**HA**	**C**	**V**	**A**	**EE**
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	--	--	--	--	--	--	--	1	--	--	--
CO2	1	--	--	--	--	2	--	--	1	--	--	--
CO3	1	2	--	--	--	--	--	--	1	--	--	--
CO4	1	--	--	--	--	--	--	2	1	--	--	--

1: strongly related, 2: moderately related and 3: weakly related

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DMGT2101	FINANCIAL & CORPORATE ACCOUNTING	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Description

This course intends to introduce basic accounting principles and practices, train students on ledger posting, preparation of trial balance, and final accounts of sole trading business. It also focuses on accounting for shares/debentures issues and redemption apart from the valuation of goodwill and shares. This course would be useful for all those who are desirous of having an understanding and application of the financial dynamics of the business

Course Objectives

The aim of this course is to

1. Provide an understanding of the application of various principles and practices of Accounting.
2. Estimate annual financial statements of sole trading concerns and joint stock companies
3. Do the accounting for the issue and redemption of shares and debentures
4. Find the value of goodwill and calculate the share value

Course Outcomes:

On successful completion of the course, the students should be able to:

CO1: Understand and apply the principles of accounting and accounting standards followed in India and globally.

CO2: Able to prepare subsidiary books and final accounts of sole trading enterprises

CO3: Understand and do the accounting of issue and redemption of shares and debentures.

CO4: Analyse goodwill value under different methods of estimate and valuation of shares

Modules	Blooms level*	Number of hours
Module 1: **Introduction to Accounting** Meaning, need for accounting, users of accounting information, limitations of accounting, accounting concepts and conventions, Generally Accepted Accounting Principles, accounting standards, Indian GAAP vs US GAAP	L1,L2, L3	8
Module 2: **Accounting Process & Subsidiary Books** Double entry system-Rules for debit and credit, preparation of journal- ledger-trial balance. Introduction to subsidiary books-preparation of cash book-single column, double column, and three-columnar cash book	L1, L2, L3	12
Module 3:**Preparation of financial statements(sole trading concerns)** Preparation of trading account, profit and loss account, and balance sheet along with adjustments	L1, L3	10
Module 4: **Accounting for the Issue of shares and Debentures** Special features of joint stock companies, features of Companies Act, 2013, kinds of shares and debentures, accounting for issue and redemption of shares, accounting for issue and redemption of debentures, share buyback, underwriting	L1, L3,L4	7

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Module 5:Valuation of goodwill and shares Good will – Meaning, Definition, Elements, Types and Methods of Valuation of Goodwill, Methods of share valuation (Equity & preference shares)	L1,L2 L3,L4	8
Tutorial: **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3,L4	15

**Bloom's Level:L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Theory & Problems proportion: Theory 40% and Problems(60%)

Text Books:

- Maheshwari, S.N., Advanced Accountancy Volume-I, Ninth Edition, Vikas Publishing House Pvt. Ltd.
- S.Anil Kumar, V Rajesh Kumar and B Mariappa(2014). Corporate Accounting, Himalaya Publishing House, New Delhi.
- Gupta, R.L., & Radhaswamy, M(2013). Corporate Accounting. Sultan Chand & Sons, New Delhi
- Raman, B. S(2014).Financial Accounting(1st Edition)I & II, New Delhi, United Publishers

Reference Books:

1. Grewal, T. S., Shukla, M .C, Advanced Accountancy, Sixteenth Edition, Sultan Chand and Sons.
2. Tulsian, P.C (2009), Financial Accounting 2nd Edition, Pearson Education.
3. Narayanaswamy, R. Financial Accounting- A Managerial Perspective, Second Edition, Prentice Hall India
4. Monga, J.R(2012).Fundamentals of Corporate Accounting, K.L Malik &Sons Pvt Ltd, New Delhi.

Pedagogy:
Lectures
Cases/Numericals
Field based assignments
Seminars

Examination Scheme:

Components	**CPA**	**TP**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	**5**	**5**	**5**	**5**	**10**	**70**

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	2					1	1	2		
CO2	1	1	2					1	1	2	2	
CO3	1	1	2					1	1			
CO4	1	1	2					1	1			

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DMBF2101	PRINCIPLES OF BANKING	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Objective:
The course aims to acquaint the student with a basic and elementary knowledge of the banking services and practices. It provides institutional features of banking system in India.

Course Contents:

Modules	Bloom's level*	Number of hours
Module I: Introduction Banking – An overview, Bank structure and types, Establishment of Banks, Principles of Banking, Functions of Banking	L1, L2, L3, L4	8
Module II: Indian Financial System and environment Indian financial system. Financial services and economic development, Financial Institutions, and types - IDBI, NABARD, SIDBI, IFCI. An Introduction to business environment, Nature, Scope and role of business environment, financial environment	L1, L2, L4	7
Module III: Evolution of Banking Systems of Banking- Mixed, Branch, Unit, Group, Chain; Brief Structure of banks; RBI-Organisation, Functions, Methods of credit control; Commercial banking; Balance sheet of a Bank; Credit creation.	L1, L2, L4	8
Module IV: Banking system in India Structure and Characteristics of Financial & Banking system in India; Indian Money Market; Indian Capital Market. Role of **Central Bank**, Policy Framework for RBI, RBI and Monetary Policy, Regulation and Supervision of Banking system, Review of the Banking system, Review of RBI balance sheet, Current Developments and Reports of RBI	L1, L2,L3, L4	7
Module V: Overview and regulations of **Commercial Banks and Co Operative Banks**, Regional Banks, Rural Banks and Co-Operative banking societies, Banker Customer Relationship, Management of Deposit Business & Credit Business, Fee Based services, Liquidity Vs. Profitability	L1, L2,L3, L4	7
Module VI: Emerging trends in Banking Sources and Uses of Funds in Banks; Value Chain Analysis in Banking Industry, Emerging trends in Banking: Universal Banking, Venture Capital, Project Financing, Merchant, Banking, E-Banking, Credit Cards, Banking Ombudsman Scheme, Corporate governance.	L1, L2,L3, L4	8
Fieldwork		15

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

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Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

(C - Case Discussion/ Presentation; **HA -** Home Assignment; **Q** – Quiz; **V** - Viva; **CT** - Class Test; A - Attendance; **EE** - End Semester Examination)

Text & References:

Text:

- Sundaram & Varshney, " Banking, Theory Law and Practice" Sultan chand & sons;2004
- Vasant Desai; (2001) "Development Banking & Financial Intermediaries"; Himalaya Publishing House

References:

- Chaturvedi D.D., Anand Mittal, " Business Economics-II", Brijwasi Book Distributors;2005
- Varshney & Malhotra, "Principles of Banking",Sultan Chand & Sons, 2005.
- Mithani, D.M., Gordon, E.; (2003) "Banking & Financial Systems"; Himalaya Publishing House;.
- Reddy, P.N., Appannaiah, H.R.; (2003) "Theory & Practice of Banking"; Himalaya Publishing House;
- Robert N. Stavins (ed.), Economics of the Environment: Selected Readings, W.W.Norton, 5th edition, 2005.

CO , PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1						2		1	1	-	2
CO2	2			1					1	1	-	**2**
CO3	1								2	2	-	**2**

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SEMESTER-II

DMGT2251	MARKETING MANAGEMENT	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

In this course, the basic concept related to marketing, marketing mix, marketing philosophies, consumer behaviour, segmentation & targeting, positioning strategies, marketing environment analysis are discussed in detail. Various strategies based on marketing mix such as product, price, place and promotion are also discussed in detail. New emerging marketing paradigms are discussed to give students an overview of current marketing situation. The main aim of this course is to give students an elementary knowledge of the fundamentals in the field of marketing.

Course Objectives

The objective of this course is to

1. Develop and help the students imbibe basic marketing principles and establishing an appreciation of contemporary realities.
2. Formulate a marketing plan including marketing objectives, marketing mix, strategies, budgetary considerations, and evaluation criteria.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain various definitions and concepts of marketing.
CO2: Analyse various models of marketing research.
CO3: Identify consumer behaviour and apply the understanding to real life business cases.
CO4: Discuss various steps of product development and pricing approaches.
CO5: Explain and discuss the distribution and logistics decisions in business.
CO6: Aware about changing paradigms and development in marketing concepts and theories.

Modules	Blooms level*	Number of hours
MODULE I- Introduction to Marketing Core concepts of marketing - the production concept, the product concept, selling concept and the marketing concept, societal marketing, relationship marketing.	L1, L2, L3	4
MODULE 2: Marketing Mix- Product & Price Meaning, Elements of Marketing Mix (Four P's); Product-Product Mix, Product Line, Product Lifecycle, New Product Development, Branding, Packing and Packaging, Labeling, Pricing – Objectives, Factors influencing Pricing Policy, Methods of Pricing	L1, L2, L3, L5	8
MODULE 3: Marketing Mix- Place & Promotion Physical Distribution–Meaning, Factors affecting Channel Selection, Types of Marketing Channels. Promotion – Meaning and Significance of Promotion, Personal Selling and Advertising, Public Relations, Publicity, Sales Promotion	L1,	7

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MODULE 4: Analysing Market Environment **Market Environment**- Microenvironment – The company, suppliers, marketing intermediaries' competitors, public and customers. Macro Environment- Demographic, Economic, Natural, Technological, Political, Legal, Socio-Cultural Environment.	L1, L2, L3	10
MODULE 5: Strategic Planning, Market Segmentation and Consumer Behaviour **Market Segmentation**- Bases of Market Segmentation, Targeting and Positioning approaches, **Consumer Behaviour**- Model of Consumer Behavior; Understanding the consumer decision making process & Buying Situations, Factors affecting Buying Behaviour **Strategic Planning in Marketing**- Business Portfolio, BCG matrix, GE 9 cell model; Marketing Research.	L1, L2, L3, L4, L5, L6	8
MODULE 6: Service Marketing Meaning and definition of services, features of services, Seven P's of services marketing, differentiation between goods and services.	L1, L2, L3	4
MODULE 7: Emerging Marketing Paradigms Overview of E-marketing, Global marketing, Mobile marketing, Kiosk marketing, Green marketing, Tele marketing, Multi-level marketing & Rural marketing.	L1, L2. L3	4
Tutorial: **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3, L4	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis; L6-Evaluation*

Textbooks

1. Kotler, Philip & Armstrong, Gray, Principles of Marketing, 10th Edition, Pearson Education.
2. Saxena, Rajan (2008), Marketing Management, 3rd Edition, McGrew Hills Education.

Reference Books

1. Ramaswamy and Namkumar, S (2009), Marketing Management Global Perspective: Indian Context, McMillion, New Delhi.
2. Kumar, Arun and Meenakashi, N (2009), Marketing Management, Vikas Publishing House.
3. Russel, Wines, Marketing Management, 3rd Edition, Pearson Education.
4. Kotler, Koshi Jha (2009), Marketing Management, 13th Edition, Pearson Education.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components		CT	P	C	A	EE
Weightage (%)		10	10	5	5	70

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester Examination

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	--	--	--	--	--	--	--	1	--	--	--
CO2	--	1	--	--	--	--	--	--	1	--	--	--
CO3	--	--	2	1	--	--	--	--	1	--	--	--
CO4	--	--	--	--	--	--	--	1	1	2	--	--
CO5	1	--	--	--	--	--	2	--	1	--	--	--
CO6	1	--	--	--	--	--	--	--		--	--	--

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DMGT2201	COST & MANAGEMENT ACCOUNTING	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course aims to give an understanding of how management accountants provide information to facilitate decision-making in an organization. It will acquaint students with various concepts of costing and highlight the decision making and control focus of managerial accounting. **Cost Accounting** is concerned with the computation and assessment of costs and expenses incurred in the acquisition or production of anything. It is about calculating the cost per unit using various costing approaches. Its primary goal is to assist managers in making decisions. **Management accounting** is concerned with the provision of relevant information to support decision-making, planning, cost control, and performance evaluation. Management accounting converts data into information, knowledge, and wisdom regarding the activities of a company entity. This is a step beyond cost accounting.

Course Objectives

The objective of this course is to

- Understand and explain the conceptual framework of Cost Accounting and processes used to determine total and per unit cost.
- To make known to the students to assess material, labour, and overhead cost
- To enrich the knowledge of the learners in knowing in applying tools like cash flow statement for analysis of financial statements
- To make the students in understanding how marginal costing is used in profit planning and management decision-making under different situations.

Course Outcomes to

On completion of this course, the students will be able to

CO1: Identify the principles of cost and management accounting and apply the same for the preparation of cost sheets and quotations

CO2:Assess material, labour and overhead cost of manufacturing firms

CO3: Analyse financial statements using appropriate techniques

CO4: Prepare budgets for business firms.

CO5: Evaluate business options and take informed decisions using marginal costing

Modules	Blooms level*	Number of hours
Module I: Cost Accounting Introduction – Classification of cost, Cost Accounting-Objectives and functions, Comparison of Cost Accounting with Financial Accounting and Management Accounting, Designing and installation of costing system, Uses of Management Accounting, Preparation of cost sheet and quotation	L1,L2,L3	10

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Module II: Material, Labour &Overheads **Material cost**: Direct and Indirect material cost, Techniques of inventory control-stock levels and EOQ, Pricing of material issues-FIFO and LIFO **Labour cost:** Causes of effects of labour turnovers, Methods of wage payment-Halsey and Rowan plans, Taylor's piece rate system **Overheads**: Classification, Allocation and Apportionment, Primary and Secondary distribution(Repeated distribution method and Simultaneous equation method)	L1, L2,L3	12
Module III: Marginal Costing Marginal costing-Meaning and importance-Applications of marginal costing, Cost-volume-profit analysis, Break-even chart, uses and limitations of Break-even analysis, Decision-making areas- product mix, make/ buy, pricing decision.	L1, L2,L3,L6	8
Module IV: Budgetary Control Budget, budgeting and budgetary control-Meaning and objectives of budgetary control, Classification of budgets, Preparation of cash budget and flexible budget	L1,L2,L3	7
Module V: Cash Flow Statement Cashflow and profit, Cash flow statement-uses and limitations- Preparation of cash flow statement (AS 3-Indirect method) .	L1, L2,L4	8
Module VI: Ratios		
Tutorial: **Flip Classroom-** C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3,L4,L6	15

**Bloom's Level: L1-Knowledge;L2-Comprehension;L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Theory & Problems weightage: 40 % Theory & 60% problems

Text Books

1. MaheshwariS.N (2015),Cost Accounting, Mahavir Publications.
2. M Kishore Ravi (2015) ,Taxmann's Cost and Management Accounting,6th Edition.
3. Arora M.N(2019),Cost & Management Accounting, New Delhi. Himalaya Publishing House.

Reference Books

1. Jain & Narang, Cost Accounting (2016), Kalyani Publishers.
2. Shukla M.C.,Grewal T.S. and Gupta M.P.(2013),Cost Accounting Text and Problems: Texts and Problems, S.Chand Publishers.

Pedagogy: Lectures, Cases/Numericals, Field-based assignments

Examination Scheme:

Components	CT	C	HA	A	EE
Weightage (%)	10	10	5	5	70

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester Examination

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	1	--	--	--	--	2	--	1	2	--	--
CO2	1	1	--	--	--	--	--	1	1	2	--	--
CO3	1	1	--	--	--	--	--	1	1	2	--	--
CO4	1	1	--	--	--	--	--	1	1	2	--	3
CO5	1	1	--	--	--	--	2	--	1	2	--	--
CO6	1	1	--	--	--	--	--	--	1	2	--	--

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DMBF2201	RETAIL BANKING	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

The basic objectives of the course are to acquaint the students with the concept of Retail Banking and the various products of Retail Banking. It will also develop our understanding about recent developments in digital banking, its products, issues and challenges.

Course Objectives

The objective of this course is to

1. Enhance the conceptual knowledge related to functional activities performed in Retail Banking
2. Develop capabilities to comprehensively understand the changing dynamics in retail environment and e-banking.

Course Outcomes

On completion of this course, the students will be able to

CO1: Understand the concept of retail banking and its applicability

CO2: Explain the features of retail products(loans), procedures and issues including credit or debit cards

CO3: Analyse the changing dynamics of the retail environment with digital banking and its payment systems

CO4: Evaluate the recent developments like reverse mortgages, wealth management services, various Acts and their application in case of loan defaults etc.

Modules	Blooms level*	Number of hours
Module I: Introduction History & and definition of Retail Banking, the role of retail banking within the bank operations, the Applicability of various retailing concepts, the distinction between Retail and Wholesale and Corporate Banking	L2, L5,L6	8
Module II: Retail Products **Loans**: Eligibility, Purpose, Margin requirements, Amounts of Security, Disbursement, Moratorium, Prepayment issues, Collection or Repayments in case of Home Loans, Auto or Vehicle Loans, Personal Loans and Educational Loans**Credit or Debit Cards – Credit Cards vs** Debit Cards, Eligibility for having Cards, Purpose, Amounts, Margin, Security, the process of using the cards, Billing Cycle, Credit or Reward Points etc.	L4,L5,L6	13
Module III: Digital Banking: Various Digital Banking Products such as Cards, EMV technology, ATMs, Cash Deposit Machines, Internet Banking, Mobile Banking, Cash Re-Cyclers, POS terminals, Branchless Banking, Payment Systems, marketing of Digital Banking Products, New Developments in Digital Banking	L1,L3,L6	12

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Module IV: Other Issues Related to Retail Banking The Current Trends in retailing, new products such as Insurance, Demat services, Property services, Reverse mortgages, Investment advisory and Wealth Management, Cross-selling opportunities etc. **Recovery of Retail Loans:**Recovery of Retail Loans as well as Defaults in retail loans, Re-scheduling of retail loans, recovery process for defaulted accounts; SARFAESI Act, DRT Act, use of Lok Adalat forums for the same; Recovery Agents and guidelines of Reserve Bank of India	L2,L4	12
Fieldwork		15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books:

1. Retail Banking, Raghu Palat, Executive Excellence Publishing(publisher)
2. CAIIB Study Material
3. Jha, S.M., (2000), "Bank Marketing", Himalaya Publishing House.

Reference Books:

1. Singh & Chabra, (2001), "Commercial Banking",Dhanpat Rai& Sons,.
2. Mithani & Gorden, (2003), "Banking Theory & Practice",Himalaya Publications,.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CT**	**HA**	**C**	**V**	**A**	**EE**
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; **HA -** Home Assignment; **Q** – Quiz; **V** - Viva; **CT** - Class Test; A - Attendance; **EE** - End Semester Examination

CO, PO and PSO mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	3	1	3	-	3	-	-	1	2	-	-
CO2	1	3	-	3	-	2	-	3	1	1	3	-
CO3	1	3	2	2	-	3	-	2	1	1	2	-
CO4	1	-	-	-	-	-	-	3	2	1	-	-

1: strongly related, 2: moderately related and 3: weakly related

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SEMESTER-III

DMGT2351	ORGANIZATIONAL BEHAVIOR AND HUMAN RESOURCE MANAGEMENT	L	T	P	C
Version 1.1	For Approval	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

The course is constructed with an objective to create a deep and nuanced understanding of the behavioural patterns of individual in an organisational setting. Having understood the role of these assumptions, beliefs, values, would enable a leader to be effective and rational decisionmaker. The course is designed to make students interpret the impact of personality and environmental influences on the working of the individual with an organisational setting and equally harness the potentials of human capital with respect to various facets of job and develop his competencies to achieve individual and organisational goals. The focus of the course would be making students understand the motivation, individual differences, group culture and its impact of various functions of HR viz staffing, training & development, career development and appraisals. Thus, this course takes a practical approach that integrates contributions of behavioral sciences with the technical aspects of implementing the HR function in the real world.

Course Objectives

The objectives of this course are to:

1. Appreciate the impact of behavioral sciences on HR management functions.
2. Understand the implications of individual differences on work performance and their group behavior.
3. Understand the dynamics of organizational culture and structure.
4. Get familiarized with various elements of the HR function (e.g. – recruitment, selection, training, and development, etc.)
5. Relate and apply the principles and techniques of human resource management to the real life discussion of critical personnel issues.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Understand the significance of individual attributes in work settings.
CO2: Demonstrate a basic understanding of organizational dynamics, conflicts, and structure.
CO3: Interpret and relate the relationship between various HR functions and personnel growth.
CO4: Understand, analyze, the concepts of basic HR functions and their application in global context.
CO5: Understand the recent advancement in the context of OB and HRM

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Modules	Blooms Level*	Number of hours
Module I: Introduction to OB Introduction to Organizational Behavior – Concept, Definitions, Evolution of OB. Importance of Organizational Behavior – Cross-cultural Dynamics, Creating Ethical Organizational Culture and Climate. Individual and Group Behavior – OB Models and SOBC in Context with Indian OB. Human Relations and Organizational Behaviour.	L1, L2	7
Module II: Foundations of Individual Differences Managing Communication, Perception, Attitude, Personality, Learning, Time Management Strategies. Group: Team Structure and effectiveness, Learning Organization and Organizational Design. Organizational Culture and Change, – Conflict Management Techniques,	L1, L2, L3, L4	14
Module III: Concepts of HRM HRM – Meaning Objectives, Scope, and Functions, HRP – Definition, Objectives, Importance, Factors Affecting HRP, Process of HRP, Strategies of HRM and Global HR Strategies, HRD – Concept, Meaning, Objectives and HRD Functions.	L1, L2,	10
Module IV: Onboarding the talent Recruitment and Selection- factors, methods and process. Induction, Training & Development, Performance & Potential Appraisal – Concept, Process, Methods and Problems, Key Result Area(s)	L1, L2, L3, L4	10
Module V : Wage concepts and Career Planning Compensation – Concept, Components of Pay Structure, Wage and Salary Administration, Incentives and Employee Benefits. Career Planning – Concept of Career Planning, Career Stages and Career Anchors, Succession Planning.	L1, L2, L3, L4, L5	10
Module VI: HRM Trends Rewards and Punishments – Termination, Layoffs, Attrition, Retrenchment, Separation and Downsizing. Industrial Relations, Overview of International and Global HRM, Recent Trends in OB & HRM.	L1, L4, L5,L6	9
Field work	L4, L5,L6	15

***Bloom's Level:**
L1-Knowledge; L2-Comprehension; L3-Application; L4-Anaylysis; L5-Synthesis; L6-Evaluation

Text Books:

- Stephen P. Robbins, Timothy A. Judge (2012), Organisational Behaviour, 15th edition, Prentice Hall.
- David A. Decenzo ,Stephen P. Robbins , Susan L. Verhulst,(2015), Human Resource Management ,eleventh edition , Wiley;
- Prasad. L.M, (2014) Human Resource Management, Third Edition, Sultan Chand & Sons; New Delhi.

Reference Books:

- Chhabra T.N,(2014) Human Resource Management: Concepts and Issues, Edition 2014,Dhanpat Rai & Co
- **Dessler** G (2014) A Framework for Human Resource Management, 7 edition (2014), Pearson Education India;

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- Michael Armstrong , Stephen Taylor,(2017), Armstrong's Handbook of Human Resource Management Practice, 14 edition (3 February 2017), Kogan Page

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	Assignment1	Assignment2/live project	Case discussion	Sessional	A	EE
Weightage (%)	5	5	5	10	5	70

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	2	1	2	1	2	1	1	1	3	2	3	2
CO2	2	1	2	1	2	3	1	1	2	2	2	2
CO3	3	1	2	1	2	3	1	1	2	2	2	2
CO4	2	1	2	1	2	2	-1	1	2	2	2	2
CO5	2	1	2	1	2	1	1	1	2	2	2	2

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DMBF2301	MONEY, BANKING & FINANCIAL SERVICES	L	T	P	C
Version 1.1		2	1	2	4
Pre-requisites/ Exposure					
Co-requisites					

Catalog Description

The basic objective of this course is to acquaint the students with the latest developments in the field of Money, Banking & Financial Services**.** This course aims at helping the students to learn advanced topics related to Money, Banking & Financial Services.

Course Objectives

The objective of this course is to:

1. Understand the functions of Money control.
2. Gain insight into advancements in the Banking & Financial Services field.
3. Learn and integrate the various aspects for the financial decision-making.

Course Outcomes

On completion of this course, the students will be able to

CO1: Identify the key themes in Money, Banking & Financial services**.**
CO2: Identify and apply the valuation concepts and measures of financial performance.
CO3: Identify and explain the various aspects of financial markets.
CO4: Explain and analyse the interrelationship between finance, governance and ethics.
CO5: Apply the main concepts, research tools and methodologies of financial service.

Modules	Blooms level*	Number of hours
Module I: Money: Concept, functions, measurement; theories of money supply determination RBI approach to money supply; High powered money and money multiplier. .	L1, L2	7
Module II: Financial Innovations: Role of financial markets and institutions Structure of money market and capital market — Call money market. Treasury bill market, Commercial bill market including commercial paper and certificate of deposits, Government securities market, Primary and secondary market for securities. Financial sector Reforms in India, Role of Financial Derivatives Financial Institutions: Types; Banking and Non Banking Financial Institutions.	L1, L2, L3	10
Module III: Banking System: Meaning and types; Functions of commercial banks; the process of credit creation and its limitations; Balance sheet and portfolio management, banking sector reforms	L1, L2	6
Module IV: Central Banking and Monetary Policy: Central Banking: Function of the Central Bank, Monetary policy: objectives, indicators and instruments of monetary control. Monetary management in an open economy, current monetary policy of India	L1, L2, L4	7

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Module V: Mutual Funds The concept & Role of M/Fs, History of M/Fs in India, Types of M/Fs, Fund Structure & constituent, Selecting the right Investment Products for Investors, Comparison of Investment products, Measuring of Risk In M/Fs, recommending model Portfolios & selecting the right funds	L1, L2, L3	8
Module VI: Credit Rating & other Financial Services Credit rating concept of Credit rating, Types of credit rating, Advantages and Disadvantages of credit rating, Credit rating agencies and their methodology and process, Individual Credit rating, Sovereign Credit Rating Practices. Custodial Services, Credit Cards	L1, L2, L4	7
Fieldwork		15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text Books

1. M. Y. Khan, Indian Financial System, Tata McGraw Hill, 7th edition, 2011.
2. N. Jadhav, Monetary Policy, Financial Stability and Central Banking in India, Macmillan, 2006

Reference Books

1. F. S. Mishkin and S. G. Eakins, Financial Markets and Institutions, Pearson Education, 6th edition, 2009.
2. F. J. Fabozzi, F. Modigliani, F. J. Jones, M. G. Ferri, Foundations of Financial Markets and Institutions, Pearson Education, 3rd edition, 2009

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

CT: Class Test, HA: Home Assignment, V: Viva, EE: End Semester Examination; Att: Attendance, C: Case Analysis

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	1	--	--	--	--	--	--	1	1	--	--
CO2	1	1	--	--	--	--	--	--	1	1	--	--
CO3	1	1	--	--	--	--	--	--	1	1	--	--
CO4	1	1	--	--	--	--	--	--	2	1	--	--
CO5	1	1	--	--	--	--	--	--	2	1	--	--
CO6	1	1	--	--	--	--	--	--	2	1	--	--

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SEMESTER-IV

DMGT2451	FINANCIAL MANAGEMENT	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course focuses on a firm's financial goals and decisions to maximize shareholders' wealth. It examines financial concepts and analytical techniques, financial performance, time value of money, measurement of risk and return, capital budgeting, capital structure, short-term financial planning, working capital management, and international finance.

Course Objectives

The course aims to:

1. Familiar students to take decisions which are effective, a manager in any of the functional areas be it Marketing, HR or IT requires a thorough cost and benefit analysis and a feel for Finance so as to look at the long term implications of his/her decision.
2. An understanding and a feel for Financial decision making.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the theoretical models of financial management in the context of business development.

CO2: Describe and analyse financial decisions made by company managements using accounting and other financial information.

CO3: Analyse and consider time value of money while taking investment decisions.

CO4: Explain theoretical understanding to real life problems, in order to develop possible solutions.

CO5: Identify and apply best investment options estimating future cash flows

CO6: Identify the need of working capital requirement along with inventory management.

CO7: Define the dividend policies and apply theories to practical decisions for dividends.

Modules	Blooms level*	Number of hours
Module I: Introduction to Financial Management Evolution of Financial Management, Key activities of Finance Manager Changing Role of Finance Managers, Key Decision Areas in Financial Management, Objectives of the firm	L1, L2	7
Module II: Financial Statement Analysis Introduction, objectives of financial statement analysis, Techniques-Ratio analysis, Comparative analysis and limitations of financial statement analysis, AS-20 (no numerical)	L1, L2, L4	8
Module III: Valuation Concepts Concept of Time value of Money, Process of Compounding and Discounting, Future Value of a Single amount, Future Value of an Annuity, Present Value of a Single Amount, Present Value of an Annuity, Cost of capital, Weighted average cost of capital, Leverage Analysis	L2,L3	8
Module IV: Financing Decision Capital structure, Factors affecting Capital Structure decisions, Theory of Capital Structure Decisions, MM Theory, NI, NOI and Traditional theory, Pecking order theory.	L2	6

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Module V: Investment Decision Basics of Capital Budgeting, Types of capital budgeting decisions, Estimating cash flows for project appraisal, Green capital budgeting, Non-discounted Cash Flow Techniques: Payback Period, ARR, Discounted Cash Flow Techniques: NPV, IRR, PI. Risk Analysis of Capital Budgeting: Risk adjusted discount rate, Certainty Equivalent Approach.	L2,L4	6
Module VI: Working Capital Management Meaning and importance of adequate working capital, Excess or Inadequate working capital, Determinants of working capital requirement, Cash management, Receivable management and Inventory management – Sources of working capital.	L1,L2, L3	5
Module VII: Dividend Decisions Importance of dividend decisions, Theories of Dividend decisions: Irrelevance theory, Optimal dividend decision, Relevance theory, Determinants of dividend policy: Bonus Shares, Stock Splits & Buyback of shares. Tax considerations.	L1,L2	4
Fieldwork		15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Book

Pandey, I. M, (2010), Financial Management. 10th Edition, Vikas Publishing House Pvt. Ltd.

Reference Books

1. Van Horne, J.C (2008), Financial Management & Policy, 13th Edition, Prentice Hall, 2008
2. Chandra, P., Fundamentals of Financial Management, 7th Edition, Tata McGraw Hill.
3. Brearly R.A. and Myers, S.C. Principles of Corporate Finance,12th Edition, Tata Mc- Graw Hill, 2018

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CT	HA	C	V	Att	EE
Weightage (%)	10	5	5	5	5	70

CT: Class Test, HA: Home Assignment, V: Viva, EE: End Semester Examination; Att: Attendance, C: Case Analysis

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	--	--	--	--	--	--	--	1	--	--	--
CO2	1	2	--	--	--	--	--	--	1	--	--	--
CO3	1	--	--	--	--	--	--	1	1	--	--	--
CO4	1	1	--	--	--	--	--	--	1	--	--	--
CO5	1	1	--	--	--	--	--	--	1	--	--	--
CO6	1	1	--	--	--	--	--	--	1	--	--	--
CO7	1	1	--	--	--	--	--	--	1	--	--	--

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DMGT2401	LEGAL ASPECTS OF BUSINESS	2	0	0	2
Version 1.1	Latest Approved				
Pre-requisites/Exposure					
Co-requisites					

Catalog Description
This course introduces the student to the legal and ethical framework of business. Contracts, negotiable instruments, the law of sales, torts, crimes, constitutional law, and companies act. Upon completion the student should be able to identify legal and ethical issues that arise in business decisions and the laws that apply to them.

Course Objectives:
The objective of the course is to:
1.Understand introduces the student to the legal and ethical framework of business

2.Understand Contracts, negotiable instruments, the law of sales, torts, crimes, constitutional law, and companies act.

Course Outcomes
On completion of this course, the students will be able to
CO1: Describe the importance of law and legal environment of business.
CO2: Explain Indian Contract Act, 1872 and its main provisions.
CO3:Explain Indian Sale of Goods Act, 1930 and its main provisions.
CO4: Explain Negotiable Instruments Act, 1881 and its main provisions.
CO5: Explain Elements of Company Law and its main provisions.
CO6: Explain Consumer Protection Act 1986 and its main provisions

Modules	Blooms level*	Number of hours
Module I: Legal Environment of Business Importance of Law, Legal environment of business, Sources of law, Function of law**.**	L1, L2	7
Module II: Indian Contract Act, 1872 Nature and kinds of Contracts, Concepts related to offer, Acceptance and Consideration, Principles Governing Capacity of Parties and Free Consent, Legality of Objects, Performance and Discharge of Contract, Breach of Contract and its Remedies, Basic Elements of Law Relating to Agency, Guarantee and Pledge	L1, L2	7
Module III: Indian Sale of Goods Act, 1930 Sale and Agreement to Sell, Hire Purchase, Pledge, Mortgage, Hypothecation Lease, Goods, Different types of Goods, Passing of Property in Goods, Conditions and Warranties, Doctrine of Caveat emptor, Rights of an unpaid Seller.	L1, L2	8
Module IV: Negotiable Instruments Act, 1881 Meaning of Negotiability and Definition of Negotiable Instruments, Features, Cheques, Bill of Exchange and Promissory Note, Holder in Due Course, Crossing of Cheques, Endorsement and Dishonour of Cheques	L1,L2	8

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Module V: Elements of Company Law Meaning and types of companies, Formation of a company, Memorandum and Articles of Association, Prospectus and Issue of Shares, Share Capital and Shareholders, Company Meetings and Proceedings, Powers and Liabilities of Directors, meeting, Managerial Remuneration and Winding up of Company	L1, L2	7
Module VI: Consumer Protection Act 1986 and Torts Need for Consumer Protection, Meaning of Consumer, Different Redressal Forums for Consumers, Rights of Consumers, Unfair Trade Practices, and Procedure for Filing Complaints, Meaning of tort, Application of Tortuous Liability in Business Situations**.**	L1, L2	8
Field work	L1,L2,L3,L4,L5	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books:

1.Kapoor, N.D. Business Law (2019) , Sultan Chand & Sons (P) Ltd. (20 July 2019)

2.P.K Goel, (2006) Business Law for managers Wiley

Reference Books:

1.Shukla, S.M. and Gupta, (2015)O P, Mercantile Law.(Sahitya Bhawan Publishers & Distributors Pvt. Ltd.

2.S. S. Gulshan Mercantile Law, (2019)New Age International

3.Maheshwari & Maheshwari Business Law. (2014)Himalaya Pub. House-New Delhi

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CPA**	**TP**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	5	5	5	5	10	70

C - Case Discussion/ Presentation; HA - Home Assignment; V - Viva; CT- Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	PSO1	PSO2	PSO3	PSO4
CO1	1	1	-	-	-	-	-	-	1	-	-	-
CO2	1	1	-	-	-	-	-	-	1	-	-	-
CO3	1	1	-	-	-	-	-	-	1	-	-	-
CO4	1	1	-	-	-	-	-	-	1	-	-	-
CO5	1	1	-	-	-	-	-	-	1	-	-	-
CO6	1	1	-	-	-	-	-	-	1	-	-	-

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DMGT2402	MANAGERIAL ECONOMICS	L	T	P	C
Version 1.1	Latest Approved	2	0	0	2
Pre-requisites/Exposure	Basic knowledge of economic science preferred but not compulsory				
Co-requisites					

Catalog Description

In this course the students are introduced with various basic concepts of managerial economics to make them familiarize with undergraduate level working knowledge. To begin with, introductory concepts of economics, consumer behavior and utility theory are discussed. Thereafter concepts related to demand analysis, demand forecasting, supply analysis, and equilibrium market conditions are discussed in detail. The next phase deals extensively concepts related to production theory, cost theory and revenue aspects. Following that various macroeconomic concepts and business phases along with their implications are analyzed in detail. Finally, various concepts related to market structure are discussed in detail. The overall aim of this course is to make the students familiar with working knowledge of the fundamentals of managerial economics as part of rational choice decision science.

Course Objectives:

The objective of this course is to:

1. Make students aware of theoretical concepts of economic science so that they can analyze situations and improve upon their managerial decision process.
2. Provide students with extensive exposure about the micro and macro level variables that influence business and managerial strategies of the firm and business cycles under which they operate.

Course Outcomes:

On completion of this course, the students will be able to:

CO1: Explain basic concepts of economic analysis, utility theory, demand and supply dynamics, demand forecasting techniques and their application, and analyze the working of free market mechanism.

CO2: Analyze the relevant production and cost concepts along with revenue in managerial decision process.

CO3: Describe the various forms of market structure and their implications in economy.

CO4: Discuss holistically the various macroeconomic aspects of business decision process along with complexities of business phases.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Managerial Economics Nature, Scope, Definitions of Managerial Economics, Application of Managerial Economics to Business, Micro Vs. Macro Economics, Opportunity Costs, Time Value of Money, Marginalism, Incrementalism, Market Forces and Equilibrium.	L1, L2, L4	7

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MODULE 2: Consumer Behaviour and Demand Analysis Cardinal Utility Approach: Diminishing Marginal Utility, Law of Equi-Marginal Utility, Ordinal Utility Approach: Indifference Curves, Marginal Rate of Substitution, Budget Line and Consumer Equilibrium, Theory of Demand, Law of Demand, Movement along vs. Shift in Demand Curve, Concept of Measurement of Elasticity of Demand, Factors Affecting Elasticity of Demand, Income Elasticity of Demand, Cross Elasticity of Demand. Production with one variable input, Production and optimal input proportions, two variable inputs, Law of variable proportions and law of return to scale, Cost Concepts, Theory of costs in short run and long run.	L1, L2, L4, L5	12
MODULE 3: Theory of Production, Cost and Firm's Behaviour Meaning and concept of Production, Factors of Production and Production Function, Fixed and Variable Factors, Law of Variable Proportion (Short Run Production Analysis), Law of Returns to a Scale (Long Analysis), Concept of Cost, Cost Function, Short Run Cost, Long Run Cost, Economics and Diseconomies of Scale, Explicit cost and Implicit Cost, Private and Social Cost	L1, L2, L4, L5	9
MODULE 4: Macro Economics and Business Decisions Phases of Business cycle - Evil effects of cyclical fluctuations on business firms - Minimizing effects of Business cycles, Economic and Business forecasting - uses of economic forecasts - Methods of economic forecasting - selecting a forecast - evaluating forecasts.	L1, L2, L4	9
MODULE 5: Price and Output Decisions under Different Market Structures Price and Output Decisions under Perfect Competition, Monopoly and Monopolistic Competition - Pricing under Oligopoly - Kinked Demand Curve - Price Leadership - Pricing under Collusion.	L1, L2, L4	8
Field work	L1,L2,L3,L4,L5	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. Dwivedi, D. N., Managerial Economics, 7th Edition, Vikas Publishing House.
2. Gould John P. and Edward P. Lazear Micro Economic Theory, All India Traveller Book-seller, New Delhi.
3. Koutsoyiannis Modern Micro Economics, Macmillan Press Limited, New Delhi.
4. Dewett. K.K. Micro Economics, S. Chand &Co, New Delhi

Reference Books

1. Ahuja, H.L. Advanced Economic Theory (Micro Economics), S. Chand & Co, New Delhi
2. Browning Edgar K. & Jacquel Line M. Browning, Micro Economics and Application, Kalyani Publishers, New Delhi.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**

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CO1	1	1	--	--	--	--	--	--	1	--	--	--
CO2	1	1	--	--	--	--	--	--	1	--	--	--
CO3	1	1	--	--	--	--	--	--	1	2	2	2
CO4	1	1	--	--	--	--	--	--	1	2	1	1

1: strongly related, 2: moderately related and 3: weakly related

SEMESTER-V

DMGT2551	**OPERATIONS AND SUPPLY CHAIN MANAGEMENT**	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Operations and Supply chain are an integral contributor to an organisation's top and bottom line success. This course is based on a foundation in the theories and practice of management in businesses where operations and supply chain management are critical to success. These include product and process design, choosing appropriate technology, adopting efficient work methods, planning (including location and facilities layout), streamlining the flow of people and materials, and continuously improving the quality of the final product, in order to create internal and external customer value.

Course Objectives:

The objectives of this course are to:

1. Provide and practice of management in businesses.
2. Make them aware regarding planning.
3. Know product and process design, appropriate technology, adopting efficient work methods

Course Outcomes

On completion of this course, the students will be able to:

CO1: Demonstrate ability to systematically analyse operational and supply chain strategies in the light of the emerging supply chain frameworks and business models;

CO2: Develop business, operations and supply chain management strategies using strategic alignment model;

CO3: Effectively apply the alignment model and assess the strategic needs of business and supply chain networks;

CO4: Evaluate emerging operations initiatives for supply chain collaboration and their strategic implication;

CO5: Integrate organisational changes related to supply chain strategy implementation

Modules	**Blooms level***	**Number of hours**
Module I: Introduction, Significance of POM in business, POM model and its elements, Scope of POM, History of POM.	L1, L2	2

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Module II: **Competitive Advantage through operations management** Competitive Advantage through POM, Critical factors for gaining competitive advantage, Operations models, Operations strategy Case discussion	L1, L2, L3	3
Module III: **Product** Product – levels, types, categories Product design and development Commercial production and launch Support and up-gradation	L1, L2, L3	5
Module IV: Processes and Technology Types of productive systems Types of production processes Comparison of production processes Case discussion	L1,L2	5
Module V: Forecasting Significance of forecasting for operations management Forecasting techniques Mathematical models and their practical applications Forecasting errors. Laws of forecasting and how they affect operations	L1, L2	5
Module VI: Planning and Scheduling Operations Planning and Scheduling Long range and aggregate output planning Master production schedules Functional planning and production control Operations scheduling Case discussion **Module VII: Quality Management** Quality management SQT, AS, SQC, SPC and practical applications Case discussion	L1,L3,L6	5
Module VIII: Performance improvement in operations Latest techniques in operations management Just-In-Time technique Ergonomics and work study Case discussion **Module IX: Operations Management in the Indian context** Implementation of operations management techniques by Indian companies Case discussion	L1, l2	5
Module X: Supply Chain Management Operations capacity Capacity measures Capacity planning process Evaluation of alternatives for capacity expansion	L1, L2, L6	5

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Module XI: Site Location and Layout Planning Factors affecting site location decisions Evaluation of site location options Objectives of layout planning Types of layouts Designing of layouts	L1, l2	5
Module XII: Supply Chain Management Basic Concepts Characteristics of business partners of a supply chain. Elements of supply chain management systems Demand management, customer service management Procurement, Outsourcing, supplier relationship management Physical distribution management, returns management	L1, l2	5

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books:

Norman Gaither & Greg Frazier, 2005, Operations Management - Thomson , South Western

Reference Books:

1. E Adam and Ronald J Ebert, 2005, Production and Operations Management, Prentice Hall of India
2. Cecil Bozarth and Robert B. Handfield, Introduction to Operations and Supply Chain Management 2nd Edition, 2007Roberta (Robin) Russell and Bernard W. Taylor, Operations Management: Creating value along the Supply Chain, 2007
3. Roberta (Robin) Russell and Bernard W. Taylor, Operations Management: Creating value along the Supply Chain, 6th Edition , Loose Leaf, 2008
4. Terry P. Harrison, Hau L. Lee, and John J. Neale, The Practice of Supply Chain Management: Where theory and application converge (International Series in Operations Research & Management Science),2005
5. Sunil Chopra and Peter Meindl, Supply Chain Management: Strategy, Planning and Operations, 2000
6. David L. Taylor and David Brunt, Manufacturing Operations and Supply Chain Management: The LEAN Approach, 2000
7. John Tom Mentzer, Matthew B. Myers, and Theodore P. Handbook of Global Supply Chain Management,2006

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CPA**	**TP**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	5	5	5	5	10	70

CPA: Case Discussion/Presentation/Analysis V: Viva A: Attendance CT: Class Test EE: End Term Examination

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**
CO1	1	1	-	-	-	-	-	-	-	1	-	2
CO2	1	1	-	-	-	-	-	-	-	1	-	2
CO3	1	1	-	-	-	-	-	-	-	1	-	2
CO4	1	1	-	-	-	-	-	-	-	2	-	2
CO5	1	1	-	-	-	-	-	-	-	1	-	1

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DMGT2501	STATISTICS IN RESEARCH	L	T	P	C
Version 1.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description
The course teaches students the basics of descriptive statistics. It sets a necessary foundation for the study of inferential statistics in the programme.

Course Objective:

1. This course will deal with all fundamental statistical methods of tools that the students have to use in economic analysis and decision-making problems.
2. The student will understand the concepts in descriptive statistics and be familiar with some commonly used statistical techniques like correlation, regression, index numbers and time series analysis.

Course Outcome:
Upon successful completion of the course, a student will be able to:
CO1: Define statistical methods and provide an insight into their uses in economics
CO2: Demonstrate the application of a range of statistical techniques to economic problems
CO3: Apply Skills in describing, analysing and interpreting statistical data
CO4: Comprehend the principles and assumptions on which these procedures are based
CO5: Apply the ability to analyse statistical data using MS Excel
CO6: Apply the ability to relate statistical methodology to economic enquiry

Modules	Blooms level*	Number of hours
Module I : Introduction: Basic concepts: Population, Sample, Parameter, Statistic, Frequency distribution, Cumulative frequency distribution; Graphic and diagrammatic representation of data; Techniques of data collection. Sampling vs. Population, primary and secondary data.	L1, L2, L3, L4, L5, L6	15
Module II: Central Tendency and Dispersion: Measures of Central Tendency: Mean, Median, Mode, Geometric mean, Harmonic mean; Measures of Dispersion; Range, Quartile deviation Mean deviation, Standard deviation; Skewness and Kurtosis, Moments.	L1, L2, L3, L4, L5, L6	12
Module III: Correlation and Regression: Correlation: Simple; Coefficient of correlation; Karl Pearson and Rank correlation; Partial and Multiple Correlation analysis; Regression analysis – Estimation of a regression line in a bivariate distribution, Least squares method; Interpretation of correlation and regression coefficients; Coefficient of determination.	L1, L2, L3, L4, L5, L6	12
Module IV: Time Series: Time Series Analysis - concept and components, determination of trend (Linear, Quadratic and Exponential) and seasonal indices	L1, L2, L3, L4, L5, L6	12

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Module V: Index Numbers Concept of an index number; Laspeyer's, Paasche's and Fisher's Index Numbers; Chain base index; Problems in the Construction of an index number; splicing; base shifting and use of index number for deflating other series.	L1, L2, L3, L4, L5, L6	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

References

Main text

1. Anderson David R, Sweeny Dennis J, Williams Thomas A. (2022) *Statistics for Business and Economics* (11th edition), Centage Learning**:** Delhi

Additional Texts:

2. Keller Gerald, Warrack Brian, (2013), *Statistics for Management and Economics*, Thomson: Singapore.
3. Douglas A. Lind, William G. Marchal, Samuel A.Wathen, (2012) *Statistical Techniques in Business & Economics*, (15th Edition), McGraw-Hill: New York
4. David M. Levine, David F. Stephan, Kathryn A. Szabat, (2017). *Statistics for Managers Using Microsoft® Excel*, (8th Edition), Pearson: Edinburg
5. **George Argyrous**, (2012). *Statistics for Research: With a Guide to SPSS.* (3rd Edition), Sage: New Delhi

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	1	3	1	1	2	2	2	3	3	--	--
CO2	1	2	--	1	1	2	2	1	2	--	--	--
CO3	1	2	-	1	1	3	3	3	-	--	--	--
CO4	2	1	--	1	1	--	2	--	--	--	3	--
CO5	2	2	-	1	1	--	--	--	--	--	2	--
CO6	2	2	--	1	1	--	--	--	--	-	--	--

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DMBF2501	PRINCIPLES OF INVESTMENT MANAGEMENT	L	T	P	C
Version 1.1		2	1	2	4
Pre-requisites/ Exposure					
Co-requisites					

Catalogue Description
Investment management is all about investment decisions and asset allocation. This course aims at helping the students to understand the investment strategies and directing funds to property, equities, or debt securities on behalf of clients. Investment bankers, by contrast, are deal-makers. They work as high-level consultants and analysts for large companies to help with capital raising strategies.

Course Objectives
The objective of this course is to:

1. Equip the undergraduate students with financial tools, which help in making decisions for investment in financial securities.
2. Impart a basic understanding of the influence of changing economic scenario on the decisions and important theories and models, techniques and regulations underlying these decisions.

Learning Outcomes:
On successful completion of this module a student should be able to:
CO1: Explain different financial market structures, players including their roles and respective stakeholders
CO2: Demonstrate the basic knowledge of key financial markets, major product types, and the scope for misconduct, agency failures and moral hazard
CO3: Identify and explain the aims, role and structures to provide financial markets supervision including their limitations and recent criticisms & the key theories for corporate governance and risk governance practices for financial institutions, and how governance mechanism may interact to impact performance or risk-taking
CO4: Analyse the potential for ethical behaviour and improved conduct to fill the void where law and regulations fail to succeed

Modules	Blooms level*	Number of hours
Module I: Introduction to Investments Investments: Introduction, Avenues for Investment including introduction to derivatives, Investments and Speculation, Features of a Good Investment programme, Process of Investment Decision Making, Risks involved in Investments including the concept of beta, Principle of Dominance.	L1, L2	6
Module II: The Stock Markets in India Nature and Functions of the Stock Market, OTCEI & BSE, NSE & Role of Depositories, Market Indices, Brokerage Business	L1, L2, L3	7
Module III: Valuation of Securities Bond Valuation and Analysis, Preference share Valuation and Analysis, Equity Share Valuation	L1, L2	8

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Module IV: Fundamental Security Analysis Fundamental analysis-Economic &industry analysis, concept of Business Cycles, Indicators of economic prosperity, Industry analysis, Company analysis, Company valuation. DOW"s Theory	L1, L3, L4	8
Module V: Technical Security Analysis Various Technical analysis tools like Moving averages, Volume Analysis, Indicators, RSI, Patten analysis, Candlesicks, Market breadth analysis, Trend analysis	L1, L3, L4	8
Module V: Portfolio Analysis and Management Portfolio Analysis: Risk and Return, Portfolio Choice: Utility Theory and Indifference Curves, Markowitz: Portfolio Selection Model, Capital Asset Pricing Model, Sharpe's Single Index Model and Portfolio Evaluation Treynor, Sharpe and Jensen.	L1, L2, L3, L4	8
Fieldwork		15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text Book

1. Sharpe, William F. Alexander and Bailey, Investments, Sixth Edition, Prentice – Hall, India

Reference Books:

1. Fisher, Donald E & Jordan, Ronald., Securities Analysis & Portfolio Management: Sixth Edition, Prentice Hall
2. Haugen, Robert. Modern Investment Theory, Fifth Edition, Prentice Hall
3. Bhalla, V. K. Investment Management, S. Chand & Co. New Delhi.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CPA**	**TP**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	**5**	**5**	**5**	**5**	**10**	**70**

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	2	--	--	--	--	1	1	1	-	-
CO2	1	1	2	--	--	--	--	1	1	1	-	-
CO3	1	1	2	2	2	--	--	1	1	1	-	-
CO4	1	1	2	--	--	--	--	1	1	1	-	-

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SEMESTER-VI

DMGT2651	BUSINESS POLICY AND STRATEGIC MANAGEMENT	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description
This course introduce to the students theories and practices of Strategic Management acquired knowledge in formulation and implementation of strategies for better decision-making.

Course Objectives
The objective of this course is to
1.Orient the students in theories and practices of Strategic Management.
2. Apply the acquired knowledge in formulation and implementation of strategies for better decision-making.

Course Outcomes
On completion of this course, the students will be able to:
CO1: Define the basic concepts and principles of strategic management and define the internal and external environment of business.
CO2: Recognize organizational strategies that will be effective for the current business environment.
CO3: Illustrate strategic approaches to managing a business successfully in a global context.
CO4: Analyze and evaluate critically real life company situations and develop creative solutions, using a strategic management perspective.

Modules	Blooms level*	Number of hours
Module I: Introduction Planning, Evolution of strategic management, Concept of Corporate Strategy: Intended & Emergent, Patterns of Strategy Development, Levels of strategy	L1, L2	8
Module II: Mission & Vision Concept of Strategic Intent, Vision and Mission, Formulation of Vision and Mission Statements, Different Perspectives on Vision and Mission, Business Definition and concept of a Business Model**.**	L1, L2	7
Module III: Strategic Analysis Industry Analysis, Competitor Analysis using Porter's 5-Forces model, Market Analysis, Environmental Threat and Opportunity Profile (ETOP), Internal Analysis: Building Organization Capability Profile and Strategic Advantage Profile (SAP), Building competencies using Value chain Analysis, Environmental Analysis and dealing with uncertainty, Scenario Analysis, SWOT Analysis	L1, L2	8
Module IV: Strategic Choice Strategic alternatives at corporate level: Expansion, Stability, Retrenchment and Combination, Strategic choice models for dominant single- Business companies- Strickland's Grand Strategy Selection Matrix, Model of Grand Strategy Clusters, Strategic choice models for multi-business companies- BCG, GE Nine Cell Matrix, Hofer's Model, Coevolving, Patching, Strategy as simple rules, Strategic alternatives at business level: Michael Porter's Generic competitive strategies, Building Sustainable Competitive Advantage	L1,L2	7
Module V: Strategic Implementation Operationalizing strategy and Institutionalizing strategy- Developing short-term	L1, L2	10

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objectives and policies, Functional tactics, and Rewards, Structural Implementation, Strategic Control, Mc Kinsey 7-S Framework. **Module VI: Recent Developments** Recent Developments in the Field of Strategy: Use of Balanced Scorecard approach, Corporate Governance and Corporate Social Responsibility, Corporate sustainability**.**		5
Tutorial: Flip Classes/Presentation/Assignments/Discussions	L3,L4,L5	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Book:

1. Jauch & Glueck,1998, Business Policy and Strategic Management.
2. Pearce & Robinson,2012, Strategic Management Formulation Implementation & Control, 12th Edition, McGraw Hill.

Reference Books:

1. Lynch,2006, Corporate Strategy, 4th Edition, Pearson.
2. Ramaswamy & Namakumari, 1996, Strategic Planning for corporate success, Sage Publications.
3. Michael E. Porter, 1998, Competitive Advantage, Crafting & Executing Strategy, Free press.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CPA**	**TP**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	5	5	5	5	10	70

C - Case Discussion/ Presentation; HA - Home Assignment; V - Viva; CT- Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	-	-	-	-	-	3	-	-	1	-	1
CO2	1	2	1	-	-	-	3	3	-	1	-	1
CO3	1	1	1	-	-	2	1	3	-	1	-	1
CO4	1	1	3	2	2	1	1	3	-	1	-	1

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DMBF2601	E-BANKING	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Microsoft Excel is a very popular business productivity application for the management and manipulation of data. With the right training and understanding of Excel, businesses and individual users can unlock the world of opportunities that this powerful business application offers. This course will provide all the tools necessary to create and use basic and advanced spreadsheets.

Course Objectives

The objective of this course is to enable students to:

1. Understand the role of information and technology in banking.
2. Grasp the skill related to IT implementation in banking industry.
3. Make them aware about the various security measures and laws related.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the terminology related to E-Banking and Cyber threat and security issues.
CO2: Outline the cyber security threats and issues facing the Banking sector
CO3: Identify the basic elements of electronic payment systems.
CO4: Assess and review the legal issues and provisions of IT Act 2000.

Modules	Blooms level*	Number of hours
Module I: Introduction Concept, Definition & Origin of E-Banking, Scope and Type of E-Banking – Internet Banking, Mobile Banking etc., Issues and Challenges in E-Banking, Advantages and Limitations of E-Banking, Future of E-Banking in India.	L1, L3	8
Module II: Electronic Payment System Concept of Electronic Payment, Basic elements of electronic payment system, Types of Electronic Payment Systems – Electronic Cash, Electronic Cheque, EFT, RTGS, Credit Card, Smart Card, Concept of Payment Gateway and Paypal, Concept & Working of ATM.	L1, L2	7
Module III: Cyber Security and Legal Issues Cyber Crimes & Security, Cyber Attacks – Trojan, Virus, Worm, Spam, Hacking – Phishing, IP Spoofing, Safety Measures – Firewalls, Intrusion Detection, Systems, Secure Sockets Layer, Authentication & Assurance of Data Integrity, Cryptography, Digital Signatures, Overview of Information Technology Act – 2000	L1, L2, L6	6

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Module IV: Regulations and Compliance in E-Banking Regulatory framework for E-Banking: roles and responsibilities of regulatory bodies such as RBI and ECB,Compliance with data protection laws, anti-money laundering regulations, and cybersecurity standards, Risk management guidelines and reporting requirements in E-Banking, Compliance tools and processes: internal audit procedures, fraud prevention measures, and security awareness training, Regular compliance audits and regulatory filings, E-Banking governance and ethics: responsible banking principles, ethical practices, data privacy, and consumer protection guidelines	L1, L2, L3	12
Module V: Emerging Trends and Future Directions in E-Banking Emerging E-Banking technologies: artificial intelligence (AI), machine learning (ML), and big data analytics,Blockchain technology and distributed ledgers in E-Banking, Open banking and APIs for innovation and collaboration in the financial ecosystem, Personalization and customer experience: omnichannel banking experiences, personalized customer journeys, real-time customer insights, contextual marketing, Artificial intelligence chatbots and virtual assistants in E-Banking. Challenges and opportunities in E-Banking: cybersecurity threats, maintaining a competitive edge in the digital banking landscape, addressing the digital divide and bridging the gap between the unbanked and underserved populations	L1, L2, L3	12
Fieldwork		15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. BV, S. E. (2013). Electronic banking: The ultimate guide to business and technology of online banking. Springer Science & Business Media.
2. Bajaj, K. K. & Nag, D. "E-Commerce". New Delhi: Tata McGrawHill.
3. Kaptan S. S. & Choubey, N. S. "Indian Banking in Electronic Era". New Delhi: Sarup & Sons.
4. Sharma, K. C. "Modern Banking in India." New Delhi: Deep & Deep Publications.

Reference Books

1. Diwan, P. & Sharma, S. "E-commerce-A Manager's Guide to e- Business". New Delhi: Excel Books.
2. Kalakota, R. & Whinston A. B. "Frontiers of Electronic Commerce". New Delhi: Pearson Education.
3. Kaptan S. S. & Choubey, N. S. "Indian Banking in Electronic Era". New Delhi: Sarup & Sons.
4. Sharma, K. C. "Modern Banking in India." New Delhi: Deep & Deep Publications.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CT**	**HA**	**C**	**V**	**A**	**EE**
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; **HA -** Home Assignment; **Q** – Quiz; **V** - Viva; **CT** - Class Test; A - Attendance; **EE** - End Semester Examination

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1							1		1		
CO2	1	2						1		1		
CO3	1	1						1		1		
CO4	1	1						1		1		

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DMBF2602	ADVANCED CORPORATE FINANCE	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/ Exposure					
Co-requisites					

Catalog Description

The basic objective of this course is to acquaint the students with the latest developments in the field of corporate finance. This course aims at helping the students to learn advanced topics related to behavioral finance, corporate restructuring & corporate governance.

Course Objectives

The objective of this course is to

- Understand the functions of corporate finance.
- Gain insight into advancements in the corporate finance field.
- Learn and integrate the various aspects for the financial decision-making.

Course Outcomes

On completion of this course, the students will be able to

CO1: Identify the key themes in corporate finance.
CO2: Identify and apply the valuation concepts and measures of financial performance.
CO3: Identify and explain the various aspects of Mergers and Acquisitions such as theories, Costs and benefits, financial synergies and Tax planning.
CO4: Explain and analyse the interrelationship between finance, governance and ethics.
CO5: Apply the main concepts, research tools and methodologies of behavioural finance.
CO6: Analyse the relationship between strategic decision making and corporate financing decisions

Modules	Blooms level*	Number of hours
Module I: Introduction Objectives of Corporate finance, Shareholder wealth maximization, Agency Problems, Management Compensation & measurement of Performance.	L1, L2	6
Module II: Valuation Concepts **Valuation Models**, **Application of Valuation Model**, EVA/MVA, Balanced scorecard and other methods/measures of financial performance.	L1, L2, L3	8
Module III: Corporate restructuring Differential Efficiency & Financial Synergy: Theory of Mergers, Operating Synergy & Pure Diversification: Theory of mergers, Costs and Benefits of Merger, Evaluation of Merger as a Capital Budgeting Decision, Poison Pills, **Turnaround Strategies**, Tax Planning relating to mergers and Amalgamation	L1, L2	10
Module IV: Corporate Governance& Business Ethics **Implementation of Corporate Governance**, Ethics and finance, Ethical practices in market place, Corporate Responsibility, Social Audit and Ethical Investing	L1, L2, L4	6
Module V: Behavioural Finance Introduction and Expected Utility, Non-Expected Utility Preferences, A review of classical probability theory, Beliefs, Biases and Heuristics, Preferences and Anomalies in the Financial markets.	L1, L2, L3	8

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Module VI: Strategic Cost management Financial aspects of Supply Chain Management, Operations management perspective on Costs, different kind of cost, cost assessment, Strategic cost analysis (using activity-based costing, target costing and life cycle costing) and Product pricing at Different stages of product's life cycle.	L1, L2, L4	7
Fieldwork		15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text Books

1. Corporate Finance, by Stephen A. Ross, Randolph W. Westerfield and Jeffrey Jaffe (RWJ), 10th edition, McGraw-Hill 2013.
2. Damodaran Aswath (2018),Applied Corporate Finance,4th Edition, Wiley.

Reference Books

1. Brealey Richard and Myers Stewart (2019), Principles of Corporate Finance, 13th Edition,Tata Mc Graw Hill.
2. International Corporate Finance by Indian Institute of Banking and Finance.
3. Ross, Westerfield and Jordan(2018), Fundamentals of Corporate Finance,12thEdition, Tata McGraw Hill.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CPA**	**TP**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	5	5	5	5	10	70

CT: Class Test, HA: Home Assignment, V: Viva, EE: End Semester Examination; Att: Attendance, C: Case Analysis

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	--	--	--	--	--	--	1	1	--	--
CO2	1	1	--	--	--	--	--	--	1	1	--	--
CO3	1	1	--	--	--	--	--	--	1	1	--	--
CO4	1	1	--	--	--	--	--	--	2	1	--	--
CO5	1	1	--	--	--	--	--	--	2	1	--	--
CO6	1	1	--	--	--	--	--	--	2	1	--	--

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DMBF2603	CORPORATE TAX PLANNING	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is designed to make the students aware of the corporate tax laws of India. Understanding the corporate tax laws and using it for tax planning is the basic objective of the course. The course is designed so that the students are aware of what business income is and when it gets taxed. The course also provides students with knowledge of the deductions available under the Income Tax Act, GST procedures, tax plannin in special managerial decisions etc.

Course Objectives

The objective of this course is to

1. To know the Outline the corporate tax laws.
2. To make a practices of deductions of expenses to reduce the taxable income.
3. Apply the relevant sections of the Income Tax Act to compute taxable income and tax payable for a corporation

Course Outcomes

On completion of this course, the students will be able to

CO1: Identify the concept of tax planning, tax evasion and tax avoidance and describe how the provisions in the corporate tax laws can be used for tax planning.
CO2: Determine the residential status of companies and taxable income under business and profession.
CO3: Explain different types of incomes and their taxability and expenses and their deductibility.
CO4: Interpret the foreign financial transactions for taxation purposes.
CO5: Apply the indirect taxation laws and principles.
CO6: Relate the tax planning decisions with financial management decisions.

Modules	Blooms level*	Number of hours
Module I: Introduction to Tax Management Concept of tax planning, Objectives, types of corporate tax planning, Tax avoidance and tax evasion, Tax planning and Corporate planning	L1,L2	5
Module II: Income from Business Residential Status of companies, Taxable income under Business and Profession, Computation of Profit and Gains from business and profession, Deemed business profits, Assessment of Retail Business, Deemed incomes (cash credit, unexplained investments, unexplained money and other assets, unexplained expenditures, investments and valuable articles not fully disclosed in books of accounts).	L1, L2,L3	10

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Module III: Deductions Allowed Under Business and Profession Deduction Expressly allowed section 30-35, Depreciation deduction calculation, Setoff and carry forward of unabsorbed depreciation section 32(2). Determining Actual Cost43(1), Set-off and Carry Forward Losses, Bonus or commission to employees section, Interest on borrowed capital, Insurance premium 36(1(i)), Employees contribution to provident fund, Bad debts 36, Revenue expenditure incurred by statutory corporation, Banking transaction tax, Security transaction tax, Commodity transaction tax, provision for admissibility of general deduction 37(1)	L1, L2	8
Module IV: International Accounting and Taxation Analysis of foreign financial statements, Accounting standard: US GAAP, Indian GAAP, IAS, IFRS. Transfer Pricing – Meaning, measurement, strategic considerations Norms and practices. Tax havens, Double taxation agreement among countries, Tax implication of activities of foreign enterprise in India: Mode of entry and taxation respectively.	L1,L2	7
Module V: Indirect Taxation and Assessment Proceedings GST Taxation/ Assessment proceedings Return- Refunds- Input Tax Credit- Reverse charge Mechanism, Transitional Provisions composition under GST- Administrative structure of GST-Officers as per CGST Act- Officers as per SGST Act-Jurisdiction- Appointment Powers. Relevance of Cross Empowerments .	L1, L2,L3	8
Module VI: Tax Planning and Financial Management Decisions Tax planning relating to making or buying, owning or leasing, repair, renewal or replacement of assets, capital structure decisions, dividends, and bonus shares, Tax provisions relating to free trade zones, Infrastructure sector, and backward areas, and Tax incentives for exports.	L1,L2,L5	7
Fieldwork		15

**Bloom's Level: L1-Knowledge;L2-Comprehension;L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. Ahuja Girish & Gupta Ravi(2018) ,Corporate Tax Planning & Management,19th Edition, CCH Wolter Kluwer Publishers.
2. Singhania Monica & Singhania Vinod K,Corporate Tax Planning & Business Tax Procedures with Case Studies, 22nd Edition, Taxmann Publishers.

Reference Books

1. Lal & Vashisht, Direct Taxes, 29th Edition, Pearson.
2. Mehrotra H.C.& Goyal S.P.(2019),Corporate Tax Planning and Management,17th Edition, Sahitya Bhawan Publications.
3. Sweta Jain GST law and practice Taxmann Publishers, July 2017
4. V.S.Daty – GST- Input Tax Credi- Taxmann Publishers, second edition August 2017

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CT	C	HA	A	EE
Weightage (%)	**10**	**10**	**5**	**5**	**70**

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester Examination

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	1	--	--	--	--	--	--	1	1	--	--
CO2	1	1	--	--	--	--	--	--	1	1	--	--
CO3	1	1	--	--	--	--	--	--	1	1	--	--
CO4	1	1	--	--	--	--	--	--	2	1	--	--
CO5	1	1	--	--	--	--	--	--	2	1	--	--
CO6	1	1	--	--	--	--	--	--	2	1	--	--

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SEMESTER-VII

DMGT2701	DISRUPTIVE MANAGEMENT PRACTICES	L	T	P	C
Version 1.1		2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Description:
Disruptive management practice has upended traditional profitability models of industry after industry. Executives, focused on fine-tuning their current business models, often haven't seen the threats before their business landscapes are suddenly and permanently changed. Data and the increased development of technology have accelerated the rate of these massive changes. No industry is immune from competitors looking to grab market share through disruptive innovation.

Course Objectives:
This course will prepare leaders to harness the power of disruptive innovation before their competitors do. Students will gain a deeper understanding of what disruptive innovation is and will learn how to spot potential threats and opportunities in their own business. The coursework will focus on planning for disruption, using concrete steps to identify potential disruptions in the industry, and building the right culture to implement change. Students will be trained to view their business through a "jobs to be done" framework and use customer-centric problem-solving to discover new ideas and justify business changes.

Course Outcomes:

- Understand the forces of disruption that could impact their business and see how to spot them early
- Uncover a new approach for customer centricity to spot and shape new opportunities by applying the jobs to be done framework
- Learn, through practical examples, how to leverage new business models and potential application for their companies

Modules	Blooms level*	Number of hours
Module 1 - Imperative and Fundamental Concepts- Disruptive Innovation- Complementary Thoughts on Christensen's Theory of Disruptive Innovation, Theory of Disruption Waves or the Modulation of Disruption, Benefit of a Unified View on Disruption, Relativity of Disruption, and Typical Warning Signals for Disruptive Threats. Form Follows Function - Concept and Architecture.	L1, L2, L4	10
Module 2 - Market Understanding - Understanding Your Market, Market Segmentation for Multiple Segmentation Criteria, Identifying a Customers' "Job to Be Done", Differentiating Market Segmentation from Design Thinking, Creating Customer Value Through Design Thinking- Design Thinking, When to Use Design Thinking?, Defining Understanding, The Different Levels of Understanding, Phases of Design Thinking, Empathy for Individuals, Empathy in the B2B Context, Ideation, Prototyping and Testing, Scaling.	L1, L2,L4,L5	10

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Module 3 - Design to Value (DTV) - Defining Value in Product Development, Lifecycle Cost, the Framework and measuring value. Modularization: A Strategic Lever for Innovation, Platform- Core Platform versus Inclusive Platform, Implementing a Modular Platform- Organizational Aspects and Strategic Aspects, Agile – agile project management, frameworks.	L1, L2, L4, L5	10
Module 4 - Requirement Focus - Kano Model, Pair-wise Comparison, Requirements Management, Tree Diagram, Empathy Map, Concept Focus- Functional Modelling, Morphological Matrix/Morphological Box, Modular Function Deployment, Onion Peel Model, Design for Variety, Customer Focus Group, Osborne Checklist. Cost Focus - Target Costing, Measurement Sheet, Lifecycle Cost model, Complexity Cost Calculation for Product Families, Business Plan.	L1, L2,L3, L4	10
Module 5 - General Description of Disruption Management- Approaches to Uncertainties, General Guidance of Disruption Management, Understanding your business needs, Identify data roles in the organization. Challenges: Identify hurdles to becoming a data-driven organization, Disruption vs. Optimization, Disruptive Business Applications.	L1, L2, L3, L4	10
Module 6 - Enterprise Agile- Common Approach to Enterprise Agile Adoption, Building Blocks of Your Lean-Agile Culture Transformation, Base line assessment, Waterfall Training Development, sponsor Agile, Agility in a World of Change and Complexity, Traditional Organization v/s Agile Organizations and challenges in agile.	L1, L2, L4	10

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination Scheme:

Components	**CT**	**HA**	**C**	**V**	**A**	**EE**
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; **HA -** Home Assignment; **P -** Project; **S -** Seminar; **V** - Viva; **Q** - Quiz; **CT** - Class Test; **A** - Attendance; **EE** - End Semester Examination

Text and Reference Books:

1. **Disruption Management Framework, Models and Applications (2004) - Gang Yu and Xiangtong Qi,** https://doi.org/10.1142/5632
2. **Disruptive Management - Not Playing by the Rules, C. P. Ramchandani.**
3. https://www.routledge.com/Emerging-Trends-in-Disruptive-Technology-Management-for-Sustainable-Development/Das-Banerjee-De/p/book/9780367249649#
4. https://link.springer.com/book/10.1007/978-3-030-79709-6?page=2#toc

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	2								-	1	--	3
CO2	1	3								-	1	--	3
CO3	1	1								-	1	--	2

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DMGT2702	ARTIFICIAL INTELLIGENCE IN MANAGEMENT	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Description:
This course introduces to the exciting world of Artificial Intelligence (AI) and its transformative impact on business. We will explore the core concepts of AI, delve into the power of Machine Learning and Deep Learning, and discover how AI is revolutionizing various business functions. Through real-world case studies, hands-on activities, and discussions with industry leaders, you will gain the knowledge and skills to leverage AI for strategic decision-making, optimize operations, and gain a competitive edge in the job market.

Course Objectives:
- Understand the fundamentals of Artificial Intelligence and its applications in business.
- Master the key concepts of Machine Learning, including supervised and unsupervised learning algorithms.
- Gain practical experience through case studies, hands-on exercises, and guest lectures.
- Prepare for a successful career in the AI-powered future of business.

Course Outcome
CO-1: Explore the potential of Deep Learning and its impact on various industries.
CO-2: Analyze the ethical considerations and challenges surrounding AI implementation.
CO-3: Develop critical thinking skills to evaluate the business value of AI solutions.
CO-4: Develop a model for decision making for business decision.

Modules	Blooms level*	Number of hours
Module 1: Introduction to AI What is AI?, A brief history of AI, Different types of AI, Applications of AI in business, The impact of AI on jobs and the workforce	L1, L2	9
Module 2: Machine Learning What is machine learning?, Supervised vs. unsupervised learning, Common machine learning algorithms, Applications of machine learning in business, Case studies of companies using machine learning	L1, L2	9
Module 3: Deep Learning What is deep learning?, Neural networks, Convolutional neural networks (CNNs), Recurrent neural networks (RNNs), Applications of deep learning in business, Case studies of companies using deep learning	L1, L2	9
Module 4: AI for Decision Making How can AI be used to improve decision making?, AI-powered analytics and reporting, Predictive modeling and forecasting Optimization and simulation, AI-driven marketing and customer relationship management	L1, L2,L3	9

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Module 5: The Future of AI in Management The ethical implications of AI, The challenges of implementing AI The future of work in an AI-powered world,How to prepare for the AI revolution	L1,L2,L5	9
P - Project; This would be the field project related to the subject where the student need to work outside the class collect the data and make report .	L3 , L4	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis L5-Synthesis; L6-Evaluation*

References

Akerkar, R. (2019). *Artificial intelligence for business*. Springer.
Harmon, P., & King, D. (1985). *Expert systems: Artificial intelligence in business*. John Wiley & Sons, Inc..

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CT**	**HA**	**C**	**V**	**A**	**EE**
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	--	--	--	--	--	--	--	1	--	--	--
CO2	1	--	--	--	--	2	--	--	1	--	--	--
CO3	1	2	--	--	--	--	--	--	1	--	--	--
CO4	1	--	--	--	--	--	--	2	1	--	--	--

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DMGT2703	SUSTAINABILITY MANAGEMENT	L	T	P	C
Version 1.1	Latest Updated	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Description: This cross-disciplinary graduate course provides a holistic overview of the environmental, social, economic and governance (ESEG) aspects of sustainability management and how to address them strategically to maximize business and product performance to meet changing stakeholder expectations. You will have the opportunity to learn about a variety of sustainability challenges faced by a variety of industry sectors, such as: mitigation and adaptation to climate change; energy, water, materials and resource management; minimizing supply chain risks that can derail business continuity. Internationally recognized frameworks, best practices, methodologies, tools and standards will be introduced as vehicles to tie the concepts together for practical application of solutions that support leadership in sustainability performance improvement.

Course Objectives: This course is for aspiring sustainability change agents who wish to gain a broader and deeper understanding of business and product strategic sustainability management from multiple stakeholder perspectives that make up the business-to-business value chain. This course is for you--- if you believe that businesses can and should be a thriving force for good in the world with products that do not harm the environment or social wellbeing. As a student, you seek to understand, facilitate and influence how stakeholders can collaborate to lead the development and implementation of transformative management systems and programs for a sustainably prosperous world for all.

Course Outcomes: At the end of this course, you will be able to:

• Identify the drivers, risks, challenges and opportunities associated with addressing sustainability management challenges.

• Apply the guiding principles and values that are a foundation for a holistic mind-set that guides an effective sustainability vision, strategy and implementation plans.

• Identify the factors in developing a credible business case for common sustainability management approaches that deliver actual improvements and breakthrough sustainability performance.

• Navigate common and conflicting needs, perspectives and interests of multiple stakeholder groups, cross-sector, cross-disciplinary, cross-functional and industry-specific perspectives.

• Promote strategic benefits of integrating and engaging the business value chain from suppliers through to end customers for achieving and communicating breakthrough sustainability outcomes.

• Link systems thinking and life cycle thinking to core business strategy and decision-making using product life cycle assessment based on international ISO standards.

Modules	Blooms level*	Number of hours
Module 1- Introduction – Global Challenges (Climate Change, Biodiversity Loss, Rising Inequality, and Resource Depletion), Sustainability- Global Sustainability Initiatives, Sustainable Approaches, SDGs and how are they linked ESG, Requirement of ESG, Value Creation Opportunities and Benefits From ESG, Setting up an ESG Strategy, Sustainable Supply Chain and its Decarbonisation, Sustainable Procurement.	L1, L2, L4	10

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Module 2 Introduction to Decarbonisation- Key terms, Decarbonisation Strategies, Challenges of Decarbonisation, Solutions and Initiatives, Role of Technology in Decarbonisation, Economic Impacts, Societal and Cultural Aspects, Measurement policies, Future prospects. Renewable Energy- Environmental Significance & its role in combating climate change, Sustainability & Resource renewal, Types of Renewable Energy, Importance of Renewable Energy, Challenges and Considerations, Future prospects -The role of Renewable Energy in a sustainable future, Call to action.	L1, L2,L4,L5	10
Module 3 Introduction - green hydrogen, Advantages & Disadvantages, The Impact of Green hydrogen, The Indian scenario, Uses of Green hydrogen. Introduction & history EV- Types of Electric vehicles, Advantages & Challenges, key components, Market trends, Indian Scenario, Future of EVs, Introduction & Types of Sustainable fuels, Advantages & Challenges, Indian Scenario.	L1, L2, L4, L5	10
Module 4 Introduction to Carbon Credits- Definition of Carbon Credits, Purpose and Significance, Historical Background, Types of Carbon Credits, Regulatory Framework, Carbon Credit Standards, Carbon Accounting and Measurement, Project Types Eligible for Carbon Credits, Carbon Credit Certification Process. Carbon Credit Market- Carbon Credit Pricing, Carbon Credit Trading Platforms, Voluntary vs. Compliance Markets, Challenges and Controversies, Benefits of Carbon Credits, Indian Energy Scenario and future outlook.	L1, L2,L3, L4	10
Module 5 ESG reporting- companies' Non- Financial Information report, use ESG reporting, improve your ESG sustainability reporting and score, Benefits of reporting, ESG reports includes, ESG score or rating, ESG regulations, Aligning with NGRBC Principles. BRSR- Nine Principles of BRSR, Key Concepts in BRSR, Frameworks and Guidelines for BRSR, The pillars of BRSR, Alignment of BRSR principles with the SDGs, Implementation and Benefits, Challenges.	L1, L2, L3, L4	10
Module 6 SEBI Circulars related to BRSR- Introduction to Cost of Capital and ESG- the Relationship between Cost of Capital and ESG, Factors Affecting Cost of Capital and ESG Integration, Measurement and Assessment, ESG Risk Management, Challenges and Trade-offs, Future Trends. Green Bonds- Market Growth, Types of Green Bonds, ESG Data Collection- Investor's Perspective on ESG- ESG Risk and Opportunity, GRI-Introduction, Structure, Benefits and Limitations of GRI, TCFD and its mission, Benefits of TCFD, Scenario Analysis, ISSB standards, GHG Emissions and Net Zero.	L1, L2, L4	10

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination Scheme:

Components	**CT**	**HA**	**C**	**V**	**A**	**EE**
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; **HA** - Home Assignment; **P** - Project; **S** - Seminar; **V** - Viva; **Q** - Quiz; **CT** - Class Test; **A** - Attendance; **EE** - End Semester Examination

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Text and Reference Books:

- Steve Cohen, William Eimicke, Alison Miller, Sustainability Policy: Hastening the Transition to a Cleaner Economy.
- Black and Cherrier (2010). "Anti-consumption as part of living a sustainable lifestyle: Daily practices, contextual motivations and subjective values." Journal of Consumer Behavior.
- Lueneburger and Goleman (2010). "The Change Leadership Sustainability Demands." MIT Sloan Management Review.
- Weber, Elke (2017). "Breaking cognitive barriers to a sustainable future," Nature Human Behavior.
- Jose Galan, "How I Did It: The CEO of Iberdrola on Committing to Clean Energy".

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DMBF2701	FINANCIAL ENGINEERING	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Finance has evolved as an exciting discipline in terms of innovations it has witnessed in recent past. This aspect known as Financial Engineering starts where financial analysis ends. The objective of the course is to enable the students to think in terms of innovative solutions to financial problems with particular emphasis on understanding new risks, which the changing scenario of finance is creating for individuals and firms and equip them with innovative tools of financial engineering called derivatives and skills to use them in forming effective strategies to cope with the changing environment and hedge against the financial risks

Course Objectives

1. To provide the necessary tools for participants who want to learn about managing corporate's financial risk and trading risk. The main focus will be on effective hedging using derivatives.
2. To gain knowledge on the workings of options, futures, and other derivatives and some structured products.

Course Outcomes

On the successful completion of this course the student will be able to:

CO1: Identify in terms of innovative solutions to financial problems with particular emphasis on understanding new risks,

CO2: Assess the changing scenario of finance is creating for individuals and firms and equip them with innovative tools of financial engineering called derivatives and skills to use them in forming effective strategies to cope with the changing environment and hedge against the financial risks

Modules	Blooms level*	Number of hours
Module 1: Introduction Changing Environment and Increasing Price Risks, Financial Engineering as a response to Increased Risks, Types of Risks and Risk Management, Tools of Risk Management, Conceptual and Physical Tools of Financial Engineering, Effect of Speculation and Arbitrage on Market Efficiency, Derivative Market in India	L1,L2, L3	8
Module 2: Futures and Forwards The Futures Markets, Buying and Selling Futures, Devising a Hedging Strategy Using Futures, Stock Index Futures, Value at Risk, Short Term and Long Term Interest Rate Futures, Foreign Currency Futures and Commodity Futures	L1, L3,L4	8
Module 3: Swaps Structure of a Swap, Interest Rate Swaps, Currency of Swaps, Commodity Swaps, Other Swaps, Credit Risk, Role of a Swap Dealer.	L1, L3,L4	7

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Module 4: Options Options Markets; Properties of Stock Option Prices; Option Pricing Models – Binomial Model, Black-Scholes; Model, Single Period Options – Calls and Puts, Payoff Diagrams of Simple and Complex Option Strategies, Cash Settled Options, Multi-Period Options – Caps, Floors, Collars, Captions, Swaptions and Compound options, Cross-currency Futures and Options.	L1, L3,L5	10
Module 5: Other Innovations Debt Market Innovations, Mortgage Backed Securities, Hybrid Securities, Asset-Liability Management	L1, L3	6
Module 6: Recent Trends Exotic Options, Synthetic Instruments, Developments in Equity-Based Strategies, Direct and Cross Hedges, Future Trends and Issues in Financial Engineering.	L1, L3	6
Fieldwork		15

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Hull, J. C. (1999), Introduction to Futures and Options Markets, Prentice Hall of India.
2. Edwards, F. R. and Ma, C. W. (1992), Futures and Options, McGraw-Hill International.
3. Rebonato, R. (1996), Interest Rate Option Models: Understanding, Analyzing and Using Models for Exotic Interest Rate Options, John Wiley and Sons.

Reference Books

1. Kolb, R. W. (1997), Understanding Futures Markets, Prentice Hall of India.
2. Marshall, J. F. and Bansal, V. K. (2006). Financial Engineering: A Complete Guide to Financial Innovation, Prentice Hall of India.
3. Articles from selected journals and magazines.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CPA**	**TP**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	**5**	**5**	**5**	**5**	**10**	**70**

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	--	1	--	1	2	--	--	1	1	--	--
CO2	1	1	--	1	--	1	2	--	--	1	1	--	--

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DMBF2739	BASICS OF RESEARCH METHODOLOGY, ETHICS, AND RESEARCH COMMUNICATION	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description

This course aims to provide students with a comprehensive understanding of conducting ethical research, utilizing proper research methodologies, and effectively communicating research findings. The course includes a final project where students will write a Literature Review on a topic chosen in consultation with the teacher(s).

This course is designed to equip students with essential skills and knowledge to conduct ethical research, employ proper research methodologies, and effectively communicate scientific information (with focus on writing a literature review). The course will cover topics such as research design, data collection and analysis, research ethics, and science communication strategies. Through a combination of lectures, discussions, case studies, and practical exercises, students will develop a deeper understanding of the research process and its ethical implications.

Course Objectives

The objective of this course is to impart knowledge about various stages of research process, research ethics and different ways of research communication.

The aim of this course is to impart research skills to the beginners and help to improve the quality of research by the existing researchers. It also encompasses the understanding and application of appropriate research design, statistics, and the use of the computer for reference management, report writing, research paper writing and presentation. The course also introduces the key conceptual issues of each research method, as well as giving practical guidance. It covers the series of research methodology contents: from problem formulation, to design, to data collection, analysis, reporting and dissemination. The course has the dual aims of equipping students with conceptual understandings of current academic debates regarding different methods, and the practical skills to put those methods into practice.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define criteria of good research, steps in research process, and data collection.

CO2. Identify different types of sampling and its purpose.

CO3. Conduct hypothesis testing for different types of samples and interpret the results.

CO4: Learn the importance of literature review, write research paper/thesis, use reference management software.

Course Content :

Module	Topic	**Blooms level***	Hours

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1	**Research Methodology** Understanding the research process: From research questions to conclusions Types of research: Qualitative and quantitative research Exploratory, descriptive, experimental, and correlational studies Scientific Thinking: Subjective Vs. Objective Thinking Logical Reasoning: Inductive Vs. Deductive Reasoning Formulating research hypotheses and objectives Purpose of a good research, Criteria of good research	L1, L2	10
2	**Descriptive Statistics** Data, Types of Data, Methods of data collection, Benefits and drawbacks, Graphical representation of data and interpretation. Measures of Central Tendency: Arithmetic Mean, Median, Mode, Measures of Dispersion: Range, Standard Deviation, Variance, Coefficient of Variation.	L1, L2, L3	15
3	**Inferential Statistics** **Sampling:** Basic concepts, Process of Sampling, Sample Size, Types of Samples, Sampling and non- sampling errors, Statistics and Parameters, Sampling Distribution of Means and Proportion, **Hypothesis Testing**, steps in testing of hypothesis, errors in hypothesis testing, z test and t test.	L1, L2, L3	15
4	**Research Ethics** Plagiarism, Fabrication, Falsification, Ethics with respect to human and Animal Research	L1, L2	5
5	**Communication** Characteristics of a good Research paper, Systematics Literature Review (choosing a topic, preparing outline, gathering authentic & appropriate references, avoiding plagiarism, use of reference management systems), Writing a good literature review, Structure of report (Introduction, Methodology, Analysis, Results, Discussions, Conclusions, Recommendations), Writing Quality Research Paper, Publishing Research Work in Quality Journals, Reference Management Software	L1, L2, L3	15

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional Exam	End Term Examination
Weightage (%)	5	10	15	70

Project based assignment: Student teams (2-3 students per team) will write a literature review on a topic of choice, in consultation with the teacher.

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Text books/ Reference books

- Research Methodology for Natural Sciences by Soumitro Banerjee, Publisher: IISc Press (1 January 2022); ISBN-10: 8194835178; ISBN-13: 978-8194835172
- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt. Ltd., New Delhi-110001
- Geode, Millian J.& Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Kothari, C.R.2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.
- Levin R I., Rubin D S. Statistics for Management. Sixth Edition, PHI
- Kapoor & Gupta. Probability & Statistics. S Chand Publishers, New Delhi.
- Montomery, Douglas C.(2007), 5th Ed. Design and Analysis of Experiments, Wiley India.
- Cooper, Donald R. and Pamels Schindler, Business Research Methods, Tata McGraw Hills, New Delhi
- Krishnaswamy, K.N. Sivakumar. Appa lyer and Mathiranjan M. 2006, Management Research Methodology: Integration of Principles, Methods and Techniques, Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Sachdeva, J.K. 2008. Business Research methodology. Himalaya Publishing House, New Delhi.
- Shekharan, Uma, Business Research Methods, Miley Education, Singapore.
- Zikmund, Millian G., Business Research Methods, Thomson Learning, Bombay.

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SEMESTER-VIII

DMGT2801	STRATEGIC LEADERSHIP	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description:
This course introduces the concept of Strategic Leadership. Strategic leadership is a practice in which executives, using different styles of **management**, develop a vision for their organization that enables it to adapt to or remain **competitive** in a changing economic and technological climate. Strategic leaders can use this vision to motivate employees and departments, fostering among them a sense of unity and direction to implement change within their organization. The main objectives of this course is to understand that how strategic leaders streamline processes, boost strategic productivity, promote innovation and cultivate an environment that encourages employees to be productive, independent and to push forward their own ideas and how to manage the make use of reward or incentive programs to encourage employees and help them reach their goals.

Course Objectives
The objective of this course is to:
1. Introduce students to the key concepts, tools and principles of Strategy and leadership and strategic Leadership.
2. Expose the students to the various approaches in crafting business strategy, tools that aid in reasoning carefully about strategic options, and learning how companies use what-if analysis to evaluate action alternatives and make sound strategic decisions.
3. Develop an understanding of the concept of leadership and different styles of leadership and models.
4. Expose the students to the various approaches in crafting business strategy, tools that aid in reasoning carefully about strategic options, and learning how Leadership can be instrumental of achieving these objectives.

Course Outcomes
On completion of this course, the students will be able to
CO1: Identify and determine the concept of strategy, Mission, Vision and Strategic Management Process.
CO2: Analyze and understand the concept Leadership its theories, Styles and Models and Strategic Leadership
CO3: Analyze the concept of how Leadership can be instrumental in Strategic formulation and implementation
CO4: Analyze the concept of Strategic Leadership and Change Management and Agile Leadership and Counseling

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Modules	Blooms level*	Number of hours
MODULE I-Introduction and Purpose of Strategy Concept of Strategy, corporate, Business and Functional Levels of Strategy, Mission, Vision, Objectives, Approaches to four Phases in Strategic Management Process, Stakeholders in business and their roles in strategic management, Strategic decision making	L1, L2	2
MODULE 2: Leadership: Importance of leadership, Roles of a Leader, Overview of Organizational Leadership Major Coursework and Issues in Organizational Leadership Theories of Leadership, Leadership Traits, Leadership Skills, Leadership Styles, Levels of Analysis of Leadership Theory – Leadership Traits and Ethics: Leadership Behavior and Styles, Process Theories: Reinforcement Theory, Contingency Leadership Theories and Models, normative leadership theory,	L1,L2, L3	7
MODULE 3: Introduction To Strategic Leadership Definition and Qualities of a Strategic Leader, Strategic leadership skills and characteristics, How to Become a Strategic Leader Strategic leadership vs. other classifications of leadership, strategic leadership environment challenges of strategic leadership Examples of Strategic Leaders,. Integrating Strategy and Leadership, Mission and Vision: The Heart of Strategic Leadership, Leadership and Systems Thinking, Describe the relationship between strategy and operations	L1, L2, L3	9
MODULE 4: Strategic Leadership Model/TYPES Transactional Leaders, Transformational Leaders Sigrufícance of Transformational Leadership Types of Transformational Leaders Intellectual Reforms Revolutionaries Charismatic Role of Transformational Leadership in What Strategies do Transformational Leaders Use ,Charismatic-Visionary Leadership Team Leadership – Strategic Leadership Models	L1, L3,	10
MODULE 5: Strategic Leadership and Change Management, Leading High-performance Teams, Leading organisations into a new paradigm/ growth strategies	L1,L2 L3,	8
Module 6: Agile Leadership and Coaching and counseling Applying positive psychology and positive psychological capital Coaching models & framework, Coaching skills practice, Creating a coaching culture in organizations. Reflection and action planning	L1,L2 L3	10
P - Project; This would be the field project related to the subject where the student need to work outside the class collect the data and make report .	L3 , L4	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis L5-Synthesis; L6-Evaluation*

Text Books

1.Pearce & Robinson,2012, Strategic Management Formulation Implementation & Control, 12th Edition, McGraw Hill

2.Steven J. Stowell (Author), Stephanie S. Mead (Author)**2016 Art Of Strategic Leadership, Wiley; 1st edition**

3. John Adair (Author) **Strategic Leadership: How to Think and Plan Strategically and Provide Direction, Kogan Page Ltd; 1st edition**

Reference Books

1. Lynch,2006, Corporate Strategy, 4th Edition, Pearson.

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2. Ramaswamy & Namakumari, 1996, Strategic Planning for corporate success, Sage Publications.
3. Michael E. Porter, 1998, Competitive Advantage, Crafting & Executing Strategy, Free press.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	--	--	--	--	--	--	--	1	--	--	--
CO2	1	--	--	--	--	2	--	--	1	--	--	--
CO3	1	2	--	--	--	--	--	--	1	--	--	--
CO4	1	--	--	--	--	--	--	2	1	--	--	--

1: strongly related, 2: moderately related and 3: weakly related

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DMGT2802	BUSINESS ANALYTICS	L	T	P	C
Version 1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

The course provides an introduction to data analytics to be used in business. The students will learn how data analysts describe, predict and make informed business decisions in various business domains like marketing, human resources, finance and operations. The aim of the course is to develop basic data literacy and an analytic mindset in students that will help them to make strategic decisions based on data.

C**ourse Objective:**

1. To investigate data to establish new relationships and patterns
2. To analyze the correlation between different variables for the predictive analytic and predictive modelling
3. To analyze the possibility of default and generate customer records
4. To understand and explore problems in business
5. To make the use of tools such as Excel and open source to interpret data
6. To use analytics to solve business problems

Course Outcomes

On successful completion of these programs, students will be able to:

CO1. Understand, integrate, and apply relevant knowledge and skills in a global context
CO2. Identify and describe complex business problems in terms of analytical models
CO3. Apply appropriate analytical methods to find solutions to business problems that achieve stated objectives
CO4. Translate results of business analytic projects into effective courses of action
CO5. Communicate technical information to both technical and non-technical audiences in speech, in writing, and graphically

Modules	Blooms level*	Number of hours
Module I: Introduction to Business Analytics Importance and role of data driven decisions. Business Analytics – Definition, Market, Trends; Paradigm Shift from Data to Insight and from Business Intelligence to Business Analytics; Examples and Types of Business Analytics Analysis-Forecasting & Predictive Modeling; Descriptive, Prescriptive and Predictive Analytics. Data Summarization, Data visualization – Various visualization techniques, standardized reporting and Pivot Tables – Using Excel	L1, L2, L3	8
Module II: Data Mining Introduction to Data Mining; Crucial processes in data mining; Data Warehousing; Data Mining Techniques and Exploratory Data Analysis; Data Mining Tool – XL Miner.	L1, L2, L3, L5	8

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Module III: Decision Making & Optimization Decision making under uncertainty – Decision Trees and Risk Profiles; Sensitivity Analysis; Optimizing complex decisions – Optimization of a large number of decisions while accounting for different kinds of physical and business decisions. Introduction to Optimization Techniques –Linear Programming; Optimization – Use of Excel to solve business problems like marketing mix, capital budgeting and portfolio optimization.	L1, L2, L3, L4, L5, L6	9
Module IV: Big Data and Introduction to R Introduction to Big Data, Big Data driven decisions in business organizations – Benefits and Security/Privacy concerns. Building Business and Economic Models –Tools to leverage data for Prediction purposes; Logistic Regression. Introduction to Machine Learning; Statistical Learning vs. Machine Learning; Major classes of Learning Algorithms –Supervised Vs Unsupervised Learning. Introduction to R Programing	L1, L2, L3, L4, L5, L6	10
Module V: Simulation using R and Excel Hands on Regression using R; Introduction to Simulation; Applications of Simulation and Building a Simulation Model. (Using Excel and R)	L1, L2, L3, L4, L5, L6	10
Capstone Project.		15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

- Aczel, D.A., Sounderpandian, J., Saravanan, P. and Joshi, R. (2012). *Complete Business Statistics (7th ed.)*. New Delhi, India: McGraw Hill Education (India) Private Limited
- Cooper, R.D., Schindler, S. P. and Sharma, J.K. (2015). Business Research Methods. New Delhi, India: McGraw Hill Education (India) Private Limited
- Gujrati, Damodar N and Sangeetha (2011). *Basic Econometrics (4th Ed.)*. New Delhi, India: McGraw Hill Education (India) Private Limited
- Beri, C. (2016). *Business Statistics*. New Delhi, India: McGraw Hill Education (India) Private Limited
- Kothari, C.R. (2009). *Research Methodology: Methods and Techniques (2nd revised ed.)*. New Delhi, India: New Age International Publisher
- Sharma, J.K. (2013). *Operation Research: Theory and Applications (5th ed.)*. New Delhi, India: Macmillan Publishers India limited
- Stephen Powell and Ken Baker., "The Art of Modeling with Spreadsheet"
- Data, data everywhere, "Special report on managing information, Economist", February 27th, 2010.
- Liberatore and Luo, "The Analytics Movement, Interfaces, Articles in Advance", pp. 1–12, 2010.
- "Using R for Data Analysis and Graphics". Introduction, Code and Commentary

Reference Books

- Frederick Shiller & Gerald J Liberman. *Introduction to Operation Research*. New Delhi, India: Tata McGraw- Hill Education (India) Private Limited
- Albright and Winston. Business Analytics: Data Analysis and Decision Making, 5th Edition
- Gillet, B.E. *Introduction to Business Research*. Tata McGraw Hill

Modes of Evaluation: Class Test/Assignment /Written Examination

Examination Scheme:

Components	ME	A	Q/S	L	CT	EE
Weightage (%)	10	5	5	5	5	70

ME- Mid Term Examination; A- Attendance; Q/S- Quiz/Seminar; L- Lab, EE- External Examination

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1		1	2	--	--	--	--	--	--	1	1	--	1
CO2	1	1	2	--	--	--	--	--	--	1	2	--	2
CO3	1	1	--	--	--	--	--	--	--	1	2	--	3
CO4	1	1	1	1	--	--	--	--	--	1	3	3	3
CO5	1	--	--	1	--	--	--	--	--	1	3	--	3

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DMBF2801	FINANCIAL MARKET & INSTITUTIONS	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

A financial market is a **market** in which people **trade** financial **securities** and derivatives at low **transaction costs**. Securities include **stocks** and **bonds**, and precious metals. A financial institution (FI) is a company engaged in the business of dealing with financial and monetary transactions such as deposits, loans, investments, and currency exchange. ... Virtually everyone living in a developed economy has an ongoing or at least periodic need for the services of financial institutions. This course deals with the financial markets and institutions together.

Course Objectives

The objective of this course is to

1. To provide students with an introduction to the theory and practice of financial markets and institutions.
2. To helps students to gain a thorough understanding of the workings of financial markets and of financial instruments
3. To introduce the students to the management of financial markets, services and institutions in Indian context.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Outline the Indian Financial systems with various financial instruments.

CO2: Comparing the various investment avenues with risk and return trade off.

CO3: Recognize various instruments traded in capital markets, merchant & Investment Banking and apply stock trading techniques.

CO4. Review the process of leasing, hire purchase and consumer credit.

CO5: Gain a thorough understanding of the workings of financial markets , financial instruments and financial services.

. Modules	Blooms level*	Number of hours
Module I: Introduction to the Financial System Introduction to Indian Financial System, Assets and liabilities, portfolio, financial instruments, stocks and flows, lending, borrowing, and wealth, weakness of Indian Financial System	L1,	7
Module 2: Money Market Call money market, Treasury bills market, Commercial bills market, Commercial papers and certificates of deposits, Discount and Finance House of India, Government Securities Market, Recent developments.	L1, L2, L3	7
Module 3: Capital Market Impact of monetary policy, Industrial securities market, Primary market and Secondary market. Nature and role of financial system: Financial system and markets, Efficiency and stability, Technology, Government intervention in the financial system, SEBI, Discount market, 'parallel' markets, capital markets, stock markets, bonds, equities, mutual fund, hedge funds, private equity, financial crisis, custodial services, stock exchanges, depository services: NSDL, CDSL.	L1, L2,L3,L4	10

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Module 4: Institutions: Banking Evolution of modern commercial banks, Evolution of bank assets, liabilities and activities; Banking structure, Merchant Banking, Matching revenues and costs, capital adequacy; Accounting policies and related matters, Direct investments, and credit programmes. Central banking and monetary policy: Central banking functions; Money creation, process and control; monetary policy.	L1, L2,L3	8
Module 5: Other Financial Institutions NBFC Evolution and present status. Insurance Companies: Economics of insurance, The insurance industry and its regulation; LIC, GIC. Development finance institutions: Concept, role of DFIs, Sources of funds, DFIs in India, Khan Committee Report and Universal banking; Recent trends. Ministry of Finance-Fiscal Policy, IRDA, NPS.	L1, L2,L3	9
Module 6: International Financial Markets The world capital market, the New Tiger Economics, Trends in the global financial markets.	L1, L2,	4
Fieldwork		15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. Bhole L.M, Financial Institutions and Markets, Tata McGraw Hill.

References

1. Gordon and Natarajan, Financial Markets and Services, Himalaya Publishing House.
2. Khan, M.Y, Financial Services, Tata McGraw Hill.
3. Jeff Madura, Financial Markets and Institutions, South-Western College Publishing.
4. B.C Vasant Desai, The Indian Financial System, Himalaya Publishing House.

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	**10**	**5**	**5**	**5**	**5**	**70**

(C - Case Discussion/ Presentation; HA - Home Assignment; V - Viva; CT - Class Test; A - Attendance; EE - End Semester Examination)

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	--	--	--	--	--	--		2	1	--	--
CO2	1	1	--	--	--	--	--	--	--	2	1	--	--
CO3	1	1	--	--	--	--	--	--	--	2	1	--	--
CO4	1	1	--	--	--	--	--	--	--	2	1	--	--
CO5	1	1	2						2	2	1	-	-

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DMBF2802	GENERAL BANKING OPERATIONS	L	T	P	C
Version 1	Latest Version	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Description

The banking profession, today, is a nice career for all students from the commerce, economics, and accounts domain. For beginners, it's the first step to understand the global economy, discover marketplace challenges, and identify themselves with a rewarding career which provides them tremendous opportunities, both nationally and internationally. The objective of the general banking operations course is to build a pool of competent banking professionals, who can sustain the growing momentum of the banking sector and help to breach new standards of profit margins and customer responsiveness. The course also enhances the skills of existing professionals via a continued learning process. It goes on to create first-day-first-hour industry ready banking professionals

Course Objectives

The objective of this course is to:

1. describe the main trends in banking with regards to how the products and services are offered to customers, with a special focus on Indian banking system.
2. equip students on the basis of: a) customers needs, b) competition, c) technological developments influence the development of distribution channels.
3. identify the need and the development of electronic form of distribution and transforming products and services into electronic form benefits both the customer and the bank.

Course Outcome:

On completion of this course, the students will be able to:

CO1: provide an insight into the properties and the role of money and other financial assets within a modern monetary economy.

CO2: analyze banking products and services in relation to the bank customer's needs and describe the distribution channels.

CO3: identify suspicious activities and transactions and take appropriate measures according to the bank rules and procedures.

CO4: critically evaluate the functions and operations of modern central banks and international financial institutions.

Modules	Blooms Level	Number of Hours
Module 1: An Overview of Banking Definition of Banking; Roles of Banks: Intermediation, Payment System, Financial Services; Banking Services and Products: Payment and Remittance Services, Collection Services, Foreign Exchange, Deposit Services, Loan or Credit Services, Distribution, Collection of Taxes and Bills, Demand Accounts, Safe Keeping, Advisory Service; Banking Channels, Various Facilities.	L1, L2, L5	8

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Module 2: Types of Customers Individuals; Mandate Holder/Power of Attorney; Nomination; Joint Accounts; Minors; Illiterates, Deaf and Dumb, Blind, Aged Persons; Operations of Bank Accounts of Sick/Old/Incapacitated Customers; Executor and Administrator; Proprietorship Concerns; Partnership Firms; Joint Stock Companies; Hindu Undivided Family (HUF); Trusts; Societies and Associates; Clubs; Self Help Groups (SHGs) Government Departments and Municipal Bodies.	L1, L2	9
Module 3: Types of Deposits and Account Opening Demand Deposit; Savings Accounts; Current Accounts; Term Deposits; 2 in 1 Accounts; Recurring Deposits. Know Your Customer (KYC) Policy: Customer Acceptance Policy, Customer Identification Procedure, Monitoring, Due Deligence, KYC Documentation, Verification of Documents; Introduction: Types of Introducers; Financial Inclusions; Opening Accounts of Individuals; Accounts of Proprietary Concerns; Accounts of Parternship Firms; Accounts of Companies; Accounts of Societies and Associations; Accounts of Trusts; General Precaution.	L4, L5, L6	9
Module 4: Banker Customer Relationship Relationship: Debtor-Creditor, Pledgee-Pledgor, Agent-Pricipal, Agent of Third Parties, Lessor-Lessee, Advisor-Advisee; Bank's Rights and Obligations, Right of General Lein; Right of Set Off; Right of Appropriation; Obligations of Maintain Secrecy of Account Information; Extent of Secrecy; Disclosure Authorisation by Law; Disclosure Permitted as per Banking Practice.	L1, L2, L5	9
Module 5: Cash, Cheques Collection, Payment and Remittance Services Storage of Cash: Dual Control, Denomination wise Storage; Registers; Cash Processing; Currency Chests; Counterfiet Notes; Acceptance of Notes and Coins and Exchange of Soiled/torn/mutilated/defective notes; Reporting Transactions exceeding Rs. 10 lacs; Teller Counter; Activities: Opening Cash, Cash Receipt, Cash Payment, Closing Cash. Local Cheque Clearing; Speed Clearing; Electronic Clearing Services (ECS); Upcountry Cheque Collection; Liability of Collecting Banker; Protection to the Collecting Banker.Pay orders (PO)/Banker's Cheque; Demand Draft; Electronic Fund Transfer. Cheque Truncation System	L1, L2, L5	10
Fieldwork		15

*Bloom's Level:
L1 – Knowledge; L2-Comprehension, L3 – Application, L4 – Analysis, L5 – Synthesis, L6 – Evaluation

Text Books

1. Banking Theory and Practice K.C.Shekhar & Lekshmy Shekhar , Vikas
2. Banking Theory Law & Practice Sundaram & Varshney Sultan Chand & Sons

Reference Books

1. RBI Website and reading of an Economic / Business daily and a Business Magazine regularly
2. Banking Products and Services, IIBF, Taxman
3. Principles and Practices of Banking, IIBF, Macmillan 2005(REPRINT 2010)

Modes of Evaluation: Quiz/Assignment/Presentation/Written Examination
Examination Scheme:

Components	Assessment 1 Group Presentation	Assessment 2 In Class Quiz	Class Test/Mid Term Exam	Attendance	External
Weightage (%)	**10**	**5**	**10**	**5**	**70**

CT: Class Test, HA: Home Assignment, Q: Quiz, P: Presentation, EE: End Semester Examination, Att: Attendance

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CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO9	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1		--	--	--	--	--	--	-	--	1	--	--
CO2	1	1	1	--	1	--	-	1	--	-	--	1	--	--
CO3	1	1	--	1	1	--	1	1	--	-	--	1	--	--
CO4	1	1	--	--	--	--	1	1	--	-	--	1	--	--

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DMBF2839	DATA ANALYSIS & VISUALISATION USING SOFTWARE	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	Class X Mathematics				
Co-requisites					

Catalog Description

The implosion of available data has made visualization more critical but also more challenging. Data analysis and Data Visualization are essential tools for business analysis, engineers, policymakers, and decision-makers. Developed originally for "small data", visualization techniques have been met with varied success in the past centuries and decades. There are a few well-known visualizations that are very effective in capturing the essence of the data, and of course, there are many infamous negative examples of poor visuals. An effective visual is critical for decision making it, but it also requires a lot of work, customization, attention to detail, and refinements.

Course Objectives

The course is designed to help students develop skills and knowledge in the following area(s):

- Develop an understanding of what is a good visualization for a given purpose
- Learn visualization theory & techniques
- Build a substantial data analytic project
- Apply data analysis and visualization with Excel, SPSS, R, Python, NVivo and MATLAB

Course Outcomes

On completion of this course, the students will be able to

CO1. Students will be able to articulate meaningful lines of inquiry that might be explored through the collection, organization, visualization, and analysis of data in a context associated with their primary field of study using (as appropriate) numerical, textual, spatial, and/ or visual data.

CO2. Student will understand what data are, how they are collected, and how to assess the quality/ reliability of data.

CO3. Students will demonstrate intermediate proficiency in the visualization of data to communicate information and patterns that exist in the data.

CO4: Students will be able to use at beginning level of proficiency the tools of statistics and machine learning to ask questions of and explore patterns in data.

Course Content :

Module	Topics Covered	Blooms Level	Contact Hours

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1	**Module-1: Introduction to Excel** Data Analysis using Excel, Curve fitting, Correlation, Linear Regression, Multiple regression, Principal Component Analysis and Factor Analysis, Hypothesis testing **Introduction to Excel and SPSS** Introduction to SPSS and Types of Data, Importing, exporting and data handling in SPSS; Exploratory data analysis using SPSS and data visualization; Introduction to statistical inference and various univariate tests by using SPSS; Analysis of Variance (One Way ANOVA, Two Way ANOVA and ANCOVA); Correlation, Simple and Multiple linear Regression Analysis; Principal Component Analysis and Factor Analysis	L1, L2, L3, L4	20 hours
2	**Module-2: VOS Viewer** **Web of Science, Scopus, Dimensions, Lens, and PubMed.** Co-authorship networks, citation-based networks, and co-occurrence networks can be created based on data downloaded from Web of Science, Scopus, Dimensions, and Lens. Co-authorship networks and co-occurrence networks can also be created based on PubMed data. **Crossref, Europe PMC, and OpenAlex**. Networks can also be created based on data retrieved through the APIs of Crossref, Europe PMC, and OpenAlex, These APIs can be queried interactively in VOS viewer. **Semantic Scholar, Open Citations, and Wiki Data.** For a given set of DOIs, networks can also be created based on data retrieved through the APIs of Semantic Scholar, Open Citations and Wiki Data.	L1, L2, L3, L4	10 Hours

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3	**Faculty of Management Studies & Behavioural Sciences** **Module 3: Domain Specific Software** **- Structural Equation Modelling** **Smart PLS** Introduction to Structural Equation Modelling (SEM), Introduction to the software's AMOS and SPSS, SMART PLS, Testing of Statistical assumptions, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), common method bias (CMB) test, Measurement Model Assessment, Discussing Fit Indices, Reliability and Validity Testing, Structural Model Assessment identifying multivariate outlier, Construct Validity: Convergent and Discriminant Validity, Measurement Model & Structural Equation Modelling, Mediation and Moderation Effects, Multi-Group Analysis.	L1, L2, L3, L4	30 Hours
	Faculty of Arts **N Vivo** 1. Import text, audio, video, emails, images, spreadsheets, online surveys, web content, and social media from various sources into a simple, intuitive interface. 2. Create and NVivo project, import and organise qualitative and quantitative data 3.Manage a literature review in NVivo 4. Autocode structured data deductively and identify themes inductively 5. Generate and falsify hypotheses 6. Combine data in sets for analysis 7. Seek patterns and identify relationships across codes and cases 8. Present findings using visualisations 9. Export data out of NVivo 10. Coordinate teamwork.		

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	Faculty of Science Engineering and Technology **Faculty of Health & Allied Sciences** **R programming / Python/ MATLAB** **R Programming-** Introduction to R, Variables and datatypes in R, Dataframes, Recasting and joining of dataframes, Arithmetic, logical and matrix operations in R, Functions in R, Control structure in R, Data visualization in R. **Python Programming-** Basics of programming, data structure and algorithm using Python, Strings, lists, control, functions, manipulating lists, loops, arrays, selection sort, insertion sort, recursion, sorting, dictionaries, exception handling, file handling, string processing, data analysis using Python **MATLAB Programming-** Introduction, basic features, managing workspace, mathematical functions, basic plotting, Matrices, array operations and linear equations, MATLAB programming- M files script, M-file functions, control flow and operations.		

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional (Theory/ Practical)	End Term Examination
Weightage (%)	5	10	15	70

References:

- David Houcque, 2005. Introduction to MATLAB programming for Engineering students., Northwestern University, E- Book https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf
- Mark Lutz, 2009. Learning Python. O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.
- Emmanuel Paradis, 2005. R for Beginners. E book. https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf
- A Handbook of Statistical Analysis using SPSS by Dr. Brijesh Awasthi, Redshine Publication.

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Amity Business School

Bachelor of Business Administration (Business Analytics) (Honors/ Honors with Research)

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Curriculum & Scheme of Examination

2023

AMITY UNIVERSITY HARYANA

GURUGRAM

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BBA Business Analytics (Honors/ Honors with Research)
SEMESTER-I

DMGT2151	MANAGEMENT FOUNDATIONS	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Management Foundation is an introductory course on management process from managers' perspective. The course seeks to help students acquire the requisite knowledge, skills and abilities needed to successfully manage the organization.

The course examines the logic and working of organizations and outlines the major functions of management. It details the different functions of management such as planning, organizing, staffing, directing, and controlling. The course also emphasizes on identification of critical issues and framing of strategies and scenarios required to execute management functions. The aim of the course is to orient the students in theories and practices of Management so as to apply the acquired knowledge in actual business practices.

Course Objectives

The objective of this course is to:

Provide a **gateway to the real world of management** and decision-making.
Help the **students gain understanding of the functions and responsibilities of managers**.
Impart **tools and techniques** to be used in the performance of the managerial job.
Enable students to analyse and understand the **environment** of the organization.
Help the students to develop cognizance of the **importance of management principles**

Course Outcomes

On completion of this course, the students will be able to:

CO1: Discuss the concepts related to management of business.
CO2: Demonstrate the roles, skills and functions of management.
CO3: Analyse effective application of MF knowledge to diagnose and solve organizational problems and develop optimal managerial decisions.
CO4: Recognise the complexities associated with management of human resources in the organizations and integrate the learning in handling these complexities.

Modules	Blooms level*	Number of hours
MODULE I- Introduction Concept, Nature, Scope and Functions of Management, Levels of Management, Evolution and Foundations of Management Theories - Classical and Neo - Classical Theories, Systems Approach to organization, Modern Organization Theory.	L1, L2	5
MODULE 2: Management Planning Process Planning objectives and characteristics, Hierarchies of planning, the concept and techniques of forecasting, Decision making – concepts & process, MBO, concept and relevance.	L1, L2, L3	5

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MODULE 3: Organization Meaning, Importance and Principles, Departmentalization, Span of Control, Types of Organization, Authority, Delegation of Authority.	L1, L2, L3	5
MODULE 4: Staffing Meaning, Job analysis, Manpower planning, Recruitment, Transfers and Promotions, Appraisals, Management Development, Job Rotation, Training, Rewards and Recognition.	L1, L2, L3, L4	5
MODULE 5: Directing Motivation, Co-ordination, Communication,	L1, L2, L3 , L4	5
Module VI: Management Control Meaning, Nature, Objectives and Process of Management Control, Techniques and Behavioral Aspects of Management control.	L1, L2, L3	5
P - Project; This would be the field project related to the subject where the student need to work outside the class collect the data and make report .	L3 , L4	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis L5-Synthesis; L6-Evaluation*

Text Books

1. Koontz, H, & Weihrich, H (2016). Essentials of Management: An International Perspective (8th ed.), Tata McGraw Hills, New Delhi.
2. Ghuman, K & Aswathapa, K, (2017). Management concepts and cases (10th ed.), Tata McGraw Hills, New Delhi.
3. Telsan, M.T. (2016). Industrial and Business Management, (4th ed.), S. Chand, New Delhi.

Reference Books

1. Robbins, S. (2017). Management, (13th ed.), Pearson Education, New Delhi.
2. Ramaswamy, I. (2011). Principles of Business Management, (8th ed.), Himalaya Publishing House, New Delhi.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	--	--	--	--	--	--	--	1	--	--	--
CO2	1	--	--	--	--	2	--	--	1	--	--	--
CO3	1	2	--	--	--	--	--	--	1	--	--	--
CO4	1	--	--	--	--	--	--	2	1	--	--	--

1: strongly related, 2: moderately related and 3: weakly related

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DMGT2101	FINANCIAL & CORPORATE ACCOUNTING	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Description

This course intends to introduce basic accounting principles and practices, train students on ledger posting, preparation of trial balance, and final accounts of sole trading business. It also focuses on accounting for shares/debentures issues and redemption apart from the valuation of goodwill and shares. This course would be useful for all those who are desirous of having an understanding and application of the financial dynamics of the business

Course Objectives

The aim of this course is to

1. Provide an understanding of the application of various principles and practices of Accounting.
2. Estimate annual financial statements of sole trading concerns and joint stock companies
3. Do the accounting for the issue and redemption of shares and debentures
4. Find the value of goodwill and calculate the share value

Course Outcomes:

On successful completion of the course, the students should be able to:

CO1: Understand and apply the principles of accounting and accounting standards followed in India and globally.

CO2: Able to prepare subsidiary books and final accounts of sole trading enterprises

CO3: Understand and do the accounting of issue and redemption of shares and debentures.

CO4: Analyse goodwill value under different methods of estimate and valuation of shares

Modules	Blooms level*	Number of hours
Module 1: **Introduction to Accounting** Meaning, need for accounting, users of accounting information, limitations of accounting, accounting concepts and conventions, Generally Accepted Accounting Principles, accounting standards, Indian GAAP vs US GAAP	L1,L2, L3	8
Module 2: **Accounting Process & Subsidiary Books** Double entry system-Rules for debit and credit, preparation of journal- ledger-trial balance. Introduction to subsidiary books-preparation of cash book-single column, double column, and three-columnar cash book	L1, L2, L3	12
Module 3:**Preparation of financial statements(sole trading concerns)** Preparation of trading account, profit and loss account, and balance sheet along with adjustments	L1, L3	10
Module 4: **Accounting for the Issue of shares and Debentures** Special features of joint stock companies, features of Companies Act, 2013, kinds of shares and debentures, accounting for issue and redemption of shares, accounting for issue and redemption of debentures, share buyback, underwriting	L1, L3,L4	7
Module 5:Valuation of goodwill and shares Good will – Meaning, Definition, Elements, Types and Methods of Valuation of Goodwill, Methods of share valuation (Equity & preference shares)	L1,L2 L3,L4	8

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Tutorial: **Flip Classroom**- C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3,L4	15

**Bloom's Level:L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Theory & Problems proportion: Theory 40% and Problems(60%)

Text Books:

- Maheshwari, S.N., Advanced Accountancy Volume-I, Ninth Edition, Vikas Publishing House Pvt. Ltd.
- S.Anil Kumar, V Rajesh Kumar and B Mariappa(2014). Corporate Accounting, Himalaya Publishing House, New Delhi.
- Gupta, R.L., & Radhaswamy, M(2013). Corporate Accounting. Sultan Chand & Sons, New Delhi
- Raman, B. S(2014).Financial Accounting(1st Edition)I & II, New Delhi, United Publishers

Reference Books:

1. Grewal, T. S., Shukla, M .C, Advanced Accountancy, Sixteenth Edition, Sultan Chand and Sons.
2. Tulsian, P.C (2009), Financial Accounting 2nd Edition, Pearson Education.
3. Narayanaswamy, R. Financial Accounting- A Managerial Perspective, Second Edition, Prentice Hall India
4. Monga, J.R(2012).Fundamentals of Corporate Accounting, K.L Malik &Sons Pvt Ltd, New Delhi.

Pedagogy:
Lectures
Cases/Numericals
Field based assignments
Seminars

Examination Scheme:

Components	**CPA**	**TP**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	**5**	**5**	**5**	**5**	**10**	**70**

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	2					1	1	2		
CO2	1	1	2					1	1	2	2	
CO3	1	1	2					1	1			
CO4	1	1	2					1	1			

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DBUA2101	INTRODUCTION TO BUSINESS ANALYTICS	L	T	P	C
Version 1.1	Latest Approved	0	0	4	2
Pre-requisites/ Exposure					
Co-requisites					

Catalog Description:
Businesses are increasingly turning to data analytics to evaluate and improve business decisions. The ability to collect, analyze, and use data to inform important decisions is a critical skill for modern business students. This course will introduce students to the growing role of big data and the quantitative strategies to answer businesses questions. Students will know business cases in which data have helped businesses make better decisions, exposing them to real world applications of analytics to solve problems in accounting, economics, finance, hospitality, management, and marketing. The course will also introduce students to some basic technologies used in business analytics.

Course Objectives:

1. To understand the big picture of data analytics as a transformative force in the world of modern business
2. Explain the differences between predictive, prescriptive, and descriptive analytics, and the business questions that can be answered with each approach.
3. Identify opportunities to use analytics to address unstructured business problems.
4. To understand how these technologies are endangering the organization or industry in which we operate.

Course Outcomes:
Upon completion of this course, students will be able to:
CO1. Gain an understanding of how managers use data to formulate and solve business problems and to support managerial decision making.
CO2. Describe and interpret the basic concepts of business analytics. Evaluate business problems and determine suitable analytical methods.
CO3. Prepare raw data for business analytics, including partitioning data and attributing missing values.
CO4. Understand various descriptive and predictive business analytics techniques.
CO5. Explain about data mining, data modelling, DLM and disruption.

Modules	Blooms level*	Number of hours
MODULE 1: Overview of Business Analytics: Introduction to Analytics, Data Analytics, Data science & Business Analytics. Descriptive Analytics, Diagnostic Analytics, Predictive Analytics, Prescriptive Analytics, **Business Analytics-** Financial Analytics, Human Resource (HR) Analytics, Marketing Analytics, Health Care Analytics, Supply Chain Analytics, Analytics for Government and Non-profits, Sports Analytics, Web Analytics.	L1, L2, L4	10
MODULE 2: BUSINESS INTELLIGENCE: Overview of Using Data: Definitions and Goals-Types of Data, concepts of business intelligence and its role in decision making, types of decision making, tools for business intelligence, application of business intelligence. Cleansing of data, Data flows and introduction to data modelling.	L1, L2,L4,L5	11

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MODULE 3:DATA WAREHOUSING & Data mining: Introduction to data warehousing, design consideration for data warehousing, data warehousing architecture, introduction to data mining, data mining process, myths about data mining, Data Sampling, Data Preparation.	L1, L2, L4, L5	8
MODULE 4: DATA LIFECYCLE MANAGEMENT: Data Life Cycle: Identify the stages in the data life cycle – Benefits of the DLM, Data Protection Strategy, Technology and Data, Data in the organization.	L1, L2, L4	8
MODULE 5: DISRUPTION: Understanding your business needs, Identify data roles in the organization. Challenges: Identify hurdles to becoming a data-driven organization, Disruption vs. Optimization, Disruptive Business Applications.	L1, L2, L4	8
Field work	L1, L2, L3L4, L5	15

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; **HA -** Home Assignment; **P -** Project; **S -** Seminar; **V** - Viva; **Q** - Quiz; **CT** - Class Test; **A** - Attendance; **EE** - End Semester Examination

Text and Reference Books

- Jeffrey D. Camm, James J. Cochran, Michael J. Fry, Jeffrey W. Oh - Essentials of Business Analytics (2014, Cengage Learning).
- Patel, Nitin R._Bruce, Peter C._Shmueli, Galit - Data Mining for Business Intelligence_ Concepts, **Techniques, and Applications in Microsoft Office Excel (r) with XLMiner (r) (2011, John Wiley & Sons).**
- https://www.ibm.com/topics/data-lifecycle-management
- https://www.techtarget.com/searchstorage/definition/data-life-cycle-management
- https://www.forbes.com/sites/forbestechcouncil/2019/12/17/data-in-the-era-of-disruption/?sh=3cf1718a6c06
- https://emeritus.org/in/learn/what-are-the-disruptive-business-applications-of-data-science/
- https://www.wired.com/insights/2014/09/big-data-innovation/

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DBUA2102	ANALYTICAL TECHNIQUES FOR DECISION MAKING	L	T	P	C
Version 1.1	Latest Approved	0	0	4	2
Pre-requisites/ Exposure					
Co-requisites					

Catalog Description

Analytical Technique are used for better decision making. This course will provide the better understanding of data and various techniques using excel. The ability to collect, analyze, and use data to inform important decisions is a critical skill for modern business students. Students will know business cases in which data have helped businesses make better decisions, exposing them to real world applications of analytics to solve problems in business.

Course Objectives

The objective of this course is to

This course provides students the fundamental concepts and knowledge needed to understand the emerging role of business analytics in organizations and enable students how to apply essential tools in a spreadsheet environment. Emphasis is on business applications, concept development and effective interpretation of models and results, rather than theory and calculations. Students use a computer software package for data analysis.

Course Outcomes

On completion of this course, the students will be able to

CO1: To understand the overview of business analytics

CO2: To create models for summarizing, visualizing, and understanding useful information from historical data.

CO3: To understand the decision analysis approaches for incorporating a decision maker's view about risk into decision making.

CO4: To analyse the data and use the dashboard for solving the problem

CO5: To formulate the regression model for better decision.

Modules	Blooms level*	Number of hours
MODULE I: Introduction Decision making, Business analytics defined, a cauterization of analytical methods and models: Descriptive analysis, predictive analysis, prescriptive analysis, big data. Business analytics in practice: Financial analytics, Human resource analytics, marketing analytics, supply chain analytics.	L1, L2, L3	8
Module 2: Getting Started with Excel Introduction to Spreadsheets: Launching Excel, entering data in spreadsheet, widening rows and columns, applying basic formatting in spreadsheet, saving work in excel. Entering Data into cells:Using autofill, sort & filter feature, creating lists, inserting & deleting rows and columns. Wrapping & merging text and cells, Protecting & sharing workbooks, freeze panes, understanding normal, page layout and page break preview in excel. Setting the page orientation and print area. Adding hyperlinks to cells, inserting images, objects, equations and symbols.	L1, L2, L3	10

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Module 3: Descriptive statistics Overview of using data: definitions and goals, types of data, modifying data in excel, modifying data in excel, creating distributions from data, measures of location, measures of variability, analyzing distributions, measures of association between two variables.	L1, L2, L3, L4, L5,L6	8
Module 4: Charts & Formulas in Excel Understanding Charts: Inserting bar charts, pie charts, column charts and line charts in spreadsheets, formatting and resizing the chart. Using Basic functions- average, sum, min, max, product etc. date functions, time functions. Math Operators in Excel, combining mathematical operators. **Data Visualisation:** Overview of data visualization, tables, charts, advanced data visualization, data dashboards.	L1, L2, L3, L4, L5, L6	11
Module:5 Functions in Excel Logical- using IF, AND, OR, NOT, TRUE, FALSE Functions. Textual- using TRIM, UPPER, LOWER, REPLACE Functions.Import data into excel, Look up functions with index and match. Rounding, sum product, conditional counts and conditional sums, Filtering data, pivot table, pivot charts, conditional formatting.	L1, L2, L3	8
Field work	L1, L2, L3L4, L5	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis; L6-Evaluation*

Text book:

1. Essentials of Business Analytics, 1st Edition Jeffrey D. Camm, James J. Cochran, Michael J. Fry, Jeffrey W. Ohlmann, David R. Anderson, Dennis J. Sweeney, Thomas A. Williams.Cengage learning.

REFERENCE BOOKS:

1. Business Analytics data analysis and decision making Albright,Winston, edition CENGAGE Learning.
2. Statistics for Managers using Microsoft Excel, David M.Levine, David F.Stephan, KathryanA.Sizabat, 7th edition, PHI.
3. Glyn Davis and BrankoPecar (2013), "Business Statistics using Excel", Oxford University Press, New Delhi.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components		CT	P	C	A	EE
Weightage (%)		10	10	5	5	70

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	--	--	--	--	--	--	--	1	--	--	--
CO2	--	1	--	--	--	--	--	--	1	--	--	--
CO3	--	--	2	1	--	--	--	--	1	--	--	--
CO4	--	--	--	--	--	--	--	1	1	2	--	--
CO5	1	--	--	--	--	--	2	--	1	--	--	--

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SEMESTER-II

DMGT2251	MARKETING MANAGEMENT	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

In this course, the basic concept related to marketing, marketing mix, marketing philosophies, consumer behaviour, segmentation & targeting, positioning strategies, marketing environment analysis are discussed in detail. Various strategies based on marketing mix such as product, price, place and promotion are also discussed in detail. New emerging marketing paradigms are discussed to give students an overview of current marketing situation. The main aim of this course is to give students an elementary knowledge of the fundamentals in the field of marketing.

Course Objectives

The objective of this course is to

1. Develop and help the students imbibe basic marketing principles and establishing an appreciation of contemporary realities.
2. Formulate a marketing plan including marketing objectives, marketing mix, strategies, budgetary considerations, and evaluation criteria.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain various definitions and concepts of marketing.
CO2: Analyse various models of marketing research.
CO3: Identify consumer behaviour and apply the understanding to real life business cases.
CO4: Discuss various steps of product development and pricing approaches.
CO5: Explain and discuss the distribution and logistics decisions in business.
CO6: Aware about changing paradigms and development in marketing concepts and theories.

Modules	Blooms level*	Number of hours
MODULE I- Introduction to Marketing Core concepts of marketing - the production concept, the product concept, selling concept and the marketing concept, societal marketing, relationship marketing.	L1, L2, L3	4
MODULE 2: Marketing Mix- Product & Price Meaning, Elements of Marketing Mix (Four P's); Product-Product Mix, Product Line, Product Lifecycle, New Product Development, Branding, Packing and Packaging, Labeling, Pricing – Objectives, Factors influencing Pricing Policy, Methods of Pricing	L1, L2, L3, L5	8
MODULE 3: Marketing Mix- Place & Promotion Physical Distribution–Meaning, Factors affecting Channel Selection, Types of Marketing Channels. Promotion – Meaning and Significance of Promotion, Personal Selling and Advertising, Public Relations, Publicity, Sales Promotion	L1,	7
MODULE 4: Analysing Market Environment **Market Environment**- Microenvironment – The company, suppliers, marketing intermediaries' competitors, public and customers. Macro Environment- Demographic, Economic, Natural, Technological, Political, Legal, Socio-Cultural Environment.	L1, L2, L3	10

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MODULE 5: Strategic Planning, Market Segmentation and Consumer Behaviour **Market Segmentation**- Bases of Market Segmentation, Targeting and Positioning approaches, **Consumer Behaviour**- Model of Consumer Behavior; Understanding the consumer decision making process & Buying Situations, Factors affecting Buying Behaviour **Strategic Planning in Marketing**- Business Portfolio, BCG matrix, GE 9 cell model; Marketing Research.	L1, L2, L3, L4, L5, L6	8
MODULE 6: Service Marketing Meaning and definition of services, features of services, Seven P's of services marketing, differentiation between goods and services.	L1, L2, L3	4
MODULE 7: Emerging Marketing Paradigms Overview of E-marketing, Global marketing, Mobile marketing, Kiosk marketing, Green marketing, Tele marketing, Multi-level marketing & Rural marketing.	L1, L2. L3	4
Tutorial: **Flip Classroom**- C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3, L4	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis; L6-Evaluation*

Textbooks

1. Kotler, Philip & Armstrong, Gray, Principles of Marketing, 10th Edition, Pearson Education.
2. Saxena, Rajan (2008), Marketing Management, 3rd Edition, McGrew Hills Education.

Reference Books

1. Ramaswamy and Namkumar, S (2009), Marketing Management Global Perspective: Indian Context, McMillion, New Delhi.
2. Kumar, Arun and Meenakashi, N (2009), Marketing Management, Vikas Publishing House.
3. Russel, Wines, Marketing Management, 3rd Edition, Pearson Education.
4. Kotler, Koshi Jha (2009), Marketing Management, 13th Edition, Pearson Education.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CT	P	C	A	EE
Weightage (%)	10	10	5	5	70

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	--	--	--	--	--	--	--	1	--	--	--
CO2	--	1	--	--	--	--	--	--	1	--	--	--
CO3	--	--	2	1	--	--	--	--	1	--	--	--
CO4	--	--	--	--	--	--	--	1	1	2	--	--
CO5	1	--	--	--	--	--	2	--	1	--	--	--
CO6	1	--	--	--	--	--	--	--		--	--	--

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DMGT2201	COST & MANAGEMENT ACCOUNTING	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course aims to give an understanding of how management accountants provide information to facilitate decision-making in an organization. It will acquaint students with various concepts of costing and highlight the decision making and control focus of managerial accounting. **Cost Accounting** is concerned with the computation and assessment of costs and expenses incurred in the acquisition or production of anything. It is about calculating the cost per unit using various costing approaches. Its primary goal is to assist managers in making decisions. **Management accounting** is concerned with the provision of relevant information to support decision-making, planning, cost control, and performance evaluation. Management accounting converts data into information, knowledge, and wisdom regarding the activities of a company entity. This is a step beyond cost accounting.

Course Objectives

The objective of this course is to

1. Understand and explain the conceptual framework of Cost Accounting and processes used to determine total and per unit cost.
2. To make known to the students to assess material, labour, and overhead cost
3. To enrich the knowledge of the learners in knowing in applying tools like cash flow statement for analysis of financial statements
4. To make the students in understanding how marginal costing is used in profit planning and management decision-making under different situations.

Course Outcomes to

On completion of this course, the students will be able to

CO1: Identify the principles of cost and management accounting and apply the same for the preparation of cost sheets and quotations

CO2:Assess material, labour and overhead cost of manufacturing firms

CO3: Analyse financial statements using appropriate techniques

CO4: Prepare budgets for business firms.

CO5: Evaluate business options and take informed decisions using marginal costing

Modules	Blooms level*	Number of hours
Module I: Cost Accounting Introduction – Classification of cost, Cost Accounting-Objectives and functions, Comparison of Cost Accounting with Financial Accounting and Management Accounting, Designing and installation of costing system, Uses of Management Accounting, Preparation of cost sheet and quotation	L1,L2,L3	10

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Module II: Material, Labour &Overheads **Material cost**: Direct and Indirect material cost, Techniques of inventory control-stock levels and EOQ, Pricing of material issues-FIFO and LIFO **Labour cost:** Causes of effects of labour turnovers, Methods of wage payment-Halsey and Rowan plans, Taylor's piece rate system **Overheads**: Classification, Allocation and Apportionment, Primary and Secondary distribution(Repeated distribution method and Simultaneous equation method)	L1, L2,L3	12
Module III: Marginal Costing Marginal costing-Meaning and importance-Applications of marginal costing, Cost-volume-profit analysis, Break-even chart, uses and limitations of Break-even analysis, Decision-making areas- product mix, make/ buy, pricing decision.	L1, L2,L3,L6	8
Module IV: Budgetary Control Budget, budgeting and budgetary control-Meaning and objectives of budgetary control, Classification of budgets, Preparation of cash budget and flexible budget	L1,L2,L3	7
Module V: Cash Flow Statement Cashflow and profit, Cash flow statement-uses and limitations- Preparation of cash flow statement (AS 3-Indirect method) .	L1, L2,L4	8
Module VI: Ratios		
Tutorial: **Flip Classroom**- C - Case Discussion/ Presentation; HA - Home Assignment; S - Seminar; V - Viva; Q – Quiz	L3,L4,L6	15

**Bloom's Level: L1-Knowledge;L2-Comprehension;L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Theory & Problems weightage: 40 % Theory & 60% problems

Text Books

1. MaheshwariS.N (2015),Cost Accounting, Mahavir Publications.
2. M Kishore Ravi (2015) ,Taxmann's Cost and Management Accounting,6th Edition.
3. Arora M.N(2019),Cost & Management Accounting, New Delhi. Himalaya Publishing House.

Reference Books

1. Jain & Narang, Cost Accounting (2016), Kalyani Publishers.
2. Shukla M.C.,Grewal T.S. and Gupta M.P.(2013),Cost Accounting Text and Problems: Texts and Problems, S.Chand Publishers.

Pedagogy: Lectures, Cases/Numericals, Field-based assignments

Examination Scheme:

Components	CT	C	HA	A	EE
Weightage (%)	10	10	5	5	70

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	1	--	--	--	--	2	--	1	2	--	--
CO2	1	1	--	--	--	--	--	1	1	2	--	--
CO3	1	1	--	--	--	--	--	1	1	2	--	--
CO4	1	1	--	--	--	--	--	1	1	2	--	3
CO5	1	1	--	--	--	--	2	--	1	2	--	--
CO6	1	1	--	--	--	--	--	--	1	2	--	--

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DBUA2201	STATISTICAL TECHNIQUES IN RESEARCH	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/ Exposure					
Co-requisites					

Catalog Description

This course will introduce you to business statistics, or the application of statistics in the workplace. Statistics is how we gather, analyze, and interpret data. It emphasizes how to apply various statistical techniques in the support of managerial decisions in the various functional areas of business and business research.

Course Objectives

The objective of this course is to

1. Familiarize the students with various statistical tools which can help them in analysis and interpretation of business data and research.
2. Provide students with hands-on experience to promote the use of statistical thinking and techniques to apply them to make educated decisions whenever there is variation in business data and research.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define and apply basic statistical concepts to various field of management.

CO2: Apply statistical methods such as statistical collection, species characteristics, statistical series, tabular and graphical representation of data, measures of central tendency, dispersion.

CO3: Demonstrate the knowledge of correlation and regression analysis to research related problems.

CO4: Apply knowledge to solve tasks using time series analysis

CO5: Independently calculate statistical probability and probability distribution for the solutions.

CO6: Interpret technique to analyze, interpret and conclude research findings and provide relevant recommendations.

Module 1: Introduction to Statistics Definitions, Functions of Statistics, Statistics and Computers, Limitation of Statistics, Application of Statistics. Nature and scope of marketing research, Marketing research as input in decision making process, Marketing research and marketing information system. Applications of marketing research, Planning a research project, Problem identification and formulation of Research Design, introduction to Research Design, Market research on the Internet.	L1, L2	12
Module 2: Data collection methods Attitudes measurement and scaling techniques, Ratio, Interval, Ordinal and Nominal scales, Likert's scale, Thurstone scale, Semantic differentiation method, Observation methods and questionnaire method, Questionnaire design, Steps in constructing a questionnaire, Types of questions, introduction to Projective techniques and perceptual mapping. Methods of Data Collection, Primary and Secondary Data, Graphic Representation of Data, Measures of Dispersion-Range, Quartile Deviation, Mean Deviation, Standard Deviation, Coefficient of Variation.(Absolute & Relative Measure of Dispersion), Skewness-Karl-Pearson's Coefficient of Skewness, Bowley's Coefficient of Skewness, Kurtosis.	L1, L2	13

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Module 3: Sampling Sampling decisions, Sampling frame, Sample selection methods - Probability and non probability, Sample size, sampling error, Application of sampling methods to marketing problems.	L1,L2	5
Module 4: Correlation Analysis and Regression Analysis Introduction-Importance of Correlation, Types of Correlation, Scatter Diagram Method, Karl Pearson's coefficient of Correlation (Grouped and Ungrouped). Spearman's Coefficient of Rank Correlation, Rank Correlation for Tied Ranks, Regression Analysis- Concepts of Regression, Difference b/w Correlation and Regression, Regression Lines.	L2,L3	10
Module 5: Probability Introduction, Terminology used in Probability, Definitions of Probability, Mathematical, Statistical and Axiomatic Approach to Probability, Probability Rules-Addition Rule, Multiplication Rule of Probability, Conditional Probability- Bayes Theorem, Problems on Bayes Theorem.	L4	5
Field work	L1, L2, L3,L4,L5	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Textbooks

1. Gupta S P, Statistical Methods, S. Chand & Co. New Delhi, 28th edition.
2. Kapoor & Sancheti, Business Statistics, Sultan Chand & Sons, New Delhi, 2010.
3. Malhotra, Naresh, (2019), Marketing Research, 7th Edition, Pearson Eucation.
4. Luck, David J and Rubin, Ronald S., Marketing Research, Seventh edition, Prentice Hall of India

Reference Books

1. Khanna K K, Prof. Jagjit Singh & Dr. Chandan J S, Business Statistics, Second edition, Vikas Publishing House, 1995
2. Anderson Sweeney Williams, Statistics for Business and Economics, Twelth edition, Thomson, 2018
3. Kothari C R, Quantitative Techniques, Third edition, Vikas Publishing House, 2013
4. Aggarwal B M, Business Statistics, S. Chand & Co, 2010.
5. Hooda R P, (2005), Introduction to Statistics, Macmillan
6. Rubin & Levin, Statistics for Management, Eighth edition, Pearson, Prentice Hall of India, 2017

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CT	P	A	EE
Weightage (%)	10	15	5	70

CT: Class Test, HA: Home Assignment, V: Viva, EE: End Semester Examination; A: Attendance, C: Case Analysis

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	2	--	--	--	--	--	--	1	--	--	--
CO2	--	1	--	--	--	--	--	--	1	--	--	--
CO3	--	--	--	--	--	--	--	1	1	--	--	--
CO4	--	1	--	--	--	--	--	--	1	--	--	--
CO5	--	1	--	--	--	--	--	2	1	--	--	--
CO6	--	1	--	--	--	--	--	2	1	--	--	--

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SEMESTER-III

DMGT2351	ORGANIZATIONAL BEHAVIOR AND HUMAN RESOURCE MANAGEMENT	L	T	P	C
Version 1.1	For Approval	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

The course is constructed with an objective to create a deep and nuanced understanding of the behavioural patterns of individual in an organisational setting. Having understood the role of these assumptions, beliefs, values, would enable a leader to be effective and rational decisionmaker. The course is designed to make students interpret the impact of personality and environmental influences on the working of the individual with an organisational setting and equally harness the potentials of human capital with respect to various facets of job and develop his competencies to achieve individual and organisational goals. The focus of the course would be making students understand the motivation, individual differences, group culture and its impact of various functions of HR viz staffing, training & development, career development and appraisals. Thus, this course takes a practical approach that integrates contributions of behavioral sciences with the technical aspects of implementing the HR function in the real world.

Course Objectives

The objectives of this course are to:

1. Appreciate the impact of behavioral sciences on HR management functions.
2. Understand the implications of individual differences on work performance and their group behavior.
3. Understand the dynamics of organizational culture and structure.
4. Get familiarized with various elements of the HR function (e.g. – recruitment, selection, training, and development, etc.)
5. Relate and apply the principles and techniques of human resource management to the real life discussion of critical personnel issues.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Understand the significance of individual attributes in work settings.
CO2: Demonstrate a basic understanding of organizational dynamics, conflicts, and structure.
CO3: Interpret and relate the relationship between various HR functions and personnel growth.
CO4: Understand, analyze, the concepts of basic HR functions and their application in global context.
CO5: Understand the recent advancement in the context of OB and HRM

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Modules	Blooms Level*	Number of hours
Module I: Introduction to OB Introduction to Organizational Behavior – Concept, Definitions, Evolution of OB. Importance of Organizational Behavior – Cross-cultural Dynamics, Creating Ethical Organizational Culture and Climate. Individual and Group Behavior – OB Models and SOBC in Context with Indian OB. Human Relations and Organizational Behaviour.	L1, L2	7
Module II: Foundations of Individual Differences Managing Communication, Perception, Attitude, Personality, Learning, Time Management Strategies. Group: Team Structure and effectiveness, Learning Organization and Organizational Design. Organizational Culture and Change, – Conflict Management Techniques,	L1, L2, L3, L4	14
Module III: Concepts of HRM HRM – Meaning Objectives, Scope, and Functions, HRP – Definition, Objectives, Importance, Factors Affecting HRP, Process of HRP, Strategies of HRM and Global HR Strategies, HRD – Concept, Meaning, Objectives and HRD Functions.	L1, L2,	10
Module IV: Onboarding the talent Recruitment and Selection- factors, methods and process. Induction, Training & Development, Performance & Potential Appraisal – Concept, Process, Methods and Problems, Key Result Area(s)	L1, L2, L3, L4	10
Module V : Wage concepts and Career Planning Compensation – Concept, Components of Pay Structure, Wage and Salary Administration, Incentives and Employee Benefits. Career Planning – Concept of Career Planning, Career Stages and Career Anchors, Succession Planning.	L1, L2, L3, L4, L5	10
Module VI: HRM Trends Rewards and Punishments – Termination, Layoffs, Attrition, Retrenchment, Separation and Downsizing. Industrial Relations, Overview of International and Global HRM, Recent Trends in OB & HRM.	L1, L4, L5,L6	9
Field work	L4, L5,L6	15

***Bloom's Level:**
L1-Knowledge; L2-Comprehension; L3-Application; L4-Anaylysis; L5-Synthesis; L6-Evaluation

Text Books:

- Stephen P. Robbins, Timothy A. Judge (2012), Organisational Behaviour, 15th edition, Prentice Hall.
- David A. Decenzo ,Stephen P. Robbins , Susan L. Verhulst,(2015), Human Resource Management ,eleventh edition , Wiley;
- Prasad. L.M, (2014) Human Resource Management, Third Edition, Sultan Chand & Sons; New Delhi.

Reference Books:

- Chhabra T.N,(2014) Human Resource Management: Concepts and Issues, Edition 2014,Dhanpat Rai & Co
- **Dessler** G (2014) A Framework for Human Resource Management, 7 edition (2014), Pearson Education India;
- Michael Armstrong , Stephen Taylor,(2017), Armstrong's Handbook of Human Resource Management Practice, 14 edition (3 February 2017), Kogan Page

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	Assignment1	Assignment2/live project	Case discussion	Sessional	A	EE
Weightage (%)	5	5	5	10	5	70

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	2	1	2	1	2	1	1	1	3	2	3	2
CO2	2	1	2	1	2	3	1	1	2	2	2	2
CO3	3	1	2	1	2	3	1	1	2	2	2	2
CO4	2	1	2	1	2	2	-1	1	2	2	2	2
CO5	2	1	2	1	2	1	1	1	2	2	2	2

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DBUA2301	ADVANCED STATISTICAL TECHNIQUES	L	T	P	C
Version 1.1	Latest Approved	0	0	4	2
Pre-requisites/ Exposure					
Co-requisites					

Course Description
This course offers the understanding on identification of data, analysis and interpretation of data using basic quantitative tools & techniques. In this course, students can apply the quantitative techniques in the analysis of statistical and economic/business problems. Basic understanding of statistical concepts helps in deciding on the suitable technique for data analysis and also to interpret results.

Course Objectives
The objectives of this course are to
1. Familiarize the students with basic quantitative tools & techniques for data analysis.
2. Equip the students with the concept of probability, hypothesis testing, data identification, and data analysis.
3. Facilitate hands on experience to various statistical problems using various statistical software such as STATA, R, SPSS, Eview.

Modules	Blooms level*	Number of hours
MODULE 1: Basic Statistics Measures of central tendencies, measures of dispersion, skewness, kurtosis, correlation, and regression.	L1, L2,L3	10
MODULE 2: Probability Theory and Distributions Elements of Probability Theory, The addition rule, Multiplication Rule, conditional probability, random variables; probability distributions.	L1, L2,L3	10
MODULE 3: Regression and Estimation Methods of sampling; sampling distribution; distribution of the sample mean; sampling error and standard error; Point and interval estimation; properties of an estimator; linear regression, hypothesis testing; z-test, t-test, ANOVA	L1, L2,L3,L4	10
MODULE 4: Advanced Statistics CLRM assumptions, stationarity, autocorrelation, heteroscedasticity, multicollinearity.	L1, L2,L3	15
Field work	L1, L2, L3,L4,L5	15

Text Books
Gupta S.C, *Fundamentals of Statistical Methods*, Sultanchand& Sons. 12

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	CT	P	A	EE
Weightage (%)	10	15	5	70

CT: Class Test, HA: Home Assignment, V: Viva, EE: End Semester Examination; A: Attendance, C: Case Analysis

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	2	--	--	--	--	--	--	1	--	--	--
CO2	--	1	--	--	--	--	--	--	1	--	--	--
CO3	--	--	--	--	--	--	--	1	1	--	--	--
CO4	--	1	--	--	--	--	--	--	1	--	--	--
CO5	--	1	--	--	--	--	--	2	1	--	--	--
CO6	--	1	--	--	--	--	--	2	1	--	--	--

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DBUA2302	DATA PRIVACY AND DATA SECURITY LAWS	L	T	P	C
Version 1.1	Latest Approved	2	0	0	2
Pre-requisites/ Exposure					
Co-requisites					

Course Description
This course is designed to familiarize the students with the basic concepts of data privacy issues and security laws including current and proposed laws and regulations that govern data security and privacy.

Course Objectives
The objective of this course is to:
1. Provide the foundational knowledge based on data security investigation and data policy questions concerning the value of data security and data privacy regulations.
2. Emphasize on the real world effects of data breaches on individuals and businesses.
3. Provide an understanding on how to secure data and balancing of interests among individuals, government, and enterprises from the technical and legal perspective.

Course Outcomes
On completion of this course, the students will be able to:
CO1: Explain the fundamental concepts of data security and security laws.
CO2: Explain the business needs for data privacy and security investigation.
CO3: Assess the risk for data security.
CO4: Identify the legal, professional and ethical issues related to data.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Data Security History of data security, Meaning of data Security and data privacy, Critical Characteristics and components of Data security, Need for Security, Business Needs, Threats, Attacks, Meaning of term personal data, data processing, data protection, NSTISSC Data Security Model, Balancing Security and Access to data, The SDLC model, The Security SDLC	L1, L2	12
MODULE 2: Introduction to Data Security Laws Introduction of the General Data Protection Regulation (GDPR), rationale for the introduction of the GDPR , primary objectives of the General Data Protection Regulation, scope of data processing activities covered by the GDPR, territorial scope of the GDPR regarding the location of personal data processing and data subjects, GDPR impact on Indian Companies, Data protection Laws in India	L1, L2	12
MODULE 3: Data Privacy: Legal Issues and Landscape Development of Privacy Laws (historical and legal context), Fair Information Principles, The Statutory Landscape in the US, Indian IT Act, Adjudication under Indian IT ACT, IT Service Management Concept, IT Audit standards, ISO/IEC 27000 Series, COBIT, HIPPA, SOX, System audit, Information security audit, ISMS, SoA (Statement of Applicability), BCP (Business Continuity Plan), DR (Disaster Recovery), RA (Risk Analysis/Assessment)	L1, L2	11

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MODULE 4: Data Security Analysis and Risk Management Risk Management: Identification, Assessment and controlling of Risk Logical Design: Blueprint for Security, Information Security Policy, Standards and Practices, ISO17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity Physical Design: Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel	L1, L2	10
Field work	L1, L2, L3,L4,L5	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis; L6-Evaluation*

Text and Reference Books

1. Micki Krause, Harold F. Tipton, "Handbook of Information Security Management", Vol 1-3 CRC Press LLC, 2004.
2. Stuart McClure, Joel Scrambray, George Kurtz, "Hacking Exposed", Tata McGraw- Hill, 2003.
3. Matt Bishop, " Computer Security Art and Science", Pearson/PHI, 2002.
4. International Guide to Privacy – American Bar Association (Privacy)
5. International Guide to Cyber Security – American Bar Association (Cyber Security)
6. Roadmap to an Enterprise Security Program - American Bar Association (Roadmap)
7. The Executive Guide to Information Security – Egan and Mather (Guide)
8. Case studies from the Harvard Business School; http://cb.hbsp.harvard.edu/cb/access/5263390

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CT	P	A	EE
Weightage (%)	10	15	5	70

CT: Class Test, HA: Home Assignment, V: Viva, EE: End Semester Examination; A: Attendance, C: Case Analysis

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	2	--	--	--	--	--	--	1	--	--	--
CO2	--	1	--	--	--	--	--	--	1	--	--	--
CO3	--	--	--	--	--	--	--	1	1	--	--	--
CO4	--	1	--	--	--	--	--	--	1	--	--	--
CO5	--	1	--	--	--	--	--	2	1	--	--	--
CO6	--	1	--	--	--	--	--	2	1	--	--	--

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SEMESTER-IV

DMGT2451	FINANCIAL MANAGEMENT	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course focuses on a firm's financial goals and decisions to maximize shareholders' wealth. It examines financial concepts and analytical techniques, financial performance, time value of money, measurement of risk and return, capital budgeting, capital structure, short-term financial planning, working capital management, and international finance.

Course Objectives

The course aims to:

1. Familiar students to take decisions which are effective, a manager in any of the functional areas be it Marketing, HR or IT requires a thorough cost and benefit analysis and a feel for Finance so as to look at the long term implications of his/her decision.
2. An understanding and a feel for Financial decision making.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the theoretical models of financial management in the context of business development.

CO2: Describe and analyse financial decisions made by company managements using accounting and other financial information.

CO3: Analyse and consider time value of money while taking investment decisions.

CO4: Explain theoretical understanding to real life problems, in order to develop possible solutions.

CO5: Identify and apply best investment options estimating future cash flows

CO6: Identify the need of working capital requirement along with inventory management.

CO7: Define the dividend policies and apply theories to practical decisions for dividends.

Modules	Blooms level*	Number of hours
Module I: Introduction to Financial Management Evolution of Financial Management, Key activities of Finance Manager Changing Role of Finance Managers, Key Decision Areas in Financial Management, Objectives of the firm	L1, L2	7
Module II: Financial Statement Analysis Introduction, objectives of financial statement analysis, Techniques-Ratio analysis, Comparative analysis and limitations of financial statement analysis, AS-20 (no numerical)	L1, L2, L4	8
Module III: Valuation Concepts Concept of Time value of Money, Process of Compounding and Discounting, Future Value of a Single amount, Future Value of an Annuity, Present Value of a Single Amount, Present Value of an Annuity, Cost of capital, Weighted average cost of capital, Leverage Analysis	L2,L3	8
Module IV: Financing Decision Capital structure, Factors affecting Capital Structure decisions, Theory of Capital Structure Decisions, MM Theory, NI, NOI and Traditional theory, Pecking order theory.	L2	6

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Module V: Investment Decision Basics of Capital Budgeting, Types of capital budgeting decisions, Estimating cash flows for project appraisal, Green capital budgeting, Non-discounted Cash Flow Techniques: Payback Period, ARR, Discounted Cash Flow Techniques: NPV, IRR, PI. Risk Analysis of Capital Budgeting: Risk adjusted discount rate, Certainty Equivalent Approach.	L2,L4	6
Module VI: Working Capital Management Meaning and importance of adequate working capital, Excess or Inadequate working capital, Determinants of working capital requirement, Cash management, Receivable management and Inventory management – Sources of working capital.	L1,L2, L3	5
Module VII: Dividend Decisions Importance of dividend decisions, Theories of Dividend decisions: Irrelevance theory, Optimal dividend decision, Relevance theory, Determinants of dividend policy: Bonus Shares, Stock Splits & Buyback of shares. Tax considerations.	L1,L2	4
Fieldwork		15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Book

Pandey, I. M, (2010), Financial Management. 10th Edition, Vikas Publishing House Pvt. Ltd.

Reference Books

1. Van Horne, J.C (2008), Financial Management & Policy, 13th Edition, Prentice Hall, 2008
2. Chandra, P., Fundamentals of Financial Management, 7th Edition, Tata McGraw Hill.
3. Brearly R.A. and Myers, S.C. Principles of Corporate Finance,12th Edition, Tata Mc- Graw Hill, 2018

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CT	HA	C	V	Att	EE
Weightage (%)	10	5	5	5	5	70

CT: Class Test, HA: Home Assignment, V: Viva, EE: End Semester Examination; Att: Attendance, C: Case Analysis

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	--	--	--	--	--	--	--	1	--	--	--
CO2	1	2	--	--	--	--	--	--	1	--	--	--
CO3	1	--	--	--	--	--	--	1	1	--	--	--
CO4	1	1	--	--	--	--	--	--	1	--	--	--
CO5	1	1	--	--	--	--	--	--	1	--	--	--
CO6	1	1	--	--	--	--	--	--	1	--	--	--
CO7	1	1	--	--	--	--	--	--	1	--	--	--

1: strongly related, 2: moderately related and 3: weakly related

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DMGT2402	MANAGERIAL ECONOMICS	L	T	P	C
Version 1.1	Latest Approved	2	0	0	2
Pre-requisites/Exposure	Basic knowledge of economic science preferred but not compulsory				
Co-requisites					

Catalog Description

In this course the students are introduced with various basic concepts of managerial economics to make them familiarize with undergraduate level working knowledge. To begin with, introductory concepts of economics, consumer behavior and utility theory are discussed. Thereafter concepts related to demand analysis, demand forecasting, supply analysis, and equilibrium market conditions are discussed in detail. The next phase deals extensively concepts related to production theory, cost theory and revenue aspects. Following that various macroeconomic concepts and business phases along with their implications are analyzed in detail. Finally, various concepts related to market structure are discussed in detail. The overall aim of this course is to make the students familiar with working knowledge of the fundamentals of managerial economics as part of rational choice decision science.

Course Objectives:

The objective of this course is to:

1. Make students aware of theoretical concepts of economic science so that they can analyze situations and improve upon their managerial decision process.
2. Provide students with extensive exposure about the micro and macro level variables that influence business and managerial strategies of the firm and business cycles under which they operate.

Course Outcomes:

On completion of this course, the students will be able to:

CO1: Explain basic concepts of economic analysis, utility theory, demand and supply dynamics, demand forecasting techniques and their application, and analyze the working of free market mechanism.

CO2: Analyze the relevant production and cost concepts along with revenue in managerial decision process.

CO3: Describe the various forms of market structure and their implications in economy.

CO4: Discuss holistically the various macroeconomic aspects of business decision process along with complexities of business phases.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Managerial Economics Nature, Scope, Definitions of Managerial Economics, Application of Managerial Economics to Business, Micro Vs. Macro Economics, Opportunity Costs, Time Value of Money, Marginalism, Incrementalism, Market Forces and Equilibrium.	L1, L2, L4	7

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MODULE 2: Consumer Behaviour and Demand Analysis Cardinal Utility Approach: Diminishing Marginal Utility, Law of Equi-Marginal Utility, Ordinal Utility Approach: Indifference Curves, Marginal Rate of Substitution, Budget Line and Consumer Equilibrium, Theory of Demand, Law of Demand, Movement along vs. Shift in Demand Curve, Concept of Measurement of Elasticity of Demand, Factors Affecting Elasticity of Demand, Income Elasticity of Demand, Cross Elasticity of Demand. Production with one variable input, Production and optimal input proportions, two variable inputs, Law of variable proportions and law of return to scale, Cost Concepts, Theory of costs in short run and long run.	L1, L2, L4, L5	12
MODULE 3: Theory of Production, Cost and Firm's Behaviour Meaning and concept of Production, Factors of Production and Production Function, Fixed and Variable Factors, Law of Variable Proportion (Short Run Production Analysis), Law of Returns to a Scale (Long Analysis), Concept of Cost, Cost Function, Short Run Cost, Long Run Cost, Economics and Diseconomies of Scale, Explicit cost and Implicit Cost, Private and Social Cost	L1, L2, L4, L5	9
MODULE 4: Macro Economics and Business Decisions Phases of Business cycle - Evil effects of cyclical fluctuations on business firms - Minimizing effects of Business cycles, Economic and Business forecasting - uses of economic forecasts - Methods of economic forecasting - selecting a forecast - evaluating forecasts.	L1, L2, L4	9
MODULE 5: Price and Output Decisions under Different Market Structures Price and Output Decisions under Perfect Competition, Monopoly and Monopolistic Competition - Pricing under Oligopoly - Kinked Demand Curve - Price Leadership - Pricing under Collusion.	L1, L2, L4	8
Field work	L1,L2,L3,L4,L5	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. Dwivedi, D. N., Managerial Economics, 7th Edition, Vikas Publishing House.
2. Gould John P. and Edward P. Lazear Micro Economic Theory, All India Traveller Book-seller, New Delhi.
3. Koutsoyiannis Modern Micro Economics, Macmillan Press Limited, New Delhi.
4. Dewett. K.K. Micro Economics, S. Chand &Co, New Delhi

Reference Books

1. Ahuja, H.L. Advanced Economic Theory (Micro Economics), S. Chand & Co, New Delhi
2. Browning Edgar K. & Jacquel Line M. Browning, Micro Economics and Application, Kalyani Publishers, New Delhi.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	1	--	--	--	--	--	--	1	--	--	--
CO2	1	1	--	--	--	--	--	--	1	--	--	--
CO3	1	1	--	--	--	--	--	--	1	2	2	2
CO4	1	1	--	--	--	--	--	--	1	2	1	1

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DBUA2401	INTRODUCTION TO ADVANCED EXCEL	L	T	P	C
Version 1.1	Latest Approved	0	0	4	2
Pre-requisites/ Exposure					
Co-requisites					

Course Description

Microsoft Excel is a very popular business productivity application for the management and manipulation of data. With the right training and understanding of Excel, businesses and individual users can unlock the world of opportunities that this powerful business application offers. This course will provide all the tools necessary to create and use basic and advanced spreadsheets.

Course Objectives

The course enables students to:

1. Explore the Microsoft Excel as a tool for facilitating solutions for business problems/decision making
2. Have an understanding on the advanced functions of excel through guided demonstration.
3. Enhance excel skills of students and develops a set of fundamental skills that are essential for survival in business amid global uncertainty.

Course Outcomes:

On successful completion of this course students shall be able to:

1: Demonstrating the basic mechanics and navigation of an Excel spreadsheet.
2: Use advanced functions and productivity tools to assist in developing worksheets.
3: Manipulate data lists using Outline, Auto filter, data cleaning and PivotTables.
4: Use Consolidation to summarise and report results from multiple worksheets.
5: Gain knowledge in Simulation and Decision tree Contents Record repetitive tasks by creating Macros.

Modules	Blooms level*	Number of hours
Module 1: Overview of Excel **Contents:** Introduction to Spreadsheets: data entry using autofill, sort & filter feature, widening rows and columns, inserting & deleting rows and columns, creating lists, wrapping & merging text and cells. Introduction to basic data formatting, saving work in excel. Protecting, signing & sharing workbooks, freeze panes, understanding normal, page layout and page break preview in excel, page orientation and print area in Excel. How to adding hyperlinks to cells, inserting images, objects, equations and symbols. Activating separator. Introduction to Figures and Charts: Inserting bar charts, pie charts, column charts and line charts in spreadsheets, formatting and resizing the chart.	L1, L3, L4	9
Module 2: Data Cleansing and Lookups Contents: Textual functions- TRIM, SUBSTITUTE, CLEAN, STORED AS TEXT, DE-DUPLICATING, LEN & FIND, CONCATENATE, UPPER, LOWER, REPLACE functions, Warning messages and Data validation; Look up functions-VLookup, multiple Vlook up together and Hlookup with index and match.	L1, L3, L4	9

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Module 3: Functions and Pivot Tables Contents: Basic functions- ROUNDING, SUM, PRODUCT, MIN, MAX, AVERAGE, CONDITIONAL COUNTS, LARGE, RANK, VAR, Std Dev, CONDITIONAL SUMS. Date functions and Time functions. Logical functions- IF, THEN, AND, OR, NOT, COUNTIFS, SUMIFS, TRUE, FALSE Functions. Financial functions: Time value of money- Present value, Future value, PMT with beginning date, PMT with ending date, NPV, Math functions, What-if analysis, Goal Seek Analysis, Scenario Manager, Solver (Add- ins). Pivot table, pivot charts and conditional formatting.	L1, L3, L4	10
Module 4: Simulation and Decision Making Contents: Basics of simulation, Monte Carlo Experiment, Decision Analysis (DA): Terminology, DA without probabilities (Maximax, Maximin, Minimax Regret), DA with probabilities: (Decision point / branch, chance event / branch, Decision tree with examples.	L1, L3, L4	9
Module 5 : Use Macros to Automate Excel Tasks and Database: Intro to Macro, Recording a Macro, Running a Macro, Add a Macro Button to the Ribbon, Assign a Macro to a Button on the Quick Access Toolbar, Assign a Macro to a Graphic Object, Macro Security, Trust Center Macro Settings, Trusted Locations, Editing Recorded Macros, Editing the Macro in the Visual Basic Editor. Create a database in excel along with the use of filters, input masks.	L1, L3, L4	8
Field work	L1, L2, L3,L4,L5	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. Carlberg CG, "*Business Analysis with Microsoft Excel* (2nd Edition)", Que Publishing, ISBN 0974415626.
2. Harvey G (2012), "*Excel 2013 for Dummies*" John Wiley & Sons, ISBN 9781118559703

Reference Book

- Nathan George (2019), "Excel 2019 Advanced Topics Leverage More Powerful Tools to Enhance Your Productivity", UK.
- Mark Page T. Hopper (2019), "Microsoft Excel 2019", US.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CT**	**P**	**A**	**EE**
Weightage (%)	10	15	5	70

CT: Class Test, HA: Home Assignment, V: Viva, EE: End Semester Examination; A: Attendance, C: Case Analysis

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	2	--	--	--	--	--	--	1	--	--	--
CO2	--	1	--	--	--	--	--	--	1	--	--	--
CO3	--	--	--	--	--	--	--	1	1	--	--	--
CO4	--	1	--	--	--	--	--	--	1	--	--	--
CO5	--	1	--	--	--	--	--	2	1	--	--	--
CO6	--	1	--	--	--	--	--	2	1	--	--	--

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SEMESTER-V

DMGT2551	OPERATIONS AND SUPPLY CHAIN MANAGEMENT	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description
Operations and Supply chain are an integral contributor to an organisation's top and bottom line success. This course is based on a foundation in the theories and practice of management in businesses where operations and supply chain management are critical to success. These include product and process design, choosing appropriate technology, adopting efficient work methods, planning (including location and facilities layout), streamlining the flow of people and materials, and continuously improving the quality of the final product, in order to create internal and external customer value.

Course Objectives:
The objectives of this course are to:
1. Provide and practice of management in businesses.
2. Make them aware regarding planning.
3. Know product and process design, appropriate technology, adopting efficient work methods

Course Outcomes
On completion of this course, the students will be able to:
CO1: Demonstrate ability to systematically analyse operational and supply chain strategies in the light of the emerging supply chain frameworks and business models;
CO2: Develop business, operations and supply chain management strategies using strategic alignment model;
CO3: Effectively apply the alignment model and assess the strategic needs of business and supply chain networks;
CO4: Evaluate emerging operations initiatives for supply chain collaboration and their strategic implication;
CO5: Integrate organisational changes related to supply chain strategy implementation

Modules	Blooms level*	Number of hours
Module I: Introduction, Significance of POM in business, POM model and its elements, Scope of POM, History of POM.	L1, L2	1
Module II:**Competitive Advantage through operations management** Competitive Advantage through POM Critical factors for gaining competitive advantage Operations models Operations strategy Case discussion	L1, L2, L3	2
Module III: **Product** Product – levels, types, categories Product design and development Commercial production and launch Support and up-gradation	L1, L2, L3	2

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Module IV:Processes and Technology Types of productive systems Types of production processes Comparison of production processes Case discussion	L1,L2	2
Module V: Forecasting Significance of forecasting for operations management Forecasting techniques Mathematical models and their practical applications Forecasting errors. Laws of forecasting and how they affect operations	L1, L2	2
Module VI: Planning and Scheduling Operations Planning and Scheduling Long range and aggregate output planning Master production schedules Functional planning and production control Operations scheduling Case discussion	L1, l2, l3	2
Module VII: Quality Management Quality management SQT, AS, SQC, SPC and practical applications Case discussion	L1, L2,L3	2
Module VIII: Performance improvement in operations Latest techniques in operations management Just-In-Time technique Ergonomics and work study Case discussion		2
Module IX: Operations Management in the Indian context Implementation of operations management techniques by Indian companies Case discussion	L1, l2	2
Module X: Supply Chain Management Operations capacity Capacity measures Capacity planning process Evaluation of alternatives for capacity expansion	L1,L3,L6	2
Module XI: Site Location and Layout Planning Factors affecting site location decisions Evaluation of site location options Objectives of layout planning Types of layouts Designing of layouts	L1, L2, L6	2
Module XII: Supply Chain Management Basic Concepts Characteristics of business partners of a supply chain. Elements of supply chain management systems Demand management, customer service management Procurement, Outsourcing, supplier relationship management Physical distribution management, returns management	L1, l2	3 6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books:

Norman Gaither & Greg Frazier, 2005, Operations Management - Thomson , South Western

Reference Books:

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1. E Adam and Ronald J Ebert, 2005, Production and Operations Management, Prentice Hall of India
2. Cecil Bozarth and Robert B. Handfield, Introduction to Operations and Supply Chain Management 2nd Edition, 2007Roberta (Robin) Russell and Bernard W. Taylor, Operations Management: Creating value along the Supply Chain, 2007
3. Roberta (Robin) Russell and Bernard W. Taylor, Operations Management: Creating value along the Supply Chain, 6th Edition , Loose Leaf, 2008
4. Terry P. Harrison, Hau L. Lee, and John J. Neale, The Practice of Supply Chain Management: Where theory and application converge (International Series in Operations Research & Management Science),2005
5. Sunil Chopra and Peter Meindl, Supply Chain Management: Strategy, Planning and Operations, 2000
6. David L. Taylor and David Brunt, Manufacturing Operations and Supply Chain Management: The LEAN Approach, 2000
7. John Tom Mentzer, Matthew B. Myers, and Theodore P. Handbook of Global Supply Chain Management,2006

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

CPA: Case Discussion/Presentation/Analysis V: Viva A: Attendance CT: Class Test EE: End Term Examination

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO1	1	1	-	-	-	-	-	-	-	1	-	2
CO2	1	1	-	-	-	-	-	-	-	1	-	2
CO3	1	1	-	-	-	-	-	-	-	1	-	2
CO4	1	1	-	-	-	-	-	-	-	2	-	2
CO5	1	1	-	-	-	-	-	-	-	1	-	1

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DBUA2501	SQL AND DATAMINING	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/ Exposure					
Co-requisites					

Course Description

Every business organization is realizing the importance of data. They are harnessing the benefits offered by Data Mining as it allows them to see hidden patterns from the data and helps in framing business policies. This course emphasizes on utilizing the techniques offered by Data Mining.

Course Objectives

This course enable students to:

1. Understand the basic concepts, principles, methods, implementation techniques, and applications of data mining, with a focus on major data mining functions such as cluster analysis.
2. Develops skills to use data mining software and other data mining techniques to solve business problems.

Modules	Blooms level*	Number of hours
Module 1: Introduction to Data Mining- What is data mining? Related technologies - Machine Learning, DBMS, OLAP, Statistics, Data Mining Goals, Stages of the Data Mining Process, Data Mining Techniques, Knowledge Representation Methods, Applications (Example: weather data), Data Warehouse and DBMS, Multidimensional data model, OLAP operations (Example: loan data set). Data cleaning, Data transformation, Data reduction, Discretization and generating concept hierarchies, Data Mining Primitives: What Defines a Data Mining Task? Task-Relevant Data, The Kind of Knowledge to be Mined, KDD.	L1, L2,L3	9
Module 2: Mining Association Rules in Large Databases, Association Rule Mining, Market Basket Analysis: Mining A Road Map, The Apriori Algorithm: Finding Frequent Item sets Using Candidate Generation, Generating Association Rules from Frequent Item sets, Improving the Efficiently of Apriori, Mining Frequent Item sets without Candidate Generation, Multilevel Association Rules, Approaches to Mining Multilevel Association Rules, Mining Multidimensional Association Rules for Relational Database and Data Warehouses, Multidimensional Association Rules, Mining Quantitative Association Rules, Mining Distance-Based Association Rules, From Association Mining (Example: mining weather data , Basic idea: item sets, Generating item sets and rules efficiently) to Correlation Analysis.	L2, L3	9

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Module 3: Classification (Basic learning/mining tasks, Inferring rudimentary rules: 1R algorithm) – Prediction (The prediction task, Statistical (Bayesian) classification, Bayesian networks, Instance-based methods (nearest neighbor), Linear models), Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Bayes Theorem, Naïve Bayesian Classification, Classification by Back propagation, A Multilayer Feed-Forward Neural Network, Defining a Network Topology, Classification Based of Concepts from Association Rule Mining, Other Classification Methods, k-Nearest Neighbor Classifiers, Genetic Algorithms, Rough Set Approach, Fuzzy Set Approaches, Prediction, Linear and Multiple Regression, Nonlinear Regression, Other Regression Models, Classifier Accuracy.	L1, L2, L3	9
Module 4: Cluster Analysis, Types of Data in Cluster Analysis, Basic issues in clustering, First conceptual clustering system: Cluster/2, A Categorization of Major Clustering Methods, Classical Partitioning Methods: k-Means, expectation maximization (EM), and k-Medoids, Partitioning Methods in Large Databases: From k-Medoids to CLARANS, Hierarchical Methods, Agglomerative and Divisive Hierarchical Clustering, Grid based Methods, Density-Based Methods, Wave Cluster: Clustering Using Wavelet Transformation, CLIQUE: Clustering High-Dimensional Space, Model-Based Clustering Methods, Statistical Approach ,Neural Network Approach, Conceptual clustering and Cobweb.	L1, L2, L3,L4	8
Module 5: Introduction to Data, Databases and SQL – SELECT, NULL, ORDER BY, LIMIT, OFFSET, SELECT DISTINCT, WHERE, aggregate functions, multiple conditions, SQL Queries - WHERE –IN –clause, GROUP BY and GROUP BY HAVING clauses, Creating and Managing Tables – insert rows and columns (Multiple), ALTER TABLE, VALUES clause, Joining Tables – inner join, left join, right join, full join, ON, AS, Conditional Expressions- COALESCE, NULLIF function, text strings, sets and sub queries, exporting data into other applications.	L3,L4,L6	10
Field work	L1, L2, L3,L4,L5	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text & References:

1. Han, J., Kamber, M., & Pei, J. (2011). Data mining: Concepts and techniques (3rd ed.). Waltham: Morgan Kaufmann.
2. Alex Berson, Data Warehousing, Data Mining, and Olap, Tata McGraw Hill.
3. George M Marakas, Modern Data Warehousing, Mining & Visualization Core Concepts, Pearson Education.
4. (Berry, Michael)Data Mining Techniques.
5. (Sharma, Gajendra)Data Mining, Data Warehousing and OLAP.
6. (Gupta, GK) Data Mining with Case Studies.
7. (Han &Kamber)Data Mining: Concepts and Techniques.
8. (PaulrajPonniah) Datawarehousing Fundamentals

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**IP**	**EE**	**EP**
Weightage (%)	5	25	50	20

IP: Internal Practical, EE: End Semester Examination; EP: External Practical; A: Attendance

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	2	--	--	--	--	--	--	1	--	--	--
CO2	--	1	--	--	--	--	--	--	1	--	--	--
CO3	--	--	--	--	--	--	--	1	1	--	--	--
CO4	--	1	--	--	--	--	--	--	1	--	--	--
CO5	--	1	--	--	--	--	--	2	1	--	--	--
CO6	--	1	--	--	--	--	--	2	1	--	--	--

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DBUA2502	PROGRAMMING FOR BUSINESS ANALYTICS USING R	L	T	P	C
Version 1.1	Latest Approved	1	0	6	4
Pre-requisites/ Exposure					
Co-requisites					

Course Description

This course offers the specialization on R (powerful language used widely for data analysis and statistical computing). This course facilitates a good understanding on the process of data manipulation and visualization. The course provides ample working examples on statistical data analysis using R.

Course Objectives

The objective of this course is to:

1. Provide learning on how to program in R, how to use R for effective data analysis, how to install and configure software necessary for a statistical programming environment.
2. Provide applications on statistical computing which includes programming in R, reading data into R, accessing R packages, writing R functions, debugging, profiling R code, and organizing and commenting R code.
3. Facilitate hands on experience to various real world business problems using R.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Gain an in-depth understanding of fundamentals of R Programming & data structure used in R and learn to import/export data in R.
CO2: Interpret the probability distributions and use the hypothesis testing method to drive business decisions.
CO3: Gain a basic understanding of various statistical concepts and use the various graphics in R for data visualization.
CO4: Understand and use linear and non-linear regression models, and classification techniques for data analysis.
CO5: Choosing the loops and decision-making statements to solve the problems.
CO6: Learn and use association rule, clustering methods including k-means and hierarchical clustering.

Modules	Blooms level*	Number of hours
MODULE 1: Introducing to R, Data types & Data structures: Scalars, Vectors, Lists, Matrices (Creating matrices, Matrix operations, Applying Functions to Matrix Rows and Columns, Adding and deleting rows and columns, Vector/Matrix Distinction), Arrays, and Factors. Basic syntax, Declarations, recycling, Variables, Types of operators: Arithmetic operators, Relational operators, Logical Operators, Assignment Operators, Conditional Statements in R, Loops in R, Functions in R, Help functions in R, NA and NULL values , Filtering , Vectorized if-then else , Vector Equality , Vector Element names, Importing CSV files and Excel files.	L1, L2,L3	12
MODULE 2: Data Frames- Creating Data Frames, Matrix-like operations in frames, Merging Data Frames, Applying functions to Data frames, Factors and Tables, factors and levels, Common functions used with factors, Working with tables - Other factors and table related functions - Control statements, Arithmetic and Boolean operators and values, Default values for arguments.	L1, L2,L3	8

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MODULE 3: Data Reshaping, Binomial distribution, Poisson distribution, normal distribution, missing values, removing outliers, Hypothesis, Data Sampling, Confidence and Significance Levels, Hypothesis Tests about Population Means, Hypothesis Tests about Population Variance, Hypothesis Tests about Population Proportions, Basic Statistics.	L1, L2,L3	8
MODULE 4: Parametric Tests, Non-Parametric Tests, Data Visualization Using Graphics in R, Ggplot2, File Formats of Graphic Outputs R, Pie charts, Bar charts, Box plots, Histograms, line graphs, Scatter plots, customizing graphs, saving graphs to files.	L1, L2,L3	9
MODULE 5: Introduction to Regression Analysis, Types of Regression Analysis Models, Simple Linear Regression, Non-Linear Regression, Regression Analysis with Multiple Variables, logistic regression, Cross Validation, Factor Analysis, cluster analysis, Survival analysis, association rule.	L1, L2, L3	8
Field work	L1, L2, L3,L4,L5	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis;L6-Evaluation*

Text Books

1. The Art of R Programming, Norman Matloff, 5/e, Cengage Learning, 2011.
2. R Cookbook, Paul Teetor, 5/e, Oreilly, 2011.
3. R in Action, Rob Kabacoff, 2/e, Manning, 2015.
4. R for Everyone, Lander, 4/e, Pearson, 2014

Reference Books

1. Beginning R – The Statistical Programming Language by Mark Gardener, Wiley, 2013
2. Introductory R: A Beginner's Guide to Data Visualisation, Statistical Analysis and Programming in R
3. ByRobert Knell, Amazon Digital South Asia Services Inc, 2013

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**IP**	**EE**	**EP**
Weightage (%)	5	25	50	20

IP: Internal Practical, EE: End Semester Examination; EP: External Practical; A: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	2	--	--	--	--	--	--	1	--	--	--
CO2	--	1	--	--	--	--	--	--	1	--	--	--
CO3	--	--	--	--	--	--	--	1	1	--	--	--
CO4	--	1	--	--	--	--	--	--	1	--	--	--
CO5	--	1	--	--	--	--	--	2	1	--	--	--
CO6	--	1	--	--	--	--	--	2	1	--	--	--

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SEMESTER-VI

DMGT2651	BUSINESS POLICY AND STRATEGIC MANAGEMENT	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description
This course introduce to the students theories and practices of Strategic Management acquired knowledge in formulation and implementation of strategies for better decision-making.

Course Objectives
The objective of this course is to
1.Orient the students in theories and practices of Strategic Management.
2. Apply the acquired knowledge in formulation and implementation of strategies for better decision-making.

Course Outcomes
On completion of this course, the students will be able to:
CO1: Define the basic concepts and principles of strategic management and define the internal and external environment of business.
CO2: Recognize organizational strategies that will be effective for the current business environment.
CO3: Illustrate strategic approaches to managing a business successfully in a global context.
CO4: Analyze and evaluate critically real life company situations and develop creative solutions, using a strategic management perspective.

Modules	Blooms level*	Number of hours
Module I: Introduction Planning, Evolution of strategic management, Concept of Corporate Strategy: Intended & Emergent, Patterns of Strategy Development, Levels of strategy	L1, L2	8
Module II: Mission & Vision Concept of Strategic Intent, Vision and Mission, Formulation of Vision and Mission Statements, Different Perspectives on Vision and Mission, Business Definition and concept of a Business Model**.**	L1, L2	7
Module III: Strategic Analysis Industry Analysis, Competitor Analysis using Porter's 5-Forces model, Market Analysis, Environmental Threat and Opportunity Profile (ETOP), Internal Analysis: Building Organization Capability Profile and Strategic Advantage Profile (SAP), Building competencies using Value chain Analysis, Environmental Analysis and dealing with uncertainty, Scenario Analysis, SWOT Analysis	L1, L2	8
Module IV: Strategic Choice Strategic alternatives at corporate level: Expansion, Stability, Retrenchment and Combination, Strategic choice models for dominant single- Business companies- Strickland's Grand Strategy Selection Matrix, Model of Grand Strategy Clusters, Strategic choice models for multi-business companies- BCG, GE Nine Cell Matrix, Hofer's Model, Coevolving, Patching, Strategy as simple rules, Strategic alternatives at business level: Michael Porter's Generic competitive strategies, Building Sustainable Competitive Advantage	L1,L2	7
Module V: Strategic Implementation	L1, L2	10

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Operationalizing strategy and Institutionalizing strategy- Developing short-term objectives and policies, Functional tactics, and Rewards, Structural Implementation, Strategic Control, Mc Kinsey 7-S Framework. **Module VI**: Recent Developments Recent Developments in the Field of Strategy: Use of Balanced Scorecard approach, Corporate Governance and Corporate Social Responsibility, Corporate sustainability**.**		5
Tutorial: Flip Classes/Presentation/Assignments/Discussions	L3,L4,L5	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Book:

1. Jauch & Glueck,1998, Business Policy and Strategic Management.
2. Pearce & Robinson,2012, Strategic Management Formulation Implementation & Control, 12th Edition, McGraw Hill.

Reference Books:

1. Lynch,2006, Corporate Strategy, 4th Edition, Pearson.
2. Ramaswamy & Namakumari, 1996, Strategic Planning for corporate success, Sage Publications.
3. Michael E. Porter, 1998, Competitive Advantage, Crafting & Executing Strategy, Free press.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

C - Case Discussion/ Presentation; HA - Home Assignment; V - Viva; CT- Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	3	-	-	-	-	-	3	-	-	1	-	1
CO2	1	2	1	-	-	-	3	3	-	1	-	1
CO3	1	1	1	-	-	2	1	3	-	1	-	1
CO4	1	1	3	2	2	1	1	3	-	1	-	1

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DBUA2601	INTRODUCTION TO MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE	L	T	P	C
Version 1.1	Latest Approved	1	0	6	4
Pre-requisites/ Exposure					
Co-requisites					

Course Description This module comprises of conceptual, statistical and Machine Learning algorithms. It covers all the necessary models pertaining to Machine Learning such as Regression, Decision Trees, Support Vectors, Clustering, Association Analysis and Dimensionality Reduction.

Course Objectives

After this course students will gain critical knowledge and understanding about major Data Mining procedures like Decision Tree, Cluster Analysis, Neural Networks, Support Vector Machine, Bayesian Networks and Machine Learning fundamentals. Students will be able to apply and practice this gained knowledge in variety of Business Scenarios.

Course Outcomes

Upon successful completion of this module, students should be able to:

CO1: Understand and employ a wide variety of Statistical and Machine Learning Algorithms.

CO2: Identify the characteristics of Datasets, Problem Statement and develop Machine Learning programs with reference to known Computing Techniques.

CO3: Understand the Model Performance Evaluation and select the best one based on the solution.

CO4: Implement Machine Learning techniques and the Programming Framework to obtain acceptable decisions for the Real-World problems.

Modules	Blooms level*	Number of hours
MODULE 1: Classification and Regression Tree Classification & Regression, working of a Decision Tree, Attribute Selection Measures, Information Gain, Gain Ratio, Gini Index, Building Decision Trees, CART, C5.0, and CHAID Trees, Prediction by Decision Tree, Advantages and Disadvantages of Decision Trees, Model Overfitting, Building Decision Trees in R.	L1, L2,L3	12
MODULE 2: Clustering Cluster Analysis versus Factor Analysis, Overview of Basic Clustering Methods, Agglomerative Hierarchical Clustering, Within-Group Linkage, Nearest Neighbour or Single Linkage, Furthest Neighbour or Complete Linkage, Centroid Clustering, Ward's Method, K-Means Algorithm, Dendrogram, Profiling of Cluster, Cluster Evaluation. **Module III**	L1, L2,L3	8
MODULE 3: Support Vector Machine Decision Boundaries for Support Vector Machine, Maximum Margin Hyperplanes, Structural Risk Minimization, Linear SVM-Separable Case, Linear SVM-Non-Separable Case, Kernel Function, Kernel Trick, Kernel Hilbert Space, Model Evaluation.	L1, L2,L3	10

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Module 4 **Market Basket Analysis** Market Basket Analysis and Association Analysis, Market Basket Data, Stores, Customers, Orders, Items, Order Characteristics, Product Popularity, Tracking Marketing Interventions, Association Rules, Support, Confidence, Lift, Chi-Square Value, Sequential Pattern Analysis.	L1, L2,L3	8
Module 5 : Introduction to Artificial Intelligence Current Trends in AI, Intelligent Agents, Environments, Problem Solving Agents, Searching Techniques, Knowledge and Reasoning in AI, Forms of Learning, Structure of a Neural Network, Analogy with Biological Neural Network, Activation Functions, Gradient Descent, Model Accuracy.	L1, L2, L3	7
Field Work	L4,L5,L6	15

References

1. Kevin Knight, Elaine Rich, B.Nair, 2017, *Artificial Intelligence*, McGraw.
2. Han, Jiawei and Kamber, Micheline, 2012, *Data Mining: Concepts and Techniques*, Morgan Kaufman Publishers.
3. AnandRajaraman, 2011, *Mining of Massive Datasets*, Cambridge University Press.
4. Mitchell, 2013, *Machine Learning*, McGraw Hill.
5. Stuart Russell, Peter Norvig, 2004, *Artificial Intelligence – A Modern Approach*, Pearson.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**IP**	**EE**	**EP**
Weightage (%)	5	25	50	20

IP: Internal Practical, EE: End Semester Examination; EP: External Practical; A: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	2	--	--	--	--	--	--	1	--	--	--
CO2	--	1	--	--	--	--	--	--	1	--	--	--
CO3	--	--	--	--	--	--	--	1	1	--	--	--
CO4	--	1	--	--	--	--	--	--	1	--	--	--
CO5	--	1	--	--	--	--	--	2	1	--	--	--
CO6	--	1	--	--	--	--	--	2	1	--	--	--

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DBUA2602	PROGRAMMING FOR BUSINESS ANALYTICS USING PYTHON	L	T	P	C
Version 1.1	Latest Approved	1	0	6	4
Pre-requisites/ Exposure					
Co-requisites					

Course Description

This course is designed in such a way that leads the students from the basics of writing and running Python scripts to more advanced features such as file operations, regular expressions, working with binary data, and using the extensive functionality of Python modules.

Course Objectives

The objective of this course is to:

1. Equip students with the concepts of the fundamental programming concepts including data structures, networked application program interfaces, and databases, using the Python programming language.
2. Provide applications on statistical, machine learning, information visualization, text analysis, and social network analysis techniques through popular python toolkits such as pandas, matplotlib, scikit-learn, nltk, and networkx to gain insights into data analysis process.

Course Outcomes

On completion of this course, the students will be able to

CO1: Create applications for data retrieval and processing
CO2: Conduct an inferential statistical analysis of various business problems
CO3: Explain fundamental Python functionality and features used for data science
CO4: Apply techniques such as lambdas and manipulate csv files

Modules	Blooms level*	Number of hours
MODULE 1: Installing Python; basic syntax, interactive shell, editing, saving, and running a script, Concept of data types; variables, assignments; immutable variables; numerical types; arithmetic operators and expressions; comments in the program; understanding error messages Conditions, boolean logic, logical operators; ranges; Control statements: if-else, loops (for, while); short-circuit (lazy) evaluation	L1, L2,L3	8
MODULE 2: Strings and text files; manipulating files and directories, os and sys modules; text files: reading/writing text and numbers from/to a file; creating and reading a formatted file (csv or tab-separated).String manipulations: subscript operator, indexing, slicing a string; strings and number system: converting strings to numbers and vice versa. Binary, octal, hexadecimal numbers	L1, L2,L3	10
MODULE 3: Lists, tuples, and dictionaries; basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries. Design with functions: hiding redundancy, complexity; arguments and return values; formal vs actual arguments, named arguments, Program structure and design, Recursive functions	L1, L2,L3	10

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MODULE 4: Simple Graphics and Image Processing: "turtle" module; simple 2d drawing - colors, shapes; digital images, image file formats, image processing Simple image manipulations with 'image' module (convert to bw, greyscale, blur, etc).Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data modeling; persistent storage of objects OOP, continued: inheritance, polymorphism, operator overloading (_eq_, _str_, etc); abstract classes; exception handling, try block	L1, L2,L3	10
MODULE 5: Graphical user interfaces; event-driven programming paradigm; tkinter module, creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors layouts, nested frames Multithreading, Networks, and Client/Server Programming; introduction to HTML, interacting with remote HTML server, running html-based queries, downloading pages; CGI programming, programming a simple CGI form. Searching, Sorting, and Complexity Analysis.	L1, L2, L3	7
Field Work	L4,L5,L6	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis;L6-Evaluation*

Text and Reference Books

1. Bharti Motwani (2020), Data Analytics using Python, Wiley.
2. U. Dinesh Kumar, (2021), Business Analytics : The Science of Data-Driven Decision Making, 2ed,Wiley.
3. Core Python Programming by Wesley Chun,Prentice Hall
4. Fundamentals of Python: First Programs By Kenneth Lambert,Course Technology, Cengage Learning
5. Learning Python by David Ascher and Mark Lutz,Oreilly

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**IP**	**EE**	**EP**
Weightage (%)	5	25	50	20

IP: Internal Practical, EE: End Semester Examination; EP: External Practical; A: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	1	2	1	--	--	3	1	1	2	1	--	--
CO2	1	1	3	2	--	--	3	1	2	2	1	--	--
CO3	1	2	2	1	--	--	3	1	1	2	1	--	--
CO4	2	1	3	2	--	--	3	1	2	2	1	--	--

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DBUA2603	DATA VISUALIZATION-TABLEAU & POWER BI	L	T	P	C
Version 1.1	Latest Approved	1	0	6	4
Pre-requisites/ Exposure					
Co-requisites					

Catalog Description

This course familiarizes the students on data visualization tools. This course is designed to provide a fundamental and strategic understanding on the concepts of Business Intelligence using Tableau.

Course Objectives

The objective of this course is to:

1. Equip students with the concepts of BIs and its types and how to connect to and import data, visualize data using Tableau
2. Emphasize on how to create dashboards and share with business users using Tableau.
3. Emphasize on how to create dashboards and share with business users using PowerBI.

Course Outcomes

On completion of this course, the students will be able to:

1: Connect, import, shape, and transform data for business intelligence (BI)
2: Visualize data, author reports, and schedule automated refresh of your reports
3: Create and share dashboards based on reports in tableau desktop and Excel
4: Use natural language queries and create real-time dashboards.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Tableau and Power BI Interface Data visualization and its significance, Connecting Tableau to a Data File – Excel, CSV File, etc., Navigating Tableau, creating calculated fields and set, Working with Discrete vs. Continuous Data, adding colors, adding labels and formatting, exporting worksheet. Working with data extracts, working with time series data, understanding aggregation, granularity and level of detail, creating an area chart and learning about highlighting, adding a filter and quick filter.	L1, L2,L3	10
MODULE 2: Data Blending and Data Joining Relationships v/s joins, Joining data – Inner join, Right Join, Left join, Full outer join, Cross database join, blending data, data joining v/s data blending, limitations of data blending and dual axis chart.	L1, L2,L3	7

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MODULE 3: Basic and Advanced Charts Common chart types- Bar chart, times-series line chart, dot plot, scatter plot. Creating a map - Choropleth Map, Symbol Map, table, highlight table, Bullet graph, Gantt bar, bump chart, clouds and bubbles working with hierarchies, applying filters to multiple worksheets.	L1, L2,L3	10
MODULE 4: Interactive Dashboard Creation Create interactive dashboard- Metrics Dashboard, Design considerations for effective data visualization, Human cognition and visual perception, Using Maps to Visualize Spatial Data, What –if analysis, Multiple key performance metrics, Web analytics, Sentimental Analysis.	L1, L2,L3,L4	10
MODULE 5: Storytelling The visual storytelling framework, the business value of visual stories, Creating dashboards and story points, Formatting worksheets and dashboards. Common pitfalls of data visualization, Common pitfalls of data narratives, Share and critique an example of a data visualization, Provide your Tableau Public URL, Share data visualization on Tableau Public, Building a Dashboard in Tableau, Develop a data story pitch.	L1, L3,L4,L6	8
Field Work	L1, L2,L3,L4,L5,L6	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis;L6-Evaluation*

Text Books

1. Joshua N. Milligan, (2023). Learning Tableau 2022 - Fifth Edition: Create effective data visualizations, build interactive visual analytics, and improve your data storytelling capabilities, Packt Publishing via Publish Drive.
2. Jeremey Arnold (2022). Learning Microsoft Power BI: Transforming Data into Insights (Grayscale Indian Edition) Paperback – 5 October 2022. O'Reilly.
3. Steve Wexler_ Jeffrey Shaffer_ Andy Cotgreave - The Big Book of Dashboards_ Visualizing Your Data Using Real-World Business Scenarios (2017, Wiley)
4. Tableau Your Data! Fast and Easy Visual Analysis with Tableau Software: Daniel G. Murray and the Inter Works BI Team, John Wiley & Sons 2013.

Reference Books

1. Microsoft Business Intelligence Tools for Excel Analysts: Michael Alexander, Jared Decker, Bernard Wehbe, John Wiley & Sons, 2014
2. Getting started with Watson Analytics: IBM Corporation 2015
3. Beginning Big Data with Power BI and Excel 2013: Neil Dunlop, Apress 2015
4. IBM Watson Content Analytics Discovering Actionable Insight from Your Content: Wei-Dong (Jackie)
5. Zhu Bob Foyle, Daniel Gagné, Vijay Gupta, Josemina Magdalen, Amarjeet S Mundi, Tetsuya Nasukawa Mark Paulis, Jane Singer, Martin Triska, ibm.com/redbooks, IBM Corporation July 2014

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**IP**	**EE**	**EP**
Weightage (%)	5	25	50	20

IP: Internal Practical, EE: End Semester Examination; EP: External Practical; A: Attendance

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	2	--	--	--	--	--	--	1	--	--	--
CO2	--	1	--	--	--	--	--	--	1	--	--	--
CO3	--	--	--	--	--	--	--	1	1	--	--	--
CO4	--	1	--	--	--	--	--	--	1	--	--	--
CO5	--	1	--	--	--	--	--	2	1	--	--	--
CO6	--	1	--	--	--	--	--	2	1	--	--	--

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SEMESTER-VII

DMGT2701	DISRUPTIVE MANAGEMENT PRACTICES	L	T	P	C
Version 1.1		2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Description:
Disruptive management practice has upended traditional profitability models of industry after industry. Executives, focused on fine-tuning their current business models, often haven't seen the threats before their business landscapes are suddenly and permanently changed. Data and the increased development of technology have accelerated the rate of these massive changes. No industry is immune from competitors looking to grab market share through disruptive innovation.

Course Objectives:
This course will prepare leaders to harness the power of disruptive innovation before their competitors do. Students will gain a deeper understanding of what disruptive innovation is and will learn how to spot potential threats and opportunities in their own business. The coursework will focus on planning for disruption, using concrete steps to identify potential disruptions in the industry, and building the right culture to implement change. Students will be trained to view their business through a "jobs to be done" framework and use customer-centric problem-solving to discover new ideas and justify business changes.

Course Outcomes:
- Understand the forces of disruption that could impact their business and see how to spot them early
- Uncover a new approach for customer centricity to spot and shape new opportunities by applying the jobs to be done framework
- Learn, through practical examples, how to leverage new business models and potential application for their companies

Modules	Blooms level*	Number of hours
Module 1 - Imperative and Fundamental Concepts- Disruptive Innovation- Complementary Thoughts on Christensen's Theory of Disruptive Innovation, Theory of Disruption Waves or the Modulation of Disruption, Benefit of a Unified View on Disruption, Relativity of Disruption, and Typical Warning Signals for Disruptive Threats. Form Follows Function - Concept and Architecture.	L1, L2, L4	10
Module 2 - Market Understanding - Understanding Your Market, Market Segmentation for Multiple Segmentation Criteria, Identifying a Customers' "Job to Be Done", Differentiating Market Segmentation from Design Thinking, Creating Customer Value Through Design Thinking- Design Thinking, When to Use Design Thinking?, Defining Understanding, The Different Levels of Understanding, Phases of Design Thinking, Empathy for Individuals, Empathy in the B2B Context, Ideation, Prototyping and Testing, Scaling.	L1, L2,L4,L5	10

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Module 3 - Design to Value (DTV) - Defining Value in Product Development, Lifecycle Cost, the Framework and measuring value. Modularization: A Strategic Lever for Innovation, Platform- Core Platform versus Inclusive Platform, Implementing a Modular Platform- Organizational Aspects and Strategic Aspects, Agile – agile project management, frameworks.	L1, L2, L4, L5	10
Module 4 - Requirement Focus - Kano Model, Pair-wise Comparison, Requirements Management, Tree Diagram, Empathy Map, Concept Focus- Functional Modelling, Morphological Matrix/Morphological Box, Modular Function Deployment, Onion Peel Model, Design for Variety, Customer Focus Group, Osborne Checklist. Cost Focus - Target Costing, Measurement Sheet, Lifecycle Cost model, Complexity Cost Calculation for Product Families, Business Plan.	L1, L2,L3, L4	10
Module 5 - General Description of Disruption Management- Approaches to Uncertainties, General Guidance of Disruption Management, Understanding your business needs, Identify data roles in the organization. Challenges: Identify hurdles to becoming a data-driven organization, Disruption vs. Optimization, Disruptive Business Applications.	L1, L2, L3, L4	10
Module 6 - Enterprise Agile- Common Approach to Enterprise Agile Adoption, Building Blocks of Your Lean-Agile Culture Transformation, Base line assessment, Waterfall Training Development, sponsor Agile, Agility in a World of Change and Complexity, Traditional Organization v/s Agile Organizations and challenges in agile.	L1, L2, L4	10

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination Scheme:

Components	**CT**	**HA**	**C**	**V**	**A**	**EE**
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; **HA -** Home Assignment; **P -** Project; **S -** Seminar; **V** - Viva; **Q** - Quiz; **CT** - Class Test; **A** - Attendance; **EE** - End Semester Examination

Text and Reference Books:

1. Disruption Management Framework, Models and Applications (2004) - Gang Yu and Xiangtong Qi, https://doi.org/10.1142/5632
2. **Disruptive Management - Not Playing by the Rules, C. P. Ramchandani.**
3. https://www.routledge.com/Emerging-Trends-in-Disruptive-Technology-Management-for-Sustainable-Development/Das-Banerjee-De/p/book/9780367249649#
4. https://link.springer.com/book/10.1007/978-3-030-79709-6?page=2#toc

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	2								-	1	--	3
CO2	1	3								-	1	--	3
CO3	1	1								-	1	--	2

1: strongly related, 2: moderately related and 3: weakly related

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DMGT2702	ARTIFICIAL INTELLIGENCE IN MANAGEMENT	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Description:
This course introduces to the exciting world of Artificial Intelligence (AI) and its transformative impact on business. We will explore the core concepts of AI, delve into the power of Machine Learning and Deep Learning, and discover how AI is revolutionizing various business functions. Through real-world case studies, hands-on activities, and discussions with industry leaders, you will gain the knowledge and skills to leverage AI for strategic decision-making, optimize operations, and gain a competitive edge in the job market.

Course Objectives:

- Understand the fundamentals of Artificial Intelligence and its applications in business.
- Master the key concepts of Machine Learning, including supervised and unsupervised learning algorithms.
- Gain practical experience through case studies, hands-on exercises, and guest lectures.
- Prepare for a successful career in the AI-powered future of business.

Course Outcome
CO-1: Explore the potential of Deep Learning and its impact on various industries.
CO-2: Analyze the ethical considerations and challenges surrounding AI implementation.
CO-3: Develop critical thinking skills to evaluate the business value of AI solutions.
CO-4: Develop a model for decision making for business decision.

Modules	Blooms level*	Number of hours
Module 1: Introduction to AI What is AI?, A brief history of AI, Different types of AI, Applications of AI in business, The impact of AI on jobs and the workforce	L1, L2	9
Module 2: Machine Learning What is machine learning?, Supervised vs. unsupervised learning, Common machine learning algorithms, Applications of machine learning in business, Case studies of companies using machine learning	L1, L2	9
Module 3: Deep Learning What is deep learning?, Neural networks, Convolutional neural networks (CNNs), Recurrent neural networks (RNNs), Applications of deep learning in business, Case studies of companies using deep learning	L1, L2	9
Module 4: AI for Decision Making How can AI be used to improve decision making?, AI-powered analytics and reporting, Predictive modeling and forecasting Optimization and simulation, AI-driven marketing and customer relationship management	L1, L2,L3	9
Module 5: The Future of AI in Management The ethical implications of AI, The challenges of implementing AI The future of work in an AI-powered world,How to prepare for the AI revolution	L1,L2,L5	9
P - Project; This would be the field project related to the subject where the student need to work outside the class collect the data and make report .	L3 , L4	15

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**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis L5-Synthesis; L6-Evaluation*

References

Akerkar, R. (2019). *Artificial intelligence for business*. Springer.

Harmon, P., & King, D. (1985). *Expert systems: Artificial intelligence in business*. John Wiley & Sons, Inc..

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	--	--	--	--	--	--	--	1	--	--	--
CO2	1	--	--	--	--	2	--	--	1	--	--	--
CO3	1	2	--	--	--	--	--	--	1	--	--	--
CO4	1	--	--	--	--	--	--	2	1	--	--	--

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DMGT2703	SUSTAINABILITY MANAGEMENT	L	T	P	C
Version 1.1	Latest Updated	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Description: This cross-disciplinary graduate course provides a holistic overview of the environmental, social, economic and governance (ESEG) aspects of sustainability management and how to address them strategically to maximize business and product performance to meet changing stakeholder expectations. You will have the opportunity to learn about a variety of sustainability challenges faced by a variety of industry sectors, such as: mitigation and adaptation to climate change; energy, water, materials and resource management; minimizing supply chain risks that can derail business continuity. Internationally recognized frameworks, best practices, methodologies, tools and standards will be introduced as vehicles to tie the concepts together for practical application of solutions that support leadership in sustainability performance improvement.

Course Objectives: This course is for aspiring sustainability change agents who wish to gain a broader and deeper understanding of business and product strategic sustainability management from multiple stakeholder perspectives that make up the business-to-business value chain. This course is for you--- if you believe that businesses can and should be a thriving force for good in the world with products that do not harm the environment or social wellbeing. As a student, you seek to understand, facilitate and influence how stakeholders can collaborate to lead the development and implementation of transformative management systems and programs for a sustainably prosperous world for all.

Course Outcomes: At the end of this course, you will be able to:

• Identify the drivers, risks, challenges and opportunities associated with addressing sustainability management challenges.

• Apply the guiding principles and values that are a foundation for a holistic mind-set that guides an effective sustainability vision, strategy and implementation plans.

• Identify the factors in developing a credible business case for common sustainability management approaches that deliver actual improvements and breakthrough sustainability performance.

• Navigate common and conflicting needs, perspectives and interests of multiple stakeholder groups, cross-sector, cross-disciplinary, cross-functional and industry-specific perspectives.

• Promote strategic benefits of integrating and engaging the business value chain from suppliers through to end customers for achieving and communicating breakthrough sustainability outcomes.

• Link systems thinking and life cycle thinking to core business strategy and decision-making using product life cycle assessment based on international ISO standards.

Modules	Blooms level*	Number of hours
Module 1- Introduction – Global Challenges (Climate Change, Biodiversity Loss, Rising Inequality, and Resource Depletion), Sustainability- Global Sustainability Initiatives, Sustainable Approaches, SDGs and how are they linked ESG, Requirement of ESG, Value Creation Opportunities and Benefits From ESG, Setting up an ESG Strategy, Sustainable Supply Chain and its Decarbonisation, Sustainable Procurement.	L1, L2, L4	10

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Module 2 Introduction to Decarbonisation- Key terms, Decarbonisation Strategies, Challenges of Decarbonisation, Solutions and Initiatives, Role of Technology in Decarbonisation, Economic Impacts, Societal and Cultural Aspects, Measurement policies, Future prospects. Renewable Energy- Environmental Significance & its role in combating climate change, Sustainability & Resource renewal, Types of Renewable Energy, Importance of Renewable Energy, Challenges and Considerations, Future prospects -The role of Renewable Energy in a sustainable future, Call to action.	L1, L2,L4,L5	10
Module 3 Introduction - green hydrogen, Advantages & Disadvantages, The Impact of Green hydrogen, The Indian scenario, Uses of Green hydrogen. Introduction & history EV- Types of Electric vehicles, Advantages & Challenges, key components, Market trends, Indian Scenario, Future of EVs, Introduction & Types of Sustainable fuels, Advantages & Challenges, Indian Scenario.	L1, L2, L4, L5	10
Module 4 Introduction to Carbon Credits- Definition of Carbon Credits, Purpose and Significance, Historical Background, Types of Carbon Credits, Regulatory Framework, Carbon Credit Standards, Carbon Accounting and Measurement, Project Types Eligible for Carbon Credits, Carbon Credit Certification Process. Carbon Credit Market- Carbon Credit Pricing, Carbon Credit Trading Platforms, Voluntary vs. Compliance Markets, Challenges and Controversies, Benefits of Carbon Credits, Indian Energy Scenario and future outlook.	L1, L2,L3, L4	10
Module 5 ESG reporting- companies' Non- Financial Information report, use ESG reporting, improve your ESG sustainability reporting and score, Benefits of reporting, ESG reports includes, ESG score or rating, ESG regulations, Aligning with NGRBC Principles. BRSR- Nine Principles of BRSR, Key Concepts in BRSR, Frameworks and Guidelines for BRSR, The pillars of BRSR, Alignment of BRSR principles with the SDGs, Implementation and Benefits, Challenges.	L1, L2, L3, L4	10
Module 6 SEBI Circulars related to BRSR- Introduction to Cost of Capital and ESG- the Relationship between Cost of Capital and ESG, Factors Affecting Cost of Capital and ESG Integration, Measurement and Assessment, ESG Risk Management, Challenges and Trade-offs, Future Trends. Green Bonds- Market Growth, Types of Green Bonds, ESG Data Collection- Investor's Perspective on ESG- ESG Risk and Opportunity, GRI-Introduction, Structure, Benefits and Limitations of GRI, TCFD and its mission, Benefits of TCFD, Scenario Analysis, ISSB standards, GHG Emissions and Net Zero.	L1, L2, L4	10

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination Scheme:

Components	**CT**	**HA**	**C**	**V**	**A**	**EE**
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; **HA -** Home Assignment; **P -** Project; **S -** Seminar; **V** - Viva; **Q** - Quiz; **CT** - Class Test; **A** - Attendance; **EE** - End Semester Examination

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Text and Reference Books:

1. Steve Cohen, William Eimicke, Alison Miller, Sustainability Policy: Hastening the Transition to a Cleaner Economy.
2. Black and Cherrier (2010). "Anti-consumption as part of living a sustainable lifestyle: Daily practices, contextual motivations and subjective values." Journal of Consumer Behavior.
3. Lueneburger and Goleman (2010). "The Change Leadership Sustainability Demands." MIT Sloan Management Review.
4. Weber, Elke (2017). "Breaking cognitive barriers to a sustainable future," Nature Human Behavior.
5. Jose Galan, "How I Did It: The CEO of Iberdrola on Committing to Clean Energy".

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DBUA2701	TEXT ANALYTICS	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/ Exposure					
Co-requisites					

Catalog Description: The following module aims to provide an exposure to students based on Natural Language Processing Techniques, Algorithms and Analytics based on Textual Data. The module comprises of NLP basics, Feature Extraction, Relationship Extraction, Text Categorization, Clustering and Topic Modelling Algorithms and Practices.

Course Objectives

The course introduces the concepts of Text Analytics, Unstructured Information Analysis for better decision making by deriving valuable insights. The course will help the students understand the roots behind Text Mining which evolved from Machine Learning, Natural Language Processing and Statistics. Upon completion, students are expected to be able to describe basic concepts and methods of Text Mining, Information Extraction, Text Classification and Clustering, Topic Modelling.

Course Outcomes

After the successful completion of this module, students will be able to:
CO1: Understand approaches to Syntax and Semantics in NLP.
CO2: Understand various methods for Statistical approaches to Machine Translation.
CO3: Build Models which extract information from Textual Unstructured Data.
CO4: Understand and implement Topic Modelling and Probabilistic Models for Information Extraction.
CO5: Implement and deploy programs based on Relationship Extraction, POS Tagging and Clustering Algorithms based on NLP.

Modules	Blooms level*	Number of hours
Module 1: Introduction to Text Mining Basics of Text Mining, Natural Language Content Analysis, Core Text Mining Operations, Associations, Using Background Knowledge for Text Mining, Domain Ontologies, Domain Lexicons. Text Mining Pre-processing Techniques, Task Oriented Approaches, NLP Tasks, Tokenization, Part-of-Speech Tagging, Syntactical Parsing and Shallow Parsing.	L4,L5	10
Module 2 Extracting Features, Relations from Text Finding Implicit Features, Finding Opinion Phrases and their Polarity, Context-Specific Word Semantic Orientation, Analysis of Word and Document Frequency, tf-idf, Zipf's Law, bind tf_idf Function, Subsequence Kernels for Relation Extraction, Capturing Relation Patterns with a String Kernel.	L2, L3,L6	5
Module 3 Text Categorization and Clustering Applications of Text Categorization, Document Representation, Knowledge Engineering Approach to Text Categorization, Machine Learning Approach to Text Categorization, Evaluation of Text Classifiers. Clustering Tasks in Text Analysis, Clustering Algorithms and Clustering of Textual Data.	L2, L5	10

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Module 4 Relationships between Words Tokenizing by N-gram, Counting and Filtering N-gram, Analysing Bigrams to provide Context in Sentiment Analysis, visualizing a Network of Bigrams using ggraph, Counting and Correlating Pairs of Words with the widyr Package, Counting and Correlating among Sections, Examining Pairwise Correlation	L2,L5	10
Module 5 Topic Modelling and Probabilistic Models for Information Extraction Latent Dirichlet Allocation, Word Topic Probabilities, Per-Document Classification, By-words Assignments, Alternative LDA Implementations. Hidden Markov models, Stochastic Context Free Grammar, Conditional Random fields, Parallel Learning Algorithms.	L2, L6	10
Field Work	L4,L5,L6	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

References

1. Julia Silge, David Robinson, 2018, *Text Mining with R-A Tidy Approach*, O'Reilly
2. Matthew L. Jockers, 2014, *Text Analysis with R for Students of Literature*, Springer.
3. James Pustejovsky, Amber Stubbs, 2012, *Natural Language Annotation for Machine Learning*, O'Reilly.
4. Steve R. Poteet, 2007, *Natural Language Processing with Text Mining*, Springer.
5. James Sanger, Ronen Feldman, 2002, *The Text Mining Handbook: Advanced Approaches in Analysing Unstructured Data*, Cambridge.
6. David Feldspar (2018). Text Analytics: Practical Steps to Sort Data. A to Z Publishing.
7. Brandon M. Stewart, Justin Grimmer, Margaret E. Roberts, (2022), Text as Data: A New Framework for Machine Learning and the Social Sciences, Princeton University Press.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme: Components	**CPA**	**TP**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	5	5	5	5	10	70

CT: Class Test, HA: Home Assignment, V: Viva, EE: End Semester Examination; A: Attendance, C: Case Analysis

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	2	--	--	--	--	--	--	1	--	--	--
CO2	--	1	--	--	--	--	--	--	1	--	--	--
CO3	--	--	--	--	--	--	--	1	1	--	--	--
CO4	--	1	--	--	--	--	--	--	1	--	--	--
CO5	--	1	--	--	--	--	--	2	1	--	--	--
CO6	--	1	--	--	--	--	--	2	1	--	--	--

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DBUA2739	BASICS OF RESEARCH METHODOLOGY, ETHICS, AND RESEARCH COMMUNICATION	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description

This course aims to provide students with a comprehensive understanding of conducting ethical research, utilizing proper research methodologies, and effectively communicating research findings. The course includes a final project where students will write a Literature Review on a topic chosen in consultation with the teacher(s).

This course is designed to equip students with essential skills and knowledge to conduct ethical research, employ proper research methodologies, and effectively communicate scientific information (with focus on writing a literature review). The course will cover topics such as research design, data collection and analysis, research ethics, and science communication strategies. Through a combination of lectures, discussions, case studies, and practical exercises, students will develop a deeper understanding of the research process and its ethical implications.

Course Objectives

The objective of this course is to impart knowledge about various stages of research process, research ethics and different ways of research communication.

The aim of this course is to impart research skills to the beginners and help to improve the quality of research by the existing researchers. It also encompasses the understanding and application of appropriate research design, statistics, and the use of the computer for reference management, report writing, research paper writing and presentation. The course also introduces the key conceptual issues of each research method, as well as giving practical guidance. It covers the series of research methodology contents: from problem formulation, to design, to data collection, analysis, reporting and dissemination. The course has the dual aims of equipping students with conceptual understandings of current academic debates regarding different methods, and the practical skills to put those methods into practice.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define criteria of good research, steps in research process, and data collection.

CO2. Identify different types of sampling and its purpose.

CO3. Conduct hypothesis testing for different types of samples and interpret the results.

CO4: Learn the importance of literature review, write research paper/thesis, use reference management software.

Course Content :

Module	Topic	**Blooms level***	Hours

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1	**Research Methodology** Understanding the research process: From research questions to conclusions Types of research: Qualitative and quantitative research Exploratory, descriptive, experimental, and correlational studies Scientific Thinking: Subjective Vs. Objective Thinking Logical Reasoning: Inductive Vs. Deductive Reasoning Formulating research hypotheses and objectives Purpose of a good research, Criteria of good research	L1, L2	10
2	**Descriptive Statistics** Data, Types of Data, Methods of data collection, Benefits and drawbacks, Graphical representation of data and interpretation. Measures of Central Tendency: Arithmetic Mean, Median, Mode, Measures of Dispersion: Range, Standard Deviation, Variance, Coefficient of Variation.	L1, L2, L3	15
3	**Inferential Statistics** Sampling: Basic concepts, Process of Sampling, Sample Size, Types of Samples, Sampling and non- sampling errors, Statistics and Parameters, Sampling Distribution of Means and Proportion, **Hypothesis Testing**, steps in testing of hypothesis, errors in hypothesis testing, z test and t test.	L1, L2, L3	15
4	**Research Ethics** Plagiarism, Fabrication, Falsification, Ethics with respect to human and Animal Research	L1, L2	5
5	**Communication** Characteristics of a good Research paper, Systematics Literature Review (choosing a topic, preparing outline, gathering authentic & appropriate references, avoiding plagiarism, use of reference management systems), Writing a good literature review, Structure of report (Introduction, Methodology, Analysis, Results, Discussions, Conclusions, Recommendations), Writing Quality Research Paper, Publishing Research Work in Quality Journals, Reference Management Software	L1, L2, L3	15

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional Exam	End Term Examination
Weightage (%)	5	10	15	70

Project based assignment: Student teams (2-3 students per team) will write a literature review on a topic of choice, in consultation with the teacher.

Text books/ Reference books

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- Research Methodology for Natural Sciences by Soumitro Banerjee, Publisher: IISc Press (1 January 2022); ISBN-10: 8194835178; ISBN-13: 978-8194835172
- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt. Ltd., New Delhi-110001
- Geode, Millian J.& Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Kothari, C.R.2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.
- Levin R I., Rubin D S. Statistics for Management. Sixth Edition, PHI
- Kapoor & Gupta. Probability & Statistics. S Chand Publishers, New Delhi.
- Montomery, Douglas C.(2007), 5th Ed. Design and Analysis of Experiments, Wiley India.
- Cooper, Donald R. and Pamels Schindler, Business Research Methods, Tata McGraw Hills, New Delhi
- Krishnaswamy, K.N. Sivakumar. Appa lyer and Mathiranjan M. 2006, Management Research Methodology: Integration of Principles, Methods and Techniques, Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Sachdeva, J.K. 2008. Business Research methodology. Himalaya Publishing House, New Delhi.
- Shekharan, Uma, Business Research Methods, Miley Education, Singapore.
- Zikmund, Millian G., Business Research Methods, Thomson Learning, Bombay.

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SEMESTER-VIII

DMGT2801	STRATEGIC LEADERSHIP	L	T	P	C
Version 1.1	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description:
This course introduces the concept of Strategic Leadership. Strategic leadership is a practice in which executives, using different styles of **management**, develop a vision for their organization that enables it to adapt to or remain **competitive** in a changing economic and technological climate. Strategic leaders can use this vision to motivate employees and departments, fostering among them a sense of unity and direction to implement change within their organization. The main objectives of this course is to understand that how strategic leaders streamline processes, boost strategic productivity, promote innovation and cultivate an environment that encourages employees to be productive, independent and to push forward their own ideas and how to manage the make use of reward or incentive programs to encourage employees and help them reach their goals.

Course Objectives
The objective of this course is to:
1. Introduce students to the key concepts, tools and principles of Strategy and leadership and strategic Leadership.
2. Expose the students to the various approaches in crafting business strategy, tools that aid in reasoning carefully about strategic options, and learning how companies use what-if analysis to evaluate action alternatives and make sound strategic decisions.
3. Develop an understanding of the concept of leadership and different styles of leadership and models.
4. Expose the students to the various approaches in crafting business strategy, tools that aid in reasoning carefully about strategic options, and learning how Leadership can be instrumental of achieving these objectives.

Course Outcomes
On completion of this course, the students will be able to
CO1: Identify and determine the concept of strategy, Mission, Vision and Strategic Management Process.
CO2: Analyze and understand the concept Leadership its theories, Styles and Models and Strategic Leadership
CO3: Analyze the concept of how Leadership can be instrumental in Strategic formulation and implementation
CO4: Analyze the concept of Strategic Leadership and Change Management and Agile Leadership and Counseling

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Modules	Blooms level*	Number of hours
MODULE I-Introduction and Purpose of Strategy Concept of Strategy, corporate, Business and Functional Levels of Strategy, Mission, Vision, Objectives, Approaches to four Phases in Strategic Management Process, Stakeholders in business and their roles in strategic management, Strategic decision making	L1, L2	2
MODULE 2: Leadership: Importance of leadership, Roles of a Leader, Overview of Organizational Leadership Major Coursework and Issues in Organizational Leadership Theories of Leadership, Leadership Traits, Leadership Skills, Leadership Styles, Levels of Analysis of Leadership Theory – Leadership Traits and Ethics: Leadership Behavior and Styles, Process Theories: Reinforcement Theory, Contingency Leadership Theories and Models, normative leadership theory,	L1,L2, L3	7
MODULE 3: Introduction To Strategic Leadership Definition and **Qualities** of a Strategic Leader, Strategic leadership skills and characteristics, How to Become a Strategic Leader Strategic leadership vs. other classifications of leadership, strategic leadership environment challenges of strategic leadership Examples of Strategic Leaders,. Integrating Strategy and Leadership, Mission and Vision: The Heart of Strategic Leadership, Leadership and Systems Thinking, Describe the relationship between strategy and operations	L1, L2, L3	9
MODULE 4: Strategic Leadership Model/TYPES Transactional Leaders, Transformational Leaders Sigruficance of Transformational Leadership Types of Transformational Leaders Intellectual Reforms Revolutionaries Charismatic Role of Transformational Leadership in What Strategies do Transformational Leaders Use ,Charismatic-Visionary Leadership Team Leadership – Strategic Leadership Models	L1, L3,	10
MODULE 5: Strategic Leadership and Change Management, Leading High-performance Teams, Leading organisations into a new paradigm/ growth strategies	L1,L2 L3,	8
Module 6: Agile Leadership and Coaching and counseling Applying positive psychology and positive psychological capital Coaching models & framework, Coaching skills practice, Creating a coaching culture in organizations. Reflection and action planning	L1,L2 L3	10
P - Project; This would be the field project related to the subject where the student need to work outside the class collect the data and make report .	L3 , L4	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis L5-Synthesis; L6-Evaluation*

Text Books

1.Pearce & Robinson,2012, Strategic Management Formulation Implementation & Control, 12th Edition, McGraw Hill

2.Steven J. Stowell (Author), Stephanie S. Mead (Author)2016 Art Of Strategic Leadership, **Wiley; 1st edition**

3. John Adair (Author) Strategic Leadership: How to Think and Plan Strategically and Provide Direction, **Kogan Page Ltd; 1st edition**

Reference Books

1.Lynch,2006, Corporate Strategy, 4th Edition, Pearson.

2. Ramaswamy & Namakumari, 1996, Strategic Planning for corporate success,

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Sage Publications.
3. Michael E. Porter, 1998, Competitive Advantage, Crafting & Executing Strategy, Free press.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	--	--	--	--	--	--	--	1	--	--	--
CO2	1	--	--	--	--	2	--	--	1	--	--	--
CO3	1	2	--	--	--	--	--	--	1	--	--	--
CO4	1	--	--	--	--	--	--	2	1	--	--	--

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DBUA2801	BUSINESS RESEARCH METHODS	L	T	P	C
Course Version	Latest Approved	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Catalogue Description:
The main objective of the course is to equip the students with the basic understanding of research methodology in changing business scenario. It will also provide them an insight into the application of dynamic analytical tools to face the stormy challenges aimed at fulfilling the purpose of business decision making.

Course Objectives :
The objectives of this course are to ensure that students are able to-

1: Understand the basic framework of research process.
2: Comprehend of various research designs and techniques.
3: Identify various sources of information for literature review and data collection.
4: Understand some basic concepts of research and its methodologies.
5: Understand as how to organize and conduct research in a more appropriate manner and write a research report, thesis and a research proposal.

Course Outcomes :
On completion of this course, the students will be able to:
CO1: Apply a range of quantitative and / or qualitative research techniques to business and management problems / issues
CO2: Determine and apply research approaches, techniques and strategies in the appropriate manner for managerial decision making
CO3: Demonstrate knowledge and understanding of data analysis and interpretation in relation to the research process
CO4: Synthesize and Evaluate different research approaches utilised in the different industries and be able to critically assess the overall process of designing a research study from its inception to its final report preparation.

Modules	Blooms level*	Number of hours
Module I: Introduction Meaning of research, importance of scientific research in business decision making, types of research, complete research process, research methodology, criterion for good research, Identification of research problem and formulation of hypothesis, research designs, drafting a research proposal	L1, L2	9
Module II: Measurement and Data Collection Primary data, secondary data, design of questionnaire, sampling fundamentals and sample designs, Qualitative and quantitative research, measurement and scaling techniques, measures of central tendency mean, median, mode; measures of dispersion, data processing	L1, L2,L3,L4, L6	9

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Module III: Data Analysis I Cross tabulation, univariate analysis, bivariate analysis: Correlation, Karl Pearson's coefficient of correlation, Spearman's coefficient of correlation, hypothesis testing, t-test, Z test, F-test, Chi- square test, Analysis of variance, Non-parametric tests: Sign test, Run test, Krushall-Wallis test	L1, L2,L3,L4,L5,L6	9
Module IV: Data Analysis-II Simple linear regression: coefficient of determination, significance tests, residual analysis, Multivariate techniques: multiple linear regression: Multiple coefficient of determination, interpretation of regression coefficients, heteroscedasticity, multicollinearity, outliers, auto regression, factor analysis, cluster analysis (concept)	L1,L2,L3,L4,L5,L6	9
Module V: Report Writing Pre-Writing Considerations, structure of research report, common problems encountered while preparing the research report, presentation of research report, ethical issues while preparing a research report	L1,L2,L3,L4,L6	9
Fieldwork		15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Book:

Cooper, R.D., Schindler, S. P. and Sharma, J.K. (2015). Business Research Methods. New Delhi, India: McGraw Hill Education (India) Private Limited

Reference Book/s:

1 .Zikmund, William C (1997). *Business Research Methods (5th Ed.)*. The Dryden Press, Harcourt Brace College Publishers

2 Levin & Rubin (2004), Statistics for Management, 8th Ed, Prentice Hall of India

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CT**	**HA**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	5	5	5	5	10	70

CT: Class Test, HA: Home Assignment, Q/S: Seminar/Viva/Quiz, ME: Mid Term Exam EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	--	-	--	--	--	-	--	1	3	-	-
CO2	1	1	-	--	--	-	--	-	-	1	2	-	-
CO3	1	2	--	-	--	--	-	--	--	1	3	-	-
CO4	1	1	--	--	3	-	2	--	--	1	3	2	2

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DBUA2802	ECONOMETRICS	L	T	P	C
Version 1.1	Latest Approved	3	1	0	4
Pre-requisites/ Exposure					
Co-requisites					

Catalog Description

This course offers both fundamental and strategic understanding on identification of business problem and how to approach that problem using econometric techniques. This course facilitates a good learning on the estimation of parameters and forecasting of any indicator/variable related to business/ economy at both micro and macro level. Also, this course covers the quantitative analysis, model building and policy making for any economic/business problem. The course starts with simple and multiple linear regressions, followed by topics of special interest to deal with model specification, endogenous variables, binary choice data, and time series data. The aim of the course is to make the students familiar with statistical techniques and quantitative analysis.

Course Objectives

The objective of this course is to

1. Provide a good understanding on identification of problem, estimation of parameters and interpretation of results.
2. Equip the students with major statistical tools and techniques using various statistical software such as STATA, R, SPSS, Eview.
3. Explore statistical techniques and demonstrate through practical examples and interactive experiments.
4. Facilitate hands on experience to various real world business problems.

Course Outcomes

On completion of this course, the students will be able to

CO1: Translate data into models to make forecasts and to support decision making in a wide variety of fields, ranging from macroeconomics to finance and marketing.

CO2: Use statistical software or programming languages to combine data sets and estimate econometric models.

CO3: Analyse time series, cross sectional and panel data using appropriate statistical models.

Modules	Blooms level*	Number of hours
MODULE 1: Parametric Tests Nature, meaning and scope of econometrics; Simple and general linear regression model —Assumptions, Estimation (through OLS approach) and properties of estimators; Gauss-Markov theorem; Concepts and derivation of R2 and adjusted R2; Concept and analysis of variance approach and its application in regression analysis.	L1, L2,L3,L4,L5,L6	8

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MODULE 2: Autocorrelation Nature, test, consequences, and remedial steps of problems of autocorrelation **Project 1:** Autocorrelation for time series analysis	L1, L2, L3, L4,L5,L6	9
MODULE 3: Heteroscedasticity Nature, test, consequences, and remedial steps of problems of heteroscedasticity. **Project 2:** Heteroscedasticity for cross section data analysis	L1, L2,L3,L4,L5,L6	9
MODULE 4: Multicollinearity Nature, test, consequences, and remedial steps of problems of Multicollinearity. **Project 3 -** Multicollinearity for panel data analysis	L1, L2,L3,L4,L5,L6	10
MODULE 5: Non-Parametric Tests Dummy variable technique, Testing structural stability of regression models, Stationarity Tests, Logit, Probit and Tobit models — Applications.	L1, L2, L3,L4,L5	9
Field Work	L3,L$,L5,L6	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis; L6-Evaluation*

Text Books

1. Gujarati, D.N. (2017), *Basic Econometrics* (5th Edition), McGraw Hill, New Delhi.
2. Theil, H. (1981), *Introduction to Econometrics*, Prentice Hall of India, New Delhi.
3. G.M.K. Madnani (2015), Introduction to Econometrics: Principles And Applications, Oxford & IBH Publishing Co Pvt.Ltd.

Reference Books

1. Suresh K. Ghoshe, *Econometrics*, Prentice Hall of India Private Limited, New Delhi (2003)
2. A. Koutsoyiannis, *The theory of Econometrics: An introduction exposition of econometric methods*, Educational low-priced books scheme, McMillan Education (1992)
3. Christopher Dougherty, *Introduction to Econometrics*, Oxford University Press (3rd edition)
4. Amemiya, T. (1985), *Advanced Econometrics*, Harvard University Press, Cambridge, Mass.
5. Baltagi, B.H. (1998), *Econometrics*, Springer, New York.
6. Dongherty, C. (1992), *Introduction to Econometrics*, Oxford University Press, New York.
7. Goldberger, A.S. (1998), *Introductory Econometrics*, Harvard University Press, Cambridge

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	Project	EE
Weightage (%)	5	10	5	10	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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DBUA2803	SOCIAL MEDIA ANALYSIS	L	T	P	C
Version 1.1	Latest Approved	3	1	0	4
Pre-requisites/ Exposure					
Co-requisites					

Catalog Description
This module comprises of advanced disciplines and Modules pertaining to Analytics, Data Acquisition via web, Understanding and analysing Unstructured Data along with the future implementations and growth in the discipline of Analytics.

Course Objectives
This course aims at giving exposure on the advanced aspects with regards to Analytics. The course comprises of social media, Mobile, Text Analytics along with Web Scraping and the future advancements in the field of Analytics.

Course Outcomes
Upon successful completion of this module, students should be able to:
CO1: Apply and use Social Media Analytics for the betterment of the business.
CO2: Use Mobile Analytics for solving complex business problems and to stop churn.
CO3: Evaluate the business problem and apply analytics techniques for better output.
CO4: Analyse and understand patterns and techniques in social media & Mobile Analytics to solve complex problems.

Modules	Blooms level*	Number of hours
MODULE 1: Overview Social Media, On-Line Social Network, Off-Line Social Network, Metrics and Measurement, Dashboard, Target Audience, Desired Action, Content, Market Research Online Comm Moduleies, Cluster Analysis, Conjoint Analysis, Multidimensional Scaling, Social Media Listening, Social Media Scoring, Social Media Modelling.	L1, L2,L3,L4,L5,L6	8
MODULE 2: Mobile Analytics Understanding Mobile Analytics Concepts, difference between Mobile Analytics and Site Analytics, Natural language Processing with Mobile Analytics, Text Mining for Mobile Analytics, Mobile Analytics Tools, Churn Analytics.	L1, L2, L3, L4,L5,L6	10
MODULE 3: Text Analytics Text Data, Sources of Text Data, Information Clusters, Patterns, Trends, Tagging, Natural Learning Process, Lexical Analysis, Social Network Nodes, Linkage Structure, Node Labelling, Content-Based Classification, Word Stemming, Stemming Algorithms, Polarity of the Attitude, Psychological Profiling, Sentiment Analysis.	L1, L2,L3,L4,L5,L6	9

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MODULE 4: Web Scraping Web Scraping of unstructured data, Gathering data from HTTP and HTTPS format, Web Scraping from XML and JSON file, Regular expressions, Extraction Strategies, Term Document Matrix, Data Cleansing, Data Manipulation and Data Transformation after Scrapping.	L1, L2,L3,L4,L5,L6	9
MODULE 5: Future of Analytics Introduction to Big Data, Predictive Analysis for Business, Social Information Processing and Distributed Computing, Advances in Machine Learning, Traditional Data Models Evolve, Analytics to Solve Social Problems, Location Based Data Explosion, Data Privacy Backlash, Internet of Things, Artificial Intelligence.	L1, L2, L3,L4,L5	9
Field Work	L4,L5,L6	15

References

1. Galit Shamuelli, 2017, *Data Mining for Business Analytics: Concepts, Techniques and Applications with R*, Wiley.
2. Luis Torgo, 2017, *Data Mining with R: Learning Case Studies*, Chapman.
3. Zaki & Meira, 2014, *Data Mining and Analysis Fundamental Concepts and Algorithms*, Cambridge.
4. Han, Kamber & Pei, 2013, *Data Mining: Concepts and Techniques*, Morgan Kaufmann.
5. Han, Jiawei and Kamber, Micheline, 2012, *Data Mining: Concepts and Techniques*, Morgan Kaufman.
6. KUMAR, Social Media Analytics and Practical Applications 1st Edition 2022, CRC Press.
7. Ganis/Kohirkar, SOCIAL MEDIA ANALYTICS, 1st edition, Pearson Education India.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CT**	**P**	**A**	**EE**
Weightage (%)	10	15	5	70

CT: Class Test, HA: Home Assignment, V: Viva, EE: End Semester Examination; A: Attendance, C: Case Analysis

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	2	--	--	--	--	--	--	1	--	--	--
CO2	--	1	--	--	--	--	--	--	1	--	--	--
CO3	--	--	--	--	--	--	--	1	1	--	--	--
CO4	--	1	--	--	--	--	--	--	1	--	--	--
CO5	--	1	--	--	--	--	--	2	1	--	--	--
CO6	--	1	--	--	--	--	--	2	1	--	--	--

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DBUA2839	DATA ANALYSIS & VISUALISATION USING SOFTWARE	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	Class X Mathematics				
Co-requisites					

Catalog Description

The implosion of available data has made visualization more critical but also more challenging. Data analysis and Data Visualization are essential tools for business analysis, engineers, policymakers, and decision-makers. Developed originally for "small data", visualization techniques have been met with varied success in the past centuries and decades. There are a few well-known visualizations that are very effective in capturing the essence of the data, and of course, there are many infamous negative examples of poor visuals. An effective visual is critical for decision making it, but it also requires a lot of work, customization, attention to detail, and refinements.

Course Objectives

The course is designed to help students develop skills and knowledge in the following area(s):

- Develop an understanding of what is a good visualization for a given purpose
- Learn visualization theory & techniques
- Build a substantial data analytic project
- Apply data analysis and visualization with Excel, SPSS, R, Python, NVivo and MATLAB

Course Outcomes

On completion of this course, the students will be able to

CO1. Students will be able to articulate meaningful lines of inquiry that might be explored through the collection, organization, visualization, and analysis of data in a context associated with their primary field of study using (as appropriate) numerical, textual, spatial, and/ or visual data.

CO2. Student will understand what data are, how they are collected, and how to assess the quality/ reliability of data.

CO3. Students will demonstrate intermediate proficiency in the visualization of data to communicate information and patterns that exist in the data.

CO4: Students will be able to use at beginning level of proficiency the tools of statistics and machine learning to ask questions of and explore patterns in data.

Course Content :

Module	Topics Covered	Blooms Level	Contact Hours

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1	**Module-1: Introduction to Excel** Data Analysis using Excel, Curve fitting, Correlation, Linear Regression, Multiple regression, Principal Component Analysis and Factor Analysis, Hypothesis testing **Introduction to Excel and SPSS** Introduction to SPSS and Types of Data, Importing, exporting and data handling in SPSS; Exploratory data analysis using SPSS and data visualization; Introduction to statistical inference and various univariate tests by using SPSS; Analysis of Variance (One Way ANOVA, Two Way ANOVA and ANCOVA); Correlation, Simple and Multiple linear Regression Analysis; Principal Component Analysis and Factor Analysis	L1, L2, L3, L4	20 hours
2	**Module-2: VOS Viewer** **Web of Science, Scopus, Dimensions, Lens, and PubMed.** Co-authorship networks, citation-based networks, and co-occurrence networks can be created based on data downloaded from Web of Science, Scopus, Dimensions, and Lens. Co-authorship networks and co-occurrence networks can also be created based on PubMed data. **Crossref, Europe PMC, and OpenAlex**. Networks can also be created based on data retrieved through the APIs of Crossref, Europe PMC, and OpenAlex, These APIs can be queried interactively in VOS viewer. **Semantic Scholar, Open Citations, and Wiki Data.** For a given set of DOIs, networks can also be created based on data retrieved through the APIs of Semantic Scholar, Open Citations and Wiki Data.	L1, L2, L3, L4	10 Hours

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3	**Faculty of Management Studies & Behavioural Sciences** **Module 3: Domain Specific Software** **- Structural Equation Modelling** **Smart PLS** Introduction to Structural Equation Modelling (SEM), Introduction to the software's AMOS and SPSS, SMART PLS, Testing of Statistical assumptions, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), common method bias (CMB) test, Measurement Model Assessment, Discussing Fit Indices, Reliability and Validity Testing, Structural Model Assessment identifying multivariate outlier, Construct Validity: Convergent and Discriminant Validity, Measurement Model & Structural Equation Modelling, Mediation and Moderation Effects, Multi-Group Analysis.	L1, L2, L3, L4	30 Hours
	Faculty of Arts **N Vivo** 1. Import text, audio, video, emails, images, spreadsheets, online surveys, web content, and social media from various sources into a simple, intuitive interface. 2. Create and NVivo project, import and organise qualitative and quantitative data 3.Manage a literature review in NVivo 4. Autocode structured data deductively and identify themes inductively 5. Generate and falsify hypotheses 6. Combine data in sets for analysis 7. Seek patterns and identify relationships across codes and cases 8. Present findings using visualisations 9. Export data out of NVivo 10. Coordinate teamwork.		

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	Faculty of Science Engineering and Technology **Faculty of Health & Allied Sciences** **R programming / Python/ MATLAB** **R Programming-** Introduction to R, Variables and datatypes in R, Dataframes, Recasting and joining of dataframes, Arithmetic, logical and matrix operations in R, Functions in R, Control structure in R, Data visualization in R. **Python Programming-** Basics of programming, data structure and algorithm using Python, Strings, lists, control, functions, manipulating lists, loops, arrays, selection sort, insertion sort, recursion, sorting, dictionaries, exception handling, file handling, string processing, data analysis using Python **MATLAB Programming-** Introduction, basic features, managing workspace, mathematical functions, basic plotting, Matrices, array operations and linear equations, MATLAB programming- M files script, M-file functions, control flow and operations.		

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional (Theory/ Practical)	End Term Examination
Weightage (%)	5	10	15	70

References:

- David Houcque, 2005. Introduction to MATLAB programming for Engineering students., Northwestern University, E- Book **https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf**
- Mark Lutz, 2009. Learning Python. O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.
- Emmanuel Paradis, 2005. R for Beginners. E book. **https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf**
- A Handbook of Statistical Analysis using SPSS by Dr. Brijesh Awasthi, Redshine Publication.

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Master of Business Administration

ACCOUNTING FOR MANAGEMENT

Course Code: MGT4102 **Credit Units: 03**

Course Objective:
Participants in this course will develop the essential ability of all managers, to use complex accounting information as a platform for decision-making. As the course unfolds, participants will build an increasingly sophisticated level of understanding of the language of accounting and its key concepts. In addition the course develops skills in interpreting earnings statements, balance sheets, and cash flow reports. This ability to analyze financial statements will enable participants to deal more effectively with strategic options for their businesses or business units.

Course Contents:

Module I: Introduction
The Financial Accounting Framework, Accounting Policies, Need of Accounting. Users of Accounting Information, Accounting Cycle, Accounting and Management Control.Balance sheet-Dual Aspect principle, Classification Items of Balance Sheet, Formats of Balance Sheet.Preparation of Balance Sheet. Income Statement- Realization vs. Accrual Principle, Format of Income Statement), Preparation of Income Statement (IAS,GAAP&IFRS) Depreciation Accounting.

Module II: Measuring and Reporting
Measuring and Reporting :Cost of sales and Inventories, Debentures, Investments, Shareholder Equity. Human Resource Accounting-Valuation of Human Resources, Recording and Disclosure in Financial Statements

Module III: Management Accounting
Contrast between Management Accounting and Financial Accounting and Reporting, Types of Management Accounting Information and their uses, General Observation on Management Accounting. Statement of Cash Flows-Profit versus Cash, Purpose and Use of Cash Flow Statement, Format of Cash Flow Statement (AS-3), Preparation of Cash Flow Statement (IAS,GAAP& IFRS).

Module IV: Analyzing and Interpreting Financial Statements
Financial Statement Analysis – Basic Relationship, Overall Measures, Profitability Ratios, Investment Utilization Ratios, Financial Condition Ratios, Making Comparisons.Du-pont analysis.Interpretations of calculated Ratios.

Module V: Cost Accounting: The behavior of cost- Relation of cost to volume, BEP & Profit graph-CVP analysis, Full cost and its uses. Techniques of costing.Standard costing.Strategic planning and budgeting.

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Examination Scheme:

Components	Assessment 1 Group Presentation	Assessment 2 In Class Quiz	Class Test/Mid Term Exam	Attendance	External
Weightage (%)	10	5	10	5	70

Core Text Book:

- Anthony, N.R; Hawkings, F. D; Merchant, A.K (2014), Accounting Text and Cases, 13th Edition, Mc Graw Hill.
- Ramachandran, N (2011), Financial Accounting for Management, 3rd Edition, Mc Graw Hill.

References Book:

- Bhattacharya, S.K. and Dearden, J, 3rd Edition, Accounting for Management, Text and Cases, Vikas Publishing house
- Narayanaswamy R (2014), Finanacial Accounting – A Managerial Perspective, 5th Edition, Prentice Hall of India.
- Maheshwari S N; Maheshwari SK and Maheshwari SK, 3rd Edition, A Text Book for Accounting for Management, Vikas Publishing House.
- M.N Arora 10th Edition, A Text Book of Cost and Management Accounting, Vikas Publishing House.

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QUANTITATIVE TECHNIQUES IN MANAGEMENT

Course Code: MGT4106 **Credit Units: 03**

Course Objective:
The aim of this course is to develop the understanding of various statistical tools used for decisions making and how each applies to and can be used in the business environment using contemporary software.

Course Contents:
Module I: Introduction
Application of Statistics in Business; Classification of Data; Interpretation of computer output of diagrammatic and graphical presentation of data, measures of central tendency, measures of dispersion and skewness.

Module II: Probability and Probability Distributions
Concepts of Probability, addition theorem, multiplication theorem, Baye's Theorem; continuous and discrete probability distribution:Binomial Probability Distribution, Poisson Probability Distribution and Normal Probability Distribution.

Module III: Sampling and Sampling Distribution
Sampling: Basic Concept, Types of Sampling, Errors and Precautions in sampling, size of sample, Parameter and Statistic, Sampling Distribution of the mean, Sampling distribution of proportion, Estimation – point estimation, Interval Estimation,

Module IV: Tests of Hypothesis
Null and Alternative hypothesis, One-Tailed and Two-Tailed tests of hypothesis, Type I and Type II error, rejection rule using p – Value and critical value approach. Hypothesis Testing to compare two populations: Test for one sample mean, Test for two population means (Independent Samples), Tests for two population means (Dependent Samples), Tests for two population proportions (Independent Samples), Tests for two population variances (Dependent Samples), F-test, Chi – Square Test

Module V: Forecasting Techniques
Correlation - Karl Person, Spearman's Rank methods, simple linear regression analysis – Estimated regression equation, least squares method, coefficient of determination, interpretation of computer output for Regression, Introduction to time series, trend analysis

Module VI: Introduction to SPSS, performing univariate and bivariate analysis on SPSS
Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text & References:

- Anderson D.R; Sweeny D.J, Williams T.A (2002), Statistics for Business and Economics, Cengage learning.
- KazinierL.J.,& Pohl N.F. (2004), Basic Statistics for Business and Economics, New York: McGraw Hill.
- Levin Richard I. & Rubin David S.(1998), Statistics for Management, Pearson Education India
- Stephen .K.C. (2002), Applied Business Statistics: Text, Problems and Cases. New York: Harper and Row.
- Sharma, J.K. (2007), Business Statistics, Pearson Education India.

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INFORMATION TECHNOLOGY AND E-COMMERCE

Course Code: MGT4109 **Credit Units: 02**

Course Objective:
This course will expose students to developments in computer technology and understand the working of a computer system. It will introduce end-user computing and build skills in using IT and understanding various technologies like internet, telecom, DBMS concepts, e-commerce etc. The course will expose the students to the latest trends in e-business models, electronic payment systems and data & information security

Course Contents:

Module I: Modern Computer Systems
Evolution of Computer Systems, Input, output and storage technologies, Computer Assisted Control and Automation, (e.g. Delhi Metro , Digitally Controlled Car engines etc.), Computer Controlled Biometric/RFID based Access Control , Contemporary hardware and software platforms(Open Source, Web Software etc.), Storage of Data Resources

Module II: Data Resource Management
Introduction to DBMS, Benefits of DBMS over traditional file system, Types of DBMS, Application of DBMS using MS-ACCESS / ORACLE as a tool for understanding of DBMS concepts.SQL Query handling, Forms, Concept of Data Warehouses and Data Marts, Introduction to Data Centers. Storage Technologies and Architecture (DAT, NAS, SAN etc.). Live examples of storage strategies of companies like Google, Amazon Wal-Mart dealing with storage crisis

Module III: Telecommunications and Computer Networks
Networked Enterprise :- Components, Types of networks, Advantages of Network Environment, Business Uses of Internet, Intranet and Extranet, Network Topologies, Web 2.0/3.0, Distributed/Cloud/Grid Computing, GSM & CDMA, GPRS ,Features of 3G & 4G technologies, VOIP and IPTV.

Module IV: Electronic Commerce Systems
Meaning, Definition, Concept, Features, Function of E-Commerce, E-Commerce Practices v/s Traditional Practices, Scope and basic models of E-Commerce, Limitations of E-Commerce, Precaution for secure E-Commerce, proxy services.

Module V: E-Commerce Business Models & EDI
Concept of EDI, Difference between paper based Business and EDI Based business, Advantages of EDI, Application areas for EDI, Action plan for Implementing EDI, Factors influencing the choice of EDI.Various business models in Ecommerce likeB2C, B2B, C2C.

Module VI: E-Payment Systems and Security Management
Transactions through Internet, Requirements of E-Payment system, Post paid payment system- Credit card solutions, Cyber cash Internet Cheques, Instant Paid payment system- Debit card, Direct Debit, Prepaid payment system- Electronic cash, Digicash, Netcash, Cybercash, Smart Cards.
The Information Security, System Vulnerability and Abuse, Security Threats (Malicious Software, Hacking etc.) and counter measure. Definition of Cyber Crime and Types.Antivirus, Firewalls, Anti-Spyware, Security Audit, Discussion on Overview of IT-ACT 2000.

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Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text & References:

- Norton P (2010), Introduction to Computers, Tata McGraw-Hill
- Potter T (2010), Introduction to Computers, John Wiley & Sons (Asia) Pvt Ltd
- Morley D & Parker CS (2009), Understanding Computers – Today and Tomorrow, Thompson Press
- Elias M Awad, Electronic Commerce from Vision to fulfilment, Third Edition, Pearson Education
- Ravi Kalakota& Andrew B. Shinston, Electronic Commerce – A manager's Guide, Pearson Education.
- Bhaskar Bharat, Electronic Commerce - Technologies & Applications, Tata McGraw Hill.
- J. Christopher & T.H.K. Clerk, Global E-Commerce, University Press.

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BUSINESS RESEARCH METHODS

Course Code: MGT4203 **Credit Units: 02**

Course Objective:
The main objective of the course is to equip the students with the basic understanding of research methodology in changing business scenario. It will also provide them an insight into the application of dynamic analytical tools to face the stormy challenges aimed at fulfilling the purpose of business decision making.

Course Contents:

Module I: Introduction
Meaning of research, importance of scientific research in business decision making, types of research, complete research process, research methodology, criterion for good research, Identification of research problem and formulation of hypothesis, research designs, drafting a research proposal

Module II: Measurement and Data Collection
Primary data, secondary data, design of questionnaire, sampling fundamentals and sample designs, Qualitative and quantitative research, measurement and scaling techniques, measures of central tendency mean, median, mode; measures of dispersion, data processing

Module III: Data Analysis I
Cross tabulation, univariate analysis, bivariate analysis: Correlation, Karl Pearson's coefficient of correlation, Spearman's coefficient of correlation, hypothesis testing, t-test, Z test, F-test, Chi- square test, Analysis of variance, Non-parametric tests: Sign test, Run test, Krushall-Wallis test

Module IV: Data Analysis-II
Simple linear regression: coefficient of determination, significance tests, residual analysis,
Multivariate techniques: multiple linear regression: Multiple coefficient of determination, interpretation of regression coefficients, heteroscedasticity, multicollinearity, outliers, auto regression, factor analysis, cluster analysis (concept)

Module V: Report Writing
Pre-Writing Considerations, structure of research report, common problems encountered while preparing the research report, presentation of research report, ethical issues while preparing a research report

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Case study must be included in the discussion.

Text & References*:*

- Cooper, R.D., Schindler, S. P. and Sharma, J.K. (2015). Business Research Methods. New Delhi, India: McGraw Hill Education (India) Private Limited
- Zikmund, William C (1997). *Business Research Methods (5th Ed.)*. The Dryden Press, Harcourt Brace College Publishers
- Kothari C R, (2014) Research Methodology: Methods & Techniques, Vikas Publishing House Pvt.Ltd
- Levin & Rubin (2004), Statistics for Management, 8th Ed, Prentice Hall of India

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- Srivastava, Shenoy and Sharma (2002)., Quantitative Techniques for Business Decisions, 4th Ed , Allied Publishers
- Bajpai, Naval (2013). *Business Research Methods*. Pearson
- Shajahan, S. (2004) , Research Methods for Management 2nd Edition, Jaico Publishers
- Kumar, Ranjit (2005), Research Methodology, Pearson Education

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MANAGEMENT SCIENCE

Course Code:MGT4207 **Credit Units: 03**

Course Objective:
The main objective of the course is to provide the students the insight into structures and processes that management science can offer and the enormous practical utility of its various utility. The course is designed to introduce the fundamental tools of management science and their application to real life business problems. It will help students to take well informed decisions in their corporate life.

Course Contents:

Module I: Introduction
Management Science: uses, scope, applications in managerial decision making; assumptions of management science models, decision making environments: decisions under certainty, uncertainty and risk situation; decision tree approach and its applications.

Module II: Linear Programming Problems
Linear Programming Problems: Modeling and Solution Methods- graphical method, simplex methods, problems with maximization and minimization objects, duality and its managerial interpretation;
Sensitivity analysis: meaning, Change in Objective Function Coefficients, Change in Right Hand Side Values, Change in Availability of resources and Addition of a new variable.

Module III: Transportation and Assignment Model
Transportation model: various methods of finding initial basic feasible solution and optimal solution, MODI method, degeneracy, unbalanced problems, prohibited route problems, maximization transportation problems
Assignment Model: Hungarian method for solution, unbalanced assignment problems, restrictions on assignments, travelling salesman problem.

Module IV: Game Theory
Two-Person Zero Sum Games, Pure Strategies: Games with Saddle Point, Mixed Strategies: Games without Saddle Point, Principle of Dominance, and Solution Methods for Games without saddle point – Algebraic Method, Arithmetic Method, Graphical Method.

Module V: Markov Chains
Markov Chains: introduction, characteristics, applications, state and transition probabilities, steady-state probability (equilibrium conditions), absorbing states and other applications of Markov Analysis.

Module VI: Simulation
Simulation: meaning, types of simulation, steps of simulation process, Monte Carlo simulation, applications of simulation

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

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Text & References:

- Anderson David R, Sweeny Dennis J, Williams Thomas A (2007), An Introduction to Management Science Quantitative Approaches to Decision Making, Cengage Learning.
- Render Berry, Stair Ralph M., Hanna Michel E.(2008),Quantitative Analysis for Management, Pearson Education
- Sharma J.K. (2010), Operations Research: Theory & Application, Mac Millan India Ltd.
- Taha H.A (1998), Operations Research: An Introduction, Prentice Hall of India.
- Vohra N.D.(1998), Quantitative Techniques in Management, Tata McGraw Hill

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BUSINESS ANALYTICS

Course Code: MGT4210 **Credit Units: 02**

Course Objective:

The course provides an introduction to data analytics to be used in business. The students will learn how data analysts describe, predict and make informed business decisions in various business domains like marketing, human resources, finance and operations.The aim of the course is to develop basic data literacy and an analytic mindset in students that will help them to make strategic decisions based on data.

Course Contents:

Module I: Introduction to Business Analytics

Importance and role of data driven decisions. Business Analytics – Definition, Market, Trends; Paradigm Shift from Data to Insight and from Business Intelligence to Business Analytics; Examples and Types of Business Analytics Analysis- Forecasting & Predictive Modeling; Descriptive, Prescriptive and Predictive Analytics. Data Summarization, Data visualization – Various visualization techniques, standardized reporting and Pivot Tables – Using Excel

Module II: Data Mining

Introduction to Data Mining; Crucial processes in data mining; Data Warehousing; Data Mining Techniques and Exploratory Data Analysis; Data Mining Tool – XL Miner.

Module III: Decision Making & Optimization

Decision making under uncertainty – Decision Trees and Risk Profiles; Sensitivity Analysis;
Optimizing complex decisions – Optimization of a large number of decisions while accounting for different kinds of physical and business decisions. Introduction to Optimization Techniques –Linear Programming; Optimization – Use of Excel to solve business problems like marketing mix, capital budgeting and portfolio optimization.

Module IV: Big Data and Introduction to R

Introduction to Big Data, Big Data driven decisions in business organizations – Benefits and Security/Privacy concerns.
Building Business and Economic Models –Tools to leverage data for Prediction purposes; Logistic Regression.
Introduction to Machine Learning; Statistical Learning vs. Machine Learning; Major classes of Learning Algorithms –Supervised Vs Unsupervised Learning.
Introduction to R Programing

Module V: Simulation using R and Excel

Hands on Regression using R;Introduction to Simulation; Applications of Simulation and Building a Simulation Model. (Using Excel and R)
Capstone Project.

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

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Text & References:

- Aczel, D.A., Sounderpandian, J., Saravanan, P. and Joshi, R. (2012). *Complete Business Statistics (7th ed.*). New Delhi, India: McGraw Hill Education (India) Private Limited
- Cooper, R.D., Schindler, S. P. and Sharma, J.K. (2015). Business Research Methods. New Delhi, India: McGraw Hill Education (India) Private Limited
- Gujrati, Damodar N and Sangeetha (2011). *Basic Econometrics (4th Ed.).* New Delhi, India: McGraw Hill Education (India) Private Limited
- Beri, C. (2016). *Business Statistics*. New Delhi, India: McGraw Hill Education (India) Private Limited
- Kothari, C.R. (2009). *Research Methodology: Methods and Techniques (2nd revised ed.).* New Delhi, India: New Age International Publisher
- Sharma, J.K. (2013). *Operation Research: Theory and Applications (5th ed.).* New Delhi, India: Macmillan Publishers India limited
- Albright and Winston. Business Analytics: Data Analysis and Decision Making, 5th Edition.
- Stephen Powell and Ken Baker., "The Art of Modeling with Spreadsheet"
- Data, data everywhere, "Special report on managing information,Economist", February 27th, 2010.
- Liberatore and Luo, "The Analytics Movement, Interfaces, Articles inAdvance", pp. 1–12, 2010.
- "Using R for Data Analysis and Graphics". Introduction, Code andCommentary,

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EXCEL FOR MANAGERS

Course Code: MGT4211 **Credit Units: 01**

Course Objective:

Microsoft Excel is a very popular business productivity application for the management and manipulation of data. With the right training and understanding of Excel, businesses and individual users can unlock the world of opportunities that this powerful business application offers.This course will provide all the tools necessary to create and use basic and advanced spreadsheets. After completion of this course, students will be able to learn the various methods for entering and editing data and also learn the various ways to write simple formulas.

Course Contents:

Module-I: Getting Started with Excel

Introduction to Spreadsheets: Launching Excel, entering data in spreadsheet, widening rows and columns, applying basic formatting in spreadsheet, saving work in excel. Entering Data into cells:Using autofill, sort & filter feature, creating lists, inserting & deleting rows and columns. Wrapping & merging text and cells,

Module-II: Basics in excel

Protecting & sharing workbooks, freeze panes, understanding normal, page layout and page break preview in excel. Setting the page orientation and print area.Adding hyperlinks to cells, inserting images, objects, equations and symbols.

Module-III: Charts & Formulas in Excel

Understanding Charts: Inserting bar charts, pie charts, column charts and line charts in spreadsheets, formatting and resizing the chart. Using Basic functions- average, sum, min, max, product etc. date functions, time functions. Math Operators in Excel, combining mathematical operators.

Module-IV: Functions in Excel

Logical- using IF, AND, OR, NOT, TRUE, FALSE Functions. Textual- using TRIM, UPPER, LOWER, REPLACE Functions.Import data into excel, Look up functions with index and match. Rounding, sum product, conditional counts and conditional sums, Filtering data, pivot table, pivot charts, conditional formatting.

Module-V: Financial and Statistical Functions in Excel

Financial functions: Time value of money- Present value, Future value, PMT with beginning date, PMT with ending date, NPV, Goal seek, Scenario Manager, IRR. Statistical functions: Max, Min, Average, Large, Rank, Small, Var, Std Dev.

Examination Scheme:

Components	Written Test	Practical	V/P	File/Assignment	Attendance
Weightage (%)	20	30	30	15	5

Suggested Readings & Textbooks

- Business Analysis with Microsoft Excel by Conrad George Carlberg,, Que Publishing, second edition, ISBN 0974415626.
- Excel 2013 for Dummies by Greg Harvey, John Wiley & Sons , 2012, ISBN 9781118559703

Web Resources

- https://spreadsheeto.com/
- https://www.tutorialspoint.com/excel/

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CORPORATE FINANCIAL REPORTING & ANALYSIS

Course Code: FIN4201 **Credit Units: 03**

Course Objective:
The International Financial Reporting Standards (IFRS) issued by International Accounting Standards Board (IASB) are gaining recognition as Global Reporting Standards. While appreciating the emerging diversities and complexities in the world of accounting and the need for knowledge of IFRS in relation to the convergence of the Indian Accounting Standards. The objective of this Subject is to enhance the knowledge of IFRS issued by IASB as well as to provide practical framework to the student in the globalization scenario.

Course Content:
Module-I:
Brief overview of Indian Accounting Standard and different accounting standards at international level.Rational of Accounting Standards. IFRS Framework, Features of IFRS, Genesis of IFRS, Journey of IAS to IFRS, Advantage of adopting. IFRS.Challenges in Adopting IFRS.Difference between Indian GAAP and IFRS.

Module-II:
Concept of Fair Value Accounting Concept of Adoption and convergence. Significant Difference between Ind AS and IFRS. Problem of Carve Out. Timeline for Adoption for Ind- As, Concept of Fair Value Accounting Presentation of Financial Statement as per Ind-AS1, Statement of Change in Equity, Cash Flow Statement and Ind AS 7.

Module-III:
Treatment of Inventories as per Ind AS 2-; Property plant and equipment- Ind AS 16, recognition, measurement, cost model, revaluation model, depreciation and impairment of assets and related disclosures, Revenue recognition Ind AS 18- scope, revenue from sales of goods, Services, interest royalties and dividends and disclosures, Financial Instruments: Presentation, Recognition and Measurement (Ind AS 32 and 39), Ind AS 33 Earnings per Share .

Module-IV:
First time adoption of accounting standard: Recognition and measurement, Presentation and Disclosure

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Recommended Text Book& Reference:

- Wiley IFRS: Practical Implementation Guide and Workbook; By Abbas, Graham, Liesel; Wiley publications, 3rd edition
- Faculty material will be provided
- International Financial Reporting Standards, Produced and printed on behalf of: The Institute of Chartered Accountants of India, website of Ministry of Corporate Affairs.
- International Financial Reporting Standards (IFRSs) - published by Taxmann Publications P Ltd.
- A Guide through International Financial Reporting Standards July 2008 -Published by IASB.
- IFRS : A Quick Reference Guide by Robert Kirk
- Wiley IFRS: Practical implementation guide and workbook by Abbas Ali Mirza, Graham J. Holt and Magnus Orrell5. Wiley IFRS 2008: Interpretation and application of International Accounting and Financial Reporting Standards 2008 by Eva K. Jermakowic

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FINANCIAL STATEMENT ANALYSIS

Course Code: FIN4203 **Credit Units: 03**

Course Objective:
This course is designed to prepare students to interpret and analyze financial statements for tasks such as credit and security analyses, lending and investment decisions, and other decisions that rely on financial data. This course explores in greater depth financial reporting from the perspective of financial statement users. Students develop a sufficient understanding of the concepts and recording procedures and therefore are able to interpret various disclosures in an informed manner. Students learn to compare companies financially, understand cash flow, and grasp basic profitability issues and risk analysis concepts. Ultimately, students who complete this course develop a more efficient and effective approach to researching, interpreting, and analyzing financial statements.

Course Contents:

Module-I: Introduction to Financial Statements
Income Statement- Introduction, Revenue Recognition, Expense recognition, Comprehensive income, Accrual concept, Balance Sheet-Introduction, Components, measurement base of Balance sheet, Cash Flow statement- Format, Analysis of Cash flow statement.

Module-II: Financial Ratios
Introduction, Financial Analysis tools and techniques, Internal liquidity ratios, operating profitability ratios, Return on investment ratios, financial risk ratios, growth potential ratios, Return on equity and du pont system, Basic earning per share, dilutive earning per share, uses and limitations of ratio analysis.

Module-III: Analysis of Assets
Investment securities, Inventory analysis- conversion of inventory methods, long term assets- capitalizing vs. expensing, depreciation accounting, capitalizing intangible assets, Asset Impairment, natural assets.

Module-IV: Aanlysis of Liabilities
Introduction, Income Tax- terminology, Deferred tax accounting, Long term bonds- total interest cost component, retirement or conversion of bonds, interest rate impact on bond value, Leases- operating vs. financing lease, determining the value of lease and lease assets.

Module-V: Red Flags
Introduction, Accounting shenanigans, causes of accounting shenanigans, finding shenanigans.

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Required text:
- Prescribed Textbook:
- "The Analysis and use of Financial Statements", (3rd Ed.), Gerald I. White, Ashinpaul C. Sondhi and Dov Fired, Wiley-India.
- Financial Reporting and Analysis CFA level 1, latest edition

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WEB DESIGN USING HTML

Course Code: ECM4204 **Credit Units: 03**

Course Objective: To make the students understand the basics of web designing and to impart knowledge about the web page and website creation and making the students aware about the technologies available and their applications.

Course Contents:

Module I: Web Design Introduction

Basic principles involved in developing a web site, Planning process, Five Golden rules of web designing, Designing navigation bar, Page design, Home Page Layout, Design Concept, Brief History of Internet, What is World Wide Web. Why create a web site, Web Standards, Audience requirement.

Module II:HTML Basics

What is HTML, HTML Documents, Basic structure of an HTML document, creating an HTML document, Mark up Tags, Heading-Paragraphs, Line Breaks, HTML Tags.

Module III:Elements of HTML

Introduction to elements of HTML, Working with Text, Working with Lists, Tables and Frames, Working with Hyperlinks, Images and Multimedia, Working with Forms and controls. XML, Java Script

Module IV: CSS

CSS Introduction: CSS Syntax, CSS Id & Class, CSS How. **CSS Styling:** Styling Backgrounds, Styling Text, Styling Fonts, Styling Links, Styling Lists, Styling Tables. **CSS Box Model:** CSS Border, CSS Outline, CSS Margin, CSS Padding

Module V: CSS Advanced

CSS Grouping/Nesting, CSS Dimension, CSS Display, CSS Positioning, CSS Floating, CSS Align, CSS Pseudo-class, CSS Pseudo-element, CSS Navigation Bar, CSS Image Gallery, CSS Image Opacity, CSS Image Sprites. CSS Media Types, CSS Attribute Selectors

Module VI: Dreamweaver & Web Site

Dreamweaver Basics, Dreamweaver shortcuts, Dreamweaver panels, Dreamweaver toolbars, Dreamweaver automation, Source code formatting

Web Site: Creating the Web Site, Saving the site, working on the web site, Creating web site structure, Creating Titles for web pages, Themes-Publishing web sites.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- .HTML 5 in simple steps, Kogent Learning Solutions Inc Dreamtech Press
- A beginner's guide to HTML NCSA
- Creating a Web Page and Web Site, Murray,Tom/Lynchburg
- HTML, XHTML, and CSS Bible ,Steven M. Schafer, 5ed Wiley India
- Beginning HTML, XHTML, CSS, and JavaScript, John Duckett Wiley India
- Beginning CSS: Cascading Style Sheets for Web Design ,Ian Pouncey, Richard York Wiley India
- Learning Web Technologies: HTML, Javascript , Kogent Wiley India

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SUMMER INTERNSHIP EVALUATION

Course Code: MGT4335 **Credit Units: 06**

There are certain phases of every Intern's professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship programme can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal class room situations. These attributes are intellectual ability, professional judgment and decision making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc.

In order to achieve these objectives, each student will maintain and submit a file (**Internship File**) and a report (**Internship Report**)

INTERNSHIP FILE

The Internship File aims to encourage students to keep a personal record of their learning and achievements throughout the Programme. It can be used as the basis for lifelong learning and for job applications. **Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development.**

The File will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and his/her own personal contribution to the organization.

The File is essentially a comprehensive documentation of how one proceeds while working on the assignment and should be regularly checked by the faculty guide/ supervisor, issues discussed with the students, doubts if any clarified and signed as having done so. This will form the basis of **continuous evaluation** of the project.

The File will include **five sections** in the order described below.

1. **The Title Page –** An Internship Experience Report For (Your Name), name of internship organization, name of the Supervisor/Guide and his/her designation, date started and completed, and number of credits for which the report is submitted.
2. **Table of Content –** An outline of the contents of the file by topics and subtopics with the page number and location of each section.
3. **Introduction** – Short, but should include how and why you obtained the internship experience position and the relationship it has to your academic/professional and career goals.
4. **Main Body** – Should include a brief summary/ executive summary of the **Internship Project Report** that the student has worked on, an **analysis of the company/organization** in which the student is working, a **personal review** of the student's management skills and how they have been developed through the programme, the daily tasks performed, major projects contributed to, dates and hours spent on a task, observations and feelings, meetings attended and their purposes, listing of tools and materials and their suppliers, and photographs if possible of projects, buildings and co-workers.
5. **Appendices** – Include pamphlets, forms, charts, brochures, technical and descriptive literature, graphs and other information related to your Internship experience.

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INTERNSHIP REPORT

The **Internship Report** is the research report that the student has to prepare on the project assigned by the organization. (Incase a student is not assigned a specific research project in the organization, he has to select any one aspect of the organization and prepare a research report on it). The lay out of the report should be as per the standard layout prescribed by the organization wherein the student undertakes the Internship. In case, there is no layout prescribed by the organization the following components should be included in the report:

- **Title or Cover Page**
  The title page should contain Project Title; Student's Name; Programme; Year and Semester and Name of the Faculty Guide.

- **Acknowledgements**
  Acknowledgment to any advisory or financial assistance received in the course of work may be given. It is incomplete without student's signature.

- **Abstract**
  A good"Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project. It should not exceed more than 1000 words.

- **Table of Contents**
  Titles and subtitles are to correspond exactly with those in the text.

- **Introduction**
  Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

- **Materials and Methods**
  This section should aim at experimental designs, materials used (wherever applicable). Methodology should be mentioned in details including modifications undertaken, if any. It includes organization site(s), sample, instruments used with its validation, procedures followed and precautions.

- **Results and Discussion**
  Present results, discuss and compare these with those from other workers, etc. In writing this section, emphasis should be laid on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

  Note that in writing the various secions, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary, do not write in "point" form.

  While presenting the results, write at length about the the various statistical tools used in the data interpretation. The result interpretation should be simple but full of data and statistical analysis. This data interpretation should be in congruence with the written objectives and the inferences should be drawn on data and not on impression. Avoid writing straight forward conclusion rather, it should lead to generalization of data on the chosen sample.

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Results and its discussion should be supporting/contradicting with the previous research work in the given area. Usually one should not use more than two researches in either case of supporing or contradicting the present case of research.

- **Conclusion(s) & Recommendations**
  A conclusion should be the final section in which the outcome of the work is mentioned briefly. Check that your work answers the following questions:
  - Did the research project meet its aims (check back to introduction for stated aims)?
  - What are the main findings of the research?
  - Are there any recommendations?
  - Do you have any conclusion on the research process itself?

- **Implications for Future Research**
  This should bring out further prospects for the study either thrown open by the present work or with the purpose of making it more comprehensive.

- **Appendices**
  The Appendices contain material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

- **References**
  References should include papers, books etc. referred to in the body of the report. These should be written in the alphabetical order of the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

  Examples
  For research article
  Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic Escherichia coli O157: H7. Clin Microbiol Infect, 8(suppl 1): 116–117.
  For book
  Kowalski,M.(1976) Transduction of effectiveness in Rhizobium meliloti. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67

The Layout Guidelines for the Internship File & Internship Report

- A4 size Paper
- Font: Arial (10 points) or Times New Roman (12 points)
- Line spacing: 1.5
- Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

Examination Scheme:

Continuous Evaluation by faculty guide	15%
Continuous evaluation by CRC	15%
Feedback from industry guide	35%
Report, Presentation & Viva Voce	35%
TOTAL	**100%**

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BUSINESS VALUATION

Course Code: FIN4302 **Credit Units: 03**

Course Objective:
The objective of this course is to develop a detailed understanding of the tools used by market professionals and corporate managers to analyze the value of companies and stocks. The central theme of the course will be the pricing of equity securities using discounted cash flow and relative valuation techniques. Students will apply what they've learned to the valuation of a specific company, with the goal of becoming an expert on that firm. After completing this course, students should be able to: (i) Develop quantitative models for firm and equity valuation based on DCF and multiples. (ii) Identify and interpret accounting and non-accounting information necessary for valuation. (iii) Identify and interpret the key value drivers for a firm or industry. (iv) Critically analyze firm and equity valuation models and assumptions developed by others. (v) Present valuation analyses and assumptions in a professional manner.

Course Contents:
Module-I: Introduction to Valuation
Valuation vs. Pricing.A philosophical basis for Valuation, Misconceptions about Valuation, Biasness in Valuation, Uncertainties in Valuation.Approaches to Valuation, Understanding Financial Statements, Basics of Risk.

Module-II: Discounted Cash Flow Valuation
Discounted Cashflow Valuation: Basis for Approach, Going Concern versus Liquidation Valuation, Equity Valuation versus Firm Valuation, Three pathways to DCF value, Advantages & Disadvantages of DCF Valuation, Riskless Rates and Risk Premiums, Estimating Risk Parameters and Costs of Financing, Measuring Earnings,Earnings to Cash Flows, Estimating Growth, Closure in Valuation: Estimating Terminal Value, Free Cash flow to Equity Models,

Module-III: Relative Valuation
Fundamental Principles of Relative Valuation, Choices with multiples- Earnings Multiples, Book Value Multiples,Choosing the Comparable firm: Making the comparison, Revenue and Sector-Specific Multiples, Advantages &Disadvantages of Relative Valuation, DCF vs Relative valuation.

Module-IV: Applicability of Valuation (Cases and research papers); Valuing Financial Services firm, Valuing Firms with Negative Earnings, Valuing Young and Start-up Firms, Valuing Private Firms, valuing Acquisitions and Takeovers,

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Required Textbook

- Investment Valuation: Tools and Techniques for Determining the Value of Any Asset, Second Edition, University Editionby Aswath Damodaran

Recommended other Textbook

- Krishna G. Palepu and Paul M. Healy: *Business Analysis & Valuation Using Financial Statements*, Text Only(PHB) 5th Edition, Cengage Learning 2012.
- Joshua Rosenbaum and Joshua Pearl: *Investment Banking: Valuation, Leveraged Buyouts, and Mergers and Acquisitions*, John Wiley & Sons; 2nd edition (2013), ISBN: 1118656210

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FINANCIAL MODELING WITH MS-EXCEL

Course Code:FIN4306 **Credit Units: 03**

Introduction

Modeling techniques for accurate financial forecasting are used in many areas of finance, such as derivatives, valuation, project evaluation, deal structuring, portfolio management and the like. In the course, the participants will learn the model building skills required to build powerful models in finance with the help of excel. There are many features of model building that are common irrespective of the final model that one intends to build. In the course we will also emphasize on the different model building skills that one should have irrespective of the final use that one is going to make of it.

By the end of the course the participants should be better able to:

- Understand the basic and advanced features of excel
- Understand how to build models in excel to suit one's purpose
- Building models in different areas of finance including investments, corporate finance and derivatives
- Identifying and controlling the key sensitivities with advanced spreadsheet simulation
- Understand how risk can be built into the model to enhance decision making process

Course Contents:

Module-I: Understanding the Basic Featuresof Excel : Introduction to Modeling, Introduction to Excel,Database Functions in Excel Creating Charts Using Forms and Control Toolbox Understanding Finance Functions present in Excel Creating Dynamic Models

Module-II: Simulation using Excel : Different Statistical Distributions used in Simulation Generating Random Numbers that follow a particular distribution Building Models in Finance using Simulation

Module-III: Excel in Capital Budgeting, valuation: Preparing common size statements directly from Trial Balance Forecasting Financial Statements using Excel Analysing Financial Statements by using Spreadsheet Model ; Determining Project Viability Risk Analysis in Project Appraisal Simulation in Project Appraisal; Determination of Value Drivers, DCF Valuation, Risk Analysis in Valuation; Determining Efficient Portfolio, Creating Dynamic Portfolios Portfolio Insurance Fixed Income Portfolio Management using Excel.

Module-IV: Understanding Subroutines and Functions and building simple financial models using subroutines and functions Recording and Editing Macros Subroutines and Functions Decision Rules Message Box and Input Box Debugging, **Designing Advanced Financial Models** using VBA User Forms Other Advanced Features Actual Model Building.

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

(C - Case Discussion/ Presentation; **HA** - Home Assignment; **Q** – Quiz; **V** - Viva; **CT** - Class Test; A-Attendance; **EE** - End Semester Examination)

Text & References:

Text:

- Benninga, S., 2008, Financial Modeling, The MIT Press, Third Edition

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References:

- J & S: Jackson M. and Staunton M., 2001, Advanced Modelling in Finance using Excel and VBA, John Wiley and Sons Ltd
- B & M: Brealey R.A. and Myers S., 2003, Principles of Corporate Finance, Seventh Edition, McGraw Hill
- Financial Analysis and Modeling using Excel and VBA – Chandan Sengupta
- Building Financial Models, John Tjia

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TRAINING AND DEVELOPMENT

Course Code: HRM4305 **Credit Units: 03**

Course Objective:
This course is designed to provide in depth understanding and enable the students to manage training processes and system for developing human resource of the organization.

Course Contents:

Module I: Introduction to Training and Development
Training – concept, and rationale; training process: role of stakeholders in training programme; Organization and Management of training function; Training needs assessment – organizational analysis, operational analysis, person analysis; competency mapping; Learning theories, learning process.

Module II: Training Design
Designing the training programme: process of learning in training programme – attributes and factors influencing; learning process; learning styles; training climate and pedagogy; developing training modules; Training aids

Module III:Training Methods and Techniques
Training methods and techniques – role playing, business games, in basket exercises, laboratory training; incidents and cases; seminars, syndicates and group discussion; lecture, programmed instructions; inspirational techniques – brainstorming, mind mapping, creative problem solving; Management Development

Module IV:Evaluation of training
Evaluation of training – need for evaluation, principles of evaluation, criteria and approaches; return on investment in training, process of calculating ROI in training;

Module V: Emerging Trends in Training and Development
Emerging trends in training and development; new perspectives on training – cross cultural training, e-learning, knowledge management

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text & References:
Text:
- Noe, Raymond A, "Employee Training and Development" Tata McGraw Hill Education; 6th edition 2013

References:
- Agochia, Devendra, Every Trainer's Handbook, New Delhi; Sage Publications
- De Simone, R.L. and Harris, D.M., Human Resource Development, Thomson Learning
- Sahu, R.K., Training for Development , Excel Books, New Delhi
- Blanchard, P Nick, and James W. Thacker, Effective Training – Systems, Strategies, and Practices, Pearson Education, New Delhi
- Goldstein, Training in Organization , Thomson Learning, Bombay
- McGrath, Training for Life and Leadership in Industry, Prentice Hall of India, New Delhi

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DATABASE MANAGEMENT SYSTEMS

Course Code: ITM4302 **Credit Units: 03**

Course Objectives

The course aims to make the students understand the basic and advanced concepts in databases and database management systems. Students will be able to understand the importance of databases in day to day life. The course will also provide the students, a hands-on experience on the SQL-the language of databases.

Course Contents:

Module I: Introduction to DBMS

Definition of DBMS, Concept and Goals of DBMS, Data Independence, DBMS Architecture, Levels, Database Administrator, File System Approach Vs DBMS Approach, Advantages of Using a DBMS, Data Models, Schemas, and Instances, Database Languages, Database Users, Database Abstraction.

Module II: Relational Database & ER Model

Relational Database: Relational System, Codd's Rule, Relational Model, Optimization, Tables and Views

ER Model: Entity Type, Entity Set, Relationship type, Relationship sets, Constraints: Cardinality Ratio and Participation Constraint, Keys, Mapping, Design of ER diagrams.

Module III: Relational Model Objects

Domains and Relations, Relations and predicates, Relational Data Integrity; Primary Key, Candidate Key, Foreign Key and their rules, Relational operators, Relational Algebra

Module IV: SQL

SQL Language, DDL,DML and DCL commands. Data definition, Data retrieval and update operations on MS ACCESS and SQL Server DBMS.

Module V: Database Applications and Types

Distributed Database, Object Oriented Database, Multimedia Database, Data Mining, Digital Libraries. Data Warehouse.

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text & References

- Elmasari, Navathe, "Fundamentals of Database Systems", Addision Wesley.
- Korth, Silbertz, Sudarshan, "Database Concepts". McGraw Hill.
- Majumdar & Bhattacharya, "Database Management System", Tata McGraw Hill.
- Date C J." An Introduction to Database Systems", Addision Wesley.

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DIGITAL MARKETING

Course Code: ITM4303 **Credit Units: 03**

Course Overview:
The course examines digital marketing strategy, implementation and executional considerations for B-to-B and B-to-C brands and provides a detailed understanding of all digital marketing concepts. Participants will complete the course with a comprehensive knowledge of and experience with how to develop an integrated digital marketing strategy, from formulation to implementation. Strong focus will be on developing student's business skills and growing real-world experience of the digital media sector to enhance their knowledge to cope with employability demand.

Course Objectives:
Digital Marketing Course is an initiative designed to educate students and practitioners in the area of Digital Marketing analytics and make them ready for jobs or prepare them to launch campaign for their own organisations.

- To Understand how and why to use digital marketing for multiple goals within a larger marketing and/or media strategy
- Understand the major digital marketing channels - online advertising: Digital display, video, mobile, search engine, and social media
- Learn to develop, evaluate, and execute a comprehensive digital marketing strategy and plan
- Learn how to measure digital marketing efforts and calculate ROI
- Explore the latest digital ad technologies

Course Contents:

Module-I: Digital Marketing Overview:
What is Digital Marketing? Understanding Marketing Process? Why Digital Marketing Wins Over traditional Marketing? Understanding Digital Marketing Process; Digital Marketing Planning and Strategy

Module-II: Website Planning and Creation:
Understanding Internet; Difference between Internet & web; Understanding websites; Understanding domain names & domain extensions; What is web server & web hosting? Different types of web servers; Different types of websites; Planning & Conceptualising a Website; Building website using CMS in Class.

Module-III: Digital Advertising (PPC, Digital Display and YouTube):
Google AdWords Overview; Understanding Adwords Algorithm; Creating Search Campaigns; Types of Search Campaigns - Standard, All features, dynamic search & product listing. Tracking Performance/Conversion: What is conversion tracking? Why is it important, how to set up conversion tracking. Optimizing Search Campaigns: How to optimize campaigns at the time of creation? Optimizing campaign via adgroups.Creating Display Campaign; Types of display campaigns- All features, Mobile app, Remarketing, Engagement. Optimizing Display Campaign and Re-marketing .
What is Online Advertising? Types of Online Advertising, Display Advertising, Contextual advertising, what are Payment Modules?Different Online advertising platforms Creating Banner Ads Using Tools.

Module-IV: Emerging trends in Digital Marketing:
Affiliate Marketing- Affiliate marketing history**,** Affiliate marketing scenario in India**,** Different ways to do affiliate marketing. **Email Marketing-** What is email marketing and how it works? Types of email marketing- Opt-in & bulk emailing; Setting up email marketing account, creating a broadcast email. What are auto responders? Setting up auto responders; Tricks to land in inbox instead of spam folder; **Social Media Marketing-**Concept**,** How social media marketing is different than

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others Forms of Internet marketing, Understanding Facebook marketing, Linkedin Marketing, Twitter Marketing, Video Marketing **and** VIDEO & AUDIO (PODCASTING) marketing; **and Mobile Web Marketing-** Understanding Mobile Devices, Mobile Marketing Measurement and Analytics; Fundamentals of Mobile Marketing, Creating mobile website through wordpress; Using tools to create mobile websites; Using tools to create mobile app Advertising on mobile (App & Web); Content Marketing on mobile. **Content Marketing-**Introduction to content marketing, Objective of content marketing, Content marketing 7 step strategy building process, How to write great compelling content, Optimizing content for search engines, How to increase opt-in email list with content marketing with examples.

Module-V: Search Engine Optimization (SEO):
What is SEO? Introduction to SERP, What are search engines? How search engines work? Major functions of a search engine; what are keywords? Different types of keywords ; Google keyword planner tool; Keywords research process; Understanding keywords; On page optimization; Off Page optimization; Top tools for SEO; Monitoring SEO process; Preparing SEO reports, How to create SEO Strategy for your business, What is link juice? Importance of domain and page authority?How to optimize exact keywords for your business. What is Google Panda Algorithm, Google Penguin and Google EMD Update. How to save your site from Google Panda, Penguin and EMD Update, How to recover your site from Panda, Penguin and EMD.

Module-VI: E-Commerce and Payment Gateway:
What is ecommerce? Top ecommerce websites around the world & it's scenario in India; Difference between E-Commerce software and Shopping Cart; software Payment Gateways, Merchant Accounts & Logistics for physical goods. Integrating Woo-commerce and setting up an ecommerce store on WordPress. Case studies on ecommerce websites. How to do Google Product Listing Ads (PLA) for ecommerce websites.How to do SEO for an ecommerce website.

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text & References:

- Marketing 4.0: Moving from Traditional to Digital by P. Kotler. Wiley Publication.
- The Essentials of E-Marketing, 4th edition by Quirk Education (E-Book)
- The Art of Digital Marketing by Ian Dodson.
- Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, by Damian Ryan and Calvin Jones. KoganPage Publication, 3rd edition.
- Digital Marketing, VandanaAhuja, Oxford Publication.
- Digital Marketing Insights 2017, Social Beat Digital Marketing LLP, Kindle Edition.
- Social Media for Business – Stories of Indian Brands, By Sorav Jain
- Total E-mail Marketing: Maximizing your results from Integrated E-marketing (E-marketing essentials): Dave Chaffey.

Websites:
SEOMoz.org ;mashable.com; http://www.convinceandconvert.com; ClickZ.com ; eMarketer forrester.com; contentmarketinginstitute.com ; adage.com; adweek.com

Final Project: Group Paper and Presentation
Students will work in instructor-selected groups of four or five to complete a 15-20 page digital marketing plan utilizing the concepts and frameworks covered in the course. Papers should be double-spaced using 12-point font and 1-inch margins, and submitted accordingly. All groups will be required to give a presentation in class highlighting the important points of their plan and submit their presentation slides for review. Presentations will take place in class via web conference on prescribed date. Students will need to ensure their audio is working well in order to present. All students will be required to complete evaluations of the group presentations given in class. 25% will be deducted per day for late papers and slides.

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INTRODUCTION TO CLOUD COMPUTING

Course Code: ITM4304 **Credit Units: 03**

Course Objective:
This course gives students an insight into the basics of cloud computing along with virtualization, cloud computing is one of the fastest growing domain from a while now. It will provide the students basic understanding about cloud and virtualization along with it how one can migrate over it.

Course Contents:
Module-I: Cloud Computing Overview
Origins of Cloud computing – Cloud components - Essential characteristics – On-demand self-service, Broad network access, Location independent resource pooling ,Rapid elasticity , Measured service, Comparing cloud providers with traditional IT service providers, Roots of cloud computing.

Module-II: Cloud Insights
Architectural influences – High-performance computing, Utility and Enterprise grid computing, Cloud scenarios – Benefits: scalability ,simplicity ,vendors ,security, Limitations – Sensitive information - Application development- security level of third party - security benefits, Regularity issues: Government policies.

Module-III: Cloud Architecture- Layers and Models
Layers in cloud architecture, Software as a Service (SaaS), features of SaaS and benefits, Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits, Service providers, challenges and risks in cloud adoption.Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing.

Module-IV: Cloud Simulators- CloudSim and GreenCloud
Introduction to Simulator, understanding CloudSim simulator, CloudSim Architecture, Understanding Working platform for CloudSim, Introduction to GreenCloud

Module-V: Introduction to VMWare Simulator
Basics of VMWare, virtualization, advantages of virtualization, using Vmware workstation, creating virtualmachines-understanding virtual machines, create a new virtual machine on local host, cloning virtual machines, virtualize a physical machine.

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text & References:
Text:
- Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010
- Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008

References:
- Cloud computing for dummies- Judith Hurwitz , Robin Bloor , Marcia Kaufman ,Fern Halper, Wiley Publishing, Inc, 2010
- Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011

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SYSTEM ANALYSIS AND DESIGN

Course Code: ITM4305 **Credit Units: 03**

Course Objective:
The course aims at preparing students conceptualize and define scope and domain of system analysis and design. It also focuses on system development life cycle using conventional and structural look.

Course Contents:

Module I: Systems Development Environment. (Information system development life cycle)
System & its parts, Types of Systems, Characteristics of a System, System Analyst in system Development, Developing Systems- SDLC, Approaches to System Development (Prototyping, Joint Application Design (JAD), Participatory Design (PD)), System Development Models (Waterfall model & Spiral Model), System Planning & Selection (Identifying, Selecting, Initiating & Planning System Development Project).

Module II: System Planning and Selection (Graphic technology modeling tool)
Identifying and Selecting Projects (Identifying potential development projects, classifying and ranking projects, and selecting projects for development), Methods for project identification and selection, Evaluation criteria for classifying and ranking projects, Initiating and Planning System Development Projects (Process & performed Activities, Deliverables & Outcomes), Assessing Project Feasibility (Economic, Operational, Technical, Schedule, Legal & Contractual, Political Feasibility)

Module III: System & Data Analysis (Data Analyzing Modeling)
Determining System Requirements (Traditional Methods, Modern & Radical Methods), Structuring System Requirements (Process Modeling – DFD, Logic Modeling – Structured English & Decision Tables, Conceptual Modeling – ER Model), Data Analysis & Techniques (Interpretive, Coding, Recursive Abstraction and Mechanical Technique), Types of Analysis (Descriptive, Exploratory, Confirmatory and Predictive), Modeling Methodologies (Bottom Up method & Top Down Method), Generic and Schematic Data Modeling.

Module IV: System Design
System Design (Design Objectives, Phases in Designing, Purpose of System Design), System Design Goals, Type of Design, Design Strategy, System Decomposition (Modeling, Connection and Coupling of a System), System Design Methodologies, Roles & Duties of System Administration. Succeeding as System Analyst, Interpersonal kills, Management skills, Analytical skills and Technical skills.

Module V: System Implementation & Operation (System Management)
Activities in implementing (Coding, Testing & Installation, Documentation, Training, Support, Maintenance), Types of testing, planning installation, approaches to installation, Documenting a system, Training and Supporting users, Types & Frequencies of Training Methods, Reasons of System Implementation Failures, Project Closedown, Conducting System Maintenance – Types of Maintenance (Corrective, Adaptive and Perfective Maintenance), effective maintenance, Evaluation of System's Success, System Enhancement, Quality Assurance in System Cycle.

Module VI: System Security and Auditing
System Security: Data Security, Backup & Recovery during System & Database failure, Ethical Issues in System Development, Threat and Risk Analysis, Audit, System Audit, System Audit Standards (Planning, Implantation and Reporting Standards), System Analysis and Programming (Overview, Role & Duties of System Experts as Analyst and Programmer).

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Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; **HA -** Home Assignment; **P -** Project; **S -** Seminar; **V** - Viva; **Q** - Quiz; **CT** - Class Test; **A** - Attendance; **EE** - End Semester Examination

Text & References:

Text:

- Valacich George Hoffer, Essentials of System Analysis & Design, Second Edition, Prentice-Hall India.

References:

- James A. Senn, Analysis and Design of information systems.
- Kroeber, Donald W. and Watron, Hugh J., Computer Based Information Systems.
- E. M. Awad, Systems Analysis & Design.
- Dennis Wixom and Wiley, Systems Analysis and Design – An Applied Approach.

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DYNAMIC WEB DESIGN & DEVELOPMENT

Course Code: ITM4306 **Credit Units: 03**

Course Objective:
To develop applications in PHP using various concepts like arrays, user defined functions, Sessions which makes the students to understand and to establish the connectivity between PHP and database and develop programs to add records, retrieve records and delete records from a table.

Course Contents:
Module I: Introduction to Web Development & Cascading Style Sheets
Web pages, Static and Dynamic web pages, Client side VS Server side, Introduction to HTML, HTML Elements, HTML attributes, Styling and formatting HTML, Forms, Tables.
CSS Basics: CSS Introduction: CSS Syntax, CSS Id & Class, CSS How
CSS Styling: Styling Backgrounds, Styling Text, Styling Fonts, Styling Links, Styling Lists, Styling Tables. **CSS Box Model:** CSS Border, CSS Outline, CSS Margin, CSS Padding

Module II: CSS Advanced
CSS Grouping/Nesting, CSS Dimension, CSS Display, CSS Positioning, CSS Floating, CSS Align, CSS Pseudo-class, CSS Pseudo-element, CSS Navigation Bar, CSS Image Gallery, CSS Image Opacity, CSS Image Sprites. CSS Media Types, CSS Attribute Selectors

Module III: Introduction to PHP, Decisions, Loop & Functions
Evaluation of Php, Basic Syntax, Defining variable and constant, Php Data type, Operator and Expression, Making Decisions, Doing Repetitive task with looping, Mixing Decisions and looping with Html.
What is a function, Define a function, Call by value and Call by reference, Recursive function, String Creating and accessing, String Searching & Replacing String, Formatting String, String Related Library function,Anatomy of an Array, Creating index based and Associative array Accessing array, Element Looping with Index based array, Looping with associative array using each () and foreach(), Some useful Library function

Module IV: Handling HTML Forms using PHP, Working with Files and Directories
Capturing Form, Data Dealing with Multi-value filed, and Generating File uploaded form, redirecting a form after submission.
Understanding, file & directory, Opening and closing a file, Coping, renaming and deleting a file, working with directories, Creating and deleting folder, File Uploading & Downloading.

Module V: Session and Cookie, Database Connectivity with MySql, Exception Handling
Introduction to Session Control, Session Functionality What is a Cookie, Setting Cookies with PHP. Using Cookies with Sessions, Deleting Cookies, Registering Session variables, Destroying the variables and Session.Introduction to RDBMS, Connection with MySql Database, Performing basic database operation(DML) (Insert, Delete, Update, Select), Setting query parameter, Executing queryJoin (Cross joins, Inner joins, Outer Joins, Self joins.)
Understanding Exception and error, Try, catch, throw. Error tracking and debugging.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
- . Learning PHP, MySQL, books by ‘ O’ riley Press

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ADVERTISING AND SALES PROMOTION

Course Code: MKT4301 **Credit Units: 03**

Course Objective:
The main objective of this course is to familiarize the students with the role of advertising in the context of promoting products and services. Advertising is one of the most used promotional tools. It will help students to understand the advertising process and key decision areas for effective management of this function.

Course Contents:

Module-I: Introduction
Evolution of advertisement, Advertiser, Facilitating Institutions, advertising and society, advertising and regulations; ***Advertising Planning and decision making:*** Planning framework, Situation analysis, advertising plan, Communication and persuasion process.

Module-II: Objective Setting and Market Positioning
IMC: Role of advertising within marketing program and communication mix, sales promotion, public relations, publicity and integrating different elements; ***Setting goals and objectives:*** *Behavioral dynamics, advertising response variables, DAGMAR.* ***How advertising works:*** Low-Involvement learning, Central versus Peripheral routes to persuasion, ELM, Cognitive response model.

Module-III: Message Strategy
Attention and comprehension:Attention, Comprehension, Recall, Interpretation; ***Understanding Benefit-based attitude:*** Attitude levels, Means-Ends and Laddering Analysis, Multi-attribute models, Segmentation using attitude structure; ***Associating feelings with brands:*** Modeling the feelings response to advertising, transformational advertising, role of classical conditioning; brand personality associations; ***WOM Advertising:*** Informational influence and Normative influence.
Message Tactics-*Creative approaches*: Rational and emotional creative approaches, Using Endorser, Distraction Effect; ***Copywriting:*** Illustrating, layout, creative styles; ***Copy testing:*** Strategy, diagnostic copy tests; ***Production and implementation:*** Advertising production process, model of the creation and production process, Client-Agency relationship.

Module-IV: Media Strategy and tactics
Setting Media Budgets: Budget allocation, budgeting methods; ***Media Tactics:*** Media class decisions, media vehicle decisions, media option decisions, scheduling and timing decision, creativity in media planning.

Module-V: Sales Promotion
Introduction, Role & Scope, Consumer & Trade Promotions, Sales promotion Strategy, Promotional offers- coupons, price-offs, premiums, sweepstakes, refund and rebates, sampling, loyalty programmes, POP displays, Dealer loader, Celebrity Endorsements.

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

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Suggested Readings

- Arens, W. F. (2008). *Contemporary advertising*. New Delhi: Prentice Hall.
- Batra, R., Myers, J. G., & Aaker, D. A. (2006). *Advertising management*. New Delhi: Pearson Education.
- Guinn O', T. C., Allen, C. T., & Semenik, R. J. (2009). *Advertising management with integrated brand promotion*. New Delhi: Cengage Learning.
- Moriarty, S., Mitchell, N., & Wells, W. (2008). *Advertising principles and practice* (8th ed.). New Delhi: Pearson Education.
- Sandage, C. H., Fryburger, V., & Rotzoll, K. B. (1983). *Advertising theory and practice*. Homewood: Richard D Irvin.

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DIGITAL MARKETING

Course Code: MKT4303 **Credit Units: 03**

Course Overview
The course examines digital marketing strategy, implementation and executional considerations for B-to-B and B-to-C brands and provides a detailed understanding of all digital marketing concepts. Participants will complete the course with a comprehensive knowledge of and experience with how to develop an integrated digital marketing strategy, from formulation to implementation. Strong focus will be on developing student's business skills and growing real-world experience of the digital media sector to enhance their knowledge to cope with employability demand.

Course Objectives
Digital Marketing Course is an initiative designed to educate students and practitioners in the area of Digital Marketing analytics and make them ready for jobs or prepare them to launch campaign for their own organisations.

- To Understand how and why to use digital marketing for multiple goals within a larger marketing and/or media strategy
- Understand the major digital marketing channels - online advertising: Digital display, video, mobile, search engine, and social media
- Learn to develop, evaluate, and execute a comprehensive digital marketing strategy and plan
- Learn how to measure digital marketing efforts and calculate ROI
- Explore the latest digital ad technologies

Course Contents:

Module-I: Digital Marketing Overview:
What is Digital Marketing? Understanding Marketing Process? Why Digital Marketing Wins Over traditional Marketing? Understanding Digital Marketing Process; Digital Marketing Planning and Strategy

Module-II: Website Planning and Creation:
Understanding Internet; Difference between Internet & web; Understanding websites; Understanding domain names & domain extensions; What is web server & web hosting? Different types of web servers; Different types of websites; Planning & Conceptualising a Website; Building website using CMS in Class.

Module-III: Digital Advertising (PPC, Digital Display and YouTube):
Google AdWords Overview; Understanding Adwords Algorithm; Creating Search Campaigns; Types of Search Campaigns - Standard, All features, dynamic search & product listing. Tracking Performance/Conversion: What is conversion tracking? Why is it important, how to set up conversion tracking. Optimizing Search Campaigns: How to optimize campaigns at the time of creation? Optimizing campaign via adgroups. Creating Display Campaign; Types of display campaigns- All features, Mobile app, Remarketing, Engagement. Optimizing Display Campaign and Re-marketing .
What is Online Advertising? Types of Online Advertising, Display Advertising, Contextual advertising, what are Payment Modules? Different Online advertising platforms Creating Banner Ads Using Tools.

Module-IV: Emerging trends in Digital Marketing:
Affiliate Marketing- Affiliate marketing history**,** Affiliate marketing scenario in India**,** Different ways to do affiliate marketing. **Email Marketing-** What is email marketing and how it works? Types of email marketing- Opt-in & bulk emailing; Setting up email marketing account, creating a broadcast email. What are auto responders? Setting up auto responders; Tricks to land in inbox instead of spam folder; **Social Media Marketing-**Concept**,** How social media marketing is different than

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others Forms of Internet marketing, Understanding Facebook marketing, Linkedin Marketing, Twitter Marketing, Video Marketing **and** VIDEO & AUDIO (PODCASTING) marketing; **and Mobile Web Marketing-** Understanding Mobile Devices, Mobile Marketing Measurement and Analytics; Fundamentals of Mobile Marketing, Creating mobile website through wordpress; Using tools to create mobile websites; Using tools to create mobile app Advertising on mobile (App & Web); Content Marketing on mobile. **Content Marketing-**Introduction to content marketing, Objective of content marketing, Content marketing 7 step strategy building process, How to write great compelling content, Optimizing content for search engines, How to increase opt-in email list with content marketing with examples.

Module-V: Search Engine Optimization (SEO):
What is SEO? Introduction to SERP, What are search engines? How search engines work? Major functions of a search engine; what are keywords? Different types of keywords ; Google keyword planner tool; Keywords research process; Understanding keywords; On page optimization; Off Page optimization; Top tools for SEO; Monitoring SEO process; Preparing SEO reports, How to create SEO Strategy for your business, What is link juice? Importance of domain and page authority? How to optimize exact keywords for your business. What is Google Panda Algorithm, Google Penguin and Google EMD Update. How to save your site from Google Panda, Penguin and EMD Update, How to recover your site from Panda, Penguin and EMD.

Module-VI: E-Commerce and Payment Gateway:
What is ecommerce? Top ecommerce websites around the world & it's scenario in India; Difference between E-Commerce software and Shopping Cart; software Payment Gateways, Merchant Accounts & Logistics for physical goods. Integrating Woo-commerce and setting up an ecommerce store on WordPress. Case studies on ecommerce websites. How to do Google Product Listing Ads (PLA) for ecommerce websites. How to do SEO for an ecommerce website.

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text & References:

- Marketing 4.0: Moving from Traditional to Digital by P. Kotler. Wiley Publication.
- The Essentials of E-Marketing, 4th edition by Quirk Education (E-Book)
- The Art of Digital Marketing by Ian Dodson.
- Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, by Damian Ryan and Calvin Jones. KoganPage Publication, 3rd edition.
- Digital Marketing, VandanaAhuja, Oxford Publication.
- Digital Marketing Insights 2017, Social Beat Digital Marketing LLP, Kindle Edition.
- Social Media for Business – Stories of Indian Brands, By Sorav Jain
- Total E-mail Marketing: Maximizing your results from Integrated E-marketing (E-marketing essentials): Dave Chaffey.

Websites:
SEOMoz.org ;mashable.com; http://www.convinceandconvert.com; ClickZ.com ; eMarketer forrester.com; contentmarketinginstitute.com ; adage.com; adweek.com

Final Project: Group Paper and Presentation
Students will work in instructor-selected groups of four or five to complete a 15-20 page digital marketing plan utilizing the concepts and frameworks covered in the course. Papers should be double-spaced using 12-point font and 1-inch margins, and submitted accordingly. All groups will be required to give a presentation in class highlighting the important points of their plan and submit their presentation slides for review. Presentations will take place in class via web conference on prescribed date. Students will need to ensure their audio is working well in order to present. All students will be required to complete evaluations of the group presentations given in class. 25% will be deducted per day for late papers and slides.

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DIRECT MARKETING

Course Code: MKT4305 **Credit Units: 03**

Course Objective:
Direct marketing is quickly becoming an integral part of the marketing strategies of general marketing as well as the method of operation of traditional direct marketers. The course focuses on the marketing perspectives and technologies that are distinctly direct marketing and with the interrelationship of direct marketing with the general marketing field.

Course Contents:
Module I: Conceptual Framework of Direct Marketing
Basics and scope of Direct Marketing, Objectives of Direct Marketing, Advantage & Disadvantage of Direct Marketing, Integrated Direct Marketing, Business, Strategic & Direct Marketing planning, Strengths& weakness of Social Media

Module II: Analyzing & Encashing Marketing opportunities for Direct Marketing
Research design for direct marketers, The Customer Database: Analysis and Application, Consumer & Business mailing list, offer, Media of direct marketing, Telemarketing, Internet E-communications, Managing Direct Sales Force.

Module III: Managing the Creativity Process in Direct Marketing
Introducing Creative Practices and techniques, Direct Marketing Creativity, Basic Steps of Managing catalogue & print advertising, Innovation through Creativity & testing The Strategic drivers of Creative Practices.

Module IV: Direct Marketing into Business
B to B Marketing, Making a lead generation programme, Overview of E-commerce.retaining and activating customers

Module V: Direct Marketing Implementation and Control
Marketing Intelligence- Modeling for business decision support, Mathematics tool for control in Direct marketing, Future of Direct Marketing.

Module VI: Emerging Trends
Integrating the concepts with other functions of Management
Live project to be undertaken starting with conception of idea to final execution.,
Case studies
Latest emerging trends and practices.

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text & References:
- Bob stone & Ron Jacobs, Successful Direct Marketing Methods, Tata McGraw Hill.
- Nash & Edward L, Direct Marketing Hand Book, Tata McGraw Hill

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RETAIL MANAGEMENT

Course Code: MKT4306 **Credit Units: 03**

Course Objective:
The primary objective of the course is to develop fundamental competencies in retail management. The course is designed to prepare students for positions in the FMCG/Pharmaceutical/Electronics/Consumer Durable/Fashion/Apparel retail businesses or positions in the real estate companies with additional interest in mall management. The course also benefit students interested in starting their own entrepreneurial retail operation. Additionally this course aims at familiarizing students with emergence of malls as a new format of market with emphasis on mall management principles and practices.

Course Contents:

Module-I: Introduction to Retailing
Introduction, Meaning of Retailing, Economic Significance of Retailing, Retailing Management Decision Process, Product Retailing vs. Service Retailing, Types of Retailers, Indian vs. Global Scenario, Difference between organized and unorganized retailing, Issues and challenges of retailing in India

Module-II:Store Planning, Design and Layout
Store Planning- Introduction, Types of Retail Stores Location, Factors Affecting Retail Location Decisions, Country/Region Analysis, Trade Area Analysis, Site Evaluation, Site Selection, Location Based Retail Strategies
Store Design- Atmospherics, Retailing Image Mix, Space mix
Store Layout- Effective retail space management based on Store Layout

Module-III: Retail Merchandise Management
Retail Merchandising: Introduction, Understanding Merchandising Management, Activities of a Merchandiser, Retail Merchandising Management Process
Private Branding in Retail-Introduction, Difference between a Store/Private Brand and a National Brand, Growth Drivers of Private Label, Advantages of Private Label, Disadvantages of Private Label

Module-IV: Store Operations
POS (Point of Sale) / Cash process, Customer service and accommodation, Retail selling process, Retail floor and shelf management, Retail accounting and cash management, Merchandise and category management. Visual merchandising and displays, Retail technology and retail automation, POS and Back-end Technologies.

Module-V: Mall Management
Introduction – Defining the shopping mall, Difference between Shopping Mall and other retail formats, **Shopping Centre / Mall Location:** Existing mall traffic, Clean environment, Designated parking area, Medium to high rental cost, Strengths and Weaknesses of the Mall format; Licenses and Permits for mall operations, **Positioning & Zoning of mall** – formulating the right tenant mix and its placement in a mall**, Facility management** – Infrastructure, Traffic and ambience management, Finance management, Lifestyle centers and their management, Indian scenario of mall management practices.

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

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Text & References:

- Michael Levy, Barton A Weitz and Ajay Pandit, (2008), Retailing Management, Tata McGraw Hill
- R Vedamani&Gibbson, (2008), Retail Management: Functional Principals and Practices, Jaico publications
- Patrick M. Dunne & Robert F Lusch, (2002), Retail Management, Cengage Learning
- Berry Berman & Joel R. Evans, (2009), Retail Management – A Strategic Approach, Pearson Education

Learning Resources:

- Images Retail magazine
- Cygnus Report on Retail Sector
- CII Report on Retail Scenario in India
- Images Malls in India
- Images Year Book
- AT Kearney Report

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SALES MANAGEMENT

Course Code: MKT4307 **Credit Units: 03**

Course Objective:
This course has been designed to help students learn sales management concepts and how to apply them to solve business problems and to function as effective managers. It deals with all important back end management of sales and front end personal selling issues with a view to handle the situations professionally and improve the outcome with result orientation.

Course Contents:

Module I
Changing world of Sales Management and Professionalism in sales. Classification of Personal Selling approaches. Sales jobs, Qualification and skill required for success. Organizational buyer behavior and buying situations. Contrasting Transactional and Relationship Selling models, Sales Teams. Sales management Competencies for effective and outstanding results. Developing Sales Management Strategy / Objectives and Sales Force Roles. Buyer-Seller Daydic Relationship.

Module II
Recruitment planning process: Job analysis, description, qualifications, buyer's perspective and methods of locating prospective candidates. Selection: Application forms, Types of Interviews, Testing and Validating the hiring process.
Sales Training: Determining training needs, Training analysis, Methods of Evaluating sales Training and building a sales training program. Instructional methods used in training.

Module III
Motivation and the reasons for motivating sales people. Maslow's Hierarchy of Needs related to the sales force motivators and company's actions to fill needs. Methods of giving status to sales people to motivate them.
Sales force compensation. Components of compensation and their purpose. Comparison of various compensation plans. Optimizing sales compensation: Customer – Product Matrix and relating it to the appropriate compensation plans.

Module IV
Sales territory; Reasons for establishing or revising Sales Territories, Setting up and revising Sales Territories: Market build-up and Work load method; optimizing sales territory.
Sales quotas; Objectives in using Quotas, Types of Sales Quotas and Quota setting procedures. Reasons when not to use Quotas.

Module V
Personal Selling process: Prospecting: Developing a prospect base, Strategic prospecting, Sources of prospects, common causes of customer attrition, Preparing a prospect list and organizing information. Planning the initial sales call and approach: Pre call information on the Buyer and Organisation, Call Objectives, Planning the approach. Sales Presentation techniques: Types of presentation techniques, Presentation sequence, Adoptive Selling Model. Demonstrations: Demonstration plans, actions, custom fitting demonstrations, use of sales tools. Handling customer objections: types of objections, types of close, Trial Close. Closing the sales.

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

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Text & References:

- Still, Cundiff and Govoni. (2009), Sales Management, Decisions, Strategies and Cases, Prentice Hall of India Pvt. Ltd.
- Ingram, Laforge, Avila, Schwepker Jr., Williams.(2009), Analysis and Decision Making, Segment Books
- Douglas J. Dalrymple, Cron and Decarlo.(2003), Sales Management, John Wiley & Sons Inc.
- Charles M. Futrell (2010). Fundamentals of Selling. Tata McGraw Hill
- Gerald L Manning**,** Michael Ahearne and Barry L Reece (2011). Selling Today, Prentice Hall Pub.

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CONSUMER BEHAVIOUR

Course Code:MKT4308 **Credit Units: 03**

Course Objective:

The course will enable the students to define the concept of consumer behavior and reveal its importance in the context of marketing, to identify various factors that influence consumer behavior and also to examine the intricacies involved in the consumer decision-making process.

Course Contents:

Module-I: Introduction:

Introduction to CB, Model of Consumer buying Decision Making, Participants in buying process, Individual v/s org buying behavior, Concept of consumer Research, Consumer Research Process, Consumer Research Design, Identifying segments, Addressing the needs of market, Profitability of segmentation, Criteria of segmentation, Bayesian Analysis, Value of brand, Brand Loyalty, Seven R's of marketing mix, Inter-market segmentation, STP.

Module-II:Consumer as an Individual:

Consumer demographics*:** Analysis, Consumer life styles and lifestyle marketing VALS, LOV; ***Motivation*:** Types of Needs and Goals, Nature and role of motive, Classifying motives, Motive arousal, Motivation Research; ***Personality*:** Personality theories, Measuring Personality, How self concept develops, Consistency of Self; ***Perception*:** Active Search, Passive reception, concepts related to perception, Marketing Implications; ***Learning: Cues, Response, Reinforcement, Characteristics of Memory systems, Theories of learning; ***Attitude*:** Characteristics of attitude, Functions of attitude, Sources of attitude development. , Attitude theories and models, Strategies for changing attitude.

Module-III: Environmental influences on CB:

Group Dynamics: Importance of group dynamics in decision making, Characteristics of group, Types of groups; ***Reference groups***: Types of reference groups, Application of reference group in CB; ***Family***: Significance of family in CB, Family life cycle, Family purchasing decision; ***Social Class***: Meaning of social class, Process of social stratification, Nature of social class, Social class measurement, Role of social class in segmenting markets, Social class and consumer behavior; ***Culture:*** What is culture, The content of culture, Culture as a process. ***Sub-Culture:*** Defining subculture, Analyzing subculture; ***Personal Influence*** : Nature and significance of personal influence, Who are opinion leaders, Why do opinion leader attempts to influence others, Why followers accept personal influence, The market maven,., Marketing Implications of Personal influence, Identifying and using opinion leaders directly, Creating opinion leaders, Simulating opinion leadership, Stifling opinion leadership, Identifying OL

Module-IV: Consumer Decision Making Process

Decision Process:Buying decision process, Nicosia Model, Howard Sheth Model, Engel –Kollat-Blackwell Model, Types of buying behavior, Steps in buying decision process, Impulse purchase and customer loyalty; ***Diffusion of innovation:***What is an innovation, Types of Innovation, The Adoption process, The Diffusion process.

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Suggested books:

- Schiffman, L.G., Wisenblit,J, J.& Kumar, S.R.(2016). *Consumer Behavior* (11th ed.*)*. Noida, India: Pearson
- Loudon, D. L. & Bitta, A. J.(2002). *Consumer Behavior*. N. Delhi, India: Tata-McGraw-Hill
- Blackwell, R.D., Miniard, P.W. &.Engel, J.F.(2007). *Consumer Behavior*. Kundli, India: Thomsons South-Western.
- Gupta, S.L. & Pal, S (2006).*Consumer Behavior*. N. Delhi, India: Sultan Chand &Sons.

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DIGITAL MARKETING

Course Code: ECM4301 **Credit Units: 03**

Course Overview

The course examines digital marketing strategy, implementation and executional considerations for B-to-B and B-to-C brands and provides a detailed understanding of all digital marketing concepts. Participants will complete the course with a comprehensive knowledge of and experience with how to develop an integrated digital marketing strategy, from formulation to implementation. Strong focus will be on developing student's business skills and growing real-world experience of the digital media sector to enhance their knowledge to cope with employability demand.

Course Objectives

Digital Marketing Course is an initiative designed to educate students and practitioners in the area of Digital Marketing analytics and make them ready for jobs or prepare them to launch campaign for their own organisations.

- To Understand how and why to use digital marketing for multiple goals within a larger marketing and/or media strategy
- Understand the major digital marketing channels - online advertising: Digital display, video, mobile, search engine, and social media
- Learn to develop, evaluate, and execute a comprehensive digital marketing strategy and plan
- Learn how to measure digital marketing efforts and calculate ROI
- Explore the latest digital ad technologies

Course Contents:

Module-I: Digital Marketing Overview:

What is Digital Marketing? Understanding Marketing Process? Why Digital Marketing Wins Over traditional Marketing? Understanding Digital Marketing Process; Digital Marketing Planning and Strategy

Module-II: Website Planning and Creation:

Understanding Internet; Difference between Internet & web; Understanding websites; Understanding domain names & domain extensions; What is web server & web hosting? Different types of web servers; Different types of websites; Planning & Conceptualising a Website; Building website using CMS in Class.

Module-III: Digital Advertising (PPC, Digital Display and YouTube):

Google AdWords Overview; Understanding Adwords Algorithm; Creating Search Campaigns; Types of Search Campaigns - Standard, All features, dynamic search & product listing. Tracking Performance/Conversion: What is conversion tracking? Why is it important, how to set up conversion tracking. Optimizing Search Campaigns: How to optimize campaigns at the time of creation? Optimizing campaign via adgroups.Creating Display Campaign; Types of display campaigns- All features, Mobile app, Remarketing, Engagement. Optimizing Display Campaign and Re-marketing .
What is Online Advertising? Types of Online Advertising, Display Advertising, Contextual advertising, what are Payment Modules?Different Online advertising platforms Creating Banner Ads Using Tools.

Module-IV: Emerging trends in Digital Marketing:

Affiliate Marketing- Affiliate marketing history**,** Affiliate marketing scenario in India**,** Different ways to do affiliate marketing. **Email Marketing-** What is email marketing and how it works? Types of email marketing- Opt-in & bulk emailing; Setting up email marketing account, creating a broadcast email. What are auto responders? Setting up auto responders; Tricks to land in inbox instead of spam folder; **Social Media Marketing-**Concept**,** How social media marketing is different than others Forms of Internet marketing, Understanding Facebook marketing, Linkedin Marketing, Twitter Marketing, Video Marketing **and** VIDEO & AUDIO (PODCASTING) marketing; **and Mobile Web**

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Marketing- Understanding Mobile Devices, Mobile Marketing Measurement and Analytics; Fundamentals of Mobile Marketing, Creating mobile website through wordpress; Using tools to create mobile websites; Using tools to create mobile app Advertising on mobile (App & Web); Content Marketing on mobile. **Content Marketing-**Introduction to content marketing, Objective of content marketing, Content marketing 7 step strategy building process, How to write great compelling content, Optimizing content for search engines, How to increase opt-in email list with content marketing with examples.

Module-V: Search Engine Optimization (SEO):
What is SEO? Introduction to SERP, What are search engines? How search engines work? Major functions of a search engine; what are keywords? Different types of keywords ; Google keyword planner tool; Keywords research process; Understanding keywords; On page optimization; Off Page optimization; Top tools for SEO; Monitoring SEO process; Preparing SEO reports, How to create SEO Strategy for your business, What is link juice? Importance of domain and page authority?How to optimize exact keywords for your business. What is Google Panda Algorithm, Google Penguin and Google EMD Update. How to save your site from Google Panda, Penguin and EMD Update, How to recover your site from Panda, Penguin and EMD.

Module-VI: E-Commerce and Payment Gateway:
What is ecommerce? Top ecommerce websites around the world & it's scenario in India; Difference between E-Commerce software and Shopping Cart; software Payment Gateways, Merchant Accounts & Logistics for physical goods. Integrating Woo-commerce and setting up an ecommerce store on WordPress. Case studies on ecommerce websites. How to do Google Product Listing Ads (PLA) for ecommerce websites.How to do SEO for an ecommerce website.

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text & References:

- Marketing 4.0: Moving from Traditional to Digital by P. Kotler. Wiley Publication.
- The Essentials of E-Marketing, 4th edition by Quirk Education (E-Book)
- The Art of Digital Marketing by Ian Dodson.
- Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, by Damian Ryan and Calvin Jones. KoganPage Publication, 3rd edition.
- Digital Marketing, VandanaAhuja, Oxford Publication.
- Digital Marketing Insights 2017, Social Beat Digital Marketing LLP, Kindle Edition.
- Social Media for Business – Stories of Indian Brands, By Sorav Jain
- Total E-mail Marketing: Maximizing your results from Integrated E-marketing (E-marketing essentials): Dave Chaffey.

Websites:
SEOMoz.org ;mashable.com; http://www.convinceandconvert.com; ClickZ.com ; eMarketer forrester.com; contentmarketinginstitute.com ; adage.com; adweek.com

Final Project: Group Paper and Presentation
Students will work in instructor-selected groups of four or five to complete a 15-20 page digital marketing plan utilizing the concepts and frameworks covered in the course. Papers should be double-spaced using 12-point font and 1-inch margins, and submitted accordingly. All groups will be required to give a presentation in class highlighting the important points of their plan and submit their presentation slides for review. Presentations will take place in class via web conference on prescribed date. Students will need to ensure their audio is working well in order to present. All students will be required to complete evaluations of the group presentations given in class. 25% will be deducted per day for late papers and slides.

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DATABASE MANAGEMENT SYSTEMS

Course Code: ECM4302 **Credit Units: 3**

Course Objectives

The course aims to make the students understand the basic and advanced concepts in databases and database management systems. Students will be able to understand the importance of databases in day to day life. The course will also provide the students, a hands-on experience on the SQL-the language of databases.

Course Contents:

Module I: Introduction to DBMS

Definition of DBMS, Concept and Goals of DBMS, Data Independence, DBMS Architecture, Levels, Database Administrator, File System Approach Vs DBMS Approach, Advantages of Using a DBMS, Data Models, Schemas, and Instances, Database Languages, Database Users, Database Abstraction.

Module II: Relational Database & ER Model

Relational Database: Relational System, Codd's Rule, Relational Model, Optimization, Tables and Views

ER Model: Entity Type, Entity Set, Relationship type, Relationship sets, Constraints: Cardinality Ratio and Participation Constraint, Keys, Mapping, Design of ER diagrams.

Module III: Relational Model Objects

Domains and Relations, Relations and predicates, Relational Data Integrity; Primary Key, Candidate Key, Foreign Key and their rules, Relational operators, Relational Algebra

Module IV: SQL

SQL Language, DDL,DML and DCL commands. Data definition, Data retrieval and update operations on MS ACCESS and SQL Server DBMS.

Module V: Database Applications and Types

Distributed Database, Object Oriented Database, Multimedia Database, Data Mining, Digital Libraries. Data Warehouse.

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text & References

- Elmasari, Navathe, "Fundamentals of Database Systems", Addision Wesley.
- Korth, Silbertz, Sudarshan, "Database Concepts". McGraw Hill.
- Majumdar & Bhattacharya, "Database Management System", Tata McGraw Hill.
- Date C J." An Introduction to Database Systems", Addision Wesley.

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DYNAMIC WEB DESIGN & DEVELOPMENT

Course Code: ECM4307 **Credit Units: 03**

Course Objective:
To develop applications in PHP using various concepts like arrays, user defined functions, Sessions which makes the students to understand and to establish the connectivity between PHP and database and develop programs to add records, retrieve records and delete records from a table.

Course Contents:

Module I: Introduction to Web Development & Cascading Style Sheets
Web pages, Static and Dynamic web pages, Client side VS Server side, Introduction to HTML, HTML Elements, HTML attributes, Styling and formatting HTML, Forms, Tables.
CSS Basics: CSS Introduction: CSS Syntax, CSS Id & Class, CSS How
CSS Styling: Styling Backgrounds, Styling Text, Styling Fonts, Styling Links, Styling Lists, Styling Tables
CSS Box Model: CSS Border, CSS Outline, CSS Margin, CSS Padding

Module II: CSS Advanced
CSS Grouping/Nesting, CSS Dimension, CSS Display, CSS Positioning, CSS Floating, CSS Align, CSS Pseudo-class, CSS Pseudo-element, CSS Navigation Bar, CSS Image Gallery, CSS Image Opacity, CSS Image Sprites
CSS Media Types, CSS Attribute Selectors

Module III: Introduction to PHP, Decisions, Loop & Functions
Evaluation of Php, Basic Syntax, Defining variable and constant, Php Data type, Operator and Expression, Making Decisions, Doing Repetitive task with looping, Mixing Decisions and looping with Html.
What is a function, Define a function, Call by value and Call by reference, Recursive function, String Creating and accessing, String Searching & Replacing String, Formatting String, String Related Library function,Anatomy of an Array, Creating index based and Associative array Accessing array, Element Looping with Index based array, Looping with associative array using each () and foreach(), Some useful Library function

Module IV: Handling HTML Forms using PHP, Working with Files and Directories
Capturing Form, Data Dealing with Multi-value filed, and Generating File uploaded form, redirecting a form after submission.
Understanding, file & directory, Opening and closing a file, Coping, renaming and deleting a file, working with directories, Creating and deleting folder, File Uploading & Downloading.

Module V: Session and Cookie, Database Connectivity with MySql, Exception Handling
Introduction to Session Control, Session Functionality What is a Cookie, Setting Cookies with PHP. Using Cookies with Sessions, Deleting Cookies, Registering Session variables, Destroying the variables and Session.
Introduction to RDBMS, Connection with MySql Database, Performing basic database operation(DML) (Insert, Delete, Update, Select), Setting query parameter, Executing queryJoin (Cross joins, Inner joins, Outer Joins, Self joins.)
Understanding Exception and error, Try, catch, throw. Error tracking and debugging.

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- . Learning PHP, MySQL, books by ‘ O’ riley Press

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ENTREPRENEURSHIP DEVELOPMENT

Course Code: MGT4429 **Credit Units: 02**

Course Contents:

Module I: Decision to Become an Entrepreneur

Introduction to Entrepreneurship: What Is Entrepreneurship? Why Become an Entrepreneur?, Characteristics of Successful Entrepreneurs ,Common Myths About Entrepreneurs, Types of Start-Up Firms ,Changing Demographics Of Entrepreneurs.

Entrepreneurship's Importance: Economic Impact of Entrepreneurial Firms, Entrepreneurial Firms' Impact on Society, and Entrepreneurial Firms' Impact on Larger Firms.

The Entrepreneurial Process: Decision to Become an Entrepreneur, Developing Successful Business Ideas Moving from an Idea to an Entrepreneurial Firm, Managing and Growing an Entrepreneurial Firm.

Module II: Developing Successful Business Ideas

Identifying And Recognizing Opportunities: Observing Trends, Solving a Problem ,Finding Gaps In The Marketplace **,**Personal Characteristics of the Entrepreneur .

Techniques for Generating Ideas: Brainstorming, Focus Groups Library and Internet Research, Other Techniques.

Encouraging and Protecting New Ideas: Establishing a Focal Point for Ideas, Encouraging Creativity at the Firm Level, Protecting Ideas from Being Lost or Stolen, Find a mentor.

Feasibility Analysis: Product/Service Feasibility Analysis, Industry/Target Market Feasibility Analysis, organizational Feasibility Analysis, Financial Feasibility Analysis.

The Business Plan: Reasons for Writing a Business Plan , Who Reads the Business Plan—And What Are They Looking For? Guidelines for Writing a Business Plan, Outline Of the Business PlanandExploring Each Section of the Plan Oral Presentation of a Business Plan, Questions and Feedback to Expect from Investors.

Industry and Competitor Analysis: Studying Industry Trends, The Five Forces Model, The Value of the Five Forces Mode, Industry Types and the Opportunities They Offer , Identifying Competitors ,Sources of Competitive Intelligence, Completing a Competitive Analysis Grid.

Business Models: The Importance and Diversity of Business Models, How Business Models Emerge, Potential Fatal Flaws of Business Models, Components of An Effective Business Model**,** Core Strategy, Strategic Resources, Partnership Network, customer interface.

Module III: Moving from an Idea to an reality

Initial Ethical and Legal Issues Facing a New Firm: Establishing a Strong Ethical Culture for a Firm, Choosing an Attorney for a Firm, Drafting a Founders' Agreement.

Obtaining Business Licenses and Permits: Business Licenses, Business Permits, Choosing a Form of Business Organization, Sole Proprietorship, Partnerships, Corporations, Limited Liability Company.

Introduction To Financial Management : Financial Objectives of a Firm, The Process of Financial Management, Financial Statements ,Forecasts ,Pro Forma Income Statement ,Pro Forma Balance Sheet, Pro Forma Statement of Cash Flows, Ratio Analysis.

Building a New-Venture: Recruiting and Selecting Key Employees, Roles of the Board of Directors Board of Advisers, Lenders and Other Professionals.

Getting Financing or Funding: The Importance, Sources of Personal Financing, Preparing to Raise Debt or Equity Financing, business Angels, Venture Capital, Initial Public Offering, Commercial Banks, SBA Guaranteed Loans, Other Sources of Debt Financing, Leasing, Strategic Partners.

Module IV: Managing and Growing the new venture

Marketing Issues: Segmenting the Market, Selecting a Target Market, Establishing a Unique Positioning, Branding, 4Ps/7Ps Of Marketing For New Ventures.

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The Importance of Intellectual Property: Determining What Intellectual Property to Legally Protect, The Four Key Forms of Intellectual Property, Types of Patents, Who Can Apply for a Patent? The Process of Obtaining a Patent, Patent Infringement, The Four Types of Trademarks, What Is Protected Under Trademark Law? Exclusions from Trademark Protection, The Process of Obtaining a Trademark, What Is Protected by a Copyright? Exclusions from Copyright Protection,
How to Obtain a Copyright , Copyright Infringement, Copyrights and the Internet , Conducting an Intellectual Property Audit, The Process of Conducting an Intellectual Property Audit.
Preparing for and Evaluating the Challenges of Growth : Appreciating the Nature of Business Growth ,Staying Committed to a Core Strategy ,Planning for Growth, Knowing and Managing the Stages of Growth , Challenges Of Growth **,** Strategies for Firm Growth (internal and external),Franchising**.**

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text & References:

- Alejandro Cremades (2016) , The Art of Startup Fundraising: Pitching Investors, Negotiating the Deal, and Everything Else Entrepreneurs Need to Know. Wiley, New York.
- Burton and Bragg (2006),Accounting and Finance for your Small Business. John Wiley and Sons, New York.
- Peter Drucker (2015), Innovation And Entrepreneurship. Harper Collins, India.
- Nandan H (2013), Fundamentals of Entrepreneurship. Prentice Hall India Learning Private Limited; Third edition: India.

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DISSERTATION

Course Code: MGT4437 **Credit Units: 06**

The aim of the dissertation is to provide you with an opportunity to further your intellectual and personal development in your chosen field by undertaking a significant practical unit of activity, having an educational value at a level commensurate with the award of your degree

The dissertation can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Selecting the Dissertation Topic
It is usual to give you some discretion in the choice of topic for the dissertation and the approach to be adopted. You will need to ensure that your dissertation is related to your field of specialization.

Deciding this is often the most difficult part of the dissertation process, and perhaps, you have been thinking of a topic for some time.

It is important to distinguish here between 'dissertation topic' and 'dissertation title'. The topic is the specific area that you wish to investigate. The title may not be decided until the dissertation has been written so as to reflect its content properly.

Few restrictions are placed on the choice of the topic. Normally we would expect it to be:

- relevant to business, defined broadly;
- related to one or more of the subjects or areas of study within the core program and specialisation stream;
- clearly focused so as to facilitate an in-depth approach, subject to the availability of adequate sources of information and to your own knowledge;
- of value and interest to you and your personal and professional development.

Planning the Dissertation
This will entail following:

- Selecting a topic for investigation.
- Establishing the precise focus of your study by deciding on the aims and objectives of the dissertation, or formulating questions to be investigated. Consider very carefully what is worth investigating and its feasibility.
- Drawing up initial dissertation outlines considering the aims and objectives of the dissertation. Workout various stages of dissertation
- Devising a timetable to ensure that all stages of dissertation are completed in time. The timetable should include writing of the dissertation and regular meetings with your dissertation guide.

The Dissertation plan or outline
It is recommended that you should have a dissertation plan to guide you right from the outset. Essentially, the dissertation plan is an outline of what you intend to do, chapter wise and therefore should reflect the aims and objectives of your dissertation.

There are several reasons for having a dissertation plan

- It provides a focus to your thoughts.
- It provides your faculty-guide with an opportunity, at an early stage of your work, to make constructive comments and help guide the direction of your research.
- The writing of a plan is the first formal stage of the writing process, and therefore helps build up your confidence.
- In many ways, the plan encourages you to come to terms with the reading, thinking and writing in a systematic and integrated way, with plenty of time left for changes.

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- Finally, the dissertation plan generally provides a revision point in the development of your dissertation report in order to allow appropriate changes in the scope and even direction of your work as it progresses.

Keeping records

This includes the following:

- Making a note of everything you read; including those discarded.
- Ensuring that when recording sources, author's name and initials, date of publication, title, place of publication and publisher are included. (You may consider starting a card index or database from the outset). Making an accurate note of all quotations at the time you read them.
- Make clear what is a direct a direct quotation and what is your paraphrase.

Dissertation format

All students must follow the following rules in submitting their dissertation.

- Front page should provide title, author, Name of degree/diploma and the date of submission.
- Second page should be the table of contents giving page references for each chapter and section.
- The next page should be the table of appendices, graphs and tables giving titles and page references.
- Next to follow should be a synopsis or abstract of the dissertation (approximately 500 words) titled: **Executive Summary**
- Next is the 'acknowledgements'.
- Chapter I should be a general introduction, giving the background to the dissertation, the objectives of the dissertation, the rationale for the dissertation, the plan, methodological issues and problems. The limitations of the dissertation should also be hinted in this chapter.
- Other chapters will constitute the body of the dissertation. The number of chapters and their sequence will usually vary depending on, among others, on a critical review of the previous relevant work relating to your major findings, a discussion of their implications, and conclusions, possibly with a suggestion of the direction of future research on the area.
- After this concluding chapter, you should give a list of all the references you have used. These should be cross - references with your text. For articles from journals, the following details are required e.g.

Draper P and Pandyal K. 1991, The Investment Trust Discount Revisited, Journal of Business Finance and Accounting, Vol18, No6, Nov, pp 791-832.

For books, the following details are required:
Levi, M. 1996, International Financial Management, Prentice Hall, New York, 3rd Ed, 1996

- Finally, you should give any appendices. These should only include relevant statistical data or material that cannot be fitted into the above categories.

The Layout Guidelines for the Dissertation

- A4 size Paper
- Font: Arial (10 points) or Times New Roman (12 points)
- Line spacing: 1.5
- Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

Guidelines for the Assessment of the Dissertation

While evaluating the dissertation, faculty guide will consider the following aspects:

1. Has the student made a clear statement of the objective or objective(s).
2. If there is more than one objective, do these constitute parts of a whole?
3. Has the student developed an appropriate analytical framework for addressing the problem at hand.
4. Is this based on up-to-date developments in the topic area?

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5. Has the student collected information / data suitable to the frameworks?
6. Are the techniques employed by the student to analyse the data / information appropriate and relevant?
7. Has the student succeeded in drawing conclusion form the analysis?
8. Do the conclusions relate well to the objectives of the project?
9. Has the student been regular in his work?
10. Layout of the written report.

Examination Scheme:

Contents & Layout of the Report	30
Conceptual Framework	10
Objectives & Methodology	15
Implications & Conclusions	15
Viva/ Presentations	30
TOTAL	**100**

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PRIVATE EQUITY AND ENTREPRENEURIAL FINANCE

Course Code: FIN4405 **Credit Units: 03**

Description

Private equity is composed of funds and investors that directly invest in **private** companies, or that engage in buyouts of public companies, resulting in the delisting of public **equity**. In finance, **private equity** is a type of **equity** and one of the asset classes consisting of **equity** securities and debt in operating companies that are not publicly traded on a stock exchange. A **private equity** investment will generally be made by a **private equity** firm, a venture capital firm or an angel investor. With support of Private equity, the new entrepreneur will hope up to start a new firm for the benefit of economic development.

Objectives

- To understand the various types of activities that falls under the purview of Private equity. Corporate Restructuring
- To understand intricacies of raising of various methods of financing
- To deal with Issues involved in Private financing and entrepreneurial development activities.
- To examine key elements of understanding a business from a private equity investment perspective

Assessment

The subject would comprise of both theory and numerical solving. The assessment of the learner would be done through assignments, case discussion, articles on current research & issues, problem solving and simulation. The students would be expected to do a project, quiz and comprehend the application part of the concepts taught in the class.

Course Contents :

Module-I: Introduction: Over view of the Private Equity Industry, Development and Growth, terminology, and categories within the asset class, participants, anatomy of funds and partnership agreements, perspectives and negotiations and perspectives of companies

Module-II: The Fundamentals of Private Equity Investing:,financing, structuring and negotiating - buyout and growth capital transactions, and managing the portfolio company over the life of the investmentand including an exit and / or value realization transaction.

Module-III: Understanding and Evaluating Private Equity Firms in Financial Markets: We will consider how the financial community assesses firms and chooses which funds to invest in and how funds assemble portfolios of companies and how LP investors assemble their portfolios of LP interests. Other topics will include understanding and managing LP liquidity options; the rise and role of other alternative investment vehicles, most notably hedge funds and sovereign wealth funds; the publicly traded private equity firm; the impact of the financial crisis and current issues under discussion in the area of financial regulation

Module-IV: Private Equity in Secondary Markets – Key components of value creation- Relative value Matrix – Industry Value creation.

Module-V: Private Equity - corporate governance and ethics - Iinvestments in developing markets - Sourcing of private equity - Deals and management of portfolio company - Expectations and Negotiation

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Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Reference books

- Jason A. Scharfman, Private Equity Operational Due Diligence: Tools to Evaluate Liquidity, Valuation, and Documentation, + Website , ISBN: 978-1-118-11390-5, March 2012
- Stowell D, An Introduction To Investment Banks, Hedge Funds, And Private Equity – 2011, Elsevir (2011), **ISBN :** 978-9380931074

Case studies published from various journals.

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COMPENSATION AND REWARD MANAGEMENT

Course Code: HRM4401 **Credit Units: 03**

Course Objective:
This course helps students to learn how compensation system operates to attract, retain and motivate competent work force.

Course Contents:

Module I: Introduction
Concept of Compensation, System of Compensating, Concept of Reward and Reward System, Economic Theory of Wages, Limitations of Economic Theories. Wage and Salary Administration at micro level, Wage concepts, Methods of Job Evaluation, Role of various parties – Employees, Employers, Unions & Government, Overview of Legislations affecting Compensation

Module II: Compensation Structure- Indian Practices
Salary Progression, Methods of Payment, Limitations of the Job Related Compensation, Competency based Compensations, Performance linked Compensations- Performance Appraisal

Module III: Elements of Compensation
Variable Compensation, Principles of Reward Strategy, Perquisites, Bonuses & Incentives Scope and Process, Ethical Considerations, Social Security, Sharing Productivity Gains with Employees, Gain Sharing, Team Based Pay, The Role of Compensation in Sales Force Success, Constructing pay structure

Module IV: Incentive Schemes / Payment by Results
Types of Incentive Schemes/ Systems and Plans, Merits and Demerits of Incentives

Module V: Benefits and Services
Concept of Benefit- Strategic Perspectives on Benefits, Type of Benefits, Factor Influencing Choice of Benefit Package, Administration of Benefits and Services

Module VI: Current Trends in Compensation and Reward Management
Elements of Managerial Compensation- A New Approach, VRS, Pay the Person, Rewarding Excellence, Individualizing the Pay System, Executive compensation, International Compensation

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text & References:

- Singh B.D. (2007). Compensation and Reward Management, Excel Books, New Delhi.
- Milkovich& Newman (2005), Compensation , McGraw-Hill
- Henderson Richard (2006), Compensation Management in a Knowledge - Based World, Prentice Hall India
- Armstrong Michael &Murlis Helen (2005), Reward Management A Handbook of Remuneration, Strategy and Practice, Kogan Page

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PSYCHOLOGICAL TESTING

Course Code: HRM4402 **Credit Units: 03**

Course Objective:
To develop an understanding of the concept of psychological testing by providing a theoretical background of psychological assessment of personality tests and their applications and the ethics of the usage of different types of psychological tests.

Course Contents:

Module I: Functions and Origins of Psychological Testing
Concept of Psychological Testing, Nature and Use of Psychological Tests, Historical Antecedents of Modern Testing

Module II: Technical and Methodological Principles
Norms and Meaning of Test Scores, Reliability and Validity

Module III: Personality Testing
Self-Report Inventories and Scales- MBTI and FIRO-B
Projective Techniques- TAT, Sentence Completion Test
Measures of Styles and Types
Situational Tests
Self-Concepts and Personal Constructs
Observer Reports

Module IV: Applications of testing
Educational Testing
Occupational Testing

Module V: Ethical and Social Considerations in Testing
Protection of Privacy and Confidentiality
Communicating Test Results

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text & References:

- Anastasi, A. and Urbina, S.,(2005) Psychological Testing,Pearson Education
- Freeman, Frank S (1962). Theory Practice of Psychological Testing. Oxford and IBH.
- Edward Hoffman (2004), Psychological Testing at work, Tata McGraw-Hill.
- Charles Jackson (2001), Understanding Psychological Testing, Jaico Publishing House.

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MANAGERIAL COUNSELLING

Course Code: HRM4406 **Credit Units: 03**

Course Objective:
To understand the concept and process so as to develop the professional counseling skills among the students.

Course Contents:

Module I: Introduction
Self-Development of Managers as Counselors, Barefoot Counseling, Assertiveness and Interpersonal Skills for Counselors, Counseling Relationship.

Module II: Approaches to Counseling
Development of Counseling Skill, Introduction to the Important Schools of Counseling, Psychoanalytic Foundations, Transactional Analysis, Gestalt Therapy, Rational Emotive Therapy, Person-Centered Approach to Counseling, An Integrated Model, Essentials of Skills, Nonverbal Clues.

Module III: Counseling Process
Counseling Interventions in Organizations, Empathy, Listening and Responding, Effective Feedback, Role conflict in counselling, Genuineness, Social Skills at workplace

Module IV: Counseling at Work
Performance Counseling, Counseling in Problem Situations, Interpersonal Conflicts, Midlife Blues, Integration and Action Plan.

Module V: Current Trends in Counselling
Modern trends in counselling, role of a counsellor, Importance of mindfulness, Counselling in Indian Industries.

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text & References:

- Welfel E.R. and Patterson Lewis E (2007), The Counselling Process, Thomson
- Singh Kavita (2010), Counselling Skills for Managers, Prentice Hall India
- Rao. S.N (2010), Counselling and Guidance, Tata McGraw Hill
- Felthman C. and Dryden W (2010), Brief Counselling- A Practical Integrative Approach, Tata McGraw Hill
- Mc. Grath E.H. Basic managerial skills for all, PHI, New Delhi
- Michael Reddy, The Managers guide to counselling at work, Universities, press
- Eric Parsloe, The Managers as coach & mentor, Universities, press
- David Fantoma, Social Skills at work, Universities, press

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INTERNATIONAL TRADE PROCEDURES AND DOCUMENTATION

Course Code: IBM4407 **Credit Units: 03**

Course Objective:
Learning the importance and procedural & documentation aspects of export-import of goods and services; impart knowledge of governments, departments, international institutions involved ; teach an Export Manager to develop a systematic methodology to handle exports ; understand the relevance and importance of various government policy measures for export as well as import.

Course Contents:
Module I: Introduction
Export documentation Framework – the need, entities & documents as per requirement of (a) the contract (b) Govt. of India (c) Importing country d) for claiming export assistance.

Module II: Documents for processing export order and legal implications
Processing of Product enquiry/quotation, Purchase/Export Order, Letter of intent, Payment Terms, International Transport Modes, INCOTERMS, advising & scrutiny of a Letter of Credit (L/C), seeking L/C amendments, International Chamber of Commerce's UCPDC articles.

Module III: Export/Import Documents
How to make Commercial, Financial, Transport, Title, Official, Insurance, Export assistance Documents & Certificates for Exports.Ensuring error-free export documentation as per L/C. How to open L/C, apply for license and make Customs/ Sales Tax documents for imports. International Transactions involving Documents Against Payment and Document Against Acceptance. Negotiation of Export Bills, Bank realization, late payment follow-up.

Module IV: Central Excise, Sales Tax, Customs and Port Clearances
Clearance of Export & Import Cargo, Role of Clearing and Forwarding Agents, Shipment of Export Cargo, Excise, Sales Tax & Customs Department regulation compliance. Port and Shipping clearance of Export and Import cargo.

Module V: EXIM Policy Framework
EPCG Scheme, Duty Exemption Pass Book Scheme, Export Oriented Units, Export houses, Trading houses, Export Processing Zones, Special Economic Zone, Bank, RBI, DGFT, Customs & FEMA regulatory compliances.

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text & References:
- Export Import Procedures, Documentation and Logistics: C. Rama Gopal, New Age International Publishers, New Delhi
- Nabhi (2011-12)1999, How to Export, Nabhi Publications
- RBI MuMGTi, Export Procedures and Documentation
- Handbook of Exim Procedures and Documentation – Govt. of India Publication Division
- Handbook of DGFT Publications – Ministry of Commerce, Govt. of India.

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DATA WAREHOUSING & DATA MINING

Course Code: ITM4401 **Credit Units: 03**

Course Contents:

Module-I: DATA WAREHOUSING

Data warehousing Components –Building a Data warehouse –- Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata.

Module-II: BUSINESS ANALYSIS

Reporting and Query tools and Applications – Tool Categories – The Need for Applications – Cognos Impromptu – Online Analytical Processing (OLAP) – Need – Multidimensional Data Model – OLAP Guidelines – Multidimensional versus Multi relational OLAP – Categories of Tools – OLAP Tools and the Internet.

Module-III: DATA MINING AND TRENDS IN DATA MINING

Introduction – Data – Types of Data – Data Mining Functionalities – Interestingness of Patterns – Classification of Data Mining Systems – Data Mining Task Primitives – Integration of a Data Mining System with a Data Warehouse – Issues –Data Preprocessing,– Based Cluster Analysis – Outlier Analysis – Data Mining Applications.

Module-IV: CLUSTERING AND APPLICATIONS

Cluster Analysis - Types of Data – Categorization of Major Clustering Methods – K means – Partitioning Methods – Hierarchical Methods - Density-Based Methods –Grid Based Methods – Model-Based Clustering Methods – Clustering High Dimensional Data - Constraint

Module-V: ASSOCIATION RULE MINING AND CLASSIFICATION

Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining Various Kinds of Association Rules – Correlation Analysis – Constraint Based Association Mining – Classification and Prediction - Basic Concepts - Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Other Classification Methods – Prediction

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

TEXT BOOKS:

1. Alex Berson and Stephen J. Smith, " Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Tenth Reprint 2007.
2. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Second Edition, Elsevier, 2007.

REFERENCES:

1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, " Introduction To Data Mining", Person Education, 2007.
2. K.P. Soman, Shyam Diwakar and V. Ajay ", Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2006.
3. G. K. Gupta, " Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India
4. Daniel T.Larose, "Data Mining Methods and Models", Wile-Interscience, 2006.

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SEARCH ENGINE OPTIMIZATION

Course Code: ITM4405 **Credit Units: 3**

Course Objective:

Course Contents:

Module-I: SEO Basics
Introduction about Domain, World Wide Web, Difference between Portal & Search Engine, Importance of Search Engine, Working of search engine, Difference between directories & search engine. Website performance monitor in search engine

Module-II:
Introduction to SEO, Web Traffic, Need of SEO, Working of SEO, Steps in SEO, Types of SEO techniques : Black Hat Techniques, White Hat Techniques,

Module-III: Keyword Research & Analysis
Introduction to Keyword research: Types of keywords, Keyword research methodology, keywords analysis tools, Preparing keyword list, localized keyword research, Keyword density, Keyword prominence, keyword stuffing

Module-IV: On Page Optimization
Basis of website designing, Essentials of good website designing, HTML Basics for SEO : Page Title, Meta Descriptions & Meta Keywords, Headings, Bod Text, Image & Alt tag, Invisible text, HTML Site Map Creation, Web Master Tools

Module-V: Off Page SEO Optimization
Page Rank, Link Popularity, Link Building, Types of Link Building, Book Marking, Article Submission Blog Marketing, Blog commenting, XML Site Ma submission, Customer review submission, press release submission, search engine submission

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text & References

- The Art of SEO: Mastering Search Engine Optimization 3rd Edition by Eric Enge, Stephan Spencer and Jessie Stricchiola, O Reilly Publication
- Search engine optimization 2017: Learn SEO with smart internet marketing strategies Paperbackby Adam Clarke,
- Search Engine Optimization All-in-One For Dummies 3rd Edition by Bruce Clay

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TOOLS FOR BUSINESS INTELLIGENCE

Course Code: ITM4406 **Credit Units: 03**

Course Objective:
This course provides an introduction to the concepts of business intelligence (BI) as components and functionality of information systems. The course aims at examining Business Intelligence (BI) as a broad category of applications and technologies for gathering, storing, analyzing, sharing and providing access to data to help enterprise users make better managerial decisions. Students will be able to learn the principles and best practices for how to use data in order to support fact-based decision making

Course Contents:

Module-I: Business Intelligence: An Introduction
Introduction, Definition, History and Evolution, Business Intelligence Segments, Difference between Information and Intelligence, Defining Business Intelligence Value Chain, Factors of Business Intelligence System, Real time Business Intelligence, Business Intelligence Applications.

Module-II: Business Intelligence Types:
Types of Business Intelligence, Business Intelligence Platform, Dynamic roles in Business Intelligence, Roles of Business Intelligence in Modern Business- Challenges of BI, Multiplicity of Business Intelligence Tools, Types of Business Intelligence Tools, Modern Business Intelligence, the Enterprise Business Intelligence, Information Workers

Module-III: Business Intelligence Life Cycle
Introduction, Business Intelligence Lifecycle, **Enterprise Performance Life Cycle (EPLC)**Framework Elements, Life Cycle Phases, Human Factors in BI Implementation, BI Strategy, Objectives and Deliverables, Transformation Roadmap, Building a transformation roadmap, BI Development Stages and Steps, Parallel Development Tracks, BI Framework

Module-IV: Introduction to Data Warehousing& Data Mining
Data Warehousing, Advantages and Disadvantages, Data Mart, Online Analytical Processing (OLAP), Characteristics, Tools, Difference between OLAP and OLTP, Multidimensional Data Model. Definition of Data Mining, Data mining parameters, How Data Mining works?, Types of relationships, Architecture of Data Mining, Kinds of Data which can be mined, Functionalities of Data Mining, Classification on Data Mining system, Various risks in Data Mining, Advantages and disadvantages of Data Mining

Module-V: Business Intelligence User Model
Introduction, Evolution of Business Intelligence, Business Intelligence Opportunity Analysis Overview, Content Management System, End User Segmentation, Basic Reporting and Querying, Online Analytical Processing, OLAP Techniques, OLAP Applications, Applying the OLAP to Data Warehousing, Benefits of using OLAP, Dashboard, Advanced/Emerging BI Technologies, Future of Business Intelligence

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text & References

- Business Intelligence and Analytics. Systems for Decision Support, 10th Edition. R. Sharda, D. Delen, & E. Turban; Pearson/Prentice Hall, © 2015. ISBN-13: 978-0-13-305090-5
- Business Intelligence: A Managerial Perspective on Analytics**,** R. Sharda, D. Delen, 3rd edition, Pearson Education **ISBN-13:** 978-0133051056

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SOCIAL MEDIA ANALYTICS

Course Code: ECM4401 **Credit Units: 03**

Course Objective:
Social media not only provides marketers with a means of communicating with their customers, but also a way to better understand their customers. This course will provide students with an advanced understanding of social media, marketing plans and social media analytics.

Course Contents:

Module-I: Introduction
Introduction to various social network platforms- Twitter, Facebook, Google+, LinkedIn and their features. Utilizing social media for Business. Promoting business on social media.

Module-II: Mining Twitter
Introduction to Twitter, Exploring Twitter's API and Terminology, exploring trending topics, searching for keywords, extracting tweet entities with frequency analysis, computing tweet diversity, examining patterns in retweets, visualizing frequency data with histograms.

Module-III: Mining Facebook & LinkedIn
Introduction, Understanding the Social Graph API, the Open Graph Protocol, Analyzing Social Graph Connections, analyzing facebook pages, examining friendships.
Introduction, Making LinkedIn API Requests, Data Clustering, normalizing data for analysis, measuring similarity, clustering algorithms.

Module-IV: Mining Google+
Introduction, Exploring the Google+ API, Term Frequency, Inverse Document Frequency, Querying Human Language Data with TF-IDF 1. Introducing the Natural Language Toolkit, Applying TF-IDF to Human Language,Finding Similar Documents , Analyzing Bigrams in Human Language Reflections on Analyzing Human Language Data

Module-V: Mining Web pages
Scraping, Parsing, and Crawling the Web, Breadth-First Search in Web Crawling, Discovering Semantics by Decoding Syntax. Natural Language Processing Illustrated Step-by-Step. Sentence Detection in Human Language Data. Document Summarization. Entity-Centric Analysis: A Paradigm Shift. Gisting Human Language Data. Quality of Analytics for Processing Human Language Data

Module-VI: Twitter Cookbook
Discovering the Trending Topics, Searching for Tweets, Collecting Time-Series Data, Extracting Tweet Entities Finding the Most Popular Tweets in a Collection of Tweets, Tabulating Frequency Analysis, Finding Users Who Have Retweeted a Status, Extracting a Retweet's Attribution, Making Robust Twitter Request, Resolving User Profile Information Extracting Tweet Entities from Arbitrary Text. Getting All Friends or Followers for a User, Analyzing a User's Friends and Followers Harvesting a User's Tweets. Crawling a Friendship Graph

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

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Text & References

Text:

- "Mining the Social Web". 2nd Edition. Matthew A. Russell, O'Reilly Media. 2013
- "Social Media Mining: An Introduction", Reza Zafarani, Mohammad Ali Abbasi, and Huan Liu, Cambridge University Press, 2014

References:

- Hanneman, Robert and Mark Riddle. 2005. Introduction to Social Network Methods
- "Modern Information Retrieval: The Concepts and Technology behind Search (2nd Edition)". Ricardo Baeza-Yates and Berthier Ribeiro-Neto ACM Press Books, 2011. ISBN-10: 0321416910, ISBN-13: 978-0321416919.
- Social Media Marketing, Tracy Tuten & Michael Solomon Pearson 2013 ISBN: 978013-2551793

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TOOLS FOR BUSINESS INTELLIGENCE

Course Code: ECM4404 **Credit Units: 03**

Course Objective:
This course provides an introduction to the concepts of business intelligence (BI) as components and functionality of information systems. The course aims at examining Business Intelligence (BI) as a broad category of applications and technologies for gathering, storing, analyzing, sharing and providing access to data to help enterprise users make better managerial decisions. Students will be able to learn the principles and best practices for how to use data in order to support fact-based decision making

Course Contents:

Module-I: Business Intelligence: An Introduction
Introduction, Definition, History and Evolution, Business Intelligence Segments, Difference between Information and Intelligence, Defining Business Intelligence Value Chain, Factors of Business Intelligence System, Real time Business Intelligence, Business Intelligence Applications.

Module-II: Business Intelligence Types:
Types of Business Intelligence, Business Intelligence Platform, Dynamic roles in Business Intelligence, Roles of Business Intelligence in Modern Business- Challenges of BI, Multiplicity of Business Intelligence Tools, Types of Business Intelligence Tools, Modern Business Intelligence, the Enterprise Business Intelligence, Information Workers

Module-III: Business Intelligence Life Cycle
Introduction, Business Intelligence Lifecycle, **Enterprise Performance Life Cycle (EPLC)**Framework Elements, Life Cycle Phases, Human Factors in BI Implementation, BI Strategy, Objectives and Deliverables, Transformation Roadmap, Building a transformation roadmap, BI Development Stages and Steps, Parallel Development Tracks, BI Framework

Module-IV: Introduction to Data Warehousing& Data Mining
Data Warehousing, Advantages and Disadvantages, Data Mart, Online Analytical Processing (OLAP), Characteristics, Tools, Difference between OLAP and OLTP, Multidimensional Data Model. Definition of Data Mining, Data mining parameters, How Data Mining works?, Types of relationships, Architecture of Data Mining, Kinds of Data which can be mined, Functionalities of Data Mining, Classification on Data Mining system, Various risks in Data Mining, Advantages and disadvantages of Data Mining

Module-V: Business Intelligence User Model
Introduction, Evolution of Business Intelligence, Business Intelligence Opportunity Analysis Overview, Content Management System, End User Segmentation, Basic Reporting and Querying, Online Analytical Processing, OLAP Techniques, OLAP Applications, Applying the OLAP to Data Warehousing, Benefits of using OLAP, Dashboard, Advanced/Emerging BI Technologies, Future of Business Intelligence

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text & References

- Business Intelligence and Analytics. Systems for Decision Support, 10th Edition. R. Sharda, D. Delen, & E. Turban; Pearson/Prentice Hall, © 2015. ISBN-13: 978-0-13-305090-5
- Business Intelligence: A Managerial Perspective on Analytics**,** R. Sharda, D. Delen, 3rd edition, Pearson Education **ISBN-13:** 978-0133051056

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SEARCH ENGINE OPTIMIZATION

Course Code: ECM4406 **Credit Units: 03**

Course Objective
The course will enable students the craft of optimizing websites for Search Engines. Students will learn about how the search engine works, the techniques for conducting SEO and keywords searching.

Course Contents:

Module-I: SEO Basics
Introduction about Domain, World Wide Web, Difference between Portal & Search Engine, Importance of Search Engine, Working of search engine, Difference between directories & search engine. Website performance monitor in search engine

Module-II:
Introduction to SEO, Web Traffic, Need of SEO, Working of SEO, Steps in SEO, Types of SEO techniques : Black Hat Techniques, White Hat Techniques,

Module-III: Keyword Research & Analysis
Introduction to Keyword research: Types of keywords, Keyword research methodology, keywords analysis tools, Preparing keyword list, localized keyword research, Keyword density, Keyword prominence, keyword stuffing

Module-IV: On Page Optimization
Basis of website designing, Essentials of good website designing, HTML Basics for SEO : Page Title, Meta Descriptions & Meta Keywords, Headings, Bod Text, Image & Alt tag, Invisible text, HTML Site Map Creation, Web Master Tools

Module-V: Off Page SEO Optimization
Page Rank, Link Popularity, Link Building, Types of Link Building, Book Marking, Article Submission Blog Marketing, Blog commenting, XML Site Ma submission, Customer review submission, press release submission, search engine submission

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text & References

- The Art of SEO: Mastering Search Engine Optimization 3rd Edition by Eric Enge, Stephan Spencer and Jessie Stricchiola, O Reilly Publication
- Search engine optimization 2017: Learn SEO with smart internet marketing strategies Paperbackby Adam Clarke,
- Search Engine Optimization All-in-One For Dummies 3rd Edition by Bruce Clay

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Amity Business School

Master of Business Administration
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Curriculum & Scheme of Examination

2023

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Master of Business Administration (Banking & Finance)

ACCOUNTING FOR MANAGEMENT

Course Code: MBF4102 **Credit Units: 03**

Course Objective:
Participants in this course will develop the essential ability of all managers, to use complex accounting information as a platform for decision-making. As the course unfolds, participants will build an increasingly sophisticated level of understanding of the language of accounting and its key concepts. In addition the course develops skills in interpreting earnings statements, balance sheets, and cash flow reports. This ability to analyze financial statements will enable participants to deal more effectively with strategic options for their businesses or business units.

Course Contents:
Module I: Introduction
The Financial Accounting Framework, Accounting Policies, Need of Accounting. Users of Accounting Information, Accounting Cycle, Accounting and Management Control.Balance sheet-Dual Aspect principle, Classification Items of Balance Sheet, Formats of Balance Sheet.Preparation of Balance Sheet. Income Statement- Realization vs. Accrual Principle, Format of Income Statement), Preparation of Income Statement (IAS,GAAP&IFRS) Depreciation Accounting.

Module II: Measuring and Reporting
Measuring and Reporting :Cost of sales and Inventories, Debentures, Investments, Shareholder Equity. Human Resource Accounting-Valuation of Human Resources, Recording and Disclosure in Financial Statements

Module III: Management Accounting
Contrast between Management Accounting and Financial Accounting and Reporting, Types of Management Accounting Information and their uses, General Observation on Management Accounting. Statement of Cash Flows-Profit versus Cash, Purpose and Use of Cash Flow Statement, Format of Cash Flow Statement (AS-3), Preparation of Cash Flow Statement (IAS,GAAP& IFRS).

Module IV: Analyzing and Interpreting Financial Statements
Financial Statement Analysis – Basic Relationship, Overall Measures, Profitability Ratios, Investment Utilization Ratios, Financial Condition Ratios, Making Comparisons.Du-pontanalysis.Interpretations of calculated Ratios.

Module V: Cost Accounting: The behavior of cost- Relation of cost to volume, BEP & Profit graph-CVP analysis, Full cost and its uses. Techniques of costing.Standardcosting.Strategic planning and budgeting.

Examination Scheme:

Components	Assessment 1 Group Presentation	Assessment 2 In Class Quiz	Class Test/Mid Term Exam	Attendance	External
Weightage (%)	10	5	10	5	70

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Core Text Book:

- Anthony, N.R; Hawkings, F. D; Merchant, A.K (2014), Accounting Text and Cases, 13th Edition, McGraw Hill.
- Ramachandran, N (2011), Financial Accounting for Management, 3rd Edition, McGraw Hill.

References Book:

- Bhattacharya, S.K. and Dearden, J, 3rd Edition, Accounting for Management, Text and Cases, Vikas Publishing house
- Narayanaswamy R (2014), Finanacial Accounting – A Managerial Perspective, 5th Edition, Prentice Hall of India.
- Maheshwari S N; Maheshwari SK and Maheshwari SK, 3rd Edition, A Text Book for Accounting for Management, Vikas Publishing House.
- M.N Arora 10th Edition, A Text Book of Cost and Management Accounting, Vikas Publishing House.

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QUANTITATIVE TECHNIQUES IN MANAGEMENT

Course Code: MBF4106 **Credit Units: 03**

Course Objective:
The aim of this course is to develop the understanding of various statistical tools used for decisions making and how each applies to and can be used in the business environment using contemporary software.

Course Contents:
Module I: Introduction
Application of Statistics in Business; Classification of Data; Interpretation of computer output of diagrammatic and graphical presentation of data, measures of central tendency, measures of dispersion and skewness.

Module II: Probability and Probability Distributions
Concepts of Probability, addition theorem, multiplication theorem, Baye's Theorem; continuous and discrete probability distribution:Binomial Probability Distribution, Poisson Probability Distribution and Normal Probability Distribution.

Module III: Sampling and Sampling Distribution
Sampling: Basic Concept, Types of Sampling, Errors and Precautions in sampling, size of sample, Parameter and Statistic, Sampling Distribution of the mean, Sampling distribution of proportion, Estimation – point estimation, Interval Estimation,

Module IV: Tests of Hypothesis
Null and Alternative hypothesis, One-Tailed and Two-Tailed tests of hypothesis, Type I and Type II error, rejection rule using p – Value and critical value approach. Hypothesis Testing to compare two populations: Test for one sample mean, Test for two population means (Independent Samples), Tests for two population means (Dependent Samples), Tests for two population proportions (Independent Samples), Tests for two population variances (Dependent Samples), F-test, Chi – Square Test

Module V: Forecasting Techniques
Correlation - Karl Person, Spearman's Rank methods, simple linear regression analysis – Estimated regression equation, least squares method, coefficient of determination, interpretation of computer output for Regression, Introduction to time series, trend analysis

Module VI: Introduction to SPSS, performing univariate and bivariate analysis on SPSS

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text & References:

- Anderson D.R; Sweeny D.J, Williams T.A (2002), Statistics for Business and Economics, Cengage learning.
- KazinierL.J.,& Pohl N.F. (2004), Basic Statistics for Business and Economics, New York: McGraw Hill.
- Levin Richard I. & Rubin David S.(1998), Statistics for Management, Pearson Education India
- Stephen .K.C. (2002), Applied Business Statistics: Text, Problems and Cases. New York: Harper and Row.
- Sharma, J.K. (2007), Business Statistics, Pearson Education India.

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INFORMATION TECHNOLOGY AND E-COMMERCE

Course Code: MBF4109 **Credit Units: 02**

Course Objective:
This course will expose students to developments in computer technology and understand the working of a computer system. It will introduce end-user computing and build skills in using IT and understanding various technologies like internet, telecom, DBMS concepts, e-commerce etc. The course will expose the students to the latest trends in e-business models, electronic payment systems and data & information security

Course Contents:

Module I: Modern Computer Systems
Evolution of Computer Systems, Input, output and storage technologies, Computer Assisted Control and Automation, (e.g. Delhi Metro , Digitally Controlled Car engines etc.), Computer Controlled Biometric/RFID based Access Control , Contemporary hardware and software platforms(Open Source, Web Software etc.), Storage of Data Resources

Module II: Data Resource Management
Introduction to DBMS, Benefits of DBMS over traditional file system, Types of DBMS, Application of DBMS using MS-ACCESS / ORACLE as a tool for understanding of DBMS concepts.SQL Query handling, Forms, Concept of Data Warehouses and Data Marts, Introduction to Data Centers. Storage Technologies and Architecture (DAT, NAS, SAN etc.). Live examples of storage strategies of companies like Google, Amazon Wal-Mart dealing with storage crisis

Module III: Telecommunications and Computer Networks
Networked Enterprise :- Components, Types of networks, Advantages of Network Environment, Business Uses of Internet, Intranet and Extranet, Network Topologies, Web 2.0/3.0, Distributed/Cloud/Grid Computing, GSM & CDMA, GPRS ,Features of 3G & 4G technologies, VOIP and IPTV.

Module IV: Electronic Commerce Systems
Meaning, Definition, Concept, Features, Function of E-Commerce, E-Commerce Practices v/s Traditional Practices, Scope and basic models of E-Commerce, Limitations of E-Commerce, Precaution for secure E-Commerce, proxy services.

Module V: E-Commerce Business Models & EDI
Concept of EDI, Difference between paper based Business and EDI Based business, Advantages of EDI, Application areas for EDI, Action plan for Implementing EDI, Factors influencing the choice of EDI.Various business models in Ecommerce likeB2C, B2B, C2C.

Module VI: E-Payment Systems and Security Management
Transactions through Internet, Requirements of E-Payment system, Post paid payment system- Credit card solutions, Cyber cash Internet Cheques, Instant Paid payment system- Debit card, Direct Debit, Prepaid payment system- Electronic cash, Digicash, Netcash, Cybercash, Smart Cards.
The Information Security, System Vulnerability and Abuse, Security Threats (Malicious Software, Hacking etc.) and counter measure. Definition of Cyber Crime and Types.Antivirus, Firewalls, Anti-Spyware, Security Audit, Discussion on Overview of IT-ACT 2000.

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text & References:

- Norton P (2010), Introduction to Computers, Tata McGraw-Hill
- Potter T (2010), Introduction to Computers, John Wiley & Sons (Asia) Pvt Ltd

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- Morley D & Parker CS (2009), Understanding Computers – Today and Tomorrow, Thompson Press
- Elias M Awad, Electronic Commerce from Vision to fulfilment, Third Edition, Pearson Education
- Ravi Kalakota& Andrew B. Shinston, Electronic Commerce – A manager's Guide, Pearson Education.
- Bhaskar Bharat, Electronic Commerce - Technologies & Applications, Tata McGraw Hill.
- J. Christopher & T.H.K. Clerk, Global E-Commerce, University Press.

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BUSINESS RESEARCH METHODS

Course Code: MBF4203 **Credit Units: 02**

Course Objective:
The main objective of the course is to equip the students with the basic understanding of research methodology in changing business scenario. It will also provide them an insight into the application of dynamic analytical tools to face the stormy challenges aimed at fulfilling the purpose of business decision making.

Course Contents:
Module I: Introduction
Meaning of research, importance of scientific research in business decision making, types of research, complete research process, research methodology, criterion for good research, Identification of research problem and formulation of hypothesis, research designs, drafting a research proposal

Module II: Measurement and Data Collection
Primary data, secondary data, design of questionnaire, sampling fundamentals and sample designs, Qualitative and quantitative research, measurement and scaling techniques, measures of central tendency mean, median, mode; measures of dispersion, data processing

Module III: Data Analysis I
Cross tabulation, univariate analysis, bivariate analysis: Correlation, Karl Pearson's coefficient of correlation, Spearman's coefficient of correlation, hypothesis testing, t-test, Z test, F-test, Chi- square test, Analysis of variance, Non-parametric tests: Sign test, Run test, Krushall-Wallis test

Module IV: Data Analysis-II
Simple linear regression: coefficient of determination, significance tests, residual analysis,
Multivariate techniques: multiple linear regression: Multiple coefficient of determination, interpretation of regression coefficients, heteroscedasticity, multicollinearity, outliers, auto regression, factor analysis, cluster analysis (concept)

Module V: Report Writing
Pre-Writing Considerations, structure of research report, common problems encountered while preparing the research report, presentation of research report, ethical issues while preparing a research report

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Case study must be included in the discussion.

Text & References*:*

- Cooper, R.D., Schindler, S. P. and Sharma, J.K. (2015). Business Research Methods. New Delhi, India: McGraw Hill Education (India) Private Limited
- Zikmund, William C (1997). *Business Research Methods (5th Ed.)*. The Dryden Press, Harcourt Brace College Publishers
- Kothari C R, (2014) Research Methodology: Methods & Techniques, Vikas Publishing House Pvt.Ltd
- Levin & Rubin (2004), Statistics for Management, 8th Ed, Prentice Hall of India
- Srivastava, Shenoy and Sharma (2002)., Quantitative Techniques for Business Decisions, 4th Ed , Allied Publishers
- Bajpai, Naval (2013). *Business Research Methods*. Pearson
- Shajahan, S. (2004) , Research Methods for Management 2nd Edition, Jaico Publishers
- Kumar, Ranjit (2005), Research Methodology, Pearson Education

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BUSINESS ANALYTICS

Course Code: MBF4210 **Credit Units: 02**

Course Objective:

The course provides an introduction to data analytics to be used in business. The students will learn how data analysts describe, predict and make informed business decisions in various business domains like marketing, human resources, finance and operations.The aim of the course is to develop basic data literacy and an analytic mindset in students that will help them to make strategic decisions based on data.

Course Contents:

Module I: Introduction to Business Analytics

Importance and role of data driven decisions. Business Analytics – Definition, Market, Trends; Paradigm Shift from Data to Insight and from Business Intelligence to Business Analytics; Examples and Types of Business Analytics Analysis- Forecasting & Predictive Modeling; Descriptive, Prescriptive and Predictive Analytics. Data Summarization, Data visualization – Various visualization techniques, standardized reporting and Pivot Tables – Using Excel

Module II: Data Mining

Introduction to Data Mining; Crucial processes in data mining; Data Warehousing; Data Mining Techniques and Exploratory Data Analysis; Data Mining Tool – XL Miner.

Module III: Decision Making & Optimization

Decision making under uncertainty – Decision Trees and Risk Profiles; Sensitivity Analysis;
Optimizing complex decisions – Optimization of a large number of decisions while accounting for different kinds of physical and business decisions. Introduction to Optimization Techniques –Linear Programming; Optimization – Use of Excel to solve business problems like marketing mix, capital budgeting and portfolio optimization.

Module IV: Big Data and Introduction to R

Introduction to Big Data, Big Data driven decisions in business organizations – Benefits and Security/Privacy concerns.
Building Business and Economic Models –Tools to leverage data for Prediction purposes; Logistic Regression.
Introduction to Machine Learning; Statistical Learning vs. Machine Learning; Major classes of Learning Algorithms –Supervised Vs Unsupervised Learning.
Introduction to R Programing

Module V: Simulation using R and Excel

Hands on Regression using R;Introduction to Simulation; Applications of Simulation and Building a Simulation Model. (Using Excel and R)
Capstone Project.

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text & References:

- Aczel, D.A., Sounderpandian, J., Saravanan, P. and Joshi, R. (2012). *Complete Business Statistics (7th ed.*). New Delhi, India: McGraw Hill Education (India) Private Limited
- Cooper, R.D., Schindler, S. P. and Sharma, J.K. (2015). Business Research Methods. New Delhi, India: McGraw Hill Education (India) Private Limited
- Gujrati, Damodar N and Sangeetha (2011). *Basic Econometrics (4th Ed.).* New Delhi, India: McGraw Hill Education (India) Private Limited
- Beri, C. (2016). *Business Statistics*. New Delhi, India: McGraw Hill Education (India) Private Limited

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- Kothari, C.R. (2009). *Research Methodology: Methods and Techniques (2nd revised ed.).* New Delhi, India: New Age International Publisher
- Sharma, J.K. (2013). *Operation Research: Theory and Applications (5thed.).* New Delhi, India: Macmillan Publishers India limited
- Albright and Winston. Business Analytics: Data Analysis and Decision Making, 5th Edition.
- Stephen Powell and Ken Baker., "The Art of Modeling with Spreadsheet"
- Data, data everywhere, "Special report on managing information,Economist", February 27th, 2010.
- Liberatore and Luo, "The Analytics Movement, Interfaces, Articles inAdvance", pp. 1–12, 2010.
- "Using R for Data Analysis and Graphics". Introduction, Code andCommentary,

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EXCEL FOR MANAGERS

Course Code: MBF4211 **Credit Units: 01**

Course Overview:
Microsoft Excel is a very popular business productivity application for the management and manipulation of data. With the right training and understanding of Excel, businesses and individual users can unlock the world of opportunities that this powerful business application offers.This course will provide all the tools necessary to create and use basic and advanced spreadsheets. After completion of this course, students will be able to learn the various methods for entering and editing data and also learn the various ways to write simple formulas.

Course Contents:

Module-I: Getting Started with Excel
Introduction to Spreadsheets: Launching Excel, entering data in spreadsheet, widening rows and columns, applying basic formatting in spreadsheet, saving work in excel. Entering Data into cells:Usingautofill, sort & filter feature, creating lists, inserting & deleting rows and columns. Wrapping & merging text and cells,

Module-II: Basics in excel
Protecting & sharing workbooks, freeze panes, understanding normal, page layout and page break preview in excel. Setting the page orientation and print area.Adding hyperlinks to cells, inserting images, objects, equations and symbols.

Module-III: Charts & Formulas in Excel
Understanding Charts: Inserting bar charts, pie charts, column charts and line charts in spreadsheets, formatting and resizing the chart. Using Basic functions- average, sum, min, max, product etc. date functions, time functions. Math Operators in Excel, combining mathematical operators.

Module-IV: Functions in Excel
Logical- using IF, AND, OR, NOT, TRUE, FALSE Functions. Textual- using TRIM, UPPER, LOWER, REPLACE Functions.Import data into excel, Look up functions with index and match. Rounding, sum product, conditional counts and conditional sums, Filtering data, pivot table, pivot charts, conditional formatting.

Module-V: Financial and Statistical Functions in Excel
Financial functions: Time value of money- Present value, Future value, PMT with beginning date, PMT with ending date, NPV, Goal seek, Scenario Manager, IRR. Statistical functions: Max, Min, Average, Large, Rank, Small, Var, Std Dev.

Examination Scheme:

Components	Written Test	Practical	V/P	File/Assignment	Attendance
Weightage (%)	20	30	30	15	5

Suggested Readings & Textbooks

- Business Analysis with Microsoft Excel by Conrad George Carlberg,,Que Publishing, second edition, ISBN 0974415626.
- Excel 2013 for Dummies by Greg Harvey, John Wiley & Sons , 2012, ISBN 9781118559703

Web Resources

- https://spreadsheeto.com/
- https://www.tutorialspoint.com/excel/

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SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT

Course Code: MBF4308 **Credit Units: 03**

Course Objective:
This course aims at providing a clear understanding of the changing domestic and global investment scenario in general and Indian capital market in particular with reference to availability of various financial products and operations of stock exchanges. Important theories, techniques, regulations and certain advancements in theory of investment will be covered with an aim of helping the participants make sound investment decisions both in the context of individual security and portfolio investment.

Course Contents:
Module I: Background of Capital market/Corporate Governance and Methods of Fund Raising
Importance of Strong Capital market in Economy, Investment opportunities available to Investors, relation of demographic characteristics with investment pattern of individuals, Process of investment in Financial assets, intermediaries and Role of SEBIOTCEI//ROC/Stock exchanges-Listing agreement, clause 49, Importance of Corporate Governance and changes taking place/required in the law.Salient features and operation of stock exchanges,Trading arrangements, Changing scenario of Indian stock market.Relationship of Primary market with Secondary market, raising of Funds by IPO/FPO/Right issue and intermediaries involved. Merchant banking and its functions, contemporary issue in Capital market.

Module II: Debt
Malkiels's Law, Interrelationship of Bond Market and Stock market, International events and its impact on security market Risk and return in the context of Portfolio, , Common stock valuation models, Term structure of Interest Rates,Role of FII"S, DII/MF /QIB in Capital market.Participatory notes and its Impact, index formation..

Module III
Fundamental analysis-Economic &industry analysis, concept of Business Cycles, Indicators of economic prosperity, Industry analysis, Company analysis, Company valuation.DOW"s Theory, Various Technical analysis tools like Moving averages, Volume Analysis, Indicators, RSI, Patten analysis,Candlesicks,Market breadth analysis, Trend analysis,Elliot wave Rules Fibonacci numbers, ROC/RSI, CAPM and Fama and French challenge, lagging indicators and leading indicators analysis, reading and interpretations of technical patterns and charts,Other tools to Forecast the market and take Entry and exit decisions.

Module IV
Arbitrage pricing theory, Generating the efficient frontier,Efficient market theory, Valuation by PE ratio /Book value to price value analysis,Motivation for partitioning of risk, Markowitz Risk -return optimisation,

Module V
Types of Mutual Funds--SIP/ELSS, Tax Implications. , Investment Banking, Role of Fund Manager, Portfolio management services, Churning and revision of Portfolio, Portfolio re balancing and up gradation, Sharpe"performance Index, Trennor"performance Index, Jensen's performance Index.

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text &References:

- Chandra, P.(2002), Investment Analysis, Tata McGraw Hill
- Fischer, D.E. and Jordan, R.J. (1995), Security Analysis & Portfolio Management, Prentice Hall of India
- Bhat, Sudhindra;(2009); Security Analysis & Portfolio Management; Excel Books

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- Dash, A.P.;(2009); Security Analysis & Portfolio Management; I.K. International
- Bhatt, S.N.;(2011); Security Analysis & Portfolio Management; Biztantra
- Rangnatham M., Madhumalathi, R.,(2006); Security Analysis & Portfolio Management; Pearson Education
- Khatri, Dhanesh;(2010); Security Analysis & Portfolio Management; MacMillan India Ltd.

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BUSINESS VALUATION

Course Code: MBF4311 **Credit Units: 03**

COURSE DESCRIPTION AND OBJECTIVES:

The objective of this course is to develop a detailed understanding of the tools used by market professionals and corporate managers to analyze the value of companies and stocks. The central theme of the course will be the pricing of equity securities using discounted cash flow and relative valuation techniques. Students will apply what they've learned to the valuation of a specific company, with the goal of becoming an expert on that firm. After completing this course, students should be able to: (i) Develop quantitative models for firm and equity valuation based on DCF and multiples. (ii) Identify and interpret accounting and non-accounting information necessary for valuation. (iii) Identify and interpret the key value drivers for a firm or industry. (iv) Critically analyze firm and equity valuation models and assumptions developed by others. (v) Present valuation analyses and assumptions in a professional manner.

Course Contents:

Module-I: Introduction to Valuation

Valuation vs. Pricing.A philosophical basis for Valuation, Misconceptions about Valuation, Biasness in Valuation, Uncertainties in Valuation.Approaches to Valuation, Understanding Financial Statements, Basics of Risk.

Module-II: Discounted Cash Flow Valuation

Discounted Cashflow Valuation: Basis for Approach, Going Concern versus Liquidation Valuation, Equity Valuation versus Firm Valuation, Three pathways to DCF value, Advantages & Disadvantages of DCF Valuation, Riskless Rates and Risk Premiums, Estimating Risk Parameters and Costs of Financing, Measuring Earnings,Earnings to Cash Flows, Estimating Growth, Closure in Valuation: Estimating Terminal Value, Free Cash flow to Equity Models,

Module-III: Relative Valuation

Fundamental Principles of Relative Valuation, Choices with multiples- Earnings Multiples, Book Value Multiples,Choosing the Comparable firm: Making the comparison, Revenue and Sector-Specific Multiples, Advantages &Disadvantages of Relative Valuation, DCF vs Relative valuation.

Module-IV: Applicability of Valuation (Cases and research papers); Valuing Financial Services firm, Valuing Firms with Negative Earnings, Valuing Young and Start-up Firms, Valuing Private Firms, valuing Acquisitions and Takeovers,

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Required Textbook

- Investment Valuation: Tools and Techniques for Determining the Value of Any Asset, Second Edition, University Edition
- by AswathDamodaran

Recommended other Textbook

- Krishna G. Palepu and Paul M. Healy: *Business Analysis & Valuation Using Financial Statements*, Text Only(PHB) 5th Edition, Cengage Learning 2012.
- Joshua Rosenbaum and Joshua Pearl: *Investment Banking: Valuation, Leveraged Buyouts, and Mergers and Acquisitions*, John Wiley & Sons; 2nd edition (2013), ISBN: 1118656210

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FINANCIAL MODELING USING MS- EXCEL/SPREADSHEET

Course Code: MBF4313 **Credit Units: 03**

Introduction

Modeling techniques for accurate financial forecasting are used in many areas of finance, such as derivatives, valuation, project evaluation, deal structuring, portfolio management and the like. In the course, the participants will learn the model building skills required to build powerful models in finance with the help of excel. There are many features of model building that are common irrespective of the final model that one intends to build. In the course we will also emphasize on the different model building skills that one should have irrespective of the final use that one is going to make of it.

By the end of the course the participants should be better able to:

- Understand the basic and advanced features of excel
- Understand how to build models in excel to suit one's purpose
- Building models in different areas of finance including investments, corporate finance and derivatives
- Identifying and controlling the key sensitivities with advanced spreadsheet simulation
- Understand how risk can be built into the model to enhance decision making process

Course Contents:

Module-I: Understanding the Basic Featuresof Excel : Introduction to Modeling, Introduction to Excel,Database Functions in Excel Creating Charts Using Forms and Control Toolbox Understanding Finance Functions present in Excel Creating Dynamic Models

Module-II: Simulation using Excel: Different Statistical Distributions used in Simulation Generating Random Numbers that follow a particular distribution Building Models in Finance using Simulation

Module-III: Excel in Capital Budgeting, valuation: Preparing common size statements directly from Trial Balance Forecasting Financial Statements using Excel Analysing Financial Statements by using Spreadsheet Model ; Determining Project Viability Risk Analysis in Project Appraisal Simulation in Project Appraisal; Determination of Value Drivers, DCF Valuation, Risk Analysis in Valuation; Determining Efficient Portfolio, Creating Dynamic Portfolios Portfolio Insurance Fixed Income Portfolio Management using Excel.

Module-IV: Understanding Subroutines and Functions and building simple financial models using subroutines and functions Recording and Editing Macros Subroutines and Functions Decision Rules Message Box and Input Box Debugging, **Designing Advanced Financial Models** using VBA User Forms Other Advanced Features Actual Model Building.

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

(C - Case Discussion/ Presentation; **HA** - Home Assignment; **Q** – Quiz; **V** - Viva; **CT** - Class Test; A- Attendance; **EE** - End Semester Examination)

Text & References:

Text:

- Benninga, S., 2008, Financial Modeling, The MIT Press, Third Edition

References:

- J & S: Jackson M. and Staunton M., 2001, Advanced Modelling in Finance using Excel and VBA, John Wiley and Sons Ltd
- B & M: Brealey R.A. and Myers S., 2003, Principles of Corporate Finance, Seventh Edition, McGraw Hill
- Financial Analysis and Modeling using Excel and VBA – ChandanSengupta
- Building Financial Models, John Tjia

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FINANCIAL RISK MANAGEMENT

Course Code: MBF4314 **Credit Units: 03**

Course Objectives:

The FRM challenges candidates to understand and apply a range of knowledge and skills necessary to function effectively as a risk manager. Its curriculum is updated annually by a group of distinguished risk professionals and leading academics with diverse backgrounds, ensuring that the designation meets the evolving demands of the financial industry. The FRM helps professionals in risk management, investment management, or other critical areas of the financial services industry to broaden their knowledge of the different types of financial risk and enhance their current skill set. Those who are just beginning their careers benefit from the breadth of the curriculum, which exposes candidates to the major strategic aspects of risk management. More established practitioners often choose to become Certified FRMs in order to ensure that they are apprised of the latest trends in risk management, or because they want to challenge themselves by testing their knowledge against an elite pool of risk managers.

Course Contents:

Module I: Foundations of Risk Management

Basic risk types, measurement and management tools, Creating value with risk management; The role of risk management in corporate governance; Enterprise Risk Management (ERM); Financial disasters and risk management failures; The Capital Asset Pricing Model (CAPM); Risk-adjusted performance measurement; Multifactor models; Data aggregation and risk reporting; Ethics and the GARP Code of Conduct.

Module II: Financial Markets and Products

Structures and functions of financial institutions, Structure and mechanics of OTC and exchange markets Structure, mechanics, and valuation of forwards, futures, swaps, and options ; Hedging with derivatives; Interest rates and measures of interest rate sensitivity; Foreign exchange risk; Corporate bonds; Mortgage-backed securities

Module III : Valuation and Risk Models

Value-at-Risk (VaR)-VaR mapping • Expected shortfall (ES), Stress testing and scenario analysis • Option valuation • Fixed income valuation • Hedging • Country and sovereign risk models and management • External and internal credit ratings • Expected and unexpected losses • Operational risk

Module IV: Basel-I, Basel-II, Solvency-II, Basel 2.5, Basel-III:

The reasons for regulating Banks, Bank Regulation Pre-1988, 1988BIS Accord, The G-30 Policy recommendation, Netting, 1996 Amendment, Basel II, Credit Risk capital under Basel II, Operational Risk capital under Basel II, Pillar 2- Supervisory Review, Pillar 3- Market Discipline, Basel 2.5, Basel-III.

Module V: Credit Risk Measurement and Management

• Credit analysis • Default risk: Quantitative methodologies • Expected and unexpected loss • Credit VaR • Counterparty risk • Credit derivatives • Structured finance and securitization

Module VI: Operational and Integrated Risk Management

Risk-adjusted return on capital (RAROC) • Economic capital frameworks and capital planning • Liquidity risk measurement and management • Failure mechanics of dealer banks • Stress testing banks • Third-party outsourcing risk • Risks related to money laundering and financing of terrorism • Regulation and the Basel Accords

Banking Resolution and Deposit Insurance Act (BRDI) 2017, Insolvency and Bankruptcy Code (IBC).

Examination Scheme:

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Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text Books & References:

- John C. Hull, Risk Management and Financial Institutions, 4th Edition (Hoboken, NJ: John Wiley & Sons, 2015).
- Keep on updating of www.garp.org/frm (Global association of Risk professional)
- Michel Crouhy, Dan Galai, and Robert Mark, The Essentials of Risk Management, 2nd Edition (New York, NY: McGraw-Hill, 2014).
- James Lam, Enterprise Risk Management: From Incentives to Controls, 2nd Edition (Hoboken, NJ: John Wiley & Sons, 2014)
- René Stulz, "Risk Management, Governance, Culture and Risk Taking in Banks," FRBNY Economic Policy Review, (August 2016): 43-59.
- Edwin J. Elton, Martin J. Gruber, Stephen J. Brown and William N. Goetzmann, Modern Portfolio Theory and Investment Analysis, 9th Edition (Hoboken, NJ: John Wiley & Sons, 2014).
- Noel Amenc and Veronique Le Sourd, Portfolio Theory and Performance Analysis (West Sussex, UK: John Wiley & Sons, 2003).
- ZviBodie, Alex Kane, and Alan J. Marcus, Investments, 10th Edition (New York, NY: McGraw-Hill, 2013).
- "Principles for Effective Data Aggregation and Risk Reporting," (Basel Committee on Banking Supervision Publication, January 2013).
- Michael Miller, Mathematics and Statistics for Financial Risk Management, 2nd Edition (Hoboken, NJ: John Wiley & Sons, 2013).
- James Stock and Mark Watson, Introduction to Econometrics, Brief Edition (Boston, MA: Pearson, 2008).
- Robert McDonald, Derivatives Markets, 3rd Edition (Boston, MA: Addison-Wesley, 2013).
- Frank Fabozzi (editor), The Handbook of Fixed Income Securities, 8th Edition (New York, NY: McGraw-Hill, 2012).
- AswathDamodaran, "Country Risk: Determinants, Measures and Implications - The 2017 Edition" (July 19, 2017).
- Gunter Meissner, Correlation Risk Modeling and Management (New York, NY: John Wiley & Sons, 2014).
- Jon Gregory, The xVA Challenge: Counterparty Credit Risk, Funding, Collateral, and Capital (West Sussex, UK: John Wiley & Sons, 2015)
- "Principles for the Sound Management of Operational Risk," (Basel Committee on Banking Supervision Publication, June 2011)
- Philippa X. Girling, Operational Risk Management: A Complete Guide to a Successful Operational Risk Framework (Hoboken, NJ: John Wiley & Sons, 2013).
- Bruce Tuckman and Angel Serrat, Fixed Income Securities: Tools for Today's Markets, 3rd Edition (Hoboken, NJ: John Wiley & Sons, 2011)
- Case studies published from various journals.

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FIXED INCOME SECURITIES ANALYSIS

Course Code: MBF4315 **Credit Units: 03**

Course Objectives:

This course is intended to analyze the fixed income securities markets and its implications for investments. It will analyze the market characteristics, instruments, selling techniques, pricing and valuation issues, floating rate instruments, relations with money market instruments, risk and return of fixed income securities, portfolio management techniques, term structure modeling, bond indexing, corporate debt and convertibles, bonds with embedded options, municipal bonds markets, corporate bonds & credit risk analysis, interest rate risk management with swaps, options and futures, bond management & trading. The course intends to cover the specific features of the Indian Fixed Income Securities Markets.The course will construct several Excel based techniques to analyze bond valuation, term structure, portfolio statistics and risk mapping

Course Contents:

Module-I: Overview of Fixed Income Securities, The Grammar of Fixed Income Securities, Fixed Income Markets, Institutional Arrangements, Market Participants and Instruments, Investors Perspectives, & Market Conventions, features of a government securities market

Module-II: Bond Valuation, Time Value of Money, Price and Yield Conventions, Bond Valuation under flat term structure, Yield & return, & horizon return,Valuation of other Bonds, Floating Rate securities, index bonds, illiquid bonds

Module-III: Understanding market linkages, bonds and money market instruments, MIFOR Curve Risk Identification in Bonds: Duration, Convexity, and Immunization Risk measurement in fixed income securities using value at risk, Corporate Debt, Valuation, valuation of convertibles
Yield Curve Analysis: Par Value, Zero, Spot Curve, Bootstrapping, spot & forward rates, (Nelson-Seigel model of the Indian NSE)

Module-IV: Government securitiesauction& Bidding, Uniform vs discriminatory auction, biddingbehavior, winners curse analysisAuction Game: students run a game in groups, with bidding an upcoming auction, using real time market prices, and finalist selected based on their success, performance in WI trade, Bond Indexing, methodology for constructing a bond index, index return comparison

Module-V: Portfolio construction, setting portfolio objectives, interpreting portfolio parameters, Passive vs Active portfolio management strategies, bullet vs barbell, other strategies.Global Bond Markets, foreign currency bonds, dual currency bonds, analysis of global bond spread behavior in recent times.

Module-VI: Fixed Income Derivative Markets: FRAs, Interest rate Swaps, swap pricing and swap curve,Fixed Income Derivative Markets: Interest rate futures, Fixed Income Derivative Markets: Interest Rate Options, Caps & Floors pricing

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Required Textbook:

- Frank Fabozzi, Bond Markets, Analysis, and Strategies, Seventh or Eighth Edition,
- Pearson Suresh Sundaresan, Fixed Income Markets and Their Derivatives, 2009,

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SUMMER INTERNSHIP EVALUATION

Course Code: MBF4335 **Credit Units: 06**

There are certain phases of every Intern's professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship programme can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal class room situations. These attributes are intellectual ability, professional judgment and decision making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc.

In order to achieve these objectives, each student will maintain and submit a file (**Internship File**) and a report (**Internship Report**)

INTERNSHIP FILE

The Internship File aims to encourage students to keep a personal record of their learning and achievements throughout the Programme. It can be used as the basis for lifelong learning and for job applications. **Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development.**

The File will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and his/her own personal contribution to the organization.

The File is essentially a comprehensive documentation of how one proceeds while working on the assignment and should be regularly checked by the faculty guide/ supervisor, issues discussed with the students, doubts if any clarified and signed as having done so. This will form the basis of **continuous evaluation** of the project.

The File will include **five sections** in the order described below.

1. **The Title Page –** An Internship Experience Report For (Your Name), name of internship organization, name of the Supervisor/Guide and his/her designation, date started and completed, and number of credits for which the report is submitted.
2. **Table of Content – A**n outline of the contents of the file by topics and subtopics with the page number and location of each section.
3. **Introduction** – Short, but should include how and why you obtained the internship experience position and the relationship it has to your academic/professional and career goals.
4. **Main Body** – Should include a brief summary/ executive summary of the **Internship Project Report** that the student has worked on, an **analysis of the company/organization** in which the student is working, a **personal review** of the student's management skills and how they have been developed through the programme, the daily tasks performed, major projects contributed to, dates and hours spent on a task, observations and feelings, meetings attended and their purposes, listing of tools and materials and their suppliers, and photographs if possible of projects, buildings and co-workers.
5. **Appendices** – Include pamphlets, forms, charts, brochures, technical and descriptive literature, graphs and other information related to your Internship experience.

INTERNSHIP REPORT

The **Internship Report** is the research report that the student has to prepare on the project assigned by the organization. (Incase a student is not assigned a specific research project in the organization, he has to select any one aspect of the organization and prepare a research report on it). The lay out of the report

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should be as per the standard layout prescribed by the organization wherein the student undertakes the Internship. In case, there is no layout prescribed by the organization the following components should be included in the report:

- **Title or Cover Page**
  The title page should contain Project Title; Student's Name; Programme; Year and Semester and Name of the Faculty Guide.

- **Acknowledgements**
  Acknowledgment to any advisory or financial assistance received in the course of work may be given. It is incomplete without student's signature.

- **Abstract**
  A good"Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project. It should not exceed more than 1000 words.

- **Table of Contents**
  Titles and subtitles are to correspond exactly with those in the text.

- **Introduction**
  Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

- **Materials and Methods**
  This section should aim at experimental designs, materials used (wherever applicable). Methodology should be mentioned in details including modifications undertaken, if any. It includes organization site(s), sample, instruments used with its validation, procedures followed and precautions.

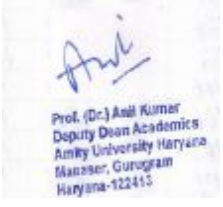
- **Results and Discussion**
  Present results, discuss and compare these with those from other workers, etc. In writing this section, emphasis should be laid on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

  Note that in writing the various secions, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary, do not write in "point" form.

  While presenting the results, write at length about the the various statistical tools used in the data interpretation. The result interpretation should be simple but full of data and statistical analysis. This data interpretation should be in congruence with the written objectives and the inferences should be drawn on data and not on impression. Avoid writing straight forward conclusion rather, it should lead to generalization of data on the chosen sample.

  Results and its discussion should be supporting/contradicting with the previous research work in the given area. Usually one should not use more than two researches in either case of supporing or contradicting the present case of research.

- **Conclusion(s) & Recommendations**
  A conclusion should be the final section in which the outcome of the work is mentioned briefly.
  Check that your work answers the following questions:
  - Did the research project meet its aims (check back to introduction for stated aims)?





- What are the main findings of the research?
- Are there any recommendations?
- Do you have any conclusion on the research process itself?

➢ **Implications for Future Research**
This should bring out further prospects for the study either thrown open by the present work or with the purpose of making it more comprehensive.

➢ **Appendices**
The Appendices contain material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

➢ **References**
References should include papers, books etc. referred to in the body of the report. These should be written in the alphabetical order of the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Examples
For research article
Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic Escherichia coli O157: H7. ClinMicrobiol Infect, 8(suppl 1): 116–117.
For book
Kowalski,M.(1976) Transduction of effectiveness in Rhizobium meliloti. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67

The Layout Guidelines for the Internship File & Internship Report

- A4 size Paper
- Font: Arial (10 points) or Times New Roman (12 points)
- Line spacing: 1.5
- Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

Examination Scheme:

Continuous Evaluation by faculty guide	15%
Continuous evaluation by CRC	15%
Feedback from industry guide	35%
Report, Presentation & Viva Voce	35%
TOTAL	**100%**

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ENTREPRENEURSHIP DEVELOPMENT

Course Code: MBF4413 **Credit Units: 02**

Course Contents:

Module I: Decision to Become an Entrepreneur

Introduction to Entrepreneurship: What Is Entrepreneurship? Why Become an Entrepreneur?, Characteristics of Successful Entrepreneurs ,Common Myths About Entrepreneurs, Types of Start-Up Firms ,Changing Demographics Of Entrepreneurs.

Entrepreneurship's Importance: Economic Impact of Entrepreneurial Firms, Entrepreneurial Firms' Impact on Society, and Entrepreneurial Firms' Impact on Larger Firms.

The Entrepreneurial Process: Decision to Become an Entrepreneur, Developing Successful Business Ideas Moving from an Idea to an Entrepreneurial Firm, Managing and Growing an Entrepreneurial Firm.

Module II: Developing Successful Business Ideas

Identifying And Recognizing Opportunities: Observing Trends, Solving a Problem ,Finding Gaps In The Marketplace **,**Personal Characteristics of the Entrepreneur .

Techniques for Generating Ideas: Brainstorming, Focus Groups Library and Internet Research, Other Techniques.

Encouraging and Protecting New Ideas: Establishing a Focal Point for Ideas, Encouraging Creativity at the Firm Level, Protecting Ideas from Being Lost or Stolen, Find a mentor.

Feasibility Analysis: Product/Service Feasibility Analysis, Industry/Target Market Feasibility Analysis, organizational Feasibility Analysis, Financial Feasibility Analysis.

The Business Plan: Reasons for Writing a Business Plan , Who Reads the Business Plan—And What Are They Looking For? Guidelines for Writing a Business Plan, Outline Of the Business PlanandExploring Each Section of the Plan Oral Presentation of a Business Plan, Questions and Feedback to Expect from Investors.

Industry and Competitor Analysis: Studying Industry Trends, The Five Forces Model, The Value of the Five Forces Mode, Industry Types and the Opportunities They Offer , Identifying Competitors ,Sources of Competitive Intelligence, Completing a Competitive Analysis Grid.

Business Models: The Importance and Diversity of Business Models, How Business Models Emerge, Potential Fatal Flaws of Business Models, Components of An Effective Business Model**,** Core Strategy, Strategic Resources, Partnership Network, customer interface.

Module III: Moving from an Idea to an reality

Initial Ethical and Legal Issues Facing a New Firm: Establishing a Strong Ethical Culture for a Firm, Choosing an Attorney for a Firm, Drafting a Founders' Agreement.

Obtaining Business Licenses and Permits: Business Licenses, Business Permits, Choosing a Form of Business Organization, Sole Proprietorship, Partnerships, Corporations, Limited Liability Company.

Introduction To Financial Management : Financial Objectives of a Firm, The Process of Financial Management, Financial Statements ,Forecasts ,Pro Forma Income Statement ,Pro Forma Balance Sheet, Pro Forma Statement of Cash Flows, Ratio Analysis.

Building a New-Venture: Recruiting and Selecting Key Employees, Roles of the Board of Directors Board of Advisers, Lenders and Other Professionals.

Getting Financing or Funding: The Importance, Sources of Personal Financing, Preparing to Raise Debt or Equity Financing, business Angels, Venture Capital, Initial Public Offering, Commercial Banks, SBA Guaranteed Loans, Other Sources of Debt Financing, Leasing, Strategic Partners.

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Module IV: Managing and Growing the new venture

Marketing Issues: Segmenting the Market, Selecting a Target Market, Establishing a Unique Positioning, Branding, 4Ps/7Ps Of Marketing For New Ventures.

The Importance of Intellectual Property: Determining What Intellectual Property to Legally Protect, The Four Key Forms of Intellectual Property, Types of Patents, Who Can Apply for a Patent? The Process of Obtaining a Patent, Patent Infringement, The Four Types of Trademarks, What Is Protected Under Trademark Law? Exclusions from Trademark Protection, The Process of Obtaining a Trademark, What Is Protected by a Copyright? Exclusions from Copyright Protection,

How to Obtain a Copyright , Copyright Infringement, Copyrights and the Internet , Conducting an Intellectual Property Audit, The Process of Conducting an Intellectual Property Audit.

Preparing for and Evaluating the Challenges of Growth : Appreciating the Nature of Business Growth ,Staying Committed to a Core Strategy ,Planning for Growth, Knowing and Managing the Stages of Growth , Challenges Of Growth **,** Strategies for Firm Growth (internal and external),Franchising**.**

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text & References:

- Alejandro Cremades (2016) , The Art of Startup Fundraising: Pitching Investors, Negotiating the Deal, and Everything Else Entrepreneurs Need to Know. Wiley, New York.
- Burton and Bragg (2006),Accounting and Finance for your Small Business. John Wiley and Sons, New York.
- Peter Drucker (2015), Innovation And Entrepreneurship. Harper Collins, India.
- Nandan H (2013), Fundamentals of Entrepreneurship. Prentice Hall India Learning Private Limited; Third edition: India.

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DISSERTATION

Course Code: MBF4437 **Credit Units: 06**

The aim of the dissertation is to provide you with an opportunity to further your intellectual and personal development in your chosen field by undertaking a significant practical unit of activity, having an educational value at a level commensurate with the award of your degree

The dissertation can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Selecting the Dissertation Topic
It is usual to give you some discretion in the choice of topic for the dissertation and the approach to be adopted. You will need to ensure that your dissertation is related to your field of specialization.

Deciding this is often the most difficult part of the dissertation process, and perhaps, you have been thinking of a topic for some time.

It is important to distinguish here between 'dissertation topic' and 'dissertation title'. The topic is the specific area that you wish to investigate. The title may not be decided until the dissertation has been written so as to reflect its content properly.

Few restrictions are placed on the choice of the topic. Normally we would expect it to be:
- relevant to business, defined broadly;
- related to one or more of the subjects or areas of study within the core program and specialisation stream;
- clearly focused so as to facilitate an in-depth approach, subject to the availability of adequate sources of information and to your own knowledge;
- of value and interest to you and your personal and professional development.

Planning the Dissertation
This will entail following:
- Selecting a topic for investigation.
- Establishing the precise focus of your study by deciding on the aims and objectives of the dissertation, or formulating questions to be investigated. Consider very carefully what is worth investigating and its feasibility.
- Drawing up initial dissertation outlines considering the aims and objectives of the dissertation. Workout various stages of dissertation
- Devising a timetable to ensure that all stages of dissertation are completed in time. The timetable should include writing of the dissertation and regular meetings with your dissertation guide.

The Dissertation plan or outline
It is recommended that you should have a dissertation plan to guide you right from the outset. Essentially, the dissertation plan is an outline of what you intend to do, chapter wise and therefore should reflect the aims and objectives of your dissertation.

There are several reasons for having a dissertation plan
- It provides a focus to your thoughts.
- It provides your faculty-guide with an opportunity, at an early stage of your work, to make constructive comments and help guide the direction of your research.
- The writing of a plan is the first formal stage of the writing process, and therefore helps build up your confidence.
- In many ways, the plan encourages you to come to terms with the reading, thinking and writing in a systematic and integrated way, with plenty of time left for changes.
- Finally, the dissertation plan generally provides a revision point in the development of your dissertation report in order to allow appropriate changes in the scope and even direction of your work as it progresses.

Keeping records

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This includes the following:

- Making a note of everything you read; including those discarded.
- Ensuring that when recording sources, author's name and initials, date of publication, title, place of publication and publisher are included. (You may consider starting a card index or database from the outset). Making an accurate note of all quotations at the time you read them.
- Make clear what is a direct a direct quotation and what is your paraphrase.

Dissertation format

All students must follow the following rules in submitting their dissertation.

- Front page should provide title, author, Name of degree/diploma and the date of submission.
- Second page should be the table of contents giving page references for each chapter and section.
- The next page should be the table of appendices, graphs and tables giving titles and page references.
- Next to follow should be a synopsis or abstract of the dissertation (approximately 500 words) titled: **Executive Summary**
- Next is the 'acknowledgements'.
- Chapter I should be a general introduction, giving the background to the dissertation, the objectives of the dissertation, the rationale for the dissertation, the plan, methodological issues and problems. The limitations of the dissertation should also be hinted in this chapter.
- Other chapters will constitute the body of the dissertation. The number of chapters and their sequence will usually vary depending on, among others, on a critical review of the previous relevant work relating to your major findings, a discussion of their implications, and conclusions, possibly with a suggestion of the direction of future research on the area.
- After this concluding chapter, you should give a list of all the references you have used. These should be cross - references with your text. For articles from journals, the following details are required e.g.

  Draper P and Pandyal K. 1991, The Investment Trust Discount Revisited, Journal of Business Finance and Accounting, Vol18, No6, Nov, pp 791-832.

  For books, the following details are required:
  Levi, M. 1996, International Financial Management, Prentice Hall, New York, 3rd Ed, 1996

- Finally, you should give any appendices. These should only include relevant statistical data or material that cannot be fitted into the above categories.

The Layout Guidelines for the Dissertation

- A4 size Paper
- Font: Arial (10 points) or Times New Roman (12 points)
- Line spacing: 1.5
- Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

Guidelines for the Assessment of the Dissertation

While evaluating the dissertation, faculty guide will consider the following aspects:

1. Has the student made a clear statement of the objective or objective(s).
2. If there is more than one objective, do these constitute parts of a whole?
3. Has the student developed an appropriate analytical framework for addressing the problem at hand.
4. Is this based on up-to-date developments in the topic area?
5. Has the student collected information / data suitable to the frameworks?
6. Are the techniques employed by the student to analyse the data / information appropriate and relevant?
7. Has the student succeeded in drawing conclusion form the analysis?
8. Do the conclusions relate well to the objectives of the project?
9. Has the student been regular in his work?
10. Layout of the written report.



Examination Scheme:



Contents & Layout of the Report	30
Conceptual Framework	10
Objectives & Methodology	15
Implications & Conclusions	15
Viva/ Presentations	30
TOTAL	**100**

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CORPORATE TAX PLANNING

Course Code: MBF4408 **Credit Units: 03**

Course Objective:
At the end of the course, the students should be able to understand Indian accounting Standards and the impact of USGAAP on Financial Statements. To create an understanding of the accounting of Mergers and Acquisitions and Valuation of goodwill & Shares.
In addition to Corporate Accounting the students should be able to demonstrate an understanding of the tax provisions enabling them to make use of legitimate tax shelters, deductions, exceptions, rebates and allowances; with the ultimate aim of minimizing the corporate tax liability.

Course Contents:
Module I: Accounting Norms
Various Accounting Standards in India and comparison with International accounting Standards and US.GAAP.

Module II: Accounting for Merger and Acquisitions
Accounting for Acquisition of Business, Calculation of Purchase consideration and Profit (Loss) Prior to Incorporation.Accounting for Amalgamation in the nature of Merger and in the nature of Purchase.

Module III: Valuation of Goodwill and Shares
Valuation of Goodwill – Different Methods of Valuation of Goodwill, Valuation of Shares – Net Asset Backing Method and Yield Method.

Module IV: Basic Concepts of Income Tax
Introduction to Income Tax Act, 1961, Residential Status, Exempted Incomes of Companies An overview of various provisions of Business & profession & Capital gains – applicable to companies
Goods and Services Tax – Features - Implications - Rate slap - Model - Products Excluded From GST – Registration Procedure

Module V: Assessment of Companies
Computation of taxable income, MAT, Set off & carry forward of losses in companies, Deductions from Gross total income applicable to companies, Tax planning with reference to new projects/expansions/rehabilitation plans including mergers, amalgamation or de-mergers of companies, Concept of avoidance of double taxation.

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text & References:

- Singhania V.K. &SinghaniaKapil , Direct Taxes law & practices, Taxmann
- Ravi M Kishore, Advanced Accounting, Taxmann.
- Lakhotia , R.N. &Lakhotia, Corporate Tax Planning, Vision books
- Singhania, V.K., Student's guide to Income Tax, Taxmann
- International dictionary of taxation by Indian Tax Institute, 1st Edition.
- Maheshwari S.N and Maheshwari S.K Advanced Accountancy, Vikas Publishing House.

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PRIVATE EQUITY AND ENTREPRENEURIAL FINANCE

Course Code: MBF4412 **Credit Units: 03**

Description

Private equity is composed of funds and investors that directly invest in **private** companies, or that engage in buyouts of public companies, resulting in the delisting of public **equity**. In finance, **private equity** is a type of **equity** and one of the asset classes consisting of **equity** securities and debt in operating companies that are not publicly traded on a stock exchange. A **private equity** investment will generally be made by a **private equity** firm, a venture capital firm or an angel investor. With support of Private equity, the new entrepreneur will hope up to start a new firm for the benefit of economic development.

Objectives

1. To understand the various types of activities that falls under the purview of Private equity. Corporate Restructuring
2. To understand intricacies of raising of various methods of financing
3. To deal with Issues involved in Private financing and entrepreneurial development activities.
4. To examine key elements of understanding a business from a private equity investment perspective

Assessment

The subject would comprise of both theory and numerical solving. The assessment of the learner would be done through assignments, case discussion, articles on current research & issues, problem solving and simulation. The students would be expected to do a project, quiz and comprehend the application part of the concepts taught in the class.

Course Contents:

Module-I: Introduction: Over view of the Private Equity Industry, Development and Growth, terminology, and categories within the asset class, participants, anatomy of funds and partnership agreements, perspectives and negotiations and perspectives of companies

Module-II: The Fundamentals of Private Equity Investing:, financing, structuring and negotiating - buyout and growth capital transactions, and managing the portfolio company over the life of the investment and including an exit and / or value realization transaction.

Module-III: Understanding and Evaluating Private Equity Firms in Financial Markets: We will consider how the financial community assesses firms and chooses which funds to invest in and how funds assemble portfolios of companies and how LP investors assemble their portfolios of LP interests. Other topics will include understanding and managing LP liquidity options; the rise and role of other alternative investment vehicles, most notably hedge funds and sovereign wealth funds; the publicly traded private equity firm; the impact of the financial crisis and current issues under discussion in the area of financial regulation

Module-IV: Private Equity in Secondary Markets – Key components of value creation- Relative value Matrix – Industry Value creation.

Module-V: Private Equity - corporate governance and ethics - Iinvestments in developing markets - Sourcing of private equity - Deals and management of portfolio company - Expectations and Negotiation

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Reference books

- Jason A. Scharfman, Private Equity Operational Due Diligence: Tools to Evaluate Liquidity, Valuation, and Documentation, + Website , ISBN: 978-1-118-11390-5, March 2012
- Stowell D, An Introduction To Investment Banks, Hedge Funds, And Private Equity – 2011, Elsevir (2011), **ISBN :** 978-9380931074

Case studies published from various journals.

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Amity Business School

Master of Business Administration (Business Analytics)

FLEXILEARN
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Curriculum & Scheme of Examination

2023

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Master of Business Administration (Business Analytics)

Programme Mission:

The mission of the MBA programme is to foster an environment of academic excellence in Business Management through research and innovation, industry integration, internationalization and extension activities and develop highly trained and employable professionals with specialization in the area of Marketing & Sales, Finance, Banking & Finance, Human Resource Management, International Business, Information Technology, E-Commerce and Hospital & Healthcare, who are socially responsible and globally minded professional to meet the current and emerging needs of business and society.

Programme Description:

The two year full time Masters in Business Administration programme is to educate and prepare students with the knowledge, analytical ability, and management perspectives and skills needed to lead, to motivate and to manage diversified workforce, rapid technological change and competitive marketplace while considering the principles of ethical, legal and corporate governance fundamentals.

Programme Outcome (PO):

PO1	Apply the knowledge of marketing, human resource management, finance and other functional areas of management to solve complex management issues in volatile business environment
PO2	Student shall have ability to acquire & evaluate new knowledge through Business Research Methods, have the ability to identify, define, investigate, and solve critical business issues using management principles, analyse data/information and interpret results for reaching optimum solutions.
PO3	Student shall be able to understand global issues from different perspectives, recognize the opportunities to improve the business value chain as an entrepreneur and shall develop and display basic business acumen & business skills and be able to apply different forms of communication in diversified cultural settings.
PO4	Student shall able to critically thinkto assess societal, health, safety, legal, and cultural issues and apply range of strategies for solving a problem and decision making
PO5	Student shall be able to practice ethical principles and commit to professional ethics and responsibilities and norms of the management practice.
PO6	Student shall develop range of Leadership skills and shall demonstrate excellent interpersonal skills, understanding of group dynamics and effective teamwork, including awareness about personal strengths and limitations.
PO7	Student shall be able to communicate effectively on complex management activities with various stakeholders being able to comprehend and write effective reports, design documentation, make effective presentations, and give & receive clear instructions.
PO8	Student shall recognize the need for, and have the ability to engage in independent and life-long learning in the broadest context of technological change.
PO9	Student shall be able to create, select, and apply appropriate techniques, resources, and modern management and IT tools including prediction and modeling to make decisions.

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Supporting document for PSOs (Programme Specific Outcomes) of MBA BA

PSO 1			PSO 2	PSO 3		PSO4	
Student shall be able to describe fundamental knowledge of general and functional management courses & relevant technological tools to identify opportunities and apply appropriate business strategies & solutions.			Student shall be able to apply knowledge of business analytics to solve business problems using appropriate technology such as machine learning/artificial intelligence and software solutions such as R, Python, SPSS, SAS to make holistic judgment. Student shall also apply technical skills to design effective advanced analytics models and simulations for effective decision making.	Student shall be able to apply specific and cross functional knowledge to solve critical business and management issues, write effective reports, demonstrate leadership and interpersonal skills, understanding of group dynamics and effective teamwork, including awareness about personal strengths and limitations.		Student shall be able to communicate effectively on complex management issues, make effective presentation with various stakeholders being able to comprehend and shall be able to practice ethical principles, professional values and fulfil social responsibilities and engage in life-long learning	
Fundamental Business Management	**Functional Management domain**	**Research, Analysis and Technical Management Domain**	**Business Analytics**	**NTCC**		**Communication**	**Value Added**
Management Process and Organizational Behaviour	Accounting for Management	Operations and Supply Chain Management	Datamining	Financial Analytics	Summer Internship Evaluation	Basics of Communication	Self Development & Interpersonal Skills
Economics for Management	Marketing Management	Business Research Methods	Predictive Analytics-I Machine Learning using R	Supply Chain Analytics	Dissertation (Analytics Project)	Corporate Communication	Behavioural Communication & Relationship Management
Strategic Management	Human Resource Management		Predictive Analytics-II Machine Learning using Python	HR Analytics		Interpersonal Communication	Leading Through Teams
Total Quality Management	Financial Management		Big Data Analytics- Hadoop	Marketing Analytics		Cross Cultural Communication	Professional Excellence
	Consumer Behaviour		Financial Decision Analysis	Data Privacy and Data Security Laws		**Foreign Business Language**	
			Visual Analytics- Tablue/ Power BI	Statistical Techniques		Chinese	French

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			Econometrics	Excel for Decision Making		Portuguese	German
			Programming for Analytics using R	Optimization Techniques		Korean	Spanish
			Programming for Analytics using Python	Database Management System		Japanese	Russian

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BUA4102	**ACCOUNTING FOR MANAGEMENT**	L	T	P	C
Version 1.1	Latest Approved	3	0	0	3
Pre-requisites/Exposure	Basic knowledge of general Management				
Co-requisites	Student must have basic understanding of General Management.				

Catalog Description

The intent of this course is to acquaint the students with fundamental concepts and processes of accounting so that they are able to appreciate the nature of item presented in the annual accounts of an organization. The student will be able to familiarize with the significant tools and techniques of financial analysis further useful in the interpretation of the financial statements. The aim of this course does not focus on to make the student's expert accountant but to have a good comprehension on the management planning and control systems. However, the principal focus will be related to the interpretation and use of the financial data by non-accounting students to gain the ability of using accounting information as a tool in applying solutions for managerial problems, evaluating the financial performance, and interpreting the financial structure.

Course Objectives

The objective of this course is to:

1. Equip the students to develop the essential ability of all managers, to use complex accounting information as a platform for decision-making. As the course unfolds, students will build an increasingly sophisticated level of understanding of the language of accounting and its key concepts.
2. Develop skills in interpreting earnings statements, balance sheets, and cash flow reports. This ability to analyze financial statements will enable participants to deal more effectively with strategic options for their businesses or business units.

Course Outcome:

On completion of this course, the students will be able to:

CO1: Enable the students to combine practice and theoretical knowledge of financial accounting.

CO2: Demonstrate the decision-making skills to the students in the financial analysis context,

CO3: Develop an ability to identify and analyze complex financial accounting problems and opportunities in real life situations.

CO4: Develop skills in applying management accounting techniques to assist in decision making.

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Modules	Blooms Level	Number of Hours
Module 1: Introduction The Financial Accounting Framework, Accounting Policies, Need of Accounting. Users of Accounting Information, Accounting Cycle, Accounting and Management Control. Balance sheet- Classification Items of Balance Sheet, Formats of Balance Sheet. Preparation of Balance Sheet. Income Statement- Realization vs. Accrual Principle, Format of Income Statement), Preparation of Income Statement (IAS,GAAP&IFRS), Depreciation Accounting.	L1, L2, L3	8
Module 2: Measuring and Reporting Measuring and Reporting Assets, Liabilities &Equity:Cost of sales and Inventories, Debentures, Investments, Shareholder Equity; Human Resource Accounting: Valuation of Human Resources, Recording and Disclosure in Financial Statements.	L1, L2, L5	8
Module 3: Analyzing and Interpreting Financial Statements Financial Statement Analysis – Basic Relationship, Overall Measures, Profitability Ratios, Investment Utilization Ratios, Financial Condition Ratios, Making Comparisons. The Statement of Cash Flows-Profit versus Cash, Purpose and Use of Cash Flow Statement, Format of Cash Flow Statement (AS-3), Preparation of Cash Flow Statement (IAS,GAAP&IFRS).	L4, L5, L6	9
Module 4: Management Accounting Emergence of Management Account, Managerial costing and Cost-Volume- Profit Analysis, Budgeting and Budgetary control, Variance Analysis .	L1, L2, L5	5
Module 5: Cost Accounting: Elements of Cost, Cost Classification and Allocation, Cost sheet, Process Costing, Job Costing.	L1, L2, L5	5

*Bloom's Level: L1 – Knowledge; L2-Comprehension, L3 – Application, L4 – Analysis, L5 – Synthesis, L6 - Evaluation

Text Books

1. Anthony, N.R; Hawkings, F. D; Merchant, A.K (2014), Accounting Text and Cases, 13th Edition, McGraw Hill.
2. Ramachandran, N (2011), Financial Accounting for Management, 3rd Edition, McGraw Hill.

Reference Books

1. Bhattacharya, S.K. and Dearden, J, 3rd Edition, Accounting for Management, Text and Cases, Vikas Publishing House
2. Narayanaswamy R (2014), Finanacial Accounting – A Managerial Perspective, Prentice Hall of India.
3. Maheshwari S N; Maheshwari SK and Maheshwari SK, 3rd Edition, A Text Book for Accounting for Management, Vikas Publishing House.

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4. Tulsian, P.C (2006), Financial Accounting, Tata McGraw Hill.
5. Banerjee, A (2005), Financial Accounting, Excel Books.
6. Ghosh,T.P (2005), Fundamentals of Management Accounting, Excel Books
7. M.N Arora 10th Edition, A Text Book of Cost and Management Accounting, Vikas Publishing House.

Modes of Evaluation: Quiz/Assignment/Presentation/Written Examination
Examination Scheme:

Components	Group Presentation	In Class Quiz	Class Test/Mid Term Exam	Attendance	External Exam
Weightage (%)	10	5	10	5	70

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	-	1	1	--	--	--	--	--	--	1	--	--	--
CO2	1	1	1	--	--	--	1	--	--	1	--	--	--
CO3	1	1	--	1	--	--	--	--	--	1	--	--	--
CO4	1	1	--	--	--	--	--	--	--	1	--	--	--

1: strongly related, 2: moderately related and 3: weakly related

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BUA4104	**STATISTICAL TECHNIQUES**	L	T	P	C
Version 1.1	Latest Approved	3	0	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course offers the understanding on identification of data, analysis and interpretation of data using basic quantitative tools & techniques. In this course, students can apply the quantitative techniques in the analysis of statistical and economic problems. Probability and hypothesis testing are major topics to be covered. Basic understanding of statistical concepts helps in deciding on the suitable technique for data analysis and also to interpret results.

Course Objectives

The objectives of this course are to

1. Familiarize the students with basic quantitative tools & techniques for data analysis.
2. Equip the students with the concept of probability, hypothesis testing, data identification, and data analysis and interpretation using statistical tools.
3. Facilitate hands on experience to various statistical problems.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the basic concepts of probability and Bayes Theorem and manipulate the probability models that are most widely used in economics, and apply them correctly and carry out the appropriate statistical analysis.

CO2: Apply the appropriate statistical tools and techniques for data analysis of economic models.

CO3: Apply graphical, numerical methods and Excel to make calculate and illustrate descriptive statistics and critically evaluate the basis for these calculations.

CO4: Identify the appropriate regression model to apply to an economics dataset and also the problems associated with these models such as autocorrelation. Multicollinearity, heteroscedasticity, non Stationarity data series that may affect regression analyses.

Modules	**Blooms level***	**Number of hours**
MODULE 1: Probability Theory Elements of Probability Theory: Sample space Events, meaning of probability Classical definition of probability, The addition rule, Multiplication Rule, Theorems of total probability, conditional and statistical independence, limitation of classical definition, Bayes formula, random variable, expectation and variance of random variable (for random sampling with or without replacement)	L1, L2,L3	9

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MODULE 2: Random Variables and Probability Distributions Defining random variables; probability distributions; expected values of random variables and of functions of random variables; properties of commonly used discrete and continuous distributions (uniform, binomial, normal, poisson and exponential random variables).	L1, L2,L3	9
MODULE 3:Introduction to Estimation Methods of sampling; sampling distribution of a statistic; distribution of the sample mean; sampling error and standard error of a statistic with special reference to the mean; Point and interval estimation of parameters; properties of an estimator; unbiasedness, relative efficiency and consistency.	L1, L2,L3	9
MODULE 4: Hypothesis Testing Testing of Hypothesis; type I and type II errors, power of a test; large sample tests, "t" test for the mean; one tail and two tail tests for difference of means; z-test, f-test, Chi-square test for (i) goodness of fit and (ii) independence of two attributes.	L1, L2,L3	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. Gupta S.C, *Fundamentals of Statistical Methods*, Sultanchand& Sons.
2. Allen Webster, Applied Statistics for Business and Economics, (3rd edition), McGraw Hill, International Edition 1998.
3. Pitman, Australia. M.R. Spiegel (2nd edition), *Theory and Problems of Statistics*, Schaum Series.

Reference Books

1. P.H. Karmel and M. Polasek, *Applied Statistics for Economists* (4th edition)
2. N.G.Das, *Statistical Methods* (Edition 1&2), Tata McGraw Hill

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	3	1	2	1	--	--	3	1	1	2	1	--	--
CO2	1	1	3	1	--	--	3	1	2	2	1	--	--
CO3	1	2	2	1	--	--	3	1	1	2	1	--	--
CO4	2	1	3	1	--	--	3	1	2	2	1	--	--

1: strongly related, 2: moderately related and 3: weakly related

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BUA4105	**EXCEL FOR DECISION MAKING**	L	T	P	C
Version 1.1	Latest Approved	1	0	2	2
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Microsoft Excel is a very popular business productivity application for the management and manipulation of data. With the right training and understanding of Excel, businesses and individual users can unlock the world of opportunities that this powerful business application offers. This course will provide all the tools necessary to create and use basic and advanced spreadsheets.

Course Objectives

The course enables students to:

1. Explore the Microsoft Excel as a tool for facilitating solutions for business problems/decision making

2. Have an understanding on the advanced functions of excel through guided demonstration.

3. Enhance excel skills of students and develops a set of fundamental skills that are essential for survival in business amid global uncertainty.

Course Outcomes

On completion of this course, the students will be able to

CO1: Manage data in excel.

CO2: Explore the functions of basic and advanced excel.

CO3: Analyze the real time series dataset.

CO4: Explain insights about decision making in business.

Modules	**Blooms level***	**Number of hours**

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Module 1: Overview of Excel **Contents:** Introduction to Spreadsheets: data entry using autofill, sort & filter feature, widening rows and columns, inserting & deleting rows and columns, creating lists, wrapping & merging text and cells. Introduction to basic data formatting, saving work in excel. Protecting & sharing workbooks, freeze panes, understanding normal, page layout and page break preview in excel, page orientation and print area in Excel. How to adding hyperlinks to cells, inserting images, objects, equations and symbols. Introduction toFigures and Charts: Inserting bar charts, pie charts, column charts and line charts in spreadsheets, formatting and resizing the chart.	L1, L3, L4	4
Module 2: Data Cleansing and Lookups **Contents:** Textual functions- TRIM, SUBSTITUTE, CLEAN, STORED AS TEXT, DE-DUPLICATING, LEN & FIND, CONCATENATE, UPPER, LOWER, REPLACE functions and Data validation; Look up functions- VLookup, multiple VLook up together and HLookup with index and match; Basics of Macros.	L1, L3, L4	4
Module 3: Logical Functions and Pivot Tables **Contents:** Basic functions- ROUNDING, SUM, PRODUCT, MIN, MAX, AVERAGE, CONDITIONAL COUNTS, LARGE, RANK, VAR, Std Dev, CONDITIONAL SUMS. Date functions and Time functions. Logical functions- IF, THEN, AND, OR, NOT, COUNTIFS, SUMIFS, TRUE, FALSE Functions. Financial functions: Time value of money- Present value, Future value, PMT with beginning date, PMT with ending date, NPV, Goal seek, Scenario Manager. Pivot table, pivot charts and conditional formatting.	L1, L3, L4	4
Module 4: Simulation and Decision Making **Contents:** Basics of simulation, Monte Carlo Exoperiment, Decision Analysis (DA): Terminology, DA without probabilities (Maximax, Maximin, Minimax Regret), DA with probabilities: (Decision point / branch, chance event / branch, Decision tree with examples.	L1, L3, L4	4

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	Written Test	Practical	Viva	File/Assignment	Attendance
Weightage (%)	20	30	30	15	5

Text Books

1. Carlberg CG, "*Business Analysis with Microsoft Excel* (2nd Edition)", Que Publishing, ISBN 0974415626.
2. Harvey G (2012), "*Excel 2013 for Dummies*" John Wiley & Sons, ISBN 9781118559703

Reference Book

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Excel 2013 for Dummies by Greg Harvey, John Wiley & Sons, 2012, ISBN 9781118559703

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	-	-	-	-	-	-	-	1	-	1	-	-
CO2	-	-	-	-	-	-	-	-	1	-	1	-	-
CO3	-	-	-	-	-	-	-	-	1	-	1	-	-
CO4	-	-	-	-	-	-	-	-	1	-	1	-	-

1: strongly related, 2: moderately related and 3: weakly related

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BUA4106	**OPTIMIZATION TECHNIQUES**	L	T	P	C
Version 1	Latest approved	2	0	2	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

The main objective of the course is to provide the students the insight into structures and processes that management science can offer and the enormous practical utility of its various utility. The course is designed to introduce the fundamental tools of MS and their application to real life business problems. It will help students to take well informed decisions in their corporate life.

C**ourse Objective:**

The main objectives of this course are to:

1. Take decision under certain, uncertain and risky environment
2. Understand various business problems and applying a suitable MS model
3. Formulate Linear Programming Problem and solving using graphical and Simplex methods
4. Design the transportation and assignment problem, solve them and interpret the result
5. Design and solving the problems of game theory for the optimal solution
6. Describe the application of simulations.

Course Outcomes

On completion of this course**, s**tudents shell be able to:

CO1. To recall the evolution of OR and specify currently used OR models for different business situations

CO2. To describe a business problem and analyzing it for the optimum solution

CO3. To illustrate different prevailing constraints while finding out optimum solution

CO4. To evaluate various models to take better and improved decisions

Modules	Blooms level*	Number of hours
Module I: Introduction Optimization Techniques: uses, scope, applications in managerial decision making; assumptions of management science models, decision making environments: decisions under certainty, uncertainty and risk situation; decision tree approach and its applications.	L1, L2, L3	6

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Module II: Linear Programming Problems Linear Programming Problems: Modeling and Solution Methods- graphical method, simplex methods, problems with maximization and minimization objects, duality and its managerial interpretation; Sensitivity analysis: meaning, Change in Objective Function Coefficients, Change in Right Hand Side Values, Change in Availability of resources and Addition of a new variable.	L1, L2, L3, L4, L6	8
Module III: Transportation and Assignment Model Transportation model: various methods of finding initial basic feasible solution and optimal solution, MODI method, degeneracy, unbalanced problems, prohibited route problems, maximization transportation problems Assignment Model: Hungarian method for solution, unbalanced assignment problems, restrictions on assignments, travelling salesman problem.	L1, L2, L3, L4, L6	8
Module IV: Game Theory Two-Person Zero Sum Games, Pure Strategies: Games with Saddle Point, Mixed Strategies: Games without Saddle Point, Principle of Dominance, and Solution Methods for Games without saddle point – Algebraic Method, Arithmetic Method, Graphical Method.	L1, L2, L3, L4, L6	8
Module VI: Simulation Simulation: meaning, types of simulation, steps of simulation process, Monte Carlo simulation, applications of simulation	L1, L2, L3, L4, L6	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. Vohra, N.D. (2007). *Quantitative Techniques in Management (3rd ed.*). New Delhi, India: Tata McGraw-Hill Publishing Company Limited
2. Sharma, J.K. (2013). *Operation Research: Theory and Applications (5th ed.).* New Delhi, India: Macmillan Publishers India limited
3. Jaishankar, S. (2010). *Operation Research.* New Delhi, India: Excel Books
4. Kalavathy, S. (2002). *Operation Research (2nd ed.).* New Delhi, India: Vikas Publishing House
5. Kapoor, V.K. (2008). *Operation Research: Techniques for Management (7th ed.).* New Delhi, India: Sultan Chand and Sons

Reference Books

1. Frederick Shiller & Gerald J Liberman. *Introduction to Operation Research*. New Delhi, India: Tata McGraw- Hill Education (India) Private Limited
2. Taha, H.A. *Operation Ressearch.* New Delhi, India: Prentice Hall India
3. Gillet, B.E. *Introduction to Business Research*. Tata McGraw Hill

Modes of Evaluation: Class Test/Assignment /Written Examination

Examination Scheme:

Components	ME	A	Q/S	Asn	CT	EE
Weightage (%)	10	5	5	5	5	70

ME- Mid Term Examination; A- Attendance; Q/S- Quiz/Seminar; Asn- Assignment, EE- External Examination, CT- Class test

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	-	1	2	--	--	--	--	--	--	1	1	--	
CO2	-	1	2	--	--	--	--	--	--	1	2	2	
CO3	-	1	--	--	--	--	--	--	--	1	2	2	
CO4	-	1	1	1	--	--	--	--	--	1	3	3	

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BUA4107	**DATABASE MANAGEMENT SYSTEMS**	L	T	P	C
Version 1.1	Latest Approved	3	0	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

In this course the students will learn about the importance and usage of database management systems in the modern day organizations. The students shall grasp sound knowledge of various types of databases that exist, creation of data warehouse and application areas of data mining. Also, the students will be learning SQL, the language of databases.

Course Objectives

The course aims to make the students

1. Understand the basic and advanced concepts in databases and database management systems
2. Analyze the importance of databases in day to day life.
3. Get a hands-on experience on the SQL-the language of databases.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define the basic terminology used in databases.

CO2: Describe the concepts related to databases architecture.

CO3: Apply the knowledge of SQL in creating databases using DBMS software for a business organization.

CO4: Compare and contrast various types of keys used in database creation.

CO5: Review and assess the organization's data and network security aspects.

Modules	Blooms level*	Number of hours
Module I: Introduction to DBMS Definition of DBMS, Concept and Goals of DBMS, Data Independence, DBMS Architecture, Levels, Database Administrator, File System Approach Vs DBMS Approach, Advantages of Using a DBMS, Data Models, Schemas, and Instances, Database Languages, Database Users, Database Abstraction.	L1, L2	6

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Module II: Relational Database & ER Model **Relational Database**: Relational System, Codd's Rule, Relational Model, Optimization, Tables and Views **ER Model:** Entity Type, Entity Set, Relationship type, Relationship sets, Constraints: Cardinality Ratio and Participation Constraint, Keys, Mapping, Design of ER diagrams.	L2, L3	7
Module III: Relational Model Objects Domains and Relations, Relations and predicates, Relational Data Integrity; Primary Key, Candidate Key, Foreign Key and their rules, Relational operators, Relational Algebra	L1, L2	7
Module 4: SQL SQL Language, DDL, DML and DCL commands. Data definition, Data retrieval and update operations on MS ACCESS and SQL Server DBMS.	L1, L2	8
Module 5: Database Applications and Types Distributed Database, Object Oriented Database, Multimedia Database, Data Mining, Digital Libraries. Data Warehouse.	L1, L2	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Elmasari, Navathe, "Fundamentals of Database Systems", Addision Wesley.
2. Korth, Silbertz, Sudarshan, "Database Concepts". McGraw Hill.

Reference Books

1. Majumdar & Bhattacharya, "Database Management System", Tata McGraw Hill.
2. Date C J." An Introduction to Database Systems", Addision Wesley.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

ME- Mid Term Examination; A- Attendance; Q/S- Quiz/Seminar; Asn- Assignment, EE- External Examination

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1			-				-	-		1		
CO2	1			-				-	-		1		
CO3	2			-				-	1		1		
CO4	-			-				1	2		1		
CO5	-			1				2	-		1		

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BUA4204	**BUSINESS RESEARCH METHODS**	L	T	P	C
Version 1.1	Latest Approved	1	0	2	2
Pre-requisites/Exposure					
Co-requisites					

Catalog Description:
The main objective of the course is to equip the students with the basic understanding of research methodology in changing business scenario. It will also provide them an insight into the application of dynamic analytical tools to face the stormy challenges aimed at fulfilling the purpose of business decision making.

Course Objectives:
The objectives of this course are to ensure that students are able to:

1. Understand the basic framework of research process.
2. Comprehend of various research designs and techniques.
3. Identify various sources of information for literature review and data collection.
4. Understand some basic concepts of research and its methodologies
5. Understand as how to organize and conduct research in a more appropriate manner and write a research report, thesis and a research proposal

Course Outcomes (CO):
On completion of this course, the students will be able to:
CO1: Apply a range of quantitative and / or qualitative research techniques to business and management problems / issues
CO2: Determine and apply research approaches, techniques and strategies in the appropriate manner for managerial decision making
CO3: Demonstrate knowledge and understanding of data analysis and interpretation in relation to the research process
CO4: Develop necessary critical thinking skills in order to evaluate different research approaches utilised in the different industries and be able to critically assess the overall process of designing a research study from its inception to its final report preparation.

Modules	**Blooms level***	**Number of hours**
Module I: Introduction Meaning of research, importance of scientific research in business decision making, types of research, complete research process, research methodology, criterion for good research, Identification of research problem and formulation of hypothesis, research designs, drafting a research proposal	L1, L2	2

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Module II: Measurement and Data Collection Primary data, secondary data, design of questionnaire, sampling fundamentals and sample designs, Qualitative and quantitative research, measurement and scaling techniques, measures of central tendency mean, median, mode; measures of dispersion, data processing	L1, L2,L3,L4, L5	8
Module III: Data Analysis I Cross tabulation, univariate analysis, bivariate analysis: Correlation, Karl Pearson's coefficient of correlation, Spearman's coefficient of correlation, hypothesis testing, t-test, Z test, F-test, Chi- square test, Analysis of variance, Non-parametric tests: Sign test, Run test, Krushall-Wallis test	L1, L2,L3,L4,L5	6
Module IV: Data Analysis-II Simple linear regression: coefficient of determination, significance tests, residual analysis, Multivariate techniques: multiple linear regression: Multiple coefficient of determination, interpretation of regression coefficients, heteroscedasticity, multicollinearity, outliers, auto regression, factor analysis, cluster analysis (concept)	L1,L2,L3,L4, L5	4
Module V: Report Writing Pre-Writing Considerations, structure of research report, common problems encountered while preparing the research report, presentation of research report, ethical issues while preparing a research report	L1,L2,L3,L4, L5	4

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Book:

Cooper, R.D., Schindler, S. P. and Sharma, J.K. (2015). Business Research Methods. New Delhi, India: McGraw Hill Education (India) Private Limited

Reference Books:

1. Zikmund, William C (1997). Business Research Methods (5th Ed.). The Dryden Press, Harcourt Brace College Publishers
2. Levin & Rubin (2004), Statistics for Management, 8th Ed, Prentice Hall of India

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CT	HA	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

CT: Class Test, HA: Home Assignment, Q/S: Seminar/Viva/Quiz, ME: Mid Term Exam EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	1	--	-	--	--	--	-	--	1	3	-	-
CO2	1	1	-	--	--	-	--	-	-	1	2	-	-
CO3	1	2	--	-	--	--	-	--	--	1	3	-	-
CO4	1	1	--	--	3	-	2	--	--	1	3	2	2

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BUA4206	**PROGRAMMING FOR ANALYTICS USING R**	L	T	P	C
Version 1.1	Date of Approval: Latest Approved	2	0	2	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course offers the specialization on R (powerful language used widely for data analysis and statistical computing). This course facilitates a good understanding on the process of data manipulation and visualization. The course provides ample working examples on statistical data analysis using R.

Course Objectives

The objective of this course is to:

1. Provide learning on how to program in R, how to use R for effective data analysis, how to install and configure software necessary for a statistical programming environment.
2. Provide applications on statistical computing which includes programming in R, reading data into R, accessing R packages, writing R functions, debugging, profiling R code, and organizing and commenting R code.
3. Facilitate hands on experience to various real world business problems using R.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Analyze different datasets using R

CO2: Explore real time data at various levels using appropriate visualizations

CO3: Apply critical programming language concepts such as data types, iteration, control structures, functions, and boolean operators by writing R programs and through examples

Modules	Blooms level*	Number of hours
MODULE 1: Introduction: Introducing to R , R Data Structures , Help functions in R , Vectors , Scalars , Declarations , recycling , Common Vector operations , Using all and any, Vectorized operations , NA and NULL values , Filtering , Vectorized if-then else , Vector Equality , Vector Element names	L1, L2,L3	8
MODULE 2: Matrices, Arrays And Lists: Creating matrices , Matrix operations , Applying Functions to Matrix Rows and Columns , Adding and deleting rows and columns , Vector/Matrix Distinction , Avoiding Dimension Reduction , Higher Dimensional arrays , lists , Creating lists , General list operations , Accessing list components and values , applying functions to lists , recursive lists	L1, L2,L3	7

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MODULE 3: Data Frames: Creating Data Frames , Matrix-like operations in frames , Merging Data Frames , Applying functions to Data frames , Factors and Tables , factors and levels , Common functions used with factors , Working with tables - Other factors and table related functions - Control statements , Arithmetic and Boolean operators and values , Default values for arguments - Returning Boolean values , functions are objects , Environment and Scope issues , Writing Upstairs - Recursion , Replacement functions , Tools for composing function code , Math and Simulations in R	L1, L2,L3	7
MODULE 4: OOP: S3 Classes , S4 Classes , Managing your objects , Input/ Output , accessing keyboard and monitor , reading and writing files , accessing the internet , String Manipulation , Graphics , Creating Graphs , Customizing Graphs , Saving graphs to files , Creating three-dimensional plots	L1, L2,L3	7
MODULE 5: Interfacing: Interfacing R to other languages , Parallel R , Basic Statistics , Linear Model , Generalized Linear models , Non-linear models , Time Series and Auto-correlation , Clustering	L1, L2, L3	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis;L6-Evaluation*

Text and Reference Books

1. Beginning R – The Statistical Programming Language by Mark Gardener, Wiley, 2013
2. Introductory R: A Beginner's Guide to Data Visualisation, Statistical Analysis and Programming in R
3. ByRobert Knell, Amazon Digital South Asia Services Inc, 2013

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**IP**	**EE**	**EP**
Weightage (%)	5	25	50	20

IP: Internal Practical, EE: End Semester Examination; EP: External Practical; A: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	1	2	1	--	--	3	1	1	2	1	--	--
CO2	1	1	3	1	--	--	3	1	2	2	1	--	--
CO3	1	2	2	1	--	--	3	1	1	2	1	--	--

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BUA4207	**PROGRAMMING FOR ANALYTICS USING PYTHON**	L	T	P	C
Version 1.1	Latest Approved	2	0	2	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is designed in such a way that leads the students from the basics of writing and running Python scripts to more advanced features such as file operations, regular expressions, working with binary data, and using the extensive functionality of Python modules.

Course Objectives

The objective of this course is to:

1. Equip students with the concepts of thefundamental programming concepts including data structures, networked application program interfaces, and databases, using the Python programming language.
2. Provide applications on statistical, machine learning, information visualization, text analysis, and social network analysis techniques through popular python toolkits such as pandas, matplotlib, scikit-learn, nltk, and networkx to gain insights into data analysis process.

Course Outcomes

On completion of this course, the students will be able to

CO1: Create applications for data retrieval and processing

CO2: Conduct an inferential statistical analysis of various business problems

CO3: Explain fundamental Python functionality and features used for data science

CO4: Apply techniques such as lambdas and manipulate csv files

Modules	Blooms level*	Number of hours
MODULE 1: Installing Python; basic syntax, interactive shell, editing, saving, and running a script, Concept of data types; variables, assignments; immutable variables; numerical types; arithmetic operators and expressions; comments in the program; understanding error messages Conditions, boolean logic, logical operators; ranges; Control statements: if-else, loops (for, while); short-circuit (lazy) evaluation	L1, L2,L3	8

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MODULE 2: Strings and text files; manipulating files and directories, os and sys modules; text files: reading/writing text and numbers from/to a file; creating and reading a formatted file (csv or tab-separated).String manipulations: subscript operator, indexing, slicing a string; strings and number system: converting strings to numbers and vice versa. Binary, octal, hexadecimal numbers	L1, L2,L3	7
MODULE 3: Lists, tuples, and dictionaries; basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries. Design with functions: hiding redundancy, complexity; arguments and return values; formal vs actual arguments, named arguments, Program structure and design, Recursive functions	L1, L2,L3	7
MODULE 4: Simple Graphics and Image Processing: "turtle" module; simple 2d drawing - colors, shapes; digital images, image file formats, image processing Simple image manipulations with 'image' module (convert to bw, greyscale, blur, etc).Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data modeling; persistent storage of objects OOP, continued: inheritance, polymorphism, operator overloading (_eq_, _str_, etc); abstract classes; exception handling, try block	L1, L2,L3	7
MODULE 5: Graphical user interfaces; event-driven programming paradigm; tkinter module, creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors layouts, nested frames Multithreading, Networks, and Client/Server Programming; introduction to HTML, interacting with remote HTML server, running html-based queries, downloading pages; CGI programming, programming a simple CGI form. Searching, Sorting, and Complexity Analysis	L1, L2, L3	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis;L6-Evaluation*

Text and Reference Books

1. Core Python Programming by Wesley Chun,Prentice Hall
2. Fundamentals of Python: First Programs By Kenneth Lambert,Course Technology, Cengage Learning
3. Learning Python by David Ascher and Mark Lutz,Oreilly

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**IP**	**EE**	**EP**
Weightage (%)	5	25	50	20

IP: Internal Practical, EE: End Semester Examination; EP: External Practical; A: Attendance

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	3	1	2	1	--	--	3	1	1	2	1	--	--
CO2	1	1	3	2	--	--	3	1	2	2	1	--	--
CO3	1	2	2	1	--	--	3	1	1	2	1	--	--
CO4	2	1	3	2	--	--	3	1	2	2	1	--	--

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BUA4302	**DATAMINING**	L	T	P	C
Version 1.1	Latest Approved	2	0	2	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Every business organization is realizing the importance of data. They are harnessing the benefits offered by Data Mining as it allows them to see hidden patterns from the data and helps in framing business policies. This course emphasizes on utilizing the techniques offered by Data Mining.

Course Objectives

This course enable students to:

1. Understand the basic concepts, principles, methods, implementation techniques, and applications of data mining, with a focus on major data mining functions such as cluster analysis.
2. Develops skills to use data mining software and other data mining techniques to solve business problems.

Course Outcomes

On completion of this course, the students will be able to

CO1: Evaluate and implement a wide range of emerging and new technologies to facilitate the knowledge discovery.

CO2: Assess raw input data, and process it to provide suitable input for a range of data mining algorithms.

CO3: Compare and evaluate different data mining techniques like classification, prediction, clustering and association rule mining

CO4: Discover and measure interesting patterns from different kind of databases.

CO5: Determine data mining functionalities.

CO6: Identify appropriate data mining algorithms, and apply and interpret and report the output appropriately.

CO7: Describe complex data types with respect to spatial and web mining

CO8: Analyze data using the powerful data mining tool Weka.

Modules	**Blooms level***	**Number of hours**

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Module I: Introduction to Data Mining What is data mining? Related technologies - Machine Learning, DBMS, OLAP, Statistics, Data Mining Goals, Stages of the Data Mining Process, Data Mining Techniques, Knowledge Representation Methods, Applications, Example: weather data, Data Warehouse and DBMS, Multidimensional data model, OLAP operations, Example: loan data set. Data cleaning, Data transformation, Data reduction, Discretization and generating concept hierarchies, Installing Weka 3 Data Mining System, Experiments with Weka - filters, discretization	L1, L2	6
Module II: Data mining knowledge representation and Attribute oriented Analysis **Data mining knowledge representation** Task relevant data, Background knowledge, Interestingness measures, Representing input data and output knowledge, Visualization techniques, Experiments with Weka – visualization. **Attribute oriented Analysis:** Attribute generalization, Attribute relevance, Class comparison, Statistical measures, Experiments with Weka - using filters and statistics.	L2, L3	7
Module III: Data mining algorithms **Association rules:** Motivation and terminology, Example: mining weather data , Basic idea: item sets, Generating item sets and rules efficiently, Correlation analysis, Experiments with Weka - mining association rules **Classification:** Basic learning/mining tasks, Inferring rudimentary rules: 1R algorithm, Decision trees, Covering rules, Experiments with Weka - decision trees, rules **Prediction:** The prediction task, Statistical (Bayesian) classification, Bayesian networks, Instance-based methods (nearest neighbor), Linear models, Experiments with Weka - Prediction	L1, L2, L3	7
Module IV: Cluster Analysis: Concepts and Methods Basic issues in clustering, First conceptual clustering system: Cluster/2, Partitioning methods: k-means, expectation maximization (EM), Hierarchical methods: distance-based agglomerative and divisible clustering, Density Based, Grid based Methods, Conceptual clustering: Cobweb, Experiments with Weka - k-means, EM, Cobweb	L1, L2, L3	8
Module V: Advanced techniques- Data Mining software and applications Text mining: extracting attributes (keywords), structural approaches (parsing, soft parsing), Bayesian approach to classifying text, Web mining: classifying web pages, extracting knowledge from the web, Data Mining software and applications	L1, L2, L3	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text & References:

1. Han, J., Kamber, M., & Pei, J. (2011). Data mining: Concepts and techniques (3rd ed.). Waltham: Morgan Kaufmann.

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2. Alex Berson, Data Warehousing, Data Mining, and Olap, Tata McGraw Hill.
3. George M Marakas, Modern Data Warehousing, Mining & Visualization Core Concepts, Pearson Education.
4. (Berry, Michael)Data Mining Techniques.
5. (Sharma, Gajendra)Data Mining, Data Warehousing and OLAP.
6. (Gupta, GK) Data Mining with Case Studies.
7. (Han &Kamber)Data Mining: Concepts and Techniques.
8. (PaulrajPonniah) Datawarehousing Fundamentals

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**IP**	**EE**	**EP**
Weightage (%)	5	25	50	20

IP: Internal Practical, EE: End Semester Examination; EP: External Practical; A: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1							1			1		
CO2	1							1			1		
CO3	2							1	1		1		
CO4	1							1	2		1		
CO5	1			1				2			1		
CO6	1										1		
CO7	1										1		
CO8	1										1		

1: strongly related, 2: moderately related and 3: weakly related

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BUA4303	**PREDICTIVE ANALYTICS-I MACHINE LEARNING USING R**	L	T	P	C
Version 1.1	Latest Approved	2	0	2	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course offers fundamental and applied evidence based knowledge to improve professional practice of students. It provides a detailed understanding of both supervised and unsupervised learning as it is vital for a data scientist. This course offer insight on text mining using "tidytext."

Course Objectives

The objective of this course is to:

1. Facilitate an introduction to machine learning techniques using several popular algorithms.
2. Internalize a core set of practical and effective machine learning methods and concepts, and apply them to solve some real world problems.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Explain and apply a set of unsupervised learning concepts and methods, classification methods of increasing complexity (rules, trees, random forests), and associated optimization methods (gradient descent and variants)

CO2: Explain the common idioms of large-scale graph analytics, including structural query, traversals and recursive queries, PageRank, and community detection

CO3: Apply the popular algorithms of machine learning using R

CO4: Analyze and interpret the results using specific statistical tools and techniques in R.

Modules	Blooms level*	Number of hours
MODULE 1: Linear Methods for Regression and Classification: Overview of supervised learning, Linear regression models and least squares, Multiple regression, Multiple outputs, Subset selection, Ridge regression, Lasso regression , Linear Discriminant Analysis , Logistic regression, Perception learning algorithm	L1, L2,L3,L4	8
MODULE 2: Model Assessment and Selection: Bias, Variance, and model complexity, Bias-variance trade off, Optimism of the training error rate, Estimate of In-sample prediction error, Effective number of parameters, Bayesian approach and BIC, Cross- validation, Boot strap methods, conditional or expected test error	L1, L2,L3,L4	7

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MODULE 3: Additive Models, Trees and Boosting: Generalized additive models, Regression and classification trees, Boosting methods-exponential loss and AdaBoost, Numerical Optimization via gradient boosting	L1, L2,L3,L4	7
MODULE 4: Neural Networks (NN), Support Vector Machines (SVM), and K-nearest Neighbor: Fitting neural networks, Back propagation, Issues in training NN, SVM for classification, Reproducing Kernels, SVM for regression, K-nearest –Neighbour classifiers (Image Scene Classification)	L1, L2,L3,L4	7
MODULE 5: Implementation of following methods using R Simple and multiple linear regression, Logistic regression, Linear discriminant analysis, Ridge regression, Cross-validation and boot strap, Fitting classification and regression trees, K-nearest neighbours, Principal component analysis, K-means clustering	L1, L2, L3,L4	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis; L6-Evaluation*

Text and Reference Books

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman , *The Elements of Statistical Learning-Data Mining, Inference, and Prediction* ,Second Edition , Springer Verlag, 2009.
2. G.James, D.Witten,T.Hastie,R.Tibshirani-*An introduction to statistical learning with applications in R*,Springer,2013.
3. E.Alpaydin, *Introduction to Machine Learning*, Prentice Hall Of India, 2010

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**IP**	**EE**	**EP**
Weightage (%)	5	25	50	20

IP: Internal Practical, EE: End Semester Examination; EP: External Practical; A: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	2	--	3	--	--	--	--	2	1	3	1	--	--
CO2	3	2	1	2	--	2	1	--	1	2	1	3	--
CO3	2	1	1	2	--	--	1	3	1	2	1	3	--
CO4	3	1	2	1	--	--	1	--	1	2	1	3	--

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BUA4304	**PREDICTIVE ANALYTICS-II MACHINE LEARNING USING PYTHON**	L	T	P	C
Version 1.1	Latest Approved	2	0	2	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course offers the specialization of Python staring with data strategy. This course covers the two core paradigms that account for most business applications of predictive modeling: classification and prediction. It also covers the use of partitioning to divide the data into training data (data used to build a model), validation data (data used to assess the performance of different models, or, in some cases, to fine tune the model) and test data (data used to predict the performance of the final model).

Course Objectives

The objective of this course is to:

1. Facilitates a good learning to students on how to make meaningful predictions for a wide range of business purposes.
2. Provide provides a sufficient understanding on development of statistical models and how to devise data-driven workflows.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Apply data science techniques to extract insights from a wide range of data sources and to provide an assessment basis for predictive models. Also, students shall be able to explain how ensemble models improve predictions

CO2: Visualize and explore data to better understand relationships among variables

CO3: Identify and implement appropriate performance measures for predictive models with popular algorithms

Modules	**Blooms level***	**Number of hours**
MODULE 1: Data Cleaning: Reading the data – variations and examples, Data frames, Delimiters, Various methods of importing data in Python: csv method, open method in Pyton, reading data form a URL, reading .xlsor .xlsx files, Reading from an .xls or .xlsx file, Writing to a CSV or Excel file. Handling missing values, Creating dummy variables, Visualizing a dataset by basic plotting, Scatter plots, Histograms, Boxplots	L1, L2,L3,L4	8

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MODULE 2: Data Wrangling: Subsetting a dataset, Selecting columns, Selecting rows, Selecting a combination of rows and columns, Creating new columns, Generating random numbers and their usage, Seeding a random number, Generating random numbers following probability distributions, Probability density function, Cumulative density function, Uniform distribution, Normal distribution, Using the Monte-Carlo simulation to find the value of pi, Geometry and mathematics behind the calculation of pi, Generating a dummy data frame, Grouping the data: aggregation, filtering, and transformation	L1, L2,L3	7
MODULE 3: Statistical Concepts for Predictive Modelling, Random sampling and the central limit theorem, Hypothesis testing, Null versus alternate hypothesis, Linear Regression with Python: Understanding the math behind linear regression, Linear regression using simulated data, Fitting a linear regression model and checking its efficacy, Finding the optimum value of variable coefficients ,Making sense of result parameters, p-values, F-statistics, Residual Standard Error, Implementing linear regression with Python, Linear regression using the stats model library, Multiple linear regression, Multi-collinearity, Variance Inflation Factor, Model validation, Training and testing data split , Handling categorical variables, Transforming a variable to fit non-linear relations	L1, L2,L3,L4	7
MODULE 4: Logistic Regression with Python, Linear regression versus logistic regression, Understanding the math behind logistic regression, Contingency tables, Conditional probability, Odds ratio, Moving on to logistic regression from linear regression, Estimation using the Maximum Likelihood Method, Likelihood function: Log likelihood function, Building the logistic regression model from scratch, Making sense of logistic regression parameters, Wald test, Likelihood Ratio Test statistic, Chi-square test, Implementing logistic regression with Python, Processing the data, Data exploration, Data visualization, Creating dummy variables for categorical variables, Feature selection, Implementing the model, Model validation and evaluation, Cross validation, Model validation, The ROC curve, Confusion matrix.	L1, L2,L3,L4	7

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MODULE 5: Trees and Random Forests with Python: Introducing decision trees, A decision tree Understanding the mathematics behind decision trees, Homogeneity, Entropy, Information gain, ID3 algorithm to create a decision tree, Gini index, Reduction in Variance, Pruning a tree, Handling a continuous numerical variable, Handling a missing value of an attribute, Implementing a decision tree with scikit-learn, Visualizing the tree, Cross-validating and pruning the decision tree, Understanding and implementing regression trees, Regression tree algorithm, Implementing a regression tree using Python, Understanding and implementing random forests, The random forest algorithm, Implementing a random forest using Python, Why do random forests work?, Important parameters for random forests	L1, L2, L3,L4	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis;L6-Evaluation*

Text and Reference Books

1. A. I. Khuri. Introduction to linear regression analysis, by Douglas C. Montgomery, Elizabeth A. Peck, G. Geoffrey Vining. International Statistical Review, 81(2):318–319, 2013.
2. A. Toescher, M. Jahrer, and R. M. Bell. The bigchaos solution to the netflix grand prize. Netflix prize documentation, 2009.
3. C. J. Burges. A tutorial on support vector machines for pattern recognition. Data mining and knowledge discovery, 2(2):121–167, 1998.
4. D. H. Wolpert and W. G. Macready. No free lunch theorems for optimization. Evolutionary Computation, IEEE Transactions on, 1(1):67–82, 1997.
5. D. H. Wolpert. Stacked generalization. Neural networks, 5(2):241–259, 1992.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**IP**	**EE**	**EP**
Weightage (%)	5	25	50	20

IP: Internal Practical, EE: End Semester Examination; EP: External Practical; A: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	2	1	--	2	--	2	1	--	1	2	1	--	--
CO2	2	1	--	2	--	2	1	--	1	--	1	--	--
CO3	2	1	--	2	--	2	1	--	1	2	1	--	--

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BUA4305	**BIG DATA ANALYTICS- HADOOP**	L	T	P	C
Version 1.1	Latest Approved	2	0	2	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course familiarizes the students on how to perform analytical operations on structured and unstructured data to gain insights from data processed through Hadoop. This offers a specialization on Big Data Platform and its use cases providing an overview of Apache Hadoop.

Course Objectives

The objective of this course is to:

1. Equip students with the concepts of how to use Pig, Hive, and Impala to practice and examine tremendous datasets stored in the HDFS, and use Sqoop and Flume for data ingestion.
2. Provide applications on components of Hadoop and Hadoop Eco-System such as Hadoop Cluster Architecture, Important Configuration files in a Hadoop Cluster, Data Loading Techniques, how to setup single node Hadoop clusterl installation of VM player and Hadoop, Important Configuration files in a Hadoop Cluster, Linux commands, Importing Hadoop Jars, Data Loading Techniques

Course Outcomes

On completion of this course, the students will be able to:

CO1: Identify Big Data and its Business Implications
CO2: Access and Process Data on Distributed File System
CO3: Manage Job Execution in Hadoop Environment
CO4: Develop Big Data Solutions using Hadoop Eco System

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Big Data Definition of Big Data, The 5 V's of Big Data(Volume, Variety, Velocity, Veracity, Value), Comparison of Traditional Data with Big Data, Management of Big Data, Analyzing Big Data, and Technology Challenges for Big Data. Big Data Sources, Big Data Applications, Big Data Architecture	L1, L2,L3	8

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MODULE 2: Technologies for Handling Big Data Introduction to Traditional RDBMS, OLTP, OLAP, Data Mining, Data Warehouse, Basic SQL Commands and queries: CREATE, INSERT, DELETE, UPDATE, SELECT Cloud Computing : Definition, Characteristics, Applications, Deployment Model, Service Models	L1, L2,L3	7
MODULE 3:Distributed Computing Using Hadoop Introduction, Hadoop Framework, Hadoop Distributed File System, Map Reduce, Hive, Pig Sample Map Reduce Application, HIVE language capabilities, Pig Language capabilities, HIVE query examples, Pig Scripts examples	L1, L2,L3	7
MODULE 4: Big Data in Business Case Studies: Big Data in Marketing, Retail Hospitality, Customer Services, Decision Support using Big Data. Developing a Big Data Strategy/ Defining a Big Data strategy for your organization, Big Data Platform for Internet of Things	L1, L2,L3	7
MODULE 5:Visualization and Analytics Visualizations - Visual Data Analysis Techniques - Interaction Techniques; Systems and Analytics Applications - Analytics using Statistical packages-Approaches to modeling in Analytics – correlation, regression, decision trees, classification, association-Intelligence from unstructured information	L1, L2, L3	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis;L6-Evaluation*

Text and Reference Books

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007
2. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012
3. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012
4. Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons, 2007
5. Pete Warden, "Big Data Glossary", O'Reilly, 2011
6. Jiawei Han, MichelineKamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**IP**	**EE**	**EP**
Weightage (%)	5	25	50	20

IP: Internal Practical, EE: End Semester Examination; EP: External Practical; A: Attendance

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	3	1	2	1	--	--	3	1	1	2	1	--	--
CO2	1	1	3	2	--	--	3	1	2	2	1	--	--
CO3	1	2	2	1	--	--	3	1	1	2	1	--	--
CO4	2	1	3	2	--	--	3	1	2	2	1	--	--

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BUA4306	**FINANCIAL DECISION ANALYSIS**	L	T	P	C
Version 1.1	Latest Approved	2	0	2	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Financial decision making involves analyzing the financial problems that the company faces and deciding which course of action should be taken. In order to make financial decisions, you must be able to identify potential financial problems and analyze the effects of alternative courses of action.

Course Objectives

This course provides a specialization on financial tools to apply to decision-making within organizations. The course helps the student to

1. Develop a range of financial analysis skills through a combination of class discussions and analyses of case studies of specific organizations.
2. Demonstrates the complex relationships between finance, impact, strategy, and governance in business organizations.

Course Outcomes

By the end of the course the participants should be better able to:

CO1: Explain how organisations make value optimising financial decisions, and reflectively and critically assess the ethical issues arising from these decisions.

CO2: Critically analyse and evaluate various financial models and decision making techniques and their impact on different constituencies of stakeholder. Apply financial analysis skills in the facilitation of strategic decision making.

CO3: Review Assess the features of alternative and diverse sources of finance and critically evaluate their appropriateness under different circumstances and evaluate elements of risk, return and value in a range of strategic operational financial decisions and understand the implications in regulatory and governance terms of the consequences of doing so.

Modules	**Blooms level***	**Number of hours**

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Module I : Financial governance: objectives and environment The role of shareholder wealth maximisation in modern financial management, Shareholder v stakeholder perspectives, Role of the finance , function Balancing risk and return, Shareholder wealth maximisation and ethical behaviour Ethics and the finance function, Corporate Governance *:* Corporate Governance and the agency problem, Financial aspects of the Indian Corporate Governance Code New public management, Listing requirements in the Stock Exchanges.	L1,L2, L3	5
Module II: Management performance measurement Financial ratio analysis – Profitability – Efficiency – Liquidity - Investment performance. Operating, Financial and Combined Leverage. Financial distress and insolvency, including the use of financial ratios based on univariate and multivariate analysis to predict financial failure. Analysis of Risk and Uncertainty in Capital Budgeting, Description and Measurement of Risk; and Risk Evaluation Approaches. Risk and Return - Conceptual Framework of Risk and Return: Type of Risks; Risk and Return of a Single Asset; Risk and Return of Portfolio (only two asset portfolio); Portfolio Selection; and Capital Asset Pricing Model (CAPM)	L1, L2, L3	6
Module III:-Making distributions to shareholders Dividend policy and shareholder wealth – Traditional v Modigliani and Miller arguments Reasons for the importance of dividends, Factors determining the level of dividends Scrip dividends, Special dividends and share buybacks, Tax Aspects associated with Dividend Decision	L1, L3	6
Module IV: - Long term investment decisions The nature of investment decisions - Investment appraisal methods - Payback period (including discounted payback period) - Accounting rate of return - Net present value - Internal rate of return – MIRR – XIRR- CAGR, Investment opportunities and risk - Risk and Return preferences of investors. Risk appraisal methods – Sensitivity analysis – Scenario analysis –Simulations - Expected net present value - Risk-adjusted discount rate. **Shareholder value analysis:** Shareholder value and the need for new forms of measurement-Shareholder value analysis and net present value -Comparison of shareholder value analysis and Economic value added -Total shareholder return (TSR) and market value added (MVA) , Cash Value added, Market to Book Value , Evaluation of the shareholder value approach. **Analysis of securities**: Cost method and market method. Equity method of accounting and analysis of minority interest.	L1, L3,L4	7

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Module V: Business combinations and share valuation **Business Valuation**: Conceptual Framework of Valuation; Approaches/Methods of Valuation; and other Approaches to Value Measurement, **Corporate Restructuring**: Conceptual Framework; Financial Framework; Tax Aspect of Amalgamation; Merger and Demergers; Legal and Procedural Aspects of Mergers/Amalgamations and Acquisition/Takeovers; and other forms of Corporate Restructuring. Economic rationale for mergers and acquisitions, forms of purchase consideration with DCF model. **Option Valuation**: Concept and Types of Options; Option Payoffs; Call Option Boundaries; Factors Influencing Option Valuation; and The Black-Scholes Option Pricing Model. **Valuation and forecasting -** Valuation models: Asset based models, DCF models and abnormal earnings or Edwards-Bells-Ohlson model. Forecasting models: Extrapolative models and index models, Forecasting with disintegrated data, Comparison with financial analysts' forecast.	L1, L3,L4	5
Module VI: Capital markets and long-term financing decisions Financial markets and institutions-The role of the Stock Exchange Advantages and disadvantages of a Stock Exchange listing Stock market efficiency – Long term sources of financing – Shares– Debts - Debentures – Personal financing -		7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text and Reference Books:

1. Khan, M.Y & Jain, P.K.: Financial Management; Tata McGraw Hill, New Delhi, 2015.
2. Pandey, I. M.: Financial Management; Vikas Publishing House, New Delhi, 2015.
3. Chandra, Prasana: Financial Management; Tata McGraw Hill, New Delhi, 2008.
4. Brealey and Meyers: Principles of Corporate Finance: Tata McGraw Hill, New Delhi, 2008.
5. Keown, Martin, Petty and Scott (Jr): Financial Management: Principles and Applications; Prentice Hall of India, New Delhi, 2002.
6. Gitman, L.J: Principles of Managerial Finance; Addison Wasley, 2009.
7. Vanhorne, James C: Financial Management and Policy; Prentice Hall of India, New Delhi, 2015.
8. Kishore Ravi, M: Financial Management; Taxman, 2018.
9. Gerald I. White, Ashinpaul C. Sondhi and Dov Fired , "The Analysis and use of Financial Statements", (3rd Ed.), , Wiley-India

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CT	HA	P	A	EE
Weightage (%)	**10**	**5**	**10**	**5**	**70**

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester Examination

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	1	--	--	--	--	--	--	1	1	1	--	--
CO2	1	1	--	--	--	--	--	--	1	1	1	--	--
CO3	1	1	--	--	--	--	--	--	1	1	1	--	--

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BUA4307	**VISUAL ANALYTICS- TABLUE /POWER BI**	L	T	P	C
Version 1.1	Latest Approved	2	0	2	3
Pre-requisites/ Exposure					
Co-requisites					

Catalog Description

This course familiarizes the students on data visualization tools. This course is designed to provide a fundamental and strategic understanding on the concepts of Business Intelligence using Tablue.

Course Objectives

The objective of this course is to:

1. Equip students with the concepts of BIs and its types and how to connect to and import data, author reports using Power BI Desktop, and publish those reports to the Power BI service
2. Emphasize on how to create dashboards and share with business users—on the web and on mobile devices

Course Outcomes

On completion of this course, the students will be able to:

CO1: Connect, import, shape, and transform data for business intelligence (BI)
CO2: Visualize data, author reports, and schedule automated refresh of your reports
CO3: Create and share dashboards based on reports in Power BI desktop and Excel
CO4: Use natural language queries and create real-time dashboards

Modules	Blooms level*	Number of hours
MODULE 1: Tableau: Introduction, Getting Started with Tableau, Connecting to Data, Data Prep with Excel, Overview of the Tableau User Interface, Working with Discrete vs. Continuous Data, Calculated fields **Power BI**: Understanding key concepts in business intelligence, data analysis, and data visualization, Importing data and automatically creating dashboards from services such as Marketo, Salesforce, and Google Analytics, Connecting to and importing your data, then shaping and transforming that data, Enriching your data with business calculations.	L1, L2,L3	8

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MODULE 2: Tableau: Introduction to data visualization, the evolution of the BI industry, Understanding the business value of visual analytics, Data visualization best practices (overview), Power BI: Visualizing your data and authoring reports, Scheduling automated refresh of your reports, Creating dashboards based on reports and natural language queries, Sharing dashboards across your organization, Consuming dashboards in mobile apps	L1, L2,L3	7
MODULE 3:Tableau: Basic charts, Design considerations for effective data visualization, Human cognition and visual perception, Using Maps to Visualize Spatial Data, **Power BI:** Leveraging your Excel reports within Power BI, Creating custom visualizations that you can use in dashboards and reports, Collaborating within groups to author reports and dashboards, Sharing dashboards effectively based on your organization's needs.	L1, L2,L3	7
MODULE 4: Tableau: The visual storytelling framework, the business value of visual stories, Creating dashboards and story points, Formatting worksheets and dashboards. **Power BI:** Exploring live connections to data with Power BI, Connecting directly to SQL Azure, HD Spark, and SQL Server Analysis Services, Introduction to Power BI Development API, Leveraging custom visuals in Power BI	L1, L2,L3	7
MODULE 5: Common pitfalls of data visualization, Common pitfalls of data narratives, Share and critique an example of a data visualization, Provide your Tableau Public URL, Share data visualization on Tableau Public, Building a Dashboard in Tableau and Power BI, Develop a data story pitch	L1, L2, L3	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis;L6-Evaluation*

Text and Reference Books

1. Microsoft Business Intelligence Tools for Excel Analysts: Michael Alexander, Jared Decker, Bernard Wehbe, John Wiley & Sons, 2014
2. Introducing Microsoft Power BI: Alberto Ferrari and Marco Russo, Microsoft Press 2016
3. Getting started with Watson Analytics: IBM Corporation 2015
4. Tableau Your Data! Fast and Easy Visual Analysis with Tableau Software: Daniel G. Murray and the InterWorks BI Team, John Wiley & Sons 2013
5. Beginning Big Data with Power BI and Excel 2013: Neil Dunlop, Apress 2015
6. IBM Watson Content Analytics Discovering Actionable Insight from Your Content: Wei-Dong (Jackie)
7. Zhu Bob Foyle, Daniel Gagné, Vijay Gupta, Josemina Magdalen, Amarjeet S Mundi, Tetsuya Nasukawa Mark Paulis, Jane Singer, Martin Triska, ibm.com/redbooks, IBM Corporation July 2014

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

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Components	A	IP	EE	EP
Weightage (%)	5	25	50	20

IP: Internal Practical, EE: End Semester Examination; EP: External Practical; A: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	3	1	2	1	--	--	3	1	1	2	1	--	--
CO2	1	1	3	2	--	--	3	1	2	2	1	--	--
CO3	1	2	2	1	--	--	3	1	1	2	1	--	--
CO4	2	1	3	2	--	--	3	1	2	2	1	--	--

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BUA4335	**SUMMER INTERNSHIP EVALUATION**	**L**	**T**	**P**	**C**
Version 1.1	Latest Approved	0	0	0	6
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

There are certain phases of every Intern's professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship programme can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal class room situations. These attributes are intellectual ability, professional judgment and decision making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc.

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Course Objectives

The objective of this course is to:

1. Offer students the opportunity to apply their knowledge in real-life environments through an industry placement for eight-weeks.
2. Providedesired skills to students that will help them perform better on their jobs after graduation.

Course Outcomes

On completion of Summer Internship,the students will be able to:

CO1: Get hands-on experience about real world problems in a field relevant to their major of studies.

CO2: Acquire confidence for employment after graduation.

CO3: Acquire skills important for time management, discipline, self-learning, effective communication and so on.

CO4: Learn practically about team-work, collaboration, and leadership.

Credit Hours: 6 hours

Course Duration: Six-Eight weeks

Semester Offered: Summer

Format for Report Writing	**Blooms level***	**Number of hours**

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1. Title of the project 2. About the organization 3. Introduction and objectives of the project/ programme / organization 4. Funding agency—about the agency, how to get funding, Nature of funding agency 5. Staffing pattern of the project with their functions 6. Major activities going under project 7. Results achieved so far (target Vs achievement) 8. Role of the candidate in the project/programme / organization 9. Evaluation by the candidate	L1, L2 ,L3,L4,L5,L6	6hours (Duration-6-8 weeks during summer)

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis; L6-Evaluation*

SIP Guidelines

1.Every student is required to write an Internship report upon completion of their internship and required to submit two copies (student copy + department copy) of the report to concerned department HOD (along with internal marks certificate given by the company) for final evaluation and awarding of end examination marks.

2.Before submitting the report to the HOD, the student required to go through multiple rounds of revision in collaboration with the industry guide and department internship mentor/coordinator/supervisor.

The Internship Report serves multiple purposes:

• Help the student develop written communication skills. • Serve as an archival record of the internship experience. • Give the student an opportunity to reflect on the professional aspects of the internship experience and the skills that were learned. • Allow the student to describe the science content of the internship. • Have the student to reflect on the initial goals of the internship and how they were (or were not) achieved during the internship.

Modes of Evaluation: Presentation/Viva/ Report /Assignment Examination

Examination Scheme:

Components	Content & Layout of Report	Conceptual Framework	Objectives & Methodology	Implications & Conclusions	Presentation
Weightage	30	10	15	15	30

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	--	--	--	--	--	--	1	--	--	--	1	--
CO2		1	--	--	--	--	--	--	--	--	--	1	--
CO3	--	--	1	--	--	1	1	--	--	--	--	1	2
CO4	--	--	--	--	--	--	1	--	--	--	--	1	2

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BUA4402	**FINANCIAL ANALYTICS**	L	T	P	C
Version 1.1	Latest Approved	2	0	2	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Every business in the industry is generating loads of financial data and they understand the significance of deriving logical inferences out of it to streamline their decision making process. Lately, accurate financial data analysis is not enough for a business to sail through. They need predictive insights which can improve their real time day to day decision making. Financial analytics helps in combining internal and external financial information by using social media and big data to provide predictive insights. Whether it is with respect to stock market prediction or customer profitability, finance analytics enables to provide a direction in predicting all.This course blends easy-to-use statistical tools with complex machine learning tools and algorithms to equip the participants with the requisite skill set in analysing data. By the end of this course, the participants should be able to perform financial analysis using powerful tools like R and Python.

Course Objectives

The objective of this course is to:

1. Make students understand and diagnose the information contained in financial statement with a view to judge the profitability and financial soundness of the firm, and to make forecast about future prospects of the firm.
2. Provide understanding on diverse needs of the traditional financial department, and advancements in technology, all point to the need for financial analytics.
3. Help students to shape up the business' future goals and to improve the decision-making strategies for various business situations.
4. Emphasize on measuring and managing business' tangible assets such as cash and equipment.
5. Provides an in-depth insight into the organization's financial status and improves the cash flow, profitability, and business value.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Understand and interpret the financial data about the company

CO2: Forecast the firm financial position and interpret accordingly

CO3: Evaluate the financial position with the support of various financial tools like financial statement analysis, time value of money, bond valuation and valuation of the firm

CO4: Equip the requisite skill set in analyzing data in terms of finance

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Modules	Blooms level*	Number of hours
Module I: Introduction to Financial Analytics and Time Series Data Subjective Forecasting, Business Forecasting and Time Series Data, Introduction to Financial Analytics, Forecasting Performance Measurements: Distance, Forecasting Performance Measurements: Metrics.	L1,L2,L3	7
Module II: Performance Measures and Holt-Winters Model Introduction to Forecasting: Average Method, Naive Method, Linear regression, R example, Moving Averages, Introduction to Exponential Smoothing, Simple Exponential Smoothing, R example on Simple exponential smoothing, Holt's Exponential Smoothing, Holt-Winter's Forecasting Model, Holt-Winter's Model: R Example, Autoregression: Introduction, Autoregression: R Example	L1, L2, L3,L4, L6	8
Module III : Financial Statement Analysis Balance Sheet, Income Statement, Cash Flow Statement, Understanding the Financial Statements and their interlinking, Financial Ratios, Ratio Analysis Present Value (single and multiple cash flows), Future Value (single and multiple cash flows), Annuity, Perpetuity, Growing Annuity. Application: Loan Amortization, Compounding the interest rate	L1, L2, L4, L6	7
Module IV: Modern Portfolio Theory and Introduction to Algorithmic Trading Portfolio Theory: Introduction, Expected Returns, Risk of a Security, Efficient Frontier, Portfolio Weights, Capital Allocation Line, Diversification, Introduction to Algorithmic Trading, Trend Following Strategy, Backtesting, R Example	L1, L2, L3,L4	7
Module V:Linear Regression, Predicting Binary Outcomes (Credit Prediction) Single and Multiple Linear Regression, Modelling and Prediction (Examples using financial data), Logistic Regression, Multiple Logistic Model, Historical Simulation, Simple Variance based approach, Risk Metrics, Monte Carlo Simulation, Value-at-Risk Estimation and Backtesting	L1, L2, L3,L4	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books:

Edward E Williams (Author), John A Dobelman , Quantitative Financial Analytics: The Path To Investment Profits, 2017, Publisher: WSPC, ISBN-10: 9813224258I

Reference Books:

1. Thomas Mazzoni , A First Course in Quantitative Finance, 2018, Cambridge University Press (March 22, 2018)ISBN-10: 9781108411431
2. Mark J. Bennett and Dirk L. Hugen, Financial Analytics with R: Building a Laptop Laboratory for Data Science, 2016 by Cambridge University Press

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Modes of Evaluation: Presentation/Viva/ Report /Assignment Examination
Examination Scheme:

Components	A	IP	EE	EP
Weightage (%)	5	25	50	20

IP: Internal Practical, EE: End Semester Examination; EP: External Practical; A: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	1	--	--	--	2	--	2	1	2	1	--	--
CO2	1	1	--	--	--	2	--	2	1	2	1	--	--
CO3	1	1	--	--	--	2	--	2	1	2	1	--	--
CO4	1	1	--	--	--	2	--	2	1	2	1	--	--

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BUA4403	**SUPPLY CHAIN ANALYTICS**	L	T	P	C
Version 1.1	Latest Approved	2	0	2	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course provides foundational knowledge associated with the operations analytics. The course offers insights on the various tools and techniques for implementation of analytics based on the supply chain drivers such as location, logistics and inventory.

Course Objectives

The objective of this course is to:

1. Manage uncertainty and risk within supply chain management
2. Segment different customers, products, and channels and design an optimal portfolio of logistics approaches and strategies for these various segments
3. Understand the appropriate forecasting methodology for each segment

Course Outcomes

On completion of this course, the students will be able to:

CO1: Describe the various techniques for analytics based on the Multi Attribute Decision Making (MADM) and risk.

CO2: Identify the inventory techniques for analytics and the different network models.

CO3: Analyze the inventory using aggregate production model.

CO4: Illustrate the transportation problems for analytics in network design.

CO5: Analyze the different dimensions using Analytic Hierarchy Process.

Modules	**Blooms level***	**Number of hours**
Module I: Warehousing Decisions, Mathematical Programming Models, P-Median Methods, Guided LP Approach, Balmer – Wolfe Method, Greedy Drop Heuristics, Dynamic Location Models, Space Determination and Layout Methods.	L1, L2	7
Module II:Inventory Management, Inventory aggregation Models, Dynamic Lot sizing Methods, MultiEchelon Inventory models, Aggregate Inventory system and LIMIT, Transportation Network Models, Notion of Graphs, Minimal Spanning Tree.	L1, L2	8

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Module III: Shortest Path Algorithms, Maximal Flow Problems, Multistage Transshipment and Transportation Problems, Set covering and Set Partitioning Problems, Traveling Salesman Algorithms, Advanced Vehicle Routing Problem Heuristics, Scheduling Algorithms-Deficit function Approach and Linking Algorithms.	L1, L2	6
Module IV: Analytic Hierarchy Process, Data Envelopment Analysis, Risk Analysis in Supply Chain, Measuring transit risks, supply risks, delivering risks	L1,L2	5
Module V: Risk pooling strategies, Fuzzy Logic and Techniques-Application in SCM	L1, L2	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books:

1. Gerad Feigin, Supply Chain planning and analytics – The right product in the right place at the right time, Business Expert Press, 2011
2. Peter Bolstorff, Robert G. Rosenbaum, Supply Chain Excellence: A Handbook for Dramatic Improvement Using the SCOR Model, AMACOM Div American MgmtAssn, 2007
3. Robert Penn Burrows, Lora Cecere, Gregory P. Hackett, The Market-Driven Supply Chain: A Revolutionary Model for Sales and Operations Planning in the New On Demand Economy, AMACOM Div American Mgmt Assn, 2013.

Reference Books:

1. Hamdy A. Taha, "Operations Research An Introduction", Prentice Hall India. Sixth, Edition
2. Anderson, Sweeney and Williams, "An Introduction to Management Science: Quantitative Approaches to Decision Making", Cengage Learning, Fifth India Edition
3. Barry Render, Ralph M. Stair Jr. "Quantitative Analysis for Management, Rearson Education, Eighth Edition
4. Frederick S. Hillier and Mark S. Hillier, Introduction to Management Science: A Modeling and Case Studies Approach with Spreadsheets, Tata McGrow-Hill Edition, Second Edition

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**IP**	**EE**	**EP**
Weightage (%)	5	25	50	20

IP: Internal Practical, EE: End Semester Examination; EP: External Practical; A: Attendance

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	1	-	-	-	-	-	-	3	-	1	--	3
CO2	1	1	-	-	-	-	-	-	3	-	1	--	3
CO3	1	1	-	-	-	-	-	-	3	-	1	--	3
CO4	1	1	-	-	-	-	-	-	3	-	1	--	3
CO5	1	2	-	-	-	-	-	-	3	-	1	--	3

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BUA4404	HR ANALYTICS	L	T	P	C
Version 1.1	Latest Approved	2	0	2	3
Pre-requisites/Exposure					
Co-requisites					

Catalogue Description:
Developing the right HR metrics and analytics for your specific context which support long-term performance and improving the decision making is a key competitive edge in the modern economy. HR is increasingly difficult in an era of talent wars, complex environments and a deluge of information.

Course Objective:
The course aims to:
1. Give students a good understanding on the concepts and techniques of human resource analytics.
2. Familiarize the students on how to prepare HR reports and identify decision technologies.
3. Develop a structured approach among students to apply judgment, and generate insight from data for enhanced decision making.

Course Outcomes:
On successful completion of the course a student will be able to:
CO1. Explain internal and external human resource metrics benchmarks and indicators.
CO2. Reproduce knowledge on relational databases and make recommendations regarding the appropriate HRIS to meet organization's human resource needs.
CO3. To identify appropriate software to record, maintain, retrieve and analyze human resources information (e.g., staffing, skills, performance ratings and compensation information).
CO4. To describe both the quantitative and qualitative analysis to understand trends and indicators in human resource data.

Modules	Blooms level*	Number of hours

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Module I:Introduction to HR Analytics Basics of HR Analytics: Concept and Evolution of HR Analytics & data sources - HCM: 21Model, Use of workforce analytics to improve decision making, Analytics and Prediction, Introduction to HR Metrics and predictive analytics, Importance of HR Analytics, Data Analytic techniques using software packages, Future of Human Resource Analytics.HR Metrics and HR Analytics; Intuition versus analytical thinking.	L1, L2	7
Module II: Creating business understanding for HR initiatives Workforce segmentation and search for critical job roles; Statistical driver analysis – association and causation; Linking HR measures to business results; choosing the right measures for scorecards; Identifying and using key HR Metrics.	L1, L2	6
Module III:Forecasting budget numbers for HR costs Workforce planning including internal mobility and career pathing; training and development requirement forecasting and measuring the value and results of improvement initiatives; optimizing selection and promotion decisions	L1, L2	8
Module IV:Predictive modelling in HR Employee retention and turnover; workforce productivity and performance; scenario planning.	L1,L2	6
Module V:Communicating with data and visuals Data requirements; identifying data needs and gathering data; HR data quality, validity and consistency; Using historical data; Data exploration; Data visualization; Association between variables; Insights from reports; Root cause analysis of HR issues	L1, L2	4

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text and Reference Books:

1. Fitz-Enz, J (2010)*The New HR Analytics: Predicting the Economic Value of Your Company's Human Capital Investments*, Amacom.
2. Pease,G Byerly, B& Fitz-enz, J(2012).*Human Capital Analytics: How to Harness the Potential of Your Organization's Greatest Asset*, John Wiley & Sons

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**IP**	**EE**	**EP**
Weightage (%)	5	25	50	20

IP: Internal Practical, EE: End Semester Examination; EP: External Practical; A: Attendance

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	2									1	1		
CO2	1						1			2	1		
CO3								2	1		1		
CO4	2	1									1		

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BUA4405	MARKETING ANALYTICS	L	T	P	C
Version 1.1	Latest Approved	2	0	2	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course provides an understanding on the use of analytics in Marketing Management. The course offers insights to the students on the use of predictive analysis in decision making. The course familiarizes the students on the concept of the market place, various segments of products and services in the markets, and changing consumer needs in the markets.

Course Objectives

The objective of this course is to

1. Develop the ability to critically evaluate business problems and to determine the most appropriate analytical technique address marketing problems.
2. Acquaint the students to develop and implement the marketing strategy by providing a framework from which to identify and evaluate strategic options and programs.
3. Enable students to solve real-world marketing problems across a wide range of industries, giving them a competitive edge.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Identify various methods followed build CRM practices and various positioning strategies followed by the companies.

CO2: Contrast the characteristics of industrial and consumer goods.

CO3: Identify and apply the various techniques of predictive analysis in the different market situations.

CO4: Explain the need for digital evolution in marketing.

Modules	Blooms level*	Number of hours
Module 1: Introduction to Marketing Understanding the marketplace and consumer needs, Designing a Customer Driven Marketing Strategy, Building Customer Relationships, Consumer Behaviour and Business Buyer Behaviour	L2,L5	7
Module 2: Marketing Strategy Market Segmentation and Product Positioning, Market Segmentation, Market Targeting, Target Market Strategies, Product Positioning and Differentiation, Choosing a Differentiation and Positioning Strategy.	L1, L4	8

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Module 3: Product and Service Products and services, product and service classifications, consumer products, industrial products, product and service decisions, product and service attributes, product support services, services marketing – the nature and characteristics of a service.	L2,L4	7
Module 4: Retail Analytics – I Customer Analytics Overview; Quantifying Customer Value, Using Stata for Basic Customer Analysis, Predicting Response with RFM Analysis, Statistics Review, Predicting Response with Logistic Regression, Predicting Response with Neural Networks, Predicting Response with Decision Trees.	L2,L3, L5	6
Module 5: Retail Analytics – II The digital evolution of retail marketing, Digital natives, Constant connectivity Social interaction, Predictive modelling, Keeping track, Data availability, Efficiency optimization.	L2,L4	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books:

1. Kotler, P., Keller, K. L. ,Koshy, A., Jha, M. Marketing Management: A South Asian Perspective. New Delhi: Pearson Education , 14th edn,.2013
2. Rajan, S. Marketing Management. India: New Delhi: Tata McGraw-Hill Education. 4th edn,2005

Reference Books:

1. Karunakaran, K..Marketing Management. New Delhi: Himalaya Publishing House. 3rd edition, 2013.
2. Kumar, A., Meenakshi. Marketing Management. New Delhi: Vikas Publishing House Pvt Ltd. , 2nd edition,2013
3. Ramaswamy, V. S., Namakumari, S. Marketing Management Global Perspective, Indian Context. New Delhi: Macmillan India Limited. 3rd edition, 2009

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**IP**	**EE**	**EP**
Weightage (%)	5	25	50	20

IP: Internal Practical, EE: End Semester Examination; EP: External Practical; A: Attendance

CO, PO and PSO mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	-	-	1	1	-	-	1	1	1	1	1	-	-
CO2	-	-	1	1	-	-	1	1	1	1	1	-	-
CO3	-	-	1	1	-	-	1	1	1	1	1	-	-
CO4	-	-	1	1	-	-	1	1	1	1	1	-	-

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BUA4406	**DATA PRIVACY AND DATA SECURITY LAWS**	L	T	P	C
Version 1.1	Latest Approved	2	0	0	2
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is designed to familiarize the students with the basic concepts of data privacy issues and security laws including current and proposed laws and regulations that govern data security and privacy.

Course Objectives

The objective of this course is to:

1. Provide the foundational knowledge based on data security investigation and data policy questions concerning the value of data security and data privacy regulations.
2. Emphasize on the real world effects of data breaches on individuals and businesses.
3. Provide an understanding on how to secure data and balancing of interests among individuals, government, and enterprises from the technical and legal perspective.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Explain the fundamental concepts of data security and security laws.
CO2: Explain the business needs for data privacy and security investigation.
CO3: Assess the risk for data security.
CO4: Identify the legal, professional and ethical issues related to data.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Data Security History of data security, Meaning of data Security and data privacy, Critical Characteristics and components of Data security, Need for Security, Business Needs, Threats, Attacks, Meaning of term personal data, data processing, data protection, NSTISSC Data Security Model, Balancing Security and Access to data, The SDLC model, The Security SDLC	L1, L2	6
MODULE 2: Introduction to Data Security Laws Introduction of the General Data Protection Regulation (GDPR), rationale for the introduction of the GDPR , primary objectives of the General Data Protection Regulation, scope of data processing activities covered by the GDPR, territorial scope of the GDPR regarding the location of personal data processing and data subjects, GDPR impact on Indian Companies, Data protection Laws in India	L1, L2	6

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MODULE 3: Data Privacy: Legal Issues and Landscape Development of Privacy Laws (historical and legal context), Fair Information Principles, The Statutory Landscape in the US, Indian IT Act, Adjudication under Indian IT ACT, IT Service Management Concept, IT Audit standards, ISO/IEC 27000 Series, COBIT, HIPPA, SOX, System audit, Information security audit, ISMS, SoA (Statement of Applicability), BCP (Business Continuity Plan), DR (Disaster Recovery), RA (Risk Analysis/Assessment)	L1, L2	6
MODULE 4: Data Security Analysis and Risk Management **Risk Management:** Identification, Assessment and controlling of Risk **Logical Design:** Blueprint for Security, Information Security Policy, Standards and Practices, ISO17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity **Physical Design:** Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel	L1, L2	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis; L6-Evaluation*

Text and Reference Books

1. Micki Krause, Harold F. Tipton, "Handbook of Information Security Management", Vol 1-3 CRC Press LLC, 2004.
2. Stuart McClure, Joel Scrambray, George Kurtz, "Hacking Exposed", Tata McGraw-Hill, 2003.
3. Matt Bishop, " Computer Security Art and Science", Pearson/PHI, 2002.
4. International Guide to Privacy – American Bar Association (Privacy)
5. International Guide to Cyber Security – American Bar Association (Cyber Security)
6. Roadmap to an Enterprise Security Program - American Bar Association (Roadmap)
7. The Executive Guide to Information Security – Egan and Mather (Guide)
8. Case studies from the Harvard Business School; http://cb.hbsp.harvard.edu/cb/access/5263390

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	1	3	--	2	2	2	--	1	--	3
CO2	2	2	--	1	3	--	2	2	--	--	1	--	2
CO3	2	3	1	1	2	--	2	--	2	--	1	--	3
CO4	2	2	2	1	1	--	2	2	2	--	1	--	--

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BUA4437	**DISSERTATION (ANALYTICS PROJECT)**	L	T	P	C
Version 1.1		0	0	0	6
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Under this, it is usual to give the student some discretion in the choice of topic for the dissertation and the approach to be adopted. The dissertation topic is related to the field of specialization. Deciding this is often the most difficult part of the dissertation process, and requires thorough preparation and background research.

The aim of the dissertation is to provide the students with an opportunity to further their intellectual and personal development in their chosen field by undertaking a significant practical unit of activity, having an educational value at a level commensurate with the award of their degree.

Course Objectives

The objective of this course is to:

1. Understand and apply theoretical frameworks to the chosen area of study.
2. Produce a coherent and logically argued piece of writing that demonstrates competence in research and the ability to operate independently.

Course Outcomes

On completion of Dissertation, the students will be able to

CO1: Describe a relevant area of career development, career coaching, coaching or work-related learning studies.

CO2: Identify research methods and state research questions.

CO3: Critically analyze and evaluate the knowledge and understanding in relation to the agreed area of study.

CO4: Integrate theory and practice for the development of responses on the basis of the evaluation and analysis undertaken.

CO5: Communicate in written form by integrating, analyzing and applying key texts and practices.

CO6: Demonstrate advanced critical research skills in relation to career development or work-related learning studies.

Planning the dissertation	**Blooms level***	**Number of hours**

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• Selecting a topic for investigation. • Establishing the precise focus of the study by deciding on the aims and objectives of the dissertation, or formulating questions to be investigated. Consider very carefully what is worth investigating and its feasibility. • Drawing up initial dissertation outlines considering the aims and objectives of the dissertation. Workout various stages of dissertation • Devising a timetable to ensure that all stages of dissertation are completed in time. The timetable should include writing of the dissertation and regular meetings with your dissertation guide.	L1, L2 ,L3,L4,L5,L6	6hours a Week

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis; L6-Evaluation*

Modes of Evaluation: Viva/ Report Examination

Examination Scheme:

Components	Content & Layout of Report	Conceptual Framework	Objectives & Methodology	Implications & Conclusions	Viva-Voce
Weightage	30	10	15	15	30

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	--	--	--	--	--	--	1	--	--	--	1	--
CO2	--	1	--	--	--	--	--	--	--	--	--	1	--
CO3	--	1	2	--	--	--	--	--	--	--	--	1	--
CO4	1	--	--	--	--	--	--	--	--	--	--	1	--
CO5	--	--	--	--	--	--	1	--	--	--	--	1	2
CO6	--	--	--	--	--	--	--	--	1	--	--	1	--

1: strongly related, 2: moderately related and 3: weakly related

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Master of Business Administration
(Hospital & Healthcare Management)

FLEXILEARN
-Freedom to design your degree



Curriculum & Scheme of Examination

2023

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GURUGRAM

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Master of Business Administration
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Syllabus – First Semester

ACCOUNTING FOR MANAGEMENT

Course Code: HHM4102 **Credits Units: 03**

Course Objective: Participants in this course will develop the essential ability of all managers, to use complex accounting information as a platform for decision-making. As the course unfolds, participants will build an increasingly sophisticated level of understanding of the language of accounting and its key concepts. In addition the course develops skills in interpreting earnings statements, balance sheets, and cash flow reports. This ability to analyse financial statements will enable participants to deal more effectively with strategic options for their businesses or business units.

Course Contents:

Module I:Accounting Basics
Introduction, Foundations, Accounting policies, Accounting and management control, Branches of accounting, Recording of transactions and classification, Trial Balance & Errors, Cash book

Module II:Final Accounts
Preparation, Adjustments, Analysis, Depreciation Accounting, Reserves &Provisions.Form and contents of financial statements with reference to Indian Companies Act.

Module III:Financial Statement Analysis
Relation and Comparison of Accounting data and using financial statement information, Ratio Analysis, Cash flow analysis.Determination of Existing and future capital requirement.

Module IV: Cost Accounting
Elements of cost, Cost Classification and Allocation, Cost Sheet

Module V:Management A**ccounting**
Emergence of Management Accounting, Marginal Costing and Cost Volume Profit Analysis, Budgeting & Variance Analysis.

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text &References:

- Bhattacharya, S.K. and Dearden, J (2006),Accounting for Management, Vikas Publishing House
- Narayanaswamy R (2005),Finanacial Accounting – A Managerial Perspective, Prentice Hall of India.
- Maheshwari S N and S K Maheshwari (2006), Accounting for Management, Vikas Pub. House.
- Tulsian, P.C (2006), Financial Accounting, Tata McGraw Hill.
- Banerjee, A (2005), Financial Accounting, Excel Books.

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BIOSTATISTICS

Course Code: HHM4104 **Credit Units: 03**

Course Objective:
The aim of this course is to develop the understanding of various statistical tools used for decisions making and how each applies to and can be used in the Hospital environment.

Course Contents:

Module I- Introduction to Statistics
Variables -Types of Variables ,Sampling-Sample size and Sampling techniques Data Collection – Types of data (Primary and Secondary Data) , Methods of Data Collection - Respondents, interviews, observation, questionnaire, survey, direct and indirect research techniques, Data Collection in Quantitative and Qualitative Research , Organizing the data.

Module II- Data Analysis
Data Analysis – techniques and tools, Manual and Computerized, Use of statistical software in data analysis - univariate, bivariate and multivariate analysis.

Module III- Data Presentation
Data Presentation - frequency distribution, charting of data – Bar Chart, Pie chart, Line Diagram, Tables, Histogram.

Module IV-Demography and Vital Statistics
Mortality and Morbidity Rates, Birth Rates, Specific Death Rates, Fertility Rates, Abortion Rates.

Module V-Hospital Statistics
Application of statistics in healthcare and hospital settings - utilization of the basic data, sources of health statistics, problems in collection of sickness data, measurement of sickness, vital statistics.

Examination Scheme:

Components	CP	V	A	ME	EE
Weightage (%)	5	5	5	15	70

Text & References:

- B.K. Mahajan. *Methods in Biostatistics*, Jaypee Brothers
- P.S.S. Sundar Rao. *An Introduction to Biostatistics: A manual for students in Health Sciences*, J.Richard Prentice Hall, 1996.
- Daniel, Wayne.W. *Bio-Statistics: A foundation for Analysis in the Health Sciences*, John Wiley and Sons Pub, 1991.
- K. Vishwas Rao. *Bio-Statistics: A Manual of statistical methods for use in the Health, Nutrition and Anthropology*, Jaypee Brothers Medical Pub, 1996.
- Verma B.L., Shukla G.D. *Bio-Statistics perspective in Health care research and practice*, C.B.S. Pub, 1993.
- Krishnaiah, P.K. Rao, C.R. (ed), *Handbook of Statistics*, Elsevier Science Pub, 1988.

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INFORMATION TECHNOLOGY& E-COMMERCE

Course Code: HHM4109 **Credit Units: 02**

Course Objective:
This course will expose students to developments in computer technology and understand the working of a computer system. It will introduce end-user computing and build skills in using IT and understanding various technologies like internet, telecom, DBMS concepts, e-commerce etc. The course will expose the students to the latest trends in computer.

Course Contents:

Module I: Modern Computer Systems
Evolution of Computer Systems, Input, output and storage technologies, Computer Assisted Control and Automation , (e.g. Delhi Metro , Digitally Controlled Car engines etc.) , Computer Controlled Biometric/RFID based Access Control , Contemporary hardware and software platforms(Open Source, Web Software etc.), Storage of Data Resources

Module II: Data Resource Management
Introduction to DBMS, Benefits of DBMS over traditional file system, Types of DBMS, Application of DBMS using MS-ACCESS / ORACLE as a tool for understanding of DBMS concepts. SQL Query handling , Forms, Concept of Data Warehouses and Data Marts, Introduction to Data Centers. Storage Technologies and Architecture (DAT, NAS, SAN etc.) . Live examples of storage strategies of companies like Google, Amazon Wal-Mart dealing with storage crisis

Module III: Telecommunications and Computer Networks
Networked Enterprise :- Components, Types of networks, Advantages of Network Environment, Business Uses of Internet, Intranet and Extranet, Web 2.0/3.0 , Distributed/Cloud/Grid Computing, GSM & CDMA, GPRS ,3G & 4G technologies, VOIP and IPTV.

Module IV: Electronic Commerce Systems
Introduction to e-Commerce and M-Commerce, Advantages and Disadvantages of each. Concept of B2B, B2C, C2C , with examples. Concept of Internet Banking and Online Shopping, Electronic Payment Systems. Project Discussion :- Development of e-commerce store (Web Site Development, Internet Publicity , Payment Gateway, Packaging & Delivery , After Sales Support) .

Module V: E-governance
Concept of e-governance , World Perspective , Indian Perspective , Technologies for e-governance , e-governance as an effective tool to manage the country's citizens and resources, Advantages and Disadvantage of E-governance, E-governance perspective in India. Discussion on MCA21 Project ,Bhoomi etc. .

Module VI: Security Management
The Information Security, System Vulnerability and Abuse, Security Threats (Malicious Software , Hacking etc.) and counter measure. Definition of Cyber Crime and Types. Antivirus, Firewalls, Anti-Spyware , Security Audit, Discussion on Overview of IT-ACT 2000.

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text &References:

- Norton P (2010), Introduction to Computers, Tata McGraw-Hill
- Potter T (2010), Introduction to Computers, John Wiley & Sons
- Morley D & Parker CS (2009), Understanding Computers – Today and Tomorrow, Thompson Press
- Jawadekar, WS (2009); Management Information System; Tata McGraw Hill
- Mclead R & Schell G (2009), Management Information Systems; Pearson Prentice Hall
- O'Brein, JA (2009); Introduction to Information Systems; Tata McGraw Hill

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Syllabus - Second Semester

RESEARCH METHODOLOGY

Course Code: HHM4203 **CreditUnits: 03**

Course Objective: To provide basic understanding towards research principles and methods. To introduce important analytical tools for research data analysis. To assist in the development of research proposals/reports

Course Contents:

Module I: Basics of Research
Definitions and designs, uses of research in healthcare, formulation of research problems, developing hypothesis, writing research questions

Module II
Sampling, Design, and development of interview schedule, questionnaire construction, pre-testing (reliability & validity), research ethics

Module III
- Data collection: field work, mapping and listing operations, selecting of respondents and MIS for major research projects
- Data Management: editing, entry and preparing data sets for analysis
- Data analysis: using SPSS/ epi.info/ use of matrices

Module IV: Qualitative Research
- Development of conceptual framework
- Qualitative methods: FGDs, in-depth interviews, biographics, participatory methods, participant observation etc.

Module V:Research Ethics
History of ethics in health research, Principles and Concepts in research ethics – confidentiality and privacy, informed consent, vulnerable subjects and special treatments, standards of care – principles, review processes etc.

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text & References

- Gummersson, E. *Qualitative methods in Management Research*, Sage publications
- Verkevieser et al, *Designing and conducting Health Systems Research Projects* WHO and IDRC
- Grundy F and Reinke W A, *Health Practice Research and formalize Managerial Methods*, Geneva, WHO
- *Designing and conducting Health surveys*, Jossey Bass Publishers.

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HOSPITAL PLANNING

Course Code: HHM4205 **Credit Units: 03**

Course Objective

To expose the students to planning and operation of hospitals in a detailed manner which will include all facets of hospital planning activities covering every department that is involved both in clinical care as well as supportive services. A chapter on research in Hospital Services and Resources is also added to give impetus for research in this field.

Course Contents

Module I: Introduction to Hospital Planning

Conception of idea, formation of hospital planning team, market survey, feasibility study, selection of location, Financial planning of hospitals, Macro level planning.
Conception to commissioning- site development, architects brief working drawings and specifications, engineering drawing, equipment planning, bed distribution, space allocation, interior designing and construction of building - commissioning, shake down period

Module II

Planning for the out-patient services and emergency services, day care services
Planning for patient care units –Inpatient services and intensive care units
Planning for surgical suites.
Planning for labor and delivery suites-LDRP suites

Module III

Planning for laboratory service, blood banking and Radiological services.

Module IV

Conceptual planning for advanced facilities like Cardiac catheterization laboratory, various endoscopy units, Extra corporeal shock wave lithotripsy, radiotherapy unit, IVF unit and Dialysis unit

ModuleV

Planning for supportive services-medical gases, HVAC, House-keeping, CSSD, Food and beverages.

Examination Scheme:

Components	CP	V	A	ME	EE
Weightage (%)	5	5	5	15	70

Texts & References:

- *Hospitals: Facilities Planning and Management*, GD Kunders by Tata Mcgraw Hill
- *Modern Trends in Planning & Designing of Hospitals: Principles and Practice*: Shakti Kumar Gupta, Sunil Kant, R Chandrashekhar, SidharthSatpathy, by Jaypee – 2007
- *Hospital Planning*: Charles Butler, Addison Erdman
- Dr Malhotra's series: *Step by Step – Hospital designing & Planning*, by Jaypee 2007

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HOSPITAL MATERIALS MANAGEMENT

Course Code: HHM4206 **Credit Units: 03**

Course Objective:
Hospitals carry a large inventory of drugs, sophisticated and highly costly equipment besides beds, furniture and linen. The student should be conversant with Inventory and various methods of control and Purchase management.

Course Contents:

Module I: The Materials Function
Definition, scope and importance of materials management, objectives of materials management, functional areas of materials management, documents used in materials function, material identification codes, role of computers in the materials management, special features of materials management applied to hospitals.

Module II: Stores Management
Responsibilities and functioning of stores, Types of stores in hospitals, Location and layout of stores, Stock verification techniques, Control of pilferages, Standardization and codification.

Module III: Inventory Management
Definition of inventory- Need of control, objectives of inventory control, scope & importance, categories of materials in hospital, hospital, Cost associated with inventories- Ordering cost, carrying cost, over stocking cost, under stocking cost, other costs associated with service level. Inventory control Techniques, Economic order quantity (EOQ), inventory models: safety stocks, fixation of re-order level,

Module IV: Purchase Management
Objectives and responsibilities of purchasing, Vendor evaluation techniques, Price and quality considerations, Tendering procedures, Types of purchasing.

Module V: Legal aspects
Letter of credit, Duty of customs, Types of hospital imports, import procedures & Documentation, government policy.

Module VI: Maintenance Management & Disposal
Maintenance of equipment, Inventory control of spares, Maintenance contracts, Disposal of Waste and Scrap

Examination Scheme:

Components	CP	V	A	ME	EE
Weightage (%)	5	5	5	15	70

Texts & References:

- *Procurement and Materials management for Hospitals,* Rex H Gregor, Harold C. Mickey
- *Material Management* by Dr. PawanArora, Global India Publication Pvt Ltd
- *Handbook of Materials Management*, P. Gopalkrishnan, EasternEconomy Edition.

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EXCEL FOR MANAGERS

Course Code: HHM4209 **Credit Units: 01**

Course Overview:
Microsoft Excel is a very popular business productivity application for the management and manipulation of data. With the right training and understanding of Excel, businesses and individual users can unlock the world of opportunities that this powerful business application offers.This course will provide all the tools necessary to create and use basic and advanced spreadsheets. After completion of this course, students will be able to learn the various methods for entering and editing data and also learn the various ways to write simple formulas.

Course Contents:

Module-I: Getting Started with Excel
Introduction to Spreadsheets: Launching Excel, entering data in spreadsheet, widening rows and columns, applying basic formatting in spreadsheet, saving work in excel. Entering Data into cells:Usingautofill, sort & filter feature, creating lists, inserting & deleting rows and columns. Wrapping & merging text and cells,

Module-II: Basics in excel
Protecting & sharing workbooks, freeze panes, understanding normal, page layout and page break preview in excel. Setting the page orientation and print area.Adding hyperlinks to cells, inserting images, objects, equations and symbols.

Module-III: Charts & Formulas in Excel
Understanding Charts: Inserting bar charts, pie charts, column charts and line charts in spreadsheets, formatting and resizing the chart. Using Basic functions- average, sum, min, max, product etc. date functions, time functions. Math Operators in Excel, combining mathematical operators.

Module-IV: Functions in Excel
Logical- using IF, AND, OR, NOT, TRUE, FALSE Functions. Textual- using TRIM, UPPER, LOWER, REPLACE Functions.Import data into excel, Look up functions with index and match. Rounding, sum product, conditional counts and conditional sums, Filtering data, pivot table, pivot charts, conditional formatting.

Module-V: Financial and Statistical Functions in Excel
Financial functions: Time value of money- Present value, Future value, PMT with beginning date, PMT with ending date, NPV, Goal seek, Scenario Manager, IRR. Statistical functions: Max, Min, Average, Large, Rank, Small, Var, Std Dev.

Examination Scheme:

Components	Written Test	Practical	V/P	File/Assignment	Attendance
Weightage (%)	20	30	30	15	5

Suggested Readings & Textbooks

- Business Analysis with Microsoft Excel by Conrad George Carlberg,,Que Publishing, second edition, ISBN 0974415626.
- Excel 2013 for Dummies by Greg Harvey, John Wiley & Sons , 2012, ISBN 9781118559703

Web Resources

- https://spreadsheeto.com/
- https://www.tutorialspoint.com/excel/

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TERM PAPER

Course Code: HHM4231 **Credit Units: 04**

Course Objective:

The aim of the term paper is to provide the students with an opportunity to further enhance their knowledge by undertaking a **significant practical unit of examining and analyzing various aspects of healthcare management** at a level commensurate with the learning outcomes of the various courses taken upto them in the ongoing semester.

For students of the first semester, the required term paper is primarily a self- worded structured report written by the students after interpreting & analyzing various primary & secondary records of intelligent interviews/readings from several sources on a particular sector.

Conduct of Term Paper

The term paper will be executed & submitted by students individually.

- The students have to decide the topic of study / hospital of interest **within two weeks of the start of the semester**.
- A Faculty Mentor will be assigned to each group of students undertaking a Team Paper.
- Special Time slot to conduct the research will be included in the timetable.
- The Mentor will conduct weekly sessions to guide & follow up the students as well as to clarify any queries or problem faced by the students.
- Weekly review of the Work in Progress will be maintained by Faculty Mentor & will carry 20% weightage during the final evaluation.
- This will be substantiated through a proper economic diary maintained by the students documenting their daily objectives, plan of action, activities undertaken, documentation of reading & referencing material, analysis (if any) & learning outcomes.
- Students may use innovative tools & techniques to maintain this diary such as e-concepts, online blogs, charts, graphs etc.
- Students will be given some discretion in the choice of topic for the term paper and the approach to be adopted.
- The term paper has to be formulated with multi-disciplinary aspects explained in the section below.

Focus Areas of Study

1. Hospital organization & Management Process (HOMP)

Analysis of organisational process of 5 hospitals (include public and private hospitals) while maintaining a scrap book of the latest news & views.

2. Medical Records (MR)
   - Role of E-codes in injury prevention.
   - Differentiation of roles and functions of medical record practitioners
   - Bar code tracking system enhances record- and film-handling productivity
   - Evaluation of use of bar coding in medical record processing
   - Trends in utilization management: legal implications for health record administration

3. Management in Healthcare Systems (MEHS)
   a. A brief overview of the major management functions of health systems.
   b. Procurement Management in Healthcare Systems
   c. Cultural Variation in healthcare consumption in 5 Asian Countries including India: National and individual drivers in mild medical conditions

4. Epidemiology (ED)
   a. Epidemiology and RiskFactors for Isolation of Multi-Drug ResistantOrganisms in patients
   b. Overview of NutritionalEpidemiology
   c. RiskAssessmentStudies : Epidemiology
   d. Epidemiology of Endophthalmitis and Treatment

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trend in India

e. Epidemiology of cause of death in Childrenwith Acute RespiratoryDistress Syndrome

5. Quality Management in Hospitals (QMH)
    a. Assessing the organizational characteristics influencing Quality Improvement implementation in Indian Hospitals
    b. Basic quality tools applied in Indian healthcare system
    c. Total Quality Management Approach to improve patient safety by preventing medication error incidences
    d. A Holistic Approach for Conceptualizing Hospital Service Quality

Needless to add, effective deployment of Self -Development, Interpersonal Skills & techniques of Business Communication is integral to all aspects of the term paper and will be evaluated accordingly.

General Guidelines

- All students must submit an *independently written* report of their term paper project.
- All contents need to be sourced from reliable primary & secondary sources; references for which **MUST** be maintained in proper format.
- At least one middle level or senior level person of a hospital from healthcare sector has to be interviewed face to face.

- Though the term paper is more a descriptive report covering the 'What, Why and How' aspects; participation in leg work or field research of a hospital (s) will add value to the study.

- The paper should utilise class room learning and industry exposure to evaluate issues on hand and suggest remedial/progressive measures that may be taken by a hospital(s).

Assessment & Evaluation:

The term paper will be in the form of an integrated report and assignment.

- A board consisting of all the faculty members who are teaching the students in the first semester will conduct the final evaluation.
- The faculty mentor assigned to the students will do the continuous evaluation.

All reports will be examined most strictly for plagiarism.

Components	**Continuous Assessment & Economic Diary**	**Presentation**	**Content & Layout of Report**	**Analysis**	**Conclusion & Recommend ations**	**Viva/ Defending Questions**
Weightage (%)	20%	15%	20%	20%	10%	15%

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Syllabus - Third Semester

MANAGEMENT OF CLINICAL SERVICES

Course Code: HHM4303 **Credit Units: 03**

Course Objective:
To enable the students gain insights into various aspects like importance, functions, policies and procedures, equipping, controlling, co-ordination, communication, staffing, reporting and documentation of both clinical services in a hospital.To understand the processes and details related to effective patient care and to further increase the satisfaction level of patients

Course Contents:

Module I: Patient centric management
Concept of patient care, Patient-centric management, Organization of hospital departments, Roles of departments/managers in enhancing care, Patient counseling & Practical examples of patient centric management in hospitals.Patient safety and patient risk management.

Module II: Quality in patient care management
Defining quality, Systems approach towards quality, towards a quality framework, Key theories and concepts, Models for quality improvement & Variations in practice

Module III: Patient classification systems
Types of patient classification systems, ICD 9 (CM, PM), Casemix classification systems, DRG, HBG, ARDRG.

Module IV: Patient Medical Records
Policies & procedures for maintaining medical records.e-records, legal aspects of medical records, its safety, preservation and storage.

Module V: Overview
Hospital operations management, role and decisions, Difference of hospital operations from other sevice and manufacturing organizations.

Module VI: Out Patient Services
Overview of the department, day care, accident and emergency services, physical medicine and rehabilitation, occupational therapy unit, physiotherapy department

Module VII: In Patient Services
Ward design (general & specialized), critical care services – ICU, CCU, NICU, , medical services, surgical services – operation theater, nuclear medicine, burn unit, nursing services and administration.

Module VIII: Specialty Services
Pediatrics, Obs&Gynec, ENT, Ophthalmology, Orthopedic, Psychiatry, Anesthesia, Dental

Module IX: Super-specialty Services
Cardiology, Thoracic Surgery, Neurology, Neurosurgery, Nephrology- Dialysis Unit, Transplantation Services.

Examination Scheme:

Components	CP	V	A	ME	EE
Weightage (%)	5	5	5	15	70

Texts & References:

- *Management of Hospitals & Health services*: Strategic issues and performance, Rockwell Schulz, Alton C. Johnson
- Shakharkar B.M., *Principles of Hospital Administration and*

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Planning

- *Hospital managerial services* Volume -4, S.L. Goel, R. Kumar
- *Hospital Core Services: Hospital administration in 21st century*Vol 1 Kumar R, S.L. Goel
- *Hospital Management, Dr. A.K. Malhotra,* Global India Publications Pvt ltd, New Delhi
- *Hospital Management : A guide to departments,* Howard S. Roland, Beatrice L Rowland

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OPERATIONS RESEARCH

Course Code: HHM4305 **CreditUnits: 03**

Course Contents:

Module I: Introduction
The OR approach to problem-solving and decision-making, Scope and limitations of OR in managerial decision-making.

Module II: Introduction to OR Techniques
Linear Programming, Decision Tree Analysis, Queuing theory, PERT/CPM, Replacement models, Sensitivity analysis, Assignment models, Inventory control models, Forecasting.

Module III: Applications of OR in Hospitals and Health Agencies
Resource allocation, Health services planning, Deployment of health human power, Materials Management, Equipment replacement, Patient scheduling.

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text & References:

- *Operations Research in Hospitals: Diagnosis and Prognosis*, David H. Stimson, Ruth H. Stimson
- *Operations Research and Healthcare: A handbook of methods and Applications*, Margaret L. Brandeau, Francois Sainfort, William P. Pierskalla
- *Patients hospitals and Operational Research*, Taylor Francis
- *Operations Research* by P. Rama Murthy
- *Operations Research: Methods, Models and Applications*, Jay E, Aronson and Stanley Zionts

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MANAGEMENT OF SUPPORT & UTILITY SERVICES

Course Code: HHM4308 **Credit Units: 03**

Course Objective:
To enable the students gain insights into various aspects like importance, functions, policies and procedures, equipping, controlling, co-ordination, communication, staffing, reporting and documentation of non clinical services in a hospital.
To understand the processes and details related to effective patient care and to further increase the satisfaction level of patients

Course Contents:

Module-I: Support Services
Diagnostic-Radiology & Imaging Services, Hospital Laboratory etc, Blood Bank & Transfusion Services, Ambulance Services, Pharmacy, CSSD, Oxygen Manifold/Concentrator, Dietary Service, Hospital Laundry and Linen, Medical Social Worker, Marketing and Public Relations, Finance and Administrative Departments, Outsourcing.

Module-II: Utility Services
Housekeeping, Hospital Engineering and Maintenance, Biomedical Department, Medical Records-confidentiality of records, reception, enquiry, registration and admission, central billing and accounts, Cafeteria/canteen, Mortuary.

Module-III: Biomedical Waste Management and Hazards in Hospital
Definition of Biomedical Waste, BMW – Segregation, collection, transportation, disposal, Liquid BMW, Radioactive waste, Metals / Chemicals / Drug waste, BMW Management & methods of disinfection, Modern technology for handling BMW, Monitoring & controlling of cross infection (Protective devices), BMW from Administrative point (Budget, Health check-up, Insurance)

Module-IV: Other Hospital Functional Activities
Hospital Acquired Infection - Source and Control, Modern trends in Hospital Administration, Telemedicine.

Examination Scheme:

Components	CP	V	A	ME	EE
Weightage (%)	5	5	5	15	70

Texts & References:

- *Management of Hospitals & Health services*: Strategic issues and performance, Rockwell Schulz, Alton C. Johnson
- Shakharkar B.M., *Principles of Hospital Administration and Planning*
- *Hospital managerial services* Volume -4, S.L. Goel, R. Kumar
- *Hospital Core Services: Hospital administration in 21st century*Vol 1 Kumar R, S.L. Goel
- *Hospital Management, Dr. A.K. Malhotra*, Global India Publications Pvt ltd, New Delhi.
- *Hospital Management : A guide to departments,* Howard S. Roland, Beatrice L Rowland.

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SUMMER INTERNSHIP EVALUATION

Course Code: HHM4335 **Credits Units: 06**

Course Objective:
To provide on the job experience, as an understudy in a hospital, to help the student understand systems and procedures and learn to make decisions considering the Hospital as an integral unit.

Duration: 2 months

Objectives of Training:
- To collect the information about organization
- To learn about the differentprojects run by the organization
- To befamiliarwithcommunicationprocedurebetweenhealthworkersand community
- To identify practical things aboutproject planning and implementation
- To discover the problems faced in implementing the project
- To learn about working of the information system
- To know about method and source of evaluation

Format for Report Writing
1. Title of the project
2. About the organization
3. Introduction and objectives of the project/ programme / organization
4. Funding agency—about the agency, how to get funding, Nature of funding agency
5. Staffing pattern of the project with their functions
6. Major activities going under project
7. Results achieved so far (target Vs achievement)
8. Role of the candidate in the project/programme / organization
9. Evaluation by the candidate

Guidelines for presentation-
- Powerpoint presentation
- Timeforpresentation: 20minutes
- Time for discussion: 10 minutes

Examination Scheme:

Components	Presentation	Report submitted	Viva-voce
Weightage (%)	25	50	25

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Syllabus - Fourth Semester

HOSPITAL MANAGEMENT INFORMATION SYSTEM

Course Code: HHM4401 **CreditUnits: 04**

Course Objective:
To understand the various indicators of health and health information system and health management information system in hospitals.

Course Contents:

Module I: Introduction
Concept of information as a resource, Understanding the principles of information systems, Classification of information systems in hospitals.

Module II: Managing Hospital Information Systems
Setting strategic objectives for information systems, organizing an information systems department, Principles of systems development, Importance of security and confidentiality of data.

Module III: Role of Information Technology in Hospitals
Principles of information processing, Role of information technology in information processing, Role of database management systems, Role of communication in managing hospital information systems.

Module IV: Management Information System
Concept of Management Information System (MIS).Developing indicators, identifying data and developing tools of measurement. Use of MIS: monitoring progress and evaluation, hospital planning, monitoring employees, monitoring health development, decision making. Computerization of MIS: demonstration and critical analysis of different MIS software packages used in health projects in hospitals.

Examination Scheme:

Components	CP	V	A	CT 1	CT 2
Weightage (%)	20	15	5	30	30

Text & References

- *Management Information System (MIS) in Hospitals: A computer based approach for quality in hospital services and administration,* by Anil Kumar Saini
- S.C. Joshi & S.N. Mehta. *National Information System: Planning and Management*, Global vision publishing house.
- *Information Technology in health care: Socio technical approaches, 2010.* IOS Press BV

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ENTREPRENEURSHIP & CONSULTANCY IN HEALTHCARE

Course Code: HHM4406 **Credit Units: 03**

Course Objective:
To create interest in students to start a venture, learn the intricacies of starting as enterprise, identifying opportunities, inculcating enterprising values with orientation towards setting up own enterprises and equip the student to take up consultancy work in various facets of hospital management.

Course Contents:
Module I- Overview of Entrepreneurship
Overview: Definition and Meaning of Entrepreneurship Characteristics and Function of Entrepreneur Importance and Limitations of Entrepreneurship: Entrepreneurial Laboratory: Types of Entrepreneurs Entrepreneurship Games Innovation and Entrepreneurship.
Idea Generation: Brain Storming in terms for Project Ideas, Normal Group Technique; Creativity. Lateral Thinking; Research &Development, Reverse Engineering IPR, Patenting ;Environment Scanning Opportunities in Health care ; NGO Collaboration.

Module II- Feasibility Study
Operational Feasibility, Technical Feasibility, Market Feasibility, Financial Feasibility, Economic Forecasting Project Report Writing; Support Systems for New Enterprise Creation, New Enterprise Identification and Selection Enterprise Establishment and Management.

Module III-Sources of Finance
Short Term Sources – Instruments – Long term Sources – Instruments – Sources – Commercial Banks, Development Agencies. Indian and International Funding Organizations Capita Market Venture and Startup Capital.

Module IV-Overview of Health care Consultancy
Consulting industry with specific reference to hospital and Health care Consulting Perspective.Professionalism& Ethics in Consulting Consultant – Client Relation ship, Behavioral roles of consultants.

Module V-Consulting Process in Health care
Entry: Initial Contracts – Preliminary Problem Diagnosis – Terms and Reference – Assignment Strategy and Plan – Proposal to the Clint – Consulting Contract.
Diagnosis: Conceptual Frame work of Diagnosis – Diagnosing Purpose and Problem - Defining Necessary Facts – Sources and Ways of Obtaining Facts – Data Analysis – Feedback.
Action Planning: Possible Solutions – Evaluating Alternatives – Presentation of Action. Implementation & Termination: Consulting in Various Areas of Health care Management.

Examination Scheme:

Components	CP	V	A	ME	EE
Weightage (%)	5	5	5	15	70

Texts &References:

- J.B.Patel and D.G.Allampally ,Manual on how to Prepare a Project Report, Entrepreneurship development Institute Ahmadabad.
- .J.B.Patel and S.S.Modi ,Manual on Business Opportunity dentification& Selection, Entrepreneurship
- Development Institute Ahmadabad.
- Edward Bono ,Lateral Thinking, Penguin Books, London 1990
- Holt HG David ,Entrepreneurship, Prentice Hall India Publisher, New Delhi 2001.
- S.S.Khanka, Entrepreneurial Development S. Chand & Co New Delhi 2007.

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DISASTER MANAGEMENT

Course Code:HHM4408 **CreditUnits: 02**

Course Objective

To learn, identify and assess disasters in the community. To set-forth policies and procedures for disaster preparedness and to prepare disaster plan.

Course Contents

Module I: Basics of Disaster Management

Basics of disaster management and Mass casualties, Classification of disaster on the basis of origin, source, onset response; Disaster Phases, Disaster Process, Effects of Disasters, Disasters and Health Problems, Triaging, Impact of Disasters on the Hospitals, Disaster Response – local, national & International, Disaster Management Act – 2005.

Module II: Disaster preparedness

Policies & procedures for general safety, fire safety procedure for evacuation, Components of Disaster Plan – Pre-hospital & Hospital, Hospital disaster plan formulation & implementation, crisis management.

Examination Scheme:

Components	CP	V	A	CT 1	CT 2
Weightage (%)	20	15	5	30	30

Text&References:

- *A guide to emergency health management after natural disasters*, American health organization scientific publication.
- *Emergency vector control after Natural disaster*, American health organization scientific publication.
- *District Health facilities*, WHO regional publication western pacific services.
- *Medical supply management after natural disaster*, American health organization scientific publication.

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DISSERTATION

Course Code: HHM4437 **Credit Units: 06**

The Aim of the Dissertation

The aim of the dissertation is to provide the students with an opportunity to further their intellectual and personal development in their chosen field by undertaking a significant practical unit of activity, having an educational value at a level commensurate with the award of their degree.

The dissertation can be defined as a scholarly inquiry into problem(s) or issues(s), involving a systematic approach to gathering and analysis of information / data and leading to production of a structured report.

The Dissertation Topic

It is usual to give the student some discretion in the choice of topic for the dissertation and the approach to be adopted. Kindly ensure that the dissertation is related to the field of specialization.

Deciding this is often the most difficult part of the dissertation process, and requires thorough preparation and background research.

It is important to distinguish here between 'dissertation topic' and 'dissertation title'. The topic is the specific area that the student wishes to investigate. The title may not be decided until the dissertation has been written so as to reflect its content properly.

Few restrictions are placed on the choice of the topic. Normally, it is expected that the topic is:

- Relevant to business, defined broadly;
- Related to one or more of the subjects or areas of study within the core program and specialization stream;
- Clearly focused so as to facilitate an in-depth approach, subject to the availability of adequate sources of information and to the student's knowledge;
- Of value and interest to the student's personal and professional development.

Planning the dissertation

This entails the following:

- Selecting a topic for investigation.
- Establishing the precise focus of the study by deciding on the aims and objectives of the dissertation, or formulating questions to be investigated. Consider very carefully what is worth investigating and its feasibility.
- Drawing up initial dissertation outlines considering the aims and objectives of the dissertation. Workout various stages of dissertation
- Devising a timetable to ensure that all stages of dissertation are completed in time. The timetable should include writing of the dissertation and regular meetings with your dissertation guide.

The dissertation plan/ outline or Synopsis

It is recommended that the students should have a synopsis/dissertation plan to guide them right from the outset. Essentially, the synopsis/dissertation plan is an outline of what the student intends to do, chapter wise and therefore should reflect the aims and objectives of the dissertation in detail along with detailed bibliography and critical review of literature.

There are several reasons for having a dissertation plan

- It provides the correct area of focus
- It provides the faculty-guide with an opportunity, at an early stage, to make constructive comments and help guide the direction of the research.
- The writing of a plan is the first formal stage of the writing process, and therefore helps build up confidence.
- In many ways, the plan encourages the student to come to terms with the reading, thinking and writing in a systematic and integrated way, with plenty of time left for changes.
- Finally, the dissertation plan generally provides a revision point in the development of the dissertation report in order to allow appropriate changes in the scope and even direction of work as it progresses.

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Keeping records

This includes the following:

- Making a note of everything read; including those discarded.
- Ensuring that when recording sources, author's name and initials, date of publication, title, place of publication and publisher are included. (Students may consider starting a card index or database from the outset).
- Making an accurate note of all quotations at the time they are read.
- Make clear what is a direct a direct quotation and what is a paraphrase.

Dissertation format

All students must follow the following rules in submitting their dissertation.

- Front page should provide title, author, Name of degree/diploma and the date of submission.
- Second page should be the table of contents giving page references for each chapter and section.
- The next page should be the table of appendices, graphs and tables giving titles and page references.
- Next to follow should be a synopsis or abstract of the dissertation (approximately 500 words) titled: **Executive Summary.**
- Next is the 'acknowledgements'.
- Chapter I should be a general introduction, giving the background to the dissertation, the objectives of the dissertation, the rationale for the dissertation, the plan, methodological issues and problems. The limitations of the dissertation should also be hinted in this chapter.
- Other chapters will constitute the body of the dissertation. The number of chapters and their sequence will usually vary depending on, among others, on a critical review of the previous relevant work relating to the major findings, a discussion of their implications, and conclusions, possibly with a suggestion of the direction of future research on the area.
- After this concluding chapter, give a list of all the references used. These should be cross - references with the text. For articles from journals, the following details are required e.g.
  Draper P and Pandyal K. 1991, The Investment Trust Discount Revisited, Journal of Business Finance and Accounting, Vol18, No6, Nov, pp 791-832.
  For books, the following details are required:
  Levi, M. 1996, International Financial Management, Prentice Hall, New York, 3rd Ed, 1996
- Finally, include appendices. These should only include relevant statistical data or material that cannot be fitted into the above categories.

Guidelines for the assessment of the dissertation

While evaluating the dissertation, faculty guide will consider the following aspects:

1. Has the student made a clear statement of the objective or objective(s)
2. If there is more than one objective, do these constitute parts of a whole?
3. Are the objectives and methodology of practical relevance to the business world/economy?
4. Has the student done sufficient background reading and reviewed the available literature critically?
5. Has the student developed an appropriate analytical framework for addressing the problem at hand?
6. Is this based on up-to-date developments in the topic area?
7. Has the student collected information / data suitable to the frameworks?
8. Are the techniques employed by the student to analyse the data / information appropriate and relevant?
9. Has the student succeeded in drawing conclusion form the analysis?
10. Do the conclusions relate well to the objectives of the project?
11. Has the student been regular in his work?
12. Layout of the written report.
13. Confidence and knowledge of the student while answering questions and giving the presentation.

Examination Scheme:

Contents & Layout of the Report	30	
Conceptual Framework	10	
Objectives & Methodology	15	
Implications & Conclusions		15
Viva/ Presentations		30
TOTAL		**100**

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Amity Business School

MBA-Executive (Working Professionals)

FLEXILEARN
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Curriculum & Scheme of Examination

2023

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Master of Business Administration (Executive Working Professional)

Programme Mission:

The mission of the MBA programme is to foster an environment of academic excellence in Business Management through research and innovation, industry integration, internationalization and extension activities and develop highly trained and employable professionals with specialization in the area of Marketing & Sales, Finance, Banking & Finance, Human Resource Management, International Business, Information Technology, E-Commerce and Hospital & Healthcare, who are socially responsible and globally minded professional to meet the current and emerging needs of business and society.

Programme Description:

The two year full time Masters in Business Administration programme is to educate and prepare students with the knowledge, analytical ability, and management perspectives and skills needed to lead, to motivate and to manage diversified workforce, rapid technological change and competitive marketplace while considering the principles of ethical, legal and corporate governance fundamentals.

Programme Outcome (PO):

PO1	Apply the knowledge of marketing, human resource management, finance and other functional areas of management to solve complex management issues in volatile business environment
PO2	Student shall have ability to acquire & evaluate new knowledge through Business Research Methods, have the ability to identify, define, investigate, and solve critical business issues using management principles, analyse data/information and interpret results for reaching optimum solutions.
PO3	Student shall be able to understand global issues from different perspectives, recognize the opportunities to improve the business value chain as an entrepreneur and shall develop and display basic business acumen & business skills and be able to apply different forms of communication in diversified cultural settings.
PO4	Student shall able to critically think to assess societal, health, safety, legal, and cultural issues and apply range of strategies for solving a problem and decision making
PO5	Student shall be able to practice ethical principles and commit to professional ethics and responsibilities and norms of the management practice.
PO6	Student shall develop range of Leadership skills and shall demonstrate excellent interpersonal skills, understanding of group dynamics and effective teamwork, including awareness about personal strengths and limitations.

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PO7	Student shall be able to communicate effectively on complex management activities with various stakeholders being able to comprehend and write effective reports, design documentation, make effective presentations, and give & receive clear instructions.
PO8	Student shall recognize the need for, and have the ability to engage in independent and life-long learning in the broadest context of technological change.
PO9	Student shall be able to create, select, and apply appropriate techniques, resources, and modern management and IT tools including prediction and modeling to make decisions.

PSO 1			**PSO 2**					**PSO 3**
Student shall be able to describe fundamental knowledge of general and functional management courses & relevant technological tools to identify opportunities relating their existing industry knowledge base			Student shall able to apply technical and management knowledge in the domain of finance, marketing, human resources and information technologies to solve complex business and management problems in global business environment					Student shall be able to apply specific and cross functional knowledge to solve critical
Fundamental Business Management	**Functional Management domain**	**Research, Analysis and Technical Management Domain**	**M&S/IT&EC/Finance/HR/BA**					**NTCC**
Economics for Managers	Marketing Management	Business Statistics	Sales and Distribution Management	Database Management System for Business	Mergers, Acquisitions & Re-Structuring	Compensation and Reward Management	Programming for Analytics using R	Research Project
Information Technology for Managers	Accounting for Managers	Operations & Supply Chain Management	Marketing of Services	E-Commerce Fundamentals	Management of Banks and Financial Institutions	Learning and Development	Programming for Analytics using Python	Dissertation

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Strategic Management	Strategic Human Resource Management	Research Methods & Report Preparations	Consumer Behaviour	System Analysis & Design	Security Analysis and Portfolio Management	Organizational Development & Change	Visual Analytics-Tableau/ Power BI	
			Advertising Management and Sales Promotion	Dynamic Web Design & Development	Corporate Valuation	Performance Management System	Econometrics	
			Retail Management	Data Warehousing & Data Mining	Fintech	International Human Resource Management	Predictive Analytics-I Machine Learning using R	
			Digital Marketing	ERP for Businesses	Strategic Financial Management	Leadership Development	Predictive Analytics-II Machine Learning using Python	
			Strategic Brand Management	Digital Marketing	International Finance	Strategic Human Resource Management	Big Data Analytics-Hadoop	
			Customer Relationship Management	E-Supply Chain Management	Private Equity and Entrepreneurial Finance	Talent Management and Succession Planning	Data Mining	

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MWP4106	BUSINESS STATISTICS	L	T	P	C
Version	Latest Approved	2	0	1	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course not only exposes the students to the theory of probability and sampling distribution but also includes the various types of statistical tools which are to be used in the present rapidly changing business environment. Its main focus is on the application of data analytic tools to enable the students to make correct decision making under the complex and dynamic business scenario. The content of the course will also include the different forecasting techniques with main focus on the quantitative technique that would be immensely beneficial for the students to make the predictions correctly. Numerous empirical examples and real business cases are used to illustrate applications of the material covered

Course Objectives

The aim of this course is to:

1. Develop the understanding of the various statistical models used for decisions making
2. To appreciate the problems of obtaining or gathering the desired information or data.
3. To understand the types of classification of data, representation of data in the form of diagrams, graphs or tables.
4. To appreciate the basics of central value, dispersion, skewness etc and their applications in real business problems.
5. To examine the problems related to theory of probability, various types of probability distribution and particularly Baye's theorem and their application in real-life problems.
6. To describe the process of hypothesis testing for large and small samples and its uses in business problems
7. To equip with the knowledge of correlation, regression and time series; enabling them to make the correct future predictions

Course Outcomes

On completion of this course, the students will be able to:

CO1. Define and apply basic statistical concepts to various field of management

CO2: Apply statistical methods such as statistical collection, species characteristics, statistical series, tabular and graphical representation of data, measures of central tendency, and dispersion for managerial decision making.

CO3. Apply various forecasting techniques.

CO4. Describe different types of probability distributions

CO5. Explain and analyze a given business problem and applying required statistical hypothesis and sampling tool accordingly

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CO6. Define the decision theories for practical business problems.

Modules	Blooms level*	Number of hours
Module I: Introduction Application of Statistics in Business & Management; Basic Concepts of Statistical Studies: Variable and Classification of Data; Diagrammatic & Graphical Presentation of Data, Measures of Central Tendency, Measures of Dispersion	L1, L2	9
Module II: Forecasting Techniques Simple Correlation & Regression Analysis, Time Series Analysis-Introduction, Variation in Time Series, Trend Analysis, Cyclical Analysis, Seasonal Analysis, Irregular Variation	L1, L2, L3	9
Module III: Probability & Probability Distributions Probability: Basic Terminology in Probability, Types of Probability, Probability rules, Probabilities under condition of Statistical Independence, Probabilities under condition of Statistical dependence, Baye's Theorem Probability Distributions: Binomial Distribution, Poisson Distribution, The Normal Distribution	L2,L3	9
Module IV: Sampling, Estimation and Testing of Hypotheses Sampling & Sampling Distribution: Parameter and Statistic, Point and Interval Estimation, Interval Estimation of three common parameters viz. Mean Standard Deviation and Proportion. Hypothesis Testing for a Single Population: Concept of Hypothesis, Test involving a population mean, Test involving a population proportion, Test involving population Standard Deviation, Test for two population means (Independent Samples), Tests for two population means (Dependent Samples), Tests for two population proportions (Independent Samples),Tests for two population variances (Dependent Samples), F-test, Non-parametric Tests (Chi – Square Test)	L1, L2	9

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Levin R.I. & Rubin S.R. 2012, Statistics for Management, 7th Ed. Prentice Hall Of India
2. Gupta S P, Statistical Methods, S. Chand & Co. New Delhi, 35th edition

Reference Books

1. Anderson David R, Sweeny Dennis J, Williams Thomas A, Statistics for Business and Economics 12th ed,Cengage learning, 2018.
2. Keller Gerald, Statistics for Management, Cengage Learning, 2014
3. Rubin & Levin, Statistics for Management, Eighth edition, Pearson, Prentice Hall of India, 2017.

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4. Vohra N.D., Quantitative Techniques in Management, Tata McGraw Hill, 2017

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**C**	**A**	**CT**	**EE**
Weightage (%)	10	5	5	70

CT: Class Test, A: Attendance, EE: End Semester Examination; A: Attendance, C: Case Analysis

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**
CO1	1	1	--	--	--	--	--	--	--	1	--	--
CO2	1	1	--	--	--	--	--	--	--	1	--	--
CO3	1	1	--	--	--	--	--	--	--	1	--	--
CO4	1	1	--	--	--	--	--	--	2	1	--	--
CO5	1	1	--	--	--	--	--	--	2	1	--	--
CO6	1	1	--	--	--	--	--	--	2	1	--	--

1: strongly related, 2: moderately related and 3: weakly related

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MWP4109	INFORMATION TECHNOLOGY FOR MANAGERS	L	T	P	C
Version 1.1	Latest Approved	2	0	1	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

In this course the students will learn the concepts of computer evolution, database management systems, networking fundamentals and management information system.The aim of this course is to make the students familiar with the basic concepts of Information Technology that assists managers in executing their tasks with efficiency.

Course Objectives

This course will expose students to

1. Developments in computer technology and understand the advancements in Information Technology.
2. Introduce end-user computing and build skills in using IT and understanding various technologies like internet, telecom, DBMS concepts and information systems.
3. The latest trends in information system development and its relevance in present scenario for modern businesses.

Course Outcomes

On completion of this course, the students will be able to

CO1: State the strategic use of Information Technology in Business and differentiate between functional and cross functional information systems.

CO2: Describe the concepts related to databases and networking.

CO3: Apply the knowledge of Information Technology in managing the broad array of responsibilities in the business organization.

CO4: Analyze how are information systems transforming business and what is their relationship to globalization.

CO5: Review and assess the available tools and technologies pertaining to organization's information system.

Modules	Blooms level*	Number of hours

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Module I: Information Technology Infrastructure Defining IT Infrastructure, Evolution of Computer Systems, Input, output and storage technologies, Contemporary hardware and software platforms(Open Source, Web Software etc.), Introduction to Cloud Computing Storage of Data Resources.	L1, L2	4
Module II: Databases and Information Management Organizing Data in traditional file environment , Introduction to Databases and Database Management System, Types of DBMS, Capabilities of Databases, Designing databases through Entity Relationship Diagrams, Concept of Data Warehouses and Data Marts, Tools for Business Intelligence: Multidimensional data analysis and Data Mining.	L2, L3	4
Module III: Telecommunications and Networking in Business Networking and Communication Trends, Computer Networks Types of networks, Advantages of Network Environment, Network in large companies, Network Topologies, Various network components, Physical Transmission Media, Business Uses of Internet, Intranet and Extranet, Internet Addressing and Architecture, Internet Services	L1, L2	4
Module IV: Information System Essentials: Role of information systems in business, Introduction to MIS and its relevance for business firms, Components of MIS, Types of information systems, Digital firms and business processes, Strategic Business Objectives of information systems, Dimensions of Information Systems, Collaboration and teamwork, Tools and technologies for collaboration and teamwork, Information System function in Business- Roles and Responsibilities of IT Department Personnel	L1, L2	4

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. Kenneth C. Lauden and Jane P. Lauden (2017), Management Information Systems: Managing the Digital Firm, Pearson Education, 15th Edition, ISBN 978-0134639710.

Reference Books

1. Morley D & Parker CS (2009), Understanding Computers – Today and Tomorrow, Thompson Press.
2. Norton P (2010), Introduction to Computers, Tata McGraw-Hill
3. Potter T (2010), Introduction to Computers, John Wiley & Sons (Asia) Pvt Ltd

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1									1			
CO2	1	2								2			
CO3	2	1	1							2			
CO4									2	1			
CO5		1							2	1			

1: strongly related, 2: moderately related and 3: weakly related

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MWP4204	Research Methodology & Report Preparation	L	T	P	C
Course Version	Latest Approved	2	0	1	3
Pre-requisites/Exposure					
Co-requisites					

Catalogue Description:
The main objective of the course is to equip the students with the basic understanding of research methodology in changing business scenario. It will also provide them an insight into the application of dynamic analytical tools to face the stormy challenges aimed at fulfilling the purpose of business decision making.

Course Objectives :
The objectives of this course are to ensure that students are able to-

1:Understand the basic framework of research process.
2:Comprehend of various research designs and techniques.
3:Identify various sources of information for literature review and data collection.
4:Understand some basic concepts of research and its methodologies.
5: Understand as how to organize and conduct research in a more appropriate manner andwrite a research report, thesis and a research proposal.

Course Outcomes :
On completion of this course, the students will be able to:
CO1: Apply a range of quantitative and / or qualitative research techniques to business and management problems / issues
CO2: Determine and apply research approaches, techniques and strategies in the appropriate manner for managerial decision making
CO3: Demonstrate knowledge and understanding of data analysis and interpretation in relation to the research process
CO4: Synthesize and Evaluate different research approaches utilised in the different industries and be able to critically assess the overall process of designing a research study from its inception to its final report preparation.

Modules	Blooms level*	Number of hours

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Module I: Introduction Meaning of research, importance of scientific research in business decision making, types of research, complete research process, research methodology, criterion for good research, Identification of research problem and formulation of hypothesis, research designs, drafting a research proposal	L1, L2	9
Module II: Measurement and Data Collection Primary data, secondary data, design of questionnaire, sampling fundamentals and sample designs, Qualitative and quantitative research, measurement and scaling techniques, measures of central tendency mean, median, mode; measures of dispersion, data processing	L1, L2,L3,L4, L6	9
Module III: Data Analysis I Cross tabulation, univariate analysis, bivariate analysis: Correlation, Karl Pearson's coefficient of correlation, Spearman's coefficient of correlation, hypothesis testing, t-test, Z test, F-test, Chi- square test, Analysis of variance, Non-parametric tests: Sign test, Run test, Krushall-Wallis test	L1, L2,L3,L4,L5,L6	9
Module IV: Report Writing Pre-Writing Considerations, structure of research report, common problems encountered while preparing the research report, presentation of research report, ethical issues while preparing a research report	L1,L2,L3,L4,L5,L6	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Book:

Cooper, R.D., Schindler, S. P. and Sharma, J.K. (2015). Business Research Methods. New Delhi, India: McGraw Hill Education (India) Private Limited

Reference Book/s:

1 .Zikmund, William C (1997). *Business Research Methods (5th Ed.)*. The Dryden Press, Harcourt Brace College Publishers

2 Levin & Rubin (2004), Statistics for Management, 8th Ed, Prentice Hall of India

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CT**	**HA**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	5	5	5	5	10	70

CT: Class Test, HA: Home Assignment, Q/S: Seminar/Viva/Quiz, ME: Mid Term Exam EE: End Semester Examination; A: Attendance

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	1	--	-	--	--	--	-	--	1	3	-	-
CO2	1	1	-	--	--	-	--	-	-	1	2	-	-
CO3	1	2	--	-	--	--	-	--	--	1	3	-	-
CO4	1	1	--	--	3	-	2	--	--	1	3	2	2

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MWP4205	FUNDAMENTALS OF DATA ANALYTICS	L	T	P	C
Version 1.1	Latest Approved	2	0	1	3
Pre-requisites/Exposure					
Co-requisites					

Course Description

The course is designed at par with current industry needs for data analysis. It includes many cutting-edge learning modules which will provide a rich experience and exposure to different modern data analytical tools and techniques to the students.

Course Objectives:

1. To provide detail knowledge of data analytics and data science
2. To provide basic understanding of MS excel as a tool of data analysis
3. To help the students to know about different types of data, sources of data and data generation techniques
4. To provide the basic understanding of salesforce platform

Course Outcomes

On completion of this course, the students will be able to,

CO1: To develop a comprehensive understanding about data analytics and data science. It will help the students to identify the business problems where data analytics can used.
CO2: To develop basic understanding of MS Excel that can further be used to apply basic data analytic tools.
CO3: To develop an integrated knowledge about different types of data, data sources and data generation techniques which will help the students in decision making.
CO4: To develop the knowledge about wave analysis using salesforce platform. It will help the students to create various dashboards to understand the real business situation and suggesting possible solutions.

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Modules	Blooms level*	Number of hours
Module I: Introductionto Data Analytics • Introduction to Data Analytics • Data Analytics vs Data Science • Data Analytics in business needs • Data Analysis Types, Process, Techniques and Tools • Role of Data Analyst in Analytics • ELT Process • DWH, Benefit of DWH, Use, Type of DWH	L1, L2,L5, L6.	8
Module II: Data Analytics using MS-Excel • Data Analysis with Excel, Advantages, Business need and usage • Data Import – Text, CSV, JSON, XML, SQL Query • Data Table, Pivot Table • Excel Formula, usage, advantages, formula use in Data Analysis. • What-If-Analysis, scenario Manager, Goal Seek, Solver. • Data Visualization with Charts – Histogram, Run Chart, Line, Scatter, Bar • Functions – Financial, Logical, Text and Mathematical	L1, L2,L3, L5, L6.	8
Module III: Introduction to Data Science • Data Mining Process Techniques and Tools • Exploratively Data Analysis • Machine learning, Advantage Algorithms, Types • Machine learning VS Statistical Learning • Supervised ML VS Unsupervised ML vs Reinforcement ML	L1, L2,L5, L6.	8
Module IV: Industry Wave Analytics using Salesforce CRM • SFDC Data Analysis, Advantages, Industry Needs and Usage • Reports, Reports Types – Tabular, Summary, Matrix, Joined • Charts – Line, Bar, Pie, Funnel, Scatter, Donut • Dashboard: Executive Dashboard, Sales & Service Dashboards • Reports & Dashboards Access and Security with Users, Groups and Roles	L1, L2,L3, L5, L5, L6.	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Reference Books

1. Introduction to Data Mining by *Pang-Ning Tan & Vipin Kumar*





2. Business Analytics: The Science of Data - Driven Decision Making by *U Dinesh Kumar*
3. Microsoft Excel Data Analysis and Business Modeling by *Wayne L. Winston*
4. Advance/Data Analysis with Excel by *Manisha Nigam*
5. Data Science for Business by *Foster Provost*
6. Data Science for Business Professionals by *Probyto Data Science and Consulting Pvt. Ltd.*
7. Salesforce Lightning Reporting and Dashboards by *Yu Johan*
8. Pro Salesforce Analytics Cloud: A Guide to Wave Platform, Builder, and Explorer by *William Smith & Helen Sun*

Modes of Evaluation: Quiz/Assignment/ Practical lab/ Seminar/Written Examination

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	1	1	2	2	1
CO2	1	1	1	-	2	1
CO3	2	1	1	-	1	1
CO4	2	1	1	2	3	1

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MWP4231	TERM PAPER	L	T	P	C
Version 1.1	Latest Approved	2	0	0	2
Pre-requisites/Exposure					
Co-requisites					

Course Description

A term paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. At least one middle level or senior level person of a company from the chosen sector may be interviewed face to face

Course Objectives

The objective of this course is to judge the understanding as well as application of the knowledge gained by the students. The aim of the term paper is to provide the students with an opportunity to further enhance their knowledge in a sector of their choice by undertaking a significant practical unit of examining and analyzing various aspects of business management at a level commensurate with the learning outcomes of the various courses taken up them in the ongoing semester.

Guidelines:

1. The term paper will be related to the contemporary business issue and the topic will be given by the department.

2. The presentation of the term paper is scheduled to be held before the commencement of Semester examinations.

3. The paper will carry 100 marks that will be marked on the basis of understanding and organization of content based on the literature review. The Bibliography shall form an important part of the paper.

4. Examples of a few broad areas for Term Paper (List is indicative, not exhaustive)

- Inflation
- Unemployment
- Fiscal Deficit
- Poverty
- Education
- Malnutrition
- Rural Development
- Regional Imbalance
- Globalization
- Foreign Direct Investment
- Current trends in consumer behavior
- Innovative management
- Company rituals and corporate culture

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- Negotiation and diplomacy
- Effective advertising
- International trade trends in the USA
- Geo-arbitrage and business success
- Advantages of increasing brand awareness
- Social media as a new market
- Healthy work environment and employee diversity

Evaluation Scheme

Organisation and relevance of content	**Literature Review**	**Bibliography**	**Presentation**	**Total**
30	30	20	20	100

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MWP4311	INNOVATION AND ENTREPRENEURSHIP	L	T	P	C
Course Version	Latest Approved	2	1	0	3
Pre-requisites/Exposure	NA				
Co-requisites	NA				

Catalog Description:
The objective of the course is to provide students an understanding of entrepreneurship & the process of creating and grooming a new venture. students will be introduced to the basic terminology, typology of innovations and historical context for better comprehension. Also issues of innovation management will be introduced. Students will become familiar with the impact of innovation on competitiveness as well as individual companies with innovative processes and aspects that affect it, including applicable methods and innovation management techniques.The course also focuses on giving the students the concept of an entrepreneur who is willing to accept all the risks & put forth the effort necessary to create a new venture. The challenge rolls out in a learning environment corresponding to current and future workplace requirements - cross-functional and virtual teams with crowd-sourced work tasks, multicultural work force and extremely demanding organisation, planning and communication skills.

Course Objectives:
The objectives of this course are to ensure that-
1: The student is able to understand the concepts and theories related to entrepreneurship.
2: The student has gained up to date understanding of the field in regard to the process of assessing the commercial potential of new markets.
3: The student has acquired a cutting edge understanding when it comes to identifying opportunities and challenges affiliated with the organization and financing of new initiatives such as new business ventures.
4: The candidate is also aware of challenges affiliated with the rapid growth of new business ventures.

Course Outcomes (CO):
On completion of this course, the students will be able to-
CO1: Apply the various principles of entrepreneurship.
CO2: Apply the theories of viability of businesses, new business proposals, and opportunities within existing businesses;
CO3: Apply the principles of entrepreneurial management and develop strategic plans and prepare a startup business plan emphasizing financing, marketing, and organizing;
CO4: Able to define, identify and evaluate the concept related not only to creating but also to defend an entrepreneurial marketing plan along with developing pro forma financial statements.

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Modules	Blooms level*	Number of hours
Module I: **Entrepreneurship:** What Is Entrepreneurship? Why Become an Entrepreneur? Characteristics of Successful Entrepreneurs ,Common Myths About Entrepreneurs, Types of Start-Up Firms ,Changing Demographics Of Entrepreneurs.	L1, L2	9
Module II: Innovation: the basic definition and classification. The relationship of innovation and entrepreneurship, creation of competitive advantage based on innovation.Innovative models. Product, process, organizational and marketing innovation and their role in business development. Sources of innovation, transfer of technology. Barriers to innovation in business, innovation failure.	L1, L2,L3,L4, L6	9
Module III: Developing Successful Business Ideas **Identifying And Recognizing Opportunities:** Observing Trends, Solving a Problem, Finding Gaps In The Marketplace**,**Personal Characteristics of the Entrepreneur.Techniques for Generating Ideas, Team Formation, Product/ Market Fit, Customer Validation, Prototyping, Feasibility Analysis. **The Business Plan:** Reasons for Writing a Business Plan , Who Reads the Business Plan—And What Are They Looking For? Outline Of the Business Plan.	L1, L2,L3,L4	9
Module IV:Moving from an Idea to a reality Obtaining Business Licenses and Permits: Introduction to various form of business organization (sole proprietorship, partnership, corporations, Limited Liability company), mission, vision and strategy formulation. Intellectual Property. **Getting Financing or Funding:** The Importance, Sources of Personal Financing, Preparing to Raise Debt or Equity Financing, Venture Capital, Initial Public Offering, Commercial Banks, Other Sources of Debt Financing. **Managing and Growing the new venture:** Segmenting the Market, Selecting a Target Market, Establishing a Unique Positioning, Branding, 4Ps/7Ps Of Marketing For New Ventures	L1,L2,L3	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books:

1**.** Robert D. Hisrich, Michael P. Peters, Dean A Shepherd, *Entrepreneurship*, 6th edition, Tata McGraw-Hill Publishing company Ltd. New Delhi

Reference Book/s:

1. Barringer, Bruce R. &Ireland, R. D. (2012).*Entrepreneurship: Successfully Launching New Venture,4th edition.* New Jersey.USA: Pearson Education

2.M.J.Dollinger (2003), *Entrepreneurship: Strategies and Resources*, 3rd edition, Delhi: Pearson Education

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3.Clifton, Davis S and Fyffe, David E, “Project Feasibility Analysis”, 1977 John Wiley, New York.
S. Carter and D. Jones-Evans, Enterprise and small business- Principal Practice and Policy, Pearson Education (2006)
T. H. Byers, R. C. Dorf, A. Nelson, Technology Ventures: From Idea to Enterprise, McGraw Hill (2013)
Prasad, Rohit (2013), Start-up sutra: what the angels won’t tell you about business and life, Hachette India

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	CT	HA	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

CT: Class Test, HA: Home Assignment, Q/S: Seminar/Viva/Quiz, ME: Mid Term Exam EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	3	--	2	--	--	--	1	--	1	1	1	--
CO2	1	1	2	--	--	--	--		--	1	2	1	--
CO3	1	3	--	2	--	--	--	--	--	2	1	1	1
CO4	1	2	--	--	--	--	--	--	--	1	1	1	--

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MWP4337	PROJECT-I	L	T	P	C
Course Version	Latest Approved	-	-	-	8
Pre-requisites/Exposure	NA				
Co-requisites	NA				

Catalog Description

Under this, it is usual to give the student some discretion in the choice of topic for the Research Project and the approach to be adopted. The Research Project topic is related to the field of specialization. Deciding this is often the most difficult part of the Research Project process, and requires thorough preparation and background research.

The aim of the Research Project is to provide the students with an opportunity to further their intellectual and personal development in their chosen field by undertaking a significant practical unit of activity, having an educational value at a level commensurate with the award of their degree.

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Course Objectives

The objective of this course is to

1. Understand and apply theoretical frameworks to the chosen area of study.
2. Produce a coherent and logically argued piece of writing that demonstrates competence in research and the ability to operate independently.

Course Outcomes

On completion of Research Project, the students will be able to

CO1: Describe a relevant area of career development, career coaching, coaching or work-related learning studies.

CO2: Identify research methods and state research questions.

CO3: Critically analyze and evaluate the knowledge and understanding in relation to the agreed area of study.

CO4: Integrate theory and practice for the development of responses on the basis of the evaluation and analysis undertaken.

CO5: Communicate in written form by integrating, analyzing and applying key texts and practices.

CO6: Demonstrate advanced critical research skills in relation to career development or work-related learning studies.

Planning the Research Project	Blooms level*	Number of hours

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• Selecting a topic for investigation. • Establishing the precise focus of the study by deciding on the aims and objectives of the Research Project, or formulating questions to be investigated. Consider very carefully what is worth investigating and its feasibility. • Drawing up initial Research Project outlines considering the aims and objectives of the Research Project. Workout various stages of Research Project • Devising a timetable to ensure that all stages of Research Project are completed in time. The timetable should include writing of the Research Project and regular meetings with your Research Project guide	L1, L2 ,L3,L4,L5,L6	6hours a Week

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis; L6-Evaluation*

Modes of Evaluation: Viva/ Report Examination

Examination Scheme:

Components	Content & Layout of Report	Conceptual Framework	Objectives & Methodology	Implications & Conclusions	Viva-Voce
Weightage	30	10	15	15	30

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO1	1	--	--	--	--	--	--	1	--	--	--	1
CO2	--	1	--	--	--	--	--	--	--	--	--	1
CO3	--	1	2	--	--	--	--	--	--	--	--	1
CO4	1	--	--	--	--	--	--	--	--	--	--	1
CO5	--	--	--	--	--	--	1	--	--	--	--	1
CO6	--	--	--	--	--	--	--	--	1	--	--	1

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MWP4322	**DATABASE MANAGEMENT SYSTEM FOR BUSINESS**	L	T	P	C
Version 1.1	Latest Approved	2	0	1	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

In this course the students will learn about the importance and usage of database management systems in the modern day organizations. The students shall grasp sound knowledge of various types of databases that exist, creation of data warehouse and application areas of data mining. Also, the students will be learning SQL, the language of databases.

Course Objectives

The course aims to make the students:

1. Understand the basic and advanced concepts in databases and database management systems.
2. Grasp the importance of databases in day to day life.
3. Gain a hands-on experience on the SQL-the language of databases.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define the basic terminology used in databases.

CO2: Describe the concepts related to databases architecture.

CO3: Apply the knowledge of SQL in creating databases using DBMS software for a business organization.

CO4: Compare and contrast various types of keys used in database creation.

CO5: Review and assess the organization's data and network security aspects.

Modules	**Blooms level***	**Number of hours**
Module I: Introduction to DBMS Definition of DBMS, Concept and Goals of DBMS, Data Independence, DBMS Architecture, Levels, Database Administrator, File System Approach Vs DBMS Approach, Advantages of Using a DBMS, Data Models, Schemas, and Instances, Database Languages, Database Users, Database Abstraction.	L1, L2	4

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Module II: Relational Database & ER Model **Relational Database**: Relational System, Codd's Rule, Relational Model, Optimization, Tables and Views, Relational Data Integrity; Primary Key, Candidate Key, Foreign Key and their rules, **ER Model:** Entity Type, Entity Set, Relationship type, Relationship sets, Constraints: Cardinality Ratio and Participation Constraint, Keys, Mapping, Design of ER diagrams.	L2, L3, L4	4
Module III: SQL SQL Language, DDL,DML and DCL commands. Data definition, Data retrieval and update operations on MS ACCESS and SQL Server DBMS.	L2, L3, L4	4
Module IV: Transaction Management and Concurrency Control Transaction management: ACID properties, serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks),Time stamping methods, optimistic methods, database recovery management.	L2, L3, L4	4

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. Elmasari, Navathe (2015), "Database Systems", Pearson, ISBN 978-8131792476
2. Korth, Silbertz, Sudarshan (2013), "Database System Concepts". McGraw Hill. ISBN **978-**9332901384

Reference Books

1. Majumdar & Bhattacharya, "Database Management System", Tata McGraw Hill.
2. Date C J." An Introduction to Database Systems", Addision Wesley.
3. *Database Systems: The Complete Book (2nd edition)* by Hector Garcia-Molina, Jeff Ullman, and Jennifer Widom (ISBN 978-0131873254, Pearson Prentice Hall, 2009)

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

CPA: Case Discussion/Presentation/Analysis, TP: Project, Q/S:Quiz/Seminar
A: Attendance, ME: Mid Term Exam, EE: End Term Examination

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1										1		
CO2	1										1		
CO3	2								1		1		
CO4								1	2		1		
CO5				1				2			1		

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MWP4323	E-COMMERCE FUNDAMENTALS	L	T	P	C
Version 1.1	Latest Approved	3	0	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

In this course the students will learn the fundamental concepts of e-commerce which includes various e-commerce business models, electronic data interchange, electronic payment systems and security issues related to computer systems. The aim of this course is to make the students familiar with the basic concepts of Information Technology and E-commerce.

Course Objectives

This course will expose students to:

1. To develop the techno managers with deep understanding of managerial aspects as to use Information Technology effectively and efficiently.
2. To help the students with a view to emulate, entrepreneurial ventures in e-commerce and m-commerce.
3. To prepare the students to cope with the ever changing IT- Industry and to useInformation technology to gain competitive advantage in business.

Course Outcomes

On completion of this course, the students will be able to

CO1: State the strategic use of Information Technology in Business and differentiate between functional and cross functional information systems.

CO2: Describe the concepts related to databases and networking.

CO3: Apply the knowledge of Information Technology in managing the broad array of responsibilities in the business organization.

CO4: Design the e-commerce website for various e-business organization using e-commerce models.

CO5: Review and assess the organization's data and network security aspects.

Modules	Blooms level*	Number of hours

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Module I: Electronic Commerce Systems Meaning, Definition, Concept, Features, Function of E-Commerce, E-Commerce Practices v/s Traditional Practices, Scope and basic models of E-Commerce, Limitations of E-Commerce, Precaution for secure E-Commerce, proxy services.	L1, L2	6
Module II: E-Commerce Business Models & EDI Concept of EDI, Difference between paper based Business and EDI Based business, Advantages of EDI, Application areas for EDI, Action plan for Implementing EDI, Factors influencing the choice of EDI.Various business models in Ecommerce likeB2C, B2B, C2C.	L1, L2	6
Module III: E-Payment Systems and Security Management Transactions through Internet, Requirements of E-Payment system, Post paid payment system- Credit card solutions, Cyber cash Internet Cheques, Instant Paid payment system- Debit card, Direct Debit, Prepaid payment system- Electronic cash, Digicash, Netcash, Cybercash, Smart Cards. The Information Security, System Vulnerability and Abuse, Security Threats (Malicious Software, Hacking etc.) and counter measure. Definition of Cyber Crime and Types.Antivirus, Firewalls, Anti-Spyware, Security Audit, Discussion on Overview of IT-ACT 2000.	L1, L2	6
Module IV: E-Marketing and E-Finance Traditional Marketing V/S E-Marketing, impact of Ecommerce on markets, marketing issue in E-Marketing, promoting your E-Business, Direct marketing, one to one marketing Areas of E-Financing, E-Banking, traditional v/s E-Banking, operations in E-Banking; E-Trading- Stock marketing, trading v/s E-Trading, importance of E-Trading, advantages of E-trading, operational aspects of E-Trading.		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. Elias M Awad, Electronic Commerce from Vision to fulfilment, Third Edition, Pearson Education
2. Ravi Kalakota& Andrew B. Shinston, Electronic Commerce – A manager's Guide, Pearson Education.

Reference Books

3. Bhaskar Bharat, Electronic Commerce - Technologies & Applications, Tata McGraw Hill.
4. J. Christopher & T.H.K. Clerk, Global E-Commerce, University Press.

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1										1		
CO2									1		1		
CO3	1										1		
CO4									1		1		

1: strongly related, 2: moderately related and 3: weakly related

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MWP4326	**PROGRAMMING FOR ANALYTICS USING R**	L	T	P	C
Version 1.1	Date of Approval: Latest Approved	2	0	1	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course offers the specialization on R (powerful language used widely for data analysis and statistical computing). This course facilitates a good understanding on the process of data manipulation and visualization. The course provides ample working examples on statistical data analysis using R.

Course Objectives

The objective of this course is to:

1. Provide learning on how to program in R, how to use R for effective data analysis, how to install and configure software necessary for a statistical programming environment.
2. Provide applications on statistical computing which includes programming in R, reading data into R, accessing R packages, writing R functions, debugging, profiling R code, and organizing and commenting R code.
3. Facilitate hands on experience to various real world business problems using R.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Analyze different datasets using R

CO2: Explore real time data at various levels using appropriate visualizations

CO3: Apply critical programming language concepts such as data types, iteration, control structures, functions, and boolean operators by writing R programs and through examples

Modules	**Blooms level***	**Number of hours**
MODULE 1: Introducing to R , R Data Structures , Help functions in R , Vectors , Scalars , Declarations , recycling , Common Vector operations , Using all and any, Vectorized operations , NA and NULL values , Filtering , Vectorized if-then else , Vector Equality , Vector Element names.	L1, L2,L3	9

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MODULE 2: Matrices, Arrays And Lists: Creating matrices , Matrix operations , Applying Functions to Matrix Rows and Columns , Adding and deleting rows and columns , Vector/Matrix Distinction , Avoiding Dimension Reduction , Higher Dimensional arrays , lists , Creating lists , General list operations , Accessing list components and values , applying functions to lists , recursive lists.	L1, L2,L3	9
MODULE 3: Data Frames: Creating Data Frames , Matrix-like operations in frames , Merging Data Frames , Applying functions to Data frames , Factors and Tables , factors and levels , Common functions used with factors , Working with tables - Other factors and table related functions - Control statements , Arithmetic and Boolean operators and values , Default values for arguments - Returning Boolean values , functions are objects , Writing Upstairs - Recursion , Math and Simulations in R.	L1, L2,L3	9
MODULE 4: Input/ Output , accessing keyboard and monitor , reading and writing files , accessing the internet , String Manipulation , Graphics , Creating Graphs , Customizing Graphs , Saving graphs to files , Creating three-dimensional plots Interfacing R with Python , Basic Statistics , Regression Basic Idea, Linear Model , Generalized Linear models , Non-linear models , Time Series and Auto-correlation.	L1, L2,L3	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis;L6-Evaluation*

Text and Reference Books

1. Beginning R – The Statistical Programming Language by Mark Gardener, Wiley, 2013
2. Introductory R: A Beginner's Guide to Data Visualisation, Statistical Analysis and Programming in R by Robert Knell, Amazon Digital South Asia Services Inc, 2013.
3. "THE ART OF RPROGRAMMING "A Tour of Statistical Software Design By Norman Matloff, No Starch Press.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**IP**	**EE**	**EP**
Weightage (%)	5	25	50	20

IP: Internal Practical, EE: End Semester Examination; EP: External Practical; A: Attendance

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	3	1	2	1	--	--	3	1	1	2	1	--	--
CO2	1	1	3	1	--	--	3	1	2	2	1	--	--
CO3	1	2	2	1	--	--	3	1	1	2	1	--	--

1: strongly related, 2: moderately related and 3: weakly related

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MWP 4327	**PROGRAMMING FOR ANALYTICS USING PYTHON**	L	T	P	C
Version 1.1	Latest Approved	2	0	1	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is designed in such a way that leads the students from the basics of writing and running Python scripts to more advanced features such as file operations, regular expressions, working with binary data, and using the extensive functionality of Python modules.

Course Objectives

The objective of this course is to:

1. Equip students with the concepts of the fundamental programming concepts including data structures, networked application program interfaces, and databases, using the Python programming language.
2. Provide applications on statistical, machine learning, information visualization, text analysis, and social network analysis techniques through popular python toolkits to gain insights into data analysis process.

Course Outcomes

On completion of this course, the students will be able to

CO1: Create applications for data retrieval and processing

CO2: Conduct an inferential statistical analysis of various business problems

CO3: Explain fundamental Python functionality and features used for data science

CO4: Apply techniques such as lambdas and manipulate csv files

Modules	**Blooms level***	**Number of hours**
MODULE 1: Installing Python; basic syntax, interactive shell, editing, saving, and running a script, Concept of data types; variables, assignments; immutable variables; numerical types; arithmetic operators and expressions; comments in the program; understanding error messages Conditions, boolean logic, logical operators; ranges; Control statements: if-else, loops (for, while); short-circuit (lazy) evaluation.	L1, L2,L3	9

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MODULE 2: Strings and text files; manipulating files and directories, os and sys modules; text files: reading/writing text and numbers from/to a file; creating and reading a formatted file (csv or tab-separated).String manipulations: subscript operator, indexing, slicing a string; strings and number system: converting strings to numbers and vice versa. Binary, octal, hexadecimal numbers.	L1, L2,L3	9
MODULE 3: Lists, tuples, and dictionaries; basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries. Design with functions: arguments and return values; formal vs actual arguments, named arguments, Recursive functions.	L1, L2,L3	9
MODULE 4: Simple Graphics and Image Processing: digital images, image file formats, image processing Simple image manipulations with 'image' module (convert to bw, greyscale, blur, etc).Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data modeling; persistent storage of objects OOP, continued: inheritance, polymorphism, abstract classes; exception handling, try block.Graphical user interfaces; event-driven programming paradigm; tkinter module, creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors layouts, nested frames.	L1, L2,L3	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis;L6-Evaluation*

Text and Reference Books

1. Core Python Programming by Wesley Chun,Prentice Hall
2. Fundamentals of Python: First Programs By Kenneth Lambert,Course Technology, Cengage Learning
3. Learning Python by David Ascher and Mark Lutz,Oreilly

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**IP**	**EE**	**EP**
Weightage (%)	5	25	50	20

IP: Internal Practical, EE: End Semester Examination; EP: External Practical; A: Attendance

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	3	1	2	1	--	--	3	1	1	2	1	--	--
CO2	1	1	3	2	--	--	3	1	2	2	1	--	--
CO3	1	2	2	1	--	--	3	1	1	2	1	--	--
CO4	2	1	3	2	--	--	3	1	2	2	1	--	--

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MWP4328	**VISUAL ANALYTICS- TABLEAU /POWER BI**	L	T	P	C
Version 1.1	Latest Approved	2	0	1	3
Pre-requisites/ Exposure					
Co-requisites					

Catalog Description

This course familiarizes the students on data visualization tools. This course is designed to provide a fundamental and strategic understanding on the concepts of Business Intelligence using Tableau.

Course Objectives

The objective of this course is to:

1. Equip students with the concepts of BIs and its types and how to connect to and import data, author reports using Power BI Desktop, and publish those reports to the Power BI service
2. Emphasize on how to create dashboards and share with business users—on the web and on mobile devices

Course Outcomes

On completion of this course, the students will be able to:

CO1: Connect, import, shape, and transform data for business intelligence (BI)
CO2: Visualize data, author reports, and schedule automated refresh of your reports
CO3: Create and share dashboards based on reports in Power BI desktop and Excel
CO4: Use natural language queries and create real-time dashboards

Modules	Blooms level*	Number of hours
MODULE 1: **Tableau:** Data visualization and its significance, Connecting Tableau to a Data File - CSV File, Navigating Tableau, creating calculated fields, adding colors, adding labels and formatting, exporting worksheet. **Power BI**: What is Power BI? Installing Power BI Desktop & Project Setup, Connecting Power BI Desktop to Source Files, Working in the Query Editor, Understanding the Data Model & Creating Visuals.	L1, L2,L3	8

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MODULE 2: **Tableau:** working with data extracts, working with time series data, understanding aggregation, granularity and level of detail, creating an area chart and learning about highlighting, adding a filter and quick filter. **Power BI:** Understanding the Power BI Desktop Workflow, Exploring the Interface of the Data Model, Understanding the Query Editor Interface, Keeping & Removing Rows, Working with Filters, Removing Empty Rows, Working with Columns, Replacing Values, Formatting Data & Handling Formatting Errors.	L1, L2,L3	8
MODULE 3: **Tableau:** Relationships v/s joins, Joining data, blending data, data joining v/s data blending, dual axis chart. **Power BI:** Pivoting & Unpivoting Data, Splitting Columns, Creating Groups & Cleaning Up Project, The Star Schema, Query Duplicates vs References, Creating the DIM-Region Table & Removing Duplicates, Merging Queries, Understanding "Extract", Working with Conditional Columns, Understanding Basic Mathematical Operations, Performance Optimization	L1, L2,L3,L4	10
MODULE 4: **Tableau:** Creating a map, scatter plot, working with hierarchies, applying filters to multiple worksheets, create interactive dashboard, storytelling. **Power BI:** Understanding Relationships, Cross Filter Direction & Many-to-Many, Understanding the DAX Basics, Applying the DAX Basics, Creating Visuals in the Report View	L1, L2,L3,L4,L5	10

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis;L6-Evaluation

Text and Reference Books

1. Microsoft Business Intelligence Tools for Excel Analysts: Michael Alexander, Jared Decker, Bernard Wehbe, John Wiley & Sons, 2014
2. Introducing Microsoft Power BI: Alberto Ferrari and Marco Russo, Microsoft Press 2016
3. Getting started with Watson Analytics: IBM Corporation 2015
4. Tableau Your Data! Fast and Easy Visual Analysis with Tableau Software: Daniel G. Murray and the InterWorks BI Team, John Wiley & Sons 2013
5. Beginning Big Data with Power BI and Excel 2013: Neil Dunlop, Apress 2015

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

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Components	A	IP	EE	EP
Weightage (%)	5	25	50	20

IP: Internal Practical, EE: End Semester Examination; EP: External Practical; A: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	3	1	2	1	--	--	3	1	1	2	1	--	--
CO2	1	1	3	2	--	--	3	1	2	2	1	--	--
CO3	1	2	2	1	--	--	3	1	1	2	1	--	--
CO4	2	1	3	2	--	--	3	1	2	2	1	--	--

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MWP4411	ENVIRONMENTAL GOVERNANCE AND SUSTAINABILITY	L	T	P	C
Version 1.1	Latest Approved	3	0	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Environmental problems and global environmental change are multifaceted, trans-boundary, multi-level and multi-sector issues, that need to be dealt with at all administrative levels and with an integrated approach across policy areas. By applying theories of governance, we will discuss what this may imply in practice for the policy-making and implementation of environmental politics at different levels. The course introduces key theoretical concepts useful for the understanding of environmental change as a policy problem. This course explores the crucial link between governance and sustainable development. Sustainable development has emerged as the global norm and dominant approach to reconcile the goals of economic development, environmental quality and social equity. Governance can be understood as the rules, mechanisms, processes and institutions through which important decisions are made and implemented. The course discusses the contested nature of both these concepts, and investigates how both are combined in local, national, regional and international policy-making about environment and development challenges such as poverty, global inequalities, loss of biodiversity, deterioration of global eco-systems, and the threat of climate change to human societies.

Course Objectives

The objectives of this course are to:

1. Provide the students exposure to environmental governance practices.
2. Enhance student's knowledge towards concepts of sustainable development and global institutional arrangements for the governance of different dimensions of environment
3. Familiarize students with contemporary environmental issues, including alternative sources of energy and climate change, as well as with the most important global and regional institutions that create the global environmental governance architecture.
4. Comprehend and critically discuss the contemporary sustainable development agenda.

Course Outcomes

On completion of this course, the students will be able to:

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CO1: Classify and compare different Environmental Governance practices employed by multiple factors across different levels.
CO2: Describe the rationale behind regulatory, community-based, and market/incentive-based approaches to environmental governance, as well as newer approaches in integrated governance.
CO3: Describe different initiatives and strategy for sustainable development and also able to analyze the implementation of the Sustainable Development Goals.
CO4: Describe and understand the complexity of environmental problems, and drivers of and societal solutions to global environmental change.
CO5: Conduct analyses of Environmental Governance practices.

Modules	Blooms Level*	Number of hours
Module 1: **Introduction to the challenges and players in environmental governance:** Overview of environmental governance, Contemporary Discourses on Governance in India, problem and prospects of environmental governance in India, Democracy, Development and Governance. **Environmental Governance**: Human–Environment Interaction, Green Governance: Sustainable Human Development. Global environmental change. Governance of ecological conflicts and disasters, global ecological governance in particular in regard to climate change.	L1, L2	10
Module 2: Good Governance Initiatives in India: Government, Governance and Public Service Delivery in India, E-Governance in India. Democratic Decentralization and Local Governance in India. People's Participation in Governance, Citizen's Charter and Right to Information in India Corporate Social Responsibility: the Indian Experience.	L1, L2, L3	8
Module-3: Sustainable Development: Issues and Challenges-I **Introduction to Sustainable Development:** Parameters of sustainable development, Approaches to the study of SD, Issues and challenges. **Developmental issues**: Natural resource exploitation, Patterns of Industrialization, Inequitable Growth, Global and Regional dimensions	L1, L2, L3	9
Module-4: Sustainable Development: Issues and Challenges-II **Initiatives towards sustainable development:** State Initiatives global initiatives, Civil Societies and Community Initiatives, **Strategy for sustainable development:** Community Knowledge, Harness Technology, Innovative Practices, Cooperation and Partnership. SDGs.	L1, L2, L3	9

***Bloom's Level:**
L1-Knowledge; L2-Comprehension; L3-Application; L4-Anaylysis; L5-Synthesis; L6-Evaluation

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Text Books

- Environmental Governance in India by Dr. Devasish Sarkar and Ravi Ghosh. Global Vision Publishing House; 2nd edition.
- Environmental Governance in India: Issues and Challenges, by Prakash Chand Kandpal, Sage Publication.
- Governance: Issues and Challenges, by **Abhay Prasad Singh and, Krishna Murari**, Pearson Publication, 2018.
- Evans, J. P. (2011) Environmental Governance. Routledge, London.

Reference Books

- Adger, N. et al. (2003) Governance for sustainability: towards a `thick' analysis of environmental decision making, Environment and Planning A 35, pp. 1095 – 1110
- Adger, W. N. and A. Jordan (2009). Governing Sustainability. Cambridge, Cambridge University Press.
- Biermann, F, Pattberg, P. and Zelli, F. (eds). (2010). Global Climate Governance Beyond 2012: Architecture, Agency and Adaptation, Cambridge University Press.
- Evans, J. P. (2011) Environmental Governance. Routledge, London
- Glasbergen, P., Bierman, F., Mol, A. (eds) (2007) Partnerships, Governance and Sustainable Development: Reflections on Theory and Practice Cheltenham, UK: Edward Elgar Publishing.
- Lange, P., Driessen, P.J., Sauer, A., Bornemann, B., Burger, P. (2013) Governing Towards SustainabilityżConceptualizing Modes of Governance, Journal of Environmental Policy and Planning 15(3), p403-425
- Meadowcroft, J., Langhelle, O., Ruud, A. (2012) Governance, Democracy and Sustainable Development: Moving Beyond the Impasse. Cheltenham, UK: Edward Elgar Publishing.
- Young, O. R. (2002). "Evaluating the success of international environmental regimes: where are we now?" Global Environmental Change 12(1): 73-77

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance.

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	1	1	1	--	1	1	--	1	1	1	--	1
CO2	1	1	1	1	--	1	1	--	1	1	1	--	1
CO3	1	1	1	1	--	1	1	--	1	1	1	--	1
CO4	1	1	1	1	--	1	1	--	1	1	1	--	1
C05	1	1	1	1	--	1	1	--	1	1	1	--	1

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MWP4412	E-BUSINESS ESSENTIALS	L	T	P	C
Version 1.1	Latest Approved	2	1	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

The course aims to make the students understand the nuts and bolts of forming an e-business and prepares students to evaluate the requirements of an e-business and develop e –business plans. As business environment is witnessing so many changes every day, it gets vital for business organizations to recognize and learn to create their presence in cyber space.

Course Objectives

The objective of this course is to:

1. Introduce the students to the world of e-business, the openings and the risks and makes them learn the strategies of making businesses successful worldwide.
2. Make the students understand the nuts and bolts of forming an e-business and prepares students to evaluate the requirements of an e-business and develop e –business plans

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the digital technologies necessary for e-business.

CO2: Identify and use the database to improve business performance and decision making.

CO3: Create a web design for an e-business web portal.

CO4: Analyze the processes associated with e-payment systems, e-marketing, e-procurement and e-distribution.

Modules	Blooms level*	Number of hours
Module 1: Introduction to E-Business The impact of the electronic communications on traditional businesses, difference between e-commerce and e-business, E-business opportunities, Business adoption of digital technologies for e-commerce and e-business, E-business risks and barriers to business adoption, Management responses to e-commerce and e-business, Business models for e-commerce.	L2 ,L4	4

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Module 2: E-Business Web Design Elements of site design, site navigation, site structure, page and content design, web accessibility. Components of a business model, classification of business webs, comparison and valuation of networks, price formation process. Internet, intranet and extranet, choosing an ISP and Internet terminology Acquiring e-business systems, development of web based content and services, Software and services for web-site development and testing , testing process, environment, database creation and data migration, content management and maintenance	L2, L4	4
Module 3: E-Marketing & E-Procurement E-Marketing: comparison of communication media, development model for online customers, online promotion strategies. E-procurement: strategic and operational procurement, information support for e-procurement, types, catalog management.	L2,L4,L5	4
Module 4: E-Payment Systems and E-Distribution E-payments: credit card based procedures, SSL, SET, paypal and very-sign, Secure e-commerce transactions, principles, approaches to develop secure systems, digital certificates, symmetric and asymmetric encryption, digital signatures, PKI's and CA's. E-Distribution: components and types, online, offline and hybrid types, SCM and ESD: architecture, functions and services, digital watermarks.	L2,L4	4

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books*:*

1. A. Meier, H. Stormer, 2009, *E-Business and E-commerce: Managing the Digital Value Chain*, Springer
2. D. Chaffey, 2009, *E-Business and e-commerce management*, 4thed, Pearson/Prentice Hall.

References Books:

1. In Lee, 2007, *E-business innovation and Process Managemen*, Cybertech Publishing
2. A. Cordella, A. Martin, M. Shaikh S. Smithson, 2011, *Management and innovation of e-business*, London School of Economics and Political Science
3. Kenneth C. Laudon, Jane p. Laudon 2012: *Management information System: Managing the Digital Firm*, 12thed, Pearson/Prentice Hall.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	**CT**	**HA**	**C**	**V**	**A**	**EE**
Weightage (%)	**10**	**5**	**5**	**5**	**5**	**70**

C- Case Discussion/Presentation; HA - Home Assignment; V- Viva; CT - Class Test; A - Attendance; EE - End Semester Examination

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CO, PO and PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	-	-	-	-	-	-		3		1	-	-
CO2	1	-	2	-	-	-	-		2		1	-	-
CO3	1	-	1	-	-	-	-		3		1		-
CO4	1	-	3	3	-	-	-		2		1		-

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MWP4437	PROJECT-II	L	T	P	C
Version 1.1	Latest Approved	2	1	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Under this, it is usual to give the student some discretion in the choice of topic for the dissertation and the approach to be adopted. The dissertation topic is related to the field of specialization. Deciding this is often the most difficult part of the dissertation process, and requires thorough preparation and background research.

The aim of the dissertation is to provide the students with an opportunity to further their intellectual and personal development in their chosen field by undertaking a significant practical unit of activity, having an educational value at a level commensurate with the award of their degree.

Course Objectives

The objective of this course is to

1. Understand and apply theoretical frameworks to the chosen area of study.
2. Produce a coherent and logically argued piece of writing that demonstrates competence in research and the ability to operate independently**.**

Course Outcomes

On completion of Dissertation, the students will be able to

CO1: Describe a relevant area of career development, career coaching, coaching or work-related learning studies.

CO2: Identify research methods and state research questions.

CO3: Critically analyze and evaluate the knowledge and understanding in relation to the agreed area of study.

CO4: Integrate theory and practice for the development of responses on the basis of the evaluation and analysis undertaken.

CO5: Communicate in written form by integrating, analyzing and applying key texts and practices.

CO6: Demonstrate advanced critical research skills in relation to career development or work-related learning studies.

Planning the dissertation	**Blooms level***	**Number of hours**

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• Selecting a topic for investigation. • Establishing the precise focus of the study by deciding on the aims and objectives of the dissertation, or formulating questions to be investigated. Consider very carefully what is worth investigating and its feasibility. • Drawing up initial dissertation outlines considering the aims and objectives of the dissertation. Workout various stages of dissertation • Devising a timetable to ensure that all stages of dissertation are completed in time. The timetable should include writing of the dissertation and regular meetings with your dissertation guide.	L1, L2 ,L3,L4,L5,L6	6hours a Week

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis; L6-Evaluation*

Modes of Evaluation: Viva/ Report Examination

Examination Scheme:

Components	Content & Layout of Report	Conceptual Framework	Objectives & Methodology	Implications & Conclusions	Viva-Voce
Weightage	30	10	15	15	30

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	--	--	--	--	--	--	1	--	--	--	1	--
CO2	--	1	--	--	--	--	--	--	--	--	--	1	--
CO3	--	1	2	--	--	--	--	--	--	--	--	1	--
CO4	1	--	--	--	--	--	--	--	--	--	--	1	--
CO5	--	--	--	--	--	--	1	--	--	--	--	1	2
CO6	--	--	--	--	--	--	--	--	1	--	--	1	--

1: strongly related, 2: moderately related and 3: weakly related

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MWP4426	**DIGITAL MARKETING**	L	T	P	C
Version 1.1	Latest Approved	3	0	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

The course examines digital marketing strategy, implementation and executional considerations for B-to-B and B-to-C brands and provides a detailed understanding of all digital marketing concepts. Students will learn the course with a comprehensive knowledge of and experience with how to develop an integrated digital marketing strategy, from formulation to implementation. Strong focus will be on developing student's business skills and growing real-world experience of the digital media sector to enhance their knowledge to cope with employability demand. The course is an initiative designed to educate students and practitioners in the area of Digital Marketing analytics and make them ready for jobs or prepare them to launch campaign for their own organisations.

Course Objectives

The objectives of this course are to:

1. To understand how and why to use digital marketing for multiple goals within a larger marketing and/or media strategy.
2. Understand the major digital marketing channels - online advertising: Digital display, video, mobile, search engine, and social media.
3. Learn to develop, evaluate, and execute a comprehensive digital marketing strategy and plan.
4. Learn how to measure digital marketing efforts and calculate ROI.
5. Explore the latest digital ad technologies.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Gain knowledge about digital marketing strategy and planning.

CO2: Create and/or improve a strategy for measuring and improving digital media effectiveness

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CO3: Examine online advertising including ad networks and behavioral targeting.
CO4: Devise Emerging trends in digital marketing.
CO5: Analyze how to create search engine optimization strategy for own business.

Modules	Blooms Level*	Number of hours
Module 1: Introduction to Digital Marketing: Understanding Digital Marketing, Importance of Digital Marketing. Difference between traditional and digital marketing. Understanding Digital Marketing Process; Digital Marketing Planning and Strategy. **Website Planning and Creation:** Understanding websites; Understanding domain names & domain extensions; Web server & web hosting, Different types of web servers; Different types of websites; Planning & Conceptualizing a Website; Building website using CMS in Class.	L1, L2, L3	10
Module 2: Digital Advertising (PPC, Digital Display and YouTube): Creating Display Campaign; Types of display campaigns- All features, Mobile app, Remarketing, Engagement. Optimizing Display Campaign and Re-marketing. Concept of Online Advertising. Types of Online Advertising, Display Advertising, Contextual advertising, Payment models and bidding strategies for online advertising, Different Online advertising platforms. Pay per click advertising.	L1, L2, L3	9
Module 3: Search Engine Optimization (SEO): Introduction to Search Engine Optimization, History and Growth of SEO, Functions of search engines. Concept of search engine result page. Understanding keywords; On page optimization; Off Page optimization; Creating SEO Strategy for your business. Keywords, Google Adwords.	L1, L2, L3, L6	9

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Module 4: Emerging trends in Digital Marketing: Affiliate Marketing; Email Marketing, Social Media Marketing- Face book marketing, LinkedIn Marketing, Twitter Marketing, Video Marketing and VIDEO & AUDIO (PODCASTING) marketing; and Mobile Web Marketing and Content Marketing.	L1, L2, L3, L4, L6	8

Bloom's Level*

L1-Knowledge; L2-Comprehension; L3-Application; L4-Anaylysis; L5-Synthesis; L6-Evaluation

Text Book

- Marketing 4.0: Moving from Traditional to Digital by P. Kotler. Wiley Publication.

Reference Books

1. The Essentials of E-Marketing, 4th edition by Quirk Education (E-Book)
2. The Beginner's Guide to Digital Marketing (2015). Digital Marketer. Pulizzi,J.(2014) Epic Content Marketing, Mcgraw Hill Education.
3. Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, by Damian Ryan and Calvin Jones. KoganPage Publication, 3rd edition.
4. Ryan, D. (2014). Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Kogan Page Limited.
5. Digital Marketing, VandanaAhuja, Oxford Publication.
6. Digital Marketing Insights 2017, Social Beat Digital Marketing LLP, Kindle Edition.
7. Social Media for Business – Stories of Indian Brands, By Sorav Jain
8. Total E-mail Marketing: Maximizing your results from Integrated E-marketing (E-marketing essentials): Dave Chaffey.

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance.

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	--	--	1	1	--	1	1	--	1	1	--	--
CO2	1	--	--	1	1	--	1	1	--	1	1	--	--
CO3	1	--	--	1	1	--	1	1	--	1	1	--	--
CO4	1	--	--	1	1	--	1	1	--	1	1	--	--
C05	1	--	--	1	1	--	1	1	--	1	1	--	--

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MWP4425	ERP FOR BUSINESSES	L	T	P	C
Version 1.1	Latest Approved	3	0	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

In the face of intense competition and other business pressures on organizations, quality initiatives and continuous, incremental process improvement, though still essential, will no longer be sufficient. Such radical levels of change require powerful information technology tools such as ERP to facilitate the fundamental redesign of work. Students learn about the state-of-the-art techniques used in support of business process redesign.

Course Objectives

The students will be able to:

1. Grasp the concepts of enterprise resource planning
2. Have a contemporary and forward-looking on the theory and practice of Enterprise Resource Planning Technology
3. Integrate the ERP concepts with the organization's IT system.
4. Understand the concepts of business process reengineering.
   Develop the basic understanding of how ERP enriches the business organizations in achieving a multidimensional growth.

Course Outcomes

On completion of this course, the students will be able to:

CO1: List and define the concepts, vies and latest methodologies of business process design.

CO2: Explain key concepts in the design and utilization of best business practices embedded in an Enterprise Resource Planning System.

CO3: Analyze the strategic options for ERP identification and adoption

CO4: Summarize the activities carried out under Business Process Reengineering.

Modules	Blooms level*	Number of hours
Module I: Introduction to ERP Overview of ERP, its importance, Evolution, ERP Packages, Advantages of ERP, and its future Functional Modules of ERP, Risks & Benefits of ERP, ERP & related technologies Integration of ERP, SCM and CRM applications	L1, L2	6

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Module II: ERP Implementation Introduction, Why ERP, Reasons for Implementing ERP, Implementation Challenges ERP Implementation Life Cycle, Success & Failure Factors of an ERP Implementation ERP Package Selection and Evaluation ERP Implementation Process	L2, L3	6
Module III: Present and Future ERP and eBusiness, ERP, Internet and WWW, Future Directions and Trends in ERP	L1, L2	6
Module IV: Business Engineering and marketing of ERP BPR, ERP & IT – their linkage Business Model of ERP Marketing Dynamics & Competitive Strategy	L1, L2, L4	6
Module V: Practical aspects of ERP Introduction to ERP packages – SAP, BAAN, PeopleSoft & Open Source ERP	L1, L2, L6	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Book:

1. Enterprise Resource Planning: Alexis Leon, TMH, 2nd Edition

References Book:

1. Michael Hammer and James Champy, Harper Business
2. Process Mapping: How to Reengineer Your Business Process, V. Daniel Hunt, John Wiley & Sons
3. The Essence of Business Process Reengineering, Joe Peppard and Philip Rowland, Prentice-Hall
4. Redesigning Enterprise Processes for e-Business, Omar A. El Sawy, McGraw-Hill

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**P1**	**C1**	**CT1**	**EE**
Weightage (%)	10	10	20	60

C – Case Discussion, HA – Home assignment, CT – Class Test, S – Seminar, A: Attendance , EE: End semester Examination

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**
CO1	1							1			1	
CO2	1	2						1			1	
CO3				1				1			1	
CO4	1							1			1	

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MWP4428	**PREDICTIVE ANALYTICS-I MACHINE LEARNING USING R**	L	T	P	C
Version 1.1	Latest Approved	2	0	2	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course offers fundamental and applied evidence based knowledge to improve professional practice of students. It provides a detailed understanding of both supervised and unsupervised learning as it is vital for a data scientist. This course offer insight on text mining using "tidytext."

Course Objectives

The objective of this course is to:

1. Facilitate an introduction to machine learning techniques using several popular algorithms.
2. Internalize a core set of practical and effective machine learning methods and concepts, and apply them to solve some real world problems.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Explain and apply a set of unsupervised learning concepts and methods, classification methods of increasing complexity (rules, trees, random forests), and associated optimization methods (gradient descent and variants)

CO2: Explain the common idioms of large-scale graph analytics, including structural query, traversals and recursive queries, PageRank, and community detection

CO3: Apply the popular algorithms of machine learning using R

CO4: Analyze and interpret the results using specific statistical tools and techniques in R.

Modules	Blooms level*	Number of hours
MODULE 1: Linear Methods for Regression and Classification: Overview of supervised learning, Linear regression models and least squares, Multiple regression, Multiple outputs, Subset selection, Ridge regression, Lasso regression , Linear Discriminant Analysis , Logistic regression, Perception learning algorithm.	L1, L2,L3,L4	9
MODULE 2: Model Assessment and Selection: Bias, Variance, and model complexity, Bias-variance trade off, Optimism of the training error rate, Estimate of In-sample prediction error, Effective number of parameters, Bayesian approach and BIC, Cross- validation, Boot strap methods, conditional or expected test error.	L1, L2,L3,L4	9

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MODULE 3: Additive Models, Trees and Boosting: Generalized additive models, Regression and classification trees, Boosting methods-exponential loss and AdaBoost, Numerical Optimization via gradient boosting.	L1, L2,L3,L4	9
MODULE 4: Neural Networks (NN), Support Vector Machines (SVM), and K-nearest Neighbor: Fitting neural networks, Back propagation, Issues in training NN, SVM for classification, SVM for regression, K-nearest –Neighbour classifiers (Image Scene Classification) . Cross-validation and boot strap, Fitting classification and regression trees, K-nearest neighbours, Principal component analysis, K-means clustering,Web app development using R.	L1, L2,L3,L4	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis; L6-Evaluation*

Text and Reference Books

1. "Machine Learning Mastery with R", online Jason Brownee.
2. "Machine Learning with R,Expert techniques for predictive modeling", Brett Lantz,Pact Publication.
3. "Applied SupervisedLearning with R",Karthik Ramasubramanian and Jojo Moolayil, Pact Publication.
4. Trevor Hastie, Robert Tibshirani, Jerome Friedman , *The Elements of Statistical Learning-Data Mining, Inference, and Prediction* ,Second Edition , Springer Verlag, 2009.
5. G.James,D.Witten,T.Hastie,R.Tibshirani-*An introduction to statistical learning with applications in R*,Springer,2013.
6. E.Alpaydin, *Introduction to Machine Learning*, Prentice Hall Of India,2010

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**IP**	**EE**	**EP**
Weightage (%)	5	25	50	20

IP: Internal Practical, EE: End Semester Examination; EP: External Practical; A: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	2	--	3	--	--	--	--	2	1	3	1	--	--
CO2	3	2	1	2	--	2	1	--	1	2	1	3	--
CO3	2	1	1	2	--	--	1	3	1	2	1	3	--
CO4	3	1	2	1	--	--	1	--	1	2	1	3	--

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MWP4429	**PREDICTIVE ANALYTICS-II MACHINE LEARNING USING PYTHON**	L	T	P	C
Version 1.1	Latest Approved	2	0	2	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course offers the specialization of Python staring with data strategy. This course covers the two core paradigms that account for most business applications of predictive modeling: classification and prediction. It also covers the use of partitioning to divide the data into training data (data used to build a model), validation data (data used to assess the performance of different models, or, in some cases, to fine tune the model) and test data (data used to predict the performance of the final model).

Course Objectives

The objective of this course is to:

1. Facilitates a good learning to students on how to make meaningful predictions for a wide range of business purposes.
2. Provide provides a sufficient understanding on development of statistical models and how to devise data-driven workflows.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Apply data science techniques to extract insights from a wide range of data sources and to provide an assessment basis for predictive models. Also, students shall be able to explain how ensemble models improve predictions

CO2: Visualize and explore data to better understand relationships among variables

CO3: Identify and implement appropriate performance measures for predictive models with popular algorithms

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Modules	Blooms level*	Number of hours
MODULE 1: Introduction to machine learning, ML python essentials: numpy, pandas, matplotlib. Data Cleaning: Reading the data – variations and examples, Data frames, Delimiters, Various methods of importing data in Python: csv method, open method in Pyton, reading data form a URL, reading .xlsor .xlsx files, Reading from an .xls or .xlsx file, Writing to a CSV or Excel file. Handling missing values, Creating dummy variables, Visualizing a dataset by basic plotting, Scatter plots, Histograms, Boxplots.	L1, L2,L3,L4	9
MODULE 2: Data Wrangling: Subsetting a dataset, Selecting columns, Selecting rows, Selecting a combination of rows and columns, Creating new columns, Generating random numbers and their usage, Seeding a random number, Generating random numbers following probability distributions, Probability density function, Cumulative density function, Uniform distribution, Normal distribution, Generating a dummy data frame, Grouping the data: aggregation, filtering, and transformation.	L1, L2,L3	9
MODULE 3: Statistical Concepts for Predictive Modelling, Random sampling and the central limit theorem Hypothesis testing, Null versus alternate hypothesis, Linear Regression with Python: Understanding the math behind linear regression, Linear regression using simulated data, Fitting a linear regression model and checking its efficacy, Finding the optimum value of variable coefficients ,Making sense of result parameters, p-values, Residual Standard Error, Implementing linear regression with Python, Linear regression using the stats model library, Multiple linear regression, Model validation, Training and testing data split , Handling categorical variables.	L1, L2,L3,L4	9
MODULE 4: Logistic Regression with Python, Linear regression versus logistic regression, Understanding the math behind logistic regression, Contingency tables, Conditional probability, Odds ratio, Estimation using the Maximum Likelihood Method, Likelihood function: Log likelihood function, Processing the data, Data exploration, Data visualization, Creating dummy variables for categorical variables, Feature selection, Implementing the model, Model validation and evaluation, Cross validation, Model validation, The ROC curve, Confusion matrix.Decision Tree and Ensemble Techniques: RandomForest, Bagging and Boosting, Adaboost in python. ML based Web app development.	L1, L2, L3,L4	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis;L6-Evaluation*

Text Books

1. Pilgrim, Dive, "Introduction to Python", 3rd Edition, Apress, 2009.
2. Allen Downey, Jeffrey Elkner, Chris Meyers, "How to Think Like a Computer Scientist Learning with Python" 2nd Edition Green Tea Press,2002.
3. Manaranjan Pradhan and U Dinesh Kumar, "Machine Learning using Python" , Wiley Publication

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4. Andreas C. Müller & Sarah Guido “Introduction to Machine Learning using python”,Oreilly Publications.

Reference Books

1. John V. Guttag, “Introduction to Computation and Programming using Python”, Prentice Hall of India, 2014.
2. Mark Lutz, “Learning Python: Powerful Object-Oriented Programming‖”, Fifth Edition, O‘Reilly, Shroff Publishers and Distributors, 2013.
3. Michale Bowles “Machine Learning in Python: Essential Techniques for Predictive Analysis” Wiley Publication.

Web Resources:

- Anaconda Scientific Python Distribution: https://store.continuum.io/cshop/anaconda/
- BLAS (Basic Linear Algebra Subprograms): http://www.netlib.org/blas/
- Graphviz - Graph Visualization Software: http://www.graphviz.org
- https://github.com/rasbt/python-machine-learning-book/blob/master/docs/references.md
- Installing Python: https://docs.python.org/3/installing/index.html
- IPython Notebook: https://ipython.org/ipython-doc/3/notebook/index.html
- Iris dataset: https://archive.ics.uci.edu/ml/datasets/Iris
- LAPACK — Linear Algebra PACKage: http://www.netlib.org/lapack/
- LIBLINEAR -- A Library for Large Linear Classification: http://www.csie.ntu.edu.tw/~cjlin/liblinear/
- LIBSVM -- A Library for Support Vector Machines https://www.csie.ntu.edu.tw/~cjlin/libsvm/
- Matplotlib Tutorial: http://matplotlib.org/users/beginner.html
- NumPy Tutorial: http://wiki.scipy.org/Tentative_NumPy_Tutorial
- Pandas Tutorial: http://pandas.pydata.org/pandas-docs/stable/tutorials.html
- Python: https://www.python.org
- scikit-learn: http://scikit-learn.org/stable/
- UCI Machine Learning Repository: http://archive.ics.uci.edu/ml/

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**IP**	**EE**	**EP**
Weightage (%)	5	25	50	20

IP: Internal Practical, EE: End Semester Examination; EP: External Practical; A: Attendance

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	2	1	--	2	--	2	1	--	1	2	1	--	--
CO2	2	1	--	2	--	2	1	--	1	--	1	--	--
CO3	2	1	--	2	--	2	1	--	1	2	1	--	--

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Amity Business School

MBA-Executive (Sustainability Management)

FLEXILEARN
-Freedom to design your degree



Curriculum & Scheme of Examination

2023

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Master of Business Administration-Executive (Sustainability Management)

Programme Mission:

The mission of the MBA programme is to foster an environment of academic excellence in Business Management through research and innovation, industry integration, internationalization and extension activities and develop highly trained and employable professionals with specialization in the area of Marketing & Sales, Finance, Banking & Finance, Human Resource Management, International Business, Information Technology, E-Commerce and Hospital & Healthcare, who are socially responsible and globally minded professional to meet the current and emerging needs of business and society.

Programme Description:

The two year full time Masters in Business Administration programme is to educate and prepare students with the knowledge, analytical ability, and management perspectives and skills needed to lead, to motivate and to manage diversified workforce, rapid technological change and competitive marketplace while considering the principles of ethical, legal and corporate governance fundamentals.

PO1	Apply the expertise in marketing, human resource management, finance and other functional areas of management to solve sustainability issues in volatile business environment.
PO2	Evaluate business issues within the context of ethics and social sustainability through business research methods and inculcate among students the awareness of the mandatory compliances that are pertinent to their respective organizations.
PO3	Student shall be able to understand global issues from sustainability perspectives, like climate change, come up with sustainable solutions as a social entrepreneur to contribute to the greater good of the society.
PO4	Student shall able to critically think to assess societal, safety, environmental, and human issues and apply a range of strategies for solving a problem and decision making
PO5	Student shall develop range of Leadership skills and understanding of group dynamics and effective teamwork, to be able develop sustainable enterprise.
PO6	Enable students to formulate, evaluate and implement crucial business strategies considering the 3 Ps of People, Profit and Planet to make a sustainable business organization.

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Semester - I

MSP4101	SUSTAINABLE MARKETING CONCEPTS	L	T	P	SW/FW	C
Version 1.1	Latest Approved	3	0	0	0	3
Pre-requisites/Exposure						
Co-requisites						

Course Objectives:

Course Objectives: The purpose of the course is to educate the students about various aspects of marketing at Social Organization, working towards public good. Course will also provide knowledge of marketing tools to promote social change and to achieve social goals. It will focus on the roles of different stakeholders such as Government, Corporate Social Responsibility Entities as well as Non-profit Organizations.

Pre-requisites: Student should have completed the basic course of Marketing Management

Course Outcomes: After Completion of Course Students will be able to:

Module I: Introduction to Sustainable marketing	**15% weightage**
Developments and Challenges, Alternative Concepts: No- Profit Marketing, Sustainable marketing Role of Stakeholders such as Government, Corporate Social Responsibility Entities as well as Non-profit Organizations	
Module II: Social Messaging and Communication	**15% weightage**
Identifying consumers and beneficiaries, Achieving Social Goals through Marketing, Decision processes-Implications for the promotion of pro-social behavior, Social Messaging, Learning & behavior modification, Fare Trade Principles	
Module III: Marketing Mix	**20% weightage**
Marketing Orientation towards Non-profit / social change promotion, 4Ps of Social Marketing, Strategic Marketing Planning: Value Proposition, Branding, Segmentation, Targeting, Positioning, Competitive Advantage, Community based Social marketing	
Module IV: Understanding Campaigns	**20% weightage**
Ongoing Marketing Campaigns in non-profits: e.g. arts, education, health, rural development, charities Developing an effective marketing Campaign: Objective formulation, Identifying Audience, reducing barriers, communicatingeffectively; Evaluation, Monitoring and Control for Marketing Initiatives, Prominent Cases	
Module V: Corporate Social Responsibility	**15% weightage**
Cause Marketing: Introduction, Need and Relevance, Corporate Social Responsibility: Introduction, Regulations and Linkages with Non-Profits, CSR utility towards Brand & Image Building and Recruitment	
Module VI: Latest Trends	**15% weightage**
Latest trends in Social Marketing, Employee volunteering, Multi stakeholder Initiatives, Campaign Financing & Regulations, Useof Information Technology.	

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- CO1: Understand social/Non-profit marketing concept and role of different stakeholders;
- CO2: Plan, perform and monitor effective Marketing Campaigns in the Non-Profits environment
- CO3: Identify and Interpret social marketing orientation of NGO's
- CO4: Relate to the role of private sector, partnerships and alliances to the non-profit sector

Pedagogy for Course Delivery: This class will be taught using a mix of theory and the case methods. It will cover important course content and be illustratedby case examples.

- Lectures & Case Study Discussion
- Group Project
- Group Discussion

List of Professional Skill Development Activities (PSDA):

i.Analyzing Social Marketing Campaigns & Designing Social Marketing Campaigns

ii.Stakeholder Identification

Theory L/T (%)	Lab/Practical/Studio (%)	End Term Examination
40%	NA	60%

Continuous Assessment/Internal Assessment					End Term Examination
Components	Mid-Term Exam	Project	Viva	Attendance	
Linkage of PSDA with Internal Assessment Component, if any		Analyzing Social Marketing Campaigns;Designing Social Marketing Campaigns	Stakeholder Identification		
Weightage (%)	10%	15%	10%	5%	60%

Text Reading:

- Consumer India: Inside the Indian Mind and Wallet, by Dheeraj Sinha
- Consumer Behaviour by Schiffman and Kanuk PHI publications 7th edition.

References:

- India After Gandhi by Ramachandra Guha.

Additional Reading:

- Solomon.R.Michael. (2004). Consumer Behavior. Pearson Prentice Hall of India.
- Understanding Indian Consumers by Durairaj Maheswaran & Thomas Puliyel
- Winning in the Indian Market: Understanding the Transformation of Consumer India By Rama Bijapurka

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MSP4102	**ACCOUNTING FOR MANAGERS**	L	T	P	C
Version 1.1	Latest Approved	2	1	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

The intent of this course is to acquaint the students with fundamental concepts and processes of accounting so that they are able to appreciate the nature of item presented in the annual accounts of an organization. The student will be able to familiarize with the significant tools and techniques of financial analysis further useful in the interpretation of the financial statements. The aim of this course does not focus on to make the student's expert accountant but to have a good comprehension on the management planning and control systems. However the principal focus will be related to the interpretation and use of the financial data by non-accounting students to gain the ability of using accounting information as a tool in applying solutions for managerial problems, evaluating the financial performance, and interpreting the financial structure.

Course Objectives

The objective of this course is to:

1. Equip the students to develop the essential ability of all managers, to use complex accounting information as a platform for decision-making. As the course unfolds, students will build an increasingly sophisticated level of understanding of the language of accounting and its key concepts.
2. Develop skills in interpreting earnings statements, balance sheets, and cash flow reports. This ability to analyze financial statements will enable participants to deal more effectively with strategic options for their businesses or business units.
3. To make the students to understand the corporate financial resources

Course Outcome

On completion of this course, the students will be able to:

CO1: Explain the theoretical and practical aspects of financial accounting.
CO2: Prepare financial statements as per the Accounting principles and standards.
CO3:Evaluate Depreciation and Inventory valuation of the given organization
CO4: Demonstrate the decision-making skills in financial analysis context.
CO5: Having an ability to use techniques, skills and modern managerial tools & techniques necessary for business practice
CO6: Comprehend the role of financial manager, objectives of financial management and sources of finance.
CO7: Apply the recent trends of accounting in business decision-making.

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Modules	Blooms level*	Number of hours
Module I: Accounting Basics Accounting Concepts, Branches of Accounting, Policies, Accounting Principles, Accounting Standards, International Financial Reporting System, Accounting Equation Approach, Posting to ledger accounts, Trial Balance, Cash Book and Bank Reconciliation Statement **Final Accounts** Income Statement, Balance Sheet. Final Accounts with Adjustments- Provision for doubtful debts, Discount on Debtors and Creditors, Bad Debts, Interest on Capital, Prepaid expenses, outstanding expenses, etc.,		
Module II: Financial Statement Analysis Relation and Comparison of Accounting data and using financial statement information, Ratio Analysis and Interpretation of Ratios, Comparison betweenFund flow and Cash flow analysis, Preparation of Cash Flow Statement (AS3).		
Module III: Cost and Management Accounting Elements of cost, Cost Classification and Allocation, Cost Sheet, Method of Inventory Valuation, Marginal Costing and Cost Volume Profit Analysis, Budgeting & Variance Analysis		
Module IV: Basics of Finance Meaning, nature and scope of finance goal – profit vs. wealth maximization; Finance decisions – investment, financing and dividend decisions, Time Value of Money. **Contemporary Issues in Accounting and Finance** Guest Lecture from industry experts on contemporary Accounting practices in decision making and role of financial managers.		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. Anthony A. Atkinson, Robert S. Kaplan, S. Mark Young, Ella Mae Matsumura, G. Arunkumar (2014), Management Accounting: Information for Decision Making and Strategy Execution, 6th edition, Pearson Education, India.
2. Horngren T. Charles, (2012), Cost Accounting: A Managerial Emphasis, 15th edition, Pearson Education, India
3. Ramachandran, N (2011), Financial Accounting for Management, 3rd Edition, McGraw Hill.
4. Khan M.Y, Jain P.K, (2009), Management Accounting, 5th edition, McGraw Hill, India
5. I.M.Pandey, (2015), Financial Management, 11th edition, Vikas Publishing, India.

Reference Books

1. Bhattacharya, S.K. and Dearden, J, 3rd Edition, Accounting for Management, Text and Cases, Vikas Publishing House.
2. Narayanaswamy R (2014), Finanacial Accounting – A Managerial Perspective, Prentice Hall of India.
3. M.N Arora 10th Edition, A Text Book of Cost and Management Accounting, Vikas Publishing House.

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4. Debarshi Bhattacharyya, (2010), Management Accounting, 1st edition, McGraw Hill, India
5. Khan M.Y, Jain P.K, (2014), Financial Management- Text, Problems and Cases, 7th edition, McGraw Hill.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	P1	C1	CT1	EE
Weightage (%)	10	10	20	60

CT: Class Test, A: Attendance, EE: End Semester Examination; A: Attendance, C: Case Analysis

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1						
CO2						
CO3						
CO4						
CO5						
CO6						
CO7						

1: strongly related, 2: moderately related and 3: weakly related

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MSP4103	BUSINESS STATISTICS	L	T	P	C
Version	Latest Approved	2	0	1	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course not only exposes the students to the theory of probability and sampling distribution but also includes the various types of statistical tools which are to be used in the present rapidly changing business environment. Its main focus is on the application of data analytic tools to enable the students to make correct decision making under the complex and dynamic business scenario. The content of the course will also include the different forecasting techniques with main focus on the quantitative technique that would be immensely beneficial for the students to make the predictions correctly. Numerous empirical examples and real business cases are used to illustrate applications of the material covered

Course Objectives

The aim of this course is to:

1. Develop the understanding of the various statistical models used for decisions making
2. To appreciate the problems of obtaining or gathering the desired information or data.
3. To understand the types of classification of data, representation of data in the form of diagrams, graphs or tables.
4. To appreciate the basics of central value, dispersion, skewness etc and their applications in real business problems.
5. To examine the problems related to theory of probability, various types of probability distribution and particularly Baye's theorem and their application in real-life problems.
6. To describe the process of hypothesis testing for large and small samples and its uses in business problems
7. To equip with the knowledge of correlation, regression and time series; enabling them to make the correct future predictions

Course Outcomes

On completion of this course, the students will be able to:

CO1. Define and apply basic statistical concepts to various field of management

CO2: Apply statistical methods such as statistical collection, species characteristics, statistical series, tabular and graphical representation of data, measures of central tendency, and dispersion for managerial decision making.

CO3. Apply various forecasting techniques.

CO4. Describe different types of probability distributions

CO5. Explain and analyze a given business problem and applying required statistical hypothesis and sampling tool accordingly

CO6. Define the decision theories for practical business problems.

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Modules	Blooms level*	Number of hours
Module I: Introduction Application of Statistics in Business & Management; Basic Concepts of Statistical Studies: Variable and Classification of Data; Diagrammatic & Graphical Presentation of Data, Measures of Central Tendency, Measures of Dispersion		
Module II: Forecasting Techniques Simple Correlation & Regression Analysis, Time Series Analysis- Introduction, Variation in Time Series, Trend Analysis, Cyclical Analysis, Seasonal Analysis, Irregular Variation		
Module III: Probability & Probability Distributions Probability: Basic Terminology in Probability, Types of Probability, Probability rules, Probabilities under condition of Statistical Independence, Probabilities under condition of Statistical dependence, Baye's Theorem Probability Distributions: Binomial Distribution, Poisson Distribution, The Normal Distribution		
Module IV: Sampling, Estimation and Testing of Hypotheses Sampling & Sampling Distribution: Parameter and Statistic, Point and Interval Estimation, Interval Estimation of three common parameters viz. Mean Standard Deviation and Proportion. Hypothesis Testing for a Single Population: Concept of Hypothesis, Test involving a population mean, Test involving a population proportion, Test involving population Standard Deviation, Test for two population means (Independent Samples), Tests for two population means (Dependent Samples), Tests for two population proportions (Independent Samples),Tests for two population variances (Dependent Samples), F-test, Non-parametric Tests (Chi – Square Test)		

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Levin R.I. & Rubin S.R. 2012, Statistics for Management, 7th Ed. Prentice Hall Of India
2. Gupta S P, Statistical Methods, S. Chand & Co. New Delhi, 35th edition

Reference Books

1. Anderson David R, Sweeny Dennis J, Williams Thomas A, Statistics for Business and Economics 12th ed,Cengage learning, 2018.
2. Keller Gerald, Statistics for Management, Cengage Learning, 2014
3. Rubin & Levin, Statistics for Management, Eighth edition, Pearson, Prentice Hall of India, 2017.
4. Vohra N.D., Quantitative Techniques in Management, Tata McGraw Hill, 2017

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	C	A	CT	EE
Weightage (%)	10	5	5	70

CT: Class Test, A: Attendance, EE: End Semester Examination; A: Attendance, C: Case Analysis

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1						
CO2						
CO3						
CO4						
CO5						
CO6						

1: strongly related, 2: moderately related and 3: weakly related

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MSP4104	**ECONOMICS FOR MANAGERS**	L	T	P	C
Version 1.1	Latest Approved	2	1	0	3
Pre-requisites/Exposure	Basic knowledge of managerial economic science preferred but not compulsory				
Co-requisites					

Catalog Description

In this course the students are introduced with various concepts of economic science that relates to decision making process based on rational choice approach. To begin with, introductory concepts of economic theory and their implications on managerial decision process are analyzed. Thereafter concepts related to demand analysis, demand forecasting supply analysis, and equilibrium market conditions are discussed in detail. The next phase deals extensively concepts related to production theory, cost theory and revenue aspects. Third, various concepts related to market structure are discussed in detail. Finally, various macroeconomic concepts, policy perspectives of government and other institutions are explored in detail. The overall aim of this course is to make the students familiar with working knowledge of the fundamentals of economic theory relevant to business and industry.

Course Objectives:

The objective of this course is to:

1. Make the students aware of the theoretical concepts of managerial economic science so that they can analyze situations and improve upon their managerial decision process in workplace.
2. Provide students with extensive exposure about the micro and macro level variables that influence business operations and strategies of the firm and business environment and regulatory framework under which they operate.
3. Enhance students' understanding of application of various theoretical perspectives of managerial economics into practical working environment in order deal with industry complexities in an efficient manner.
4. Explain the various macroeconomic policy initiatives in terms of their implications in management and business decision process thereby facilitating optimization of resources.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Explain basic concepts of managerial economics, demand and supply dynamics, demand forecasting techniques and their application, and analyze the working of free market mechanism and appreciate how forces of demand and supply reinforce each other for attaining market equilibrium.

CO2: Analyze rationally the dynamics of production and cost aspects in order to make a holistic assessment of the complexities inherent in production system.

CO3: Describe the various forms of market structure and their implications in managerial decision process.

CO4: Discuss holistically the various macroeconomic aspects of business and implications of government policies in shaping the dynamics of business and industry.

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Modules	Blooms level*	Number of hours
MODULE 1: Theory of demand and supply Nature and scope of economic analysis: its relevance for managerial decision making, Demand analysis: nature of demand for a product- individual demand and market demand, demand by market segmentation. Demand function and determinants of demand. Supply function: determinants of supply of a product, law of supply. Elasticity of supply. Concept of elasticity of demand- income, cross, price and advertizing elasticity. Theorems on the price elasticity of demand. Applications of the concept of price elasticity of demand in business decisions. Demand forecasting need for forecasting and techniques of forecasting. Free Market Mechanism. Cost concepts: costs relevant for management decision making. Economies of scale: internal and external. Cost function: cost and output relationship. Short run and long run.		
MODULE 2: Theory of production and cost Production analysis: Production function-neo-classical, Least cost combination of inputs for a firm. Concept of an isoquant-smooth curvature and right angle. Returns to scale and returns to a factor. Expansion path of a firm. Cost Analysis: Cost relevant for management decision making. Economies of scale: Internal and External, Cost Function: Cost and output relationship. Short Run and Long run. An Analysis of the Objectives of a Business Firm: Profit Maximization Model.		
MODULE 3: Market Structure: Price and Output decisions Pricing and Output decisions – Perfectly Competitive and Monopoly Market Pricing and Output Decisions-Under Monopolistically Competitive Market-Product Differentiation; Price Discriminating Monopolist; Models of Oligopolistic Market: Collusive and Non-Collusive Oligopoly structure. Price Rigidity – The Kink Demand Curve Model and Price War. Price Leadership Models, Cartels and Collusion.		
MODULE 4: Macroeconomics Analysis Economic Policy and Analysis: Macro Economic Variables and Functional Relationships. Business Environment: Exogenous Variables. Factors Influencing the Business Environment. National Income Analysis: National Income Aggregates. Circular Flow of income, Money-Incorporating Savings Investment, Foreign Trade and Government Sector. Government Macroeconomic Policy Measures – GST, Demonetization – and their impact on Business; Consumption Function, Saving Function and investment Function. Concepts of Investment Multiplier. Factors Influencing Consumption Function- Objective, Subjective and Structural. Demand and Supply of Money: Transaction, Precautionary and Speculative Demand for Money; Liquidity preference function; Components of Money Supply. Business Cycles: An Analysis of Fluctuation in the level of Economic Activity. Phases of Business Cycles. Inflation and Deflation: Demand – Pull and Cost – Push Inflation. Impact of Inflation on Employment, Price Level and other Macro Economic Variables and Analysis of Policies to control inflation. Deflation. Monetary Policy: Objectives of Monetary Policy. Function of Central Bank. Credit Policy and its implications on the Corporate Sector. Fiscal Policy: meaning, objectives and impact on economy. Money Market, Capital Market and Foreign Exchange Market.		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

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Text Books

1. Salvatore, D. Managerial Economics, 8th Edition, Oxford University Press
2. Krugman, Paul and Maurice Obstfeld. (2008), South Asian Edition, International Trade Policy, Pearsons.
3. Thomas, Christopher R., S. Charles Maurice, Sumit Sarkar, Managerial Economics, 9th Edition, Tata McGraw Hills.
4. Samuelson, Paul A., and William Nordhaus, Economics, 19th Edition, McGraw Hills India Pvt. Ltd.

Reference Books

1. Peterson, H.C and Lewis, W.C., Managerial Economics, Prentice Hall of India
2. Bhattacharya, Govind and Debasis Bhattacharya. (2018), GST and Its Aftermath: Is Consumer Really the King, SAGE Publications.
3. Gupta, G.S. (2006), Managerial Economics, Tata McGraw Hill
4. Mishra, S.K., and V.K. Puri. Indian Economy, 27th Edition, Himalaya Publishing House.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1				--	--	--
CO2				--	--	--
CO3				--	--	--
CO4				--	--	--

1: strongly related, 2: moderately related and 3: weakly related

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MSP4105	Organizational Behaviour and Human Resource Management	L	T	P	C
Version 1.1	Latest approved	3	0	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description:

The general purpose of this course is to familiarize students with the basic principles and techniques of human resource management. This course takes a practical approach that integrates contributions of behavioural sciences with the technical aspects of implementing the HR function in the real world.

Course Objectives:

The objective of this course is to:

1. Appreciate the importance of human resource management as a field of study and as a central management function;
2. Understand the implications for human resource management of the behavioral sciences, government regulations.
3. Know the elements of the HR function (e.g. – recruitment, selection, training and development, etc.) and be familiar with each element's key concepts & terminology; and
4. Apply the principles and techniques of human resource management gained through this course to the discussion of major personnel issues and the solution of typical case problems.

Course Outcomes:

On completion of the course the students will be able to:

CO1: Explain and apply the concepts of human resources management.

CO2: Demonstrate a basic understanding of different tools and techniques used in forecasting and planning human resource requirements.

CO3: Interpret the industry regulations that will effect employees and employers and apply them effectively.

CO4: Analyze and solve key issues related to the human elements, both nationally and internationally such as employee acquisition, retention compensation, appraisal, training, career planning and diversity.

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Modules		
Module I: Introduction to Human Resource Management and Organization Behavior • Understanding Organisation, Significance of Scientific study of Human Behaviour, Hawthorn Studies it's importance & implication, Motivation Process. • Perspectives of Organisation, Perception & Impression, Personality & Attitudes, Learning Values. • Typical responsibilities of HR departments and how they are affected by the corporate culture, environmental forces, and government regulations. • Staffing processes-Recruitment and SelectionMethods – Interview, Tests, Placement and Induction. **Module II: Compensation & Benefits** • This unit focuses on compensation and related issues. • Forms of and bases for compensation, job evaluation and compensation/evaluation systems. • Methods of Job Evaluation, Strategic Compensation, Equity Theory, Components of Pay Structure, • Designing and Administration of Wage and Salary Structure, Wage Regulations in India **Module III : HRD and Performance Management** • Training and Development,deciding who is to be trained, in what and how they are to be trained, and how effective was the training for the employee and her/his organizational component. • Understanding of Performance Management Systems,performance evaluation as a system including process and procedures used in developing reliable and valid standards, criteria, and evaluation mechanisms • Potential Appraisal, • Career Development. Career development theories; occupational educational, and personal/social information sources and delivery systems **Module IV : Global Human Resource Management & Future Issues** • Overview of Human Resource Information System (HRIS), • Introduction to HR Audit, IHRM Practices, Cross- Cultural and Diversity Management, • Work-life integration, Human Resource Outsourcing Declining productivity, substantial demographic shifts, changing employee attitudes and expectations, innovation technologies, • Significant trends in human resource management and how they can be addressed through innovative and effective organizational strategies.		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text Books:

- David A. Decenzo ,Stephen P. Robbins , Susan L. Verhulst,(2015), Human Resource Management ,eleventh edition , Wiley;
- Prasad. L.M, (2014) Human Resource Management, Third Edition, Sultan Chand & Sons; New Delhi.

Reference Books:

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- Chhabra T.N,(2014) Human Resource Management: Concepts and Issues, Edition 2014,Dhanpat Rai & Co
- Dessler G (2014) A Framework for Human Resource Management, 7 edition (2014), Pearson Education India;
- Michael Armstrong , Stephen Taylor,(2017), Armstrong's Handbook of Human Resource Management Practice, 14 edition (3 February 2017), Kogan Page

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CPA**	**TP**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	5	5	5	5	10	70

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1						
CO2						
CO3						
CO4						
CO5						
CO6						

1: strongly related, 2: moderately related and 3: weakly related

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MSP4106	APPLICATION OF DISRUPTIVE TECHNOLOGIES IN BUSINESS	L	T	P	SW/FW	C
Version 1.1	Latest Approved	2	0	1		3
Pre-requisites/Exposure						
Co-requisites						

Course Description:

Disruptive technology significantly alters the way businesses or entire industries operate. It often forces companies to change the way they approach their business for fear of losing market share or becoming irrelevant. Disruptive Technologies are the ultimate challenge in current business environment. This course will review in detail the basis of Disruptive Technologies ie. Disruptive Innovation and how these technologies are impacting the Business.

Course Objectives: The aim of this course is to

1. To understand how Organizations need to evolve to address the changing business landscapes.
2. To study how technological innovations leads to technology disruptions and how these innovations bring value to the organization.
3. To understand how these technologies are endangering the organization or industry in which we operate.
4. To study whether these technologies are easily adopted or is the organization experiencing difficulty integrating these new technologies.

Course Outcomes

On successful completion of this course, students should be able to

CO1: Analyze the processes that have enabled certain technologies to change our lives.

CO2: Illustrate the positive and negative consequences of disruptive technologies.

CO3: Devise the understanding of the key elements that need to be evaluated when trying to anticipate and manage disruptive technologies in the marketplace.

CO4: Manage the dynamic aspects of technology-enabled marketplaces as a way to understand industry disruption.

Course Structure

Module No.	Course Contents	Weightage
1	Introduction to Disruptive Technologies - Determining technology trends by a historical review , overview of how technological disruption happens, "DisruptiveTechnologies: Understand, Evaluate, Respond,. Positive & Negative Effects Of Disruptive Technology " Application of Various Disruptive technologies in Business	20%
2	BI Disruption- Effective & timely decisions using BI, Role of mathematical models using BI, BI Architecture, Descriptive Analytics – Datawarehousing, Business Analytics: Emerging Trends and Future Impacts, Application of BI Disruptions in industry	20%

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3	Artificial Intelligence Disruption- Introduction to AI , Various AI Tools, Problem solving to find the "best" solution in the problem space. How AI helps to Reason &Interpret to justify solutions or sub-solutions, language comprehension to handle for data/problem/knowledge representation, Business decision using AI a process to find better ways for solving a problem (or a class of problems). Application of AI in Automobile, health care, retail sector	20%
4	IOT & Smart application Disruptions- Introduction to IoT , Future Factor Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in Business toMaster IoT, Value Creation from Big Data and Serialization Application of IoT in Industry (Home Management, eHealth., banks, Retail sector)	20%
5	Block chain Disruptions – Introduction to the Block chain , Its Origin, Blockchain working, Benefits of Blockchain and Challenges. Blockchain Database vsTraditional Database, Public, Private and Hybrid Blockchain , Smart contract working and its benefits Application of Block chain in Supply chain , KYC , Healthcare etc.	20%

Pedagogy for Course Delivery: This course pedagogy will involve a blended learning approach, having formal lectures, Case studies, group project work; andstudent presentations of the work in progress, as well as online lectures and tutorials.

List of Professional Skill Development Activities (PSDA):

1. Student will be divided into a group of 4-5 and will present on any one Disruptive Technology in the class.
2. Students will explore the application of disruptive technology in any area /domain
3. and document it in a form of case study and then present the same inthe class.
4. Students will submit a 10 page write up on how the disruptive technology is impacting the society in general & business in particular.

Continuous Assessment/Internal Assessment					**End Term Examination**
Components (Drop down)	Mid-Term Exam	Project	Presentation	Attendance	
Weightage (%)	10%	10%	5%	5%	70%

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Semester - II

MSP4201	FUNDAMENTALS OF DATA ANALYTICS	L	T	P	C
Version 1.1	Latest Approved	2	0	1	3
Pre-requisites/Exposure					
Co-requisites					

Course Description

The course is designed at par with current industry needs for data analysis. It includes many cutting-edge learning modules which will provide a rich experience and exposure to different modern data analytical tools and techniques to the students.

Course Objectives:

1. To provide detail knowledge of data analytics and data science
2. To provide basic understanding of MS excel as a tool of data analysis
3. To help the students to know about different types of data, sources of data and data generation techniques
4. To provide the basic understanding of salesforce platform

Course Outcomes

On completion of this course, the students will be able to,

CO1: To develop a comprehensive understanding about data analytics and data science. It will help the students to identify the business problems where data analytics can used.
CO2: To develop basic understanding of MS Excel that can further be used to apply basic data analytic tools.
CO3: To develop an integrated knowledge about different types of data, data sources and data generation techniques which will help the students in decision making.
CO4: To develop the knowledge about wave analysis using salesforce platform. It will help the students to create various dashboards to understand the real business situation and suggesting possible solutions.

Modules	Blooms level*	Number of hours
Module I: Introductionto Data Analytics • Introduction to Data Analytics • Data Analytics vs Data Science • Data Analytics in business needs • Data Analysis Types, Process, Techniques and Tools • Role of Data Analyst in Analytics • ELT Process • DWH, Benefit of DWH, Use, Type of DWH		

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Module II: Data Analytics using MS-Excel • Data Analysis with Excel, Advantages, Business need and usage • Data Import – Text, CSV, JSON, XML, SQL Query • Data Table, Pivot Table • Excel Formula, usage, advantages, formula use in Data Analysis. • What-If-Analysis, scenario Manager, Goal Seek, Solver. • Data Visualization with Charts – Histogram, Run Chart, Line, Scatter, Bar • Functions – Financial, Logical, Text and Mathematical		
Module III: Introduction to Data Science • Data Mining Process Techniques and Tools • Exploratively Data Analysis • Machine learning, Advantage Algorithms, Types • Machine learning VS Statistical Learning • Supervised ML VS Unsupervised ML vs Reinforcement ML		
Module IV: Industry Wave Analytics using Salesforce CRM • SFDC Data Analysis, Advantages, Industry Needs and Usage • Reports, Reports Types – Tabular, Summary, Matrix, Joined • Charts – Line, Bar, Pie, Funnel, Scatter, Donut • Dashboard: Executive Dashboard, Sales & Service Dashboards • Reports & Dashboards Access and Security with Users, Groups and Roles		

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Reference Books

1. Introduction to Data Mining by *Pang-Ning Tan & Vipin Kumar*
2. Business Analytics: The Science of Data - Driven Decision Making by *U Dinesh Kumar*
3. Microsoft Excel Data Analysis and Business Modeling by *Wayne L. Winston*
4. Advance/Data Analysis with Excel by *Manisha Nigam*
5. Data Science for Business by *Foster Provost*
6. Data Science for Business Professionals by *Probyto Data Science and Consulting Pvt. Ltd.*
7. Salesforce Lightning Reporting and Dashboards by *Yu Johan*
8. Pro Salesforce Analytics Cloud: A Guide to Wave Platform, Builder, and Explorer by *William Smith & Helen Sun*

Modes of Evaluation: Quiz/Assignment/ Practical lab/ Seminar/Written Examination

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1						
CO2						
CO3						
CO4						

1: strongly related, 2: moderately related and 3: weakly related

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MSP4202	SUSTAINABLE DEVELOPMENT & SUSTAINABILITY	L	T	P	SW/FW	C
Version 1	Latest Approved	3	0	0		3
Pre-requisites/Exposure						
Co-requisites						

Course Objectives

1. The course seeks to build an inter-disciplinary perspective on understanding sustainable development concerns and challenges.
2. This course familiarizes students with current debates and perspectives in analyzing constraints and opportunities for sustainable development**.**

Pre-requisites: Basic understanding of the concept of sustainability.

Course Outcomes

On completion of this course, the students will be able to
CO1: Implement world policies based on sustainable development, cooperative responsibility and environmental security.
CO2: Study sustainable alternatives for strengthening local economies.
CO3: Build capacity of communities, with special emphasis on those regions or populations characterized by poverty, marginalization andexclusion.

Course Contents/Syllabus:

Modules	Blooms level*	Number of hours
Module I: Perspective of Sustainable Development Definitions & principles of Sustainable Development; Origin and evolution of the Sustainable Development; Notion of carrying capacity; Brundtland Commission Report; UN Conference on Human Environment 1972; Earth Summit 1992; World Summit 2002; The role of population growth, migration, technological change, industrialization and international politics; Millennium Development Goals: Status (Global and Indian), Sustainable Development Goals: Status (Global and Indian); Indicators of environment and social development.		

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Module II: Concept of Sustainability Definition sustainability; Dimensions of sustainability; Measuring sustainability: indicators and certifications; Governance and scales of decision-making; Consumption patterns and ecological footprints; Resources, Wealth Distribution and Quality of Life; Environmental security; Measuring, monitoring and improving sustainability performance; Establishing sustainability indicators, developing goals and improvement program; Life cycle assessment; Principles and guidelines of corporate sustainability.		
Module III: Sustainable Development Challenges and Response Challenges to sustainable development: limited awareness, poor education systems, social barriers, governance,conflict between governments, political will, technology; Responses to sustainable development: Public Policy (Community Participation and Participatory Learning); Economics and Policy Coherence; Rural development & environmental sustainability; ESP: Equality, sustainability and peace; Sustainable development in private sector; International cooperation on sustainable development; Sustainable development: futurescenarios. Case studies		

Pedagogy for Course Delivery:

The subject methodology will follow the teaching approach which takes into account the students' own knowledge and their autonomous learning. In this regard, classes focus on a combination of lectures and participatory dynamics. The structure of each unit includes a daily compulsory reading, followed by oral presentations by the students which will lead to class debates, group works and other activities. These activities will be complemented by lectures.

Text & References:

Text

- Elliott, J. A. 2006 An Introduction to Sustainable Development. 3rd ed. Abingdon, Oxon; New York: Routledge. Rogers,
- P.P., Jalal., K. F., and J. A. Boyd 2008. An Introduction to Sustainable Development. Earthscan

References

- Adams, W.M. 200. Green Development: Environment and Sustainability in the Third World, Routledge, New York.
- Agyeman, J., Bullard, R.D. and B. Evans (Eds.) 2003. Just Sustainabilities: Development in an Unequal World. London: EarthscanBarbier, E. 2005. Natural Resources & Economic Development', Cambridge University Press, Cambridge.
- Peet, R. and M. Watts (Eds.) 2004. Liberation Ecologies: Environment, Development, Social Movements. London: Routledge. Robbins, P.2004 Political Ecology: A Critical Introduction. Blackwell Publishing.

Text Books

- P. Armstrong. "Disruptive Technologies: Understand, Evaluate, Respond", Kogan Page Publishers. (2017)
- Efraim Turban, Ramesh Sharda, Dursun Delen, "Decision Support and Business Intelligence Systems", 9th Edition, Pearson 2013.
- Qiangfu ZHAO and Tatsuo Higuchi, Artificial Intelligence: from fundamentals to intelligent searches,

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Kyoritsu, 2017, ISBN:978-4-320-12419-6 (inJapanese

- Introduction to Artificial Intelligence, Shinji Araya, KYORITSU SHUPPAN, ISBN4-320-12116-3 (in Japanese)
- Internet of things (IOT)Technologies, Applications, Challenges and solutions by BK Tripathy (Editor), J Anuradha
- Blockchain and the supply chain:: Concepts, Strategies and Practical Applications by Nick Vyas, Aljosja Beije
- New Artificial Intelligence (Fundamental), Takashi Maeda and Fumio Aoki, Ohmsha, ISBN4-274-13179 (in Japanese)

References:

- Larissa T. Moss, S. Atre, "Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making", Addison Wesley, 2003.
- Carlo Vercellis, "Business Intelligence: Data Mining and Optimization for Decision Making", Wiley Publications, 2009.
- David Loshin Morgan, Kaufman, "Business Intelligence: The Savvy Manager"s Guide", Second Edition, 2012.
- Cindi Howson, "Successful Business Intelligence: Secrets to Making BI a Killer App",

Assessment/Examination Scheme

	Continuous Assessment/Internal Assessment			End Term Examination
Components	**Class Test**	**Home Assignment**	**Presentation**	
Weightage (%)	10	05	10	70

McGraw-Hill, 2007.

- Ralph Kimball , Margy Ross , Warren Thornthwaite, Joy Mundy, Bob Becker, "The Data Warehouse Lifecycle Toolkit", Wiley Publication Inc.,2007

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MSP 4203	FINANCIAL MANAGEMENT	L	T	P	C
Version 1.1		2	1	0	3
Pre-requisites/Exposure					
Co-requisites					

The focus of this course is in the area of financial management. Course will explain know financial management and its interface with other areas of management, applying time value of money in investment decision-making and understanding cost of capital in financing decisions of firms. It helps to understand how firms meet their financial objectives utilising financial decision-making. This course will also explain financial tools and techniques, which can be used to help firms maximize value by improving decisions relating to capital budgeting, capital structure, and working capital management.

Course Objectives

1. To familiarize the students with basic concepts of financial management and financial system.
2. To understand concept of time value of money and its implication.
3. To evaluate the investment proposals.
4. To understand the management of working capital in an organization.
5. To analyze capital structure and dividend decision.

Course Outcomes:

At the end of the course the student will be able to:
CO 1:Understand the basic financial concepts
CO2: Apply time value of money
CO3:Evaluate the investment decisions
CO4: Estimate working capital requirements
CO5: Analyze the capital structure and dividend decisions

Modules	Blooms level*	Number of hours
Module I Meaning and objectives of Financial Management, changing role of finance managers. Interface of Financial Management with other functional areas. changing role of finance managers. Emerging issues in Financial Management-Risk Management, Behavioural Finance, Financial Engineering, Derivatives (Theory)		

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Module II Time value of money& Cost of capital Meaning of Time value of money –Future value of single cash flow & annuity, present value of single cash flow, annuity & perpetuity. Simple interest & Compound interest, Capital recovery & loan amortization. (Theory & Problem). **Sources of Financing:** Shares, Debentures, Term loans, Venture Capital, Angel investing and private equity (Theory Only). **Cost of Capital:** Basic concepts. Cost of debenture capital, cost of preferential capital, cost of equity capital including CAPM - Determination of Weighted average cost of capital (WACC) (Theory & Problems). **Case Study on WACC.**		
Module III Investment Decision & Capital Structure Planning **Investment Decision**: Capital budgeting process, Investment evaluation techniques – Net present value, Internal rate of return, Modified internal rate of return, Profitability index, Payback period, accounting rate of return (theory &Problems) **Capital structure Planning**: Practical considerations in designing capital structure, Theories of capital structure – NI approach, NOI approach, Modigliani Miller approach, Traditional approach(Theory only). **Planning the capital structure: EBIT and EPS analysis(Case Study)**		
Module IV Working Capital Management Concept of working capital, working capital finance, Factors influencing working capital requirements ,current asset finance policy, Estimation of operating cycle and cash cycle, Estimation of working capital requirements of a firm **Case study on Working Capital Determination**		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Textbooks				
Sl. No.	**Title of the book**	**Name of the Author/s**	**Publisher Name**	**Edition and year**
1	Financial Management	Khan M. Y.& Jain P. K,	TMH	7/e,
2	Financial Management	Prasanna Chandra	TMH	9/e,
3	Financial Management: A Strategic Perspective	Nikhil Chandra Shil & Bhagaban Das	Sage Publications	1/e, 2016
Reference Books				
1	Financial Management	I M Pandey	Vikas Publishing	11/e, 2012
2	Principles of Corporate Finance	Brealey, Myers, Allen & Mohanty	McGraw Hill Education	11/e, 2014
3	Cases in Financial Management	I.M.Pandey & Ramesh Bhat	McGraw Hill Education	3/e, 2015
4	Corporate Finance	Vishwanath S. R.	Sage Publications	3/e, 2019

Theory: 40%, Problems:60%

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	CAP	Q /S	A	ME	EE
Weightage (%)	10	5	5	10	70

CPA: Case Discussion/ Presentation/ Analysis, Q/S : Quiz / Seminar, A : Attendance, ME : Mid-term Examination, EE: End semester Examination

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO1	1	1	--	--	--	2	--	2	1	2	1	--
CO2	1	1	--	--	--	2	--	2	1	2	1	--
CO3	1	1	--	--	--	2	--	2	1	2	1	--
CO4	1	1	--	--	--	2	--	2	1	2	1	--

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MSP4204	OPERATIONS AND SUPPLY CHAIN MANAGEMENT	L	T	P	C
Version 1.1	Latest Approved	2	0	1	3
Pre-requisites/Exposure					
Co-requisites					

Course Description

This course is designed to explain the basic theories and techniques of operations and supply chain management to examine the prevailing issues and problems in changing business environment and to show how enterprises can augment their effectiveness and competitiveness by focusing on different operations and supply chains.

Course Objectives:

1. To provide the basic understanding of different operational strategies to be used in manufacturing and service providing organizations.
2. To provide knowledge about various types of inventories, costs of inventories and control of inventories
3. To provide an understanding about different types of supply chains and their issues
4. To provide an insight about the modern trends and challenges of supply chains

Course Outcomes

On completion of this course, the students will be able to,

CO1: To develop a comprehensive understanding about different operational strategies so that students can analyze and apply them in given situation.

CO2: To develop insights about inventory management so that students can understand various types of inventory control techniques and use them efficiently under a given situation.

CO3: To develop an integrated knowledge about different designs of supply chains, key issues, problems, and suggested solutions.

CO4: To help the students understand the latest trends in supply chains, contemporary challenges like greening, flexibility, and adaptability etc. of supply chains.

Modules	Blooms level*	Number of hours
Module I: Introduction Operations in manufacturing and service organizations, scope of operations management, operations strategy and competitiveness, facility location decisions, factors affecting location, location techniques: factor rating method, centroid method, types of production systems- continuous and intermittent production systems, facility layout, process layout, systematic layout planning, product layout, fixed position layout, service operations layout, capacity planning: long term and short term, operations scheduling: loading, sequencing, priority rules and techniques, economies of scale		
Module II: Inventory Management Inventory management: Objectives, factors, process, inventory costs, inventory models, inventory control techniques: ABC, VED, EOQ, SED analysis, Just-in-Time (JIT), JIT vs traditional systems of operations, JIT in services		

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Module III: Supply Chain Management: An Overview The Basics of Supply Chain Management- Introduction, Definition of Supply Chain Management, Key Drivers of Supply Chain Management, Components of Supply Chains, Cycle View of Supply Chain, Problems in SCM and Suggested Solutions, Supply Chain Benchmarking		
Module IV: Recent Trends in Supply Chain Management New Developments in Supply Chain Management, Outsourcing Supply Chain Operations, Co-Maker ship, The Role of E-Commerce in Supply Chain Management, Green Supply Chain Management, Distribution Resource Planning, World Class Supply Chain Management		

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

TextBooks:

1. Production and Operations Management, S.N. Cherry, McGraw Hill Publications, 3/e, 4th reprint 2007
2. Production and Operations Management, Sunil Chopra, Peter Meindle, Prentice Hall of India
3. Supply Chain Management, R.B. Handfield, Prentice Hall of India
4. Supply Chain Management, Ajay Garg, McGraw Hill Publications
5. Introduction to Supply Chain Management, Frederick Shiller& Gerald J Liberman, Tata McGraw Hill edition
6. Operation Research, H..A.Taha, Prentice Hall India
7. Introduction to Operation Research, B.E .Gillet ,Tata McGraw Hill:

Reference Books

1. RichardB.Chase,RaviShankarandF.RobertJacobs(2014);Operations&Supply Chain Management; McGraw-Hill - 2014 (14thEdition).
2. CharyS.N.TheoryandProblemsinProduction&OperationsMgt.;TataMcGraw Hill(14th Edition).
3. Krajewski Lee; Operations Mgt. Process for ValueChains; Prentice Hall (8th Edition)

Russell S. Roberta & Taylor, Operations Mgt., Prentice Hall (4thEdition).

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	1	1	2	2	1
CO2	1	1	1	-	2	1
CO3	2	1	1	-	1	1
CO4	2	1	1	2	3	1

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MSP4205	Research Methodology & Report Preparation	L	T	P	C
Course Version	Latest Approved	2	0	1	3
Pre-requisites/Exposure					
Co-requisites					

Catalogue Description:
The main objective of the course is to equip the students with the basic understanding of research methodology in changing business scenario. It will also provide them an insight into the application of dynamic analytical tools to face the stormy challenges aimed at fulfilling the purpose of business decision making.

Course Objectives :
The objectives of this course are to ensure that students are able to-

1:Understand the basic framework of research process.
2:Comprehend of various research designs and techniques.
3:Identify various sources of information for literature review and data collection.
4:Understand some basic concepts of research and its methodologies.
5: Understand as how to organize and conduct research in a more appropriate manner andwrite a research report, thesis and a research proposal.

Course Outcomes :
On completion of this course, the students will be able to:
CO1: Apply a range of quantitative and / or qualitative research techniques to business and management problems / issues
CO2: Determine and apply research approaches, techniques and strategies in the appropriate manner for managerial decision making
CO3: Demonstrate knowledge and understanding of data analysis and interpretation in relation to the research process
CO4: Synthesize and Evaluate different research approaches utilised in the different industries and be able to critically assess the overall process of designing a research study from its inception to its final report preparation.

Modules	Blooms level*	Number of hours
Module I: Introduction Meaning of research, importance of scientific research in business decision making, types of research, complete research process, research methodology, criterion for good research, Identification of research problem and formulation of hypothesis, research designs, drafting a research proposal		

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Module II: Measurement and Data Collection Primary data, secondary data, design of questionnaire, sampling fundamentals and sample designs, Qualitative and quantitative research, measurement and scaling techniques, measures of central tendency mean, median, mode; measures of dispersion, data processing		
Module III: Data Analysis I Cross tabulation, univariate analysis, bivariate analysis: Correlation, Karl Pearson's coefficient of correlation, Spearman's coefficient of correlation, hypothesis testing, t-test, Z test, F-test, Chi- square test, Analysis of variance, Non-parametric tests: Sign test, Run test, Krushall-Wallis test		
Module IV: Report Writing Pre-Writing Considerations, structure of research report, common problems encountered while preparing the research report, presentation of research report, ethical issues while preparing a research report		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Book:

Cooper, R.D., Schindler, S. P. and Sharma, J.K. (2015). Business Research Methods. New Delhi, India: McGraw Hill Education (India) Private Limited

Reference Book/s:

1 .Zikmund, William C (1997). *Business Research Methods (5th Ed.)*. The Dryden Press, Harcourt Brace College Publishers

2 Levin & Rubin (2004), Statistics for Management, 8th Ed, Prentice Hall of India

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CT**	**HA**	**Q/S**	**A**	**ME**	**EE**
Weightage (%)	5	5	5	5	10	70

CT: Class Test, HA: Home Assignment, Q/S: Seminar/Viva/Quiz, ME: Mid Term Exam EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	--	-	--	--	--	-	--	1	3	-	-
CO2	1	1	-	--	--	-	--	-	-	1	2	-	-
CO3	1	2	--	-	--	--	-	--	--	1	3	-	-
CO4	1	1	--	--	3	-	2	--	--	1	3	2	2

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MSP4231	TERM PAPER-I	L	T	P	C
Version 1.1	Latest Approved		0	0	2
Pre-requisites/Exposure					
Co-requisites					

Course Description

A term paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. At least one middle level or senior level person of a company from the chosen sector may be interviewed face to face

Course Objectives

The objective of this course is to judge the understanding as well as application of the knowledge gained by the students. The aim of the term paper is to provide the students with an opportunity to further enhance their knowledge in a sector of their choice by undertaking a significant practical unit of examining and analyzing various aspects of business management at a level commensurate with the learning outcomes of the various courses taken up them in the ongoing semester.

Guidelines:

1. The term paper will be related to the contemporary business issue and the topic will be given by the department.

2. The presentation of the term paper is scheduled to be held before the commencement of Semester examinations.

3. The paper will carry 100 marks that will be marked on the basis of understanding and organization of content based on the literature review. The Bibliography shall form an important part of the paper.

4. Examples of a few broad areas for Term Paper (List is indicative, not exhaustive)

- Inflation
- Unemployment
- Fiscal Deficit
- Poverty
- Education
- Malnutrition
- Rural Development
- Regional Imbalance
- Globalization
- Foreign Direct Investment
- Current trends in consumer behavior
- Innovative management
- Company rituals and corporate culture
- Negotiation and diplomacy
- Effective advertising
- International trade trends in the USA
- Geo-arbitrage and business success
- Advantages of increasing brand awareness
- Social media as a new market
- Healthy work environment and employee diversity

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Evaluation Scheme

Organisation and relevance of content	Literature Review	Bibliography	Presentation	Total
30	30	20	20	100

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SEMESTER-III

MSP4301	**STRATEGIC MANAGEMENT**	L	T	P	C
Version 1.1	Latest Approved	3	0	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course introduces the key concepts, tools, and principles of strategy formulation and competitive analysis. It is concerned with managerial decisions and actions that affect the performance and survival of business enterprises. The course is focused on the information, analyses, organizational processes, and skills and business judgment managers must use to devise strategies, position their businesses, define firm boundaries and maximize long-term profits in the face of uncertainty and competition.

Course Objectives

The objective of this course is to

1. Introduce students to the key concepts, tools and principles of business policy and strategic management.
2. Expand the student's capacity to integrate and appreciate the changes in the environment that shape the strategy of a business and lead to developing a competitive edge.
3. Develop the perspective of students towards understanding the culmination of different functional areas into building up of a corporate strategy.
4. Expose the students to the various approaches in crafting business strategy, tools that aid in reasoning carefully about strategic options, and learning how companies use what-if analysis to evaluate action alternatives and make sound strategic decisions.

Course Outcomes

On completion of this course, the students will be able to

CO1: Identify and explain the various levels at which strategic decision making happens in an organization.

CO2: Analyse the internal and external environment of business that will lead to formulation of strategic plans.

CO3: Determine the suitability of strategies that firms have developed in the real world scenario to achieve valueable outcomes.

CO4: Prepare strategic analysis and choice in order to determine alternative courses of action that could best enable the firm to achieve its mission and objectives.

CO5: Review strategy implementation to gain competitive advantage.

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Modules	Blooms level*	Number of hours
Module I: Introduction and Purpose of Strategy Formulation Evolution and Introduction of strategic management, Concept of Strategy, corporate, Business and Functional Levels of Strategy, Mission, Vision, Objectives, Approaches to four Phases in Strategic Management Process, Stakeholders in business and their roles in strategic management, Strategic decision making.		
Module II: Environmental Analysis Analysing company's External Environment: PESTLE Analysis; Preparing an Environmental Threat and Opportunity Profile (ETOP), Analysing Industry Environment: Industry Analysis – Porter's Five Forces Model of competition, Strategic Group analysis.		
Module III: Analysis of Organizational Competencies Analysing Company's Internal Environment Resource based view of a firm, meaning, types & sources of competitive advantage, analysing company's Resources and Competitive Position, VRIO Framework; Benchmarking as a method of comparative analysis, Competitive advantage; Concept of a Core competence and Distinctive competitiveness, Characteristics of Core Competencies; Value Chain Analysis Using Porter's Model; Organizational Capability Profile: Strategic Advantage Profile.s		
Module IV: Strategic Analysis and Choice Generic Competitive Strategies: Meaning of Generic competitive strategies, Low cost, Differentiation, Focus – when to use which strategy; Grand Strategies: Stability, Growth (Diversification Strategies, Vertical Integration Strategies, Mergers, Acquisition & Takeover Strategies, Strategic alliances & Collaborative Partnerships), Retrenchment – Turnaround, Divestment, Liquidation, Outsourcing Strategies; Offensive and Defensive Strategies, Blue Ocean Strategy, Strategy in the age of Internet and E-commerce; Portfolio Analysis Business Portfolio Analysis – BCG Matrix – GE 9 Cell Model; Evaluation of Strategic Alternatives: SWOT Analysis, Grand Strategy Selection Matrix.		
Module V: Strategy Implementation and Evaluation Strategy Implementation, Barriers to implementation of strategy, Mc Kinsey's 7s Framework; Organization Structures for Strategy Implementation, Leadership Implementation, Functional Implementation, Strategic evaluation review and control.		

**Bloom's Level: L1-Knowledge;L2-Comprehension;L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. Kazmi, A.(2015), Business Policy and Strategic Management 4th edition), Tata Mc Graw Hill.
2. Wheelen and Hunger,(2018),Strategic Management and Business Policy :Globalisation, Innovation and Sustainability, Pearson Education.

Reference Books

1. Pearce and Robinson (2017), Strategic Management: Formulation, Implementation and Control, Tata McGraw Hill.
2. David Fred R.(2018)Strategic Management Concepts: A Competitive Advantage Approach, Pearson Education

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	1	--	2	--	--
CO2	1	1	--	--	--	2
CO3	1	1	--	2	--	--
CO4	1	1	--	--	--	--
CO5	1	1	--	--	--	--

1: strongly related, 2: moderately related and 3: weakly related

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MSP 4337	PROJECT-I	L	T	P	C
Course Version	Latest Approved	-	-	-	8
Pre-requisites/Exposure	NA				
Co-requisites	NA				

Catalog Description

Under this, it is usual to give the student some discretion in the choice of topic for the Research Project and the approach to be adopted. The Research Project topic is related to the field of specialization. Deciding this is often the most difficult part of the Research Project process, and requires thorough preparation and background research.

The aim of the Research Project is to provide the students with an opportunity to further their intellectual and personal development in their chosen field by undertaking a significant practical unit of activity, having an educational value at a level commensurate with the award of their degree.

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Course Objectives

The objective of this course is to

1. Understand and apply theoretical frameworks to the chosen area of study.
2. Produce a coherent and logically argued piece of writing that demonstrates competence in research and the ability to operate independently.

Course Outcomes

On completion of Research Project, the students will be able to

CO1: Describe a relevant area of career development, career coaching, coaching or work-related learning studies.

CO2: Identify research methods and state research questions.

CO3: Critically analyze and evaluate the knowledge and understanding in relation to the agreed area of study.

CO4: Integrate theory and practice for the development of responses on the basis of the evaluation and analysis undertaken.

CO5: Communicate in written form by integrating, analyzing and applying key texts and practices.

CO6: Demonstrate advanced critical research skills in relation to career development or work-related learning studies.

Planning the Research Project	Blooms level*	Number of hours

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• Selecting a topic for investigation. • Establishing the precise focus of the study by deciding on the aims and objectives of the Research Project, or formulating questions to be investigated. Consider very carefully what is worth investigating and its feasibility. • Drawing up initial Research Project outlines considering the aims and objectives of the Research Project. Workout various stages of Research Project • Devising a timetable to ensure that all stages of Research Project are completed in time. The timetable should include writing of the Research Project and regular meetings with your Research Project guide		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis; L6-Evaluation*

Modes of Evaluation: Viva/ Report Examination

Examination Scheme:

Components	Content & Layout of Report	Conceptual Framework	Objectives & Methodology	Implications & Conclusions	Viva-Voce
Weightage	30	10	15	15	30

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

1: strongly related, 2: moderately related and 3: weakly related

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MSP4303	SUSTAINABLE DEVELOPMENT & CLIMATE CHANGE	L	T	P	SW/FW	C
Version 1.1	Latest Approved	3	0	0	1	4
Pre-requisites/Exposure						
Co-requisites						

Course Objectives:

1. To familiarizes students with the development of the Earth's atmosphere, its dynamic nature and variability in terms of the global energy balance
2. To appraise the students on the management of climate change through mitigated and adaptive measures.
3. To enhance the understanding on the varied impacts of climate change on various sectors and introduces about the international and national bodies like UNFCCC, IPCC, Kyoto Protocol; national and international policies, laws & regulations applicable to climate change.

Pre-requisites: Basic understanding of the environment and natural resources.

Course Outcome

On the completion of the course, students will be able to

CO1: Explain the greenhouse effect, including consideration of natural and anthropogenic greenhouse gases, and their principal sources and sinks

CO2: Describe the natural carbon cycle and human impacts on the carbon cycle

CO3: Demonstrate an understanding of the range of options available for reducing global greenhouse gas emissions, including the use of carbon sinks andcarbon sequestration

CO4: Describe the various incentives and mechanisms used to promote greenhouse gas emissions reductions

CO5: Evaluate Global and National policies on climate change

CO6: Assess and select low-carbon products and services

Modules	Blooms level*	Number of hours
Module I: Introduction to Climate Change Green House Effect and Global Warming, Radiative Forcing, Feedback Mechanism, Global Warming Potential (GWP), Green House Gas emissions from various natural & anthropogenic sources, Natural causes of climate change – Milankovitch cycles, Schwabe cycles, Eccentricity and Obliquity, Records of climate change (glacial cycles, ocean sediments, corals, trees) Earth energy balance, Ozone Layer Depletion, ENSO - El Nino and La Nina Effects		

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Module II: Climate Change Vulnerability and Impacts Potential impacts of climate change on water resources, agriculture, forest, natural ecosystems, infrastructure & energy sector, coastal zones, human habitats (rural & urban) and health. Approaches and tools of assessment of climate change.		
Module III: Climate Change Adaptation Definition of adaptation and mitigation; Adaptation options for terrestrial, fresh water & ocean ecosystem and their confluences. Adaptation options available for human systems like human health, human settlement, agriculture and food security and energy industry under various climate change scenarios. Carbon Sequestration – Carbon Capture and Storage		
Module IV: Climate Change Policy and Law **I**nternational & national legislative framework in the field of climate change agreements, UNFCCC and Implementation (JI), decisions of the COP and COP/MOP, DNA, CDM-EB and all Subsidiary Bodies, Introduction toREDD and REDD Plus.		

Pedagogy for Course Delivery: The course will be delivered through lecture mode. During tutorial sessions, written assignments, quiz and seminar presentations on various topics related to the course will be organized. Class room interactions on one to one basis will be an integral part of the learning experience. Students will be supplied with study materials regularly.

Components	**Class Test**	**Home Assignment**	**Presentation**	**Attendance**	**End Term**
Weightage	10	5	10	5	70

Text:

- Gilbert M. Masters, Introduction to Environmental Engineering and Science
- Hardy, John T, Climate Change - Causes, Effects, and Solutions, John Wiley & Sons April 2003
- Stephen J Culver, Biotic Response to Global Change Cambridge University Press July 2000
- Edited by Steffen, W., Jäger, J., Carson, D. J., Bradshaw, C. Challenges of a Changing Earth Springer 2003
- Anil Markandya and Kirsten Halsnaes Ed, Climate Change and Sustainable Development: Prospects for Developing Countries Earthscan 2002
- Global Warming The Complete Briefing, Third Edition, Johan Houghton, Cambridge University Press.

References:

- IPCC Fourth and Fifth Assessment Report
- www.unfccc.int
- www.cdmrulebook.com
- www.carbonyatra.com
- www.earthscan.co.uk

Sustainability Measurement & Reporting- Syllabus to be prepared

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MSP4305	HUMAN DIMENSIONS OF SUSTAINABILITY	L	T	P	SW/FW	C
Version 1.1	Latest Approved	3	0	0	1	4
Pre-requisites/Exposure						
Co-requisites						

Course Objectives:

1. Aims at understanding the human dimensions of sustainability issues, encompassing societal, political, economic, technological and cultural aspects
2. Helps to analyse the human dimensions of environmental change and sustainability issues are: Transitions Theory, Social-Ecological Systems and Political Ecology

Course Outcome

On the completion of the course, students will be able to

CO1: Engage critically with a range of contemporary environmental change and sustainability topics, especially regarding the societal, political, economic,technological and cultural aspects of managing and responding to contemporary environmental change and sustainability problems.

CO2: Critically reflect on the interrelationships between environmental change and sustainability

CO3: Evaluate and gain a deeper understanding of particular environmental change and sustainability

Modules	Blooms level*	Number of hours
Module I: Introduction Introduction to human dimensions of sustainability issues; Sustainability and societal, political, economic, technological and cultural aspects; Origins and Evolution: History of international efforts for environment and sustainability		
Module II: Analytical Perspective Origins and Evolution, Transitions Theory, Social-Ecological Systems, Political Ecology, Economic development, wealth and poverty, social development, and the environment in an integrated systems perspective		
Module III: Issues & Challenges Sustainability issues in regard to land, climate change, energy conservation and water supplies, biodiversity, food and governance; Relevance of sustainability as a priority for communities, national governments, and the international system; Sustainable Development Goals and the need for an integrated approach to their implementation		
Module IV: Education for Sustainable Development and Responsible Living Understanding sustainable development at the individual level, Action plan to live in a more sustainable way, Explain the importance of sustainability to others and to accompany them as they implement more sustainable practices		

Pedagogy for course delivery:

The subject methodology will follow the teaching approach which takes into account the students' own knowledge and their self- learning. In this regard, classes focus on a combination of lectures and participatory method. The structure of each unit includes a daily compulsory reading and by oral presentations by the students which will lead to class debates, group works and

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other activities. These activities willbe complemented by lectures and video presentation.

Assessment/Examination Scheme:

Components	Class Test	Home Assignment	Presentation	Attendance	End Term
Weightage	15	10	10	5	60

Text & References:

- Blaikie, P. (1995) Changing environments or changing views: A political ecology for developing countries, Geography 80 pp.203
- Folke, C., Hahn, T., Olsson, P. & Norberg, J. (2005) Adaptive Governance of Social-ecological systems, Annual Review of Environmental Resources 30 pp. 441-73Griggs, D., Stafford-Smith, M., Gaffney, O., Rockström, J., Öhman, M.C., Shyamsundar, P., Steffen, W., Glaser, G., Kanie, N., & Noble, N., (2013) Policy: Sustainable development goals for people and planet, Nature 495 pp. 305-307 http://www.nature.com/nature/journal/v495/n7441/full/495305a.html
- Loorbach, D., Frantzeskaki, F. & Avelino, F. (2017) Sustainability Transitions Research: Transforming Science and Practice for Societal Change, Annual Review ofEnvironment and Resources 42 pp. 599-626
- Peet, R., Robbins, P. & Watts, M. (2011) Global Political Ecology. New York: Routledge
- Robbins, P. (2012) Political Ecology: A critical introduction (2nd edition) Chichester, UK: Wiley-Blackwell (read Part 1: 1 Political versus Apolitical Ecologies(p11))
- Rotmans, J. & Loorbach, D. (2009) Complexity and Transition Management, Journal of Industrial Ecology 13 (2) pp. 184-196.

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MSP4306	BUSINESS CERTIFICATION FOR SUSTAINABILITY	L	T	P	SW/FW	C
Version 1.1	Latest Approved	3	0	0	1	4
Pre-requisites/Exposure						
Co-requisites						

Course Objectives:

To develop an understanding of how going green can save money, increase customers and provide a new way to business for going up

To explain the relevance of sustainability on the specific areas which can help companies to make a difference tothe world.

Pre-requisites: Introduction to Sustainable development and sustainability

Course Outcome

On the completion of the course, students will be able to

CO1: Understand eco-friendly programs relevant to the companies

CO2: Analyze impact of sustainable solutions on businesses and eliminate carbon emission

CO3: Evaluate the importance of sustainability certifications as voluntary standard relating to environmental, social, ethical and food safety issues

CO4: Critically reflect understanding of third party certification

Modules	Blooms level*	Number of hours
Module I: Introduction Meaning and Benefits of sustainable business certification; Business commitment to environmentalism and social responsibility; Best practices in green business certification		
Module II: Green programs and social initiatives Eco friendly and socially responsible programs for the companies, importance of leadership and expert guidance, Self assessment of company's sustainable efforts and identify areas to focus to become green, Eliminate operational carbon emissions from the facilities.		
Module III: Reporting Corporate Sustainability Reporting Standards, Public disclosure of Corporate information, Sustainability reporting by independent organizations: Global Reporting Initiative (GRI), Sustainability Accounting Standards Board (SASB), Task force on Climate related financial disclosures.		
Module IV: Third Party Certifications Importance & Impact of Third party Certification on business, Third party certification organizations including LEED, ISO, B-Corp, and Green Business Bureau.		

Pedagogy for course delivery:

The subject methodology will follow the teaching approach which takes into account the students' own knowledge and their self- learning. In this regard, classes focus on a combination of lectures and participatory method. The structure of each unit includes a daily compulsory reading and by oral presentations by the students which will lead to class debates, group works and other activities. These activities willbe complemented by lectures and video presentation.

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Assessment/Examination Scheme:

Components	Class Test	Home Assignment	Presentation	Attendance	End Term
Weightage	15	10	10	5	60

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Semester- IV

MSP4401	ENVIRONMENTAL GOVERNANCE AND SUSTAINABILITY	L	T	P	C
Version 1.1	Latest Approved	3	0	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Environmental problems and global environmental change are multifaceted, trans-boundary, multi-level and multi-sector issues, that need to be dealt with at all administrative levels and with an integrated approach across policy areas. By applying theories of governance, we will discuss what this may imply in practice for the policy-making and implementation of environmental politics at different levels. The course introduces key theoretical concepts useful for the understanding of environmental change as a policy problem. This course explores the crucial link between governance and sustainable development. Sustainable development has emerged as the global norm and dominant approach to reconcile the goals of economic development, environmental quality and social equity. Governance can be understood as the rules, mechanisms, processes and institutions through which important decisions are made and implemented. The course discusses the contested nature of both these concepts, and investigates how both are combined in local, national, regional and international policy-making about environment and development challenges such as poverty, global inequalities, loss of biodiversity, deterioration of global eco-systems, and the threat of climate change to human societies.

Course Objectives

The objectives of this course are to:

1. Provide the students exposure to environmental governance practices.
2. Enhance student's knowledge towards concepts of sustainable development and global institutional arrangements for the governance of different dimensions of environment
3. Familiarize students with contemporary environmental issues, including alternative sources of energy and climate change, as well as with the most important global and regional institutions that create the global environmental governance architecture.
4. Comprehend and critically discuss the contemporary sustainable development agenda.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Classify and compare different Environmental Governance practices employed by multiple factors across different levels.

CO2: Describe the rationale behind regulatory, community-based, and market/incentive-based approaches to environmental governance, as well as newer approaches in integrated governance.

CO3: Describe different initiatives and strategy for sustainable development and also able to analyze the implementation of the Sustainable Development Goals.

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CO4: Describe and understand the complexity of environmental problems, and drivers of and societal solutions to global environmental change.
CO5: Conduct analyses of Environmental Governance practices.

Modules	Blooms Level*	Number of hours
Module 1: **Introduction to the challenges and players in environmental governance:** Overview of environmental governance, Contemporary Discourses on Governance in India, problem and prospects of environmental governance in India, Democracy, Development and Governance. **Environmental Governance**: Human–Environment Interaction, Green Governance: Sustainable Human Development. Global environmental change. Governance of ecological conflicts and disasters, global ecological governance in particular in regard to climate change.		
Module 2: Good Governance Initiatives in India: Government, Governance and Public Service Delivery in India, E-Governance in India. Democratic Decentralization and Local Governance in India. People's Participation in Governance, Citizen's Charter and Right to Information in India Corporate Social Responsibility: the Indian Experience.		
Module-3: Sustainable Development: Issues and Challenges-I **Introduction to Sustainable Development:** Parameters of sustainable development, Approaches to the study of SD, Issues and challenges. **Developmental issues**: Natural resource exploitation, Patterns of Industrialization, Inequitable Growth, Global and Regional dimensions		
Module-4: Sustainable Development: Issues and Challenges-II **Initiatives towards sustainable development:** State Initiatives global initiatives, Civil Societies and Community Initiatives, **Strategy for sustainable development:** Community Knowledge, Harness Technology, Innovative Practices, Cooperation and Partnership. SDGs.		

***Bloom's Level:**
L1-Knowledge; L2-Comprehension; L3-Application; L4-Anaylysis; L5-Synthesis; L6-Evaluation
Text Books

- Environmental Governance in India by Dr. Devasish Sarkar and Ravi Ghosh. Global Vision Publishing House; 2nd edition.
- Environmental Governance in India: Issues and Challenges, by Prakash Chand Kandpal, Sage Publication.
- Governance: Issues and Challenges, by **Abhay Prasad Singh and, Krishna Murari**, Pearson Publication, 2018.
- Evans, J. P. (2011) Environmental Governance. Routledge, London.

Reference Books

- Adger, N. et al. (2003) Governance for sustainability: towards a `thick' analysis of environmental decision making, Environment and Planning A 35, pp. 1095 – 1110
- Adger, W. N. and A. Jordan (2009). Governing Sustainability. Cambridge, Cambridge University Press.
- Biermann, F, Pattberg, P. and Zelli, F. (eds). (2010). Global Climate Governance Beyond 2012: Architecture, Agency and Adaptation, Cambridge University Press.
- Evans, J. P. (2011) Environmental Governance. Routledge, London
- Glasbergen, P., Bierman, F., Mol, A. (eds) (2007) Partnerships, Governance and Sustainable Development: Reflections on Theory and Practice Cheltenham, UK: Edward Elgar Publishing.

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- Lange, P., Driessen, P.J., Sauer, A., Bornemann, B., Burger, P. (2013) Governing Towards SustainabilityżConceptualizing Modes of Governance, Journal of Environmental Policy and Planning 15(3), p403-425
- Meadowcroft, J., Langhelle, O., Ruud, A. (2012) Governance, Democracy and Sustainable Development: Moving Beyond the Impasse. Cheltenham, UK: Edward Elgar Publishing.
- Young, O. R. (2002). "Evaluating the success of international environmental regimes: where are we now?" Global Environmental Change 12(1): 73-77

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance.

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1													
CO2													
CO3													
CO4													
C05													

1: strongly related, 2: moderately related and 3: weakly related

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MSP4402	E-BUSINESS ESSENTIALS	L	T	P	C
Version 1.1	Latest Approved	2	1	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

The course aims to make the students understand the nuts and bolts of forming an e-business and prepares students to evaluate the requirements of an e-business and develop e –business plans. As business environment is witnessing so many changes every day, it gets vital for business organizations to recognize and learn to create their presence in cyber space.

Course Objectives

The objective of this course is to:

1. Introduce the students to the world of e-business, the openings and the risks and makes them learn the strategies of making businesses successful worldwide.
2. Make the students understand the nuts and bolts of forming an e-business and prepares students to evaluate the requirements of an e-business and develop e –business plans

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the digital technologies necessary for e-business.

CO2: Identify and use the database to improve business performance and decision making.

CO3: Create a web design for an e-business web portal.

CO4: Analyze the processes associated with e-payment systems, e-marketing, e-procurement and e-distribution.

Modules	Blooms level*	Number of hours
Module 1: Introduction to E-Business The impact of the electronic communications on traditional businesses, difference between e-commerce and e-business, E-business opportunities, Business adoption of digital technologies for e-commerce and e-business, E-business risks and barriers to business adoption, Management responses to e-commerce and e-business, Business models for e-commerce.		
Module 2: E-Business Web Design Elements of site design, site navigation, site structure, page and content design, web accessibility. Components of a business model, classification of business webs, comparison and valuation of networks, price formation process. Internet, intranet and extranet, choosing an ISP and Internet terminology Acquiring e-business systems, development of web based content and services, Software and services for web-site development and testing , testing process, environment, database creation and data migration, content management and maintenance		
Module 3: E-Marketing & E-Procurement E-Marketing: comparison of communication media, development model for online customers, online promotion strategies. E-procurement: strategic and operational procurement, information support for e-procurement, types, catalog management.		

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Module 4: E-Payment Systems and E-Distribution E-payments: credit card based procedures, SSL, SET, paypal and very-sign, Secure e-commerce transactions, principles, approaches to develop secure systems, digital certificates, symmetric and asymmetric encryption, digital signatures, PKI's and CA's. E-Distribution: components and types, online, offline and hybrid types, SCM and ESD: architecture, functions and services, digital watermarks.		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books*:*

1. A. Meier, H. Stormer, 2009, *E-Business and E-commerce: Managing the Digital Value Chain*, Springer
2. D. Chaffey, 2009, *E-Business and e-commerce management*, 4thed, Pearson/Prentice Hall.

References Books:

1. In Lee, 2007, *E-business innovation and Process Managemen*, Cybertech Publishing
2. A. Cordella, A. Martin, M. Shaikh S. Smithson, 2011, *Management and innovation of e-business*, London School of Economics and Political Science
3. Kenneth C. Laudon, Jane p. Laudon 2012: *Management information System: Managing the Digital Firm*, 12thed, Pearson/Prentice Hall.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	**CT**	**HA**	**C**	**V**	**A**	**EE**
Weightage (%)	**10**	**5**	**5**	**5**	**5**	**70**

C- Case Discussion/Presentation; HA - Home Assignment; V- Viva; CT - Class Test; A - Attendance; EE - End Semester Examination

CO, PO and PSO mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1													
CO2													
CO3													
CO4													

1: strongly related, 2: moderately related and 3: weakly related

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MSP4437	PROJECT-II	L	T	P	C
Version 1.1	Latest Approved			0	8
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Under this, it is usual to give the student some discretion in the choice of topic for the dissertation and the approach to be adopted. The dissertation topic is related to the field of specialization. Deciding this is often the most difficult part of the dissertation process, and requires thorough preparation and background research.

The aim of the dissertation is to provide the students with an opportunity to further their intellectual and personal development in their chosen field by undertaking a significant practical unit of activity, having an educational value at a level commensurate with the award of their degree.

Course Objectives

The objective of this course is to

1. Understand and apply theoretical frameworks to the chosen area of study.
2. Produce a coherent and logically argued piece of writing that demonstrates competence in research and the ability to operate independently**.**

Course Outcomes

On completion of Dissertation, the students will be able to

CO1: Describe a relevant area of career development, career coaching, coaching or work-related learning studies.

CO2: Identify research methods and state research questions.

CO3: Critically analyze and evaluate the knowledge and understanding in relation to the agreed area of study.

CO4: Integrate theory and practice for the development of responses on the basis of the evaluation and analysis undertaken.

CO5: Communicate in written form by integrating, analyzing and applying key texts and practices.

CO6: Demonstrate advanced critical research skills in relation to career development or work-related learning studies.

Planning the dissertation	**Blooms level***	**Number of hours**
• Selecting a topic for investigation. • Establishing the precise focus of the study by deciding on the aims and objectives of the dissertation, or formulating questions to be investigated. Consider very carefully what is worth investigating and its feasibility. • Drawing up initial dissertation outlines considering the aims and objectives of the dissertation. Workout various stages of dissertation • Devising a timetable to ensure that all stages of dissertation are completed in time. The timetable should include writing of the dissertation and regular meetings with your dissertation guide.		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis; L6-Evaluation*

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Modes of Evaluation: Viva/ Report Examination

Examination Scheme:

Components	Content & Layout of Report	Conceptual Framework	Objectives & Methodology	Implications & Conclusions	Viva-Voce
Weightage	30	10	15	15	30

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1													
CO2													
CO3													
CO4													
CO5													
CO6													

1: strongly related, 2: moderately related and 3: weakly related

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MSP4403	SUSTAINABLE ENTERPRISE DEVELOPMENT & LEADERSHIP	L	T	P	SW/FW	C
Version 1.1	Latest Approved	3	0	0	1	4
Pre-requisites/Exposure						
Co-requisites						

Course Objectives:
To examine a wide variety of leadership styles in sustainable enterprise development with the intent to investigate their long-term application to a more global visionof leadership.
To pay attention to those individuals and institutions that are changing world for better

Pre-requisites: The student opting for this course should have interest in leadership and global environment.
Course Outcomes
On completion of Dissertation, the students will be able to

CO1: Understand key concepts of global leadership
CO2: Discuss pressing global issues that require leaders' attention.
CO3: Personalize and implement the practices of altruistic leadership
CO4: Discover characteristics and challenges of leadership in the global environment
CO5: Gain insights to more effective personal leadership in cross-cultural settings

Modules	Blooms level*	Number of hours
Module I Introductions and Overview Leadership and management for sustainable enterprise development, Introductions and assessment of needs for sustainable business solution, Perspectives on global leadership and management, **Leadership and Management in a Globalized World:** Leadership with global perspective of human and ecological survival, Globalization Implications for shifts in Leadership.		
Module II Leadership Dimension **Leadership: The Individual Dimension:** The EMERGE Solution to Wicked Challenges: Public Leadership for Sustainable Development, Values Integration for Professional and Personal Grounding, From Personal to Systems Mastery :The Leadership Role Profile, **Leadership: The Team Dimension:** Team Concepts and Applications, Leadership and Followership, Cross-cultural Awareness and Communications		

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Module III Leadership: The Organizational and Societal Context **Leadership: The Organizational and Societal Context:** Inspirational Visioning: From Rhetoric to Empowerment and Action, Norming New Solutions **The Powers to Lead:** Leadership and Smart Power, Releasing the Full Potential of Followers, Convening Coalitions for the Public Good		
Module IV Building and Sustaining a Culture of Authentic Leadership: Leadership and Management Development, The Performance Learning Approach and Collective Individualism, Concluding Thoughts on Public Leadership and Management		

Pedagogy for Course Delivery
This class will be taught using a mix of theory, latest concepts from research publications in leading International Journals and the case method.

Assessment/Examination Scheme:

Components	**Project**	**Viva**	**Class Test**	**Attendance**	**End Term**
Weightage	10%	5%	10%	5%	70%

Text & References

- Brinkerhoff, D. and B. Crosby. 2002. Managing Policy Reform: Concepts and Tools for Decision Makers in Developing and Transitioning Countries Kumarian Press.
- Nye, J. S. Jr., 2008. The Powers to Lead.Oxford University Press.
- Wheatley, Margaret J. 2007. Finding our Way: Leadership for an Uncertain Time. Berrett Koehler Publishers (Paperback)

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MSP4404	CREATIVITY AND INNOVATION IN DESIGNING SUSTAINABLE SOLUTIONS	L	T	P	SW/FW	C
Version 1.1	Latest Approved	2	1	0	1	4
Pre-requisites/Exposure						
Co-requisites						

Course Objectives:

To introduce the student to the practices necessary to stimulate and manage innovation in a business for designing sustainable solutions.
To give frameworks and methods to students for designing, developing, and implementing innovation in real work situations.
To provide the perspective and skill base necessary to manage innovation-focused projects, people, and ventures.
To develop creative problem-solving skills to identify emerging opportunities and challenging conventional wisdoms.

Prerequisites:
The student opting for this course should have successfully completed the course "Entrepreneurship and New Venture Creation" offered by the university.This course focuses on the understanding the concept of innovation and creativity from a real-life perspective. The student should have a keen sense of understanding analytical thinking as the course is designed to help the students use new techniques to think creatively and innovatively.

Course Outcomes
On completion of Dissertation, the students will be able to:

CO1: Interpret and examine the impact of innovation and creativity in business.
CO2: Identify, infer and apply different creative thinking techniques and model them against principles of creative management.
CO3: Construct the processes and determinants of the successful exploitation of innovation.
CO4: Develop and formulate managerial strategies to shape innovative performance by capturing emerging trends.
CO5: Assess and evaluate creative development within an organization and support a plan of action to enhance theability to think creatively and foster innovation.

Modules	Blooms Level*	Number of hours

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Module I: Introduction to Innovation Defining innovation and its relevance in developing sustainable business solutions, Need and importance of innovation, types of innovation, innovation v/s invention, Lateral & horizontal technique of innovation, Need for Creativity and Innovation in start-ups and existing organizations, Drivers to Innovation; Barriers and Challenges to Innovation, Game changer		
Module 2: Idea Generations: Creativity & Innovation, Nature of Creativity: Person, Process, Product and Environment, Generation of ideas, Capturing & Processing of thoughts, Methods for generating and evaluating creative ideas including brainstorming, mapping, metaphors, networking,intuition, judgment and imaging		
Module-3: **Idea Conversion:** Evaluating ideas, conversion and implementation of ideas, Business Dimension of Innovation and nature of Innovation, Making the Idea a reality, Connecting the dots, Lasting & differentiating leadership, motivation & success		
Module-4: Models of Innovation: Static and dynamic models of Innovation, Incremental versus Radical innovation, Abernatty- Clark Model, Henderson Clark Model, Disruptive Technological Changes		
Module V Managing Creativity and Innovation Assessing Personal Creativity and Ability to Innovate, Enhancing Creative and Innovative Abilities, Entrepreneurial Tools for Creativity and Innovation—Exploring the Intersection, Developing and Contributingto a Creative-Innovation Team, Evolving a Culture of Creativity and Innovation in Organizations		

Pedagogy for Course Delivery:
This class will be taught using the theory and case method. In addition to assigning the case studies, the course instructor will spend considerable time in understanding the concept of innovation through the eyes of the consumer. The instructor will cover the ways to think innovatively liberally using thinkingtechniques.

List of Professional Skill Development Activities (PSDA):

i. Identifying the problem and searching for an appropriate solution through Design thinking framework
ii. Searching for newer platforms for efficacy of the idea

Components	**Mid Term**	**Term Paper**	**Home Assignment**	**Project & Viva**	**Attendance**	**End Term**
Weightage	10%	10%	5%	20%	5%	50%

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Text:

- The Seed of Innovation, Dundon E, PHI, ISBN: 978-8120332683
- Getting to Innovation, VanGundy A.B., PHI, ISBN: 978-8120335782

References:

- Sharma, Apoorv and Joshi, Manoj and Shukla, Balvinder, Is Accelerator an Option? Impact of Accelerator in Start-up Eco-System! (May 19, 2014).Available at SSRN: https://ssrn.com/abstract=2438846 or http://dx.doi.org/10.2139/ssrn.2438846
- Joshi, Manoj and Shukla, Balvinder, A Perspective of Innovation in Entrepreneurial Firms (July 28, 2014). Available atSSRN: https://ssrn.com/abstract=2442757 or http://dx.doi.org/10.2139/ssrn.2442757
- Research on Innovation: A Review and Agenda for Marketing Science, Hauser J, Tellis G J, Griffin A, Marketing Science Vol 25, No. 6, November-December 2006
- Disruptive Innovation for Social Change, by Christensen C M, Baumann H, Harvard Business Review, December 2006

Journals

- Harvard Business Review
- International Journal of Entrepreneurship and Innovation, IP Publishing
- Journal of Business Venturing - Elsevier
- Journal of Entrepreneurship in Emerging Markets, Emerald
- Technology, Innovation, Entrepreneurship and Competitive Strategy, Emerald

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MSP4405	GREEN MARKETING & ENVIRONMENTAL PRODUCT DESIGN	L	T	P	SW/FW	C
Version 1.1	Latest Approved	3	0	0	1	4
Pre-requisites/Exposure						
Co-requisites						

Course Objectives:
To explain the strategies for green marketing and to introduce students to the role of environmental marketing within society and within the economic system.
To develop student's understanding of the breadth of activities that fall within the domain of green marketing

Course Outcomes
On completion of Dissertation, the students will be able to:

CO1: Demonstrate knowledge of concepts and definitions of sustainability marketing.
CO2: Understand ways to deliver superior customer value based on sustainability principles.
CO3: Understand commercial, institutional, ecological and social perspectives of sustainability marketing
CO4: Evaluate the relationship between sustainability with marketing mix.

Modules	Blooms Level*	Number of hours
Module I: Green Marketing Strategy and the Four P's of Marketing Green marketing strategy, incorporating a green strategy into a company's vision, how sustainability works in the marketing mix, consumer market segmentation, marketing tools to help promote a brand		
Module II: Sustainable Marketing Mix 4Ps of Marketing based on sustainability principles, Consumer Target Market Segmentation, Eco-friendly environmental packaging		
Module III Environmental Product Design: Minimize materials use, Minimize the negative impact of the production process, Maximize the efficiency of the distribution process.		
Module-4: Models of Innovation: Static and dynamic models of Innovation, Incremental versus Radical innovation, Abernatty- Clark Model, Henderson Clark Model, Disruptive Technological Changes		
Module IV Tools for developing Sustainable business model Product, service, Design and packaging, Life Cycle Analysis, Design for Environment, MET Matrix, ecological footprint and environmental checklists		

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Module V Issues & Challenges Basic environmental problems, Decision making and implementing appropriate strategies to address environmental problems, Total Quality Environmental Management, Strategic Opportunities in Green Marketing		

Pedagogy for Course Delivery:
This class will be taught using the theory and case method. In addition to assigning the case studies, the course instructor will spend considerable time in understanding the concept of innovation through the eyes of the consumer. The instructor will cover the ways to think innovatively liberally using thinkingtechniques.

Assessment/Examination scheme:

Components	Mid Term	Term Paper	Home Assignment	Project & Viva	Attendance	End Term
Weightage	10%	10%	5%	20%	5%	50%

Reference Material

- The New Rules of Green Marketing: Strategies, Tools, and Inspiration for Sustainable Branding by Jacquelyn Ottman
- Green Marketing Management by Robert Dahlstrom,
- Principles of Sustainability by Simon Dresner, 2nd Edition"
- Strategies for the Green Economy: Opportunities and Challenges in the New World of Business by Joel Makower
- Natural Capitalism by L. Hunter.
- Green to Gold: How Smart Companies Use Environmental Strategy to Innovate, Create Value, and Build Competitive Advantage" by Daniel Esty

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Bachelor of Arts (Honors/ Honors with Research) in Economics
SEMESTER-I

DECO2151	MICROECONOMICS	L	T	P	C
Version 1.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is designed to expose first –year students, who may be new to economics, to the basic principles of microeconomic theory. The emphasis would be on thinking like economists & the course will illustrate how microeconomic concepts can be applied to analyze real-life situations. The course provides an introduction to a core area of economics known as microeconomics. It considers the operation of a market economy and the problem of how best to allocate society's scarce resources. The course considers how various decision-making units in the economy (individuals and firms) make their consumption and production decisions and how these decisions are coordinated. It considers the laws of supply and demand and introduces the theory of the firm and its components, production and cost theories and models of market structure.

Course Objectives

The objective of this course is to

1. Explain how competitive markets organise the allocation of scarce resources and the distribution of goods and services
2. Assess the efficiency of markets and describe the various factors that might impact efficiency
3. Distinguish between the various forms of market failure and explain how governments might need to intervene
4. Describe the various types of markets and compare their efficiency
5. Introduce a framework for learning about consumer behaviour and analyzing consumer decisions
6. Demonstrate mathematical applications of microeconomic problems and different market situations to analyze production and consumption decisions

Course Outcomes

On completion of this course, the students will be able to:-

CO1: Evaluate the basic economic theory and principles of current microeconomic issues and related policies.

CO2: Analyze economic models and relate them to realistic situations.

CO3: Comprehend their knowledge and understanding of economic issues using written, verbal and visual expression.

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CO4:Evaluate outcomes based on the costs and benefits involved.

CO5:Comprehend the broader consequences of economic decision-making.

Modules	Blooms level*	Number of hours
MODULE I: Consumer Behaviour The scope and method of economics; scarcity and choice; questions of what, how and for whom to produce and how to distribute output; Individual demand and supply schedules and the derivation of market demand and supply; shifts in demand and supply curves; the role of prices in resource allocation; Elasticity of Demand — price, income and cross; Consumer's surplus. Utility-cardinal and ordinal approaches, Indifference curves; budget constraints; Consumer's equilibrium (Hicks and Slutsky); Giffin goods; Compensated demand; Revealed preference theory; Engel curve.	L1, L2, L4	15
MODULE II: Production and Costs: Technology, Isoquants, production with one or more variable inputs, Returns to scale, short-run and long-run costs, cost curves in the short run and long run, total, average, and marginal product, cost minimization and expansion path, elasticity of substitution.	L1, L3, L4, L6	12
MODULE III: Market Structure Review of perfect competition and monopoly; Equilibrium of Firm and Industry under perfect Competition, Supply curve under perfect competition; Equilibrium of Firm under monopoly, Discriminating Monopoly, Price Discrimination, Degree of Monopoly; Monopolistic competition; Oligopoly.	L1, L3,L4,L6	12
MODULE IV: Factor Pricing Derived demand for a single input and multiple inputs in competitive & imperfect competition markets, firm demand and industry demand, collective bargaining and exploitation rent & quasi rent. Ricardian and Modern Theories of Rent.; Quasi Rent: Theories of Interest-Classical, Keynesian and Modern theories.	L1,L3,L4,L6	12
Module V: Welfare Economics Conditions of Pareto optimality in pure exchange and with production, optimality of perfect competition.	L1,L3,L4,L6-	9

Bloom's Level:
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Snyder C and W. Nicholson, Fundamentals of Microeconomics, Cengage Learning (India), 2022.
- Douglas Bernheim and Michael D. Whinston, Microeconomics, Tata McGraw-Hill (India), 2019
- Ahuja H.L. (2020) Principles of Microeconomics, 20th Edition, S. Chand& Co. Ltd.
- Robert S. Pindyk and D.L. Rubinfeld, (2018), Microeconomics, 3rd edition, Prentice Hall India.
- Koutsoyiannis, A. (1990), Modern Microeconomics, Macmillan
- W.J. Baumol, 'Economic Theory and Operations Analysis'4th edition, Prentice Hall.

Reference Books

- N. Gregory Mankiw (2017), Economics: Principles and Applications, 4th edition, India edition by South-Western, a part of Cengage Learning, Cengage Learning India Private

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- Karl E. Case and Ray C. Fair (2017), Principles of Economics, 8th edition, Pearson Education Inc., ISBN 81-317-1587-6.
- Joseph E. Stiglitz and Carl E. Walsh (2016), Economics, International Student Edition, 4th Edition, W.W. Norton & Company, Inc., New York, ISBN 0-393-92622-2.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written ExaminationExamination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	10	5	10	70

(A-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination)

CO and PO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	2	2	1	2	3	2	1	1	3	--	--
CO2	1	2	1	1	3	2	3	1	2	2	--	--
CO3	1	3	1	1	--	--	2	1	3	--	--	--
CO4	1	2	2	1	--	--	1	1	2	--	--	--
CO5	1	2	1	2	--	--	1	1	2	--	--	--

1: strongly related, 2: moderately related and 3: weakly related

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DECO2101	MATHEMATICS METHODS FOR ECONOMICS	L	T	P	C
Version 1.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure	Basic understanding of mathematical concepts				
Co-requisites					

Course Description

The main objective of the inclusion of this course in economics is to familiarize the students with basic quantitative & algebraic tools & techniques which will be needed for the understanding of the core subject and the students can apply the quantitative techniques in the analysis of economic and managerial problems.

Course Objectives

The objective of this course is to

1. Equip the students with the concepts of real numbers, sets, relations, functions, differentiation, integration, marginal utilities, marginal products, partials derivatives and linear programming.
2. Familiarize the students with economic applications of mathematical concepts. For instance, how to minimize risk, maximize profit, calculate elasticities, and consumer and producer surplus.

Course Outcomes

Upon completion of this course, the students will be able to

CO1: Define and replicate the connections between diagrammatic models and their underlying formal mathematical structures using algebra and calculus.
CO2: Compile and review derivatives of functions defined implicitly and learn the notion of differential of a function and apply it for finding approximate changes in functions.
CO3: Use the mathematical method to solve optimization problems such as cost minimization and profit maximization.

Modules	Blooms level*	Number of hours
MODULE I: Preliminaries Sets and set operations; relations; functions and their properties; Number systems; Types of functions- constant, polynomial, rational, exponential, logarithmic; Graphs and graphs of functions; Limit and continuity of functions; Limit theorems	L1,L2, L3 L4, L5, L6	8
MODULE II: Matrices and Determinants Matrices: concept, types, matrix algebra, transpose, inverse, rank; Determinants: concept, properties, solving problems using properties of determinants, the solution to a system of equations - Crammer's rule and matrix inversion method	L1,L2, L3 L4, L5, L6	10
MODULE III: Derivative of a function Rate of change and derivative; Derivative and slope of a curve; Continuity and differentiability of a function; Rules of differentiation for a function of one variable; Application- Relationship between total, average and marginal functions; Partial differentiation techniques; Geometric interpretation of partial derivatives; Partial derivatives in Economics; Elasticity of a function – demand and cost elasticity, cross and partial elasticity	L1,L2, L3 L4, L5, L6	11

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MODULE IV: Differential calculus Properties of linear homogenous functions, Euler's theorem. Problems of Maxima and Minima in Single and Multivariable functions; Constrained and unconstrained optimization with first-order and second-order conditions, Lagrangian Method, Hessian and Jacobian Matrices, Applications – utility maximization, cost minimization, profit–output maximization	L1,L2, L3 L4, L5, L6	11
MODULE V: Integration Integration - meaning and economic interpretation; Indefinite and definite integration; Simple techniques including integration by substitution and integration by parts; Applications-consumer surplus and producer surplus	L1,L2, L3 L4, L5, L6	11
MODULE VI: Linear Programming Linear Programming - Relevance and basic concepts, graphic, simplex and dual solution, Economic interpretation.	L1,L2, L3 L4, L5, L6	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Reference Books

- Knut Sydsaeter and Peter. J. Hammond (2002) Mathematics for Economic Analysis, Pearson Educational Asia: Delhi (reprint of 1st 1995 edition).
- Chiang, Alpha C. "Fundamental Methods of Mathematical Economics" (McGraw Hill).
- R.G.D. Allen. Mathematical Analysis for Economists, MacMillan, India Limited, Delhi.
- Dowling, Edward T. "Mathematics for Economists"(Schaum's Outline Series, Tata Mcgraw Hill).

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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SEMESTER-II

DECO2251	STATISTICAL METHODS IN ECONOMICS	L	T	P	C
Version 1.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description
The course teaches students the basics of descriptive statistics. It sets a necessary foundation for the study of inferential statistics in the Honors programme.

Course Objective:

1. This course will deal with all fundamental statistical methods of tools that the students have to use in economic analysis and decision-making problems.
2. The student will understand the concepts in descriptive statistics and be familiar with some commonly used statistical techniques like correlation, regression, index numbers and time series analysis.

Course Outcome:
Upon successful completion of the course, a student will be able to:
CO1: Define statistical methods and provide an insight into their uses in economics
CO2: Demonstrate the application of a range of statistical techniques to economic problems
CO3: Apply Skills in describing, analysing and interpreting statistical data
CO4: Comprehend the principles and assumptions on which these procedures are based
CO5: Apply the ability to analyse statistical data using MS Excel
CO6: Apply the ability to relate statistical methodology to economic enquiry

Modules	Blooms level*	Number of hours
Module I : Introduction: Basic concepts: Population, Sample, Parameter, Statistic, Frequency distribution, Cumulative frequency distribution; Graphic and diagrammatic representation of data; Techniques of data collection. Sampling vs. Population, primary and secondary data.	L1, L2, L3, L4, L5, L6	15
Module II: Central Tendency and Dispersion: Measures of Central Tendency: Mean, Median, Mode, Geometric mean, Harmonic mean; Measures of Dispersion; Range, Quartile deviation Mean deviation, Standard deviation; Skewness and Kurtosis, Moments.	L1, L2, L3, L4, L5, L6	12
Module III: Correlation and Regression: Correlation: Simple; Coefficient of correlation; Karl Pearson and Rank correlation; Partial and Multiple Correlation analysis; Regression analysis – Estimation of a regression line in a bivariate distribution, Least squares method; Interpretation of correlation and regression coefficients; Coefficient of determination.	L1, L2, L3, L4, L5, L6	12
Module IV: Time Series: Time Series Analysis - concept and components, determination of trend (Linear, Quadratic and Exponential) and seasonal indices	L1, L2, L3, L4, L5, L6	12

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Module V: Index Numbers Concept of an index number; Laspeyer's, Paasche's and Fisher's Index Numbers; Chain base index; Problems in the Construction of an index number; splicing; base shifting and use of index number for deflating other series.	L1, L2, L3, L4, L5, L6	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

References

Main text

1. Anderson David R, Sweeny Dennis J, Williams Thomas A. (2022) *Statistics for Business and Economics* (11th edition), Centage Learning**:** Delhi

Additional Texts:

2. Keller Gerald, Warrack Brian, (2013), *Statistics for Management and Economics*, Thomson: Singapore.
3. Douglas A. Lind, William G. Marchal, Samuel A.Wathen, (2012) *Statistical Techniques in Business & Economics*, (15th Edition), McGraw-Hill: New York
4. David M. Levine, David F. Stephan, Kathryn A. Szabat, (2017). *Statistics for Managers Using Microsoft® Excel*, (8th Edition), Pearson: Edinburg
5. **George Argyrous**, (2012). *Statistics for Research: With a Guide to SPSS.* (3rd Edition), Sage: New Delhi

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	1	3	1	1	2	2	2	3	3	--	--
CO2	1	2	--	1	1	2	2	1	2	--	--	--
CO3	1	2	-	1	1	3	3	3	-	--	--	--
CO4	2	1	--	1	1	--	2	--	--	--	3	--
CO5	2	2	-	1	1	--	--	--	--	--	2	--
CO6	2	2	--	1	1	--	--	--	--	-	--	--

1: strongly related, 2: moderately related and 3: weakly related

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DECO2201	INDIAN ECONOMY	L	T	P	C
Version 1.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This subject covers the major features of the Indian Economy at Independence in the field of agriculture industry and other infrastructure of the economy. It also deals with the growth of development of different phases on the current issues in Indian economic policy.

Course Objectives

The objective of this course is to

1. To Understand the various aspects of India's economy.
2. To Develop a perspective on the different problems and approaches to economic planning and development in India
3. To Understand the role of the Indian Economy in the global context, and how different factors have affected this process
4. To Know the development process in India after independence
5. To Understand the problems and measures in their contextual perspective
6. To Identify and analyse current issues and policy formulation

Course Outcomes

Upon completion of this course, the students will be able to

CO1: Explain the Historical Growth and Development of the Indian Economy
CO2: Assess the Concept and Development of Economic Planning in India
CO3: Interpret the major Economic Issues related to Poverty and Unemployment
CO4: Assess and analyse the Concept and Functioning of India's External Sector
CO5: Assess and analyse the Development of the Industrial Sector in India.

Modules	Blooms level*	Number of hours
MODULE I: Economic Development on the Eve of Independence Major features of the economy at the time of independence: Colonial economy; Semi-feudal economy; Backward economy; Stagnant economy	L1, L2,	8
MODULE II Planning in India Objectives; Strategy; Broad achievements and failures; Five Year Plans — objectives, allocation and targets; New economic reforms — Liberalization, privatization and globalization; Rationale behind economic reforms; Progress of privatization and globalization; NITI Aayog and latest developments; Viksit Bharat@2047	L1, L2,	10
MODULE III: Major Economic Issues Poverty Alleviation; Unemployment; Inequality -Disparities between urban and rural areas, as well as among different states, have been a major issue, Infrastructure Deficiency- in sectors like transportation, energy, and healthcare; Corruption- public services, government projects, and business operations. Environmental Sustainability-sustainable development practices and policies to balance economic growth with environmental conservation. Globalization and	L1, L2	10

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Trade Balance.		
MODULE IV: External Sector Role of foreign trade; Trends in exports and imports; Composition and direction of India's foreign trade; Balance of payments crisis; Export promotion measures and the new trade policies to benefit the domestic economy.	L1,L2, L4	10
MODULE V: Agriculture Nature and importance; Trends in agricultural production and productivity; Factors determining productivity; Land Reforms; New agricultural strategy and green revolution, current issues in the agricultural sector	L1,L2	10
MODULE VI: Industry and Service Industrial development during the planning period; Industrial policy of 1991 and the latest Industrial policies; Growth and problems of MSMEs; Role of public sector enterprises in India's industrialization. Service Secor in India – Overview, market size, growth, contribution to India's GDP	L1, L2	12

loom's Level:
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Kapila, U., (Ed.) (2020). Indian Economy Since Independence, Academic Foundation: New Delhi.
2. Ashima Goyal (2020) A Concise Handbook of the Indian Economy in the 21st Century, 2nd ed, OUP
3. Datt and Sundaram, (2020) Indian Economy, 72nd edition, S.chand: New Delhi.
4. Ramesh Singh (2020) Indian Economy 12th ed. McGraw Hill Education (India) Private Limite
5. Mishra & Puri(2022) Indian Economy, Himalayan Publishing House, Bombay
6. Government of India, Economic Survey(annual) New Delhi
7. Reserve Bank of India, Handbook of Statistics of Indian Economy(Annual)

References:

1. Rajesh Kumar and Murali Patibandla (eds) (2009) Institutional Dynamics and the Evolution of the Indian Economy, Palgrave
2. Yashwant Sinha, Vinay K. Srivastava (2017) The Future of Indian Economy_ Past Reforms and Challenges Ahead, Rupa Publications
3. NILANJAN BANIK (2015) The Indian Economy A Macroeconomic Perspective, Sage
4. Matthew McCartney (2019) The Indian Economy, Agenda Publishing
5. Sri Ram Srirangam, et.al (2020) Indian Economy, Pearson
6. Jnakarajan et al (2015)Indian Economy in Transition, Sage
7. T.C.A. Srinivasa Raghavan (2019) All the wrong turns: A perspective on Indian Economy, Westland Publications
8. Aggarwal N(2016). Indian Economy Problems of Development and Planning, Wishwa Parkashan, New Delhi.
9. B.A. Prakash (2011) The Indian Economy Since 1991_ Economic Reforms and Performance, Pearson.
10. Bagchi, A. (1982). The Political Economy of Underdevelopment in India, Cambridge University Press: Cambridge.
11. Bardhan, P. (1984). The Political Economy of Development in India, Oxford University Press: New Delhi.
12. Brahmandnda, P. R. and V. R. Panchumkhi, (Eds) (1987). The Development Process of the Indian Economy: Himalaya Publishing House, Bombay.
13. Dandekar, V. M. & N. Rath. Poverty in India; Indian School of Political Economy, Bombay.
14. Datta, Bhab atosh (1977). The Contents of Economic Growth, and Other Essay, Research India Publication, Calcutta.

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	10	5	10	70

(A-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination)

CO and PO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2	2	--	--	--	--	2	2	--	--
CO2	1	2	2	2	2	--	--	--	2	--	--	--
CO3	2	2	2	3	3	--	--	--	2	--	--	--
CO4	3	3	--	--	2		--	--	2	--	--	--
CO5	3	3	--	--	2	2	--	--	2	--	--	--

1: strongly related, 2: moderately related and 3: weakly relate

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SEMESTER-III

DECO2351	MACROECONOMICS	L	T	P	C
Version 1.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

The objective of the course is to provide students with a thorough understanding of the principles of economics that apply to an economic system as a whole. This course aims to introduce the fundamentals of Macroeconomic theories, policies and models from a historical perspective. It deals with totals or aggregate measures of the economy, like national income or average unemployment rates, aggregate consumption, aggregate investment, etc. Macroeconomics asks how economic aggregates are determined, why problems related to aggregate economic performance occur, and what government can and should do to overcome such problems. Throughout the course, a focus will be on 'critical thinking' to analyze macroeconomic problems

Course Objectives

The objective of this course is to

1. This course aims to introduce the fundamentals of Macroeconomic theories, policies and models from a historical perspective.
2. To enable the students to develop a critical insight on Classical and Keynesian macroeconomic models.
3. To understand the relationship between inflation and employment by providing exposure to the constructions of Friedman, Phelps & Phillips.

Course Outcomes

Upon completion of this course, the students will be able to

CO1: Analyse the factors determining gross domestic product, employment, the general level of prices and interest rates.

CO2: Critically Evaluate Economic Theories.

CO3: Apply Theories of Money and Investment to assess the functioning of financial markets.

CO4: Evaluate Consumption Theories in the context of changing economic conditions and individual behaviour.

CO5: Analyze inflation types, business cycle theories, and the effectiveness of economic policies in stabilizing the economy.

CO6: Demonstrate a deep understanding of market equilibrium, both in the product and money markets and its relevance to macroeconomic stability.

Modules	Blooms level*	Number of hours
MODULE I: Introduction & National Income Accounting The roots of macroeconomics, macroeconomic concerns, the role of government in the macro economy, the components of the macro economy, the methodology of macroeconomics; Concepts of GDP and national income, approaches to calculating GDP, GDP and personal income, Nominal and real GDP, Limitations of the GDP concept.	L1, L3,L4, L6	8

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MODULE II: Income and Employment Determination Determination of Income and Employment, Classical Theory of Income and employment, Say's law of Markets; Wage Price Flexibility; Implication of Classical Theory; Keynes Theory of Income and employment; Theories of Demand for Money: Quantity Theory and Keynes approach; Characteristics of a monetary economy; the supply of money and overall liquidity position; credit creation	L1, L3,L4, L6	12
MODULE III: Consumption Theories Consumption function; theory of investment-marginal efficiency of capital; saving and investment; The Investment Multiplier and its application to LDC's; Income Consumption Relationship-Absolute Income Hypothesis, Relative Income Hypothesis; Permanent Income Hypothesis, Life Cycle Hypothesis	L1, L3,L4,L6	10
MODULE IV: Investment Theories Types of Investment; Classical & Keynes Approach; Multiplier- Concept of Multiplier, Leakages in Multiplier; Concept of Acceleration.	L1,L3,L4,L6	10
MODULE V: Inflation & Business Cycle Inflation: types, causes, consequences and impact on the Indian economy; remedial measures; Fiscal policy: objectives, targets, instruments and implications on an economy. Monetary policy :objectives, targets, instruments and implications on an economy. Business Cycle Theories of Schumpeter, Kaldor, Samuelson and Hicks; Control of business cycles –relative efficacy of monetary and fiscal policies	L1,L3,L4,L6	10
MODULE VI: Equilibrium of Product Market and Money Market Theory of Interest; IS and LM curves: Derivation, shifts and rotations. Simultaneous equilibrium of product market and money markets..	L1,L3,L4,L6	10

Bloom's Level:
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Mankiw, N. (2022). Macroeconomics, 11th ed. Worth Publishers
2. Macro Economics Theory and Policy, H.L. Ahuja (2019)
3. Dornbusch, Fischer and Startz, Macroeconomics, McGraw Hill, 11th edition, 2010
4. Ahuja H.l. (2010) Macroeconomics: Theory and Policy, S. Chand& Co. Ltd.
5. Mc Connell. C.R & H.C. Gupta, "Introduction to Macro Economics", Tata McGraw Hill, Delhi

Reference Books

1. J.E. Stiglitz, and C.E. Walsh (2002), Principles of Economics, 3rd Edition, W.W. Norton & Company, New York.
2. R. Stone and G. Stone (1977), National Income and Expenditure,10th edition, Bowes and Bowes London.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	10	5	10	70

(A-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination)

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CO and PO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2	2	--	--	--	--	2	2	--	--
CO2	1	2	2	2	2	--	--	--	2	--	--	--
CO3	2	2	2	3	3	--	--	--	2	--	--	--
CO4	3	3	--	--	2	--	--	--	2	--	--	--
CO5	3	3	--	--	2	2	--	--	2	--	--	--
CO6	2	1	2	1	1	--	--	--	--	--	--	--

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DECO2301	AGRICULTURAL ECONOMICS	L	T	P	C
Version 1.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This subject is aimed at providing knowledge on the agricultural economy of India and developing a critical study on recent agricultural crises in India. As an introductory course on the basics of the agricultural economy of India, it enables the students to learn the importance of agriculture in the economy of India. This course explores the economic principles and theories applied to agriculture in the unique context of India. Students will analyze agricultural policies, market structures, technology adoption, rural development, and sustainability issues within the Indian agricultural sector. The course also covers key challenges and potential solutions to enhance agricultural productivity, income, and rural livelihoods in India.

Course Objectives

The objective of this course is to

1. This subject is aimed at providing knowledge on the agricultural economy of India, its development, productivity, rural indebtedness and defects in the agricultural market and to develop a critical study on recent agricultural crises in India.
2. To familiarize the agricultural situation in India to provide a sound knowledge base on India's Agricultural economy before the green revolution and after it.
3. It will enhance the conceptual knowledge in finding the relationship between Agriculture and the economic development of the country.

Course Outcomes

On completion of this course, the students will be able to

CO1: Identify the Features and Importance of Agriculture in the Indian Economy.
CO2: Track the History of Agriculture Development in India.
CO3: Assess the Concept and features of Agriculture Marketing in India.
CO4: Analyse the Issues and Growth-related aspects of the Indian Agriculture Sector.

Modules	Blooms level*	Number of hours
MODULE I: Agriculture in the Indian Economy Features of Agriculture - Importance of Agriculture in the Indian Economy – Relationship between Agriculture and Non-Agriculture sectors, Agricultural Geography of India, Agro-climatic Zones and Crop Pattern in India	L1, L2, L6	8
MODULE II: Issues of Agricultural Development in India Agriculture Development in India - Subdivision and Fragmentation of holdings in India and causes - Land Tenure and Land Reforms Productivity in Agriculture - Factors of Production in Agriculture: Land, Labor, Capital, and Technology, Input-Output Analysis in Agriculture New Agriculture Strategy - Green Revolution - Nature of Food Economy - Agriculture Price Policy in India - Public Distribution System	L1, L2 , L6	13

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MODULE III: Agricultural Finance and Marketing Rural Credit and Microfinance, Rural Indebtedness - Causes of Rural Indebtedness - Sources of Agricultural Finance. Agricultural Market Structure in India, Market and Marketed Surplus - Defects in marketing Agricultural produce – Regulated markets - Co-operative marketing - Farmers Market. , Farmers Producers Organizations FPO and their role in Indian Agriculture, Price Determination and Market Integration, Export-Import Policies and Challenges in Agricultural Trade	L1, L2, L6	12
MODULE IV: Agricultural Policies, Subsidies, and Sustainability Evolution of Agricultural Policies in India, Agricultural Subsidies and their Impact, Crop Insurance Schemes and Price Support Mechanisms, Sustainable Agricultural Growth - Concepts & Constraints, Sustainable Agricultural Growth in Eastern India, New Farm Laws and Further Developments, Doubling of Farmers' Income, Current Issues in Haryana Agriculture, Challenges and Opportunities in Indian Agriculture.	L1, L2,L4, L6	14
Module V: Agricultural Technology, Trade, and Future Challenges Government Policies and Programs for Agricultural Development, Current Level of Agricultural Technology in India, Water Management and Irrigation Techniques, Climate Change and Its Impact on Indian Agriculture, Precision Agriculture and Technology Adoption Agri-Entrepreneurship and Start-ups in Agriculture, Case studies of successful agri-startups and their contributions to the sector, India's Role in World Agricultural Trade, WTO and Indian Agriculture	L1, L2,L4, L6	13

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Main Readings.

- Paroda RS.(2018). **Reorienting Indian Agriculture: Challenges and Opportunities**, Boston: CABI
- Seema Bathla, Amaresh Dubey (2017) **Changing Contours of Indian Agriculture: Investment, Income and Non-farm Employment**, (Ed) Springer: Singapore
- Prabhu Pingali et.al (2019) Transforming Food Systems for a Rising India, Palgrave Studies in Agricultural Economics and Food Policy, **https://doi.org/10.1007/978-3-030-14409-8**
- Government of India (2017) **Report of the Committee on Doubling Farmers' Income** (All 14 Volumes), Ministry of Agriculture & Farmers' Welfare, New Delhi. Accessible at **https://agricoop.nic.in/en/doubling-farmers**
- Ramesh Singh (2020), **Indian Economy**, 12th edition. McGraw Hill Education (India) Private Limited
- Ruddar Dutt and K P M Sundaram (2018), **Indian Economy,** S. Chand & Co. Ltd, New Delhi.
- Uma Kapila, (2019) **Indian Economy: Performance and Policies.** 20th edition, Academic Foundation: New Delhi
- NITI Aayog (2023) *A New Paradigm for Indian Agriculture: From Agroindustry to Agroecology,* New Delhi.

Additional Readings:

- Ashok Gulati (2000), Indian Agriculture in an Open Economy: Will it Prosper?
- Ahluwalia & Little (eds) *India's Economic reforms & development: Essay for Manmohan Singh,* Oxford University Press.

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- Ashok Gulati, Devesh Kapur, Marshall M Bouton, (2020) 'Reforming Indian Agriculture' *Economic & Political Weekly* vol lV no 11 March EPW
- Ramesh Chand (2019) 'Transforming Agriculture for Challenges of 21st Century' Presidential Address, Indian Economic Association.
- Pradip Kumar Biswas, Panchanan Das (2019) *Indian Economy: Reforms and Development* Springer: Singapore
- Yoginder K Alagh (2021) 'Globalisation and the Indian Farmer', *Economic & Political Weekly*, July 10, vol LVI No 14
- Srijit Mishra, Kaushiki Singh (2021) Scale Neutrality in Indian Agriculture, *Economic & Political Weekly, June 26, vol LVI nos 26 & 27*
- Ashok Gulati, Seema Bathla (2001) Capital Formation in Indian Agriculture Re-visiting the Debate, *Economic & Political Weekly, May 19.*
- Government of India, *Economic Survey* (refer to last Five years' reports), Ministry of Finance Department of Economic Affairs, Economic Division. Available at: **https://www.indiabudget.gov.in/economicsurvey/**
- Ashok Gulati, Pritha Banerjee (2020) Goal Setting for Indian Agriculture, *Economic & Political Weekly*, FEBRUARY 29, vol LV 34 no 9.
- S. Mahendra Dev (2018) Transformation of Indian agriculture? Growth, Inclusiveness and Sustainability, Indira Gandhi Institute of Development Research, Mumbai

Other readings:

i. Economic and Political Weekly
ii. Indian Journal of Agricultural Economics

Students are advised to keep up-to-date on the subject matter by reading articles published in newspapers, magazines, FAO newsletters, and even checking out the Websites of the Ministry of Agriculture, FAO and NITI Aayog etc.

Web Resources:

https://niti.gov.in/
http://www.mospi.gov.in/

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	2	3	3	--	--	--	--	2	--	--	--
CO2	2	2	--	3	3	--	--	--	2	3	--	--
CO3	2	3	--	2	3	--	--	--	3	--	--	--
CO4	2	2	3	3	--	--	--	--	3	--	--	--

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SEMESTER-IV

DECO2451	PUBLIC FINANCE	L	T	P	C
Version 1.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This subject is primarily aimed at introducing principles of public finance, the role of different governments, public expenditure, taxation, budget and fiscal policy in India. The government plays different roles and performs varied functions which are different from earlier societies. In this context, the public financial functions of the government need to be understood by a student, by studying the relevant theory, empirical analysis and functioning of modern public finance.

Course Objectives

The objective of this course is to

i. Understand the role and functions of government in an organized society.
ii. Provide the students with an in-depth understanding of public revenue, public expenditure and public debt management.
iii. Provide the students with an understanding of budget and fiscal federalism with practical experience in the Indian context.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Demonstrate the economic and regulatory functions of the government and its significance in an organised society,
CO2: Examine the impact of government policies on taxation, expenditure and public debt.
CO3: Analyze the Union Budget of India and its macroeconomic implications in a federalism.

Modules	Blooms level*	Number of hours
MODULE I: Introduction Nature, Scope and Importance of Public Finance; Public Finance and Private Finance – Similarities and Dissimilarities; Theory of Maximum Social Advantage; Private goods, Public goods and Merit goods; Economic systems – Characteristics, Role of government in managing the economy under different economic systems; Market failure, Externalities – Problems in allocation of resources.	L1, L2, L4	10
MODULE II: Public Revenue Public Revenue - Sources of Public Revenue; Tax and non-tax revenue; Objectives of Taxation; Canons of Taxation; Characteristics of a good Tax system; Types of Taxes – Direct and Indirect; Proportional, Progressive, Regressive and Degressive taxes; Impact, Shifting and Incidence of Taxation; Effects of taxation; Benefit and ability-to-pay approaches; Subjective approach of ability to pay principle; Requirements of a sound tax system; Indian Tax Structure – VAT, GST; Chelliah Committee Report - Evaluation of Tax Reforms	L1, L3, L4, L6	12
MODULE III: Public Expenditure	L1, L3, L4,	14

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Public Expenditure – Meaning and Scope, Structure and growth of public expenditure; Wagner's Views on Public Expenditure; Peacock - Wiseman Hypothesis; Objectives of Public Expenditure (Musgrave's View), Canons of Public Expenditure; Effects of Public Expenditure; Growth of public expenditure in India; Role of public expenditure in development of the economy; Social cost-benefit analysis.	L6	
MODULE IV: Public Debt Public Debt: Meaning, objectives and Classification; Impact of Public Debt on the Economy; Causes and Consequences of public debt accumulation. Burden of Public debt; Methods of debt redemption. Debt Sustainability: Measures to assess and manage public debt sustainability. Debt Management Strategies: Approaches to debt management and their implications. Indian Public Debt Scenario: Analysis of India's public debt and strategies for prudent management. Budget: Principles of budgeting; Budgetary procedure; Types or Classification of budget – Revenue and Capital Budget, Balanced and Unbalanced budget	L1, L3, L4, L6	14
Module V: Fiscal Policy Objectives of Fiscal Policy; Role of Fiscal Policy in India; Factors that Affect Fiscal Policy – Roles of Multiplier and Accelerator, Roles of Taxation and Public Expenditure. Fiscal Policy-Economic Growth and Distribution Justice – Fiscal Policy and Economic Growth, Fiscal Policy and Distributive Justice. Impact of Deficit Financing policies on the economy – Effects on growth, employment, Income. Functions of Finance Commissions, (15th and 16th); Planning Commission; State Finance Commissions and Local Self Government finance.	L1, L3, L4, L6	10

Bloom's Level:
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Musgrave, R.A. and P.B. Musgrave (2017), *Public Finance in Theory and Practice*, 5th Edition, McGraw- Hill Kogakusha, Tokyo.
- Bhatia, H. L. (2022). *Public Finance* (31st Ed.): New Delhi: Vikas Publishing House.
- Bagchi, A. (2005). *Readings in Public Finance*. Oxford: Oxford University Press.
- Jha, R. (2010). *Modern Public Economics* (2nd ed.). London: Routledge.
- Cullis, J. & Jones, P. (2009). *Public Finance & Public Choice*, New York: Oxford University Press.

Reference Books

- Atkinson, A., & Stiglitz, J. E. (2015). Lectures on Public Economics. Princeton: Princeton University Press.
- Basu, K. (2016). An Economist in the Real World: The Art of Policymaking in India. New Delhi: Viking books.
- Cullis, J., & Jones, P. (2009). *Public Finance & Public Choice* (3rd ed.). New York: Oxford University Press.
- Chellia, R. J. (1981). *Trends and Issues in Indian Federal Finance*. New Delhi: National Institute of Public Finance and Policy.
- Stiglitz. J. E., & Rosengard, J. K. (2015), Economics of the Public Sector (4th ed.). New Delhi: W. W. Norton & Co Inc.
- Jalan, J., Marjit. S., &Santra, S. (2016). *India Public Finance and Policy Report 2016: Fiscal Issues and Macro Economy*. New Delhi: Oxford University Press.

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- Government of India, Report of the 14th, 15th and 16th Finance Commission.
- Economic Survey, Government of India (latest).
- State Finances: A Study of Budgets, Reserve Bank of India (latest). https://rbi.org.in/Scripts/AnnualPublications.aspx?head=State%20Finances%20:%20A%20Study%20of%20Budgets

Modes of Evaluation: Quiz/Assignment/ Seminar/Written ExaminationExamination Scheme:

Components	A	P	HA	CT	EE
Weight age (%)	5	10	5	10	70

(A-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination)

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2	2	3	3	--	--	1	1	3	--
CO2	1	1	3	2	1	2	3	--	1	1	3	--
CO3	1	1	2	1	3	3	3	3	1	1	2	--
CO4	2	1	2	3	3	2	3	2	1	1	1	--

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DECO2401	RESEARCH METHODOLOGY	L	T	P	C
Version 1.1	Date of Approval:	2	0	0	2
Pre-requisites/Exposure	Statistics for Economics				
Co-requisites					

Catalog Description

The course imparts skills to undertake data-based research. The student would develop, in addition to the deep knowledge of the use of scientific method(s) in knowledge generation, competency in executing sample surveys and reasonable exposure to a variety of secondary data sources and analysis of the data collected.

Course Objective:

To provide exposure to the students about the nature and extent of research orientation, which they are expected to possess when they enter the industry/organization as practitioners. To give them an understanding of the basic techniques and tools of Economics research. The objective of the course is to equip students with designing and adhering to the appropriate methodology for conducting quality research and familiarizing the students with different techniques for research related to economic issues.

Course Outcome:

On completion of this course, the students will be able to:

CO1: Apply scientific research methods and techniques in dealing with issues in Applied Economic Research.

CO2: Identify a research problem, prepare the research design, collect & analyse of data and writing of research reports with a focus on problem-oriented Applied Economics research in India.

CO3: Prepare research proposal for the dissertation work/ get research funding from agencies

CO4: Apply the key analytical techniques of the discipline of Statistics with confidence and use them to support and enhance the outcome of research work.

CO5: Analyze and take initiative in research activities at a professional level take up own research projects and manage a research team.

Modules	Blooms level*	Number of hours
MODULE I: Introduction Meaning and definition of research- classification of research (pure, applied, exploratory, descriptive, historical, diagnostic, experimental, qualitative, quantitative) - importance, applications and limitations of social science research- interdisciplinary and trans-disciplinary approaches Statistics and information - communication technology in research- Basic elements of the scientific method- theory and research- the meaning of methodology	L1, L2, L3, L4, L5, L6	9
Module II: Research problem and design An overview of the different steps in the research process - Selection of the topic and formulation of the research problem in Economics with illustrations- review of literature- Research design, features of a good design-different research design for exploratory, descriptive, diagnostic and experimental research	L1, L2, L3, L4, L5, L6	8

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Module III: Collection and analysis of data Sample design- probability and non-probability sampling- complex random sampling designs- Methods of collecting primary data- questionnaire and schedules- sources of secondary data on Indian economy- case study method -processing of data- sources of hypothesis-Testing of hypothesis – procedure for testing hypothesis-one tailed and two-tailed tests – basics of the important parametric and non-parametric tests- basic awareness of SPSS	L1, L2, L3, L4, L5, L6	8
Module IV: Interpretation and preparation of the report Interpretation, drawing conclusions and reporting it structure of the research report- Types of reports- Methods of footnotes and referencing	L1, L2, L3, L4, L5, L6	5

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Don Ethridge (2004) Research Methodology in Applied Economics: Organizing, planning, and Conducting Economic Research, Black well publishing, Iowa
2. Jill Collis, Roger Hussey, (2014), Business Research: A Practical Guide for undergraduate and postgraduate students (4th Edition), Palgrave Macmillan, New York.

Reference Books

1. Ranjit Kumar S., (2005), Research Methodology: A Step-by-Step Guide for Beginners, (2nd ed), Sage Publications, New Delhi.
2. William G. Zikmund, (1994), Business Research Methods, (3rd e.d.), The Dryden Press, New York.
3. William M. K. Trochim, (2003), Research Methods, (2nd ed), Biztantra, New Delhi.
4. Maxim Paul S. (1999), Quantitative Research Methods in the Social Sciences, Oxford University Press, New York.
5. Neuman, W.L. (1994), Social research methods: Qualitative and Quantitative approaches, (2nd ed), Allyn &Bacon, Needham Heights, Mass.
6. Donald C. Cooper, Pamela S. Schindler, (2006), Business Research Methods, (9th ed), McGraw-Hill, Boston

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Mapping Matrix – CO, PO and PSO

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	1	--	3	2	1	--	3	2	1	1	3	--
CO2	1	1	--	3	2	1	--	3	2	1	1	3	--
CO3	1	1	--	3	2	1	--	3	2	1	1	3	--
CO4	1	1	--	3	2	1	--	3	2	1	1	3	--
CO5	1	1	--	3	2	1	--	3	2	1	1	3	--

1: strongly related, 2: moderately related and 3: weakly related

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DECO2402	BANKING AND FINANCIAL INSTITUTIONS	L	T	P	C
Version 1.1	Date of Approval:	1	1	0	2
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

In this course, the students are provided with substantive knowledge regarding the various banking and financial institutions operating in the country. Enumerating various types of financial instruments, financial institutions, and financial services within the Indian financial landscape. Thereafter comprehensive analysis of central banking, commercial banking and development banks are done for students to get comprehensive knowledge on the same. The next phase deals extensively with prevailing financial practices and the working of other non-banking financial institutions including major insurance companies. Finally, a detailed appraisal of the regulatory framework associated with the financial market is made. The overall aim of this course is to make the students familiar with meaningful knowledge about the changing paradigm in the banking and financial sector.

Course Objectives

The objective of this course is to

1. Make the students aware of theoretical concepts related to the origin and functionalities of banking and financial institutions with special reference to the regulatory framework.
2. Provide students with extensive exposure to the prevailing practices and major players in the banking and financial sector in the country.

Course Outcomes

On completion of this course, the students will be able to

CO1: Understand the theoretical concepts related to the origin and functionalities of banking and financial institutions, and the regulatory framework that governs them.

CO2: Analyse and evaluate the roles and functions of different types of financial institutions, such as commercial banks, investment banks, and credit unions.

CO3: Synthesize and apply theoretical knowledge to critically assess and propose solutions to real-world issues and challenges in the banking and financial sector.

CO4: Explore contemporary issues and challenges faced by the banking and financial industry, such as digital banking, fintech innovations, and changing customer preferences.

CO5: Identify and explain the major regulatory bodies and frameworks that oversee the banking and financial sector, including their roles and responsibilities.

Modules	Blooms level*	Number of hours
MODULE I: Indian Financial System Introduction to financial systems; Indicators of financial development; components of financial system: financial markets, financial instruments, financial institutions and financial services; role, functions, and types of financial institutions.	L1, L2,	6
MODULE II: Banking Institutions Banks- concept, classifications, objectives, and functions. Structure of the Indian banking system: Central Bank (Reserve bank of India), Commercial banks and the nationalisation of commercial banks, Cooperative banks, Regional Rural banks, Development banks, NABARD, SFBs, and Microfinance Institutions	L1, L2, L4	6

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MODULE III: Non-Banking Financial Institutions Non-banking financial companies (NBFCs), Insurance companies: Life Insurance Corporation (LIC), General Insurance Corporations; Mutual Funds; Hedge Funds.	L1, L2	6
MODULE IV: Innovation in Banking and Financial Sector E-banking and e-trading services; decentralized finance- 'de-fi'; fintech platforms, role of artificial intelligence in the digital transformation of the banking and financial services.	L1, L2, L4	6
MODULE V: Regulatory Framework Legal framework of regulation of banks; the Banking Regulation Act, 1949 and its main amendments; reforms in the banking sector post 1991; financial sector reforms; Regulatory bodies: RBI, SEBI, IRDA.	L1, L2, L3, L4	6

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Bhole, L., Mahukud, J. (2017). Financial institutions and markets, 6th ed. Tata McGraw-Hill.
- Bharti, P. (2018). Indian Financial System, 5/e. Pearson Education India.

Reference Books

- Fabozzi, F., Modigliani, F., Jones, F., Ferri, M. (2010). *Foundations of financial markets and institutions*, 4th ed. Pearson Education.
- Khan, M. (2015). *Indian financial system*, 9th ed. Tata McGraw-Hill.
- Mishkin, F., Eakins, S. (2017). *Financial markets and institutions*, 8th ed. Pearson.
- Harvey, C. R., Ramachandran, A., & Santoro, J. (2021). *DeFi and the Future of Finance*. John Wiley & Sons.
- Vigna, P., & Casey, M. J. (2016). *The age of cryptocurrency: how Bitcoin and the blockchain are challenging the global economic order*. Macmillan.
- Various latest issues of RBI Bulletins, Annual Reports, Reports on Currency and Finance, and Reports of the Working Group, IMF Staff Papers.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	10	5	10	70

(A-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination)

CO and PO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	2	--	1	1	2	2	--	--	1	3	2	--
CO2	1	2	--	1	1	2	2	--	--	1	3	2	--
CO3	1	2	--	1	1	2	2	--	--	1	3	2	--
CO4	1	2	--	1	1	2	2	--	--	1	3	2	--

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SEMESTER-V

DECO2551	INTERNATIONAL ECONOMICS	L	T	P	C
Version 1.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

The course provides a strong foundation in the various theories of international economics. It also enables the understanding of the trade policies and practices adopted in various countries as well as the impact of the same. The course exposes the students to the forms of economic integration in theory and practice. The module on the structure of the balance of payments and foreign exchange markets gives an in-depth understanding of the same and the issues therein. The course concludes with a detailed discussion of the international monetary system and the economic crises in recent times.

Course Objectives

The objective of this course is to

1. Introduce the different theories about international trade.
2. Enhance the understanding of trade policies and practices adopted globally.
3. Understand how cross-country differences in endowment and technology determine the world trade pattern and why similar countries also trade with each other.
4. Comprehend the interlinkages between the balance of payment, foreign exchange markets, financial liberalization and economic crises.
5. Provide a theoretical and practical understanding of the forms and effects of economic integration.

Course Outcomes

On completion of this course, the students will be able to:
CO1: Demonstrate a strong foundation in the theories of international economics.
CO2: Examine the trade policies and practices adopted globally.
CO3: Apply economic reasoning to issues of the day surrounding globalization.
CO4: Interpret the causes and consequences of economic crises and other issues that have occurred globally in recent times.
CO5: Analyse the effects of economic integration on the economy.

Modules	Blooms level: l*	Number of hours
MODULE I: Introduction and International Trade Theories Meaning, Nature and Scope of International Economics; The Subject Matter of International Economics; Theories of International Trade: Trade Based on Absolute Advantage; Trade Based on Comparative Advantage; Haberler's Opportunity Cost Theory; Mill's Reciprocal Demand Theory; Factor Endowment Theory: Heckscher Ohlin Theorem; Factor Price Equalisation theorem; Leontief paradox. Intra-industry trade.	L1, L3, L4, L6	12
MODULE II: Gains from Trade Gains from Trade: Distribution of Gains; Special Gains to Small Countries; Disadvantages/Problems of Trade; Factors affecting Gains from Trade; The Basis for and the Gains from Trade with Increasing Costs; Trade Based on	L1, L3, L4, L6	12

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Differences in Tastes; The Equilibrium Relative Commodity Price with Trade; Partial Equilibrium Analysis & General Equilibrium Analysis.		
MODULE III: Terms of Trade Terms of Trade: Types of Terms of Trade; Different Concepts of Terms of Trade; Factors Affecting Terms of Trade; Problems of Measurement of Terms of Trade; Economic Growth and International Trade: Effects of Growth on Trade – Production and Consumption effects. Effects of growth on terms of trade; Immiserating growth; Increase in factor endowments and International Trade: Rybczynski theorem; Harmful Effects of Trade.	L1, L3, L4, L6	12
MODULE IV: The Balance of Payments, Foreign Exchange Rates Balance of Payments: Principles; Disequilibrium in BOP, BOP Crisis in India in 1991. Functions of the Foreign Exchange Markets; Foreign Exchange Rates; Purchasing Power Parity Theory; Stable and Unstable Foreign Exchange Markets. Fixed v/s Flexible Exchange Rate. Role of RBI in foreign exchange management.	L1, L3,L4,L6	12
Module V: Economic Integration Meaning of Economic Integration, Trade-Creating Customs Unions; Trade-Diverting Customs Unions; The Theory of the Second Best and Other Static Welfare Effects of Customs Unions; EU, ASEAN, SAARC, BRICS, G7, G20, Multilateralism; WTO; New outlook towards a global trading system.	L1, L3, L4, L6	12

Bloom's Level:
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Salvatore, D. (2021). *International Economics: Trade and Finance*. (13th ed.). Oxford: John Wiley International Student Edition.
2. Kindleberger, C.P, & Obstfeld, M., Melitz, M.J. (2020). *International Economics: Theory and Policy*, 11th Edition, New Delhi: Pearson Education.
3. Cherunilam, F. (2020). *International Economics*, 6th Edition, Tata McGraw-Hill Publishing Company, New Delhi.
4. Jhingan M. L. (2022). *International Economics*, 7th Edition, Vrinda Publications (P) Ltd. Delhi.

Reference Books:

1. Bowen, H., Hollander A. &Viaene J. (2012). Applied International Trade Analysis. London: Macmillan Publication.
2. Meade, J.F. (1964). *Theory of International Policy*, Volume II. London: Oxford University Press.
3. Marrewijk, C.V. (2007). International Economics: Theory, Application and Policy. Oxford: Oxford University Press.
4. Dornbusch, R. (1980). *Open-Economy Macroeconomics* (International Students Edition). New York: Basic Books.
5. Kapila, U. (2018). *Indian Economy: Performance and Policies*. (17th ed.). New Delhi: Academic Foundation.
6. Stiglitz, J. (2016). The Euro and its Threat to the Future of Europe. London: Penguin.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written ExaminationExamination Scheme:

Components	P0(Att.)	P1	C1	CT	EE
Weightage (%)	5	5	5	15	70

(A-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination)

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2	2	3	3	--	--	1	1	--	--
CO2	1	1	3	2	1	--	--	--	1	1	--	--
CO3	1	1	2	1	3	3	--	3	1	1	2	--
CO4	2	1	2	3	3	2	--	2	1	1	3	--

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DECO2501	ADVANCED STATISTICAL METHODS IN ECONOMICS	L	T	P	C
Version 1.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure	Basic understanding of statistical concepts				
Co-requisites	Basic understanding of MS Excel				

Course Description

In this course, students learn the conceptual underpinnings of statistical methods and how to apply them to address more advanced statistical questions than are covered in a statistical method in economics course. The statistical methods covered in the course are useful for many types of questions that relate to multiple variables and/or multiple groups. Learning how to effectively use data and statistical methods to make evidence-based business decisions is the overarching goal of the course. Statistical analyses will be performed using SPSS and Excel.

Course Objectives

The objective of this course is to

1. Understand the types of questions that the statistical method addresses and apply the method to other examples and situations.
2. Implement the method using software (e.g., SPSS or Microsoft Excel).
3. Interpret the results in a way that addresses the question of interest.
4. Use data to make evidence-based decisions and communicate the purposes of the analyses, the findings from the analysis, and the implications of those findings.

Course Outcomes

On completion of this course, the students will be able to

CO1: Apply statistical methods and hypothesis testing to business problems

CO2: Understand the details, complexities and implications of hypothesis testing.

CO3: Understand the details, complexities and implications of Analysis of Variance (ANOVA)

Modules	Blooms level*	Number of hours
MODULE I: Probability: Introduction, random experiments, sample space, events and algebra of events. Definitions of Probability-classical, statistical, and axiomatic. Conditional Probability, Addition and multiplication theorem of probability, independent events, Theorem of Total probability, Bayes' theorem and its applications.	L1,L2, L3 L4, L5, L6	12
MODULE II: Random variables Discrete and continuous, illustrations and properties of random variables, pmf, pdf and cdf, Two-dimensional random variables: Joint, marginal and conditional pmf/pdf, independence of random variables. Univariate transformation. Mathematical Expectation: Expectation of random variables and their properties.	L1,L2, L3 L4, L5, L6	12

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MODULE III: Probability distributions Discrete Probability Distributions: Uniform, Binomial, Poisson, Geometric, Negative Binomial and Hyper-geometric distributions along with their characteristic properties and limiting/approximation cases. Continuous probability distributions: Normal, Exponential, and Uniform distributions along with their characteristic properties and limiting/approximation cases.	L1, L2, L3 L4, L5, L6	12
MODULE IV: Estimation Concepts of estimation, unbiasedness, sufficiency, consistency and efficiency. Principles of test of significance: Null and alternative hypotheses (simple and composite), Type-I and Type-II errors, critical region, level of significance, size and power, best critical region, most powerful test. Sampling distribution and standard error.	L1, L2, L3 L4, L5, L6	12
MODULE V: Hypothesis Testing Large sample tests, exact sampling tests: t-test, F-test and ANOVA, z-transformation, Chi-square tests	L1, L2, L3 L4, L5, L6	12

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Statistical Methods by S.P. Gupta (31st Edition); Publisher: Sultan Chand & Sons
2. Mathematical Statistics by S.C. Gupta & V.K. Kapur (10th Edition); Publisher: Sultan Chand & Sons.

Reference Books

1. Bhat, B.R, Srivenkatramana, T. and Rao, Madhava K.S. (1997). Statistics: A Beginner's Text, Vol. I, New Age International (P) Ltd.
2. Freund, R. J., & Wilson, W. J. (2003). *Statistical methods*. Elsevier.
3. Chiang, C. L. (2003). *Statistical methods of analysis*. World Scientific.
4. Barkus, E. J. (2006). Using Advanced Statistics.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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DECO2502	HISTORY OF ECONOMIC THOUGHT	L	T	P	C
Version 1.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is essential for a student who aspires to advanced training in economics. Contemporary economic ideas have evolved over many centuries. The evolution of economics in each instance was as much a response to immediate economic problems and policy issues as it was a self-conscious attempt to refine the earlier analysis by correcting mistakes and filling in the gaps in analysis. Economic ideas did not evolve in isolation but were an integral and important part of the evolution of modern social thought. Prevailing ideas of science, scientific rigour and measurement played a significant role in the shaping of economic science at each stage of its evolution. This course, tracing the history of economic thought, would enable the student to understand how contemporary economics came to be what it is.

Course Objectives

The objective of this course is to

1. Students will be able to understand well-developed economic theories and distinguish them from inconsistent ones.
2. Students will be able to understand the evolution of economic thoughts, views and ideas of different economists from time to time, even before Adam Smith (1776).
3. Students will be able to gain knowledge regarding various economic models and theories developed from the very beginning of economies and will be able to analyze their pros and cons for current economic scenarios.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the basic and very important thoughts and views regarding different economic subjects.

CO2: Explain and analyse the different economic models and theories developed by mercantilists, physiocrats, classical, marginalists, and neo–classical and modern economists.

CO3: Describe the impact and influence of different economic thoughts on the current economic setup of the countries.

CO4: Discuss the changes required for the growth and development of particular countries and make a comparative analysis.

CO5: Comprehend the development of the theory of economics from a historical perspective and emerging paradigms and aberrations with its reasons and will Debate on similarities and differences among different economy schools.

Modules	Blooms level*	Number of hours

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MODULE I: Introduction to History of Economic Thought Nature and the Importance of Economic Thought. Different approaches to study the history of economic thought. Economic Thought of Plato and Aristotle Mercantilism: Main characteristics; Thomas Mun; Physiocracy: Principles; Doctrines - Natural order, Net Product, Circulation of Wealth.	L1, L3, L4	10
MODULE II: Classical Period Adam Smith — Productive and Unproductive Labour, Theory of Value, Theory of Distribution: Wages, Rent, Profit and Interest; Theory of taxation – Canons of Taxation David Ricardo — Theory of Value, Theory of Distribution: Rent, Wages, Profit and Interest; Ideas on international trade. Thomas R. Malthus — Theory of Population. J.B. Say – Says' Law of Market, Economic ideas of J.S. Mill- John Stuart Mill and Utilitarianism Karl Marx and Critique of Capitalism — Stages of Social Development, Labour Theory of Value, Surplus Value, Theory of Economic Development.	L1, L3, L4	15
MODULE III: Marginalists and Neo-Classicals The marginalist revolution: J. B. Clark – Marginal Theory of Distribution, Theory of Capital. Leon Walras – General Equilibrium Analysis. Neo-Classical School: Alfred Marshal – Consumers Surplus; Elasticity of Demand; Value, Demand and Supply. A. C. Pigou – Concept of Welfare.	L1, L3, L4	10
MODULE IV: Institutional Economics and Keynesian Revolution Thorstein Veblen and Institutional Economics John Maynard Keynes and Keynesian Economics The Great Depression and Keynesian Policy Responses	L1, L3, L4	10
MODULE V: Post-World War II Developments Milton Friedman and Monetarism Development Economics: Rostow, Prebisch, and Dependency Theory New Institutional Economics: Ronald Coase and Douglass North **Contemporary Economic Thought** Rational Choice Theory and Behavioral Economics Economic Globalization and New Challenges Environmental Economics and Sustainable Development	L1, L3, L4	15

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Hunt E.K, Lautzenheiser Mark (2011) *History of Economic Thought*, 3rd edition, New Arrival ME Sharpe
- Blackhouse, R. (1985), *A History of Modern Economic Analysis*, Basil Blackwell, Oxford.
- Ganguli, B.N. (1977), *Indian Economic Thought: A 19th Century Perspective*, Tata McGraw Hill, New Delhi.
- Robert Heilbroner & William Milberg. (2011). *The Making of Economic Society* 13th Edition, The Pearson series in Economics.
- Landreth, Harry & Colander, David C. (2002) History of Economic Thought, 4th Edition, Houghton Mifflin Company

Reference Books

- Dasgupta, A.K. (1985), *Epochs of Economic Theory*, Oxford University Press, New Delhi.
- Gandhi, M.K. (1947), *India of My Dream*s, Navajivan Publishing House, Ahmedabad.
- Koot, G.M. (1988), *English Historical Economics: 1850-1926*,

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Cambridge University Press, Cambridge.
- Rao, M.N. (1964), *Memoirs*, Allied Publishing House, Bombay.
- Schumpeter, J.A. (1951), *Ten Great Economists*, Oxford University Press, New York. Shionya, Y.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	10	5	10	70

(A-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination)

CO, PP and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	1	1	1	3	--	--	--	1	3	--	--
CO2	1	1	1	2	3	--	--	--	2	2	--	--
CO3	1	1	2	--	2	--	--	--	2	--	--	--
CO4	1	1	1	1	--	--	--	--	1	--	--	--
CO5	1	1	1	2	--	--	--	--	2	--	--	--

1: strongly related, 2: moderately related and 3: weakly related

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SEMESTER-VI

DECO2651	ECONOMICS OF GROWTH & DEVELOPMENT	L	T	P	C
Version 1.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course explores theories and empirical evidence related to economic growth and development. Students will analyze the factors influencing economic growth, the role of institutions, policies, and globalization, and the challenges faced by developing economies. The course will provide insights into both macroeconomic and microeconomic aspects of growth and development, preparing students to critically assess development strategies and policies.

Course Objective:

By the end of the course, students should be able to:

1. Understand Growth Theories: Explain classical and modern theories of economic growth.
Analyze factors influencing economic growth at the macroeconomic level.
2. Examine Development Theories: Understand key development theories, including dependency theory, modernization theory, and structuralist approaches. Evaluate the relevance of these theories in different historical and global contexts.
3. Analyze Policy Interventions: Assess the impact of various policy interventions on economic growth and development. Understand the role of institutions and governance in promoting sustainable development.
4. Explore Globalization and Development: Analyze the effects of globalization on developing economies. Understand trade, investment, and technology transfer in the context of economic development.
5. Evaluate Social and Human Development: Examine social and human development indicators and their role in economic development. Analyze poverty, inequality, and social justice issues in developing economies.

Course Outcome:

Upon successful completion of the course, students will be able to:

CO1: Demonstrate Knowledge-Demonstrate a deep understanding of growth and development theories, policies, and challenges.
CO2: Critical Analysis- Critically analyze economic growth strategies and development policies in different countries. Evaluate the strengths and weaknesses of various development theories.
CO3: Policy Evaluation-Evaluate the effectiveness of economic policies in promoting inclusive growth and sustainable development. Understand the implications of policy decisions on different sectors of the economy.
CO4: Research and Presentation Skills-Conduct research on specific development issues and present findings effectively. Use data and empirical evidence to support arguments and policy recommendations.
CO5: Global Perspective- Develop a global perspective on economic development challenges and opportunities. Understand the interconnectedness of economies in the era of globalization.

Modules	Blooms level*	Number of hours

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Module I : Introduction Definitions and distinctions between economic growth and development. Overview of Economic Growth and Development: Historical perspectives on global economic development and Sustainable Development Measurement of Economic Development: GDP, HDI, and other Indicators– Factors determining economic development – Obstacles of economic development: vicious circle of poverty.	L1, L2, L3, L4, L5, L6	10
Module II: Theories of Economic Growth: Classical growth theories: Mercantilist, Smithian, and Malthusian perspectives. Growth Theories- Karl Marx-Schumpeter's theory of Development-Keynes-Rostow's stages of Economic Growth-Big Bush theory. Modern growth theories: Harrod-Domar, Solow-Swan, and endogenous growth models. Endogenous growth models: Human capital, innovation, and institutions. Assessing the limitations and applicability of growth theories.	L1, L2, L3, L4, L5, L6	10
Module III: Development Theories and Approaches: Dependency theory, structuralist theory, and modernization theory. Human development approach and capability approach (Amartya Sen). Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs). Poverty, Inequality, and Development, Education and Health in Economic Development, Gender Inequality and Development	L1, L2, L3, L4, L5, L6	10
Module IV: Growth and Development Policies Role of government and institutions in promoting economic growth and development. Policy interventions in areas such as education, health, infrastructure, and industrialization. Development Planning and Policies: Evaluation of the effectiveness of development policies. Import substitution vs. export-led growth strategies. Poverty alleviation programs and social safety nets. Institutional Development: Role of institutions in economic development. Governance, corruption, and development outcomes.	*L1, L2, L3, L4, L5, L6*	10
Module V: Globalization, Trade, and Development Globalization and Economic Development: The impact of globalization on developing economies. Trade liberalization, foreign direct investment, and technology transfer. Trade-offs and challenges faced by developing countries in a globalized world. Sustainable Development Goals (SDGs): Understanding the UNs' SDGs and their relevance to developing countries. Case studies on successful implementation of SDGs in different regions.	*L1, L2, L3, L4, L5, L6*	10
Module VI: Development Challenges and Future Directions Income Inequality and Poverty: Causes and consequences of income inequality. Poverty measurement methods and anti-poverty programs. Environmental Sustainability: Environmental degradation and its economic implications. Sustainable development practices and green growth. Emerging issues in growth and development: Digital transformation, gender equity, and inclusive development. Impact of digitalization and artificial intelligence on developing economies. Future challenges and opportunities in the era of technology-driven development. Success stories and lessons learned from development experiences.	*L1, L2, L3, L4, L5, L6*	10

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Textbooks:

- Todaro M.P. Smith S.C (2017). Economic Development (12th Edition), Pearson,

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New Delhi
- Yujiro Hayami, Yoshihisa Godo,(2005) Development Economics: From the Poverty to the Wealth of Nations, 3rdc Edition Oxford University Press: New Delhi
- Thirlwal A.P.(19990. Growth and Development (6th Edition), Macmillan, London
- Meier, G., Rauch, J. (2005). *Leading issues in economic development*. Oxford University Press.

- Subrata Ghatak,(2005). Introduction to Development Economics (Third Ed), Routledge, London
- Daron Acemoglu, (2009) Introduction to Modern Economic Growth, Princeton University Press: Princeton.

References:

- Hirschman, A. (1992). *Rival views of market society and other essays*. Ch. 3: "Linkages in Economic Development". Harvard University Press.
- UNDP. Human Development Report. Relevant years.
- Ray, D. (1998). *Development economics*. Princeton University Press.
- Rodrik, D. (2009). *One economics, many recipes: Globalization, institutions and economic growth*. Ch. 1: ``Fifty Years of Growth (and lack thereof): An Interpretation". Princeton University Press.
- Sen, A. (2000). *Development as freedom*. Oxford University Press.
- Shleifer, A., Vishny, R. (1993). Corruption. *Quarterly Journal of Economics*, 108, 599-617.
- Rodrik, D. (2011). *The globalization paradox: Why global markets, states and democracy can't coexist*. Oxford University Press.
- Kapila, U., (Ed.) (2019). Indian Economy Since Independence, Academic Foundation: New Delhi.
- Bardhan, P. (1984). The Political Economy of Development in India, Oxford University Press: New Delhi.
- Jhingan M. L. (2013) The Economics of Development and Planning, (40th Edition), Vrinda Publications: New Delhi

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	3	1	1	1	3	2	1	1	--	--	3
CO2	1	3	1	1	1	3	2	1	1	--	--	--
CO3	1	3	1	1	1	3	2	1	1	--	--	3
CO4	1	3	1	1	1	3	2	1	1	3	--	3
CO5	1	3	1	1	1	3	2	1	1	3	--	--
CO6	1	3	1	1	1	3	2	1	1	3	--	--

1: strongly related, 2: moderately related and 3: weakly related

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DECO2601	MONETARY ECONOMICS	L	T	P	C
Version 1.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure	Macroeconomics.				
Co-requisites					

Catalog Description

This course introduces the concept of money; what it is, why we use it and how it is created. It examines monetary policy in a closed and open economy, considering several models that allow real effects of monetary policy, ranging from new-Classical to Keynesian. Specific models will be introduced and solved, allowing students to see exactly how these models work and what differentiates one from another.

Course Objectives

The objective of this course is to

1. Analyze and discuss the essential functions of money, including its role as a medium of exchange, unit of account, and store of value in economic transactions.
2. Gain insight into how money is created, including the roles of central banks, commercial banks, and the money supply. They should understand the mechanisms by which new money enters the economy.
3. Evaluate the objectives and tools of monetary policy, as well as the role of central banks in influencing the money supply and interest rates. Also, to assess the impact of monetary policy on the economy.
4. Distinguish between closed and open economies, understand the implications of international trade and capital flows, and apply economic models to analyze these scenarios.
5. Analyze the real-world consequences of monetary policy decisions, including their impact on variables like inflation, employment, and economic growth.

Course Outcomes

On completion of this course, the students will be able to

CO1: Understand the fundamental concepts and principles of money, monetary policy, and economic models.

CO2: Explain the process of money creation and the central role of central banks and commercial banks in managing the money supply.

CO3: Critically assess the objectives and tools of monetary policy and understand the implications of different policy choices for the broader economy.

CO4: Differentiate between new-Classical, Keynesian, and other economic models, and apply the appropriate model for analyzing specific economic scenarios.

CO5: Apply economic models to real-world situations, demonstrating the ability to make informed judgments and policy recommendations.

Modules	Blooms level*	Number of hours
MODULE I: Introduction to Money and its Functions The Concept of Money; Functions of Money; Historical Evolution of Money - Barter Systems, Emergence of Currency, Development of Modern Money; Types	L1, L2,	12

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of Money - Physical Money (Coins and Banknotes), Digital and Electronic Money, and Cryptocurrencies; Role of Money in an Economy: The Quantity Theory of Money and its relationship with the supply and demand for money.		
MODULE II: Money Creation and Monetary Policy Money Creation Process- Role of Central Banks, The Money Supply Process, Fractional Reserve Banking, the concept of the money multiplier and its connection to the money supply. Central Banks and Their Functions, Objectives, Role in Monetary Policy, Monetary Policy: Objectives, Tools of Monetary Policy - Open Market Operations, Reserve Requirements, Discount Rate, and Forward Guidance	L1, L2, L4	12
MODULE III: Closed Economy Models Introduction to Economic Models; New-Classical Models- Assumptions and Key Concepts, Implications for Monetary Policy; Keynesian Models - Assumptions and Key Concepts, Implications for Monetary Policy	L1, L2	12
MODULE IV: Open Economy Models Introduction to Open Economies- Defining Open Economies, Role of International Trade, Exchange Rates and Trade- Determinants of Exchange Rates, Trade Balances and Flows; Open Economy Models - Model Assumptions and Components, Analysis of Open Economy Effects	L1, L2, L4	12
MODULE V: Evaluating Monetary Policy and Real-World Applications Real-World Application of Models - Applying Economic Models to Real Situations: Case Studies and Examples; Analyzing the Effects of Monetary Policy- Evaluating Monetary Policy Decisions, Measuring Policy Impact; Monetary Policy in Practice- Central Banks' Decision-Making Process, Monetary Policy Challenges and Implementation	L1, L2, L3, L4	12

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Mankiw, N. G. (2018). Macroeconomics. Cengage Learning.
- Friedman, B. M., & Hahn, F. H. (1991). Monetary Economics. Cambridge University Press.
- Mishkin, F. S. (2018). The Economics of Money, Banking, and Financial Markets. Pearson.

Reference Books

- Galí, J. (2015). Monetary Policy, Inflation, and the Business Cycle: An Introduction to the New Keynesian Framework and Its Applications. Princeton University Press.
- Walsh, C. E. (2017). Monetary Theory and Policy. The MIT Press.
- Cecchetti, S. G., & Schoenholtz, K. L. (2017). Money, Banking, and Financial Markets. McGraw-Hill Education.
- Landau, J.-P. (2017). Money, Monetary Policy, and Central Banking. Routledge.
- Walsh, C. E. (2017). Monetary Theory and Policy. The MIT Press.
- Yuen, M. M.-C. (2019). Money and Banking: What Everyone Should Know. World Scientific.
- Berk, M., & Berk, J. M. (2013). Money, Banking and Monetary Policy. Springer.
- Bain, K. (2019). Monetary Economics. Oxford University Press.
- Gupta, S.B. (2010). Monetary Economics: Institutions, Theory & Policy. S. Chand and Company; New Delhi.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

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Components	A	P	HA	CT	EE
Weightage (%)	5	10	5	10	70

(A-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination)

CO and PO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	2	--	1	1	2	2	--	--	1	3	2	--
CO2	1	2	--	1	1	2	2	--	--	1	3	2	--
CO3	1	2	--	1	1	2	2	--	--	1	3	2	--
CO4	1	2	--	1	1	2	2	--	--	1	3	2	--

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DECO2602	ECONOMETRICS: BASIC THEORY AND APPLICATIONS	L	T	P	C
Version 1.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure	Basic understanding of statistical concepts				
Co-requisites	Basics of MS Excel				

Catalog Description

This course provides a comprehensive introduction to basic econometric concepts and techniques. It covers the estimation and diagnostic testing of simple and multiple regression models. The course also covers the consequences of tests for misspecification of regression models. At the same time, helps develop a deeper understanding of the applications and limitations of econometrics in various fields of economics and related disciplines.

Course Objectives

The objective of this course is to

1. Introduce students to fundamental econometric concepts, tools, and techniques used in empirical economic analysis.
2. Provide a solid understanding of the principles of estimation in econometrics, focusing on both simple and multiple regression models.
3. Equip students with the skills to conduct diagnostic tests to assess the validity and reliability of regression models.
4. Explore the consequences of misspecification in regression models and how to identify and address these issues.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define and explain key econometric concepts, including endogeneity, heteroscedasticity, multicollinearity, and autocorrelation.
CO2: Perform and interpret ordinary least squares (OLS) estimation for simple and multiple regression models, including the estimation of coefficients, standard errors, and confidence intervals.
CO3: Apply appropriate diagnostic tests to assess the assumptions of the classical linear regression model (CLRM), including tests for homoscedasticity, normality of residuals, and linearity of relationships.
CO4: Identify and address misspecification in regression models by employing relevant diagnostic techniques, such as specification tests and model selection methods.
CO5: Construct and interpret hypothesis tests and confidence intervals for regression coefficients, making informed inferences about the relationship between variables.
CO6: Select and justify the most suitable regression model for a given empirical analysis, taking into account the research question and data characteristics.
CO7: Use econometric software and tools effectively to estimate, diagnose, and analyze regression models, and to generate meaningful graphical representations of the results.

Modules	Blooms level*	Number of hours

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MODULE I: Introduction to Econometrics Nature and Scope of Econometrics 2. Statistical Concepts Normal distribution; chi-sq, t- and F-distributions; estimation of parameters; properties of estimators; testing of hypotheses.	L1, L2, L3, L4, L5, L6	10
MODULE II: **Simple Linear Regression Model: Two Variable Case** Estimation of the model by method of ordinary least squares; properties of estimators; goodness of fit; tests of hypotheses; scaling and units of measurement; confidence intervals; Gauss-Markov theorem; forecasting.	L1, L2, L3, L4, L5, L6	13
MODULE III: Multiple Linear Regression Model Estimation of parameters; properties of OLS estimators; goodness of fit - R2 and adjusted R2; partial regression coefficients; testing hypotheses – individual and joint; functional forms of regression models; qualitative (dummy) independent variables.	L1, L2, L3, L4, L5, L6	13
MODULE IV: Violations of Classical Assumptions: Consequences, Detection and Remedies Multicollinearity; heteroscedasticity; serial and autocorrelation.	L1, L2, L3, L4, L5, L6	12
MODULE V: Specification Analysis Omission of a relevant variable; inclusion of irrelevant variable; tests of specification errors.	L1, L2, L3, L4, L5	12

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis; L6-Evaluation*

Text Books

1. Gujarati, D. N. (2021). *Essentials of econometrics*. Sage Publications.
2. Theil, H. (1981), *Introduction to Econometrics*, Prentice Hall of India, New Delhi.
3. Dougherty, C. (2011). *Introduction to econometrics*. Oxford University Press, USA.

Reference Books

1. Suresh K. Ghosh, *Econometrics*, Prentice Hall of India Private Limited, New Delhi (2003)
2. A. Koutsoyiannis, *The theory of Econometrics: An introduction exposition of econometric methods*, Educational low-priced books scheme, McMillan Education (1992)
3. Christopher Dougherty, *Introduction to Econometrics*, Oxford University Press (3rd edition)
4. Amemiya, T. (1985), *Advanced Econometrics*, Harvard University Press, Cambridge, Mass.
5. Baltagi, B.H. (1998), *Econometrics*, Springer, New York.
6. Goldberger, A.S. (1998), *Introductory Econometrics*, Harvard University Press, Cambridge
7. D. N. Gujarati and D.C. Porter, Essentials of Econometrics, McGraw Hill, 4th edition, International Edition, 2009.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	Project	EE
Weightage (%)	5	10	5	10	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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DECO2603	INDUSTRIAL ECONOMICS	L	T	P	C
Version 1.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course exposes students to theory and analytical understanding of the industrial sector of the economy. The core idea behind the inclusion of this subject is to introduce the students to the industrial developmental side of India, its different facts, different areas, policies & prospects. Industrial Economics is concerned with issues such as Patterns, Processes, speed and implications of Industrialization and the main focus is on issues relating to the composition of Indian Industry, Industrial Policies of India and introduction to Industrial finance of India. It also discusses productivity studies concerning the Indian industries and the impact of government policies on the Indian industries since independence.

Course Objectives

The objective of this course is to

1. Examine industrial models and their links in practice, with a special accent on government policy.
2. Understand various industrial productivity concepts and methods of measurement.
3. Provide insight and exposure to industrial development in India.
4. Enhance the conceptual knowledge of students regarding the role & functions of financial institutions in Industrial Development in India

Course Outcomes

On completion of this course, the students will be able to

CO1: Outline the basic idea about the issues and policies about the industrial environment.

CO2: Demonstrate and explain various industrial productivity concepts and measurements.

CO3: Describe the various theories, problems, and perspectives and integrate them to begin the process of developing an innovative research agenda.

CO4: Demonstrate the role & functions of financial institutions in the Industrial Development of India.

Modules	Blooms level*	Number of hours
MODULE I: Introduction Concepts in industrial Economics; Meaning, Characteristics, Patterns, speed of industrialization; Effect of Industrialization; Factors inhibiting industrialization; Measures conducive to industrialization; Size and efficiency of an industrial unit; Factors determining the optimum size of industrial units. Regional inequalities in industries. Agro-based industries. **Group-wise Project on an industrial sector**	L1, L2, L4	12
MODULE II: Industrial Composition and Productivity Composition of Indian Industry: Small Scale Industries; Large Scale Industries; Micro Small and Medium Industries (MSMEs). Public and Private Sectors: Role of Public Sector in India; Problems of Public Sector Enterprises; Role of Private Sector in India; Problems and Prospects of Private Sector. Productivity: Concept, importance and growth of productivity; Efficiency of Firm and Industry: Dimensions of Industrial Efficiency; Determinants of Economic Efficiency. Empirical evidence of productivity in Indian industries; Industrial sickness - factors	L1, L2, L4	14

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accounting for it and consequences. **Group-wise Project on an industrial sector**		
MODULE III: Theories of Industries and Location Theories of Industrial Growth: Hoffmann's Industrial Growth Theory; Chenery's Pattern of Industrial Growth. Theories of industrial location: Alfred Weber's Theory of Industrial Location; Sargant Florence's Theory of Industrial Location; Factors Influencing the Location of Industries. **Group-wise Project on an industrial sector**	L1, L2, L4	12
MODULE IV: Role of Industrial Policies in Industrial Development Introduction to Industrial Policy; Industrial Development in India**:** New Industrial Policy 1991 and recent industrial policies in India; Industrial Growth and Pattern in India; Performance of Industrial Development Since Independence; Globalization and its impacts on industries; Industrial regulations in India. **Group wise Project on industrial sector**	L1, L2, L4	12
MODULE V: Industrial Finance Need of finance; Types of finance; Sources of finance; Choice of funding; Role and functions of IFCI, IDBI, SIDBI, MSFC in Industrial Finance. **Group wise Project on industrial sector**	L1, L2, L4	10

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Barthwal, R. R. (2021). *Industrial Economics: An introductory textbook*. New Delhi: New Age International.
2. Datt, Gaurav & Mahajan, Ashwani (2020). *Datt & Sundharam's Indian Economy*, S. Chand Publishing, New Delhi.
3.Ahluwalia, I. J. (1985). *Industrial Growth in India: Stagnation since the Mid-Sixties*. New Delhi: Oxford University Press.

Reference Books

- Kapila, U. (2022). Indian Economy Since Independence, 33rd Edition, New Delhi: Academic Foundation.
- Sach S J and Varshney A (Eds.) (2000). *India in the Era of Economic Reforms: A Political Economy* New York: Oxford University Press.
- Kar, S and Datta, D. (2015). Industrial and Labour Economics: Issues in Developing and Transition Countries. New Delhi: Springer.
- Schmalensee, R. L. (2023). *Industrial Economics: An Overview*. Legare Street Press.
- Cable, J. R. (1994). *Current Issues in Industrial Economics*. London: Macmillan.
- Ferguson, P. R., & Ferguson, G. (1994). *Industrial Economics: Issues and Perspectives*. New York: NYU Press.
- Hay, D. A., & Morris, D. J. (1991). *Industrial Economics and Organization: Theory and Evidence*. Oxford: Oxford University Press.
- Howe, W. S. (1978). *Industrial Economics: An Applied Approach.* London: Macmillan.
- Martin, S. (1994). *Industrial Economics: Economic Analysis and Public Policy*. New Jersey: Prentice Hall.

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	P	HA	CT	EE
Weight age (%)	5	10	5	10	70

(A-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination)

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	1	1	3	2	--	--	--	--	3	--	--	--
CO 2	1	2	--	1	--	--	--	3	2	--	--	--
CO 3	1	2	-	1	1	3	--	--	--	--	--	--
CO 4	2	1	--	1	1	--	2	--	--	--	3	--

1: strongly related, 2: moderately related and 3: weakly related

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SEMESTER-VII

DECO2701	ADVANCED MICROECONOMICS THEORY & APPLICATIONS	L	T	P	C
Version 1.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This paper analyses the economic behaviour of individuals, firms and markets. It is mainly concerned with the objective of equipping the students rigorously and comprehensively with the various aspects of consumer behaviour and demand analysis, production theory and behaviour of costs, the theory of traditional markets and the equilibrium of firms in modern non-profit maximizing framework.

Course Objectives

The objective of this course is to:

1. acquire a profound knowledge of fundamental problems from microeconomics
2. Understand that policy decisions require different kinds of actions to take place when producing goods/services for different markets.
3. Understand models used for the analysis of problems within microeconomics, and learn the latest developments in microeconomic theory and apply them in research.
4. Understand the modelling of markets and present ideas mathematically, and provide economic modelling of human decisions under uncertainty, cooperation, etc

Course Outcomes

On completion of this course, the students will be able to

CO1: analyse various theories of demand and its relation with the market.
CO2: interpret various decisions related to production and behaviour of different firms.
CO3: Design or relate different models of market structure.
CO4: Compile and review various theories related to market structure.

Modules	Blooms level*	Number of hours
MODULE 1: Demand Analysis Theories of demand — utility; indifference curve (income and substitution effects, Slutsky theorem, compensated demand curve) and their applications; Revealed preference theory; Revision of demand theory by Hicks; Characteristics of goods approach; consumer's choice involving risk; Indirect utility functions (duality theory); Recent developments in demand analysis (pragmatic approach and linear expenditure systems); Consumer's surplus; Inter-temporal consumption; Recent developments in demand; Elementary theory of price formation — demand and supply equilibrium; Cobweb theorem; lagged adjustment in interrelated markets.	L1,L2, L3 L4, L5, L6	12
MODULE 2 Production, Costs and Uncertainty & Information Technology, isoquants, production with one or more variable inputs, returns to scale, short run and long run costs. Total, average and marginal costs, cost minimization and expansion path, elasticity of substitution, Cobb – Douglas Linear and CES production function.	L1,L2, L3 L4, L5, L6	8

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Expected utility; Why expected utility is reasonable; Risk aversion; Risk spreading; Asymmetric Information-Market for lemons; Market signalling. Principle- agent problems Moral Hazard;		
MODULE 3: Market Structure & Theories of Distribution Marginal analysis as an approach to price and output determination: perfect competition — short-run and long-run equilibrium of the firm and industry, price and output determination, supply curve; Perfect competition: short-run and long-run equilibrium of a firm and industry. Monopoly: short-run and long-run equilibrium of a monopolist, price discrimination under monopoly: first-degree, second degree and third-degree discrimination; welfare aspects, monopoly control and regulation. Monopolistic Competition. Marginal productivity theory, the general theory of factor price discrimination under competition, monopoly and monopsony; Determination of rent wages and interest; Concept of exploitation of labour and role of labour unions in wage determination; The nature of profit; Euler's Product – Exhaustion theorem	L1,L2, L3 L4, L5, L6	10
MODULE 4: Game theory Theory of games, zero-sum and non-zero-sum games; Nash equilibrium; Mixed strategies; Oligopoly- Cournot, Bertrand and Stackelberg models; Cartels - Joint profit maximization and market sharing cartels; Price leadership - low-cost price and dominant price leadership;	L1,L2, L3 L4, L5, L6	6
Module 5: Managerial theories of firm Marginalism - attacks and defence; Average cost pricing- the markup rule; Limit pricing-Bain's concept of entry and barriers to entry; Model of Sylos-Labini and Franco Modigliani; Baumol's static and dynamic models of sales revenue maximization; Marris's model of managerial enterprise; Williamson's simplified model of managerial discretion;		
Module 6: General Equilibrium & Welfare Economics Meaning, partial v/s general equilibrium approach, Walrasian General Equilibrium model, Tatonnement, Existence, Uniqueness and stability of equilibrium; A graphical treatment of the 2-factor, 2-commodity, 2-consumer general equilibrium system (2x2x2 model) Criteria of social welfare – value judgments in welfare economics, basic theorems of new welfare economics – Pareto Optimality and necessary conditions to achieve it; Market forms and welfare. Compensation principle: Kaldor – Hick's criterion, Little's criterion, the Bergson criterion: social welfare function.		

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. W.S. Baumol, 'Economic Theory And Operational Analysis', Prentice Hall
2. Kreps, David M. (1990), A Course in Microeconomic Theory, Princeton University Press, Princeton.
3. Koutsoyiannis, A. (1979), Modern Microeconomics, (2nd Edition), Macmillan Press, London

Reference Books

1. Ferguson, 'Microeconomic Theory', Cambridge University Press
2. L.M.B.Cabral, (2000) Introduction to Industrial Organization, MIT Press
3. P.K.Dutta (1999) Strategies and Games: Theories and Practices, MIT Press
4. Formsom and Gould – Microeconomic Theory

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	10	5	10	70

A-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination)

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	1	3	2	1	1	1	1	1	1	--	--	--
CO2	1	1	3	2	1	1	1	1	1	1	--	--	--
CO3	1	1	3	2	1	1	1	1	1	1	--	--	--
CO4	1	1	3	2	1	1	1	1	1	1	--	--	--

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DECO2702	ADVANCED MACROECONOMIC THEORY & APPLICATIONS	L	T	P	C
Version 1.1	Date of Approval	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course aims to lead students to the arena of macroeconomic theories, policies and models such as investment demand, the New classical model, the New Keynesian model and macroeconomics of an open economy**.**

Course Objectives

The objective of this course is to

1. Measure living standards, inflation, and unemployment for use as economic indicators.
2. Understanding the perspective of classical economists on the nature and causes of the wealth of nations.
3. Understand the factors determining gross domestic product, employment, the general level of prices, and interest rates.
4. Explain the differences between the classical and Keynesian approaches to understanding the macro economy, including the political implications of each approach and the role of an activist fiscal policy in the Keynesian approach.
5. Analyze the determinants of the relative strengths of fiscal and monetary policy for affecting gross domestic product.
6. Understand the importance of wage flexibility and price expectations for the impact of spending behaviour on gross domestic production, the unemployment rate, and the rate of inflation.
7. Understand monetarist, supply-siders, and New Classical approaches to macroeconomic issues.
8. Learn the determinants of long-term economic growth, including the role of saving and investment on the rate of growth.
9. Understand the role of international trade, international finance and exchange rates in affecting living standards.
10. Analyze the factors that determine currency exchange rates and the impact of changes in exchange rates on exports and imports.

Course Outcomes

On completion of this course, the students will be able to

CO1: Analyse the workings of the economy.
CO2: Assess and analyse various theories of investment demand.
CO3: Compile the different models of macroeconomics.
CO4: Analyse how Equilibrium is determined in the Money Market

Modules	Blooms level*	Number of hours
MODULE I: New Macroeconomics Main Features of New Classical Macro Economics; Friedman's Adaptive Expectations hypothesis; Rational Expectations-Anticipated and Unanticipated Shocks; Lucas Critique; Policy Ineffectiveness theorem; Policy Implications of	L1, L2,, L3, L4, L5	15

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New Classical approach; New Keynesian Model of wage-price stickiness; Mankiw Model; Efficiency wage Model; Policy Implication of New Keynesian Model		
MODULE II: Theory of Inflation and Business Cycle Inflation-Bent Hansen Model of Inflation; Modified Philips Curve-Friedman, Tobin and Solow; Money-Inflation Link; Fishers's Equation; Budget Deficit and Growth of Money Supply; Money Financing of Budget Deficit and debt Financing of Budget Deficit; Inflation Tax, Ricardian Equivalence; Theories of Trade cycle-Cob-web theory; Kaldor's Model, real Business Cycle	L1, L2,, L3, L4, L5	15
MODULE III: Macroeconomics and Open Economy Macroeconomics variables and equilibrium in open economy; IS-LM Model; IS-LM curve and Balance of Trade-Zero Capital Mobility; Implications of capital mobility for Macroeconomic policy; Mundell-Fleming Model under fixed and flexible exchange rate system; Relative effectiveness of monetary and fiscal policies under imperfect and perfect Mobility; Marshall-learner condition; Internal and External Balances and Economics Policies	L1, L2, L3, L4, L5	15
MODULE IV: Macro Economic Policy Issues Macroeconomic Policy-Meaning and Objectives; Targets and Instruments; Fixed and Flexible target approach; Uncertainty and economic policies; Lags in the effect of policy; Gradualism vs Shock therapy; Rules Vs Discretion; Problems of coordination of macroeconomic policy objectives; Policy Implications of Monetarism vs Keynesianism. Contemporary Issues in Macroeconomics and their Dynamic Model-based Analyses	L1,L2, L3, L4, L5	15

Bloom's Level:
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Gardner Ackeley, Macro Economics: Theory and Policy. Macmillan
2. McConnell, C.R & H.C. Gupta, "Introduction to Macroeconomics", Tata McGraw Hill, Delhi
3. Paul A. Samuelson, William D. Nordhaus, (2010) Macroeconomics, 19th edition, McGraw-Hill Education

Reference Books

1. Liesey & Chrystal – Principles of Economics
2. Edgmand, M.R., Macroeconomics: Theory and Policy, Prentice – Hall of India, Delhi
3. J.E. Stiglitz, and C.E. Walsh (2002), Principles of Economics. 3rd Edition. W.W. Norton & Company, New York
4. Arnold, Roger A., (2019) Macroeconomics, 13th Edition Cengage Learning.
5. Boyes William, Michael Melvin, (2011) Macroeconomics. 8th Edition, South-western.
6. Colander, David C. (2010) Macroeconomics.8th Edition Mc GrawHill
7. N. Gregory Mankiw (2019) Macroeconomics, Tenth Edition, Worth Pub, New York

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	10	5	10	70

(A-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination)

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	1	3	2	1	1	1	1	1	1	--	--	--
CO2	1	1	3	2	1	1	1	1	1	1	--	--	--
CO3	1	1	3	2	1	1	1	1	1	1	--	--	--
CO4	1	1	3	2	1	1	1	1	1	1	--	--	--
CO5	1	1	3	2	1	1	1	1	1	1	--	--	--

1: strongly related, 2: moderately related and 3: weakly related

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DECO2703	ENVIRONMENT, SUSTAINABILITY & RESOURCE ECONOMICS	L	T	P	C
Version 1.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Environment and Resource Economics is an advanced course that integrates the principles of environmental economics and resource economics. It provides students with a comprehensive understanding of the economic aspects of environmental issues, natural resource management, and sustainable development. The course explores the economic theories, tools, and policies used to analyze and address the challenges related to environmental degradation, resource allocation, and sustainability.

Course Objectives

By the end of the course, students will have developed a comprehensive understanding of the economic principles, theories, and tools used in the field of environment and resource economics. They will be equipped with the knowledge and skills to critically analyze environmental problems, assess policy interventions, and propose sustainable solutions to address the challenges of environmental degradation and resource management.

Course Outcomes

Upon successful completion of the course, a student will be able to:

CO1. Develop an in-depth understanding of the economic principles and theories underlying environmental and resource economics.

CO 2. Analyze the economic implications of environmental problems and their interdependence with resource allocation.

CO 3. Explore the role of economic instruments and policies in addressing environmental degradation and managing natural resources.

CO 4. Examine the challenges and trade-offs between economic growth, environmental sustainability, and resource conservation.

CO 5. Enhance critical thinking and problem-solving skills through case studies and real-world applications in environment and resource economics.

Modules	Blooms level*	Number of Lecture hours

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Module 1: Introduction to Environment and Resource Economics - Definition and scope of environment and resource economics - The interplay between environmental degradation and resource scarcity - Economic approaches to sustainable development **Market Failure and Environmental Externalities** - Market failures in the presence of environmental externalities - Cost-benefit analysis and environmental valuation - Economic instruments for pollution control - Externalities and their impact on resource allocation - Public goods and common property resources	L1, L2, L3, L4,L5	12
MODULE 2: Natural Resource Economics - Classification and characteristics of natural resources - Intertemporal allocation and optimal extraction of non-renewable resources - Renewable resource management and sustainability - Cost-benefit analysis, Discounting and intergenerational equity, Economic impact assessment **Economics of Climate Change** - The economics of greenhouse gas emissions and global warming - Mitigation and adaptation strategies for climate change - Economic analysis of climate policies and international agreements	L1, L2, L3, L4,L5	12
MODULE 3: Biodiversity and Ecosystem Services Economics - Valuation of biodiversity and ecosystem services - Economic approaches to conservation and ecosystem management - Market-based instruments for biodiversity conservation **Environmental Policy and Governance** - Command and control regulations vs. market-based approaches - Environmental policy instruments (taxes, subsidies, tradable permits) - Institutions and governance mechanisms for environmental management	L1, L2, L3, L4,L5	12
MODULE 4: Economic Analysis of Energy, Water Resources and Natural Resource Markets - Economics of energy production and consumption - Resource markets and pricing (e.g., minerals, forests, fisheries) - Economic impacts of resource extraction and energy transitions **Economics of Water Resources** - Water scarcity and economics of water allocation - Pricing mechanisms and efficiency measures in water management - Integrated water resource management and conflicts	L1, L2, L3, L4,L5	12
Module 5: Sustainability and Economic Development Sustainable Development- Conceptual Frameworks and Goals Sustainable Development Indicators and Measurements Economics of Sustainability- Balancing Economic Growth and Environmental Conservation Sustainable Development and Poverty Alleviation - Linkages between economic development, poverty, and environmental degradation, Green growth strategies and inclusive sustainability **Case Studies and Applications in Environment and Resource Economics** - Case studies on specific environmental and resource management challenges in Sustainable development. - Application of economic tools and models to real-world problems - Group projects and presentations	L1, L2, L3, L4,L5	12

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis,

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L6:Evaluation

Texts :

1. Tom Tietenberg and Lynne Lewis (2019) Environmental and Natural Resource Economics
2. Charles Kolstad, Intermediate Environmental Economics, Oxford University Press, 2nd edition, 2010.
3. Roger Perman, Yue Ma, Michael Common, David Maddison and James McGilvray, "Natural Resource and Environmental Economics", Pearson Education/Addison Wesley, 4th edition, 2019.
4. Charles Kolstad, "Intermediate Environmental Economics", Oxford University Press, 2nd edition, 2019.
5. Robert N. Stavins (ed.), "Economics of the Environment: Selected Readings", W.W. Norton, 6th edition, 2018.
6. Robert Solow, "An Almost Practical Step toward Sustainability," Resources for the Future 40th anniversary lecture,1992.
7. Kenneth Arrow et al., "Are We Consuming Too Much?" Journal of Economic Perspectives, 18(3): 147-172, 2004.
8. Jon M. Conrad and Colin Whitcomb Clark, Resource Economics

References

1. IPCC (Intergovernmental Panel on Climate Change), Fifth Assessment Report (forthcoming 2018).Breck &Helfand(2011) The Economics of Environment, Prentice Hall
2. Robert N. Stavins (ed.), Economics of the Environment: Selected Readings, W.W. Norton, 5th edition, 2005.
3. Roger Perman, Yue Ma, James McGilvray and Michael Common, Natural Resource and Environmental Economics, Pearson Education/Addison Wesley, 3rd edition, 2003.
4. Maureen L. Cropper and Wallace E. Oates, 1992, "Environmental Economics: A Survey", Journal of Economic Literature, Volume 30, pp. 675-74

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2	2	--	--	--	--	2	2	--	--
CO2	1	2	2	2	2	--	--	--	2	--	--	--
CO3	2	2	2	3	3	--	--	--	2	--	--	--
CO4	3	3	--	--	2	--	--	--	2	--	--	--
CO5	3	3	--	--	2	2	--	--	2	--	--	--
CO6	2	1	2	1	1	--	--	--	--	--	--	--

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DECO2704	URBAN ECONOMICS	L	T	P	C
Version 1.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

To understand the causes and consequences of urban growth and economic issues in the provision of urban amenities. Urban economics is the study of the location choices of firms and consumers and how these choices affect city size, urban growth or decline, the spatial distribution of economic activity, pollution, congestion, poverty and segregation.

Course Objectives

The objective of this course is to

1. Define the Model of the Urban System
2. Understand the concept and Importance of the Economics of Location
3. Understand the development of regional metropolitan economies.
4. Assess the economic underpinnings and issues of selected urban problems (e.g., poverty, transportation, education, employment
5. Trace the evolution of cities and urban areas, including the economic incentives for their development.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define the concepts and functions of Urban Systems
CO2: Describe the unique features of the Economics of Location
CO3: Asses the Importance of Urban Infrastructure
CO4: Assess and analyse the concept of Urban Planning
CO5: Assess and analyse the concept of Urban Finance

Modules	Blooms level*	Number of hours
MODULE 1: Urban Systems Urban Economics: Meaning; Five Axioms of Urban Economics. Urbanization; Structure of Human settlement; Functional dependencies between human settlements of different sizes; Urban Settlement; Urban system; Characteristics of an economy passing through different stages of urbanization.	L1, L2,	6
MODULE 2: Economics of Location Economics of location: Satellite Town; Neo-classical spatial equilibrium; Neo-classical location theory; Central Place Theory; Core-Periphery Model; Core-Periphery Stages of Development in an Urban System; Agglomeration economics; Location Decisions of Firms; Why Do Firms Cluster? Benefits and Costs of Bigger Cities; Urban Spatial Structure: Features and Concepts of City Structure.	L1, L2,	8

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MODULE 3: Urbanization Challenges Urbanization, Urban Life, and Urban Spaces; Patterns and process of Urban development; Nature and dimensions, factors initiating and perpetuating urbanization process; Characteristics of an economy passing through different stages of urbanization; Overpopulation and Congestion; Urban sprawls, Urbanization and Housing; Urban Poverty and Emerging New Inequalities; Urban crimes; Urban Infrastructure: Water Supply, Sanitation and Solid waste management.	L1, L2	8
MODULE 4: Urban Planning Urban Planning: Meaning, Need and Importance; Types of Plans for Urban Planning; Strategy of Urban Planning; Role of Smart Cities for economic development. Urban Planning under Five-Year Plans in India; Urban Land Use Planning: Meaning and Types; Objectives, Processes and Steps in Land Use Planning; Principles of Land Use Planning; Key Legislations on Land Use Planning; The Future of Sustainable Cities; Sustainable Urban Development.	L1, L2, L4	8
MODULE 5: Urban Governance Urban Governance: Concept and Need; Urban Local Bodies and Municipal Governance in India; Urban Governance in India: Structural Changes and Innovations; Impediments in Improved Governance; Measures to strengthen Urban Governance; Management of Urban Services.	L1, L3, L4	6

Bloom's Level:
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Sullivan, A. (2014). *Urban Economics*, 8th Edition, McGraw Hill/Irwin, UK.

Reference Books

1. Bahl, R. W., & Linn, J. F. (1992). *Urban public finance in developing countries*. The World Bank.
2. Henderson, V. (2002). Urbanization in developing countries. *The World Bank Research Observer*, *17*(1), 89-112.
3. Misra, R.P. (2019). *Million cities of India: Growth dynamics, internal structure, quality of life, and planning perspectives*. New Delhi: Concept Publishing Pvt. ltd.
4. Singh, K., & Ta'i, B. (2000). *Financing and Pricing of Urban Infrastructure*. New Age International (P) Limited Publishers.
5. Sivaramakrishnan, K. C. 1., Kundu, A., & Singh, B. N. (2007). *Handbook of urbanization in India: An analysis of trends and processes* (2nd ed.). New York: Oxford University Press.
6. Adams, D. (1994), *Urban Planning and the Development Process*, UCL Press, England.
7. Amler, B. Betke, D. Eger, H. Ehrich, C. Kohler, A. Kutter, A. Von A., Lossau, U., Müller, S. Seidemann, Steurer, R. (1999) *Land Use Planning Methods, Strategies and Tools*, GTZ, 65726 Eschborn, Germany

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

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Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	10	5	10	70

(A-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination)

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2	--	3	3	--	--	1	1	--	--
CO2	1	1	3	--	1	--	--	--	1	1	--	--
CO3	1	1	2	--	3	3	--	3	1	1	2	--
CO4	2	1	2	3	3	2	--	2	1	1	3	--
CO5	1	1	3	3	2	3	--	3	1	1	3	--

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DECO2739	BASICS OF RESEARCH METHODOLOGY, ETHICS, AND RESEARCH COMMUNICATIONS	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description

This course aims to provide students with a comprehensive understanding of conducting ethical research, utilizing proper research methodologies, and effectively communicating research findings. The course includes a final project where students will write a Literature Review on a topic chosen in consultation with the teacher(s).

This course is designed to equip students with essential skills and knowledge to conduct ethical research, employ proper research methodologies, and effectively communicate scientific information (with focus on writing a literature review). The course will cover topics such as research design, data collection and analysis, research ethics, and science communication strategies. Through a combination of lectures, discussions, case studies, and practical exercises, students will develop a deeper understanding of the research process and its ethical implications.

Course Objectives

The objective of this course is to impart knowledge about various stages of research process, research ethics and different ways of research communication.

The aim of this course is to impart research skills to the beginners and help to improve the quality of research by the existing researchers. It also encompasses the understanding and application of appropriate research design, statistics, and the use of the computer for reference management, report writing, research paper writing and presentation. The course also introduces the key conceptual issues of each research method, as well as giving practical guidance. It covers the series of research methodology contents: from problem formulation, to design, to data collection, analysis, reporting and dissemination. The course has the dual aims of equipping students with conceptual understandings of current academic debates regarding different methods, and the practical skills to put those methods into practice.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define criteria of good research, steps in research process, and data collection.

CO2. Identify different types of sampling and its purpose.

CO3. Conduct hypothesis testing for different types of samples and interpret the results.

CO4: Learn the importance of literature review, write research paper/thesis, use reference management software.

Course Content :

Module	Topic	**Blooms level***	Hours

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1	**Research Methodology** Understanding the research process: From research questions to conclusions Types of research: Qualitative and quantitative research Exploratory, descriptive, experimental, and correlational studies Scientific Thinking: Subjective Vs. Objective Thinking Logical Reasoning: Inductive Vs. Deductive Reasoning Formulating research hypotheses and objectives Purpose of a good research, Criteria of good research	L1, L2	10
2	**Descriptive Statistics** Data, Types of Data, Methods of data collection, Benefits and drawbacks, Graphical representation of data and interpretation. Measures of Central Tendency: Arithmetic Mean, Median, Mode, Measures of Dispersion: Range, Standard Deviation, Variance, Coefficient of Variation.	L1, L2, L3	15
3	**Inferential Statistics** Sampling: Basic concepts, Process of Sampling, Sample Size, Types of Samples, Sampling and non- sampling errors, Statistics and Parameters, Sampling Distribution of Means and Proportion, Hypothesis Testing, steps in testing of hypothesis, errors in hypothesis testing, z test and t test.	L1, L2, L3	15
4	**Research Ethics** Plagiarism, Fabrication, Falsification, Ethics with respect to human and Animal Research	L1, L2	5
5	**Communication** Characteristics of a good Research paper, Systematics Literature Review (choosing a topic, preparing outline, gathering authentic & appropriate references, avoiding plagiarism, use of reference management systems), Writing a good literature review, Structure of report (Introduction, Methodology, Analysis, Results, Discussions, Conclusions, Recommendations), Writing Quality Research Paper, Publishing Research Work in Quality Journals, Reference Management Software	L1, L2, L3	15

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional Exam	End Term Examination
Weightage (%)	5	10	15	70

Project based assignment: Student teams (2-3 students per team) will write a literature review on a topic of choice, in consultation with the teacher.

Text books/ Reference books

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- Research Methodology for Natural Sciences by Soumitro Banerjee, Publisher: IISc Press (1 January 2022); ISBN-10: 8194835178; ISBN-13: 978-8194835172
- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt. Ltd., New Delhi-110001
- Geode, Millian J.& Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Kothari, C.R.2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.
- Levin R I., Rubin D S. Statistics for Management. Sixth Edition, PHI
- Kapoor & Gupta. Probability & Statistics. S Chand Publishers, New Delhi.
- Montomery, Douglas C.(2007), 5th Ed. Design and Analysis of Experiments, Wiley India.
- Cooper, Donald R. and Pamels Schindler, Business Research Methods, Tata McGraw Hills, New Delhi
- Krishnaswamy, K.N. Sivakumar. Appa lyer and Mathiranjan M. 2006, Management Research Methodology: Integration of Principles, Methods and Techniques, Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Sachdeva, J.K. 2008. Business Research methodology. Himalaya Publishing House, New Delhi.
- Shekharan, Uma, Business Research Methods, Miley Education, Singapore.
- Zikmund, Millian G., Business Research Methods, Thomson Learning, Bombay.

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SEMESTER-VIII

DECO2801	ADVANCED ECONOMETRICS	L	T	P	C
Version 1.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure	Basic understanding of statistics and econometrics				
Co-requisites	Basic understanding of MS Excel or other statistical software				

Course Description
This course focuses on developing different techniques that are commonly used in empirical research. This course assumes that students are familiar with simple linear regression and multiple regression analysis and will build on this foundation. Students will learn how to analyze data, make informed conclusions, and critique the limitations and assumptions of empirical analysis. The course will emphasize the application of econometrics, particularly through econometric software packages such as STATA/Eviews/R.

Course Objectives
The objective of this course is to
1. Familiarize the students with advanced econometric methods, estimation methods and related econometric theories and application of methods for data analysis and data interpretation.
2. Facilitate hands-on experience to estimate econometric models using software like Eviews, STATA, SPSS, R etc. various statistical problems.

Course Outcomes
On completion of this course, the students will be able to
CO1: Identify different datasets and use a variety of econometric techniques for conducting empirical research using data.
CO2: Apply econometric techniques that are most appropriate to use, by assessing their limitations and assumptions, for making causal inferences for a given question and dataset.
CO3: Analyze data by implementing econometric techniques using the econometric software package STATA.

Modules	Blooms level*	Number of hours
MODULE 1: Simultaneous Equation Models Introduction and examples; The simultaneous equation bias and inconsistency of OLS estimators; The identification problem; Rules of identification — order and rank conditions.	L1, L2,L3,L4,L5,L6	8
MODULE 2: Methods of Estimating Simultaneous Equation System Recursive Methods and OLS; Indirect Least Squares (ILS), Instrumental Variables (IV) 2SLS and 3SLS Methods	L1, L2,L3,L4,L5,L6	12
MODULE 3: Time Series Analysis Stationarity, unit roots, co-integration-spurious regression, Dickey-Fuller test, Engle-Granger test, Random walk model	L1, L2,L3,L4,L5,L6	10

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MODULE 4: Forecasting Techniques Forecasting with ARIMA modelling; Box-Jenkins methodology; Vector autoregression; Problems with VAR modelling — Applications; Time-varying parameters and Kalman filter Project 1: ARIMA model for predicting the development of the price of gold	L1, L2,L3,L4,L5,L6	10
MODULE 5: Panel Data Techniques Panel data techniques — Random coefficients model; Fix effects model; Random effect model **Project 2:** Panel data analysis of fixed and random effects using Stata/R	L1, L2,L3,L4,L5,L6	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Greene, W. H. (2018). Econometric Analysis. Pearson.
2. Wooldridge, J. M. (2010). Econometric Analysis of Cross Section and Panel Data. MIT Press.
3. Cryer, J. D., & Chan, K-S. (2008). Time Series Analysis. Springer.

Reference Books:

1. Amemiya, T. (1985). Advanced Econometrics. Harvard University Press.
2. Adams, A., & Clarke, D. (2015). Micro econometrics and MATLAB: An Introduction. Oxford University Press.
3. Hayashi, F. (2000). Econometrics. Princeton University Press.
4. Fomby, T. B., Hill, R. C., & Johnson, S. R. (2011). Econometric Analysis of Financial and Economic Time Series. Wiley.
5. Biørn, E. (2004). Econometrics of Panel Data: Methods and Applications. Oxford University Press.
6. Huffaker, R. (2017). Nonlinear Time Series Analysis with R. CRC Press.
7. Racine, J. S. (2008). Econometrics: A Modern Approach. Wiley.
8. Arellano, M., & Bond, S. (1991). Panel Data Econometrics. Institute for Fiscal Studies.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**Project**	**EE**
Weightage (%)	5	10	5	10	70

CT: Class Test, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO and PO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	2	--	1	1	2	2	--	--	1	3	2	--
CO2	1	2	--	1	1	2	2	--	--	1	3	2	--
CO3	1	2	--	1	1	2	2	--	--	1	3	2	--
CO4	1	2	--	1	1	2	2	--	--	1	3	2	--

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DECO2802	DATA ANALYSIS USING STATISTICAL SOFTWARE	L	T	P	C
Version 1.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure	Basic understanding of statistics and econometrics				
Co-requisites	Basic understanding of MS Excel				

Course Description

This course will provide students with a comprehensive overview of data management, exploration, visualization and analysis. It is designed to serve as a bridge between economic theory, statistics/econometrics, and practical work. The emphasis throughout the class will be placed on providing hands-on experience with data analysis using statistical software.

Course Objectives

The objective of this course is to

1. Introduce students to the field by covering state-of-the-art modelling, analysis and visualization techniques.
2. Emphasize practical challenges involving complex real-world data and include case studies and hands-on work to communicate relevant data patterns in the form of graphical displays.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explore univariate and bivariate data consisting of categorical and quantitative variables by using numerical summary measures to explain which summary measures have good statistical properties.
CO2: Apply methods for data analysis using different data types: temporal data, categorical data, and textual data.
CO3: Draw conclusions about the distribution of data using graphs, summarize data using measures of centre, spread and association, and analyze data using normal distribution.

Modules	Blooms level*	Number of hours
MODULE 1: Descriptive Statistics Descriptive Statistics: Type of data (dichotomous, continuous, nominal, categorical, ordinal, etc.); proportions, ratios and rates; building, cleaning and administering databases in SPSS (including defining, computing, selecting and recoding variables for data analyses); measures of central tendency (mean, median, mode); measures of dispersion (range, extreme values, percentiles, variance, standard deviation); data presentation and visualisation (tabulations, bar/pie diagrams, histogram, frequency curve, boxplots, scatterplots, etc.	L1, L2,L3,L4,L5,L6	8
MODULE 2: Statistical Inference Statistical population, Parameter, Sample, Statistic, Sampling distribution, sampling error, point estimation, interval estimation, Null hypothesis, Alternative hypothesis, level of significance, sample size determination, one-side test, two-side test, type I error, type II error, power of a test, confidence intervals for proportions, means, variances, standard deviations	L1, L2,L3,L4,L5,L6	10

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MODULE 3: Parametric Tests Large sample tests (Z-test) and small sample tests (t-test, F-test, Chi-square test), ANOVA (One-way analysis, Two-way analysis, missing observations), Bonferroni test for multiple comparisons. Non-parametric tests: Kolmogorov-Smirnov test of normality, difference between 2 medians (Mann-Whitney and Wilcoxon tests for independent and related samples); difference among >2 medians (Kruskal-Wallis and Kendall tests for independent and related samples)	L1, L2,L3,L4,L5,L6	10
MODULE 4: Correlation and Regression Analysis definition of Correlation, Pearson correlation coefficient, Spearman correlation coefficient, coefficient of determination, testing the significance of correlation coefficient, correlation matrix, linear regression lines, multiple regression analysis with more than two variables, stepwise regression, best-set regression, residual analysis, logistic regression analysis.	L1, L2,L3,L4,L5,L6	10
MODULE 5: Time Series Analysis : Components of time series, Decomposition of time series, Trend analysis (moving averages method, curve fitting method), growth rates (linear, geometric), test for trend, Seasonality indices, smoothing methods (moving average method of smoothing, exponential smoothing), periodogram analysis	L1, L2,L3,L4,L5,L6	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Textbooks:

- Bruce, A., & Bruce, P. (2017). Practical Statistics for Data Scientists. O'Reilly Media.
- Moore, D. S., McCabe, G. P., & Craig, B. A. (2019). Introduction to the Practice of Statistics. W. H. Freeman.
- Gaur, A. S., & Gaur, S. S. (2017). Statistical Methods for Practice and Research: A Guide to Data Analysis Using SPSS. SAGE Publications.

Reference Books:

- Chang, W. (2018). R Graphics Cookbook: Practical Recipes for Visualizing Data. O'Reilly Media.
- Peng, R. D. (2020). The Art of Data Science. Leanpub.
- Schmuller, J. (2016). Statistical Analysis with Excel For Dummies. For Dummies.
- Stata Press. (2015). Stata Data Management Reference Manual. Stata Press.
- McDaniel, S., & Hemedinger, C. (2011). SAS For Dummies. For Dummies.
- Griffith, A. (2015). SPSS for Dummies. For Dummies.
- Provost, F., & Fawcett, T. (2013). Data Science for Business. O'Reilly Media.
- Ruppert, D. (2010). Statistics and Data Analysis for Financial Engineering. Springer.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	10	5	10	70

(A-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination)

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CO and PO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	2	--	1	1	2	2	--	--	1	3	2	--
CO2	1	2	--	1	1	2	2	--	--	1	3	2	--
CO3	1	2	--	1	1	2	2	--	--	1	3	2	--
CO4	1	2	--	1	1	2	2	--	--	1	3	2	--

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DECO2803	FINANCIAL ECONOMICS	L	T	P	C
Version 1.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Globally, the financial sectors have, in recent years, been expanding at phenomenal rates and witnessing dramatic changes in their range and sophistication of operations. Hence, there is increasing demand for financial practitioners who are not only equipped with a good foundation in economics, mathematics and statistics but who are also well-trained in the emerging theoretical and empirical tools for a better understanding of the sector. The Financial Economics course is meant to cater to this demand. This course introduces students to the economics of finance. Some of the basic models used to benchmark the valuation of assets and derivatives are studied in detail; these include the CAPM and the Binomial Option Pricing models.

Course Objectives

The objective of this course is to

1. Understand various terms and concepts related to financial markets.
2. Acquire extensive theoretical knowledge in portfolio risk management.
3. Understand different asset-pricing models and apply them to real-world economics
4. Understand the operation of financial derivatives.

Course Outcomes

On completion of this course, the students will be able to

CO1: Students acquire extensive theoretical knowledge in portfolio risk management, capital asset pricing, and the operation of financial derivatives.

CO2: The course familiarizes students with the terms and concepts related to financial markets and helps them comprehend business news/articles better.

CO3: The course also helps to enhance a student's understanding of real-life investment decisions.

CO4: The course has a strong employability quotient given the relatively high demand for skilled experts in the financial sector.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Financial Markets Capital markets, consumption and investments with and without capital markets, market places and transaction costs and the breakdown of separation; Fisher separation theorem; the agency problem; maximization of shareholder's wealth.	L1, L2,	7
MODULE 2: Mean-Variance Portfolio Theory Measuring portfolio return and risks, the effect of diversification, minimum variance portfolio, perfectly correlated assets, minimum variance opportunity set, optimal portfolio choice; mean-variance frontier of risky and risk-free asset, portfolio weights.	L1, L2, L4	7
MODULE 3: Index Models, CAPM & APT Models of asset returns, multi-index models, single index model, systematic and specific risk, equilibrium models-capital asset pricing model, capital market line, security market line, estimation of beta, arbitrage pricing theory.	L1, L2	7
MODULE 4: Fixed Income Securities	L1, L2, L4	7

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Bond prices, spot prices, discount factors, and arbitrage, forward rates and yield-to-maturity, Price sensitivity, Hedging.		
MODULE 5: Future Contracts and Markets: Option Pricing Models Forward and future contracts and markets; European and American options; pricing futures, wasp and synthetic futures; bounds for option prices, put-call parity; derivation of option pricing formula-Binomial approach; Black-Scholes option pricing models, option to expand, valuation of a real option	L1, L2, L3, L4	8

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Textbooks:

- Ross, S. A., Westerfield, R. W., & Jaffe, J. (2018). Corporate Finance. McGraw-Hill Education.
- Bodie, Z., & Merton, R. C. (2021). Financial Economics. Pearson.
- Bodie, Z., Kane, A., & Marcus, A. J. (2018). Investments. McGraw-Hill Education.

Reference Books:

- Karpoff, J. M. (Ed.). (2020). The Oxford Handbook of Corporate Finance. Oxford University Press.
- Constantinides, G. M., Harris, M., & Stulz, R. M. (Eds.). (2013). Handbook of the Economics of Finance (Vols. 1 & 2). Elsevier.
- Tirole, J. (2006). The Theory of Corporate Finance. Princeton University Press.
- McKinsey & Company Inc., & Koller, T. (2015). Valuation: Measuring and Managing the Value of Companies. Wiley.
- Abergel, F., Aoyama, H., & Chakrabarti, B. K. (Eds.). (2014). Market Microstructure: Confronting Many Viewpoints. World Scientific.
- Hull, J. C. (2017). Options, Futures, and Other Derivatives. Pearson.
- Brealey, R. A., Myers, S. C., & Allen, F. (2017). Principles of Corporate Finance. McGraw-Hill Education.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	10	5	10	70

(A-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination)

CO and PO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1	2	--	1	1	2	2	--	--	1	3	2	--
CO2	1	2	--	1	1	2	2	--	--	1	3	2	--
CO3	1	2	--	1	1	2	2	--	--	1	3	2	--
CO4	1	2	--	1	1	2	2	--	--	1	3	2	--

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DECO2804	HEALTH AND GENDER ECONOMICS	L	T	P	C
Version 1.1	Date of Approval: Latest Approved	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

The importance of education and health in improving well-being is reflected in their inclusion among the Millennium Development Goals adopted by the United Nations member states, which include among other goals, achieving universal primary education, reducing child mortality, improving maternal health and combating diseases.

Course Objective:

This course provides a microeconomic framework to analyse, among other things, individual choice in the demand for health and education, government intervention and aspects of inequity and discrimination in both sectors. It also gives an overview of health and education in India.

Course Outcome:

Upon successful completion of the course, a student will be able to:

CO1: Describe the unique economics of the health care system adopted by the United Nations member states.
CO2: Describe the differences between public and private insurance systems.
CO3: Describe the role of health policy in shaping incentives for consumers and providers.
CO4: Evaluate hypothetical and existing health policies in India.
CO5: Devise feasible policies to solve healthcare system problems using economic analysis**.**
CO6: Evaluate the strengths and weakness of analyses in health care economics.

Modules	Blooms level*	Number of hours
Module I: Introduction to Health Economics; Health, good health and quality of life; Determinants of good health; Measurement of health status; Mortality, morbidity and "HALY family" of summary measures QALY	L1, L2, L3, L4, L5, L6	10
Module II: Healthcare Delivery and Market Analysis Healthcare Markets: Demand and Supply Dynamics, Provider Behavior: Incentives, Regulation, and Quality , Pharmaceutical Markets and Pricing Strategies **Demand for Health and Demand for Health Care Services**. Supplier-induced demand; Production of health care, providers- physicians, hospitals and pharmaceuticals; Role of technological change in health care; Sustainability, equity-efficiency trade-off	L1, L2, L3, L4, L5, L6	12

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Module III: Health Cost concepts – opportunity cost, fixed and variable costs, incremental and marginal cost, direct and indirect medical costs time costs and travel cost. **Healthcare Financing and Insurance**; Information asymmetry –adverse selection; Risk aversion; Moral hazard; Health insurance-challenges; Insurance concepts; Co-payments; Co-insurance rates, deductibles, group insurance Models of Healthcare Financing: Public vs. Private Systems Health Insurance Mechanisms and Coverage Equity and Efficiency in Healthcare Financing	L1, L2, L3, L4, L5, L6	14
Module IV: **Health and Education Sector and Health Policy in India**: Overview: Health outcomes; health systems; health financing Literacy rates, school participation, school quality measures **Health Policy and Evaluation:** Health Policy Analysis and Design Assessing Healthcare Interventions and Programs, Economic Evaluation in Healthcare: Cost-Benefit and Cost-Effectiveness Analysis	L1, L2, L3, L4, L5, L6	10
Module V Gender Economics Introduction to Gender Economics, Theoretical frameworks, Measuring Gender Inequality, Gender Disparities in Labor Markets, Education, Human Capital & Gender, Gender & Entrepreneurship and Innovation, Gender& Macroeconomic Policies. Case study on policy interventions to understand how gender influences economic outcomes and shapes socio-economic structures.	L1,L2,L3, L4,L5,L6	14

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Textbooks:

- Phelps, C. E. (2017). Health Economics. Routledge.
- Santerre, R. E., & Neun, S. P. (2018). Health Economics: Theory, Insights, and Industry Studies. Cengage Learning.
- Bhattacharya, J., Hyde, T., & Tu, P. (2021). Health Economics. Routledge.

Reference Books:

- Culyer, A. J., & Newhouse, J. P. (Eds.). (2000). Handbook of Health Economics (Vols. 1 & 2). Elsevier.
- Jones, A. M. (Ed.). (2012). Oxford Handbook of Health Economics. Oxford University Press.
- Kenkel, C. T. (2006). Health Economics. Oxford University Press.
- Dewar, D. M. (2015). Essentials of Health Economics. Jones & Bartlett Learning.
- Kalipeni, E. (2004). Public Health, Disease and Development in Africa. Nova Science Publishers.
- Folland, S., Goodman, A. C., & Stano, M. (2016). The Economics of Health and Health Care. Pearson.
- Olsen, J. A. (2016). Principles in Health Economics and Policy. Oxford University Press.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	10	5	10	70

(A-Attendance; P-Project/Seminar/Quiz/Viva; HA-Home Assignment; CT-Class Test; EE-End Semester Examination

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CO and PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	3	2	1	2	3	2	1	1	--	--	3
CO2	1	3	2	2	1	3	2	1	1	--	--	--
CO3	1	3	2	2	3	3	2	1	1	--	--	3
CO4	1	3	--	2	1	3	2	1	1	3	--	3
CO5	1	3	--	2	3	3	2	1	1	3	--	--
CO6	1	3	1	1	1	3	2	1	1	3	--	--

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DECO2839	DATA ANALYSIS & VISUALISATION USING SOFTWARE	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	Class X Mathematics				
Co-requisites					

Catalog Description

The implosion of available data has made visualization more critical but also more challenging. Data analysis and Data Visualization are essential tools for business analysis, engineers, policymakers, and decision-makers. Developed originally for "small data", visualization techniques have been met with varied success in the past centuries and decades. There are a few well-known visualizations that are very effective in capturing the essence of the data, and of course, there are many infamous negative examples of poor visuals. An effective visual is critical for decision making it, but it also requires a lot of work, customization, attention to detail, and refinements.

Course Objectives

The course is designed to help students develop skills and knowledge in the following area(s):

- Develop an understanding of what is a good visualization for a given purpose
- Learn visualization theory & techniques
- Build a substantial data analytic project
- Apply data analysis and visualization with Excel, SPSS, R, Python, NVivo and MATLAB

Course Outcomes

On completion of this course, the students will be able to

CO1. Students will be able to articulate meaningful lines of inquiry that might be explored through the collection, organization, visualization, and analysis of data in a context associated with their primary field of study using (as appropriate) numerical, textual, spatial, and/ or visual data.

CO2. Student will understand what data are, how they are collected, and how to assess the quality/ reliability of data.

CO3. Students will demonstrate intermediate proficiency in the visualization of data to communicate information and patterns that exist in the data.

CO4: Students will be able to use at beginning level of proficiency the tools of statistics and machine learning to ask questions of and explore patterns in data.

Course Content :

Module	Topics Covered	Blooms Level	Contact Hours

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1	**Module-1: Introduction to Excel** Data Analysis using Excel, Curve fitting, Correlation, Linear Regression, Multiple regression, Principal Component Analysis and Factor Analysis, Hypothesis testing **Introduction to Excel and SPSS** Introduction to SPSS and Types of Data, Importing, exporting and data handling in SPSS; Exploratory data analysis using SPSS and data visualization; Introduction to statistical inference and various univariate tests by using SPSS; Analysis of Variance (One Way ANOVA, Two Way ANOVA and ANCOVA); Correlation, Simple and Multiple linear Regression Analysis; Principal Component Analysis and Factor Analysis	L1, L2, L3, L4	20 hours
2	**Module-2: VOS Viewer** **Web of Science, Scopus, Dimensions, Lens, and PubMed.** Co-authorship networks, citation-based networks, and co-occurrence networks can be created based on data downloaded from Web of Science, Scopus, Dimensions, and Lens. Co-authorship networks and co-occurrence networks can also be created based on PubMed data. **Crossref, Europe PMC, and OpenAlex**. Networks can also be created based on data retrieved through the APIs of Crossref, Europe PMC, and OpenAlex, These APIs can be queried interactively in VOS viewer. **Semantic Scholar, Open Citations, and Wiki Data.** For a given set of DOIs, networks can also be created based on data retrieved through the APIs of Semantic Scholar, Open Citations and Wiki Data.	L1, L2, L3, L4	10 Hours

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3	**Faculty of Management Studies & Behavioural Sciences** **Module 3: Domain Specific Software** **- Structural Equation Modelling** **Smart PLS** Introduction to Structural Equation Modelling (SEM), Introduction to the software's AMOS and SPSS, SMART PLS, Testing of Statistical assumptions, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), common method bias (CMB) test, Measurement Model Assessment, Discussing Fit Indices, Reliability and Validity Testing, Structural Model Assessment identifying multivariate outlier, Construct Validity: Convergent and Discriminant Validity, Measurement Model & Structural Equation Modelling, Mediation and Moderation Effects, Multi-Group Analysis.	L1, L2, L3, L4	30 Hours
	Faculty of Arts **N Vivo** 1. Import text, audio, video, emails, images, spreadsheets, online surveys, web content, and social media from various sources into a simple, intuitive interface. 2. Create and NVivo project, import and organise qualitative and quantitative data 3.Manage a literature review in NVivo 4. Autocode structured data deductively and identify themes inductively 5. Generate and falsify hypotheses 6. Combine data in sets for analysis 7. Seek patterns and identify relationships across codes and cases 8. Present findings using visualisations 9. Export data out of NVivo 10. Coordinate teamwork.		

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	Faculty of Science Engineering and Technology **Faculty of Health & Allied Sciences** **R programming / Python/ MATLAB** **R Programming-** Introduction to R, Variables and datatypes in R, Dataframes, Recasting and joining of dataframes, Arithmetic, logical and matrix operations in R, Functions in R, Control structure in R, Data visualization in R. **Python Programming-** Basics of programming, data structure and algorithm using Python, Strings, lists, control, functions, manipulating lists, loops, arrays, selection sort, insertion sort, recursion, sorting, dictionaries, exception handling, file handling, string processing, data analysis using Python **MATLAB Programming-** Introduction, basic features, managing workspace, mathematical functions, basic plotting, Matrices, array operations and linear equations, MATLAB programming- M files script, M-file functions, control flow and operations.		

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional (Theory/ Practical)	End Term Examination
Weightage (%)	5	10	15	70

References:

- David Houcque, 2005. Introduction to MATLAB programming for Engineering students., Northwestern University, E- Book **https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf**
- Mark Lutz, 2009. Learning Python. O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.
- Emmanuel Paradis, 2005. R for Beginners. E book. **https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf**
- A Handbook of Statistical Analysis using SPSS by Dr. Brijesh Awasthi, Redshine Publication.

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Curriculum & Scheme of Examination

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Master of Arts Economics

COMPUTER APPLICATION IN ECONOMIC ANALYSIS

Course Code: ECO4103 **Credit Unit: 03**

Course Objective:

The objective of the course is to demonstrate knowledge of the computer applications in economic analysis and be able to choose the appropriate application for a given task.

Course Content:

Module 1: Computers and Peripherals
Basic components of computer – CPU, input-output devices, keyboard, mouse and scanner, Video display, printers and plotters, data storage and retrieval, hard disk, floppy disk and CD ROM; Types of computers and their applications; Computer networking and resource sharing, Hardware and software - Operating system.

Module 2: Data Processing, Techniques and Algorithms
Concept of data, record and file; Types of data and data structures, data analysis; File handling and, appending and cascading, closing and attribute control; Data storage and retrieval; Data operations; Algorithms like sorting, merging, joining and bifurcation; Database concepts and operation on database; DBMS and RDBMS. Introduction to MS Excel and MS Access

Module 3: Software-based Analysis
SPSS/STATISTICA: A package for Statistical Analysis in Social Sciences. Basic Operations; File, Edit, View, Data, Transformation, Graph and Utilities. Statistical Analysis using SPSS/STATISTICA: Summary, Tabulation and Comparison of Summary Statistics; Correlation and Regression (Linear and Non-linear) using SPSS/STATISTICA; Discriminant analysis, Principal Components, Factor Analysis and Cluster analysis by SPSS/STATISTICA; Use of MATLAB.

Module 4: IT Application to Economics
On line banking; ATM‘s Electronic stock exchange; Electronic trading; Data sharing and dissemination; Electronic transaction; Document delivery; Authentication and validation transaction processing – Electronic trading and marketing; On line shopping and malls, B2B, B2C, models, Document and transaction security and digital signature; Integrated transaction on mobile platforms. E-Commerce applications in India

Examination Scheme:

Components	P0(Att.)	P1	C1	CT	EE
Weightage (%)	5	5	5	15	70

Text & References:

Text:

- Krishnamurthy and Sen :Computer-Based Numerical Algorithms, Affiliated East-West Press, ND
- Lipschultz, M.M. and S. Lipschultz (1982): Theory and Problems of Data Processing, Schaum’s Outline Series, McGraw Hill, NY.
- Mishra, S.K. and J.C. Binwal (1991): Computer Applications in Social Science Research, Vikas, Delhi.
- Rajaraman, V. (1996): Fundamental of Computers, Prentice Hall, ND.

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- Sanders, D.H. (1988): Computer Today, McGraw Hill (3e), NY.
- Sinha, P.K. (1992): Computer Fundamentals, BPB Publications, ND

References:

- Kim, J. and C.W. Muller (1989): Factor Analysis: Statistical Methods and Practical Issues, Sage, ND.
- Kuester, J.L. and J.H. Mize (1973): Optimization Techniques with FORTRAN IV, McGraw Hill, NY.
- Nie, N.H. (1970): SPSS – Statistical Package for Social Sciences, McGraw Hill, NY
- Rushton, G., M.F. Goodchild and L.M. Ostresh (1973): Computer Programs for Location-Allocation
  Problems. Monograph 6, Dept. of Geography, Univ. of Iowa, Iowa
- Sharma, J.K. (1997): Operations Research, Macmillan, Delhi.

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INDIAN ECONOMY-ISSUES & POLICY

Course Code: ECO4105 **Credit Unit: 04**

Course Objective:
The objective of this course is to provide to students the basic knowledge of the structure of Indian Economy and its current developments.

Course Contents

Module I: Growth and Structure of Indian Economy Since 1950
Growth of Indianeconomy since 1950; Measures for raising economic growth; Trends in the nature andmmagnitude of poverty, inequality and unemployment; Changes in occupational Pattern, Demographic trends and economic development; Rate and trend in saving, Investment and growth rate

Module II: Growth of Agricultural and Industrial Sectors
Trends in agricultural production and productivity; Food policy and Public Distribution System (PDS); Impact of liberalization in agricultural sector; Industrial Growth performance and problems; Industrial concentration; its nature and extent; Cottage and small scale industries; Impact of liberalization and privatization on the
Industrial sector

Module III: Money Supply, Inflation and Public Policies
Factors determining interest rates; Money supply and inflation in India; financial sector reforms during 1990's Recent tax reforms; Growth and structure of Subsidies in India; Macro-economic policies – fiscal policy, income policy and Stabilization policy; Parallel economy and its implications

Module IV: International Trade Policies
Composition and directions of India's foreign trade; Factors determining the Balance of payment. Is equilibrium in the balance of payment? Causes, consequences; and policy measure; India's policies towards foreign capital; collaboration, export; Promotion and import substitution. Exchange rate policy and the convertibility of Rupee

Module V: Development Policies
India's planned development; Successes and failures. Policies for social justice (With special reference to the alleviation of poverty, inequality and unemployment) Sectoral policies: Industrial and agrarian. Policies for liberalization and privatization

Examination Scheme:

Components	P0(Att.)	P1	C1	CT	EE
Weight age (%)	5	5	5	15	70

Text & References:

Text:

- Bagchi, A. (1982). The Political Economy of Underdevelopment in India,
- Cabridge University Press, Cambridge.
- Bardhan, P. (1984). The political Economy of Development in India, Oxford
- University Press, New Delhi.
- Brahmandnda, P. R. and V. R. Panchumkhi, (Eds) (1987). The Development

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- Process of the Indian Economy, Himalaya Publishing House, Bombay.
- Dandekar, V. M. & N. Rath. Poverty in India; Indian School of Political
- Economy, Bombay.
- Datta, Bhabatosh (1977). The Contents of Economic Growth, and other
- Eassay, Research India Publication, Calcutta.
- Rao, V. K. R. V. (1983). India's National Income : 1950-1980, Sage Publications, New Delhi.

References:

- Kapila, U., (Ed.) (1988). Indian Economy Since Independence, Vol. – I, Academic foundation, New Delhi.
- N. Aggarwal (1995). Indian Economy Problems of Development and
- Planning, WishwaParkashan, New Delhi.
- Misra S. K. and Puri V. K. (1993). Indian Economy-its Development Experience, Hinday Publishing House.

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TERM PAPER/ REVIEW OF DISSERTATION-I

Course Code: ECO4231 **Credit Units: 02**

GUIDELINES FOR TERM PAPER

A term (or research) paper is primarily a record of intelligent articulation through several sources on a particular topic of a given subject.

The students will choose the topic at the beginning of the session in consultation with the faculty assigned/chosen. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned/chosen. The evaluation will be done by Board of examiners comprising of the faculties.

The procedure for writing a term paper may consists of the following steps:

Choosing a topic

1. Finding sources of material
2. Collecting the notes
3. Outlining the paper
4. Writing the first draft
5. Editing & preparing the final paper

1. Choosing a Topic

The topic chosen should not be too general. Student will normally consult the faculty guide while finalizing the topic.

2. **Finding Sources of material**

- The material sources should be not more than 5 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.
- Begin by making a list of subject-headings under which you might expect the topics to be listed.
- The sources could be books and magazines articles, news stories, periodicals, journals, internet etc.

3. Collecting the notes

Skim through sources, locate the useful material, make notes of it, including quotes and information for footnotes.

- ***Get facts, not just opinions***. Compare the facts with author's conclusion(s)/recommendations.
- In research studies, notice the methods and procedures, results & conclusions.
- Check cross references.

4. Outlining the paper

- Review notes to find main sub-divisions of the topic.
- Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

5. Writing the first draft

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is. You may follow the following:

- statement of purpose/objectives
- main body of the paper
- statement of summary and possible conclusion(s)/recommendations

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Avoid short, bumpy telegraphic sentences and long straggling sentences with more than one main ideas.

6. Editing & preparing the final paper

a) Before writing a term paper, you should ensure you have an issue(s) which you attempt to address in your paper and this should be kept in mind throughout the paper. Include only information/ details/ analyses that are relevant to the issue(s) at hand. Sometimes, the relevance of a particular section may be clear to you but not to your readers. To avoid this, ensure that you briefly explain the relevance of every section.
b) Read the paper to ensure that the language is not awkward, and that it "flows" smoothly.
c) Check for proper spelling, phrasing and sentence construction.
d) Check for proper form on footnotes, quotes, and punctuation.
e) Check to see that quotations serve one of the following purposes:
   (i) Show evidence of what an author has said.
   (ii) Avoid misrepresentation through restatement.
   (iii) Save unnecessary writing when ideas have been well expressed by the original author.
f) Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:

1. Title page
2. Abstract
3. Introduction
4. Review of the Literature
5. Discussion&Conclusion
6. References
7. Appendix

Generally, the introduction, discussion, conclusion and references should account for a third of the paper and the review part should be two thirds of the paper.

Discussion

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the paper.

Conclusion

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

a. summary of objectives and issues raised.
b. summary of findings
c. summary of limitations of the study at hand
d. details of possibilities for related future research

References

From the very beginning of the research work, one should be careful to note all details of articles or any other material gathered. The Reference part should list ALL references included in the paper. References not included in the text in any form should NOT be listed here. The key issue here is consistency. Choose a particular convention and stick to this.

The Conventions

Monographs

Crystal, D. (2001), *Language and the internet.* Cambridge: Cambridge University Press.

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Edited volumes
Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language.* Berlin/ NY: Mouton de Gruyter.
[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

Edited articles
Schmidt, R./Shimura, A./Wang, Z./Jeong, H. (1996), Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea. In: Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language.* Berlin/ NY: Mouton de Gruyter: 285-316.

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Electronic book
Chandler, D. (1994), *Semiotics for beginners* [HTML document]. Retrieved [5.10.'01] from the World Wide Web, http://www.aber.ac.uk/media/Documents/S4B/.

Electronic journal articles
Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document]. *German as a Foreign Language Journal [online] 1.* Retrieved [12.09.'00] from the World Wide Web, http://www.gfl-journal.com/.

Other websites
Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document]. Retrieved [13.10.'01] from the World Wide Web, http://olaf.hiof.no/~sverrev/eng.html.

Appendix
The appendix should be used for data collected (e.g. questionnaires, transcripts etc.) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

The Layout Guidelines for the Term Paper
- A4 size Paper
  - Font: Arial (10 points) or Times New Roman (12 points)
  - Line spacing: 1.5
  - Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

Assessment Scheme:

Continuous Evaluation: 40%
(Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)

Final Evaluation: 60%
(Based on the organization of the paper, objectives/ problem profile/ issue outlining, comprehensiveness of the research, flow of the idea/ ideas, relevance of material used/presented, outcomes vs. objectives, presentation/ viva etc.)

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FUNDAMENTALS OF ECONOMETRICS

Course Code: ECO4301 **CreditUnits: 04**

Course Objective:

This course presents the basic econometrics techniques emphasizing numerical estimation of economic relationships as applied to practical economic and managerial problems

Course Contents:

Module I: Basic Econometrics

Nature, meaning and scope of econometrics; Simple and general linear regression model — Assumptions, Estimation (through OLS approach) and properties of estimators; Gauss-Markov theorem; Concepts and derivation of R2 and adjusted R2; Concept and analysis of variance approach and its application in regression analysis;

Module II: Problems in Regression Analysis

Nature, test, consequences and remedial steps of problems of heteroscedasticity; Multicollinearity and auto-correlation; Problems of specification error; Errors of measurement

Module III:Regressions with Qualitative Independent Variables

Dummy variable technique — Testing structural stability of regression models comparing to regressions, interaction effects, seasonal analysis, piecewise linear regression, use of dummy variables, regression with dummy dependent variables; The LPM, Logit, Probit and Tobit models — Applications.

Module IV: Dynamic Econometric Model

Autoregressive and distributed lag models — Koyak model, Partial adjustment model, adaptive expectations; Instrumental variables; Problem of auto-correlation — Application; Almon approach to distributed-lag models; Error correlation mechanism, Causality test, Granger test and Sim's test

Examination Scheme:

Components	P0(Att.)	P1	C1	CT	EE
Weightage (%)	5	5	5	15	70

Text & References:

Text:

- Gujarati, D.N. (1995), Basic Econometrics (2nd Edition), McGraw Hill, New Delhi.
- Theil, H. (1981), Introduction to Econometrics, Prentice Hall of India, New Delhi.

***References*:**

- A.S. Goldberger (1998), Introductory Econometrics, Harvard University Press, Cambridge
- Suresh K. Ghoshe, "Econometrics", Prentice Hall of India Private Limited, New Delhi
- A. Koutsoyiannis, "The theory of Econometrics: An introduction exposition of econometric methods", Educational low-priced books scheme, McMillan Education (1992)
- Damodar N. Gujarathi," Basic Econometrics", Tata McGraw Hill Ltd., 1999 (4th ed.)
- J. Johnson," Econometric Methods"
- Christopher Dougherty," Introduction to Econometrics", Oxford University Press (3rd edition)
- Amemiya, T. (1985), Advanced Econometrics, Harvard University Press, Cambridge, Mass.
- Baltagi, B.H. (1998), Econometrics, Springer, New York.
- Dongherty, C. (1992), Introduction to Econometrics, Oxford University Press, New York.
- Goldberger, A.S. (1998), Introductory Econometrics, Harvard University Press, Cambridge,Mass.

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RESEARCH METHODS IN ECONOMICS

Course Code: ECO4303 **Credit Units: 03**

Course Objective:

The need of this subject is for those concerned with research to pay due attention to the designing and adhering to the appropriate methodology for improving the quality of research and specifically for introducing the different techniques of doing marketing research.

Course Contents:

Module I -Preliminaries
Meaning and definition of research- classification of research(pure, applied, exploratory, descriptive, historical, diagnostic, experimental, qualitative, quantitative) - importance, applications and limitations of social science research- interdisciplinary and trans-disciplinary approaches Statistics and information -communication technology in research- Basic elements of the scientific method-theory and research- the meaning of methodology

Module II- Research problem and design
An overview of the different steps in research process-selection of the topic and formulation of the research problem in Economics with illustrations- review of literature- Research design, features of a good design-different research designs for exploratory, descriptive, diagnostic and experimental research

Module III -Collection and analysis of data
Sample design- probability and non probability sampling- complex random sampling designs-Methods of collecting primary data- questionnaire and schedules- sources of secondary data on Indian economy- case study method -processing of data- sources of hypothesis-Testing of hypothesis – procedure for testing hypothesis-one tailed and two tailed tests – basics of the important parametric and non-parametric tests- basic awareness of SPSS

Module IV- Interpretation and preparation of the report
Interpretation, drawing conclusions and reporting it-Structure of the research report- Types of reports-Methods of footnotes and referencing

Examination Scheme:

Components	P0(Att.)	P1	C1	CT	EE
Weightage (%)	5	5	5	15	70

Text & References:

Text:

- William J Goode and Paul K Hatt,1981 Methods in social Research, McGraw- Hill
- Wilkinson and Bhandarkar,2002 Methodology and Techniques of Social Research, Himalaya
- Kothari, C.R., Research Methodology, Wiley Eastern Ltd, New Delhi

***References*:**

- William J Goode and Paul K Hatt,1981 Methods in social Research, McGraw- Hill
- Wilkinson and Bhandarkar,2002 Methodology and Techniques of Social Research, Himalaya
- Marc Blaug The Methodology of Economics, or How Economics Explain, Cambridge University
- P.S Mohanakumar(Edited),1998 : A Handbook on Research Methodology. Right Publishers, Kudavechoor

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ENVIRONMENTAL ECONOMICS

Course Code: ECO4309 **Credit Units: 03**

Course Objective:

The course will provide an insight into basics of environmental problems environmental management and interrelationshipbetweenenvironment and economic development.

Course Contents:

Module I: Introduction
Environmental Economics - Meaning, nature and Historical development of environmental economics. Structure of environment, Characteristics of Environment, Sustainable development: concept, indicator and measurement.

Module II: Waste management
Pollution prevention, physical operations of waste treatment, Water pollution, Air pollution and control, Global Environmental Issues

Module III: Environmental Management
Environmental Legislations in India, Environment Quality Objectives and standards, Institutional Environmental agreements; Tools for environmental management; Environmental economics

Module IV:Environment and Economic Development
Interrelationship between environment and economic development; Environnemental pollution in global perspective; Case studies on environmental management – Textile Industries and Tanneries

Examination Scheme:

Components	P0(Att.)	P1	C1	CT	EE
Weightage (%)	5	5	5	15	70

Text & References:

Text:

- Joseph, K. and R. Nagendran; Essentials of Environmental Studies, Pearson Education.
- DeshBandhu, H Singh and A.K. Mitra (1990). Environmental Education and Sustainable Development. New Delhi, Indian Environmental Society

***References*:**

- Dhaliwal, G.S., G.S Sangha and P.K. Ralhan (1998); Fundamentals of Environmental Science; New Delhi; Kalyani Publishers.
- Dixon, John A., Louise F. Scura, Richard A. Carpenter and Paul B. Sherman (1994); Economic Analysis of Environmental Impacts. London: Earthscan Publications.
- Elkins, Paul (2001); Economic Growth, Human welfare and Environmental Sustainability; New York; Routledge.

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TERM PAPER/ REVIEW OF DISSERTATION-II

Course Code: ECO4331 **Credit Units: 02**

GUIDELINES FOR TERM PAPER

A term (or research) paper is primarily a record of intelligent articulation through several sources on a particular topic of a given subject.

The students will choose the topic at the beginning of the session in consultation with the faculty assigned/chosen. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned/chosen. The evaluation will be done by Board of examiners comprising of the faculties.

The procedure for writing a term paper may consists of the following steps:

Choosing a topic

1. Finding sources of material
2. Collecting the notes
3. Outlining the paper
4. Writing the first draft
5. Editing & preparing the final paper

1. Choosing a Topic

The topic chosen should not be too general. Student will normally consult the faculty guide while finalizing the topic.

2. **Finding Sources of material**

- The material sources should be not more than 5 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.
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The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the paper.

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The Layout Guidelines for the Term Paper
- A4 size Paper
  - Font: Arial (10 points) or Times New Roman (12 points)
  - Line spacing: 1.5
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Assessment Scheme:

Continuous Evaluation: 40%
(Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)

Final Evaluation: 60%
(Based on the organization of the paper, objectives/ problem profile/ issue outlining, comprehensiveness of the research, flow of the idea/ ideas, relevance of material used/presented, outcomes vs. objectives, presentation/ viva etc.)

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SUMMER INTERNSHIP EVALUATION

Course Code: ECO4335 **Credit Units: 06**

GUIDELINES FOR INTERNSHIP FILE AND INTERNSHIP REPORT

(These guidelines will be useful for undertaking an internship programme during the summer or at any other time wherein the student/ researcher works full time with a company/organisation)

There are certain phases of every Intern's professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship programme can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal class room situations. These attributes are intellectual ability, professional judgment and decision making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc.

In order to achieve these objectives, each student will maintain and submit a file (**Internship File**) and a report (**Internship Report**).

INTERNSHIP FILE
The Internship File aims to encourage students to keep a personal record of their learning and achievements throughout the Programme. It can be used as the basis for lifelong learning and for job applications. ***Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development.***

The File will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and his/her own personal contribution to the organization.

The File is essentially a comprehensive documentation of how one proceeds while working on the assignment and should be regularly checked by the faculty guide/ supervisor, issues discussed with the students, doubts if any clarified and signed as having done so. This will form the basis of **continuous evaluation** of the project.

The File will include ***five sections*** in the order described below.

1. **The Title Page –** An Internship Experience Report For (Your Name), name of internship organization, name of the Supervisor/Guide and his/her designation, date started and completed, and number of credits for which the report is submitted.
2. **Table of Content –** An outline of the contents of the file by topics and subtopics with the page number and location of each section.
3. **Introduction** – Short, but should include how and why you obtained the internship experience position and the relationship it has to your academic/professional and career goals.
4. **Main Body** – Should include a brief summary/ executive summary of the **Internship Project Report** that the student has worked on, an **analysis of the company/organization** in which the student is working, a **personal review** of the student's management skills and how they have been developed through the programme, the daily tasks performed, major projects contributed to, dates

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and hours spent on a task, observations and feelings, meetings attended and their purposes, listing of tools and materials and their suppliers, and photographs if possible of projects, buildings and co-workers.

5. **Appendices** – Include pamphlets, forms, charts, brochures, technical and descriptive literature, graphs and other information related to your Internship experience.

INTERNSHIP REPORT

The **Internship Report** is the research report that the student has to prepare on the project assigned by the organization. (Incase a student is not assigned a specific research project in the organization, he has to select any one aspect of the organization and prepare a research report on it). The lay out of the report should be as per the standard layout prescribed by the organization wherein the student undertakes the Internship. In case, there is no layout prescribed by the organization the following components should be included in the report:

- **Title or Cover Page**.
  The title page should contain Project Title; Student's Name; Programme; Year and Semester and Name of the Faculty Guide.

- **Acknowledgements**
  Acknowledgment to any advisory or financial assistance received in the course of work may be given. It is incomplete without student's signature.

- **Abstract**
  A good"Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project. It should not exceed more than 1000 words.

- **Table of Contents**
  Titles and subtitles are to correspond exactly with those in the text.

- **Introduction**
  Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

- **Materials and Methods**
  This section should aim at experimental designs, materials used (wherever applicable). Methodology should be mentioned in details including modifications undertaken, if any. It includes organization site(s), sample, instruments used with its validation, procedures followed and precautions.

- **Results and Discussion**
  Present results, discuss and compare these with those from other workers, etc. In writing this section, emphasis should be laid on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

  Note that in writing the various secions, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate

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titles or captions. All major equations should also be numbered and unless it is really necessary, do not write in "point" form.

While presenting the results, write at length about the the various statistical tools used in the data interpretation. The result interpretation should be simple but full of data and statistical analysis. This data interpretation should be in congruence with the written objectives and the inferences should be drawn on data and not on impression. Avoid writing straight forward conclusion rather, it should lead to generalization of data on the chosen sample.

Results and its discussion should be supporting/contradicting with the previous research work in the given area. Usually one should not use more than two researches in either case of supporing or contradicting the present case of research.

- **Conclusion(s) & Recommendations**
  A conclusion should be the final section in which the outcome of the work is mentioned briefly. Check that your work answers the following questions:
  - Did the research project meet its aims (check back to introduction for stated aims)?
  - What are the main findings of the research?
  - Are there any recommendations?
  - Do you have any conclusion on the research process itself?

- **Implications for Future Research**
  This should bring out further prospects for the study either thrown open by the present work or with the purpose of making it more comprehensive.

- **Appendices**
  The Appendices contain material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.
- **References**
  References should include papers, books etc. referred to in the body of the report. These should be written in the alphabetical order of the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

The Layout Guidelines for the Internship File & Internship Report:

- A4 size Paper
- Font: Arial (10 points) or Times New Roman (12 points)
- Line spacing: 1.5
- Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

Assessment Scheme:

Continuous Evaluation: 30%
(based on Internship File and the observations of the faculty guide/ supervisor)

Feedback from Company/ Organization: 10%

Final Evaluation:
(Based on Internship Report, Viva/ Presentation) 60%

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ENTREPRENEURSHIP & SMALL SCALE BUSINESS

Course Code: ECO4404 **Credit Units: 03**

Course Objective: The purpose of this paper is to prepare a ground where the students view Entrepreneurship as a desirable and feasible career option. In particular the paper seeks to build the necessary competencies and motivation for a career in Entrepreneurship.

Course Content:

Module I: Er.-Entrepreneurship-Enterprise: Conceptual issues. Entrepreneurship vs. Management. Roles and functions of er in relation to the enterprise and in relation to the economy. Entrepreneurship is an interactive process between the individual and the environment. Small business as seedbed of Entrepreneurship; Entrepreneur competencies, Entrepreneur motivation, performance and rewards

Module II: Opportunity scouting and idea generation: role of creativity and innovation and business research. Sources of business ideas; Entrepreneur opportunities in contemporary business environment, for example opportunities in net-work marketing, franchising, business process outsourcing in the early 21 century. The process of setting up a small business: Preliminary screening and aspects of the detailed study of the feasibility of the business idea and financing/non-financing support agencies to familiarize themselves with the policies/programs and procedures and the available schemes.

Module III: Management roles and functions in a small business. Designing and re-designing business process, location, layout, operations planning and control. Basic awareness on the issues impinging on quality, productivity and environment; Managing business growth; The pros and cons of alternative growth options: internal expansion, acquisitions and mergers, integration and diversification; Crisis in business growth

Module IV: Sources of risk/venture capital, fixed capital, working capital and a basic awareness of financial services such as leasing and factoring.

Module V: Issues in small business marketing. The concept and application of product life cycle [plc], advertising and publicity, sales and distribution management; The idea of consortium marketing, competitive bidding/tender marketing, negotiating with principal customers. The contemporary perspectives on Infrastructure Development, Product and Procurement Reservation, Marketing Assistance, Subsidies and other Fiscal and Monetary Incentives. National state level and grass-root level financial and non-financial institutions in support of small business development.

Examination Scheme:

Components	P0(Att.)	P1	C1	CT	EE
Weightage (%)	5	5	5	15	70

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Text & References:

Text:

- Bhide, Amar V., The Origin and Evolution of New Business, Oxford University Press, New York, 2000.
- Desai, Vasant Dr. (2004) Management of small scale enterprises New Delhi: Himalaya Publishing House

References

- Taneja, Gupta, Entrepreneur Development New Venture Creation,: 2nd ed. Galgotia Publishing Company
- Dollinger M.J., 'Entrepreneurship strategies and Resources', 3rd edition, Pearson Education, New Delhi 2006.
- Brandt, Steven C., The 10 Commandments for Building a Growth Company, Third Edition, Macmillan Business Books, Delhi, 1977
- Holt, David H., Entrepreneurship: Strategies and Resources, Illinois, Irwin, 1955.
- Panda, ShibaCharan, Entrepreneurship Development, New Delhi, Anmol Publications.
- Patel, V.G., The Seven Business Crises and How to Beat Them, Tata-Mcgraw, New Delhi, 1995.
- SIDBI Report n Small Scale Industries Sector[latest edition]
- Verma, J.C.., and Gurpal Singh, Small Business and Industry-A Handbook for Entrepreneurs, Sage, New Delhi, 2002 11. Vesper, Karl H., New Venture Strategies, [Revised Edition], New Jersy, Prentice Hall, 1990

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DISSERTATION

Course Code: ECO4437 **Credit Units: 06**

GUIDELINES FOR DISSERTATION

The aim of the dissertation is to provide you with an opportunity to further your intellectual and personal development in your chosen field by undertaking a significant practical unit of activity, having an educational value at a level commensurate with the award of your degree

The dissertation can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Selecting the Dissertation Topic

It is usual to give you some discretion in the choice of topic for the dissertation and the approach to be adopted. You will need to ensure that your dissertation is related to your field of specialization.

Deciding this is often the most difficult part of the dissertation process, and perhaps, you have been thinking of a topic for some time.

It is important to distinguish here between 'dissertation topic' and 'dissertation title'. The topic is the specific area that you wish to investigate. The title may not be decided until the dissertation has been written so as to reflect its content properly.

Few restrictions are placed on the choice of the topic. Normally we would expect it to be:

- relevant to business, defined broadly;
- related to one or more of the subjects or areas of study within the core program and specialisation stream;
- clearly focused so as to facilitate an in-depth approach, subject to the availability of adequate sources of information and to your own knowledge;
- of value and interest to you and your personal and professional development.

Planning the Dissertation

This will entail following:

- Selecting a topic for investigation.
- Establishing the precise focus of your study by deciding on the aims and objectives of the dissertation, or formulating questions to be investigated. Consider very carefully what is worth investigating and its feasibility.
- Drawing up initial dissertation outlines considering the aims and objectives of the dissertation. Workout various stages of dissertation
- Devising a timetable to ensure that all stages of dissertation are completed in time. The timetable should include writing of the dissertation and regular meetings with your dissertation guide.

The Dissertation plan or outline

It is recommended that you should have a dissertation plan to guide you right from the outset. Essentially, the dissertation plan is an outline of what you intend to do, chapter wise and therefore should reflect the aims and objectives of your dissertation.

There are several reasons for having a dissertation plan

- It provides a focus to your thoughts.
- It provides your faculty-guide with an opportunity, at an early stage of your work, to make constructive comments and help guide the direction of your research.
- The writing of a plan is the first formal stage of the writing process, and therefore helps build up

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your confidence.

- In many ways, the plan encourages you to come to terms with the reading, thinking and writing in a systematic and integrated way, with plenty of time left for changes.
- Finally, the dissertation plan generally provides a revision point in the development of your dissertation report in order to allow appropriate changes in the scope and even direction of your work as it progresses.

Keeping records

This includes the following:

- Making a note of everything you read; including those discarded.
- Ensuring that when recording sources, author's name and initials, date of publication, title, place of publication and publisher are included. (You may consider starting a card index or database from the outset). Making an accurate note of all quotations at the time you read them.
- Make clear what is a direct a direct quotation and what is your paraphrase.

Dissertation format

All students must follow the following rules in submitting their dissertation.

- Front page should provide title, author, Name of degree/diploma and the date of submission.
- Second page should be the table of contents giving page references for each chapter and section.
- The next page should be the table of appendices, graphs and tables giving titles and page references.
- Next to follow should be a synopsis or abstract of the dissertation (approximately 500 words) titled: **Executive Summary.**
- Next is the 'acknowledgements'.
- Chapter I should be a general introduction, giving the background to the dissertation, the objectives of the dissertation, the rationale for the dissertation, the plan, methodological issues and problems. The limitations of the dissertation should also be hinted in this chapter.
- Other chapters will constitute the body of the dissertation. The number of chapters and their sequence will usually vary depending on, among others, on a critical review of the previous relevant work relating to your major findings, a discussion of their implications, and conclusions, possibly with a suggestion of the direction of future research on the area.
- After this concluding chapter, you should give a list of all the references you have used. These should be cross - references with your text. For articles from journals, the following details are required e.g.

  Draper P and Pandyal K. 1991, The Investment Trust Discount Revisited, Journal of Business Finance and Accounting, Vol18, No6, Nov, pp 791-832.

  For books, the following details are required:
  Levi, M. 1996, International Financial Management, Prentice Hall, New York, 3rd Ed, 1996

- Finally, you should give any appendices. These should only include relevant statistical data or material that cannot be fitted into the above categories.

The Layout Guidelines for the Dissertation:

- A4 size Paper
- Font: Arial (10 points) or Times New Roman (12 points)
- Line spacing: 1.5
- Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

Guidelines for the Assessment of the Dissertation

While evaluating the dissertation, faculty guide will consider the following aspects:

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1. Has the student made a clear statement of the objective or objective(s).
2. If there is more than one objective, do these constitute parts of a whole?
3. Has the student developed an appropriate analytical framework for addressing the problem at hand.
4. Is this based on up-to-date developments in the topic area?
5. Has the student collected information / data suitable to the frameworks?
6. Are the techniques employed by the student to analyse the data / information appropriate and relevant?
7. Has the student succeeded in drawing conclusion form the analysis?
8. Do the conclusions relate well to the objectives of the project?
9. Has the student been regular in his work?
10. Layout of the written report.

Assessment Scheme:

Continuous Evaluation: (Based on Abstract, Regularity, Adherence to initial plan, Records etc.)	40%
Final Evaluation: Based on,	60%
Contents & Layout of the Report,	25
Conceptual Framework,	10
Objectives & Methodology and	10
Implications & Conclusions	15

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SKILL ENHANCEMENT COURSES UNDER NEP PROGRAMMES



Achieving Academic Excellence

Programme Structure

Curriculum & Scheme of Examination

2023

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Skill Enhancement Courses under NEP Programmes (Semester-III & IV)

Sl. No.	Institute/ School	Name of Programme	Course Code	Name of Course	Credit	Semester	Page No.
1	ABS	Bachelor of Business Administration (Honors/ Honors with Research)/ Bachelor of Business Administration- Banking & Finance (Honors/ Honors with Research)/ Bachelor of Arts (Honors/ Honors with Research) in Economics	SMGT2301	Advanced Excel for Managers	3	III	4
2	ABS	Bachelor of Business Administration (Honors/ Honors with Research)/ Bachelor of Business Administration- Banking & Finance (Honors/ Honors with Research)/ Bachelor of Arts (Honors/ Honors with Research) in Economics	SMGT2401	Data Interpretations and Visualisation	3	IV	8
3	ABS	Bachelor of Business Administration- Business Analytics (Honors/ Honors with Research)	SBUA2301	Natural Language Processing	3	III	10
4	ABS	Bachelor of Business Administration- Business Analytics (Honors/ Honors with Research)	SBUA2401	Big Data Analytics	3	IV	12
5	ACC	Bachelor of Commerce (Honors/ Honors with Research)	SMGT2301	Advanced Excel for Managers	3	III	4
6	ACC	Bachelor of Commerce (Honors/ Honors with Research)	SMGT2401	Data Interpretations and Visualisation	3	IV	8
7	AIBAS	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology/ Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	SPSY2301	Psychometric Testing	3	III	14
8	AIBAS	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology/ Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	SPSY2401	Psychological Tools Development for Clinical Psychology	3	IV	16
9	ASET	Bachelor of Science (Honors/ Honors with Research) in Information Technology	SIFT2301	Robotic Process Automation	3	III	18
10	ASET	Bachelor of Science (Honors/ Honors with Research) in Information Technology	SIFT2401	Network Design and Management	3	IV	20

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11	ASET	Bachelor of Computer Application (Honors/ Honors with Research)	SIFT2301	Robotic Process Automation	3	III	18
12	ASET	Bachelor of Computer Application (Honors/ Honors with Research)	SIFT2402	Android Programming	3	IV	21
13	ASAS	Bachelor of Science (Honors/ Honors with Research) in Chemistry	SCHY2301	Rubber Technology	3	III	23
14	ASAS	Bachelor of Science (Honors/ Honors with Research) in Chemistry	SCHY2401	Industrial Application of Carbon Nano Composites	3	IV	25
15	ASAS	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	SFCH2301	Crime Scene Investigation Techniques	3	III	27
16	ASAS	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	SFCH2401	Cyber Forensics	3	IV	29
17	ASAS	Bachelor of Science (Honors/ Honors with Research) in Mathematics	SMTH2301	Fundamentals of C Programming	2	III	31
18	ASAS	Bachelor of Science (Honors/ Honors with Research) in Mathematics	SMTH2302	C Programming Lab	1	III	33
19	ASAS	Bachelor of Science (Honors/ Honors with Research) in Mathematics	SMTH2401	Programming with MATLAB	3	IV	35
20	ASAS	Bachelor of Science (Honors/ Honors with Research) in Physics	SPHY2301	Fundamentals of C Programming	2	III	37
21	ASAS	Bachelor of Science (Honors/ Honors with Research) in Physics	SPHY2302	C Programming Lab	1	III	39
22	ASAS	Bachelor of Science (Honors/ Honors with Research) in Physics	SPHY2401	Instrumentation Physics	3	IV	41
23	ASEES	Bachelor of Science (Honors/ Honors with Research) in Earth Sciences	SESC2301	Remote Sensing and GIS	3	III	43
24	ASEES	Bachelor of Science (Honors/ Honors with Research) in Earth Sciences	SESC2401	Surveying and Mapping	3	IV	44
25	AIB	Bachelor of Science (Honors/ Honors with Research) in Biotechnology/ Bachelor of Science (Honors/ Honors with Research) in Biological Science	SBTH2301/ SBLS2301	Computer Applications for Biologists	3	III	45
26	AIB	Bachelor of Science (Honors/ Honors with Research) in Biotechnology/ Bachelor of Science (Honors/ Honors with Research) in Biological Science	SBTH2401/ SBLS2401	Introduction to Bioinformatics	3	IV	47
27	ASCO	Bachelor of Science (Honors/ Honors with Research) in	SANI2301	Media Entrepreneurship	3	III	49

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		Animation & Visual Graphics					
28	ASCO	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	SANI2401	Portfolio Via Web Design	3	IV	52
29	ASCO	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	SJRN2301	Graphics & Basic Animation	3	III	55
30	ASCO	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	SJRN2401	Media Entrepreneurship	3	IV	49
31	ASLA&FL	Bachelor of Arts (Honors/ Honors with Research) in History	SHIS2301	An Introduction to Archaeology	3	III	58
32	ASLA&FL	Bachelor of Arts (Honors/ Honors with Research) in History	SHIS2401	Understanding Culture, Heritage and Tourism	3	IV	60
33	ASLA&FL	Bachelor of Arts (Honors/ Honors with Research) in Political Science	SPOL2301	Political Leadership & Communication	3	III	62
34	ASLA&FL	Bachelor of Arts (Honors/ Honors with Research) in Political Science	SPOL2401	Basics of Debunking Fake News and Dis-information	3	IV	64
35	ASLA&FL	Bachelor of Arts (Honors/ Honors with Research) in English	SENG2301	Academic Writing and Composition	3	III	66
36	ASLA&FL	Bachelor of Arts (Honors/ Honors with Research) in English	SENG2401	Media and Communication	3	IV	68
37	ASLA&FL	Bachelor of Arts (Honors/ Honors with Research) in French	SFRE2301	Advanced Writing Skills	3	III	70
38	ASLA&FL	Bachelor of Arts (Honors/ Honors with Research) in French	SFRE2401	Introduction to Translation Theory	3	IV	72
39	ASLA&FL	Bachelor of Arts (Honors/ Honors with Research) in German	SGER2301	Advanced Writing Skills	3	III	75
40	ASLA&FL	Bachelor of Arts (Honors/ Honors with Research) in German	SGER2401	Basics of Translation	3	IV	78
41	ASLA&FL	Bachelor of Arts (Honors/ Honors with Research) in Spanish	SSPA2301	Advanced Writing Skills	3	III	81
42	ASLA&FL	Bachelor of Arts (Honors/ Honors with Research) in Spanish	SSPA2401	Introduction to Translation Theory	3	IV	83
43	AMS	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	SDAN2301	Healthy and Sustainable Food Choices	3	III	85
44	AMS	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	SDAN2401	Utilization of Food Waste Management	3	IV	86

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45	AMS	Bachelor of Science (Honors) in Medical Laboratory Technology	SMLT2301	Laboratory Management	3	III	87
46	AMS	Bachelor of Science (Honors) in Medical Laboratory Technology	SMLT2401	Clinical Visit	3	IV	--
47	AMS	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technology	SSCT2301	Bioinstrumentation in Molecular Medicine & Stem Cell Biology	3	III	89
48	AMS	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technology	SSCT2401	Good Laboratory Practices	3	IV	91

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Bachelor of Business Administration (Honors/ Honors with Research)/ Bachelor of Business Administration- Banking & Finance (Honors/ Honors with Research)/ Bachelor of Arts (Honors/ Honors with Research) in Economics/ Bachelor of Commerce (Honors/ Honors with Research)
(Semester-III)

Course Code: SMGT2301	**ADVANCED EXCEL FOR MANAGERS**	L	T	P	C
Version 1.1	Latest Approved	2	0	1	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description
Microsoft Excel is a very popular business productivity application for the management and manipulation of data. With the right training and understanding of Excel, businesses and individual users can unlock the world of opportunities that this powerful business application offers. This course will provide all the tools necessary to create and use basic and advanced spreadsheets.

Course Objectives
After completion of this course, students will be able to
- Learn the various methods for entering and editing data
- Understand the various ways to write simple formulas.
- Analyse the data using techniques in excel

Course Outcomes
On completion of this course, the students will be able to
CO1: Describe the features offered by spreadsheet program.
CO2: Demonstrate their knowledge of features of basic excel.
CO3: Illustrate the usage of functions in excel.
CO4: Apply the option of charts and graphs in Ms Excel.

Course Content:

Modules	**Number of hours**
Module 1: Getting Started with Excel Introduction to Spreadsheets: Launching Excel, entering data in spreadsheet, widening rows and columns, applying basic formatting in spreadsheet, saving work in excel. Entering Data into cells: Using autofill, sort & filter feature, creating lists, inserting & deleting rows and columns. Wrapping & merging text and cells,	9
Module 2: Basics in excel Protecting & sharing workbooks, freeze panes, understanding normal, page layout and page break preview in excel. Setting the page orientation and print area. Adding hyperlinks to cells, inserting images, objects, equations and symbols.	9
Module 3: Charts & Formulas in Excel Understanding Charts: Inserting bar charts, pie charts, column charts and line charts in spreadsheets, formatting and resizing the chart. Using Basic	9

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functions- average, sum, min, max, product etc. date functions, time functions. Math Operators in Excel, combining mathematical operators.	
Module 4: Functions in Excel Logical- using IF, AND, OR, NOT, TRUE, FALSE Functions. Textual- using TRIM, UPPER, LOWER, REPLACE Functions. Import data into excel, Look up functions with index and match. Rounding, sum product, conditional counts and conditional sums, Filtering data, pivot table, pivot charts, conditional formatting.	9
Module 5: Financial and Statistical Functions in Excel & Pivot and Dashboard Financial functions: Time value of money- Present value, Future value, PMT with beginning date, PMT with ending date, NPV, Goal seek, Scenario Manager, IRR. Statistical functions: Max, Min, Average, Large, Rank, Small, Var, Std Dev. Working with external data, advanced use of pivot tables and creating dashboard. V lookup and H lookup table.	9

Textbooks

- Business Analysis with Microsoft Excel by Conrad George Carlberg, Que Publishing, second edition, ISBN 0974415626.

References

- Excel 2013 for Dummies by Greg Harvey, John Wiley & Sons, 2012, ISBN 9781118559703

Modes of Evaluation: Class Test/Assignment /Written Examination

Examination Scheme:

Components	Written Test	Practical	V/P	File/Assignment	Attendance
Weightage (%)	20	30	30	15	5

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1								1	1			
CO2									1	1			
CO3									1	1			
CO4									1	1			

1: strongly related, 2: moderately related and 3: weakly related

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Bachelor of Business Administration (Honors/ Honors with Research)/ Bachelor of Business Administration- Banking & Finance (Honors/ Honors with Research)/ Bachelor of Arts (Honors/ Honors with Research) in Economics/ Bachelor of Commerce (Honors/ Honors with Research)
(Semester-IV)

Course Code: SMGT2401	**DATA INTERPRETATIONS AND VISUALISATION**	L	T	P	C
Version 1.1	Latest Approved	2	0	1	3
Pre-requisites/ Exposure					
Co-requisites					

Catalog Description
This course familiarizes the students on data visualization tools. This course is designed to provide a fundamental and strategic understanding on the concepts of Business Intelligence using Tableau.

Course Objectives
The objective of this course is to:

- Equip students with the concepts of BIs and its types and how to connect to and import data, author reports using Power BI Desktop, and publish those reports to the Power BI service
- Emphasize on how to create dashboards and share with business users—on the web and on mobile devices

Course Outcomes
On completion of this course, the students will be able to:
CO1: Connect, import, shape, and transform data for business intelligence (BI)
CO2: Visualize data, author reports, and schedule automated refresh of your reports
CO3: Create and share dashboards based on reports in Power BI desktop and Excel
CO4: Use natural language queries and create real-time dashboards

Course Content:

Modules	**Number of hours**
MODULE 1: **Tableau:** Data visualization and its significance, Connecting Tableau to a Data File - CSV File, Navigating Tableau, creating calculated fields, adding colors, adding labels and formatting, exporting worksheet. **Power BI**: What is Power BI? Installing Power BI Desktop & Project Setup, Connecting Power BI Desktop to Source Files, Working in the Query Editor, Understanding the Data Model & Creating Visuals.	9
MODULE 2: **Tableau:** working with data extracts, working with time series data, understanding aggregation, granularity and level of detail, creating an area chart and learning about highlighting, adding a filter and quick filter.	12

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Power BI: Understanding the Power BI Desktop Workflow, Exploring the Interface of the Data Model, Understanding the Query Editor Interface, Keeping & Removing Rows, Working with Filters, Removing Empty Rows, Working with Columns, Replacing Values, Formatting Data & Handling Formatting Errors.	
MODULE 3: **Tableau:** Relationships v/s joins, Joining data, blending data, data joining v/s data blending, dual axis chart. **Power BI:** Pivoting & Unpivoting Data, Splitting Columns, Creating Groups & Cleaning Up Project, The Star Schema, Query Duplicates vs References, Creating the DIM-Region Table & Removing Duplicates, Merging Queries, Understanding "Extract", Working with Conditional Columns, Understanding Basic Mathematical Operations, Performance Optimization	12
MODULE 4: **Tableau:** Creating a map, scatter plot, working with hierarchies, applying filters to multiple worksheets, create interactive dashboard, storytelling. **Power BI:** Understanding Relationships, Cross Filter Direction & Many-to-Many, Understanding the DAX Basics, Applying the DAX Basics, Creating Visuals in the Report View.	12

Text and Reference Books

- Microsoft Business Intelligence Tools for Excel Analysts: Michael Alexander, Jared Decker, Bernard Wehbe, John Wiley & Sons, 2014
- Introducing Microsoft Power BI: Alberto Ferrari and Marco Russo, Microsoft Press 2016
- Getting started with Watson Analytics: IBM Corporation 2015
- Tableau Your Data! Fast and Easy Visual Analysis with Tableau Software: Daniel G. Murray and the InterWorks BI Team, John Wiley & Sons 2013
- Beginning Big Data with Power BI and Excel 2013: Neil Dunlop, Apress 2015

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**IP**	**EE**	**EP**
Weightage (%)	5	25	50	20

IP: Internal Practical, EE: End Semester Examination; EP: External Practical; A: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	1	2	1	--	--	3	1	1	2	1	--	--
CO2	1	1	3	2	--	--	3	1	2	2	1	--	--
CO3	1	2	2	1	--	--	3	1	1	2	1	--	--
CO4	2	1	3	2	--	--	3	1	2	2	1	--	--

1: strongly related, 2: moderately related and 3: weakly related

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Bachelor of Business Administration- Business Analytics (Honors/ Honors with Research)
(Semester-III)

Course Code: SBUA2301	**NATURAL LANGUAGE PROCESSING**	L	T	P	C
Version 1.1	Latest Approved	2	0	1	3
Pre-requisites/Exposure					
Co-requisites					

Course Description:
In this course general introduction including the use of state automata for language processing and syntax including a basic parse for natural language processing are discussed in detail. Basic features like regular expressions, Text Normalization, Edit Distance, n-gram model and advanced features like feature structures and realistic parsing methodologies, part of speech tagging will be introduced. The concepts learnt in the studies of natural language processing will be applied in jupyter notebook using python for developing small to medium level applications.

Course Objectives: The objective of this course is to

- Equip the students with concepts of natural language processing through problem solving and practical approach.
- Provide an overview of various tools in the field of natural language processing to gain practical understanding of the concepts.

Course Outcomes: On completion of this course, the students will be able to
CO1: Explain, knowledge in speech recognition, models and algorithms; Explain regular expressions and solve related problems; Explain and solve problems related to lemmatization and stemming, minimum edit distance.
CO2: Explain language models and compare their performance on datasets; Solve some problems on naïve bayes algorithm.
CO3: Explain logistic regression, similarity, language modelling and solve problems based on them.
CO4:.Describe ANN and Part of speech tagging; Solve problems based on them.
CO5:Describe RNN models and distinguish between simple ANN and RNN

Course Content:

Modules	**No of Hrs**
Module-I Knowledge in Speech and Language Processing ,Ambiguity ,Models and Algorithms Language, Thought, and Understanding ,The State of the Art and The Near-Term Future Some Brief History, Regular Expressions, Words ,Corpora, Text Normalization ,Minimum Edit Distance	**9**
Module-II Evaluating Language Models, Generalization and Zeros, Smoothing, Kneser-Ney Smoothing, The Web and Stupid Backoff, Advanced: Perplexity's Relation to Entropy, Naive Bayes Classifiers, Training the Naive Bayes Classifier, Worked example, Optimizing for Sentiment Analysis, Naive Bayes for other text classification tasks, Naive Bayes as a Language Model, Evaluation: Precision, Recall, F-measure, Test sets and Cross-validation, Statistical Significance Testing Advanced: Feature Selection.	**9**

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Module-III Classification: the sigmoid, Learning in Logistic Regression, The cross-entropy loss function, Gradient Descent, Regularization, Multinomial logistic regression, Interpreting models, Advanced: Deriving the Gradient Equation, Lexical Semantics, Vector Semantics, Words and Vectors, Cosine for measuring similarity, TF-IDF: Weighing terms in the vector, Applications of the tf-idf vector model, Optional: Pointwise Mutual Information (PMI), Word2vec, Visualizing Embeddings, Semantic properties of embeddings, Bias and Embeddings, Evaluating Vector Models.	**9**
Module-IV Units,The XOR problem, Feed-Forward Neural Networks, Training Neural Nets, Neural Language Models, (Mostly) English Word Classes, The Penn Treebank Partof-Speech Tagset, Part-of-Speech Tagging , HMM Part-of-Speech Tagging, Maximum Entropy Markov Models, Bidirectionality, Part-of-Speech Tagging for Other Languages.	**9**
Module-V Simple Recurrent Networks, Applications of RNNs, Deep Networks: Stacked and Bidirectional RNNs, Managing Context in RNNs: LSTMs and GRUs, Words, Characters and Byte-Pairs.	**9**

Readings:

- Daniel Jurafsky & James H.Martin, “Speech and Language Processing", 2nd Edition, Pearson Education, 2009.
- James Allen, "Natural Language Understanding", 2nd Edition, Pearson Education, 2008.
- Manning, Christopher D and Hinrich Schütze, “Foundations of Statistical Natural Language Processing”, Cambridge, 1st Edition, MA: MIT Press, 1999.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1										1		
CO2	1	2									1		
CO3				1					1		1		
CO4	1								1		1		
CO5	1						2		1		1		

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Bachelor of Business Administration- Business Analytics (Honors/ Honors with Research)
(Semester-IV)

Course Code: SBUA2401	**BIG DATA ANALYTICS**	L	T	P	C
Version 1.1	Latest Approved	2	0	1	3
Pre-requisites/Exposure					
Co-requisites					

Course Description:
In today's data-driven world, organizations are inundated with vast amounts of data from various sources such as social media, sensors, mobile devices, and more. Big Data Analytics has emerged as a crucial field for extracting meaningful insights and making informed decisions from these large and complex datasets. This course provides a comprehensive overview of Big Data Analytics, covering fundamental concepts, techniques, and tools used to analyze, process, and interpret massive datasets.

Course Objectives:
On completion of this course, the students will be able to:
CO1: To understand the big Data Platform and its uses
CO2: To provide an overview of apache hadoop
CO3: To provide HDFS concepts and interfacing with HDFS
CO4: To provide hands on Hadoop Eco System
CO5: TO understand spark framework

Course Outcomes
The learning outcomes of this course are as under:

- After studying this course, students will be able to identify Big data and its Business Implications
- After studying this course, students will be able to list the components of Hadoop and Hadoop eco system.
- After studying this course, students will be able to access and process data on distributed file system.
- After studying this course, students will be able to manage job execution in Hadoop environment
- After studying this course, students will be able to develop Big Data Solutions using Hadoop Eco System

Course Content:

Modules	**Hours**
Module-I Fundamentals of Big Data Analysis Data storage and analysis, Characteristics of big data, Big Data analytics, Typical analytical architecture, requirement for new analytical architecture, challenges in big data analytics-Need of big data framework	**6**
Module-II Hadoop Framework	**9**

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Hadoop, requirement of Hadoop Framework, Design principle of Hadoop-comparison with other systems, Hadoop Components-Hadoop1 vs Hadoop2, Hadoop1 Daemon's-HDFS Commands, Map Reduce Programming: I/O formats, Map side join, reduce side join, secondary sorting, pipelining Map Reduce jobs	
Module-III HDFS (Hadoop Distributed File Systems) The design of HDFS, HDFS concepts, command line interface, Hadoop file system interfaces, Data flow, Data Ingest with flume and scoop and Hadoop archives, Hadoop I/O: compression, serialization, Avro and File based data structures	**9**
Module-IV Spart Framework and Data Analysis with Spark Shell Introduction to GPU computing, CUDA, Programming Model, API, Simple Matrix, Multiplication in CUDA, CUDA Memory Model, shared memory Matrix Multiplication, Addition CUDA API features, Writing Spark Application-Spark Programming in Scala, Python, R, Java-Application Execution.	**9**
Module-V: Practical Exercises	**12**

Readings:

Text Book:

- Seema Acharya, Subhashini Chellappan, "Big Data and Analytics", Wiley Publications, First Edition,2015

Reference Books

- Judith Huruwitz, Alan Nugent, Fern Halper, Marcia Kaufman, "Big data for dummies", John Wiley & Sons, Inc.(2013)
- Tom White, "Hadoop The Definitive Guide", O'Reilly Publications, Fourth Edition,2015
- Dirk Deroos, Paul C.Zikopoulos, Roman B.Melnky, Bruce Brown, Rafael Coss, "Hadoop For Dummies", Wiley Publications,2014
- Robert D.Schneider, "Hadoop For Dummies", John Wiley & Sons, Inc.(2012)
- Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGraw Hill, 2012 Chuck Lam, "Hadoop In Action", Dreamtech Publications, 2010

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CPA	TP	Q/S	A	ME	EE
Weightage (%)	5	5	5	5	10	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	1										1		
CO2	1	2									1		
CO3				1					1		1		
CO4	1								1		1		
CO5	1						2		1		1		

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Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology/ Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology
(Semester-III)

Course Code: SPSY2301	PSYCHOMETRIC TESTING	L	T	P	FW/ Proj	C
Version	**2023**	2	1	0	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course explores the role of psychological assessment in understanding the behaviour of the individual. Psychometric testing is a sophisticated and scientific approach to evaluating an individual's psychological traits, abilities, and preferences. At its core, it's a methodical process that employs standardized assessments to measure various aspects of cognition, personality, and behavior. The course is theoretically driven, as it delivers the concepts related to psychometric testing based on rigorous scientific principles and statistical analyses to ensure the validity, reliability, and fairness of the assessments.

Course Objectives

Psychological assessment is a process of testing that uses a combination of techniques to help arrive at some hypotheses about a person and their behaviour, personality, and capabilities. Psychological assessment is also referred to as psychological testing or performing a psychological battery on a person. A psychological assessment is the attempt of a skilled professional, usually a psychologist, to use the techniques and tools of psychology to learn either general or specific facts about another person, either to inform others of how they function now, or to predict their behaviour and functioning in the future. Psychologists are the only profession that is expertly trained to perform and interpret psychological tests. Below are the objectives of studying this particular paper of Psychology:

- To train the students in various psychological assessment techniques.
- To impart skills necessary for selecting and applying different tests for different purposes such as evaluation, training, and rehabilitation.

Course Outcomes (COs):

On completion of this course, the students will be able to

- Define psychometric testing and ethical issues related to testing.
- Understand the measurement process, various levels of measurement and steps to construct a psychological test.
- Conceive and develop an idea related to psychometric properties such as reliability, validity, and norms.
- Get knowledge about various tests to assess behavioral and cognitive aspects of the individual and the application of psychological tests in different set-ups.

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Course Content:

Modules	Blooms level*	Number of hours
Module 1: Introduction History of Psychological Testing Meaning, Definition and Types of Psychological Testing Ethical issues in Psychological Testing	**L1, L2, L3**	18
Module 2: Measurement Nature and significance of Measurement Distinction between assessment and measurement Levels of measurement Techniques of Attitude Measurement Steps of constructing a Psychological Test	**L1, L2, L3**	18
Module 3: Psychometric properties of Psychological Test Reliability: Meaning, types and factors affecting reliability Validity: Meaning, types and factors affecting Validity Norms: Steps in developing norms, types of norms.	**L3, L4, L5**	18
Module 4: Brief Overview of some selected tests Personality: Personality Inventory for Youth, Children's Personality Questionnaire. Verbal Learning: Rey Auditory Verbal Learning Test	**L3, L4, L5**	18
Module 5: Psychometric Tests and their Application Psychometric Tests used in Educational, Clinical, Industrial and Organizational set-up Application of Psychometric Tests in Educational, Clinical, Industrial and Organizational set-up.	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text & References:

Text:

- Anastasi, A. & Urbina, S.: Psychological Testing. U.S.A.: Prentice Hall International Inc.
- Gregory, R.J. (2016) Psychological testing: History, principles, and applications. Boston: Pearson.
- Graham, J. R. & Lilly, R. S.: Psychological Testing. New Jersey: Prentice Hall Inc.
- Kaplan, R. K. & Sacuzzo, D. P.: Psychological Testing- Principles, Applications and Issues. New Delhi: Cengage Learning India Pvt. Ltd
- Aiken, L.R. & Groth-Marnat, G.: Psychological Testing and Assessment (12th Ed.) Pearson Education
- Freeman, F. S.: Psychological Testing. Oxford University Press

References:

- Hasan, Q.: Personality Assessment: A fresh Psychological Look. New Delhi: Gyan Publishing House
- Kline, T. J. B.: Psychological Testing – A Practical Approach to Design and Evaluation. New Delhi: Vistaar Publication

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Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology/ Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology
(Semester-IV)

Course Code: SPSY2401	PSYCHOLOGICAL TOOLS DEVELOPMENT FOR CLINICAL PSYCHOLOGY	L	T	P	FW/ Proj	C
Version	**2023**	2	1	0	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description
This course explores the role of Psychological Test Development to equip students with the knowledge and skills needed to create, administer, and interpret psychological tests effectively and ethically. This includes understanding psychological constructs, mastering test construction principles, learning about psychometric properties, administration procedures, interpretation techniques, ethical considerations, and the application of tests in various settings. The course emphasizes critical evaluation of existing tests, research skills development, and preparing students for careers in psychological assessment and research.

Course Objectives
The course objective of Psychological Tool Development typically revolves around providing students with the knowledge and skills necessary to create, administer, and interpret psychological tests effectively and ethically. Followings are the objectives of studying this particular paper of Psychology:

- To Learn the principles and techniques involved in constructing valid, reliable, and culturally fair psychological tests.
- To Understand psychometric properties such as reliability, validity, and standardization, and learn how to assess and improve these properties during test development.
- To Develop critical thinking skills to evaluate existing psychological tests critically, considering their strengths, limitations, and appropriateness for different purposes and populations.
- Develop research skills necessary for conducting empirical studies related to test development, validation, and refinement,

Course Outcomes (COs):
On completion of this course, the students will be able to

- Designing and Writing about Items
- Understand Meaning and Purpose of Item Analysis, Factor Affecting Item difficulty and discrimination.
- Know about various theories of item analysis.
- Understand various psychometric properties such as reliability and validity, various types of reliability and validity.
- Explore various norms required for test standardization and psychological test manual writing.

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Course Content:

Modules	Blooms level*	Number of hours
Module I: Designing and Writing Items: Meaning and types of Items: Essay type and Objective type. Guidelines for Item writing. Characteristics of Good item.	**L1, L2, L3**	18
Module II: Item Analysis Meaning and Purpose of Item Analysis Item Difficulty and Item Discrimination. Factor Affecting Item difficulty and discrimination. Problems of Item Analysis.	**L1, L2, L3**	18
Module III: Theories of Item Analysis Classical Test Theory: Assumptions, Limitation, Analysis. Item-to Total Correlations, Inter-Item correlations. Item Response Theory: Assumptions, Limitations and Models.	**L3, L4, L5**	18
Module IV: Reliability and Validity testing Reliability Testing: Measurement Error and Reliability, Correlation Coefficient as a Reliability Coefficient and its Interpretation. Reliability for Temporal Stability and Internal Consistency Validity: Convergent and Discriminant validation, Approaches to Construct Validity. Relation of Validity and Reliability	**L3, L4, L5**	18
Module V: Norms of a Test Standardization and Publication Types of Norms: Age, Grade, Percentile rank Norms Standard score Norms: z-score, t-score. Psychological Test Manual Writing. Research article Publication.	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

Text & References:

Text:

- Anastasi, A. & Urbina, S.: Psychological Testing. U.S.A.: Prentice Hall International Inc.
- Gregory, R.J. (2016) Psychological testing: History, principles, and applications. Boston: Pearson.
- Graham, J. R. & Lilly, R. S.: Psychological Testing. New Jersey: Prentice Hall Inc.
- Kaplan, R. K. & Sacuzzo, D. P.: Psychological Testing- Principles, Applications and Issues. New Delhi: Cengage Learning India Pvt. Ltd
- Aiken, L.R. & Groth-Marnat, G.: Psychological Testing and Assessment (12th Ed.) Pearson Education
- Freeman, F. S.: Psychological Testing. Oxford University Press

References:

- Hasan, Q.: Personality Assessment: A fresh Psychological Look. New Delhi: Gyan Publishing House
- Kline, T. J. B.: Psychological Testing – A Practical Approach to Design and Evaluation. New Delhi: Vistaar Publication

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Bachelor of Science (Honors/ Honors with Research) in Information Technology/ Bachelor of Computer Application (Honors/ Honors with Research)
(Semester-III)

ROBOTIC PROCESS AUTOMATION

Course Code: SIFT2301 **Credit Units: 3**

This course aims at providing knowledge of basic concepts of Robotic Process Automation to University students. It further builds on these concepts and introduces key RPA Design and Development strategies and methodologies specifically in context of UiPath products. The student undergoing the course shall develop the competence to design and develop a robot for a defined process.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of robotic process automation
2. Provide an overview of designing with uipath software.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain key terms and trends around the robotic process automation along with its physical and logical design

CO2: Understand the potential and value of the robotic process automation.

CO3: Describe the technologies used for the robotic process automation and mobile devices, including (passive and active) sensors, the physical communications layer, communications protocols, programming frameworks,

CO4: Design programs and have hands on experience on uipath software

CO5: Develop RPA programs of moderate complexity for a well-used robotic automation process using uipath.

Course Contents:

Module 1: Programming Basic and Recap

Programming Concepts Basics I - Understanding the application, Basic Web Concepts, Protocols, Email Clients, Data Structures, Data Tables, Algorithms, Software Processes, Software Design, SDLC.

Programming Concepts Basics 2- Scripting, Net Framework, Net Fundamentals, XML, Control structures and functions, XML, HTML, CSS, Variables & Arguments.

Module II: RPA Concepts

RPA Basics - History of Automation, what is RPA, RPA vs Automation, Processes & Flowcharts, Programming Constructs in RPA, What Processes can be Automated, Types of Bots, Workloads which can be automated.

RPA Advanced Concepts - Standardization of processes, RPA Development methodologies, Difference from SDLC, Robotic control flow architecture, RPA business case, RPA Team, Process Design Document/Solution Design Document, Industries best suited for RPA, Risks & Challenges with RPA, RPA, and emerging ecosystem

Module III: UiPath Introduction & Basics

Introduction to UiPath- Installing UiPath Studio community edition, The User Interface, Keyboard Shortcuts, About Updating, About Automation Projects, Introduction to Automation Debugging, Managing Activation Packages, Reusing Automations Library, Installing the Chrome Extension, Installing the Firefox Extension, Connecting your project to a source control system, Activities Guide.

Variables, **Control Flow**

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Data Manipulation- Data Manipulation Introduction, Scalar variables, collections and Tables, Text Manipulation, Data Manipulation, Gathering and Assembling Data.
Recording and Advanced UI Interaction - Recording Introduction, Basic and Desktop Recording, Web Recording, Input/Output Methods, Screen Scraping, Data Scraping, Scraping advanced techniques. Selectors

Module IV: **UiPath Advanced Automation concepts and techniques**
Image, Text & Advanced Citrix Automation- Introduction to Image & Text Automation, Image based automation, Keyboard based automation, Information Retrieval, Advanced Citrix Automation challenges, Best Practices, using tab for Images, Starting Apps.
Excel Data Tables & PDF - Data Tables in RPA, Excel and Data Table basics, Data Manipulation in excel, Extracting Data from PDF, extracting a single piece of data, Anchors, Using anchors in PDF.
Email Automation- Email Automation, Incoming Email automation, Sending Email automation

Text Books

- "Learning Robotic Process Automation" By Alok Mani Tripathi, Packet Publications, Ist Edition,2018

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Bachelor of Science (Honors/ Honors with Research) in Information Technology (Semester-IV)

NETWORK DESIGN AND MANAGEMENT

Course Code: SIFT2401 **Credit Units: 3**

Course Contents:

Module I: Network Devices & Hardware
Introduction to Computer components- CPU, Motherboard types, NIC, RAM categories, storage devices, IOS and CMOS, boot process, Installation, configuration and troubleshooting of system components.
Introduction to Network hardware- Workstation, printer, Server, UPS. Cable types, Networking devices and their role- Hub, repeater, amplifier, bridge, switch, router, gateway, firewall, multiplexer, demultiplexer, modem, wireless Access Point.

Module 2:
Goals and applications of networks, Categories of networks,
Organization of the Internet, ISP, Network structure and architecture (layering principles, services, protocols and standards), The OSI reference model, TCP/IP protocol suite, Network devices and components.

Module 3: Configuring and Troubleshooting
Configuring CISCO devices –IOS basics, applying a Basic Configuration using CISCO IOS, Verifying Connectivity; Common symptoms and problems with hardware. Isolating problems using error codes, POST audible/visual codes. Troubleshooting procedures, Troubleshooting commands for IOS.

Module 4: Security and Troubleshooting
Security Fundamentals: WLAN vulnerabilities, WLAN threats, Basic WLAN Security Technologies: Wired equivalent privacy (WEP), Authentication and association; Wi-Fi Protected Access (WPA), Cisco Wireless LAN Security, Modes of unauthorized access in WLAN, Security measures to prevent unauthorized access in WLAN, Configuring Basic WLAN Security, Using VPNs; Other Enterprise Security Services: VLANs, Spanningtree, General Approach to Preparing for network failure, Network and fault management

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

REFERENCES:
1. Data Communications and Networking by Behrouz Forouzan, 3e, Tata McGraw-Hill
2. Computer Networks by Andrews S. Tanenbaum, 4e, Pearson Education.
3. Computer Networking for LANS to WANS: Hardware, Software and Security by Kenneth C. Mansfield, Jr., James L.

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Bachelor of Computer Application (Honors/ Honors with Research)
(Semester-IV)

Course Code: SIFT2402	ANDROID PROGRAMMING	L	T	P	C
Version : 2023.1	Date of Approval:	2	0	1	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Modules	Blooms level*	Number of hours
Module-I: Introduction to Android Development Overview of Android platform: History, architecture, versions, and development tools (Android Studio, SDK Manager, AVD Manager) Basics of Java programming language: Data types, control flow, loops, arrays, functions, and object-oriented programming concepts (classes, objects, inheritance, polymorphism) Setting up Android development environment: Installation, configuration, and project setup Introduction to Android application components: Activities, services, broadcast receivers, content providers User Interface (UI) design fundamentals: Layouts, views, resources, XML-based UI design	L1, L2 and L3	6
Module-2: Android UI Development User Interface (UI) components in Android: TextView, EditText, Button, ImageView, etc. Layouts in Android: LinearLayout, RelativeLayout, ConstraintLayout, FrameLayout, TableLayout Handling user input: Event handling, listeners, and event-driven programming Working with resources: Strings, images, colors, dimensions, styles, and themes Fragments: Understanding fragments, fragment lifecycle, and fragment transactions Material Design principles: Design guidelines, components, and patterns for Android apps	L2 and L3	8
Module 3: Android Application Development Android activities and intents: Lifecycle methods, explicit and implicit intents, intent filters Android user interface (UI) customization: Custom views, view groups, and drawing on canvas Working with data: SQLite database integration, CRUD operations, content providers Networking in Android: Consuming RESTful APIs, Http URLConnection, AsyncTask, Retrofit library	L2, L3 and L4	7

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Handling background tasks: AsyncTask, Handler, Thread, and Executor framework Location-based services: Accessing device location, GPS, and Google Maps integration		
Module-4: Advanced Topics in Android Development** Working with multimedia: Audio and video playback, camera integration, and media capture Sensor integration: Accessing device sensors (accelerometer, gyroscope, compass) Firebase integration: Authentication, real-time database, cloud messaging, and analytics Android app publishing: Preparing apps for release, signing, and deploying to Google Play Store Android app optimization: Performance tuning, memory management, and battery optimization techniques Emerging trends and future directions in Android development: Kotlin programming language, Jetpack libraries, Android Jetpack Compose for UI development	L2, L3 and L4	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books:-

- Head First Android Development: A Brain-Friendly Guide by Dawn Griffiths and David Griffiths
- Android Programming: The Big Nerd Ranch Guide by Bill Phillips and Chris Stewart
- Head First Android Development: A Brain-Friendly Guide" by Dawn Griffiths and David Griffiths
- Android Programming: The Big Nerd Ranch Guide" by Bill Phillips and Chris Stewart
- Android Programming for Beginners" by John Horton
- Android Studio 4.0 Development Essentials - Kotlin Edition: Developing Android Apps Using Android Studio 4.0, Kotlin, and Android Jetpack" by Neil Smyth
- Professional Android 4th Edition" by Reto Meier

Reference Books:-

- Android Programming for Beginners by John Horton.
- Professional Android 4th Edition" by Reto Meier.

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Bachelor of Science (Honors/ Honors with Research) in Chemistry
(Semester-III)

Course Code: SCHY2301	RUBBER TECHNOLOGY	L	T	P	FW/ Proj	C
Version	**2023**	3	0	0	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Course Objectives
At the end of the course students should be able to understand different types of rubbers, additives used in rubber industries to improve its end use performance, different techniques for the compounding of rubber, manufacturing of tyres and design of tyres.

Course Outcomes (COs):
On completion of this course, the students will be able to

- Define Rubber, Natural and Synthetic and additives to improve the properties.
- Understand how the rubber is manufactured.
- Conceive and develop an idea for different types of rubber and their applications.
- Apply knowledge and understanding of various characterization parameters of rubber.
- Explain testing parameters of rubber products.

Course Content:

Modules	Blooms level*	Number of hours
MODULE-I: Rubber Technology: Introduction, natural rubber- composition, extraction, processing, mastication, smoke rubber, crape rubber, Structure-properties relationship and applications.	**L1, L2, L3**	9
MODULE-II: Synthetic rubbers- Manufacture, properties and applications of nitrile rubber, chloroprene rubber, diene rubber, SBR rubbers, silicon-based rubbers, Thermoplastic elastomers.	**L1, L2, L3**	9
MODULE III: Additives used in rubber industries, filler systems, stabilizer systems, colorants, UV absorber, Antioxidants, blowing agent, flame retardant, antistatic agents, plasticizers, release agents, vulcanization system, compounding Techniques.	**L3, L4, L5**	9
MODULE-IV: Introduction to Tyres, Development of tyres, classification and types of tyres, tyre components, pneumatic tyres. Conveyer, V- belt, cable & hoses, Footwear, cellular & rubber molded products, Latex products & adhesives	**L3, L4, L5**	9
MODULE-V: Testing of rubber products- Mechanical Testing, Tensile, Flexural, Compression, Abrasion resistance, Creep resistance, Fatigue resistance, Thermal Testing, Electrical, Environmental Stress Cracking, Morphological.	**L3, L4, L5, L6**	9

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**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

1. Handbook of Plastics Testing & Failure Analysis, Vishu Shah, Wiley Interscience.
2. Polymer Testing & Evaluation of Plastics, Mathur & Bhardwaj, Allied Publishers.
3. Encyclopedia of Polymer Science & Technology, Herman F. Mark, Wiley Interscience
4. Fatigue, Testing & Analysis, Lee, Elsevier
5. Introduction to Plastics & Composites, E. Miller, Marcel Dekker

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**MT**	**A**	**Assignment**	**EE**
Weightage (%)	15	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	--	2	--	--	--	--	--	1	2	2	2
CO2	--	2	--	--	--	--	--	1	2	2	2
CO3	--	2	--	--	--	--	--	1	2	2	2
CO4	--	2	2	--	--	--	--	1	--	2	2
CO5	--	--	2	--	--	--	1	1	2	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Bachelor of Science (Honors/ Honors with Research) in Chemistry
(Semester-IV)

Course Code: SCHY2401	INDUSTRIAL APPLICATIONS OF CARBON-NANOCOMPOSITES	L	T	P	FW/ Proj	C
Version	**2023**	3	0	0	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Course Objectives
At the end of the course students should be able to understand nanocomposites their synthesis with special emphasis on carbon nanocomposites and their applications and high-end usages in industries.

Course Outcomes (COs):
On completion of this course, the students will be able to

- Define carbon nanocomposites, multiwalled carbon nanotube.
- Understand different forms of carbon and types of nanocomposites.
- Conceive and develop an idea for synthesis, functionalization & processing of carbon nanocomposites.
- Explain the processing methods of carbon nanocomposites.
- Apply knowledge and understanding of carbon nanocomposites in daily life in different fields such as of sensing, energy storage devices etc.

Course Content:

Modules	Blooms level*	Number of hours
MODULE I: Introduction to Carbon Carbon molecules, nature of the carbon bond, new carbon structures, discovery of C60/C70 structure of C60/C70 and its crystal, from a Graphene Sheet to a Nanotube, Single wall and Multi walled Nanotubes, Zigzag and Armchair Nanotubes, Nomenclature, Euler's Theorem.	**L1, L2, L3**	9
MODULE II: Carbon Nano-composite: Definition of nanocomposites, Constituent of nanocomposites, General characteristics of particle reinforced composites- classification, Terminology used in fiber reinforced composites, Classification based on matrix and topology: Carbon nanotube (CNT) based nanocomposites, Graphene based nanocomposites, Carbon nano-diamond based nanocomposites, Hard nanocomposite coatings with amorphous carbon, Core-Shell nanocomposites.	**L1, L2, L3**	9
MODULE III: Synthesis of Carbon-nanocomposites: Covalent functionalization, non-covalent functionalization, wet synthesis, dry synthesis.	**L3, L4, L5**	9
MODULE IV: Nanocomposite Processing Methods: Nanocomposite processing: In-situ polymerization technique, Solution casting, Electro spinning, melt mixing, Filament Winding, Injection and compression molding, Vacuum bag moulding Method, Pultrusion Process	**L3, L4, L5**	9

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MODULE V: Applications of Carbon-nanocomposite: Catalysis, super capacitor, biosensor, solar cells, radar absorbing materials, field emission, energy storage, conductive plastics.	**L3, L4, L5, L6**	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

1. Carbon Nanotubes: Properties and Applications- Michael J. O'Connell.
2. Carbon Nanotechnology- Liming Dai.
3. Nanotubes and Nanowires- CNR Rao and A Govindaraj RCS Publishing.
4. Physical properties of Carbon Nanotube-R Satio. NSC 480: Basics of Nanotechnology in Tissue Engineering
5.Composite Polymeric Materials – Sheldon.
6. Lubin - Handbook of composites – (Van Nostrand, 1982)
7. Carbon Nanotube and Graphene Device Physics, by H.-S. Philip Wong (Author), Deji Akinwande (Author)
8. K. Chawla, Composite Materials – Science & Engg., Springer- Veslag, New York, 1988.
9. Mohr - SPIE Handbook of Technology and Engineering of Reinforced Plastics/Composites – (Van Nostrand, 1998)

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**MT**	**A**	**Assignment**	**EE**
Weightage (%)	15	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	--	2	--	--	2	--	--	1	2	2	2
CO2	--	2	--	--	--	--	--	1	2	2	2
CO3	--	2	--	2	--	--	--	1	2	2	2
CO4	--	2	--	2	--	--	--	1	--	2	2
CO5	--	--	--	--	--	--	1	1	2	2	2

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Bachelor of Science (Honors/ Honors with Research) in Forensic Science
(Semester-III)

Course Code: SFCH2301	CRIME SCENE INVESTIGATION TECHNIQUES	L	T	P	C
Version 1.1	Date of Approval: December, 2023	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description
This course will help the students to learn the collection, packaging, preservation and transportation of serological evidence from crime scenes. The course will also overview the different types of forensic evidence and their examination.

Course Objective: This course will cover:

- Complete and thorough knowledge regarding the various aspects of forensic science
- Crime scene analysis and methods of searching of the crime scene.
- Fingerprint types and their methods of analysis.
- Blood and techniques for its identification
- Analysis of questioned documents.

Course Outcomes
On completion of this course, the students will be able to
CO1. Understand and describe the basic properties of different types of crime scenes.
CO2. Develop and identify different types of fingerprints
CO3. Apply advanced analytical methods of analysis of serological evidence.
CO4. Explain, identify and analyse the questioned documents.

Course Contents:

Modules	Blooms level*	Number of hours
Module 1: Crime Scene and its Management Defining a crime and crime scene, Introduction to Crime Scene Management, Handling clues and evidence. Types of crime scenes, Primary, Secondary crime scene, Mobile, Indoor and Outdoor crime scenes; Crime Scene documentation, Barrication of Crime Scene, Crime Scene Photography, Videography; Sketching; Notes making	L1, L2,L3	9
Module 2: Fingerprinting Techniques Types of fingerprints, Fingerprint characteristics: class and individual, Collection, lifting and preservation of fingerprints, Methods of lifting and developing latent fingerprints – Physical methods - Powder method (Black, silver, florescent, red, yellow), Iodine fuming etc. Chemical methods - Ninhydrin, Silver nitrate method.	L1, L2	9
Module 3: Biological fluid analysis techniques Application of Spectrophotometric method, chromatographic and immunological methods (Ring, Precipitin, Ouchterlony, reverse agglutination, normal/mixed agglutination).	L1, L2	9
Module 4: Questioned Documents examination questioned documents and its classification. Authentic Signatures, Simulated signatures, disguised signatures, traced signatures, and their	L1, L2, L3	9

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characteristics. Forgery and its characteristics, erasures, obliteration, alteration and addition. Detection and deciphering of indented writing, charred documents, invisible and secret writings.		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Suggested Reading:

- Eckert, W.G., & James S.H., Interpretation of bloodstain evidence at crime scene, CRC Press, Florida, 1989.
- James, S.H. and Nordby, J.J. (Eds.), Forensic Science - An introduction to Scientific and investigative Techniques, CRC Press, London, 2003.
- Saferstein, R. (1998). Criminalistics, An Introduction to Forensic Science, 6th Ed. 6th Ed. Prentice –Hall
- Kirk, P.L., Introduction in crime investigation (2nd), John Willey and, New York, 1974.
- Albert, S. Osborn, Questioned Documents, Second Ed., Universal Law Publishing, Delhi, 1998.
- Nath, S., Fingerprint Identification, CRC Press, 2nd edition, 2002.
- Champhod, C., Fingerprint and other ridge skin impressions, CRC Press, 2004.

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO1	1	2	--	--	--	--	1	--	-	3	-
CO2	1	2	--	-	--	--	1	-	-	3	-
CO3	1	2	--	--	--	--	1	-	-	3	-
CO4	1	2	--	--	--	--	1	-	-	3	-
CO5	1	2	2		-	3	1	1	1	2	-

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Bachelor of Science (Honors/ Honors with Research) in Forensic Science
(Semester-IV)

Course Code : SFCH2401	CYBER FORENSICS	L	T	P	C
Version 1.1	Date of Approval: December, 2023	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description
This course introduces undergraduate students with a comprehensive understanding of the methods used to investigate cybercrimes. Students will explore various types of cybercrimes, learn how to trace and analyze digital evidence, and understand the legal and ethical implications of cyber investigations.

Course Objective:
- To understand the nature and types of cybercrimes.
- To learn about digital evidence collection, analysis, and preservation in the context of cybercrimes.
- To gain hands-on experience with tools and techniques for cyber forensic investigations.
- To comprehend the legal and ethical dimensions of cyber forensics.

Course Outcomes
On completion of this course, the students will be able to
CO1: Understand various types of cybercrimes.
CO2: Become proficient in the legal and ethical aspects.
CO3: Effecting reporting and communication.
CO4: Become aware of evolving cyber crimes.

Course Contents:

Modules	Blooms level*	Number of hours
Module 1: Introduction to Cybercrimes and Cyber Forensics Overview of cybercrimes: definitions, types, and evolution; Introduction to cyber forensics: scope, importance, and basic principles; Case studies illustrating various cybercrimes.	L1	8
Module 2: Legal and Ethical Issues in Cyber Forensics Overview of laws and regulations impacting cyber forensics; Understanding Cyber Law Framework; Jurisdictional challenges; Legal Procedures and compliance; Ethics in Cyber Forensics; Privacy Concerns in Digital Investigations; Data Protection and Information Security	L1, L2	8
Module 3: Digital Evidence in Cyber Forensics Classification: Types of Digital Evidence, Digital Evidence in Various Environments, Evidence Identification and Collection, Special Considerations for Encrypted and Hidden Data, Preservation of Digital Evidence, Overcoming Challenges in Evidence Management	L1, L3	12
Module 4: Cyber Forensic Tools and Techniques Introduction to Forensic Tools and Software: Overview of commonly used tools in cyber forensics (e.g., Wireshark for network analysis, FTK for data recovery); Network Analysis Tools (e.g., Wireshark, tcpdump); Data Recovery Tools (e.g., Recuva, TestDisk); Email Analysis Techniques (e.g., MailXaminer); Analyzing Encrypted Data (e.g., John the Ripper, Hashcat	L2, L3	8

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for password and hash cracking) Forensic Analysis of Mobile Devices (e.g., Cellebrite)		
Module 5: Reporting and Case Presentation Preparing Forensic Reports: Fundamentals of Forensic Reporting, Detailing Forensic Findings, Legal Considerations in Report Writing; Techniques for Effective Presentation, Handling Questions and Scrutiny, Best Practices in Evidence Presentation	L3, L4	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Suggested Readings:

- Marcella Jr., A. J., & Greenfield, R. S. (2007). Cyber Forensics: A Field Manual for Collecting, Examining, and Preserving Evidence of Computer Crimes. CRC Press.
- Carrier, B. (2005). File System Forensic Analysis. Addison-Wesley Professional.
- Sammons, J. (2015). The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics. Syngress.
- "Cyber Forensics." (n.d.). In Cyber Forensics (cyberforensics.in). Retrieved from Cyber Forensics Website.
- "Computer Forensics." (n.d.). In InfoSec Institute - Resources for Cyber Forensics (resources.infosecinstitute.com/category/computer forensics). Retrieved from InfoSec Institute Resources.

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO1	1	2	--	--	--	--	1	2	-	3	
CO2	1	2	--	-	--	--	1	2	-	3	
CO3	1	2	--	--	--	--	1	2	-	3	

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Bachelor of Science (Honors/ Honors with Research) in Mathematics
(Semester-III)

Course Code: SMTH2301	FUNDAMENTALS OF C PROGRAMMING	L	T	P	C
Version		2	0	0	2
Pr-requisites/Exposure					
Co-requisites					

Catalog Description
This course is aimed to provide a fundamental understanding of programming concepts. C Language is the language which used to write solution for the basic computational problem in the form of instructions and programs. The basic and advanced features of C Language including Data types, Operators, Conditional & Control Statements, Arrays, Strings, Structure & Union and File Handling will be introduced.

Course Outcomes : On successful completion of this course, all students will be able to:
CO1 : Understand binary, hexadecimal and octal number systems and their arithmetic.
CO2 : Define the purpose and structure of C Program for programming; identify and distinguish various datatypes and operators; conditional and control statement; Apply if-else, Switch and loops to rewrite basic C program for problem solving.
CO3 : Compare and contrast various Array types, its declaration and implementation; differentiate between Call by Value and Reference if Functions; apply the concepts to rewrite C Programs
CO4 : Differentiate between various String Handling Functions;

Course Content

Modules	Blooms level*	Number of hours
Module-I: Computers fundamentals: definition, block diagram, diagram with components and characteristics, classification of computers History of C: Introduction of C, Basic structure of C program, Concept of problem solving, program design, debugging, Types of errors in programming, Number systems, Binary, octal, hexadecimal and their inter conversions.	L1, L2 and L3	08
Module-II: Element used in C, Header file, key words, identifiers, concept of variables, constants and data types in C, Input/output function, arithmetic, relational and bitwise operator, increment and decrement operator, unary operator, type casting, operator hierarchy, Conditional operator	L1,L2 and L3	08
Module-III: Decision making with if statement, else statement, if-else statement, nesting if, switch and break, go to statement. Decision making statement concepts of loops like while loop, do while loop, for loop, nested for loops, jumps in loop.	L1, L2 and L3	10
Module-IV: Functions: - use of inbuilt function, user defined functions, arrays:- one dimensional and n dimensional array, initialization of array, iterative programs using arrays, uses of array with combination of decision making operator, Function prototype, Return values and their types, function argument, recursion, Strings, array of strings.	L2, L3 and L4	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, **HA**: Home Assignment, **S/V/Q:** Seminar/Viva/Quiz, **A:**Attendance,**EE:** End Semester Examination

Text & References Books :

1. E Balagurusamy, ANSI C, McGraw Hill Education India Private Limited; Seventh edition (2017).
2. Yashwant Kanetkar, Let us C, BPB Publications, 2nd Edition, 2001.
3. Herbert Schildt, C: The complete reference, Osbourne Mcgraw Hill, 4th Edition, 2002.
4. V. RajaRaman, Computer Programming in C, Prentice Hall of India, 1995.
5. Kernighan & Ritchie, C Programming Language, The (Ansi C Version), PHI, 2nd Edition.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO1	1	2	--	3	3	3	--	3	--	1	1
CO2	1	--	--	2	3	3	3	2	3	1	1
CO3	1	--	--	2	3	3	3	2	3	1	1
CO4	1	--	--	2	3	3	3	2	3	1	1

1: strongly related, 2: moderately related and 3: weakly related

Course Outcomes Assessment

There will be a midterm exams and a comprehensive final. The midterm exams will be given during lecture time**.** Final exam questions in the course will address the outcomes. Instructors will provide copies of questions. Weekly homework assignments will be given to the students.

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Bachelor of Science (Honors/ Honors with Research) in Mathematics
(Semester-III)

Course Code: SMTH2302	**C PROGRAMMING LAB**	L	T	P	C
Version		0	0	2	1
Pre-requisites/Exposure					
Co-requisites	NIL				

Catalog Description
The primary objective of this course is to understand all the components of C, including the C language, the C Preprocessor, and the C Standard Library.

Course Objectives : The objective of this course is to
1. Equip the students with concepts of Programming through C Language
2. Provide an overview of programming concepts like Functions, Arrays and String Handling

Course Outcomes : On completion of this course, the students will be able to
CO1 : Demonstrate the use of various data types and operators in C programs; Solve various problems using conditional control statements (if-else, Switch case).
CO2 : Construct C programs related to problems involving the usage of loops, arrays and functions.
CO3 : Construct C programs using string handling functions.

Course Content:

Modules/Topics Covered**	**Blooms level***	**Number of hours**
1. Basic programming to understand the working of C a. Write a program to calculate simple interest and amount. b. Write a program to swap two numbers using third variable. c. Write a program to calculate area of circle	L3	2
2. Programs using if, else if statements, switch case a. Write a program to check if the number is even or odd. b. Write a program to perform arithmetic operations using Switch Case statement. c. Write a program to demonstrate Greatest of 3 nos	L3	2
3. Programs using loops like while and do while (a) Write a program to find factorial of given no using do while statement. (b) Write a program to print prime numbers up to 'n'. (c) Write a program to sum of n natural no.	L3	2
4. Pattern programs using loops and multiple loops a. Write a program to print the following pattern using for loop 1 2 2 3 3 3 4 4 4 4 b. Write a program to print the following pattern using for loop	L3	2

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A A B A B C a. A B C D		
5. Simple programs with the help of function a. Write a program to swap two numbers using call by value. b. Write a program to find factorial of a number with return with argument.	L3	2
6. Simple programs involving array and strings a. Write a program to read nnum of students and 5 subjects marks. b. Write a program to add two 3* 3 matix. c. Write a program to perform operations on strings using string handling in-built functions (concatenation, reversal, copy etc.)	L3	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text & References

1. E Balagurusamy, ANSI C, McGraw Hill Education India Private Limited; Seventh edition (2017).
2. YashwantKanetkar, Let us C, BPB Publications, 2nd Edition, 2001.
3. Herbert Schildt, C: The complete reference, OsbourneMcgraw Hill, 4th Edition, 2002.
4. V. RajaRaman, Computer Programming in C, Prentice Hall of India, 1995.
5. Kernighan & Ritchie, C Programming Language, The (Ansi C Version), PHI, 2nd Edition.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme :

	IA				Performance	Viva
Components	**A**	**PR**	**LR**	**V**		
Weightage (%)	5	10	10	5	**35**	**35**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO1	**1**	**2**	--	**3**	**3**	**3**	--	**3**	--	**1**	**1**
CO2	**1**	--	--	**2**	**3**	**3**	**3**	**2**	**3**	**1**	**1**
CO3	**1**	--	--	**2**	**3**	**3**	**3**	**2**	**3**	**1**	**1**
CO4	**1**	--	--	**2**	**3**	**3**	**3**	**2**	**3**	**1**	**1**

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Bachelor of Science (Honors/ Honors with Research) in Mathematics
(Semester-IV)

Course Code: SMTH2401	**PROGRAMMING WITH MATLAB**	L	T	P	C
Version		0	0	6	3
Pre-requisites/Exposure	Algorithms and basic knowledge of programming				
Co-requisites					

Course Objectives : MATLAB is a scientific computing tool which covers almost all area of science and engineering. Students will be using MATLAB environment to solve various types of mathematical problems.

Course Outcomes : On completion of this course, the students will be able to
CO1 : Learn the basic concept of MATLAB
CO2 : Learn how to use matrix theory in MATLAB.
CO3 : Learn how to plot functions using plot functions and m file
CO4 : How to make script file and function file
CO5 : How to use if, while, do while, for loop etc

Catalog Description
The course will provides the students how to use MATALB in scientific and mathematical way

Course Content :

Programs	**Blooms Level**	**Hours**
1. Generating arrays and matrices and their manipulations 2. Introduction on few builtin functions 3. 2D and 3D plots, multiple plots using figure and subplot commands 4. Annotation of plots 5. Simple script files and editing them 6. Programs using If, else, nested if else, statements 7. Programs using switch case 8 Programs using loop structures 9 Introduction of function files 10 Introducing notion of sub-functions and nested functions 11 Solving IVPs using ode45 and other solvers	**L1, L2, L3, L4**	

Text Book:

1. R. Pratap, Getting started with MATLAB, Oxford publication, 2016
2. A. Gilat, MATLAB-An introduction with application, wiley publication, 2014

Reference:

1. S. Swapna Kumar and S. V. B. Lenina, MATLAB easy way of learning, Prentice-Hall of India Pvt.Ltd

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Examination Scheme :

IA					Performance	Viva
Components	**A**	**PR**	**LR**	**V**		
Weightage (%)	5	10	10	5	**35**	**35**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE- External Exam

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Bachelor of Science (Honors/ Honors with Research) in Physics
(Semester-III)

Course Code: SPHY2301	FUNDAMENTALS OF C PROGRAMMING	L	T	P	C
Version		2	0	0	2
Pr-requisites/Exposure					
Co-requisites					

Catalog Description
This course is aimed to provide a fundamental understanding of programming concepts. C Language is the language which used to write solution for the basic computational problem in the form of instructions and programs. The basic and advanced features of C Language including Data types, Operators, Conditional & Control Statements, Arrays, Strings, Structure & Union and File Handling will be introduced.

Course Outcomes : On successful completion of this course, all students will be able to:
CO1 : Understand binary, hexadecimal and octal number systems and their arithmetic.
CO2 : Define the purpose and structure of C Program for programming; identify and distinguish various datatypes and operators; conditional and control statement; Apply if-else, Switch and loops to rewrite basic C program for problem solving.
CO3 : Compare and contrast various Array types, its declaration and implementation; differentiate between Call by Value and Reference if Functions; apply the concepts to rewrite C Programs
CO4 : Differentiate between various String Handling Functions;

Course Content:

Modules	Blooms level*	Number of hours
Module-I: Computers fundamentals: definition, block diagram, diagram with components and characteristics, classification of computers History of C: Introduction of C, Basic structure of C program, Concept of problem solving, program design, debugging, Types of errors in programming, Number systems, Binary, octal, hexadecimal and their inter conversions.	L1, L2 and L3	08
Module-II: Element used in C, Header file, key words, identifiers, concept of variables, constants and data types in C, Input/output function, arithmetic, relational and bitwise operator, increment and decrement operator, unary operator, type casting, operator hierarchy, Conditional operator	L1,L2 and L3	08
Module-III: Decision making with if statement, else statement, if-else statement, nesting if, switch and break, go to statement. Decision making statement concepts of loops like while loop, do while loop, for loop, nested for loops, jumps in loop.	L1, L2 and L3	10
Module-IV: Functions: - use of inbuilt function, user defined functions, arrays:- one dimensional and n dimensional array, initialization of array, iterative programs using arrays, uses of array with combination of decision making operator, Function prototype, Return values and their types, function argument, recursion, Strings, array of strings.	L2, L3 and L4	10

**Bloom's Level:*

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L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, **HA**: Home Assignment, **S/V/Q:** Seminar/Viva/Quiz, **A:**Attendance,**EE:** End Semester Examination

Text & References Books :

- E Balagurusamy, ANSI C, McGraw Hill Education India Private Limited; Seventh edition (2017).
- Yashwant Kanetkar, Let us C, BPB Publications, 2nd Edition, 2001.
- Herbert Schildt, C: The complete reference, OsbourneMcgraw Hill, 4th Edition, 2002.
- V. RajaRaman, Computer Programming in C, Prentice Hall of India, 1995.
- Kernighan & Ritchie, C Programming Language, The (Ansi C Version), PHI, 2nd Edition.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO1	1	2	--	3	3	3	--	3	--	1	1
CO2	1	--	--	2	3	3	3	2	3	1	1
CO3	1	--	--	2	3	3	3	2	3	1	1
CO4	1	--	--	2	3	3	3	2	3	1	1

1: strongly related, 2: moderately related and 3: weakly related

Course Outcomes Assessment

There will be a midterm exams and a comprehensive final. The midterm exams will be given during lecture time**.** Final exam questions in the course will address the outcomes. Instructors will provide copies of questions. Weekly homework assignments will be given to the students.

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Bachelor of Science (Honors/ Honors with Research) in Physics
(Semester-III)

Course Code: SPHY2302	**C PROGRAMMING LAB**	L	T	P	C
Version		0	0	2	1
Pre-requisites/Exposure					
Co-requisites	NIL				

Catalog Description
The primary objective of this course is to understand all the components of C, including the C language, the C Preprocessor, and the C Standard Library.

Course Objectives : The objective of this course is to
- Equip the students with concepts of Programming through C Language
- Provide an overview of programming concepts like Functions, Arrays and String Handling

Course Outcomes : On completion of this course, the students will be able to
CO1 : Demonstrate the use of various data types and operators in C programs; Solve various problems using conditional control statements (if-else, Switch case).
CO2 : Construct C programs related to problems involving the usage of loops, arrays and functions.
CO3 : Construct C programs using string handling functions.

Course Content:

Modules/Topics Covered**	**Blooms level***	**Number of hours**
1. Basic programming to understand the working of C d. Write a program to calculate simple interest and amount. e. Write a program to swap two numbers using third variable. f. Write a program to calculate area of circle	L3	2
2. Programs using if, else if statements, switch case d. Write a program to check if the number is even or odd. e. Write a program to perform arithmetic operations using Switch Case statement. f. Write a program to demonstrate Greatest of 3 nos	L3	2
3. Programs using loops like while and do while (d) Write a program to find factorial of given no using do while statement. (e) Write a program to print prime numbers up to 'n'. (f) Write a program to sum of n natural no.	L3	2
4. Pattern programs using loops and multiple loops c. Write a program to print the following pattern using for loop d. Write a program to print the following pattern using for loop	L3	2
5. Simple programs with the help of function c. Write a program to swap two numbers using call by value. d. Write a program to find factorial of a number with return with argument.	L3	2

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6. Simple programs involving array and strings d. Write a program to read nnum of students and 5 subjects marks. e. Write a program to add two 3* 3 matix. f. Write a program to perform operations on strings using string handling in-built functions (concatenation, reversal, copy etc.)	L3	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text & References

- E Balagurusamy, ANSI C, McGraw Hill Education India Private Limited; Seventh edition (2017).
- YashwantKanetkar, Let us C, BPB Publications, 2nd Edition, 2001.
- Herbert Schildt, C: The complete reference, OsbourneMcgraw Hill, 4th Edition, 2002.
- V. RajaRaman, Computer Programming in C, Prentice Hall of India, 1995.
- Kernighan & Ritchie, C Programming Language, The (Ansi C Version), PHI, 2nd Edition.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme :

	IA				Performance	Viva
Components	**A**	**PR**	**LR**	**V**		
Weightage (%)	5	10	10	5	**35**	**35**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO1	**1**	**2**	--	**3**	**3**	**3**	--	**3**	--	**1**	**1**
CO2	**1**	--	--	**2**	**3**	**3**	**3**	**2**	**3**	**1**	**1**
CO3	**1**	--	--	**2**	**3**	**3**	**3**	**2**	**3**	**1**	**1**
CO4	**1**	--	--	**2**	**3**	**3**	**3**	**2**	**3**	**1**	**1**

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Bachelor of Science (Honors/ Honors with Research) in Physics
(Semester-IV)

Course Code: SPHY2401	**INSTRUMENTATION PHYSICS**	L	T	P	C
Version	Date of Approval:	2	1	0	3
Pre-requisites/Exposure	Basic understanding of physics				
Co-requisites	Solid State Physics, Analog & Digital electronics				

Course Objectives
The objective of this course is to
 This course will be an introduction to some experimental techniques like clean room technology, vacuum science techniques and measurement.
 The course also covers various diffraction and microscopic techniques used extensively for crystal structure determination and morphology study respectively.

Course Outcomes
On completion of this course, the students will be able to
CO1: Understand the basics and significance of Clean Room Technology, Vacuum Technology and vacuum measurement.
CO2: Develop an understanding of various diffraction techniques such as x-ray, electron and neutron diffraction to determine the crystal structure of materials.
CO3: Understand the basics and significance various Spectroscopic Techniques.
CO4: Develop an understanding of various microscopic techniques such as TEM, SEM, AFM, STM to study the morphology
CO5:Apply key analysis techniques to typical problems encountered in the field.

Catalog Description
This course is intended to give insight of providing the basic knowledge of some experimental techniques like clean room technology, vacuum science, diffraction techniques and microscopic techniques.

Course Content:

Modules	**Blooms level***	**Number of hours**
Module I: Error analysis and Vacuum technology Description of error analysis, reporting and usage of uncertainties, Propagation of uncertainties, Error analysis: Instrumental and statistical uncertainties, propagation of errors, Estimation of Mean and Errors, Least Square Fitting, Calibration. Introduction to Vacuum Systems, Kinetic Theory of Gases, Production of Vacuums, Vacuum Pumps – Rotary, Diffusion, Terbo molecular, Pressure Measurement, Leak Detection, Specimen **Handling**	L1, L2, L3,	10
Module II: Instrumentation of Diffraction and Microscopic Techniques X-ray Sources – Crookes Tubes, Coolidge Tubes, Filters, mono chromator crystals, Multilayered monochromators and mirrors, Detectors-Photographic film, Gas detectors, Solid detectors, Diffractometers-The Debye-Scherrer and Hull diffractometer, Bragg-Brentano diffractometers,	L1, L2, L3, L4,	16

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An introduction to surface diffractometry. Scanning Electron Microscope Instrumentation- Electron Beam Parameters, Electron. Optical Parameters- Beam Energy, Beam Diameter, Beam Current, Beam Solid Angle. SEM Imaging Modes- High Current Mode, Resolution Mode, Low Voltage Modes		
Module III: Instrumentation of Spectroscopic Techniques Gas Discharge Lamps, Spectral Lamps and Shapes of Spectral Lines-Low Pressure Spectral Lamps, Shape of Spectral Lines. Optical Filters, Polarizers and Phase Plates. Monochromators – Prism Monochromator, Grating Monochromator	L1, L2, L3,L4,	10

Text & References:

1. John R. Taylor, An introduction to error analysis: a study of uncertainties in physical measurements, University Science Books California). 1997.
2. P E J Flewitt, RK Wild, Physical Methods for Materials Characterization, IOP Publishing 2003.
3. R. Guinebretière, X-ray Diffraction by Polycrystalline Materials, LAVOISIER 2006.
4. Joseph I Goldstein, Scanning Electron Microscopy and X-ray Microanalysis, Springer 2018.
5. Hans Kuzmany, Solid- State Spectroscopy an Introduction, Springer 2009.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO5**
CO1	**1**	--	**1**	--	--	--	**1**	**1**	--	**1**	--
CO2	**1**	--	**1**	--	--	--	**1**	**1**	--	**1**	--
CO3	**1**	--	**1**	--	--	--	**1**	**1**	--	**1**	--
CO4	**1**	--	**1**	--	--	--	**1**	**1**	--	**1**	--
CO5	**1**		**1**				**1**	**1**		**1**	

1: strongly related, 2: moderately related and 3: weakly related

Course Outcomes Assessment

The outcome will be measured by the performance of students in various class tests/assignments in addition to the End Semester Examination (ESE) that contains significant number of questions on problems related to low temperature physics and superconductivity**.**

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Bachelor of Science (Honors/ Honors with Research) in Earth Sciences
(Semester-III)

REMOTE SENSING AND GIS

Course Code: SESC2301 **Credit Units: 3**

Course objective: This course will develop the skills of students in the field of GIS and remote sensing. It will also give the basic concepts of remote sensing and principles associated with image acquisition and image processing. The role of GIS as a tool in environmental management and knowledge of GPS will be facilitated.

Course Content:

Module I: Remote sensing: Introduction, scope and components; Electromagnetic spectrum, its characteristics and interaction with environment; Absorption, Transmission, Scattering: Mie- sattering & Rayleigh Scattering; Platforms: Types of Platform (Ground, Air, Space) & Sensors (Active & Passive) Resolution: (Spatial, Temporal, Radiometric); Ground & Satellite Remote Sensing; Albedo, Atmospheric Windows; Aerial photography, Elements of Visual Image Interpretation (Tone, Texture, Size, Shape, Shadow, Pattern), Spectral Signature,

Module II: Techniques and applications of remote sensing in water resource management, Land Use land cover mapping, forest cover/ type mapping, habitat analysis, biodiversity characterization; Use of GIS and remote sensing in environmental monitoringand early warning
system; Raster Data; Vector Data; Indian Remote Sensing Satellite

Module III: Image classification and accuracy assessment: Supervised and Unsupervised classification; GPS and its applications; Digital image processing; Optical remote sensing, microwave remote sensing; Photogrammetry: Introduction, stereoscopic vision; Concept of Digital Elevation Model.

Module IV: Lab based project: Basics of Arc-GIS software, Data Downloading, observation, interpretation, Geo-referencing, mosaic. Classification of images: Supervised and Unsupervised; DEM analysis: generating slope map, aspect map and drainage network map and its applications.

Examination Scheme:

Components	A	FP	HA	EE
Weightage (%)	5	20	5	70

A: Attendance, FP: Field Project, HA: Home Assignment, EE: End Semester Examination;

Suggested Readings:

- Lillisand, Thomas, Ralph W. Kiefer and Jonathan Chipman. 2007. Remote Sensingand Image Interpretation. Wiley India.
- Jensen, John R. 2004. Introductory Digital Image Processing: A Remote Sensing Perspective. Prentice Hall.
- Burrough, P.A. and McDonnell, R.A. (1998) Principles of geographical information systems. Oxford University Press, Oxford, 327 pp.
- Jensen J.R. (2000) Remote Sensing of the Environment: An Earth Resource Perspective, Prentice Hall, ISBN 0-13-489733-1.

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Bachelor of Science (Honors/ Honors with Research) in Earth Sciences
(Semester-IV)

SURVEYING AND MAPPING

Course Code: SESC2401 **Credit Units: 3**

Course objective: this course will develop the skills of students in the field of surveying and mapping. It will also give the basic concepts of surveying and mapping and to promote planned, economic and artistic development of town, cities and rural areas.

Course Content:

Module I: Introduction:

Significance and Principles of Surveying, Survey methods- Compass, Tape, Chain, Plain Table, Theodolite, Electronic Distance Meter, Total Station; Contouring and Plotting, Measurement of slope heights, aspects and gradients; Use of abney level, Global Position System; Geodetic survey, Datum, survey of India topographical maps.

Module II: Different type of maps: base maps, thematic maps. Main categories of thematic maps used in earth sciences; Techniques for legend and symbols in the maps; Scale of maps, classification of maps according to the scale, effect of the scale on the level of details of the information; Geographic projections and deformation of the real world in the maps; Coordinate systems;

Module III: Exercise of localization of points in the map using their coordinates; Representation of the 3rd dimension in the maps: isolines, elevation points; Exercises of estimation of slope and real distance in the maps; Landform identification from maps (identification of valleys, hills). Delineation of drainage basins. Construction of elevation profiles from maps.

Module IV: Lab Project Exercises of estimation of slope and real distance in the maps, Remote sensing and map based basic skilling, theoretical study and lab work followed by evaluation by Peer group.

Examination Scheme:

Components	A	FP	HA	EE
Weightage (%)	5	20	5	70

A: Attendance, FP: Field Project, HA: Home Assignment, EE: End Semester Examination;

Suggested Readings:

- GPS Satellite Surveying: By Alfred Leic, Published by Wiley.
- Remote Sensing and Geographical Information System: By AM Chandra and SK Ghosh, Published by Narosa Publishing House.
- Surveying: Principles and Applications: By Barry F. Kavanagh, eight edition

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Bachelor of Science (Honors/ Honors with Research) in Biotechnology/ Bachelor of Science (Honors/ Honors with Research) in Biological Science
(Semester-III)

Course Code: SBTH2301/ SBLS2301	COMPUTER APPLICATIONS FOR BIOLOGISTS	L	T	P	FW/ Proj	C
Version	**2023**	2	0	1	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description
This is an introductory course designed to provide fundamental knowledge and practical skills in computer applications. Students will learn essential concepts such as operating systems, word processing, spreadsheets, presentations, and internet basics. The course aims to equip participants with the foundational understanding needed to navigate and utilize computer applications effectively in various personal and professional settings.

Course Objectives
The course aims to provide students with a comprehensive understanding of fundamental computer concepts and applications. By the end of the course, students will be able to utilize word processing software for document creation and formatting, employ spreadsheet software for data organization and analysis, create engaging presentations using presentation software, and effectively utilize internet resources for research and communication purposes. Additionally, students will develop essential skills in file management, basic troubleshooting, and cybersecurity awareness. Through hands-on exercises and practical assignments, students will gain the confidence and competence to apply their newfound knowledge in real-world scenarios.

Course Outcomes (COs):
On completion of this course, the students will be able to
- Demonstrate basic computer literacy and computer application skills in word processing, spreadsheet usage, presentation design and delivery, internet usage, email etiquette, use of collaborative tools for communication, document sharing and collaboration.
- Develop awareness of cybersecurity risks, challenges, and protective measures.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Basic Computer Literacy General features of a computer system: characteristics of computers, Input and output devices, Application of computers in day-to-day life. Computer organization. Central processing Unit, Computer memory-primary memory and secondary memory. Secondary storage devices. Computer hardware and software, Machine language, high-level language, low level language, Application software and system software.	**L1, L2, L3**	10L+10P

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Module II: Essential tools and skills using computers Word Processing Skills: (Create, format, and edit documents using word processing software, including features such as text formatting, page layout, and document templates). Spreadsheet Proficiency: (Use spreadsheet software to organize data, perform calculations, and create basic charts and graphs to visually represent numerical information). Presentation Design and Delivery: (Develop engaging and visually appealing presentations using presentation software, incorporating text, images, and multimedia elements. Deliver effective presentations with confidence, clarity, and appropriate use of visual aids). Internet and Email Skills: (Navigate the internet effectively to search for information, access online resources, and evaluate the credibility of online sources. Use email software to compose, send, receive, and manage email messages, including file attachments and email etiquette.) Collaboration and Communication Tools: (Utilize collaborative tools and platforms for online communication, document sharing, and project collaboration, such as cloud storage, messaging apps, and collaboration software). Cybersecurity Awareness: (Identify common cybersecurity threats, risks, and best practices for protecting personal and organizational information. Practice safe and secure online behaviors, including password management, data encryption, and awareness of phishing scams.)	**L1, L2, L3**	20L+20P

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books & References:

- Craig Stinson "Running Microsoft Windows-98" – Microsoft press.
- Joshua C. Nossiter. " Using Excel – 5 for Windows"
- "Working with Word" – Aptech Computer Education
- "Power Point Presentation" – Aptech Computer Education.
- Malhotra, Computer Applications in Business
- Rajaraman V, Analysis and Design of Information System, Prentice Hall of India, New Delhi

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**P**	**A**	**CT**	**EE**
Weightage (%)	15	5	10	70

CT: Class Test, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	--	2	2	--	2	--	--	--	3	--	--
CO2	2	2	2	--	2	--	--	--	3	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Bachelor of Science (Honors/ Honors with Research) in Biotechnology/ Bachelor of Science (Honors/ Honors with Research) in Biological Science
(Semester-IV)

Course Code: SBTH2401/ SBLS2401	INTRODUCTION TO BIOINFORMATICS	L	T	P	FW/ Proj	C
Version	**2023**	2	0	1	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description
This introductory course provides students with fundamental knowledge and practical skills in bioinformatics, an interdisciplinary field combining biology, computer science, and statistics. Students will explore the principles, tools, and applications of bioinformatics in biological research and data analysis. Through lectures, hands-on exercises, and projects, students will learn to analyze biological data, interpret results, and apply bioinformatics techniques to solve biological problems.

Course Objectives
This course aims to impart students a basic understanding of the concepts and principles of bioinformatics, along with the skill in using bioinformatics tools and databases for biological data analysis. This course will help the students develop critical thinking skills in interpreting and evaluating bioinformatics results, and apply bioinformatics techniques to address biological research questions.

Course Outcomes (COs):
On completion of this course, the students will be able to
- Understand the basic concepts and principles of bioinformatics.
- Gain proficiency in using bioinformatics tools and databases for biological data analysis.
- Develop critical thinking skills in interpreting and evaluating bioinformatics results.
- Apply bioinformatics techniques to address biological research questions.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to Bioinformatics Fields, Application, Scope & Uses of Bioinformatics	**L1, L2, L3**	4L+4P
Module II: Biological Databases Introduction to Databases Types of Databases: Sequence Databases, Structure Databases	**L1, L2, L3**	6L+6P
Module III: Data Retrieval and Database Searching Biological data retrieval: sequence, structure, family, conserved domains	**L1, L2, L3**	6L+6P
Module IV: Sequence Analysis Sequence alignment Pairwise and multiple sequence alignment Local and Global sequence alignment	**L1, L2, L3**	8L+8P

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Tools for sequence alignment: BLAST, CLUSTAL		
Module V: Phylogenetic Analysis Introduction to Phylogenetic analysis Trees (rooted & unrooted; Tree building approaches.	**L1, L2, L3**	6L+6P

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Introduction to Bioinformatics; Arthur M. Lesk; Oxford University Press.
- Bioinformatics: Sequence and Genome Analysis; David W Mount, Cold Spring Harbor Laboratory Press, U.S.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**P**	**A**	**CT**	**EE**
Weightage (%)	15	5	10	70

CT: Class Test, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	2	--	--	--	--	--	3	2	1	3
CO2	3	2	--	--	--	--	--	3	2	1	3
CO3	3	2	--	--	--	--	--	3	2	1	3
CO4	3	2	--	--	--	--	--	3	2	1	3
CO5	--	--	--	--	--	--	--	--	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Manesar Gurgaon-122413

Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics (Semester-III)
Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication (Semester-IV)

Course Code: SANI2301/ SJRN2401	MEDIA ENTREPRENEURSHIP	L	T	P	FW/ Proj	C
Version	**2023**	2	1	0	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description
This course explores the role of entrepreneurship in media and journalism, teaches the learner to observe and investigate acts of entrepreneurship in the media landscape, and leads the student through the process of building a proposal for a new business venture. The course is theoretically driven, as it delivers the concepts related to entrepreneurship and the entrepreneurial process and explores some of the issues and discussions around entrepreneurship in the media landscape through lectures and literature. Students then use that knowledge to analyze and present a case study that they consider to be media entrepreneurship and reflect on the entrepreneurial process in an individual essay.

Course Objectives
This course is designed to enable students to identify entrepreneurship, entrepreneurship processes, and entrepreneurs in the media landscape. The students should be able to analyze the opportunities, challenges, and the proposed value of entrepreneurial projects and products in media industries by presenting a proposed media start-up project. The learner should be able to propose a media start-up plan, including the business model, ideation, and tools for market analysis and would design a presentation that will convince an audience of peers to engage in a business entrepreneurship idea, selecting the appropriate (media) from for this presentation in the process.

Course Outcomes (COs):
On completion of this course, the students will be able to

- Define media entrepreneurship and the multiple career paths that fit within it.
- Understand how the media industry is changing to give rise to these paths.
- Conceive and develop an idea for a digital media startup by clearly stating a value proposition, conducting rigorous market and competitor research, and by evaluating revenue streams and startup funding options.
- Write, review, and revise a media business plan according to the conventions of the genre.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Intro to Media Entrepreneurship • Meaning, definition and concept of Entrepreneurship • Nature and scope of media entrepreneurship • Duties and responsibilities of the entrepreneurs • Challenges and risks in media Entrepreneurship • Intrapreneur vs entrepreneur • Freelancing as Entrepreneurship and Consulting as Business Models • Famous Media entrepreneur in India and around the World	**L1, L2, L3**	18

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• Future of Media's Unicorns & Making Media Sustainable • Q&A With a Young Media Innovator		
Module II: Entrepreneurship in different types of media • Entrepreneurship in Print media • Entrepreneurship in Television and radio • Entrepreneurship in Digital media • Entrepreneurship in Advertising and Public Relations • Entrepreneurship in Entertainment Industry • Freelance Journalism	**L1, L2, L3**	18
Module III: Developing the Entrepreneurial Mindset • Principles of freelancing and self-employment • Taking Risks and Building Resilience on the Path to Innovation • Understand the professional, financial, legal and regulatory framework of self-employment. • Develop and polish a freelance pitch. • Strengthen your personal brand through social media and your online portfolio. • Attitudes, behaviors, knowledge, and skills required for entrepreneurship • Entrepreneurship Abroad: Cultural and International Perspectives and Challenges • Pitching Ideas	**L3, L4, L5**	18
Module IV: Startup Funding • Introduction • Why Funding • Traditional Venture Funding • Nontraditional Funding Sources • Crowdfunding • Writing a Business Plan & Budget • Attracting Investors	**L3, L4, L5**	18
Module V: Management and Entrepreneurship • Modern management theory and practice for planning, organizing, leading, and deploying human capital to maximize organizational and personal success. • Motivation, human capital planning, performance management, organizational culture, decision making and leadership of self and others. • Technology behind multiple digital platforms. • New innovation in their media-related company, • How to manage communication technology. • Managing budgets, vendors, workflow, hardware, software, and production. • Marketing Your Venture: Engagement and Analytics	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Media Innovation and Entrepreneurship, edited by Michelle Ferrier and Elizabeth Mays may be accessed in digital format on https://press.rebus.community/media-innovation-and-entrepreneurship/
- Developing The Entrepreneurial Mindset by Mike Green

Reference Material

- https://press.rebus.community/media-innovation-and-entrepreneurship/

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Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	P	A	CT	EE
Weightage (%)	15	5	10	70

CT: Class Test, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	--	2	--	--	--	--	--	1	2	2	2
CO2	--	2	--	--	--	--	--	1	2	2	2
CO3	--	2	--	--	--	--	--	1	2	2	2
CO4	--	2	--	--	--	--	--	1	--	2	2
CO5	--	--	--	--	--	--	1	1	2	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics
(Semester-IV)

Course Code: SANI2401	PORTFOLIO VIA WEB DESIGN	L	T	P	FW/Proj	C
Version	**2023**	2	0	2	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

In this course, students will learn how to create a professional and visually appealing web portfolio that showcases their skills, experience, and work samples. Using popular platforms like WordPress, students will design and build a personalized portfolio website to highlight their resume, showreels, rate card, and other key elements that demonstrate their capabilities to potential clients or employers. The course covers essential web design principles, portfolio structure, and customization techniques to ensure each portfolio is unique and engaging. By the end of the course, students will have a fully functional web portfolio that effectively communicates their talent and professionalism.

Course Objectives

- Understand the fundamentals of web design and portfolio structure.
- Create a personalized portfolio website using WordPress or similar platforms.
- Upload and organize a resume, showreels, rate card, and work samples in a user-friendly manner.
- Use templates and customization tools to make the portfolio visually appealing and professional.

Course Outcomes (COs):

On completion of this course, the students will be able to

Expected Outcome	Bloom's Taxonomy level
1. **Portfolio Creation and Design:** Students will be able to design and construct a fully functional web portfolio using WordPress or similar platforms, demonstrating proficiency in layout, navigation, and visual aesthetics.	L1, L2, L3
2. **Content Management and Organization:** Students will be able to upload, organize, and categorize essential portfolio content, including resumes, showreels, rate cards, and project samples, ensuring clear and user-friendly presentation.	L2, L3, L4, L5
3. **Customization and Branding:** Students will demonstrate the ability to customize WordPress templates to reflect personal or professional branding, incorporating elements like logos, color schemes, and typography that align with their identity.	L3, L4, L5
4. **Responsiveness and Accessibility:** Students will learn to create interactive prototypes that simulate user interactions, providing a realistic representation of the final product and allowing for usability testing.	L3, L4, L5

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Course Content:

Modules	Blooms level*	Number of hours
Module 1: Introduction to WordPress and Web Portfolio Basics • **Getting Started with WordPress:** Installing WordPress locally or on a web server, creating a new site, and understanding the WordPress dashboard. • **Choosing and Installing Themes**: Exploring WordPress themes, selecting an appropriate theme for a portfolio, and customizing the theme settings. • **Basic Portfolio Structure:** Understanding the key components of a web portfolio (resume, projects, showreels, rate cards, etc.), and planning the overall structure. • **Creating Pages and Posts:** Learning the difference between pages and posts, creating essential pages (e.g., About, Projects, Contact), and setting up the portfolio's navigation menu. • **Hands-on Exercises**: Creating basic pages, setting up the homepage, and establishing site navigation.	**L1, L2**	8
Module 2: Customization and Branding • **Advanced Theme Customization:** Using the WordPress Customizer to adjust site elements like colors, fonts, headers, footers, and backgrounds to reflect personal branding. • **Working with Widgets and Plugins:** Adding and customizing widgets for extra functionality (e.g., social media links, contact forms), and exploring useful plugins for portfolios (e.g., portfolio galleries, SEO tools). • **Implementing Personal Branding:** Incorporating branding elements like logos, color schemes, and typography to create a unique identity. • **Hands-on Exercises**: Customizing a theme to align with personal branding and adding useful plugins for additional functionality.	**L1, L2, L3**	10
Module 3: Visual Design and Interaction Design • **Uploading and Organizing Portfolio Content**: Managing multimedia content (images, videos, PDFs), uploading showreels, and structuring the content for a professional presentation. • **Creating Engaging Portfolio Sections:** Designing project galleries, embedding multimedia content, and organizing portfolio items for easy navigation. • **Improving Content Quality:** Tips for writing compelling copy, creating effective project descriptions, and maintaining consistent tone and style across the portfolio. • **Hands-on Exercises:** Uploading and organizing content in the portfolio, creating project galleries, and refining portfolio sections for better user experience.	**L2, L3, L4, L5**	10
Module 4: Responsiveness, Accessibility, and Finalization • **Ensuring Responsive Design:** Testing the portfolio on various devices (desktop, tablet, mobile) to ensure a seamless experience across different screen sizes. • **Accessibility Considerations**: Implementing basic accessibility features like alt text for images, keyboard navigation, and color contrast for better accessibility.	**L1, L2, L3, L4, L6**	8

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• **Finalizing the Portfolio:** Reviewing the overall structure, checking for errors, and ensuring consistent design and branding throughout. • **Launching and Promoting the Portfolio:** Tips for deploying the portfolio to a live server, optimizing for SEO, and promoting the portfolio to potential employers or clients. • **Hands-on Exercises:** Testing and finalizing the portfolio, optimizing for SEO, and preparing for launch		

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- "WordPress All-in-One For Dummies" by Lisa Sabin-Wilson
- "Building Your Business with WordPress: A Complete Guide to Building Any Business Website Using WordPress" by Diane Kinney and Chris Lema.
- "HTML and CSS: Design and Build Websites" by Jon Duckett

Reference Books

- "WordPress Plug-in Development Cookbook" by Yannick Lefebvre

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	H	A	CT	FP	EE
Weightage (%)	10	5	15	20	50

CT: Class Test, EE: End Semester Examination; A: Attendance; H: Home Assignments

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	1	--	--	--	2	2	1	2
CO2	1	2	3	2	--	--	--	1	1	1	2
CO3	2	1	1	1	--	--	--	1	3	2	3
CO4	1	1	1	1	--	--	--	2	1	2	1
CO5	--	--	--	--	--	--	--	--	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication (Semester-III)

Course Code: SJRN2301	GRAPHICS & BASIC ANIMATION	L	T	P	FW/ Proj	C
Version	**2023**	2	0	2	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course introduces students to the art and concept of graphics and animation. This course focusses both on the theoretical and practical aspects of design principles & fundamentals of animation and it is reinforced through many hours of hands-on lab training designed to right from the start, train the students to be industry ready.

Course Objectives

The objective of this course is to:

- Enable the students to comprehend principles of design and graphics using a blended learning approach.
- To familiarize students with all aspects of software, both at the beginner as well as at an intermediate level
- To integrate seamlessly both theoretical as well as practical aspects of graphic design and animation such that the learner is able to instantly identify as well as appreciate design principles incorporated in the physical realm, be it print, net, web, film or television.
- To attain more than a level of familiarity with popular commercial as well as open-source software so that s/he can instantly start designing the moment a project is assigned.

Course Outcomes (COs):

On completion of this course, the students will be able to

- Be able to visualize and conceptualize layouts for print, web, video, and Multimedia.
- Completely proficient with all aspects of atleast one graphic design and animation software each, notably from Adobe Photoshop, Illustrator, After Effects and Animate CC. They can also be taught fundamentals of Corel Draw or InDesign, at a beginner level.
- Be proficient at delivery of design projects, both at a conceptual level and at the execution stage.
- Be able to work in a team delegating different aspects of production to team members and also work at a peer-to-peer level, so that professional quality work can be produced and exported.

Course Content:

Modules	Blooms level*	Number of hours
MODULE1: Design Concepts – traditional and digital Differences between traditional design, primarily for print as compared to designing for the web, the internet, and for television and film will be compared and contrasted, and how these inherent differences can be optimized for a specific media will be explained and elaborated upon.	**L1, L2, L3**	12

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A broad overview imparted to each software with its distinguishing features and also reasons will be emphasized why a particular software is more suitable for a design project than others. The importance of maintaining inter-software compatibility as well as with market employed software will also be highlighted.		
MODULE2: What is Design? This module focuses exclusively on Design Elements, Design Principles and Aesthetics. How elements and principles help InDesign. Where, how and in which situation, these elements and principles are applicable. How do different design elements combine and mesh together to create an overall 'look' and feel for the published output – be it a web page, a mobile app or graphics for a social media video.	**L1, L2, L3**	12
MODULE3: Fundamentals of Design Software Editing of images, making selections and cropping, integration of text with graphics, as well as the importance of resolution, image size, pixel depth, and the different sizes and formats for print, web, broadcast, and internet mediums such as YouTube are all covered in this module. Also, the different image file formats such as jpg, png, tiff etc. along with transparency and scaling are also explained. From technical definitions we move on to the software itself, covering all basic aspects of industry standard software like Photoshop, Illustrator, Corel Draw and Adobe InDesign. An overview of the Affinity range of products like Designer and Photo is also covered so that the student can compare and contrast the differences and know which software to use in a given workplace situation.	**L3, L4, L5**	16
Module IV: Fundamentals of Animation This Unit moves into the domain of After effects. Since this package is used heavily by the Television Industry, many examples from this medium will be used to illustrate hard-to-grasp concepts. Various components of After Effects that will be taught in this module are: • The After Effects interface: Moving about and navigation in After Effects • AE tools and panels; how to customize and optimize them. • Keyboard shortcuts - how to use and customize. • Creating your first composition • The Timeline - navigation, panels, and scope of the timeline • Project windows and assets • Moving assets from project to timeline • Use of keyframes to create simple animations. • Principles of animation • Frame rates, speeding up and slowing down of animation. • Rendering and compression concepts. • Different kinds of movie formats • Exporting your first animation. • Settings and how they can be tweaked.	**L3, L4, L5**	16

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• Fundamentals of Motion Graphics		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Textbooks

- Sarkar,N.M. Art& Print Production. 2013Ed.
- Krug, Steve. Don't Make Me Think: A Common-Sense Approach to Web Usability. NewRiders Publishing, California. 2nd Edition
- Bauer,Peter.AdobePhotoshop CC ForDummies.Wileys.2nd Edition
- Wood, Brian. Adobe Illustrator CC Classroom in a Book (2023 Release), Adobe Press.First Edition.December 2022.
- Williams, Richard. The Animation Survival Kit. Expanded Ed. 2009.
- Whitaker, Harold. Timing for Animation. Focal Press, 2002

Reference Material

- Schenk, Sonja. Long, Ben. The Digital Filmmaking Handbook. Fourth Edition.
- Gyncild, Brie. Adobe After Effects CC: Classroom in a Book: the Official Training
- Workbook from Adobe Systems. 2014 Ed.
- Morrison, Robert. ADOBE INDESIGN 2023 FOR STARTERS: Beginners Guide to Mastering and Getting Basic knowledge About Adobe Indesign, Adobe Press. February 2023
- Norman, Don. The Design of Everyday Things: Revised and Expanded Edition. November 2013.
- Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**P**	**A**	**CT**	**EE**
Weightage (%)	15	5	10	70

CT: Class Test, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	--	2	--	--	--	--	--	1	2	2	2
CO2	--	2	--	--	--	--	--	1	2	2	2
CO3	--	2	--	--	--	--	--	1	2	2	2
CO4	--	2	--	--	--	--	--	1	--	2	2
CO5	--	--	--	--	--	--	1	1	2	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Bachelor of Arts (Honors/ Honors with Research) in History
(Semester-III)

Course Code: SHIS2301	AN INTRODUCTION TO ARCHAEOLOGY	L	T	P	FW/ Proj	C
Version	**2023**	2	1	0	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description:

Course Objectives:

Course Outcomes (COs):
On completion of this course, the students will be able to:

- To introduce students about the emergence of branch of archaeology
- To explain the the origins of specific science of archaeology
- To develop critical thinking about the variety of archaeological evidence
- To develop the understanding among students about the concepts of various techniques
- To critically examine the various evidence about the explored sites
- To develop understanding in students about the chief features of sites and facts
- To develop the understanding of sites in Africa, Europe and India.
- Explore the various open sites in India.
- To introduce students about the importance of excavated sites in India.
- To develop critical thinking about the chief features of the sites in India.
- To develop critical understanding about understanding of methods of archaeology

Course Content:

Modules	Blooms level*	Number of hours
Module I: Defining archaeology; understanding its origins and development • Definition of the term and its implications • Description of Archaeology as Science	**L1, L2, L3**	18
Module II: The variety of archaeological evidence • Early Study of the site and collection of evidence techniques • Expiations about various archaeological method and techniques • The Science of archaeology in action and its implementation • The unearthing of different sites and its implications on World history • Application of Archaeological evidences in reconstruction of history • Explorations of the sites in India and its impact	**L1, L2, L3**	18
Module III: Survey and excavation of sites and features • The idea of field archaeology and its application to actual site Survey • The applied archology and its explanation	**L3, L4, L5**	18

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Module IV: Discovering human experience through archaeology • The study and significance of archaeology • The idea about relevance of use of material and resources in Archaeology	**L3, L4, L5**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Essential Readings

- ASI publications
- Bahn, P. *Archaeology – A Very Short Introduction*. Oxford: Oxford University Paperback, 1996.
- Chakrabarti, D. K. *The Oxford Companion to Indian Archaeology*. New Delhi: Oxford University Press, 2006.
- Hall, M. & W. Silliman, *Historical Archaeology*. USA: Wiley-Blackwell, 2006.
- Renfrew, C. and Paul Bahn. *Archaeology – Theories Methods and Practice*. London: Thames and Hudson Paperback, 1991.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**P**	**A**	**CT**	**EE**
Weightage (%)	15	5	10	70

CT: Class Test, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	1	1						1		
CO2		1	1					1		
CO3	1									1
CO4	1									

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Bachelor of Arts (Honors/ Honors with Research) in History
(Semester-IV)

Course Code: SHIS2401	UNDERSTANDING CULTURE, HERITAGE, AND TOURISM	L	T	P	FW/ Proj	C
Version	**2023**	2	1	0	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description:

Course Objectives:

Course Outcomes (COs):
On completion of this course, the students will be able to:

- **To introduce students about the emergence of branch of archaeology**
- To explain the origins of specific science of archaeology
- To develop critical thinking about the built heritage.
- To develop the understanding among students about the concept of built heritage.
- To critically examine the importance of built heritage.
- To develop understanding in students about tourism and its importance.
- To develop the understanding of tourism and its implications on the built sites.
- Explore the various monuments in India.
- To introduce students about the importance tourism in India.
- To develop critical thinking about the chief features varieties of tourism.
- To develop critical understanding about understanding of heritage and role of tourism industry.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Defining Heritage • Definition of the term and its implications • Description of built and tangible heritage	**L1, L2, L3**	18
Module II: Understanding built Heritage • Defining Study of the built heritage • Expiations about various monument • The built heritage and community participation its importance • The understanding of different sites and its main implications • Built heritage and its help in reconstruction of history • Discussion about many new built sites.	**L1, L2, L3**	18
Module III: Varieties of Tourism • The study of various tourist destinations and how these can be used as form of revenue generations. • The understanding about the learning of various aspect of tourism industry.	**L3, L4, L5**	18

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Module IV: Understanding heritage through excursions • The study and significance of visit to a local museum or archives • To understand about importance of a field trip towards any particular monuments	**L3, L4, L5**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Essential Reaadings

- Agarwal, V.S. Indian Art. Varanasi: Prithvi Prakashan, 1972.
- Bhowmik, S. K. Heritage Management: Care, Understanding & Appreciation of Cultural Heritage, Jaipur, 2004.
- Harle, J. The Art and Architecture of the Indian Subcontinent. Hormonds Worth: Penguin, 1988.
- Howard, P. Heritage: Management, Interpretation, Identity and London. London: Continuum International Publishing, 2003.
- Kumar, S. The Present in Delhi's Past. Delhi: Gyan Publishing House, 2002.
- Ghosh, B. Tourism and Travel Management. New Delhi: Vikas Publishing House,1998.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**P**	**A**	**CT**	**EE**
Weightage (%)	15	5	10	70

CT: Class Test, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	1	1						1		
CO2		1	1					1		
CO3	1									1
CO4	1									

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Bachelor of Arts (Honors/ Honors with Research) in Political Science
(Semester-III)

Course code: SPOL2301	POLITICAL LEADERSHIP AND COMMUNICATION	L	T	P	C
Version 1.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	NIL				
Co-requisites	NIL				

Catalog Description
The course seeks to discuss the various aspects of political leadership and political communication to develop skills and training to the students.

Course Objectives
The objective of this course is to:
1. To enable students to develop an understanding of political communication in its linkages with leadership in democratic politics.
2. To understand the various aspects of election campaign studies, opinion polls and exit polls survey.

Course Outcomes
On completion of this course, the students will be able to
CO1: To understand the basics of political leadership.
CO2: Analyze the various aspects of political communication process and effective communication strategies.
CO3: Explain the changing role of communication in changing media environment particularly use of social media.
CO4: Demonstrate empirical and professional implications of Political Communication and to develop skills and orientations of different related professions.

Course Content:

Modules	Blooms level*	Number of hours
Module 1: Introduction to Political Leadership Themes, theories and typologies, participation and performance	L1, L2	9
Module 2: Basics of Political Communication Meaning, nature and scope, the political communication process: various actors and challenges, effective communication strategies	L1, L2	9
Module 3: Political Communication in a Changing Media Environment Social media and political communication, role of print media and television in shaping political opinion	L1, L2	9
Module 4: Empirical and Professional implications of Political Communication Basics of psephology, career options: political analysts, survey of opinion polls and exit polls	L1, L2	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Text Books

- H.A. Semetko and M. Scammell (eds.) (2012). The SAGE Handbook of Political Communication. London: Sage.
- Kiran Prasad (ed.) (2003). Political Communication: The Indian Experience. New Delhi: B.R. Publications.

References

- D.A. Graber (2005). 'Political Communication Faces the 21st Century', Journal of Communication, September: 479-507.
- Pole (2009). Blogging the Political: Politics and Participation in a networked Society. New York: Routledge.
- Frank Esser and Barbara Pfetsh (eds.). (2004). Comparing Political Communication Theories, Cases and Challenges. Cambridge: Cambridge University Press.
- G. Gerbner, L. Gross, M. Morgan and N. Singnorielli (1982). 'Charting the Mainstream: Television's Contribution to Political Orientations', Journal of Communication, 32(2): 100-27.
- John C Maxwell (2008). Developing the Leader Within You. New Delhi: Harper Collins.

Web Source

- https://www.politicalcommunication.org/history.html

Examination Scheme

Components	P	A	CT	EE
Weightage (%)	10	5	15	70

CT: Class Test, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	--	2	--	--	--	--	--	1	2	2	2
CO2	--	2	--	--	--	--	--	1	2	2	2
CO3	--	2	--	--	--	--	--	1	2	2	2
CO4	--	2	--	--	--	--	--	1	--	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Bachelor of Arts (Honors/ Honors with Research) in Political Science
(Semester-IV)

Course Code: SPOL2401	BASICS OF DEBUNKING FAKE NEWS & DISINFORMATION	L	T	P	Credits
Pre-requisites/ Exposure	**NIL**	3	0	0	3
Co-requisites	**NIL**				

Catalog Description

The course seeks to develop critical thinking to assess the validity and credibility of news and information and to develop many tools for enabling such assessment.

Course Objectives

- By enhancing their critical thinking abilities, participants will be better equipped to evaluate the accuracy and reliability of news and information they encounter.
- By understanding the tools and techniques, students will be able to recognize patterns and characteristics that can help them identify misleading or deceptive content.
- Participants will learn how to navigate fact-checking resources, employ digital verification techniques, and communicate their findings to others in a clear and persuasive manner.

Course Outcomes

CO1: Students will be equipped with the necessary tools to critically evaluate news sources, assess credibility, and identify potential red flags, thereby enhancing their ability to make informed decisions based on accurate information.

CO2: Students will be able to employ fact-checking techniques, utilize reliable verification tools, and effectively communicate their findings.

CO3: Students will have the knowledge and skills to protect themselves and others from falling victim to fake news and disinformation, fostering a culture of critical thinking, fact-checking, and responsible sharing of information.

Course Contents:

Module	Weightage
Module I: MEDIA LITERACY & ITS IMPORTANCE Developing critical thinking, understanding bias, difference between fake news, misinformation and disinformation	**10 %**
Module II: Fact Finding from the Images Understanding images & metadata, Error Level Analysis (ELA), Digital Forensics	**20 %**
Module III: Fact Finding from the Videos Understanding videos & metadata, video verification, YouTube Data viewer	**20 %**
Module IV: Basics of Social Media Understanding social media, study of digital media algorithms, knowledge of digital media tools	**10 %**
Module V: Detection Software & Tools Open Source Intelligence Software	

Text Books

- "The News Literacy Handbook: An Educator's Guide to Teaching Digital and Media Literacy" by Michelle Luhtala and Jacquelyn Whiting
- "Network Propaganda: Manipulation, Disinformation, and Radicalization in American Politics" by Yochai Benkler, Robert Faris, and Hal Roberts

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- "Fake News: Understanding Media and Misinformation in the Digital Age" by Melissa Zimdars

References

- "The Misinformation Age: How False Beliefs Spread" by Cailin O'Connor and James Owen Weatherall
- "Trust Me, I'm Lying: Confessions of a Media Manipulator" by Ryan Holiday
- "Weaponized Lies: How to Think Critically in the Post-Truth Era" by Daniel J. Levitin
- "The Smear: How Shady Political Operatives and Fake News Control What You See, What You Think, and How You Vote" by Sharyl Attkisson
- "Breaking the News: How the Media Undermine American Democracy" by James Fallows.

Examination Scheme:

Components	**P**	**A**	**CT**	**EE**
Weightage (%)	10	5	15	70

CT: Class Test, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	--	2	--	--	--	--	--	1	2	2	2
CO2	--	2	--	--	--	--	--	1	2	2	2
CO3	--	2	--	--	--	--	--	1	2	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Bachelor of Arts (Honors/ Honors with Research) in English
(Semester-III)

Course Code: SENG2301	ACADEMIC WRITING & COMPOSITION	L	T	P	Credits
Pre-requisites/ Exposure	**NIL**	2	1	0	3
Co-requisites	**NIL**				

Catalog Description
In this course Academic Writing and Composition is designed to help the students develop the skills necessary for effective academic writing and help the students understand the ways that language and communication shape experience, construct meaning and foster community.

Course Objective

- To provide strategies and processes that successful writers employ as they work to accomplish specific purposes. knowledge and praxis of Academic writing in detail to the students
- To provide students with rhetorical foundations and prepare them for the demands of the professional writings

Course Outcome
After completing this course, the students will be able to:
CO1- Define the scope of Academic Writing and Composition.
CO2- Describe and explain the various writing processes and skills.
CO3- Demonstrate their academic writing skills by composing various types of academic writings.
CO4- Differentiate between various types of academic writings.

CO5- Develop critical thinking and successfully structure an argument in their writings.

Course Content:

Module	Blooms Level*	Credit Hours
Module 1: **Introduction to the Writing Process** Developing writing skills, writing comprehension **Writing in one's own words** Summarizing, Paraphrasing, condensation	L1, L2	12
Module 2: **a) Critical Thinking:** Syntheses, Analyses, and Evaluation **b) Structuring an Argument:** Introduction, Interjection, and Conclusion	L1, L2	12
Module 3: Citing Resources Editing, Book and Media Review	L1, L2	12

***Bloom's Level:** *L1- Knowledge; L2- Comprehension; L3- Application; L4- Analysis; L5- Synthesis, L6- Evaluation*

Text Books

- Lyons, Liz Hamp Lyons and Ben Heasley. 2006. *Study writing: A Course in Writing Skills for Academic Purposes*. Cambridge University Press.
- Renu Gupta. 2010. *A Course in Academic Writing.* Orient BlackSwan.

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Reference Books

- Ilona Leki. 1998. *Academic Writing: Exploring Processes and Strategies*. 2nd Edition, Cambridge University Press.
- Gerald Graff and Cathy Birkenstein,. 2009. *They Say/I Say: The Moves That Matter in Academic Writing*. Orient BlackSwan.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

Relationship between the Course Outcomes (COs), Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	1	3		2	3	2	1		1
CO2	1	1	3		2	2	2	2		1
CO3	1	1	3	3	2		2	2		1
CO4	1	1	3		2	2	2	1		1
CO5	1	2	2	2	2	2	2	1		1

1. Strongly Related 2. Moderately related 3. Weakly Related

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Bachelor of Arts (Honors/ Honors with Research) in English
(Semester-IV)

Course Code: SENG2401	MEDIA AND COMMUNICATION	L	T	P	Credits
Pre-requisites/ Exposure	**NIL**	2	1	0	3
Co-requisites	**NIL**				

Catalog Description
In this course Academic Writing and Composition is designed to help the students develop the skills necessary for effective academic writing and help the students understand the ways that language and communication shape experience, construct meaning and foster community.

Course Objective

- To develop an awareness about the types and significant role of Media & communication in the present world with its areas of communication inquiry, social interaction and mediated communication.
- To enable students to practice the ethics and etiquettes during both face-to-face and Mediated social encounters

Course Outcome
After completing this course, the students will be able to:
CO1- To understand the process of communication, including different forms, levels and barriers.
CO2- To get knowledge about communication models and its application
CO3- To understanding Media Systems and Communication Theories
CO4- To learn about the wide array of communication from folk media to Social media.
CO5-. To understand the role of media in development

Course Content:

Modules	Blooms Level*	Credit Hours
Module 1: Introduction to Mass Communication Mass Communication and Globalization**;** Forms of Mass Communication: social media, Face book, Twitter; Marshal McLuhan: *The Medium is the Message* Topics for Student Presentations: a. Case studies on current issues Indian journalism b. Performing Street plays c. Writing pamphlets and posters, etc.	L1, L2	12
Module 2: Media Writing and Advertisement Scriptwriting for TV and Radio**;** Writing News Reports and Editorials**;** Editing for Print and Online Media Topics for Student Presentations: a. Script writing for a TV news/panel discussion/radio programme/hosting radio programmes on community radio b. Writing news reports/book reviews/film reviews/TV program reviews/interviews c. Editing articles d. Writing an editorial on a topical subject	L1, L2	12

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Module 3: Introduction to Cyber Media and social media Types of Social Media**;** The Impact of social media**;** Introduction to Cyber Media	L1, L2	12

***Bloom's Level:** *L1- Knowledge; L2- Comprehension; L3- Application; L4- Analysis; L5- Synthesis, L6- Evaluation*

Text Books

1. Keval J Kumar, Mass Communication in India, 4th Edition, Jaico Publishing House, Delhi, India
2. James G. Stovall, Writing for Mass Media, Pearson, London, UK, 2011

Reference Books

1. Jethawaney J and Jain Shruti, Advertising Management, Oxford University Press, Delhi 2006.
2. Frank Jefkins, Advertising, Tata McGraw- Hill, New Delhi 2007.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

Relationship between the Course Outcomes (COs), Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	1	1	3		2	3	2	1		1
CO2	1	1	3		2	2	2	2		1
CO3	1	1	3	3	2		2	2		1
CO4	1	1	3		2	2	2	1		1
CO5	1	2	2	2	2	2	2	1		1

2. Strongly Related 2. Moderately related 3. Weakly Related

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Bachelor of Arts (Honors/ Honors with Research) in French
(Semester-III)

Course Code: SFRE2301	ADVANCED WRITING SKILLS	L	T	P	FW/ Proj	C
Version	**2023**	3	0	0	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalogue Description
Course Description: This class aims to equip students with advanced writing capabilities essential for thriving in academic, professional, and personal spheres. Expanding on fundamental writing skills, students will participate in various writing assignments focused on enhancing their capacity to communicate clearly, convincingly, and imaginatively. With rigorous practice and constructive critique, students will refine their expertise in professional writing and their aptitude for critically evaluating and generating a range of written materials. Special attention will be given to cultivating a polished writing demeanour. Furthermore, students will delve into the cultural and situational influences on writing conventions.

Course Objectives:
- Examine and create diverse written works, such as essays, reports, stories, and professional papers.
- Utilize self-editing and revising methods to enhance clarity, cohesion, and brevity in writing.
- Recognize the impact of cultural and situational factors on writing norms .
- Critically analyse texts and cultivate abilities in thorough reading and textual interpretation.
- Implement advanced writing abilities across academic, professional, and personal settings.

Course Outcomes (COs):
On completion of this course, the students will be able to
- students will be adept at crafting persuasive essays that effectively convey their ideas and viewpoints.
- students will refine their professional writing prowess, cultivating a distinct and impactful voice in their written communication.
- students will gain comprehensive insight into the cultural and contextual factors shaping professional writing practices, facilitating nuanced and culturally sensitive communication in diverse settings.
- students will implement advanced writing abilities across academic, professional, and personal settings.

Course Content:

Modules	Blooms level*	Number of hours
Module 1: Literary review and critic In this module, students will focus on how to review and criticize literary works such as poetry, drama, extracts of novels and different art forms such as movies and paintings. Students will delve into the mastery of creating convincing arguments and engaging essays. They will hone their	**L1, L2, L3,L4**	15

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persuasive writing abilities across diverse subjects, enhancing their capacity to sway and impact others through written expression.		
Module 2: Project Report Writing Project Report Writing includes mastering the skills needed to effectively communicate project objectives, methodologies, findings, and conclusions through written reports. In this module, students will learn how to structure reports professionally, present data and analysis coherently, and adhere to academic standards for formatting and citation. By the end of the course, students should be capable of producing high-quality project reports that are informative, persuasive, and well-organized.	**L1, L3, L5**	15
Module 3: Professional Writing Skills In this module, students will delve into the intricacies of professional writing, honing skills essential for job applications, CV writing and crafting commercial correspondence. Exploring various genres of professional writing such as cover letters, follow up emails.	**L3, L4, L5**	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Texts & References

- "The Elements of Style" by William Strunk Jr. and E.B. White
- "Writing Tools: 50 Essential Strategies for Every Writer" by Roy Peter Clark
- "They Say/I Say: The Moves That Matter in Academic Writing" by Gerald Graff and Cathy Birkenstein
- "The Art of Fiction: Notes on Craft for Young Writers" by John Gardner
- "On Writing Well: The Classic Guide to Writing Nonfiction" by William Zinsser
- "L'écriture créative" by Yves Lavandier
- "Le plaisir d'écrire" by Julien Green
- "Ecrire un roman" by Françoise Sagan
- "Leçons de littérature : Un cours universitaire de création littéraire" by Michel Ciment
- "La création littéraire" by Elisabeth Bing
- "Histoire de la littérature française" by Lagarde et Michard

Examination Scheme:

Components	**CT**	**Attd.**	**EE**
Weightage (%)	25	5	70

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	2					1	2		1	
CO2	1	2	2					1	2	1	1	
CO3	1		1					1		1	1	1
CO4	1	1	1					1	2	1		

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Bachelor of Arts (Honors/ Honors with Research) in French
(Semester-IV)

Course Code: SFRE2401	INTRODUCTION TO TRANSLATION THEORY	L	T	P	FW/ Proj	C
Version	**2023**	3	0	0	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

The course "Introduction to Translation Theory" provides students with a comprehensive understanding of the theoretical foundations that underpin the practice of translation and interpretation. It covers various schools of thought and approaches to translation and interpretation, including equivalence theory, functionalist approaches, and cultural translation. Students explore key concepts such as fidelity, meaning, and adaptation in translation and interpretation, and critically analyse different translation and interpretation strategies and techniques. Through readings, discussions, and practical exercises, students gain insight into the complexities of translation and interpretation and develop the analytical skills necessary to assess and apply different theoretical frameworks in their work.

Course Objectives:

- Understand the definition and scope of translation, distinguishing between different types of translation (literal, literary, technical, etc.) and their respective purposes.
- Analyse and apply basic translation and interpretation techniques and strategies, such as literal, paraphrasing, and cultural adaptation, in various translation and interpretation scenarios.
- Evaluate the role of translators and interpreters as mediators between languages and cultures, considering their ethical responsibilities and cultural sensitivities.
- Compare and contrast major theoretical approaches in translation studies, including functionalist, descriptive, and sociocultural perspectives, and analyse their implications for translation practice.

Course Outcomes (COs)

On completion of this course, the students will be able to

- Understand the foundation of the principles underlying the translation and interpretation process.
- Explore how different theoretical lenses shape our understanding of the translation and interpretation process.
- Understand different approaches to achieving equivalence in translation and interpretation.
- Identify challenges in achieving equivalence between source and target texts, including lexical gaps, cultural nuances, and register differences.

Course Content:

Modules	Blooms level*	Number of hours
Module 1: Translation theories This module examines key theoretical frameworks in translation studies. Topics covered include the historical development of translation theory,	**L1, L2, L3**	15

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major theoretical approaches (such as functionalist, descriptive, and sociocultural approaches), and interdisciplinary perspectives on translation.		
Module 2: Initiation to Interpretation This module introduces students to the fundamental concepts of interpretation. Topics covered include the basic techniques of interpretation, and the role of interpreters in bridging linguistic and cultural divides.	**L1, L2, L3**	15
Module 3: Application of translation and interpretation theories In this module, students will translate texts from French to English and English to French. The students will also be required to do consecutive and simultaneous interpretation of discourses.	**L3, L5, L6**	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Texts & References:

- " Hatim, Basil, and Jeremy Munday. Translation: An Advanced Resource Book. Routledge, 2004.
- Baker, Mona. Foundations of Translation Studies: Perspectives, Pedagogies, and Practices. Routledge, 2018.
- Munday, Jeremy. Introducing Translation Studies: Theories and Applications. Routledge, 2016.
- Venuti, Lawrence. The Translator's Invisibility: A History of Translation. Routledge, 2008.
- Bassnett, Susan, and André Lefevere. Translation Studies. Routledge, 1998.
- Weissbort, Daniel, and Astradur Eysteinsson, editors. Translation Theory and Practice: A Historical Reader. Oxford University Press, 2006.
- Snell-Hornby, Mary. Translation Studies: An Integrated Approach. John Benjamins Publishing Company, 2006.
- Chesterman, Andrew. Translation in Context. Routledge, 2014.
- Hatim, Basil, and Ian Mason. The Translator as Communicator. Routledge, 2005.
- Pym, Anthony, et al., editors. Beyond Descriptive Translation Studies: Investigations in Homage to Gideon Toury. John Benjamins Publishing Company, 2008.
- Van Leuven-Zwart, Kitty. Translation and Equivalence: Methodological Issues in Cross-Cultural Research. Rodopi, 1989.
- Venuti, Laurence. Equivalence in Translation: Between Myth and Reality. Routledge, 1995.
- Clifford, James, and Marcus G. Green, editors. Cultural Translation: Problems and Practice. Routledge, 1992.
- Venuti, Lawrence, editor. The Translation Studies Reader. Routledge, 2012.
- Hung, Eva, editor. Translation and Cultural Change: Studies in History, Norms, and Image-projection. John Benjamin Publishing Company, 2005.
- Baker, Mona, In Other Words: A coursebook on Translation, 2018
- Seleskovitch, D., Lederer, M. (2002). *Pédagogie raisonnée de l'interprétation*, Didier Érudition.
- Seleskovitch, D., Lederer, M. (2020) *Interpréter pour traduire* (Nouvelle éd. revue et corrigée). Les belles lettres.
- Vinay J.-P. & Darbelnet J. (1958). *Stylistique comparée du français et de l'anglais* (Nouv. éd. corr). Didier.

Examination Scheme:

Components	CT	Attd.	EE
Weightage (%)	25	5	70

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CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	P08	PSO1	PSO2	PSO3	PSO4
CO1	1	1							2	1		
CO2		1	1						2			1
CO3	1	1	2			1			2	1		1
CO4		1	2			1			2		1	1

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Bachelor of Arts (Honors/ Honors with Research) in German
(Semester-III)

Course Code: SGER2301	ADVANCED WRITING SKILLS	L	T	P	FW/ Project	C
Version	**2023**	3	0	0	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

Course Description: Writing is not only a crucial competency, but also a quintessential prerequisite to succeed in life in general, and academics in particular. This course seeks to help students to hone their advanced writing skills. Therefore, the course will primarily focus on the non-fiction, academic aspect of writing. Conscious of the fact that writing is a critical, reflexive process, and hence, it requires practice and perseverance to evolve, this course aims at striking a balance between the theoretical and practical aspects of writing. In the framework of this aim, the course begins with the ***semantic aspect*** of writing, which is language specific. Here the major themes of discussion will be grammar and structure of texts belonging to various genres. Learning nitty-gritties of indexing and referencing will be other salient themes of this section. Following it, the course will then delve into the ***semiotic aspect*** of writing and touch upon topics like paraphrasing, plagiarism and punctuation etc. Finally, the concluding part of this course will deal with the ***pragmatic aspect*** of writing. The emphasis of this part will be on recognizing the purpose and the context of writing, so that the desired text can be drafted by the students. This section will be mainly practical in nature where students will be first introduced to various contexts of writing and the genres corresponding to them, like writing expose, report writing, writing to seek grants, writing motivation letters among other such needs in class, and then they will be given situations to write about. It goes without saying that a good writer shall always be a good reader, a good listener first; therefore reading exercises in group, listening to podcasts and summarizing the key ideas therein with pen and paper will be an implicit part of this course.

Course Objectives:

- Inculcate advance level proficiency of grammar, syntax, and various referencing styles in students.
- Enrichment of domain specific vocabulary along with their contextual usage.
- Awareness of the rhetorical devices and various ways of argumentation.
- Analyse and produce a variety of written texts, including essays, protocols, reports, summaries, and other such professional documents.
- Learn and master editing and revision techniques to improve clarity, coherence, and conciseness.
- Engage critically with texts and develop skills in close reading and textual analysis.
- Understand the cultural and contextual influences on writing practices and vice versa.
- Apply advanced writing skills in professional and personal contexts alike.

Course Outcomes (COs):

On completion of this course, the students will be able to

- Students will demonstrate advanced level of grammatical competence and will be able to express their views in a cogent and coherent manner.
- Students will be well versed with techniques of writing texts critically and convincingly.

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- Students will apply the referencing styles for their academic writing. Additionally, they will learn about the various possibilities of plagiarism as well as the ways to check and eliminate them from their writings.
- Students will gain comprehensive insight into the cultural and contextual nuances, enabling them to write in a politically correct and gender sensitive manner.

Course Content:

Modules	Blooms level*	Number of hours
Module 1: The Semantics of Writing: How do we write? The focus of this module will be to impart advanced level of grammar along with other structural nuances needed for effective writing. The students will critically engage themselves with complex sentence structures, verb tenses, mood and voice, parallelism, and punctuation through targeted lessons and exercises. The emphasis will be on identifying and correcting common grammatical errors and understanding how syntax as well as citation affects the writing process, as far as professional writing is concerned. Another highlight of this module will be to equip students with writing etiquettes, particularly valuable for day-to-day communication in a professional set-up.	**L1, L2,L3, L4**	15
Module 2: The Semiotics of writing: What do we write? As the titles suggests, this module will be primarily dedicated to in-depth discussion of what meaning is; what constitutes this meaning; how is it created and communicated; and finally what can happen if one fails to decipher vis-à-vis disseminate the meaning. Rhetoric is an important aspect of writing that compensates the gap created during the transmission of oral content into the written, and thus, also helps to get close to the meaning. Therefore, awareness of rhetorical devices along with advanced level vocabulary, like idiomatic and phrasal expressions will be the key take away of this module.	**L1, L2, L3,L4**	15
Module 3: The Pragmatics of Writing: Why do we write? In this module the emphasis will be on putting the skills gained in class thus far on test. To that end, the students will learn about the various contexts that require advanced writing skills to succeed professionally. Keeping practice of more and more writing at the center, this module will delve into the intricacies of professional writing. For example, drafting a professional CV; writing expose, research papers, motivation letters, and reports of events; commercial correspondence mainly through email in contemporary times among various other such occasions that can contextually arise time to time in students' life. Cognizant of the continuity needed to master writing skills, writing a protocol of every lecture held will be a compulsory component of this module for every student.	**L1, L2, L3, L4, L5, L6**	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Texts & References

- Balzert, Helmut, Schäfer, Christian, Schröder, Marion, Kern, Uwe. *Wissenschaftliches Arbeiten*, 2. Aufl. Berlin 2017.
- Davis, Jason and Rhonda Liss. *Effective Academic Writing* (Level 3) Oxford University Press: Oxford, 2006.
- Disterer, Georg. *Studienarbeiten schreiben*, 7. Aufl. Berlin 2014

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- E. Suresh Kumar and et al. *Enriching Speaking and Writing Skills*. Second Edition. Orient Black swan: Hyderabad, 2012.
- Goatly, Andrew. *Critical Reading and Writing*. Routledge: United States of America, 2000.
- Hoffmann, Monika. *Deutsch fürs Studium*. 3. Aufl. Paderborn 2015
- Karmasin, Matthias, Ribing, Rainer. *Die Gestaltung wissenschaftlicher Arbeiten*, 7. Aufl. Wien 2012
- Kirchner, Hildebert. *Abkürzungsverzeichnis der Rechtssprache*, 9 Aufl. Berlin 2018
- Kowalski, Philipp. *Geschlechtergerechte Sprache im Spannungsfeld mit rechtswissenschaftlicher Methodik*. NJW 2020
- Kruse, Otto. *Lesen und Schreiben. Der richtige Umgang mit Texten im Studium*. 3. Aufl. Konstanz 2018
- Petelin, Roslyn and Marsh Durham. *The Professional Writing Guide: Knowing Well and Knowing Why*. Business & Professional Publishing: Australia, 2004
- Withrow, Jeans and et al. *Inspired to Write. Readings and Tasks to develop writing skills*. Cambridge University Press: Cambridge, 2004.

Examination Scheme:

Components	CT	Attd.	EE
Weightage(%)	25	5	70

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2	1					2	1	2	
CO2	1	1							2	1		
CO3	1	1	1						2	1	1	
CO4	1	1	1					1	2	1	1	1

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Bachelor of Arts (Honors/ Honors with Research) in German
(Semester-IV)

Course Code: SGER2401	BASICS OF TRANSLATION	L	T	P	FW/ Proj	C
Version	**2023**	3	0	0	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

Course Description: This course takes students on a reflexive journey of translation as an everyday practice as well as an academic discipline. Since translation is as old a practice as the need to share and communicate, the course will begin with offering a critical insight into the brief history of translation as a field of study. Here, various thinkers and their ideas about translation will offer a theoretical foundation for the discussions to follow in the course. The course will then shift its focus on the practical aspect of translation and discuss the various contexts that require translation; the strategies for doing an effective translation; the tools and techniques available to tackle challenges arising while doing a translation. Towards the end of this course students will critically engage themselves with the crucial concepts of translation along with their application in professional walk of life. The major themes of discussion in this section will be the role of culture in doing a translation, as in translating culture vis-à-vis the culture of translation and its impact on peoples' lives. Starting with history of translation studies, through offering an insight into the various methods of translation, to leaving students with critical, reflexive deliberations on philosophical and political implications of translation practices, the course seeks to prepare students to take a plunge into oceanic world of translation with some sense of orientation gained in this course.

Course Objectives:

- Understand the definition and scope of translation, distinguishing between different types of translation (literal, literary, technical, etc.) and their respective purposes.
- Analyse and apply basic translation and interpretation techniques and strategies, such as literal, paraphrasing, and cultural adaptation, in various translation and interpretation scenarios.
- Evaluate the role of translators and interpreters as mediators between languages and cultures, considering their ethical responsibilities and cultural sensitivities.
- Compare and contrast major theoretical approaches in translation studies, including functionalist, descriptive, and sociocultural perspectives, and analyse their implications for translation practice.

Course Outcomes (COs)

On completion of this course, the students will be able to

- Understand the foundation of the principles underlying the translation and interpretation process.
- Explore how different theoretical lenses shape our understanding of the translation and interpretation process.
- Understand different approaches to achieving equivalence in translation and interpretation.
- Identify challenges in achieving equivalence between source and target texts, including lexical gaps, cultural nuances, and register differences.

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Course Content:

Modules	Blooms level*	Number of hours
Module 1: Translation theories This module examines key theoretical frameworks in translation studies. Topics covered include the historical development of translation theory, major theoretical approaches (such as functionalist, descriptive, and sociocultural approaches), and interdisciplinary perspectives on translation.	**L1, L2, L3**	15
Module 2: Initiation to Interpretation This module introduces students to the fundamental concepts of interpretation. Topics covered include the basic techniques of interpretation, and the role of interpreters in bridging linguistic and cultural divides.	**L1, L2, L3**	15
Module 3: Application of translation and interpretation theories In this module, students will translate texts from French to English and English to French. The students will also be required to do consecutive and simultaneous interpretation of discourses.	**L1, L2 L3, L5, L6**	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Texts & References:

- Albrecht, Jörn: *Literarische Übersetzung: Geschichte - Theorie - Kulturelle Wirkung*. Darmstadt: WBG (Wissenschaftliche Buchgesellschaft), 2009.
- Baker, Mona, Saldanha, Gabriela eds: *Encyclopedia of Translation Studies*. Abingdon/New York: Routledge, 2011.
- Baker, Mona. *Foundations of Translation Studies: Perspectives, Pedagogies, and Practices*. Routledge, 2018.
- Baker, Mona, *In Other Words: A coursebook on Translation*, 2018.
- Clifford, James, and Marcus G. Green, editors. *Cultural Translation: Problems and Practice*. Routledge, 1992.
- Bassnett, Susan, Lefevere, André. *Translation Studies*. Routledge, 1998.
- Bassnett, Susan. *Translation Studies*. London: Routledge, 2014.
- Chesterman, Andrew. *Translation in Context*. Routledge, 2014.
- Hatim, Basil, and Ian Mason. *The Translator as Communicator*. Routledge, 2005.
- Hung, Eva, editor. *Translation and Cultural Change: Studies in History, Norms, and Image-projection*. John Benjamin Publishing Company, 2005.
- Kirsten Malmkjær, Kevin Windle: *The Oxford Handbook of Translation Studies Oxford*: OUP, 2011.
- Koller, Werner, Henjum, Kjetil Berg. *Einführung in die Übersetzungswissenschaft.* 9. Auflg. Tübingen: Francke, 2020.
- Munday, Jeremy. *Introducing Translation Studies: Theories and Applications.* Routledge, 2016.
- Nord, Christiane: *Einführung in das funktionale Übersetzen: am Beispiel von Titeln und Überschriften*. Tübingen: Francke, 1993.
- Pym, Anthony, et al., editors. *Beyond Descriptive Translation Studies: Investigations in Homage to Gideon Toury*. John Benjamins Publishing Company, 2008.
- Snell-Hornby, Mary. Translation Studies: *An Integrated Approach*. John Benjamins Publishing Company, 2006.
- Snell-Hornby, Mary: *Handbuch Translation*. Tübingen: Stauffenburg Verlag, 2006.
- Stolze, Radegundis: *Übersetzungstheorien: Eine Einführung*. Tübingen: Francke, 2011

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- Van Leuven-*Zwart, Kitty. Translation and Equivalence: Methodological Issues in Cross-Cultural Research*. Rodopi, 1989.
- Venuti, Laurence. *Equivalence in Translation: Between Myth and Reality*. Routledge, 1995.
- Venuti, Lawrence. *The Translator's Invisibility: A History of Translation*. Routledge, 2008.
- Venuti, Lawrence, editor. *The Translation Studies Reader*. Routledge, 2012.
- Weissbort, Daniel, and Eysteinsson ,Astradur, eds. *Translation Theory and Practice: A Historical Reader*. Oxford University Press, 2006.

Examination Scheme:

Components	CT	Attd.	EE
Weightage (%)	25	5	70

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	P08	PSO1	PSO2	PSO3	PSO4
CO1	1	1							2	1		
CO2		1	1						2			1
CO3	1	1	2			1			2	1		1
CO4		1	2			1			2		1	1

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Bachelor of Arts (Honors/ Honors with Research) in Spanish
(Semester-III)

Course Code: SSPA2301	ADVANCED WRITING SKILLS	L	T	P	FW/ Proj	C
Version	**2023**	3	0	0	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

Course Description: This course is designed to provide students with the advanced writing skills necessary for success in academic, professional, and personal contexts. Building upon foundational writing competencies, students will engage in a variety of writing tasks aimed at refining their ability to communicate effectively, persuasively, and creatively. Through intensive practice and feedback, students will develop their mastery of grammar, syntax, vocabulary, and rhetorical strategies, as well as their ability to critically analyse and produce diverse types of written texts. Emphasis will be placed on developing a sophisticated writing style. Students will also explore the cultural and contextual factors that shape writing practices.

Course Objectives:

- Develop advanced proficiency in grammar, syntax, and punctuation.
- Expand vocabulary and employ rhetorical devices to enhance writing style.
- Analyse and produce a variety of written texts, including essays, reports, narratives, and professional documents.
- Practice self-editing and revision techniques to improve clarity, coherence, and conciseness.
- Engage critically with texts and develop skills in close reading and textual analysis.
- Understand the cultural and contextual influences on writing practices.
- Apply advanced writing skills in academic, professional, and personal contexts.

Course Outcomes (COs):

On completion of this course, the students will be able to

- students will have refined their grammatical skills and gained confidence in expressing themselves with precision and fluency.
- students will be adept at crafting persuasive essays that effectively convey their ideas and viewpoints.
- students will refine their professional writing prowess, cultivating a distinct and impactful voice in their written communication.
- students will gain comprehensive insight into the cultural and contextual factors shaping professional writing practices, facilitating nuanced and culturally sensitive communication in diverse settings.

Course Content:

Modules	Blooms level*	Number of hours
Module 1: Refining Grammar and Syntax	**L1, L2**	15

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In this module, students will focus on advanced grammar and syntax to improve the clarity, precision, and sophistication of their writing. They will review complex sentence structures, verb tenses, mood and voice, parallelism, and punctuation through targeted lessons and exercises. The emphasis will be on identifying and correcting common grammatical errors and understanding how syntax affects writing effectiveness.		
Module 2: Crafting Compelling and Persuasive Arguments In this module, students will focus on the art of crafting compelling arguments and persuasive essays. Through the study of rhetorical strategies, logical reasoning, and persuasive techniques, students will learn how to construct well-reasoned arguments, support their claims with evidence, and engage readers effectively. Students will practice writing persuasive essays on a variety of topics, refining their ability to persuade and influence through written communication.	**L1, L2, L3,L4**	15
Module 3: Professional Writing Skills In this module, students will delve into the intricacies of professional writing, honing skills essential for job applications, CV writing and crafting commercial correspondence. Exploring various genres of professional writing such as cover letters, follow up emails and report writing.	**L3, L4, L5**	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Texts & References

- "The Elements of Style" by William Strunk Jr. and E.B. White
- "Writing Tools: 50 Essential Strategies for Every Writer" by Roy Peter Clark
- "They Say/I Say: The Moves That Matter in Academic Writing" by Gerald Graff and Cathy Birkenstein
- "The Art of Fiction: Notes on Craft for Young Writers" by John Gardner
- "On Writing Well: The Classic Guide to Writing Nonfiction" by William Zinsser
- "El arte de la escritura persuasiva" por Jay Heinrichs
- "La guía de estilo de la Universidad de Chicago"
- "Técnicas de edición y revisión de textos" por María del Carmen Marín Paredes
- "Cómo escribir bien en español: Manual de redacción" por María Marta García Negroni
- "Manual de Escritura Académica y Profesional" por Rodolfo Martínez Sosa
- "El poder de la escritura: Técnicas para escribir con claridad, coherencia y estilo" por Linda Flower y John R. Hayes
- "Gramática de la lengua española" por Emilio Alarcos Llorach

Examination Scheme:

Components	CT	Attd.	EE
Weightage(%)	25	5	70

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2	1					2	1	2	
CO2	1	1							2	1		
CO3	1	1	1						2	1	1	
CO4	1	1	1					1	2	1	1	1

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Bachelor of Arts (Honors/ Honors with Research) in Spanish
(Semester-IV)

Course Code: SSPA2401	INTRODUCTION TO TRANSLATION THEORY	L	T	P	FW/ Proj	C
Version	**2023**	3	0	0	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description
The course "Introduction to Translation Theory" provides students with a comprehensive understanding of the theoretical foundations that underpin the practice of translation. It covers various schools of thought and approaches to translation, including equivalence theory, functionalist approaches, and cultural translation. Students explore key concepts such as fidelity, meaning, and adaptation in translation, and critically analyse different translation strategies and techniques. Through readings, discussions, and practical exercises, students gain insight into the complexities of translation and develop the analytical skills necessary to assess and apply different theoretical frameworks in their translation work.

Course Objectives:
- Understand the definition and scope of translation, distinguishing between different types of translation (literal, literary, technical, etc.) and their respective purposes.
- Analyse and apply basic translation techniques and strategies, such as literal translation, paraphrasing, and cultural adaptation, in various translation scenarios.
- Evaluate the role of translators as mediators between languages and cultures, considering their ethical responsibilities and cultural sensitivities.
- Trace the historical development of translation theory, identifying key milestones and influential figures in the field.
- Compare and contrast major theoretical approaches in translation studies, including functionalist, descriptive, and sociocultural perspectives, and analyze their implications for translation practice.
- Critically assess the concept of translation equivalence, exploring its linguistic, cultural, and pragmatic dimensions.

Course Outcomes (COs)
On completion of this course, the students will be able to
- Understand the foundation of the principles underlying the translation process.
- Explore how different theoretical lenses shape our understanding of the translation process.
- Understand different approaches to achieving equivalence in translation
- Identify challenges in achieving equivalence between source and target texts, including lexical gaps, cultural nuances, and register differences.

Course Content:

Modules	Blooms level*	Number of hours
Module 1: Fundamentals of Translation	**L1, L2, L3**	15

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This module introduces students to the fundamental concepts of translation theory. Topics covered include the definition of translation, basic translation techniques, and the role of translators in bridging linguistic and cultural divides.		
Module 2: Theoretical Perspectives on Translation This module examines key theoretical frameworks in translation studies. Topics covered include the historical development of translation theory, major theoretical approaches (such as functionalist, descriptive, and sociocultural approaches), and interdisciplinary perspectives on translation.	**L1, L2, L3**	15
Module 3: Approaches to Translation Equivalence In this module, students explore the concept of translation equivalence and its various interpretations. Topics covered include linguistic and cultural aspects of equivalence, as well as the challenges of achieving fidelity to the source text while adapting to the target language and culture.	**L3, L4, L5**	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Texts & References:

- " Hatim, Basil, and Jeremy Munday. Translation: An Advanced Resource Book. Routledge, 2004.
- Baker, Mona. Foundations of Translation Studies: Perspectives, Pedagogies, and Practices. Routledge, 2018.
- Munday, Jeremy. Introducing Translation Studies: Theories and Applications. Routledge, 2016.
- Venuti, Lawrence. The Translator's Invisibility: A History of Translation. Routledge, 2008.
- Bassnett, Susan, and André Lefevere. Translation Studies. Routledge, 1998.
- Weissbort, Daniel, and Astradur Eysteinsson, editors. Translation Theory and Practice: A Historical Reader. Oxford University Press, 2006.
- Snell-Hornby, Mary. Translation Studies: An Integrated Approach. John Benjamins Publishing Company, 2006.
- Chesterman, Andrew. Translation in Context. Routledge, 2014.
- Hatim, Basil, and Ian Mason. The Translator as Communicator. Routledge, 2005.
- Pym, Anthony, et al., editors. Beyond Descriptive Translation Studies: Investigations in Homage to Gideon Toury. John Benjamins Publishing Company, 2008.
- Van Leuven-Zwart, Kitty. Translation and Equivalence: Methodological Issues in Cross-Cultural Research. Rodopi, 1989.
- Venuti, Laurence. Equivalence in Translation: Between Myth and Reality. Routledge, 1995.
- Clifford, James, and Marcus G. Green, editors. Cultural Translation: Problems and Practice. Routledge, 1992.
- Venuti, Lawrence, editor. The Translation Studies Reader. Routledge, 2012.
- Hung, Eva, editor. Translation and Cultural Change: Studies in History, Norms, and Image-projection. John Benjamin Publishing Company, 2005.

Examination Scheme:

Components	CT	Attd.	EE
Weightage (%)	25	5	70

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CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	P08	PSO1	PSO2	PSO3	PSO4
CO1		1	1						1	1		1
CO2		1	1							1	1	
CO3		1							1	1	1	1
CO4	1	1	1					1	1	1	1	1

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition (Semester-III)

HEALTHY AND SUSTAINABLE FOOD CHOICES

Course Code- SDAN2301 **Credit Units: 03**

Course Contents:

Module I: Healthy food choices

Identification of healthy and unhealthy foods and understanding the immediate food environment

- Food labels and basics of nutrient profiling models to classify foods as HFSS
- Nutrient profiling of commonly consumed food items
- Exploring the food environment by mapping the food outlets and food available near home and college

Module II: Food portion sizes and related factors

Understanding food portion sizes and its relation to nutrient density

- The concept of portion/serving sizes and portion control
- Estimation of energy and nutrient density of selected food products using nutrient composition database

Module III: Basics of food preparation

Planning and preparation of healthy and nutritious dishes

Planning and preparation of the following:

- Snacks
- Soups and Salads
- Desserts
- Meal combinations

Module IV: Sustainability and healthy food

Linking the concept of healthy eating with sustainability

- Identification of nutritious food sources which have minimal impact on the environment
- Case study on understanding the food supply chain and carbon footprints of any commonly consumed foods.

REFERENCE:

- Chadha R and Mathur P (2015). Nutrition - A Lifecycle Approach. New Delhi: Orient Blackswan Pvt Ltd.
- Longvah T, Ananthan R, Bhaskarachary K and Venkaiah K (2017). Indian Food Composition Tables. National Institute of Nutrition, Indian Council of Medical Research, Department of Health Research, Ministry of Health and Family Welfare, Government of India, Hyderabad.
- Khanna K, Gupta S, Seth R, Mahna R, Rekhi T (2004). The Art and Science of Cooking: A Practical Manual, Revised Edition. New Delhi: Elite Publishing House Pvt Ltd.
- Raina U, Kashyap S, Narula V, Thomas S, Suvira, Vir S, Chopra S (2010). Basic Food Preparation: A Complete Manual, Fourth Edition. Hyderabad: Orient Black Swan.

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Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition (Semester-IV)

UTILIZATION OF FOOD WASTE MANAGEMENT

Course Code: SDAN2401 **Credit Units: 03**

Course Contents:

- Identification of waste from agriculture and food processing (Dairy/ Meat/ Fruits Vegetables / Alcoholic beverages/ cereals)
- Study and layout of wastewater treatment system (ETP)
- Identification of co-products from the F&V industry, estimation and utilization to develop value-added products (pectin, banana fibre, lycopene from tomato waste, watermelon/ pumpkin rind).
- Identification of waste from the animal industry and utilisation to develop value-added products (gelatin, eggshell).
- Identification of various co-products from the dairy industry, estimation and utilization to develop value-added products (utilisation of ghee residue, buttermilk beverage, whey).
- Identification of co-products from cereal industry, estimation and utilization to develop value-added products (cereal husk, wheat fibre).
- Determination of physicochemical properties of wastewater.
- Production of alcohol/ acetic acid from waste material.

REFERENCES

- Marriott, N. G., Gravani, R. B., & Schilling, M. W. (2006). Principles of food sanitation(Vol. 22). New York: Springer.
- Sadasivam, A, & Manickam, A. (2021). Biochemical Methods. New Age InternationalPublishers.
- Green, J. H., & Kramer, A. (1979). Food Processing. Waste Management. Avi PublishingCompany, 629.
- Herzka, A. and Booth, R.G. Food Industry and Trade: Recycling Waste. Applied SciencePublishers, 1981.
- Tegge, G., Green, J. H., and A. Kramer. Food Processing Waste Management; AVIPublishing, 1979

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Bachelor of Science (Honors) in Medical Laboratory Technology
(Semester-III)

Course Code: SMLT2301	LABORATORY MANAGEMENT	L	T	P	FW/ Proj	C
Version	**2024**	2	1	0	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description:
This syllabus aims to prepare students for effective management and ethical practices in clinical laboratory settings through a comprehensive curriculum. It covers fundamental management principles, decision-making strategies, and leadership development tailored to laboratory environments. Emphasis is placed on ethical conduct, safety protocols, and adherence to good laboratory procedures to ensure the integrity of results and patient safety. Additionally, students are introduced to laboratory information systems, financial management principles, and quality assurance methods essential for efficient laboratory operations. Through this program, students will develop the skills necessary to lead teams, manage resources, and uphold ethical standards in clinical laboratory practice.

Course Objectives:
This course is designed to enable students to the basics of management, decision-making, and leadership. Emphasize ethical practices, safety, and good laboratory procedures. Introduce laboratory information systems, financial management, and quality assurance. Promote ethical behavior in laboratory procedures, record-keeping, procurement, and audits. Foster leadership skills and teamwork in a clinical laboratory setting.

Course Outcomes (COs):
CO1: Understand foundational management principles relevant to clinical laboratory settings.
CO2: Apply strategic management concepts to address challenges in clinical laboratories
CO3: Utilize planning tools and techniques for efficient laboratory management
CO4: Evaluate decision-making strategies and employ conflict resolution techniques in clinical laboratory contexts.

Course Content:

Modules	Blooms level*	Number of hours
Module 1: Management Principles and Ethical Practices • Introduction to management principles • Strategic management • Foundations of planning • Planning tools and techniques • Decision making, conflict, and stress management • Managing change and innovation • Understanding groups and teams • Leadership • Time management • Cost and efficiency	**L1, L2, L3,L4**	12

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• Laboratory Information System (LIS) and Hospital Information System (HIS) • Financial management • Ethical principles and standards for clinical laboratory professionals		
Module II: Good Laboratory Practice (GLP) and Accreditation • Introduction to GLP regulations and accreditation • Basics of GLP and accreditation • Aims and advantages of accreditation • National and international agencies for laboratory accreditation • Awareness and safety in a clinical laboratory • Patient management for sample collection, transportation, and preservation	**L1, L2, L3, L4**	10
Module III: Sample Analysis and Reporting • Factors affecting sample analysis • Reporting results • Basic format of a test report • Reported reference range • Clinical alerts and abnormal results • Turnaround time • Results from referral laboratories • Release of examination results • Alteration in reports	**L3, L4,L5**	11
Module IV: Quality Management and Financial Management • Introduction to quality management system • Quality assurance and quality control • Internal and external quality control • Calibration and validation of clinical laboratory instruments • Laboratory Information System (LIS) and Hospital Information System (HIS) in management • Functions and standards of laboratory management systems • Introduction to financial management in a clinical laboratory	**L3, L4,L5**	12

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur

Reference Material

- Laboratory Management: Principles and Processes" Author(s)/Editor(s): Harmening DM Publisher: Prentice Hall

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	P	A	CT	EE
Weightage (%)	15	5	10	70

CT: Class Test, EE: End Semester Examination; A: Attendance; P: Project file

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CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	--	2	--	--	--	--	--	1	2	2	2	2
CO2	--	2	--	--	--	--	--	1	2	2	2	2
CO3	--	2	--	--	--	--	--	1	2	2	2	2
CO4	--	2	--	--	--	--	--	1	--	2	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technology
(Semester-III)

Course Code: SSCT2301	BIOINSTRUMENTATION IN MOLECULAR MEDICINE & STEM CELL BIOLOGY	L	T	P	FW/ Project	C
Version	**2023**	3	0	0	0	3
Pre-requisites/Exposure	Pre exposure of mathematics at least at high-school level is preferred. Students are requested to go through the textbooks and reference books mentioned, before attending the class.					
Co-requisites	Student will be asked to prepare assignments/presentations on recent publication in concerned subject/ topic selected by instructor to provide a platform of discussion on what is been discovered and where field needs advancement.					

Catalog Description

1. Students will acquire knowledge about safe laboratory practices.
2. Students will also learn about bio-analytical instruments, principles of their proper functioning, and analysis methods applied to biological data obtained in experimental techniques.

Course Objective:

The course is deigned to develop the understanding of electromagnetic radiation, absorption spectrum, Beer's law and Lambert's law, principle, working and applications of spectrophotometer, concepts of chromatography and concept of partition coefficient and application of various chromatographic techniques, Centrifugation and Electrophoresis-Principles and applications, Importance of radioactivity in biological studies, GM counters and Scintillation counting.

Course outcome

Upon successfully completing this course the students could be able to:

- Understand and explain the use of basic biomedical instrumentation, principles and techniques of preparative analytical centrifugation, include ultra centrifugation, sedimentation analysis and gradient centrifugation.
- Understand the theory and application of Chromatography techniques, Gel filtration, ion exchange, affinity, HPLC and electrophoresis.
- Know the theory and application of UV and visible spectroscopy. Fluorescence spectroscopy, NMR, X-ray diffraction, MS, MALDI-TOF, and application radioisotopes in different techniques.

Course Contents:

Modules	Blooms level*	Number of hours
Module I: Sampling and sample preparation Sample fixing for various analytical applications and sample processing. Principles of microscopy, Light, dark field, fluorescence microscope, confocal microscope, transmission and Scanning electron microscopy, microtomy and analysis and measurement of image. Fluorescence activated cell sorter (FACS) basic principles and applications.	L1, L2, L3, L4	9

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Module II: Biotechniques for DNA, RNA, and Proteins Electrophoresis of DNA, RNA and proteins. Capillary electrophoresis, Two-dimensional electrophoresis, Southern blotting, Northern blotting, Immunoprecipitation, Western blotting. Sequencing, Next Generation Sequencing, RNA-Seq. etc.	L1, L2, L3, L4	9
Module III: Centrifugation techniques Introduction, Basic principle of sedimentation, centrifuges and their uses, Density gradient and analytical centrifugation. Spectroscopy techniques: UV and visible spectroscopy, infrared and atomic absorption spectroscopy, fluorescence spectroscopy, mass spectrometry, MALDI-TOF, nuclear magnetic resonance and electron spin resonance spectroscopy.	L1, L2, L3, L4	9
Module IV: Chromatography Chromatography: Theoretical basis of chromatographic separations. Column, Thin layer, Paper, Normal phase and reverse phase chromatography, Ion-exchange, Affinity and Gas Chromatography, High performance liquid chromatography (HPLC) and GLC.	L1, L2, L3, L4	9
Module V: Introduction to mass spectroscopy radioisotopic techniques Principles of X-ray diffraction and X-ray Crystallography, Theory and application of UV-VIS, IR, NMR, Fluorescence, Atomic absorption spectroscopy, X-ray diffraction, Introduction to radioisotopes, detection, measurement and uses of radioisotopes, counting efficiency and autoradiography, Biotechnological applications	L1, L2, L3, L4	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & References:

Text:

- Principles of Physical Biochemistry, K.E. Van Holde, Prentice Hall.
- Essentials of Biophysics, P. Narayanan, New Age International Publishers References:
- Advanced Instrumentation, Data Interpretation, and Control of Biotechnological Processes, J.F. Van Impe, Kluwer Academic
- Crystal Structure Analysis, J.P. Glusker and K.N. Trueblood, Oxford University Press
- Crystallography made Crystal Clear, G. Rhodes, Academic Press
- Modern Spectroscopy, J.M. Hollas, John Wiley and Son Ltd.
- NMR Spectroscopy: Basic Principles, Concepts and Applications in Chemistry, H. Gunther, John Wi

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

CT: Class Test, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1	1	--	--	--	--	--	1	2	2	2
CO2	1	1	--	--	--	--	--	2	2	2	2
CO3	1	1	--	--	--	--	--	2	2	2	2
CO4	1	1	--	--	--	--	--	2	--	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technology
(Semester-IV)

Course Code: SSCT2401	**GOOD LABORATORY PRACTICES**	**L**	**T**	**P**	**FW / Project**	**C**
Version	2023	3	0	0	0	3
Pre-requisites/Exposure	Pre exposure of mathematics at least at high-school level is preferred. Students are requested to go through the textbooks and reference books mentioned, before attending the class. A knowledge of materials to be classified as biohazard, knowledge about current scenario of biotechnological issues.					
Co-requisites	Student will be asked to prepare assignments/presentations on recent publication in concerned subject/ topic selected by instructor to provide a platform of discussion on what is been discovered and where field needs advancement.					

Catalog Description

The basic principles and practices of biosafety are examined. This course teaches the identification, handling, and containment of potentially hazardous biological materials, including microorganism and recombinant DNA.

Course Objective:

The objective of the course is to teach the students safety handling and regulation laboratory facility, how to keep the record, analyze laboratory data with accuracy. Also, to educate them about the ways to minimize the errors related with handling of laboratory accessories and equipment's, and to learn the standard operating procedures (SOPs).

Course Outcomes

- To be aware of rules and regulations setup at the university level for working in the lab specially related to biosafety
- To know the social and legal state of the society with respect to genetically engineered products or other outcomes of biotechnology
- Work according to the safety precautions set up by international bodies while handling bio-hazardous material

Course Contents:

Modules	**Blooms level***	**Number of hours**
Module-I: Introduction to GLP Introduction to GLP, History, Scope, Fundamental points of GLP (Resources Characterization, Rules, Results, Quality assurance)	L1, L2, L3	12
Module-II: Laboratory rules and Protocols General Rules/Protocols for Lab Safety measures, Precaution and Safety in handling of chemicals, Laboratory tools, Glassware and instruments. Internal and External Audit	L1, L2, L3	12
Module-III: Laboratory hierarchy and SOP Levels of Laboratories	L3, L4, L5	12

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Log Book Maintenance, Basic SOPs for instrument handling and Maintenance, calibration of Instruments: PH meter, colorimeter, spectrophotometer, water bath, Distillation assembly, Burette, and Pipette etc.		
Module-IV: Record Keeping and Interpretation Keeping data records, its analysis by using statistical and mathematical tools. Result analysis and its interpretation. Use of Microsoft word, Excel for data entry, calculation and graphical representation, and use of internet and emails	L3, L4, L5	09

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Book and References:

1. Handbook Good Laboratory Practices-World health organization (WHO)
2. Life science protocol manual (2018)-DBT star college scheme
3. Guidelines for good laboratory practices-Indian council of medical research, New Delhi (2008)

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

CT: Class Test, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1	1	--	--	--	--	--	1	1	2	2
CO2	1	1	--	--	--	--	--	1	1	2	2
CO3	1	1	--	--	--	--	--	1	1	2	2
CO4	1	1	--	--	--	--	--	1	1	2	2
CO5	1	1	--	--	--	--	1	1	1	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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MANAGEMENT

Programme Structure

Course code	Course title	Lectures(L) Hour per week	Tutorial (T) Hour per week	Practical (P) Hours per week	Total Credits
MGT2151	Management Foundations	2	1	-	3
MGT2251	Marketing Management	2	1	-	3
MGT2351	Organisational Behaviour	2	1	-	3
MGT2451	Business Environment	2	1	-	3
MGT2551	Operations Research	2	1	-	3
MGT2651	Business Law	-	-	6	3
	TOTAL				**18**

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MANAGEMENT

Syllabus - Semester First

MANAGEMENT FOUNDATIONS

Course Code: MGT2151 **Credit Units: 03**

Course Objective:
The aim of the course is to orient the students in theories and practices of Management so as to apply the acquired knowledge in actual business practices. This is a gateway to the real world of management and decision-making.

Course Contents:

Module I: Introduction
Concept, Nature, Scope and Functions of Management, Levels of Management, Evolution and Foundations of Management Theories - Classical and Neo - Classical Theories, Systems Approach to organization, Modern Organization Theory.

Module II: Management Planning Process
Planning objectives and characteristics, Hierarchies of planning, the concept and techniques of forecasting, Decision making – concepts & process, MBO, concept and relevance.

Module III: Organization
Meaning, Importance and Principles, Departmentalization, Span of Control, Types of Organization, Authority, Delegation of Authority.

Module IV: Staffing
Meaning, Job analysis, Manpower planning, Recruitment, Transfers and Promotions, Appraisals, Management Development, Job Rotation, Training, Rewards and Recognition.

Module V: Directing
Motivation, Co-ordination, Communication, Directing and Management Control, Decision Making, Management by objectives (MBO) the concept and relevance.

Module VI: Management Control
Coordination, Meaning, Nature, Features, Objectives and Process of Management Control, Techniques and Behavioural Aspects of Management control.

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

(C - Case Discussion/ Presentation; **HA** - Home Assignment; **V** - Viva; **CT**- Class Test; **A** - Attendance; **EE** - End Semester Examination)

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Text & References:

Text:

- Stoner, Freeman and Gilbert Jr. (2010), Management, 8th Edition, Pearson Education
- Robbins, (2009), Fundamentals of Management: Essential concepts and Applications, 6th edition, Pearson Education

References:

- Prasad, L.M. Principles & Practice of Management, 1st Edition, Tata McGrew Hills.
- Gupta, C.B., Management Concepts and Practices, Sultan Chand & Sons, New Delhi

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Syllabus - Semester Second

MARKETING MANAGEMENT

Course Code: MGT2251 **Credit Units: 03**

Course Objective:
The main objective of this course is to give students an elementary knowledge of the fundamentals in the field of marketing. The focus will be both on developing and helping them imbibe basic marketing principles and establishing an appreciation of contemporary realities.

Course Contents:

Module I: Introduction to Marketing
Meaning of marketing, Core concepts of marketing, Evolution and its role in the changing business environment, various marketing management philosophies, viz., the production concept, the product concept, selling concept and the marketing concept, Newer definitions of marketing- societal marketing and relationship marketing, Strategies planning in marketing, Formulation of marketing plan.

Module II: Analyzing Marketing Opportunities
Internal and External Marketing Environment Analysis, Introduction to Marketing Information System and Marketing Research, BCG matrix, GE 9 cell model.

Module III: Studying Consumer Behaviour and Selecting Markets
Buying Behaviour for Consumer Markets and Industrial Markets, Types of Buying Situations, Buying Decision Process and Factors Affecting Buyer Behaviour, Consumer Adoption Process, Concept of Market Segmentation, Bases for segmenting Consumer and Business markets, Approaches for Targeting, Differentiation and Positioning.

Module IV: Product Mix Strategy
Product: concept & levels, Classification of consumer and industrial products, Product Differentiation, Product Mix, Product Life Cycle and various strategies, Branding: concept and challenges, Brand decisions, Packaging and Labeling.

Module V: Product Development Decision and Pricing
Product Line Decisions, New Product Development: Challenges & Process; Consumer Adoption Process, Diffusion of Innovation, Pricing Strategies; Setting the price, Understanding various pricing strategies and their application.

Module VI: Distribution and Logistics Decision and Integrated Communication Mix
Nature of Marketing Channels, Channel Functions and Flows, Channel Design and Management Decisions, Channel Dynamics, Introduction to Wholesaling, Retailing and Logistics, Marketing communication mix and Introduction to various elements of integrated marketing communications briefly

Module VII: Emerging Marketing Paradigms
E-marketing, Global marketing, Mobile marketing, Kiosk marketing, Green marketing, Tele marketing, Multi level marketing, Rural marketing.

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Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; **HA -** Home Assignment; **P -** Project; **S -** Seminar; **V** - Viva; **Q** - Quiz; **CT** - Class Test; **A** - Attendance; **EE** - End Semester Examination

Text & References:

Text:

- Kotler, Philip & Armstrong, Gray, Principles of Marketing, 10th Edition, Pearson Education.
- Saxena, Rajan (2008), Marketing Management, 3rd Edition, McGrew Hills Education.

References:

- Ramaswamy and Namkumar, S (2009), Marketing Management Global Perspective: Indian Context, McMillion, New Delhi.
- Kumar, Arun and Meenakashi, N (2009), Marketing Management, Vikas Publishing House.
- Russel, Wines, Marketing Management, 3rd Edition, Pearson Education.
- Kotler, Koshi Jha (2009), Marketing Management, 13th Edition, Pearson Education.

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Syllabus - Semester Third

ORGANISATIONAL BEHAVIOUR

Course Code: MGT2351 **Credit Units: 03**

Course Objective:
The objective of this course is to familiarize the students with the behavioural patterns of Human beings at individual and group levels.

Course Contents:

Module I: Understanding Human Behaviour
Concept, Nature and Significance of Human Behaviour, Factors Affecting Human Behaviour, Levels of Human Behaviour; Disciplines contributing to OB.

Module II: Individual Behaviour
Individual Differences; Personality and Theories of Personality; Perception; Learning and Behaviour reinforcement, Values.

Module III: Motivation & Attitude
Concept, Significance and Theories of Motivation, Motivation and Behaviour, Motivation at Work, Attitudes, Meaning and nature, Formation and change in attitudes, Job related attitudes.

Module IV: Interpersonal Behaviour, Power & Politics
Interpersonal Dimensions of Behaviour; Transactional Analysis Implications of TA, Organizational communication, making communication effective, Power: Concept, determinants, types; Organizational Politics: Tactics, Impression Management.

Module V: Group Behaviour and Leadership
Group Behaviour; Types, Functions, Determinants of Group Behaviour, Inter Group Problems, Leadership: Nature and Significance of Leadership, Leadership Styles, Theories of Leadership; Trait Theory, Behavioural Theory, Managerial Grid.

Module VI: Change and Conflicts
Organizational conflict, Nature and types of conflict, Management of organizational conflict, Approaches to conflict management, Organizational culture, Learning and maintaining organizational culture, Organizational change, Planned change, Resistance to change, Organization development, Definition, Need for organization development, Organization development process.

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; **HA** - Home Assignment; **P** - Project; **S** - Seminar; **V** - Viva; **Q** - Quiz; **CT** - Class Test; **A** - Attendance; **EE** - End Semester Examination

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Text & References:

Text:

- Stephen Robbins, Organisational Behaviour, 15th Edition PHI.

References:

- K. Ashwathappa, (2005) Organisational Behaviour, Tata McGrae Hill
- Keith Davis, Organisational Behaviour, Tata Mc Graw-Hill
- Keith Davis, Human Behaviour at Work, Tata McGraw-Hill

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Syllabus - Semester Fourth

BUSINESS ENVIRONMENT

Course Code: MGT2451 **Credit Units: 03**

Course Objective:
The aim of the course is to orient the students towards the basic concepts of Indian and global business environment.

Course Contents:
Module I: Overview of Business Environment
Meaning and types of business environment, Internal and external environment, Micro and macro environment, Factors (Cultural, social, Political economic legal, demographic and technological) effecting business environment.

Module II: Indian Industrial environment
Industrial policy up to 1991, New industrial policy, Liberalization, Privatization and Globalization process in India, Disinvestment, Industrial sickness, MRTP act 1969, Competition law2002, Foreign Exchange Regulation Act and Foreign Exchange Management Act (FERA and FEMA).

Module III: Financial Environment
Indian money and capital markets: meaning, functions and constituents, Stock exchange- importance and functions, SEBI, Capital market reforms and development, Industrial financial institutions (IDBI, SIDBI, ICICI, IFCI etc.).

Module IV: Labour Environment
Labour legislation in India, Social security benefits, Industrial disputes- causes and preventive measures, Settlement of disputes, International Labour Organisation (ILO), Trade union- meaning and functions, Trade Union Act.

Module V: Economic Planning and Development
Planning in India- needs and objectives, five year plans, planning commission, 11th five year plan, Green and white revolution- achievements and failures, Second green revolution, foreign trade policy 2009, Export processing zones, Export oriented units, Special economic zones (EPZ's, EOU's, SEZ's) and trading houses in India.

Module VI: Global Environment
Bretton woods system, features of Uruguay round of negotiations, GATT/ WTO- role, functions and ministerial conferences, IMF, World Bank (International Bank for Reconstruction and Development), Regional economic cooperation institutions, SAARC, EU, NAFTA and ASEAN.

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; **HA** - Home Assignment; **P** - Project; **S** - Seminar; **V** - Viva; **Q** - Quiz; **CT** - Class Test; **A** - Attendance; **EE** - End Semester Examination

Text & References:

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Text:

- Francis Cherunillum, (2007), Business Environment Text and Cases, Himalaya Publications.

References:

- Bedi Suresh, (2004), Business Environment, Excel Books, N. Delhi.
- Shaikh Saleem, (2010), Business Environment, 2nd Edition, Pearson Education.
- Bhatia H.L, International Economics, Vikas Publications.
- Mishra S.K, and Puri V.K, Indian Economy, Himalaya Publishing House.
- Gupta, C B, (2008), Business Environment, 4th Edition, S. Chand & Co. New Delhi
- Rudra Dutta and Sundharam, Indian Economy, S. Chand & Co. New Delhi

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Syllabus - Semester Fifth

OPERATIONS RESEARCH

Course Code: MGT2551 **Credit Units: 03**

Course Objective:
The objective of this paper is to make students familiar with basic concepts and tools in Operations Research. These techniques assist in solving complex problems and help in decision making.

Course Contents:

Module I: Introduction
Introduction to Operations Research, Definition, scope and limitations of Operations Research

Module II: Linear Programming
Linear Programming – Basic Concepts, Model formulation; Solution methods – Graphical Solution method, Simplex method (problems involving only upto 3 constraints and of inequality <), Application of LPP in business decision making.

Module III: Transportation Problem
Transportation problem- Initial Basic feasible solution (North - West corner rule, Vogels approximation method), Test for optimality (Modified Distribution (MODI) method)

Module IV: Assignment Problem
Assignment Problem – Introduction, Approach of the Assignment model, Solution Methods (Hungarian method)

Module V: Game Theory
Game Theory - Concept and definition; Solution methods of Pure Strategy games (with saddle point), Significance of Game Theory.

Module VI: Queuing & Simulation
Introduction, Elementary queuing system, Introduction to Single – channel queuing model (with Poisson arrivals and Exponential service times), (no numerical); Introduction to Simulation, applications, advantages and drawbacks of simulation, Introduction to Monte – Carlo Simulation, Role of computers in Simulation.

Examination Scheme:

Components	CT	HA	Q	C	A	EE
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; **HA -** Home Assignment; **P -** Project; **S -** Seminar; **V** - Viva; **Q** - Quiz; **CT -** Class Test; **A -** Attendance; **EE -** End Semester Examination

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Text & References:

Text:

- Kapoor V K, Operations Research (Techniques for Management), Seventh edition, Sultan Chand & Sons.

References:

- Sharma J K, Operations Research (Theory & Practices), Second edition, Macmillan India Ltd.
- Hamdy A Taha, Operations Research, Seventh edition, Prentice Hall India
- Kothari C R, An introduction to Operations Research, Third edition, Vikas Publishing House

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Syllabus - Semester Sixth

BUSINESS LAW

Course Code: MGT2651 **Credit Units: 03**

Course Objective:
The objective of the course is to acquaint the students with the fundamentals of business related laws, which have an important role over smooth conduct of business.

Course Contents:

Module I: Legal Environment of Business
Importance of Law, Legal environment of business, Sources of law, Function of law.

Module II: Indian Contract Act, 1872
Nature and kinds of Contracts, Concepts related to offer, Acceptance and Consideration, Principles Governing Capacity of Parties and Free Consent, Legality of Objects, Performance and Discharge of Contract, Breach of Contract and its Remedies, Basic Elements of Law Relating to Agency, Guarantee and Pledge.

Module III: Indian Sale of Goods Act, 1930
Sale and Agreement to Sell, Hire Purchase, Pledge, Mortgage, Hypothecation Lease, Goods, Different types of Goods, Passing of Property in Goods, Conditions and Warranties, Doctrine of Caveat emptor, Rights of an unpaid Seller.

Module IV: Negotiable Instruments Act, 1881
Meaning of Negotiability and Definition of Negotiable Instruments, Features, Cheques, Bill of Exchange and Promissory Note, Holder in Due Course, Crossing of Cheques, Endorsement and Dishonour of Cheques.

Module V: Elements of Company Law
Meaning and types of companies, Formation of a company, Memorandum and Articles of Association, Prospectus and Issue of Shares, Share Capital and Shareholders, Company Meetings and Proceedings, Powers and Liabilities of Directors, meeting, Managerial Remuneration and Winding up of Company.

Module VI: Consumer Protection Act 1986 and Torts
Need for Consumer Protection, Meaning of Consumer, Different Redressal Forums for Consumers, Rights of Consumers, Unfair Trade Practices, and Procedure for Filing Complaints, Meaning of tort, Application of Tortuous Liability in Business Situations.

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; **HA** - Home Assignment; **P** - Project; **S** - Seminar; **V** - Viva; **Q** - Quiz; **CT** - Class Test; **A** - Attendance; **EE** - End Semester Examination

Text & References:

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Text:

- N.D. Kapoor, Mercantile Law
- P.K Goel, Business Law for managers Biztantra.

References:

- Shukla, S.M. and Gupta, O P, Mercantile Law.
- S. S. Gulshan Mercantile Law, Excel Book.
- Maheshwari & Maheshwari Business Law.

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ENTREPRENEURSHIP

Programme Structure

Course Code	Course Title	Lecture (L) Hours /Week	Tutorial (T) Hours /Week	Practical (P) Hours/Week	Total Credits
MGT2152	Orientation Programme in Entrepreneurship	2	-	2	3
MGT2252	Exploring Business Opportunity	2	-	2	3
MGT2352	Developing a Business Model	2	-	2	3
MGT2452	Translating Business Model into Startup	2	-	2	3
MGT2552	Advanced Programme in Entrepreneurship: Growth	2	-	2	3
MGT2652	Advanced Programme in Entrepreneurship: Expansion	2	-	2	3
	TOTAL				**18**

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ENTREPRENEURSHIP

Syllabus - Semester First

ORIENTATION PROGRAMME IN ENTREPRENEURSHIP

Course Code: MGT2152 **Credit Units: 03**

Course Overview

The goals of this programme are to inspire students and help them imbibe an entrepreneurial mind-set. The students will learn what entrepreneurship is and how it has impacted the world and their country. They will be introduced to key traits and the DNA of an entrepreneur, and be given an opportunity to assess their own strengths and identify gaps that need to be addressed to become a successful entrepreneur.

The programme comprises several short courses, each focusing on a specific entrepreneurial knowledge or skill requirement such as creative thinking, communication, risk taking, and resilience and helping them become career ready, whether it is entrepreneurship or any other career.

Course Contents:

Module-I: Introduction to Entrepreneurship

Meaning and concept of entrepreneurship, the history of entrepreneurship development, role of entrepreneurship in economic development, Myths about entrepreneurs, agencies in entrepreneurship management and future of entrepreneurship types of entrepreneurs.

Module-II: The Entrepreneur

Why to become entrepreneur, the skills/ traits required to be an entrepreneur, Creative and Design Thinking, the entrepreneurial decision process, skill gap analysis, and role models, mentors and support system, entrepreneurial success stories.

Module-III: E-Cell

Meaning and concept of E-cells, advantages to join E-cell, significance of E-cell, various activities conducted by E-cell

Module-IV: Communication

Importance of communication, barriers and gateways to communication, listening to people, the power of talk, personal selling, risk taking & resilience, negotiation.

Module-V: Introduction to various form of business organization (sole proprietorship, partnership, corporations, Limited Liability company), mission, vision and strategy formulation.

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

(C - Case Discussion/ Presentation; **HA** - Home Assignment; **V** - Viva; **CT**- Class Test; **A** - Attendance; **EE** - End Semester Examination)

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Learning Outcomes

At the end of the course, the students will:

• Develop awareness about entrepreneurship and successful entrepreneurs.

• Develop an entrepreneurial mind-set by learning key skills such as design, personal selling, and communication.

• Understand the DNA of an entrepreneur and assess their strengths and weaknesses from an entrepreneurial perspective.

Learning Methods

Videos and quizzes through the on-line Learning Management System (LMS); Classroom learning through an experienced Facilitator/Faculty on campus (Videos, In-class Activities, Outbound Activities); Assignments and Projects; and Practical Experiences including challenges, internships and apprenticeships.

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Syllabus - Semester Second

EXPLORING BUSINESS OPPORTUNITY

Course Code: MGT2252 **Credit Units: 03**

Course Overview

The goal of this programme is to provide a space and platform for discovery, both self discovery and opportunity discovery. Students will discover their strengths in terms of an entrepreneurial founding team and learn basics such as opportunity discovery, prototyping, competition analysis, and early customer insights and participate in on-line and campus activities and events such as idea competitions, business plan challenges, etc.

Course Contents:

Module-I: Self-Discovery

Natural born entrepreneur, the reluctant entrepreneur, the hidden traits, discovers your own strength.

Module-II: Idea Generation

Sources of business ideas, how to find & assess ideas? Where to find data for ideation? What is a good problem? Opportunity recognition.

Module-III: Idea Evaluation

Design thinking for finding solutions, prototyping, idea evaluation, entrepreneurial Outlook, value proposition design, customer insight, ideas development , capstone project presentation.

Module-IV: Feasibility Analysis

Product/Service Feasibility Analysis, Industry & competition analysis, environment analysis, financial feasibility analysis.

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

(C - Case Discussion/ Presentation; **HA -** Home Assignment; **V** - Viva; **CT**- Class Test; **A** - Attendance; **EE** - End Semester Examination)

Learning Outcomes

At the end of the course, the students will be able to:

- Further discover their strengths and weaknesses in terms of qualities and traits required to be a successful entrepreneur in the context of a founding team.
- Identify gaps in terms of qualities and traits required to be an entrepreneur, if any, and make a personal action plan to close those gaps.
- Develop the entrepreneurial mind-set further in terms of acquiring a business focus, creative thinking, risk-taking ability, and more.
- Learn about opportunity discovery and evaluation of viable business ideas for new venture creation.

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- Practice critical talents and traits required for entrepreneurs such as problem solving, creativity, communication, business math, sales, and negotiation.
- Start customer development, validate their ideas, and learn what prototyping is.
- Understand the value of mentorship in the success of an entrepreneur and their ventures.

Learning Methods

Videos and quizzes through the on-line Learning Management System (LMS); Classroom learning through an experienced Facilitator/Faculty on campus (Videos, In-class Activities, Outbound Activities); Assignments and Projects; and Practical Experiences including challenges, internships and apprenticeships.

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Syllabus - Semester Third

DEVELOPING A BUSINESS MODEL

Course Code: MGT2352 **Credit Units: 03**

Course Overview

The goal of this program is to take the students from the MVP (Minimum Viable Product) stage to the Business Model stage, i.e. the students will acquire the skills required to transform their MVP into a business model. In this course, they will start building their teams by finding co-founders and perhaps even hiring. They will transform their business idea into the Business Model Canvas and will use it to further refine their MVP. They will also set up a digital presence and learn to use promotional channels and distribution channels to engage and serve their customers. Additionally, they will get started with various legal and operational aspects as well as initial funding concepts such as bootstrapping.

Course Contents:

Module-I: Team

Finding your team, art of team formation, teamwork planning, chief mentor/ founder & Co founders, team formation, and delegation of work.

Module-II: Preparation of Business model/Plan

Meaning and significance of a business plan, components of a business plan, and feasibility study, Iterating the MVP, Digital Presence for Ventures, Clarifying the value proposition, Guidelines for writing BP, pre- requisites from the perspective of investor.

Module-III: Business Model

The importance and diversity of business model, how business model emerge, potential fatal flaws of business models, components of an effective business model, core strategy, strategic resources, partnership network, customer interface.

Module-IV: Product/ Market Fit

Understanding basics of unit economics, cost and profitability, Refining the product/service, Establish the success and operational matrix, Starting Operations.

Customer Validation: Evaluate the efficiency with which customers can be captured and kept, Early insights on cost of customer acquisition, Other Stakeholder Validation, Customer Development and Experience.

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

(C - Case Discussion/ Presentation; **HA -** Home Assignment; **V** - Viva; **CT**- Class Test; **A** - Attendance; **EE** - End Semester Examination)

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Learning Outcomes

At the end of this course, the students will be able to:

- Acquire the skills and knowledge related to the various phases in venture creation process such as creating a business model and building a prototype.
- Practice entrepreneurship by forming and running a Campus Venture as part of a team.

Learning Methods

Videos and quizzes through the on-line Learning Management System (LMS); Classroom learning through an experienced Facilitator/Faculty on campus (Videos, In-class Activities, Outbound Activities); Assignments and Projects; and Practical Experiences including challenges, internships and apprenticeships.

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Syllabus - Semester Fourth

TRANSLATING BUSINESS MODEL INTO STARTUP

Course Code: MGT2452 **Credit Units: 03**

Course Overview
The students who are keen to launch their own venture will take this course. Students will select a vertical and launch their own venture. They will learn about market size, costs, channels and customer acquisition, business model and plan finalization, efficiency and growth processes.

Course Contents:

Module-I: Gaining marketing Intelligence
Identify the vertical you will operate in and the business opportunity, understand your customers and accurately assess market opportunity, minimum viable product and the lean method.

Module-II: Develop and validate business model for your venture
Value Proposition, Customer Segments, Channels and Partners, Revenue Model and Streams, Key Resources, Activities, and Costs Customer Relationships and Customer.

Module-III: Development Processes
Translate Business Model into a Business Plan, Visioning for venture, Take product or service to market, Deliver an investor pitch to a panel of investors, Identify possible sources of funding for your venture – customers, friends and family, Angels, VCs, Bank Loans and key elements of raising money for a new venture.

Module-IV: Business Plan & Startup-I
Get to market Plan, Effective ways of marketing for start-ups – Digital and Viral Marketing; Hire and Manage a Team, Managing start-up finance: The Concept of Costs, Profits, and Losses, Manage your Cash Flow, analyse your Financial Performance, budgeting.

Module-V: Business Plan & Startup-II
Establishing a ethical culture for a firm, Legal and regulatory aspects for starting up specific to your venture, Enhancing the growth process and creating scalability (customers, market share, and/or sales), Thorough understanding of market size, costs, margins, delivery channels, customer acquisition costs, Identify areas to build efficiency (product making, service delivery, and channels - key areas of the BM Canvas are identified by now), Finalize business model and plan, Have a 1-2 year roadmap and trajectory.

Module-VI: Obtaining Business Licenses and permits
Business Licenses, business permits, choosing a form of business organization, sole proprietorship, partnership, corporations, Limited Liability company.

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

(C - Case Discussion/ Presentation; **HA** - Home Assignment; **V** - Viva; **CT**- Class Test; **A** - Attendance; **EE** - End Semester Examination)

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Learning Outcomes

At the end of the course, the students will be able to:

- Launch a sustainable venture with a valid business model, with co-founder(s) on or off campus, and real paying customers.
- Create and validate a business model and business plan for their idea.
- Develop the Minimum Viable Product (MVP).
- Implement an inexpensive and optimum Go-to-Market plan for their business.
- Craft and present an effective business pitch for investors, partners and other stakeholders.
- Gain in-depth knowledge and relevant skills about a specific vertical.
- Students build a prototype or service, generate jobs and revenue.

Learning Methods

Videos and quizzes through the on-line Learning Management System (LMS); Classroom learning through an experienced Facilitator/Faculty on campus (Videos, In-class Activities, Outbound Activities); Assignments and Projects including Student Venture; and Practical Experiences including challenges, internships and apprenticeships.

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Syllabus - Semester Fifth

ADVANCED PROGRAMME IN ENTREPRENEURSHIP: GROWTH

Course Code: MGT2552 **Credit Units: 03**

Course Overview

The students who already have their own venture will take this course to focus on a growth agenda. They will learn advanced concepts and build sustainability in their venture in various ways such as Growth Financing, process refinement, and scalability.

Course Contents:

Module-I: Growth Opportunities

Characteristics of high growth new ventures, strategies for growth, and building the new venture capital, discovering and assessing opportunities for growth, developing a growth mind-set and visioning for growth, review the robustness and relevance of business model vis-à-vis current market situation, map financing decisions to business models and reiterating business models

Module-II: Retention & Expansion Strategies

Dealing with stagnation of customer base and developing customer base: expansion to new markets – options and strategies, product Life Cycle – Product Road Map; Getting to Plan B, p*roject to Process:* Build, adapt, test, and establish key processes and systems that enable efficiency, continuous and sustained innovation

Module-III: Developing the organizational capabilities for growth

Develop strong leadership capabilities, ability to delegate and manage key leadership tasks. o Streamline operations and organizational design to accommodate growth, Implement new and effective approaches to marketing and communication for customers, suppliers, and employees, Acquire new resources for strategic growth: executive hires.

Module-IV: Planning and streamlining financial/ Legal processes:

Managing cash for growth, Balance between profitability and growth costs, Role of business services – accountant, lawyer, Understanding legal requirements, and compliance issues, Exit options :Evaluating opportunities for acquisition; Growth financing, Scalability & efficiency improvements, IPR.

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

(C - Case Discussion/ Presentation; **HA -** Home Assignment; **V** - Viva; **CT**- Class Test; **A** - Attendance; **EE** - End Semester Examination)

Learning Outcomes

At the end of the course, the students will be able to:

- Manage and grow their business in terms of jobs and revenue.
- Make a Growth Plan and pitch it to all stakeholders (investors, partners, key employees etc.).
- Sign up for advanced support for entrepreneurs – Mentor Platform.
- Identify key drivers of growth in a venture.

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- Develop a growth mind-set.
- Understand the basics of organization and team building; and establishing policies to hire and retain staff.
- Understanding legal and compliance issues related to their business.
- Present a pitch for funding their growth plan.

Learning Methods

Videos and quizzes through the on-line Learning Management System (LMS); Classroom learning through an experienced Facilitator/Faculty on campus (Videos, In-class Activities, Outbound Activities); Assignments and Projects; and Practical Experiences including challenges, internships and apprenticeships.

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Syllabus - Semester Sixth

ADVANCED PROGRAMME IN ENTREPRENEURSHIP: EXPANSION

Course Code: MGT2652 **Credit Units: 03**

Course Overview

The students who have a sustainable venture will get ready for the expansion phase. They will focus on expansion and go on the path of creating a high-performance company. They will learn advanced concepts such as franchising, renewal, and profit maximization.

Audience

This course will be offered to all the students who have gone through Advanced Programme in Entrepreneurship. It is suitable for students, keen to continue to grow their ventures. deally, they will have a reasonable understanding of growth challenges and how to tackle them and would seek to expand further through inputs from this course.

Course Contents:

Module-I: Expansion model – Geographical/Franchising/Licensing routes to new market expansion

Module-II: Maximizing Profits- Testing price elasticity, Cost reduction through scaling up, Expanding offerings, other revenue streams (partnerships)

Module-III: Renewal - Similar to Take-off and Resource Maturity of SMEs

Module-IV: Harvesting Rewards- Exit strategies for entrepreneurs, bankruptcy, and succession and harvesting strategy

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

(C - Case Discussion/ Presentation; **HA** - Home Assignment; **V** - Viva; **CT**- Class Test; **A** - Attendance; **EE** - End Semester Examination)

Learning Outcomes

At the end of the course, the students will be able to:

- Effectively tackle growth challenges of their venture.
- Nurture and apply a growth mind-set.
- Continue refining their business model.
- Draw an expansion plan for their venture.
- Scale up their business.
- HR policies, How to attract and retain key management team.
- Focus on revenue maximization.
- Build key aspects of adaptation and sustainability.
- Manage and grow their business in terms of expansion and look for partnerships.

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Learning Methods

Videos and quizzes through the on-line Learning Management System (LMS); Classroom learning through an experienced Facilitator/Faculty on campus (Videos, In-class Activities, Outbound Activities); Assignments and Projects; and Practical Experiences including challenges, internships and apprenticeships.

PRACTICUM PROGRAMMES

- Practicum programmes enable real-world experiences that empower students to explore and strengthen their entrepreneurial abilities. Students join E-cells in the first year, build their skills through a series of activities, and practice by starting campus companies as they move forward.
- The Practicum Approach motivates and nurtures entrepreneurial development through hands-on work at the E-Cells. By managing operations of E-cells, interacting with entrepreneurs, organizing workshops, enabling start-up internships, and running campus companies, students apply learnings to real world situations and challenges. Additionally, all E-Cells participate in entrepreneurship events through the year.
- The Practicum Programme is designed to cater the learning needs of new (basic) students and advanced students in the entrepreneurship learning curve.
- A bouquet of 16 activities, 8 per category will be offered both for the Basic and Advanced students. In addition to two hands-on Programs.
- Additionally, a select number of students from each institute will be trained as leaders. These E-leaders manage the E-cells and run the Practicum activities along with the designated faculty.
- The structure of the Programme is provided in the below table.

Text & References:

- Ramachandran , Entrepreneurship Development, Mc Graw Hill
- Katz , Entrepreneurship Small Business, Mc Graw Hill
- Byrd Megginson,,Small Business Management An Entrepreneur's Guidebook 7th ed, McGraw-Hill
- Fayolle A (2007) Entrepreneurship and new value creation. Cambridge, Cambridge University Press
- Hougaard S. (2005) The business idea. Berlin, Springer
- Lowe R & S Mariott (2006) Enterprise: Entrepreneurship & Innovation. Burlington, ButterworthHeinemann
- Léo-Paul Dana ,World Encyclopedia of Entrepreneurship, , Edward Elgar

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ECONOMICS

Programme Structure

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits
ECO2151	Micro Economics-I	3	-	-	3
ECO2251	Indian Economy	3	-	-	3
ECO2351	Macro Economics-I	3	-	-	3
ECO2451	Public Finance	3	-	-	3
ECO2552	Statistical Methods in Economics	3	-	-	3
ECO2651	Money, Banking & Financial Markets	3	-	-	3
	TOTAL				**18**

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ECONOMICS

Syllabus - Semester First

MICRO ECONOMICS-I

Course Code: ECO2151 **Credit Units: 03**

Course Objective:
This course is designed to expose first –year students, who may be new to economics, the basic principles of microeconomic theory. The emphasis would be on thinking like an economists & the course will illustrate how microeconomic concepts can be applied to analyze real life situations.

Course Contents:
Module I: Exploring the Subject Matter of Economics
Why study economics? The scope and method of economics; scarcity and choice; questions of what, how and for whom to produce and how to distribute output

Module II: Supply and Demand: How Markets Work, Markets and Welfare
Individual demand and supply schedules and the derivation of market demand and supply; shifts in demand and supply curves; the role prices in resource allocation; Elasticity of Demand — price, income and cross; Consumer's surplus

Module III: Consumer's Behavior
Utility-cardinal and ordinal approaches, Indifference curves; budget constraints;. Consumer's equilibrium (Hicks and Slutsky); Giffin goods; Compensated demand; Revealed preference theory; Engel curve.

Module IV: Theory of Production and Costs:
Technology, Isoquants, production with one and more variable inputs, Returns to scale, short run and long run costs, cost curves in the short run and long run, total, average, and marginal product, cost minimization and expansion path, elasticity of substitution.

Examination Scheme:

Components	A	P	HA	CT	EE
Weight age (%)	5	10	5	10	70

(A-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination)

Text & References:
Text:
- C. Snyder and W. Nicholson, Fundamentals of Microeconomics, Cengage Learning (India), 2010.
- B. Douglas Bernheim and Michael D. Whinston, Microeconomics, Tata McGraw-Hill (India), 2009
- Ahuja H.L. (2010) Principles of Microeconomics, 18th Edition, S. Chand& Co. Ltd.

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- Robert S. Pindyk and D.L. Rubinfeld, (2000), Microeconomics, 3rd edition, Prentice Hall India.
- Ferguson &Gould(1989) Micro Economic Theory, 6th edition, all India Traveller Bookseller.
- Koutsoyiannis, A. (1990), Modern Microeconomics, Macmillan

References:

- N. Gregory Mankiw (2007), Economics: Principles and Applications, 4th edition, India edition by South-Western, a part of Cengage Learning, Cengage Learning India Private

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Syllabus - Semester Second

INDIAN ECONOMY

Course Code: ECO2251 **Credit Units: 03**

Course Objective:
This subject covers the major features of Indian Economy at Independence in the field of agriculture industry and other infrastructure of the economy. It also deals with growth of development of different phases on the current issues in Indian economy policy.

Course Contents:

Module I: Economic Development at the time of Independence
Major features of the economy at independence: Colonial economy; Semi-feudal economy; Backward economy; Stagnant economy

Module II: Planning in India
Objectives; Strategy; Broad achievements and failures; Current Five Year Plan — objectives, allocation and targets; New economic reforms — Liberalization, privatization and globalization; Rationale behind economic reforms; Progress of privatization and globalization

Module III: Major Economic Issues
Demographic trends and issues; education; poverty and inequality; unemployment, inflation

Module IV: External Sector
Role of foreign trade; Trends in exports and imports; Composition and direction of India's foreign trade; Balance of payments crisis; Export promotion measures and the new trade policies

Module V: Agriculture
Nature and importance; Trends in agricultural production and productivity; Factors determining productivity; Land Reforms; New agricultural strategy and green revolution

Module VI: Industry
Industrial development during the planning period; Industrial policy of 1991 and the latest Industrial policy; Growth and problems of small scale industries; Role of public sector enterprises in India's industrialization

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	10	5	10	70

(A-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination)

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Text & References:

Text:

- RuddarDutt and K.P.M Sundaram(2012) Indian Economy, S.Chand& Co. Ltd, Delhi
- Mishra &Puri(2005) Indian Economy, Himalayan Publishing House, Bombay
- V.M. Dandekar (1992), Forty Years after Independence in B. Jalan (ed.), The Indian Economy, Problems and Prospects, Viking Press.

References:

- Sebastian Morris (2001), Issues in Infrastructure Development Today: The Interlinkages, in India Infrastructure Report, OUP
- MontekAhluwalia, (2002), State level Performance under Economic Reforms in India, in A.O. Krueger(ed), Economic Policy Reforms and the Indian Economy**,** Univ. of Chicago Press.
- PranabBardhan(2003), Poverty, Agrarian Structure and Political Economy in India: Selected Essay, OUP, CH.5.
- JagdishBhagwati, (1993), India in Tansition, Freeing the Economy, Clarendon Press, Ch. 2.
- J. Bhagwati and Padma Desai (1970), India: Planning for Industrialization, Ch 2 OUP.
- S. Chakravarty (1987), Development Planning: The Indian Experience, Clarendon Press.
- Jean Dreze and AmartyaSen (2002), India: Development and Participation, OUP, Chs. 2, 3,5,6,9.
- B.S. Minhas (1991), Public vs Private sectors: Neglect of Lessons of Economics in Indian Policy Formulation, R.R. Kale Lecture, Gokhale Institute of Politics & Economics, Pune.
- MihirRakshit (2001), On Correcting Fiscal Imbalances In the Indian Economy: Some Perspectives
- Government of India, Economic Survey(annual) New Delhi
- Reserve Bank of India, Handbook of statistics of Indian Economy(Annual)

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Syllabus - Semester Third

MACRO ECONOMICS-I

Course Code: ECO2351 **Credit Units: 03**

Course Objective:
This course aims at introducing the fundamentals of Macroeconomic theories, policies and models in a historical perspective. It will enable the students to develop a critical insight on Classical and Keynesian macroeconomic models, to understand the relationship between inflation and employment by providing exposure to the constructions of Friedman, Phelps & Phillips.

Course Contents:

Module I: Introduction to Macroeconomics
The roots of macroeconomics, macroeconomic concerns, the role of government in the macro economy, the components of the macro economy, the methodology of macroeconomics

Module II: Introduction to National Income Accounting
Concepts of GDP and national income, approaches to calculating GDP, GDP and personal income, Nominal and real GDP, Limitations of the GDP concept.

Module III: Schools of Macroeconomic Thoughts
Classical, Neo Classical and Keynesian Models.; Say's Law of Markets and Classical Theory of Employment

Module IV: Keynesian Model
Keynes theory of income and employment; Consumption function; theory of investment-marginal efficiency of capital; saving and investment; The Investment Multiplier and its application to LDC's

Module V: Money in the Modern Economy
Theories of Demand for Money: Quantity Theory and Keynes approach; Characteristics of a monetary economy; the supply of money and overall liquidity position; credit creation

Module VI: Inflation
Inflation: types, causes, consequences and impact on the Indian economy; remedial measures.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	10	5	10	70

(A-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination)

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Text & References:

Text:

- Dornbusch, Fischer and Startz, Macroeconomics, McGraw Hill, 11th edition, 2010Ahuja H.l. (2010) Macroeconomics: Theory and Policy,S. Chand& Co. Ltd.
- Mc Connell. C.R & H.C. Gupta, "Introduction to Macro Economics", Tata McGraw Hill, Delhi
- Gardner Ackeley, "Macro Economics".

References:

- J.E. Stiglitz, and C.E. Walsh (2002), Principles of Economics, 3rd Edition, W.W. Norton & Company, New York.
- R. Stone and G. Stone (1977), National Income and Expenditure,10th edition, Bowes and Bowes London.
- K.K. Dewett: Modern Economic Theory, New Delhi, Shyamlal Charitable Trust.

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Syllabus - Semester Fourth

PUBLIC FINANCE

Course Code: ECO2451 **Credit Units: 03**

Course Objective:
This subject is primarily aimed at introducing principles of public finance, role of different governments, public expenditure, taxation, budget and fiscal policy in India. The government plays different roles and performs varied functions which are different from earlier societies. In this context the public financial functions of the government need to be understood by a student, by studying the relevant theory and empirical analysis.

Course Contents:

Module I: Introduction
Nature, Scope and Importance, Theory of Maximum Social Advantage, Private goods, Public goods and Merit goods; Role of government in managing the economy under different economic systems – Social Welfare Function; Theory of Public goods - Market failure - Externalities - problems in allocation of resources - theoretical developments in Demand revelation for social goods -Public choice.

Module II: Public Expenditure
Theories of Public Expenditure -Structure and growth of public expenditure - Criteria for public investment - Income Redistribution – Expenditure Programmes for the poor - Social Insurance: Unemployment Insurance, Health Care, and Education - Social cost-benefit analysis - benefit estimation and evaluation.

Module III: Taxation
Theory of Taxation - Benefit and ability-to-pay approaches - Indian Direct and Indirect Taxes - Effects of taxation - Requirements of a sound tax system - Canons of taxation - Tax reforms since 1975 - Chelliah Committee Report - Evaluation of Tax Reforms -Taxation Incidence and alternative concepts of Incidence.

Module IV Budgeting and Debt
Budget - Concept of PPB - Zero-based Budgeting - Cash budgeting : Cash management and Treasury functions in Government - Deficit Budgeting - Types of Deficits - Public Debt: Trends and composition of Indian Public Debt: Instruments - Treasury bills, bonds and other securities, Role of RBI - Debt management - Methods of debt redemption.

Module V: Fiscal Policy
Role of Fiscal Policy in India - Principles of Fiscal federalism in India; Finance Commissions and Planning Commission

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Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	10	5	10	70

(A-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination)

Text & References:

Text:

- Musgrave, R.A. and P.B. Musgrave (1976), Public Finance in Theory and Practice, 3rd edition, McGraw- Hill Kogakusha, Tokyo.
- RaghbendraJha : (1998), Modern Public Economics.
- Rosen, Harway, S. - Public Finance, IVthEdn. Irwin.

References:

- Mueller, D.C. (1979), Public Choice, Cambridge University Press, Cambridge.
- Brown, C.V. and Jackson - Public Sector Economics
- Raja J. Chellia et al. - Trends in Federal Finance.
- D.N. Dwivedi, Readings in India Public finance
- Government of India, Report of the 13th Finance Commission.
- Economic Survey, Government of India (latest).
- State Finances: A Study of Budgets, Reserve Bank of India (latest).

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Syllabus - Semester Fifth

STATISTICAL METHODS IN ECONOMICS

Course Code: ECO2552 **Credit Units: 03**

Course Objective:
This subject will deal with all fundamental statistical methods of tools which the students have to use in economic analysis and decision making problems.

Course Contents:

Module I: Introduction:
Basic concepts: Population, Sample, Parameter, Statistic, Frequency distribution, Cumulative frequency distribution; Graphic and diagrammatic representation of data; Techniques of data collection. Sampling vs. Population, primary and secondary data.

Module II: Central Tendency and Dispersion:
Measures of Central Tendency: Mean, Median, Mode, Geometric mean, Harmonic mean; Measures of Dispersion; Range, Quartile deviation Mean deviation, Standard deviation; Skewness and Kurtosis, Moments.

Module III: Correlation and Regression:
Correlation: Simple; Coefficient of correlation; Karl Pearson and Rank correlation; Partial and Multiple Correlation analysis; Regression analysis – Estimation of a regression line in a bivariate distribution, Least squares method; Interpretation of correlation and regression coefficients; Coefficient of determination.

Module IV: Time Series:
Time Series Analysis - concept and components, determination of trend (Linear, Quadratic and Exponential) and seasonal indices

Module V: Index Numbers
Concept of an index number; Laspeyer's, Paasche's and Fisher's Index Numbers; Time Reversal, Factor reversal and circular tests; Chain base index; Problems in the Construction of an index number; splicing; base shifting and use of index number for deflating other series.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	10	5	10	70

(A-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination)

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Text & References:

Text:

- Allen Webster, Applied Statistics for Business and Economics, (3rd edition), McGraw Hill, International Edition 1998.
- Richard J. Larsen and Morris L. Marx, An Introduction to Mathematical Statistics and its Applications, Prentice Hall, 2011.

References:

- P.H. Karmel and M. Polasek, Applied Statistics for Economists (4th edition), Pitman, Australia.
- M.R. Spiegel (2nd edition), Theory and Problems of Statistics, Schaum Series.

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Syllabus - Semester Sixth

MONEY, BANKING AND FINANCIAL MARKETS

Course Code: ECO2651 **Credit Units: 03**

Course Objective:

The main objective of the course is to impart knowledge about the concept of money, financial markets, financial instruments &banking industry; The concepts like estimation of demand for & Supply of money, financial deepening etc. will also be introduced.

Course Contents:

Module I: Money in the Financial System
Role of money in the economy - various schools of economic thought. Functions of money, financial markets, financial instruments and financial deepening;

Module II :Financial Markets
Structure of Money and Capital market in India. Monetary and Financial sector reforms in India. Concept of risk and return ; management of risk and return, Optimal Portfolio, Financial Innovations.

Module III: Interest Rates
Theories of Interest, Determination and Interstates differentials, Structure of interest rates in India. Theories of term structure of interest rates.

Module IV: Banking System
Introduction to the Banking system, Role and functions of commercial banks, Balance sheet and Portfolio Management, Indian Banking system –Changing role and structure, Banking Regulations, Banking sector reforms in India.

Module V: Central Banking and Monetary Policy
Functions of Central Banking, Various measures of money supply, Reserve Money .Goals, Targets, Instruments of Monetary Control, Monetary Policy Transmission mechanism, Monetary- management in an open economy, current monetary policy of India.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage(%)	5	10	5	10	70

(A-Attendance; **P**-Project/Seminar/Quiz/Viva;**HA**-Home Assignment;**CT**-Class Test;**EE**-End Semester Examination)

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Text & References:

Text:

- L. M. Bhole andJ.Mahukud, FinancialInstitutions and Markets,TataMcGraw Hill, 5th edition, 2011.
- M. Y. Khan, Indian FinancialSystem, TataMcGraw Hill, 7th edition, 2011.
- NarendraJhadav, Monetary Economics for India, Macmillan India Publishers,1994.
- D.N Diwedi, Macroeconomics – Theory and Policy, Tata McGraw Hill Publishers, 3rd edition 2010

References:

- F.J. Fabozzi, F. Modigliani, F.J.Jones,M. G. Ferri, Foundations ofFinancialMarkets and Institutions, Pearson Education,3rdedition, 2009
- Various latestissuesofR.B.I. Bulletins, AnnualReports, Reportson CurrencyandFinance and Reports of the WorkingGroup, IMF StaffPapers.M.R. Baye,D.W.Jansen(1996),MoneyBankingand
- FinancialMarkets, AITBS, (Indian Edition)
- F. S. MishkinandS.G. Eakins, FinancialMarkets andInstitutions, PearsonEducation, 6th edition,2009.
- Annual Report of RBI 2014 -15 Chapter 3
- How does the Reserve Bank of India conduct its Monetary Policy? Aug 12,2011 (available on www.rbi.org.in)

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MILITARY TRAINING FOUNDATION

Programme Structure

SINGLE SEMESTER COURSE

Course Code	Course Title	Lecture (L) Hours Per	Tutorial (T) Hours Per Week	Practical (P) Hours Per	Total Credits
GEN2051	Military Training Foundation	-	-	-	3
	TOTAL				**3**

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MILITARY TRAINING FOUNDATION

Syllabus

MILITARY TRAINING FOUNDATION

Course Code: GEN2051 **Credit Units: 03**

SINGLE SEMESTER COURSE

Introduction

In accordance with the National Youth Policy which envisages that youth of the country should spend at least one fifth of their total time spent in an educational institution on outdoor activities. In furtherance of our National Youth Policy compulsory military training is being conducted for UG students at Amity University Gurgaon. A tented camp has been established at the sprawling campus at Amity University Gurgaon, surrounded by forest land and orchards within the campus, the camp gives a feeling of living in field conditions, in the wild.

Proposal

It is proposed to introduce military training (MTC) for under graduate students as an open elective, as part and parcel of the flexi credit system, wherein a student can design his own degree from a basket of courses.

Aim& Objectives

The aim of Military Training for UG students is :-

- To inculcate an essence of camaraderie and brotherhood amongst the students.
- To bring energy and team spirit amongst participants.
- To expose the students to the essentials of physical well-being and fitness.
- To give exposure to students regarding adventure training.
- To inculcate leadership qualities in students.
- To expose students to subjects of general awareness such as role of armed forces in nation building, map reading and fire fighting.

Methodology

MTC is organized as a combined camp for both boys and girls,however, separate infrastructure for boys and girls have been created at AUG.

Assessment

Assessment of a student is based on the following :-

(a) Participating in all activities and successfully completing the course.
(b) Performance in the assimilation exercise held at the end of the course.
(c) Participation in debate and class participation.
(d) Exhibiting leadership qualities i.e. leading drill contingents.

Maximum of three credit will be given to participants.

Three modules have been designed to fulfill the aim and objectives of this Military Training Foundation Course as under :-

(a) Module I - Military Training.
(b) Module II - Leadership and Motivation.
(c) Module III - Adventure training.

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MODULES: MILITARY TRAINING CAMAPS (MTC)

Module-I: Military Training

Part-A

1.1 Introduction of Basic principles of Camping.
1.2 Drill aspect of discipline.
1.3 Camp Layout.
1.4 Hygiene and sanitation of camp.
1.5 Introduction to Armed Forces.
1.6 Role of Armed force in Nation building.

Part-B

I. Conducting drill.
II. Camp setting.
III. General fitness exercises.
IV. Obstacle crossing.
V. Weapon firing.

Module-II: Leadership and Motivation

Part-A

2.1 National character and values
2.2 Role and importance of Leadership
2.3 Law of Armed Conflict
2.4 Team play and group cohesion

Part-B

I. Tug of war
II. Task assignment and conduct
III. Group Discussion
IV. Games
V. Fire safety drills
VI. March past

Module-III: Adventure Training

Part-B

I. Trekking
II. Rappelling
III. Rope Climbing

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Amity College of Commerce

Bachelor of Commerce
(Honors/ Honors with Research)

FLEXILEARN
-Freedom to design your degree



Curriculum & Scheme of Examination

2023

AMITY UNIVERSITY HARYANA

GURUGRAM

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Bachelor of Commerce (Honors/ Honors with Research)
SEMESTER-I

FINANCIAL ACCOUNTING-I

Course Code: DCOM2151 **Credit Units: 04**

Course Objective:
To develop conceptual understanding of the fundamentals of financial accounting system which processes transactions and other events through a book-keeping mechanism to prepare financial statements, and also to impart skills in accounting for recording various kinds of business transactions.

Course Contents:

Module I: Introduction
Financial Accounting Concepts, importance and scope, Single entry vs Double entry system of as accounting. Journal, Ledger, Trial Balance, Errors and their rectification, Cash Book, Bank reconciliation statement.

Module II: Accounting Standards & IFRS, GAAP
Meaning of Accounting Standards, Types of Accounting Standards, Meaning of IFRS, Types of IFRS, Difference between IFRS & Indian GAAP,

Module III: Depreciation Accounting-(AS 6) & Inventory Valuation
Depreciation accounting and its methods (Straight line, Diminishing Balance), Change of Method,. Inventory Valuation: Meaning, Significance of Inventory Valuation, Inventory Record System-Periodic and Perpetual, Methods of Inventory Valuation :FIFO, LIFO and Weighted Average (Relevant accounting Standards as applicable)

Module IV: Final Account of Sole Proprietor & Incomplete Record
Final accounts – Meaning Preparation of trading, Profitable Loss Account and Balance Sheet with adjustment, Non Profit organization – Meaning, Preparation of receipts and payments, income and expenditure accounts & balance sheet.

Module 5: Computerized Accounting System Computerized Accounting System: Computerized accounts by using any popular accounting software: Creating a company; Configure and Features settings; Creating Accounting Ledgers and Groups, Creating Stock Items and Groups; Vouchers Entry; Generating Reports – Cash Book, Ledger Accounts, Trail Balance, Profit and Loss Account, Balance Sheet,

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Text & References:
- Dr. S.N. Maheswari, Financial Accounting
- BS Raman, Financial Accounting
- Grewal and Gupta, Advanced Accounting
- Radhaswamy and R.L. Gupta, Advanced Accounting
- S.Kr. Paul, Advanced Accounting
- P.C. Tulasian, Pearson Editions, Introduction to Accounting
- Jain & Narang, Financial Accounting
- Robert, L. Hurt, Accounting Information Systems: Basic Concepts and Current Issues

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MICROECONOMICS THEORY AND APPLICATIONS

Course Code: DCOM2101 **Credit Units: 04**

Course Objective

The objective of this paper is to make the student to understand how the business organizations work by applying economic principles in their business management. The course will attempt to relate theory to practice and try to instill in students the ability to apply basic microeconomic concepts to the understanding of everyday phenomena.

Course Contents

Module I: Introduction

Problem of scarcity and choice: scarcity, choice and opportunity cost; production possibility frontier; economic systems. Demand and supply: law of demand, determinants of demand, shifts of demand versus movements along a demand curve, market demand, law of supply, determinants of supply, shifts of supply versus movements along a supply curve, market supply, market equilibrium. Applications of Demand and Supply: Price rationing, Price floors, Consumer surplus, Producer surplus. Demand Forecasting. Elasticity: Elasticity of demand, calculating Elasticity, Price, Income and Cross elasticity.

Module II: Consumer Behaviour

Consumer sovereignty-limitations. Approaches to the study of consumer behaviour. Cardinal approach: Law of equi-marginal utility, Ordinal approach: Indifference curve analysis, Properties. Consumer surplus: Meaning, Significance and Limitations. Price, income and substitution effects. Giffen goods. Engel curve.

Module III: Production and Costs

Production: Behaviour of profit-maximizing firms, production process, production functions, law of variable proportions, choice of technology, isoquant and iso-cost lines, cost-minimizing equilibrium condition.

Module IV: Market Structures

Market structures & Business decisions; Objectives of Business firm. Perfect competition: Profit Maximization, and equilibrium of firm & industry; Short-run and long-run supply curves; price and output determination, practical applications. Monopoly: Determination of price under monopoly; Equilibrium of a firm; Comparison between perfect competition and monopoly; Multi plant monopoly, Price discrimination; Practical applications. Monopolistic Competition: Meaning & Characteristics; Price and Output determination under monopolistic Competition; Excess capacity under monopolistic competition. Oligopoly: Characteristics, indeterminate pricing and output; classical models of oligopoly; price leadership; Collusive oligopoly, kinked demand curve.

Module V: Income Distribution & Factor Pricing

Demand for factors, Supply of factors, backward bending supply curve for labour, Concepts of economic rent; Functional distribution of income.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

Text & References:

- I.C. Dhingra, Principles of Microeconomics- Sultan Chand & Sons
- H.L. Ahuja- Microeconomics
- Baumol, W.J. Economic Theory and Operations Analysis, Prentice Hall of India, New Delhi.
- Bach, G.L, Economics, Prentice Hall of India, New Delhi.
- Gould, J.P. and Edward P.L, Microeconomic Theory, Richard, Irwin. Homewood.
- Koutsoyiannis, A, Modern Microeconomics, Macmillan.
- Lipsey, R.G. and K.A. Chrystal, Principles of Economics, Oxford University Press, Oxford.

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SEMESTER-II

FINANCIAL ACCOUNTING-II

Course Code: DCOM2251 **Credit Units: 04**

Course Objective:
To develop conceptual understanding of the fundamentals of financial accounting system which processes transactions and other events through a book-keeping mechanism to prepare financial statements, and also to impart skills in accounting for recording various kinds of business transactions.

Course Contents:

Module I: Partnership
Partnership - Introduction, Types, Admission and Retirement, Dissolution of Partnership Firms – Legal Position, Accounting for Simple Dissolution, Analysis of Financial Statements

Module II: Branch & Departmental Accounting
Branch & Departmental Accounting – Meaning, Types of Branch, Methods of Recording, Journal Entries in case of dependent branch, ascertainment of profit by debtors method and stock and debtors method. Departmental Account – Meaning, Methods of Recording, Transaction in case of departments

Module III: Consignment and Joint Venture Accounts
- **Consignments:** Features, Accounting treatment in the books of the consignor and consignee.
- **Joint Ventures**: Joint Ventures - Accounting Procedures Part – 1, Joint Ventures – Accounting Procedures Part - 2, Inland Branches.

Module IV: Hire purchase and Installment Payment System
Hire purchase – Introduction, Nature, Methods of Recording, Accounting arrangement of Hire-purchase, Accounting treatment.

Module V: Latest trends in accounting: Introduction to Forensic Accounting, IASB- Role, Achievements of IASB in standard setting; Global convergence of accounting standards; IFRSs, ASs vs. Ind. ASS ,

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Text & References:
- Dr. S.N. Maheswari, Financial Accounting
- BS Raman, Financial Accounting
- Grewal and Gupta, Advanced Accounting
- Radhaswamy and R.L. Gupta, Advanced Accounting
- S.Kr. Paul, Advanced Accounting
- P.C. Tulasian, Pearson Editions, Introduction to Accounting
- Jain & Narang, Financial Accounting
- Sehgal, A and Sehgal,D "Advanced Accounting", Part – 1, Taxmann Applied services, New Delhi

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BUSINESS AND ECONOMIC LAWS

Course Code: DCOM2201 **Credit Units: 04**

Course Objective:
The objective of the course is to impart basic knowledge that a common person comes across in this various business dealings and, make him aware of the relevant case laws

Course Contents:

Module I: Introduction
Meaning and Scope of business law – Sources of Indian Business Law.

Module II: Indian Contract Act
Definition – types of contract – essentials – offer, acceptance, consideration, capacity of parties – free consent (meaning only) – legality of object and consideration – various modes of discharge of a contract – remedies for breach of contract ,contract of indemnity and guarantee, bailment and pledge, law of agency.

Module III: Indian Sale of Goods Act
Formation of a contract, Condition and warranties, Transfer of ownership, Performance of the contract, Rights of unpaid seller.

Module IV: Negotiable Instruments Act
Definition of a negotiable instrument; instruments negotiable by law and by custom; types of negotiable instruments; parties to a negotiable instrument - duties, rights, liabilities and discharge; material alteration; crossing of cheques;

Module V: Indian Partnership Act
Definition and nature of partnership - Rights and duties of partner - Types of partners - Incoming and outgoing and minor as a partner - Dissolution of partnership - Registration of firm

Module VI: Consumer Protection Act. [COPRA] 1986
Back ground – definitions of 1) Consumer 2) Consumer Dispute 3) Complaint 4) Deficiency 5) Service Consumer Protection Council – Consumer Redressal Agencies – District Forum, State Commission and National Commission.

Module VII: Foreign Exchange Management Act 1999
Objectives, Scope and salient features – offences under the Act.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

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Text & References:

- *Tulsian - Business Law, Tata Mcgraw Hill, New Delhi.*
- *Aswathappa. K & Ramachandra – Business Law, HPH, Mumbai.*
- *Kapoor N.D. - Business Law, Sultan Chand & Co.*
- *Bare Acts.*
- *Nabhi - Business Law, Indian Law House, Mumbai.*
- *Garg, Sareen, Sharma & Chawla - Business Law.*
- *M.C. Kuchhal, Business Law.*

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SEMESTER-III

CORPORATE ACCOUNTING

Course Code: DCOM2351 **Credit Units: 04**

Course Objective:
This course enables the students to develop awareness about Corporate Accounting in conformity with the Provision of Companies' Act and the latest amendments thereto with adoption of Accounting Standards that are likely to be introduced from time to time.

Course Contents:
Module I- Accounting for Share Capital
Share Capital – Meaning, types of shares, types of share capital, difference between equity shares and preference shares, Concept of Issue, Forfeiture and Reissue of shares, Accounting treatment of issue, forfeiture and reissue of shares.

Module II: Accounting For Debentures
Debenture- meaning, types, concept and accounting treatment of issue of debentures, Redemption of Debentures: concept, sources of finance for the redemption of debentures, methods of redemption of debentures.

Module III: Valuation of Goodwill and Shares
Valuation of Goodwill: Meaning, determinants, needs for valuation of Goodwill, methods of valuation of goodwill.
Valuation of Shares: Meaning, determinants, need for valuation of shares, methods of valuation of shares.

Module IV: Amalgamation
Accounting treatment for amalgamation with reference to As-14 (excluding intercompany transactions & holdings), absorption and reconstruction of companies; Internal Reconstruction.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Text & References:
- S.N. Maheswari, Financial Accounting
- Narayanaswamy, Financial Accounting
- SP Iyengar, Advanced Accountancy
- RL Gupta, Advanced Accountancy
- Jain and Narang, Corporate Accounting
- Tulsian, Advanced Accounting

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HUMAN RESOURCE MANAGEMENT

Course Code: DCOM2301 **Credit Units: 04**

Course Objective:
To help students to understand the concept of human resource management to enable them to better manage the most important asset of any organisation which are people.

Course Contents:
Module I:
Human Resource Management: Relevance and spectrum, HRD: concept and evolution, Organization of HR Department, Role, Status and competencies of HR Manager, HR Policies. Emerging dimensions in HRM like empowerment, diversity etc. Work life balance

Module II
Acquisition of Human Resource: HRM environment and environmental scanning; Human Resource Planning- Quantitative and Qualitative dimensions; job analysis – job description and job specification; recruitment – Concept and sources; selection – Concept and process; test and interview; placement induction. Socialisation and retention;

Module III
Training and Development: Concept and importance; identifying training and development needs; designing training programmes; role specific and competency based training; evaluating training effectiveness; training process outsourcing; management development systems; career development.

Module IV
Performance Appraisal System: nature and objectives; techniques of performance appraisal; potential appraisal and employee counseling; job changes - transfers and promotions. separation and right sizing.

Module V
Compensation: concept, policies and administration; job evaluation; methods of wage payments and incentive plans; fringe benefits; performance linked compensation. Maintenance: employee health and safety; employee welfare; social security; grievance handling and redressal. Impact of HRM practices on organisational performance; International Dimensions of HRM; Employee Empowerment; E-HRM/HRIS.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Text and References:

- S. P. Robbins, Human Resource Management, Prentice Hall of India, New Delhi
- Iam Beardwell and Len Holden, Human Resource Management, Macmillan, New
- Delhi
- R. Wayne Mondy, Robert M. Noe, Human Resource Management, Pearson Education, New Delhi
- Randy L. Desimone, Jon M. Wernea, David M. Harris, Human Resource Management, International Student Edn, Thomson A.

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SEMESTER-IV

FINANCIAL MANAGEMENT

Course Code: DCOM2451 **Credit Units: 04**

Course Objective:
To give insight into financial decision making and composition of different securities in the total Capital structure.

Course Contents:

Module I
Nature, Scope & Objectives of Financial Management, Goals of Financial Management, Time value of money, Concept of risk & return (including capital asset pricing model.

Module II
Financing Decisions: Operating, Financial and Combined leverage, Capital structure theories; NI, NOI and MM & Traditional Approach, Factors determining capital structure. Concept & measurement of cost of capital, weighed Average cost of capital, EBIT-EPS analysis.

Module III
Capital Budgeting Decisions: Capital budgeting process; estimation of relevant cash flows, non-discounted & discounted cash flows techniques- pay back, Discounted Pay-back, ARR, NPV, IRR, and profitability index;
Cost of Capital: Estimation of components of cost of capital: Method for calculating cost of equity, Cost of retained Earnings, Cost of Debt, Cost of Preference Capital, Weighted Average Cost of Capital (WACC) and Incremental (Marginal) Cost of Capital.

Module IV
Dividend Decisions – dividend policy – determinants of dividend policy – types of dividend policy – forms of dividend. Different Schools of thought on dividend policy (Gordon, Walter, MM).

Module V
Working Capital Management – Concepts, sources of working capital, Operating & Cash Cycles, Risk-return Trade off, working capital estimation, cash management, Receivable management, and inventory management.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test;
EE-End Semester Examination

Text & References:

- S N Maheshwari, Financial Management.
- Khan and Jain, Financial Management.
- Dorai Raj. S.N, Financial Management.
- Sharma and Sashi Gupta, Financial Management.
- I M Pandey, Financial Management.
- James C Vanhorne, Financial Management.
- Prasanna Chandra, Financial Management.

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INCOME TAX LAW AND PRACTICE

Course Code: DCOM2401 **Credit Units: 04**

Course Objective:
To prepare the students with the concepts and theory of income tax accounting and to give a practical exposure to them

Course Contents:

Module-I: Introduction
Brief History of Income Tax, Legal Frame work, Cannons of Taxation – Finance Bill – Scheme of Income Tax. Definition: Assessee, Person, assessment year, previous year, income, Gross Total Income, Total Income, Agricultural Income (including integration of Agricultural Income with Non- Agriculture Income), Revenue and Capital (a) Receipts (b) Expenditure (c) Loss. Residential Status and Incidence of Tax.

Module II : Income from Salary
Income from Salary – Features of Salary Income – Basic Salary – Allowance, Perquisites section 89(1) – Tax Rebate U/S 88 – Problems.

Module III : Income from House Property
Income from House Property – Introduction – Annual value under different situations – deductions– problems.

Module IV : Profits from Business & Profession
Profits & Gains of Business & Profession – Introduction, Basic Principles, Basic Principles, Computation of Taxable profits of Business & Profession, deductions, problems.

Module V : Income from Capital Gains
Income from Capital Gains:- Introduction, Meaning & types of capital assets, Computation of Capital Gains, Problems.

Module VI : Income from Other Sources
Income from Other Sources:- Meaning, examples of income, Computation of income, Problems.

Module VII: Computation of Individual Tax Liability
Deductions from GTI: Rebates and reliefs, Clubbing provisions; set off and carry forward of losses. Assessment of an Individual

Examination Scheme:

Components	A	P	C	CT	EE
Weightage (%)	5	10	5	10	70

A-Attendance; **P**-Project/Seminar/Quiz/Viva/Home Assignment; C-Case Discussion **CT**-Class Test; **EE**-End Semester Examination

Text & References:
- *Dr. Vinod K. Singhania: Direct Taxes – Law and Practice, Taxmann publication.*
- *B.B. Lal: Direct Taxes, Konark Publisher (P) ltd.*
- *Bhagwathi Prasad: Direct Taxes – Law and Practice, Wishwa Prakashana.*
- *Dr. Mehrotra and Dr. Goyal: Direct Taxes – Law and Practice, Sahitya Bhavan Publication.*
- *Dinakar Pagare: Law and Practice of Income Tax, Sultan Chand and sons.*
- *Gaur & Narang: Income Tax.*

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SEMESTER-V
COST ACCOUNTING

Course Code: DCOM2551 **Credit Units: 04**

Course Objective:
To get an expert knowledge in the area of cost management and cost control to enable effective management decisions.

Course Contents:
Module I: Cost Accounting
Introduction – Meaning of Cost, costing and Cost Accounting – Comparison between Financial Accounts and Cost Accounts –Cost concepts and Classification of Costs – Cost Module – Cost Center, cost object – Preparation of cost sheet

Module II: **Material and Labour Costing**
Methods of pricing of material issues- LIFO, FIFO- Weighed Average Method, Simple Average Method; Inventory Control- Concept & techniques like fixing of stock levels, EOQ, ABC analysis.

Control of labour cost – Labour Turn Turnover – Causes and effects of labour turnover – Meaning of Time and Motion Study, Merit Rating, Job Analysis, Time keeping and Time booking – Idle time, Overtime – Methods of Wage Payment, Time rate and Piece Rate – Incentive Schemes – Halsey Premium Plan – Rowan Bonus Plan – Taylor's and Merrick's differential piece rate systems – Problems.

Module IV: Overhead Costing
Definition, Classification, allocation, apportionment & absorption of overhead, treatment of over & under absorption, Capacity Levels and Costs, Treatments of certain items in costing like interest and financing charges, packing expenses, bad debts, research, and development costs.

Module V: Costing Methods
Job costing, Contract costing, Process costing, Activity based costing, Service costing.

Module VI: Cost Management System and Decision making:
Total Quality Management, Just in Time (JIT), Benchmark, Back-flush costing, Reengineering, Cost reduction and value Analysis: Concept and Techniques, Decision Making, Make or buy, Add or Drop, Operate/Shutdown, Sell/Process

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Text & References:
- *Khanna Pandey & Ahuja: Practical Costing*
- *M.L. Agarwal: Cost Accounting*
- *Jain & Narang: Cost Accounting*
- *S.N. Maheshwari: Cost Accounting*
- *M. N. Arora: Cost Accounting*

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AUDITING

Course Code: DCOM2501 **Credit Units: 04**

Course Objective
Students learn to understand the concept of Auditing to enable them to understand the concepts of frauds and errors which happen in the organizations and to check and rectify those in the organizations.

Module 1: Introduction
Introduction to auditing Introduction: meaning, definition, difference between accountancy and auditing, types of audit, advantages of auditing, preparation before commencement of new audit, Auditing and Assurance Standard (AAS).

Module 2: Internal check
Internal check Meaning and objects of internal check; Internal control: meaning definition, Fundamental Principles: Internal check as regards wages, Cash sales, Cash purchases: internal check in a departmental store, Internal audit: Meaning, Significance and Limitations.

Module 3: Verification and Vouching
Verification and valuation of assets and liabilities: Meaning and objectives, Position of an auditor as regards to the valuation of assets; Verification and Valuation of different items: Assets, Fixed assets, Goodwill, Stock in trade, Investments, liabilities, capital, debentures, bills payable sundry creditors, contingent liabilities. Vouching: Concepts, objectives; Procedure of Vouching; Vouching of Cash and Bank, Purchase and Sales; Verification of Assets and Liabilities; Inventory Valuation.

Module 4: Audit Report
Audit of different organizations drafting of audit programs or trading and non-trading organizations in a tabular form. Preparation of clean and qualified audit report with special reference to manufacturing and other Companies Audit Report 1975.

Module 5: Audit Report and Special Audit
Contents and types of audit report, Qualified and Unqualified report; National Financial Reporting Authority. Special Audit: Banking and Insurance company; Forensic Audit.

Module 6: Computer Applications in Auditing
Computer-aided audit tools (CAATTs); Big Data and the Audit Challenge; Enterprise resource planning (ERP); Role of Artificial Intelligence in Auditing.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Text & References:

- *TR Sharma, Auditing.*
- *BN Tandon, Practical Auditing.*
- *MS Ramaswamy, Principles and Practice of Auditing.*
- *Dinakar Pagare, Practice of Auditing.*
- *Kamal Gupta, Practical Auditing.*
- *P N Reddy & Appannaiah, Auditing.*

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PRINCIPLES OF MARKETING

Course Code: DCOM2502 **Credit Units: 04**

Course Objective:
To help students to understand the concept of marketing and its applications, also to expose the Students to the latest trends in marketing.

Course Contents:
Module I - Introduction
Nature and scope of marketing- Importance of marketing as a business function - and in the economy ; Marketing management process- a strategic perspective, concept of marketing mix, market analysis.
- Marketing concepts - Traditional and Modern, Selling V/S marketing - Marketing Environment.

Module II
Markets and Segmentation. Meaning of Market - Various types of markets and their characteristics. Concept of market segmentation and its Importance - bases for market segmentation.
Consumer behaviour Nature, scope & significance of consumer behaviour - factors affecting consumer behaviour.

Module III
Product - concept of product - consumer and Industrial goods - product planning and development packaging - role and functions - Brand name and Trademark - after sale service - product life cycle concept.

Module IV
Price - Importance of price in the marketing mix, factor affecting price of a product / service, Pricing Strategies. Distribution channels - concept and role - types of distribution channels - Factors affecting choice of a distribution channel.

Module V
Promotion : Method of promotion - optimum promotion mix. Promotion tools and their effectiveness. Meaning and Importance of advertising - advertising medias - ethics of good advertising.

Module VI
Marketing Planning, Organization and Control: Marketing planning process, organizing the marketing department, marketing implementation & control, Social, Ethical and Legal Aspects of Marketing, Consumer Protection and CRM in India, rural marketing, direct marketing, online marketing, emerging trends and issues in marketing developments.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Text & References:
- *Philip Kotler: Marketing Management, Prentice Hall of India Ltd, New Delhi.*
- *Dr. C. N. Sontakki: Marketing Management Kalyani Publications New Delhi.*
- *Marchannd & B. Vardharajan: An introduction to Marketing, Vikas Publishing House, Delhi.*
- *Mohammad Amanatuallh: Principles of Modern Marketing. Kalyani Publications New Delhi.*

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SEMESTER-VI
MANAGEMENT ACCOUNTING

Course Code: DCOM2651 **Credit Units: 04**

Course Objective: To provide the students' knowledge about the use of costing data for planning, control and decision making.

Course Contents:

Module I: Management Accounting

Introduction to different types of Accounting: Financial Accounting, Cost Accounting and Management Accounting, Management Accounting –evolution, meaning, objectives, nature, scope, functions, techniques, and limitations. Financial Accounting vs. Cost Accounting vs. Management Accounting.

Module II: Budgetary Control and Ratio Analysis

Budgets- meaning, objectives, classification, and preparation of budgets: Fixed and Flexible budget, Cash Budget, Importance of budgets. Ratio Analysis - meaning, objectives, significance, limitations, classification and computation of ratios: Liquidity Ratio, Activity ratio, Profitability ratio and Capital structure ratios.

Module III: Cost Volume Profit Analysis

Cost Volume Profit Analysis – meaning, objectives, advantages, methods of cost volume profit analysis. Concept of Angle of Incidence.

Module IV: Cash Flow Analysis & Fund Flow Analysis

Funds Flow Statement: meaning, objectives, limitations, concept of funds from business operations, introduction to schedule of changes in working capital and preparation of Funds Flow Statement. Cash Flow Statement: meaning, objectives, limitations, preparation of cash flow statement (indirect method), difference between cash flow statement and fund flow statement.

Module V: Standard Costing

Standard costing: meaning, concept, objectives, advantages, and limitations. Variance analysis: concept, types of variances: material and labour variances and their accounting treatment.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Text & References:

- *Dr. S.N. Maheswari , Management Accounting*
- *Sexana, Management Accounting*
- *Made Gowda, Management Accounting*
- *Dr. S.N. Goyal and Manmohan, Management Accounting*
- *B.S. Raman, Management Accounting*
- *R.S.N. Pillai and Bagavathi, Management Accounting*
- *Sharma and Gupta, Management Accounting*
- *J. Batty, Management Accounting*

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CORPORATE TAX PLANNING

Course Code: DCOM2601 **Credit Units: 04**

Course Objective:
The aim of this course is to familiarize the student with major latest provisions of the Indian tax laws and related judicial pronouncements pertaining to corporate enterprises having implications for various aspects of corporate planning with a view to derive maximum possible tax benefits admissible under the law.

Course Contents:

Module-I:
Introduction
Meaning of tax planning and management, tax evasion and tax avoidance; Nature and scope of tax planning and management in the corporate sector; Justification of corporate tax planning and management.

Module-II: Computation of corporate tax
Computation of corporate tax: Carry forward and set off of losses in the case of certain companies under Sec. 79 of Income -tax Act, 1961; Computation of taxable income of companies; Computation of the amount of corporate tax liability; Minimum Alternate Tax; Tax on distributed profits of domestic companies; Tax on income distributed to unit holders. **Deductions available to corporate assesses.**

Module-III
Implications of Tax concessions and incentives for corporate decisions in respect of setting up a new business, location of business and nature of business, distribution of assets at the time of liquidation and sale of scientific research assets.

Module-IV
Tax planning with reference to financial management decisions: Capital structure decisions; Dividend Policy; Bonus Share; Investments and Capital Gains. Tax planning with reference to managerial decisions: Owning or leasing of an asset; purchasing of assets by installment system or Hire System; Purchasing of an asset out of own funds or out of borrowed capital; manufacturing or buying Tax planning in respect of non-resident Indians: Tax on non-resident sportsmen or sports associations, Exemption of Interest on NRE accounts and Exemption in respect of salaries of foreign citizens;, Transfer pricing: Arm‘s length price and its computation; Advance rulings.

Module-V
Foreign collaborations and incidence of taxation on domestic companies ; provisions for relief in respect of double taxation; important Double Taxation Avoidance Agreements with different countries like USA, UK, Germany, France, etc.

Examination Scheme:

Components	A	P	C	CT	EE
Weightage (%)	5	10	5	10	70

A-Attendance; **P**-Project/Seminar/Quiz/Viva/Home Assignment; C-Case Discussion **CT**-Class Test; **EE**-End Semester Examination

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Suggested Readings:

- *E.A. Srinivas, Corporate Tax Planning, Tata McGraw Hill.*
- *Vinod K. Singhania, Taxmann's Direct Taxes Planning and Management.*
- *V.S. Sundaram, Commentaries on the Law of Income- Tax in India, Law Publishers,*
- *Allahabad.*
- *A.C. Sampath Iyengar, Law of Income Tax, Bharat Publishing House, Allahabad.*
- *Taxman, The Tax and Corporate Law Weekly.*
- *Bhagmati Prasad, Direct Taxes Laws Practice, Wishwa Prakashan.*

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MACRO ECONOMICS

Course Code: DCOM2602 **Credit Units: 04**

Course Objective:
This course aims at introducing the fundamentals of Macroeconomic theories, policies and models in a historical perspective. It will enable the students to develop a critical insight on Classical and Keynesian macroeconomic models, to understand the relationship between inflation and employment by providing exposure to the constructions of Friedman, Phelps & Phillips.

Course Contents:

Module I: Introduction to Macroeconomics
The roots of macroeconomics, macroeconomic concerns, the role of government in the macro economy, the components of the macro economy, the methodology of macroeconomics Static macroeconomics analysis short run and the long run.

Module II: Introduction to National Income Accounting
Concepts of GDP and national income, approaches to calculating GDP, GDP and personal income, Nominal and real GDP, Limitations of the GDP concept, GDP and the black economy.

Module III: Schools of Macroeconomic Thoughts
Classical, Neo Classical and Keynesian Models.; Say's Law of Markets and Classical Theory of Employment

Module IV: Keynesian Model
Aggregate expenditure and equilibrium output; Behavioural foundation:- Consumption function; investment ; determinants of business Fixed investment ; theory of investment-marginal efficiency of capital; saving and investment; The Investment Multiplier and its application to LDC's

Module V: Money in the Modern Economy
Theories of Demand for Money: Quantity Theory and Keynes approach. Baumol and Tobin Contributions and Friedman's restatement of quantity theory Characteristics of a monetary economy; the supply of money and overall liquidity position; credit creation

Module VI: Inflation
The causes of inflation, measures to control inflation; level of prices and the value of money, The Fisher effect, the cost of inflation.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Text & References:

- *Mc Connell. C.R & H.C. Gupta, "Introduction to Macro Economics", Tata McGraw Hill, Delhi*
- *Gardner Ackeley, "Macro Economics".:*
- *J.E. Stiglitz, and C.E. Walsh (2002), Principles of Economics, 3rd Edition, W.W. Norton & Company, New York.*
- *R. Stone and G. Stone (1962), National Income and Expenditure, Bowes and Bowes London.*
- *Lipsey & Chrystal- Principles of Economics*

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INTERNATIONAL BUSINESS

Course Code: DCOM2603 **Credit Units: 04**

Course Objective:
The purpose of this course is to acquaint the students with nature, scope, structure and operations of international business and familiarize them with trends and developments in India's foreign trade and investments and policy framework.

Course Contents:
Module-I: Introduction
International Business: Its Importance, Nature and Scope; Driving Forces of Globalisation, Modes of Entry into International Business; Entry Barriers, Management of International Business Operations – Complexities and Issues; IT and International Business, India's involvement in International Business.
Cross Cultural Management: Hofstede Study, Edward T Hall Study.

Module-II: Fundamentals of International Trade
Theoretical Foundations of International Trade: Reasons for International Trade; Theories of International Trade; Gains from Trade; Foreign Trade Multiplier; Terms of rade.

Module-III: Instruments of Commercial Policy
Instruments of Commercial Policy: Tariffs, quotas and other measures and their effects; World trade and protectionism. Balance of Payment Account: Current and Capital Account components and accounting system; Balance of payment deficits and adjustment policies.

Module-IV: International Business Environment
International Business Environment: Framework for analyzing international business environment; Domestic and foreign environments and their impact on international business decisions; World trading environment – Pattern and structure of world trade in goods and services; Counter trade. International Financial Environment: Exchange rate mechanism and arrangement; International money and capital markets; Foreign investment flows – Pattern, structure and effects. Movements in foreign exchange and interest rates and their impact on trade and investment flows.

Module-V: International Economic Institutions and Agreements
International Economic Institutions and Agreements: WTO, IMF, World bank, UNCTAD, Agreement on Textiles and Clothing, GSP, GSTP and other international agreements and treaties; International commodity trading and agreements- India's involvement and consequences ,Anti Dumping Duties:Concept.

Module-VI: Regional Economic Integration
Types of Regional Economic Integration - Free Trade Area, Custom Union, Common Market, Economic Union, Monitory Union and Political Union etc., Theory of customs union; Trade creation and diversion effects; Regionalism vs. multilateralism; Theory - Mercantilism, absolute advantage and comparative advantage, Trends in Global Trade ,Trends in India's Trade, Trading Blocks: ASEAN, SAFTA,SAARC,NAFTA,EU.

Module-VII: Multinational Companies
Multinationals (MNCs) in International Business: Issue in investment, technology transfer, pricing and regulations; International collaborations and strategic alliances. Contemporary Developments and Issues in International Business.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test;

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EE-End Semester Examination

Suggested Readings:

- *Danoes, John D. Radebaugh, Lee H., and Daniel P. Sullivan International Business: Environment and Operations, 12th ed., Prentice Hall, 2009.*
- *Griffin, Ricky W. and Pustay, Michael W, International Business: A Managerial Perspective, Prentice Hall, 2009.*
- *Hill, Charles, W.L., International Business, McGraw Hill Company, New York, 2009.*
- *Ball, Donald, Wendall H. McCulloch, Hichael Geringer, Michael S. Minor and Jeanne M. McNett, International Business: The Challenge of Global Competit ion, 12th edition, 2009, McGraw Hill Co.*

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SEMESTER-VII

BUSINESS MATHEMATICS

Course Code: DCOM2701 **Credit Units: 04**

Course Objective: To familiarize the students with basic mathematical tools and the application of the same to business and economic situations.

Course Contents:

Module I

Formulation and basics of linear programming problem (LPP), graphical method to solve the linear programming problem, solution by Simplex Method- Minimization and maximization cases, feasible solution, optimal solution and degeneracy.

Module II

Arithmetic Progressions and Geometric progressions basic concepts and practical examples based on business related fields.

Module III

Matrices and determinants Definition of a matrix; Types of matrices; Algebra of matrices; properties of determinants; calculation of values of Determinants upto third order; Adjoint of a matrix, Finding inverse of a matrix; Rank of a matrix, Solution of system of linear equations by Cramer's Rule and Matrix Inverse Method (including not more than three variables).

Module IV

Differentiation Definition; Derivative using first Principle; Method of Differentiation of sum, difference, product and Quotient of two functions; Derivative if compositive, inverse, exponential, Logarithmic, second order derivative, Application of Differentiation.

Module V

Maxima and minima Case of one variable involving Second Order derivative; Average Cost, Average revenue functions, marginal cost, marginal revenue, Elasticity of demand, Application of Maxima or Minima.

Module VI:

Integration as anti-derivative process; Standard forms; Method of Integration by substitution, by parts and by use of partial fractions. Definite integral and their properties; Determination of Cost, revenue and demand function; Consumer's surplus and Producer's surplus.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	50

A-Attendance; P -Project/Seminar/Quiz/Viva; HA-Home Assignment; CT-Class Test; EE-End Semester Examination

Text & References:

1. Kumbhojkar G.V.: Business Mathematics
2. Soni R.S.: Business Mathematics, Pitamber Publishing House
3. Kapoor V.K.: Business mathematics, Sultan Chand & Sons, Delhi.
4. J.K. Singh, Himalaya publication house: Business Mathematics
5. Anthony, M., & Biggs, N. (1996), MATHEMATICS FOR ECONOMICS AND FINANCE, Cambridge: Cambridge University Press.

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STRATEGIC MANAGEMENT

Course Code: DCOM2702 **Credit Units: 04**

Module 1 Introduction to Strategic Management:
Meaning, Evolution, Conceptual Framework of Strategic Management, Strategic Management Process, Schools of Strategy Formulation, Participants in Strategic Management: Role of Board of Directors, Role of Chief Executive, Role of Corporate Planning Staff, Role of Other Management, Role of Consultants.

Module 2 Strategic Intent and Strategy Formulation:
Strategic Intent: Meaning, Vision, Mission, Business Definition, Goals and Objectives, Relevance of Strategic Intent, Environmental Analysis: Concept, Environmental Factors, Industry Analysis, Competition Analysis, Organizational Analysis: Concept, Strategic Factors and Analysis, Strategic Audit, SWOT Analysis, Corporate Strategies, Business Strategies, Choice of Strategy.

Module 3 Strategy Implementation and Control:
Issues in Strategy Implementation, Structural Implementation: Forms of Organization Structure, Strategy Structure Relationship, Relating Structure to Strategy, Behavioral Implementation: Leadership, Organizational Culture, Values, Ideologies and Ethics, Social Responsibility and Corporate Governance, Functional Implementation, Strategic Control.

Module 4 Strategic Issues in Specified Areas:
Performance Management - Concept, components; Performance, Productivity and Efficiency, Financial Performance Analysis, Supply Chain Management (SCM), Customer Relationship Management (CRM) & Customer Profitability analysis.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; P -Project/Seminar/Quiz/Viva; HA-Home Assignment; CT-Class Test; EE-End Semester

Texts & References:

- *Hill and Jones. Strategic Management. Dream-tech Press India, Indian Adaptation*
- *Hitt & Hoskisson, Strategic Management: Competitiveness and Globalization. South Western Thomson*
- *Hunger & Whleen, Essentials of Strategic Management. Prentice Hall of India*
- *John Parnell. Strategic Management: Theory and Practice, 4th Edition. Sage*
- *McCarthy, Minichiello & Curran, Business Policy and Strategy – Concepts and Readings. AITBS Publishers & Distributors (Regd.), Delhi 318*
- *Pitts, Strategic Management, Building and Sustaining Competitive Advantage. South Western Thomson*
- *Porter. Competitive Advantage. The Free Press, New York*
- *Thompson, Strickland & Gamble. Strategic Management: Concepts and Cases. Tata McGraw Hill*

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MERGER AND ACQUISITIONS

Course Code: DCOM2703 **Credit Units: 04**

Course Description
In this course the concepts of Corporate Restructuring, categories of corporate restricting, types of merger and acquisition, various methods of merger and acquisition are discussed. The concept of various techniques used for merger and acquisition, procedure of disinvestment in public and private sector used by the organizations. The aim of this course is to make the students familiar with the fundamentals of merger and acquisition.

Course Objective:
The main objective of this course is to familiarize the students with the basic aspects of mergers and acquisitions.

Module 1: Mergers and Acquisitions – Overview:
Introduction – Forms of Corporate Restructuring – Expansion – Mergers and Acquisitions – Tender Offers – Joint Ventures – Sell Offs – Spin Offs – Split Offs – Split Ups – Divestitures – Equity Carve outs - Corporate Control – Premium Buy Backs – Standstill Agreements – Anti- Takeover Amendments – Proxy Contests - Changes in Ownership Structures - Share Repurchases – Exchange Offers – Leveraged Buy – out – Going Private – Issue Raised by Restructuring – History of Merger Movements.

Module 2: Mergers and Acquisitions:
Economic Rationale for Major Types of Mergers - Horizontal Mergers – Vertical Mergers – Conglomerate Mergers - Concentric Mergers.

Module 3: Theories of Mergers:
Efficiency Theories – Differential Efficiency - Inefficient Management – Operating Synergy – Pure Diversification - Financial Synergy – Strategic Realignment to Changing Environments – Undervaluation – Information and Signalling – Agency Problems and Managerialism - Takeovers as a Solution to Agency Problems.

Module 4: Methods of Valuation:
CashFlow Basis, Earning Potential basis, Growth Rate, Market Price etc., Computation of Impact on EPS and market Price ,Determination of Exchange Ratio, MBO,LBO, Bootstrapping, Criteria for Negotiating Friendly takeovers, Financing of mergers.

Module 5: Legal Aspects of Mergers/Amalgamations and Acquisitions:
Provision of Companies Act, Regulation by SEBI, Takeover Code: Scheme of Amalgamation, Approval from Court.
Recent Case studies on Mergers and Acquisitions.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; P -Project/Seminar/Quiz/Viva; HA-Home Assignment; CT-Class Test; EE-End Semester

Text & References:
Text:

- *The Complete Guide to Mergers and Acquisitions : Process Tools to Support M & A Integration at Every Level – Timothy J Galpin and Mark Herndon, 2007*
- *Mergers – What Can Go Wrong and How to Prevent it – Patrick A Gaughan (Wiley Finance)*

References:

- *Mergers and Acquisitions – Fred Weston*
- *M & A and Corporate Restructuring - Patrick A Gaughan (Wiley Finance Series)*

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ADVANCE ACCOUNTING

Course Code: DCOM2704 **Credit Units: 04**

Course Objectives: The objective of the course is to acquaint students about emerging accounting trends.

Course Contents:
Module I – Valuation of Assets: Inventories, Goodwill, Shares.

Module II- Accounting for Investments, Accounting for Financial instruments.

Module III- Agricultural Farm Accounting, Hotel Accounting, Inflation Accounting, Human Resource Accounting.

Module IV- Accounts of Government Companies and Statutory Corporations, Corporate Social Accounting, Environmental Accounting, Lean Accounting, Forensic Accounting, International Accounting.

Module V- Value Added Statement, Economic Value Added (EVA), Social Accounting.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

Attendance; **P-** Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Texts & References:

Texts:

- *Advanced Accounting, Batliboi*
- *Advanced Accounts, M.C. Shukla & T.S. Grewal*
- *Advanced Accountancy, R.L.Gupta*

References:

- *Advanced Accountancy, Jain & Narang*
- *Advanced Accountancy, H. Chakraborthy*
- *Advanced Accountancy, M.C.K. Nambiar*

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BUSINESS TAXATION

Course Code: DCOM2705 **Credit Units: 04**

Course Objectives

The objective of this course is to Enable the students to acquire working knowledge of principles and provisions of GST and Customs Law. Enable the students to acquire working knowledge of principles and provisions of Customs Law.

Course Content :

MODULE 1:

Taxation powers of the Union and State Governments, Introduction Constitutional framework of Indirect Taxes before GST (Taxation Powers of Union& State Government); Concept of VAT: Meaning, Variants and Methods; Major Defects in the structure of Indirect Taxes prior to GST; Rationale for GST; Structure of GST (SGST,CGST, UTGST & IGST); GST Council, Decision-making process and its impact on GST policies. GST Network, State Compensation Mechanism, Registration., Legal foundation for GST and its significance in India's tax reform.

MODULE 2:

Procedures and compliance requirements for the movement of goods., Levy and collection of GST Taxable event- "Supply" of Goods and Services; Place of Supply: Within state, Interstate, Import and Export; Time of supply; Valuation for GST Valuation rules, taxability of reimbursement of expenses; Exemption from GST: Small supplies, Refund Mechanisms under GST and Composition Scheme; Classification of Goods and Services: Composite and Mixed Supplies.

MODULE 3:

Input Tax Credit-ITC Reconciliation and Matching , ITC on Supplies Received under Reverse Charge Mechanism (RCM) Eligible and Ineligible Input Tax Credit; Apportionments of Credit and Blocked Credits; Tax Credit in respect of Capital Goods; Recovery of Excess Tax Credit; Availability of Tax Credit in special circumstances; Input Service Distribution; Payment of Taxes; Doctrine of unjust enrichment; TDS, TCS. Provisions, Reverse Charge Mechanism

MODULE 4:

Filing of Annual Returns and GST Reconciliation, Procedures Tax Invoice, Credit and Debit Notes, Returns, Audit in GST, Assessment: Self-Assessment, Summary and Scrutiny. Provisional Assessment under GST.

MODULE 5:

GST on Export and Import of Services ,Special Provisions Taxability of E-Commerce, Anti-Profiteering, Avoidance of dual control, E-way bills, zero-rated supply, Offences and Penalties, Appeals and Revisions , Advance Ruling Mechanism under GST.

MODULE 6:

Customs Duty Drawback Scheme, Prohibited and Restricted Goods, Customs Law Basic Concepts, Territorial Waters, High Seas, Classification of Custom Duties, Valuation, Baggage Rules & Exemptions. Penalties and Confiscation under Customs Act

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

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Texts & References:

Texts:

1. *Goods & Service Tax , V.S. Datey, Taxmann , New Delhi*
2. *Fundamentals of GST & Customs Law , CA(Dr) K.M.Bansal , Taxman , New Delhi*
3. *Goods & Service Tax , Naveen Kumar C.M , Venkatesh S.N , Himalaya Publishing House*
4. *Bare Act of Goods & Service Tax*
5. *Bare Act of Custom Act*
6. *GST made Simple , Awadhesh Singh*
7. *Handbook of GST in India : Rakesh Garg & Sandeep Garg*

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CORPORATE TAX LAW & PRACTICE

Course Code: DCOM2706 **Credit Units: 04**

Course Objectives: To prepare the students with the concepts and theory of corporate tax law and practices and to give a practical exposure to them.

Course Contents:

Module I

Computation of total income in case of companies including non-residents, Co-operative Society

Module II

Procedure for assessment: Section 139 to 148 (Return of Income)PAN, Assessments, Methods of Accounting, Accounting standards, Time limit for completion of Assessment, Rectification of mistake etc. Special procedure for assessment of search cases.

Module III

Liability in Special Cases: Legal representatives, Representative assesses: provisions applicable to firms, AOP & BOI, executors succession, shipping companies. Recovery of tax in respect of non- resident, persons leaving India, person trying to alienate their property, discontinuation of business & profession

Module IV

Collection and Recovery of tax, TDS, Advance payment of income tax, Interest u/s 234, Refunds and settlement of cases

Module V

Appeals & Revision, Acquisition of Immovable properties, provisions to counter evasion of tax, Penalties, Offences and Prosecutions, Authorized representation and miscellaneous provisions.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Texts & References:

Texts:

- *Income Tax Act, Taxmann, New Delhi*
- *Income Tax Rules, Taxmann, New Delhi*

References:

- *Direct taxes, V.K. Singhania, Taxmann, New Delhi*
- *Circulars and Notification issued by CBDT*

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BASICS OF RESEARCH METHODOLOGY, ETHICS AND RESEARCH COMMUNICATION

Course Code: DCOM2739 **Credit Units: 04**

Course Objectives:

Module1: Basics of Research Methodology
Business Research: Meaning, Need, Types, Approaches, Research methods vs Research Methodology, Research Process, Role of research in important areas, Identification and Formulation of Research Problem, Variables and Variable type, Hypothesis, Types and Formulation of Hypothesis.

Module 2: Research Design
Research Design: Meaning, Need, Types of Research Design: Exploratory, Descriptive. Experimental and Diagnostic and Survey Research, Features of a good research design.

Module 3: Sampling Design
Sampling design: Meaning, Need, and Advantages of sampling over census, Probability and Non - probability Sampling Methods, Criteria of Selecting a sampling procedure, Factors influencing sample size.

Module 4: Data Collection
Data Collection Methods: Primary and Secondary Data collection methods, Questionnaire/Schedule; Questionnaire designing, Interview and Observational methods, Measurement Scales, Techniques of Developing Scales, Reliability and Validity of scales

Module 5: Data Analysis and Ethics
Data Analysis: Descriptive and Univariate Statistics; Bivariate Analysis: Test of Difference, Measures of Association; Introduction to Multivariate Analysis, Report Writing: Need, Types and Characteristics of a research report, Publication ethics: definition, introduction and importance, Predatory publishers and journals, Plagiarism: Use of plagiarism software like Turnitin, Urkund and other open- source software tools.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Text & References:

- *William G. Zikmund, Business Research Methods, 7th Edition, Cengage Learning, India.*
- *K.N. Krishnaswamy, Appa lyer Sivakumar, M.Mathirajan, Management Research Methodology: Integration of Principles, Methods and Techniques, Pearson Education*
- *Ranjeet Kumar, Research Methods, Pearson Education*
- *Donald S. Tull, Del I. Hawkins, Marketing Research, Measurement and Methods, 6th Edition, PHI*
- *Naresh Malhotra and Satya Bhushan Das, Marketing Research: An applied Orientation, Pearson Education*
- *Mcburney, Research Methods, 7th Edition, Cengage Learning, India. Reference Books:*
- *J. K. Sachdeva, Business Research Methodology, Himalaya Pub. House*
- *Paul E. Green, Donald S. Tull, Research for Marketing Decisions, 5th Edition, PHI.*

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SEMESTER-VIII

STATISTICAL METHODS IN RESEARCH

Course Code: DCOM2801 **Credit Units: 04**

Course Objectives:
To provide basic understanding of quantitative tools and their elementary application to business problems. The formulation of hypothesis and application of statistical methods.

Course Contents:
Module I- Descriptive Statistics
Processing Data - Editing, Coding and Tabulating Presentation of Data; Diagrammatic and Graphic Representation of Data. Analysis of Data; Mean, Median, Mode Weighted Average and its Merits and Demerits – Dispersion; Range, Standard Deviation, Co-efficient of Variation, Lorenz Curve

Module II-Analytical Statistics
Correlation; Simple, Partial and Multiple – Pearson's Coefficient of Correlation and Rank Correlation – Regression; Simple, Linear and Non-linear Regression

Module III- Statistical Methods
Random Variable- Continuous & discrete; Discrete distribution- Binomial & Poisson, Bernoulli's trials; Continuous Distribution- Normal distribution, Properties of normal curve, importance & application

Module IV- Tests of Hypothesis
Significance test: concepts and applications, acceptance and critical regions, null and alternative hypothesis, judgemental errors, level of significance. Power of a test, z test for testing of mean, proportion and equality of means, t- test, Chi square Test.

Module V- Decision Theory
Decision making, under certainity, uncertainity & risk, Bayersian Analysis, Decision tree.

Examination Scheme: **Components**	**A**	**P**	**HA**	**CT**	**EE**
Weightage (%)	5	5	5	15	70

References and Textbooks:

- *Bhandarkar, P.L. & Wilkinson, T.S. (2016). Methodology and Techniques of Social Research. Himalaya Publishing House, Mumbai.*
- *Elhance, D.N., Elhance V. & Aggarwal, B.M. (2018). Fundamentals of Statistics. Kitab Mahal, Mumbai.*
- *Ferber, R. & Verdoon, P.J. (1962). Research Methods in Economics and Business. Macmillan, New York.*
- *Ghosh, B.N. (2015). Scientific Method and Social Research. Sterling Publishers, New Delhi.*
- *Goode, W.J. & Hatt, P.K. (2022). Methods in Social Research. McGraw Hill, London.*
- *Gujarati, D., Porter, D.C. & Pal, M. (2017). Basic Econometrics. Tata McGraw Hill, New Delhi.*
- *Gupta, S.P. (2021). Statistical Methods. S. Chand & Company, New Delhi.*
- *Kothari, C.R. & Garg, G. (2019). Research Methodology: Methods and Techniques. New Age International Publishers, New Delhi.*
- *Kurien, C.T. (1973). Research Methodology in Economics. Sangam Publishers, Madras.*

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ENTREPRENEURSHIP DEVELOPMENT

Course Code: DCOM2802 **Credit Units: 04**

Module 1: Introduction to Entrepreneurship; Entrepreneurship Meaning- Characteristics- Functions- Traits- Types of Entrepreneurs- Women Entrepreneurship- Rural Entrepreneurship- Role of Entrepreneurship in Economic Development – Factors affecting entrepreneurial growth.

Module 2: **Institutional Support to Entrepreneurs Entrepreneurship** Development Programme- Need- Objectives- Course Contents Phases-Evaluation - DIC, NSIC, SIDO, KVIC, SIDC, Industrial Estates, NIESBUD, SIDBI, EDII- - Angel Investors- Incubators- STEP- Venture Capital

Module 3: MOTIVATION: Major Motives Influencing an entrepreneur–Achievement, Motivation Training, self-Rating, Business Game, Thematic Apperception Test– Stress management, Entrepreneurship Development Programs– Need, Objectives

Module 4: BUSINESS: Small Enterprises – Definition, Classification– Characteristics, Ownership Structures–Project Formulation– Steps involved in setting up a Business–identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment– Preparation of Preliminary Project Reports– Project Appraisal–Sources of Information– Classification of Needs and Agencies

Module 5: Business Plan and Legal Aspects: Development of Business Plan and starting venture- Registration Formalities- IPR Incentives and Subsidies- Need for Incentives and Subsidies- Tax benefits for SSI Units- Sickness in Small Industries- Causes and Remedies and Revival.

Examination Scheme: **Components**	**A**	**P**	**HA**	**CT**	**EE**
Weightage (%)	5	5	5	15	70

References:

- *Hisrich R D and Peters M P, "Entrepreneurship" 5th Edition Tata McGraw -Hill, 2002.*
- *Mathew J Manimala," Entrepreneurship theory at cross roads: paradigms and praxis" Dreamtech 2nd edition 2006.*
- *Rabindra N. Kanungo "Entrepreneurship and innovation", Sage Publications, New Delhi,1998.93*
- *Khanka SS - Entrepreneurial Development - S.Chand & Co. Ltd 2010.*
- *Gupta CB and Srinivasan NP - Entrepreneurship Development in India - S.Chand & Co. Ltd.*

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ADVANCED COST ACCOUNTING

Course Code: DCOM2803 **Credit Units: 04**

Course Contents:

Module I: Cost Book-Keeping
Non-integrated Accounting system, Accounting Ledgers And Control Accounts, Integrated Accounting, Reconciliation of Cost & Financial Accounts.

Module II: Process Costing
Basic Concept, Joint products and By-products, work-in-progress, (Equivalent production), inter- Process profits, Uniform Costing and inter firm comparisons.

Module III: Activity Based Costing
Problems of Traditional Costing, Cost analysis under ABC, Institution of ABC, Benefits and Weaknesses, Life Cycle Costing; Target Costing.

Module IV: Cost Management System
Total Quality Management, Benchmark, Back-flush Costing, Reengineering, Cost Reduction and value Analysis: Concept and Techniques.

Module V:
Service Costing, Marginal Costing, Standard Costing, Decision Making, Make or buy, Add or Drop, Operate/Shutdown, Sell/Process.

Examination Scheme:

Components	A	P	HA	CTT	EE
Weightage (%)	5	5	5	15	70

Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Text & References:

Text:

- Principles and Practice of Cost Accounting, N. K. Prasad
- Cost Accounting, C.D. Vashisht & V. K. Saxena, Sultan Chand& Sons, New Delhi.

References:

- Principles & Practice of Cost Accounting, Asish K Bhattacharyya ,Wheller Publishing, N. Delhi
- Management Accounting, J. Batty
- Advanced Cost Accounting & Cost System, M. Kishore Ravi
- Accounting For Management, Guru Prasad Murthy
- Decisional Phenomena And Management Accountants, Backer and Jucobson

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RECENT TRENDS IN ACCOUNTING

Course Code: DCOM2804 **Credit Units: 04**

Course Contents:

Module I: Forensic Accounting

Meaning, Functioning, Types of Forensic Accounting, Forensic Accountant Duties, Audit procedures in Forensic Accounting, Advantages and Disadvantages of working in Forensic Accounting, Emerging Trends in Forensic Accounting: Data Analytics, Cyber Forensic Accounting, Cryptocurrencies, and Blockchain Technology for Fraud Investigation and Prevention.

Module II: Behavioral Accounting

Introduction to Behavioral Accounting and Auditing, Types of Behavioral Accounting, Behavioral Biases in Financial Decision-Making, The Influence of Cognitive Factors on Accounting Practices, Emotional Aspects in Auditing and Reporting, Heuristics and their impact on Financial Statements, Ethical Considerations in Behavioral Accounting, Behavioral Auditing Techniques and Tools, Future Trends in Behavioral Accounting.

Module III: ESG

Meaning, ESG Reporting Frameworks, ESG Metrics in Financial Statement, Role of Accountants in ESG Strategy, ESG Impact on Valuation and Investment, Stakeholder engagement in ESG Reporting. ESG Performance – Definition, Process and measurement. Models/Approaches to measure business sustainability: Altman Z-score Model, Risk Adjusted Return on Capital, Economic Value Added (EVA), Market Value Added (MVA), Sustainable Value-Added Approach.

Module IV: AI and Accounting

The Role of AI in Modern Accounting, Key Benefits of AI in Accounting, AI use cases in Accounting, AI tools for accountants, Ways to Implement AI in Accounting system, Challenges in Implementation and Ways to overcome challenges of AI Implementation in Accounting, Compliance and Ethical consideration, Future trends in AI-Driven Accounting.

Examination Scheme:

Components	A	P	HA	CTT	EE
Weightage (%)	5	5	5	15	70

Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

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INDIRECT TAXES WITH GST

Course Code: DCOM2805 **Credit Units: 04**

Course Objectives: To provide students with adequate theoretical and working knowledge about GST and its practical application in unification of indirect tax system in India. The course intends to make students aware of the latest developments and changes being incorporated in GST at the systemic level and its implications in the process of economic and financial integration.

Course Contents:

Module 1:

Concept of Indirect Taxes -Advantages and disadvantages, difference between direct and indirect tax, Principles of Indirect Taxes, Evolution of GST concept, ,GST Laws, Constitutional Perspectives – Cooperative Federalism in economic system Adjudication and offenses, Application of GST in tax sharing – CGST/SGST/IGST, Classification of goods and services in GST assessment, Exemption from Tax, Composition levy. , Valuation of Taxable Services

Module 2:

Basic Framework of GST – Unification of indirect tax system, GST Council – composition, objectives, functions and significance, Tax sharing and disbursement mechanism between the Centre and states, Responsibilities of various stakeholders – government, firms, traders, consumers,. Registration, Tax invoice, Returns. Input Tax Credit, Calculation of VAT, Concept of CENVAT.

Module 3:

Concept and General Principles of VAT, Practical Problems on VAT, Administration of GST – GST Network, Registration, Tax Invoice, , Electronic way bill for interstate movement of goods, Computation of GST Liability, , Concept of times value of supply, Filing of Returns, Payment of Tax, Search, Seizure & arrest, e-filing of service returns, Offences & Penalties

Module 4:

Goods and excisable goods, Refunds and appeals, General Procedures, Safeguard Measures – Anti-profiteering clause, Reverse charge mechanism, Assessment & Audit, Inspection – Concept of HSN and SAC, Appeals & Revision, Implications on Tax terrorism, corruption

Module 5:

Basic Countervailing and anti-dumping Duty, Protective duty, Safeguard Duty, Comparative analysis between GST in India and other countries such as Canada, France, Australia and China, Advantages and Disadvantages, Custom Laws, Import and Export Procedures,

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Text & References:

Text:

1. GST Council, Government of India, Publications.
2. Singh, Awdhesh (2018), *GST Made Simple: A Complete Guide to Goods and Services Tax in India*, Centax Publications.
3. Bhattacharjee Govind and Debasis Bhattacharya (2018), *GST and Its Aftermath – Is Consumer Really the King?* SAGE Publications.
4. Garg, Rakesh (2016), *Handbook of GST in India: Concepts and Procedures,* Bloomsbury.

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PUBLIC FINANCE & TAX PRACTICES

Course Code: DCOM2806 **Credit Units: 04**

Course Objective:
To provide students with a foundational understanding of public finance, its principles, and its role in economic development. To explore the relationship between government revenue, expenditure, and economic policies.

Course Contents:

Module 1: Origin and Development of Public Finance, Meaning, public finance and federal finance, Meaning, Importance, Scope and categories, Role of Finance Commissions, public finance and private finance, Principles of Taxation and Government Expenditure, Benefit approach, allocation of public goods, Ability to pay approach, excess burden of taxes

Module 2: Tax Policy and administration in India, Raising of Public Funds
Sources and classification of public revenues, incidences and shifting of taxes
Distribution of Public Funds, categories, Effect on production, employment, distribution and stability, public debt and fiscal deficit

Module 3: Public Debt – Meaning and Types, Public Debt Management and Taxation Development of Federal Finance in India, The constitutional arrangements, Role of Finance Commissions Role of Fiscal Policy Towards Public Goods and Externalities

Module 4 : Effects of Fiscal Policy, Central and State Finances, Sources and uses of funds, Types of Funds , relation between planning and central budgeting State Finances- Sources and uses of funds, Fiscal Federalism-issues of federalism

Module 5: Constitutional Provisions, Financing of Five-year Plans Changing scenario of Indian tax Structure, new economic policy since 1991 Indian Fiscal Policy and Deficit Financing,

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	15	5	5	70

A-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-EndSemester Examination

Texts & References:

Texts:

1. R. Mursgrave, The Theory of Public Finance, McGraw Hill
2. R. Mursgrave and P.B. Mursgrave, Public Finance in Theory and Practice, McGraw Hill
3. J. M. Buchanan, Public Finance
4. Due and Friedlandar, Public Finance
5. S. Ganguli, Public Finance, World Press
6. B. M. Bhargava, Public Finance
7. B. M. Bhargava, The Theory and Working of Union Public of India
8. Vaish and Agarwal, Public Finance, Wiley Eastern

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DATA ANALYSIS & VISUALISATION USING SOFTWARE

Course Code: DCOM2839 **Credit Units: 04**

Prerequisite: Basic knowledge of business statistics and computer applications

Course Objectives:

- To introduce students to the principles of data analysis.
- To develop skills in using software tools for analyzing and visualizing business data.
- To make students proficient in interpreting data-driven insights.
- To foster decision-making abilities using data analysis.

Course Content:

Module 1: Introduction to Data Analysis

Types of data (qualitative vs. quantitative, continuous vs. discrete), Importance of data analysis in business decision-making, Basic concepts of statistics: Mean, Median, Mode, Range, Variance, Standard Deviation

Module 2: Data Collection and Cleaning

Sources of business data (Surveys, Transactions, Web Data), Introduction to data cleaning techniques (handling missing values, outliers, and errors)

Module 3: Basics of Excel for Data Analysis

Data Manipulation and Analysis in Excel: Data validation, conditional formatting, PivotTables and Pivot-Charts, Descriptive statistics functions in Excel, Creating and using named ranges

Module 4: Advanced Excel Techniques

Data Visualization in Excel: Creating and formatting various charts: Bar, Line, Pie, Scatter, etc. Introduction to Dashboards, calculating mean, median, variance, standard deviation and standard error.

Module 5: Introduction to Statistical Software

Introduction to Statistical Software: Overview of popular software for data analysis: SPSS and R, Choosing the right tool for different data analysis tasks

Basic Analysis Using SPSS/R: Setting up data in SPSS/R, Descriptive statistics and data visualization in SPSS/R, Introduction to hypothesis testing (t-tests, chi-square tests)

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

Suggested Textbooks & References:

- **Primary Textbooks:**
  - "Data Analysis for Business Decisions" by P. N. Reddy & C. S. S. Reddy
  - "Excel 2019 for Data Analysis" by Michael Alexander and Richard Kusleika
  - "Data Science for Business" by Foster Provost and Tom Fawcett
- **Additional Reading:**
  - "Practical Business Statistics" by Andrew F. Siegel
  - "Data Visualization with Excel" by Jon Peltier
  - "Data Visualization: A Practical Introduction" by Kieran Healy

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Master of Commerce

QUANTITATIVE TECHNIQUES FOR BUSINESS DECISIONS

Course Code: COM4102 **Credit Units: 03**

Course Objective:
The objective of the course is to acquaint the students with the use of quantitative models in decision making.

Course Contents:
Module-I : Introduction
Introduction: Quantitative approach to management decision making. Linear Programming: Mathematical formulation of linear programming problems and their solution using graphic approach and simplex algorithm. Duality Sensitivity analysis. Big M Method

Module-II : Transportation
Transportation: Solving the problem, testing optimality MODI method. Cases of unbalanced problems, degeneracy, maximization objective, multiple solutions and prohibited routes.

Module-III
Assignment: Solving the problem. Cases of unbalanced problems, multiple optimum solutions, maximization objective and unacceptable assignments. Integer Programming: problem Formulation and solution.

Module-IV
Game Theory: Games of pure strategy. Games of mixed strategy. Dominance. Queuing Theory: Elements of a queuing system. Models with Poisson arrival and services rates, single server and infinite and finite population.

Module-V: Sequencing
Sequencing: n-jobs to be processed on two machines in the same order of machines. N-jobs to be processed on m machines in the same order of machines – by converting it into a two – n machine case. Two jobs to be processed on machines in the different orders of machines.

(The emphasis should be on concepts and application of concepts)
Examination Scheme:

Components	A	P	C	CT	EE
Weightage (%)	5	10	5	10	70

A-Attendance; **P**-Project/Seminar/Quiz/Viva/Home Assignment; C-Case Discussion **CT**-Class Test; **EE**-End Semester Examination

Suggested Readings:

- Levin, R.I., D.S. Rubin and J.P. Stingson, "*Quantitative Approaches toManagement"*, 1986, McGraw - Hill.
- Vohra N.D., "*Quantitative Techniques in Management "*, 3rd Edition, The McGraw Hill companies, 2006.
- Bierman H. Jr, C.P. Bonini and W.H. Hausman, "Quantitative Analysis for Business Decisions", 7th Edition, Homewood, Ill., Irwin 1983
- Taha, Hamdy A., "Operations Research: An Introduction", 8 th Edition, Prentice – Hall of India.

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AUDITING

Course Code: COM4105 **Credit Units: 03**

Course Objective:
To provide knowledge of auditing principles, procedures and techniques in accordance with the professional standards and requirements.

Course Contents:
Module-I: Introduction
Introduction to auditing Introduction – meaning- definition – difference between accountancy and auditing – types of audit—advantages of auditing – preparation before commencement of new audit

Module-II: Internal Check & Control
Internal check - Meaning and objects of internal check – internal control-meaning definition-fundamental Principles-internal check as regards wages, cash sales, cash purchases - internal check in a departmental stores-internal audit – meaning-importance – advantage and disadvantages. Duties and Responsibilities of an auditor.

Module-III: Valuation & Verification of Assets & Liabilities
Verification and valuation of assets and liabilities: Meaning and objectives – position of an auditor as regards to the valuation of assets – verification and valuation of different items – assets –fixed assets - goodwill – stock in trade – investments – liabilities – capital – debentures – bills payable sundry creditors – contingent liabilities –

Module-IV
Audit of different organizations drafting of audit program or trading and non-trading organization in a tabular form. Preparation of clean and qualified audit report with special reference to manufacturing and other Companies Audit Report 1975

Module-V
Visit an audit firm, write about the procedure followed by them in Auditing the books of accounts of a firm. Record the verification procedure with respect to any one fixed asset.
Prepare a qualified or clean audit report for a given situation.
Audit Program, Draft an audit program.

Examination Scheme:

Components	A	P	C	CT	EE
Weightage (%)	5	10	5	10	70

A-Attendance; **P**-Project/Seminar/Quiz/Viva/Home Assignment; C-Case Discussion **CT**-Class Test; **EE**-End Semester Examination

Text & References:
- TR Sharma, Auditing.
- BN Tandon, Practical Auditing.
- MS Ramaswamy, Principles and Practice of Auditing.
- Dinakar Pagare, Practice of Auditing.
- Kamal Gupta, Practical Auditing.
- P N Reddy & Appannaiah, Auditing.
- Shekar, Auditing.
- Pradeep Kumar, Auditing.
- Jagadeesh Prakash, Auditing

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COMPUTER APPLICATIONS IN BUSINESS

Course Code: COM4106 **Credit Units: 03**

Course Objective:
The purpose of this course is to equip the students with fundamental aspects of computers and communication and their application in Commerce.

Course Contents:
Module-I: Introduction
Introduction to Data Information, and knowledge and IT. Changing decision making scenario; Quality of information role of IT in information generation and value addition.

Module-II: Computer Hardware & Software
Computer Hardware and Software: Types of computer systems – micro, mini, mainframe, super. Personal Database Management System: Concept of Database Management System, database Design - Physical and Logical. Data computers –its main component and configuration. Operating system, Application Software. Programming Language.

Module-III : Introduction to Internet
Internet and World Wide Web: History and future of Internet. Web client and Web-Server. Web page and Website. Domain Name System. WWW as a marketplace. Client side programming and server - side programming.

Module-IV
Desktop Application: Important features of Word processing, Presentation, Graphics and Spreadsheet Application Software. Statistical Packages: for Analysis of Variance Multi-variate analysis, Factor, Cluster Discriminant and Regression Analysis.

Module-V : Database Management system
Databases Management System: Concept of Database Management System. Database Design – Physical and Logical. Data bases and tables Forms, Queries and Reports. SQL. Client server Architecture, Distributed Databases.

Module-VI : Networking
Fundamentals of Networking and Communication: LAN, MAN, WAN, Networking Topologies Data communication. Broad Band Communication, Wireless Mobile Communication.

Module-VII: Management Information System
Management information system: Transaction processing system (TPS) Traditional v/s contemporary TPS. Decision support system (DSS). Expert system. Recent developments in Computer Application.

Examination Scheme:

Components	A	P	C	CT	EE
Weightage (%)	5	10	5	10	70

A-Attendance; **P**-Project/Seminar/Quiz/Viva/Home Assignment; C-Case Discussion **CT**-Class Test; **EE**-End Semester Examination

Suggested Readings:
1. Comer, Douglas E. (2007), the Internet Book, New Delhi : PHI Learning Private Limited).
2. Morley, Deborah and Charles S. parker (2007) Fundamentals of Computers (New Delhi : Learning India Pvt. Ltd.)
3. Leon a. and Leon M., (2002) Fundamental of Information Technology, Vikas Software Manuals.
4. Laudon, Kenneth C. and Jane P. Laudon, (2003), Management Information Systems (New Delhi: Prentice Hall of India).

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MANAGERIAL ACCOUNTING

Course Code: COM4201 **Credit Units: 03**

Course Objective:
The objective of the course is to enable students to acquire sound Knowledge of concepts, methods and techniques of management accounting and to make the students develop competence with their usage in managerial decision making and control.

Course Contents:
Module-I: Introduction
Management Accounting – Nature and Functions; Financial vs. Management Accounting; Cost vs. Management Accounting; Role of Management Accountant, Cost Concepts and Classifications.

Module-II: Cost-Volume-Profit Analysis
Cost-Volume-Profit (CVP) Analysis – Contribution Margin; Break – Even Analysis; Profit Volume (P/V) Analysis; Multiple -Product Analysis; Optimal use of Limited Resources, Relevant Information and Short -Run Managerial Decisions – Managerial Decision Making; Decision Making Process; Differential Analysis; Types of Managerial Decisions – Make/Buy, Add/Drop, Sell/ Process Further, Operate/Shutdown, Special Order, Product-Mix, Pricing Decisions.

Module-III: Budgeting
Budgeting – Nature and functions; Preparation of Different Types of Budgets, Fixed Versus Flexible Budgeting.

Module-IV: Marginal and Standard Costing
Variable and Absorption Costing – Concept, Comparison, Applications of Variable Costing, Preparation of Income Statements. Standard Costing – Concept, Advantages; Types of Standards; Variance Analysis; Materials, Labour, Overhead; Managerial Uses of Variances.

Module-V: Responsibility Accounting
Responsibility Accounting and Divisional Performance Measurement – Advantages and Disadvantages of Divisionalisation; Concept of Responsibility Accounting; Responsibility Centres – Cost Centre, Revenue Centre, Profit Centre, Investment Centre, Responsibility Performance Reporting, Divisional Performance Measurement – Measures of Performance; Return on Investment (ROI) Versus Residual Income (RI); Non- Financial Performance Measures; Transfer Pricing Methods.

Examination Scheme:

Components	A	P	C	CT	EE
Weightage (%)	5	10	5	10	70

A-Attendance; **P**-Project/Seminar/Quiz/Viva/Home Assignment; C-Case Discussion **CT**-Class Test; **EE**-End Semester Examination

Suggested Readings:

- Atkinson Anthony A., Rajiv D. Banker, Robert Kaplan and S. Mark *Young,Management Accounting,* Prentice Hall, 2001.

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- Horngreen Charles T., and Gary L. S undem and William O. Stratton, *Introduction to Management Accounting*, Prentice Hall of India, 2006.
- Drury Colin, *Management and Cost Accounting* , Thomson Learning, 2001. 4. Garison R.H. and E.W. Noreeb, *Managerial Accounting*, McGraw Hill, 2000.
- Ronald W. Hilton, Managerial Accounting, McGraw Hill Education, 2006.
- Jawahar Lal, Advanced Management Accounting, Text, Problems and Cases, S. Chand & Co., New Delhi, 2009

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CORPORATE ACCOUNTING

Course Code: COM4203 **Credit Units: 03**

Course Objective:
This course enables the students to develop awareness about Corporate Accounting in conformity with the Provision of Companies' Act and latest amendments thereto with adoption of Accounting Standards that are likely to be introduced from time to time.

Course Contents:

Module-I: Accounting for Shares and Debentures
Accounting for share capital transactions - issue of shares at par, at premium and at discount; forfeiture and re-issue of shares; buy-back of shares; redemption of preference shares - statutory requirements, disclosure in balance sheet; rights issue, with advanced problems. Issue of debentures - accounting treatment and procedures; redemption of debentures; conversion of debentures into shares, different methods for redemption of debentures.

Module-II: Final Accounts of Company
Preparation and presentation of final accounts of joint stock companies as per company law requirements; provisions and reserves; determination of managerial remuneration; appropriation out of profits; transfer of profits to reserves; payment of dividend, transfer of unpaid dividend to Investor Education and Protection Fund; bonus shares and payment of interest out of capital.

Module-III
Accounting treatment for amalgamation, absorption and reconstruction of companies; internal and external reconstruction, Advanced Problems.

Module-IV: Holding & Subsidiary Company
Holding and subsidiary companies - accounting treatment and disclosures; consolidation of accounts.

Module-V: Valuation of Goodwill & Shares
Valuation of Goodwill and Shares
Goodwill - Meaning – Definition – Elements of goodwill – Types of Goodwill – Purchased Goodwill – Nonpurchased or inherent Goodwill – Valuation of Non-purchased Goodwill – Average Profit Method – Super Profit Method – Capitalization of Average Profit Method – Capitalization of Super Profit Method – annuity method Shares - Meaning – need for valuation – factors affecting valuation – methods of valuation – Asset Backing or Intrinsic Value Method –Yield Valuation Method – Dividend Yield –Fair Value method – value of right shares – valuation of preference shares.

Module-VI: Liquidation Accounts
Voluntary Liquidation – Preparation of Liquidator's Statement of affairs – order of payment - Calculation of commission on Assets Realized – payment to unsecured creditors – payment to Unsecured creditors other than preferential creditors – calculation of pro rata- treatment of uncalled Capital – liability of contributors.

Examination Scheme:

Components	A	P	C	CT	EE
Weightage (%)	5	10	5	10	70

A-Attendance; **P**-Project/Seminar/Quiz/Viva/Home Assignment; C-Case Discussion **CT**-Class Test; **EE**-End Semester Examination

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Text & References:

- S.N. Maheswari, Financial Accounting
- Narayanaswamy, Financial Accounting
- SP Iyengar, Advanced Accountancy
- RL Gupta, Advanced Accountancy
- Jain and Narang, Corporate Accounting
- Tulsian, Advanced Accounting

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E-COMMERCE

Course Code: COM4205 **Credit Units: 03**

Course Objective:
The purpose of this course is to develop understanding of Web - based Commerce and equip them to assess e-commerce requirements of a business and develop e –business plans and to interact with various IT professionals who m ay be developing e-commerce applications.

Course Contents:
Module-I: Introduction
Introduction to Electronic Commerce: Meaning, nature and scope; Business application of e-commerce; Global trading environment and adopting of e -commerce, evolution of World Wide Web, future of Web.

Module–II
Web-site Design: Web sites as market place; Role of web site in B2C e -commerce; Web site strategies; Web site design principles; push and pull approaches; Alternative methods of customer communication such as e -mail, BBA; E-mail etiquette and e-mail security.

Module–III
Business Models of E-Commerce; B2B, B2C, B2G and other models of e - commerce; Applications of e-commerce to supply chain management; Product and service digitisation; Remote servicing, procurement and online marketing and advertising; Applications to Customer Relationship Management. Business to Consumer E-Commerce Applications: Cataloging, Order planning and order generation; Cost estimation ad pricing; Order receipt and accounting; Order selection and prioritization; Order scheduling , fulfilling and delivery, Order billing, Post sales services.

Module–IV
Business to Business E-Commerce: Need and alternative models of B2B e - commerce; Using public and private computer networks for B2B trading; EDI and paperless trading; characteristic featur es of EDI service arrangement; Internet based EDI; EDI architecture and standards; Vans; Costs of EDI infrastructure; Reasons for slow acceptability of EDI for trading; E -marketing-Traditional web promotion; Web counters; Web advertisements. XML, XML -EDI and its application.

Module–V: E-Payment System
Electronic Payment System: Types of payment systems –e-cash and currency servers, e-cheques, credit cards, smart cards; electronic purses and debit cards; Operational, credit and legal risk of e - payment, Risk management options for epayment systems, Set standards.

Module–VI
Security Issues in E-Commerce: Risks of e-commerce –Types and sources of threats, Protecting electronic commerce assets and intellectual property; Firewalls; Client server network security; Data and message security; S ecurity tools; Digital identity and electronic signature; Encryption and concepts of public and private key infrastructure; Risk management approach to e -commerce security.

Module–VII : Environment of E-commerce
Environment of E-Commerce: Issues regarding language, culture and infrastructure, Legal environment-borders and jurisdiction, contracting and contract enforcement;58 International cyber laws – cyber laws – Aims and salient Provisions; Cyber laws in India and their limitations; Taxation and e-commerce, Ethical Issues in e - commerce.

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Examination Scheme:

Components	A	P	C	CT	EE
Weightage (%)	5	10	5	10	70

A-Attendance; **P**-Project/Seminar/Quiz/Viva/Home Assignment; C-Case Discussion **CT**-Class Test; **EE**-End Semester Examination

Suggested Readings:

- Laudon, Kenneth C. and Carol Guercio Traver (2002) E -commerce: business, technology, society. (New Delhi : Pearson Educatin).
- Awad, Elias M. (2007), Electronic Commerce: From Vision to Fulfillment (New Delhi : Pearson Education).
- Kalakota, Ravi and Marcia Robinson (2001). Business 2.0: Roadmap for Success (New Delhi : Pearson Education).
- Smith, P.R. and Dave Chaffey (2005), eMarketing eXcellence; The Heart of eBusiness (UK : Elsevier Ltd.)

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CORPORATE LAW

Course Code: COM4301 **Credit Units: 03**

Course Objectives:
The objective of the course is to familiarize the students with the nature of legal regulatory environment of corporate enterprises in India.

Course Contents:
Module–I
Provisions of the Companies Act, 2013 and case law relating to Managerial remuneration, Accounts and audit. The Companies Amendment Act, 2015 (Their Main Provisions).

Module–II
Prevention & Money Laundry Act, 2002 – Definition, Punishment for the offence of Money Laundry, Obligation of Banking Companies, Appellate Tribunal, Special Court, Fines & Penalties.

Module–III
SEBI Act, 1992 – Functions of SEBI. Powers of SEBI in relation to securities markets. Guidelines for Securities issues.

Module–IV
Consumer Protection Act, 1986 – Objectives. Rights of consumers. Mechanism of Redressal of Consumer grievances.

Module–V
Environment Protection Act, 1986 – Objectives. Powers of the Central Government, Major Provisions.

Module–VI
Foreign Exchange Management Act (FEMA). Emerging issues in Corporate Laws and Governance. Introduction, Definition, Regulation & Management of Foreign Exchange, Contravention & Penalties, Miscellaneous Provision in Brief.

Examination Scheme:

Components	A	P	C	CT	EE
Weightage (%)	5	10	5	10	70

A-Attendance; **P**-Project/Seminar/Quiz/Viva/Home Assignment; C-Case Discussion **CT**-Class Test; **EE**-End Semester Examination

Suggested Readings:

- Mayson, French & Ryan, *Company Law*, 25th edn, 2009, Oxford University Press.
- Brenda Hannigan, *Company Law*, 2009 edn, LexisNexis, UK.
- Ramaiya A, Guide to *Company Law*, 2009 edn, Wadhwa Nagpur.
- The Institute of Company Secretaries of India , *Company Law*, *Course Study Material* ,2009
- Puliani Ravi & Mahesh Puliani, *Manual of Companies Act & Corporate Lawsincluding SEBI Rules, Regulations, Etc* , Vol 1 & 2, 2009 edn, Bharat Law House Pvt.Ltd, New Delhi.
- Jain D. K, *Company Law Ready Reckoner*, 2009 edn, Bharat Law House Pvt. Ltd,New Delhi.
- Bindal C. M, Mittal P. K, Frequently *Asked Questions on Company Law (Problems &Solutions)*, 2006 edn, Bharat Law House Pvt. Ltd, New Delhi.

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COST ACCOUNTING

Course Code: COM4302 **Credit Units: 03**

Course Objective:
To get an expert knowledge in the area of cost management and cost control to enable effective management decisions.

Course Contents:

Module I: Cost Accounting
Introduction – Meaning of Cost, costing and Cost Accounting – Comparison between Financial Accounts and Cost Accounts – Application of Cost Accounting – Designing and installing a Cost Accounting system – Cost concepts and Classification of Costs – Cost Module – Cost Center – Elements of Cost – Preparation of cost sheet – Tenders and Quotations – Problems.

Module II: Labour Costing
Control of labour cost – Labour Turn Turnover – Causes and effects of labour turnover – Meaning of Time and Motion Study, Merit Rating, Job Analysis, Time keeping and Time booking – Idle time, causes and treatment – Overtime – Methods of Wage Payment, Time rate and Piece Rate – Incentive Schemes – Halsey Premium Plan – Rowan Bonus Plan – Taylor's and Merrick's differential piece rate systems – Problems.

Module III: Overhead Costing
Definition – Classification of overheads – Procedure for accounting and control of overheads – Allocation of overheads – Appointment of overheads – Apportionment of Service department costs to production departments – Repeated Distribution method – Simultaneous equation method – absorption of OH's – Methods of Absorption – Percentage of direct material cost – Direct Labour Cost – Prime Cost, Direct Labour hour rate and Machine Hour Rate – Problems.

Module IV: Costing Methods
Costing Methods Introduction - Job Costing – Batch Costing – Contract Costing-
Process Costing – principles – distinction between Process and Job – Preparation of process accounts – treatment of normal loss – abnormal loss – abnormal gain – Joint and By-products. Service costing. Unit, Output and Operating Costing,

Module V:
Reconciliation of Cost and Financial Accounts - Need for reconciliation – Reasons for difference in profits – Problems on preparation of Reconciliation statements including Memorandum Reconciliation account,

Examination Scheme:

Components	A	P	C	CT	EE
Weightage (%)	5	10	5	10	70

A-Attendance; **P**-Project/Seminar/Quiz/Viva/Home Assignment; C-Case Discussion **CT**-Class Test; **EE**-End Semester Examination

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Text & References:

- N.K. Prasad : Cost Accounting
- Nigam & Sharma : Cost Accounting
- Khanna Pandey & Ahuja : Practical Costing
- M.L. Agarwal : Cost Accounting
- Jain & Narang : Cost Accounting
- S.P. Iyengar : Cost Accounting
- S.N. Maheshwari : Cost Accounting
- Horngren : Cost Accounting : A Managerial Emphasis
- M. N. Arora : Cost Accounting
- Dutta : Cost Accounting
- Khan & Jain : Cost Accounting

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ADVANCE BUSINESS STATISTICS AND RESEARCH METHODOLOGY

Course Code: COM4303 **Credit Units: 03**

Course Objective:
The objective of the course is to acquaint students with some of the important statistical techniques for managerial decision making .The emphasis will be on their applications to business and economic situations.

Course Contents:
Module-I: Probability and Expectation
Probability and Expectation: Approaches to probability. Addition, multiplication and Bayes Theorem, Mathematical Expectation. Probability Distribution: Binomial, Poisson, Exponential, Beta and Normal Distributions.

Module-II: Statistical Decision Theory
Statistical Decision Theory: Risk and uncertainty, Expected value approach, Marginal analysis, Decision tree.

Module-III: Sampling and Sampling Distributions
Sampling and Sampling Distributions: Methods of sampling, Sampling distribution of a statistic and its standard error. Point Estimation and interval estimation, Properties of an estimator.

Module-IV: Hypothesis Testing
Hypothesis Testing; Power of a test, Large sample tests for proportions, means and standard deviations. Small sample tests –t and F tests. Design of Experiments and analysis of variance. Non-Parametric Tests: Chi-square test, Sign test, Median test and Rank correlation test.

Module-V: Inventory Control
Inventory Control: Techniques of selective control, Economic order quantity (EOQ) models- classical, gradual replenishment without shortages, price breaks and planned stock outs, Deciding optimum safety stock and reorder level. PERT/CPM: Networking with one estimate of time. Networks with three estimates of time. Time-cost trade-off. PERT/cost. Resource allocation and resource leveling.

Module-VI: Regression Analysis
Regression Analysis: Simple and linear regression analysis up to three variables. Statistical Quality Control: Control charts for variables and attributes, Acceptance sampling.

Case Studies: Application of statistics to some cases of business enterprise are required to be discussed.

Examination Scheme:

Components	A	P	C	CT	EE
Weightage (%)	5	10	5	10	70

A-Attendance; **P**-Project/Seminar/Quiz/Viva/Home Assignment; C-Case Discussion **CT**-Class Test; **EE**-End Semester Examination

Suggested Readings:

- Levin, R.I. and D.S. Rubin, *Statistics for Management* , Prentice-Hall of India.
- Spiegel, M.R. *Theory and Problems of Statistics* , Schaum Publishing Company.
- Aczel, Amir D., *Complete Business Statistics*, McGraw Hill, 1999.
- Kazmeir Leonard J., Norval F. Pohl, *Basic Statistics for Business and Economics* , McGraw Hill International (2nd ed.)

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INCOME TAX LAW AND PRACTICE

Course Code: COM4304 **Credit Units: 03**

Course Objective:
To prepare the students with the concepts and theory of income tax accounting and to give a practical exposure to them

Course Contents:
Module I:
(a) Conceptual Frame-work: Definitions: Residential status and incidence of tax.
(b) Exemptions and exclusions: Exempted income and incomes not included in total income

Module II:
Heads of Income (1): (i) Salaries (ii) Income from House Property

Module III:
Head of Income (2):Profits and gains of Business or Profession; depreciation allowance, capital gains and income from other sources

Module IV:
Deductions from GTI: Rebates and reliefs, Clubbing provisions; set off and carry forward of losses. Assessment of an Individual

Module V:
Assessment of H.U.F./Firm/A.O.P.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Texts & References:
Texts:
- Income Tax, Kanga & Palkiwala, N.M. Tripathi & Sons Ltd., Bombay
- India Income Tax Law, Sampat Ayenger

References:
- Income Tax Law and Accounts, R.R. Gupta Agra Book Store
- Income Tax Law and Accounts for M.Com., H.C. Mehrotra, Sahitya Bhawan,Agra
- Income Tax Manual, Government of India publication
- Student's Guide to Income Tax, Singhania, Vinod K. & Monika, Taxma

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TAX PLANNING & TAX MANAGEMENT

Course Code: COM4305 **Credit Units: 03**

Course Objectives:
To Provide an in depth knowledge of tax-laws and their impact on management decisions. The course will help the students to understand the intricacies of tax planning and management.

Course Contents:
Module-I: Recognised Methods of Tax Planning, Problems of Tax Planning and Tax Management

Module-II: Tax Planning for Individuals and H.U.F.

Module-III: Tax Planning For Non-corporate entities: Partnership firms and Association of person

Module-IV: Corporate Tax Planning
Tax Planning for Corporate entities, Public and Private Companies, Tax incentives, Tax incentives for Industrial growth, tax holidays and other reliefs and rebates

Module-V: Assessment of Charitable Trust, Assessment of Non-Resident, Special procedure for assessment of search cases, Application of Computer technique in Tax Management

Examination Scheme:

Components	A	P	C	CT	EE
Weightage (%)	5	10	5	10	70

A-Attendance; **P**-Project/Seminar/Quiz/Viva/Home Assignment; C-Case Discussion **CT**-Class Test; **EE**-End Semester Examination

Suggested Readings

- Singhania, V.K. : Direct Taxes Law and Practice, Taxman Publications (Pvt.) Ltd., Delhi
- Sukumar Bhattacharya : Indian Income Tax Law and Practice, Wadhwa & Co., Agra Nagpur
- Srinivas, E.A.: Corporate Tax Planning, Tata Mcgraw Hill Publishing Co. Ltd.
- Palkiwala, N.A. and Palkiwala, B.A.: Law and Practice of Income Tax, N M. Tripathi Bombay
- Iyengar Sampat, A.C.: Law of Income Tax, Bharat Publishing House Allied Publishers
- Shah, D.D. : A Treatise on Tax Planning N.M. Tripathi , Bombay
- Lakhotia, R.U. : How to Save Income Tax by Tax Planning , Asia Pub. House, Calcutta
- Raina, H.P. : Corporate Taxation A Hand Book , Orient Law House , New Delhi/ Allahabad
- Lakhotia , R.N. : Tax Management , A Pitmans Publication, Calcutta
- Study Material of the Institute of Company Secretaries of India

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ADVERTISING AND SALES MANAGEMENT

Course Code: COM4310 **Credit Units: 03**

Course Objective:
The course aims at enabling the students to develop an in -depth understanding of the modern concepts and latest techniques of advertising and personal selling and sales force management which constitute a fast -growing area of marketing.

Course Contents:
1. Section A
Advertising:
Module-I: Introduction to Communication
Communication Basics: Role of communication; Communication process and flows; Planning the promotion mix; Advertising: Nature and importance; Advertising and the economy; Advertising and publicity; Advertising management process – an overview; Determining target audience; Advertising objectives and positioning decisions; Advertising budget decisions.

Module-II: Message Decision
Message Decision: Determining advertising message; Developing advertising copy – Headline main copy, logo, illustration, appeal, layout, creativity in advertising. Media Planning: Types of media and their merits and limitations; Advertising through the internet; Media selection; Media scheduling.

Module-III: Organization of Advertising Operations
Organization of Advertising Operations : In -house vs. advertising agency arrangements; Managing advertising agency relations ; Evaluation of advertisement and campaign effectiveness – Before - and – after advertising tests and techniques.

Module-IV: Advertising in India
Advertising in India; Social and regulatory aspects of advertising. Recent developments and issues in advertising.

2. Section B
Sales Management:
Module-V: Fundamentals of Personal Selling
Fundamentals of Personal Selling: Nature and importance of selling; Types of selling; Personal selling, salesmanship and sales management; Process of effective selling; Strategic Sales management.

Module-VI: Sales Planning
Sales Planning: Setting personal selling objective; Market analysis and sales forecasting; Sales budget; Sales territory; Sales quota. Sales Organization: Organization structure; relationship of sales department with other departments; Distribution networks relationship.

Module-VII: Sales Force Management
Sales Force Management: Recruitment and selection; training and development; motivating, supervising and compensating sales personnel; Controlling the sales effort; Evaluation of sales personnel; Sales and cost analysis. Ethical and legal aspects of selling.

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Examination Scheme:

Components	A	P	C	CT	EE
Weightage (%)	5	10	5	10	70

A-Attendance; **P**-Project/Seminar/Quiz/Viva/Home Assignment; C-Case Discussion **CT**-Class Test; **EE**-End Semester Examination

Suggested Readings:

- Aaker, David A., Rajeev Batra and John G. Mayers, *Advertising Management*, Prentice Hall of India, New Delhi.
- Belch. George and Michael Belch, Advertising and Promotion : An Integrated Marketing Communications Perspective 6 th Ed., McGraw Hill, 2004.
- Mandell, Maurice, *Advertising* , Prentice- Hall of India, New Delhi.
- Still, Richard R. Edward W. Cundiff and Norman A.P.Govoni, *Sales Management:Decisions, Strategies and cases*, Prentice Hall of India, New Delhi.
- Anderson B. Robert, *Professional Selling*, Prentice-Hall Inc.
- Spiro, Rosann, William J. Stanton and Greg Richo, *Management of a Sales Force*, McGraw Hill/Irwin, 2007.
- Pederson Carlton A/, Miburn D. Wright, Barton A, Weitz, *Selling Principles and Methods*, Richard D. Irwin, IIIinois.

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SUMMER INTERNSHIP EVALUATION

Course Code: COM4335 **Credit Units: 06**

GUIDELINES FOR INTERNSHIP FILE

There are certain phases of every Intern's professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship program can best be described as an attempt to institutionalise efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal class room situations. These attributes are intellectual ability, professional judgment and decision making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc.

In order to achieve these objectives, each student will maintain a file (Internship File). The Internship File aims to encourage students to keep a personal record of their learning and achievement throughout the Programme. It can be used as the basis for lifelong learning and for job applications. Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development.

The File will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and their own personal contribution to the organization.

The layout guidelines for the Internship File

- A4 size Paper
  - font: Arial (10 points) or Times New Roman (12 points)
  - line spacing: 1.5
  - top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

The File will include *five sections* in the order described below. The content and comprehensiveness of the main body and appendices of the report should include the following:

1. The Title Page--Title - An Internship Experience Report for (Your Name), name of internship organization, name of the Supervisor/Guide and his/her designation, date started and completed, and number of credits for which the report is submitted.
2. Table of Content--an outline of the contents by topics and subtopics with the page number and location of each section.
3. Introduction--short, but should include how and why you obtained the internship experience position and the relationship it has to your professional and career goals.
4. Main Body--should include but not be limited to daily tasks performed. Major projects contributed to, dates, hours on task, observations and feelings, meetings attended and their purposes, listing of tools and materials and their suppliers, and photographs if possible of projects, buildings and co-workers.
5. Appendices--include pamphlets, forms, charts, brochures, technical and descriptive literature, graphs and other information related to your Internship experience.

The Main Body will have three sections and will include the following items which will be evaluated for the final assessment:-

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An analysis of the company/organization in which the student is working

A personal review of the student's management skills and how they have been developed through the programme.

The research report that the student has prepared on the project assigned to him by the organization. (Incase a student is not assigned a specific research project in the organization, he has to select any one aspect of the organization and prepare a research report on it).

ASSESSMENT OF THE INTERNSHIP FILE

The student will be provided with the Student Assessment Record (SAR) to be placed in front of the Internship File. Each item in the SAR is ticked off when it is completed successfully. The faculty will also assess each item as it is completed. The SAR will be signed by the student and by the faculty to indicate that the File is the student's own work. It will also ensure regularity and meeting the deadlines.

STUDENT ASSESSMENT RECORD (SAR)

Management File Item	Criteria for successful completion of the item
1. Analysis of organization (1500- 2000 words)	• Clear presentation of ideas and analysis • Provides an organizational diagram, following organization presentation conventions • Analysis covers the organization's: ➢ Business strategy and mission ➢ Structure ➢ Resources and assets ➢ Current financial performance ➢ Leadership/decision-making style ➢ Staffing and skill base ➢ Products/services and customers
2. Personal review of Management skills development (1000-1500 words)	• Clear presentation of ideas and analysis • Demonstrate awareness of own management skills • Presents critical analysis of own management effectiveness, supported with examples • Provides evidence of development of specific management skills e.g. strategic, financial, leadership • Explains how new skills and learning have benefited the organization and self
3. Design of Research Project (1500- 2000 words)	• Clear presentation of ideas and analysis • Justifies the choice of subject for the research project and why this might be beneficial to the organization • Selects and justifies appropriate research methods for the project • Demonstrate understanding of the key stages in undertaking a research project • Indicates which analytical/statistical tools would be most appropriate and why • The design plan takes account of the resourcing implications of carrying out the research e.g. staffing and other costs

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Examination Scheme:

Report by Student (Internship File)	
a. Organization & Presentation/Language and clarity /substance of Contents covered and Comprehensiveness	20%
b. Research Report	30%
Industry Feedback (continuous)	20%
Presentation & Viva (At the end)	30%
Total	**100%**

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CORPORATE TAX PLANNING

Course Code: COM4402 **Credit Units: 03**

Course Objective:
The aim of this course is to familiarize the student with major latest provisions of the Indian tax laws and related judicial pronouncements pertaining to corporate enterprises having implications for various aspects of Corporate planning with a view to derive maximum possible tax benefits admissible under the law.

Course Contents:
Module-I: Introduction
Meaning of tax planning and management, tax evasion and tax avoidance; Nature and scope of tax planning and management in the corporate sector; Justification of corporate tax planning and management.

Module-II: Computation of corporate tax
Computation of corporate tax: Carry forward and set off of losses in the case of certain companies under Sec. 79 of Income -tax Act, 1961; Computation of taxable income of companies; Computation of the amount of corporate tax liability; Minimum Alternate Tax; Tax on distributed profits of domestic companies; Tax on income distributed to unit holders.

Module-III
Implications of Tax concessions and incentives for corporate decisions in respect of setting up a new business, location of business and nature of business.

Module-IV: Tax Planning
Tax planning with reference to financial management decisions: Capital structure decisions; Dividend Policy; Bonus Share; Investments and Capital Gains. Tax planning with reference to managerial decisions: Owning or leasing of an asset; purchasing of assets by installment system or Hire System; Purchasing of an asset out of own funds or out of borrowed capital; manufacturing or buying; Repairing, replacing, renewing or renovating an asset; Sale of assets used for scientific research; Shutting down or continuing operations.

Module-V
Foreign collaborations and incidence of taxation on domestic companies ; provisions for relief in respect of double taxation; important Double Taxation Avoidance Agreements with different countries like USA, UK, Germany, France, etc.

Examination Scheme:

Components	A	P	C	CT	EE
Weightage (%)	5	10	5	10	70

A-Attendance; **P**-Project/Seminar/Quiz/Viva/Home Assignment; C-Case Discussion **CT**-Class Test; **EE**-End Semester Examination

Suggested Readings:
- E.A. Srinivas, *Corporate Tax Planning*, Tata McGraw Hill.
- Vinod K. Singhania, Taxmann's *Direct Taxes Planning and Management.*
- V.S. Sundaram, *Commentaries on the Law of Income- Tax in India*, Law Publishers,
- Allahabad.
- A.C. Sampath Iyengar, *Law of Income Tax*, Bharat Publishing House, Allahabad.
- Taxman, *The Tax and Corporate Law* Weekly.
- Bhagmati Prasad, Direct Taxes Laws Practice, Wishwa Prakashan.

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INDUSTRIAL LAW

Course Code: COM4404 **Credit Units: 03**

Course Objective:
The course is designed to provide an understanding of certain industrial legislations in the context of the Indian Socio – economic conditions.

Course Contents:

Module-I: The factories Act, 1948
The factories Act, 1948 : Objects, provisions relating to hazardous process, health, safety, welfare, working hours, leave etc. of workers, approval, licensing and registration of factories , manager and occupier – their obligations, power of the authorities under the Act, penal provisions.

Module-II: The payment of Bonus Act, 1965
The payment of Bonus Act, 1965: Object, Scope and Application, Definitions, Calculation of amount payable as Bonus, Eligibility for Bonus, Disqualification for Bonus; Minimum & maximum Bonus, Set on & Set off of Allocable Surplus, Application of Act in Establishment in Public Sector, Bonus linked with Production or Productivity.

Module-III: The Employees State Insurance Act, 1948
The Employees State Insurance Act, 1948: Objects, Definitions, Application, Employees State Insurance Scheme, Employees' State Insurance corporation, Constitution-Powers and Duties of the Corporation, Wings of the Corporation, Employees' State Insurance Fund, Contribution, Benefits.

Module-IV: The Industrial Disputes Act, 1947
The Industrial Disputes Act, 1947: Objects, authorities for settlement of industrial disputes, reference of industrial disputes, procedure, powers and duties of authorities, settlements and awards, strikes , lock-outs, lay-off, retrenchment, transfer and closure, unfair labour practices, miscellaneous provision.

Module-V: The Trade Unions Act, 1926
The Trade Unions Act, 1926: Objects, registration of trade unions, rights and liabilities of registered trade unions -procedure, penalties. The Workmen's compensation Act, 1923: Objects, Employer's liability for compensation, amount of compensation, distribution of compensation, notice and claims, remedies of employers against stranger, commissioners for workmen's compensation.

Module-VI: The Employees' Provident Funds & Miscellaneous provision Act, 1952
The Employees' Provident Funds & Miscellaneous provision Act, 1952: Objects, Schemes under the Act. Employees' Provident Fund Scheme, Employees' pension Scheme, 1995, Employees' Deposit linked Insurance Scheme, Determination and Recovery of Money due from and by employers, protection against attachment.

Module-VII: Wage Act, 1936
The payment of Wage Act, 1936: Objects, Application, responsibility for payment of wages, wage periods, time-limits, Deduction from wages , remedy available to worker for delay or unauthorized education.

Module-VIII: Payment of Gratuity Act, 1972
The Payment of Gratuity Act, 1972: Object, continuous service, controlling authority, payment of Gratuity, Compulsory insurance, Nomination, Recovery of Gratuity, Protection of Gratuity.

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Examination Scheme:

Components	A	P	C	CT	EE
Weightage (%)	5	10	5	10	70

A-Attendance; **P**-Project/Seminar/Quiz/Viva/Home Assignment; C-Case Discussion **CT**-Class Test; **EE**-End Semester Examination

Suggested Readings:

- Malik P. L, *Labour and Industrial Law, 9th edn, 2009, Eastern* Book Company, Lucknow.
- Sharma J. P, *Simplified Approach to Labour* Laws 3rd edn, 2009, Bharat Law House Pvt. Ltd, New Delhi.
- Kumar H. L, *Digest of Labour Cases-1990 –2009,* Universal Law Publishing Co Pvt Ltd, Delhi.
- Singh Avtar, *Introduction to Labour & Industrial Law*, 2009 edn, Wadhwa and Company, Nagpur.
- Sharma J. P, *Employees' Provident Funds and Miscellaneous Provisions Act, 1952 with frequently Raised Queries including Schemes & Rules,* 2nd edn, 2009, Bharat Law House Pvt. Ltd, New Delhi
- Sharma J. P, *Employees' State Insurance Act, 1948 with Frequently Raised Queries,* 2nd edn, 2009, Bharat Law House Pvt. Ltd, New Delhi
- Sharma J. P, *Factories Act, 1948 with Frequently Raised Queries* , 2nd edn, 2009, Bharat Law House Pvt. Ltd, New Delhi

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INTERNATIONAL ACCOUNTING

Course Code: COM4405 **Credit Units: 03**

Course Objective:
The objective of this course is to develop some conceptual knowledge and understanding of international accounting issues among students. In addition, this course makes students capable of tackling issues in prevailing regulatory environments.

Course Contents:
Module-I: Introduction
International Dimensions of accounting and control: Multinational enterprise, Inter-nationalisation of capital markets, Internationalization of accounting profession. Operational and conceptual issue.

Module-II
Foreign currency translations, methods and practices, & their applications. Specific Reporting Issues: Regulatory Disclosure Requirements; Foreign Operations Disclosure; Social Responsibility Disclosures.

Module-III: Managerial Accounting Issues
Managerial Accounting Issues: Strategic Planning; Management Control Systems; Performance Evaluation of foreign operations.

Module-IV: International Standards and Organization
International Standards and Organization: Advantages, supporting and deterring forces; International and Regional Efforts in Standard Setting; International Standards setting process, Harmonisation; International Accounting Standards Board; Accounting and Auditing Standards.

Module-V: Financial Statement Analysis of companies
Financial Statement Analysis of companies and countries differences in accounting principles, foreign currency statements and Ratio Analysis.

Module-VI: Transfer Pricing
Transfer pricing, methods, objectives, strategies. Emerging issues in International Accounting.

Examination Scheme:

Components	A	P	C	CT	EE
Weightage (%)	5	10	5	10	70

A-Attendance; **P**-Project/Seminar/Quiz/Viva/Home Assignment; C-Case Discussion **CT**-Class Test; **EE**-End Semester Examination

Suggested Readings:

- Radebaugh L. H. and S.J. Gray, *International Accounting*, and Multinational Enterprises, John Wiley & Sons, 2002 .
- Sandagaran S.M., *International Accounting,* South Western, 2001.
- Gray, S.J., *International Accounting and Transnational Decisions* , Butterworth, London, U.K.,
- Holzer H. Peter, *International Accounting,* Horper and Row Publishers, New York.
- Frederick D.S. Choi and Gary K. Meek, *International Accounting*, Pearson Education, 2005
- Shirin Rathore, *International Accounting* Prentice Hall of India, 2008.

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PRINCIPLES & PRACTICE OF TAXATION & INDIAN TAX SYSTEM

Course Code: COM4406 **Credit Units: 03**

Course Objective:
The purpose of this course is to familiarize and update the students with the basic principles of taxation and the actual operation of income tax in the Indian economy.

Course Contents:

Module I
International comparison of taxes; Tax-GDP ratios; Direct and indirect taxes –inflation adjustment schemes in selected countries. The problems of international double taxation – The assignment rules: source versus residence – methods to alleviate international tax duplication: Tax credit relief; Double tax treaties: OECD Models; United Nations Model – International tax avoidance and evasion; transfer pricing; Tax havens – Anti-avoidance measures.

Module II
Tax bases and tax policy – Determinants of tax yield – Classification of taxes: Direct and indirect taxes; OECD classification; Progressive, proportional and regressive taxes; Ad-valorem and specific taxes. Taxes and inflation; Taxes and savings; Taxes and Labour supply – Tax equity : Benefit principle of Taxation; Ability-to-pay principle of taxation.

Module III
Incidence of Taxation: Factors determining extent of tax shifting – Taxation and efficiency: Excess burden of taxation; Administrative costs; Compliance costs – Tax incentives: Various forms; Rationale; Problems created by tax incentives. Tax avoidance and tax evasion – Tax ratio, taxable capacity and tax effort. Trends in tax- GDP ratio – relative roles of direct and indirect taxes;

Module IV
Distribution of tax burden – Buoyancy and elasticity of tax revenue – Tax evasion. Distribution of taxation powers between the Center and the States in the constitution of India; Restrictions on the taxation powers of the States; sharing of Central taxes; Rationale for constitutional arrangements.

Module V
Residential status and income tax liability – incomes exempt from tax – tax holiday schemes. Set off and carry forward of losses – Rebates – tax incentives for savings. Tax treatment of capital gains – Main features of company taxation – Taxation of partnership firms – Taxation of small traders (presumptive tax) – Tax amnesties.
Case Studies : Some case studies involving the learning from the course.

Examination Scheme:

Components	A	P	C	CT	EE
Weightage (%)	5	10	5	10	70

A-Attendance; **P**-Project/Seminar/Quiz/Viva/Home Assignment; C-Case Discussion **CT**-Class Test; **EE**-End Semester Examination

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Suggested Readings:

- Richard Musgrave and Peggy Musgrave, Public Finance in Theory and Practice (New York: McGraw Hill Book Company, 5th Edition, 1989).38
- Richard Goode, Government Finance in Developing Countries (New Delhi. TataMcGraw Hill Publishing Company Ltd., 1986)
- Government of India, Ministry of Finance, Report of the Indirect Taxation Enquiry Committee (Chairman, L.K.Jha), Part I (November 1977) and Part II (January 1978).
- Government of India , Ministry of Finance, Speeches of Union Finance Ministers, 1947-48 to 1984-85 (New Delhi, 1984).
- Vinod K. Singhania, Direct Taxes: Law and Practice (Delhi :Taxmann Publications (P) Ltd.,) Latest edition.

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INTERNATIONAL FINANCIAL MANAGEMENT

Course Code: COM4408 **Credit Units: 03**

Course Objective:
The objective of the course is to acquaint the students with financial management problems of multinational corporations and prepare them to tackle these problems.

Course Contents:

Module I
International Monetary System: Developments in the international monetary system, gold standard, Bretton Woods system of exchange rate, exchange rate regime since mid-1970s. IMF and international Liquidity. System of exchanging currencies. Exchange rate quotation and determination: direct and indirect quotes, bid and ask quote, spot and forward quote, cross rates. Determination of exchange rate in spot and forward market. PPP theory, IRP theory, Monetary theories of exchange rate determination, Overshooting models.

Module II
Foreign exchange market – spot and forward. Participants in foreign exchange market – arbitraging, hedging and speculation, covered interest rate arbitrage. Borrowing and investing markets. Tax consideration and investment. Exchange rate risk: translation, transaction and real operating exposure – their measurement and management. Investment decisions of multinational corporations (MNCs): International capital budgeting – estimation of cash flows, the cost of capital. Portfolio consideration of a multinational corporation.

Module III
International Financial markets: Multilateral development banks, Euro-currency markets, Euro-banking, Market for international securities – international bonds, Euro notes and Euro-notes and Euro-commercial papers, Medium-term Euro-notes. Market for derivatives, currency futures, options and synthetics, currency risk management, financial swaps and interest – rate risk management. Assessment and management of political risk.

Module IV
International working capital management: Cash management. Management of receivables and inventory. Financing of foreign trade: Foreign trade documents, modes of payment, Preshipment, post-shipment and medium-term credit, Forfaiting. International accounting: Consolidation and harmonisation of accounts. Transfer pricing.

Module V
Case Studies: Some case studies involving the conceptual learning from the course are required to be discussed.

Examination Scheme:

Components	A	P	C	CT	EE
Weightage (%)	5	10	5	10	70

A-Attendance; **P**-Project/Seminar/Quiz/Viva/Home Assignment; C-Case Discussion **CT**-Class Test; **EE**-End Semester Examination

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Suggested Readings:

- Levi, Maurice, International Finance, New York, McGraw Hill Inc., 1996.
- Eiteman, David K., Arthur Stonehill and Michael H. Moffett, Multinational Business Finance, Reading mass., Addision – Wesley Publishing company,1998.
- Shapiro, Allen C., Multinational Financial Management, New Delhi, Prentice Hall India Pvt. Ltd., 1995.
- Apte P.G., Multinational Financial Management, New Delhi, Tata McGraw Hill, 1998
- 5.Seth A.K., International Financial Management, New Delhi, Galgotia Publishing

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MARKETING RESEARCH

Course Code: COM4409 **Credit Units: 03**

Course Objective:
The course aims at exposing the students to the concept, tools and techniques of marketing research and developing their skills to be able to apply research techniques to aid marketing decision making.

Course Contents:
Module I
Introduction : Meaning, nature and importance of marketing research; Marketing research and scientific method; Research reliability and validity; Problems in conducting marketing research; Marketing information system (MIS); Ways of conducting marketing research; Syndicated research.

Module II
Marketing Research Process : Steps involved in conducting marketing research; Problem identification; Determining information needs; Developing marketing research proposal.

Module III
Research Design : Meaning and importance; Types of research designs – explorative, descriptive and conclusive researches; Secondary data – sources, uses and limitations; Primary data collection methods – questioning techniques and observation methods; Online data sources and research; Questionnaire preparation.

Module IV
Sample Design and Field Work : Defining universe and sampling unit; Determining sampling frame; Probability and non-probability sampling methods; Sample size determination; Field work and data collection – sampling and non-sampling errors.
Data Analysis and Report Preparation: Data editing, coding tabulation and graphical presentation; Univariate and multivariate data analyses techniques and their applications in marketing research; Report preparation, presentation and follow-up.

Module V
Marketing Research Applications : Consumer research – behaviour and motivation research, attitude measurement and scaling techniques; Product research; Advertising research; Marketing and sales forecasting; Sales analysis. Marketing Research in India : Status, organization and developments; Ethical issues in marketing research.

Examination Scheme:

Components	A	P	C	CT	EE
Weightage (%)	5	10	5	10	70

A-Attendance; **P**-Project/Seminar/Quiz/Viva/Home Assignment; C-Case Discussion **CT**-Class Test; **EE**-End Semester Examination

Suggested Readings :

- Harper W. Boyd, Ralph Westfall and Stanley F. Stasch, Marketing research: Text and Cases, 2005.
- Malhotra, Naresh K., Marketing Research, 5th Ed., Prentice Hall of India.
- Cooper, Donald R. and Pamela S. Schindler, Marketing Research, Tata McGraw Hill, 2005.
- Paul E. Green, et.al., Research for Marketing Decisions, Prentice-Hall of India Pvt. Ltd, New Delhi.
- Donald S. Tull and Del I. Hawkins, Marketing Research: Measurement and Methods, Prentice-Hall of India Pvt. Ltd. New Delhi, 1998

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DISSERTATION

Course Code: COM4437 **Credit Units: 06**

The Aims of the Dissertation

The aim of the dissertation is to provide you with an opportunity to further your intellectual and personal development in your chosen field by undertaking a significant practical unit of activity, having an educational value at a level commensurate with the award of your degree

The dissertation can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

The Dissertation Topic

It is usual to give you some discretion in the choice of topic for the dissertation and the approach to be adopted. You will need to ensure that your dissertation is related to your field of specialisation.

Deciding this is often the most difficult part of the dissertation process, and perhaps, you have been thinking of a topic for some time.

It is important to distinguish here between 'dissertation topic' and 'dissertation title'. The topic is the specific area that you wish to investigate. The title may not be decided until the dissertation has been written so as to reflect its content properly.

Few restrictions are placed on the choice of the topic. Normally we would expect it to be:

- relevant to business, defined broadly;
- related to one or more of the subjects or areas of study within the core program and specialisation stream;
- clearly focused so as to facilitate an in-depth approach, subject to the availability of adequate sources of information and to your own knowledge;
- of value and interest to you and your personal and professional development.

Planning your dissertation

This will entail following:

- Selecting a topic for investigation.
- Establishing the precise focus of your study by deciding on the aims and objectives of the dissertation, or formulating questions to be investigated. Consider very carefully what is worth investigating and its feasibility.
- Drawing up initial dissertation outlines considering the aims and objectives of the dissertation. Workout various stages of dissertation
- Devising a timetable to ensure that all stages of dissertation are completed in time. The timetable should include writing of the dissertation and regular meetings with your dissertation guide.

The dissertation plan or outline

It is recommended that you should have a dissertation plan to guide you right from the outset. Essentially, the dissertation plan is an outline of what you intend to do, chapter wise and therefore should reflect the aims and objectives of your dissertation.

There are several reasons for having a dissertation plan

- It provides a focus to your thoughts.
- It provides your faculty-guide with an opportunity, at an early stage of your work, to make constructive comments and help guide the direction of your research.

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- The writing of a plan is the first formal stage of the writing process, and therefore helps build up your confidence.
- In many ways, the plan encourages you to come to terms with the reading, thinking and writing in a systematic and integrated way, with plenty of time left for changes.
- Finally, the dissertation plan generally provides a revision point in the development of your dissertation report in order to allow appropriate changes in the scope and even direction of your work as it progresses.

Keeping records

This includes the following:

- Making a note of everything you read; including those discarded.
- Ensuring that when recording sources, author's name and initials, date of publication, title, place of publication and publisher are included. (You may consider starting a card index or database from the outset). Making an accurate note of all quotations at the time you read them.
- Make clear what is a direct quotation and what is your paraphrase.

Dissertation format

All students must follow the following rules in submitting their dissertation.

- Front page should provide title, author, Name of degree/diploma and the date of submission.
- Second page should be the table of contents giving page references for each chapter and section.
- The next page should be the table of appendices, graphs and tables giving titles and page references.
- Next to follow should be a synopsis or abstract of the dissertation (approximately 500 words) titled: **Executive Summary**
- Next is the 'acknowledgements'.
- Chapter I should be a general introduction, giving the background to the dissertation, the objectives of the dissertation, the rationale for the dissertation, the plan, methodological issues and problems. The limitations of the dissertation should also be hinted in this chapter.
- Other chapters will constitute the body of the dissertation. The number of chapters and their sequence will usually vary depending on, among others, on a critical review of the previous relevant work relating to your major findings, a discussion of their implications, and conclusions, possibly with a suggestion of the direction of future research on the area.
- After this concluding chapter, you should give a list of all the references you have used. These should be cross - references with your text. For articles from journals, the following details are required e.g.
  Draper P and Pandyal K. 1991, The Investment Trust Discount Revisited, Journal of Business Finance and Accounting, Vol18, No6, Nov, pp 791-832.
  For books, the following details are required:
  Levi, M. 1996, International Financial Management, Prentice Hall, New York, 3rd Ed, 1996

- Finally, you should give any appendices. These should only include relevant statistical data or material that cannot be fitted into the above categories.

Guidelines for the assessment of the dissertation

While evaluating the dissertation, faculty guide will consider the following aspects:

1. Has the student made a clear statement of the objective or objective(s).
2. If there is more than one objective, do these constitute parts of a whole?
3. Has the student developed an appropriate analytical framework for addressing the problem at hand.
4. Is this based on up-to-date developments in the topic area?
5. Has the student collected information / data suitable to the frameworks?
6. Are the techniques employed by the student to analyse the data / information appropriate and relevant?
7. Has the student succeeded in drawing conclusion form the analysis?
8. Do the conclusions relate well to the objectives of the project?

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9. Has the student been regular in his work?
10. Layout of the written report.

Examination Scheme:

Dissertation:	75
Viva Voce:	25
Total:	**100**

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ACCOUNTING

Programme Structure

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits
COM2151	Financial Accounting-I	3	-	-	3
COM2251	Financial Accounting-II	3	-	-	3
COM2351	Corporate Accounting	3	-	-	3
COM2451	Financial Management	3	-	-	3
COM2551	Cost Accounting	3	-	-	3
COM2651	Management Accounting	3	-	-	3
	TOTAL				**18**

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ACCOUNTING

Syllabus - Semester First

FINANCIAL ACCOUNTING-I

Course Code: COM2151 **Credit Units: 03**

Course Objective:
To develop conceptual understanding of the fundamentals of financial accounting system which processes transactions and other events through a book-keeping mechanism to prepare financial statements, and also to impart skills in accounting for recording various kinds of business transactions.

Course Contents:
Module I
Financial Accounting Concepts, importance and scope, Single entry vs Double entry system of accounting. Journal, Ledger, Trial Balance, Errors and their rectification, Cash Book, Bank reconciliation statement.

Module II
Final accounts, receipts and payments, income and expenditure accounts, balance sheet.

Module III
Depreciation accounting and its methods, Inventory valuation and its methods. Accounting for Hire Purchase Transactions, Journal entries and ledger accounts in the books of Hire Vendors and Hire purchaser

Module IV
Inland Branches: Dependent branches only and ascertainment of profit by debtors method and stock and debtors method.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Text & References:
- Dr. S.N. Maheswari, Financial Accounting
- BS Raman, Financial Accounting
- Grewal and Gupta, Advanced Accounting
- Radhaswamy and R.L. Gupta, Advanced Accounting
- S.Kr. Paul, Advanced Accounting
- P.C. Tulasian, Pearson Editions, Introduction to Accounting
- Jain &Narang, Financial Accounting
- Sehgal, A and Sehgal,D "Advanced Accounting", Part – 1, Taxmann Applied services, New Delhi

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Syllabus - Semester Second

FINANCIAL ACCOUNTING-II

Course Code: COM2251 **Credit Units: 03**

Course Objective:
To develop conceptual understanding of the fundamentals of financial accounting system which processes transactions and other events through a book-keeping mechanism to prepare financial statements, and also to impart skills in accounting for recording various kinds of business transactions.

Course Contents:
Module I
Consignment and Joint Venture Accounts:
(i) ***Consignments:*** Features, Accounting treatment in the books of the consignor and consignee.
(ii) ***Joint Ventures:*** Accounting procedures: Joint Bank Account, Records Maintained by Co- venturer of (a) all transactions (b) only his own transactions. (Memorandum joint venture account).

Module II
Accounting for bills of exchange - bills receivable and payable, acceptance, endorsement, discounting, dishonour and renewal of bills, accommodation bills.

Module III
Partnership
Admission of a partner: partnership deed, goodwill valuation and treatment. Sacrificing ratio.
Retirement and death of a partner: gaining ratio, goodwill treatment
Dissolution of partnership: revaluation of assets and liabilities. Legal Position, Accounting for simple dissolution,
Applications of rule in case of Garner Vs. Murray in case of insolvency of partner(s)
(excluding piecemeal distribution and sale of a firm to a company).

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Text & References:
- Dr. S.N. Maheswari, Financial Accounting
- BS Raman, Financial Accounting
- Grewal and Gupta, Advanced Accounting
- Radhaswamy and R.L. Gupta, Advanced Accounting
- S.Kr. Paul, Advanced Accounting
- P.C. Tulasian, Pearson Editions, Introduction to Accounting
- Jain &Narang, Financial Accounting

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Syllabus - Semester Third

CORPORATE ACCOUNTING

Course Code: COM2351 **Credit Units: 03**

Course Objective:
This course enables the students to develop awareness about Corporate Accounting in conformity with the Provision of Companies' Act and latest amendments thereto with adoption of Accounting Standards that are likely to be introduced from time to time.

Course Contents:
Module I- Introduction to Corporate Accounts
Statutory records to be maintained by a company; Accounting for share capital transactions- issue of shares at par, at premium and at discount; forfeiture and re-issue of shares; buy-back of equity shares; redemption of preference shares - statutory requirements, disclosure in balance sheet; rights issue.

Module II
Issue & Redemption of debentures - accounting treatment and procedures; conversion of debentures into shares; Final accounts of Limited liability companies; Preparation of Profit & Loss account, Profit & Loss appropriation & Balance Sheet account in accordance with the provisions of existing companies act(excluding managerial remuneration).

Module III
Holding and subsidiary companies - accounting treatment and disclosures; consolidation of accounts.

Module IV
Valuation of Goodwill and shares
Good will- Meaning, definition, elements, types and methods of valuation of Goodwill, Methods of share valuation (Equity & preference shares).

Module V
Accounting treatment for amalgamation with reference to As-14 (excluding intercompany transactions & holdings), absorption and reconstruction of companies; internal & external reconstruction, Liquidation – Preparation of Liquidator's Statement of affairs, deficiency /surplus statement, calculation of pro rata treatment of uncalled capital.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Text & References:
- S.N. Maheswari, Financial Accounting
- Narayanaswamy, Financial Accounting
- SP Iyengar, Advanced Accountancy
- RL Gupta, Advanced Accountancy
- Jain and Narang, Corporate Accounting

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Syllabus - Semester Fourth

FINANCIAL MANAGEMENT

Course Code: COM2451 **Credit Units: 03**

Course Objective:
To give insight into financial decision making and composition of different securities in the total Capital structure.

Course Contents:
Module I
Nature, Scope & Objectives of Financial Management, Goals of Financial Management, Time value of money, Concept of risk & return (including capital asset pricing model.

Module II
Financing Decisions: Operating & Financial leverage, Capital structure theories; NI, NOI and MM & Traditional Approach, Factors determining capital structure. Concept & measurement of cost of capital, weighed Average cost of capital.

Module III
Capital Budgeting Decisions: Capital budgeting process; estimation of relevant cash flows, Non-discounted& discounted cash flows techniques- pay back, ARR, NPV, IRR, and profitability index;
Module IV
Investment Decisions – capital budgeting – significance – techniques of evaluation of investment Proposals- payback method – return on investment method, net present value method – Case Studies

Module IV
Dividend Decisions – dividend policy – determinants of dividend policy – types of dividend policy – forms of dividend. Different Schools of thought on dividend policy (Gordon, Walter, MM).
Module V
Working Capital Management – meaning – importance of adequate working capital- excess or Inadequate working capital – determinants of working capital requirement – cash management, Receivable management and inventory management – sources of working capital.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Text & References:

- S N Maheshwari, Financial Management.
- Khan and Jain, Financial Management.
- Dorai Raj. S.N, Financial Management.
- Sharma and Sashi Gupta, Financial Management.
- I M Pandey, Financial Management.
- James C Vanhorne, Financial Management.
- Prasanna Chandra, Financial Management.
- PN Reddy &Appanaiah, Financial Management.

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Syllabus - Semester Fifth

COST ACCOUNTING

Course Code: COM2551 **Credit Units: 03**

Course Objective:
To get an expert knowledge in the area of cost management and cost control to enable effective management decisions.

Course Contents:
Module I: Cost Accounting
Introduction – Meaning of Cost, costing and Cost Accounting – Comparison between Financial Accounts and Cost Accounts –Cost concepts and Classification of Costs – Cost Module – Cost Center, cost object – Preparation of cost sheet

Module II: Material Costing
Issue of materials, Methods of pricing of material issues- LIFO, FIFO- Weighed Average Method, Simple Average Method; Inventory Control- Concept & techniques like fixing of stock levels, EOQ, ABC analysis, perpetual & periodic inventory systems, material losses & their treatment.

Module III: Labour Costing
Control of labour cost – Labour Turn Turnover – Causes and effects of labour turnover – Meaning of Time and Motion Study, Merit Rating, Job Analysis, Time keeping and Time booking – Idle time, causes and treatment – Overtime – Methods of Wage Payment, Time rate and Piece Rate – Incentive Schemes – Halsey Premium Plan – Rowan Bonus Plan – Taylor's and Merrick's differential piece rate systems – Problems.

Module IV: Overhead Costing
Definition, Classification, allocation, apportionment & absorption of overhead, treatment of over & under absorption

Module V:
Costing Methods Introduction - Job Costing – Batch Costing – Contract Costing-
Process Costing – principles – distinction between Process and Job – Preparation of process accounts – treatment of normal loss – abnormal loss – abnormal gain – Joint and By-products. Service costing. Marginal costing- introduction, contribution, PVR, BEP Chart and Margin of safety.

Module VI:
Reconciliation of Cost and Financial Accounts - Need for reconciliation – Reasons for difference in profits – Problems on preparation of Reconciliation statements including Memorandum Reconciliation account.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

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Text & References:

- N.K. Prasad: Cost Accounting
- Nigam & Sharma: Cost Accounting
- Khanna Pandey & Ahuja: Practical Costing
- M.L. Agarwal: Cost Accounting
- Jain &Narang: Cost Accounting
- S.P. Iyengar: Cost Accounting
- S.N. Maheshwari: Cost Accounting
- Horngren: Cost Accounting: A Managerial Emphasis
- M. N. Arora: Cost Accounting
- Dutta: Cost Accounting

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Syllabus - Semester Sixth

MANAGEMENT ACCOUNTING

Course Code: COM2651 **Credit Units: 03**

Course Objective:
To provide the students knowledge about the use of costing data for planning, control and decision making.

Course Contents:
Module I: Management Accounting
Nature & Scope: Meaning and Definition - Objectives of Management Accounting - Management Accounting and Financial Accounting - Management Accounting and Cost Accounting - Utility of Management Accounting - Limitations of Management Accounting - Position of Management Accountant in the Organisation.

Module II: Analysis and Interpretation of Financial Statements - I
Concept of Financial Statements and their Nature - Limitations of Financial Statements - Analysis and Interpretation - Tools - Comparative Financial Statements - Common size Statements - Trend Percentages Ratio Analysis - Nature and Interpretation - Utility and Limitations of Ratios - Short-term Financial Ratios - Long-term Financial Ratios - Profitability Ratios - Proprietary and Yield Ratios - Turnover Ratios - DUPONT Control Chart

Module III:Cash Flow Analysis
Distinction of cash from funds-utility of cash flow statement construction of cash flow statement

Module IV: Responsibilty Accounting and Standard Costing
Concept of Responsibility Accounting - Cost Centers and Profit Centers - Contribution by Segments

Module V: Budgets and Budgetary Control
Concept of Budgets and Budgetary Control - Nature and Objectives of Budgetary Control - Advantages and Limitations of Budgetary Control - Establishing a system of Budgetary Control - Preparation of Sales Budget, Selling and Distribution Cost Budget, Production Budget, Purchase Budget, Cash Budget etc. - Flexible Budgets and Master Budgets

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

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Text & References:

- Dr. S.N. Maheswari , Management Accounting
- Sexana, Management Accounting
- Made Gowda, Management Accounting
- Dr. S.N. Goyal and Manmohan, Management Accounting
- B.S. Raman, Management Accounting
- R.S.N. Pillai and Bagavathi, Management Accounting
- Sharma and Gupta, Management Accounting
- J. Batty, Management Accounting
- Foster, Financial Statement Analysis, Pearson.
- PN Reddy &Appanaiah, Essentials of Management Accounting

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Curriculum & Scheme of Examination

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Bachelor of Hotel Management

FOOD PRODUCTION FOUNDATION-I

Course Code: HMC2101 **Credit Units: 02**

Course Objective:
The curriculum is based on to familiarize the students with the basic concepts of food such as –
- To make the students learn about the professionalism and basic etiquette of culinary art
- To make them learnt about raw material, uses, composition, benefits and methods
- To sharpen the culinary skills in the field of food production
- To impart knowledge of history of culinary art and changes along with the times
- To give the basic idea about physical and chemical composition of different food products.

Course Contents:

Cookery
Module – I :Food Service industry
1.1 Culinary History

Module – II :Standards of Professionalism
2.1 Levels of Skills
2.2 Attitude and Professionalism in Kitchen
2.3 Attires of chefs

Module – III :Kitchen Organization
3.1 Kitchen Brigade & Work Flow
3.2 Duties & responsibilities of various chefs
3.3 Interdepartmental Relationship

Module – IV :Kitchen Equipment
4.1 Introduction to Different Equipments
4.2 Safety procedure in handling equipment

Module – V :Basic Cookery Principles
5.1 Transfer of heat
5.2 Aims & Objective of Cooking
5.3 Effect of Heat on Cooking
5.4 Characteristic of Raw Materials
5.5 Preparation of ingredients
5.6 Cooking Times
5.7 Different fuels used in commercial kitchen
5.8 Methods of Cooking with advantages & disadvantages
5.9 Pre-Preparation
5.10 Culinary Terms Indian & Western

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Module – VI : Commodities

6.1 Cereals – Types & Forms in Which The Products Are Available in The Market, Their Vernacular & English Names & Uses- Wheat, Rice, Maize, Oats, Barley, Ragi, Bajra & Other Millets
6.2 Pulses – Identification of The Wide Range of Pulses Available in The Market, The Vernacular & English Names and Uses.
6.3 Herbs, Spices & Condiments – Classification, Identification, Vernacular & English Names.
6.4 Fats & Oils – Types & Forms, Sources, Processing and Uses of Vanaspati, Margarine, Refined, Double Refined, Unrefined. Butter etc.

Bakery &Confectionery

Module – VII : Introduction to Bakery and Patisserie

7.1 History of Baking
7.2 Baking As An Art and Science

Module – VIII : Basic Principles of Bakery

8.1 Formulas and Measurements
8.2 Baking Process

Module – IX : Equipment Used in Bakery

9.1 Use, Care, Cleaning, Storage

Module – X : Ingredients Used in Bakery - Types and Use

10.1 Flour
10.2 Fat
10.3 Cream
10.4 Sugar
10.5 Milk
10.6 Egg

Module – XI : Definition and Terms Used in Bakery

Module – XII : Yeast Products

12.1 Importance of Yeast in Baking –
12.2 Types, Storage and Use

Module – XIII : Bread Making

13.1 Functions of ingredients Used
13.2 Steps in Bread Making
13.3 Bread Diseases –Origin and Remedies
13.4 Different Recipes of Breads - Rye Bread, Corn Bread, French bread, international Breads
13.5 Types of Rolls - Soft Rolls; Hard Rolls
13.6 Quick Breads.- Ingredients, Types of Batter and Dough, Examples

Examination Scheme:

Components	**V**	**H**	**CT**	**A**	**EE**
Weightage (%)	06	04	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

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Text & References:

Text:

- Theory of Catering by Kinton Cesserani, Published by Hodder & Stoughton
- Practical Cookery by Kinton Cesserani, Published by Hodder & Stoughton

References:

- Theory of Cookery by K Arora published by Frank Bros &Co., New Delhi
- Professional chef by John Wiley
- Ultimate Cooking Course by Carole clement publish by Joana Lorrenz
- Essential of Cooking by James Peterson published by Artisan
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi.

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FOOD & BEVERAGE SERVICE FOUNDATION-I

Course Code: HMC2102 **Credit Units: 02**

Course Objective:

At the end of the semester the students will be able to –

Explain the growth and role of hotel industry and catering establishment
Understand the various types of hotels and their features
List and explain various catering establishment with their features
Explain staff organization structure of food and beverage department
Describe and understand job description of each personnel working in each F&B service outlet
List various F&B service equipments with its use and care.

Course Contents:

Module –I : Introduction to the World of Hospitality, Food & Beverage

1.1 Sectors of Hospitality industry
- 1.1.1 Railway
- 1.1.2 Airline
- 1.1.3 Cruise Liners
- 1.1.4 Industrial Catering
- 1.1.5 Institutional Catering

1.2 Major Hospitality Organisations - international & National
- 1.2.1 Oberoi, Taj Groups & Others

Module –II : Introduction to The Hotel industry

2.1 Classification of Catering Establishments
2.2 Types of F&B Outlets
2.3 Food & Beverage Departmental Organization
2.4 Duties & Responsibilities of F&B Staff at Various Levels
2.5 Attributes of a Hotelier

Module -III : Ancillary Departments

3.1 Still Room / Pantry
3.2 Wash Up (Kitchen Stewarding)
3.3 Plate Room

Module – IV : Restaurant Equipment

4.1 Glassware
4.2 Crockery
4.3 Silverware
4.4 Furniture
4.5 Linen

Module – V : Meals & Menu

5.1 Types of Meals
- 5.1.1 EMT
- 5.1.2 Breakfast
- 5.1.3 Lunch
- 5.1.4 Dinner

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5.1.5 Brunch
5.1.6 High Tea
5.1.7 Afternoon Tea
5.1.8 Elevenses

5.2 Types of Menu
5.2.1 À La Carte & Table d'hôte

5.3 Courses of Menu
5.3.1 Course Item Examples with Accompaniments
5.3.2 Covers for Each Course

Module – VI : Service Procedures

6.1 Types of Services
6.1.1 Assisted
6.1.1.1 Platter to Plate / Silver
6.1.1.2 Pre-Plated
6.1.1.3 Host
6.1.1.4 Guéridon
6.1.2 Non-Assisted
6.2.1.1 Buffet – Sit-down, Standing
6.2.1.2 Single Service
6.2.1.3 Counter Service

Examination Scheme:

Components	V	H	CT1	A	EE1
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Text & References:

Text:

- Food & Beverage Services by SN Bagchi & Anita Sharma, Aman Publications, New Delhi
- Food & Beverage Service by Lilicrap
- Food & Beverage Service by R. Singaravelavan, OUP

References:

- F & B Service Manual by Sudhir Andrews, Tata McGraw Hill
- The Waiter by John Fullar
- Professional Table Service by Dennis Lilicrap.
- Food & Beverage Management & Control by Dr. JM Negi, Kanishka Publications, New Delhi

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FRONT OFFICE FOUNDATION

Course Code: HMC2103 **Credit Units: 02**

Course Objective:
At the end of the semester the students will be able to explain & understand-
The growth, role of tourism in hospitality and hotel industry
The classification and main features of hotels
The Front Office staff and organization structure, duties/responsibilities of each personnel
Appraisal of Front Office equipment and furniture, welcoming of guest and telephone handling

Course Contents:

Module – I : Introduction to the Hospitality Industry

Module – II : Classification of Hotels
- 2.1 Size and Types of Hotel
- 2.2 Levels of Service
- 2.3 Ownership and Affiliation

Module – III :Basic Criteria of Star Categorization of Hotels

Module – IV :Hotel Organisation
- 4.1 Organization Chart

Module – V :Types of Rooms

Module – VI :Functional Organisation of Front office
- 6.1 Different Sections of Front office Department & Their Brief Functions

Module – VII : Staff Organisation of Front office Department
- 7.1 Duties & Responsibilities of Front office Department

Module – VIII :Front Desk Layout and Equipment
- 8.1 Layout
- 8.2 Equipment and Its Utility

Module – IX :Rate Categories
- 9.1 Food Plans
- 9.2 Basis of Charging Room Rates
- 9.3 Tariff Card

Module – X :Front office Systems
- 10.1 Non-Automated
- 10.2 Semi- Automated
- 10.3 Fully- Automated

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Examination Scheme:

Components	A	JE	P	CT	EE
Weightage (%)	05	05	05	15	70

CT-class test; A-attendance; EE-end semester examination; P-project: JE-Journal Evaluation

Text & References:

Text:

- Front Office Management by Bardi, John Willy and Sons
- Front Office Management by Mr. Sbhal Nagar
- Professional Hotel Front Office Management – Anutosh Bhakta
- Hotel Management by Dr. Jagmohan Negi, Himalaya Publishing House, New Delhi.
- Professional Hotel Management by Dr. JM Negi, S. Chand & Co, New Delhi
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi

References:

- Front Office by Abbott, Butter Worth Hiemann.
- Front Office Manual by Sudhir Andrews, Tata McGraw Hill

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HOUSEKEEPING FOUNDATION

Course Code: HMC2104 **Credit Units: 02**

Course Objective:
At the end of the semester the students would have a through knowledge of:
Organization of Housekeeping department and its basic functioning
All agents and equipment used for cleaning of all possible surfaces
Room layouts and what are constitutes in a guest room
Pests found in the hotel and their control.

Course Contents:

Module – I : The Role of Housekeeping in Hospitality Operation
- 1.1 Role of Housekeeping in Guest satisfaction and repeat Business

Module – II : Introduction to Housekeeping Department
- 2.1 Identifying Housekeeping Responsibilities
- 2.2 Organizational Structure of Housekeeping Department for: Small Hotel, Medium Hotel, Large Hotel
- 2.3 Duties & Responsibilities of Housekeeping Staff
- 2.4 Personality Attributes of Housekeeping Staff
- 2.5 Layout of the Housekeeping Department

Module – III : Cleaning Equipments
- 3.1 General Consideration for Selection
- 3.2 Classification & Types of Equipments
- 3.3 Method of Use and Mechanism for Each Type
- 3.4 Care and Maintenance

Module – IV : Cleaning Agents
- 4.1 Classification
- 4.2 General Criteria for Selection
- 4.3 Use, Care & Storage
- 4.4 Distribution & Control

Module – V :Use of Computers in Housekeeping Department

Module – VI : Care and Cleaning of Different Surface
- 6.1 Metals, Glass, Ceramics, Wood, Wall finishes, Floor finishes

Module – VII : Inter-Departmental Coordination with
- 7.1 Front office
- 7.2 Maintenance
- 7.3 Food Production & Service Areas
- 7.4 Personnel
- 7.5 Purchase, Receiving & Stores
- 7.6 Laundry
- 7.7 Computer Centre
- 7.8 Security

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7.9 Accounts & Credit
7.10 Other Departments

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Text & References:

Text:

- Professional Management of Housekeeping Operation by Robert J. Martin
- Hotel, Hostel & Hospital Housekeeping by John C. Branson & Margaret Lennox
- Housekeeping Management by Keppa Margret M
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi

References:

- Accommodation Management by Roy C
- Hotel Housekeeping Training Manual by Sudhir Andrew
- Professional House Keeping by Madlin Tucker
- Housekeeping Management by Keppa Margret M
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi

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APPLICATION OF COMPUTERS

Course Code: HMC2105 **Credit Units: 01**

Course Objective:
The basic objective of the course is to introduce the students to the world of computers and computer technology. The students will be introduced to the basic concept of operating system, word processing, database, presentation.

Course Contents:
Module I: Computer Fundamentals
Elements of a Computer system
Characteristic of Computers
Classification of Computers
Limitations
Hardware features and uses
Generations of Computer
Primary and Secondary Storage Concepts
Data Entry Devices
Data Output Devices
Software Concepts
System Software
Application Software
Language Classification
Compilers and Interpreters

Module II: Operating Systems/Environment
Introduction to Windows
GUI/Features
What are Window & Window 95 and above
Part of a Typical Window and their functions

Examination Scheme:

Components	V	H	A	CT	EE
Weightage (%)	05	05	05	15	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Text & References:

Text:
- Basic Computers by IBM
- DOEAC 'O' Level *Information Technology by V.K. Jain BPB Publications*

References:
- Insider Internet Marketing by Jim Deniels
- The Birth of Internet Marketing & Communication by Don Stan Boch

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FOOD PRODUCTION FOUNDATION LAB-I

Course Code: HMC2106 **Credit Units: 03**

Course Objective:
At the end of the semester the students will be able-
- To learn about the basics of food production in continental and Indian cuisine
- To make a menu and would be able to explain the meaning of the dishes
- To prepare the basic stock, sauce and soup
- To use the knife and other equipments confidently
- To cut all kind of vegetable cutting.

Course Contents:
Practical
Module – I : Cookery
- Identification of Kitchen Equipments
- Identification of raw materials
- Preparing & Cooking Vegetables
- Different cuts of vegetables
- Demonstration of various Cooking Methods
- Compiled 3 course menu

Module – II : Bakery & Confectionery
- Preparation of Breads using different Methods
- Identification & Understanding of Bread Ingredients
- Preparation of different types of bread rolls
- Preparation of Various Quick Breads – Muffins, Pancakes

Examination Scheme:

Internal: 30 Marks

Components	JE	LE	VV	A
Weightage (%)	05	15	5	5

End-Term: 70 Marks

Components	JE	VV	INDENT	LE
Weightage (%)	05	05	10	50

Abbreviation: JE= Journal Evaluation; LE= Lab Evaluation; VV= Viva-Voce; GP= Grooming & Punctuality

Text & References:
Text:
- Theory of Catering by Kinton Cesserani, Published by Hodder & Stoughton
- Practical Cookery by Kinton Cesserani, Published by Hodder & Stoughton

References:
- Theory of Cookery by K Arora published, Frank Bros &Co. New Delhi
- Professional Chef by John Wiley
- Ultimate Cooking Course by Carole Clement publish by Joana Lorrenz
- Essential of Cooking by James Peterson published by Artisan

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FOOD & BEVERAGE SERVICE FOUNDATION LAB-I

Course Code: HMC2107 **Credit Units: 01**

Course Objective:

At the end of the semester the students will be able-

- To use and maintain all items of crockery, cutlery, glassware, flatware and hollowware used in a restaurant
- To arrange the restaurant and connected service area
- To serve water & food as per the standard rules

Course Contents:

Module – I : Basics of Service

- Service Grooming and Restaurant Etiquettes.
- Identification of equipments
- Mis-en-Place and Mis-en-Scene

Module – II : Essentials of Service

- Writing a Menu in French
- Food and Beverage service sequence
- Water pouring and seating a guest.
- Laying and relaying of Tablecloth
- Napkin folds
- Carrying a Salver or Tray
- Sideboard setup

Module – III :Service at Table

- Rules for laying table - Laying covers as per menus
- TDH and A la carte cover Layout
- Handling service gear
- Carrying plates, Glasses and other Equipment
- Clearing an ashtray
- Crumbing, Clearance and presentation of bill
- Sequence of Service of a Meal
- Breakfast table lay-up
- Silver service
- American service

Module – IV : Basics of Service

- Situation handling
- Restaurant reservation system
- Hostess desk functions
- Order taking – writing a food KOT, writing a BOT

Examination Scheme:

Internal: 30 Marks

Components	JE	LE	VV	A
Weightage (%)	05	15	05	5

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End-Term: 70 Marks

Components	JE	VV	GP	LE
Weightage (%)	10	10	10	40

Abbreviation: JE= Journal Evaluation; LE= Lab Evaluation; VV= Viva-Voce; GP= Grooming & Punctuality

Text & References:

Text:

- Food & Beverage Services by SN Bagchi & Anita Sharma, Aman Publications, New Delhi
- Food & Beverage Service by Lilicrap
- Food & Beverage Service by R. Singaravelavan, OUP

References:

- F & B Service Manual by Sudhir Andrews, Tata McGraw Hill
- The Waiter by John Fullar
- Professional Table Service by Dennis Lilicrap.
- Food & Beverage Management & Control by Dr. JM Negi, Kanishka Publications, New Delhi

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FRONT OFFICE FOUNDATION LAB

Course Code: HMC2108 **Credit Units: 01**

Course Objective:

At the end of the semester the students will be able-

- Understand the growth, role of tourism in hospitality and hotel industry
- Explain the classification and main features of hotels
- Describe Front Office staff and organization structure, duties/responsibilities of each personnel
- Do the Appraisal of Front Office equipment and furniture, welcoming of guest and telephone handling.

Course Contents:

- Basic Manners & Attributes for Front Office Operations.
- Communication Skills – Verbal & Non Verbal
- Telephone Handling
- Forms & Formats related to 1st Semester

Examination Scheme:

Internal: 30 Marks

Components	JE	LE	VV	A
Weightage (%)	05	15	05	05

End-Term: 70 Marks

Components	JE	VV	GP	LE
Weightage (%)	10	10	10	40

Abbreviation: JE= Journal Evaluation; LE= Lab Evaluation; VV= Viva-Voce; GP= Grooming & Punctuality A: Attendance

Text & References:

Text:

- Front Office Management by Bardi, John Willy and Sons
- Front Office Management by Mr. Sbhal Nagar
- Professional Hotel Front Office Management – Anutosh Bhakta
- Hotel Management by Dr. Jagmohan Negi, Himalaya Publishing House, New Delhi.
- Professional Hotel Management by Dr. JM Negi, S. Chand & Co, New Delhi
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi

References:

- Front Office by Abbott, Butter Worth Hiemann.
- Front Office Manual by Sudhir Andrews, Tata McGraw Hill

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HOUSEKEEPING FOUNDATION LAB

Course Code: HMC2109 **Credit Units: 01**

Course Objective:
At the end of the semester the students would have a thorough knowledge of-
- Use of cleaning agents
- Use of cleaning equipment (manual as well as mechanical)
- Cleaning of all kinds of surfaces in a hotel.

Course Contents:
- Identifying Cleaning Equipment & Agents
- Cleaning of Guest Room & Bathroom – Occupied / Vacant
- Cleaning of Various Surfaces
- Composition, Care and Cleaning of Various Surfaces
  - Metals - Brass, Copper, Silver, EPNS, Bronze, Chromium, Aluminum, Stainless Steel & Protective Finishes of Various Kinds
  - Glass-Various Type
  - Leather, Rexine
  - Plastic
  - Ceramic - Various Types
  - Wood- Various Types & Their Protective Finishes

Examination Scheme:

Internal: 30 Marks

Components	JE	LE	VV	A
Weightage (%)	5	15	5	5

End-Term: 70 Marks

Components	JE	VV	GP	LE
Weightage (%)	10	10	10	40

Abbreviation: JE= Journal Evaluation; LE= Lab Evaluation; VV= Viva-Voce; GP= Grooming & Punctuality

Text & References:
Text:
- Professional Management of Housekeeping Operation by Robert J. Martin
- Hotel, Hostel & Hospital Housekeeping by John C. Branson & Margaret Lennox
- Housekeeping Management by Keppa Margret M
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi

References:
- Accommodation Management by Roy C
- Hotel Housekeeping Training Manual by Sudhir Andrew
- Professional House Keeping by Madlin Tucker

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APPLICATION OF COMPUTERS LAB

Course Code: HMC2110 **Credit Units: 01**

Course Objective:
At the end of the semester the students would be able to-
- Create folders
- Shortcuts copy files & folders
- Deleting files and exploring windows etc.

Course Contents:

Module I: Window Operations
Creating Folders, Creating Shortcuts, C
opying Files/Folders, Renaming Files/Folders, Deleting Files
Exploring Windows
Quick Menu

Module II: MS Word
Creating a Document, Formatting Documents, Special Effects
Cut, Copy, Paste.
Table, Graphics.
Print Options.

Examination Scheme:

Internal: 30 Marks

Components	JE	LE	VV	A
Weightage (%)	05	15	05	05

End-Term: 70 Marks

Components	JE	VV	GP	LE
Weightage (%)	10	10	10	40

Abbreviation: JE= Journal Evaluation; LE= Lab Evaluation; VV= Viva-Voce; GP= Grooming & Punctuality

Text & References:
Text:
- Microsoft Work 2000 by Heidi Steele Techmedia Publications
- Basic Computers by IBM

References:
- Insider Internet Marketing by Jim Deniels
- The Birth of Internet Marketing & Communication by Don Stan Boch
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi

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FIELD WORK PROJECT-I

Course Code: HMC2111 **Credit Units: 02**

Course Objective:
Students of hospitality need to go through the basics of practical service exposure in different hospitality outlets. To maximize this exposure students will be send for different hospitality services in all the major & minor areas of operation & management within & outside the campus.

Methodology:
Students should be send for various learning opportunity outside the class room. They should submit the journal after the event is over to assigned faculty from the committee in following format.

- Name of the event
- Location
- Time
- Faculty Responsible
- Task Assigned
- Learning Outcome
- Suggestions

All the assignments should be duly authorized by the faculty responsible for the event.

Student services will be monitored & evaluated by the committee comprising of Program leader & faculty (as approved by HOI) and the marks will be allotted based on the performance, attitude, learning and utilization of knowledge in practical field.

Examination Scheme:

Components	C	S	V	P	JE
Weightage (%)	20	20	20	20	20

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FOOD PRODUCTION FOUNDATION–II

Course Code: HMC2201 **Credit Units: 02**

Course Objective:

The curriculum is based on to familiarize the students with the basic concepts of food such as –

- To make the students learn about the professionalism and basic etiquette of culinary art
- To make them learnt about raw material, uses, composition, benefits and methods
- To sharpen the culinary skills in the field of food production
- To impart knowledge of history of culinary art and changes along with the times
- To give the basic idea about physical and chemical composition of different food products.

Course Contents:

Cookery

Module – I :Breakfast Cookery

1.1 Types of breakfast
1.2 International & Indian menu for breakfast
1.3 Various breakfast rolls

Module – II :Commodities

2.1 Elementary Pastas - Method of Manufacture, Ranges Available in The Market e.g. : Macaroni, Spaghetti, Noodle Etc. & Their Uses.
2.2 Milk & Milk Product - Forms in Which Available, Processing e.g. : Full Cream, Fresh Milk, Toned Milk, Skimmed Milk, Buffalo & Cow's Milk; Pasteurized, Sterilised, Dehydrated etc. Khoa, Paneer, Cream, Etc.
2.3 Cream - Process of Making Cream, Types of Cream
2.4 Cheese- Introduction, Types, Processing of Cheese, Serving of Cheese

Module – III :Stocks

2.5 Definition, Elements of Stock
2.6 Classification & uses
2.7 Special care during stock making

Module – IV :Sauces

2.8 Definition
2.9 Classification of Mother Sauces
2.10 Derivatives

Module – V :Soups

2.11 Definition
2.12 Classification With example

Module – VI :Vegetable Cookery

2.13 Basic Knowledge, Identification, Various Cuts.
2.14 Preparation, Storage, Nutritional Aspects

Module – VII :Fruits

2.15 Types, Classification

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2.16 Preparation, Handling, Storage
2.17 Nutritional Aspects

Bakery & Patisserie
Module – VIII :Cookies

2.18 Definition, ingredients Used & Their Functions, Different Methods Used and Examples

Module – IX :Pastries

2.19 Definition of Pastries
2.20 Classification
2.21 Ingredients Used, Methods
2.22 Usage, Faults

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	06	04	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Text & References:

Text:

- Theory of Catering by Kinton Cesserani, Published by Hodder & Stoughton
- Practical Cookery by Kinton Cesserani, Published by Hodder & Stoughton

References:

- Theory of Cookery by K Arora published by Frank Bros &Co., New Delhi
- Professional chef by John Wiley
- Ultimate Cooking Course by Carole clement publish by Joana Lorrenz
- Essential of Cooking by James Peterson published by Artisan
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi.

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FOOD & BEVERAGE SERVICE FOUNDATION-II

Course Code: HMC2202 **Credit Units: 02**

Module – I :Beverages

1.1 Classification
- 1.1.1 Non-Alcoholic Beverages
  - 1.1.1.1 Types of Waters
  - 1.1.1.2 Soft Drinks
  - 1.1.1.3 Juices / Syrups / Crushes
  - 1.1.1.4 Tea Coffee
- 1.1.2 Alcoholic Beverages
  - 1.1.2.1 Introduction
  - 1.1.2.2 Types

Module – II :Beer

Module – III :Wines

2.1 Introduction to Wines
2.2 Classification of Wines
2.3 Grapes & Factors Affecting Wine Quality
2.4 Vinification
2.5 Production of Red / White / Rosé Wines
2.6 Production of Fortified & Aromatised Wines
2.7 Production of Sparkling Wine
2.8 Wine Producing Regions of the World
2.9 France, Germany, Italy, Spain, Portugal
2.10 USA
2.11 Australia & India
2.12 Food & Wine Harmony

Examination Scheme:

Components	V	H	CT1	A	EE1
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Text & References:

Text:

- Food & Beverage Services by SN Bagchi & Anita Sharma, Aman Publications, New Delhi
- Food & Beverage Service by Lillicrap
- Food & Beverage Service by R. Singaravelavan, OUP

References:

- F & B Service Manual by Sudhir Andrews, Tata McGraw Hill
- The Waiter by John Fullar
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- Food & Beverage Management & Control by Dr. JM Negi, Kanishka Publications, New Delhi

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FRONT OFFICE OPERATION-I

Course Code: HMC2203 **Credit Units: 02**

Module – I :Reservation Activities

- 1.1 Importance of Reservations
- 1.2 Sources of Reservation
- 1.3 Modes of Reservation
- 1.4 Telephone Etiquette
- 1.5 Reservation Activities
- 1.6 Tools of Reservation
  - 1.6.1 Room Status Board
  - 1.6.2 Advance Letting Chart
  - 1.6.3 Density Control Chart
  - 1.6.4 Movement List / Expected Arrival List
- 1.7 Systems of Reservation
  - 1.7.1 Diary System
  - 1.7.2 Whitney System
- 1.8 Processing Group Reservation
- 1.9 Product Knowledge of Receptionists
- 1.10 Up-selling : Techniques
- 1.11 Over-booking : Why & How
- 1.12 Cancellation Procedure
- 1.13 Amendment Procedure

Module – II : Registration

- 2.1 Room Position

Module – III : Pre Arrival

- 3.1 Pre Registration Procedure

Module – IV : On Arrival Procedures

- 4.1 Receiving, Greeting, Welcoming A Guest
- 4.2 Assessing The Guest Requirements
- 4.3 Registration & Rooming Procedure

Module – V : Post Arrival Procedure

Module – VI : Chapter 2 to Chapter 5 for :

- 6.1 FIT
- 6.2 VIP
- 6.3 Group
- 6.4 Foreigner

Module – VII : Room Change Procedure

Module – VIII : Handling of Special Situations Like

- 8.1 DNS
- 8.2 DNA
- 8.3 RNA

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8.4 NI (No information)
8.5 VIP / Spat / DG Guests
8.6 Scanty Baggage Guest
8.7 Refusing Accommodation
8.7.1 Black Listed Guest
8.7.2 Walking A Guest

Module – IX : Manual Key Control Procedure

Examination Scheme:

Components	A	JE	P	CT	EE
Weightage (%)	05	05	05	15	70

CT-class test; A-attendance; EE-end semester examination; P-project: JE-Journal Evaluation

Text & References:

Text:

- Front Office Management by Bardi, John Willy and Sons
- Front Office Management by Mr. Sbhal Nagar
- Professional Hotel Front Office Management – Anutosh Bhakta
- Hotel Management by Dr. Jagmohan Negi, Himalaya Publishing House, New Delhi.
- Professional Hotel Management by Dr. JM Negi, S. Chand & Co, New Delhi
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi

References:

- Front Office by Abbott, Butter Worth Hiemann.
- Front Office Manual by Sudhir Andrews, Tata McGraw Hill

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HOUSE KEEPING OPERATION-I

Course Code: HMC2204 **Credit Units: 02**

Course Objective:

At the end of the semester the students will have a thorough knowledge of-

- Key Control & its importance
- All types of beds and mattresses
- Cleaning Procedures & schedule
- All routine and records maintained of H.K. department
- Pest Control

Module – I :Keys

1.1 Types of keys,
1.2 Key control

Module – II :Types of Beds and Mattresses

Module – III :Introduction to Cleaning

3.1 Principles of cleaning
3.2 Methods of organizing cleaning
3.3 Frequency of cleaning daily, periodic, special

Module – IV :Cleaning Organization

4.1 Guestroom Cleaning
4.1.1 Stacking of Chambers Maid Trolley
4.1.2 Pre – Preparation
4.1.3 Entering the guestroom
4.1.4 Bed Making
4.1.5 Bathroom Cleaning
4.1.6 Second Service
4.1.7 Turndown Service
4.2 Public Area CleaningHotel Entrance, Lobby, Front Office, Restaurants, Elevators, etc

4.3 Guest Room inspection

Module – V :Routine Systems and Records of Housekeeping Department

5.1 Room Occupancy Report,
5.2 Guest Room Inspection Checklists,
5.3 Work Orders, Log Sheet,
5.4 Lost and Found Register and Enquiry File,
5.5 Housekeeper's Report,
5.6 Guest's Special Requests Register,
5.7 Record of Special Cleaning,
5.8 Call Register,
5.9 VIP Lists.

Module – VI :Pest Control

6.1 Definitions of Pests & Control
6.2 Areas of infestations

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6.3 Prevention & Control of Pests
6.4 Responsibility of Housekeeping in Pests Control

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Text & References:

Text:

- Professional Management of Housekeeping Operation by Robert J. Martin
- Hotel, Hostel & Hospital Housekeeping by John C. Branson & Margaret Lennox
- Housekeeping Management by Keppa Margret M
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi

References:

- Accommodation Management by Roy C
- Hotel Housekeeping Training Manual by Sudhir Andrew
- Professional House Keeping by Madlin Tucker
- Housekeeping Management by Keppa Margret M
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi

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FOOD SCIENCE & NUTRITION

Course Code: HMC2205 **Credit Units: 01**

Course Objective:

At the end of the semester students will be able to-

- Understand functions of Foods which supply our nutritional needs
- Explain how to meet human need nutrients in terms of available foods
- Acquire techniques of preparation which help us meet our needs in an enjoyable manner
- Understand role of nutrients in menu planning

Course Contents:

Module I:Food Science

Definition and scope of Food Science

Module II:Nutrition & Nutrients

Introduction, Type of Nutrients (Macro & Micro Nutrients), Classification of various nutrients, Dietary Sources of various nutrients, Effect of cooking on Nutrients, Uses of various nutrients in food preparation

Module III: Nutrient specific chemical Processes

Dextrinization, Autoxidation (factors and prevention measures), Flavour reversion, Refining, Hydrogenation & winterization, **Gelation, Emulsification, Foamability, Viscosity,** Browning

Module IV:Food Processing

Definition, Objectives, Types of treatment, Effect of factors like heat, acid, alkali on food constituents

Module V: Evaluation of Food

Objectives, Sensory assessment of food quality, Methods
Introduction to proximate analysis of Food constituents, Rheological aspects of food

Module VI: Emulsions & Colloids

Theory of emulsification & Colloids, Types of emulsions, Emulsifying agents, Role of emulsifying agents & Colloids in food preparation

Module VII: Flavour

Definition, Description of food flavours (tea, coffee, wine, meat, fish spices)

Module VIII: Energy

Definition of Energy and Units of its measurement (Kcal), Energy contribution from macronutrients (Carbohydrates, Proteins and Fat), Factors affecting energy requirements, Concept of BMR, SDA, Thermodynamic action of food, Dietary sources of energy, Concept of energy balance and the health hazards associated with Underweight, Overweight

Module IX: Balanced Diet

Definition, Importance of balanced diet, RDA for various nutrients – age, gender, physiological state

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Module X: Menu Planning

Planning of nutritionally balanced meals based upon the three food group system, Factors affecting meal planning, Critical evaluation of few meals served at the Institutes/Hotels based on the principle of meal planning, Calculation of nutritive value of dishes/meals

Examination Scheme:

Components	V	A	CT	EE
Weightage (%)	10	05	15	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Text & References:

Text:

- Human Nutrition by Guthrice HA & Picciano MF 1995, Mosby Pub.Co.Toronto
- Perspectives in Nutrition by Wardlaw MW & Insel PM 1993 Mosby Pub Co. Toronto
- Food facts & Principles by Manay & Shalakshara Swamy New Age Int. 2001
- Fundamentals of Food & Nutrition 4th edition 2001by Mudambi & Rajgopal
- Nutritive Value of Indian Foods- Indian Council of Medical Research

References:

- Food Science by Potter & Hotchkiss
- Principles of Food Science by Borgstrom and Macmillion
- Food Chemistry by Fennima
- Sensory Evaluation by Amerine (Academic Press)
- Handbook of Analysis and Quality Control for fruits & Vegetables by Rangana S (Tata McGraw Hill)
- Principles of Food Technology by P.J Fellows.

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FUNDAMENTALS OF ACCOUNTING-I

Course Code: HMC2206 **Credit Units: 02**

Course Objective:

At the end of the semester the students will be able to-

- Understand basic concept of hospitality accounting system
- The meaning and need for accounting
- Distinguish between book keeping and accounting
- Record the transactions using rules of debit and credit
- Ascertain the correct bank balances
- To check the accuracy of accounting records.

Course Contents:

Module I: Introduction to Accounting

Meaning & Definition, Types and Classification, Principles of Accounting, Systems of Accounting, Generally Accepted Accounting, Principles

Module II: Primary Books (Journal)

Meaning and Definition, Format of Journal, Rules of Debit and Credit, Opening entry, simple and compound entries, Practical

Module III: Subsidiary Books (Ledger)

Meaning and Uses, Formats, Posting, Practical

Module IV: Subsidiary Books

Need and Use

Classification

- Purchase book
- Sales book
- Purchase returns
- Sales return
- Journal proper
- Practical

Module V: Trial Balance

Meaning, Methods, Advantages, Limitations, Practical

Examination Scheme:

Components	H	P	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination; P-project

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Text & References:

Text:

- Element of Hotel Accounting by Dr. JM Negi & G.S. Rawat, HKS International (now Aman Publication, New Delhi)
- Hotel Management Accounting & Control by Dr. JM Negi, Himalaya Publication, New Delhi
- Management Accounting by Dr. Hingorani & Prof. Ramanathan, Sultan Chand & Sons

References:

- Management Accounting & Financial Control by Dr. SN Maheshwari, Sultan Chand & Sons
- Understanding Hospitality Accounting by Raymond Cote, EI-AH&LA USA
- Financial Accounting by GC Maheshwari, NCERT, N. Delhi
- Fundamentals of Hotel Accounting by G.S. Rawat & Dr. JM Negi, Aman Publications, New Delhi

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FOOD PRODUCTION FOUNDATION LAB-II

Course Code: HMC2207 **Credit Units: 03**

Cookery

- Preparing & Cooking Fish & Shellfish
- Preparing & Cooking Poultry
- Preparing & Cooking Meat
- Preparing 3 to 5 course Continental Menu

Patisserie

- Different methods & Types Cookie making
- Different Types of Pastries & their applications

Examination Scheme:

Internal: 30 Marks

Components	JE	LE	VV	A
Weightage (%)	05	15	5	5

End-Term: 70 Marks

Components	JE	VV	INDENT	LE
Weightage (%)	05	05	10	50

Abbreviation: JE= Journal Evaluation; LE= Lab Evaluation; VV= Viva-Voce; GP= Grooming & Punctuality

Text & References:

Text:

- Theory of Catering by Kinton Cesserani, Published by Hodder & Stoughton
- Practical Cookery by Kinton Cesserani, Published by Hodder & Stoughton

References:

- Theory of Cookery by K Arora, Frank Bros &Co. New Delhi
- Professional Chef by John Wiley
- Ultimate Cooking Course by Carole Clement publish by Joana Lorrenz
- Essential of Cooking by James Peterson published by Artisan

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FOOD & BEVERAGE SERVICE FOUNDATION LAB-II

Course Code: HMC2208 **Credit Units: 01**

- Room service tray and trolley lay-up and service
- Room service amenities, Set-up in rooms
- Functional and floor layouts for room service
- Conducting briefing and de-briefing for F&B Outlets
- Beverage order-taking
- Service of hot and cold non- alcoholic beverages
- Table set-up with wines on the menu
- Service of Beer, Sake, and Other fermented and brewed beverages
- Service of sparkling, aromatized, fortified, still wines.
- Glassware used for different spirits,
- Non alcoholic drinks offered with different Spirits - service procedure.
- Order taking –writing a BOT

Examination Scheme:

Internal: 30 Marks

Components	JE	LE	VV	A
Weightage (%)	05	15	05	5

End-Term: 70 Marks

Components	JE	VV	GP	LE
Weightage (%)	10	10	10	40

Abbreviation: JE= Journal Evaluation; LE= Lab Evaluation; VV= Viva-Voce; GP= Grooming & Punctuality

Text & References:

Text & References:

Text:

- Food & Beverage Services by SN Bagchi & Anita Sharma, Aman Publications, New Delhi
- Food & Beverage Service by Lilicrap
- Food & Beverage Service by R. Singaravelavan, OUP

References:

- F & B Service Manual by Sudhir Andrews, Tata McGraw Hill
- The Waiter by John Fullar
- Professional Table Service by Dennis Lilicrap.
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FRONT OFFICE OPERATION LAB-I

Course Code: HMC2209 **Credit Units: 01**

- Identification of equipment, Work Structure & Stationery
- Procedure of taking Reservations – in Person & over Telephone
- Converting enquiry into valid reservation
- Suggestive Selling

Examination Scheme:

Internal: 30 Marks

Components	JE	LE	VV	A
Weightage (%)	05	15	05	05

End-Term: 70 Marks

Components	JE	VV	GP	LE
Weightage (%)	10	10	10	40

Abbreviation: JE= Journal Evaluation; LE= Lab Evaluation; VV= Viva-Voce; GP= Grooming & Punctuality A: Attendance

Text & References:

Text:

- Front Office Management by Bardi, John Willy and Sons
- Front Office Management by Mr. Sbhal Nagar
- Professional Hotel Front Office Management – Anutosh Bhakta
- Hotel Management by Dr. Jagmohan Negi, Himalaya Publishing House, New Delhi.
- Professional Hotel Management by Dr. JM Negi, S. Chand & Co, New Delhi
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi

References:

- Front Office by Abbott, Butter Worth Hiemann.
- Front Office Manual by Sudhir Andrews, Tata McGraw Hill

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HOUSEKEEPING OPERATION LAB-I

Course Code: HMC2210 **Credit Units: 01**

- Identifying Guest Supplies
- Bed Making
- Bed Making (Variations)

Examination Scheme:

Internal: 30 Marks

Components	JE	LE	VV	A
Weightage (%)	5	15	5	5

End-Term: 70 Marks

Components	JE	VV	GP	LE
Weightage (%)	10	10	10	40

Abbreviation: JE= Journal Evaluation; LE= Lab Evaluation; VV= Viva-Voce; GP= Grooming & Punctuality

Text & References:

Text:

- Professional Management of Housekeeping Operation by Robert J. Martin
- Hotel, Hostel & Hospital Housekeeping by John C. Branson & Margaret Lennox
- Housekeeping Management by Keppa Margret M
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi

References:

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FIELD WORK PROJECT-II

Course Code: HMC2211 **Credit Units: 03**

Course Objective:
Students of hospitality need to go through the basics of practical service exposure in different hospitality outlets. To maximize this exposure students will be send for different hospitality services in all the major & minor areas of operation & management within & outside the campus.

Methodology:
Students should be send for various learning opportunity outside the class room. They should submit the journal after the event is over to assigned faculty from the committee in following format.

- Name of the event
- Location
- Time
- Faculty Responsible
- Task Assigned
- Learning Outcome
- Suggestions

All the assignments should be duly authorized by the faculty responsible for the event.

Student services will be monitored & evaluated by the committee comprising of Program leader & faculty (as approved by HOI) and the marks will be allotted based on the performance, attitude, learning and utilization of knowledge in practical field.

C-20
S-20
V-20
P-20
JE-20

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FOOD PRODUCTION OPERATIONS-I

Course Code: HMC2301 **Credit Units: 02**

Course Objective:
After completion of this course the students will have the basic concepts of –
- Standard Recipe, Menu planning
- Classification & cooking of Egg, Meat, Poultry / Game, Fish
- Indian Gravies & Masalas
- Accompaniments & Garnish
- Production of Cakes, role of different ingredients used

Module I:Standard Recipe
- Introduction & Types of standard Recipes
- Method of writing & Uses

Module II :Menu planning
- Introduction
- Types of menus
- Factor effecting menu planning

Module III:Egg Cookery
- Structure, Composition, Varieties, Storage
- Nutritional Aspects
- Preparation

Module IV :Meat Cookery
- Composition, Selection, Grading of Mutton, Lamb, Pork, Beef, Veal
- Cuts of Different Meats, Cooking Times, & Handling
- Nutritional and Storage Points

Module V :Poultry / Game Cookery
- Types/Classification
- Food Value, Storage & Nutritional Value

Module VI:Fish Cookery
- Classification, Source
- Storage, Food Value Preservation

Module VII:Basic Gravies
- Basic ingredients used in gravies
- Types of gravies
- Uses with examples

Module VIII:Masalas
- Blending of spices
- Different Masalas used in Indian cookery
- Wet Masala
    - Dry Masala

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- Composition of different Masalas
- Verities of Masalasavailable in regional areas
- Special Masala blends

Module IX : Accompaniments&Garnish

Module X :Cakes (Bakery & Patisserie)

- Ingredients Used in Cake-Making & Their Functions
- Type of Methods
- Cake Balancing Formulas, Faults & Remedies
- High Ratio Cakes, Pound Cakes - Definitions, Formulas
- Cake Decorations , Icings, Types of Icing, Other Decorative Items

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	06	04	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Text & References:

Text:

- Theory of Catering by Kinton Cesserani, Published by Hodder & Stoughton
- Practical Cookery by Kinton Cesserani, Published by Hodder & Stoughton

References:

- Theory of Cookery by K Arora published by Frank Bros &Co., New Delhi
- Professional chef by John Wiley
- Ultimate Cooking Course by Carole clement publish by Joana Lorrenz
- Essential of Cooking by James Peterson published by Artisan
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi.

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FOOD & BEVERAGE SERVICE OPERATIONS-I

Course Code: HMC2302 **Credit Units: 02**

Course Objective:
After completion of this course the students will have the clear concepts of –
- Spirits & their production methods
- Calculation of strength of Spirit
- Types of Spirits
- Liqueurs & Bitters
- Cigars & Cigarettes

Module I :Spirits
- 1.1 Introduction & Types
- 1.2 Measuring Strength of Spirit
- 1.3 Styles of Production
- 1.4 Whisky
- 1.5 Brandy
- 1.6 Rum
- 1.7 Gin
- 1.8 Vodka
- 1.9 Tequila
- 1.10 Other Spirits (Pernod, Marc, Grappa Etc.)

Module II :Liqueurs & Bitters
- 2.1 Types
- 2.2 Production
- 2.3 Bases & Brands

Module III :Cigars & Cigarettes
- 3.1 Manufacturing
- 3.2 Care & Storing
- 3.3 Types, Brands

Examination Scheme:

Components	V	H	CT1	A	EE1
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Text & References:
Text:
- Food & Beverage Services by SN Bagchi & Anita Sharma, Aman Publications, New Delhi
- Food & Beverage Service by Lillicrap
- Food & Beverage Service by R. Singaravelavan, OUP

References:
- F & B Service Manual by Sudhir Andrews, Tata McGraw Hill
- The Waiter by John Phullar
- Professional Table Service by Dennis Lillicrap.
- Food & Beverage Management & Control by Dr. JM Negi, Kanishka Publications, New Delhi

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FRONT OFFICE OPERATION-II

Course Code: HMC2303 **Credit Units: 02**

Course Objective:

After completion of this course the students will have clear concept on –

- Front office Communication
- Bell Desk Service
- Guest Services

Module I : Bell Desk Service

1.1 Bell Desk Layout, Equipment
1.2 Staff Organisation, Duty Rotas & Work Schedule
1.3 Luggage Handling Procedures
1.4 Left Luggage Procedures
1.5 Other Functions of Bell Desk

Module II :Front office Communication

2.1 Importance of inter-Departmental Communication
2.2 Types & Methods of Communication

Module III :Guest Services

3.1 Handling Guest Requests
3.2 Handling Guest Complaints
3.3 Mail Handling Procedures
  3.3.1 Importance of Handling Mail without Delay, Sorting of Mail
  3.3.2 Categories of Guest Mail :- Resident Guest, Departed Guest & Guest Still to Arrive
  3.3.3 Special Handling of Registered Mail and Parcels
3.4 Message Handling Procedure
  3.4.1 Importance, Procedure, Method of Receiving and Transmitting Messages for Guest, Location Form, Paging Procedure

Examination Scheme:

Components	A	JE	P	CT	EE
Weightage (%)	05	05	05	15	70

CT-class test; A-attendance; EE-end semester examination; P-project: JE-Journal Evaluation

Text & References:

Text:

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- Front Office Management by Mr. Sbhal Nagar
- Professional Hotel Front Office Management – Anutosh Bhakta
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HOUSE KEEPING OPERATION-II

Course Code: HMC2304 **Credit Units: 02**

Course Objective:

At the end of the semester the students will have a thorough knowledge of-

- Fibres & Fabrics, Methods of Weaving, Linen
- Linen Room
- Uniforms & Uniform Room
- Sewing Room.

Module I : Fibres & Fabrics

Definition of Fibre

Classification of Fibre - The Origin, Characteristics & Usage in the Hotel

Module II :Weaving

Stages

Terms Used - Weft, Warp, Selvedge, Thread Count

Classification of Weaves - Plain -Basket, Twill, Damask, Satin, Figured, Bird Eye, Herring Bone, Dobby, Jacquard, Pile (Cut & Uncut)

Fabric Commonly Used - Flannel, Parcale, Calico, Cambrioc, Candlewick, Denim, Rayon, Velvet,

Finishes -Sizing, Degumming, Weighting, Boiling off, Scouring, Singeing, Calendering, Decatizing, Shearing, Brushing, Floacking, Sanforisation, Mercerization, Pleating / Fluting, Napping, Bleaching, Dyeing, Printing (Roller & Screen)

Module III :Linen

Classification of Linen

Items Classified As Bed and Bath Linen, Their Sizes

Items Classified As Table Linen, Their Sizes

Materials Used For Making Fabric & Their Classification

Selection Criteria for the Linen Items (Bed Sheets Pillowcases, Towels and Bath Mats, Table Cloths, Serviettes)

Selection Criteria & Calculating Material Required for Soft Furnishings (Curtains, Bedspreads, Upholstery & Cushions)

Module IV :Linen Room

Activities of Linen Room

Location, Equipment & Layout of a Linen Room (Basic Rules)

Purchase of Linen / Linen Hire / Quality & Quantity

Storage & inspection

Issuing of Linen to Floors & Departments (Procedure & Records)

Dispatch & Delivery from Laundry (Procedure & Records)

Stock Taking - Procedure & Records

Condemned Linen & Cut-Down-Procedure and Records

Marking & Monogramming

Module V :Uniforms & Uniform Room

Purpose of Uniforms

Number of Sets, Issuing Procedure & Exchange of Uniforms

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Designing A Uniform - Functional Aesthetic Considerations
Layout & Planning of the Uniform Room (Basic Considerations)

Module VI :Sewing Room

Equipments in a sewing room
Functions carried out in a sewing room

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Text & References:

Text:

- Professional Management of Housekeeping Operation by Robert J. Martin
- Hotel, Hostel & Hospital Housekeeping by John C. Branson & Margaret Lennox
- Housekeeping Management by Keppa Margret M
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi

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FOOD PRODUCTION OPERATIONS LAB-I

Course Code: HMC2308 **Credit Units: 03**

Cookery

- Preparing Indian Masalas & Gravies
- Preparing & Cooking Indian Vegetables
- Preparing Rice, Dal, Breads
- Preparing Indian& continental Menus
- Preparing for Indian & Continental Desserts

Patisserie

- Different methods & Types Cake making
- Icing – Types & Applications

Examination Scheme:

Internal: 30 Marks

Components	JE	LE	VV	A
Weightage (%)	05	15	5	5

End-Term: 70 Marks

Components	JE	VV	INDENT	LE
Weightage (%)	05	05	10	50

Abbreviation: JE= Journal Evaluation; LE= Lab Evaluation; VV= Viva-Voce; GP= Grooming & Punctuality

Text & References:

Text:

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FOOD & BEVERAGE SERVICE OPERATIONS LAB-I

Course Code: HMC2309 **Credit Units: 02**

- Service of spirits and liqueurs
- Bar setup and operations
- Cocktail and Mocktail preparations, presentation and service
- Service of Cigars and cigarettes
- Service of Afternoon and High Teas
- Cocktail Parties

Examination Scheme:

Internal: 30 Marks

Components	JE	LE	VV	A
Weightage (%)	05	15	05	5

End-Term: 70 Marks

Components	JE	VV	GP	LE
Weightage (%)	10	10	10	40

Abbreviation: JE= Journal Evaluation; LE= Lab Evaluation; VV= Viva-Voce; GP= Grooming & Punctuality

Text & References:

Text:

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- Food & Beverage Service by Lilicrap
- Food & Beverage Service by R. Singaravelavan, OUP

References:

- F & B Service Manual by Sudhir Andrews, Tata McGraw Hill
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FRONT OFFICE OPERATION LAB-II

Course Code: HMC2310 **Credit Units: 01**

- Handling Telephones
- Taking Reservations
- Processing Reservations
- Role Play – Check-in / Walk-in / FIT / GIT / VIP / CIP / HG etc.
- Mock Situations – Role – Plays
- Filling up of C – Forms
- Preparation & Filling up of Guest Registration Card

Examination Scheme:

Internal: 30 Marks

Components	JE	LE	VV	A
Weightage (%)	05	15	05	05

End-Term: 70 Marks

Components	JE	VV	GP	LE
Weightage (%)	10	10	10	40

Abbreviation: JE= Journal Evaluation; LE= Lab Evaluation; VV= Viva-Voce; GP= Grooming & Punctuality A: Attendance

Text & References:

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HOUSEKEEPING OPERATION LAB-II

Course Code: HMC2311 **Credit Units: 01**

- Identification of Fibre & Fabrics
- Test of Fibre & Fabrics
- Sewing & Stitching

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

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Text & References:

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FOOD PRODUCTION OPERATIONS-II

Course Code: HMC2401 **Credit Units: 02**

Course Objective:

At the end of the semester the students will develop a clear concept on –

- Quantity Food Production
- Menu Planning
- Regional Indian Cuisine
- Frozen Desserts
- Sugar Cookery
- Chocolate Confectionary

Module I: Quantity Food Production- Equipment

Equipment required for mass/volume feeding
Heat and cold generating equipment
Care and maintenance of these equipments
Modern development in equipment manufacture

Module II: Menu Planning

Basic principles of menu planning – recapitulation
Points to consider in menu planning for various volume feeding outlets such as Industrial, Institutional, Mobile Catering Units
Planning menus for;

1. School/college students
2. Industrial workers
3. Hospitals
4. Outdoor parties
5. Theme dinners
6. Transport facilities, cruise lines, airlines, railway

Nutrition factors for the above

Module III: Indenting

Principles of indenting for volume feeding
Portion sizes of various items for different types of volume feeding
Modifying recipes for indenting for large scale catering
Practical difficulties while indenting for volume feeding

Module IV: Planning

Principles of planning for quantity food production with regard to

- Space allocation
- Equipment selection
- Staffing

Module V: Volume Feeding

Institutional and Industrial Catering

- Types of Institutional & Industrial Catering
- Problems associated with this type of catering
- Scope of development and growth

Hospital Catering

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- Highlights of hospital catering for patients, staff, visitors
- Diet menus and nutritional requirements

Off Premises Catering

- Reasons for growth and development
- Menu planning and theme parties
- Concept of a Central Production Unit
- Problems associated with off-premises catering

Mobile Catering

- Characteristics of Rail, Airline (Flight Kitchen) and Sea Catering.
- Branches of Mobile Catering

Quantity Purchase & Storage

- Introduction of purchasing
- Purchasing system
- Purchasing specifications
- Purchasing techniques
- Storage

Module VI: Regional Indian Cuisine

Introduction to Regional Indian Cuisine
Heritage of Indian Cuisine
Cuisine and its highlights of different states/region/ communities to be discussed under:

- Geographic location
- Seasonal availability
- Special equipment
- Staple diets
- Specialty cuisine for festivals and special occasions

States - Andhra Pradesh, Bengal, Goa, Gujarat, Karnataka, Kashmir, Kerala, Madhya Pradesh, Maharashtra, North-Eastern States, Punjab, Rajasthan, Tamil Nadu and Uttar Pradesh/Uttranchal

Communities- Parsee, Chettinad, Hyderabadi, Lucknowi (Avadhi), Malabari / Syrian, Christian and Bohri

Discussions- Indian Breads, Indian Sweets, Indian Snacks.

Patisserie

Module VII : Frozen Desserts : ingredients; Types

Sherbets,
Ice-creams

Module VIII :Sugar Cookery

Manufacturing, Syrups, Types, Stages of Cooking With Temperatures

Module IX :Chocolate Confectionary

Origin of Chocolate, Manufacturing, Tempering, Types, Usage

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Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	06	04	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

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- Theory of Cookery by K Arora published by Frank Bros &Co., New Delhi
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FOOD & BEVERAGE SERVICE OPERATIONS-II

Course Code: HMC2402 **Credit Units: 02**

Course Objective:
At the end of the semester the students will develop a clear concept on –
- Guéridon Service
- Banquets
- Bar Operations

Module I:Guéridon Service
- Types of Trolleys
- Sequence of Service

Module II:Banquets
- History of Banquets
- Types of Banquets
- Organization of Banquet Section
- Banquet Procedures
- Buffets
- Banquet Protocols
- Conferences

Module III :Bar Operations
- Bar Set Up
- Equipment
- Bar Control
- Cocktails

Examination Scheme:

Components	V	H	CT1	A	EE1
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Text & References:

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- Food & Beverage Service by Lillicrap
- Food & Beverage Service by R. Singaravelavan, OUP

References:
- F & B Service Manual by Sudhir Andrews, Tata McGraw Hill
- The Waiter by John Phullar
- Professional Table Service by Dennis Lillicrap.
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FRONT OFFICE MANAGEMENT-I

Course Code: HMC2403 **Credit Units: 02**

Course Objective:
At the end of the semester the students will develop a clear concept on –
- Checkout & Settlement
- Front office Accounting Systems
- Night Audit
- Hotel / Front office Security System
- Property Management Systems

Module I :Checkout & Settlement
- Procedures at Reception, Cash Section, Bell Desk
- Express Check-Out & Self Check-Out
- Reduction of Late Charges
- Effective Billing & Collection

Module II: Front office Accounting Systems
- Accounting Fundamentals
- Creation & Maintenance of Accounts
- Audits & internal Control
- Settlement of Accounts
- Cash Control
- Credit Control

Module III: Night Audit
- Night Audit Process
- Function of Night Auditor
- Night Audit Reports

Module IV: Hotel / Front office Security System
- Methods
- Equipment Used
- Card Key Control
- Emergency Procedures
- Management's Role in Security

Module V:Property Management Systems
- Reservation Management Software
- Room Management Software
- Guest Account Management Software
- General Management Software

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Examination Scheme:

Components	A	JE	P	CT	EE
Weightage (%)	05	05	05	15	70

CT-class test; A-attendance; EE-end semester examination; P-project: JE-Journal Evaluation

Text & References:

Text:

- Front Office Management by Bardi, John Willy and Sons
- Front Office Management by Mr. Sbhal Nagar
- Professional Hotel Front Office Management – Anutosh Bhakta
- Hotel Management by Dr. Jagmohan Negi, Himalaya Publishing House, New Delhi.
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HOUSEKEEPING MANAGEMENT-I

Course Code: HMC2404 **Credit Units: 02**

Course Objective:
At the end of the semester the students will develop a clear concept on –
- Laundry Operation
- Contract Cleaning
- Flower Arrangement

Module I : Laundry Operation
- Duties & Responsibilities of Laundry Staff (Laundry Manager and Shift-In-Leader, Dry Cleaning, Supervisor, Spotter cum Presser, Laundry Clerk, Attendants Valet Runner, Laundry)
- Importance and Principles of Laundry Operations
- Flow Process of industrial Laundering [Collection, Transportation Arrivals, Sorting, Weighing, Loading, Washing, Rinsing, Starching, Hydro-Extraction, Drying, Unloading, Tumbling, Finishing (Calender / Steam Press) Folding, & Storing Transfer & Use]
- Stages in Wash Cycle (Flush-Suds-Bleach Rinse-Sour & Soft-Extract, Break & Soaking)
- Equipment, Layout & Planning & Laundry (Basic Rules)
- Role of Laundry Agents
- Classification of Laundry Agents (Synthetic, Detergent, Built Soap Detergents, Enzyme Action-Detergents, Explain Briefly)
- Stain Removal

Module II :Contract Cleaning
- Types of Contract Cleaning
- Methods of Pricing of Contract Cleaning
- Advantages and Disadvantages of Contract Cleaning
- Eco-Friendly Process

Module III :Flower Arrangement
- Purpose of Flower Arrangement, Placement & Level of Placement
- With Relevant Examples
- Equipment & Materials Required
- Conditioning of Plant Material
- Styles of Flower Arrangement (Western, Japanese, Free-Style & Abstract)
- Principle of Flower Arrangement (Design, Scale, Balance, Focal Point, Rhythm, Texture, Repetition, Unity & Harmony)

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

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Text & References:

Text:

- Professional Management of Housekeeping Operation by Robert J. Martin
- Hotel, Hostel & Hospital Housekeeping by John C. Branson & Margaret Lennox
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FOOD PRODUCTION OPERATIONS LAB-II

Course Code: HMC2408 **Credit Units: 04**

Cookery

- To formulate different sets of menus from the following regions and to include more dishes from the respective regions. The practical class will be conducted preferably by demonstrative method.
  - Awadh
  - Bengal
  - Goa
  - Gujarat
  - Hyderabad
  - Kashmiri
  - Maharashtra
  - Punjabi
  - Rajasthan
  - South India (Tamil Nadu, Karnataka, Kerala).

Patisserie

- Preparation & Application of Cream, Filling & Custards & Their uses
- Sugar Products
- Chocolate Confectionery

Examination Scheme:

Internal: 30 Marks

Components	JE	LE	VV	A
Weightage (%)	05	15	5	5

End-Term: 70 Marks

Components	JE	VV	INDENT	LE
Weightage (%)	05	05	10	50

Abbreviation: JE= Journal Evaluation; LE= Lab Evaluation; VV= Viva-Voce; GP= Grooming & Punctuality

Text & References:

Text:

- Theory of Catering by Kinton Cesserani, Published by Hodder & Stoughton
- Practical Cookery by Kinton Cesserani, Published by Hodder & Stoughton

References:

- Theory of Cookery by K Arora published, Frank Bros &Co. New Delhi
- Professional Chef by John Wiley
- Ultimate Cooking Course by Carole Clement publish by Joana Lorrenz
- Essential of Cooking by James Peterson published by Artisan

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FOOD & BEVERAGE SERVICE OPERATIONS LAB-II

Course Code: HMC2409 **Credit Units: 02**

- Buffet Lay-ups, theme Buffet setups
- Restaurant setups of different types
- Service of Cheese
- Preparation of Flambé dishes

Examination Scheme:

Internal: 30 Marks

Components	JE	LE	VV	A
Weightage (%)	05	15	05	5

End-Term: 70 Marks

Components	JE	VV	GP	LE
Weightage (%)	10	10	10	40

Abbreviation: JE= Journal Evaluation; LE= Lab Evaluation; VV= Viva-Voce; GP= Grooming & Punctuality

Text & References:

Text & References:

Text:

- Food & Beverage Services by SN Bagchi & Anita Sharma, Aman Publications, New Delhi
- Food & Beverage Service by Lilicrap
- Food & Beverage Service by R. Singaravelavan, OUP

References:

- F & B Service Manual by Sudhir Andrews, Tata McGraw Hill
- The Waiter by John Fullar
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FRONT OFFICE MANAGEMENT LAB

Course Code: HMC2410 **Credit Units: 01**

- Preparation & Study of Countries – Capitals & Currency, Airlines, Flag Charts, Credit Cards, Travel Agency etc.
- Telecommunication Skills
- Preparation of Guest Folio
- Guest Complaint Handling
- Preparation of Guest History Cards

Examination Scheme:

Internal: 30 Marks

Components	JE	LE	VV	A
Weightage (%)	05	15	05	05

End-Term: 70 Marks

Components	JE	VV	GP	LE
Weightage (%)	10	10	10	40

Abbreviation: JE= Journal Evaluation; LE= Lab Evaluation; VV= Viva-Voce; GP= Grooming & Punctuality A: Attendance

Text & References:

Text:

- Front Office Management by Bardi, John Willy and Sons
- Front Office Management by Mr. Sbhal Nagar
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HOUSEKEEPING MANAGEMENT LAB

Course Code: HMC2411 **Credit Units: 01**

- Laundry Operations
- Washing & Finishing of various Fibres & Fabrics
- Stain Removal

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Text & References:

Text:

- Professional Management of Housekeeping Operation by Robert J. Martin
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FOOD PRODUCTION TRAINING REPORT

Course Code: HMC2501 **Credit Units: 05**

Course Objective:

At the end of the industrial training the student would be able to;
(i) Explain the organizational structure of the department
(ii) Describe job description of various job titles, work schedules, opening & closing duties.
(iii) Explain various sections and their functions
(iv) Observe personal hygiene, kitchen hygiene and sanitation
(v) Identify forms/formats, records and registers maintained
(vi) Help in preparation of various dishes, garnish and service
(vii) Observe food production standards of finished products

On completion of the project the student will be required to submit the following:

Project File or Industrial workflow log book - The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

In general, the File should be comprehensive and include:
- A short account of the activities that were undertaken as part of the training;
- A statement about the extent to which the training has achieved its stated goals.
- A statement about the outcomes of the learning, evaluation and dissemination processes engaged in as part of the training;
- Any activities planned but not yet completed as part of the training, or as a future initiative directly resulting from the project;
- Any problems that have arisen that may be useful to document for future reference.

Training Report
The report should be submitted in duplicate (2 copies) spiral bound and a CD and should contain the following components:

- **Title or Cover Page**

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- **Introduction**

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- **Materials and Methods**

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This section should aim at experimental designs, materials used. Methodology should be mentioned in details including modifications if any.

- **Suggestions**

In writing these section, emphasis should be given on what has been performed and achieved in the course of the work and any ideas/suggestions they feel will can be implemented, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis.

- **Conclusion**

A conclusion should be the final section in which the outcome of the work is mentioned briefly.

- **Appendices**

The Appendix contains material which is of interest to the reader ,and may include any forms, formats and any problem that have arisen that may be useful to document for future reference.

- **Performance Appraisal & Completion Certificate** duly signed and stamped

Examination Scheme:

Project Report:	50
Log book + Attendance + Appraisal	20
Presentation & Viva Voce:	30
Total:	**100**

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FOOD & BEVERAGE SERVICE TRAINING REPORT

Course Code: HMC2502 **Credit Units: 05**

Course Objective:
At the end of the industrial training the student would be able to:
(i) explain staff organization
(ii) do layout
(iii) list all equipments used (including crockery, cutlery, glassware etc) and use of these equipment
(iv) describe and explain the menu and bar card
(v) perform task for table reservation & receiving the guest
(vi) lay the table, placing the order and pick-up, service and clearance procedure
(vii) list all bar equipments
(viii) take and serve orders of different beverages, cigars and cigarettes.

On completion of the project the student will be required to submit the following:

Project File or Industrial workflow log book - The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

In general, the File should be comprehensive and include:
- A short account of the activities that were undertaken as part of the training;
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FRONT OFFICE MANAGEMENT TRAINING REPORT

Course Code: HMC2503 **Credit Units: 05**

Course Objective:
At the end of the industrial training the student would be able to:
(i) understand and explain the organization structure
(ii) prepare job descriptions of various job titles at front office
(iii) understand various procedures & functions followed for:-
1. reservations
2. reception & information
3. bell desk
4. bills and cash
5. guest relations
6. night auditing

(iv) maintain various records & registers and understand their uses.

On completion of the project the student will be required to submit the following:

Project File or Industrial workflow log book - The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

In general, the File should be comprehensive and include:
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Log book + Attendance + Appraisal	20
Presentation & Viva Voce:	30
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HOUSEKEEPING MANAGEMENT TRAINING REPORT

Course Code: HMC2504 **Credit Units: 05**

Course Objective:
At the end of the industrial training the student would be able to:
i) understand and explain the organization structure and various sections of the department
ii) perform duties and responsibilities of the executives and non-executives of the department
iii) describe the functions of various sections
iv) explain the duties of room attendant and houseman in different shifts
v) maintain various records and registers
vi) demonstrate and follow procedures for:
   a) cleaning of room and bathroom
   b) lost and found items
   c) exchange of linen
   d) cleaning of various surfaces
   e) pest control
   f) flower arrangement procedures

On completion of the project the student will be required to submit the following:

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ADVANCED FOOD PRODUCTION OPERATIONS-I

Course Code: HMC2601 **Credit Units: 02**

Course Objective:

At the end of the semester the students will develop a clear concept on –

- Larder and its activities
- Chaud Froid, Aspic & Jelly
- Charcuterie, Ham, Bacon & Gammon, Forcemeats, Galantines, Pates, Terrine, Mouse & Mousseline, Quenelles, Parfaits, Roulades, Brines, Cures & Marinades
- Non edible Displays

Module I: Larder

Layout & Equipment

- Introduction of Larder Work
- Definition
- Equipment found in the larder
- Layout of typical larder with equipment and various sections

Terms & Larder Control

- Common terms used in the Larder and Larder Control
- Essentials of Larder Control
- Importance of larder Control
- Devising Larder Control Systems
- Liasoning with Other Departments
- Yield Testing

Duties & Responsibilities of the Larder Chef

- Functions of the Larder
- Hierarchy of larder Staff
- Sections of the Larder
- Duties and responsibilities of larder Chef.

Module II: Charcuterie

- Introduction to charcuterie
- Sausage – Types & Varieties
- Casings – Types & Varieties
- Fillings – Types & Varieties
- Additives & Preservatives

Module III :Forcemeats

- Types of forcemeats
- Preparation of forcemeats
- Uses of forcemeats

Module IV :Brines, Cures & Marinades

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- Types of Brines
- Preparation of Brines
- Methods of Curing
- Types of marinades
- Uses of Marinades
- Difference between Brines, Cures & Marinades

Module V :Ham, Bacon & Gammon

- Cuts of Ham, Bacon & Gammon
- Differences between Ham, Bacon & Gammon
- Processing of Ham & Bacon
- Green Bacon
- Uses of the different cuts

Module VI :Galantines

- Making of Galantines
- Types of Galantine
- Ballotines

Module VII: Pate& Terrine

- Types of Pate
- Pate de foie gras
- Making of Pate
- Commercial pate and Pate Maison
- Truffle – sources, cultivation and uses of types of truffle

Module VIII: Mouse & Mousseline

- Types of mousse
- Preparation of mousse
- Preparation of mousseline
- Difference between mousse and mousseline

Module IX : Chaud Froid

- Meaning of chaud froid
- Making of chaud froid & precautions
- Types of chaud froid
- Uses of chaud froid

Module X :Aspic & Jelly

- Definition of aspic and jelly
- Difference between the two
- Making of aspic and Jelly
- Uses of aspic and Jelly

Module XI:Quenelles, Parfaits, Roulades

- Preparation of Quenelles, Parfaits and roulades

Module XII :Non edible Displays

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- Ice carvings
- Tallow sculpture
- Fruit & vegetable displays
- Salt dough
- Pastillage
- Jelly Logo
- Thermocol work.

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	06	04	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Text & References:

Text:

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ADVANCED FOOD & BEVERAGE SERVICE OPERATIONS-I

Course Code: HMC2602 **Credit Units: 02**

Course Objective:
At the end of the semester the students will develop a clear concept on –
- Restaurant Planning & Layout
- Menu Planning
- Manpower Planning

Module I :Restaurant Planning & Layout
- Choosing of Location
- Layout Planning
- Décor
- Furnishing, Fixtures & Fittings
- Equipment Selection

Module II :Menu Planning
- Objectives & Procedures
- Menu Planning Considerations &Constrains
- Menu Designing
- Menu Merchandising

Module III :Manpower Planning
- Job Description
- Job Specification
- Recruitment
- Induction & Training

Examination Scheme:

Components	V	H	CT1	A	EE1
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Text & References:

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FRONT OFFICE MANAGEMENT-II

Course Code: HMC2603 **Credit Units: 02**

Course Objective:
At the end of the semester the students will develop a clear concept on –
- Establishing Room Rates
- Forecasting Room Availability
- Budgeting for Operations
- Evaluating Front office Operations

Module I :Establishing Room Rates
- Market Condition Approach
- Rule-of-Thumb Approach
- Hubbart Formula

Module II :Forecasting Room Availability
- Forecasting Data
- Percentage of No-Shows
- Percentage of Walk-Ins
- Percentage of Over-stays
- Percentage of Under-stays
- ARR (Average Room Rate)
- RevPAR (Revenue Per Available Room)
- Forecast Formula
- Room Count Considerations

Module III :Budgeting for Operations
- Forecasting Rooms Revenue
- Estimating Expenses

Module IV :Evaluating Front office Operations
- Daily Operations Report
- Occupancy Ratios
- Rooms Revenue Analysis
- Operating Ratios
- Rooms Division income Statement & Budget Reports

Examination Scheme:

Components	A	JE	P	CT	EE
Weightage (%)	05	05	05	15	70

CT-class test; A-attendance; EE-end semester examination; P-project: JE-Journal Evaluation

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HOUSEKEEPING MANAGEMENT-II

Course Code: HMC2604 **Credit Units: 02**

Course Objective:
At the end of the semester the students will develop a clear concept on –
- Interior Designing
- Interior Decoration
- Safety and Security

Module I :Interior Designing
- Objectives
- Elements
- Principles
- Planning Trends in Hotels

Module II :Interior Decoration
- Colours
- Lighting
- Furniture
- Floor Finishes
- Carpets
- Wall Coverings
- Windows
- Guestroom Accessories

Module III :Safety and Security
- Fire Prevention
- Accident Prevention
- First Aid
- Crime Prevention
- Dealing With Emergencies

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Text & References:

Text:
- Professional Management of Housekeeping Operation by Robert J. Martin
- Hotel, Hostel & Hospital Housekeeping by John C. Branson & Margaret Lennox
- Housekeeping Management by Keppa Margret M
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi

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References:

- Accommodation Management by Roy C
- Hotel Housekeeping Training Manual by Sudhir Andrew
- Professional House Keeping by Madlin Tucker
- Housekeeping Management by Keppa Margret M
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi

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ADVANCED FOOD PRODUCTION OPERATIONS LAB-I

Course Code: HMC2608 **Credit Units: 04**

Course Objective:
At the end of the semester students would be able to-
- learn about the technique of advance skill in food production
- develop concept of International cuisine

Course Contents:

Module I: Three course menus to be formulated featuring International Cuisines
- French.
- Oriental (Chinese and Thai)
- Italian
- Scandinavian
- British
- Spanish
- Demonstration
  - German Greece, Mexican, Mediterranean and Lebanese.

Module II: Demonstration of- Charcuterie
- Galantines
- Pate
- Terrines
- Mousselines

Module III: Bakery & Patisserie Practical-
- Decorated Cakes
- Gateaux
- International Breads
- Sorbets, Parfaits
- Hot / Cold Desserts

Examination Scheme:

Internal: 30 Marks

Components	JE	LE	VV	A
Weightage (%)	05	15	5	5

End-Term: 70 Marks

Components	JE	VV	INDENT	LE
Weightage (%)	05	05	10	50

Abbreviation: JE= Journal Evaluation; LE= Lab Evaluation; VV= Viva-Voce

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Text & References:

Text:

- Theory of Catering by Kinton Cesroni, Hodder & Stoughton
- Practical Cookery by Kinton Cesroni, Hodder & Stoughton
- Theory of Cookery by K Arora, Frank Bros &Co. New Delhi

References:

- Professional Chef by John Wiley
- Ultimate Cooking Course by Carole Clement, Joana Lorrenz
- Essential of Cooking by James Peterson, Artisan

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ADVANCED FOOD & BEVERAGE SERVICE OPERATIONS LAB-I

Course Code: HMC2609 **Credit Units: 02**

Course Objective:
At the end of the semester students will be able to-
- Prepare and give presentation on case studies on planning of F&B outlets
- Plan and supervise service of banquet, buffet, cocktails, gueridon service and setup bar for parties.

Course Contents:
Module I: Case Study on planning of
- Special Restaurant
- Room Service
- Coffee Shop
- Presentation.

Module II
- Case Study on Planning of Manpower of F&B department:-
- Presentation.

Module III
- Supervision of F&B Service in Training Restaurant.

Module IV
- Case Study of Planning Formal & Informal Banquet function including space requirement, Menu Planning.

Module V
- Setting up of various types of Buffet (Design, Layout).

Module VI
- Demonstration and Practice of Guerdon Service.

Module VII
- Case Study on setting up of Bar for parties.

Module VIII
- Demonstration and Practice of Making Cocktails.

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Examination Scheme:

Internal: 30 Marks

Components	JE	LE	VV	A
Weightage (%)	05	15	05	5

End-Term: 70 Marks

Components	JE	VV	GP	LE
Weightage (%)	10	10	10	40

Abbreviation: JE= Journal Evaluation; LE= Lab Evaluation; VV= Viva-Voce; GP= Grooming & Punctuality

Text & References:

Text:

- Food & Beverage Services by SN Bagchi & Anita Sharma, Aman Publications, New Delhi
- Food & Beverage Service by Lilicrap
- Food & Beverage Service by R. Singaravelavan, OUP

References:

- F & B Service Manual by Sudhir Andrews, Tata McGraw Hill
- The Waiter by John Fullar
- Professional Table Service by Dennis Lilicrap.
- Food & Beverage Management & Control by Dr. JM Negi, Kanishka Publications, New Delhi

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FRONT OFFICE MANAGEMENT LAB-II

Course Code: HMC2610 **Credit Units: 02**

- Role Play – Lobby Manager, GRE, Concierge, Bell Boy, Bell Captain etc.
- Accommodation Management Related Calculations

Examination Scheme:

Internal: 30 Marks

Components	JE	LE	VV	A
Weightage (%)	05	15	05	05

End-Term: 70 Marks

Components	JE	VV	GP	LE
Weightage (%)	10	10	10	40

Abbreviation: JE= Journal Evaluation; LE= Lab Evaluation; VV= Viva-Voce; GP= Grooming & Punctuality A: Attendance

Text & References:

Text:

- Front Office Management by Bardi, John Willy and Sons
- Front Office Management by Mr. Sbhal Nagar
- Professional Hotel Front Office Management – Anutosh Bhakta
- Hotel Management by Dr. Jagmohan Negi, Himalaya Publishing House, New Delhi.
- Professional Hotel Management by Dr. JM Negi, S. Chand & Co, New Delhi
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi

References:

- Front Office by Abbott, Butter Worth Hiemann.
- Front Office Manual by Sudhir Andrews, Tata McGraw Hill

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HOUSEKEEPING MANAGEMENT LAB-II

Course Code: HMC2611 **Credit Units: 02**

- Flower Arrangement
- Theme Decoration

Examination Scheme:

Internal: 30 Marks

Components	JE	LE	VV	A
Weightage (%)	05	15	05	05

End-Term: 70 Marks

Components	JE	VV	GP	LE
Weightage (%)	10	10	10	40

Abbreviation: JE= Journal Evaluation; LE= Lab Evaluation; VV= Viva-Voce; GP= Grooming & Punctuality A: Attendance

Text & References:

Text:

- Professional Management of Housekeeping Operation by Robert J. Martin
- Hotel, Hostel & Hospital Housekeeping by John C. Branson & Margaret Lennox
- Housekeeping Management by Keppa Margret M
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi

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- Housekeeping Management by Keppa Margret M
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ADVANCED FOOD PRODUCTION-II

Course Code: HMC2701 **Credit Units: 02**

Course Objective:
At the end of the semester the students will develop clear concept on -

- Modern Trend in Food Production
- Rechauffé Cookery
- Kitchen Planning, Layout and Design
- Quality Control & Standardization of Recipes
- Freezing Techniques
- Food Cost

Module – I :Modern Trend in Food Production Concept

- Frozen Foods
- Types
- Advantages & Disadvantages
- Handling Frozen Foods
- Defrosting Techniques

Module – II : Rechauffé Cookery

- Changes in Food Items
- Optimum Utilization

Module – III :Kitchen Planning, Layout and Design

- Principles of kitchen layout and design,
- Areas of various kitchens with recommended dimension,
- Factors that affect kitchen design,
- Placement of equipments,Flow of work,
- Space allocation,
- Layout of commercial kitchen (types, drawing a layout of a Commercial kitchen),
- Central Kitchen, Satellite Kitchen
- Planning of various supporting services (pot wash, wet grinding, chef room, larder, store and other staff facilities)

Module – IV :Quality Control & Standardization of Recipes

- Raw Materials
- Finished Goods
- Structure of Recipe

Module – V :Indenting

- Concept of indenting\
- Problems Related to indenting
- Storage System

Module – VI :Purchasing

- Receiving
    - Ordering

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- Movements of Goods
- Purchasing Techniques

Module – VII :Freezing Techniques

- Dry Storage
- Cold Rooms

Module – VIII :Food Cost

- Food Cost
- Food Cost Percentage
- Control Cycle
- Various Reports

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	06	04	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Text & References:

Text:

- Theory of Catering by Kinton Cesserani, Published by Hodder & Stoughton
- Practical Cookery by Kinton Cesserani, Published by Hodder & Stoughton

References:

- Theory of Cookery by K Arora published by Frank Bros &Co., New Delhi
- Professional chef by John Wiley
- Ultimate Cooking Course by Carole clement publish by Joana Lorrenz
- Essential of Cooking by James Peterson published by Artisan
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi.

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ADVANCED FOOD & BEVERAGE SERVICE-II

Course Code: HMC2702 **Credit Units: 02**

Course Objective:

At the end of the semester the students will develop clear concept on -

- Cycles of Control
- Food Cost Control
- Budgets & Budgetary Control
- Liquor Control

Module – I :Cycles of Control

3.1 Purchasing
3.2 Receiving
3.3 Storing
3.4 Issuing
3.5 Preparation
3.6 Costing & Selling
3.7 Control

Module – II :Food Cost Control

4.1 Food Costing
4.2 Checks & Checking System
4.3 Standard Costing
4.4 Variance Analysis

Module – III :Budgets & Budgetary Control

5.1 Definition, Different Types of Budgeting
5.2 Different Steps of Preparing Different Budgets
5.3 Budgetary Control
5.4 Formats for Budgeting

Module – IV :Liquor Control

6.1 Purchase Procedures
6.2 Assessment of Quality
6.3 Stock Control
6.4 Beverage Sales Control

Examination Scheme:

Components	V	H	CT1	A	EE1
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

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Text & References:

Text:

- Food & Beverage Services by SN Bagchi & Anita Sharma, Aman Publications, New Delhi
- Food & Beverage Service by Lillicrap
- Food & Beverage Service by R. Singaravelavan, OUP

References:

- F & B Service Manual by Sudhir Andrews, Tata McGraw Hill
- The Waiter by John Phullar
- Professional Table Service by Dennis Lillicrap.
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ADVANCED FRONT OFFICE MANAGEMENT

Course Code: HMC2703 **Credit Units: 02**

Course Objective:
At the end of the semester the students will develop clear concept on -

- Yield Management
- Human Relations Management

Module – I :Yield Management

- Concept of Yield Management
- Capacity Management
- Discount Allocation

Module – II :Measuring Yield

- Potential Average SGL / DBL Rate
- Multiple Occupancy Percentage
- Rate Spread
- Potential Average Rate
- Room Rate Achievement Factor
- Yield Statistic
- Equivalent Occupancy
- Required Non-Room Revenue Per Guest

Module – III :Elements of Yield Management

- Group Room Sales
- Transient Room Sales
- Food & Beverage Activity
- Special Events
- Using Yield Management

Module – IV :Human Relations Management

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Text & References:

Text:

- Front Office Management by Bardi, John Willy and Sons
- Front Office Management by Mr. Sbhal Nagar
- Professional Hotel Front Office Management – Anutosh Bhakta
- Hotel Management by Dr. Jagmohan Negi, Himalaya Publishing House, New Delhi.
- Professional Hotel Management by Dr. JM Negi, S. Chand & Co, New Delhi
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi

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References:

- Front Office by Abbott, Butter Worth Hiemann.
- Front Office Manual by Sudhir Andrews, Tata McGraw Hill
- Front Office Training manual – Sudhir Andrews.
- Managing Front Office Operations – Kasavana & Brooks
- Front Office – operations and management – Ahmed Ismail (Thomson Delmar).
- Managing Computers in Hospitality Industry – Michael Kasavana & Cahell.
- Front Office Operations – Colin Dix & Chris Baird.
- Front Office Operations & Management – S. Bhatnagar

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ACCOMMODATION MANAGEMENT

Course Code: HMC2704 **Credit Units: 02**

Course Objective:
At the end of the semester the students will develop clear concept on -

- Budgeting, Purchasing, Controls in Housekeeping Department
- Recruitment of Staff, Induction & Training of Hotel Housekeeping Staff
- Working Methods

Module – I :Budgeting

- Definition
- Capital & Operational Budget
- Advantages
- Preparation of a Budget
- Budgetary Control

Module – II :Purchasing

- Department Requirements
- Methods of Purchasing

Module – III :Controls in Housekeeping Department

- Purpose
- Expenses
- Functioning
- Forms

Module – IV :Recruitment of Staff

- Job Specifications & Job Descriptions
- Duty Rotas,
- Manual for Standard Housekeeping Procedures of Commercial Establishments

Module – V :Induction & Training of Hotel Housekeeping Staff

Module – VI :Working Methods

- Optimum Time Requirement
- Planning of Work Methods

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Text & References:

Text:

- Professional Management of Housekeeping Operation by Robert J. Martin
- Hotel, Hostel & Hospital Housekeeping by John C. Branson & Margaret Lennox

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- Housekeeping Management by Keppa Margret M
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi

References:

- Accommodation Management by Roy C
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- Professional House Keeping by Madlin Tucker
- Housekeeping Management by Keppa Margret M
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi

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FACILITY MANAGEMENT, PLANNING & DESIGN

Course Code: HMC2705 **Credit Units: 01**

Course Objective:

At the end of the semester the students will be able to-

- Explain & understand hotel design,project management, architectural aspects aspects of facility planning,kitchen stewarding layout &design and methods of energy conservation.,.

Course Contents:

Module I: Hotel Design

Design Consideration, Attractive Appearance, Efficient Plan, Good Location, Suitable Material, Good Workmanship, Sound financing, Competent Management

Module II : Project Management

Introduction of Network analysis, Basic rules and procedures for Network analysis, C.P.M. and PERT, Comparison of CPM and PERT, Classroom exercises, Network crashing determining crash cost, normal cost.

Module III : Facilities Planning

The Systematic Layout Planning Pattern (SLP) for hotel,Planning Consideration,Flow Process and Flow Diagram Procedure for determining space considering ,the guiding factors for the guest room / public facilities, support facilities and services, hotel administration,

Module IV : Architectural Consideration

Difference between carpet area, plinth area and super built area, their relationships, reading of blueprint (plumbing, electrical, AC, ventilation, FSI, FAR, public areas),Approximate cost of construction estimation Approximate operating areas in budget type / 5 star type hotel / guest room,Approximate requirement and estimation of water / electrical load gas, ventilation.

Module V : Kitchen Stewarding Layout and Design

Importance of kitchen stewarding, Kitchen stewarding department layout and design, Equipment found in kitchen stewarding department

Module VI: Stores – Layout and Design

Stores layout and planning (dry, cold and bar), Various equipment of the stores work flow in stores

Module VII : Car Parking

Calculation of car park area for different types of hotels

Module VIII : Energy Conservation

Necessity for energy conservation, Methods of conserving energy in different area of operation of a hotel, Developing and implementing energy conservation program for a hotel

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Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Text & References:

Text:

- Systematic Layout Planning by Richard Muther, Cahners Books Division of Sahners Publishing Company Inc. 9 Franklin Street, USA
- Food Service Planning- Layout Equipment by Lendal H Kotschevar & Margrat E Terrell

References:

- Management Operations & Research by N. Satyanarayan & Latika Raman, Himalaya Publishing House.
- Hospitality Facilities Management and Design by David M Stipanuk

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ENTREPRENEURSHIP DEVELOPMENT

Course Code: HMC2708 **Credit Units: 01**

Course Objective:

At the end of semester students will be able to-

- Acquire be self-employed and inculcate a habit of self-earning and maintain a dignified life
- Plan a path for hospitality students to make them successful entrepreneurs in their life and contribute to society
- To understand basic knowledge in the field of entrepreneurship development and give them basic exposure of Govt. policies and assistance
- Describes the roles that new venture creation plays in the economy, defines entrepreneurship and show how three factors – individuals, environments and organizations comes through to create the entrepreneurship event
- Impart the knowledge of the resource based framework i.e. Financial, physical, technological, human and organizational
- Exposed get with franchising opportunity and discuss what elements make a business concepts a legitimate franchise opportunity
- Acquire an effective leadership, quality and effective decision-making.

Course Contents:

Module I: Entrepreneurship Skills

Personality attribute of an entrepreneurs

- Self control-value attitude, Socio-culture factors

Unique characters of the hospitality industry

- Human psychology, Inter-personal relationship, Team building, Customer orientation

Positive entrepreneurship behaviour

- Overcoming external constrains, Solving internal problems

Module II: Identification of business opportunities in the hospitality industry

Demand / Market Analysis, Present and future competition, Government policy regarding small Enterprises

Module III: Organization of small enterprises - Form of organization

Sole ownership, Partnership, Private Ltd. Company, Public Ltd. Company, Manpower requirement

Module IV: Incentives and Assistance-

From central government, From State Government, From Financial Institutions

Module V: Small Enterprises Risk Analysis

Motivational factors, Developing Achievement Orientation, Strength and weakness of Independent Business, Feasibility and viability

Module VI: Establishment of an Enterprise

Registration of business, Licenses and Permits, Financial resources ,Organizing material, human and technical resource, Launching the enterprises, Formulating and implanting business strategies

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Examination Scheme

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Text & References:

Text:

- Small Scale Industries and Entrepreneurship, by Desai Vasant; Bombay, Himalaya
- Small Scale Industries in the Developing Countries, by Staley E. & Morsey R. McGraw Hill.
- Management of Small Scale Industries, by Malhotra I. S. & Gupta S. L,
- Innovation and Entrepreneurship, by Drucker, Peter F; East-West Press (P) Ltd.

References:

- Entrepreneurial Development in India, by Gupta CB & Srinivasan; Sultan Chand
- Entrepreneur Development– New Ventures Creation, by Taneja S & Gupta SL
- Entrepreneurship Management by Dr. Aruna Kaulgud, Vikas Publishing House.

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EVENT MANAGEMENT

Course Code: HMC2709 **Credit Units: 01**

Course Objective:
At the end of the semester the students will be able to Explain & understand the concept of Event Management, its Design & Feasibility, Marketing of Event, Financial Management, Risk Management, Planning, Operations & Logistics, Control& Evaluation

Module I :Introduction to Event Management
- Size of Events
- Types of Events
- The Event Team
- Code of Ethics

Module II :Concept and Design
- Developing The Concept
- Analysing The Concept
- Designing The Event
- Logistics of The Concept

Module III :Feasibility
- Keys to Success
- The SWOT Analysis

Module IV :Legal Compliance
- Relevant Legislation
- Official Bodies Involved
- Contracts

Module V :Marketing of Event
- Nature of Event Marketing
- Process of Event Marketing
- The Marketing Mix
- Sponsorship

Module VI :Promotion
- Image / Branding
- Advertising
- Publicity
- Public Relations

Module VII :Financial Management
- The Budget
- Break-Even Point & Cash Flow Analysis
- Profit & Loss Statement
- Balance Sheet
- Financial Control Systems

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Module VIII :Risk Management

- Process of Risk Management
- Incident Reporting
- Emergency Response Plans
- Standards for Risk Management

Module IX :Planning

- Establish The Aims of The Event & Objectives
- Prepare an Event Proposal
- Planning Tools

Module X :Protocol

- Order of Precedence; Titles; Styles of Address; Dress Codes
- Protocol for Speakers
- Seating Plans
- Religious & Cultural Protocol
- Rules of Flag Flying

Module XI :Staging The Event

- Choosing The Event Site
- Developing The Theme
- Providing Services
- Managing The Environment

Module XII :Staffing

- Recruitment & Selection; Rosters
- Training; Briefing Staff
- Managing Volunteers

Module XIII :Operations & Logistics

- Logistics
- Policies
- Procedures
- Performance Standards
- Functional Areas

Module XIV :Crowd Management & Evacuation

- The Crowd Management Plan
- Emergency Planning
- Implementing Emergency Procedures

Module XV :Control & Evaluation

- Monitoring & Control Systems
- Operational Monitoring & Control
- Evaluation

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ADVANCED FOOD PRODUCTION OPERATIONS LAB-II

Course Code: HMC2710 **Credit Units: 04**

Preparation & Presentation of International Cuisine

- France
- Italian
- Spanish
- Chinese
- Thai
- Mexican

Basket Cooking

- Planning & Practicing for 3 to 5 course including Patisserie Products

Examination Scheme:

Internal: 30 Marks

Components	JE	LE	VV	A
Weightage (%)	05	15	5	5

End-Term: 70 Marks

Components	JE	VV	INDENT	LE
Weightage (%)	05	05	10	50

Abbreviation: JE= Journal Evaluation; LE= Lab Evaluation; VV= Viva-Voce; GP= Grooming & Punctuality

Text & References:

Text:

- Theory of Catering by Kinton Cesserani, Published by Hodder & Stoughton
- Practical Cookery by Kinton Cesserani, Published by Hodder & Stoughton

References:

- Theory of Cookery by K Arora published, Frank Bros &Co. New Delhi
- Professional Chef by John Wiley
- Ultimate Cooking Course by Carole Clement publish by Joana Lorrenz
- Essential of Cooking by James Peterson published by Artisan

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ADVANCED FOOD & BEVERAGE SERVICE LAB-II

Course Code: HMC2711 **Credit Units: 01**

Course Objective:
At the end of the semester the students will be able to-
- Prepare budget of a F&B outlet
- Calculate breakeven point & display on graphs
- Take & record inventories
- Demonstrate & perform supervisory skills in a F&B service outlet.

Course Contents:

Module I
Preparation of Budget of an Event / Outlet**.**

Module II
Calculate breakeven for an F&B outlet and prepare graphs for the above.

Module III
Case Study & Presentation on calculating cost and cost %.

Module IV
Taking and Recording of Inventory.

Module V
Preparation of Bar Inventory procedure and taking Bar Inventory.

Module VI
Case Study and Presentation of Menu Engineering.

Module VII
Preparation of MIS of F&B Outlet of a month with Graphs.

Module VIII
Supervision - F&B Service in Training Restaurant.
Examination Scheme:

Internal: 30 Marks

Components	JE	LE	VV	A
Weightage (%)	05	15	05	5

End-Term: 70 Marks

Components	JE	VV	GP	LE
Weightage (%)	10	10	10	40

Abbreviation: JE= Journal Evaluation; LE= Lab Evaluation; VV= Viva-Voce; GP= Grooming & Punctuality

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Text & References:

Text:

- Food & Beverage Services by SN Bagchi & Anita Sharma, Aman Publications, New Delhi
- Food & Beverage Service by Lilicrap
- Food & Beverage Service by R. Singaravelavan, OUP

References:

- F & B Service Manual by Sudhir Andrews, Tata McGraw Hill
- The Waiter by John Fullar
- Professional Table Service by Dennis Lilicrap.
- Food & Beverage Management & Control by Dr. JM Negi, Kanishka Publications, New Delhi

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RESEARCH METHODOLOGY

Course Code: HMC2803 **Credit Units: 02**

Course Objective:
Research methodology will be taught in the theory class to prepare students how to approach the subject of research project in the semester. To deal with surging information data regarding the various aspects of tourism industry, one should have a working efficiency with research and statistical techniques. The techniques may be applied in collecting, organizing, analyzing and interpreting data for decision-making. These may also be applied for formulating and testing research hypothesis. The course has been designed to equip the students with latest and necessary field techniques and to build a necessary statistical acumen among them. Students will master the skill for-

- Writing different types of research proposals
- Constructing the relevant tools of research
- Conduct a research project using appropriate qualitative and quantitative techniques
- Write a research report
- Evaluate a research report
- Give presentation of report supported by latest aids.

Course Contents:

Module I: Research Methodology
Meaning of research,Need and importance of research,Types of research,Criteria of good research

Module III: Data collection, analysis and interpretation (Sample designing)
Types & Sources of Data,Techniques of data collection; Correlation and regression analysis of two variables only.Hypothesis testingTest of significance,Chi-square analysis,Reports

Module IV: Preparation of research proposals-
Selection and formulation of research problem,Operationalization of concepts and constructs,Review of related literature,Aims and objectives,Hypothesis, method, sample and tools.

Module V: Evaluation of research report
Research Report Format,Presentation of Report

Examination Scheme:

Components	V	A	S	CT	EE
Weightage (%)	05	05	05	15	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination; S-seminar

Text & References:

Text:

- Applied General Statistics by Crovton and Crowder
- Behavioural Process in Organizations by Pareek, U.Rao. T.V. & Pestonjee D.M
- Professional Hotel Management by J.M. Negi, S Chand & Co, New Delhi

References:

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- Towards Appropriate Tourism– The case of Developing Countries by Peter long Frankfurt
- Method of Social Research – New York; The Free Press
- How to Complete Your Research Work Successfully by Judith Bell; UBS Publisher, Delhi
- How to Research and Write a Thesis in Hospitality & Tourism by James M. Paynter, John Wiley & Sons, New York, USA
- Strategic Management by John A Pearce II & Richard B Robinson Jr.
- Strategic Management by Samual C Cerco
- Quantitative Techniques in Management by Vokra
- Quantitative Approaches to Management by Levin I Richerd

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SPECIALIZATION COURSE (LAB)

Course Code: HMC2804 **Credit Units: 04**

Course Objective:

At the end of the semester the students will be develop competency in specialized area selected by him/her.

FOOD PRODUCTION

- **Module I**
  Theme Cuisine

- **Module II**
  Planning and implementing strategies for Quantity Food Production

- **Module III**
  Fusion Cooking

- **Module IV**
  Display Cuisine

- **Module V**
  Designing & setting up Commercial Kitchen Area

F&B SERVICE

- **Module I: Case Study on planning of**
  Special Restaurant
  Room Service
  Coffee Shop
  Presentation.

- **Module II**
  Case Study on Planning of Manpower of F&B department:-
  Presentation.

- **Module III**
  Supervision of F&B Service in Training Restaurant.

- **Module IV**
  Case Study of Planning Formal & Informal Banquet function including space requirement, Menu Planning.

- **Module V**
  Setting up of various types of Buffet (Design, Layout).

- **Module VI**
  Demonstration and Practice of Guerdon Service.

- **Module VII**

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Case Study on setting up of Bar for parties.

- **Module VIII**
  Demonstration and Practice of Making Cocktails.

FRONT OFFICE

- **Module I**
  Role Play

- **Module II**
  Situation Handling

- **Module III**
  Work – Time Management

- **Module IV**
  Work Schedule Designing

HOUSEKEEPING

- **Module I:**
  First Aid
  First aid kit
  Dealing with emergency situation

- **Module II**
  Special Decorations

- **Module III**
  Layout of a guest room (Refurbishing & Redecoration)

- **Module IV**
  Team cleaning Management

- **Module V**
  Devising Training modules/standard operating procedure/Inspection check lists

Internal: 30 Marks

Components	**JE**	**LE**	**VV**	**A**
Weightage (%)	05	15	05	5

End-Term: 70 Marks

Components	**JE**	**VV**	**GP**	**LE**
Weightage (%)	10	10	10	40

Abbreviation: JE= Journal Evaluation; LE= Lab Evaluation; VV= Viva-Voce; GP= Grooming & Punctuality

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GDPI SESSIONS

Course Code: HMC2805 **Credit Units: 03**

Course Objective:

These sessions would help the students to perform well in the campus interview at the final year stage.

1. **Pre-Preparation before GD/PI**
   - 1.1 Previous day
   - 1.2 Previous night
   - 1.3 Type of food
   - 1.4 Rest & sleep
   - 1.5 On GD/PI day
   - 1.6 Personal Hygiene
   - 1.7 Grooming
   - 1.8 Curriculum Vitae &Testimonials
   - 1.9 Sense of Time

2. Process of Evaluation during Group Discussion
   - 2.1 Skills assessed in a Group Discussion Session
     - 2.1.1 Leadership skills
     - 2.1.2 Communication skills
     - 2.1.3 Interpersonal skills
     - 2.1.4 Persuasive skills
     - 2.1.5 Problem solving skills
     - 2.1.6 Conceptualizing skills
   - 2.2 Rules to follow during the Group Discussion
   - 2.3 Points to remember during Group Discussion
   - 2.4 What to avoid during Group Discussion - Common Mistakes
   - 2.5 Preparations to be taken before appearing in a Group Discussion
     - 2.5.1 Get noticed - But for the right reasons
     - 2.5.2 Egotism Showing off
     - 2.5.3 Quality Vs Quantity

3. Types of Group Discussion GD topics
   - 3.1 Factual
   - 3.2 Abstract
   - 3.3 Argumentative/ Controversial topics
   - 3.4 Opinion based
   - 3.5 Current topics
   - 3.6 Case based topics

4. Steps on how to prepare for an interview?

5. What is an interview?

6. What's the purpose of an interview

7. What to do Before an Interview

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8. What to do During the Interview
   8.1 Make Your Entrance
   8.2 Getting Started
   8.3 Attitude Counts

9. What to do after the Interview is over

10. Interview Do's and Don'ts

Examination Scheme:

Components	V	A	S	CT	EE
Weightage (%)	05	05	05	15	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination; S-seminar

Suggested Reading :

- Body Language – Your Success Mantra Dr. Shalini Verma S. Chand
- The Pocket Guide to Manwatching; Desmond Morris Triad Grafton Books

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RESEARCH PROJECT

Course Code: HMC2837 **Credit Units: 12**

Course Objective:

The purpose of research (Hospitality and Tourism based) is to seek answers to problems through the application of scientific methodology, which guarantees that the information is reliable and unbiased. This information is utilized to make conclusions and recommend solution. Some elementary factors need to be kept in mind while preparing a research and deciding the topic, these could be based on its relevance, feasibility, coverage, accuracy and research, objectivity and ethics.

To deal with surging information data regarding the various aspects of tourism industry, one should have a working efficiency with research and statistical techniques. The techniques may be applied in collecting, organizing, analyzing and interpreting data for decision-making. These may also be applied for formulating and testing research hypothesis. The course has been designed to equip the students with latest and necessary field techniques and to build a necessary statistical acumen among them. Students will master the skill for-

- Writing different types of research proposals and reports
- Constructing the relevant tools of research
- Conduct a research project using appropriate qualitative and quantitative techniques
- Do presentation with the help of tutorial aid
- Evaluate a research report.

The research topic should be assigned by the deputed subject faculty in the beginning of semester & should be approved by PL & HOI. Continuous monitoring and guidance should be provided to student at all the steps.

At the term end, the research project will be presented before a panel and evaluated by examiners (As nominated by HOI). The evaluation should be based on presentation, viva, report content & format & conclusion.

Examination Scheme:

Internal Assessment:

Abstract:	10
Draft:	15
Research Orientation:	10
Reading:	05

External Evaluation:

Objective:	05
Issue Profile:	10
Comprehensiveness	10
Relevance:	10
Presentation:	15
Viva:	10

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Text & References:

Text:

- Applied General Statistics by Crovton and Crowder
- Behavioural Process in Organizations by Pareek, U.Rao. T.V. Pestonjee D.M
- Professional Hotel Management by J.M. Negi, S Chand & Co, New Delhi

References:

- Towards Appropriate Tourism– The case of Developing Countries by Peter long Frankfurt
- Method of Social Research – New York; The Free Press
- How to Complete Your Research Work Successfully by Judith Bell; UBS Publisher, Delhi
- How to Research and Write a Thesis in Hospitality & Tourism by James M. Paynter, John Wiley & Sons, New York, USA.
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi
- Methodology & Techniques of Social Research by Wilkinson & Bhandarkar
- Methods in Social Research by Gode WJ & Hatt PK
- Scientific Social Surveys & Research by Pouline Young & CF Schmid
- Evaluation Information: A Guide for users of Social Scienec by Lescard, Kartzer Jeffery
- Understanding & Conducting Research Application Education & Behavioural Sciences- 2nd Edition.

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Amity School of Hospitality

Bachelor of Tourism & Travel Management

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Curriculum & Scheme of Examination

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Bachelor of Tourism & Travel Management

Syllabus - First Semester

BASICS OF TOURISM MANAGEMENT

Course Code: TRM2101 **Credit Units : 03**

Course Objective: The primary purpose of the paper is to acquaint the students about the basic and preliminary knowledge of the terms, concepts, systems and trends in tourism. It will form the first step to move forward to interact with the advanced knowledge pertaining to travel and tourism.

Course Contents:

Module – I : Conceptual Framework

- Tourism: Definition, Meaning, Nature and Scope.
- Tourist, Travelers, Visitor, Transit Visitor and Excursionist - Definition and Differentiation
- Meaning and Relationship between Leisure, Recreation and Tourism.
- Components and Elements of Tourism
- Types and Typologies (International, Inbound, Outbound, Inter regional, Intra Regional, Domestic, International, National and other Forms, Social Tourism.) of Tourism.

Module – II : Historical Dimensions of Tourism

- Travel and Tourism through the Ages: Early Travels, 'Renaissance' and 'Age of Grand Tours'; Emergence of Modern Tourism, Concept of "Paid Holiday", Silk Route.
- Thomas Cook and the Development of Tourism, & Present Scenario of the Tourism Industry.

Module – III : Motivation and Significance of Travel and Tourism

- **Motivations**
  - Physical Motivations: Travel for Sports and Adventure, Rest and Relaxation, Health and Medical Reasons etc.
  - Cultural Motivations: Pilgrimage Tourism, Cultural Curiosity, Religious etc.
  - Interpersonal Motivation: Meeting New People, VFR, etc
  - Status and Prestige Motivation
  - Business Motivation
- **Significances**
  - The Economic, Social and Cultural Significance of Tourism

Module – IV : Factors that have led to the Growth of Tourism

- **Growth factors**
  - Technology and Destination Development
  - Changing Social Patterns
  - Changing Living Standards
- **Barriers to the Growth of Tourism**
  - Factors Existing at the Destination: Terrorism, & Political and Social Environment
  - Factors Barring a Potential Tourist from Traveling: Time, Cost, and Social Barriers.

Module – V : Studying Tourism

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- Tourism Education and its Significance for Tourism Business Growth
- Professionalism – Key to Tourism Growth

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Readings:

- Pran Seth: Successful tourism Management (Vol. 1 & 2)
- Anand, M.M., Tourism and hotel Industry ii1 India, Prentice Hall, New Delhi, 1976
- Bhatia, A. K., International Tourism, Sterling Publishers, New Delhi
- Bhatia, A. K., Tourism development: Principles, Practices and Philosophies,
- Sterling Publishers, New Delhi
- McIntosh, Robert, W. Goldner, Charles, Tourism: Principles, Practices and Philosophies, John Wiley and Sons Inc. New York, 1990 (9th edition)
- Mill, Robert Christie and Alastair M. Morrison, The Tourism System, Englewood Cliffs, N.J., Prentice Hall, 1985
- Negi, J.M.S., Tourism and Travel- Concepts and principles, Gitanjali Publishing House, New Delhi, 1990
- Robinson, H.A., Geography of Tourism, Me Donald and Evans, London, 1976

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INDIAN GEOGRAPHY OF TOURISM

Course Code: TRM2102 **Credit Units : 03**

Course Objective: Geography of Tourism includes the phenomena of tourism over the global space with 'spatial' attention on the place of origin, place of destination & routes through which the travel & tourism takes place. This course has been simplified with very few case studies & broad information about the continents, so the students can have knowledge of India.

Course Contents:

Module – I : India

- General Introduction, States & Capitals
- Physiographic Units
- Seasons and Climatic Regions & their Impacts on Tourism.
- Natural Vegetation & Wild Animals of India
- India: A Destination for all Reasons & Seasons.

Module – II : The Northern Mountains

- General Introduction of the Himalayas & other Ranges
- Importance of the Himalayas & other Ranges for Religious Tourism
- Importance of the Himalayas & other Ranges for Hill Station & Adventure Tourism.

➢ **Case studies**

- Sri Nagar, Shimla, Nainital, Darjeeling & Gangtok.

Module – III : The Deserts & Central Plains

- General Introduction of Deserts & Central Plains.
- Their Importance for Cultural, Religious & Adventure Tourism.

➢ **Case studies**

- Amritsar, Jaipur, Delhi, Lucknow, Kolkata.

Module – IV : The Peninsula

- General Features of Indian Peninsula with their Tourism Significance.

➢ **Case studies**

- Bhopal, Khajuraho, Hyderabad, Banglore, Ooty

Module – V : The Coastal Plains and Islands

- General Features of Coastal Regions, their Importance for Religious, Cultural & Beach Tourism.

➢ **Case Studies**

- Mumbai, Goa, Cochin, Chennai, Andaman & Nicobar Islands.

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Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Readings:

- Ahmad, Aizaz: General Geography of India, NCERT, New Delhi
- Goh Cheong Long: An Economics Atlas of India, Oxford University.
- National Atlas of India, Govt. of India Publication, Calcutta 1997.
- Atlas of World Oxford Press, New Delhi.
- Singh, R.L.(ed) India: A Regional Geography National Geographical Society of India, Varanasi, 1989.
- Manorama Year Book
- India Year Book 2009, Publication Division. Govt. of India, New Delhi
- Tourism Planner
- Tour Brochures etc.
- Lonely Planet – India
- Kumar, Ravi Bhushan: Coastal Tourism & Environment, AOH Publishing Corporation, New Delhi
- Pilgrimage in India, R.N.Pillai
- Kohli, M.S.: Mountaineering in India, Vikas Publishing House, and New Delhi

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CULTURAL TOURISM OF INDIA

Course Code: TRM2103 **Credit Units : 03**

Course Objective: Cultural tourism is the subset of tourism concerned with a country or region's culture, specifically the lifestyle of the people in those geographical areas, the history of those people, their art, architecture, religion(s), and other elements. Through this subject students will come to about to relate culture with tourism and how to combine these together.

Course Contents:

Module – I : Introduction to Culture

- Culture: Concept and its Essential Characteristics
- Indian Culture: Fundamentals of Indian Culture; Indian Culture through the Ages
- Culture and Tourism Relationship with Special Reference to India

Module – II : Indian Architecture

- Buddhist Architecture: Ajanta, Ellora and Sanchi
- Hindu Architecture: Khajuraho Temples, Sun Temple of Konark, Shore Temple of Mamallpuram and Brihadisvara Temple at Thanjavur
- Medieval Architecture: TajMahal, Red Fort of Delhi, FatehpurSikri and QutubMinar

Module – III : Dances, Music and Handicrafts of India

- Classical Dances of India
- Classical Music of India
- Handicrafts and Handlooms

Module – IV : Fairs and Festivals

- Major Fairs and Festivals of India and their Significance for Tourism
- Holi, Dussehra, Diwali, Baisakhi, Pongal, Bihu, Desert Festival (Jaisalmer), Surajkund Craft Fair, International Trade Fair (New Delhi),

Module – V : Cultural Impact

- Positive Impact of Tourism on Cultural & Vice-Versa
- Negative Impact of Tourism on Cultural & Vice-Versa

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Readings:

- Pran Seth: Successful tourism Management (Vol. 1 & 2)
- McIntosh, Robert, W. Goldner, Charles, Tourism: Principles, Practices and Philosophies, John Wiley and Sons Inc. New York, 1990 (9th edition)
- Mill, Robert Christie and Alastair M. Morrison, The Tourism System, Englewood Cliffs, N.J., Prentice Hall, 1985
- Negi, J.M.S., Tourism and Travel- Concepts and principles, Gitanjali Publishing House, New Delhi, 1990
- Cultural Tourism & Heritage Management - by Shalini Sign, Rawat Publication, Jaipur.
- Hill Stations of India - Gillan Wright, Penguin Books, New Delhi - 19.
- Tourism in India - K.K. Sharma, Classic Publishing House, Jaipur.
- Invitation to Indian Dances by SusheelaMisra Arnold Publishers, New Delhi - 29.

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- Acharya, R. (1986): Tourism & Cultural Heritage of India, ROSA Publication, Jaipur
- Harle, J.C. ( ): The Art and Architecture of Indian Sub Continent
- Hussain,A.A.(1987) :The national culture of India, National Book Trust, New Delhi
- Jacob, R., Joseph, S., Philip, A. (2007): Indian Tourism Practices, Abhijit Publications
- Percy, B. ( ): Indian Architecture – Hindu and Buddhist Period
- Mukerjee, R.K. : The Culture and Art of India: George
- Raina, A.K, Raina, C. L, (2005) Fundamentals of Tourism and Indian Religion, Principles and Practices, Kanishka Publishers, Distributors, New Delhi-02

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NATURAL TOURISM PRODUCTS OF INDIA

Course Code: TRM2104 **Credit Units : 03**

Course Objective: Tourism begins with the motivation to visit attractions at destinations. The attractions may be natural or man-made (cultural). This course will help the students to give an insight about the rich natural tourist products of India.

Course Contents:

Module – I : Natural and Wild life Tourism

- Meaning, Concept and Scope
- The Importance of Nature in Tourism

Module - II: Natural Attractions

- Brief Study of National Parks and Wildlife Sanctuaries, Bird Sanctuaries, Tiger ,Crocodile and Elephant Project Sites of India.
- Major Hill Stations, Islands, River and River Islands of India

Module - III: Beaches of India

- Important of Sea Beaches of India- Mumbai, Puri, Goa, Chennai, Trivandrum and Kerela.

Module - IV: Adventure Sports

- Existing Trends and Places of Importance for Land Based, Water Based and Aero Based Adventure Sports of India.

Module - V: Hill Stations

- Manali, Mussoorie, Almora, Chamba, Gulmarg, Darjeeling.

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Readings:

- Rai. H. C. Hill Tourism Planning & Development
- Ahmad, Aizaz: General Geography of India, NCERT, New Delhi
- Goh Cheong Long: An Economics Atlas of India, Oxford University.
- National Atlas of India, Govt. of India Publication, Calcutta 1997.
- Atlas of World Oxford Press, New Delhi.
- Singh, R.L.(ed) India: A Regional Geography National Geographical Society of India, Varanasi, 1989.
- Manorama Year Book
- India Year Book 2009, Publication Division. Govt. of India, New Delhi
- Tourism Planner, Tour Brochures etc.
- Lonely Planet – India
- Kumar, Ravi Bhushan: Coastal Tourism & Environment, AOH Publishing Corporation, New Delhi
- Pilgrimage in India, R.N.Pillai
- Kohli, M.S.: Mountaineering in India, Vikas Publishing House, and New Delhi

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RELIGIOUS TOURISM-I

Course Code: TRM2105 **Credit Units : 02**

Course Objective: The paper focuses on the religions in India which constitute the major motivation for tourists particularly the domestic tourists. The paper gives an exhaustive and selective view of the major religions in India and familiarizes the student with various popular religious destinations associated with different religions.

Course Contents:

Module – I : Hinduism

- Hinduism (Vedic, Bhagvatism and Shaivism Streams): Basic Features; Growth Over the Years

Module – II : Sikhism

- Sikhism: Basic Features and Growth Over the Year

Module – III : Islam and Christianity

- Islam and Christianity in India: Basic Features and Geographical Extent

Module – IV : Buddhism and Jainism

- Buddhism and Jainism: Their Teachings and Philosophy and Growth Over the Year

Module – V : Religious Tourism: An Overview

- Religious Tourism: Concept, Definition and Significance
- Trends and Pattern in Religious Tourism in India
- Problems and Prospects of Religious Tourism in India

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Readings:

- AbidHussain, S. 2003 (reprint) The National Culture of India, National Book Trust, New Delhi.
- Basham, A.L., 1985 (reprint) The Wonder That Was India, Rupa % Co,. New Delhi
- Hay, Stephen, (Ed.) 1992, Sources of Indian Tradition, 2 vols., Penguin Books, Delhi
- Nadakarni, M.V. 2006, Hinduism: The Gandhian Perspective, Ane Books India, New Delhi
- Radhakrishanan, S. 1999 (Oxford India paperback) Indian Philosophy, 2 vols., Oxford University Press, New Delhi
- Raju, P.T. 1985, Structural Depths of Indian Thought, South Asian Publishers, New Delhi.
- M. Hiriyanna,2009 Outlines of Indian Philosophy, Eastern Book Corporation, Calcutta

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APPLICATION OF COMPUTERS

Course Code: TRM2106 **Credit Units: 01**

Course Objective:
The basic objective of the course is to introduce the students to the world of computers and computer technology. The students will be introducedto the basic concept of operating system, word processing, database, presentation.

Course Contents:
Module - I: Computer Fundamentals
Elements of a Computer system
Characteristic of Computers
Classification of Computers
Limitations
Hardware features and uses
Generations of Computer
Primary and Secondary Storage Concepts
Data Entry Devices
Data Output Devices
Software Concepts
System Software
Application Software
Language Classification
Compilers and Interpreters

Module - II: Operating Systems/Environment
Introduction to Windows
GUI/Features
What are Window & Window 95 and above
Part of a Typical Window and their functions

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Reading ::

Text:
- Basic Computers by IBM
- DOEAC 'O' Level *Information Technology by V.K. Jain BPB Publications*

References:
- Insider Internet Marketing by Jim Deniels
- The Birth of Internet Marketing & Communication by Don Stan Boch

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APPLICATION OF COMPUTERS LAB

Course Code: TRM2107 **Credit Units: 01**

Course Objective:
At the end of the semester the students would be able to-
- Create folders
- Shortcuts copy files & folders
- Deleting files and exploring windows etc.

Course Contents:

Module - I: Window Operations
Creating Folders, Creating Shortcuts, C
opying Files/Folders, Renaming Files/Folders, Deleting Files
Exploring Windows
Quick Menu

Module - II: MS Word
Creating a Document, Formatting Documents, Special Effects
Cut, Copy, Paste.
Table, Graphics.
Print Options.

Examination Scheme:

Internal: 30 Marks

Components	JE	LE	VV	A
Weightage (%)	05	15	05	05

End-Term: 70 Marks

Components	JE	VV	GP	LE
Weightage (%)	10	10	10	40

Abbreviation: JE= Journal Evaluation; LE= Lab Evaluation; VV= Viva-Voce; GP= Grooming & Punctuality

Suggested Reading :

Text:
- Microsoft Work 2000 by Heidi Steele Techmedia Publications
- Basic Computers by IBM

References:
- Insider Internet Marketing by Jim Deniels
- The Birth of Internet Marketing & Communication by Don Stan Boch
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi

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FIELD WORK PROJECT-I

Course Code: TRM2108 **Credit Units: 03**

Course Objective: Students of Tourism need to go through the basics of practical service exposure in different Tourism & Hospitality outlets. To maximize this exposure students will be send for different Tourism services in all the major & minor areas of operation & management within & outside the campus.

Methodology:
Students should be sending for various learning opportunity outside the class room. They should submit the journal after the event is over to assigned faculty from the committee in following format.

- Name of the Event
- Location
- Time
- Faculty Responsible
- Task Assigned
- Learning Outcome
- Suggestions

All the assignments should be duly authorized by the faculty responsible for the event.

Student services will be monitored & evaluated by the committee comprising of Program leader & faculty (as approved by HOI) and the marks will be allotted based on the performance, attitude, learning and utilization of knowledge in practical field.

C-20
S-20
V-20
P-20
JE-20

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Syllabus – Second Semester

TRAVEL AGENCY AND TOUR OPERATOR

Course Code: TRM2201 **Credit Units : 03**

Course Objective: To understand various skills necessary for travel agency and tour operation business.

Course Contents:

Module – I : Travel Agency Business

- Travel Agent: Definition, Types of Travel Agencies
- History, Departments of Travel Agencies
- Major Activities, Functions of Travel Agencies
- Income Sources, Linkages and Integration of Travel Agencies,

Module – II : Tour Operation Business

- Evolution of Tour Operation Business: Definition, Tour Operation, Types of Tour, FIT, GIT, Inbound, Outbound, Escorted, Guided etc.
- Role and Relevance of Tour Operation Business in Modern Scenario.

Module – III : Setting up of Travel Agency and Tour Operating Enterprises

- Entrepreneurship and Tourism
- Procedure for Setting up of Travel Agency and Tour Operating Enterprises; Their Role in Development of Tourism Industry
- Approval from Department of Tourism (DOT), International Air Transport Association (IATA)

Module – IV : The Tour Guide & Escort

- Meaning and Classification, Qualities of an Ideal Tour Guide,
- Various Role of Tour Guide, The Business of Guiding, Organizing a Guiding Business
- Difference Between Guide & Escort

Module – V : Case Studies

- Kuoni, Cox & Kings, Thomas Cook, Carlson Major Tour Operation Companies and Packages (Areas of Operation, Packages, Rates, Itineraries, Marketing Strategies). Role and Relevance of Tour Operation Business in Modern Scenario.

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Reading:

- Stoner. Jeen (2005), Management. Prentice Hall, New Delhi
- R.K. Singla,(2007) Business Management, V.K. publication, new Delhi.
- D.K.Goyal,(2008), Business Management, Arya publication
- Prasad. L.M.(2007), Principles and Practice of Management, Sultan Chand and Sons, New Delhi
- Banerjee, S. (2006), Principles and Practice of Management, Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi

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WORLD GEOGRAPHY OF TOURISM

Course Code: TRM2202 **Credit Units : 03**

Course Objective: This course has been simplified with very few case studies & broad information about the continents. It provides a thorough knowledge about the characteristics of tourist markets, attractions of destinations &the accessibility of the world with a focus on a few selected countries of world.

Course Contents:

Module - I: Introduction to World Geography

- Brief Introduction of Continents & Oceans.
- Map Reading.
- Greenwich Mean Time. International Date Line.
- Elements of Weather & Climate. Climatic Zones of the World.
- Natural Vegetation of the World.
- Main Tourist Activities in Different Climatic Zones.

Module - II: Asia

- General Geographical Features: Physiographic Units, Climate, Vegetation Main Countries, Capitals &their Tourist Attractions.
- A Case Study of Japan, Singapore, Sri Lanka, Saudi Arabia.

Module - III: Europe

- General Geographical Features; Physiography, Climate, Vegetation. Main Countries, Capitals &Their Tourist Attractions.
- A Case Study of France, United Kingdom, Switzerland, Netherlands

Module - IV: America

- General Geographical Features of North & South Americas; Physiographic, Climate, Vegetation, Main Countries, Capitals & Their Tourist Attractions.
- A Case Study of The U.S.A. (Only 5 Destinations), Canada, Brazil, Cuba.

Module - V: Other Countries

- General Geographical Features of Given Countries with Information about Physiographic, Climate, Vegetation & Tourist Attractions of South Africa, Egypt, Australia, New Zeeland.

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Readings:

- Badawi, Cherine: Footprint Egypt, Footprint Travel Guides, 2004.
- Bickersteth, Jane & Eliot, Joshua: Singapore handbook: the travel guide, Footprint Travel Guides, 2001.
- Blore, Shawn; Davidson, Hilary; Karr, Paul; Livesey, Herbert Bailey & McRae, Bill: Frommer's Canada, John Wiley and Sons, 2004.
- Campbell , Jeff ; Chilcoat, Loretta; Derby, Susan ; Greenfield, Beth; Heller, Carolyn B. ; Martin, Sam ; Miller, Debra ; Morris, Bob; Peevers , Andrea Schultze ; Wolff, Kurt & Zimmerman, Karla : USA , Lonely Planet, 2004 .

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- Williams, Stephen: Tourism geography, Routledge, 1998.
- Taylor, Chris; Rowthorn, Chris; Ashburne, John; Benson, Sara & Florence, Mason: Japan, Lonely Planet, University of California, 2000.
- Mente, Boye De: Passport's Japan Almanac, Passport Books, University of Michigan,1987.
- Ellis, Royston: Sri Lanka: TheBradt Travel Guide, Bradt Travel Guides, 2005.
- Plunkett, Richard; Ellemor, Brigitte & Campbell, Verity: Sri Lanka, Lonely Planet, 2003.
- Else, David: England, Lonely Planet, 2007.
- Europe on a Shoestring, Lonely Planet, 2003.
- Prosser, Robert: France, Evans Brothers, 2005.
- Williams, Nicola; Berry, Oliver; Fallon, Steve &Nevez, Catherine Le: France, Lonely Planet, 2007.
- Simonis, Damien; Johnstone, Sarah & Williams, Nicola: Switzerland, Lonely Planet, 2006.
- Steves, Rick: Rick Steves' Switzerland, Avalon Travel Publishing, 2006.
- Louis, Regis St.; Chandler, Gary Prado &Draffen, Andrew: Brazil, Lonely Planet, 2005.
- Peevers, Andrea Schulte & Burgess, Kerryn: Canada, Lonely Planet, 2005.
- Lonely Planet Staff: USA and Canada on a Shoestring 2, Lonely Planet, 1900.
- Fitzpatrick, Mary; Blond, Becca; Pitcher, Gemma; Richmond, Simon; & Warren, Matt: South Africa, Lesotho & Swaziland, Lonely Planet, 2004.
- O'Hagan, Tim: Travel South Africa, Southern Book Publishers, 2000.
- Firestone, Matthew D.; O'Neill, Zora; Sattin, Anthony &Wlodarski, Rafael: Egypt, Lonely Planet, 2008.
- McPhee, Margaret: Australia's Top Tourist Destinations, Universal Publishers, 2003.
- Smitz, Paul; Bain, Carolyn; Bao, Sandra &Farfor, Susannah: Australia, Lonely Planet, 2005

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RELIGIOUS TOURISM-II

Course Code: TRM2203 **Credit Units : 02**

Course Objective: The paper focuses on the religions in India which constitute the major motivation for tourists particularly the domestic tourists. The paper gives an exhaustive and selective view of the major religions in India and familiarizes the student with various popular religious destinations associated with different religions

Course Contents:

Module – I : Religious Destinations of Hinduism

- Hinduism: Four Dhams i.e. Badrinath, Rameshwaram, Puri and Dwarka; Varanasi, Mathura, Vrindavan, Haridwar, Vaishno Devi, Allahabad and Tirupati

Module – II : Religious Destinations of Buddhist

- Buddhist:Lumbini, Bodhgaya, Sarnath, Kushinagar, Sharavasti, Sankisa, Vaishali, Rajgriha, Kapilvastu, Nalanda, Sanchi, Ajanta.

Module – III : Religious Destinations of Jain:

- Jain:Kashi, Pavapuri, Shatrunjaya, Girnar, Mt. Abu, Sharavanbelgola, Palitana

Module – IV : Religious Destinations of Muslim

- Muslim: Ajmer Sharif, Nizamuddin (Delhi), FatehpurSikri, and Some Important Mazars.

Module – V : Religious Destinations of Sikh

- Sikh : Patna, Nanded, Guru-ka-Tal (Agra), Amritsar, Manikaran

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Readings:

- Gupta, SP, Lal, K, Bhattacharya, M. Cultural Tourism in India (DK Print 2002)
- Dixit, M and Sheela, C. Tourism Products (New Royal Book, 2001)
- Michell, George, Monuments of India, Vol. 1. London.
- Davies, Philip, Monuments of India, Vol. II.,London.
- Brown Percy, Indian Architecture (Buddhist and Hindu),Bombay.
- Brown Percy, Indian Architecture (Islamic period), Bombay.
- Hawkins. R.E., Encyclopaedia of Indian Natural History.

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INTERNATIONAL TOURISM BUSINESS

Course Code: TRM2204 **Credit Units : 03**

Course Objective: To make students aware about the international tourism trends and patterns.

Course Contents:

Module – I : Trends in Tourism

- Trends and Patterns in International Tourism

Module – II : Responsible Factors

- Factors Responsible for Growth and Development of International Tourism
- Motivations in Tourism

Module – III : Marketing

- Overseas Travel Agencies Marketing Planning and Strategies

Module – IV : International Time

- Time Calculation, Flying Time Calculation, Time Zones, Day Light Saving Time,
- International Date Line, Marking of Cities on Outlines Maps.

Module – V : Case Studies

- Main 3 International Cultural and Historical Tour Packages.
- Main 3 International Natural Tour Packages.
- Overseas MICE Tourism

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Readings:

- Anand, M.M., **Tourism and hotel Industry in India,** Prentice Hall, New Delhi, 1976
- Bhatia, A. K., **International Tourism**, Sterling Publishers, New Delhi
- Bhatia, A. K., **Tourism development: Principles, Practices and Philosophies**, Sterling Publishers, New Delhi
- Burkart A. &Medlik S., Tourism: Past, Present and Future, Heinemann Professional Publishing
- www.unwto.org
- Kaul, R.N., Dynamics of Tourism: A Trilogy, Sterling Publishers, New Delhi
- Peters, M., International Tourism, Hutchinson, London

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TOURISM ORGANIZATIONS

Course Code: TRM2205 **Credit Units : 03**

Course Objective: These are the organizations to support tourism and travel practices all over the world. This subject will provide with the understanding of these organizations working for tourism

Course Contents:

Module – I : Indian Organization of Tourism and Hospitality

- The Role of the State in Tourism
- National Tourism Organization
- Department of Tourism, India
- ITDC
- DGCA
- AAI
- FHRAI

Module – II : International Tourism Organizations

- UFTAA
- WATA
- ASTA
- WTO
- PATA & PATA Chapters
- IATA
- ICAO
- IHA

Module – III : Travel Industry Fairs

- Participation Advantages
- ITB
- WTM
- PATA Travel Mart
- ICCA

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Readings:

- Pran Seth: Successful tourism Management (Vol. 1 & 2)
- Websites of all Organizations.

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HISTORICAL TOURISM PRODUCTS OF INDIA

Course Code: TRM2206 **Credit Units : 03**

Module – I : Importance of History on Indian Tourism

- Sources of Indian History
- Historical impact on Indian Tourism

Module – II : Various periods in Indian History

- Pre and Protohistory, Vedic Period, Mahajanapada, Maurya, Foreign Invesions
- History up to 650 A.D., Western Kshatrapas, Guptas, Vakatakas, Harshavardhana.
- History up to 1300 A.D., Chalukyas, Cholas, Yadavas, Palas, Pratiharas, Paramaras.
- History up to 1707 A.D., Sultanas, Mughala, Rajputs

Module – III :Historical Tourism Products:

- Definition, Concept and classification.
- Meaning and types of Heritage Tourism,
- Heritage Management Organisations- UNESCO, ASI, ICOMOS, INTACH.

Module – IV :Architectural Heritage of India

- Glimpses on the prominent architecture style flourished in different period. Different style of architecture in India - Hindu, Buddhist and Islamic. Selected case studies of World Heritage Sites in India

Module – V :Historical / Monumental / Architectural destinations

- Delhi, Agra, Jaipur, Khajuraho, Nalanda, Ajanta, Ellora, Hampi- Halebid, Lucknow.Hyderabad, Badami, Aihole, Pattadakkal, Belur, Halebid-, Sravanabelagola, Bijapur, Madurai, Tanjavur, Thiruvananthapuram

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Reading :

Books Recommended :

1. Basham, A.L., The Wonder That was India
2. Chopra,S.K., B.N.Puri, and M.N.Das, A Socio-Cultural and Economic History of India
3. Majumdar,R.C., H.C.Raychoudhari and K.K.Datta, An Advanced History of India
4. NeelakanthaSastry, K.A., An Advanced History of India
5. ThaparRomila, A History of India

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FUNDAMENTALS OF ACCOUNTING-I

Course Code: TRM2207 **Credit Units : 02**

Course Objective:

At the end of the semester the students will be able to-

- Understand basic concept of hospitality accounting system
- The meaning and need for accounting
- Distinguish between book keeping and accounting
- Record the transactions using rules of debit and credit
- Ascertain the correct bank balances
- To check the accuracy of accounting records.

Course Contents:

Module – I : Introduction to Accounting

Meaning & Definition, Types and Classification, Principles of Accounting, Systems of Accounting, Generally Accepted Accounting, Principles

Module – II : Primary Books (Journal)

Meaning and Definition, Format of Journal, Rules of Debit and Credit, Opening entry, simple and compound entries, Practical

Module – III : Subsidiary Books (Ledger)

Meaning and Uses, Formats, Posting, Practical

Module - IV: Subsidiary Books

Need and Use

Classification

- Purchase book
- Sales book
- Purchase returns
- Sales return
- Journal proper
- Practical

Module – V : Trial Balance

Meaning, Methods, Advantages, Limitations, Practical

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Readings:

- Element of Hotel Accounting by Dr. JM Negi& G.S. Rawat, HKS International (now Aman Publication, New Delhi)
- Hotel Management Accounting & Control by Dr. JM Negi, Himalaya Publication, New Delhi
- Management Accounting by Dr. Hingorani& Prof. Ramanathan, Sultan Chand & Sons
- Management Accounting & Financial Control by Dr. SN Maheshwari, Sultan Chand & Sons
- Understanding Hospitality Accounting by Raymond Cote, EI-AH&LA USA
- Financial Accounting by GC Maheshwari, NCERT, N. Delhi
- Fundamentals of Hotel Accounting by G.S. Rawat& Dr. JM Negi, Aman Publications, New Delhi

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FIELD WORK PROJECT - II

Course Code: TRM2208 **Credit Units : 03**

Course Objective: Students of Tourism & Hospitality need to go through the basics of practical service exposure in different Tourism & Hospitality outlets. To maximize this exposure students will be send for different Tourism & Hospitality services in all the major & minor areas of operation & management within & outside the campus.

Methodology:
Students should be sending for various learning opportunity outside the class room. They should submit the journal after the event is over to assigned faculty from the committee in following format.

- Name of the event
- Location
- Time
- Faculty Responsible
- Task Assigned
- Learning Outcome
- Suggestions

All the assignments should be duly authorized by the faculty responsible for the event.

Student services will be monitored & evaluated by the committee comprising of Program leader & faculty (as approved by HOI) and the marks will be allotted based on the performance, attitude, learning and utilization of knowledge in practical field.

C-20
S-20
V-20
P-20
JE-20

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Syllabus – Third Semester

TOURISM TRENDS IN INDIA

Course Code: TRM2301 **Credit Units : 03**

Course Objective: To make student aware about new emerging trends of tourism in India.

Course Contents:

Module – I : Trends in Tourism

- Domestic and International Trends and Patterns in Indian Tourism Travel.
- Factors responsible for growth and development of Indian tourism
- Motivations in tourism in India.

Module – II : Tourism in Indian States

- Overview, Trends and Pattern, State Tourism Organization
  - Andhra Pradesh
  - Tamil Nadu
  - Uttar Pradesh
  - Karnataka Madhya Pradesh
  - Delhi

Module – III : Rural Tourism in India

- Meaning, Definition, Concept and Scope of Rural Tourism in India.
- Planning and Management of Rural Tourism
- Sustainable Practices in Rural Tourism
- Benefits of Rural Tourism Development
- Socio-Cultural Impact of Tourism

Module – IV : Reason for Travel in India

- Main Reason and Trends of travelling in India.
- Tourist Arrivals by Mode of Transport: Air, Land, Sea.
- Foreign Tourist Arrivals by Port of Entry.

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Readings:

- Indian Tourism Statistics
- Website of Different States of India

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TRANSPORT MANAGEMENT

Course Code: TRM2302 **Credit Units : 03**

Course Objective: The purpose of this course is to acquire an in-depth knowledge about the transport management and to become familiar with the techniques and approaches for successful management of tourist transport business.

Course Contents:

Module – I : Introduction to Transport in Tourism

- Evolution of Tourist Transport System
- Importance and Significances of Transport in Tourism.

Module – II : Roadways Industry

- History and Evaluation
- National and State Highways, Express Highways, Golden Quadrilateral.
- Significances of Roadways Transport in Tourism

Module – III : Railways Industry

- History and Evaluation
- Various Tourist Trains: Palace on Wheels, Deccan Odyssey, Fairy Queen**,** 5 Toy Trains
- Significances of Railway Transport in Tourism**.**

Module – IV : Aviation Industry

- History and Evaluation
- Domestic and International Airlines
- Significances of Domestic and International Airlines Transport in Tourism

Module – V : Water Transport

- History and Evaluation
- National and International Cruises
- Significances of WaterTransport in Tourism

Examination Scheme:

Components	**V**	**H**	**CT**	**A**	**EE**
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Readings:

- Pran Seth: Successful tourism Management (Vol. 1 & 2)
- Anand, M.M., Tourism and hotel Industry in India, Prentice Hall, New Delhi, 1976
- Bhatia, A. K., International Tourism, Sterling Publishers, New Delhi
- Bhatia, A. K., Tourism development: Principles, Practices and Philosophies, Sterling Publishers, New Delhi

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HOSPITALITY MANAGEMENT IN TOURISM

Course Code: TRM2303 **Credit Units : 03**

Course Objective: To provide an overview to the students about the hospitality industry and its importance in tourism.

Course Contents:

Module – I : Introduction to Hospitality

- Hospitality & Hotel: Meaning/Definition, Evolution & History, Classification and Categorization of Hotels, Star Rating of Hotels.

Module – II : Introduction to Hotels

- Organization Structure of a Small, Medium and a Large Hotel, Importance of Grooming and Personality Development, Latest Trends in Hotels

Module – III : Hotel Departments

- Major Departments – Hierarchy, Duties and Responsibilities,
  - Front Office Operations
  - Accommodation Operations
  - F&B Service
  - Food Production

Module – IV : Co-Ordination

- Inter Departmental Co-Ordination
- Support Areas in a Hotel – Duties and Responsibilities
  - Human Resource
  - Accounts
  - Sales and Marketing
  - Purchase Department
  - Security
  - Stores
  - Maintenance

Module – V : Case Study

- A Case Study to be Done on any One of TheFollowing Hotel Chains in India – Taj, Oberoi, Marriot, ITC, Lalit, Hilton, Sheraton, Hyatt, Radisson, TheLeela, etc

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Readings:

- Hotel Management & Operations by Fallon & Rutherford (John Wiley & Sons)
- Introduction to Tourism & Hospitality by Sudhir Andrews (McGraw-Hill Company)
- Introduction to the Hospitality Industry by Tom Powers (John Wiley & Sons)
- Marketing For Hospitality And Tourism 5/e 5th Edition by Philip Kotler (Pearson Education)
- The Origins of Hospitality and Tourism by Kevin D. O'Gorman (Goodfellow Publishers Limited)

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TRAVEL DOCUMENTATION

Course Code: TRM2304 **Credit Units : 03**

Course Objective: To make students understand about the documentation process of travelling.

Course Contents:

Module - I: Passport

- Passport, Requirements, Checklists, Types, Changes, Procedure, Tatkal Scheme and Fees, Passport Act and Penalties under Section 12 (1) B

Module - II: Visas

- Documents for obtaining Visa of Major Tourist Destinations of World including Health Check Documents, Types of Visa, Visa Fees, , Refused or Pending Visas, Destination Departure Records.
- Difference between Visa and Passport.

Module - III: Travel out of India

- Rules and Regulations about Eligibility, Quantum and Documentation Required for Foreign Exchange Management Act, Basic Travel Quota, Foreign Exchange for Business, TC, Emigration Requirements, ECNR

Module - IV: Passenger Ticket

- Different Coupons, Ticketing Instruction and Conjunction Tickets, Open Tickets, E-Tickets and its Advantages, Miscellaneous Charges Order (MCO) and Prepaid Ticket Advice (PTA), The Rounding off of Currencies, Referring to Airline Time Table, TIM, OAG, PAT.

Module - V: Destinations

- Tourist Visa for New Zealand and Australia Tourist Visa for Europe Tourist Visa of USA & Canada

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Readings

- Websites of UK, USA, Canada and Australia
- Websites of Indian ministries and offices related to foreign exchange

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TOUR PACKAGING MANAGEMENT

Course Code: TRM2305 **Credit Units : 03**

Course Objective: To provide students with the ability to initiate and carry out advanced analysis and research in the field of destination development.

Course Contents:

Module – I : Tour Package

- Meaning, Type of Tour Package & its Components

Module – II : Planning of Tour Package

- Designing and Process of Tour Package
- Factor Affecting Tour Package

Module – III : Designing of Different Tour Packages

- Cultural Tourism Product: Designing, Development, Issues and Considerations
- Heritage Tourism Product: Designing, Development, Issues and Considerations

Module – IV : Designing of Different Tour Packages

- Religious Tourism Product: Designing, Development, Issues and Considerations
- Medical Tourism Product: Designing, Development, Issues and Considerations

Module – V : Destination Management Handling Company

- Meaning, Factor of Consideration to chose Destination Management Handling Company

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Readings:

- Pran Seth: Successful tourism Management (Vol. 1 & 2)
- Anand, M.M., Tourism and hotel Industry ii1 India, Prentice Hall, New Delhi, 1976
- Bhatia, A. K., International Tourism, Sterling Publishers, New Delhi
- Bhatia, A. K., Tourism development: Principles, Practices and Philosophies, Sterling Publishers, New Delhi
- Chand Mohinder, Travel Agency Management: An Introductory Text, Anmol Publisher; 2nd Revised edition edition (1 November 2007)

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AUTOMATION IN TRAVEL AND TOURISM

Course Code: TRM2306 **Credit Units : 02**

Course Objective: Tomake students familiar with the different CRS/GDS systems.

Course Contents:

Module – I : Automation in the Tourism Industry

- An Introduction of CRS/GDS
- Importance of Information Technology in Tourism
- Automation in theHotel, Airlines and Travel Business

Module – II : CRS/GDS

- Use and Practices of Galileo / Amadeus

Examination Scheme:

Internal: 30 Marks

Components	JE	LE	VV	A
Weightage (%)	05	15	05	05

End-Term: 70 Marks

Components	JE	VV	GP	LE
Weightage (%)	05	5	10	50

Abbreviation: JE= Journal Evaluation; LE= Lab Evaluation; VV= Viva-Voce; GP= Grooming & Punctuality

Suggested Readings:

- Lucas Jr., H. C. (2005) Information Technology For Management McGraw Hill.
- Burch, J. and Grudnitski G. (1989). Information Systems:
- Theory and Practice. 5th ed., John Wiley, New York.
- David, V. (1992). Foundations of Business Systems, Dryden Press, Fort Worth.

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FUNDAMENTALS OF ACCOUNTING-II

Course Code: TRM2307 **Credit Units : 02**

Course Objective:
At the end of the semester students will be able to
- The concept of double entry book keeping system
- Reconcile the bank statement
- Check the accuracy of accounts
- Prepare trial balance / P&L A/c and balance sheet concept
- The hospitality revenue and non revenue producing departmental accounting system
- The for casting of expense and revenue
- The concept of budgeting
- The hotel departmental accounting system.

Course Contents:

Module - I
Cash Book, Meaning, Advantages, Simple, Double and Three Column Petty Cash book with imprest system (simple and tabular forms), Practical

Module - II: Final Accounts
Meaning, Procedure for preparation of final accounts , Difference between Trading Accounts, Profit & Loss Accounts & Balance Sheet

Module - III: Adjustments
Closing Stock, Prepaid expenses, Outstanding expenses, Depreciation

Module - IV: Capital and Revenue Expenditure
Meaning, Definition of Capital and Revenue Expenditure,

Module V: Depreciation
Meaning of Depreciation, Need and Causes, Straight line method, Diminishing Balance method, Practical

Module VI: Ratio Analysis
Importance of Ratios
- Liquidity Ratios, Current ratio, Quick ratio, **Solvency Ratios,** Debt equity ratio, Interest coverage ratio

Activity Ratio, Capital turnover ratio, Stock turnover ratio, Debtors turnover ratio, **Profitability Ratios**
- Gross profit ratio, Net profit ratio.

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

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Suggested Readings:

- Element of Hotel Accounting by Dr. J.M Negi, HKS International
- Finance & Cost Control- Techniques in the Hotel & Catering Industry by Dr. J.M Negi, Metropolita Publication, New Delhi
- Management Accounting by Dr. Hingorani& Prof. Ramanathan, Sultan Chand & Sons
- Hotel Management – Accounting & Control by JagmohanNegi, Himnalayan Publishing House, New Delhi.
- Management Accounting & Financial Control by Dr. S.N Maheshwari, Sultan Chand & Sons
- Understanding Hospitality Accounting by Raymond Cote, EI-AH&LA USA
- Financial Accounting by G.C Maheshwari, NCERT, N. Delhi
- Fundamentals of Hotel Accounting by G.S. Rawat& Dr. J.M Negi.

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Syllabus – Fourth Semester

TOURISM PLANNING AND POLICY

Course Code: TRM2401 **Credit Units : 03**

Course Objective: To develop an understanding of the basic concepts of tourism planning for public and private sector community and regional tourism development

Course Contents:

Module – I : Introduction to Tourism Planning

- Evolution of Tourism planning, Importance, Planning Process, Planning Approaches, Tourism Planning.

Module – II : Stakeholder Participation

- Concept, Need, Objective, Institutional Framework of Public Tourism Policy.
- The Role of Government, Public and Private Sector in Formulation of Tourism Policy.
- Policy Making Bodies and its Process at National Levels.

Module – III : Outline of Tourism Policy

- L.K. Jha Committee - 1963, National Tourism Policy - 1982,
- National Committee Report - 2002, National Action Plan on Tourism – 1992.
- The Latest Policy Document on Tourism.

Module – IV : Type of Tourism Planning

- International, National, Regional, State and Local Level.
- Agents and Typologies of Tourism Development.

Module – V : International Agreements

- Chicago Convention, Warsaw Convention, Open Sky Policy, Bermuda Convention, Euro Agreement, Schengen Agreement

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Readings:

- Indian Tourism Beyond the Millennium - Bezbaruah M.P. (New Delhi)
- Tourism: Past Present & Future : Burkart A.J. and Medlik (London, Heinemann)
- Essays on Tourism : Chib, SomNath (New Delhi, Cross Section Publication)
- Travel Industry : Gee, Chunk Y., James C. & Dexter J.L. Choy (New York, Van Nostrand Reinhold)
- Tourism Planning : Gunn. Clare A. (New York, Taylor & Francis)
- Tourism Dimensions : S.P. Tiwari (New Delhi)
- Tourism : A Community Approach - Murphy, Peter E. (New York, Methuen)
- Tourism Planning : An integrated and Sustainable Approach - Inskeep E.
- National &Reginal Tourism Planning : Inskeep E. (Londown, Routledge)
- Ecotourism: A case guide for planners and managers - Ecotourism Society
- Report of Adhoc Committee on Tourism - 1963
- National Tourism Policy - 1982
- National Committee Report - 2002
    - National Action - 1992

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- Draft of Tourism Policy – 1997
- Young G. Tourism: Blessing or Blight Pengain Book 1973.
- Cheechi and Co. The Future of Tourism in far East 1961.
- Copen Evic. 'Towards a Sociology of International Tourism, Social Research 39.1 91972) 164-82.
- Cleverdon Robert: The Economic and Social Impact of International Tourism in Developing Countries (London: The Economic Intelligence Unit Ltd. 1979)

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CARGO MANAGEMENT

Course Code: TRM2402 **Credit Units : 03**

Course Objective: The objective of this subject is to provide the participants with a good knowledge of airfreight operations, services and management that can support them in various business functions and roles such as operations, customer service, account management and sales

Course Contents:

Module – I : Introduction to Air Cargo

- Aviation and Airline Terminology, IATA Areas, Country Currency, Airlines /Aircraft Layout , Different Types of Aircraft

Module – II : Aircraft Manufacturers

- Aircraft Manufacturers, ULD, International Air Routes, Airports Codes, Consortium, Hub & Spoke Process Flow

Module – III : General Process

- Advices, Booking , SLI, Labeling , Volume/ Weight Ratio, Shipment Planning , TACT, Air Cargo Rates and Charges, Cargo Operations, Cargo Operations Process, Customs Clearance

Module – IV : Air Freight

- Air Freight Forwarding: Air freight Exports and Imports, Special Cargoes , Consolidation

Module – V : Documentation

- Air Way Bill (AWB), Communication, Handling COD Shipments, POD, Conditions of Contract, Dangerous (DGR) or Hazardous Goods

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Readings:

- Air transport logistics by Simon Taylor (Hampton)
- Air cargo distributions: a management analysis of its economic and marketing benefits / [by] Paul ackson and William Brackenridge (Gower Press)
- Air freight: operations, marketing and economics / (by) Peter S. Smith (Faber)
- 4th Party Cyber Logistics for Air Cargo by Sung Chi-Chu (Boston : Kluwer Academic Publishers)
- Accelerated Logistics by Mark Wang (Santa Monica CA)
- Airports; some elements of designs and future development-John Walter wood
- Fundamental of air transport management by P.S.Senguttavan.
- Oxford ATLAS-OXFORD PUBLISHING
- Aviation century: wings of change- A global survey-Ratandeepsingh-jain book

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ITINERARY DESIGNING MANAGEMENT

Course Code: TRM2403 **Credit Units : 03**

Course Objective: To make students understand about different tour packages and itinerary.

Course Contents:

Module – I : Itinerary Planning

- Itinerary and its Importance
- Types of Itineraries and Component of Itinerary
- Factors to keep in Mind while Designing an Itinerary
- Type of Journey

Module – II : Itinerary for Inbound Tourist

- Itinerary on Buddhist Circuit, Itinerary on Puri-Bhubaneswar-Konark

Module – III : Itinerary for Inbound Tourist

- Itineraries for Inbound and Domestic Tourists:- Golden Triangle, Rajasthan Tour, Kerala Tour

Module – IV : Itinerary for Outbound Tourist

- Popular Outbound Itineraries of Singapore, Malaysia, Thailand , Europe Tour, Australia Tour

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Readings:

- Travel Agency and Tour Operation, Concepts and Principls - J.M.S. Negi
- Professional Travel Agency Management - Chunk, James, Dexter &Boberg
- The Business of Travel Agency Operations and Management - D.L. Foster
- Travel Agency Management-An Introductory Text, Anmol Publication New Delhi.
- Tourist Guide and Tour Operations, Kanishka Publication, New Delhi.

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AIRLINE OPERATION MANAGEMENT

Course Code: TRM2404 **Credit Units : 03**

Course Objective: To make students familiarize with the travel modes and documents.

Course Contents:

Module – I : Management of Airport

- Airport Codes, Airline Codes, Phonetic Alphabet, Airport Lounges, How airports Work?, Baggage Handling, Airport Security

Module – II : Introduction to Journey and Tickets

- Types of Journeys (OW, CT, RT, OJ, RTW).
- Passenger Ticket: Different Coupons, Ticketing Instruction and Conjunction Tickets, Open Tickets, E-Tickets and Its Advantages
- Miscellaneous Charges Order (MCO) and Prepaid Ticket Advice (PTA),The Rounding off of Currencies
- Referring to Airline Time Table, TIM, OAG, PAT.

Module – III : Management of Airlines

- Types of Airlines, Airlines Personnel and Revenue Earning, Airport Management, Study of Aircraft Parts, The Aircraft Turnaround, The Control Tower, Airport Facilities and Special Passengers, Airport Access.

Module – IV : Airport Formalities

- Check in Facilities, Landing Facilities for Departing Passengers, In-Flight Services, Cabin Component, Audio and Video Projection Equipment, Emergency Equipment for Disembarkation, In-Flight Entertainment, Classes of Service with more Comfort.

Module – V : Case Study Discussions

- Jet Airways, Kingfisher, Indian Airlines
- British Airways, Fly Emirates, Singapore Airlines

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Readings*:*

- JagmohanNegi: Travel Agency & Tour Operation – Concepts and Principles. (Kanishka Pub, New Delhi)
- JagmohanNegi: Air Travel and Fare Construction. - Kanishka Pub, New Delhi 2004
- Dennis. L. Foster: The Business of Travel Agency Operations and Administration (Mc. Graw Hill)
- Study Kit for IATA/UFTAA - Foundation Course: -
    - Module – I – Introduction to tourism
    - Module – II – Travel Geography
    - Module – III – Air Transport
    - Module – IV – Air Fares &Ticketing

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MANAGEMENT INFORMATION SYSTEM

Course Code: TRM2405 **Credit Units : 01**

Course Objective:
At the end of the semester the students will develop a clear concept on –
- Management Information System (MIS)
- Role of Hotel Information System
- Various interfaces used in Hospitality Industry

Module – I : Management Information System (MIS)
- Concepts, evaluation & meaning
- MIS Designs and functions
- Managing multi processor environments.
- MIS Security issues
- MIS performance evaluation

Module – II : Hotel Information System
- The Concept
- Software Modules
  - Reservation
  - Guest Accounting
  - Room Management
  - Point of Sales
  - General Management

Module – III : Computer Based Reservation System
- Global Distribution System
- Inter sell agencies
- Central Reservation Systems(CRS)
- Affiliate and Non Affiliate Systems
- Property Level Reservation Systems
  - Reservation Inquiry
  - Determination of Availability
  - Creation of Reservation Record
  - Maintenance of Reservation Records
- Generation of reports.
- New Developments Reservation through the Internet

Module – IV : Guest Accounting Module
- Types of Accounts
- Posting entries to Accounts
- Night audit routine
- Account settlement
- Generation of reports

Module – V : Property Management System Interfaces
- Point of sale Systems (POS)
- Cash Accounting Systems (CAS)
- CAS / PMS Advantages and concerns.
- Electronic Locking Systems.
- Energy Management Systems.
- Auxiliary Guest Services

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- Guest Operated Devices in room Vending Systems
- Guest Information Systems

Module – VI : Point of Sale - Applications

- POS order - Entry units
- Key Boards and Monitors
- Touch Screen Terminals
- Immediate Character Recognition (ICR) Terminal.
- Wireless Terminals
- POSD Printers.
- Guest check Printers
- Receipt Printers
- Workstation Printers
- Consolidated reports

Module – VII : Accounting Applications

- Account Receivable Module
- Account Payable Module
- Payroll Module
- Inventory Module
- Purchasing Module
- Financial Reporting Module

Module – VIII : Selecting and Implementing Computer Systems

- Analyzing Current Information Needs
- Collection Information of Computer Systems
- Establishing System Requirements
- Proposals from Vendors
- Contract Negotiations
- Installation Factors

Examination Scheme:

Components	**V**	**H**	**CT**	**A**	**EE**
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Reading :

- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi
- Management Information System James A O' Brien
- Management Information System 2nd Ed Gordon B Davis

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PRINCIPLES OF MANAGEMENT

Course Code: TRM2406 **Credit Units : 01**

Course Objective: To make students understand management concepts and their application in the field of tourism industry.

Course Contents:

Module – I : Introduction to Management

- Concept, Nature, Functions, Process, Traits of a Successful Manager and Managerial Role.
- Management and Society: Business Ethics and Social Responsibilities

Module – II : Planning

- Nature, Purpose, Types and Process of Planning.

Module – III : Organizing

- Concept of Organizing and Organization. Line & Staff, Span of Control.
- Delegation, Decentralization Organization Structure.

Module – IV : Directing

- Communication-Process and Types of Communication, Barriers and Principles of Effective Communication
- Motivation: Meaning, Theories, Maslow and Herzberg, Leadership
- Co-Ordination: Meaning, Definition, Principles of Co-Ordination, Techniques of Effective Co-Ordination.

Module – V : Leadership

- Concept, Qualities of a Successful Leader: Factors Influencing Performance of Leaders. Styles of Leadership, Management Grid.
- Controlling: Process. Methods and Techniques

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Readings:

- Stoner. Jeen (2005), Management. Prentice Hall, New Delhi
- R.K. Singla,(2007) Business Management, V.K. publication, new Delhi.
- D.K.Goyal,(2008), Business Management, Arya publication
- Prasad. L.M.(2007), Principles and Practice of Management, Sultan Chand and Sons, New Delhi
- Banerjee, S. (2006), Principles and Practice of Management, Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi

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ECONOMICS OF TOURISM

Course Code: TRM2407 **Credit Units : 01**

Course Objective:
At the end of the semester students would be able to:-
It intends to help the students in understanding the nature of Indian Economy in general & economic planning for tourism & hospitality in general.
It will further help them to understand the basic mechanism of pricing of products in different sector of economy with a special focus on product formulation, packaging & pricing of tourist & hospitality product.

Course Contents:

Module - I
- Meaning of Economics

Module - II
- Relevance of Economics in Hospitality and Tourism Industry

Module - III
- Meaning of Demand

Module - IV
- Demand Curve Analysis

Module V
- Factors Affecting Demand

Module VI
- Concept of inflation and types of inflation

Module VII
- Demand and methods of Forecasting

Module VIII
- GDP (Gross Domestic Product) & GNP (Gross National Product)

Module - IX
- Fiscal Policy and its Feature and Mechanism

Module X
- Monetary Policy and its functions

Module XI
- Economic Growth and Economic Development, Growth Patterns of Indian Economy

Module XII
- Market Structure and Hospitality and Tourism Industry

Module XIII
- A small capsule on WTO and its implications on Hospitality and Tourism Industry has also been included.

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Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Reading :

Text:

- Tourism Economics by Mathieson Alistor& Wall Gerllliej, Physical & Social Impacts.
- The Economics, Travel & Tourism by Anil Andirous, LengmanCheshues, Melbourne.
- International Travel & Tourism- Principles & Concepts by Dr. JM Negi, S. Chand & Co, New Delhi

References:

- Managerial Economics by Mote Lal& Gupta, Tata McGraw Hill, New Delhi
- Fundamentals of Economic Balances
- Indian Economy by AN Aggarwal
- Indian Economy by Dutta&Sundram
- Indian Economy by Saradesai.

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Syllabus - Fifth Semester

INDUSTRIAL TRAINING PROJECT & PRACTICUM

Course Code: TRM2535 **Credit Units: 20**

Course Objective:
At the end of the industrial training the student would be able to:
(i) understand and explain the organization structure of a Travel Agency / Tour Operator
(ii) prepare job descriptions of various job titles in the organisation
(iii) understand various procedures & functions followed for:-
1. Reservations
2. Information
3. Booking
4. Ticketing
5. Bills and Cash
6. Guest Relations
7. Auditing

(iv) maintain various records & registers and understand their uses.

On completion of the project the student will be required to submit the following:
Project File or Industrial workflow log book - The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.
In general, the File should be comprehensive and include:
- A short account of the activities that were undertaken as part of the training;
- A statement about the extent to which the training has achieved its stated goals.
- A statement about the outcomes of the learning, evaluation and dissemination processes engaged in as part of the training;
- Any activities planned but not yet completed as part of the training, or as a future initiative directly resulting from the project;
- Any problems that have arisen that may be useful to document for future reference.

Training Report
The report should be submitted in duplicate (2 copies) spiral bound and a CD and should contain the following components:
- **Title or Cover Page**

The title page should contain the following information: Department Name; Student's Name; Course; Year; Supervisor's Name.
- **Acknowledgements**

Acknowledgment to any advisory received in the course of work may be given.

- **Table of Contents**

Titles and subtitles are to correspond exactly with those in the text.

- **Introduction**

Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

- **Materials and Methods**

This section should aim at experimental designs, materials used. Methodology should be mentioned in details including modifications if any.

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- **Suggestions**

In writing these section, emphasis should be given on what has been performed and achieved in the course of the work and any ideas/suggestions they feel will can be implemented, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis.

- **Conclusion**

A conclusion should be the final section in which the outcome of the work is mentioned briefly.

- **Appendices**

The Appendix contains material which is of interest to the reader ,and may include any forms, formats and any problem that have arisen that may be useful to document for future reference.

- **Performance Appraisal & Completion Certificate** duly signed and stamped

Examination Scheme:

Appraisal Report:	50
Log book + Attendance + Appraisal	20
Presentation & Viva Voce:	30
Total:	**100**

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Syllabus – Sixth Semester

ECO-TOURISM AND SUSTAINABLE TOURISM

Course Code: TRM2601 **Credit Units : 03**

Course Objective: To explore the interrelationships between the environment & its resource for sustainable tourism planning and development.

Course Contents:

Module – I : Eco Tourism

- Eco Tourism and Development: Community Awareness and Participation Contribution of Eco-Tourism to Environmental Conservation: Socio-Cultural Conservation

Module – II : Benefits and Impacts

- Mass and Alternative Tourism, Potential Benefits from Ecotourism.
- Environmental Impacts of Tourism
- Difference Between Mass and Green Tourism

Module – III : Eco-Tourism Planning and development strategies

- Eco-Tourism Strategies with Special Reference to Environmental Protection (Environmental Impact Analysis)

Module – IV : Sustainable Tourism

- Definition of, Benefits and Importance of Sustainable Tourism, Agenda 21, Definition and Bodies Promoting Sustainable Tourism, Principles of Sustainable Tourism, Process to set up Sustainable Development at Tourist Destination.

Module – V : Carrying Capacity

- Types of Carrying Capacity: Physical, Biological, Social Carrying Capacity, Importance of Carrying Capacity, Effect of Guest Population on the Carrying Capacity.

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Readings:

- Uma Pillai, 2004, Ecotourism and Environmental Handbook
- Harish Bhatt and B.S. Badan, 2006, Ecotourism
- Baldvin J.H. (1985) Environmental Planning and Management. I.B.D. Dehradun
- Singh Ratandeep : Handbook of Environmental Guidelines for Indian Tourism, Kanishka Publishers, New Delhi.
- RomilaChawla : Wildlife Tourism and Development; Sonali Publications, New Delhi.
- Dash M.C. (1993) fundamentals of Ecology (New Delhi), Tata McGraw Hill Co.Ltd., Publishing Co.Ltd.)
- Eagles P.F.J. 1987. The Planning and Management of Environmentally sensitive areas. (U.S., A.Lengman).
- Khoshov T.N. 1987. The Planning and Management of Environmentally sensitive areas. (U.S., A.Lengman).
- Kormandy E.J. (1989) Environmental issues Concerns and Strategies (New Delhi) Ashish
- Mcnealy J. (1989), Economics and Biological Diversity I.U.C.N.

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(Switzerland)
- Mridula& N. Dutt (1991) Ecology and Tourism (New Delhi, Universal Publishers)
- Negi. J (1990) Tourism development and Resource conservation (New Delhi Metropolitan)
- Sapru R.K. (1987) Environment Management in India (New Delhi) Ashish.
- Singh T.V., J. Kaur and D.P. Singh (1982) Studies in Tourism Wildlife parts conservation (New Delhi Metropolitan)
- Singh S.C. (Ed.) 1989) Impact of tourism on mountain Environment (Meerat Research India Publications)
- Verma P.S. and V.R. Agarwal; 1996 Principles of Ecology (New Delhi S. Chand)
- Kandari O. P., Chandra Ashish : Tourism Biodiversity & Sustainable Development, Isha Books, Delhi.

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TOURIST BEHAVIOUR

Course Code: TRM2602 **Credit Units : 03**

Module – I : Understanding Travel & Tourism Behavior

- Characteristics affecting consumer behavior - cultural Factors, Social Factors, Personal Factors, Psychological Factors, Group Factors
- Models of consumer behavior - Economic Man, Passive Men, Cognitive Man, Emotional Man,
- Black Box Model
- High Commitment & Low Commitment Consumer Behavior.

Module – II : Examination of tourist forms & types & there characteristics

- Activities, Interests & Opinions of Tourism Market Segments & Their Buying Decision Behavior.
- Buyer Decision Process - Need Recognition, Information Search, Evaluation of Alternatives, Purchase Decision
- Post Purchase Behaviour.

Module – III : Tourist as an individual

- Tourist Behaviour, Tourist Perception, Learning and Attitudes Concepts, Process, Important Theories and Application of The Concepts to Tourist Behaviour.

Module – IV : Impact of Tourism in Society

- Specific consideration of Host Guest-Interaction & Their Impact On Physical, Social &Cultural Environments, Cross-Cultural Impacts.
- Management Implication- Consideration of the Implications for Tourism Managements, Communication, Promotion, Tourist Guide Interactions.

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Reading :

- Case Studies In Tourism and Hospitality Marketing, Harris
- Cases in Hospitality & Tourism Management, O' Halloram / Amy Allen
- Ecotourism & Sustainable Development, Ravishankar Kumar Singh
- Encyclopedia of Ecotourism, Eco-Tourism Edited By P.C. Sinha
- Environment Security & Tourism Development in South Asia (3 Vol. Set), Pandey, Isha
- Environmental Consciousness : Urban Planning--Tracts for The Times, M.N.Buch,Orient Longman
- Environmental management, S. N. Chary, Vyasulu Vinod, Macmillan Press Ltd
- Environmental Management in The Hospitality Industry: A Guide for Students & Managers, Kathryn Webster Cassell education ltd.
- Hospitality and travel marketing, Alastair M. Morrison Delmar pub.
- International Tourism An Economic Perspective, Francois Vellas, Lionel Becherel Macmillan Press Ltd
- National Eco-Tourism & Wildlife Tourism : Policies & Guidelines, Singh
- Natural Area Tourism, Newsome
- Nature - Based Tourism in Peripheral Areas, Hall
- Tourism & hoteliering, J. M. S. Negi Pitman Pub.

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TOURISM & HOSPITALITY IMPACTS

Course Code: TRM2603 **Credit Units : 03**

Module – I : Hospitality Industry and Tourism
Relation of Hospitality Industry with Tourism, Definition, size and scope of Hotel Industry,
Principles and concepts of Hotel and its objectives, organization, departments and classification of Hotels, star categorization, Types of rooms and Types of plan- License, permits and regulatory condition and guidelines for hotel

Module – II : Hospitality Industry
Operational Organisation structure of a Hotel, Various departments and their main activities, Importance of each from tour operations point of view

Module – III : Handling Tourists at Front Office
Front Office Techniques- Front office lay out and activities, guest activities in hotel reservation, role of reception - Forecasting room availability, registration procedure, handling guests on arrival, , Billing and departure activities, Group Handling, Role of Front Office Manager and Personnel, Housekeeping Activities.

Module – IV :Handling Tourists at F&B Division
Food and Beverages activities, Banquet Function, Convention Halls, Meeting room- Arrangement for general and business meetings, organizations and procedure for arrangement of conferences and exhibitions and outdoor catering.

Module – V : Resort Management
Historical perspective, Indian scenario, basic characteristics, phases of resort planning and development, trends and factors in development, Trends and factors in developed tourist markets leading to growth to resort concept, basic element of a resort complex- Loading facilities, land escaping, Dining and Drinking facilities, Family oriented services, shops and entertainment services

Module – VI : Impacts
Impact of Tourism on Hotel Industry and vice versa – Business, Facilityfor tourist, marketing Job opportunity, Govt. revenue earning etc.

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Reading :

- Case Studies In Tourism and Hospitality Marketing, Harris
- Cases in Hospitality & Tourism Management, O' Halloram / Amy Allen
- Ecotourism, Page
- Ecotourism & Sustainable Development, Ravishankar Kumar Singh
- Encyclopedia of Ecotourism, Edited By P.C. Sinha
- Endangered Animals of India, S. M. Nair National book Trust
- Environment Security & Tourism Development in South Asia (3 Vol. Set), Pandey Isha
- Environmental Consciousness : Urban Planning--Tracts for The Times, M.N.Buch Orient Longman
- Environmental management, S. N. Chary, Vyasulu Vinod, Macmillan Press Ltd
- Environmental Management in The Hospitality Industry: A Guide for Students & Managers, Kathryn Webster, Cassell education ltd.

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- eTourism: Information technology for strategic tourism management, Buhalis
- A Guide to India's Wildlife; TT Maps & Pub. Ltd.
- National Eco-Tourism & Wildlife Tourism : Policies & Guidelines, Singh
- Natural Area Tourism, Newsome
- Nature - Based Tourism in Peripheral Areas, Hall
- Understanding The Hospitality Consumer, Alistair Williams, Butterworth Heineman
- World Travel & Tourism Development, David Boothroyd...[et al.] THM International Pub.
- World Travel & Tourism Development, THG International Pub.
- World Wide Destinations : Geography of Travel & Tourism, Boniface

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SOCIOLOGY OF TOURISM

Course Code: TRM2604 **Credit Units : 03**

Course Objective: The paper looks into the sociological concepts like society, culture, social change etc. so that the student can easily grasp the social impacts of tourism. Similar other issues of concern form the basis of this paper.

Course Contents:

Module – I : Understanding Sociology

- Sociology: Definition, Nature and Scope
- Society: Definition and Different Types of Societies

Module – II : Sociological Approach to Tourism

- Sociological Factor in Tourist Motivation, Attitude and Perception
- Social Dimension of Host and Tourist Relationship
- Socio-Cultural Impacts of Tourism

Module – III : Tourism System and the Individual

- Socialization through Interaction and Exchange of Values, Norms, Social Laws and Usages
- Factors Influencing Individual's Role, Behavior, Attitudes and Experiences at the Destination

Module – IV : Tourism and Social Institutions

- Social Institutions and their Roles
- Factors Influencing the Roles and Status of Social Institutions
- Influence of Tourism on Social Institutions

Module – V : Tourism and Social Change

- Social Change: Definition and Theories of Social Change
- Factors Affecting Social Change
- Tourism as an Instrument of Social Change

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Readings:

- Apostolopoulos, y., Leivadi, S &Yiannakis, A., (eds.) 2000, The Sociology of Tourism: Theoretical and Empirical Investigations, Routledge, London and New York
- VidyaBhushan and Sachdeva,D.R., 1992. An Introduction to Sociology, KitabMahal, Allahabad
- Srinivas, M.N. 1987. Social Change in Modern India, Orient Longman, New Delhi
- Veena das (Ed.), 2006. Handbook of Indian Sociology, Oxford University Press, New Delhi

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MANAGERIAL ACCOUNTING

Course Code: TRM2605 **Credit Units : 01**

Course Objective:

At the end of the semester the students would be able to-

- Understand the concept of managerial accounting
- Explain contents of income statement, balance sheet and departmental income statements and expense statement and solve practical problem
- Understand objectives, characteristics and implementations of internal control
- Distinguish between internal and statutory audit and views of internal audit

Course Contents:

Module – I : Managerial Accounting

- Meaning of managerial accounting
- Functions of managerial accounting
- Utility of managerial accounting

Module – II : Uniform System of Accounts for Hotels

- Introduction to Uniform system of accounts
- Contents of the Income Statement
- Practical Problems
- Contents of the Balance Sheet (under uniform system)
- Practical Problem
- Departmental Income Statements and Expense Statement (Schedules 1 to 16)
- Practical Problem

Module – III : Internal Control

- Definition and objectives of Internal Control
- Characteristics of Internal Control
- Implementation and Review of Internal Control

Module – IV : Internal Audit and Statutory Audit

- An introduction to Internal and Statutory Audit
- Distinction between Internal Audit and Statutory Audit
- Implementation and Review of Internal Audit

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Readings:

- Financial & Cost Control Techniques in Hotel & Catering Industry by JM Negi, Metropolitan, New Delhi
- Elements of Hotel Accountancy by Dr. JM Negi, Aman Publications New Delhi
- Hotel Management – Accounting & Control by Dr. JagmohanNegi, Himalaya Publishing House, New Delhi
- Basic Financial Accounting by Raymond Schmidgall
- Accounting for Hospitality Management by Andrew N Valdamir
- Fundamentals of Accounting by Raymond S Kolt
- An introduction to Accountancy by S N Maheshwari

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HOSPITALITY & TOURISM MARKETING

Course Code: TRM2606 **Credit Units : 01**

Course Objective:
At the end of the semester the students will be able to understand the concept of –
- Marketing Hospitality Tourism Products
- Various tools of marketing
- Service Marketing Mix

Module – I : Introduction to Marketing
- Marketing Concepts
- Functions of Marketing
- Importance of Marketing
- Difference between Marketing and Selling
- Related Application of Concept in Hotel Service Industry

Module – II : Marketing Mix – 7P's of Marketing
- Product – Product Management, Development, Product Lifecycle and Branding
- Pricing – Factors Influencing Pricing, Methods of Price Fixation and Strategies
- Promotion – Promotion Mix and Tools,
- People – Encounters, Managing Tourism Experience Through People and Important
- Practices to Manage People
- Process – Elements, Managing Process, Developments in Service Processes in Tourism,
- Physical Evidence – Concept, Role & Components

Module – III : Market Segmentation and Targeting
- Concept of Market Segmentation
- Procedure and Importance of Market Segmentation
- Market Targeting Process
- Product Positioning

Module – IV : Marketing of Tourism & Hospitality Products
- The Tourism Destination
- Marketing Hotels
- Investment in Tourist Attractions
- Identifying Target Markets
- Classification of Visitor Segments
- Monitoring the Tourist Markets
- Organizing and Managing Tourism Marketing
- Marketing to Business and Leisure Travellers
- Marketing to of Hotels to Travel Agents

Module – V : Destination Marketing
- Country, Regions, Cities
- Events and Activities
- Leisure Activities
- Accommodation Marketing
- Marketing Local Foods

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Module – VI : Designing of Marketing Mix for Specific situations

- Familiarization Tours
- Tourism Fairs
- During Off Season / On Season – For Hotels

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Readings:

- Case studies in marketing :the Indian Context - R. Srinivason
- Event Marketing & Management - Sanjaya Singh Gaur, Sanjay V Saggere,
- Hospitality Marketing - Phillip Kotler
- Marketing Hospitality: Sales & Marketing for Hotels Motels & Resorts - Dennis L. Foster TATA McGrawhill
- Customer Service: Career Success Through Customer Loyalty, 5/e - Timm
- Hospitality Marketing in E-Commerce Age - Wearne
- Hospitality Marketing Management, 5th Ed - Robert D. Reid, David e Bojanic
- Hotel & Food Service Marketing - Francis ButtleCassell education ltd.
- Hotel Sales & Operation - Ahmed IsmailDelmar pub.
- Marketing for Tourism, 4/e - Holloway
- Marketing Hotel & Restaurant Into The 90's - Melvyn Grefne
- Marketing in Hospitality & Tourism - Richard Teare...[et al.] Cassell education ltd.

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DMC INTEGRATED PROJECT

Course Code: TRM2632 **Credit Units: 12**

Course Objective:
To plan a Tourism Destination with varied facilities and attractions

Modus Operandi:

- **Formation of Team of 5 members**
  Team Designates are the following:
  - Project Head
  - Finance Head
  - HR Head
  - Marketing Head
  - Operations Head

  The planning process is shared by the team members according to their respective portfolio.

- **Presentation & Dissertation**
  The Team should present the Project Plan before the selected Board. Dissertation led by the Team Leader and supported by the rest of the team members.

- **Open to Question-Answer Session**
  The Team will be asked Questions on the Project planned by the Board which should be justified by relevant answers.

- **On completion of the project the student will be required to submit the following:**
  - Project Report
  - Presentation

Examination Scheme:

Project Plan:	50
Presentation	20
Viva Voce:	30
Total:	**100**

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Syllabus – Seventh Semester

FACILITY MANAGEMENT PLANNING & DESIGN

Course Code: TRM2701 **Credit Units : 01**

Course Objective:

At the end of the semester the students will be able to-

- Explain the Procedures for Planning, Designing & Managing of Hospitality project, its architectural aspects of facility planning, layout &design, and also develop concepts &methods of energy conservation.,.

Course Contents:

Module – I : Design Hospitality Unit

Design Consideration, Attractive Appearance, Efficient Plan, Good Location, Suitable Material, Good Workmanship, Sound financing, Competent Management

Module – II : Project Management

Introduction of Network analysis, Basic rules and procedures for Network analysis, C.P.M. and PERT, Comparison of CPM and PERT, Classroom exercises, Network crashing determining crash cost, normal cost.

Module – III : Facilities Planning

The Systematic Layout Planning Pattern (SLP) for hotel, Planning Consideration, Flow Process and Flow Diagram Procedure for determining space considering ,the guiding factors for the guest room / public facilities, support facilities and services, administration,

Module – IV : Architectural Consideration

Difference between carpet area, plinth area and super built area, their relationships, reading of blueprint (plumbing, electrical, AC, ventilation, FSI, FAR, public areas), Approximate cost of construction estimation Approximate operating areas in various types budget wise, Approximate requirement and estimation of water / electrical load gas, ventilation.

Module – V : Operational Area requirements

Layout and design, Furniture, Equipment, Installation &functioning

Module – VII : Car Parking

Calculation of car park area for different types of hotels

Module – VIII : Energy Conservation

Necessity for energy conservation, Methods of conserving energy in different area of operation of a hotel, Developing and implementing energy conservation program for a hotel

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Readings:

- Systematic Layout Planning by Richard Muther, Cahners Books Division of Sahners Publishing Company Inc. 9 Franklin Street, USA
- Food Service Planning- Layout Equipment by Lendal H Kotschevar&Margrat E Terrell
- Management Operations & Research by N. Satyanarayan&Latika Raman, Himalaya Publishing House.
- Hospitality Facilities Management and Design by David M Stipanuk

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TOURISM & ENVIRONMENTAL LAW

Course Code: TRM2702 **Credit Units : 03**

Module – I : Understanding Law in Tourism Industry

Company - meaning, definition, types, formation and incorporation under companies act, 1956.
Contract act - meaning and essentials of a valid contract, breach and termination of contract.

Module – II : Hotel & Accommodation

Laws relating to Accommodation

Module – III : Travel Agents & Tour Operators

Tourism Packages & Legal Issues
Consumer Protection Act - meaning and its relevance in travel and tourism business.
MRTPC - applicability and significance in tourism and travel related business.
Travel Insurance and consumer protection act, International consumer protection acts in tourism

Module – IV : Common Carriers – Air, Land & Sea

Air Law- Law and regulations related to airlines and airways, Laws relating to passenger safety, convenience and compensation during air travel, Baggage concessions for tourist, Compensation for lost and damaged baggage. Insurance for tourists and their baggage. DGCA formalities for business and recreational flying in India
Laws related to surface transport.
Law of Sea - concept, bill of lading and foreign travels

Module – V : Tourist Documents

Laws and legislation relating to tourist entry, stay and departure.
Passport Act & Visa Extension.
Procedure and requirement for procuring various travel documents (passport, visa, Health Certificates & Insurance) with relation to inbound and outbound tourists.
Laws relating to currency exchange, FEMA.

Module – VI : Foreigners Act

Foreigners Act 1946. Special permits to restricted areas for foreign tourist in India, restricted area in India for foreign tourists and related authorities at these places to obtain permits, permits related to various monasteries and wild life areas and their procedure.

Module – VII : Adventure Tour Operation

Law designed for Adventure Tour operation, special permits for Rafting, Paragliding, Heli-Skiing & Angling. Peak booking formalities, IMF rules for mountain expeditions, cancellation of permits and bookings.

Module – VIII : Wild Life, Heritage and Environment

Wild Life Protection Act - Laws related to Environment and Wild Life.
Antiquities & Art Treasures Act – Laws related to Antiquities & Art Treasures
The Ancient Monument & Archaeological Sites & Remains Act
Laws relating to protection, presentation and conservation of heritage and environment.
Environment Protection Act. Air, Water & Noise Pollution Act.

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

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Suggested Reading :

- Sachindra Shekhar Bishwas - Protecting The Cultural Heritage
- Sinha P. C - International Encyclopedia of Tourism Management
- Malik S - Ethical & Legal & Regulatory Aspects Tourism Business
- Tourism Guide Lines Published by Govt. of India, Ministry of Tourism.
- Tourism Guidelines Issued By Department of Tourism for Hotel and Restaurant Operation.
- Sajnanimanohar (1999) Indian Tourism Business : A Legal Perspective, New Delhi.
- R. K. Malhotra (2005) Socio – Environmental and Legal Issues In Tourism, New Delhi.
- Gupta S.K. (1989) Foreign Exchange Laws and Practice, Taxman Publications Delhi.
- Sheshadre, B., India's Wild Life and Tribal Life
- Tajvir Singh, Jagdish, Studies in Tourism, Wild Life Parks and Conservation
- A.S.I., Archaeological Remains, Monuments and Museums
- Acharya, Ram, Tourism & Cultural Heritage of India

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MICE MANAGEMENT

Course Code: TRM2703 **Credit Units : 02**

Course Objective:
At the end of the semester the students will be able to Explain & understand the concept of Event Management, its Design & Feasibility, Marketing of Event, Financial Management, Risk Management, Planning, Operations & Logistics, Control& Evaluation

Module - I : Introduction to Concept of MICE
- Types of Events- meetings, incentives, conference/conventions, and exhibitions
- Size of Events
- The Event Team
- Code of Ethics
- The impact of conventions on local and national communities.

Module - II : Concept and Design
- Developing The Concept
- Analysing The Concept
- Designing The Event
- Logistics of The Concept

Module – III : Feasibility
- Keys to Success
- The SWOT Analysis

Module - IV : Legal Compliance
- Relevant Legislation
- Official Bodies Involved
- Contracts

Module – V : Marketing of Event
- Nature of Event Marketing
- Process of Event Marketing
- The Marketing Mix
- Sponsorship

Module – VI : Promotion
- Image / Branding
- Advertising
- Publicity
- Public Relations

Module – VII : Financial Management
- The Budget
- Break-Even Point & Cash Flow Analysis
- Profit & Loss Statement
- Balance Sheet
- Financial Control Systems

Module – VIII : Risk Management
- Process of Risk Management
- Incident Reporting

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- Emergency Response Plans
- Standards for Risk Management

Module – IX : Planning

- Establish The Aims of The Event & Objectives
- Prepare an Event Proposal
- Planning Tools

Module – X : Protocol

- Order of Precedence; Titles; Styles of Address; Dress Codes
- Protocol for Speakers
- Seating Plans
- Religious & Cultural Protocol
- Rules of Flag Flying

Module – XI : Staging The Event

- Choosing The Event Site
- Developing The Theme
- Providing Services
- Managing The Environment

Module – XII : Staffing

- Recruitment & Selection; Rosters
- Training; Briefing Staff
- Managing Volunteers

Module – XIII : Operations & Logistics

- Logistics
- Policies
- Procedures
- Performance Standards
- Functional Areas

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Module – XIV : Crowd Management & Evacuation

- The Crowd Management Plan
- Emergency Planning
- Implementing Emergency Procedures

Module – XV : Control & Evaluation

- Monitoring & Control Systems
- Operational Monitoring & Control
- Evaluation

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Reading :

- Behind The Scenes at Special Events - by Lena Malouf
- Global Meetings & Exhibitions, - by Krugman, John Wiley & Sons
- How to Plan Exhibitions & Conferences From A to Z, Sam Black
- Special Events : Event Leadership for a New World, Goldblatt

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DESTINATION MANAGEMENT

Course Code: TRM2704 **Credit Units : 03**

Module – I : Understanding Destination Management
Destination Planning, Development and Management. Nature, Scope and Significance, Destination Development and its Components. Process of Tourism Planning, Necessity of Tourism Plans. Planning of Tourism for the Development of Economy.

Module – II : Significance
Significance of Effective Publicity, Promotion/ Information System/ Tourism Education and Human Resource Development. Major Considerations in Destination Planning, Types, steps and Stages in Destination Planning.

Module – III : Fund flow in Destination Management
Role of Private and public Sector in Destination and Planning Development. In affluent and Developing Economics, Role and Input of Multinationals. Tourism Carrying Capacity Assessment.

Module – III : Planning in India
Approaches to Destination Resort Planning, Levels, Relevance of Planning in National Regional and Local Context. Major Committees and Their Prospective of Tourism Planning. L.K. Jha Committee (1982), National Committee on Tourism Report (1988), National Action Plan (1992), National Tourism Policy(2000), Important Features of Five Year Tourism plans in India.

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Reading :

1. Baud, Bovy Munuel and Lawson(1976) Tourism and Recreation Development C.B.I. Pub.6.
2. Likorish Leonard J, 1991 Development Tourism Destination Policies and Perspectives.
3. Seth P.N(1987) Successful Tourism Planning Management, Cross publication.
4. Murphy Peter E.(1987) Tourism- A Community Approach New York.
5. Kaul R.N. 1985 Dynamic of Tourism- A Trilogy Sterling Publishers, New Delhi.

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TOURISM TECHNOLOGY & MEDIA

Course Code: TRM2705 **Credit Units : 03**

Module – I : The application of technology in tourism

Introduction – Concept – Development – Benefit to Service Providers & Tourists – Future Prospect

Module – II : Tourism Related Software & Internet links

- Brief idea about Software related to booking of Hotel, Ticket for Airlines, Train, Road Transport, Ocean liners
- Tourism related IT innovations such as Virtual Globetrotting, Virtual Adventure Sports, tourism related Apps, Digital Guide, Digital Map etc.
- Digital Marketing and Travel Distribution Emerging Trends
- Creative on-line Destination and Business Approaches and Successes
- On-line Consumer Reviews and the Impact on Operators and Destinations
- On-line data sources to enhance business success like PATAmPOWER [http://mpower.pata.org/]

Module – III : Digital gadgets - replace the need for human tour guides

- Mobile Phone
- Digital Audio Guide
- New Innovations

Module – IV : Role of media in tourism

Awareness generation through powerful effects of media communications in line of -

- Social Interaction and cultural and educational aspects of our life
- peace, security and sustainable development
- social, cultural, economic, political and environmental benefits
- developing eco tourism

Module – V : Dependency of Tourism on media reporting

Module – VI : Social Media and Simple Acts of Kindness

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Reading :

- Air Travel Ticketing & Fare Construction, Jagmohan Negi
- All You Wanted to Know About Airline Function, Kaykay Sikdar Wheeler pub.
- Case Studies In Tourism and Hospitality Marketing, Harris
- Cases in Hospitality & Tourism Management, O' Halloram / Amy Allen
- eTourism: Information technology for strategic tourism management, Buhalis
- Progressing Tourism Research, Faulkner

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HUMAN RESOURCE MANAGEMENT

Course Code: TRM2706 **Credit Units : 01**

Course Objective:
Human Resource Management has acquired significance in the process and problems of developments both in the case of developed & developing nations of the world. It has acquired importance in the case of tourism & hospitality management in creating permanent & better images in the minds of tourists coming with specific perception & motivations. Further it is a complex phenomenon with many equally important components; each requires special skills & talents. The present course intents to place focus on various segments of the hospitality with regards to management of human resources.

Course Contents:

Module - I: Introduction to Management
Definition, Nature, Scope and Functions of Management, Levels of Management and Management Theories - Classical and Neo - Classical Theories, Systems Approach to organization, Modern Organization Theory.

Module - II: Different Function of Management
Planning,Organizing,Staffing,Directing,Management Control

Module - III: Human Resource Management
Role, importance, & Applications in hotel Industry

Module - IV: Human Resource Planning
Importance and Relevance of HRP, Job Analysis, Job Description, Job Specification & Job Evaluation Method

Module V: Recruitment and Selection
Sources of Recruitment, Selection Process, Induction & Orientation.

Module VI: Training and Development
Training Methods and Evaluation

Module VII: Other Human resource related Functions
Motivation and Productivity ,Job Enrichment ,Career planning employee counseling
Employee Benefits and Welfare Scheme

Module VIII: Disciplinary Issues
Employee Grievance handling process

Module - IX: Case Study
Live case study on HR from Hospitality industry, solving problems & implementation.

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

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Suggested Reading :

- HR Development- Quarterly Journal of Administration (ILE), Vol. II, by Briggs B.
- Human Resource Development in Tourism & Hospitality by Dr. JM Negi, Frank Bros, New Delhi.
- Personnel Management by Devans R.S., Vikas Publishing House, New Delhi.
- The Personnel Management Process: Human Resource development by French, Wendell, Houghton Mifflin Company, Bombay
- Personnel Management by Monappa, A.S., Mirza, S, Tata McGraw Hill, Bombay.

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ENTREPRENEURSHIP DEVELOPMENT

Course Code: TRM2707 **Credit Units : 01**

Course Objective:

At the end of semester students will be able to-

- Acquire be self-employed and inculcate a habit of self-earning and maintain a dignified life
- Plan a path for hospitality students to make them successful entrepreneurs in their life and contribute to society
- To understand basic knowledge in the field of entrepreneurship development and give them basic exposure of Govt. policies and assistance
- Describes the roles that new venture creation plays in the economy, defines entrepreneurship and show how three factors – individuals, environments and organizations comes through to create the entrepreneurship event
- Impart the knowledge of the resource based framework i.e. Financial, physical, technological, human and organizational
- Exposed get with franchising opportunity and discuss what elements make a business concepts a legitimate franchise opportunity
- Acquire an effective leadership, quality and effective decision-making.

Course Contents:

Module - I: Entrepreneurship Skills

Personality attribute of an entrepreneurs

- Self control-value attitude,Socio-culture factors

Unique characters of the hospitality industry

- Human psychology,Inter-personal relationship,Team building,Customer orientation

Positive entrepreneurship behaviour

- Overcoming external constrains,Solving internal problems

Module - II: Identification of business opportunities in the hospitality industry

Demand / Market Analysis,Present and future competition,Government policy regarding small Enterprises

Module - III: Organization of small enterprises - Form of organization

Sole ownership,Partnership,Private Ltd. Company,Public Ltd. Company,Manpower requirement

Module - IV: Incentives and Assistance-

From central government,From State Government,From Financial Institutions

Module V: Small Enterprises Risk Analysis

Motivational factors,Developing Achievement Orientation,Strength and weakness of Independent Business, Feasibility and viability

Module VI: Establishment of an Enterprise

Registration of business,Licenses and Permits,Financial resources,Organizing material, human and technical resource,Launching the enterprises,Formulating and implanting business strategies

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Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Reading :

- Small Scale Industries and Entrepreneurship, by Desai Vasant; Bombay, Himalaya
- Small Scale Industries in the Developing Countries, by Staley E. &Morsey R. McGraw Hill.
- Management of Small Scale Industries, by Malhotra I. S. & Gupta S. L,
- Innovation and Entrepreneurship, by Drucker, Peter F; East-West Press (P) Ltd.
- Entrepreneurial Development in India, by Gupta CB &Srinivasan; Sultan Chand
- Entrepreneur Development– New Ventures Creation, by Taneja S & Gupta SL
- Entrepreneurship Management by Dr. ArunaKaulgud, Vikas Publishing House.

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Syllabus – Eighth Semester

BASICS OF REVENUE MANAGEMENT

Course Code: TRM2801 **Credit Units : 02**

Course Objective:

At the end of the semester the students will be able to Explain & understand the concept of Revenue Management, necessity of its implementation in Hospitality Industry

1. Concept of Revenue Management

2. Basic Terms

3. Core Concepts of Revenue Management

4. Strategic Planning
   - 4.1 Supply & Demand Ratio
   - 4.2 Cost & Pricing
   - 4.3 Value Pricing
   - 4.4 Differential Pricing

5. Revenue Maximization vs. Optimization

6. Forecasting Demand

7. Inventory and Price Management

8. Overbooking as a Strategy

9. Managing Distribution Channels

10. Ethical aspects of Revenue Management

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Reading :

An Introduction to Revenue Management for the Hospitality Industry: Principles and Practices for the Real World,by Tranter

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RESEARCH METHODOLOGY

Course Code: TRM2802 **Credit Units : 02**

Course Objective:
Research methodology will be taught in the theory class to prepare students how to approach the subject of research project in the semester. To deal with surging information data regarding the various aspects of tourism industry, one should have a working efficiency with research and statistical techniques. The techniques may be applied in collecting, organizing, analyzing and interpreting data for decision-making. These may also be applied for formulating and testing research hypothesis. The course has been designed to equip the students with latest and necessary field techniques and to build a necessary statistical acumen among them. Students will master the skill for-

- Writing different types of research proposals
- Constructing the relevant tools of research
- Conduct a research project using appropriate qualitative and quantitative techniques
- Write a research report
- Evaluate a research report
- Give presentation of report supported by latest aids.

Course Contents:

Module - I: Research Methodology
Meaning of research, Need and importance of research, Types of research, Criteria of good research

Module - III: Data collection, analysis and interpretation (Sample designing)
Types & Sources of Data, Techniques of data collection; Correlation and regression analysis of two variables only. Hypothesis testing Test of significance, Chi-square analysis, Reports

Module - IV: Preparation of research proposals-
Selection and formulation of research problem, Operationalization of concepts and constructs, Review of related literature, Aims and objectives, Hypothesis, method, sample and tools.

Module V: Evaluation of research report
Research Report Format, Presentation of Report

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Reading :

- Applied General Statistics by Crovton and Crowder
- Behavioural Process in Organizations by Pareek, U.Rao. T.V. &Pestonjee D.M
- Professional Hotel Management by J.M. Negi, S Chand & Co, New Delhi
- Towards Appropriate Tourism– The case of Developing Countries by Peter long Frankfurt
- Method of Social Research – New York; The Free Press
- How to Complete Your Research Work Successfully by Judith Bell; UBS Publisher, Delhi
- How to Research and Write a Thesis in Hospitality & Tourism by James M. Paynter, John Wiley & Sons, New York, USA

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- Strategic Management by John A Pearce II & Richard B Robinson Jr.
- Strategic Management by Samual C Cerco
- Quantitative Techniques in Management by Vokra
- Quantitative Approaches to Management by Levin I Richerd

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ETHICS IN HOSPITALITY & TOURISM

Course Code: TRM2803 **Credit Units: 03**

Module – I : Ethics and its Significance

Defining ethics and its significance in tourism, Principles and Practices in Business Ethics - its relevance and applicability in Travel & Tourism Industry, Business Compulsions, Motivation and Ethical parameters.

Module – II : Safety & Security

Safety & Security of tourist, Tourist Police, place of Tourism in the constitution, need of tourism legislation

Module – III : Attitude & Behaviour

Attitude & Behaviour of the Tourists, Respect for Local Culture, Respect for Other Religions, Knowledge of Local Laws & Regulations

Module –IV : Impact on Host

Sense of Conservation towards Natural Resources, Concept of Carrying Capacity & Sustainable consumption, Socio-Cultural Impact of Tourism in the host area, Impact of Personal Grooming and Dress Code among the conservative area

Module –V : Communication – Micro level & Macro Level

Communication through Verbal Language & Body Language, Role of Travel Agents, Tour Operator, Guides & Escorts, Role of Media

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Reading :

- R. K. Malhotra (2005) Socio – Environmental and Legal Issues In Tourism, New Delhi.
- Tourism Guidelines Issued By Department of Tourism for Hotel and Restaurant Operation.
- Tourism Guide Lines Published by Govt. of India, Ministry of Tourism.
- Malik S - Ethical & Legal & Regulatory Aspects Tourism Business
- Sinha P. C - International Encyclopedia of Tourism Management
- Sinha P. C - Tourism Impact Assessment

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GDPI SESSIONS

Course Code: TRM2804 **Credit Units : 03**

Course Objective:

These sessions would help the students to perform well in the campus interview at the final year stage.

1. **Pre-Preparation before GD/PI**
   - 1.1 Previous day
   - 1.2 Previous night
   - 1.3 Type of food
   - 1.4 Rest & sleep
   - 1.5 On GD/PI day
   - 1.6 Personal Hygiene
   - 1.7 Grooming
   - 1.8 Curriculum Vitae &Testimonials
   - 1.9 Sense of Time

2. Process of Evaluation during Group Discussion
   - 2.1 Skills assessed in a Group Discussion Session
     - 2.1.1 Leadership skills
     - 2.1.2 Communication skills
     - 2.1.3 Interpersonal skills
     - 2.1.4 Persuasive skills
     - 2.1.5 Problem solving skills
     - 2.1.6 Conceptualizing skills
   - 2.2 Rules to follow during the Group Discussion
   - 2.3 Points to remember during Group Discussion
   - 2.4 What to avoid during Group Discussion - Common Mistakes
   - 2.5 Preparations to be taken before appearing in a Group Discussion
     - 2.5.1 Get noticed - But for the right reasons
     - 2.5.2 Egotism Showing off
     - 2.5.3 Quality Vs Quantity

3. Types of Group Discussion GD topics
   - 3.1 Factual
   - 3.2 Abstract
   - 3.3 Argumentative/ Controversial topics
   - 3.4 Opinion based
   - 3.5 Current topics
   - 3.6 Case based topics

4. Steps on how to prepare for an interview?

5. What is an interview?

6. What's the purpose of an interview

7. What to do Before an Interview

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8. What to do During the Interview
   8.1 Make Your Entrance
   8.2 Getting Started
   8.3 Attitude Counts

9. What to do after the Interview is over

10. Interview Do's and Don'ts

Examination Scheme:

Components	V	H	CT	A	EE
Weightage (%)	05	05	15	5	70

V-viva; H-home assignment; CT-class test; A-attendance; EE-end semester examination

Suggested Reading :

- Body Language – Your Success Mantra Dr. ShaliniVerma S. Chand
- The Pocket Guide to Man watching; Desmond Morris Triad Grafton Books

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RESEARCH PROJECT

Course Code: TRM2837 **Credit Units: 15**

Course Objective:

The purpose of research (Hospitality and Tourism based) is to seek answers to problems through the application of scientific methodology, which guarantees that the information is reliable and unbiased. This information is utilized to make conclusions and recommend solution. Some elementary factors need to be kept in mind while preparing a research and deciding the topic, these could be based on its relevance, feasibility, coverage, accuracy and research, objectivity and ethics.

To deal with surging information data regarding the various aspects of tourism industry, one should have a working efficiency with research and statistical techniques. The techniques may be applied in collecting, organizing, analyzing and interpreting data for decision-making. These may also be applied for formulating and testing research hypothesis. The course has been designed to equip the students with latest and necessary field techniques and to build a necessary statistical acumen among them. Students will master the skill for-

- Writing different types of research proposals and reports
- Constructing the relevant tools of research
- Conduct a research project using appropriate qualitative and quantitative techniques
- Do presentation with the help of tutorial aid
- Evaluate a research report.

The research topic should be assigned by the deputed subject faculty in the beginning of semester & should be approved by PL & HOI. Continuous monitoring and guidance should be provided to student at all the steps.

At the term end, the research project will be presented before a panel and evaluated by examiners (As nominated by HOI). The evaluation should be based on presentation, viva, report content & format & conclusion.

Examination Scheme:

Internal Assessment:

Abstract:	10
Draft:	15
Research Orientation:	10
Reading:	05

External Evaluation:

Objective:	05
Issue Profile:	10
Comprehensiveness	10
Relevance:	10
Presentation:	15
Viva:	10

Suggested Reading :

- Applied General Statistics by Crovton and Crowder
- Behavioural Process in Organizations by Pareek, U.Rao. T.V. Pestonjee D.M
- Professional Hotel Management by J.M. Negi, S Chand & Co, New Delhi

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- Towards Appropriate Tourism– The case of Developing Countries by Peter long Frankfurt
- Method of Social Research – New York; The Free Press
- How to Complete Your Research Work Successfully by Judith Bell; UBS Publisher, Delhi
- How to Research and Write a Thesis in Hospitality & Tourism by James M. Paynter, John Wiley & Sons, New York, USA.
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi
- Methodology & Techniques of Social Research by Wilkinson &Bhandarkar
- Methods in Social Research by Gode WJ &Hatt PK
- Scientific Social Surveys & Research by Pouline Young & CF Schmid
- Evaluation Information: A Guide for users of Social Scienec by Lescard, Kartzer Jeffery
- Understanding & Conducting Research Application Education &Behavioural Sciences- 2nd Edition.

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FOOD & BEVERAGE SERVICE
(Skill Track)

Programme Structure

Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
VHM2152	Basics of Food Service	1	-	4	3
VHM2252	Advanced Food Service	1	-	4	3
VHM2352	Beverage Studies-Basic	1	-	4	3
VHM2452	Beverage Studies-Advanced	1	-	4	3
VHM2552	F&B Service Supervisory Skills	1	-	4	3
VHM2652	F&B Management Skills	3	-	-	3
	TOTAL				**18**

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FOOD & BEVERAGE SERVICE

Syllabus - Semester First

BASICS OF FOOD SERVICE

Course Code: VHM2152 **Credit Units: 03**

Prerequisites : 10+2

Course Objective:
At the end of the semester the students will be able to –

- Explain the growth and role of hotel industry and catering establishment
- Understand the various types of hotels and their features
- List and explain various catering establishment with their features
- Explain staff organization structure of food and beverage department
- Describe and understand job description of each personnel working in each F&B outlet
- List various F&B service equipment with its use and care.

Course Contents:

Module –I

1.0 Growth of Hotel Industry
  1.1 Sections of The Industry
2.0 Catering Establishments
  2.1 Different Types

Module –II

3.0 Personnel
  3.1 Staff Organisation in F&B Department
  3.2 Attributes of a Waiter

Module –III

4.0 Furniture & Equipment in a Restaurant

Module –IV

5.0 Plan for serving food and beverages
6.0 Greet customer, take orders and serve
7.0 Clean tables and counters

Module –V

8.0 Communicate with customer and colleagues
9.0 Maintain customer-centric service orientation
10.0 Maintain standard of etiquette and hospitable conduct

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Examination Scheme:

Components	Internal Assessment			EE	
	V	LP	A	Th	Pr
Weightage (%)	05	20	05	40	30

V-Viva; LP-Lab Performance; A-Attendance; EE-End Semester Examination

Suggested Readings :

- Food & Beverage Services by SN Bagchi& Anita Sharma, Aman Publications, New Delhi
- Food & Beverage Service by Lilicrap
- Food & Beverage Service by R. Singaravelavan, OUP
- F & B Service Manual by Sudhir Andrews, Tata McGraw Hill
- The Waiter by John Fullar
- Professional Table Service by Dennis Lilicrap.
- Food & Beverage Management & Control by Dr. JM Negi, Kanishka Publications, New Delhi

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Syllabus - Semester Second

ADVANCED FOOD SERVICE

Course Code: VHM2252 **Credit Units: 03**

Prerequisites : Basics of Food Service (VHM2152)

Course Objective:

At the end of the semester the students will be able to –

- Explain the various types of Meals
- Define & explain the concept of Menu
- Classify various methods of Service
- Calculate bill for meals & Handle payment made by the guests
- Deal with different types of guests in different situations
- Maintain hygiene and safety at workplace

Course Contents:

Module – I

1.0 Meals & Menu
- 1.1 Types of Meals
- 1.2 Introduction to Menu
- 1.3 Courses of Menu
- 1.4 Classification of Menu
- 1.5 Types of Service

Module – II

2.0 Deal with customer payment
3.0 Resolve customer service issues
4.0 Follow gender and age sensitive service practices

Module – III

5.0 Maintain IPR of organisation and customers

Module – IV

6.0 Maintain health and hygiene
7.0 Maintain safety at workplace

Module – V

8.0 Service Terminology

Examination Scheme:

Components	Internal Assessment			EE	
	V	LP	A	Th	Pr
Weightage (%)	05	20	05	40	30

V-Viva; LP-Lab Performance; A-Attendance; EE-End Semester Examination

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Suggested Readings :

- Food & Beverage Services by SN Bagchi& Anita Sharma, Aman Publications, New Delhi
- Food & Beverage Service by Lilicrap
- Food & Beverage Service by R. Singaravelavan, OUP
- F & B Service Manual by Sudhir Andrews, Tata McGraw Hill
- The Waiter by John Fullar
- Professional Table Service by Dennis Lilicrap.
- Food & Beverage Management & Control by Dr. JM Negi, Kanishka Publications, New Delhi

After successful completion of study of the above Courses (VHM2152**&**VHM2252***), the student becomes eligible to appear for "Qualification Pack: Food & Beverage Service – Steward" (NSQF level - 4) examination under THSC & NSDC by paying fees as applicable.***

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Syllabus - Semester Third

BEVERAGE STUDIES - BASIC

Course Code: VHM2352 **Credit Units: 03**

Prerequisites : Advanced Food Service (VHM2252)

Course Objective:
At the end of the semester the students will be able to –

- Define & Classify Beverage
- State the various types of Non-Alcoholic & Alcoholic Beverages
- Understand & Explain the Classification, Production& service of Beer & Wine
- Manage inventory

Course Contents:

Module – I

1.0 Classification of Beverage
2.0 Non-Alcoholic Beverages

Module – II

3.0 Alcoholic Beverages : Classification
4.0 Beer : Manufacture, Service, Brands

Module – III

5.0 Wine :Classification, Still Wine, Fortified Wine, Sparkling Wine, Production, Wine producing countries, Wine & Food Harmony

Module – IV

6.0 Supervise food and beverage service
7.0 Manage customer service

Module – V

8.0 Manage inventory and staff

Examination Scheme:

Components	Internal Assessment			EE	
	V	LP	A	Th	Pr
Weightage (%)	05	20	05	40	30

V-Viva; LP-Lab Performance; A-Attendance; EE-End Semester Examination

Suggested Readings :

- Food & Beverage Services by SN Bagchi& Anita Sharma, Aman Publications, New Delhi
- Food & Beverage Service by Lilicrap
- Food & Beverage Service by R. Singaravelavan, OUP
- F & B Service Manual by Sudhir Andrews, Tata McGraw Hill
- The Waiter by John Fullar
- Professional Table Service by Dennis Lilicrap.
- Food & Beverage Management & Control by Dr. JM Negi, Kanishka Publications, New Delhi

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Syllabus - Semester Fourth

BEVERAGE STUDIES - ADVANCED

Course Code: VHM2452 **Credit Units: 03**

Prerequisites : Beverage Studies – Basic (VHM2352)

Course Objective:

At the end of the semester the students will be able to –

- Define & Explain Distillation process
- Classify Spirits
- State the various types of Non-Alcoholic & Alcoholic Beverages
- Understand & Explain the Production & service of various Spirits
- Prepare Cocktails

Course Contents:

Module – I

1.0 Distillation & Spirits

Module – II

2.0 Whisky : Manufacture, Service, Brands
3.0 Rum : Manufacture, Service, Brands
4.0 Gin : Manufacture, Service, Brands
5.0 Vodka : Manufacture, Service, Brands
6.0 Brandy : Manufacture, Service, Brands

Module – III

7.0 Other Spirits – Country of origin, Manufacture, Service, Brands

Module – IV

8.0 Liqueurs : Manufacture, Service, Brands

Module – V

9.0 Cocktails

Examination Scheme:

Components	Internal Assessment			EE	
	V	LP	A	Th	Pr
Weightage (%)	05	20	05	40	30

V-Viva; LP-Lab Performance; A-Attendance; EE-End Semester Examination

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Suggested Readings :

- Food & Beverage Services by SN Bagchi& Anita Sharma, Aman Publications, New Delhi
- Food & Beverage Service by Lilicrap
- Food & Beverage Service by R. Singaravelavan, OUP
- F & B Service Manual by Sudhir Andrews, Tata McGraw Hill
- The Waiter by John Fullar
- Professional Table Service by Dennis Lilicrap.
- Food & Beverage Management & Control by Dr. JM Negi, Kanishka Publications, New Delhi

After successful completion of study of the above Courses (VHM2552**&**VHM2452***), the student becomes eligible to appear for "Qualification Pack: Captain" (NSQF level - 6) examination under THSC & NSDC by paying fees as applicable.***

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Syllabus - Semester Fifth

F&B SERVICE SUPERVISORY SKILLS

Course Code: VHM2552 **Credit Units: 03**

Prerequisites : Beverage Studies – Advanced (VHM2452)

Course Objective:
At the end of the semester the students will be able to –

- Develop Supervisory Skills
- Train Staffs
- Manage Inventory & Budget

Course Contents:

Module – I
1.0 Restaurant Planning & Layout
- 1.1 Choosing of Location
- 1.2 Layout Planning
- 1.3 Décor
- 1.4 Furnishing, Fixtures & Fittings
- 1.5 Equipment Selection

Module – II
2.0 Arranging Equipment
3.0 Manage stock

Module – III
4.0 Supervisory Skills

Module – IV
5.0 Training Staffs
Manage human resource and quality

Module – V
6.0 Manage finances of the facility

Examination Scheme:

Components	Internal Assessment			EE	
	V	LP	A	Th	Pr
Weightage (%)	05	20	05	40	30

V-Viva; LP-Lab Performance; A-Attendance; EE-End Semester Examination

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Suggested Readings :

- Food & Beverage Services by SN Bagchi& Anita Sharma, Aman Publications, New Delhi
- Food & Beverage Service by Lilicrap
- Food & Beverage Service by R. Singaravelavan, OUP
- F & B Service Manual by Sudhir Andrews, Tata McGraw Hill
- The Waiter by John Fullar
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- Food & Beverage Management & Control by Dr. JM Negi, Kanishka Publications, New Delhi

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Syllabus - Semester Sixth

F&B MANAGEMENT SKILLS

Course Code: VHM2652 **Credit Units: 03**

Prerequisites : Service Supervisory Skills (VHM2552)

Course Objective:
At the end of the semester the students will be able to –

- Understand & Explain F&B Control
- Implement Menu Engineering

Course Contents:

Module – I

1.0 Cycles of Control
- 1.1 Purchasing
- 1.2 Receiving
- 1.3 Storing
- 1.4 Issuing
- 1.5 Preparation
- 1.6 Costing & Selling
- 1.7 Control

Module – II

2.0 Food Cost Control
- 2.1 Food Costing
- 2.2 Checks & Checking System
- 2.3 Standard Costing
- 2.4 Variance Analysis

Module – III

3.0 Budgets & Budgetary Control
- 3.1 Definition, Different Types of Budgeting
- 3.2 Different Steps of Preparing Different Budgets
- 3.3 Budgetary Control
- 3.4 Formats for Budgeting

Module – IV

4.0 Liquor Control
- 4.1 Purchase Procedures
- 4.2 Assessment of Quality
- 4.3 Stock Control
- 4.4 Beverage Sales Control

Module – V

5.0 Menu Engineering

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Examination Scheme:

Components	Internal Assessment				EE
	V	H	CT	A	Th
Weightage (%)	05	05	15	05	70

V-Viva; H-Home Assignment; CT-Class Test; A-Attendance; EE-End Semester Examination

Suggested Readings :

- Food & Beverage Services by SN Bagchi& Anita Sharma, Aman Publications, New Delhi
- Food & Beverage Service by Lilicrap
- Food & Beverage Service by R. Singaravelavan, OUP
- F & B Service Manual by Sudhir Andrews, Tata McGraw Hill
- The Waiter by John Fullar
- Professional Table Service by Dennis Lilicrap.
- Food & Beverage Management & Control by Dr. JM Negi, Kanishka Publications, New Delhi

After successful completion of study of the above Courses (VHM2552**&**VHM2652***), the student becomes eligible to appear for "Qualification Pack: Assistant Catering Manager" (NSQF level - 6) examination under THSC & NSDC by paying fees as applicable.***

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FOOD PRODUCTION TECHNIQUES
(Skill Track)

Programme Structure

Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
VHM2151	Basics of Food Production	1	-	4	3
VHM2251	Food Production Skills	1	-	4	3
VHM2351	Food Production Operations	1	-	4	3
VHM2451	Advanced Food Production	1	-	4	3
VHM2551	Food Production Supervisory Skills	1	-	4	3
VHM2651	Food Production Management	1	-	4	3
	TOTAL				**18**

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FOOD PRODUCTION TECHNIQUES

Syllabus - Semester First

BASICS OF FOOD PRODUCTION

Course Code: VHM2151 **Credit Units: 03**

Course Objective:
At the end of the semester the students will be able to –

- Explain the structure of Kitchenin hotel industry
- Understand the use of various resources used in kitchen
- Handle Commodities used in Food Production
- State the methods of cooking & apply the on various ingredients
- Define & prepare Stocks, Sauces & Gravies
- Understand Vegetable Cookery
- Set up and close kitchen
- Meet the need of the customers

Course Contents:
Module –I
1. Organising Kitchen
   1.1. Kitchen Brigade
   1.2. Kitchen Equipment
   1.3. Commodities

Module – II
2. Fundamentals of Cookery
   2.1. Preparation of Ingredients
   2.2. Methods of Cooking
   2.3. Stocks – Definition, Types & Methods
   2.4. Sauce – Definition, Types & Methods
   2.5. Gravy – Definition, Types & Methods

Module – III
3. Soups – Definition, Types & Methods
4. Vegetable Cookery - Basic Knowledge, Identification, Various Cuts, Preparation

Module – IV
5. Assist in food preparation
6. Set up and close kitchen

Module – V
7. Communicate with customer and colleagues
8. Maintain customer-centric service orientation
9. Maintain standard of etiquette and hospitable conduct

Examination Scheme:

Components	Internal Assessment			EE	
	V	LP	A	Th	Pr
Weightage (%)	05	20	05	40	30

V-Viva; LP-Lab Performance; A-Attendance; EE-End Semester Examination

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Suggested Readings :

- Theory of Catering by KintonCesserani, Published by Hodder & Stoughton
- Practical Cookery by KintonCesserani, Published by Hodder & Stoughton
- Theory of Cookery by K Arora published by Frank Bros &Co., New Delhi
- Professional chef by John Wiley
- Ultimate Cooking Course by Carole clement publish by Joana Lorrenz
- Essential of Cooking by James Peterson published by Artisan
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi.

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Syllabus - Semester Second

FOOD PRODUCTION SKILLS

Course Code: VHM2251 **Credit Units: 03**

Prerequisites : Basics of Food Production (VHM2151)

Course Objective:
At the end of the semester the students will be able to –

- Understand concept of Egg cookery
- Classify Fish and prepare various preparations
- Understand types, Cuts & preparation of Poultry / Game
- Explain the various types of Meals
- Define & explain the concept of Menu
- Classify various methods of Service
- Calculate bill for meals & Handle payment made by the guests
- Deal with different types of guests in different situations
- Maintain hygiene and safety at workplace

Course Contents:

Module – I

1. Egg Cookery - Structure, Composition, Varieties, Preparation

Module – II

2. Fish Cookery - Classification, Various Cuts, Preparation

Module – III

3. Poultry / Game Cookery - Classification, Various Cuts, Preparation

Module – IV

4. Meat Cookery
   4.1. Types - Mutton, Lamb, Pork, Beef, Veal
   4.2. Different Cuts & Preparation

Module – V

5. Monitor stock movement

Module – VI

6. Follow gender and age sensitive service practices
7. Maintain IPR of organization and customers
8. Maintain health and hygiene
9. Maintain safety at workplace

Examination Scheme:

Components	Internal Assessment			EE	
	V	LP	A	Th	Pr
Weightage (%)	05	20	05	40	30

V-Viva; LP-Lab Performance; A-Attendance; EE-End Semester Examination

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Suggested Readings :

- Theory of Catering by KintonCesserani, Published by Hodder & Stoughton
- Practical Cookery by KintonCesserani, Published by Hodder & Stoughton
- Theory of Cookery by K Arora published by Frank Bros &Co., New Delhi
- Professional chef by John Wiley
- Ultimate Cooking Course by Carole clement publish by Joana Lorrenz
- Essential of Cooking by James Peterson published by Artisan
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi.

After successful completion of study of the above Courses (VHM2151**&**VHM2251***), the student becomes eligible to appear for "Qualification Pack: Commis Chef" (NSQF level - 4) examination under THSC & NSDC by paying fees as applicable.***

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Syllabus - Semester Third

FOOD PRODUCTION OPERATIONS

Course Code: VHM2351 **Credit Units: 03**

Prerequisites : Food Production Skills (VHM2251)

Course Objective:
At the end of the semester the students will be able to –

- Understand importance of Mise-en-place &Mise-en-scene
- Design & Prepare Menu as par Indian Regional Cuisine
- Plan Indian Breakfast Menu & prepare
- Plan Western Breakfast Menu & prepare

Course Contents:

Module –I

1. Indian Regional Cuisine
   1.1. Study of Main Regions: North, South, East & West
   1.2. Main Meals & Snacks

Module –II

2. Indian Regional Cuisine
   2.1. Ethnic Eating Traditional Indian Bread & Sweet Meats

Module –III

3. Indian Regional Cuisine
   3.1. Indian Masalas& their characteristics

Module – IV

4. Breakfast Cookery
   4.1. Indian – region wise
   4.2. Western

Module – V

5. Prepare for food and kitchen activities

Examination Scheme:

Components	Internal Assessment			EE	
	V	LP	A	Th	Pr
Weightage (%)	05	20	05	40	30

V-Viva; LP-Lab Performance; A-Attendance; EE-End Semester Examination

Suggested Readings :

- Theory of Catering by KintonCesserani, Published by Hodder & Stoughton
- Practical Cookery by KintonCesserani, Published by Hodder & Stoughton
- Theory of Cookery by K Arora published by Frank Bros &Co., New Delhi
- Professional chef by John Wiley
- Ultimate Cooking Course by Carole clement publish by Joana Lorrenz
- Essential of Cooking by James Peterson published by Artisan
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Syllabus - Semester Fourth

ADVANCED FOOD PRODUCTION

Course Code: VHM2451 **Credit Units: 03**

Prerequisites : Food Production Operations (VHM2351)

Course Objective:

At the end of the semester the students will be able to –

- Design & Prepare Menu as par Occidental & Oriental Cuisines
- Understand concept of Bakery & Confectionery
- Prepare Cookies & Cakes

Course Contents:

Module – I

1. International Cuisine
   - 1.1. English
   - 1.2. Spanish
   - 1.3. French
   - 1.4. Mexican
   - 1.5. Oriental
   - 1.6. Italian
   - 1.7. Pasta Cookery

Module – II

2. Fundamentals of Bakery
   - 2.1. Various Ingredients & their use

Module – III

3. Cookies – types, methods

Module – IV

4. Cakes – types, methods, decoration, faults

Module – V

5. Perform food preparation as per standards
6. Assist the commi and senior chefs

Examination Scheme:

Components	Internal Assessment			EE	
	V	LP	A	Th	Pr
Weightage (%)	05	20	05	40	30

V-Viva; LP-Lab Performance; A-Attendance; EE-End Semester Examination

Suggested Readings :

- Theory of Catering by KintonCesserani, Published by Hodder & Stoughton
- Practical Cookery by KintonCesserani, Published by Hodder & Stoughton

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- Theory of Cookery by K Arora published by Frank Bros &Co., New Delhi
- Professional chef by John Wiley
- Basic Baking – S. C Dubey
- Ultimate Cooking Course by Carole clement publish by Joana Lorrenz
- Essential of Cooking by James Peterson published by Artisan
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi.

After successful completion of study of the above Courses (VHM2351***&***VHM2451***), the student becomes eligible to appear for "Qualification Pack: Commi 1" (NSQF level - 5) examination under THSC & NSDC by paying fees as applicable.***

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Syllabus - Semester Fifth

FOOD PRODUCTION SUPERVISORY SKILLS

Course Code: VHM2551 **Credit Units: 03**

Prerequisites : Advanced Food Production (VHM2451)

Course Objective:

- At the end of the semester the students will be able to –
- Prepare Various types of Salads & Sandwiches
- Decorate & Present with appropriate garnish
- Prepare various types of Cold Desserts
- Design Menu for different Catering outlets & understand the importance of Standard Recipe

Course Contents:

Module –I

1. Salads & Sandwiches - Definition, Classification, Preparation Use & Function

Module – II

2. Food Presentation & Garnish
   2.1. Various Aspects of Presentation; Materials Used

Module – III

3. Cold Desserts – Bakery & Confectionery

Module – IV

4. Menu Planning
5. Standardization of Recipe

Module – IV

6. Assist in creating new recipes and writing menus
7. Manage food resources in the kitchen

Examination Scheme:

Components	Internal Assessment			EE	
	V	LP	A	Th	Pr
Weightage (%)	05	20	05	40	30

V-Viva; LP-Lab Performance; A-Attendance; EE-End Semester Examination

Suggested Readings :

- Theory of Catering by KintonCesserani, Published by Hodder & Stoughton
- Practical Cookery by KintonCesserani, Published by Hodder & Stoughton
- Theory of Cookery by K Arora published by Frank Bros & Co., New Delhi
- Basic Baking – S. C Dubey
- Professional chef by John Wiley
- Ultimate Cooking Course by Carole clement publish by Joana Lorrenz
- Essential of Cooking by James Peterson published by Artisan
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi.

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Syllabus - Semester Sixth

FOOD PRODUCTION MANAGEMENT

Course Code: VHM2651 **Credit Units: 03**

Prerequisites : Supervisory Skills (VHM2551)

Course Objective:
At the end of the semester the students will be able to –

- Understand concept & methods of Quantity Food Production
- Prepare various types of Pastries
- Define & explain the concept of Menu
- Classify various methods of Service
- Calculate bill for meals & Handle payment made by the guests
- Deal with different types of guests in different situations
- Maintain hygiene and safety at workplace

Course Contents:

Module – I
1.0 Quantity Food Production

Module – II
2.0 Pastries
- 2.1 Definition
- *2.2* Ingredients Used,
- *2.3* Classification, Methods, Usage, Faults

Module – III
3.0 Modern Trend in Food Production Concept
- 3.1 Frozen Foods
- 3.2 Types
- 3.3 Advantages & Disadvantages
- 3.4 Handling Frozen Foods
- 3.5 Defrosting Techniques

Module – IV
4.0 Kitchen Management
- 4.1 Manage kitchen operations
- 4.2 Perform administrative work

Module – V
5.0 Food Cost
- 5.1 Food Cost Concept
- 5.2 Food Cost Percentage
- 5.3 Control Cycle
- 5.4 Various Reports

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Examination Scheme:

Components	Internal Assessment			EE	
	V	LP	A	Th	Pr
Weightage (%)	05	20	05	40	30

V-Viva; LP-Lab Performance; A-Attendance; EE-End Semester Examination

Suggested Readings:

- Theory of Catering by KintonCesserani, Published by Hodder & Stoughton
- Practical Cookery by KintonCesserani, Published by Hodder & Stoughton
- Theory of Cookery by K Arora published by Frank Bros & Co., New Delhi
- Professional chef by John Wiley
- Basic Baking – S. C Dubey
- Ultimate Cooking Course by Carole clement publish by Joana Lorrenz
- Essential of Cooking by James Peterson published by Artisan
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi.

After successful completion of study of the above Courses (VHM2551**&**VHM2651***), the student becomes eligible to appear for "Qualification Pack: Sous Chef" (NSQF level - 7) examination under THSC & NSDC by paying fees as applicable***

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FRONT OFFICE OPERATIONS
(Skill Track)

Programme Structure

Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
VHM2153	Fundamentals of Front Office Operations	1	-	4	3
VHM2253	Handling Reception	1	-	4	3
VHM2353	Check-in & Check-out Process	1	-	4	3
VHM2453	Front Office Supervisory Skills	1	-	4	3
VHM2553	Front Office Yield Management	3	-	-	3
VHM2653	Managing Front Office	3	-	-	3
	TOTAL				**18**

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FRONT OFFICE OPERATIONS

Syllabus - Semester First

FUNDAMENTALS OF FRONT OFFICE OPERATIONS

Course Code: VHM2153 **Credit Units: 03**

Prerequisites : 10+2

Course Objective:

At the end of the semester the students will be able to –

Understand the various types of hotels and their features
Explain the structure of Front Office Department
Develop clear concept about Accommodation facilities
Handle Reservation activities
Deal effectively with Guests &Colleagues
Maintain Personal Care & Safety

Course Contents:

Module – I

1.0 Structure of Front Office Department
- 1.1 Functional Organisation of Front office
- 1.2 Front Desk Layout and Equipment

Module – II

2.0 Accommodation Concept
- 2.1 Size and Types of Hotel
- 2.2 Types of Rooms
- 2.3 Rate Categories
- 2.4 Food Plans
- 2.5 Basis of Charging Room Rates
- 2.6 Tariff Card

Module – III

3.0 Reservation Activities
- 3.1 Processing of reservation request
- 3.2 Systems & Tools used

Module – IV

4.0 Communicate with customer and colleagues
- 4.1 Maintain standard of etiquette and hospitable conduct
- 4.2 Maintain customer-centric service orientation
- 4.3 Follow gender and age sensitive service practices

Module – V

5.0 Personal Care &Safety
- 5.1 Maintain health and hygiene
- **5.2** Maintain safety at work place

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Examination Scheme:

Components	Internal Assessment			EE	
	V	LP	A	Th	Pr
Weightage (%)	05	20	05	40	30

V-Viva; LP-Lab Performance; A-Attendance; EE-End Semester Examination

Suggested Readings :

- Front Office Management by Bardi, John Willy and Sons
- Front Office Management by Mr. Sbhal Nagar
- Professional Hotel Front Office Management – Anutosh Bhakta
- Hotel Management by Dr. Jagmohan Negi, Himalaya Publishing House, New Delhi.
- Professional Hotel Management by Dr. JM Negi, S. Chand & Co, New Delhi
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi
- Front Office by Abbott, Butter Worth Hiemann.
- Front Office Manual by Sudhir Andrews, Tata McGraw Hill

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Syllabus - Semester Second

HANDLING RECEPTION

Course Code: VHM2253 **Credit Units: 03**

Prerequisites : Fundamentals of Front Office Operations(VHM2153)

Course Objective:

At the end of the semester the students will be able to –

Handle 'On-Arrival' Procedures of a Guest
Understand & Explain various terminologies used in Hotel reception
Handle Guest's Queries, Complaints & Requests
Prepare Guest Bill & Complete the transaction

Course Contents:

Module – I

1.0 On-Arrival Procedures
- 1.1 Receiving, Greeting, Welcoming A Guest
- 1.2 Assessing The Guest Requirements
- 1.3 Registration & Rooming Procedure
- 1.4 Room Change

Module – II

2.0 Concept of - Over Booking, Scanty Baggage, Room Position, Cancellation, Amendment, Walk-in Guest, walking a Guest, Black listed Guest

Module – III

3.0 Attend to guest queries
- 3.1 Handling Guest Requests
- 3.2 Mail Handling Procedures
- 3.3 Message Handling Procedure - Importance, Procedure, Method of Receiving and Transmitting Messages for Guest, Location Form, Paging Procedure

Module – IV

4.0 Checkout & Settlement
- 4.1 Procedures at Reception, Cash Section, Bell Desk
- 4.2 Reduction of Late Charges
- 4.3 Effective Billing & Collection

Module – V

5.0 Maintain IPR of organisation and customers

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Examination Scheme:

Components	Internal Assessment			EE	
	V	LP	A	Th	Pr
Weightage (%)	05	20	05	40	30

V-Viva; LP-Lab Performance; A-Attendance; EE-End Semester Examination

Suggested Readings :

- Front Office Management by Bardi, John Willy and Sons
- Front Office Management by Mr. Sbhal Nagar
- Professional Hotel Front Office Management – Anutosh Bhakta
- Hotel Management by Dr. Jagmohan Negi, Himalaya Publishing House, New Delhi.
- Professional Hotel Management by Dr. JM Negi, S. Chand & Co, New Delhi
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi
- Front Office by Abbott, Butter Worth Hiemann.
- Front Office Manual by Sudhir Andrews, Tata McGraw Hill

After successful completion of study of the above Courses (VHM2153***&***VHM2253***), the student becomes eligible to appear for "Qualification Pack: Front Office Associate" (NSQF level - 4) examination under THSC & NSDC by paying fees as applicable.***

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Syllabus - Semester Third

CHECK-IN & CHECK-OUT PROCESS

Course Code: VHM2353 **Credit Units: 03**

Prerequisites : Handling Reception (VHM2253)

Course Objective:

At the end of the semester the students will be able to –

Understand the importance of Communication
Deal with special situations that may arise during Front Office operations
Handle Guest complaints
Guide staffs in handling situations
Prepare Duty Rota

Course Contents:

Module –I

1.0 Front office Communication
- 2.1 Importance of inter-Departmental Communication
- 2.2 Types & Methods of Communication

Module – II

2.0 Handling of Special Situations Like
- 2.1 DNS, DNA, RNA, NI (No information)
- 2.2 Scanty Baggage Guest
- 2.3 Refusing Accommodation
  - 2.3.1 Black Listed Guest
  - 2.3.2 Walking A Guest

Module – III

3.0 Assist guest in check-in and checkout process –'Express Check-Out'&'Self Check-Out'

Module – IV

4.0 Handling guest complaints and guide front office staff – Staff Organisation, Duty Rotas& Work Schedule

Module – V

5.0 Front Office related terms

Examination Scheme:

Components	Internal Assessment			EE	
	V	LP	A	Th	Pr
Weightage (%)	05	20	05	40	30

V-Viva; LP-Lab Performance; A-Attendance; EE-End Semester Examination

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Suggested Readings :

- Front Office Management by Bardi, John Willy and Sons
- Front Office Management by Mr. Sbhal Nagar
- Professional Hotel Front Office Management – Anutosh Bhakta
- Hotel Management by Dr. Jagmohan Negi, Himalaya Publishing House, New Delhi.
- Professional Hotel Management by Dr. JM Negi, S. Chand & Co, New Delhi
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi
- Front Office by Abbott, Butter Worth Hiemann.
- Front Office Manual by Sudhir Andrews, Tata McGraw Hill

After successful completion of study of the above Course (VHM2353***), the student becomes eligible to appear for "Qualification Pack: Front Office Executive" (NSQF level - 5) examination under THSC & NSDC by paying fees as applicable.***

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Syllabus - Semester Fourth

FRONT OFFICE SUPERVISORY SKILLS

Course Code: VHM2453 **Credit Units: 03**

Prerequisites : Check-in & Check-out Process (VHM2353)

Course Objective:

At the end of the semester the students will be able to –

Understand need of Guests
Handle Guests Requests, Complaints, Messages, Mails
Understand Hotel's Security System
Perform as par the operating System of the department
Guide Staffs in dealing with guests

Course Contents:

Module – I

1.0 Communicating with Guests
- 1.1 Handling Guest Requests & Guest Complaints
- 1.2 Message Handling Procedure – Importance, Procedure, Method of Receiving and Transmitting Messages for Guests, Location Form, Paging Procedure
- 1.3 Importance of Handling Mail without Delay, Sorting of Mail

Module – II

2.0 Facilitate a smooth stay for the guests at the hotel
- 2.1 Manual Key Control Procedure
- 2.2 Left Luggage Procedures
- 2.3 Handling of Special Situations Like – VIP / Spat / DG Guests

Module – III

3.0 Hotel / Front office Security System
- 3.1 Methods
- 3.2 Equipment Used
- 3.3 Card Key Control
- 3.4 Emergency Procedures
- 3.5 Management's Role in Security

Module – IV

4.0 Front office Systems
- 4.1 Non-Automated
- 4.2 Semi- Automated
- 4.3 Fully- Automated

Module – V

5.0 Train and supervise front office staffs for –
- 5.1 Receiving, Greeting, Welcoming A Guest
- 5.2 Assessing The Guest Requirements in cases like – FIT, VIP, Group, Foreigner

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Examination Scheme:

Components	Internal Assessment			EE	
	V	LP	A	Th	Pr
Weightage (%)	05	20	05	40	30

V-Viva; LP-Lab Performance; A-Attendance; EE-End Semester Examination

Suggested Readings :

- Front Office Management by Bardi, John Willy and Sons
- Front Office Management by Mr. Sbhal Nagar
- Professional Hotel Front Office Management – Anutosh Bhakta
- Hotel Management by Dr. Jagmohan Negi, Himalaya Publishing House, New Delhi.
- Professional Hotel Management by Dr. JM Negi, S. Chand & Co, New Delhi
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi
- Front Office by Abbott, Butter Worth Hiemann.
- Front Office Manual by Sudhir Andrews, Tata McGraw Hill

After successful completion of study of the above Course (VHM2453***), the student becomes eligible to appear for "Qualification Pack: Guest Relations Manager" (NSQF level - 6) examination under THSC & NSDC by paying fees as applicable.***

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Syllabus - Semester Fifth

FRONT OFFICE YIELD MANAGEMENT

Course Code: VHM2553 **Credit Units: 03**

Prerequisites : Front Office Supervisory Skills (VHM2453)

Course Objective:

At the end of the semester the students will be able to –

Explain the concept of Yield Management
Take measures to maximize yield of the department
Deal with Staff needs
Analyze Training needs and arrange Training

Course Contents:

Module –I

1.0 Yield Management
- 1.1 Concept of Yield Management
- 1.2 Capacity Management
- 1.3 Discount Allocation

Module – II

2.0 Measuring Yield
- 2.1 Potential Average SGL / DBL Rate
- 2.2 Multiple Occupancy Percentage
- 2.3 Rate Spread
- 2.4 Potential Average Rate
- 2.5 Room Rate Achievement Factor
- 2.6 Yield Statistic
- 2.7 Equivalent Occupancy
- 2.8 Required Non-Room Revenue Per Guest

Module – III

3.0 Elements of Yield Management
- 3.1 Group Room Sales
- 3.2 Transient Room Sales
- 3.3 Food & Beverage Activity
- 3.4 Special Events

Module – IV

4.0 Application of Yield Management Concepts

Module – V

5.0 Human Relations Management

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Examination Scheme:

Components	Internal Assessment				EE
	V	H	CT	A	Th
Weightage (%)	05	05	15	05	70

V-Viva; H-Home Assignment; CT-Class Test; A-Attendance; EE-End Semester Examination

Suggested Readings :

- Front Office Management by Bardi, John Willy and Sons
- Front Office Management by Mr. Sbhal Nagar
- Professional Hotel Front Office Management – Anutosh Bhakta
- Hotel Management by Dr. Jagmohan Negi, Himalaya Publishing House, New Delhi.
- Professional Hotel Management by Dr. JM Negi, S. Chand & Co, New Delhi
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi
- Front Office by Abbott, Butter Worth Hiemann.
- Front Office Manual by Sudhir Andrews, Tata McGraw Hill

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Syllabus - Semester Sixth

MANAGING FRONT OFFICE

Course Code: VHM2653 **Credit Units: 03**

Prerequisites : Front Office Yield Management (VHM2553)

Course Objective:

At the end of the semester the students will be able to –

Explain the various types of Meals
Define & explain the concept of Menu
Classify various methods of Service
Calculate bill for meals & Handle payment made by the guests
Deal with different types of guests in different situations
Maintain hygiene and safety at workplace

Course Contents:

Module – I

1.0 Planning & Operations
- 1.1 Plan and control day to day front office activities
- 1.2 Assist in managing the front office operation
- 1.3 Manage the front office staffing process

Module – II

2.0 Establishing Room Rates
- 2.1 Market Condition Approach
- 2.2 Rule-of-Thumb Approach
- 2.3 Hubbart Formula

Module – III

3.0 Forecasting Room Availability
- 3.1 Forecasting Data
- 3.2 Percentage of No-Shows
- 3.3 Percentage of Walk-Ins
- 3.4 Percentage of Over-stays
- 3.5 Percentage of Under-stays
- 3.6 ARR (Average Room Rate)
- 3.7 RevPAR (Revenue Per Available Room)
- 3.8 Forecast Formula
- 3.9 Room Count Considerations

Module – IV

4.0 Budgeting for Operations
- 4.1 Forecasting Rooms Revenue
- 4.2 Estimating Expenses

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Module – V

5.0 Evaluating Front Office Operations

- 5.1 Daily Operations Report
- 5.2 Occupancy Ratios
- 5.3 Rooms Revenue Analysis
- 5.4 Operating Ratios
- 5.5 Rooms Division Income Statement & Budget Reports

Examination Scheme:

Components	**Internal Assessment**				**EE**
	V	**H**	**CT**	**A**	**Th**
Weightage (%)	05	05	15	05	70

V-Viva; H-Home Assignment; CT-Class Test; A-Attendance; EE-End Semester Examination

Suggested Readings:

- Front Office Management by Bardi, John Willy and Sons
- Front Office Management by Mr. Sbhal Nagar
- Professional Hotel Front Office Management – Anutosh Bhakta
- Hotel Management by Dr. Jagmohan Negi, Himalaya Publishing House, New Delhi.
- Professional Hotel Management by Dr. JM Negi, S. Chand & Co, New Delhi
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi
- Front Office by Abbott, Butter Worth Hiemann.
- Front Office Manual by Sudhir Andrews, Tata McGraw Hill

After successful completion of study of the above Courses (VHM2553***&***VHM2653***), the student becomes eligible to appear for "Qualification Pack: Duty Manager" (NSQF level - 7) examination under THSC & NSDC by paying fees as applicable.***

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HOSPITALITY & TOURISM

Discipline	Course Code	Name of Course	Type (Major/ Minor)	Semester	Total Credits
Hospitality & Tourism	DHMC2151	Introduction to Hospitality & Tourism-I	Major/ Minor	1	4
Hospitality & Tourism	DHMC2251	Introduction to Hospitality & Tourism-II	Major/ Minor	2	4
Hospitality & Tourism	DHMC2351	Supervising Hotel Operations	Major/ Minor	3	4
Hospitality & Tourism	DHMC2451	Managing Tourism Operations	Major/ Minor	4	4
Hospitality & Tourism	DHMC2551	Food & Beverage Division Management	Major/ Minor	5	4
Hospitality & Tourism	DHMC2501	Revenue & Yield Management	Major	5	4
Hospitality & Tourism	DHMC2651	Rooms Division Management	Major/ Minor	6	4
Hospitality & Tourism	DHMC2601	MICE Management	Major	6	4
Hospitality & Tourism	DHMC2602	Customer Delight & Entrepreneurship Management	Major	6	4

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Course Code : DHMC2151	Course : Introduction to Hospitality & Tourism - I	L	T	P	C
Version - 1.1		3	0	2	4
Pre-requisites / Exposure : 10+2	Co-requisites : Nil				

Course Description

The back-to-basics course helps students to understand the foundations of the core Hospitality and Tourism subjects. The topics will help students to prepare for the first step in the industry. All the fundamental topics from the core areas of Hospitality and Tourism will be focused upon.

Course Objective:

1. To learn the fundamentals of each core area of Hospitality and Tourism.
2. To revise the basics of all core courses.
3. To improve the confidence levels in students to appear for placement Interviews.

Learning Outcome

After completing this course, the student will be able to:
LO1: Retrieve the basics of hotel operations and the travel & tourism industry.
LO2: Associate the basics of theories and practical's of the hotel, hospitality, and tourism industry.
LO3: Executing the labs independently.

Course Outcome (CO)

On completion of this course, the students will be able to:
CO1: To define the overview of the hospitality and tourism industry.
CO2: To highlight, summarize and execute the basics of culinary arts and baking.
CO3: To memorize and relate to the fundamentals of food and beverage service.
CO4: To quote and interpret the basics of the front office and housekeeping operations.
CO5: To identify the fundamentals of the travel and tourism industry.

Course Content

Modules	Blooms level*	Number of hours
Module – 1 : Introduction the Tourism Industry • Definition of tourism • Historical evolution and growth of the industry • Importance of the industry in global economy • Key sectors within tourism (accommodation, food & beverage, travel services, etc.) • Career opportunities in the industry	*L1*	8
Module – 2 : Tourism Segments and Types • Tourism segments e.g., domestic, international, mass, niche, etc. • Types of tourism.	*L1, L2, L3*	4
Module 3: Travel Facilitators and Documentation. • Travel facilitators (travel agencies, tour operators, online platforms) • Travel documentation (passports, visas, travel insurance)	*L1, L2*	6
Module 4: Introduction to Hotel Operations • Types of Hotels and their classifications.	*L1, L2*	6

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• Departments of a hotel.		
Module 5: Front Office Operations • Role of the Front Office department in hotel operations. • Front Office department structure and responsibilities. • Reservation systems and booking processes. • Guest registration and check-in procedures. • Handling guest inquiries, complaints, and requests. • Check-out procedures and billing.	*L1*	6
Module 6: Housekeeping Operations • Importance of housekeeping in guest satisfaction. • Housekeeping department structure and responsibilities. • Cleaning procedures and room inspections. • Linen and laundry management. • Maintenance and upkeep of guest rooms and public areas.	*L1*	6
Practical Sessions		
Hotel Front Office Operations		
Front Desk Procedures • Check-in and check-out processes • Room assignment and handling guest requests. • Role-playing exercises for front desk scenarios	*L1, L2, L3*	3
Reservation System Training • Practical experience with reservation software • Handling real reservation requests • Managing group reservations	*L1, L2, L3*	2
Guest Service Skills • Receiving telephone calls and providing information • Handling guest complaints and requests • Practicing guest interaction scenarios	*L1, L2, L3*	2
Practical Application and Case Studies • Group projects on real hotel scenarios • Role-playing exercises for complex front office situations	*L1, L2, L3*	2
<u>Hotel Housekeeping Operations</u>		
Cleaning Techniques and Procedures • Cleaning tools, equipment, and supplies • Proper cleaning techniques for different surfaces • Handling cleaning chemicals safely	*L1, L2, L3*	3
Guest Room Cleaning • Cleaning guest rooms, including beds, bathrooms, and living areas • Restocking amenities and supplies • Room inspection and quality control	*L1, L2, L3*	2
Laundry Operations • Sorting, washing, and folding linens • Stain removal techniques	*L1, L2, L3*	2

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• Maintenance of laundry equipment		
Public Area Cleaning • Cleaning and maintaining public spaces • Cleaning and caring for carpets and floors • Handling trash and waste disposal	*L1, L2, L3*	2
Guest Service Skills • Interacting with guests professionally • Handling guest requests and complaints • Providing extra amenities and services	*L1, L2, L3*	2
Sustainable Housekeeping Practices • Eco-friendly cleaning products and practices • Reducing waste and conserving resources • Green certifications and industry trends	*L1, L2, L3*	2
Practical Application and Case Studies • Group projects on real housekeeping scenarios • Role-play exercises for guest interactions	*L1, L2, L3*	2

Bloom's Level:
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text:

- Bardi, James A., 1947- Hotel front office management –5th ed.
- John Cousins, Dennis Lillicrap, Suzanne Weekes - Food and Beverage Service 9th Edition
- Gisslen, Wayne, 1946- Professional cooking / Wayne Gisslen- 7th ed.
- G. Raghubalan, and Smritee Raghubalan, 2015. Hotel Housekeeping: Operations & Management 3rd Ed

References:

- Carole clement. (2003). Ultimate Cooking Course. Hermes House (2003)
- Peterson, J. (2003). Essentials of cooking. Artisan Books.
- Negi, J., & Manoher, G. (2009). Hospitality Management. Laxmi Publications, Ltd.
- Gisslen, W. (2010). Professional cooking, college version. John Wiley & Sons.
- Professional Cookery, John Wiley

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

- Quizzes and examinations on each Module's content
- Group projects exploring real-world hospitality and tourism scenarios.
- Final comprehensive examination covering the entire course.

Examination Scheme:

Components	EE		CE		
	Th	Pr	CT	HA	A
Weightage (%)	40	30	15	10	5

Th = Theory; Pr = Practical; EE = End Sem Exam; CE = Continuous Evaluation;
CT = Class Test; HA = Home Assignment; A = Attendance

CO, PO and PSO Mapping

Course Outcome	Program Outcome							Program Specific Outcome			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1							1			
CO2	1							1			
CO3	1							1			
CO4	1							1			
CO5	1							1			

1 = Strongly Related, 2 = Moderately Related, 3 = Weakly Related

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Course Code : DHMC2251	Course : Introduction to Hospitality & Tourism - II	L	T	P	C
Version - 1.1		3	0	2	4
Pre-requisites / Exposure : DHMC2151	Co-requisites : Nil				

Course Description
The course helps students to understand the operations of the core courses in Hotel Management. The topics will help students prepare for the first step in the industry. All the operational topics from the core areas of hotel management will be focused.

Course Objective:
1. To learn the operations of each core area of Hotel Management
2. Revise the operations of all core courses.
3. To improve the confidence levels of students to appear for placement Interviews.

Learning Outcome
After completing this course, the student will be able to:
- Retrieve the operations of the core hotel industry.
- Associate the workflow in the theories with the practical's of the hotel industry.
- Executing the labs independently.

Course Outcome (CO)
On completion of this course, the students will be able to:
CO1: Define the hotel industry in totality.
CO2: Highlight, summarize, and execute the operations of culinary arts and baking.
CO3: Memorize and relate to the operations of food and beverage service.
CO4: Quote and interpret the operations of the front office department.
CO5: Identify and express the operations of the housekeeping department.

Course Content

Modules	Blooms level*	Number of hours
Module – 1 : Cultural and Heritage Tourism • UNESCO World Heritage Sites in India • Religious Tourism: Temples, Mosques, Churches • Historical Monuments and Forts	L1	3
Module – 2 : Natural Tourism and Wildlife • National Parks and Wildlife Sanctuaries	L1, L2, L3	2
Module – 3 : Festivals and Cultural Events • Major Festivals Celebrated Across India • Cultural Significance and Tourist Attractions	L1, L2, L3	3
Module – 4 : Food and Beverage Operations • F&B departmental structure and responsibilities. • Various F&B outlets in a hotel. • Types and courses of menu. • Breakfast service. • Overview of Bar, Room Service and Banquet operations.	L1, L2, L3	4
Module – 5 : Introduction to Hotel Food Production	L1, L2, L3	4

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• Importance of Hygiene in Food Production • Introduction to Different Kitchen Sections: Hot Kitchen, Cold Kitchen, Pastry Kitchen		
Module – 6 : Culinary Techniques and Skills • Knife Skills and Basic Culinary Tools • Cooking Methods: Grilling, Roasting, Sauteing, Braising, etc. • Seasoning, Flavoring, and Garnishing • Food Presentation and Plating Techniques	L1, L2, L3	4
Module – 7 : Stocks, Soups, and Sauces • Creating Various Types of Soups (Clear, Cream, Consommé) • Basic and Derivative Sauces (Bechamel, Velouté, Espagnole, Hollandaise, Tomato)	L1, L2, L3	4
Module – 8 : Main Course Dishes • Cooking Meat: Roasting, Braising, Pan-frying • Vegetable Dishes and Accompaniments	L1, L2, L3	4
Module – 9 : Bakery and Pastry Basics • Introduction to Baking Ingredients and Techniques • Breads and Rolls Production	L1, L2, L3	4
Module – 10 : Food Safety and Sanitation • HACCP Principles: Hazard Analysis and Critical Control Points • Safe Food Handling and Storage	L1, L2, L3	4
LAB SESSIONS (Practical) :		
F&B Service • Familiarization with Restaurant Furniture, Equipment and Tools. • Laying of 3 Course A La Carte cover • Mock service of 3 Course Menu (Soup, Main Course and Dessert)	L1, L2, L3	8
Food Production & Bakery • As required to support theory class sessions.	L1, L2, L3	16

Bloom's Level:
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text:

- Bardi, James A., 1947- Hotel front office management /James A. Bardi.–5th ed.
- John Cousins, Dennis Lillicrap, Suzanne Weekes - Food and Beverage Service 9th Edition
- Gisslen, Wayne, 1946- Professional cooking / Wayne Gisslen- 7th ed.
- G. Raghubalan, and Smritee Raghubalan, 2015. Hotel Housekeeping: Operations And Management 3rd Ed

References:

- Carole clement. (2003). Ultimate Cooking Course. Hermes House (2003)
- Peterson, J. (2003). Essentials of cooking. Artisan Books.
- Negi, J., & Manoher, G. (2009). Hospitality Management. Laxmi Publications, Ltd.
- Gisslen, W. (2010). Professional cooking, college version. John Wiley & Sons.
- Professional Cookery, John Wiley

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

- Quizzes and examinations on each Module's content
- Group projects exploring real-world hospitality and tourism scenarios.
- Final comprehensive examination covering the entire course.

Examination Scheme:

Components	EE		CE		
	Th	Pr	CT	HA	A
Weightage (%)	40	30	15	10	5

Th = Theory; Pr = Practical; EE = End Sem Exam; CE = Continuous Evaluation; CT = Class Test; HA = Home Assignment; A = Attendance

CO, PO and PSO Mapping

Course Outcome	Program Outcome							Program Specific Outcome			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1							1			
CO2	1							1			
CO3	1							1			
CO4	1							1			
CO5	1							1			

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Course Code : DHMC2351	Course : Supervising Hotel Operations	L	T	P	C
Version - 1.1		3	0	2	4
Pre-requisites / Exposure : DHMC2251	Co-requisites : Nil				

Course Description

This course provides an in-depth look at the day-to-day operations of hotels, including front office management, housekeeping, and maintenance. Students will learn about the key performance indicators used to measure a hotel's success.

Course Objectives:

The student will get knowledge about:

- A better perspective of the lodging industry, both domestic and international.
- Understanding the history of the lodging industry and identify future trends that will affect it.
- Identification the relationship between a hotel's operational departments.
- Understanding common lodging terms, and how they are used in the hotel industry.
- The operating goals of the modern hotel.
- The basic organizational structure of a hotel.

Course Outcomes (CO)

On completion of this course, the students will be able to

CO1: Identify the Hotel operations.
CO2: Describe the advanced techniques used in hotel industry.
CO3: Prepare reservation chart, check-in, check-out procedure.
CO4: Handle guest services
CO5: Understand the modern technology and practices in hospitality industry.

Course Content

Modules	Blooms level*	Number of hours
	L1	2
Module – 1 : The Traditional Hotel Industry Introduction, Organisational Structure of small, medium, and large hotel, History of Hotel Industry, Indian hospital industry	L1	8
Module – 2 : The Modern Hotel Industry Introduction, emerging trends in hotel industry, demand in modern era, modern facilities provided by hotel, staffing and their duties in modern trends.	L1, L2	8
Module – 3 : Changing trends in Hospitality. Hygiene not just cleanliness Training and motivation Trends	L1, L2	6
Module – 4 : Hotel Technology Introduction, Emerging trends in technology adoption in hotels, eco-friendly practices in various departments of hotel, handling emergencies	L1, L2	6
Module – 5 : New Property Operations Division of work Staffing consideration	*L1*	8

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Orientation and training Area responsibility plan Counting before the opening		
Practical Sessions		
Check-out process	L1, L2, L3	4
Handling guests calls	L1, L2, L3	4
Telephonic etiquette	L1, L2, L3	4
Software handing operations	L1, L2, L3	6
Handling Orientation and training	L1, L2, L3	6

Bloom's Level:
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text:

- Kaushal, S.& Gautam, S. (1994). *Accommodation Operation Management* (4thed.). Noida: Frank Bros & Co.
- Andrews, S. (1990). *Hotel Housekeeping Management and Operations* (3rded.). NY: Tata McGraw Hill Companies.
- Margaret, M., Kappa, A.L., & Patricia, B. (2002). *Housekeeping Management* Educational Institute of the American Hotels & Motels Association

References:

- Chakravarti, B. K. (1999). *Welcome to Hospitality – An Introduction* (2nd ed.). Broussard, Louisiana: Delmar publication.
- Tarachand, R. (2000). *Hotel and Restaurant Management*. New Delhi, Delhi: Mohit Publications.
- Bardi, T., & James, A. (2013). *Hotel Front Office Management* (5th ed.). Hoboken, New Jersey: Wiley.
- Tewari, K., Jatashankar, R. (2012). *Hotel Front Office: Operations And Management* (5th ed.). Oxford, United Kingdom: Oxford Uni. Press

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

- Quizzes and examinations on each Module's content
- Group projects exploring real-world hospitality and tourism scenarios.
- Final comprehensive examination covering the entire course.

Examination Scheme:

Components	EE		CE		
	Th	Pr	CT	HA	A
Weightage (%)	40	30	15	10	5

Th = Theory; Pr = Practical; EE = End Sem Exam; CE = Continuous Evaluation;
CT = Class Test; HA = Home Assignment; A = Attendance

CO, PO and PSO Mapping

Course Outcome	Program Outcome							Program Specific Outcome			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1							1			
CO2	1							1			
CO3	1							1			
CO4	1							1			
CO5	1							1			

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Course Code : DHMC2451	Course : Managing Tourism Operations	L	T	P	C
Version - 1.1		3	1	0	4
Pre-requisites / Exposure : DHMC2351	Co-requisites : Nil				

Course Description
In this course the various concepts of Tourism Management will be addressed.

Course Objectives
At the end of the semester the students will develop a clear concept on –

- Tourism and Tourists.
- Tourists Characteristics and preferences
- Tourism destinations and Management
- Tourism Product Development

Course Outcomes
On completion of this course, the students will be able to
CO1 : Define the concept Tourism
CO2 : State Characteristics of Tourists
CO3 : Identify Tourism Destinations
CO4 : Manage Destination operations
CO5 : Develop a Tourism Product

Modules	Blooms level*	Number of hours
Module – 1 : Introduction to Tourism • What is Tourism? • Factors that Motivate People to Travel • Traditional and Niche Tourism • What is Tourism Management? • Types of Tourism & Tourism Terminology • Factors Affecting Tourism & Demand of Tourism	L1, L2	8
Module – 2 : Characteristics of Tourists • Motivation Factors of the Tourists • Maslow's Pyramid of Motivation • Internal & External Factors of Motivation • Plog's Model of Tourist Typologies • Consumer Behavior in Tourism • Factors Affecting Tourist Behavior: Intrinsic and Extrinsic • Henley Centre Model of Holidaymaking	L1, L2	8
Module – 3 : Tourism Destinations • Destination Awareness • What is a Tourist Destination? • How Can a Destination Attract Tourists? • The Five A's • Types of Tourist Destinations • Building Online Destination Awareness • Milieus of Tourism : Geographical & Cultural	L1, L2	10
Module – 4 : Destination Management • What is Destination Management? • Why Manage Destinations?	L1, L2	12

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• The Destination Management Organization (DMO) • Tools for Destination Management • Steps of Destination Development • Managing Tourism Supply • Components of Tourism Supply • Categories of Tourism Supply Components • Tourism Functional Management • Departments of a Tourism Business • Tourism – Market Segmentation • Tourism – Marketing Mix, Products and Services		
Module – 5 : Developing a Tourism Product • Elements of a Tourism Product • Key Principles of Tourism Product Development • Phases & Steps of Tourism Product Development • Impacts of Tourism : Economic, Environmental & Social • Tourism – Trends and Future • Digital Technology in Tourism • New Trends in Tourism • Elements of a Tourism Product	L1, L2	10

Bloom's Level:
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

1. Rajput, R.K. (2013). *Elements of Mechanical Engineering*, Delhi: Lakmi Publication.
2. Jain, V. (2011). *Basics of Mechanical Engineering*, Delhi : Dhanpat Rai Publication.
3. Kumar, D.S. (2013). *Elements of Mechanical Engineering*, , Delhi : S.K. Kataria and Sons Publications.

Reference Books

1. Ganesan, V. (2017). *Internal Combustion Engine*, New-Delhi: Tata McGraw Hill.
2. Nag, P.K. (2013). *Engineering thermodynamics*, New-Delhi: Tata McGraw Hill.
3. Kumar, D.S. (2013). *Thermal Engineering*, New-Delhi: S.K. Kataria and Sons Publications.
4. Hazra, S.K. and Chaudhary, A.K. (2012). *Workshop Technology Vol. II* . New Delhi: Asian Book Comp.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

- Quizzes and examinations on each Module's content
- Group projects exploring real-world hospitality and tourism scenarios.
- Final comprehensive examination covering the entire course.

Examination Scheme:

Components	EE	CE		
	Th	CT	HA	A
Weightage (%)	70	15	10	5

Th = Theory; EE = End Sem Exam; CE = Continuous Evaluation;
CT = Class Test; HA = Home Assignment; A = Attendance

CO, PO and PSO Mapping

Course Outcome	Program Outcome							Program Specific Outcome			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1	1						1	1		
CO2	1	1						1	1		
CO3	1	1						1	1		

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CO4	1	1						1	1		
CO5	1	1						2	1		

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Course Code : DHMC2551	Course : Food & Beverage Division Management	L	T	P	C
Version - 1.1		3	0	2	4
Pre-requisites / Exposure : DHMC2451	Co-requisites : Nil				

Course Description

This course is intended for students to gain expertise in F&B service. The student will develop clear concepts on F&B Control, Menu Planning & Analysis, Restaurant designing, HR Planning after completing this course.

Course Objectives

The student will get knowledge about-

- F&B Control, Menu Engineering and Budgetary control.
- F&B Service procedures and planning of operational requirements providing them desired efficiency and effectiveness in the subject.
- Advanced Menu Planning, concept of Menu Engineering, Planning Special Menus
- Planning and Designing of Restaurant & other F&B outlets
- Planning of Human Resource

Course Outcomes

On completion of this course, the students will be able to

CO1 : Explain various control mechanisms in F&B operations
CO2 : Illustrate different concepts of Advanced Menu Planning using Menu engineering
CO3 : Plan layouts and design the operational area of the F&B POS
CO4 : Conduct and plan service of various special menus
CO5 : Conduct Human Resource planning of F&B department

Course Content

Modules	Blooms level*	Number of hours
Theory Sessions		
Module – 1 : F&B Control Cycles of Control, Purchasing, Receiving, Storing, Issuing, Preparation, Costing & Selling, Food Costing, Food Cost Control, Checks & Checking System, Standard Costing, Variance Analysis, Liquor Control, Purchase Procedures, Assessment of Quality, Stock Control, Beverage Sales Control	L1, L2, L3, L4, L5	8
Module – 2 : Menu Analysis & Menu Planning Menu Engineering, Concept, KOT Analysis, Classification of dishes, Remedial measures, Menu Planning, Objectives & Procedures, Menu Planning Considerations & Constrains, Menu Designing, Menu Merchandising, Regional Cuisine, Menu writing of regional dishes, Table laying of regional dishes, Service of regional dishes	L1, L2, L3, L4, L5	8
Module – 3 : Budgets Budgets & Budgetary Control, Definition, Different Types of Budgeting, Different Steps of Preparing Different Budgets, Budgetary Control, Formats for Budgeting	L1, L2, L3, L4, L5	6

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Module – 4 : Planning and Designing Restaurant Planning & Layout, Choosing of Location, Layout Planning, Décor, Furnishing, Fixtures & Fittings, Equipment Selection, Theme Restaurant/Banquets, History of theme restaurants and banquets. Operations of a theme restaurant/banquets	L1, L2, L3, L4, L5	8
Module – 5 : HR Planning Manpower Planning, Job Description, Job Specification, Recruitment, Induction & Training	L1, L2, L3, L4, L5	6
<u>Lab Sessions</u> (Practical)		
• Designing Menu	L1, L2, L3, L4, L5, L6	8
• Menu Analysis	L1, L2, L3, L4, L5, L6	8
• F&B Control cycle implementation with the help of case studies	L1, L2, L3, L4, L5, L6	8

Bloom's Level:
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Andrews, S. (2013). *F&B Service : A training manual*. Tata McGraw-Hill Education.
- Axler, B. H., & Litrides, C. A. (1990). *Food and beverage service* (Vol. 1). John Wiley & Sons Inc.
- Bagchi, S., N. and Sharma, A.; Text Book of Food & Beverage Service, Third Edition, Aman Publications, New Delhi, 2012.
- Cousins, J., Lillicrap, D., & Weekes, S. (2014). *Food and beverage service*. Hachette UK.
- Dhawan, V.; Food & Beverage Service; Second Edition, Frank Brothers & Co., New Delhi, 2009.
- Singaravelavan, R.; Food and Beverage Service, First Edition, Oxford University Press, New Delhi, 2012.

Reference Books

- Bamunuge, H.; Food & Beverage Service; First Edition, Pearson Oxford
- Bhatnagar, S., K.; Managing Food & Beverage Operations, First Edition, Frank Brothers & Co., New Delhi, 2009.
- Davis, B., Lockwood, A. and Stone, S.; Food and Beverage Management; Third Edition, Elsevier, New Delhi, 2008.
- Dhiman, M. C., & Ghai, A. (2013). Bar Service Operation Practices in Indian Hotel Industry: An Investigation of Bar Managers' Perceptions. *International Journal of Hospitality & Tourism Systems*, *6*(2).
- Fullar John, The Waiter
- George, B.; Food & Beverage Service and Management; First Edition, Jaico Publications, New Delhi, 2008.
- Heinemann, 2010. http://barmansjournal.com/category/drinks/
- https://www.goodcocktails.com/bartending/garnishes.php
- https://www.liquor.com/recipes/
- Negi Dr. J. M., Food & Beverage Management & Control, Kanishka Publications, New Delhi

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

- Quizzes and examinations on each Module's content
- Group projects exploring real-world hospitality and tourism scenarios.
- Final comprehensive examination covering the entire course.

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Examination Scheme:

Components	EE		CE		
	Th	Pr	CT	HA	A
Weightage (%)	40	30	15	10	5

Th = Theory; Pr = Practical; EE = End Sem Exam; CE = Continuous Evaluation; CT = Class Test; HA = Home Assignment; A = Attendance

CO, PO and PSO Mapping

Course Outcome	Program Outcome							Program Specific Outcome			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1					3	2	2		2	2
CO2	1		2		3			3		2	2
CO3	1	1	1	1	1		2	3		2	2
CO4	2	1	1	1	1	2	2	3		2	2
CO5	1	2	2	2	2		2	2		2	2

1 = Strongly Related, 2 = Moderately Related, 3 = Weakly Related

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Course Code : DHMC2501	Course : Revenue & Yield Management	L	T	P	C
Version - 1.1		3	1	0	4
Pre-requisites / Exposure :	Co-requisites : Nil				

Course Description

This course is intended for students to gain expertise in Revenue & Yield Management. The student will develop clear concepts on generating Revenue for the organization. They will also understand the importance of yield and learn various methods of maximizing the same.

Course Objectives

The student will get knowledge about-

- Concept of Revenue Management,
- Yield determination
- Elements & use of Revenue management
- Amalgamation of Human resources & Technical resources in Revenue Management
- Yield Management application

Course Outcomes

On completion of this course, the students will be able to

CO1 : Explain various Concept of Revenue Management
CO2 : Illustrate different concepts Yield determination
CO3 : Implement Revenue management in Hotel operations
CO4 : Relate Human Resource & Technical resources in Revenue Management
CO5 : Conduct and plan yield management activities

Course Content

Modules	Blooms level*	Number of hours
Module - 1 : The Concept of Revenue Management • Hotel Industry Applications • Benefits of the techniques / Areas where this concept is applied / How the concept is applied	L1, L2, L3, L4, L5, L6	8
Module - 2 : Measuring Yield • Yield Statistic / Determination of Potential Revenue / Potential Average Single Rate / Potential Average Double Rate / Multiple Occupancy Percentage / Rate Spread / Potential Average Rate / Room Rate Achievement Factor / Identical Yields / Equivalent Occupancy / Required Non-Room Revenue per Guest	L1, L2, L3, L4, L5, L6	8
Module - 3 : Elements of Revenue Management • Group Room Sales / Transient Room Sales / Food & Beverage Activity / Local and Area-Wide Activities / Special Events	L1, L2, L3, L4, L5, L6	6
Module - 4 : Using Revenue Management • Potential High and Low Demand Tactics • Implementing Revenue Strategies / Availability Strategies •	L1, L2, L3, L4, L5, L6	6
Module - 5 : Revenue Management Computer Software • Works performed by Revenue Management Software • Working on the software/system • Advantages of computerized revenue management • Reports generated •	L1, L2, L3, L4, L5, L6	8

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Module - 6 : Revenue Management Team • Composition of Revenue Management Team • Role of Revenue Management Team •	L1, L2, L3, L4, L5, L6	6
Module - 7 : Industry-wise Comparison of Yield Management Application • Airline / Hotels / Car Rentals / Cruise lines / Package Tours	L1, L2, L3, L4, L5, L6	6

Bloom's Level:
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Andrews, S. (2013). *F&B Service : A training manual*. Tata McGraw-Hill Education.
- Axler, B. H., & Litrides, C. A. (1990). *Food and beverage service* (Vol. 1). John Wiley & Sons Inc.
- Bagchi, S., N. and Sharma, A.; Text Book of Food & Beverage Service, Third Edition, Aman Publications, New Delhi, 2012.
- Cousins, J., Lillicrap, D., & Weekes, S. (2014). *Food and beverage service*. Hachette UK.
- Dhawan, V.; Food & Beverage Service; Second Edition, Frank Brothers & Co., New Delhi, 2009.
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- Davis, B., Lockwood, A. and Stone, S.; Food and Beverage Management; Third Edition, Elsevier, New Delhi, 2008.
- Dhiman, M. C., & Ghai, A. (2013). Bar Service Operation Practices in Indian Hotel Industry: An Investigation of Bar Managers' Perceptions. *International Journal of Hospitality & Tourism Systems*, *6*(2).
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- https://www.goodcocktails.com/bartending/garnishes.php
- https://www.liquor.com/recipes/
- Negi Dr. J. M., Food & Beverage Management & Control, Kanishka Publications, New Delhi

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

- Quizzes and examinations on each Module's content
- Group projects exploring real-world hospitality and tourism scenarios.
- Final comprehensive examination covering the entire course.

Examination Scheme:

Components	**EE**	**CE**		
	Th	**CT**	**HA**	**A**
Weightage (%)	70	15	10	5

Th = Theory; EE = End Sem Exam; CE = Continuous Evaluation;
CT = Class Test; HA = Home Assignment; A = Attendance

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CO, PO and PSO Mapping

Course Outcome	Program Outcome							Program Specific Outcome			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1					3	2	2		2	2
CO2	1		2		3			3		2	2
CO3	1	1	1	1	1		2	3		2	2
CO4	2	1	1	1	1	2	2	3		2	2
CO5	1	2	2	2	2		2	2		2	2

1 = Strongly Related, 2 = Moderately Related, 3 = Weakly Related

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Course Code : DHMC2651	Course : Rooms Division Management	L	T	P	C
Version - 1.1		3	0	2	4
Pre-requisites / Exposure : DHMC2551	Co-requisites : Nil				

Course Description:
This course is intended for students who want to pursue their career in Rooms Division. This course shares common fundamental concepts about Rooms Division Management using various interactive teaching methodologies & lab sessions.

Course Objective:
- To focus and provide knowledge about establishing room rates, budgeting for operations & forecasting room availability.
- To impart learnings about yield management, elements of yield management, measuring yield & human relations management theory.
- Defining process of Budgeting, purchasing, controls in the housekeeping department, recruitment of staff
- To understand Interior Designing, Interior Decoration Safety & Security protocols of hotel.
- To understand recruitment, use of duty roster ,training and standard operating manuals.

Learning Outcome:
After completing this course, the student will be able to:
LO1: Retrieve the concept of establishing room rates, budgeting for operations & forecasting room availability.
LO2: Associate with the concept of yield management, elements of yield management, measuring yield & human relations management theory.
LO3 Predicting the process of budgeting, purchasing, controls in the housekeeping department, recruitment of staff.
LO4: Summarize Interior Designing, Interior Decoration Safety & Security protocols of hotel.
LO5: Determine about recruitment, use of duty roster, training and standard operating manuals.

Course Outcome (CO):
On completion of this course, the students will be able to:
CO1: Explain the process of establishing room rates, budgeting for operations & forecasting room availability.
CO2: Describe the concept of yield management, elements of yield management, measuring yield & human relations management theory.
CO3: Explain the use & importance of budgeting and purchasing.
CO4: Explain the use of elements of interior designing, interior decoration & List and explain various types of fires and their extinguishing procedures.
CO5: Learn First Aid, crime prevention & dealing with emergencies Define the purpose of controls in the housekeeping department & Understand recruitment, use of duty roster ,training and standard operating manuals.

Course Content:

Modules	Blooms level*	Number of hours
Module – 1 : Establishing Room Rates, Budgeting for Operations & Forecasting Room Availability • Market Condition Approach • Rule-of-Thumb Approach • Hubbart Formula	L1, L2, L3, L4	8

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• Forecast Formula • Forecasting Rooms Revenue • Estimating Expenses • Percentage of No-Shows • Percentage of Walk-Ins • Percentage of Over-stays • Percentage of Under-stays • ARR (Average Room Rate) • RevPAR (Revenue Per Available Room) **Lab Sessions** • Taking Reservation on Property Management System • Registering Guest on Property Management System • Role Play-Handling Emergency Situations		
Module – 2 : Yield Management, Elements of Yield Management, Measuring Yield & Human Relations Management Theory • Capacity Management • Discount Allocation • Duration Control • Group Room Sales • Transient Room Sales • Food & Beverage Activity • Special Events • Potential Average Single Rate • Potential Average Double Rate • Rate Spread • Multiple Occupancy Percentage • Potential Average Rate • Room Rate Achievement Factor • Yield • Human Relations Management Theory **Lab Sessions** • Handling Concierge Services • Creating Tariff Card • Role Play–Check-in & Check-out of FIT & GIT	L1, L2, L3, L4	10
Module – 3 : Controls in Housekeeping Department & Recruitment of Staff • Purpose, • Functioning &forms • Job specifications & job descriptions • Duty roaster • Manual for standard housekeeping procedures **Lab session** • Towel Art • First aid procedure • Firefighting workshop • Theme decoration - rooms for special occasions, restaurants & lobby & public area	L1, L2, L3, L4	10
Module – 4 : Interior Designing & Interior Decoration • Objectives,	L1, L2, L3,	10

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• Elements, • Principles, • Planning Trends in Hotels • Colours, • Lighting, Furniture • Floor finishes, • Carpets • Wall Coverings • Guestroom Accessories **Lab Session** • Flower Arrangement • Case study		
Module – 5 : Safety and Security, Budgeting & Purchasing& Induction & Training of Hotel Housekeeping Staff & working Methods. • Fire Prevention, • Accident Prevention, • First Aid, • Crime Prevention, • Dealing With Emergencies • Definition, capital & operational budget • Advantages • Preparation of a budget • Budgetary control • Department requirements • Methods of purchasing • Time motion study • optimum time requirement • planning of work methods **Lab Session** • Situation Handling	L1, L2, L3, L4	10

Bloom's Level:
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text:

- Bardi, James A., 1947- Hotel Front Office Management /James A. Bardi. –5th ed.
- Tewari, J. R. (2012). Hotel Front Office: Operations and Management, (5th ed.). Oxford Uni. Press.
- Branson, J. C., & Lennox, M. (1988). Hotel, hostel and hospital housekeeping. Edward Arnold.
- Kappa, M. M., Nitschke, A., &Schappert, P. B. (1997). Housekeeping management. Educational Inst of the Amer Hotel.
- Jones, T. J. (2007). Professional management of housekeeping operations. John Wiley & Sons.

References:

- Ahmed, I. (2004). Front Office Operations and Management. (3rd ed.). Clifton Park, NY: Delmar Publications.
- Andrews, S. (1982). Hotel Front Office Training Manual, (5th ed.). New Delhi: Tata Mc Graw Hill publishing Company Ltd.
- Kappa, M. M., Nitschke, A., &Schappert, P. B. (1997). Housekeeping management. Educational Inst of the Amer Hotel.
- Negi, J., & Manoher, G. (2009). Hospitality Management. Laxmi Publications, Ltd.

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- Andrews, S. (2013). Hotel housekeeping: A training manual. Tata McGraw-Hill Education.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

- Quizzes and examinations on each Module's content
- Group projects exploring real-world hospitality and tourism scenarios.
- Final comprehensive examination covering the entire course.

Examination Scheme:

Components	EE		CE		
	Th	Pr	CT	HA	A
Weightage (%)	40	30	15	10	5

Th = Theory; Pr = Practical; EE = End Sem Exam; CE = Continuous Evaluation; CT = Class Test; HA = Home Assignment; A = Attendance

CO, PO and PSO Mapping

Course Outcome	Program Outcome							Program Specific Outcome			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1	1						1			
CO2	1	1						1			
CO3	1	1						1			
CO4	1	1						1			
CO5	1	1						1			

1 = Strongly Related, 2 = Moderately Related, 3 = Weakly Related

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Course Code : DHMC2601	Course : MICE Management	L	T	P	C
Version - 1.1		3	1	0	4
Pre-requisites / Exposure :	Co-requisites : Nil				

Course Description

Event management is an exciting and rapidly expanding field. This course allows students to build their understanding of the foundational knowledge, theory and methodology underpinning modern event management. The course incorporates case studies and guest speakers to provide a contemporary context for examining best practice. Students will gain a comprehensive understanding of the planning and logistics of event management.

Course Objectives

The objective of this course is

- To study the concept & significance of event tourism and event management
- To understand the various dimensions of event tourism & their impact
- To comprehend the linkages of event tourism industry.
- To enable students to get knowledge of legal and ethical issues involved in event management

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the use & importance of management of event,event concept, swot analysis,and event marketing.

CO2: Define the use of promotions, financial management, importance of risk management, planning & relevance of protocol in event management.

CO3: Describe importance of staging, staffing and use of logistical standards in managing event management.

CO4: Define emergency planning in view of crowd management & evacuation in event management

CO5: Explain the use of control systems and importance of monitoring

Course Content

Modules	Blooms level*	Number of hours
Module – 1 : Introduction to MICE Management Size of Events, Types of Events, The Event Team & Code of Ethics	*L1, L2*	3
Module – 2 : Concept and Design Developing The Concept, Analysing The Concept, Designing The Event & Logistics of The Concept	*L1, L2*	4
Module – 3 : Feasibility Keys to Success & The SWOT Analysis	*L1, L2*	3
Module – 4 : Legal Compliance Relevant Legislation, Official Bodies Involved & Contracts	*L1, L2*	3
Module – 5 : Marketing of Event Nature of Event Marketing, Process of Event Marketing, The Marketing Mix &Sponsorship	*L1, L2*	3
Module – 6 : Promotion Image / Branding, Advertising, Publicity & Public Relations	*L1, L2*	3
Module – 7 : Financial Management The Budget, Break-Even Point & Cash Flow Analysis, Profit & Loss Statement, Balance Sheet & Financial Control Systems	*L1, L2*	4
Module – 8 : Risk Management Process of Risk Management, Incident Reporting, Emergency Response Plans & Standards for Risk Management	*L1, L2*	3

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Module – 9 : Planning Establish The Aims of The Event & Objectives, Prepare an Event Proposal & Planning Tools	*L1, L2*	3
Module – 10 : Protocol Order of Precedence; Titles; Styles of Address; Dress Codes, Protocol for Speakers, Seating Plans, Religious & Cultural Protocol & Rules of Flag Flying	*L1, L2*	4
Module – 11 : Staging The Event Choosing The Event Site, Developing The Theme, Providing Services & Managing The Environment	*L1, L2*	3
Module – 12 : Staffing Recruitment & Selection; Rosters, Training; Briefing Staff &Managing Volunteers	*L1, L2*	3
Module – 13 : Operations & Logistics Logistics, Policies, Procedures, Performance Standards & Functional Areas	*L1, L2*	3
Module – 14 : Crowd Management & Evacuation The Crowd Management Plan, Emergency Planning & Implementing Emergency Procedures	*L1, L2*	3
Module – 15 : Control & Evaluation Monitoring & Control System, Operational Monitoring & Control & Evaluation	*L1, L2*	3

Bloom's Level:
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Lynn Van Der Wagen& Brenda R. Carlos, Event Management for Tourism, Cultural, Business and Sporting Events, Pearson Prentice Hall, 2005

Reference Books

- Anton Shone & Bryn Parry, „ Event Successful Management' , Cengage learning 2002
- 2. Leonard H. Hoyle, Jr, Event Marketing, John Willy and Sons, New York 1997
- 3. Avrich, Barry Event and Entertainment Marketing, Vikas Publishing House New Delhi, 1994
- 4. Julia Rutherford Silvers Professional Event Coordination, John Willey & Sons 2003

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

- Quizzes and examinations on each Module's content
- Group projects exploring real-world hospitality and tourism scenarios.
- Final comprehensive examination covering the entire course.

Examination Scheme:

Components	**EE**	**CE**		
	Th	**CT**	**HA**	**A**
Weightage (%)	70	15	10	5

Th = Theory; EE = End Sem Exam; CE = Continuous Evaluation;
CT = Class Test; HA = Home Assignment; A = Attendance

CO, PO and PSO Mapping

Course Outcome	**Program Outcome**							**Program Specific Outcome**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1							1		
CO2	1	1							1		
CO3	1	1							1		
CO4	1	1							1		
CO5	1	1							1		

1 = Strongly Related, 2 = Moderately Related, 3 = Weakly Related

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Course Code : DHMC2602	Course : Customer Delight & Entrepreneurship Development	L	T	P	C
Version - 1.1		3	1	0	4
Pre-requisites / Exposure :	Co-requisites : Nil				

Course Description

This course is intended for people who have never engaged in professional study of entrepreneurship development with relevance to tourism and hospitality. Knowledge of entrepreneurship skill are necessary: the students need to be aware of Govt. policies and assistance, explore opportunities and new venture creation benefitting individuals, environments and organizations. The students should understand the influence of resources like Financial, physical, technological, human and organization.

Course Objectives

The objective of the course is to

- Focus into the Entrepreneurship Development of the student.
- Enable the student to grasp entrepreneurship skills and participate in the venture creation in tourism and hospitality.

Course Outcomes

On completion of this course, the students will be able to

CO1 : Acquire be self-employed and inculcate a habit of self-earning and maintain a dignified life

CO2 : understand basic knowledge in the field of entrepreneurship development and give them basic exposure of Govt. policies and assistance

CO3 : Describes the roles that new venture creation plays in the economy, defines entrepreneurship and show how three factors – individuals, environments and organizations comes through to create the entrepreneurship event

CO4 : Impart the knowledge of the resource based framework i.e. Financial, physical, technological, human and organizational

CO5 : Exposed get with franchising opportunity and discuss what elements make a business concepts a legitimate franchise opportunity and acquire an effective leadership, quality and effective decision-making.

Course Content

Modules	Blooms level*	Number of hours
Module - 1 : Entrepreneurship Skills • Personality attribute of an entrepreneurs • Self control-value attitude, Socio-culture factors • Unique characters of the hospitality industry • Human psychology, Inter-personal relationship, Teambuilding, Customer orientation • Positive entrepreneurship behaviour • Overcoming external constrains, Solving internal problems	L1, L2, L3,	8
Module - 2 : Business Opportunities • Identification of business opportunities in the Hospitality and Tourism Industry • Demand / Market Analysis, Present and future competition, Government policy regarding small Enterprises	L1, L2, L3,	8
Module - 3 : Organization of small enterprises	L1, L2, L3, L4,	8

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• Form of organization – Sole ownership, Partnership, Private Ltd. Company, Public Ltd. Company, Manpower requirement • Small Enterprises Risk Analysis • Motivational factors, Developing Achievement Orientation, • Strength and weakness of Independent Business, Feasibility and viability study.		
Module - 4 : Incentives and Assistance • From Central Government, • From State Government, • From Financial Institutions	L1, L2, L3,	8
Module - 5 : Establishment of an Enterprise • Registration of business, • Licenses and Permits, • Financial resources, • Organizing material, human and technical resource, • Launching the enterprises, • Formulating and implanting business strategies	L1, L2, L3,	8
Module - 6 : Enhancement of Entrepreneurial Skills • Formulating a business proposal, project submission. • Acquiring negotiation skills, advocacy skills, • Networking and social skills. • Self-branding and sustainable business branding. • Business promotion through Consumer Delight.	L1, L2, L3,	8

Bloom's Level:
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Readings:

1. Desai Vasant (2011), Small Scale Industries and Entrepreneurship, Himalaya Publishing House; Ninth Edition Edition,
2. Small Scale Industries in the Developing Countries, by Staley E. &Morsey R. McGraw Hill.
3. Management of Small-Scale Industries, by Malhotra I. S. & Gupta S. L,
4. Drucker, Peter F (9 May 2006), Innovation and Entrepreneurship, Harper Business; Reprint edition
5. Gupta CB &Srinivasan (2015), Entrepreneurial Development in India, Sultan Chand & Sons; 2015 edition ISBN-10: 9351610438ISBN-13: 978-9351610434

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

- Quizzes and examinations on each Module's content
- Group projects exploring real-world hospitality and tourism scenarios.
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CO, PO and PSO Mapping

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CO1	1					3	2	2		2	2

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CO2	1		2		3			3		2	2
CO3	1	1	1	1	1		2	3		2	2
CO4	2	1	1	1	1	2	2	3		2	2
CO5	1	2	2	2	2		2	2		2	2

1 = Strongly Related, 2 = Moderately Related, 3 = Weakly Related

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HOUSEKEEPING FUNCTIONS
(Skill Track)

Programme Structure

Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
VHM2154	Basics of Housekeeping	1	-	4	3
VHM2254	Rules for Cleaning	1	-	4	3
VHM2354	Laundry Operations	1	-	4	3
VHM2454	Maintaining Guest Room	1	-	4	3
VHM2554	Housekeeping Supervisory Skills	1	-	4	3
VHM2654	Housekeeping Management Skills	3	-	-	3
	TOTAL				**18**

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HOUSEKEEPING FUNCTIONS

Syllabus - Semester First

BASICS OF HOUSEKEEPING

Course Code: VHM2154 **Credit Units: 03**

Prerequisites : 10+2

Course Objective:

At the end of the semester the students would have a thorough knowledge of:

Organization of Housekeeping department and its basic functioning
All agents and equipment used for cleaning of all possible surfaces

Course Contents:

Module –I

1.0 Housekeeping Department in Hospitality Industry
- 1.1 Role of Housekeeping in Guest satisfaction and repeat Business
- 1.2 Organizational Structure of Housekeeping Department for: Small Hotel, Medium Hotel, Large Hotel
- 1.3 Layout of the Housekeeping Department

Module –II

2.0 Cleaning Equipment
- 2.1 General Consideration for Selection
- 2.2 Classification & Types of Equipments
- 2.3 Method of Use and Mechanism for Each Type
- 2.4 Care and Maintenance

Module – III

3.0 Cleaning Agents
- 3.1 Classification
- 3.2 General Criteria for Selection
- 3.3 Use, Care & Storage
- 3.4 Distribution & Control

Module – IV

4.0 Care and Cleaning of Different Surface
- 4.1 Metals, Glass, Ceramics, Wood, Wall finishes, Floor finishes, Floor Coverings

Module – V

5.0 Communicate with customer and colleagues
6.0 Maintain safety at workplace

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Examination Scheme:

Components	Internal Assessment			EE	
	V	LP	A	Th	Pr
Weightage (%)	05	20	05	40	30

V-Viva; LP-Lab Performance; A-Attendance; EE-End Semester Examination

Suggested Readings :

- Professional Management of Housekeeping Operation by Robert J. Martin
- Hotel, Hostel & Hospital Housekeeping by John C. Branson & Margaret Lennox
- Housekeeping Management by Keppa Margret M
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi
- Accommodation Management by Roy C
- Hotel Housekeeping Training Manual by Sudhir Andrew
- Professional House Keeping by Madlin Tucker

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Syllabus - Semester Second

RULES FOR CLEANING

Course Code: VHM2254 **Credit Units: 03**

Prerequisites : Basics of Housekeeping (VHM2154)

Course Objective:
At the end of the semester the students would have a thorough knowledge of:
- Cleaning Methods & Schedules
- Pests & their control
- Customer-Centric Service
- Maintaining Etiquette & Hygiene

Course Contents:

Module – I

1.0 Introduction to Cleaning
- 1.1 Rules & methods of cleaning
- 1.2 Organizing cleaning schedules
- 1.3 Frequency of cleaning daily, periodic, special

Module – II

2.0 Pests found in the hotel and their control.

Module – III

3.0 Maintain customer-centric service orientation

4.0 Follow gender and age sensitive service practices (FM)

Module – IV

5.0 Maintain standard of etiquette and hospitable conduct

6.0 Maintain health and hygiene

Module – V

7.0 Maintain IPR of organisation and customer

Examination Scheme:

Components	Internal Assessment			EE	
	V	LP	A	Th	Pr
Weightage (%)	05	20	05	40	30

V-Viva; LP-Lab Performance; A-Attendance; EE-End Semester Examination

Suggested Readings :
- Professional Management of Housekeeping Operation by Robert J. Martin
- Hotel, Hostel & Hospital Housekeeping by John C. Branson & Margaret Lennox
- Housekeeping Management by Keppa Margret M

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- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi
- Accommodation Management by Roy C
- Hotel Housekeeping Training Manual by Sudhir Andrew
- Professional House Keeping by Madlin Tucker

After successful completion of study of the above Courses (VHM2154**&**VHM2254***), the student becomes eligible to appear for "Qualification Pack: Cleaner – Carpet and Chair / Surface Polisher" (NSQF level - 4) examination under THSC & NSDC by paying fees as applicable.***

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Syllabus - Semester Third

LAUNDRY OPERATIONS

Course Code: VHM2354 **Credit Units: 03**

Prerequisites : Rules for Cleaning (VHM2254)

Course Objective:
At the end of the semester the students would have a thorough knowledge of:

Fibre & Fabrics
Laundry Operations
Stain Removal

Course Contents:

Module – I

1.0 Fibres& Fabrics
- 1.1 Definition of Fibre
- 1.1 Classification of Fibre - The Origin, Characteristics & Usage in the Hotel, Care & Cleaning

Module – II

2.0 Laundry in Hotel
- 2.1 Duties & Responsibilities of Laundry Staff (Laundry Manager and Shift-In-Leader, Dry Cleaning, Supervisor, Spotter cum Presser, Laundry Clerk, Attendants Valet Runner, Laundry)
- 2.2 Importance and Principles of Laundry Operations
- 2.3 Equipment, Layout & Planning & Laundry (Basic Rules)

Module – III

3.0 Laundry Work Flow
- 3.1 Flow Process of industrial Laundering [Collection, Transportation Arrivals, Sorting, Weighing, Loading, Washing, Rinsing, Starching, Hydro-Extraction, Drying, Unloading, Tumbling, Finishing (Calender / Steam Press) Folding, & Storing Transfer & Use]
- 3.2 Stages in Wash Cycle (Flush-Suds-Bleach Rinse-Sour & Soft-Extract, Break & Soaking)

Module – IV

4.0 Laundry Cleaning Agents
- 4.1 Role of Laundry Agents
- 4.2 Classification of Laundry Agents (Synthetic, Detergent, Built Soap Detergents, Enzyme Action- Detergents, Explain Briefly)

Module – V

5.0 Stain Removal
- 5.1 Special Equipment & Agents
- 5.2 Process of Stain Removal

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Examination Scheme:

Components	Internal Assessment			EE	
	V	LP	A	Th	Pr
Weightage (%)	05	20	05	40	30

V-Viva; LP-Lab Performance; A-Attendance; EE-End Semester Examination

Suggested Readings :

- Professional Management of Housekeeping Operation by Robert J. Martin
- Hotel, Hostel & Hospital Housekeeping by John C. Branson & Margaret Lennox
- Housekeeping Management by Keppa Margret M
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi
- Accommodation Management by Roy C
- Hotel Housekeeping Training Manual by Sudhir Andrew
- Professional House Keeping by Madlin Tucker

After successful completion of study of the above Course (VHM2354***), the student becomes eligible to appear for "Qualification Pack: Laundry Machine Operator" (NSQF level - 5) examination under THSC & NSDC by paying fees as applicable.***

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Syllabus - Semester Fourth

MAINTAINING GUEST ROOM

Course Code: VHM2454 **Credit Units: 03**

Prerequisites : Laundry Operations (VHM2354)

Course Objective:
At the end of the semester the students would have a thorough knowledge of:

Guest Room of a Hotel
Cleaning of Guest Room
Bed Making
Use of Guest Room Supplies
Waste Disposal
Room inspection & Report documentation

Course Contents:

Module – I

1.0 Guest Room
- 1.1 Types of Rooms
- 1.2 Room layouts and what are constitutes in a guest room

Module – II

2.0 Guestroom Cleaning
- 2.1 Stacking of Chambers Maid Trolley
- 2.2 Pre – Preparation
- 2.3 Entering the guestroom
- 2.4 Bed Making
- 2.5 Bathroom Cleaning
- 2.6 Second Service
- 2.7 Turndown Service

Module – III

3.0 Identifying Guest Supplies

Module – IV

4.0 Conduct periodic deep cleaning
5.0 Collect and dispose waste properly

Module – V

6.0 Guest Room inspection
7.0 Report, record and prepare documentation

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Examination Scheme:

Components	Internal Assessment			EE	
	V	LP	A	Th	Pr
Weightage (%)	05	20	05	40	30

V-Viva; LP-Lab Performance; A-Attendance; EE-End Semester Examination

Suggested Readings :

- Professional Management of Housekeeping Operation by Robert J. Martin
- Hotel, Hostel & Hospital Housekeeping by John C. Branson & Margaret Lennox
- Housekeeping Management by Keppa Margret M
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi
- Accommodation Management by Roy C
- Hotel Housekeeping Training Manual by Sudhir Andrew
- Professional House Keeping by Madlin Tucker

After successful completion of study of the above Course (VHM2454***), the student becomes eligible to appear for "Qualification Pack: Room Attendant" (NSQF level - 4) examination under THSC & NSDC by paying fees as applicable.***

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Syllabus - Semester Fifth

HOUSEKEEPING SUPERVISORY SKILLS

Course Code: VHM2554 **Credit Units: 03**

Prerequisites : Maintaining Guest Room (VHM2454)

Course Objective:
At the end of the semester the students would have a thorough knowledge of:

Safety & Security measures in the organization
Planning & Supervising Housekeeping work schedule
Monitoring performance & designing training needs
Prepare documented record & reports

Course Contents:

Module – I
1.0 Safety and Security
- 1.1 Fire Prevention
- 1.2 Accident Prevention
- 1.3 First Aid
- 1.4 Crime Prevention
- 1.5 Dealing with Emergencies

Module – I
2.0 Plan and prepare for housekeeping services
- 2.1 Periodical Cleaning schedule
- 2.2 Special Cleaning schedule

Module – II
3.0 Supervise and monitor housekeeping services
- 3.1 Inspection & Checking

Module – III
4.0 Support individual and team performance
- 4.1 Analysis performance & Arrange Training if required

Module – IV
5.0 Record and prepare documentation
6.0 Report submission

Examination Scheme:

Components	Internal Assessment			EE	
	V	LP	A	Th	Pr
Weightage (%)	05	20	05	40	30

V-Viva; LP-Lab Performance; A-Attendance; EE-End Semester Examination

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Suggested Readings :

- Professional Management of Housekeeping Operation by Robert J. Martin
- Hotel, Hostel & Hospital Housekeeping by John C. Branson & Margaret Lennox
- Housekeeping Management by Keppa Margret M
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi
- Accommodation Management by Roy C
- Hotel Housekeeping Training Manual by Sudhir Andrew
- Professional House Keeping by Madlin Tucker

After successful completion of study of the above Courses (VHM2554***), the student becomes eligible to appear for "Qualification Pack: Housekeeping Supervisor" (NSQF level - 6) examination under THSC & NSDC by paying fees as applicable.***

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Syllabus - Semester Sixth

HOUSEKEEPING MANAGEMENT SKILLS

Course Code: VHM2654 **Credit Units: 03**

Prerequisites : Housekeeping Supervisory Skills (VHM2554)

Course Objective:

At the end of the semester the students would have a thorough knowledge of:

Housekeeping Contract Cleaning
Interior Decoration
Planning & use of Resources in Housekeeping department
Overall control of the department

Course Contents:

Module – I

1.0 Contract Cleaning
- 1.1 Types of Contract Cleaning
- 1.2 Methods of Pricing of Contract Cleaning
- 1.3 Advantages and Disadvantages of Contract Cleaning
- 1.4 Eco-Friendly Process

Module – II

2.0 Interior Decoration
- 2.1 Colours
- 2.2 Lighting
- 2.3 Furniture
- 2.4 Floor Finishes
- 2.5 Carpets
- 2.6 Wall Coverings
- 2.7 Windows
- 2.8 Guestroom Accessories

Module – III

3.0 Plan effectively the activities of housekeeping department

Module – IV

4.0 Perform staffing and organizing of housekeeping department

Module – V

5.0 Control the activities of housekeeping department

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Examination Scheme:

Components	Internal Assessment				EE
	V	H	CT	A	Th
Weightage (%)	05	05	15	05	70

V-Viva; H-Home Assignment; CT-Class Test; A-Attendance; EE-End Semester Examination

Suggested Readings :

- Professional Management of Housekeeping Operation by Robert J. Martin
- Hotel, Hostel & Hospital Housekeeping by John C. Branson & Margaret Lennox
- Housekeeping Management by Keppa Margret M
- Hospitality Management: Current Trends & Practices by Dr. JM Negi, Amity University Press, New Delhi
- Accommodation Management by Roy C
- Hotel Housekeeping Training Manual by Sudhir Andrew
- Professional House Keeping by Madlin Tucker

After successful completion of study of the above Courses (VHM2654***), the student becomes eligible to appear for "Qualification Pack: Housekeeping Manager" (NSQF level - 7) examination under THSC & NSDC by paying fees as applicable.***

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TOURISM OPERATIONS
(Skill Track)

Programme Structure

Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
VTM2151	Fundamentals of Tourism	2	1	-	3
VTM2251	Tour Operations & Tourist Guidance	2	1	-	3
VTM2351	Handling Travel Agency	2	1	-	3
VTM2451	Coordinating Tour Transportations	2	1	-	3
VTM2551	Tourism Management	2	1	-	3
VTM2651	Event Planning	2	1	-	3
	TOTAL				**18**

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TOURISM OPERATIONS

Syllabus - Semester First

FUNDAMENTALS OF TOURISM

Course Code: VTM2151 **Credit Units: 03**

Prerequisites : 10+2

Course Objective:

At the end of the semester the students would have a thorough knowledge of:

History of Tourism
Forms & Types of Tourism
Tourist Attractions & facilities

Course Contents:

Module –I

1.0 Introduction to Tourism
- 1.1 Origin, Growth & Development of Tourism
- 1.2 Early History
- 1.3 Development of Tourism
- 1.4 Forms & Types of Tourism

Module –II

2.0 Tourist Attractions & facilities
- 2.1 Tourism Accommodation& Accessibility
- 2.2 Geographical Resources for Tourism
- 2.3 Tourism Potential
- 2.4 Various Tourist Attractions of India

Module –III

3.0 Coordinate with travel partners
4.0 Engage with tourists
5.0 Communicate with customer and colleagues

Module –IV

6.0 Guide the tourists at heritage sites
7.0 Maintain customer-centric service orientation

Module – V

8.0 Maintain standard of etiquette and hospitable conduct
9.0 Follow gender and age sensitive service practices
10.0 Maintain health and hygiene

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Examination Scheme:

Components	Internal Assessment				EE
	V	H	CT	A	Th
Weightage (%)	05	05	15	05	70

V-Viva; H-Home Assignment; CT-Class Test; A-Attendance; EE-End Semester Examination

Suggested Readings:

- Pran Seth: Successful tourism Management (Vol. 1 & 2)
- Anand, M.M., Tourism and hotel Industry ii1 India, Prentice Hall, New Delhi, 1976
- Bhatia, A. K., International Tourism, Sterling Publishers, New Delhi
- Bhatia, A. K., Tourism development: Principles, Practices and Philosophies,
- Sterling Publishers, New Delhi
- McIntosh, Robert, W. Goldner, Charles, Tourism: Principles, Practices and Philosophies, John Wiley and Sons Inc. New York, 1990 (9th edition)
- Mill, Robert Christie and Alastair M. Morrison, The Tourism System, Englewood Cliffs, N.J., Prentice Hall, 1985
- Negi, J.M.S., Tourism and Travel- Concepts and principles, Gitanjali Publishing House, New Delhi, 1990
- Robinson, H.A., Geography of Tourism, Me Donald and Evans, London, 1976

After successful completion of study of the above Course (VTM2151***), the student becomes eligible to appear for "Qualification Pack: Heritage Tour Guide" (NSQF level - 4) examination under THSC & NSDC by paying fees as applicable.***

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Syllabus - Semester Second

TOUR OPERATIONS & TOURIST GUIDANCE

Course Code: VTM2251 **Credit Units: 03**

Prerequisites : Fundamentals of Tourism (VTM2151)

Course Objective:
At the end of the semester the students would have a thorough knowledge of:
Various forms of Tourism
Effective communication with Tourists
Guiding Tourists

Course Contents:
Module – I
1.0 Guide tourists at religious destinations
2.0 Guide tourists during culture tours

Module – II
3.0 Guide tourists at nature/eco/rural spots
4.0 Guide tourists during gastronomy tours

Module – III
5.0 Guide tourists in leisure and recreation tours
6.0 Guide tourists in cruise

Module – IV
7.0 Guide tourists for sporting events
8.0 Guide tourist on desert tours

Module – V
9.0 Guide tourist on wellness and medical tours

Examination Scheme:

Components	Internal Assessment				EE
	V	H	CT	A	Th
Weightage (%)	05	05	15	05	70

V-Viva; H-Home Assignment; CT-Class Test; A-Attendance; EE-End Semester Examination

Suggested Readings:

- Pran Seth: Successful tourism Management (Vol. 1 & 2)
- Anand, M.M., Tourism and hotel Industry ii1 India, Prentice Hall, New Delhi, 1976
- Bhatia, A. K., International Tourism, Sterling Publishers, New Delhi
- Bhatia, A. K., Tourism development: Principles, Practices and Philosophies,
- Sterling Publishers, New Delhi
- McIntosh, Robert, W. Goldner, Charles, Tourism: Principles, Practices and Philosophies, John Wiley and Sons Inc. New York, 1990 (9th edition)

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- Mill, Robert Christie and Alastair M. Morrison, The Tourism System, Englewood Cliffs, N.J., Prentice Hall, 1985
- Negi, J.M.S., Tourism and Travel- Concepts and principles, Gitanjali Publishing House, New Delhi, 1990
- Robinson, H.A., Geography of Tourism, Me Donald and Evans, London, 1976

After successful completion of study of the above Courses (VTM2251***), the student becomes eligible to appear for "Qualification Pack: Tour Guide" (NSQF level - 4) examination under THSC & NSDC by paying fees as applicable.***

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Syllabus - Semester Third

HANDLING TRAVEL AGENCY

Course Code: VTM2351 **Credit Units: 03**

Prerequisites : Tour Operations & Tourist Guidance (VTM2251)

Course Objective:

At the end of the semester the students would have a thorough knowledge of:

Tour Package
Planning of Tour Package
Designing Tour Packages

Course Contents:

Module –I

1.0 Tour Package - Meaning, Type of Tour Package & its Components

Module – II

2.0 Planning of Tour Package
- 2.1 Designing and Process of Tour Package
- 2.2 Engage with customer to understand their tour packaging requirements
- 2.3 Plan travel itinerary as per customer's requirement
- 2.4 Factor Affecting Tour Package
- 2.5 Arrange tour package in coordination with service providers and partners

Module – III

3.0 Designing Tour Packages
- 3.1 Cultural Tourism Product: Designing, Development, Issues and Considerations
- 3.2 Heritage Tourism Product: Designing, Development, Issues and Considerations
- 3.3 Religious Tourism Product: Designing, Development, Issues and Considerations

Module – IV

4.0 Designing Tour Packages
- 4.1 Adventure Tourism Product: Designing, Development, Issues and Considerations
- 4.2 Medical Tourism Product: Designing, Development, Issues and Considerations

Module – V

5.0 Destination Management
- 5.1 Meaning, Factor of Consideration to choose Destination Management Handling Company
- 5.2 Monitor the tour progress
- 5.3 Maintain IPR of organisation and customer

Examination Scheme:

Components	Internal Assessment				EE
	V	H	CT	A	Th
Weightage (%)	05	05	15	05	70

V-Viva; H-Home Assignment; CT-Class Test; A-Attendance; EE-End Semester Examination

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Suggested Readings:

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- Anand, M.M., Tourism and hotel Industry ii1 India, Prentice Hall, New Delhi, 1976
- Bhatia, A. K., International Tourism, Sterling Publishers, New Delhi
- Bhatia, A. K., Tourism development: Principles, Practices and Philosophies,
- Sterling Publishers, New Delhi
- McIntosh, Robert, W. Goldner, Charles, Tourism: Principles, Practices and Philosophies, John Wiley and Sons Inc. New York, 1990 (9th edition)
- Mill, Robert Christie and Alastair M. Morrison, The Tourism System, Englewood Cliffs, N.J., Prentice Hall, 1985
- Negi, J.M.S., Tourism and Travel- Concepts and principles, Gitanjali Publishing House, New Delhi, 1990
- Robinson, H.A., Geography of Tourism, Me Donald and Evans, London, 1976

After successful completion of study of the above Course (VTM2351***), the student becomes eligible to appear for "Qualification Pack: Travel Consultant" (NSQF level - 4) examination under THSC & NSDC by paying fees as applicable.***

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Syllabus - Semester Fourth

COORDINATING TOUR TRANSPORTATIONS

Course Code: VTM2451 **Credit Units: 03**

Prerequisites : Handling Travel Agency (VTM2351)

Course Objective:
At the end of the semester the students would have a thorough knowledge of:
Transport System
Transport Schedule& Arrangement for tourists

Course Contents:
Module – I
1.0 Modes of Transport
1.1 Road ways
1.2 Railways
1.3 Air ways
1.4 Water ways

Module – II
2.0 Types of transport operator
2.1 Public & Private
2.2 Domestic & International

Module – III
3.0 Transport Schedule
3.1 Travel Time
3.2 Preparation of itinerary

Module – IV
4.0 Interact with the customers or tourists
5.0 Arrange for the travel

Module – V
6.0 Follow up with customer or tourist

Examination Scheme:

Components	Internal Assessment				EE
	V	H	CT	A	Th
Weightage (%)	05	05	15	05	70

V-Viva; H-Home Assignment; CT-Class Test; A-Attendance; EE-End Semester Examination

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Suggested Readings:

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- Anand, M.M., Tourism and hotel Industry ii1 India, Prentice Hall, New Delhi, 1976
- Bhatia, A. K., International Tourism, Sterling Publishers, New Delhi
- Bhatia, A. K., Tourism development: Principles, Practices and Philosophies,
- Sterling Publishers, New Delhi
- McIntosh, Robert, W. Goldner, Charles, Tourism: Principles, Practices and Philosophies, John Wiley and Sons Inc. New York, 1990 (9th edition)
- Mill, Robert Christie and Alastair M. Morrison, The Tourism System, Englewood Cliffs, N.J., Prentice Hall, 1985
- Negi, J.M.S., Tourism and Travel- Concepts and principles, Gitanjali Publishing House, New Delhi, 1990
- Robinson, H.A., Geography of Tourism, Me Donald and Evans, London, 1976

After successful completion of study of the above Course (VTM2451***), the student becomes eligible to appear for "Qualification Pack: Transport Coordinator" (NSQF level - 5) examination under THSC & NSDC by paying fees as applicable.***

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Syllabus - Semester Fifth

TOURISM MANAGEMENT

Course Code: VTM2551 **Credit Units: 03**

Prerequisites : Coordinating Tour Transportations (VTM2451)

Course Objective:
At the end of the semester the students would have a thorough knowledge of:

Motivation of Travel and Tourism
Significance of Travel and Tourism
Growth factors of Tourism& its barriers
Eco-Tourism

Course Contents:

Module –I

1.0 Motivation of Travel and Tourism
- 1.1 Physical Motivations: Travel for Sports and Adventure, Rest and Relaxation, Health and Medical Reasons etc.
- 1.2 Cultural Motivations: Pilgrimage Tourism, Cultural Curiosity, Religious etc.
- 1.3 Interpersonal Motivation: Meeting New People, VFR, etc
- 1.4 Status and Prestige Motivation
- 1.5 Business Motivation

Module – II

2.0 Significance of Travel and Tourism
- 2.1 The Economic, Social and Cultural Significance of Tourism

Module – III

3.0 Growthfactors of Tourism
- 3.1 Technology and Destination Development
- 3.2 Changing Social Patterns
- 3.3 Changing Living Standards

Module –IV

4.0 Barriers to the Growth of Tourism
- 4.1 Factors Existing at the Destination: Terrorism, & Political and Social Environment
- 4.2 Factors Barring a Potential Tourist from Traveling: Time, Cost, and Social Barriers.

Module – V

5.0 Eco-Tourism Planning and development strategies
- 5.1 Eco-Tourism Strategies with Special Reference to Environmental Protection (Environmental Impact Analysis)

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Examination Scheme:

Components	Internal Assessment				EE
	V	H	CT	A	Th
Weightage (%)	05	05	15	05	70

V-Viva; H-Home Assignment; CT-Class Test; A-Attendance; EE-End Semester Examination

Suggested Readings:

- Pran Seth: Successful tourism Management (Vol. 1 & 2)
- Anand, M.M., Tourism and hotel Industry ii1 India, Prentice Hall, New Delhi, 1976
- Bhatia, A. K., International Tourism, Sterling Publishers, New Delhi
- Bhatia, A. K., Tourism development: Principles, Practices and Philosophies,
- Sterling Publishers, New Delhi
- McIntosh, Robert, W. Goldner, Charles, Tourism: Principles, Practices and Philosophies, John Wiley and Sons Inc. New York, 1990 (9th edition)
- Mill, Robert Christie and Alastair M. Morrison, The Tourism System, Englewood Cliffs, N.J., Prentice Hall, 1985
- Negi, J.M.S., Tourism and Travel- Concepts and principles, Gitanjali Publishing House, New Delhi, 1990
- Robinson, H.A., Geography of Tourism, Me Donald and Evans, London, 1976

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Syllabus - Semester Sixth

EVENT PLANNING

Course Code: VTM2651 **Credit Units: 03**

Prerequisites : Tourism Management (VTM2551)

Course Objective:

At the end of the semester the students would have a thorough knowledge of:

Concept of MICE
Marketing MICE
Planning MICE
Staging MICE

Course Contents:

Module – I

1.0 Introduction to Concept of MICE
- 1.1 Types of Events- meetings, incentives, conference/conventions, and exhibitions
- 1.2 Size of Events
- 1.3 The Event Team
- 1.4 Code of Ethics
- 1.5 The impact of conventions on local and national communities.

Module – II

2.0 Map the customer requirement
- 2.1 Visualise the need
- 2.2 Guide the customer
- 2.3 Estimate the budget

Module – III

3.0 Concept and Design
- 3.1 Developing The Concept
- 3.2 Analysing The Concept
- 3.3 Designing The Event
- 3.4 Logistics of The Concept

Module – IV

4.0 Marketing of Event
- 4.1 Nature of Event Marketing
- 4.2 Process of Event Marketing
- 4.3 The Marketing Mix
- 4.4 Sponsorship

Module – V

5.0 Staging The Event
- 5.1 Choosing The Event Site
- 5.2 Developing The Theme
- 5.3 Providing Services
- 5.4 Managing The Environment

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Examination Scheme:

Components	Internal Assessment				EE
	V	H	CT	A	Th
Weightage (%)	05	05	15	05	70

V-Viva; H-Home Assignment; CT-Class Test; A-Attendance; EE-End Semester Examination

Suggested Reading :

- Behind The Scenes at Special Events - by Lena Malouf
- Global Meetings & Exhibitions, - by Krugman, John Wiley & Sons
- How to Plan Exhibitions & Conferences From A to Z, Sam Black
- Special Events : Event Leadership for a New World, Goldblatt

After successful completion of study of the above Courses (VTM2551**&**VTM2651***), the student becomes eligible to appear for "Qualification Pack: Meeting, Conference and Event Planner" (NSQF level - 5) examination under THSC & NSDC by paying fees as applicable.***

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Amity Institute of Behavioural & Allied Sciences

Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology

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Curriculum & Scheme of Examination

2023

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Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology
SEMESTER-I

DPSY2151	INTRODUCTION TO PSYCHOLOGY	L	T	P	FW/ Proj	C
Version	2023	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course introduces the basics of psychology, covering its main theories, important terms, methods, and fields. It looks at the history of psychology from both Western and Indian perspectives, highlighting important contributions from different cultures and people therein. Students will learn about various schools of thought like Structuralism, Functionalism, Behaviorism, Gestaltism, Psychoanalysis, Humanism, Existentialism, and Cognitive Psychology. The course also explores different methods used in psychology, such as introspection, observation, experiments, interviews, questionnaires, and surveys. Additionally, it discusses key concepts and theories of learning, including Classical Conditioning, Operant Conditioning, and Insight Learning, as well as the idea of transfer of training. This course sets the stage for further study in psychology.

Course Objectives

This course is designed to introduce the science of psychology. It identifies and defines the theories, terms, methods, and various fields of psychology. This course can be used as a foundation towards continued education in more specific areas of psychology. General Psychology encourages students to study in depth the notions of modern scientific psychology. Upon completion of this course, student should have the following objectives:

- To know the major personalities important to the field of general psychology and the ideas, theories, and schools with which they are associated.
- To know the major terms associated with general psychology and their meanings.
- To know the major concepts associated with the area of general psychology.

Course Outcomes (COs):

On completion of this course, the students will be able to

1. learn the main theories, concepts, and schools of thought in psychology, including both Western and Indian perspectives.
2. Identify important personalities in psychology and understand their ideas and theories.
3. Know how to use different psychological methods like introspection, observation, experiments, interviews, questionnaires, and surveys.
4. learn about various types of learning and key theories such as Classical Conditioning, Operant Conditioning, and Insight Learning.
5. Understand the concept of transfer of training, including its types and related theories.

Course Content:

Modules	Blooms level*	Number of hours
Module 1 Historical background of psychology in Indian perspective: Bhagwat Geeta, Bhuddiam, Sufism, and Integral Yoga Emergence of Indian Psychology in Academia	**L1, L2, L3**	18

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Module 2 Meaning, Definition, Nature and Goals of Psychology Psychology as Science	**L1, L2, L3**	18
Module 3 Background of Psychology from Western perspective Schools of Psychology: Structuralism, Functionalism, Behaviorism, Gestaltism, Psychoanalysis, Humanism, Existentialism, Cognitive	**L3, L4, L5**	18
Module 4 Methods of Psychology: Introspection, Observation, Experimental, Interview, Questionnaire, Survey	**L3, L4, L5**	18
Module 5 Meaning, Nature and Types of learning (Verbal, Motor, Concept etc) Theories of Learning –Trial and Error Theory, Classical Conditioning Theory, Operant / Instrumental Conditioning, Insight Learning Theory Transfer of Training: Meaning, Types and Theories of Transfer of Training	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text & References:

Text:

- Morgan & King : Introduction to Psychology. Tata McGraw Hill Publishing Company Limited, N. Delhi
- Munn, N.L.: Psychology. Oxford & IBH Publishing Co Pvt. Ltd, N. Delhi
- Hilgard & Atkinson: Introduction to Psychology, 6th Ed. New Delhi: Oxford & IBH Publishing Co
- Sdorow: Psychology. 3rd Edition Broalu & Benewmark Publishers Guilford, J. P.: General Psychology. New York: D. Van Nostrand
- Mohsin, S.M.: Elementary Psychology. Motilal Banarasidas.
- Mishra, B. K.: Psychology. PHI Learning Pvt. Ltd
- Morris, C. G. & Maisto, A. A.: Psychology: An Introduction. (12thed.).Upper Saddle River, NJ: Prentice Hall.
- Leahy, T. H., (1991): A History of Modern Psychology; New York: Prentice Hall
- Wolman, B. B. (1979): Contemporary Theories and Systems in Psychology; London: Freeman Book Company
- Chaplin, J. P. & Krawice, T. S. (1979): Systems and Theories in Psychology; New York: Holt Rinechart & Winston
- Mar, M. H. & Hillix, W. A. (1986): Systems and Theories in Psychology; New York: McGraw Hill

References:

- Atkinson & Hilgard: Psychology: An Introduction. Cengage Learning EMEA
- Kosslyn & Rosenberg : Psychology (3rded.). Allyn & Bacon

Lahey, B. B. & Majors, M.: Psychology: An Introduction. Tata McGraw Hill

Humanities/Social Sciences/Lingua

DPSY2101	**EXPERIMENTAL PSYCHOLOGY**	**L**	**T**	**P**	**FW/ Proj**	**C**

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Version	**2023**	2	1	0	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course provides an in-depth understanding of the scientific methods used in experimental psychology. Students will explore the history and steps of the experimental method, basic concepts of psychophysics, and sensory processes, including the structure and function of sensory organs. The course covers perceptual processes, focusing on how we perceive space, depth, and distance, and examines perceptual illusions. It also addresses the nature and theories of emotions and motivation. By the end of the course, students will be prepared for advanced studies in experimental psychology.

Course Objectives

The basic general objective of Experimental Psychology is to familiarize the student with a basic and broad understanding of the scientific method and its application to the problems of Psychology. The course focuses on the logic, principles and practices of modern science and how it is applied to understanding the nature of reality. Successful completion of this course will prepare the student for graduate work and advanced experimental concepts.

Course Outcomes (COs):

On completion of this course, the students will be able to

1. learn the meaning, history, and steps of the experimental method, including psychophysics and threshold determination.
2. Understand the types of senses and their functioning, such as vision, hearing, smell, taste, touch, temperature, pain, kinesthetic, and vestibular senses.
3. Grasp the nature of perception, principles of perceptual organization, and concepts like space, depth, distance perception, and perceptual constancy, including illusions, delusions, and hallucinations.
4. Learn about the nature and characteristics of emotions, bodily and physiological changes, and key theories of emotion.
5. Understand the nature of motivation, motivational cycles, types of needs, drives, and incentives, and major theories of motivation.

Course Content:

Modules	Blooms level*	Number of hours
Module I Meaning and History of Experimental Psychology Steps of Experimental method Psychophysics: Basic Concepts, Stimulus and Differential Threshold Determination of Thresholds: Method of Limits, Method of Average Error, Method of Constant Stimuli	**L1, L2, L3**	18
Module II Sensory Process: Meaning and Types of Senses, Sensation and Sensitivity Visual Sense- Structure and Functioning of Eye Hearing Sense- Structure and Functioning of Ear Chemical Senses- Sense of Smell and Sense of Taste Skin Senses- Sense of Touch or Pressure, Sense of Temperature and Pain Body Senses- Kinesthetic Sense and Vestibular Sense	**L1, L2, L3**	18

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Module III Perceptual Process: Meaning and Nature of Perception Principal of Perceptual organization Perception of Space, Depth–Visual Monocular Cues and Binocular Cues, Perception of Distance and Perceptual constancy Perceptual Illusions; Delusions and Hallucinations	**L3, L4, L5**	18
Module IV Meaning, Nature and Characteristics of Emotions Aspect of Emotions- Bodily and Physiological Changes Theories of Emotion: James-Lange Theory, Cannon-Bard Theory, Schachter and Singer's Cognitive Theory, Lindsey's Activation Theory.	**L3, L4, L5**	18
Module V Meaning, Definition and Nature of Motivation, Motivational Cycle Needs– Biological and Psychosocial, Drive and Incentive Classification of Motives– Biogenic and Psycho-social Motives Theories of Motivation–Need and Drive Reduction Theory, Instinctive Theory, Social-Urges Theory, Self- Actualization Theory.	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

Text:

- Morgan & King : Introduction to Psychology. Tata McGraw Hill Publishing Company Limited, N. Delhi
- Myers, A. & Wadsworth Hansen, C. H. : Experimental Psychology (6thed.).
- Mishra, B. K.: Psychology. PHI Learning Pvt. Ltd
- Postman, L. & Egan, J. P.: Experimental Psychology: An Introduction
- Munn, N.: Psychology. Oxford & IBH Publishing Co Pvt. Ltd, New Delhi
- Hilgard & Atkinson: Introduction to Psychology, 6th Ed. New Delhi: Oxford & IBH Publishing Co. Sdorow: Psychology. 3rd Edition Broalu & Benewmark Publishers
- D'Amoto, M, R: Experimental Psychology: Methodology Psycho- Physics and Learning.
TMH Ed. Tata McGraw Hill Publishing Company Limited, New Delhi.

References:

- Sharma, R. N. & Sharma, R.: Experimental Psychology. Atlantic
- Sharan, A. K.: Experimental Psychology. Anmol Publication
- Kantowitz: Experimental Psychology. USA: Wadsworth Cengage Learning

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DPSY2102	CLINICAL PSYCHOLOGY PRACTICALS-I	L	T	P	FW/ Proj	C
Version	**2023**	0	0	2	0	1
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

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Catalog Description

This course provides hands-on experience in administering, scoring, and interpreting psychological tests. Students will learn the basic procedures and design of psychological experiments and will be introduced to elementary/basic statistical techniques. Additionally, the course encourages students to undertake a small-scale research project, fostering practical research skills. A total of six practical will be conducted in the first semester, with the first three being mandatory

Course Objectives

1. To give practical experience to the students in administering and scoring psychological tests and interpreting the scores.
2. To acquaint the students with the basic procedure and design of psychology experiments.
3. To familiarize the students with the use of elementary statistical techniques.
4. To encourage and guide the students to undertake a small-scale research project.

Note: Total of 6 practicals will be conducted in the first semester among the list of following practicals out of which the first three practicals are compulsory.

Course Outcomes (COs):

On completion of this course, the students will be able to

1. learn to effectively administer, score, and interpret various psychological tests.
2. gain knowledge of the basic procedures and design of psychological experiments.
3. introduced to elementary statistical techniques used in psychology.
4. encouraged and guided to undertake small-scale research projects.
5. Apply practical skills Through practical exercises like the Muller Lyre Illusion, Mental Health Checklist, Emotional Intelligence Questionnaire, Students Stress Scale, Depth Perception, and Maze Learning, students will apply their theoretical knowledge to real-world scenarios.

Course Content:

1.	Muller Lyre Illusion	Perception Illusion
2.	General Health Questionnaire	Psychiatric Disorder
3.	Emotional Maturity Scale	Emotional Intelligence
4.	Peer Pressure Scale	Peer Pressure
5.	Depth perception	Perception
6.	Mirror Drawing	Motor Learning

Examination Scheme:

Components	CT	File Demonstration	V	A	EE
Weightage (%)		35	35	5	25

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

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Text & References:

- ***Text:*** Mohsin, S. M .: Experiments in Psychology. Motilal Banarasidas
- Woodworth, R. S.: Experimental Psychology. Oxford & IBH & Schlosberg, H Publishing
- Postman; L & Egan, J.P.: Experimental Psychology: An Introduction. Harper and Row

Humanities/Social Sciences/Lingua

SEMESTER-II

DPSY2251	**SOCIAL PSYCHOLOGY**	**L**	**T**	**P**	**FW/ Proj**	**C**
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					

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Co-requisites	Nil

Catalog Description
This course offers a comprehensive introduction to the field of social psychology, examining how individuals' behaviors, thoughts, and feelings are shaped by social influences. It integrates empirical research, and real-world applications to explore the dynamics of human interaction and social influence.

Course Objectives:
- Understand and critically evaluate key theories and concepts in social psychology.
- Develop insights into how social factors influence individual behavior and mental processes.
- Apply social psychological principles to real-world issues and personal experiences.
- Conduct and analyze research in social psychology.
- Enhance skills in critical thinking, communication, and collaboration.

Course Outcomes:
By the end of this course, students will be able to:
- Articulate and summarize major theories and foundational concepts in social psychology, such as social cognition, social influence, and group dynamics.
- Understand the historical development and the evolution of social psychological thought.
- Apply social psychological theories to explain social behaviors and events in real-world contexts. Identify and analyze the cognitive and social factors that influence individual and group behavior in various situations.
- Utilize social psychological principles to develop strategies and interventions for reducing prejudice, discrimination, and intergroup conflict.
- Implement social psychological insights in everyday life and professional settings, such as in understanding and improving interpersonal relationships, workplace dynamics, and community interactions.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to Social Psychology Social Psychology: Meaning and Nature, Origin and Development. Methods and their Application: Experimental Method, Observation Method, Correlational Method, Interview and Questionnaire, Sociometry, Ethical Issues in Social Psychology Research	**L1, L2, L3**	18
Module II: Social Perception Social Perception: Communication, Attribution, Interpersonal Attraction, Impression Formation and Management, Group: Types, Dynamics and Norms. Social Identity, Crowd Behaviour.	**L1, L2, L3**	18
Module III: Prejudice and Stereotyping Nature and components of prejudice, Acquisition of prejudice, Reduction of prejudice Stereotyping and its impacts on individuals, families and community, Strategies to reduce prejudice and Stereotypy	**L3, L4, L5**	18
Module IV: Groups and Prosocial Behaviour Attitude: Nature, Formation, Maintenance and theories of Change (Heider and Festinger), Social Influence: Conformity, Compliance, and Obedience, Stereotyping, Prejudice, and Discrimination: Causes and Effects.	**L3, L4, L5**	18
Module V: Interpersonal Attraction	**L3, L4, L5, L6**	18

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Concept and meaning of interpersonal attraction, Factors affecting interpersonal attraction, Theories of interpersonal attraction: Reinforcement Theory, Complementary Theory, Exchange Theory, Balance Theories, Equity Theory		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Myers, D. G.: Social Psychology (10th Ed). New York: McGraw Hill.
- Baron, R. A., & Byrne, D. (2004). Social Psychology. Singapore: Pearson Education
- Baron, R. A., Byrne, D., & Johnson, B. T. (1998). Exploring Social Psychology. USA: Allyn andBacon.
- Fiske, S. T., Gilbert, D. T., & Lindzey, G. (Eds.). (2010). Handbook of Social Psychology. (Vol. 1 & 2). John Wiley and Sons.
- Myers, D. G., Sahajpal, P., & Behera, P. (2012). Social Psychology. New Delhi: Tata McGraw-Hill.
- Taylor, S. E., Peplau, L. A., & Sears, D. O. (2006). Social psychology. New Jersey: Pearson Prentice Hall.

DPSY2201	**ELEMENTARY STATISTICS**	**L**	**T**	**P**	**FW/ Proj**	**C**
Version	**2023**	2	1	0	0	3

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Pre-requisites/Exposure	Nil
Co-requisites	Nil

Catalog Description:
This course introduces the fundamental concepts and methods of Statistics as applied in behavioral science. Students will learn to quantify psychological data and understand and apply elementary statistical principles. The course emphasizes the logic of statistical reasoning and the practical application of statistical techniques to psychological research. Mastering these skills will prepare students to critically evaluate research findings and succeed in more advanced Psychology courses.

Course Objectives:
The paper on statistics introduces the quantification of psychological data and gives the students a primary research orientation. Understanding statistics and the basic logic of statistics is crucial to reading psychology research articles. Further, by mastering the basic logic and ways of thinking about Statistics, students will be unusually well prepared for the advanced courses. Below are the objectives of studying this paper on Psychology:

1. Understand how to accurately measure and quantify various psychological phenomena and data.
2. Gain primary research skills and orientation essential for conducting psychological research.
3. Develop a solid understanding of the basic logic and principles of Statistics, which is crucial for interpreting research findings.
4. Acquire the ability to critically read and comprehend psychology research articles that utilize statistical methods.
5. Build a strong foundation in Statistics that will prepare students for more advanced courses in Psychology and related fields.

Course Outcomes (COs):
By the end of this course, students will be:

1. Accurately quantify psychological data using appropriate statistical methods.
2. Develop a strong understanding of the basic logic and principles of Statistics, essential for interpreting research findings in Psychology.
3. Capable of critically reading and evaluating psychology research articles that employ statistical methods.
4. well-prepared for advanced Psychology courses that require a solid understanding of statistical concepts.

Course Content:

Modules	**Blooms level***	**Number of hours**
Module 1 Meaning, Definition, Relevance and Limitations of Statistics in Psychology Categories of statistics: Descriptive and Inferential	**L1, L2, L3**	18
Module 2 Primary and Secondary Data Classification and Tabulation of Data Frequency Distribution, Computation of percentiles and percentiles ranks from grouped data.	**L1, L2, L3**	18
Module 3 Graphical presentation of Data: Histograms, Frequency polygon, Frequency Curve, Cumulative Frequency Curve (Ogive), Cumulative Percentage Curve	**L3, L4, L5**	18

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Module 4 Measures of Central Tendency: Meaning, Application and Computation of Mean, Median and Mode from raw scores. Measures of Variability: Range and Variation; Average deviation, Quartile deviation and Standard deviation	**L3, L4, L5**	18
Module 5 Characteristics and Problems in Normal Probability Curve (NPC), The Standard Normal Curve. Computation of the standard error of mean, application and interpretation, Degrees of freedom, Levels of significance, Standard error of difference between two independent means (t-test: Large & small samples), Type I and Type II errors	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text & References:

Text:

- Garrettt, H. E.: Statistics in Psychology and Education, Vakils, Feffer and Simons Ltd. Bombay
- Aron/Aron & Coups: Statistics for Psychology (5th Ed).Pearson Education
- Howitt, D. &: Introduction to Statistics in Psychology (5th Ed). Cramer, D. England: Pearson Education Limited.
- Sprinthall, R.C. : Basic Statistical Analysis. Prentice Hall College Div
- Downie, N. M.: Basic Statistical Methods. Harper & Row Publishers, New York
- Colman, A. M.: Psychological Research Methods and Statistics. London and New York: Longman.
- Gupta, S. C.: Fundamentals of Statistics. N. Delhi: Himalaya
- Siegel, S.: (1956), Non Parametric Statistics, New York, McGraw Hill
- Broota, S.: (1992), Experimental Design in Behaviour Research, New Delhi
- Mohsin, S. M.: Fundamental Statistics for the Behavioural Sciences. Motilal Banarasidas, Patna

References:

- Agrawal, B. L.**:** Basic Statistics. New Age International
- Guilford, J.P.: Fundamental Statistics in Psychology and Education. McGraw Hill Kogakusha Ltd.
- Minimum, E. W., King, H. M. & Bear G., (1993), Statistical Reasoning in Psychology & Education, 3rd Edition, New York: John Willey & Sons
- Freeman: Statistics in Psychology

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DPSY2202	CLINICAL PSYCHOLOGY PRACTICALS-II	L	T	P	FW/ Proj	C
Version	**2023**	0	0	2	0	1
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course introduces the use and interpretation of psychological assessment tools. Students will learn about various scales and questionnaires used to measure different psychological constructs, such as social intelligence, aggression, adjustment, leadership, social maturity, and attitudes toward home and family. The course emphasizes developing the skills needed to administer, score, and interpret these assessments and to understand their applications in psychological research and practice.

Course Objectives

Below are the objectives of conducting practical this semester:

1. Understand the purpose and applications of various psychological scales and questionnaires.
2. Develop skills to administer and score different psychological assessments properly.
3. Learn to interpret the results of these assessments meaningfully.
4. Gain insights into key psychological constructs such as social intelligence, aggression, adjustment, leadership, social maturity, and attitudes.
5. Understand how these tools can be used in psychological research and applied settings.
6. Learn about the ethical issues involved in the use of psychological assessments.

Course Outcomes (COs):

Upon successful completion of this course, students will be able to:

1. Demonstrate an understanding of various psychological assessment tools and their applications.
2. Accurately administer and score the Social Intelligence Scale, Aggression Questionnaire, College Adjustment Scale, Authentic Leadership Questionnaire, Vineland Social Maturity Scale, and Attitude Scale Towards Home and Family.
3. Effectively interpret the results from these assessments and explain their implications.
4. Describe the psychological constructs measured by these tools and understand their relevance in different contexts.
5. Apply these assessment tools in research projects or practical settings, demonstrating their practical utility.
6. Recognize and adhere to ethical guidelines in administering, scoring, interpreting, and reporting psychological assessments.

Course Content:

1.	SOCIAL INTELLIGENCE SCALE	Social Intelligence
2.	AQ – AGGRESSION QUESTIONNAIRE	Aggression
3.	CAS – COLLEGE ADJUSTMENT SCALE	Adjustment
4.	ALQ – AUTHENTIC LEADERSHIP QUESTIONNAIRE	Leadership
5.	VSMS – VINELAND SOCIAL MATURITY SCALE	Social Maturity
6.	ATTITUDE SCALE TOWARDS HOME AND FAMILY	Attitude

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**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	File Demonstration	V	A	EE
Weightage (%)		35	35	5	25

Text & References:

- Mohsin, S. M.: Experiments in Psychology. Motilal Banarasidas
- Woodworth, R.S.: Experimental Psychology. Oxford & IBH & Schlosberg, H. Publishing
- Postman, L. & Egan, J. P.: Experimental Psychology: An Introduction. Harper and Row

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SEMESTER-III

DPSY2351	COGNITIVE PSYCHOLOGY	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course provides an in-depth exploration of key topics in cognitive psychology. Through lectures, discussions, and practical exercises, students will examine the theoretical foundations, empirical research, and practical applications of cognitive processes. Topics include attention processes, thinking, problem-solving, reasoning, decision-making, intelligence, memory, forgetting, language, and language disorders. Emphasis is placed on understanding the nature of cognition, its underlying mechanisms, and its implications for human behaviour.

Course Objectives:

1. To introduce students to the history, background, and foundational concepts of cognitive psychology.
2. To familiarize students with various theories and models related to attention processes, thinking, problem-solving, reasoning, decision-making, intelligence, memory, forgetting, language, and language disorders.
3. To enable students to critically analyse and evaluate research findings and theoretical perspectives in cognitive psychology.
4. To develop students' ability to apply cognitive psychology principles to real-world situations and problem-solving tasks.
5. To enhance students' understanding of the complexities of human cognition and its relevance to other disciplines such as education, neuroscience, and artificial intelligence.

Course Outcomes:

By the end of the course, students will be able to:

1. Describe the historical development and theoretical frameworks of cognitive psychology.
2. Identify different types of attention and factors influencing attentional processes.
3. Analyse various methods and stages of problem-solving and decision-making.
4. Evaluate theories of intelligence and their implications for understanding human cognition.
5. Discuss the nature and stages of memory, as well as factors affecting memory formation and retrieval. They will also recognize the causes and theories of forgetting and apply strategies to improve memory.
6. Define language and its components and identify common language disorders.
7. Apply cognitive psychology principles to analyse and solve real-world problems.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction Introduction, History, and Background of Cognitive Psychology	**L1, L2, L3**	18
Module II: Attention Processes Nature and Meaning of Attention Types of Attention Factors affecting Attention.	**L1, L2, L3**	18

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Theories of Attention: Broadbent 's filter theory, Treisman's attenuation theory, automatic-controlled processing, and sensory integration theory		
Module III: Thinking, Problem-solving, Reasoning and Decision-making Nature, Types, and tools of thinking Meaning, Method, and stages of problem-solving Meaning and Types of Reasoning Meaning, types, and hindrances of decision making.	**L3, L4, L5**	18
Module IV: Intelligence Meaning, Nature of Intelligence Theories of intelligence: Unitary Theory, Two Factor Theory, Theory of primary mental abilities, Guilford's structure of intellect, Sternberg's, Tricirchy theory of intelligence, J.P Dass model of intelligence, Cattell's theory of intelligence. Genetic and Environmental Influence on Intelligence Types of Intelligence tests	**L3, L4, L5**	18
Module V: Memory & Forgetting Meaning and stages of memory Types of Memory, information-processing approach, Baddley- Hitch model of working memory. Methods of measuring memory Methods of improving memory Forgetting- Nature and causes of Forgetting. Theories of Forgetting	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Solso, R.L.,(2004). Cognitive Psychology, 6th ed.; Delhi: Pearson Education
- Matlin M W (2005).Cognition, Wiley & Sons, Inc.
- Haberlandt, K. Cognitive Psychology. Allyn and Bacon, Boston.
- Anderson, J.R. Cognitive Psychology and its implications. 5th Edi.: Worth Publishers
- Smity, E. E. &Kosslyn, S (2007). Cognitive Psychology: Mind and Brain. Prentice Hall.
- Sen, A.K. &Pande, P. (Eds.) (1998). Current issues in cognitive psychology, Delhi Campus
- Posner, M. (Ed.) (1989). Foundations of cognitive science. London: MIT Press

DPSY2301	**RESEARCH METHODS & ADVANCED STATISTICS**	**L**	**T**	**P**	**FW/ Proj**	**C**

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Version	**2023**	2	1	0	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course offers a comprehensive introduction to psychology's research methods and statistical techniques. Students will explore research design fundamentals, including experimental and non-experimental methods, and learn to differentiate between qualitative and quantitative research. The course covers the entire research process, from formulating questions and hypotheses to ethical considerations. Additionally, students will gain knowledge of sampling techniques and delve into both parametric and non-parametric statistical methods, enhancing their ability to analyse and interpret psychological data.

Course Objectives

1. Provide a foundational understanding of research and its various types in Psychology.
2. Equip students with the skills to navigate the research process, including formulating research questions and hypotheses.
3. Instil the importance of ethical considerations in conducting research.
4. Differentiate between experimental and non-experimental research designs and qualitative vs. quantitative methods.
5. Introduce various sampling techniques and concepts of population and sample.
6. Teach the basic differences and applications of parametric and non-parametric statistical methods.
7. Familiarize students with key statistical tests and their uses in psychological research.

Course Outcomes (COs)

On completion of this course, the students will be able to

1. Define research and describe different types of research used in Psychology.
2. Outline and implement the steps involved in the research process.
3. Identify and apply ethical principles in the design and conduct of psychological research.
4. Differentiate between experimental and non-experimental research, and between qualitative and quantitative research methods.
5. Develop clear and testable research questions and hypotheses.
6. Define and operationalize variables for research purposes.
7. Apply appropriate sampling techniques and determine suitable sample sizes for research studies.
8. Distinguish between parametric and non-parametric statistical methods, understanding their assumptions and appropriate uses.
9. Conducted and interpreted results from parametric tests such as t-tests, ANOVA, and correlation analyses.
10. Conducted and interpreted results from non-parametric tests such as the Mann-Whitney, Spearman rank-order, and Kruskal-Wallis tests.

Course Content:

Modules	**Blooms level***	**Number of hours**

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Module 1: Introduction to Research What is research Types of research. The research processes Ethical considerations in research.	**L1, L2, L3**	18
Module 2: Research Designs and Related concepts. Experimental vs. non-experimental research Qualitative vs. quantitative research Research questions and hypotheses Variables and their operationalization	**L1, L2, L3**	18
Module 3: Sampling. Population and sample Probability and non-probability sampling Sampling techniques Sample size determination	**L3, L4, L5**	18
Module 4: Parametric Vs Non-Parametric Statistics Introduction, Assumptions, basic differences, uses of parametric and non-parametric tests	**L3, L4, L5**	18
Module 5: Introduction to various statistical techniques Parametric tests: Introduction to various techniques, t-test, ANOVA, Correlation. Non-Parametric tests: Mann-Whitney test, spearmen rank order test, Kruskal Wallis test.	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text & References:

Text:

- Garrettt, H. E.: Statistics in Psychology and Education, Vakils, Feffer and Simons Ltd. Bombay
- Aron/Aron & Coups: Statistics for Psychology (5th Ed). Pearson Education
- Howitt, D. &: Introduction to Statistics in Psychology (5th Ed). Cramer, D. England: PearsonEducation Limited.
- Sprinthall, R.C.: Basic Statistical Analysis. Prentice Hall College Div
- Downie, N. M.: Basic Statistical Methods. Harper & Row Publishers, New York
- Colman, A. M.: Psychological Research Methods and Statistics. London and New York: Longman.
- Gupta, S. C.: Fundamentals of Statistics. N. Delhi: Himalaya
- Siegel, S.: (1956), Non-Parametric Statistics, New York, McGraw Hill
- Broota, S.: (1992), Experimental Design in Behaviour Research, New Delhi
- Mosin, S. M.: Fundamental Statistics for the Behavioural Sciences. Motilal Banarasidas, Patna

DPSY2302	**CLINICAL PSYCHOLOGY PRACTICALS-III**	**L**	**T**	**P**	**FW/ Proj**	**C**

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Version	**2023**	0	0	2	0	1
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This paper provides hands-on experience in exploring and understanding various cognitive processes through practical conduction of tests and experiments. Students will engage in a series of practical sessions focusing on attention, problem-solving, memory, visual memory, and the Stroop test as per the description of the manual. Through these practical sessions, students will develop essential skills in experimental design, data collection, analysis, and interpretation within the field of psychology.

Course Objectives:

- To give practical experience to the students in administering and scoring psychological tests and interpreting the scores.
- To acquaint the students with the basic procedure and design of psychology experiments.
- To familiarize the students with the use of elementary statistical techniques.
- To encourage and guide the students to undertake a small-scale research project.

Course Outcomes:

By the end of the course, students will be able to:

- Demonstrate an understanding of fundamental cognitive processes including attention, memory, problem-solving, and executive functioning.
- Apply theoretical knowledge to the design, implementation, and analysis of cognitive psychology experiments.
- Develop practical skills in data collection, statistical analysis, and interpretation within the field of cognitive psychology.
- Critically evaluate research findings and their implications for understanding human cognition and behavior.
- Communicate scientific ideas and findings effectively through written reports and oral presentations.

This course aims to provide students with a comprehensive and practical understanding of cognitive psychology and personality principles, preparing them for further study and research in the field or applications in various professional domains.

Note: Out of the 6 practicals mentioned below, 4 practicals + 1 small-scale research project will be conducted in the third semester.

Course Contents:

1	Draw A Person Intellectual Ability Test	Intelligence
2	Swaroop Mehta Test of Thinking Strategy	Thinking
3	CVMT – CONTINUOUS VISUAL MEMORY TEST	Memory
4	PSAT – PROBLEM SOLVING ABILITY TEST	Problem Solving Ability
5	RETROACTIVE INHIBITION; EFFECTS OF INTERPOLATED ACTIVITIES ON P.L	Retroactive Inhibition.
6	STROOP EFFECT TEST*	Selective Attention

Note: Use group data for small-scale research project

Examination Scheme:

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Components	CT	File Demonstration	V	A	EE
Weightage (%)		35	35	5	25

Text & References:

- Mohsin, S. M.: Experiments in Psychology. Motilal Banarasidas
- Woodworth, R.S.: Experimental Psychology. Oxford & IBH & Schlosberg, H. Publishing
- Postman, L. & Egan, J. P.: Experimental Psychology: An Introduction. Harper and Row

SEMESTER-IV

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DPSY2451	ABNORMAL PSYCHOLOGY	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course provides a comprehensive overview of abnormal psychology, focusing on the understanding, classification, and models of abnormal behaviour. Through exploration of various psychological disorders, including neurotic, mood, psychotic, and somatoform disorders, students will examine clinical presentations, etiology, and treatment approaches. Emphasis is placed on differentiating between normal and abnormal behaviour, as well as understanding the impact of psychological disorders on individuals and society.

Course Objectives:

1. To introduce students to the concept of abnormal behaviour and the criteria used for its definition and classification.
2. To familiarize students with recent versions of classification systems for psychological disorders, including the DSM (Diagnostic and Statistical Manual of Mental Disorders) and ICD (International Classification of Diseases).
3. To differentiate between neurosis and psychosis and understand their clinical features and implications.
4. To explore various models of abnormality, including biological, psychodynamic, behavioural, and humanistic perspectives, and their applications in understanding psychological disorders.
5. To examine the clinical picture, etiology, and subtypes of anxiety disorders, including generalized anxiety disorder, obsessive-compulsive disorder, phobic disorders, and eating disorders.
6. To understand the clinical presentation, course, and treatment approaches for mood disorders, including depression and bipolar disorder.
7. To analyze the clinical features, etiology, and subtypes of psychotic disorders, focusing on schizophrenia, psychotic depression, and delusional disorders.
8. To explore somatoform disorders, including pain disorder, hypochondriasis disorder, and body dysmorphic disorder, and understand their psychological and physiological components.
9. To develop empathy, sensitivity, and ethical awareness in dealing with individuals experiencing psychological distress or disorders.

Course Outcomes:

By the end of the course, students will be able to:

1. Define and differentiate between normal and abnormal behaviour based on established criteria.
2. Critically evaluate the utility and limitations of classification systems such as the DSM and ICD in diagnosing psychological disorders.
3. Identify and explain the clinical features and etiology of neurotic and psychotic disorders.
4. Analyse and apply different models of abnormality in understanding psychological disorders.
5. Describe the clinical presentation, etiology, and treatment approaches for various anxiety disorders, mood disorders, psychotic disorders, and somatoform disorders.
6. Demonstrate an understanding of the impact of psychological disorders on individuals, families, and society.
7. Apply ethical principles and sensitivity in discussing and addressing issues related to abnormal behaviour and psychological disorders.
8. Collaborate effectively in group discussions and activities related to understanding and analysing psychological disorders.

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Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction Understanding abnormal Behaviour: Definition and Criteria Understanding Classifications (Recent Versions)- DSM and ICD Difference between Neurosis and Psychosis	**L1, L2, L3**	18
Module II: Models of Abnormality Biological Psychodynamic Behavioural Humanistic	**L1, L2, L3**	18
Module III: Neurotic Disorder Anxiety Disorders: Clinical Picture and Etiology Types of Anxiety Disorders- Generalized anxiety disorders, Obsessive-Compulsive disorders, Phobic Disorders, Eating Disorders	**L3, L4, L5**	18
Module IV: Mood Disorders Depression Bipolar Disorder	**L3, L4, L5**	18
Module V: Psychotic Disorder Schizophrenia: Clinical Picture and Etiology Psychotic depression Delusional Disorders	**L3, L4, L5, L6**	18
Module VI: Somatoform Disorders Pain Disorder Hypochondriasis Disorder Body Dysmorphic Disorder		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

Text:

- Page, J.D.: Abnormal Psychology. New Delhi: Tata McGraw Hill Publishing Company Limited
- Shanmugam, T.E.: Abnormal Psychology. New Delhi: Tata McGraw Hill Publishing Company Limited
- Coleman, J.C.: Abnormal Psychology and Modern Life. Bombay: D.B. Taraporewala Sons.&OCLtd.
- Davison G.C. & Neale, J. M.: Abnormal Psychology. New York: John Willey & Sons.
- Carson, R.C., Butcher, J.N. & Mineka, S.: Abnormal Psychology and Modern Life. Delhi: & Person Education, 2000
- Sarason, I. G. & Sarason, B. R.: Abnormal Psychology: The Problem of Maladaptive Behaviour, 11th Ed. Prentice-Hall
- Mangal, S. K.: Abnormal Psychology. New Delhi: Sterling Publishers Pvt Ltd

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References:

- Comer, R. J.: Abnormal Psychology, 5th Ed. Worth Publishers
- Kumar, V.: Abnormal Psychology: Causes and Treatment. Aadi Publications
- Kaur, R.: Abnormal Psychology: New Trends and Innovations Delhi: Deep & Deep Publications (P) Ltd.

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DPSY2401	PERSONALITY	L	T	P	FW/ Proj	C
Version	**2023**	2	1	0	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

Personality Psychology delves into the complex and fascinating study of personality, exploring the enduring patterns of thoughts, emotions, and behaviors that characterize individuals. This course provides a comprehensive overview of the major theories and research methods in personality psychology, examining how personality develops, is assessed, and influences various aspects of life. Students will engage with diverse theoretical perspectives, including psychoanalytic, trait, biological, humanistic, behavioral, cognitive, and social-cognitive approaches, and will critically analyze and compare these theories. The course also discusses the Nature-Nurture role in the development of Personality.

Course Objective:

1. To introduce students to the foundational concepts and historical development of personality psychology.
2. To familiarize students with different theoretical approaches used to study personality, including psychoanalytic, cognitive, social, learning, and humanistic perspectives.
3. To explore key trait theories proposed by influential psychologists such as Allport, Cattell, and Eysenck, and understand their implications for understanding individual differences.
4. To provide students with practical knowledge of personality assessment techniques, including self-report questionnaires and projective measures.
5. To critically analyze the role of biological, environmental, and socio-cultural factors in shaping personality development.
6. To encourage students to apply theoretical concepts and assessment tools to real-world contexts, such as understanding the impact of parenting styles on personality development.

Course Outcome: By the end of the course, students will be able to:

1. Demonstrate an understanding of the historical and conceptual foundations of personality psychology.
2. Evaluate and compare different theoretical approaches to the study of personality, identifying their strengths and limitations.
3. Apply key concepts from trait theories to analyze and interpret individual differences in personality.
4. Utilize various personality assessment techniques to gather and analyze data effectively.
5. Critically evaluate the relative contributions of genetic, environmental, and socio-cultural factors to personality development.
6. Communicate insights and findings related to personality psychology through written assignments, presentations, and class discussions.
7. Apply theoretical knowledge to practical scenarios, demonstrating an understanding of how personality theories can inform real-world applications such as counseling, education, and organizational psychology.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction Introduction: Nature, Conceptual History; Basic Assumptions about Human Nature; Genetic and Environmental Determinants of Personality. Type Theories:	**L1, L2, L3**	18

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Galen's Theory, Personality Typology (Sheldon and Kretschmer), and Triguna theory.		
Module II: Approaches to Study Personality Approaches to Study Personality: Psychoanalytic, Cognitive, Social, Learning, and Humanistic.	**L1, L2, L3**	18
Module III: Trait Theories of Personality Trait Theories: Allport's Theory, Cattell's Theory; Basic Concepts, Identification of Temperament, Ability, and Dynamic traits, Eysenckian Model: Structure, Physiological Basis and Behavioural Correlates; Alternative Five Factor Models of Personality.	**L3, L4, L5**	18
Module IV: Assessment of Personality Assessment of Personality: Questionnaire and Self Report (16 PF, EPQ-R, Neo-PI-R); Projective Techniques; Rorschach Inkblot Test, TAT, SIS, Rotter's Incomplete Sentences Blank; Objective Analytic Tests.	**L3, L4, L5**	18
Module V: Determinants of Personality Nature / Nurture Controversy: Biological Determinants: Role of Genes and Endocrine Glands Role of Physical Environment: Natural Environment, Constructed Environment, Behavioural Role of Socio – Cultural Environment: Early Social Experiences and Impact of parenting styles.	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Suggested Readings

- Boyle, G. J., Matthews, G., & Saklofske, D. H. (Eds.). (2008). The SAGE handbook of personality theory and assessment, (Vol. 1&2) Personality theories and models. Sage Publications, Inc.
- Cattell, R. B., & Kline, P. E. (1977). The scientific analysis of personality and motivation. Academic Press.
- Eysenck, H. J. (1981). Model for personality. New York: Springer-Verlag. Page 23 of 52.
- Eysenck, H. J., & Eysenck, M. W. (1985). Personality and Individual Differences: A Natural Science Approach. Plenum Press- New York and London.
- Hall G. S., & Lindzey, G. (1988). Theories of Personality (4Ed.) New Delhi: Wiley Eastern.
- Hjelle, L. L., & Ziegler, D. J. (1992). Personality theories: Basic assumptions, research, and applications (3rd Ed.). McGraw-Hill Book Company.
- John, O. P., Robins, R. W., & Pervin, L. A. (2008). HB of Personality: Theory and Research (3rd Ed.). NY: Oxford Press.
- Larsen, R. J., & Buss, D. M. (2011). Personality Psychology: Domains of Knowledge about Human Nature. New Delhi: Tata McGraw-Hill.

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DPSY2402	CLINICAL PSYCHOLOGY PRACTICALS-IV	L	T	P	FW/ Proj	C
Version	**2023**	0	0	2	0	1
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course focuses on the assessment tools and techniques used in diagnosing and evaluating autism spectrum disorder (ASD) and related developmental disorders. Students will explore a range of assessment instruments, including checklists, questionnaires, personality inventories, and cognitive tests commonly used in clinical and educational settings. Special emphasis is placed on understanding the administration procedures, interpretation guidelines, and ethical considerations associated with assessing individuals with ASD. Additionally, students will learn about the Seguin Form Board Test, a measure of intelligence, and the Rey Auditory Verbal Learning Test, which assesses memory and learning abilities.

Course Objectives:

In this semester students will learn about abnormal psychology and personality and thus the tests are chosen for:

1. To familiarize with the assessment process for Autism Spectrum Disorder (ASD) and related developmental disorders.
2. To introduce a variety of assessment tools used in diagnosing and evaluating ASD, including checklists, questionnaires, and personality inventories.
3. To provide an understanding of the administration procedures, scoring methods, and interpretation guidelines for ASD assessment instruments.
4. To equip with the knowledge and skills necessary to administer and interpret cognitive tests, such as the Seguin Form Board Test, in the assessment of individuals with ASD.
5. To introduce the Rey Auditory Verbal Learning Test and its application in assessing memory and learning abilities in individuals with ASD.

Course Outcomes (COs):

On completion of this course, the students will be able to

1. Demonstrate a comprehensive understanding of the assessment process for Autism Spectrum Disorder and related developmental disorders.
2. Identify and select appropriate assessment tools based on the specific needs and characteristics of individuals with ASD.
3. Interpret assessment results effectively, taking into account individual differences, cultural considerations, and ethical guidelines.
4. Apply knowledge of cognitive testing procedures to assess intellectual functioning in individuals with ASD using the Seguin Form Board Test.
5. Utilize the Rey Auditory Verbal Learning Test to evaluate memory and learning abilities in individuals with ASD.
6. Critically evaluate assessment practices and make evidence-based decisions in the diagnosis and treatment planning for individuals with ASD.

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1.	CHECKLIST FOR AUTISM SPECTRUM DISORDER	AUTISM
2.	MARYLAND ADDICTIONS QUESTIONNAIRE	ADDICTIONS
3.	PERSONALITY INVENTORY FOR YOUTH	PERSONALITY
4.	CHILDREN INVENTORY OF ANGER	ANGER
5.	CHILDREN'S PERSONALITY QUESTIONNAIRE	PERSONALITY
6.	REY AUDITORY VERBAL LEARNING TEST	AUDITORY VERBAL

Note: Use group data for small-scale research project

Examination Scheme:

Components	CT	File Demonstration	V	A	EE
Weightage (%)		35	35	5	25

Text & References:

- Mohsin, S. M.: Experiments in Psychology. Motilal Banarasidas
- Woodworth, R.S.: Experimental Psychology. Oxford & IBH & Schlosberg, H. Publishing
- Postman, L. & Egan, J. P.: Experimental Psychology: An Introduction. Harper and Row

SEMESTER-V

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DPSY2551	DEVELOPMENTAL PSYCHOLOGY	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

Developmental Psychology examines the psychological and emotional changes throughout the human life span, from conception to old age. The course covers physical, cognitive, affective, moral, social, and neural development, emphasizing the roles of heredity, maturation, and environment. Students will explore key theories, cultural influences on child-rearing and attachment, developmental disorders, and the challenges of aging, with a focus on Indian and global perspectives.

Course Objectives

Developmental psychology, also known as human development, is the scientific study of systematic psychological changes, and emotional changes that occur in human beings over the course of their life span. Originally concerned with infants and children, the field has expanded to include adolescence, adult development, aging, and the entire life span. Developmental psychology course will provide enriching understanding of various child rearing practices, attachment styles across different cultures. Moreover, students will attain knowledge regarding challenges in human development through the understanding of various developmental disorders. The objective of this paper is:

1. To provide an understanding of Physical, cognitive, affective, moral, social and neural development during infancy, childhood, and adolescence.
2. To critically evaluate the role of heredity, maturation, and the environment in development.

To critically examine the influence of different cultural practices in development.

Course Outcomes (COs):

On completion of this course, the students will be able to

1. Understand Developmental Stages: Grasp physical, cognitive, affective, moral, social, and neural development in infancy, childhood, and adolescence.
2. Analyze Theoretical Frameworks to evaluate Freud's psychosexual stages, Erikson's psychosocial theory, and Bronfenbrenner's ecological model.
3. Explore Cognitive and Moral Development to understand Piaget's and Vygotsky's theories and Kohlberg's moral development stages.
4. Evaluate Cultural Influences to examine child-rearing practices and attachment styles across cultures, with a focus on Indian and global contexts.
5. Identify Developmental Disorders to learn about nervous system-related, degenerative, and sensory-related developmental disorders.
6. Understand Aging and Its Challenges to define types of aging, analyze aging theories, and explore challenges and interventions for the elderly.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction Meaning, Goals and Concept of Development Methods Of Developmental Psychology- Longitudinal, Cross-Sectional and Family Studies.	**L1, L2, L3**	18

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Factors influencing development		
Module II: Biological Basis Conception and Prenatal Development: The Interaction of Heredity and Environment. Birth and newborn: Birth Complications, Competent Newborn.	**L1, L2, L3**	18
Module III: Psychoanalytic Theories and Ecological Model Sigmund Freud Theory- Psychosexual Stages Erik Erikson's Psychosocial Theory Urie Bronfenbrenner Ecological Model	**L3, L4, L5**	18
Module IV: Cognitive and Moral Development Theories Jean Piaget's Theory Neo Piagetian Theories Lev Semenoich Vygotsky Theory- Sociocultural Theory Moral Development- Kohlberg	**L3, L4, L5**	18
Module V: Global Perspectives and Challenges Child Rearing Practices across different Cultures- East and West Parenting and Attachment Styles Developmental Disorders and their types- Nervous system related disorders, Degenerative disorders, Sensory related disorders.	**L3, L4, L5, L6**	18
Module VI: Aging Definition of Aging Types of Aging Theories of Aging Challenges and Intervention for the elderly		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text & References:

Text:

- Bee, H. & Boyd, D.: Life Span Development, Boston, M.A.: Allyn and Bacon.
- Berk, L.E.: Child Development. New Delhi: Pearson Education.
- Crain, W.: Theories of Development. Englewood Cliffs, New Jersey: Prentice Hall.
- Feldman, R. S.: Discovering the Life Span (2nd Ed.). Prentice Hall
- Heatherington, E.M. & Parke, R.D.: Child Psychology: A Contemporary Viewpoint New York: McGraw-Hill
- Hurlock, E. B.: Developmental Psychology. McGraw-Hill
- Kail R. V.: Children and their development. Prentice Hall Inc.
- Newman, B.M. & Newman, P.R.: Development Through Life: A Psychosocial Approach. New York: Wadsworth Publishing Company.
  Papalia, D. E.; Olds, S. W. & Feldman, R.D: Human Development (10th Ed.).New York: McGraw-Hill

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- Brodzinsky, D.M.; Gormly, A.V. & Anibron, S.R.: Life Span Human Development; New Delhi: CBS Publication
- Bukatko, D. & Daehler, M.W.:Child Development: A Thematic Approach. New York: Houghton Mifflin Company.
- Santrock, J.W.: A Topical Approach to Life Span Development. New Delhi: Tata McGraw Hill.

DPSY2501	**HEALTH PSYCHOLOGY**	**L**	**T**	**P**	**FW/ Proj**	**C**

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Version	**2023**	2	1	0	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course explores the role health in the overall wellbeing of an individual. This course describe various methodologies, that affect the health and illness relationship. Health psychology introduce the various perspective of happiness and well-being including the eastern perspectives. The course is theoretically driven, as it help in predicting health behavior in light of many health behavior related theories.

Course Objectives:

1. To provide students with a comprehensive understanding of health psychology, including its definition, methodologies, and the role of health psychologists in promoting wellness and addressing psychological factors related to health and illness.
2. To explore Eastern perspectives of happiness and well-being, including concepts such as Shunyata, Ananda, and Shatchitananda, and how these perspectives influence conceptualizations of health in Indian traditions.
3. To examine the psycho-neuro-immunological aspects of the immune system, including its functioning, disorders, and the psychological factors influencing immune health, such as stress and coping mechanisms.
4. To introduce theoretical foundations for predicting health behavior, including attribution theory, health locus of control, and various cognitive and social cognition models such as the health belief model and the theory of planned behavior.
5. To discuss health-enhancing behaviors and factors influencing healthcare utilization, including inequalities in healthcare access, doctor-patient communication, and burnout among healthcare professionals.
6. To emphasize the importance of a bio-psycho-social model of health, integrating biological, psychological, and social factors in understanding health and illness.
7. To analyze future challenges and trends in healthcare and the role of health psychology in addressing these challenges, including the growth of telemedicine and the importance of designing healthcare environments conducive to well-being.

Course Outcomes (COs):

On completion of this course, the students will be able to

1. Understand and articulate the foundational principles and major theoretical frameworks in Health Psychology.
2. Comprehend how psychological, social, and biological factors interact to influence health and illness.
3. Recognize and apply psychological methods to promote healthy behaviors and prevent illness.
4. Evaluate the psychological effects of chronic illness on individuals and families, and understand effective coping mechanisms.
5. Develop, implement, and assess interventions aimed at improving health outcomes and enhancing the quality of life.
6. Use research skills to investigate health psychology questions and contribute to the scientific understanding of health and illness.

Course Content:

Modules	Blooms level*	Number of hours

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Module I: Introduction & Methodology Definition of Health Psychology; Mind-Body Relationship; Discuss the roles that health psychologists play in promoting wellness and in addressing and treating psychological factors related to health and illness, medical acceptance of health psychology	**L1, L2, L3**	18
Module II: Eastern perspectives of happiness and well-being, Concepts of Shunyata, Ananda, and Shatchitananda, Faith Healing traditions, conceptualizing Indian notions of Health.	**L1, L2, L3**	18
Module III: The Immune System Psycho-Neuro Immunology- the Immune System & immune functioning. Disorders of the Immune System- Infectious Diseases (viral infections & disease); Co-factor theory; Behavioral factors and common cold; AIDS (Transmission of HIV-AIDS & its consequences, coping with AIDS); Cancer- (Psychological factors in Cancer, causes of cancer)	**L3, L4, L5**	18
Module IV: Theoretical foundations: Predicting health behavior. Attribution theory, health locus of control, unrealistic optimism, stages of change model; Cognition models – health belief model, protection motivation theory; Social cognition models – theories of reasoned action and planned behavior, the health action process approach; Leventhal's self-regulatory model of illness cognition. Bio-Psycho-Social Model of Health	**L3, L4, L5**	18
Module V: Health Enhancing Behavior Inequalities in health care, using health services, the attitude of health professionals, doctor-patient communication, burnout in health professionals, designing health care work environment, future challenges for health care, and growth of health psychology.	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

Text:

- Allen Felicity. Health Psychology: theory and practice, Published by Allen & Unwin, 1998
- Friedma. Health Psychology: Health Psychology, 2nd Edition, Published by Academic Internet Publishers Incorporated, 2006
- Shelley E. Taylor. Health Psychology (McGraw-Hill Companies (2011)
- Dimatteo, M.R. & Martin, L.R.: Health Psychology. Allyn and Bacon
- Ogden, J. (2012). Health Psychology. Mc Crawhill Foundation
- Taylor, S. E. (2006). Health psychology. Tata McGraw-Hill Education
- Sarafino, E. P. (1994). Health Psychology, Biopsychosocial interactions. John Wiley & Sons

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DPSY2502	CLINICAL PSYCHOLOGY PRACTICALS-V	L	T	P	FW/ Proj	C
Version	**2023**	0	0	2	0	1
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course provides hands-on experience with the methods and techniques used in psychological research and assessment. Students will engage in practical exercises that cover various aspects of psychology, including cognitive, developmental, social, and clinical psychology. This course aims to develop students' skills in designing experiments, collecting and analyzing data, and interpreting results.

Course Objectives

- To give practical experience to the students in administering and scoring psychological tests and interpreting the scores.
- To acquaint the students with the basic procedure and design of psychology experiments.
- To familiarize the students with the use of elementary statistical techniques
- To encourage and guide the students to undertake a small-scale research project.

Course Outcomes (COs):

On completion of this course, the students will be able to: -

- Develop hypotheses, design experimental procedures, and carry out research studies in various areas of psychology.
- Gain proficiency in administering, scoring, and interpreting psychological tests and assessments.
- Apply statistical methods to analyze data collected from psychological experiments and assessments and interpret the results accurately.
- Understand and adhere to ethical guidelines in the conduct of psychological research and assessment.

Note: Total 5 practicals will be conducted in the Fifth semester among the list of following practicals out of which first three practicals are compulsory.

Course Content:

1	PGI General Wellbeing Measure	Health
2	Child Behavior Checklist (CBCL)	Developmental
3	Malin's Intelligence Scale for Indian Children- 2	Developmental
4	Creativity Assessment Packet	Positive
5	Behaviour Rating Inventory of Executive Function Adult Form	Developmental
6	Suicidal Ideation Questionnaire	Positive

Examination Scheme:

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Components	CT	File Demonstration	V	A	EE
Weightage (%)		35	35	5	25

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text & References:

- Mohsin, S. M.: Experiments in Psychology. Motilal Banarasidas
- Woodworth, R.S.: Experimental Psychology. Oxford & IBH & Schlosberg, H. Publishing
- Postman, L. & Egan, J. P.: Experimental Psychology: An Introduction. Harper and Row

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DPSY2503	POSITIVE PSYCHOLOGY	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

Positive Psychology is the scientific study of the strengths and virtues that enable individuals and communities to thrive. It is based on the belief that people want to lead meaningful and fulfilling lives, to cultivate what is best within themselves, and to enhance their experiences of love, work, and play. This course explores the principles and practices that promote well-being, happiness, and resilience. Students will learn about the theories and research underpinning positive emotions, strengths, and virtues, and how these can be applied to improve personal and societal well-being.

Course Objectives

1. To introduce students to the field of positive psychology, providing a historical overview and comparing Eastern and Western perspectives on well-being and positive emotional states.
2. To explore theories of positive emotions, including the Broaden & Build Theory, and examine concepts such as love, empathy, emotional intelligence, happiness, wellbeing, and resilience in the face of challenges and loss.
3. To delve into theories of positive cognitive states, including optimism, hope, wisdom, flow, mindfulness, and self-efficacy, and their implications for personal growth and development.
4. To highlight the importance of goals and character strengths in fostering positivity and developing a positive personality, drawing on frameworks such as the Values in Action (VIA) classification of character strengths and virtues.
5. To discuss preventive strategies and applications of positive psychology, including positive thinking, meditation, gratitude, kindness, and positive therapy, and their roles in enhancing various domains of life such as relationships, family, education, and health.
6. To examine the concept of aging, including definitions, types, and theories of aging, and to explore challenges faced by the elderly population and potential interventions to promote well-being and quality of life in later stages.

Course Outcomes (COs):

On completion of this course, the students will be able to

1. Define key concepts and theories in Positive Psychology: Understand and articulate the foundational principles and major theoretical frameworks in Positive Psychology.
2. Understand the scientific basis of well-being and happiness: Comprehend the research methodologies and empirical findings related to positive emotions, strengths, and virtues.
3. Apply positive psychological interventions: Utilize evidence-based strategies to enhance personal well-being and foster positive relationships.
4. Develop resilience and coping strategies: Learn and implement techniques to build resilience and effectively manage stress and adversity.
5. Promote well-being in various settings: Design and evaluate programs aimed at increasing well-being in personal, educational, and organizational contexts.
6. Critically evaluate Positive Psychology research and its applications: Analyze and assess the strengths and limitations of Positive Psychology studies and their practical implications.

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Modules	Blooms level*	Number of hours
Module I: Introduction Positive Psychology, An Historically Introduction, Perspective on Positive Psychology: Eastern and Western	**L1, L2, L3**	18
Module II: Positive Emotional States and Processes Broaden & Build Theory of Positive Emotions Positive Emotions theories: Love and Empathy, Emotional Intelligence, And Happiness, Wellbeing, Resilience in the phase of challenge & Loss	**L1, L2, L3**	18
Module III: Positive Cognitive States and Processes Positive Cognitive theories: Optimism, Hope, Wisdom, And Flow, Mindfulness, Self-efficacy,	**L3, L4, L5**	18
Module IV: Developing Positivity Importance of Goals, Character Strengths as "Value of Action (VIA)" and Virtues Developing Positive Personality	**L3, L4, L5**	18
Module V: Prevention and Applications of Positive Psychology Prevention: Positive thinking, Meditation, Gratitude, Kindness & Positive Therapy Application: Relationship, Family and Aging Work, Education, Health	**L3, L4, L5, L6**	18
Module VI: Aging Definition of Aging Types of Aging Theories of Aging Challenges and Intervention for the elderly		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text & References:

Text:

- Kumar, U., Archana, &Prakash, V. (2015).Positive psychology – Applications in work, health and well-being.Delhi & Chennai, India: Pearson.
- Joseph, S. (Ed.) (2015). Positive psychology in practice: Promoting human flourishing in work, health, education, and everyday life. Hoboken, NJ: John Wiley & Sons.
- Snyder, C. R., & Lopez, S. J. (2002).Handbook of positive psychology.New York: Oxford University.
- Snyder, C.R., Lopez, S.J. & Pedrotti, J.T. (2011): Positive Psychology: The Scientific and Practical Explorations Of Human Strengths (2nd Ed). Sage Publication, Inc.
- Baumgardner, S. R., Crothers, M. K. (2009). Positive psychology. New Delhi, India: Pearson.
- Boniwell, I. (2012). Positive Psychology in a Nutshell: The Science of Happiness. 3rd Edition. McGraw Hill

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DPSY2504	PHYSIOLOGICAL PSYCHOLOGY	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

Physiological Psychology, also known as Biopsychology or Behavioral Neuroscience, is the study of the biological bases of behavior. This course examines the structure and function of the nervous system, exploring how brain activity and neurotransmission influence behaviors, thoughts, and emotions. Topics include neural communication, sensory and motor systems, regulatory behaviors, emotions, learning and memory, and psychological disorders from a biological perspective. Through this course, students will gain an understanding of how physiological processes underpin complex behaviors and mental functions.

Course Objectives:

 To provide students with a comprehensive understanding of physiological psychology, including its conceptual framework, methodologies, reductionism, and ethical considerations in research.
 To explore the structure and function of neurons, including impulse conduction, synaptic transmission, and the role of neurotransmitters in neural communication.
 To examine the basic subdivisions of the nervous system, including the peripheral and central nervous systems, and their respective roles in physiological processes.
 To investigate hemisphere function, focusing on cortical lobes (frontal, parietal, and temporal) and their functions, as well as hemispheric specialization and the role of the corpus callosum in interhemispheric communication.
 To discuss the neurobiological basis of learning and memory, including neuropathologies such as anterograde and retrograde amnesia, dementia, Alzheimer's disease, and Korsakoff's syndrome.
 To examine the concept of arousal, physiological measures of arousal such as EEG brain waves, the role of the reticular formation in central arousal, and the functions of sleep, including REM and non-REM sleep stages, as well as other biological rhythms and the influence of endocrine glands.

Course Outcomes (COs):

On completion of this course, the students will be able to

1. Understand and articulate the foundational principles and major theoretical frameworks in Physiological Psychology.
2. Understand the structure and function of the nervous system.
3. Describe how neural mechanisms and neurotransmission influence various behaviors, including sensory processing, motor control, and emotional regulation.
4. Utilize techniques such as brain imaging, electrophysiology, and pharmacology to investigate psychological phenomena.
5. Evaluate the interactions between different brain regions and their impact on cognition, learning, memory, and psychological disorders.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to Physiological Concept of Physiological, Methods, Reductionism, ethical issues	**L1, L2, L3**	18

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The Neurons: Structure, Impulse conduction, Synapse, Role of Neurotransmitters. The nervous system: Basic subdivisions- Peripheral and Central.		
Module II: Hemisphere function Cortical Lobes (Frontal, Parietal & Temporal) and their functions, Corpus Callosum, and the split–brain studies, Hemispheric specialization across two lobes.	**L1, L2, L3**	18
Module III: Learning and Memory Neuro-biological basis of Learning and memory Neuropathology--Anterograde and Retrograde Amnesia Dementia & Alzheimer ‘s disease, Korsakoff ‘s Syndrome	**L3, L4, L5**	18
Module IV: Emotion, Hunger & Motivation Psychophysiology of Emotions-Peripheral & Central route Physiological mechanism of Stress and Anxiety, Physiological basis of Hunger & Thirst motivation, Homeostasis: Obesity, Anorexia Nervosa & Bulimia Nervosa	**L3, L4, L5**	18
Module V: Sleep, Arousal and Biological Rhythms Concept of arousal; Physiological measures of arousal (EEG Brain waves) Reticular Formation and Central arousal Sleep—REM and Non-REM sleep, Functions of sleep Other Biological rhythms & Role of Endocrine glands	**L3, L4, L5, L6**	18

**Bloom’s Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

Morgan, C. T., & King, R. (1993). Introduction to psychology. New Delhi, India: Tata McGraw Hill Publishing Company Limited.
• Leukel, F. (). Introduction to Physiological Psychology
• Ciccarelli, S.K., & Meyer, G.E. (2007). Psychology. (South Asian Edition). India: Pearson Education Inc.
• Feldman, R.S., (2009). Essentials of Understanding Psychology. New Delhi: Tata McGraw-Hill.
• Green, S. (1995). Principles of biopsychology. UK: Lawrence Erlbaum Associates Ltd.
• Annett, M. (1984). Left, right, hand and brain: The right shift theory. London: Lawrence Erlbaum Associates Ltd.
• Pinel, J. P. J. (2004). Biopsychology. Boston, MA: Allyn & Bacon.
• Sperry, R.W. (1982). Some effects of disconnecting the cerebral hemispheres. Science, 217, 1223-1226.
• Rosenzweig, M. R., Leiman, A. L., & Breedlove, S. M. (1996). Biological psychology. Sunderland, Mass: Sinauer Associates.
• Carlson, N. R. (2012). Foundations of physiological psychology. (Sixth Edition). Delhi: Pearson Education.

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SEMESTER-VI

DPSY2601	CLINICAL PSYCHOLOGY	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

Clinical Psychology integrates science, theory, and clinical knowledge to understand, prevent, and alleviate psychological distress while promoting well-being and personal development. This course provides students with a comprehensive foundation in clinical psychology, covering historical and contemporary issues, ethical and legal considerations, classification systems, diagnostic techniques, and psychotherapy. Emphasizing practical skills and ethical awareness, the course prepares students for professional practice and specialized areas of psychological services, fostering self-reflective skills and academic growth.

Course Objectives

Clinical Psychology is an integration of science, theory and clinical knowledge for the purpose of understanding, preventing, and relieving psychologically based distress or dysfunction and to promote subjective well-being and personal development. In many countries, clinical psychology is a regulated mental health profession. Keeping pace with the disciplinary advances and with the goal of acquiring specialized knowledge, the paper would allow students to nurture their academic interest in clinical and other research domains of psychology, along with personal growth and citizenship. The faculty is expected to perform the following functions so that the objective of the concerned programme can be obtained:

- Integrate the course contents with the clinical viewpoint in a service setting.
- To train them into skills and competencies which are required for practice as a psychologist.
- To sensitize them to the ethics of profession.
- To impart knowledge and skills required for diagnosis of psychopathological conditions.
- To prepare students in specific areas in which professional psychological services can be rendered.
- To develop self-reflective skills.

Course Outcomes (COs):

On completion of this course, the students will be able to

1. Gain knowledge about the meaning, nature, and historical development of clinical psychology.
2. Explore the professional activities, subspecialties, and organizational roles within clinical psychology, along with the ethical and legal issues involved.
3. Learn about current classification systems, their uses, and limitations in diagnosing psychological disorders.
4. Develop skills in clinical diagnosis and assessment, including case studies, mental state examinations, and various clinical interview methods.
5. Acquire knowledge about the definition, goals, stages, and essential processes of psychotherapy, preparing for effective therapeutic interventions.

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Course Content:

Modules	Blooms level*	Number of hours
Module I: Foundation of Clinical Psychology Introduction to Clinical Psychology: Meaning and nature of discipline, Historical Development of Clinical Psychology	**L1, L2, L3**	18
Module II: Contemporary Issues Professional Activities of Clinical Psychologist Subspecialties of Clinical Psychology Organizations in Clinical Psychology Ethical and Legal Issues in Clinical Psychology	**L1, L2, L3**	18
Module III: Classification Systems Introduction to Classificatory System Classification System currently in use Limitations	**L3, L4, L5**	18
Module IV: Diagnosis and Assessment Nature and Purpose of Clinical Diagnosis and Assessment Stages in the Assessment Process Clinical Assessment Methods	**L3, L4, L5**	18
Module V: Diagnostic Techniques Case Study, Mental State Examination Clinical interview & its types	**L3, L4, L5, L6**	18
Module VI: Psychotherapy Definition, Goals and Stages of Psychotherapy Essential Process in Psychotherapy		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text & References:

Text:

- Plante, T. G.: Contemporary Clinical Psychology. New York: John Willey & Sons, Inc.
- Bellack, A. S. & Hersen, M.: Introduction to Clinical Psychology. New York: Oxford University Press
- Korchin, S. J.: Modern Clinical Psychology. Delhi CRR Publishers and Distributers
- Ray, S. D.: The Practice of Psychotherapy. New Delhi: New Age International
- Hecker, J. E. & Thorpe, G. L: Introduction to Clinical Psychology. Delhi: Pearson Education

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- Herbert, M.: Clinical Child Psychology: Social Learning, Development and Behaviour. New York: John Willey & Sons, Inc.
- Field, A. P. & Field: Clinical Psychology. Learning Matters
- Hatton, C. Bromley, J., & Craine, A.: Clinical Psychology. New York: John Willey & Sons, Inc
- Modern Clinical Psychology-Sheldon J. Korchin
- Clinical Psychology- Pearson Publications
- Theory of Practice of Counseling and Psychotherapy-Gerald Corey

References:

- Pomerantz, A. M.: Clinical Psychology- Science, Practice and Culture. New Delhi: Sage Publications
- Matthews, J. R.: Introduction to Clinical Psychology. New York: Oxford Anton, B. S. University Press Kumar, A.: Clinical Psychology. Anmol Publications

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DPSY2602	GENDER PSYCHOLOGY	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

Gender Psychology explores psychological theories and research on gender differences and similarities, focusing on the effects of gender in social contexts. This course examines the complexity and diversity of gendered experiences across cultures, covering biological, sociocultural, and historical determinants of sex and gender. Students will study various psychological perspectives on gender, gender roles and stereotypes, intellectual and physical abilities across the gender spectrum, and the impact of gender on health and well-being. The course aims to provide a nuanced understanding of gender dynamics in contemporary society.

Course Objectives

1. To introduce students to the field of gender psychology, providing an understanding of the determinants of sex and gender, including biological and sociocultural factors, and examining the contemporary understanding of gender spectrum in both informal and formal communication.
2. To explore the historical antecedents of the concept of gender usage in psychology.
3. To analyze gender from various psychological perspectives, including Freudian and Neo-Freudian theories, Social Learning Theory, and Gender Schema Theory.
4. To examine gender roles and stereotypes, including concepts of masculinity and femininity, and explore the religious, cultural, economic, and media contexts that influence the construction and perpetuation of gender stereotypes.
5. To explore the potential across the gender spectrum, including intellectual and cognitive abilities in STEAM fields, physical abilities and sports achievements, creativity, and the unique abilities and challenges faced by neurodivergent individuals across genders.
6. To understand the intersection of gender and health, including factors determining health and fitness, gender dysphoria, and the impact of stress, coping mechanisms, and psychopathology on gendered experiences of health and well-being.

Course Outcomes (COs):

On completion of this course, the students will be able to

1. Comprehend the determinants of sex and gender, including biological and sociocultural factors, and the historical development of gender concepts in psychology.
2. Evaluate Freudian, Neo-Freudian, Social Learning, and Gender Schema theories to understand gender from various psychological viewpoints.
3. Investigate gender stereotypes and roles within religious, cultural, economic, and media contexts, focusing on the concepts of masculinity and femininity.
4. Assess intellectual, cognitive, and physical abilities across the gender spectrum, including achievements and challenges in STEAM fields, sports, art, and creativity, with a special focus on neurodivergent populations.
5. Analyze factors affecting health and fitness, gender dysphoria, and the relationship between gender, stress, coping mechanisms, and psychopathology.

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Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to Gender Psychology Understanding Sex and Gender – determinants of sex and gender: biological and sociocultural factors Gender spectrum: Contemporary understanding of gender and sex related in language of daily & formal communication Historical antecedents of concept of gender usage in psychology	**L1, L2, L3**	18
Module II: Understanding Gender from psychological perspectives. Freudian, Neo-Freudian perspectives Social Learning Theory Gender Schema theory	**L1, L2, L3**	18
Module III: Gender Roles & Stereotypes Masculinity and Femininity – Gender stereotypes and roles Religious Context of Gender Cultural & Economic Context of Gender Media and Depiction of gender roles and stereotypes	**L3, L4, L5**	18
Module IV: Exploring potential across the Gender Spectrum Intellectual and Cognitive abilities – milestones in (Science, Technology, Engineering, Arts & Mathematics) STEAM fields Physical abilities & sports – achievements and debates Art & Creativity – research evidence Gender based abilities and challenges in neurodivergent population.	**L3, L4, L5**	18
Module V: Gender & Health Factors determining health & fitness Gender dysphoria Stress, Coping & Psychopathology	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

Text:

- Brannon L. Gender Psychological Perspectives , 2/E. Misclenious Publishers.
- Brannon, L. (2001). Gender: Psychological Perspectives (3rd edition). Needam Heights, MA: Allyn and Bacon.
- Helgeson, V. S. (2020). *Psychology of gender* (4th edition). Routledge.
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- Best, D. L. (2001). Gender concepts: Convergence in cross-cultural research and methodologies. Cross-Cultural Research: *The Journal of Comparative Social Science, 35(1)*, 23–43.

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- Else-Quest, N. M., Hyde, J. S., Goldsmith, H. H., & Van Hulle, C. A. (2006). Gender differences in temperament: A meta-analysis. *Psychological Bulletin, 132(1)*, 33–72.
- Kimmel, M. S. and Aronson, A. (2000). The Gendered Society Reader; New York: Oxford University Press.
- Maccoby, E. E. (1998). *The two sexes: Growing up apart, coming together*. Cambridge, MA: Belknap Press/Harvard University Press.
- Martin, C. L., Ruble, D. N., & Szkrybalo, J. (2002). Cognitive theories of early gender development. *Psychological Bulletin, 128(6)*, 903–933. doi: 10.1037/0033-2909.128.6.903
- Wood, W., & Eagly, A. H. (2002). A cross-cultural analysis of the behavior of women and men: Implications for the origins of sex differences. *Psychological Bulletin, 128(5)*, 699–727.

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DPSY2651	GUIDANCE AND COUNSELLING PSYCHOLOGY	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

Guidance and Counselling Psychology explores the theories, principles, and practices involved in assisting individuals to overcome personal, social, educational, and vocational challenges. This course delves into the application of psychological theories and techniques to promote holistic well-being, enhance personal development, and facilitate effective decision-making. Topics include counselling theories, assessment methods, ethical considerations, multicultural competence, and interventions aimed at fostering psychological resilience and growth. Through experiential learning, students develop essential counselling skills, including active listening, empathy, rapport-building, and goal-setting, to support individuals in navigating life transitions and achieving their fullest potential."

Course Objectives

The objective of this course is to provide a comprehensive understanding of guidance and counselling in educational settings. It aims to equip participants with the knowledge and skills necessary to effectively support individuals in achieving personal, social, educational, and career goals. It concentrates on the importance of counsellors and of the multicultural, ethical and legal environments in which counsellors operate. This paper focuses on the context and process of counselling to provide a range of high quality and responsive counselling skills and its applications to help oneself and others. The current discipline will enable the students to develop an understanding of counselling within school setup, which is collaborative work of counsellor and other school staff.

Course Outcome:

On completion of this course, students will be able to:

1. Understand the definition and significance of guidance and counselling.
2. Identify the goals and characteristics of effective counselling.
3. Recognize the importance of guidance and counselling in school settings.
4. Differentiate between guidance, counselling, and psychotherapy.
5. Understand the structure and phases of the counselling process.
6. Develop skills for building and maintaining effective counselling relationships.
7. Learn techniques for working through counselling sessions and terminating the relationship appropriately.
8. Master verbal and non-verbal communication techniques essential for effective counselling.
9. Explore theoretical approaches in counselling, including psychoanalytic, behavioristic, cognitive-behavioral, and humanistic/existential approaches.
10. Examine current issues, ethical considerations, and legal standards in counselling practice, as per the American Psychological Association (APA) guidelines.

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Modules	Blooms level*	Number of hours
Module I: Introduction Definition of Guidance Meaning and Goals of counselling Characteristics of a good counsellor Importance of guidance and counselling in school Difference between Guidance, Counselling and Psychotherapy	**L1, L2, L3**	18
Module II: Counselling Process Building Counselling Relationship: Structure and phase of counselling Working in a Counselling Relationship Termination of Counselling Relationship	**L1, L2, L3**	18
Module III: Fundamentals of Counselling Skills Special Relationship Problems: Transference, Countertransference, Resistance Verbal and Non-Verbal Techniques	**L3, L4, L5**	18
Module IV: Basics of Guidance Organizations of good guidance service at different levels of education Essentials of good guidance programme	**L3, L4, L5**	18
Module V: Theoretical approaches in counselling Freud's Psychoanalytic Approach Behavioristic Approach Cognitive-Behavioral Approach Humanistic and Existential Approaches	**L3, L4, L5, L6**	18
Module VI: Current Issues in Counselling Ethical and Legal Issues in counselling as per the APA Code of Professional Ethics Ethical standards for evaluation Criticisms to Counselling		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

Text:

- Rao, S. N.: Counselling and Guidance (2nd Ed.). Tata McGraw Hill
- Belkin, G.S.: Introduction to Counselling. W.C.: Brown Publishers
- Nelson, J.: The Theory and Practice of Counselling Psychology. New York: Hollt Rinehart & Winston
- Gibson, R. L. & Mitchell, M. H.: Introduction to Counselling and Guidance (7th).New Delhi Prentice-Hall of India Pvt. Ltd
- Gladding, S. T.: Counselling: A Comprehensive Profession (6th Ed.). Dorling Kindersley India Pvt. Ltd.
- Hansen, J. H. & Rosberg, R.H: Counselling: Theory and Process (5th Ed.). Allyn & Bacon
- Pal, O. B.: Guidance and Counselling. New Delhi: Motilal Banarsidas Publishers Private Ltd.
- Milner, J., Byrne, P. O. & Campling, J.: Assessment in Counselling: Theory, Process and Decision-Making. Palgrave MacMillan

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- Patterson, L.E.: The Counselling Process. Wadsworth Publishing

References:

- Welfel, E.R., & Patterson, L.E: The Counselling Process: A Multi-theoritical Integrative Approach. Thomson Brooks / Cole

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DPSY2603	ORGANIZATIONAL BEHAVIOUR	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

Organizational Behavior explores the dynamics of individual, group, and organizational behavior within the context of various workplace settings. This course examines theories, research findings, and practical applications relevant to understanding human behavior in organizations. Topics may include individual differences, motivation, communication, leadership, decision-making, teamwork, organizational culture, and change management. Through case studies, simulations, and experiential learning activities, students develop insights into how individuals and groups interact within organizations, and how these interactions influence organizational effectiveness and employee well-being. Emphasis is placed on developing practical skills for effective leadership, communication, conflict resolution, and organizational development.

Course Objectives

The course aims to provide a comprehensive understanding of Organizational Psychology, beginning with its concept, meaning, and historical evolution. It delves into the subject matter and functions of Organizational Psychology, covering areas such as work motivation, organizational attitude and behavior, leadership, and organizational culture. Through the exploration of both early and contemporary theories, students will gain insights into factors influencing work motivation, job satisfaction, and organizational commitment, as well as the dynamics of leadership and power within organizations. Additionally, the course examines the development, impact, and consequences of organizational culture, equipping students with the knowledge and analytical skills necessary to address organizational challenges effectively.

Course Outcomes (COs):

On completion of this course, the students will be able to

1. Demonstrate an understanding of the factors influencing individual behavior in organizations, personality, attitudes, motivation, and job satisfaction.
2. Analyze and evaluate group dynamics, including team formation, communication patterns, decision-making processes, and conflict resolution strategies.
3. 3.Uunderstand different types of organizational structures and their impact on communication, coordination, and decision-making within organizations.
4. Develop leadership and management skills, including the ability to identify different leadership styles, traits, and behaviors, and their effects on employee motivation and organizational performance.
5. Understand the process of organizational change, including the reasons for change, resistance to change, and strategies for managing change effectively.
6. Apply concepts and theories from organizational behavior to analyze and solve real-world organizational challenges, demonstrating their ability to apply theoretical knowledge to practical situations.

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Modules	Blooms level*	Number of hours
Module I: Nature and Scope of Organizational Psychology Organizational Psychology: Concept, Meaning and definitions, subject matter and functions of Organizational Psychology, Historical development of Organizational Psychology	**L1, L2, L3**	18
Module II: Work Motivation Early theories: Maslow, McClelland, Two factors Contemporary theories: Goal setting, Equity, Expectancy	**L1, L2, L3**	18
Module III: Organizational Attitude and Behaviour Organizational Commitment: Concepts, Determinants and Consequences Job Satisfaction, Job Involvement, Job Design: Job enlargement, Job enrichment and Job characteristics models Applications: Job Characteristics Model, Job redesign, MBO	**L3, L4, L5**	18
Module IV: Leadership and Influence Processes Leadership: Meaning, Concept and different types of leadership Theories of Leadership Power and Influence in Organizations	**L3, L4, L5**	18
Module V: Organizational Culture Organizational Culture: Meaning and definitions. Development of Organizational Culture Impact and Consequences of organizational culture	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text & References:

Text:

- Robbin's S.P. (1993). Organizational Behaviour: Concepts Controversies and Applications; (6th Ed.)New Delhi: Prentice Hall.
- Bass, B.H. & Berrett, G.V. (1981). People, Work, and Organizations an Introduction to Industrialand Organizational Psychology; Boston: Allyn and Bacon, INC.
- Feldman, D.C. & Aenold, H.J. (1985). Managing Individual and Group Behaviour in Organizations;New York: McGraw-Hill.
- Smith, R.D., (1988). Organizational Behaviour; New York: McGraw-Hill.
- Luthans, F. (1998). Organizational Behaviour; New York: McGraw-Hill

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- Davis, K. & Newstroms, J.W. (1989). Human Behaviour at Work: Organizational Behaviour; NewYork: McGraw-Hill
- Sekaran, U. (1989). Organizational Behaviour: Text and Cases; New Delhi: Tata Mcdraw Hill
- Cascio, W. (1993). Applied Psychology in Personal Management; New York: Prentice Hall

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DPSY2604	ARTIFICIAL INTELLIGENCE AND CYBER-PSYCHOLOGY	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description:

The association between AI and Cyber-Psychology is essential for developing technologies that are both advanced and human centric. AI provides powerful tools for understanding and improving human behaviour, while Cyber-Psychology ensures that these technologies are used ethically and effectively. Together, they hold the potential to transform mental health care, enhance digital well-being, and create more supportive and engaging online environments. Their collaboration can lead to innovative solutions that address complex psychological and societal challenges, ultimately improving the quality of life in the digital age.

Course Objective:

Cyberpsychology is the field of psychology that investigates the impact of digital technology and online interactions on human behaviour and mental processes, exploring topics like internet addiction, online relationships, and digital well-being. AI, or Artificial Intelligence, refers to the development of computer systems that can perform tasks typically requiring human intelligence, such as problem-solving, decision-making, and natural language understanding.

This course has the following objectives.

- a comprehensive understanding of the psychological aspects of online behaviour, exploring topics such as internet addiction, toxic disinhibition, online identity, social media behaviour, social and professional networking online, cyberbullying, and some aspects of cybersecurity.
- Learners gain an applicatory know-how of psychological principles to address the challenges and opportunities arising from the digital world.
- Explore the complex issues surrounding gaming addiction, online behavioural misconduct, and cyberbullying. Understand the symptoms of internet and gaming addiction, the psychological implications of anonymity, and the types and forms of cyberbullying, along with strategies for prevention and legal interventions.
- Examine the evolving landscape of digital mental health and cognitive development, including the effectiveness and ethical considerations of cybertheory, the role of AI chatbots and virtual therapists, and the psychological aspects of online learning, critical thinking, memory, and digital amnesia.

Course Outcomes (COs):

- Students will learn key principles of cyber-psychology, such as online behavior, digital identity, and the psychological effects of internet use.
- They will explore case studies of AI applications in mental health, user experience, and online behavior monitoring.
- Students will understand the ethical considerations in AI development and deployment, including issues related to privacy, bias, and transparency.
- Students will learn how to use AI for behavioral analytics, understanding how to interpret data from digital footprints to make predictions about human behavior.

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Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to Cyberpsychology • Definition and scope of cyberpsychology • Historical context and development of the field • Ethical considerations in cyberpsychological research • Examination of communication patterns in online environments	**L1, L2, L3**	18
Module II: Online Self, Social Media and Relationships • Online self-disclosure, Impression management and privacy concerns • Identity theft and digital footprints ,Effects of social media on interpersonal relationships • Social Capital, social comparison and self-esteem in the digital age • Online dating, Virtual Dating and Chatbots and its psychological implications	**L1, L2, L3**	18
Module III: Gaming Addiction and Online Behavioural Misconduct • Understanding Internet and gaming addiction, symptoms, treatment approaches • Anonymity and online disinhibition effect • Types and forms of cyberbullying: Psychological impact on victims and perpetrators • Strategies for prevention and legal interventions	**L3, L4, L5**	18
Module IV: Digital Mental Health and Cognitive Development • Cybertherapy and Digital Mental Health (teletherapy, Efficacy and ethical considerations) • AI Chatbots and Virtual Therapists, other Techniques and strategies • Online Learning and Cognition (online learning and critical thinking, cognitive overload, memory and digital amnesia)	**L3, L4, L5**	18
Module V: Cybersecurity and Virtual Reality • Virtual Reality and Immersive Technologies: Psychological implications of virtual reality experiences, Uses of VR in therapy, education, and entertainment • Cybersecurity and Online Safety: Psychological factors, Cybersecurity threats and their impact on mental well-being • Promoting digital citizenship and responsible online behaviour	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Joinson, A. (2007). Understanding the Psychology of Internet Behaviour: Virtual Worlds, Real Lives. Palgrave Macmillan.
- Wallace, P. (2014). The Psychology of the Internet. Cambridge University Press.
- Young, K. S., & Abreu, C. N. (2011). Internet Addiction: A Handbook and Guide to Evaluation and Treatment. John Wiley & Sons.
- Whitty, M. T., & Joinson, A. (2010). Revealing the 'real' me, searching for the 'actual' you: Presentations of self on an internet dating site. In A. N. Joinson, K. Y. A. McKenna, T. Postmes, & U.-D. Reips (Eds.), The Oxford Handbook of Internet Psychology (pp. 241-257). Oxford University Press.

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- Kuss, D. J., & Griffiths, M. D. (2012). Internet gaming addiction: A systematic review of empirical research. International Journal of Mental Health and Addiction, 10(2), 278-296.

References:

- Shadiev, R., Hwang, W. Y., & Huang, Y. M. (2019). Exploring the role of artificial intelligence in cyberpsychology: A systematic review. International Journal of Human-Computer Interaction, 35(13), 1160-1175.
- Yang, W., Zhang, Z., & Cao, R. (2020). The influence of artificial intelligence on human behavior and well-being: A cyberpsychological perspective. Frontiers in Psychology, 11, 788.
- Kätsyri, J., Förger, K., Mäkäräinen, M., & Takala, T. (2019). A review of empirical evidence on different uncanny valley hypotheses: Support for perceptual mismatch as one road to affective response. International Journal of Social Robotics, 11(2), 241-261.
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- Riva, G., Mantovani, F., Capideville, C. S., Preziosa, A., Morganti, F., Villani, D., ... & Alcañiz, M. (2007). Affective interactions using virtual reality: The link between presence and emotions. CyberPsychology & Behavior, 10(1), 45-56.
- Wang, Y. C., Chen, J. Y., Chou, C., Chang, Y. P., & Yeh, S. C. (2015). Enriched and impoverished environments: Effects on brain and behavior. International Journal of Comparative Psychology, 28,

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SEMESTER-VII

DPSY2701	ADVANCED STATISTICS (PARAMETRIC & NON-PARAMETRIC)	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course provides an in-depth exploration of advanced statistical methods and their applications in psychological research. Students will learn about various statistical techniques, including ANOVA, correlation, chi-square tests, regression analysis, and factor analysis. The course also introduces students to the use of SPSS and online platforms for statistical analysis. Emphasis is placed on understanding the concepts, assumptions, and applications of these methods, as well as interpreting and reporting results accurately.

Course Objectives

- Provide a comprehensive understanding of advanced statistical concepts and their applications in Psychology.
- Develop proficiency in identifying and applying different scales of measurement.
- Equip students with the skills to conduct and interpret hypothesis testing.
- Emphasize the importance of reliability and understanding the standard error of the mean.
- Teach the computation, interpretation, and application of ANOVA, correlation, chi-square tests, and regression analysis.
- Introduce factor analysis and its application in psychological research.
- Familiarize students with SPSS and online platforms for statistical analysis.

Course Outcomes (COs)

Upon successful completion of this course, students will be able to:

1. Define key statistical concepts and apply them in psychological research.
2. Accurately use and differentiate between nominal, ordinal, interval, and ratio scales of measurement.
3. Perform and interpret one-tailed and two-tailed hypothesis tests, understanding Type I and Type II errors.
4. Determine and evaluate the reliability of statistics in data analysis.
5. Understand and calculate the standard error of the mean.
6. Conduct and interpret two-way ANOVA, Friedman's two-way analysis, Wilcoxon Rank Sum Test, and Kolmogorov-Smirnov test.
7. Perform and interpret various types of correlation analyses, including Phi-Coefficient, Contingency Coefficient, and Tetrachoric.
8. Conduct and interpret Chi-Square Goodness of Fit and Chi-Square Test of Independence.
9. Conduct and interpret simple and multiple linear regression analyses.
10. Understand and apply factor analysis techniques.
11. Use SPSS and online platforms for conducting and interpreting statistical analyses.

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Modules	Blooms level*	Number of hours
Module I: Basics Concept of Reasoning, population, sample, and probability theory in statistical inferences Scales of Measurement: Nominal, Ordinal, Interval, Ratio Hypothesis testing: One-tailed and Two-tailed tests, Type I and Type II errors Meaning, concept and importance of determining reliability of statistics in data analysis Standard error of mean	**L1, L2, L3**	18
Module II: Statistics and Test of Significance ANOVA: Two-way computation, interpretation and its uses in psychological research. The Friedman Two-way analysis of variance by ranks-Basic concepts, uses and computations. Wilcoxen Rank sum test. Test of differences between groups (Independent samples): Kolmogorov-Smirnov test, uses	**L1, L2, L3**	18
Module III: Correlation and its techniques Correlation: concept, types, assumption and Utility of Cor-relational Analysis in Psychological Research Concept definition assumptions of Nominal Measures of Correlations The Phi-Coefficient, Contingency coefficient concepts uses and calculations Tetrachoric**r**: Its uses, computation and comparison Bi-serial Correlation, Point Bi-serial Correlation, Partial Correlation, Tetra-choric Correlation	**L3, L4, L5**	18
Module IV: Chi-Square and Regression Concept and Definition, its assumptions and use Chi-Square Goodness of Fit (One-Sample Test), Chi-Square Test of Independence Simple regression analysis and Multiple linear regression, its uses, concepts and assumptions	**L3, L4, L5**	18
Module V: Factor Analysis Factor analysis: A hypothetical example, Factor matrices and factor loadings. Methods of factor analysis. Types of factor analysis.	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Text & References:

Text:

- Kerlinger, F. N. (2017). Foundations of behavioral research. Surjeet Publications, India.
- Minium E.W. King, H.M & Bear G, 1993. Statistical Reasoning in Psychology and Education (3rd Ed.) N Y: John Willey and Sons
- Garett, H.E., (2004), Statistics in Psychology and Education (11th ed.); New Delhi: Paragon International
- Gupta S.P.: Statistical methods, Sultan and Sons, New Delhi.
- Broota, K.D.: Experimental design in Correlational Research, New Delhi: Wiley Eastern 1989.
- Downie, N.M.: Basic Statistical Methods. New York: Harper and Publishers

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- Howitt, D & Cramer, D: Introduction to SPSS statistics in psychology
- James K. Lindsey : Parametric Statistical Inference, Oxford science Publication.
- Cox, D.R.: Principles of statistical inferences.

References:

- Edward, A.E.: Experimental Design in Psychological Research (3rd Ed.), New Delhi: American Publishing Co. 1971
- Berger. R.L: Statistical Inferences, Cole Pub. Co.
- Wesley O. J & Geisser. S: Modes of Parametric Statistical Inference. Wiley-Interscience
- Rice, J.A: Mathematical Statistics & Data Analysis, South western.
- Salkind, N & Green, S: SPSS Quick Starts.

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DPSY2702	PSYCHOLOGICAL ASSESSMENT AND DIAGNOSIS	L	T	P	FW/ Proj	C
Version	**2023**	1	1	0	0	2
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description: This course provides an in-depth exploration of various psychological assessment tools and techniques used in clinical and educational settings. It covers the theoretical foundations, administration procedures, interpretation, and ethical considerations associated with a wide range of psychological tests, including intelligence tests, achievement tests, personality assessments, projective tests, and developmental scales. Special emphasis is placed on understanding the principles of test construction, bias, fairness, and emerging trends in online testing.

Course Objectives:

1. To familiarize students with the purpose, types, and ethical issues related to psychological testing.
2. To provide an understanding of the theoretical frameworks underlying cognitive, achievement, and personality assessments.
3. To introduce students to a variety of psychological assessment tools, including intelligence tests, achievement tests, personality inventories, and projective techniques.
4. To equip students with the necessary skills to administer, score, and interpret psychological tests accurately and ethically.
5. To enhance students' critical thinking skills regarding the selection and application of appropriate assessment measures based on client characteristics and assessment goals.
6. To explore emerging trends in online testing and their implications for psychological assessment practices.

Course Outcomes: By the end of the course, students should be able to:

1. Demonstrate a comprehensive understanding of the purpose, principles, and types of psychological tests.
2. Evaluate the validity, reliability, and fairness of psychological assessment instruments.
3. Administer, score, and interpret a variety of psychological tests, including intelligence tests, achievement tests, and personality inventories.
4. Identify and address ethical issues and considerations in psychological testing, including cultural and contextual factors.
5. Apply psychological assessment techniques effectively in diverse clinical and educational settings.
6. Critically analyze and synthesize assessment data to generate comprehensive psychological evaluation reports.
7. Adapt assessment strategies to meet the needs of individuals across the lifespan, including children, adolescents, and adults.
8. Stay informed about emerging trends and advancements in psychological assessment, particularly in the context of online testing platforms

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Modules	Blooms level*	Number of hours
Module I: Introduction Purpose of testing, types of test , Bias & Fairness Ethical Issues in Psychological Testing Norms and types, Report Writings Emerging trends of online testing	**L1, L2, L3**	18
Module II: Cognitive assessment and neuropsychological Assessment Intelligence Tests: Bhatia Battery Weschler‘s Adult Performance Intelligence Scale (WAPIS) Raven‘s Progressive Matrices (Colour Progressive Matrices, Standard Progressive Matrices and Advanced Progressive Matrices) Binet Kamat Test Weschler‘s Intelligence Scale for Children – Revised (WISC) Wide Range Intelligence Test (WRIT) Alexander Pass-a-long Test of Intelligence Draw-A-person Intellectual Ability Test for Children, Adolescents and Adults (DAP:IQ) NIMHANS Battery of Intelligence	**L1, L2, L3**	18
Module III: Achievement Test Wechsler Individual Achievement Test (WIAT) Diagnostic Achievement Test For Adolescents – Second Edition (DATA-2) Kaufman Test of Educational Achievement (KTEA) Woodcock-Johnson Tests of Achievement (WJ)	**L3, L4, L5**	18
Module IV: Assessment of Personality: Non-Projective Test Cattell‘s 16 Personality Factor Inventory (16 PF) California Q-Sort Tests Myers Briggs Type Indicator (MBTI) Minnesota Multiphasic Personality Inventory (MMPI) Personality Inventory for Children Bell‘s Adjustment Inventory Eysenck‘s Personality Questionnaire NEO-TM Personality Inventory-3 (NEOTM-PI-3) Adult / Adolescent	**L3, L4, L5**	18
Module V: Assessment of Personality: Projective Tests Introduction of Projective Techniques Difference between Projective & Non-Projective Techniques Thematic Apperception Test Rorschach Inkblot Test House-Tree-Person (H-T-P) Sentence Completion Test	**L3, L4, L5, L6**	18
Module VI: Developmental Scales Developmental Screening Test Vineland‘s Social Maturity Scale Measures of Psychosocial Development (MPD) Gesells‘ Developmental Schedule		

**Bloom’s Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

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Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Text & References:

Text:

- Freeman, F. S.,(1965), Theory and Practice of Psychological Testing; New Delhi: Oxford &IBTT

References:

- Jackson C.,(1998), Understanding Psychological Testing; Jaico Publishing House
- Anastasi&Urbina S.(2000), Psychological Testing ,7th Edition; Person Education (Singapore)
- Pte. Ltd.,
- Guilford J.P.: Psychometric Methods

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DPSY2703	CLINICAL PSYCHOLOGY PRACTICALS-VII	L	T	P	FW/ Proj	C
Version	**2023**	0	0	4	0	2
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description:
This course is essential for students to pursue careers in clinical psychology, neuropsychology, health psychology, and related fields, providing them with the necessary tools and knowledge to conduct psychological assessments effectively. This practical course provides hands-on training in the administration, scoring, and interpretation of key psychological assessment tools used in clinical and research settings. Students will become proficient in using the ADHD Symptom Checklist, Clinical Analysis Questionnaire (CAQ), PGI Health Questionnaire, Psychological Diagnostic Screening Questionnaire, AIIMS Comprehensive Neuro Psychological Battery (Hindi), and Standard Progressive Matrices. Emphasis will be placed on understanding the theoretical underpinnings, psychometric properties, and practical applications of these tools. Additionally, students will learn about ethical considerations and cultural sensitivities in psychological testing.

Course Objective:

1. To demonstrate practical experience to the students in administering and scoring psychological tests andinterpreting the scores.
2. To acquaint the students with the basic procedure and design of psychology tests.
3. To familiarize the students with the use of appropriate statistical techniques
4. To encourage and guide the students to undertake a small-scale research project.

Course Outcomes (COs):
On completion of this course, the students will be able to

- Proficiency in administering various psychological assessments.
- Ability to score and interpret assessment results accurately.
- Score and interpret the results of different standardized tools.
- Understand the theoretical background and practical applications of the tools.
- Discuss the psychometric properties and utility of the PGI Health Questionnaire in different contexts.
- This approach ensures that students gain hands-on experience with each assessment tool and understand their practical applications in real-world settings.

Note: Total 5 practicals will be conducted in the Fifth semester among the list of following practicals out of which first three practicals are compulsory.

Course Content:

1	ADHD Symptom Checklist	Neuropsychology
2	Clinical Analysis Questionnaire (CAQ)	Personality & Psychopathology
3	PGI Health Questionnaire	Health
4	Psychological Diagnostic Screening questionnaire	Diagnosis
5	AIIMS Comprehensive Neuro Psychological Battery (Hindi)	Neuropsychology
6	Standard Progressive Matrices	Intelligence

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Examination Scheme:

Components	CT	File Demonstration	V	A	EE
Weightage (%)		35	35	5	25

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text & References:

- Mohsin, S. M.: Experiments in Psychology. Motilal Banarasidas
- Woodworth, R.S.: Experimental Psychology. Oxford & IBH & Schlosberg, H. Publishing
- Postman, L. & Egan, J. P.: Experimental Psychology: An Introduction. Harper and Row.
- Respective Manuals of the tests.

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DPSY2704	NEUROPSYCHOLOGY	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

Neuropsychology provides an in-depth understanding of the brain and its various functions to elucidate its role in human behaviour. The course covers the historical background and emergence of neuropsychology, methods for studying brain structure and function, brain plasticity, and the specific roles of different brain lobes. Additionally, students will explore neuropsychological rehabilitation, including cognitive retraining and the role of family and community support, as well as the impact of social support on health. This comprehensive course integrates theoretical knowledge with practical assessment techniques.

Course Objectives:

1. To introduce students to the field of neuropsychology, providing a historical background and outlining the emergence of neuropsychology as a discipline, as well as exploring its scope in understanding brain-behavior relationships.
2. To familiarize students with various methods used in neuropsychology for measuring brain structure and function, including invasive techniques, electrical procedures, in-vivo imaging, and neuropsychological assessment tools.
3. To examine the plasticity of the brain from a neuropsychological perspective, focusing on the cerebral cortex and the localization and lateralization of functions within the brain.
4. To explore deficits associated with frontal, temporal, parietal, and occipital lobes, including behavioral, emotional, personality, and cognitive changes linked to each lobe's functions.
5. To understand the holistic approach to neuropsychological rehabilitation, including planning, process, and outcomes of cognitive retraining, and the role of family and community support in the rehabilitation process, as well as financial and employment rehabilitation.
6. To discuss the link between social support and health, exploring factors contributing to the personality and health link, different types of social support, and the cross-cultural perspectives on health and social support.

Course Outcomes (COs):

On completion of this course, the students will be able to

1. Gain knowledge of the historical background, emergence, and scope of neuropsychology as a discipline.
2. Learn about invasive and non-invasive techniques for measuring brain structure and function, including electrical procedures, in-vivo imaging, and neuropsychological assessments.
3. Explore the neuropsychological aspects of brain plasticity and the localization of functions within the cerebral cortex, including lateralization.
4. Examine the behavioral, emotional, personality, and cognitive changes associated with deficits in the frontal, temporal, parietal, and occipital lobes.
5. Understand the planning, process, and outcomes of cognitive retraining and the role of social support in rehabilitation. Learn to administer neuropsychological assessments such as the Bender Gestalt Test and Benton's Visual Retention Test.

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Modules	Blooms level*	Number of hours
Module I: Introduction Introduction to Neuropsychology; Historical Background of Neuropsychology; The emergence of Neuropsychology as a discipline; The scope of Neuropsychology	**L1, L2, L3**	18
Module II: Methods in neuropsychology Invasive techniques for measuring brain structure and function, Electrical procedures, In-vivo imaging, Neuropsychological assessment.	**L1, L2, L3**	18
Module III: Plasticity of Brain Neuropsychological aspect of plasticity of brain Cerebral cortex and lateralization / localization of functions	**L3, L4, L5**	18
Module IV: Frontal, Temporal, Parietal and Occipital Lobes Deficits Behavioural, emotional, personality and cognitive changes associated with the lobe functions: Behavioral, emotional, ,cognitive functions associated with each lobe.	**L3, L4, L5**	18
Module V: Neuropsychological Rehabilitation (Holistic Approach) Planning, process and outcome of cognitive retraining Role of family and larger community Financial/ employment Rehabilitation Neuropsychological Assessment - Bender Gestalt Test - Benton's Visual Retention Test	**L3, L4, L5, L6**	18
Module VI: Social Support and Health Factors for Personality and Health Link Types of Social Support Link between social support and Health Cross cultural images of health		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text & References:

Text:

- Luria, A.R. (1966), Higher cortical functions in man, New York, basic books.
- Hecaen, H. and Albert, M.L. (1978), Human Neuropsychology, New York, John Wily and Sons.
- Brannon, L. & Feist, J. (2007): Introduction to Health Psychology. Cengage Learning

References:

- Walsh, K. W. (I978), Neuropsychology a clinical approach, Edinburgh, Churchill Livingston.
- Vinken, P.J. & Bruyn, G.W. (1969) (Ed.), handbook of Clinical Neurology, Amesterdam, North Holland .
- Kirshener, H.S, (1986) Behavioural Neurology, New York, Churchill Livingston.
- Lhermitte, F. (1986) Human Autonomy and the Frontal Lobes. Part II: Patient Behavioural in complex and social situation: The "Environmental Dependency

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Syndrome". Annuals of Neurology, 19, 335- 343.
- Strub and Black Neuro-behavioural Disorder.
- Taylor, SE (1986) Health Psychology Random House, New York.

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DPSY2705	FORENSIC PSYCHOLOGY	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course offers an in-depth exploration of forensic psychology, focusing on its theoretical foundations, practical applications, and ethical considerations within the legal system. Students will examine the historical development of forensic psychology, legal structures, and the roles of forensic psychologists in various aspects of the legal process. Topics include competency and insanity, theories of criminal behavior, psychopathy, eyewitness testimony, and the intersection of mental health and the criminal justice system. Through lectures, discussions, and case studies, students will gain insight into the complexities of forensic psychology and its relevance in legal settings.

Course Objective:

1. To provide students with a comprehensive understanding of forensic psychology, including its historical development, theoretical underpinnings, and practical applications within the legal system.
2. To familiarize students with the structure of the legal system and the roles of forensic psychologists in conducting evaluations, providing expert testimony, and assisting in legal decision-making processes.
3. To explore key concepts and issues related to competency and insanity, including the evaluation and treatment of individuals involved in legal proceedings.
4. To examine theories of criminal behavior and the phenomenon of psychopathy, including assessment methods and interventions for individuals with psychopathic traits.
5. To analyze factors influencing eyewitness testimony accuracy, lineup procedures, and the reliability of eyewitness memory in legal contexts.
6. To understand the relationship between mental illness and criminal behavior, including competency evaluations, insanity defense, and the challenges of addressing mental health needs within the criminal justice system.
7. To foster critical thinking and ethical awareness in applying forensic psychology principles to real-world scenarios, promoting the fair and just treatment of individuals within the legal system.

Course Outcomes (COs):

On completion of this course, the students will be able to

1. Demonstrate a comprehensive understanding of key concepts, theories, and practices in forensic psychology.
2. Explain the roles and responsibilities of forensic psychologists within the criminal justice system.
3. Perform psychological assessments to evaluate competency to stand trial, mental state at the time of an offense, risk of reoffending, and other legal considerations.
4. Assess and advise on the psychological impact of law enforcement practices on officers and suspects.

Course Content:

Modules	Blooms level*	Number of hours
Module I: **Basics** • Overview of forensic psychology • Historical perspective • Legal and ethical issues	**L1, L2, L3**	18

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Module II: The Legal System • Structure of the legal system • Roles of forensic psychologists in the legal system • Competency and insanity	**L1, L2, L3**	18
Module III: Criminal Behavior and Psychopathy • Theories of criminal behaviour • Understanding psychopathy • Assessment and treatment of psychopathy	**L3, L4, L5**	18
Module IV: Eyewitness Testimony • Factors influencing eyewitness accuracy • Lineup procedures and identification • Eyewitness memory and suggestibility	**L3, L4, L5**	18
Module V: Mental Health and the Criminal Justice System • Mental illness and criminal behavior • Competency evaluations • Insanity defense	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

Text:

- **Forensic Psychology" by Joanna Pozzulo, Craig Bennell, and Adelle Forth** - This textbook provides a comprehensive overview of the field of forensic psychology, covering various topics from criminal behavior to the legal system.
- **"Introduction to Forensic Psychology: Research and Application" by Curt R. Bartol and Anne M. Bartol** - This book is widely used in forensic psychology courses and offers a solid foundation in the subject.
- **"Psychology and Law: An Empirical Perspective" by Neil Brewer and Kipling D. Williams** - This text focuses on the empirical and research aspects of psychology and law, providing insights into the scientific basis of forensic psychology.
- **"Forensic Psychology: A Very Short Introduction" by David Canter** - Part of the "Very Short Introduction" series, this book is a concise yet informative overview of the field, suitable as an introductory text.
- **"Ethics in Psychology and the Mental Health Professions: Standards and Cases" by Gerald P. Koocher and Patricia Keith-Spiegel** - This book is essential for understanding the ethical considerations in forensic psychology practice.
- **"Forensic Psychology and Law" by Ronald Roesch, Patricia A. Zapf, and Stephen D. Hart** - This text covers various aspects of forensic psychology, including assessment, treatment, and research, with a focus on its application to the legal system.

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- **"The Psychology of Criminal Justice" by Ray Bull and Tim Valentine** - This book explores the psychology behind criminal justice processes, including investigative procedures, the courtroom, and correctional systems.
- **"Handbook of Forensic Psychology" edited by William O'Donohue and Eric R. Levensky** - This comprehensive handbook covers a wide range of topics within forensic psychology and is suitable for more advanced courses.
- **"Forensic and Legal Psychology: Psychological Science Applied to Law" by Mark Costanzo and Daniel Krauss** - This book provides an overview of the applications of psychological science to various aspects of the legal system.
- **"Forensic Psychology: From Classroom to Courtroom" by R. Eric Landrum and Carl B. Clements** - This text focuses on the practical aspects of forensic psychology, including preparing for a career in the field.

References:

- **The Oxford Handbook of Forensic Psychology" edited by James R.P. Ogloff, David M. Shum, and E. Simon Shyken** - This comprehensive handbook covers a wide range of topics within forensic psychology and is an excellent reference for researchers and practitioners.
- **"APA Handbook of Forensic Psychology" edited by Brian L. Cutler** - Published by the American Psychological Association (APA), this handbook provides an authoritative overview of forensic psychology.
- **"Wiley Handbook on the Psychology of Violence" edited by Carlos A. Cuevas and Callie Harbin Burt** - This handbook covers various aspects of violence, including criminal behavior, victimology, and intervention strategies..
- **"Handbook of Forensic Assessment: Psychological and Psychiatric Perspectives" edited by Eric Y. Drogin, Frank M. Dattilio, and Robert L. Sadoff** - This handbook focuses on the assessment and evaluation of individuals within the legal system.
- **"The Handbook of Eyewitness Psychology: Volume I - Memory for Events" and "Volume II - Memory for People" edited by Michael P. Toglia, J. Don Read, David F. Ross, and Ray Bull** - These volumes provide comprehensive coverage of eyewitness memory and identification, which is a crucial aspect of forensic psychology.
- **"The Handbook of Juvenile Forensic Psychology and Psychiatry" edited by Thomas Grisso, Ray Bull, and David Shumaker** - This reference book focuses on the psychological and psychiatric aspects of working with juvenile offenders.

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DPSY2706	PSYCHOTHERAPY	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description:
This course offers a comprehensive exploration of psychotherapy theories and practices. Students will gain an in-depth understanding of major therapeutic approaches, including psychodynamic, cognitive-behavioral, humanistic, and integrative models. The course emphasizes the development of practical skills in conducting psychotherapy, understanding therapeutic processes, and applying evidence-based techniques. Students will also learn about the ethical and cultural considerations essential for effective therapy. Through lectures, role-plays, case studies, and supervised practice, students will be prepared as professional psychotherapists.

Course Objective:
1. To provide students with a comprehensive understanding of psychotherapy, including its meaning, nature, and scope, and to differentiate between psychotherapy and counselling.
2. To explore the variables affecting psychotherapy, and to understand their impact on the therapeutic process.
3. To examine the Indian perspective of psychotherapy, with a focus on spirituality and mindfulness.
4. To introduce students to a composite model of human effectiveness and the role of self-awareness in counselling, emphasizing personal characteristics that contribute to effective therapeutic practice.
5. To familiarize students with different genres of psychotherapy, and to discuss the advantages and limitations of individual versus group psychotherapy.
6. To examine psychoanalytic therapies, including Freud's psychoanalytic therapy, Jungian therapy, and Adlerian psychotherapy, through case studies and discussions of issues and clientele.
7. To introduce humanistic therapies such as client-centered expressive art therapy, emotion-focused therapy (EFT), motivational interviewing, and existential therapy, and to analyze their application, issues, and clientele through case studies.

Course Outcome:
By the end of this course, students will be able to:
- Understand and Compare Major Theoretical Approaches.
- Demonstrate basic psychotherapy skills, such as active listening, empathy, rapport-building, and effective questioning.
- Identify and apply ethical principles in psychotherapy, including confidentiality, informed consent, and professional boundaries.
- Use supervision and peer feedback to improve therapeutic skills and personal development as a therapist.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction Psychotherapy: Meaning, Nature & Scope, Difference Comparison of Psychotherapy and counselling. Variables affecting Psychotherapy: Client Variable, Therapist Variable, Placebo effects of psychotherapy	**L1, L2, L3**	18

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Indian perspective of psychotherapy: Spirituality & mindfulness Personal characteristics: A composite model of human effectiveness, the role of self-awareness in counselling.		
Module II: Genres of Psychotherapy Supportive therapy Re-educative Therapy Re-constructive therapy Individual Vs Group Psychotherapy Technology and psychotherapy- tele-counselling, AI and app based interventions Art & play integrated psychotherapy	**L1, L2, L3**	18
Module III: Psychoanalytic Therapies Freud's Psycho-analytic Therapy, Jungian Therapy, Adlerian Psychotherapy Issues & clientele, case studies	**L3, L4, L5**	18
Module IV: Humanistic Therapies Client centered expressive art therapy, Emotion focussed therapy (EFT) Motivational Interviewing Existential Therapy Issues & clientele, case studies	**L3, L4, L5**	18
Module V: Behavioral and Cognitive Behavior Therapy Cognitive Behavior therapy, Rational Emotive Behavior Therapy (Ellis) Dialectic Behavioral Therapy (DBT) Issues & clientele, case studies	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Text & References:

Text:

- Corey, G. (2013). *Theory and practice of counseling and psychotherapy*. Cengage learning.
- Germer, C., Siegel, R. D., & Fulton, P. R. (Eds.). (2016). *Mindfulness and psychotherapy*. Guilford Publications.
- Golfried, H. R. & Davison, G. C.: Clinical Behaviour Therapy
- Henrik, R. (ed) *The Psychotherapy Handbook. The A-Z handbook to more than 250 psychotherapies as used today* (1980) New American Library.
- Kapur, M. (2011). *Counselling children with psychological problems*. Pearson Education India.
- VanFleet, R., Sywulak, A. E., & Sniscak, C. C. (2011). *Child-centered play therapy*. Guilford Press.
- Sharf R., Theories of Psychotherapy & Counselling – Concepts and Cases; 2nd Edition.

References:

- Bryant, R.A.; Moulds, M.L.; Guthrie, R.M.; Nixon, R.D.V. (2005)."The Additive Benefit of hypnosis and Cognitive-Behavioral Therapy in Treating Acute Stress Disorder.
- Didonna, F. (2009). *Clinical handbook of mindfulness* (Vol. 18, pp. 5-18). New York: Springer.
- Kahn M.,: Between Therapist and Client- The New Relationship- Revised Edition
- Kirt S.H. & Clark: Cognitive Behaviour Therapy for Psychiatric Problems.
- Pradhan, B. (2014). *Yoga and mindfulness based cognitive therapy: a clinical guide*. Springer.

DPSY2739	**BASICS OF RESEARCH METHODOLOGY, ETHICS, AND RESEARCH COMMUNICATIONS**	L	T	P	C

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Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description
This course aims to provide students with a comprehensive understanding of conducting ethical research, utilizing proper research methodologies, and effectively communicating research findings. The course includes a final project where students will write a Literature Review on a topic chosen in consultation with the teacher(s).

This course is designed to equip students with essential skills and knowledge to conduct ethical research, employ proper research methodologies, and effectively communicate scientific information (with focus on writing a literature review). The course will cover topics such as research design, data collection and analysis, research ethics, and science communication strategies. Through a combination of lectures, discussions, case studies, and practical exercises, students will develop a deeper understanding of the research process and its ethical implications.

Course Objectives
The objective of this course is to impart knowledge about various stages of research process, research ethics and different ways of research communication.

The aim of this course is to impart research skills to the beginners and help to improve the quality of research by the existing researchers. It also encompasses the understanding and application of appropriate research design, statistics, and the use of the computer for reference management, report writing, research paper writing and presentation. The course also introduces the key conceptual issues of each research method, as well as giving practical guidance. It covers the series of research methodology contents: from problem formulation, to design, to data collection, analysis, reporting and dissemination. The course has the dual aims of equipping students with conceptual understandings of current academic debates regarding different methods, and the practical skills to put those methods into practice.

Course Outcomes
On completion of this course, the students will be able to
CO1. Define criteria of good research, steps in research process, and data collection.
CO2. Identify different types of sampling and its purpose.
CO3. Conduct hypothesis testing for different types of samples and interpret the results.
CO4: Learn the importance of literature review, write research paper/thesis, use reference management software.

Course Content :

Module	Topic	**Blooms level***	Hours
1	**Research Methodology** Understanding the research process: From research questions to conclusions Types of research: Qualitative and quantitative research Exploratory, descriptive, experimental, and correlational studies Scientific Thinking: Subjective Vs. Objective Thinking Logical Reasoning: Inductive Vs. Deductive Reasoning Formulating research hypotheses and objectives Purpose of a good research, Criteria of good research	L1, L2	10

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2	**Descriptive Statistics** Data, Types of Data, Methods of data collection, Benefits and drawbacks, Graphical representation of data and interpretation. Measures of Central Tendency: Arithmetic Mean, Median, Mode, Measures of Dispersion: Range, Standard Deviation, Variance, Coefficient of Variation.	L1, L2, L3	15
3	**Inferential Statistics** Sampling: Basic concepts, Process of Sampling, Sample Size, Types of Samples, Sampling and non- sampling errors, Statistics and Parameters, Sampling Distribution of Means and Proportion, **Hypothesis Testing**, steps in testing of hypothesis, errors in hypothesis testing, z test and t test.	L1, L2, L3	15
4	**Research Ethics** Plagiarism, Fabrication, Falsification, Ethics with respect to human and Animal Research	L1, L2	5
5	**Communication** Characteristics of a good Research paper, Systematics Literature Review (choosing a topic, preparing outline, gathering authentic & appropriate references, avoiding plagiarism, use of reference management systems), Writing a good literature review, Structure of report (Introduction, Methodology, Analysis, Results, Discussions, Conclusions, Recommendations), Writing Quality Research Paper, Publishing Research Work in Quality Journals, Reference Management Software	L1, L2, L3	15

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional Exam	End Term Examination
Weightage (%)	5	10	15	70

Project based assignment: Student teams (2-3 students per team) will write a literature review on a topic of choice, in consultation with the teacher.

Text books/ Reference books

- Research Methodology for Natural Sciences by Soumitro Banerjee, Publisher: IISc Press (1 January 2022); ISBN-10: 8194835178; ISBN-13: 978-8194835172
- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt. Ltd., New Delhi-110001
- Geode, Millian J.& Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Kothari, C.R.2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.
- Levin R I., Rubin D S. Statistics for Management. Sixth Edition, PHI
- Kapoor & Gupta. Probability & Statistics. S Chand Publishers, New Delhi.
- Montomery, Douglas C.(2007), 5th Ed. Design and Analysis of Experiments, Wiley India.

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- Cooper, Donald R. and Pamels Schindler, Business Research Methods, Tata McGraw Hills, New Delhi
- Krishnaswamy, K.N. Sivakumar. Appa lyer and Mathiranjan M. 2006, Management Research Methodology: Integration of Principles, Methods and Techniques, Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Sachdeva, J.K. 2008. Business Research methodology. Himalaya Publishing House, New Delhi.
- Shekharan, Uma, Business Research Methods, Miley Education, Singapore.
- Zikmund, Millian G., Business Research Methods, Thomson Learning, Bombay.

SEMESTER-VIII

DPSY2801	**DIFFERENTIAL DIAGNOSTIC TECHNIQUES**	**L**	**T**	**P**	**FW/ Proj**	**C**
Version	**2023**	1	1	0	0	2

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Pre-requisites/Exposure	Nil
Co-requisites	Nil

Catalog Description:
This course delves into the essential role of differential diagnostic techniques in psychological assessment. It emphasizes the importance of distinguishing between conditions with overlapping symptoms to arrive at accurate diagnoses. Students will explore a variety of methods including clinical interviews, psychometric testing, behavioural observations, and the integration of collateral information. The course is designed to equip students with the skills needed to systematically and ethically differentiate between potential psychological disorders, ensuring precise and effective treatment planning. Emphasis is placed on the application of scientific principles, understanding cultural contexts, and managing comorbid conditions, making this a comprehensive approach to modern psychological diagnostics.

Course Objectives
The main goal of this course is to provide students with a thorough understanding of differential diagnostic techniques within the context of psychological assessment. The objectives of this course are for students are:

1. To familiarize with the process of diagnosis and differential diagnosis in clinical assessment, including the use of case history, mental status examination, and rationale for psychological testing, as well as ethical considerations in assessment practices.
2. To introduce to assessment tools and techniques for evaluating cognitive functions.
3. To explore tests for differential diagnosis, including Rorschach Psychodiagnostics, tests for thought disorders such as the Color Form Sorting Test and Proverbs Test, and screening instruments like the Minnesota Multiphasic Personality Inventory and GHQ for detecting psychopathology.
4. To discuss tests for adjustment and personality assessment, including questionnaires and inventories such as the 16 Personality Factor Questionnaire, NEO-5 Personality Inventory, Eysenck's Personality Inventory, and self-concept/self-esteem scales, as well as projective tests like the Sentence Completion Test and Thematic Apperception Test.
5. To provide students with practical skills in administering, scoring, and interpreting various assessment tools, and to understand the limitations and strengths of each tool in clinical practice.
6. To emphasize the importance of culturally sensitive assessment practices and the integration of assessment findings into comprehensive clinical reports and treatment planning.

Course Outcomes (COs)
By the end of this course, students will be able to:

1. Articulate the principles and importance of differential diagnosis in psychological assessment.
2. Demonstrate proficiency in using various types of clinical interviews to gather diagnostic information.
3. Select and interpret appropriate psychometric tests to differentiate between similar psychological conditions.
4. Accurately observe and analyse behavioural data to support differential diagnosis.
5. Integrate information from diverse sources, including collateral reports and medical histories, to formulate accurate diagnostic conclusions.
6. Incorporate cultural and contextual factors into the differential diagnostic process to ensure fair and accurate assessments.
7. Identify and manage the presence of comorbid conditions during the diagnostic assessment.
8. Maintain ethical standards in collecting, interpreting, and reporting diagnostic data in psychological assessments.

Course Content:

Modules	Blooms level*	Number of hours

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Module I: Introduction Diagnosis and Differential Diagnosis: Case history; mental status examination; rationale of psychological test; behavioral observation, response recording and syntheses of information from different sources; formats of report writing, context of clinical assessment, types of referrals, ethical practice of assessment, selecting psychological tests.	**L1, L2, L3**	18
Module II: Assessment of Cognitive Functions PGI Memory scale; Bhatia's battery of performance tests of intelligence Binet's test of intelligence, Wechsler adult intelligence scale.	**L1, L2, L3**	18
Module III: Test for Differential Diagnosis Tests for diagnostic clarification: A) Rorschach psychodiagnostics, B) Tests for thought disorders – color form sorting test, object sorting test, proverbs test, C) Minnesota multiphasic personality inventory; Multiphasic questionnaire, clinical analysis questionnaire, IPDE, D) screening instruments such as GHQ, hospital anxiety/depression scale etc. to detect psychopathology.	**L3, L4, L5**	18
Module IV: Tests for Adjustment and Personality Assessment Questionnaires and Inventories – 16 personality factor questionnaire, NEO-5 personality inventory, Eyesenk's personality inventory, self-concept and self esteem scales, Rottor's locus of control scale, Bell's adjustment inventory (students' and adults'), subjective well-being questionnaires, QOL, Projective tests – sentence completion test, picture frustration test, draw-a-person test; TAT – Murray's and Uma Chowdhary's	**L3, L4, L5**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Text & References:

Text:

- Freeman, F.S. (1965). Theory and practice of psychological testing, Oxford and IHBN: New Delhi.
- Bellack, A.S. & Hersen, M (1998): Comprehensive Clinical Psychology: Assessment, Vol. 4. Elsiever Science Ltd.: Great Britain
- Exner, J.E. The Rorschach – A Comprehensive System, Vol. 1, 4th ed., John Wiley and sons: NY.
- Choudhary, U. An Indian modification of the Thematic Apperception Test. Shree Saraswathi Press: Calcutta

References:

- Hersen, M; Segal, D. L; Hilsenroth, M.J. (2004). Comprehensive handbook of psychological assessment, Vol. 1 & 2. John Wiley & Sons: USA
- Murray H.A. (1971): The Thematic Apperception Test manual, Harvard University Press.

DPSY2802	**CLINICAL PSYCHOLOGY PRACTICALS-VIII**	**L**	**T**	**P**	**FW/ Proj**	**C**
Version	**2023**	0	0	4	0	2
Pre-requisites/Exposure	Nil					

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Co-requisites	Nil

Catalog Description
This course prepares students for professional roles in clinical psychology and counselling psychology by equipping them with essential assessment skills. This practical course guides students in the administration, scoring, and interpretation of key psychological assessments. The emphasis is on learning about different personality, intelligence, and neuropsychological assessment tools. Students will gain hands-on experience and develop the necessary skills to apply these tools in clinical settings.

Course Objective:
1. To give practical experience to the students in administering and scoring psychological tests and interpreting the scores.
2. To acquaint the students with the basic procedure and design of psychology experiments.
3. To encourage and guide the students to undertake a small-scale research project.
4. To apply the general concepts of psychology through experimentation and testing

Course Outcomes (COs):
On completion of this course, the students will be able to
- Develop skills in integrating assessment findings into clinical practice.
- Gain an understanding of ethical principles in psychological assessment.
- Administer the different scales to individuals.
- Knowledge of cultural and linguistic considerations in psychological testing.

Comprehend the psychometric properties and clinical applications of the tools

Note: Out of the 6 practicals mentioned below, 5 practicals will be conducted in the eighth semester.

Course Content:

1	Minnesta Multiphasic Personality Inventory (MMPI – 2	Personality
2	Neuropsychological Assessment Battery® (NAB®) Attention Module Kit	Neuropsychological Assessment
3	Reynolds Intellectual Assessment Scales (RIAS)	Intelligence
4	Detroit Tests of Learning Aptitude - Fourth Edition (DTLA-4)	Learning
5	Verbal learning Experiments: Serial Recall vs Parid associate recall	Verbal Learning Experiment
6	Sociometry Experiment	Interpresonal relationship and Group Dynamic

Examination Scheme:

Components	CT	File Demonstration	V	A	EE
Weightage (%)		35	35	5	25

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CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text & References:

- Mohsin, S. M.: Experiments in Psychology. Motilal Banarasidas
- Woodworth, R.S.: Experimental Psychology. Oxford & IBH & Schlosberg, H. Publishing
- Postman, L. & Egan, J. P.: Experimental Psychology: An Introduction. Harper and Row

DPSY2803	**REHABILITATION PSYCHOLOGY**	**L**	**T**	**P**	**FW/ Proj**	**C**
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					

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Co-requisites	Nil

Catalog Description

Rehabilitation Psychology offers an in-depth exploration of the psychological principles, theories, and practices involved in assisting individuals with disabilities or chronic health conditions to achieve optimal functioning and well-being. This course examines the biopsychosocial aspects of disability, including the impact of physical, cognitive, emotional, and environmental factors on individuals' functioning and quality of life. Topics may include adjustment to disability, coping strategies, resilience, self-management skills, psychosocial interventions, and advocacy for disability rights. Through case studies, experiential learning activities, and discussions, students gain insight into the challenges faced by individuals with disabilities and develop the knowledge and skills necessary to support their rehabilitation and integration into society.

Course Objectives:

- To provide an in-depth understanding of the profession of Rehabilitation Psychology and its practices.
- To familiarize students with the history, growth, and scope of rehabilitation psychology, as well as various areas of specialization within the field. Additionally, the course seeks to equip students with the necessary knowledge and skills to assess impairments, disabilities, and handicaps, along with conducting evaluations of cognition, aptitudes, psychopathology, work/vocational abilities, and daily functioning.
- To introduce students to theoretical frameworks in health behavior and rehabilitation, including theories of health behavior change and intervention strategies for individuals and families affected by disabilities.
- To explore the dynamics of family reactions to disabilities, coping styles, and the role of family counseling, as well as coordination within multidisciplinary teams. It delves into the principles and practices of Community-Based Rehabilitation (CBR).
- To address ethical and policy issues pertinent to rehabilitation psychology, including rehabilitation ethics, relevant policies and acts.

Course Outcome:

By the end of this course, students should be able to:

1. Demonstrate a comprehensive understanding of the profession of Rehabilitation Psychology, including its history, growth, and scope.
2. Apply knowledge of assessment techniques to evaluate impairments, disabilities, and handicaps, as well as cognitive, vocational, and daily functioning abilities.
3. Analyze and apply theoretical frameworks in health behavior and rehabilitation to develop effective intervention strategies for individuals and families affected by disabilities.
4. Utilize behavior modification and cognitive therapies in rehabilitation contexts to facilitate positive outcomes for clients.
5. Understand and address the dynamics of family reactions to disabilities, employing appropriate coping strategies and family counseling techniques.
6. Collaborate effectively within multidisciplinary teams to provide holistic rehabilitation services.
7. Implement principles of Community-Based Rehabilitation (CBR) to promote inclusion and empowerment within communities.
8. Demonstrate awareness of ethical considerations and policies relevant to rehabilitation psychology practice, ensuring adherence to professional standards and regulations.

Course Content:

Modules	**Blooms level***	**Number of hours**
Module I: Introduction Overview of the profession of Rehabilitation Psychology and practice History, growth and scope	**L1, L2, L3**	18

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Areas of Specialization Role of Psychologist in Rehabilitation		
Module II: Basic Concepts & Assessment Impairment, Disability and Handicap Types of Impairments Assessment of Cognition, aptitudes, psychopathology, work/vocational and daily functioning Neuropsychological assessment	**L1, L2, L3**	18
Module III: Theoretical Framework Health behavior: Theories of health behavior change, interventions strategies for individuals and families of disabled Behavior Modification and Cognitive Therapies in Rehabilitation	**L3, L4, L5**	18
Module IV: Dealing with Families- Family's reactions to disabilities, coping styles, family counseling, Coordination with Multidisciplinary team	**L3, L4, L5**	18
Module V: Community Based Rehabilitation – Goals of CBR, components of CBR, Role of Professionals, role of Community, Ethical Issues	**L3, L4, L5, L6**	18
Module VI: Ethics & Policy Issues Rehabilitation Ethics Rehabilitation Policies & Acts (Persons with Disabilities Act, The National trust Act, Mental Health Care Act, Rehabilitation Council of India Act, UNCRPD) Social Benefits and Support from Government of India		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text & References:

Text:

- NIMH (1989) Mental Retardation : A Manual for Psychologist, Secundrabad
- Mohapatra C.S. (2004) Disability Management, NIMH, Secundrabad
- Robert G. Frank Timothy R.Elliott (2000). Handbook of Rehabilitation Psychology, APA Washington.
- Michael Brnes Anthony Ward (2009) Oxford Handbook of Rehabilitation Medicine

References:

- Peshawaria R. and Venkatesan (1992) Behavioural Approach in Teaching Mentally Retarded Children, NIMH, Secundrabad
- WHO (2004) Community Based Rehabilitation
- Tally A.B, Sivaraman K.P and Murali T(1998) Neurorehabilitaion Principles &practice, NIMHANS Bangalore India
- ASCA (2003). The ASCA national model: a framework for school counseling programs

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- TSCA (2004). Pre-K-12th grade program development guide.
- Mahoney, M. J., & Avener, M. (1977). Psychology of the elite athlete: An exploratory study. Cognitive Therapy and Research, 1(2), 135-141.
- Brewer, B. W., Van Raalte, J. L., & Linder, D. E. (1993). Athletes' use of imagery in the rehabilitation process. Journal of Sport Rehabilitation, 2(3), 209-218.
- Treasure, D. C., & Roberts, G. C. (1998). Applications of achievement goal theory to physical education: Implications for enhancing motivation. Quest, 50(3), 290-306
- Van Raalte, J. L., Cornelius, A. E., Linder, D. E., & Brewer, B. W. (2015). The relationship between imagery function and imagery use among college athletes. Journal of Applied Sport Psychology, 27(2), 176-186.

DPSY2804	**NEURODEVELOPMENTAL DISABILITIES**	**L**	**T**	**P**	**FW/ Proj**	**C**
Version	**2023**	3	1	0	0	4

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Pre-requisites/Exposure	Nil
Co-requisites	Nil

Catalog Description

Neurodevelopmental Disabilities offers an in-depth understanding of various neurodevelopmental conditions such as autism spectrum disorders, intellectual disabilities, and attention-deficit/hyperactivity disorder. The course provides comprehensive insights into the epidemiology, clinical features, diagnostic criteria, and interventions associated with these disabilities. Students will explore the complexities of these conditions, enhancing their ability to diagnose and treat individuals with neurodevelopmental disabilities, and develop a nuanced understanding of the challenges and support systems needed for effective management.

Course Objectives

The objective of this course is to provide a comprehensive understanding of neurodevelopmental disabilities, encompassing various conditions such as autism spectrum disorders, intellectual disabilities, and attention-deficit/hyperactivity disorder. Through in-depth study and analysis, students will explore the underlying causes, diagnostic criteria, and interventions associated with these disabilities.

Course Outcomes (COs):

On completion of this course, the students will be able to

1. Gain knowledge about various neurodevelopmental disabilities, including intellectual disabilities, learning disabilities, autism spectrum disorders, communication disorders, cerebral palsy, and myelomeningocele.
2. Understand the definitions, clinical features, diagnostic criteria, and treatment options for conditions within the autism spectrum, such as Autistic Disorder, Asperger's Disorder, Childhood Disintegrative Disorder, and Rett's Syndrome.
3. Learn about the definition, clinical features, comorbidities, and treatment of Attention Deficit and Hyperactivity Disorder (ADHD).
4. Understand the definitions, types, diagnostic criteria, comorbidities, and treatment strategies for various learning disabilities.
5. Gain insights into the definitions, clinical features, diagnostic methods, and treatment options for intellectual disabilities, and understand their impact on individuals and families.

Course Content:

Modules	**Blooms level***	**Number of hours**
Module 1: Neurodevelopmental Disabilities: Introduction and Epidemiology Introduction: Intellectual disability, Learning Disabilities, Autism Spectrum Disorders, Communication Disorders, Cerebral Palsy and Myelomeningocele. Dual Diagnosis	**L1, L2, L3**	18
Module 2: Autism Spectrum Disorders Introduction: Definition, Autistic Disorder, Asperger`s Disorder, Childhood Disintegrative Disorder and Rett`s Syndrome. Clinical Features. Diagnosis and Treatment	**L1, L2, L3**	18
Module 3: Attention Deficit and Hyperactive Disorder Introduction: Definition, Clinical features, ADHD and comorbidities, Treatment	**L3, L4, L5**	18
Module 4: Learning Disabilities Definition of learning Disabilities, Types of Learning Disabilities, Diagnosis, comorbidity, and Treatment	**L3, L4, L5**	18

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Module 5: Intellectual Disability Definition, Clinical Features, Diagnosis and Treatment.	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text

1. Patel, D. R., Greydanus, D. E., Merrick, J., & Omar, H. A. (Eds.). (2011). *Neurodevelopmental disabilities: clinical care for children and young adults*. Springer Science+ Business Media BV.
2. Vargo, F. E. (2015). *Neurodevelopmental disorders: A definitive guide for educators*. WW Norton & Company.
3. Tager-Flusberg, H. (Ed.). (1999). *Neurodevelopmental disorders*. MIT press.
4. D'Souza, H., & Karmiloff-Smith, A. (2017). Neurodevelopmental disorders. *Wiley Interdisciplinary Reviews: Cognitive Science*, *8*(1-2), e1398.

References

1. Farran, E. K., & Karmiloff-Smith, A. (Eds.). (2011). *Neurodevelopmental disorders across the lifespan: A neuroconstructivist approach*. OUP Oxford.
2. Hagerman, R. J. (1999). *Neurodevelopmental disorders: Diagnosis and treatment*. Oxford University Press.

DPSY2805	**CHILDHOOD PATHOLOGY & EXCEPTIONAL CHILDREN**	**L**	**T**	**P**	**FW/ Proj**	**C**

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Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course focuses on the psychological assessment of childhood pathology and the identification of exceptional children. It explores the developmental, behavioral, and emotional challenges that can affect children, as well as the characteristics and needs of children who are considered exceptional due to giftedness or disabilities. The course provides a comprehensive overview of the tools and techniques used to assess and diagnose various childhood disorders and exceptionalities. Students will learn to apply evidence-based approaches to assess childhood pathology, differentiate between typical and atypical development, and support children with special needs in educational and therapeutic settings. Emphasis is placed on integrating developmental theories, understanding the role of family and culture, and applying ethical practices in assessment.

Course Objectives

This course is designed to introduce students to various behavioural, intellectual, developmental, learning & mood disorders prominent among children. The course will give students detailed overview of the diagnostic criteria and etiology of these disorders amongst children along with psychotherapy and educational means of intervention for their training and counselling. Also, the course will provide students an opportunity to understand important concepts like neurodivergence, inclusive education and giftedness.

Course Outcomes (COs):

On completion of this course, the students will be able to

1. Gain a foundational understanding of normal and abnormal psychological development in children.
2. Learn to recognize and assess children with exceptional needs, including those who are gifted or have disabilities.
3. Become proficient in selecting and applying various psychological assessments tailored to children.
4. Develop skills in assessing developmental delays, learning disabilities, and behavioural disorders.
5. Apply developmental theories and models to understand and assess childhood pathology.
6. Understand the impact of family dynamics, cultural context, and environmental factors on child development and behaviour.
7. Adhere to ethical guidelines and standards when assessing and working with children and families.

Course Content:

Modules	**Blooms level***	**Number of hours**
Module I: Introduction to Childhood psychopathology Classification of Childhood Pathology: Physiological & Psychological Meaning definition and goals of Childhood psychopathology Role of family & societal influences Neurodivergent children: Definition, classification of Children with special needs & Exceptional Children Definition, classification	**L1, L2, L3**	18
Module II: High Incidence & Low Incidence Disorders in children & adolescents Diagnosis, causes and remedial interventions for: conduct disorders, ADHD, Depression, anxiety disorders Diagnosis, causes and remediation interventions for: eating disorders, bipolar disorders, school refusal, post-traumatic stress disorders	**L1, L2, L3**	18

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Module III: Developmental Disorders, Learning Disorders, Gifted children Diagnosis, causes and remedial interventions for: Intellectual Developmental Disabilities Autism Spectrum Disorder Specific Learning Disability Dyspraxia Gifted children Children with comorbidities	**L3, L4, L5**	18
Module IV: Global & National Legal Frameworks & Provisions for children with special needs Legislation & litigation concerning the Education of Special Children Disability Act, 1995 An overview of different organizations working for exceptional & differently abled children Contemporary national and global measures for protection of rights of differently abled & exceptional children	**L3, L4, L5**	18
Module V: Interventions for the gifted and children with special needs Conceptual understanding of Mainstreaming, Integration, Inclusion, Special Education Services Approaches for Gifted Children: Differentiated curriculum & Acceleration approaches (Advanced placement, Ability grouping & Individualized instruction) Therapies: Art, Play, Mindfulness, CBT and other forms of therapies.	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text & References:

- Davis, A., Gant, J., Moore, A., Westrich-Wood, N., Belcher, M., Ciucci, A. C., ... & Councill, T. (2021). *Pediatric Medical Art Therapy*. Jessica Kingsley Publishers.
- Dash, M. (2007). *Education of exceptional children*. Atlantic Publishers & Dist.
- Mash, E. J., & Wolfe, D. A. (2012). Disorders of childhood and adolescence. *Handbook of Psychology, Second Edition*, *8*.
- Panda, K. C. (1999). *Education of exceptional children.* Vikas Publishing House.
- Schneider, B. H. (2014). *Child psychopathology: From infancy to adolescence*. Cambridge University Press.
- VanFleet, R., Sywulak, A. E., & Sniscak, C. C. (2011). *Child-centered play therapy*. Guilford Press.

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References:

- American Psychiatric Association, D. S. M. T. F., & American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders: DSM-5* (Vol. 5, No. 5). Washington, DC: American Psychiatric Association..
- Mash, E.J., & Wolfe, D.A. (2016). *Abnormal Child Psychology (6th Edition).* Belmont,
- CA: Wadsworth, Cengage Learning. ISBN #978-1-305-10542-3.
- Vaidyanathan, P.V. (2010). Managing the Unmanageable Child. Peacock Books.
- Sullivan, B. (2003). Casebook in Child Behavior Disorders , By CA Kearney,(2003). Belmont, CA: Wadsworth/Thompson. 241pp ISBN 0-534-51249-6. *Journal of Psychologists and Counsellors in Schools*, *13*(2), 227-228.

DPSY2806	**ACADEMIC-WRITINGS AND RESEARCH SKILLS**	**L**	**T**	**P**	**FW/ Proj**	**C**
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

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This course provides a comprehensive guide to academic writing and research skills specifically tailored for students in psychological assessment. It covers the fundamentals of scholarly writing, including the development of clear and concise arguments, proper citation practices, and the structure of research papers. Additionally, the course delves into research methodologies, from designing and conducting studies to analysing and interpreting data. Emphasis is placed on fostering critical thinking, enhancing information literacy, and adhering to ethical standards in both writing and research. Students will learn to synthesize research findings, present their ideas effectively, and contribute to the field of psychology through well-crafted academic work.

Course Objectives

This course will introduce students to the domain of academic writing andits intricacies. The course seeks to impart knowledge about the styles of writing used in the current academic scenario. The course also familiarizes students with different types of academic writing and the latest APA manual.

The following are specific course objectives:

1.To identify different types of scientific articles from journal.

2.To know the appropriate style of scientific writing tocommunicate a topic or a finding effectively.

3.To present scientific findings in APA format and to follow APAguidelines in academic writing.

4.To understand the need to follow ethical standards in academic writing and to avoid practices such as plagiarism.

5. To learn ethical issues in using AI for research

Course Outcomes (COs):

On completion of this course, the students will be able to

1. Gain a solid understanding of the conventions and styles of academic writing in psychology.
2. Learn to construct clear, coherent, and well-organized academic papers and reports.
3. Become proficient in using various citation styles (e.g., APA, MLA) and managing references effectively.
4. Develop skills to search for, evaluate, and synthesize scholarly literature in psychology.
5. Learn to design methodologically sound research studies, including formulating research questions, hypotheses, and selecting appropriate methodologies.
6. Gain competence in statistical analysis and interpretation of research data.
7. Understand and adhere to ethical guidelines in conducting and reporting research.
8. Cultivate the ability to critically evaluate research findings and theoretical perspectives.
9. Learn to effectively present research findings through written reports, presentations, and publications.

Course Content:

Modules	Blooms level*	Number of hours
Module – I: Introduction to Academic Writing A framework of the state of academic writing today and its significance; Distinct methods and procedures of academic writing for research synopsis and research publication	**L1, L2, L3**	18
Module- II: Rules and Guidelines in Academic Writing An overview of style and formatting using the American Psychological Association's (7th) criteria particular rules for references, index citations, and academic paper structure.	**L1, L2, L3**	18

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Module- III: Forms of Academic Writing Abstract writing; Review of literature; Scientific poster/paper presentations; Book review; Tables and graphs in academic papers.	**L3, L4, L5**	18
Module- IV: Plagiarism and Its Types Plagiarism: Introduction of plagiarism, Types of plagiarism, Tools to check plagiarism, Ethics in research regarding plagiarism	**L3, L4, L5**	18
Module- V: Experiential Learning and Assessment Strategies- Understanding of Online search engines and generating self profiles in search engines; Assignment on review of literature on styles and formats.	**L3, L4, L5, L6**	18
Module- VI: Classroom Assignment and Assessment Classroom writing assignments on Review of Literature and paper /poster presentation and research paper writing, Using Chat GPT and generating the AI ethically. Individual/Group presentations on forms and issues in academic writing.		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Suggested Readings

- American Psychological Association. (2020). *Publication manual of the American Psychological Association* (7th ed.). Washington, DC: American Psychological Association.
- Harris, Robert (2001) The Plagiarism Handbook: Strategies for Preventing,
- Detecting and Dealing With Plagiarism, Routledge Publications.

DPSY2839	**DATA ANALYSIS & VISUALISATION USING SOFTWARE**	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	Class X Mathematics				
Co-requisites					

Catalog Description

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The implosion of available data has made visualization more critical but also more challenging. Data analysis and Data Visualization are essential tools for business analysis, engineers, policymakers, and decision-makers. Developed originally for "small data", visualization techniques have been met with varied success in the past centuries and decades. There are a few well-known visualizations that are very effective in capturing the essence of the data, and of course, there are many infamous negative examples of poor visuals. An effective visual is critical for decision making it, but it also requires a lot of work, customization, attention to detail, and refinements.

Course Objectives

The course is designed to help students develop skills and knowledge in the following area(s):

- Develop an understanding of what is a good visualization for a given purpose
- Learn visualization theory & techniques
- Build a substantial data analytic project
- Apply data analysis and visualization with Excel, SPSS, R, Python, NVivo and MATLAB

Course Outcomes

On completion of this course, the students will be able to

CO1. Students will be able to articulate meaningful lines of inquiry that might be explored through the collection, organization, visualization, and analysis of data in a context associated with their primary field of study using (as appropriate) numerical, textual, spatial, and/ or visual data.

CO2. Student will understand what data are, how they are collected, and how to assess the quality/ reliability of data.

CO3. Students will demonstrate intermediate proficiency in the visualization of data to communicate information and patterns that exist in the data.

CO4: Students will be able to use at beginning level of proficiency the tools of statistics and machine learning to ask questions of and explore patterns in data.

Course Content :

Module	Topics Covered	Blooms Level	Contact Hours
1	**Module-1: Introduction to Excel** Data Analysis using Excel, Curve fitting, Correlation, Linear Regression, Multiple regression, Principal Component Analysis and Factor Analysis, Hypothesis testing **Introduction to Excel and SPSS** Introduction to SPSS and Types of Data, Importing, exporting and data handling in SPSS; Exploratory data analysis using SPSS and data visualization; Introduction to statistical inference and various univariate tests by using SPSS; Analysis of Variance (One Way ANOVA, Two Way ANOVA and ANCOVA); Correlation, Simple and Multiple linear Regression Analysis; Principal Component Analysis and Factor Analysis	L1, L2, L3, L4	20 hours
2	**Module-2: VOS Viewer** **Web of Science, Scopus, Dimensions, Lens, and PubMed.** Co-authorship networks, citation-based networks, and co-occurrence networks can be created based on data downloaded from Web of Science, Scopus, Dimensions, and Lens. Co-authorship	L1, L2, L3, L4	10 Hours

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	networks and co-occurrence networks can also be created based on PubMed data. **Crossref, Europe PMC, and OpenAlex**. Networks can also be created based on data retrieved through the APIs of Crossref, Europe PMC, and OpenAlex, These APIs can be queried interactively in VOS viewer. **Semantic Scholar, Open Citations, and Wiki Data.** For a given set of DOIs, networks can also be created based on data retrieved through the APIs of Semantic Scholar, Open Citations and Wiki Data.		
3	**Faculty of Management Studies & Behavioural Sciences** **Module 3: Domain Specific Software** **- Structural Equation Modelling** **Smart PLS** Introduction to Structural Equation Modelling (SEM), Introduction to the software's AMOS and SPSS, SMART PLS, Testing of Statistical assumptions, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), common method bias (CMB) test, Measurement Model Assessment, Discussing Fit Indices, Reliability and Validity Testing, Structural Model Assessment identifying multivariate outlier, Construct Validity: Convergent and Discriminant Validity, Measurement Model & Structural Equation Modelling, Mediation and Moderation Effects, Multi-Group Analysis.	L1, L2, L3, L4	30 Hours
	Faculty of Arts **N Vivo** 1. Import text, audio, video, emails, images, spreadsheets, online surveys, web content, and social media from various sources into a simple, intuitive interface. 2. Create and NVivo project, import and organise qualitative and quantitative data 3.Manage a literature review in NVivo 4. Autocode structured data deductively and identify themes inductively 5. Generate and falsify hypotheses 6. Combine data in sets for analysis 7. Seek patterns and identify relationships across codes and cases 8. Present findings using visualisations 9. Export data out of NVivo 10. Coordinate teamwork.		

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	Faculty of Science Engineering and Technology **Faculty of Health & Allied Sciences** **R programming / Python/ MATLAB** **R Programming-** Introduction to R, Variables and datatypes in R, Dataframes, Recasting and joining of dataframes, Arithmetic, logical and matrix operations in R, Functions in R, Control structure in R, Data visualization in R. **Python Programming-** Basics of programming, data structure and algorithm using Python, Strings, lists, control, functions, manipulating lists, loops, arrays, selection sort, insertion sort, recursion, sorting, dictionaries, exception handling, file handling, string processing, data analysis using Python **MATLAB Programming-** Introduction, basic features, managing workspace, mathematical functions, basic plotting, Matrices, array operations and linear equations, MATLAB programming- M files script, M-file functions, control flow and operations.		

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional (Theory/ Practical)	End Term Examination
Weightage (%)	5	10	15	70

References:

- David Houcque, 2005. Introduction to MATLAB programming for Engineering students., Northwestern University, E- Book **https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf**
- Mark Lutz, 2009. Learning Python. O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.
- Emmanuel Paradis, 2005. R for Beginners. E book. **https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf**
- A Handbook of Statistical Analysis using SPSS by Dr. Brijesh Awasthi, Redshine Publication.

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Curriculum & Scheme of Examination

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Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology
SEMESTER-I

DPSY2151	INTRODUCTION TO PSYCHOLOGY	L	T	P	FW/ Proj	C
Version	2023	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course introduces the basics of psychology, covering its main theories, important terms, methods, and fields. It looks at the history of psychology from both Western and Indian perspectives, highlighting important contributions from different cultures and people therein. Students will learn about various schools of thought like Structuralism, Functionalism, Behaviorism, Gestaltism, Psychoanalysis, Humanism, Existentialism, and Cognitive Psychology. The course also explores different methods used in psychology, such as introspection, observation, experiments, interviews, questionnaires, and surveys. Additionally, it discusses key concepts and theories of learning, including Classical Conditioning, Operant Conditioning, and Insight Learning, as well as the idea of transfer of training. This course sets the stage for further study in psychology.

Course Objectives

This course is designed to introduce the science of psychology. It identifies and defines the theories, terms, methods, and various fields of psychology. This course can be used as a foundation towards continued education in more specific areas of psychology. General Psychology encourages students to study in depth the notions of modern scientific psychology. Upon completion of this course, student should have the following objectives:

- To know the major personalities important to the field of general psychology and the ideas, theories, and schools with which they are associated.
- To know the major terms associated with general psychology and their meanings.
- To know the major concepts associated with the area of general psychology.

Course Outcomes (COs):

On completion of this course, the students will be able to

1. learn the main theories, concepts, and schools of thought in psychology, including both Western and Indian perspectives.
2. Identify important personalities in psychology and understand their ideas and theories.
3. Know how to use different psychological methods like introspection, observation, experiments, interviews, questionnaires, and surveys.
4. learn about various types of learning and key theories such as Classical Conditioning, Operant Conditioning, and Insight Learning.
5. Understand the concept of transfer of training, including its types and related theories.

Course Content:

Modules	Blooms level*	Number of hours

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Module 1 Historical background of psychology in Indian perspective: Bhagwat Geeta, Bhuddiam, Sufism, and Integral Yoga Emergence of Indian Psychology in Academia	**L1, L2, L3**	18
Module 2 Meaning, Definition, Nature and Goals of Psychology Psychology as Science	**L1, L2, L3**	18
Module 3 Background of Psychology from Western perspective Schools of Psychology: Structuralism, Functionalism, Behaviorism, Gestaltism, Psychoanalysis, Humanism, Existentialism, Cognitive	**L3, L4, L5**	18
Module 4 Methods of Psychology: Introspection, Observation, Experimental, Interview, Questionnaire, Survey	**L3, L4, L5**	18
Module 5 Meaning, Nature and Types of learning (Verbal, Motor, Concept etc) Theories of Learning –Trial and Error Theory, Classical Conditioning Theory, Operant / Instrumental Conditioning, Insight Learning Theory Transfer of Training: Meaning, Types and Theories of Transfer of Training	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text & References:

Text:

- Morgan & King : Introduction to Psychology. Tata McGraw Hill Publishing Company Limited, N. Delhi
- Munn, N.L.: Psychology. Oxford & IBH Publishing Co Pvt. Ltd, N. Delhi
- Hilgard & Atkinson: Introduction to Psychology, 6th Ed. New Delhi: Oxford & IBH Publishing Co
- Sdorow: Psychology. 3rd Edition Broalu & Benewmark Publishers Guilford, J. P.: General Psychology. New York: D. Van Nostrand
- Mohsin, S.M.: Elementary Psychology. Motilal Banarasidas.
- Mishra, B. K.: Psychology. PHI Learning Pvt. Ltd
- Morris, C. G. & Maisto, A. A.: Psychology: An Introduction. (12thed.).Upper Saddle River, NJ: Prentice Hall.
- Leahy, T. H., (1991): A History of Modern Psychology; New York: Prentice Hall
- Wolman, B. B. (1979): Contemporary Theories and Systems in Psychology; London: Freeman Book Company
- Chaplin, J. P. & Krawice, T. S. (1979): Systems and Theories in Psychology; New York: Holt Rinechart & Winston
- Mar, M. H. & Hillix, W. A. (1986): Systems and Theories in Psychology; New York: McGraw Hill

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References:

- Atkinson & Hilgard: Psychology: An Introduction. Cengage Learning EMEA
- Kosslyn & Rosenberg : Psychology (3rd ed.). Allyn & Bacon

Lahey, B. B. & Majors, M.: Psychology: An Introduction. Tata McGraw Hill

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DPSY2101	EXPERIMENTAL PSYCHOLOGY	L	T	P	FW/ Proj	C
Version	**2023**	2	1	0	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course provides an in-depth understanding of the scientific methods used in experimental psychology. Students will explore the history and steps of the experimental method, basic concepts of psychophysics, and sensory processes, including the structure and function of sensory organs. The course covers perceptual processes, focusing on how we perceive space, depth, and distance, and examines perceptual illusions. It also addresses the nature and theories of emotions and motivation. By the end of the course, students will be prepared for advanced studies in experimental psychology.

Course Objectives

The basic general objective of Experimental Psychology is to familiarize the student with a basic and broad understanding of the scientific method and its application to the problems of Psychology. The course focuses on the logic, principles and practices of modern science and how it is applied to understanding the nature of reality. Successful completion of this course will prepare the student for graduate work and advanced experimental concepts.

Course Outcomes (COs):

On completion of this course, the students will be able to

- learn the meaning, history, and steps of the experimental method, including psychophysics and threshold determination.
- Understand the types of senses and their functioning, such as vision, hearing, smell, taste, touch, temperature, pain, kinesthetic, and vestibular senses.
- Grasp the nature of perception, principles of perceptual organization, and concepts like space, depth, distance perception, and perceptual constancy, including illusions, delusions, and hallucinations.
- Learn about the nature and characteristics of emotions, bodily and physiological changes, and key theories of emotion.
- Understand the nature of motivation, motivational cycles, types of needs, drives, and incentives, and major theories of motivation.

Course Content:

Modules	Blooms level*	Number of hours
Module I Meaning and History of Experimental Psychology Steps of Experimental method Psychophysics: Basic Concepts, Stimulus and Differential Threshold Determination of Thresholds: Method of Limits, Method of Average Error, Method of Constant Stimuli	**L1, L2, L3**	18

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Module II Sensory Process: Meaning and Types of Senses, Sensation and Sensitivity Visual Sense- Structure and Functioning of Eye Hearing Sense- Structure and Functioning of Ear Chemical Senses- Sense of Smell and Sense of Taste Skin Senses- Sense of Touch or Pressure, Sense of Temperature and Pain Body Senses- Kinesthetic Sense and Vestibular Sense	**L1, L2, L3**	18
Module III Perceptual Process: Meaning and Nature of Perception Principal of Perceptual organization Perception of Space, Depth–Visual Monocular Cues and Binocular Cues, Perception of Distance and Perceptual constancy Perceptual Illusions; Delusions and Hallucinations	**L3, L4, L5**	18
Module IV Meaning, Nature and Characteristics of Emotions Aspect of Emotions- Bodily and Physiological Changes Theories of Emotion: James-Lange Theory, Cannon-Bard Theory, Schachter and Singer's Cognitive Theory, Lindsey's Activation Theory.	**L3, L4, L5**	18
Module V Meaning, Definition and Nature of Motivation, Motivational Cycle Needs– Biological and Psychosocial, Drive and Incentive Classification of Motives– Biogenic and Psycho-social Motives Theories of Motivation–Need and Drive Reduction Theory, Instinctive Theory, Social-Urges Theory, Self- Actualization Theory.	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

Text:

- Morgan & King : Introduction to Psychology. Tata McGraw Hill Publishing Company Limited, N. Delhi
- Myers, A. & Wadsworth Hansen, C. H. : Experimental Psychology (6thed.).
- Mishra, B. K.: Psychology. PHI Learning Pvt. Ltd
- Postman, L. & Egan, J. P.: Experimental Psychology: An Introduction
- Munn, N.: Psychology. Oxford & IBH Publishing Co Pvt. Ltd, New Delhi
- Hilgard & Atkinson: Introduction to Psychology, 6th Ed. New Delhi: Oxford & IBH Publishing Co. Sdorow: Psychology. 3rd Edition Broalu & Benewmark Publishers
- D'Amoto, M, R: Experimental Psychology: Methodology Psycho- Physics and Learning.

TMH Ed. Tata McGraw Hill Publishing Company Limited, New Delhi.

References:

- Sharma, R. N. & Sharma, R.: Experimental Psychology. Atlantic
- Sharan, A. K.: Experimental Psychology. Anmol Publication
- Kantowitz: Experimental Psychology. USA: Wadsworth Cengage Learning

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DPSY2103	PRACTICALS-I	L	T	P	FW/ Proj	C
Version	**2023**	0	0	2	0	1
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course provides an overview of various psychological assessments and perceptual phenomena commonly encountered in psychological research and clinical practice. They will gain hands-on experience in using psychological tests, conducting experiments, and analysing data. They will also get a chance to explore different areas of psychology through practical activities. Students will explore a range of assessment tools and perceptual illusions, including the Muller-Lyer illusion, General Health Questionnaire, Emotional Maturity Scale, Peer Pressure Scale, Depth Perception assessments, and Mirror Drawing tasks. Through lectures, discussions, and hands-on activities, students will gain insight into the theoretical underpinnings, administration, interpretation, and practical applications of these assessments and perceptual phenomena. Emphasis will be placed on understanding the psychometric properties of assessment tools, as well as the implications of perceptual illusions for our understanding of human perception and cognition. This course aims to equip students with foundational knowledge and practical skills necessary for conducting psychological assessments and investigating perceptual processes in research and clinical settings.

Course Objectives

- To give practical experience to the students in administering and scoring psychological tests and interpreting the scores.
- To acquaint the students with the basic procedure and design of psychology experiments.
- To familiarize the students with the use of elementary statistical techniques.
- To encourage and guide the students to undertake a small-scale research project.

Course Outcome:

On completion of this course, the student will be able to

1. Learn how to give psychological tests to assess people's thoughts, feelings, and behaviour. They will also understand how to score these tests and interpret the results.
2. Understand the basics of designing psychology experiments. They will learn how to set up experiments and follow the right procedures.
3. Learn elementary statistical techniques to analyze data collected during experiments and tests.
4. Undertake their own small research projects. This will help them develop their research skills and explore topics of interest in psychology.

Note: Total of 6 practicals will be conducted in the first semester among the list of following practicals out of which the first three practicals are compulsory.

Course Content:

1.	Muller Lyre Illusion	Perception Illusion
2.	General Health Questionnaire	Psychiatric Disorder
3.	Emotional Maturity Scale	Emotional Intelligence

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4.	Peer Pressure Scale	Peer Pressure
5.	Depth perception	Perception
6.	Mirror Drawing	Motor Learning

Examination Scheme:

Components	CT	File Demonstration	V	A	EE
Weightage (%)		35	35	5	25

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text & References:

- ***Text:*** Mohsin, S. M .: Experiments in Psychology. Motilal Banarasidas
- Woodworth, R. S.: Experimental Psychology. Oxford & IBH & Schlosberg, H Publishing
- Postman; L & Egan, J.P.: Experimental Psychology: An Introduction. Harper and Row Humanities/Social Sciences/Lingua

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SEMESTER-II

DPSY2251	SOCIAL PSYCHOLOGY	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course offers a comprehensive introduction to the field of social psychology, examining how individuals' behaviors, thoughts, and feelings are shaped by social influences. It integrates empirical research, and real-world applications to explore the dynamics of human interaction and social influence.

Course Objectives:

- Understand and critically evaluate key theories and concepts in social psychology.
- Develop insights into how social factors influence individual behavior and mental processes.
- Apply social psychological principles to real-world issues and personal experiences.
- Conduct and analyze research in social psychology.
- Enhance skills in critical thinking, communication, and collaboration.

Course Outcomes:

By the end of this course, students will be able to:

- Articulate and summarize major theories and foundational concepts in social psychology, such as social cognition, social influence, and group dynamics.
- Understand the historical development and the evolution of social psychological thought.
- Apply social psychological theories to explain social behaviors and events in real-world contexts. Identify and analyze the cognitive and social factors that influence individual and group behavior in various situations.
- Utilize social psychological principles to develop strategies and interventions for reducing prejudice, discrimination, and intergroup conflict.
- Implement social psychological insights in everyday life and professional settings, such as in understanding and improving interpersonal relationships, workplace dynamics, and community interactions.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to Social Psychology Social Psychology: Meaning and Nature, Origin and Development. Methods and their Application: Experimental Method, Observation Method, Correlational Method, Interview and Questionnaire, Sociometry, Ethical Issues in Social Psychology Research	**L1, L2, L3**	18

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Module II: Social Perception Social Perception: Communication, Attribution, Interpersonal Attraction, Impression Formation and Management, Group: Types, Dynamics and Norms. Social Identity, Crowd Behaviour.	**L1, L2, L3**	18
Module III: Prejudice and Stereotyping Nature and components of prejudice, Acquisition of prejudice, Reduction of prejudice Stereotyping and its impacts on individuals, families and community, Strategies to reduce prejudice and Stereotypy	**L3, L4, L5**	18
Module IV: Groups and Prosocial Behaviour Attitude: Nature, Formation, Maintenance and theories of Change (Heider and Festinger), Social Influence: Conformity, Compliance, and Obedience, Stereotyping, Prejudice, and Discrimination: Causes and Effects.	**L3, L4, L5**	18
Module V: Interpersonal Attraction Concept and meaning of interpersonal attraction, Factors affecting interpersonal attraction, Theories of interpersonal attraction: Reinforcement Theory, Complementary Theory, Exchange Theory, Balance Theories, Equity Theory	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Myers, D. G.: Social Psychology (10th Ed). New York: McGraw Hill.
- Baron, R. A., & Byrne, D. (2004). Social Psychology. Singapore: Pearson Education
- Baron, R. A., Byrne, D., & Johnson, B. T. (1998). Exploring Social Psychology. USA: Allyn andBacon.
- Fiske, S. T., Gilbert, D. T., & Lindzey, G. (Eds.). (2010). Handbook of Social Psychology. (Vol. 1 & 2). John Wiley and Sons.
- Myers, D. G., Sahajpal, P., & Behera, P. (2012). Social Psychology. New Delhi: Tata McGraw-Hill.
- Taylor, S. E., Peplau, L. A., & Sears, D. O. (2006). Social psychology. New Jersey: Pearson Prentice Hall.

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DPSY2201	ELEMENTARY STATISTICS	L	T	P	FW/ Proj	C
Version	**2023**	2	1	0	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description:
This course introduces the fundamental concepts and methods of Statistics as applied in behavioral science. Students will learn to quantify psychological data and understand and apply elementary statistical principles. The course emphasizes the logic of statistical reasoning and the practical application of statistical techniques to psychological research. Mastering these skills will prepare students to critically evaluate research findings and succeed in more advanced Psychology courses.

Course Objectives:
The paper on statistics introduces the quantification of psychological data and gives the students a primary research orientation. Understanding statistics and the basic logic of statistics is crucial to reading psychology research articles. Further, by mastering the basic logic and ways of thinking about Statistics, students will be unusually well prepared for the advanced courses. Below are the objectives of studying this paper on Psychology:

1. Understand how to accurately measure and quantify various psychological phenomena and data.
2. Gain primary research skills and orientation essential for conducting psychological research.
3. Develop a solid understanding of the basic logic and principles of Statistics, which is crucial for interpreting research findings.
4. Acquire the ability to critically read and comprehend psychology research articles that utilize statistical methods.
5. Build a strong foundation in Statistics that will prepare students for more advanced courses in Psychology and related fields.

Course Outcomes (COs):
By the end of this course, students will be:

1. Accurately quantify psychological data using appropriate statistical methods.
2. Develop a strong understanding of the basic logic and principles of Statistics, essential for interpreting research findings in Psychology.
3. Capable of critically reading and evaluating psychology research articles that employ statistical methods.

well-prepared for advanced Psychology courses that require a solid understanding of statistical concepts.

Course Content:

Modules	Blooms level*	Number of hours
Module 1 Meaning, Definition, Relevance and Limitations of Statistics in Psychology Categories of statistics: Descriptive and Inferential	**L1, L2, L3**	18

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Module 2 Primary and Secondary Data Classification and Tabulation of Data Frequency Distribution, Computation of percentiles and percentiles ranks from grouped data.	**L1, L2, L3**	18
Module 3 Graphical presentation of Data: Histograms, Frequency polygon, Frequency Curve, Cumulative Frequency Curve (Ogive), Cumulative Percentage Curve	**L3, L4, L5**	18
Module 4 Measures of Central Tendency: Meaning, Application and Computation of Mean, Median and Mode from raw scores. Measures of Variability: Range and Variation; Average deviation, Quartile deviation and Standard deviation	**L3, L4, L5**	18
Module 5 Characteristics and Problems in Normal Probability Curve (NPC), The Standard Normal Curve. Computation of the standard error of mean, application and interpretation, Degrees of freedom, Levels of significance, Standard error of difference between two independent means (t-test: Large & small samples), Type I and Type II errors	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text & References:

Text:

- Garrettt, H. E.: Statistics in Psychology and Education, Vakils, Feffer and Simons Ltd. Bombay
- Aron/Aron & Coups: Statistics for Psychology (5th Ed).Pearson Education
- Howitt, D. &: Introduction to Statistics in Psychology (5th Ed). Cramer, D. England: Pearson Education Limited.
- Sprinthall, R.C. : Basic Statistical Analysis. Prentice Hall College Div
- Downie, N. M.: Basic Statistical Methods. Harper & Row Publishers, New York
- Colman, A. M.: Psychological Research Methods and Statistics. London and New York: Longman.
- Gupta, S. C.: Fundamentals of Statistics. N. Delhi: Himalaya
- Siegel, S.: (1956), Non Parametric Statistics, New York, McGraw Hill
- Broota, S.: (1992), Experimental Design in Behaviour Research, New Delhi
- Mohsin, S. M.: Fundamental Statistics for the Behavioural Sciences. Motilal Banarasidas, Patna

References:

- Agrawal, B. L.**:** Basic Statistics. New Age International
- Guilford, J.P.: Fundamental Statistics in Psychology and Education. McGraw Hill Kogakusha Ltd.
- Minimum, E. W., King, H. M. & Bear G., (1993), Statistical Reasoning in Psychology & Education, 3rd Edition, New York: John Willey & Sons
- Freeman: Statistics in Psychology

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DPSY2203	PRACTICALS-II	L	T	P	FW/ Proj	C
Version	**2023**	0	0	2	0	1
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course introduces students to key psychological assessment tools for measuring various psychological constructs such as job satisfaction, aggression, college adjustment, leadership, social maturity, and attitudes toward home and family. Students will learn the principles of administering, scoring, and interpreting these scales. The course emphasizes the importance of these assessments in both research and applied settings and covers ethical considerations in the use of psychological tests.

Course Objectives

Below are the objectives of conducting practical this semester.

1. Provide an overview of various psychological scales and their applications.
2. Teach students how to administer and score different psychological assessments properly.
3. Develop skills to interpret the results of these assessments accurately.
4. Explain the psychological constructs measured by each scale.
5. Demonstrate the use of these tools in research and applied settings.
6. Highlight the ethical considerations in administering, scoring, and interpreting psychological assessments.

Course Outcomes (COs):

Upon successful completion of this course, students will be able to:

1. Describe various psychological assessment tools and their specific applications.
2. Administer the Job Satisfaction Scale, Aggression Questionnaire, College Adjustment Scale, Authentic Leadership Questionnaire, Vineland Social Maturity Scale, and Attitude Scale Towards Home and Family accurately.
3. Score these assessments reliably and accurately.
4. Interpret the results from these scales and understand their implications.
5. Explain the constructs measured by these scales, such as job satisfaction, aggression, adjustment, leadership, social maturity, and attitudes.
6. Apply these assessment tools in both research and practical settings.
7. Adhere to ethical guidelines in the administration, scoring, and interpretation of psychological assessments.
8. Effectively communicate assessment findings in both written and oral formats.

Course Contents:

1.	JOB SATISFACTION SCALE	Job Satisfaction
2.	AQ – AGGRESSION QUESTIONNAIRE	Aggression
3.	CAS – COLLEGE ADJUSTMENT SCALE	Adjustment
4.	ALQ – AUTHENTIC LEADERSHIP QUESTIONNAIRE	Leadership
5.	VSMS – VINELAND SOCIAL MATURITY SCALE	Social Maturity
6.	ATTITUDE SCALE TOWARDS HOME AND FAMILY	Attitude

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**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	File Demonstration	V	A	EE
Weightage (%)		35	35	5	25

Text & References:

- Mohsin, S. M.: Experiments in Psychology. Motilal Banarasidas
- Woodworth, R.S.: Experimental Psychology. Oxford & IBH & Schlosberg, H. Publishing
- Postman, L. & Egan, J. P.: Experimental Psychology: An Introduction. Harper and Row

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SEMESTER-III

DPSY2351	COGNITIVE PSYCHOLOGY	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course provides an in-depth exploration of key topics in cognitive psychology. Through lectures, discussions, and practical exercises, students will examine the theoretical foundations, empirical research, and practical applications of cognitive processes. Topics include attention processes, thinking, problem-solving, reasoning, decision-making, intelligence, memory, forgetting, language, and language disorders. Emphasis is placed on understanding the nature of cognition, its underlying mechanisms, and its implications for human behaviour.

Course Objectives:

1. To introduce students to the history, background, and foundational concepts of cognitive psychology.
2. To familiarize students with various theories and models related to attention processes, thinking, problem-solving, reasoning, decision-making, intelligence, memory, forgetting, language, and language disorders.
3. To enable students to critically analyse and evaluate research findings and theoretical perspectives in cognitive psychology.
4. To develop students' ability to apply cognitive psychology principles to real-world situations and problem-solving tasks.
5. To enhance students' understanding of the complexities of human cognition and its relevance to other disciplines such as education, neuroscience, and artificial intelligence.

Course Outcomes:

By the end of the course, students will be able to:

1. Describe the historical development and theoretical frameworks of cognitive psychology.
2. Identify different types of attention and factors influencing attentional processes.
3. Analyse various methods and stages of problem-solving and decision-making.
4. Evaluate theories of intelligence and their implications for understanding human cognition.
5. Discuss the nature and stages of memory, as well as factors affecting memory formation and retrieval. They will also recognize the causes and theories of forgetting and apply strategies to improve memory.
6. Define language and its components and identify common language disorders.
7. Apply cognitive psychology principles to analyse and solve real-world problems.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction Introduction, History, and Background of Cognitive Psychology	**L1, L2, L3**	18

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Module II: Attention Processes Nature and Meaning of Attention Types of Attention Factors affecting Attention. Theories of Attention: Broadbent 's filter theory, Treisman's attenuation theory, automatic-controlled processing, and sensory integration theory	**L1, L2, L3**	18
Module III: Thinking, Problem-solving, Reasoning and Decision-making Nature, Types, and tools of thinking Meaning, Method, and stages of problem-solving Meaning and Types of Reasoning Meaning, types, and hindrances of decision making.	**L3, L4, L5**	18
Module IV: Intelligence Meaning, Nature of Intelligence Theories of intelligence: Unitary Theory, Two Factor Theory, Theory of primary mental abilities, Guilford's structure of intellect, Sternberg's, Tricirchy theory of intelligence, J.P Dass model of intelligence, Cattell's theory of intelligence. Genetic and Environmental Influence on Intelligence Types of Intelligence tests	**L3, L4, L5**	18
Module V: Memory & Forgetting Meaning and stages of memory Types of Memory, information-processing approach, Baddley- Hitch model of working memory. Methods of measuring memory Methods of improving memory Forgetting- Nature and causes of Forgetting. Theories of Forgetting	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Solso, R.L.,(2004). Cognitive Psychology, 6th ed.; Delhi: Pearson Education
- Matlin M W (2005).Cognition, Wiley & Sons, Inc.
- Haberlandt, K. Cognitive Psychology. Allyn and Bacon, Boston.
- Anderson, J.R. Cognitive Psychology and its implications. 5th Edi.: Worth Publishers
- Smity, E. E. &Kosslyn, S (2007). Cognitive Psychology: Mind and Brain. Prentice Hall.
- Sen, A.K. &Pande, P. (Eds.) (1998). Current issues in cognitive psychology, Delhi Campus
- Posner, M. (Ed.) (1989). Foundations of cognitive science. London: MIT Press

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DPSY2301	RESEARCH METHODS & ADVANCED STATISTICS	L	T	P	FW/ Proj	C
Version	**2024**	2	1	0	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course offers a comprehensive introduction to psychology's research methods and statistical techniques. Students will explore research design fundamentals, including experimental and non-experimental methods, and learn to differentiate between qualitative and quantitative research. The course covers the entire research process, from formulating questions and hypotheses to ethical considerations. Additionally, students will gain knowledge of sampling techniques and delve into both parametric and non-parametric statistical methods, enhancing their ability to analyse and interpret psychological data.

Course Objectives

1. Provide a foundational understanding of research and its various types in Psychology.
2. Equip students with the skills to navigate the research process, including formulating research questions and hypotheses.
3. Instil the importance of ethical considerations in conducting research.
4. Differentiate between experimental and non-experimental research designs and qualitative vs. quantitative methods.
5. Introduce various sampling techniques and concepts of population and sample.
6. Teach the basic differences and applications of parametric and non-parametric statistical methods.
7. Familiarize students with key statistical tests and their uses in psychological research.

Course Outcomes (COs)

On completion of this course, the students will be able to

1. Define research and describe different types of research used in Psychology.
2. Outline and implement the steps involved in the research process.
3. Identify and apply ethical principles in the design and conduct of psychological research.
4. Differentiate between experimental and non-experimental research, and between qualitative and quantitative research methods.
5. Develop clear and testable research questions and hypotheses.
6. Define and operationalize variables for research purposes.
7. Apply appropriate sampling techniques and determine suitable sample sizes for research studies.
8. Distinguish between parametric and non-parametric statistical methods, understanding their assumptions and appropriate uses.
9. Conducted and interpreted results from parametric tests such as t-tests, ANOVA, and correlation analyses.
10. Conducted and interpreted results from non-parametric tests such as the Mann-Whitney, Spearman rank-order, and Kruskal-Wallis tests.

Course Content:

Modules	Blooms level*	Number of hours

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Module 1: Introduction to Research What is research Types of research. The research processes Ethical considerations in research.	**L1, L2, L3**	18
Module 2: Research Designs and Related concepts. Experimental vs. non-experimental research Qualitative vs. quantitative research Research questions and hypotheses Variables and their operationalization	**L1, L2, L3**	18
Module 3: Sampling. Population and sample Probability and non-probability sampling Sampling techniques Sample size determination	**L3, L4, L5**	18
Module 4: Parametric Vs Non-Parametric Statistics Introduction, Assumptions, basic differences, uses of parametric and non-parametric tests	**L3, L4, L5**	18
Module 5: Introduction to various statistical techniques Parametric tests: Introduction to various techniques, t-test, ANOVA, Correlation. Non-Parametric tests: Mann-Whitney test, spearmen rank order test, Kruskal Wallis test.	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text & References:

Text:

- Garrettt, H. E.: Statistics in Psychology and Education, Vakils, Feffer and Simons Ltd. Bombay
- Aron/Aron & Coups: Statistics for Psychology (5th Ed). Pearson Education
- Howitt, D. &: Introduction to Statistics in Psychology (5th Ed). Cramer, D. England: PearsonEducation Limited.
- Sprinthall, R.C.: Basic Statistical Analysis. Prentice Hall College Div
- Downie, N. M.: Basic Statistical Methods. Harper & Row Publishers, New York
- Colman, A. M.: Psychological Research Methods and Statistics. London and New York: Longman.
- Gupta, S. C.: Fundamentals of Statistics. N. Delhi: Himalaya
- Siegel, S.: (1956), Non-Parametric Statistics, New York, McGraw Hill
- Broota, S.: (1992), Experimental Design in Behaviour Research, New Delhi
- Mosin, S. M.: Fundamental Statistics for the Behavioural Sciences. Motilal Banarasidas, Patna

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DPSY2303	PRACTICALS-III	L	T	P	FW/ Proj	C
Version	**2023**	0	0	2	0	1
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course provides an in-depth exploration of various psychological assessment tools used to measure intellectual ability, thinking strategies, memory, problem-solving ability, self-concept, and attention. Students will examine the Draw-A-Person Intellectual Ability Test, Swaroop Mehta Test of Thinking Strategy, Continuous Visual Memory Test (CVMT), Problem Solving Ability Test (PSAT), Multidimensional Self-Concept Scale, and Brief Test of Attention (BTA). Through lectures, hands-on practice, and case studies, students will gain insight into the theoretical foundations, administration procedures, scoring methods, and interpretation of these assessment tools. Emphasis will be placed on understanding the psychometric properties, reliability, and validity of each test, as well as their applications in clinical, educational, and research settings. This course aims to equip students with the knowledge and skills necessary to effectively administer, interpret, and utilize psychological assessment tools for understanding cognitive processes, self-concept, and attentional functioning.

Course Objective:

1. To introduce students to a range of psychological assessment tools used to measure intellectual ability, thinking strategies, memory, problem-solving ability, self-concept, and attention.
2. To familiarize students with the theoretical foundations, administration procedures, scoring methods, and interpretation guidelines for each assessment tool.
3. To explore the psychometric properties, reliability, and validity of the assessment tools, and their applications in clinical, educational, and research settings.
4. To provide students with hands-on practice in administering and scoring the assessment tools, and interpreting the results to make informed decisions in various contexts.
5. To foster critical thinking and analytical skills in evaluating the appropriateness and effectiveness of different assessment tools for specific purposes and populations.

Course Outcome:

By the end of the course, students will be able to:

1. Demonstrate knowledge of the theoretical foundations and practical applications of various psychological assessment tools.
2. Effectively administer, score, and interpret the results of the Draw-A-Person Intellectual Ability Test, Swaroop Mehta Test of Thinking Strategy, CVMT, PSAT, Multidimensional Self-Concept Scale, and BTA.
3. Analyze the psychometric properties, reliability, and validity of assessment tools, and make informed decisions about their use in different settings.
4. Apply assessment results to understand cognitive processes, self-concept, and attentional functioning in individuals across different age groups and cultural backgrounds.
5. Critically evaluate the strengths and limitations of psychological assessment tools and make recommendations for their use based on empirical evidence and professional guidelines.

Note: Out of the 6 practicals mentioned below, 4 practicals + 1 small-scale research project will be conducted in the third semester.

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Course Contents:

1	Draw A Person Intellectual Ability Test	Intelligence
2	Swaroop Mehta Test of Thinking Strategy	Thinking
3	CVMT – CONTINUOUS VISUAL MEMORY TEST	Memory
4	PSAT – PROBLEM SOLVING ABILITY TEST	Problem Solving Ability
5	Multidimensional Self Concept Scale	Self-Concept
6	BTA – BRIEF TEST OF ATTENTION*	Attention

Note: Use group data for small-scale research project

Examination Scheme:

Components		File Demonstration	V	A	EE
Weightage (%)		35	35	5	25

Text & References:

- Mohsin, S. M.: Experiments in Psychology. Motilal Banarasidas
- Woodworth, R.S.: Experimental Psychology. Oxford & IBH & Schlosberg, H. Publishing
- Postman, L. & Egan, J. P.: Experimental Psychology: An Introduction. Harper and Row

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SEMESTER-IV

DPSY2451	ABNORMAL PSYCHOLOGY	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course provides a comprehensive overview of abnormal psychology, focusing on the understanding, classification, and models of abnormal behaviour. Through exploration of various psychological disorders, including neurotic, mood, psychotic, and somatoform disorders, students will examine clinical presentations, etiology, and treatment approaches. Emphasis is placed on differentiating between normal and abnormal behaviour, as well as understanding the impact of psychological disorders on individuals and society.

Course Objectives:

1. To introduce students to the concept of abnormal behaviour and the criteria used for its definition and classification.
2. To familiarize students with recent versions of classification systems for psychological disorders, including the DSM (Diagnostic and Statistical Manual of Mental Disorders) and ICD (International Classification of Diseases).
3. To differentiate between neurosis and psychosis and understand their clinical features and implications.
4. To explore various models of abnormality, including biological, psychodynamic, behavioural, and humanistic perspectives, and their applications in understanding psychological disorders.
5. To examine the clinical picture, etiology, and subtypes of anxiety disorders, including generalized anxiety disorder, obsessive-compulsive disorder, phobic disorders, and eating disorders.
6. To understand the clinical presentation, course, and treatment approaches for mood disorders, including depression and bipolar disorder.
7. To analyze the clinical features, etiology, and subtypes of psychotic disorders, focusing on schizophrenia, psychotic depression, and delusional disorders.
8. To explore somatoform disorders, including pain disorder, hypochondriasis disorder, and body dysmorphic disorder, and understand their psychological and physiological components.
9. To develop empathy, sensitivity, and ethical awareness in dealing with individuals experiencing psychological distress or disorders.

Course Outcomes:

By the end of the course, students will be able to:

1. Define and differentiate between normal and abnormal behaviour based on established criteria.
2. Critically evaluate the utility and limitations of classification systems such as the DSM and ICD in diagnosing psychological disorders.
3. Identify and explain the clinical features and etiology of neurotic and psychotic disorders.
4. Analyse and apply different models of abnormality in understanding psychological disorders.
5. Describe the clinical presentation, etiology, and treatment approaches for various anxiety disorders, mood disorders, psychotic disorders, and somatoform disorders.
6. Demonstrate an understanding of the impact of psychological disorders on individuals, families, and society.
7. Apply ethical principles and sensitivity in discussing and addressing issues related to abnormal behaviour and psychological disorders.
8. Collaborate effectively in group discussions and activities related to understanding

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and analysing psychological disorders.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction Understanding abnormal Behaviour: Definition and Criteria Understanding Classifications (Recent Versions)- DSM and ICD Difference between Neurosis and Psychosis	**L1, L2, L3**	18
Module II: Models of Abnormality Biological Psychodynamic Behavioural Humanistic	**L1, L2, L3**	18
Module III: Neurotic Disorder Anxiety Disorders: Clinical Picture and Etiology Types of Anxiety Disorders- Generalized anxiety disorders, Obsessive-Compulsive disorders, Phobic Disorders, Eating Disorders	**L3, L4, L5**	18
Module IV: Mood Disorders Depression Bipolar Disorder	**L3, L4, L5**	18
Module V: Psychotic Disorder Schizophrenia: Clinical Picture and Etiology Psychotic depression Delusional Disorders	**L3, L4, L5, L6**	18
Module VI: Somatoform Disorders Pain Disorder Hypochondriasis Disorder Body Dysmorphic Disorder		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

Text:

- Page, J.D.: Abnormal Psychology. New Delhi: Tata McGraw Hill Publishing Company Limited
- Shanmugam, T.E.: Abnormal Psychology. New Delhi: Tata McGraw Hill Publishing Company Limited
- Coleman, J.C.: Abnormal Psychology and Modern Life. Bombay: D.B. Taraporewala Sons.&OCLtd.
- Davison G.C. & Neale, J. M.: Abnormal Psychology. New York: John Willey & Sons.
- Carson, R.C., Butcher, J.N. & Mineka, S.: Abnormal Psychology and Modern Life. Delhi: & Person Education, 2000
- Sarason, I. G. & Sarason, B. R.: Abnormal Psychology: The Problem of

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Maladaptive Behaviour, 11th Ed. Prentice-Hall
- Mangal, S. K.: Abnormal Psychology. New Delhi: Sterling Publishers Pvt Ltd

References:

- Comer, R. J.: Abnormal Psychology, 5th Ed. Worth Publishers
- Kumar, V.: Abnormal Psychology: Causes and Treatment. Aadi Publications
- Kaur, R.: Abnormal Psychology: New Trends and Innovations Delhi: Deep & Deep Publications (P) Ltd.

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DPSY2401	PERSONALITY	L	T	P	FW/ Proj	C
Version	**2023**	2	1	0	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

Personality Psychology delves into the complex and fascinating study of personality, exploring the enduring patterns of thoughts, emotions, and behaviors that characterize individuals. This course provides a comprehensive overview of the major theories and research methods in personality psychology, examining how personality develops, is assessed, and influences various aspects of life. Students will engage with diverse theoretical perspectives, including psychoanalytic, trait, biological, humanistic, behavioral, cognitive, and social-cognitive approaches, and will critically analyze and compare these theories. The course also discusses the Nature-Nurture role in the development of Personality.

Course Objective:

1. To introduce students to the foundational concepts and historical development of personality psychology.
2. To familiarize students with different theoretical approaches used to study personality, including psychoanalytic, cognitive, social, learning, and humanistic perspectives.
3. To explore key trait theories proposed by influential psychologists such as Allport, Cattell, and Eysenck, and understand their implications for understanding individual differences.
4. To provide students with practical knowledge of personality assessment techniques, including self-report questionnaires and projective measures.
5. To critically analyze the role of biological, environmental, and socio-cultural factors in shaping personality development.
6. To encourage students to apply theoretical concepts and assessment tools to real-world contexts, such as understanding the impact of parenting styles on personality development.

Course Outcome: By the end of the course, students will be able to:

1. Demonstrate an understanding of the historical and conceptual foundations of personality psychology.
2. Evaluate and compare different theoretical approaches to the study of personality, identifying their strengths and limitations.
3. Apply key concepts from trait theories to analyze and interpret individual differences in personality.
4. Utilize various personality assessment techniques to gather and analyze data effectively.
5. Critically evaluate the relative contributions of genetic, environmental, and socio-cultural factors to personality development.
6. Communicate insights and findings related to personality psychology through written assignments, presentations, and class discussions.
7. Apply theoretical knowledge to practical scenarios, demonstrating an understanding of how personality theories can inform real-world applications such as counseling, education, and organizational psychology.

Course Content:

Modules	Blooms level*	Number of hours

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Module I: Introduction Introduction: Nature, Conceptual History; Basic Assumptions about Human Nature; Genetic and Environmental Determinants of Personality. Type Theories: Galen's Theory, Personality Typology (Sheldon and Kretschmer), and Triguna theory.	**L1, L2, L3**	18
Module II: Approaches to Study Personality Approaches to Study Personality: Psychoanalytic, Cognitive, Social, Learning, and Humanistic.	**L1, L2, L3**	18
Module III: Trait Theories of Personality Trait Theories: Allport's Theory, Cattell's Theory; Basic Concepts, Identification of Temperament, Ability, and Dynamic traits, Eysenckian Model: Structure, Physiological Basis and Behavioural Correlates; Alternative Five Factor Models of Personality.	**L3, L4, L5**	18
Module IV: Assessment of Personality Assessment of Personality: Questionnaire and Self Report (16 PF, EPQ-R, Neo-PI-R); Projective Techniques; Rorschach Inkblot Test, TAT, SIS, Rotter's Incomplete Sentences Blank; Objective Analytic Tests.	**L3, L4, L5**	18
Module V: Determinants of Personality Nature / Nurture Controversy: Biological Determinants: Role of Genes and Endocrine Glands Role of Physical Environment: Natural Environment, Constructed Environment, Behavioural Role of Socio – Cultural Environment: Early Social Experiences and Impact of parenting styles.	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Suggested Readings

- Boyle, G. J., Matthews, G., & Saklofske, D. H. (Eds.). (2008). The SAGE handbook of personality theory and assessment, (Vol. 1&2) Personality theories and models. Sage Publications, Inc.
- Cattell, R. B., & Kline, P. E. (1977). The scientific analysis of personality and motivation. Academic Press.
- Eysenck, H. J. (1981). Model for personality. New York: Springer-Verlag. Page 23 of 52.
- Eysenck, H. J., & Eysenck, M. W. (1985). Personality and Individual Differences: A Natural Science Approach. Plenum Press- New York and London.
- Hall G. S., & Lindzey, G. (1988). Theories of Personality (4Ed.) New Delhi: Wiley Eastern.
- Hjelle, L. L., & Ziegler, D. J. (1992). Personality theories: Basic assumptions, research, and applications (3rd Ed.). McGraw-Hill Book Company.
- John, O. P., Robins, R. W., & Pervin, L. A. (2008). HB of Personality: Theory and Research (3rd Ed.). NY: Oxford Press.
- Larsen, R. J., & Buss, D. M. (2011). Personality Psychology: Domains of Knowledge about Human Nature. New Delhi: Tata McGraw-Hill.

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DPSY2403	PRACTICALS-IV	L	T	P	FW/ Proj	C
Version	2023	0	0	2	0	1
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course provides an in-depth examination of assessment tools commonly used in the evaluation of Autism Spectrum Disorder (ASD) and related behavioural and emotional issues in children and adolescents. Students will gain familiarity with a variety of assessment instruments, including checklists, questionnaires, and standardized tests designed to measure various aspects of ASD symptoms, addictive behaviours, personality traits, anger expression, and cognitive functioning. Emphasis is placed on understanding the administration procedures, interpretation guidelines, and ethical considerations associated with the use of these assessment tools.

Course Objectives:

1. To introduce students to the assessment process for Autism Spectrum Disorder (ASD) and related behavioural and emotional disorders in children and adolescents.
2. To familiarize students with a range of assessment instruments used in diagnosing and evaluating ASD symptoms, addictive behaviours, personality traits, anger expression, and cognitive functioning.
3. To provide students with an understanding of the administration procedures, scoring methods, and interpretation guidelines for each assessment tool.
4. To explore the ethical considerations and cultural factors involved in the assessment of children and adolescents with ASD and related disorders.
5. To equip students with the knowledge and skills necessary to administer and interpret the Rey Auditory Verbal Learning Test, a measure of memory and learning abilities.
6. To enhance students' critical thinking skills in selecting appropriate assessment tools and interpreting assessment results in the context of ASD and related disorders.
7. To foster effective communication skills for conveying assessment findings through written reports and oral presentations.

Course Outcomes: Upon completion of the course, students should be able to:

1. Demonstrate a comprehensive understanding of the assessment process for Autism Spectrum Disorder and related behavioural and emotional disorders in children and adolescents.
2. Identify and select appropriate assessment tools based on the specific needs and characteristics of the population being assessed.
3. Administer and score assessment instruments accurately and reliably, following standardized procedures and ethical guidelines.
4. Interpret assessment results effectively, taking into account individual differences, cultural considerations, and contextual factors.
5. Apply knowledge of cognitive testing procedures to assess memory and learning abilities in children and adolescents using the Rey Auditory Verbal Learning Test.

Course Contents

1.	CHECKLIST FOR AUTISM SPECTRUM DISORDER	AUTISM

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2.	MARYLAND ADDICTIONS QUESTIONNAIRE	ADDICTIONS
3.	PERSONALITY INVENTORY FOR YOUTH	PERSONALITY
4.	CHILDREN INVENTORY OF ANGER	ANGER
5.	CHILDREN'S PERSONALITY QUESTIONNAIRE	PERSONALITY
6.	REY AUDITORY VERBAL LEARNING TEST	AUDITORY VERBAL

Note: Use group data for small-scale research project

Examination Scheme:

Components	CT	File Demonstration	V	A	EE
Weightage (%)		35	35	5	25

Text & References:

- Mohsin, S. M.: Experiments in Psychology. Motilal Banarasidas
- Woodworth, R.S.: Experimental Psychology. Oxford & IBH & Schlosberg, H. Publishing
- Postman, L. & Egan, J. P.: Experimental Psychology: An Introduction. Harper and Row

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SEMESTER-V

DPSY2551	DEVELOPMENTAL PSYCHOLOGY	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

Developmental Psychology examines the psychological and emotional changes throughout the human life span, from conception to old age. The course covers physical, cognitive, affective, moral, social, and neural development, emphasizing the roles of heredity, maturation, and environment. Students will explore key theories, cultural influences on child-rearing and attachment, developmental disorders, and the challenges of aging, with a focus on Indian and global perspectives.

Course Objectives

Developmental psychology, also known as human development, is the scientific study of systematic psychological changes, and emotional changes that occur in human beings over the course of their life span. Originally concerned with infants and children, the field has expanded to include adolescence, adult development, aging, and the entire life span. Developmental psychology course will provide enriching understanding of various child rearing practices, attachment styles across different cultures. Moreover, students will attain knowledge regarding challenges in human development through the understanding of various developmental disorders. The objective of this paper is:

1. To provide an understanding of Physical, cognitive, affective, moral, social and neural development during infancy, childhood, and adolescence.
2. To critically evaluate the role of heredity, maturation, and the environment in development.

To critically examine the influence of different cultural practices in development.

Course Outcomes (COs):

On completion of this course, the students will be able to

1. Understand Developmental Stages: Grasp physical, cognitive, affective, moral, social, and neural development in infancy, childhood, and adolescence.
2. Analyze Theoretical Frameworks to evaluate Freud's psychosexual stages, Erikson's psychosocial theory, and Bronfenbrenner's ecological model.
3. Explore Cognitive and Moral Development to understand Piaget's and Vygotsky's theories and Kohlberg's moral development stages.
4. Evaluate Cultural Influences to examine child-rearing practices and attachment styles across cultures, with a focus on Indian and global contexts.
5. Identify Developmental Disorders to learn about nervous system-related, degenerative, and sensory-related developmental disorders.
6. Understand Aging and Its Challenges to define types of aging, analyze aging theories, and explore challenges and interventions for the elderly.

Course Content:

Modules	Blooms level*	Number of hours

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Module I: Introduction Meaning, Goals and Concept of Development Methods Of Developmental Psychology- Longitudinal, Cross-Sectional and Family Studies. Factors influencing development	**L1, L2, L3**	18
Module II: Biological Basis Conception and Prenatal Development: The Interaction of Heredity and Environment. Birth and newborn: Birth Complications, Competent Newborn.	**L1, L2, L3**	18
Module III: Psychoanalytic Theories and Ecological Model Sigmund Freud Theory- Psychosexual Stages Erik Erikson's Psychosocial Theory Urie Bronfenbrenner Ecological Model	**L3, L4, L5**	18
Module IV: Cognitive and Moral Development Theories Jean Piaget's Theory Neo Piagetian Theories Lev Semenoich Vygotsky Theory- Sociocultural Theory Moral Development- Kohlberg	**L3, L4, L5**	18
Module V: Global Perspectives and Challenges Child Rearing Practices across different Cultures- East and West Parenting and Attachment Styles Developmental Disorders and their types- Nervous system related disorders, Degenerative disorders, Sensory related disorders.	**L3, L4, L5, L6**	18
Module VI: Aging Definition of Aging Types of Aging Theories of Aging Challenges and Intervention for the elderly		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text & References:

Text:

- Bee, H. & Boyd, D.: Life Span Development, Boston, M.A.: Allyn and Bacon.
- Berk, L.E.: Child Development. New Delhi: Pearson Education.
- Crain, W.: Theories of Development. Englewood Cliffs, New Jersey: Prentice Hall.
- Feldman, R. S.: Discovering the Life Span (2nd Ed.). Prentice Hall
- Heatherington, E.M. & Parke, R.D.: Child Psychology: A Contemporary Viewpoint New York: McGraw-Hill

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- Hurlock, E. B.: Developmental Psychology. McGraw-Hill
- Kail R. V.: Children and their development. Prentice Hall Inc.
- Newman, B.M. & Newman, P.R.: Development Through Life: A Psychosocial Approach. New York: Wadsworth Publishing Company.
  Papalia, D. E.; Olds, S. W. & Feldman, R.D: Human Development (10th Ed.).New York: McGraw-Hill

References:

- Brodzinsky, D.M.; Gormly, A.V. & Anibron, S.R.: Life Span Human Development; New Delhi: CBS Publication
- Bukatko, D. & Daehler, M.W.:Child Development: A Thematic Approach. New York: Houghton Mifflin Company.
- Santrock, J.W.: A Topical Approach to Life Span Development. New Delhi: Tata McGraw Hill.

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DPSY2501	HEALTH PSYCHOLOGY	L	T	P	FW/ Proj	C
Version	**2023**	2	1	0	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course explores the role health in the overall wellbeing of an individual. This course describe various methodologies, that affect the health and illness relationship. Health psychology introduce the various perspective of happiness and well-being including the eastern perspectives. The course is theoretically driven, as it help in predicting health behavior in light of many health behavior related theories.

Course Objectives:

1. To provide students with a comprehensive understanding of health psychology, including its definition, methodologies, and the role of health psychologists in promoting wellness and addressing psychological factors related to health and illness.
2. To explore Eastern perspectives of happiness and well-being, including concepts such as Shunyata, Ananda, and Shatchitananda, and how these perspectives influence conceptualizations of health in Indian traditions.
3. To examine the psycho-neuro-immunological aspects of the immune system, including its functioning, disorders, and the psychological factors influencing immune health, such as stress and coping mechanisms.
4. To introduce theoretical foundations for predicting health behavior, including attribution theory, health locus of control, and various cognitive and social cognition models such as the health belief model and the theory of planned behavior.
5. To discuss health-enhancing behaviors and factors influencing healthcare utilization, including inequalities in healthcare access, doctor-patient communication, and burnout among healthcare professionals.
6. To emphasize the importance of a bio-psycho-social model of health, integrating biological, psychological, and social factors in understanding health and illness.
7. To analyze future challenges and trends in healthcare and the role of health psychology in addressing these challenges, including the growth of telemedicine and the importance of designing healthcare environments conducive to well-being.

Course Outcomes (COs):

On completion of this course, the students will be able to

1. Understand and articulate the foundational principles and major theoretical frameworks in Health Psychology.
2. Comprehend how psychological, social, and biological factors interact to influence health and illness.
3. Recognize and apply psychological methods to promote healthy behaviors and prevent illness.
4. Evaluate the psychological effects of chronic illness on individuals and families, and understand effective coping mechanisms.

Course Content:

Modules	Blooms level*	Number of hours

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Module I: Introduction & Methodology Definition of Health Psychology; Mind-Body Relationship; Discuss the roles that health psychologists play in promoting wellness and in addressing and treating psychological factors related to health and illness, medical acceptance of health psychology	**L1, L2, L3**	18
Module II: Eastern perspectives of happiness and well-being, Concepts of Shunyata, Ananda, and Shatchitananda, Faith Healing traditions, conceptualizing Indian notions of Health.	**L1, L2, L3**	18
Module III: The Immune System Psycho-Neuro Immunology- the Immune System & immune functioning. Disorders of the Immune System- Infectious Diseases (viral infections & disease); Co-factor theory; Behavioral factors and common cold; AIDS (Transmission of HIV-AIDS & its consequences, coping with AIDS); Cancer-(Psychological factors in Cancer, causes of cancer)	**L3, L4, L5**	18
Module IV: Theoretical foundations: Predicting health behavior. Attribution theory, health locus of control, unrealistic optimism, stages of change model; Cognition models – health belief model, protection motivation theory; Social cognition models – theories of reasoned action and planned behavior, the health action process approach; Leventhal's self-regulatory model of illness cognition. Bio-Psycho-Social Model of Health	**L3, L4, L5**	18
Module V: Health Enhancing Behavior Inequalities in health care, using health services, the attitude of health professionals, doctor-patient communication, burnout in health professionals, designing health care work environment, future challenges for health care, and growth of health psychology.	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

Text:

- Allen Felicity. Health Psychology: theory and practice, Published by Allen & Unwin, 1998
- Friedma. Health Psychology: Health Psychology, 2nd Edition, Published by Academic Internet Publishers Incorporated, 2006
- Shelley E. Taylor. Health Psychology (McGraw-Hill Companies (2011)
- Dimatteo, M.R. & Martin, L.R.: Health Psychology. Allyn and Bacon
- Ogden, J. (2012). Health Psychology. Mc Crawhill Foundation
- Taylor, S. E. (2006). Health psychology. Tata McGraw-Hill Education
- Sarafino, E. P. (1994). Health Psychology, Biopsychosocial interactions. John Wiley & Sons

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DPSY2505	PRACTICALS-V	L	T	P	FW/ Proj	C
Version	**2023**	0	0	2	0	1
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course provides hands-on experience with the methods and techniques used in psychological research and assessment. Students will engage in practical exercises that cover various aspects of psychology, including health, developmental and positive psychology. This course aims to develop students' skills in designing experiments, collecting and analyzing data, and interpreting results.

Course Objectives

- To give practical experience to the students in administering and scoring psychological tests and interpreting the scores.
- To acquaint the students with the basic procedure and design of psychology experiments.
- To familiarize the students with the use of elementary statistical techniques
- To encourage and guide the students to undertake a small-scale research project.

Course Outcomes (COs):

On completion of this course, the students will be able to:

1. Develop hypotheses, design experimental procedures, and carry out research studies in various areas of psychology.
2. Gain proficiency in administering, scoring, and interpreting psychological tests and assessments.
3. Apply statistical methods to analyse data collected from psychological experiments and assessments and interpret the results accurately.
4. Understand and adhere to ethical guidelines in the conduct of psychological research and assessment.

Note: Total 5 practicals will be conducted in the Fifth semester among the list of following practicals out of which first three practicals are compulsory.

Course Content:

1	PGI General Wellbeing Measure	Health
2	Children Inventory of Anger	Developmental
3	Vineland Social Maturity Scale	Developmental
4	College Adjustment Scale-CAS	Health
5	Behaviour Rating Inventory of Executive Function Adult Form	Developmental
6	Suicidal Ideation Questionnaire	Positive

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Examination Scheme:

Components	CT	File Demonstration	V	A	EE
Weightage (%)		35	35	5	25

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text & References:

- Mohsin, S. M.: Experiments in Psychology. Motilal Banarasidas
- Woodworth, R.S.: Experimental Psychology. Oxford & IBH & Schlosberg, H. Publishing
- Postman, L. & Egan, J. P.: Experimental Psychology: An Introduction. Harper and Row

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DPSY2503	POSITIVE PSYCHOLOGY	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

Positive Psychology is the scientific study of the strengths and virtues that enable individuals and communities to thrive. It is based on the belief that people want to lead meaningful and fulfilling lives, to cultivate what is best within themselves, and to enhance their experiences of love, work, and play. This course explores the principles and practices that promote well-being, happiness, and resilience. Students will learn about the theories and research underpinning positive emotions, strengths, and virtues, and how these can be applied to improve personal and societal well-being.

Course Objectives

1. To introduce students to the field of positive psychology, providing a historical overview and comparing Eastern and Western perspectives on well-being and positive emotional states.
2. To explore theories of positive emotions, including the Broaden & Build Theory, and examine concepts such as love, empathy, emotional intelligence, happiness, wellbeing, and resilience in the face of challenges and loss.
3. To delve into theories of positive cognitive states, including optimism, hope, wisdom, flow, mindfulness, and self-efficacy, and their implications for personal growth and development.
4. To highlight the importance of goals and character strengths in fostering positivity and developing a positive personality, drawing on frameworks such as the Values in Action (VIA) classification of character strengths and virtues.
5. To discuss preventive strategies and applications of positive psychology, including positive thinking, meditation, gratitude, kindness, and positive therapy, and their roles in enhancing various domains of life such as relationships, family, education, and health.
6. To examine the concept of aging, including definitions, types, and theories of aging, and to explore challenges faced by the elderly population and potential interventions to promote well-being and quality of life in later stages.

Course Outcomes (COs):

On completion of this course, the students will be able to

1. Define key concepts and theories in Positive Psychology: Understand and articulate the foundational principles and major theoretical frameworks in Positive Psychology.
2. Understand the scientific basis of well-being and happiness: Comprehend the research methodologies and empirical findings related to positive emotions, strengths, and virtues.
3. Apply positive psychological interventions: Utilize evidence-based strategies to enhance personal well-being and foster positive relationships.
4. Develop resilience and coping strategies: Learn and implement techniques to build resilience and effectively manage stress and adversity.
5. Promote well-being in various settings: Design and evaluate programs aimed at increasing well-being in personal, educational, and organizational contexts.
6. Critically evaluate Positive Psychology research and its applications: Analyze and assess the strengths and limitations of Positive Psychology studies and their practical implications.

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Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction Positive Psychology, An Historically Introduction, Perspective on Positive Psychology: Eastern and Western	**L1, L2, L3**	18
Module II: Positive Emotional States and Processes Broaden & Build Theory of Positive Emotions Positive Emotions theories: Love and Empathy, Emotional Intelligence, And Happiness, Wellbeing, Resilience in the phase of challenge & Loss	**L1, L2, L3**	18
Module III: Positive Cognitive States and Processes Positive Cognitive theories: Optimism, Hope, Wisdom, And Flow, Mindfulness, Self-efficacy,	**L3, L4, L5**	18
Module IV: Developing Positivity Importance of Goals, Character Strengths as "Value of Action (VIA)" and Virtues Developing Positive Personality	**L3, L4, L5**	18
Module V: Prevention and Applications of Positive Psychology Prevention: Positive thinking, Meditation, Gratitude, Kindness & Positive Therapy Application: Relationship, Family and Aging Work, Education, Health	**L3, L4, L5, L6**	18
Module VI: Aging Definition of Aging Types of Aging Theories of Aging Challenges and Intervention for the elderly		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text & References:

Text:

- Kumar, U., Archana, &Prakash, V. (2015).Positive psychology – Applications in work, health and well-being.Delhi & Chennai, India: Pearson.
- Joseph, S. (Ed.) (2015). Positive psychology in practice: Promoting human flourishing in work, health, education, and everyday life. Hoboken, NJ: John Wiley & Sons.
- Snyder, C. R., & Lopez, S. J. (2002).Handbook of positive psychology.New York: Oxford University.
- Snyder, C.R., Lopez, S.J. & Pedrotti, J.T. (2011): Positive Psychology: The Scientific and Practical Explorations Of Human Strengths (2nd Ed). Sage Publication, Inc.
- Baumgardner, S. R., Crothers, M. K. (2009). Positive psychology. New Delhi, India: Pearson.
- Boniwell, I. (2012). Positive Psychology in a Nutshell: The Science of Happiness. 3rd Edition. McGraw Hill

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DPSY2504	PHYSIOLOGICAL PSYCHOLOGY	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

Physiological Psychology, also known as Biopsychology or Behavioral Neuroscience, is the study of the biological bases of behavior. This course examines the structure and function of the nervous system, exploring how brain activity and neurotransmission influence behaviors, thoughts, and emotions. Topics include neural communication, sensory and motor systems, regulatory behaviors, emotions, learning and memory, and psychological disorders from a biological perspective. Through this course, students will gain an understanding of how physiological processes underpin complex behaviors and mental functions.

Course Objectives:

- To provide students with a comprehensive understanding of physiological psychology, including its conceptual framework, methodologies, reductionism, and ethical considerations in research.
- To explore the structure and function of neurons, including impulse conduction, synaptic transmission, and the role of neurotransmitters in neural communication.
- To examine the basic subdivisions of the nervous system, including the peripheral and central nervous systems, and their respective roles in physiological processes.
- To investigate hemisphere function, focusing on cortical lobes (frontal, parietal, and temporal) and their functions, as well as hemispheric specialization and the role of the corpus callosum in interhemispheric communication.
- To discuss the neurobiological basis of learning and memory, including neuropathologies such as anterograde and retrograde amnesia, dementia, Alzheimer's disease, and Korsakoff's syndrome.
- To examine the concept of arousal, physiological measures of arousal such as EEG brain waves, the role of the reticular formation in central arousal, and the functions of sleep, including REM and non-REM sleep stages, as well as other biological rhythms and the influence of endocrine glands.

Course Outcomes (COs):

On completion of this course, the students will be able to

1. Understand and articulate the foundational principles and major theoretical frameworks in Physiological Psychology.
2. Understand the structure and function of the nervous system.
3. Describe how neural mechanisms and neurotransmission influence various behaviors, including sensory processing, motor control, and emotional regulation.
4. Utilize techniques such as brain imaging, electrophysiology, and pharmacology to investigate psychological phenomena.
5. Evaluate the interactions between different brain regions and their impact on cognition, learning, memory, and psychological disorders.

Course Content:

Modules	Blooms level*	Number of hours

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Module I: Introduction to Physiological Concept of Physiological, Methods, Reductionism, ethical issues The Neurons: Structure, Impulse conduction, Synapse, Role of Neurotransmitters. The nervous system: Basic subdivisions- Peripheral and Central.	**L1, L2, L3**	18
Module II: Hemisphere function Cortical Lobes (Frontal, Parietal & Temporal) and their functions, Corpus Callosum, and the split–brain studies, Hemispheric specialization across two lobes.	**L1, L2, L3**	18
Module III: Learning and Memory Neuro-biological basis of Learning and memory Neuropathology--Anterograde and Retrograde Amnesia Dementia & Alzheimer ‘s disease, Korsakoff ‘s Syndrome	**L3, L4, L5**	18
Module IV: Emotion, Hunger & Motivation Psychophysiology of Emotions-Peripheral & Central route Physiological mechanism of Stress and Anxiety, Physiological basis of Hunger & Thirst motivation, Homeostasis: Obesity, Anorexia Nervosa & Bulimia Nervosa	**L3, L4, L5**	18
Module V: Sleep, Arousal and Biological Rhythms Concept of arousal; Physiological measures of arousal (EEG Brain waves) Reticular Formation and Central arousal Sleep—REM and Non-REM sleep, Functions of sleep Other Biological rhythms & Role of Endocrine glands	**L3, L4, L5, L6**	18

**Bloom’s Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

Morgan, C. T., & King, R. (1993). Introduction to psychology. New Delhi, India: Tata McGraw Hill Publishing Company Limited.
• Leukel, F. (). Introduction to Physiological Psychology
• Ciccarelli, S.K., & Meyer, G.E. (2007). Psychology. (South Asian Edition). India: Pearson Education Inc.
• Feldman, R.S., (2009). Essentials of Understanding Psychology. New Delhi: Tata McGraw-Hill.
• Green, S. (1995). Principles of biopsychology. UK: Lawrence Erlbaum Associates Ltd.
• Annett, M. (1984). Left, right, hand and brain: The right shift theory. London: Lawrence Erlbaum Associates Ltd.
• Pinel, J. P. J. (2004). Biopsychology. Boston, MA: Allyn & Bacon.
• Sperry, R.W. (1982). Some effects of disconnecting the cerebral hemispheres. Science, 217, 1223-1226.
• Rosenzweig, M. R., Leiman, A. L., & Breedlove, S. M. (1996). Biological psychology. Sunderland, Mass: Sinauer Associates.
• Carlson, N. R. (2012). Foundations of physiological psychology. (Sixth Edition). Delhi: Pearson Education.

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SEMESTER-VI

DPSY2651	GUIDANCE AND COUNSELLING PSYCHOLOGY	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description:
Guidance and Counselling Psychology explores the theories, principles, and practices involved in assisting individuals to overcome personal, social, educational, and vocational challenges. This course delves into the application of psychological theories and techniques to promote holistic well-being, enhance personal development, and facilitate effective decision-making. Topics include counselling theories, assessment methods, ethical considerations, multicultural competence, and interventions aimed at fostering psychological resilience and growth. Through experiential learning, students develop essential counselling skills, including active listening, empathy, rapport-building, and goal-setting, to support individuals in navigating life transitions and achieving their fullest potential."

Course Objectives
The objective of this course is to provide a comprehensive understanding of guidance and counselling in educational settings. It aims to equip participants with the knowledge and skills necessary to effectively support individuals in achieving personal, social, educational, and career goals. It concentrates on the importance of counsellors and of the multicultural, ethical and legal environments in which counsellors operate. This paper focuses on the context and process of counselling to provide a range of high quality and responsive counselling skills and its applications to help oneself and others. The current discipline will enable the students to develop an understanding of counselling within school setup, which is collaborative work of counsellor and other school staff.

Course Outcome:
On completion of this course, students will be able to:

1. Understand the definition and significance of guidance and counselling.
2. Identify the goals and characteristics of effective counselling.
3. Recognize the importance of guidance and counselling in school settings.
4. Differentiate between guidance, counselling, and psychotherapy.
5. Understand the structure and phases of the counselling process.
6. Develop skills for building and maintaining effective counselling relationships.
7. Learn techniques for working through counselling sessions and terminating the relationship appropriately.
8. Master verbal and non-verbal communication techniques essential for effective counselling.
9. Explore theoretical approaches in counselling, including psychoanalytic, behavioristic, cognitive-behavioral, and humanistic/existential approaches.
10. Examine current issues, ethical considerations, and legal standards in counselling practice, as per the American Psychological Association (APA) guidelines.

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Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction Definition of Guidance Meaning and Goals of counselling Characteristics of a good counsellor Importance of guidance and counselling in school Difference between Guidance, Counselling and Psychotherapy	**L1, L2, L3**	18
Module II: Counselling Process Building Counselling Relationship: Structure and phase of counselling Working in a Counselling Relationship Termination of Counselling Relationship	**L1, L2, L3**	18
Module III: Fundamentals of Counselling Skills Special Relationship Problems: Transference, Countertransference, Resistance Verbal and Non-Verbal Techniques	**L3, L4, L5**	18
Module IV: Basics of Guidance Organizations of good guidance service at different levels of education Essentials of good guidance programme	**L3, L4, L5**	18
Module V: Theoretical approaches in counselling Freud's Psychoanalytic Approach Behavioristic Approach Cognitive-Behavioral Approach Humanistic and Existential Approaches	**L3, L4, L5, L6**	18
Module VI: Current Issues in Counselling Ethical and Legal Issues in counselling as per the APA Code of Professional Ethics Ethical standards for evaluation Criticisms to Counselling		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

Text:

- Rao, S. N.: Counselling and Guidance (2nd Ed.). Tata McGraw Hill
- Belkin, G.S.: Introduction to Counselling. W.C.: Brown Publishers
- Nelson, J.: The Theory and Practice of Counselling Psychology. New York: Hollt Rinehart & Winston
- Gibson, R. L. & Mitchell, M. H.: Introduction to Counselling and Guidance (7th).New Delhi Prentice-Hall of India Pvt. Ltd

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- Gladding, S. T.: Counselling: A Comprehensive Profession (6th Ed.). Dorling Kindersley India Pvt. Ltd.
- Hansen, J. H. & Rosberg, R.H: Counselling: Theory and Process (5th Ed.). Allyn & Bacon
- Pal, O. B.: Guidance and Counselling. New Delhi: Motilal Banarsidas Publishers Private Ltd.
- Milner, J., Byrne, P. O. & Campling, J.: Assessment in Counselling: Theory, Process and Decision-Making. Palgrave MacMillan
- Patterson, L.E.: The Counselling Process. Wadsworth Publishing

References:

Welfel, E.R., & Patterson, L.E: The Counselling Process: A Multi-theoritical Integrative Approach. Thomson Brooks / Cole

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DPSY2603	ORGANIZATIONAL BEHAVIOUR	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

Organizational Behaviour explores the dynamics of individual, group, and organizational behaviour within the context of various workplace settings. This course examines theories, research findings, and practical applications relevant to understanding human behaviour in organizations. Topics may include individual differences, motivation, communication, leadership, decision-making, teamwork, organizational culture, and change management. Through case studies, simulations, and experiential learning activities, students develop insights into how individuals and groups interact within organizations, and how these interactions influence organizational effectiveness and employee well-being. Emphasis is placed on developing practical skills for effective leadership, communication, conflict resolution, and organizational development.

Course Objectives

The course aims to provide a comprehensive understanding of Organizational Psychology, beginning with its concept, meaning, and historical evolution. It delves into the subject matter and functions of Organizational Psychology, covering areas such as work motivation, organizational attitude and behaviour, leadership, and organizational culture. Through the exploration of both early and contemporary theories, students will gain insights into factors influencing work motivation, job satisfaction, and organizational commitment, as well as the dynamics of leadership and power within organizations. Additionally, the course examines the development, impact, and consequences of organizational culture, equipping students with the knowledge and analytical skills necessary to address organizational challenges effectively.

Course Outcomes (COs):

On completion of this course, the students will be able to

1. Demonstrate an understanding of the factors influencing individual behaviour in organizations, personality, attitudes, motivation, and job satisfaction.
2. Analyse and evaluate group dynamics, including team formation, communication patterns, decision-making processes, and conflict resolution strategies.
3. 3.Uunderstand different types of organizational structures and their impact on communication, coordination, and decision-making within organizations.
4. Develop leadership and management skills, including the ability to identify different leadership styles, traits, and behaviours, and their effects on employee motivation and organizational performance.
5. Understand the process of organizational change, including the reasons for change, resistance to change, and strategies for managing change effectively.
6. Apply concepts and theories from organizational behaviour to analyse and solve real-world organizational challenges, demonstrating their ability to apply theoretical knowledge to practical situations.

Course Content:

Modules	Blooms level*	Number of hours

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Module I: Nature and Scope of Organizational Psychology Organizational Psychology: Concept, Meaning and definitions, subject matter and functions of Organizational Psychology, Historical development of Organizational Psychology	**L1, L2, L3**	18
Module II: Work Motivation Early theories: Maslow, McClelland, Two factors Contemporary theories: Goal setting, Equity, Expectancy	**L1, L2, L3**	18
Module III: Organizational Attitude and Behaviour Organizational Commitment: Concepts, Determinants and Consequences Job Satisfaction, Job Involvement, Job Design: Job enlargement, Job enrichment and Job characteristics models Applications: Job Characteristics Model, Job redesign, MBO	**L3, L4, L5**	18
Module IV: Leadership and Influence Processes Leadership: Meaning, Concept and different types of leadership Theories of Leadership Power and Influence in Organizations	**L3, L4, L5**	18
Module V: Organizational Culture Organizational Culture: Meaning and definitions. Development of Organizational Culture Impact and Consequences of organizational culture	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text & References:

Text:

- Robbin's S.P. (1993). Organizational Behaviour: Concepts Controversies and Applications; (6th Ed.)New Delhi: Prentice Hall.
- Bass, B.H. & Berrett, G.V. (1981). People, Work, and Organizations an Introduction to Industrialand Organizational Psychology; Boston: Allyn and Bacon, INC.
- Feldman, D.C. & Aenold, H.J. (1985). Managing Individual and Group Behaviour in Organizations;New York: McGraw-Hill.
- Smith, R.D., (1988). Organizational Behaviour; New York: McGraw-Hill.
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- Davis, K. & Newstroms, J.W. (1989). Human Behaviour at Work: Organizational Behaviour; NewYork: McGraw-Hill
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DPSY2604	ARTIFICIAL INTELLIGENCE AND CYBER-PSYCHOLOGY	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description:

The **association between AI and Cyber-Psychology** is essential for developing technologies that are both advanced and human centric. AI provides powerful tools for understanding and improving human behaviour, while Cyber-Psychology ensures that these technologies are used ethically and effectively. Together, they hold the potential to transform mental health care, enhance digital well-being, and create more supportive and engaging online environments. Their collaboration can lead to innovative solutions that address complex psychological and societal challenges, ultimately improving the quality of life in the digital age.

Course Objective:

Cyberpsychology is the field of psychology that investigates the impact of digital technology and online interactions on human behaviour and mental processes, exploring topics like internet addiction, online relationships, and digital well-being. AI, or Artificial Intelligence, refers to the development of computer systems that can perform tasks typically requiring human intelligence, such as problem-solving, decision-making, and natural language understanding.

This course has the following objectives.

- a comprehensive understanding of the psychological aspects of online behaviour, exploring topics such as internet addiction, toxic disinhibition, online identity, social media behaviour, social and professional networking online, cyberbullying, and some aspects of cybersecurity.
- Learners gain an applicatory know-how of psychological principles to address the challenges and opportunities arising from the digital world.
- Explore the complex issues surrounding gaming addiction, online behavioural misconduct, and cyberbullying. Understand the symptoms of internet and gaming addiction, the psychological implications of anonymity, and the types and forms of cyberbullying, along with strategies for prevention and legal interventions.
- Examine the evolving landscape of digital mental health and cognitive development, including the effectiveness and ethical considerations of cybertheory, the role of AI chatbots and virtual therapists, and the psychological aspects of online learning, critical thinking, memory, and digital amnesia.

Course Outcomes (COs):

- Students will learn key principles of cyber-psychology, such as online behavior, digital identity, and the psychological effects of internet use.
- They will explore case studies of AI applications in mental health, user experience, and online behavior monitoring.
- Students will understand the ethical considerations in AI development and deployment, including issues related to privacy, bias, and transparency.
- Students will learn how to use AI for behavioral analytics, understanding how to interpret data from digital footprints to make predictions about human behavior.

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Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to Cyberpsychology • Definition and scope of cyberpsychology • Historical context and development of the field • Ethical considerations in cyberpsychology research • Examination of communication patterns in online environments	**L1, L2, L3**	18
Module II: Online Self, Social Media and Relationships • Online self-disclosure, Impression management and privacy concerns • Identity theft and digital footprints, Effects of social media on interpersonal relationships • Social Capital, social comparison and self-esteem in the digital age • Online dating, Virtual Dating and Chatbots and its psychological implications	**L1, L2, L3**	18
Module III: Gaming Addiction and Online Behavioural Misconduct • Understanding Internet and gaming addiction, symptoms, treatment approaches • Anonymity and online disinhibition effect • Types and forms of cyberbullying: Psychological impact on victims and perpetrators • Strategies for prevention and legal interventions	**L3, L4, L5**	18
Module IV: Digital Mental Health and Cognitive Development • Cybertherapy and Digital Mental Health (teletherapy, Efficacy and ethical considerations) • AI Chatbots and Virtual Therapists, other Techniques and strategies • Online Learning and Cognition (online learning and critical thinking, cognitive overload, memory and digital amnesia)	**L3, L4, L5**	18
Module V: Cybersecurity and Virtual Reality • Virtual Reality and Immersive Technologies: Psychological implications of virtual reality experiences, Uses of VR in therapy, education, and entertainment • Cybersecurity and Online Safety: Psychological factors, Cybersecurity threats and their impact on mental well-being • Promoting digital citizenship and responsible online behaviour	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Joinson, A. (2007). Understanding the Psychology of Internet Behaviour: Virtual Worlds, Real Lives. Palgrave Macmillan.
- Wallace, P. (2014). The Psychology of the Internet. Cambridge University Press.
- Young, K. S., & Abreu, C. N. (2011). Internet Addiction: A Handbook and Guide to Evaluation and Treatment. John Wiley & Sons.

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- Kätsyri, J., Förger, K., Mäkäräinen, M., & Takala, T. (2019). A review of empirical evidence on different uncanny valley hypotheses: Support for perceptual mismatch as one road to affective response. International Journal of Social Robotics, 11(2), 241-261.
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DPSY2605	MEDIA AND CONSUMER PSYCHOLOGY	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course provides a comprehensive examination of the relationship between media and consumer behavior. Students will explore key concepts, historical perspectives, and theories of consumer behavior, examining how media influences consumer choices and purchasing decisions. Topics include the role of advertising in shaping consumer behavior, branding strategies, the impact of different media channels on consumer behavior, digital media and online shopping, consumer decision-making processes, and emerging trends in media and consumer behavior. Ethical considerations, cultural influences, and future trends in media consumption will also be discussed.

Course Objectives

Media and Consumer Behaviour is a field of study that examines how various forms of media, such as advertising, television, social media, and digital platforms, influence and shape the choices, perceptions, and decision-making processes of consumers. This discipline explores the interplay between media messages and consumer behaviour, delving into the psychological, cultural, and ethical factors that impact how individuals respond to marketing campaigns, make purchasing decisions, and form brand loyalties.

This course has the following objectives.

1. To understand key concepts, theories, and the historical context.
2. To analyse advertising's role, branding, and ethical considerations.
3. To explore the impact of different media channels.
4. To investigate digital media's influence on consumer choices.
5. To understand the consumer decision-making process.
6. To examine cultural and ethical influences on consumer behaviour.
7. To enhance media literacy and ethical awareness.
8. To analyse public policy and emerging media trends.

Course Outcomes (COs):

On completion of this course, the students will be able to

- Demonstrate a comprehensive understanding of key theories and principles in media and consumer psychology.
- Analyze how different types of media (e.g., television, social media, print) impact consumer attitudes, perceptions, and behaviors.
- Apply theories of persuasion and attitude change to develop effective marketing and advertising campaigns.
- Design and conduct research studies to investigate consumer attitudes, preferences, and behaviors.

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Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to Media and Consumer Behaviour • Defining key concepts • Historical perspective on media and consumption • Theories of consumer behavior	**L1, L2, L3**	18
Module II: Media and Advertising • The role of advertising in shaping consumer behavior • Branding, Brand loyalty, and Brand perceptions • Advertising strategies and techniques • Ethical considerations in advertising	**L1, L2, L3**	18
Module III: Media Channels and Consumer Behavior • Television OTT, Radio and consumer behavior • Effects of Print media and online media on consumer behavior	**L3, L4, L5**	18
Module IV: Digital Media and Online Shopping • E-commerce and consumer behavior • Social media and its influence on consumer choices • Online reviews and consumer trust	**L3, L4, L5**	18
Module V: Consumer Decision-Making and Branding • Problem recognition and information search • Evaluation of alternatives • Purchase and post-purchase evaluation • Consumer Perception, Attitudes, and Attitude change	**L3, L4, L5, L6**	18
Module VI: Culture, Ethics, and Future Trends • Culture(Social norms, and Subcultures) and its influence on consumer behavior • Consumer Ethics, Media Literacy. Public Policy and Government regulations, Emerging media issues. • Emerging Trends in Media and Consumer Behavior, Artificial intelligence, Virtual reality, and Mobile consumption		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Consumer Behavior – Building Marketing Strategy, tenth edition. Hawkins, Mothersbaugh, Best; McGraw-Hill, 2007. ISBN-10: 0-07-310137-0
- Curtis P Haugtvedt -Curtis P Haugtvedt- Handbook of Consumer

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- Barrie Gunter- The Psychology of Consumer Profiling in a Digital Age. Routledge
- Potter, W. J. (2014). Media Effects. Sage Publications.
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DPSY2606	SPORTS PSYCHOLOGY	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

Sports Psychology is a comprehensive examination of the psychological factors that influence participation and performance in sports and exercise. This course covers a range of topics including motivation, anxiety, concentration, self-confidence, and the psychological benefits of physical activity. Through a combination of theoretical frameworks and practical applications, students will gain insights into the mental processes and behaviors of athletes and teams.

Course Objectives

Sports psychology is a subfield of psychology that focuses on understanding and enhancing the psychological factors that influence sports performance, exercise, and physical activity. It involves the application of psychological principles and techniques to help athletes, coaches, and sports teams improve their mental and emotional well-being, develop effective strategies for performance, and achieve their athletic goals.

This course has the following objectives.

- Develop an understanding of the psychological principles that underlie sports performance, including stress, motivation, and attention.
- Explore the historical and contemporary perspectives of sports psychology to appreciate its evolution and significance in the field of sports and athletics.
- Examine the role of personality, motivation, and skill development in enhancing athletic performance.
- Investigate the cognitive and social aspects of sports, focusing on areas like information processing, group dynamics, and leadership.
- Acquire practical knowledge and ethical considerations for applying sports psychology in training, coaching, and the overall well-being of athletes.

Course Outcomes (COs):

On completion of this course, the students will be able to

1. Explain major psychological theories and concepts related to sports performance and exercise behavior.
2. Assess different types of motivation and their effects on athletic performance, distinguishing between intrinsic and extrinsic motivators.
3. Identify sources of stress and anxiety in sports contexts and implement effective strategies to manage these psychological factors.
4. Utilize techniques to improve concentration and mental focus, applying these strategies in practical sports settings.
5. Demonstrate methods to build and sustain self-confidence in athletes, recognizing its importance for performance.
6. Analyze and improve team dynamics by applying psychological principles to enhance communication, cohesion, and leadership within sports teams.
7. Implement psychological skills training techniques, including visualization, relaxation, and mental rehearsal, to enhance athletic performance.
8. Understand the psychological impact of sports injuries and apply strategies to support athletes through recovery and rehabilitation.

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Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to Sports Psychology Nature and Scope of Sports Psychology Historical Perspectives, Recent Developments and Trends on Sports Psychology Biopsychosocial Model in Sports Psychology Practical Applications of Sports Psychology: Assessment Tools, Case Studies and Real-world Examples Ethical Considerations and Future Directions in Sports Psychology	**L1, L2, L3**	18
Module II: Psychological Factors in Sports Performance The Role of Stress in Sports Performance Arousal, Anxiety, and Their Impact on Athletes: Drive theory, inverted U theory and the Catastrophe theory Attention and Concentration in Individual and Team Sports Self-Efficacy Theory in Sports, Self Esteem and Familial factors	**L1, L2, L3**	18
Module III: Motivation and Personality in Sports Motivation and Its Influence on Sports Performance: Psychodynamic, Behavioral, Humanistic Perspectives Achievement Goal Theory, Self-Determination Theory in Sports Personality Traits and Athletic Performance: Big 5, Belbin Team Roles Goal Setting in Sports	**L3, L4, L5**	18
Module IV: Cognitive and Social Aspects of Sports Cognitive Processes in Individual and Team Sports Information Processing, Memory in Sports Behavior Modification, Mental Imagery and Visualization Social Identity Theory and Group Behavior in Sports Leadership, Team Formation, Team Cohesion in Sports	**L3, L4, L5**	18
Module V: Aggression and Resilience in Sports **Aggression:** Theories, individual differences, situational factors in sports Reduction and channelizing of aggression Compliance, Conflict Resolution and Resilience Cultural and Diversity Considerations in Sports Psychology	**L3, L4, L5, L6**	18
Module VI: Sports Training and Coaching Effective Coaching Techniques and Strategies Feedback and Reinforcement in Coaching Athlete Learning Styles and Instruction Recovery and Rehabilitation in Sports Periodization in Sports Training		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text & References:

- Matt Jarvis (2006). Sports Psychology –A student's Handbook,Routledge Publication.
- D.F.Shaw, T.Gorely&R.M.Corban (2005). Sports and Exercise Psychology, BIOS Publisher.
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SEMESTER-VII

DPSY2701	ADVANCED STATISTICS (PARAMETRIC & NON-PARAMETRIC)	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course provides an in-depth exploration of advanced statistical methods and their applications in psychological research. Students will learn about various statistical techniques, including ANOVA, correlation, chi-square tests, regression analysis, and factor analysis. The course also introduces students to the use of SPSS and online platforms for statistical analysis. Emphasis is placed on understanding the concepts, assumptions, and applications of these methods, as well as interpreting and reporting results accurately.

Course Objectives

- Provide a comprehensive understanding of advanced statistical concepts and their applications in Psychology.
- Develop proficiency in identifying and applying different scales of measurement.
- Equip students with the skills to conduct and interpret hypothesis testing.
- Emphasize the importance of reliability and understanding the standard error of the mean.
- Teach the computation, interpretation, and application of ANOVA, correlation, chi-square tests, and regression analysis.
- Introduce factor analysis and its application in psychological research.
- Familiarize students with SPSS and online platforms for statistical analysis.

Course Outcomes (COs)

Upon successful completion of this course, students will be able to:

1. Define key statistical concepts and apply them in psychological research.
2. Accurately use and differentiate between nominal, ordinal, interval, and ratio scales of measurement.
3. Perform and interpret one-tailed and two-tailed hypothesis tests, understanding Type I and Type II errors.
4. Determine and evaluate the reliability of statistics in data analysis.
5. Understand and calculate the standard error of the mean.
6. Conduct and interpret two-way ANOVA, Friedman's two-way analysis, Wilcoxon Rank Sum Test, and Kolmogorov-Smirnov test.
7. Perform and interpret various types of correlation analyses, including Phi-Coefficient, Contingency Coefficient, and Tetrachoric.
8. Conduct and interpret Chi-Square Goodness of Fit and Chi-Square Test of Independence.
9. Conduct and interpret simple and multiple linear regression analyses.
10. Understand and apply factor analysis techniques.
11. Use SPSS and online platforms for conducting and interpreting statistical analyses.

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Course Content:

Modules	Blooms level*	Number of hours
Module I: Basics Concept of Reasoning, population, sample, and probability theory in statistical inferences Scales of Measurement: Nominal, Ordinal, Interval, Ratio Hypothesis testing: One-tailed and Two-tailed tests, Type I and Type II errors Meaning, concept and importance of determining reliability of statistics in data analysis Standard error of mean	**L1, L2, L3**	18
Module II: Statistics and Test of Significance ANOVA: Two-way computation, interpretation and its uses in psychological research. The Friedman Two-way analysis of variance by ranks-Basic concepts, uses and computations. Wilcoxen Rank sum test. Test of differences between groups (Independent samples): Kolmogorov-Smirnov test, uses	**L1, L2, L3**	18
Module III: Correlation and its techniques Correlation: concept, types, assumption and Utility of Cor-relational Analysis in Psychological Research Concept definition assumptions of Nominal Measures of Correlations The Phi-Coefficient, Contingency coefficient concepts uses and calculations Tetrachoric**r**: Its uses, computation and comparison Bi-serial Correlation, Point Bi-serial Correlation, Partial Correlation, Tetra-choric Correlation	**L3, L4, L5**	18
Module IV: Chi-Square and Regression Concept and Definition, its assumptions and use Chi-Square Goodness of Fit (One-Sample Test), Chi-Square Test of Independence Simple regression analysis and Multiple linear regression, its uses, concepts and assumptions	**L3, L4, L5**	18
Module V: Factor Analysis Factor analysis: A hypothetical example, Factor matrices and factor loadings. Methods of factor analysis. Types of factor analysis.	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

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Text & References:

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- Rice, J.A: Mathematical Statistics & Data Analysis, South western.
- Salkind, N & Green, S: SPSS Quick Starts.

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DPSY2702	PSYCHOLOGICAL ASSESSMENT AND DIAGNOSIS	L	T	P	FW/ Proj	C
Version	**2023**	1	1	0	0	2
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description: This course provides an in-depth exploration of various psychological assessment tools and techniques used in clinical and educational settings. It covers the theoretical foundations, administration procedures, interpretation, and ethical considerations associated with a wide range of psychological tests, including intelligence tests, achievement tests, personality assessments, projective tests, and developmental scales. Special emphasis is placed on understanding the principles of test construction, bias, fairness, and emerging trends in online testing.

Course Objectives:

1. To familiarize students with the purpose, types, and ethical issues related to psychological testing.
2. To provide an understanding of the theoretical frameworks underlying cognitive, achievement, and personality assessments.
3. To introduce students to a variety of psychological assessment tools, including intelligence tests, achievement tests, personality inventories, and projective techniques.
4. To equip students with the necessary skills to administer, score, and interpret psychological tests accurately and ethically.
5. To enhance students' critical thinking skills regarding the selection and application of appropriate assessment measures based on client characteristics and assessment goals.
6. To explore emerging trends in online testing and their implications for psychological assessment practices.

Course Outcomes: By the end of the course, students should be able to:

1. Demonstrate a comprehensive understanding of the purpose, principles, and types of psychological tests.
2. Evaluate the validity, reliability, and fairness of psychological assessment instruments.
3. Administer, score, and interpret a variety of psychological tests, including intelligence tests, achievement tests, and personality inventories.
4. Identify and address ethical issues and considerations in psychological testing, including cultural and contextual factors.
5. Apply psychological assessment techniques effectively in diverse clinical and educational settings.
6. Critically analyze and synthesize assessment data to generate comprehensive psychological evaluation reports.
7. Adapt assessment strategies to meet the needs of individuals across the lifespan, including children, adolescents, and adults.
8. Stay informed about emerging trends and advancements in psychological assessment, particularly in the context of online testing platforms

Course Content:

Modules	Blooms level*	Number of hours

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Module I: Introduction Purpose of testing, types of test , Bias & Fairness Ethical Issues in Psychological Testing Norms and types, Report Writings Emerging trends of online testing	**L1, L2, L3**	18
Module II: Cognitive assessment and neuropsychological Assessment Intelligence Tests: Bhatia Battery Weschler's Adult Performance Intelligence Scale (WAPIS) Raven's Progressive Matrices (Colour Progressive Matrices, Standard Progressive Matrices and Advanced Progressive Matrices) Binet Kamat Test Weschler's Intelligence Scale for Children – Revised (WISC) Wide Range Intelligence Test (WRIT) Alexander Pass-a-long Test of Intelligence Draw-A-person Intellectual Ability Test for Children, Adolescents and Adults (DAP:IQ) NIMHANS Battery of Intelligence	**L1, L2, L3**	18
Module III: Achievement Test Wechsler Individual Achievement Test (WIAT) Diagnostic Achievement Test For Adolescents – Second Edition (DATA-2) Kaufman Test of Educational Achievement (KTEA) Woodcock-Johnson Tests of Achievement (WJ)	**L3, L4, L5**	18
Module IV: Assessment of Personality: Non-Projective Test Cattell's 16 Personality Factor Inventory (16 PF) California Q-Sort Tests Myers Briggs Type Indicator (MBTI) Minnesota Multiphasic Personality Inventory (MMPI) Personality Inventory for Children Bell's Adjustment Inventory Eysenck's Personality Questionnaire NEO-TM Personality Inventory-3 (NEOTM-PI-3) Adult / Adolescent	**L3, L4, L5**	18
Module V: Assessment of Personality: Projective Tests Introduction of Projective Techniques Difference between Projective & Non-Projective Techniques Thematic Apperception Test Rorschach Inkblot Test House-Tree-Person (H-T-P) Sentence Completion Test	**L3, L4, L5, L6**	18
Module VI: Developmental Scales Developmental Screening Test Vineland's Social Maturity Scale Measures of Psychosocial Development (MPD) Gesells' Developmental Schedule		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Text & References:

Text:

- Freeman, F. S.,(1965), Theory and Practice of Psychological Testing; New Delhi: Oxford &IBTT

References:

- Jackson C.,(1998), Understanding Psychological Testing; Jaico Publishing House
- Anastasi&Urbina S.(2000), Psychological Testing ,7th Edition; Person Education (Singapore)
- Pte. Ltd.,
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DPSY2709	PRACTICALS-VII	L	T	P	FW/ Proj	C
Version	**2023**	0	0	4	0	2
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

The "Psychological Practical" course immerses students in the application of key psychological assessment tools used in clinical and research settings. Students will gain firsthand experience in administering and interpreting assessments such as the Mobile Phone Addiction Scale, Clinical Analysis Questionnaire (CAQ), PGI Health Questionnaire, Career Decision Scale (CDS), NEO Five-Factor Inventory (NEO-FFI), and Raven's Standard Progressive Matrices (SPM). Each of these instruments is pivotal in understanding different aspects of human behavior and mental processes. The course emphasizes the practical application of these assessments, including scoring, interpretation, and reporting results. Through this course, students will build competencies that are crucial for professional practice in psychology.

Course Objectives

1. To demonstrate practical experience to the students in administering and scoring psychological tests andinterpreting the scores.
2. To acquaint the students with the basic procedure and design of psychology tests.
3. To familiarize the students with the use of appropriate statistical techniques
4. To encourage and guide the students to undertake a small-scale research project.

Course Outcomes (COs):

The primary goal of this course is to develop students' practical skills in psychological assessment through direct experience with a variety of testing instruments. By the end of this course, students will be able to:

1. Learn to accurately administer a range of psychological tests and assessments.
2. Develop skills to score assessments correctly and interpret the results in a meaningful way.
3. Gain insights into the specific applications and relevance of each test in different psychological contexts.
4. Understand and evaluate the reliability, validity, and normative data of the assessments.
5. Learn to synthesize assessment results into comprehensive reports.
6. Address ethical considerations and cultural factors in the administration and interpretation of assessments.
7. Build proficiency in the use of technology and tools required for administering assessments.

Note: Total 5 practicals will be conducted in the Fifth semester among the list of following practicals out of which first three practicals are compulsory.

Course Content:

1	Mobile Phone Addiction	Digital Addiction
2	Clinical Analysis Questionnaire (CAQ)	Personality & Psychopathology
3	PGI Health Questionnaire	Health
4	Career Decision Scale	Career
5	NEO-FFI	Personality

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6	Standard Progressive Matrices	Intelligence

Examination Scheme:

Components	CT	File Demonstration	V	A	EE
Weightage (%)		35	35	5	25

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text & References:

- Mohsin, S. M.: Experiments in Psychology. Motilal Banarasidas
- Woodworth, R.S.: Experimental Psychology. Oxford & IBH & Schlosberg, H. Publishing
- Postman, L. & Egan, J. P.: Experimental Psychology: An Introduction. Harper and Row.
- Respective Manuals of the tests.

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DPSY2707	SCHOOL COUNSELLING	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course provides an overview of the theory and practice of school counselling. It covers essential counselling techniques, developmental theories, and strategies for supporting students' academic, social, and emotional growth. Students will learn how to design and implement comprehensive school counselling programs, address diverse student needs, and collaborate with educators, parents, and community resources. The course emphasizes ethical and cultural considerations in school counselling practice.

Course Objectives

1. To provide students with an understanding of the importance and need for guidance and counseling in school settings.
2. To familiarize students with the role of a counselor in various educational settings.
3. To explore the role of personal guidance in school counseling, emphasizing coordination, collaboration, referral processes, and team-building efforts with teachers, parents, support personnel, and community resources, and recognizing the importance of a holistic approach in counseling.
4. To examine the mental health needs of students, as well as the role of faith and spirituality in students' mental health.
5. To understand the experience of transition for students and to develop knowledge of prevention and crisis intervention strategies to support students.
6. To equip students with practical skills in counseling techniques, communication strategies, and ethical guidelines for working with students in educational settings, fostering empathy, understanding, and support for students' emotional and psychological well-being.
7. To encourage critical thinking and reflection on the role of counselors in promoting students' academic success, personal development, and mental health.

Course Outcomes (COs):

On completion of this course, the students will be able to

- Describe key theories and models in school counselling.
- Apply developmental theories to support student growth and learning.
- Demonstrate effective counselling techniques for individual and group settings.
- Utilize active listening, empathy, and problem-solving strategies in sessions.
- Implement culturally responsive counselling practices
- Adhere to ethical guidelines in school counselling.

Course Content:

Modules	Blooms level*	Number of hours

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Module I: Introduction Guidance & Counselling, Need for and importance of guidance and counselling in school History, philosophy, and current trends in school counselling and educational systems	**L1, L2, L3**	18
Module II: Counsellor in Educational Setting Elementary School, Middle School, Secondary School & Higher Secondary Knowledge of the school setting, environment, and pre-K—12 curriculum Counselling & Curriculum, Counselling & Family	**L1, L2, L3**	18
Module III: Role of Personal Guidance Coordination, collaboration, referral, and team-building efforts with teachers, parents, support personnel, and community resources Importance of holistic approach in counselling	**L3, L4, L5**	18
Module IV: Mental Health of Students Typical difficulties of students Supportive Services Self Help Material, Students' perspective of Mental Health Role of Faith & Spirituality in Students mental Health	**L3, L4, L5**	18
Module V: Experience of Transition Concept of Change, Adjustment & Transition Transition & Students' experiences Knowledge of prevention and crisis intervention strategies	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text & References:

- Schmidt, J. (2008). Counseling in Schools: Comprehensive programs of responsive services for all students. Boston, MA, Allyn and Bacon.
- Dougherty, A. (2005). Psychological consultation and collaboration in school and community settings. Belmont, CA:Thomson Brooks/Cole.
- Ben, N. Ard, Jr. (Ed.) (1997). Counselling and Psychotherapy: Classics on Theories and Issues; Science and Behaviour Books Co.
- Nelson, J. (1982). The Theory and Practice of Counselling Psychology; New York: Hollt Rinehart & Winston.
- Brammer, L.M. & Shostrom, E.L. (1977). Therapeutic psychology: Fundamentals of Counselling Psychotherapy (3rd Ed.). Englewood Cliffs: Prentice Hall
- Wittmer, J. (2000). Managing you school counseling program: K-12 developmental strategies. Minneapolis, MN:Education Media.
- Gysbers, N. & Henderson, P. (2006). Developing and managing your school guidance and counseling program. Alexandria, VA: American Counseling Association.

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- Stone, C. B., & Dahir, C. A. (2006). The transformed school counselor. Boston: Lahaska.
- ASCA (2003). The ASCA national model: a framework for school counseling programs
- TSCA (2004). Pre-K-12th grade program development guide.
- Mahoney, M. J., & Avener, M. (1977). Psychology of the elite athlete: An exploratory study. Cognitive Therapy and Research, 1(2), 135-141.
- Brewer, B. W., Van Raalte, J. L., & Linder, D. E. (1993). Athletes' use of imagery in the rehabilitation process. Journal of Sport Rehabilitation, 2(3), 209-218.
- Treasure, D. C., & Roberts, G. C. (1998). Applications of achievement goal theory to physical education: Implications for enhancing motivation. Quest, 50(3), 290-306
- Van Raalte, J. L., Cornelius, A. E., Linder, D. E., & Brewer, B. W. (2015). The relationship between imagery function and imagery use among college athletes. Journal of Applied Sport Psychology, 27(2), 176-186.

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DPSY2708	EMERGING FIELDS OF PSYCHOLOGY	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course explores the cutting-edge developments and innovative fields within psychology. Students will examine new and interdisciplinary areas such as neuropsychology, positive psychology, health psychology, forensic psychology, and cyberpsychology. The course focuses on contemporary research, applications, and the impact of these emerging fields on society. Students will gain insights into the future directions of psychological science and practice.

Course Objective:

- To make student to become aware of the major psychological approaches to the study of behaviour and mental process,
- To become familiar with major fields of study within psychology, key research findings and theories of these fields.
- To recognize and apply psychological concepts and research findings to everyday situations.

Course Outcome:

By the end of this course, students will be able to:

1. Discuss potential future developments and innovations in psychology
2. Evaluate recent research findings and methodologies in these emerging areas.
3. Identify real-world applications and career opportunities within emerging fields of psychology.
4. Assess the societal impact and ethical considerations of advancements in these areas.
5. This course is ideal for students interested in exploring the latest trends and future directions in psychology, equipping them with knowledge of cutting-edge developments and interdisciplinary approaches

Course Content:

Modules	Blooms level*	Number of hours
Module I: Aviation Psychology Meaning and scope of aviation psychology; Role of an aviation psychologist; Models: Human performance, Human information processing, accident causation, Aeronautical decision-making (ADM). Research Methods use in Aviation Psychology, Abilities and Personality traits.	**L1, L2, L3**	18
Module II: Community Psychology Concept, definition of community psychology, Role of community psychologists, Values in Community Psychology, Research Methods use in community psychology, Social Change, Community Psychology Applied to Various Settings, Case study: Clean India Campaign	**L1, L2, L3**	18

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Module III: Forensic Psychology Forensic Psychology: Meaning, Origin, The roles of forensic psychologist; Relationship between Psychology & Law. Eyewitness testimony: The role of Memory; How do We study Eyewitness Issues, The psychology of Investigation.	**L3, L4, L5**	18
Module IV: Environmental Psychology Concepts and description and relationship of environmental psychology to other disciplines. Current Scope and Characteristics of the Field, Main Research Methods in Environmental Psychology, Climate change, Environment and Quality of Life, Future Perspectives in Environmental Psychology	**L3, L4, L5**	18
Module V: Traffic Psychology Concept, definition of Traffic psychology, E's in Road Safety, Social, Personality, and Affective Constructs in Driving, Mental Health and Driving, Vulnerable road users.	**L3, L4, L5, L6**	18
Module VI: Military Psychology Military Psychology: Nature, Scope, Historical perspective, Application, Developments, Contemporary issues and Emerging trends. Selection, Allocation and Training: Psychological Assessment for Personnel Selection, Issues relating Special Operations, Training and Performance in Special Situations, Futuristic Warfare.		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Text & References:

- Bor, R., & Hubbard, T. (Eds.). (2006). *Aviation mental health: Psychological implications for air transportation*. Ashgate Publishing, Ltd.
- Martinussen, M. & Hunter, D. R. (2017). *Aviation Psychology and Human Factors 2nd Edition*. CRC Press. (https://www.abul.org.br/biblioteca/78.pdf)
- Kalaga, L. (2023) Study of aviation psychology and its impact on human factors to substantially reduce human error through crew resource management, *International Journal of Science & Engineering Development Research*, 8 (2), 373 – 377. http://www.ijsdr.org/papers/IJSDR2302066.pdf
- Curtis, V. (2019). Explaining the outcomes of the'Clean India'campaign: institutional behaviour and sanitation transformation in India. *BMJ global health*, *4*(5), e001892.
- Moritsugu, J., Vera, E., Wong, F. Y., & Duffy, K. (2019). *Community psychology*. Routledge.
- Steg, L., Van Den Berg, A. E., & De Groot, J. I. (2018). Environmental psychology: History, scope, and methods. *Environmental psychology: An introduction*, 1-11.
- Porter, B. E. (Ed.). (2011). *Handbook of traffic psychology*. Academic press.
- Sullman, M., & Dorn, L. (2019). *Advances in traffic psychology*. CRC Press.
- Pozzulo, J., Forth, A. E., & Bennell, C. (2018).Forensic psychology.5th Ed. Pearson Prentice Hall. Durrant, R. (2013). An introduction to criminal psychology.Routledge.
- Bartol, C., &Bartol, A. (2008).Introduction to Forensic Psychology: Research and Application (Second ed.). London: SAGE.

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- Bartol, C. R., & Bartol, A. M. (2018). *Introduction to forensic psychology: Research and application*. Sage Publications.
- Huss, M. T. (2013). *Forensic psychology*. John Wiley & Sons.
- Clive Hollin (n.d.) Forensic Psychology: chapter 21, Blackwell publishing. https://www.blackwellpublishing.com/intropsych/pdf/chapter21.pdf
- Hall, R. & Mangelsdroff, A.D. (1991).Handbook of Military Psychology.USA: John Wiley & Sons. Kennedy, C.H. & Zillmer, E.A. (2006). Military Psychology: Clinical and Operational Applications. N.Y: Guilford Press.

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DPSY2739	BASICS OF RESEARCH METHODOLOGY, ETHICS, AND RESEARCH COMMUNICATIONS	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description

This course aims to provide students with a comprehensive understanding of conducting ethical research, utilizing proper research methodologies, and effectively communicating research findings. The course includes a final project where students will write a Literature Review on a topic chosen in consultation with the teacher(s).

This course is designed to equip students with essential skills and knowledge to conduct ethical research, employ proper research methodologies, and effectively communicate scientific information (with focus on writing a literature review). The course will cover topics such as research design, data collection and analysis, research ethics, and science communication strategies. Through a combination of lectures, discussions, case studies, and practical exercises, students will develop a deeper understanding of the research process and its ethical implications.

Course Objectives

The objective of this course is to impart knowledge about various stages of research process, research ethics and different ways of research communication.

The aim of this course is to impart research skills to the beginners and help to improve the quality of research by the existing researchers. It also encompasses the understanding and application of appropriate research design, statistics, and the use of the computer for reference management, report writing, research paper writing and presentation. The course also introduces the key conceptual issues of each research method, as well as giving practical guidance. It covers the series of research methodology contents: from problem formulation, to design, to data collection, analysis, reporting and dissemination. The course has the dual aims of equipping students with conceptual understandings of current academic debates regarding different methods, and the practical skills to put those methods into practice.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define criteria of good research, steps in research process, and data collection.

CO2. Identify different types of sampling and its purpose.

CO3. Conduct hypothesis testing for different types of samples and interpret the results.

CO4: Learn the importance of literature review, write research paper/thesis, use reference management software.

Course Content :

Module	Topic	**Blooms level***	Hours

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1	**Research Methodology** Understanding the research process: From research questions to conclusions Types of research: Qualitative and quantitative research Exploratory, descriptive, experimental, and correlational studies Scientific Thinking: Subjective Vs. Objective Thinking Logical Reasoning: Inductive Vs. Deductive Reasoning Formulating research hypotheses and objectives Purpose of a good research, Criteria of good research	L1, L2	10
2	**Descriptive Statistics** Data, Types of Data, Methods of data collection, Benefits and drawbacks, Graphical representation of data and interpretation. Measures of Central Tendency: Arithmetic Mean, Median, Mode, Measures of Dispersion: Range, Standard Deviation, Variance, Coefficient of Variation.	L1, L2, L3	15
3	**Inferential Statistics** Sampling: Basic concepts, Process of Sampling, Sample Size, Types of Samples, Sampling and non- sampling errors, Statistics and Parameters, Sampling Distribution of Means and Proportion, **Hypothesis Testing**, steps in testing of hypothesis, errors in hypothesis testing, z test and t test.	L1, L2, L3	15
4	**Research Ethics** Plagiarism, Fabrication, Falsification, Ethics with respect to human and Animal Research	L1, L2	5
5	**Communication** Characteristics of a good Research paper, Systematics Literature Review (choosing a topic, preparing outline, gathering authentic & appropriate references, avoiding plagiarism, use of reference management systems), Writing a good literature review, Structure of report (Introduction, Methodology, Analysis, Results, Discussions, Conclusions, Recommendations), Writing Quality Research Paper, Publishing Research Work in Quality Journals, Reference Management Software	L1, L2, L3	15

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional Exam	End Term Examination
Weightage (%)	5	10	15	70

Project based assignment: Student teams (2-3 students per team) will write a literature review on a topic of choice, in consultation with the teacher.

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Text books/ Reference books

- Research Methodology for Natural Sciences by Soumitro Banerjee, Publisher: IISc Press (1 January 2022); ISBN-10: 8194835178; ISBN-13: 978-8194835172
- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt. Ltd., New Delhi-110001
- Geode, Millian J.& Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Kothari, C.R.2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.
- Levin R I., Rubin D S. Statistics for Management. Sixth Edition, PHI
- Kapoor & Gupta. Probability & Statistics. S Chand Publishers, New Delhi.
- Montomery, Douglas C.(2007), 5th Ed. Design and Analysis of Experiments, Wiley India.
- Cooper, Donald R. and Pamels Schindler, Business Research Methods, Tata McGraw Hills, New Delhi
- Krishnaswamy, K.N. Sivakumar. Appa lyer and Mathiranjan M. 2006, Management Research Methodology: Integration of Principles, Methods and Techniques, Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Sachdeva, J.K. 2008. Business Research methodology. Himalaya Publishing House, New Delhi.
- Shekharan, Uma, Business Research Methods, Miley Education, Singapore.
- Zikmund, Millian G., Business Research Methods, Thomson Learning, Bombay.

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SEMESTER-VIII

DPSY2807	ADVANCED AND APPLIED COUNSELLING SKILLS	L	T	P	FW/ Proj	C
Version	**2023**	1	1	0	0	2
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

Advanced & Applied Counselling Skills is an in-depth exploration of sophisticated counselling techniques and their practical application in diverse settings. This course aims to build upon foundational counselling skills, introducing students to advanced methods and strategies to effectively address complex client issues. Through theoretical study and hands-on practice, students will refine their skills in various counselling modalities, ethical decision-making, and culturally responsive practices.

Course Objectives

This course enables students to gather knowledge about theories of Advanced Counselling Skills. It is further designed to equip students with skills to practice as a Counselling Psychologist.

Course Outcomes (COs):

On completion of this course, the students will be able to

1.Demonstrate Proficiency in Advanced Counselling Theories: Exhibit a deep understanding of advanced counselling theories and their practical applications.

2.Utilize sophisticated counselling techniques effectively to address complex client issues.

3. Confidently handle complex ethical dilemmas and understand the legal responsibilities in counselling practice.

4. Implement culturally responsive strategies in counselling, effectively addressing the needs of diverse clients.

5. Apply crisis intervention techniques and trauma-informed counselling practices in appropriate situations.

6. Combine various counselling theories and techniques to create personalized interventions for clients.

7. Perform thorough client assessments and develop effective, comprehensive treatment plans.

8. Successfully lead group counselling sessions, managing group dynamics and processes.

9. Utilize feedback from professional supervision to enhance counselling skills and professional growth.

Course Content:

Modules	Blooms level*	Number of hours

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Module I: Historical Perspective of Counseling in India and counselor as a person Development of the profession: Stages of the development of the profession; Traditional activities of counselors; Counselling in India Goal and Function of the Counsellor: Definition of Goal in counseling, Generic roles, organizing roles & functions. Personal characteristics: A composite model of human effectiveness, the role of self-awareness in counselling.	**L1, L2, L3**	18
Module II: Communication Skills – I Basic Communication Skills: Attending skills, Listening skills, Integrating Listening Skills. Exploration Skills: Probe, Immediacy, Self-disclosure, Interpretation, Confrontation. Action Skills: Information giving, Advice giving, Goal setting, Reinforcement, Directives, Managing resistance. Self-disclosure by counsellor – when and how Skills of closure and terminating	**L1, L2, L3**	18
Module III: Techniques of Helping and working with emotions Self-monitoring of Thought, Feeling and Action, Facilitating problem solving Understanding and Improving Self talk, rules and thinking patterns. Behavioural Methods	**L3, L4, L5**	18
Module IV: Counseling Applications Distinguish between guidance, psychotherapy and counselling Adolescent Counselling: Concept and Issues Group Counselling: Concept & Process. Academic Counselling: Definition and Scope. Marital and Family Counselling: Concept & Process. Geriatric Counselling: Concept and Scope.	**L3, L4, L5**	18
Module V: Professional, ethical, and legal policies Demonstrate a critical understanding of professional, ethical, and legal policies and procedures in mental health and counselling practice.	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Text & References:

Text:

- Patri, V., & Anthors R.(2001), Counselling Psychology, Press, New Delhi

References:

- Felthman, C., & Horton, I. (2000). Handbook of Counselling and Psychotherapy. Sage

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- Crouch a. (1997), Inside Counselling ; Sage Publication, London
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DPSY2810	PRACTICALS-VIII	L	T	P	FW/ Proj	C
Version	**2023**	0	0	4	0	2
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

The course immerses students in the hands-on application of advanced psychological assessment tools and experimental techniques. This course covers a range of instruments, including the Culture-Free Self-Esteem Inventories, NEO-4, Wide Range Intelligence Test (WRIT), Detroit Tests of Learning Aptitude (DTLA), Verbal Learning Experiments, and Sociometry Experiment. Students will learn to administer these tools, interpret their results, and understand their applications in various psychological contexts. The course emphasizes practical skill development, ethical considerations, and the integration of cultural factors in psychological assessment.

Course Objectives

1. To give practical experience to the students in administering and scoring psychological tests and interpreting the scores.
2. To acquaint the students with the basic procedure and design of psychology experiments.
3. To encourage and guide the students to undertake a small-scale research project.
4. To apply the general concepts of psychology through experimentation and testing

Course Outcomes (COs):

On completion of this course, the students will be able to

1. **Administer and Interpret Self-Esteem Inventories**
2. Gain proficiency in using the NEO-4 to assess the four major dimensions of personality.
3. Develop skills in administering and interpreting the Wide Range Intelligence Test to measure cognitive abilities.
4. Use the Detroit Tests of Learning Aptitude to assess various learning aptitudes and educational capabilities.
5. Perform and analyze verbal learning experiments to understand memory processes.
6. Implement and interpret Sociometry Experiments to evaluate social relationships and group dynamics.
7. Apply cultural and contextual considerations to ensure fair and accurate assessment outcomes.
8. Develop comprehensive reports that integrate findings from multiple assessment tools and experiments.

note: Out of the 6 practicals mentioned below, 5 practicals will be conducted in the eighth semester.

Course Content:

1	Culture Free Self-Esteem Inventories, 3rd Edition	Self-Esteem
2	NEO-4™ - Comprehensive Kit	Personality
3	Wide Range Intelligence Test (WRIT)	Intelligence
4	Detroit Tests of Learning Aptitude - Fourth Edition (DTLA-4)	Learning

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5	Verbal learning Experiments: Serial Recall vs Parid associate recall	Verbal Learning Experiment
6	Sociometry Experiment	Interpresonal relationship and Group Dynamic

Examination Scheme:

Components	CT	File Demonstration	V	A	EE
Weightage (%)		35	35	5	25

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text & References:

- Mohsin, S. M.: Experiments in Psychology. Motilal Banarasidas
- Woodworth, R.S.: Experimental Psychology. Oxford & IBH & Schlosberg, H. Publishing
- Postman, L. & Egan, J. P.: Experimental Psychology: An Introduction. Harper and Row

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DPSY2803	REHABILITATION PSYCHOLOGY	L	T	P	FW/ Proj	C
Version	**2024**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

Rehabilitation Psychology offers an in-depth exploration of the psychological principles, theories, and practices involved in assisting individuals with disabilities or chronic health conditions to achieve optimal functioning and well-being. This course examines the biopsychosocial aspects of disability, including the impact of physical, cognitive, emotional, and environmental factors on individuals' functioning and quality of life. Topics may include adjustment to disability, coping strategies, resilience, self-management skills, psychosocial interventions, and advocacy for disability rights. Through case studies, experiential learning activities, and discussions, students gain insight into the challenges faced by individuals with disabilities and develop the knowledge and skills necessary to support their rehabilitation and integration into society.

Course Objectives:

- To provide an in-depth understanding of the profession of Rehabilitation Psychology and its practices.
- To familiarize students with the history, growth, and scope of rehabilitation psychology, as well as various areas of specialization within the field. Additionally, the course seeks to equip students with the necessary knowledge and skills to assess impairments, disabilities, and handicaps, along with conducting evaluations of cognition, aptitudes, psychopathology, work/vocational abilities, and daily functioning.
- To introduce students to theoretical frameworks in health behavior and rehabilitation, including theories of health behavior change and intervention strategies for individuals and families affected by disabilities.
- To explore the dynamics of family reactions to disabilities, coping styles, and the role of family counseling, as well as coordination within multidisciplinary teams. It delves into the principles and practices of Community-Based Rehabilitation (CBR).
- To address ethical and policy issues pertinent to rehabilitation psychology, including rehabilitation ethics, relevant policies and acts.

Course Outcome:

By the end of this course, students should be able to:

1. Demonstrate a comprehensive understanding of the profession of Rehabilitation Psychology, including its history, growth, and scope.
2. Apply knowledge of assessment techniques to evaluate impairments, disabilities, and handicaps, as well as cognitive, vocational, and daily functioning abilities.
3. Analyze and apply theoretical frameworks in health behavior and rehabilitation to develop effective intervention strategies for individuals and families affected by disabilities.
4. Utilize behavior modification and cognitive therapies in rehabilitation contexts to facilitate positive outcomes for clients.
5. Understand and address the dynamics of family reactions to disabilities, employing appropriate coping strategies and family counseling techniques.
6. Collaborate effectively within multidisciplinary teams to provide holistic rehabilitation services.
7. Implement principles of Community-Based Rehabilitation (CBR) to promote inclusion and empowerment within communities.
8. Demonstrate awareness of ethical considerations and policies relevant to

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rehabilitation psychology practice, ensuring adherence to professional standards and regulations.

Course Content:

Modules	**Blooms level***	**Number of hours**
Module I: Introduction Overview of the profession of Rehabilitation Psychology and practice History, growth and scope Areas of Specialization Role of Psychologist in Rehabilitation	**L1, L2, L3**	18
Module II: Basic Concepts & Assessment Impairment, Disability and Handicap Types of Impairments Assessment of Cognition, aptitudes, psychopathology, work/vocational and daily functioning Neuropsychological assessment	**L1, L2, L3**	18
Module III: Theoretical Framework Health behavior: Theories of health behavior change, interventions strategies for individuals and families of disabled Behavior Modification and Cognitive Therapies in Rehabilitation	**L3, L4, L5**	18
Module IV: Dealing with Families- Family's reactions to disabilities, coping styles, family counseling, Coordination with Multidisciplinary team	**L3, L4, L5**	18
Module V: Community Based Rehabilitation – Goals of CBR, components of CBR, Role of Professionals, role of Community, Ethical Issues	**L3, L4, L5, L6**	18
Module VI: Ethics & Policy Issues Rehabilitation Ethics Rehabilitation Policies & Acts (Persons with Disabilities Act, The National trust Act, Mental Health Care Act, Rehabilitation Council of India Act, UNCRPD) Social Benefits and Support from Government of India		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Session Exam

Text & References:

Text:

- NIMH (1989) Mental Retardation : A Manual for Psychologist, Secundrabad
- Mohapatra C.S. (2004) Disability Management, NIMH, Secundrabad

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- Robert G. Frank Timothy R.Elliott (2000). Handbook of Rehabilitation Psychology, APA Washington.
- Michael Brnes Anthony Ward (2009) Oxford Handbook of Rehabilitation Medicine

References:

- Peshawaria R. and Venkatesan (1992) Behavioural Approach in Teaching Mentally Retarded Children, NIMH, Secundrabad
- WHO (2004) Community Based Rehabilitation
- Tally A.B, Sivaraman K.P and Murali T(1998) Neurorehabilitaion Principles &practice, NIMHANS Bangalore India
- ASCA (2003). The ASCA national model: a framework for school counseling programs
- TSCA (2004). Pre-K-12th grade program development guide.
- Mahoney, M. J., & Avener, M. (1977). Psychology of the elite athlete: An exploratory study. Cognitive Therapy and Research, 1(2), 135-141.
- Brewer, B. W., Van Raalte, J. L., & Linder, D. E. (1993). Athletes' use of imagery in the rehabilitation process. Journal of Sport Rehabilitation, 2(3), 209-218.
- Treasure, D. C., & Roberts, G. C. (1998). Applications of achievement goal theory to physical education: Implications for enhancing motivation. Quest, 50(3), 290-306
- Van Raalte, J. L., Cornelius, A. E., Linder, D. E., & Brewer, B. W. (2015). The relationship between imagery function and imagery use among college athletes. Journal of Applied Sport Psychology, 27(2), 176-186.

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DPSY2806	ACADEMIC-WRITINGS AND RESEARCH SKILLS	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course provides a comprehensive guide to academic writing and research skills specifically tailored for students in psychological assessment. It covers the fundamentals of scholarly writing, including the development of clear and concise arguments, proper citation practices, and the structure of research papers. Additionally, the course delves into research methodologies, from designing and conducting studies to analyzing and interpreting data. Emphasis is placed on fostering critical thinking, enhancing information literacy, and adhering to ethical standards in both writing and research. Students will learn to synthesize research findings, present their ideas effectively, and contribute to the field of psychology through well-crafted academic work.

Course Objectives

This course will introduce students to the domain of academic writing andits intricacies. The course seeks to impart knowledge about the styles of writing used in the current academic scenario. The course also familiarizes students with different types of academic writing and the latest APA manual.

The following are specific course objectives:

1.To identify different types of scientific articles from journal.

2.To know the appropriate style of scientific writing tocommunicate a topic or a finding effectively.

3.To present scientific findings in APA format and to follow APAguidelines in academic writing.

4.To understand the need to follow ethical standards in academic writing and to avoid practices such as plagiarism.

5. To learn ethical issues in using AI for research

Course Outcomes (COs):

On completion of this course, the students will be able to

1. Gain a solid understanding of the conventions and styles of academic writing in psychology.
2. Learn to construct clear, coherent, and well-organized academic papers and reports.
3. Become proficient in using various citation styles (e.g., APA, MLA) and managing references effectively.
4. Develop skills to search for, evaluate, and synthesize scholarly literature in psychology.
5. Learn to design methodologically sound research studies, including formulating research questions, hypotheses, and selecting appropriate methodologies.
6. Gain competence in statistical analysis and interpretation of research data.
7. Understand and adhere to ethical guidelines in conducting and reporting research.
8. Cultivate the ability to critically evaluate research findings and theoretical perspectives.
9. Learn to effectively present research findings through written reports, presentations, and publications.

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Course Content:

Modules	Blooms level*	Number of hours
Module – I: Introduction to Academic Writing A framework of the state of academic writing today and its significance; Distinct methods and procedures of academic writing for research synopsis and research publication	**L1, L2, L3**	18
Module- II: Rules and Guidelines in Academic Writing An overview of style and formatting using the American Psychological Association's (7th) criteria particular rules for references, index citations, and academic paper structure.	**L1, L2, L3**	18
Module- III: Forms of Academic Writing Abstract writing; Review of literature; Scientific poster/paper presentations; Book review; Tables and graphs in academic papers.	**L3, L4, L5**	18
Module- IV: Plagiarism and Its Types Plagiarism: Introduction of plagiarism, Types of plagiarism, Tools to check plagiarism, Ethics in research regarding plagiarism	**L3, L4, L5**	18
Module- V: Experiential Learning and Assessment Strategies- Understanding of Online search engines and generating self profiles in search engines; Assignment on review of literature on styles and formats.	**L3, L4, L5, L6**	18
Module- VI: Classroom Assignment and Assessment Classroom writing assignments on Review of Literature and paper /poster presentation and research paper writing, Using Chat GPT and generating the AI ethically. Individual/Group presentations on forms and issues in academic writing.		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Suggested Readings

- American Psychological Association. (2020). *Publication manual of the American Psychological Association* (7th ed.). Washington, DC: American Psychological Association.
- Harris, Robert (2001) The Plagiarism Handbook: Strategies for Preventing,
- Detecting and Dealing With Plagiarism, Routledge Publications.

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DPSY2808	APPLIED PSYCHOTHERAPY	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course, Applied Psychotherapy, helps students learn how to counsel and provide therapy to people facing emotional challenges. It covers different skills and techniques used in counselling and therapy sessions.

Course Objectives

To provide knowledge and skills to students about counseling and psychotherapy and also to trainthem in using therapeutic and counseling techniques for effectively practicing

.

Course Outcomes (COs):

On completion of this course, the students will be able to

1. Understand the basics of counselling and psychotherapy, like listening and showing empathy.
2. Learn advanced skills such as interpreting people's behaviour and managing difficult situations.
3. Know how to start and end counselling sessions and deal with crises effectively.
4. Gain insights into the counselling process, including setting goals and assessing progress.
5. Develop skills to handle resistance from clients and understand their feelings.
6. Learn about legal and ethical aspects of counselling and how to document therapy sessions properly.
7. Practice case formulation through role-playing exercises to apply learned skills in real-life scenarios.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Basic Counseling and Psychotherapeutic Skills What is psychotherapy discuss the basic Skills of a psychotherapist and a counsellor: Empathy, Genuineness, unconditional positive regard, congruence, Listening, Para-phrasing, reflecting, summarizing Advanced Skills of a psychotherapist: interpretation, insight, transference interpretation, exploring projections, identifying failure of therapy, identifying working with burnout, self-supervision, confrontation Characteristics of effective counselor/ therapists	**L1, L2, L3**	18

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Module II: **Therapeutic assessment and counseling session initiation** Therapeutic assessment, History taking, and Formulation, setting goals Contracting and its implications: Contracting for therapyand socialization, communicating ethical and professional rights responsibilities, violations of contract, Initial session, crisis and support , Counseling session's opening and closing skills, Effective conduction of counseling sessions	**L1, L2, L3**	18
Module III: Counseling and Psychotherapy Process Psychotherapy Process: Initial phase, Psych- education, Supportive psychotherapy. Selecting techniques Ice-breaking, exploration, Loss framework. Dealing with Resistance: Techniques and applications Transference and counter-transference	**L3, L4, L5**	18
Module IV: Termination, Follow-up and Documentation Termination: Evaluating and sharing progress, Issues in termination and resolution Follow-up: Systems and techniques, sustained changes Documentation: Therapists documentation, Communication with other professionals and referrals Legal implications: Legal communication, documentation, Legal issues in psychotherapy and counselling.	**L3, L4, L5**	18
Module V: Therapeutic Case formulation and Demonstration Two Hypothetical case formulation and demonstration by using Role play (video recorded), evaluation of basic and advanced skills for simulated cases, Two Hypotheticalcase formulation and demonstration by using Role play (video recorded) for contracting and skills for opening and closing,	**L3, L4, L5, L6**	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Text & References:

Text:

- Patri, V., & Anthors R.(2001), Counselling Psychology, Press, New Delhi

References:

- Felthman, C., & Horton, I. (2000). Handbook of Counselling and Psychotherapy. Sage
- Robert, G. L., & Marianne, M.H. (2003). Introduction to Counselling and Guidance. Pearson education, Inc.
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- Nelson R Jones ,(2003), Basic Counselling Skills; Sage Publication, London
- Gerald C. (2001), Case Approach to Counselling Psycology; Brooks/Cole, Australia
- Crouch a. (1997), Inside Counselling ; Sage Publication, London
- Ivey A.E. & Ivey M. B. (1999), Intentional Interviewing & Counselling, 4th Edition.

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- Faiver, C., Eisengart, S., Colonna, S. (2003), The counselor intern‘s handbook.Brooks/Cole Publishing Company, Pacific Grove, California.
- Martin, D. G. (2011). Counseling and Therapy Skills . NY D.
- Morrison, J. (2007) The First Interview, Third Edition . Moursund, J., and Kenny, M. C. (2002). TheProcess of Counseling and Therapy (4th edition). Upper Saddle River, New Jersey: Prentice Hall.

Books

- Corey G. (2012). Theory and Practice of Counseling and Psychotherapy.
- Daniel Keeran. (2009). Effective Counseling Skills: the practical wording of therapeutic statements and processes.
- Edward S. Neukrug (2010). Counseling Theory and Practice.
- D. Hutchinson D. R. (2011). The Counseling Skills Practice Manual
- John Sommers-Flanagan and Rita Sommers-Flanagan (2012). Counseling and Psychotherapy
- Theories in Context and Practice: Skills, Strategies, and Techniques.
- Wayne Perry .Basic Counseling Techniques:: A Beginning Therapist's Tool Kit (Second Edition)
- Wolberg, L. R. (2005). The Technique of Psychotherapy Part I and II. NJ: Jason Aronson Inc.

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DPSY2809	PSYCHOLOGY OF CRIMINAL BEHAVIOR AND PROFILING	L	T	P	FW/ Proj	C
Version	**2023**	3	1	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course of Psychology of Criminal Behaviour and Profiling is a field that examines the psychological factors influencing criminal actions and utilizes this understanding to develop profiles of offenders. It involves studying the mental, emotional, and social processes that contribute to criminal behaviour, including personality traits, developmental experiences, and environmental influences. By analysing crime scenes, victimology, and patterns of behaviour, forensic psychologists and criminal profilers aim to identify characteristics and predict the future actions of offenders. This field combines elements of psychology, criminology, and law enforcement to understand the motivations behind crimes, aid in criminal investigations, and contribute to the apprehension and prosecution of criminals. It also involves assessing the risk of reoffending and providing insights into preventive measures and rehabilitation programs. Through a combination of theoretical knowledge and practical application, professionals in this area help to ensure justice and enhance public safety.

Course Objectives

- Demonstrate an understanding of the psychological theories and factors influencing criminal behaviour.
- Apply knowledge of criminal profiling methodologies and techniques.
- Critically evaluate and analyse real-life criminal cases using psychological principles.
- Discuss the ethical considerations and challenges in criminal psychology and profiling.
- Identify emerging trends and contemporary issues in the field of criminal psychology.

Course Outcomes (COs):

- Explain the various factors, including biological, psychological, and social influences, that contribute to criminal behaviour.
- Analyse different types of criminal behaviour and the psychological motivations behind them.
- Conduct and interpret psychological assessments of offenders to determine risk factors, mental state, and likelihood of reoffending.

Course Content:

Modules	Blooms level*	Number of hours
Module 1: Introduction to Criminal Psychology • Meaning and Historical perspective of criminal psychology • Biological, psychological, and social factors in criminal behaviour • Ethics and controversies in criminal psychology research • Rehabilitation Of Offenders and Victims	**L1, L2, L3**	18

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Module 2: Theories of Criminal Behavior • Theories of Crime Causation • Psychodynamic theories (e.g., Freud, Bowlby), Behaviourism, Morality theories , Developmental, and Social learning theories • Neurological, Biological and genetic influences on criminal behavior	**L1, L2, L3**	18
Module 3: The Criminal Mind • Typology of offence: (Assault: Homicide, serial murders, sexual offence; petty theft, burglary and ransom; Violence & Terrorism; Abuse and Addiction, White Collar, Cybercrimes) • Criminal Psychopathy and behaviour • Juvenile Delinquency and Childhood Crimes • Criminal behaviour and personality assessment	**L3, L4, L5**	18
Module 4: Criminal Profiling and Correctional Methods • Psychological assessment in Corrections (Interviewing, Interrogation, Tests, Detection of Deception and Eyewitness Evidence) • The system and process of criminal profiling: geographic profiling, psychological profiling • Case studies and real-world applications of profiling • Institutional corrections- Correctional facilities, Legal rights of inmates, Roles of correctional psychologists- - treatment and rehabilitation	**L3, L4, L5**	18
Module 5: Investigative Psychology • Crime scene analysis and behaviour analysis • Forensic psychology and the legal system: Process, risk assessment- Trial and Litigation consultation, Expert Testimony, survival of witness stand. Criminal Courts: Pleading Insanity and other defences; Family Law and Child custody evaluations) • Profiling and law enforcement collaboration • Ethics in criminal profiling and the role of the profiler in court	**L3, L4, L5, L6**	18
Module 6: Emerging Trends and Contemporary Issues • Multiculturism and Victimization: Gender Equality, Racism • Cybercrime and the psychology of online offenders • Use of AI and Technology for Crime Detection and profiling • Current research and Global perspectives on criminal behaviour and profiling		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Text & References:

Text:

- Patri, V., & Anthors R.(2001), Counselling Psychology, Press, New Delhi

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Text & References:

- Bartol & Bartol. (2004). Introduction to forensic Psychology. Sage publications: USA
- Burke, R.H., (2014). An Introduction to Criminological Theory. (4th ed). CPI Group Ltd: UK
- Howitt, D., (2002). Forensic and Criminal Psychology. Pearson Education: USA
- Hirani, N. (2023). *AI COP: The AI based Criminal Outlining Profiler*.
- Maguire, B., & Radosh, P.F., (1999). Introduction to Criminology. Wadsworth Publishing Company: USA
- Siegel, L.J., (2007). Criminology: Theories, Patterns & Typologies. (9th ed). Thomson Wadsworth: USA

References:

- Egger, S. A. (1999). Psychological profiling: Past, present, and future. *Journal of Contemporary Criminal Justice*, *15*(3), 242-261.
- Ostapovich, V., Barko, V., Okhrimenko, I., Yevdokimova, O. O., Ponomarenko, Y. S., Prontenko, K., ... & Bloshchynskyi, I. (2020). Psychological profile of successful criminal police officer.
- Whitty, M. T. (2020). Is there a scam for everyone? Psychologically profiling cyberscam victims. *European Journal on Criminal Policy and Research*, *26*(3), 399-409.
- Marono, A. J., Reid, S., Yaksic, E., & Keatley, D. A. (2020). A behaviour sequence analysis of serial killers' lives: From childhood abuse to methods of murder. *Psychiatry, psychology and law*, *27*(1), 126-137.

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DPSY2839	DATA ANALYSIS & VISUALISATION USING SOFTWARE	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	Class X Mathematics				
Co-requisites					

Catalog Description

The implosion of available data has made visualization more critical but also more challenging. Data analysis and Data Visualization are essential tools for business analysis, engineers, policymakers, and decision-makers. Developed originally for "small data", visualization techniques have been met with varied success in the past centuries and decades. There are a few well-known visualizations that are very effective in capturing the essence of the data, and of course, there are many infamous negative examples of poor visuals. An effective visual is critical for decision making it, but it also requires a lot of work, customization, attention to detail, and refinements.

Course Objectives

The course is designed to help students develop skills and knowledge in the following area(s):

- Develop an understanding of what is a good visualization for a given purpose
- Learn visualization theory & techniques
- Build a substantial data analytic project
- Apply data analysis and visualization with Excel, SPSS, R, Python, NVivo and MATLAB

Course Outcomes

On completion of this course, the students will be able to

CO1. Students will be able to articulate meaningful lines of inquiry that might be explored through the collection, organization, visualization, and analysis of data in a context associated with their primary field of study using (as appropriate) numerical, textual, spatial, and/ or visual data.

CO2. Student will understand what data are, how they are collected, and how to assess the quality/ reliability of data.

CO3. Students will demonstrate intermediate proficiency in the visualization of data to communicate information and patterns that exist in the data.

CO4: Students will be able to use at beginning level of proficiency the tools of statistics and machine learning to ask questions of and explore patterns in data.

Course Content :

Module	Topics Covered	Blooms Level	Contact Hours

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1	**Module-1: Introduction to Excel** Data Analysis using Excel, Curve fitting, Correlation, Linear Regression, Multiple regression, Principal Component Analysis and Factor Analysis, Hypothesis testing **Introduction to Excel and SPSS** Introduction to SPSS and Types of Data, Importing, exporting and data handling in SPSS; Exploratory data analysis using SPSS and data visualization; Introduction to statistical inference and various univariate tests by using SPSS; Analysis of Variance (One Way ANOVA, Two Way ANOVA and ANCOVA); Correlation, Simple and Multiple linear Regression Analysis; Principal Component Analysis and Factor Analysis	L1, L2, L3, L4	20 hours
2	**Module-2: VOS Viewer** **Web of Science, Scopus, Dimensions, Lens, and PubMed.** Co-authorship networks, citation-based networks, and co-occurrence networks can be created based on data downloaded from Web of Science, Scopus, Dimensions, and Lens. Co-authorship networks and co-occurrence networks can also be created based on PubMed data. **Crossref, Europe PMC, and OpenAlex**. Networks can also be created based on data retrieved through the APIs of Crossref, Europe PMC, and OpenAlex, These APIs can be queried interactively in VOS viewer. **Semantic Scholar, Open Citations, and Wiki Data.** For a given set of DOIs, networks can also be created based on data retrieved through the APIs of Semantic Scholar, Open Citations and Wiki Data.	L1, L2, L3, L4	10 Hours

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3	**Faculty of Management Studies & Behavioural Sciences** **Module 3: Domain Specific Software** **- Structural Equation Modelling** **Smart PLS** Introduction to Structural Equation Modelling (SEM), Introduction to the software's AMOS and SPSS, SMART PLS, Testing of Statistical assumptions, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), common method bias (CMB) test, Measurement Model Assessment, Discussing Fit Indices, Reliability and Validity Testing, Structural Model Assessment identifying multivariate outlier, Construct Validity: Convergent and Discriminant Validity, Measurement Model & Structural Equation Modelling, Mediation and Moderation Effects, Multi-Group Analysis.	L1, L2, L3, L4	30 Hours
	Faculty of Arts **N Vivo** 1. Import text, audio, video, emails, images, spreadsheets, online surveys, web content, and social media from various sources into a simple, intuitive interface. 2. Create and NVivo project, import and organise qualitative and quantitative data 3.Manage a literature review in NVivo 4. Autocode structured data deductively and identify themes inductively 5. Generate and falsify hypotheses 6. Combine data in sets for analysis 7. Seek patterns and identify relationships across codes and cases 8. Present findings using visualisations 9. Export data out of NVivo 10. Coordinate teamwork.		

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	Faculty of Science Engineering and Technology **Faculty of Health & Allied Sciences** **R programming / Python/ MATLAB** **R Programming-** Introduction to R, Variables and datatypes in R, Dataframes, Recasting and joining of dataframes, Arithmetic, logical and matrix operations in R, Functions in R, Control structure in R, Data visualization in R. **Python Programming-** Basics of programming, data structure and algorithm using Python, Strings, lists, control, functions, manipulating lists, loops, arrays, selection sort, insertion sort, recursion, sorting, dictionaries, exception handling, file handling, string processing, data analysis using Python **MATLAB Programming-** Introduction, basic features, managing workspace, mathematical functions, basic plotting, Matrices, array operations and linear equations, MATLAB programming- M files script, M-file functions, control flow and operations.		

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional (Theory/ Practical)	End Term Examination
Weightage (%)	5	10	15	70

References:

- David Houcque, 2005. Introduction to MATLAB programming for Engineering students., Northwestern University, E- Book **https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf**
- Mark Lutz, 2009. Learning Python. O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.
- Emmanuel Paradis, 2005. R for Beginners. E book. **https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf**
- A Handbook of Statistical Analysis using SPSS by Dr. Brijesh Awasthi, Redshine Publication.

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Curriculum & Scheme of Examination

2023

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Master of Arts - Counselling Psychology

COGNITIVE PSYCHOLOGY

Course Code: PSY4102 **Credit Units: 02**

Course Objective:
The course deals with the understanding of higher mental processes and its relevance in daily living. The study of normal processes is essential to enable the understanding of neurological or abnormal dysfunctions. The objective of this course is (a) to provide an understanding of normal metal processes and their relationship to brain, mind and behavior, and (b) to study the concept of cognition and its application in cognitive psychology. This will facilitate the students develop the cognitive skills in themselves and others.

Course Contents:
Module I: Historical Background
Psychophysical approach
Information processing approach
Ecological Approach
Contemporary Cognitive Psychology

Module II: Attention and Perception
Theories of Attention and current developments: Broadbent's filter theory, Triesman's attenuation theory, automatic and controlled processing, switching attention.
Perceptual learning and development
Perception of shape, space and movement
Implicit perception and sensory integration theory
Cognitive – Attentional Theory: Information Processor, Cognitive Timer

Module III: Learning
General Phenomenon of Learning: Learning vs Maturation, Native Response Tendencies Theoretical issues of learning: Classical conditioning, Instrumental conditioning Verbal learning: Stimulus material, Trigram Methods-Serial Learning, Paired Associate Learning Discrimination Learning: Nature, Theories-Algebraic Summation Theory, Relational Theory, Transposition Effect

Module IV: Memory & Forgetting
Sensory memory, STM, LTM, Working memory
Metamemory: Semantic & Episodic Memory
Models of Semantic knowledge
Theories of forgetting
Mnemonics

Module V: Thinking and Language Formation
Concept formation and categorization
Judgment and Decision-making
Reasoning & Problem solving: Stages – Preparation, Production, Judgment and Incubation
Structure of language, its acquisition and Formation
Language and Thinking: Linguistic Determinism, language and Cognition

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Module VI: Learning and Language Disorder
Reading Disorder/Developmental Dyslexia
Disorder of written expression / Dysphasia / Aphasia
Math Disability / Dyscalculia
Auditory Processing Disorder
Speech and Language pathology
Specific language Impairment

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

Text & References:
Text:

- Solso, R.L.,(2004). Cognitive Psychology, 6th ed.; Delhi: Pearson Education
- Matlin M W (2005).Cognition, Wiley & Sons, Inc.
- Haberlandt, K. Cognitive Psychology. Allyn and Bacon, Boston.
- Anderson, J.R. Cognitive Psychology and its implications. 5th Edi.: Worth Publishers
- Smity, E. E. &Kosslyn, S (2007). Cognitive Psychology: Mind and Brain. Prentice Hall.
- Sen, A.K. &Pande, P. (Eds.) (1998). Current issues in cognitive psychology, Delhi Campus
- Posner, M. (Ed.) (1989). Foundations of cognitive science. London: MIT Press

References:

- Ittyearh, M., &Broota, K.D. (1983). Inter and Intra Model Processing of Sensory-Specific Information. Perceptual and Motor Skills 56. 507-517
- John A & Proctor R (2004). Attention: Theory and Practice. Sage.
- Rock, I. (1995). Perception; NY: Scientific American
- Demjber, & Warm, J.S. (1979). Psychology of perception; NY: Holt
- Wilhit, S.C., & Payne, D.E. (1992). Learning and Memory: The Basis of Behaviours; Needham Heights, Mass: Allyn and Bacon
- Kintsch, W.(1970). Learning, Memory and conceptual process. John Wiley &Son,New York
- Houston, J.P. Fundamentals of Learning and Memory (3rd Ed.). harcourt brace Jovanovich, Inc, New York.
- Newell, A., & Simon H. (1972). Human Problem solving; NJ: Prentice Hall.

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PARAMETRIC STATISTICAL METHOD

Course Code: PSY4105 **Credit Units: 03**

Course Objective:
The Present paper focuses on providing knowledge about the basics of statistics. It will give clear understanding to the students about application of parametric statistical methods. Parametric tests are generally more powerful in that the likelihood (probability) of a test reaching the correct conclusion is greater. Besides this, a module is added in last so to make students aware of parametric statistics in SPSS. Thereby they can understand the procedures and applications of parametric statistics using SPSS.

Course Contents:
Module I: Basics
Nature, Meaning and importance of statistics Concept of Reasoning, population, sample and probability theory in statistical inferences Categories of statistics: Descriptive and Inferential Variables and their types Scales of Measurement: Nominal, Ordinal, Interval, Ratio.

Module II: Statistical conjecture
Sampling and its kinds: Probability sampling method and Non-Probability sampling method.
Difference between Objectives and Hypothesis
Hypothesis testing: One-tailed and Two-tailed tests, Type I and Type II errors

Module III: Statistics and Test of Significance
Meaning, concept and importance of determining reliability of statistics in data analysis Standard error of mean, standard deviations, percentages and correlation coefficients Significance of difference between means-critical ratio and t-test calculation (large and small sample) assumption & uses One-Way and Two Way ANOVA.

Module IV: Correlation and Regression
Correlation: concept, types, assumption and Utility of Cor-relational Analysis in Psychological Research Bi-serial Correlation, Point Bi-serial Correlation, Partial Correlation, Tetra-choric Correlation Simple and Multiple linear regression, its uses, concepts and assumptions Difference between Simple linear and multiple regressions

Module V: Introduction to SPSS and parametric statistics in SPSS
Introduction to SPSS, its usage and functioning
Understanding the concepts of Parametric tests in SPSS
Learning data entry

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

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Text & References:

Text:

- Minium E.W. King, H.M & Bear G, 1993. Statistical Reasoning in Psychology and Education (3rd Ed.) N Y: John Willey and Sons
- Garett, H.E., (2004), Statistics in Psychology and Education (11th ed.); New Delhi: Paragon International
- Gupta S.P.: Statistical methods, Sultan and Sons, New Delhi.
- Broota, K.D.: Experimental design in Correlational Research, New Delhi: Wiley Eastern 1989.
- Downie, N.M.: Basic Statistical Methods. New York: Harper and Publishers
- Howitt, D & Cramer, D: Introduction to SPSS statistics in psychology
- James K. Lindsey : Parametric Statistical Inference, Oxford science Publication.
- Cox, D.R.: Principles of statistical inferences.

References:

- Edward, A.E.: Experimental Design in Psychological Research (3rd Ed.), New Delhi: American Publishing Co. 1971
- Berger. R.L: Statistical Inferences, Cole Pub. Co.
- Wesley O. J & Geisser. S: Modes of Parametric Statistical Inference. Wiley-Interscience
- Rice, J.A: Mathematical Statistics & Data Analysis, South western.
- Salkind, N & Green, S: SPSS Quick Starts.

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PRACTICUM- I

Course Code: PSY4106 **Credit Units: 03**

Course Objective:

1. To give practical experience to the students in administering and scoring psychological tests and interpreting the scores.
2. To acquaint the students with the basic procedure and design of psychology experiments.
3. To encourage and guide the students to undertake a small-scale research project.
4. To apply the general concepts of psychology through experimentation and testing

Note: Total 5 practicals will be conducted in the first semester among the list of following practicals

Course Content:

1	Continuous Visual Memory Test (CVMT)	Memory
2	Illinois Test of Psycholinguistic Abilities – Third Edition (ITPA-3)	Language
3	16 PF Questionnaire - Fifth Edition with Hand scoring	Personality
4	Tennessee Self-Concept Scale - Second Edition (TSCS:2)	Self-Concept
5	Developmental Test of Visual Perception – Adolescence and Adult	Perception
6	Test of Memory and Learning – Second Ed. (TOMAL-2)	Memory and Learning

Examination Scheme:

Components	A	File Demonstration	Viva	EE
Weightage (%)	5	35	35	25

Text & References:

- Mohsin, S. M.: Experiments in Psychology. Motilal Banarasidas
- Woodworth, R.S.: Experimental Psychology. Oxford & IBH & Schlosberg, H. Publishing
- Postman, L. & Egan, J. P.: Experimental Psychology: An Introduction. Harper and Row

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FIELD PRACTICE-I

Course Code: PSY4107 **Credit Units: 04**

Course Objective:
To develop, in students the skills of observation, collection and documentation of data for conducting theoretically correct and practically relevant research

Methodology

Each student will engage themselves in interaction and observation of psychological processes in a subject/ field of their choice.
Student will then present their findings in the form of a paper for seminar discussions.
Similarly, field work will be done by students in their area of interest and present their practical observations, as a report with analysis and suggestions.

Examination Scheme:

Field/Seminar Report	:	40 marks
Viva-Voce	:	30 marks
Internal Faculty and Interaction	:	10 marks
Presentation/Daily Diary Report	:	20 marks

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PSYCHOPATHOLOGY

Course Code: PSY4201 **Credit Units: 03**

Course Objective:

- To acquaint students with various manifestations of psychopathology
- To impart knowledge and skills required for diagnosis of psychological conditions.
- To introduce them to different perspectives and models of etiology.
- To develop skills required for psychopathological formulation.

This course enables students to the study and prediction of adaptive and maladaptive behaviours and its processes across lifespan. It also enables students to understand different diagnostic and educational models of psychopathology.

Course Content:

Module I: Classification and Theoretical Models

Systems of Classification, basic features; DSM-IV TR, ICD-10, similarities and differences Major Theoretical Models of Psychopathology: The medical model, Psychoanalytic model, Behaviouristic model, Humanistic-existential models, Interpersonal approach, Systems approach.

Module II: Diagnosis and Prognosis

Problems and methods of diagnosis: physiological examination, observation, case-history, interview method, psycho-diagnostic tests, measures of bodily functions, computer assisted diagnosis.

Module III: Mood and Anxiety Disorder

Bipolar disorders: Manic, Depressive, Mixed Depressive disorder: Major depression and dysthymia, Suicide Anxiety Disorders: Generalized anxiety disorder, phobia, panic disorder, post traumatic stress disorder and obsessive compulsive disorder

Module IV: Major Clinical Disorders

Schizophrenia
Other psychotic disorders: Bipolar, Delusional, psychotic depression

Module V: Somatoform Disorders

Conversion disorder, Somatization disorder, Hypochondriasis, Body dysmorphic disorder, Pain disorder

Module VI: Disorders of Infancy, Childhood and Adolescence

Developmental disorder: PDD, Rett Disorder, Asperger Disorder,
Behavioral Disorder: Conduct Disorder, Hyperactivity Disorder, ADHD,
Genetic Disorders: Down Syndrome

Module VII: Personality Disorder

Personality Disorder: Narcissistic Personality, Histrionic Personality, Antisocial (Psychopathic) Personality, Borderline Personality, Paranoid Personality, and Schizotype Personality

Module VIII: Sexual Dysfunctions and Paraphilias

Dysfunctions of Desire, Arousal, Orgasm and Pain
Paraphilias, Paedophilia and Rape
Gender identity disorders
Impotence and frigidity
Causes, preventing suicide

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Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Text & References:

Text:

- Davison, G.C. & Neale, J.M. (1990): Abnormal Psychology. New York: John Wilay& Sons
- Carson, R.C. & Butcher, J.N. (1992): Abnormal Psychology and Modern Life (9th Ed.). New Yark: Haper & Collins.
- Hamilton, Max, (1994). Fish's: Clinical Psychopathology; Verghese Publishing House, Bombay
- Ahuja N (2002). A short text book of Psychiatry (5th edition). New Delhi. Jaypee Brothers.
- Sarason & Sarason (1998). Abnormal Psychology. New Delhi: Prentice Hall of India

References:

- Sarason & Sarason (2002), Abnormal Psychology; Pearson Education, Delhi
- Bennett, P. (2010). Abnormal and Clinical Psychology: An Introductory Textbook. New Delhi: Tata McGraw Hill Education pvt. Ltd.
- Sadock, B.J. & Sadock, V.A. (2003). Kaplan &Sadock's Synopsis of psychiatry: Behavioral sciences/clinical psychiatry (9th. Ed.). Philadelphia: Lippincott Williams & Wilkins
- Coleman, J.C. : Abnormal Psychology & Modern Life
- Lazarus and Folkman: Stress, appraisal and coping.

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PSYCHOLOGICAL ASSESSMENT AND DIAGNOSIS

Course Code: PSY4202 **Credit Units: 03**

Course Objective:
The course teaches the students about the characteristics, objectives and wide ranging effects of psychological testing. It further describes the various testing methodologies and outlines capabilities and limitations of these methods.

Course Contents:
Module I: Introduction
Purpose of testing, types of test used, Bias & Fairness
Ethical Issues in Psychological Testing
Overview of Tests
Norms, Scoring Interpretation and Report Writings
Issues in measurement
Emerging trends of online testing

Module II: Cognitive functions and their assessment
Concept of Attention, Gestalt Theory, Memory and Forgetting, PGI Memory Scale
Theories of Intelligence
Intelligence Tests:
Slosson Intelligence Test – Revised For Children and Adults (SIT-3/R)
Bhatia Battery Weschler's Adult Performance Intelligence Scale (WAPIS)
Raven's Progressive Matrices (Colour Progressive Matrices, Standard Progressive Matrices and Advanced Progressive Matrices)
Binet Kamat Test
Weschler's Intelligence Scale for Children – Revised (WISC)
Wide Range Intelligence Test (WRIT)
Alexander Pass-a-long Test of Intelligence
Draw-A-person Intellectual Ability Test for Children, Adolescents and Adults (DAP:IQ)

Module III: Achievement Test
Wechsler Individual Achievement Test (WIAT)
Diagnostic Achievement Test For Adolescents – Second Edition (DATA-2)
Kaufman Test of Educational Achievement (KTEA)
Woodcock-Johnson Tests of Achievement (WJ)

Module IV: Assessment of Personality: Non-Projective Test
Cattell's 16 Personality Factor Inventory (16 PF)
California Q-Sort Tests
Myers Briggs Type Indicator (MBTI)
Minnesota Multiphasic Personality Inventory (MMPI)
Personality Inventory for Children
OMNI Personality Inventory (OMNI)
Bell's Adjustment Inventory
Eysenck's Personality Questionnaire
NEO™ Personality Inventory-3 (NEO™-PI-3) Adult / Adolescent

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Module V: Assessment of Personality: Projective Tests
Introduction of Projective Techniques
Difference between Projective & Non-Projective Techniques
Thematic Apperception Test
Rorschach Inkblot Test
House-Tree-Person (H-T-P)
Sentence Completion Test

Module VI: Developmental Scales
Developmental Screening Test
Vineland's Social Maturity Scale
Measures of Psychosocial Development (MPD)
Gesells' Developmental Schedule

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Text & References:
Text:
- Freeman, F. S.,(1965), Theory and Practice of Psychological Testing; New Delhi: Oxford &IBTT

References:
- Jackson C.,(1998), Understanding Psychological Testing; Jaico Publishing House
- Anastasi&Urbina S.(2000), Psychological Testing ,7th Edition; Person Education (Singapore) Pte. Ltd.,
- Guilford J.P.: Psychometric Methods

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NON-PARAMETRIC STATISTICAL METHOD

Course Code: PSY4204 **Credit Units: 03**

Course Objective: The Present paper focuses on providing knowledge about the basics of nonparametric statistics. It will give clear understanding about differences between Parametric & Nonparametric Test Procedures. This paper will

1. Explain commonly used Nonparametric Test Procedures.
2. Perform Hypothesis Tests Using Nonparametric Procedures.
3. Going to teach student how to use SPSS with non-parametric statistics.

Course Contents:

Module I: Basics
What is Non-Parametric statistics: Nature, Meaning and Concept strengths and limitations of non-parametric procedures Parametric VS Non- Parametric Statistics
Four Levels of Measurement and Non-parametric statistics

Module 2: Tests of differences between Groups and Variables
The Friedman Two-way analysis of variance by ranks-Basic concepts, uses and computations
Test of differences between groups (Independent samples): Mann-Whitney U test computations, Kolmogorov-Smirnov test, uses Test of differences between variables (Dependent samples): Kruskal-Wallis ANOVA analysis of ranks, K-Sample Median test, uses and concepts

Module 3: Nominal Measures of Correlations
Concept definition assumptions of Nominal Measures of Correlations
The Phi-Coefficient, Contingency coefficient concepts uses and calculations
Tetrachoric**r**: Its uses, computation and comparison

Module 4: Chi-Square
Concept and Definition, its assumptions and use
Chi-Square Goodness of Fit (One-Sample Test)
Chi-Square Test of Independence

Module 5: Introduction to SPSS and Non-parametric statistics in SPSS
Introduction to SPSS, its usage and functioning
Understanding the concepts of Non-Parametric tests in SPSS
Learning data entry

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Text & References:
Text:

- Dowine, N.M.: Basic Statistical methods, Harper and Publishes New York.
- Gupta S.P. Statistical methods, Sultan and Sons, New Delhi.
- Broota, K.D.: Experimental design in correlational research, New Delhi: Wiley

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Eastern 1989.
- Salkind, N & Green, S.:SPSS Quick Starts.
- Howitt, D & Cramer, D.:Introduction to SPSS statistics in psychology.
- McNemar Q.:Psychological Statistics, 3rd Ed. New York, John Wiley 1962.
- Edward, A. E: Experimental Design in Psychological research (3rd Ed) New Delhi: American publishing.

Reference

- Higgins. J.J: Introduction to Modern Nonparametric Statistics.
- Siegal.S: Nonparametric statistics for the behavioral sciences.
- Castellan, J.N. and Siegal. S: Non-parametric statistics for behavioural sciences.
- Daniel, W. Wayne: Applied non-parametric statistics.ADVANCED COUNSELLING SKILLS

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POSITIVE PSYCHOLOGY

Course Code: PSY4206 **Credit Units: 02**

Course Objective: To enable students to understand the theories and research related to positive psychology and equip students to develop and apply positive psychology for enhancement of self and others.

- To trace the development of positive psychology as an independent discipline with its multidimensional perspective.
- To study the relationship of personality and situational variables with positive psychology.
- To discuss strategies to enhance positive affect.

Course Contents:

Module I: Introduction to Positive Psychology
Positive Psychology: Concept, History, Nature and Scope
Art of Well Being
Defense Mechanism & Coping Strategies

Module II: Interpersonal Perspectives & Emotional Intelligence
Empathy Compassion, Love, Social relations
Hope & Optimism
Theory of Emotions
Emotional Intelligence & its importance

Module III: Strengths and Virtues
Tyranny of Wisdom
Character Strengths and Virtues
Resiliency in the phase of challenge & Loss

Module IV: Happiness
Theories, measures and Positive correlates of happiness
Traits associated with Subjective Happiness
Cross-cultural differences

Module V: Psychology of Positivisms
Positive Emotional States and Well Being with special emphasis on Forgiveness and Gratitude
Positive Institutions: Families, Religion, Spirituality and Well being.
Specific issues: Aging Well

Module VI: Positive Thinking and Applications of Positive Psychology

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

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Text & References:

Text:

- Crompton, W.C. (2005), An Introduction to Positive Psychology, Singapore : Thomson.
- Snyder, C.R. and Lopez, S.J. (2005), Handbook of Positive Psychology, New York Oxford University Press.
- Carr, A. (2004), Positive Psychology: The Science of Happiness and Human Strengths, New York: Brunner – Routledge.
- Linley, P.A. and Joseph, S. (2004), Positive Psychology in Practice, New York : John Wiley and Sons.
- Peterson, C. (2006), Positive Psychology, New York: Oxford University Press.

References:

- Goleman & Daniel, Emotional Intelligence
- C. R. Snyder, Shane J. Lopez, The Handbook of Positive Psychology
- C. R. Snyder, Shane J. Lopez, Positive Psychology: The Scientific and Practical Explorations of Human Strengths
- Rich Gilman, Michael Furlong, E. Scott Huebner, A Handbook of Positive Psychology in Schools
- Ilona Boniwell, Positive Psychology in a Nutshell

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PRACTICUM- II

Course Code: PSY4207 **Credit Units: 03**

Course Objective:

1. To give practical experience to the students in administering and scoring psychological tests and interpreting the scores.
2. To acquaint the students with the basic procedure and design of psychology experiments.
3. To encourage and guide the students to undertake a small-scale research project.
4. To apply the general concepts of psychology through experimentation and testing

Note: Total 5 practicals will be conducted in the second semester among the list of following practicals

Course Content:

1	Slosson Intelligence Test – Revised For Children and Adults (SIT-3/R)	Intelligence
2	Diagnostic Achievement Test For Adolescents – Second Edition (DATA-2)	Achievement
3	House-Tree-Person (H-T-P)	Personality: Projective
4	Rorschach Ink Blot Test	Personality: Projective
5	Personality Inventory for Children scoring kit	Personality:
6	OMNI Personality Inventory (OMNI) Introductory Kit	Personality:

Examination Scheme:

Components	A	File Demonstration	Viva	EE
Weightage (%)	5	35	35	25

Text & References:

- Mohsin, S. M.: Experiments in Psychology. Motilal Banarasidas
- Woodworth, R.S.: Experimental Psychology. Oxford & IBH & Schlosberg, H. Publishing
- Postman, L. & Egan, J. P.: Experimental Psychology: An Introduction. Harper and Row

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FIELD PRACTICE-II

Course Code: PSY4208 **Credit Units: 04**

Course Objective:
To develop, in students the skills of observation, collection and documentation of data for conducting theoretically correct and practically relevant research

Methodology

Each student will engage themselves in interaction and observation of psychological processes in a subject/ field of their choice.
Student will then present their findings in the form of a paper for seminar discussions.
Similarly, field work will be done by students in their area of interest and present their practical observations, as a report with analysis and suggestions.

Examination Scheme:

Field/Seminar Report	:	40 marks
Viva-Voce	:	30 marks
Internal Faculty and Interaction	:	10 marks
Presentation/Daily Diary Report	:	20 marks

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SCIENTIFIC RESEARCH PAPER

Course Code: PSY4209 **Credit Units: 01**

Course Objective:
The scientific research papers for Masters Students is to enhance the reading and writing habits of the students and to make them aware about the process of carrying out a research work. This helps them to develop insight into the course they are studying which creates an academic interest among the students. Presentation of the term paper plays an important role as it facilitates knowledge sharing and improvement in presentation skills which will further enhance the confidence of the students. The overall objective of this term paper is to develop research orientations in students and to make them understand and enhance skills in Research Methodology.

Guidelines for Research Article or Scientific Papers:

Topic
Introduction
Review Research
Objective
Methodology
Discussion
Conclusion
References & Bibliography

No. of pages in the compilation of the paper 25-30 (minimum 25 pages)

Examination Scheme:

Components	Compilation	Viva	Presentation
Weightage (%)	50	25	25

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RESEARCH METHODS: EXPERIMENTAL DESIGN

Course Code: PSY4301 **Credit Unit: 02**

Course Objective:
Research Methodology is a way to find out the result of a given problem on a specific matter or problem that is also referred as research problem. In Methodology, researcher uses different criteria for solving/searching the given research problem. Different sources use different type of methods for solving the problem. So this course will enable the student to understand and apply basic research methods in psychology including research design, data analysis and report findings research conclusion apparently based on the parameters of particular research methods.

Course Contents:

Module I: Introduction to Research
Meaning of Scientific Research
Objectives and Steps in Scientific Research
Defining research problem
Defining variables
Developing hypothesis

Module II: Evaluating Measures and Hypothesis
Need For Evaluating Measures
Reliability and Validity
Hypothesis testing: Type1 and Type 2
Going beyond hypothesis testing: Effect size and Power

Module III: Validity of Experimental Researches and Threats to them
Statistical Conclusion validity
Construct validity and External Validity
Establishing the cause and Effect
Single Group threat, Multiple Group threats, Social threats

Module IV: Experimental Designs-I
Two-Group experimental designs
- Within-subject Design
- Between-subject design
- General Linear Model

Module V: Experimental Designs-II
Factorial designs
Randomized Block designs
Hybrid Experimental Designs: Soloman four group designs
Mixed designs

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Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Text & References:

Text:

- Shuttleworth, Martyn (2008). "Definition of Research". *Experiment Resources*. Experiment-Research.com. Retrieved 14 August 2011.
- Creswell, J. W. (2008). Educational Research: Planning, conducting, and evaluating quantitative and qualitative research (3rd ed.). Upper Saddle River: Pearson.
- Trochim, W.M.K, (2006). Research Methods Knowledge Base.
- Montgomery, Douglas (2013). *Design and analysis of experiments* (8th ed.). Hoboken, NJ: John Wiley & Sons, Inc.

Reference

- Review of Foundations for research: Methods of inquiry in education and the social sciences, by Kathleen B. deMarrais and Stephen D. Lapan. 2004. Reference & Research Book News 19:1**.**
- Denscombe, Martyn. 2007. The good research guide for small-scale social research projects. 3rd ed. Maidenhead, UK: Open University Press. 360 pages. ISBN: 0335220223. $48.50 (pbk).
- Baker, Lynda M. 2001. Review of Understanding Research Methods: An Overview of the Essentials, 2nd ed., by Mildred L. Patten. The Library Quarterly 71:96.
- Ellingson, L. L. 2007. Review of Qualitative research methods for the social sciences, 6th ed, by B. L. Berg. Communication Research Trends 26.1: 24.

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PSYCHOTHERAPY

Course Code: PSY4302 **Credit Units: 03**

Course Objective:
The course enables students to learn various therapies and their applications in counselling field. The course aims to enable participants to acquire the development and therapies in counselling which can be used in a variety of settings, and also to understand the importance of the development of personal awareness in the effective application of counseling skills.

Course Contents:
Module I: Introduction
Psychotherapy: Meaning, Nature & Scope
Variables affecting Psychotherapy: Specific Variables: Client Variable, Therapist Variable, Process variables, Social & Environmental Variable
Non-Specific Variables: Spontaneous cure, Placebo Effect
Currents and Future Trends of Psychotherapy

Module II: Psychotherapy in India
Psychotherapy in the Indian context
Spirituality and psychotherapy
Yoga and Meditation

Module III: Varieties of Psychotherapy
Supportive therapy
Re-educative Therapy
Re-constructive therapy
Counselling vs. Psychotherapy

Module IV: Psychoanalytic Therapies
Freud's Psycho-analytic Therapy, Adlerian Psychotherapy, Brief Dynamic Therapies

Module V: Humanistic Therapies
Client-Centered Therapy, Existential Therapy and Gestalt Therapy

Module VI: Behavioral and Cognitive Behavior Therapy
Behavioral therapy, Cognitive Behavior therapy, Rational Emotive Behavior Therapy (Ellis)

Module VII: Few more Important Therapies
Family, Marital and Interpersonal Therapy
Therapies with Children and Adolescents
Group Therapy

Module VIII: Therapeutic Guidelines while working with
Women, Older clients, Clients with personality disorder
Grief and loss
Self-harm
Persons from disadvantaged context

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Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Text & References:

Text:

- Golfried, H. R. & Davison, G. C.: Clinical Behaviour Therapy
- Sharf R., Theories of Psychotherapy & Counselling – Concepts and Cases; 2nd Edition.
- The Top 10: The Most Influential Therapists of the Past Quarter-Century. Psychotherapy Networker.: 2007, March/April (retrieved 7 Oct 2010)
- Henrik, R. (ed) *The Psychotherapy Handbook. The A-Z handbook to more than 250 psychotherapies as used today* (1980) New American Library.

References:

- Kirt S.H. & Clark: Cognitive Behaviour Therapy for Psychiatric Problems.
- Gurman & Kniskern: Handbook of Family Therapy.
- Kahn M.,: Between Therapist and Client- The New Relationship- Revised Edition
- Bryant, R.A.; Moulds, M.L.; Guthrie, R.M.; Nixon, R.D.V. (2005)."The Additive Benefit of Hypnosis and Cognitive-Behavioral Therapy in Treating Acute Stress Disorder"

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COUNSELLING PSYCHOLOGY

Course Code: PSY4304 **Credit Unit: 03**

Course Objective: To produce graduates with a well-developed professional identity as counseling psychologists, including awareness and appreciation of context, development, and strength-based interventions. Thus, we seek to develop the professional skills of our students such that each is able to:

- Demonstrate understanding of the impact of multiple contexts on human behavior
- Demonstrate understanding of theories and techniques of developmentally-based health promotion and intervention for individuals, systems, and communities
- Appreciate the role of individual and cultural differences and diversity in human development and behavior

Course Contents:

Module I: Introduction

Meaning, Definition & Goals
Historical Background: Origin of Counseling within Philosophy and Medicine,
Influence from Psychology, Mental health development, the guidance movement and other influences
Difference between Counseling and other associated helping professions (psychotherapy, psychiatry, social work, guidance etc.)

Module II: Counseling Process

Settings for counseling
Steps in counseling
Therapeutic relationship: The importance of relationship, components of relationship, Facilitative conditions for the counseling relationship

Module III: Counseling Approach: Insight oriented

Psychodynamic Approach: Psychoanalytic, Adlerian
Humanistic Approach: Existential, Client-centered, Gestalt

Module IV: Counselling Approach: Action oriented & other approaches

Behavioural Approach: Operant-Conditioning, Classical-Conditioning.
Cognitive Approach: Cognitive Tharepy, Rational emotive therapy.
Other Approaches: Narrative Therapy, Expressive Therapy, and Biofeedback.

Module V: Current Issues in Counseling:

Ethical Issues: Professional Codes, Our divided loyalties, Areas of ethnical difficulty, recent trends
Legal Issues: Advice for the passionately committed counseling student
Mental Health Counseling
Counseling diverse population: Gender bias, Counseling the aged, the ethnic minorities, and the physically challenged

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

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Text & References:

Text:

- Williams, E.N., Hayes, J.A., & Fauth, J. (2008). Therapist self-awareness: Interdisciplinary connections and future directions. In S. Brown & R. Lent (Eds.), Handbook of Counseling Psychology (4th ed) (pp. 267–283). NY: Wiley.
- Levy, K. N., &Scala, J. (2012). Transference, transference interpretations, and transference-focused psychotherapies. Psychotherapy, 49(3), 391-403. doi:10.1037/a0029371
- Ladany, N. & Inman, A. (2008) Handbook of Counseling Psychology, (4th ed.). John Wiley & Sons: New York.

References:

- Society of Counseling Psychologists. (n.d.). About counseling psychologists. Found online at http://www.apa.org/ed/accreditation/doctoral.html
- Brems, C. & Johnson, M. E. (1997). Comparison of recent graduates of clinical versus counseling psychology programs. Journal of Psychology, 131, 91-99.
- Disner SG, Beevers CG, Haigh EA, Beck AT. (2011) "Neural mechanisms of the cognitive model of depression". Nat Rev Neurosci. 2011 Jul 6;12 (8):467-77.
- Whyte, C (1978) "Effective Counseling Methods for High-Risk College Freshmen". Measurement and Evaluation in Guidance. January. 6. (4).198-2000

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PRACTICUM- III

Course Code: PSY4308 **Credit Units: 03**

Course Objective:

1. To give practical experience to the students in administering and scoring psychological tests and interpreting the scores.
2. To acquaint the students with the basic procedure and design of psychology experiments.
3. To encourage and guide the students to undertake a small-scale research project.
4. To apply the general concepts of psychology through experimentation and testing

Note: Total 5 practicals will be conducted in the third semester among the list of following practicals

Course Content:

1	Measures of Psychosocial Development (MPD)	Development
2	Culture Free Self-Esteem Inventories, 3rd Edition	Self-Esteem
3	State-Trait Anger Expression Inventory-2™ (STAXI-2)	Anger
4	Personality Inventory for Youth	Personality
5	Family Relations Test: Children's Version	Interpersonal Relationship
6	Wide Range Intelligence Test (WRIT)	Intelligence

Examination Scheme:

Components	A	File Demonstration	Viva	EE
Weightage (%)	5	35	35	25

Text & References:

- Mohsin, S. M.: Experiments in Psychology. Motilal Banarasidas
- Woodworth, R.S.: Experimental Psychology. Oxford & IBH & Schlosberg, H. Publishing
- Postman, L. & Egan, J. P.: Experimental Psychology: An Introduction. Harper and Row

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FIELD PRACTICE-III

Course Code: PSY4309 **Credit Units: 04**

Course Objective:
To develop, in students the skills of observation, collection and documentation of data for conducting theoretically correct and practically relevant research

Methodology

Each student will engage themselves in interaction and observation of psychological processes in a subject/ field of their choice.
Student will then present their findings in the form of a paper for seminar discussions.
Similarly, field work will be done by students in their area of interest and present their practical observations, as a report with analysis and suggestions.

Examination Scheme:

Field/Seminar Report	:	40 marks
Viva-Voce	:	30 marks
Internal Faculty and Interaction	:	10 marks
Presentation/Daily Diary Report	:	20 marks

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SUMMER INTERNSHIP EVALUATION

Course Code: PSY4335 **Credit Units: 06**

GUIDELINES FOR INTERNSHIP FILE AND INTERNSHIP REPORT

(These guidelines will be useful for undertaking an internship programme during the summer or at any other time wherein the student/ researcher works full time with a company/organisation)

There are certain phases of every Intern's professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship programme can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal class room situations. These attributes are intellectual ability, professional judgment and decision making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc.

In order to achieve these objectives, each student will maintain and submit a file (**Internship File**) and a report (**Internship Report**).

INTERNSHIP FILE

The Internship File aims to encourage students to keep a personal record of their learning and achievements throughout the Programme. It can be used as the basis for lifelong learning and for job applications. ***Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development.***

The File will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and his/her own personal contribution to the organization.

The File is essentially a comprehensive documentation of how one proceeds while working on the assignment and should be regularly checked by the faculty guide/ supervisor, issues discussed with the students, doubts if any clarified and signed as having done so. This will form the basis of **continuous evaluation** of the project.

The File will include ***five sections*** in the order described below.

1. **The Title Page –** An Internship Experience Report For (Your Name), name of internship organization, name of the Supervisor/Guide and his/her designation, date started and completed, and number of credits for which the report is submitted.
2. **Table of Content –** An outline of the contents of the file by topics and subtopics with the page number and location of each section.
3. **Introduction** – Short, but should include how and why you obtained the internship experience position and the relationship it has to your academic/professional and career goals.
4. **Main Body** – Should include a brief summary/ executive summary of the **Internship Project Report** that the student has worked on, an **analysis of the company/organization** in which the

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student is working, a **personal review** of the student's management skills and how they have been developed through the programme, the daily tasks performed, major projects contributed to, dates and hours spent on a task, observations and feelings, meetings attended and their purposes, listing of tools and materials and their suppliers, and photographs if possible of projects, buildings and co-workers.

5. **Appendices** – Include pamphlets, forms, charts, brochures, technical and descriptive literature, graphs and other information related to your Internship experience.

INTERNSHIP REPORT

The **Internship Report** is the research report that the student has to prepare on the project assigned by the organization. (Incase a student is not assigned a specific research project in the organization, he has to select any one aspect of the organization and prepare a research report on it). The lay out of the report should be as per the standard layout prescribed by the organization wherein the student undertakes the Internship. In case, there is no layout prescribed by the organization the following components should be included in the report:

- **Title or Cover Page**.
  The title page should contain Project Title; Student's Name; Programme; Year and Semester and Name of the Faculty Guide.

- **Acknowledgements**
  Acknowledgment to any advisory or financial assistance received in the course of work may be given. It is incomplete without student's signature.

- **Abstract**
  A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project. It should not exceed more than 1000 words.

- **Table of Contents**
  Titles and subtitles are to correspond exactly with those in the text.

- **Introduction**
  Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

- **Materials and Methods**
  This section should aim at experimental designs, materials used (wherever applicable). Methodology should be mentioned in details including modifications undertaken, if any. It includes organization site(s), sample, instruments used with its validation, procedures followed and precautions.

- **Results and Discussion**
  Present results, discuss and compare these with those from other workers, etc. In writing this section, emphasis should be laid on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

  Note that in writing the various secions, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and

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given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary, do not write in "point" form.

While presenting the results, write at length about the the various statistical tools used in the data interpretation. The result interpretation should be simple but full of data and statistical analysis. This data interpretation should be in congruence with the written objectives and the inferences should be drawn on data and not on impression. Avoid writing straight forward conclusion rather, it should lead to generalization of data on the chosen sample.

Results and its discussion should be supporting/contradicting with the previous research work in the given area. Usually one should not use more than two researches in either case of supporing or contradicting the present case of research.

- **Conclusion(s) & Recommendations**
  A conclusion should be the final section in which the outcome of the work is mentioned briefly. Check that your work answers the following questions:
  - Did the research project meet its aims (check back to introduction for stated aims)?
  - What are the main findings of the research?
  - Are there any recommendations?
  - Do you have any conclusion on the research process itself?

- **Implications for Future Research**
  This should bring out further prospects for the study either thrown open by the present work or with the purpose of making it more comprehensive.

- **Appendices**
  The Appendices contain material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.
- **References**
  References should include papers, books etc. referred to in the body of the report. These should be written in the alphabetical order of the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

The Layout Guidelines for the Internship File & Internship Report:

- A4 size Paper
- Font: Arial (10 points) or Times New Roman (12 points)
- Line spacing: 1.5
- Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

Assessment Scheme:

Continuous Evaluation: 30%
(based on Internship File and the observations of the faculty guide/ supervisor)

Feedback from Company/ Organization: 10%

Final Evaluation:
(Based on Internship Report, Viva/ Presentation) 60%

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CLINICAL PSYCHOLOGY

Course Code: PSY4303 **Credit Units: 03**

Course objective:
Clinical psychology is the branch of psychology concerned with the assessment and treatment of mental illness, abnormal behavior and psychiatric problems. This field integrates the science of psychology with the treatment of complex human problems, making it an exciting career choice for people who are looking for a challenging and rewarding field.

Course Contents:
Module I: Introduction
Meaning and Nature of Clinical Psychology
Background of Clinical Psychology: First Fifty years of Clinical Psychology (Establishment of Psychological Clinics and Influence of World War I)
Clinical Psychology: between World War I and II; From World War II to Present

Module II: **Foundation of Clinical Psychology**
Historical origin, the Psychometric tradition, the influence of health and child guidance movement, the influence of Sigmund Freud & the American Psychologist's in America.
The influence of World War II on development of Clinical Psychology
Roots of Clinical Psychology in India: the pre-independence phase, post independence to the present scenario.

Module III: Development of clinical Psychology as a profession.
Activities of Clinical Psychologist: psychological assessment, Psychotherapy, research, community mental health programme, teaching, consultation, administration.
Differences & similarities with other mental health professions
Subspecialties of clinical Psychology: Clinical health Psychology, Forensic Psychology, Geropsychology, Clinical Neuropsychology, and child clinical psychology.
Professional identity, responsibilities

Module IV: Diagnosis and assessment.
Nature and purpose of Clinical diagnosis & assessment
Stages in the Assessment Process
Clinical Assessment Techniques: observation, interview, case-study, Psychological tests.

Module V:
Employment Setting for Clinical Psychologist
Subspecialties of Clinical Psychology
Organizations in Clinical Psychology
Ethical and Legal Issues in Clinical Psychology
Cultural issues, current scenario & future prospects.

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

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Text & References

Text

- Anastasi, A.: Psychological Testing, New York: MacMillan Publishing company.
- Bellack, A. S.**:** Introduction to Clinical Psychology. New York: Oxford & Hersen, M.University Press
- Karliger, F.N.: Foundations of Behavioural Research, New York: Holt Rinehart Winston.
- Korchin, S. J.**:** Modern Clinical Psychology. Delhi CRR Publishers and Distributers
- Ray, S. D.: The Practice of Psychotherapy. New Delhi: New Age International
- Plante, T. G.: Contemporary Clinical Psychology. New York: John Willey& Sons, Inc.
- Pomerantz, A. M. : Clinical Psychology- Science, Practice and Culture. New Delhi: Sage Publications
- Hecker, J. E.: Introduction to Clinical Psychology. Delhi: Pearson Thorpe, G. L.Education
- Matthews, J. R.: Introduction to Clinical Psychology. New York: Oxford Anton, B. S.University Press
- Herbert, M.: Clinical Child Psychology: Social Learning, Development And Behaviour.New York: John Willey & Sons, Inc.
- Kumar, A.: Clinical Psychology. Anmol Publications
- Field, A. P.: Clinical Psychology. Learning Matters & Field
- Hatton, C.: Clinical Psychology. New York: John Willey & Sons, Inc.

References:

- Barlow et al.(2010): Oxford Handbook of clinical psychology.1st Edition.
- Gross and Hersen., (2007): Handbook of clinical Psychology .Volume 1

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DEVELOPMENTAL PSYCHOLOGY

Course Code: PSY4305 **Credit Units: 03**

Course objective:
To develop the understanding as to how developmental psychology focuses on the development of individuals across their lifespan within the context of family, peer groups, child-care and after-school programs, schools, neighborhoods, and larger communities and society. It considers the well-being of children, youth, and adults, vis-a-vis the cognitive, emotional, social, academic, and health domains

Course Contents

Module 1: Background of Developmental Psychology
Historical Background
Meaning, Nature and scope
Obstacles in studying Life-Span Development and its effect

Module2: Stages of Development
General Patterns of Development
Stages of Development- Physical, Cognitive, Emotional, Social and Moral

Module 3: Theoretical perspective on Development
Psychodynamic Theories: Freud, Erikson
Social Learning Theory: Albert Bandura
Cognitive Theory: Piaget
Attachment Theory: Bowlby
Socio Cultural Theory: Konrad-Lorens & Niko Tinbergen, Lev Vygotsky
Ecological Theory: Uric Bronfen Brenner
Ethology & Evolutionary Theory

Module 4: Development Related Disorders (DSM-IVTR and I.C.D-10)
Pervasive Developmental Disorder: Autism
Specific Developmental Disorder of Speech and Language
Specific Learning Disabilities-Reading, Spelling, and Arithmetical Disorder
Behavioral Disorders: Attention Deficit Hyperkinetic Disorder, Conduct Disorder, Oppositional defiant Disorder

Module 5: Adjustment Related Issues.
Adolescence: Psychological Hazards, Effects of Immaturity, and happiness in adolescence. Early Adulthood: Social Mobility, Sex-Role Adjustments, Personal & Social Hazards.Middle Age: Adjustment to Physical and mental changes, Vocational and marital hazards.Old Age: Changes in motor and mental abilities, Hazards to Personal and Social Adjustment.

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

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Text & References:

Text:

- Hurlock, E. B.: Developmental Psychology. McGraw-Hill
- Papalia, D. E.; Olds, S. W. & Feldman, R.D: Human Development (10th Ed.).New York: McGraw-Hill.
- Feldman, R. S.: Discovering the Life Span (2nd Ed.). Prentice Hall
- Berk, L.E.: Child Development. New Delhi: Pearson Education.
- Heatherington, E.M. & Parke, R.D.: Child Psychology: A Contemporary Viewpoint New York: McGraw-Hill
- Kail R. V.: Children and their development. Prentice Hall Inc.
- Bee, H. & Boyd, D.: Life Span Development, Boston, M.A.: Allyn and Bacon.
- Crain, W.: Theories of Development. Englewood Cliffs, New Jersey: Prentice Hall.
- Newman, B.M. & Newman, P.R.: Development Through Life: A Psychosocial Approach. New York: Wadsworth Publishing Company.

References:

- Brodzinsky, D.M.; Gormly, A.V. & Anibron, S.R.: Life Span Human Development; New Delhi: CBS Publication
- Santrock, J.W.: A Topical Approach to Life Span Development. New Delhi: Tata McGraw Hill.
- Bukatko, D. & Daehler, M.W.:Child Development: A Thematic Approach. New York: Houghton Mifflin Company.

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RESEARCH METHODS: NON-EXPERIMENTAL DESIGN

Course Code: PSY4401 **Credit Unit: 02**

Course Objective:
Research Methodology is a way to find out the result of a given problem on a specific matter or problem that is also referred as research problem. In Methodology, researcher uses different criteria for solving/searching the given research problem. Different sources use different type of methods for solving the problem. So this course will enable the student to understand and apply basic research methods in psychology including research design, data analysis and report findings research conclusion apparently based on the parameters of particular research methods.

Course Contents:

Module I: Introduction
Nature and Purpose of Non-Experimental Research Designs and their importance
Advantages and Disadvantages of Non-experimental Research Designs
Differences between Experimental and Non-Experimental Research Designs
Types or Non-experimental Designs: Pure Descriptive design, Correlational Descriptive Design and Other type

Module II: Quasi- Experimental designs
Quasi- experimental research designs: their uses and importance
One-Group Designs
Non-equivalent control group designs
Pretest-Posttest Control Group Design

Module III: Non-Experimental Designs
Quantitative Non-Experimental Designs, Causal Comparative
Qualitative and Quantitative perspectives: Collecting qualitative data: Case study, interview, Observational method. Discourse Analysis, Grand narrative analysis, Ethnographic methodology.
Time series Designs

Module IV: Correlational Designs
Correlational research design: Its Basic nature and uses
Kinds of Correlational designs: Panel Design, Cross-Sectional Design and Longitudinal Designs
Concept and application of Multiple Regression Analysis (linear and stepwise)
Factor analysis and Its Implications

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

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Text & References:

Text:

- Shuttleworth, Martyn (2008). "Definition of Research". Experiment Resources. Experiment-Research.com. Retrieved 14 August 2011.
- Creswell, J. W. (2008). Educational Research: Planning, conducting, and evaluating quantitative and qualitative research (3rd ed). Upper Saddle River: Pearson.
- Trochim, W.M.K, (2006). Research Methods Knowledge Base.
- Montgomery, Douglas (2013). Design and analysis of experiments (8th ed). Hoboken, NJ: John Wiley & Sons, Inc. ISBN 9781118146927.

Reference:

- Kothari, C.R (2004), Research Methodology: Methods and Techniques.
- Kumar, R (2005), Research Methodology: A step-by-step beginners.
- Melville and Goddard (2004), Research Methodology: An introduction.
- Khan, J.A(2011), Research Methodology.

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ADVANCE AND APPLIED COUNSELLING SKILLS

Course Code: PSY4403 **Credit Unit: 02**

Course Objective:
This course enables students to gather knowledge about theories of Advanced Counselling Skills. It is further designed to equip students with skills to practice as a Counselling Psychologist.

Course Contents:

Module I: Counsellor as a person

Personal characteristics: A composite model of human effectiveness, role of self awareness in counselling.
Role and Function of the Counsellor: Definition of Role, Generic roles, organizing roles & functions

Module II: Communication Skills – I

Basic Communication Skills: Attending skills, Listening skills, Integrating Listening Skills.
Exploration Skills: Probe, Immediacy, Self-disclosure, Interpretation, Confrontation.
Action Skills: Information giving, Advice giving, Goal setting, Reinforcement, Directives
Self-disclosure by counsellor – when and how
Helping clients develop and work on preferred scenarios, negotiating homework.
Managing resistance and other obstacles in counselling
Skills of closure and terminating

Module III: Techniques of Helping and working with emotions

Self monitoring of Thought, Feeling and Action, Facilitating problem solving
Understanding and Improving Self talk, rules and thinking patterns.
Behavioural Methods

Module IV: Counseling Applications

Pediatric Counseling: Dynamics and process
Adolescent Counselling: Concept and Issues
Group Counselling: Concept & Process.
Academic Counselling: Definition and Scope.
Marital and Family Counselling: Concept & Process.
Addiction counseling: Principles & Prevention
Geriatric Counselling: Concept and Scope.
Rehabilitation Counseling, And Crisis Intervention &Trauma Counseling

Module V: Assessment in psychology

The purpose of assessment in counselling, Assessment principles
Intelligence and general ability testing
Measuring Achievement and aptitude
Appraisal of personality
Spiritual assessment strategies
Applications of assessment: Treatment planning, evaluation and accountability.

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Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Text & References:

Text:

- Patri, V., & Anthors R.(2001), Counselling Psychology, Press, New Delhi

References:

- Nelson R Jones ,(2003), Basic Counselling Skills; Sage Publication, London
- Gerald C. (2001), Case Approach to Counselling Psycology; Brooks/Cole, Australia
- Crouch a. (1997), Inside Counselling ; Sage Publication, London
- Ivey A.E. & Ivey M. B. (1999), Intentional Interviewing & Counselling, 4th Edition.
- Woolfe R. & Dryden W. (2001)Handbook of Counselling Psychology; Sage Publication, London

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PRACTICUM- IV

Course Code: PSY4412 **Credit Units: 03**

Course Objective:

1. To give practical experience to the students in administering and scoring psychological tests and interpreting the scores.
2. To acquaint the students with the basic procedure and design of psychology experiments.
3. To encourage and guide the students to undertake a small-scale research project.
4. To apply the general concepts of psychology through experimentation and testing

Note: Total 5 practicals will be conducted in the fourth semester among the list of following practicals

Course Content:

1	NEO-4™ - Comprehensive Kit	Personality
2	Comprehensive Test of Non-verbal Intelligence-Second Edition (CTONI-2)	Intelligence
3	Neuropsychological Assessment Battery® (NAB®) Attention Module Kit	Attention
4	Detroit Tests of Learning Aptitude - Fourth Edition (DTLA-4)	Learning
5	Reynolds Intellectual Assessment Scales (RIAS)	Intelligence
6	General Health Questionnaire (GHQ)	Health

Examination Scheme:

Components	A	File Demonstration	Viva	EE
Weightage (%)	5	35	35	25

Text & References:

- Mohsin, S. M.: Experiments in Psychology. Motilal Banarasidas
- Woodworth, R.S.: Experimental Psychology. Oxford & IBH & Schlosberg, H. Publishing
- Postman, L. & Egan, J. P.: Experimental Psychology: An Introduction. Harper and Row

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FIELD PRACTICE-IV

Course Code: PSY4413 **Credit Units: 04**

Course Objective:
To develop, in students the skills of observation, collection and documentation of data for conducting theoretically correct and practically relevant research

Methodology

Each student will engage themselves in interaction and observation of psychological processes in a subject/ field of their choice.
Student will then present their findings in the form of a paper for seminar discussions.
Similarly, field work will be done by students in their area of interest and present their practical observations, as a report with analysis and suggestions.

Examination Scheme:

Field/Seminar Report	:	40 marks
Viva-Voce	:	30 marks
Internal Faculty and Interaction	:	10 marks
Presentation/Daily Diary Report	:	20 marks

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DISSERTATION

Course Code: PSY4437 **Credit Units: 06**

GUIDELINES FOR DISSERTATION

The aim of the dissertation is to provide you with an opportunity to further your intellectual and personal development in your chosen field by undertaking a significant practical unit of activity, having an educational value at a level commensurate with the award of your degree

The dissertation can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Selecting the Dissertation Topic
It is usual to give you some discretion in the choice of topic for the dissertation and the approach to be adopted. You will need to ensure that your dissertation is related to your field of specialization.

Deciding this is often the most difficult part of the dissertation process, and perhaps, you have been thinking of a topic for some time.

It is important to distinguish here between 'dissertation topic' and 'dissertation title'. The topic is the specific area that you wish to investigate. The title may not be decided until the dissertation has been written so as to reflect its content properly.

Few restrictions are placed on the choice of the topic. Normally we would expect it to be:
- relevant to business, defined broadly;
- related to one or more of the subjects or areas of study within the core program and specialisation stream;
- clearly focused so as to facilitate an in-depth approach, subject to the availability of adequate sources of information and to your own knowledge;
- of value and interest to you and your personal and professional development.

Planning the Dissertation
This will entail following:
- Selecting a topic for investigation.
- Establishing the precise focus of your study by deciding on the aims and objectives of the dissertation, or formulating questions to be investigated. Consider very carefully what is worth investigating and its feasibility.
- Drawing up initial dissertation outlines considering the aims and objectives of the dissertation. Workout various stages of dissertation
- Devising a timetable to ensure that all stages of dissertation are completed in time. The timetable should include writing of the dissertation and regular meetings with your dissertation guide.

The Dissertation plan or outline
It is recommended that you should have a dissertation plan to guide you right from the outset. Essentially, the dissertation plan is an outline of what you intend to do, chapter wise and therefore should reflect the aims and objectives of your dissertation.

There are several reasons for having a dissertation plan

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- It provides a focus to your thoughts.
- It provides your faculty-guide with an opportunity, at an early stage of your work, to make constructive comments and help guide the direction of your research.
- The writing of a plan is the first formal stage of the writing process, and therefore helps build up your confidence.
- In many ways, the plan encourages you to come to terms with the reading, thinking and writing in a systematic and integrated way, with plenty of time left for changes.
- Finally, the dissertation plan generally provides a revision point in the development of your dissertation report in order to allow appropriate changes in the scope and even direction of your work as it progresses.

Keeping records
This includes the following:

- Making a note of everything you read; including those discarded.
- Ensuring that when recording sources, author's name and initials, date of publication, title, place of publication and publisher are included. (You may consider starting a card index or database from the outset). Making an accurate note of all quotations at the time you read them.
- Make clear what is a direct a direct quotation and what is your paraphrase.

Dissertation format
All students must follow the following rules in submitting their dissertation.
- Front page should provide title, author, Name of degree/diploma and the date of submission.
- Second page should be the table of contents giving page references for each chapter and section.
- The next page should be the table of appendices, graphs and tables giving titles and page references.
- Next to follow should be a synopsis or abstract of the dissertation (approximately 500 words) titled: **Executive Summary.**
- Next is the 'acknowledgements'.
- Chapter I should be a general introduction, giving the background to the dissertation, the objectives of the dissertation, the rationale for the dissertation, the plan, methodological issues and problems. The limitations of the dissertation should also be hinted in this chapter.
- Other chapters will constitute the body of the dissertation. The number of chapters and their sequence will usually vary depending on, among others, on a critical review of the previous relevant work relating to your major findings, a discussion of their implications, and conclusions, possibly with a suggestion of the direction of future research on the area.
- After this concluding chapter, you should give a list of all the references you have used. These should be cross - references with your text. For articles from journals, the following details are required e.g.

  Draper P and Pandyal K. 1991, The Investment Trust Discount Revisited, Journal of Business Finance and Accounting, Vol18, No6, Nov, pp 791-832.

  For books, the following details are required:
  Levi, M. 1996, International Financial Management, Prentice Hall, New York, 3rd Ed, 1996

- Finally, you should give any appendices. These should only include relevant statistical data or material that cannot be fitted into the above categories.

The Layout Guidelines for the Dissertation:
- A4 size Paper
- Font: Arial (10 points) or Times New Roman (12 points)

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- Line spacing: 1.5
- Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

Guidelines for the Assessment of the Dissertation
While evaluating the dissertation, faculty guide will consider the following aspects:

1. Has the student made a clear statement of the objective or objective(s).
2. If there is more than one objective, do these constitute parts of a whole?
3. Has the student developed an appropriate analytical framework for addressing the problem at hand.
4. Is this based on up-to-date developments in the topic area?
5. Has the student collected information / data suitable to the frameworks?
6. Are the techniques employed by the student to analyse the data / information appropriate and relevant?
7. Has the student succeeded in drawing conclusion form the analysis?
8. Do the conclusions relate well to the objectives of the project?
9. Has the student been regular in his work?
10. Layout of the written report.

Assessment Scheme:

Continuous Evaluation: (Based on Abstract, Regularity, Adherence to initial plan, Records etc.)	40%
Final Evaluation: Based on,	60%
Contents & Layout of the Report,	25
Conceptual Framework,	10
Objectives & Methodology and	10
Implications & Conclusions	15

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MENTAL RETARDATION

Course Code: PSY4402 **Credit Unit: 03**

Course Objective:
The paper on Mental Retardation introduces nature of mental retardation, its classification, assessment and intervention programs.
Course Contents:

Module I:
Mental Retardation: Definition of mental retardation, Classification-Psychological Classification Medical and Educational Classification, Causes and Prevention

Module II:
Mental Retardation: Psycho-educational Assessment, Intelligence Tests, FACP, BASIC-MR, BASAL-MR

Module III:
Mental Retardation: Enhancing Skills- CTC, IEP, Prompting, Task Analysis, Channing, Shaping, Modeling, Reinforcement

Module IV:
Mental Retardation: Reducing maladaptive behaviours- Assessment of maladaptive behaviours, plan of behavior modification, techniques for decreasing problem behavior.

Module V:
Vocational Training and Empowering families having child with Mental Retardation, Special Sports, Acts and Policies

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Text & References:

Text:

- NIMH (1989) Mental Retardation : A Manual for Psychologist, Secundrabad
- Peshawaria R. and Venkatesan (1992) Behavioural Approach in Teaching Mentally Retarded Children, NIMH, Secundrabad
- Thressiakutty A.T. and Govindrao L. (2001) Transition of Persons with Mental Retardation from School to Work, NIMH Secundrabad

References:

- Rao, T.A.S. (1992) Manual on Developing Communication Skills in Mentally Retarded Persons, NIMH, Secundrabad
- Hallahan D.P. and Kauffman J.M. (1980) Exceptional Children, Prentice Hall
- National Trust, Govt. of India, Handbook for Teachers

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CHILDHOOD PATHOLOGY AND EXCEPTIONAL CHILDREN

Course Code: PSY4405 **Credit Unit: 03**

Course Objective:

Objective of this course is to learn various categories of exceptionality, early identification, special and mainstream education

Course Contents:

Module I:

Developmental Disorders- Autism Spectrum Disorders, attention deficit hyperactivity disorder, Mental Retardation, Learning Disabilities, Hearing Impairment, Disability of Locomotion

Module II:

Bipolar disorder in children, conduct disorder, emotional disorders, eating disorders, enuresis
Psychological Assessment of Childhood disorders

Module III:

Special Education: Special Schools and Rehabilitation centres
Mainstreaming: assistive devices, adaptation, barrier free environment
Mainstreaming: Attitudinal change- teachers, non disabled students, Parents and Community

Module IV:

National Institutes in the field of disability: NIMH, NIVH, NIOH, AYJNIHH, NIEPMD, SVNIRTAR, Alimbco.
NGOs, Parent Organizations, Advocacy organization

Module V:

Legislative framework: Mental Health Act, RCI Act, Persons with Disability Act, National Trust Act, UNCRPD

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Text & References:

Text:

- Hallahan D.P. and Kauffman J.M. (1980) Exceptional Children, Prentice Hall
- Cratty B.J. and Goldman R.L. (1995) Learning Disabilities: Contemporary Viewpoints, Harwood Academic Publishers
- Cruschank, W.M. (1975). Psychology of Exceptional Children and Youth, Englewood Cliffs N.J.: Prentice Hall

References:

- Rao, T.A.S. (1992) Manual on Developing Communication Skills in Mentally Retarded Persons, NIMH, Secundrabad
- National Trust, Govt. of India, Handbook for Teachers
- NIMH (1989) Mental Retardation : A Manual for Psychologist, Secundrabad
- Peshawaria R. and Venkatesan (1992) Behavioural Approach in Teaching Mentally Retarded Children, NIMH, Secundrabad

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EMPLOYEE COUNSELING AND EMPOWERMENT

Course Code: PSY4409 **Credit Units: 3**

Course Objective:
To enable students to understand the diversity in organizations and equip them with skills to handle, manage and adjust to a culturally and socially diverse work environment.

Course Contents:
Module I: Mentoring Career
Improving various Professionally & Psychologically Skills, Performance & Capacity Development, Career Planning, Setting Goals, Interview Techniques, and Negotiation Skills

Module II: Work Life Counseling:
Managing work life: key to perform well; remain stress free, happy & successful at work.

- Dealing with Boss, Colleagues & Juniors
- Stress Management, Time Management, Crisis Management
- Enhancing Performance & Will Power
- Work-Life Balance, Motivation & Performance
- Meeting Challenges of Workplace Harassment, Discrimination

Module III: Personal Life Counseling:
Personality Development and Behavioural Management

- Understanding, Improving & Balancing Habits and Behavior
- Identifying Power within self
- Developing EQ & Emotional Intelligence, Developing Positive Psychology
- Utilizing Multiple Intelligence, Confidence Building
- Handling & Eradicating Stress & Phobia, Handling Frustration & Unhappiness
- Handling Ego/ Self Respect, Handling & eradicating Depression & Loneliness

Module IV: Introduction to Employee Counselling
Meaning, Nature & Scope
Types and functions of Employee Counselling
Coaching, Mentoring and Counselling

Module V: Differences and power
Concepts of prejudice, discrimination and oppression
Cultural and ethnicity as dimensions of differences
Race and racism in organizations
Gender and sexism in organization
Sexual orientation, physical ability, age, social class and other differences in workplace

Module VI: Conflict and Negotiation viz Employee Counselling
Concept of Conflict and Negotiation
Importance and relevance of Conflict and Negotiation in Employee Counselling

Module VII: Employee Empowerment and leadership
Change Management, Employee Involvement for Effective Change Management, Leadership Management, Motivation / Recognition / Retention.

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Essentials of Leadership Quality
Self-leadership leads to Empowerment
Relevance of Empowerment in Employee Counselling

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Text & References:

Text

- Luthans, F. Organizational Behaviour, McGraw – Hill International, 1998.
- Lashley, C (2001) Empowerment : HR strategies for service excellence Oxford,
- Lashley C (1997) Empowering Service Excellence: beyond the quick fix, London,
- Harold Koontz, O'Donnel and Weihrich, Management, Tata McGraw Hill, New Delhi, 1992.
- MonirH.Tayeb(2005). International Human Resource Management-, Oxford Publications.
- http://www.newdirectionscounseling.com/defcoun.html

References:

- Stephen P. Robbins, Organizational Behaviour: Concepts, Controversies, Applications, Prentice Hall, New Delhi, 2000.
- Hyman, J. and Mason, B. (1995) Managing employee involvement and participation.
- Ashkenas, Ulrich, The boundryless Organizations, Jossey- Bass.
- Dalton, Ernst Christ, Success for the Global managers, Jossey- Bass.
- Dhar&Ravishankar, Global Managers, Himalayan Publishing House.

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ORGANIZATIONAL BEHAVIOR AND INDUSTRIAL RELATIONS

Course Code: PSY4410 **Credit Units: 03**

Course Objective:
To equip students with the basic knowledge of psychological processes in the organizations and skills for using the same for organizational development and to aims at orienting the students to the functions of Industrial relations with relevance to the Indian context.

Course Contents:
Module I: Evolution of management Thought
Organizational Behavior: Definition, goals, fundamental concepts
Concept, Determinants and Models
Historical development of industrial organizational psychology

Module II: Job analysis and selection
Job analysis – Definition and methods – Questionnaire method, checklist method, individual interview method, observation interview method, group method, technical conference method, diary method, work participation method and critical incident method
Selection – Application blank, psychological tests used in selection – Intelligence tests, personality tests, interest tests and aptitude tests (mention two tests in each area). Interview, guided interview, unguided interview, stress interview, group interview.

Module III:
Individual Behavior: Foundation of Individual Behaviour, Personality, Learning, Perception and Attribution, Values and Attitudes, motivation and job performance. Management's assumptions about people.
Group Behavior: Foundation of group behavior, Group Dynamics, Leadership: theories and styles. Conflict: Sources, Patterns, Levels and Resolution. Organizational Power and Politics.

Module IV:
Industrial Relation: Origin, Definition, Scope, Determinant, Socio-Economic, Technical,
Political factors affecting IR in changing Environment, Approaches to the study of IR
–Psychological, Human Relation, Socio,Gandhinian approach &It's Effect on
Management

Module V:
1. Present day industrial worker - comparison with predecessor Industrial disputes: meaning-causes. Importance of good labour management relations-causes of industrial unrest
2. Directive principles of State policy-creating and adopting labour policy.
3. Role of ILO in industrial relations.

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

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Text & References:

Text:

- Blum & Naylor, Industrial Psychology, CBS Publishers & Distributors.
- Robbins, Stephen P., Organizational Behaviour, Prentice -Hall, New Delhi, 9th ed., 2000.
- B.D.Singh (2007). Compensation and Reward Management, Excel Books, New Delhi.
- Luthans, F. Organizational Behaviour, McGraw – Hill International, 1998.
- Personnel Management and Industrial Relations –P.C.ShejwalkarandS.B.Malegaonkar.

References:

- Kaji H. Hona, Syndrome in workers occupationally exposed, Journal of Hard Surgery.
- Kadefore. R., Ergonomic model for workplace assessment, Human Factors Association of Canada.
- Malik P.L., Industrial Law Eastern, Lucknow, 1991.
- Muchinshy. M. Paul, Psychology Applied to Work – Wadsworth.
- The Future of Industrial Relations. New Delhi Sage, 1994. Niland JR.

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PSYCHOLOGICAL PRACTICE IN PERSONNEL AND HUMAN RESOURCE MANAGEMENT

Course Code: PSY4411 **Credit Units: 03**

Course Objective:
To enable students to understand the concepts of psychology as applied in various aspects of human resources in organizations and equip them to develop modules in accordance with the optimum use of the same.

Course Contents:
Module I: The Human Resource Management
Structure of Human Resource Management, Role and Responsibilities of the Human Resource Manager; Human Resource Policies - Formulation and Essentials of Sound HR Policies

Module II: Challenges of Personnel Management: Individual and Competitiveness, balancing organizational demands and employees concerns-metaphors used to manage people.

Module III: Development of Human Resources
Learning, Training, Training and Development, Evaluation and Performance Appraisal

Module IV: Meeting HR requirements
Job Analysis and job Descriptions, diversity and empowered employees, career management and developing diverse talent pool, competency assessment- Perspective and Techniques

Module V: Employment Testing
Testing abilities, Testing personality, Testing skills and achievements, Using and not using tests.

Module VI: Contemporary Issues in HR
Strategic Human Resource Management, International Human
Resource Management Creating High Performing HR Systems: Wellness Programs and Work Life Balance and Green HRM

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Text & References:

Text:

- Cascio (1998) Managing Human Resources. Delhi: Tata McGraw Hill.
- Cascio W.F. &Aguinis H. (2008), Applied Psychology in Human Resource Management, 6th Edition, Printice-Hall, USA
- Robert A. Baron and Donn Byrne, "Social Psychology: Understanding Human Interactions", New Delhi, Prentice Hall of India, 7th Ed.,1995.
- John B. Miner, "Industrial - Organizational Psychology", Singapore, McGraw-Hill, 1992.

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References:

- Snell &Bohlander (2007) Human Resource Management, Thomson South Western.
- David S. Decenzo and Stephen P. Robbins, Personnel/Human Resource Management, Prentice Hall, New Delhi.
- William B. Werther Jr. and Keith Davis, Human Resources and Personnel Management, McGraw Hill, Singapore, 4th Ed.,1993 .
- ArunMonappa and Mirza S. Saiyadain, Personnel Management, Tata Mc-Graw Hill, New Delhi 1995.
- P Subba Rao, Essentials of Human Resource Management and Industrial Relations: Text, Cases and Games, Himalaya, Mumbai,2000.
- BiswajeetPatanayak, Human Resource Management, Prentice Hall India, New Delhi 2001.

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Master of Arts - Applied Psychology
PARAMETRIC STATISTICAL METHOD

Course Code: PSY4105 **Credit Units: 03**

Course Objective

The Present paper focuses on providing knowledge about the basics of statistics. It will give clear understanding to the students about application of parametric statistical methods. Parametric tests are generally more powerful in that the likelihood (probability) of a test reaching the correct conclusion is greater. Besides this, a module is added in last so to make students aware of parametric statistics in SPSS. Thereby they can understand the procedures and applications of parametric statistics using SPSS.

Course Contents

Module I: Basics

Nature, Meaning and importance of statistics
Concept of Reasoning, population, sample and probability theory in statistical inferences
Categories of statistics: Descriptive and Inferential
Variables and their types
Scales of Measurement: Nominal, Ordinal, Interval, Ratio

Module II: Statistical conjecture

Sampling and its kinds: Probability sampling method and Non-Probability sampling method.
Difference between Objectives and Hypothesis
Hypothesis testing: One-tailed and Two-tailed tests, Type I and Type II errors

Module III: Statistics and Test of Significance

Meaning, concept and importance of determining reliability of statistics in data analysis
Standard error of mean, standard deviations, percentages and correlation coefficients
Significance of difference between means-critical ratio and t-test calculation (large and small sample) assumption & uses
One-Way and Two Way ANOVA.

Module IV: Correlation and Regression

Correlation: concept, types, assumption and Utility of Cor-relational Analysis in Psychological Research
Bi-serial Correlation, Point Bi-serial Correlation, Partial Correlation, Tetra-choric Correlation
Simple and Multiple linear regression, its uses, concepts and assumptions
Difference between Simple linear and multiple regressions

Module V: Introduction to SPSS and parametric statistics in SPSS

Introduction to SPSS, its usage and functioning
Understanding the concepts of Parametric tests in SPSS
Learning data entry

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

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Text & References:

Text:

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- Edward, A.E.: Experimental Design in Psychological Research (3rd Ed.), New Delhi: American Publishing Co. 1971
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PRACTICUM-I

Course Code: PSY4106 **Credit Units: 03**

Course Objective

Present course give practical experience to the students in administering and scoring psychological tests and interpreting the scores to acquaint the students with the basic procedure and design of psychology experiments. Course will also encourage and guide the students to undertake a small-scale research project to apply the general concepts of psychology through experimentation and testing

Note: Total 5 practical will be conducted in the first semester among the list of following practical

Course Content

1	Memory
2	Language
3	Personality
4	Self-Concept
5	Perception
6	Memory and Learning

Examination Scheme

Components	**A**	**File Demonstration**	**Viva**	**EE**
Weightage (%)	5	35	35	25

Text & References

- Mohsin, S. M.: Experiments in Psychology. Motilal Banarasidas
- Woodworth, R.S.: Experimental Psychology. Oxford & IBH & Schlosberg, H. Publishing
- Postman, L. & Egan, J. P.: Experimental Psychology: An Introduction. Harper and Row

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FIELD PRACTICE-I

Course Code: PSY4107 **Credit Units: 04**

Course Objective

To develop student's skills of observation, collection and documentation of data for conducting theoretically correct and practically relevant research

Methodology

Each student will engage themselves in interaction and observation of psychological processes in a subject/ field of their choice.

Student will then present their findings in the form of a paper for seminar discussions.

Similarly, field work will be done by students in their area of interest and present their practical observations, as a report with analysis and suggestions.

Examination Scheme

Field/Seminar Report	:	40 marks
Viva-Voce	:	30 marks
Internal Faculty and Interaction	:	10 marks
Presentation/Daily Diary Report	:	20 marks

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PSYCHOPATHOLOGY

Course Code: PSY4201 **Credit Units: 03**

Course Objective

To acquaint the students with various manifestations of psychopathology for imparting knowledge and skills required for diagnosis of psychological conditions. To introduce them to different perspectives and models of etiology and also to develop skills required for psychopathological formulation. This course will also enables students to the study and prediction of adaptive and maladaptive behaviours and its processes across lifespan. It also enables students to understand different diagnostic and educational models of psychopathology.

Course Content

Module I: Classification and Theoretical Models

Systems of Classification, basic features; DSM-IV TR, ICD-10, similarities and differences

Major Theoretical Models of Psychopathology: The medical model, Psychoanalytic model, Behaviouristic model, Humanistic-existential models, Interpersonal approach, Systems approach.

Module II: Diagnosis and Prognosis

Problems and methods of diagnosis: physiological examination, observation, case-history, interview method, psycho-diagnostic tests, measures of bodily functions, computer assisted diagnosis.

Module III: Mood and Anxiety Disorder

Bipolar disorders: Manic, Depressive, Mixed

Depressive disorder: Major depression and dysthymia, Suicide

Anxiety Disorders: Generalized anxiety disorder, phobia, panic disorder, post traumatic stress disorder and obsessive compulsive disorder

Module IV: Major Clinical Disorders

Schizophrenia

Other psychotic disorders: Bipolar, Delusional, psychotic depression

Module V: Somatoform Disorders

Conversion disorder, Somatization disorder, Hypochondriasis, Body dysmorphic disorder, Pain disorder

Module VI: Disorders of Infancy, Childhood and Adolescence

Developmental disorder: PDD, Rett Disorder, Asperger Disorder,

Behavioral Disorder: Conduct Disorder, Hyperactivity Disorder, ADHD,

Genetic Disorders: Down Syndrome

Module VII: Personality Disorder

Personality Disorder: Narcissistic Personality, Histrionic Personality, Antisocial (Psychopathic) Personality, Borderline Personality, Paranoid Personality, and Schizotype Personality

Module VIII: Sexuel Dysfunctions and Paraphilias

Dysfunctions of Desire, Arousal, Orgasm and Pain

Paraphilias, Paedophilia and Rape

Gender identity disorders

Impotence and frigidity

Causes, preventing suicide

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Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

Text & References

Text:

- Davison, G.C. & Neale, J.M. (1990): Abnormal Psychology. New York: John Wilay& Sons
- Carson, R.C. & Butcher, J.N. (1992): Abnormal Psychology and Modern Life (9th Ed.). New Yark: Haper& Collins.
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- Bennett, P. (2010). Abnormal and Clinical Psychology: An Introductory Textbook. New Delhi: Tata McGraw Hill Education pvt. Ltd.
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- Lazarus and Folkman: Stress, appraisal and coping

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PSYCHOLOGICAL ASSESSMENT AND DIAGNOSIS

Course Code: PSY4202 **Credit Units: 03**

Course Objective

The course teaches the students about the characteristics, objectives and wide ranging effects of psychological testing. It further describes the various testing methodologies and outlines capabilities and limitations of these methods.

Course Contents

Module I: Introduction

Purpose of testing, types of test used, Bias & Fairness
Ethical Issues in Psychological Testing
Overview of Tests
Norms, Scoring Interpretation and Report Writings
Issues in measurement
Emerging trends of online testing

Module II: Cognitive functions and their assessment

Concept of Attention, Gestalt Theory, Memory and Forgetting, PGI Memory Scale
Theories of Intelligence
Intelligence Tests:Slosson Intelligence Test – Revised For Children and Adults (SIT-3/R)
Bhatia Battery, Weschler's Adult Performance Intelligence Scale (WAPIS) ***BinetKamat Test***
Weschler's Intelligence Scale for Children – Revised (WISC)Wide Range Intelligence Test (WRIT)Alexander Pass-a-long Test of Intelligence
Draw-A-person Intellectual Ability Test for Children, Adolescents and Adults (DAP:IQ)
Raven's Progressive Matrices (Colour Progressive Matrices, Standard Progressive Matrices and Advanced Progressive Matrices)

Module III: Achievement Test

Wechsler Individual Achievement Test (WIAT)
Diagnostic Achievement Test For Adolescents – Second Edition (DATA-2)
Kaufman Test of Educational Achievement (KTEA)
Woodcock-Johnson Tests of Achievement (WJ)

Module IV: Assessment of Personality: Non-Projective Test

Cattell's 16 Personality Factor Inventory (16 PF)
California Q-Sort Tests
Myers Briggs Type Indicator (MBTI)
Minnesota Multiphasic Personality Inventory (MMPI)
Personality Inventory for Children
OMNI Personality Inventory (OMNI)
Bell's Adjustment Inventory
Eysenck'sPersonality Questionnaire
NEO™ Personality Inventory-3 (NEO™-PI-3) Adult / Adolescent

Module V: Assessment of Personality: Projective Tests

Introduction of Projective Techniques
Difference between Projective & Non-Projective Techniques
Thematic Apperception Test
Rorschach Inkblot Test
House-Tree-Person (H-T-P), Sentence Completion Test

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Module VI: Developmental Scales
Developmental Screening Test
Vineland's Social Maturity Scale
Measures of Psychosocial Development (MPD)
Gesells' Developmental Schedule

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

Text & References
Text:
- Freeman, F. S.,(1965), Theory and Practice of Psychological Testing; New Delhi: Oxford &IBTT

References:
- Jackson C.,(1998), Understanding Psychological Testing; Jaico Publishing House
- Anastasi&Urbina S.(2000), Psychological Testing ,7th Edition; Person Education (Singapore) Pte. Ltd.,
- Guilford J.P.: Psychometric Methods

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NON-PARAMETRIC STATISTICAL METHOD

Course Code: PSY4204 **Credit Units: 03**

Course Objective

The Present paper focuses on providing knowledge about the basics of nonparametric statistics. It will give clear understanding about differences between Parametric & Nonparametric Test Procedures. Paper will also explain commonly used Nonparametric Test Procedures and Perform Hypothesis Tests Using Nonparametric Procedures to teach student how to use SPSS with non-parametric statistics.

Course Contents

Module I: Basics

What is Non-Parametric statistics: Nature, Meaning and Concept strengths and limitations of non-parametric procedures
Parametric VS Non- Parametric Statistics
Four Levels of Measurement and Non-parametric statistics

Module II: Tests of differences between Groups and Variables

The Friedman Two-way analysis of variance by ranks-Basic concepts, uses and computations
Test of differences between groups (Independent samples): Mann-Whitney U test computations, Kolmogorov-Smirnov test, uses
Test of differences between variables (Dependent samples): Kruskal-Wallis ANOVA analysis of ranks, K-Sample Median test, uses and concepts

Module III: Nominal Measures of Correlations

Concept definition assumptions of Nominal Measures of Correlations
The Phi-Coefficient, Contingency coefficient concepts uses and calculations
Tetrachoric**r**: Its uses, computation and comparison

Module IV: Chi-Square

Concept and Definition, its assumptions and use
Chi-Square Goodness of Fit (One-Sample Test)
Chi-Square Test of Independence

Module V: Introduction to SPSS and Non-parametric statistics in SPSS

Introduction to SPSS, its usage and functioning
Understanding the concepts of Non-Parametric tests in SPSS
Learning data entry

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

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Text & References

Text:

- Dowine, N.M.: Basic Statistical methods, Harper and Publishes New York.
- Gupta S.P. Statistical methods, Sultan and Sons, New Delhi.
- Broota, K.D.: Experimental design in correlational research, New Delhi: Wiley Eastern 1989.
- Salkind, N & Green, S.:SPSS Quick Starts.
- Howitt, D & Cramer, D.: Introduction to SPSS statistics in psychology.
- McNemarQ.: Psychological Statistics, 3rd Ed. New York, John Wiley 1962.
- Edward, A. E: Experimental Design in Psychological research (3rd Ed) New Delhi: American publishing.

Reference

- Higgins. J.J: Introduction to Modern Nonparametric Statistics.
- Siegal.S: Nonparametric statistics for the behavioral sciences.
- Castellan, J.N. and Siegal. S: Non-parametric statistics for behavioural sciences.
- Daniel, W. Wayne: Applied non-parametric statistics.

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PRACTICUM-II

Course Code: PSY4207 **Credit Units: 03**

Course Objective

1. To give practical experience to the students in administering and scoring psychological tests and interpreting the scores.
2. To acquaint the students with the basic procedure and design of psychology experiments.
3. To encourage and guide the students to undertake a small-scale research project.
4. To apply the general concepts of psychology through experimentation and testing

Note: Total 5 practicals will be conducted in the second semester among the list of following practicals

Course Content

1	Intelligence
2	Achievement
3	Personality: Projective
4	Personality: Projective
5	Personality:
6	Personality:

Examination Scheme:

Components	**A**	**File Demonstration**	**Viva**	**EE**
Weightage (%)	5	35	35	25

Text & References:

- Mohsin, S. M.: Experiments in Psychology. MotilalBanarasidas
- Woodworth, R.S.: Experimental Psychology. Oxford & IBH & Schlosberg, H. Publishing
- Postman, L. & Egan, J. P.: Experimental Psychology: An Introduction. Harper and Row

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FIELD PRACTICE-II

Course Code: PSY4208 **Credit Units: 04**

Course Objective

To develop, in students the skills of observation, collection and documentation of data for conducting theoretically correct and practically relevant research

Methodology

Each student will engage themselves in interaction and observation of psychological processes in a subject/ field of their choice.

Student will then present their findings in the form of a paper for seminar discussions.

Similarly, field work will be done by students in their area of interest and present their practical observations, as a report with analysis and suggestions.

Examination Scheme

Field/Seminar Report	:	40 marks
Viva-Voce	:	30 marks
Internal Faculty and Interaction	:	10 marks
Presentation/Daily Diary Report	:	20 marks

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SCIENTIFIC RESEARCH PAPER

Course Code: PSY4209 **Credit Units: 01**

Course Objective

The scientific research papers for Masters Students is to enhance the reading and writing habits of the students and to make them aware about the process of carrying out a research work. This helps them to develop insight into the course they are studying which creates an academic interest among the students. Presentation of the term paper plays an important role as it facilitates knowledge sharing and improvement in presentation skills which will further enhance the confidence of the students. The overall objective of this term paper is to develop research orientations in students and to make them understand and enhance skills in Research Methodology.

Guidelines for Research Article or Scientific Papers

Topic
Introduction
Review Research
Objective
Methodology
Discussion
Conclusion
References & Bibliography

No. of pages in the compilation of the paper 25-30 (minimum 25 pages)

Examination Scheme

Components	Compilation	Viva	Presentation
Weightage (%)	50	25	25

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APPLIED PSYCHOTHERAPY

Course Code: PSY4310 **Credit Units: 03**

Course Objectives

To provide knowledge and skills to students about counseling and psychotherapy and also to train them in using therapeutic and counseling techniques for effectively practicing

Course Contents

Module I: Basic Counseling and Psychotherapeutic Skills

Basic Skills: Empathy, Genuineness, unconditional positive regard, congruence, Listening, Paraphrasing, reflecting, summarizing

Advanced Skills: interpretation, insight, transference interpretation, exploring projections, identifying failure of therapy, identifying working with burnout, self-supervision, confrontation

Characteristics of effective counselor/ therapists

Challenges faced by novice

therapists: Dealing with anxiety, being oneself, self-disclosure, avoiding perfectionism, honesty with limitations, understanding silence, demands from clients; Understanding once own self and Psychotherapy with self

Module II: **Therapeutic assessment and counseling session initiation**

Therapeutic assessment, History taking, and Formulation, setting goals

Contracting and its implications: Contracting for therapyand socialization, communicating ethical and professional rights responsibilities, violations of contract, Initial session, crisis and support , Counseling session's opening and closing skills, Effective conduction of counseling sessions

Module III: Counseling and Psychotherapy Process

Initial phase: Psych- education, Supportive psychotherapy. Selecting techniques

Ice-breaking, exploration, Loss framework.

Dealing with Resistance: Techniques and applications

Transference and counter-transference

Module IV: Termination, Follow-up and Documentation

Termination: Evaluating and sharing progress, Issues in termination and resolution Follow-up: Systems and techniques, sustained changes

Documentation: Therapists documentation, Communication with other professionals and referrals

Legal implications: Legal communication, documentation, Legal issues in psychotherapy and counselling .

Module V: Therapeutic Case formulation and Demonstration

Two Hypothetical case formulation and demonstration by using

Role play (video recorded), evaluation of basic and advanced skills for simulated cases, Two Hypothetical case formulation and demonstration by using

Role play (video recorded) for contracting and skills for opening and closing,

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Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

References

- Archer, J., & McCarthy, C. J. (2008). Theories of Counseling and Psychotherapy: Contemporary. Ap plications. Upper Saddle River, New Jersey: Merrill Prentice Hall.
- Faiver, C., Eisengart, S., Colonna, S. (2003), The counselor intern's handbook.Brooks/Cole Publishi ng Company, Pacific Grove, California.
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Books

- Corey G. (2012). Theory and Practice of Counseling and Psychotherapy.
- Daniel Keeran. (2009). Effective Counseling Skills: the practical wording of therapeutic statement s and processes.
- Edward S. Neukrug (2010). Counseling Theory and Practice.
- D. Hutchinson D. R. (2011). The Counseling Skills Practice Manual
- John Sommers-Flanagan and Rita Sommers-Flanagan (2012). Counseling and Psychotherapy
- Theories in Context and Practice: Skills, Strategies, and Techniques.
- Wayne Perry .Basic Counseling Techniques:: A Beginning Therapist's Tool Kit (Second Edition)
- Wolberg, L. R. (2005). The Technique of Psychotherapy Part I and II. NJ: Jason Aronson Inc.

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RESEARCH METHODS IN APPLIED PSYCHOLOGY

Course Code: PSY4311 **Credit Unit: 02**

Course Objective

Research Methodology is a way to find out the result of a given problem on a specific matter or problem that is also referred as research problem. In Methodology, researcher uses different criteria for solving/searching the given research problem. Different sources use different type of methods for solving the problem. So this course will enable the student to understand and apply basic research methods in psychology including research design, data analysis and report findings research conclusion apparently based on the parameters of particular research methods.

Course Contents

Module I: Introduction to Research

Meaning of Scientific Research
Objectives and Steps in Scientific Research
Defining research problem
Defining variables
Developing hypothesis

Module II: Evaluating Measures and Hypothesis

Need For Evaluating Measures
Reliability and Validity
Hypothesis testing: Type1 and Type 2
Going beyond hypothesis testing: Effect size and Power

Module III: Validity of Experimental Researches and Threats to them

Statistical Conclusion validity
Construct validity and External Validity
Establishing the cause and Effect
Single Group threat, Multiple Group threats, Social threats

Module IV: Experimental Designs-I

Two-Group experimental designs Within-subject Design
Between-subject design
General Linear Model

Module V: Experimental Designs-II

Factorial designs
Randomized Block designs
Hybrid Experimental Designs: Soloman four group designs Mixed designs

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

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Text & References

Text:

- Shuttleworth, Martyn (2008). "Definition of Research". Experiment Resources. Experiment-Research.com. Retrieved 14 August 2011.
- Creswell, J. W. (2008). Educational Research: Planning, conducting, and evaluating quantitative and qualitative research (3rd ed.). Upper Saddle River: Pearson.
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- Montgomery, Douglas (2013). Design and analysis of experiments (8th ed.). Hoboken, NJ: John Wiley & Sons, Inc.

Reference:

- Review of Foundations for research: Methods of inquiry in education and the social sciences, by Kathleen B. deMarrais and Stephen D. Lapan. 2004. Reference& Research Book News 19:1.
- Denscombe, Martyn. 2007. The good research guide for small-scale social research projects. 3rd ed. Maidenhead, UK: Open University Press. 360 pages. ISBN: 0335220223. $48.50 (pbk).
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- Ellingson, L. L. 2007. Review of Qualitative research methods for the social sciences, 6th ed, by B. L. Berg. Communication Research Trends 26.1: 24.

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INTERVIEWING AND COUNSELLING SKILLS

Course Code: PSY4312 **Credit Unit: 02**

Course Objective

This course enables students to gather knowledge about interview techniques and cultivate Advanced Counselling Skills. It is further designed to equip students with skills to practice as a Counselling Psychologist.

Course Contents

Module I: Counsellor as a person

Personal characteristics: A composite model of human effectiveness, role of self awareness in counselling.

Role and Function of the Counsellor: Definition of Role, Generic roles, organizing roles & functions

Module II: Communication Skills-I

Basic Communication Skills: Attending skills, Listening skills,Integrating Listening Skills.

Exploration Skills: Probe, Immediacy, Self-disclosure, Interpretation, Confrontation.

Action Skills: Information giving, Advice giving, Goal setting, Reinforcement, Directives

Self-disclosure by counsellor – when and how

Helping clients develop and work on preferred scenarios, negotiating homework.

Managing resistance and other obstacles in counselling

Skills of closure and terminating

Module III: Techniques of Helping and working with emotions

Self monitoring of Thought, Feeling and Action, Facilitating problem solving

Understanding and Improving Self talk, rules and thinking patterns.

Behavioural Methods

Module IV: Counseling Applications

Pediatric Counseling: Dynamics and process

Adolescent Counselling: Concept and Issues

Group Counselling: Concept & Process.

Academic Counselling: Definition and Scope.

Marital and Family Counselling: Concept & Process.

Addiction counseling: Principles & Prevention

Geriatric Counselling: Concept and Scope.

Rehabilitation Counseling, And Crisis Intervention &Trauma Counseling

Module V: Assessment in psychology

The purpose of assessment in counselling, Assessment principles

Intelligence and general ability testing

Measuring Achievement and aptitude

Appraisal of personality

Spiritual assessment strategies

Applications of assessment: Treatment planning, evaluation and accountability.

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance, EE: End Semester Examination

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Text & References

Text:

- Patri, V., &Anthors R.(2001), Counselling Psychology, Press, New Delhi

References:

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PRACTICUM-III

Course Code: PSY4308 **Credit Units: 03**

Course Objective

To give practical experience to the students in administering and scoring psychological tests and interpreting the scores and to acquaint the students with the basic procedure and design of psychology experiments and also to encourage and guide the students to undertake a small-scale research project to apply the general concepts of psychology through experimentation and testing

Note: Total 5 Practical will be conducted in the third semester among the list of following Practical

Course Content

1	Psychosocial Development
2	Self Esteem
3	State Trait Anger
4	Personality
5	Family and Interpersonal Relationship
6	Intelligence

Examination Scheme

Components	**A**	**File Demonstration**	**Viva**	**EE**
Weightage (%)	5	35	35	25

Text & References

- Mohsin, S. M.: Experiments in Psychology. MotilalBanarasidas.
- Woodworth, R.S.: Experimental Psychology. Oxford & IBH & Postman, L.Schlosberg, H. Publishing
- Postman, L. & Egan, J. P.: Experimental Psychology: An Introduction. Harper and Row

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FIELD PRACTICE-III

Course Code: PSY4309 **Credit Units: 04**

Course Objective

To cultivate the observation skills and techniques among students to gather and collect information from clients and documentation of data for conducting theoretically correct and practically relevant research

Methodology

Each student will engage themselves in interaction and observation of psychological processes in a subject/ field of their choice.
Student will then present their findings in the form of a paper for seminar discussions.
Similarly, field work will be done by students in their area of interest and present their practical observations, as a report with analysis and suggestions.

Examination Scheme

Field/Seminar Report	:	40 marks
Viva-Voce	:	30 marks
Internal Faculty and Interaction	:	10 marks
Presentation/Daily Diary Report :	:	20 marks

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SUMMER INTERNSHIP EVALUATION

Course Code: PSY4335 **Credit Units: 06**

GUIDELINES FOR INTERNSHIP FILE AND INTERNSHIP REPORT

(These guidelines will be useful for undertaking an internship programme during the summer or at any other time wherein the student/ researcher works full time with a company/organisation)

There are certain phases of every Intern's professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship programme can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal class room situations. These attributes are intellectual ability, professional judgment and decision making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc.

In order to achieve these objectives, each student will maintain and submit a file **(Internship File)** and a report **(Internship Report)**.

INTERNSHIP FILE

The Internship File aims to encourage students to keep a personal record of their learning and achievements throughout the Programme. It can be used as the basis for lifelong learning and for job applications. **Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development.**

The File will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and his/her own personal contribution to the organization.

The File is essentially a comprehensive documentation of how one proceeds while working on the assignment and should be regularly checked by the faculty guide/ supervisor, issues discussed with the students, doubts if any clarified and signed as having done so. This will form the basis of continuous evaluation of the project.

The File will include five sections in the order described below.

1. The Title Page – An Internship Experience Report For (Your Name), name of internship organization, name of the Supervisor/Guide and his/her designation, date started and completed, and number of credits for which the report is submitted.
2. Table of Content – An outline of the contents of the file by topics and subtopics with the page number and location of each section.
3. Introduction – Short, but should include how and why you obtained the internship experience position and the relationship it has to your academic/professional and career goals.
4. Main Body – Should include a brief summary/ executive summary of the Internship Project Report that the student has worked on, an analysis of the company/organization in which the student is working, a personal review of the student's management skills and how they have been developed through the programme, the daily tasks performed, major projects contributed to, dates and hours spent on a task, observations and feelings, meetings attended and their purposes, listing of tools and materials and their suppliers, and photographs if possible of projects, buildings and co-workers.
5. Appendices – Include pamphlets, forms, charts, brochures, technical and descriptive literature, graphs and other information related to your Internship experience.

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INTERNSHIP REPORT

The **Internship Report** is the research report that the student has to prepare on the project assigned by the organization. (Incase a student is not assigned a specific research project in the organization, he has to select any one aspect of the organization and prepare a research report on it). The lay out of the report should be as per the standard layout prescribed by the organization wherein the student undertakes the Internship. In case, there is no layout prescribed by the organization the following components should be included in the report:

- Title or Cover Page. The title page should contain Project Title; Student's Name; Programme; Year and Semester and Name of the Faculty Guide.
- Acknowledgements Acknowledgment to any advisory or financial assistance received in the course of work may be given. It is incomplete without student's signature.
- Abstract A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project. It should not exceed more than 1000 words.
- Table of Contents Titles and subtitles are to correspond exactly with those in the text.
- Introduction Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.
- Materials and Methods This section should aim at experimental designs, materials used (wherever applicable). Methodology should be mentioned in details including modifications undertaken, if any. It includes organization site(s), sample, instruments used with its validation, procedures followed and precautions.
- Results and Discussion Present results, discuss and compare these with those from other workers, etc. In writing this section, emphasis should be laid on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

Note that in writing the various secions, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary, do not write in "point" form.

While presenting the results, write at length about the the various statistical tools used in the data interpretation. The result interpretation should be simple but full of data and statistical analysis. This data interpretation should be in congruence with the written objectives and the inferences should be drawn on data and not on impression. Avoid writing straight forward conclusion rather, it should lead to generalization of data on the chosen sample.

Results and its discussion should be supporting/contradicting with the previous research work in the given area. Usually one should not use more than two researches in either case of supporing or contradicting the present case of research.

Conclusion(s) & Recommendations

A conclusion should be the final section in which the outcome of the work is mentioned briefly. Check that your work answers the following questions:

- Did the research project meet its aims (check back to introduction for stated aims)?
- What are the main findings of the research?
- Are there any recommendations?
- Do you have any conclusion on the research process itself?

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Implications for Future Research

This should bring out further prospects for the study either thrown open by the present work or with the purpose of making it more comprehensive.

- **Appendices**

The Appendices contain material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

- **References**

References should include papers, books etc. referred to in the body of the report. These should be written in the alphabetical order of the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

The Layout Guidelines for the Internship File & Internship Report:

- A4 size Paper
- Font: Arial (10 points) or Times New Roman (12 points)
- Line spacing: 1.5
- Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

Assessment Scheme:

Continuous Evaluation: 30%

(based on Internship File and the observations of the faculty guide/ supervisor)

Feedback from Company/ Organization: 10%

Final Evaluation:

(Based on Internship Report, Viva/ Presentation) 60%

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APPLIED PSYCHOPHYSIOLOGY AND BIOFEEDBACK

Course Code: PSY4313 **Credit Units: 03**

Course Objectives

To familiarize the students with various approaches, techniques and skills of counselling and psychotherapy in mental health problems To prepare the students to conduct different types of counselling and psychotherapies with different clinical and sub-clinical population To help them in identifying the processes of therapy and therapeutic change in the client and to enable them to conduct research in psychotherapy and report the findings

Course Contents

Module I: Introduction

Conceptual Issues, Client Variables in Counseling and Psychotherapy, Processes and Techniques of Psychotherapy

Module II: Modalities of Psychotherapy

Gestalt Therapy; Experiential and Transpersonal Psychotherapies, Art Therapy, Play Therapy, Family Therapy, Yoga and Other Indegenious therapies, Research Designs, Issues and Evaluation.

Module- III: Applied Research

Research in Psychotherapy: Experimental and Quasi-experimental designs. Ethical Issues in Psychotherapy

Module IV: Institutional visit

Supervised Practicum: Students will be provided demonstrations in the laboratory setting and visit institutions providing specialized services and produce at least 2 case records. 10 Hrs.

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

References:

- Bergin, A. E., & Garfield, S. L. (Eds.) (1994) Handbook of Psychotherapy and Behaviour Change, (4th Ed.). New York: Wiley.
- Finx, B.(2007) Fundamentals of Psychoanalytic Techniques. New York: Norton.
- Rama, S., Ballentine, R. &Ajaya, S. (1976) Yoga Psychotherapy. Pennsylvania: HIP.

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HUMAN FACTORS PSYCHOLOGY AND ERGONOMICS

Course Code: PSY4314 **Credit Units: 03**

Course Objective

To gain an understanding of human strengths and limitations by studying human perception, cognition, memory, attention, biomechanics, and motor control/learning and also to gain an understanding of guidelines for displays, controls, anthropometry, office ergonomics, work physiology, and manual material handling.

Course contents

Module I: Introduction to Human Factor Psychology

Introduction to Human Factor Psychology and Ergonomics, Historical foundations, Biological basis of psychology and sensation, Human Information Processing

Module II: Visual system and Auditory and tactile systems

Visual system: sensation vs. perception (depth perception, motion perception, and pattern recognition), color vision, visual search, perceptual speed, perceptual organization, visual display. Auditory and tactile systems: audition and touch, RSI (Repetitive Strain Injury), designing for hearing and touch, haptic/tactile interfaces.

Module III: Memory and attention

Memory and attention: theories of attention, selective/divided attention, Multiple Resource Theory, reasoning, decision making, designing for memory.

Module IV: Performance measurement

Performance measurement: Psychometric tests (Simple/Choice Reaction Time tests, digit/word span, other visuo-spatial and cognitive tests, etc), Fitts' Law, Hicks' Law, quantitative and qualitative methods. Workload management: mental workload, stress, fatigue and coping.

Module V: Ergonomics science in a glance

Ergonomics science in a glance: introduction to anthropometry, work physiology and biomechanics.

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

References:

- Wickens, C. D., Lee, J. D. Liu, Y. & Becker, S. E. G., Second Ed. (2004).
- Introduction to human factors engineering. NY: Longman. Note. Used Wickens et al. text must be Second Edition. Casey, S. (1998).
- Set phasers on stun and other true tales of design, technology, and human error. Santa Barbara, CA: Aegean Publishing Co. Task description methods. Chapter 3. (pp. 81-145).
- In B. Kirwan& L. K. Ainsworth (eds.) (1992.)A guide to task analysis. London: Taylor & Francis. (Handout). Norman, D. (2002). Design of everyday things.NY:Basic Books. Paperback

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FORENSIC AND LEGAL PSYCHOLOGY

Course Code: PSY4315 **Credit Units: 03**

Course Objectives

To introduce the students with knowledge and techniques of forensic psychology and further providing training in identification of criminals and forensic verification by using psychological methods

Course Contents

Module I: Introduction to forensic Psychology
Forensic Psychology: Introduction and overview, Historical Perspective, Fields of Forensic Psychology, Education and Training.

Module II: Criminal and Investigative Psychology
Criminal and Investigative Psychology: Police Psychology, Mental and Aptitude testing, Personality assessment. Occupational stress in Police and investigation, Hostage taking Police interrogation and false confession Criminal of Psychological autopsy, Geographical profiling and mental manpower, Criminal Identification

Module III: Violence and sexual offences
Psychological impacts of violence and sexual offences, Post-traumatic stress disorder, Family violence and victimization, Psychology of the bystanders 1

Module IV: Correctional Psychology
Correctional Psychology: Legal rights of inmates: Rights to treatment, Right top refuse treatment, Inmates with mental disorders, Solitary confinement, Psychological assessment in correction, Psychological methods of correction, Treatment of sexual offenders, Community-based correction, Group homes, Family preservation model, Substance abuse model, Prevention of violence.

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

References:

- Bartol, C. R. &Bartol, A. M. (2004) Introduction to forensic psychology. New Delhi: Sage.
- Blackburn, R., (1993) The psychology of criminal conduct: Theory research and practice. Chichester: Wiley & Sons.
- Dhanda, A. (2000) Legal order and mental disorder. New Delhi: Sage.
- Harari, L. (1981) Forensic psychology. London: Batsford Academic.

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COMMUNITY PSYCHOLOGY

Course Code: PSY4316 **Credit Units: 03**

Course Objectives

To acquaint the students about the history & present status of community mental health services and also to develop a community based orientation towards mental health.

Course Contents

Module I: Introduction to Community Psychology

Historical and social contexts of community psychology: concept, evolution, scope and nature of community mental health.

Module II: Mental Health Models

Models of mental health services: mental, social, organizational and ecological

Module III: Community mental health intervention and rehabilitation

Community mental health intervention and community based rehabilitation (CBR): Issues, principles and programmes; evaluation of CBR; training the para-professional and non-professionals.

Module IV:

Community mental health in India: Prospects, Issues & challenges, Legal issues in mental health, role of NGO, Govt. and hospitals in mental health in India

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

References

- Bloom, B. (1973). Community Mental Health—A critical analysis. New Jeresey: General Learning Press
- Koch, C.H.(ed.) (1986). Community Clinical Psychology. London: Croon Helm.
- Mann, P.A. (1978). Community Psychology: Concepts and Application. New York: The Free Press.
- Rappaport, J. (1977). Community Psychology: Values, Research and Action. New York: Holt, Reindhart and Wingston.

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PSYCHOLOGICAL PRACTICE IN PERSONNEL AND HUMAN RESOURCE MANAGEMENT

Course Code: PSY4317 **Credit Units: 03**

Course Objective
To enable students to understand the concepts of psychology as applied in various aspects of human resources in organizations and equip them to develop modules in accordance with the optimum use of the same.

Course Contents
Module I: The Human Resource Management
Structure of Human Resource Management, Role and Responsibilities of the Human Resource Manager; Human Resource Policies - Formulation and Essentials of Sound HR Policies

Module II: Challenges of Personnel Management: Individual and Competitiveness, balancing organizational demands and employees concerns-metaphors used to manage people.

Module III: Development of Human Resources
Learning, Training, Training and Development, Evaluation and Performance Appraisal

Module IV: Meeting HR requirements
Job Analysis and job Descriptions, diversity and empowered employees, career management and developing diverse talent pool, competency assessment- Perspective and Techniques

Module V: Employment Testing
Testing abilities, Testing personality, Testing skills and achievements, Using and not using tests.

Module VI: Contemporary Issues in HR
Strategic Human Resource Management, International Human
Resource Management Creating High Performing HR Systems: Wellness Programs and Work Life Balance and Green HRM

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

Text & References
Text:

- Cascio (1998) Managing Human Resources. Delhi: Tata McGraw Hill.
- Cascio W.F. &Aguinis H. (2008), Applied Psychology in Human Resource Management, 6th Edition, Printice-Hall, USA
- Robert A. Baron and Donn Byrne, "Social Psychology: Understanding Human Interactions", New Delhi, Prentice Hall of India, 7th Ed.,1995.
- John B. Miner, "Industrial - Organizational Psychology", Singapore, McGraw-Hill, 1992.

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References:

- Snell &Bohlander (2007) Human Resource Management, Thomson South Western.
- David S. Decenzo and Stephen P. Robbins, Personnel/Human Resource Management, Prentice Hall, New Delhi.
- William B. Werther Jr. and Keith Davis, Human Resources and Personnel Management, McGraw Hill, Singapore, 4th Ed.,1993 .
- ArunMonappa and Mirza S. Saiyadain, Personnel Management, Tata Mc-Graw Hill, New Delhi 1995.
- P SubbaRao, Essentials of Human Resource Management and Industrial Relations: Text, Cases and Games, Himalaya, Mumbai,2000.
- BiswajeetPatanayak, Human Resource Management, Prentice Hall India, New Delhi 2001.

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REHABILITATION PSYCHOLOGY

Course Code: PSY4404 **Credit Units: 03**

Course Objective
Objective of this course is to learn profession of Rehabilitation Psychology, Psychological Assessment of persons with disabilities, Psychological Interventions and dealing with families

Course Contents

Module I: Introduction
Overview of the profession of Rehabilitation Psychology and practice, history, growth and scope, Role of Psychologist in Rehabilitation

Module II: Psychological Assessment
Psychological Assessment- Assessment of Cognition, aptitudes, psychopathology, work/vocational and daily functioning

Module III: Health Behavior
Health behavior: Theories of health behavior change, interventions strategies for individuals and families of disabled
Behaviour Modification and Cognitive Therapies in Rehabilitation

Module IV: Families and disability
Dealing with Families- Family's reactions to disabilities, coping styles, family counseling, Coordination with Multidisciplinary team

Module V: Community Based Rehabilitation
Community Based Rehabilitation – Goals of CBR, components of CBR, Role of Professionals, role of Community, Ethical Issues

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

Text & References

Text:

- NIMH (1989) Mental Retardation : A Manual for Psychologist, Secundrabad
- Mohapatra C.S. (2004) Disability Management, NIMH, Secundrabad
- Robert G. Frank Timothy R.Elliott (2000). Handbook of Rehabilitation Psychology, APA Washington.
- Michael Brnes Anthony Ward (2009) Oxford Handbook of Rehabilitation Medicine

References:

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- Peshawaria R. and Venkatesan (1992) Behavioural Approach in Teaching Mentally Retarded Children, NIMH, Secundrabad
- WHO (2004) Community Based Rehabilitation
- Tally A.B, Sivaraman K.P and Murali T(1998)Neurorehabilitaion Principles &practice, NIMHANS Bangalore India

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PSYCHOMETRICS

Course Code: PSY4415 **Credit Units: 02**

Course Objectives

To acquaint students with advanced topics in psychometrics by supporting them in using the advanced psychometric models with psychometric data and also train students in writing report of the psychometric techniques

Course Contents

Module I: Psychometrics

Psychometrics: Concepts, Classical Test Theory and PracticingPsychometrics, Scaling, statistical concept s, Reliability: Conceptual basis and empirical estimation
Validity: Conceptual basis and empirical estimation, factor analysis and test dimensionality
Classical test theory: assumptions, ramification and practice
Threats to psychometric quality: Test bias, response bias. Special problems in CCT

Module II: Modern test Theory and Practice

Item Response Theory (IRT): basic concepts, models and estimations; Item and Item information;
Models for Nominal and graded responses, Nonparametric and Bayesian approach
Other IRT models and applications to non standard testing conditions

Module III: Generalizability Theory

Concepts, Generalizability and variance component G studies and D studies
Conducting and Interpreting Generalizability: One Facet design, two facet design, other designs.

Module IV: Applications

Psychometric Assessment in Occupational Settings.
Psychometric Clinical Assessment
Psychometrics in Educational Settings
Developing publication quality instrument and manual

Module V: **Presentations**

Multidimensional scaling,Profile analysis,Descriminant analysis,Software applications: R in particular;
Dominance (preference) scaling , Categorical modeling, Binary classifications;
Non-geometric and non Euclidian model, Confirmatory Factor analysis

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
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Reference

- Borsboom, D. (2005). Measuring the mind: Conceptual issues in contemporary psychometrics .Cam bridge , UK : Cambridge University Press .
- C.R. Rao (Editor), SandipSinharay (Editor). Handbook of Statistics, Volume 26: Psychometrics.
- John Rust and Susan Golombok (2009) Modern Psychometrics: The Science of Psychological Assess ment, Third Edition.
- JumNunnally and Ira Bernstein. (1994). Psychometric Theory.
- Lord, F. M., & Novick, M. R. (1968). Statistical theories of mental test scores. Reading , MA : Addis on-Wesley.
- PB , John Rust, Susan Golombok. (2008). Modern Psychometrics (3rd Revised edition).Taylor & Fra ncis Ltd: UK
- R. Michael Furr and Verne R. Bacharach (2013). Psychometrics: An Introduction

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PRACTICUM-IV

Course Code: PSY4412 **Credit Units: 03**

Course Objective

To give practical experience to the students in administering and scoring psychological tests and interpreting the scores Also to acquaint the students with the basic procedure and design of psychology experiments Course will also encourage and guide the students to undertake a small-scale research project to apply the general concepts of psychology through experimentation and testing

Note: Total 5practicals will be conducted in the fourth semester among the list of following practicals

Course Content

1	Personality
2	Intelligence
3	Attention
4	Learning
5	Intelligence
6	Health

Examination Scheme

Components	A	File Demonstration	Viva	EE
Weightage (%)	5	35	35	25

Text & References

- Mohsin, S. M.:Experiments in Psychology. MotilalBanarasidas
- Woodworth, R.S.:Experimental Psychology. Oxford & IBH & Schlosberg, H. Publishing
- Postman, L. &Egan, J. P.: Experimental Psychology: An Introduction.Harper and Row

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FIELD PRACTICE-IV

Course Code: PSY4413 **Credit Units: 04**

Course Objective

To develop, in students the skills of observation, collection and documentation of data for conducting theoretically correct and practically relevant research

Methodology

Each student will engage themselves in interaction and observation of psychological processes in a subject/ field of their choice.

Student will then present their findings in the form of a paper for seminar discussions.

Similarly, field work will be done by students in their area of interest and present their practical observations, as a report with analysis and suggestions.

Examination Scheme

Field/Seminar Report	:	40 marks
Viva-Voce	:	30 marks
Internal Faculty and Interaction	:	10 marks
Presentation/Daily Diary Report	:	20 marks

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DISSERTATION

Course Code: PSY4437 **Credit Units: 06**

GUIDELINES FOR DISSERTATION

The aim of the dissertation is to provide you with an opportunity to further your intellectual and personal development in your chosen field by undertaking a significant practical unit of activity, having an educational value at a level commensurate with the award of your degree

The dissertation can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Selecting the Dissertation Topic
It is usual to give you some discretion in the choice of topic for the dissertation and the approach to be adopted. You will need to ensure that your dissertation is related to your field of specialization.

Deciding this is often the most difficult part of the dissertation process, and perhaps, you have been thinking of a topic for some time.

It is important to distinguish here between 'dissertation topic' and 'dissertation title'. The topic is the specific area that you wish to investigate. The title may not be decided until the dissertation has been written so as to reflect its content properly.

Few restrictions are placed on the choice of the topic. Normally we would expect it to be:
- relevant to business, defined broadly;
- related to one or more of the subjects or areas of study within the core program and specialisation stream;
- clearly focused so as to facilitate an in-depth approach, subject to the availability of adequate sources of information and to your own knowledge;
- of value and interest to you and your personal and professional development.

Planning the Dissertation
This will entail following:
- Selecting a topic for investigation.
- Establishing the precise focus of your study by deciding on the aims and objectives of the dissertation, or formulating questions to be investigated. Consider very carefully what is worth investigating and its feasibility.
- Drawing up initial dissertation outlines considering the aims and objectives of the dissertation. Workout various stages of dissertation
- Devising a timetable to ensure that all stages of dissertation are completed in time. The timetable should include writing of the dissertation and regular meetings with your dissertation guide.

The Dissertation plan or outline
It is recommended that you should have a dissertation plan to guide you right from the outset. Essentially, the dissertation plan is an outline of what you intend to do, chapter wise and therefore should reflect the aims and objectives of your dissertation.

There are several reasons for having a dissertation plan
- It provides a focus to your thoughts.
- It provides your faculty-guide with an opportunity, at an early stage of your work, to make constructive comments and help guide the direction of your research.

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- The writing of a plan is the first formal stage of the writing process, and therefore helps build up your confidence.
- In many ways, the plan encourages you to come to terms with the reading, thinking and writing in a systematic and integrated way, with plenty of time left for changes.
- Finally, the dissertation plan generally provides a revision point in the development of your dissertation report in order to allow appropriate changes in the scope and even direction of your work as it progresses.

Keeping records
This includes the following:

- Making a note of everything you read; including those discarded.
- Ensuring that when recording sources, author's name and initials, date of publication, title, place of publication and publisher are included. (You may consider starting a card index or database from the outset). Making an accurate note of all quotations at the time you read them.
- Make clear what is a direct a direct quotation and what is your paraphrase.

Dissertation format
All students must follow the following rules in submitting their dissertation.
- Front page should provide title, author, Name of degree/diploma and the date of submission.
- Second page should be the table of contents giving page references for each chapter and section.
- The next page should be the table of appendices, graphs and tables giving titles and page references.
- Next to follow should be a synopsis or abstract of the dissertation (approximately 500 words) titled: **Executive Summary.**
- Next is the 'acknowledgements'.
- Chapter I should be a general introduction, giving the background to the dissertation, the objectives of the dissertation, the rationale for the dissertation, the plan, methodological issues and problems. The limitations of the dissertation should also be hinted in this chapter.
- Other chapters will constitute the body of the dissertation. The number of chapters and their sequence will usually vary depending on, among others, on a critical review of the previous relevant work relating to your major findings, a discussion of their implications, and conclusions, possibly with a suggestion of the direction of future research on the area.
- After this concluding chapter, you should give a list of all the references you have used. These should be cross - references with your text. For articles from journals, the following details are required e.g.

  Draper P and Pandyal K. 1991, The Investment Trust Discount Revisited, Journal of Business Finance and Accounting, Vol18, No6, Nov, pp 791-832.

  For books, the following details are required:
  Levi, M. 1996, International Financial Management, Prentice Hall, New York, 3rd Ed, 1996

- Finally, you should give any appendices. These should only include relevant statistical data or material that cannot be fitted into the above categories.

The Layout Guidelines for the Dissertation:
- A4 size Paper
- Font: Arial (10 points) or Times New Roman (12 points)
- Line spacing: 1.5
- Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

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Guidelines for the Assessment of the Dissertation
While evaluating the dissertation, faculty guide will consider the following aspects:

1. Has the student made a clear statement of the objective or objective(s).
2. If there is more than one objective, do these constitute parts of a whole?
3. Has the student developed an appropriate analytical framework for addressing the problem at hand.
4. Is this based on up-to-date developments in the topic area?
5. Has the student collected information / data suitable to the frameworks?
6. Are the techniques employed by the student to analyse the data / information appropriate and relevant?
7. Has the student succeeded in drawing conclusion form the analysis?
8. Do the conclusions relate well to the objectives of the project?
9. Has the student been regular in his work?
10. Layout of the written report.

Assessment Scheme:

Continuous Evaluation: (Based on Abstract, Regularity, Adherence to initial plan, Records etc.)	40%
Final Evaluation: Based on,	60%
Contents & Layout of the Report,	25
Conceptual Framework,	10
Objectives & Methodology and	10
Implications & Conclusions	15

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EMPLOYEE COUNSELLING AND EMPOWERMENT

Course Code: PSY4409 **Credit Units: 3**

Course Objective

To enable students to understand the diversity in organizations and equip them with skills to handle, manage and adjust to a culturally and socially diverse work environment.

Course Contents

Module I: Mentoring Career

Improving various Professionally & Psychologically Skills, Performance & Capacity Development, Career Planning, Setting Goals, Interview Techniques, and Negotiation Skills

Module II: Work Life Counseling

Managing work life: key to perform well; remain stress free, happy & successful at work.
Dealing with Boss, Colleagues & Juniors
Stress Management, Time Management, Crisis Management
Enhancing Performance & Will Power
Work-Life Balance, Motivation & Performance
Meeting Challenges of Workplace Harassment, Discrimination

Module III: Personal Life Counseling

Personality Development and Behavioural Management

Understanding, Improving & Balancing Habits and Behavior
Identifying Power within self
Developing EQ & Emotional Intelligence, Developing Positive Psychology
Utilizing Multiple Intelligence, Confidence Building
Handling & Eradicating Stress & Phobia, Handling Frustration & Unhappiness
Handling Ego/ Self Respect, Handling & eradicating Depression & Loneliness

Module IV: Introduction to Employee Counselling

Meaning, Nature & Scope
Types and functions of Employee Counselling
Coaching, Mentoring and Counselling

Module V: Differences and power

Concepts of prejudice, discrimination and oppression
Cultural and ethnicity as dimensions of differences
Race and racism in organizations
Gender and sexism in organization
Sexual orientation, physical ability, age, social class and other differences in workplace

Module VI: Conflict and Negotiation viz Employee Counselling

Concept of Conflict and Negotiation
Importance and relevance of Conflict and Negotiation in Employee Counselling

Module VII: Employee Empowerment and leadership

Change Management, Employee Involvement for Effective Change Management, Leadership Management, Motivation / Recognition / Retention.

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Essentials of Leadership Quality
Self-leadership leads to Empowerment
Relevance of Empowerment in Employee Counselling

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

Text & References

Text

- Luthans, F. Organizational Behaviour, McGraw – Hill International, 1998.
- Lashley, C (2001) Empowerment : HR strategies for service excellence Oxford,
- Lashley C (1997) Empowering Service Excellence: beyond the quick fix, London,
- Harold Koontz, O'Donnel and Weihrich, Management, Tata McGraw Hill, New Delhi, 1992.
- MonirH.Tayeb(2005). International Human Resource Management-, Oxford Publications.
- http://www.newdirectionscounseling.com/defcoun.html

References:

- Stephen P. Robbins, Organizational Behaviour: Concepts, Controversies, Applications, Prentice Hall, New Delhi, 2000.
- Hyman, J. and Mason, B. (1995) Managing employee involvement and participation.
- Ashkenas, Ulrich, The boundryless Organizations, Jossey- Bass.
- Dalton, Ernst Christ, Success for the Global managers, Jossey- Bass.
- Dhar&Ravishankar, Global Managers, Himalayan Publishing House.

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PSYCHOLOGY OF SELLING, MARKETING AND ADVERTISING

Course Code: PSY4416 **Credit Units: 03**

Course Objectives

To impart the basic knowledge of main psychological theories that is relevant within the field of market psychology among students. How does psychology apply to marketing? Clearly, psychology and marketing are closely related. As a marketing strategist, you need be looking less at what your product has to offer per se and more to the psychology of the consumers to whom you want to sell it.

Course contents

Module I: Introduction

Understanding selling, marketing, advertising Psychology, Nature, scope and need , marketing, advertising Psychology of application of psychology principles in selling, marketing and advertising, The Monkey Business Illusion

Module II: Cognitive Skills: Disciplinary & Cultural Knowledge

Field of psychology complements the field of marketing Identify, main psychological theories and consumer behaviour, Judgment heuristics, rules of perception and marketing psychology, Role of personality, emotions, and motivation in consumer behaviour, Host-city manifestations of the influence of psychology on local consumer

Module III: Analytical Skills: Critical Thinking in Oral & Written Work

Marketing techniques in psychology, Importance of emotions in advertising campaigns, Work of locus of control in your own self-control

Module IV: Affective Skills: Attitudinal & Intrapersonal

Develop and convey empathy for the host peoples' attitudes towards consumption, Curiosity and Interface between marketing and psychology, Respond to psychology of marketing on critical-analytical levels and develop an open mind regarding local consumer habits

Module V: Behavioral Skills: Cultural Engagement & Interpersonal

Knowledge of psychology to become a more aware and self-directed consumer, Use course-related criteria when purchasing you consumer good in the host country, Knowledge of marketing psychology to engage positively with host people & culture

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

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Reference

- Raab, Gerhard; Goddard, G. Jason; Ajami, Riad A. The Psychology of Marketing: Cross-Cultural Perspectives. Farnham, Surrey, GB: Ashgate Publishing Group, 2010. p. 414.
- Bakir, Aysen; Palan, Kay M. "How Are Children's Attitudes Toward Ads and Brands Affected by GenderRelated Content in Advertising?" Journal of Advertising. Vol. 39 Issue 1. (Spring2010):35-48.
- Bawa, Anupam; Kansal, Purva. "Cognitive Dissonance and the Marketing of Services: Some Issues". Journal of Services Research. Vol. 8 Issue 2. (Oct2008): 31-51.
- Bhattacharjee, Amit. "Constraints and Consequences: Psychological Reactance in Consumption Contexts". Advances in Consumer Research - North American Conference Proceedings. Vol. 37. (2010):53-56.
- Bitektine, Alex. "Toward a Theory of Social Judgments of Organizations: The Case of Legitimacy, Reputation, and Status". Academy of Management Review. Vol. 36 Issue 1. (2011): 151-179.
- Bradley, Nigel. "Graphology: A Tool for Marketing". Marketing Review. Vol. 11 Issue 2 (Summer 2011):103- 115.
- Briñol, Pablo; Petty, Richard E.; Tormala, Zakary. "Self-Validation of Cognitive Responses to Advertisements". The Journal of Consumer Research. Vol. 30, Issue 4. (Mar2004):559-573.

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PSYCHOLOGY OF CRIMINAL BEHAVIOUR AND CRIMINAL PROFILING

Course Code: PSY4417 **Credit Units: 03**

Course Objectives

To familiarize students with the emerging importance of psychology of criminal behaviour and criminal profiling and also to build awareness regarding the role of the psychologist in Forensic evaluations.

Course Contents

Module I: **Bases of criminal behavior**

Biological and psychological basis of criminal behavior
Theoretical models in Forensic psychology
Place of psychology in forensic science
Ethical principles and professional competencies

Module II: **Forensic assessment**

Empirical profiling of psychopathy
Detection of Malingering and Deception
Use of Brain Electrical Oscillation Signature (BEOS)
Psychology and law : custody issues, testimony, documentation

Module III: **Civil forensic procedures**

Eye witness memory
Jury selection
Child custody
Evaluation of child trauma

Module IV: Criminal Forensic procedures

Forensic evaluation of delinquency and criminal responsibility
Child sexual abuse evaluations
Violence risk assessment
Competence to stand trial

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

Reference

- Bull, R. (ed) 2011) Four volume set Forensic Psychology. LA: Sage publications
- Scott, Adrian (2010) Forensic psychology. NY: Palgrave MacMillan.

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Books for reference

- Donohue, W.T. and Levensky, T.R. (2004)Handbook of Forensic Psychology. NY: Elsevier.
- Goldstein, A. M. Volume ed. Weiner, I.B. Series ed. (2003) Handbook of Psychology: Volume 11 For ensic psychology. NJ: J. Wiley and Sons.
- Heilbrun, K, Marczyk, G.R. and DeMatteo D. (2002) Forensic Mental Health Assessment : A Caseboo k. UK:OUP.
- McCaffrey, R.J. , Williams, A.D., Fisher, J.M. , Laing, L.C. (1997) The practice of forensic neuropsyc hology. NY: Plenum press.
- Weiner, I.B. and Hess, A.K. Ed. (2006) Handbook of Forensic Psychology. NJ: J.Wiley and Sons.

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GUIDANCE AND COUNSELLING

Course Code: PSY4419 **Credit Units: 03**

Course Objectives

This course enables students to gather knowledge about techniques of guidance and Counselling. It is further designed to equip students to practice these learned skills in their day to day life.

Module I: Introduction

Concept of Guidance and Counseling Meaning, Nature, Goals and Principles; Need and Relevance Emergence and Growth of Guidance and Counseling Psychology; Guidance and counseling Movement in India Ethical and legal considerations

Module II: Oragnization of Programme

Organizing a Guidance Programme Principles of organizing an effective guidance program; Guidance activities at Elementary, Secondary and Senior Secondary level Meaning & Importance of Counseling Skills & Strategies; Stages of Counseling

Module III: Educational Guidance

Educational Guidance Nature, Pupil Personnel work, Pupil Appraisal information, School Curriculum and Guidance. Vocational Guidance Nature, Study of Occupations- Collecting and Disseminating occupational information; Theories of occupation choice Role of counselor in education and vocational guidance

Module IV: Counseling skills

Developing Empathy, rapport establishment, respect and genuineness Skills of Counselor Selection, implementation, evaluation, Observation, listening, silence, attending behaviour, use of questions & termination of counselling.

Module V: Approaches of Counseling

Approaches of Counseling: Directive, Non-directive and Eclectic. Guidance Personel in organizing Guidance Programmes,Theories of multicultural counseling: identity development, and social justice, Theories and models of individual, cultural, couple, family, and community resilience.

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

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References:

- Arther J. J., (1971). Principles of Guidance Delhi : Tata McGraw Hill. - Bhatnagar, A., & Gupta N. (1999). Guidance &Counselling : Practical (Vol I & II) New Delhi: Vikas Publishing House.
- Bernard, H., &Fullmer, D.W. (1977) . Principles of Guidance , New York : Harper & Row. - Chauhan, V., &Jain., (2004). NireshanEvamPramarsh. Udaipur: AnkurPrakashan. - Gelso, C., &Fretz, B. (2001). Counselling Psychology. USA: Harcourt College.
- George, R.L., &Cristiani, T.S. (1995). Counselling Theory & Practice. Boston: Allyn& Bacon. - Nelson – Jones, R. (1994). The Theory and Practice of Counselling Psychology. London: Cassell.
- Gupta, S.K. (1985). Guidance and Counselling. Delhi: Mittal. - Kochhar, S.K. (1984). Educational and Vocational Guidance in Secondary Schools. New Delhi: Sterling.
- Palmer, S., & Mc Mohan, G. (1997). Handbook of Counselling Psychology. London: British association for counselling. - Pietrofessa, J.J., Bernstein, B., Minor, J., & Stanford, S. (1980). Guidance: An Introduction. Chicago: RanelMcNally College.

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Master of Science - Clinical Psychology

FLEXILEARN
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Curriculum & Scheme of Examination

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Master of Science - Clinical Psychology

PARAMETRIC STATISTICAL METHOD

Course Code: PSY4105 **Credit Units: 03**

Course Objective:
The Present paper focuses on providing knowledge about the basics of statistics. It will give clear understanding to the students about application of parametric statistical methods. Parametric tests are generally more powerful in that the likelihood (probability) of a test reaching the correct conclusion is greater. Besides this, a module is added in last so to make students aware of parametric statistics in SPSS. Thereby they can understand the procedures and applications of parametric statistics using SPSS.

Course Contents:
Module I: Basics
Nature, Meaning and importance of statistics
Concept of Reasoning, population, sample and probability theory in statistical inferences
Categories of statistics: Descriptive and Inferential
Variables and their types
Scales of Measurement: Nominal, Ordinal, Interval, Ratio

Module II: Statistical conjecture
Sampling and its kinds: Probability sampling method and Non-Probability sampling method.
Difference between Objectives and Hypothesis
Hypothesis testing: One-tailed and Two-tailed tests, Type I and Type II errors

Module III: Statistics and Test of Significance
Meaning, concept and importance of determining reliability of statistics in data analysis
Standard error of mean, standard deviations, percentages and correlation coefficients
Significance of difference between means-critical ratio and t-test calculation (large and small sample) assumption & uses
One-Way and Two Way ANOVA.

Module IV: Correlation and Regression
Correlation: concept, types, assumption and Utility of Cor-relational Analysis in Psychological Research
Bi-serial Correlation, Point Bi-serial Correlation, Partial Correlation, Tetra-choric Correlation
Simple and Multiple linear regression, its uses, concepts and assumptions
Difference between Simple linear and multiple regressions

Module V: Introduction to SPSS and parametric statistics in SPSS
Introduction to SPSS, its usage and functioning
Understanding the concepts of Parametric tests in SPSS
Learning data entry

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

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Text & References:

Text:

- Minium E.W. King, H.M & Bear G, 1993. Statistical Reasoning in Psychology and Education (3rd Ed.) N Y: John Willey and Sons
- Garett, H.E., (2004), Statistics in Psychology and Education (11th ed.); New Delhi: Paragon International
- Gupta S.P.: Statistical methods, Sultan and Sons, New Delhi.
- Broota, K.D.: Experimental design in Correlational Research, New Delhi: Wiley Eastern 1989.
- Downie, N.M.: Basic Statistical Methods. New York: Harper and Publishers
- Howitt, D & Cramer, D: Introduction to SPSS statistics in psychology
- James K. Lindsey : Parametric Statistical Inference, Oxford science Publication.
- Cox, D.R.: Principles of statistical inferences.

References:

- Edward, A.E.: Experimental Design in Psychological Research (3rd Ed.), New Delhi: American Publishing Co. 1971
- Berger. R.L: Statistical Inferences, Cole Pub. Co.
- Wesley O. J & Geisser. S: Modes of Parametric Statistical Inference. Wiley-Interscience
- Rice, J.A: Mathematical Statistics & Data Analysis, South western.
- Salkind, N & Green, S: SPSS Quick Starts.

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PRACTICUM- I

Course Code: PSY4106 **Credit Units: 03**

Course Objective:

- To give practical experience to the students in administering and scoring psychological tests and interpreting the scores.
- To acquaint the students with the basic procedure and design of psychology experiments.
- To encourage and guide the students to undertake a small-scale research project.
- To apply the general concepts of psychology through experimentation and testing

Note: Total 5 practicals will be conducted in the first semester among the list of following practicals

Course Content:

1	Continuous Visual Memory Test (CVMT)	Memory
2	Illinois Test of Psycholinguistic Abilities – Third Edition (ITPA-3)	Language
3	16 PF Questionnaire - Fifth Edition with Hand scoring	Personality
4	Tennessee Self-Concept Scale - Second Edition (TSCS:2)	Self-Concept
5	Developmental Test of Visual Perception – Adolescence and Adult	Perception
6	Test of Memory and Learning – Second Ed. (TOMAL-2)	Memory and Learning

Examination Scheme:

Components	A	File Demonstration	Viva	EE
Weightage (%)	5	35	35	25

Text & References:

- Mohsin, S. M.: Experiments in Psychology. Motilal Banarasidas
- Woodworth, R.S.: Experimental Psychology. Oxford & IBH & Schlosberg, H. Publishing
- Postman, L. & Egan, J. P.: Experimental Psychology: An Introduction. Harper and Row

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FIELD PRACTICE-I

Course Code: PSY4107 **Credit Units: 04**

Course Objective:
To develop, in students the skills of observation, collection and documentation of data for conducting theoretically correct and practically relevant research

Methodology

Each student will engage themselves in interaction and observation of psychological processes in a subject/ field of their choice.
Student will then present their findings in the form of a paper for seminar discussions.
Similarly, field work will be done by students in their area of interest and present their practical observations, as a report with analysis and suggestions.

Examination Scheme:

Field/Seminar Report	:	40 marks
Viva-Voce	:	30 marks
Internal Faculty and Interaction	:	10 marks
Presentation/Daily Diary Report	:	20 marks

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PSYCHOPATHOLOGY

Course Code: PSY4201 **Credit Units: 03**

Course Objective:

- To acquaint students with various manifestations of psychopathology
- To impart knowledge and skills required for diagnosis of psychological conditions.
- To introduce them to different perspectives and models of etiology.
- To develop skills required for psychopathological formulation.

This course enables students to the study and prediction of adaptive and maladaptive behaviours and its processes across lifespan. It also enables students to understand different diagnostic and educational models of psychopathology.

Course Content:

Module I: Classification and Theoretical Models

Systems of Classification, basic features; DSM-IV TR, ICD-10, similarities and differences

Major Theoretical Models of Psychopathology: The medical model, Psychoanalytic model, Behaviouristic model, Humanistic-existential models, Interpersonal approach, Systems approach.

Module II: Diagnosis and Prognosis

Problems and methods of diagnosis: physiological examination, observation, case-history, interview method, psycho-diagnostic tests, measures of bodily functions, computer assisted diagnosis.

Module III: Mood and Anxiety Disorder

Bipolar disorders: Manic, Depressive, Mixed

Depressive disorder: Major depression and dysthymia, Suicide

Anxiety Disorders: Generalized anxiety disorder, phobia, panic disorder, post traumatic stress disorder and obsessive compulsive disorder

Module IV: Major Clinical Disorders

Schizophrenia

Other psychotic disorders: Bipolar, Delusional, psychotic depression

Module V: Somatoform Disorders

Conversion disorder, Somatization disorder, Hypochondriasis, Body dysmorphic disorder, Pain disorder

Module VI: Disorders of Infancy, Childhood and Adolescence

Developmental disorder: PDD, Rett Disorder, Asperger Disorder,

Behavioral Disorder: Conduct Disorder, Hyperactivity Disorder, ADHD,

Genetic Disorders: Down Syndrome

Module VII: Personality Disorder

Personality Disorder: Narcissistic Personality, Histrionic Personality, Antisocial (Psychopathic) Personality, Borderline Personality, Paranoid Personality, and Schizotype Personality

Module VIII: Sexual Dysfunctions and Paraphilias

Dysfunctions of Desire, Arousal, Orgasm and Pain

Paraphilias, Paedophilia and Rape

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Gender identity disorders
Impotence and frigidity
Causes, preventing suicide

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Text & References:

Text:

- Davison, G.C. & Neale, J.M. (1990): Abnormal Psychology. New York: John Wilay& Sons
- Carson, R.C. & Butcher, J.N. (1992): Abnormal Psychology and Modern Life (9th Ed.). New Yark: Haper & Collins.
- Hamilton, Max, (1994). Fish's: Clinical Psychopathology; Verghese Publishing House, Bombay
- Ahuja N (2002). A short text book of Psychiatry (5th edition). New Delhi. Jaypee Brothers.
- Sarason & Sarason (1998). Abnormal Psychology. New Delhi: Prentice Hall of India

References:

- Sarason & Sarason (2002), Abnormal Psychology; Pearson Education, Delhi
- Bennett, P. (2010). Abnormal and Clinical Psychology: An Introductory Textbook. New Delhi: Tata McGraw Hill Education pvt. Ltd.
- Sadock, B.J. & Sadock, V.A. (2003). Kaplan &Sadock's Synopsis of psychiatry: Behavioral sciences/clinical psychiatry (9th. Ed.). Philadelphia: Lippincott Williams & Wilkins
- Coleman, J.C. : Abnormal Psychology & Modern Life
- Lazarus and Folkman: Stress, appraisal and coping

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PSYCHOLOGICAL ASSESSMENT AND DIAGNOSIS

Course Code: PSY4202 **Credit Units: 03**

Course Objective:
The course teaches the students about the characteristics, objectives and wide ranging effects of psychological testing. It further describes the various testing methodologies and outlines capabilities and limitations of these methods.

Course Contents:
Module I: Introduction
Purpose of testing, types of test used, Bias & Fairness
Ethical Issues in Psychological Testing
Overview of Tests
Norms, Scoring Interpretation and Report Writings
Issues in measurement
Emerging trends of online testing

Module II: Cognitive functions and their assessment

Concept of Attention, Gestalt Theory, Memory and Forgetting, PGI Memory Scale
Theories of Intelligence
Intelligence Tests:
- **Slosson Intelligence Test** – Revised For Children and Adults (SIT-3/R)
- Bhatia Battery
- Weschler's Adult Performance Intelligence Scale (WAPIS)
- Raven's Progressive Matrices (Colour Progressive Matrices, Standard Progressive Matrices and Advanced Progressive Matrices)
- Binet Kamat Test
- Weschler's Intelligence Scale for Children – Revised (WISC)
- Wide Range Intelligence Test (WRIT)
- Alexander Pass-a-long Test of Intelligence
- Draw-A-person Intellectual Ability Test for Children, Adolescents and Adults (DAP:IQ)

Module III: Achievement Test
- Wechsler Individual Achievement Test (WIAT)
- **Diagnostic Achievement Test For Adolescents – Second Edition (DATA-2)**
- Kaufman Test of Educational Achievement (KTEA)
- Woodcock-Johnson Tests of Achievement (WJ)

Module IV: Assessment of Personality: Non-Projective Test
- Cattell's 16 Personality Factor Inventory (16 PF)
- California Q-Sort Tests
- Myers Briggs Type Indicator (MBTI)
- Minnesota Multiphasic Personality Inventory (MMPI)
- **Personality Inventory for Children**
- **OMNI Personality Inventory (OMNI)**
- Bell's Adjustment Inventory
- Eysenck's Personality Questionnaire
- NEO™ Personality Inventory-3 (NEO™-PI-3) Adult / Adolescent

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Module V: Assessment of Personality: Projective Tests
Introduction of Projective Techniques
Difference between Projective & Non-Projective Techniques
Thematic Apperception Test
Rorschach Inkblot Test
House-Tree-Person (H-T-P)
Sentence Completion Test

Module VI: Developmental Scales
Developmental Screening Test
Vineland's Social Maturity Scale
Measures of Psychosocial Development (MPD)
Gesells' Developmental Schedule

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Text & References:
Text:
- Freeman, F. S.,(1965), Theory and Practice of Psychological Testing; New Delhi: Oxford &IBTT

References:
- Jackson C.,(1998), Understanding Psychological Testing; Jaico Publishing House
- Anastasi&Urbina S.(2000), Psychological Testing ,7th Edition; Person Education (Singapore) Pte. Ltd.,
- Guilford J.P.: Psychometric Methods

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NON-PARAMETRIC STATISTICAL METHOD

Course Code: PSY4204 **Credit Units: 03**

Course Objective: The Present paper focuses on providing knowledge about the basics of nonparametric statistics. It will give clear understanding about differences between Parametric & Nonparametric Test Procedures. This paper will

1. Explain commonly used Nonparametric Test Procedures.
2. Perform Hypothesis Tests Using Nonparametric Procedures.
3. Going to teach student how to use SPSS with non-parametric statistics.

Course Contents:

Module 1: Basics

What is Non-Parametric statistics: Nature, Meaning and Concept strengths and limitations of non-parametric procedures
Parametric VS Non- Parametric Statistics
Four Levels of Measurement and Non-parametric statistics

Module 2: Tests of differences between Groups and Variables

The Friedman Two-way analysis of variance by ranks-Basic concepts, uses and computations
Test of differences between groups (Independent samples): Mann-Whitney U test computations, Kolmogorov-Smirnov test, uses
Test of differences between variables (Dependent samples): Kruskal-Wallis ANOVA analysis of ranks, K-Sample Median test, uses and concepts

Module 3: Nominal Measures of Correlations

Concept definition assumptions of Nominal Measures of Correlations
The Phi-Coefficient, Contingency coefficient concepts uses and calculations
Tetrachoric**r**: Its uses, computation and comparison

Module 4: Chi-Square

Concept and Definition, its assumptions and use
Chi-Square Goodness of Fit (One-Sample Test)
Chi-Square Test of Independence

Module 5: Introduction to SPSS and Non-parametric statistics in SPSS

Introduction to SPSS, its usage and functioning
Understanding the concepts of Non-Parametric tests in SPSS
Learning data entry

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

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Text & References:

Text:

- Dowine, N.M.: Basic Statistical methods, Harper and Publishes New York.
- Gupta S.P. Statistical methods, Sultan and Sons, New Delhi.
- Broota, K.D.: Experimental design in correlational research, New Delhi: Wiley Eastern 1989.
- Salkind, N & Green, S.:SPSS Quick Starts.
- Howitt, D & Cramer, D.:Introduction to SPSS statistics in psychology.
- McNemar Q.:Psychological Statistics, 3rd Ed. New York, John Wiley 1962.
- Edward, A. E: Experimental Design in Psychological research (3rd Ed) New Delhi: American publishing

Reference

- Higgins. J.J: Introduction to Modern Nonparametric Statistics.
- Siegal.S: Nonparametric statistics for the behavioral sciences.
- Castellan, J.N. and Siegal. S: Non-parametric statistics for behavioural sciences.
- Daniel, W. Wayne: Applied non-parametric statistics.

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HEALTH PSYCHOLOGY

Course Code: PSY4205 **Credit Units: 02**

Course Objective:

- To give a better understanding of the concept of health and it's various functions to understand its role in human behaviour.
- To acquaint the students with nature and significance of emerging areas of health psychology.
- To highlight the role of social, psychological and behavioural risk factors in health promotion and disease prevention.
- To introduce the students to types of stressors, their consequences, cognitive behavioural interventions for managing stress.
- To impart knowledge about causes and intervention for some prevalent stress related disorders / addictions.

Course Content:

Module I: Introduction to Health

Historical background; Aims and Objectives of Health Psychology, Challenges for the future
Significance of Health Behaviour, Theory of Planned Behaviour: Attributive Theory, Health Locus of Control

Module II: Social Support & Health

Factors for Personality & Health Link, Types of Social Support, Link between social support & Health, Cross Cultural Images of Health

Module III: Life Style Disorder

CAD, CHD, Hypertension, Stroke, Obesity, peptic ulcer, Migraine, Asthma, and Diabetes: Overview, Implications & Management.

Module IV: Health Enhancing Behaviour

Stress: Meaning, Dimensions and Coping Strategies.
Improving Health & Well Being, Enhancing Support
Maintenance of Health: Diet and Nutrition, Relaxation Techniques: Jacobson Progressive Relaxation, Broota's Relaxation Response

Module V: Health Behaviour Modification

Cognitive Behvavioural approach, Relapse Prevention, Attitude & Health-Belief Model
Models of Mental Health: Clinical, Community and Social Action Model

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

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Text & References:

Text:

- Ogden, J. (1996): Health Psychology: A textbook Open University Press, Buckingham
- Shelly E. Taylor (2006): Health Psychology (6th Ed.). New Delhi: Tata McGraw-Hill
- Pitts, M. & Phillips, K. (1991): Psychology of Health: An Introduction. London: Routledge press
- Khatoon, N. (2012). Ed. Health Psychology. Pearson Education Inc. India
- Taylor, S.E. (1986): Health Psychology. New York: Random House

References:

- Lhermitte, F. (1986) Human Autonomy and the Frontal Lobes. Part II: Patient Behaviour in complex and social situation: The "Environmental Dependency Syndrome". Annuals of Neurology, 19, 335- 343.
- Strub and Black "Neuro-behavioural Disorder"
- Luria, A.R. (1966), Higher cortical functions in man, New York, basic books.
- Hecaen, H. and Albert, M.L. (I978), Human Neuropsychology, New York, John Wily and Sons.

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PRACTICUM- II

Course Code: PSY4207 **Credit Units: 03**

Course Objective:

1. To give practical experience to the students in administering and scoring psychological tests and interpreting the scores.
2. To acquaint the students with the basic procedure and design of psychology experiments.
3. To encourage and guide the students to undertake a small-scale research project.
4. To apply the general concepts of psychology through experimentation and testing

Note: Total 5 practicals will be conducted in the second semester among the list of following practicals

Course Content:

1	Slosson Intelligence Test – Revised For Children and Adults (SIT-3/R)	Intelligence
2	Diagnostic Achievement Test For Adolescents – Second Edition (DATA-2)	Achievement
3	House-Tree-Person (H-T-P)	Personality: Projective
4	Rorschach Ink Blot Test	Personality: Projective
5	Personality Inventory for Children scoring kit	Personality:
6	OMNI Personality Inventory (OMNI) Introductory Kit	Personality:

Text & References:

- Mohsin, S. M.: Experiments in Psychology. Motilal Banarasidas
- Woodworth, R.S.: Experimental Psychology. Oxford & IBH & Schlosberg, H. Publishing
- Postman, L. & Egan, J. P.: Experimental Psychology: An Introduction. Harper and Row

Examination Scheme:

Components	A	File Demonstration	Viva	EE
Weightage (%)	5	35	35	25

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FIELD PRACTICE-II

Course Code: PSY4208 **Credit Units: 04**

Course Objective:
To develop, in students the skills of observation, collection and documentation of data for conducting theoretically correct and practically relevant research

Methodology

Each student will engage themselves in interaction and observation of psychological processes in a subject/ field of their choice.
Student will then present their findings in the form of a paper for seminar discussions.
Similarly, field work will be done by students in their area of interest and present their practical observations, as a report with analysis and suggestions.

Examination Scheme:

Field/Seminar Report	:	40 marks
Viva-Voce	:	30 marks
Internal Faculty and Interaction	:	10 marks
Presentation/Daily Diary Report	:	20 marks

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SCIENTIFIC RESEARCH PAPER

Course Code: PSY4209 **Credit Units: 01**

Course Objective:
The scientific research papers for Masters Students is to enhance the reading and writing habits of the students and to make them aware about the process of carrying out a research work. This helps them to develop insight into the course they are studying which creates an academic interest among the students. Presentation of the term paper plays an important role as it facilitates knowledge sharing and improvement in presentation skills which will further enhance the confidence of the students. The overall objective of this term paper is to develop research orientations in students and to make them understand and enhance skills in Research Methodology.

Guidelines for Research Article or Scientific Papers:

Topic
Introduction
Review Research
Objective
Methodology
Discussion
Conclusion
References & Bibliography

No. of pages in the compilation of the paper 25-30 (minimum 25 pages)

Examination Scheme:

Components	Compilation	Viva	Presentation
Weightage (%)	50	25	25

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RESEARCH METHODS: EXPERIMENTAL DESIGN

Course Code: PSY4301 **Credit Unit: 02**

Course Objective:
Research Methodology is a way to find out the result of a given problem on a specific matter or problem that is also referred as research problem. In Methodology, researcher uses different criteria for solving/searching the given research problem. Different sources use different type of methods for solving the problem. So this course will enable the student to understand and apply basic research methods in psychology including research design, data analysis and report findings research conclusion apparently based on the parameters of particular research methods.

Course Contents:

Module I: Introduction to Research
Meaning of Scientific Research
Objectives and Steps in Scientific Research
Defining research problem
Defining variables
Developing hypothesis

Module II: Evaluating Measures and Hypothesis
Need For Evaluating Measures
Reliability and Validity
Hypothesis testing: Type1 and Type 2
Going beyond hypothesis testing: Effect size and Power

Module III: Validity of Experimental Researches and Threats to them
Statistical Conclusion validity
Construct validity and External Validity
Establishing the cause and Effect
Single Group threat, Multiple Group threats, Social threats

Module IV: Experimental Designs-I
Two-Group experimental designs
- Within-subject Design
- Between-subject design
- General Linear Model

Module V: Experimental Designs-II
Factorial designs
Randomized Block designs
Hybrid Experimental Designs: Soloman four group designs
Mixed designs

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Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Text & References:

Text:

- Shuttleworth, Martyn (2008). "Definition of Research". *Experiment Resources*. Experiment-Research.com. Retrieved 14 August 2011.
- Creswell, J. W. (2008). Educational Research: Planning, conducting, and evaluating quantitative and qualitative research (3rd ed.). Upper Saddle River: Pearson.
- Trochim, W.M.K, (2006). Research Methods Knowledge Base.
- Montgomery, Douglas (2013). *Design and analysis of experiments* (8th ed.). Hoboken, NJ: John Wiley & Sons, Inc.

Reference

- Review of Foundations for research: Methods of inquiry in education and the social sciences, by Kathleen B. deMarrais and Stephen D. Lapan. 2004. Reference & Research Book News 19:1**.**
- Denscombe, Martyn. 2007. The good research guide for small-scale social research projects. 3rd ed. Maidenhead, UK: Open University Press. 360 pages. ISBN: 0335220223. $48.50 (pbk).
- Baker, Lynda M. 2001. Review of Understanding Research Methods: An Overview of the Essentials, 2nd ed., by Mildred L. Patten. The Library Quarterly 71:96.
- Ellingson, L. L. 2007. Review of Qualitative research methods for the social sciences, 6th ed, by B. L. Berg. Communication Research Trends 26.1: 24.

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PSYCHOTHERAPY

Course Code: PSY4302 **Credit Units: 03**

Course Objective:
The course enables students to learn various therapies and their applications in counselling field. The course aims to enable participants to acquire the development and therapies in counselling which can be used in a variety of settings, and also to understand the importance of the development of personal awareness in the effective application of counseling skills.

Course Contents:
Module I: Introduction
Psychotherapy: Meaning, Nature & Scope
Variables affecting Psychotherapy: Specific Variables: Client Variable, Therapist Variable, Process variables, Social & Environmental Variable
Non-Specific Variables: Spontaneous cure, Placebo Effect
Currents and Future Trends of Psychotherapy

Module II: Psychotherapy in India
Psychotherapy in the Indian context
Spirituality and psychotherapy
Yoga and Meditation

Module III: Varieties of Psychotherapy
Supportive therapy
Re-educative Therapy
Re-constructive therapy
Counselling vs. Psychotherapy

Module IV: Psychoanalytic Therapies
Freud's Psycho-analytic Therapy, Adlerian Psychotherapy, Brief Dynamic Therapies

Module V: Humanistic Therapies
Client-Centered Therapy, Existential Therapy and Gestalt Therapy

Module VI: Behavioral and Cognitive Behavior Therapy
Behavioral therapy, Cognitive Behavior therapy, Rational Emotive Behavior Therapy (Ellis)

Module VII: Few more Important Therapies
Family, Marital and Interpersonal Therapy
Therapies with Children and Adolescents
Group Therapy

Module VIII: Therapeutic Guidelines while working with
Women, Older clients, Clients with personality disorder
Grief and loss
Self-harm
Persons from disadvantaged context

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Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Text & References:

Text:

- Golfried, H. R. & Davison, G. C.: Clinical Behaviour Therapy
- Sharf R., Theories of Psychotherapy & Counselling – Concepts and Cases; 2nd Edition.
- The Top 10: The Most Influential Therapists of the Past Quarter-Century. Psychotherapy Networker.: 2007, March/April (retrieved 7 Oct 2010)
- Henrik, R. (ed) *The Psychotherapy Handbook. The A-Z handbook to more than 250 psychotherapies as used today* (1980) New American Library.

References:

- Kirt S.H. & Clark: Cognitive Behaviour Therapy for Psychiatric Problems.
- Gurman & Kniskern: Handbook of Family Therapy.
- Kahn M.,: Between Therapist and Client- The New Relationship- Revised Edition
- Bryant, R.A.; Moulds, M.L.; Guthrie, R.M.; Nixon, R.D.V. (2005)."The Additive Benefit of Hypnosis and Cognitive-Behavioral Therapy in Treating Acute Stress Disorder"

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CLINICAL PSYCHOLOGY

Course Code: PSY4303 **Credit Units: 03**

Course objective:
Clinical psychology is the branch of psychology concerned with the assessment and treatment of mental illness, abnormal behavior and psychiatric problems. This field integrates the science of psychology with the treatment of complex human problems, making it an exciting career choice for people who are looking for a challenging and rewarding field.

Course Contents:
Module I: Introduction
Meaning and Nature of Clinical Psychology
Background of Clinical Psychology: First Fifty years of Clinical Psychology (Establishment of Psychological Clinics and Influence of World War I)
Clinical Psychology: between World War I and II; From World War II to Present

Module II: **Foundation of Clinical Psychology**
Historical origin, the Psychometric tradition, the influence of health and child guidance movement, the influence of Sigmund Freud & the American Psychologist's in America.
The influence of World War II on development of Clinical Psychology
Roots of Clinical Psychology in India: the pre-independence phase, post independence to the present scenario.

Module III: Development of clinical Psychology as a profession.
Activities of Clinical Psychologist: psychological assessment, Psychotherapy, research, community mental health programme, teaching, consultation, administration.
Differences & similarities with other mental health professions
Subspecialties of clinical Psychology: Clinical health Psychology, Forensic Psychology, Geropsychology, Clinical Neuropsychology, and child clinical psychology.
Professional identity, responsibilities

Module IV: Diagnosis and assessment.
Nature and purpose of Clinical diagnosis & assessment
Stages in the Assessment Process
Clinical Assessment Techniques: observation, interview, case-study, Psychological tests.

Module V:
Employment Setting for Clinical Psychologist
Subspecialties of Clinical Psychology
Organizations in Clinical Psychology
Ethical and Legal Issues in Clinical Psychology
Cultural issues, current scenario & future prospects.

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

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Text & References

Text

- Anastasi, A.: Psychological Testing, New York: MacMillan Publishing company.
- Bellack, A. S.**:** Introduction to Clinical Psychology. New York: Oxford & Hersen, M.University Press
- Karliger, F.N.: Foundations of Behavioural Research, New York: Holt Rinehart Winston.
- Korchin, S. J.**:** Modern Clinical Psychology. Delhi CRR Publishers and Distributers
- Ray, S. D.: The Practice of Psychotherapy. New Delhi: New Age International
- Plante, T. G.: Contemporary Clinical Psychology. New York: John Willey& Sons, Inc.
- Pomerantz, A. M. : Clinical Psychology- Science, Practice and Culture. New Delhi: Sage Publications
- Hecker, J. E.: Introduction to Clinical Psychology. Delhi: Pearson Thorpe, G. L.Education
- Matthews, J. R.: Introduction to Clinical Psychology. New York: Oxford Anton, B. S.University Press
- Herbert, M.: Clinical Child Psychology: Social Learning, Development And Behaviour.New York: John Willey & Sons, Inc.
- Kumar, A.: Clinical Psychology. Anmol Publications
- Field, A. P.: Clinical Psychology. Learning Matters & Field
- Hatton, C.: Clinical Psychology. New York: John Willey & Sons, Inc.

References:

- Barlow et al.(2010): Oxford Handbook of clinical psychology.1st Edition.
- Gross and Hersen., (2007): Handbook of clinical Psychology .Volume 1

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PRACTICUM- III

Course Code: PSY4308 **Credit Units: 03**

Course Objective:

1. To give practical experience to the students in administering and scoring psychological tests and interpreting the scores.
2. To acquaint the students with the basic procedure and design of psychology experiments.
3. To encourage and guide the students to undertake a small-scale research project.
4. To apply the general concepts of psychology through experimentation and testing

Note: Total 5 practicals will be conducted in the third semester among the list of following practicals

Course Content:

1	Measures of Psychosocial Development (MPD)	Development
2	Culture Free Self-Esteem Inventories, 3rd Edition	Self-Esteem
3	State-Trait Anger Expression Inventory-2™ (STAXI-2)	Anger
4	Personality Inventory for Youth	Personality
5	Family Relations Test: Children's Version	Interpersonal Relationship
6	Wide Range Intelligence Test (WRIT)	Intelligence

Text & References:

- Mohsin, S. M.: Experiments in Psychology. Motilal Banarasidas
- Woodworth, R.S.: Experimental Psychology. Oxford & IBH & Schlosberg, H. Publishing
- Postman, L. & Egan, J. P.: Experimental Psychology: An Introduction. Harper and Row

Examination Scheme:

Components	A	File Demonstration	Viva	EE
Weightage (%)	5	35	35	25

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FIELD PRACTICE-III

Course Code: PSY4309 **Credit Units: 04**

Course Objective:
To develop, in students the skills of observation, collection and documentation of data for conducting theoretically correct and practically relevant research

Methodology

Each student will engage themselves in interaction and observation of psychological processes in a subject/ field of their choice.
Student will then present their findings in the form of a paper for seminar discussions.
Similarly, field work will be done by students in their area of interest and present their practical observations, as a report with analysis and suggestions.

Examination Scheme:

Field/Seminar Report	:	40 marks
Viva-Voce	:	30 marks
Internal Faculty and Interaction	:	10 marks
Presentation/Daily Diary Report	:	20 marks

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SUMMER INTERNSHIP EVALUATION

Course Code: PSY4335 **Credit Units: 06**

GUIDELINES FOR INTERNSHIP FILE AND INTERNSHIP REPORT

(These guidelines will be useful for undertaking an internship programme during the summer or at any other time wherein the student/ researcher works full time with a company/organisation)

There are certain phases of every Intern's professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship programme can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal class room situations. These attributes are intellectual ability, professional judgment and decision making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc.

In order to achieve these objectives, each student will maintain and submit a file (**Internship File**) and a report (**Internship Report**).

INTERNSHIP FILE

The Internship File aims to encourage students to keep a personal record of their learning and achievements throughout the Programme. It can be used as the basis for lifelong learning and for job applications. ***Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development.***

The File will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and his/her own personal contribution to the organization.

The File is essentially a comprehensive documentation of how one proceeds while working on the assignment and should be regularly checked by the faculty guide/ supervisor, issues discussed with the students, doubts if any clarified and signed as having done so. This will form the basis of **continuous evaluation** of the project.

The File will include ***five sections*** in the order described below.

1. **The Title Page –** An Internship Experience Report For (Your Name), name of internship organization, name of the Supervisor/Guide and his/her designation, date started and completed, and number of credits for which the report is submitted.
2. **Table of Content –** An outline of the contents of the file by topics and subtopics with the page number and location of each section.
3. **Introduction** – Short, but should include how and why you obtained the internship experience position and the relationship it has to your academic/professional and career goals.
4. **Main Body** – Should include a brief summary/ executive summary of the **Internship Project Report** that the student has worked on, an **analysis of the company/organization** in which the student is working, a **personal review** of the student's management skills and how they have been

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developed through the programme, the daily tasks performed, major projects contributed to, dates and hours spent on a task, observations and feelings, meetings attended and their purposes, listing of tools and materials and their suppliers, and photographs if possible of projects, buildings and co-workers.

5. **Appendices** – Include pamphlets, forms, charts, brochures, technical and descriptive literature, graphs and other information related to your Internship experience.

INTERNSHIP REPORT

The **Internship Report** is the research report that the student has to prepare on the project assigned by the organization. (Incase a student is not assigned a specific research project in the organization, he has to select any one aspect of the organization and prepare a research report on it). The lay out of the report should be as per the standard layout prescribed by the organization wherein the student undertakes the Internship. In case, there is no layout prescribed by the organization the following components should be included in the report:

- **Title or Cover Page**.
  The title page should contain Project Title; Student's Name; Programme; Year and Semester and Name of the Faculty Guide.

- **Acknowledgements**
  Acknowledgment to any advisory or financial assistance received in the course of work may be given. It is incomplete without student's signature.

- **Abstract**
  A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project. It should not exceed more than 1000 words.

- **Table of Contents**
  Titles and subtitles are to correspond exactly with those in the text.

- **Introduction**
  Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

- **Materials and Methods**
  This section should aim at experimental designs, materials used (wherever applicable). Methodology should be mentioned in details including modifications undertaken, if any. It includes organization site(s), sample, instruments used with its validation, procedures followed and precautions.

- **Results and Discussion**
  Present results, discuss and compare these with those from other workers, etc. In writing this section, emphasis should be laid on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

  Note that in writing the various secions, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or

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captions. All major equations should also be numbered and unless it is really necessary, do not write in "point" form.

While presenting the results, write at length about the the various statistical tools used in the data interpretation. The result interpretation should be simple but full of data and statistical analysis. This data interpretation should be in congruence with the written objectives and the inferences should be drawn on data and not on impression. Avoid writing straight forward conclusion rather, it should lead to generalization of data on the chosen sample.

Results and its discussion should be supporting/contradicting with the previous research work in the given area. Usually one should not use more than two researches in either case of supporing or contradicting the present case of research.

- **Conclusion(s) & Recommendations**
  A conclusion should be the final section in which the outcome of the work is mentioned briefly. Check that your work answers the following questions:
  - Did the research project meet its aims (check back to introduction for stated aims)?
  - What are the main findings of the research?
  - Are there any recommendations?
  - Do you have any conclusion on the research process itself?

- **Implications for Future Research**
  This should bring out further prospects for the study either thrown open by the present work or with the purpose of making it more comprehensive.

- **Appendices**
  The Appendices contain material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.
- **References**
  References should include papers, books etc. referred to in the body of the report. These should be written in the alphabetical order of the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

The Layout Guidelines for the Internship File & Internship Report:

- A4 size Paper
- Font: Arial (10 points) or Times New Roman (12 points)
- Line spacing: 1.5
- Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

Assessment Scheme:

Continuous Evaluation: 30%
(based on Internship File and the observations of the faculty guide/ supervisor)

Feedback from Company/ Organization: 10%

Final Evaluation:
(Based on Internship Report, Viva/ Presentation) 60%

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COUNSELLING PSYCHOLOGY

Course Code: PSY4304 **Credit Unit: 03**

Course Objective: To produce graduates with a well-developed professional identity as counseling psychologists, including awareness and appreciation of context, development, and strength-based interventions. Thus, we seek to develop the professional skills of our students such that each is able to:

- Demonstrate understanding of the impact of multiple contexts on human behavior
- Demonstrate understanding of theories and techniques of developmentally-based health promotion and intervention for individuals, systems, and communities
- Appreciate the role of individual and cultural differences and diversity in human development and behavior

Course Contents:

Module I: Introduction

Meaning, Definition & Goals
Historical Background: Origin of Counseling within Philosophy and Medicine,
Influence from Psychology, Mental health development, the guidance movement and other influences
Difference between Counseling and other associated helping professions (psychotherapy, psychiatry, social work, guidance etc.)

Module II: Counseling Process

Settings for counseling
Steps in counseling
Therapeutic relationship: The importance of relationship, components of relationship, Facilitative conditions for the counseling relationship

Module III: Counseling Approach: Insight oriented

Psychodynamic Approach: Psychoanalytic, Adlerian
Humanistic Approach: Existential, Client-centered, Gestalt

Module IV: Counselling Approach: Action oriented & other approaches

Behavioural Approach: Operant-Conditioning, Classical-Conditioning.
Cognitive Approach: Cognitive Tharepy, Rational emotive therapy.
Other Approaches: Narrative Therapy, Expressive Therapy, and Biofeedback.

Module V: Current Issues in Counseling:

Ethical Issues: Professional Codes, Our divided loyalties, Areas of ethnical difficulty, recent trends
Legal Issues: Advice for the passionately committed counseling student
Mental Health Counseling
Counseling diverse population: Gender bias, Counseling the aged, the ethnic minorities, and the physically challenged

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

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Text & References:

Text:

- Williams, E.N., Hayes, J.A., & Fauth, J. (2008). Therapist self-awareness: Interdisciplinary connections and future directions. In S. Brown & R. Lent (Eds.), Handbook of Counseling Psychology (4th ed) (pp. 267–283). NY: Wiley.
- Levy, K. N., &Scala, J. (2012). Transference, transference interpretations, and transference-focused psychotherapies. Psychotherapy, 49(3), 391-403. doi:10.1037/a0029371
- Ladany, N. & Inman, A. (2008) Handbook of Counseling Psychology, (4th ed.). John Wiley & Sons: New York.

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- Society of Counseling Psychologists. (n.d.). About counseling psychologists. Found online at http://www.apa.org/ed/accreditation/doctoral.html
- Brems, C. & Johnson, M. E. (1997). Comparison of recent graduates of clinical versus counseling psychology programs. Journal of Psychology, 131, 91-99.
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- Whyte, C (1978) "Effective Counseling Methods for High-Risk College Freshmen". Measurement and Evaluation in Guidance. January. 6. (4).198-2000

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NEURO-PSYCHOLOGY

Course Code: PSY4306 **Credit Units: 03**

Course Objective:
The objective of this course is to give a better knowledge of brain and its various functions to understand its role in human behavior.

Course Contents:
Module I: Introduction
Understanding the concept of Neuropsychology
The rationale for Neuropsychological evaluation
Common problems with brain damage

Module II: Plasticity of Brain
Neuropsychological aspect of plasticity of brain
Cerebral cortex and lateralization / localization of functions

Module III: Frontal Lobe and Temporal Lobe Deficits
Behavioural/ emotional/ personality/ cognitive changes associated with the lobe functions.

Module IV: Parietal and Occipital Lobes Deficits
Behavioural / emotional/ cognitive functions associated with each lobe.

Module V: Neuropsychological Rehabilitation (Holistic Approach)
Planning, process and outcome of cognitive retraining
Role of family and larger community
Financial/ employment Rehabilitation
Neuropsychological Assessment
- Bender Gestalt Test
- Benton's Visual Retention Test

Module VI: Social Support and Health
Factors for Personality and Health Link
Types of Social Support
Link between social support and Health
Cross cultural images of health

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

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Text & References:

Text:

- Luria, A.R. (1966), Higher cortical functions in man, New York, basic books.
- Hecaen, H. and Albert, M.L. (1978), Human Neuropsychology, New York, John Wily and Sons.
- Brannon, L. & Feist, J. (2007): Introduction to Health Psychology. Cengage Learning

References:

- Walsh, K. W. (I978), Neuropsychology a clinical approach, Edinburgh, Churchill Livingston.
- Vinken, P.J. & Bruyn, G.W. (1969) (Ed.), handbook of Clinical Neurology, Amesterdam, North Holland .
    - Kirshener, H.S, (1986) Behavioural Neurology, New York, Churchill Livingston.
- Lhermitte, F. (1986) Human Autonomy and the Frontal Lobes. Part II: Patient Behavioural in complex and social situation: The "Environmental Dependency Syndrome". Annuals of Neurology, 19, 335- 343.
    - Strub and Black Neuro-behavioural Disorder.
    - Taylor, SE (1986) Health Psychology Random House, New York.

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RESEARCH METHODS: NON-EXPERIMENTAL DESIGN

Course Code: PSY4401 **Credit Unit: 02**

Course Objective:
Research Methodology is a way to find out the result of a given problem on a specific matter or problem that is also referred as research problem. In Methodology, researcher uses different criteria for solving/searching the given research problem. Different sources use different type of methods for solving the problem. So this course will enable the student to understand and apply basic research methods in psychology including research design, data analysis and report findings research conclusion apparently based on the parameters of particular research methods.

Course Contents:

Module I: Introduction

Nature and Purpose of Non-Experimental Research Designs and their importance
Advantages and Disadvantages of Non-experimental Research Designs
Differences between Experimental and Non-Experimental Research Designs
Types or Non-experimental Designs: Pure Descriptive design, Correlational Descriptive Design and Other type

Module II: Quasi- Experimental designs

Quasi- experimental research designs: their uses and importance
One-Group Designs
Non-equivalent control group designs
Pretest-Posttest Control Group Design

Module III: Non-Experimental Designs

Quantitative Non-Experimental Designs, Causal Comparative
Qualitative and Quantitative perspectives: Collecting qualitative data: Case study, interview, Observational method. Discourse Analysis, Grand narrative analysis, Ethnographic methodology.
Time series Designs

Module IV: Correlational Designs

Correlational research design: Its Basic nature and uses
Kinds of Correlational designs: Panel Design, Cross-Sectional Design and Longitudinal Designs
Concept and application of Multiple Regression Analysis (linear and stepwise)
Factor analysis and Its Implications

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

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Text & References:

Text:

- Shuttleworth, Martyn (2008). "Definition of Research". Experiment Resources. Experiment-Research.com. Retrieved 14 August 2011.
- Creswell, J. W. (2008). Educational Research: Planning, conducting, and evaluating quantitative and qualitative research (3rd ed). Upper Saddle River: Pearson.
- Trochim, W.M.K, (2006). Research Methods Knowledge Base.
- Montgomery, Douglas (2013). Design and analysis of experiments (8th ed). Hoboken, NJ: John Wiley & Sons, Inc. ISBN 9781118146927.

Reference:

- Kothari, C.R (2004), Research Methodology: Methods and Techniques.
- Kumar, R (2005), Research Methodology: A step-by-step beginners.
- Melville and Goddard (2004), Research Methodology: An introduction.
- Khan, J.A(2011), Research Methodology.

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MENTAL RETARDATION

Course Code: PSY4402 **Credit Units: 02**

Course Objective:
The paper on Mental Retardation introduces nature of mental retardation, its classification, assessment and intervention programs.

Course Contents:
Module I:
Mental Retardation: Definition of mental retardation, Classification-Psychological Classification Medical and Educational Classification, Causes and Prevention

Module II:
Mental Retardation: Psycho-educational Assessment, Intelligence Tests, FACP, BASIC-MR, BASAL-MR

Module III:
Mental Retardation: Enhancing Skills- CTC, IEP, Prompting, Task Analysis, Channing, Shaping, Modeling, Reinforcement

Module IV:
Mental Retardation: Reducing maladaptive behaviours- Assessment of maladaptive behaviours, plan of behavior modification, techniques for decreasing problem behavior.

Module V:
Vocational Training and Empowering families having child with Mental Retardation, Special Sports, Acts and Policies

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Text & References:

Text:

- NIMH (1989) Mental Retardation : A Manual for Psychologist, Secundrabad
- Peshawaria R. and Venkatesan (1992) Behavioural Approach in Teaching Mentally Retarded Children, NIMH, Secundrabad
- Thressiakutty A.T. and Govindrao L. (2001) Transition of Persons with Mental Retardation from School to Work, NIMH Secundrabad

References:

- Rao, T.A.S. (1992) Manual on Developing Communication Skills in Mentally Retarded Persons, NIMH, Secundrabad
- Hallahan D.P. and Kauffman J.M. (1980) Exceptional Children, Prentice Hall
- National Trust, Govt. of India, Handbook for Teachers

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PRACTICUM- IV

Course Code: PSY4412 **Credit Units: 03**

Course Objective:

1. To give practical experience to the students in administering and scoring psychological tests and interpreting the scores.
2. To acquaint the students with the basic procedure and design of psychology experiments.
3. To encourage and guide the students to undertake a small-scale research project.
4. To apply the general concepts of psychology through experimentation and testing

Note: Total 5 practicals will be conducted in the fourth semester among the list of following practicals

Course Content:

1	NEO-4™ - Comprehensive Kit	Personality
2	Comprehensive Test of Non-verbal Intelligence-Second Edition (CTONI-2)	Intelligence
3	Neuropsychological Assessment Battery® (NAB®) Attention Module Kit	Attention
4	Detroit Tests of Learning Aptitude - Fourth Edition (DTLA-4)	Learning
5	Reynolds Intellectual Assessment Scales (RIAS)	Intelligence
6	General Health Questionnaire (GHQ)	Health

Examination Scheme:

Components	A	File Demonstration	Viva	EE
Weightage (%)	5	35	35	25

Text & References:

- Mohsin, S. M.: Experiments in Psychology. Motilal Banarasidas
- Woodworth, R.S.: Experimental Psychology. Oxford & IBH & Schlosberg, H. Publishing
- Postman, L. & Egan, J. P.: Experimental Psychology: An Introduction. Harper and Row

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FIELD PRACTICE-IV

Course Code: PSY4413 **Credit Units: 04**

Course Objective:
To develop, in students the skills of observation, collection and documentation of data for conducting theoretically correct and practically relevant research

Methodology

Each student will engage themselves in interaction and observation of psychological processes in a subject/ field of their choice.
Student will then present their findings in the form of a paper for seminar discussions.
Similarly, field work will be done by students in their area of interest and present their practical observations, as a report with analysis and suggestions.

Examination Scheme:

Field/Seminar Report	:	40 marks
Viva-Voce	:	30 marks
Internal Faculty and Interaction	:	10 marks
Presentation/Daily Diary Report	:	20 marks

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DISSERTATION

Course Code: PSY4437 **Credit Units: 06**

GUIDELINES FOR DISSERTATION

The aim of the dissertation is to provide you with an opportunity to further your intellectual and personal development in your chosen field by undertaking a significant practical unit of activity, having an educational value at a level commensurate with the award of your degree

The dissertation can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Selecting the Dissertation Topic
It is usual to give you some discretion in the choice of topic for the dissertation and the approach to be adopted. You will need to ensure that your dissertation is related to your field of specialization.

Deciding this is often the most difficult part of the dissertation process, and perhaps, you have been thinking of a topic for some time.

It is important to distinguish here between 'dissertation topic' and 'dissertation title'. The topic is the specific area that you wish to investigate. The title may not be decided until the dissertation has been written so as to reflect its content properly.

Few restrictions are placed on the choice of the topic. Normally we would expect it to be:
- relevant to business, defined broadly;
- related to one or more of the subjects or areas of study within the core program and specialisation stream;
- clearly focused so as to facilitate an in-depth approach, subject to the availability of adequate sources of information and to your own knowledge;
- of value and interest to you and your personal and professional development.

Planning the Dissertation
This will entail following:
- Selecting a topic for investigation.
- Establishing the precise focus of your study by deciding on the aims and objectives of the dissertation, or formulating questions to be investigated. Consider very carefully what is worth investigating and its feasibility.
- Drawing up initial dissertation outlines considering the aims and objectives of the dissertation. Workout various stages of dissertation
- Devising a timetable to ensure that all stages of dissertation are completed in time. The timetable should include writing of the dissertation and regular meetings with your dissertation guide.

The Dissertation plan or outline
It is recommended that you should have a dissertation plan to guide you right from the outset. Essentially, the dissertation plan is an outline of what you intend to do, chapter wise and therefore should reflect the aims and objectives of your dissertation.

There are several reasons for having a dissertation plan
- It provides a focus to your thoughts.

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- It provides your faculty-guide with an opportunity, at an early stage of your work, to make constructive comments and help guide the direction of your research.
- The writing of a plan is the first formal stage of the writing process, and therefore helps build up your confidence.
- In many ways, the plan encourages you to come to terms with the reading, thinking and writing in a systematic and integrated way, with plenty of time left for changes.
- Finally, the dissertation plan generally provides a revision point in the development of your dissertation report in order to allow appropriate changes in the scope and even direction of your work as it progresses.

Keeping records
This includes the following:

- Making a note of everything you read; including those discarded.
- Ensuring that when recording sources, author's name and initials, date of publication, title, place of publication and publisher are included. (You may consider starting a card index or database from the outset). Making an accurate note of all quotations at the time you read them.
- Make clear what is a direct a direct quotation and what is your paraphrase.

Dissertation format
All students must follow the following rules in submitting their dissertation.
- Front page should provide title, author, Name of degree/diploma and the date of submission.
- Second page should be the table of contents giving page references for each chapter and section.
- The next page should be the table of appendices, graphs and tables giving titles and page references.
- Next to follow should be a synopsis or abstract of the dissertation (approximately 500 words) titled: **Executive Summary.**
- Next is the 'acknowledgements'.
- Chapter I should be a general introduction, giving the background to the dissertation, the objectives of the dissertation, the rationale for the dissertation, the plan, methodological issues and problems. The limitations of the dissertation should also be hinted in this chapter.
- Other chapters will constitute the body of the dissertation. The number of chapters and their sequence will usually vary depending on, among others, on a critical review of the previous relevant work relating to your major findings, a discussion of their implications, and conclusions, possibly with a suggestion of the direction of future research on the area.
- After this concluding chapter, you should give a list of all the references you have used. These should be cross - references with your text. For articles from journals, the following details are required e.g.

  Draper P and Pandyal K. 1991, The Investment Trust Discount Revisited, Journal of Business Finance and Accounting, Vol18, No6, Nov, pp 791-832.

  For books, the following details are required:
  Levi, M. 1996, International Financial Management, Prentice Hall, New York, 3rd Ed, 1996

- Finally, you should give any appendices. These should only include relevant statistical data or material that cannot be fitted into the above categories.

The Layout Guidelines for the Dissertation:
- A4 size Paper
- Font: Arial (10 points) or Times New Roman (12 points)
- Line spacing: 1.5

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- Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

Guidelines for the Assessment of the Dissertation
While evaluating the dissertation, faculty guide will consider the following aspects:

1. Has the student made a clear statement of the objective or objective(s).
2. If there is more than one objective, do these constitute parts of a whole?
3. Has the student developed an appropriate analytical framework for addressing the problem at hand.
4. Is this based on up-to-date developments in the topic area?
5. Has the student collected information / data suitable to the frameworks?
6. Are the techniques employed by the student to analyse the data / information appropriate and relevant?
7. Has the student succeeded in drawing conclusion form the analysis?
8. Do the conclusions relate well to the objectives of the project?
9. Has the student been regular in his work?
10. Layout of the written report.

Assessment Scheme:

Continuous Evaluation: (Based on Abstract, Regularity, Adherence to initial plan, Records etc.)	40%
Final Evaluation: Based on,	60%
Contents & Layout of the Report,	25
Conceptual Framework,	10
Objectives & Methodology and	10
Implications & Conclusions	15

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REHABILITATION PSYCHOLOGY

Course Code: PSY4404 **Credit Unit: 03**

Course Objective:
Objective of this course is to learn profession of Rehabilitation Psychology, Psychological Assessment of persons with disabilities, Psychological Interventions and dealing with families

Course Contents:
Module I:
Overview of the profession of Rehabilitation Psychology and practice, history, growth and scope, Role of Psychologist in Rehabilitation

Module II:
Psychological Assessment- Assessment of Cognition, aptitudes, psychopathology, work/vocational and daily functioning

Module III:
Health behavior: Theories of health behavior change, interventions strategies for individuals and families of disabled
Behaviour Modification and Cognitive Therapies in Rehabilitation

Module IV:
Dealing with Families- Family's reactions to disabilities, coping styles, family counseling, Coordination with Multidisciplinary team

Module V:
Community Based Rehabilitation – Goals of CBR, components of CBR, Role of Professionals, role of Community, Ethical Issues

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Text & References:
Text:

- NIMH (1989) Mental Retardation : A Manual for Psychologist, Secundrabad
- Mohapatra C.S. (2004) Disability Management, NIMH, Secundrabad
- Robert G. Frank Timothy R.Elliott (2000). Handbook of Rehabilitation Psychology, APA Washington.
- Michael Brnes Anthony Ward (2009) Oxford Handbook of Rehabilitation Medicine

References:

- Peshawaria R. and Venkatesan (1992) Behavioural Approach in Teaching Mentally Retarded Children, NIMH, Secundrabad
- WHO (2004) Community Based Rehabilitation
- Tally A.B, Sivaraman K.P and Murali T(1998) Neurorehabilitaion Principles &practice, NIMHANS Bangalore India

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CHILDHOOD PATHOLOGY AND EXCEPTIONAL CHILDREN

Course Code: PSY4405 **Credit Unit: 03**

Course Objective:
Objective of this course is to learn various categories of exceptionality, early identification, special and mainstream education

Course Contents:
Module I:
Developmental Disorders- Autism Spectrum Disorders, attention deficit hyperactivity disorder, Mental Retardation, Learning Disabilities, Hearing Impairment, Disability of Locomotion

Module II:
Bipolar disorder in children, conduct disorder, emotional disorders, eating disorders, enuresis
Psychological Assessment of Childhood disorders

Module III:
Special Education: Special Schools and Rehabilitation centres
Mainstreaming: assistive devices, adaptation, barrier free environment
Mainstreaming: Attitudinal change- teachers, non disabled students, Parents and Community

Module IV:
National Institutes in the field of disability: NIMH, NIVH, NIOH, AYJNIHH, NIEPMD, SVNIRTAR, Alimbco.
NGOs, Parent Organizations, Advocacy organization

Module V:
Legislative framework: Mental Health Act, RCI Act, Persons with Disability Act, National Trust Act, UNCRPD

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

Text & References:
Text:

- Hallahan D.P. and Kauffman J.M. (1980) Exceptional Children, Prentice Hall
- Cratty B.J. and Goldman R.L. (1995) Learning Disabilities: Contemporary Viewpoints, Harwood Academic Publishers
- Cruschank, W.M. (1975). Psychology of Exceptional Children and Youth, Englewood Cliffs N.J.: Prentice Hall

References:

- Rao, T.A.S. (1992) Manual on Developing Communication Skills in Mentally Retarded Persons, NIMH, Secundrabad
- National Trust, Govt. of India, Handbook for Teachers
- NIMH (1989) Mental Retardation : A Manual for Psychologist, Secundrabad
- Peshawaria R. and Venkatesan (1992) Behavioural Approach in Teaching Mentally Retarded Children, NIMH, Secundrabad

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PSYCHOTHERAPEUTIC INTERVENTION IN CLINICAL SETTING

Course Code: PSY4406 **Credit Unit: 03**

Course Objective:
To equip students with the basic understanding of various types of therapies and their implications in different clinical settings

Course Contents

Module I: Introduction
Psychotherapy Overview of historical developments and current trends in psychotherapy, issues related to consent (assent in case of minors), planning and recording of counseling session; and setting goals; pre and post assessment, interviewing: objectives of interview, structured and unstructured interview, open and close ended questions, clarification, reflection, facilitation and confrontation, silences in interviews.

Module II: Behavior Therapy
Origin, Foundations; Principles and Methodologies, behavioral assessment, formulation and behavioral goals Systematic desensitization (in vivo and in vitro); Extinction: Flooding and Response Prevention, Implosion, Covert Sensitization, Negative Practice and stimulus satiation. Skill training: Assertiveness Training; Modeling; Behavioral Rehearsal. Operant procedures: Token economy, Contingency management. JPMR and Biofeedback

Module III: Cognitive Therapy
Cognitive behavior therapy: Cognitive model; automatic negative thoughts, schemas principles and assumptions, technique: Ellis's Rational Emotive Behavior Therapy (REBT) and Beck's cognitive therapy, dialectical behavior therapy

Module IV: Therapy in Special Condition
Chronic mental illness, Substance Abuse, Learning Disabilities and Mental retardation and such other conditions, where integrative/eclectic approach is the basis of clinical intervention

Module V: Biomedical Therapy
Electro-convulsive therapy, Drug therapy-Antipsychotic drugs, Anti depressant drugs and Anti anxiety drugs

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

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Text & References:

Text:

- An introduction to the Psychotherapies, 3rd edition, bLoch, S (2000) Oxford Medical Publications.
- Encyclopedia of Psychotherapy, vol. 1 and 2, Hersen M & Sledge W. (2002). USA.
- Techiniques of Psychotherapy, 4th edition, Parts 1 & 2, Wolberg, L.R. Grune and Stratton: NY.
- Theories of Psychotherapy and Counselling, 2nd edition, Sharf, R.S. (2000). Brooks/Cole; USA.

References:

- Bellack, A.S. & Hersen, M., (1998). Comprehensive Clinical Psychology, Vol., Elsiever Science Ltd.: Great Britain.
- Cognitive Behavior Therapy for Psychiatric Disorders. A Practical Guide, Hawton, K. Salkovskis, P.M., Kirk, J and Clark, D.M. (1989) Oxford University Press.

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DIFFERENTIAL DIAGNOSTIC TECHNIQUES

Course Code: PSY4407 **Credit Unit: 03**

Course Objective:
Enable students to selecting an appropriate test for a particular purpose, administration, scoring and interpreting psychological test profile in clinical settings

Course Contents

Module I: Introduction
Case history; mental status examination; rationale of psychological test; behavioral observation, response recording and syntheses of information from different sources; formats of report writing, context of clinical assessment, types of referrals, ethical practice of assessment, selecting psychological tests.

Module II: Assessment of Cognitive Functions
Bender gestalt test, PGI Memory scale; Bhatia's battery of performance tests of intelligence
Binet's test of intelligence, Wechsler adult intelligence scale

Module III: Test for Differential Diagnosis
Tests for diagnostic clarification: A) Rorschach psychodiagnostics, B) Tests for thought disorders – color form sorting test, object sorting test, proverbs test, C) Minnesota multiphasic personality inventory; Multiphasic questionnaire, clinical analysis questionnaire, IPDE, D) screening instruments such as GHQ, hospital anxiety/depression scale etc. to detect psychopathology.

Module IV: Tests for Adjustment and Personality Assessment
Questionnaires and Inventories – 16 personality factor questionnaire, NEO-5 personality inventory, temperament and character inventory, Eyesenk's personality inventory, Eysenck's personality questionnaire, self-concept and self esteem scales, Rottor's locus of control scale, Bell's adjustment inventory (students' and adults'), subjective well-being questionnaires, QOL
Projective tests – sentence completion test, picture frustration test, draw-a-person test; TAT – Murray's and Uma Chowdhary's

Module V: Therapy in Special Condition
Psychological assessment of children: A) Developmental psychopathology check list, CBCL, B) Administration, scoring and interpretation of tests of intelligence scale for children such as SFB, C- 42 RPM, Malin's WISC, Binet's tests, and developmental schedules (Gesell's, Illingworth's and other) Vineland social maturity scale.

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

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Text & References:

Text:

- Freeman, F.S. (1965). Theory and practice of psychological testing, Oxford and IHBN: New Delhi.
- Bellack, A.S. & Hersen, M (1998): Comprehensive Clinical Psychology: Assessment, Vol. 4. Elsiever Science Ltd.: Great Britain
- Exner, J.E. The Rorschach – A Comprehensive System, Vol. 1, 4th ed., John Wiley and sons: NY.
- Choudhary, U. An Indian modification of the Thematic Apperception Test. Shree Saraswathi Press: Calcutta

References:

- Hersen, M; Segal, D. L; Hilsenroth, M.J. (2004). Comprehensive handbook of psychological assessment, Vol. 1 & 2. John Wiley & Sons: USA
- Murray H.A. (1971): The Thematic Apperception Test manual, Harvard University Press.

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COMMUNITY PSYCHOLOGY AND INTERVENTION

Course Code: PSY4408 **Credit Units: 03**

Course Objective:
This course provides an introduction to the community psychology. Rehabilitation and human service system and professionally prepares the students for becoming rehabilitation counselors. It lays emphasis on the stands, approaches and contemporary issues related to community and rehabilitation psychology.

Course Contents

Module I: Rehabilitation
Case history; mental status examination; rationale of psychological test; behavioral observation, response recording and syntheses of information from different sources; formats of report writing, context of clinical assessment, types of referrals, ethical practice of assessment, selecting psychological tests

Module II: Health Behavior
Theories of Health Behavior Change, Interventions Strategies For Individuals And Families of Disabled, Models Of Therapeutic Education For Successful Rehabilitation

Module III: Community issues
Evaluation of community needs, rehabilitation in community, social counseling, training in daily living skills, community awareness raising and increasing community involvement, facilitating access to loans, vocational training, information for local self-help groups, contacts with different authorities, school enrolment **.**

Module IV: Psychotherapy in the Indian Context
Historical perspective in psychological healing practices from the Vedic period and the systems of Ayurveda and Yoga, contemporary perspectives; socio-cultural issues in the Indian context in practice of psychotherapy; ongoing research related to process and outcome.

Module V: Mental Health Policies of Government (National Mental Health Program, Mental Health Act)

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	8	10	7	5	70

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Text & References:

Text:

- Mann, A.P.; Community and Applications
- Rappaport, J.; Community Psychology: Values, Research and Action

Reference:

- Book, P. E.; Community Psychology Mental Health
- Kuppuswami, B.; An Introduction to Social Psychology
- Bates, A. P. & Julian, J.; Sociology— Understanding Social Behavior
- Broom, Leonard and Selzmick, Philip – A test with Adapted Readings
- Browning & Charles J.; Differential Impact of Family Disorganization on Male Adolescents in social problems.
- Burgers, E.W., and Lock, H.J.; 'The Family'
- Nimkoff, M.E. ;'The Family'
- Albert C. K.; Deviance and Control
- Gobbons, Don, C.; Deviant Behavior (2nd ed.)
- Jenkins, Richard L., "Motivation and Frustration in Delinquency" ; American Journal of Orthospsychiatry

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Master of Social Work (MSW)

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Curriculum & Scheme of Examination

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Master of Social Work (MSW)

BASICS OF SOCIAL WORK

Course Code: SCW4102 **Credit Units: 03**

Course Objective:

- To understand the concept of social work.
- To get acquainted with the approaches and ethics of social work.
- To understand the areas of social work.

Course Contents:

Module I: Concepts in Social Work and Social Work Practice

Objectives and Functions of Social Work; Methods of Social Work (Primary and Secondary methods of social work); Social Service; Social Services
Social Exclusion (marginalization, exploitation, oppression); Empowerment
Social Development, Social Change, Social Action, Social Activism
Human rights and Human Rights Perspective

Module II: Approaches

The Concept of Social Welfare; Welfare approach,
Remedial and Therapeutic Approach,
Social Development Approach
Conflict Oriented Approach

Module III: **The Profession of Social Work**

The Basic Values and Principles of Professional Social Work
Religious, Political and Utilitarian Values
Code of professional ethic
Professional status of Social work in India

Module IV: **Fields of Social Work**

Family & Child Welfare;
Women Centric Practice
Medical and Psychiatric Social Work
Criminology and Correctional Work

Module V: HRD and HRM

Social Welfare Administration
Urban and Rural Community Development;
Dalit and Tribal Community Organization
Livelihoods and Social Entrepreneurship

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

References

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- Yelaja, S. A. (1982). Ethical Issues in Social Work, Springfield, Charles, C. Thomas.

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WORK WITH INDIVIDUALS AND FAMILIES: SOCIAL CASE WORK

Course Code: SCW4103 **Credit Units: 03**

Course Objective:

- To be introduced to the method of working with individuals
- To understand the various contexts and the dimensions of issues and problems that individuals face and critically analyze them
- To be exposed to the approaches of social work practice with individuals
- To acquire the skills and techniques of working with individuals
- To comprehend the diversity of practice settings

Course Contents:

Module I: Social Casework as a Method of Social Work

Concept and Definition of Casework; Adjustment and maladjustment; Historical development of Social Casework; Influence of psychoanalysis on casework.

Principles of Social Casework Practice: Individualization, Acceptance, Non-judgmental Attitude, Participation, Relationship, Purposeful expression of feelings, Controlled emotional involvement, Client Self Determination, and Confidentiality

Components of Casework: Person- client, significant others and collaterals; Problem- need, impaired social functioning; Place- agency, objectives, functions, policies and resources; Process- Study, assessment, intervention, evaluation, follow-up, termination.

Skills and Techniques of working with individuals and families: Supportive, resource enhancement and Counselling, Knowledge of resources (networking)

Essential qualities in the caseworker: empathy, non-possessive warmth, genuineness.

Self as a professional: Conflicts and dilemmas in working with individuals and families.

Module II: Approaches and Models to understand clients and their contexts

Psycho Social Diagnostic approach (Richmond), Supportive and Modificatory Approach (Hamilton), Classified Treatment method (Floence Hollies)

Psychoanalytical, Functional approach

Problem solving approach (Perlman), Crisis intervention (Rappaport), Competence based approach (Elleen Grabrill), Empowerment approach

Family intervention, Person-in-Environment Model

Transactional Analysis, Holistic approach, Eclectic approach.

Module III: Case work tools

Listening, Communication Skills, Rapport Building.

Interview, Observation, Home visit, collateral contacts, referrals

Records: Nature, purpose and principles of recording. Types of Recording: narrative, process, problem oriented record keeping. Case history taking Use of case work records as tool of intervention. Subjective –objective assessment plan (SOAP). Modeling, role-playing and confrontation

Case presentation as tool of professional development. Developing self awareness, JoHari window, dealing with stress and burnout

Module IV: Casework Process

Phase 1 – Exploration of person in environment

Phase 2 - Multidimensional assessment and planning, multidimensional intervention

Phase 3 – Helping: implementing intervention and goal attainment

Phase 4 – Termination and evaluation, follow up

Case worker - client Relationship; characteristics of professional relationship: transference, counter transference and resistance; sustaining the relationship; obstacles in client - worker relationship.

Module V:Application of Method

Types of problems faced by Individuals and families; individual differences and needs; Primary and secondary settings

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Application of methods in family, women, and child welfare settings
Marriage Counselling centers
School settings
Medical and psychiatric settings
Correctional institutions and industry

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

References

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WORK WITH GROUPS: SOCIAL GROUP WORK

Course Code: SCW4104 **Credit Units: 03**

Course Objective:

- To understand of group work as a method of professional social work
- To learn theoretical approaches that inform group work practice.
- To gain insight into dimensions of group processes and group work practice
- To develop competencies for working with groups in diverse settings.

Course Contents:

Module I: Social groups and Group Work

Definition, Characteristics, and Importance Classification of Groups
Cooley, Sumner, MacIver & Page, Tosel and Rivas Theories of Group formation
Social Group Work – Concept, Historical development of Group Work, Values and Skills
Principles and Purpose of Group work

Module II: Theoretical approaches of group work practice

Psychoanalytic, Learning, Field, Social Exchange, Systems theories.
Stages of Group Development – Tuckman, Klien, Garland, Jones & Kolodny.
Models of social group work – Social goals, Remedial, Reciprocal models.
Programme development process, Programme Media.

Module III: Basic Group Processes

Sub-group, Group conflict, Group decision making,
Leadership in groups.
Group dynamics – Concept, and Areas – Communication and Interaction Patterns, Group Cohesion, Social Control Dynamics and Group Culture.

Module IV: Stages or Phases of Group work

Pre group formation, Beginning phase, Middle/Working phase and Termination phase, Follow up, Facilitation Skills and Techniques used in these Phases.

Module V: Group Work Practice in diverse settings

Disaster victims, Substance abusers, Alcohol Anonymous and elderly care – Role of group worker – Group psychotherapy, Group work Recording, Monitoring and Evaluation.

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

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RESEARCH METHODS IN SOCIAL WORK: QUANTITATIVE APPROACH

Course Code: SCW4105 **Credit Units: 03**

Course Objective:

- To develop an understanding about the scientific approach to human inquiry.
- To develop an appreciation of the value and approach in social work research in addressing problems in the field of professional practice.
- To develop attitudes and skills appropriate for social work research.
- To acquire the skills for data analyses and research writing

Course Contents:

Module I: Introduction

Meaning, purpose and Dimensions of Research, Paradigms of research: Quantitative and Qualitative Approaches; Types of variables; Levels of measurement

The main preoccupations of quantitative researchers: Measurement, Causality, Generalization, Replication.

Distinction between social research and social work research

Introduction to sampling, sampling error, types of probability sample, sample size, types of non-probability sampling

Module II: Analytic Techniques

Univariate analysis: Frequency tables, measures of central tendency, measures of dispersion

Bivariate analysis: Pearson's r, Spearman's rho

Inferential Analyses: measures of association, tests of significance (chi square, t-test,) analysis of variance (ANOVA)

Multivariate analysis: Regression; Factorial Ananlysis; Path Analysis

Module III: Social Work Research

Use of research in social work; Intervention research and practice based research, Difference between social science research and social work research.

Types of social work research: need assessment studies, situational analysis, monitoring and evaluation, impact assessment, policy research

Steps in Social Work Research: identification of problem; need assessment; selection of research design; baseline study; intervention; assessment of intervention effects/impact; data editing and classification, data processing and analysis, report writing.

Module IV: Research Designs in Social Work Research

Scientific Social Surveys and field studies

Experimental study design, logic of experimentation, causation and control, randomization and matching internal validity

Types of experimental design (pre-experiment, true experiment, quasi experiment, external validity)

Other research approaches supportive to social work research: Action research; Participatory research

Module V: Scaling Techniques and Psychometric worth of data

Objective tests and scales; Difference between test, scale, questionnaire and inventory,

Scaling Techniques: Likert, Thurstone, Guttman.

Reliability: The concepts of variance in and stability and consistency of measures; the maxmincon principle; Internal reliability; Inter-observer consistency. Types of reliability

Validity: Concept; Relationship between reliability and validity; Types of validity

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE

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Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

References

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FIELD WORK PRACTICUM-I

Course Code: SCW4107 **Credit Units: 04**

Course Objective:
The emphasis is on-learning skills which revolve around specific tasks where cause-effect relationships are understood, where the persons have problems but they are more victims of their life circumstances rattier than of pathology for which great knowledge of psychological and social dynamics would be required and lower order of skills of intervention is required to be utilized. The processes dealt with at the individual, group or community is specific. Show dynamics but do not require unusual skills of intervention. Administrative tasks are also specific, e.g. planning and programming around a specific service.

The specific objectives of field-work in the first semester may include:
Development of the knowledge of:
(a) Socio-economic background and the living condition of tire vulnerable groups and the problems confronting them.
(b) Problem-solving techniques utilized in the specific area of work of the organization where student is placed.
(e) The use of simple research procedures and maintenance of scientific data to assess problems/needs/agency.

Development of skills in:
(a) Work with individuals, families, groups and communities and seeing the need for an integrated approach to problem solving.
(b) Selecting and utilization of community resources.
(c) Work as a member of a team with other professional anti own discipline to, plan, organise and implement projects, programmes with emphasis cm the use of the process in problem-assessment and problem solving.

Development of professional attitudes, conducive to work with individual families group and communities, leading gradually to an awareness of self as a professional person. Efforts will be made to work out objectives in each semester for every student in field practicum according to the nature and services of the agency and his performance will be evaluated accordingly.

Methodology
Each student will engage themselves in interaction and observation of social phenomenon and processes in a subject/ field of their choice. Student will then present their findings in the form of a paper for seminar discussions. Similarly, field work will be done by students in their area of interest and present their practical observations, as a report with analysis and suggestions.

Examination Scheme:

Field/Seminar Report :	40 marks
Viva-Voce :	30 marks
Internal Faculty and Interaction :	10 marks
Presentation/Daily Diary Report :	20 marks

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SOCIAL POLICY AND SOCIAL WELFARE ADMINISTRATION

Course Code: SCW4201 **Credit Units: 03**

Course Objective:

- To gain knowledge of policy analysis and the policy formulation process.
- To acquire skills in critical analysis of social policies and development plans.
- To develop an understanding of social policy in the perspective of national goals as stated in the Constitution, particularly with reference to Fundamental Rights and the Directive Principles of State Policy.
- To critically understand the concept, content and process of social development.
- To develop the capacity to identify linkages among social needs, problems, development issues and policies.
- To locate strategies and skills necessary for social development and reinforce values of social justice, gender justice and equality.

Course Contents:

Module I: Social Policy and Constitution

Concept of social policy, sectoral policies and social services. Relationship between social policy and social development. Values underlying social policy and planning based on the Constitutional provisions (i.e. the Directive Principles of State Policy and Fundamental Rights) and the Human Rights. Different models of social policy and their applicability to the Indian situation.

Module II: Sectoral Social Policies in India

Evolution of social policy in India in a historical perspective.
Implementation of different sectoral policies related to education, health, social welfare, women, children, welfare of backward classes, social security, housing, youth, population and family welfare, environment and ecology, urban, rural and tribal development, and poverty alleviation.

Module III: Social Planning

Concept and scope of social planning;
Goals of social development. The popular restricted view of planning for social services;
The wider view as inclusive of all sectoral planning to achieve social goals.
Indian planning in a historical perspective; The Constitutional position of planning in India.
The legal status of the Planning Commission; Coordination between Centre and State;
Need for decentralization; Panchayath Raj; People participation.

Module IV: Social Development

Concept of social development; Current debates about development;
Approaches to development; Social Development Index and Social Progress Index; Social capital; Social development, community and reciprocity; Sustainable and equal society; Importance and challenges of a developing society;
Social development strategy of empowering people by transforming institutions

Module V: Procedures in registering an organization and its administrative processes

Societies Registration Act, 1860, Indian Trust Act, 1882, The Companies Act, 1956. Administrative Structure – Memorandum of Association, Bye laws, Constitution, Deed, Functions and responsibilities of governing board, committees and office bearers. Administrative structure of social welfare at the Central, State and Local level – Programmes of Central Social Welfare Board and State Social Welfare Boards.

Administrative Processes: Planning, Organizing, Staffing, Directing, Coordinating, Reporting and Budgeting (POSDCORB) – Mobilization of financial resources - Grants in Aid – Foreign Contribution Regulation Act, 1976 – Exemption from Income tax – Administrative skills – Writing reports, letters and

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minutes of meetings – Project formulation, implementation, monitoring and evaluation.

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

References

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SOCIAL WORK WITH COMMUNITIES

Course Code: SCW4202 **Credit Units: 03**

Course Objective:

- To gain knowledge about the primary method of social work practice with communities.
- To understand the techniques and approaches of social work practice with communities.
- To acquire the skill of working with communities.

Course Contents:

Module I: Community organization

History, Concept, Principles, Assumptions and Objectives
Community Organization and Community Development
Process of community organization: Study and Survey, Analysis, Assessment, Discussion, Organization, Action, Reflection, Modification and Continuation.

Module II: Models of community organization

Locality development, social planning, social action
Skills in community organization: Communication, Training, Consultation, Publicrelations, resource mobilization, liaisoning.
Approaches to community organization; General content, Specific content and Process objective.

Module III: Methods of community organization

Awareness creation, Planning and Organizing, Education, Networking, Participation,
Leadership; Community organization with vulnerable communities; Migrants, Refugees,
Slum dwellers and transgender.

Module IV: Social Action in Community Organization

Concept, Purpose, Strategies and Tactics in Social Action
Social Action as a method of social work
Approaches to social action; Paulo Friere, Saul Alinsky, Mahatma Gandhi and Ambedkar.

Module V: Concept of advocacy as a tool

Strategy for advocacy: Campaigning, Lobbying, Use of media and public opinion building in advocacy
Coalition and Network building, linking up protest movement with development work.

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

References

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COMMUNITY ORGANIZATION AND SOCIAL ACTION

Course Code: SCW4204 **Credit Units: 03**

Course Objective:
To understand theory and practice of social work in community

Course Contents:
Module I: Community Work and Social Action
Definition of Community, Types of Communities. Difference between Rural and Urban Communities, Power Structure in the Community, Community Leaderships
Types of Community Leaders, Role of Community leaders in Community Development.

Module II: Strategies of Community Work and Social Action
Approaches to Community Work: Neighborhood Development, Systems and Radical, Politics and Community Work, Role of Community Organiser and Social Activist, Contemporary Social Action Interventions in India

Module III: Community Organization
Definition, Objectives, Community Organization as a Method of Social Work
Various approaches to Community Organization; General content approach, Specific content approach, Process content approach.
Community organization and Development

Module IV: Methods of Community Organization
Fact Finding, Planning, Group Decision Making, Conference and Committee Practice, Co-operative action negotiation, consultation, Methods of Conflict Resolutions, Resource Mobilization, Administration, Recording Evaluation, Skill required for Community Organization.

Module V: Application of Community Organization Methods
Application in Slums, Rural areas, during Flood, Famine and War.Community Organization for prompting Public Health and Family Welfare.

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

References

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RESEARCH METHODS IN SOCIAL WORK: QUALITATIVE APPROACH

Course Code: SCW4205 **Credit Units: 03**

Course Objective:

- To understand various styles of interpretation of qualitative data.
- To analyze the relative appropriateness of different analysis approaches for a particular qualitative study.
- To apply one or more analytic approaches to data they have been collected and write a report.
- To understand ethical issues for qualitative research.
- To manage qualitative data files effectively to ensure ease of use and participant confidentiality.
- To use the basic and intermediate functions of a computer software program for coding of textual data.

Course Contents:

Module I: Introduction

Differences between Qualitative and Quantitative research
Nature and traditions of qualitative research: Naturalism, Ethnomethodology, Emotionalism, Post-Modernism,
Deductive and Inductive approaches to data collection
Paradigmatic issues in Qualitative research

Module II: Qualitative Validity

Reliability and Validity: Types and procedures
Criteria for evaluating the worth of qualitative research: Credibility, Transferability, Dependability, Conformability. Triangulation
Collaborative Enquiry

Module III: Theoretical Background for Qualitative Research

Phenomenology: Realistic and Constitutive Phenomenology, Existential analysis,
Constructivism: Social constructivism and Psychological Constructivism
Metaphysics: Existentialism
Grounded theory: Goals and Perspectives, Methods: Axial coding and selective coding

Module IV: Methods of Data Collection

Interview: Purposes; Stages; Types: Structured, Semi-structured and Unstructured; Advantages and disadvantages associated with each; Interviewing Skills;
Focus group: Uses, recording and Transcription, size of groups, Limitations
Discourse analysis; Narrative analysis; Rhetorical analysis; Conversational analysis
Ethnography and participant Observation: Forms; Logistics; Advantages and disadvantages; Confidentiality; Taking and expanding field notes; Documenting; Being an effective participant observer
Documents as sources of data: Personal, Public, Organizational, Mass-Media, visual and virtual
Qualitative content analysis; mixed methods analysis

Module V: Use of Computers and Software

Qualitative Data Analysis (QDA) Softwares: Computer Assisted Qualitative Data Analysis Software (CAQDAS); MAXQDA
Defining Variables; Developing coding systems; Tabulating Data
Quantification in qualitative research: Thematic, Qausi-Quantification in qualitative research
Data Analysis and knowledge management

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Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

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SKILL BASED PROJECT

Course Code: SCW4206 **Credit Units: 01**

Course Objective:
The aim of the skill based project is to help learners acquire specific skills to deal with situations encountered during practice and acquire skills for intervention. It provides learner with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

These may be for problems/ concerns, issues or situations like work with alcoholics, HIV/AIDS affected persons, adolescents for life skills development, youth for leadership development and couples for marital relationship and enrichment work with elderly. The skill based project is primarily to enhance skills/ develop new skills for practice in specific situation, specific problems and issues.

Chapter Scheme and distribution of marks:

Chapter 1: Introduction – 10 marks
Chapter 2: Conceptual Framework/ National/International Scenario – 25 marks
Chapter 3: Presentation, Analysis & Findings -- 25 marks
Chapter 4: Conclusion & Recommendations -- 10 marks
Chapter 5: Bibliography -- 05 marks

Project Report Power Point Presentation & Viva

75 marks 25 marks

Components of a Project Report

The outcome of Project Work is the Project Report. A project report should have the following components:

1- Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.

2- Acknowledgement: Various organizations and individuals who might have provided assistance /cooperation during the process of carrying out the study.

3-Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.

4- Body of the Report: The body of the report should have these four logical divisions
a) ***Introduction:*** This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.
b) ***Conceptual Framework / National and International Scenario*****:** (relating to the topic of the Project).
c***) Presentation of Data, Analysis and Findings*****:** (using the tools and techniques mentioned in the methodology).
d) ***Conclusion and Recommendations:*** In this section, the concluding observations based on the main findings and suggestions are to be provided.

5- Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.

6- Annexures: Questionaires (if any) relevant reports etc.

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(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

The Steps of a Project Report

Step I: Selection of the topic for the project by taking following points into consideration:
Suitability of the topic.
Relevance of the topic.
Time available at the disposal.
Feasibility of data collection within the given time limit.
Challenges involved in the data collection (time & cost involved in the data collection, possibility ofgetting responses, etc.)

Step II: Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.

Step III: Collection of information and data relating to the topic and analysis of the same.

Step IV: Writing the report dividing it into suitable chapters, viz.,
Chapter 1: Introduction,
Chapter 2: Conceptual Framework / National & International Scenario.
Chapter 3: Analysis & Findings
Chapter 4: Conclusion and Recommendations.

Step V: The following documents are to be attached with the Final Project Report.
1) Approval letter from the supervisor (Annexure-IA)
2) Student's declaration (Annexure-IB)
3) Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for Evaluation:

- Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below.
- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bound.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate.

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FIELD WORK PRACTICUM-II

Course Code: SCW4207 **Credit Units: 04**

Course Objective:

The emphasis is on-learning skills which revolve around specific tasks where cause-effect relationships are understood, where the persons have problems but they are more victims of their life circumstances rattier than of pathology for which great knowledge of psychological and social dynamics would be required and lower order of skills of intervention is required to be utilized. The processes dealt with at the individual, group or community is specific. Show dynamics but do not require unusual skills of intervention. Administrative tasks are also specific, e.g. planning and programming around a specific service.

The specific objectives of field-work in the second semester may include:

1. Development of the knowledge of:
   (a) Socio-economic background and the living condition of tire vulnerable groups and the problems confronting them.
   (b) Problem-solving techniques utilized in the specific area of work of the organization where student is placed.
   (e) The use of simple research procedures and maintenance of scientific data to assess problems/needs/agency.

2. Development of skills in :
   (a) Work with individuals, families, groups and communities and seeing the need for an integrated approach to problem solving.
   (b) Selecting and utilization of community resources.
   (c) Work as a member of a team with other professional anti own discipline to, plan, organise and implement projects, programmes with emphasis cm the use of the process in problem-assessment and problem solving.

3. Development of professional attitudes, conducive to work with individual families group and communities, leading gradually to an awareness of self as a professional person.
   Efforts will be made to work out objectives in each semester for every student in field practicum according to the nature and services of the agency and his performance will be evaluated accordingly.

Methodology

Each student will engage themselves in interaction and observation of social phenomenon and processes in a subject/ field of their choice. Student will then present their findings in the form of a paper for seminar discussions. Similarly, field work will be done by students in their area of interest and present their practical observations, as a report with analysis and suggestions.

Examination Scheme:

Field/Seminar Report :	40 marks
Viva-Voce :	30 marks
Internal Faculty and Interaction :	10 marks
Presentation/Daily Diary Report :	20 marks

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SOCIAL JUSTICE AND EMPOWERMENT

Course Code: SCW4302 **Credit Units: 03**

Course Objective:

- To understand the concept of social justice and acquire information on the legal rights of people.
- To develop an understanding of the legal system and get acquainted with the process of the legal system with emphasis on functioning in India.
- To understand the role of the police, prosecution, judiciary and correction.
- To gain insight into the problems faced by the people belonging to different strata of society, in interacting with this system.
- To develop an understanding of the processes and problems of public interest litigation and legal aid to marginalized.

Course Contents:

Module I: Social Justice

Meaning and Concept; Social legislation: Definitions and concept. Social justice as an essential basis of social legislations; Social legislations in a welfare state with special reference to India.

Rights: Concept and definitions; Types of Rights; Rights of women and children; Rights of Scheduled Castes and Scheduled Tribes; Rights of accused and offender under Constitution of India, Indian Penal Code and Criminal Procedure Code.

Module II: Division of Law

Substantive Law and Procedural Law. Legislations pertaining to Social Institutions: Marriage, divorce, maintenance of spouse, adoption.

Legislations for prevention of Crime and Deviance: Indian Penal Code (relevant chapters on Offences against Public Tranquility, Public Health, Safety, Convenience, Decency and Morals, Offences relating to Religion, Offences affecting the Human Body, Offences relating to Marriage and Cruelty).

Legislations pertaining to women

Module III: Criminal Justice System in India

Objectives of Criminal Justice System.

Police: Structure, powers and functions and their role in maintaining of peace and order in the society.

Prosecution: Meaning, structure and role in criminal justice; Trial participation.

Administration of criminal justice system; Understaffed police and judiciary, and lack of political will as ailments of criminal justice system in India

Module IV: Judicial System in India

Constitution of Supreme Court and High Court: Powers and functions.

District and Subordinate Courts: District Sessions Court, Magistrate Courts, Family Courts, Tribunals, Fast Track Courts, Lok Adalats.

Salient features of judicial system in India.

Judicialactivism.

Module-V: Correction and Correctional Laws

Corrective measures as per Criminal Procedure Code, Probation of Offenders Act, Juvenile Justice (Care and Protection of Children) Act. Legal Aid: Concept of legal-aid, history of legal-aid, persons needing legal-aid, legal-aid schemes.

Public Interest Litigation: Meaning, Concept, Process and Problems.

Right to Information Act- Provisions and implementation.

Role of Social Worker: Social Work intervention, need, methods.

Examination Scheme

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Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

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COMMUNICATION AND COUNSELLING

Course Code: SCW4303 **Credit Units: 03**

Course Objective:

- To understand the meaning and importance of communication in day-to-day life.
- To identify salient features of effective interpersonal communication and interviewing.
- To develop holistic understanding of Counselling as a tool for help.
- To acquire knowledge of various approaches: their theoretical under-pinnings for goals, values, processes and techniques.
- To develop and practice skills of communication and interviewing and applying it in real life situations.

Course Content:

Module I: Communication: Meaning and importance

Basics of Communication: Process, components, types Verbal and nonverbal communication; Interpersonal and Interpersonal communication; Education and communication for national development.

Interviewing: Objectives, principles of interviewing, interviewing skills: listening, reflection, questioning, confronting.

Formal verbal communication in seminars, conferences, lectures, group discussion, panel discussion, symposium, workshop, role playing, simulation exercises

Written communication: reports, letters, e mails, article/essay, project report.

Module II: Visual aids in communication

Posters, notice boards, flip charts, charts, flash cards, photographs, pamphlets, slide shows.

Mass Communication: Television, exhibition, newspapers and magazines, advertisements, radio, film, VCD/ DVD, social media and internet.

Impact of mass communication on society, family, marriage and child development.

Communication Analysis and Planning: Planning and executing a communication campaign on an issue using various methods of communication.

Module III: Counselling

Nature, goals and areas of counselling; ethics in counselling; cultural sensitivity in counselling; intentional Counselling and interviewing.

Counselling Situations: Developmental, preventive, educative, facilitative.

Process and stages of Counselling; Qualities of an effective counselor: Empathy, genuineness and non-possessive warmth

Counselling Skills: Building rapport, mind skills, feeling skills, relationship skills.

Module IV: Approaches to Counselling

Rogers Person-centeredApproach

Beck's Cognitive Therapy; Ellis' Ratioal Emotive Behaviour Therapy

Behaviour Counselling and Therapy: common principles, methods based on classical conditioning, methods based on instrumental conditioning

Gestalt Therapy: assumptions, games and exercises; Existential approaches

Eclectic model; Indigenous Approach: Mindfulness, meditation, yoga, philosophy of *Nishkam Karma* and Non-Doer.

Module V: Group and Relational Approaches

Couple and Family Counselling: Issues related to dysfunctional communication, roles and boundaries in the family; Intervention strategies

Group Counselling: Process, advantages and disadvantages

Counselling in family Counselling centers, family courts, counselling bureau, vocational Counselling centers, mental health centers, child guidance clinics, correctional institutions, de-addiction and rehabilitation center, educational institutions.

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Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
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References

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FIELD WORK PRACTICUM-III

Course Code: SCW4304 **Credit Units: 04**

Course Objective:

The emphasis is on-learning skills which revolve around specific tasks where cause-effect relationships are understood, where the persons have problems but they are more victims of their life circumstances rattier than of pathology for which great knowledge of psychological and social dynamics would be required and lower order of skills of intervention is required to be utilized. The processes dealt with at the individual, group or community is specific. Show dynamics but do not require unusual skills of intervention. Administrative tasks are also specific, e.g. planning and programming around a specific service.

The specific objectives of field-work in the third semester may include:

1. Development of the knowledge of:
   (a) Socio-economic background and the living condition of tire vulnerable groups and the problems confronting them.
   (b) Problem-solving techniques utilized in the specific area of work of the organization where student is placed.
   (e) The use of simple research procedures and maintenance of scientific data to assess problems/needs/agency.

2. Development of skills in :
   (a) Work with individuals, families, groups and communities and seeing the need for an integrated approach to problem solving.
   (b) Selecting and utilization of community resources.
   (c) Work as a member of a team with other professional anti own discipline to, plan, organise and implement projects, programmes with emphasis cm the use of the process in problem-assessment and problem solving.

3. Development of professional attitudes, conducive to work with individual families group and communities, leading gradually to an awareness of self as a professional person.

Efforts will be made to work out objectives in each semester for every student in field practicum according to the nature and services of the agency and his performance will be evaluated accordingly.

Methodology

Each student will engage themselves in interaction and observation of social phenomenon and processes in a subject/ field of their choice. Student will then present their findings in the form of a paper for seminar discussions. Similarly, field work will be done by students in their area of interest and present their practical observations, as a report with analysis and suggestions.

Examination Scheme:

Field/Seminar Report :	40 marks
Viva-Voce :	30 marks
Internal Faculty and Interaction :	10 marks
Presentation/Daily Diary Report :	20 marks

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SUMMER INTERNSHIP EVALUATION

Course Code: SCW4335 **Credit Units: 06**

GUIDELINES FOR INTERNSHIP FILE AND INTERNSHIP REPORT

(These guidelines will be useful for undertaking an internship programme during the summer or at any other time wherein the student/ researcher works full time with a company/organization)

There are certain phases of every Intern's professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship programme can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal class room situations. These attributes are intellectual ability, professional judgment and decision making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc.
In order to achieve these objectives, each student will maintain and submit a file (**Internship File**) and a report (**Internship Report**).

INTERNSHIP FILE
The Internship File aims to encourage students to keep a personal record of their learning and achievements throughout the Programme. It can be used as the basis for lifelong learning and for job applications. ***Item scan be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development.***

The File will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and his/her own personal contribution to the organization.

The File is essentially a comprehensive documentation of how one proceeds while working on the assignment and should be regularly checked by the faculty guide/ supervisor, issues discussed with the students, doubts if any clarified and signed as having done so. This will form the basis of **continuous evaluation** of the project.

The File will include ***five sections*** in the order described below.

1. **The Title Page –** An Internship Experience Report For (Your Name), name of internship organization, name of the Supervisor/Guide and his/her designation, date started and completed, and number of credits for which the report is submitted.
2. **Table of Content –** An outline of the contents of the file by topics and subtopics with the page number and location of each section.
3. **Introduction** – Short, but should include how and why you obtained the internship experience position and the relationship it has to your academic/professional and career goals.
4. **Main Body** – Should include a brief summary/ executive summary of the **Internship Project Report** that the student has worked on, an **analysis of the company/organization** in which the student is working, a **personal review** of the student's management skills and how they have been developed through the programme, the daily tasks performed, major projects contributed to, dates and hours spent on a task, observations and feelings, meetings attended and their purposes, listing of tools and materials and their suppliers, and photographs if possible of projects, buildings and co-workers.
5.**Appendices -** Include pamphlets, forms, charts, brochures, technical and descriptive literature, graphs and other information related to your Internship experience.

INTERNSHIP REPORT
The **Internship Report** is the research report that the student has to prepare on the project assigned by the organization. (Incase a student is not assigned a specific research project in the organization, he has to selectany one aspect of the organization and prepare a research report on it).The

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lay out of the report should be as per the standard layout prescribed by the organization wherein the student undertakes the Internship. In case, there is no layout prescribed by the organization the following components should be included in the report:

- **Title or Cover Page**.
  The title page should contain Project Title; Student's Name; Programme; Year and Semester and Name of the Faculty Guide.
- **Acknowledgements**.
  Acknowledgment to any advisory or financial assistance received in the course of work may be given. It is incomplete without student's signature.
- **Abstract**
  A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project. It should not exceed more than 1000 words.
- **Table of Contents**
  Titles and subtitles are to correspond exactly with those in the text.
- **Introduction**
  Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.
- **Materials and Methods**
  This section should aim at experimental designs, materials used (wherever applicable). Methodology should be mentioned in details including modifications undertaken, if any. It includes organization site(s), sample, instruments used with its validation, procedures followed and precautions.
- **Results and Discussion**
  Present results, discuss and compare these with those from other workers, etc. In writing this section, emphasis should be laid on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

  Note that in writing the various sections, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary, do not write in "point" form.

  While presenting the results, write at length about the the various statistical tools used in the data interpretation. The result interpretation should be simple but full of data and statistical analysis. This data interpretation should be in congruence with the written objectives and the inferences should be drawn on data and not on impression. Avoid writing straight forward conclusion rather, it should lead to generalization of data on the chosen sample.

  Results and its discussion should be supporting/contradicting with the previous research work in the given area. Usually one should not use more than two researches in either case of supporing or contradicting the present case of research.

- **Conclusion(s) & Recommendations**
  A conclusion should be the final section in which the outcome of the work is mentioned briefly. Check that your work answers the following questions:
  - Did the research project meet its aims (check back to introduction for stated aims)?
  - What are the main findings of the research?
  - Are there any recommendations?
  - Do you have any conclusion on the research process itself?

- **Implications for Future Research**
  This should bring out further prospects for the study either thrown open by the present work or with the purpose of making it more comprehensive.

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- **Appendices**
  The Appendices contain material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

- **References**
  References should include papers, books etc. referred to in the body of the report. These should be written in the alphabetical order of the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

The Layout Guidelines for the Internship File & Internship Report:

- A4 size Paper Font: Arial (10 points) or Times New Roman (12 points)
- Line spacing: 1.5
- Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

Assessment Scheme:

Continuous Evaluation:
(based on Internship File and the observations of the faculty guide/ supervisor) 30%

Feedback from Company/ Organization: 10%

Final Evaluation:
(Based on Internship Report, Viva/ Presentation) 60%

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HUMAN RESOURCE DEVELOPMENT AND EMPLOYEE WELLNESS

Course Code: SCW4305 **Credit Units: 03**

Course Objective:

- To develop multi facets of the personality and to build self confidence. To develop a spirit of continuous learning and innovation.
- To strengthen the competency base of individuals, teams and organization and also familar with the organizational culture.
- To understand and further the organization culture.
- To appreciate the importance of bottom-line focus to the Human Resource function and trend toward HR Accountability.
- To understand the various approaches to and techniques of measuring HR issues.
- To create awareness of different types of information systems in an organization so as to enable the use of computer resources efficiently, for effective decision- making.

Course Content:

Module I: Human Resource Development (HRD)

Concept, origin and needs for HRD; Overview of HRD as a Total system; Approaches to HRD; human capital approach; social psychology approach and poverty alleviation approach
HRD and its dimension
Competency Mapping.

Module II: HRD Interventions

Performance Measurement Systems: Fundamental issues. Feedback sessions.
Organizational goal setting process, Key Result Area (KRA) and Key Performance Indicator (KPI),Coaching, Mentoring, career planning, career development, reward system, quality of work life.
HRIS: Computers and computer based Information Systems. Measuring HR: Changing role of HR, HR as a strategic partner, the need for measuring HR.
Approaches to measuring HR: Competitive Benchmarking, HR Accounting, HR Auditing, HR Effectiveness Index, HR Key Indicators, HR MBO (Management by Objectives).

Module III: Instructional Technology

Learning and HRD; Building Learning Organization; Learning as intellectual capital, Measuring learning
Architecting a learning organization, Organizational Learning, models and curriculum
Factors and principles of learning; group and individual learning; HRD trends; Behavioural Sciences; Transactional Analysis Concepts of continuous learning, Behaviour modeling and self-directed learning
Evaluating the HRD effort: Data gathering; analysis and feedback; HRD experience in Indian organizations; future of HRD - Organization culture and development.

Module IV: Talent Development

Concept and importance; Training Need Analysis, process of training, designing and evaluating training and development programs. Use of information technology, Types and Methods of Training: Training within industry (TWI), External training: on and off the job; Training methods; lecture, incident process, role play, structured and unstructured discussion, in-basket exercise, simulation, vestibule, training, management games, case study, programmed instruction, team development, and sensitivity training;
Review of training programs.

Module V: Employee Wellness

Concept, philosophy, principles and scope; Importance and relevance of wellness programs, Role of Welfare Officer as per the Factories Act 1948. Relevance - with reference to Accidents, Absenteeism, Alcoholism, Domestic Violence: Preventive and remedial measures. Employee Counselling. Role of Counselor in Organizations. Corporate Social Responsibility (CSR): CSR as a business strategy.
Environmental management systems ISO 14001, ISO 26000:

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Social responsibility guidance standard, environmental impact assessment.

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

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MENTAL HEALTH AND PSYCHIATRIC SOCIAL WORK

Course Code: SCW4306 **Credit Units: 03**

Course Objective:

- Understand the concepts of mental health and mental illness.
- Understand the signs and symptoms, etiology, diagnosis and treatment of mental health problems.
- Understand different services for the care of mentally ill.
- Understand historical background of psychiatric social work in India and abroad.
- Understand the nature of psychiatric social work services and relevance of team work.
- Understand the nature of collaboration with voluntary organizations for the welfare of mentally ill.
- Identify the issues related to psychiatric social work department in hospitals and community mental health settings.

Course Contents:

Module I: Mental Health

Concept of health and illness; WHO's definition of Health; Mental health and mental illness; Deficit and competence based models of mental health; Classification of Mental Disorders: International Classification of Mental Disorders (ICD) and Diagnostic ans Statistical Manual of Mental Disorders (DSM) – 5.

Symptoms, etiology, diagnosis, prognosis and management of –Neuroses, Psychoses, Psycho physiologic disorders, Personality disorders, Psychiatric disturbances in children and adolescents, Organic psychotic conditions, Mental retardation.

Module II: Introduction to Psychiatric Social Work

Meaning and Scope: Historical background of psychiatric social work in India and abroad; Reasons for its development as a specialty.

Application of social work methods and other related techniques used in the field

Multi-disciplinary approach and team work in mental health care Problems of hospitalization; Impact of mental illness on the patient, family and community.

Module III: Practice of Social Work

Importance of home visit and visit to the place of work

Role of family in the treatment of mentally ill

Preparing the family and community for the return of the affected individual

Follow-up

Module IV: Care of mentally ill:

Day-care centre, night-care centre, half-way-home, sheltered workshop, Occupational therapy units;

Role of voluntary organizations, governmental-agencies and paraprofessionals in the welfare of mentally ill.

Role of social worker in mental health centers, departments of psychiatry, general hospitals, child guidance clinics, community mental health units, correctional institutions, industries, and family welfare centers.

Role of social worker in the management of substance abuse. Educational avenues in psychiatric social work; Research avenue in the field of mental health for social workers.

Module V: Organization of psychiatric social work

Psychiatric Departments: Functions and collaboration with other departments.

Community mental health and social work, NMHP, Innovations like Satellite clinics, district mental health programme etc.

Rehabilitation and Acts: Occupational therapy - Principles and practice - Psychosocial rehabilitation.

Mental Health Act, 1987.

The Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995.

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Weightage (%)	7	10	8	5	70

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EE: End Semester Examination

References

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SOCIAL WORK WITH FAMILIES AND CHILDREN

Course Code: SCW4307 **Credit Units: 03**

Course Objective:

- To strengthen the professional competence of Social work Practice with families and children.
- To gain understanding of type of practice settings working with families and children.
- To understand the role of the profession and the stakeholders in the welfare of families and children.

Course Content:

Module I: Social Work with Families and Children

Working effectively with children and families, Values and Ethics in social work with children and families, Family as a Client System, Strengthening Family structure and Communication.

Module II: Process of Intervention

Social Worker-client relationship, Social Study, Assessment, Goal Setting, Contracting, Intervention; Development of practice skills: Conceptual skills, Interviewing skills – Informational interview, Diagnostic/Assessment interview, Therapeutic Interview, Recording skills, Evaluation.

Module III: Social Work Practice in different settings

Social Work interventions for children in different settings: school settings, correctional settings, institutionalized children, community based interventions, children in care and protection, adoption centres, street children, children abusing substances, children in clinical settings, Social work interventions for families in different settings: Family Counselling centres, short stay, Respite care, Destitute homes, Clinical settings.

Module IV: Role of the Social Worker

Role of the Social Worker while working with children and families**:** Case worker, Group Facilitator, Community Organizer, Case Manager, Enabler, Reformer, Project Manager, Researcher, Activist, Advocacy and Lobbying, Sensitisation, Campaigning, Social Audits, Trainer, Monitoring and Evaluation, Documentation, Fund Raising, Resource Mobilisation, Policy Planning, Catalyst, Change maker, Role Model, Community Organiser, Coordinator, Enabler, Reformer, Facilitator, Volunteer

Module V: Stakeholder's Participation

State, Global Community, NGO's, Institutions of National Importance, Judiciary, Bureaucrats, Policy Makers, Social Activist, Educational Institutions, PRI's, Self Help Groups, Community Leaders, Religious Institutions, Gram Panchayats, Police, Health Workers, Grassroot Level workers, Anganwadi Workers, ASHA's, Donors, Volunteers, Youth, Civil Society Organisation, Community Based Organisations.

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

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EE: End Semester Examination

References

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CORRECTIONAL ADMINISTRATION AND SERVICES

Course Code: SCW4308 **Credit Units: 03**

Course Objective:

- To acquaint with the correctional institution and non-institutional programmes.
- To understand the different services for juvenile, young and adults offenders and also to understand the legal provisions and procedures for their assistance.
- To understand the role of custodial staff in the process of correction and rehabilitation.
- To understand the structure, function, treatment and facilities provided by the institutions.

Course Content:

Module I: Institutional systems
Introduction to correctional administration. History of Correctional Administration in India: Concept, objectives and functions of Correctional administration.
Institutional protection for children and young offenders: Juvenile Justice (Care and Protection of Children) Act -2002, 2005.
Observation Home, Juvenile Homes for Boys and Girls and their functions. District Shelter for boys and girls and their functions.

Module II: Institutional Treatment for Released Offenders and Convicts
Prison: Historical development of prison system; Indian Prison Act, Prison Manual (Haryana).
Prison administration, prison Labour, prison discipline and prison education; Pre-release programs; Prisoners' Welfare Board.
Open-air prison: Historical development of open-air prison system, organization and administration.

Module III: Non-institutional systems
Probation: Historical development of probation system, principles and procedure.
Parole: Historical development of parole; functions and powers of Parole Board; Conditions under the Prison Manual. Indian Penal Code, provisions on Parole.
Pre-release preparation of the parolee

Module IV: After care services
Legal provision for establishing social institution.
Provision for assistance to released prisoners: Role of voluntary organization, corporate bodies and the state in the rehabilitation.
Prevention of Immoral Traffic Act: Its objectives; State Home for Women (Sthrinikethana)
Citizen committees, Police help-line.

Module V: Social work intervention
Scope of social work intervention in prisons.
Role of social worker in the prison administration.
Social work practice in correctional services: Nature, scope and challenges
Comprehensive assessments: of offenders, their families, and communities to identify offenders' needs, strengths, ability to cope and any support networks they may require.
A career in social work at correctional services

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
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MANAGEMENT OF DEVELOPMENT AND WELFARE SERVICES

Course Code: SCW4310 **Credit Units: 03**

Course Objective:

- To understand the overall environment and its impact on the nature, structure and development of organizations in corporate, public and voluntary sectors in the context of social work profession.
- To understand policies and procedures involved in establishing and maintaining human service organizations.
- To acquire skills to network and participate in the management of resources human, material and environmental.
- To develop skills to participate in management of programmes, as a part of the inter-disciplinary team and initiate as well as develop new programmes.
- To develop ability to analyze the practices applied in specific settings.

Course Contents:

Module I: Social Services

Need for welfare and developmental organisations, Factors determining social welfare programmes, Development and Welfare organizations' response to societal needs; role of state, voluntary and corporate sector. Management services: Types of settings, organizational characteristics like origin, nature, size, structure, and design, organizational climate and impact of sociopolitical environment.
Management process: Vision, Planning, Organizing, Directing, Staffing, Coordination, Reporting, Budgeting. Establishment: Registration, different types of legislations, legal status, constitution, rules and procedure, goals - Financial resources: Organizational Budget, Sources of finance, Fund Raising, Records, Audit.

Module II: Physical Structure and Infrastructure

All activities related to acquiring, hiring and maintaining importable structure and infrastructure, maintenance of premises and daily upkeep. Enhancing the involvement and the potential of people in organization's executive boards, committees; professionals and other staff-relationship, communication, team work, and facilitating team building, supervision, and participation in training.

Module III: Programme Development

Programme management: long term, short term, and Documentation. Project proposals based on felt-needs, nature of resources, eligibility criteria, records, evaluation and research.
Impact analysis - Qualitative and quantitative

Module IV: Public Relations

Public relations need and its promotion by all in the organisation. Representing the organization, networking, public, corporate and voluntary sector, resource building, accountability, transparency, use of media for publicity.

Module V: Change and its Management

Understand and manage change, innovation in a rapidly changing social environment: for policy programmes and structure. Organizational understanding: Conflict, conflict resolution, creating positive climate.

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
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HUMAN RIGHTS AND SOCIAL WORK PRACTICE

Course Code: SCW4401 **Credit Units: 03**

Course Content:

Module I: Human Rights

Definition and Classification

Civil and Political Rights, Socio Economic and Cultural Rights. Universal Declaration of Human Rights

Similarities and Differences between Human Rights and Fundamental Rights

Module II: Human Rights Acts and Institutions

Indian Constitution and Relevant Articles relating to HR. The protection of Human Rights Act 1993. Structure and Function of National Human Rights Institutions National HR Commissions National SC/ST Commissions National commission for Women National commission for Minorities State Human Rights Institutions State HR commissions State commission for women State commission for Minorities.

Module III: Human Rights in the Context of Specific Population

SC/ST, Religious Minorities

Physical, Visual and Mentally Handicapped.

HIV/AIDS victims

Refugees, War victims

Prisoners, Custodial Violence,

Women and Children, Senior Citizens

Work situations

Module IV: Social Policy

Definition, need, evolution and constitutional base; Sources and instrument of social policy.

Social Planning and Social Development: Meaning of social planning, community planning and community participation. Planning machineries at the State and National levels

Five year plans and Social development; Concept and indicators; social change and social development in India.

Module V: Social Legislations

Salient Features of Child Labour Act, Right To Information Act, Suppression of Immoral Traffic Act and Prevention of Immoral Trafficking. Domestic Violence Act**.**

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
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References

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SOCIAL WORK WITH URBAN, RURAL AND TRIBAL COMMUNITIES

Course Code: SCW4403 **Credit Units: 03**

Course Objective:

- To develop an understanding of Urban, tribal and rural communities.
- To understand the characteristics and problems of urban, tribal and rural communities.
- To acquire knowledge about the contribution of Governmental and Nongovernmental Organisations to urban, tribal and rural development.
- To develop an understanding of the functions of Panchayath Raj Institutions .Gain knowledge about the application of social work in tribal and rural development programmes.

Course Contents:

Module I: Tribe in Relation to Caste and Nation

Nature and Characteristics of Primitive Cultures: Tribes in India and their ecological distribution.
Important tribal groups in India
Emerging Trends in Tribal Social Institutions: Family and Kinship Systems, Jati Structure, Economic Structure, Political organizations.
Characteristics of Tribal Society: Economic, Social, Political and Cultural Problems of Tribal Life.

Module II: Government Programs for Tribal Societies

Post Independence Programs and their Impact on Tribal Societies Programmes of Voluntary Agencies and their Impact on Tribal Societies.
Analysis and Assessment of Tribal Communities; Special Problems of the Tribals in a different areas.
Social Work Practice in Tribal Development: Community organization as a method of intervention, Participatory Rural Appraisal (PRA), Logical Framework Approach/Analysis (LFA), Scope of other techniques of intervention in tribal community development.

Module III: Rural Society and Poverty

Historical perspective: Dynamics in the village society; Caste/class relationships; Control and Power, Conflict and Integration. Poverty in the rural context; Nature and manifestations.
Analysis of Basic Problems: Issues faced by the rural poor such as Indebtedness, Bonded labour, Low wages, Unemployment, Underemployment, and other forms of exploitations.
Current Rural Development Programs in India: Council for the Advancement of People's Action and Rural Technology (CAPART) and other Rural Development Statutory Bodies. Panchayat Raj System in Indian states and its role in rural and tribal development.
Role of social worker in tribal and rural development programs.

Module IV: Perspectives on Urban Community Development

Urban Economy: Urban economy in the context of land, labor, capital, technology, and organizations.
Concept and Meaning of Development: Basic Elements and Dimensions with an Urban Focus.
Economic Development in the Urban Context: Industrialization and Employment generation Different service sectors.
Infrastructure facilities: Road, Energy and Finance
Development of cities: production, distribution and the present shift; Economics of local Government – Revenue and tax collection and distribution for Development.

Module V: Urban Development and Civic Administration

Growth of High-rise as well as slums; Slum–city relationship and its problems
Role of civic administration
Voluntary Organizations (NGOs) and urban dwellers
Role of law and town planning in urban development.

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Examination Scheme

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Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

References

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FIELD WORK PRACTICUM-IV

Course Code: SCW4404 **Credit Units: 03**

Course Objective:

The emphasis is on-learning skills which revolve around specific tasks where cause-effect relationships are understood, where the persons have problems but they are more victims of their life circumstances rattier than of pathology for which great knowledge of psychological and social dynamics would be required and lower order of skills of intervention is required to be utilized. The processes dealt with at the individual, group or community is specific. Show dynamics but do not require unusual skills of intervention. Administrative tasks are also specific, e.g. planning and programming around a specific service.

The specific objectives of field-work in the Fourth semester may include:

1. Development of the knowledge of:
   (a) Socio-economic background and the living condition of tire vulnerable groups and the problems confronting them.
   (b) Problem-solving techniques utilized in the specific area of work of the organization where student is placed.
   (e) The use of simple research procedures and maintenance of scientific data to assess problems/needs/agency.

2. Development of skills in :
   (a) Work with individuals, families, groups and communities and seeing the need for an integrated approach to problem solving.
   (b) Selecting and utilization of community resources.
   (c) Work as a member of a team with other professional anti own discipline to, plan, organise and implement projects, programmes with emphasis cm the use of the process in problem-assessment and problem solving.

3. Development of professional attitudes, conducive to work with individual families group and communities, leading gradually to an awareness of self as a professional person.

Efforts will be made to work out objectives in each semester for every student in field practicum according to the nature and services of the agency and his performance will be evaluated accordingly.

Methodology

Each student will engage themselves in interaction and observation of social phenomenon and processes in a subject/ field of their choice. Student will then present their findings in the form of a paper for seminar discussions. Similarly, field work will be done by students in their area of interest and present their practical observations, as a report with analysis and suggestions.

Examination Scheme:

Field/Seminar Report :	40 marks
Viva-Voce :	30 marks
Internal Faculty and Interaction :	10 marks
Presentation/Daily Diary Report :	20 marks

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DISSERTATION

Course Code: SCW4437 **Credit Units: 06**

GUIDELINES FOR DISSERTATION

The aim of the dissertation is to provide you with an opportunity to further your intellectual and personal development in your chosen field by undertaking a significant practical unit of activity, having an educational value at a level commensurate with the award of your degree The dissertation can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Selecting the Dissertation Topic

It is usual to give you some discretion in the choice of topic for the dissertation and the approach to be adopted. You will need to ensure that your dissertation is related to your field of specialization.

Deciding this is often the most difficult part of the dissertation process, and perhaps, you have been thinking of a topic for some time.

It is important to distinguish here between 'dissertation topic' and 'dissertation title'. The topic is the specific area that you wish to investigate. The title may not be decided until the dissertation has been written so as to reflect its content properly.

Few restrictions are placed on the choice of the topic. Normally we would expect it to be:

- relevant to business, defined broadly;
- related to one or more of the subjects or areas of study within the core program and specialisation stream;
- clearly focused so as to facilitate an in-depth approach, subject to the availability of adequate sources of;
- information and to your own knowledge; of value and interest to you and your personal and professional development.

Planning the Dissertation

This will entail following:

- Selecting a topic for investigation.
- Establishing the precise focus of your study by deciding on the aims and objectives of the dissertation, or formulating questions to be investigated. Consider very carefully what is worth investigating and its feasibility.
- Drawing up initial dissertation outlines considering the aims and objectives of the dissertation. Workout various stages of dissertation
- Devising a timetable to ensure that all stages of dissertation are completed in time. The timetable should include writing of the dissertation and regular meetings with your dissertation guide.

The Dissertation plan or outline

It is recommended that you should have a dissertation plan to guide you right from the outset. Essentially, the dissertation plan is an outline of what you intend to do, chapter wise and therefore should reflect the aims and objectives of your dissertation.

There are several reasons for having a dissertation plan

- It provides a focus to your thoughts.
- It provides your faculty-guide with an opportunity, at an early stage of your work, to make constructive comments and help guide the direction of your research.
- The writing of a plan is the first formal stage of the writing process, and therefore helps build up your confidence.
- In many ways, the plan encourages you to come to terms with the reading, thinking and writing in a systematic and integrated way, with plenty of time left for changes.

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- Finally, the dissertation plan generally provides a revision point in the development of your dissertation report in order to allow appropriate changes in the scope and even direction of your work as it progresses.

Keeping records
This includes the following:

- Making a note of everything you read; including those discarded.
- Ensuring that when recording sources, author's name and initials, date of publication, title, place of publication and publisher are included. (You may consider starting a card index or database from the outset). Making an accurate note of all quotations at the time you read them.
- Make clear what is a direct a direct quotation and what is your paraphrase.

Dissertation format All students must follow the following rules in submitting their dissertation.

- Front page should provide title, author, Name of degree/diploma and the date of submission.
- Second page should be the table of contents giving page references for each chapter and section.
- The next page should be the table of appendices, graphs and tables giving titles and page references.
- Next to follow should be a synopsis or abstract of the dissertation (approximately 500 words) titled: **Executive Summary.**
- Next is the 'acknowledgements'.
- Chapter I should be a general introduction, giving the background to the dissertation, the objectives of the dissertation, the rationale for the dissertation, the plan, methodological issues and problems. The limitations of the dissertation should also be hinted in this chapter.
- Other chapters will constitute the body of the dissertation. The number of chapters and their sequence will usually vary depending on, among others, on a critical review of the previous relevant work relating to your major findings, a discussion of their implications, and conclusions, possibly with a suggestion of the direction of future research on the area.
- After this concluding chapter, you should give a list of all the references you have used. These should be cross - references with your text. For articles from journals, the following details are required e.g.

  Draper P and Pandyal K. 1991, The Investment Trust Discount Revisited, Journal of Business Finance and Accounting, Vol18, No6, Nov, pp 791-832.
  For books, the following details are required: Levi, M. 1996, International Financial Management, Prentice Hall, New York, 3rd Ed, 1996
- Finally, you should give any appendices. These should only include relevant statistical data or material that cannot be fitted into the above categories.

The Layout Guidelines for the Dissertation:

- A4 size Paper
- Font: Arial (10 points) or Times New Roman (12 points)
- Line spacing: 1.5Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

Guidelines for the Assessment of the Dissertation

While evaluating the dissertation, faculty guide will consider the following aspects:
Has the student made a clear statement of the objective or objective(s).
If there is more than one objective, do these constitute parts of a whole?
Has the student developed an appropriate analytical framework for addressing the problem at hand.
Is this based on up-to-date developments in the topic area?
Has the student collected information/data suitable to the frameworks?
Are the techniques employed by the student to analyse the data / information appropriate and relevant?
Has the student succeeded in drawing conclusion form the analysis?
Do the conclusions relate well to the objectives of the project?
Has the student been regular in his work?
Layout of the written report

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Assessment Scheme:

Continuous Evaluation: (Based on Abstract, Regularity, Adherence to initial plan, Records etc.)	40%
Final Evaluation: Based on,	60%
Contents & Layout of the Report,	25
Conceptual Framework,	10
Objectives & Methodology and	10
Implications & Conclusions	15

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SOCIAL WORK WITH PWD

Course Code: SCW4407 **Credit Units: 03**

Course Objective:

• Gain knowledge about the concept of and different types of disabilities.
• Acquire an understanding of the theoretical models and approaches to disability
• Develop an attitude of respect and dignity towards persons with disability
• Become skilled at undertaking social work interventions with other stakeholders in the field of disability

Course Contents:

Module I: Concept of Disability and Impairment

ICIDH and WHO definitions of disability; causes, types Magnitude of various disabilities and their impact on persons with disability and their families
Discourses and models of disability
Developing an anti-oppressive and Inclusive understanding of disability

Module II: Types, Causes and Rehabilitative Concerns

Types of disability: physical, sensory, intellectual, multiple disabilities, learning developmental disabilities, psychosocial disability
Causes, types and care for persons with disabilities (medical and other interventions including aids and appliances)

Process of rehabilitation: early identification, education, vocational rehabilitation, social inclusion and empowerment within the family and community.
Understanding the experience of disability: Limitations, strengths and potentials of persons with disabilities

Module III: Impact of disability on individuals and their families

Reactions of parents/family members and individuals ways of coping with disability.
Needs and problems of persons with disability and their families across the life span and at critical stages in their lives
Social work intervention at each stage

Module IV: Disability Intervention at Individual and Family Levels

Individual level strategies: Self help and support groups; assertiveness training, life skills enrichment
Family level strategies: Family crisis intervention, family centered intervention, parent guidance, parent training
Role of social worker in different settings: Hospital and treatment centers, home, educational institutions, vocational rehabilitation centers, the community
Multidisciplinary rehabilitation teams and their roles.

Module V: Disability intervention at community and policy levels

Building awareness, community education, community based rehabilitation, advocacy and lobbying
Using international instruments (Salamanca Declaration, Standard Rules, UNCRPD) and legislations governing disability (Persons with Disability Act, 1995, RPD Bill, MHC Bill, RCI Act, National Trust Act, 1999) for advocacy
State's role in implementation of legislations.

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

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- Karanth, Pratibha & Joe Rozario. (2003). Learning disability in India, London: Sage
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SOCIAL WORK WITH HIV/AIDS

Course Code: SCW4408 **Credit Units: 03**

Course Objective:

- To understand the issues related with HIV/AIDS positive cases.
- To develop an attitude of respect and dignity towards persons with HIV/AIDS.
- To become skilled at undertaking social work interventions with and HIV/AIDS cases.

Course Contents:

Module I: HIV and AIDS: The Current Landscape from a Death Sentence to a Chronic Disease
The History of the Epidemic; Nature of the retro virus; HIV as a Behaviourally acquired infection; Modes of transmission; Prevention of transmission of infection; Safer Behaviours
HIV Testing and Treatment; the issues of Confidentiality; Counselling Centers; High risk populations; Bridge populations
Enduring Themes of Stigma and Discrimination

Module II: National Response for HIV/AIDS Management
A Health Crisis; Risk Factors for HIV; Vulnerable Groups: Youth and children, women, prisoners
National Response to the HIV/AIDS Crisis: National AIDS Control Policy (NACP) I-IV and the Formation of NACO and SACS
Challenges of Positive Living; Approaching the Epidemic Holistically
Future for HIV/AIDS Social Work: Developing a New Agenda

Module III: HIV/AIDS Prevention for MSM and IDU
Risk factors for Men Who Have Sex with Men, Diverse ideologies and psychosocial settings of MSM
IDU practices and health risks; Nationwide distribution of IDUs
Intervention for HIV-Prevention among MSM and IDU: Condom distribution and syringe exchange programs
Intricacies of Counselling MSM and IDU

Module IV: HIV/AIDS Prevention and Care for At-Risk Adolescents and Young Adults
The Disproportionate Impact of HIV on Young People; Reasons for High Risk among Youth for HIV Infection
HIV/AIDS Education for Adolescents and Young Adults; Sex and reproductive education; Impacts of Drugs and Alcohol on HIV transmission; Adolescent Sexual Minorities, Sexual Behaviour Experimentation among Adolescents; Assessment with Adolescents and Young Adults; The HEADSS Assessment Model; Suicide Risk/Depression Screening of Adolescents
Community Level Interventions Targeted at Adolescents for HIV Prevention

Module V: HIV Case Management: The Social Work Perspective
The Hub of Service Provision
Understanding Social Work Case Management
Description of Supportive HIV Case Management Services
Common Risks in People Living with HIV or AIDS
The Top Five Skills of an HIV Case Manager
The Top Five Attitudes of an HIV Case Manager
Partnership with people affected by HIV/AIDS

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
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- Centers for Disease Control and Prevention (CDC). (2011). HIV in the United States. Retrieved from httpg p ://www.cdc.gov/hiv/resources/factsheets/PDF/us.pdf
- Deb, S.,Shukla, A.(2016). HIV/AIDS in India: A Public Health Approach on Contemporary Trends, New Delhi: Global Publishing House.

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DISASTER MANAGEMENT

Course Code: SCW4410 **Credit Units: 03**

Course Objective:

- Understand key concepts, theories and approaches of disaster management with specific reference to Indian context**.**
- Develop skills to analyse factors contributing to disaster**.** Develop an understanding of the process of disaster management**.** Develop an understanding of the social worker's role in the team for disaster management.

Course Contents:

Module I: Disasters

Concept, types and impact - Famine, floods, cyclones, hurricanes, warfare, earthquake, volcanoes; traditional and modern disaster threats and care factor, classification of disasters; Disaster management - Definition and concept; approaches to disaster management, importance and relevance of disaster management in the present environmental scenario, cases studies of disaster management.

Module II: Disaster and Social Work Intervention

Scope of disaster related intervention, intervention during disaster impact stage, trauma Counselling and crisis intervention, post disaster management, damage assessment and long term rehabilitation and reconstruction, networking and co-ordination between government, NGOs, donor agencies, local bodies, police, military etc.

Module III: Disaster Prevention and Preparedness

Vulnerability analysis, hazard mapping, community based disaster preparedness programmes, training for CBDP, preparedness for post-disaster emergency response and long term rehabilitation, organization and planning, logistics; resource utilization, specialized skills and training needs; public awareness and education; first-aid training, civil defense training.

Module IV: Institutions and Instruments in Disaster Response

International decade for natural disaster reduction and UN resolutions, administration of relief in India - National, state, district and local levels.

Module V:Disaster related legislations and policies

National and international donor agencies; NGOs, mental health institutions in disaster management and relief.

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance,
EE: End Semester Examination

References

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- Fritz, C.E 1968 "Disaster", Sills D (Ed.) Internatioanl Encyclopedia of Social Science. Vol 4 USA: The MacMillan Company and the Free Press, 202-208.
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- Grossman, L 1973 “Train Crash: Social Work and Disaster Services” Social Work Vol.18, No.5, 38- 44
- Hoff, A 1978 “People in Crisis”, Understanding and Helping, California: Addison Wesley Publishing Company.
- Joint Assistantance Centre 1980 Natural Disaster, New Delhi: Adhyatma Sadhana Kendra.
- Lindomann, E 1944 “Symptomology and Management of Acute Grief”, American Journal of Psychiatry, Vol. 101, pp.141-148.
- Shader, I and Schwartz A “Management of Reaction of Disaster”, 1966 Social Work, Vol. 11, No. 2.
- Siporin, M 1966 “The Experience of Aiding the Victims of Hurricane “Betsy”, Social Service Review, Vol. 10
- Wolfenstein, M 1977 Disaster: A Psychological Essay, New York: Arno Press

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PSYCHOLOGY

Programme Structure

Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
PSY2151	Introductory Psychology	2	1	-	3
PSY2251	Abnormal Psychology	2	1	-	3
PSY2351	Basic Cognitive Psychology	2	1	-	3
PSY2451	Life Span Development	2	1	-	3
PSY2551	Psychometric Testing	2	1	-	3
PSY2651	Counselling Psychology	2	1	-	3
	TOTAL				**18**

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PSYCHOLOGY

Syllabus - Semester First

INTRODUCTORY PSYCHOLOGY

Course Code: PSY2151 **Credit Units: 3**

Course Objective:
This course is designed to introduce the science of psychology. It identifies and defines the theories, terms, methods, and various fields of psychology. This course can be used as a foundation towards continued education in more specific areas of psychology. General Psychology encourages students to study in depth the notions of modern scientific psychology. Upon completion of this course, student should have the following objectives:

- To know the major personalities important to the field of general psychology and the ideas, theories, and schools with which they are associated.
- To know the major terms associated with general psychology and their meanings.
- To know the major concepts associated with the area of general psychology.

Course Content

Module I:
Meaning, Definition, Nature and Goals of Psychology

Module II:
Scope of Psychology; Branches and Fields of Psychology

Module III:
Background of Psychology: Historical Perspective

Module IV:
Schools of Psychology: Structuralism, Functionalism, Behaviorism, Gestaltism, Psychoanalysis, Humanism, Existentialism, Cognitive

Module V:
Methods of Psychology: Introspection, Observation, Experimental, Interview, Questionnaire, Survey

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Morgan & King: Introduction to Psychology. Tata McGraw Hill Publishing Company Limited, N. Delhi
- Munn, N.L.: Psychology. Oxford & IBH Publishing Co Pvt. Ltd, N. Delhi

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- Hilgard & Atkinson: Introduction to Psychology, 6th Ed. New Delhi: Oxford & IBH Publishing Co
- Sdorow : Psychology. 3rd Edition Broalu & Benewmark Publishers
- Guilford, J. P.: General Psychology. New York: D. Van Nostrand
- Mohsin, S.M. : Elementary Psychology. Motilal Banarasi Das.
- Morris, C. G. & Maisto, A. A.: Psychology: An Introduction. (12thed.). Upper Saddle River, NJ: Prentice Hall.
- Atkinson &Hilgard: Psychology: An Introduction. Cengage Learning EMEA
- Kosslyn & Rosenberg : Psychology (3rded.). Allyn & Bacon
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- Lahey, B. B. & Majors, M.: Psychology: An Introduction. Tata McGraw Hill Humanities/Social Sciences/Lingua

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Syllabus - Semester Second

ABNORMAL PSYCHOLOGY

Course Code: PSY2251 **Credit Units: 3**

Course Objective:

Abnormal psychology is a branch of psychology that deals with psychopathology and abnormal behavior that causes suffering to the individual and others around him or her, and interferes with functioning in a significant way. The term covers a broad range of disorders, from depression to obsession-compulsion to sexual deviation and many more. The study of abnormal psychology also includes learning about the factors, situations, and conditions that cause mental disorders and how they may be best treated. Following are the objectives for the part of Psychology:

- To gain an appreciation of the fundamental issues that underlies the concept of mental abnormality.
- To become familiar with how, in terms of symptoms, the various psychological disorders present themselves.
- To appreciate different explanations of abnormality. That is, to understand the role of environment, genetic factors, psychodynamics, neuropsychology, and biochemistry in the determination of psychopathology.

Course Content:

Module I: Introduction

Concept of abnormality: Criteria and Perspectives
Classification: DSM IV-R, conceptual and operational evaluation.
Casual factors in Psychopathological Behaviour
(a) Biological determinants
(b) Psychological determinants
(c) Socio-cultural determinants

Module II: Neurosis and Psychosis

Concept and Difference between both the two

Module III: Neurotic Disorder

Generalized anxiety disorders
Obsessive-Compulsive disorders
Phobic Disorders
Eating Disorder

Module IV: Mood Disorders

Depression
Bipolar Disorder

Module V: Psychotic Disorder

Bipolar disorders: Manic, Depressive, Mixed
Psychotic depression
Delusional Disorder
Schizophrenia

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Module VI: Mental Retardation and Development Disorders
Levels of mental retardation, Organic factors in mental retardation.
Autism: Clinical picture and casual factors.
Childhood Disorder

Module VII: Substance Abuse Disorders
Alcoholism
Drug Addition

Module VIII
Psychosomatic Disorder
Somatoform Disorders
Personality Disorders

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Page, J.D.: Abnormal Psychology. New Delhi: Tata McGraw Hill Publishing Company Limited
- Shanmugam, T.E.: Abnormal Psychology. New Delhi: Tata McGraw Hill Publishing Company Limited
- Coleman, J.C.: Abnormal Psychology and Modern Life. Bombay: D.B. Taraporewala Sons.&OCLtd.
- Davison G.C.: Abnormal Psychology. New York: John Willey & Neale, J. M. Sons.
- Carson, R.C., Butcher, J.N. & Mineka, S.: Abnormal Psychology and Modern Life. Delhi: & Person Education, 2000
- Kaur, R.: Abnormal Psychology: New Trends and Innovations Delhi: Deep & Deep Publications (P) Ltd.
- Sarason, I. G. & Sarason, B. R.: Abnormal Psychology: The Problem of Maladaptive Behaviour, 11th Ed. Prentice-Hall
- Mangal, S. K.: Abnormal Psychology. New Delhi: Sterling Publishers Pvt Ltd
- Comer, R. J.: Abnormal Psychology, 5th Ed. Worth Publishers
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Syllabus - Semester Third

BASIC COGNITIVE PSYCHOLOGY

Course Code: PSY2351 **Credit Units: 3**

Course Objective:
Cognitive Psychology is an objective, empirical discipline that tends to favor an experimental approach. This paper of Psychology is crucial to understand the basis of mental activity and human behaviour. The students of Psychology will need to have this knowledge about the normal mental operation of adults in order to understand more complex processes and their disorder. The subject emphasizes cognitive aspects to show the more up to date developments. In this paper of Psychology, Students will:

- Gain factual knowledge of the terminology, methods, and research findings in the field of cognitive psychology.
- Learn the fundamental theories and principles of cognitive psychology including being able to critique them.
- Learn how professionals in the field of cognitive psychology go about the process of gaining new knowledge.

Course Content
Module I:
Introduction, History and Background of Cognitive Psychology

Module II:
Thinking: Nature, and Types of Thinking:
Tools of thinking- Images, Concept, Symbols and Signs, Language, Muscle Activities and Brain Function

Module III:
Reasoning: Meaning and Types of Reasoning: Deductive and Inductive Reasoning

Module IV:
Problem solving: Meaning and Method of Problem solving
Decision Making: Meaning, types and hindrances

Module V:
Intelligence: Meaning, Nature and Theories of intelligence: Unitary Theory, Multifactor Theory, Two Factor Theory, Group Factor Theory.
Genetic and Environmental Influence on Intelligence
Classification of Intelligence Test
Concept of Mental Age and IQ

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

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Text & References:

- Esgate, A. & Groome, D.: An Introduction to Applied Cognitive Psychology. England: Psychology Press.
- Kellogg, R. T.: Fundamentals of Cognitive Psychology. New Delhi: Sage Publication
- Morgan & King: Introduction to Psychology. Tata McGraw Hill Publishing Company Limited, N. Delhi
- Munn, N.L.: Psychology. Oxford & IBH Publishing Co Pvt. Ltd, New Delhi
- Solso, R. L.: Cognitive Psychology (8th ED.). Delhi: Pearson Education
- Best, B. J.: Cognitive Psychology. (3rded.). West Publishing Company
- Hilgard& Atkinson: Introduction to Psychology, 6th Ed. New Delhi: Oxford & IBH Publishing Co
- Sdorow: Psychology. 3rd Edition Broalu & Benewmark Publishers
- Mishra, B. K.: Psychology. PHI Learning Pvt. Ltd
- Haberlandt, K.: Cognitive Psychology. Allyn& Bacon

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Syllabus - Semester Fourth

LIFE SPAN DEVELOPMENT

Course Code: PSY2451 **Credit Units: 3**

Course Objective:
Developmental psychology, also known as human development, is the scientific study of systematic psychological changes, emotional changes, and perceptual changes that occur in human beings over the course of their life span. Originally concerned with infants and children, the field has expanded to include adolescence, adult development, aging, and the entire life span. Developmental psychology includes issues such as the extent to which development occurs through the gradual accumulation of knowledge versus stage-like development, or the extent to which children are born with innate mental structures versus learning through experience. The objective of this paper is:

1. To provide an understanding of Physical, cognitive, affective, moral, social and neural development during infancy, childhood, and adolescence.
2. To critically evaluate the role of heredity, maturation, and the environment in development.
3. To critically examine the relationship between scientific theories of development and the reality of development in everyday life.

Course Contents:

Module1: Introduction
Meaning and Concept of Development: Life Span Perspective,
Theoretical Perspective on Development,
Factors influencing development

Module 2: The Start to Life
Conception and Prenatal Development: The Interaction of Heredity and Environment;
Birth and newborn: Birth Complications, Competent Newborn.

Module 3: Development in Infancy and Toddlerhood (birth to 2years)
Physical Development
Cognitive Development: Roots of Language
Social and Personality Development

Module 4: Development in Childhood
The Preschool years (3-6 Years)
Physical Development;
Cognitive Development: Language Development
Social and Personality Development
The Middle Childhood (6-12 Years)
Physical Development
Cognitive Development: Intellectual and Language development
Social and Personality Development

Module 5: Development in Adolescence and Young Adulthood
Adolescence (12-19 years)

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Physical Development
Cognitive development in Adolescence and School Performance
Social and Personality Development
Young Adulthood (19-35 years)
Physical Development: Physical Limitations and Challenges
Cognitive Development: Intelligence and Higher Education
Social and Personality Development: Forging Relationship and Choosing Career

Module 6: Development in Middle and Late Adulthood
Middle Adulthood (35-55 years)
Physical Development: Sexuality and Health
Cognitive Development: Memory and Remembering
Social and Personality Development: Cultural Dimensions
Late Adulthood (55 years to death)
Physical Development: Health and Wellness
Cognitive Development: Memory and Forgetting
Social and Personality Development: Successful Aging
Death, Dying and Bereavement

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Hurlock, E. B.: Developmental Psychology. McGraw-Hill
- Papalia, D. E.; Olds, S. W. & Feldman, R.D: Human Development(10th ed.).New York: McGraw-Hill.
- Feldman, R. S.: Discovering the Life Span (2nd Ed.). Pearson
- Berk, L.E.: Child Development. New Delhi: Pearson Education.
- Brodzinsky, D.M.; Gormly, A.V. & Anibron, S.R.: Life Span Human Development; New Delhi: CBS Publication
- Heatherington, E.M. & Parke, R.D.: Child Psychology: A Contemporary Viewpoint New York: McGraw-Hill
- Kail R. V.: Children and their development. Prentice Hall Inc.
- Bee, H. & Boyd, D.: Life Span Development, Boston, M.A. : Allyn and Bacon.
- Bukatko, D. & Daehler, M.W.: Child Development: A Thematic Approach. New York: Houghton Mifflin Company.
- Crain, W.: Theories of Development. Englewood Cliffs, New Jersey: Prentice Hall.
- Newman, B.M. & Newman, P.R.: Development Through Life: A Psychosocial Approach. New York: Wadsworth Publishing Company.
- Santrock, J.W.: A Topical Approach to Life Span Development. New Delhi: Tata McGraw Hill.

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Syllabus - Semester Fifth

PSYCHOMETRIC TESTING

Course Code: PSY2551 **Credit Units: 3**

Course Objective:

Psychological assessment is a process of testing that uses a combination of techniques to help arrive at some hypotheses about a person and their behavior, personality and capabilities. Psychological assessment is also referred to as psychological testing, or performing a psychological battery on a person. A psychological assessment is the attempt of a skilled professional, usually a psychologist, to use the techniques and tools of psychology to learn either general or specific facts about another person, either to inform others of how they function now, or to predict their behavior and functioning in the future. Psychologists are the only profession that is expertly t rained to perform and interpret psychological tests. Below are the objectives of studying this particular paper of Psychology:

- To train the students in various psychological assessment techniques.
- To impart skills necessary for selecting and applying different tests for different purposes such as evaluation, training and rehabilitation.

Course Content:

Module-I: Introduction
History of Psychological Testing
Meaning, Definition and Types of Psychological Testing
Ethical issues in Psychological Testing

Module-II: Measurement
Nature and significance of Measurement
Distinction between assessment and measurement
Levels of measurement
Techniques of Attitude Measurement

Module-III: Construction of Test
Steps of constructing a Psychological Test
Reliability: Meaning, types and factors affecting reliability
Validity: Meaning, types and factors affecting Validity
Characteristics of a good Psychological Test

Module-IV: Assessment of General and Special Abilities
Intelligence (DAP: IQ and Slosson Intelligence Test (SIT-3/R)
Creativity: Creativity Assessment Packet (CAP)
Achievement: Diagnostic Achievement Test for Adolescents (DATA-2)

Module-V: Application of Testing
Assessment in Educational and Occupational Set-up: Achievement Test
Assessment in Clinical Set-up and in Counselling

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Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Anastasi, A. & Urbina, S.: Psychological Testing. U.S.A.: Prentice Hall International Inc.
- Hasan, Q.: Personality Assessment: A fresh Psychological Look. New Delhi: Gyan Publishing House
- Graham, J. R. & Lilly, R. S.: Psychological Testing. New Jersey: Prentice Hall Inc.
- Kaplan, R. K. & Sacuzzo, D. P.: Psychological Testing- Principles, Applications and Issues. New Delhi: Cengage Learning India Pvt Ltd
- Kline, T. J. B.: Psychological Testing – A Practical Approach to Design and Evaluation. New Delhi: Vistaar Publication
- Aiken, L.R. & Groth-Marnat, G.: Psychological Testing and Assessemnt (12th Ed.) Pearson Education
- Freeman, F. S.: Psychological Testing. Oxford University Press

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Syllabus - Semester Sixth

COUNSELLING PSYCHOLOGY

Course Code: PSY2651 **Credit Units: 3**

Course Objective:
The paper of Counselling Psychology covers its history, theories, activities, specialties and trends. It concentrates on the importance of the personhood of counselors and of the multicultural, ethical and legal environments in which counsellors operate. This paper focuses on the context and process of counselling to provide a range of high quality and responsive counseling skills and its applications to help oneself and others.

Course Contents:
Module I: Introduction
Meaning, Definitions and Goals of counselling
Role of Counsellor in different Setting
Characteristics of a good counsellor

Module II: Counselling Process
Building Counselling Relationship
Working in a Counselling Relationship
Termination of Counselling Relationship

Module III: Counselling Approaches
Insight-Oriented Counselling: Client-Centred
Action-Oriented Counselling: Behavioural
Testing, Assessment and Diagnosis in Counselling

Module IV: Counselling Applications
Child Counselling and Counselling in School
Adolescent Counselling and Counselling in College
Career Counselling: Theories of Career Development
Group Counselling and Family Counselling
Addiction Counselling

Module V: Theories and Techniques of Counselling
Psychodynamic Approaches
Humanistic Approach
Cognitive Approach
Behavioural Approaches

Module VI: Current Issues in Counselling
Ethical and Legal Issues
Mental Health Counselling
Counselling in a Multicultural Society
Counselling with Diverse Population

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Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Rao, S. N.: Counselling and Guidance (2nd Ed.). Tata McGraw Hill
- Belkin, G.S.: Introduction to Counselling. W.C.: Brown Publishers
- Nelson, J.: The Theory and Practice of Counselling Psychology. New York: Hollt Rinehart & Winston
- Gibson, R. L. & Mitchell, M. H.: Introduction to Counselling. And Guidanc (7th).New Delhi Prentice-Hall of India Pvt. Ltd
- Gladding, S. T.: Counselling: A Comprehensive Profession (6th Ed.). Dorling Kindersley India Pvt. Ltd.
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- Pal, O. B.: Guidance and Counselling. New Delhi: Motilal Banarsidas Publishers Private Ltd.
- Milner, J., Byrne, P. O. & Campling, J.: Assessment in Counselling: Theory, Process and Decision-Making. Palgrave MacMillan
- Patterson,L.E.: The Counselling Process. Wadsworth Publishing
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POSITIVE PSYCHOLOGY

Programme Structure-2017

Course Code	Course Title	Lecture (L) Hours /Week	Tutorial (T) Hours /Week	Total Credits
PSY2152	The Science of Happiness	3	-	3
PSY2252	Optimism and Success	3	-	3
PSY2352	Resilience and Well Being	3	-	3
PSY2452	Positive Psychology and Work Life	3	-	3
PSY2552	Creativity and Problem Solving	3	-	3
PSY2652	Positive Leadership & Competency Development	3	-	3
	TOTAL			**18**

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POSITIVE PSYCHOLOGY

Syllabus - Semester First

THE SCIENCE OF HAPPINESS

Course Code: PSY2152 **Credit Units: 03**

Positive Psychology is the scientific study of human flourishing, and an applied approach to optimal functioning. It has also been defined as the study of the strengths and virtues that enable individuals, communities and organizations to thrive. The underlying premise of positive psychology is that you can learn to be happier just as you can learn a foreign language or to be proficient at golf. This rapidly growing field is shedding light on what makes us happy, the pursuit of happiness, and how we can lead more fulfilling, satisfying lives. The course focuses on the psychological aspects of a fulfilling and flourishing life. Topics include happiness, self-esteem, empathy, love, achievement, creativity, music, spirituality.

Course Objectives:

- To bring an experience marked by predominance of positive emotions and informing them about emerging paradigm of Positive Psychology
- Build relevant competencies for experiencing and sharing happiness as lived experience and its implications

Course Contents:

Module-I: Introduction to Positive Psychology
Positive Psychology: Concept, History, Nature, Dimension and scope of Positive Psychology
Seligman's PERMA

Module-II: Positive Emotional States and Processes
Positive Emotions and well being: Hope & Optimism, Love
The Positive Psychology of Emotional Intelligence
Influence of Positive Emotions

Module-III: Strengths and Virtues
Character Strengths and Virtues
Resilience in the phase of challenge & Loss
Empathy and Altruism

Module-IV: Happiness
Introduction to Psychology of happiness, well being and scope, Types of happiness- Eudaimonic and Hedonic
History of Happiness, Theories, Measures and Positive correlates of happiness
Traits associated with Happiness
Setting Goals for Life and Happiness

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Module-V: Forgiveness and Gratitude
Forgiveness and Gratitude
Personal transformation and Role of suffering
Trust and Compassion

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

A: Attendance, CT: Class Test, H/P/V/Q: Home Assignment/Presentation/Viva/Quiz,
EE: End Semester Exam

Text & References:

- Argyle, M. 1987. *The psychology of happiness.* London: Methuen.
- Baumgardner, S.R. & Crothers, M.K. (2009). Positive Psychology. New Delhi: Pearson Education
- Carr, A. (2004). Positive Psychology. The Science of Happiness and Human Strengths. London: Routledge.
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- Synder, C.R.& Lopez. S. (2007). Handbook of Positive Psychology. Oxford Publications.
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- Haidt , J. (2006). The Happiness Hypothesis; Finding Modern Truth in Ancient Wisdom. New York: Basic Books.
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- Seligman, M.E.P. (2002). Authentic happiness. New York: Free Press.
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- Snyder, C.R. and Lopez, S.J. (2005), Handbook of Positive Psychology, New York Oxford University Press.
- Carr, A. (2004), Positive Psychology: The Science of Happiness and Human Strengths, New York: Brunner – Routledge.
- Linley, P.A. and Joseph, S. (2004), Positive Psychology in Practice, New York : John Wiley and Sons.
- Peterson, C. (2006), Positive Psychology, New York: Oxford University Press. Goleman & Daniel, Emotional Intelligence
- Snyder, C.R., Lopez, S.J. & Pedrotti, J.T. (2011): Positive Psychology: The Scientific and Practical Explorations Of Human Strengths (2nd Ed). Sage Publication, Inc.
- Tal Ben-Shahar (2007) Happier: Learn the Secrets to Daily Joy and Lasting Fulfillment.

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Syllabus - Semester Second

OPTIMISM AND SUCCESS

Course Code: PSY2252 **Credit Units: 03**

Course Objectives:

This course synthesizes and integrate wellness principles and strategies into life, education and work place settings, thereby contributing to enhanced productivity, the prevention of chronic lifestyle disease, enjoyment of life, and personal fulfillment

Moreover, students will become holistic thinkers and lifelong learners who are able to integrate information across multiple disciplines and apply knowledge, skills, critical thinking and problem solving to real world situations.

Course Contents:

Module-I: Optimism and Physical Health

Optimism and coping with physical illness
Optimism and quality of life
Complementary Strengths of Health Psychology and Positive Psychology

Module-II: Optimism and Psychological Health

Hope Theory
Self Esteem and Self efficacy
Well-being therapy
From Positive Potential to Positive Excellence: Steps to be optimistic

Module-III: Gratitude: Parent of all virtues

Optimism, Gratitude and Happiness
Characteristics of grateful people
Cultivating Gratitude-Becoming more grateful

Module-IV: Problem Solving Appraisal and Psychological Adjustment

Motivation and Resilience
Stress and Stress Management

Module-V: Positive Psychology in Practice

Promoting Human Flourishing in Work, Health, Education, and Everyday Life
Positive Psychology and Life Coaching
Integrating positive psychology in practice

Module-VI: Success

What is success?
SMART Goal Setting & Letters to Yourself, Self-Motivation
Human Psychological Capital
Skills Sought by Employees

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Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

A: Attendance, CT: Class Test, H/P/V/Q: Home Assignment/Presentation/Viva/Quiz,
EE: End Semester Exam

Text & References:

- Tal Ben-Shahar (2009). The Pursuit of Perfect: How to Stop Chasing Perfection and Start Living a Richer, Happier Life.
- Fredrickson, B. L. (2001). The Role of Positive Emotions in Positive Psychology: The Broadenand-Build Theory of Positive Emotions. American Psychologist, 56, 218-226.
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- Wiseman, R. (2003). The Luck Factor. The Skeptical Inquirer, 27 (3), 1-5.
- Dweck, Carol S. Mindset: The New Psychology of Success. New York: Random House, 2006. Chapters 1 – 3.
- Seligman, M. E. P. (2002). Positive Psychology, Positive Prevention, and Positive Therapy. In C. R. Snyder and S. J. Lopez (Eds.), *Handbook of Positive Psychology*, 528-540. Oxford University Press.
- Fredrickson, B. L. (2001). The Role of Positive Emotions in Positive Psychology: The Broadenand-Build Theory of Positive Emotions. *American Psychologist*, 56, 218-226.
- Blum, D. (1998). Finding Strength: How to Overcome Anything. *Psychology Today*, Document.
- Aspinwall, L. G., & Brunhart, S. N. (1996). Distinguishing optimism from denial: Optimistic beliefs predict attention to health threats. *Personalityand Social Psychology Bulletin, 22*, 993–1003.
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- Scheier, M. F., Carver, C. S., & Bridges, M. W. (1994). Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and selfesteem): A reevaluation of the Life Orientation Test. *Journal of Personality and Social Psychology, 67,* 1063–1078.

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Syllabus - Semester Third

RESILIENCE AND WELL BEING

Course Code: PSY2352 **Credit Units: 03**

Course Objectives:
Wellbeing and resilience are vital to developing efficient problem solving skills, building and maintaining interpersonal relationships and realistic goal setting, all of which greatly enhance an individual's ability to perform and contribute meaningfully in daily life. The objective of this course is to develop an awareness of how mindfulness can allow one to navigate life's transitions, learn about Signs of resilience and wellbeing, and learn how to focus on wellbeing and resilience

Course Contents:

Module-I: Resilience
Meaning, Nature and Approaches
Theories of Resilience
Promoting Resilience

Module-II: Resilience in the phase of challenge & Loss,
Positive Response to loss, Resilience & Grit
Character Strengths and Virtues

Module-III: Post Traumatic Growth & Benefit Finding
Post Traumatic Growth, Models of PTG as Outcome, Models of PTG as a Coping Strategy
Benefit Finding, Meaning Making and Stress Inoculation
Types of Growth Outcome

Module-IV: Mindfulness and Well Being
Neuroscience of Well-being, Social / Emotional Wellbeing
Mindfulness-Based Interventions, Mindfulness and mental health
Mindfulness and Positive Thinking

Module-V: Subjective Wellbeing
Promoting Wellness: Integrating community and Positive Psychology
Building Resilience and Wellbeing

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

A: Attendance, CT: Class Test, H/P/V/Q: Home Assignment/Presentation/Viva/Quiz,
EE: End Semester Exam

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Text & References:

- Jeste DV, Palmer BW. A call for a new positive psychiatry of ageing. Br J Psychiatry. 2013;202:81–3.
- Resnick B, Gwyther LP, Roberto KA, editors. Resilience in aging: concepts, research and outcomes. New York: Springer; 2011. 5.
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- Windle G, Bennett KM, Noyes J. A methodological review of resilience measurement scales. Health Qual Life Outcomes. 2011;9:8.
- Langer N. Resilience and spirituality: foundations of strengths perspective counseling in the elderly. Edu Gerontol 2004;30(7):611–17.

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Syllabus - Semester Fourth

POSITIVE PSYCHOLOGY AND WORK LIFE

Course Code: PSY2452 **Credit Units: 03**

Positive organizational psychology takes a strengths-based approach to work relationships, leadership and individual purpose in the workplace. In applying positive psychology to work settings, the goal is to improve organizational performance as well as individual performance, well-being, and fulfillment. This course is designed to explore Positive Psychology in the work place. It will focus on the application of positive subjective experiences and traits in organizations to improve workplace effectiveness. This course looks at historical trends as well as emerging changes in employees and the workplace. Directions for future research and implications for practice will be emphasized.

Course Objectives:

- Be able to summarize and identify applications of the theories, concepts, models and research in the field of positive organizational psychology.
- Personally reflect and deepen awareness of leadership skills, work attitudes, and analytical skills in relationship to the field.
- Demonstrate ability to be effective leaders and team members within business organizations, educational environments, and/or community settings.

Course Contents:

Module-I: The changing world of work
Introduction to positive psychology and its application to the workplace
Understand the world of work, upcoming trends that will affect work
Management of today's multi-generational and diverse work force

Module-II: Positive work environments for individuals and organizations:
Employee engagement- what causes individuals to join an organization and why they stay or leave, person-centered approach to engagement
Understand the concept of work as meaning
Impact of employee well-being on the organization and impact of feelings about work on the individual's well-being.
Bringing Positive Psychology to Organizational Psychology

Module-III: Enabling a positive work life
Understand the benefits of coaching, mindfulness, and strengths development in the workplace.
Work and home life balance.

Module-IV: Building psychological capital
Identify personal character strengths and understand their relationship with work satisfaction
Developing positivity and a positive team culture
Maintaining positive relationships at work

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Module-V: Positive Organizations

Applying the strengths-based approach for high performance
Appreciative Inquiry – positive change management
Maintaining positive relationships at work

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

A: Attendance, CT: Class Test, H/P/V/Q: Home Assignment/Presentation/Viva/Quiz,
EE: End Semester Exam

Text & References:

- Csikszentmihalyi, M. (1990). Flow: The Psychology of Optimal Experience. New York: Harper and Row.
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- Lyubomirsky, S. (2013). The myths of happiness: What should make you happy, but doesn't, what shouldn't make you happy, but does. New York, NY: Penguin.
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- Oxford Handbook of Positive Psychology and Work Edited by Nicola Garcea, Susan Harrington, and P. Alex Linley.
- *Huy P. Phan and Bing H. Ngu (2017).* Positive Psychology: The use of the Framework of Achievement Bests to Facilitate Personal Flourshing. I*n* "Quality of Life and Quality of Working Life", *book edited by Ana Alice Vilas Boas,*
- Cotton P., & Hart P. M. (2003). Occupational wellbeing and performance: A review of Organisational Heath research. *Australian Psychologist, 38*(2), 118-127.
- Hart, P.M., Caballero, C.L., & Cooper, W. (2010, July). *Understanding Engagement: Its Structure, Antecedents and Consequences.* Paper presented at the International Academy of Management and Business Summer Conference, Madrid.
- Hart P. M., & Cooper C. L. (2001). Occupational Stress: Towards a more integrated framework. In N. Anderson, D. S. Ones, H. K. Sinagal & C. Viswesvaran (Eds.), *Handbook of Industrial, Work and Organisational Psychology* (Vol. 2, p.93-114). London: Sage.
- Hart P. M., & Cotton, P. (2001). *Organisational correlates of fair and reasonable treatment and counterproductive behaviours.* Office of Public Employment, Victoria.
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- Hart P. M., Tan J., Sutherland, A., Wellington, C., & Cotton P. (2011). *Leading Teams: Working Well Evaluation Report*. WorkCover Authority of New South Wales.

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Syllabus - Semester Fifth

CREATIVITY AND PROBLEM SOLVING

Course Code: PSY2552 **Credit Units: 03**

Course Objectives:
To enable the students:

- Understand the process of problem solving and creative thinking.
- Facilitation and enhancement of skills required for decision-making.

Course Contents:

Module-I: Problem Solving Process
Problem-solving skills, including engaging with, researching and identifying strategies to solve unfamiliar problems and bring about change
Barriers to problem solving

Module-II: Thinking as a tool for Problem Solving
What is thinking: The Mind/Brain/Behaviour
Critical Thinking and Learning:
- Making Predictions and Reasoning
- Memory and Critical Thinking
- Emotions and Critical Thinking

Module-III: Creative Thinking
Definition and meaning of creativity
The nature of creative thinking
- Convergent and Divergent thinking
-Brain Storming
The six-phase model of Creative Thinking: ICEDIP model

Module-IV: Physical disability and Positive growth

Module-V: Change Management Skills

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

A: Attendance, CT: Class Test, H/P/V/Q: Home Assignment/Presentation/Viva/Quiz,
EE: End Semester Exam

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Text & References:

- Michael Steven: How to be a better problem solver, Kogan Page, New Delhi, 1999
- Geoff Petty: How to be better at creativity; Kogan Page, New Delhi, 1999
- Richard Y. Chang and P. Keith, Kelly: Wheeler Publishing, New Delhi, 1998.
- Phil Lowe Koge Page: Creativity and Problem Solving, New Delhi, 1996
- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 3, Management (1996); Pfeiffer &Company
- Bensley, Alan D.: Critical Thinking in Psychology – A Unified Skills Approach, (1998), Brooks/Cole Publishing Company.

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Syllabus - Semester Sixth

POSITIVE LEADERSHIP AND COMPETENCY DEVELOPMENT

Course Code: PSY2652 **Credit Units: 03**

Course Objectives:
The major objective is to learn the essential principles and techniques of applying Positive Psychology in a coaching context. The students will also learn about essential techniques of Positive Psychology Coaching, Understanding, experiencing, and practicing the techniques at the heart of effective coaching.

Course Contents:

Module-I: Positive Psychology and Individuals
An exploration of positive psychology applications in coaching, clinical and other settings
Recognize and use personal leadership strengths

Module-II: Positive Psychology and Organizations
Positive Psychology Coaching:
Essential Techniques of Positive Psychology Coaching
Coaching for Positive Change

Module-III: Positive organizational leadership
Explore and develop the elements of Authentic Leadership
Development and Positive Organizational Scholarship
Understand the role of positive emotions in the workplace and strength-based organizational development.

Module-IV: Positive Organizations and Appreciative Inquiry
Meaning in work
Creativity
Leadership Coaching and Positive Psychology

Module-V: Competence Development

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage (%)	10	10	5	5	70

A: Attendance, CT: Class Test, H/P/V/Q: Home Assignment/Presentation/Viva/Quiz,
EE: End Semester Exam

Text & References:

- Lift: Becoming a Positive Force in Any Situation (Ryan W. Quinn and Robert E. Quinn)
- The Deep Change Field Guide: A Personal Course to Discovering the Leader Within (Robert E. Quinn)
- The Best Teacher in You: How to Accelerate Learning and Change Lives (Robert E. Quinn, Katherine Heynoski, Mike Thomas and Gretchen M. Spreitzer) Suggested Readings

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- Competing Values Leadership: Second Edition (Kim S. Cameron, Robert E. Quinn, Jeff DeGraff, and Anjan J. Thakor) • Building the Bridge as You Walk on It (Robert E. Quinn)
- Company of Leaders: Five Disciplines for Unleashing the Power in Your Workforce (Gretchen Spreitzer and Robert E. Quinn)
- Lyubomirsky, Sonja. *The How of Happiness: A New Approach to Getting the Life You Want*. New York: Penguin, 2008.
- Dweck, Carol S. *Mindset: The New Psychology of Success*. New York: Random House,2006.
- Neff, Kristin. *Self-Compassion: Stop Beating Yourself Up and Leave Insecurity Behind*.New York: William Morrow, 2011.
- Szabó, Peter, and Daniel Meier. *Coaching Plain & Simple: Solution-Focused Brief Coaching Essentials*. New York: W.W. Norton &, 2009.
- Theeboom, T., Beersma, B., and van Vianen, A. "Does Coaching Work? A Meta-Analysis of the Effects of Coaching Individual-Level Outcomes in an rganizational

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SOCIAL WORK

Programme Structure-2023

Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
SCW2151	Introduction to Social Work	2	1	-	3
SCW2251	Working with Individual-Social Casework	2	1	-	3
SCW2351	Working with Groups-Social Group Work	2	1	-	3
SCW2451	Community Organization & Development	2	1	-	3
SCW2551	Social Action & Social Movements	2	1	-	3
SCW2651	Social Welfare Administration & Social Work Research	2	1	-	3
	TOTAL				**18**

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SOCIAL WORK

Syllabus - Semester First

INTRODUCTION TO SOCIAL WORK

Course Code: SCW2151 **Credit Units: 3**

Course Objective: This course is designed to introduce Social Work as an emerging profession. It identifies and defines the theories, terms, methods, and various fields of Social Work. This course can be used as a foundation for continued education in more specific areas of Social Work. Upon completion of this course, student should have the following objectives:

- To understand history of Social Work profession in India and west.
- Develop insight into origin and development of ideologies/approaches to social change and social work.
- Understand the values of Social Work and Scope

Course Content:

Module I: History of Social Work in India and Abroad
Beginning of Social Work from charity to Profession. Introduction of Social Work Education, Goals, Values, Voluntary and Evolution of Professional Social Work.

Module II: Concepts in Social Work Education & Practice
Objectives and Functions of Social Work; Methods of Social Work (Primary and Secondary methods of social work); Social Service; Social Services. Values, Voluntary and Professional Social Work, Components.

Module III: Indian Social Reformers, Ideologists & Historical Movements of Social Change
General understanding of social work in India with reference to ancient India, through social reforms, movements and emergence of various thoughts and ideologies significant for social change.

Module IV: Contemporary Issues, & Concerns for Social Work Profession
Empowerment & Social Development, Social Change, Social Exclusion (marginalization, exploitation, oppression); Social Activism Human rights and Human Rights Perspective. The Concept of Social Welfare; Welfare approach, Remedial and Therapeutic Approach, Social Development Approach in Social Work.

Module V: Scope and Fields of Social Work
Family Child Welfare, Gender Social Work, Medical & Psychiatric Social Work, Industrial Social Work, Social Work with Rural Urban & Tribal Communities, Criminology & Correctional Social Work, Livelihoods and Social Entrepreneurship

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Examination Scheme:

Components	CT	CT/H/P/V/Q	CT/H	A	EE
Weightage	10	10	5	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance, EE: End Semester Examination

Readings:

- Wadia, A.R. (1968). History and Philosophy of Social Work in India, Bombay, Allied Publishers
- Skidmore, Rex A. and Introduction to Social Work, New Jersey, Thackeray, Milton G. 1982 Prentice-Hall, Englewood Cliffs
- Jacob, K. K. (Ed.) (1994), Social Work Education in India – Retrospect and Prospect Udaipur, Himansu Publications.
- Joseph, Sherry (Ed.) (2000), Social Work: In the Third Millennium (Some Concerns and Challenges), Sriniketan, Department of Social Work Visva-Bharati

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Syllabus - Semester Second

WORKING WITH INDIVIDUAL-SOCIAL CASEWORK

Course Code: SCW2251 **Credit Units: 3**

Course Objective:

- To be introduced to the method of working with individual
- Develop the understanding of methods of working with individuals and groups.
- Develop skills to apply these methods for therapeutic and developmental work
- To understand the various contexts and the dimensions of issues and problems that individuals face in life.
- To introduce the approaches of social casework practice with individuals

Course Content:

Module I: Introduction to Social Case Work
Concept of social casework: meaning, nature, objectives, and importance. Historical development of social case work in India & West.

Module II: Principle & Components to Social Casework
Principles of social case work; Individualization, Acceptance, Non-judgmental Attitude, Participation, Relationship, Purposeful expression of feelings, Controlled emotional involvement, Client Self Determination, and Confidentiality Components of social case work: 5 Ps; person, problem, place process & professional.

Module III: Understanding Clients & Approaches to Social Case Work
Basic human needs, Concept of Personality; Determinants of Personality, Factors affecting Personality. Types of problems faced by individuals and families. Psychosocial Diagnostic approach (Richmond), Task-centered approach Social-psychological approach, Problem solving approach.

Module IV: Tools, Techniques and Skills of Social Case Work
Listening, Communication Skills, Rapport Building. Interview, Observation, Home visit, collateral contacts, referrals, Skills, and Techniques of working with individuals and families: Supportive, resource enhancement and Counselling, Knowledge of resources (networking) Essential qualities in the caseworker: empathy, non-possessive warmth, genuineness.

Module V: Process of Social Case Work Practice
Exploration of person in environment, Multidimensional assessment and planning, multidimensional intervention, helping implementing intervention and goal attainment, Termination and evaluation, follow up Case worker - client Relationship; characteristics of professional relationship: transference, counter transference and resistance; sustaining the relationship; obstacles in client - worker relationship.

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Examination Scheme:

Components	CT	CT/H/P/V/Q	CT/H	A	EE
Weightage	10	10	5	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance, EE: End Semester Examination

Readings:

- Neeraj Ahuja, Introduction to Psychiatry an A textbook
- Feldman Robert S.(1997). Understanding Psychology, 4th Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi
- Golan, Naomi. (1978). Treatment in Crisis Situations, New York: Free Press.
- Henderson, Sir David Textbook of Psychiatry, New York and Batchelor, I. R. C
- Mishne, Judith (Ed.) (1980). Psychotherapy and Training in Clinical Social Work, New York: Gardner Press.
- Mary Richmond Book on social case work
- Jeffrey, K. A., & Shepard, D. S. (2009). Counselling: theories and practice. New Delhi: Cengage Learning India Pvt. Ltd.
- Mathew, G., & Tata Institute of Social, S. (1992). An introduction to social casework: Tata Institute of Social Sciences.
- Perlman, H. H. (1957). Social casework: a problem-solving process: University of Chicago Press.

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Syllabus - Semester Third

WORKING WITH GROUPS- SOCIAL GROUP WORK

Course Code: SCW2351 **Credit Units: 3**

Course Objective:

- To understand of group work as a method of professional social work
- To learn theoretical approaches that inform group work practice.
- To gain insight into dimensions of group processes and group work practice
- To develop competencies for working with groups in diverse settings

Course Content:

Module I: Introduction to Social Group Work
Concept of social groupwork: definitions, meaning and functions. Historical development of social case work in India & West. Historical development of Group Work, Values and Skills Principles and Purpose of Group work.

Module II: Social groups and theoretical approaches of group work practice
Definition, Characteristics, and Importance Classification of Groups Cooley, Sumner, MacIver & Page. Models of social group work – Social goals, Remedial, Reciprocal models.

Module III: Groups Processes and Dynamics
Group behavior, Communication and interaction pattern, Group cohesion & conflict, Leadership in groups. Theories of Group formation, Stages of group work: planning, beginning, middle and ending phases

Module IV: Tools, Techniques and Skills of Social Group Work
Group work skills: facilitation, analytical thinking, leadership and recording in group work. Techniques of group work: group counseling group discussion, group decision-making, role play, and group sessions.

Module V: Social Group Work in Different Settings
Application of group work with different groups: children, teen age, elderly, women, and person. Differently Areas of group work practice: Health education, substance abuse, schools, labor welfare, juvenile delinquency.

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT/H	A	EE
Weightage	10	10	5	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance, EE: End Semester Examination

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Readings

- Trecker, H.B. (1970). Social group work-principles and practices. New York : Associate Press
- Toseland, R. and Rivas, R. (1995). An introduction to group work practice, (Massachusetts: Allyn and Bacon)
- Trecker, H.B. (1955). Group work: Foundations & frontiers. New York : Whiteside & William Marrow & Co.
- Northen, H. (1969). Social work with groups. New York : Columbia University Press
- Northen, H. (1976). Theory of social work with groups. New York : Columbia University Press

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Syllabus - Semester Fourth

COMMUNITY ORGANIZATION & DEVELOPMENT

Course Code: SCW2451 **Credit Units: 3**

Course Objective:

- To gain knowledge about the primary method of social work practice with communities.
- To understand the techniques and approaches of social work practice with communities.
- To acquire the skill of working with communities.
- To understand theory and practice of social work in community.

Course Content:

Module I: Community organization as a Practice
Concept of Community Work, Community Organization and Community Development. Principles of community organization. Processes in community organization. Models of community organization.

Module II: Understanding Community & Dynamic of Indian Communities
Definition of Community, Types of Communities; Rural, Urban & Tribal Communities, Power Structure in the Community, Community Leadership Types of Community Leaders, Role of Community leaders in Community Development.

Module III: Methods & Process of Community Organization
Awareness creation, Planning and Organizing, Education, Networking, Participation. Fact Finding, Planning, Group Decision Making, Conference and Committee Practice, Co-operative action negotiation, consultation, Methods of Conflict Resolutions, Resource Mobilization, Administration, Recording Evaluation.

Module IV: Approaches & Skills to Community Organization
Skills in community organization: Communication, Training, Consultation, Public relations, resource mobilization, liasoning. Approaches to community organization; General content, Specific content, and Process Approach.

Module V: Application of Community Organization Methods
Application in Slums, Rural areas, disaster management; Flood, famine, pandemic etc..., Community Organization for prompting Public Health and Family Welfare.

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT/A	A	EE
Weightage	10	10	5	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance, EE: End Semester Examination

Readings:

- Siddiqui, H. Y. (1977). Working with communities. New Delhi: Hira Publication.
- Siddiqui, H. Y. (1984) Social work and social action.(ed.), New Delhi: Harnam

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Publications

- Riss, Murray & Lappin, Ben 1967 Community Organization: Theory, Principles and Practice, New York: Harper & Row
- Somesh Kumar 2002 Methods for Community Participation: A complete guide for practitioners, New Delhi: Sage Publication (Vistaar)
- Korten, David C. 1980 Community Organization and Rural Development: A Learning Process Approach, Public Administration Review, Vol. 40 No. 5 (Sep-Oct, 1980), pp. 480-511.
- Lee Judith 2001 The Empowerment Approach to Social Work Practice: Building The Beloved Community, Columbia Press
- Vettivel, Surendra 1992 Community Participation: Empowering the Poorest: Role of NGOs, New Delhi: Vetri Publishers
- Ross, M.G. 1967 Community Organization. Theory, Principle and Practice, New York: Harper & Row (Unit V)

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Syllabus - Semester Fifth

SOCIAL ACTION AND SOCIAL MOVEMENTS

Course Code: SCW2551 **Credit Units: 3**

Course Objective:

- Familiarize with conceptual issues in defining social action and social movements.
- Provide an overview of evolution of social action as method in social work.
- Acquaint students with various theoretical perspectives on social movement.

Course Content:

Module-I: Understanding Social Action

- Social action: Concept, meaning, scope and strategies
- Models of social action
- Social action and social change

Module-II: Social Work and Social Action

- History of Radical Social Work Practice
- Settlement House Movement and Anti-oppressive Social work practice
- Critical Social work and Structural Social Work practice

Module-III: Perspectives of Social Action

- Concept of conscientisation and critical awareness
- Paulo Friere and Saul Alinskey's contribution to Social Action

Module-IV: Social Movements and Social Change

- Social Movements: Concept, nature and Components
- Classification of Social Movements
- Old and New Social Movements, Characteristics of New Social Movements

Module-V: Social Movement in India

- Overview of Social Movements in India
- Peasant Movements, Labour movements, Women's movements, Dalit movements, Tribal movements, Environmental Movements

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT/H	A	EE
Weightage	10	10	5	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance, EE: End Semester Examination

Readings:

- Khinduka, S.K & Coughlin, B,J 1975 A Conceptualization of Social Action. The Social Review, 49 (1)1-14. (Unit I)

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- Powell, F 2001 The Politics of Social Work. London: Sage Publications. (Unit II)
- Freire, P 1970 Pedagogy of the Oppressed. New York: 35 Continuum. (Unit II)
- Mullaly, R.P. and Mullaly.B. 1998 Structural Social Work: Ideology, Theory, and Practice. New York: Oxford University press. (Unit II)
- Reisch, M & Andrews J. 2002 The Road Not Taken: A History of Radical Social Work in The United States. New York: BrunnerRoutledge. (Unit II)
- Alinsky, S. 1972 Rules for Radicals. New York: Random House Shah,G. 2002 Social Movements and the State. New Delhi: Sage. (Unit IV)
- Shah,G 2004 Social Movements in India: A Review of Literature, New Delhi: Sage Publication. (Unit IV & V)
- Siddique, H.Y. 1984 Social Work and Social Action, New Delhi: Harnam Publications. (Unit I, II & III) Siddiqui, H.Y. 1997 Analysis of Literature of Social Action. Indian Journal of Social Work, 58(2), 212-232. (Unit II & III)
- Singh,R. 2001 Social Movements, Old and New: A Post-Modernist Critique . New Delhi: Sage. (Unit IV & V)
- Laird, S 2007 Anti-Oppressive Social Work. New Delhi: Sage. (Unit II)
- Bailey,R and Brake.M. 1975 Radical Social Work, London: Edward Arnold. (Unit II)
- Langan, M. Lee, P. (Eds). 1989 Radical Social Work Today. Boston: Unwin Hyman. (Unit II)

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Syllabus - Semester Sixth

SOCIAL WELFARE ADMINISTRATION & SOCIAL WORK RESEARCH

Course Code: SCW2651 **Credit Units: 3**

Course Objective:

- Understand concept, principles and components of social welfare administration.
- Develop understanding of social welfare administration as a method of social work profession.
- Familiarize students with the nature of social science research and its application in the study of social phenomena.
- Help students learn the research process and develop abilities to prepare research design.

Course Content:

Module-I: Social Welfare Administration an Introduction

- Concept and nature of social welfare administration
- History of social welfare administration
- Principles of social welfare administration

Module-II: Structures and Processes

- Central and state welfare boards
- Processes in Social Welfare Administration

Module-III: Components in Welfare Administration

- Registrations of Welfare Organization
- Resource Mobilization, Grant-in-aid
- Fund raising

Module-IV: Emerging Trends in Welfare Administration

- Practice of Social Welfare Administration in different settings.
- Social welfare Administration as an instrument of Social Change

Module-V: Research as Scientific Method

- Basics of Research: Meaning, definition, nature, types of research- Basic and applied, application of research in social sciences,
- Social science research and social work research: Meaning, nature, significance and difference
- Ethics of social research

Examination Scheme:

Components	CT	CT/H/P/V/Q	CT/H	A	EE

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Weightage	10	10	5	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance, EE: End Semester Examination

Readings:

- Connaway R.S. & Gentry M.E. 1988 Social Work Practice, New Jersey M.E. Prentice Hall. (Unit I)
- Goel, S.L. and Jain, R.K 1988 Social Welfare Administration, Vol. I and II, New Delhi Deep Publications. (Unit I)
- Jagannadham, C 1978 Administration and social change, New Delhi, Uppal Publishing House. (Unit I) 39 Reed, Ella W. ed., 1961 Social Welfare Administration, New York, Columbia University Press. (Unit I)
- Siddiqui H.Y. 1990 Social Welfare in India New Delhi Harnam Publications. (Unit I)
- Karla, K. M,: Michael O'Melia: Brenda L. DuBois 1995 Generalist Social Work Practice: An Empowering Approach) (Allyn and Bacon, London. (Unit I)
- Specht, Harry and Anne Vickery 1977 Integrating Social Work Methods, George Allen and Unwin. (UnitI I)
- Gupta, N.S. 1979 Principles and Practice of Management, New Delhi: Light and Life Publications. (Unit II I)
- Kabra, K.N. 1977 Planning Process in a District New Delhi: India Institute of public Administration. (Unit III)
- Sachdeva, D.R. 1993 Social Welfare Administration in India, Allahabad, Kitab Mahal. (Unit IV & V)
- Laldas, D. K., 2005 Design of Social Research, Rawat Publication, New Delhi. (Unit II)
- Kothari, C. R., 2004 Research Methodology –Methods and Techniques, 2nd ed., New Age International (P) Ltd., New Delhi. (Unit I)
- Kumar, R., 2006 Research Methodology, 2nd ed., Pearson Education, New Delhi (Unit I)
- Ramachandram, P. 1990 Issues in Social Work Research in India, TISS, Bombay. (Unit I) Rubin, A. & Babie, E 2001 Research Methods for Social Work, 4th ed., Wadsworth, USA (Unit III)

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BEHAVIOURAL SCIENCE - COURSES BEING OFFERED IN VARIOUS PROGRAMMES



Achieving Academic Excellence

Programme Structure
Curriculum & Scheme of Examination

AMITY UNIVERSITY HARYANA

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PROGRAMME STRUCTURE OF BEHAVIOURAL SCIENCE COURSES BEING OFFERED IN VARIOUS PROGRAMMES

UNDERGRADUATE -4 YEAR PROGRAMMES AND UNDERGRADUATE –INTEGRATED LAW PROGRAMMES (BA LLB, B.COM LLB & BBA LLB)

Semester	Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
1	BEH2151	Understanding Self for Effectiveness	1	-	-	1
2	BEH2251	Problem Solving and Creative Thinking	1	-	-	1
3	BEH2351	Group Dynamics and Team Building	1	-	-	1
4	BEH2451	Stress and Coping Strategies	1	-	-	1
5	BEH2552	Personality, Nationalism and Human Values	1	-	-	1
6	BEH2652	Interpersonal Communication	1	-	-	1
7	BEH2751	Relationship Management	1	-	-	1
8	BEH2851	Personal & Professional Excellence	1	-	-	1

UNDERGRADUATE - 4 YEAR NEP PROGRAMMES

Semester	Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
1	BEH2151/ SEBS2101	Understanding Self for Effectiveness	1	-	-	1
2	BEH2251/ SEBS2201	Problem Solving and Creative Thinking	1	-	-	1
3	BEH2351/ SEBS2301	Group Dynamics and Team Building	1	-	-	1
4	BEH2451/ SEBS2401	Stress and Coping Strategies	1	-	-	1
5	BEH2551/ SEBS2501	Individual, Society and Nations	1	-	-	1
6	BEH2651	Interpersonal Communication and Relationship Management	1	-	-	1

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POSTGRADUATE PROGRAMMES

Semester	Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
1	BEH4151	Self-Development and Interpersonal Skills	1	-	-	1
2	BEH4251	Behavioural Communication and Relationship Management	1	-	-	1
3	BEH4351	Leading Through Teams	1	-	-	1
4	BEH4451	Professional Excellence	1	-	-	1

INTEGRATED PROGRAMMES (UNDERGRADUATE-POSTGRADUATE)

Semester	Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
1	BEH2151	Understanding Self for Effectiveness	1	-	-	1
2	BEH2251	Problem Solving and Creative Thinking	1	-	-	1
3	BEH2351	Group Dynamics and Team Building	1	-	-	1
4	BEH2451	Stress and Coping Strategies	1	-	-	1
5	BEH2551	Individual, Society and Nations	1	-	-	1
6	BEH2651	Interpersonal Communication and Relationship Management	1	-	-	1
7	BEH4151	Self-Development and Interpersonal Skills	1	-	-	1
8	BEH4451	Professional Excellence	1	-	-	1
9	BEH4351	Leading Through Teams	1	-	-	1

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SYLLABUS-UNDERGRADUATE-4 YEAR PROGRAMMES & UNDERGRADUATE- INTEGRATED LAW PROGRAMMES (BA LLB, B.COM LLB & BBA LLB)

Syllabus - First Semester

UNDERSTANDING SELF FOR EFFECTIVENESS

Course Code: BEH2151 **Credit Units: 01**

Course Objective:
This course aims at imparting**:**

- Understanding self & process of self exploration
- Learning strategies for development of a healthy self esteem
- Importance of attitudes and its effective on personality
- Building Emotional Competence

Course Contents:
Module I: Self: Core Competency
Understanding of Self
Components of Self – Self identity
Self concept
Self confidence
Self image

Module II: Techniques of Self Awareness
Exploration through Johari Window
Mapping the key characteristics of self
Framing a charter for self
Stages – self awareness, self acceptance and self realization

Module III: Self Esteem & Effectiveness
Meaning and Importance
Components of self esteem
High and low self esteem
Measuring your self esteem

Module IV: Building Positive Attitude
Meaning and nature of attitude
Components and Types of attitude
Importance and relevance of attitude

Module V: Building Emotional Competence
Emotional Intelligence – Meaning, components, Importance and Relevance
Positive and Negative emotions

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Healthy and Unhealthy expression of emotions

Module VI: End-of-Semester Appraisal

Viva based on personal journal

Assessment of Behavioural change as a result of training

Exit Level Rating by Self and Observer

Examination Scheme: Total Internal (100)

Components	SAP	Journal for Success (JOS)	A	Mid Term Test / CT / Assignment	VIVA / Presentation
Weightage (%)	25	10	5	30	30

SAP: Social Awareness Programme, A: Attendance, CT: Class Test

Text & References:

- Organizational Behaviour, Davis, K.
- Hoover, Judhith D. Effective Small Group and Team Communication, 2002,HarcourtCollege Publishers
- Dick, McCann&Margerison, Charles: Team Management, 1992 Edition, viva books
- Bates, A. P. and Julian, J.: Sociology - Understanding Social Behaviour
- Dressler, David and Cans, Donald: The Study of Human Interaction
- Lapiere, Richard. T – Social Change
- Lindzey, G. and Borgatta, E: Sociometric Measurement in the Handbook of Social Psychology, Addison – Welsley, US.
- Rose, G.: Oxford Textbook of Public Health, Vol.4, 1985.
- LaFasto and Larson: When Teams Work Best, 2001, Response Books (Sage), New Delhi
- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 2, Group (1996); Pfeiffer & Company
- Smither Robert D.; The Psychology of Work and Human Performance, 1994, Harper Collins College Publishers

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Syllabus – Second Semester

PROBLEM SOLVING AND CREATIVE THINKING

Course Code: BEH2251 **Credit Units: 01**

Course Objective:
To enable the students:
- Understand the process of problem solving and creative thinking.
- Facilitation and enhancement of skills required for decision-making.

Course Contents:
Module I: Thinking as a tool for Problem Solving
What is thinking: The Mind/Brain/Behaviour
Critical Thinking and Learning:
- Making Predictions and Reasoning
- Memory and Critical Thinking
- Emotions and Critical Thinking

Thinking skills

Module II: Hindrances to Problem Solving Process
Perception
Expression
Emotion
Intellect
Work environment

Module III: Problem Solving Process
Recognizing and Defining a problem
Analyzing the problem (potential causes)
Developing possible alternatives
Evaluating Solutions
Resolution of problem
Implementation
Barriers to problem solving:
- Perception
- Expression
- Emotion
- Intellect
- Work environment

Module IV: Plan of Action
Construction of POA
Monitoring
Reviewing and analyzing the outcome

Module V: Creative Thinking
Definition and meaning of creativity
The nature of creative thinking

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- Convergent and Divergent thinking
- Idea generation and evaluation (Brain Storming)
- Image generation and evaluation
- Debating

The six-phase model of Creative Thinking: ICEDIP model

Module VI: End-of-Semester Appraisal

Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

Examination Scheme: Total Internal (100)

Components	SAP	Journal for Success (JOS)	A	Mid Term Test / CT / Assignment	VIVA / Presentation
Weightage (%)	25	10	5	30	30

SAP: Social Awareness Programme, A: Attendance, CT: Class Test

Text & References:

- Michael Steven: How to be a better problem solver, Kogan Page, New Delhi, 1999
- Geoff Petty: How to be better at creativity; Kogan Page, New Delhi, 1999
- Richard Y. Chang and P. Keith, Kelly: Wheeler Publishing, New Delhi, 1998.
- Phil Lowe Koge Page: Creativity and Problem Solving, New Delhi, 1996
- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 3, Management (1996); Pfeiffer &Company
- Bensley, Alan D.: Critical Thinking in Psychology – A Unified Skills Approach, (1998), Brooks/Cole Publishing Company.

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Syllabus – Third Semester

GROUP DYNAMICS AND TEAM BUILDING

Course Code: BEH2351 **Credit Units: 01**

Course Objective:
To inculcate in the students an elementary level of understanding of group/team functions.
To develop team spirit and to know the importance of working in teams.

Course Contents:

Module I: Group formation
Definition and Characteristics
Importance of groups
Classification of groups
Stages of group formation
Benefits of group formation

Module II: Group Functions
External Conditions affecting group functioning: Authority, Structure, Org. Resources, Organizational policies etc.
Internal conditions affecting group functioning: Roles, Norms, Conformity, Status, Cohesiveness, Size, Inter group conflict.
Group Cohesiveness and Group Conflict
Adjustment in Groups

Module III: Teams
Meaning and nature of teams
External and internal factors effecting team
Building Effective Teams
Consensus Building
Collaboration

Module IV: Leadership
Meaning, Nature and Functions
Self leadership
Leadership styles in organization
Leadership in Teams

Module V: Power to empower: Individual and Teams
Meaning and Nature
Types of power
Relevance in organization and Society

Module VI: End-of-Semester Appraisal
Viva based on personal journal
Assessment of Behavioural change as a result of training

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Exit Level Rating by Self and Observer

Examination Scheme: Total Internal (100)

Components	SAP	Journal for Success (JOS)	A	Mid Term Test / CT / Assignment	VIVA / Presentation
Weightage (%)	25	10	5	30	30

SAP: Social Awareness Programme, A: Attendance, CT: Class Test

Text & References:

- Organizational Behaviour, Davis, K.
- Hoover, Judhith D. Effective Small Group and Team Communication, 2002,HarcourtCollege Publishers.
- Dick, McCann&Margerison, Charles: Team Management, 1992 Edition, viva books.
- Bates, A. P. and Julian, J.: Sociology - Understanding Social Behaviour.
- Dressers, David and Cans, Donald: The Study of Human Interaction.
- Lapiere, Richard. T – Social Change.
- Lindzey, G. and Borgatta, E: Sociometric Measurement in the Handbook of Social Psychology, Addison – Welsley, US.
- Rose, G.: Oxford Textbook of Public Health, Vol.4, 1985.
- LaFasto and Larson: When Teams Work Best, 2001, Response Books (Sage), New Delhi
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Syllabus - Fourth Semester

STRESS AND COPING STRATEGIES

Course Code: BEH2451 **Credit Units: 01**

Course Objective:
To develop an understanding the concept of stress its causes, symptoms and consequences.
To develop an understanding the consequences of the stress on one's wellness, health, and work performance.

Course Contents:
Module I: Stress
Meaning & Nature
Characteristics
Types of stress

Module II: Stages and Models of Stress
Stages of stress
The physiology of stress
Stimulus-oriented approach.
Response-oriented approach.
The transactional and interactional model
Pressure – environment fit model of stress

Module III: Causes and symptoms of stress
Personal
Organizational
Environmental

Module IV: Consequences of stress
Effect on behaviour and personality
Effect of stress on performance
Individual and Organizational consequences with special focus on health

Module V: Strategies for stress management
Importance of stress management
Healthy and Unhealthy strategies
Peer group and social support
Happiness and well-being

Module VI: End-of-Semester Appraisal
Viva based on personal journal
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Exit Level Rating by Self and Observer

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Examination Scheme: Total Internal (100)

Components	SAP	Journal for Success (JOS)	A	Mid Term Test / CT / Assignment	VIVA / Presentation
Weightage (%)	25	10	5	30	30

SAP: Social Awareness Programme, A: Attendance, CT: Class Test

Text & References:

- Blonna, Richard; Coping with Stress in a Changing World: Second edition
- Pestonjee, D.M, Pareek, Udai, Agarwal Rita; Studies in Stress And its Management
- Pestonjee, D.M.; Stress and Coping: The Indian Experience
- Clegg, Brian; Instant Stress Management – Bring calm to your life now

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Syllabus – Fifth Semester

PERSONALITY, NATIONALISM AND HUMAN VALUES

Course Code: BEH2552 **Credit Units: 01**

Course Objective:
This course aims at enabling students towards:
Understand the importance of individual differences
Better understanding of self in relation to society and nation
Facilitation for a meaningful existence and adjustment in society
Inculcating patriotism and national pride

Course Contents:

Module I: Individual differences& Personality
Personality: Definition& Relevance
Importance of nature & nurture in Personality Development
Importance and Recognition of Individual differences in Personality
Accepting and Managing Individual differences (adjustment mechanisms)
Intuition, Jugement, Perception & Sensation (MBTI)
BIG5 Factors

Module II: Managing Diversity
Defining Diversity
Affirmation Action and Managing Diversity
Increasing Diversity in Work Force
Barriers and Challenges in Managing Diversity

Module III: Socialization
Nature of Socialization
Social Interaction
Interaction of Socialization Process
Contributions to Society and Nation

Module IV: Patriotism and National Pride
Sense of pride and patriotism
Importance of discipline and hard work
Integrity and accountability

Module V: Human Rights, Values and Ethics
Meaning and Importance of human rights
Human rights awareness
Values and Ethics- Learning based on project work on Scriptures like- Ramayana, Mahabharata, Gita etc.

Module VI: End-of-Semester Appraisal
Viva based on personal journal
Assessment of Behavioural change as a result of training

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Exit Level Rating by Self and Observer

Examination Scheme: Total Internal (100)

Components	SAP	Journal for Success (JOS)	A	Mid Term Test / CT / Assignment	VIVA / Presentation
Weightage (%)	25	10	5	30	30

SAP: Social Awareness Programme, A: Attendance, CT: Class Test

Text & References:

- Davis, K. Organizational Behaviour,
- Bates, A. P. and Julian, J.: Sociology - Understanding Social Behaviour
- Dressler, David and Cans, Donald: The Study of Human Interaction
- Lapiere, Richard. T – Social Change
- Lindzey, G. and Borgatta, E: Sociometric Measurement in the Handbook of Social Psychology, Addison – Welsley, US.
- Rose, G.: Oxford Textbook of Public Health, Vol.4, 1985.
- Robbins O.B.Stephen;. Organizational Behaviour

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Syllabus – Sixth Semester

INTERPERSONAL COMMUNICATION

Course Code: BEH2652 **Credit Units: 01**

Course Objective:
This course provides practical guidance on

- Enhancing personal effectiveness and performance through effective interpersonal communication
- Enhancing their conflict management and negotiation skills

Course Contents:

Module I: Interpersonal Communication: An Introduction
Importance of Interpersonal Communication
Types – Self and Other Oriented
Rapport Building – NLP, Communication Mode
Steps to improve Interpersonal Communication

Module II: Behavioural Communication
Meaning and Nature of behavioural communication
Persuasion, Influence, Listening and Questioning
Guidelines for developing Human Communication skills
Relevance of Behavioural Communication for personal and professional development

Module III: Interpersonal Styles
Transactional Analysis
Life Position/Script Analysis
Games Analysis
Interactional and Transactional Styles

Module IV: Conflict Management
Meaning and nature of conflicts
Styles and techniques of conflict management
Conflict management and interpersonal communication

Module V: Negotiation Skills
Meaning and Negotiation approaches (Traditional and Contemporary)
Process and strategies of negotiations
Negotiation and interpersonal communication

Module VI: End-of-Semester Appraisal
Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

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Examination Scheme: Total Internal (100)

Components	SAP	Journal for Success (JOS)	A	Mid Term Test / CT / Assignment	VIVA / Presentation
Weightage (%)	25	10	5	30	30

SAP: Social Awareness Programme, A: Attendance, CT: Class Test

Text & References:

- Vangelist L. Anita, Mark N. Knapp, Inter Personal Communication and Human Relationships: Third Edition, Allyn and Bacon.
- Julia T. Wood. Interpersonal Communication everyday encounter
- Simons, Christine, Naylor, Belinda: Effective Communication for Managers, 1997 1st Edition Cassel
- Goddard, Ken: Informative Writing, 1995 1st Edition, Cassell
- HarvardBusinessSchool, Effective Communication: United States of America
- Foster John, Effective Writing Skills: Volume-7, First Edition 2000, Institute of Public Relations (IPR)
- Beebe, Beebe and Redmond; Interpersonal Communication, 1996; Allyn and Bacon Publishers

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Syllabus – Seventh Semester

RELATIONSHIP MANAGEMENT

Course Code: BEH2751 **Credit Units: 01**

Course Objective:
To understand the basis of interpersonal relationship
To understand various communication style
To learn the strategies for effective interpersonal relationship

Course Contents:

Module I: Understanding Relationships
Importance of relationships
Role and relationships
Maintaining healthy relationships

Module II: Bridging Individual Differences
Understanding individual differences
Bridging differences in Interpersonal Relationship – TA
Communication Styles

Module III: Interpersonal Relationship Development
Importance of Interpersonal Relationships
Interpersonal Relationships Skills
Types of Interpersonal Relationships

Module IV: Theories of Interpersonal Relationships
Theories: Social Exchange, Uncertainty Reduction Theory
Factors Affecting Interpersonal Relationships
Improving Interpersonal Relationships

Module V: Impression Management
Meaning & Components of Impression Management
Impression Management Techniques (Influencing Skills)
Impression Management Training-Self help and Formal approaches

Module VI: End-of-Semester Appraisal
Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

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Examination Scheme: Total Internal (100)

Components	SAP	Journal for Success (JOS)	A	Mid Term Test / CT / Assignment	VIVA / Presentation
Weightage (%)	25	10	5	30	30

SAP: Social Awareness Programme, A: Attendance, CT: Class Test

Text & References:

- Vangelist L. Anita, Mark N. Knapp, Inter Personal Communication and Human Relationships: Third Edition, Allyn and Bacon
- Julia T. Wood. Interpersonal Communication everyday encounter
- Simons, Christine, Naylor, Belinda: Effective Communication for Managers, 1997 1st Edition Cassell
- Goddard, Ken: Informative Writing, 1995 1st Edition, Cassell
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Syllabus – Eighth Semester

PERSONAL AND PROFESSIONAL EXCELLENCE

Course Code: BEH2851 **Credit Units: 01**

Course Objective:
Importance of Personal and Professional excellence
Inculcating the components of excellence

Course Contents:

Module I: Components of Excellence
Personal Excellence:
Identifying long-term choices and goals
Uncovering the talent, strength & style
Analyzing choke points in your personal processes by analysis in area of placements, events, seminars, conference, extracurricular activities, projects etc.

Module II: Managing Personal Effectiveness
Setting goals to maintain focus
Dimensions of personal effectiveness (self disclosure, openness to feedback and perceptiveness)
Integration of personal and organizational vision for effectiveness
A healthy balance of work and play
Managing Stress creatively and productively

Module III: Personal Success Strategy
Time management
Handling criticism and interruptions
Dealing with difficult people
Mapping and evaluating the situations
Identifying long-term goals

Module IV: Positive Personal Growth
Understanding & Developing positive emotions
Positive approach towards future
Resilience during loss and challenge

Module V: Professional Success
Building independence & interdependence
Reducing resistance to change
Continued reflection (Placements, events, seminars, conferences, projects extracurricular Activities etc.)

Module VI: End-of-Semester Appraisal
Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

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Examination Scheme: Total Internal (100)

Components	SAP	Journal for Success (JOS)	A	Mid Term Test / CT / Assignment	VIVA / Presentation
Weightage (%)	25	10	5	30	30

SAP: Social Awareness Programme, A: Attendance, CT: Class Test

Text & References:

- Dr. Michael J. Provitera: Mastering Self-Motivation: Preparing Yourself for Personal Excellence
- George Leonard: Mastery: The keys to success and long-term fulfillment.
- Arlene R. Barro: Win Without Competing! Career Success the Right Fit Way

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SYLLABUS - UNDERGRADUATE-4 YEAR NEP PROGRAMMES

Syllabus - First Semester

UNDERSTANDING SELF FOR EFFECTIVENESS

Course Code: BEH2151/ SEBS2101 **Credit Units: 01**

Course Objective:
This course aims at imparting**:**

- Understanding self & process of self exploration
- Learning strategies for development of a healthy self esteem
- Importance of attitudes and its effective on personality
- Building Emotional Competence

Course Contents:
Module I: Self: Core Competency
Understanding of Self
Components of Self – Self identity
Self concept
Self confidence
Self image

Module II: Techniques of Self Awareness
Exploration through Johari Window
Mapping the key characteristics of self
Framing a charter for self
Stages – self awareness, self acceptance and self realization

Module III: Self Esteem & Effectiveness
Meaning and Importance
Components of self esteem
High and low self esteem
Measuring your self esteem

Module IV: Building Positive Attitude
Meaning and nature of attitude
Components and Types of attitude
Importance and relevance of attitude

Module V: Building Emotional Competence
Emotional Intelligence – Meaning, components, Importance and Relevance
Positive and Negative emotions
Healthy and Unhealthy expression of emotions

Module VI: End-of-Semester Appraisal

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Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

Examination Scheme: Total Internal (100)

Components	SAP	Journal for Success (JOS)	A	Mid Term Test / CT / Assignment	VIVA / Presentation
Weightage (%)	25	10	5	30	30

SAP: Social Awareness Programme, A: Attendance, CT: Class Test

Text & References:

- Organizational Behaviour, Davis, K.
- Hoover, Judhith D. Effective Small Group and Team Communication, 2002,HarcourtCollege Publishers
- Dick, McCann&Margerison, Charles: Team Management, 1992 Edition, viva books
- Bates, A. P. and Julian, J.: Sociology - Understanding Social Behaviour
- Dressler, David and Cans, Donald: The Study of Human Interaction
- Lapiere, Richard. T – Social Change
- Lindzey, G. and Borgatta, E: Sociometric Measurement in the Handbook of Social Psychology, Addison – Welsley, US.
- Rose, G.: Oxford Textbook of Public Health, Vol.4, 1985.
- LaFasto and Larson: When Teams Work Best, 2001, Response Books (Sage), New Delhi
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Syllabus – Second Semester

PROBLEM SOLVING AND CREATIVE THINKING

Course Code: BEH2251/ SEBS2201 **Credit Units: 01**

Course Objective:
To enable the students:
- Understand the process of problem solving and creative thinking.
- Facilitation and enhancement of skills required for decision-making.

Course Contents:
Module I: Thinking as a tool for Problem Solving
What is thinking: The Mind/Brain/Behaviour
Critical Thinking and Learning:
- Making Predictions and Reasoning
- Memory and Critical Thinking
- Emotions and Critical Thinking

Thinking skills

Module II: Hindrances to Problem Solving Process
Perception
Expression
Emotion
Intellect
Work environment

Module III: Problem Solving Process
Recognizing and Defining a problem
Analyzing the problem (potential causes)
Developing possible alternatives
Evaluating Solutions
Resolution of problem
Implementation
Barriers to problem solving:
- Perception
- Expression
- Emotion
- Intellect
- Work environment

Module IV: Plan of Action
Construction of POA
Monitoring
Reviewing and analyzing the outcome

Module V: Creative Thinking
Definition and meaning of creativity
The nature of creative thinking

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- Convergent and Divergent thinking
- Idea generation and evaluation (Brain Storming)
- Image generation and evaluation
- Debating

The six-phase model of Creative Thinking: ICEDIP model

Module VI: End-of-Semester Appraisal

Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

Examination Scheme: Total Internal (100)

Components	SAP	Journal for Success (JOS)	A	Mid Term Test / CT / Assignment	VIVA / Presentation
Weightage (%)	25	10	5	30	30

SAP: Social Awareness Programme, A: Attendance, CT: Class Test

Text & References:

- Michael Steven: How to be a better problem solver, Kogan Page, New Delhi, 1999
- Geoff Petty: How to be better at creativity; Kogan Page, New Delhi, 1999
- Richard Y. Chang and P. Keith, Kelly: Wheeler Publishing, New Delhi, 1998.
- Phil Lowe Koge Page: Creativity and Problem Solving, New Delhi, 1996
- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 3, Management (1996); Pfeiffer &Company
- Bensley, Alan D.: Critical Thinking in Psychology – A Unified Skills Approach, (1998), Brooks/Cole Publishing Company.

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Syllabus – Third Semester

GROUP DYNAMICS AND TEAM BUILDING

Course Code: BEH2351/ SEBS2301 **Credit Units: 1**

Course Objective:
To inculcate in the students an elementary level of understanding of group/team functions.
To develop team spirit and to know the importance of working in teams.

Course Contents:

Module I: Group formation
Definition and Characteristics
Importance of groups
Classification of groups
Stages of group formation
Benefits of group formation

Module II: Group Functions
External Conditions affecting group functioning: Authority, Structure, Org. Resources, Organizational policies etc.
Internal conditions affecting group functioning: Roles, Norms,Conformity, Status, Cohesiveness, Size, Inter group conflict.
Group Cohesiveness and Group Conflict
Adjustment in Groups

Module III: Teams
Meaning and nature of teams
External and internal factors effecting team
Building Effective Teams
ConsensusBuilding
Collaboration

Module IV: Leadership
Meaning, Nature and Functions
Self leadership
Leadership styles in organization
Leadership in Teams

Module V: Power to empower: Individual and Teams
Meaning and Nature
Types of power
Relevance in organization and Society

Module VI: End-of-Semester Appraisal
Viva based on personal journal
Assessment of Behavioural change as a result of training

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Exit Level Rating by Self and Observer

Examination Scheme: Total Internal (100)

Components	SAP	Journal for Success (JOS)	A	Mid Term Test / CT / Assignment	VIVA / Presentation
Weightage (%)	25	10	5	30	30

SAP: Social Awareness Programme, A: Attendance, CT: Class Test

Text & References:

- Organizational Behaviour, Davis, K.
- Hoover, Judhith D. Effective Small Group and Team Communication, 2002,HarcourtCollege Publishers.
- Dick, McCann&Margerison, Charles: Team Management, 1992 Edition, viva books.
- Bates, A. P. and Julian, J.: Sociology - Understanding Social Behaviour.
- Dressers, David and Cans, Donald: The Study of Human Interaction.
- Lapiere, Richard. T – Social Change.
- Lindzey, G. and Borgatta, E: Sociometric Measurement in the Handbook of Social Psychology, Addison – Welsley, US.
- Rose, G.: Oxford Textbook of Public Health, Vol.4, 1985.
- LaFasto and Larson: When Teams Work Best, 2001, Response Books (Sage), New Delhi
- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 2, Group (1996); Pfeiffer & Company.
- Smither Robert D.; The Psychology of Work and Human Performance, 1994, Harper Collins College Publishers.

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Syllabus – Fourth Semester

STRESS AND COPING STRATEGIES

Course Code: BEH2451/ SEBS2401 **Credit Units: 01**

Course Objective:
To develop an understanding the concept of stress its causes, symptoms and consequences.
To develop an understanding the consequences of the stress on one's wellness, health, and work performance.

Course Contents:
Module I: Stress
Meaning & Nature
Characteristics
Types of stress

Module II: Stages and Models of Stress
Stages of stress
The physiology of stress
Stimulus-oriented approach.
Response-oriented approach.
The transactional and interact ional model.
Pressure – environment fit model of stress.

Module III: Causes and symptoms of stress
Personal
Organizational
Environmental

Module IV: Consequences of stress
Effect on behaviour and personality
Effect of stress on performance
Individual and Organizational consequences with special focus on health

Module V: Strategies for stress management
Importance of stress management
Healthy and Unhealthy strategies
Peer group and social support
Happiness and well-being

Module VI: End-of-Semester Appraisal
Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

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Examination Scheme: Total Internal (100)

Components	SAP	Journal for Success (JOS)	A	Mid Term Test / CT / Assignment	VIVA / Presentation
Weightage (%)	25	10	5	30	30

SAP: Social Awareness Programme, A: Attendance, CT: Class Test

Text & References:

- Blonna, Richard; Coping with Stress in a Changing World: Second edition
- Pestonjee, D.M, Pareek, Udai, Agarwal Rita; Studies in Stress And its Management
- Pestonjee, D.M.; Stress and Coping: The Indian Experience
- Clegg, Brian; Instant Stress Management – Bring calm to your life now

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Syllabus – Fifth Semester

INDIVIDUAL, SOCIETY AND NATIONS

Course Code: BEH2551/ SEBS2501 **Credit Units: 01**

Course Objective:
This course aims at enabling students towards:

- Understand the importance of individual differences
- Better understanding of self in relation to society and nation
- Facilitation for a meaningful existence and adjustment in society
- To inculcate patriotism and National pride.
- To enhance personal and professional excellence

Course Contents:

Module I: Individual differences& Personality
Personality: Definition& Relevance
Importance of nature & nurture in Personality Development
Importance and Recognition of Individual differences in Personality
Accepting and Managing Individual differences (Adjustment Mechanisms)
Intuition, Judgment, Perception & Sensation (MBTI)
BIG5 Factors

Module II: Socialization
Nature of Socialization
Social Interaction
Interaction of Socialization Process
Contributions to Society & Nation

Module III: Patriotism and National Pride
Sense of Pride and Patriotism
Importance of Discipline and hard work
Integrity and accountability

Module IV: Human Rights, Values and Ethics
Meaning of Human Rights
Human Rights Awareness
Importance of human rights
Values and Ethics- Learning based on project work on Scriptures like Ramayana, Mahabharata, Gitaetc

Module V: Personal and Professional Excellence
Personal excellence:

- Identifying Long-term choices and goals
- Uncovering talent, strength and style

Alan P. Rossiter's eight aspects of Professional Excellence
Resilience during challenge and loss

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Continued Reflection (Placements, Events, Seminars, Conferences, Projects, Extracurricular Activities, etc.)

Module VI: End-of-Semester Appraisal
Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

Examination Scheme: Total Internal (100)

Components	SAP	Journal for Success (JOS)	A	Mid Term Test / CT / Assignment	VIVA / Presentation
Weightage (%)	25	10	5	30	30

SAP: Social Awareness Programme, A: Attendance, CT: Class Test

Text & References:

- Bates, A. P. and Julian, J.: Sociology - Understanding Social Behaviour
- Dressler, David and Cans, Donald: The Study of Human Interaction
- Lapiere, Richard. T – Social Change
- Rose, G.: Oxford Textbook of Public Health, Vol.4, 1985.
- Robbins O.B.Stephen;. Organizational Behaviour

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Syllabus – Sixth Semester

INTERPERSONAL COMMUNICATION & RELATIONSHIP MANAGEMENT

Course Code: BEH2651 **Credit Units: 01**

Course Objective:
This course aims at imparting an understanding of:
Interpersonal communication and relationship
Strategies for healthy interpersonal relationship
Effective management of emotions
Building interpersonal competence

Course Contents:
Module I: Interpersonal Communication
Importance of Behavioural/ Interpersonal Communication
Types – Self and Other Oriented
Rapport Building – NLP, Communication Mode
Steps to improve Interpersonal Communication

Module II: Interpersonal Styles
Transactional Analysis
Life Position/Script Analysis
Games Analysis
Interactional and Transactional Styles
Bridging differences in Interpersonal Relationship through TA
Communication Styles

Module III: Conflict Management and Negotiation
Meaning and Nature of conflicts
Styles and techniques of conflict management
Meaning of Negotiation
Process and Strategies of Negotiation
Interpersonal Communication: Conflict Management and Negotiation

Module IV: Interpersonal Relationship Development
Importance of Interpersonal Relationships
Interpersonal Relationship Skills
Types of Interpersonal Relationships
Relevance of Interpersonal Communication in Relationship Development

Module V: Impression Management
Meaning & Components of Impression Management
Impression Management Techniques
Impression Management Training-Self help and Formal approaches

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Module VI: End-of-Semester Appraisal
Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

Examination Scheme: Total Internal (100)

Components	SAP	Journal for Success (JOS)	A	Mid Term Test / CT / Assignment	VIVA / Presentation
Weightage (%)	25	10	5	30	30

SAP: Social Awareness Programme, A: Attendance, CT: Class Test

Text & References:

- Vangelist L. Anita, Mark N. Knapp, Inter Personal Communication and Human Relationships: Third Edition, Allyn and Bacon
- Julia T. Wood. Interpersonal Communication everyday encounter
- Beebe, Beebe and Redmond; Interpersonal Communication, 1996; Allyn and Bacon Publishers.
- Rosenfeld, P., Giacalone, R.A. and Catherine, A.R. (2003). Impression Management: Building and Enhancing Reputations at Work. Thomson Learning, Singapore.

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SYLLABUS – POSTGRADUATE PROGRAMMES

Syllabus – First Semester

SELF-DEVELOPMENT AND INTERPERSONAL SKILLS

Course Code: BEH4151 **Credit Units: 01**

Course Objective:
This course aims at imparting an understanding of:
Self and the process of self exploration
Learning strategies for development of a healthy self esteem
Importance of attitudes and their effect on work behaviour
Effective management of emotions and building interpersonal competence.

Course Contents:

Module I: Understanding Self
Formation of self concept
Dimension of Self
Components of self
Self Competency

Module II: Self-Esteem: Sense of Worth
Meaning and Nature of Self Esteem
Characteristics of High and Low Self Esteem
Importance & need of Self Esteem
Self esteem at work
Steps to enhance Self Esteem

Module III: Emotional Intelligence: Brain Power
Introduction to EI
Difference between IQ, EQ and SQ
Relevance of EI at workplace
Self assessment, analysis and action plan

Module IV: Managing Emotions and Building Interpersonal Competence
Need and importance of Emotions
Healthy and Unhealthy expression of emotions
Anger: Conceptualization and Cycle
Developing emotional and interpersonal competence
Self assessment, analysis and action plan

Module V: Leading Through Positive Attitude
Understanding Attitudes
Formation of Attitudes
Types of Attitudes

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Effects of Attitude on
Behaviour
Perception
Motivation
Stress
Adjustment
Time Management
Effective Performance
Building Positive Attitude

Module VI: End-of-Semester Appraisal
Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

Examination Scheme: Total Internal (100)

Components	SAP	Journal for Success (JOS)	A	Mid Term Test / CT / Assignment	VIVA / Presentation
Weightage (%)	25	10	5	30	30

SAP: Social Awareness Programme, A: Attendance, CT: Class Test

Text & References:

- Towers, Marc: Self Esteem, 1st Edition 1997, American Media
- Pedler Mike, Burgoyne John, Boydell Tom, A Manager's Guide to Self-Development: Second edition, McGraw-Hill Book Company.
- Covey, R. Stephen: Seven habits of Highly Effective People, 1992 Edition, Simon & Schuster Ltd.
- Khera Shiv: You Can Win, 1st Edition, 1999, Macmillan
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- ChatterjeeDebashish, Leading Consciously: 1998 1st Edition, Viva Books Pvt Ltd.
- Dr. Dinkmeyer Don, Dr. Losoncy Lewis, The Skills of Encouragement: St. Lucie Press.
- Singh, Dalip, 2002, Emotional Intelligence at work; First Edition, Sage Publications.
- Goleman, Daniel: Emotional Intelligence, 1995 Edition, Bantam Books
- Goleman, Daniel: Working with E.I., 1998 Edition, Bantam Books.

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Syllabus – Second Semester

BEHAVIOURAL COMMUNICATION AND RELATIONSHIP MANAGEMENT

Course Code: BEH4251 **Credit Units: 01**

Course Objective:
This course aims at imparting an understanding of:
Process of Behavioural communication
Aspects of interpersonal communication and relationship
Management of individual differences as important dimension of IPR

Course Contents:

Module I: Behavioural Communication
Scope of Behavioural Communication
Process – Personal, Impersonal and Interpersonal Communication
Guidelines for developing Human Communication skills
Relevance of Behavioural Communication in relationship management

Module II: Managing Individual Differences in Relationships
Principles
Types of issues
Approaches
Understanding and importance of self disclosure
Guidelines for effective communication during conflicts

Module III: Communication Climate: Foundation of Interpersonal Relationships
Elements of satisfying relationships
Conforming and Disconfirming Communication
Culturally Relevant Communication
Guideline for Creating and Sustaining Healthy Climate

Module IV: Interpersonal Communication
Imperatives for Interpersonal Communication
Models – Linear, Interaction and Transaction
Patterns – Complementary, Symmetrical and Parallel
Types – Self and Other Oriented
Steps to improve Interpersonal Communication

Module V: Interpersonal Relationship Development
Relationship circle – Peer/ Colleague, Superior and Subordinate
Initiating and establishing IPR
Escalating, maintaining and terminating IPR
Direct and indirect strategies of terminating relationship
Model of ending relationship

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Module VI: End-of-Semester Appraisal
Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

Examination Scheme: Total Internal (100)

Components	SAP	Journal for Success (JOS)	A	Mid Term Test / CT / Assignment	VIVA / Presentation
Weightage (%)	25	10	5	30	30

SAP: Social Awareness Programme, A: Attendance, CT: Class Test

Text & References:

- Vangelist L. Anita, Mark N. Knapp, Inter Personal Communication and Human Relationships: Third Edition, Allyn and Bacon
- Julia T. Wood. Interpersonal Communication everyday encounter
- Simons, Christine, Naylor, Belinda: Effective Communication for Managers, 1997 1st Edition Cassell
- Harvard Business School, Effective Communication: United States of America
- Beebe, Beebe and Redmond; Interpersonal Communication, 1996; Allyn and Bacon Publishers.

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Syllabus – Third Semester

LEADING THROUGH TEAMS

Course Code: BEH4351 **Credit Units: 01**

Course Objective:
This course aims to enable students to:
Understand the concept and building of teams
Manage conflict and stress within team
Facilitate better team management and organizational effectiveness through universal human values.

Course Contents:

Module I: Teams: An Overview
Team Design Features: team vs. group
Effective Team Mission and Vision
Life Cycle of a Project Team
Rationale of a Team, Goal Analysis and Team Roles

Module II: Team & Sociometry
Patterns of Interaction in a Team
Sociometry: Method of studying attractions and repulsions in groups
Construction of sociogram for studying interpersonal relations in a Team

Module III: Team Building
Types and Development of Team Building
Stages of team growth
Team performance curve
Profiling your Team: Internal & External Dynamics
Team Strategies for organizational vision
Team communication

Module IV: Team Leadership & Conflict Management
Leadership styles in organizations
Self Authorized team leadership
Causes of team conflict
Conflict management strategies
Stress and Coping in teams

Module V: Global Teams and Universal Values
Management by values
Pragmatic spirituality in life and organization
Building global teams through universal human values
Learning based on project work on Scriptures like Ramayana, Mahabharata, Gita etc.

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Module VI: End-of-Semester Appraisal
Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

Examination Scheme: Total Internal (100)

Components	SAP	Journal for Success (JOS)	A	Mid Term Test / CT / Assignment	VIVA / Presentation
Weightage (%)	25	10	5	30	30

SAP: Social Awareness Programme, A: Attendance, CT: Class Test

Text & References:

- Organizational Behaviour, Davis, K.
- Hoover, Judhith D. Effective Small Group and Team Communication, 2002,Harcourt College Publishers
- LaFasto and Larson: When Teams Work Best, 2001, Response Books (Sage), New Delhi
- Dick, McCann&Margerison, Charles: Team Management, 1992 Edition, viva books
- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 2, Group (1996); Pfeiffer & Company
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Syllabus – Fourth Semester

PROFESSIONAL EXCELLENCE

Course Code: BEH4451 **Credit Units: 01**

Course Objective:
This course aims at imparting an understanding of:
Build and leverage your professional reputation
Maintain focus in pressure situations
Make a balanced choice between professional and personal commitments

Course Contents:
Module I: Individual, Society and Nation
Individual Differences and Dimensions of Personality
Socialization Process
Relating to the Nation: Values, Culture, Religion
Sense of pride and Patriotism
Managing Diversity

Module II: Components of Excellence
Personal Excellence:
Identifying long-term choices and goals
Uncovering the talent, strength & style
Analyzing choke points in your personal processes by analysis in area of placements, events, seminars, conference, extracurricular activities, projects etc.
Developing professional power: Goal-setting, time management, handling criticism, interruptions and time wasters

Module III: Career Planning
Knowing one's Interest and Aptitude
Identifying available Resources
Setting goals to maintain focus:
Developing Positive attributes in personality
Self-reliance and Employability skills

Module IV: Stress Management for Healthy Living
Meaning and Nature of Stress
Stages of stress
Causes and Consequences of stress: Personal, Organizational and Environmental
Personal Styles and strategies of coping

Module V: Professional Success
Building independence &interdependence
Reducing resistance to change
Continued reflection (Placements, events, seminars, conferences, projects extracurricular Activities etc.)

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Module VI: End-of-Semester Appraisal
Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

Examination Scheme: Total Internal (100)

Components	SAP	Journal for Success (JOS)	A	Mid Term Test / CT / Assignment	VIVA / Presentation
Weightage (%)	25	10	5	30	30

SAP: Social Awareness Programme, A: Attendance, CT: Class Test

Text & References:

- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 2, Group (1996); Pfeiffer & Company
- Smither Robert D.; The Psychology of Work and Human Performance, 1994, Harper Collins College Publishers
- Raman, A.T. (2003) Knowledge Management: A Resource Book. Excel Books, Delhi.
- Kamalavijayan, D. (2005). Information and Knowledge Management. Macmillan India Ltd. Delhi

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SYLLABUS - INTEGRATED PROGRAMMES (UNDERGRADUATE-POSTGRADUATE)

Syllabus – First Semester

UNDERSTANDING SELF FOR EFFECTIVENESS

Course Code: BEH2151 **Credit Units: 01**

Course Objective:
This course aims at imparting**:**

- Understanding self & process of self exploration
- Learning strategies for development of a healthy self esteem
- Importance of attitudes and its effective on personality
- Building Emotional Competence

Course Contents:
Module I: Self: Core Competency
Understanding of Self
Components of Self – Self identity
Self concept
Self confidence
Self image

Module II: Techniques of Self Awareness
Exploration through Johari Window
Mapping the key characteristics of self
Framing a charter for self
Stages – self awareness, self acceptance and self realization

Module III: Self Esteem & Effectiveness
Meaning and Importance
Components of self esteem
High and low self esteem
Measuring your self esteem

Module IV: Building Positive Attitude
Meaning and nature of attitude
Components and Types of attitude
Importance and relevance of attitude

Module V: Building Emotional Competence
Emotional Intelligence – Meaning, components, Importance and Relevance
Positive and Negative emotions
Healthy and Unhealthy expression of emotions

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Module VI: End-of-Semester Appraisal
Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

Examination Scheme: Total Internal (100)

Components	SAP	Journal for Success (JOS)	A	Mid Term Test / CT / Assignment	VIVA / Presentation
Weightage (%)	25	10	5	30	30

SAP: Social Awareness Programme, A: Attendance, CT: Class Test

Text & References:

- Organizational Behaviour, Davis, K.
- Hoover, Judhith D. Effective Small Group and Team Communication, 2002,HarcourtCollege Publishers
- Dick, McCann&Margerison, Charles: Team Management, 1992 Edition, viva books
- Bates, A. P. and Julian, J.: Sociology - Understanding Social Behaviour
- Dressler, David and Cans, Donald: The Study of Human Interaction
- Lapiere, Richard. T – Social Change
- Lindzey, G. and Borgatta, E: Sociometric Measurement in the Handbook of Social Psychology, Addison – Welsley, US.
- Rose, G.: Oxford Textbook of Public Health, Vol.4, 1985.
- LaFasto and Larson: When Teams Work Best, 2001, Response Books (Sage), New Delhi
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Syllabus - Second Semester

PROBLEM SOLVING AND CREATIVE THINKING

Course Code: BEH2251 **Credit Units: 01**

Course Objective:
To enable the students:
- Understand the process of problem solving and creative thinking.
- Facilitation and enhancement of skills required for decision-making.

Course Contents:
Module I: Thinking as a tool for Problem Solving
What is thinking: The Mind/Brain/Behaviour
Critical Thinking and Learning:
- Making Predictions and Reasoning
- Memory and Critical Thinking
- Emotions and Critical Thinking

Thinking skills

Module II: Hindrances to Problem Solving Process
Perception
Expression
Emotion
Intellect
Work environment

Module III: Problem Solving Process
Recognizing and Defining a problem
Analyzing the problem (potential causes)
Developing possible alternatives
Evaluating Solutions
Resolution of problem
Implementation
Barriers to problem solving:
- Perception
- Expression
- Emotion
- Intellect
- Work environment

Module IV: Plan of Action
Construction of POA
Monitoring
Reviewing and analyzing the outcome

Module V: Creative Thinking
Definition and meaning of creativity
The nature of creative thinking

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- Convergent and Divergent thinking
- Idea generation and evaluation (Brain Storming)
- Image generation and evaluation
- Debating

The six-phase model of Creative Thinking: ICEDIP model

Module VI: End-of-Semester Appraisal

Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

Examination Scheme: Total Internal (100)

Components	SAP	Journal for Success (JOS)	A	Mid Term Test / CT / Assignment	VIVA / Presentation
Weightage (%)	25	10	5	30	30

SAP: Social Awareness Programme, A: Attendance, CT: Class Test

Text & References:

- Michael Steven: How to be a better problem solver, Kogan Page, New Delhi, 1999
- Geoff Petty: How to be better at creativity; Kogan Page, New Delhi, 1999
- Richard Y. Chang and P. Keith, Kelly: Wheeler Publishing, New Delhi, 1998.
- Phil Lowe Koge Page: Creativity and Problem Solving, New Delhi, 1996
- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 3, Management (1996); Pfeiffer &Company
- Bensley, Alan D.: Critical Thinking in Psychology – A Unified Skills Approach, (1998), Brooks/Cole Publishing Company.

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Syllabus – Third Semester

GROUP DYNAMICS AND TEAM BUILDING

Course Code: BEH2351 **Credit Units: 01**

Course Objective:
To inculcate in the students an elementary level of understanding of group/team functions.
To develop team spirit and to know the importance of working in teams.

Course Contents:

Module I: Group formation
Definition and Characteristics
Importance of groups
Classification of groups
Stages of group formation
Benefits of group formation

Module II: Group Functions
External Conditions affecting group functioning: Authority, Structure, Org. Resources, Organizational policies etc.
Internal conditions affecting group functioning: Roles, Norms, Conformity, Status, Cohesiveness, Size, Inter group conflict.
Group Cohesiveness and Group Conflict
Adjustment in Groups

Module III: Teams
Meaning and nature of teams
External and internal factors effecting team
Building Effective Teams
Consensus Building
Collaboration

Module IV: Leadership
Meaning, Nature and Functions
Self leadership
Leadership styles in organization
Leadership in Teams

Module V: Power to empower: Individual and Teams
Meaning and Nature
Types of power
Relevance in organization and Society

Module VI: End-of-Semester Appraisal
Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

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Examination Scheme: Total Internal (100)

Components	SAP	Journal for Success (JOS)	A	Mid Term Test / CT / Assignment	VIVA / Presentation
Weightage (%)	25	10	5	30	30

SAP: Social Awareness Programme, A: Attendance, CT: Class Test

Text & References:

- Organizational Behaviour, Davis, K.
- Hoover, Judhith D. Effective Small Group and Team Communication, 2002,HarcourtCollege Publishers.
- Dick, McCann&Margerison, Charles: Team Management, 1992 Edition, viva books.
- Bates, A. P. and Julian, J.: Sociology - Understanding Social Behaviour.
- Dressers, David and Cans, Donald: The Study of Human Interaction.
- Lapiere, Richard. T – Social Change.
- Lindzey, G. and Borgatta, E: Sociometric Measurement in the Handbook of Social Psychology, Addison – Welsley, US.
- Rose, G.: Oxford Textbook of Public Health, Vol.4, 1985.
- LaFasto and Larson: When Teams Work Best, 2001, Response Books (Sage), New Delhi
- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 2, Group (1996); Pfeiffer & Company.
- Smither Robert D.; The Psychology of Work and Human Performance, 1994, Harper Collins College Publishers.

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Syllabus – Fourth Semester

STRESS AND COPING STRATEGIES

Course Code: BEH2451 **Credit Units: 01**

Course Objective:
To develop an understanding the concept of stress its causes, symptoms and consequences.
To develop an understanding the consequences of the stress on one's wellness, health, and work performance.

Course Contents:
Module I: Stress
Meaning & Nature
Characteristics
Types of stress

Module II: Stages and Models of Stress
Stages of stress
The physiology of stress
Stimulus-oriented approach.
Response-oriented approach.
The transactional and interactional model.
Pressure – environment fit model of stress.

Module III: Causes and symptoms of stress
Personal
Organizational
Environmental

Module IV: Consequences of stress
Effect on behaviour and personality
Effect of stress on performance
Individual and Organizational consequences with special focus on health

Module V: Strategies for stress management
Importance of stress management
Healthy and Unhealthy strategies
Peer group and social support
Happiness and well-being

Module VI: End-of-Semester Appraisal
Viva based on personal journal
Assessment of Behavioural change as a result of training
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Examination Scheme: Total Internal (100)

Components	SAP	Journal for Success (JOS)	A	Mid Term Test / CT / Assignment	VIVA / Presentation
Weightage (%)	25	10	5	30	30

SAP: Social Awareness Programme, A: Attendance, CT: Class Test

Text & References:

- Blonna, Richard; Coping with Stress in a Changing World: Second edition
- Pestonjee, D.M, Pareek, Udai, Agarwal Rita; Studies in Stress And its Management
- Pestonjee, D.M.; Stress and Coping: The Indian Experience
- Clegg, Brian; Instant Stress Management – Bring calm to your life now

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Syllabus – Fifth Semester

INDIVIDUAL, SOCIETY AND NATIONS

Course Code: BEH2551 **Credit Units: 01**

Course Objective:
This course aims at enabling students towards:

- Understand the importance of individual differences
- Better understanding of self in relation to society and nation
- Facilitation for a meaningful existence and adjustment in society
- To inculcate patriotism and National pride.
- To enhance personal and professional excellence

Course Contents:

Module I: Individual differences& Personality
Personality: Definition& Relevance
Importance of nature & nurture in Personality Development
Importance and Recognition of Individual differences in Personality
Accepting and Managing Individual differences (Adjustment Mechanisms)
Intuition, Judgment, Perception & Sensation (MBTI)
BIG5 Factors

Module II: Socialization
Nature of Socialization
Social Interaction
Interaction of Socialization Process
Contributions to Society & Nation

Module III: Patriotism and National Pride
Sense of Pride and Patriotism
Importance of Discipline and hard work
Integrity and accountability

Module IV: Human Rights, Values and Ethics
Meaning of Human Rights
Human Rights Awareness
Importance of human rights
Values and Ethics- Learning based on project work on Scriptures like Ramayana, Mahabharata, Gitaetc

Module V: Personal and Professional Excellence
Personal excellence:

- Identifying Long-term choices and goals
- Uncovering talent, strength and style

Alan P. Rossiter's eight aspects of Professional Excellence
Resilience during challenge and loss
Continued Reflection (Placements, Events, Seminars, Conferences, Projects, Extracurricular

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Activities, etc.)

Module VI: End-of-Semester Appraisal
Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

Examination Scheme: Total Internal (100)

Components	SAP	Journal for Success (JOS)	A	Mid Term Test / CT / Assignment	VIVA / Presentation
Weightage (%)	25	10	5	30	30

SAP: Social Awareness Programme, A: Attendance, CT: Class Test

Text & References:

- Bates, A. P. and Julian, J.: Sociology - Understanding Social Behaviour
- Dressler, David and Cans, Donald: The Study of Human Interaction
- Lapiere, Richard. T – Social Change
- Rose, G.: Oxford Textbook of Public Health, Vol.4, 1985.
- Robbins O.B.Stephen;. Organizational Behaviour

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Syllabus – Sixth Semester

INTERPERSONAL COMMUNICATION AND RELATIONSHIP MANAGEMENT

Course Code: BEH2651 **Credit Units: 01**

Course Objective:
This course aims at imparting an understanding of:
Interpersonal communication and relationship.
Strategies for healthy interpersonal relationship
Effective management of emotions.
Building interpersonal competence.

Course Contents:
Module I: Interpersonal Communication
Importance of Behavioural/ Interpersonal Communication
Types – Self and Other Oriented
RapportBuilding – NLP, Communication Mode
Steps to improve Interpersonal Communication

Module II: Interpersonal Styles
Transactional Analysis
Life Position/Script Analysis
Games Analysis
Interactional and Transactional Styles
Bridging differences in Interpersonal Relationship through TA
Communication Styles

Module III: Conflict Management and Negotiation
Meaning and Nature of conflicts
Styles and techniques of conflict management
Meaning of Negotiation
Process and Strategies of Negotiation
Interpersonal Communication: Conflict Management and Negotiation

Module IV: Interpersonal Relationship Development
Importance of Interpersonal Relationships
Interpersonal Relationship Skills
Types of Interpersonal Relationships
Relevance of Interpersonal Communication in Relationship Development

Module V: Impression Management
Meaning & Components of Impression Management
Impression Management Techniques
Impression Management Training-Self help and Formal approaches

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Module VI: End-of-Semester Appraisal
Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

Examination Scheme: Total Internal (100)

Components	SAP	Journal for Success (JOS)	A	Mid Term Test / CT / Assignment	VIVA / Presentation
Weightage (%)	25	10	5	30	30

SAP: Social Awareness Programme, A: Attendance, CT: Class Test

Text & References:

- Vangelist L. Anita, Mark N. Knapp, Inter Personal Communication and Human Relationships: Third Edition, Allyn and Bacon
- Julia T. Wood. Interpersonal Communication everyday encounter
- Beebe, Beebe and Redmond; Interpersonal Communication, 1996; Allyn and Bacon Publishers.
- Rosenfeld, P., Giacalone, R.A. and Catherine, A.R. (2003). Impression Management: Building and Enhancing Reputations at Work. Thomson Learning, Singapore.

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Syllabus – Seventh Semester

SELF-DEVELOPMENT AND INTERPERSONAL SKILLS

Course Code: BEH4151 **Credit Units: 01**

Course Objective:
This course aims at imparting an understanding of:
Self and the process of self exploration
Learning strategies for development of a healthy self esteem
Importance of attitudes and their effect on work behaviour
Effective management of emotions and building interpersonal competence.

Course Contents:

Module I: Understanding Self
Formation of self concept
Dimension of Self
Components of self
Self Competency

Module II: Self-Esteem: Sense of Worth
Meaning and Nature of Self Esteem
Characteristics of High and Low Self Esteem
Importance & need of Self Esteem
Self esteem at work
Steps to enhance Self Esteem

Module III: Emotional Intelligence: Brain Power
Introduction to EI
Difference between IQ, EQ and SQ
Relevance of EI at workplace
Self assessment, analysis and action plan

Module IV: Managing Emotions and Building Interpersonal Competence
Need and importance of Emotions
Healthy and Unhealthy expression of emotions
Anger: Conceptualization and Cycle
Developing emotional and interpersonal competence
Self assessment, analysis and action plan

Module V: Leading Through Positive Attitude
Understanding Attitudes
Formation of Attitudes
Types of Attitudes
Effects of Attitude on
Behaviour
Perception
Motivation
Stress

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Adjustment
Time Management
Effective Performance
Building Positive Attitude

Module VI: End-of-Semester Appraisal
Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

Examination Scheme: Total Internal (100)

Components	SAP	Journal for Success (JOS)	A	Mid Term Test / CT / Assignment	VIVA / Presentation
Weightage (%)	25	10	5	30	30

SAP: Social Awareness Programme, A: Attendance, CT: Class Test

Text & References:

- Towers, Marc: Self Esteem, 1st Edition 1997, American Media
- Pedler Mike, Burgoyne John, Boydell Tom, A Manager's Guide to Self-Development: Second edition, McGraw-Hill Book Company.
- Covey, R. Stephen: Seven habits of Highly Effective People, 1992 Edition, Simon & Schuster Ltd.
- Khera Shiv: You Can Win, 1st Edition, 1999, Macmillan
- Gegax Tom, Winning in the Game of Life: 1st Edition, Harmony Books
- ChatterjeeDebashish, Leading Consciously: 1998 1st Edition, Viva Books Pvt Ltd.
- Dr. Dinkmeyer Don, Dr. Losoncy Lewis, The Skills of Encouragement: St. Lucie Press.
- Singh, Dalip, 2002, Emotional Intelligence at work; First Edition, Sage Publications.
- Goleman, Daniel: Emotional Intelligence, 1995 Edition, Bantam Books
- Goleman, Daniel: Working with E.I., 1998 Edition, Bantam Books.

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Syllabus – Eighth Semester

PROFESSIONAL EXCELLENCE

Course Code: BEH4451 **Credit Units: 01**

Course Objective:
This course aims at imparting an understanding of:
Build and leverage your professional reputation
Maintain focus in pressure situations
Make a balanced choice between professional and personal commitments

Course Contents:
Module I: Individual, Society and Nation
Individual Differences and Dimensions of Personality
Socialization Process
Relating to the Nation: Values, Culture, Religion
Sense of pride and Patriotism
Managing Diversity

Module II: Components of Excellence
Personal Excellence:
Identifying long-term choices and goals
Uncovering the talent, strength & style
Analyzing choke points in your personal processes by analysis in area of placements, events, seminars, conference, extracurricular activities, projects etc.
Developing professional power: Goal-setting, time management, handling criticism, interruptions and time wasters

Module III: Career Planning
Knowing one's Interest and Aptitude
Identifying available Resources
Setting goals to maintain focus:
Developing Positive attributes in personality
Self-reliance and Employability skills

Module IV: Stress Management for Healthy Living
Meaning and Nature of Stress
Stages of stress
Causes and Consequences of stress: Personal, Organizational and Environmental
Personal Styles and strategies of coping

Module V: Professional Success
Building independence &interdependence
Reducing resistance to change
Continued reflection (Placements, events, seminars, conferences, projects extracurricular Activities etc.)

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Module VI: End-of-Semester Appraisal
Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

Examination Scheme: Total Internal (100)

Components	SAP	Journal for Success (JOS)	A	Mid Term Test / CT / Assignment	VIVA / Presentation
Weightage (%)	25	10	5	30	30

SAP: Social Awareness Programme, A: Attendance, CT: Class Test

Text & References:

- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 2, Group (1996); Pfeiffer & Company
- Smither Robert D.; The Psychology of Work and Human Performance, 1994, Harper Collins College Publishers
- Raman, A.T. (2003) Knowledge Management: A Resource Book. Excel Books, Delhi.
- Kamalavijayan, D. (2005). Information and Knowledge Management. Macmillan India Ltd. Delhi

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Syllabus – Ninth Semester

LEADING THROUGH TEAMS

Course Code: BEH4351 **Credit Units: 01**

Course Objective:
This course aims to enable students to:
Understand the concept and building of teams
Manage conflict and stress within team
Facilitate better team management and organizational effectiveness through universal human values.

Course Contents:
Module I: Teams: An Overview
Team Design Features: team vs. group
Effective Team Mission and Vision
Life Cycle of a Project Team
Rationale of a Team, Goal Analysis and Team Roles

Module II: Team & Sociometry
Patterns of Interaction in a Team
Sociometry: Method of studying attractions and repulsions in groups
Construction of sociogram for studying interpersonal relations in a Team

Module III: Team Building
Types and Development of Team Building
Stages of team growth
Team performance curve
Profiling your Team: Internal & External Dynamics
Team Strategies for organizational vision
Team communication

Module IV: Team Leadership & Conflict Management
Leadership styles in organizations
Self Authorized team leadership
Causes of team conflict
Conflict management strategies
Stress and Coping in teams

Module V: Global Teams and Universal Values
Management by values
Pragmatic spirituality in life and organization
Building global teams through universal human values
Learning based on project work on Scriptures like Ramayana, Mahabharata, Gita etc.

Module VI: End-of-Semester Appraisal
Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

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Examination Scheme: Total Internal (100)

Components	SAP	Journal for Success (JOS)	A	Mid Term Test / CT / Assignment	VIVA / Presentation
Weightage (%)	25	10	5	30	30

SAP: Social Awareness Programme, A: Attendance, CT: Class Test

Text & References:

- Organizational Behaviour, Davis, K.
- Hoover, Judhith D. Effective Small Group and Team Communication, 2002,Harcourt College Publishers
- LaFasto and Larson: When Teams Work Best, 2001, Response Books (Sage), New Delhi
- Dick, McCann&Margerison, Charles: Team Management, 1992 Edition, viva books
- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 2, Group (1996); Pfeiffer & Company
- Smither Robert D.; The Psychology of Work and Human Performance, 1994, Harper Collins College Publishers

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M. Phil in Clinical Psychology



Achieving Academic Excellence

Curriculum & Scheme of Examination

2023

AMITY UNIVERSITY HARYANA

Note: This is based on M.Phil (Clinical Psychology) Guidelines & Syllabus as given on the RCI website (www.rehabcouncil.nic.in/writereaddata/mphilcp09.pdf)

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PAPER-I: PSYCHOSOCIAL FOUNDATION OF BEHAVIOR AND PSYCHOPATHOLOGY

Course Code: PSY5101 **Credit Units: 12**

Aims: The psychosocial perspectives attempt to understand human cognition, motives, perceptions and behavior as well as their aberrations as product of an interaction amongst societal, cultural, familial and religious factors. The overall aim is to introduce conceptualizations of mental health problems within the psychosocial framework, giving due considerations to contextual issues. Each Module in this paper pays attention to the different types of causal factors considered most influential in shaping both vulnerability to psychopathology and the form that pathology may take.

Objectives: By the end of Part-I, trainees are required to demonstrate ability to:

- Demonstrate a working knowledge of the theoretical application of the psychosocial model to various disorders.
- Make distinctions between universal and culture-specific disorders paying attention to the different types of sociocultural causal factors.
- Demonstrate an awareness of the range of mental health problems with which clients can present to services, as well as their psychosocial/contextual mediation.
- Carry out the clinical work up of clients with mental health problems and build psychosocial formulations and interventions, drawing on their knowledge of psychosocial models and their strengths and weaknesses.
- Apply and integrate alternative or complementary theoretical frameworks, for example, biological and/or religious perspectives, sociocultural beliefs and practices etc. in overall management of mental health problems.
- Describe, explain and apply current code of conduct and ethical principles that apply to clinical psychologists working in the area of mental health and illness.
- Describe Mental Health Acts and Policies, currently prevailing in the country and their implications in professional activities of clinical psychologists.

Academic Format of Modules: Learning would be mainly through clinical workup of clients presenting with range of mental health problems, and supplemented by lectures, seminars and tutorials, allowing trainees to participate in collaborative discussion.

Evaluation: Theory – involving long and short essays

Course Contents: Part-A (Psychosocial Foundations of Behavior)

Module - I: **Introduction**
Overview of the profession and practice; history and growth; professional role and functions; current issues and trends; areas of specialization; ethical and legal issues; code of conduct

Module - II: **Mental health and illness**
Mental health care – past and present; stigma and attitude towards mental illness; concept of mental health and illness; perspectives – psychodynamic, behavioral, cognitive, humanistic, existential and biological models of mental health/illness;

Module - III: Epidemiology
Studies in Indian context; tools available/standardized for epidemiological surveys; socio-cultural correlates of mental illness; religion and mental health; psychological well-being and quality of life - measures and factors influencing

Module - IV: Self and relationships
Self-concept, self-image, self-perception and self-regulations in mental health and illness; learned helplessness and attribution theories; social skill model; interpersonal and communication models of mental illness; stress diathesis model, resilience, coping and social support.

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Module - V: Family influences
Early deprivation and trauma; neglect and abuse; attachment; separation; inadequate parenting styles; marital discord and divorce; maladaptive peer relationships; communication style; family burden; emotional adaptation; expressed emotions and relapse.

Module - VI: Societal influences
Discrimination in race, gender and ethnicity; social class and structure, poverty and unemployment; prejudice, social change and uncertainty; crime and delinquency; social tension & violence; urban stressors; torture & terrorism; culture shock; migration; religion & gender related issues with reference to India.

Module - VII: Disability
Definition and classification of disability; psychosocial models of disability; impact, needs and problems; issues related to assessment/certification of disability – areas and measures.

Module - VIII: **Rehabilitation**
Approaches to rehabilitation; interventions in the rehabilitation processes; models of adaptation to disability; family and caregivers issues; rights of mentally ill; empowerment issues; support to recovery.

Module - IX: Policies and Acts
Rehabilitation Policies and Acts; assistance, concessions, social benefits and support from government and voluntary organizations; contemporary challenges; rehabilitation ethics and professional code of conduct

Course Contents: Part-B (Psychopathology)

Module - X: **Introduction to psychopathology**
Definition; concepts of normality and abnormality; clinical criteria of abnormality; continuity (dimensional) versus discontinuity (categorical), and prototype models of psychopathology; classification and taxonomies – reliability and utility; classificatory systems, currently in use and their advantages and limitations.

Module - XI: **Signs and symptoms**
Disorders of consciousness, attention, motor behavior, orientation, experience of self, speech, thought, perception, emotion, and memory.

Module - XII: Psychological theories
Psychodynamic; behavioral; cognitive; humanistic; interpersonal; psychosocial; and other prominent theories/models of principal clinical disorders and problems, viz. anxiety, obsessive-compulsive, somatoform, dissociative, adjustment, sexual, substance use, personality, suicide, childhood adolescence, psychotic, mood disorders, and culture-specific disorders.

Module - XIII: **Indian thoughts**
Concept of mental health and illness; nosology and taxonomy of mental illness; social identity and stratification (Varnashrama Vyawastha); concept of – cognition, emotion, personality, motivation and their disorders

Examination Scheme:

	Internal Assessment (30 Marks)				**Final Exam**	**Total Marks**
Components	CT	H/P/V/Q	CT	A		
Weightage (%)	10	5	10	5	70	100

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Term Exam

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Text & References:

- An Introduction to Social Psychology, 2nd ed. Kuppuswamy, B. Konark Publishers: New Delhi
- Culture, Socialization and human development, Saraswathi, T.S (1999). Sage publications: New Delhi
- Asian perspectives in Psychology, Vol. 19. Rao, H.S.R & Sinha D. (1997). Sage publications: New Delhi
- Indian Social Problems, Vol.1 & 2, Madan G.R (2003). Allied Publishers Pvt. Ltd., New Delhi. Elements of ancient Indian Psychology, 1st ed. Kuppuswamy, B. (1990) Konark Publishers: New Delhi.
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- Family Theories – an Introduction, Klein, D.M. & White, J.M. (1996). Sage Publications: New Delhi.
- Personality & Social Psychology: towards a synthesis, Krahe, Sage Publications: New Delhi Psychopathology, Buss A.H. (1966). John Wiley and sons: NY
- Making sense of illness: the social psychology of health and disease. Radley, A. (1994). Sage publications: New Delhi
- The sociology of mental illness. 3rd ed. Irallagher, B. J. (1995). Prentice hall: USA Oxford Textbook of Psychopathology, Millon, T., Blaney, P.H. & Davis, R.D. (1999). Oxford University Press: NY
- Abnormal Psychology, 13th ed, Carson, R.C, Butcher, T.N, Mureka, S. & Hooley, J.M. (2007). Dorling Kindersley Pvt Ltd: India
- Developmental Psychopathology, Achenback T.M. (1974). Ronald Press Co.: NY
- Fish's Clinical Psychopathology, Fish, F, & Hamilton, M (1979). John Wright & Sons: Bristol. Psychopathology in the aged, Cole, J.O. & Barrett, J.E. (1980). Raven Press: NY
- Abnormal Child Psychology, Mash, E.J & Wolfe, D.A. (1999). Wadsworth Publishing: U.S.A Handbook of Clinical Child Psychology, 3rd ed. Walker, C.E & Roberts, M.C. (2001). John Wiley & Sons: Canada.
- Clinical Child Psychology, Pfeiffer, S.I. (1985). Grune & Stratton: USA
- Mental Health of Indian Children, Kapur, (1995). Sage publications: New Delhi
- The Inner world: a psychoanalytic study of childhood and society in India, Kakar, S (1981). Oxford University press: New Delhi
- Applied Cross cultural psychology, Brislin, R. W. (1990). Sage publications: New Delhi

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PAPER-II: PSYCHIATRY

Course Code: PSY5103 **Credit Units: 12**

Aim: The aim is to train in conceptualization of psychopathology from different etiological perspectives, eliciting phenomenology and arrive at the clinical diagnosis following a classificatory system and propose/carry out psychological interventions including psychosocial treatment/management for the entire range of psychological disorders. Also, to train in assessing the caregivers' burden, disability and dysfunctions that are often associated with mental disorders and intervene as indicated in a given case.

Objectives: By the end of Part-I, trainees are required to demonstrate ability to:

- Demonstrate an understanding of a clinically significant behavioral and psychological syndrome, and differentiate between child and adult clinical features/presentation.
- Understand that in many ways the culture, societal and familial practices shape the clinical presentation of mental disorders, and understand the role of developmental factors in adult psychopathology.
- Carryout the clinical work up of clients presenting with the range of mental health problems and make clinical formulations/diagnosis drawing on their knowledge of a pertinent diagnostic criteria and phenomenology.
- Summarizes the psychosocial, biological and socio-cultural causal factors associated with mental health problems and neuropsychological disorders with an emphasis on bio-psychosocial and other systemic models.
- Carryout with full competence the psychological assessment, selecting and using a variety of instruments in both children and adults.
- Describe various intervention programs in terms of their efficacy and effectiveness with regard to short and longer term goals, and demonstrate beginning competence in carrying out the indicated interventions, monitor progress and outcome.
- Discuss various pharmacological agents that are used to treat common mental disorders and their mode of action.
- Demonstrate an understanding of caregiver, and family burden and their coping style.
- Assess the disability/dysfunctions that are associated with mental health problems, using appropriate measures.
- Discuss the medico-legal and ethical issues in patients requiring chronic care and institutionalization.

Academic Format of Modules: The learning would be primarily through clinical workups of cases having psychiatric disorders. A mixed lectures/seminar format, allowing trainees to participate in collaborative discussion, could be adapted in addition, for imparting theory components.

Evaluation: Theory – involving long and short essays, practical/clinical exam in psychological assessment of psychiatric cases and comprehensive viva.

Course Contents:

Module - I: Introduction

Approach to clinical interviewing and diagnosis; case history; mental status examination; organization and presentation of psychiatric information; diagnostic formulation; classificatory system in use.

Module - II: Psychoses

Schizophrenia, affective disorders, delusional disorders and other forms of psychotic disorders – types, clinical features, etiology and management

Module - III: Neurotic, stress-related and somatoform disorders

Types, clinical features, etiology and management

Module - IV: **Disorders of personality and behavior**

Specific personality disorders; mental & behavioral disorders due to psychoactive substance use; habit and impulse disorders; sexual

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disorders and dysfunctions – types, clinical features, etiology and management.

Module - V: Organic mental disorders
Dementia, delirium and other related conditions with neuralgic and systemic disorders – types, clinical features, etiology and management.

Module-VI: Behavioral, emotional and developmental disorders of childhood and adolescence: types, clinical features, etiology and management.

Module - VII: Mental retardation
Classification, etiology and management

Module - VIII: Neurobiology of mental disorders
Neurobiological theories of psychosis, mood disorders, suicide, anxiety disorders, substance use disorders and other emotional and behavioral syndromes.

Module - IX: **Therapeutic approaches**
Drugs, ECT, psychosurgery, psychotherapy, and behavior therapy, preventive and rehabilitative strategies – halfway home, sheltered workshop, daycare, and institutionalization.

Module - X: Consultation-liaison psychiatry
Psychiatric consultation in general hospital; primary care setting

Module - XI: **Special populations/Specialties**
Geriatric, terminally ill, HIV/AIDS, suicidal, abused, violent and non-cooperative patients; psychiatric services in community, and following disaster/calamity

Module - XII: **Mental health policies and legislation**
Mental Health Act of 1987, National Mental Health Program 1982, the Persons With Disabilities (equal opportunities, protection of rights and full participation) Act 1995; Rehabilitation Council of India (RCI) Act of 1993, National Trust for Mental Retardation, CP and Autistic Children 1999, Juvenile Justice Act of 1986; ethical and forensic issues in psychiatry practice.

Examination Scheme:

	Internal Assessment (30 Marks)				**Final Exam**	**Total Marks**
Components	CT	H/P/V/Q	CT	A		
Weightage (%)	10	5	10	5	70	100

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Term Exam

Text & References:

- Comprehensive Textbook of Psychiatry, 6th ed., Vol. 1 & 2, Kaplan & Sadock, (1995). William & Wilkins: London.
- Oxford Textbook of psychiatry, 2nd ed., Gelder, Gath & Mayon, (1989). Oxford University Press: NY
- Symptoms in mind: Introduction to descriptive psychopathology, Sims A, Bailliere T, (1988) Textbook of postgraduate psychiatry, 2nd ed. Vol 1 & 2, Vyas, J.N. & Ahuja, N. (1999). Jaypee brothers: New Delhi.
- Child and Adolescent Psychiatry: Modern approaches, 3rd ed., Rutter, M. & Herson, L (1994) Blackwell Scientific Publications: London.

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PAPER-III: STATISTICS AND RESEARCH METHODOLOGY

Course Code: PSY5106 **Credit Units: 12**

Aim: The aim of this paper is to elucidate various issues involved in conduct of a sound experiment/survey. With suitable examples from behavioral field, introduce the trainees to the menu of statistical tools available for their research, and to develop their understanding of the conceptual bases of these tools. Tutorial work will involve exposure to the features available in a large statistical package (SPSS) while at the same time reinforcing the concepts discussed in lectures.

Objectives: By the end of Part-II, trainees are required to demonstrate ability to:

- Understand the empirical meaning of parameters in statistical models
- Understand the scientific meaning of explaining variability
- Understand experimental design issues - control of unwanted variability, confounding and bias.
- Take account of relevant factors in deciding on appropriate methods and instruments to use in specific research projects.
- Understand the limitations and shortcomings of statistical models
- Apply relevant design/statistical concepts in their own particular research projects.
- Analyze data and interpret output in a scientifically meaningful way
- Generate hypothesis/hypotheses about behavior and prepare a research protocol outlining the methodology for an experiment/survey.
- Critically review the literature to appreciate the theoretical and methodological issues.

Academic Format of Modules: The course will be taught mainly in a mixed lecture/tutorial format, allowing trainees to participate in collaborative discussion. Demonstration and hands-on experience with SPSS program are desired activities.

Evaluation: Theory - involving long and short essays, and problem-solving exercises.

Course Contents:

Module - I: Introduction

Various methods to ascertain knowledge, scientific method and its features; problems in measurement in behavioral sciences; levels of measurement of psychological variables - nominal, ordinal, interval and ratio scales; test construction - item analysis, concept and methods of establishing reliability, validity and norms.

Module - II: Sampling

Probability and non-probability; various methods of sampling - simple random, stratified, systematic, cluster and multistage sampling; sampling and non-sampling errors and methods of minimizing these errors

Module - III: Concept of probability

Probability distribution - normal, poisson, binomial; descriptive statistics - central tendency, dispersion, skewness and kurtosis

Module - IV: Hypothesis testing

Formulation and types; null hypothesis, alternate hypothesis, type I and type II errors, level of significance, power of the test, p-value. Concept of standard error and confidence interval

Module - V: **Tests of significance- Parametric tests**

Requirements, "t" test, normal z-test, and "F" test including post-hoc tests, one-way and two-way analysis of variance, analysis of covariance, repeated measures analysis of variance, simple linear correlation and regression.

Module – VI: **Tests of significance - Non-parametric tests**

Requirements, onesample tests – sign test, sign rank test, median test, Mc Nemer test; two-sample test – Mann Whitney U test, Wilcoxon rank sum test, Kolmogorov-Smirnov test, normal scores test, chi-square test;

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ksample tests - Kruskal Wallies test, and Friedman test, Anderson darling test, Cramer-von Mises test.

Module - VII: Experimental design
Randomization, replication, completely randomized design, randomized block design, factorial design, crossover design, single subject design, non-experimental design.

Module - VIII: **Epidemiological studies**
Prospective and retrospective studies, case control and cohort studies, rates, sensitivity, specificity, predictive values, Kappa statistics, odds ratio, relative risk, population attributable risk, Mantel Haenzel test, prevalence, and incidence. Age specific, disease specific and adjusted rates, standardization of rates. Tests of association, 2 x 2 and row x column contingency tables

Module - IX: **Multivariate analysis**
Introduction, Multiple regression, logistic regression, factor analysis, cluster analysis, discriminant function analysis, path analysis, MANOVA, Canonical correlation, and Multidimensional scaling.

Module - X: Sample size estimation
Sample size determination for estimation of mean, estimation of proportion, comparing two means and comparing two proportions.

Module - XI: **Qualitative analysis of data**
Content analysis, qualitative methods of psychosocial research

Module - XII: **Use of computers**
Use of relevant statistical package in the field of behavioral science and their limitations

Examination Scheme:

	Internal Assessment (30 Marks)				**Final Exam**	**Total Marks**
Components	CT	H/P/V/Q	CT	A		
Weightage	10	5	10	5	70	100

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Term Exam

Text & References:

- Research Methodology, Kothari, C. R. (2003). Wishwa Prakshan: New Delhi
- Foundations of Behavioral Research, Kerlinger, F.N. (1995). Holt, Rinehart & Winston: USA.
- Understanding Biostatistics, Hassart, T.H. (1991). Mosby Year Book
- Biostatistics: a foundation for analysis in health sciences, 8th ed, Daniel, W.W. (2005). John Wiley and sons: USA
- Multivariate analysis: Methods & Applications, Dillon, W.R. & Goldstein, M. (1984), John Wiley & Sons: USA
- Non-parametric statistics for the behavioral sciences, Siegal, S & Castellan, N.J. (1988). McGraw Hill: New Delhi
- Qualitative Research: Methods for the social sciences, 6th ed, Berg, B.L. (2007). Pearson Education, USA.

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PAPER-IV: PRACTICAL: PSYCHOLOGICAL ASSESSMENT INCLUDING VIVA-VOCE

Course Code: PSY5104 **Credit Units: 12**

Aim: To provide hands-on experience in acquiring the necessary skills and competency in selecting, administering, scoring and interpreting psychological tests often employed in clients with mental or neuropsychological disorders. Since psychological assessment involves integration of information from multiple sources, the trainees are required to be given extensive exposure in working up of cases and carrying out the assessment at all levels. Typical areas of focus for psychological assessment includes (not necessarily limited to): cognition, intelligence, personality, diagnostic, levels of adjustment, disability/functional capacity, neuropsychological functions, clinical ratings of symptomatology, variables that help/direct treatment, and assess treatment outcomes.

Objectives: By the end of Part-I, trainees are required to demonstrate ability to:

- Use relevant criteria to assess the quality and appropriateness of a psychological test and evaluate its strengths and weaknesses for clinical purposes.
- Able to carry out the clinical work-up and discuss the diagnostic possibilities based on the history and mental status examination of the clients with psychological/neuropsychological problems.
- Synthesize and integrate collateral information from multiple sources and discuss the rationale for psychological assessment as relevant to the areas being assessed.
- Select and justify the use of psychological tests and carry out the assessment as per the specified procedures in investigating the relevant domains.
- Interpret the findings in the backdrop of the clinical history and mental status findings and arrive at a diagnosis.
- Prepare the report of the findings as relevant to the clinical questions asked or hypothesis set up before the testing began, and integrate the findings in service activities.

Academic Format of Modules: Acquiring the required competency/skills would be primarily through clinical workups of cases having psychological/neuropsychological disorders and carrying out the indicated psychological assessments within the clinical context. Demonstration and tutorials shall be held for imparting practical/theory components of the psychological tests.

Evaluation: Practical/clinical – involve working up cases and carrying out the psychological assessment within clinical context and viva voce.

Course Contents:

Module - I: Introduction

Case history; mental status examination; rationale of psychological assessment; behavioral observations, response recording, and syntheses of information from different sources; formats of report writing

Module - II: Tests of cognitive functions

Bender gestalt test; Wechsler memory scale; PGI memory scale; Wilcoxen cord sorting test, Bhatia's battery of performance tests of intelligence; Binet's test of intelligence (locally standardized); Raven's progressive matrices (all versions); Wechsler adult intelligence scale – Indian adaptation (WAPIS – Ramalingaswamy's), WAIS-R.

Module - III: Tests for diagnostic clarification

A) Rorschach psychodiagnostics, B) Tests for thought disorders – color form sorting test, object sorting test, proverbs test, C) Minnesota multiphasic personality inventory; multiphasic questionnaire, clinical analysis questionnaire, IPDE, D) screening instruments such as GHQ, hospital anxiety/depression scale etc. to detect psychopathology.

Module - IV: **Tests for adjustment and personality assessment**

A) Questionnaires and inventories – 16 personality factor questionnaire, NEO-5 personality inventory, temperament and character inventory, Eyesenk's personality inventory, Eysenck's personality

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questionnaire, self-concept and self-esteem scales, Rottor's locus of control scale, Bell's adjustment inventory (students' and adults'), subjective wellbeing questionnaires, QOL , B) projective tests – sentence completion test, picture frustration test, draw-a-person test; TAT – Murray's and Uma Chowdhary's.

Module - V: **Rating scales**
Self-rated and observer-rated scales of different clinical conditions such as anxiety, depression, mania, OCD, phobia, panic disorder etc. (including Leyton's obsessional inventory, Y-BOCS, BDI, STAI, HADS, HARS, SANS, SAPS, PANSS, BPRS), issues related to clinical applications and recent developments.

Module - VI: Psychological assessment of children
A) Developmental psychopathology check list, CBCL, B) Administration, scoring and interpretation of tests of intelligence scale for children such as SFB, C-RPM, Malin's WISC, Binet's tests, and developmental schedules (Gesell's, Illingworth's and other) Vineland social maturity scale, AMD adaptation scale for mental retardation, BASIC-MR, developmental screening test (Bharatraj's), C) Tests of scholastic abilities, tests of attention, reading, writing, arithmetic, visuo-motor gestalt, and integration, D) Projective tests – Raven's controlled projection test, draw-a-person test, children's apperception test, E) Clinical rating scales such as for autism, ADHD etc.

Module - VII: **Tests for people with disabilities**
WAIS-R, WISC-R (for visual handicapped), blind learning aptitude test, and other interest and aptitude tests, Kauffman's assessment battery and such other tests/scales for physically handicapped individuals

Module - VIII: Neuropsychological assessment
LNNB, Halstead-Reitan battery, PGI-BBD, NIMHANS and other batteries of neuropsychological tests in current use

Core Tests:
1. Stanford Binet's test of intelligence (any vernacular version)
2. Raven's test of intelligence (all forms)
3. Bhatia's battery of intelligence tests
4. Wechsler adult performance intelligence scale
5. Malin's intelligence scale for children
6. Gesell's developmental schedule
7. Wechsler memory scale
8. PGI memory scale
9. 16 personality factor questionnaire
10. NEO-5 personality inventory
11. Temperament and character inventory
12. Children personality questionnaire
13. Clinical analysis questionnaire
14. Multiphasic questionnaire
15. Object sorting/classification test
16. Sentence completion test
17. Thematic apperception test
18. Children' apperception test
19. Rorschach psychodiagnostics
20. Neuropsychological battery of tests (any standard version)

A certificate by the head of the department that the candidate has attained the required competence in all of the above tests shall be necessary for appearing in the university examinations of Part – I. However, if the center opts to test and certify the competency in neuropsychological tests as part of the requirements for appearing in the university examinations of Part - II (i.e. excluding it from Part - I), it could be done so. In such case, the Practical/Clinical examinations of Part – II shall include an examination in this area, in addition to examination in Psychological Therapies.

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Examination Scheme:

	Internal Exam (30)			Final Exam (70)		Total Marks
Components	File demonstration	Case Conference, Seminar, Journal	A	End Term Exam	Viva	
Weightage (%)	20	5	5	35	35	100

Text & References:

- Theory and practice of psychological testing, Freeman, F.S. (1965). Oxford and IHBN: New Delhi.
- Comprehensive handbook of psychological assessment, Vol 1 & 2, Hersen, M, Segal, D. L, Hilsenroth, M.J. (2004). John Wiley & Sons: USA
- Comprehensive Clinical Psychology: Assessment, Vol. 4, Bellack, A.S. & Hersen, M (1998). Elsiever Science Ltd.: Great Britain
- The Rorschach – A Comprehensive System, Vol 1, 4th ed., Exner, J.E. John Wiley and sons: NY.
- The Thematic Apperception Test manual, Murray H.A. (1971), Harvard University Press. An Indian modification of the Thematic Apperception Test, Choudhary, U. Shree Saraswathi Press: Calcutta.

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PAPER-V: SUBMISSION OF PSYCHODIAGNOSTIC RECORDS

Course Code: PSY5105 **Credit Units: 12**

Course Contents:

Five full-length Psycho-diagnostic Records: out of which one record each should be related to, child and neuropsychological assessment. The records should include a summary of the clinical history organized under relevant headings, and a discussion on

a) rationale for testing,
b) areas to be investigated,
c) tests administered and their rationale,
d) test findings and
e) impression

Examination Scheme:

Components	Submission of five cases of full-length Psycho-diagnostics Report
Weightage (%)	100

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PAPER-I: PSYCHOTHERAPY AND COUNSELLING

Course Code: PSY5301 **Credit Units: 12**

Aim: Impart knowledge and skills necessary to carry out psychological interventions in mental health problems with required competency. As a prelude to problem-based learning within a clinical context, the trainees are introduced to factors that lead to development of an effective working therapeutic alliance, pre-treatment assessment, setting therapy goals, evaluation of success of therapy in producing desired changes, and variables that affect the therapy processes. Further, the aim is to equip the trainees with various theories of clinical problems, and intervention techniques, and their advantages and limitations.

Objectives: By the end of Part-II, trainees are required to demonstrate ability to:

- Describe what factors are important in determining how well patients do in psychotherapy?
- Demonstrate an ability to provide a clear, coherent, and succinct account of patient's problems and to develop an appropriate treatment plan.
- Demonstrate a sense of working collaboratively on the problem and ability to foster an effective alliance.
- Demonstrate a working knowledge of theoretical application of various approaches of therapy to clinical conditions.
- Set realistic goals for intervention taking into consideration the social and contextual mediation.
- Carry out specialized assessments and interventions, drawing on their knowledge of pertinent outcome/evidence research.
- Use appropriate measures of quantifying changes and, apply and integrate alternative or complementary theoretical approach, depending on the intervention outcome.
- Demonstrate skills in presenting and communicating some aspects of current intervention work for assessment by other health professionals, give and receive constructive feedback.
- Demonstrate ability to link theory-practice and assimilate clinical, professional, academic and ethical knowledge in their role of a therapist.
- Present a critical analysis of intervention related research articles and propose their own methods/design of replicating such research.

Academic Format of Modules: Acquiring the required competency/skills would be primarily through clinical workups and carrying out of various treatment techniques, under supervision, within clinical context. The trainees are required to be involved in all clinical service activities – institutional or community based, of the center. Demonstration, clinical issue seminar, clinical seminar, clinical case conferences are required to be planned to impart the necessary knowledge and skills.

Evaluation: Theory - involving long and short essays, and practical/clinical - involving workup and assessment of clinical cases with viva voce.

Course Contents:

Module - I: Introduction to Psychotherapy

Definitions, objectives, issues related to training professional therapists; ethical and legal issues involved in therapy work; rights and responsibilities in psychotherapy; issues related to consent (assent in case of minors); planning and recording of therapy sessions; structuring and setting goals; pre- and postassessment; practice of evidence-based therapies.

Module - II: Therapeutic Relationship

Client and therapist characteristics; illness, technique and other factors influencing the relationship

Module - III: Interviewing

Objectives of interview, interviewing techniques, types of interview, characteristics of structured and unstructured interview, interviewing skills (micro skills), open-ended questions, clarification, reflection, facilitation

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and confrontation, silences in interviews, verbal and non-verbal components

Module - IV: **Affective psychotherapies**
Origin, basis, formulation, procedures, techniques, stages, process, outcome, indications, and research & current status with respect to psychodynamic, brief psychotherapy, humanistic, existential, gestalt, person-centered, Adlerian, transactional analysis, reality therapy, supportive, clinical hypnotherapy, play therapy, psychodrama, and oriental approaches such as yoga, meditation, shavasana, pranic healing, reiki, tai chi etc.

Module-V: Behavior therapies
Origin, foundations, principles & methodologies, problems and criticisms, empirical status, behavioral assessment, formulations and treatment goals, Desensitization - (imaginal, in-vivo, enriched, assisted), Extinction - (graded exposure, flooding and response prevention, implosion, covert extinction, negative practice, stimulus satiation), Skill training - (assertiveness training, modeling, behavioral rehearsal), Operant procedures - (token economy, contingency management), Aversion - (faradic aversion therapy, covert sensitization, aversion relief procedure, anxiety relief procedure and avoidance conditioning), Self-control procedures - (thought stop, paradoxical intention, stimulus satiation), Biofeedback – (EMG, GSR, EEG, Temp., EKG), Behavioral counseling, Group behavioral approaches, Behavioral family/marital therapies.

Module - VI: Cognitive therapies
Cognitive model, principles and assumptions, techniques, indications and current status of rational emotive behavior therapy, cognitive behavior therapy, cognitive analytic therapy, dialectical behavior therapy, problem-solving therapy, mindfulness based cognitive therapy, schema focused therapy, cognitive restructuring, and other principal models of cognitive therapies.

Module – VII: Systemic therapies
Origin, theoretical models, formulation, procedures, techniques, stages, process, outcome, indications, and research & current status with respect to family therapy, marital therapy, group therapy, sex therapy, interpersonal therapy and other prominent therapies.

Module – VIII: Physiological therapies
Origin, basis, formulation, procedures, techniques, stages, process, outcome, indications, and current status with respect to progressive muscular relaxation, autogenic training, biofeedback, eye-movement desensitization and reprocessing, and other forms of evidence-based therapies

Module – IX: **Counseling**
Definition and goals, techniques, behavioral, cognitive and humanistic approaches, process, counseling theory and procedures to specific domains of counseling

Module - X: Therapy in special conditions
Therapies and techniques in the management of deliberate self harm, bereavement, traumatic, victims of man-made or natural disasters, in crisis, personality disorders, chronic mental illness, substance use, HIV/AIDS, learning disabilities, mental retardation, and such other conditions where integrative/eclectic approach is the basis of clinical intervention.

Module - XI: Therapy with children
Introduction to different approaches, psychoanalytic therapies (Ana Freud, Melanie Klein, Donald Winnicott); special techniques (behavioral and play) for developmental internalizing and externalizing disorders; therapy in special conditions such as psycho-physiological and chronic physical illness; parent and family counseling; therapy with adolescents

Module – XII: Psycho-education (therapeutic education)
Information and emotional support for family members and caregivers, models of therapeutic education, family counseling for a collaborative effort towards recovery, relapse-prevention and successful rehabilitation with regard to various debilitating mental disorders.

Module – XIII: Psychosocial rehabilitation
Rehabilitation services, resources, medical and psychosocial aspects of disability, assessment, group therapy, supportive therapy

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and other forms of empirically supported psychotherapies for core and peripheral members.

Module - XIV: **Psychotherapy in the Indian Context**
Historical perspective in psychological healing practices from the Vedic period and the systems of Ayurveda and Yoga, contemporary perspectives; socio-cultural issues in the Indian context in practice of psychotherapy; ongoing research related to process and outcome.

Module - XV: Contemporary issues and research
Issues related evidence-based practice, managed care, and research related to process and outcome.

Examination Scheme:

	Internal Assessment (30 Marks)				**Final Exam**	**Total Marks**
Components	CT	H/P/V/Q	CT	A		
Weightage (%)	10	5	10	5	70	100

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Term Exam

Text & References:

- An introduction to the psychotherapies, 3rd ed., Bloch, S (2000). Oxford Medical Publications: NY Encyclopedia of Psychotherapy, Vol 1 & 2, Hersen M & Sledge W. (2002). Academic Press: USA
- The techniques of psychotherapy, 4th ed., Parts 1 & 2, Wolberg, L.R. Grune & Stratton: NY Theories of Psychotherapy & Counseling, 2nd ed., Sharf, R.S. (2000). Brooks/Cole: USA Handbook of Psychotherapy & Behavior change – An empirical analysis, Bergin, A.G. & Garfield, S. L. (1978). John Wiley & Sons: NY
- Comprehensive Clinical Psychology, Vol 6, Bellack, A.S. & Hersen, M., (1998). Elsiever Science Ltd: Great Britain
- Handbook of Individual Therapy, 4th ed., Dryden, W. (2002). Sage Publications: New Delhi. Psychotherapy: an eclectic integrative approach, 2nd ed. Garfield, S. L. (1995). John Wiley and sons: USA
- International handbook of behavior modification and therapy, Bellack, A.S., Hersen, M and Kazdin, A.E. (1985). Plenum Press: NY
- Behavior therapy: Techniques and empirical findings, Rimm D.C. & Masters J.C. (1979). Academic Press: NY.
- Handbook of Clinical Behavior therapy, Turner, S.M., Calhown K.S and Adams H.E. (1992). Wiley Interscience: NY
- Dictionary of Behavior Therapy, Bellack, H. Pergamon Press: NY
- Comprehensive Handbook of cognitive therapy, Freeman, A., Simon, K.M., Beutler L.E. & Arkowitz, M. (1988), Plenum Press: NY
- Cognitive Behavior Therapy for psychiatric problems: A practical guide, Hawton, K. Salkovskis, P.M., Kirk, J. and Clark, D.M. (1989). Oxford University Press: NY
- Rational Emotive Behaviour Therapy, Dryden, W. (1995). Sage publications: New Delhi Cognitive Therapy: an Introduction, 2nd ed, Sanders, D & Wills, F. (2005). Sage Publications: New Delhi
- Advances in Cognitive Behavior therapy, Dobson, K S and Craig, K D. (1996). Sage publications: USA
- Science and Practice of CBT, Clark, D M and Fairburn, C. G. (2001). Oxford University press: Great Britain.
- Counseling and Psychotherapy: theories and interventions. 3rd ed. Capuzzi, D and Gross D. R. (2003). Merrill Prentice Hall: New Jersey
- Handbook of psychotherapy case formulation. 2nd ed. Eells, T.D (2007). Guilford press: USA Psychoanalytic techniques, a handbook for practicing psychoanalyst, Wolman BB Basic Book: NY
- The Technique and Practice of psychoanalysis Vol. 1, Greenson, R.R. (1967). International Universities Press: USA.

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- Psychotherapy: The analytic approach, Aronson, M. J and Scharfman, M.A. (1992). Jason Aronson Inc: USA
- New Approach of Interpersonal Psychotherapy, Klerman, G. L., Weissman, M. M (1993). American Psychiatric press: Washington
- Handbook of clinical child psychology, 3rd ed., Walker, C.E. & Roberts, MC (2001). John Wiley and Sons: Canada.
- Abnormal child psychology, Mash, E.J & Wolfe, D.A. (1999). Wadsworth Publishing: USA Clinical Practice of cognitive therapy with children and adolescents, Friedberg R.D. & McClure, J.M. Guilford Press, NY
- CBT for children and families, 2nd ed., Graham, P.J. (1998). Cambridge University Press: UK Handbook of clinical behavior therapy, Turner, S.M, Calhour, K.S. & Adams, H.E.(1992). Wiley Interscience: NY
- Basic family therapy, Baker, P, (1992). Blackwell Scientific Pub.: New Delhi
- Handbook of family and marital therapy, Wolman, B.B. & Stricker, G, (1983). Plenum: NY Introduction to Counseling and Guidance, 6th ed., Gibson, R.L. & Mitchell M.H. (2006), Pearson, New Delhi.

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PAPER-II: BEHAVIOURAL MEDICINE

Course Code: PSY5302 **Credit Units: 12**

Aim: Health psychology, as one of the subspecialties of applied psychology, has made a notable impact on almost the entire range of clinical medicine. The field deals with psychological theories and methods that contribute immensely to the understanding and appreciation of health behavior, psychosocial and cultural factors influencing the development, adjustment to, treatment, outcome and prevention of psychological components of medical problems. The aim of behavioral medicine is to elucidate the effects of stress on immune, endocrine, and neurotransmitter functions among others, psychological process involved in health choices individuals make and adherence to preventive regimens, the effectiveness of psychological interventions in altering unhealthy lifestyles and in directly reducing illness related to various systems. Further, to provide the required skills and competency to assess and intervene for psychological factors that may predispose an individual to physical illness and that maintain symptoms, in methods of mitigating the negative effects of stressful situations/events, and buffering personal resources.

Objectives: By the end of Part-II, trainees are required to demonstrate ability to:

- Appreciate the impact of psychological factors on developing and surviving a systemic illness.
- Understand the psychosocial impact of an illness and psychological interventions used in this context.
- Understand the psychosocial outcomes of disease, psychosocial interventions employed to alter the unfavorable outcomes.
- Understand the rationale of psychological interventions and their relative efficacy in chronic disease, and carry out the indicated interventions.
- Understand the importance of physician-patient relationships and communication in determining health outcomes.
- Understand of how basic principles of health psychology are applied in specific context of various health problems, and apply them with competence.
- Demonstrate the required sensitivity to issues of death and dying, breaking bad news, and end-of-life issues.
- Carry out specialized interventions during period of crisis, grief and bereavement.
- Understand, assimilate, apply and integrate newer evidence-based research findings in therapies, techniques and processes.
- Critically evaluate current health psychology/behavioral medicine research articles, and present improved design/methods of replicating such research.
- Demonstrate the sense responsibility while working collaboratively with another specialist and foster a working alliance.

Academic Format of Modules: Format would be essentially same as Paper – I on Therapies. The competency/skills are imparted through supervised workups, assessment and practical work of carrying out various treatment techniques within clinical context. Depending on availability of resources at the parent center, the trainees may be posted for extra-institutional learning. Demonstration, clinical issue seminar, clinical seminar, clinical case conferences are required to impart the necessary knowledge and skills. Evaluation: Theory - involving long and short essays, and practical/clinical - involving workup and assessment of clinical cases with viva voce.

Course Contents:

Module-I: Introduction

Definition, boundary, psychological and behavioral influences on health and illness, neuroendocrine, neurotransmitter and neuroimmune responses to stress, negative affectivity, behavioral patterns, and coping styles, psychophysiological models of disease, theoretical models of health behavior, scope and application of psychological principles in health, illness and health care.

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Module – II: **Central nervous system**
Cognitive, personality, behavioral, emotional disturbances in major CNS diseases like cerebrovascular (stroke, vascular dementia etc.), developmental (cerebral palsy), degenerative (Parkinson's etc.), trauma (traumatic brain and spinal cord injury), convulsive (epilepsy), and infectious (AIDS dementia), assessment and methods for psychological intervention and rehabilitation with such patients.

Module – III: Cardiovascular system
Psychosocial, personality, lifestyle, and health practice issues, psychobehavioral responses including coping with illness and functional loss in hypertension, MI, following CABG and other cardiovascular conditions, salient issues with regard to quality-of-life and well-being, empirically proven methods of psychological management of CVS diseases.

Module – IV: **Respiratory system**
precipitants, such as emotional arousal, and other external stimuli, exacerbants such as anxiety and panic symptoms, effects, such as secondary gain, low self-esteem in asthma and other airway diseases, psychological, behavioral and biofeedback strategies as adjunct in the management.

Module – V: **Gastrointestinal system**
Evaluation of psychological factors including personality characteristics and stress/coping style in functional GI disorders such as irritable bowel syndrome, inflammatory bowel disease, peptic ulcer disease, esophageal disorder etc., role of psychotherapy, behavior modification, cognitive restructuring, biofeedback and relaxation training

Module – VI: Genitourinary/renal/reproductive system
Psychosocial issues in male/female sexual dysfunctions, micturition/voiding problems including primary / secondary enuresis, end-stage renal disease, dialysis treatment, primary and secondary infertility, empirically validated psychological and behavioral interventions in these conditions.

Module – VII: **Dermatology:**
Role of stress and anxiety in psychodermatological conditions such as psoriasis, chronic urticaria, dermatitis, alopecia and the impact of these on self-esteem, body image and mood, role of psychological interventions such as relaxation, stress management, counseling and biofeedback strategies.

Module – VIII: Oncology
Psychosocial issues associated with cancer - quality of life, denial, grief reaction to bodily changes, fear of treatment, side effects, abandonment, recurrence, resilience, assessment tools, and goals of interventions for individual and family, and therapy techniques.

Module – IX: HIV/AIDS
Model of HIV disease service program in India, pre- and post-test counseling, psychosocial issues and their resolutions during HIV progress, psychological assessment and interventions in infected adults and children, and family members/caregivers, highly active anti-retroviral treatments (HAART), neuropsychological findings at different stages of infection, issues related to prevention/spreading awareness and interventions in at risk populations.

Module – X: **Pain**
Physiological and psychological processes involved in pain experience and behavior, assessment tools for acute and chronic pain intensity, behavior, and dysfunctions/disability related to pain, psychological interventions such as cognitive, behavioral, biofeedback and hypnotic therapies.

Module – XI: **Terminally ill**
Medical, religious and spiritual definition of death and dying, psychology of dying and bereaved family, strategies of breaking bad news, bereavement and grief counseling, management of pain and other physical symptoms associated with end-of-life distress in patients with cancer, AIDS, and other terminal illness, professional issues related to working in hospice including working through one's own death anxiety, euthanasia – types, arguments for and against.

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Module – XII: Other general clinical conditions
Application of psychological techniques and their rationale in the clinical care of patients in general medical settings where psychological services appears to affect the outcome of medical management positively, for example in diabetes, sleep disorders, obesity, dental anxiety, burns injury, pre- and postsurgery, preparing for amputation, evaluation of organ donors/recipient, pre- and post-transplantation, organ replacement, hemophiliacs, sensory impairment, rheumatic diseases, abnormal illness behavior, health anxiety etc.

Module – XIII: **Contemporary Issues**
Research and developments in health psychology, psychophysiology, psychoneuroimmunology, psychobiology, sociobiology and their implications, and effects of psychotherapy on the biology of brain

Examination Scheme:

	Internal Assessment (30 Marks)				**Final Exam**	**Total Marks**
Components	CT	H/P/V/Q	CT	A		
Weightage (%)	10	5	10	5	70	100

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Term Exam

Text & References:

- International handbook of behavior modification and therapy, Bellack, A.S., Hersen, M and Kazdin, A.E. (1985). Plenum Press: NY
- Behavior therapy: Techniques and empirical findings, Rimm D.C. & Masters J.C. (1979). Academic Press: NY.
- Handbook of Clinical Behavior therapy, Turner, S.M., Calhown, K.S and Adams, H.E. (1992). Wiley Interscience: NY
- Dictionary of Behavior Therapy, Bellack Handbook of clinical psychology in medical settings, Sweet, J.J, Rozensky, R.H. & Tovian, S.M. (1991), Plenum Press: NY.
- Health Psychology, Dimatteo, M R and Martin, L.R. (2002). Pearson, New Delhi
- Biofeedback – Principles and practice for clinicians, Basmajian J.V. (1979). Williams & Wilkins Company: Baltimore
- Handbook of Psychotherapy and behaviour change, 5th ed., Lambert, M.J (2004). John Wiley and Sons: USA
- Behavioral Medicine: Concepts & Procedures, Tunks, E & Bellismo, A. (1991). Pergamon Press: USA Health Psychology, Vol 1 to Vol 4, Weinman, J, Johnston, M & Molloy, G (2006). Sage publications: Great Britain.

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PAPER-III: BIOLOGICAL FOUNDATION OF BEHAVIOR

Course Code: PSY5306 **Credit Units: 12**

Aim: Brain disorders cause symptoms that look remarkably like other functional psychological disorders. Learning how brain is involved in the genesis of normal and abnormal behavioral/emotional manifestation would result in better clinical judgment, lesser diagnostic errors and increase sensitivity to consider and rule out a neuropsyhological origin or biochemical mediation of the psychopathology. Also, current researches have indicated many pharmacological agents dramatically alter the severity and course of certain mental disorders, particularly the more severe disorders. Therefore, the aim of this paper is to provide important biological foundations of human behavior and various syndromes. The main focus is the nervous system and its command center – the brain.

Objectives: By the end of Part-I, trainees are required to demonstrate ability to:

- Describe the nature and basic functions of the nervous system.
- Explain what neurons are and how they process information.
- Identify the brain's levels and structures, and summarize the functions of its structures.
- Describe the biochemical aspects of brain and how genetics increase our understanding of behavior.
- State what endocrine system is and how it regulates internal environment and affects behavior.
- Discuss the principles of psychopharmacology and review the general role of neurotransmitters and neuromodulators in the brain.
- Describe the monoaminergic and cholinergic pathway in the brain and the drugs that affect these neurons.
- Describe the role of neurons that release amino acid neurotransmitters and the drugs that affect these neurons.
- Describe what kinds of clinical symptoms are often associated with lesions of frontal, parietal, temporal and occipital lobes of the brain.
- Describe what kinds of neuropsychological deficits are often associated with lesions of frontal, parietal, temporal and occipital lobes of the brain, and carry out the indicated neuropsychological assessment employing any valid battery of tests.
- Describe what kinds of neuropsychological deficits are often associated with subcortical lesions of the brain.
- List symptoms that are typical of focal and diffuse brain damage.
- Enumerate the characteristics of clinical syndrome and the nature of neuropsychological deficits seen in various cortical and sub-cortical dementias.
- Describe the neuropsychological profile of principal psychiatric syndromes.
- Demonstrate an understanding of functional neuro-imaging techniques and their application in psychological disorders and cognitive neuroscience.
- Demonstrate an understanding of the principles involved in neuropsychological assessment, its strengths and weaknesses, and its indications.
- Describe the nature of disability associated with head injury in the short and longer term, methods of remedial training and their strengths and weakness.

Academic Format of Modules: The learning would be primarily through clinical assessment of cases with brain lesions and disorders. Lectures, seminars and demonstrations by the experts in specific discipline, disease, topics such as by Anatomist, Biochemist, Physiologist, Psychiatrist, Neurologist and Neurosurgeons are required to impart knowledge and skills in certain domains. Depending on the resources available at the center these academic activity can be arranged.

Evaluation: Theory– involving long and short essays, practical/clinical exam in neuropsychological assessment with cases having a brain lesion/disorder and comprehensive viva.

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Course Contents: Part-A (Anatomy, Physiology and Biochemistry of CNS)

Module – I: **Anatomy of the brain**
Major anatomical sub-divisions of the human brain; the surface anatomy and interior structures of cortical and subcortical regions; anatomical connectivity among the various regions; blood supply to brain and the CSF system; cytoarchitecture and modular organization in the brain.

Module – II: Structure and functions of cells
Cells of the nervous system (neurons, supporting cells, blood-brain barrier); communication within a neuron (membrane potential, action potential); communication between neurons (neurotransmitters, neuromodulators and hormones).

Module – III: Biochemistry of the brain
Biochemical and metabolic aspects of Brain; medical genetics; structure and function of chromosomes; molecular methods in genetics; genetic variation; population genetics; single-gene inheritance; cytogenetic abnormalities; multi-factorial inheritance; biochemistry of genetic diseases.

Module – IV: Neurobiology of sensory and motor systems
Organization of sensory system in terms of receptors, relay neurons, thalamus and cortical processing of different sensations; principle motor mechanisms of the periphery (muscle spindle), thalamus, basal ganglia, brain stem, cerebellum and cerebral cortex.

Module – V: Regulation of internal environment
Role of limbic, autonomic and the neuro-endocrine system in regulating the internal environment; reticular formation and other important neural substrates regulating the state of sleep/wakefulness

Module – VI: Neurobiology of behavior
Neurobiological aspects of drives, motivation, hunger, thirst, sex, emotions, learning and memory;

Module – VII: Psychopharmacology: Principles of psycho pharmacology (pharmacokinetics, drug effectiveness, effect of repeated administration); sites of drug action (effects on production, storage, release, receptors, reuptake and destruction); neurotransmitters and neuromodulators (acetylcholine, monoamines, amino acids, peptides, lipids).

Course Contents: Part-B (Neuropsychology)

Module - VIII: Introduction:
Relationship between structure and function of the brain; the rise of neuropsychology as a distinct discipline, logic of cerebral organization; localization and lateralization of functions; approaches and methodologies of clinical and cognitive neuro-psycholoigsts.

Module- IX: Frontal lobe syndrome
Disturbances of regulatory functions; attentional processes; emotions; memory and intellectual activity; language and motor functions

Module-X: Temporal lobe syndrome
Special senses – hearing, vestibular functions and integrative functions; disturbances in learning and memory functions; language, emotions, time perception and consciousness

Module – XI: Parietal and occipital lobe syndromes
Disturbances in sensory functions and body schema perception; agnosias and apraxias; disturbances in visual space perception; color perception; writing and reading ability

Module–XII: Neuropsychological profile of various neurological and psychiatric conditions: Huntington's disease,

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Parkinson's disease, progressive supranuclear palsy, thalamic degenerative disease, multiple sclerosis, cortical and subcortical dementias, Alzheimer's dementia, AIDS dementia complex etc., and principal psychiatric syndromes such as psychosis, mood disorders, suicide, anxiety disorders, and other emotional and behavioral syndromes.

Module – XIII: **Functional human brain mapping**
QEEG, EP & ERP, PET, SPECT, FMRI

Module – XIV: **Neuropsychological assessment**
Introduction, principles, relevance, scope and indications for neuropsychological assessment and issues involved in neuropsychological assessment of children.

Module – XV: Neuropsychological rehabilitation
Principles, objectives and methods of neuro-rehabilitation of traumatic brain injury and brain diseased; scope of computer-based retraining, neuro-feedback, cognitive aids etc.

Examination Scheme:

	Internal Assessment (30 Marks)				**Final Exam**	**Total Marks**
Components	CT	H/P/V/Q	CT	A		
Weightage	10	5	10	5	70	100

CT-Class Test; **H**-Home Assignment; **P**-Presentation; **V**-Viva; **Q**-Quiz; **A**-Attendance; **EE**-End Term Exam

Text & References:

- Clinical Neuroanatomy for Medical Students, Snell, R.S. (1992), Little Brown & Co.: Boston.
- Neuropsychology, a clinical approach, Walsh K. (1994), Churchill Livingstone: Edinburgh. Textbook of Medical Physiology, Guyton, A.C. Saunders Company: Philadelphia.
- Behavioral Neurology, Kirshner H.S, (1986). Churchill Livingstone: NY.
- Principles of neural science, Kandel, E. R, & Schwartz, J. H (1985). Elsevier: NY
- Foundations of physiological psychology, 6th ed., Carlson, N.R. (2005). Pearson Education Inc: India
- Essential psychopharmacology, Stahl, S.M. (1998). Cambridge University Press: UK
- Textbook of physiology, Vol 2, Jain, A.K (2005). Avichal Publishing Company: New Delhi.
- Handbook of clinical neurology, Vols, 2, 4, 45 and 46, Vinken, P J, & Bruyn, G W, (1969). North Holland Publishing Co.: Amsterdam
- Fundamentals of human neuropsychology, Kolb, B.I. Freeman & Company: NY
- Neuropsychology, a Clinical approach, 4th ed., Walsh, K (2003). Churchill Livingstone: Edinburgh
- Handbook of Cognitive Neuroscience, Gazaaniga, M. S. (1984). Plenum Press: NY
- Textbook of postgraduate psychiatry, 2nd ed., Vol 1 & 2, Vyas, J.N. & Ahuja, N (1999). Jaypee brothers: New Delhi.
- Handbook of clinical neurology, Vols, 2, 4, and 45, Vinken, PJ, & Bruyn, GW, (1969). North Holland Publishing Co.: Amsterdam Neuropsychological assessment of neuropsychiatric disorders, 2nd ed., Grant, I. & Adams, K.M. (1996). Oxford University Press: NY.
- Neuropsychology, a clinical approach, Walsh K. (1994), Churchill Livingstone: Edinburgh. Diagnosis & Rehabilitation in clinical neuropsychology, Golden, CJ, Charles, C.T. (1981). Spring Field: USA
- Principles of Neuropsychological Rehabilitation, Prigatano, G.P. (1999). Oxford University Press: NY
- Event Related brain potentials – Basic issues & applications, Rohrbaugh, J W (1990). Oxford University Press: NY.
- Neuropsychological assessment, Lezak, M.D. (1995), Oxford Univ. Press: NY

Neuropsychological assessment of neuropsychiatric disorders, 2nd ed., Grant, I. & Adams, K.M. (1996), Oxford University Press: NY.

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- Comprehensive clinical psychology- Assessment, Vol 4, Bellack A.S. & Hersen M. (1998). Elsiever Science Ltd.: Great Britain

PAPER-IV: PRACTICAL: PSYCHOLOGICAL THERAPIES INCLUDING VIVA-VOCE

Course Code: PSY5304 **Credit Units: 12**

Aim: Acquire and practice theoretical understanding, attitude and skills necessary to apply various psychotherapeutic interventions to mental health problems and to also develop skills and competency to intervene in stress associated with medical problems among patients as well as their care givers.

Objectives:

- Understanding the role of important client, counselor and context related factors in the psychotherapeutic process
- Systematic application of psychotherapeutic approaches in clinical conditions
- Carry out interventions considering relevant outcome research with ethical considerations
- Application and understanding of health psychology principles in various health conditions
- Working collaboratively with other health care professionals
- Appreciation of the role of social and cultural factors in intervention
- Learn strategies of raising and supporting mental health awareness

Core Topics for practical practice

1. Presenting a clear and precise account of client's problems and Skill of collaborative working
2. Developing appropriate treatment plans
3. Formulating realistic goals for intervention taking into consideration the social and contextual mediation
4. Using appropriate measures of quantifying therapeutic changes
5. Conducting specialized interventions
6. Identifying/making use of factors that help patients get better with psychotherapy
7. Skills in presenting and communicating aspects of current intervention work for assessment by other health professionals
8. Ability to link theory with practice assimilating clinical, professional, academic and ethical knowledge in their role of a therapist
9. Presenting a critical analysis of intervention related research articles and developing methods of replicating such research
10. Understanding, assimilating and integrating newer evidence based research findings in therapies, techniques and processes
11. Understanding psychosocial impact of an illness and relevant psychological interventions
12. Understanding the rationale of psychological interventions and their relative efficacy in various disorders
13. Understanding the importance of counselor-patient relationships in determining therapy outcomes
14. Application of health psychology principles in specific health problems
15. Sensitive handling of issues related to death and dying, breaking bad news and end of life concerns
16. Ability to carry out specialized interventions during periods of crisis, grief and bereavement
17. Understanding training aspects of psychotherapy and ethical/legal issues involved in therapy
18. Ability to conduct a well rounded interview in clinical settings
19. Developing interviewing and counseling micro skills
20. Understanding and application of behavior therapy approaches- classical conditioning based procedures, operant procedures, self control procedures, Biofeedback- in individual, group, family and marital counseling
21. Application of rational emotive behavior therapy, cognitive behavior therapy,

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cognitive analytic therapy, dialectical behavior therapy, problem solving therapy, mindfulness based cognitive therapy and schema focused therapy

22. Understanding progressive muscular relaxation, autogenic training, biofeedback, eye-movement desensitization and reprocessing
23. Application of psychoanalytic therapies (Ana Freud, Melanie Klein, Donald Winnicott); special techniques (behavioral and play) for developmental, internalizing and externalizing disorders in children
24. Understanding and application of eclectic/integrative approaches for managing deliberate self harm, traumatic conditions, victims of disasters, chronic mental illnesses
25. Understanding of Yoga, meditation, Shavasana, Pranik Healing, Reiki, Tai Chi, etc.
26. Understanding of psycho-education for family members and care givers
27. Understanding psychosocial aspects of disabilities and extending various kinds of rehabilitation services
28. Understanding of stressors, resources and support systems specific to the Indian social context
29. Understanding of Indian psychological healing practices
30. Ability to review literature, appreciate theoretical/methodological issues involved, analyze data and interpret results in a scientifically meaningful ways

Note: A certificate by the head of the department that the candidate has attained the required competence in all of the above tests shall be necessary for appearing in the university examinations of Part-I & II.

Examination Scheme:

	Internal Exam (60)			**Final Exam (140)**		**Total Marks**
Components	File demonstration	Case Conference, Seminar, Journal Club	A	End Term Exam	Viva	
Weightage (%)	45	10	5	70	70	200

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PAPER-V: SUBMISSION OF PSYCHOTHERAPY RECORDS

Course Code: PSY5305 **Credit Units: 12**

Course Contents:

Five fully worked-out Psychotherapy Records, out of which one should be child therapy record. The records should include a summary of the clinical history organized under relevant headings, and a discussion on

a) reasons for intervention(s),
b) areas to be focused including short- and long-term objectives,
c) type and technique of intervention employed and rationale
d) therapy processes,
e) changes in therapy or objectives, if any, and the reasons for the same,
f) outcome,
g) prevention strategies,
h) future plans

Examination Scheme:

Components	Submission of five fully worked-out Psychotherapy Records
Weightage (%)	100

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PAPER-VI: DISSERTATION

Course Code: PSY5337 **Credit Units: 10**

Under the guidance of a Clinical Psychology faculty member with Ph.D. or minimum 2-yr experience (post-qualification) in clinical teaching or clinical research. If the research work is of interdisciplinary nature requiring input/supervision from another specialist, co guide(s) from the related discipline may be appointed as deem necessary.

GUIDELINES FOR DISSERTATION

The aim of the dissertation is to provide you with an opportunity to further your intellectual and personal development in your chosen field by undertaking a significant practical unit of activity, having an educational value at a level commensurate with the award of your degree The dissertation can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Selecting the Dissertation Topic

It is usual to give you some discretion in the choice of topic for the dissertation and the approach to be adopted. You will need to ensure that your dissertation is related to your field of specialization.

Deciding this is often the most difficult part of the dissertation process, and perhaps, you have been thinking of a topic for some time.

It is important to distinguish here between 'dissertation topic' and 'dissertation title'. The topic is the specific area that you wish to investigate. The title may not be decided until the dissertation has been written so as to reflect its content properly.

Few restrictions are placed on the choice of the topic. Normally we would expect it to be:

- relevant to business, defined broadly;
- related to one or more of the subjects or areas of study within the core program and specialisation stream;
- clearly focused so as to facilitate an in-depth approach, subject to the availability of adequate sources of;
- information and to your own knowledge; of value and interest to you and your personal and professional development.

Planning the Dissertation

This will entail following:

- Selecting a topic for investigation.
- Establishing the precise focus of your study by deciding on the aims and objectives of the dissertation, or formulating questions to be investigated. Consider very carefully what is worth investigating and its feasibility.
- Drawing up initial dissertation outlines considering the aims and objectives of the dissertation. Workout various stages of dissertation
- Devising a timetable to ensure that all stages of dissertation are completed in time. The timetable should include writing of the dissertation and regular meetings with your dissertation guide.

The Dissertation plan or outline

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It is recommended that you should have a dissertation plan to guide you right from the outset. Essentially, the dissertation plan is an outline of what you intend to do, chapter wise and therefore should reflect the aims and objectives of your dissertation.

There are several reasons for having a dissertation plan

- It provides a focus to your thoughts.
- It provides your faculty-guide with an opportunity, at an early stage of your work, to make constructive comments and help guide the direction of your research.
- The writing of a plan is the first formal stage of the writing process, and therefore helps build up your confidence.
- In many ways, the plan encourages you to come to terms with the reading, thinking and writing in a systematic and integrated way, with plenty of time left for changes.
- Finally, the dissertation plan generally provides a revision point in the development of your dissertation report in order to allow appropriate changes in the scope and even direction of your work as it progresses.

Keeping records

This includes the following:

- Making a note of everything you read; including those discarded.
- Ensuring that when recording sources, author's name and initials, date of publication, title, place of publication and publisher are included. (You may consider starting a card index or database from the outset). Making an accurate note of all quotations at the time you read them.
- Make clear what is a direct a direct quotation and what is your paraphrase.

Dissertation format All students must follow the following rules in submitting their dissertation.

- Front page should provide title, author, Name of degree/diploma and the date of submission.
- Second page should be the table of contents giving page references for each chapter and section.
- The next page should be the table of appendices, graphs and tables giving titles and page references.
- Next to follow should be a synopsis or abstract of the dissertation (approximately 500 words) titled: **Executive Summary.**
- Next is the 'acknowledgements'.
- Chapter I should be a general introduction, giving the background to the dissertation, the objectives of the dissertation, the rationale for the dissertation, the plan, methodological issues and problems. The limitations of the dissertation should also be hinted in this chapter.
- Other chapters will constitute the body of the dissertation. The number of chapters and their sequence will usually vary depending on, among others, on a critical review of the previous relevant work relating to your major findings, a discussion of their implications, and conclusions, possibly with a suggestion of the direction of future research on the area.
- After this concluding chapter, you should give a list of all the references you have used. These should be cross - references with your text. For articles from journals, the following details are required e.g.

  Draper P and Pandyal K. 1991, The Investment Trust Discount Revisited, Journal of Business Finance and Accounting, Vol18, No6, Nov, pp 791-832.

  For books, the following details are required: Levi, M. 1996, International Financial Management, Prentice Hall, New York, 3rd Ed, 1996
- Finally, you should give any appendices. These should only include relevant statistical data or material that cannot be fitted into the above categories.

The Layout Guidelines for the Dissertation:

- A4 size Paper
- Font: Arial (10 points) or Times New Roman (12 points)
- Line spacing: 1.5Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

Guidelines for the Assessment of the Dissertation

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While evaluating the dissertation, faculty guide will consider the following aspects:
Has the student made a clear statement of the objective or objective(s).
If there is more than one objective, do these constitute parts of a whole?
Has the student developed an appropriate analytical framework for addressing the problem at hand.
Is this based on up-to-date developments in the topic area?
Has the student collected information/data suitable to the frameworks?
Are the techniques employed by the student to analyse the data / information appropriate and relevant?
Has the student succeeded in drawing conclusion form the analysis?
Do the conclusions relate well to the objectives of the project?
Has the student been regular in his work?
Layout of the written report

Assessment Scheme:

Continuous Evaluation: (Based on Abstract, Regularity, Adherence to initial plan, Records etc.)	30%
Final Evaluation: Based on,	70%
Contents & Layout of the Report,	25
Conceptual Framework,	15
Objectives & Methodology and	15
Implications & Conclusions	15

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Amity Institute of Clinical Psychology

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Curriculum & Scheme of Examination

2023

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Note: This is based on Professional Diploma in Clinical Psychology Guidelines & Syllabus as given on the RCI website

Paper I: PSYCHOSOCIAL PERSPECTIVES OF MENTAL DISORDERS

Course Code: PCP3101 **Credit Units: 12**

Course Contents:

Module-I: Clinical Psychology & Mental Health: History of Clinical Psychology and its role in understanding and alleviation of mental illness, promotion of mental health and rehabilitation of the mentally ill, role and functions of Clinical Psychologists in DMHP, Professional code of conduct and ethical issues

Module-II: Epidemiology: Epidemiological surveys in Indian context; socio- cultural correlates of mental illness; psychological well-being and quality of life – measures and factors influencing.

Module-III: Models of Mental Disorders: Concept of normality and abnormality, causes of mental disorders – psychodynamic, behavioral, cognitive, humanistic and biological models

Module-IV: Family influences: Early deprivation and trauma; neglect and abuse; attachment; separation; inadequate parenting styles; marital discord and divorce; maladaptive peer relationships; communication style; family burden; expressed emotions and relapse

Module-V: Social Pathology: Discrimination, gender and ethnicity, social class, poverty and unemployment, social tension & violence, crime and delinquency, suicide, addictive behavior, social aggression with special reference to Indian context.

Module-VI: Psychopathology of specific conditions: Neurotic, Stress-related, Somatoform, Psychotic, Personality, Childhood and Adolescence Disorders.

Module-VII: Disability: Definition and classification of disability; psychosocial models of disability; impact, needs and problems; issues related to assessment/certification of disability – areas and measures.

Module-VIII: Rehabilitation: Approaches to rehabilitation; interventions in the rehabilitation processes; models of adaptation to disability; family and caregivers issues; rights of mentally ill; empowerment issues; support to recovery, policies and Acts.

Essential References:

- An Introduction to Social Psychology, 2nd ed. Kuppuswamy, B. Konark Publishers: New Delhi
- Culture, Socialization and human development, Saraswathi, T.S (1999). Sage publications: New Delhi
- Asian perspectives in Psychology, Vol. 19. Rao, H.S.R & Sinha D. (1997). Sage publications: New Delhi
- Indian Social Problems, Vol.1 & 2, Madan G.R (2003). Allied Publishers Pvt. Ltd., New Delhi.
- Family Theories – an Introduction, Klein, D.M. & White, J.M. (1996). Sage Publications: New Delhi.
- Fish's Clinical Psychopathology, Fish, F. and Hamilton, M. (1979), John Wright & Sons: Bristol
- Personality & Social Psychology: towards a synthesis, Krahe, Sage Publications: New Delhi Psychopathology, Buss A.H. (1966). John Wiley and sons: NY
- Making sense of illness: the social psychology of health and disease. Radley, A. (1994). Sage publications: New Delhi
- Oxford Textbook of Psychopathology, Millon, T., Blaney, P.H. & Davis, R.D. (1999). Oxford University Press: NY
- Abnormal Psychology, 13th ed, Carson, R.C, Butcher, T.N, Mureka, S. & Hooley, J.M. (2007). Dorling Kindersley Pvt Ltd: India
- Developmental Psychopathology, Achenback T.M.

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(1974). Ronald Press Co.: NY Psychopathology in the aged, Cole, J.O. & Barrett, J.E. (1980). Raven Press: NY

- Abnormal Child Psychology, Mash, E.J & Wolfe, D.A. (1999). Wadsworth Publishing: U.S.A
- Handbook of Clinical Child Psychology, 3rd ed. Walker, C.E & Roberts, M.C. (2001). John Wiley & Sons: Canada.
- Mental Health of Indian Children, Kapur, (1995). Sage publications: New Delhi

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Paper II : COUNSELING AND THERAPY

Course Code: PCP3102 **Credit Units: 12**

Course Contents:

Module-I: Introduction to Psychotherapy and Counseling: Definitions, Objectives, Models of counseling, Schools of Psychotherapy, Planning and recording of counseling and therapy sessions.

Module-II: Interviewing: Objectives of interviews, interviewing techniques, types of interview, characteristics of structured and unstructured interview, interviewing skills.

Module-III: Behavior Modification and Therapy: Introduction, Behavioral assessment, analysis and formulations (for Neuroses, Psychoses and other conditions), Relaxation techniques, social skills training, operant procedures, self control procedures and behavioral counseling.

Module-IV: Cognitive Therapies: Introduction to Cognitive Model, basic principles and assumptions, techniques based on Cognitive restricting and therapies.

Module-V: Crisis Intervention: Definition of Crisis, phases of Crisis, Techniques, and Stages of crisis work, Applications, supportive psychotherapy – goals, indications and techniques.

Module-VI: Group Therapy: Theoretical models, types of groups, stages of group therapy, process issues including role of the therapist, techniques, applications of group therapy.

Module-VII: Family Counseling/Therapy: Models for the assessment of families, common family problems and their intervention, goals and methods of family intervention, ethical issues in family counseling and therapy.

Module-VIII: Therapy with children and special conditions: Interventions for internalizing and externalizing Disorders, disorder of scholastic skills, deliberate self-harm, trauma and abuse, bereavement, school counseling, Parent and Family Counseling, chronic mental disorders.

Essential References:

- An introduction to the psychotherapies, 3rd ed., Bloch, S (2000). Oxford Medical Pub.: NY
- Encyclopedia of Psychotherapy, Vol 1 & 2, Hersen M & Sledge W. (2002). Academic Press: USA
- The techniques of psychotherapy, 4th ed., Parts 1 & 2, Wolberg, L.R. Grune & Stratton: NY
- Theories of Psychotherapy & Counseling, 2nd ed., Sharf, R.S. (2000). Brooks/Cole: USA
- Handbook of Psychotherapy & Behavior change – An empirical analysis, Bergin, A.G. & Garfield, S. L. (1978). John Wiley & Sons: NY
- Comprehensive Clinical Psychology, Vol 6, Bellack, A.S. & Hersen, M., (1998). Elsiever Science Ltd: Great Britain Handbook of Individual Therapy, 4th ed., Dryden, W. (2002). Sage Publications: New Delhi.
- Psychotherapy: an eclectic integrative approach, 2nd sons: USA ed. Garfield, S. L. (1995). John Wiley and International handbook of behavior modification and therapy, Bellack, A.S., Hersen, M and Kazdin, A.E. (1985). Plenum Press: NY
- Behavior therapy: Techniques and empirical findings, Rimm D.C. & Masters J.C. (1979). Academic Press: NY.
- Handbook of Clinical Behavior therapy, Turner, S.M., Calhown K.S and Adams H.E. (1992). Wiley Interscience: NY
- Handbook of clinical behavior therapy, Turner, S.M, Calhour, K.S. & Adams, H.E.(1992). Wiley Interscience: NY

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- Introduction to Counseling and Guidance, 6 Pearson, New Delhi ed., Gibson, R.L. & Mitchell M.H. (2006),
- Cognitive Behavior Therapy for psychiatric problems: A practical guide, Hawton, K. Salkovskis, P.M., Kirk, J. and Clark, D.M. (1989). Oxford University Press: NY
- Counseling and Psychotherapy: theories and interventions. 3 (2003). Merrill Prentice Hall: New Jersey ed. Capuzzi, D and Gross D. R. Handbook of psychotherapy case formulation. 2 ed. Eells, T.D (2007). Guilford press: USA

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Paper - III: PSYCHIATRY

Course Code: PCP3103 **Credit Units: 12**

Course Contents:

Module-I: Nomenclature: Introduction to classificatory systems currently in use and their limitations.

Module-II: Psychoses: Schizophrenia, affective (mood) disorders, delusional disorders and other forms of psychotic disorders – types, clinical features, etiology and management.

Module-III: Neurotic, Stress-related and Somatoform disorders: types, clinical features, etiology and management.

Module-IV: Disorders of personality and behavior: Specific Personality disorders, Mental & behavioral disorders due to psychoactive substance use, Habit and impulse disorders, Sexual disorders and dysfunctions.

Module-V: Organic mental disorders: types, clinical features, etiology and management.

Module-VI: Behavioral, emotional and developmental disorders of childhood and adolescence: types, clinical features, etiology and management.

Module-VII: Mental Retardation: Classification, etiology and management/ rehabilitation.

Module-VIII: Mental health policies and legislation: Mental Health Act of 1987, National Mental Health Program 1982, the persons with disabilities (equal opportunities, protection of rights and full participation) Act 1995; Rehabilitation Council of India (RCI) Act of 1993, National Trust for Mental Retardation, CP and Autistic Children 1999, Forensic issues related to mental disorders.

Essential References:

- Comprehensive Textbook of Psychiatry, 6 & Wilkins: London ed., Vol. 1 & 2, Kaplan & Sadock, (1995). William Oxford Textbook of psychiatry, 2 Press: NYed., Gelder, Gath & Mayon, (1989). Oxford University
- Symptoms in mind: Introduction to descriptive psychopathology, Sims A, Bailliere T, (1988)
- Textbook of postgraduate psychiatry, 2 brothers: New Delhi. ed. Vol 1 & 2, Vyas, J.N. & Ahuja, N. (1999). Jaypee
- Child and Adolescent Psychiatry: Modern approaches, 3 Blackwell Scientific Publications: Londoned., Rutter, M. & Herson, L (1994)

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Practical – I: Psychological Assessment

Course Code: PCP3104 **Credit Units: 12**

Course Contents:

The candidates should be provided with abundant opportunities to acquire the necessary skill and competency in each of the following psychological tests. Since psychological assessment forms major part of Diploma level training, extensive exposure in working up of cases and carrying out the assessment shall be ensured.
The domains that should be emphasized include but not limited to: Case history method, mental status examinations, arriving at the clinical diagnosis, rationale of psychological testing, observations, response recording, analyze, interpret and communicate the findings to the team members.

Specific tests: Tests for attention, memory, intelligence, developmental skills, abstract ability, personality, diagnosis, rating scales, assessing disability, QOL and wellbeing, stress and adaptation (includes standardized vernacular version of tests/scales those used in adult and child conditions).

List of Core Tests:

- Binet-Kamat test
- Raven's tests of intelligence (all forms)
- Bhatia's battery of intelligence tests
- Malin's intelligence scale for children
- Wechsler adult performance intelligence scale
- Wechsler memory scale
- PGI memory scale
- 16-PF
- Eysenck's personality inventory/questionnaire
- Thematic apperception test
- Children apperception test
- Rorschach psychodiagnostics

A certificate by the Head of the Department that the candidate has attained the required competence in all of the above Core Tests shall be necessary for appearing in the final examination.

Essential References:

- Comprehensive handbook of psychological assessment, Vol 1 & 2, Hersen, M, Segal, D. L, Hilsenroth, M.J. (2004). John Wiley & Sons: USA
- Comprehensive Clinical Psychology: Assessment, Vol. 4, Bellack, A.S. & Hersen, M (1998). Elsiever Science Ltd.: Great Britain
- The Rorschach – A Comprehensive System, Vol 1, 4 NY.ed., Exner, J.E. John Wiley and sons:
- The Thematic Apperception Test manual, Murray H.A. (1971), Harvard University Press.
- An Indian modification of the Thematic Apperception Test, Choudhary, U. Shree Saraswathi Press: Calcutta

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Postgraduate Diploma in Rehabilitation Psychology



Achieving Academic Excellence

Curriculum & Scheme of Examination

2023

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Note: This is based on Postgraduate Diploma in Rehabilitation Psychology Guidelines & Syllabus as given on the RCI website

Syllabus

Paper I: DISABILITY AND REHABILITATION

Course Code: PRP3101 **Credit Units: 12**

Course Contents:

Module-I: Introduction – Overview of the profession, history and growth of rehabilitation field, areas of specialization, current issues and trends in different areas of rehabilitation, magnitude and incidence of disability, cost of disability, major national reports and surveys

Module-II: Concepts and theory – Impairment, disability and handicap, types and causes of impairments, realms of impairments, concept of functional capacity, coping and well-being, quality of life and its functional domains, content areas, methods of assessment, specific and global indicators of quality of life

Module-III: Disability and Rehabilitation – Models of disability and rehabilitation, enabling–disabling processes, impact of the physical, social and psychological environments on the enabling– disabling processes, effects of disability on participation, psychosocial theories of adjustment, strategies to enhance adjustment, functional limitations and strategies to reduce and accommodate limitations

Module-IV: Disability through life-cycle – Specific problems pertaining to each stage of life - childhood, adolescence, young adulthood, middle age, and older adulthood, and adapting strategies

Module-V: Ethics and policy issues – Rehabilitation ethics, rehabilitation policies and Acts (Persons with Disabilities Act, The National Trust Act, Mental Health Care Act, Rehabilitation Council of India Act, UNCRPD), assistance, concessions, social benefits and support from government, and voluntary organizations; contemporary challenges, civil rights and legislation, empowerment issues

References:

- Encyclopedia of Disability, Gary L. Albrecht, Vol. 1 – 5, Sage Publications, Chicago, 2006
- Encyclopedia of Disability and Rehabilitation, Arthur E. Dell Orto and Robert P.Marinelli (Eds.), MacMillan Reference Books, 1995
- Perspectives on Disability and Rehabilitation: Contesting Assumptions, Challenging Practice, Karen Whalley Hammell, Churchill Livingstone, 2006
- Status of Disability in India – 2012, Rehabilitation Council of India, New Delhi.
- Development and Disability, Lewish, Blackwell Publishers, U.K., 2003
- Learning Disabilities: The interaction of students and their environments, Smith, C.R., Allyn and Bacon, Boston, 2004
- The handbook of Autism: A guide for parents and professionals, Aarons, M. and Glittens, T., Routledge, New York, 1992
- The Persons of Persons with Disabilities Act, Ministry of Social Justice & Empowerment, Government of India, New Delhi, 2016
- The National Trust for Welfare of Persons with Autism, Cerebral Palsy, Mental Retardation and Multiple Disabilities Act, Government of India, New Delhi, 1999
- Yuker, H. E. (Ed). (1988). Attitudes Toward Persons with Disabilities. New York: Springer Publishing Company.
- Dell Orto, A. E., & Marinelli, R. P. (Eds.) (1995). Encyclopedia of disability and rehabilitation. NY: Simon & Schuster Macmillan.
- Eisenberg, M. G., Glueckauf, R. L., & Zaretsky, H. H. (Eds.) (1999). Medical aspects

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of disability: A handbook for the rehabilitation professional (2nd ed.). NY: Springer.
- Jena, S.P.K.(2013). Learning Disabilities: Theory to Practice, New Delhi. Sage Publication
- Sagar, R. (Ed.) (2014). Specific Learning Disorder: Indian Scenario. New Delhi: Department of Science and Technology, Govt. of India
- Smart, J. (2012). Disability across the Developmental Life Span: For the rehabilitation counselor. New York: Springer Publishing Company

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Paper II: PSYCHOSOCIAL ISSUES IN DISABILITY

Course Code: PRP3102 **Credit Units: 12**

Course Contents:

Module-I: Stress and Coping Style – Stress due to disability, threat to life and physical well being, body image, independency, autonomy and control, self-concept, self esteem, life goals and future plan, invisible disabilities, marginalization, Denial, regression, compensation, rationalization, emotional reaction – grief, loss, guilt and fear, coping styles and strategies, stages of adaptation and adjustment, factors impeding adjustment to disability and disabling processes, psychological control

Module-II: Mental health issues – Psychopathological reactions such as anxiety, depression, adjustment problems, other co-existing mental morbidity, emotional and behavioral disorders in children and adolescents, problems related to marital and sexual life, abuse and exploitation, substance use, interventions for mental illnesses

Module-III: Family issues – Relationship issues with family, problems of families of disabled adults and children, impact of disability on family, family burden, needs of family and models of family adaptation, intervention to strengthening family support to disabled

Module-IV: Social issues – Societal attitudes toward disabilities, measurement of attitude and strategies for attitude change, social environment, social participation, social interaction, social network and support, disabling factors, prejudice, stigma, discrimination, marginalization, gender disparity

Module-V: Vocational issues - Career competency, career development issues, work related stress, economic independence, well-being, assistive devices for activities of daily living, mobility aids, at work place, sensory devices, environment modifications and universal designs, needed support system

References:

- Mary Ann Bruce and Barbara Borg (2001). Overview - Psychosocial Frames of Reference, SLACK, Incorporated, 2001
- Dunn, D. S. (2000). Social psychological issues in disability. In R. G. Frank & T. R. Elliott (Eds.), Handbook of Rehabilitation Psychology. Washington, D.C.: American Psychological Association.
- Wright, B. A. (1983). Physical Disability: A Psychosocial Approach, 2nd ed. New York: Harper and Row.
- Backman, M. (1989). The Psychology of the Physically Ill Patient: A Clinician's Guide. New York: Plenum Press. Caplan, B., & Shechter, J. (1987). Denial and depression in disabling illness.
- Caplan (Ed.) Rehabilitation Psychology Desk Reference. Aspen Systems Corp.
- Cash, T. & Pruzinsky, T. (2002). Body Image: A Handbook of Theory, Research, and Clinical Practice. New York: Guilford Publications.
- Rohe, D. E. (1998). Psychological aspects of rehabilitation. In J. A. DeLisa & B. Gans (Eds.)
- Rehabilitation Medicine: Principles and Practice , 3rd Edition. Philadelphia: LippencottRaven, 189-212.
- Snyder, C. R. (1999). Coping: The Psychology of What Works. London: Oxford Press.
- Wortman, C. B., & Silver, R. C. (1989). The myths of coping with loss. J Consult Clin Psychol, 57(3), 349-57.
- Devy John (1994). Introduction to Social Psychology
- Ahuja, N. (2011). A Short Textbook of Psychiatry. New Delhi: Jaypee Brothers Medical Publishers Pvt. Ltd..

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- Jahan, M. (2016). Manasik Rog. Ahuja Book Company Pvt. Ltd., New Delhi
- Singh, R., Yadava, A. & Sharma, N. R. (Eds) (2005). Health Psychology. New Delhi: Global Vision Publishing House.
- Goreczny, A. J. (Ed) (1995). Handbook of Health and Rehabilitation Psychology. New York: Plenum Press.

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Paper III: REHABILITATION ASSESSMENT AND COUNSELING

Course Code: PRP3103 **Credit Units: 12**

Course Contents:

Module-I: Assessment – Need for assessment in counseling, assessmentbased model for decision making, planning, and implementing individualized interventions, various instruments used for assessing cognitive, learning, behavioral, and emotional functioning, social and emotional development, assessment of perception of the problems and potential to participate and benefit from interventions, and assessing intervention efficacy

Module-II: Theory and concepts – Definition and goals of rehabilitation counseling, theories and techniques, counselor role, boundaries of confidentiality, ethical guidelines in counseling activities, concept of dual relationships, professional challenges in counseling and conflict resolutions, models, spiritual, culture and gender issues in counseling

Module-III: Intervention Approaches – Individual counseling approaches viz. non-directive, existential, humanistic, person-centered, cognitive and behavioral counseling, and behavior modification, techniques of remedial training for scholastic/learning problems

Module-IV: Specific Interventions – Specific intervention for developing social skills, academic skills, assertiveness, anger management, addressing anxiety/mood disorders, assessing family functioning, its strengths and resources, family counseling, crisis intervention

Module-V: Vocational counseling – Assessment and components of vocational counseling viz. identifying interests, goals and plans, and counseling during the training and job placement processes, scheme related to skill development

References:

- Carpener B, (2002). Families in Context, Emerging Trends in Family Support and Intervention, David Fulton Publishers Ltd., London.
- Ben-Yishay, Y. & Diller, L. (1993). Cognitive remediation in traumatic brain injury: Update and issues. Archives of Physical Medicine and Rehabilitation, 74, 204-213.
- Hansen, S. L., Guenther, R., Kerkhoff, T. & Liss, M. (2000). Ethics: historical foundations, basic principles and contemporary issues. In R. G. Frank & T. R. Elliott (Eds.), Handbook of Rehabilitation Psychology. Washington, D.C.: American Psychological Association.
- Kerkhoff, T., Hanson, S., Guenther, R., & Ashkanazi, G. (1997). The foundation and application of ethical principles in rehabilitation psychology. Rehabilitation Psychology, 42 (1),17-30.
- Shewchuk, R., & Elliott, T. (2000). Family caregiving in chronic disease and disability. In R. G. Frank & T. R. Elliott (Eds.), Handbook of Rehabilitation Psychology. Washington, D.C.: American Psychological Association
- Goodheart, C. & Lansing, M. H. (2001). Treating People with Chronic Disease: A Psychological Guide. Washington, D.C.: American Psychological Association.
- Meichenbaum, D., & Turk, D. (1987). Facilitating treatment adherence: A practitioner's guidebook. New York: Plenum Press.
- Radnitz, C. L., Bockian, N., & Moran, A. I. (2000). Assessment of psychopathology and personality in people with physical disabilities. Handbook of Rehabilitation Psychology. Eds. Frank, R.G., Elliott, T.R. Washington, D.C.: American Psychological Association. 287-309.

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- Corthell, D. S. (Ed.) (1997). Traumatic Brain Injury and Vocational Rehabilitation. Menomonie, WI: University of Wisconsin- Stout.
- Fraser, R. (1991). Vocational evaluation. Journal of Head Trauma Rehabilitation, 6, 46-58.
- Rao, N., & Kilgore, K. U. (1992). Predicting return to work in traumatic brain injury using assessment scales. Archives of Physical Medicine and Rehabilitation, 73, 911-916.
- Rohe, D. E., & Athelstan, G. T. (1982). Vocational interests of persons with spinal cord injury. Journal of Counseling Psychology, 29 (3), 283-291.
- Rohe, D. E., & Athelstan, G. T. (1985). Change in vocational interests after disability. Rehabilitation Psychology, 30 (3), 131-143.
- Rohe, D. E. & Krause, J. S. (1998). Stability of Interests After Severe Physical Disability: An 11-Year Longitudinal Study. Journal of Vocational Behavior, 52, 45-58.
- Szymanski, E. M. (2000). Disability and vocational behavior. In R. G. Frank & T. R. Elliott (Eds.), Handbook of Rehabilitation Psychology. Washington, D.C.: American Psychological Association
- Gladding, S. T. (2014). Counselling: A comprehensive profession. Pearson Education Inc. (Published by Dorling Kindersley (India) Pvt. Ltd., Noida for India).
- Hough, M. (2014). Counselling Skills and Theory. Italy: Hodder Education.
- Whiston, S. C. (2009). Principles and Applications of Assessment in Counselling. CA: Brooks/Cole Cengage Learning

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Paper IV: COMMUNITY BASED REHABILITATION

Course Code: PRP3104 **Credit Units: 12**

Course Contents:

Module-I: Goals and Objectives – Definition of CBR, Goals and objectives, key principles - equality, social justice, solidarity, integration and dignity

Module-II: Components – Creation of a positive attitude, provision of rehabilitation services, education and training opportunities, creation of micro and macro income generation opportunities, provision of long term care facilities, prevention of causes of disabilities and monitoring & evaluation

Module-III: Role of CBR professionals – As local advocates, liaison and continuity of care, continued supervision of home programs, community initiatives to remove barriers that affect exclusion, advocacy

Module-IV: Initiatives – Social counseling, training in mobility and daily living skills, community awareness raising, facilitating access to loans, vocational training, information for local self-help groups, contacts with different authorities, school enrolment

Module-V: Empowerment issues – Approaches for empowering - social mobilization, political participation, communication, self help groups and organization working for persons with disabilities

References:

- Helander Einar (1999). Prejudice and Dignity – An Introduction to Community Based Rehabilitation, Second Edition, United Nations Development Program, NY
- Community Based Rehabilitation and the health care referral services (1994), World health Organization
- Community Based rehabilitation for and with people with disabilities (1994), UNESCO (Special Education) , WHO
- Jonsson Ture (1994). Inclusive Education – United Nations Development Program
- David Werner. Disabled Village Children: a guide for community health workers, rehabilitation workers families, The Hesperian Foundation, USA.
- Einar Helander, Padmani Mendis and Gunnel Nelson. Training disabled people in the Community — a manual on CBR for developing countries, WHO, Switzerland.
- Community Based Rehabilitation —Report of a WHO International Consultation, Colombo, Lanka,
- Scheme of assistance to Organizations for disabled persons, Ministry of Social Welfare, Govt. of India, New Delhi.
- Govt. of India Scholarships for the disabled persons: Ministry of Social Welfare, Govt. of India, New Delhi.
- Programmes and Concessions for the disabled persons: Ministry of Social Welfare, Govt. of India, New Delhi.
- Einar Helander (1984). Rehabilitation For All: a guide to the management of CBR
- M.C. Narasimhan and A.K. Mukherjee. Disability: a Continuing Challenge, Wiley Eastern Ltd.,
- Training Manual for Village Rehabilitation Workers, District Rehabilitation Centre Scheme, Ministry of Welfare, Govt. of India published by Wiley Eastern Ltd.
- Mrs.Achala Pahwa (Ed.). Manual on Community Based Rehabilitation. Ministry of Social Welfare, Govt. of India.
- Pilling, A. (1991). Rehabilitation and Community Care. London: Routledge

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ASE2105	Introduction to Computers and Programming in C	L	T	P	C
Version: 2019.1	Date of Approval: May 21, 2019	2	1	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The objective of this course module is to acquaint the students with the basics of computers system, its components, data representation inside computer and to get them familiar with various important features of procedure-oriented programming language i.e. C.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of Programming through C Language
2. Provide an overview of advanced programming concepts like Structure, Union and File Handling

Course Outcomes

On completion of this course, the students will be able to

After the completion of course, the students will be able to,

CO 1:Define the purpose and structure of C Program for programming; identify and distinguish various data types and operators; conditional and control statement; Apply if-else, Switch and loops to rewrite basic C program for problem solving.

CO 2: Compare and contrast various Array types, its declaration and implementation; differentiate between Call by Value and Reference if Functions; apply the concepts to rewrite C Programs

CO 3: Differentiate between various String Handling Functions; describe the concept of Pointers in C Language

CO 4: Explain the concept of Structure and Union; apply the concept of File Handling to provide data storage support to the programs.

CO 5: Apply the concept of Computer Graphics using C programming concepts for implementing line drawing, circle drawing algorithms.

Modules	Blooms level*	Number of hours
Module I: Introduction Introduction to computer, history, von-Neumann architecture, memory system (hierarchy, characteristics and types), H/W concepts (I/O Devices), S/W concepts (System S/W & Application S/W, utilities). Data Representation: Number systems, character representation codes, Binary, octal, hexadecimal and their interconversions. Binary arithmetic, floating point arithmetic, signed and unsigned numbers, Memory storage unit.	L1, L2 and L3	7

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Module II: Programming in C History of C, Introduction of C, Basic structure of C program, Concept of variables, constants and data types in C, Operators and expressions: Introduction, arithmetic, relational, Logical, Assignment, Increment and decrement operator, Conditional, bitwise operators, Expressions, Operator precedence and associativity. Managing Input and output Operation, formatting I/O.	L2, L3 and L4	7
Module III: Fundamental Features in C C Statements, conditional executing using if, else, nesting of if, switch and break Concepts of loops, example of loops in C using for, while and do-while, continue and break. Storage types (automatic, register etc.), predefined processor, Command Line Argument.	L2, L3 and L4	7
Module IV: Arrays and Functions One dimensional arrays and example of iterative programs using arrays, 2-D arrays Use in matrix computations. Concept of Sub-programming, functions Example of user defined functions. Function prototype, Return values and their types, calling function, function argument, function with variable number of argument, recursion.	L2 and L3	7
Module V: Advanced features in C Pointers, relationship between arrays and pointers Argument passing using pointers, Array of pointers. Passing arrays as arguments.Strings and C string library.Structure and Union. Defining C structures, Giving values to members, Array of structure, Nested structure, passing strings as arguments. File Handling.	L2, L3 and L4	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6:Evaluation

Text Books

1. E Balagurusamy, "Programming in ANSI C", Seventh Edition, Tata McGraw Hill Education private limited, July 2017.
2. YashwantKanetkar, "Let Us C", 16th Edition, BPB Publication, June 2017.

Reference Books

1. Brain W Kernighan and Dennis M Ricchie, "The C Programming Language", 2nd Edition, Pearson Publication, Jan 2015.
2. Byron Gottfried, "Programming with C", Third Edition, Tata McGraw Hill Education private limited, July 2017.
3. E Balagurusamy, "Computer Concepts & Programming in C", Seventh Edition, Tata McGraw Hill Education private limited, July 2011.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

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CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**2**	--	**2**	--	--	--	--	--	--	--	--	**1**	--	**1**	--
CO2	**1**	**1**	**2**	**2**	--	--	--	--	--	--	--	--	**1**	--	**1**	--
CO3	**1**	**1**	**2**	**3**	--	--	--	--	--	--	--	--	**1**	--	**1**	--
CO4	**1**	**1**	**2**	**2**	**3**	--	--	--	--	--	--	--	**1**	--	**1**	--
CO5	**1**	**1**	**2**	**2**	**3**	--	--	--	--	--	--	--	**1**	--	**1**	--

1: strongly related, 2: moderately related and 3: weakly related

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ASE2110	Programming in C Lab	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The primary objective of this course is to understand all the components of C, including the C language, the C Preprocessor, and the C Standard Library. An understanding of some advanced practical issues, including memory management, testing and debugging, complex declarations and expression evaluation, building and using libraries, and evaluating tradeoffs, such as size vs. speed and speed vs. complexity. The ability to write C code and create and manipulate logical programs.

Course Objectives

The objective of this course is to

- Equip the students with concepts of Programming through C Language
- Provide an overview of advanced programming concepts like Structure, Union and File Handling.

Course Outcomes

After the completion of course, the students will be able to,

CO 1:Demonstrate the use of various data types and operators in C programs; Solve various problems using conditional control statements (if-else, Switch case).

CO 2: Construct C programs related to problems involving the usage of loops, arrays and functions.

CO 3: Apply the concept of Pointers for efficient memory management and construct C programs using string handling functions.

CO 4: Demonstrate the use of Structure, Union and concept of File Handling to provide data storage support to the programs.

Modules	Blooms level*	Number of hours

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LABORATORY SESSSION 1 OPERATORS, EXPRESSIONS and DECISION MAKING 1. Write a program to calculate simple interest and amount. 2. Write a program to swap two numbers using third variable. 3. Write a program to demonstrate Greatest of 3 nos and to print the given no in ascending order. 4. Write a program to check if the number is even or odd. 5. Write a program to perform arithmetic operations using Switch Case statement. 6. Write a program to calculate area of circle, rectangle, square and triangle using Switch Case statement.	L3	5
LABORATORY SESSSION 2 LOOPING 1. Write a program to find factorial of given no using do while statement. 2. Write a program to print prime numbers up to 'n'. 3. Write a program to sum of n natural no. 4. Write a program to print Fibonacci series. 5. Write a program to reverse a number. 6. Write a program to print the following pattern using for loop 1 2 2 3 3 3 4 4 4 4 7. Write a program to print the following pattern using for loop A A B A B C A B C D	L3	6
LABORATORY SESSSION 3 ARRAYS and FUNCTIONS 1. Write a program to read nnum of students and 5 subjects marks. 2. Write a program to swap two numbers using call by value. 3. Write a program to convert all lower case to uppercase characters 4. Write a program to find the factorial of a number using recursion. 5. Write a program to print the add/product of two matrices of any order.	L3	5
LABORATORY SESSSION 4 POINTERS AND STRING 1. Write a program to perform operations on strings using string handling in-built functions (concatenation, reversal, copy etc.) 2. Write a program to swap two numbers using call by reference. 3. Write a program to perform dynamic memory allocation and de-allocation. 4. Write a program to print elements of array using pointers.	L3	4

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LABORATORY SESSSION 5 STRUCTURE,UNION & FILE HANDLING 1. WAP program to display student information by initializing structures. 2. WAP program to find the total salary of employee and employee details using structure. 3. Write a program to store and display information using Union. 4. Program to write data into file and read data from file.	L3	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- E Balagurusamy, "Programming in ANSI C", Seventh Edition, Tata McGraw Hill Education private limited, July 2017.
- YashwantKanetkar, "Let Us C", 16th Edition, BPB Publication, June 2017.

Reference Books

1. Brain W Kernighan and Dennis M Ricchie, "The C Programming Language", 2nd Edition, Pearson Publication, Jan 2015.
2. Byron Gottfried, "Programming with C", Third Edition, Tata McGraw Hill Education private limited, July 2017.
3. E Balagurusamy, "Computer Concepts & Programming in C", Seventh Edition, Tata McGraw Hill Education private limited, July 2011.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	2	--	2	--	--	--	--	--	--	--	--	1	--	2	--
CO 2	1	1	2	2	--	--	--	--	--	--	--	--	1	--	2	--
CO 3	1	1	2	3	--	--	--	--	--	--	--	--	1	--	2	--
CO 4	1	1	2	2	3	--	--	--	--	--	--	--	1	--	2	--

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ASE2215	Workshop Technology	L	T	P	C
Version 1.1	Date of Approval: May, 2019	2	0	0	2
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

In this course the concepts of machine tool like Lathe, Shaper, Milling, and Drilling machines are discussed. Elementary concept of foundry, sheet metal and welding processes are discussed in detail. The aim of this course is to make the students familiar with the basic workshop processes.

Course Objectives

The objective of this course is to

- Equip the students with concept of machine tool, foundry, sheet metal and welding processes.
- Provide an overview of workshop technology.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define the manufacturing process and engineering materials.
CO2: Explain the foundry, sheet metal and welding processes.
CO3: Demonstrate the machine tools like Lathe, Shaper, Milling, Drilling machines.
CO4: Discuss the basic elements of metal cutting and cutting parameters.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction: Introduction to Manufacturing Processes and their Classification. Engineering Materials: General Properties and Applications of Engineering Materials, Plain carbon steel & classification.	L1, L2 and L3	3
MODULE 2: Foundry: Introduction to Casting Processes, Basic Steps in Casting Process, Pattern, Types of Patterns, Pattern Allowances, Moulding Sand and its composition, Sand Preparation, Molding Methods, Mould Assembly, Melting (Cupola) and Pouring, Fettling, Casting Defects and Remedies.	L1, L2 and L3	5
MODULE 3: Sheet Metal Work: Sheet Metal Operations, Measuring, Layout Marking, Shearing, Punching, Blanking, Piercing, Forming and Bending.	L1, L2 and L3	4
MODULE 4: Introduction to Machine Tools: Specifications and Uses of commonly used Machine Tools in a Workshop such as Lathe, Shaper, Milling, Drilling. Basic elements of metal cutting and cutting parameters.	L1, L2 and L3	6

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MODULE 5: Welding: Introduction to Welding, Classification of Welding Processes, Gas Welding: Oxy-Acetylene Welding, Resistance Welding; Spot and Seam Welding, Arc Welding: Metal Arc, Welding Defects and Remedies.	L1, L2 and L3	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

- Jain, R.K. (2004). *Production Technology: Manufacturing Processes, Technology and Automation.* Delhi: Khanna Publishers.
- Hazra, S.K. and Chaudhary, A.K. (2012). *Workshop Technology Vol. II*. New Delhi: Asian Book Comp.
- Rao, P.N. (2018). *Manufacturing Technology (Foundry, Forming and Welding)*. Delhi: Tata McGraw.

Reference Books

- Khanna, O.P. (2015). *Foundry Technology.* Delhi: Dhanpat Rai Publication.
- Parmer, R. S. (2003). *Welding Engineering and Technology.* Delhi: Khanna Publishers.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO2	**1**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO3	**1**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO4	**1**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**1**	--	--

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ASE2212	ENGINEERING GRAPHICS LAB	L	T	P	C
Version 2019.1	Date of Approval: July 14, 2019	0	0	4	2
Pre-requisites/Exposure	Concepts Mathematics (especially Trigonometry and Geometry)				
Co-requisites	Machine Drawing & CAD				

Catalog Description:
A freshman level course which provides the undergraduate engineering students with a background in descriptive geometry, orthographic projection, engineering drawing standards and annotation, computer-aided engineering graphics. The concepts of point, line and plane relationships in projection, multi-view engineering drawings, auxiliary and section views, basic dimensioning and annotation, engineering applications of drawings are also discussed.

Course Objective:
The objective of this course is to

- Equip the students with the in-depth knowledge of drawings of points, straight line, planes, cylinders, prisms, pyramids, parabola, ellipse etc.
- Draw different figures manually and will be capable of using various instruments involved in drawings.

Course Outcomes (COs):
At the end of the course, the student shall be able to:
CO 1 - Define and explain basic principles of projections of points and lines.
CO 2 - Define, describe and construct the different orientations and projections of planes.
CO 3 – Explain and construct the projections of solids and sectioning of solids in different orientations.
CO 4 - State and draw the concepts of development of surfaces and introduction to auto CAD.
CO 5 – Define and construct orthographic and isometric view of an object.

Modules	Blooms level*	Number of hours
Module I: Introduction Importance, significance and scope of engineering drawing, drawing instruments and their use, lettering, dimensioning, scales, sense of proportioning, different types of projections, B.I.S. Specifications.	L1 and L2	8
Module II: Projection of points, lines and plane surface Principal planes, principles of orthographic projections, Projection of points in all quadrants, Projection methods - First angle & third angle projection, Projections of straight lines (first angle projection) inclined to both the planes, true lengths and traces, projection of planes, projection of planes in simple position and inclined to both the principal planes, auxiliary planes and views	L1, L2 and L3	12

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Module III: Projection of solids & section of solids Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to both of the principal planes, Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other, obtaining true shape of section	L1, L2 and L3	12
Module IV: Development of surfaces & Isometric projections Development of surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones, Principles of isometric projection, isometric scale, Isometric projections of simple solids and truncated solids, Prisms, pyramids, cylinders, cones, Conversion of Orthographic Views to Isometric Views and Vice-versa.	L1, L2 and L3	8
Module V: Introduction to CAD Introduction to CAD and use of its commands, practice of some 2D figures using CAD.	L1, L2 and L3	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	50	20

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text Books:

- PS Gill, 2013, Engineering Drawing, Kataria Publication.
- ND Bhatt, 2014, Engineering Drawing, Charotar publications.

References Books:

- N Sidheshwar, 2014 Machine Drawing Drawing, Tata McGraw Hill
- M.B. Shah & B.C. Rana, 2007, Engineering Drawing, Pearson Education.
- CADFolks, AutoCAD 2018 For Beginners, CreateSpace Independent *Publishing* Platform; 6 edition.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--
CO2	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--
CO3	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--
CO4	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--
CO5	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--

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ENGINEERING MECHANICS LAB

Course Code: ASE2218 **Credit Units: 01**

Engineering Mechanics:

1. To verify the law of Force Polygon
2. To verify the law of Moments using Parallel Force apparatus. (Simply supported type)
3. To determine the co-efficient of friction between wood and various surface (like
4. Leather, Wood, Aluminum) on an inclined plane.
5. To find the forces in the members of Jib Crane.
6. To determine the mechanical advantage, Velocity ratio and efficiency of a screw jack.
7. To determine the mechanical advantage, Velocity ratio and Mechanical efficiency of the
8. Wheel and Axle
9. To determine the MA, VR, η of Worm Wheel (2-start)
10. Verification of force transmitted by members of given truss.
11. To verify the law of moments using Bell crank lever
12. To find CG and moment of Inertia of an irregular body using Computation method

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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ASE2315	Strength of Materials	L	T	P	C
Version 2019-1	Date of Approval: May 2019	3	0	0	3
Pre-requisites/ Exposure	Physics, Engineering Mechanics				
Co-requisites					

Course Catalog

The objective of this course is to make the students understand the concept of stress and strain in different types of structure/machine under different loading conditions. The course also covers the simple and compound stresses due to forces, stresses and deflection in beams due to bending, torsion in circular section, strain energy, different theories of failure and stress in thin cylinder thick cylinder and spheres due to external and internal pressure.

Course Objectives

The objective of this course is to

- Equip the students with concept of stress and strain induced in material under various loading conditions.
- Provide an overview of stresses induced in beam, shaft, column and deflection of beam under various loading conditions.

Course Outcomes

On completion of this course, the students will be able to

CO1. Identify, explain, and apply the principles of stress and strain and relationship between elastic constant to solve complex engineering problems.

CO2. Identify, explain, and apply the principles of shear force and bending moment under various loads to solve complex engineering problems.

CO3. Identify, explain, and apply the principles of torsion and torsional stresses to solve complex engineering problems.

CO4. Identify, explain, and apply the methods to solve complex engineering problems related to columns and struts.

CO5. Identify, explain, and apply the methods to solve complex engineering problems related to slope and deflection of different bodies.

Course Content

Modules	Blooms level*	Number of hours
Module I: Simple Stresses and Strains Concept of stress and strain; Hooke's law, Young's modulus, Poisson ratio, stress at a point, stress and strains in bars subjected to axial loading. Modulus of elasticity, stress produced in compound bars subject to axial loading. Mohr Circle, problems.	L1, L2, L3	6
Module II: Shear Force and Bending Moment Definitions, Types of loads, Types of beams, Shear force and bending moment diagrams for cantilevers, simply supported beams, calculation of maximum bending moment & shear force. Bending Stress, assumptions in the simple bending theory, derivation of formula and its application to beams of rectangular, circular and channel sections, problems.	L1, L2, L3	8

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Module III: Torsion Derivation of torsion equation and its assumptions. Applications of the equation for the hollow and solid circular shafts, torsional rigidity, combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion, problems.	L1, L2, L3	7
Module IV: Columns and Struts Columns and Struts and their failure mechanism, Euler's formulas; Rankine-Gordon's formula, Johnson's empirical formula for axially loaded columns and their applications, problems.	L1, L2, L3	7
Module IV: Slope and Deflection Relationship between moment, slope and deflection, Mohr's theorem; Moment area method; method of integration; Macaulay's method: Use of all these methods to calculate slope and deflection for the following: a) Cantilevers b) Simply supported beams with or without overhang c) Under concentrated loads, uniformly distributed loads or combination of concentrated and uniformly distributed loads, problems.	L1, L2, L3	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books

Text:

1. Ramamurtham, S., "Strength of Materials", 16th Edition, Dhanpat Rai Publishing Company, 2011.
2. Peery, D. J., "Aircraft Structures", Dover Publications, 2011.
3. Megson, T. H. G., "Aircraft Structures for Engineering Students", Elsevier India, 2005.
4. Sun, C. T., "Mechanics of Aircraft Structures", 2nd Edition, Wiley-India Pvt. Ltd., 2006.

Reference:

1. Timoshanko, S. P. and Goodier, J. N., "Theory of Elastic Stability", 2nd Edition, Dover Publications Inc., New York, 2009.
2. Sinha, N. C., "Elements of Structural Analysis", New Central Book Agency, 2011

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

CO, PO and PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	1	2	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	1	1	2	-	-	-	-	-	-	-	-	-	1	-	-	-
CO3	1	1	2	-	-	-	-	-	-	-	-	-	1	-	-	-
CO4	1	1	2	-	-	-	-	-	-	-	-	-	1	-	-	-
CO5	1	1	2	-	-	-	-	-	-	-	-	-	1	-	-	-

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ASE2317	Strength of Materials Lab	L	T	P	C
Version 2019-1	Date of Approval: May 2019	0	0	2	1
Pre-requisites/ Exposure	Physics, Engineering Mechanics				
Co-requisites	Strength of Materials				

Course Catalog

The objective of the Strength of Materials lab is to demonstrate the basic principles in the area of strength and mechanics of materials and structural analysis to the undergraduate students through a series of experiments. In this lab, the experiments are performed to measure the properties of the materials such as impact strength, tensile strength, compressive strength, hardness, ductility etc.

Course Outcomes

At the end of the course, the student shall be able to:

- **CO1.** Identify, explain, and demonstrate the procedure to conduct hardness tests using differenttesting techniques.
- **CO2.** Identify, explain, and demonstrate the procedure to conduct compression and stiffness testsusing different testing techniques.
- **CO3.** Identify, explain, and demonstrate the procedure to conduct impact and tensile tests usingdifferent testing techniques.
- **CO4.** Identify, explain, and demonstrate the procedure to conduct torsion tests and draw shearforce and bending moment diagrams for bodies under different loading conditions.

Modules	Blooms level*	Number of hours
1. To study the Brinell hardness testing machine & perform the Brinell hardness test.	L1, L2, L3	2
2. To study the Rockwell hardness testing machine & perform the Rockwell hardness test.	L1, L2, L3	2
3. To study the Spring Compression Testing machine and perform the Spring Stiffness test.	L1, L2, L3	2
4. To study the Impact testing machine and perform the Impact tests (Izod&Charpy Test)	L1, L2, L3	2
5. To study the Universal Testing Machine and perform the tensile test on Universal Testing Machine.	L1, L2, L3	2
6. To perform compression & bending tests on UTM.	L1, L2, L3	2
7. To study the torsion testing machine and perform the torsion test.	L1, L2, L3	2
8. To draw shear Force, Bending Moment Diagrams for a simply Supported Beam under Point and Distributed Loads.	L1, L2, L3	2

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books

Text:

- G. H. Ryder, "Strength of Materials", India: Macmillan, 1969.
- R. K. Bansal, "A Textbook of Strength of Materials", Laxmi Publications, 2010.
- V. Jain, "Strength of Material –I". Dhanpat Rai Publications, 2012.

Reference:

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- S. Singh, “Strength of Material”, Khanna Publisher, 2010.
- R. K. Rajput, “Strength of Materials”, S. Chand Publications, 2006.

Examination Scheme

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	1	3	-	1	-	-	-	-	2	2	3	3	1	-	-	3
CO2	1	3	-	1	-	-	-	-	2	2	3	3	1	-	-	3
CO3	1	3	-	1	-	-	-	-	2	2	3	3	1	-	-	3
CO4	1	3	-	1	-	-	-	-	2	2	3	3	1	-	-	3

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ASE2322	Fluid Mechanics and Dynamics	L	T	P	C
Version 2019-1	Date of Approval: May 2019	3	0	0	3
Pre-requisites/ Exposure	Basic Physics				
Co-requisites					

Course Catalog

This course provides the basic knowledge and understanding of the properties, types, motion and forces of fluid. A student is supposed to have a basic knowledge of physics to comprehend the contents of this course. The subject will further enhance the knowledge regarding different types of flows and their practical applications in the field of aerospace. The course also includes different fluid equations like Euler's, Bernoulli's etc. and their practical applications.

Course Objectives

The objective of this course is to

- Provide introductory knowledge to the students about different properties of fluids and equip the students with the knowledge of basic principles and laws governing the motion of fluid.
- Equip the students with knowledge and understanding of the different behaviors of flow past submerged bodies of different shapes and cross-sections.

Course Outcomes

On successful completion of this course, students will be able to

CO1. Identify, describe, and distinguish amongst the various types and properties of fluids, hydrostatic forces and their measurement techniques.

CO2. Identify, describe, and distinguish amongst the various properties of Kinematics of fluid motion and solve relevant engineering problems.

CO3. Identify, describe, and distinguish amongst the various properties of Dynamics of fluid motion and solve relevant engineering problems using various techniques of dimensional analysis.

CO4. Define, and explain various forces and moments acting on fully submerged bodies and apply the basic principles to solve relevant engineering problems.

CO5. Identify, describe, and distinguish between various properties of internal and external laminar and turbulent flows and solve relevant engineering problems.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Introduction to Fluid Properties and Fluid Static Physical properties of fluids, Newtonian and Non-Newtonian Fluids, Incompressible and compressible fluids. Pascal's Law, Hydrostatic law, concept of pressure and its measurement, forces on plane and curved surfaces. Buoyancy, stability of floating bodies.	L1, L2	7
Module 2: Fluid Kinematics Description of fluid flow; Lagrangian and Eulerian approach, Types of fluid flows, streamline, pathline and streakline, velocity potential and stream function. Source, sink, doublet, superimposed flow, vorticity and circulation, vortex flow, free and forced vortex.	L1, L2	8

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Module 3: Fluid Dynamics and Dimensional Analysis Conservation equations, Euler's equation, Bernoulli's equation, Introduction to Navier-stokes equation, Pilot tube, Venturimeter, orificemeter, notches. Buckingham π-Theorem, Rayleigh Theorem, Types of similarity, Dimensionless numbers and their significance.	L1, L2, L3	7
Module 4: Flow past Submerged Bodies Drag and Lift, Types of drag force, Drag on various bodies, circulation and lift on cylinder and airfoil, Magnus Effect, Introduction to boundary layer, Boundary layer thickness, boundary layer separation.	L1, L2, L3	7
Module 5: Laminar and Turbulent Flow Reynolds' experiment, critical velocity, steady laminar flow through a circular tube, flow between parallel plates, Transition from laminar to turbulent flow, velocity distribution law near a solid boundary. Flow through pipes, Energy losses, minor losses in pipe lines.	L1, L2, L3	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books:

Text:

1. R. K. Bansal, "Fluid Mechanics & Hydraulic Machines", Laxmi Publications Pvt. Ltd., 2002.
2. D. S. Kumar, "Fluid Mechanics and Fluid Power Engineering", S. K. Kataria& Sons, 2000.

References:

1. G. S. Sawhney, "Fundamentals of Fluid Mechanics", I K International Publishing House, 2011.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

CO, PO and PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	1	3	-	-	-	-	-	-	-	-	-	1	3	-	-
CO2	1	1	3	-	-	-	-	-	-	-	-	-	1	3	-	-
CO3	1	1	3	-	-	-	-	-	-	-	-	-	1	3	-	-
CO4	1	1	3	-	-	-	-	-	-	-	-	-	1	3	-	-
CO5	1	1	3	-	-	-	-	-	-	-	-	-	1	3	-	-

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ASE2323	Fluid Mechanics and Dynamics Lab	L	T	P	C
Version 2019-1	Date of Approval: May 2019	0	0	2	1
Pre-requisites/ Exposure	Basic Physics				
Co-requisites	Fluid Mechanics and Dynamics				

Course Catalog

The objective of the Fluid Mechanics and Dynamics lab is to familiarize the students with application of basic physics of fluids, its viscosity, and its laws of conservation of energy. It provides the students with the knowledge of laboratory methods and interpretation of results with regard to fluid engineering applications such as design and operation of water, losses it goes through while energy is being transferred.

Course Objectives

- Equip the students with concepts of properties of fluid flow and fluids; energy losses calculations and its measurement through different geometric cross sections.
- Provide an outline of calculations of coefficient of discharge velocity and contraction through various flow measuring devices.

Course Outcomes

At the end of the course, the student shall be able to:

CO1. Describe the working, interpret, calculate, and validate the Bernoulli's experiment.
CO2. Describe the working of Venturimeter and Orificemeter, determine the coefficient of discharge.
CO3. Describe, categorize, differentiate the various major and minor losses, and calculate the losses in the pipeline structure.
CO4. Describe the Reynolds's experiment and metacenter. Determine the type of the flow and interpret the conditions for a body to float.
CO5. State the pressure measuring devices, their working and determine the viscosity of fluid with change in the temperature.

Modules	Blooms level*	Number of hours
1. Verification of Bernoulli's Theorem	L2, L4	1
2. To determine the coefficient of discharge of Venturimeter	L2, L3	2
3. To determination of coefficient of Discharge C_d, coefficient of contraction C_c and coefficient of velocity C_v of an Orificemeter	L2, L3	1
4. To find major head losses in a pipe line	L2, L3 and L4	1
5. To find minor head losses in a pipe line (sudden expansion/contraction/bend)	L2, L3 and L4	1
6. To find critical Reynold's number for a pipe flow	L2, L3	1
7. To determine the metacentric height of a floating body	L2, L3	1
8. To study pressure measuring devices	L1, L2	1
9. To determine the viscosity of the fluid with the change in the temperature	L1, L2	1
10. To determine the coefficient of discharge by falling head method	L2, L3	1

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Text & Reference Books

Text:

1. R. K. Bansal, "Fluid Mechanics & Hydraulic Machines", Laxmi Publications Pvt. Ltd., 2002.
2. D. S. Kumar, "Fluid Mechanics and Fluid Power Engineering", S. K. Kataria& Sons, 2000.

References:

1. G. S. Sawhney, "Fundamentals of Fluid Mechanics", I K International Publishing House, 2011.

Examination Scheme

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	1	3	-	1	-	-	-	-	2	2	3	3	1	-	-	3
CO2	1	3	-	1	-	-	-	-	2	2	3	3	1	-	-	3
CO3	1	3	-	1	-	-	-	-	2	2	3	3	1	-	-	3
CO4	1	3	-	1	-	-	-	-	2	2	3	3	1	-	-	3

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ASE2324	Aircraft Manufacturing Processes	L	T	P	C
Version 2019-1	Date of Approval: May 2019	2	0	0	2
Pre-requisites/ Exposure	Basic Physics, Chemistry, Engineering Mechanics				
Co-requisites					

Course Catalog

This course provides basic knowledge and understanding of various tools, techniques, processes, and practices utilized in manufacturing and maintenance workshops. This course also deals with various specific processes utilized in manufacturing of aircraft structure and components. Basic understanding of engineering physics and elements of mechanical engineering is prerequisite to comprehend the contents of this course.

Course Objectives

The objective of this course is to

- Provide introductory knowledge to the students regarding the basic manufacturing processes, and heat treatment techniques.
- Equip the students with knowledge of various tools, processes, and techniques used in manufacturing of aircraft and its components.

Course Outcomes

On successful completion of this course, students will be able to

CO1. Identify, describe and distinguish amongst the basic tools and processes used in sheet metal and wood working.

CO2. Identify, describe, and distinguish between various heat treatment processes and their impacts on material properties.

CO3. Identify, describe, and distinguish between various types of machining tool used in manufacturing and fabrication of components.

CO4. Identify, describe, and distinguish between various types of jigs and fixtures used in manufacturing and fabrication of aircraft components.

CO5. Identify, describe, and distinguish between various processes and techniques used in manufacturing and fabrication of aircraft structure and components.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Introduction Selection of materials. Importance of material processes. Manufacturing Processes. Sheet Metal working. Wood Working.	L1, L2	4
Module 2: Heat Treatment of Steels Relation between heat treatment and physical properties of steels. Critical temperatures, annealing, normalizing, tempering, case carburizing, hardening, nitriding and other surface hardening methods. Quenching. Hardness numbers, hardness testing machines.	L1, L2	6
Module 3: Machining Tools Types of lathe, lathe operations – facing, turning, threading, shapers. Types of shapers, general applications. Milling machines, types of milling machines. Work holding devices, cutter holding devices. Abrasives, bonds, grinding wheels.	L1, L2	5

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Module 4: Jigs and Fixtures General design. Method of location of cylindrical and flat surfaces. Design principles of Wing Jig, Fuselage jig and other components.	L1, L2	4
Module 5: Aircraft Manufacturing Processes Profiling, hydroforming, spar milling, spark erosion, high energy rate forming. Manufacturing of honeycomb structures. General methods of construction of aircraft and engine parts.	L1, L2	5

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books:

Text:

1. W. A. J. Chapman, "Workshop Technology-Vol. I, II, III", 5th Edition, Butterworth-Heinemann, 1972.
2. G. F. Titterton, "Aircraft Materials and Processes", Sterling Book House, 2007.
3. G. B. Ashmead, "Aircraft Production Methods" 1st Edition, Chilton Company, 1956.

References:

1. L. Gupta, "Advanced Composite Materials", Himalayan Books, New Delhi, 1998.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

CO, PO and PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	-	1	-	2	-	-	-	-	-	-	-	3	1	2	-
CO2	1	-	1	-	2	-	-	-	-	-	-	-	3	1	2	-
CO3	1	-	1	-	2	-	-	-	-	-	-	-	3	1	2	-
CO4	1	-	1	-	2	-	-	-	-	-	-	-	3	1	2	-
CO5	1	-	1	-	2	-	-	-	-	-	-	-	3	1	2	-

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ASE2412	Numerical Analysis and Programming	L	T	P	C
Version 2019-1	Date of Approval: May 2019	2	0	0	2
Pre-requisites/ Exposure	Basic Mathematics				
Co-requisites					

Course Catalog

This course deals with the techniques of numerical analysis, which gives the solution to applied problem when ordinary analytical method fails. The given techniques can be used in design of engineering and scientific problems. This course provides the basic knowledge and fundamentals related to the concepts of engineering mathematics, errors and approximation theory, interpolation, graph fitting and statistical computation.

Course Objectives

The objective of this course is to

- Provide an understanding to the students about the various numerical tools to solve problems related to formulation of algebraic equations and data interpolation.
- Equip the students with knowledge to use various numerical tools to solve problems related to calculus, differential equations, and statistics.

Course Outcomes

On completion of this course, the students will be able to

CO1. Identify, distinguish and apply the concept of errors, data interpretation and approximation theory to solve relevant problems.

CO2. Identify, distinguish the various methods of Interpolation, and apply the concept to solve realistic problems.

CO3. Distinguish and apply the various methods of numerical integration and differentiation to solve complex engineering problems.

CO4. Interpret and construct differential equations various different methods to solve complex engineering problems.

CO5. Identify, distinguish and apply various technical tools of curve fitting and their utilisation in engineering.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Solution of Algebraic and Transcendental Equation Error in a series approximation, Bisection Method, Iteration method, Method of false position, Newton-Raphson method. Solutions of Simultaneous equation: Gauss elimination method, Jacobi iteration method, Gauss Seidal method.	L1, L2, L3	10
Module 2: Interpolation Finite Differences, Difference tables, Polynomial Interpolation**:** Newton's forward and backward formula, Central Difference Formulae: Gauss forward and backward formula. Interpolation with unequal intervals: Lagrange's Interpolation, Newton Divided difference formula.	L1, L2, L3	10
Module 3: Numerical Integration and Differentiation Introduction, Numerical differentiation Numerical Integration: Trapezoidal rule, Simpson's 1/3 and 3/8 rules.	L2, L3	5
Module 4: Solution of Differential Equations Euler's Method, Runga-Kutta Methods	L2, L3, L4	3

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Module 5: Statistical Computation Frequency chart, Curve fitting by method of least squares, fitting of straight lines, polynomials, exponential curves etc., Data fitting with Cubic splines.	L1, L2, L3	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books

Text:

- Eyengar, S. R. K., Jain, S. K. and Jain, R. K., "Numerical Methods for Scientific and Engineering Computations", New Age International Publishers, 2007.
- Sastry, S. S., "Introductory Methods of Numerical Analysis", 5th Edition, Pearson, 2012.

Reference Books

- Gerald, "Applied Numerical Analysis", 7th Edition, Pearson, 2007.
- Gupta, C. B., "Introduction to statistical Methods", 23rd Edition, Vikas Publishing House Pvt. Ltd., 2007.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance; CT: Class Test; S/V/Q: Seminar/Viva/Quiz; HA: Home Assignment; EE: End Semester Examination

CO, PO and PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	1	2	-	3	-	-	-	-	-	-	-	1	1	-	-
CO2	1	1	2	-	3	-	-	-	-	-	-	-	1	1	-	-
CO3	1	1	2	-	3	-	-	-	-	-	-	-	1	1	-	-
CO4	1	1	2	-	3	-	-	-	-	-	-	-	1	1	-	-
CO5	1	1	2	-	3	-	-	-	-	-	-	-	1	1	-	-

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ASE2416	Aircraft Propulsion	L	T	P	C
Version 2019-1	Date of Approval: May 2019	3	0	0	3
Pre-requisites/ Exposure	Basic Physics, Introduction to Aerospace Engineering, Engineering Thermodynamics				
Co-requisites					

Course Catalog

This course provides basic knowledge and understanding of aerospace propulsive devices as systems, with functional requirements and environmental considerations. This course provides intermediate knowledge to the students about the design, construction, and working of different types of propulsion systems and of their components and sub-systems. Knowledge of basic physics, thermodynamics, and components of flight vehicle's power plant is crucial to comprehend the contents of this course. This course serves as a prerequisite for better understanding of advanced courses related to propulsion of flight vehicles.

Course Objectives

The objective of this course is to

1. Equip the students with basic knowledge and governing principles of jet propulsion, propulsion systems, and their components.
2. Enable students with problem solving skills related to design, construction, and performance of aircraft powerplants, their systems, and subsystems.

Course Outcomes

On successful completion of this course, students will be able to

CO1. Identify and explain the basic science and principles of jet propulsion and relevant performance parameters.

CO2. Identify, describe and compare amongst the various types of propellers and explain the mathematical theories behind the operation of propellers.

CO3. List, summarize and compare amongst the construction, components, and operation of various types of air-breathing engines, their systems, and subsystems and solve relevant problems.

CO4. List, summarize, and compare amongst the construction, components, and operation of various types of aircraft piston engines, their systems and subsystems.

CO5. Outline and describe different types of fuels, their characteristics, and environmental consideration associated with their use.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Introduction Basics of Jet propulsion. Classification of powerplants. Propulsive efficiency, Specific fuel consumption, Thrust and power. Factors affecting thrust and power.	L1, L2	7
Module 2: Propeller Blade Theory Ideal momentum theory and blade element theory. Selection of propellers, Types of propellers, Prop-fan, Shrouded propellers. Propeller power losses, Propeller performance parameters. Windmilling Effect.	L1, L2, L4	7

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Module 3: Air-breathing Engines Gas turbine cycle. Compressor and turbine efficiencies. Compressor work and turbine work. Centrifugal and axial type of compressor and their comparative action. Combustion chambers, various arrangements and performance. Nozzles and their operation, afterburners.	L1, L2, L3, L4	6
Module 4: Aircraft Piston Engines S.I. and C.I. engines, 4-stroke and 2-stroke engines. Various type of arrangements, multi-cylinder engines, their merits and operational efficiencies. Intake and exhaust manifolds. Cooling and lubrication systems. Valve timing and arrangements. Combustion knock, knock rating. Carburetion and fuel injection. Ignition of the charge, ignition system. I.H.P., B.H.P and F.H.P, engine performance, effect of altitude, power required and power available. Supercharging and turbocharging	L1, L2, L4	10
Module 5: Aviation Fuel and Environmental Considerations Liquid fuels, hydrocarbons, gasoline, aviation turbine fuels. Fuel characteristics, vapor lock. Aircraft emission standards, environmental implications.	L1, L2	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books:

Text:

- Hill, P. and Peterson, C., "Mechanics and Thermodynamics of Propulsion", 2nd Edition, Pearson, 1991.
- Mattingly, J. D., "Elements of Gas Turbine Propulsion", 1st Edition, McGraw Hill, 1997.
- Heywood, J. B., "Internal-Combustion Engine Fundamentals", 1st Edition, McGraw Hill, 2017.

Reference:

- Treager, I., "Aircraft Gas Turbine Engine Technology", 3rd Edition, McGraw Hill, 2017.
- Sarvanmattoo, H. I. H., Rogers, G. F. C., Cohen, H. and Straznicky, P., "Gas Turbine Theory", 6th Edition, Pearson Education, 2008.
- Mukunda, H. S., "Understanding Aerospace Chemical Propulsion", I K International Publishing House Pvt. Ltd., 2017.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

CO, PO and PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	1	2	2	-	-	-	-	-	-	-	-	-	-	1	-	-
CO3	1	2	3	-	-	-	-	-	-	-	-	-	-	1	3	-
CO4	1	2	3	-	3	-	-	-	-	-	-	-	-	1	3	-
CO5	1	3	-	-	-	-	1	-	-	-	-	-	-	1	1	-

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ASE2417	Aerospace Structures-I	L	T	P	C
Version 2019-1	Date of Approval: May 2019	3	0	0	3
Pre-requisites/ Exposure	Engineering Mechanics, Strength of Materials				
Co-requisites					

Course Catalog

This course provides basic knowledge and understanding of various kinds of loads acting on aircraft structural members and their importance. This course provides knowledge and understanding to the students about the analysis of stress, strain, deflection, and torsion of a structure under varying loads using numerous methods. Knowledge of engineering mechanics and strength of materials is crucial to comprehend the contents of this course. This course serves as a prerequisite for better understanding of advanced courses related to structure of flight vehicles.

Course Objectives

The objective of this course is to

- Provide an overview of structural problems of beams and trusses which serves as benchmarks in analysis of structural members of flight vehicles.
- Enable the students to understand and utilized different theorems and principles governing the structural designing of flight vehicles.

Course Outcomes

On completion of this course, the students will be able to

CO6. Identify, describe, and analyze structural problems of stress and strain in Cartesian and Polar coordinates using governing equations.

CO7. Describe and determine the deflection and rotation of beams under different loads using various theorems.

CO8. Identify, describe, and determine the forces acting on statically indeterminate structures under different loads using various theorems.

CO9. Describe and apply the fundamental knowledge of torsion to solve relevant problems about solid bars, shells, and tubes.

CO10. Identify, describe and compare amongst various loads acting on structure members of an aircraft.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Analysis of 2D Problems Plane Stress and Plane Strain. Equilibrium equations, compatibility conditions, governing equations and boundary conditions. Analysis of 2D problems, Theory of Elasticity.	L1, L2, L4	6

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Module 2: Structural Analysis Method Energy method, strain energy due to axial, bending and torsional loads, complimentary energy. Castigliano's theorems, Maxwell's reciprocal theorem. Unit load method. Principle of virtual work and virtual displacement. Principle of superposition.	L2, L3	6
Module 3: Statically Indeterminate Structures Statically determinate and indeterminate structures. Analysis of plane truss: Moment distribution method, Stiffness method, Flexibility method. Analysis of frames and rings.	L1, L2, L3, L4	6
Module 4: Torsion Torsion of non-circular solid bars, warping, axially constrained stresses. Torsional deflection of non-circular shell. Analysis of thin and thick walled tubes. Multi-cell sections.	L2, L3	6
Module 5: Structural Loads Loads on flight vehicles, Aerodynamic loads, Maneuvering loads, Inertia loads, Gust loads. Velocity-load factor diagram. Factor of safety.	L1, L2, L4	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books

Text:

- Ramamurtham, S., "Strength of Materials", 16th Edition, Dhanpat Rai Publishing Company, 2011.
- Peery, D. J., "Aircraft Structures", Dover Publications, 2011.
- Megson, T. H. G., "Aircraft Structures for Engineering Students", Elsevier India, 2005.
- Sun, C. T., "Mechanics of Aircraft Structures", 2nd Edition, Wiley-India Pvt. Ltd., 2006.

Reference:

- Timoshanko, S. P. and Goodier, J. N., "Theory of Elastic Stability", 2nd Edition, Dover Publications Inc., New York, 2009.
- Sinha, N. C., "Elements of Structural Analysis", New Central Book Agency, 2011

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

CO, PO and PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	1	-	2	-	-	-	-	-	-	-	-	1	-	-	-
CO2	1	1	-	2	-	-	-	-	-	-	-	-	1	-	-	-
CO3	1	1	-	2	-	-	-	-	-	-	-	-	1	-	-	-
CO4	1	1	-	2	-	-	-	-	-	-	-	-	1	-	-	-
CO5	1	1	-	2	-	-	-	-	-	-	-	-	1	-	-	-

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ASE2419	Low Speed Aerodynamics Lab	L	T	P	C
Version 2019-1	Date of Approval: May 2019	0	0	2	1
Pre-requisites/ Exposure	Fluid Mechanics and Dynamics				
Co-requisites	Low Speed Aerodynamics				

Course Catalog

The objective of this course is to provide practical knowledge and understanding to the students about the aerodynamics over bodies of different cross-sections and shapes. Knowledge of fluid mechanics and basic aerodynamics is necessary to comprehend the contents of this course. This course equip the students with necessary knowledge to design and carry out experiments, gather results and interpret them in order to observe the aerodynamic behavior of bodies.

Course Objectives

The objective of this course is to

1. Equip the students with necessary practical understanding and skill to carry out experiments to visualize and observe the flow behavior over different bodies.
2. Provide practical skill and knowledge to carry out experiments using wind tunnel to gather results as per designed experiment.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain and demonstrate the construction and procedure of operating a wind tunnel and measurement of pressure gradient along a wind tunnel.

CO2. Explain and demonstrate the procedure of utilizing Pitot - static tube and anemometer for flow velocity calculations.

CO3. Explain and demonstrate the procedure of determining pressure distribution over bodies of different cross-sections.

CO4. Explain and demonstrate the procedure of utilizing Hele-shaw apparatus for flow visualization over bodies of different cross-sections.

Course Content

Modules	Blooms level*	Number of hours
Experiment 1: Wind tunnel as a tool, their classification, uses and applications.	L1, L2	2
Experiment 2: Measurement of pressure gradient along a wind tunnel	L1, L2	2
Experiment 3: Use of Pitot - static tube and Anemometer for measuring velocity	L1, L2	2
Experiment 4: Pressure distribution over a 2D cylinder	L1, L2	2
Experiment 5: Pressure distribution over an airfoil	L1, L2	2
Experiment 6: Flow visualization over flat plate	L1, L2	2
Experiment 6: Flow visualization over cylinder	L1, L2	2
Experiment 7: Flow visualization over an airfoil	L1, L2	2

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Experiment 8: Experiments on potential flow Analogy (Hele-Shaw flow).	L1, L2	2
Experiment 9: Setting up of liquid paraffin smoke wire for flow visualization.	L1, L2	2

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books

Text:

1. J. D. Anderson, Jr., "Fundamentals of Aerodynamics", 2nd Edition, McGraw Hill, 1990.
2. E. L. Houghton, P. W. Carpenter, "Aerodynamics of Engineering Students", 4th Edition, CBSPublishers & Distributors, 2005.
3. F. M. White, "Fluid Mechanics", 2nd Edition, McGraw Hill, 1986.

Reference Books

1. J. G. Bertin, R. M. Cummings, "Aerodynamics for Engineers", 6th Edition, Pearson, 2013.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	**5**	**35**	**35**

IA: Internal Assessment, EE: External Exam, PR: Performance, LR: Lab Record, V: Viva.

CO, PO and PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	1	3	-	-	-	-	-	-	2	2	3	3	1	1	-	3
CO2	1	3	-	-	-	-	-	-	2	2	3	3	1	1	-	3
CO3	1	3	-	-	-	-	-	-	2	2	3	3	1	1	-	3
CO4	1	3	-	-	-	-	-	-	2	2	3	3	1	1	-	3

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ASE2420	Aircraft Propulsion Lab	L	T	P	C
Version 2019-1	Date of Approval: May 2019	0	0	2	1
Pre-requisites/ Exposure	Introduction to Aerospace Engineering				
Co-requisites	Aircraft Propulsion				

Course Description

The objective of this course is to provide practical knowledge and understanding to the students about the various propulsion systems and subsystems used in aerospace applications. Knowledge of fluid mechanics, thermodynamics, and heat transfer is necessary to comprehend the contents of this course. This course equips the students with necessary knowledge to understand the construction and operation of propulsion systems.

Course Objectives

The objective of this course is to

1. Provide practical knowledge to the students about the various types of piston engine, their construction, and operation.
2. Provide practical knowledge to the students about the various subsystems of SI and CI engines, their construction, and operation.

Course Outcomes

On completion of this course, the students will be able to

CO1. List, explain, and differentiate amongst the various types of piston engines based on their construction and operation.

CO2. Explain and demonstrate the construction and operation of various subsystems of piston engines.

CO3. Explain and demonstrate the knowledge of determining different kinds of powers in a piston engine.

CO4. Determine and analyze the performance of nozzle and duct burner.

Course Content

Modules	Blooms level*	Number of hours
Experiment 1: To study the construction and working of CI and SI engines having various arrangements of cylinders.	L2, L3	1
Experiment 2: To study the construction and working of two-stroke and four-stroke piston engines.	L2, L3	1
Experiment 3: To study the construction and working of a carburettor.	L2, L3	1
Experiment 4: To study the components and working of the fuel system of petrol and diesel engine.	L2, L3	1
Experiment 5: To study the components and working of the ignition system of the petrol engine.	L2, L3	1
Experiment 6: To determine the valve timings for a given piston-cylinder arrangement.	L2, L3	1
Experiment 7: To determine the IHP, BHP, and FHP of a four-stroke petrol engine.	L2, L3, L4	2

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Experiment 8: To determine the performance of a nozzle.	L2, L3, L4	2
Experiment 9: To determine the performance of a duct burner.	L2, L3, L4	2

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books:

Text:

1. P. Hill, C. Peterson, "Mechanics and Thermodynamics of Propulsion", 2nd Edition, Pearson, 1991.
2. J. D.Mattingly, "Elements of Gas Turbine Propulsion", 1st Edition, McGraw Hill, 1997.
3. J. B.Heywood, "Internal-Combustion Engine Fundamentals", 1st Edition, McGraw Hill, 2017.

Reference:

1. I.Treager, "Aircraft Gas Turbine Engine Technology", 3rd Edition, McGraw Hill, 2017.
2. H. I. H.Sarvanmattoo, G. F. C.Rogers, H.Cohen, P.Straznicky, "Gas Turbine Theory", 6th Edition, Pearson Education, 2008.
3. H. S. Mukunda, "Understanding Aerospace Chemical Propulsion", I K International Publishing House Pvt. Ltd., 2017.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	**5**	**35**	**35**

IA: Internal Assessment, EE: External Exam, PR: Performance, LR: Lab Record, V: Viva.

CO, PO and PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	1	3	-	-	-	-	-	-	2	2	3	3	-	1	-	3
CO2	1	3	-	-	-	-	-	-	2	2	3	3	-	1	-	3
CO3	1	3	-	-	-	-	-	-	2	2	3	3	-	1	-	3
CO4	1	3	-	-	-	-	-	-	2	2	3	3	-	1	-	3

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ASE2421	NUMERICAL ANALYSIS AND PROGRAMMING LAB USING MATLAB	L	T	P	C
Version		0	0	2	1
Pre-requisites/Exposure					
Co-requisites					

Catalog Description:
The purpose of this course is to provide students with the skill, knowledge and attitude required to determine approximate numerical solutions to mathematical problems which cannot always be solved by conventional analytical technique, and to demonstrate the importance of selecting the right numerical technique for a particular application, and carefully analyzing and interpreting the results obtained.

Course Objectives:

1. Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.
2. Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.

Course Outcomes:
On completion of this course, the students will be able to
CO1: Define and describe the Algebraic and Transcendental Equation and solve the problems using appropriate Numerical methods.
CO2: Describing the interpolation methods to find intermediate values in given graphical or tabulated data.
CO3: Describe and apply Trapezoidal and Simpson's Rule to solve given integration problems.
CO4: Define and describe Runga-Kutta method and Euler's Method to solve differential equations.
CO5: Explain and describe the Statistical Computation using frequency charts, methods of least square etc.

Modules	Blooms level*	Number of hours
1. Solving Problems using Newton-Raphson Method in C Programming	L1,L2,L3	2
2. Solving Problems using Secant Method in C Programming	L1,L2,L3	2
3. Solving Problems using Bisection Method in C Programming	L1,L2,L3	1
4. Solving Problems using Regula Falsi Method in C Programming	L1,L2,L3	1
5. Solving Problems using Trapezoidal Rule in C Programming	L1,L2,L3	1
6. Solving Problems using Simpson's 1/3rd Rule in C Programming	L1,L2,L3	1
7. Solving Problems using Simpson's 3/8th Rule in C Programming	L1,L2,L3	1

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8. Solving Problems using Euler's Method in C Programming	L1,L2,L3	1
9. Solving Problems using Modified Euler's Method in C Programming	L1,L2,L3	1
10. Solving Problems using Gauss Elimination Method in C Programming	L1,L2,L3	1

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text Books

- V. Rajaraman, Computer oriented Numerical Methods, PHI Learning, 1993.
- Gerald &Whealey, Applied Numerical Analysis, Pearson Education, Limited, 2006.
- Grewal B S , Numerical methods in Engineering and Science, Khanna Publishers, Delhi, 2014.

References Books

- T Veerarajan, T Ramachandran, "Theory and Problems in Numerical Methods, TMH
- Pradip Niyogi, "Numerical Analysis and Algorithms", TMH
- Francis Scheld, " Numerical Analysis", TMH
- Sastry S. S, "Introductory Methods of Numerical Analysis", Pearson Education.
- Gupta C.B., Vijay Gupta, "Introduction to Statistical Methods", Vikas Publishing.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**1**	--	--	**3**	--	--	--	-	--	-	-	**1**	--	-	**1**
CO2	**1**	**1**	--	--	**3**	--	--	--	-	-	--	-	**1**	--	-	**1**
CO3	**1**	**1**	--	--	**3**	--	--	--	-	-	-	-	**1**	--	-	**1**
CO4	**1**	**1**	--	--	**3**	--	--	--	--	-	--	-	**1**	--	-	**1**
CO5	**1**	**1**	--	--	**3**	--	--	--	--	-	--	-	**1**	--	-	**1**

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ASE2422	Fuels and Combustion	L	T	P	C
Version 2019-1	Date of Approval: May 2019	3	0	0	3
Pre-requisites/ Exposure	Introduction to Aerospace Engineering, Chemistry				
Co-requisites	Aircraft Propulsion				

Course Description

This course provides basic understanding to the students about various types of fuels used in aviation application along with an insight to their physical and chemical parameters. This course also deals with various combustion mechanisms of fuels and enable the students in understanding the need and techniques of flame stability and fuel treatment. Basic knowledge of engineering chemistry and thermodynamics is a prerequisite to comprehend the contents of this course.

Course Objectives

The objective of this course is to

1. Provide a basic understanding to the students about the various aviation fuels and their properties.
2. Equip the students with knowledge about combustion fundamentals and performance.

Course Outcomes

On completion of this course, the students will be able to

CO1. Identify, explain, and compare amongst the various properties of fuels.
CO2. Identify, explain, and compare amongst the various types of alternative fuels used in aviation applications.
CO3. Explain, describe, and compare amongst the various fundamentals of combustion and flames.
CO4. Identify, explain and compare amongst the various fundamentals and techniques related to flame stabilization.
CO5. List, explain, and compare amongst the various methods and processes of fuel treatments.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Fuel and its Properties. Fuels, types of fuels, relative density, molecular mass, vapor pressure, flash point, volatility point, viscosity, surface tension, freezing point, specific heat, latent heat, thermal conductivity. Combustion properties of fuels. Calorific value, enthalpy, spontaneous-ignition temperature, limits of flammability, smoke point. Pressure and temperature effects.	L1, L2	7
Module 2: Alternative Fuels for Aerospace Applications Alternative fuels, synthetic fuels, biofuels, biodiesels, alternative fuel properties. Combustion and emissions performance. Fuel preparation, fuel atomization.	L1, L2	7
Module 3: Fundamentals of Combustion Deflagration, detonation, classification of flames, physics of combustion chemistry. Flammability limits, weak mixtures, rich mixtures. Laminar and turbulent flames, Premixed and diffusion flames, flame burning velocity. Factors influencing flame propagation speed. Stoichiometric ratio, equivalence ratio. Flame propagation in heterogeneous mixtures of fuel drops, fuel vapor, and air.	L2, L4	8

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Module 4: Flame Stabilization Flame stability, definition of stability performance, measurement of stability performance. Bluff-body flame holders, stabilization. Mechanisms of flame stabilization, flame stabilization in combustion chambers.	L1, L2	7
Module 5: Fuel Treatment Introduction to fuel treatment, removal of sulfur compounds, contaminants, asphaltenes, gum, sediment, ash, water, sodium, vanadium, additives, gum prevention, corrosion inhibition/lubricity improvers, anti-icing, antismoke. Environmental considerations.	L1, L2	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books

Text:

1. S. Sarkar, "Fuels & Combustion", 3rd Edition, CRC Press, 2010.
2. R. L. Bechtold, "Alternative Fuels Guidebook", SAE International, 1997.
3. K. K. Kuo, "Principles of Combustion", 2nd Edition, Wiley India Pvt. Ltd., 2012.

Reference:

1. J. Hancsok, S. P. Srivastava, "Fuels and Fuel Additives", 1st Edition, Wiley, 2014.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance; CT: Class Test; S/V/Q: Seminar/Viva/Quiz; HA: Home Assignment; EE: End Semester Examination

CO, PO and PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO3	1	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO4	1	2	-	-	-	-	-	-	-	-	-	-	-	1	3	-
CO5	1	-	3	-	-	-	1	-	-	-	-	-	-	1	1	-

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ASE2423	Control Systems	L	T	P	C
Version 2019-1	Date of Approval: May 2019	3	0	0	3
Pre-requisites/ Exposure	Basics of Electrical and Electronics Engineering				
Co-requisites					

Course Description

This course provides basic understanding and knowledge to the students about various control systems and their utilization in aerospace applications. Basic knowledge of electronics is a prerequisite to comprehend the contents of this course. This course also deals with analysis and design of control systems and enables the students in understanding the application of control systems in automatic flying control of flight vehicles.

Course Objectives

The objective of this course is to

1. Provide a basic understanding to the students about the control systems and their applications.
2. Equip the students with knowledge about operation, design, and analysis of control systems.

Course Outcomes

On completion of this course, the students will be able to

- **CO1.** Identify, explain, and categorize amongst the various types of control systems used in flight vehicle operation and control.
- **CO2.** Explain, describe, and compare amongst the various types of open and closed loop control systems, illustrate block diagrams and signal flow graphs.
- **CO3.** Explain and analyze the operation of transient and steady-state response control systems.
- **CO4.** List, explain, design, and analyze different types of controllers using various approaches.
- **CO5.** Describe, distinguish, and compare amongst the different types of control systems utilized in Automatic flying control systems of aircrafts.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Introduction to Control Systems History of Automatic Control. Control Engineering Practice. Simple pneumatic, hydraulic, and thermal systems. Parallel and series systems. Analogies-mechanical and electrical components. Development of flight control systems.	L1, L2, L4	7
Module 2: Open and Closed Loop Systems Concept of controls. Open-loop and closed-loop systems with examples. Concepts of feedback and basic structure of feedback control system. Laplace's transform. Block diagram, representation of block diagram, reduction block diagram. Output to input ratios, signal flow graph. Requirements of an ideal control system.	L2, L3, L4	7
Module 3: Transient and Steady-State Response Analysis Introduction. Type and order of systems, time response specifications. Transient, and steady state response. Input signals. First order system with unit step response, Second order system with unit step response for un-damped, critical damped, overdamped, and underdamped cases. Higher order system. Routh's – Hurwitz Criterion. Steady and transient state errors in unit feedback control systems.	L2, L4	8

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Module 4: Control Systems Analysis and Design Introduction. Types of controllers. Root locus plot, lead and lag compensation techniques. Bode plot: concepts and construction. Lead and lag compensation technique based on the frequency-response approach.	L1, L2, L3, L4	7
Module 5: Automatic Flight Control Introduction to Automatic flight control, automatic flight control system components. Autopilot, longitudinal autopilots. Brief description through block diagrams and Root locus of displacement auto pilot. Pitch orientation control system. Acceleration control system.	L2, L4	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books

Text:

1. K. Ogata, "Modern Control Engineering", 5th Edition, Prentice Hall of India, 2010.
2. R. C. Drof, R. H. Bishop, "Modern Control System", 13th Edition, Pearson, 2017.
3. B. C. Kuo, F. Golnaraghi, "Automatic Control Systems", 9th Edition, John Wiley & Sons, 2014.

Reference:

1. I. J. Nagrath, M. Gopal, "Control Systems Engineering" New Age Publication, 2001.
2. J. J. Distefano, "Feedback and Control Systems", 2nd Edition, Tata McGraw hill, 2011.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance; CT: Class Test; S/V/Q: Seminar/Viva/Quiz; HA: Home Assignment; EE: End Semester Examination

CO, PO and PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	-	-	-	-	-	-	-	-	-	-	-	1	3	-
CO2	1	2	-	-	-	-	-	-	-	-	-	-	-	1	3	-
CO3	1	2	-	-	-	-	-	-	-	-	-	-	-	1	3	-
CO4	1	3	1	-	-	-	-	-	-	-	-	-	-	1	3	-
CO4	1	3	1	-	-	-	-	-	-	-	-	-	-	1	3	-

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ASE2424	Mechatronics	L	T	P	C
Version 2019-1	Date of Approval: May 2019	3	0	0	3
Pre-requisites/ Exposure	Basics of Electrical and Electronics Engineering				
Co-requisites					

Course Description

This course represents the design of computer-controlled electromechanical system. Basic knowledge of electronics and measurements systems is a prerequisite to comprehend the contents of this course. This course enables the student to design and operate a mechatronics system after integrating the principles of mechanical, computer, electrical, and controls engineering.

Course Objectives

The objective of this course is to

1. Provide brief introduction of various components of mechatronics systems comprising electrical, mechanical and control systems along with basic knowledge of mathematical models and theories.
2. Equip the students with knowledge about different types of sensors, actuation systems and microprocessors and their applications.

Course Outcomes

On completion of this course, the students will be able to

- **CO1.** List, explain, and describe different types of mechatronics systems, their components and working.
- **CO2.** Describe and represent mathematical models and blocks of mechatronic systems with various system theories.
- **CO3.** Identify, describe and select appropriate sensors and transducers and design an instrumentation system for collecting information about processes.
- **CO4.** Describe and distinguish between Pneumatic and hydraulic actuation systems, their design and operation.
- **CO5.** Identify, describe, and design the architecture and the instruction set for a microprocessor and its language programming with various types of digital and analog interfaces.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Introduction Introduction to mechatronics systems. Mechatronics in manufacturing, products, and design. Mechatronics system components. Measurement systems, control systems, electrical systems, mechanical systems.	L1, L2	6
Module 2: System Models Mathematical models. Mechanical system building blocks. Modeling dynamic systems. First order systems, second order systems.	L2, L4	6
Module 3: Transducers and Sensors Definition and classification of transducers and sensors. Principle of working and applications of light sensors, proximity sensors and Hall effect sensors. Signal conditioning, introduction to signal conditioning. Operational amplifier, protection, filtering, Wheatstone bridge. Digital signals multiplexers. Data acquisition.	L1, L2, L3	8

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Module 4: Actuation Systems Introduction. Need and necessity of actuation systems. Pneumatic and hydraulic actuation systems, system components, graphic representations, symbols. Directional control valves, pressure control valves, process control valves. Hydraulic power packs, pumps. Design of hydraulic circuits.	L2, L3	8
Module 5: Introduction to Microprocessors Evolution of Microprocessor. Organization of Microprocessors (Preliminary concepts). Basic concepts of programming of microprocessors. Review of concepts - Boolean algebra, logic gates and gate networks, binary & decimal number systems, memory representation. Conversion of real, numbers, floating point notation, representation of floating point numbers, accuracy and range, overflow and underflow, addition of floating point numbers, character representation.	L1, L2, L3	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books

Text:

1. N. Mahalik, "Mechatronics - Principles, Concepts and Applications", Tata McGraw Hill Education, 2017.
2. R. K. Rajput, "A Textbook of Mechatronics", S. Chand & Company, 2007.
3. W. Bolton, "Mechatronics", 4th Edition, Pearson Education, 2010.
4. M. A. Mazidi, J. G. Mazidi, "The 8051 Microcontroller", Pearson, 2004.

Reference:

- D. Alciatore, "Introduction to Mechatronics and Measurement Systems, 4th Edition, Tata McGraw Hill Education, 2017.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance; CT: Class Test; S/V/Q: Seminar/Viva/Quiz; HA: Home Assignment; EE: End Semester Examination

CO, PO and PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	-	-	-	-	-	-	-	-	-	-	1	1	-	-
CO2	1	2	-	-	-	-	-	-	-	-	-	-	2	2	-	-
CO3	1	2	-	-	-	-	-	-	-	-	-	-	1	1	-	-
CO4	1	2	-	-	-	-	-	-	-	-	-	-	1	1	-	-
CO5	1	2	-	-	-	-	-	-	-	-	-	-	2	2	-	-

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ASE2510	Turbomachinery	L	T	P	C
Version 2019-1	Date of Approval: May 2019	3	0	0	3
Pre-requisites/ Exposure	Engineering Thermodynamics, Aircraft Propulsion				
Co-requisites					

Course Catalog

This course provides basic knowledge and understanding of shaft power and aircraft engines components such as inlet compressor, combustion chamber and nozzles. This course focuses on educating the students about various physical laws and mathematical theories that define the flow behavior, efficiencies and losses, i.e., performance characteristics of the components based on thermodynamics and aerodynamics. Knowledge of basic physics and fluid mechanics is crucial to comprehend the contents of this course. This course serves as a prerequisite for designing of engine components.

Course Objectives

The objective of this course is to

1. Provide knowledge about the basic principles and parameters of gas turbine/Turbomachinery.
2. Educate the students about the theories and laws governing the aerodynamic and thermodynamics analysis of turbomachinery.

Course Outcomes

On completion of this course, the students will be able to

CO6. Identify and explain various configurations of shaft power and aircraft engines.

CO7. Describe and analyze various components of centrifugal compressor and also describe its performance characteristics.

CO8. Describe and analyze various components of axial flow compressor and also describe its performance characteristics.

CO9. Describe and analyze various components of axial flow turbines and also describe its performance characteristics.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Introduction Open-cycle single shaft and twin shaft arrangements, Multi spool arrangements, Closed cycles, Aircraft propulsion, Industrial applications, Marine and land transportation	L1, L2	6
Module 2: Shaft power cycles Ideal cycles, Methods of accounting components losses, Design point performance calculations, Comparative performance of practical cycles, Combined cycles and cogeneration schemes, Closed cycle gas turbines	L1, L2	8
Module 3: Centrifugal compressor Principle of operation, Work done and pressure rise, The diffuser, Non dimensional quantities for plotting compressor characteristics, compressor characteristics.	L2, L4	6

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Module 4: Axial flow compressor Basic operation, Elementary theory, Factor affecting stage pressure ratio. Blockage in compressor annulus, Degree of reaction, Three dimensional Flow, Design process, Blade design, Calculations of stage performance, compressibility effects, Off design Performance, Axial compressor characteristics.	L2, L4	8
Module 5: Axial Flow turbines Elementary theory of axial flow turbine, vortex theory, choice of blade profile, pitch and chord, Estimation of stage performance, overall turbine performance, The cooled turbine	L2, L4	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books:

Text:

1. H. I. H. Saravanamuttoo, H. Cohen, G. F. C. Rogers, "Gas Turbine Theory", 2001.
2. S. M. Yahya, "Turbine, Compressors and Fans", Tata McGraw- Hill Publishing Company Ltd., New Delhi,

Reference:

1. N. Cumpsty, Compressor Aerodynamics, Kreiger Publications, USA, 2004.
2. I. A. Johnson, R. O. Bullock, "NASA-SP-36: Axial Flow Compressors", NTIS (re-release), 2002.
3. M. M. El-Wakil, "Powerplant Technology", McGraw-Hill Pub, 1984.
4. NASA-SP-290, "Axial Flow turbines", NTIS, USA, 2002 (re-release).

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO3	1	1	3	-	-	-	-	-	-	-	-	-	1	-	-	-
CO4	1	1	3	-	-	-	-	-	-	-	-	-	1	-	-	-

1: strongly related, 2: moderately related and 3: weakly related

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ASE2511	High Speed Aerodynamics	L	T	P	C
Version 2019-1	Date of Approval: May 2019	3	0	0	3
Pre-requisites/ Exposure	Low Speed Aerodynamics				
Co-requisites					

Course Catalog

Course contains the basic material essential for a foundation of compressible flow aerodynamics. The course introduces the fundamental concepts and principles of compressible flow and intends to provide the necessary background for advanced studies on the subject. The course covers the general principles and essentials of compressible flow, the flow equations, one-dimensional gas dynamics, wave motion and waves in supersonic flow, flow in ducts, small-perturbation theory. The exercises included in the course are intended to demonstrate the use of the course material and to outline additional equations and results.

Course Objectives

The objective of this course is to

1. Provide knowledge to the students about compressible flow and its applications.
2. Enable students to know about shock waves in supersonic flow and different related techniques to solve problems

Course Outcomes

On completion of this course, the students will be able to

- **CO1.** Identify and explain fundamental principles of compressible flow.
- **CO2.** Describe and derive wave motion and waves in supersonic flow.
- **CO3.** Explain, derive, and apply various governing equations and theories of compressible flow in ducts.
- **CO4.** Explain, derive, and apply governing small perturbation theory.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Compressible Aerodynamics Basic concepts of compressible flow continuity, energy and momentum equations. One dimensional inviscid flow; Stagnation quantities; Isentropic conditions. Speed of sound and Mach number; Isentropic relations; Area-velocity relation. Flow through constant area duct; Normal shock; Propagating Normal Shock. One dimensional linear and nonlinear wave motion.	L1, L2	9
Module 2: Oblique shocks and compressible Flows through ducts Oblique shock and supersonic compression by turning. Weak shocks and Mach waves; Supersonic expansion by turning. Prandtl-Meyer expansion fan; Reflection and intersection of shocks. Shock detachment and bow shock; Shock Expansion theory with application to thin airfoils. Governing equations for quasi One Dimensional Flow through converging and diverging ducts. Diffusers and supersonic Wind Tunnels.	L2, L3	9
Module 3: Subsonic compressible Flow over Airfoils, Linear Theory The derivation of velocity potential equation, Linearized velocity potential equation, Prandtl-Glauert compressibility correction, Critical Mach number, Whitcomb's area rule, Super critical airfoil.	L1, L2, L3	9

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Module 4: Linearized Supersonic Flow Introduction, Derivation of Linearized supersonic Pressure Coefficient Formula, Application to supersonic Airfoils Viscous Flow Supersonic Airfoil Drag	L1, L2, L3	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books:

Text:

1. J. D. Anderson, Jr., "Fundamentals of Aerodynamics", 2nd Edition, McGraw Hill, 1990.
2. E. L. Houghton, and P. W. Carpenter, "Aerodynamics of Engineering Students", 4th Edition, CBS Publishers & Distributors, 2005.
3. F. M. White, "Fluid Mechanics", 2nd Edition, McGraw Hill, 1986.

Reference:

1. A. H. Shapiro, "Dynamics and Thermodynamics of Compressible Fluid Flow - Volume I& II", Ronald Press, 2002.
2. H. W. Liepmann, and A. Roshko, "Elements of Gas Dynamics", John Wiley & Sons, 1999.
3. J. G. Bertin and R. M. Cummings, "Aerodynamics for Engineers", 6th Edition, Pearson, 2013.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO3	1	1	3	-	-	-	-	-	-	-	-	-	1	-	-	-
CO4	1	1	3	-	-	-	-	-	-	-	-	-	1	-	-	-

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ASE2512	Aerospace Structures - II	L	T	P	C
Version 2019-1	Date of Approval: May 2019	3	0	0	3
Pre-requisites/ Exposure	Mechanics of Solids, Aerospace Structures-I				
Co-requisites					

Course Catalog

Knowledge of basic mechanics and structures-I is crucial to comprehend the contents of this course. This course provides exhaustive knowledge to the students about the buckling and post buckling behavior of columns, plates and beams, which serve as a foundation for solving critical aerospace problems.

Course Objectives

The objective of this course is to

- Equip the students to understand the analytical study of the buckling behavior of columns and plates.
- Provide the knowledge to the students about the post buckling behavior of plates and field beams under tension.

Course Outcomes

On successful completion of this course, the students will be able to

CO1. Identify, explain, apply and analyze the fundamentals of buckling of columns and plates.
CO2. Identify, describe and determine the buckling of open sections.
CO3. Identify, explain and analyze the post buckling behavior of plates.
CO4. Identify, explain, apply and analyze the fundamentals of buckling of columns.
CO5. List and explain the different types of stress & strain measurement techniques.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Elastic Buckling of Columns Stability criteria: equilibrium approach, energy approach, imperfection approach, dynamic approach; Higher order governing equation; Large deflection of columns; Buckling of laminated composite columns; Approximate Techniques: Timoshenko's method, Rayleigh-Ritz method, Galerkin's technique; Effect of shear on buckling load; Problems.	L1, L2, L3, L4	8
Module 2: Buckling of Open Sections Torsional load –deformation characteristics; Equilibrium approach in Torsional Buckling & Torsional-Flexural Buckling; Energy Approach: Rayleigh-Ritz Method; Problems.	L1, L2	8
Module 3: Elastic Buckling of Thin Plates Introduction; Equilibrium approach; Energy Approach; Approximate Techniques: Rayleigh-Ritz method, Galerkin's Technique; Buckling of Stiffened Plates, Circular Plates & Thick Rectangular Plates; Problems.	L1, L2, L4	8
Module 4: Post-Buckling Behavior of Plates Introduction; Governing Equation; Energy Approach; Complete Tension Field Beams; Semi-Tension Field Beam; Angle of Diagonal Tension.	L1, L2, L3, L4	5
Module 5: Inelastic Buckling of Columns Double Modulus Theory; Tangent Modulus Theory; Eccentrically Loaded Columns; Empirical Relations for Short Columns.	L1, L2, L3, L4	4

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Module 6: Measurement of Stress & Strain Measurement of Strain and Stress; Techniques & principles of measurement; Strain Gauges; Photoelasticity: principle, working, applications.	L1, L2	3

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books

Text:

1. N. G. R. Iyengar, "Structural stability of Columns and Plates", 1st Edition, affiliated East-West Press (Pvt.) Ltd., New Delhi, 1986.
2. D. J. Perry, "Aircraft Structures", Dover Publications, 2011.
3. T. H. G. Megson, "Aircraft Structures for Engineering Students", Elsevier India, 2005.

Reference:

3. S. P. Timoshanko, and J. N. Goodier, "Theory of Elastic Stability", 2nd Edition, Dover Publications Inc., New York, 2009.
4. N. C. Sinha, "Elements of Structural Analysis", New Central Book Agency, 2011

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	1	1	-	2	-	-	-	-	-	-	-	-	1	-	-	-
CO2	1	1	-	2	-	-	-	-	-	-	-	-	1	-	-	-
CO3	1	1	-	2	-	-	-	-	-	-	-	-	1	-	-	-
CO4	1	1	-	2	-	-	-	-	-	-	-	-	1	-	-	-
CO5	1	1	-	2	-	-	-	-	-	-	-	-	1	-	-	-

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ASE2513	Flight Mechanics	L	T	P	C
Version 2019-1	Date of Approval: May 2019	3	0	0	3
Pre-requisites/ Exposure	Introduction to Aerospace Engineering, Low Speed Aerodynamics				
Co-requisites					

Course Catalog

This course contains Fundamental characteristics of standard atmosphere which are crucial for aerodynamic characteristics of airfoil and airplane. The course is designed to make students to understand aerodynamic forces and moments in steady, accelerated flight and in maneuvers for different flight modes and conditions.

Course Objectives

The objective of this course is to

1. Provide an insight to students about the characteristics of atmosphere.
2. Equip students about different forces on airfoil and wing due to immersion in free stream of air in flight.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define and explain parameters of International Standard Atmosphere.

CO2. State, explain and apply the physical principle in estimation of aerodynamic drag over flight vehicles.

CO3. Describe, apply and analyze the aerodynamic characteristics over airfoils and wings of flight vehicles.

CO4. Explain and apply the basic equations and principles to analyze the airplane mechanics in steady flight.

CO5. Explain and apply the basic equations and principles to analyze the airplane performance in accelerated flight and maneuvers.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Standard Atmosphere Standard atmosphere, relation between Geopotential and Geometric altitudes, pressure, temperature and density altitudes, Relation for stratosphere and troposphere, Stability of atmosphere, aero-thermodynamics, Measurement of air-speed: true airspeed, indicated airspeed and equivalent airspeed, Airspeed indicator	L1, L2	7
Module 2: Aerodynamic Drag Drag and its effects, Types of drag and affecting factors, Drag polar, Compressibility drag, Design for minimum drag, Estimation of drag of complete airplane, Terminal velocity	L1, L2, L3	7

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Module 3: Aerodynamic Characteristics Force and Moments coefficients dimensional analysis, Pressure distribution over 2D airfoil, Variation with angle of attack, Center of pressure, Aerodynamic center and connected problems, Lift, Drag and moment coefficients; Relations between lift and drag, Estimation of these characteristics from measured pressure distributions, Variation of aerodynamic coefficients with Reynolds Number and Mach Number, Effect of span, Aspect ratio, plan form, sweep, taper and twist on aerodynamic characteristics of a lifting surface, Delta wing aerodynamics	L2, L3, L4	7
Module 4: Airplane Mechanics in Steady Flight Straight and Level flight, stalling speed; Variation of drag with flight, Speed conditions for minimum drag, minimum power conditions; Power at other speeds, Gliding flight, Shallow and steep angles of glide; Sinking speed, Minimum sinking speed, Time of descent, Climbing flight at shallow angles, Correction for steep angles, Time to flight, Maximum rate of climb	L2, L3, L4	7
Module 5: Airplane Performance in Accelerated Flight and Maneuvers Take-off and landing, Calculations of take-off ground run, Take-off distances, Minimum ground run, assisted take-off, Calculation of landing ground run, Range and endurance and problems connected with them. Introductory comments on spins and stalls; turning flight, Maneuvers in 3D space	L2, L3, L4	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books:

Text:

1. D. O. Dommasch, S. S. Sherby & T. F. Connolly, "Airplane Aerodynamics", 4th Ed. Pitman Publishing Group, 1998.
2. E. L. Houghton and A. E. Brock, "Aerodynamics for Engineering Students", Edward Arnolds, 1986.
3. R. S. Shevell, "Fundamentals of Flight", 3rd Ed. Prentice Hall, 1999.
4. John D. Anderson, "Introduction to Flight", McGraw Hill, 3rd Ed, 2004.

References:

1. J. J. Bertin and M. L. Smith, "Aerodynamics for Engineers", 2nd Ed., Prentice Hall.
2. C. D. Perkins and R. E Hage, "Airplane Performance, Stability and Control", John Wiley, 1949.

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO3	1	1	3	-	-	-	-	-	-	-	-	-	1	-	-	-
CO4	1	1	3	-	-	-	-	-	-	-	-	-	1	-	-	-
CO5	1	1	3	-	-	-	-	-	-	-	-	-	1	-	-	-

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ASE2514	Computer Aided Drafting Lab	L	T	P	C
Version 2019-1	Date of Approval: May 2019	0	0	2	1
Pre-requisites/ Exposure	Engineering Graphics				
Co-requisites					

Course Catalog

In this course the concept of design, drafting and modeling are discussed in details using AutoCAD software. The course contents include the basic commands, 2D and 3D modeling of machine components using AutoCAD. To master this course, students should have a background in basic knowledge of Engineering graphics and design.

Course Objectives

The objective of this course is to

- Equip the students with the concept of basic commands and features used in AutoCAD.
- Provide an overview to learn and apply the use of basic commands in generating the 2D sketches and 3D models of machine components.

Course Outcomes

On completion of this course, the students will be able to

CO1: Construct, edit and plot drawings using basic AutoCAD commands and features.
CO2: Construct and edit the model of machine components such as Piston, Connecting rod.
CO3: Construct and edit 2D sketches of pentagon, hexagon and any 2D drawing.
CO4: Construct and edit 3D model of nut, bolt and gear.
CO5: Construct and edit the geometry of hollow cylinder containing sphere and triangle.

Course Content

Modules	Blooms level*	Number of hours
Experiment 1: Basics of AutoCAD	L2, L3	2
Experiment 2: Modeling of machine Components such as Connecting, Rod, piston etc.	L2, L3	2
Experiment 3: 2D modeling for different Geometrics such as Hexagon, Pentagon etc	L2, L3	2
Experiment 4: 3D modeling of nut and Bolt.	L2, L3	2
Experiment 5: Modeling of Gear.	L2, L3	2
Experiment 6: Modeling of Compound Geometrics such as Hollow Cylinder containing Sphere, Triangle etc.	L2, L3	2

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books:

Text:

- P. S. Gill, "Engineering Drawing", S. K. Kataria & Sons, New Delhi, 2009.
- N. D. Bhat, "Engineering Drawing: Plane and Solid Geometry", Charotar Publishing House Pvt. Limited, New Delhi, 2010.

Reference:

- J. M. Kirkpatrick, "The AutoCAD Book: Drawing, Modeling,

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and Applications", Prentice Hall, 1996
- P. Karaiskos, N. Fulton, "AutoCAD for Mechanical Engineers and Designer", Wiley, 1995

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	**5**	**35**	**35**

IA: Internal Assessment, EE: External Exam, PR: Performance, LR: Lab Record, V: Viva.

CO, PO and PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	1	3	-	-	-	-	-	-	2	2	3	3	1	-	-	-
CO2	1	2	-	-	-	-	-	-	2	2	3	3	1	-	-	-
CO3	1	2	-	-	-	-	-	-	2	2	3	3	1	-	-	-
CO4	1	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO5	1	2	-	-	-	-	-	-	-	-	-	-	1	-	-	-

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ASE2515	Structural Analysis Lab	L	T	P	C
Version 2019-1	Date of Approval: May 2019	0	0	2	1
Pre-requisites/ Exposure	Aerospace Structures-I, Aerospace Structures-II				
Co-requisites					

Course Catalog

Knowledge of basic structures and modeling is crucial to comprehend the contents of this course. This course provides extensive knowledge to the students about various modeling and analysis tools for the designing of aircraft structures and testing them practically, leading to the development and fabrication that serve as a foundation for better and safe futuristic designs.

Course Objectives

The objective of this course is to

1. Equip the students with the practical knowledge and applications of different types of beams and columns.
2. Provide an overview to learn and apply the FEM based tool for detailed structural analysis

Course Outcomes

On completion of this course, the students will be able to

CO1: List, explain and apply the basics of FEM and structures lab.
CO2: Explain and apply the different theorems in finding loads and shear center over the given types of beams and sections.
CO3: Describe and apply the concepts of photoelasticity for visualizing the stress distribution.
CO4: Describe, apply and analyze the stress distribution using FEM based designing tool.

Course Content

Modules	Blooms level*	Number of hours
Experiment 1: Introduction to FEM & Aircraft Structures Lab	L1, L2, L3	2
Experiment 2: To Verify the following theorems for the given beams a. Maxwell's Reciprocal Theorem b. Principle of Superposition c. Castigliano's Theorem	L2, L3	2
Experiment 3: To determine the shear center for Open & Closed sections	L2, L3	2
Experiment 4: To study the Photoelasticity apparatus and visualize the stress distribution over different sample shapes.	L2, L3	2
Experiment 5: To determine the stress distribution over a circular cylinder under axial compressive and tensile load using ANSYS structural workbench.	L2, L3, L4	2
Experiment 6: To determine the stress distribution over a rectangular plate under compressive and tensile load using ANSYS structural workbench.	L2, L3, L4	2

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Text & Reference Books:

Text:

1. B. C. Nakra and K. K. Chaudhary, "Instrumentation Measurement and Analysis", Tata McGraw Hill, 2nd Ed, 1993.
2. N. G. R. Iyengar, "Structural stability of Columns and Plates", 1st Edition, affiliated East-West Press (Pvt.) Ltd., New Delhi, 1986.
3. D. J. Perry, "Aircraft Structures", Dover Publications, 2011.

Reference:

1. S. P. Timoshanko, and J. N. Goodier, "Theory of Elastic Stability", 2nd Edition, Dover Publications Inc., New York, 2009.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	**5**	**35**	**35**

IA: Internal Assessment, EE: External Exam, PR: Performance, LR: Lab Record, V: Viva.

CO, PO and PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	1	3	-	-	-	-	-	-	2	2	3	3	1	-	-	-
CO2	1	2	-	-	-	-	-	-	2	2	3	3	1	-	-	-
CO3	1	2	-	-	-	-	-	-	2	2	3	3	1	-	-	-
CO4	1	3	-	-	-	-	-	-	2	2	3	3	1	-	-	-

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ASE2535	Summer Internship Evaluation-I	L	T	P	C
Version 2019-1	Date of Approval: May 2019	3	0	0	3
Pre-requisites/ Exposure					
Co-requisites					

Course Catalog

The internship experience provides the student with an opportunity to explore career interests while applying knowledge and skills learned in the classroom in a work setting. The training may undergo in an industrial environment or may be an in-house training on some latest software which is in high demand in market. The experience also helps students gain a clearer sense of what they still need to learn and provides an opportunity to build professional networks. The intern develops a greater understanding about career options while more clearly defining personal career goals. Hence, the training will be useful for their future employment in industry. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university.

Course Objectives

The objective of this course is to

1. Provide practical training on some demo or live projects that will increase the capability of the students to work in a team on actual problems in industry.
2. Provide students with capabilities to design systems, analyze results, write technical reports and engage in life-long learning practices.

Course Outcomes

On completion of this course, the students will be able to

CO1. Relate and apply the acquired classroom knowledge with technical, real-time industry environment.

CO2. Relate and demonstrate capabilities to create and review technological solutions to complex engineering problems of relevant domains.

CO3. Apply the acquired knowledge to demonstrate the skills to create and compile technical reports pertaining to a given project.

CO4. Demonstrate the skills to work ethically and professionally in a team and engage in life-long learning.

Course Content

Guidelines

In order to achieve the objectives:

- Each student will be allotted a supervisor for proper guidance.
- Student will first submit details of company, external guide, project title to coordinator/supervisor as per given schedule.
- For internal assessment purpose, students will submit an industry feedback and a progress report.
- Student will maintain a file (Internship File/Project Report) which he/she will submit after completion of internship. Further, coordinator will provide Non-Teaching Credit Course project guidelines and sample to help in preparation of file. The Internship File aims to encourage students to keep a personal record of their learning and achievement throughout the Programme. It can be used as the basis for lifelong learning and for job applications. Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development.The file will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and their own personal contribution to the organization.

The **layout guidelines** for the Project Report

1. File should be in the following specification

– A4 size paper

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- Spiral Binding

- **Font**

For normal text Font Type and Size must be- Times New Roman, 12 pt. The minimum font size of materials within a table or a figure can be 10 point.

- **Margins**

A margin of 3.75 cm (1½ inch) is to be given on the binding edge while on the other sides it is to be 2.5 cm (1 inch). The text of the report, including headings, figures, tables, and notes, but excluding page numbers, must be accommodated within the page area.

- **Line Spacing**

The line spacing in the main text must be between one-and-a-half (1.5). Single line spacing should be given for figure captions, table titles, figure legends, and footnotes. Equations, tables, figures, and quotations should be set off from the main text with adequate space (not less than the normal line spacing adopted for the main text). Two consecutive paragraphs should be separated by a spacing which must be larger than the line spacing adopted for the text.

- **Tables and Figures**

Each sketch, drawing, graph and photograph should have a figure number and title below the figure etc. Numbering should be sequential, chapter wise. For instance, if there are 24 figures chapter 3 spread over all of its sections the figure numbers run from Figure 3.1 through Figure 3.24. In figures experimental data should typically be represented by centered symbols, and theoretical data by continuous curves.

Each table should have a table number and caption above the table. Numbering should be sequential, chapter wise, as in the case of Figure numbers. For instance, if there are 18 tables in chapter 3 the table numbers run from Figure 3.1 through Figure 3.18.

Make sure that figures and tables are complete in other respects such as legends, references (if any) and coordinate labels with units. Each figure and table must be explicitly referred to in the text and located where its first reference occurs, preferably after the reference.

- **Drawings**

All engineering drawings must conform to relevant Standards and should include a title block. If drawings are large they should be included at the back of the report in a separate pocket. In case drawings are made using CAD packages, a CD ROM should be included which contains all the files and details of the packages used.

- **Equations**

The numbering of equations should be sequential, chapter wise. Numbered equations must be explicitly referred to in the text.

2. Report Size: The maximum number of pages of the Report should be preferably between 40-70 pages.

3. Report Layout: The report should contain the following components

- Front Page
- Declaration
- Student Certificate (University)
- Certificate(Company)
- Acknowledgement
- Abstract
- Contents
- List of Figures
- List of Tables
- Company Profile (optional)
- Chapters
- Appendices(optional)
- References / Bibliography

The above components are described below:

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Haryana-122413

Registrar
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- **Title Page** - Format will be given by coordinator/supervisor.
- **Declaration by the Students-**This is page number (i), the beginning of the small case Roman numeral page numbers. The student has to give a declaration to the effect that the data used for the work, the work depicted in the report, and the written material contained in the report are not copied from others and that due permission has been taken from, and due credit has been given to, the sources whenever they are used.
- **Certificate-**This is page number (ii). It is given by the Institute.The certificate will be signed by the Faculty Supervisor(s) before the viva-voce after verifying the format and by the Head of the Department after review with the Supervisor(s).
- **Company Certificate -**This is a certificate, which the company gives to the students.
- **Contents-**This is page number (iii). The table of Contents should be titled just *Contents* (not Table of Contents). Try to fit it into one or two pages.
- **Acknowledgement-**This is page number (iv). Keep this brief and avoid using informal language. This page must be signed by the candidate.
- **Abstract and Keywords-**This is page number (v). The abstract (preferably one page) should contain the context/relevance of the problem at hand, a description of what was done and a gist of the significant observations/results.
- The keywords (maximum 6) are a hint that what is contained in the report.
- **Company Profile -**A Company Profile corresponds to a file with company-specific data. Company data can be stored there and included in a booking when needed.
- **Chapters-**Introduction, Literature Review/Background Study etc. as given by coordinator/supervisor.
- **References / Bibliography-**This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Modes of Evaluation: Viva/Progress Report/Presentation/Final Report

Continuous Internal Assessment	Final Assessment
50 Marks	50 Marks

Examination Scheme

Components	V	IF	R	PR	FP
Weightage (%)	20	20	20	20	20

V – Viva, IF – Industry Feedback, FP – Final Presentation, R – Report, PR–Progress Report

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	2	-	-	-	-	-	-	-	-	-	1	1	-	-
CO2	2	2	-	1	3	-	-	-	-	-	-	-	1	1	1	-
CO3	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	1
CO4	-	-	-	-	-	-	-	1	1	-	1	1	-	-	-	1

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ASE2517	Aircraft Systems and Instrumentation	L	T	P	C
Version 2019-1	Date of Approval: May 2019	3	0	0	3
Pre-requisites/ Exposure	Introduction to Aerospace Engineering				
Co-requisites					

Course Catalog

This course provides basic knowledge and understanding of various kinds of aircraft systems and their importance based on various aspects. Knowledge of basic physics is crucial to comprehend the contents of this course. Studying this course the students will learn about various components, systems and instruments of aircrafts that serve as a foundation for better understanding of advanced course.

Course Objectives

The objective of this course is to

1. Provide knowledge of different types of control systems used in the aircraft and their associated instruments.
2. Provide knowledge about the applications and real time problems associated with those systems.

Course Outcomes

On completion of this course, the students will be able to

CO1. List, explain and compare various types of flight control systems.
CO2. Identify and describe the engine control system with applications.
CO3. List and explain the hydraulic and environment control system.
CO4. Outline and describe about the gyroscopic systems used in aircrafts.
CO5. List and explain about the different types of navigational and pitot static instruments.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Flight Control Systems Primary and secondary flight control, Flight control linkage systems, push-pull control rod system, cable and pulley systems, High lift control surfaces, Flight control actuation, linear actuator, mechanical actuator, mechanical screw jack actuator, Direct drive actuation, fly-by-wire actuator, electro-hydrostatic actuator, electro-mechanical actuator	L1, L2, L4	6
Module 2: Engine Control Systems Engine technology and principle of operation, fuel flow control, air flow control, control systems, control system parameters, input signals, output signals, example systems, engine starting, fuel control, ignition control, engine rotation, throttle levers, starting sequence, engine oil systems.	L1, L2	6
Module 3: Hydraulic and Environment Control Systems Hydraulic circuit design, hydraulic actuation, hydraulic fluid, fluid pressure and temperature, fluid flow rate, hydraulic piping and pumps, need for controlled environment, heat sources, ram air cooling, fuel cooling, engine bleed, bleed flow and temperature control, air cycle refrigeration, humidity control, hypoxia, g tolerance.	L1, L2	6
Module 4: Gyroscopic Systems Gyroscope and its properties, Gyro horizon, Turn and bank indicator, turn coordinator, Direct reading magnetic compass, Directional gyros.	L1, L2	6

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Module 5: Navigational Instruments Very high and ultra-high frequency radio aids, VOR, TACAN, VORTAC, VHF direction finding, instrument landing system, microwave landing system.	L1, L2	6
Module 6: Pitot Static Instruments Pitot static system, air speed indicator, altimeter, Mach meter, Mach /airspeed indicator, vertical speed indicator.	L1, L2	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & References Books:

Text:

- I. Moir, and A. Seabridge, "Aircraft Systems: Mechanical, electrical, and avionics subsystems integration", John Wiley & Sons, 2011.
- E. H. Pallett, "Aircraft instruments: principles and applications", London: Pitman, 1981.

Reference:

1. D. A. Lombardo, "Aircraft Systems", 2nd edition, Tata McGraw Hill, 2009.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	-	2	-	-	-	-	-	-	-	-	-	1	2	1	-
CO2	1	-	2	-	-	-	-	-	-	-	-	-	1	2	1	-
CO3	1	-	2	-	-	-	-	-	-	-	-	-	1	2	1	-
CO4	1	-	2	-	-	-	-	-	-	-	-	-	1	2	1	-
CO5	1	3	2	-	-	-	-	-	-	-	-	-	1	2	1	-

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ASE2609	Aircraft Maintenance & Quality Assurance	L	T	P	C
Version 2019-1	Date of Approval: May 2019	3	0	0	3
Pre-requisites/ Exposure	Introduction to Aerospace Engineering				
Co-requisites					

Course Catalog

This course provides basic knowledge and understanding of various kinds of aircraft maintenances and their importance based on various aspects. This course provides introductory knowledge to the students about testing of various components as well as the fabrication of FRPs that serve as a foundation for better understanding of advanced course.

Course Objectives

The objective of this course is to

- Provide knowledge of various types of preventive maintenance: repairs, overhauls, and calibration, rigging and testing of aircraft and its instruments and components/systems.
- Provide knowledge about the layout of aircraft structure, corrosion of aircraft components and its prevention.

Course Outcomes

On completion of this course, the students will be able to

CO5. Identify and explain the importance of aircraft maintenance and quality assurance.

CO6. List and explain various types of testings for aircraft materials using DTs and NDTs and the corrosion prevention methods.

CO7. Illustrate the fabrication and repair of FRP components and explain the quality assurance practices.

CO8. Explain and demonstrate the layout of an aircraft along with the assembly and rigging.

CO9. Explain and demonstrate their course knowledge to disciplinary as well as interdisciplinary audience.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Introduction to Maintenance Requirement of maintenance of aircraft, its components, systems, subsystems. Types of maintenance scheduling, Inspection of aircraft components. Types of Inspections, Repair, Modifications, and Reconditioning. Role of airworthiness, Issue of C of A.	L1, L2	6
Module 2: Testing of Aircraft Materials and Components Testing techniques for Tension, Hardness, Bending, Impact, Crushing, Torsion, Fatigue, Hydrostatic tests. NDT Techniques: X-ray, Gamma Ray, Ultra-sonic; Magna-flux.	L1, L2	6
Module 3: Layout of Aircraft Structure Principle and important sub-groups, Aircraft Station numbering sub-assemblies in airframe, landing gear, Power plant and its attachment, Rotorcraft Structure.	L1, L2	6

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Module 4:Aircraft Assembly and Rigging Aircraft Assembly, Rigging, Alignment of fixed surfaces and flight controls and systems in details, balancing, Inspection and Maintenance. Flight control system of Helicopter.	L1, L2	6
Module 5: Fabrication and Repair of FRP Components Development of metal bonding and composite materials, Bonding Structures, Composites: Characteristics, types, Fabrication and repair.	L1, L2	6
Module 6: Quality Assurance Meaning of Quality and quality improvement, need of Quality, Statistical methods for quality control, Process capability. Need of Quality Assurance, Quality Audit, Concept of Zero defect, ISO 9000 quality systems, TQM.	L1, L2	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books:

Text:

- M. J. Kroes, W. A. Watkins, F. Delp, and R. Sterkenburg, "Aircraft Maintenance and Repair", 7th edition, McGraw-Hill Education, 2013.
- G. F. Titterton, "Aircraft Materials and Processes", 3rd edition, Himalayan Books, New Delhi, 1998.
- A. Mitra, "Fundamentals of Quality Control", Wiley-Blackwell; 4th edition, 2016.

References:

1. A. V. Feigenbaum, "Total Quality Control", 40th anniversary edition, 1983.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

A: Attendance; CT: Class Test; S/V/Q: Seminar/Viva/Quiz; HA: Home Assignment; EE: End Semester Examination

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	1	-	3	-	-	-	-	-	-	-	-	-	2	1	-	-
CO2	1	2	3	-	-	-	-	-	-	-	-	-	2	1	-	-
CO3	1	2	1	3	-	-	-	-	-	-	-	-	2	1	-	-
CO4	-	-	2	-	1	-	-	-	-	-	-	-	2	1	-	-
CO5	-	3	-	3	-	-	-	-	-	1	-	-	2	1	-	-

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ASE2613	Computational Fluid Dynamics	L	T	P	C
Version 2019-1	Date of Approval: May 2019	3	0	0	3
Pre-requisites/ Exposure	Fluid Mechanics and Dynamics, Flight Dynamics				
Co-requisites					

Course Catalog

This course introduces the beginning graduate and advanced undergraduate students to finite difference methods as a means of solving different type of differential equations that arise in fluid dynamics. Fundamentals of numerical analysis, ordinary differential equations and partial differential equations related to fluid mechanics and heat transfer will be reviewed. Error control and stability considerations are discussed and demonstrated. The Navier-Stokes equations will be solved using a commercial software.

Course Objectives

The objective of this course is to

- Provide introductory knowledge to the students about a variety of computational techniques that can be used for solving engineering problems.
- Provide education to the students about utilizing the computational software for result presentations and data visualization of engineering problems.

Course Outcomes

On completion of this course, the students will be able to

CO1. Describe, and apply the various governing equations to solve engineering problems.
CO2. Describe, and apply various mathematical approaches to solve partial differential equations.
CO3. Describe, and apply the fundamental knowledge and various techniques to create computational grids.
CO4. Describe, and apply the fundamental knowledge and various techniques to discretize computational grids.
CO5. Describe, and apply the knowledge and technique of finite volume method to achieve numerical solution of problems.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Introduction Governing Equations of Fluid Dynamics: Continuity, Momentum and Energy Equations; Derivation in Various Forms; Integral Versus Differential Form of Equations; Models of Flows; Substantial Derivative; Divergence of Velocity; Physical Boundary Conditions.	L2, L3	6
Module 2: Mathematical Behaviour of Partial Differential Equations Classification of Partial Differential Equations; Cramer Rule and Eigen Value Methods for Classification; Hyperbolic, Parabolic, and Elliptic Forms of Equations.	L2, L3	5
Module 3: Grid Generation and Techniques Need for Grid Generation; General Transformation of The Equations; Metrics and Jacobians; Structured Grids-Essential Features; Structured Grid Generation Techniques - Algebraic and Numerical Methods; Unstructured Grids-Essential Features; Unstructured Grid Generation Techniques- Delaunay-Voronoi Diagram; Advancing Front Method.	L2, L3, L5	5

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Module 4: Discretization Finite Differences Methods and Difference Equations; Explicit and Implicit Approaches; Unsteady Problem - Explicit Versus Implicit Scheme; Errors and Stability Analysis; Time Marching and Space Marching; Reflection Boundary Condition; Relaxation Techniques; Alternating Direction Implicit Method; Successive over Relaxation/Under Relaxation.	L2, L3, L5	6
Module 5: Finite Volume Technique and Some Applications Spatial Discretization - Cell Centered and Cell Vertex Techniques (Overlapping Control Volume, Duel Control Volume); Temporal Discretization - Explicit Time Stepping and Implicit Time Stepping; Time Step Calculation; Upwind Scheme and High Resolution Scheme; Unsteady Flows and Heat Conduction Problems.	L2, L3, L4	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books:

Text:

1. C. A. J. Fletcher, "Computational Techniques for Fluid Dynamics", 2nd Edition, Springer, 2002.
2. J. D. Anderson, "Computational Fluid Dynamics", McGraw Hill, 2013.

Reference:

1. J. F. Wendt, "Computational Fluid Dynamics - An Introduction", 3rd Edition, Springer, 2013.
2. C. Hirsch, "Numerical Computation of Internal and External Flows", 1st Edition, Elsevier, 2007.
3. K. A Hoffmann, S. T. Chiang, "Computational Fluid Dynamics for Engineers", Vols. I & II, Engineering Education System, 1993.
4. T. K. Sengupta, "Fundamentals of CFD", Universities Press, 2004.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	-	3	-	-	-	-	-	-	-	-	1	1	3	-
CO2	1	2	-	3	-	-	-	-	-	-	-	-	1	1	3	-
CO3	1	2	-	3	-	-	-	-	-	-	-	-	1	1	3	-
CO4	1	2	-	3	-	-	-	-	-	-	-	-	1	1	3	-
CO5	1	2	-	3	-	-	-	-	-	-	-	-	1	1	3	-

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ASE2614	Aerospace Materials	L	T	P	C
Version 2019-1	Date of Approval: May 2019	3	0	0	3
Pre-requisites/ Exposure	Introduction to Aerospace Engineering, Aerospace Structures-I				
Co-requisites					

Course Catalog

This course provides basic knowledge and understanding of various types of materials, their properties and their applications in aerospace. This course serves as a foundation for better understanding of advanced courses relevant to aircraft manufacturing, aircraft design, construction and fabrication.

Course Objectives

The objective of this course is to

1. Provide strong knowledge base to students in respect of various important aerospace materials used in the manufacture of aircraft.
2. Provide introductory knowledge base to students regarding different types of alloys, their heat treatment processes and applications.

Course Outcomes

On completion of this course, the students will be able to

CO1. Identify and explain the fundamental of materials and their importance on flight vehicle.

CO2. Identify, explain and compare the properties of various aluminum and magnesium alloys and steel compositions. Also their application to aerospace vehicle vehicles.

CO3. Identify, describe and compare the properties of high strength and high resistance alloys along with their application to aerospace vehicle vehicles.

CO4. Identify and explain the corrosion and its different prevention methods for preventing aircraft components.

CO5. Identify and explain about the composite materials, their applications and different types.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Introduction To Materials Properties of flight vehicle materials, Importance of strength/weight ratio of materials for Aerospace Vehicles, Importance of temperature variations, factors affecting choice of material for different parts of airplane.	L1, L2	6
Module 2: Aluminium & Magnesium Alloys Aluminium alloys, Heat treatment, High strength and high corrosion resistant alloys, Magnesium alloys and their properties, Heat treatment. Application to Aerospace Vehicle of these alloys.	L1, L2, L4	6
Module 3: Aircraft Steels Classification of alloy steels, Effect of alloying elements, Carbon steels v/s Alloys steels, corrosion resistant steels, Heat treatment, Corrosion prevention methods, Selection and application of steel alloys to aircraft manufacture.	L1, L2, L4	6
Module 4: High Strength And Heat Resistant Alloys Classification of heat resistant materials and iron, Nickel and cobalt base alloys, Refractory materials: Ceramics, Titanium and its alloys, properties of Inconel, Monal and K-Monal, Nimonic and super alloys: Application to Aerospace vehicles.	L1, L2	6

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Module 5: Corrosion And Its Prevention Corrosion of dissimilar metals, protection, Cleaning, Plating anodic, Oxidation, Paints. Problems of corrosion to aircraft near sea, Protective/Preventive measures.	L1, L2	6
Module 5: Composite Materials Classification and characteristics of Composite materials, Types of Composite materials, Matrix phase, Dispersion phase, Advantages of composite materials, FRP, MMC, PMC, CMC, and Applications of Composites in Aircrafts.	L1, L2	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books:

Text:

- W. A. J. Chapman, "Workshop Technology-Vol. I-III", 5th Edition, Butterworth-Heinemann, 1972.
- G. F. Titterton, "Aircraft Materials and Processes", Sterling Book House, 2007.
- L. Gupta, "Advanced Composite Materials", Himalayan Books, New Delhi, 1998.

References:

- G. B. Ashmead, "Aircraft Production Methods", 1st Edition, Chilton Company, 1956.
- R. F. Gibson, "Principles of composite Materials Mechanics", 2nd Edition, McGraw Hill, CRC Press, 2011.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

A: Attendance; CT: Class Test; S/V/Q: Seminar/Viva/Quiz; HA: Home Assignment; EE: End Semester Examination

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	1	-	2	-	-	-	-	-	-	-	-	-	3	1	-	-
CO2	1	-	2	-	-	-	-	-	-	-	-	-	3	1	-	-
CO3	-	-	1	-	2	-	-	-	-	-	-	-	3	1	-	-
CO4	1	2	1	3	-	-	-	-	-	-	-	-	3	1	-	-
CO5	-	-	1	2	2	-	-	-	-	-	-	-	3	1	-	-

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ASE2651	Aircraft Stability and Control	L	T	P	C
Version 2019-1	Date of Approval: May 2019	3	0	0	3
Pre-requisites/ Exposure	Introduction to Aerospace Engineering, Low Speed Aerodynamics, Flight Mechanics				
Co-requisites					

Course Catalog

This course provides the fundamental knowledge of stability and control of an aircraft. Students will understand the importance of different components of an aircraft in providing stability and giving control to aircraft motion. This course also provides understanding of mathematics behind the designing of aircraft and its components. The content of this course serves as a foundation for advance course of aircraft designing.

Course Objectives

The objective of this course is to

1. Provide understanding of various aspects of stability of an aircraft in flight and how geometric features of control surfaces and their proper angular movements achieve it.
2. Provide an analytical understanding of longitudinal, lateral and directional stability and measures that can be taken to control the same.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define, explain, apply and compare the various fundamentals and aspects of stick fixed static longitudinal stability.

CO2. Define, explain, apply and compare the various fundamentals and aspects of stick free static longitudinal stability.

CO3. Define, explain, apply and compare the various fundamentals and aspects of directional stability and control of flight vehicles.

CO4. Define, explain, apply and compare the various fundamentals and aspects of lateral stability and control of flight vehicles.

CO5. Define, explain, apply and compare the various fundamentals and aspects of dynamic stability of flight vehicles.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Stick Fixed Static Longitudinal Stability Introduction to stability of airplane, stick fixed longitudinal stability, Neutral point, Centre of gravity limits, In flight measurement of stick fixed neutral point	L1, L2, L3, L4	8
Module 2: Stick Free Static Longitudinal Stability Control surface hinge moments, floating and restoring tendencies, the tab, Effect of free elevator on airplane stability, Elevator Control force, stick force gradients, Neutral point, Controls free center of gravity limit, In-flight measurement of stick free neutral point	L1, L2, L3, L4	7
Module 3: Directional Stability and Control Asymmetric flight, Feather cock stability, contribution of different parts of Airplane, Rudder Fixed and Rudder free static directional stability, rudder lock	L1, L2, L3, L4	7

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Module 4: Lateral Stability and Control Dihedral Effect, Contribution of different parts of airplane controls in roll, aileron control power, cross coupling of lateral and directional effects	L1, L2, L3, L4	7
Module 5: Dynamic Stability (a) Longitudinal Dynamic Stability: Simple analysis of short period and phugoid modes, stick-fixed and stick-free (b) Lateral and Directional Dynamic Stability: Simple analysis of roll subsidence spiral mode and Dutch roll	L1, L2, L3, L4	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books:

Text:

1. C. D. Perkins, R. E. Hage, "Airplane Performance Stability and Control", John Wiley & Sons, 1949.
2. B. Dickinson, "Aircraft Stability and control for Pilots and Engineers", Pitman, 1968.
3. B. N. Pamadi, "Performance, Stability, Dynamics and Control of Airplanes", 2nd Edition, American Institute of Aeronautics & Astronautics, 2004.
4. R. Nelson, "Flight Stability and Automatic Control", McGraw Hill Education, 2017.

Reference:

1. M. V. Cook, "Flight Dynamics Principles: A Linear Systems Approach to Aircraft Stability and Control", Wiley, 1997.
2. J. Roskam, "Airplane Flight Dynamics and Automatic Flight Controls", Roskam Aviation and Engineering Corporation, 2001.
3. B. Etkin, L. D. Reid, "Dynamics of Flight: Stability and Control", 3rd Edition, Wiley, 1995.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	1	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO3	1	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO4	1	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO5	1	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-

1: strongly related, 2: moderately related and 3: weakly related

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ASE2612	Computational Fluid Dynamics Lab	L	T	P	C
Version 2019-1	Date of Approval: May 2019	0	0	2	1
Pre-requisites/ Exposure	Fluid Mechanics and Dynamics, Low Speed Aerodynamics, CAD				
Co-requisites	Computational Fluid Dynamics				

Course Description

The objective of this course is to provide knowledge and understanding to the students about the modeling, meshing and simulation of flow over aircraft and its components. Knowledge of Fluid Mechanics and Dynamics, Low Speed Aerodynamics, Computer Aided drafting is necessary to comprehend the contents of this course. This course equips the students with various approaches and tools of modeling and grid generations, also a brief knowledge is provided to the students about the numerical methods to solve numerous problems related to aerospace and mechanical systems.

Course Objectives

The objective of this course is to

1. Provide experience in computing aerodynamic problems and understanding flow physics over flat plate, pipe, cylinder, over a wedge and flow over an airfoil.
2. Provide knowledge to estimate flow characteristics with different Mach numbers to determining the pressure coefficients over different structural objects.

Course Outcomes

On completion of this course, the students will be able to

CO5. Describe and apply the engineering fundamentals and principles to model flat plate, pipe, cylinder, wedge, Nozzle, airfoil and wing in ANSYS Workbench/ AutoCAD.

CO6. Describe and apply the engineering fundamentals and principles to generate different types of grids with varying qualities, arrangement of nodes and topology.

CO7. Describe and apply the engineering fundamentals and principles to simulate the flow with varying parameters over the object with different numerical methods.

CO8. Compare and analyze the results of flow simulation to achieve an optimum design of the structure.

Course Content

Modules	Blooms level*	Number of hours
Experiment 1: Introduction to ANSYS	L1, L2,	1
Experiment 2: To simulate and analyze the flow over a flat plate	L1, L2, L3, L4	1
Experiment 3: To simulate and analyze the flow through a pipe	L1, L2, L3, L4	1
Experiment 4: To simulate and analyze the flow over a circular cylinder	L1, L2, L3, L4	1
Experiment 5: To simulate and analyze the flow over a wedge	L1, L2, L3, L4	1
Experiment 6: To simulate and analyze the subsonic flow through a nozzle	L1, L2, L3, L4	1
Experiment 7: To simulate and analyze the supersonic flow through a nozzle	L1, L2, L3, L4	1
Experiment 8: To simulate and analyze the flow over a symmetric aerofoil	L1, L2, L3, L4	1

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Experiment 9: To simulate and analyze the flow over a cambered aerofoil	L1, L2, L3, L4	2
Experiment 10: To simulate and analyze the flow over a wing structure	L1, L2, L3, L4	2

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books:

Text:

- C. A. Fletcher, "Computational Techniques for Fluid Dynamics", 2nd Edition, Springer, 2002.
- J. D. Anderson, "Computational Fluid Dynamics", McGraw Hill, 2013.
- ANSYS, Inc., ANSYS Fluent Tutorial Guide, 2018.
- ANSYS, Inc., ANSYS Theory Reference, 11th Edition, 1999.
- ANSYS, Inc., ANSYS Workbench, 2005.

Reference:

- C. Hirsch, "Numerical Computation of Internal and External Flows", 1st Edition, Elsevier, 2007.
- T. K. Sengupta, "Fundamentals of CFD", Universities Press, 2004.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	**5**	**35**	**35**

IA: Internal Assessment, EE: External Exam, PR: Performance, LR: Lab Record, V: Viva.

CO, PO and PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	1	2	2	-	-	-	-	-	3	2	-	3	1	1	2	3
CO2	1	2	2	-	-	-	-	-	3	2	-	3	1	1	2	3
CO3	1	2	2	-	-	-	-	-	3	2	-	3	1	1	2	3
CO4	1	2	2	-	-	-	-	-	3	2	-	3	1	1	2	3

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ASE2615	Aeromodelling Lab	L	T	P	C
Version 2019-1	Date of Approval: May 2019	0	0	2	1
Pre-requisites/ Exposure	Introduction to Aerospace Engineering, Low Speed Aerodynamics, Aircraft Propulsion				
Co-requisites					

Course Description

The objective of this course is to provide practical knowledge and understanding to the students about the design and fabrication of models and prototypes of aircraft. Knowledge of Introduction to Aerospace Engineering, Low Speed Aerodynamics, Aircraft Propulsion, and Aircraft Structures is necessary to comprehend the contents of this course. This course equips the students with necessary knowledge to understand the construction and operation of model and prototype flight vehicles.

Course Objectives

The objective of this course is to

- Provide practical knowledge to the students about the design of model and prototypes of flight vehicles.
- Provide practical knowledge to the students about the fabrication and operation of model and prototypes of flight vehicles.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain and apply the engineering fundamentals and principles to design and create various types airfoils and wing planforms using basic construction materials.

CO2. Explain and apply the engineering fundamentals and principles to design and create unpowered and powered gliders using basic construction materials.

CO3. Explain and apply the engineering fundamentals and principles to design and create radio-controlled flight vehicles.

Course Content

Modules	Blooms level*	Number of hours
Experiment 1: To design and fabricate various types of airfoils using basic raw materials (Thermocol, Balsa wood, Cardboard, etc.).	L2, L3, L5	2
Experiment 2: To design and fabricate various types of wing planforms using basic raw materials (Thermocol, Balsa wood, Cardboard, etc.).	L2, L3, L5	2
Experiment 3: To perform design calculations and fabrication of an unpowered glider aircraft.	L2, L3, L5	2
Experiment 4: To perform design calculations and fabrication of a powered glider aircraft.	L2, L3, L5	2
Experiment 5: To perform design calculations of a small-scale, radio-controlled, fixed-wing flight vehicle.	L2, L3, L5	2

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Experiment 6: To fabricate and test a small-scale, radio-controlled, fixed-wing flight vehicle.	L2, L3, L5	2

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books:

Text:

- J. D. Anderson, "Fundamentals of Flight", McGraw Hill, 2000.
- V. Smeed, "The Basics of Aeromodelling", Nexus Special Interests, 1995.
- R. H. Warring, "Basic Aeromodelling", Special Interest Model Books, 1976.

Reference:

1. R. Randolph, "R/C Airplane Building Techniques", Air Age Publications, 1991.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	**5**	**35**	**35**

IA: Internal Assessment, EE: External Exam, PR: Performance, LR: Lab Record, V: Viva.

CO, PO and PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	1	2	2	-	-	-	-	-	2	2	3	3	1	1	1	2
CO2	1	2	2	-	-	-	-	-	2	2	3	3	1	1	1	2
CO3	1	2	2	-	-	-	-	-	2	2	3	3	1	1	1	2

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ASE2637	Minor Project	L	T	P	C
Version 2019-1	Date of Approval: May 2019	2	0	0	2
Pre-requisites/ Exposure					
Co-requisites					

Course Catalog

The minor project provides the student with an opportunity to apply knowledge and skills learned in the classroom in carrying out a project. The minor project is an in-house training on real-time project or on latest software. The experience and skills that come with carrying out minor project build a foundation and aptitude in students to conduct meaningful research towards a practical outcome. The minor project aims to impart necessary training to the students that is a value addition for their employability.

Course Objectives

The objective of this course is to

1. Provide practical training on small-scale projects that will increase the capability of the students to work individually or in teams on actual problems in industry.
2. Provide students with capabilities to design systems, analyze results, write technical reports and engage in life-long learning practices.

Course Outcomes

On completion of this course, the students will be able to

CO1. Relate and apply the acquired classroom knowledge with technical and real-time environment.

CO2. Relate and demonstrate capabilities to create and review technological solutions to complex engineering problems of relevant domains.

CO3. Apply the acquired knowledge to demonstrate the skills to create and compile technical reports pertaining to a given project.

CO4. Demonstrate the skills to work ethically and professionally in a team and engage in life-long learning.

Course Content

Guidelines

In order to achieve the objectives:

- Each student will be allotted a supervisor for proper guidance.
- Student will first submit details of company, external guide, project title to coordinator/supervisor as per given schedule.
- For internal assessment purpose, students will submit an industry feedback and a progress report.
- Student will maintain a file (Internship File/Project Report) which he/she will submit after completion of internship. Further, coordinator will provide Non-Teaching Credit Course project guidelines and sample to help in preparation of file. The Internship File aims to encourage students to keep a personal record of their learning and achievement throughout the Programme. It can be used as the basis for lifelong learning and for job applications. Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development. The file will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and their own personal contribution to the organization.

The **layout guidelines** for the Project Report

1. File should be in the following specification

- A4 size paper
- Spiral Binding
- **Font**

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For normal text Font Type and Size must be- Times New Roman, 12 pt. The minimum font size of materials within a table or a figure can be 10 point.

- **Margins**

A margin of 3.75 cm (1½ inch) is to be given on the binding edge while on the other sides it is to be 2.5 cm (1 inch). The text of the report, including headings, figures, tables, and notes, but excluding page numbers, must be accommodated within the page area.

- **Line Spacing**

The line spacing in the main text must be between one-and-a-half (1.5). Single line spacing should be given for figure captions, table titles, figure legends, and footnotes. Equations, tables, figures, and quotations should be set off from the main text with adequate space (not less than the normal line spacing adopted for the main text). Two consecutive paragraphs should be separated by a spacing which must be larger than the line spacing adopted for the text.

- **Tables and Figures**

Each sketch, drawing, graph and photograph should have a figure number and title below the figure etc. Numbering should be sequential, chapter wise. For instance, if there are 24 figures chapter 3 spread over all of its sections the figure numbers run from Figure 3.1 through Figure 3.24. In figures experimental data should typically be represented by centered symbols, and theoretical data by continuous curves.

Each table should have a table number and caption above the table. Numbering should be sequential, chapter wise, as in the case of Figure numbers. For instance, if there are 18 tables in chapter 3 the table numbers run from Figure 3.1 through Figure 3.18.

Make sure that figures and tables are complete in other respects such as legends, references (if any) and coordinate labels with units. Each figure and table must be explicitly referred to in the text and located where its first reference occurs, preferably after the reference.

- **Drawings**

All engineering drawings must conform to relevant Standards and should include a title block. If drawings are large they should be included at the back of the report in a separate pocket. In case drawings are made using CAD packages, a CD ROM should be included which contains all the files and details of the packages used.

- **Equations**

The numbering of equations should be sequential, chapter wise. Numbered equations must be explicitly referred to in the text.

2. Report Size: The maximum number of pages of the Report should be preferably between 40-70 pages.

3. Report Layout: The report should contain the following components

- Front Page
- Declaration
- Student Certificate (University)
- Certificate(Company)
- Acknowledgement
- Abstract
- Contents
- List of Figures
- List of Tables
- Company Profile (optional)
- Chapters
- Appendices(optional)
- References / Bibliography

The above components are described below:

- **Title Page** - Format will be given by coordinator/supervisor.
- **Declaration by the Students -** This is page number (i), the beginning of the small

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case Roman numeral page numbers. The student has to give a declaration to the effect that the data used for the work, the work depicted in the report, and the written material contained in the report are not copied from others and that due permission has been taken from, and due credit has been given to, the sources whenever they are used.

- **Certificate** - This is page number (ii). It is given by the Institute.The certificate will be signed by the Faculty Supervisor(s) before the viva-voce after verifying the format and by the Head of the Department after review with the Supervisor(s).
- **Company Certificate** - This is a certificate, which the company gives to the students.
- **Contents** - This is page number (iii). The table of Contents should be titled just *Contents* (not Table of Contents). Try to fit it into one or two pages.
- **Acknowledgement** - This is page number (iv). Keep this brief and avoid using informal language. This page must be signed by the candidate.
- **Abstract and Keywords** - This is page number (v). The abstract (preferably one page) should contain the context/relevance of the problem at hand, a description of what was done and a gist of the significant observations/results.
- The keywords (maximum 6) are a hint that what is contained in the report.
- **Company Profile** - A Company Profile corresponds to a file with company-specific data. Company data can be stored there and included in a booking when needed.
- **Chapters** - Introduction, Literature Review/Background Study etc. as given by coordinator/supervisor.
- **References / Bibliography** - This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Modes of Evaluation: Viva/Progress Report/Presentation/Final Report

Continuous Internal Assessment	Final Assessment
50 Marks	50 Marks

Examination Scheme

Internal and Final Assessment (50)													
S. No.	Name of the Student	Project Title	Guide	Co-guide	Well defined problem, objectives and methodology (5)	Individual Contribution by the student to the project work (5)	Subject Knowledge / skill related to project work (10)	Presentation skills (5)	Thesis Report (7)	Presentation (6)	Execution (6)	Viva Voce (6)	Total (50)

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CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	2	-	-	-	-	-	-	-	-	-	1	1	-	-
CO2	2	2	-	1	3	-	-	-	-	-	-	-	1	1	1	-
CO3	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	1
CO4	-	-	-	-	-	-	-	1	1	-	1	1	-	-	-	1

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ASE2618	Finite Element Method	L	T	P	C
Version 2019-1	Date of Approval: May 2019	2	0	0	2
Pre-requisites/ Exposure	Engineering Thermodynamics, Aircraft Propulsion				
Co-requisites					

Course Catalog

This course provides basic knowledge and understanding of various kinds of aircraft maintenances and their importance based on various aspects. This course provides introductory knowledge to the students about testing of various components as well as the fabrication of FRPs that serve as a foundation for better understanding of advanced course.

Course Objectives

The objective of this course is to

1. Provide knowledge of various concepts of Mathematical Modeling of Engineering Problems.
2. Provide knowledge about the basics of the Finite Element Technique, a numerical tool for the solution of different classes of problems in solid mechanics.

Course Outcomes

On completion of this course, the students will be able to

CO1. Identify and explain the basics of finite elements analysis.

CO2. Summarize and explain various types of techniques used in the formulation of finite elements methods.

CO3. List, identify and describe the different elemental properties along with their applications in the FEM of plates and shells.

CO4. List, explain and apply the gained knowledge in related FEM domains.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Introduction to Finite Element Analysis Introduction; Basic Concepts of Finite Element Analysis; Introduction to Elasticity; Steps in Finite Element Analysis	L1, L2	4
Module 2: Finite Element Formulation Techniques Virtual Work and Variational Principle; Galerkin Method; Finite Element Method: Displacement Approach; Stiffness Matrix and Boundary Conditions	L1, L2	4
Module 3: Element Properties Natural Coordinates; Triangular Elements; Rectangular Elements; Lagrange and Serendipity Elements; Solid Elements; Isoparametric Formulation;	L1, L2	6
Module 4: FEM for Plates and Shells Introduction to Plate Bending Problems; Finite Element Analysis of Thin Plate ; Finite Element Analysis of Thick Plate; Finite Element Analysis of Skew Plate ;	L1, L2	6
Module 5: Additional Applications of FEM Finite Elements for Elastic Stability; Finite Elements in Fluid Mechanics; Dynamic Analysis	L1, L2, L3	4

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Text & Reference Books:

Text:

1. J. N. Reddy, "An Introduction to the Finite Element Method", 3rd Edition, Tata McGraw-Hill, 2005.
2. P. Seshu, "Text Book of Finite Element Analysis", Prentice-Hall of India Pvt. Ltd., New Delhi, 2007.

References:

1. C. S. Krishnamoorthy, "Finite element analysis: theory and programming", Tata McGraw-Hill Education, 1994.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

A: Attendance; CT: Class Test; S/V/Q: Seminar/Viva/Quiz; HA: Home Assignment; EE: End Semester Examination

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	1	-	-	-	-	-	-	-	-	-	-	-	1	2	-	-
CO2	1	2	-	-	-	-	-	-	-	-	-	-	1	2	-	-
CO3	1	2	-	3	-	-	-	-	-	-	-	-	1	2	-	-
CO4	1	-	-	-	-	-	-	-	-	-	-	-	1	2	-	-

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ASE2702	Flight Dynamics	L	T	P	C
Version 2019-1	Date of Approval: May 2019	3	0	0	3
Pre-requisites/ Exposure	Basic Mathematics, Low Speed Aerodynamics, Flight Mechanics,				
Co-requisites					

Course Catalog

This course contains Fundamental mathematical and dynamic principles for flight dynamics. The course also provides basic knowledge and understanding of use of general equations for unsteady motion of airplane, such as force equations, momentum equations and principle of rotation. It also provides basic knowledge of small disturbance theory for aircraft stability and control.

Course Objectives

The objective of this course is to

- Equip students to understand the complexities of airplane and rocket dynamics
- Equip the students about the degrees of freedom of flight trajectory and analysis of stability and control based on small disturbance theory and stability derivatives for airplane and rockets.

Course Outcomes

On completion of this course, the students will be able to

CO10. Define and explain particle and rigid body kinematics for different system of frames and use of co-ordinate transformation.

CO11. Define, explain and apply the equations of motion of aircraft and flight simulation of powered and unpowered flight.

CO12. Describe, apply and analyze small disturbance theory for stability and control.

CO13. Describe, apply and analyze Physical significance of stability derivatives and their use.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Introduction Overview; Fundamental of Vectors; Fixed and Inertial frame of reference, Earth as a flat surface, Coriolis Effect, Longitudinal, Directional and Lateral forces and moments; Longitudinal, Directional and Lateral Stability.	L1, L2	6
Module 2: Transformation Coordinate Systems; Transformation from Cartesian to Cylindrical and Cylindrical to Spherical Coordinate Systems; Transformation Matrix about X, Y And Z Axis; Rotation Matrix about X, Y And Z Axis; Earth, Body, Wind and Stability Axis Systems and their Transformation.	L1, L2	6
Module 3: Aircraft Equations of Motion Force equations in moving frame, Moment equations in moving frame, Orientation and position of the airplane: Principle Rotation, Euler angles, Euler rates, Transformation matrix, External forces, Angular velocities equations in moving frame	L1, L2, L3	8
Module 4: Small Disturbance Theory Introduction; Assumptions, Linearized equations of aircraft motion: Control fixed longitudinal directional equations, control fixed lateral directional equations, Stability analysis of linearized equations of motion	L1, L3, L4	8

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Module 5: Stability Derivatives Introduction, Expressions for Cx, and Cz. The α Derivatives: $Cx_\alpha, Cz_\alpha, Cm_\alpha$. The u Derivatives: Cx_u, Cz_u, Cm_u. The q Derivatives: Cz_q, Cm_q. The $\dot{\alpha}$ Derivatives: $C_{L\dot{\alpha}}, C_{m\dot{\alpha}}$. The β Derivatives: $C_{y\beta}, C_{l\beta}, C_{n\beta}$. The p Derivatives: C_{yp}, C_{lp}, C_{np}. The r Derivatives: C_{yp}, C_{lp}, C_{np}	L1, L3, L4	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books:

Text:

1. B. Etkin, "Dynamics of Flight" 3rd Edition, John Wiley & Sons, Inc., 2007.
2. J. L. Meriam, "Dynamics" John Wiley & Sons, Inc., 1987.
3. R. C. Nelson, "Flight Stability and Automatic Control", McGraw-Hill, 2002.

References:

1. A. E. Roy, "Foundation of Astrodynamics", Macmillan, US, 1997.
2. M. H. Kaplan, "Spacecraft Dynamics and Control", John Wiley & Sons, Inc., 2004.

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO3	1	1	3	-	-	-	-	-	-	-	-	-	1	-	-	-
CO4	1	1	3	-	-	-	-	-	-	-	-	-	1	-	-	-

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ASE2709	Aircraft Design	L	T	P	C
Version 2019-1	Date of Approval: May 2019	3	0	0	3
Pre-requisites/ Exposure	Basic Mathematics, Low Speed Aerodynamics, Flight Mechanics				
Co-requisites					

Course Catalog

This course provides basic knowledge and understanding of various aspects and processes of aircraft design. This course provides in-depth knowledge to the students about flow process of carrying out the designing of aircraft, its associated loads and the safety requirements. Based on this course, students will be able to investigate new and emerging design aspects

Course Objectives

The objective of this course is to

- Provide introductory knowledge to the students regarding the fundamentals of aircraft designing and its structural analysis
- Provide education to the students about the concepts of different structural members and various associated loads

Course Outcomes

On successful completion of this course, the students will be able to

CO1. List and describe the basics of aircraft system design and aircraft structures
CO2. Identify, explain and analyze the applicability of design aspects and different aircraft loads.
CO3. Identify and explain the design considerations of wings and high lift devices.
CO4. Identify, correlate and apply the numerical and theoretical knowledge to investigate new and emerging design aspects

Course Content

Modules	Blooms level*	Number of hours
Module 1: Introduction Aircraft design, requirements and specifications, Different design phases, Importance of each phase. Weight, its importance. Aerodynamic and structural design considerations. Classifications of airplane.	L1, L2	8
Module 2: Air Loads during Flight Ground Loads, Airframe loads, maneuvering loads in flight, Load factor, V-n diagram, gust loads, and estimation of gust loads.	L1, L2	6
Module 3: Wing Design Consideration Selection of airfoil and planform. Span wise air loads variation, BMD and SFD. Weight distribution.	L1, L2, L4	8
Module 4: High Lift Systems Airfoil's maximum lift coefficient, leading and trailing edge devices, effect of sweep back. Stall and the deep stall. Effect of Re, V/STOL configurations.	L1, L2	7
Module 5: Conceptual Design of Airplane & Layout Preparation of 3-views and layout. Estimation of take-off, landing, climbing and cruise performance. Flight envelope.	L1, L2, L3	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Text & Reference Books:

Text:

1. D. P. Raymer, "Airplane Design-A Conceptual Approach", 3rd Edition, AIAA Education Series, 1999.
2. D. Stinton, "The Design of Airplane", 1st edition, Granada, UK, 2000.

References:

1. L. M. Nikolai, "Fundamentals of Aircraft Design", 2nd edition, Univ. of Dayton Ohio, 1975.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	-	1	-	2	-	-	-	-	-	-	-	3	1	-	-
CO2	1	-	1	-	2	-	-	-	-	-	-	-	3	1	-	-
CO3	1	-	2	-	2	-	-	-	-	-	-	-	3	1	-	-
CO4	1	2	2	-	2	-	-	-	-	-	-	-	3	1	-	-

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ASE2713	Vibration Engineering	L	T	P	C
Version 2019-1	Date of Approval: May 2019	3	0	0	3
Pre-requisites/ Exposure	Engineering Mechanics				
Co-requisites					

Course Catalog

This subject will cover the fundamental concepts on the vibration of mechanical systems of one degree freedom, Lagrange's equations of motion and multiple degree of freedom systems. This course includes introduction to matrix methods, influence coefficient, forced vibration, principle mode of vibration, Rayleigh method, measuring instruments, isolation, torsional systems and balancing of machine.

Course Objectives

The objective of this course is to

1. Provide adequate knowledge to analyse one-degree and multi-degree of freedom systems of vibrations using different methods.
2. Find out natural frequencies and amplitude responses of different systems.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain, determine and apply the equation of motions for free vibration under damped and undamped condition for one degree freedom system.

CO2: Explain, determine and apply the equation of motion for forced vibration due to excitation of support.

CO3: Determine and apply the equation of motion in reciprocating and rotary balancing of machine and explain the vibration isolation.

CO4: Explain, determine and apply the equation of motion for two degree of freedom system and explain vibration absorber

CO5: Derive and apply the principle mode of vibration by matrix iteration, influence coefficient and solve the problem free and forced vibration having multi degree of freedom systems.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Scope of Vibration Important terminology and classification, Degrees of freedom, Harmonic motion, vectorial representation, complex number representation, addition, Derivation of equation of motion for one dimensional longitudinal, transverse and torsional vibrations without damping using Newton's second law, D' Alembert's principle and Principle of conservation of energy, Compound pendulum and centre of percussion, Damped vibrations of single degree of freedom systems, Viscous damping, underdamped, critically damped and overdamped systems, Logarithmic decrement, Vibration characteristics of Coulomb damped and Hysteretic damped systems.	L1, L2, L3	6
Module 2: Forced Vibrations of Single Degree of Freedom Systems Forced vibration with constant harmonic excitation, Steady state and transient parts, Frequency response curves and phase angle plot, Forced vibration due to excitation of support.	L1, L2, L3	8

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Module 3: Vibration Isolation and Transmissibility Force transmissibility, Motion transmissibility, Forced vibration with rotating and reciprocating unbalance, Materials used in vibration isolation.	L1, L2, L3	6
Module 4: System with Two Degrees of Freedom principle mode of vibration, Mode shapes, Undamped forced vibrations of two degrees of freedom system with harmonic excitation, Vibration Absorber, Undamped dynamic vibration absorber and centrifugal pendulum absorber	L1, L2, L3	8
Module 5: Multi-degree of Freedom Systems Undamped free vibrations, principal modes, and normal co-ordinates. Orthogonality of principal modes of vibrations. Semi-definitive systems. Systems with equal frequencies, influence coefficients, natural frequencies and principal modes by matrix iteration, damped free vibrations, forced vibrations, Rayleigh's, Dunkerley's, Stodola's and Holzer's methods. Vibrations of continuous systems, Transverse vibration of a string, longitudinal vibration of a bar, Torsional vibration of a shaft.	L1, L2, L3	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text & Reference Books

Text:

1. S. T. Francis, I. E. Morse, "Mechanical Vibrations", Prentice Hall of India, 1994.
2. H. A. Church, "Mechanical Vibrations", John Wiley and Sons, Reprint 199.
3. S. Timoshenko, "Vibration Problems in Engineering", Van Nostrand, 1961.

Reference:

1. S. G. Kelly, "Mechanical Vibrations", McGraw-Hill, New Delhi, 1960.
2. G. K. Grover, "Mechanical Vibrations", Nem Chand, New Delhi, 1977.
3. V. P. Singh, "Mechanical Vibrations", Dhanpat Rai Publications, 2002.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PSO 3	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**
CO 2	**1**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**
CO 3	**1**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**
CO 4	**1**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**
CO 5	**1**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	

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ASE2714	Vibration Engineering Lab	L	T	P	C
Version 2019-1	Date of Approval: May 2019	0	0	2	1
Pre-requisites/ Exposure	Engineering Mechanics				
Co-requisites	Vibrations Engineering				

Course Catalog

The vibration engineering lab will cover the fundamental concepts on the vibration of mechanical systems of free vibration of simple and compound pendulum and Torsional vibration of rotor. An Interpretation of results is to find out the natural frequency of different mechanical systems.

Course Objectives

The objective of this course is to

1. Provide adequate knowledge to analyses one-degree and multi-degree of freedom systems of vibrations using different methods.
2. Find out natural frequencies and amplitude responses of different systems.

Course outcomes

On completion of this course, the students will be able to

CO1: Explain and apply the natural frequency of simple pendulum, compound pendulum and bifilar suspension.

CO2: Explain and apply the equation of motion of torsional vibration and determine the damping coefficient of free vibration.

CO3: Explain and apply the equation of motion of longitudinal vibration and determine the natural frequency of spring mass system.

CO4: Explain and apply the Dunkerley's rule and determine the natural frequency of beam.

CO5: Determine and apply the principle mode of vibration of shaft with different end conditions.

Course Content

Experiment	Blooms level*	Number of hours
1. To verify the relation $T = 2\pi\sqrt{\frac{L}{g}}$ for a simple pendulum.	L2, L3	1
2. To determine the radius of gyration 'k' of compound pendulum and verify the relation $T = 2\pi\sqrt{\frac{k^2+og^2}{g(og)}}$	L2, L3	1
3. To determine the radius of gyration of bar using Bi-filar suspension.	L2, L3	1
4. To study the torsional vibration (undamped) of single rotor shaft system	L2, L3	1
5. To study the damped torsional oscillations and determine the damping coefficient	L2, L3	1
6. To study the longitudinal vibration of spring and to determine the frequency theoretically and actually by experiment	L2, L3	1
7. To study the undamped free vibration of equivalent spring mass system.	L2, L3	1
8. To verify the Dunkerley's rule on simply supported beam and compare it with actually by experiment.	L2, L3	1
9. To study the forced lateral vibration of the beam for different damping	L2, L3	1

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10. To determine experimentally the whirling speed of shaft for a given system.	L2, L3	1
11. Harmonic excitation of cantilever beam using electrodynamics shaker and determination of resonant frequencies	L2, L3	2

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text & Reference Books

Text:

1. S. T. Francis, I. E. Morse, "Mechanical Vibrations", Prentice Hall of India, 1994.
2. H. A. Church, "Mechanical Vibrations", John Wiley and Sons, Reprint 199.
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3. V. P. Singh, "Mechanical Vibrations", DhanpatRai Publications, 2002.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**1**	**-**	**2**	**--**	**--**	**--**	**--**	**3**	**1**	**--**	**1**	**1**	**1**	**3**	**1**
CO2	**1**	**1**	**-**	**2**	**--**	**--**	**--**	**--**	**3**	**1**	**--**	**1**	**1**	**1**	**3**	**1**
CO3	**1**	**1**	**-**	**2**	**--**	**--**	**--**	**--**	**3**	**1**	**--**	**1**	**1**	**1**	**3**	**1**
CO4	**1**	**1**	**-**	**2**	**--**	**--**	**--**	**--**	**3**	**1**	**--**	**1**	**1**	**1**	**3**	**1**
CO5	**1**	**1**	**-**	**2**	**--**	**--**	**--**	**--**	**3**	**1**	**--**	**1**	**1**	**1**	**3**	**1**

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ASE2735	Summer Internship Evaluation-II	L	T	P	C
Version 2019-1	Date of Approval: May 2019	3	0	0	3
Pre-requisites/ Exposure					
Co-requisites					

Course Catalog

The internship experience provides the student with an opportunity to explore career interests while applying knowledge and skills learned in the classroom in a work setting. The training may undergo in an industrial environment or may be an in-house training on some latest software which is in high demand in market. The experience also helps students gain a clearer sense of what they still need to learn and provides an opportunity to build professional networks. The intern develops a greater understanding about career options while more clearly defining personal career goals. Hence, the training will be useful for their future employment in industry. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university.

Course Objectives

The objective of this course is to

1. Provide practical training on some demo or live projects that will increase the capability of the students to work in a team on actual problems in industry.
2. Provide students with capabilities to design systems, analyze results, write technical reports and engage in life-long learning practices.

Course Outcomes

On completion of this course, the students will be able to

CO1. Relate and apply the acquired classroom knowledge with technical, real-time industry environment.

CO2. Relate and demonstrate capabilities to create and review technological solutions to complex engineering problems of relevant domains.

CO3. Apply the acquired knowledge to demonstrate the skills to create and compile technical reports pertaining to a given project.

CO4. Demonstrate the skills to work ethically and professionally in a team and engage in life-long learning.

Course Content

Guidelines

In order to achieve the objectives:

- Each student will be allotted a supervisor for proper guidance.
- Student will first submit details of company, external guide, project title to coordinator/supervisor as per given schedule.
- For internal assessment purpose, students will submit an industry feedback and a progress report.
- Student will maintain a file (Internship File/Project Report) which he/she will submit after completion of internship. Further, coordinator will provide Non-Teaching Credit Course project guidelines and sample to help in preparation of file. The Internship File aims to encourage students to keep a personal record of their learning and achievement throughout the Programme. It can be used as the basis for lifelong learning and for job applications. Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development. The file will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and their own personal contribution to the organization.

  The **layout guidelines** for the Project Report

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1. File should be in the following specification

- A4 size paper
- Spiral Binding

- **Font**

For normal text Font Type and Size must be- Times New Roman, 12 pt. The minimum font size of materials within a table or a figure can be 10 point.

- **Margins**

A margin of 3.75 cm (1½ inch) is to be given on the binding edge while on the other sides it is to be 2.5 cm (1 inch). The text of the report, including headings, figures, tables, and notes, but excluding page numbers, must be accommodated within the page area.

- **Line Spacing**

The line spacing in the main text must be between one-and-a-half (1.5). Single line spacing should be given for figure captions, table titles, figure legends, and footnotes. Equations, tables, figures, and quotations should be set off from the main text with adequate space (not less than the normal line spacing adopted for the main text). Two consecutive paragraphs should be separated by a spacing which must be larger than the line spacing adopted for the text.

- **Tables and Figures**

Each sketch, drawing, graph and photograph should have a figure number and title below the figure etc. Numbering should be sequential, chapter wise. For instance, if there are 24 figures chapter 3 spread over all of its sections the figure numbers run from Figure 3.1 through Figure 3.24. In figures experimental data should typically be represented by centered symbols, and theoretical data by continuous curves.

Each table should have a table number and caption above the table. Numbering should be sequential, chapter wise, as in the case of Figure numbers. For instance, if there are 18 tables in chapter 3 the table numbers run from Figure 3.1 through Figure 3.18.

Make sure that figures and tables are complete in other respects such as legends, references (if any) and coordinate labels with units. Each figure and table must be explicitly referred to in the text and located where its first reference occurs, preferably after the reference.

- **Drawings**

All engineering drawings must conform to relevant Standards and should include a title block. If drawings are large they should be included at the back of the report in a separate pocket. In case drawings are made using CAD packages, a CD ROM should be included which contains all the files and details of the packages used.

- **Equations**

The numbering of equations should be sequential, chapter wise. Numbered equations must be explicitly referred to in the text.

2. Report Size: The maximum number of pages of the Report should be preferably between 40-70 pages.

3. Report Layout: The report should contain the following components

- Front Page
- Declaration
- Student Certificate (University)
- Certificate(Company)
- Acknowledgement
- Abstract
- Contents
- List of Figures
- List of Tables
- Company Profile (optional)
- Chapters
    - Appendices(optional)

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– References / Bibliography

The above components are described below:

- **Title Page** - Format will be given by coordinator/supervisor.
- **Declaration by the Students -** This is page number (i), the beginning of the small case Roman numeral page numbers. The student has to give a declaration to the effect that the data used for the work, the work depicted in the report, and the written material contained in the report are not copied from others and that due permission has been taken from, and due credit has been given to, the sources whenever they are used.
- **Certificate -** This is page number (ii). It is given by the Institute.The certificate will be signed by the Faculty Supervisor(s) before the viva-voce after verifying the format and by the Head of the Department after review with the Supervisor(s).
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- **Acknowledgement -** This is page number (iv). Keep this brief and avoid using informal language. This page must be signed by the candidate.
- **Abstract and Keywords -** This is page number (v). The abstract (preferably one page) should contain the context/relevance of the problem at hand, a description of what was done and a gist of the significant observations/results.
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Modes of Evaluation: Viva/Progress Report/Presentation/Final Report

Continuous Internal Assessment	Final Assessment
50 Marks	50 Marks

Examination Scheme

Components	V	IF	R	PR	FP
Weightage (%)	20	20	20	20	20

V – Viva, IF – Industry Feedback, FP – Final Presentation, R – Report, PR – Progress Report

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	2	-	-	-	-	-	-	-	-	-	1	1	-	-
CO2	2	2	-	1	3	-	-	-	-	-	-	-	1	1	1	-
CO3	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	1
CO4	-	-	-	-	-	-	-	1	1	-	1	1	-	-	-	1

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ASE2737	Major Project	L	T	P	C
Version 2019-1	Date of Approval: May 2019	2	0	0	2
Pre-requisites/ Exposure					
Co-requisites					

Course Catalog

The major project provides the student with an opportunity to apply knowledge and skills learned in the classroom in carrying out a project. The major project is an in-house training on real-time project or on latest software. The experience and skills that come with carrying out major project build a foundation and aptitude in students to conduct meaningful research towards achieving practical and technological outcomes for a given engineering problem. The major project aims to impart necessary training to the students that is a value addition for their employability.

Course Objectives

The objective of this course is to

1. Provide practical training on projects that will increase the capability of the students to work individually or in teams on actual problems in industry.
2. Provide students with capabilities to design systems, analyze results, write technical reports and engage in life-long learning practices.

Course Outcomes

On completion of this course, the students will be able to

CO1. Relate and apply the acquired classroom knowledge with technical and real-time environment.

CO2. Relate and demonstrate capabilities to create and review technological solutions to complex engineering problems of relevant domains.

CO3. Apply the acquired knowledge to demonstrate the skills to create and compile technical reports pertaining to a given project.

CO4. Demonstrate the skills to work ethically and professionally in a team and engage in life-long learning.

Course Content

Guidelines

In order to achieve the objectives:

- Each student will be allotted a supervisor for proper guidance.
- Student will first submit details of company, external guide, project title to coordinator/supervisor as per given schedule.
- For internal assessment purpose, students will submit an industry feedback and a progress report.
- Student will maintain a file (Internship File/Project Report) which he/she will submit after completion of internship. Further, coordinator will provide Non-Teaching Credit Course project guidelines and sample to help in preparation of file. The Internship File aims to encourage students to keep a personal record of their learning and achievement throughout the Programme. It can be used as the basis for lifelong learning and for job applications. Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development. The file will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and their own personal contribution to the organization.

The **layout guidelines** for the Project Report

1. File should be in the following specification

- A4 size paper
- Spiral Binding

- **Font**

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The numbering of equations should be sequential, chapter wise. Numbered equations must be explicitly referred to in the text.

2. Report Size: The maximum number of pages of the Report should be preferably between 40-70 pages.

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- **Chapters -** Introduction, Literature Review/Background Study etc. as given by coordinator/supervisor.
- **References / Bibliography -** This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Modes of Evaluation: Viva/Progress Report/Presentation/Final Report

Continuous Internal Assessment	Final Assessment
50 Marks	50 Marks

Examination Scheme

Internal Examiner (50)													
S. No.	Name of the Student	Project Title	Guide	Co-guide	Well defined problem, objectives and methodology (5)	Individual Contribution by the student to the project work (5)	Subject Knowledge / skill related to project work (10)	Presentation skills (5)	Thesis Report (7)	Presentation (6)	Execution (6)	Viva Voce (6)	Total (50)

External Examiner (50)	

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S. No.	Name of the Student	Project Title	Guide	Co-guide	Well defined problem, objectives and methodology (5)	Individual Contribution by the student to the project work (5)	Subject Knowledge / skill related to project work (10)	Presentation skills (5)	Thesis Report (7)	Presentation (6)	Execution (6)	Viva Voce (6)	Total (50)

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	2	-	-	-	-	-	-	-	-	-	1	1	-	-
CO2	2	2	-	1	3	-	-	-	-	-	-	-	1	1	1	-
CO3	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	1
CO4	-	-	-	-	-	-	-	1	1	-	1	1	-	-	-	1

1: strongly related, 2: moderately related and 3: weakly related

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ASE2812	Aerospace Navigation, Guidance & Control	L	T	P	C
Version 2019-1	Date of Approval: May 2019	2	0	0	2
Pre-requisites/ Exposure	Introduction to Avionics				
Co-requisites					

Course Catalog

This course provides basic knowledge and understanding of science and principles governing the navigation and communication of aerospace vehicles. Knowledge of basic physics, natural laws, interplanetary flight and flight vehicles is crucial to comprehend the contents of this course. This course provides introductory knowledge to the students about the construction, components and operation of various systems and sub-systems used for navigation, guidance and communication of interplanetary flight vehicles.

Course Objectives

The objective of this course is to

1. Provide introductory knowledge to the students regarding the basic science and principles as applicable to navigation of interplanetary flight vehicles in atmosphere, space and around planetary bodies.
2. Provide education to the students about the various navigation, guidance and communication systems and subsystems of different types of spacecraft.

Course Outcomes

On completion of this course, the students will be able to

CO1. State, explain, and summarize the basic science and principles behind the operation of Radar.
CO2. State and explain the physical and natural laws as applicable to the navigation of flight vehicles in atmosphere and space.
CO3. List, explain, and categorize various systems and sub-systems used for navigation, guidance and control of interplanetary flight vehicles.
CO4. List, explain, and summarize the different Fly-by-wire avionics systems used in modern aircrafts.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Introduction Concepts of Navigation, Guidance and Control, Introduction to Basic Principles, Air Data Information, Principle of Working of Radar, MTI and Pulsed Doppler Radar, Moving Target Detector, Limitation of MTI Performance.	L1, L2	6
Module 2: Navigation on Earth's Surface Basic Principle of Navigation; Position Fixing; Global Positioning System; Geodetics and Basic Reference Frames; Simplified Aerospace Vehicle Equation; Fundamental of Navigation Equation; International Satellite navigation system.	L1, L2	6
Module 3: Guidance of Aerospace Vehicles Introduction; Classification; Description; Guidance Phases During Flight; Categories of Homing and Command Guidance, Kinematic Equations, Missile Guidance Laws; Classification of Guidance Laws; Classical Guidance Laws; Modern Guidance Laws	L1, L2	6

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Module 4: Control Systems Basic Definitions; Open Loop and Closed Loop Systems; Input-Output Description; Performance Criteria; Feedback Control; Root Locus; Evan's Form; Steps to Obtain Root Locus; Root Locus Example.	L1, L2	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books:

Text:

1. P. T. Kabamba, A. R. Girard, "Fundamentals of Aerospace Navigation and Guidance", Cambridge Aerospace Series, 2014
2. J. H. Blakelock, "Automatic control of Aircraft & Missiles", 2nd Edition, Wiley Interscience Publication, 1990.

Reference:

1. R. B. Underdown, Tony Palmer, "Navigation", Black Well Publishing, 2001.
2. M. I. Skolnik, "Introduction to Radar Systems", 3rd Edition, Tata McGraw Hill, 2001.
3. G. M. Siouris, "Missile Guidance and Control Systems", Springer, 2004.
4. M. Kayton, W. Fried, "Avionics Navigation System", Wiley Interscience Publication, 1997.
5. P. Zarchan, "Tactical and Strategic Missile Guidance", AIAA, 2007.
6. N. S. Nise, "Control Systems Engineering", Wiley-India, 2004.
7. B. Friedland, "Control System Design", Dover Publication, 2005.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	-	-	-	-	-	-	-	-	-	-	-	1	3	-
CO2	1	2	-	-	-	-	-	-	-	-	-	-	-	1	3	-
CO3	1	2	-	-	-	-	-	-	-	-	-	-	-	1	3	-
CO4	1	2	-	-	-	-	-	-	-	-	-	-	-	1	3	-

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ASE2837	Project-Dissertation	L	T	P	C
Version 2019-1	Date of Approval: May 2019	2	0	0	2
Pre-requisites/ Exposure					
Co-requisites					

Course Catalog

The project-dissertation provides the student with an opportunity to apply knowledge and skills learned in the classroom in carrying out a project. The project-dissertation is an in-house training on real-time project or on latest software. The experience and skills that come with carrying out project-dissertation build a foundation and aptitude in students to conduct meaningful research towards achieving practical and technological outcomes for a given engineering problem. The project-dissertation aims to impart necessary training to the students that is a value addition for their employability.

Course Objectives

The objective of this course is to

1. Provide practical training on projects that will increase the capability of the students to work individually or in teams on actual problems in industry.
2. Provide students with capabilities to design systems, analyze results, write technical reports and engage in life-long learning practices.

Course Outcomes

On completion of this course, the students will be able to

CO1. Relate and apply the acquired classroom knowledge with technical and real-time environment.

CO2. Relate and demonstrate capabilities to create and review technological solutions to complex engineering problems of relevant domains.

CO3. Apply the acquired knowledge to demonstrate the skills to create and compile technical reports pertaining to a given project.

CO4. Demonstrate the skills to work ethically and professionally in a team and engage in life-long learning.

Course Content

Guidelines

In order to achieve the objectives:

- Each student will be allotted a supervisor for proper guidance.
- Student will first submit details of company, external guide, project title to coordinator/supervisor as per given schedule.
- For internal assessment purpose, students will submit an industry feedback and a progress report.
- Student will maintain a file (Internship File/Project Report) which he/she will submit after completion of internship. Further, coordinator will provide Non-Teaching Credit Course project guidelines and sample to help in preparation of file. The Internship File aims to encourage students to keep a personal record of their learning and achievement throughout the Programme. It can be used as the basis for lifelong learning and for job applications. Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development. The file will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and their own personal contribution to the organization.

The **layout guidelines** for the Project Report

1. File should be in the following specification

- A4 size paper
- Spiral Binding

- **Font**

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For normal text Font Type and Size must be- Times New Roman, 12 pt. The minimum font size of materials within a table or a figure can be 10 point.

- **Margins**

A margin of 3.75 cm (1½ inch) is to be given on the binding edge while on the other sides it is to be 2.5 cm (1 inch). The text of the report, including headings, figures, tables, and notes, but excluding page numbers, must be accommodated within the page area.

- **Line Spacing**

The line spacing in the main text must be between one-and-a-half (1.5). Single line spacing should be given for figure captions, table titles, figure legends, and footnotes. Equations, tables, figures, and quotations should be set off from the main text with adequate space (not less than the normal line spacing adopted for the main text). Two consecutive paragraphs should be separated by a spacing which must be larger than the line spacing adopted for the text.

- **Tables and Figures**

Each sketch, drawing, graph and photograph should have a figure number and title below the figure etc. Numbering should be sequential, chapter wise. For instance, if there are 24 figures chapter 3 spread over all of its sections the figure numbers run from Figure 3.1 through Figure 3.24. In figures experimental data should typically be represented by centered symbols, and theoretical data by continuous curves.

Each table should have a table number and caption above the table. Numbering should be sequential, chapter wise, as in the case of Figure numbers. For instance, if there are 18 tables in chapter 3 the table numbers run from Figure 3.1 through Figure 3.18.

Make sure that figures and tables are complete in other respects such as legends, references (if any) and coordinate labels with units. Each figure and table must be explicitly referred to in the text and located where its first reference occurs, preferably after the reference.

- **Drawings**

All engineering drawings must conform to relevant Standards and should include a title block. If drawings are large they should be included at the back of the report in a separate pocket. In case drawings are made using CAD packages, a CD ROM should be included which contains all the files and details of the packages used.

- **Equations**

The numbering of equations should be sequential, chapter wise. Numbered equations must be explicitly referred to in the text.

2. Report Size: The maximum number of pages of the Report should be preferably between 40-70 pages.

3. Report Layout: The report should contain the following components

- Front Page
- Declaration
- Student Certificate (University)
- Certificate(Company)
- Acknowledgement
- Abstract
- Contents
- List of Figures
- List of Tables
- Company Profile (optional)
- Chapters
- Appendices(optional)
- References / Bibliography

The above components are described below:

- **Title Page** - Format will be given by coordinator/supervisor.
- **Declaration by the Students -** This is page number (i), the beginning of the small

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case Roman numeral page numbers. The student has to give a declaration to the effect that the data used for the work, the work depicted in the report, and the written material contained in the report are not copied from others and that due permission has been taken from, and due credit has been given to, the sources whenever they are used.

- **Certificate -** This is page number (ii). It is given by the Institute.The certificate will be signed by the Faculty Supervisor(s) before the viva-voce after verifying the format and by the Head of the Department after review with the Supervisor(s).
- **Company Certificate -** This is a certificate, which the company gives to the students.
- **Contents -** This is page number (iii). The table of Contents should be titled just *Contents* (not Table of Contents). Try to fit it into one or two pages.
- **Acknowledgement -** This is page number (iv). Keep this brief and avoid using informal language. This page must be signed by the candidate.
- **Abstract and Keywords -** This is page number (v). The abstract (preferably one page) should contain the context/relevance of the problem at hand, a description of what was done and a gist of the significant observations/results.
- The keywords (maximum 6) are a hint that what is contained in the report.
- **Company Profile -** A Company Profile corresponds to a file with company-specific data. Company data can be stored there and included in a booking when needed.
- **Chapters -** Introduction, Literature Review/Background Study etc. as given by coordinator/supervisor.
- **References / Bibliography -** This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Modes of Evaluation: Viva/Progress Report/Presentation/Final Report

Continuous Internal Assessment	Final Assessment
50 Marks	50 Marks

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Examination Scheme

Internal Examiner (50)													
S. No.	**Name of the Student**	**Project Title**	**Guide**	**Co-guide**	**Well defined problem, objectives and methodology (5)**	**Individual Contribution by the student to the project work (5)**	**Subject Knowledge / skill related to project work (10)**	**Presentation skills (5)**	**Thesis Report (7)**	**Presentation (6)**	**Execution (6)**	**Viva Voce (6)**	**Total (50)**

External Examiner (50)													
S. No.	**Name of the Student**	**Project Title**	**Guide**	**Co-guide**	**Well defined problem, objectives and methodology (5)**	**Individual Contribution by the student to the project work (5)**	**Subject Knowledge / skill related to project work (10)**	**Presentation skills (5)**	**Thesis Report (7)**	**Presentation (6)**	**Execution (6)**	**Viva Voce (6)**	**Total (50)**

CO, PO, PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	1	2	2	-	-	-	-	-	-	-	-	-	1	1	-	-
CO2	2	2	-	1	3	-	-	-	-	-	-	-	1	1	1	-
CO3	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	1
CO4	-	-	-	-	-	-	-	1	1	-	1	1	-	-	-	1

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ASE2813	Aeroelasticity	L	T	P	C
Version 2019-1	Date of Approval: May 2019	2	0	0	2
Pre-requisites/ Exposure	High Speed Aerodynamics				
Co-requisites					

Course Catalog

This course provides basic knowledge and understanding of aeroelastic phenomenon. The courses on educating students about different aeroelastic phenomenon related to aircraft and their effect on aircraft performance. This also provides mathematical strategies to solve aeroelastic problems. Knowledge of basic strength of materials and aerodynamics is crucial to comprehend the content this course. This course serves as a prerequisite for designing of engine components.

Course Objectives

The objective of this course is to

1. Provide students knowledge about the Elastic behavior of the different parts of aircraft under loads.
2. Educate the students about the theories and laws governing the aero elasticity.
3. Provide solution of elastic phenomenon for arbitrary shaped oscillatory objects.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define, explain and apply about the elastic behavior of the different parts of aircraft under loads

CO2. Define, explain, apply and distinguishes between static and dynamic aero elastic phenomenon.

CO3. Define, explain, and apply phenomena of divergence of 2D wing sections and cantilever wind and their solutions in generalized co-ordinates.

CO4. Define and explain reversal of aileron and its consequences on longitudinal stability.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Introduction Definition and historical background, Static and dynamic aeroelasticity phenomenon, integration of aerodynamic, elastic and inertia forces, Influence of aeroelasticity phenomenon on aircraft design	L1, L2, L3	5
Module 2: Divergence of Lifting Surface Phenomenon of divergence, Divergence of 2-D wing section, Divergence of an idealized cantilever wing, Solution to generalized co-ordinates, Method of successive approximation	L1, L2, L3	5
Module 3: Steady State Aeroelasticity Problems in General Loss and reversal of aileron control: 2D case, Aileron reversal general case, Lift distribution on a rigid and elastic wing, Effect on static longitudinal stability of aircraft	L1, L2, L3	4
Module 4: Introduction to Flutter and Buffeting Phenomenon of flutter, Flutter of a cantilever wing, Approximate determination of critical speed by Galerkin's Method, Buffeting and stall flutter	L1, L2, L3	5
Module 5: Non - Aeroelastic Problems Flow around an oscillating circular cylinder, Applications to H-shaped sections, Prevention of aero-elastic instabilities	L1, L2	5

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Text & Reference Books:

Text:

1. Y. C. Fung, "An Introduction to Theory of Aeroelasticity", Dover Publication, 1st Ed.,1967.
2. R. L. Bisplinghoff, H. Ashley and R. L. Halfman, "Aeroelasticity", Addison-Wesley Publishing Company, Reading Mass,1st Ed 1963.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO3	1	1	3	-	-	-	-	-	-	-	-	-	1	-	-	-
CO4	1	1	3	-	-	-	-	-	-	-	-	-	1	-	-	-

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ASE2814	Aerospace Industrial Management	L	T	P	C
Version 2019-1	Date of Approval: May 2019	2	0	0	2
Pre-requisites/ Exposure	Introduction to Aerospace Engineering				
Co-requisites					

Course Catalog

This course provides basic knowledge and understanding of the management practices of airlines, airports and businesses related to the aerospace industry. This course is aimed to equip the students with necessary information and knowledge about the various aspects related to the design, maintenance, and production management practices of aerospace industries.

Course Objectives

The objective of this course is to

1. Provide introductory knowledge to the students regarding the management practices of aerospace industries for the maintenance and design of flight vehicles.
2. Provide education to the students about the production, safety and quality management practices followed in aerospace industries.

Course Outcomes

On completion of this course, the students will be able to

CO1. Identify, describe, and compare amongst the various management practices and principles followed by aerospace industries for maintenance of flight vehicles.

CO2. Identify, describe, and compare amongst the various management practices and principles followed by aerospace industries for product design.

CO3. Identify, describe, and compare amongst the various management practices and principles followed by aerospace industries for preferred production processes.

CO4. Identify, describe, and compare amongst the various management practices and principles followed by aerospace industries regarding the safety and outcome quality of carried out processes.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Maintenance Management Maintenance Programme – Necessity, Structure, Content, Life Cycle Monitoring, Status Reporting; Reliability Managements; Aircraft Maintenance – Scheduled, Unscheduled, Line and Base Maintenance; Setup of Maintenance Organization; Planning and Controlling; Engine and Propeller Maintenance.	L1, L2, L4	6
Module 2: Design Management Basic Design Organization Requirements; Essential Design Organizational Structure; Specifications of Design Project; Design Classifications; Management Basics of Major Design Projects; Minor Design Changes; Component Development.	L1, L2, L4	6
Module 3: Production Management Production and Maintenance Planning; Technical, Organizational and Personnel Requirements; Infrastructure, Work Environment and Equipment; Selection and Monitoring of Supplies; Material Control and Handling	L1, L2, L4	6

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Module 4: Quality and Safety Management Quality Management Systems – Basics, Purpose, Objectives and Documentation; Safety/ Risk Management Systems – Basics, Organizational Framework, Safety/ Risk Monitoring, Promoting Safety Expertise and Culture; Auditing – Internal and External.	L1, L2, L4	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books:

Text:

1. M. Hinsch, "Industrial Aviation Management" Springer, 2018.
2. P. Malaval, C. Bénaroya, J.Aflalo, "Aerospace Marketing Management: A Handbook for the Entire Value Chain (Management for Professionals)", Springer, 2016.

Reference:

1. H. Geraint, "Management in the Airline Industry", Routledge, 2007.
2. S. Eriksson, H. Steenhuis, "The Global Commercial Aviation Industry", Routledge, 2015.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	-	-	-	-	3	2	-	-	-	-	1	-	-	-	1	3
CO2	-	-	-	-	3	2	-	-	-	-	1	-	-	-	1	3
CO3	-	-	-	-	3	2	-	-	-	-	1	-	-	-	1	3
CO4	-	-	-	-	3	1	-	-	-	-	1	-	-	-	1	3

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Curriculum & Scheme of Examination

2023

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Syllabus - First Semester

ENGINEERING MATHEMATICS-I

Course Code: CIV2113 **Credit Units: 04**

Course Objective:
The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects. Here our intention is to make the students acquainted with the concept of basic topics from Mathematics, which they need to pursue their Engineering degree in different disciplines.

Course Contents:

Module I: Differential Calculus
Successive differentiation, Leibnitz's theorem (without proof), Mean value theorem, Taylor's theorem (proof), Remainder terms, Asymptote & Curvature, Partial derivatives, Chain rule, Differentiation of Implicit functions, Exact differentials, Tangents and Normals, Maxima, Approximations, Differentiation under integral sign, Jacobians and transformations of coordinates.

Module II: Integral Calculus
Fundamental theorems, Reduction formulae, Properties of definite integrals, Applications to length, area, volume, surface of revolution, improper integrals, Multiple Integrals-Double integrals, Applications to areas, volumes.

Module III: Ordinary Differential Equations
Formation of ODEs, Definition of order, degree & solutions, ODE of first order: Method of separation of variables, homogeneous and non homogeneous equations, Exactness & integrating factors, Linear equations & Bernoulli equations, General linear ODE of nth order, Solution of homogeneous equations, Operator method, Method of undetermined coefficients, Solution of simple simultaneous ODE.

Module IV: Vector Calculus
Scalar and Vector Field, Derivative of a Vector, Gradient, Directional Derivative, Divergence and Curl and their Physical Significance, Arc Length, Tangent, Directional Derivative, Evaluation of Line Integral, Green's Theorem in Plane (without proof), Representation of Surfaces, Tangent Plane and Surface Normal, Surface Integral, Stoke's Theorem (without proof), Gauss Divergence Theorem (without proof).

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- Differential Calculus by Shanti Narain
- Integral Calculus by Shanti Narain

References:
- Differential Equation by A.R. Forsyth
- Higher Engineering Mathematics by H.K. Dass

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ENGINEERING CHEMISTRY

Course Code: CIV2114 **Credit Units: 02**

Course Objective:

Four basic sciences, Physics, Chemistry, Mathematics and Biology are the building blocks in engineering and technology. Chemistry is essential to develop analytical capabilities of students, so that they can characterize, transform and use materials in engineering and apply knowledge in their field. All engineering fields have unique bonds with chemistry whether it is Aerospace, Mechanical, Environmental and other fields the makeup of substances is always a key factor, which must be known. For electronics and computer science engineering, apart from the material, computer modeling and simulation knowledge can be inherited from the molecule designing. The upcoming field of technology like Nanotechnology and Biotechnology depends fully on the knowledge of basic chemistry. With this versatile need in view, course has been designed in such a way so that the student should get an overview of the whole subject.

Course Contents:

Module I: Water Technology

Introduction and specifications of water,
Hardness and its determination (EDTA method only), Alkalinity,
Boiler feed water, boiler problems – scale, sludge, priming & foaming: causes & prevention, Boiler problems – caustic embrittlement & corrosion: causes & prevention,
Carbonate & phosphate conditioning, colloidal conditioning & calgon treatment
Water softening processes: Lime – soda process, Ion exchange method, Water for domestic use.

Module II: Fuels

Classification, calorific value of fuel, (gross and net), Determination of calorific value of fuels, bomb calorimeter,Solid fuels - Proximate and ultimate analysis, Octane & Cetane No. and its significance.
Numericals on combustion

Module III: Instrumental Methods of analysis

Introduction; Principles of spectroscopy; Laws of absorbance
IR: Principle, Instrumentation, Application
UV: Principle, Instrumentation, Application
NMR: Principle, Instrumentation, Application

Module IV: Lubricants

Introduction; Mechanism of Lubrication; Types of Lubricants; Chemical structure related to Lubrication;
Properties of lubricants; Viscosity and Viscosity Index; Iodine Value; Aniline Point; Emulsion number; Flash Point; Fire Point; Drop Point; Cloud Point; Pour Point.
Selection of Lubricants.

Module V: Corrosion

Introduction, Mechanism of dry and wet corrosion,
Types of corrosion-Galvanic, Concentration cell, soil, pitting, intergranular, waterline. Passivity.
Factors influencing corrosion. Corrosion control.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Text & References:

Text:

- Engineering Chemistry- Jain and Jain
- Engineering Chemistry- Sunita Rattan
- Engineering Chemistry-Shashi Chawla

References:

- Engineering Chemistry –Dara and Dara
- Spectroscopy- Y.R Sharma
- Corrosion Engineering – Fontenna and Greene

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ELEMENTS OF MECHANICAL ENGINEERING

Course Code: CIV2104 **Credit Units: 02**

Course Objective:
The objective of this course is to impart the basic knowledge of thermodynamics, stress- strain, materials & their properties and various manufacturing processes to the students of all engineering discipline.

Course Contents:

Module I: Fundamental Concepts
Definition of thermodynamics, system, surrounding and universe, phase, concept of continuum, macroscopic & microscopic point of view, Thermodynamic equilibrium, property, state, path, process, cyclic process, Zeroth, first and second law of thermodynamics, Carnot Cycle, Introduction to I.C. Engines-two & four stoke S.I. and C.I. engines. Otto cycle. Diesel cycle.

Module II: Stress And Strain Analysis
Simple stress and strain: introduction, normal shear, and stresses-strain diagrams for ductile and brittle materials. Elastic constants, one-dimensional loadings of members of varying cross-section, Strain Energy, Properties of material-strength, elasticity, stiffness, malleability, ductility, brittleness, hardness and plasticity etc; Concept of stress and strain stress strain diagram, tensile test, impact test and hardness test.

Module III:Casting& Forging
Introduction of casting, pattern, mould making procedures, sand mould casting, casting defects, allowances of pattern. Forging-introduction, upsetting & drawing out, drop forging, press forging & m/c forging

Module IV: Welding& Sheet metal working:
Introduction of welding processes, classification, gas welding, arc welding, resistance welding. Introduction to sheet metal shop, Shearing, trimming, blanking, piercing, shaving, notching, stretch forming, nibbling coining, embossing and drawing.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Engineering thermodynamics, by P.K. Nag, Tata McGraw Hill.
- Thermal Engineering, by D.S. Kumar. S.K. Kataria and Sons.
- Thermal Engineering by PL Ballaney; Khanna Publishers, Delhi.
- Engineering Thermodynamics: Work and Heat Transfer, by Rogers and Mayhew, ELBS Publications
- Heine, R.W. C.R. Loper and P.C. Rosenthal, Principles of metal casting McGraw Hill
- Welding Technology by R.S. Parmar, Khanna Publishers.
- Thermodynamics and Heat Engines Volume-I, by R. Yadav: Central Publications.
- Ganesan, V. *Internal Combustion Engine*, Tata McGraw-Hill.

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INTRODUCTION TO COMPUTERS AND PROGRAMMING IN C

Course Code: CIV2105 **Credit Units: 03**

Course Objective:
The objective of this course module is to acquaint the students with the basics of computers system, its components, data representation inside computer and to get them familiar with various important features of procedure oriented programming language i.e. C.

Course Contents:

Module I: Introduction
Introduction to computer, history, von-Neumann architecture, memory system (hierarchy, characteristics and types), H/W concepts (I/O Devices), S/W concepts (System S/W & Application S/W, utilities). Data Representation: Number systems, character representation codes, Binary, octal, hexadecimal and their interconversions. Binary arithmetic, floating point arithmetic, signed and unsigned numbers, Memory storage unit.

Module II: Programming in C
History of C, Introduction of C, Basic structure of C program, Concept of variables, constants and data types in C, Operators and expressions: Introduction, arithmetic, relational, Logical, Assignment, Increment and decrement operator, Conditional, bitwise operators, Expressions, Operator precedence and associativity. Managing Input and output Operation, formatting I/O.

Module III: Fundamental Features in C
C Statements, conditional executing using if, else, nesting of if, switch and break Concepts of loops, example of loops in C using for, while and do-while, continue and break. Storage types (automatic, register etc.), predefined processor, Command Line Argument.

Module IV: Arrays and Functions
One dimensional arrays and example of iterative programs using arrays, 2-D arrays Use in matrix computations.
Concept of Sub-programming, functions Example of user defined functions. Function prototype, Return values and their types, calling function, function argument, function with variable number of argument, recursion.

Module V: Advanced features in C
Pointers, relationship between arrays and pointers Argument passing using pointers, Array of pointers. Passing arrays as arguments.
Strings and C string library.
Structure and Union. Defining C structures, Giving values to members, Array of structure, Nested structure, passing strings as arguments.
File Handling.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:
- "ANSI C" by E Balagurusamy
- Yashwant Kanetkar, "Let us C", BPB Publications, 2nd Edition, 2001.
- Herbert Schildt, "C: The complete reference", Osbourne Mcgraw Hill, 4th Edition, 2002.

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- V. Raja Raman, “Computer Programming in C”, Prentice Hall of India, 1995.

References:

- ***Kernighan & Ritchie, “C Programming Language”, The (Ansi C Version), PHI, 2nd Edition.***
- ***J. B Dixit, “Fundamentals of Computers and Programming in ‘C’.***
- P.K. Sinha and Priti Sinha, “Computer Fundamentals”, BPB publication.

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ELECTRICAL SCIENCE

Course Code: CIV2106 **Credit Units: 03**

Course Objective:
The objective of the course is to provide a brief knowledge of Electrical Engineering to students of all disciplines. This Course includes some theorems related to electrical, some law's related to flow of current, voltages, basic knowledge of Transformer, basic knowledge of electromagnetism, basic knowledge of electrical network.

Course Contents:

Module I: Basic Electrical Quantities
Basic Electrical definitions-Energy, Power, Charge, Current, Voltage, Electric Field Strength, Magnetic Flux Density, etc., Resistance, Inductance and Capacitance. Ideal Source, Independent Source and Controlled Source

Module II: Network Analysis Techniques & Theorems
Circuit Principles: Ohm's Law, Kirchoff's Current Law, Kirchoff's Voltage Law Network Reduction: Star–Delta Transformation, Source Transformation, Nodal Analysis, Loop analysis. Superposition theorem, Thevenin's Theorem, Norton's theorem and Reciprocity theorem.

Module III: Alternating Current Circuits
Peak, Average and RMS values for alternating currents, Power calculation:
reactive power, active power, Complex power, power factor, impedance, reactance, conductance, susceptance Resonance: series Resonance, parallel resonance, basic definition of Q factor & Band-width.

Module IV: Transformers
Basic Transformer Operation principle, Construction, Voltage relations, current relations, Linear circuit models, open circuit test, short circuit test, Transformer Efficiency.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
- R.J. Smith, R.C. Dorf: Circuits, devices and Systems
- B.L. Thareja: Electrical Technology: Part -1 & 2
- V. Deltoro: Electrical Engineering fundamentals
- Schaum's Series: Electrical Circuits

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ELEMENTS OF MECHANICAL ENGINEERING LAB

Course Code: CIV2109 **Credit Units: 01**

Course Contents:

1. Welding

   (a) Arc Welding
   - Butt Joint
   - Lap Joint
   - T Joint

   (b) Gas Welding
   - Butt Joint
   - Lap Joint
   - Brazing of Broken pieces

2. Foundry
   - Sand mould casting by single piece pattern& Split pattern bracket with cores

3. Sheet Metal
   - Dust Bin
   - Mug
   - Funnel
   - Cylindrical Mug with handle-Rectangular

4. Fitting Shop
   - Male – Female Joint
   - Rectangular piece
   - Filing the job

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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PROGRAMMING IN C LAB

Course Code: CIV2110 **Credit Units: 01**

Software Required: Turbo C

Course Contents:

- C program involving problems like finding the nth value of cosine series, Fibonacci series. Etc.
- C programs including user defined function calls
- C programs involving pointers, and solving various problems with the help of those.
- File handling

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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ELECTRICAL SCIENCE LAB

Course Code: CIV2111 **Credit Units: 01**

List of Experiments:

1. To verify KVL & KCL in the given network.
2. To verify Superposition Theorem.
3. To verify Maximum Power Transfer Theorem.
4. To verify Reciprocity Theorem.
5. To determine and verify RTh, VTh, RN, IN in a given network.
6. To perform open circuit & short circuit test on a single-phase transformer.
7. To study transient response of a given RLC Circuit.
8. To perform regulation, ratio & polarity test on a single-phase transformer.
9. To measure power & power factor in a three phase circuit by two wattmeter method.
10. To measure power & power factor in a three phase load using three ammeter & three voltmeter method.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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ENGINEERING GRAPHICS LAB

Course Code: CIV2112 **Credit Units: 01**

Course Objective:
This course will provide students concepts on the drawings of different curves like straight line, parabola, ellipse etc. After completion of this course, students will be able to draw different figures manually and will be capable of using various instruments involved in drawings.

Course Contents:

Module I: General
Importance, Significance and scope of engineering drawing, Lettering, Dimensioning, Scales, Sense of proportioning, Different types of projections, Orthographic Projection, B.I.S. Specifications.

Module II: Projections of Point and Lines
Introduction of planes of projection, Reference and auxiliary planes, projections of points and Lines in different quadrants, traces, inclinations, and true lengths of the lines, projections on Auxiliary planes, shortest distance, intersecting and non-intersecting lines.

Module III: Planes other than the Reference Planes
Introduction of other planes (perpendicular and oblique), their traces, inclinations etc., Projections of points and lines lying in the planes, conversion of oblique plane into auxiliary Plane and solution of related problems.

Module IV: Projections of Plane Figures
Different cases of plane figures (of different shapes) making different angles with one or both reference planes and lines lying in the plane figures making different given angles (with one of both reference planes). Obtaining true shape of the plane figure by projection.

Module V: Projection of Solids
Simple cases when solid is placed in different positions, Axis faces and lines lying in the faces of the solid making given angles.

Module VI: Development of Surface
Development of simple objects with and without sectioning. Isometric Projection

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text & References:

- M.B. Shah & B.C. Rana, Engineering Drawing, Pearson Education, 2007
- PS Gill, Engineering Drawing, Kataria Publication
- ND Bhatt, Engineering Drawing, Charotar publications
- N Sidheshwar, Engineering Drawing, Tata McGraw Hill
- CL Tanta, Mechanical Drawing, "Dhanpat Rai"

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ENGINEERING CHEMISTRY LAB

Course Code: CIV2115 **Credit Units: 01**

Course Contents:

List of Experiments:
(Any 10 Experiments)

1. To determine the ion exchange capacity of a given cation exchanger.

2. To determine the temporary, permanent and total hardness of a sample of water by complexometric titration method.

3. To determine the type and extent of alkalinity of given water sample.

4. To determine the number of water molecules of crystallization in Mohr's salt (ferrous ammonium sulphate) provided standard potassium dichromate solution (0.1N) using diphenylamine as internal indicator.

5. To determine the ferrous content in the supplied sample of iron ore by titrimetric analysis against standard $K_2Cr_2O_7$ solution using potassium ferricyanide $[K_3Fe(CN)_6]$ as external indicator.

6. (a) To determine the surface tension of a given liquid by drop number method.
(b) To determine the composition of a liquid mixture A and B (acetic acid and water) by surface tension method.

7. To prepare and describe a titration curve for phosphoric acid – sodium hydroxide titration using pH-meter.

8. (a) To find the cell constant of conductivity cell.
(b) Determine the strength of hydrochloric acid solution by titrating it against standard sodium hydroxide solution conductometrically
9. Determination of Dissolved oxygen in the given water sample.

10 To determine the total residual chlorine in water.

11 Determination of amount of oxalic acid and H_2SO_4 in 1 L of solution using N/10 NaOH and N/10 $KMnO_4$ solution.

12 Determination of viscosity of given oil by means of Redwood viscometer I.

13 To determine flash point and fire point of an oil by Pensky Martin's Apparatus

14 To determine the Iodine value of the oil.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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Syllabus - Second Semester

ENGINEERING MATHEMATICS-II

Course Code: CIV2208 **Credit Units: 04**

Course Objective:
The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects. Here our intention is to make the students acquainted with the concept of basic topics from Mathematics, which they need to pursue their Engineering degree in different disciplines.

Course Contents:
Module I: Linear Algebra
Hermitian and Skew Hermitian Matrix, Unitary Matrix, Orthogonal Matrix, Elementary Row Transformation, Reduction of a Matrix to Row Echelon Form, Rank of a Matrix, Consistency of Linear Simultaneous Equations, Gauss Elimination Method, Gauss-Jordan Method, Eigen Values and Eigen Vectors of a Matrix, Caley-Hamilton Theorem, Diagonalization of a Matrix, Vector Space, Linear Independence and Dependence of Vectors, Linear Transformations.

Module II: Infinite Series
Definition of Sequence, Bounded Sequence, Limit of a Sequence, Series, Finite and Infinite Series, Convergence and Divergence of Infinite series, Cauchy's Principle of Convergence, Positive Term Infinite Series, Comparison test, D'Alembert's Ratio test. Raabe's Test, Cauchy's nth root Test. Logarithmic Test, Alternating Series, Leibnitz's Test, Absolute and conditioinal convergence, Uniform Convergence, Power Series and its Interval of Convergence.

Module III: Complex Analysis
De Moivre's Theorem and Roots of Complex Numbers, Logarithmic Functions, Circular, Hyperbolic Functions and their Inverses.
Functions of a Complex Variables, Limits, Continuity and Derivatives, Analytic Function, Cauchy-Riemann Equations (without proof), Harmonic Function, Harmonic Conjugates, Conformal Mapping, Bilinear Transformations, Complex Line Integral, Cauchy Integral Theorem, Cauchy Integral Formula, Derivative of Analytic Function, Power Series, Taylor Series, Laurent Series, Zeroes and Singularities, Residues, Residue Theorem, Evaluation of Real Integrals of the Form and $\int_{-\infty}^{\infty} \frac{f(x)}{F(x)} dx$.

Module IV: **Statistics and Probability**
Moments, Skewness, Kurtosis, Random Variables and Probability Distribution, Mean and Variance of a Probability Distribution, Binomial Distribution, Poisson Distribution and Normal Distribution.

Examination Scheme:

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	15	20	20	20	5

C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:
- Engineering Mathematics by Erwin Kreyszig.
- Engineering Mathematics by R.K. Jain and S.R.K. Iyengar.
- Higher Engineering Mathematics by H.K. Dass.
- Engineering Mathematics by B.S. Grewal.
- Differential Calculus by Shanti Narain.
- Integral Calculus by Shanti Narain.
- Linear Algebra- Schaum Outline Series.

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ENGINEERING PHYSICS

Course Code: CIV2209 **Credit Units: 03**

Course Objective:
Aim of this course is to introduce the students to fundamentals of graduate level physics, which form the basis of all applied science and engineering

Course Contents:

Module I: Oscillations & Waves
Oscillations: Introduction to S.H.M. Damped Oscillations: Differential Equation and its solution, logarithmic decrement, Quality Factor, Different conditions of damping of harmonic oscillations. Forced oscillations: Amplitude and Frequency Response, Resonance, Sharpness of Resonance
Plane Progressive Waves: Differential Equation and Solution, Superposition of Progressive Waves stationary waves.
Ultrasonics: Generation and application of ultrasonicwaves.

Module II: Wave Nature of Light
Interference: Coherent Sources, Conditions of interference, Interference due to division of wavefront, Fresnels biprism Interference due to division of amplitude, Newton's rings, Interference due to thin films, .
Diffraction: Fresnel and Fraunhofer diffraction, Fraunhofer diffraction at a single slit, double slit, N Slits, Transmission grating, Rayleigh criterion and Resolving power of grating.
Polarization: Birefringence, Nicol prism, Production and analysis of plane, circularly and elliptically polarized light, Half and quarter wave plates, Optical rotation, Polarimeter.

Module III: Electromagnetics
Scalar and vector fields, gradient of a scalar field, physical significance of gradient, equipotential surface. Line, surface and volume integrals, Divergence and curl of vector field and mathematical analysis physical significance, Electric flux, Gauss' law, Proof and Applications, Gauss divergence and Stokes theorems.
Differential form of Gauss' Law, Amperes' Law, Displacement current, Faradays Law, Maxwell equations in free space & isotropic media (Integral form & differential form), EM wave propagation in free space, Poynting vector.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
- Waves & oscillation, A. P. French
- Physics of waves, W. C. Elmore & M. A. Heald
- Introduction to Electrodynamics, D. J. Griffith
- Electrodynamics, Gupta, Kumar & Singh
- Optics, A. K. Ghatak
- Engineering Physics, Satya Prakash

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OBJECT ORIENTED PROGRAMMING IN C++

Course Code: CIV2203 **Credit Units: 02**

Course Objective:
The objective of this module is to introduce object oriented programming. To explore and implement the various features of OOP such as inheritance, polymorphism, Exceptional handling using programming language C++. After completing this course student can easily identify the basic difference between the programming approaches like procedural and object oriented.

Course Contents:
Module I: Introduction
Review of C, Difference between C and C++, Procedure Oriented and Object Oriented Approach. Basic Concepts: Objects, classes, Principals like Abstraction, Encapsulation, Inheritance and Polymorphism. Dynamic Binding, Message Passing. Characteristics of Object-Oriented Languages. Introduction to Object-Oriented Modeling techniques (Object, Functional and Dynamic Modeling).

Module II: Classes and Objects
Abstract data types, Object & classes, attributes, methods, C++ class declaration, Local Class and Global Class, State identity and behaviour of an object, Local Object and Global Object, Scope resolution operator, Friend Functions, Inline functions, Constructors and destructors, instantiation of objects, Types of Constructors, Static Class Data, Array of Objects, Constant member functions and Objects, Memory management Operators.

Module III: Inheritance
Inheritance, Types of Inheritance, access modes – public, private & protected, Abstract Classes, Ambiguity resolution using scope resolution operator and Virtual base class, Aggregation, composition vs classification hiérarchies, Overriding inheritance methods, Constructors in derived classes, Nesting of Classes.

Module IV: Polymorphism
Polymorphism, Type of Polymorphism – Compile time and runtime, Function Overloading, Operator Overloading (Unary and Binary) Polymorphism by parameter, Pointer to objects, this pointer, Virtual Functions, pure virtual functions.

Module V: Strings, Files and Exception Handling
Manipulating strings, Streams and files handling, formatted and Unformatted Input output. Exception handling, Generic Programming – function template, class Template Standard Template Library: Standard Template Library, Overview of Standard Template Library, Containers, Algorithms, Iterators, Other STL Elements, The Container Classes, General Theory of Operation, Vectors.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

Text & References:
Text:

- A.R. Venugopal, Rajkumar, T. Ravishanker "Mastering C++", TMH, 1997
- R. Lafore, "Object Oriented Programming using C++", BPB Publications, 2004.
- "Object Oriented Programming with C++" By E. Balagurusamy.
- Schildt Herbert, "C++: The Complete Reference", Wiley DreamTech, 2005.

References:

- Parasons, "Object Oriented Programming with C++", BPB Publication, 1999.
- Steven C. Lawlor, "The Art of Programming Computer Science with C++", Vikas Publication, 2002.
- Yashwant Kanethkar, "Object Oriented Programming using C++", BPB, 2004

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ENGINEERING MECHANICS

Course Code: CIV2204 **Credit Units: 03**

Course Objective:
Objective of this course is to provide fundamental knowledge of force system and its effect on the behaviour of the bodies that may be in dynamic or in static state. It includes the equilibrium of different structures like beams, frames, truss etc and the force transfer mechanism in the different components of a body under given loading condition.

Course Contents:

Module I: Force system & Structure
Free body diagram, Equilibrium equations and applications. Plane truss, perfect and imperfect truss, assumption in the truss analysis, analysis of perfect plane trusses by the method of joints, method of section.

Module II:Friction
Static and Kinetic friction, laws of dry friction, co-efficient of friction, angle of friction, angle of repose, cone of friction, friction lock, efficiency of screw jack, transmission of power through belt

Module III: Distributed Force
Determination of center of gravity, center of mass and centroid by direct integration and by the method of composite bodies, mass moment of inertia and area moment of inertia by direct integration and composite bodies method, radius of gyration, parallel axis theorem, Pappus theorems and its application, polar moment of inertia.

Module IV: Work -Energy
Work energy equation, conservation of energy, Virtual work, impulse, momentum conservation, impact of bodies, co-efficient of restitution, loss of energy during impact, D'alembert principle

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
- S.S. Bhavikatti, Engineering Mechanics, New Age International Ltd
- Timoshenko, Engineering Mechanics, McGraw Hill
- R. S. Khurmi, Engineering Mechanics, S. Chand Publication
- H. Shames & G. K. M. Rao, Engineering Mechanics, Pearson Education, 2006

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OBJECT ORIENTED PROGRAMMING IN C++ LAB

Course Code: CIV2206 **Credit Units: 01**

Software Required: Turbo C++

Course Contents:

- Creation of objects in programs and solving problems through them.
- Different use of private, public member variables and functions and friend functions.
- Use of constructors and destructors.
- Operator overloading
- Use of inheritance in and accessing objects of different derived classes.
- Polymorphism and virtual functions (using pointers).
- File handling.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab

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ENGINEERING MECHANICS LAB

Course Code: CIV2207 **Credit Units: 01**

Engineering Mechanics:

1. To verify the law of Force Polygon
2. To verify the law of Moments using Parallel Force apparatus. (Simply supported type)
3. To determine the co-efficient of friction between wood and various surface (like
4. Leather, Wood, Aluminum) on an inclined plane.
5. To find the forces in the members of Jib Crane.
6. To determine the mechanical advantage, Velocity ratio and efficiency of a screw jack.
7. To determine the mechanical advantage, Velocity ratio and Mechanical efficiency of the
8. Wheel and Axle
9. To determine the MA, VR, η of Worm Wheel (2-start)
10. Verification of force transmitted by members of given truss.
11. To verify the law of moments using Bell crank lever
12. To find CG and moment of Inertia of an irregular body using Computation method

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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ENGINEERING PHYSICS LAB

Course Code: CIV2210 **Credit Units: 01**

List of Experiments:

1. To determine the wavelength of sodium light by Newton's rings method.
2. To determine the dispersive power of the material of prism with the help of a spectrometer.
3. To determine the specific rotation of sugar by Bi-quartz or Laurent half shade polarimeter.
4. To determine the speed of ultrasonic waves in liquid by diffraction method.
5. To determine the width of a narrow slit using diffraction phenomena.
6. To determine the temperature coefficient of platinum wire, using a platinum resistance thermometer and a Callender & Griffth's bridge.
7. To determine the value of specific charge (ratio of e/m) of an electron by Thomson method.
8. To determine the internal resistance of Leclanche cell with the help of Potentiometer.
9. To determine the resistance per unit length of a Carey Foster's bridge wire and also to find out the specific resistance of a given wire.
10. To plot graph showing the variation of magnetic field with distance along the aixs of a circular coil carrying current, and hence estimate the radius of the coil.
11. To determine the value of acceleration due to gravity ('g') in the laboratory using bar pendulum.
12. To determine the moment of inertia of a flywheel about its own axis of rotation.
13. To determine the density of material of the given wire with the help of sonometer.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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Syllabus - Third Semester

BUILDING TECHNOLOGY

Course Code: CIV2304 **Credit Units: 02**

Course Objective:
The course covers building materials and their testing, cement and its applications foundation and structural members of building. Different areas and utilities of building like floors, doors etc.

Course Contents:
Module I
Building stones - Classification of rocks - Quarrying - Dressing - Properties and uses of common type of stones; Timber - Defects - Seasoning - Decay - Preservation - Plywood, fibre board, particle board; Clay products - Bricks - Manufacture - IS classifications - Properties and testing - Types of bricks - Tiles - Manufacture, properties and uses - Types of tiles; Ceramic products - Lime - Classification - Manufacture, properties and uses.

Module II
Cement - Ingredients - Manufacture - Types of cement - Properties and testing - Uses; Mortar - Sand - Properties - Types of mortar and uses; Concrete - Properties of fresh concrete and tests - Proportioning of concrete mixes - Properties of hardened concrete and tests – Recent developments in concrete; Iron and steel - Structural sections - Properties and uses of structural steel - Recent developments; Miscellaneous materials - Glass - Plastics -A.C.sheets – Thermocole.

Module III
Foundation - Timbering of foundation trenches - Bearing capacity of soils - Improvement of bearing capacity - Settlement of foundation - Description of spread, grillage, raft and pile foundations; Brick and stone masonry - Bonds in brick work - Types of stone masonry -Cavity walls - Lintels and arches; concrete construction - Batching, mixing, placing, compacting and curing of concrete - form work - Precast concrete - Prestressed concrete - Recent developments in concreting; Partition walls - Types and features.

Module IV
Floors and flooring – Different types and applications; Doors, windows and ventilators - Different types; Finishing works; Building Failures - Concrete failure - Steel failure -Foundation failure - Other types of failures – Causes and Remedial measures – Building repairs - Shoring - Underpinning – Scaffolding; Tall buildings - Framed structures - Steel and concrete frames – Joints in steel and concrete frames - Introduction to prefabrication – Slip form and lift slab constructions; Fire proof construction - Fire load - Fire resisting properties of building materials – Fire extinguishing methods – Fire proof construction methods.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Punmia B. C, Ashok Kr. Jain, Arun Kr. Jain, Building Construction, Laxmi Publications, New Delhi. (2008).
- Shetty M. S, Concrete Technology, S. Chand & Co., New Delhi (2008).

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SURVEYING-I

Course Code: CIV2305 **Credit Units: 02**

Course Objective:
Surveying is the basic element of mapping areas for civil engineering construction. Methods of surveying including leveling, and leveling methods, contours, estimation of volumes etc are covered.

Course Contents:

Module I
Introduction - classification of surveys - plane surveying - geodetic surveying – topographic surveying - reconnaissance - principle of working from whole to part - provision of control -conventional signs - chain survey - instruments - principles of chain survey - field book - plotting - tie line and check line - chaining and ranging - obstacles - chaining on sloping ground - errors in chain survey - uses of cross staff and optical square

Module II
Compass survey - prismatic compass - surveyor's compass - whole circle and reduced bearing- true and magnetic bearing - dip and declination - local attraction - traversing - plotting - error of closure - graphical and analytical adjustments - plane table survey - instruments and accessories - different methods - orientation - advantages and disadvantages of plane tabling -two point problem - three point problem - errors in plane tabling - minor instruments – hand levels - clinometer - Ceylon ghat tracer - hypsometer - pantagraph -ediograph - box sextant -telescopic alidade

Module III
Levelling - definition of level surfaces - mean sea level - reduced level - bench marks - levelling instruments - temporary and permanent adjustments - fly leveling - booking - reduction of levels - corrections for refraction and curvature - reciprocal leveling - longitudinal levelling and cross sectioning - contour survey - definition - characteristics of contour - uses of contour - methods of contouring - direct and indirect interpolation – plotting - areas and volumes - trapezoidal rule - Simpson's rule - area from latitude and departure - uses of planimeter - volumes - trapezoidal and prismoidal formula

Module IV
Total Station – introduction – EDM- measurement of horizontal & vertical angles – traversing – trigonometric leveling. Theodolite surveying - study of theodolite - temporary and permanent adjustments -measurement of horizontal angles - method of repetition and reiteration - measurement of vertical angles - theodolite traverse - calculation of co ordinates - corrections - traverse table - omitted measurements - tacheometric surveying - stadia system - fixed and movable hair methods - staff held vertical and normal - instrument constants - analytic lens – tangential system - direct reading tacheometer - subtense bar – trigonometric leveling

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- S.K Duggal, Surveying Vol 1 and II, 2nd ed., Tata - McGraw Hill, New Delhi (2004).
- Arora K.R., Surveying Vol I &II, Standard Book House, New Delhi (2008)
- Punmia, B.C., Ashok Kr. Jain, Arun Kr. Jain, Surveying Vol I & II, Laxmi Publications, New Delhi (2008).

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STRENGTH OF MATERIALS

Course Code: CIV2312 **Credit Units: 04**

Course Objective:
The objective of this course is to make the students understand the concept of stress and strain in different types of structure/machine under different loading conditions. The course also covers the simple and compound stresses due to forces, stresses and deflection in beams due to bending, torsion in circular section, strain energy, different theories of failure, stress in thin cylinder thick cylinder and spheres due to external and internal pressure.

Course Contents:
Module I: Simple stresses and strains
Concept of stress and strain; Hooke's law, Young's modulus, Poisson ratio, stress at a point, stress and strains in bars subjected to axial loading. Modulus of elasticity, stress produced in compound bars subject to axial loading. Temperature stress and strain calculations due to applications of axial loads and variation of temperature in single and compound walls.

Module II: Compound stress and strains
The two dimensional system; stress at a point on a plane, principal stresses and principal planes; Mohr's circle of stress. Graphical and Analytical methods for stresses on oblique section of body. Shear force and bending moment diagrams for cantilever, simply supported and overhanging beams.

Module III: Bending Stress
Theory of bending stresses in beams due to bending, assumptions in the simple bending theory, derivation of formula: its application to beams of rectangular, circular and channel sections, composite / flitched beams, bending and shear stresses in composite beams.

Module IV: Torsion
Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts torsional rigidity, combined torsion and bending of circular shafts principal stress and maximum shear stresses under combined loading of bending and torsion, analysis of close-coiled-helical springs.

Module V: Thin cylinders and spheres
Derivation of formulae and calculation of hoop stress, longitudinal stress in a cylinder and sphere subjected to internal pressure.

Module VI: Columns and struts
Columns and failure of columns, Euler's formulas; Rankine-Gordon's formula, Johnson's empirical formula for axially loaded columns and their applications**.**

Module VII: Slope and deflection
Relationship between moment, slope and deflection, Mohr's theorem; Moment area method; method of integration; Macaulay's method: Use of all these methods to calculate slope and deflection for the following:
a) Cantilevers
b) Simply supported beams with or without overhang
c) Under concentrated loads, uniformly distributed loads or combination of concentrated and uniformly distributed loads

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

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Text & References:

Text:

- Jindal U.C., "Strength of Materials", Galgotia Publication, New Delhi, 1998.
- Ryder G.H., "Strength of Materials", Macmillan, Delhi, 2003.
- R.K. Bansal, "Strength of Materials", Laxmi Publication, New Delhi, 2001.

References:

- Sadhu Singh, "Strength of Materials", Khanna Publishers, New Delhi, 2000.
- Timoshenko S.P., "Elements of Strength of Materials", East-West affiliated, New Delhi, 2000.
- Hibbler R.C., "Mechanics of Materials", Prentice Hall, New Delhi, 1994.
- Popov Eger P., "Engg. Mechanics of solids", Prentice Hall, New Delhi, 1998.
- Fenner, Roger. T, "Mechanics of Solids", U.K. B.C. Publication, New Delhi, 1990.
- Srinath L.S. et.al., "Strength of Materials", McMillan, New Delhi,2001

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CONCRETE TECHNOLOGY

Course Code: CIV2313 **Credit Units: 03**

Course Objective: The students will be able to learn about the concrete making material materials, their significance and use. This will also enable the students to understand the manufacturing process of concrete and the precautions, various properties of concrete and different types of concrete and their application.

Course Contents:

Module I: Materials

Materials: cement - different types - chemical composition and physical properties - tests on cement - I.S. specifications - aggregates - classification - mechanical properties and tests as per I.S. - alkali aggregate reaction - grading requirements - heavy weight - light weight - normal weight - aggregate - sampling of aggregate - water - quality of water - permissible impurities as per I.S - admixtures - accelerators - retarders - water reducing agents – super plasticizers- use of silica fumes.

Module II: Manufacture

Manufacture of concrete - measurement of materials - storage and handling - batching plant and equipment - mixing - types of mixers - transportation of concrete - pumping of concrete - placing of concrete - under water concreting - compaction of concrete - curing of concrete - ready mixed concrete - mix design - nominal mixes - design mixes - factors influencing mix design - A.C.I method - I.S method - design for high strength mixes.

Module III: Properties of Concrete

Properties of concrete - fresh concrete - workability - factors affecting workability - tests for workability - segregation and bleeding - hardened concrete - factors affecting strength of concrete - strength of concrete in compression, tension and flexure - stress- strain characteristics and elastic properties - shrinkage and creep - durability of concrete - permeability - chemical attack - sulphate attack - resistance to abrasion and cavitaion - resistance to freezing and thawing - resistance to fire - marine atmosphere - quality control - frequency of sampling - test specimens - statistical analysis of test results - standard deviation - acceptance criteria

Module IV: Special Concretes

Special concrete - light weight concrete - high density concrete - vacuum concrete - shotcrete - Fibre reinforced concrete-polymer concrete - ferrocement - high performance concrete - self compacting concrete - types of failure - diagnosis of distress in concrete - crack control - leak proofing - guniting and jacketing techniques.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Neville A.M., Properties of Concrete, Pitman
- Shetty M.S., Concrete Technology, S I Chand & Company, 1993.
- Gambhir M.L., Concrete Technology, Tata McGraw Hill, 1995.
- Krishna Raju N., Design of Concrete Mixes, CBS publishers, 1988.
- Raina V.K., Concrete for Construction-Facts & Practices, Tata McGraw Hill publishing co. 1988.
- Murdock L.J., Concrete: Materials & Practice, Edward Arnold, 1968.

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ENGINEERING MATHEMATICS-III

Course Code: CIV2311 **Credit Units: 04**

Course Objective:
The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects. Here our intention is to make the students acquainted with the concept of basic topics from Mathematics, which they need to pursue their Engineering degree in different disciplines.

Course Contents:
Module I: Partial Differential Equations
Formation of PDE, Equations solvable by direct integration, Linear equations of the first order, Non-linear equations of the first order, Charpit's method, Homogeneous linear equations with constant coefficients, Non homogeneous linear equation

Module II: Fourier Series
Periodic Functions, Fourier Series, Functions having points of discontinuity, Even or Odd Functions, Change of Interval, Half-range series, Parseval's Formula, Complex form of Fourier series, Practical Harmonic Analysis, Fourier Transforms, Sine and Cosine Transforms

Module III: Laplace Transformation
Definition, Transforms of elementary functions, Properties of Laplace transforms, Existence conditions, Transforms of derivatives, Transforms of integrals, Evaluation of integrals by Laplace transform, Inverse transforms, Other methods of finding inverse transforms, Convolution theorem, Application to differential equations, Simultaneous linear equations with constant coefficients, Unit step functions, Periodic functions

Module IV: Linear Programming
Formulation of the problem, Graphical method, Canonical and Standard forms of L.P.P. Simplex Method, Artificial variable Techniques-M-method, Two phase method, Degeneracy, Dual simplex method

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att.: Attendance

Text & References:
- Shanti Narain., "Differential Calculus"
- Shanti Narain., "Integral Calculus"
- B.S. Grewal., "Higher Engineering Mathematics'
- A.R. Forsyth., "Differential Equations"
- H.K. Dass., "Higher Engineering Mathematics"
- I.N. Snedon., "Partial Differential Equations"

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CIVIL ENGINEERING DRAWING LAB & CAD LAB

Course Code: CIV2307 **Credit Units: 01**

Course Contents:

1. Paneled doors, glazed windows and ventilators in wood.
2. Steel and aluminum windows.
3. Steel roof trusses.
4. Reinforced concrete staircase.
5. Residential buildings with flat and pitched roof – RC and tiled.
6. Public buildings like office, dispensary, post office, bank etc.
7. Industrial buildings.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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Text & References:

- National Building Code of India
- Local Building Bye-laws
- Callender, John Hancock, Time Saver Standards for Architectural design Data, Tata McGraw Hill.
- Chiara, Callender, John Hancock, Time Saver Standards for Building Type, McGraw Hill
- Chiara, Joseph De, Time Saver Standards for Site Planning, McGraw Hill
- Ching, Francis D K, Architectural Graphics. .John Wiley

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STRENGTH OF MATERIALS LAB

Course Code: CIV2314 **Credit Units: 01**

List of Experiments:

1. Universal Testing Machine
2. Tensile Test (MS)
3. Double Shear Test (MS)
4. Compression Test (CI)
5. Brinell Hardness No.
6. Izod Impact
7. Testing Machine
8. Rockwell Hardness Tester
9. Spring Stiffness (Spring Compression Testing machine)
10. Torsion testing machine

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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BASICS OF NATURAL RESOURCES MANAGEMENT

Course Code: CIV2315 **Credit Units: 03**

Course Objectives: students shall have a basic understanding of development problems associated with natural resource management, be able to explain and use basic concepts, such as water and nutrient balances, and to use GIS methods to visualise and analyse spatial data related to natural resource management.

Course Contents:

Module I
Introduction to Natural Resource Bases: Concept of resource, classification of natural resources. Factors influencing resource availability, distribution and uses. Interrelationships among different types of natural resources. Concern on Productivity issues. Ecological, social and economic dimension of resource management.

Module II
Forest resources: forest vegetation, status and distribution, major forest types and their characteristics. Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people, forest management. Developing and developed world strategies for forestry. Land resources: Land as a resource. Dry land, land use classification, land degradation, man induced landslides, soil erosion and desertification. Landscape impact analysis, wetland ecology & management. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Water ecology and management. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies Food resources: World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case-studies. Fish and other marine resources: Production, status, dependence on fish resource, unsustainable harvesting, issues and challenges for resource supply, new prospects.

Module III
Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. Resource Management Paradigms: Resource management the evolution and history of resource management paradigms. Resource conflicts: Resource extraction, access and control system. Approaches in Resource Management: Ecological approach; economic approach; ethnological approach; implications of the approaches; integrated resource management strategies. Poverty and implications in Resource Management in developing countries – Poverty in developing countries, causes and link with resources scarcity and poverty.

Module IV
Management of Common International Resources: Ocean, climate, International fisheries and management commissions; Antarctica: the evolution of an international resource management regime. Case Studies: 8
1. Resource management in mountain ecosystem
2. Dry-land ecosystem
3. The management of marine and coastal resources
4. Case study of shifting cultivation
5. Mangrove ecosystem and their management

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

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Recommended Books:

- Coastal Ecology & Management, Mann, K.H. 2000. Ecology of Coastal Waters with Implications for Management (2nd Edition).Chap. 2-5, pp.18-78 & Chap. 16, pp.280-303.
- Global Change and Natural Resource Management, Vitousek, P.M. 1994. Beyond global warming: Ecology and global change. Ecology 75, 1861-1876.
- Agarwal, K.C., 2001. Environmental Biology, Nidhi Publication Ltd. Bikaner.
- Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publishing House.
- Heywood, V.H. & Watson, R.T. 1995. Global Biodiversity Assessment.Cambridge Univ. Press.
- Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
- Townsend C., Harper J, and Michael Begon. Essentials of Ecology, Blackwell Science

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DISASTER MANAGEMENT & MITIGATION

Course Code: CIV2316 **Credit Units: 03**

Course Contents:

Module I:
Understanding Disasters: Meaning, nature, characteristics and types of Disasters, Causes and effects, Disaster: A Global View

Module II:
Introduction to disaster Preparedness, Disaster Management: Prevention, Preparedness and Mitigation, Disaster Preparedness: Concept & Nature, Disaster Preparedness Plan, Disaster Preparedness for People and Infrastructure, Community based Disaster Preparedness Plan.

Module III:
Disaster Mitigation, Disaster Mitigation: meaning and concept, Disaster Mitigation Strategies, Emerging Trends in Disaster Mitigation, Mitigation management, Role of Team and Coordination.

Module IV:
Technologies for Disaster Management, Role of IT in Disaster Preparedness, Remote Sensing, GIS and GPS, Use and Application of Emerging Technologies, Application of Modern Technologies for the Emergency communication, Application and use of ICST for different disasters.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Sharma, R.K. & Sharma, G. (2005) (ed) Natural Disaster, APH Publishing Corporation, New Delhi.
- Carter, W. Nick, 1991: Disaster Management, Asian Development Bank, Manila
- Bryant Edwards (2005): Natural Hazards, Cambridge University Press, U.K.
- Roy, P.S. (2000): Space Technology for Disaster management: A Remote Sensing & GIS Perspective, Indian Institute of Remote Sensing (NRSA) Dehradun.

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ENGINEERING ECONOMICS AND MANAGEMENT

Course Code: CIV2317 **Credit Units: 03**

Course Objective: This course will enable the students to understand the basics concepts of organizations' economic environment, macroeconomics, financial and inventory management.

Course Contents:

Module I: Organizations and their Economic Environment
Definition of Economics and Managerial Economics – Nature and Scope – Definition and Concept of Good, Want, Value, Wealth, Utility – Utility and Demand – Law of Diminishing Marginal Utility – Assumptions and Importance. Demand and Supply – Law of Demand and Law of Supply. Market price and natural price. Standard market forms- Monopoly, Perfect competition. Organisational forms- Proprietorship, partnership, Joint Stock Company – Cooperative organisation.

Module II: Macroeconomics
Money- nature and functions – Inflation and Deflation – Kinds of Banking – commercial banks – Central banking – Credit instrument - Monetary Policy – International trade – Balance of trade and Balance of Payments – taxation – Direct and Indirect taxes – GST- Impact and Incidence of tax- Concept of National Income – Features with reference to developing countries.

Module III: Introduction to Management
Management Theory- Characteristics of management – Systems Approach to management – Concepts of goal, objective, strategies, programmes. Decision making under certainty, uncertainty and risk – Introduction to functional areas of management – Operations management, Human resources management, marketing management.

Module IV: Financial and Inventory Management
Need for Financial Management – Types of financing (Short term and long term) - Borrowing – Equity financing – Analysis of Financial Statement – balance sheet – Profit and Loss account – Fund flow statement – Ratio Analysis . Functions and objectives of Inventory management – Decision models – Economic Order Quantity (EOQ) model – sensitivity analysis of EOQ model - inventory model with planned shortages – Periodic order quantity – single period Inventory models

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Konni, Donnel C.O. and Weighnrich. H., Management, Eight Edition, McGraw Hill International Book Company, 1997.
- Philip Kotler, Marketing Management, Prentice-Hall of India, Edition 1998.
- G.W. Plossl, Production and inventory control by, Prentice Hall.
- Paul A Samuelson and William D Nardhaus, Economics, McGraw Hill International Edition.
- Barthwal R R, Industrial Economics – An Introductory Text Book, New Age International Pvt Ltd, 2000.
- Aninnya Sen, Microeconomics – Theory and Applications, OUP.
- Sharma J.L., Construction management and accounts, Sathya Prakashan, New Delhi, 1994.
- Srinath,L.S. An Introduction to Project Management, Tata McGraw Hill publications, 1995.

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NUMERICAL ANALYSIS AND PROGRAMMING

Course Code: CIV2401 **Credit Units: 03**

Course Objective:
This course deals with the techniques of numerical analysis, which gives the solution to applied problem when ordinary analytical method fails. Emphasis is given on computer programming also so that the given techniques can be used in design of engineering and scientific problems.

Course Contents:
Module I
Solution of Algebraic and Transcendental Equation
Error in a series approximation, Bisection Method, Iteration method, Method of false position, Newton-Raphson method
Solutions of Simultaneous equation
Gauss elimination method, Jacobi iteration method, Gauss Seidal method

Module II: Interpolation
Finite Differences, Difference tables
Polynomial Interpolation**:** Newton's forward and backward formula
Central Difference Formulae: Gauss forward and backward formula.
Interpolation with unequal intervals: Lagrange's Interpolation, Newton Divided difference formula

Module III: Numerical Integration and Differentiation
Introduction, Numerical differentiation Numerical Integration: Trapezoidal rule, Simpson's 1/3 and 3/8 rules.

Module IV: Solution of differential Equations
Euler's Method, Runga-Kutta Methods.

Module V: Statistical Computation
Frequency chart, Curve fitting by method of least squares, fitting of straight lines, polynomials, exponential curves etc, Data fitting with Cubic splines.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- Rajaraman V, "Computer Oriented Numerical Methods", Pearson Education
- Gerald & Whealey, "Applied Numerical Analyses", AW
- Jain, Iyengar and Jain, "Numerical Methods for Scientific and Engineering Computations", New Age Int.
- Grewal B S, "Numerical methods in Engineering and Science", Khanna Publishers, Delhi

References:
- T Veerarajan, T Ramachandran, "Theory and Problems in Numerical Methods, TMH
- Pradip Niyogi, "Numerical Analysis and Algorithms", TMH
- Francis Scheld," Numerical Analysis", TMH
- Sastry S. S, "Introductory Methods of Numerical Analysis", Pearson Education.
- Gupta C.B., Vijay Gupta, "Introduction to Statistical Methods", Vikas Publishing.
- Goyal, M, "Computer Based Numerical and Statistical Techniques", Firewall Media, New Delhi.

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STRUCTURAL ANALYSIS-I

Course Code: CIV2402 **Credit Units: 04**

Course Objective:
Structural Analysis, being the critical part in designing building and other structures, is important. Elastic theorems fixed and continuous beams, circular beams over simple support and theory of columns are covered in this course.

Course Contents:

Module I: Deflection of beams
Differential equation of the elastic curve - slope and deflection of beams by method of successive integration - Macaulay's method - Moment area method - Conjugate beam method - Deflection due to shear.

Module II: Elastic theorems and energy principles
Strain energy and complementary energy - review of strain energy due to axial load - bending, shear and torsion - principle of superposition - principle of virtual work - Castigliano's theorem for deflection - theorem of complementary energy - Betti's theorem - Maxwell's law of reciprocal deflections - principle of least work - application of method of virtual work (unit load method) and strain energy method for determination of deflections of statically determinate beams - pin-joined trusses and rigid frames - temperature effects.

Module III: Fixed and continuous beams
Statically indeterminate structures - degree of static and kinematic indeterminacies – brief introduction to force and displacement methods - fixed and continuous beams - force method - analysis by consistent deformation method - application of moment area and conjugate beam methods for fixed beams - theorem of three moments for continuous beams - shear force and bending moment diagrams - deflection and support settlement.

Module IV: Beams curved in plan
Analysis of cantilever beam curved in plan - analysis of circular beams over simple supports
Theory of columns
Axial loading of short strut - long columns - Euler's Formula - Rankine Formula – Secant Formula - eccentric loading - direct and bending stresses – Buckling Load as an eigen value problem.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Texts & References:
- R. Vaidyanathan, P. Perumal, Comprehensive Structural Analysis Vol. I & II, Laxmi Publications, New Delhi
- Reddy C.S., Basic Structural Analysis, 2nd ed., Tata McGraw Hill, New Delhi (2004).
- S Ramamrutham, R Narayan, Theory of Structures

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TRANSPORTATION ENGINEERING-I

Course Code: CIV2404 **Credit Units: 03**

Course Objective:
Modern road design and construction are covered in the syllabus.

Course Contents:

Module I: Highway Classification, Alignment and Geometrical Design
Introduction – Highway development in India - Classification of roads - Typical cross sections of roads in urban and rural area - Requirements and factors controlling alignment of roads - Engineering surveys for highway location - Pavement surface characteristics - Camber and width requirements – Sight distances - stopping and overtaking sight distances, overtaking zone requirements - Design of horizontal alignment - speed, radius, super elevation, methods of providing super elevation, extra widening of pavements, transition curves - Design of vertical alignment - gradient, grade compensation, summit curves and valley curves - worked out problems on all the above topics.

Module II: Traffic engineering
Introduction - Road user, vehicle and traffic characteristics - Speed and volume studies - Simple worked out problems - Principles of design of at-grade intersections -Simple layouts - Objectives, classification and uses of traffic signs and markings - Design of isolated signals by Webster's method.

Module III: Pavement Materials and Design
Desirable properties and testing of highway materials: road aggregates, bituminous materials and subgrade soil - Factors influencing the design of pavements - CBR method and IRC guidelines of flexible pavements design - Design of rigid pavements using IRC charts - worked out problems.

Module IV: Pavement Construction and Maintenance
Historical development of road construction -Construction of earth roads, WBM roads, stabilized roads, bituminous pavements, cement concrete roads and joints in cement concrete roads - Types and causes of failures in flexible & rigid pavements.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Papacostas, C.S., Transportation Engineering and Planning, 3rd ed., Pearson Education, New Delhi (2008)
- O' Flaherty Coleman. A., Transport Planning and Traffic Engineering, Elsevier, New Delhi (2008).
- Slinn, Mike, Traffic Engineering Design (Principles and Practice), Elsevier, New Delhi (2008), O'Flaherty, Coleman A., Highways (The Location, Design, Construction and Maintenance of Pavement) 4th ed, Elsevier, New Delhi (2008).

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SURVEYING-II

Course Code: CIV2411 **Credit Units: 02**

Course Objective:
Geoinformatics is an important data system for all civil engineering activities including construction of structures, dams, water systems etc. Correct and reliable information and geographical data are a requirement today. The course thus addresses this issue.

Course Contents:

Module I
Triangulation - principle - reconnaissance - selection of site for base line - selection of stations - orders of triangulation - triangulation figures - scaffolds and signals - marking of stations - intervisibility and heights of stations - satellite stations - base line measurement - equipment and corrections - adjustment of observations.

Module II
Survey adjustments and theory of errors – introduction – laws of accidental errors –probability curve – principle of least squares – laws of weights – probable error – normal equation – most probable value – method of correlates – angle adjustment – station adjustment – figure adjustment – adjustment of triangles.

Module III
Curves - types of curves - elements of a curve - simple curves - different methods of setting out – introduction to compound curves - reverse curves, transition curves, vertical curves.

Module IV
Photogrammetry – terrestrial and aerial photogrammetry – heights and distances from Photographs – flight planning — photo mosaic – photo interpretation – applications of photogrammetry. GNSS – GPS – differential GPS.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Texts & References:
- S.K Duggal, Sruveying Vol. I and II, 2nd ed., Tata McGraw Hill, New Delhi (2004).
- Arora K.R., Surveying Vol. I & II, Standard Book House, New Delhi (2008)
- Punmia B.C., Ashok Kr. Jain, Arun Kr. Jain, Surveying Vol. I &II, Laxmi Pub, New Delhi (2004)

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FLUID MECHANICS

Course Code: CIV2412 **Credit Units: 04**

Course Objective:
The objective of Fluid Mechanics subject is that students should understand the, properties of fluids, pressure measurement devices, hydraulic forces on surfaces, bouncy and flotation in fluids, kinematics and static behaviour of fluids, dimension and model analysis, laminar and turbulent flow, flow through pipes and orifices, boundary layer theory.

Course Contents:

Module I: Fluid Properties and Fluid Statics
Newtonian and Non-Newtonian Fluids; Viscosity; Incompressible and compressible fluids, compressibility. Forces on plane surfaces, forces on curved surfaces, buoyant forces, and stability of floating bodies, metacentre and metacentre height.

Module II: Kinematics of Fluid Motion
Steady and unsteady flow; uniform and non-uniform flow; Laminar and turbulent flow; streamline, path line and streak line; continuity equation, irrotational and rotational flow, velocity potential and stream function, vortex flow, free and forced vortex.

Module III: Dynamics of Fluid Flow
Euler's equation of motion and its integration to yield Bernoulli's equation, its practical applications – Pilot tube, Venturi meter; steady flow momentum equation, force exerted on a pipe bend.

Module IV: Dimensional Analysis and Principles of Similarity
Buckingham π-Theorem and its applications, Geometric, Kinematics and Dynamic similarity; Dimensionless numbers-Reynolds, Froude, Euler, Mach, Weber Number and their significance.

Module V: Laminar and Turbulent Flow
Reynold's experiment, critical velocity, steady laminar flow through a circular tube, flow between parallel plates. Transition from laminar to turbulent flow, courses of turbulence, velocity distribution law near a solid boundary, velocity distribution in rough pipes, Hazen – Williams's formula.

Module VI: Analysis of Pipe Flow
Energy losses, minor losses in pipe lines, concept of equivalent length, flow between two reservoirs, and multiple pipe systems – in series and parallel, siphon.

Module VII: Flow Measurements
Measurement of flow using Venturi meter, orifice meter, Pitot tube, measurement of flow in open channels – rectangular, triangular, trapezoidal weir, Cipoeletti weir.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- R.K. Bansal, "Fluid Mechanics & Hydraulic Machines", Laxmi Publications (P) Ltd., 2002.
- Gupta, S. C., Fluid Mechanics and Hydraulic Machines, Pearson Education, 2007
- D.S. Kumar, "Fluid Mechanics and Fluid Power Engineering", S.K. Kataria& Sons, 2000.

References:

- F. M. White, Introduction to Fluid Mechanics, McGraw Hill
- I.H. Shames, "Mechanics of Fluids", Tata McGraw Hill
- Douglas, J. F., Gasiorek, J.M. and Swaffield, J., Fluid Mechanics, Pearson Education, 4/e, 2006
- V.L. Streeter and E.B. Wylie, "Fluid Mechanics", Tata McGraw Hill
- Massey B S, Mechanics of Fluids, Van Nostrand Reinhold Co

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NUMERICAL ANALYSIS AND PROGRAMMING LAB

Course Code: CIV2405 **Credit Units: 01**

Course Contents:

Assignments will be provided for the following:

- Analysis of various numerical and statistical techniques

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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SURVEYING PRACTICAL

Course Code: CIV2407 **Credit Units: 01**

Course Contents:

List of Exercises:

1. Introduction to Total Station including the settings etc.
2. Measurement of horizontal distance using Total Station.
3. Introduction to Measurement of Horizontal and Vertical angles by the use of Total Station.
4. Traversing by use of Total Station.
5. Setting out of Simple Curves – Linear Method.
6. Setting out of Simple Curves – Angular Method.
7. Setting out of Transition Curve.
8. Layout of a building.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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FLUID MECHANICS LAB

Course Code: CIV2413 **Credit Units: 01**

Course Contents:

1.Verification of Bernoulli's Theorem

2.Experiment using Venturimeter

3.Determination of coefficient of Discharge C_d, C_c, $C_!$ Using

4.Circular/triangular/rectangular orifice

5.To find major head losses in a pipe line

6.To find minor head losses in a pipe line (sudden expansion/contraction/bend)

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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FLUID MACHINERY

Course Code: CIV2414 **Credit Units: 03**

Course Objective:
Fluid power systems cover generation, transmission, and control applications of power by using pressurized fluids. This course imparts the knowledge of different fluid power systems (pneumatic and hydraulic) which are used in industries and hydropower plants.

Course Contents:

Module I:Introduction
Euler's equations for turbo machines; impulse and reaction forces due to fluid systems on stationery and moving system of vanes; jet propulsion.

Module II: WaterTurbines
Classification: Pelton, Francis, Propeller and Kaplan turbines; velocity triangles; efficiency; draft tubes, governing.

Module III: Pumps
Centrifugal pumps, velocity triangles, efficiency, turbine pumps, axial and mixed flow pumps.

Module IV: Performance of Fluid Machines
Similarity laws applied to rotodynamic machines; specific speed, unit quantities; characteristic curves; use of models; cavitations and attendant problems in turbo machines; selection of turbines hydroelectric plants.

Module V: HydraulicPower Transmission
Transmission of hydraulic power through pipe lines; water hammer; precautions against water hammer in turbine and pump installations: hydraulic ram.

Module VI: PowerHydraulics
Positive pumps: gear, vane, screw, pump, variable delivery valves: flow control, pressure control, direction control, solenoid operated valve, hydraulic circuits, fluid coupling and torque converter.
Pneumatic Power: Basic principles, comparison of pneumatic and hydraulic Systems.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- Gupta, S. C., Fluid Mechanics and Hydraulic Machines, Pearson Education, 2007
- R.K. Bansal, "Fluid Mechanics & Hydraulic Machines", Laxmi Publications (P) Ltd., 2002.

References:
- Dr. D.S. Kumar, "Fluid Mechanics & Fluid Power Engineering", S.K. Kataria& Sons,2001
- D.R. Malhotra & N.K. Malhotra, "The Fluid Mech. & Hydraulics", Satya Prakashan, 2001
- V.P. Gupta, Alam Singh, Manish Gupta, "Fluid Mechanics, Fluid Mechanics & Hydraulics", CBS Publishers; 1999.

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HYDROLOGY AND FLOOD CONTROL

Course Code: CIV2415 **Credit Units: 03**

Course Objective:
This course deals with advanced concept of hydrology.

Course Contents:

Module I
Introduction hydrologic cycle, water budget equations, world water balance, application in engineering. Precipitation: Forms of precipitation, measurement, depth-area-duration & intensity-duration- frequency relationships, probable maximum precipitation.

Module II
Abstraction from Precipitation: Evaporation – process, measurement and estimation; Evapotranspiration-
measurement and estimation; Initial Losses- Interception & Depression storage; Infiltration- process, capacities, indices, measurement & estimation

Module III: Runoff and Hydrographs
Hydrograph, runoff characteristics of stream, Yield, Rainfall-runoff correlations, flow duration curve, mass curve, droughts and floods. Factors affecting flood hydrographs, unit hydrograph and its analysis, s-curve hydrograph, synthetic and instantaneous unit hydrographs.

Module IV: Flood
Rational method, empirical formulae, unit hydrograph method, flood frequency studies, statistical analysis, regional flood frequency analysis, design storm & design flood, risk/reliability and safety factor; Flood Routing: Basic equation, hydrologic storage routing & attenuation, hydrologic channel routing, flood forecasting & control, hydraulic method of flood routing.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- 'Hydrology for Engineers' by Linsley R. K., Kohler M. A. and Paulhus J. L. H.
- 'Engineering Hydrology' by K. Subramanya
- 'Hydrology: Principles. Analysis. Design' by Raghunath H. M.
- 'Handbook of Applied Hydrology' by Chow V. T.
- 'Irrigation: Theory & Practice' by Michael A. M.

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REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEMS

Course Code: CIV2416 **Credit Units: 03**

Course Objective:
This course deals with remote sensing and geographic information systems.

Course Contents:
Module I
Concepts and foundations of remote sensing- electromagnetic spectrum, energy sources and radiation principles, energy interactions in the atmosphere and with earth surface features, data acquisition and interpretation, reference data, ideal remote sensing systems, characteristics of real remote sensing systems. Classification of maps, map scale, spatial reference system, map projections, grid systems, linkage of GIS to remote sensing. Radar principle- Factors affecting microwave measurements, radar wavebands, SLAR systems, interaction between microwaves and earth's surface. Basic principles of photogrammetry – geometrical characteristics of aerial photographs, photographic scale, ground coverage, area measurement, relief displacement of vertical features, image parallax, ground control, mapping.

Module II
Remote sensing platforms and sensors - Satellite system parameters, sensor parameters, imaging sensor systems, earth resources and meteorological satellites with microwave sensors, scanners, radiometers. The Indian Remote Sensing Program. Data types and format, scale and legend.
Visual Image Interpretation - Digital Image Processing - Basic character of a digital image, image rectification & restoration, preprocessing, registration, enhancement, contrast, spatial feature and multi image manipulation, spatial filtering, image transformations, image classification, performance analysis, data merging and GIS integration.

Module III
GIS overview – what is GIS, components, definitions & terminology, uses, GIS queries & architecture, theoretical models & framework, GIS technology trends, data sources, collection, and entry, data formats & standards, types of analysis, spatial data modeling, GIS data management, database models, storage of data, object based GIS models, data input & editing, data quality issues. Data analysis & modeling – Integration of remote sensing & GIS.

Module IV
Application of Remote Sensing& GIS in natural resources management with specific reference to impact of mining activities on environment, biodiversity, coastal zone protection, flood management, forest protection, monitoring urban growth, managing watersheds & water resources, hydrologic modeling, preventing natural disasters etc.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Thomas. M. Lillesand and Ralph. W. Kiefer, Remote Sensing and Image Interpretation:, John Wiley and Sons, Inc., 2002
- M. Anji Reddy, Text Book of Remote Sensing and Geographical Information Systems:, B.S. Publications, 2001
- Ian Heywood, Sarah Cornelius, and Steve Carver, An Introduction to Geographical Information Systems, Pearson Education Asia, 2001
- George. B. Korte, The GIS Book:, Onward Press, Thomson Learning, 2001
- D. P. Rao, Association of Exploration Geophysicists, 1995, Remote Sensing for Earth Resources.

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Syllabus - Fifth Semester

STRUCTURAL ANALYSIS-II

Course Code: CIV2501 **Credit Units: 03**

Course Objective:
The course builds upon the earlier course of Structural Analysis I and deals with more advanced methods.

Course Contents:

Module I: Force method of analysis of indeterminate structures Analysis of rigid frames of different geometry by consistent deformation method – settlement effects - analysis of pin-jointed trusses by consistent deformation method - externally and internally redundant trusses - effects of settlement and prestrains.

Module II: Displacement method of analysis of indeterminate structures Slope deflection method - analysis of continuous beams - beams with overhang - analysis of rigid frames - frames with sloping legs - gabled frames - frames without sway and with sway - settlement effects - moment distribution method as successive approximation of slope deflection equations - analysis of beams and frames - non-sway and sway analyses - Kani's method as iterative method of analysis of frames (outline only)

Module III: Moving Loads & Influence Lines
Introduction to moving loads - concept of influence lines - influence lines for reaction, shear force and bending moment in simply supported beams - influence lines for forces in trusses – analysis for different types of moving loads - single concentrated load - several concentrated loads - uniformly distributed load shorter and longer than the span.

Module IV: Cables, suspension bridges and arches
Analysis of forces in cables - suspension bridges with three-hinged and two-hinged stiffening girders - theory of arches - Eddy's theorem - analysis of three-hinged and two-hinged arches - settlement and temperature effects.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Wang C.K., Statically Indeterminate Structures, McGraw Hill, New York, 1983.
- Wilbur J.B. & Norris C.H., Elementary Structural Analysis, McGraw Hill, 1960.
- Wang C.K., Intermediate Structural Analysis, McGraw Hill, 1983.
- Timoshenko S.P. & Young D.H., Theory of Structures, McGraw Hill, 1965.
- Kinney S.J., Indeterminate Structural Analysis, Oxford & IBH, 1985.
- Matheson J.A.L., Hyperstatic Structures, John Wiley and Sons, 1996.
- Reddy C.S., Basic Structural Analysis, Tata McGraw Hill
- Negi L.S. & Jangid R.S, Structural Analysis, Tata McGraw Hill
- Rajasekaran S. & Sankarasubramanian G., Computational Structural Mechanics, PHI

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PRINCIPLES OF STRUCTURAL DESIGN

Course Code: CIV2502 **Credit Units: 03**

Course Objective:
Based on the course Structural Analysis the student should be able to start design of structures using various types of materials.

Course Contents:

Module I: Design Philosophy
Introduction –Structures and structural systems– Introduction – materials – mix design by IS method – basic properties of concrete and reinforcement, testing of concrete , Introduction to Various Design Philosophies– design considerations – loading standards – working stress method(WSM) – ultimate load method – probabilistic analysis and design – uncertainties in design –limit state method(LSM) – limit states – multiple safety factor formats – load and resistance factor design format – partial safety factor format.

Module II: Design of RC Beams
Basic design concepts of working stress method (WSM) – analysis of sections by WSM – Design of Rectangular Singly and Doubly Reinforced Sections by Working Stress Method. Assumptions in Limit State Design Method, Design of Rectangular Singly and Doubly Reinforced beams, T-beams, L-beams by Limit State Design Method.

Module III: Shear and Torsion
Behaviour of RC beam in Shear, Shear Strength of beams with and without shear reinforcement, Minimum and Maximum shear reinforcement, design of beam in shear, Introduction to development length, Anchorage bond, flexural bond. (Detailed Examples by Limit State Design Method), Failure of beam under shear, Concept of Equivalent Shear and Moments.

Module IV: Design of Slabs
Design of one way and two way solid slabs by Limit State Design Method, Serviceability Limit States, Control of deflection, cracking and vibrations.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Pillai S.U. & Menon D, Reinforced Concrete Design Tata McGraw Hill, 2003.
- Varghese P.C., Limit State Design of Reinforced Concrete, Prentice Hall of India, 2003.
- Mallick S.K. & Gupta A.K., Reinforced Concrete, Oxford & IBH, 1982.
- Jain A.K., Reinforced Concrete - Limit State Design, Standard Book House, 1998.
- Shetty M.S., Concrete Technology, S. Chand, 1988.
- Punmia B.C., Reinforced Concrete Structures Vol. I, Standard Book House, 2005
- Jain & Jaikrishna, Plain & Reinforced Concrete Vol. I, Nemchand, 2000.
- Sinha S.N., Reinforced Concrete Design, Tata McGraw Hill, 2005.
- Ram Chandra, Design of Steel Structures Vol. I, Standard Book House, 2005.
- Negi L.S., Design of Steel Structures Vol. I, Tata McGraw Hill, 2005.
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TRANSPORTATION ENGINEERING-II

Course Code: CIV2503 **Credit Units: 03**

Course Objective:
This course deals with the design concept of railways, airport and tunnel.

Course Contents:

Module I: Components & Geometric Design of Railways
Introduction. Typical cross-sections. Various gauges. Coning of wheels and tilting of rails. Functions and requirements of component parts of a railway track. Creep of rails. Geometrical design of railway track. Horizontal curves, radius, superelevation, cant deficiency, transition curves, safe speed on curves, different types of gradients, grade compensation. Worked out problems.

Module II: Railway Operation and Control
Points and crossings and their design. Track junctions and simple track layouts. Details of different types of stations and yards. Signaling and interlocking. Control of train movements. Absolute block . Automatic block system and CTC system. Railway Construction and Maintenance: Construction of railway track: earthwork, plate laying and packing. Maintenance of track-alignment, gauge, renewal of component parts and drainage, modern methods of track maintenance.

Module III: Tunneling
Tunnel alignment and grade. Size and shape of a tunnel. Methods of tunneling in hard rocks. Full face method, heading and bench method, drift method. Methods of tunneling in soft soils. Compressed air and shield tunneling Shafts in tunnels. Ventilation of tunnel and various methods. Lining of tunnels. Drainage and lighting of . Micro Tunneling. Trenchless technology.

Module IV: Airport planning and Design
Introduction. Aircraft characteristics and their influence on planning of airports. Airport obstructions and zoning. Component parts of airport and site selection. Runway design. Orientation, basic runway length, corrections and geometric. Design of taxiways and aprons - Terminal area planning. Facilities in terminal area and their planning concepts, aircraft parking configurations. Airport drainage system. Surface and subsurface drainage systems and their design.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
- Antia K.F, Railway Track, New Book Company Pvt. Ltd, 1960.
- Agarwal M.M., Railway Engineering, Prabha and Co
- Khanna S.K & Arora M.G., Airport Planning and Design, Nemchand & Bros.
- Horonjeff R., Planning and Design of Airports, Mc Graw Hill
- Mundrey J.S, Railway Track Engineering, TMGS, 1988.

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GEOTECHNICAL ENGINEERING-I

Course Code: CIV2551 **Credit Units: 03**

Course Objective:
Soil mechanics and related topics are important areas in Civil Engineering and the first part of Geotechnical Engineering deals with soils and their characteristics.

Course Contents:
Module I: Nature of soil and functional relationships
Soil type -Concepts of single grained, honey combed and flocculent structure and their effects on the basic soil properties - 3 phase system - void ratio - specific gravity - dry density - porosity - water content - saturated unit weight - submerged unit weight - degree of saturation. Laboratory and field identification of soils: Determination of water content by oven drying -Specific gravity using pycnometer and specific gravity bottle - Grain size analysis by sieve analysis, hydrometer analysis and pipette analysis - Atterberg limits and indices – Visual identification by simple field tests - Field density by core cutter, sand replacement and wax coating methods. Classification of soils: Necessity - Principles of classification - I.S. classification – Plasticity charts - Group index.

Module II: Soil Water, Permeability and Stress Distribution
Soil water: Types - Effective stress - Total stress - Pore pressure - Pressure diagrams. Permeability: Definition - Darcy's law - Factors affecting permeability – Laboratory determination - Stratified soils: average permeability. Stress distribution: Boussinesq's equations for vertical pressure due to point loads- Assumptions and limitations - pressure bulb – Influence diagram - Vertical pressure due to uniformly distributed loads, line loads and strip loads - Newmark charts and their use - Westergaard's solution.

Module III: Consolidation and Compa tion
Consolidation: Definition - Concepts of coefficient of compressibility - Coefficient of volume change and compression index - e-log p curves - Terzaghi's theory of one dimensional consolidation – Determination of coefficient of consolidation- pre-consolidation pressure difference between consolidation and compaction. Compaction: Definition and objectives of compaction - Proctor test and modified proctor test - Concept of OMC and maximum dry density - Zero air voids line -Factors influencing compaction.- Effect of compaction on soil properties - Field compaction methods - Proctor needle for field control.

Module IV: Shear Strength and Stability of Slopes
Shear Strength: Definition - Mohr's strength and stress circles - origin of planes - Mohr's envelope - Mohr-Coulomb strength theory -Direct, triaxial and UCC tests - Drainage conditions - Measurement of pore pressure - Vane shear tests -Total and effective stress -strength parameters – Stress path, Liquefaction of sand - Choice of test conditions for field problems. Stability of slopes: Slope failure, base failure and toe failure - Swedish circle method - $\varphi=0$ analysis and $c=0$ analysis - Friction circle method - Taylor's stability number -Stability charts - Sliding block analysis.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Terzaghi K. & Peck R.B., Soil Mechanics in Engineering Practice, John Wiley Sons, 1967.
- Alam Singh, Soil Engineering-Theory and Practice, Asia Pub, 1967.
- Punmia B.C., Soil Mechanics and Foundations, Saurabh,1992.
- Murthy V.N.S., Soil Mechanics and Foundation Engineering, Dhanpat Rai, 1984
- Khan I.H., Text Book of Geotechnical Engineering, Prentice Hall of India

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MATERIAL TESTING LAB

Course Code: CIV2504 **Credit Units: 01**

List of Exercises

1. Concrete:
   (a) Slump Test of Concrete (b) Compaction Factor Test of Concrete (c) Vee-Bee Test of Concrete (d) Compressive Strength.

2. Fine Aggregate:
   (a) Fineness Modulas (b) % of material less than 75 micron (c) Silt Content.

3. Flakiness Index.

4. Elongation Index.

5. Rebound Hammer Test.

6. Ultrasonic Pulse Velocity Meter

7. Bending test on steel beams.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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TRANSPORTATION ENGINEERING LABORATORY

Course Code: CIV2509 **Credit Units: 01**

LIST OF EXPERIMENTS

Course objective: The students will learn different tests on aggregates and bitumen. They will also learn about the significance of these tests.

1. Impact test and Abrasion test of aggregate
2. Elongation and Flakiness index of aggregate
3. Water absorption test of aggregate
4. CBR test for subgrade
5. Determination of Flash and Fire test of bitumen
6. Determine the specific gravity of bitumen
7. Determination of penetration value of bitumen.
8. Determination of softening point test.
9. Determination of ductility of bitumen.
10. Determination of viscosity.
11. Determination of bitumen by centrifuge extractor.
12. Pavement evaluation and maintenance test.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text book & Reference:

- Khanna, S.K., Justo, C.E.G., and Veeraragavan, A., Highway Materials laboratory testing, Nem Chand & Brothers
- Relevant IRC and AASHTO codes

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SUMMER INTERNSHIP EVALUATION-I

Course Code: CIV2535 **Credit Units: 03**

Methodology:
Practical training is based on the theoretical subjects studied by students. An industry visit will be planned for each student and on-site practical training will be imparted with the help of the industry guide. The students are to learn various industrial, technical and administrative processes followed in the industry. On completion of the practical training the students are to present a report covering various aspects learnt by them and give a presentation on same.

Examination Scheme:

Feedback from industry/work place	20
Training Report	40
Viva	15
Presentation	25

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SUSTAINABLE DEVELOPMENT IN CIVIL ENGINEERING

Course Code: CIV2510 **Credit Units: 03**

Course Objectives: Learn about the principles, indicators and general concept of sustainability. Apprehend the local, regional and global impacts of unsustainable designs, products and processes. Student shall be able to apply the sustainability concepts in engineering. Know built environment frameworks and their use. Understand how building and design is judged and valued by clients and stakeholders and how to implement sustainability.

Course Contents:

Module-I

Introduction: Sustainability - Introduction, Need and concept of sustainability, Social-environmental and economic sustainability concepts. Sustainable development, Nexus between Technology and Sustainable development, Challenges for Sustainable Development. Multilateral environmental agreements and Protocols - Clean Development Mechanism (CDM), Environmental legislations in India - Water Act, Air Act.

Module-II

Global Environmental Issue: Resource degradation, Climate change, Regional and Local Environmental Issues. Carbon credits and carbon trading, carbon foot print Carbon sequestration – Carbon capture and storage (CCS). Environmental management standards, ISO 14000 series, Life Cycle Analysis (LCA) - Scope and Goal, Bio-mimicking

Module-III

Sustainable Design: Basic concepts of sustainable habitat, Green buildings, green materials for building construction, material selection for sustainable design, green building certification- GRIHA & IGBC Certification for buildings, Energy efficient building design- Passive solar design technique, Thermal storage, Cooling strategies, high performance insulation. Sustainable cities, Sustainable transport.

Module-IV

Clean Technology and Energy: Energy sources: Basic concepts-Conventional and non-conventional, solar energy, Fuel cells, Wind energy, Small hydro plants, bio-fuels, Energy derived from oceans, Geothermal energy. Rainwater harvesting

Module-V

Green Engineering: Green Engineering concepts, Sustainable Urbanization, industrialization and poverty reduction; Social and technological change, Industrial Processes: Material selection, Pollution Prevention, Industrial Ecology, Industrial symbiosis.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Reference Books:

- Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication
- ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications-Rating System, TERI Publications - GRIHA Rating System
- Ni bin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, McGraw-Hill Professional.
- Twidell, J. W. and Weir, A. D., Renewable Energy Resources, English Language Book Society (ELBS).
- Malcolm Dowden, Climate Change and Sustainable Development: Law, Policy and Practice
- Daniel A. Vallero and Chris Brasier, " Sustainable Design: The Science of Sustainability and Green Engineering", WileyBlackwell
- Sustainable Engineering Practice: An Introduction, Committee on Sustainability, American Society of Civil Engineers.

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AIR AND WATER POLLUTION CONTROL ENGINEERING

Course Code: CIV2511 **Credit Units: 03**

Course Objectives:

- To impart knowledge on the principles and design of control of indoor/ particulate / gaseous air pollutant and its emerging trends.
- To introduce the fundamentals of mathematical models for water quality and the importance of model building.

Course Contents:

MODULE-I: INTRODUCTION TO AIR POLLUTION

Structure and composition of Atmosphere – Sources and classification of air pollutants - Effects of air pollutants on human health, vegetation & animals, Materials & Structures – Effects of air Pollutants on the atmosphere, Soil & Water bodies – Long- term effects on the planet – Global Climate Change, Ozone Holes – Ambient Air Quality and Emission Standards – Air Pollution Indices – Emission Inventories.

MODULE-II: AIR QUALITY MONITORING AND MODELLING

Ambient and Stack Sampling and Analysis of Particulate and Gaseous Pollutants -Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Transport & Dispersion of Air Pollutants - Introduction to Air Quality Modeling. Necessity, application and limitation of air quality modelling. Introduction to Dispersion Modeling, Photochemical Modeling and Receptor Modeling. Different air quality Dispersion models and their limitations.

MODULE-III: CONTROL OF AIR POLLUTANTS

Primary considerations in designing effective control strategy: Environmental, Engineering and Economic Factor - Factors to be considered while selecting control equipments - Various mechanisms to control gaseous pollutants and particulate matter. Control Equipment design for particulate matter: Gravity chamber, Cyclone separator, Electrostatic precipitator, fabric filter, bag filter, Wet scrubber, Venturi scrubber and absorption towers.Control Equipment design for gaseous pollutants: Absorption, Adsorption, Condensation and Incineration.

MODULE-IV: SURFACE AND SUB-SURFACE WATER QUALITY MODELLING

Water quality modeling of Streams, Lakes and impoundments and Estuaries – Water quality– model sensitivity – assessing model performance; Models for dissolved oxygen, pathogens and BOD-Streeter Phelps model for point and distributed sources - Modified Streeter Phelps equations -Toxicant modeling in flowing water - Groundwater flow and mass transport of solutes, Degradation of organic compounds, application of concepts to predict groundwater contaminant movement, seawater intrusion – basic concepts and modeling.

MODULE-V: AIR AND WATER QUALITY MODELLING SOFTWARES

Exposure to computer models for surface water quality, groundwater quality and air quality - Introduction to commonly used air quality models such as AERMOD, CALPUFF, ISCST3 and CALINE4 etc.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

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Text Books/References:

- Steven C. Chapra, “Surface Water Quality Modeling”, Tata McGraw-Hill Companies,Inc., New Delhi, 2008.
- “Water Quality Modelling for Rivers and Streams” Authors: Benedini, Marcello, Tsakiris, George, Springer Netherlands 2013.
- **“**Hydrodynamics and Water Quality**:** Modeling Rivers, Lakes, and Estuaries”, Zhen-Gang Ji, John Wiley & Sons, 2008.
- “Modeling Groundwater Flow and Contaminant Transport By Jacob Bear, A. H.-D. Cheng, Springer Science & Business Media, 2010.
- “Mathematical Modeling of Groundwater Pollution” Ne-Zheng Sun, Alexander Sun, Springer New York, 2012
- Lawrence K. Wang, Norman C. Parelra, Yung Tse Hung, "Air Pollution Control Engineering", Tokyo, 2004.
- Noel de Nevers, "Air Pollution Control Engg"., Mc Graw Hill, New York, 1995.
- David H.F. Liu, Bela G. Liptak „Air Pollution“, Lweis Publishers, 2000.
- Anjaneyulu. Y, “Air Pollution & Control Technologies” Allied Publishers (P) Ltd.,India, 2002. Arthur C.Stern, „Air Pollution (Vol.I – Vol.VIII)“, Academic Press, 2006.
- Wayne T.Davis, „Air Pollution Engineering Manual“, John Wiley &Sons, Inc., 2000.
- Daniel Vallero “ Fundamentals of Air Pollution”, Fourth Edition,2008.

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COMPUTER APPLICATION IN HYDRO ENGINEERING

Course Code: CIV2512 **Credit Units: 03**

Course Objective:
This course deals with computer application in hydro engineering.

Course Contents:

Module I
Review of Basic Hydraulic Principles – General flow characteristics, Energy and momentum principles and Equations, Pressure and free surface flows, HGL and TEL, Major and minor losses, Computer applications to simple flow problems, Introduction to SAP.
Storm Sewer Design and Gravity Piping Systems – Review of basic hydrologic principles, Gradually varied flow, Mixed flow profiles, Storm Sewer Applications.

Module II
Drainage Inlet Design, Culvert Hydraulics and Design.
Pressure Piping Systems & Water Quality Analysis – Analysis and design of water distribution systems
Introduction to Some Packages such as Flow Master, Storm CAD, Culvert Master, Water CAD, and Sewer CAD and EPANET.

Module III
Flow Routing - Hydrologic and hydraulic methods of routing, Sanitary sewer design including extended period simulation and routing.
Watershed modeling – Basic principles – Introduction to SWMM

Module IV
Water quality modeling in streams- Basic models, Introduction to software packages.
Ground water quality modeling
Introduction to remote sensing and GIS applications and web based applications

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Michael. M. Meadows & Thomas M Walski, Computer Applications in Hydraulic Engineering, Haestad Press, 2001.
- QIP short term course notes advanced IT applications in Civil Engineering: IIT, Kharagpur, 2001.
- L.W. Mays, Water Resources Engineering, John Wiley and Sons, 2001.
- S.C. Chapra, Surface Water Quality Modeling, McGraw Hill, Inc., 1997.

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Syllabus - Sixth Semester

ENVIRONMENTAL ENGINERING-I

Course Code: CIV2601 **Credit Units: 03**

Course Objective:
Based on course Environmental studies, the water resources and their management for environmental suitability are studied in this course.

Course Contents:

Module I: Scope of Environmental Engineering
Water Supply Engineering. Quantity of water. Types of water demand. Fluctuation in demand. Factors affecting consumption. Forecasting population. Design period.

Module II: Sources of water
Surface water sources. Intakes. Ground water Sources. Estimation of yield from various ground water sources. Quality of water. Drinking water standards – Water quality parameters- effects on human health- Methods of Physical, Chemical and Bacteriological analysis of water.

Module III: Treatment of water
Process details and design considerations. Aeration. Coagulation. Flocculation. Sedimentation. Filtration. Disinfection. Miscellaneous and advanced treatments. Iron and manganese removal. Fluoridation and defluoridation. Water Softening. Arsenic removal. Desalination. Membrane filtration.

Module IV: Water supply schemes
Gravitational, pumping and combined schemes. Pumps. Pumping stations. Transmission of water. Materials of water supply pipes. Design of gravity and pumping main. Distribution systems. Different layout of pipe networks.House connection from mains. Different valves, meters and hydrants. Storage reservoirs. Balancing reservoir. Detection and prevention of leaks in the distribution systems. Maintenance of distribution systems.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Garg S. K, Environmental Engineering, Vol. I, Khanna Publications, 2001, New Delhi.
- Birdie G.S & Birdie J.S, Water Supply and Sanitary Engineering, Dhanpat Rai & Sons, 1998, New Delhi.
- Duggal, K.N., Elements of Environmental Engineering, S Chand & Co. Ltd., 2000, New Delhi.
- Mark J. Hammer & Mark J. Hammer Jr., Water and Waste Water Technology, Prentice Hall of India Pvt. Ltd., 1998, New Delhi.
- Fair, Geyer & Okun, Water & Waste Water Engineering, John Wiley, 1966, New York.
- Ernest W. Steel & Terence J. Mc Ghee, Water Supply & Sewage, McGraw Hill, 1990, New York.
- Relevant BIS Codes.

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STRUCTURAL CONCRETE DESIGN

Course Code: CIV2602 **Credit Units: 03**

Course Objective:
This course deals with the design concept of designing concrete structure. As a prerequisite the students should have knowledge of principal of structural design.

Course Contents:
Module I: Design of Columns
Design of Columns by Limit State Design Method- Effective height of columns, Assumptions, Minimum eccentricity, Short column under axial compression, requirements for reinforcement, Column with helical reinforcement, Short column under axial load and uni-axial bending, Design of columns under bi-axial loading by Design Charts
Note: All designs shall be conforming to IS : 456 – 2000

Module II: Design of Footing
Analysis and design of beam curved in plan. 2 Structural behavior of footings, design of footing for a wall and a single column, combined rectangular and trapezoidal footings, Design of strap footing.

Module III: Design of Tank
Design criteria, material specifications and permissible stresses for tanks, design concept of circular and rectangular tanks situated on the ground / underground, design of overhead tanks.

Module IV: Design of Retaining Wall
Structural behavior of retaining wall, stability of retaining wall against overturning and sliding, Design of T-shaped retaining wall, Concept of Counter fort retaining wall. Loads, forces and I.R.C. bridge loadings, Design of R.C. slab culvert.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Pillai S.U. & Menon D., Reinforced Concrete Design Tata McGraw Hill, 2003
- Varghese P.C., Limit State Design of Reinforced Concrete, Prentice Hall of India, 2003
- Mallick S.K. & Gupta A.K., Reinforced Concrete, Oxford & IBH, 1982
- Jain A.K., Reinforced Concrete - Limit State Design, Standard Book House, 1998
- Punmia B.C., Reinforced Concrete Structures Vol. I, Standard Book House,2005
- Jain & Jaikrishna, Plain & Reinforced Concrete Vol. I, Nemchand, 2000
- Sinha S.N., Reinforced Concrete Design, Tata McGraw Hill, 2005
- BIS codes (IS 456, SP 16, SP 24, SP 34)

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WATER RESOURCE ENGINEERING-I

Course Code: CIV2610 **Credit Units: 03**

Course Objective:
This course deals with various concepts of water resources engineering. The course introduces the concept of hydrology, ground water and then deals with irrigation engineering. It also deals with design of dam.

Course Contents:

Module I: Hydrology
Hydrologic cycle- Precipitation, rainfall variations, measurement, presentation of RF data, Mean precipitation, Abstractions from precipitation- Runoff-Long term runoff, empirical formulae, short term runoff- hydrograph analysis. Flood-Rational and Empirical methods for prediction - Design floods. Ground water- Aquifer types-flow of ground water – Well hydraulics-Types of wells-Other sources of ground water.

Module II: Irrigation
Necessity of irrigation and type of irrigation systems.-Total planning concept-Water requirements of crops-Command area-duty-delta. Consumptive use of water –Irrigation efficiency-Irrigation requirement of crops-Reservoir planning-Site investigation-Zones of storage-Reservoir yield-Reservoir losses and Control-Life of reservoir

Module III
Diversion head works-Location – Essential components of Weir and Barrage-Weirs on permeable foundations-Blighs and khoslas seepage theories - Design procedure.
Dams - Types of dams and their selection-Gravity dam-Analysis and design.
Spillways-Different types and suitability.

Module IV
Regulation and control of canal system-Purpose, Types of canal regulation works and their functional aspects. Irrigation Outlets-Requirements, types, non-modular, semi-module and rigid module, selection criterion. River Training - Objective and need, classification of rivers, and river training works, meandering, stages, methods of river training, bank protection, Methods for measurement of discharge.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
- Irrigation Engg. and Hydraulic Structures by S.K. Garg, Khanna Publishers.
- Irrigation, Water Resources, and Water power Engineering By Dr P.N.Modi, Standard Book House 1990
- Engineering Hydrology by K. Subramanya, TMH.
- Irrigation Water Power and Water Resource Engg. by K.R. Arrora.
- Water Resources Engg. By Larry W. Mays, John Wiley India
- Water resources Engg. By Wurbs and James, John wiley India
- Water Resources Engg. By R. K. Linsley, McGraw Hill
- Irrigation and water Resources Engg. By G L Asawa, New age International Publishers
- Irrigation Theory and practices by A.M. Michel.
- Irrigation and water Power engineering by B.C. Punmia, Laxmi Publications.

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GEOTECHNICAL ENGINEERING-II

Course Code: CIV2651 **Credit Units: 03**

Course Objective:
Advanced topics of soil mechanics and the design of foundations are covered in this course.

Course Contents:

Module I: Earth pressure
Earth pressure at rest. Active and passive earth pressure for cohesionless and cohesive soils. Coulomb's and Rankine's theories. Point of application of earth pressure for cases of with and without surcharge in cohesionless and cohesive soils. Culmann's and Rebhan's graphical construction for active earth pressure. Friction circle method for active earth pressure. **Site investigation and soil exploration:** Objectives. Planning. Reconnaissance. Depth of exploration. Methods of subsurface exploration. Test pits. Auger borings. Wash boring. Rotary drilling. Percussion drilling. Core drilling. Sampling. Types of soil samples. Splitspoon sampler. Thin walled sampler. Piston sampler. Denison sampler. Hand cut samples. Location of water table. S.P.T. Field vane shear test. Introduction to geophysical methods. Boring log. Soil profile.

Module II: Bearing capacity
Ultimate and allowable bearing capacity. Terzaghi's equation for bearing capacity for continuous circular and square footings. Types of shear failures. Bearing capacity factors and charts. Effect of water table on bearing capacity. Meyerhoff's bearing capacity heory. Skempton's formulae. Bearing capacity from field tests. Bearing capacity from building codes. Net bearing pressure. Methods of improvement of soil bearing capacity: vibro flotation and sand drains.
Settlement analysis: Distribution of contact pressure. Immediate and consolidation settlement. Estimation of initial and final settlement under building loads. Limitations in settlement computation. Causes of . Permissible, total and differential settlements. Cracks and effects of settlement.

Module III: Foundations
General considerations: Functions of foundations. Requisites of satisfactory foundations. Different types of foundations. Definition of shallow and deep foundation. Selection of type of foundation. Advantages and limitations of various types of foundations. Design considerations . Footings subjected to eccentric loading. Conventional procedure for proportioning footings for equal settlements.
Open excavation: Open foundation excavations with unsupported slopes. Supports for shallow and deep excavations. Stress distribution in sheeting and bracing of shallow and deep excavations. Stability of bottom of excavations. **Raft foundations**: Bearing capacity equations. Design considerations. Conventional design procedure for rigid mat. Uplift pressures. Methods of resisting uplift. Floating foundations.

Module IV: Pile foundations
Uses of piles. Classification of piles based on purpose and material. Determination of type and length of piles. Determination of bearing capacity of axially loaded. Single vertical pile. Static and dynamic formulae. Determination of bearing capacity by penetration tests and pile load tests (IS methods). Negative skin friction. Group action and pile spacing. Analysis of pile groups. Load distribution by Culmann's method. **Caissons and piers:** Open (well) caissons. Box (floating) caissons. Pneumatic caissons. Construction details and design considerations of well foundations. Drilled piers and their construction details.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Text & References:

- Joseph E. & Bowles, *Foundation Analysis & Design*, McGraw Hill
- Leonards G.A., *Foundation Engineering*, McGraw Hill
- Teng W.C., Foundation Design, PHI, 1984
- Tomlinson M.J., Foundation Design & Construction, Pitman, 1963.
- Terzaghi & Peck, Soil Mechanics in Engineering Practice, Asia Publishing
- Arora K.R., *Soil Mechanics & Foundation Engg.*, Standard Publications, 1987.
- Murthy V.N.S., Soil Mechanics & Foundations.
- Punmia B.C., Soil Mechanics & Foundations, Laxmi, 1988.

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GEOTECHNICAL ENGINEERING LAB

Course Code: CIV2605 **Credit Units: 01**

Course Contents:

1. Specific gravity of coarse and fine grained soils.
2. Grain size analysis (a) Sieve analysis (b) Pipette analysis
3. Atterberg's limits and indices
4. Determination of field density (a) sand replacement method (b) core cutter method
5. Determination of coefficient of permeability by
   (a) Constant head method (b) Variable head method
6. Consolidation test
7. Compaction test (a) IS light compaction test (b) IS heavy compaction test
8. California Bearing Ratio test
9. Direct shear test
10. Triaxial shear test
11. Unconfined compressive strength test
12. Laboratory vane shear test

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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PRESTRESSED CONCRETE

Course Code: CIV2607 **Credit Units: 03**

Course Objective:
This course deals with advanced concept of structural concrete design.

Course Contents:

Module I: Materials for prestressed concrete and prestressing systems
High strength concrete and high tensile steel – tensioning devices – pretensioning systems – post tensioning systems.

Module II: Analysis of prestress and bending stresses
Analysis of prestress – resultant stresses at a sector – pressure line or thrust line and internal resisting couple – concept of load balancing – losses of prestress – deflection of beams.

Module III: Strength of prestressed concrete sections in flexure, shear and torsion
Types of flexural failure – strain compatibility method – IS code procedure – design for limit state of shear and torsion.

Module IV: Design of prestressed concrete beams and slabs
Transfer of prestress in pre tensioned and post tensioned members – design of anchorage zone reinforcement – design of simple beams – cable profiles – design of slabs.
A design project for the design and detailing of a large span beam is envisaged at this stage.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- N. Krishna Raju, Prestressed concrete, Tata McGraw Hill, 2000
- T.Y. Lin, Ned H. Burns, Design of Prestressed Concrete Structures, John Wiley & Sons, 2004.
- P. Dayaratnam, Prestressed Concrete, Oxford & IBH,1982
- R. Rajagopalan, Prestressed Concrete, Narosa publishers, 2004.
- BIS codes (IS 1343)

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TRAFFIC ENGINEERING AND MANAGEMENT

Course Code: CIV2608 **Credit Units: 03**

Course Objective:
The students acquire comprehensive knowledge of traffic surveys and studies such as 'Volume Count', 'Speed and delay', 'Origin and destination', 'Parking', 'Pedestrian' and 'Accident surveys'. They achieve knowledge on design of 'at grade' and 'grade separated' intersections. They also become familiar with various traffic control and trafficmanagement measures.

Course Contents:

Module I: Introduction
Significance and scope, Characteristics of Vehicles and Road Users, Skid Resistance and Braking Efficiency (Problems), Components of Traffic Engineering- Road, Traffic and Land Use Characteristics

Module II: Traffic Surveys and Analysis
Surveys and Analysis - Volume, Capacity, Speed and Delays, Origin and Destination, Parking, Pedestrian Studies, Accident Studies and Safety Level of Services- Basic principles of Traffic Flow.

Module III: Traffic Control
Traffic signs, Road markings, Design of Traffic signals and Signal co-ordination (Problems), Traffic control aids and Street furniture, Street Lighting, Computer applications in Signal design

Module IV: Geometric Design of Intersections
Conflicts at Intersections, Classification of 'At Grade Intersections, - Channallised Intersections - Principles of Intersection Design, Elements of Intersection Design, Rotary design, Grade Separation and interchanges - Design principles.

Module V: Traffic Management
Traffic Management- Transportation System Management (TSM) - Travel Demand Management (TDM), Traffic Forecasting techniques, Restrictions on turning movements, Oneway Streets, Traffic Segregation, Traffic Calming, Tidal flow operations, Exclusive Bus Lanes, Introduction to Intelligent Transportation System (ITS).

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Kadiyali L R, Traffic Engineering and Transport Planning, Khanna Technical Publications, Delhi, 2000.
- Khanna K and Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 2001.
- Indian Roads Congress (IRC) specifications: Guidelines and special publications on Traffic Planning and Management
- Guidelines of Ministry of Road Transport and Highways, Government of India.
- Subhash C. Saxena, A Course in Traffic Planning and Design, Dhanpat Rai Publications, New Delhi, 1989.
- Transportation Engineering – An Introduction, C.Jotin Khisty, B.Kent Lall, Prentice Hall of India Pvt Ltd, 2006.

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BASICS OF OPTIMIZATION TECHNIQUES AND MATHEMATICAL MODELING

Course Code: CIV2611 **Credit Units: 03**

Course Objectives: Optimization is the process of obtaining the best result under given circumstances. In design, construction and maintenance of any engineering system, engineers have to take many technological and managerial decisions at several stages. The ultimate goal of all such decisions is either to minimize the effort required or to maximize the desired benefit. A number of optimization methods have been developed for solving different types of optimization problems. In this course, after discussing about the optimization problem formulation, Linear Programming, Non Linear Programming, Dynamic Programming techniques are explained in detail along with number of applications in civil engineering.

Course Contents:

MODULE-I

Introduction and Basic Concepts: Historical Development; Engineering applications of Optimization; Art of Modeling Objective function; Constraints and Constraint surface; Formulation of design problems as mathematical programming problems Classification of optimization problems Optimization techniques – classical and advanced techniques.

MODULE-II

Optimization using Calculus: Stationary points; Functions of single and two variables; Global Optimum Convexity and concavity of functions of one and two variables Optimization of function of one variable and multiple variables; Gradient vectors; Examples Optimization of function of multiple variables subject to equality constraints; Lagrangian function Optimization of function of multiple variables subject to equality constraints; Hessian matrix formulation; Eigen values Kuhn-Tucker Conditions; Examples.

MODULE-III

Linear Programming: Standard form of linear programming (LP) problem; Canonical form of LP problem; Assumptions in LP Models; Elementary operations Graphical method for two variable optimization problem; Examples Motivation of simplex method, Simplex algorithm and construction of simplex tableau; Simplex criterion; Minimization versus maximization problems Revised simplex method; Duality in LP;Primaldual relations; Dual Simplex method; Sensitivity or post optimality analysis Other algorithms for solving LP problems – Karmarkar's projective scaling method

MODULE-IV

Linear Programming Applications: Use of software for solving linear optimization problems using graphical and simplex methods Examples for transportation, assignment, water resources, structural and other optimization problems. Dynamic Programming, Dynamic Programming Applications Advanced Topics in Optimization

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

TEXT BOOK:

- S.S. Rao,"Engineering Optimization: Theory and Practice", New Age International P)Ltd., New Delhi, 2000.
- G. Hadley,"Linear programming", Narosa Publishing House, New Delhi, 1990.
- H.A. Taha,"Operations Research:An Introduction", 5th Edition, Macmillan, New York, 1992.
- K. Deb,"Optimization for Engineering DesignAlgorithms and Examples",Prentice-Hall of India Pvt. Ltd., New Delhi, 1995.
- K.Srinivasa Raju and D. Nagesh Kumar, "Multicriterion Analysis in Engineering and Management",PHI Learning Pvt. Ltd., New Delhi, India, ISBN 978-81-203-3976-7, pp.288, 2 0 1 0.

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Syllabus - Seventh Semester

STRUCTURAL STEEL DESIGN

Course Code: CIV2701 **Credit Units: 03**

Course Objective:
This course deals with design of various steel structures. The prerequisite of this course is that the students should have good understanding of principles of structural design.

Course Contents:

Module-I: General Considerations
Introduction, Advantages of Steel as a Structural. Material, Disadvantages of Steel as a Structural Material, Structural Steel, Stress Strain Curve for Mild Steel, Rolled Steel Sections, Convention for Member Axes, Loads, Dead Load, Live Loads, Environmental Loads, Seismic Forces, Snow and Rain Loads, Erection Loads, Basis for Design, Design Philosophies, Local Buckling of Plate Elements. Introduction to Limit State Design Introduction, Limit States for Steel Design, Limit States of Strength, Limit States of Serviceability, Actios (Loads), Probabilistic Basis for Design, Design Criteria

Module-II: Simple Connections
Riveted, Bolted and Pinned Connections Introduction, Riveted Connections, Patterns of Riveted Joints, Bolted Connections, Types of Bolts, Types of Bolted Joints, Load Transfer Mechanism, Failure of Bolted Joints, Specification for Bolted Joints, Bearing-Type Connections, Prying Action, Tensile Strength of plate, Efficiency of the Joint, Combined Shear and Tension, Slip-Critical Connections, Combined Shear and Tension for Slip-Critical Connections, Working Load Design, Pin Connections
Simple Welded Connections
Introduction, Types, Symbols, Welding Process, Weld Defects, Inspection of Welds, Assumptions in the Analysis of Welded Joints, Design of Groove Welds, Design of Fillet Welds, Fillet Weld Applied to the Edge of A Plate or Section, Fillet Weld for Truss Members, Design of Intermittent Fillet Welds, Plug and Slot Welds, Stresses Due To Individual Forces, Combination of Stresses, Failure of Welds, Distortion of Welded Parts, Fillet Weld Vs Butt Weld, Welded Jointed Vs Bolted and Riveted Joints, Section of Fasteners, Working Load Design

Module-III: Tension Members
Introduction, Types of Tension Members, Net Sectional Area, Effective Net Area, Types of Failure, Design Strength of Tension Members, Slenderness Ratio (λ), Displacement, Design of Tension Member, Lug Angles, Splices, Gusset Plate, Working Load Design

Module-IV: Compression Members
Introduction, Effective Length, Slenderness Ratio (λ), Types of Sections, Types of Buckling, Classification of cross Sections, Column Formula, Design Strength, Design of Axially Loaded Compression Members, Built Up Columns (Latticed Columns), Lacing, Batten, Compression Member Composed ofTwo Components Back to Back, Encased Column, Splices, Design of Column Bases

Module-V: Beams
Introduction, Types of Sections, Behaviour of Beam in Flexure, Section Classification, Lateral Stability of Beams, Lateral Torsional Buckling, Bending Strength of Beams, Laterally Supported Beams, Laterally Unsupported Beams, Shear Strength of Beams, Web Buckling, Bearing Strength, Web Crippling, Deflection, Design Procedure of Rolled Beams, BuiltUp Beams (Plated Beams), Lintels, Purlins, Beam Bearing Plates, Castellated Beam, Effect of Holes in Beam, Introduction to Plate Girder , Introduction to Gantry Girder.

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Ramchandra, Design of Steel Structures Vol I and II, Standard book house, 1991
- P. Dayaratnam, Design of Steel Structures, (Wheeler), 1998
- M. Raghupathi, Design of Steel Structures, Tata McGraw Hill, 1985
- Lin & Breslar, Design of Steel Structures, John Wiley & Sons, 1963
- BIS codes (IS 800, SP: 6 – Part 1 to 6).

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ENVIRONMENTAL ENGINEERING-II

Course Code: CIV2702 **Credit Units: 03**

Course Objective:
This course deals with advanced environmental engineering concepts. It explains the design of various plumbing, treatment plant and solid waste management.

Course Contents:

Module I
Sanitary plumbing – sanitary fixtures – systems of piping – house drainage– connection of house drains and street sewers. Systems of sewerage– Dry weather flow and wet weather flow– sewers and sewer appurtenances – sewage pumping – maintenance of sewers.

Module II
Waste water- Characteristics– sampling – population equivalent — preliminary treatment of waste water – screens – grit chamber – detritus tank – Sedimentation tank.
Biological treatment (process details and design considerations) - Aerobic- Activated Sludge Process- Trickling Filter- Oxidation Ponds

Module III
Anaerobic treatment- Anaerobic digesters- Septic Tanks- Soak pits
Waste water disposal – disposal into stream –fundamentals of stream sanitation- disposal by irrigation – sludge treatment and disposal

Module IV
Solid waste management: Generation- on site handling and storage- transfer and transportprocessing-resource recovery- treatment and disposal.
Air pollution and control – sources –pollutants and their health effects– particulate and gaseous pollution control devices (fundamentals)-Settling chambers- Electrostatic precipitators- Cyclones-Wet Collectors-Gas absorption by tray and packed towers

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Birdie G. S and Birdie J.S, Water Supply and Sanitary Engineering, Dhanpat Rai and Sons (1998), New Delhi
- Duggal K.N., Elements of Environmental Engineering, S. Chand and Co. Ltd. (2000), New Delhi
- Garg S.K, Environmental Engineering Vol. II¸ Khanna Publications (2001) New Delhi
- Ehlers VM & Steel EW, Municipal & Rural Sanitation, 6th Edn.(1965)McGraw Hill.
- Sawyer and McCarte, Chemistry for Environmental Engineering, Tata McGraw-Hill, (2003) New Delhi,.
- Fair, Geyer & Okun, Water and Waste water Engineering, John Wiley & sons, Inc (1966)
- Metcalf & Eddy, Waste Water Engineering Treatment, Disposal & Reuse, Tata McGraw Hill (1979)

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WATER RESOURCE ENGINEERING-II

Course Code: CIV2711 **Credit Units: 03**

Course Objectives: To study the different aspects of design of hydraulic structures. To provide knowledge on various hydraulic structures such as energy dissipaters, head and cross regulators, canal falls and structures involved in cross drainage works

Course Contents:

MODULE-I:
Head Works:Types of head works, Functions and investigations of a diversion head work: component parts of a diversion head work and their design considerations, silt control devices.
Theories of Seepage: Seepage force and exit gradient, assumptions and salient features of Bligh's Creep theory, Limitations of Bligh's Creep theory, salient features of Lane's weighted Creep theory and Khosla's theory, Comparison of Bligh's Creep theory and Khosla's theory, Determination of uplift pressures and floor thickness.

MODULE-II:
Design of Weirs: Weirs versus barrage, types of weirs, main components of weir, causes of failure of weir and design considerations with respect to surface flow, hydraulic jump and seepage flow. Design of barrage or weir. Energy Dissipation Devices: Use of hydraulic jump in energy dissipation, Factors affecting design, Types of energy dissipators and their hydraulic design.

MODULE-III:
Canal Regulators: Offtake alignment, cross-regulators – their functions and design, Distributory head regulators, their design, canal escape. Canal Falls: Necessity and location, types of falls and their description, selection of type of falls, Principles of design, Design of Sarda type, straight glacis and Inglis or baffle wall falls. Canal Out-lets : Essential requirements, classifications, criteria for outlet behaviours, flexibility, proportionality, sensitivity, sensitiveness, etc. Details and design of nonmodular, semi-modular and modular outlets.

MODULE-IV:
Cross-Drainage works : Definitions, choice of type, Hydraulic design consideration, Aqueducts their types and design, siphon aqueducts – their types and design considerations, super passages, canal siphons and level crossing.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Irrigation Engg. & Hydraulic Structure by Santosh Kumar Garg, Khanna Publishers
- Design of Irrigation Structures by R.K. Sharma, Oxford IBH Pub
- Irrigation Engg. and Hydraulics Structures by S.R. Sahasrabudhe, . Katson Publishing
- Irrigation Practice and Design Vol. I to VII by K.B. Khushlani. Oxford IBH Pub
- P.N. Modi; Irrigation with Resources and with Power Engineering, Standard Book House
- Irrigation Engg. Vol. I & II by Ivan E. Houk, John Wiley and sons

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ENVIRONMENTAL ENGINEERING LAB

Course Code: CIV2704 **Credit Units: 01**

Course Contents:

1. Determination of solids (total, dissolved, organic, inorganic and settleable) in water
2. Determination of turbidity and the optimum coagulant dose
3. Determination of alkalinity and pH of water
4. Determination of hardness and chlorides in water
5. Determination of iron and manganese in water
6. Determination of sulphates and sulphides in water
7. Determination of D.O and B.O.D of waste water
8. Determination of available chlorine in bleaching powder and the chlorine dose required to treat the given water sample
9. Determination of coliforms in water
10. Demonstration of Instrumental methods of pollutant analysis

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text & References:

- Standard method for the examination of water and waste water, 2005, APHA, AWWA, WPCF Publication

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SUMMER INTERNSHIP EVALUATION-II

Course Code: CIV2735 **Credit Units: 03**

Objective:

There are certain phases of every Intern's professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship program can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal classroom situations. These attributes are intellectual ability, professional judgment and decision-making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc.

Guidelines

In order to achieve these objectives:

- **Each student will be allotted a supervisor** for proper guidance.
- **Student will first submit details of company, external guide, project title to coordinator/supervisor as per given schedule.**
- For internal assessment purpose, students will submit an industry feedback and a progress report.
- Student will maintain a file (**Internship File/Project Report**) which he/she will submit after completion of internship. **Further, coordinator will provide NTCC project guidelines and sample to help in preparation of file.** The Internship File aims to encourage students to keep a personal record of their learning and achievement throughout the Programme. It can be used as the basis for lifelong learning and for job applications. Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development. The File will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and their own personal contribution to the organization.

The **layout guidelines** for the Project Report

1. File should be in the following specification

- A4 size paper
- Spiral Binding
- **Font**

For normal text Font Type and Size must be- Times New Roman, 12 pt. The minimum font size of materials within a table or a figure can be 10 point.

- **Margins**

A margin of 3.75 cm (1½ inch) is to be given on the binding edge while on the other sides it is to be 2.5 cm (1 inch). The text of the report, including headings, figures, tables, and notes, but excluding page numbers, must be accommodated within the page area.

- **Line Spacing**

The line spacing in the main text must be between one-and-a-half (1.5). Single line spacing should be given for figure captions, table titles, figure legends, and footnotes. Equations, tables, figures, and quotations should be set off from the main text with adequate space (not less than the normal line spacing adopted for the main text). Two consecutive paragraphs should be separated by a spacing which must be larger than the line spacing adopted for the text.

- **Tables and Figures**

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Each sketch, drawing, graph and photograph should have a figure number and title below the figure etc. Numbering should be sequential, chapter wise. For instance, if there are 24 figures chapter 3 spread over all of its sections the figure numbers run from Figure 3.1 through Figure 3.24. In figures experimental data should typically be represented by centered symbols, and theoretical data by continuous curves.
Each table should have a table number and caption above the table. Numbering should be sequential, chapter wise, as in the case of Figure numbers. For instance, if there are 18 tables in chapter 3 the table numbers run from Figure 3.1 through Figure 3.18.

Make sure that figures and tables are complete in other respects such as legends, references (if any) and coordinate labels with units. Each figure and table must be explicitly referred to in the text and located where its first reference occurs, preferably after the reference.

- **Drawings**

All engineering drawings must conform to relevant Standards and should include a title block. If drawings are large they should be included at the back of the report in a separate pocket. In case drawings are made using CAD packages, a CD ROM should be included which contains all the files and details of the packages used.

- **Equations**

The numbering of equations should be sequential, chapter wise. Numbered equations must be explicitly referred to in the text.

2. Report Size: The maximum number of pages of the Report should be preferably between 50-80 pages.

3. Report Layout: The report should contain the following components
Front Page
Declaration
Student Certificate (University)
Certificate (Company)
Acknowledgement
Abstract
Contents
List of Figures
List of Tables
Company Profile (optional)
Chapters
Appendices(optional)
References / Bibliography

The above components are described below:
1. **The Title Page**-- Format will be given by coordinator/supervisor.
2. **Declaration by the Students-**This is page number (i), the beginning of the small case Roman numeral page numbers. The student has to give a declaration to the effect that the data used for the work, the work depicted in the report, and the written material contained in the report are not copied from others and that due permission has been taken from, and due credit has been given to, the sources whenever they are used.
3. Certificate-This is page number (ii). It is given by the Institute. The certificate will be signed by the Faculty Supervisor(s) before the viva-voce after verifying the format and by the Head of the Department after review with the Supervisor(s).
4. Company Certificate: This is a certificate, which the company gives to the students.
5. Contents-This is page number (iii). The table of Contents should be titled just Contents (not Table of Contents). Try to fit it into one or two pages.
6. Acknowledgement-This is page number (iv). Keep this brief and avoid using informal language. This page must be signed by the candidate.
7. Abstract and **Keywords-**This is page number (v). The abstract (preferably one page) should contain the context/relevance of the problem at hand, a description of what was done and a gist of the significant observations/results.

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The keywords (maximum 6) are a hint that what is contained in the report.

8. Company Profile: A Company Profile corresponds to a file with company-specific data. Company data can be stored there and included in a booking when needed.

9. **Chapters**—Introduction, Literature Review/Background Study etc. as given by coordinator/supervisor.

10. **References / Bibliography** --This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

ASSESSMENT OF THE INTERNSHIP FILE

Continuous Internal Assessment consists of topic relevance, progress report and industry feedback on company letterhead. Final Assessment includes viva, presentation, execution and report marks.

Examination Scheme:

Components	**IF**	**PR**	**R**	**E**	**V**	**FP**
Weightage (%)	20	20	15	15	15	15

V – Viva, IF – Industry Feedback, FP – Final Presentation, R – Report, PR-Progress Report, E-Execution

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INDEPENDENT STUDY

Course Code: CIV2712 **Credit Units: 02**

This is an elective, self-directed course to investigate aemerging areasof IT and Computer Science like Mobile Operating System, Cloud Computing, or from Current Research Areas etc. The primary goal of the course is to provide students with research exploration of a specific topic of interest to the individual student under the advisement of an instructor who will monitor and critique the student's progress.

Independent study provides students with the opportunity to work one-on-one with a Faculty on a particular topic. The student and faculty should discuss the aims and content of the study and present the proposal to Head of Department. The independent study proposal should include the study's title, theme, readings, work to be submitted, and syllabus. Faculty and student should meet for a minimum number of 2 hours per week. Student will give a seminar after completion of study.

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TERM PAPER

Course Code: CIV2731 **Credit Units: 02**

A term (or research) paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned. The evaluation will be done by Board of examiners comprising of the faculties.

Guidelines for Term Paper

The procedure for writing a term paper may consist of the following steps:

1. Choosing a subject
2. Finding sources of materials
3. Collecting the notes
4. Outlining the paper
5. Writing the first draft
6. Editing & preparing the final paper

1. Choosing a Subject

The subject chosen should not be too general.

2. Finding Sources of Materials

a) The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.
b) Begin by making a list of subject-headings under which you might expect the subject to be listed.
c) The sources could be books and magazine articles, news stories, periodicals, scientific journals etc.

3. Collecting the Notes

Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.

a) Get facts, not just opinions. Compare the facts with author's conclusion.
b) In research studies, notice the methods and procedures, results & conclusions.
c) Check cross references.

4. Outlining the Paper

a) Review notes to find main sub-divisions of the subject.
b) Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

5. Writing the First Draft

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is. You may follow the following:

a) statement of purpose
b) main body of the paper
c) statement of summary and conclusion

Avoid short, bumpy sentences and long straggling sentences with more than one main idea.

6. Editing &Preparing the Final Paper

a) Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/ details/ analyses of relevance to the question at hand. Sometimes, the relevance of a particular section may be clear to you but not to your readers. To avoid this, ensure you briefly explain the relevance of every section.
b) Read the paper to ensure that the language is not awkward, and that it "flows" properly.
c) Check for proper spelling, phrasing and sentence construction.
d) Check for proper form on footnotes, quotes, and punctuation.
e) Check to see that quotations serve one of the following purposes:
    (i) Show evidence of what an author has said.
    (ii) Avoid misrepresentation through restatement.

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(iii) Save unnecessary writing when ideas have been well expressed by the original author.

f) Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:

1) Title page
2) Table of contents
3) Introduction
4) Review
5) Discussion&Conclusion
6) Bibliography
7) Appendix

Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper.

Discussion

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.

Conclusion

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

a) summary of question posed
b) summary of findings
c) summary of main limitations of the study at hand
d) details of possibilities for related future research

Bibliography

From the very beginning of a research project, you should be careful to note all details of articles gathered. The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography. The key to a good bibliography is consistency. Choose a particular convention and stick to this.

Bibliographical Conventions:

Monographs

Crystal, D. (2001), Language and the internet, Cambridge: Cambridge University Press

Edited Volumes

Gass, S/Neu, J. (eds.) (1996), Speech acts across cultures, Challenges to communication in a second language, Berlin/ NY: Mouton de Gruyter.

[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

Edited Articles

Schmidt, R./Shimura, A./Wang, Z./Jeong, H. (1996), Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea. In: Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges to communication in a second language, Berlin/ NY: Mouton de Gruyter: 285-316.

Journal Articles

McQuarrie, E.F./Mick, D.G. (1992), On resonance: A critical pluralistic inquiry into advertising rhetoric. Journal of consumer research 19, 180-197.

Electronic book

Chandler, D. (1994), Semiotics for beginners [HTML document]. Retrieved on [5.10.01] from the World Wide Web, http://www.aber.ac.uk/media/Documents/S4B/.

Electronic Journal Articles

Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document], German as a Foreign Language Journal [online] 1, Retrieved [12.09.00] from the World Wide Web, http://www.gfl-journal.com/

Other Websites

Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document], Retrieved on [13.10.01] from the World Wide Web, http://olaf.hiof.no/~sverrev/eng.html

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Unpublished Papers

Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu

Unpublished Thesis/ Dissertations

Möhl, S. (1996), Alltagssituationen im interkulturellen Vergleich: Realisierung von Kritik und Ablehnung im Deutschen und Englischen. Unpublished MA thesis, University of Hamburg

Walsh, R. (1995), Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language. Unpublished PhD dissertation, University College Dublin

Appendix

The appendix should be used for data collected (e.g. questionnaires, transcripts, etc.) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

Examination Scheme:

Dissertation:	75
Viva voce	25
Total:	**100**

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PROJECT

Course Code: CIV2732 **Credit Units: 02**

Methodology

Topics of project are to be based on the latest trends, verifying engineering concepts /principals and should involve elementary research work. The projects may involve design, fabrications, testing, computer modeling, and analysis of any engineering problem. On completion of the practical training the students are to present a report covering various aspects learnt by them and give a presentation on same.

Guidelines for Project File

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critically analyzed by the faculty guide and corrected by the student at each stage.

Project File

The Project File may be a very useful tool for undertaking an assignment along-with a normal semester, an exploratory study, sponsored projects, a project undertaken during summer period or any other period where the researcher is not working with a company/organization. The project/ assignment may also be a part of the bigger research agenda being pursued by a faculty/ institution/ department

The project file is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation. This file may be considered in continuous assessment.

In general, the file should be comprehensive and includes:

- A short account of the activities that were undertaken as part of the project;
- A statement about the extent to which the project has achieved its stated objectives;
- A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;
- Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project;
- Any problems that have arisen and may be useful to document for future reference.

Layout Guidelines for the Project File

- A4 size Paper
- Font: Arial (10 points) or Times New Roman (12 points)
- Line spacing: 1.5
- Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

Assessment of the Project File

Essentially, the assessment will be based on the quality of the report, the technical merit of the project and the project execution. Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project. Project execution is concerned with assessing how much work has been put in.

The Project should fulfill the following assessment objectives:

- Range of research methods used to gain information
- Execution of research
- Data analysis (Analyse Quantitative/ Qualitative information)
- Quality Control
- Conclusions

Assessment Scheme:

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Continuous Evaluation:
40% (Based on punctuality, regularity of work, adherence to plan and methodology, refinements/ mid-course corrections etc. as reflected in the Project File.)

Final Evaluation:
60% (Based on the documentation in the file, final report layout, analysis and results, achievement of objectives, presentation/ viva)

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Syllabus - Eighth Semester

CONSTRUCTION MANAGEMENT AND QUANTITY SURVEYING

Course Code: CIV2801 **Credit Units: 03**

Course Objective:
The main objective of this course is to train the student construction management and quantity surveying

Course Contents:

Module I
Construction Management – Network techniques – introduction – Bar charts – use of CPM and PERT for planning – time estimates – critical path – updating – crashing – resource smoothing – resource leveling – computer applications
Construction planning: Preparation of job layout – labour schedule – material schedule – equipment schedule

Module II:
Project Implementation **–** Tender – earnest money deposit – security deposit – contract – contract documents – measurements – completion certificate – inspection and quality control – standardization – organisations at national and international level (BIS & ISO) – role of certification

Module III
Quantity surveying - preparation of detailed estimates for: buildings - reinforced concrete structures - sanitary and water supply works

Module IV
Preparation of specification for common materials of construction and items of work as per IS - analysis of rates and preparation of abstract of estimate
Introduction to valuation of real properties: Depreciation – Sinking fund – methods of valuation

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Vazirani V.N. & Chandola S.P., Heavy Construction, 1978.
- Jha J. & Sinha S.K., Construction & Foundation Engineering, Khanna Publications
- Verma L.C., Standardisation - A New Discipline
- Rangwala, Valuation of Real Properties, Charotar, 1978.
- Peurifoy R.L., & Ledbetter W.B., Construction Planning Equipment & Methods,
- McGraw Hill, 1956.
- Dutta B.N., Estimation & Costing in Civil Engg, UBSPD, 1992.
- Chakrabarthi, Estimation, Costing, Specification in Civil Engg,
- Shah N.A., Quantity Surveying & Specification in Civil Engg**.,**
- I.S 1200 (1968), Methods of Measurement of Building & Civil Engg. Works Mahajan S.P., Civil Estimating & Costing, Sathyaprakasham, 1988

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DISSERTATION

Course Code: CIV2837 **Credit Units: 08**

Methodology

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Guidelines for Project File and Project Report

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critically analyzed by the faculty guide and corrected by the student at each stage.

Project File

The Project File may be a very useful tool for undertaking an assignment along-with a normal semester, an exploratory study, sponsored projects, a project undertaken during summer period or any other period where the researcher is not working with a company/organization. The project/ assignment may also be a part of the bigger research agenda being pursued by a faculty/ institution/ department

The Project File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation. This file may be considered in continuous assessment.

In general, the File should be comprehensive and include

- A short account of the activities that were undertaken as part of the project;
- A statement about the extent to which the project has achieved its stated objectives;
- A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;
- Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project;
- Any problems that have arisen and may be useful to document for future reference.

Project Report

The Project Report is the final research report that the student prepares on the project assigned to him. In case of sponsored project the lay out of the project could be as prescribed by the sponsoring organization. However, in other cases the following components should be included in the project report:

- **Title or Cover Page**
  The title page should contain Project Title; Student's Name; Programme; Year and Semester and Name of the Faculty Guide.
- **Acknowledgement(s)**
  Acknowledgment to any advisory or financial assistance received in the course of work may be given. It is incomplete without student's signature.
- **Abstract**
  A good"Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project. It should not exceed more than 1000 words.
- **Table of Contents**

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Titles and subtitles are to correspond exactly with those in the text.

- **Introduction**

  Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

- **Materials and Methods**

  This section should aim at experimental designs, materials used (wherever applicable). Methodology should be mentioned in details including modifications undertaken, if any. It includes organization site(s), sample, instruments used with its validation, procedures followed and precautions.

- **Results and Discussion**

  Present results, discuss and compare these with those from other workers, etc. In writing this section, emphasis should be laid on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

  Note that in writing the various secions, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary, do not write in "point" form.

  While presenting the results, write at length about the the various statistical tools used in the data interpretation. The result interpretation should be simple but full of data and statistical analysis. This data interpretation should be in congruence with the written objectives and the inferences should be drawn on data and not on impression. Avoid writing straight forward conclusion rather, it should lead to generalization of data on the chosen sample.

  Results and its discussion should be supporting/contradicting with the previous research work in the given area. Usually one should not use more than two researches in either case of supporing or contradicting the present case of research.

- **Conclusion(s) & Recommendations**

  A conclusion should be the final section in which the outcome of the work is mentioned briefly. Check that your work answers the following questions:

  - Did the research project meet its aims (check back to introduction for stated aims)?
  - What are the main findings of the research?
  - Are there any recommendations?
  - Do you have any conclusion on the research process itself?

- **Implications for Future Research**

  This should bring out further prospects for the study either thrown open by the present work or with the purpose of making it more comprehensive.

- **Appendices**

  The Appendices contain material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

- **References**

  References should include papers, books etc. referred to in the body of the report. These should be written in the alphabetical order of the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

  Examples

  For research article

  Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic*Escherichia coli* O157: H7. *ClinMicrobiol Infect*, **8** (suppl 1): 116–117.

  For book

  Kowalski,M.(1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67

Layout Guidelines for the Project File & Project Report

- A4 size Paper
- Font: Arial (10 points) or Times New Roman (12 points)
- Line spacing: 1.5

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- Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

Assessment of the Project File and the Project Report

Essentially, the assessment will be based on the quality of the report, the technical merit of the project and the project execution. Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project. Project execution is concerned with assessing how much work has been put in.

The Project should fulfill the following assessment objectives:

- Range of Research Methods used to oASEin information
- Execution of Research
- Data Analyses (Analyse Quantitative/ Qualitative information)
- Quality Control
- Conclusions

Assessment Scheme:

Continuous Evaluation:

40% (Based on punctuality, regularity of work, adherence to plan and methodology,refinements/ mid-course corrections etc. as reflected in the Project File.)

Final Evaluation:

60% (Based on the Documentation in the file, Final report layout, analysis andresults, achievement of objectives, presentation/ viva)

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INDUSTRIAL WASTE ENGINEERING

Course Code: CIV2803 **Credit Units: 03**

Course Objective:
To provide the knowledge on the wastewater characteristics from industry, Define the Principles of pollution prevention and mechanism of industrial processes, andSuggest the suitable technologies for the treatment of wastewater.

Course Contents:

Module I
Industrial waste types and characteristics; levels of environmental pollution due to industrial wastes; health issues due to industrial wastes; ecological and human health risk assessment due to industrial wastes; waste characterization methods; treatment methods-conventional and recent trends. Industrial scenario in India– Industrial activity and Environment - Uses of Water by industry – Sources and types of industrial wastewater – Nature and Origin of Pollutants – Industrial wastewater and environmental impacts – Regulatory requirements for treatment of industrial wastewater – Industrial waste survey – Industrial wastewater monitoring and sampling - generation rates, characterization and variables –Toxicity of industrial effluents and Bioassay tests – Major issues on water quality management.

Module II
Waste management Hierarchy - Source reduction techniques – Periodic Waste Minimisation Assessments – Evaluation of Pollution Prevention Options – Cost benefit analysis – Pay-back period – Implementing & Promoting Pollution Prevention Programs in Industries.

Module III
Flow and Load Equalisation – Solids Separation – Removal of Fats, Oil & Grease- Neutralisation – Removal of Inorganic Constituents – Precipitation, Heavy metal removal, Nitrogen & Phosphorous removal, Ion exchange, Adsorption, Membrane Filtration, Eletrodialysis & Evaporation – Removal of Organic Constituents – Biological treatment Processes, Chemical Oxidation Processes, Advanced Oxidation processes – Treatability Studies.

Module IV
Individual and Common Effluent Treatment Plants – Joint treatment of industrial and domestic wastewater - Zero effluent discharge systems - Quality requirements for Wastewater reuse – Industrial reuse , Present status and issues - Disposal on water and land – Residuals of industrial wastewater treatment – Quantification and characteristics of Sludge – Thickening, digestion, conditioning, dewatering and disposal of sludge – Management of RO rejects.

Module V
Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Oil Refining–Pharmaceuticals–Sugar and Distilleries.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

References:

- "Industrial wastewater management, treatment & disposal, Water Environment" Federation Alexandria Virginia, Third Edition, 2008.
- Lawrance K.Wang, Yung Tse Hung, Howard H.Lo and Constantine Yapijakis “handlook of Industrial and Hazardous waste Treatment”, Second Edition, 2004.

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- Metcalf & Eddy/ AECOM, "water reuse Issues, Technologies and Applications", The Mc Graw- Hill companies, 2007.
- Nelson Leonard Nemerow, “Industrial waste Treatment”, Elsevier, 2007.
- Wesley Eckenfelder W., “Industrial Water Pollution Control”, Second Edition, Mc Graw Hill, 1989.
- Paul L. Bishop, „Pollution Prevention: - Fundamentals and Practice“, Mc-Graw Hill International, Boston, 2000.
- Waste water Treatment for pollution control and reuse by Soli. J. Arceivala, Shyam. R. Asolekar, Tata Mcgraw Hill, 2007.

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SOLID WASTE MANAGEMENT AND RECYCLING

Course Code: CIV2808 **Credit Units: 03**

Course objective: To provide information regarding different elements of Environmental pollution, their origin, characteristics and treatment.

Course Contents:

MODULE-I
Definition of solid waste-waste generation in a technological society- major legislation, monitoring responsibilities, sources and types of solid waste- sampling and characterization- Determination of composition of MSW- storage and handling of solid waste- Future changes in waste composition.

MODULE-II
Collection and transport of solid waste: Collection of Solid waste: type of waste collection systems, analysis of collection system- alternative techniques for collection system. Separation and Processing and Transformation of Solid Waste: unit operations used for separation and processing, Materials Recovery facilities, Waste transformation through combustion and anaerobic composting, anaerobic methods for materials recovery and treatment.

MODULE-III
Recycling of plastic materials and metals. Energy recovery – Incinerators. Transfer and Transport: need for transfer operation, transport means and methods, transfer station types and design requirements. Landfills: Site selection, design and operation, drainage and leachate collection systems – requirements and technical solutions, designated waste landfill remediation – Integrated waste management facilities.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books/References:

- John Pichtel-Waste Management Practices, CRC Press, Taylor & Francis Group.
- Technobanoglous et al –Integrated Solid Waste Management, McGraw- Hill
- Charles A. Wentz – Hazardous Waste Management, McGraw- Hill

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BASICS OF FINITE ELEMENT METHOD

Course Code: CIV2809 **Credit Units: 03**

Course Objective: This will enable the student to have a basic knowledge of finite element method and shall be able to appreciate and analyze linear elastic structures using finite element method.

Course Contents:

Module I: Introduction to FEM. Basic idea of FEM. Applications and importance of FEM. Differential equilibrium equations - strain displacement relation - linear constitutive relation - special cases- Principle of stationary potential energy - application to finite element methods. Some numerical techniques in finite element Analysis

Module II:
Displacement models - convergence requirements. Natural coordinate systems – Shape function. Interpolation function- Linear and quadratic elements - Lagrange & Serendipity elements- Strain displacement matrix - element stiffness matrix and nodal load vector. Coordinate Transformation: Transformation of vectors and tensors, transformation of stiffness matrices, degree of freedom within elements, condensation, condensation and recovery algorithm, substructuring, structural symmetry.

Module III:
Two dimensional isoparametric elements - Four noded quadrilateral elements – triangular elements- Computation of stiffness matrix for isoparametric elements - numerical integration, (Gauss quadrature) -Convergence criteria for isoparametric elements.

Module IV:
Assemblage of elements – Direct stiffness method- Special characteristics of stiffness matrix - Boundary condition & reaction - Gauss elimination and LDLT decomposition- Basic steps in finite element anlaysis, Introduction to Softwares based on FEM analysis.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Cook, R.D., Malkus, D.S., Plesha, M.E., and Witt, R.J., Concepts and Applications of Finite Element Analysis, John Wiley & Sons, 2003.
- Zienkiewicz, O.C., and Morgan, K., Finite Element Approximation, John Wiley & Sons, 1983.
- C.S.Krishnamoorthy, Finite element analysis, theory and programming, Tata McGraw Hill, 2009.
- Finite element analysis, theory and progarmming by GS Krishna Murthy.
- Zienkiewicz, O.C., and Taylor, R.L., The Finite Element Method, Vols I to III, McGraw Hill, 1999.
- Reddy, J.N., An Introduction to the Finite Element Method, McGraw Hill, 2006.

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Bachelor of Technology - Computer Science Engineering

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Curriculum & Scheme of Examination

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B.Tech (CSE) Programme Overview

B.Tech. in Computer Science and Engineering programme provides a sound knowledge of computing principles and their applications in scientific and engineering domains. It not only develops the ability to analyse complex engineering problems and generate their solutions through engineering but also gives an exposure to the principles and practices of design and development of computing systems.

Upon completion of the course the graduates will be able to apply the knowledge of science, mathematics, statistics, computer science and engineering and other engineering disciplines to identify and solve complex engineering problems across a broad range of application areas and to lead a successful career as a computer professional. The students will be able to ethically apply their knowledge and skills of computer science and engineering for the overall benefit of society with an understanding of realistic constraints; Work and communicate effectively in inter-disciplinary environment either independently or in a team and demonstrate significant leadership qualities.; Engage in life-long learning and professional development through self-study, continuing education or graduate and professional studies.

The B.Tech CSE students can have number of career opportunities in the field of government, private, industry, academia, research and business organizations.

Programme Objectives (PO)

The graduate will achive:

- PO1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO2. **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- P04. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- PO5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- PO6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- PO7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- PO8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- PO11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

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- PO12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Programme Specific Objectives(PSO)

On completion of the B. Tech in Computer Science & Engineering the student will be able to:

PSO1: Apply the knowledge of science, mathematics, statistics, information technology and other engineering disciplines to identify and solve computer science and engineering problems across a broad range of application areas.

PSO2: To apply the knowledge gained in the field of networking, artificial intelligence, computer architecture and designing software systems for the overall benefit of society.

PSO3: To regulate technical knowledge and skills gained in computer science and engineering into industrial practices with an understanding of realistic constraints.

PSO4: To comprehend and write effective technical project reports in multidisciplinary environment with regards to evolving technological advancements.

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ENGINEERING MATHEMATICS-I

Course Code: CSE2110 **Credit Units : 04**

Course Objective:
The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects. Here our intention is to make the students acquainted with the concept of basic topics from Mathematics, which they need to pursue their Engineering degree in different disciplines.

Course Contents:

Module I: Differential Calculus
Successive differentiation, Leibnitz's theorem (without proof), Mean value theorem, Taylor's theorem (proof), Remainder terms, Asymptote & Curvature, Partial derivatives, Chain rule, Differentiation of Implicit functions, Exact differentials, Tangents and Normals, Maxima, Approximations, Differentiation under integral sign, Jacobians and transformations of coordinates.

Module II: Integral Calculus
Fundamental theorems, Reduction formulae, Properties of definite integrals, Applications to length, area, volume, surface of revolution, improper integrals, Multiple Integrals-Double integrals, Applications to areas, volumes.

Module III: Ordinary Differential Equations
Formation of ODEs, Definition of order, degree & solutions, ODE of first order: Method of separation of variables, homogeneous and non homogeneous equations, Exactness & integrating factors, Linear equations & Bernoulli equations, General linear ODE of nth order, Solution of homogeneous equations, Operator method, Method of undetermined coefficients, Solution of simple simultaneous ODE.

Module IV: Vector Calculus
Scalar and Vector Field, Derivative of a Vector, Gradient, Directional Derivative, Divergence and Curl and their Physical Significance, Arc Length, Tangent, Directional Derivative, Evaluation of Line Integral, Green's Theorem in Plane (without proof), Representation of Surfaces, Tangent Plane and Surface Normal, Surface Integral, Stoke's Theorem (without proof), Gauss Divergence Theorem (without proof).

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- Differential Calculus by Shanti Narain
- Integral Calculus by Shanti Narain

References:
- Differential Equation by A.R. Forsyth
- Higher Engineering Mathematics by H.K. Dass

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ENGINEERING PHYSICS

Course Code: CSE2111 **Credit Units : 03**

Course Objective:
Aim of this course is to introduce the students to fundamentals of graduate level physics, which form the basis of all applied science and engineering

Course Contents:

Module I: Oscillations & Waves
Oscillations: Introduction to S.H.M. Damped Oscillations: Differential Equation and its solution, logarithmic decrement, Quality Factor, Different conditions of damping of harmonic oscillations. Forced oscillations: Amplitude and Frequency Response, Resonance, Sharpness of Resonance
Plane Progressive Waves: Differential Equation and Solution, Superposition of Progressive Waves stationary waves.
Ultrasonics: Generation and application of ultrasonicwaves.

Module II: Wave Nature of Light
Interference: Coherent Sources, Conditions of interference, Interference due to division of wavefront, Fresnels biprism Interference due to division of amplitude, Newton's rings, Interference due to thin films, .
Diffraction: Fresnel and Fraunhofer diffraction, Fraunhofer diffraction at a single slit, double slit, N Slits, Transmission grating, Rayleigh criterion and Resolving power of grating.
Polarization: Birefringence, Nicol prism, Production and analysis of plane, circularly and elliptically polarized light, Half and quarter wave plates, Optical rotation, Polarimeter.

Module III: Electromagnetics
Scalar and vector fields, gradient of a scalar field, physical significance of gradient, equipotential surface. Line, surface and volume integrals, Divergence and curl of vector field and mathematical analysis physical significance, Electric flux, Gauss' law, Proof and Applications, Gauss divergence and Stokes theorems.
Differential form of Gauss' Law, Amperes' Law, Displacement current, Faradays Law, Maxwell equations in free space & isotropic media (Integral form & differential form), EM wave propagation in free space, Poynting vector.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
- Waves & oscillation, A. P. French
- Physics of waves, W. C. Elmore & M. A. Heald
- Introduction to Electrodynamics, D. J. Griffith
- Electrodynamics, Gupta, Kumar & Singh
- Optics, A. K. Ghatak
- Engineering Physics, Satya Prakash

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CSE2104	INTRODUCTION TO COMPUTERS AND PROGRAMMING IN C	L	T	P	C
Version: 2017.1	Date of Approval: 14th June 2017	2	1	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The objective of this course module is to acquaint the students with the basics of computers system, its components, data representation inside computer and to get them familiar with various important features of procedure-oriented programming language i.e. C.

Course Objectives

The objective of this course is to

- Equip the students with concepts of Programming through C Language
- Provide an overview of advanced programming concepts like Structure, Union and File Handling

Course Outcomes

On completion of this course, the students will be able to

After the completion of course, the students will be able to,

CO 1: Define the purpose and structure of C Program for programming; identify and distinguish various datatypes and operators; conditional and control statement; Apply if-else, Switch and loops to rewrite basic C program for problem solving.

CO 2: Compare and contrast various Array types, its declaration and implementation; differentiate between Call by Value and Reference if Functions; apply the concepts to rewrite C Programs

CO 3: Differentiate between various String Handling Functions; describe the concept of Pointers in C Language

CO 4: Explain the concept of Structure and Union; apply the concept of File Handling to provide data storage support to the programs.

CO 5: Apply the concept of Computer Graphics using C programming concepts for implementing line drawing, circle drawing algorithms.

Modules	Blooms level*	Number of hours
Module I: Introduction Introduction to computer, history, von-Neumann architecture, memory system (hierarchy, characteristics and types), H/W concepts (I/O Devices), S/W concepts (System S/W & Application S/W, utilities). Data Representation: Number systems, character representation codes, Binary, octal, hexadecimal and their interconversions. Binary arithmetic, floating point arithmetic, signed and unsigned numbers, Memory storage unit.	L1, L2 and L3	7
Module II: Programming in C History of C, Introduction of C, Basic structure of C program, Concept of variables, constants and data types in C, Operators and expressions: Introduction, arithmetic, relational, Logical, Assignment, Increment and decrement operator, Conditional, bitwise operators, Expressions, Operator precedence and associativity. Managing Input and output Operation, formatting I/O.	L2, L3 and L4	7

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Module III: Fundamental Features in C C Statements, conditional executing using if, else, nesting of if, switch and break Concepts of loops, example of loops in C using for, while and do-while, continue and break. Storage types (automatic, register etc.), predefined processor, Command Line Argument.	L2, L3 and L4	7
Module IV: Arrays and Functions One dimensional arrays and example of iterative programs using arrays, 2-D arrays Use in matrix computations. Concept of Sub-programming, functions Example of user defined functions. Function prototype, Return values and their types, calling function, function argument, function with variable number of argument, recursion.	L2 and L3	7
Module V: Advanced features in C Pointers, relationship between arrays and pointers Argument passing using pointers, Array of pointers. Passing arrays as arguments.Strings and C string library.Structure and Union. Defining C structures, Giving values to members, Array of structure, Nested structure, passing strings as arguments. File Handling.	L2, L3 and L4	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6:Evaluation

Text Books

1. E Balagurusamy, "Programming in ANSI C", Seventh Edition, Tata McGraw Hill Education private limited, July 2017.
2. Yashwant Kanetkar, "Let Us C", 16th Edition, BPB Publication, June 2017.

Reference Books

1. Brain W Kernighan and Dennis M Ricchie, "The C Programming Language", 2nd Edition, Pearson Publication, Jan 2015.
2. Byron Gottfried, "Programming with C", Third Edition, Tata McGraw Hill Education private limited, July 2017.
3. E Balagurusamy, "Computer Concepts & Programming in C", Seventh Edition, Tata McGraw Hill Education private limited, July 2011.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	**--**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**1**	**--**
CO2	**1**	**1**	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**1**	**--**
CO3	**1**	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**1**	**--**
CO4	**1**	**1**	**2**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**1**	**--**
CO5	**1**	**1**	**2**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**1**	**--**

1: strongly related, 2: moderately related and 3: weakly related

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CSE2114	ELEMENTS OF MECHANICAL ENGINEERING	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	3	0	0	3
Pre-requisites/Exposure	NIL				
Co-requisites	NIL				

Catalog Description

In this course the concepts of various prime movers like I C Engine, Gas Turbine, Steam Turbine, and Hydraulic Turbine are discussed in detail. Concept of power absorbing devices and power transmission devices are discussed in detail. Elementary concept of mechanics of material and machine tool also discussed in detail. The aim of this course is to make the students familiar with the basic mechanical engineering.

Course Objectives

The objective of this course is to

1. Equip the students with concept of heat engine, steam, boiler, steam turbine, hydraulic turbine, hydraulic pumps, stress and strain, power transmission.
2. Provide an overview of machine tool and manufacturing system.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain working of I C engine, Gas turbine, Air standard efficiency of Otto Cycle &Diesel Cycle and Boilers.
CO2: Explain working of Steam Turbine, Hydraulic Turbine and Hydraulic Pumps.
CO3: Describe the stress strain diagram, Elastics constants and Transmission system.
CO4: Discuss the metal cutting and working of machine tool with manufacturing system.

Modules	Blooms level*	Number of hours
MODULE 1: Prime Mover (I. C. Engine) Internal Combustion Engine: Introduction to I.C. Engines-two & four stoke S.I. and C.I. engines. Otto cycle. Diesel cycle. Working principle of gas turbine, Constant pressure gas turbine cycle.	L1, L2 and L3	7
MODULE 2: Prime Mover (Turbine) Steam Turbine: Classification of boilers, Classification of steam turbines, Working principle of impulse and reaction. Hydraulic Turbine: Classification of hydraulic turbine, Construction details and working of Pelton, Francis and Kaplan turbines.	L1, L2 and L3	8

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MODULE 3: Power Absorbing machine Power absorbing devices: Hydraulic Pumps: Classification of hydraulic pumps, Working of Reciprocating and centrifugal pumps. Power transmission devices: Introduction to Power transmission, Belt drive, Rope drive, Chain drive, Gear drive, Gear train.		7
MODULE 4: Mechanics of Material Stress & Strain: Introduction, Concept & types of Stresses and strains, Poison's ratio, Stress-strain diagrams, Hooks law, Elastic constants & their relationships, Stresses and strains in simple and compound bars under axial loading, Properties of material-strength, elasticity, stiffness, malleability, ductility, brittleness, hardness and plasticity etc.	L1, L2 and L3	6
MODULE 5: Machine Tool Machine Tool: Introduction to Metal Cutting, Classification of machine tool, working and operations of Lathe, Shaper, Milling, Drilling machines. Manufacturing system: Component of Manufacturing Systems, Fundamentals of Numerical Control (NC), Advantage of NC systems, Classifications of NC, Computer Numerical control, Comparison of NC and CNC. Comparison between conventional and NC machines.	L1, L2 and L3	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

1. Rajput, R.K. (2013). *Elements of Mechanical Engineering*, Delhi: Lakmi Publication.
2. Jain, V. (2011). *Basics of Mechanical Engineering*, Delhi :Dhanpat Rai Publication.
3. Kumar, D.S. (2013). *Elements of Mechanical Engineering*, , Delhi : S.K. Kataria and Sons Publications.

Reference Books

1. **Ganesan, V. (2017). *Internal Combustion Engine*, New-Delhi: Tata McGraw Hill.**
2. Nag, P.K. (2013). *Engineering thermodynamics*, New-Delhi: Tata McGraw Hill.
3. Kumar, D.S. (2013).*Thermal Engineering*, New-Delhi: S.K. Kataria and Sons Publications.
4. **Hazra, S.K. and Chaudhary, A.K. (2012). *Workshop Technology Vol. II* . New Delhi: Asian Book Comp.**

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3	PS O 4
CO1	1	1	--	--	--	--	--	--	--	--	--	--	1	1	--	--
CO2	1	1	--	--	--	--	--	--	--	--	--	--	1	1	--	--
CO3	1	1	--	--	--	--	--	--	--	--	--	--	1	1	--	--
CO4	1	1	--	--	--	--	--	--	--	--	--	--	2	1	--	--

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CSE2107	PROGRAMMING IN C LAB	L	T	P	C
Version 2017.1	Date of Approval: 14 June, 2017	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The primary objective of this course is to understand all the components of C, including the C language, the C Preprocessor, and the C Standard Library. An understanding of some advanced practical issues, including memory management, testing and debugging, complex declarations and expression evaluation, building and using libraries, and evaluating tradeoffs, such as size vs. speed and speed vs. complexity. The ability to write C code and create and manipulate logical programs.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of Programming through C Language
2. Provide an overview of advanced programming concepts like Structure, Union and File Handling.

Course Outcomes

After the completion of course, the students will be able to,

CO 1:Demonstrate the use of various data types and operators in C programs; Solve various problems using conditional control statements (if-else, Switch case).

CO 2: Construct C programs related to problems involving the usage of loops, arrays and functions.

CO 3: Apply the concept of Pointers for efficient memory management and construct C programs using string handling functions.

CO 4: Demonstrate the use of Structure, Union and concept of File Handling to provide data storage support to the programs.

Modules	Blooms level*	Number of hours
LABORATORY SESSSION 1 OPERATORS, EXPRESSIONS and DECISION MAKING 1. Write a program to calculate simple interest and amount. 2. Write a program to swap two numbers using third variable. 3. Write a program to demonstrate Greatest of 3 nos and to print the given no in ascending order. 4. Write a program to check if the number is even or odd. 5. Write a program to perform arithmetic operations using Switch Case statement. 6. Write a program to calculate area of circle, rectangle, square and triangle using Switch Case statement.	L3	5

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LABORATORY SESSSION 2 LOOPING 1. Write a program to find factorial of given no using do while statement. 2. Write a program to print prime numbers up to 'n'. 3. Write a program to sum of n natural no. 4. Write a program to print Fibonacci series. 5. Write a program to reverse a number. 6. Write a program to print the following pattern using for loop 1 2 2 3 3 3 4 4 4 4 7. Write a program to print the following pattern using for loop A A B A B C A B C D	L3	6
LABORATORY SESSSION 3 ARRAYS and FUNCTIONS 1. Write a program to read n num of students and 5 subjects marks. 2. Write a program to swap two numbers using call by value. 3. Write a program to convert all lower case to uppercase characters 4. Write a program to find the factorial of a number using recursion. 5. Write a program to print the add/product of two matrices of any order.	L3	5
LABORATORY SESSSION 4 POINTERS AND STRING 1. Write a program to perform operations on strings using string handling in-built functions (concatenation, reversal, copy etc.) 2. Write a program to swap two numbers using call by reference. 3. Write a program to perform dynamic memory allocation and deallocation. 4. Write a program to print elements of array using pointers.	L3	4
LABORATORY SESSSION 5 STRUCTURE,UNION & FILE HANDLING 1. WAP program to display student information by initializing structures. 2. WAP program to find the total salary of employee and employee details using structure. 3. Write a program to store and display information using Union. 4. Program to write data into file and read data from file.	L3	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

4. E Balagurusamy, "Programming in ANSI C", Seventh Edition, Tata McGraw Hill Education private limited, July 2017.

5. Yashwant Kanetkar, "Let Us C", 16th Edition, BPB Publication, June 2017.

Reference Books

1. Brain W Kernighan and Dennis M Ricchie, "The C Programming Language", 2nd Edition, Pearson Publication, Jan 2015.

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2. Byron Gottfried, “Programming with C”, Third Edition, Tata McGraw Hill Education private limited, July 2017.
3. E Balagurusamy, “Computer Concepts & Programming in C”, Seventh Edition, Tata McGraw Hill Education private limited, July 2011.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	**1**	**2**	--	**2**	--	--	--	--	--	--	--	--	**1**	--	**2**	--
CO 2	**1**	**1**	**2**	**2**	--	--	--	--	--	--	--	--	**1**	--	**2**	--
CO 3	**1**	**1**	**2**	**3**	--	--	--	--	--	--	--	--	**1**	--	**2**	--
CO 4	**1**	**1**	**2**	**2**	**3**	--	--	--	--	--	--	--	**1**	--	**2**	--

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ENGINEERING PHYSICS LAB

Course Code: CSE2112 **Credit Units : 01**

List of Experiments:

1. To determine the wavelength of sodium light by Newton's rings method.
2. To determine the dispersive power of the material of prism with the help of a spectrometer.
3. To determine the specific rotation of sugar by Bi-quartz or Laurent half shade polarimeter.
4. To determine the speed of ultrasonic waves in liquid by diffraction method.
5. To determine the width of a narrow slit using diffraction phenomena.
6. To determine the temperature coefficient of platinum wire, using a platinum resistance thermometer and a Callender & Griffth's bridge.
7. To determine the value of specific charge (ratio of e/m) of an electron by Thomson method.
8. To determine the internal resistance of Leclanche cell with the help of Potentiometer.
9. To determine the resistance per unit length of a Carey Foster's bridge wire and also to find out the specific resistance of a given wire.
10. To plot graph showing the variation of magnetic field with distance along the aixs of a circular coil carrying current, and hence estimate the radius of the coil.
11. To determine the value of acceleration due to gravity ('g') in the laboratory using bar pendulum.
12. To determine the moment of inertia of a flywheel about its own axis of rotation.
13. To determine the density of material of the given wire with the help of sonometer.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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CSE2115	ELEMENTS OF MECHANICAL ENGINEERING LAB	L	T	P	C
Version 2019.1	Date of Approval: July 14, 2019	0	0	2	1
Pre-requisites/Exposure					
Co-requisites					

Pre –Requisite: Elements of Mechanical Engineering

Catalog Description

In this course the concepts of various prime movers like I C Engine, Gas Turbine, Steam Turbine, and Hydraulic Turbine are discussed in detail. Concept of power absorbing devices and power transmission devices are discussed in detail. Elementary concept of mechanics of material and machine tool also discussed in detail. The aim of this course is to make the students familiar with the basic mechanical engineering.

Course Objectives:

The objective of this course is to

- Equip the students with practical concepts of Boiler, Turbine, IC Engine and Machine tools.
- Understand the elements of mechanical engineering by working models and experiments.

Course Outcomes (COs): After studying this course the students will be able to:

CO 1- Define the basics of working of boilers, Steam turbines.

CO 2- Explain the principle and working of two strokes and four strokes internal combustion engines.

CO 3- Explain the working of Pelton wheel Turbine, Francis Turbine and Kaplan Turbine.

CO 4 - Describe the tensile test and power transmission derives.

CO 5- Identify and demonstrate the machine tools and lathe operation.

List of Experiments	Blooms level*	Number of hours
1. To Study the Cochran and Babcock & Wilcox boilers.	L1, L2 and L3	2
2. To study the working of impulse and reaction steam turbines	L1, L2 and L3	2
3. To study Two-Stroke & Four-Stroke Diesel Engines.	L1, L2 and L3	2
4. To Study Two-Stroke & Four-Stroke Petrol Engines.	L1, L2 and L3	2
5. To study the constructional features and working of Pelton wheel Turbine, Francis Turbine and Kaplan Turbine.	L1, L2 and L3	2
6. To perform tensile test, plot the stress-strain diagram and evaluate the tensile properties of a given metallic specimen.	L1, L2 and L3	2
7. To Study the different power transmission drives.	L1, L2 and L3	2
8. To Study different types of machine tools (lathe, milling, drilling & shaper).	L1, L2 and L3	2

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9. To perform the metal cutting operation on Lathe machine.	L1, L2 and L3	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text Books

- Rajput, R.K. Elements of Mechanical Engineering, Lakmi Publication, Delhi, 2013. .
- Jain, V. Basics of Mechanical Engineering, Dhanpat Rai Publication, Delhi , 2011.
- Kumar, D.S. Elements of Mechanical Engineering, S.K. Kataria and Sons Publications, Delhi 2013.

Reference Books

- Ganesan, V. Internal Combustion Engine , New-Delhi : Tata McGraw Hill, New delhi, 2017.
- Heine, R.W. Loper and P.C. Rosenthal, Principles of metal casting, McGraw Hill, New-Delhi, 2001
- Nag, P.K. Engineering thermodynamics,: Tata McGraw Hill, New-Delhi, 2013.
- Kumar, D.S. Thermal Engineering, S.K. Kataria and Sons Publications, New-Delhi, 2013.
- Hazra, S.K. and Chaudhary, A.K. Workshop Technology Vol. II . Asian Book Comp, New-Delhi, 2012.

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Syllabus - Second Semester

ENGINEERING MATHEMATICS-II

Course Code: CSE2211 **Credit Units : 04**

Course Objective:
The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects. Here our intention is to make the students acquainted with the concept of basic topics from Mathematics, which they need to pursue their Engineering degree in different disciplines.

Course Contents:

Module I: Linear Algebra
Hermitian and Skew Hermitian Matrix, Unitary Matrix, Orthogonal Matrix, Elementary Row Transformation, Reduction of a Matrix to Row Echelon Form, Rank of a Matrix, Consistency of Linear Simultaneous Equations, Gauss Elimination Method, Gauss-Jordan Method, Eigen Values and Eigen Vectors of a Matrix, Caley-Hamilton Theorem, Diagonalization of a Matrix, Vector Space, Linear Independence and Dependence of Vectors, Linear Transformations.

Module II: Infinite Series
Definition of Sequence, Bounded Sequence, Limit of a Sequence, Series, Finite and Infinite Series, Convergence and Divergence of Infinite series, Cauchy's Principle of Convergence, Positive Term Infinite Series, Comparison test, D'Alembert's Ratio test. Raabe's Test, Cauchy's nth root Test. Logarithmic Test, Alternating Series, Leibnitz's Test, Absolute and conditioinal convergence, Uniform Convergence, Power Series and its Interval of Convergence.

Module III: **Complex Analysis**
De Moivre's Theorem and Roots of Complex Numbers, Logarithmic Functions, Circular, Hyperbolic Functions and their Inverses.
Functions of a Complex Variables, Limits, Continuity and Derivatives, Analytic Function, Cauchy-Riemann Equations (without proof), Harmonic Function, Harmonic Conjugates, Conformal Mapping, Bilinear Transformations, Complex Line Integral, Cauchy Integral Theorem, Cauchy Integral Formula, Derivative of Analytic Function, Power Series, Taylor Series, Laurent Series, Zeroes and Singularities, Residues, Residue Theorem, Evaluation of Real Integrals of the Form and $\int_{-\infty}^{\infty} \frac{f(x)}{F(x)} dx$.

Module IV: **Statistics and Probability**
Moments, Skewness, Kurtosis, Random Variables and Probability Distribution, Mean and Variance of a Probability Distribution, Binomial Distribution, Poisson Distribution and Normal Distribution.

Examination Scheme:

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	15	20	20	20	5

C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:
- Engineering Mathematics by Erwin Kreyszig.
- Engineering Mathematics by R.K. Jain and S.R.K. Iyengar.
- Higher Engineering Mathematics by H.K. Dass.
- Engineering Mathematics by B.S. Grewal.
- Differential Calculus by Shanti Narain.
- Integral Calculus by Shanti Narain.
- Linear Algebra- Schaum Outline Series.

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ENGINEERING MECHANICS

Course Code: CSE2216 **Credit Units : 03**

Course Objective:
Objective of this course is to provide fundamental knowledge of force system and its effect on the behaviour of the bodies that may be in dynamic or in static state. It includes the equilibrium of different structures like beams, frames, truss etc and the force transfer mechanism in the different components of a body under given loading condition.

Course Contents:

Module I: Force system & Structure
Free body diagram, Equilibrium equations and applications. Plane truss, perfect and imperfect truss, assumption in the truss analysis, analysis of perfect plane trusses by the method of joints, method of section.

Module II:Friction
Static and Kinetic friction, laws of dry friction, co-efficient of friction, angle of friction, angle of repose, cone of friction, friction lock, efficiency of screw jack, transmission of power through belt

Module III: Distributed Force
Determination of center of gravity, center of mass and centroid by direct integration and by the method of composite bodies, mass moment of inertia and area moment of inertia by direct integration and composite bodies method, radius of gyration, parallel axis theorem, Pappus theorems and its application, polar moment of inertia.

Module IV: Work -Energy
Work energy equation, conservation of energy, Virtual work, impulse, momentum conservation, impact of bodies, co-efficient of restitution, loss of energy during impact, D'alembert principle

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
- S.S. Bhavikatti, Engineering Mechanics, New Age International Ltd
- Timoshenko, Engineering Mechanics, McGraw Hill
- R. S. Khurmi, Engineering Mechanics, S. Chand Publication
- H. Shames & G. K. M. Rao, Engineering Mechanics, Pearson Education, 2006

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ENGINEERING CHEMISTRY

Course Code: CSE2212 **Credit Units : 02**

Course Objective:
Four basic sciences, Physics, Chemistry, Mathematics and Biology are the building blocks in engineering and technology. Chemistry is essential to develop analytical capabilities of students, so that they can characterize, transform and use materials in engineering and apply knowledge in their field. All engineering fields have unique bonds with chemistry whether it is Aerospace, Mechanical, Environmental and other fields the makeup of substances is always a key factor, which must be known. For electronics and computer science engineering, apart from the material, computer modeling and simulation knowledge can be inherited from the molecule designing. The upcoming field of technology like Nanotechnology and Biotechnology depends fully on the knowledge of basic chemistry. With this versatile need in view, course has been designed in such a way so that the student should get an overview of the whole subject.

Course Contents:
Module I: Water Technology
Introduction and specifications of water,
Hardness and its determination (EDTA method only), Alkalinity,
Boiler feed water, boiler problems – scale, sludge, priming & foaming: causes & prevention, Boiler problems – caustic embrittlement & corrosion: causes & prevention,
Carbonate & phosphate conditioning, colloidal conditioning & calgon treatment
Water softening processes: Lime – soda process, Ion exchange method, Water for domestic use.

Module II: Fuels
Classification, calorific value of fuel, (gross and net), Determination of calorific value of fuels, bomb calorimeter,Solid fuels - Proximate and ultimate analysis, Octane & Cetane No. and its significance.
Numericals on combustion

Module III: Instrumental Methods of analysis
Introduction; Principles of spectroscopy; Laws of absorbance
IR: Principle, Instrumentation, Application
UV: Principle, Instrumentation, Application
NMR: Principle, Instrumentation, Application

Module IV: Lubricants
Introduction; Mechanism of Lubrication; Types of Lubricants; Chemical structure related to Lubrication;
Properties of lubricants; Viscosity and Viscosity Index; Iodine Value; Aniline Point; Emulsion number; Flash Point; Fire Point; Drop Point; Cloud Point; Pour Point.
Selection of Lubricants.

Module V: Corrosion
Introduction, Mechanism of dry and wet corrosion,
Types of corrosion-Galvanic, Concentration cell, soil, pitting, intergranular, waterline. Passivity.
Factors influencing corrosion. Corrosion control.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Text & References:

Text:

- Engineering Chemistry- Jain and Jain
- Engineering Chemistry- Sunita Rattan
- Engineering Chemistry-Shashi Chawla

References:

- Engineering Chemistry –Dara and Dara
- Spectroscopy- Y.R Sharma
- Corrosion Engineering – Fontenna and Greene

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CSE2217	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	2	1	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

In this course the concepts of electricity and electrical circuits are discussed in detail. Theorems related to electrical circuits, law's related to flow of current, voltages, basic knowledge of Transformer, basic knowledge of electromagnetism, basic knowledge of electrical network will be introduced.

Course Objectives

The objective of this course is to:

1. Provide the overview of concept of flow of current/voltage of electrical circuits.
2. Provide the basic knowledge about the concepts of electrical circuits.

Course Outcomes

On completion of this course, the students will be able to:

CO1. Explain the fundamental theorems and laws related to the electrical circuits.
CO2. Derive equations and solve problems related to network theorems.
CO3. Draw phasor diagrams for different alternating current waveforms and Explain the working principle and estimate the performance of single phase transformers.
CO4. Explain the operation, characteristic and application of PN Junction Diode, Rectifiers, Zener Diode and Bipolar Junction Transistor.

Modules	Blooms level*	Number of hours
Module I: **Direct Current Circuits:** Ohm's Law, Kirchoff's Current Law, Kirchoff's Voltage Law Network Reduction: Star-Delta Transformation, Source Transformation, Nodal Analysis, Mesh analysis, Superposition theorem, Thevenin's Theorem, Norton's theorem and Reciprocity theorem, Maximum Power transfer theorem.	L1 and L2	9
Module II: **Alternating Current Circuits:** Peak, Average and RMS values for	L1, L2 and L3	8

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alternating currents, Power calculation: reactive power, active power, Complex power, power factor, impedance, reactance, conductance, susceptance Resonance: series Resonance, parallel resonance, basic definition of Q factor & Band-width.		
Module III: **Transformer:** Basic Transformer Operation principle, Construction, Voltage relations, current relations, Linear circuit models, open circuit test, short circuit test, Transformer Efficiency.	L1, L2 and L3	6
Module IV: **Rotating Electrical Machines:** D.C. machines (motors and generators), Induction motor, Synchronous machines (motors and generators): construction, working principle, classification and applications.	L1, L2 and L3	6
Module V: **Semiconductor Devices:** Principle of operation characteristic and application of PN Junction Diode, Rectifiers, Zener Diode, Principle of operation, characteristic and application of Bipolar Junction Transistor, Regulated Power Supply.	L1, L2 and L3	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- V K Mehta and Rohit Mehta, Principles of Electrical Engineering and Electronics, 3rd edition, S. Chand Publications, 2014, New Delhi
- D. P. Kothari and I. J. Nagrath, Theory and Problem of Basic Electrical Engineering, PHI Learning Pvt. Ltd., 2015, New Delhi.
- J B Gupta, Electrical Science, S K Kataria and Sons, 2015, New Delhi.

Reference Books

- R J Smith and R C Dorf, Circuits Devices and Systems, 5th Edition, John Wiley
- B.L. Thareja, Basic Electronics, 5th edition, S. Chand Publishing, 2011, New Delhi
- V. Del Toro, Electrical Engineering fundamentals, PHI, 2016
- Mahmood Nahvi, Joseph Edminister, Electric Circuits, 7th edition, McGraw-Hill Education, 2017

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**-**	**-**
CO2	**1**	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**-**	**-**
CO3	**1**	**1**	**3**	**3**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**-**	**-**
CO4	**1**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**-**	**-**

1: strongly related, 2: moderately related and 3: weakly related

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CSE2204	OBJECT ORIENTED PROGRAMMING USING C++	L	T	P	C
Version 1.1	Date of Approval: 14th June 2017	2	1	0	3
Pre-requisites/Exposure	Hands on knowledge of C Programming				
Co-requisites	Basic concepts of C Programming				

Catalog Description

The objective of this course is to introduce object-oriented programming. To explore and implement the various features of OOP such as inheritance, polymorphism, Exceptional handling using programming language C++. After completing this course student can easily identify the basic difference between the programming approaches like procedural and object oriented.

Course Objectives

The objective of this course is

1. Equip the students with the basic features of C++ supporting object-oriented programming. Perform object oriented programming to develop solutions to problems demonstrating usage of control structures, modularity, I/O. and other standard language constructs.
2. Provide the overview of major object-oriented concepts to implement object oriented programs in C++ like encapsulation, inheritance and polymorphism, stream I/O, templates and operator overloading

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain the basic principles of object-oriented programming approach; Differentiate itwithprocedural programming approach and also discuss difference between C and C++.

CO 2: Illustrate the different ways to define a member function inline and explain how the private members of a class can be accessed. Explain how the objects can be instantiated and destroyed with static data member?

CO 3: Explain the concept of inheritance, types and implementation with suitable examples; find out ambiguity problem in inheritance; use the concept of overriding and constructors in inheritance.

CO 4: Explain polymorphism in detail and implement the concept of overloading in functions as well as in operators. Write the programs for virtual function and pointer with objects.

CO 5: Explain the exception handling mechanism. Design the programs for class and function Template. Compare and contrast various formatted and unformatted i/o function in file handling.

Modules	Blooms level*	Number of hours
MODULE 1: INTRODUCTION Review of C, Difference between C and C++, Procedure Oriented and Object Oriented Approach. Basic Concepts: Objects, classes, Principals like Abstraction, Encapsulation, Inheritance and Polymorphism. Dynamic Binding, Message Passing. Characteristics of Object-Oriented Languages. Introduction to Object-Oriented Modeling techniques (Object, Functional and Dynamic Modeling).	L1 and L2	5

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MODULE 2: CLASSES AND OBJECTS Abstract data types, Object & classes, attributes, methods, C++ class declaration, Local Class and Global Class, State identity and behaviour of an object, Local Object and Global Object, Scope resolution operator, Friend Functions, Inline functions, Constructors and destructors, instantiation of objects, Types of Constructors, Static Class Data, Array of Objects, Constant member functions and Objects, Memory management Operators.	L1, L2 and L3	7
MODULE 3: INHERITANCE Inheritance, Types of Inheritance, access modes – public, private & protected, Abstract Classes, Ambiguity resolution using scope resolution operator and Virtual base class, Aggregation, composition vs classification hiérarchies, Overriding inheritance methods, Constructors in derived classes, Nesting of Classes	L2, L3 and L4	8
MODULE 4: POLYMORPHISM Polymorphism, Type of Polymorphism – Compile time and runtime, Function Overloading, Operator Overloading (Unary and Binary) Polymorphism by parameter, Pointer to objects, this pointer, Virtual Functions, pure virtual functions.	L2, L3 and L4	8
MODULE 5: STRINGS, FILES AND EXCEPTION HANDLING Manipulating strings, Streams and files handling, formatted and Unformatted Input output. Exception handling, Generic Programming – function template, class Template Standard Template Library: Standard Template Library, Overview of Standard Template Library, Containers, Algorithms, Iterators, Other STL Elements, The Container Classes, General Theory of Operation, Vectors.	L2, L3 and L4	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. A.R. Venugopal, Rajkumar, T. Ravishanker "Mastering C++", TMH, 1997
2. R. Lafore, "Object Oriented Programming using C++", BPB Publications, 2004.
3. E. Balagurusamy ,"Object Oriented Programming with C++", Mc Graw Hill,6th Edition,2013.
4. Schildt Herbert, "C++: The Complete Reference", Wiley DreamTech, 2005.

Reference Book

1. Parasons, "Object Oriented Programming with C++", BPB Publication, 1999.
2. Steven C. Lawlor, "The Art of Programming Computer Science with C++", Vikas Publication, 2002.
3. Yashwant Kanethkar, "Object Oriented Programming using C++", BPB, 2004

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/ Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	2	--	--	--	--	--	--	--	--	--	--	1	--	2	--
CO 2	1	1	2	3	--	--	--	--	--	--	--	--	1	--	1	2
CO 3	1	1	2	--	--	--	--	--	--	--	--	--	1	--	2	2
CO 4	1	1	2	3	--	--	--	--	--	--	--	--	1	1	--	2
CO 5	1	1	2	--	--	--	--	--	--	--	--	--	1	1	--	1

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CSE2208	OBJECT ORIENTED PROGRAMMING USING C++ LAB	L	T	P	C
Version 2017.1	Date of Approval: 14th June 2017	0	0	1	1
Pre-requisites/Exposure	Turbo C++				
Co-requisites	NIL				

Catalog Description

The objective of this course is to introduce object-oriented programming. To explore and implement the various features of OOP such as inheritance, polymorphism, Exceptional handling using programming language C++. After completing this course student can easily identify the basic difference between the programming approaches like procedural and object oriented.

Course Objectives

The objective of this course is

1. Perform object-oriented programming to develop solutions to problems demonstrating usage of control structures, modularity, I/O. and other standard language constructs.
2. Demonstrate adeptness of object-oriented programming in developing solutions to problems demonstrating usage of data abstraction, encapsulation, and inheritance.
3. Demonstrate ability to implement one or more patterns involving realization of an abstract interface and utilization of polymorphism in the solution of problems which can take advantage of dynamic dispatching, syntax, features of, and how to utilize the Standard Template Library.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Define and identify the basic principles of object-oriented programming approach; Differentiate it with procedural programming approach.

CO 2: Determine the different ways to define a member function inline and explain how the private members of a class can be accessed. Solve how the objects can be instantiated and destroyed with static data member?

CO 3: Apply the concept of inheritance, types and implementation with suitable examples; find outambiguity problem in inheritance; use the concept of overriding and constructors in inheritance.

CO 4: Relate the concept polymorphism with overloading in detail and implement the concept of overloading in functions as well as in operators. Write the programs for virtual function and pointer with objects.

CO 5: Determine the exception handling mechanism. Design the programs for class and function Template. Compare and contrast various formatted and unformatted i/o function in filehandling.

Modules/Topics Covered**	Blooms level*	Number of hours
1. Sample Programs using objects and classes (a) Write a program to illustrate the concept of one class with two objects by taking student data. (b) Write a program to show the relationship of class and object to display roll no., grade and fee paid by student.	L1, L3, L5	4

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2. Sample Programs for different use of private, public member variables and functions and friend functions (a) Write a program to define the member function outside and inside the class. (b) Write a program to read and display the information of N persons to illustrate the concept of array of objects. (c) Write a program to add two numbers to illustrate the use of friend function.	L1, L3, L5	4
3. Sample Programs using constructors and destructors (a) Write a program to assign and copy values to illustrate the concept of parametrized and copy constructor. (b) Write a program to show the order of constructor and destructor.	L1, L3, L5	4
4. Sample Programs using operator overloading (a) Write a program to add two numbers using binary operator overloading. (b) Write a program to illustrate the assignment operator overloading.	L1, L3, L5	4
5. Sample Programs using inheritance in and accessing objects of different derived classes (a) Write a program to compute the marks explaining the concept of multiple inheritance. (b) Write a program to find the factorial of a number using inheritance.	L1, L3, L5	4
6. Sample Programs using polymorphism and virtual functions (using pointers) and File Handling (a) Write a program to find the volume of cylinder and cuboid using function overloading. (b) Write a program to reverse a string using pointers. (c) Write a program to explain the relationship of inheritance and virtual function. (d) Write a program to read the student name and fee paid using read() function from the file.	L1, L3, L4, L5	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

1. A.R. Venugopal, Rajkumar, T. Ravishanker "Mastering C++", TMH, 1997
2. R. Lafore, "Object Oriented Programming using C++", BPB Publications, 2004.
3. "Object Oriented Programming with C++" By E. Balagurusamy.
4. Schildt Herbert, "C++: The Complete Reference", Wiley DreamTech, 2005.

Reference Book

1. Parasons, "Object Oriented Programming with C++", BPB Publication, 1999.
2. Steven C. Lawlor, "The Art of Programming Computer Science with C++", Vikas Publication, 2002.
3. Yashwant Kanethkar, "Object Oriented Programming using C++", BPB, 2004

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	**70**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**3**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**--**	**--**
CO2	**3**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**--**	**--**
CO3	**2**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**--**	**--**
CO4	**2**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**--**	**--**
CO5	**2**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**--**	**--**

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ENGINEERING CHEMISTRY LAB

Course Code: CSE2215 **Credit Units: 01**

Course Contents:

List of Experiments:

(Any 10 Experiments)

1. To determine the ion exchange capacity of a given cation exchanger.
2. To determine the temporary, permanent and total hardness of a sample of water by complexometric titration method.
3. To determine the type and extent of alkalinity of given water sample.
4. To determine the number of water molecules of crystallization in Mohr's salt (ferrous ammonium sulphate) provided standard potassium dichromate solution (0.1N) using diphenylamine as internal indicator.
5. To determine the ferrous content in the supplied sample of iron ore by titrimetric analysis against standard $K_2Cr_2O_7$ solution using potassium ferricyanide $[K_3Fe(CN)_6]$ as external indicator.
6. (a) To determine the surface tension of a given liquid by drop number method.
   (b) To determine the composition of a liquid mixture A and B (acetic acid and water) by surface tension method.
7. To prepare and describe a titration curve for phosphoric acid – sodium hydroxide titration using pH-meter.
8. (a) To find the cell constant of conductivity cell.
   (b) Determine the strength of hydrochloric acid solution by titrating it against standard sodium hydroxide solution conductometrically
9. Determination of Dissolved oxygen in the given water sample.
10 To determine the total residual chlorine in water.
11 Determination of amount of oxalic acid and H_2SO_4 in 1 L of solution using N/10 NaOH and N/10 $KMnO_4$ solution.
12 Determination of viscosity of given oil by means of Redwood viscometer I.
13 To determine flash point and fire point of an oil by Pensky Martin's Apparatus
14 To determine the Iodine value of the oil.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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CSE2118	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

In this course, students will become familiar with basic electrical circuits. The students will learn practical aspects and implementation of theorems related to electrical circuits, law's related to flow of current, voltages, transformer and transistors.

Course Objectives

The objective of this course is to:

- Provide the overview of concept of flow of current/voltage of electrical circuits.
- Provide the basic knowledge about the concepts of electrical circuits and BJTs.

Course Outcomes

On completion of this course, the students will be able to:

CO1. Explain the fundamental theorems and laws related to the electrical circuits and experimentally verify the basic circuit theorems

CO2. Explain the working principle and estimate the performance of single phase transformers.

CO3. Understand 3 phase balanced and unbalanced, star and delta connected supply and load and to measure power in 3 phase circuits

CO4. Able to design circuit with Bipolar Junction Transistor in CB, CE & CC configurations

Modules	Blooms level*	Number of hours
Lab Session 1: Network Analysis Techniques & Theorems 1. To verify KVL & KCL in the given network. 2. To verify Superposition Theorem. 3. To verify Maximum Power Transfer Theorem. 4. To verify Reciprocity Theorem. 5. To determine and verify R_{Th}, V_{Th}, R_N, I_N in a given network.	L1 , L2 and L3	6
Lab session II: Transformers and transistors 1. To perform open circuit & short circuit test on a single-phase transformer. 2. To perform regulation, ratio & polarity test on a single-phase transformer. 3. To obtain the characteristics of a transistor under common base (CB) and common emitter (CE) configuration.	L1, L2 and L3	3

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Lab session III: Alternating Current Circuits 1. To study transient response of a given RLC Circuit. 2. To measure power & power factor in a three phase circuit by two wattmeter method. 3. To measure power & power factor in a three phase load using three ammeter & three voltmeter method.	L1, L2 and L3	3

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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- R J Smith and R C Dorf, Circuits Devices and Systems, 5th Edition, John Wiley
- B.L. Thareja, Basic Electronics, 5th edition, S. Chand Publishing, 2011, New Delhi
- V. Del Toro, Electrical Engineering fundamentals, PHI, 2016
- Mahmood Nahvi, Joseph Edminister, Electric Circuits, 7th edition, McGraw-Hill Education, 2017

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	1	2	--	--	--	--	--	--	--	--	--	--	1	-	-
CO2	1	1	2	3	--	--	--	--	--	--	--	--	1	-	-
CO3	1	1	3	3	-	--	--	--	--	--	--	--	1	-	-
CO4	1	1	2	--	--	--	--	--	--	--	--	--	1	-	-

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ENGINEERING GRAPHICS LAB

Course Code: CSE2113 **Credit Units : 01**

Course Objective:
This course will provide students concepts on the drawings of different curves like straight line, parabola, ellipse etc. After completion of this course, students will be able to draw different figures manually and will be capable of using various instruments involved in drawings.

Course Contents:

Module I: General
Importance, Significance and scope of engineering drawing, Lettering, Dimensioning, Scales, Sense of proportioning, Different types of projections, Orthographic Projection, B.I.S. Specifications.

Module II: Projections of Point and Lines
Introduction of planes of projection, Reference and auxiliary planes, projections of points and Lines in different quadrants, traces, inclinations, and true lengths of the lines, projections on Auxiliary planes, shortest distance, intersecting and non-intersecting lines.

Module III: Planes other than the Reference Planes
Introduction of other planes (perpendicular and oblique), their traces, inclinations etc., Projections of points and lines lying in the planes, conversion of oblique plane into auxiliary Plane and solution of related problems.

Module IV: Projections of Plane Figures
Different cases of plane figures (of different shapes) making different angles with one or both reference planes and lines lying in the plane figures making different given angles (with one of both reference planes). Obtaining true shape of the plane figure by projection.

Module V: Projection of Solids
Simple cases when solid is placed in different positions, Axis faces and lines lying in the faces of the solid making given angles.

Module VI:Development of Surface
Development of simple objects with and without sectioning. Isometric Projection

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text & References:
- M.B. Shah & B.C. Rana, Engineering Drawing, Pearson Education, 2007
- PS Gill, Engineering Drawing, Kataria Publication
- ND Bhatt, Engineering Drawing, Charotar publications
- N Sidheshwar, Engineering Drawing, Tata McGraw Hill
- CL Tanta, Mechanical Drawing, "Dhanpat Rai"

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SEMESTER-III

CSE2302	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
Version 2017.1	Date of Approval: 14 June 2017	3	1	0	4
Pre-requisites/Exposure	Computer Fundamentals and Mathematics Set Theory				
Co-requisites	Nil				

Catalog Description

This course is design to get students familiar with the fundamentals & basic concepts in Data Base Management Systems and their use. This course discusses architecture of Database Systems with concept of different types of available database model, concurrency techniques and new applications of the DBMS. The techniques for database design, normalization, database recovery and protection will enable students to work easily and efficiently on real databases.

Course Objectives

The objective of this course is

1. To make students familiar with the fundamental and necessary concepts of DBMS.
2. Provide an overview of normalization, concurrency techniques and database recovery with examples.

Course Outcomes

On completion of this course, the students will be able to

CO1. Differentiate between traditional data processing system and database management system and understand characteristics and applications of DBMS in real world.

CO2. Explain and use different data models such as Entity Relationship Model, Network, and Relational Model etc.

CO3. Solve queries using relational algebra, relational calculus and SQL.

CO4. Illustrate normalization concepts and apply them in real database applications.

CO5. Explain database concurrency techniques and recovery mechanisms.

Modules	Blooms level*	Number of hours
Module I: Introduction Concept and goals of DBMS, Database Languages, Database Users, Database Abstraction. Basic Concepts of ER Model, Relationship sets, Keys, Mapping, Design of ER Model.	L1, L2 and L6	9
Module II: Hierarchical model &Network Model Concepts, Data definition, Data manipulation and implementation. Network Data Model, DBTG Set Constructs, and Implementation	L1and L2	9
Module III: Relational Model Relational database, Relational Algebra, Relational & Tuple Calculus.	L1 and L3	10

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Module IV: Relational Database Design and Query Language SQL, QUEL, QBE, Normalization using Functional Dependency, Multivalued dependency and Join dependency.	L2, L3 and L4	10
Module V: Concurrency Control and New Applications Transaction basics: ACID property, Lifecycle of Transcation, Why Concurrency Control, Schedule, Serializability, Lock Based Protocols, Time Stamped Based Protocols, Deadlock Handling, Crash Recovery. Distributed Database, Objective Oriented Database, Multimedia Database, Data Mining, Digital Libraries.	L2, L3 and L4	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Korth, Silberschatz, "Database System Concepts", TMH, 4th Ed., 2000.
2. Elmsari and Navathe, "Fundamentals of Database Systems", A. Wesley, 6th Ed., 2004

Reference Books

5. Date C. J., "An Introduction to Database Systems", Narosa Publishing, 7th Ed., 2004

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	--	--	--	--	--	--	--	--	--	1	--	-	-
CO2	1	1	2	3	--	--	--	--	--	--	--	--	1	--	--	--
CO3	1	2	2	3	--	--	--	--	--	--	--	--	1	2	--	--
CO4	--	1	2	--	--	2	--	3	--	--	--	--	1	1	-	-
CO5	1	1	3	--	--	--	--	--	2	--	--	--	1	--	-	3

1: strongly related, 2: moderately related and 3: weakly related

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CSE2307	DATABASE MANAGEMENT SYSTEMS LAB	L	T	P	C
Version 2017.1	Date of Approval: 14 June 2017	0	0	2	1
Pre-requisites/Exposure	Basic Concepts of DBMS				
Co-requisites	Relational Algebra and Relational Calculus				

Catalog Description

This course is designed to get students familiar with the basic concepts of SQL including DDL, DML and DCL statements. The course also explains the basic concepts of PL/SQL. Students will learn practical on Oracle software and hence can work on any RDBMS software in future.

Course Objectives

The objective of this course is

1. To make students familiar with the concepts and working of SQL.
2. Provide an overview of PL/SQL.

Course Outcomes

On completion of this course, the students will be able to

CO1. Illustrate SQL basic concepts like languages DDL, DML etc., data types and working.

CO2. Explain concepts of database creation, manipulation of data and data retrieval and apply them in real database applications.

CO3. Design and implement various data constraints on a database for a given problem.

CO4. Solve queries using concepts like joins, subqueries, aggregate functions, triggers etc.

CO5. Prepare PL/SQL blocks.

Modules	Blooms level*	Number of hours
Lab Session 1 Introduction of RDBMS, Oracle, SQL and data types.	L1 and L2	2
Lab Session 2 Basic concept of database creation and manipulation of data.	L1and L3	2
Lab Session 3 Working with SELECT query.	L1 and L3	2
Lab Session 4 To apply data constraints on a table-Primary Key, Not Null, Unique.	L1 and L3	2
Lab Session 5 Working with Foreign Key and Check Constraint.	L1 and L3	2

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Lab Session 6 To implement the basic concept of Aggregate and Grouping Functions.	L1 and L3	2
Lab Session 7 To apply various set operators on data.	L1 and L3	2
Lab Session 8 Concept of Nested queries in database and its application in database.	L1 and L3	2
Lab Session 9 Implementation different types of JOINS in database.	L1 and L3	2
Lab Session 10 Basic concepts of Triggers and Procedures and related queries.	L1 and L3	2
Lab Session 11 Introduction to PL/SQL and basic syntax.	L1 and L3	2
Lab Session 12 Write programs in PL/SQL Using Control Structures.	L3	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1,Ivan Bayross , "SQL, PL/SQL the Programming Language of Oracle", 4th Ed., BPB Publications,2009.

2.Lynn Beighley, "Head First SQL", 1st Ed., O′Reilly, 2007.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**-**	**-**
CO2	**1**	**-**	**2**	**--**	**--**	**3**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**--**	**1**	**-**
CO3	**1**	**-**	**1**	**--**	**--**	**3**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**1**	**2**	**-**
CO4	**1**	**-**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**	**--**
CO5	**1**	**-**	**2**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**--**	**--**	**1**	**1**	**--**	**-**

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CSE2303	OPERATING SYSTEMS	L	T	P	C
Version 2017.1	Date of Approval: 14th June 2017	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

In this course Operating System, its generic types, characteristics and functions are discussed in detail. Concepts covered would enable students to identify various categories of operating systems, with details about concepts of process management and scheduling. Contents will be helpful in identifying deadlocks in the system and designated approaches used to prevent, handle or recover from them. Further it covers the concepts of managing memory, devices and mechanisms for providing security to system and files using operating system.

Course Objectives

The objective of this course is to

1. Equip the students with the knowledge about categories of operating systems and their functions.
2. Provide detailed knowhow about functions of operating system like process, memory and device management along with file system security and protection.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define and explain operating systems and their evolution, also differentiate among its various types.

CO2: Explain concepts of process and inter-process communication and synchronization. Identify solutions to detect, prevent and handle deadlocks occurring in the operating systems. Solve synchronization and CPU scheduling problems related to processes.

CO3: Define and explain concepts of memory management like fragmentation, paging and segmentation. Solve problems related to memory management using page replacement algorithms.

CO4: Describe the concepts of device management and list various disk allocation methods. Determine solutions for disk scheduling problems using available disk scheduling algorithms.

CO5: State the concept of file and file system security, also distinguish among various file allocation methods.

Modules	Blooms level*	Number of hours
MODULE 1: INTRODUCTION TO OPERATING SYSTEM Operating system and function, Evolution of operating system, Batch, Interactive, multiprogramming, Time Sharing and Real Time System, multiprocessor system, Distributed system, System protection. Operating System structure, Operating System Services, System Program and calls	L1, L2 and L4	6

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MODULE 2: PROCESS MANAGEMENT Process concept, State model, process scheduling, job and process synchronization, structure of process management, Threads Interprocess Communication and Synchronization: Principle of Concurrency, Producer Consumer Problem, Critical Section problem, Semaphores, Hardware Synchronization, Critical Regions, Conditional critical region, Monitor, Inter Process Communication. CPU Scheduling: Job scheduling functions, Process scheduling, Scheduling Algorithms, Non-Preemptive and preemptive Strategies, Algorithm Evaluation, Multiprocessor Scheduling. Deadlock: System Deadlock Model, Deadlock Characterization, Methods for handling deadlock, Prevention strategies, Avoidance and Detection, Recovery from deadlock combined approach	L1, L2 and L3	12
MODULE 3: MEMORY MANAGEMENT Single Contiguous Allocation: H/W support, S/W support, Advantages and disadvantages, Fragmentation, Paging, Segmentation, Virtual memory concept, Demand paging, Performance, Paged replaced algorithm, Allocation of frames, Thrashing, Cache memory, Swapping, Overlays	L1, L2 and L3	7
MODULE 4: DEVICE MANAGEMENT Principles of I/O hardware, Device controller, Device Drivers, Memory mapped I/O, Direct Access Memory, Interrupts, Interrupt Handlers, Application I/O interface, I/O Scheduling, Buffering, Caching, Spooling, Disk organization, Disk space management, Disk allocation Method, Disk Scheduling, Disk storage	L1, L2 and L3	7
MODULE 5: FILE SYSTEM AND PROTECTION AND SECURITY File Concept, File Organization and Access Mechanism, File Directories, Basic file system, File Sharing, Allocation method, Free space management. Policy Mechanism, Authentication, Internal excess Authorization	L1 and L2	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Milenekovic, "Operating System Concepts", McGraw Hill
2. Silberschatz, P.B. Galvin "Operating System Concepts", John Willey & son

Reference Books

- Dietel, "An introduction to operating system", Addision Wesley
- Tannenbaum, "Operating system design and implementation", PHI
- Operating System, A Modern Perspection, Gary Nutt, Pearson Edu. 2000
- A. S Tanenbaum, Modern Operating System, 2nd Edition, PHI
- Willam Stalling " Operating system" Pearson Education

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	--	--	--	--	--	--	--	--	--	1	2	--	--
CO2	1	2	3	--	--	--	--	--	--	--	--	--	1	2	--	--
CO3	1	2	3	--	--	--	--	--	--	--	--	--	1	2	--	--
CO4	1	2	3	--	--	--	--	--	--	--	--	--	1	2	--	--
CO5	1	--	2	--	--	--	--	--	--	--	--	--	1	--	--	--

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CSE2308	UNIX PROGRAMMING LAB	L	T	P	C
Version 2017.1	Date of Approval: 14th June 2017	0	0	2	1
Pre-requisites/Exposure	Basic knowledge of Operating System				
Co-requisites					

Catalog Description

This course introduces the UNIX operating system commands, shell programming. Explores the use of operating system utilities such as vi text editors, filters, process handling etc.

Course Objectives

The objective of this course is to

1. Provide knowledge of working on Unix.
2. Provide sound foundation of writing Shell scripts.
3. Implement features like piping, filters and redirection.

Course Outcomes

On completion of this course, the students will be able to

CO1: To implement various Unix commands.
CO2: To demonstrate the use of Vi Editor and other editors of UNIX.
CO3: To write simple Shell scripts.

Modules	Blooms level*	Number of hours
1. UNIX structure, history, basic commands.	L1,L3	10
2. Working of Vi Editor and its commands.	L1,L3	4
3. Shell Script i. Write shell script to find largest among three numbers. ii. Write shell script to print multiplication table of any number. iii. Write a shell script that copies multiple files into directory. iv. Write a shell script to find number of words and characters in a given file. v. Write a shell script to find the sum, the average and the product of the four integers entered. vi. Write a shell script to calculate the factorial of a number. vii. Write a shell script to generate Fibonacci series. viii. Write a shell script that computes the gross salary of employee. ix. Write a shell script that takes a command –line argument and reports on whether it is directory, a file, or something else. x. Write a shell script which receives two file names as arguments. It should check whether the two file contents are same or not. If they are same then second file should be deleted. xi. Write a shell script to calculate gcd of two numbers. xii. Write a shell script to concatenate two strings and find the length of the resultant string.	L1,L3	10

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

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1. " Unix Concepts and application" Das Sumitabha Tata Mcgraw Hill

Reference Books

1. "Unix Programming Environment" The Kernighan and Pike Prentice – Hall of India

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**--**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**	**--**
CO2	**1**	**--**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**	**--**
CO3	**1**	**--**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**	**--**

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CSE2304	DATA STRUCTURES USING C	L	T	P	C
Version:2017.1	Date of Approval: 14th June 2017	3	1		4
Pre-requisites/Exposure	Basic Knowledge of C++ Programming				
Co-requisites	Nil				

Catalog Description

This course covers the design, analysis, and implementation of data structures and algorithms to solve engineering problems using C programming language. Topics include elementary data structures, (including arrays, stacks, queues, and lists), advanced data structures (including trees and graphs), the algorithms used to manipulate these structures, and their application to solving practical engineering problems. At the end of this course student will gain knowledge about different kinds of file structures and their related operations.

Course Objectives

The objective of this course is to

1. Equip the students with knowledge of algorithms, different types of data structures and analysis of space and time complexity.
2. Provide an overview of various algorithms of data structures like stack and queues and related operations and implementation.
3. Provide an overview of dynamic Data Structure like linked list and its related operations, algorithms and programs. Demonstrate practical use of dynamic data structure to solve engineering problems.
4. Equip the students with knowledge of algorithms and operations related to tree and graph data structures and their practical applications.
5. Provide an overview of Sorting, Searching and file structures and its related algorithms and techniques.

Course Outcomes

On completion of this course, the students will be able to

CO 1:Identify operations on array, multidimensional, string and their implementation and analyze space and time complexity of algorithms.

CO 2: Explain various algorithms and operations of data structures like stack and queues and analyze complexity of each operation.

CO 3: Explain dynamic data structures and various algorithms and operations of data structures like linked list and their applications in computer science.

CO 4: Illustrate the algorithms and operations related to tree and graph data structures, their practical applications and analyze complexity of algorithm associated with each operations.

CO5: Explain Sorting, Searching and file organization and its related techniques.

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Modules	Blooms level*	Number of hours
Module I: Introduction to Data structures Data structures: Definition, Types. Algorithm design, Complexity, Time-Space Tradeoffs. Use of pointers in data structures.Array Definition and Analysis, Representation of Linear Arrays in Memory, Traversing of Linear Arrays, Insertion and Deletion, Single Dimensional Arrays, Two Dimensional Arrays, Multidimensional Arrays, Function Associated with Arrays, Character String in C, Character String Operations, Arrays as parameters, Implementing One Dimensional Array, Sparse matrix.	L1, L2	7
Module II: Introduction to Stacks and queue Stack: Definition, Array representation of stacks, Operations Associated with Stacks- Push & Pop, Polish expressions, Conversion of infix to postfix, infix to prefix (and vice versa),Application of stacks recursion, polish expression and their compilation, conversion of infix expression to prefix and postfix expression, Tower of Hanoi problem.Queue: Definition, Representation of Queues, Operations of queues- QInsert, QDelete, Priority Queues, Circular Queue, Deque.	L1, L2, L3, L4	8
Module III: Dynamic Data Structure Linked list: Introduction to Singly linked lists: Representation of linked lists in memory, Traversing, Searching, Insertion into, Deletion from linked list, doubly linked list, circular linked list, generalized list. Applications of Linked List- Polynomial representation using linked list and basic operation. Stack and queue implementation using linked list.	L1, L3 and L4	7
Module IV: Trees and Graphs Trees: Basic Terminology, Binary Trees and their representation, expression evaluation, Complete Binary trees, extended binary trees, Traversing binary trees, Searching, Insertion and Deletion in binary search trees, General trees, AVL trees, Threaded trees, B trees. Graphs: Terminology and Representations, Graphs & Multigraphs, Directed Graphs, Sequential representation of graphs, Adjacency matrices, Transversal Connected Component and Spanning trees.	L1, L3 and L5	7
Module V: Sorting and Searching and file structures Sorting: Insertion Sort, Bubble sort, Selection sort, Quick sort, two-way Merge sort, Heap sort, Partition exchange sort, Shell sort, Sorting on different keys, External sorting. Searching: Linear search, Binary search File structures: Physical storage media, File Organization, Linked organization of file, Inverted file, Organization records into blocks, Sequential blocks, Hash function, Indexing & Hashing, Multilevel indexing, Tree Index, Random file, Primary Indices, Secondary Indices, B tree index files.	L1, L4, L5	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Horowitz and Sahani, ― Fundamentals of Data structures‖, Ga lgotia publicat ions.
2. R.L. Kruse, B.P. Leary, C.L. Tondo, ―Data structure and program design in C, PHI
3. Data structures and algorithms‖ – Schaum Series.
4. File Structures An object-Oriented Approach with C++ by Michael J. Folk, Bill Zoellick, Breg Riccardi, Published by Addison Wesley (1st ISE Reprint,1999).

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Reference Books

1. J. P. Tremblay and P. G. Sorenson, Introduction to Data Structures with Applications, McGraw – Hill
2. Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Published by Prentice-Hall
3. India(1999).
4. Data Structures Using C and C++ second edition by Yeddidyah Langsam, Moshe J.Augenstein, Aaron M. Tenen Baum, Published by Prentice-Hall India
5. Data Structures and Algorithm analysis in C++ by Mark Allen Weiss, Published by Addison Wesley (3rd Indian Reprint 2000).
6. Data Structures‖ – R. S. Salaria

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

1: strongly related, 2: moderately related and 3: weakly related

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**1**	**2**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**--**
CO2	**1**	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**2**	**1**
CO3	**1**	**2**	**2**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**2**	**1**
CO4	**1**	**2**	**2**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**2**	**1**
CO5	**1**	**2**	**2**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**2**	**2**

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CSE2305	DATA STRUCTURES USING C LAB	L	T	P	C
2017.1	Date of Approval: 14th June 2017	0	0	2	1
Pre-requisites/Exposure	Basic Knowledge of C Programming				
Co-requisites	Nil				

Catalog Description

This course covers the design, analysis, and implementation of data structures and algorithms to solve engineering problems using C programming language. Topics include elementary data structures, (including arrays, stacks, queues, and lists), advanced data structures (including trees and graphs), the algorithms used to manipulate these structures, and their application to solving practical engineering problems. At the end of this course student will gain knowledge about different kinds of file structures and their related operations.

Course Objectives

The objective of this course is to

1. Equip the students with knowledge of algorithms, different types of data structures and analysis of space and time complexity.
2. Provide an overview of various algorithms of data structures like stack and queues and related operations and implementation.
3. Provide an overview of dynamic Data Structure like linked list and its related operations, algorithms and programs. Demonstrate practical use of dynamic data structure to solve engineering problems.
4. Equip the students with knowledge of algorithms and operations related to tree and graph data structures and their practical applications.
5. Provide an overview of Sorting, Searching and file structures and its related algorithms and techniques.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Identify operations and their implementation on array and multidimensional, string and estmation space and time complexity.

CO 2: Explain various algorithm and operations of data structures like stack and queues and analyze complexity of each operation.

CO 3: Explain dynamic data structures and various algorithms and operations of data structures likelinked list and their applications in computer science.

CO 4: Illustrate the algorithms and operations related to tree and graph data structures, their practical applications and analyze complexity of algorithm associated with each operations.

CO5: Explain Sorting, Searching and file organization and its related techniques.

Modules	Blooms level*	Number of hours

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Module I: Introduction to Data structures 1. Write a program to copy one string into another without using library functions. 2. Write a program to demonstrate array and linked list implementation of sparse matrix. 3. Write a program to multiply two 2D matrix.	L3,L5	2
Module II: Introduction to Stacks and queue 1. Write a program to implement push and pop operations on the stack. 2. Write a program to demonstrate conversion of infix to postfix. 3. Write a program to implement simple queue and perform insertion and deletion operation on it. 4. Write a program to implement circular queue and perform insertion and deletion operation on it. 5. Write a program to implement dqueue and perform insertion and deletion operations on it. 6. Write a program to implement priority queue and perform insertion and deletion operation on it.	L3,L5	4
Module III: Dynamic Data Structure 1. Write a program to implement singly linked list and perform following operations on it. • Insertion at end • Insertion at last • Insertion at desired place. 2. Write a program to implement singly linked list and perform following operations on it. • Deletion at end • Deletion at last • Deletion at desired place. 3. Write a program to implement doubly linked list and perform following operations on it. • Insertion at end • Insertion at last • Insertion at desired place. **4.** Write a program to implement singly linked list and perform addition of two polynomials.	L3,L5	4
Module IV: Trees and Graphs 1. Write a program to calculate in order, preorder and post order traversal on binary tree. 2. Write a program to construct binary search tree and perform following operations on it. • Deletion of element • Insertion of elements. 3. Write a program to construct binary search tree and search an element in it. 4. Write a program to implement kruskal's algorithm to find out minimum spanning tree.	L3,L5	6

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Module V: Sorting and Searching and file structures		
1. Write program to implement insertion sort. 2. Write a program to search an element in array using binary search. 3. Write a program to implement merge sort. 4. Write a program to implement quick sort. 5. Write a program to implement heap sort.	L3,L5	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Horowitz and Sahani, ―Fundamentals of Data structures‖, Ga lgotia publicat ions.
2. R.L. Kruse, B.P. Leary, C.L. Tondo, ―Data structure and program design in C, PHI
3. Data structures and algorithms‖ – Schaum Series.
4. File Structures an Object-Oriented Approach with C++ by Michael J. Folk, Bill Zoellick, Breg Riccardi, Published by Addison Wesley (1st ISE Reprint,1999).

Reference Books

1. J. P. Tremblay and P. G. Sorenson, Introduction to Data Structures with Applications, McGraw – Hill.
2. Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Published by Prentice-Hall India(1999).
3. Data Structures Using C and C++ second edition by Yeddidyah Langsam, Moshe J.Augenstein, Aaron M. Tenen Baum, Published by Prentice-Hall India
4. Data Structures and Algorithm analysis in C++ by Mark Allen Weiss, Published by Addison Wesley (3rd Indian Reprint 2000).
5. Data Structures‖ – R. S. Salaria

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

1: strongly related, 2: moderately related and 3: weakly related

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**1**	**2**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**--**
CO2	**1**	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**2**	**1**
CO3	**1**	**2**	**2**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**2**	**1**
CO4	**1**	**2**	**2**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**2**	**1**
CO5	**1**	**2**	**2**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**2**	**2**

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CSE2314	DIGITAL ELECTRONICS	L	T	P	C
Version 2019.1	Date of Approval: 15 May 2019	2	0	0	2
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course explores the theory and operation of the basic building blocks of digital electronics which includes combinational and sequential circuits. This course also explains the logic families and data convertors. The concepts learnt in the studies of sequential circuits will be applied in the design and analysis of Melay and Moore machines.

Course Objectives

The objective of this course is to

1. Provide the basic knowledge of digital logic levels and application of knowledge to understand combinational and sequential circuits.
2. Explain the operation of logic family and data convertors.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the difference between analog and digital signal; Describe the Boolean algebra; Analyze the SOP & POS form of Boolean function; Solve k-map and tabulation method to simplify the logical function; Apply universal gates to implement the given logic.

CO2: Define the multiplexer and decoder; Explain the adder & subtractor; Apply multiplexer to design Boolean function; Analyze the difference between decoder and encoder.

CO3: Define flip flops; Compare combinational and sequential circuits; Describe shift registers; Design counters and synchronous sequential circuits.

CO4: Explain the logic families; Compare the RTL, DTL, TTL and ECL logic families.

CO5: Define data convertors; Explain analog to digital convertor and digital to analog convertor.

Modules	Blooms level*	Number of hours
MODULE 1: BOOLEAN FUNCTIONS Analog & digital signals, AND, OR, NOT, NAND, NOR & XOR gates, Boolean algebra, Standard representation of logical functions, K-map representation and simplification of logical function, don't care conditions, XOR & XNOR simplifications of K-maps, Tabulation method.	L1,L2 and L3	6
MODULE 2: COMBINATIONAL CIRCUITS Adders, Subtractors, Multiplexer, de-multiplexer, decoder & encoder, code converters, Comparators, decoder / driver for display devices, Implementation of logic functions using multiplexer / de-multiplexer.	L1, L2,L3 and L4	6

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MODULE 3: SEQUENTIAL CIRCUITS Flip-flops: SR, JK, D & T flip flops – Truth table, Excitation table, Conversion of flip-flops, race around condition, Master Slave flip flop, Shift registers: SIPO, PISO, PIPO, SIPO, Bi-directional; Counters: ripple & synchronous counters – up / down; Synchronous Sequential circuit: design procedure.	L1, L2,L4 and L5	8
MODULE 4: LOGIC FAMILIES RTL, DTL, TTL, ECL.	L2 and L4	2
MODULE 5: DATA CONVERTERS ADC – successive approximation, linear ramp, dual slope; DAC – Binary Weighted, R-2R ladder type.	L1 and L2	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Anand Kumar, "Fundamentals of Digital Circuits", 2nd Edition, Prentice-Hall, 2004
2. Moris Mano, "Digital Design", 2nd Edition, Pearson Education,2007.
3. R.P. Jain, "Modern Digital Electronics", 2nd Edition, Tata Mcgraw Hill, 2003

Reference Books

1. Thomas L. Floyd, "Digital Fundamentals", 11th Edition, Pearson Education, 2015
2. Malvino and Leech, "Digital Principles & Applications", 1st Edition, Tata McGraw Hill, 1993

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS O 1**	**PS O 2**	**PS O 3**	**PSO 4**
CO 1	**1**	**2**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**--**	**--**
CO 2	**1**	**2**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**--**	**3**
CO 3	**1**	**2**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**--**	**3**
CO 4	**2**	**3**	**3**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**--**	**--**
CO 5	**2**	**3**	**3**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**--**	**3**

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CSE2310	ELECTRONIC DEVICES & CIRCUITS	L	T	P	C
Version:2017.1	Date of Approval: 14th June 2017	3	0	0	3
Pre-requisites/Exposure	Elementary Resistive Circuit, Theorems and Analysis Techniques: KCL. KVL, Nodal & Mesh Analysis, Thevenin & Norton Equivalents, Maximum Power Transfer.				
Co-requisites	Semiconductor Physics				

Catalog Description

This is the first course in Electronics and Communication Engineering, to educate and explain the methods used for biasing circuits in a graphical analysis of non-linear electronic circuits and also includes small signal transistor models, parameters and their frequency responses. Following this, analyzing different types of feedback amplifiers, and power amplifiers using transistor and designing of different electronic circuits are included in the course. This course also considers the mathematical modeling of active solid state devices their analysis and design of single state circuits. Topics covered include the study of device characteristics and applications of p-n-junction diodes, bipolar junction transistors, and field effect transistors.

Course Objectives

The objective of this course is to

1. build from basic knowledge of Semiconductor Physics to an understanding of basic devices and their models
2. familiarize the student with the analysis and design of basic transistor amplifier circuits, feedback amplifiers and wave shaping circuits
3. build a foundation for Analog Electronics-II, Digital Circuits and Systems I & II, VLSI design and analog CMOS IC Design.

Course Outcomes

On completion of this course, the students will be able to

CO1. explain different types of diodes and demonstrate wave shaping circuits

CO2. explain operating principal of Bipolar Junction Transistor, its properties, biasing techniques and stability

CO3. describe low and high frequency transistor amplifiers along with single and multi-stage amplifier

CO4. explain operating principal of JFET, MOSFET, its properties, and biasing techniques

CO5. solve and analyse different negative feedback amplifiers configurations

CO6. describe and outline power amplifiers and their application.

Modules	Blooms level*	Number of hours
Module I: Semiconductor Diode and Diode Circuits Different types of diodes: Zener, Schottky, LED. Zener as voltage regulator, Diffusion capacitance, Drift capacitance, the load line concept, half wave, full wave rectifiers, clipping and clamping circuits.	L1 L2 & L3	6

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Module II: Bipolar Junction Transistor Bipolar junction transistor: Introduction, Transistor, construction, transistor operations, BJT characteristics, load line, operating point, leakage currents, saturation and cut off mode of operations. Bias stabilization: Need for stabilization, fixed Bias, emitter bias, self bias, bias stability with respect to variations in $I_{co,}$ V_{BE} &β, Stabilization factors, thermal stability.	L1 L2 & L3	9
Module III: Small signal Analysis of transistor and Multistage Amplifier Hybrid model for transistors at low frequencies, Analysis of transistor amplifier using h parameters, emitter follower, Miller's theorem, THE CE amplifier with an emitter resistance, Hybrid π model, Hybrid π Conducatnces and Capacitances, CE short circuit current gain, CE short circuit current gain with R_L Multistage amplifier: Cascading of Amplifiers, Coupling schemes(RC coupling and Transformer coupling)	L2 & L3	6
Module IV: Field Effect Transistors Field effect transistor (JFET, MOSFET): volt-ampere characteristics, small signal model –common drain, common source, common gate, operating point, MOSFET, enhancement and -depletion mode, Common source amplifier, Source follower	L1, L2 & L3	5
Module V: Feedback Amplifiers Feedback concept, Classification of Feedback amplifiers, Properties of negative Feedback amplifiers, Impedance considerations in different Configurations, Examples of analysis of feedback Amplifiers.	L1, L2, L3 & L4	6
Module VI: Power amplifiers Power dissipation in transistors, difference with voltage amplifiers, Amplifier classification (Class A, Class B, Class C, Class AB) class AB push pull amplifier, collector efficiency of each, cross over distortion.	L1 & L2	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Jacob Millman, Christos Halkias, Chetan Parikh, Millman's Integrated Electronics, McGraw Hill Education, 2nd Edition, New Delhi
2. Sanjeev Gupta, Electronic Devices and Circuits, Dhanpat Rai Publications, 2010
3. Theraja B.L., Sedha R.S, Principles of Electronic Devices and Circuits, S Chand & Company, First Edition, New Delhi, 2002

Reference Books

1.Robert L. Boylestad: Electronic Devices and Circuits, Pearson Education, 11th Edition, 2013
2.Robert F. Pierret, Semiconductor Device Fundamentals, Pearson Education, 1st Edition, 2006
6. Nagrath I.J, Electronics: Analog and Digital, Prentice Hall India Learning Private Limited, Second Edition, 2013

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	3	--	--	--	--	--	--	--	--	3	1	--	--	3
CO2	1	2	--	--	--	--	--	--	--	--	--	3	1	3	--	3
CO3	1	2	3	--	--	--	--	--	--	--	--	--	1	-	--	--
CO4	1	2	--	--	--	--	--	--	--	--	--	3	1	3	--	3
CO5	1	2	3	--	--	--	--	--	--	--	--	3	1	--	--	3
CO6	1	3	--	--	--	--	--	--	--	--	--	3	1	--	--	3

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CSE2312	E-COMMERCE AND ERP	L	T	P	C
Version 2017.1	Date of Approval: 14, June 2017	3	0	0	3
Pre-requisites/Exposure	Knowledge of basic computer				
Co-requisites	Nil				

Catalog Description

This course examines the evolution of enterprise resource planning (ERP) systems - from internally focused client/server systems to externally focused e-business. This class studies the types of issues that managers will need to consider in implementing cross-functional integrated ERP systems. The objective of this course is to make students aware of the potential and limitations of ERP systems. This objective will be reached through hands-on experience, case studies, lectures, guest speakers and a group project. The course would equip students with the basics of E-Commerce, technologies involved with it and various issues associated with.

Course Objectives

The objective of this course is to

1. Understand the students with the role of consultants, vendors and employees.
2. Provide an overview of various phases in ERP implementation and identify various technologies used in ERP.

Course Outcomes

On completion of this course, the students will be able to

CO1: Describe the key features of Internet, Intranets and Extranets and explain how they relate to each other. Demonstrate an understanding of the foundations and importance of E-commerce and assess electronic payment systems.

CO2: Understand concepts of reengineering, data mining, data warehousing and how they relate to ERP system implementations.

CO3: Explain the challenges associated with implementing enterprise systems and their impacts on organizations.

CO4: Describe the selection, acquisition and implementation of enterprise systems and demonstrate an ability to work independently and in a group.

CO5: Identify and describe typical functionality in an ERP system.

CO 6: Analyze the strategic options for ERP identification and adoption.

Modules	Blooms level*	Number of hours
MODULE 1: INTRODUCTION AND CONCEPTS: Networks and commercial transactions - Internet and other novelties; Networks and electronic transactions today, Model for commercial transactions; Internet environment - internet advantage, world wide web and other internet sales venues; Online commerce solutions. Security Technologies: Why is internet insecure? A brief introduction to Cryptography; Public key solution. Digital payment systems; First virtual internet payment system; cyber cash model Operational process of Digicash, Ecash Trail; Using Ecash; Smart cards; Electronic Data Interchange: Its basics; EDI versus Internet and EDI over Internet.	L1, L2 and L3	8

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MODULE 2: INTRODUCTION ERP An Overview, Enterprise-An Overview, Benefits of ERP, ERP and Related Technologies, Business Process Reengineering (BPR), Data Warehousing, Data Mining, On-line Analytical Processing (OLAP), Supply Chain Management, Management Information systems (MIS), Decision support system (DSS), Executive Information systems (EIS). ERP – A Manufacturing Perspective Materials Requirement Planning (MRP), Bill of Material (Bom), Distribution Requirements Planning (DRP), JIT & Kanban, CAD/CAM, Product Data Management (PDM), Benefits of PDM, MTO, MTS, ATO, ETO, CTO.	L1,L2 and L3	10
MODULE 3: ERP IMPLEMENTATION To be or not to be, ERP Implementation Lifecycle, Implementation Methodology, Not all Packages are Created Equal!, ERP Implementation-The Hidden Costs, Organizing the Implementation, Vendors, Consultants and Users, Contracts with Vendors, Consultants and Employees, Project Management and Monitoring, After ERP Implementation.	L1,L2 and L3	8
MODULE 4: THE BUSINESS MODULES Business Modules in an ERP Package, Finance, Manufacturing (Production), Human Resources, Plant Maintenance, Materials Management, Quality Management, Sales and Distribution	L1,L2 and L3	8
MODULE 5: THE ERP MARKET ERP Market Place, SAP AG, PeopleSoft, Baan Company, JD Edwards World Solutions Company, Oracle Corporation, QAD, System Software Associates, Inc (SSA)ERP-Present and Future Turbo Charge the ERP System, Enterprise Integration Applications (EIA), ERP and E-Commerce, ERP and Internet, Future Directions in ERP, Appendices"	L2, L3 and L4	8
MODULE 6: BENEFITS OF ERP Time Reduction, Resource Utilization, Performance, Customer Satisfaction, Flexibility, Quality, Accuracy.	L1,L2 and L3	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

1.Alexis Leon, "**Enterprise Resource Planning**", 4th Edition, TMH,2012.

Reference Books

1. Daniel E.O'Leary, "**Enterprise Resource Planning Systems**," Cambridge University Press, 2012.
2. Ellen Monk, Bret Wagner, "**Concepts in Enterprise resource planning**," Cengage learning, 4th edition, 2012.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

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Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	--	2	--	--	--	--	--	3	--	--	1	2	--	1	2	--
CO 2	--	--	--	-	--	--	--	--	--	--	1	2	--	1	2	--
CO 3	--	2	--	-	-	--	--	--	2	--	1	2	--	--	1	--
CO 4	1	1	2	--	--	--	--	--	1	1	1	2	--	--	1	--
CO 5	--	1	1	--	--	--	--	--	--	1	1	2	3	--	--	2
CO 6	--	--	--	--	--	--	--	--	--	1	1	3	--	--	1	--

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CSE2316	STATISTICS & PROBABILITY CONCEPTS	L	T	P	C
Version 2019.1	Date of Approval: 15 May2019	3	0	0	3
Pre-requisites/Exposure	Basic Mathematics				
Co-requisites	Nil				

Catalog Description

In this course the concepts of statistics, the science of collecting, organizing, and interpreting numerical data are discussed. Emphasis will be placed on statistical reasoning and data analysis. The main topics are study design, descriptive statistics, probability theory, and statistical inference. As a precursor to the study of cryptography studies will be made on impact of various techniques for finding independence or dependence between data variables. The concepts learnt in the studies of statistics will be applied practically to solve number of real life problems using the statistical package like R and SPSS.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of statistics through problem solving and analytical approach.
2. Provide an overview of various statistical techniques: descriptive and inferential, parametric and non-parametric and practical statistics using R and SPSS.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain, describe and distinguish various population,sample,type of variables,measurement scales, central tendency, percentile and solve problems related to them.

CO 2: Explain the concept of descriptive and inferential statistics; probability theory; Solve problemsbased on probability; Explain binomial, poisson distribution and solve real life problems related to discrete and continuous random variable.

CO 3: Describe the concept of sampling distribution for large and small samples; Explain the concept of hypothesis testing and solve problems related using t-distribution and standard normal distribution.

CO 4: Explain concept of covariance and correlation and its applications in real life; Explain Anova and its use in real life problem solving; Explain and compare various regression analysis methods statistics for prediction

CO 5: Explain various parametric and nonparametric test and apply them to solve real life statistical problems

Modules	Blooms level*	Number of hours
Module 1: Introduction to Statistics and Data Analysis Statistical Inference, Samples, Populations and Experimental Design , The Hole of Probability Sampling Procedures; Collection of Data ,Measures of Location:,Measures of Variability ,Discrete and Continuous Data , Statistical Modeling, Scientific Inspection, and Graphical Diagnostics, Graphical Methods and Data Description ,General Types of Statistical Studies	L1, L2 and L3	7

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Module 2: Probability & Probability Distribution Sample Space, Events Probability of an Event, Additive Rules, Conditional Probability ,Multiplicative Rules,Bayes' Rule, Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions , Joint Probability Distributions ,Mean of a Random Variable, Variance and Covariance of Random Variables,Means and Variances of Linear Combinations of Random Variables, Chebyshev's Theorem, , Discrete Uniform Distribution, Binomial and Multinomial Distributions,Poisson Distribution and the Poisson Process.Continuous Uniform Distribution, Normal Distribution ,Areas under the Normal Curve ,Applications of the Normal Distribution , Gamma and Exponential Distributions, ,Chi-Squared Distribution.	L1,L2, L3	6
Module 3: Sampling Distributions and Estimation Random Sampling, Some Important Statistics, ,Data Displays and Graphical Methods, Sampling Distributions Introduction to Estimation, Statistical Inference ,Classical Methods of Estimation, Single Sample: Estimating the Mean ,Standard Error of a Point Estimate, Prediction Intervals, Tolerance Limits Two Samples: Estimating the Difference between Two Means ,Paired Observations , , Single Sample: Estimating a Proportion, Two Samples: Estimating the Difference between Two Proportion.	L1,L2, L3	6
Module 4: Hypotheses Testing Statistical Hypotheses: General Concepts ,Testing a Statistical Hypothesis, One- and Two-Tailed Tests, The Use of *P*-Values for Decision Making in Testing Hypotheses, One Sample: Test on a Single Proportion ,Two Samples: Tests on Two Proportions, Exercises ,One- and Two-Sample Tests Concerning Variances, Goodness-of-Fit Test, Test for Independence (Categorical Data),Test for Homogeneity, Testing for Several Proportions	L1, L2 L3	7
Module 5: Simple Linear Regression and Correlation Introduction to Linear Regression, The Simple Linear Regression Model, Least Squares and the Fitted .Model Analysis-of-Variance, Approach, Test for Linearity of Regression: Data with Repeated Observations, Data Plots and Transformations, Simple Linear Regression Case Study, Correlation, Classification	L1, L2	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. "Probability & Statistics for Engineers & Scientists", Ronald E. Walpole,Pearson 2007
2. Spectrum Editorial Board, Statistical Analysis Graphs and Diagrams, Spectrum Books Pvt Ltd, 2013.
3. Torsten Hothorn and Brian S. Everitt , "A Handbook of Statistical Analyses Using R", Chapman and Hall/CRC, 2006.

Reference Books

1. Pal and Sarkar, "Statistics: Concepts and Applications", Prentice Hall India Learning Private Limited, 2007.

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2	PS O 3	PS O 4
CO 1	1	1	1	--	--	--	--	--	--	--	--	--	1	3	--	--
CO 2	1	1	1	--	--	--	--	--	--	--	--	--	1	2	--	--
CO 3	1	1	1	--	-	--	--	--	--	--	--	--	1	1	--	--
CO 4	1	1	1	--	--	--	--	--	--	--	--	--	1	1	--	--
CO 5	1	1	1	--	--	--	--	--	--	--	--	--	1	1	--	--

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Haryana-122413

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Course Code: CSE2317	SOFTWARE VULNERABILITY ANALYSIS	L	T	P	C
Version	Date of Approval: May 2022	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course focuses on the foundations of software security and considers important software vulnerabilities and attacks that exploit them such as buffer overflows, SQL injection, and session hijacking. This course helps to prevent or mitigate these attacks, including advanced testing and program analysis techniques.

Course Objectives

The purpose of this course is to provide understanding of the main issues related to security in modern software security systems. In addition, this course will present different domains of code exploitation and how they can be used together to test the security of an application.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the concept of software security, goals of software security and management of software security risk.

CO2:Describe the principles of software security and methods of security violation in software system.

CO3:State and apply the knowledge of different types of overflow attack and access control in different operating system.

CO4: Explain the basic knowledge of network layers and various types of hijacking, flooding attacks.

CO5: Implement the concept of shell code.

Modules	Blooms level*	Number of hours
MODULE 1: **Introduction to Software Security** It's All about the Software, Dealing with Widespread Security Failures, Bugtraq, CERT Advisories, RISKS Digest, Technical Trends Affecting Software Security, The ilities, What is Security?, Isn't That Just Reliability?, Penetrate and Patch Is Bad, On Art and Engineering, Security Goals, Prevention, Traceability and Auditing, Monitoring, Privacy and Confidentiality, Multilevel Security, Anonymity, Authentication, Integrity, Know Your Enemy: Common Software Security Pitfalls, Software Project Goals, Conclusion. **Managing Software Security Risk:** An Overview of Software Risk Management for Security, The Role of Security Personnel, Software Security Personnel in the Life Cycle, Deriving Requirements, Risk Assessment, Design for Security, Implementation, Security Testing, A dose of Reality, Getting People to Think about Security, Software Risk management in Practice, When Development Goes Astray, When Security Analysis Goes Astray, The Common Criteria.	L1, L2 and L3	12

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MODULE 2: **On Open Source and Closed Source** Security by Obscurity, Reverse Engineering, Code Obfuscation, Security for Shrink-Wrapped Software, Security by Obscurity Is No Panacea, The Flip Side: Open- Source Software, Is the "Many-Eyeballs Phenomenon" Real? Why Vulnerability Detection Is Hard, Other Worries, On Publishing Cryptographic Algorithms, Two More Open-Source Fallacies, The Microsoft Fallacy, The Java Fallacy, An Example: GNU Mailman Security, More Evidence: Trojan Horses, To Open Source or Not to Open Source, Another Security Lesson from Buffer Overflows, Beating the Drum. **Guiding Principles for Software Security:** Principle1: Secure the Weakest Link, Principle 2: Practice Defence in Depth, Principle 3: Fail Securely, Principle 4: Follow the Principle of Least Privilege, Principle 5: Compartmentalize, Principle 6: Keep It Simple, Principle 7: Promote Privacy, Principle 8: Remember That Hiding Secrets is Hard, Principle 9: Be Reluctant to Trust, Principle 10: Use Your Community Resources Conclusion.	L1, L2, L3 and L4	10
MODULE 3: **Buffer Overflows & Access Control** What Is a Buffer Overflow?, Why Are Buffer Overflows a Security Problem?, Defending against Buffer Overflow, Major Gotchas, Internal Buffer Overflows, More Input Overflows, Other Risks, Tools That Can Help, Smashing Heaps and Stacks, Heap Overflows, Stack Overflows, Decoding the Stack, To Infinity … and Beyond!, Attack Code, A UNIX Exploit, What About Windows?The UNIX Access Control Model, How UNIX Permissions Work, Modifying File Attributes, Modifying Ownership, The unask, The Programmatic Interface, Setuid Programming, Access Control in Windows NT, Compartmentalization, Fine-Grained Privileges.	L1, L3 and L4	8
MODULE 4: **NETWORKING** OSI Model, Sockets, Socket Functions, Socket Addresses, Network Byte Order, Internet Address Conversion, A Simple Server Example, A Web Client Example, A Tinyweb Server, Peeling Back the Lower Layers, Data-Link Layer, Network Layer, Transport Layer , Network Sniffing, Raw Socket Sniffer, libpcap Sniffer, Decoding the Layers, Active Sniffing, Denial of Service, SYN Flooding, The Ping of Death, Teardrop, Ping Flooding, Amplification Attacks, Distributed DoS Flooding, TCP/IP Hijacking, RST Hijacking, Continued Hijacking, Port Scanning, Stealth SYN Scan, FIN, X-mas, and Null Scans, Spoofing Decoys, Idle Scanning, Proactive Defense (shroud), Reach Out and Hack Someone, Analysis with GDB, Almost Only Counts with Hand Grenades, Port-Binding Shellcode.	L1, L3, and L4	10
MODULE 5: **SHELLCODE** Assembly vs. C, Linux System Calls in Assembly, The Path to Shellcode, Assembly Instructions Using the Stack, Investigating with GDB, Removing Null Bytes, Shell-Spawning Shellcode, A Matter of Privilege, And Smaller Still, Port-Binding Shellcode, Duplicating Standard File Descriptors, Branching Control Structures, Connect-Back Shellcode.	L1, L2, and L3	8

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Recommended Books:

1. "Building Secure Software: How to Avoid Security Problems the Right Way" John Viega, Gary R. Tata McGraw Hill
2. Michael Howard, David LeBlanc, John Viega: 19 Deadly Sins of Software Security: Programming Flaws and How to Fix Them (Security One-off) (Addison-Wesley Professional Computing Series)

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3. Richard Sinn " Software Security , Theory Programming and Practice" Cengage Learning

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	1	--	--	--	--	--	--	--	--	1	--	2	--
CO2	1	2	--	2	--	--	--	--	--	--	--	--	1	1	--	1
CO3	1	1	3	3	--	--	--	--	--	--	--	--	1	1	--	--
CO4	1	1	3	1	--	---	--	--	--	--	--	--	1	1	--	--
CO5	1	2	3	1	--	--	--	--	--	--	--	--	1	1	--	3

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CSE2318	BASIC NETWORK CONCEPTS AND COMPUTING ARCHITECTURE	L	T	P	C
Version : Version 2023.1	Date of Approval: March 2023	3	0	0	3
Pre-requisites/Exposure	Basic computers				
Co-requisites	NIL				

Catalog Description

The course provides a unified and fundamental view of the broad field of computer networks. Furthermore, the easy to understand and extremely relevant world of Computer Networking is introduced in a top down Approach. Introduction to intranets and intranet servers and browsers, networks and network servers, LANs/WANs, internetworking technologies, the OSI reference model for networking protocols, CSMA/CD, TCP/IP and also introduction to different architectures, computing and Operating systems.

Course Objectives

The objective of this course is to

1. To provide an overview of data communication and computer networks, network specific protocols, networking devices, OSI /TCP-IP Layer concepts.
2. To familiarize with the basic taxonomy and terminology of computer networking area.
3. To experience the designing and managing of communication protocols while getting a good exposure to the TCP/IP protocol suite.

Course Outcomes

On completion of this course, the students will be able to

CO1. State the functions of data component in communication, networking devices, characteristics of topologies and describe the functionality of layers in OSI model.

CO2. Explain Error correction and detection techniques; Differentiate between different type of protocols used at data link layer.

CO3. Describe channel allocation problem and illustrate the working and applications of different wireless LANs and WANs standards

CO4. Compare and Contrast different routing algorithms; discuss the frame format of IPv4 and IPv6 .

CO5. Compare and contrast different transport layer protocols and explain various protocols used at application layer.

Modules	Blooms level*	Number of hours
Module I: Introduction Introduction to computer networks, evolution of computer networks and its uses, Advantages and Disadvantages of Computer Network, reference models: OSI reference Models, TCP/IP Protocol Suit ,Networking fundamentals: Internet, Circuit switching vs Packet switching, ISPs, Delay and Loss in Packet Switched Networks	L1, L2	8

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Module II: Local Area Network LAN Architecture Advantages and Disadvantages, LAN topologies- Bus/ Tree LAN, Ring LAN, Star LAN, Wireless LAN, Ethernet and Fast Ethernet, Token Ring, Advantages and Disadvantages .	L2, L3 and L4	8
Module III: Architectures Client server architecture, Advantages and Disadvantages, Peer to peer Architecture, Advantages and Disadvantages, Distributed Architecture, Advantages and Disadvantages, Parallel Computing architecture, Advantages and Disadvantages	L2, L3	9
Module IV: Operating System Operating System Support, Web Services and Security,Introduction , Operating System layer, Operating System Architecture, Virtualization at Operating System level, Introduction to web services, Service descriptions and IDL for web services, Applications of web services	L2, L3 and L4	6
Module V: Introduction to computing Introduction to Grid Computing, Cloud Computing, Fusion, Edge Computing, Fog Computing, Ubiquitous Computing, Green Computing,	L2, L3and L4	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text & References: ***Text:***

- Data Communication & networking: Forouzan, B. A.
- Data and Computer Communications, W. Stallings, Prentice Hall of India
- Silberschatz, P.B. Galvin "Operating System Concepts", John Willey & son

References:

- Computer Networks: Tanenbaum, Andrew S, Prentice Hall

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**	**--**
CO2	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**	**--**
CO3	**1**	**1**	**2**	**3**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**--**	**--**
CO4	**1**	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**2**	**---**
CO5	**1**	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**1**	**---**

1: strongly related, 2: moderately related and 3: weakly related.

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Course Code: CSE2319	FUNDAMENTALS OF BLOCKCHAIN TECHNOLOGY	L	T	P	C
Version 2023.1	Date of Approval: March 2023	3	0	0	3
Pre-requisites/Exposure	Basic Computer Networking and Data Structure Concepts				
Co-requisites	Nil				

Catalog Description

Blockchain is an emerging technology platform for developing decentralized applications and data storage, over and beyond its role as the technology underlying the cryptocurrencies. The basic tenet of this platform is that it allows one to create a distributed and replicated ledger of events, transactions, and data generated through various IT processes with strong cryptographic guarantees of tamper resistance, immutability, and verifiability. This course will enable the graduate students to gain the knowledge of this emerging technology and will update them with the required employability skills.

Course Objectives

The objective of this course is to:

- Familiarise the functional/operational aspects of blockchain and cryptocurrency.
- Understand emerging abstract models for Blockchain Technology.
- Identify major research challenges and technical gaps existing between theory and practice in cryptocurrency domain.

Course Outcomes

On completion of this course, the students will be able to:

CO1. Understand and explain the mechanism of Blockchain Technology.
CO2. Understand and explain the bitcoin blockchain.
CO3. Understand and apply the different models of blockchain.
CO4. Understand and explain the concept of Ethereum and Hyperledger.

Modules	Blooms Level*	Hours
MODULE 1: INTRODUCTION Basic ideas behind blockchain, how it is changing the landscape of digitalization, peer-to-peer network, Blockchain Mechanism, Blockchain vs Distributed Systems,introduction to cryptographic concepts required, Hashing, public key cryptosystems, private vs public blockchain and use cases, Hash Puzzles, Introduction to Bitcoin Blockchain, Centralization vs. Decentralization, Security of Blockchain	L1, L2	8
MODULE 2: BLOCKCHAIN DATA STRUCTURE & BITCOIN BLOCKCHAIN Cryptographic Hash Functions, Digital Signatures, Public Keys as Identities,	L1, L2	10

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Hash Pointers and Hash chain and Merkel Tree, Consensus Mechanisms, Decentralized Identity Management, Transactions, Distributed consensus, Consensus without identity using a block chain, Incentives and proof of work, Mining		

MODULE 3: BLOCKCHAIN MODELS & APPLICATIONS Abstract Models for BLOCKCHAIN - GARAY model - RLA Model - Proof of Work (PoW) as random oracle - formal treatment of consistency, liveness and fairness - Proof of Stake (PoS) based Chains - Hybrid models (PoW + PoS) Application of Blockchain in Privacy and Security, IoT and Smart Cities, Business and Industry, Data Management, e-Governance.	L1, L2, L3	10
MODULE 4: ETHEREUM AND HYPERLEDGER Ethereum - Ethereum Virtual Machine (EVM) - Wallets for Ethereum - Solidity - Smart Contracts - some attacks on smart contracts, Hyperledger, Hyperledger Stack, Multichain Blockchain. Innovation in Hyperledger, Distributed applications in Hyperledger, Zero Knowledge proofs and protocols in Blockchain	L1,L2	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016. (Free download available).
2. Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy, 2015

Reference Books

1. R.Pass et al, Analysis of Blockchain protocol in Asynchronous networks , EUROCRYPT 2017, (eprint.iacr.org/2016/454).
2. R.Pass et al, Fruitchain, a fair blockchain, PODC 2017 (eprint.iacr.org/2016/916).
3. Eric Traub, Learn Blockchain Programming with JavaScript, Packt, 2018.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	2	3	--	--	--	--	--	--	--	--	--	2	1	-	2
CO 2	2	2	3	-	--	--	--	--	--	--	--	--	2	1	-	2
CO 3	2	2	3	-	-	--	--	--	--	--	--	--	2	1	-	3
CO 4	1	2	3	-	2	--	--	--	--	--	--	--	2	1	1	2
CO 5	2	3	3	-	-	--	--	--	--	--	--	--	2	1	1	3

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Course Code: CSE2320	INTRODUCTION TO IOT	L	T	P	C
Version 2023.1	Date of Approval: March 2023	3	-	-	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Course Objective:

The Internet is evolving to connect people to physical things and also physical things to other physical things all in real time. It's becoming the Internet of Things (IoT). The course enables student to understand the basics of Internet of things and protocols. It introduces some of the application areas where Internet of Things can be applied. Students will learn about the middleware for Internet of Things. To understand the concepts of Web of Things

Modules	Blooms level*	Number of hours
MODULE 1: What is the IoT and why is it important? Elements of an IoT ecosystem, Technology drivers, Business drivers, Trends and implications, Overview of Governance, Privacy and Security Issues.	L1, L2 and L3	8
MODULE 2: **IOT PROTOCOLS -** Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE802.15.4– BACNet Protocol– Modbus – KNX – Zigbee– Network layer – APS layer – Security	L1, L2, L3 and L4	8
MODULE 3: **IOT ARCHITECTURE -** IoT Open source architecture (OIC)- OIC Architecture & Design principles- IoT Devices and deployment models- IoTivity : An Open source IoT stack - Overview- IoTivity stack architecture- Resource model and Abstraction.	L1, L3 and L4	8
MODULE 4: **WEB OF THINGS -** Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals andBusiness Intelligence.	L1, L3, and L4	6
MODULE 5: **IOT APPLICATIONS -** IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications. Study of existing IoT platforms /middleware, IoT- A, Hydra etc.	L1, L2, and L3	6

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press,2012.
- Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet ofThings", Springer, 2011.
- David Easley and Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning About a HighlyConnected World", Cambridge University Press, 2010.
- Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applicationsand Protocols", Wiley, 2012.

References:

- Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)",1st Edition, VPT, 2014
- Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to ConnectingEverything", 1st Edition, Apress Publications, 2013
- Cuno Pfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978-1-4493-9357-1

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	3	--	1	1	--	--	--	--	--	--	2	1	2	--	--
CO2	1	2	--	1	--	--	--	--	--	--	3	--	2	1	--	2
CO3	1	3	--	1	1	--	--	--	--	--	3	2	--	--	1	2
CO4	1	--	1	3	1	--	--	--	3	--	--	2	2	1	--	--
CO5	1	1	1	2	--	2	3	--	--	--	--	--	--	1	2	--

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SEMESTER-IV

CSE2403	DISCRETE MATHEMATICS	L	T	P	C
Version 2017.1	Date of Approval:14th June 2017	3	0	0	3
Pre-requisites/Exposure	Basic mathematics: Set Theory and Logic Gates				
Co-requisites					

Catalog Description

This course is intended for students, those who have little bit knowledge of logical gates and basic logical mathematics. Knowledge of basic mathematics is necessary: they need to be comfortable with simple logical, including operator precedence. They should also be comfortable working with simple recursive functions. This course will give you a better understanding on how to develop own algorithms for the conversion into programs. More importantly, you'll start to learn computational thinking, which is a fundamental approach to solving real-world problems. Computer programming languages share common fundamental concepts, and this course will introduce you to those concepts using logical thinking.

Course Objectives

The objective of the course is to:

1. Study of the logical and mathematical relationships between discrete objects using application of Boolean algebra, graphs, lattice and trees.
2. Relate computing theory with applicationsand design their project machine like Finite state machineusing algorithmic approach, and able
3. Apply theknowledge of graph algorithms in daily life research problem solving.

Course Outcomes

On completion of this course, the students will be able to:

CO1. To give the study of the logical and mathematical relationships between discrete objects based on applications of propositional arguments.

CO2. Students will be able to relate computing theory with real life applications.

CO3. They can understand and design their project machine like finite state machine, Petri nets using algorithmic approach

CO4. Able to understand the importance of graph algorithms in daily life research problem solving

CO5. To describe the applications of Boolean algebra, graphs, lattice and trees in software engineering.

Modules	Blooms level*	Number of hours
Module I: Sets, Relation and Functions: Sets and Subsets, Operations on Sets, Set Identities, Matrices, Mathematical Structures, Principle of Inclusion and Exclusion. Product Sets and Partitions, Relations and Digraphs, Properties of Relation, Equivalence Relation, Functions: Properties of Function, Composition of Function, Inverse, Binary and n-ary operations.	L1, L2 and L3	12

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Module II: Logic Proposition, Propositional Calculus- Propositional Variables and Compound Propositions, Basic Logical Operations: -Conjunction, Disjunction, Negation, Conditional, Bi-conditional. Compound Statements, Equivalence, Duality, Algebra of Statements, Valid and Invalid, Arguments, Tautologies, Contradiction, Contingency.	L1,L2, L3	11
Module III: Counting Pigeonhole principle, Mathematical Induction, Recurrence Relation: Solving Linear Homogeneous Recurrence Relations with Constant Coefficients, Solving Recurrence Relations using Generating Functions.	L1,L2, L3 and L5	11
Module IV: Lattices Lattices: Lattices as partially ordered sets, their properties, duality, Lattices as algebraic systems, Sub lattices, Direct products, Bounded Lattices, Complete Lattices, Complemented Lattices and Distributive lattices.	L1, L2 and L3	14

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. J. P. Trembley &R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, McGraw-HillBookCo.,1997.
2. J.L.Gersting, Mathematical Structurefor Computer Science (3rded.), Computer Science Press, Seymour Lepschutz, Finite Mathematics, McGraw-Hill BookCo. NewYork.

Reference Books

1. J . E . HopcroftandJ. D. Ullman, Introduction to Automata Theory Languages&Computation, Narosa Publishing House, Delhi.
2. C.L.Liu, Elements of Discrete Mathematics, Tata McGraw-Hill PublishingCo. Ltd, NewDelhi.
3. N.Deo, GraphTheory with Applications to Engineering and Computer Sciences, Prentice Hall of India,

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance.

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**3**	**-**
CO2	**1**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**2**	**-**
CO3	**1**	**1**	**1**	**--**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**3**	**-**
CO4	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**2**	**-**
CO5	**1**	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**2**	**3**	**-**

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CSE2412	ARTIFICIAL INTELLIGENCE	L	T	P	C
Version2017.1	Date of Approval: 14, June 2017	3	0	0	3
Pre-requisites/Exposure	Exposure to data structure and programming and an ability to discuss algorithms is the only pre-requisite.				
Co-requisites	Nil				

Catalog Description

Introduction to computational models of thought and construction of intelligent information systems. Topics include search algorithms, data dependencies and truth-maintenance systems, approaches to knowledge representation, automated deduction, reasoning under uncertainty, and machine learning.The field of Robotics is a multi-disciplinary as robots are amazingly complex system comprising mechanical, electrical, electronic H/W and S/W and issues germane to all these.

Course Objectives

The objective of this course is to

1. Provide an overview of problemsolving skills methods using Artificial Intelligence.
2. Equip the students with the study of programming languages that is used to develop an Intelligence System.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain how Artificial Intelligence enables capabilities that are beyond conventional technology, for example, chess-playing computers, self-driving cars, robotic vacuum cleaners and Understand the various searching techniques.

CO2: Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning.

CO3: Acquire the knowledge of real world Knowledge representation. Apply concept Natural Language processing to problems leading to understanding of cognitive computing.

CO4: Use different machine learning techniques to design AI machine and Write algorithms and implement programs in 'Prolog' language.

CO5: Explain some of the more advanced topics of AI such as Robotics and Explain what constitutes "Artificial" Intelligence and how to identify systems with Artificial Intelligence.

Modules	Blooms level*	Number of hours

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MODULE 1: PROBLEM SOLVING AND SCOPE OF AI Introduction to Artificial Intelligence. Applications- Games, theorem proving, natural language processing, vision and speech processing, robotics, expert systems. AI techniques- search knowledge, abstraction. PROBLEM SOLVING State space search; Production systems, search space control: depth-first, breadth-first search. Heuristic search - Hill climbing, best-first search, branch and bound. Problem Reduction, Constraint Satisfaction End, Means-End Analysis. LA* Algorithm, L(AO*) Algorithm.	L1, L2, L3 and L4	10
MODULE 2: KNOWLEDGE REPRESENTATION Knowledge Representation issues, first order predicate calculus, Horn Clauses, Resolution, Semantic Nets, Frames, Partitioned Nets, Procedural Vs Declarative knowledge, Forward Vs Backward Reasoning.	L1, L2 and L4	6
MODULE 3: UNDERSTANDING NATURAL LANGUAGES Introduction to NLP, Basics of Syntactic Processing, Basics of Semantic Analysis, Basics of Parsing techniques, context free and transformational grammars, transition nets, augmented transition nets, Shanks Conceptual Dependency, Scripts, Basics of grammar free analyzers, Basics of sentence generation, and Basics of translation.	L1, L2 and L4	7
MODULE 4: EXPERT SYSTEM Need and justification for expert systems, knowledge acquisition, Case studies: MYCIN, R1 LEARNING Concept of learning, learning automation, genetic algorithm, learning by inductions, neural nets. Programming Language: Introduction to programming Language, LISP and PROLOG. HANDLING UNCERTAINTIES Non-monotonic reasoning, Probabilistic reasoning, use of certainty factors, Fuzzy logic.	L1, L2, L4 and L5	7
MODULE 5: INTRODUCTION TO ROBOTICS Fundamentals of Robotics, Robot Kinematics: Position Analysis, Dynamic Analysis and Forces, Robot Programming languages & systems: Introduction, the three levels of robot programming, requirements of a robot programming language, problems peculiar to robot programming languages.	L1, L2 and L3	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. E. Rich and K. Knight, "Artificial intelligence", TMH, 2nd ed., 1992.
2. N.J. Nilsson, "Principles of AI", Narosa Publ. House, 1990.
3. John J. Craig, "Introduction to Robotics", Addison Wesley publication.
4. Richard D. Klafter, Thomas A. Chmielewski, Michael Negin, "Robotic Engineering – An integrated approach", PHI Publication.
5. Tsuneo Yoshikawa, "Foundations of Robotics", PHI Publication

Reference Books

1. D.W. Patterson, "Introduction to AI and Expert Systems", PHI, 1992.
2. Peter Jackson, "Introduction to Expert Systems", AWP, M.A., 1992.

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3. R.J. Schalkoff, “Artificial Intelligence - an Engineering Approach”, McGraw Hill Int. Ed., Singapore, 1992.
4. M. Sasikumar, S. Ramani, “Rule Based Expert Systems”, Narosa Publishing House, 1994.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**3**	**--**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**2**	**--**	**--**
CO2	**1**	**2**	**--**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**3**	**--**	**2**	**1**	**--**	**2**
CO3	**1**	**3**	**--**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**3**	**2**	**--**	**--**	**1**	**2**
CO4	**1**	**--**	**1**	**3**	**1**	**--**	**--**	**--**	**3**	**--**	**--**	**2**	**2**	**1**	**--**	**--**
CO5	**1**	**1**	**1**	**2**	**--**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**--**

1: strongly related, 2: moderately related and 3: weakly related

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CSE2413	ARTIFICIAL INTELLIGENCE LAB	L	T	P	C
Version2017.1	Date of Approval: 14, June 2017	0	0	2	1
Pre-requisites/Exposure	Basic Concepts of C and C++				
Co-requisites	Nil				

Catalog Description

PROLOG programs tell the computer what to do (declarative programming) rather than how to do it (procedural programming). PROLOG does this by making deductions and derivations, instigated by user-defined queries, from facts and rules stored in a database. The module teaches PROLOG as a practical programming tool, useful in solving various interesting problems especially in the Artificial Intelligence domain.

Course Objectives

The objective of this course is to

1. Provide an overview of a programming paradigm: programming by means of logic (also known as logic programming)
2. Provide an experience with development of AI application using PROLOG.

Course Outcomes

On completion of this course, the students will be able to

CO1: Use the basic knowledge of PROLOG programming in order to write simple PROLOG programs and explore more sophisticated PROLOG code on their own.

CO2: Use Prolog for developing artificial intelligence applications.

Modules/Topics Covered**	Blooms level*	Number of hours
1: INTRODUCTION TO PROLOG- SIMPLE FACTS, FACTS WITH ARGUMENTS. **PROBLEM STATEMENT 1:** • Convert the following into Prolog Equivalent: It is raining. This is a book. **PROBLEM STATEMENT 2:** • Convert the following into Prolog Equivalent: 1. The cakes are delicious. 2. Priya relishes coffee. 3. Edwin plays badminton.	L1 and L3	4

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2: DEFINING VARIABLES, MATCHING AND BACKTRACKING. **PROBLEM STATEMENT 3:** • Convert the sentences into Prolog Equivalent and answer the following questions: 1. Sun rises in east. 2. Dovey is a good girl. 3. Dora likes books. 4. Chin is an intelligent student? Query 1: Who is a good girl? Query 2: Dora likes What? **PROBLEM STATEMENT 4:** • Consider the following facts: 1. parent (pam, bob). 2. parent (tom, bob). 3. parent (bob, ann). 4. parent (tom, liz). Query: Who is the parent of Whom? Or Find X and Y such that X is the parent of Y.	L1, L3 and L5	4
3: RULES. **PROBLEM STATEMENT 5:** • Consider the given knowledge. Represent the knowledge into the PROLOG equivalence and answer the question using rules. Joy is father of Jay. Jay is father of Sam. Sam is brother of Sue. Alvin is father of Ali. Sim is mother of Sam. Sis is mother of Alvin. Question: Who are Sue's parent?	L1, L3 and L5	2
4: INPUT AND OUTPUT PREDICATES. **PROBLEM STATEMENT 6:** • Write a code to print a message on the screen. • Write a program to perform addition of two numbers.	L1 and L3	2
5: CONTROL SRRUCTURES AND RECURSION. **PROBLEM STATEMENT 7:** • Write a code in PROLOG to design a calculator. **PROBLEM STATEMENT 8:** • Write a code in PROLOG to find the largest number among two numbers. • Write a code in PROLOG to find the largest number among three numbers. **PROBLEM STATEMENT 9:** • Write a code in PROLOG to find the factorial of a number. **PROBLEM STATEMENT 10:** • Write a code in PROLOG to print the Fibonacci series.	L1, L3 and L5	8
6: Data Structure and Operations. **PROBLEM STATEMENT 11:** • Create a LIST of 10 elements and print Head and Tail. • Write a code in PROLOG to concatenate two strings. **PROBLEM STATEMENT 12:** • Write a code in PROLOG to search an item from a given LIST.	L1 and L3	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

1.E. Rich and K. Knight, "Artificial intelligence", TMH, 2nd ed., 1992.
2.Bratko, "PROLOG Programming for A.I*".*, 3rd Ed Ed., Addison Wesley, 2001.

Reference Books

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1. D.W. Patterson, “Introduction to AI and Expert Systems”, PHI, 1992.
2. R.J. Schalkoff, “Artificial Intelligence - an Engineering Approach”, McGraw Hill Int. Ed., Singapore, 1992.

Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	**70**
Weightage (%)	5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	--	--	--	**2**	**1**	--	--	--	--	--	--	**3**	--	**1**	--	--
CO2	--	--	**1**	**2**	--	**3**	--	--	**2**	--	**3**	--	--	**1**	**2**	--

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CSE2418	ANALYSIS & DESIGN OF ALGORITHM	L	T	P	C
Version 2019.1	Date of Approval: 15 May2019	3	0	0	3
Pre-requisites/Exposure	Data Structures				
Co-requisites	Nil				

Catalog Description

Designing an algorithm is an important component of computer science. The objective of this course is to make students aware of various techniques used to evaluate the efficiency of a particular algorithm. Students eventually should learn to design efficient algorithm for a program.

Course Objectives

The objective of this course is to

1. Equip the students with the concepts of complexity and analysis of algorithms.
2. Provide an understanding of different techniques used in designing algorithms for a variety of problems.
3. Equip the students with the concepts of complexity classes of different problems.

Course Outcomes

On completion of this course, the students will be able to

CO1: State and explain the meaning of algorithm, analysis and design; apply the algorithmic concepts to analyze a given algorithm and compute its time complexity.

CO2: Explain and apply the concept of Divide and Conquer approach in designing algorithms; analyze a divide and conquer algorithm; explain and apply the concept of Greedy approach in designing algorithms for optimization problems.

CO3: Explain and apply the concept of Dynamic Programming in designing algorithms for optimization problems; compare and contrast the Dynamic Programming with Greedy approach and Divide and Conquer approach.

CO4: State and explain Elementary Graph Algorithms; explain and apply the concept of Branch & Bound and Backtracking in designing algorithms for different problems.

CO5: Define and explain the concept of computational complexity, Polynomial Bounded Algorithms, Class NP, Class NP Hard and Class NP Complete.

Modules	Blooms level*	Number of hours
MODULE 1: INTRODUCTION Algorithm Design paradigms - motivation, concept of algorithmic efficiency, run time analysis of algorithms, Asymptotic Notations. Recurrences- substitution method, recursion tree method, master method	L1, L2, L3, and L4	7

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MODULE 2: **DIVIDE AND CONQUER APPROACH** Structure of divide-and-conquer algorithms: examples; Binary search, quick sort, Merge sort, Strassen Multiplication; Analysis of divide and conquer run time recurrence relations. **GREEDY APPROACH** Overview of the greedy paradigm examples of exact optimization solution (minimum cost spanning tree), Approximate solution (Knapsack problem), Single source shortest paths, traveling salesman	L1, L2, L3, and L4	8
MODULE 3: ***DYNAMIC PROGRAMMING*** Overview, difference between dynamic programming and divide and conquer, Applications: Shortest path in graph, chain Matrix multiplication, Traveling salesman Problem, longest Common sequence, knapsack problem	L1, L2, L3, and L4	8
MODULE 4: ELEMENTRY GRAPH ALGORITHMS Overview, Representation of graphs, strongly connected components, Traversal methods (depth first and breadth first search) BACKTRACKING Overview, 8-queen problem, and Knapsack problem BRANCH AND BOUND LC searching Bounding, FIFO branch and bound, LC branch and bound application: 0/1 Knapsack problem, Traveling Salesman Problem	L1, L2, L3, and L4	9
MODULE 5: COMPUTATIONAL COMPLEXITY Complexity measures, Polynomial Vs non-polynomial time complexity; NP-hard and NP-complete classes, examples.	L1 and L2	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. T. H. Cormen, Leiserson, Rivest and Stein, "Introduction of Computer algorithm, MIT Press, ISBN-(ISBN: 978-0262033848)
2. E. Horowitz, S. Sahni, and S. Rajsekaran, "Funadmentals of Computer Algorithms," Galgotia Publication

Reference Books

1. Sara Basse, A. V. Gelder, "Computer Algorithms," Pearson.
2. J.E Hopcroft, J.D Ullman, "Design and analysis of algorithms," Addison-Wesley

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	1	1	1	1	1	--	--	--	--	--	--	1	1	3	2
CO2	1	1	1	1	1	1	--	--	--	--	--	--	1	1	3	2
CO3	1	1	1	1	1	1	--	--	--	--	--	--	1	1	3	2
CO4	1	1	1	1	1	1	--	--	--	--	--	--	1	1	3	2
CO5	1	1	2	2	3	3	--	--	--	--	--	--	1	1	3	2

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CSE2421	ANALYSIS & DESIGN OF ALGORITHM LAB	L	T	P	C
Version 2019.1	Date of Approval: 15 May2019	0	0	2	1
Pre-requisites/Exposure	Application of Data Structures				
Co-requisites	Nil				

Catalog Description

Designing an algorithm is an important component of computer science. The objective of this course is to make students aware of various techniques used to evaluate the efficiency of a particular algorithm. Students eventually should learn to design efficient algorithm for a particular program.

Course Objectives

The objective of this course is to

1. Equip the students with the concepts of complexity and analysis of algorithms.
2. Provide an understanding of different techniques used in designing algorithms for a variety of problems.
3. Equip the students with the concepts of complexity classes of different problems.

Course Outcomes

On completion of this course, the students will be able to

CO1: State and explain the meaning of algorithm, analysis and design; apply the algorithmic concepts to analyze a given algorithm and compute its time complexity.

CO2: Explain and apply the concept of Divide and Conquer approach in designing algorithms; analyze a divide and conquer algorithm; explain and apply the concept of Greedy approach in designing algorithms for optimization problems.

CO3: Explain and apply the concept of Dynamic Programming in designing algorithms for optimization problems; compare and contrast the Dynamic Programming with Greedy approach and Divide and Conquer approach.

CO4: State and explain Elementary Graph Algorithms; explain and apply the concept of Branch & Bound and Backtracking in designing algorithms for different problems.

CO5: Define and explain the concept of computational complexity, Polynomialy Bounded Algorithms, Class NP, Class NP Hard and Class NP Complete.

Modules	Blooms level*	Number of hours
MODULE 1: Implementation of the following algorithms: • Insertion Sort • Bubble Sort • Counting Number of Inversions	L1, L2, L3, and L4	3

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MODULE 2: Implementation of the following algorithms: • Binary Search (Divide & Conquer) • Merge Sort (Divide & Conquer) • Quick Sort (Divide & Conquer) • Strassen's Matrix Multiplication (Divide & Conquer) • Graph RepresentationGraph Searching	L1, L2, and L3, and L4	5
MODULE 3: Implementation of the following algorithms: • Breadth First Dearch • Depth First Search • Strongly Connected Components • Topological Sort • Fractional Knapsack Problem (Greedy Approach)	L1, L2, L3, and L4	6
MODULE 4: Implementation of the following algorithms: • Kruskal's Algorithm. (Greedy Approach) • Prim's Algorithm (Greedy Approach) • Dijkstra's Algorithm (Greedy Approach) • Bellmanford Algorithm (Greedy Approach)	L1, L2, L3, and L4	6
MODULE 5: • 0/1-Knapsack Problem (Dynamic programming) • Matrix Chain Multiplication (Dynamic programming) • N-Queens Problem (Backtracking)	L1 and L2	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books:

1. T. H. Cormen, Leiserson, Rivest and Stein, "Introduction of Computer algorithm, MIT Press, ISBN- (ISBN: 978-0262033848)
2. E. Horowitz, S. Sahni, and S. Rajsekaran, "Fundamentals of Computer Algorithms," Galgotia Publication

Reference Books

1. Sara Basse, A. V. Gelder, "Computer Algorithms," Pearson.
2. J.E Hopcroft, J.D Ullman, "Design and analysis of algorithms," Addison-Wesley

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**1**	**1**	**1**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**3**	**2**
CO2	**1**	**1**	**1**	**1**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**3**	**2**
CO3	**1**	**1**	**1**	**1**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**3**	**2**
CO4	**1**	**1**	**1**	**1**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**3**	**2**
CO5	**1**	**1**	**2**	**2**	**3**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**3**	**2**

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CSE2419	DATA COMMUNICATION & COMPUTER NETWORKS	L	T	P	C
Version : 2019.1	Date of Approval: 15 May2019	3	0	0	3
Pre-requisites/Exposure	Basics of Computers				
Co-requisites	NIL				

Catalog Description

The objective is to acquaint the students with the basics of data communication and networking. A structured approach to explain how networks work from the inside out is being covered. The physical layer of networking, computer hardware and transmission systems have been explained. In-depth application coverage includes email, the domain name system; the World Wide Web (both client- and server-side); and multimedia (including voice over IP.

Course Objectives

The objective of this course is to

- To provide an overview of data communication and computer networks, network specific protocols, networking devices, OSI /TCP-IP Layer concepts.
- To familiarize with the basic taxonomy and terminology of computer networking area.
- To experience the designing and managing of communication protocols while getting a good exposure to the TCP/IP protocol suite.

Course Outcomes

On completion of this course, the students will be able to

CO1. State the functions of data component in communication, networking devices, characteristics of topologies and describe the functionality of layers in OSI model.

CO2. Explain Error correction and detection techniques; Differentiate between different type of protocols used at data link layer.

CO3. Describe channel allocation problem and illustrate the working and applications of different wireless LANs and WANs standards

CO4. Compare and Contrast different routing algorithms; discuss the frame format of IPv4 and IPv6 .

CO5. Compare and contrast different transport layer protocols and explain various protocols used at application layer.

Modules	Blooms level*	Number of hours
Module I: Introduction Introduction to computer networks, evolution of computer networks and its uses, reference models, example networks The physical layer: Theoretical basis for data communication, transmission media, wireless transmission, telecom infrastructure, PSTN, communication satellites, mobile telephone system	L1, L2	8
Module II: The data link layer Data link layer design issues, error detection and correction, data link protocols, sliding window protocols, example of data link protocols-HDLC, PPP Access	L2, L3 and L4	8

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Module III: Medium access layer Channel allocation problem, multiple access protocols, ALOHA, CSMA/CD, CSMA/CA, IEEE Standard 802 for LAN and MAN, Bridges, Wireless LANs. Introduction to wireless WANs: Cellular Telephone and Satellite Networks, SONETISDH, Virtual-Circuit Networks: Frame Relay and ATM.	L2, L3	9
Module IV: The network layer Network layer concepts, design issues, static and dynamic routing algorithms, shortest path routing, flooding, distance vector routing, link state routing, distance vector routing, multicast routing, congestion controland quality of service, internetworking, Ipv4	L2, L3 and L4	6
Module VI: The transport layer The transport services, elements of transport protocols, TCP and UDP. The application layer: Brief introduction to presentation and session layer, DNS,E-mail**,** WWW	L2, L3and L4	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text & References:

Text:

1. Computer networks: Tanenbaum, Andrew S, Prentice Hall
2. Data communication &Neworking: Forouzan, B. A.

References:

1. Computer network protocol standard and interface: Uyless, Black
2. Data and Computer Communications, Seventh Edition (7th.) William Stallings Publisher: Prentice Hall
3. Computer Networking: A Top-Down Approach Featuring the Internet (3rd Edition) by James F. Kurose

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**	**--**
CO2	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**	**--**
CO3	**1**	**1**	**2**	**3**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**--**	**--**
CO4	**1**	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**2**	**---**
CO5	**1**	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**1**	**---**

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CSE2420	DATA COMMUNICATION AND COMPUTER NETWORKS LAB	L	T	P	C
Version 2019.1	Date of Approval: 15 May, 2019	0	0	2	1
Pre-requisites/Exposure					
Co-requisites	Nil				

Catalog Description

The objective is to acquaint the students with the basics of data communication and networking. A structured approach to explain how networks work from the inside out is being covered. The physical layer of networking, computer hardware and transmission systems have been explained. In-depth application coverage includes email, the domain name system; the World Wide Web (both client- and server-side), routing protocols and data link layer protocols.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of data communication and networking.
2. Provide an overview of various protocols and their configurations using networking devices and servers.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Demonstrate the use of Command Line Interface (CLI) and other features and Cisco Packet Tracer; describe and distinguish networking devices and transmission media.

CO 2: Apply various application layer protocols capability on server device including DNS, DHCP, HTTP, SMTP and POP.

CO 3: Construct network topology and operate routing protocols (RIP, OSPF and EIGRP) for end-to-end connectivity.

CO 4: Illustrate the use of data link protocols-HDLC and PPP; determine network connectivity issues and fix them.

Modules	Blooms level*	Number of hours
LABORATORY SESSION 1 THE PHYSICAL LAYER • Introduction to different types of transmission media and cables. • Introduction to various networking devices and equipment. • Construct network topology and understand configuration of devices using Cisco Packet Tracer (tool).	L2, L3	6

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LABORATORY SESSION 2 THE APPLICATION LAYER 1. Configuration of Domain Name System (DNS) server using Cisco Packet Tracer. 2. Configuration of Dynamic Host Configuration Protocol (DHCP) server using Cisco Packet Tracer. 3. Configuration of mail server using Cisco Packet Tracer. 4. Configuration of web server using Cisco Packet Tracer.	L3	6
LABORATORY SESSION 3 THE NETWORK LAYER 1. Configure Routing Information Protocol (RIP) using Cisco Packet Tracer. 2. Configure Open Shortest Path First (OSPF) routing protocol using Cisco Packet Tracer. 3. Configure Enhanced Interior Gateway Routing Protocol (EIGRP) using Cisco Packet Tracer.	L3	6
LABORATORY SESSION 4 DATA LINK LAYER 1. Configure and Analyse the working of data link control protocols-HDLC and PPP access. 2. Configure PPP security protocols-PAP and CHAP using Cisco Packet Tracer. 3. Determine various issues in network connectivity and communication using troubleshooting commands.	L3,L4	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Cisco Networking Academy Programme CCNA 3 & 4 Lab Companion, 3rd Edition, Pearson Education, 2003.

Reference Books

1. Scott Empson, CCNA Routing and Switching portable command guide, 3rd Edition, Cisco Press, 2016.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**	**--**
CO2	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**	**--**
CO3	**1**	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**	**--**
CO4	**1**	**1**	**2**	**3**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**	**--**
CO5	**1**	**1**	**2**	**3**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**	**--**

1: strongly related, 2: moderately related and 3: weakly related

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CSE2410	ARTIFICIAL NEURAL NETWORK	L	T	P	C
Version 2017.1	Date of Approval: 14th June 2017	2	-	1	2
Pre-requisites/Exposure	Basic Knowledge of Brain functioning				
Co-requisites	Nil				

Catalog Description

The course provides introduction to neural network and a deep insight into the basics of brain & its functioning basics of various neural models & neural schema used for learning. With this course students would be able to know the basics of each introductory feature of human brain and its features which would prove to be very helpful throughout their degree and would prove helpful in understanding other related subjects also.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of learning of brain problem solving techniques and develop proficiency in creating neural structures using the MATLAB.
2. Provide an overview of various control statements, data structures, packages related to image addition, graphics, different types of neural models.

Course Outcome

On completion of this course, the students will be able to

CO 1: Define Artificial Neural Network & its similarity to biological neural network and explain its application in our day to day life.

CO 2: Analyze ANN learning, Error correction learning, Hebbian learning, Competitive learning and Boltzman Learning.

CO 3: Implement simple perceptron, Perceptron Learning rule, modified perceptron learning rule, feed forward neural network & feedback Neural Network.

CO 4: Explain self-organizing Map, Hopfield network, Adaptive resonance theory and its various learning rules.

CO 5: Analyze memory-based learning, Associative learning, Bi-directional learning and Auto associative learning.

Modules	Blooms level*	Number of hours
Module-I Artificial Neural Networks (ANN) and biological neural networks, supervised and unsupervised learning rules, neural network applications	L1, L2 and L3	6
Module-II Unsupervised learning:- Hebbian learning and competitive learning. Supervised learning:- Back propagation algorithms, Learning rule:- Delta learning rule, Widrow-Hoff learning rule, Winner-Take-All learning rule	L1, L2 and L3	6

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Module-III Feed forward neural network, feed backward neural network, Perceptron and its learning law, single-layer perceptron, multi-layer perceptron.	L2, L3 and L4	6
Module-IV Self organizing networks: Kohonen algorithm, Hopfield Networks: Hopfield network algorithm, Adaptive resonance theory: Network and learning rules.	L2, L3 and L4	6
Module V Associative memory, auto-associative memory, bi-directional associative memory.	L2, L3 and L4	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation
TextBook:

1. Kenji Suzuki (ed.) - InTech **,** 2013
2. Todd Troyer **-** University of Texas at San Antonio**,** 2005.

Reference Book:

1. MATLAB 2017 Book released by MATWORS

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping
1: strongly related, 2: moderately related and 3: weakly related

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**												**1**			
CO2	**1**												**1**		**1**	
CO3		**1**	**2**										**1**			
CO4		**1**	**2**	**1**									**1**		**1**	
CO5			**2**										**1**			

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CSE2411	Artificial Neural Network Lab	L	T	P	C
Version 2017.1	Date of Approval: 14th June 2017	0	0	2	1
Pre-requisites/Exposure	Basics of MATLAB				
Co-requisites	NIL				

Catalog Description

In this Lab course first student should learn about advanced level of software used for easy calculation and toolbox used for software like MATLAB.

Course Objectives

The objective of this course is to

- Make the students apply knowledge of various neural models required for solving complex problems.
- Provide a demonstration of different types of image processing techniques through MATAB toolbox.

Course Outcomes

On completion of this course, the students will be able to

CO1: Acquiring knowledge of Basics of High-end calculation software and need in Computer Science & engineering

CO2: Demonstrate the All preliminary functions in MATLAB

CO3: Apply the knowledge of all the basics function and toolbox knowledge of MATLAB

CO4: Demonstrate the Neural Network model in MATLAB

CO5: Demonstrate usage of applications involving with Image processing & Its Toolbox used by MATLAB

Modules/Topics Covered**	Blooms level*	Number of hours
1. Introduction of MATLAB (a) Basic Variable deceleration & its operation (b) Function use & its application	L3, L5	4
2. Sample Programs in MATLAB (a) Basic use of Matrix and Graph Plotting (b) Different type of graph plotting with use of different -2 type of data	L3, L5	6
3. Sample Programs using MATLAB functions (a) Create a basic program MATLAB using functions (b) Use of basic function Image processing (c) Practice on Basic function of Image processing tool box.	L3, L5	6
4. Sample programs of ANN functions (a) Practice on ANN toolbox function in MATLAB (b) Write a program for training a small network in MATLAB	L3, L5	6

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5. Sample Programs using ANN tool box & Image processing toolboix (a) Demonstrate the use of ANN tool box & Image processing toolbox and write a program after combining it.	L3, L5	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

1. Kenji Suzuki (ed.) - InTech , 2013
2. Todd Troyer - University of Texas at San Antonio , 2005

Reference Books

1. MATLAB 2017 Book realeased by MATWORS.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	**70**
Weightage (%)	5	10	10	5	

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**2**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**--**	**--**
CO2	**3**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**--**	**--**
CO3	**2**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**--**	**--**
CO4	**1**	**3**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**2**	**--**
CO5	**1**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**--**	**--**

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CSE2412	Communication System	L	T	P	C
Version 2017.1	Date of Approval: 14 July 2017	2	0	0	2
Pre-requisites/Exposure	Signal and System				
Co-requisites					

Catalog Description

The purpose of this course is to introduce students to the basic principles of the design and analysis of modern communication systems. It will provide a thorough study of both analog and digital modulation and demodulation schemes. The performance analysis of various techniques based on requirements of noise and bandwidth will also be explained. It also introduces the students to the information theory and coding for basic understanding of mobile communication system.

Course Objectives

The objective of this course is to

1. Provide a thorough introduction to analog and digital communications
2. Provide in depth study of various modulation and demodulation techniques.
3. Introduce students to basics of information theory and coding for applications in mobile communication.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define and Distinguish analog and digital communication systems.

CO2. Differentiate modulation and demodulation techniques of AM and FM systems and compare them in terms of Bandwidth and noise.

CO3. Distinguish and categorize various digital modulation techniques.

CO4. Describe Information theory and coding for applications in mobile communication system by solving different encoding problems.

Modules	Blooms level*	Number of hours
MODULE I: INTRODUCTION Communication Process, Source of Information, base-band and pass-band signals, Review of Fourier transforms, Random variables, different types of PDF, need of modulation process, analog versus digital communications	L1 and L2	4

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MODULE II: AMPLITUDE MODULATION Amplitude modulation with full carrier, suppressed carrier systems, single side band transmission, switching modulators, synchronous detection, envelope detection, effect of frequency and phase errors in synchronous detection, comparison of various AM systems, vestigial side band transmission.	L1, L2, L3and L4	8
MODULE III: ANGLE MODULATION Narrow and wide band FM, BW calculations using Carson rule, Direct & Indirect FM generations, phase modulation, Demodulation of FM signals, noise reduction using pre & de-emphasis.	L1, L2, L3and L4	9
MODULE IV: PULSE MODULATION Pulse amplitude, width & position modulation, generation & detection of PAM, PWM & PPM, Comparison of frequency division and time division multiplexed systems. Basics of Digital Communications: ASK, PSK, FSK, QPSK basics & waveform with brief mathematical introduction	L1, L2, L3 and L4	6
MODULE V: NOISE Different types of noise, noise calculations, equivalent noise band width, noise figures, effective noise temperature, noise figure.	L1 and L2	4
MODULE VI: INTRODUCTION TO INFORMATION THEORY Measurement of Information, mutual, Shannon's theorem, Source coding, channel coding and channel capacity theorem, Huffman code	L1, L2 and L3	5

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. B. P. Lathi and Zhi Ding ,"Modern Digital and Analog Coimmunication Systems", Fourth Edition, Oxford University Press, 2009

2. Wayne Tomasi, "Electronic Communication systems", 5th edition, Pearson Education,2008

Reference Books

1. Simon Haykin, "Communication Systems", Third Edition, John Wiley & Sons,2007

2. Taub and schilling, "Principles of Communication Systems", Third Edition, TMH,2008

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

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Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	--	_	--	_	2	--	--	--	--	--	--	1	--	1	--
CO2	1	3	2	--	--	2	--	--	--	--	--	--	1	--	1	--
CO3	1	3	2	--	--	2	--	--	--	--	--	--	1	--	1	--
CO4	1	2	2	--	--	3	--	--	--	--	--	--	1	--	1	--

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CSE2422	WEB DESIGNING TECHNOLOGIES	L	T	P	C
Version: 2019.1	Date of Approval: 15 May2019	2	0	0	2
Pre-requisites/Exposure	knowledge of Internet fundamentals				
Co-requisites	NIL				

Catalog Description

The objective of this course is to introduce the basic concepts of HTML5 and CSS3. To explore and implement the various concepts of website design using HTMLwith the concept of the tags, script, and code that create web pages. To understand how the web and web pages workand web pages styles using CSS3.After completing this course students can easily develop static web sites and style them using CSS3.

Course Objectives

The objective of this course is

1. Understand the advanced features of HTML5 which includes images, links, tables, frames and forms etc and gives an overview of CSS3 which is used to add style to the web pages.
2. Demonstrate the application of HTML5 in developing solutions to web site creation andunderstanding how CSS will affect web page creation.
3. Design a responsive web site using HTML5 and CSS3.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain the basic concepts of HTML, structure of HTML. Apply the different tags for images, hypertext and lists in web pages.

CO 2: Illustrate the different ways to use styles in web pages using CSS? Apply CSS style sheetsfor formatting text in web pages.

CO 3: Explain the layout of CSS style and describe how to add audio and video in html web pages.

CO 4: Demonstrate the use of Table and frames in web pages and setting properties for tables and frames.

CO 5: Explain the writing scripts in web pages and publishing Webpages on web.

Modules	Blooms level*	Number of hours
Module I History of HTML, Basic HTML Structure, Creating title, Creating header and footer, Adding Comments, Formatting Text, Specifying time, Indicating citations/references, quotes, abbreviations, pre-formatted text, Inserting Images, Creating Image Links, Scaling images with the browser, setting icons for web page, Creating hypertext, anchor tag, Creating List, Creating Definition List, Creating Hyper Text Links, Creating Link Lists.	L2 and L3	8

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Module II CSS building blocks, working with style sheets, Creating different types of style sheets- External , embedded and inline style sheets, defining selectors , Selecting on basis of class and id, selecting elements based on the attributes, combining selectors, Formatting text with styles, setting font properties.	L3 and L4	7
Module III CSS: Layout with style, changing the background color, setting border, changing the cursor, style sheets for mobile to desktop, working with web fonts, creating forms, organizing the form elements. Adding audio , video and other multi-media .	L2 and L3	7
Module IV Tables and frames, Creating Tables, Table Element, Adding Border, Adding Column Headings, Adding Spacing and Padding, Adding a Caption, Setting the table Width and Height, Add Row Headings, Aligning Cell contents, Setting Column Width, Centering a Table, Inserting and Image, Spanning Columns, Spanning Rows Assigning Background Colors, Frame Elements, Creation of Frame Based Pages.	L3	7
Module V: Working with scripts : Loading an external script, testing & debugging web pages, publishing your web page on the web.	L2	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books:

1. HTML HTML5 and CSS3, Seventh Edition: Visual QuickStart Guide ,Elizabeth Castro and Bruce Hyslop.
2. HTML, XHTML and CSS Bible, Steven M. Schefar, Wiley Publishing, Inc.

Reference Books:

1. HTML & CSS: The Complete Reference, Fifth Edition ,Thomas A. Powell, Tata McGraw Hill.
2. HTML5: Up and Running ,Mark Pilgrim, O'Reilly Media, Inc.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/ Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	--	--	1	--	1	--	--	--	--	1	--	--	1	--	--	--
CO 2	--	--	2	--	2	--	--	--	--	1	--	--	1	--	--	--
CO 3	--	--	1	--	1	--	--	--	--	2	--	--	1	--	--	--
CO 4	--	--	2	--	1	--	--	--	--	2	--	--	1	--	--	--
CO 5	--	--	1	--	2	--	--	--	2	1	--	--	1	1	--	2

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CSE2423	WEB DESIGNING TECHNOLOGIES LAB	L	T	P	C
Version: 2019.1	Date of Approval: 15 May2019	0	0	2	1
Pre-requisites/Exposure	knowledge of Internet fundamentals				
Co-requisites	NIL				

Catalog Description

The objective of this course is to introduce the basic concepts of HTML5 and CSS3. To explore and implement the various concepts of website design using HTMLwith the concept of the tags, script, and code that create web pages. To understand how the web and web pages workand web pages styles using CSS3.After completing this course students can easily develop static web sites and style them using CSS3.

Course Objectives

The objective of this course is

1. Understand the advanced features of HTML5 which includes images, links, tables, frames and forms etc and gives an overview of CSS3 which is used to add style to the web pages.
2.Demonstrate the application of HTML5 in developing solutions to web site creation andunderstanding how CSS will affect web page creation.
3.Design a responsive web site using HTML5 and CSS3.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain the basic concepts of HTML, structure of HTML. Apply the different tags for images, hypertext and lists in web pages.
CO 2: Illustrate the different ways to use styles in web pages using CSS? Apply CSS style sheetsfor formatting text in web pages.
CO 3: Explain the layout of CSS style and describe how to add audio and video in html web pages.
CO 4: Demonstrate the use of Table and frames in web pages and setting properties for tables and frames.
CO 5: Explain the writing scripts in web pages and publishing Webpages on web.

Modules	Blooms level*	Number of hours
Module I **Programs based on :** • Basic HTMLStructure, Creating title, Creating header and footer, Adding Comments, • Formatting Text, Specifying time, Indicating citations/references, quotes, abbreviations, • pre-formatted text, Inserting Images, Creating Image Links, Scaling images with the browser, • setting icons for web page, Creating hypertext, anchor tag, Creating List, • Creating Definition List, Creating Hyper Text Links, Creating Link Lists.	L2 and L3	6

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Module II & Module III **Programs based on:** • CSS style sheets, Creating different types of style sheets- External , embedded and inline style sheets, • Selection on basis of class and id, selecting elements based on the attributes, combining selectors, • Formatting text with styles, setting font properties. • Changing the background color, setting border, changing the cursor, • style sheets for mobile to desktop, • working with web fonts, creating forms, organizing the form elements. Adding audio , video and other multi-media .	L2,L3 and L4	4
Module IV **Programs based on:** • Tables and frames, Creating Tables, Table Element, Adding Border, Adding Column Headings, • Adding Spacing and Padding, Adding a Caption, Setting the table Width and Height, Add Row Headings, • Aligning Cell contents, Setting Column Width, Centering a Table, Inserting and Image, • Spanning Columns, Spanning Rows Assigning Background Colors, • Frame Elements, Creation of Frame Based Pages.	L3	4
Module V: **Programs based on** Working with scripts : Loading an external script, testing & debugging web pages, publishing your web page on the web.	L2	1

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books:

1. HTML HTML5 and CSS3, Seventh Edition: Visual QuickStart Guide ,Elizabeth Castro and Bruce Hyslop.
2. HTML, XHTML and CSS Bible, Steven M. Schefar, Wiley Publishing, Inc.

Reference Books:

1. HTML & CSS: The Complete Reference, Fifth Edition ,Thomas A. Powell, Tata McGraw Hill.
2. HTML5: Up and Running ,Mark Pilgrim, O'Reilly Media, Inc.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	--	--	1	--	1	--	--	--	--	1	--	--	1	--	--	--
CO 2	--	--	2	--	2	--	--	--	--	1	--	--	1	--	--	--
CO 3	--	--	1	--	1	--	--	--	--	2	--	--	1	--	--	--
CO 4	--	--	2	--	1	--	--	--	--	2	--	--	1	--	--	--
CO 5	--	--	1	--	2	--	--	--	2	1	--	--	1	1	--	2

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Course Code: CSE2424	**APPLIED STATISTICAL ANALYSIS**	L	T	P	C
Version	Date of Approval: May 2022	2	0	0	2
Pre-requisites/Exposure	Basic Mathematics				
Co-requisites	Nil				

Catalog Description

In this course the concepts of statistics, the science of collecting, organizing, and interpreting numerical data are discussed. Emphasis will be placed on statistical reasoning and data analysis. The main topics are study design, descriptive statistics, probability theory, and statistical inference. As a precursor to the study of cryptography studies will be made on impact of various techniques for finding independence or dependence between data variables. The concepts learnt in the studies of statistics will be applied practically to solve number of real life problems using the statistical package like R and SPSS.

Course Objectives

The objective of this course is to

- Equip the students with concepts of statistics through problem solving and analytical approach.
- Provide an overview of various statistical techniques: descriptive and inferential, parametric and non-parametric and practical statistics using R and SPSS.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain, describe and distinguish various population,sample,type of variables,measurement scales; Explain central tendency , percentile and solve problems related to them.

CO 2: Explain the concept of descriptive and inferential statistics; probability theory; Solve problems based on probability; Explain binomial, Poisson distribution and solve real life problems related to discrete and continuous random variable.

CO 3: Describe the concept of sampling distribution for large and small samples; Explain the concept of hypothesis testing and solve problems related using t-distribution and standard normal distribution.

CO 4: Explain concept of covariance and correlation and its applications in real life; Explain Anova and its use in real life problem solving; Explain and compare various regression analysis methods statistics for prediction

CO 5: Explain various parametric and nonparametric test and apply them to solve real life statistical problems

Modules	**Blooms level***	**Number of hours**
Module I Introduction to Statistical Analysis Introduction to Statics, Population Versus Sample, Population and Sample, Basic Terms, Types Of Variables, Quantitative Variables, Qualitative or Categorical Variables, Measurement Scales, Identifying The Scale of Measurement, Normal Variables, Ordinal Variables, Continuous Variables, Cross-Section Data, Time – Series Data, Sources of Data, Types of Statics, Measures of Central Tendency, Mean, Examples, Mode, Mode Scenarios, Symmetry, Skewness, Measures of Spread, Range, Variance and Standard Deviation, Examples, Solution, Population Parameters and Sample Statistics, Measures of Position–Quartiles and Interquartile Range, Quartiles, Example, Solution, Percentiles and Percentile Rank, Example, Solution, Box and Whisker Plot, Solution.	L1, L2 and L3	7

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Module II Describing Data Raw Data, Graphical Presentation of Qualitative Data, Graphical Presentation of Qualitative Data, Graphing Quantitative Data, Frequency Distributions, Relative Frequency and Percentage Distributions, Graphing Grouped Data, Cumulative Frequency Distributions, Probability Concepts, Simple and Compound Events, Two Properties of Probability, Classical Probability, Probability Concepts, Complementary Events, Example, Discrete Random Variables, The Binomial Experiment, The Poisson Probability Distribution, Continuous Random Variables, Normal Distribution, Standard Normal Distribution.	L1,L2, L3	6
Module III Testing Hypothesis Population Distribution, Sampling and Non Sampling Errors, A Point Estimate, Interval Estimation, The t Distribution Hypothesis Testing, The Chi-Square Distribution.	L1,L2, L3	6
Module IV Examining Relationship Covariance, Pearson Correction Coefficient, Computational Formulas-Covariance, Computing A Correlation, Correlation Analysis, Scatter Plots, Relationships Between Continuous Variables, Correlation, Pearson Correlation Coefficient, Hypothesis Test For A Correlation, Extreme Data Values, Correlation Matrix, Anova Overview, Anova Hypothesis, Anova, Error Sum of Squares, Model Sum of Squares, Anova-Example, Simple Regression, Relationship Between Food Expenditure And Income: (A) Linear Relationship (B) Nonlinear Relationship, Plotting A Linear Equation, Y- Intercept And Slope Of A Line, Simple Linear Regression Analysis, Scatter Diagram, Least Squares Line, Error Sum Of Squares, The Least Squares Line, Example, Solution, Error Of Prediction, Positive And Negative Linear Relationship Between X And Y, Assumptions of Regression Model, Coefficient Of Determination, Regression Analysis.	L1, L2 L3	7
Module V Advanced Techniques Non Parametric Tests, Chi-Squared Goodness- of-Fit Test, Chi-Square Test of Independence, The Sign Test, Example, Mann-Whitney U Test, The Kruskal-Wallis Test, No Title, Structural Equation Modelling, Cluster Analysis, Factor Analysis, Centroid Method, Principal Components Method.	L1, L2	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

4. Spectrum Editorial Board, Statistical Analysis Graphs and Diagrams, Spectrum Books Pvt Ltd, 2013.
5. Torsten Hothorn and Brian S. Everitt , "A Handbook of Statistical Analyses Using R", Chapman and Hall/CRC, 2006.

Reference Books

2. Pal and Sarkar, "Statistics: Concepts and Applications", Prentice Hall India Learning Private Limited, 2007.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**	**--**
CO2	**1**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**--**	**--**
CO3	**1**	**1**	**1**	**--**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**	**--**
CO4	**1**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**	**--**
CO5	**1**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**	**--**

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: CSE2425	**APPLIED STATISTICAL ANALYSIS LAB (R LAB)**	L	T	P	C
Version	Date of Approval: May 2022	0	0	2	1
Pre-requisites/Exposure	Basic Mathematics				
Co-requisites	Nil				

Catalog Description

In this lab the concepts of statistics, the science of collecting, organizing, and interpreting numerical data learned will be practically applied to solve number of real life problems using the statistical package like R and SPSS.

Course Objectives

The objective of this course is to

- Equip the students with concepts of statistics through problem solving and analytical approach.
- Provide an overview of various statistical techniques: descriptive and inferential, parametric and non-parametric and practical statistics using R and SPSS.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain, describe and distinguish various population,sample,type of variables,measurement scales; Explain central tendency , percentile and solve problems related to them. .

CO 2: Explain the concept of descriptive and inferential statistics; probability theory ; Solve problems based on probability; Explain binomial, poisson distribution and solve real life problems related to discrete and continuous random variable.

CO 3: Describe the concept of sampling distribution for large and small samples; Explain the concept of hypothesis testing and solve problems related using t-distribution and standard normal distribution.

CO 4: Explain concept of covariance and correlation and its applications in real life; Explain Anova and its use in real life problem solving; Explain and compare various regression analysis methods statistics for prediction.

CO 5: Explain various parametric and nonparametric test and apply them to solve real life statistical problems

Programs should be based on following topics:

Quick Review of interpretation of mathematical models such as formulas, graphs, tables, and schematics, and draw inferences from them; Representation of mathematical information symbolically, visually, numerically, and verbally; Use of arithmetic, algebraic, geometric, and statistical methods to solve problems; Estimation and check answers to mathematical problems in order to determine reasonableness, Identification of alternatives, and select optimal results; and recognize the limitations of mathematical and statistical models.

Lab Sessions	**Blooms level***	**Number of hours**

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1. Getting familiar with R environment and jupyter notebook in Anaconda 2. Running basic commands and small R scripts 3. Working with operators and input output , Writing R scripts to demonstrate various operators available in R	L1, L2 and L3	2
1. Demonstrating decision making statements in R by writing small R scripts. 2. Creating data frames , vectors, matrices, list in R and solving practical problems in statistics	L1, L2 and L3	2
1. Running basic R commands for central tendency, measures of variations, generating frequency tables, cumulative frequency and relative frequency table. 2. Demonstrating graphics in R with simple plot command	L1, L2 and L3	2
1. Working with bar chart in R and solving practical problems in statistics 2. Demonstrating Pie chart in R for some real life problems. 3. Demonstrate concepts of quartiles using Box and whisker plot in R with some hands on data/data sets and perform analysis	L1,L2, L3	2
1. Demonstrate stem and leaf plot in R 2. Working with loops in R by writing basic scripts. 3. Drawing standard normal distribution chart in R and finding areas under the curve in figure as well as numerica	L1,L2, L3	2
1. Perform binomial and poission distribution in R 2. Perform operations related to PMF and CDF in R /SPSS	L1,L2, L3	2
1. Demonstrate hypothesis testing in R for some real life problems using standard normal distribution and Student-t distribution. 2. Running basic commands for covariance, correlation and doing analysis for some problems.	L1,L2, L3	2
1. Demonstrate chi-square, ANOVA test in R for some real life problems. 2. Demonstrate Linear Regression Analysis in R for some built-in data sets and for real life problems.	L1,L2, L3	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Spectrum Editorial Board, Statistical Analysis Graphs and Diagrams, Spectrum Books Pvt Ltd, 2013.
- Torsten Hothorn and Brian S. Everitt , "A Handbook of Statistical Analyses Using R", Chapman and Hall/CRC, 2006.

Reference Books

- Pal and Sarkar, "Statistics: Concepts and Applications", Prentice Hall India Learning Private Limited, 2007.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**	**--**
CO2	**1**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**--**	**--**
CO3	**1**	**1**	**1**	**--**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**	**--**
CO4	**1**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**	**--**
CO5	**1**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**	**--**

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CSE2426	DISTRIBUTED SYSTEM	L	T	P	C
Version : 2019.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Computer Networks, Database Management System and Operating System				
Co-requisites	NIL				

Catalog Description

In this course we are going to present the distributed systems, high performance networks, clusters, and computational grids environments. In the end, participants will have a good idea of the basis of this subject in theoretical aspects. This course will help students understand the fundamental issues of designing and engineering distributed systems with reference to partial failure, heterogeneity, scalability, concurrency, and asynchrony.

Course Objectives

The objective of this course is to

1. To provide an overview of distrusted systems, its application, and challenges.
2. To familiarize with the basic taxonomy and terminology of distributed computing.
3. To experience the designing and managing of various protocols while getting a good exposure to various advance technologies.

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand what and why a distributed system is required.
CO2. To understand IPC, Group Communication & RPC Concepts.
CO3. To understand theoretical concepts, namely, virtual time, agreement, and consensus protocols
CO4. To understand the concepts of transaction in distributed environment and associated concepts, namely, concurrency control, deadlocks, and error recovery.
CO5. To provide an overview of distributed multimedia systems, examine the fundamental concept of digital media, identify the applications, and survey the important enabling technologies.

Modules	Blooms level	Number of hours
Module I: Introduction to Distributed System Introduction, Goals of Distributed System Examples of distributed systems , Trends in distributed systems , Resource sharing in distributed system, Challenges faced, System Models basics, types of System Models, Physical models , Architectural models , Fundamental models.	L1, L2	8

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Module II: Networking and Internetworking Introduction to networking, Networking issues for distributed systems, Types of network (LAN, MAN, WAN, WLAN, WMAN, WWAN, internetworks), Network principles, Internet protocols, Basics of Inter-Process communication, Multicast Communication, Network virtualization: overlay networks, Remote invocation, Remote Procedure Call, Remote method invocation..	L2, L3 and L4	8
Module III: Operating System Support, Web Services and Security Introduction , Operating System layer, Operating System Architecture, Virtualization at Operating System level, Introduction to web services, Service descriptions and IDL for web services, Applications of web services, Overview of Security Techniques, Cryptographic algorithms , Digital signatures, Needham–Schroeder, Kerberos techniques	L2, L3	9
Module IV: Distributed File Systems and Distributed Transactions Introduction (URI, URL's) , Name services and the Domain Name System(NameSpace, Name Resolution, DNS), Directory services, Transactions , Nested transactions , Locks , Optimistic concurrency control, Flat and nested distributed transactions , Atomic commit protocols , Concurrency control in distributed transactions , Distributed deadlocks.	L2, L3 and L4	6
Module VI: Distributed Multimedia System and Distributed Algorithms Characteristics of multimedia data, Quality of service management, Resource management, Stream adaptation, Introduction to communication protocols, Balanced sliding window protocol, Routing algorithms, Destination based routing, APP problem, Deadlock free Packet switching	L2, L3and L4	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text & References:

Text:

1. Coulouris, Dollimore, Kindberg, Blair, "Distributed System: Concepts and Design‖, Fifth Edition, Pearson Ed.
2. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill

References:

1. Andrew S. Tanenbaum, "Computer Networks", 4th ed., Prentice Hall
2. Gerald Tel, "Distributed Algorithms", Cambridge University Press

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	--	--	--	--	--	--	--	--	--	1	3	--	--
CO2	1	2	3	--	--	--	--	--	--	--	--	--	1	1	--	--
CO3	1	1	2	3	3	--	--	--	--	--	--	--	1	2	--	--
CO4	1	1	2	3	--	--	--	--	--	--	--	--	1	1	2	---

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Course Code: CSE2427	ETHEREUM AND SOLIDITY PROGRAMMING	L	T	P	C
Version 2023.1	Date of Approval: March 2023	2	0	0	2
Pre-requisites/Exposure	Basic Programming				
Co-requisites	Nil				

Catalog Description

Ethereum is a platform for digital money, international payments, and applications. The community has created a thriving digital economy, as well as innovative new ways for creators to make money online. Solidity is an object-oriented programming language created specifically by the Ethereum Network team for constructing and designing smart contracts on Blockchain platforms. Ethereum and Solidity Programming is going to revolutionize the future of computing applications.

Course Objectives

The objective of this course is to:

1. Introduce the concepts of Etherum blockchain and network.
2. Learn how the individual components of the Etherum like EVM make the whole system tick.
3. Explore Etherum development environment for executing business tasks over etherum network.
4. Understand the concepts of Solidity Programming Language.

Course Outcomes

On completion of this course, the students will be able to:

CO1. Explain the Etherum blockchain network and its functioning.
CO2. Describe the mechanism Etherum blockchain for making transactions.
CO3. Understand and use the Etherum development environment in different applications.
CO4. Understand and apply the the concepts of Solidity Programming Language.

Modules	Blooms Level*	Hours
MODULE 1: INTRODUCING ETHERUM Introduction, The yellow paper on Etherum, Useful mathematical symbols, Ethereum blockchain, Ethereum - bird's eye view, The Ethereum network, Mainnet, Testnet, Private net, Components of the Ethereum ecosystem, Keys and addresses, Accounts, Types of accounts, Transactions and messages, Messages, Calls, Transaction validation and execution, The transaction substate, State storage in the Ethereum blockchain, The world state, The account state, Transaction receipts	L1, L2	8
MODULE 2: MECHANICS OF ETHERUM Ether cryptocurrency / tokens (ETC and ETH), The Ethereum Virtual Machine (EVM), Execution environment, Machine state, The iterator function, Smart contracts, Native contracts. Further Ethereum - Programming languages, Runtime bytecode, Blocks and blockchain, Ethash, Wallets and client	L1, L2	9

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software, APIs, tools, and DApps, Applications (DApps and DAOs) developed on Ethereum		
MODULE 3: ETHEREUM DEVELOPMENT ENVIRONMENT Test networks, Setting up a private net, Network ID, The genesis file, Data directory, Flags and their meaning, Static nodes, Starting up the private network, Running Mist on private net, Deploying contracts using Mist, Block explorer for private net / local Ethereum block explorer	L1, L2	7
MODULE 4: SOLIDITY PROGRAMMING Solidity compiler (solc), Installation on Linux, Integrated Development Environments (IDEs), Remix, Tools and libraries, Node version 7, EthereumJS, Ganache, MetaMask, Truffle. Solidity language - Types, Value types, Boolean, Integers, Address, Literals, Integer literals, String literals, Hexadecimal literals, Enums., Function types, Internal functions, External functions, Reference types, Arrays, Structs, Data location, Mappings, Global variables, Control structures, Events, Inheritance, Libraries, Functions.	L1, L2	12

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

Bashir, Imran. Mastering blockchain. Packt Publishing Ltd, 2017.

Reference Books

1. Antonopoulos, Andreas M., and Gavin Wood. Mastering ethereum: building smart contracts and dapps. O'reilly Media, 2018.
2. Modi, Ritesh. Solidity Programming Essentials: A beginner's guide to build smart contracts for Ethereum and blockchain. Packt Publishing Ltd, 2018.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	2	3	--	--	--	--	--	--	--	--	--	2	1	-	2
CO 2	2	2	3	-	--	--	--	--	--	--	--	--	2	1	-	2
CO 3	2	2	3	-	-	--	--	--	--	--	--	--	2	1	-	3
CO	1	2	3	-	2	--	--	--	--	--	--	--	2	1	1	2

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4																
CO 5	**2**	**3**	**3**	**-**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**1**	**3**

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Course Code: CSE2428	ETHEREUM AND SOLIDITY PROGRAMMING LAB	L	T	P	C
Version 2023.1	Date of Approval: March 2023	0	0	2	1
Pre-requisites/Exposure	Basic Programming				
Co-requisites	Nil				

Catalog Description

Ethereum is a platform for digital money, international payments, and applications. The community has created a thriving digital economy, as well as innovative new ways for creators to make money online. Solidity is an object-oriented programming language created specifically by the Ethereum Network team for constructing and designing smart contracts on Blockchain platforms. Ethereum and Solidity Programming is going to revolutionize the future of computing applications.

Course Objectives

The objective of this course is to:

- Introduce the concepts of Etherum blockchain and network.
- Learn how the individual components of the Etherum like EVM make the whole system tick.
- Explore Etherum development environment for executing business tasks over etherum network.
- Understand the concepts of Solidity Programming Language.

Course Outcomes

On completion of this course, the students will be able to:

CO1. Explain the Etherum blockchain network and its functioning.
CO2. Describe the mechanism Etherum blockchain for making transactions.
CO3. Understand and use the Etherum development environment in different applications.
CO4. Understand and apply the the concepts of Solidity Programming Language.

Modules	Blooms Level*	Hours
MODULE 1: ETHERUM BLOCKCHAIN PLATFORM • Ethereum Nodes, Accounts, and Ethereum Addresses • Creating an Ethereum Account Using MetaMask • Creating an Ethereum Account Using MyEtherWallet (MEW) • Ether (ETH), Rinkeby Authenticated Faucet • How to Transfer ETH • Ethereum Block Explorer, Transactions, and Blocks • Ethereum Transaction's Fields • Ethereum 2.0 (ETH2). PoW vs. PoS	**L1, L2, L3**	**10**

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MODULE 2: SOLIDITY PROGRAMMING • Remix IDE • Compilation In Depth: ABI and Bytecode • Contract Deployment on JS VM • The Structure of a Smart Contract • Solidity Basic Syntax Rules, State and Local Variables • Functions, Setters, and Getters • The Constructor, Coding - Variables and Functions • Variable Types: Booleans and Integers • Fixed-Size Arrays and Dynamically-Sized Arrays • Bytes and String Types, Structs and Enums, Mappings • Storage vs. Memory (Solidity Gotchas) • Built-In Global Variables	**L1, L2, L3**	**14**

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. Antonopoulos, Andreas M., and Gavin Wood. Mastering ethereum: building smart contracts and Dapps. O'reilly Media, 2018..

Modes of Evaluation: Quiz/Assignment/ Seminar/Written
Examination Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO4**
CO 1	**2**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**		**2**
CO 2	**2**	**2**	**3**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**-**	**2**
CO 3	**2**	**2**	**3**	**-**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**-**	**3**
CO 4	**1**	**2**	**3**	**-**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**1**	**2**
CO 5	**2**	**3**	**3**	**-**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**1**	**3**

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Course Code: CSE2429	IOT PLATFORMS AND SYSTEM DESIGN	L	T	P	C
Version : 2023.1	**Date of Approval:** March 2023	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

Course Objective:

This program aims to train students to be equipped with a solid theoretical foundation, systematic professional knowledge and strong practical skills in the IoT Platform and System Design. The course focuses on understanding the vision of IoT from a global perspective, understand its applications, determine its market perspective, using gateways, devices and data management, building a state of art architecture in IoT and its applications in commercial building automation and real-world design constraints.

Modules	Blooms level*	Number of hours
Module I IoT Networking Core Technologies involved in IoT development, Internet web and Networking technologies, Infrastructure, Overview of IoT supported Hardware platforms such as: Raspberry pi, ARM Cortex Processors, Arduino and Intel Galileo boards, Wireless networking equipment and configurations, accessing hardware and device file interactions.	L1, L2 and L3	6
Module II M2M to IoT Role of M2M in IoT, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations	L1,L2, L3	5
Module III IoT Architecture -State of the Art IoT reference Model and Architecture- Functional View, Information View, Deployment and Operational View, Other Relevant architectural views, Middleware Introduction-FiWare etc., Remote monitoring and sensing, remote controlling and performance analysis, layering concepts, communication pattern, 6LoWPAN, Sensors and sensor Node and interfacing using any Embedded target boards (Raspberry Pi / Intel Galileo/ARM Cortex/ Arduino) .	L1,L2, L3	5
Module IV IoT Application Development Application protocols: MQTT, REST/HTTP, CoAP, MySQL, Back-end Application Designing Apache for handling HTTP Requests, MongoDB Object type Database, HTML, CSS & jQuery for UI Designing, JSON lib for data processing, Security & Privacy during development	L1, L2 L3	4

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Module V IoT Security and case studies Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities	L1, L2	4

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	**5**	**15**	**5**	**5**	**70**

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Texts & References:

Texts:

- Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1 st Edition, VPT, 2014
- Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", November 2013, John Wiley and Sons.

References:

- Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1 st Edition, Apress Publications, 2013
- Cuno Pfister, Getting Started with the Internet of Things, O'Reilly Media, 2011, ISBN: 978-1-4493-9357-1
- Zach Shelby, Carsten Bormann, "6LoWPAN: The Wireless Embedded Internet", John Wiley and Sons.
- Dr. Ovidiu Vermesan, Dr. Peter Friess "Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS O 1**	**PS O 2**	**PS O 3**
CO 1	**1**	**2**	**3**	**3**	--	--	--	--	--	--	--	--	**2**	**1**	--
CO 2	**1**	--	--		--	--	--	--	--	--	--	--	--	**2**	--
CO 3	**1**	**2**	**3**	**3**		--	--	--	--	--	--	--	**2**	**1**	--
CO 4	**1**	**2**	**3**	**3**	--	--	--	--	--	--	--	--	**2**	**1**	--
CO 5	**1**	--	--	--	--	--	--	--	--	--	--	--	--	**1**	--

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SEMESTER-V

CSE2502	COMPUTER ARCHITECTURE	L	T	P	C
Version 2017.1	Date of Approval: 14th June 2017	3	0	0	3
Pre-requisites/Exposure	Logic Gates				
Co-requisites	nil				

Catalog Description

Computer architecture is concerned with the structure and behavior of the various functional modules of the computer and how they interact to provide the processing needs of the user. It includes basic register transfer language and computer organization and design. Complete insight on the working of CPU, Memory and I/O communication will be provided. Pipeling and related topics will also be discussed.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of computer architectures and their modules.
2. Provide an overview of various algorithms used and hardware implementation computer.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain about Register transfer language and various micro operations of arithmetic logic unit.

CO2. Explain about the organization of computer modules and their details.

CO3. Explain in details of central processing unit like general purpose register, accumulator etc. and computer arithmetic.

CO4. Explain memory organization of computer and their interconnections. Details of direct memory access.

CO5. Explain parallel processing and pipeline techniques.

Modules	Blooms level*	Number of hours
Module I:Register Transfer Language Register Transfer, Bus and Memory Transfers, Arithmetic Micro-operations, Logic Micro-operations, Shift Micro-operations, Arithmetic Logic shift Unit.	L1, L2 and L3	10
Module II: Basic Computer Organizations and Design Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt, Design of Accumulator Logic. Hardwired and Microprogrammed control: Control Memory, Address Sequencing, Design of Control Unit	L1,L2	9

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Module III: Central Processing Unit Introduction, General Register Organization, Stack Organization, Instruction representation, Instruction Formats, Instruction type, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer RISC and CISCComputer Arithmetic: Introduction, Addition and Subtraction Algorithm,Multiplication Algorithms, Booth Multiplication, Division Algorithms, Floating-Point Arithmetic Operations	L1,L2, L3	10
Module IV: Memory and Intersystem Communication and Input output organisation Memory: Memory types and organization Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory with mapping techniues, Virtual Memory, Memory Management Hardware Intrasystem communication and I/O: Peripheral Devices, Input-Output Controller and I/O driver, IDE for hard disk, I/O port and Bus concept, Bus cycle, Synchronous and asynchronous transfer,Modes of Transfer, DMA, DMA Transfer, DMA Controller, I/O Processor, CPU-IOP Communication	L1,L2, L3.	10
Module V: Pipelining, Vector Processing and Multiprocessors Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline Multiprocessors: Characteristics of Multiprocessors	L1 and L2	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Book:

1. Morris Mano, Computer System Architecture, 3rd Edition – 1999, Prentice-Hall of India Private Limited.
2. Harry & Jordan, Computer Systems Design & Architecture, Edition 2000, Addison Wesley, Delhi.

References Books:

1. WIliam Stallings, Computer Organization and Architecture, 4th Edition-2000, Prentice-Hall of India Private Limited.
2. Kai Hwang-McGraw-Hill, Advanced Computer Architecture.
3. John D. Carpinelli, Computer system Organization & Architecture, Edition 2001, Addison Wesley, Delhi
4. M. Morris Mano and Charles, Logic and Computer Design Fundamentals, 2nd Edition Updated, Pearson Education, ASIA.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	ATT	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

ATT: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination.

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2	PS O 3
CO 1	1	2	3	3	--	--	--	--	--	--	--	--	2	1	--
CO 2	1	--	--		--	--	--	--	--	--	--	--	--	2	--
CO 3	1	2	3	3		--	--	--	--	--	--	--	2	1	--
CO 4	1	2	3	3	--	--	--	--	--	--	--	--	2	1	--
CO 5	1	--	--	--	--	--	--	--	--	--	--	--	--	1	--

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CSE2503	JAVA PROGRAMMING	L	T	P	C
Version 2017.1	Date of Approval: 14th June 2017	3	0	0	3
Pre-requisites/Exposure	Basics of Programming				
Co-requisites	NIL				

Catalog Description

The objective is to impart programming skills used in this object-oriented language java. The course explores all the basic concepts of core java programming like object, classes, data types, features, operators, control structures, interfaces, packages, applets, awt, swings and socket programming. The students are expected to learn it enough so that they can develop the basic applications as well as web solutions like creating applets etc.

Course Objectives

The objective of this course is to

1. Equip the students with the basic feature of contemporary java required in solving complex problems.
2. Provide a practical knowhow and implementation of java programming concepts like classes, objects, packages, swings,socket programming.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define and explain concept of byte code and platform independence, demonstrate basic java-based application development using operators, if-else, loops and arrays.

CO2: Distinguish between various types of inheritances, polymorphisms and other concepts and able to solve complex programming problems involving class objects, inheritances, and packages.

CO3: Describe hierarchy of exception classes and thread life cycle along with demonstrate and design solutions for some simple and complex applications using exception and multithreading concepts.

CO4: Explain event delegation model and describe AWT class hierarchy; Apply knowledge of event handling and AWT controls create some new dynamic graphical applications.

CO5: Explain the architecture of applet and concept of swing package. Demonstrate applications based on java applets and swings.

Modules	Blooms level*	Number of hours
Module I:Java Basics Concepts of OOP, Features of Java, How Java is different from C++, Environmental setup, Basic syntax, Objects and classes, Basic Data Types, Variable Types, Modifier Types, Basic operators, Loop Control, Decision Making, Strings and Arrays, Methods, I/O.	L1, L2 and L3	6
Module II: Java Object Oriented Inheritance, Overriding, Polymorphism, Abstraction, Encapsulation, Interfaces, Packages, Exploring java.util package. .	L2 and L3	7

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Module III: Exception Handling and Threading Exception Hierarchy, Exception Methods, Catching Exceptions, Multiple catch Clauses, Uncaught Exceptions Java's Built-in Exception. Creating, Implementing and Extending thread, thread priorities, synchronization suspending, resuming and stopping Threads, Multi-threading.	L2, L3 and L5	8
Module IV: Event Handling And AWT Event handling Mechanism, Event Model, Event Classes, Sources of Events, Event Listener Interfaces, AWT: Working with Windows, AWT Controls, Layout Managers	L2, L3, L4 and L5	8
Module V: Java Advanced AppletClass, Architecture, Skeleton, Display Methods.Swings: Japplet, Icons, labels, Text Fields, Buttons, Combo Boxes.Socket Programming: Socket methods, Server Socket methods, Socket Client and Socket Server examples.	L2 and L3	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text:

- "JAVA The Complete Reference" by Patrick Naughton & Herbert Schild, 10th Edition,TMH
- "Introduction to JAVA Programming a primer", E.Balaguruswamy,4th Edition,TMH

References:

1. "Introduction to JAVA Programming" By Daniel/Young PHI
2. "Java Script", By Jeff Frentzen and Sobotka,Tata McGraw Hill,1999

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**2**	**1**	--	--	--	--	--	--	--	--	--	--	**2**	--	--	--
CO2	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO3	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO4	**1**	**3**	**2**	--	--	--	--	--	--	--	--	--	**2**	--	**2**	--
CO5	**1**	**3**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--

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CSE2505	JAVA PROGRAMMING LAB	L	T	P	C
Version 2017.1	Date of Approval: 14th June 2017	0	0	2	1
Pre-requisites/Exposure	Basics of Programming				
Co-requisites	NIL				

Catalog Description

In this Lab course the basic features of contemporary java are implemented and demonstrated. Problems or programs will be related to concepts of classes, objects, threads, packages, exception handling, applets, AWT control, swings and socket programming. Concepts covered would enable them to create basic and complex console and graphical based applications for desktop and Internet

Course Objectives

The objective of this course is to

1. Equip the students to apply knowledge of various basic java features required in solving basic and complex problems.
2. Provide a demonstration of basic java programming concepts like classes, objects, threads, packages, exception handling, applets, AWT control, swings and socket programming

Course Outcomes

On completion of this course, the students will be able to

CO1: Apply the concepts learned of operators, if-else, loops and arrays to javabased application development.

CO2: Demonstrate the use of various types of inheritances, polymorphisms, class objects, inheritances, packages and other concepts to basic and complex java programming problems.

CO3: Apply the knowledge of exception handling and multithreading concepts for some simple and complex applications.

CO4: Apply knowledge of event handling and AWT controls to create some new dynamic graphical applications.

CO5: Demonstrate graphical applications based on java applets, swings and event handling.

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Modules/Topics Covered**	Blooms level*	Number of hours

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1. Sample Programs using Objects and classes, Variable Types, Modifier Types, operators, LoopsDecision Making, Strings and Arrays, (a) WAP to display "Hello, it's a first program in java". (b) WAP to find sum of two integers taken as input from user at runtime. (c) WAP to find sum of two float numbers taken as command line arguments (d) WAP to find changed case of entered character. (e) WAP to find maximum of 3 integer numbers taken as input from user at runtime. (f) WAP in java to find out the greatest out of ten numbers stored using arrays. (g) WAP to create class with "name" as String and "age" as integer data members. The class should have two methods to take input from user and display the data. (h) WAP to find factorial of a number using class and object.	L3, L5	6
2. Sample Programs using Inheritance, Overriding, Polymorphism, Interfaces, Packages a. WAP in java to illustrate the concept of interfaces. b. WAP to create a package as MyPack having a class with three methods: max, fact and show. Use it in other folder with setting classpath and without setting class path. c. Write a program in java to showcase uses of super keyword	L3, L5	4
1. Sample Programs using exception handling and threads a) Write a program to demonstrate the use of nesting of try-catch block b) WAP in java to illustrate the concept of using multiple catch clauses to handle different types of exceptions. c) WAP in java to create a user defined Exception and throw it explicitly. d) Demonstrate thread using Thread class and Runnable interface e) Demonstrate various thread methods using a program	L3, L5	6
(a) Sample Programs using event handling and AWT controls (b) Write a program to display "hello" in different color where user clicks left mouse button and "world" where right mouse button is clicked. Use black background. (c) WAP in java to create a Frame and handle window-closing event implementing the WindowListener interface. (d) WAP to create an Applet having various different buttons, recognizing them using action command string method and handling click event generated by them. (e) WAP to create a frame and illustrate the concept of using an adapter class in place of interfaces for handling various mouse events generated over frame window. (f) WAP in java to create a frame with AWT controls (like label, push buttons, Checkbox, Checkbox Group) and handle various events generated by them. (g) WAP in java to create a frame with various AWT controls (like choice, list, TextField and Buttons) and handle the events thrown by them.	L3, L5	6

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5. Sample Programs using applets, swings and stream socket a) . Write an applet which will display "HAPPY" and "DEEPAVALI" as: The word "HAPPY" will roll from top to bottom and "DEEPAVLI" from bottom to "top" . Both will run at the same speed and stop simultaneously at the center of the applet. b) Write an applet to display last 32 shades of red, green and blue in equal sized square grid accompanied by appropriate labels like" Last 32 shades of Red/Green/Blue color". Make use of BorderFactory to apply border for each individual shade. c) Create an applet with one single button with caption "Click". On clicking the button will open a new Frame with title "Factorial". The frame will have two three controls :TextField, Label and button. On clicking button calculate the factorial entered in TextField control. d) Create Java programs to demonstrate day time client and server e) Create java programs to create echo client and server	L3, L5	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Text:

1. "JAVA The Complete Reference" by Patrick Naughton & Herbert Schild, 10th Edition,TMH
2. "Introduction to JAVA Programming a primer", E. Balaguruswamy,4th Edition, TMH

References:

1. "Introduction to JAVA Programming" By Daniel/Young PHI .
2. "Java Script", By Jeff Frentzen and Sobotka, Tata McGraw Hill,1999

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	35

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**2**	**1**	--	--	--	--	--	--	--	--	--	--	**2**	--	--	--
CO2	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO3	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO4	**1**	**3**	**2**	--	--	--	--	--	--	--	--	--	**2**	--	**2**	--
CO5	**1**	**3**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--

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CSE2515	MICROPROCESSOR	L	T	P	C
Version 2019.1	Date of Approval: 15 May2019	2	1	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course deals with the systematic study of the architecture and programming issues of 8085-microprocessor family. Explanation of microprocessor in terms of ALP and timing diagrams,Memory System Design & I/O Interfacing, peripheral devices and advance Pentium Processors.

Course Objectives

The objective of this course is to

1. Equip with concepts ofmicroprocessor and interfacing with peripheral devices.
2. Provide an overview of advance microprocessors.

Course Outcomes

On completion of this course, the students will be able to

CO1: Describe the architecture of 8085 microprocessor.

CO2:Describe assembly language programming and show timing diagram for 8085 microprocessors.

CO3: Explain the input output interfacing with peripheral devices and design of memory system for 8085 microprocessors.

CO4: Describe the architecture of 8086 microprocessor and compare with 8085 microprocessors.

CO5: Explain the working principles and architecture of 8087, 80x86 and Pentium processors.

Modules	Blooms level*	Number of hours
Module I: Introduction to Microcomputer Systems Introduction to Microprocessors and microcomputers, Study of 8-bit Microprocessor, 8085 pin configuration, Internal Architecture and operations,interrupts, Stacks and subroutines, various data transfer schemes.	L1 and L2	8
Module II: ALP and timing diagrams Introduction to 8085 instruction set, advance 8085 programming, Addressing modes, Counters and time Delays, Instruction cycle, machine cycle, T-states, timing diagram for 8085 instruction.	L2 and L3	10
Module III: Memory System Design & I/O Interfacing Interfacing with 8085.Interfacing with input/output devices (memory mapped, peripheral I/O), Cache memory system. Study of following peripheral devices 8255, 8253, 8257, 8255, 8251.	L1 and L5	10

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Module IV: Architecture of 16-Bit Microprocessor Difference between 8085 and 8086, Block diagram and architecture of 8086 family, pin configuration of 8086, Minimum mode & Maximum mode Operation. Internal architecture of 8086, Bus Interface Unit, Register Organization, Instruction Pointer, Stack & Stack pointer, merits of memory segmentation, Execution Unit, Register Organization.	L1 and L2	10
Module V: Pentium Processors .Internal architecture of 8087, Operational overview of 8087, Introduction to 80186, 80286, 80386 & 80486 processors, Pentium processor.	L1 and L2	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Ramesh. S. Gaonkar, "Microprocessor architecture Programming and Application with 8085" Penram International Publishing, 4th Edition
- B. Ram, "Fundamentals of microprocessors and microcomputer" Dhanpat Rai, 5th Edition.

Reference Books

1. M. Rafiquzzaman, "Microprocessor Theory and Application" PHI – 10th Indian Reprint.
2. Naresh Grover, "Microprocessor comprehensive studies Architecture, Programming and Interfacing" Dhanpat Rai, 2003.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**2**	**3**												**1**	**1**	
CO2	**1**	**2**	**3**		**3**									**3**	**1**	**3**
CO3			**1**		**2**						**3**	**3**		**2**	**1**	**3**
CO4	**1**	**2**	**3**												**1**	**3**
CO5	**1**	**2**	**3**												**1**	**3**

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CSE2516	THEORY OF AUTOMATA & COMPUTATION	L	T	P	C
Version 17.1	Date of Approval: 15 May2019	3	0	0	3
Pre-requisite/Exposure	NIL				
Co-requisites	NIL				

Catalog Description:
In this course the concepts of General theory of Automata are discussed in detail. The course begins with the basic mathematical preliminaries and goes on to Theory of Computation (TOC), properties of regular sets and regular expressions, and the basics of formal languages. Besides, sufficient attention is devoted to such topics as push-down automaton and its relation with context free languages, Turing machines, the basic concepts of computability such as primitive recursive functions and partial recursive functions.

Course Objectives
The objective of this course is to

1. Equip the students with concepts of general theory of Automata
2. Provide an overview of analyzing the various models such as Finite Automata, Push down Automata and Turing Machines under various formal languages.

Course Outcomes
On completion of this course, the students will be able to,

CO1: Explain about Finite Automata including various formal languages, classify the role of DFA and NFA.
CO2: Define and analyzed various types of grammars in pushdown automata and classify PDA
CO3: Analyze the working of Turing Machine with its language and design new Turing machine based on problems
CO4: Categorize the solvable and un-solvable problems.
CO5: Compare the problems which are based on the different type of Recursive functions.

Modules	Blooms level*	Number of hours
Module 1: INTRODUCTION TO LANGUAGES AND AUTOMATA Formal Grammars and Chomsky Hierarchy, Regular Expression Deterministic and Nondeterministic Finite Automata, Regular Expression, two way Finite Automata, Finite Automata with output, Properties of regular sets, pumping lemma for regular sets, My-Hill-Nerode Theorem.	L1, L2 and L4	10
MODULE 2: CONTEXT FREE GRAMMARS AND PUSHDOWN AUTOMATA CFG: Formal Definition, Derivation and Syntax trees, E-removal, Ambiguous Grammar, Properties of CFL, Normal Forms (CNF and GNF), Pushdown Automata: Definitions, Relationship between PDA and context free language, Decision Algorithms	L1, L3 and L4	10

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MODULE 3: TURING MACHINE The Turing Machine Model, Language acceptability of Turing Machine, Design of TM, Universal TM, Church's Machine. Recursive and recursively enumerable language, unrestricted grammars, Context Sensitive Language, Linear Bounded Automata (LBA).	L3 and L4	10
Module 4: UNDECIDABILITY Turing machine halting Problem, undecidable problems for recursive enumerable language, Post correspondence problems (PCP) and Modified Post correspondence problems, Undecidable problems for CFL.	L2, L3 and L4	10
Module 5: COMPUTABILITY Partial and Total Functions, Primitive Recursive functions, Recursive functions.	L2 and L4	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books:

- Hopcroft and Ullman, "Introduction to Automata Theory, languages and computation", Addison Wesley,2001.
- "An introduction to formal languages and Automata (6th ed)" by Peter Linz, D. C. Health and Company,2016.

Reference Books:

- Introduction to theory of computation (2nd Ed) by Michael sipser.
- Zavi Kohavi, "Switching and finite Automata Theory "John C Martin

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3	PS O4
CO 1	1	1	2	2	2	3	--	--	--	--	--	--	1	2	3	3
CO 2	1	1	1	2	2	2	--	--	--	--	--	--	1	1	3	3
CO 3	1	1	2	3	3	--	--	--	--	--	--	--	1	2	3	3
CO 4	1	1	2	3	3	--	--	--	--	--	--	--	1	1	2	2
CO 5	1	1	1	2	2	3	--	--	--	--	--	--	1	2	2	3

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CSE2535	SUMMER INTERNSHIP EVALUATION-I	L	T	P	C
Version: 2017.1	Date of Approval: 14th June 2017	0	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The objective of this course is to provide practical training on some live projects that will increase capability to work on actual problem in industry. This training may undergo in an industrial environment or may be an in-house training on some latest software which is in high demand in market. This training will be designed such that it will useful for their future employment in industry.

Course Objectives

The objective of this course is to

1. Provide practical training on live projects
2. Increase technical capabilities on solving real life problems in company environment

Course Outcomes

On completion of this summer internship, the students will be able to:
CO1: Develop communication, interpersonal and other critical skills in the job interview process.
CO2: Design and develop software and hardware projects
CO3: Assess interests and abilities in their field of study.
CO4: Demonstrate excellent technical and communication skills to acquire employment contacts leading directly to a full-time job following graduation from college.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	1	2	2	--	--	--	1	--	--	--	1	1	1	1
CO2	1	1	2	2	2	--	--	--	1	--	--	--	1	1	1	1
CO3	1	1	2	3	2	--	--	--	1	--	--	--	1	1	1	1
CO4	1	1	2	2	2	--	--	--	1	--	--	--	1	1	1	1

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CSE2514	**FUZZY LOGIC & GENETIC ALGORITHM**	L	T	P	C
Version 2017.1	Date of Approval: 14th June 2017	3	0	0	3
Pre-requisites/Exposure	Basic Computer Concepts				
Co-requisites	Nil				

Catalog Description

In this course the concepts of fuzzy logic and genetic algorithm are discussed in detail. This course will provide an understanding of fuzzy logic and genetic algorithm and an outlook on the applications of these techniques to solve real world problems. It also provides an understanding of fuzzy-genetic based machine learning.

Course Objectives

The objective of this course is to

1. Provide the student with the basic understanding of genetic algorithm and fuzzy logic fundamentals, program and design the related systems.
2. Equip the students with concepts of fuzzy logic based solutions.
3. Provide an overview of performance of genetic algorithm, simulated annealing and tabu search.

Course Outcomes

On completion of this course, the students will be able to

CO1: Develop the skills to gain a basic understanding of genetic algorithm and fuzzy logic theory.
CO2: Appreciate the learning and adaptation capability of neural and fuzzy systems.
CO3: Apply various operators to optimize. Perform mathematical calculation of the GA
CO4: Able to identify the present application areas of fuzzy logic and GA
CO5: Explain the working principle and compare the performance with other methods –Simulated annealing and Tabu search.

Modules	**Blooms level***	**Number of hours**
MODULE 1: Crisp sets: Overview, Fuzzy sets : Basic types and concepts, Characteristics and significance of paradigm shift, Fuzzy sets vs Crisp sets, Representation of fuzzy sets	L1, L2 and L3	8
MODULE 2: Types of operations, Fuzzy complements, Fuzzy intersection: t-norms, Fuzzy union: t-conorms, Combination of operations, Aggregation operation, Fuzzy numbers , Linguistic variables, Arithmetic operations on intervals, Arithmetic operations on Fuzzy numbers, Lattice of Fuzzy numbers, Fuzzy equation.	L2, L3 and L6	10
MODULE 3: General discussion, Fuzzy controller: Overview and example, Fuzzy systems and neural networks, Fuzzy neural network, Fuzzy automata. Pattern recognition in fuzzy logic, Database and information retrieval in fuzzy logic, decision making in fuzzy logic, engineering applications and fuzzy logic, Fuzzy logic in Medicine and Economics	L1, L3 and L4	10

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MODULE 4: Fundamentals of genetic algorithm: A brief history of evolutionary computation, biological terminology, search space encoding, reproduction elements of genetic algorithm genetic modelling, comparison of GA and traditional search methods. The Fundamental Theorem, Schema Processing at work, Two-armed and k-armed Bandit problem, The Building block hypothesis.	L1, L3 and L4	10
MODULE 5: Genetic technology:- steady state algorithm, fitness scaling, inversion. Genetic programming:- Genetic Algorithm in problem solving, Implementing a Genetic Algorithm:- computer implementation, operator (reproduction, crossover and Mutation, Fitness Scaling, Coding, Discretization). Knowledge based techniques in Genetic Algorithm. Advanced operators and techniques in genetic search:- Dominance, Diploidy and Abeyance. Inversion and other reordering operators, Niche and speciation.	L3, L4 and L6	10
MODULE 5: Genetic Algorithm in engineering and optimization-natural evolution –Simulated annealing and Tabu search -Genetic Algorithm in scientific models and theoretical foundations. Applications of Genetic based machine learning-Genetic Algorithm and parallel processors- composite laminates- constraint optimization-multilevel optimization- real life problem.	L3,L4,L6	05

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Fuzzy Logic with Engineering Applications, 3rd Ed., T. J. Ross, Wiley India Pvt. Ltd., India, 2011.
2. Fuzzy Logic Intelligence Control & Information, John Yen and Reza Langari, Pearson Education Limited, India, 2007.
3. David E.Goldberg, "Genetic Algorithms in search , Optimization & Machine Learning"
4. Melanie Mitchell- 'An introduction to Genetic Algorithm'- Prentice-Hall of India

Reference Books

1. Understanding Neural Networks and Fuzzy Logic, S. V. Kartalopoulas, IEEE Press and Prentice Hall India, India, 2000.
2. Neuro-Fuzzy and Soft Computing – A Computational Approach to Learning and Machine Intelligence, Prentice Hall India, India, 2009.
3. William B. Langdon, Riccardo Poli,"Foundations of Genetic Programming"
4. P. J. Fleming, A. M. S. Zalzala "Genetic Algorithms in Engineering Systems "
5. David A. Coley, "An Introduction to Genetic Algorithms for Scientists and Engineers ".

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**	**-**
CO2	**1**	**--**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**--**	**-**
CO3	**1**	**2**	**3**	**3**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**-**
CO4	**1**	**1**	**2**	**--**	**--**	**--2**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**2**
CO5	**1**	**1**	**2**	**--**	**-2-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**-**	**2**	**1**

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CSE2518	ADVANCED WEB DESIGNING TECHNOLOGIES	L	T	P	C
Version 2019.1	Date of Approval: 15 May2019	2	0	0	2
Pre-requisites/Exposure	Knowledge of Internet fundamentals				
Co-requisites	NIL				

Catalog Description

This course is aimed to provide a fundamental understanding of JavaScript and two of its related library: Bootstrap and React for dynamic web site client side scripting. Javascript is a famous scripting language for client side. The bootstrap and react libraries are rich API for creating dynamic websites. The course builds strong foundation for client-side scripting for creating dynamic websites

Course Objectives

The objective of this course is

1. Equip the students with basic and advanced features of javascript and bootstrap library to create dynamic web sites
2. Provide an overview of basic features of react library to design dynamic websites.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain basic concepts of java scripts and apply them to create basic scripts

CO2: Explain the fundamentals of client side scripting ,document object model and apply them to create dynamic websites.

CO3: Apply basic APIs of bootstrap library to create dynamic websites

CO4: Demonstrate bootstrap java plugins and its use in designing sample websites.

CO5: Explain and apply react APIs in client side scripting

Modules	Blooms level*	Number of hours
Module 1: Basics Introduction to JavaScript, JavaScript Core Features—Overview, Data Types and Variables, Operators, Expressions, and Statements, Functions, Objects, Array, Date, Math, and Type-Related Objects, Regular Expressions	L2 and L3	8
Module 2:Fundamental of Client-Side JavaScript JavaScript Object Models, The Standard Document Object Model, Event Handling, Controlling Windows and Frames, Handling Documents, Form Handling, Dynamic Effects: Rollovers, Positioning, and Animation, Navigation and Site Visit Improvements, Browser and Capabilities Detection Advanced Topics: JavaScript and Embedded Objects, Remote JavaScript, JavaScript and XML	L2 and L3	7

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Module 3: Introduction to Bootstrap (Part 1) **Bootstrap Scaffolding:** What Is Bootstrap?**,** Bootstrap File Structure**,** Basic HTML template**,** Global Styles Default: Grid System, Basic Grid HTML, Offsetting Columns, Nesting Column, Fluid Grid System, Container Layouts **Bootstrap CSS:** Typography, Code, Tables, **Bootstrap Layout Components:** Dropdown Menus, Button Groups, Buttons with Dropdowns, Navigation Elements, Navbar, Breadcrumbs Pagination, Labels, Badges, Typographic Elements	L2 and L3	7
Module 4: Introduction to Bootstrap (Part 2) **Bootstrap JavaScript Plugins:** Overview**,** Transitions **,**Modal **,**Dropdown**,** Scrollspy**,** Toggleable Tabs**,** Tooltips**,** Popover	L2and L3	7
Module 5: The React Library Writing Your First React App, Thinking in React, Server Communication, JSX and the Virtual DOM, Advanced Components, Forms in React.	L2 and L3	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books:

1. "Javascript: The Complete Reference",Thomas Powell ,Fritz Schneider,Oreilly, 2004.
2. "Bootstrap", Jake Spurlok, Orielly, 2013.
3. "Full Stack React", Anthony Accamozo, Fullstack, 2017.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/ Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2	PS O 3	PS O 4
CO 1	--	1	1	--	1	--	--	--	--	1	--	--	1	--	--	--
CO 2	--	1	2	--	2	--	--	--	--	1	--	--	1	--	--	--
CO 3	--	1	1	--	1	--	--	--	--	2	--	--	1	--	--	--
CO 4	--	1	2	--	1	--	--	--	--	2	--	--	1	--	--	--
CO 5	--	1	1	--	2	--	--	--	2	1	--	--	1	1	--	2

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CSE2519	Advanced Web Designing Technologies Lab	L	T	P	C
Version 2019.1	Date of Approval: 14th June 2019	0	0	2	1
Pre-requisites/Exposure	Knowledge of Internet fundamentals				
Co-requisites	NIL				

Catalog Description

This course is aimed to provide a fundamental understanding of JavaScript and two of its related library: Bootstrap and React for dynamic web site client side scripting. Javascript is a famous scripting language for client side. The bootstrap and react libraries are rich API for creating dynamic websites. The course builds strong foundation for client-side scripting for creating dynamic websites

Course Objectives

The objective of this course is

1. Equip the students with basic and advanced features of javascript and bootstrap library to create dynamic web sites
2. Provide an overview of basic features of react library to design dynamic websites.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain basic concepts of java scripts and apply them to create basic scripts

CO2: Explain the fundamentals of client side scripting ,document object model and apply them to create dynamic websites.

CO3: Apply basic APIs of bootstrap library to create dynamic websites

CO4: Demonstrate bootstrap java plugins and its use in designing sample websites.

CO5: Explain and apply react APIs in client side scripting

Modules	Blooms level*	Number of hours
Module 1: Basics **Programs based on:** • JavaScript Core Features—Overview, • Data Types and Variables, Operators, Expressions, and Statements, Functions, • Objects, Array, Date, Math, Type-Related Objects, • Regular Expressions	L2 and L3	2

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Module 2:Fundamental of Client-Side JavaScript **Programs based on:** • JavaScript Object Models, The Standard Document Object Model, • Event Handling, Controlling Windows and Frames, Handling Documents, • Form Handling, Dynamic Effects: Rollovers, Positioning, and Animation, • Navigation and Site Visit Improvements, Browser and Capabilities • Detection Advanced Topics: JavaScript and Embedded Objects, Remote JavaScript, JavaScript and XML	L2 and L3	3
Module 3: Introduction to Bootstrap (Part 1) **Programs based on:** • Bootstrap File Structure**,** Basic HTML template**,** Global Styles • Default: Grid System, Basic Grid HTML, Offsetting Columns, Nesting Column, Fluid Grid System, Container Layouts • Typography, Code, Tables, • Dropdown Menus, Button Groups, Buttons with Dropdowns, Navigation Elements, Navbar, • Breadcrumbs Pagination, Labels, Badges, Typographic Elements	L2 and L3	3
Module 4: Introduction to Bootstrap (Part 2) **Programs based on:** • Transitions **,**Modal **,**Dropdown**,** • Scrollspy**,** Toggleable Tabs**,** • Tooltips**,** Popover	L2and L3	2
Module 5: The React Library • Writing Your First React App, • Thinking in React, Server Communication, • JSX and the Virtual DOM, • Advanced Components, • Forms in React.	L2 and L3	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books:

1. "Javascript: The Complete Reference",Thomas Powell ,Fritz Schneider,Oreilly, 2004.
2. "Bootstrap", Jake Spurlok, Orielly, 2013.
3. "Full Stack React", Anthony Accamozo, Fullstack, 2017.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/ Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	--	1	1	--	1	--	--	--	--	1	--	--	1	--	--	--
CO 2	--	1	2	--	2	--	--	--	--	1	--	--	1	--	--	--
CO 3	--	1	1	--	1	--	--	--	--	2	--	--	1	--	--	--
CO 4	--	1	2	--	1	--	--	--	--	2	--	--	1	--	--	--
CO 5	--	1	1	--	2	--	--	--	2	1	--	--	1	1	--	2

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Course Code:- CSE2520	BIGDATA WITH HADOOP LAB	L	T	P	C
Version 2022.1	Date of Approval: May 2022	2	0	2	3
Pre-requisites/Exposure	Basics of DBMS and SQL				
Co-requisites	Nil				

Catalog Description

This course brings together several key big data technologies used for storage, analysis and manipulation of data. It also introduces the students the key concepts of Hadoop framework, MapReduce, Pig, Hive, and No-SQL. Students will learn to work on Hadoop platform. The concepts learnt will make students capable of working on big data projects easier.

Course Objectives

The objective of this course is

1. To make students familiar with big data technologies.
2. Provide an overview of Hadoop architecture and its working with other open source technologies.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain importance and applications of Big Data Analytics.
CO2. Differentiate among analytics technologies.
CO3. Demonstrate architecture of Hadoop and Mapreduce framework.
CO4. Illustrate Hadoop installation process and commands.
CO5. Introduce concepts of Hive and Pig.

Modules	Blooms level*	Number of hours
Module I: Introduction to Big Data Big Data and its Importance – Four V's of Big Data – Drivers for Big Data – Introduction to Big Data Analytics – Big Data Analytics applications.	L1 and L2	5
Module II: Big Data Technologies Hadoop's Parallel World – Data discovery – Open source technology for Big Data Analytics – cloud and Big Data –Predictive Analytics – Mobile Business Intelligence and Big Data – Crowd Sourcing Analytics – Inter- and Trans-Firewall Analytics - Information Management.	L2 and L5	4
Module III: Processing Big Data Integrating disparate data stores - Mapping data to the programming framework - Connecting and extracting data from storage - Transforming data for processing - Subdividing data in preparation for Hadoop Map Reduce.	L1 and L3	8
Module IV: Hadoop Map Reduce Employing Hadoop Map Reduce - Creating the components of Hadoop Map Reduce jobs - Distributing data processing across server farms –Executing Hadoop Map Reduce jobs - Monitoring the progress of job flows - The Building Blocks of Hadoop Map Reduce - Distinguishing Hadoop daemons - Investigating the Hadoop Distributed File System Selecting appropriate execution modes: local, pseudo-distributed, fully distributed.	L2, L3 and L4	9

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Module V Big Data Tools and Techniques Installing and Running Pig – Comparison with Databases – Pig Latin – User-Define Functions – Data Processing Operators – Installing and Running Hive – Hive QL – Tables – Querying Data – User- Defined Functions – Oracle Big Data.	L2 and L3	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Michael Minelli, Michehe Chambers, Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business", 1st Edition, Wiley CIO Series, 2013.
2. Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'reilly, 2012.
3. Arvind Sathi, "Big Data Analytics: Disruptive Technologies for Changing the Game", 1st Edition, IBM Corporation, 2012.
4. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", 1st Edition, Wiley and SAS Business Series, 2012.

Reference Books

1. Anil Maheshwari, "Big Data", McGraw Hill
2. Mayank Bhushan, "Big Data and Hadoop- Learn by Example", BPB Publications

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**--**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**2**	**-**
CO2	**1**	**2**	**--**	**3**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**2**	**-**
CO3	**1**	**--**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**2**	**-**
CO4	**1**	**1**	**2**	**--**	**--**	**2**	**--**	**--**	**--**	**--**	**3**	**--**	**-**	**--**	**1**	**3**
CO5	**1**	**--**	**1**	**--**	**1**	**3**	**--**	**--**	**--**	**--**	**3**	**--**	**1**	**-**	**-**	**-**

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Course Code: CSE2520	HADOOP LAB	L	T	P	C
Version 2022.1	Date of Approval: May 2022	0	0	2	1
Pre-requisites/Exposure	Basic Concepts of DBMS				
Co-requisites	Relational Algebra and Relational Calculus				

Catalog Description

This course brings together several key big data technologies used for storage, analysis and manipulation of data. It also introduces the students the key concepts of Hadoop framework, MapReduce, Pig, Hive, and No-SQL. Students will learn to work on Hadoop platform. The concepts learnt will make students capable of working on big data projects easier.

Course Objectives

The objective of this course is

- To make students familiar with big data technologies.
- Provide an overview of Hadoop architecture and its working with other open source technologies.

Course Outcomes

On completion of this course, the students will be able to

CO1. Install and configure Hadoop and various tools like Pig, Hive etc.
CO2. Explain concepts of files and directories in HDFS and apply them in real database applications.
CO3. Design and implement mapreduce programs for a given problem.
CO4. Solve queries using concepts of Hive and Pig.
CO5. Perform operations using HBase.

Modules	Blooms level*	Number of hours
Lab Session 1 1. Installation & Configuration steps of Hadoop	L1 and L2	2
Lab Session 2-3 1. Working with HDFS commands :mkdir, rmdir, rm, mv, ls, du, put, rm-r, cat, tail etc 2. Working with vi editor	L1and L3	4
Lab Session 4-5 Working with Java Map Reduce : Map Class, Reduce Class, Drier Class, map side joins, reduce side joins	L1 and L3	4
Lab Session 6-8 1. Working with Hive : Queries for Hive : Create table, describe database, describe table, describe extended table, describe formatted table, drop table, drop database, display table, where clause 2. Commands : Load Files on table : Load from HDFS, load from local 3. Command :CTAS Create table as select 4. Queries to create external tables 5. Working with commands like : Order by, group by, like, upper, lower, max, min	L1 and L3	6

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Lab Session 9-10 1. Working with PIG : Order by, group by, co group, like, upper, lower, Joins, Union, Cartesian, Product, Pig Scripts	L1 and L3	4
Lab Session 11-12 Working with HBase : Start the hbase, data insert, modify, multiple version insertion, describe, delete truncate, drop etc. Working with Foreign Key and Check Constraint.	L1 and L3	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Jeffrey Aven, "SAMS Teach Yourself Hadoop in 24 Hours", 1st Ed., Pearson ,2017.
- Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'reilly, 2012.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	**--**	**--**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**-**
CO2	**1**	**-**	**--**	**--**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**1**	**1**	**-**
CO3	**1**	**-**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**1**	**1**	**-**
CO4	**1**	**-**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**---**	**1**	**1**	**--**
CO5	**1**	**-**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**-**

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Course Code: CSE2521	HIGH PERFORMANCE COMPUTING	L	T	P	C
Version : 2023.1	Date of Approval: March 2023	3	0	0	3
Pre-requisites/Exposure	Computer Organization and Architecture				
Co-requisites	NIL				

Catalog Description

This course gives an insight about Cluster and Grid computing. The major objective of this course is to provide a sound foundation to the students on the concepts, percepts and practices in a field that is of immense concern to the industry and business. This would be helpful to students for understanding a subject related to but a bit higher in its hierarchy.

Course Objectives

The objective of this course is to

1. To Study various computing technology architecture.
2. To know Emerging trends in computing technology.
3. To highlight the advantage of deploying computing technology

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand the Concept of Parallel and Distributed Programming Models.
CO2. Understand Cluster Computing and its Architecture , Cluster Setup and Administration
CO3. Understand to Grid and its Evolution, research prospects of this technology.
CO4. To Understand the integration of task parallelism and precedence relationships among constituting tasks to such high-level data parallel platforms

Modules	Blooms level	Number of hours
Module I: Parallel and Distributed Programming Models Introduction to high performance computing, basic definitions: cluster, grid, meta-computing, middleware etc., examples of representative applications. Programming models: shared memory, message passing, peer-to-peer. Development of parallel and distributed applications, Design phases, Common parallel patterns, Performance metrics and profiling	L1, L2	9
Module II: Overview of Cluster Computing The Role of Clusters, Definition and Taxonomy, Distributed Computing, Limitations, Architecture of cluster-based systems, Design Decisions, Network Hardware, Network Software, Protocols Distributed File Systems, Virtualization technologies, Issues in cluster design: performance, single-system-image, fault tolerance, manageability, programmability, load balancing, security, storage	L1, L2, L3	9

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Module III: Introduction of Grid Computing Introduction, Evolution of the Grid, Definitions of Grid Computing, Infrastructure of hardware and software, Grid models, Applications, Examples of usage, Research possibilities / scope in Grid Computing, HPC and Grids, Scheduling HPC applications in Grids, Grid Monitoring Architecture (GMA) – An Overview of Grid Monitoring Systems..	L1, L2, L3	9
<u>Module IV: Integrating task parallelism with data parallelism</u> Introduction and motivation, A model for integrating task parallelism into data parallel programming platforms, Integration of the model into ARC, Design and implementation applications, performance analysis, guidelines for composing user programs, related work. Anonymous remote computing and communication model: Introduction, Location in dependent inter task communication with DP, DP model of iterative grid computations, Design and implementation of distributed pipes	L1, L2, L3 and L4	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

<u>Text & References:</u>
Text Books:

1. High Performance Cluster Computing, Volume 1, Architecture and Systems, Rajkumar Buyya, Pearson Education.
2. Berman, Fox and Hey, Grid Computing – Making the Global Infrastructure a Reality, Wiley India.
3. Hurwitz, Bllor, Kaufman, Halper, Cloud Computing for Dummies, Wiley India.

Reference Books:
1. Ronald Krutz, Cloud Security, Wiley India.
2. Cloud Computing, A Practical Approach, Anthony Velte, Toby Velte, Robert Elsenpeter, McGrawHill
Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	**3**	--	--
CO2	**1**	**2**	**3**	--	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO3	**1**	**1**	**2**	**3**	**3**	--	--	--	--	--	--	--	**1**	**2**	--	--
CO4	**1**	**1**	**2**	**3**	--	--	--	--	--	--	--	--	**1**	**1**	**2**	---

1: strongly related, 2: moderately related and 3: weakly related.

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Course Code: CSE2522	SECURITY, CRYPTOGRAPHY AND CRYPTOCURRENCIES	L	T	P	C
Version 2023.1	Date of Approval: March 2023	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

Security has been a primary concern in almost all areas of computing and communication due to the various threats and attacks attempted by the attackers. This course lays down the foundations of basic and advanced security concepts including public key cryptography. Also,to truly comprehend what makes Bitcoin unique, we must first comprehend how it operates on a technological level. We'll answer all of your Bitcoin queries, including: How does Bitcoin function? What distinguishes Bitcoin from other cryptocurrencies? What is the security of your Bitcoins? Are Bitcoin users truly anonymous? What factors influence Bitcoin prices? Is it possible to regulate cryptocurrencies? What does the future hold for us? After completing this course, students will be able to understand the functioning of secure software that interacts with the Bitcoin network using the conceptual foundations learned. Students will also be able to incorporate Bitcoin concepts into their own applications.

Course Objectives

The objective of this course is to:

- Explain the importance and application of confidentiality, integrity, authentication and availability.
- Introduce the concepts of Bitocin blockchain and network.
- Learn how the individual components of the Bitcoin protocol make the whole system tick: transactions, script, blocks, and the peer-to-peer network.
- Explore how using Bitcoins works in practice: different ways of storing Bitcoin keys, security measures, and various types of services that allow you to trade and transact with bitcoins.
- Understand the concepts of different cryptocurrencies and associated community, politics, and regulations.

Course Outcomes

On completion of this course, the students will be able to:

CO1. Understand different cryptographic approaches for message, web authentication, and security issues.

CO2. Explain the mathematical concepts behind public-key-cryptography.

CO3. Understand and explain the concept of RSA cryptosystem, Digital Signatures, Hash Functions, and PKI.

CO4. Understand and apply the concepts of elliptic curve cryptography in designing different security algorithms.

Modules	Blooms Level*	Hours

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MODULE 1: INTRODUCTION Computer Security Concepts, Threats, Attacks, Services, Mechanism, Security Functional Requirements, Security Architecture for Open Systems, Computer Security Trends, Symmetric Key Cryptosystem, Fiestal Cipher Structure, DES, AES, Attacks on Symmetric Key Algorithms.	L1, L2	8
MODULE 2: MECHANICS OF BITCOIN Bitcoin and blocks, Bitcoin Mining - Tasks of the miners, Mining rewards, Proof of Work (PoW), The mining algorithm, The hash rate, Mining systems Bitcoin and Anonymity, Bitcoin - Wallet - Blocks - Merkley Tree - hardness of mining - transaction verifiability - anonymity - forks - double spending - mathematical analysis of properties of Bitcoin	L1, L2	9
MODULE 3: BITCOIN NETWORK & PAYMENTS Wallets, Non-deterministic wallets, Deterministic wallets, Hierarchical Deterministic wallets, Brain wallets, Paper wallets, Hardware wallets, Online wallets, Mobile wallets, Bitcoin payments. Innovation in Bitcoin - Bitcoin Improvement Proposals (BIPs), Advanced protocols, Segregated Witness (SegWit), Bitcoin Cash, Bitcoin Unlimited, Bitcoin Gold, Bitcoin investment and buying and selling bitcoins, Bitcoin Clients and APIs, Alternative Coins.	L1, L2	9
MODULE 4: CRYPTOCURRENCIES Litecoin, Namecoin, Peercoin, Dogecoin, Ripple, Monero, Tether, Cardano, Polkadot, Bitcoin Cash, Stellar. Altcoins and the Cryptocurrency Ecosystem. Community, Politics, and Regulation in using cryptocurrencies	L1, L2	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. Bashir, Imran. Mastering blockchain. Packt Publishing Ltd, 2017.
2. Narayanan, Arvind, et al. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.

Reference Books

3. Lewis, Antony. The basics of bitcoins and blockchains: an introduction to cryptocurrencies and the technology that powers them. Mango Media Inc., 2018.
4. Schar, Fabian, and Aleksander Berentsen. Bitcoin, Blockchain, and Cryptoassets: A Comprehensive Introduction. MIT press, 2020.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	2	3	--	--	--	--	--	--	--	--	--	2	1	-	2
CO 2	2	2	3	-	--	--	--	--	--	--	--	--	2	1	-	2
CO 3	2	2	3	-	-	--	--	--	--	--	--	--	2	1	-	3
CO 4	1	2	3	-	2	--	--	--	--	--	--	--	2	1	1	2
CO 5	2	3	3	-	-	--	--	--	--	--	--	--	2	1	1	3

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Course Code: CSE2523	INTRODUCTION TO RASPBERRY PI	L	T	P	C
Version 2023.1	Date of Approval: March 2023	2	0	0	2
Pre-requisites/Exposure	Raspberry Pi Basics				
Co-requisites	NIL				

Catalog Description

Course Objectives

This program aims to train students to be equipped with a solid theoretical foundation, systematic professional knowledge and strong practical skills in the Raspberry Pi and Arduino. The course focuses on higher-level operating systems, advanced networking, user interfaces, multimedia and uses more computing intensive IoT applications as examples using Raspberry Pi running Linux as the platform of choice, while also exposing the student to other comparable platforms like Arduino. After doing this course, students should be able to design and deploy multiple IoT devices that could connect to the gateway.

Modules	Blooms level*	Number of hours
Module 1: : Getting Started with Raspberry Pi Basic functionality of Raspberry Pi B+ board, setting up the board, configuration and use, implications of an operating system on the behaviour of the Raspberry Pi as an IoT device, booting Raspberry Pi 3, Downloading an Operating System, format an SD card and booting the OS. Basics of Linux and its use, main features including navigating the file system and managing processes, text-based user interface through the shell, overview of the graphic user interface for Raspbian Linux distribution	L2 and L3	5
Module 2: Interfacing Hardware with the Raspberry Pi, Raspberry Pi Remote Access, operate the Raspberry Pi in "headless mode", Bash Command line, operating Raspberry Pi without needing a GUI interface Implications of an operating system on the behaviour of the Raspberry Pi, Overview of Linux and its internal command, aptget-update, navigating the file system and managing processes, text-based user interface through the shell, overview of graphical user interface.	L2 and L3	5
Module 3: Basics of the Python programming language, programming on the Raspberry Pi. Python on Raspberry Pi, Python Programming Environment, Python Expressions, Strings, Functions and Function arguments, Lists, List Methods, Control Flow	L2 and L3	4
Module 4: Communication with devices through the pins of the Raspberry Pi, RPi. GPIO library, Python Functions, setting up the pins, General purpose IO Pins, Protocol Pins, GPIO Access, applying digital voltages, and generating Pulse Width Modulated signals, Tkinter Python library, accessing pins through a graphic user interface.	L2and L3	5
Module 5: Making noise: Playing tones, playing a melody, Types of motors DC, Servo, Motor Drivers, Speed and direction control	L2 and L3	5

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Text & References:

Text:

- Simon Monk, "Programming the Raspberry Pi: Getting Started with Python", January 2012, McGraw Hill Professional

References:

- Eben Upton and Gareth Halfacree, "Raspberry Pi User Guide", August 2016, 4th edition, John Wiley & Sons
- Alex Bradbury and Ben Everard, "Learning Python with Raspberry Pi", Feb 2014, John Wiley & Sons

Examination Scheme:

Components	CT1	Assignment/ Viva	Attendance	EE
Weightage (%)	15	10	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	--	1	2	--	--	--	--	--	--	--	--	--	1	--	--	--
CO 2	1	--	2	3	--	--	--	--	--	--	4	--	1	2	--	--
CO 3	--	1	--	--	--	--	--	--	--	2	3	--	-	1	2	--
CO 4	-	1	-	--	2	--	--	--	--	--	--	--	2	1	--	--
CO 5	--	--	1	--	--	--	--	--	2	--	--	--	--	--	--	1

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Course Code: CSE2524	INTRODUCTION TO RASPBERRY PI LAB	L	T	P	C
Version 2023.1	**Date of Approval: March 2023**	0	0	2	1
Pre-requisites/Exposure	Basics installation of Raspberry Pi				
Co-requisites	NIL				

Course Objectives

.Modules/Topics Covered**	Blooms level*	Number of hours
Programming Language: Python List of Programs: Session 1-2. Getting started with Raspberry Pi, Install Raspian on your SD card Session 3-4 Linux basic commands. Session-5-6. Coding simple programs in Python. Session 7-9 How to use Python-based IDE (integrated development environments) for the Raspberry Pi and how to trace and debug Python code on the device Session 10-12 How to have your Raspberry Pi interact with online services through the use of public APIs and SDKs. .	L3, L5	12

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	--	--	1	--	1	--	--	--	--	1	--	--	1	--	--	--
CO 2	--	--	2	--	2	--	--	--	--	1	--	--	1	--	--	--
CO 3	--	--	1	--	1	--	--	--	--	2	--	--	1	--	--	--
CO 4	--	--	2	--	1	--	--	--	--	2	--	--	1	--	--	--
CO 5	--	--	1	--	2	--	--	--	2	1	--	--	1	1	--	2

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SEMESTER-VI

CSE2604	ADVANCED JAVA PROGRAMMING	L	T	P	C
Version 2017.1	Date of Approval: 14th June, 2017	3	0	0	3
Pre-requisites/Exposure	Basics of Java Programming				
Co-requisites	NIL				

Catalog Description

In this course the advanced features of contemporary java are discussed in detail. Concepts covered would enable them to handle complex programs relating to managing data and processes over the network. Discussion will be on relating to concepts of remote method invocation to working with swings architecture. Further practical implementation of database connectivity and using them in servlet and jsp based applications will be made.

Course Objectives

The objective of this course is to

1. Equip the students with the advanced feature of contemporary java required in solving complex problems.
2. Provide a practical knowhow and implementation of advanced java programming concepts like database programming with servlets and jsp.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define and explain concept of an Remote method invocation application, demonstrate swing based application developed using concepts of remote method invocation

CO2: Distinguish between various java and open database connectivity drivers and able to solve complex programming problems involving database interaction.

CO3: Describe servlet and its lifecycle, along with demonstrate and design solutions for some complex dynamic web applications using servlets.

CO4: Explain jsp scripting and Differentiate between processing of servlets and jsp scripting pages. Apply knowledge of servlets and jsp scripting to create some new dynamic web applications.

CO5: Explain the architecture of Model View Controller and struts. Demonstrate applications based on java beans and struts.

Modules	Blooms level*	Number of hours
MODULE 1: DISTRIBUTED COMPUTING Introduction to Java RMI, RMI services, RMI client, Running client and server, Introduction of Swing, Swing Components, Look and Feel for Swing Components, Introduction to Multimedia Programming.	L1, L2 and L3	6
MODULE 2: DATABASE CONNECTIVITY ODBC and JDBC Drivers, Connecting to Database with the java.sql Package, Using JDBC Terminology, JDBC with mysql, postgresql. .	L2 and L3	7

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MODULE 3: SERVLET PROGRAMMING Introduction to Servlets, Servlet Life Cycle, Servlet based Applications, Servlet and HTML.Filters, jdbc with servelets, session Management techniques in detail.	L2, L3 and L5	8
MODULE 4: JSP PROGRAMMING JSP: Introduction to JSP, JSP implicit objects, JSP based Applications, Java. Net. Login & Logout Example, jdbc with jsp.	L2, L3, L4 and L5	8
MODULE 5: J2EE WEB APPLICATION The Model-View-Controller Architecture What is Struts, Struts Tags, Creating Beans, Other Bean Tags, Bean Output, Creating HTML Forms, The Action Form class The Action class, Simple Struts: a simple Struts application; Introduction to EJB.	L2 and L3	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. J. Jaworski, Java 1.2 Unleashed, Techmedia – SAMS, 1998, United States
2. S. Allamaraju, Professional Java Server Programming, Wrox Press Limited, 2001, United States.
3. J. Goodwill and B. Morgan, Developing Java Servlets, Techmedia – SAMS, 2017, United States

Reference Books

1. D. Flanagan, J. Parley, W. Crawford and K. Magnusson, Java Enterprise in a nutshell - A desktop Quick reference, O'REILLY, 2003, USA.
2. S. Ausbury and S. R. Weiner, Developing Java Enterprise Applications, John Wiley and Sons, 2001, USA.
3. J. Hunder and W. Crawford, Java Servlet Programming, O'REILLY, 2002, USA

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**2**	**1**	--	--	--	--	--	--	--	--	--	--	**2**	--	--	--
CO2	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO3	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO4	**1**	**3**	**2**	--	--	--	--	--	--	--	--	--	**2**	--	**2**	--
CO5	**1**	**3**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--

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CSE2608	ADVANCED JAVA PROGRAMMING LAB	L	T	P	C
Version 2017.1	Date of Approval: 14th June, 2017	0	0	2	1
Pre-requisites/Exposure	Basics of Java and Advanced Java Programming				
Co-requisites	NIL				

Catalog Description

In this Lab course the advanced features of contemporary java are implemented and demonstrated. Concepts covered would enable them to create complex applications related to data management. Problems or programs will be related to concepts of remote method invocation, swings, servlets, jsp and java beans.

Course Objectives

The objective of this course is to

1. Make the students apply knowledge of various advanced java features required in solving complex problems.
2. Provide a demonstration of advanced java programming concepts like database programming with servlets, jsp and creating java beans.

Course Outcomes

On completion of this course, the students will be able to

CO1: Apply the knowledge of swings architecture and remote method invocation used to provide solution to distributed computing problems

CO2: Demonstrate the use of JDBC connectivity along with swings based architecture, thereby handling data management.

CO3: Apply the knowledge of servlets and server programming to construct dynamic web applications using web servers.

CO4: Demonstrate the differences between creating and deploying dynamic web applications using jsp concepts and servlets.

CO5: Demonstrate usage of applications involving java beans and jdbc programming to handle data management.

Modules/Topics Covered**	Blooms level*	Number of hours
1.Sample Programs using swings architecture and remote method invocation (a) Write a program using swings creating tabbed panes and menu over a frame and handle their associated events (b) Write a program using swings List control containing list of cities, allowing the user to choose any one of them and display using event handing. (c) Demonstrate an application showcasing the use of remote method invocation(RMI) for designing a distributed application. (d) Create an application using concepts of RMI to depict a client server based interaction.	L3, L5	6

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2.Sample Programs using JDBC and swings (a) Create an application demonstrating the use of swings, having a menu over a frame and jdbc programming to perform insert and select operations by handling menu related events. (b) Create an application using swings, having a design providing features for iterating over a dataset performing operations like forward, backward, start and end with help of jdbc programming.	L3, L5	4
(c) Sample Programs using servlets with jdbc, html and swings 3. Create an application using servlets to perform redirection based on validating user data entered through a web form. 4. Design an application to fetch data from database using servlets and display it using its post method. 5. Demonstrate the process of writing cookies using a servlet and display a message after writing. 6. Write a program to create a session object for the username fetched from user using a servlet, further access that session value on another servlet invoked by redirection.	L3, L5	6
7. Sample Programs using JSP with jdbc, html and swings (a) Write a program using jsp to demonstrate the features of jsp elements used to declare, define and display sum of two integers. (b) Create an application using jsp to calculate and display the greatest out of two integers using if else statements. Integer numbers should be entered using a web form. (c) Demonstrate with a jsp program mechanism to retrieve checkbox data accessed using multiple value parameters fetching approach. (d) Write a program to demonstrate the use of jsp forward action tag used with parameters and processed using another jsp page.	L3, L5	6
8. Sample Programs using jsp, java beans and swings (a) Demonstrate the use of jsp include action tag for including an html and another jsp page in initial jsp resource. (b) Write a program creating Java bean class and setting its properties using required jsp action tags. Output should also display the retrieved property values.	L3, L5	2

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

1. J. Jaworski, Java 1.2 Unleashed, Techmedia – SAMS, 1998, United States
2. S. Allamaraju, Professional Java Server Programming, Wrox Press Limited, 2001, United States
3. J. Goodwill and B. Morgan, Developing Java Servlets, Techmedia – SAMS, 2017, United States

Reference Books

1. D. Flanagan, J. Parley, W. Crawford and K. Magnusson, Java Enterprise in a nutshell - A desktop Quick reference, O'REILLY, 2003, USA
2. S. Ausbury and S. R. Weiner, Developing Java Enterprise Applications, John Wiley and Sons, 2001, USA
3. J. Hunder and W. Crawford, Java Servlet Programming, O'REILLY, 2002, USA

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Modes of Evaluation: Lab Record /Viva- Via /Performance/Written Examination
Examination Scheme:

IA					EE
Components	**A**	**PR**	**LR**	**V**	**70**
Weightage (%)	5	10	10	5	

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE- External Exam

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**2**	**1**	--	--	--	--	--	--	--	--	--	--	**2**	--	--	--
CO2	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO3	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO4	**1**	**3**	**2**	--	--	--	--	--	--	--	--	--	**2**	--	**2**	--
CO5	**1**	**3**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--

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CSE2613	SOFTWARE ENGINEERING	L	T	P	C
Version 2019.1	Date of Approval:15 May2019	3	0	0	3
Pre-requisites/Exposure	Basic Knowledge of software development				
Co-requisites	Nil				

Catalog Description

In this course the concepts of Software development are discussed in detail. Various models of SDLC are introduced along with its application. Students will be able to apply these concepts in real time software project development.

Course Objectives

The objective of this course is to

1. Gain the knowledge of how Analysis, Design, Implementation, Testing and Maintenance processes are conducted in a software project.
2. Apply their foundations in software engineering to adapt to readily changing environments using the appropriate theory, principles and processes.

Course Outcomes

On completion of this course, the students will be able to

CO1: Apply current theories, models, and techniques that provide a basis for the software lifecycle.

CO2: Enable the students to apply a systematic application of scientific knowledge in creating and building cost effective software solutions to business and other types of problems.

CO3: Be able to elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of a software development.

CO4: Be able to evaluate the impact of potential solutions to software engineering problems in a global society, using the knowledge of contemporary issues and emerging software engineering trends, models, tools, and techniques.

CO5: Work as an individual and as part of a multidisciplinary team to design,develop and deliver quality software.

Modules	Blooms level*	Number of hours
MODULE 1: **Introduction** Software life cycle models: Waterfall, Prototype, Evolutionary and Spiral models, Overview of Quality Standards like ISO 9001, SEI-CMM	L1, L2 and L4	5
MODULE 2: **Software Metrics and Project Planning** Size Metrics like LOC, Token Count, Function Count, Design Metrics, Data Structure Metrics, Information Flow Metrics. Cost estimation, static, Single and multivariate models, COCOMO model, Putnam Resource Allocation Model, Risk management.	L2, L3 and L6	7

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MODULE 3: **Software Requirement Analysis, design and coding** Problem Analysis, Software Requirement and Specifications, Behavioural and non-behavioural requirements, Software Prototyping Cohesion & Coupling, Classification of Cohesiveness & Coupling, Function Oriented Design, Object Oriented Design, User Interface Design Top-down and bottom-up Structured programming, Information hiding.	L2, L3 and ,L5	8
MODULE 4: **Software Reliability, Testing and Maintenance**Failure and Faults, Reliability Models: Basic Model, Logarithmic Poisson Model, Software process, Functional testing: Boundary value analysis, Equivalence class testing,Structural testing: path testing, Data flow and mutation testing, unit testing, integration and system testing, Debugging, Testing Tools, & Standards.Management of maintenance, Maintenance Process, Maintenance Models, Reverse Engineering, Software RE-engineering	L2, L3 and L4,L6	10
MODULE 5: **UML**Introduction to UML,Use Case Diagrams, Class Diagram: State Diagram in UMLActivity Diagram in UMLSequence Diagram in UMLCollaboration Diagram in UML, Domain, Component Diagram and Deployment Diagram	L3,L4,L5	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books:

1. K. K. Aggarwal & Yogesh Singh, "Software Engineering", 2nd Ed, New Age International, 2005.
2. R. S. Pressman, "Software Engineering – A practitioner's approach", 5th Ed., McGraw Hill Int. Ed., 2001.

Reference Books:

- R. Fairley, "Software Engineering Concepts", Tata McGraw Hill, 1997.
- P. Jalote, "An Integrated approach to Software Engineering", Narosa, 1991.
- Stephen R. Schach, "Classical & Object -Oriented Software Engineering", IRWIN, 1996.
- James Peter, W. Pedrycz, "Software Engineering", John Wiley & Sons.
- Sommerville, "Software Engineering", Addison Wesley, 1999.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2	PS O 3	PSO 4
CO 1	--	1	2	--	--	--	--	--	--	--	--	--	1	--	--	--
CO 2	1	--	2	3	--	--	--	--	--	--	4	--	1	2	--	--
CO 3	--	1	--	--	--	--	--	--	--	2	3	--	-	1	2	--
CO 4	-	1	-	--	2	--	--	--	--	--	--	--	2	1	--	--
CO 5	--	--	1	--	--	--	--	--	2	--	--	--	--	--	--	1

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CSE2615	SOFTWARE ENGINEERING LAB	L	T	P	C
Version 2017.1	Date of Approval: 15 May2019	0	0	2	1
Pre-requisites/Exposure	Basics of Software Engineering				
Co-requisites	NIL				

Catalog Description

The course provides introduction to the fundamental's principles of software engineering. The organization broadly based on the classical analysis-design-implementation framework. Software Engineering is the systematic approach to the development, operation, maintenance, and retirement of software. Rational Rose Enterprise Edition software is used to serve the objectives.Students will be able to design models according to user requirement.

Course Objectives

The objective of this course is to

1. The basic objective of Software Engineering is to develop methods and procedures for software development that can scale up for large systems and that can be used to consistently produce high-quality software at low cost and with a small cycle time.
2. Apply basic techniques of modeling computer systems.

Course Outcomes

On completion of this course, the students will be able to

CO1: collect requirements and prepare their scenarios

CO2: Construct various UML models (including use case diagrams, class diagrams, interaction diagrams, state chart diagrams, activity diagrams, and implementation diagrams) using the appropriate notation

CO3: Demonstrate the role and function of each UML model in developing objectoriented software.

CO4: Recognize the difference between various object relationships: inheritance, association, whole-part, and dependency relationships.

Modules/Topics Covered**	Blooms level*	Number of hours
1. Introduction to Rational Rose Enterprise Edition tool and SRS (c) Explain features and characteristics of Rational Rose tool along with screenshots. (d) Create Software requirement specification document for Website application of educational institute.	L1, L2	4
2. Concept of UML and Use case diagram (c) Design Use case Diagram of ATM machine (d) Show dependencies and relationships through Use case diagram of Banking Management System	L1, L3	4
3. Class Diagrams and object diagram concepts (d) Design class diagram of Flight Reservation system (e) Design class diagram of student Management system (f) Design object diagram of courier service system (g) Design object diagram of Train Reservation system	L3, L1	8

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4. Sequence, Activity, Collaboration, State chart diagram concepts (h) Design Activity diagram of Library Management system (i) Design Sequence diagram of Food Ordering system (j) Design Collaboration diagram of Hotel Management system (k) Design State chart diagram of Turing Machine	L3, L1	8
.		

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

1.Rambugh,Grady Booch, Unified Modeling Language User Guide, Pearson Education 1998.

2.K.K. agrawal,Yogesh Singh, Software Engineering,

Reference Books

1. Martin Fowler,UML distilled:A Brief Guide to the Standard Object Modeling Language,Addison We sely,1997.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	**70**
Weightage (%)	5	10	10	5	

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	--	**1**	**2**	**3**	**4**	--	--	--	--	--	--	--	**1**	--	--	--
CO2	--	--	**1**	**2**	**3**	--	--	--	--	--	--	--	**1**	**2**	--	--
CO3	--	**1**	**2**	**3**	--	--	--	--	--	**4**	--	--	**-**	**2**	**3**	--
CO4	--	**1**	**2**	**3**	--	--	--	--	**4**	--	--	--	**3**	--	**1**	**2**

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CSE2637	MINOR PROJECT-I	L	T	P	C
Version: 2019.1	Date of Approval: 15 May2019	0	0	0	2
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The objective of this course is to provide practical training on some live/demo projects that will increase capability to work on actual problem in industry. It will be an in house training on some latest software which is in high demand in market. This training will be designed such that it will useful for their future employment in industry.

Course Objectives

The objective of this course is to

1. Provide practical training on live projects
2. Increase technical capabilities on solving real life problems in company environment

Course Outcomes

On completion of this minor project, the students will be able to:

CO1: Demonstrate a sound technical knowledge of their selected project topic.

CO2: Design and develop engineering solutions to complex problems utilising a systems approach.

CO3: Analyse various approaches for solving a complex engineering problem using different tools and techniques

CO4: Demonstrate the knowledge, skills and attitudes of a professional engineer.

CO5: Apply technical skills and knowledge in completing the project.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	--	--	--	--	--	1	--	--	--	--	--	1	1
CO2	1	1	--	--	--	--	--	--	1	--	--	--	--	--	1	1
CO3	1	1	--	--	--	--	--	--	1	--	--	--	--	--	1	1
CO4	1	1	--	--	--	--	--	--	1	--	--	--	--	--	1	1
C05	1	1	--	--	--	--			1	-	-	-	--	--	1	1

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CSE2618	DATA MINING	L	T	P	C
Version 2019.1	Date of Approval: 15 May 2019	3	0	0	3
Pre-requisites/Exposure	Concept of Database and Data Mining				
Co-requisites	Nil				

Catalog Description

Data Mining serve as one of the most important courses for postgraduate students, since it builds computational abilities, inferential thinking, and practical skills for tackling core data scientific challenges. The students will get a comprehensive understanding of different data mining techniques that can be used for prediction and for discovering patterns, be prepared to select the right technique for a given data problem and will be able to create a general-purpose analytic process.

Course Objectives

The objective of this course is to

- Provide students with an in-depth knowledge of data mining. To introduce students to basic applications, concepts, and techniques of data mining.
- Develop skills for using recent data mining software to solve practical problems and prediction in a variety of disciplines and
- Gain experience doing independent study and research.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain concepts of Data mining, predictive analytics and analyses architecture of data mining. Differentiate between supervised and unsupervised methods

CO 2: Apply classification techniques on different data sets and solve cost –benefit analysis numerical. Analyze decision tree methods.

CO 3: Implement various clustering algorithm on different data sets and describe these algorithms.

CO 4: Prepare data representation for market basket analysis and determine the usefulness of association rules. Interpret supervised and unsupervised learning methods.

CO 5: Predict market trends and outline different factors associated mail marketing.

Course Content

Modules	Bloom's level	Number of Hours
Module I Data Preparation An introduction to data mining and predictive analytics, Data Pre-processing Exploratory Data Analysis, Dimension- Reduction Methods.	**L1, L2**	**8**
Module II Classification k- Nearest Neighbour Algorithm, Decision Trees, Model Evaluation Technique, Cost –Benefit Analysis Using Data Driven Cost.	**L1, L2, L3**	**7**

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Module III Clustering Hierarchical and k- Means Clustering, Kohenen Networks, Birch Clustering, Measuring Cluster Goodness.	**L1, L2, L3,L4**	**8**
Module IV Association Rules Affinity Analysis and Market Basket Analysis, Data Representation for Market Basket Analysis, Support, Confidence, Frequent Item sets, and the a Priori Property, How Does a Priori Algorithm Work? Generating Frequent Item sets, Generating Association Rules, Extension from Flag Data to General Categorical Data, Information-Theoretic Approach: Generalized Rule Induction Method, J-Measure, Association Rules are Easy to do Badly, how can we Measure the Usefulness of Association Rules? Do Association Rules Represent Supervised or Unsupervised Learning?	**L1, L2, L3,L6**	**9**
Module IV Case Study: Predicting Response to Direct Mail Marketing Business Understanding, Data Preparation, and Eda, Clustering and Principal Components Analysis, Modelling and Evaluation for Performance and Interpretability, Modelling and Evaluation for High Performance.	**L2, L3, L4, l5**	**8**

Bloom's Level:

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Daniel T. Larose, Chantal D. Larose, "Data Mining and Predictive Analytics", John Wiley & Sons, Inc., Hoboken, New Jersey, 2015.
2. Jiawei Han and Micheline Kamber, "Data mining: concepts and techniques", Morgan Kaufmann, Second Edition, 2006.

Reference Books

1. Alex Berson, Data Warehousing, Data Mining, and Olap, Tata McGraw Hill, 2014.
2. Markus Hofmann, Ralf Klinkenberg, "Rapid-Miner: Data Mining Use Cases and Business Analytics Applications", Chapman and Hall/CRC, 2016.
3. George M Marakas, Modern Data Warehousing, Mining & Visualization Core Concepts, Pearson Education.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**2**	**3**
CO2	**1**	**1**	**2**		**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**3**	**3**
CO3	**1**	**2**	**3**	**3**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**2**	**2**
CO4	**1**	**1**	**2**	**--**	**--**	**3**	**--**	**--**	**--**	**--**	**--**	**3**	**1**	**1**	**2**	**3**
CO5	**1**	**1**	**2**	**--**	**--**	**2**	**--**	**--**	**--**	**--**	**--**	**3**	**1**	**3**	**2**	**1**

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Course Code:2610	VLSI Design	L	T	P	C
Version 2017.1	Date of Approval:14th June 2017	3	0	0	0
Pre-requisites/Exposure	Basics of semiconductor and analog electronics				
Co-requisites	Nil				

Catalog Description

This course deals with basic theories and techniques of digital VLSI design in CMOS technology. It covers the fundamental concepts and structures of designing digital VLSI systems which include CMOS devices and circuits, standard CMOS fabrication processes, CMOS design rules, staticand dynamic logic structures, CMOS chip layout, simulation and testing, low power techniques, design tools and methodologies and Stick Diagrams.

Course Objectives

The objective of this course is to

- Provide a deep understanding of the concepts, techniques and design of complex digital VLSI circuits.
- Apply mathematical methods and circuit analysis models to analyse CMOS digital circuits, and their logic components.

Course Outcomes

On completion of this course, the students will be able to

CO1.Explain the characteristics of Basic VLSI components.

CO2. Apply the knowledge of various CMOS inverters to compare their performance.

CO3. To design and realize basiccombinational and sequential functions using CMOS logic.

CO4. Design circuit Layout and Stick diagramsof CMOS logics.

Modules	Blooms level*	Number of hours
Module I: Devices and the wire Dynamic and transient behavior of Diode, Diffusion capacitance, SPICE Diode model, MOSFET basic, depletion and enhancement device. MOSFET static behavior, Threshold voltage and its dependence on V_{SB} MOSFET Operation in resistive and saturation region, channel length modulation, Velocity saturation and its impact on sub micron devices, sub threshold conduction, Model for manual analysis, Equivalent resistance for MOSFET in (velocity) saturated region, comparison of equations for PMOS and NMOS. Dynamic behavior, Channel capacitance in different regions of operation, junction capacitance, Level 1 SPICE models for MOS transistors. The Wire, Interconnect parameters: resistance, capacitance and Inductance, Lumped RC model, Elmore Delay.	L1, L2	8

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Module II: CMOS Inverter VTC of an ideal inverter, Switching Model of the CMOS inverter: NMOS /PMOS discharge and charge, VTC of CMOS inverter : PMOS and NMOS operation in various regions including velocity saturation, Switching threshold, (W/L)p/(W/L)n ratio for setting desired V_M with and without velocity saturation, Noise Margins, buffer. Ratioed logic: Pseudo NMOS inverter and PMOS to NMOS ratio for performance, tri-state inverter, Resistive load inverter. Load Capacitance calculations: fan out capacitance, self capacitance calculations: Miller effect, wire capacitance; Improving delay calculation with input slope, Propagation delay: first order analysis, analysis from a design perspective, sizing a chain of inverters for minimum delay, choosing optimum number of stages, Power, Energy and Energy Delay: Dynamic power consumption, Static power, Glitches and power dissipation due to direct path currents, power and delay trade off, Transistor sizing for energy minimization.	L3, L4	8
Module III: Combinational circuits CMOS LOGIC: Good 0 and Poor 0, series and parallel N and P switches, Two and Higher input NAND and NOR gates, Functions of the type (AB+C(D+E)) and their complements, XOR and XNOR gates, 2 input Multiplexer, Full Adder; Transistor sizing in CMOS logic for optimal delay, Pseudo NMOS NAND NOR and other gates and the transistor sizing, Introduction to DSVCL logic, CPL AND/NAND, OR/NOR, XOR/XNOR gates, Logical effort, Electrical Effort, Branching effort, Examples of sizing Combinational logic chains for minimum delay, Pass-transistor logic, pass gate configurations for NMOS and PMOS, 2 input and 4 input MUX, XOR, XNOR and implementation of general functions like AB+AB*C+A*C*, Robust and Efficient PTL Design, Delay of Transmission Gate chain. Dynamic CMOS design: Pre-charge and Evaluation, charge leakage, bootstrapping, charge sharing, Cascading Dynamic Gates, DOMINO Logic, Optimization of Domino Logic Gates, simple example circuit implementations of DOMINO logic.	L2,L3,L4	10
Module IV: Sequential Logic circuits Principle of bistability, NAND and NOR based SR latch, and clocked SR Latch, JK latch, example of master slave flip flop, CMOS D latch, , MUX based Latches, master slave edge triggered register, Static Timing Analysis –setup, hold time, clock skew, clock period, non ideal clocks, clock overlap, C2MOS register, TSPCR Register, Schmitt Trigger, Pipelining and NORA CMOS	L2,L3,L4	5
ModuleV: Layout Design Rules **5 Lecture hours** Introduction to CMOS Process technology, Latch up and its prevention Layout of CMOS inverter, CMOS NAND and NOR gates, Concept of Euler path, and stick diagrams for functions like (AB+E+CD)*.	L2,L3,L4	5

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. **Jan M Rabaey**,Digital Integrated Circuits ,Second Edition, Pearson.
2. **David Hodges**, Analysis and Design of Digital ICs, McGrew Hill
3. **Sung-MoKang,**CMOS Digital ICs,third edition,2008

Reference Books

1. **WesteNiel and Harris**,CMOS VLSI design.A Circuits And Systems Perspective, 3/E,Pearson
2. **Weste and Eshragian**,Principles of CMOS VLSI Design: a

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systems perspective, Addison-Wesley Publishing Company, 01-Jan-1993

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	3	--	--	--	--	--	--	--	--	--	--	2	1	-	-
CO 2	3	1	3	--	1	--	--	--	--	--	--	2	2	1	-	2
CO 3	3	2	1	2	--	--	--	--	--	--	--	2	2	1	-	2
CO 4	2	2	1	-	--	--	--	--	--	--	--	--	2	1	-	-

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Course Code: CSE2616	Open Source Technologies (PHP, MySQL)	L	T	P	C
Version :2019.1	Date of Approval: 15 May2019	2	0	0	2
Pre-requisites/Exposure	Basic Knowledge of HTML				
Co-requisites	Nil				

Catalog Description

The course includes the content about PHP and its Programming Concepts. It includes basic architecture of running a PHP Script. It also includes the concepts about Conditional, Control Statements, Array, Associative Array, String Functions and Concepts of Functions : Call by Value and Reference. The course also includes concepts related to Object Oriented Programming in PHP and website design support along with Database Support concepts which will be useful to design Backend for the website.

Course Objectives

The objective of this course is:

1. To provide a fundamental understanding of Dynamic Website Design in PHP.
2. To provide knowledge about various Frameworks build for Website Designing.

Course Outcomes

On completion of this course, the students will be able to

After completing the course, the students will be able to,

CO 1: Explain the basic concepts of PHP programming and write PHP scripts usin Strings and functions

CO 2: Explain and write PHP scripts based on Conditional statements, control staemnts and Arrays.

CO 3: Apply Object Oriented and Web Design concepts of PHP in order to create responsive web pages and websites

CO 4: Apply the concepts of Database and Database connectivity in order to provide backend support to website to make them Dynamic in nature

CO 5: Demonstrate the website designing process on various PHP Frameworks.

Modules	Blooms level*	Number of hours
Module I: Introduction to Open Source and PHP programming Introduction to Open Sources Technologies, Introduction to PHP, installation and configuration, Advantages and Disadvantages of PHP, Client Side Scripting, Server Side Scripting, Variables, data types, various types of function, creating your own function, Strings in PHP, String Functions.	L1, L2 and L3	4
Module II: Operators, Loops, Array, Exception and Error Handling Operators, Conditions, Loops, Using for each, Creating and Using Arrays, Multidimensional Array, Associative Array. Error Handling in PHP, Errors and Exceptions, Exception class, try/catch block, throwing an exception, defining your own Exception subclass.	L1, L2, L3	5

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Module III: Classes, File system, Passing Information between pages Object oriented programming with Php, Working with Datetime, code re-use, require (), include(), and the include_path; Understanding PHP file permissions, File reading and writing functions, File system functions, File uploads, Sending mail & use of email server. HTTP, GET arguments, POST arguments, Using Session in PHP, cookies, The setcookie() function, Deleting Cookies and Reading Cookies.	L2, L3 and L4	7
Module IV: Working with database HTML Tables and Database tables, Databasemanipulation(Select, Insert, Update, Delete), validating User Input usingJavascript. MYSQL, Introducing MySQL; database design concepts; the Structured Query Language (SQL); communicating with a MySQL backend via the PHP, MySQL APIBuilding Database Applications, Developing PHP scripts for dynamic web page like feedback form, online admission form and online test.	L2, L3 and L4	5
Module V: Working with Frameworks Working with Mambo, Working with Joomla, Working with framework. Working with wordpress, Working with drupal, Use of Joomla in rapid development of website. Developing of simple website using joomla.	L2, L3 and L4	3

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Steven Holzner **"PHP : The Complete Reference",** Mc Graw Hill Education, 2007.
2. Ivan Bayross, **"Web enabled commercial Application Development using HTML, Javascript, DHTML and PHP",** 4th Edition, BPB Publication, 2010.
3. Laura Thomson, **"PHP and MySQL Web Development",** 5th Edition, Pearson Education, 2016.

Reference Books

1. Robin Nixon, **"Learning PHP, MySQL and Javascript",** Shroff Publishers and Distributers private limited, 2015.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**1**	**3**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**			
CO2	**1**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**			
CO3	**1**	**1**	**1**	**3**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**			
CO4	**1**	**1**	**2**	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**			
CO5	**1**	**3**	**2**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**			

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CSE2617	Open Source Technologies (PHP, MySQL) Lab	L	T	P	C
Version 2019.1	Date of Approval: 15 May2019	0	0	2	1
Pre-requisites/Exposure	Basic Knowledge of HTML				
Co-requisites	Nil				

Catalog Description

The course includes PHP Programming Concepts. Conditional, Control Statements, Array, Associative Array, String Functions and Concepts of Functions: Call by Value and Reference are implemented. The course also includes concepts related to Object Oriented Programming in PHP and website design support along with Database Support concepts which will be useful to design Backend for the website.

Course Objectives

The objective of this course is:

1. To provide a fundamental understanding of Dynamic Website Design in PHP.
2. To provide knowledge about various Frameworks build for Website Designing.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Apply the basic concepts of PHP programming to rewrite PHP scripts using Strings and Functions

CO 2: Demonstrate the concept of Conditional & Control Statements and 1 D, 2 D & Associative Array using PHP scripts

CO 3: Apply Object Oriented and Web Design concepts of PHP in order to prepare responsive web pages and websites

CO 4: Apply the concepts of Database and Database connectivity to prepare backend support for website.

Lab Sessions	Blooms level*	Number of hours
1. PHP Scripts on Basic Concepts • Write the process of installation of web server. • Write programs to print all details of your php server. Use phpinfo(). • Write a program to give demo of ECHO and PRINT command. • Write a program to implement the string functions.	L1,L3	2
2. PHP Script on Conditional and Control Statements • Write a script to print Fibonacci series upto a given number. • Write a menu driven program to implement a calculator which performs only addition, subtraction, multiplication and division. The operation should happen based on user choice. • Write a script to calculate Factorial of a given number	L1,L3	4
3. PHP Scripts on Arrays: 1D, 2D, Associative • Write a program sort ten number by using array. • Write a program to demonstrate the concept of associative array. • Write a program to demonstrate the concept of multidimensional array.	L1,L3	4

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4. PHP Scripts on Object Oriented Programming and File Handling Concepts • Write a program to demonstrate the concept of Classes & objects. • Write a php script including all the file handling functions.	L1,L3	2
• **PHP Scripts on Webpage and Website Design Concepts** • Create a login form with two text fields called "login" and "password". When user enters "Amity"as a user name and "university" as a password it should be redirected to a Welcome.HTML page or toSorry.HTML in case of wrong username/password. • Write a program to design login form in which find the greatest number amongst three numbers. • WAP for Marksheet generation. • Design a webpage for entering the student details with all the validations applied on it. • Create a form with a text box asking to enter your favorite city with a submit button when the user enters the city and clicks the submit button another php page should be opened displaying "Welcometo the city".	L1,L3	6
5. PHP Scripts on Database Creation aConnectivity • Create a database in MySql and connect that database from PHP. • Write a program to Update, insert and delete the values of table in database.	L1,L3	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Steven Holzner "PHP : The Complete Reference", Mc Graw Hill Education, 2007.
2. Ivan Bayross, "Web enabled commercial Application Development using HTML, Javascript, DHTML and PHP", 4th Edition, BPB Publication, 2010.
3. Laura Thomson, "PHP and MySQL Web Development", 5th Edition, Pearson Education, 2016.

Reference Books

1. Robin Nixon, "Learning PHP, MySQL and Javascript", Shroff Publishers and Distributers private limited, 2015.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

PR: Practical, LR: Lab Record, V: Viva, EE: End Semester Examination, A: Attendance, IA: Internal Assessment

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**3**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**2**	**--**
CO2	**1**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**2**	**--**
CO3	**1**	**1**	**1**	**3**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**1**	**2**
CO4	**1**	**1**	**2**	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**1**	**2**

1: strongly related, 2: moderately related and 3: weakly related

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CSE2614	IOT AND WIRELESS SENSOR NETWORK	L	T	P	C
Version 2019.1	Date of Approval: 15 May 2019	3	0	0	3
Pre-requisites/Exposure	Concept of Networking				
Co-requisites					

Catalog Description

This course provides comprehensive and insight knowledge of Internet of Things and Wireless sensor networks. The objective of the course is to provide the students the core knowledge of architecture, routing protocols, time synchronization and security of IoT along with wireless sensor networks.

Course Objectives

The objective of this course is to

- Equip the students with concepts of internet-of-things and provide an overview of designing IoT devices.
- Equip the students with concepts of wireless sensor networks and its architecture.
- Provide a thorough understanding of routing protocols and power management.
- Give an insight of time synchronization and network security.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain key terms and trends around the Internet of Things along with its physical and logical design.
CO2: Understand the potential and value of the Internet of Things and Smart Services.
CO3: Compare and analyze different routing techniques, protocols and power management.
CO4: Explain problems, fundamentals and protocols of time synchronization and localization.
CO5: Describe the fundamentals, issues and mechanism of network security.

Modules	Blooms level*	Number of hours
Module 1: Introduction Module I: Introduction to Internet of Things Definition & characteristics of IoT, physical design of IoT-things in IoT, IoT protocols, logical design of IoT- IoT functional block, IoT communication models, IoT communication APIs, IoT enabling technologies-wireless sensor networks, cloud computing, big data analytics, communication protocols, embedded systems,IoT levels and deployment templates, IoT application.	L1, L2 and L4	9
Module 2: Developing Internet of Things IoT Design Methodology,Logical design using Python- Python data types & data structures, control flow, functions, modules, packages, classes, file handling, Python packages for IoTJSON, XML, HTTPLib, URLLib, SMTPLib, IoT end devices-building blocks, Introduction to Raspberry Pi.	L1, L2	6

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Module 3: Introduction of WSN and Architectural Framework Motivation for a Network of Wireless Sensor Nodes, Classification of sensor networks, Hardware architecture, Applications: Structural Health Monitoring, Traffic Control, Health Care, Pipeline Monitoring, Precision Agriculture, Active Volcano, Underground Mining Node Architecture: The Sensing Subsystem, the Processor Subsystem, Communication Interfaces, Prototypes. Operating Systems: Functional Aspects, Non-functional Aspects, Prototypes, Evaluation Physical Layer,	L1, L2	9
Module 4: Concept of Network Layer and Time Synchronization Basic Components, Source Encoding, Channel Encoding, Modulation Medium Access Control: Wireless MAC Protocols, Characteristics of MAC Protocols in Sensor Networks, Contention-Free MAC Protocols, Contention-Based MAC Protocols, Hybrid MAC Protocols Routing Metrics, Flooding and Gossiping, Data-Centric Routing, Proactive Routing, On-Demand Routing, Hierarchical Routing, Location-Based Routing, Clocks and the Synchronization Problem, Time Synchronization in Wireless Sensor Networks, Basics of Time Synchronization, Time Synchronization Protocols Localization: Ranging Techniques, Range-Based Localization, Range-Free Localization, Event Driven Localization.	L1, L2 and L4	8
Module 5: Security in WSN Fundamentals of Network Security, Challenges of Security in Wireless Sensor Networks , Security Attacks in Sensor Networks, Protocols and Mechanisms for Security, IEEE 802.15.4 and Zig Bee Security	L1, L2	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Internet of Things: A Hands-On Approach by Arshdeep Bahga, Vijay Madisetti.
2. Designing the Internet of Things by Adrian McEwen, Hakim Classically
3. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice", Wiley 2010.
4. Mohammad S. Obaidat, Sudip Misra, "Principles of Wireless Sensor Networks", Cambridge, 2014.

Reference Books

1. From Machine-to-Machine to the Internet of Things: Introduction to a New Age by Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle
2. Ian F. Akyildiz, Mehmet Can Vuran , "Wireless Sensor Networks", Wiley 2010
3. C S Raghavendra, K M Sivalingam, Taieb Znati, "Wireless Sensor Networks", Springer, 2010
4. C. Sivarm murthy & B.S. Manoj, "Adhoc Wireless Networks", PHI-2004

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2	PS O 3
CO 1	1	--	3	--	--	2	--	--	--	--	--	--	1	--	--
CO 2	3	--	--	--	1	--	--	--	--	--	--	--	1	--	2
CO 3	3	--	--	--	1	--	--	--	--	--	--	--	1	--	2
CO 4	3	--	--	--	1	--	--	--	--	--	--	--	1	--	2
CO 5	1	2	--	--	--	3	--	--	--	--	--	--	1	--	--

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Course Code: CSE2619	NETWORK AND WIRELESS SENSOR	L	T	P	C
Version 2022.1	Date of Approval: May 2022	3	0	0	3
Pre-requisites/Exposure	Basics of Network				
Co-requisites	Nil				

Catalog Description

In this course the concepts of network and wireless security are discussed in detail. The wireless technologies, techniques and methodologies will be introduced. The studies will be made on impact of the thoughtfulness and longevity of implementations. The concepts learnt in the studies of wireless application protocols and other protocols will be applied in the studies and analysis of security issues in wireless networks.

Course Objectives

The objective of this course is to

- Equip the students with concepts of network wireless security.
- Provide an overview of spread spectrum, cellular network, WLAN, WAP, WTLS, SSH, Bluetooth security.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain wireless security issues and its recent trends in wireless networks, cellular networks and all generations of wireless technologies.

CO2: Describe wireless transmission media, spread spectrum and its techniques, wireless standards and various threats and countermeasures in network security. Write the steps of authentication techniques.

CO3: Demonstrate the working of WAP Model and comparison with TCP/IP, OSI models; state the terminologies: viruses, authorization, non repudiation, secure sessions, security products; Construct WAP security architecture and elaborate its fields; determine issues related to marginal security.

CO4: Describe secure socket layer and transport layer security; Design SSL in OSI reference model. Draw authentication header format and describe each field of AH; Distinguish SSL/TLS; Explain WTLS and fix vulnerabilities of WTLS; Discuss LEAP with reference to WTLS.

CO5: Design and configure Bluetooth security technology; Designing its security architecture; determine security functions of the service discovery protocol. Discuss issues related encryption with ciphers. Compare threats to Bluetooth security. Write Bluetooth holes in Bluetooth technology.

Modules	Blooms level*	Number of hours

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MODULE 1: Network concepts – Threats in networks – Network security controls – Importance ofsecurity – Threat models – Security concepts – Common mitigation methods **Why is Wireless Different?** Introduction ,Protecting the Means Of Communication Protecting Privacy, Promoting Safety ,The Personal and the Public ,Shaking Up the Status Quo ,Understanding Wireless Forecasts ,Reasonable Degrees of Security, Regulatory Environments and Issues, Security-Related Regulations ,Security Related Market Factors, Guidelines for Security Measures, Cellular Networks and Bearer Technologies ,First-Generation Wireless (1G), Second-Generation Wireless (2G), Spread Spectrum, Code Division Multiple Access (CDMA) ,Time Division Multiple Sccess (TDMA) , Global System for Mobile Communications (GSM) ,Third-Generation Wireless (3G) ,Short Message Service (SMS) ,Fourth-Generation Wireless (4G)	L1, L2 and L3	6
MODULE 2: **The Wireless Local Area Network (WLAN)** Wireless Transmission Media, Infrared Systems ,Narrowband Radio System, Wideband Radio Systems: Spread Spectrum, Frequency-Hopping Spread Spectrum (FHSS) ,Direct-Sequence Spread Spectrum (DSSS) ,WLAN Products and Standards—Today's Leaders?,802.11 Security? IEEE 802.11b ,Securing WLANs ,Eavesdropping ,Unauthorized Access , Interference and Jamming ,Physical Threats ,Countermeasures, Frequency-Hopping Spread Spectrum (FHSS), Direct-Sequence Spread Spectrum (DSSS) ,Infrared (IR) ,Narrowband ,The Infamous WEP ,Encryption ,Authentication, Wired Equivalency Protocol Flaws Too Public , Other Authentication Techniques ,Physical Security	L1, L2 and L3	8
MODULE 3: **Wireless Application Protocol(WAP)** Comparison of the TCP/IP, OSI, and WAP Models, How WAP Works ,The Security Status of WAP , Viruses ,Authorization ,Non-repudiation ,Authentication, Secure Sessions ,Security Products ,Securant Technologies Clear Trust Control, WAP Security Architecture ,Marginal Security ,Wireless Access to the Internet, Wireless Middleware	L1, L2 and L3	8
MODULE 4: **Wireless Transport Layer Security (WTLS)** Secure Socket Layer, Record Protocol, SSL Handshake Protocol ,Transport Layer Security, Advantages and Disadvantages of SSL/TLS, Netscape ,Microsoft ,Entrust ,EAP-TLS ,Alternatives to SSL/TLS IP Security (IPSec) ,Authentication Header Protocol (AH) ,Encapsulating Security Payload (ESP) ,Transport and Tunnel Modes, Secure Shell (SSH) ,SSH Transport Layer Protocol ,SSH Versus TLS Implementations ,Light Extensible Authentication Protocol (LEAP) ,Wireless Transport Layer Security and WAP ,Understanding Wireless Transport Layer Security , WTLS Handshake Protocol ,WTLS Alert Protocol ,WTLS Change Cipher Protocol ,Pros and Cons of WTLS ,WTLS Vulnerabilities ,Implementations of WTLS	L2, L3 and L4	8

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MODULE 5: **Bluetooth Security** Bluetooth Basic Specifications ,Bluetooth Technology, Bluetooth Specification Development ,Design Decisions ,Piconets ,Bluetooth Security Architecture ,Scatternets ,The Bluetooth stack, Security Functions at the Baseband Layer ,Security Functions of the Service Discovery Protocol ,Security Functions at the Link Layer, Frequency-Hopping , Channel Establishment ,Security Manager ,Authentication, Authentication with the SAFER1 Block Cipher ,Encryption ,Encryption Modes ,Key Length Negotiation ,Encryption With the E0 Stream Cipher ,Threats to Bluetooth Security ,Jamming ,Bluetooth holes.	L1, L2 and L3	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Nichols and P. Lekka, Wireless Security Models, Threats and Solutions, Tata McGrawHill, Edition 2, 2006.
2. Charles P. Fleeger, Security in Computing, Prentice Hall, edition 2, 2009, New Delhi,

Reference Books

1. Behrouz A. Forouzan, Data Communication and Networking, Tata McGraw-Hill, Edition 4, 2007.
2. William Stallings, "Cryptography and Network security", Edition 6, 2013.
3. Behrouz A. Forouzan, "Cryptography and Network security", Edition 3, 6July 2015.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**-**	**-**
CO2	**1**	**2**	**2**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**-**	**-**
CO3	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**-**	**3**
CO4	**1**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**-**	**3**
CO5	**1**	**3**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**-**	**2**

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Course Code: CSE2620	INFORMATION STORAGE MANAGEMENT	L	T	P	C
Version : 2023.1	Date of Approval: March 2023	3	0	0	3
Pre-requisites/Exposure	Basic knowledge about Networking				
Co-requisites	NIL				

Catalog Description

The course provides detailed knowledge, practical training and insight into the implementation and management of various storage technologies with a focus towards applying these technologies in an information lifecycle paradigm. This course focuses on evolution of storage and implementation models, Storage devices principles, Storage classes (SAN, NAS. CAS) and Backup, Business Continuity, and Disaster Recovery principles

Course Objectives

The objective of this course is to

1. To Study various computing technology architecture.
2. To know Emerging trends in computing technology.
3. To highlight the advantage of deploying computing technology

Course Outcomes

On completion of this course, the students will be able to

CO1. To Understand the Concept of Information Storage and Data centre Environment.
CO2. To understand about Data Protection
CO3. To Know and understand Intelligent Storage System.
CO4. To Understand Fibre Channel SAN, Network Attached Storage (NAS).
CO5. To Know the Backup and Archive Technologies.

Modules	Blooms level	Number of hours
Module I: Introduction to Storage Technology Information Storage - Data, Types of Data, Information, Storage, Evolution of Storage Technology and Architecture, Data Center Infrastructure, Key Challenges in Managing Information, Information Lifecycle -Information Lifecycle Management, ILM Implementation, ILM Benefits.	L1, L2	8
Module II: Data Protection & Intelligent Storage System Components of a Storage System Environment, RAID -Implementation of RAID, RAID Array Components, RAID levels, RAID Impact on Disk Performance, Components of an Intelligent Storage System, Intelligent Storage Array-High-end Storage Systems, Midrange Storage System :	L1, L2, L3 and L4	8

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Module III: Storage Networking Technologies & Virtualization Direct-Attached Storage and Introduction to SCSI- Types of DAS, DAS Benefits and Limitations, Disk Drive Interfaces, Introduction to Parallel SCSI, Storage Area Networks- Fibre Channel: Overview, SAN and its evolution, Components of SAN, Network-Attached Storage- General Purpose Servers vs. NAS Devices, Benefits of NAS, Components of NAS.	L1, L2, L3	8
Module IV: CAS and Business Continuity CAS: Fixed Content and Archives, Types of Archives, Features and Benefits of CAS, CAS Architecture, Object Storage and Retrieval in CAS. Introduction to Business Continuity: Information Availability, BC Terminology, BC Planning Lifecycle, Failure Analysis.	L1, L2, L3 and L4	7
Module V: Backup, Recovery & Replication Backup and Recovery : Backup Purpose, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Process, Backup and Restore Operations, Backup Topologies, Backup Technologies. Replication: Local Replication- Uses of Local Replicas, Data Consistency, Local Replication Technologies, Remote Replication- Modes of Remote Replication, Remote Replication Technologies.	L1, L2, L3	5

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text & References:

Text:

1. Information Storage and Management, Wiley Publication ISBN: 978-81-265-2147-0

References:

1. Marc Farley Osborne, "Building Storage Networks", Tata McGraw Hill
2. Robert Spalding, "Storage Networks: The Complete Reference", Tata McGraw Hill

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**	**--**
CO2	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**	**--**
CO3	**1**	**1**	**2**	**3**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**--**	**--**
CO4	**1**	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**2**	**---**
CO5	**1**	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**1**	**---**

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Course Code: CSE2621	DEVELOPMENT OF DECENTRALIZED APPLICATIONS	L	T	P	C
Version 2023.1	Date of Approval: March 2023	2	0	0	2
Pre-requisites/Exposure	Basic Application Development				
Co-requisites	Nil				

Catalog Description

This course in the Blockchain specialty will teach you how to design and develop end-to-end decentralised applications (Dapps) that give anyone access to the blockchain's features and services. Truffle IDE, smart contracts, a simple web client, and a MetaMask client will all be used. You'll learn about a Dapp's architecture, which includes the front-end client interface, blockchain, and smart contracts. The course covers the fundamentals of Dapp architecture, the Truffle development process and commands (init, develop, test, and migrate), test-driven Dapp development, Dapp application models, and upcoming standards that are critical for predictable Dapp behaviour.

Course Objectives

The objective of this course is to:

- Introduce the concept of decentralized apps (DApps), and decentralized anonymous organizations (DAOs).
- Explain the technical, social and economic implications of DAaps.
- Understand consensus mechanisms, smart contracts, and token cryptoeconomics.
- Use Web3.js, Truffle, and smart contracts for developing DAap.

Course Outcomes

On completion of this course, the students will be able to:

CO1. Explain what smart contracts, decentralized apps (DApps), and decentralized anonymous organizations (DAOs) are.

CO2. Comprehend the major technical, social and economic implications of decentralized applications

CO3. Identify the role of consensus mechanisms, smart contracts, and token cryptoeconomics.

CO4. Develop a decentralized application with Web3.js, Truffle, and smart contracts.

Modules	Blooms Level*	Hours
MODULE 1: INTRODUCING DAAP Decentralized Applications (Dapps): Blockchain Server, Dapp Defined, Dapps landscape, Analysis of a dapp, Ethereum VM, Solidity 1, Dapp architecture, User identity & dapp scalability, DApp vs. App, Distributed Systems, DApp Ecosystem.	L1, L2	9
MODULE 2: TRUFFLE DEVELOPMENT Development Environment - State of Developer Tools, Web3 Base Layer Services , Deployment Tools, Smart Contract Tools, Remix IDE, Truffle Suite, Metamask Wallet. Truffle Development- Truffle IDE, Test-Driven	L1, L2	9

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Development, Web Interface & Testing, basic, functional smart contract - Structure of a Contract, Variables, Types & Structs, Functions & Parameters , Visibility & Getters, Quick Start with Remix.		
MODULE 3: SOLIDITY FOR DAAPS Solidity Programming I - Static vs. Dynamic State, Arrays & Memory Structure, Loops, Scoping and Declarations, Function Modifiers, Error Handling with Assert, Require, Revert and Exceptions, Conditionals, Events. Solidity Programming II - Reasons for Inheritance, OpenZeppelin, Commonly Inherited Contracts, Minted Crowdsale, Contract Wallet.	L1, L2	9
MODULE 4: DEVELOPING DAAP Contract Deployment - Local Network Deployment, Testnet Deployment, Truffle, Ganache. Decentralized Applications - Connecting Blockchain and Smart Contract, Web3js, Ethersjs, Truffle Box, Class DAO, DApp Design Patterns – TBD, Incremental Decentralization. Layer 2 - State Channels, Plasma	L1, L2	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. Antonopoulos, Andreas M., and Gavin Wood. Mastering ethereum: building smart contracts and dapps. O'reilly Media, 2018.
2. Infante, Roberto. Building Ethereum Dapps: decentralized applications on the Ethereum blockchain. Simon and Schuster, 2019.

Reference Books

1. Raval, Siraj. Decentralized applications: harnessing Bitcoin's blockchain technology. " O'Reilly Media, Inc.", 2016.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	2	3	--	--	--	--	--	--	--	--	--	2	1	-	2
CO 2	2	2	3	-	--	--	--	--	--	--	--	--	2	1	-	2
CO	2	2	3	-	-	--	--	--	--	--	--	--	2	1	-	3

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3																
CO 4	**1**	**2**	**3**	**-**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**1**	**2**
CO 5	**2**	**3**	**3**	**-**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**1**	**3**

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: CSE2622	DEVELOPMENT OF DECENTRALIZED APPLICATION LAB	L	T	P	C
Version 2023	Date of Approval: March 2023	0	0	2	1
Pre-requisites/Exposure	Basic Programming				
Co-requisites	Nil				

Catalog Description

Ethereum accounts come in the form of smart contracts. This indicates that they have a balance and are able to send transactions across the network. They are not, however, controlled by a user; instead, they are deployed to the network and run according to a set of instructions. User accounts can then engage with a smart contract by submitting transactions that execute the smart contract's declared function. Smart contracts, like conventional contracts, can set rules and have them enforced automatically through programming. Smart contracts are not deleteable by default, and their interactions are irrevocable. This course lays the foundations for developing smart contract for different applications.

Course Objectives

The objective of this course is to:

- Discover the basics of smart contracts, such as the Ethereum protocol, the Solidity programming language, and the Ethereum Virtual Machine.
- Dive into Solidity smart contract development and acquire experience with the Truffle framework's capabilities for deploying and testing your contracts.
- Connect your smart contracts to an application using Web3 so that people may engage with the blockchain effortlessly.
- Examine smart contract security using free online resources.

Course Outcomes

On completion of this course, the students will be able to:

CO1. Explain what smart contracts, decentralized apps (DApps), and decentralized anonymous organizations (DAOs) are.

CO2. Comprehend and apply the fundamentals of smart contracts in designing them.

CO3. Understand, explain, and apply Soligity and Primer in developing smart contracs for different applications.

CO4. Design and develop the cryptocurrency.

Modules	Blooms Level*	Hours
MODULE 1: BASICS OF SMART CONTRACT - Hello World of Smart Contracts - A smart contract in seven lines of code - Remix in a nutshell - Increment and decrement operations using Solidity	L1, L2, L3	8

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Coding a loop Raising an issue on GitHub Smart contract on a private blockchain		
MODULE 2: DEVELOPING SMART CONTRACT Deep-Diving into Smart Contracts What makes a contract "smart"? Basic anatomy of a smart contract design Running a smart contract using Web3.js API structure of Web3.js Designing an ownership contract Designing a voting DApp	L1, L2, L3	8
MODULE 3: CRYPTOCURRENCY DEVELOPMENT • Developing a Cryptocurrency from Scratch • Token versus coin • ERC20 token development using Truffle • Arbitrage trading for cryptocurrencies • Fiat2Crypto and Crypto2Crypto exchange Parity hack returns	L1, L2, L3	8

** Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. Solorio, Kevin, Randall Kanna, and Dave H. Hoover. Hands-on Smart Contract Development with Solidity and Ethereum: From Fundamentals to Deployment. O'Reilly Media, Incorporated, 2019.Wu Xun. Hyperledger Cookbook. Pact, 2019.

2. Mukhopadhyay, Mayukh. Ethereum Smart Contract Development: Build blockchain-based decentralized applications using solidity. Packt Publishing Ltd, 2018.

Reference Books

1. Mr. Peter Namisiko Wanjala PNWShah, A Beginner's Journey to Ethereum's Smart Contracts: Engineering Smart Contracts and DApps in Solidity and Web3.Js. BPB Publications, 2019.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written
Examination Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	2	3	--	--	--	--	--	--	--	--	--	2	1	-	2
CO 2	2	2	3	-	--	--	--	--	--	--	--	--	2	1	-	2

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CO 3	**2**	**2**	**3**	**-**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**-**	**3**
CO 4	**1**	**2**	**3**	**-**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**1**	**2**
CO 5	**2**	**3**	**3**	**-**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**1**	**3**

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Course Code: CSE2623	INTRODUCTION TO ARDUINO	L	T	P	C
Version 2023.1	Date of Approval: March 2023	2	0	0	2
Pre-requisites/Exposure	Basics of Arduino				
Co-requisites	Nil				

Course Objective:

This program aims to train students to be equipped with a solid theoretical foundation, systematic professional knowledge and strong practical skills in the Raspberry Pi and Arduino. The course focuses on higher-level operating systems, advanced networking, user interfaces, multimedia and uses more computing intensive IoT applications as examples using Raspberry Pi running Linux as the platform of choice, while also exposing the student to other comparable platforms like Arduino. After doing this course, students should be able to design and deploy multiple IoT devices that could connect to the gateway.

Modules	Blooms level*	Number of hours
MODULE 1: **The Arduino Environment** Introduction to the Arduino environment, the Arduino board, the Arduino IDE, and the Arduino-compatible shields together with their libraries.Arduino board main components, inputs, and outputs. Arduino Integrated Development Environment (IDE), Compiling Code, Arduino Shields and Libraries.	L1, L2 and L3	6
MODULE 2: Basics of C programming, composition of an Arduino programs, Arduino tool chain, Arduino IDE, basic structure of a sketch, including the use of the setup() and loop() functions. Accessing the pins from a sketch for input and output, introduction on debugging embedded software on an Arduino, UART communication protocol, Synchronization, parity and stop, the use of the Serial library to communicate with the Arduino through the serial monitor.	L1, L2 and L3	6
MODULE 3: **Sensing the world:** Sensors, Digital and Analog signals, temperature sensors, humidity sensors, obstacle sensors, Ultrasonic sensors, Accelerometer, and gyro	L1, L2 and L3	6

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MODULE 4: **Communication with the world** Wired and wireless communication, Communication protocols, Interfacing Communication Modules with Arduino	L2, L3 and L4	6

Examination Scheme:

Components	CT1	Assignment/ Viva	Attendance	EE
Weightage (%)	15	10	5	70

Text & References:

Text:
Massimo Banzi, "Getting Started with Arduino", First Edition, February 2009, O'Reilly Media, Inc

References:
Michael Margolis, "Arduino Cookbook", First Edition, March 2011, O'Reilly Media, Inc

Components	CT1	Assignment/ Viva	Attendance	EE
Weightage (%)	15	10	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3	PSO 4
CO 1	--	1	2	--	--	--	--	--	--	--	--	--	1	--	--	--
CO 2	1	--	2	3	--	--	--	--	--	--	4	--	1	2	--	--
CO 3	--	1	--	--	--	--	--	--	--	2	3	--	-	1	2	--
CO 4	-	1	-	--	2	--	--	--	--	--	--	--	2	1	--	--
CO 5	--	--	1	--	--	--	--	--	2	--	--	--	--	--	--	1

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Course Code: CSE2624	INTRODUCTION TO ARDUINO LAB	L	T	P	C
Version 2023.1	Date of Approval: March 2023	0	0	2	1
Pre-requisites/Exposure	Basic Knowledge of HTML				
Co-requisites	Nil				

Course Objective: Understand what is meant by Microcontroller, Microprocessor, Embedded System, IDE and Arduino.

Lab Sessions	Blooms level*	Number of hours
Session 1-3 Connection of an Arduino board with ESP8266 Wi-Fi module. Session 4-6 IoT based control of an LED using Arduino Session 7-8 IoT and cloud-based data logger using LM35 and Arduino Session 9-10 IoT based home automation using Arduino. Session 10-11 IoT based street light control using Arduino. Session 12 IoT based DC motor speed control using Arduino. L.	L1,L3	12

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

4. CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	--	--	1	--	1	--	--	--	--	1	--	--	1	--	--	--
CO 2	--	--	2	--	2	--	--	--	--	1	--	--	1	--	--	--
CO 3	--	--	1	--	1	--	--	--	--	2	--	--	1	--	--	--
CO 4	--	--	2	--	1	--	--	--	--	2	--	--	1	--	--	--
CO 5	--	--	1	--	2	--	--	--	2	1	--	--	1	1	--	2

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SEMESTER-VII

CSE2710	COMPUTER GRAPHICS	L	T	P	C
Version: 2019.1	Date of Approval: 15 May2019	3	-	-	3
Pre-requisites/Exposure	Basic Knowledge of C++ Programming				
Co-requisites	Nil				

Catalog Description

This course covers understanding of software and hardware related to computer graphics systems. Topics include an introduction to the basic concepts, 2-D and 3-D modeling and transformations, viewing transformations, clipping, color filling, projections, rendering techniques, visible surface detection and elimination algorithms, graphical software packages and graphics systems. Students will use a standard computer graphics API to reinforce concepts and study fundamental computer graphics algorithms. Last module covers elementary image processing techniques and various library function in C to build animations.

Course Objectives

The objective of this course is to

1. Equip the students with fundamental concepts of graphics system and standards.
2. Equip the students with mathematical concepts of graphics algorithms to draw objects using C language.
3. Provide an overview of various 2D & 3D transformation, clipping operations, algorithms related to hidden surface detection and elimination and their implementation.
4. Provide an overview of various elementary image processing techniques and basic library function in C to create animation sequence.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain applications of computer graphics and define various standards and components in development of computer graphics.

CO 2: Explain generation of graphics primitives and analyze their problems and solutions. Demonstrate solid filling algorithms. Demonstrate polygon clipping and line clipping algorithmand analyze their problems and solutions.

CO 3: Apply 2D geometric transformations on 2D graphics objects with their practical implement -ation. Illustrate use of window to viewport transformation in computer graphics.

CO4: Apply 3D geometric transformations on 3D objects with their practical implementation.

CO 5: Illustrate the use of 3D object modeling, Visible Surface detection and elimination algorithm and analyze their problems and solutions.

Modules	Blooms level*	Number of hours

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Module I: Introduction to Graphics and Graphics Hardware System Application of computer graphics, Video Display Devices, Raster Scan Display, Random Scan Display, Input Devices, Graphic Software and graphics standards, Numerical based on Raster and Random scan display, Frame buffer, Display processor.	L1, L2	5
Module II: Output Primitives and Clipping operations Algorithms for drawing 2D Primitives lines (DDA and Bresenham's line algorithm), circles (Bresenham's and midpoint circle algorithm), ellipses (midpoint ellipse algorithm), Antialiasing and filtering techniques. Line clipping (cohen-sutherland algorithm), Curve clipping algorithm, and polygon clipping with Sutherland Hodgeman algorithm, Area fill algorithms for various graphics primitives: Scanline fill algorithm, boundary fill algorithm, flood fill algorithm, Polygon representation, various method of Polygon Inside test: Even-Odd method, winding number method, Character generation techniques.	L2, L3, L4	6
Module III: 2D Geometric transformation 2D Transformation: Basic transformation, Translation, Rotation, Rotation relative to an arbitrary point, scaling, Matrix Representations and Homogeneous coordinates, window to viewport transformation.	L3 and L4	6
Module IV:3D Geometric transformation 3D Concepts: Parallel projection and Perspective projection, 3D Transformations, composite 3D transformation, co-ordinate transformation, Inverse transformation	L3 and L5	7
Module V: object modelling and Visible Surface detection fractal geometry methods, fractal dimensions, Geometric construction of deterministic self-similar fractals, Iterated function system to generate fractals. Bezier curves and Bezier surfaces, Bspline curves and surfaces, Visible surface detection method: Basic illumination, diffuse reflection, specular reflection, shadows. Ray tracing method, Depth-buffer method, A-buffer method, Depth-sorting method (painter's algorithm), Binary search partition method, Scan line method,	L4, L5	7
Module VI: Introduction to multimedia Design of animation sequences, Computer Animation languages, Elementary filtering techniques and elementary Image Processing techniques, graphics library functions used in animation design	L2, L3, L5	5

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1.Udit Agrawal,"Principles of Computer Graphics", 2nd Edition, DhanpatRaiPublications,New Delhi, 2017.
2.Hughes, Van Dam, et al. "Computer Graphics Principles and Practice", 3rd Edition, Pearson, 2014.
3.Hearn and Baker, "Computer Graphics with OpenGL", 3rd Edition, Prentice Hall, 2004.
4.Donald Hearn & M. Pauline Baker, "Computer Graphics C Version", Pearson Education, New Delhi, 2004.

Reference Books

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1. James D. Foley, Andries van Dam, Steven K. Feiner, John Hughes, “Computer Graphics: Principles and Practice”, 2nd Edition, Pearson Education, 2007.
2. F.S. Hill, “Computer Graphics using OPENGL”,2nd edition, Pearson Education, 2003.
3. David F. Rogers; “Procedural Elements for Computer Graphics” TMH. Publications.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping
1: strongly related, 2: moderately related and 3: weakly related

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1	_	-	--	--	--	--	--	--	--	--	--	2	--	2
CO2	1	1	1	--	--	--	--	--	--	--	--	--	2	--	2
CO3	1	1	1	3	--	--	--	--	--	--	--	--	1	3	1
CO4	1	1	2	2	--	1	--	--	--	--	--	--	2	--	1
CO5	1	3	2	1	1	2	--	--	--	--	--	--	2	3	2
CO6	1	2	3	--	1	2	--	--	--	--	--	--	2	3	2

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CSE2712	COMPUTER GRAPHICS LAB	L	T	P	C
Versionn: 2019.1	Date of Approval: 15 May2019	0	0	2	1
Pre-requisites/Exposure	Basic Knowledge of C++ Programming				
Co-requisites	Nil				

Catalog Description

This course covers understanding of software and hardware related to computer graphics systems. Topics include an introduction to the basic concepts, 2-D and 3-D modeling and transformations, viewing transformations, clipping, color filling, projections, rendering techniques, visible surface detection and elimination algorithms, graphical software packages and graphics systems. Students will use a standard computer graphics API to reinforce concepts and study fundamental computer graphics algorithms. Last module covers elementary image processing techniques and various library function in C to build animations.

Course Objectives

The objective of this course is to

1. Equip the students with fundamental concepts of graphics system and standards.
2. Equip the students with mathematical concepts of graphics algorithms to draw objects using C language.
3. Provide an overview of various 2D & 3D transformation, clipping operations, algorithms related to hidden surface detection and elimination and their implementation.
4. Provide an overview of various elementary image processing techniques and basic library function in C to create animation sequence.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain applications of computer graphics and define various standards and components in development of computer graphics.

CO 2: Explain generation of graphics primitives and analyze their problems and solutions. Demon strate solid filling algorithms. Demonstrate polygon clipping and line clipping algorithm and analyze their problems and solutions.

CO 3: Apply 2D geometric transformations on 2D graphics objects with their practical implementa tion. Illustrate use of window to viewport transformation in computer graphics.

CO4: Apply 3D geometric transformations on 3D objects with their practical implementation.

CO 5: Illustrate the use of 3D object modeling, Visible Surface detection and elimination algorithmsand analyze their problems and solutions.

CO 6: Explain Elementary filtering techniques and elementary Image Processing techniques. Apply C++graphics library functions to design animation sequence.

Modules	Blooms level*	Number of hours

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Module I: Introduction to Graphics and Graphics Hardware System 1. Demonstrate the use of graphics library functions to draw various graphics objects. 2. Demonstrate the use of graphics library functions to draw pie chart. 3. Demonstrate the use of graphics library functions to draw bar chart on screen.	L3,L5	2
Module II: Output Primitives and Clipping operations 1. Demonstrate the use of DDA line drawing algorithm to draw line on the screen when m<=1 and m>1. 2. Demonstrate the use of DDA line drawing algorithm to draw line on the screen when m<=1 and m>1. 3. Demonstrate the use of Breshenham's line drawing algorithm to draw line on the screen when m<=1 and m>1. 4. Demonstrate the use of circle drawing algorithm to draw circle on the screen. 5. Write a program to draw characters on screen using bitmap character generation method. 6. Write a program to fill a polygon using boundary fill algorithm. 7. Write a program to fill a polygon using flood fill algorithm. 8. Write a program to demonstrate line clipping algorithm to clip a line where line slop is m<=1.	L3,L5	6
Module III: 2D Geometric transformation 1. Write a program to translate a triangle where translation factors are tx=20 and ty=30. 2. Write a program to rotate a triangle in clock-wise and anti-clock-wise direction where rotation angle is 300. 3. Write a program to scale a square where scaling factors are Sx=2 and Sy=3. 4. Write a program to reflect a triangle about X axis. 5. Demonstrate combine 2D transformation after applying translation, rotation and scaling transformations. 6. Write a program to demonstrate fix point scaling where scaling factors are Sx=2 and Sy=3. 7. Write a program to demonstrate window to viewport transformation and liner mapping of the object coordinates in viewport where size of viewport is half to the size of window.	L3,L5	6

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Module IV:3D Geometric transformation 1. Write a program to translate a 3D triangle where translation factors are tx=20 and ty=30. 2. Write a program to rotate a 3D triangle in clock-wise and anti-clock-wise direction where rotation angle is 300. 3. Write a program to scale a 3D square where scaling factors are Sx=2 and Sy=3. 4. Demonstrate combine 3D transformation after applying translation, rotation and scaling transformations.	L3,L5	4
Module V: Object modelling and Visible Surface detection 1. Write a program to draw Bezier curve on the screen with 4 control points. 2. Write a program to draw spline curve on screen using 6 control points. 3. Write a program to implement fractal objects using Iterated Function System.	L3,L5	3
Module VI: Introduction to multimedia 1. Create animation Sequence using C++ Graphics Library Function. 2. Write a program to generate histogram of an image.	L3,L5	3

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Udit Agrawal,"Principles of Computer Graphics", 2nd Edition, DhanpatRaiPublications,New Delhi, 2017.
2. Hughes, Van Dam, et al. "Computer Graphics Principles and Practice", 3rd Edition, Pearson, 2014.
3. Hearn and Baker, "Computer Graphics with OpenGL", 3rd Edition, Prentice Hall, 2004.
4. Donald Hearn & M. Pauline Baker, "Computer Graphics C Version", Pearson Education, New Delhi, 2004.

Reference Books

1. James D. Foley, Andries van Dam, Steven K. Feiner, John Hughes, "Computer Graphics:Principles and Practice", 2nd Edition, Pearson Education, 2007.
2. F.S. Hill, "Computer Graphics using OPENGL",2nd edition, Pearson Education, 2003.
3. David F. Rogers; "Procedural Elements for Computer Graphics" TMH. Publications.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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CO, PO and PSO mapping

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	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	**1**	**_**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**2**
CO2	**1**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**2**
CO3	**1**	**1**	**1**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**1**
CO4	**1**	**1**	**2**	**2**	**--**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**1**
CO5	**1**	**3**	**2**	**1**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**3**	**2**
CO6	**1**	**2**	**3**	**--**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**3**	**2**

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CSE2713	CRYPTOGRAPHY & NETWORK SECURITY	L	T	P	C
Version 2019.1	Date of Approval: 15 May2019	2	1	0	3
Pre-requisites/Exposure	Basic Mathematics				
Co-requisites	Nil				

Catalog Description

In this course the concepts of cryptography and network security are discussed in detail. Substitution and transposition techniques, symmetric and asymmetric cryptographic algorithms, their applications, differences will be introduced. As a precursor to the study of cryptography studies will be made on impact of various network and web security protocols. The concepts learnt in the studies of cryptography & network security will be applied in the studies and analysis of authentication, integrity and security related protocols.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of cryptography & network security through problem solving and analytical approach.
2. Provide an overview of various network attacks and related security mechanism , various algorithms for modular arithmetic, symmetric and asymmetric cryptography and web and network security

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain, describe and distinguish various security attacks; Describe and solve block and stream ciphers and its applications in cryptography; Solve problems based on substitution and transposition ciphers.

CO2: Explain the basic mathematics of cryptography; Solve problems of groups, modular arithmetic ,gcd and inverse algorithm, chinese remainder theorem and its application in cryptography;Applying algorithms for solving problems in cryptography

CO3: Describing the concept of public key cryptosystems and its related algorithm; Explain and solve problems related to hash functions, digital signature and its applications in cryptography; Compare symmetric and asymmetric key cryptography.

CO4: Explain management,distribution,secure exchange of keys and authentication certificate and its applications in real life. Explain, compare various authentication protocols used in cryptography and network security, also solve problems based on these protocols.

CO5: Explain various security protocols: IPSec, SSL,TLS,SET; Describing malicious software's and illustrating various design approaches to Firewall.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to security attacks, services and mechanism, Classical encryption techniques: substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers. Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard (DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES	L1, L2 and L3	7

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MODULE 2: Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relativeprime numbers, Extended Euclidean Algorithm,Advanced Encryption Standard (AES) encryption and decryption, Fermat's and Euler's theorem, Primaliry testing, Chinese Remainder theorem, DiscreteLogarithmic Problem,Principals of public key crypto systems, RSA algorithm, security of RSA.	L1,L2, L3	6
MODULE 3: Message Authentication Codes: Authentication requirements, authentication functions, messageauthentication code, hash functions, birthday attacks, security of hash functions, Secure hash-algorithm (SHA)Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signaturestandards (DSS).	L1,L2, L3 and L5	7
MODULE 4: Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure. Authentication Applications: Kerberos	L1, L2 and L3	7
MODULE 5: IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Viruses and related threats, Firewalls	L1, L2	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. William Stallings,**"Cryptography & Network Security"**,4th Edition, Pearson Education,NewDelhi, 2017.
2. Behrouz A. Forouzan, "**Cryptography & Network Security**", 2ndEdition,Tata Mcgraw Hills,New Delhi, 2015

Reference Books

1. Douglas R.Stinsons, **"Cryptography Theory and Practice"**, 3rd Edition, McMillan Publications, Londan, 2003
2. Atul Kahate, **"Cryptography & Network Security"**, 3rd Edition, Tata Mcgraw Hills,New Delhi, 2017

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2	PS O 3	PS O 4
CO 1	1	1	1	--	--	--	--	--	--	--	--	--	1	1	3	-
CO 2	1	1	1	--	--	--	--	--	--	--	--	--	1	1	3	-
CO 3	1	1	1	--	-	--	--	--	--	--	--	--	1	1	3	-
CO 4	1	2	3	--	--	--	--	--	--	--	--	--	1	1	3	-
CO 5	1	2	3	--	--	--	--	--	--	--	--	--	2	2	3	-

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CSE2714	SYSTEM PROGRAMMING AND COMPILER CONSTRUCTION	L	T	P	C
Version 2019.1	Date of Approval: 15 May2019	3	0	0	3
Pre-requisites/Exposure	Fundamental concept of computer architecture and operating system and theory of automata				
Co-requisites	Basics of programming languages				

Catalog Description

This course includes the concept of system programming and compiler construction in which all the system applications and programming concepts will be discussed. All the phases of compiler construction will be discussed in detail with some brief description of context free grammar. Using Basic Parsing Techniques efficient Parsers can be constructed with the help of error detection and recovery techniques.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of system programming and working of system utilities.
2. Provide an overview of estimation of performance of compiler design in real time compilation with error handling techniques during compilation.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Describe the basics of compiler design and its co-relation with the subject computation theory of automation in terms of lexical analyzer.

CO 2: Explain the working of assembler and macro processor with all the phases of it. And also describe the concept of loader and other system utilities of system software at the time of program translation.

CO 3: Explain and differentiate the construction of parser through top-down and bottom up parsing techniques.

CO 4: Explain and analyze the automatic construction of different parsing table which do not allow any ambiguity and backtracking in the given grammar.

CO 5: Explain the process of syntax analyzer and identify any error occurs in this phase and also generate the three-address code the given grammar and the postfix translation.

Modules	Blooms level*	Number of hours
MODULE 1: **Introduction** Phases, FSM & RE's and their application to Lexical Analysis, Implementation of Lexical Analysers, The Syntactic specification of Languages: CFG, Derivation and Parse Trees, Capabilities of CFG.	L1 and L2	4

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MODULE 2: **System Programming** Editors: Introduction to system Programming Line editor, Full screen editor and multi window editor, First pass and second pass of assembler and their algorithms. Assemblers for CISC Machines: case study x85 & x86 machines. Bootstrapping for compilers, Introduction to. Design of a compiler in C++ as Prototype. Basic Macro Processor functions- Macro definition & expansion – Macro Processor Algorithm & Data Structures, conditional – Macro Expansion, Keyword Macro Parameters, Macro with in Macro Implementation, Linkers and Loaders Concept of linking. Case study of Linker in x86 machines. Loading of various loading schemes.Booting techniques and sub-routines.	L1 and L2	11
MODULE 3: **Basic Parsing Techniques** Parsers, Shift Reduce Parsing, Operator precedence parsing, topdown Parsing, Predictive Parsers.	L2, L3 and L4	9
MODULE 4: **Automatic Construction of efficient Parsers** LR Parsers, the canonical collection of LR(0) items, constructing SLR Parsing Tables, Constructing canonical LR Parsing tables and LALR parsing tables, An Automatic Parser Generator, Implementation of LR parsingTables, Constructing LALR sets of items.	L2, L3 and L4	8
MODULE 5: **Syntax Directed Translation** Syntax directed Translation Schemes, Implementation of Syntax directed translators,Intermediate Code, Postfix notation, Parse Trees and Syntax Trees, Three address Code, Quadruple & Triples, Translation of Assignment Statements, Postfix Translation.	L2 and L3	9
MODULE 6: **Error detection and Recovery** Lexical phase errors, syntax phase errors, semantic errors Code Optimization: Loop optimization, the DAG representation of basic blocks, value numbers and Algebraic Laws, Global Data – Flow Analysis.	L1, L2 and L3	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Alfread V. Aho, Ravi Sethi & J.D. Ullman, "Compiler Design", Addison Wesley
- Ullman, Principles of Compiler Design, Narosa publications.
- Donovan J.J., Systems Programming, New York, Mc-Graw Hill, 1972.

Reference Books

1. Dhamdhere, D.M., Introduction to Systems Software, Tata Mc-Graw Hill 1996.
2. D.M. Dhamdhere, "Compiler Construction – Principles & Practice", Macmillan India Ltd.
3. Holub, "Compiler Design in C", PHI.
4. Tremblay K.P & Sorenson P.G., "The Theory and practice of Compiler writing" McGraw Hill

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

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Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2	PS O 3	PS O 4
CO 1	1	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--
CO 2	1	--	2	--	--	--	--	--	--	--	--	--	--	1	--	--
CO 3	--	--	1	--	--	--	--	--	--	--	--	--	--	2	1	--
CO 4	--	--	1	2	--	--	--	--	--	--	--	--	--	2	1	--
CO 5	--	--	1	--	--	--	--	--	--	--	--	--	2	1	--	
CO 6	2	2	3	--	--	--	--	--	--	--	--	--	2	1	--	3

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CSE2716	SYSTEM PROGRAMMING & COMPILER CONSTRUCTION LAB	L	T	P	C
Version 2019.1	Date of Approval:15 May2019	0	0	2	1
Pre-requisites/Exposure	concept of pointer and file handling of C/C++ programming languages				
Co-requisites	NIL				

Catalog Description

In this Lab course the concept of system programming and compiler construction are implemented and demonstrated. Concepts covered would enable them to create and solve complex problems.
Problems or programs will be related to concepts of assembler, macro processor, text editor and parser.

Course Objectives

The objective of this course is to

1.
2. Make the students apply knowledge of various system programming concepts such as assembler, macro processor and text editor.
3. Provide a demonstration of compiler concepts like parsing techniques and implementation.

Course Outcomes

On completion of this course, the students will be able to
CO1: Apply the knowledge of regular languages and context free grammar.
CO2: Demonstrate the use of lexical analyzer and concept of editors.
CO3: Apply the knowledge of compiler design to covert the given expression into acceptable form of compiler.
CO4: Demonstrate the concept of assemble and macro-processor and their calling and expansion.
CO5: Demonstrate and apply the knowledge of compiler parsing techniques to construct parse tree for the given expression .

Modules/Topics Covered**	Blooms level*	Number of hours
1. Sample Programs using the theory of computation concepts of regular language. (a) WAP to check whether string is accepted or not for entered grammar. (b) WAP to convert NFA to DFA. (c) WAP to convert Regular Expression to NFA.	L3, L5	6
2. Sample Programs using context free grammar and editors (a) WAP to find no of Tokens in an expression. (b) Write a program to implement Text Editor.	L3, L5	4
3. Sample Programs using the notation conversion and their usage in parsing. (a) WAP to convert Infix to Postfix notation. (b) WAP to convert Infix to Prefix notation.	L3, L5	2

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4. Sample Programs using the concept of assemble and macro processor (a) Write a program to implement Assembler Pass one and Pass two. (b) Write a program to implement Macro-processor.	L3, L5	4
5. Sample Programs using the compiler parsing techniques (a) WAP to implement symbol table. (b) WAP calculate FIRST and FOLLOW of a grammar. (c) WAP to implement shift reduce parser.	L3, L5	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

1. Alfread V. Aho, Ravi Sethi & J.D. Ullman, "Compiler Design", Addison Wesley
2. Ullman, Principles of Compiler Design, Narosa publications.
3. Donovan J.J., Systems Programming, New York, Mc-Graw Hill, 1972.

Reference Books

1. Dhamdhere, D.M., Introduction to Systems Software, Tata Mc-Graw Hill 1996.
2. D.M. Dhamdhere, "Compiler Construction – Principles & Practice", Macmillan India Ltd.
3. Holub, "Compiler Design in C", PHI.
4. Tremblay K.P & Sorenson P.G., "The Theory and practice of Compiler writing" McGraw Hill

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	**70**
Weightage (%)	5	10	10	5	

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS O 1**	**PS O 2**	**PS O 3**	**PS O 4**
CO 1	**2**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**--**	**--**
CO 2	**2**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**--**	**--**
CO 3	**2**	**3**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**3**	**2**	**1**	**--**
CO 4	**3**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**1**	**--**
CO 5	**--**	**3**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**3**	**2**	**3**	**--**

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Course Code : CSE2720	LEARNING WITH BAYESIAN NETWORKS	L	T	P	C
Version : 2022.1	Date of Approval: May 2022	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course provides an in-depth description of techniques for knowledge representation, reasoning, and machine learning under uncertainty using the framework of Bayesian networks. The purpose of this course module is to acquaint the students with the concept of graphical representation of the conditional dependencies and apply mechanism to draw inference for probability computations**.**

Course Objectives

The objective of this course is to provide

1. A detailed understanding of the probabilistic principles of reasoning under uncertainty using the framework of Bayesian networks.
2. Both the theoretical underpinnings and practical considerations for probabilistic framework with a special emphasis on constructing and learning graphical models.
3. Practice of elementary knowledge modeling and probabilistic inference methods.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Construct a graphical representation of the relationship and use them to estimate uncertainty in predictions.

CO 2: Identify and apply the complementary perspectives of qualitative logic and numerical probability theory for computing highly expressive accounts of inference.

CO 3: Apply different Bayesian inference rules for deducing probability distribution from data. Can analyze the complexity of different inference methods while obtaining the probability measure for the evidences.

CO 4: Understand and apply the notion of approximate inference for complex cases, that can be further scaled up to different types of interesting, high-dimensional datasets.

CO 5: Evaluate/estimate learning parameters from complete and incomplete data when structure of network is given and vice-versa.

Modules	Blooms level*	Number of hours
Module I: Introduction Reasoning about beliefs using Logic and Probability Propositional Logic, Probability Calculus and Bayesian Reasoning, Bayesian Networks,: Syntax and Semantics, Building Bayesian Networks.	L1,L2,L3	10
Module II: Bayesian Networks Inference Inference by variable elimination, Inference by Factor Elimination (Jointree), Compiling Bayesian Networks, Complexity of probabilistic inference, compiling bayesian networks.	L1,L2,L3	10

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Module III Approximate Inference Inference by Belief Propagation: Algorithm, Iterative belief propagation, semantics of IBP, Join graphs, edge-detection semantics, Approximate Inference by Stochastic Sampling: Simulating a Bayesian network, direct sampling, expectations, estimating a conditional probability, Markov chain simulation.	L1,L2	9
Module IV Learning: The Maximum Likelihood Approach Introduction, estimating parameters from complete data, estimating parameters from incomplete data, learning network structure, searching for network structure.	L1,L2,L3	10
Module V Learning: The Bayesian Approach Introduction, Meta Networks, Learning with Discrete Parameter Sets, Learning with Continuous Parameter Sets, Learning Network Structure	L1,L2,L3	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

3. Adnan Darwiche, Modelling and Reasoning with Bayesian Networks. Cambridge University Press 2009
4. Richard E. Neapolitan, "Learning Bayesian networks", Prentice Hall Series in Artificial Intelligence, 2004.

Reference Books

1. Timo Koski, John Noble, "Bayesian Networks: An Introduction", Wiley series in Probability and Statistics, 2009.
2. Finn V. Jensen and Thomas Nielsen. Bayesian Networks and Decision Graphs. Springer 2007.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	**--**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**1**	**--**
CO2	**1**	**1**	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**1**	**--**
CO3	**1**	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**2**	**--**
CO4	**1**	**1**	**2**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**1**	**--**
CO5	**1**	**1**	**2**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**2**	**--**

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CSE2735	SUMMER INTERNSHIP EVALUATION II	L	T	P	C
Version: 2017.1	Date of Approval: 14th June 2017	0	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The objective of this course is to provide practical training on some live projects that will increase capability to work on actual problem in industry. This training may undergo in an industrial environment or may be an in-house training on some latest software which is in high demand in market. This training will be designed such that it will useful for their future employment in industry.

Course Objectives

The objective of this course is to

1. Provide practical training on live projects
2. Increase technical capabilities on solving real life problems in company environment

Course Outcomes

On completion of this summer internship, the students will be able to:
CO1: Develop communication, interpersonal and other critical skills in the job interview process.
CO2: Design and develop software and hardware projects
CO3: Assess interests and abilities in their field of study.
CO4: Demonstrate excellent technical and communication skills to acquire employment contacts leading directly to a full-time job following graduation from college.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	1	2	2	--	--	--	1	--	--	--	1	1	1	1
CO2	1	1	2	2	2	--	--	--	1	--	--	--	1	1	1	1
CO3	1	1	2	3	2	--	--	--	1	--	--	--	1	1	1	1
CO4	1	1	2	2	2	--	--	--	1	--	--	--	1	1	1	1

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CSE2737	MINOR PROJECT II	L	T	P	C
Version: 2019.1	Date of Approval: 15 May2019	0	0	0	2
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The objective of this course is to provide practical training on some live/demo projects that will increase capability to work on actual problem in industry. It will be an in house training on some latest software which is in high demand in market. This training will be designed such that it will useful for their future employment in industry.

Course Objectives

The objective of this course is to

1. Provide practical training on live projects
2. Increase technical capabilities on solving real life problems in company environment

Course Outcomes

On completion of this minor project, the students will be able to:

CO1: Demonstrate a sound technical knowledge of their selected project topic.

CO2: Design and develop engineering solutions to complex problems utilising a systems approach.

CO3: Analyse various approaches for solving a complex engineering problem using different tools and techniques

CO4: Demonstrate the knowledge, skills and attitudes of a professional engineer.

CO5: Apply technical skills and knowledge in completing the project.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**2**	--	--	--	--	--	--	**1**	--	--	--	--	--	**1**	**1**
CO2	**1**	**1**	--	--	--	--	--	--	**1**	--	--	--	--	--	**1**	**1**
CO3	**1**	**1**	--	--	--	--	--	--	**1**	--	--	--	--	--	**1**	**1**
CO4	**1**	**1**	--	--	--	--	--	--	**1**	--	--	--	--	--	**1**	**1**
C05	**1**	**1**	--	--	--	--			**1**	-	-	-	--	--	**1**	**1**

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CSE2707	MOBILE COMPUTING	L	T	P	C
Version 2017.1	Date of Approval: June 2017	3	0	0	3
Pre-requisites/Exposure	Basic Networking				
Co-requisites	Nil				

Catalog Description
The objective of this consortium is to shape and expand a full-scale and sound mobile computing system market. To achieve this, cooperation is required of interests related to communication (network), computer hardware/software, system integrators (including service providers), and the media.

Course Objectives
The objective of this course is to

1. Give a general overview of the cellular technology and the associated terms and discuss the generations of the mobile technologies starting from 1G to 3G techniques.
2. Illustrate the GPRS and WAP model for 2G internet connectivity in detail.
3. Elaborate the third-generation mobile services
4. Describe the Global Mobile Satellite Systems in detail and basic architecture of Bluetooth technology and advanced topics in mobile computing.

Course Outcomes
On completion of this course, the students will be able to
CO1: Explain the basic concepts mobile technology, computing and basic architecture of PCS and GSM.
CO2: Describe the mobile networking Infrastructure through 2G technologies (GSM, GPRS, WAP).
CO3: Explain the basic concepts of 3G technologies (WCDMA, CDMA 2000) and WLL.
CO4: Discuss the working of mobile satellite systems like IRIDIUM and GLOBALSTAR.
CO5: Explain the concepts of Bluetooth technology, its working and protocols, virtual networks and enterprise networks.

Modules	Blooms level*	Number of hours
Module I:Introduction to Personal Communications Services (PCS) PCS Architecture, Mobility management, Networks signalling. Global System for Mobile Communication (GSM) system overview: GSM Architecture, Mobility management, Network signalling.	L1, L2 and L3	8
Module II: General Packet Radio Services (GPRS) &Wireless Application Protocol (WAP) GPRS Architecture, GPRS Network Nodes. Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 standard, Mobile IP. Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, wireless mark up Languages (WML).	L1,L2	10

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Module III:Third Generation (3G) Mobile Services Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G. Wireless Local Loop(WLL): Introduction to WLL Architecture, wireless Local Loop Technologies.	L1, L2	7
Module IV: Global Mobile Satellite Systems Global Mobile Satellite Systems; case studies of the IRIDIUM and GLOBALSTAR systems.	L1, L2	7
Module V:Enterprise Networks Introduction to Virtual Networks, Blue tooth technology, Blue tooth Protocols. Advanced techniques in mobile computing.	L1, L2	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. "Wireless and Mobile Networks Architectures", by Yi-Bing Lin & Imrich Chlamtac, John Wiley & Sons, 2001.
2. "Mobile and Personal Communication systems and services", by Raj Pandya, Prentice Hall of India, 2001.

Reference Books

1. "Wireless Web Development", Ray Rischpater, Springer Publishing, 2000.
2. "The Wireless Application Protocol", by Sandeep Singhal, Pearson Education Asia, 2000.
3. "Third Generation Mobile Telecommunication systems", by P.Stavronlakis, Springer Publishers, 2001.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS O 1**	**PS O 2**	**PS O 3**	**PS O 4**
CO 1	**1**	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**-**	**3**	**-**
CO 2	**1**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**-**	**3**	**--**
CO 3	**1**	**2**	**-**	**--**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**-**	**--**	**--**
CO 4	**1**	**2**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**-**	**--**	**--**
CO 5	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**--**	**--**

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CSE2717	ROBOTIC PROCESS AUTOMATION DESIGN & DEVELOPMENT	L	T	P	C
Version 2019.1	Date of Approval: 15 May2019	3	0	0	3
Pre-requisites/Exposure	Basic Networking Concepts				
Co-requisites	Nil				

Catalog Description

This course aims at providing knowledge of basic concepts of Robotic Process Automation to University students. It further builds on these concepts and introduces key RPA Design and Development strategies and methodologies specifically in context of UiPath products. The student undergoing the course shall develop the competence to design and develop a robot for a defined process.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of robotic process automation
2. Provide an overview of designing with uipath software.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain key terms and trends around the robotic process automationalong with its physical and logical design

CO2: Understand the potential and value of the robotic process automation.

CO3: Describe the technologies used for the robotic process automationand mobile devices, including (passive and active) sensors, the physical communications layer, communications protocols, programming frameworks,.

CO4: Design programs and have hands on experience on uipath software

CO5:Develop RPA programs of moderate complexity for a well-used robotic automation process using uipath.

Modules	Bloom s level*	Numbe r of hours
Module 1: Programming Basic and Recap Programming Concepts Basics I - Understanding the application, Basic Web Concepts, Protocols, Email Clients, Data Structures, Data Tables, Algorithms, Software Processes, Software Design, SDLC. Programming Concepts Basics 2- Scripting, Net Framework, Net Fundamentals, XML, Control structures and functions, XML, HTML, CSS, Variables & Arguments.	L1, L2	8

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Module II: RPA Concepts RPA Basics - History of Automation, what is RPA, RPA vs Automation, Processes & Flowcharts, Programming Constructs in RPA, What Processes can be Automated, Types of Bots, Workloads which can be automated. **RPA Advanced Concepts -** Standardization of processes, RPA Development methodologies, Difference from SDLC, Robotic control flow architecture, RPA business case, RPA Team, Process Design Document/Solution Design Document, Industries best suited for RPA, Risks & Challenges with RPA, RPA and emerging ecosystem	L2, L3 and L4	8
Module III: UiPath Introduction & Basics Introduction to UiPath- Installing UiPath Studio community edition, The User Interface, KeyboardShortcuts,AboutUpdating,AboutAutomationProjects,IntroductiontoAutomation Debugging, Managing Activation Packages, Reusing Automations Library, Installing the Chrome Extension, Installing the Firefox Extension, Connecting your project to a source control system, Activities Guide. Variables, Control Flow DataManipulation- DataManipulationIntroduction,Scalarvariables,collectionsandTables, Text Manipulation, Data Manipulation, Gathering and AssemblingData. Recording and Advanced UI Interaction - Recording Introduction, Basic and Desktop Recording, Web Recording, Input/Output Methods, Screen Scraping, Data Scraping,Scraping advanced techniques.Selectors.	L2, L3 and L4	8
Module IV: UiPath Advanced Automation concepts and techniques Image, Text & Advanced Citrix Automation- Introduction to Image & Text Automation, Image based automation, Keyboard based automation, Information Retrieval, Advanced Citrix Automation challenges, Best Practices, using tab for Images, Starting Apps. Excel Data Tables & PDF - Data Tables in RPA, Excel and Data Table basics, Data Manipulation in excel, Extracting Data from PDF, extracting a single piece of data, Anchors, Using anchors in PDF. Email Automation- Email Automation, Incoming Email automation, Sending Email automation	L2, L3 and L4	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

"Learning Robotic Process Automation" By Alok Mani Tripathi,Packt Publications,Ist Edition,2018

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2	PS O 3	PS O 4
CO 1	1	--	--	3	--	--	--	--	--	--	2	--	1	1	-	-
CO 2	1	--	1	2	--	--	--	--	--	--	--	--	-	1	-	-
CO 3	1	--	1	2	--	--	--	--	--	--	--	--	-	1	-	2
CO 4	1	--	--	2	--	--	--	--	--	--	--	--	1	1	-	2

1: strongly related, 2: moderately related and 3: weakly related

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CSE2718	RESPONSIVE WEB DESIGN	L	T	P	C
Version : 2019.1	Date of Approval: 15 May2019	2	0	0	2
Pre-requisites/Exposure	knowledge of website design				
Co-requisites	NIL				

Catalog Description

This course is aimed to provide a fundamental understanding of JavaScript and two of its related library: Bootstrap and React for dynamic web site client side scripting. Javascript is a famous scripting language for client side. The bootstrap and react libraries are rich API for creating dynamic websites. The course builds strong foundation for client-side scripting for creating dynamic websites

Course Objectives

The objective of this course is

1. **Equip the students with basic and advanced features of javascript and bootstrap library to create dynamic web sites**
2. **Provide an overview of basic features of react library to design dynamic websites.**

Course Outcomes

On completion of this course, the students will be able to

CO1: Define the and explain concept of responsive web design and responsive content.

CO2Explain HTML and CSS contents for responsive websties; Design and Create responsive websites using html, css and media queries.

CO3: Explain the concept of responsive workflow and working with responsive web design tools; Creating responsive websites that work on variety of devices.

CO4: Designing responsive websites using the concepts of typography, navigation and header layout; Evaluating performance of responsive websites .

Modules	Blooms level*	Number of hours
Module 1: Foundations of responsive design **What Is Responsive Design?:** Just the Basics ,A Short History, Why Responsive Design **Responsive Content:** Content Strategy ,Managing Content, Developing Content, Content Parity, Content Governance, Adaptive Content	L2 and L3	8

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Module 2: Creating Responsive Websites **HTML for Responsive Sites:** Working with HTML, Basic Page Structure Viewport, Structural Elements, Creating a Page, Clean and Semantic HTML **CSS for Responsive Sites:** How CSS Works,Versions of CSS, Where CSS Goes, The Cascade, Using the Cascade, Comments, Organizing Your Stylesheet, The Box Model, display, Positioning, float and clear, Basic Styles **Media Queries:** What's a Media Query? Media Query Structure, Using Media Queries in Stylesheet Links, Other Ways to Use Media Queries, What We Can Query, Browser Support, Breakpoints, Design Ranges, Designing Responsively, Using Media Queries, Two-Column Layout, Setting a Maximum Width, How to Choose Breakpoints Images: Ways to Display Images, Alt Text, Image File Formats, Optimizing Images, Content Images, Background Images Responsive Images	L2 and L3	8
Module 3: Working Responsively **Responsive Workflow:** Strategy and Planning, Content Before Layout Thinking About Layout, Prototypes, Visual Design, Responsive Design Tools, Selling Responsive Design, Working with Clients **Mobile and Beyond:** User Experience , Device-Agnostic Design, Focusing on Mobile First, Do What You Can, Types of Devices, Touch, Screen Size, Accessibility (Universal Design), Deciding Which Devices to Support Why Use Real Devices for Testing, Testing	L2 and L3	8
Module 4:Designing Responsive Websites **Typography:** Start with HTML, Typefaces, Using Fonts, Sizing Text, Line Length, Whitespace, Margins and Padding, Changing Typeface for Screen Size **Navigation and Header Layout**: Responsive Navigation , Branding, Navigation Links, Navigation Patterns, Header **Performance:** Why Performance Matters, Performance as Design ,How Web Pages Are Loaded and Rendered, Measuring Performance Cleaning Up Your Code, Minimizing HTTP Requests, Server Stuff JavaScript, CSS, Hosting, Conditionally Loading Content, Reflows and Repaints, RESS	L2and L3	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books:

1. "Learning Responsive Web Design A Beginner's Guide",Clarissa Peterson, Orielly, 2014

Reference Books:

1. "Responsive Web Design with HTML5 and CSS3",Ben Frain, Packt, 2012
2. "Responsive Web Design by Example", Farhaan Hussain, Packt, 2017

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/ Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PS O 1	PS O 2	PS O 3	PS O 4
CO 1	--	1	1	--	1	--	--	--	--	1	--	--	1	--	--	--
CO 2	--	1	2	--	2	--	--	--	--	1	--	--	1	--	--	--
CO 3	--	1	1	--	1	--	--	--	--	2	--	--	1	--	--	--
CO 4	--	1	2	--	1	--	--	--	--	2	--	--	1	--	--	--

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CSE2719	RESPONSIVE WEB DESIGN LAB	L	T	P	C
Version : 2019.1	Date of Approval: 15 May2019	0	0	2	1
Pre-requisites/Exposure	knowledge of website design				
Co-requisites	NIL				

Catalog Description

This course is aimed to provide a fundamental understanding of JavaScript and two of its related library: Bootstrap and React for dynamic web site client side scripting. Javascript is a famous scripting language for client side. The bootstrap and react libraries are rich API for creating dynamic websites. The course builds strong foundation for client-side scripting for creating dynamic websites

Course Objectives

The objective of this course is

1. Equip the students with basic and advanced features of javascript and bootstrap library to create dynamic web sites
2. Provide an overview of basic features of react library to design dynamic websites.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define the and explain concept of responsive web design and responsive content.

CO2Explain HTML and CSS contents for responsive websties; Design and Create responsive websites using html, css and media queries.

CO3: Explain the concept of responsive workflow and working with responsive web design tools; Creating responsive websites that work on variety of devices.

CO4: Designing responsive websites using the concepts of typography, navigation and header layout; Evaluating performance of responsive websites .

Modules	Blooms level*	Number of hours
Module 1: Foundations of responsive design **Programs based on:** • Content Strategy ,Managing Content, • Developing Content, Content Parity, • Content Governance, Adaptive Content	L2 and L3	3

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Module 2: Creating Responsive Websites **Programs based on:** • Working with HTML, Basic Page Structure Viewport, Structural Elements, Creating a Page, Clean and Semantic HTML • The Cascade, Using the Cascade, Comments, Organizing Your Stylesheet, The Box Model, display, Positioning, float and clear, Basic Styles • Media Query Structure, Using Media Queries in Stylesheet Links, Other Ways to Use Media Queries, • What We Can Query, Browser Support, Breakpoints, Design Ranges, Designing Responsively, Using Media Queries, Two-Column Layout, Setting a Maximum • Width, How to Choose Breakpoints Images: Ways to Display Images, Alt Text, Image File Formats, Optimizing Images, Content Images, Background Images Responsive Images	L2 and L3	3
Module 3: Working Responsively **Programs based on:** • **Responsive Workflow**, Visual Design, Responsive Design Tools, Selling Responsive Design, Working with Clients • **Mobile and Beyond:** User Experience , Device-Agnostic Design, Focusing on Mobile First, Do What You Can, • Types of Devices, Touch, Screen Size, Accessibility (Universal Design), Deciding Which Devices to Support Why Use Real Devices for Testing, Testing	L2 and L3	3
Module 4:Designing Responsive Websites • **Typography:** Start with HTML, Typefaces, Using Fonts, Sizing Text, Line Length, Whitespace, Margins and Padding, • Changing Typeface for Screen Size • **Navigation and Header Layout**: Responsive Navigation , Branding, Navigation Links, Navigation Patterns, Header • **Performance:** Why Performance Matters, Performance as Design ,How Web Pages Are Loaded and Rendered, • Measuring Performance Cleaning Up Your Code, Minimizing HTTP Requests, Server Stuff JavaScript, CSS, Hosting, Conditionally Loading Content, Reflows and Repaints, RESS	L2and L3	3

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
Text Books:

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1. "Learning Responsive Web Design A Beginner's Guide",Clarissa Peterson, Orielly, 2014

Reference Books:

1. "Responsive Web Design with HTML5 and CSS3",Ben Frain, Packt, 2012
2. "Responsive Web Design by Example", Farhaan Hussain, Packt, 2017

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/ Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2	PS O 3	PS O 4
CO 1	--	1	1	--	1	--	--	--	--	1	--	--	1	--	--	--
CO 2	--	1	2	--	2	--	--	--	--	1	--	--	1	--	--	--
CO 3	--	1	1	--	1	--	--	--	--	2	--	--	1	--	--	--
CO 4	--	1	2	--	1	--	--	--	--	2	--	--	1	--	--	--

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Course Code: CSE2721	INTERFACING WITH VIRTUALIZATION	L	T	P	C
Version : 2023.1	Date of Approval: March 2023	3	0	0	3
Pre-requisites/Exposure	Basic networking, Distributed systems				
Co-requisites	NIL				

Catalog Description

This course gives students an insight into the basics of cloud computing along with virtualization, cloud computing is one of the fastest growing domain from a while now. It will provide the students basic understanding about cloud and virtualization along with it how one can migrate over it.

Course Objectives

The objective of this course is to

- To Study various computing technology architecture.
- To know Emerging trends in virtualization.
- To highlight the advantage of deploying the technology of virtualization

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand the Concept of virtualization Models.
CO2. Understand Cloud Computing and its Architecture
CO3. Understand to virtualization and its Evolution, research prospects of this technology.
CO4. To Understand the integration of virtualization and precedence relationships with cloud computing

Modules	Blooms level	Number of hours
Module I: Cloud Computing Overview Origins of Cloud computing – Cloud components - Essential characteristics – On-demand self-service , Broad network access, Location independent resource pooling ,Rapid elasticity , Measured service, Roots of cloud computing, Architectural influences – High-performance computing, Utility and Enterprise grid computing, Cloud scenarios – Benefits: scalability ,simplicity ,vendors ,security, Limitations – Sensitive information - Application development- security level of third party - security benefits, Regularity issues: Government policies.	L1, L2	9
Module 2: Cloud Architecture- Layers and Models Layers in cloud achitecture, Software as a Service (SaaS), features of SaaS and benefits, Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits, Service providers, challenges and risks in cloud adoption, Cloud deployment model : Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing.	L1, L2, L3	9

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Module 3: Virtualization Virtualization and cloud computing - Need of virtualization – cost , administration , fast deployment , reduce infrastructure cost – limitations Types of hardware virtualization: Full virtualization - partial virtualization - para virtualization. Desktop virtualization: Software virtualization – Memory virtualization - Storage virtualization – Data virtualization – Network virtualization Microsoft Implementation: Microsoft Hyper V – Vmware features and infrastructure – Virtual Box - Thin client	L1, L2, L3	9
Module 4: Migrating into a Cloud Introduction, Challenges while migrating to Cloud, Broad approaches to migrating into the cloud- why migrate -deciding on cloud migration, the Seven-step model of migration into a cloud, Migration Risks and Mitigation, Enterprise cloud computing paradigm, relevant Deployment Models for Enterprise Cloud Computing, Adoption and Consumption Strategies, issues for enterprise applications on the cloud.	L1, L2, L3 and L4	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text & References:

Text Books:

- Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010
- Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008

Reference Books:

1. Ronald Krutz, Cloud Security, Wiley India.
2. Cloud Computing, A Practical Approach, Anthony Velte, Toby Velte, Robert Elsenpeter, McGrawHill

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	--	--	--	--	--	--	--	--	--	1	3	--	--
CO2	1	2	3	--	--	--	--	--	--	--	--	--	1	1	--	--
CO3	1	1	2	3	3	--	--	--	--	--	--	--	1	2	--	--
CO4	1	1	2	3	--	--	--	--	--	--	--	--	1	1	2	---

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Course Code: CSE2722	HYPERLEDGER TECHNOLOGY	L	T	P	C
Version 2023.1	Date of Approval: March 2023	2	0	0	2
Pre-requisites/Exposure	Basics of Blockchain Technology				
Co-requisites	Nil				

Catalog Description

Today's popular themes include blockchain and Hyperledger technologies. Hyperledger Fabric and Hyperledger Composer are open source technologies that assist businesses in establishing private, permissioned blockchain networks. These are used in a variety of industries, including financial, banking, supply chain, and IoT. This course will serve as a handy guide for learning how to use Hyperledger technology to investigate and develop blockchain networks.

Course Objectives

The objective of this course is to:
- Know how to Set-up blockchain networks using basic Hyperledger Fabric deployment.
- Understand the considerations for creating decentralized applications
- Learn how to write Smart Contracts quickly with Hyperledger Composer.
- Realize the design transaction model and chaincode with Golang.
- Know how to maintain, monitor, and govern your blockchain solutions.

Course Outcomes

On completion of this course, the students will be able to:
CO1. Explain what smart contracts, decentralized apps (DApps), and decentralized anonymous organizations (DAOs) are.
CO2. Comprehend the major technical, social and economic implications of decentralized applications
CO3. Identify the role of consensus mechanisms, smart contracts, and token cryptoeconomics.
CO4. Develop a decentralized application with Web3.js, Truffle, and smart contracts.

Modules	Blooms Level*	Hours
MODULE 1: EXPLORING HYPERLEDGER FABRIC Building the foundations of open computing - Fundamentals of the Hyperledger project, The Linux Foundation, Hyperledger, Open source and open standards. Hyperledger frameworks, tools, and building blocks, Hyperledger Fabric component design, Hyperledger Fabric explored, Understanding governance in business networks powered by blockchain.	L1, L2	7
MODULE 2: UISNG HYPERLEDGER IN BUSINESS Setting the Stage with a Business Scenario - Trading and letter of credit, Business scenario and use case, Setting up the development environment, Designing a network, Installing prerequisites,Network components'	L1, L2	9

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configuration files, Launching a sample trade network.		
MODULE 3: WORKING WITH GOLANG Designing a Data and Transaction Model with Golang – Chaincode basics, Starting the chaincode development, Creating a chaincode, Access control, Implementing & testing chaincode functions, Chaincode design topics, Logging output. exposing Network Assets and Transactions - Building a complete application, Building the application, Creating and running the middleware	L1, L2	10
MODULE 4: BUSINESS NETWORKS Defining business networks, Introducing participants, Introducing assets, Introducing transactions, events, Implementing a business network	L1, L2	10

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. Nitin, Gaur, et al. "Hands-On Blockchain with Hyperledger." " O'Reilly Media, O (2022).
2. Wu Xun. Hyperledger Cookbook. Pact, 2019.

Reference Books

1. Shah, Nakul. Blockchain for Business with Hyperledger Fabric: A complete guide to enterprise blockchain implementation using Hyperledger Fabric. BPB Publications, 2019.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written
Examination Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	2	3	--	--	--	--	--	--	--	--	--	2	1	-	2
CO 2	2	2	3	-	--	--	--	--	--	--	--	--	2	1	-	2
CO 3	2	2	3	-	-	--	--	--	--	--	--	--	2	1	-	3
CO 4	1	2	3	-	2	--	--	--	--	--	--	--	2	1	1	2
CO 5	2	3	3	-	-	--	--	--	--	--	--	--	2	1	1	3

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Course Code: CSE2723	HYPERLEDGER TECHNOLOGY LAB	L	T	P	C
Version 2023.1	Date of Approval: March 2023	0	0	2	1
Pre-requisites/Exposure	Basic Programming				
Co-requisites	Nil				

Catalog Description

Today's popular themes include blockchain and Hyperledger technologies. Hyperledger Fabric and Hyperledger Composer are open source technologies that assist businesses in establishing private, permissioned blockchain networks. Hyperledger Technology Lab teaches you how to create Blockchain apps that are practical and functional in the real world. The students will learn how to design and deploy enterprise-ready blockchain apps to production across various cloud servers using the versatile, modular, and built-for-enterprise Hyperledger Fabric architecture.

Course Objectives

The objective of this course is to:

- Know how to Set-up blockchain networks using basic Hyperledger Fabric deployment.
- Understand and apply the considerations for creating decentralized applications
- Learn how to write Smart Contracts quickly with Hyperledger Composer.
- Realize and apply the design transaction model and chaincode with Golang.
- Know and apply how to maintain, monitor, and govern your blockchain solutions.

Course Outcomes

On completion of this course, the students will be able to:

CO1. Explain and develop smart contracts, decentralized apps (DApps), and decentralized anonymous organizations (DAOs) are.

CO2. Comprehend and apply the major technical, social and economic implications of decentralized applications

CO3. Identify the role of consensus mechanisms, smart contracts, and token cryptoeconomics.

CO4. Develop a decentralized application with Web3.js, Truffle, and smart contracts.

Modules	Blooms Level*	Hours
MODULE 1: UNDERSTANDING THE BASICS - Blocklchain Premier - A closer look at Fabric - Writing smart contract using Fabric	L1, L2, L3	7
MODULE 2: PROVISIONING A NETWORK - Development network - Debugging Fabric	L1, L2,	9

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Provisioning a channel and installing chaincode Performing transactions on the network Updating channel configuration	L3	
MODULE 3: DEVELOPING APPLICATIONS Handling data privacy Using Fabric CA Securing communications Provisioning an open LDAP server Deployment over the cloud	L1, L2, L3	10

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. Siddharth Jain. "Programming Hyperledger Fabric, Creating Permissioned Blockchains". Manning, 2020.
2. Wu Xun. "Hyperledger Cookbook". Pact, 2019.

Reference Books

1. Shah, Nakul. Blockchain for Business with Hyperledger Fabric: A complete guide to enterprise blockchain implementation using Hyperledger Fabric. BPB Publications, 2019.
2. Nitin, Gaur, et al. "Hands-On Blockchain with Hyperledger". O'Reilly Media, O (2022).

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CO, PO and PSO mapping

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CO 1	2	2	3	--	--	--	--	--	--	--	--	--	2	1	-	2
CO 2	2	2	3	-	--	--	--	--	--	--	--	--	2	1	-	2
CO 3	2	2	3	-	-	--	--	--	--	--	--	--	2	1	-	3
CO 4	1	2	3	-	2	--	--	--	--	--	--	--	2	1	1	2
CO 5	2	3	3	-	-	--	--	--	--	--	--	--	2	1	1	3

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Course Code: CSE2724	IOT APPLICATION DEVELOPMENT DESIGN SERVICES	L	T	P	C
Version : 2023.1	Date of Approval: March 2023	2	0	0	2
Pre-requisites/Exposure	knowledge of IoT Application				
Co-requisites	NIL				

Course Objective:
To introduce students with mobile operating system and mobile development IDE's. The course will explain the core concepts related to mobile application development.

Modules	Blooms level*	Number of hours
Module 1: Introduction: Mobile operating system, Operating system structure, Constraints and Restrictions, Hardware configuration with mobile operating system, Features: Multitasking Scheduling, Memory Allocation, File System Interface, Keypad Interface, I/O Interface, Protection and Security, Multimedia features	L2 and L3	6
Module 2: Introduction to Mobile development IDE's, Introduction to Worklight basics, Optimization, pages and fragments , Writing a basic program- in Worklight Studio, Client technologies, Client side debugging, Creating adapters, Invoking adapters from Worklight Client application, Common Controls, Using Java in adapters, Programming exercise with Skins, Understanding Apache Cordova, Offline access, Encrypted cache deprecated, Using JSONStore	L2 and L3	6
Module 3: Android: Introduction to Android, Architecture, memory management, communication protocols, application development methods, deployment. Case Study: Design and development of Application using mobile application development platforms e.g. WorkLight	L2 and L3	6
Module 4: Ios Introduction to iOS, Architecture, memory management, communication protocols, application development methods, deployment. Case Study: Design and development of Application using mobile application development platforms e.g. WorkLight, Kendo, Appcon, Xcode, Xpages	L2and L3	6

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- Anubhav Pradhan, Anil V Deshpande, " Mobile Apps Development" Edition: I
- Teach Yourself Android Application Development In 24 Hours, Edition: I, Publication: SAMS
- Worklight resources

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References:

- Jeff McWherter, Scott Gowell "Professional Mobile Application Development", John Wiley & Sons, 2012.
- Barry Burd, "Android Application Development All in one for Dummies", Edition: I
- Neal Goldstein, Tony Bove, "iPhone Application Development All-In-One For Dummies", John Wiley & Sons
- Henry Lee, Eugene Chuvyrov, "Beginning Windows Phone App Development", Apress, 2012.

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO4**
CO1	--	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	--	--	--
CO2	**1**	--	**2**	**3**	--	--	--	--	--	--	**4**	--	**1**	**2**	--	--
CO3	--	**1**	--	--	--	--	--	--	--	**2**	**3**	--	**-**	**1**	**2**	--
CO4	**-**	**1**	**-**	--	**2**	--	--	--	--	--	--	--	**2**	**1**	--	--
CO5	--	--	**1**	--	--	--	--	--	**2**	--	--	--	--	--	--	**1**

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SEMESTER-VIII

CSE2837	PROJECT DISSERTATION	L	T	P	C
Version: 2017.1	Date of Approval: 14th June 2017	0	0	0	8
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The objective of this course is to provide practical training on some live/demo projects that will increase capability to work on actual problem in industry. It will be an in house training on some latest software which is in high demand in market. This training will be designed such that it will useful for their future employment in industry.

Course Objectives

The objective of this course is to

1. Provide practical training on live projects
2. Increase technical capabilities on solving real life problems in company environment

Course Outcomes

On completion of this summer internship, the students will be able to:

CO1: Demonstrate a sound technical knowledge of their selected project topic.

CO2: Design and develop engineering solutions to complex problems utilising a systems approach.

CO3: Analyse various approaches for solving a complex engineering problem using different tools and techniques

CO4: Demonstrate the knowledge, skills and attitudes of a professional engineer.

CO5: Apply technical skills and knowledge in completing the project.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	2	--	--	--	--	--	--	1	--	--	--	--	--	1	1
CO 2	1	1	--	--	--	--	--	--	1	--	--	--	--	--	1	1
CO 3	1	1	--	--	--	--	--	--	1	--	--	--	--	--	1	1
CO 4	1	1	--	--	--	--	--	--	1	--	--	--	--	--	1	1
C05	1	1	--	--	--	--			1	-	-	-	--	--	1	1

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CSE2804	DOT NET PROGRAMMING	L	T	P	C
Version:2017.1	Date of Approval: 14 June, 2017	2	0	0	2
Pre-requisites/Exposure	C#.NET, HTML and CSS				
Co-requisites	Nil				

Catalog Description
This course provides knowledge regarding Creating Dynamic Web Pages with the help of ASP.NET framework. Various topics

Course Objectives
The objective of this course is to
1. Equip the students with concepts of ASP.NET web applications including State management, Web Controls and ADO.NET.
2. Provide knowledge to develop secure ASP.NET web applications using C#.NET programming language.

Course Outcomes
On completion of this course, the students will be able to
CO1: Explain the components of .NET framework and create basic ASP.NET web page.
CO2: Use various standard and advance web controls for developing ASP.NET dynamic web pages and also create custom controls.
CO3: Establish database connectivity and perform various operations on database through ASP.NET web pages.
CO4: Maintain states at client and server site both.
CO5: Develop and use web services.

Modules	Blooms level*	Number of hours
MODULE 1: **.NET FRAMEWORK** **.NET Framework and its features** **CLR, MSIL,CTS, .NET class library, .NET Languages, CTS, assemblies, manifest, and metadata,** What is ASP.NET?, Difference between ASP and ASP.NET	L1, L2	4
MODULE 2: WEB CONTROLS Standard Controls, Validation controls, Adv. Controls, Custom Controls .	L2, L3 and L4	14
MODULE 3: ADO.NET **ADO.NET,ADO.NET Architecture** **Data Adapters, Datasets, Command, Data Reader Data Reader** **Data bind Controls** **Displaying data in data grid** XML in ADO.NET	L2, L3 and L4	7
MODULE 4: SECURITY ASP.NET applications : Security, Error Handling	L2 and L3	2

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MODULE 5: STATE MANAGEMENT **State Management : View State, Session State, Web Services**	L2, L3 and L4	5

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Stephen Walther, ASP.NET Unleashed, SAMS Publication
2. Matthew MacDonald, Beginning with ASP.NET 4.5 in C#, Apress Publications

Reference Books

1. Imar Spaanjaars, Beginning with ASP.NET 4.5.1 in C# and VB, Worx Publication
2. Jesse Liberty, Dan Hurwitz, Programming ASP.NET, OReilly.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	--	--	--	--	--	--	--	--	--	--	--	**2**	**3**	--	--
CO2	**2**	**2**	**1**	**2**	**1**	--	--	--	--	--	--	--	**2**	**2**	**3**	--
CO3	**2**	**2**	**1**	**2**	**2**	--	--	--	--	--	--	--	**2**	**2**	**3**	--
CO4	**2**	**1**	**1**	**2**	**1**	--	--	--	--	--	--	--	**2**	**2**	**2**	--
CO5	**2**	**1**	**1**	**2**	**2**	--	--	--	--	--	--	--	**2**	**2**	**2**	--

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CSE2806	DOT NET PROGRAMMING LAB	L	T	P	C
Version 2017.1	Date of Approval:14, June, 2017	0	0	2	1
Pre-requisites/Exposure	C#.NET, HTML and CSS				
Co-requisites	Nil				

Catalog Description

This lab course covers development of Web applications using ASP.NET. The concepts are designed to impart the knowledge of ASP.NET framework concepts at implementation level. The major topic covered includes theme, state management, web controls and database connectivity using ADO.NET and web services.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of ASP.NET web applications including State management, Web Controls and ADO.NET.
2. Provide knowledge to develop secure ASP.NET web applications using C#.NET programming language.

Course Outcomes

On completion of this course, the students will be able to

CO1: Use various standard and advance web controls for developing ASP.NET dynamic web pages and also create custom controls.

CO2: Maintain states at client and server site both.

CO3: Establish database connectivity and perform various operations on database through ASP.NET web pages.

CO4: Develop and use web services.

Modules	Blooms level*	Number of hours
1. Basics of ASP.NET Page a) Write a program to implement C#.NET class with properties and methods. b) Design a Login Page, which displays a Welcome Page on successful Login and an error message in case of invalid Id/Password. c) Design a form and apply themes (design time and dynamically).	L1, L2	4
2. State Management a) Implement state management for Login page which move to welcome page when credentials are correct. The welcome page displays a welcome message along with the user Id. b) Implement various state management methods using a suitable web form.		2

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3. Built-in Controls, Custom Controls a) Design any web form and apply various validation controls. b) Create a web form which can work in Hindi and English language both. c) Design a web form to upload an image to server. d) Design a custom control, Numeric Textbox, which should accept only integer value for a particular range. The range should be customizable.	L2, L3 and L4	6
4. ADO.NET a) Create any database table and apply basic operations (Insert/Delete/Update) on it using ASP.NET application. b) Implement various methods of execution of SQL command. c) Display data in a Grid and perform basic database operations.	L2, L3 and L4	4
5. Security, Web Services a) Develop any web application to illustrate SQL Injection attack and redesign it to prevent the attack. b) Develop a web application to illustrate XSS attack and redesign it to prevent the attack	L2 and L3	2
6. Web Application **Create a small web application having some application.**	L2, L3 and L4	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Stephen Walther, ASP.NET Unleashed, SAMS Publication
2. Matthew MacDonald, Beginning with ASP.NET 4.5 in C#, Apress Publications

Reference Books

1. Imar Spaanjaars, Beginning with ASP.NET 4.5.1 in C# and VB, Worx Publication
2. Jesse Liberty, Dan Hurwitz, Programming ASP.NET, OReilly.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4
CO1	2	1	--	--	--	--	--	--	--	--	--	--	2	2	2	--
CO2	2	1	--	--	--	--	--	--	--	--	--	--	2	2	2	--
CO3	1	1	--	--	--	--	--	--	--	--	--	--	2	1	1	--
CO4	1	1	--	--	--	--	--	--	--	--	--	--	2	1	1	--

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CSE2812	ADVANCED ROBOTIC PROCESS AUTOMATION DESIGN & DEVELOPMENT	L	T	P	C
Version 2019.1	Date of Approval: 15 May2019	3	0	0	3
Pre-requisites/Exposure	Basic Networking Concepts				
Co-requisites	Nil				

Catalog Description

This course aims at providing knowledge of basic concepts of Robotic Process Automation to University students. It further builds on these concepts and introduces key RPA Design and Development strategies and methodologies specifically in context of UiPath products. The student undergoing the course shall develop the competence to design and develop a robot for a defined process.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of robotic process automation
2. Provide an overview of designing with uipath software.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain key terms and trends around the robotic process automationalong with its physical and logical design

CO2: Understand the potential and value of the robotic process automation.

CO3: Describe the technologies used for the robotic process automationand mobile devices, including (passive and active) sensors, the physical communications layer, communications protocols, programming frameworks,.

CO4: Design programs and have hands on experience on uipath software

CO5:Develop RPA programs of moderate complexity for a well-used robotic automation process using uipath.

Modules	Blooms level*	Number of hours
Module 1: Exception handling and Best Practices **Debugging and Exception Handling- Debugging** Tools, Strategies for solving issues, Catching errors. **Project Organization-** Concept of project organization, Best practices, Avoiding pitfalls, Invoke Activity.	L1, L2	8

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Module II: Introduction to Orchestrator Orchestrator, Tenants, Authentication, Users, Roles, Robots, Environments, Queues & Transactions, Schedules.	L2, L3 and L4	8
Module III: merging and Future Trends in IT Artificial Intelligence, Machine Learning, Agent awareness, Natural Language Processing Computer Vision	L2, L3 and L4	8
Module IV: Capstone Project Real life case studies which can be used to apply the concepts learnt during the course. The projects shall test student's skills right from process transformation and documentation to the design and development of the actual robot	L2, L3 and L4	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

"Learning Robotic Process Automation" By Alok Mani Tripathi,Packt Publications,Ist Edition,2018

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	--	--	**3**	--	--	--	--	--	--	**2**	--	**1**	**1**	-	-
CO2	**1**	--	**1**	**2**	--	--	--	--	--	--	--	--	-	**1**	-	-
CO3	**1**	--	**1**	**2**	--	--	--	--	--	--	--	--	-	**1**	-	**2**
CO4	**1**	--	--	**2**	--	--	--	--	--	--	--	--	**1**	**1**	-	**2**

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CSE2803	DIGITAL IMAGE PROCESSING	L	T	P	C
Version: 2017.1	Date of Approval: 14th June 2017	2	0	0	2
Pre-requisites/Exposure	Basics of Computer Graphics				
Co-requisites	NIL				

Catalog Description

This course gives students an insight into the basics of Image Processing along with visualization of real concept of Image processing. Concepts covered would enable students to define and differentiate among various types of image refinement. Further they would be able to gain insights about various Image restoration and modification technique.

Course Objectives

Processing color and grayscale images or other two-dimensional signals has become an important tool for research and investigation in many areas of science and engineering. *Digital Image Processing* is designed to give professionals and students a powerful collection of fundamental and advanced image processing tools on the desktop. Digital Image Processing takes full advantage of the computational technology of Mathematica.

Course Outcomes

On completion of this course, the students will be able to
CO1: Define and explain introductory part of Digital Image Processing
CO2: List out the Image Enhancement techniques in the Spatial Domain
CO3: Explain concepts of Image Enhancement in the Frequency Domain
CO4: Describe the architecture Image Compression
CO5: Explain the basics of Representation and Description

Modules	Blooms level*	Number of hours

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MODULE 1: **Introduction and Digital Image Fundamentals** The origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamentals Steps in Image Processing, Elements of Digital Image Processing Systems, Image Sampling and Quantization, Some basic relationships like Neighbors, Connectivity, Distance Measures between pixels, Linear and Non Linear Operations.	L1 and L2	8
MODULE 2: **Image Enhancement in the Spatial Domain** Some basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic and Logic operations, Basics of Spatial Filters, Smoothening and Sharpening Spatial Filters, Combining Spatial Enhancement Methods.	L2 and L3	8
MODULE 3: **Image Enhancement in the Frequency Domain** Introduction to Fourier Transform and the frequency Domain, Smoothing and Sharpening Frequency Domain Filters, Homomorphism Filtering.	L1 and L2	10
MODULE 4: **Image Compression** Coding, Interpixel and Psychovisual Redundancy, Image Compression models, Elements of Information Theory, Error free comparison, Lossy compression, Image compression standards. **Image Segmentation** Detection of Discontinuities, Edge linking and boundary detection, Threshold, Region Oriented Segmentation, Motion based segmentation.	L2 and L3	12
MODULE 5: **Representation and Description** Representation, Boundary Descriptors, Regional Descriptors, Use of Principal Components for Description, Introduction to Morphology, Some basic Morphological Algorithms. **Object Recognition** Patterns and Pattern Classes, Decision-Theoretic Methods, Structural Methods.	L2 and L3	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

Text:

- Rafael C. Conzalez & Richard E. Woods, "Digital Image Processing", 2nd edition, Pearson Education.
- A. K. Jain, "Fundamental of Digital Image Processing", PHI.

References:

- Rosefield Kak, "Digital Picture Processing",
- W.K. Pratt, "Digital Image Processing",

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

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Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4
CO1	1	2	--	--	--	--	--	--	--	--	--	--	1	--	--	--
CO2	1	--	2	--	--	--	--	--	--	--	--	--	1	2	--	--
CO3	3	--	1	--	2	--	--	--	--	--	--	--	1	3	2	--
CO4	3	--	2	--	1	--	--	--	--	--	--	--	1	--	2	--
CO5	3	--	2	--	1	--	--	--	--	--	--	--	1	--	2	--

1: strongly related, 2: moderately related and 3: weakly related

Course Code: CSE2805	DIGITAL IMAGE PROCESSING LAB	L	T	P	C
Version 2017.1	Date of Approval: 15May 2019	0	0	2	1
Pre-requisites/Exposure	Basics of MATLAB				
Co-requisites	NIL				

Catalog Description

In this Lab course first student should learn about advanced level of software used for easy calculation and toolbox used for software like MATLAB.

Course Objectives

The objective of this course is to

- Make the students apply knowledge of various Image processing & pattern recognition required for solving complex problems.
- Provide a demonstration of different types of image processing techniques through MATAB toolbox.

Course Outcomes

On completion of this course, the students will be able to

CO1: Acquiring knowledge of Basics of High-end calculation software and need in Computer Science & engineering

CO2: Demonstrate the All preliminary functions in MATLAB

CO3: Apply the knowledge of all the basics function and toolbox knowledge of MATLAB

CO4: Demonstrate the Use of MATLAB in image Processing

CO5: Demonstrate usage of applications involving with Image processing & Recognition Its Toolbox used by MATLAB

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Modules/Topics Covered**	Blooms level*	Number of hours
1. Introduction of MATLAB (e) Basic Variable deceleration & its operation (f) Function use & its application	L3, L5	4
2. Sample Programs in MATLAB (e) Basic use of Matrix and Graph Plotting (f) Different type of graph plotting with use of different -2 type of data	L3, L5	6
3. Sample Programs using MATLAB functions (l) Create a basic program MATLAB using functions (m) Use of basic function Image processing (n) Practice on Basic function of Image processing tool box.	L3, L5	6
4. Sample programs of ANN functions (c) Practice on Pattern Recognition functions in MATLAB (d) Write a program for training a small network in MATLAB	L3, L5	6
5. Sample Programs using ANN toolbox & Image processing toolbox (b) Demonstrate the use of ANN tool box & Image processing toolbox and write a program after combining it.	L3, L5	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

Text & References:

- Rafael C. Gonzalez & Richard E. Woods, "Image Processing Using MATLAB", 2nd edition, Pearson Education.
- "Pattern classifications", Richard O. Duda, PeterE. Hart, David G. Stroke. Wiley student edition, Second Edition

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA					EE
Components	**A**	**PR**	**LR**	**V**	**70**
Weightage (%)	5	10	10	5	

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE- External Exam

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	**2**	**1**	--	--	--	--	--	--	--	--	--	--	**2**	--	--	--
CO 2	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO 3	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--

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CO 4	**1**	**3**	**2**	--	--	--	--	--	--	--	--	--	**2**	--	**2**	--
CO 5	**1**	**3**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--

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Course Code: CSE2813	**INTRUSION DETECTION AND PREVENTION SYSTEM**	L	T	P	C
Version 2022.1	Date of Approval: May 2022	3	0	0	3
Pre-requisites/Exposure	Basic Networking				
Co-requisites	Nil				

Catalog Description

Intrusion Detection System (IDS) is a rapidly growing field that deals with detecting and responding to malicious network traffic and computer misuse. Intrusion detection is the process of identifying and (possibly) responding to malicious activities targeted at computing and network resources. Any hardware or software automation that monitors, detects or responds to events occurring in a network or on a host computer is considered relevant to the intrusion detection approach. This course introduces various network malicious activities, detection techniques and evaluation criteria.

Course Objectives

The objective of this course is to

- Equip the students with various network attacks and their examples.
- Provide knowledge of various approaches to develop IDS and also to evaluate them.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the network attacks and their possible reasons.

CO2: Compare currently available detection approaches to detect intrusion and anomalous activities.

CO3: Understand strengths and weaknesses of machine learning and data mining approached to choose the best approach to design and develop IDS.

CO4: Apply number of approaches to evaluate IDS using various evaluation criteria.

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Modules	Blooms level*	Number of hours
MODULE 1:NETWORK ATTACKS Attack Taxonomies, Probes: IPSweep and PortSweep, NMap , MScan, SAINT , Satan, Privilege Escalation Attacks:Buffer Overflow Attacks, Misconfiguration Attacks , Race-condition Attacks , Man-in-the-Middle Attacks. Social Engineering Attacks**.** Denial of Service (DoS) and Distributed Denial of Service (DDoS) Attacks: Detection Approaches for DoS and DDoS Attacks, Prevention and Response for DoS and DDoS Attacks, Examples of DoS and DDoS Attacks.Worms Attacks:Modeling and Analysis of Worm Behaviors, Detection and Monitoring of Worm Attacks, Worms Containment**,** Examples of Well Known Worm Attacks. Routing Attacks: OSPF Attacks, BGP Attacks.	L1 and L2	6
MODULE 2: DETECTION APPROACHES Misuse Detection: Pattern Matching, Rule-based Techniques, State-based Techniques, Techniques based on Data Mining Anomaly Detection: Advanced Statistical Models,Rule based Techniques, Biological Models, Learning Models Specification-based Detection, Hybrid Detection	L1 and L2	8
MODULE 3: THEORETICAL FOUNDATION OF DETECTION Taxonomy of Anomaly Detection Systems, Fuzzy Logic, Bayes Theory, Artificial Neural Networks, Support Vector Machine (SVM), Evolutionary Computation, Association Rules, Clustering, Signal Processing Techniques Based Models, Comparative Study of Anomaly Detection Techniques	L1, L2 and L3	10
MODULE 4: ARCHITECTURE AND IMPLEMENTATION Centralized, Distributed, Cooperative Intrusion Detection, Alert Management and Correlation: Data Fusion, Alert Correlation, Cooperative Intrusion Detection	L1 and L2	4
MODULE 5: EVALUATION CRITERIA & INTRUSION RESPONSE Accuracy, Performance, Completeness, Timely Response, Adaptation and Cost-Sensitivity, Intrusion Tolerance and Attack Resistance, Test, Evaluation and Data Sets. Response Type, Response Approach, Survivability and Intrusion Tolerance, Case study of any commercial IDS.	L2 and L4	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Ali A. Ghorbani, Wei Lu, "Network Intrusion Detection and Prevention: Concepts and Techniques", Springer, 2010.
- Matthew MacDonald, Beginning with ASP.NET 4.5 in C#, Apress Publications

Reference Books

1. Carl Enrolf, Eugene Schultz, Jim Mellander, "Intrusion detection and Prevention", McGraw Hill, 2004
2. Paul E. Proctor, "The Practical Intrusion Detection Handbook ", Prentice Hall , 2001.
3. Earl Carter, Jonathan Hogue, "Intrusion Prevention Fundamentals", Pearson Education, 2006.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	--	2	--	--	--	--	--	--	--	--	--	--	1	--	3	--
CO2	1	1	3	--	5	--	--	--	--	--	--	--	1	--	3	--
CO3	1	1	2	--	5	--	--	--	--	--	--	--	1	--	3	--
CO4	1	2	--	--	1	--	--	--	--	--	--	--	1	--	3	--

1: strongly related, 2: moderately related and 3: weakly related

CSE2814	CLOUD COMPUTING TOOLS AND TECHNIQUES	L	T	P	C
Version : 2023.1	Date of Approval: March 2023	3	0	0	3
Pre-requisites/Exposure	General Networking and basics of vitrtualization				
Co-requisites	Nil				

Catalog Description

The course introduces the basic concepts and methods of Cloud computing and develops the concepts and skills necessary to build applications in Cloud environments. The course starts by explaining the concepts of cloud computing, cloud architecture, model and the concepts of Virtualization. It then explains how such ideas form the basis for creating Computing Clouds where the concept of resources is virtualized. Case studies are used to show how applications can be run in a Cloud and the principles of creating images to run in Clouds are explained. The programming skills for business models that underlie Cloud Computing are also presented.

Course Objectives

The objective of this course is to

- Equip the students with concepts virtualization and Cloud
- Provide an overview of security issues and various tools available in Cloud

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain and differentiate between different types of computing and also determine them with the upcoming Cloud Computing environment.

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CO 2: Identify the different layers in the architecture of Cloud and explain the different services, deployment models and types of virtualization available.
CO 3: Explain the power of scalability and fault tolerant system and other features of cloud, analyzing the management of cloud in business.
CO 4: Explain, apply and compare the various security issues and their solutions and policies for security in Cloud environment.
CO 5: Analyze programming Models, its workings and comparing them with each other.

Modules	Blooms level*	Number of hours
MODULE 1: **Cloud Computing Overview** Origins of Cloud computing – Cloud components - Essential characteristics – On-demand self-service , Broad network access, Location independent resource pooling ,Rapid elasticity , Measured service, Comparing cloud providers with traditional IT service providers, Roots of cloud computing.	L1, L2 ,L3	8
MODULE 2: **Cloud Insights** Architectural influences – High-performance computing, Utility and Enterprise grid computing, Cloud scenarios – Benefits: scalability ,simplicity ,vendors ,security, Limitations – Sensitive information - Application development- security level of third party - security benefits, Regularity issues: Government policies.	L1,L2, L3	8
MODULE 3: **Cloud Architecture- Layers and Models** Layers in cloud architecture, Software as a Service (SaaS), features of SaaS and benefits, Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits, Service providers, challenges and risks in cloud adoption. Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing.	L1, L2 and L4	8
MODULE 4: **Cloud Simulators- CloudSim and GreenCloud** Introduction to Simulator, understanding CloudSim simulator, CloudSim Architecture(User code, CloudSim, GridSim, SimJava) Understanding Working platform for CloudSim, Introduction to GreenCloud .	L2, L3 and L4	7
MODULE 5: **Introduction to VMWare Simulator** Basics of VMWare, advantages of VMware virtualization, using Vmware workstation, creating virtual machines-understanding virtual machines, create a new virtual machine on local host, cloning virtual machines, virtualize a physical machine, starting and stopping a virtual machine.	L2, L4	5

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Kai Hwang, Geoffrey C Fox & Jack G Dongarra, "**Distributed and Cloud Computing, From Parallel Processing to the Internet of Things**", Morgan Kaufmann Publishers, 2012.
- Michael Miller, "**Cloud Computing**", Pearson,2008.
- Anthony T. Velte, Toby J. Velte & Robert Elsenpeter, **"Cloud Computing- A**

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practical Approach", Mc Graw Hill, Chennai, 2017.

Reference Books

- John W.Rittinghouse and James F.Ransome, "**Cloud Computing: Implementation, Management, and Security**", CRC Press, 2010
- Toby Velte, Anthony Velte, Robert Elsenpeter, "**Cloud Computing, A Practical Approach**", TMH, 2009.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	--	3	--	--	--	--	--	--	--	2	--	1	1	-	-
CO 2	1	2	3	--	2	--	--	--	--	--	--	--	1	1	-	-
CO 3	1	2	--	--	--	--	--	--	--	--	1	--	-	1	-	2
CO 4	1	--	3	--	2	1	--	--	--	--	--	--	-	1	-	2
CO 5	1	--	2	--	1	--	--	--	--	--	--	--		1	-	-

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Course Code: CSE2815	BLOCKCHAIN APPLICATIONS IN REAL WORLD AND THE LEGAL ASPECTS	L	T	P	C
Version 2023.1	Date of Approval: March 2023	3	0	0	3
Pre-requisites/Exposure	Fundamentals of Blockchain Technology				
Co-requisites	Nil				

Catalog Description

Blockchain uses go well beyond bitcoin and cryptocurrency. With its ability to increase openness and justice while simultaneously saving organizations time and money, technology is having an impact across a wide range of industries, from contract enforcement to government efficiency. This course covers the blockchain technology's potential applications and provides information to help students to better comprehend blockchain and its economic implications. This course also covers the legal and regulatory issues that it raises. Legal aspects of cryptocurrencies (like bitcoin, Ethereum), smart contracts, and digital goods ownership registries are among the topics to be covered. The course will also look at how blockchain technologies are being regulated at the state and federal levels, as well as in a few jurisdictions.

Course Objectives

The objective of this course is to:

- Introduce the practicalities of Distributed Ledger Technologies, and Cryptocurrency in business world.
- Focus on solving business problems adopting blockchain technology.

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- Understand the practical commercialization of blockchain technology in different applications.
- Identify various use cases of blockchain and assessing the risks in adopting blockchain technology.

Course Outcomes

On completion of this course, the students will be able to:

CO1. Realize and describe the adoption of blockchain technology in business scenarios and new marketplace.

CO2. Know and explain the practical commercialization of blockchain technology in different applications including digital currency, smart infrastructure, healthcare etc.

CO3. Comprehend and explain the various use cases of blockchain: Describe the risks associated with blockchain technology in practical applications.

CO4. Understand and describe legal implications of blockchain technology in in Money Transmission , Money Laundering, and Taxation by government.

Modules	Blooms Level*	Hours
MODULE 1: BLOCKCHAIN ADOPTION IN BUSINESS What Does Blockchain Solve? - Trust, Transparency and Openness, Immutability, New Using Blockchain Technology, Marketplace for Anything, Decentralized Utopia – Reality or Dream? Blockchain Adoption - How Will Blockchain Be Adopted? - The User Interface, The Understanding of Blockchain Technology, The Killer App for Blockchain, Daily Life Use Cases, Winning Business Models.		
MODULE 2: APPLICATIONS OF BLOCKCHAIN TECHNOLOGY Where Can Blockchain Technology Be Applied?- Industries, The Retail and Supply Chain Industry (Including Brands, Consumer Products, and Manufacturers) The Finance and Financial Services Industry, Healthcare. How to Commercialize Blockchain/Reach Its Potential - Blockchain Is a Network Play, Blockchain Business Case, Benefits of Implementing Blockchain Technology, Blockchain Technology Benefits Realization, Example Blockchain Implementation Plans in Retail, ASG Provenance Tracking Example	L1, L2	9
MODULE 3: USE CASES AND RISKS OF BLOCKCHAIN TECHNOLOGY Use Cases - Financial Transactions, Cryptocurrencies, Tokenization, Identity Management, Loyalty, Gift Cards, Warranty Management, Refunds Management, Improved Sourcing and Procurement, Certification and, Authentication, Inventory Management, Traceability, Provenance, Counterfeit Products. Risks of Implementing Blockchain Technology - Change (Inertia of People), User's Adoption, Scale and Complexity, Standardization, Government Regulations, Millennials and Younger Generations, Ignorance, Quantum and New Technology	L1, L2	9

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MODULE 4: LEGAL IMPLICATIONS OF CRYPTO TECHNOLOGY Money Transmission & Cryptocurrency, Money Laundering, Countering Money Laundering using Crypto Technology, Taxation in Cryptocurrency, Contracting with Blockchain, Agencies, IPR & Blockchain, Open Source Crypto Technologies, Securities Regulations, Initial Coin Offerings, Decentralized Autonomous Organizations (DAO's).	L2	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. Welfare, Antony. Commercializing blockchain: Strategic applications in the real world. John Wiley & Sons, 2019.

Reference Books

1. Panda, Sandeep Kumar, et al., eds. Blockchain Technology: Applications and Challenges. Springer International Publishing, 2021.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	**2**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**-**	**2**
CO 2	**2**	**2**	**3**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**-**	**2**
CO 3	**2**	**2**	**3**	**-**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**-**	**3**
CO 4	**1**	**2**	**3**	**-**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**1**	**2**
CO 5	**2**	**3**	**3**	**-**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**1**	**3**

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Course Code: CSE2816	DATA MANAGEMENT IN IOT	L	T	P	C
Version 2023.1	Date of Approval :March 2023	3	0	0	3
Pre-requisites/Exposure	Data Management				
Co-requisites	Nil				

Catalog Description

Learn how to design and implement IoT applications that manage big data, streaming data, and/or distributed data. The learner will be able to programme IoT applications to manage data where data volume and/or data rate is high or data is streamed. The course covers techniques to identify end-to-end data flow characteristics of an application and apply appropriate messaging models to build solutions. This Five week course covers techniques for large scale processing of data on the server / cloud including analytics using tools. The course covers algorithms / techniques for specific patterns for distributed processing on the devices as well as techniques for fault-tolerant data processing.

Course Objectives

The course makes use of experiential learning components such as Case studies, and Practical demonstrations: Exploratory Data Analysis, Predictive Analytics, Time series, and Video Analysis, Real-time analytics and Big data platforms: Hadoop, Storm and Spark.

Course Outcomes

Upon successful completion of this course, learners will be able to:

CO1. Manage data in IoT systems

CO 2. Explore and analyses data

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CO 3. Manage Big Data in IoT systems.
CO4: Deploy IoT systems

Modules	Blooms level*	Number of hours
Module I: Introduction to Data Management in IoT Data in IoT • Data Life Cycle in IoT with example • Data Sources in IoT • Types of IoT Data. Challenges in managing IoT Data • Challenges in data storage • Challenges in data processing • Technologies for the challenges • Demonstrations of Timeseries, Dynamo DB Process of Data Analytics • Role of analytics in IoT • Capabilities of Data Analytics • Technologies for Data Analytics • Overview of AWS services for IoT data • Demonstrations	L1, L2 and L3	8
Module II: Python Basics • Variables, identifiers, operators, expressions, control statements • Strings, functions, lambda functions, modules, packages • Data structures: lists, tuples, sets, dictionaries • Classes • Hands-on exercises.	L1,L2	10
Module III: Data acquisition in distributed sensor networks • Characteristics of distributed sensor networks • Data models for distributed sensor networks • Query processing in distributed sensor networks • Query optimization issues • Approaches for data acquisition Sensor data cleaning • Sources of errors • Probabilistic models: Online Bayesian Approach • Regression Models • Hands-on exercises Data Acquisition in RFID • Characteristics of RFID data • RFID Data cleaning: Missed data reading and unreliable data readings • RFID Data cleaning: Data redundancy	L1, L2	7
Module IV: Data Preparation • Introduction to Python Pandas library • Dealing with duplicates, null values, Date and time values Module Topics Exploratory Data Analysis • Exploring numeric and categorical data • Single and multi variable analysis • Introduction to Python matplotlib • Introduction to Orange, visual programming tool •Predictive Data Analytics • Techniques for identifying associations and correlations • Techniques for classification and prediction • Techniques for clustering • Introduction to Python Sci-kit library • Introduction to Orange, visual programming tool for ML • Hands-on exercise Time series analysis • Windows, smoothing • Stationary, non-Stationary models • Linear models on Time-series using Python Image, Video and Speech analysis • Concepts and principles • Introduction to TensorFlow, Keras, OpenCV	L1, L2	7
Module V: Enterprise Networks Introduction to Virtual Networks, Blue tooth technology, Blue tooth Protocols. Advanced techniques in mobile computing.	L1, L2	4

Text Books:

1. Francis daCosta, **"Rethinking the Internet of Things: A Scalable Approach to Connecting Everything",** 1st Edition, Apress Publications, 2013.
2. Big Data Management and the Internet of things for Improved Health Systems by Brojo Kishore Mishra

Examination Scheme:

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Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	3	--	1	1	--	--	--	--	--	--	2	1	2	--	--
CO 2	1	2	--	1	--	--	--	--	--	--	3	--	2	1	--	2
CO 3	1	3	--	1	1	--	--	--	--	--	3	2	--	--	1	2
CO 4	1	--	1	3	1	--	--	--	3	--	--	2	2	1	--	--

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Amity School of Engg. & Technology

Bachelor of Technology - Electronics & Communication Engineering

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Curriculum & Scheme of Examination

2023

AMITY UNIVERSITY HARYANA
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PREAMBLE

Amity University Haryana aims to achieve academic excellence by providing multi-faceted education to students and encourage them to reach the pinnacle of success. The University has designed a system that would provide rigorous academic programme with necessary skills to enable them to excel in their careers.

This booklet contains the Programme Structure, the Detailed Curriculum and the Scheme of Examination. The Programme Structure includes the courses (Core and Elective), arranged semester wise. The importance of each course is defined in terms of credits attached to it. The credit units attached to each course has been further defined in terms of contact hours i.e. Lecture Hours (L), Tutorial Hours (T), Practical Hours (P). Towards earning credits in terms of contact hours, 1 Lecture and 1 Tutorial per week are rated as 1 credit each and 2 Practical hours per week are rated as 1 credit. Thus, for example, an L-T-P structure of 3-0-0 will have 3 credits, 3-1-0 will have 4 credits, and 3-1-2 will have 5 credits.

The Curriculum and Scheme of Examination of each course includes the course objectives, course contents, scheme of examination and the list of text and references. The scheme of examination defines the various components of evaluation and the weightage attached to each component. The different codes used for the components of evaluation and the weightage attached to them are:

Components	Codes	Weightage (%)
Case Discussion/ Presentation/ Analysis	C	05 - 10
Home Assignment	H	05 - 10
Project	P	05 - 10
Seminar	S	05 - 10
Viva	V	05 - 10
Quiz	Q	05 - 10
Class Test	CT	10 - 15
Attendance	A	05
End Semester Examination	EE	70

It is hoped that it will help the students study in a planned and a structured manner and promote effective learning. Wishing you an intellectually stimulating stay at Amity University.

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POs_B.Tech Programme

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

P04. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

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PSOs for B.Tech (Electronics & Communication Engineering)

PSO1: Apply the knowledge of science, mathematics, electronics & communication related technology and other engineering disciplines to identify and solve relevant engineering problems across a broad range of application areas.

PSO2: Able to apply the knowledge & skills gained in the field of signal processing, microelectronics, embedded system, control system and circuit system to solve the industrial problems.

PSO3: Able to apply technical knowledge and skills gained in RF & microwave and communication system into telecom sector with an understanding of realistic constraints.

PSO4: Able to comprehend and write effective technical project reports in multidisciplinary environment with regards to evolving technological advancements.

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Supporting document for PSOs of B.Tech (Electronics & Communication Engineering)

PSO1		PSO2			PSO3			PSO4		
Apply the knowledge of science, mathematics, electronics & communication related technology and other engineering disciplines to identify and solve relevant engineering problems across a broad range of application areas.		Able to apply the knowledge & skills gained in the field of signal processing, microelectronics, embedded system, control system and circuit system to solve the industrial problems.			Able to apply technical knowledge and skills gained in communication system, instrumentation and interdisciplinary domains into telecom sector with an understanding of realistic constraints.			Able to comprehend and write effective technical project reports in multidisciplinary environment with regards to evolving technological advancements.		
1	2	3	4	5	6	7	8	9	10	11
Basic Science & Engineering Courses	**Basic Electronics Engineering Courses**	**Signals and Control Theory**	**Design & Fabrication**	**Programming**	**Communication Systems**	**Instrumentation**	**Interdisciplinary domain**	**Project (Dissertation)**	**Ethics/Env. & social issues**	**Value added courses**
Engineering Mathematics-I	Analog Electronics	Circuits & Systems	PCB Fabrications	Introduction to Computers & Programming in C	Digital Communications	Measurement & Measuring Instruments	Computer Architecture	Summer Internship Evaluation-I	Environmental Studies	English-I
Engineering Mathematics-II	Digital Electronics	Control Systems	Digital Circuits & Systems	Object Oriented Programming using C++	Antenna & Wave Propagation	Biomedical Instrumentation	Fuzzy Logic & Neural Networks	Summer Internship Evaluation-II	Personality, Nationalism and Human Values	English-II
Engineering Physics	Electromagnetic Field Theory	Signals & Systems	VLSI Design	Data Structure using C	Radar & Satellite Communications	Microprocessor Systems	Operating System	Project (Dissertation)	Employability Skills	Understanding Self for Effectiveness
Engineering Chemistry		Digital Image Processing	Embedded System	RTOS Programming	Microwave Engineering	Virtual Instrumentation	Computer Networks	Independent Study	Relationship Management	Problem Solving and Creative Thinking
Elements of Mechanical Engineering			Advanced VLSI Design	Verilog Programming	Mobile Communications		Advanced Networking	Term Paper		Effective Listening
Electrical Science				Software Engineering	Optical Communications		Information Storage & Management			Group Dynamics and Team Building

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Engineering Graphics Lab				Java Programming			Database Management Systems			Presentation Skills
				MATLAB						Stress and Coping Strategies
										Reading & Comprehension
										Corporate Communication
										Interpersonal Communication
										Workplace Communication
										Personal & Professional Excellence

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Syllabus - First Semester

ENGINEERING MATHEMATICS - I

Course Code: ECE2112 **Credit Units: 04**

Course Objective:
The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects. Here our intention is to make the students acquainted with the concept of basic topics from Mathematics, which they need to pursue their Engineering degree in different disciplines.

Course Contents:

Module I: Differential Calculus
Successive differentiation, Leibnitz's theorem (without proof), Mean value theorem, Taylor's theorem (proof), Remainder terms, Asymptote & Curvature, Partial derivatives, Chain rule, Differentiation of Implicit functions, Exact differentials, Tangents and Normals, Maxima, Approximations, Differentiation under integral sign, Jacobians and transformations of coordinates.

Module II: Integral Calculus
Fundamental theorems, Reduction formulae, Properties of definite integrals, Applications to length, area, volume, surface of revolution, improper integrals, Multiple Integrals-Double integrals, Applications to areas, volumes.

Module III: Ordinary Differential Equations
Formation of ODEs, Definition of order, degree & solutions, ODE of first order: Method of separation of variables, homogeneous and non homogeneous equations, Exactness & integrating factors, Linear equations & Bernoulli equations, General linear ODE of nth order, Solution of homogeneous equations, Operator method, Method of undetermined coefficients, Solution of simple simultaneous ODE.

Module IV: Vector Calculus
Scalar and Vector Field, Derivative of a Vector, Gradient, Directional Derivative, Divergence and Curl and their Physical Significance, Arc Length, Tangent, Directional Derivative, Evaluation of Line Integral, Green's Theorem in Plane (without proof), Representation of Surfaces, Tangent Plane and Surface Normal, Surface Integral, Stoke's Theorem (without proof), Gauss Divergence Theorem (without proof).

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:
- Differential Calculus by Shanti Narain
- Integral Calculus by Shanti Narain

References:
- Differential Equation by A.R. Forsyth
- Higher Engineering Mathematics by H.K. Dass

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ENGINEERING CHEMISTRY

Course Code: ECE2114 **Credit Units: 02**

Course Objective:

Four basic sciences, Physics, Chemistry, Mathematics and Biology are the building blocks in engineering and technology. Chemistry is essential to develop analytical capabilities of students, so that they can characterize, transform and use materials in engineering and apply knowledge in their field. All engineering fields have unique bonds with chemistry whether it is Aerospace, Mechanical, Environmental and other fields the makeup of substances is always a key factor, which must be known. For electronics and computer science engineering, apart from the material, computer modeling and simulation knowledge can be inherited from the molecule designing. The upcoming field of technology like Nanotechnology and Biotechnology depends fully on the knowledge of basic chemistry. With this versatile need in view, course has been designed in such a way so that the student should get an overview of the whole subject.

Course Contents:

Module I: Water Technology

Introduction and specifications of water,
Hardness and its determination (EDTA method only), Alkalinity,
Boiler feed water, boiler problems – scale, sludge, priming & foaming: causes & prevention, Boiler problems – caustic embrittlement & corrosion: causes & prevention,
Carbonate & phosphate conditioning, colloidal conditioning & calgon treatment
Water softening processes: Lime – soda process, Ion exchange method, Water for domestic use.

Module II: Fuels

Classification, calorific value of fuel, (gross and net), Determination of calorific value of fuels, bomb calorimeter,Solid fuels - Proximate and ultimate analysis, Octane & Cetane No. and its significance.
Numericals on combustion

Module III: Instrumental Methods of analysis

Introduction; Principles of spectroscopy; Laws of absorbance
IR: Principle, Instrumentation, Application
UV: Principle, Instrumentation, Application
NMR: Principle, Instrumentation, Application

Module IV: Lubricants

Introduction; Mechanism of Lubrication; Types of Lubricants; Chemical structure related to Lubrication;
Properties of lubricants; Viscosity and Viscosity Index; Iodine Value; Aniline Point; Emulsion number; Flash Point; Fire Point; Drop Point; Cloud Point; Pour Point.
Selection of Lubricants.

Module V: Corrosion

Introduction, Mechanism of dry and wet corrosion,
Types of corrosion-Galvanic, Concentration cell, soil, pitting, intergranular, waterline. Passivity.
Factors influencing corrosion. Corrosion control.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Text & References:

Text:

- Engineering Chemistry- Jain and Jain
- Engineering Chemistry- Sunita Rattan
- Engineering Chemistry-Shashi Chawla

References:

- Engineering Chemistry –Dara and Dara
- Spectroscopy- Y.R Sharma
- Corrosion Engineering – Fontenna and Greene

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ECE2104	ELEMENTS OF MECHANICAL ENGINEERING	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	3	0	0	3
Pre-requisites/Exposure	NIL				
Co-requisites	NIL				

Catalog Description

In this course the concepts of various prime movers like I C Engine, Gas Turbine, Steam Turbine, and Hydraulic Turbine are discussed in detail. Concept of power absorbing devices and power transmission devices are discussed in detail. Elementary concept of mechanics of material and machine tool also discussed in detail. The aim of this course is to make the students familiar with the basic mechanical engineering.

Course Objectives

The objective of this course is to

1. Equip the students with concept of heat engine, steam, boiler, steam turbine, hydraulic turbine, hydraulic pumps, stress and strain, power transmission.
2. Provide an overview of machine tool and manufacturing system.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain working of I C engine, Gas turbine, Air standard efficiency of Otto Cycle &Diesel Cycle and Boilers.
CO2: Explain working of Steam Turbine, Hydraulic Turbine and Hydraulic Pumps.
CO3: Describe the stress strain diagram, Elastics constants and Transmission system.
CO4: Discuss the metal cutting and working of machine tool with manufacturing system.

Modules	Blooms level*	Number of hours
MODULE 1: Prime Mover (I. C. Engine) Internal Combustion Engine: Introduction to I.C. Engines-two & four stoke S.I. and C.I. engines. Otto cycle. Diesel cycle. Working principle of gas turbine, Constant pressure gas turbine cycle.	L1, L2 and L3	7
MODULE 2: Prime Mover (Turbine) Steam Turbine: Classification of boilers, Classification of steam turbines, Working principle of impulse and reaction. Hydraulic Turbine: Classification of hydraulic turbine, Construction details and working of Pelton, Francis and Kaplan turbines.	L1, L2 and L3	8

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MODULE 3: Power Absorbing machine Power absorbing devices: Hydraulic Pumps: Classification of hydraulic pumps, Working of Reciprocating and centrifugal pumps. Power transmission devices: Introduction to Power transmission, Belt drive, Rope drive, Chain drive, Gear drive, Gear train.		7
MODULE 4: Mechanics of Material Stress & Strain: Introduction, Concept & types of Stresses and strains, Poison's ratio, Stress-strain diagrams, Hooks law, Elastic constants & their relationships, Stresses and strains in simple and compound bars under axial loading, Properties of material-strength, elasticity, stiffness, malleability, ductility, brittleness, hardness and plasticity etc.	L1, L2 and L3	6
MODULE 5: Machine Tool Machine Tool: Introduction to Metal Cutting, Classification of machine tool, working and operations of Lathe, Shaper, Milling, Drilling machines. Manufacturing system: Component of Manufacturing Systems, Fundamentals of Numerical Control (NC), Advantage of NC systems, Classifications of NC, Computer Numerical control, Comparison of NC and CNC. Comparison between conventional and NC machines.	L1, L2 and L3	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- Rajput, R.K. (2013). *Elements of Mechanical Engineering*, Delhi: Lakmi Publication.
- Jain, V. (2011). *Basics of Mechanical Engineering*, Delhi :Dhanpat Rai Publication.
- Kumar, D.S. (2013). *Elements of Mechanical Engineering*, , Delhi : S.K. Kataria and Sons Publications.

Reference Books

- Ganesan, V. (2017). *Internal Combustion Engine*, New-Delhi: Tata McGraw Hill.
- Nag, P.K. (2013). *Engineering thermodynamics*, New-Delhi: Tata McGraw Hill.
- Kumar, D.S. (2013).*Thermal Engineering*, New-Delhi: S.K. Kataria and Sons Publications.
- Hazra, S.K. and Chaudhary, A.K. (2012). *Workshop Technology Vol. II* . New Delhi: Asian Book Comp.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3	PS O 4
CO1	1	1	--	--	--	--	--	--	--	--	--	--	1	1	--	--
CO2	1	1	--	--	--	--	--	--	--	--	--	--	1	1	--	--
CO3	1	1	--	--	--	--	--	--	--	--	--	--	1	1	--	--
CO4	1	1	--	--	--	--	--	--	--	--	--	--	2	1	--	--

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ECE2105	INTRODUCTION TO COMPUTERS AND PROGRAMMING IN C	L	T	P	C
Version: 2019.1	Date of Approval: May 21, 2019	2	1	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The objective of this course module is to acquaint the students with the basics of computers system, its components, data representation inside computer and to get them familiar with various important features of procedure-oriented programming language i.e. C.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of Programming through C Language
2. Provide an overview of advanced programming concepts like Structure, Union and File Handling

Course Outcomes

On completion of this course, the students will be able to

After the completion of course, the students will be able to,

CO 1:Define the purpose and structure of C Program for programming; identify and distinguish various data types and operators; conditional and control statement; Apply if-else, Switch and loops to rewrite basic C program for problem solving.

CO 2: Compare and contrast various Array types, its declaration and implementation; differentiate between Call by Value and Reference if Functions; apply the concepts to rewrite C Programs

CO 3: Differentiate between various String Handling Functions; describe the concept of Pointers in C Language

CO 4: Explain the concept of Structure and Union; apply the concept of File Handling to provide data storage support to the programs.

CO 5: Apply the concept of Computer Graphics using C programming concepts for implementing line drawing, circle drawing algorithms.

Modules	Blooms level*	Number of hours
Module I: Introduction Introduction to computer, history, von-Neumann architecture, memory system (hierarchy, characteristics and types), H/W concepts (I/O Devices), S/W concepts (System S/W & Application S/W, utilities). Data Representation: Number systems, character representation codes, Binary, octal, hexadecimal and their interconversions. Binary arithmetic, floating point arithmetic, signed and unsigned numbers, Memory storage unit.	L1, L2 and L3	7

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Module II: Programming in C History of C, Introduction of C, Basic structure of C program, Concept of variables, constants and data types in C, Operators and expressions: Introduction, arithmetic, relational, Logical, Assignment, Increment and decrement operator, Conditional, bitwise operators, Expressions, Operator precedence and associativity. Managing Input and output Operation, formatting I/O.	L2, L3 and L4	7
Module III: Fundamental Features in C C Statements, conditional executing using if, else, nesting of if, switch and break Concepts of loops, example of loops in C using for, while and do-while, continue and break. Storage types (automatic, register etc.), predefined processor, Command Line Argument.	L2, L3 and L4	7
Module IV: Arrays and Functions One dimensional arrays and example of iterative programs using arrays, 2-D arrays Use in matrix computations. Concept of Sub-programming, functions Example of user defined functions. Function prototype, Return values and their types, calling function, function argument, function with variable number of argument, recursion.	L2 and L3	7
Module V: Advanced features in C Pointers, relationship between arrays and pointers Argument passing using pointers, Array of pointers. Passing arrays as arguments.Strings and C string library.Structure and Union. Defining C structures, Giving values to members, Array of structure, Nested structure, passing strings as arguments. File Handling.	L2, L3 and L4	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- E Balagurusamy, "Programming in ANSI C", Seventh Edition, Tata McGraw Hill Education private limited, July 2017.
- Yashwant Kanetkar, "Let Us C", 16th Edition, BPB Publication, June 2017.

Reference Books

- Brain W Kernighan and Dennis M Ricchie, "The C Programming Language", 2nd Edition, Pearson Publication, Jan 2015.
- Byron Gottfried, "Programming with C", Third Edition, Tata McGraw Hill Education private limited, July 2017.
- E Balagurusamy, "Computer Concepts & Programming in C", Seventh Edition, Tata McGraw Hill Education private limited, July 2011.

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	2	--	--	--	--	--	--	--	--	1	--	1	--
CO2	1	1	2	2	--	--	--	--	--	--	--	--	1	--	1	--
CO3	1	1	2	3	--	--	--	--	--	--	--	--	1	--	1	--
CO4	1	1	2	2	3	--	--	--	--	--	--	--	1	--	1	--
CO5	1	1	2	2	3	--	--	--	--	--	--	--	1	--	1	--

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ECE2117	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	2	1	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

In this course the concepts of electricity and electrical circuits are discussed in detail. Theorems related to electrical circuits, law's related to flow of current, voltages, basic knowledge of Transformer, basic knowledge of electromagnetism, basic knowledge of electrical network will be introduced.

Course Objectives

The objective of this course is to:

1. Provide the overview of concept of flow of current/voltage of electrical circuits.
2. Provide the basic knowledge about the concepts of electrical circuits.

Course Outcomes

On completion of this course, the students will be able to:

CO1. Explain the fundamental theorems and laws related to the electrical circuits.
CO2. Derive equations and solve problems related to network theorems.
CO3. Draw phasor diagrams for different alternating current waveforms and Explain the working principle and estimate the performance of single phase transformers.
CO4. Explain the operation, characteristic and application of PN Junction Diode, Rectifiers, Zener Diode and Bipolar Junction Transistor.

Modules	Blooms level*	Number of hours
Module I: **Direct Current Circuits:** Ohm's Law, Kirchoff's Current Law, Kirchoff's Voltage Law Network Reduction: Star-Delta Transformation, Source Transformation, Nodal Analysis, Mesh analysis, Superposition theorem, Thevenin's Theorem, Norton's theorem and Reciprocity theorem, Maximum Power transfer theorem.	L1 and L2	9
Module II: **Alternating Current Circuits:** Peak, Average and RMS values for	L1, L2 and L3	8

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alternating currents, Power calculation: reactive power, active power, Complex power, power factor, impedance, reactance, conductance, susceptance Resonance: series Resonance, parallel resonance, basic definition of Q factor & Band-width.		
Module III: **Transformer:** Basic Transformer Operation principle, Construction, Voltage relations, current relations, Linear circuit models, open circuit test, short circuit test, Transformer Efficiency.	L1, L2 and L3	6
Module IV: **Rotating Electrical Machines:** D.C. machines (motors and generators), Induction motor, Synchronous machines (motors and generators): construction, working principle, classification and applications.	L1, L2 and L3	6
Module V: **Semiconductor Devices:** Principle of operation characteristic and application of PN Junction Diode, Rectifiers, Zener Diode, Principle of operation, characteristic and application of Bipolar Junction Transistor, Regulated Power Supply.	L1, L2 and L3	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- V K Mehta and Rohit Mehta, Principles of Electrical Engineering and Electronics, 3rd edition, S. Chand Publications, 2014, New Delhi
- D. P. Kothari and I. J. Nagrath, Theory and Problem of Basic Electrical Engineering, PHI Learning Pvt. Ltd., 2015, New Delhi.
- J B Gupta, Electrical Science, S K Kataria and Sons, 2015, New Delhi.

Reference Books

- R J Smith and R C Dorf, Circuits Devices and Systems, 5th Edition, John Wiley
- B.L. Thareja, Basic Electronics, 5th edition, S. Chand Publishing, 2011, New Delhi
- V. Del Toro, Electrical Engineering fundamentals, PHI, 2016
- Mahmood Nahvi, Joseph Edminister, Electric Circuits, 7th edition, McGraw-Hill Education, 2017

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**-**	**-**
CO2	**1**	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**-**	**-**
CO3	**1**	**1**	**3**	**3**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**-**	**-**
CO4	**1**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**-**	**-**

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ENGINEERING CHEMISTRY LAB

Course Code: ECE2116 **Credit Units: 01**

Course Contents:

List of Experiments:

(Any 10 Experiments)

1. To determine the ion exchange capacity of a given cation exchanger.
2. To determine the temporary, permanent and total hardness of a sample of water by complexometric titration method.
3. To determine the type and extent of alkalinity of given water sample.
4. To determine the number of water molecules of crystallization in Mohr's salt (ferrous ammonium sulphate) provided standard potassium dichromate solution (0.1N) using diphenylamine as internal indicator.
5. To determine the ferrous content in the supplied sample of iron ore by titrimetric analysis against standard $K_2Cr_2O_7$ solution using potassium ferricyanide $[K_3Fe(CN)_6]$ as external indicator.
6. (a) To determine the surface tension of a given liquid by drop number method.
   (b) To determine the composition of a liquid mixture A and B (acetic acid and water) by surface tension method.
7. To prepare and describe a titration curve for phosphoric acid – sodium hydroxide titration using pH-meter.
8. (a) To find the cell constant of conductivity cell.
   (b) Determine the strength of hydrochloric acid solution by titrating it against standard sodium hydroxide solution conductometrically
9. Determination of Dissolved oxygen in the given water sample.
10 To determine the total residual chlorine in water.
11 Determination of amount of oxalic acid and H_2SO_4 in 1 L of solution using N/10 NaOH and N/10 $KMnO_4$ solution.
12 Determination of viscosity of given oil by means of Redwood viscometer I.
13 To determine flash point and fire point of an oil by Pensky Martin's Apparatus
14 To determine the Iodine value of the oil.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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ECE2110	PROGRAMMING IN C LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The primary objective of this course is to understand all the components of C, including the C language, the C Preprocessor, and the C Standard Library. An understanding of some advanced practical issues, including memory management, testing and debugging, complex declarations and expression evaluation, building and using libraries, and evaluating tradeoffs, such as size vs. speed and speed vs. complexity. The ability to write C code and create and manipulate logical programs.

Course Objectives

The objective of this course is to

- Equip the students with concepts of Programming through C Language
- Provide an overview of advanced programming concepts like Structure, Union and File Handling.

Course Outcomes

After the completion of course, the students will be able to,

CO 1:Demonstrate the use of various data types and operators in C programs; Solve various problems using conditional control statements (if-else, Switch case).

CO 2: Construct C programs related to problems involving the usage of loops, arrays and functions.

CO 3: Apply the concept of Pointers for efficient memory management and construct C programs using string handling functions.

CO 4: Demonstrate the use of Structure, Union and concept of File Handling to provide data storage support to the programs.

Modules	Blooms level*	Number of hours
LABORATORY SESSSION 1 OPERATORS, EXPRESSIONS and DECISION MAKING 1. Write a program to calculate simple interest and amount. 2. Write a program to swap two numbers using third variable. 3. Write a program to demonstrate Greatest of 3 nos and to print the given no in ascending order. 4. Write a program to check if the number is even or odd. 5. Write a program to perform arithmetic operations using Switch Case statement. 6. Write a program to calculate area of circle, rectangle, square and triangle using Switch Case statement.	L3	5

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LABORATORY SESSSION 2 LOOPING 1. Write a program to find factorial of given no using do while statement. 2. Write a program to print prime numbers up to 'n'. 3. Write a program to sum of n natural no. 4. Write a program to print Fibonacci series. 5. Write a program to reverse a number. 6. Write a program to print the following pattern using for loop 1 2 2 3 3 3 4 4 4 4 7. Write a program to print the following pattern using for loop A A B A B C A B C D	L3	6
LABORATORY SESSSION 3 ARRAYS and FUNCTIONS 1. Write a program to read n num of students and 5 subjects marks. 2. Write a program to swap two numbers using call by value. 3. Write a program to convert all lower case to uppercase characters 4. Write a program to find the factorial of a number using recursion. 5. Write a program to print the add/product of two matrices of any order.	L3	5
LABORATORY SESSSION 4 POINTERS AND STRING 1. Write a program to perform operations on strings using string handling in-built functions (concatenation, reversal, copy etc.) 2. Write a program to swap two numbers using call by reference. 3. Write a program to perform dynamic memory allocation and de-allocation. 4. Write a program to print elements of array using pointers.	L3	4
LABORATORY SESSSION 5 STRUCTURE,UNION & FILE HANDLING 1. WAP program to display student information by initializing structures. 2. WAP program to find the total salary of employee and employee details using structure. 3. Write a program to store and display information using Union. 4. Program to write data into file and read data from file.	L3	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V

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– Viva.

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2	PS O 3	PS O 4
CO 1	1	2	--	2	--	--	--	--	--	--	--	--	1	--	2	--
CO 2	1	1	2	2	--	--	--	--	--	--	--	--	1	--	2	--
CO 3	1	1	2	3	--	--	--	--	--	--	--	--	1	--	2	--
CO 4	1	1	2	2	3	--	--	--	--	--	--	--	1	--	2	--

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ECE2109	ELEMENTS OF MECHANICAL ENGINEERING LAB	L	T	P	C
Version 2019.1	Date of Approval: July 14, 2019	0	0	2	1
Pre-requisites/Exposure					
Co-requisites					

Pre –Requisite: Elements of Mechanical Engineering

Catalog Description

In this course the concepts of various prime movers like I C Engine, Gas Turbine, Steam Turbine, and Hydraulic Turbine are discussed in detail. Concept of power absorbing devices and power transmission devices are discussed in detail. Elementary concept of mechanics of material and machine tool also discussed in detail. The aim of this course is to make the students familiar with the basic mechanical engineering.

Course Objectives:

The objective of this course is to

- Equip the students with practical concepts of Boiler, Turbine, IC Engine and Machine tools.
- Understand the elements of mechanical engineering by working models and experiments.

Course Outcomes (COs): After studying this course the students will be able to:

CO 1- Define the basics of working of boilers, Steam turbines.

CO 2- Explain the principle and working of two strokes and four strokes internal combustion engines.

CO 3- Explain the working of Pelton wheel Turbine, Francis Turbine and Kaplan Turbine.

CO 4 - Describe the tensile test and power transmission derives.

CO 5- Identify and demonstrate the machine tools and lathe operation.

List of Experiments	Blooms level*	Number of hours
1. To Study the Cochran and Babcock & Wilcox boilers.	L1, L2 and L3	2
2. To study the working of impulse and reaction steam turbines	L1, L2 and L3	2
3. To study Two-Stroke & Four-Stroke Diesel Engines.	L1, L2 and L3	2
4. To Study Two-Stroke & Four-Stroke Petrol Engines.	L1, L2 and L3	2
5. To study the constructional features and working of Pelton wheel Turbine, Francis Turbine and Kaplan Turbine.	L1, L2 and L3	2
6. To perform tensile test, plot the stress-strain diagram and evaluate the tensile properties of a given metallic specimen.	L1, L2 and L3	2
7. To Study the different power transmission drives.	L1, L2 and L3	2
8. To Study different types of machine tools (lathe, milling, drilling & shaper).	L1, L2 and L3	2

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9. To perform the metal cutting operation on Lathe machine.	L1, L2 and L3	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text Books

- Rajput, R.K. Elements of Mechanical Engineering, Lakmi Publication, Delhi, 2013. .
- Jain, V. Basics of Mechanical Engineering, Dhanpat Rai Publication, Delhi , 2011.
- Kumar, D.S. Elements of Mechanical Engineering, S.K. Kataria and Sons Publications, Delhi 2013.

Reference Books

- Ganesan, V. Internal Combustion Engine , New-Delhi : Tata McGraw Hill, New delhi, 2017.
- Heine, R.W. Loper and P.C. Rosenthal, Principles of metal casting, McGraw Hill, New-Delhi, 2001
- Nag, P.K. Engineering thermodynamics,: Tata McGraw Hill, New-Delhi, 2013.
- Kumar, D.S. Thermal Engineering, S.K. Kataria and Sons Publications, New-Delhi, 2013.
- Hazra, S.K. and Chaudhary, A.K. Workshop Technology Vol. II . Asian Book Comp, New-Delhi, 2012.

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ECE2118	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

In this course, students will become familiar with basic electrical circuits. The students will learn practical aspects and implementation of theorems related to electrical circuits, law's related to flow of current, voltages, transformer and transistors.

Course Objectives

The objective of this course is to:

- Provide the overview of concept of flow of current/voltage of electrical circuits.
- Provide the basic knowledge about the concepts of electrical circuits and BJTs.

Course Outcomes

On completion of this course, the students will be able to:

CO1. Explain the fundamental theorems and laws related to the electrical circuits and experimentally verify the basic circuit theorems

CO2. Explain the working principle and estimate the performance of single phase transformers.

CO3. Understand 3 phase balanced and unbalanced, star and delta connected supply and load and to measure power in 3 phase circuits

CO4. Able to design circuit with Bipolar Junction Transistor in CB, CE & CC configurations

Modules	Blooms level*	Number of hours
Lab Session 1: Network Analysis Techniques & Theorems 1. To verify KVL & KCL in the given network. 2. To verify Superposition Theorem. 3. To verify Maximum Power Transfer Theorem. 4. To verify Reciprocity Theorem. 5. To determine and verify R_{Th}, V_{Th}, R_N, I_N in a given network.	L1 , L2 and L3	6
Lab session II: Transformers and transistors 1. To perform open circuit & short circuit test on a single-phase transformer. 2. To perform regulation, ratio & polarity test on a single-phase transformer. 3. To obtain the characteristics of a transistor under common base (CB) and common emitter (CE) configuration.	L1, L2 and L3	3

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Lab session III: Alternating Current Circuits 1. To study transient response of a given RLC Circuit. 2. To measure power & power factor in a three phase circuit by two wattmeter method. 3. To measure power & power factor in a three phase load using three ammeter & three voltmeter method.	L1, L2 and L3	3

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text Books

- V K Mehta and Rohit Mehta, Principles of Electrical Engineering and Electronics, 3rd edition, S. Chand Publications, 2014, New Delhi
- D. P. Kothari and I. J. Nagrath, Theory and Problem of Basic Electrical Engineering, PHI Learning Pvt. Ltd., 2015, New Delhi.
- J B Gupta, Electrical Science, S K Kataria and Sons, 2015, New Delhi.

Reference Books

- R J Smith and R C Dorf, Circuits Devices and Systems, 5th Edition, John Wiley
- B.L. Thareja, Basic Electronics, 5th edition, S. Chand Publishing, 2011, New Delhi
- V. Del Toro, Electrical Engineering fundamentals, PHI, 2016
- Mahmood Nahvi, Joseph Edminister, Electric Circuits, 7th edition, McGraw-Hill Education, 2017

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	1	2	--	--	--	--	--	--	--	--	--	--	1	-	-
CO2	1	1	2	3	--	--	--	--	--	--	--	--	1	-	-
CO3	1	1	3	3	-	--	--	--	--	--	--	--	1	-	-
CO4	1	1	2	--	--	--	--	--	--	--	--	--	1	-	-

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Syllabus - Second Semester

ENGINEERING MATHEMATICS - II

Course Code: ECE2209 **Credit Units: 04**

Course Objective:
The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects. Here our intention is to make the students acquainted with the concept of basic topics from Mathematics, which they need to pursue their Engineering degree in different disciplines.

Course Contents:

Module I: Linear Algebra
Hermitian and Skew Hermitian Matrix, Unitary Matrix, Orthogonal Matrix, Elementary Row Transformation, Reduction of a Matrix to Row Echelon Form, Rank of a Matrix, Consistency of Linear Simultaneous Equations, Gauss Elimination Method, Gauss-Jordan Method, Eigen Values and Eigen Vectors of a Matrix, Caley-Hamilton Theorem, Diagonalization of a Matrix, Vector Space, Linear Independence and Dependence of Vectors, Linear Transformations.

Module II: Infinite Series
Definition of Sequence, Bounded Sequence, Limit of a Sequence, Series, Finite and Infinite Series, Convergence and Divergence of Infinite series, Cauchy's Principle of Convergence, Positive Term Infinite Series, Comparison test, D'Alembert's Ratio test. Raabe's Test, Cauchy's nth root Test. Logarithmic Test, Alternating Series, Leibnitz's Test, Absolute and conditioinal convergence, Uniform Convergence, Power Series and its Interval of Convergence.

Module III: Complex Analysis
De Moivre's Theorem and Roots of Complex Numbers, Logarithmic Functions, Circular, Hyperbolic Functions and their Inverses.
Functions of a Complex Variables, Limits, Continuity and Derivatives, Analytic Function, Cauchy-Riemann Equations (without proof), Harmonic Function, Harmonic Conjugates, Conformal Mapping, Bilinear Transformations, Complex Line Integral, Cauchy Integral Theorem, Cauchy Integral Formula, Derivative of Analytic Function, Power Series, Taylor Series, Laurent Series, Zeroes and Singularities, Residues, Residue Theorem, Evaluation of Real Integrals of the Form and $\int_{-\infty}^{\infty} \frac{f(x)}{F(x)}\,dx$.

Module IV: Statistics and Probability
Moments, Skewness, Kurtosis, Random Variables and Probability Distribution, Mean and Variance of a Probability Distribution, Binomial Distribution, Poisson Distribution and Normal Distribution.

Examination Scheme:

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	15	20	20	20	5

C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

- Engineering Mathematics by Erwin Kreyszig.
- Engineering Mathematics by R.K. Jain and S.R.K. Iyengar.
- Higher Engineering Mathematics by H.K. Dass.
- Engineering Mathematics by B.S. Grewal.
- Differential Calculus by Shanti Narain.
- Integral Calculus by Shanti Narain.
- Linear Algebra- Schaum Outline Series.

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ECE2203	OBJECT ORIENTED PROGRAMMING USING C++	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	2	1	0	3
Pre-requisites/Exposure	Hands on knowledge of C Programming				
Co-requisites	Basic concepts of C Programming				

Catalog Description

The objective of this course is to introduce object-oriented programming. To explore and implement the various features of OOP such as inheritance, polymorphism, Exceptional handling using programming language C++. After completing this course student can easily identify the basic difference between the programming approaches like procedural and object oriented.

Course Objectives

The objective of this course is

- Equip the students with the basic features of C++ supporting object-oriented programming. Perform object oriented programming to develop solutions to problems demonstrating usage of control structures, modularity, I/O. and other standard language constructs.
- Provide the overview of major object-oriented concepts to implement object oriented programs in C++ like encapsulation, inheritance and polymorphism, stream I/O, templates and operator overloading

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain the basic principles of object-oriented programming approach; Differentiate it with procedural programming approach and also discuss difference between C and C++.

CO 2: Illustrate the different ways to define a member function inline and explain how the private members of a class can be accessed. Explain how the objects can be instantiated and destroyed with static data member?

CO 3: Explain the concept of inheritance, types and implementation with suitable examples; find out ambiguity problem in inheritance; use the concept of overriding and constructors in inheritance.

CO 4: Explain polymorphism in detail and implement the concept of overloading in functions as well as in operators. Write the programs for virtual function and pointer with objects.

CO 5: Explain the exception handling mechanism. Design the programs for class and function Template. Compare and contrast various formatted and unformatted i/o function in file handling.

Modules	Blooms level*	Number of hours
MODULE 1: INTRODUCTION Review of C, Difference between C and C++, Procedure Oriented and Object Oriented Approach. Basic Concepts: Objects, classes, Principals like Abstraction, Encapsulation, Inheritance and Polymorphism. Dynamic Binding, Message Passing. Characteristics of Object-Oriented Languages. Introduction to Object-Oriented Modeling techniques (Object, Functional and Dynamic Modeling).	L1 and L2	5

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MODULE 2: CLASSES AND OBJECTS Abstract data types, Object & classes, attributes, methods, C++ class declaration, Local Class and Global Class, State identity and behaviour of an object, Local Object and Global Object, Scope resolution operator, Friend Functions, Inline functions, Constructors and destructors, instantiation of objects, Types of Constructors, Static Class Data, Array of Objects, Constant member functions and Objects, Memory management Operators.	L1, L2 and L3	7
MODULE 3: INHERITANCE Inheritance, Types of Inheritance, access modes – public, private & protected, Abstract Classes, Ambiguity resolution using scope resolution operator and Virtual base class, Aggregation, composition vs classification hiérarchies, Overriding inheritance methods, Constructors in derived classes, Nesting of Classes	L2, L3 and L4	8
MODULE 4: POLYMORPHISM Polymorphism, Type of Polymorphism – Compile time and runtime, Function Overloading, Operator Overloading (Unary and Binary) Polymorphism by parameter, Pointer to objects, this pointer, Virtual Functions, pure virtual functions.	L2, L3 and L4	8
MODULE 5: STRINGS, FILES AND EXCEPTION HANDLING Manipulating strings, Streams and files handling, formatted and Unformatted Input output. Exception handling, Generic Programming – function template, class Template Standard Template Library: Standard Template Library, Overview of Standard Template Library, Containers, Algorithms, Iterators, Other STL Elements, The Container Classes, General Theory of Operation, Vectors.	L2, L3 and L4	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/ Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text Books

- A.R. Venugopal, Rajkumar, T. Ravishanker "Mastering C++", TMH, 1997
- R. Lafore, "Object Oriented Programming using C++", BPB Publications, 2004.
- E. Balagurusamy ,"Object Oriented Programming with C++", Mc Graw Hill,6th Edition,2013.
- Schildt Herbert, "C++: The Complete Reference", Wiley DreamTech, 2005.

Reference Book

- Parasons, "Object Oriented Programming with C++", BPB Publication, 1999.
- Steven C. Lawlor, "The Art of Programming Computer Science with C++", Vikas Publication, 2002.
- Yashwant Kanethkar, "Object Oriented Programming using C++", BPB, 2004

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	**2**	--
CO2	**1**	**1**	**2**	**3**	--	--	--	--	--	--	--	--	**1**	--	**1**	**2**
CO3	**1**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	--	**2**	**2**
CO4	**1**	**1**	**2**	**3**	--	--	--	--	--	--	--	--	**1**	**1**	--	**2**
CO5	**1**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**1**	--	**1**

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ECE2204	ENGINEERING MECHANICS	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	2	1	0	3
Pre-requisites/Exposure	Basics of Mathematics, Mathematical Equations, Force systems				
Co-requisites	-				

Catalog Description

Engineers are the ultimate problem solvers. This course introduces the principles required to solve engineering mechanics problems. It addresses the modelling and analysis of static equilibrium problems with an emphasis on real-world engineering applications and problem solving. To master this course, students should have a background in basic mathematical calculus and physics covering classical mechanics. These basic concepts of physics and mathematics will be applied to formulate problems on force systems, trusses, friction, centroid, simple lifting machines, power transmission devices and law of conservation of energy.

Course Objectives

The objective of this course is to

- Equip the students with concepts of free body diagram, friction, centroid or center of gravity, trusses, energy, force system and its effect on the behavior of the bodies
- Provide an overview of estimation of performance of belts and simple lifting machines under various operating conditions.

Course Outcomes

After completing the course, the students will be able to

CO1. Explain the concept of free body diagram, classify various force system sand apply equilibrium equations to solve different truss problems.

CO2. Define and compute various terms associated with the friction, determine the efficiency of simple lifting machines and power transmission devices.

CO3. Describe various theorems and apply them to determine centroid, centre of gravity, moment of inertia, mass moment of inertia of various bodies.

CO4. Analyse and setting up the problems involving the concept of work, energy, impulse and momentum.

Modules	Blooms level*	Number of hours
Module I: **<u>Force system</u>** Types of forces, Parallelogram law of forces, Triangle law of forces, Polygon law of forces, Free body diagram, Equilibrium equations and applications. Lami's theorem and its applications. Moment and its applications,	L1, L2 and L3	10
Module II: **<u>Determinate Structures</u>** Plane truss, perfect and imperfect truss, assumption in solving the truss problems, method of joints, method of section.	L1, L2,and L3	8
Module III: **<u>Friction</u>** Static and Kinetic friction, laws of dry friction, co-efficient of friction, angle of friction, angle of repose, ladder friction, Screw jack & determination of its efficiency	L2 and L3	10

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Module IV: **Distributed Force** Determination of center of gravity, center of mass and centroid by direct integration and by the method of composite bodies, mass moment of inertia and area moment of inertia by direct integration and composite bodies method, radius of gyration, perpendicular axis theorem, parallel axis theorem, and its application, polar moment of inertia.	L2, L3 and L4	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text Books

- **S. Timoshenko, D. H. Young**, Engineering Mechanics, 5th Ed, McGraw Hill, 2008, New-Delhi
- **S. S. Bhavikatti, K. G. Rajashekarappa**, Engineering Mechanics, New Age International Ltd, 1998, New Delhi
- **D.S. Kumar**, Engineering Mechanics, S. Chand Publication, 2013, New-Delhi

Reference Books

- **I. H. Shames & G. K. M. Rao**, Engineering Mechanics: Statics and dynamics, 4th Ed, PHI, 2002.
- **Beer Ferdinand P, Russel Johnston Jr., David F Mazure**, Vector Mechanics for Engineers: Statics and Dynamics (SIE), 5th Ed, McGraw Hill, 2008, New-Delhi
- **J. L. Meriam and L. G. Kraige**, Engineering Mechanics, Vol I – Statics, Vol II – Dynamics, 6th Ed, John Wiley, 2008.
- **R. C. Hibbler**, Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press, 2006.
- **Andy Ruina and Rudra Pratap**, Introduction to Statics and Dynamics, Oxford University Press, 2011

CO, PO and PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	3	--	--	--	--	--	--	--	--	--	--	2	--	--	--
CO 2	1	--	--	--	--	--	--	--	--	--	--	--	2	--	--	--
CO 3	1	3	--	--	--	--	--	--	--	--	--	--	3	--	--	--
CO 4	1	2	3	--	--	--	--	--	--	--	--	--	2	--	--	--

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ECE2206	OBJECT ORIENTED PROGRAMMING USING C++ LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Turbo C++				
Co-requisites	NIL				

Catalog Description

The objective of this course is to introduce object-oriented programming. To explore and implement the various features of OOP such as inheritance, polymorphism, Exceptional handling using programming language C++. After completing this course student can easily identify the basic difference between the programming approaches like procedural and object oriented.

Course Objectives

The objective of this course is

- Perform object-oriented programming to develop solutions to problems demonstrating usage of control structures, modularity, I/O. and other standard language constructs.
- Demonstrate adeptness of object-oriented programming in developing solutions to problems demonstrating usage of data abstraction, encapsulation, and inheritance.
- Demonstrate ability to implement one or more patterns involving realization of an abstract interface and utilization of polymorphism in the solution of problems which can take advantage of dynamic dispatching, syntax, features of, and how to utilize the Standard Template Library.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Define and identify the basic principles of object-oriented programming approach; Differentiate it with procedural programming approach.

CO 2: Determine the different ways to define a member function inline and explain how the private members of a class can be accessed. Solve how the objects can be instantiated and destroyed with static data member?

CO 3: Apply the concept of inheritance, types and implementation with suitable examples; find outambiguity problem in inheritance; use the concept of overriding and constructors in inheritance.

CO 4: Relate the concept polymorphism with overloading in detail and implement the concept of overloading in functions as well as in operators. Write the programs for virtual function and pointer with objects.

CO 5: Determine the exception handling mechanism. Design the programs for class and function Template. Compare and contrast various formatted and unformatted i/o function in filehandling.

Modules/Topics Covered**	Blooms level*	Number of hours
1. Sample Programs using objects and classes (a) Write a program to illustrate the concept of one class with two objects by taking student data. (b) Write a program to show the relationship of class and object to display roll no., grade and fee paid by student.	L1, L3, L5	4

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2. Sample Programs for different use of private, public member variables and functions and friend functions (a) Write a program to define the member function outside and inside the class. (b) Write a program to read and display the information of N persons to illustrate the concept of array of objects. (c) Write a program to add two numbers to illustrate the use of friend function.	L1, L3, L5	4
3. Sample Programs using constructors and destructors (a) Write a program to assign and copy values to illustrate the concept of parametrized and copy constructor. (b) Write a program to show the order of constructor and destructor.	L1, L3, L5	4
4. Sample Programs using operator overloading (a) Write a program to add two numbers using binary operator overloading. (b) Write a program to illustrate the assignment operator overloading.	L1, L3, L5	4
5. Sample Programs using inheritance in and accessing objects of different derived classes (a) Write a program to compute the marks explaining the concept of multiple inheritance. (b) Write a program to find the factorial of a number using inheritance.	L1, L3, L5	4
6. Sample Programs using polymorphism and virtual functions (using pointers) and File Handling (a) Write a program to find the volume of cylinder and cuboid using function overloading. (b) Write a program to reverse a string using pointers. (c) Write a program to explain the relationship of inheritance and virtual function. (d) Write a program to read the student name and fee paid using read() function from the file.	L1, L3, L4, L5	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	**70**
Weightage (%)	5	10	10	5	

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

Text Books

- A.R. Venugopal, Rajkumar, T. Ravishanker "Mastering C++", TMH, 1997
- R. Lafore, "Object Oriented Programming using C++", BPB Publications, 2004.
- "Object Oriented Programming with C++" By E. Balagurusamy.
- Schildt Herbert, "C++: The Complete Reference", Wiley DreamTech, 2005.

Reference Book

- Parasons, "Object Oriented Programming with C++", BPB Publication, 1999.
- Steven C. Lawlor, "The Art of Programming Computer Science with C++", Vikas Publication, 2002.
- Yashwant Kanethkar, "Object Oriented Programming using C++", BPB, 2004

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**3**	**1**	**2**	--	--	--	--	--	--	--	--	--	**2**	--	--	--
CO2	**3**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO3	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO4	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO5	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--

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ENGINEERING PHYSICS

Course Code: ECE2210 **Credit Units: 03**

Course Objective:
Aim of this course is to introduce the students to fundamentals of graduate level physics, which form the basis of all applied science and engineering

Course Contents:

Module I: Oscillations & Waves
Oscillations: Introduction to S.H.M. Damped Oscillations: Differential Equation and its solution, logarithmic decrement, Quality Factor, Different conditions of damping of harmonic oscillations. Forced oscillations: Amplitude and Frequency Response, Resonance, Sharpness of Resonance
Plane Progressive Waves: Differential Equation and Solution, Superposition of Progressive Waves stationary waves.
Ultrasonics: Generation and application of ultrasonicwaves.

Module II: Wave Nature of Light
Interference: Coherent Sources, Conditions of interference, Interference due to division of wavefront, Fresnels biprism Interference due to division of amplitude, Newton's rings, Interference due to thin films, .
Diffraction: Fresnel and Fraunhofer diffraction, Fraunhofer diffraction at a single slit, double slit, N Slits, Transmission grating, Rayleigh criterion and Resolving power of grating.
Polarization: Birefringence, Nicol prism, Production and analysis of plane, circularly and elliptically polarized light, Half and quarter wave plates, Optical rotation, Polarimeter.

Module III: Electromagnetics
Scalar and vector fields, gradient of a scalar field, physical significance of gradient, equipotential surface. Line, surface and volume integrals, Divergence and curl of vector field and mathematical analysis physical significance, Electric flux, Gauss' law, Proof and Applications, Gauss divergence and Stokes theorems.
Differential form of Gauss' Law, Amperes' Law, Displacement current, Faradays Law, Maxwell equations in free space & isotropic media (Integral form & differential form), EM wave propagation in free space, Poynting vector.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
- Waves & oscillation, A. P. French
- Physics of waves, W. C. Elmore & M. A. Heald
- Introduction to Electrodynamics, D. J. Griffith
- Electrodynamics, Gupta, Kumar & Singh
- Optics, A. K. Ghatak
- Engineering Physics, Satya Prakash

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ENGINEERING PHYSICS LAB

Course Code: ECE2211 **Credit Units: 01**

List of Experiments:

1. To determine the wavelength of sodium light by Newton's rings method.
2. To determine the dispersive power of the material of prism with the help of a spectrometer.
3. To determine the specific rotation of sugar by Bi-quartz or Laurent half shade polarimeter.
4. To determine the speed of ultrasonic waves in liquid by diffraction method.
5. To determine the width of a narrow slit using diffraction phenomena.
6. To determine the temperature coefficient of platinum wire, using a platinum resistance thermometer and a Callender & Griffth's bridge.
7. To determine the value of specific charge (ratio of e/m) of an electron by Thomson method.
8. To determine the internal resistance of Leclanche cell with the help of Potentiometer.
9. To determine the resistance per unit length of a Carey Foster's bridge wire and also to find out the specific resistance of a given wire.
10. To plot graph showing the variation of magnetic field with distance along the aixs of a circular coil carrying current, and hence estimate the radius of the coil.
11. To determine the value of acceleration due to gravity ('g') in the laboratory using bar pendulum.
12. To determine the moment of inertia of a flywheel about its own axis of rotation.
13. To determine the density of material of the given wire with the help of sonometer.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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Course Code: ECE2208	ENGINEERING GRAPHICS LAB	L	T	P	C
Version 2019.1	Date of Approval: July 14, 2019	0	0	4	2
Pre-requisites/Exposure	Concepts Mathematics (especially Trigonometry and Geometry)				
Co-requisites	Machine Drawing & CAD				

Catalog Description:
A freshman level course which provides the undergraduate engineering students with a background in descriptive geometry, orthographic projection, engineering drawing standards and annotation, computer-aided engineering graphics. The concepts of point, line and plane relationships in projection, multi-view engineering drawings, auxiliary and section views, basic dimensioning and annotation, engineering applications of drawings are also discussed.

Course Objective:
The objective of this course is to

- Equip the students with the in-depth knowledge of drawings of points, straight line, planes, cylinders, prisms, pyramids, parabola, ellipse etc.
- Draw different figures manually and will be capable of using various instruments involved in drawings.

Course Outcomes (COs):
At the end of the course, the student shall be able to:
CO 1 - Define and explain basic principles of projections of points and lines.
CO 2 - Define, describe and construct the different orientations and projections of planes.
CO 3 – Explain and construct the projections of solids and sectioning of solids in different orientations.
CO 4 - State and draw the concepts of development of surfaces and introduction to auto CAD.
CO 5 – Define and construct orthographic and isometric view of an object.

Modules	Blooms level*	Number of hours
Module I: Introduction Importance, significance and scope of engineering drawing, drawing instruments and their use, lettering, dimensioning, scales, sense of proportioning, different types of projections, B.I.S. Specifications.	L1 and L2	8
Module II: Projection of points, lines and plane surface Principal planes, principles of orthographic projections, Projection of points in all quadrants, Projection methods - First angle & third angle projection, Projections of straight lines (first angle projection) inclined to both the planes, true lengths and traces, projection of planes, projection of planes in simple position and inclined to both the principal planes, auxiliary planes and views	L1, L2 and L3	12
Module III: Projection of solids & section of solids Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to both of the principal planes, Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other, obtaining true shape of section	L1, L2 and L3	12

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Module IV: Development of surfaces & Isometric projections Development of surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones, Principles of isometric projection, isometric scale, Isometric projections of simple solids and truncated solids, Prisms, pyramids, cylinders, cones, Conversion of Orthographic Views to Isometric Views and Vice-versa.	L1, L2 and L3	8
Module V: Introduction to CAD Introduction to CAD and use of its commands, practice of some 2D figures using CAD.	L1, L2 and L3	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	50	20

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text Books:

- PS Gill, 2013, Engineering Drawing, Kataria Publication.
- ND Bhatt, 2014, Engineering Drawing, Charotar publications.

References Books:

- N Sidheshwar, 2014 Machine Drawing Drawing, Tata McGraw Hill
- M.B. Shah & B.C. Rana, 2007, Engineering Drawing, Pearson Education.
- CADFolks, AutoCAD 2018 For Beginners, CreateSpace Independent *Publishing* Platform; 6 edition.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--
CO2	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--
CO3	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--
CO4	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--
CO5	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--

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Syllabus - Third Semester

ECE2302	ANALOG ELECTRONICS-I	L	T	P	C
Version: 2019.1	Date of Approval: May 21, 2019	3	0	0	3
Pre-requisites/Exposure	Elementary Resistive Circuit, Theorems and Analysis Techniques: KCL. KVL, Nodal & Mesh Analysis, Thevenin & Norton Equivalents, Maximum Power Transfer.				
Co-requisites	Semiconductor Physics				

Catalog Description

This is the first course in Electronics and Communication Engineering, to educate and explain the methods used for biasing circuits in a graphical analysis of non linear electronic circuits and also includes small signal transistor models, parameters and their frequency responses. Following this, analyzing different types of feedback amplifiers, and power amplifiers using transistor and designing of different electronic circuits are included in the course. This course also considers the mathematical modelling of active solid state devices their analysis and design of single state circuits. Topics covered include the study of device characteristics and applications of p-n-junction diodes, bipolar junction transistors, and field effect transistors.

Course Objectives

The objective of this course is to

- build from basic knowledge of Semiconductor Physics to an understanding of basic devices and their models
- familiarize the student with the analysis and design of basic transistor amplifier circuits, feedback amplifiers and wave shaping circuits
- build a foundation for Analog Electronics-II, Digital Circuits and Systems I & II, VLSI de-sign and analog CMOS IC Design

Course Outcomes

On completion of this course, the students will be able to

CO1. explain different types of diodes and demonstrate wave shaping circuits

CO2. explain operating principal of Bipolar Junction Transistor, its properties, biasing techniques and stability

CO3. describe low and high frequency transistor amplifiers along with single and multi-stage am-plifier

CO4. explain operating principal of JFET, MOSFET, its properties, and biasing techniques

CO5. solve and analyse different negative feedback amplifiers configurations

CO6. describe and outline power amplifiers and their application.

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Modules	Blooms level*	Number of hours
Module I: Semiconductor Diode and Diode Circuits Different types of diodes: Zener, Schottky, LED. Zener as voltage regulator, Diffusion capacitance, Drift capacitance, the load line concept, half wave, full wave rectifiers, clipping and clamping circuits.	L1 L2 & L3	6
Module II: Bipolar Junction Transistor Bipolar junction transistor: Introduction, Transistor, construction, transistor operations, BJT characteristics, load line, operating point, leakage currents, saturation and cut off mode of operations. Bias stabilization: Need for stabilization, fixed Bias, emitter bias, self bias, bias stability with respect to variations in $I_{co,}$ V_{BE} & □, Stabilization factors, thermal stability.	L1 L2 & L3	9
Module III: Small signal Analysis of transistor and Multistage Amplifier Hybrid model for transistors at low frequencies, Analysis of transistor amplifier using h parameters, emitter follower, Miller's theorem, THE CE amplifier with an emitter resistance, Hybrid π model, Hybrid π Conducatnces and Capacitances, CE short circuit current gain, CE short circuit current gain with R_L Multistage amplifier: Cascading of Amplifiers, Coupling schemes(RC coupling and Transformer coupling)	L2 & L3	6
Module IV: Field Effect Transistors Field effect transistor (JFET, MOSFET): volt-ampere characteristics, small signal model –common drain, common source, common gate, operating point, MOSFET, enhancement and -depletion mode, Common source amplifier, Source follower	L1, L2 & L3	5
Module V: Feedback Amplifiers Feedback concept, Classification of Feedback amplifiers, Properties of negative Feedback amplifiers, Impedance considerations in different Configurations, Examples of analysis of feedback Amplifiers.	L1, L2, L3 & L4	6
Module VI: Power amplifiers Power dissipation in transistors, difference with voltage amplifiers, Amplifier classification (Class A, Class B, Class C, Class AB) class AB push pull amplifier, collector efficiency of each, cross over distortion.	L1 & L2	4

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

1. Jacob Millman, Christos Halkias, Chetan Parikh, Millman's Integrated Electronics, McGraw Hill Education, 2nd Edition, New Delhi
2. Sanjeev Gupta, Electronic Devices and Circuits, Dhanpat Rai Publications, 2010
3. Theraja B.L., Sedha R.S, Principles of Electronic Devices and Circuits, S Chand & Compa-ny, First Edition, New Delhi, 2002

Reference Books

1. Robert L. Boylestad: Electronic Devices and Circuits, Pearson Education, 11th Edition, 2013
2. Robert F. Pierret, Semiconductor Device Fundamentals, Pearson Education, 1st Edition, 2006
3. Nagrath I.J, Electronics: Analog and Digital, Prentice Hall India Learning Private Limited, Second Edition, 2013

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	3	--	--	--	--	--	--	--	--	3	1	--	--	3
CO2	1	2	--	--	--	--	--	--	--	--	--	3	1	3	--	3
CO3	1	2	3	--	--	--	--	--	--	--	--	--	1	-	--	--
CO4	1	2	--	--	--	--	--	--	--	--	--	3	1	3	--	3
CO5	1	2	3	--	--	--	--	--	--	--	--	3	1	--	--	3
CO6	1	3	--	--	--	--	--	--	--	--	--	3	1	--	--	3

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ECE2303	CIRCUITS AND SYSTEMS	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	2	1	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

In this course the concepts of circuits analysis based on Resistance, Inductance and Capacitance are discussed in detail. voltage- current relationship of basic circuit elements – resistors, inductors, capacitors, dependent and independent voltage and current sources; apply Kirchhoff's current and voltage laws to circuits in order to determine voltage, current and power in branches of any circuits excited by DC voltages and current sources will be discussed. Concept learnt in the studies will be applied to solve DC circuit problems using basic circuit theorems and structured methods like node voltage and mesh current analysis.

Course Objectives

The objective of this course is to

- Equip the students with concepts basic network analysis of electrical circuits using KVL and KCL.
- Provide an overview of one port and two port network analysis in time and frequency domain.

Course Outcomes

On completion of this course, the students will be able to
CO1: Expiation of graph theory for solving complex electrical circuits.
CO2: Analysis of RL, RC and RLC circuits using time domain approach.
CO3: Apply Laplace transform to solve RL, RC and RLC circuits in frequency domain.
CO4: Explanation and application of various network theorems to solve the given circuit.
CO5: Synthesis of RL, RC and RLC electrical circuits and explanation of two port network parameters.

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Modules	Blooms level*	Number of hours
Module 1: Graph Theory and Network equations Graph of a network, Trees, Co-trees and loops, cut set matrix, Tie set matrix, number of possible trees of a graph, duality, Loop Analysis and Node Analysis.	L1 and L2	8
Module 2: Analysis of circuits using classical Method Time and Frequency domain analysis of RL, RC and RLC circuits, Linear constant coefficient differential equation.	L2 and L3	10
Module 3: Signals and Laplace Transforms Unit step signal, Ramp signal, impulse signal, Laplace transformations and its properties, Gate function, Inverse Laplace transformations, Application of Laplace Transforms in circuit analysis.	L3 and L4	10
Module 4: Network Theorems Reciprocity theorem, Superposition theorem, Thevenin's and Norton's theorems, Millman's theorem, Maximum power transfer theorem, Compensation theorem, Tellegan's theorem.	L2 and L3	10
Module 5: Two port Network & Network Functions Introduction, two port z-, y-, T-, h-parameters, Inter-relations among parameters, Condition for reciprocity and symmetry, Interconnections of two port networks, Driving point and transfer functions, Poles, Zeros and nECE2ssary condition for driving point and transfer function.	L1, L3	10
Module 6: Network Synthesis Hurwitz polynomial, Positive real functions, synthesis of LC, RC, RL immittance functions.	L1 and L5	

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att:
Attendance

Text Books

- M.E. Valkenburg, "Network analysis", 3 ed, Pearson Education, 2015.
- D. R. Choudhary, "Networks and Systems", 2 ed, New Age International, 2013.
- K.M. Soni, "Circuits and Systems", S.K. Kataria & Sons Delhi, 2013.

Reference Books

- Bhise, Chadda, Kulshreshtha, "Engineering network analysis and filter design", Umesh Publication, 2012.
- F.F. Kuo, "Network Analysis and Synthesis", 2 ed, Wiley India Pvt. Ltd, 2006.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	3	--	--	--	2	--	--	--	--	--	--	--	--	2	--	--
CO2	1	--	3	--	--	--	--	--	--	--	--	--	2	1	3	3
CO3	1	--	3	--	1	--	--	--	--	--	--	--	--	1	--	--
CO4	2	3	--	--	--	--	--	--	--	--	--	--	3	1	3	3
CO5	2	3	2	--	--	--	--	--	--	--	--	--	--	1	--	--

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ECE2311	DATA STRUCTURES USING C	L	T	P	C
Version: 2019.1	Date of Approval: May 21, 2019	3	0	0	3
Pre-requisites/Exposure	Basic Knowledge of C++ Programming				
Co-requisites	Nil				

Catalog Description

This course covers the design, analysis, and implementation of data structures and algorithms to solve engineering problems using C programming language. Topics include elementary data structures, (including arrays, stacks, queues, and lists), advanced data structures (including trees and graphs), the algorithms used to manipulate these structures, and their application to solving practical engineering problems. At the end of this course student will gain knowledge about different kinds of file structures and their related operations.

Course Objectives

The objective of this course is to

1. Equip the students with knowledge of algorithms, different types of data structures and analysis of space and time complexity.
2. Provide an overview of various algorithms of data structures like stack and queues and related operations and implementation.
3. Provide an overview of dynamic Data Structure like linked list and its related operations, algorithms and programs. Demonstrate practical use of dynamic data structure to solve engineering problems.
4. Equip the students with knowledge of algorithms and operations related to tree and graph data structures and their practical applications.
5. Provide an overview of Sorting, Searching and file structures and its related algorithms and techniques.

Course Outcomes

On completion of this course, the students will be able to

CO 1:Identify operations on array, multidimensional, string and their implementation and analyze space and time complexity of algorithms.

CO 2: Explain various algorithms and operations of data structures like stack and queues and analyze complexity of each operation.

CO 3: Explain dynamic data structures and various algorithms and operations of data structures like linked list and their applications in computer science.

CO 4: Illustrate the algorithms and operations related to tree and graph data structures, their practical applications and analyze complexity of algorithm associated with each operations.

CO5: Explain Sorting, Searching and file organization and its related techniques.

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Modules	Blooms level*	Number of hours
Module I: Introduction to Data structures Data structures: Definition, Types. Algorithm design, Complexity, Time-Space Tradeoffs. Use of pointers in data structures.Array Definition and Analysis, Representation of Linear Arrays in Memory, Traversing of Linear Arrays, Insertion and Deletion, Single Dimensional Arrays, Two Dimensional Arrays, Multidimensional Arrays, Function Associated with Arrays, Character String in C, Character String Operations, Arrays as parameters, Implementing One Dimensional Array, Sparse matrix.	L1, L2	7
Module II: Introduction to Stacks and queue Stack: Definition, Array representation of stacks, Operations Associated with Stacks- Push & Pop, Polish expressions, Conversion of infix to postfix, infix to prefix (and vice versa),Application of stacks recursion, polish expression and their compilation, conversion of infix expression to prefix and postfix expression, Tower of Hanoi problem.Queue: Definition, Representation of Queues, Operations of queues- QInsert, QDelete, Priority Queues, Circular Queue, Deque.	L1, L2, L3, L4	8
Module III: Dynamic Data Structure Linked list: Introduction to Singly linked lists: Representation of linked lists in memory, Traversing, Searching, Insertion into, Deletion from linked list, doubly linked list, circular linked list, generalized list. Applications of Linked List-Polynomial representation using linked list and basic operation. Stack and queue implementation using linked list.	L1, L3 and L4	7
Module IV: Trees and Graphs Trees: Basic Terminology, Binary Trees and their representation, expression evaluation, Complete Binary trees, extended binary trees, Traversing binary trees, Searching, Insertion and Deletion in binary search trees, General trees, AVL trees, Threaded trees, B trees. Graphs: Terminology and Representations, Graphs & Multigraphs, Directed Graphs, Sequential representation of graphs, Adjacency matrices, Transversal Connected Component and Spanning trees.	L1, L3 and L5	7
Module V: Sorting and Searching and file structures Sorting: Insertion Sort, Bubble sort, Selection sort, Quick sort, two-way Merge sort, Heap sort, Partition exchange sort, Shell sort, Sorting on different keys, External sorting. Searching: Linear search, Binary search File structures: Physical storage media, File Organization, Linked organization of file, Inverted file, Organization records into blocks, Sequential blocks, Hash function, Indexing & Hashing, Multilevel indexing, Tree Index, Random file, Primary Indices, Secondary Indices, B tree index files.	L1, L4, L5	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE

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Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- Horowitz and Sahani, ―Fundamentals of Data structures‖, Ga lgotia publicat ions.
- R.L. Kruse, B.P. Leary, C.L. Tondo, ―Data structure and program design in C, PHI
- Data structures and algorithms‖ – Schaum Series.
- File Structures An object-Oriented Approach with C++ by Michael J. Folk, Bill Zoellick, Breg Riccardi, Published by Addison Wesley (1st ISE Reprint,1999).

Reference Books

- J. P. Tremblay and P. G. Sorenson, Introduction to Data Structures with Applications, McGraw – Hill
- Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Published by Prentice-Hall
- India(1999).
- Data Structures Using C and C++ second edition by Yeddidyah Langsam, Moshe J.Augenstein, Aaron M. Tenen Baum, Published by Prentice-Hall India
- Data Structures and Algorithm analysis in C++ by Mark Allen Weiss, Published by Addison Wesley (3rd Indian Reprint 2000).
- Data Structures‖ – R. S. Salaria

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**1**	**2**	**1**	--	--	--	--	--	--	--	--	--	**2**	--	--
CO2	**1**	**2**	**2**	--	--	--	--	--	--	--	--	--	**2**	**2**	**1**
CO3	**1**	**2**	**2**	**1**	--	--	--	--	--	--	--	--	**2**	**2**	**1**
CO4	**1**	**2**	**2**	**1**	--	--	--	--	--	--	--	--	**2**	**2**	**1**
CO5	**1**	**2**	**2**	**1**	--	--	--	--	--	--	--	--	**2**	**2**	**2**

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ECE2305	ANALOG ELECTRONICS - I LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course provides the practical implementation and verification of the theoretical facts studied in theory course. It includes studying the characteristics of diodes, rectifiers, transistors and amplifiers.

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Course Objectives

The objective of this course is to

1. Provide a demonstration of various analog components like diodes, rectifiers etc.
2. Equip with understanding of different circuits like BJT, JFET, MOSFET and amplifiers.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Demonstrate the characteristics of pn junction and zener diode.

CO 2: Obtain and analyze the output of clipper-clamper circuit and rectifiers with various filters.

CO 3: Plot the characteristics of BJT, JFET and MOSFET.

CO 4: Obtain the gain and demonstrate the frequency response of single stage and double stage amplifiers.

Modules/Topics Covered**	Blooms level*	Number of hours
Lab Session-1 1. To study and plot the characteristics of a junction diode. 2. To study Zener diode I-V characteristics.	L3, L5	2
Lab Session-1I 3. To study diode based clipping and clamping circuits. 4. To study half wave, full wave and bridge rectifier with filters.	L3, L5	2
Lab Session-1II 5. To study the input and output characteristics of a transistor in its various configurations (CE and CB). 6. To study various types of Bias Stabilization for a transistor. 7. To study and plot the characteristics of a MOSFET in its various configurations. 8. To study and plot the characteristics of a JFET in its various configurations .	L3, L5	6

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Lab Session-1V . 9. To study the gain and plot the frequency response of a single stage transistor amplifier. 10. To measure gain and plot the frequency response of double stage RC coupled amplifier.	L3, L5	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA					**EE**
Components	**A**	**PR**	**LR**	**V**	**70**
Weightage (%)	5	10	10	5	

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

Text Books

- Anand Kumar, "Fundamentals of Digital Circuits", 2nd Edition, Prentice-Hall, 2004
- Moris Mano, "Digital Design", 2nd Edition, Pearson Education,2007.
- R.P. Jain, "Modern Digital Electronics", 2nd Edition, Tata Mcgraw Hill, 2003

Reference Books

- Thomas L. Floyd, "Digital Fundamentals", 11th Edition, Pearson Education, 2015
- Malvino and Leech, "Digital Principles & Applications", 1st Edition, Tata McGraw Hill, 1993

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**3**	**1**	--	--	--	--	--	--	**3**	--	--	**2**	--	**1**	--	**3**
CO2	**3**	**1**	--	--	--	--	--	--	**3**	--	--	**2**	--	**1**	--	**3**
CO3	**3**	**1**	--	--	--	--	--	--	**3**	--	--	**2**	--	**1**	--	**3**
CO4	**3**	**1**	--	--	--	--	--	--	**3**	--	--	**2**	--	**1**	--	**3**

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ECE2306	CIRCUITS AND SYSTEMS LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course is intended for solving and synthesis of electrical circuits. A knowledge of grade school mathematics and physics is necessary. This course will give you a better understanding on how to solve various circuits using graph theory, nodal and mesh analysis and theorems in both time and Laplace domain.

Course Objectives

The objective of this course is to

- Provide the capability to analyze the circuits.
- Synthesize the circuits with given transfer function.

Course Outcomes

On completion of this course, the students will be able to

CO1. Analyze the circuits by various methods like graph, theorems.
CO2. Understand the various parameters to design electrical circuits.
CO3. Understand the realizability of the circuits by driving point and transfer function.

Course Content

Modules	Blooms level*	Number of hours
LABORATORY SESSSION 1 1. To verify Thevenin's theorem in a given network. 2. To verify reciprocity theorem in each network.	L1 L2 and L3	2
LABORATORY SESSSION 2 3. 2 To verify maximum power transfer theorem in a given network. 4. To verify Tellegen's theorem in a given network.	L1 and L3	2
LABORATORY SESSSION 3 5. To determine the Z- and Y- parameters of a resistive two-port network. 6. To determine the T- (ABCD) parameters of a resistive two-port network. 7. To determine the h- parameters of a resistive two-port network.	L1 and L3	4

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LABORATORY SESSSION 4 8. To design series-series connection of 2 two-port networks and determine its Z- parameters. 9. To design parallel-parallel connection of 2 two-port networks and determine its Y- parameters. 10. To design a cascade connection of 2 two-port networks and determine its T- (ABCD) parameters.	L2 and L3	4

*Bloom's Level: L1: Knowledge; L2: Comprehension; L3: Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text & References:

Textbooks

- M E Valkenburg, "Network Analysis", PHI.
- D. R. Choudhary, "Network and Systems", New Age International, Second Edition, 2005.

Reference Books

1. K. M. Soni, "Circuit and Systems", VIII Edition, S.K. Kataria and sons, Delhi, 2009.
2. F.F. Kuo, "Network Analysis and Synthesis", Wiley India Pvt Ltd., Second Edition, 2011.
3. Bhise, Chaddha, Kulshrestha, "Engineering analysis and Filter Design", Umesh Publication, 2002.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	1		2		-	2	-	1	2	2	-	2	1	-		-
CO 2	2	1	1	2	-	-	-	-	2	-	-	2	1	-		-
CO 3		2	1	3	-	-	-	-	2	-	--	2	1	-		-

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ECE2312	DATA STRUCTURES USING C LAB	L	T	P	C
Version: 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Basic Knowledge of C Programming				
Co-requisites	Nil				

Catalog Description

This course covers the design, analysis, and implementation of data structures and algorithms to solve engineering problems using C programming language. Topics include elementary data structures, (including arrays, stacks, queues, and lists), advanced data structures (including trees and graphs), the algorithms used to manipulate these structures, and their application to solving practical engineering problems. At the end of this course student will gain knowledge about different kinds of file structures and their related operations.

Course Objectives

The objective of this course is to

- Equip the students with knowledge of algorithms, different types of data structures and analysis of space and time complexity.
- Provide an overview of various algorithms of data structures like stack and queues and related operations and implementation.
- Provide an overview of dynamic Data Structure like linked list and its related operations, algorithms and programs. Demonstrate practical use of dynamic data structure to solve engineering problems.
- Equip the students with knowledge of algorithms and operations related to tree and graph data structures and their practical applications.
- Provide an overview of Sorting, Searching and file structures and its related algorithms and techniques.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Identify operations and their implementation on array and multidimensional, string and estmation space and time complexity.

CO 2: Explain various algorithm and operations of data structures like stack and queues and analyze complexity of each operation.

CO 3: Explain dynamic data structures and various algorithms and operations of data structures likelinked list and their applications in computer science.

CO 4: Illustrate the algorithms and operations related to tree and graph data structures, their practical applications and analyze complexity of algorithm associated with each operations.

CO5: Explain Sorting, Searching and file organization and its related techniques.

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Modules	Blooms level*	Number of hours
Module I: Introduction to Data structures 1. Write a program to copy one string into another without using library functions. 2. Write a program to demonstrate array and linked list implementation of sparse matrix. 3. Write a program to multiply two 2D matrix.	L3,L5	2
Module II: Introduction to Stacks and queue 1. Write a program to implement push and pop operations on the stack. 2. Write a program to demonstrate conversion of infix to postfix. 3. Write a program to implement simple queue and perform insertion and deletion operation on it. 4. Write a program to implement circular queue and perform insertion and deletion operation on it. 5. Write a program to implement dqueue and perform insertion and deletion operations on it. 6. Write a program to implement priority queue and perform insertion and deletion operation on it.	L3,L5	4
Module III: Dynamic Data Structure 1. Write a program to implement singly linked list and perform following operations on it. • Insertion at end • Insertion at last • Insertion at desired place. 2. Write a program to implement singly linked list and perform following operations on it. • Deletion at end • Deletion at last • Deletion at desired place. 3. Write a program to implement doubly linked list and perform following operations on it. • Insertion at end • Insertion at last • Insertion at desired place. 4. Write a program to implement singly linked list and perform addition of two polynomials.	L3,L5	4
Module IV: Trees and Graphs 1. Write a program to calculate in order, preorder and post order traversal on binary tree. 2. Write a program to construct binary search tree and perform following operations on it. • Deletion of element • Insertion of elements. 3. Write a program to construct binary search tree and search an element in it. 4. Write a program to implement kruskal's algorithm to find out minimum spanning tree.	L3,L5	6

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Module V: Sorting and Searching and file structures 1. Write program to implement insertion sort. 2. Write a program to search an element in array using binary search. 3. Write a program to implement merge sort. 4. Write a program to implement quick sort. 5. Write a program to implement heap sort.	L3,L5	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text Books

- Horowitz and Sahani, ―Fundamentals of Data structures‖, Ga lgotia publicat ions.
- R.L. Kruse, B.P. Leary, C.L. Tondo, ―Data structure and program design in C, PHI
- Data structures and algorithms‖ – Schaum Series.
- File Structures an Object-Oriented Approach with C++ by Michael J. Folk, Bill Zoellick, Breg Riccardi, Published by Addison Wesley (1st ISE Reprint,1999).

Reference Books

- J. P. Tremblay and P. G. Sorenson, Introduction to Data Structures with Applications, McGraw – Hill.
- Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Published by Prentice-Hall India(1999).
- Data Structures Using C and C++ second edition by Yeddidyah Langsam, Moshe J.Augenstein, Aaron M. Tenen Baum, Published by Prentice-Hall India
- Data Structures and Algorithm analysis in C++ by Mark Allen Weiss, Published by Addison Wesley (3rd Indian Reprint 2000).
- Data Structures‖ – R. S. Salaria

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**1**	**2**	**1**	--	--	--	--	--	--	--	--	--	**2**	--	--
CO2	**1**	**2**	**2**	--	--	--	--	--	--	--	--	--	**2**	**2**	**1**
CO3	**1**	**2**	**2**	**1**	--	--	--	--	--	--	--	--	**2**	**2**	**1**
CO4	**1**	**2**	**2**	**1**	--	--	--	--	--	--	--	--	**2**	**2**	**1**
CO5	**1**	**2**	**2**	**1**	--	--	--	--	--	--	--	--	**2**	**2**	**2**

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ENGINEERING MATHEMATICS-III

Subject Code: ECE2310 **Credit Units: 4**

Course Objective:
The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects. Here our intention is to make the students acquainted with the concept of basic topics from Mathematics, which they need to pursue their Engineering degree in different disciplines.

Course Contents:
Module I: Types of Matrices, Inverse of a matrix by elementary transformations, Rank of a matrix (Echelon & Normal form), Linear dependence, Consistency of linear system of equations and their solution, Characteristic equation, Eigenvalues and Eigenvectors, Cayley-Hamilton Theorem, Diagonalization, Complex and Unitary Matrices and its properties, Vector space, Linear independence and dependence of vectors, Linear Transformations.

Module II: Analytic functions, C-R equations and harmonic functions, Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic functions, Liouvilles theorem, Fundamental theorem of algebra. Representation of a function by power series, Taylor's and Laurent's series, R Singularities, zeroes and poles, Residue theorem, evaluation of real integrals of type $\int_0^{2\pi} f(cos\theta, sin\theta)d\theta$ and $\int_{-\infty}^{\infty} f(x)dx$, Conformal mapping and bilinear transformations.

Module III: Probability space, conditional probability, Bayes theorem, Moments, Moment generating functions, Skewness, Kurtosis, Correlation and Regression, Binomial distribution, Poisson distribution, Normal distribution. Method of least squares and curve fitting of straight line and parabola, Solution of cubic and biquadratic equations.

Module IV: Numerical solution of algebraic and transcendental equations: bisection, secant method, Newton-Raphson method, fixed point iteration; interpolation: error of polynomial interpolation, Lagrange, Newton interpolations; numerical integration: Trapezoidal and Simpson rules; numerical solution of systems of linear equations: direct methods (Gauss elimination, LU decomposition); iterative methods (Jacobi and Gauss-Seidel).

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References

- E. Kreyszig, Advanced Engineering Mathematics, 10th Edition, John-Wiley & Sons, 2011.
- B. V. Ramana, Higher Engineering Mathematics; Publisher: Tata McGraw Hill Publishing Company; New Delhi; Year 2007.
- R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House, 2017.
- B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd edition (2014).
- Peter V. O Neil, Advanced Engineering Mathematics, CENGAGE Learning Custom Publishing; 7th Revised ed. edition (1 January 2011).
- Thomas & Finley, Calculus, Narosa Publishing House, 1996.

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ECE2315	MEASURMENT AND MEASURING INSTRUMENTS	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	2	0	0	2
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course provides a brief knowledge of measurements and measuring instruments related to engineering. It introduces measuring elements of instruments, characteristics of measuring instruments, error analysis, transducers and its classification, measurement of resistance, capacitance and inductance, principles of analog and digital meters and different display techniques.

Course Objectives

The objective of this course is to

- Equip the students with concepts of measurement, measuring elements and challenges in measurement.
- Provide in depth knowledge of each element of measurement system.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain measuring elements and characteristics of measurement system and solve problems related with measurement errors.
CO2. Classify different types of transducers and solve problems related with transducers.
CO3. Solve problems of resistance, capacitance and inductance measurement.
CO4: Explain and solve problems on different types of analog and digital meters suitable for voltage and current measurement.
CO5: Explain display devices used in measurement system and analyze the signals on CRO.

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Modules	Blooms level*	Number of hours
Module 1: **Basics of Measurement Systems** Elements of Generalized Measurement System; Static & Dynamic Characteristics of Instruments; Errors in Measurements – Sources and Types of Errors; Statistical Treatment of Data – Mean, Measures of Dispersion, Rejection of data based on confidence interval	L1, L2 and L3	5
Module 2: **Transducers** Classification; Selection ofTransducers; ResistiveTransducers– Potentiometer, Strain gauge, Rosettes, Thermistors and RTD; Capacitive Transducers – Measurement of Liquid level by change in variation of dielectric constant; Variable Inductance Transducers – self-generating type and passive type; Piezoelectric Transducers; Photoelectric Transducers; Digital Transducer	L1, L2, L3 and L4	9
Module 3: **Measurement of Resistance, Inductance and Capacitance** D.C. Bridges: Wheatstone's bridge, Limitations; Sensitivity & Carey Foster Bridge; Kelvin double bridge; Megaohm bridge. A.C. Bridges: Maxwell's Inductance Capacitance Bridge; Andersons Bridge; De Sauty's Bridge; Schering Bridge.	L1, L2, and L3	8
Module 4: **Analog and Digital Meters** Analog meters : PMMC meters- construction, torque equation, ammeter shunts, multirange ammeter, voltmeter multiplier, sensitivity, ohmmeters, multimeters; Construction & general equation of moving iron, electrodynamometer, hot wire instruments. Digital meters: Digital voltmeter – ramp type, integrating type, potentiometer type, Applications	L1, L2, and L3	8
Module 5:		

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Display Devices and Recorders LED, LCD, Cold Cathode displays, Incandescent Displays, Fluorescent Displays, LVD, VDU Cathode Ray Oscillioscope : Basic functioning, Measurement of Voltage, Current, Phase and Frequency.	L1, L2, L3	6

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- Electronic Instrumentation Technology by MMS Anand, PHI Pvt. Ltd., New Delhi Ed. 2005.
- Electronics Instrumentation by H.S. Kalsi TMH Ed. 2004.

Reference Books

- Electronics Instrumentation & Measurement Techniques by W.D. Cooper & A.D. Helfrick, PHI 3rd Ed.
- Electronics Measurement & Instrumentation by Oliver & Cage Mc-Graw Hill.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	--	**2**	-	--	--	--	--	--	--	**3**	--	**3**	--	**3**
CO2	**1**	**1**	--	**2**	--	--	--	--	--	--	--	**2**	--	**2**	--	**2**
CO3	**1**	**2**	--	--	--	--	--	--	--	--	--	**2**	--	**2**	--	**3**
CO4	**1**	**2**	--	**2**	--	--	--	--	--	--	--	**2**	--	**2**	--	**3**
CO5	**1**	**2**	--	**2**	--	--	--	--	--	--	--	**2**	--	**2**	--	**3**

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ECE2316	MEASUREMENT AND MEASURING INSTRUMENTS LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

Measurement System has become an important field for research and development in science and engineering. This course provides the students the core knowledge of measurement systems. This course introduces the experiments of measurement of various non electrical parameters.

Course Objectives

The objective of this course is to

- Perform experiments of measurement system.
- Analyze characteristics of measurement system.

Course Outcomes

On completion of this course, the students will be able to

CO1. To study working principles of various transducers utilized in measurement system.
CO2. Perform and analyze experiments on measurement system.
CO3. Draw and analyze characteristics system.

Modules	Blooms level*	Number of hours
Lab Session 1 1. 1 To Study various Temperature Measuring Instruments and to Estimate their Response times. 2. To study the working of Bourdon Pressure Gauge and to check the calibration of the gauge in a dead-weight pressure gauge calibration set up	L2, L3,L4 and L5	3
Lab Session 2 1. To study a Linear Variable Differential Transformer (LVDT) and use it in a simple Experimental set up to measure a small displacement. 2. To measure load (tensile/compressive) using load cell on a tutor.	L2, L3,L4 and L5	3

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Lab Session 3 • To measure torque of a rotating shaft using torsion meter/strain gauge torque transducer. • To measure the speed of a motor shaft with the help of non-contact type pickups (magnetic or photoelectric).	L2, L3,L4 and L5	3
Lab Session 4 • Measurement of distance using capacitive pick up • Measurement of temperature using RTD. • Measurement of pressure using piezoelectric pick up	L2, L3,L4 and L5	3

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text Books

- Electronic Instrumentation Technology by MMS Anand, PHI Pvt. Ltd., New Delhi Ed. 2005.
- Electronics Instrumentation by H.S. Kalsi TMH Ed. 2004.

Reference Books

- Electronics Instrumentation & Measurement Techniques by W.D. Cooper & A.D. Helfrick, PHI 3rd Ed.
- Electronics Measurement & Instrumentation by Oliver & Cage Mc-Graw Hill.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**3**	**-**	**3**	**3**	--	--	--	--	--	--	**2**	**-**	**-**	**1**	**3**
CO2	**1**	**2**	**-**	**2**	**2**	--	--	--	--	--	--	**2**	**-**	**-**	**1**	**3**
CO3	**1**	**2**	**-**	**2**	**2**	--	--	--	--	--	--	**2**	**-**	**-**	**1**	**3**

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ECE2313	VIRTUAL INSTRUMENTATION	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	2	0	0	2
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This Course introduces virtual instrumentation and its comparison over conventional instrumentation. In this course, LabVIEW has been adopted as the platform of virtual instrumentation programming. System hardware and its interfacing techniques are introduced. Applications of virtual instrumentation are explained in various field e.g. Aviation, Automotive Defence, Medical etc.

Course Objectives

The objective of this course is to

1. To provide the core knowledge of Virtual Instruments used in research and industry.
2. To provide a LabVIEW platform on which low cost virtual instruments can be designed in very short time.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain virtual instrumentation and compare it with tradition instruments.

CO2. Explain components of LabVIEW, apply programming concept and design basic virtual instruments using LabVIEW software.

CO3. Explain the concepts of LabVIEW system hardware including input, output and interfacing devices.

CO4: Explain applications of virtual instrumentation in industries.

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Modules	Blooms level*	Number of hours
Module 1: **Introduction to Virtual Instrumentation** Introduction, Historical perspective, advantages, block diagram and architecture of a virtual instrument, conventional vs. virtual instrumentation.	L1, L2 and L4	4
Module 2: **Introduction to Software** Introduction to Lab VIEW, Front panel, back panel representations, Block diagram, Menus, Palettes, VI and Sub VI, Editing and Debugging VI, Structures, Arrays, Clusters, Charts and Graphs, Data acquisition, Instrument Control, Signal Generation and Signal Processing Examples	L1, L2, L3, L4 and L5	9
Module 3: **Introduction to systems hardware** ADC, DAC, D/O, counters and timer, PC hardware structure, timing, interrupts, DMA, software and hardware installation, Configuring data acquisition hardware using the drives in application software, use of DAQ library functions for different analog and digital input/output operations. Input/output devices & functions like data gloves, joysticks, CRT etc.	L1 and L2	6
Module 4: **Application of Virtual Instrumentation in various fields** Aviation, Automotive, High Voltage, Defense, Chemical, Industrial, Marine, Medical, Mining, Nuclear Energy, Virtual landscapes.	L1 and L2	5

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

1. Learning with LabVIEW 7 Express – R.H. Bishop, Pearson Education, Delhi.
2. Virtual Instrumentation Using LabVIEW- Sanjay Gupta & Joseph John, TMG; 2005.

Reference Book

1. LabVIEW Basic 1 Course Manual, National Instruments
2. LabVIEW for everyone - Wells Lisa K and Travis Jeffrey, Prentice Hall.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	-	-	--	--	--	--	--	--	3	--	-	3	3
CO2	1	1	2	2	--	--	--	--	--	--	--	2	--	-	2	2
CO3	1	2	--	--	--	--	--	--	--	--	--	2	--	-	2	3
CO4	1	2	--	-	--	--	--	--	--	--	--	2	--	-	2	3

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ECE2314	VIRTUAL INSTRUMENTATION LAB	L	T	P	C
Version 2019.1	Date of Approval: 14 July 2019	0	0	2	1
Pre-requisites/Exposure	Signal and System				
Co-requisites					

Catalog Description

This Course introduces virtual instrumentation. In this course, LabVIEW has been adopted as the platform of virtual instrumentation programming. Experiments are introduced to create virtual instrument based on various logics. Experiments are based on graphical programming.

Course Objectives

The objective of this course is to

Introduce LabVIEW software to design virtual instrument.

Design various logic in form virtual instrument using graphical programming.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain and use various functions available in LabVIEW.

CO2. Explain and create sub VIs which can be used as functions in complex VIs.

CO3. Analyse and create virtual instrument using graphical programming of various logics.

Modules	Blooms level*	Number of hours
Lab Session 1 1. To open, and explore the components of LabView. 2. To build a simple VI that converts a Celsius temperature reading to Fahrenheit.	L2, L3, L4 and L5	3
Lab Session 2 1. (a) To create an icon and a connector pane so you can use a VI as a subVI. (b) To build a VI and create its icon and connector pane so you can use it as a subVI. 2. To build a VI to generate 4*5 two dimensional array of random numbers (between1 to 2).	L2, L3, L4 and L5	3
Lab Session 3 1. To Build a VI that generate Fibonacci series starting from '0'. 2. To build a VI which finds roots of quadratic equation using formula node. 3. To build a VI that reverses the contents of an array.	L2, L3, L4 and L5	3

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Lab Session 4 1. To build a VI that can be used for sorting of numeric array i.e. in ascending or descending order. 2. To build a VI for 4*1 multiplexer operation. 3. To build a VI for 3*8 Decoder operation.	L2, L3, L4 and L5	3

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text Books

- Learning with LabVIEW 7 Express – R.H. Bishop, Pearson Education, Delhi.
- Virtual Instrumentation Using LabVIEW- Sanjay Gupta & Joseph John, TMG; 2005.

Reference Book

- LabVIEW Basic 1 Course Manual, National Instruments
- LabVIEW for everyone - Wells Lisa K and Travis Jeffrey, Prentice Hall.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	**-**	**3**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**-**	**-**	**1**	**3**
CO2	**1**	**2**	**-**	**3**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**-**	**-**	**1**	**3**
CO3	**1**	**2**	**-**	**3**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**-**	**-**	**1**	**3**

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ECE2317	STATISTICS & PROBABILITY CONCEPTS	L	T	P	C
Version 2019.1	Date of Approval: 14 July 2019	3	0	0	3
Pre-requisites/Exposure	Basic Mathematics				
Co-requisites	Nil				

Catalog Description

In this course the concepts of statistics, the science of collecting, organizing, and interpreting numerical data are discussed. Emphasis will be placed on statistical reasoning and data analysis. The main topics are study design, descriptive statistics, probability theory, and statistical inference. As a precursor to the study of cryptography studies will be made on impact of various techniques for finding independence or dependence between data variables. The concepts learnt in the studies of statistics will be applied practically to solve number of real life problems using the statistical package like R and SPSS.

Course Objectives

The objective of this course is to

- Equip the students with concepts of statistics through problem solving and analytical approach.
- Provide an overview of various statistical techniques: descriptive and inferential, parametric and non-parametric and practical statistics using R and SPSS.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain, describe and distinguish various population, sample, type of variables, measurement scales, central tendency, percentile and solve problems related to them.

CO 2: Explain the concept of descriptive and inferential statistics; probability theory; Solve problems based on probability; Explain binomial, poisson distribution and solve real life problems related to discrete and continuous random variable.

CO 3: Describe the concept of sampling distribution for large and small samples; Explain the concept of hypothesis testing and solve problems related using t-distribution and standard normal distribution.

CO 4: Explain concept of covariance and correlation and its applications in real life; Explain Anova and its use in real life problem solving; Explain and compare various regression analysis methods statistics for prediction

CO 5: Explain various parametric and nonparametric test and apply them to solve real life statistical problems

Modules	Blooms level*	Number of hours
Module 1: Introduction to Statistics and Data Analysis Statistical Inference, Samples, Populations and Experimental Design , The Hole of Probability Sampling Procedures; Collection of Data ,Measures of Location:, Measures of Variability ,Discrete and Continuous Data , Statistical Modeling, Scientific Inspection, and Graphical Diagnostics, Graphical Methods and Data Description ,General Types of Statistical Studies	L1, L2 and L3	7

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Module 2: Probability & Probability Distribution Sample Space, Events Probability of an Event, Additive Rules, Conditional Probability ,Multiplicative Rules ,Bayes' Rule, Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions , Joint Probability Distributions ,Mean of a Random Variable, Variance and Covariance of Random Variables, Means and Variances of Linear Combinations of Random Variables, Chebyshev's Theorem, , Discrete Uniform Distribution, Binomial and Multinomial Distributions, Poisson Distribution and the Poisson Process. Continuous Uniform Distribution, Normal Distribution ,Areas under the Normal Curve ,Applications of the Normal Distribution , Gamma and Exponential Distributions, ,Chi-Squared Distribution.	L1,L2, L3	6
Module 3: Sampling Distributions and Estimation Random Sampling, Some Important Statistics, ,Data Displays and Graphical Methods, Sampling Distributions Introduction to Estimation, Statistical Inference ,Classical Methods of Estimation, Single Sample: Estimating the Mean ,Standard Error of a Point Estimate, Prediction Intervals, Tolerance Limits Two Samples: Estimating the Difference between Two Means ,Paired Observations , , Single Sample: Estimating a Proportion, Two Samples: Estimating the Difference between Two Proportion.	L1,L2, L3	6
Module 4: Hypotheses Testing Statistical Hypotheses: General Concepts ,Testing a Statistical Hypothesis, One- and Two-Tailed Tests, The Use of *P*-Values for Decision Making in Testing Hypotheses, One Sample: Test on a Single Proportion ,Two Samples: Tests on Two Proportions, Exercises ,One- and Two-Sample Tests Concerning Variances, Goodness-of-Fit Test, Test for Independence (Categorical Data),Test for Homogeneity, Testing for Several Proportions	L1, L2 L3	7
Module 5: Simple Linear Regression and Correlation Introduction to Linear Regression, The Simple Linear Regression Model, Least Squares and the Fitted .Model Analysis-of-Variance, Approach, Test for Linearity of Regression: Data with Repeated Observations, Data Plots and Transformations, Simple Linear Regression Case Study, Correlation, Classification	L1, L2	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- "Probability & Statistics for Engineers & Scientists", Ronald E. Walpole,Pearson 2007
- Spectrum Editorial Board, Statistical Analysis Graphs and Diagrams, Spectrum Books Pvt Ltd, 2013.
- Torsten Hothorn and Brian S. Everitt , "A Handbook of Statistical Analyses Using R", Chapman and Hall/CRC, 2006.

Reference Books

- Pal and Sarkar, "Statistics: Concepts and Applications", Prentice Hall India Learning Private Limited, 2007.

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**1**	**1**	--	--	--	--	--	--	--	--	--	**1**	**3**	--	--
CO2	**1**	**1**	**1**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO3	**1**	**1**	**1**	--	-	--	--	--	--	--	--	--	**1**	**1**	--	--
CO4	**1**	**1**	**1**	--	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO5	**1**	**1**	**1**	--	--	--	--	--	--	--	--	--	**1**	**1**	--	--

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Course Code: ECE2319	CLEAN ROOM TECHNOLOGIES	L	T	P	C
Version: 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

In this course, students will become familiar with clean room technologies, particle technology, behavior of clean room operation professional and clean room equipment rules. It will educate and explain the about the clean room hygiene rules, defects in particle technology, fundamentals of sedimentation technology, behavior of professionals and quality management in clean room technology.

Course Objectives

The objective of this course is to:

1. Build from basic knowledge of clean room technology and fundamentals of hygiene cleaning.
2. Familiarize the student with the particle technology and effects of particle defects on yield.
3. Provide the knowledge about fundamentals of sedimentation and filtration technology.
4. Educate about professional behavior and rules in clean rooms.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the clean room technology and the performance requirements.
CO2. Introduce the particle technology and is analyze effect of particle defects on yield.
CO3. Describe the fundamentals of sedimentation, filtration technology and their applications.
CO4. Explain the rules and regulations clean room technology and the design methodology used for quality management in clean rooms .

Modules	Blooms Level*	Number of hours
Module 1- Cleanroom Technology: construction technology Cleanroom design; heating, ventilation, airconditioning and refrigeration equipment; lighting, cleanroom components Safety cabinets,air locks and air showers, floor systems, garments Fundamentals of hygiene cleaning,disinfection and sterilization; decontamination: garment basics, Performance Requirementsfor Clean-Room Garments, Clean-Room garment materials.	L1, L2,L4	5
Module 2 - Introduction to particle technology, Defects Caused by Particles &lts Probability ofDefect Formation, Quantitative Effect of Particle Defects on Yield, Particle characterization,particle size distributions, Properties of Particles, Ways to Express Particle Size, Properties ofAerosols, Particle Statics and Dynamics.	L1, L2,L3	6
Module 3 -Fundamentals of sedimentation, Filtration technology Introduction to Filtration Mechanisms,Filter Properties, Pressure Drop, Particle Collection, Filter types and their applications,Measurement and Minimization of Particles in Process Gases and Process Liquids, ultra-purewater systems and distribution.	L1, L2	5

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Module 4 - Cleanroom operation Professional behaviour in cleanrooms, air locks and air showers;measurement exercises; regulations and personnel training, Equipment Cleaning to MinimizeParticle Deposition, Equipment Cleaning Methods.	L1, L2,L4	7
Module 5 - Clean Equipment Design Rules and the SMIF Isolation Concept, Cleanroom Qualificationand validation, User requirements, quality management, Cleanroom Quality management byDesign methodology and tools Cleanroom Monitoring Measurement techniques for the onlinemonitoring of cleanrooms Regulations and audits Standards and legal regulations;	L1, L2	7

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Donovan, "R. P -Particle Control for Semiconductor Manufacturing", CRC press
2. W Whyte , "Clean room design", JOHN WILEY

Reference Books

3. Matts Ramstorp, " Introduction to Contamination Control and Cleanroom Technology",

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Course Code: ECE2320	INTRODUCTION TO IOT	L	T	P	C
Version 2023.1	Date of Approval: March 2023	3	-	-	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Course Objective:
The Internet is evolving to connect people to physical things and also physical things to other physical things all in real time. It's becoming the Internet of Things (IoT). The course enables student to understand the basics of Internet of things and protocols. It introduces some of the application areas where Internet of Things can be applied. Students will learn about the middleware for Internet of Things. To understand the concepts of Web of Things

Modules	Blooms level*	Number of hours
MODULE 1: What is the IoT and why is it important? Elements of an IoT ecosystem, Technology drivers, Business drivers, Trends and implications, Overview of Governance, Privacy and Security Issues.	L1, L2 and L3	8
MODULE 2: **IOT PROTOCOLS -** Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE802.15.4– BACNet Protocol– Modbus – KNX – Zigbee– Network layer – APS layer – Security	L1, L2, L3 and L4	8
MODULE 3: **IOT ARCHITECTURE -** IoT Open source architecture (OIC)- OIC Architecture & Design principles- IoT Devices and deployment models- IoTivity : An Open source IoT stack - Overview- IoTivity stack architecture- Resource model and Abstraction.	L1, L3 and L4	8
MODULE 4: **WEB OF THINGS -** Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals andBusiness Intelligence.	L1, L3, and L4	6
MODULE 5: **IOT APPLICATIONS -** IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications. Study of existing IoT platforms /middleware, IoT- A, Hydra etc.	L1, L2, and L3	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press,2012.
- Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet ofThings", Springer, 2011.
- David Easley and Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning About a HighlyConnected World", Cambridge University Press, 2010.
- Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applicationsand Protocols", Wiley, 2012.

References:

- Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)",1st Edition, VPT, 2014
- Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to ConnectingEverything", 1st Edition, Apress Publications, 2013
- Cuno Pfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978-1-4493-9357-1

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	3	--	1	1	--	--	--	--	--	--	2	1	2	--	--
CO2	1	2	--	1	--	--	--	--	--	--	3	--	2	1	--	2
CO3	1	3	--	1	1	--	--	--	--	--	3	2	--	--	1	2
CO4	1	--	1	3	1	--	--	--	3	--	--	2	2	1	--	--
CO5	1	1	1	2	--	2	3	--	--	--	--	--	--	1	2	--

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Syllabus - Fourth Semester

ECE2402	**COMMUNICATION SYSTEM**	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	3	0	0	3
Pre-requisites/Exposure	Signal and System				
Co-requisites					

Catalog Description

The purpose of this course is to introduce students to the basic principles of the design and analysis of modern communication systems.It will provide a thorough study of both analog and digital mod-ulation and demodulation schemes. The performance analysis of various techniques based on re-quirements of noise and bandwidth will also be explained. It also introduces the students to the in-formation theory and coding for basic understanding of mobile communication system.

Course Objectives

The objective of this course is to

- Provide a thorough introduction to analog and digital communications
- Provide in depth study of various modulation and demodulation techniques.
- Introduce students to basics of information theory and coding for applications in mobile com-munication.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define and distinguish analog and digital communication systems.

CO2. Differentiate modulation and demodulation techniques of AM and FM systems and compare them in terms of Bandwidth and noise.

CO3. Distinguish and categorize various digital modulation techniques.

CO4. Describe Information theory and coding for applications in mobile communication system by solving different encoding problems.

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Modules	Blooms level*	Number of hours
MODULE I: INTRODUCTION Communication Process, Source of Information, base-band and pass-band signals, Review of Fourier transforms, Random variables, different types of PDF, need of modulation process, analog versus digital communications	L1 and L2	4
MODULE II: AMPLITUDE MODULATION Amplitude modulation with full carrier, suppressed carrier systems, single side band transmission, switching modulators, synchronous detection, envelope detection, effect of frequency and phase errors in synchronous detection, comparison of various AM systems, vestigial side band transmission.	L1, L2, L3and L4	8
MODULE III: ANGLE MODULATION Narrow and wide band FM, BW calculations using Carson rule, Direct & Indirect FM generations, phase modulation, Demodulation of FM signals, noise reduction using pre & de-emphasis.	L1, L2, L3and L4	9
MODULE IV: PULSE MODULATION Pulse amplitude, width & position modulation, generation & detection of PAM, PWM & PPM, Comparison of frequency division and time division multiplexed systems. Basics of Digital Communications: ASK, PSK, FSK, QPSK basics & waveform with brief mathematical introduction	L1, L2, L3 and L4	6
MODULE V: NOISE	L1 and	4

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Different types of noise, noise calculations, equivalent noise band width, noise figures, effective noise temperature, noise figure.	L2	
MODULE VI:		
INTRODUCTION TO INFORMATION THEORY	L1,L2 and L3	5

Measurement of Information, mutual, Shannon's theorem, Source coding, channel coding and channel capacity theorem, Huffman code

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- B. P. Lathi and Zhi Ding ,"Modern Digital and Analog Coimmunication Systems", Fourth Edition, Oxford University Press, 2009
- Wayne Tomasi, "Electronic Communication systems", 5th edition, Pearson Education,2008

Reference Books

- Simon Haykin, "Communication Systems", Third Edition, John Wiley & Sons,2007
- Taub and schilling, "Principles of Communication Systems", Third Edition, TMH,2008

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	--	_	--	_	2	--	--	--	--	--	--	1	--	1	--
CO2	1	3	2	--	--	2	--	--	--	--	--	--	1	--	1	--
CO3	1	3	2	--	--	2	--	--	--	--	--	--	1	--	1	--
CO4	1	2	2	--	--	3	--	--	--	--	--	--	1	--	1	--

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ECE2403	ANALOG ELECTRONICS- II	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	3	0	0	3
Pre-requisites/Exposure	Basic Electronics and Circuital Analysis				
Co-requisites	Nil				

Catalog Description
This course introduces the application of semiconductor devices in linear analog circuits. The course stresses on circuit designs using the operational amplifier, active filters and oscillators. The course also provides the overview on the

Course Objectives
The objective of this course is to
- Provide the fundamental knowledge of linear analog circuits.
- Provide the knowledge about practical circuit designs using OP Amp.

Course Outcomes
On completion of this course, the students will be able to
CO1. Describe the circuits having BJT and Operational Amplifiers.
CO2. Solve the Linear and Non-linear circuits and analyze them in terms of their parameters and applications.
CO3. Categorize the waveform generation circuits and apply them in laboratory projects.
CO4. Analyze the circuital knowledge to Linear ICs and filters and apply them for industry problem.

Course Content

Modules	Blooms level*	Number of hours
MODULE I: Building Blocks of Analog ICs 6 lecture hours Differential amplifier, Op-amp Model, op-amp DC & AC parameters, virtual ground, Current mirrors, Active loads, Level shifters and output stages.	L1 and L2	6
MODULE II: Operational amplifiers Introduction, open loop and closed loop configuration, op-amp parameters (input offset current, output offset current, i/p bias current, CMRR, PSRR, null adjustment range, etc,)	L1 and L2	5

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Inverting and non-inverting configuration, voltage gain of inverting and non inverting configurations.		
MODULE III: Linear & Non Linear Wave shaping Adders, Voltage to current, current to voltage Converter, Integrators, Differentiators**,** Voltage follower (voltage buffer), summer, subtractor, Comparators, log/antilog circuits using Op-amps, precision rectifiers.	L2, L3 and L4	6
MODULE IV: Waveform Generations Damped and undamped oscillations, Barkhausen criterion for sustained oscillation. Tank circuit generator Astable multi Vibrators, OTA-C Oscillators, Crystal oscillator**.** Types of oscillators: LC-Hartley and Colpitts, RC-RC phase shift and Wien bridge oscillator, Basics of tuned Amplifiers, Voltage Controlled Oscillator.	L2 L3 and L4	7
MODULE V: Active RC Filters & Applications of Linear Circuits Idealistic & Realistic response of filters (LP, BP, and HP), Butter worth & Chebyshev approximation filter functions, LP,BP,HP and All pass, Notch Filter, Operational transconductance amplifier (OTA)-C filters.	L2, L3 and L4	6
MODULE VI: Applications of IC Analog Multiplier & Timer IC phase locked loops, 555 Timer, IC voltage regulators-(fixed, variable) 78xx, 79xx series and adjustable.	L3 and L4	6

*Bloom's Level:
L1: Knowledge; L2: Comprehension; L3: Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- **Ramakant Gaekwad,** Op-Amps and Linear Integrated Circuits, 4th Edition PHI, 2001.
- **D. Roy Choudhury and Shail B. Jain,** Linear Integrated Circuits, 2nd Edition, New age International, 2006.

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Reference Books

1. **Adel S. Sedra and K. C. Smith** Microelectronic Circuits, Sixth Edition, Oxford University Press, 2013.
2. **George Clayton and Steve Winder**, Operational Amplifiers, 5th Edition, Elsevier, 2008.

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	1	1	-	-	-	3	-	-	-	-	-	-	1	-	-	-
CO3	1	2	3	-	-	3	-	-	-	-	--	-	1	1	-	-
CO4	1	1	-	-	-	2	-	-	-	-	-	-	1	1	-	-

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ECE2404	ELECTROMAGNETIC FIELD THEORY	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	3	0	0	3
Pre-requisites/Exposure	Mathematical Basics				
Co-requisites	Wave phenomena				

Catalog Description

Electromagnetic field theory is the most fundamental subject in the curriculum of electronics and electrical engineering education. Electromagnetics explains universal concepts in three-dimension real world, i.e., electro-magnetic wave propagation in free-space. This course provides a general introduction to the important physical concepts and mathematical methods used in treating all types of wave phenomena and electromagnetic signal propagation. This course provides essential back-ground and basic preparation for more advanced work in device physics, microwave and ultra-fast circuitry, transmission lines, electro dynamic wave propagation. Antenna design, and optoelectronics.

Course Objectives

The objective of this course is to

- Equip the students with the fundamental understanding of electro-magnetic wave system.
- To lay the foundations of mathematical Maxwell equations, electrodynamic wave propaga-tion and transmission lines.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain and apply vector calculus to static and time varying electric-magnetic fields in differ-ent engineering situations.

CO2: Explain and able to solve Electromagnetic Relation using Maxwell Formulae

CO3: Examine the phenomena of electrodynamic wave propagation in unbounded media and its interfaces.

CO4: Analyze and generalized the concepts of guided structures like transmission lines and their char-acteristics.

Modules	Blooms level*	Number of hours
MODULE 1: **Mathematical Basics and Electrostatics** Coordinate Systems: Spherical and Cylindrical coordinates, Dirac delta function, Coulomb‘s law, Gauss‘s law, Poisson‘s Equation, Laplace‘s Equation, Electrostatic Boundary conditions, Work and Energy in Electro-	L1, L2 and L3	8

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statics, Conductors, Surface charge and force on conductors. .		
MODULE 2: Magnetostatics and Magnetic Fields in matter Magnetic induction and Faraday's law, Magnetic Flux density, Magnetic Field Intensity, Biot Savart Law, steady currents, Ampere's law, Magneto-static Boundary conditions, magnetic field inside matter, magnetic susceptibility and permeability, ferromagnetism, energy stored in a Magnetic field, Magnetic Vector Potential	L2, L3 and L4	8
MODULE 3: **Electrodynamics** Faraday's laws, Maxwell's equations, Maxwell's modification of Ampere's law, continuity equation and Poynting theorem	L2 ,L3and L4	6
MODULE 4: **Electrodynamics Waves** Wave propagation in unbounded media, Boundary conditions, reflection and transmission, polarization, E.M. waves in vacuum, E. M. waves in matter: reflection and transmission of plane waves.	L1, L2 and L3	8
MODULE 4: **Introduction to Transmission Lines** Transmission Line, Line Parameters, Characteristic Impedance, Image Impedance, HVDC and HVAC Common faults in transmission lines. Skin Effect, Ferranti Effect and Corona.	L1, L2 and L3	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- David J. Griffiths " Introduction to Electrodynamic" Pearson Education India Learning Private Limited; 4 edition (2015)
- Fawwaz T. Ulaby "Fundamentals of Applied Electromagnetics" Pearson; 7 edition (October 11, 2014)

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	1	2	1	--	--	--	--	--	--	--	--	--	1	-	-
CO2	1	2	1	--	--	--	--	--	--	--	--	--	1	-	-
CO3	1	1	3	--	--	2	1	--	--	--	--	--	1	-	-
CO4	1	1	1	--	--	3	1	--	--	--	--	--	1	-	-

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ECE2411	DIGITAL ELECTRONICS	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	2	1	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course explores the theory and operation of the basic building blocks of digital electronics which includes combinational and sequential circuits. This course also explains the logic families and data convertors. The concepts learnt in the studies of sequential circuits will be applied in the design and analysis of Melay and Moore machines.

Course Objectives

The objective of this course is to

1. Provide the basic knowledge of digital logic levels and application of combinational and se-quential circuits.
2. Equip with the understanding of logic family and data convertors.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the various logic gates, Boolean algebra and solve the k-map & tabulation method to simplify the logical function.

CO2: Explain the adder & subtractor; Apply and analyze multiplexer, decoder & encoder to design Boolean function.

CO3: Describe flip flops, shift registers & Design counters and synchronous sequential circuits.

CO4: Explain & compare different logic families and explain data convertors.

Modules	Blooms level*	Number of hours
MODULE 1: BOOLEAN FUNCTIONS Analog & digital signals, AND, OR, NOT, NAND, NOR , XOR & XNOR gates, Boolean algebra, DeMorgan's theorems, Implementation of logical function using only NAND/NOR gates, 1`s complement and 2`s comple- ment, BCD to Gray and Gray to BCD code conversion, Standard represen- tation of logical functions (SOP and POS forms), K-map representation and simplification of logical function up to five variables, don't care condi- tions, XOR & XNOR simplifications of K-maps, Tabulation method	L1,L2 and L3	6
MODULE 2:		

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COMBINATIONAL CIRCUITS Adders, Subtractors, Implementation of full adder using half adder, full subtractor using half subtractor, Multiplexer, de-multiplexer, decoder & encoder, code converters, 1 & 2 bit comparators, BCD to seven segment decoder/encoder, Implementation of logic functions using multiplexer/de-multiplexer and decoder, Implementation of 16×1 MUX using 4×1 MUX, 4×16 decoder using 3×8 decoder etc., logic implementations using PROM, PLA & PAL.	L1, L2,L3 and L4	6
MODULE 3: SEQUENTIAL CIRCUITS Difference between combinational and sequential circuits, Latch, Flip-flops: SR, JK, D & T flip flops – Truth table, Excitation table, Conversion of flip-flops, set up and hold time, race around condition, Master Slave flip flop, Shift registers: SIPO, PISO, PIPO, SIPO, Bi-directional, 4-bit universal shift register; Counters: Asynchronous/ripple & synchronous counters – up/down, Ring counter, sequence detector.	L2,L3, L4 and L5	7
MODULE 4: LOGIC FAMILIES & DATA CONVERTERS Logic families: Special characteristics (Fan out, Power dissipation, propagation delay, noise margin), working of RTL, DTL, TTL, ECL and CMOS families; Data converters: Special characteristics, ADC – successive approximation, linear ramp, dual slope; DAC – Binary Weighted, R-2R ladder type.	L1, L2,L3 and L4	5

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

1. Anand Kumar, "Fundamentals of Digital Circuits", 2nd Edition, Prentice-Hall, 2004
2. Moris Mano, "Digital Design", 2nd Edition, Pearson Education,2007.
3. R.P. Jain, "Modern Digital Electronics", 2nd Edition, Tata Mcgraw Hill, 2003

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Reference Books

- Thomas L. Floyd, "Digital Fundamentals", 11th Edition, Pearson Education, 2015
- Malvino and Leech, "Digital Principles & Applications", 1st Edition, Tata McGraw Hill, 1993

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO4
CO1	1	2	3	--	--	--	--	--	--	--	--	--	1	--	--	--
CO2	1	2	3	--	--	--	--	--	--	--	--	2	1	--	--	3
CO3	1	2	1	--	--	--	--	--	--	--	--	2	1	--	--	3
CO4	2	3	3	--	--	--	--	--	--	--	--	--	1	--	--	3

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ECE2417	SIGNALS AND SYSTEMS	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	2	1	0	3
Pre-requisites/Exposure	Differentiation & Integration concepts				
Co-requisites					

Catalog Description

This course deals in Digital signal processing with significant skills in advance methods for modifi-cation, analysis, classification & sampling of signals. It provides the broad knowledge of design, and realization of digital signal processing systems. The problems based on transformation of do-mains and filter design will be focused on.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of signals and systems.
2. Provide in-depth knowledge of representation of signals in frequency & z-domain.

Course Outcomes

On completion of this course, the students will be able to

CO1: Represent, analyze & categorize discrete-time signals and systems in time domain with an emphasis on linear time invariant systems.

CO2: Apply the fourier series expansion to signals and obtain its constituent frequencies.

CO3: Convert the signals from time domain to frequency domain using fourier transform.

CO4: Apply the z- transform on discrete signals to solve the problems related to computational complexity.

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Modules	Blooms level*	Number of hours
Module 1: **Signals And Systems** Introduction of signals and systems; classification of signal, continuous time and discrete time signals, operations performed on them, even and odd signals, periodic and non periodic signals, deterministic and random signals, energy signals, power signals, elementary signals: impulse, step, ramp and exponentials, classification of systems.	L1,L2 and L4	8
Module 2: **LTI System** Response of LTI system for continuous and discrete time systems, Impulse response, Step response, properties of continuous LTI and discrete LTI systems, LTI systems described by differential and difference equation, analysis of LTI Systems, interconnection of systems.	L1,L2 and L4	6
Module 3: **Fourier Series** Representation of continuous time periodic signal, properties of continuous time Fourier series, representation of discrete time periodic signals, convergence of the Fourier series, properties of discrete time Fourier series, Fourier series and LTI systems.	L2,L3	7
Module 4: **Fourier Transform** Continuous time Fourier transform, properties of continuous time Fourier transform, discrete time Fourier transform, properties of discrete time Fourier transform; applications; Bandwidth determination of signals and systems.	L2,L3	7
Module 4: **z-Transform** Definition of z-transform, region of convergence, properties of z-transform, first order system, second order system, inverse z-transform, analysis of LTI system using z-transform.	L2,L3	8

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**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- **Proakis, Manolakis**, Digital Signal processing, 4th edition, Pearson, 2007.
- **Oppenheim & Schaffer**, Digital Signal Processing, 1st edition, Pearson, 1975.

Reference Books

- **Simon Haykin**, Signals and Systems, 2nd Edition, Willy Publications.
- **B.P.Lathi**, Linear Systems & Signals, 2nd Edition, Oxford Publication.
- **Roberts**, Fundamentals of Signals and Systems, Tata Mcgraw Hills Publication.

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--
CO2	2	1	--	--	2	--	--	--	--	--	--	--	2	1	--	--
CO3	2	1	--	--	2	--	--	--	--	--	--	--	2	1	--	--
CO4	2	1	--	--	2	--	--	--	--	--	--	--	2	1	--	--

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ECE2406	COMMUNICATION SYSTEMS LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Signal and System				
Co-requisites	Nil				

Catalog Description

To impart knowledge on Amplitude Modulation and Angle modulation principles, generation, and its types. Also, to understand the basic concepts of pulse modulation techniques like PCM and PSK.

Course Objectives

The objective of this course is to

- To provide the basic skills required to understand, develop, and design of various engineering applications involving analog communication theory. To provide basic laboratory exposures for communication principles and applications.

Course Outcomes

On completion of this course, the students will be able to

CO1: Study the carrier modulation techniques like AM and FM modulation.

CO2: Study digital carrier modulation techniques using amplitude shift keying and Frequency shift keying.

CO3: Demonstrate various pulse modulation techniques (PCM), DM, ASK, DPSK and QPSK.

List of Experiments:

Modules	Blooms level*	Number of hours
1. To study the sampling and reconstruction of a given signal. 2. To study amplitude modulation and demodulation. 3. To study frequency modulation and demodulation. 4. To study time division multiplexing.	L1, L2	8
5. To study pulse amplitude modulation. 6. To study delta and adaptive delta modulation and demodulation. 7. To study carrier modulation techniques using amplitude shift keying and Frequency shift keying.	L3 and L4	10

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8. To study carrier modulation techniques using binary phase shift keying and differential shift keying. 9. To study pulse code modulation & differential pulse code modulation as well as relevant demodulations. 10. To study quadrature phase shift keying & quadrature amplitude modulation.	L2, L4	10

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2													2	
CO2	2	2			2										2	
CO3	2										2				2	

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ECE2407	ANALOG ELECTRONICS – II LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Circuit Theory				
Co-requisites	Nil				

Catalog Description

In this course the concepts of Analog Electronics are discussed. Design and analysis of efficient circuits using op-amp like adder, subtractor, filters and oscillators.

Course Objectives

The objective of this course is to

- To provide the basic skills required to understand, develop, and design of various engineering applications involving Analog Electronic & Circuits.
- To provide basic laboratory exposures for Analog Circuits and applications.

Course Outcomes

On completion of this course, the students will be able to

CO1: Construct adder, subtractor, an inverting and non-inverting amplifier.

CO2: Design transistor-based RC oscillator (Wien bridge and RC phase shift oscillator) circuit.

CO3: Construct astable and mono-stable mode timer circuit using IC 555.

CO4: Design of Integrator, differentiator and low pass & high pass active filter circuit using Op-Amp (I.C-741)

List of Experiments:

Modules	Blooms level*	Number of hours
1. To study the op amp as an inverting and non inverting amplifier. 2. To use the op amp as an adder, subtractor, integrator and differentiator. 3. To design a ramp and a square wave generator. 4. To study the IC-555 timer as stable and bistable multivibrator.	L1, L2	8
5. To design low pass, high pass and band pass filters using op- amp. and plot their frequency response. 6. To design and study class a power amplifier. 7. To design and study a class B push pull amplifier.	L3 and L4	10
8. To study various feedbacks such as voltage series feedback. 9. To design RC phase shift and Wein bridge oscillators using op amplifier. 10. To design and study Colpitt and Hartley oscillators.	L2, L4	10

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2		3										1			
CO2		2	3										3			
CO3	3												2			
CO4	3	2	2								2		1			

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ECE2412	DIGITAL ELECTRONICS LAB	L	T	P	C
Version 2019.1	Date of Approval: 14 July, 2019	0	0	2	1
Pre-requisites/Exposure	Signal and System				
Co-requisites					

Catalog Description

In this Lab course the combination and sequential circuits are designed and their functionality is verified using truth table. Concepts covered would enable them to create complex circuits related to digital design. The objective of this course is to explore and implement the various features of digital logic using basic logic gates.

Course Objectives

The objective of this course is to

- Provide a basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
- Equip with understanding of different combinational and sequential circuits.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Demonstrate the basic concept of logic gates;
CO 2: Illustrate the adder and subtractors.
CO 3: Demonstrate the code convertors.
CO 4: Demonstrate the combinational and sequential circuits.

Modules/Topics Covered**	Blooms level*	Number of hours
1. To verify the truth tables of NOT, OR, AND, NOR, NAND, XOR, XNOR gates.	L3, L5	2
2. To obtain half adder, full adder using gates and verify their truth tables.	L3, L5	2
3. To obtain half subtractor, full subtractor using gates and verify their truth tables.	L3, L5	2
4. To implement control circuit using multiplexer.	L3, L5	2
5. To convert BCD code into excess 3 code and verify the truth table.	L3, L5	2
6. To verify the truth tables of RS, D, JK and T flip- flops.	L3, L5	2
7. To implement and verify 3-bit bi-directional shift register.	L3, L5	2
8. To design and study asynchronous/ripple counter.	L3, L5	2
9. To design and study synchronous counter.	L3, L5	2
10. To design and study a sequence detector.	L3, L5	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

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Examination Scheme:

IA					EE
Components	**A**	**PR**	**LR**	**V**	**70**
Weightage (%)	5	10	10	5	

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE- External Exam

Text Books

- Anand Kumar, "Fundamentals of Digital Circuits", 2nd Edition, Prentice-Hall, 2004
- Moris Mano, "Digital Design", 2nd Edition, Pearson Education,2007.
- R.P. Jain, "Modern Digital Electronics", 2nd Edition, Tata Mcgraw Hill, 2003

Reference Books

- Thomas L. Floyd, "Digital Fundamentals", 11th Edition, Pearson Education, 2015
- Malvino and Leech, "Digital Principles & Applications", 1st Edition, Tata McGraw Hill, 1993

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	**3**
CO2	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	**3**
CO3	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	**3**
CO4	**2**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	**3**

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ECE2418	ELECTRONIC WORKSHOP & PCB LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description

The students will be able to understand the contribution of electronics to some extent. PCB's have definitely contributed in a significant manner as a means of interconnection of various electronic components. The field of PCB designing is a mutual contribution of wide range of various other fields.

Course Objectives

The objective of this course is to

1. To identify basic electronic components and understand operation of electrical devices.
2. To implement mini projects based on concept of electronics circuit concepts.

Course Outcomes

On completion of this course, the students will be able to

CO1. Measure voltage, frequency and phase of any waveform using CRO. Generate sine, square and triangular waveforms with required frequency and amplitude using function generator.

CO2. Analyse the characteristics of different electronic devices such as diodes, transistors etc., and simple circuits like rectifiers, amplifiers etc.

CO3. Obtain the PCB for a simple circuit.

Course Content

Experiments	Blooms level*	Number of hours
1. Study of CRO, DMM & Function Generator 2. Identification of Active & Passive Components	L1 and L2	2
1. Winding shop: Step down transformer winding of less than 5VA. 2. Soldering shop: Fabrication of DC regulated power supply	L1 and L2	2
1. PCB Lab: (a) Artwork & printing of a simple PCB. (b) Etching & drilling of PCB.	L1 and L2	3
1. Wiring & fitting shop: Fitting of power supply along with a meter in cabinet. 2. Testing of regulated power supply fabricated.	L1 and L2	2

*Bloom's Level:

L1: Knowledge; L2: Comprehension; L3: Application; L4: Analysis; L5: Synthesis, L6: Evaluation

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA – Internal Assessment, EE - External Exam, PR - Performance, LR – Lab Record, V – Viva.

Text Books

- **John Keown,** OrCAD PSpice and circuit simulation,4th Edition Pearson, 2001.

Reference Books

- **Muhammad H. Rasid**, Introduction to PSpice Using OrCAD for circuit and electronics, Prentice Hall of India Pvt. Ltd, 1988.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	1	-	-	-	-	-	-	-	-	-	-	-	2	-	1	1
CO 2	1	2	-	-	-	3	-	-	-	-	-	-	2	-	1	1
CO 3	1	2	3	-	-	3	-	-	-	-	--	-	2	-	1	1

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ECE2414	PCB FABRICATIONS	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	2	0	0	2
Pre-requisites/Exposure	Basic Electronics				
Co-requisites					

Catalog Description

This course will introduce students to the process of fabrication of PCB and various design and analysis concepts for the techniques used. The role of environment will also be discussed. The assembly of components on PCB and testing for quality assaurance will also be discussed.

Course Objectives

The objective of this concentration elective is

- To allow students to have insight knowledge of PCB Fabrication.
- To enhance their knowledge domain beyond main subjects for application in working on various projects.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the design flow of PCB Fabrication.
CO2. Distinguish and Explain the techniques used and design considerations.
CO3. Apply the knowledge of computer for automation in PCB fabrication.
CO4. Prepare PCB for simple circuits in lab for projects.

Modules	Blooms level*	Number of hours
MODULE I: INTRODUCTION TO THE PCB Definition and Evolution of the Printed Circuit Board (PCB), Purposes of a PCB, Applications, Market Drivers, Typical Development Flow for a PCB, Printed Circuit Technology, Basic Electronic Components, Resistors, Capacitors, Inductors, Diodes, Transistors, Relays, Connectors, Integrated Circuits: How a silicon wafer becomes an IC, Printed Circuit Board Characteristics, PCB Materials, Fillers, resins, laminates, base material characteristics, Dielectric, conductors, Engineering References	L1and L2	5

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MODULE II: DESIGN AND ANALYSES Design and Environmental Requirements: Functional, Thermal, Vibration, Shock, EMI/EMC; Electrical Engineering: Analog and digital signals, Signal integrity, Grounding concepts, Current carrying capacity, CAD, Schematics, Layout rules of thumb; Mechanical Engineering: Panels, Standard board sizes, Packaging, Thermal Design, Heat transfer basics, Convection, Conduction, PCB Thermal Design Features, Thermal modeling, Cycling and fatigue , Component Vibration Fatigue, Vibration Models and Terminology, Combined Thermal and Structural Fatigue	L1, L2 and L3	5
MODULE III: CONTAMINATION CONTROL/ENVIRONMENTAL CONTROL Contamination Control, Conformal Coatings, Polluting Agents, Safety Controls, Pollution Controls, Recycling, Standards; Manufacturing: PCB Manufacturing Information, PCB Layout and Artwork; Fabrication: Machining Operations, Blanking, Cutting, Punching, Drilling, Laminating Techniques, Plating, Etching, Surface Finishing, Conformal Coatings, Inspection and Checkout, Specifications and Standards.	L1 and L2	5
MODULE IV: ASSEMBLY PCB Assembly Drawing Examples, Component Considerations, Component mounting and support, Mechanical Devices, Soldering Technology, Non solder Connections, Cleaning, Parts Staking, Conformal Coating Removal, Repair and Rework, Safety Considerations, ESD protection, Specifications and Standards.	L1and L2	5
MODULE V: TESTING & QUALITY ASSURANCE Common PCB Production Faults, Bare Board Testing, Electrical Performance Testing, Assembled PCB Testing, Quality Assurance in	L1 and L2	4

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Design, FMEA – Failure Mode and Effects Analysis, Software Tools, Quality Assurance in Manufacturing and in Assembly, Specifications and Standards.		

*Bloom's Level:
L1: Knowledge; L2: Comprehension; L3: Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- RS Khandpur, "Printed Circuit Boards", Third Edition, Tata McGraw-Hill Education, 2008

Reference Books

- Christopher T Robertson, "Printed Circuit Board Designer's Reference: Basics", Second Edition, Prentice Hall Professional, 2004
- Charles Harper, "High Performance Printed Circuit Boards", First Edition, McGraw-Hill Education, 2000

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	-	3	-	-	3	3	-	-	-	-	1	2	1	-	2
CO2	2	-	3	-	-	2	2	-	-	-	-	1	2	1	-	2
CO3	2	-	3	-	1	3	-	-	-	-	-	1	2	1	-	1
CO4	2	-	-	-	1	-	-	-	-	-	-	-	2	1	-	1

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ECE2421	ARTIFICIAL NEURAL NETWORK	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	2	0	0	2
Pre-requisites/Exposure	Basic Knowledge of Brain functioning				
Co-requisites	Nil				

Catalog Description

The course provides introduction to neural network and a deep insight into the basics of brain & its functioning basics of various neural models & neural schema used for learning. With this course students would be able to know the basics of each introductory feature of human brain and its features which would prove to be very helpful throughout their degree and would prove helpful in understanding other related subjects also.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of learning of brain problem solving techniques and develop proficiency in creating neural structures using the MATLAB.
2. Provide an overview of various control statements, data structures, packages related to image addition, graphics, different types of neural models.

Course Outcome

On completion of this course, the students will be able to

CO 1: Define Artificial Neural Network & its similarity to biological neural network and explain its application in our day to day life.

CO 2: Analyze ANN learning, Error correction learning, Hebbian learning, Competitive learning and Boltzman Learning.

CO 3: Implement simple perceptron, Perceptron Learning rule, modified perceptron learning rule, feed forward neural network & feedback Neural Network.

CO 4: Explain self-organizing Map, Hopfield network, Adaptive resonance theory and its various learning rules.

CO 5: Analyze memory-based learning, Associative learning, Bi-directional learning and Auto associative learning.

Modules	Blooms level*	Number of hours
Module-I Artificial Neural Networks (ANN) and biological neural networks, supervised and unsupervised learning rules, neural network applications	L1, L2 and L3	6
Module-II Unsupervised learning:- Hebbian learning and competitive learning. Supervised learning:- Back propagation algorithms, Learning rule:- Delta learning rule, Widrow-Hoff learning rule, Winner-Take-All learning rule	L1, L2 and L3	6

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Module-III Feed forward neural network, feed backward neural network, Perceptron and its learning law, single-layer perceptron, multi-layer perceptron.	L2, L3 and L4	6
Module-IV Self organizing networks: Kohonen algorithm, Hopfield Networks: Hopfield network algorithm, Adaptive resonance theory: Network and learning rules.	L2, L3 and L4	6
Module V Associative memory, auto-associative memory, bi-directional associative memory.	L2, L3 and L4	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

TextBook:
- Kenji Suzuki (ed.) - InTech **,** 2013
- Todd Troyer - University of Texas at San Antonio**,** 2005.

Reference Book:
- MATLAB 2017 Book released by MATWORS

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**												**1**			
CO2	**1**												**1**		**1**	
CO3		**1**	**2**										**1**			
CO4		**1**	**2**	**1**									**1**		**1**	
CO5			**2**										**1**			

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ECE2422	ARTIFICIAL NEURAL NETWORK LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Basics of MATLAB				
Co-requisites	NIL				

Catalog Description

In this Lab course first student should learn about advanced level of software used for easy calculation and toolbox used for software like MATLAB.

Course Objectives

The objective of this course is to

- Make the students apply knowledge of various neural models required for solving complex problems.
- Provide a demonstration of different types of image processing techniques through MATAB toolbox.

Course Outcomes

On completion of this course, the students will be able to

CO1: Acquiring knowledge of Basics of High-end calculation software and need in Computer Science & engineering

CO2: Demonstrate the All preliminary functions in MATLAB

CO3: Apply the knowledge of all the basics function and toolbox knowledge of MATLAB

CO4: Demonstrate the Neural Network model in MATLAB

CO5: Demonstrate usage of applications involving with Image processing & Its Toolbox used by MATLAB

Modules/Topics Covered**	Blooms level*	Number of hours
Introduction of MATLAB (a) Basic Variable deceleration & its operation (b) Function use & its application	L3, L5	4
Sample Programs in MATLAB (a) Basic use of Matrix and Graph Plotting (b) Different type of graph plotting with use of different -2 type of data	L3, L5	6
Sample Programs using MATLAB functions (a) Create a basic program MATLAB using functions (b) Use of basic function Image processing (c) Practice on Basic function of Image processing tool box.	L3, L5	6
Sample programs of ANN functions (a) Practice on ANN toolbox function in MATLAB (b) Write a program for training a small network in MATLAB	L3, L5	6
Sample Programs using ANN tool box & Image processing toolboix (a) Demonstrate the use of ANN tool box & Image processing toolbox and write a program after combining it.	L3, L5	2

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

** Sample Programs provided are not limited to these only, can include others as desired.

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	**70**
Weightage (%)	5	10	10	5	

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE- External Exam

Text Books

- Kenji Suzuki (ed.) - InTech , 2013
- Todd Troyer - University of Texas at San Antonio , 2005

Reference Books

- MATLAB 2017 Book realeased by MATWORS.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**2**	**1**	--	--	--	--	--	--	--	--	--	--	**2**	--	--	--
CO2	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO3	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO4	**1**	**3**	**2**	--	--	--	--	--	--	--	--	--	**2**	--	**2**	--
CO5	**1**	**3**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--

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ECE2419	JAVA PROGRAMMING	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	2	0	0	2
Pre-requisites/Exposure	Basics of Programming				
Co-requisites	NIL				

Catalog Description

The objective is to impart programming skills used in this object-oriented language java. The course explores all the basic concepts of core java programming like object, classes, data types, features, operators, control structures, interfaces, packages, applets, awt, swings and socket programming. The students are expected to learn it enough so that they can develop the basic applications as well as web solutions like creating applets etc.

Course Objectives

The objective of this course is to

- Equip the students with the basic feature of contemporary java required in solving complex problems.
- Provide a practical knowhow and implementation of java programming concepts like classes, objects, packages, swings,socket programming.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define and explain concept of byte code and platform independence, demonstrate basic java-based application development using operators, if-else, loops and arrays.

CO2: Distinguish between various types of inheritances, polymorphisms and other concepts and able to solve complex programming problems involving class objects, inheritances, and packages.

CO3: Describe hierarchy of exception classes and thread life cycle along with demonstrate and design solutions for some simple and complex applications using exception and multithreading concepts.

CO4: Explain event delegation model and describe AWT class hierarchy; Apply knowledge of event handling and AWT controls create some new dynamic graphical applications.

CO5: Explain the architecture of applet and concept of swing package. Demonstrate applications based on java applets and swings.

Modules	Blooms level*	Number of hours
Module I: Java Basics Concepts of OOP, Features of Java, How Java is different from C++, Environmental setup, Basic syntax, Objects and classes, Basic Data Types, Variable Types, Modifier Types, Basic operators, Loop Control, Decision Making, Strings and Arrays, Methods, I/O.	L1, L2 and L3	6
Module II: Java Object Oriented Inheritance, Overriding, Polymorphism, Abstraction, Encapsulation, Interfaces, Packages, Exploring java.util package. .	L2 and L3	7

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Module III: Exception Handling and Threading Exception Hierarchy, Exception Methods, Catching Exceptions, Multiple catch Clauses, Uncaught Exceptions Java's Built-in Exception. Creating, Implementing and Extending thread, thread priorities, synchronization suspending, resuming and stopping Threads, Multi-threading.	L2, L3 and L5	8
Module IV: Event Handling And AWT Event handling Mechanism, Event Model, Event Classes, Sources of Events, Event Listener Interfaces, AWT: Working with Windows, AWT Controls, Layout Managers	L2, L3, L4 and L5	8
Module V: Java Advanced AppletClass, Architecture, Skeleton, Display Methods.Swings: Japplet, Icons, labels, Text Fields, Buttons, Combo Boxes.Socket Programming: Socket methods, Server Socket methods, Socket Client and Socket Server examples.	L2 and L3	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text:

- "JAVA The Complete Reference" by Patrick Naughton & Herbert Schild, 10th Edition,TMH
- "Introduction to JAVA Programming a primer", E.Balaguruswamy,4th Edition,TMH

References:

- "Introduction to JAVA Programming" By Daniel/Young PHI
- "Java Script", By Jeff Frentzen and Sobotka,Tata McGraw Hill,1999

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**2**	**1**	--	--	--	--	--	--	--	--	--	--	**2**	--	--	--
CO2	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO3	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO4	**1**	**3**	**2**	--	--	--	--	--	--	--	--	--	**2**	--	**2**	--
CO5	**1**	**3**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--

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ECE2420	JAVA PROGRAMMING LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Basics of Programming				
Co-requisites	NIL				

Catalog Description

In this Lab course the basic features of contemporary java are implemented and demonstrated. Problems or programs will be related to concepts of classes, objects, threads, packages, exception handling, applets, AWT control, swings and socket programming. Concepts covered would enable them to create basic and complex console and graphical based applications for desktop and Internet

Course Objectives

The objective of this course is to

- Equip the students to apply knowledge of various basic java features required in solving basic and complex problems.
- Provide a demonstration of basic java programming concepts like classes, objects, threads, packages, exception handling, applets, AWT control, swings and socket programming

Course Outcomes

On completion of this course, the students will be able to

CO1: Apply the concepts learned of operators, if-else, loops and arrays to javabased application development.

CO2: Demonstrate the use of various types of inheritances, polymorphisms, class objects, inheritances, packages and other concepts to basic and complex java programming problems.

CO3: Apply the knowledge of exception handling and multithreading concepts for some simple and complex applications.

CO4: Apply knowledge of event handling and AWT controls to create some new dynamic graphical applications.

CO5: Demonstrate graphical applications based on java applets, swings and event handling.

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Modules/Topics Covered**	Blooms level*	Number of hours

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1. Sample Programs using Objects and classes, Variable Types, Modifier Types, operators, LoopsDecision Making, Strings and Arrays, (a) WAP to display "Hello, it's a first program in java". (b) WAP to find sum of two integers taken as input from user at runtime. (c) WAP to find sum of two float numbers taken as command line arguments (d) WAP to find changed case of entered character. (e) WAP to find maximum of 3 integer numbers taken as input from user at runtime. (f) WAP in java to find out the greatest out of ten numbers stored using arrays. (g) WAP to create class with "name" as String and "age" as integer data members. The class should have two methods to take input from user and display the data. (h) WAP to find factorial of a number using class and object.	L3, L5	6
2. Sample Programs using Inheritance, Overriding, Polymorphism, Interfaces, Packages a. WAP in java to illustrate the concept of interfaces. b. WAP to create a package as MyPack having a class with three methods: max, fact and show. Use it in other folder with setting classpath and without setting class path. c. Write a program in java to showcase uses of super keyword	L3, L5	4
1. Sample Programs using exception handling and threads a) Write a program to demonstrate the use of nesting of try-catch block b) WAP in java to illustrate the concept of using multiple catch clauses to handle different types of exceptions. c) WAP in java to create a user defined Exception and throw it explicitly. d) Demonstrate thread using Thread class and Runnable interface e) Demonstrate various thread methods using a program	L3, L5	6
(a) Sample Programs using event handling and AWT controls (b) Write a program to display "hello" in different color where user clicks left mouse button and "world" where right mouse button is clicked. Use black background. (c) WAP in java to create a Frame and handle window-closing event implementing the WindowListener interface. (d) WAP to create an Applet having various different buttons, recognizing them using action command string method and handling click event generated by them. (e) WAP to create a frame and illustrate the concept of using an adapter class in place of interfaces for handling various mouse events generated over frame window. (f) WAP in java to create a frame with AWT controls (like label, push buttons, Checkbox, Checkbox Group) and handle various events generated by them. (g) WAP in java to create a frame with various AWT controls (like choice, list, TextField and Buttons) and handle the events thrown by them.	L3, L5	6

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5. Sample Programs using applets, swings and stream socket a) . Write an applet which will display "HAPPY" and "DEEPAVALI" as: The word "HAPPY" will roll from top to bottom and "DEEPAVLI" from bottom to "top" . Both will run at the same speed and stop simultaneously at the center of the applet. b) Write an applet to display last 32 shades of red, green and blue in equal sized square grid accompanied by appropriate labels like" Last 32 shades of Red/Green/Blue color". Make use of BorderFactory to apply border for each individual shade. c) Create an applet with one single button with caption "Click". On clicking the button will open a new Frame with title "Factorial". The frame will have two three controls :TextField, Label and button. On clicking button calculate the factorial entered in TextField control. d) Create Java programs to demonstrate day time client and server e) Create java programs to create echo client and server	L3, L5	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	35

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

Text:

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CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**2**	**1**	--	--	--	--	--	--	--	--	--	--	**2**	--	--	--
CO2	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO3	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO4	**1**	**3**	**2**	--	--	--	--	--	--	--	--	--	**2**	--	**2**	--
CO5	**1**	**3**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--

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ECE2415	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	2	0	0	2
Pre-requisites/Exposure	Computer Fundamentals and Mathematics Set Theory				
Co-requisites	Nil				

Catalog Description

This course is design to get students familiar with the fundamentals & basic concepts in Data Base Management Systems and their use. This course discusses architecture of Database Systems with concept of different types of available database model, concurrency techniques and new applications of the DBMS. The techniques for database design, normalization, database recovery and protection will enable students to work easily and efficiently on real databases.

Course Objectives

The objective of this course is

- To make students familiar with the fundamental and necessary concepts of DBMS.
- Provide an overview of normalization, concurrency techniques and database recovery with examples.

Course Outcomes

On completion of this course, the students will be able to

CO1. Differentiate between traditional data processing system and database management system and understand characteristics and applications of DBMS in real world.

CO2. Explain and use different data models such as Entity Relationship Model, Network, and Relational Model etc.

CO3. Solve queries using relational algebra, relational calculus and SQL.

CO4. Illustrate normalization concepts and apply them in real database applications.

CO5. Explain database concurrency techniques and recovery mechanisms.

Modules	Blooms level*	Number of hours
Module I: Introduction Concept and goals of DBMS, Database Languages, Database Users, Database Abstraction. Basic Concepts of ER Model, Relationship sets, Keys, Mapping, Design of ER Model.	L1, L2 and L6	9
Module II: Hierarchical model &Network Model Concepts, Data definition, Data manipulation and implementation. Network Data Model, DBTG Set Constructs, and Implementation	L1and L2	9
Module III: Relational Model Relational database, Relational Algebra, Relational & Tuple Calculus.	L1 and L3	10

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Module IV: Relational Database Design and Query Language SQL, QUEL, QBE, Normalization using Functional Dependency, Multivalued dependency and Join dependency.	L2, L3 and L4	10
Module V: Concurrency Control and New Applications Transaction basics: ACID property, Lifecycle of Transcation, Why Concurrency Control, Schedule, Serializability, Lock Based Protocols, Time Stamped Based Protocols, Deadlock Handling, Crash Recovery. Distributed Database, Objective Oriented Database, Multimedia Database, Data Mining, Digital Libraries.	L2, L3 and L4	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- Korth, Silberschatz, "Database System Concepts", TMH, 4th Ed., 2000.
- Elmsari and Navathe, "Fundamentals of Database Systems", A. Wesley, 6th Ed., 2004

Reference Books

- Date C. J., "An Introduction to Database Systems", Narosa Publishing, 7th Ed., 2004

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	--	--	--	--	--	--	--	--	--	1	--	-	-
CO2	1	1	2	3	--	--	--	--	--	--	--	--	1	--	--	--
CO3	1	2	2	3	--	--	--	--	--	--	--	--	1	2	--	--
CO4	--	1	2	--	--	2	--	3	--	--	--	--	1	1	-	-
CO5	1	1	3	--	--	--	--	--	2	--	--	--	1	--	-	3

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ECE2416	DATABASE MANAGEMENT SYSTEMS LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Basic Concepts of DBMS				
Co-requisites	Relational Algebra and Relational Calculus				

Catalog Description

This course is designed to get students familiar with the basic concepts of SQL including DDL, DML and DCL statements. The course also explains the basic concepts of PL/SQL. Students will learn practical on Oracle software and hence can work on any RDBMS software in future.

Course Objectives

The objective of this course is

- To make students familiar with the concepts and working of SQL.
- Provide an overview of PL/SQL.

Course Outcomes

On completion of this course, the students will be able to

CO1. Illustrate SQL basic concepts like languages DDL, DML etc., data types and working.
CO2. Explain concepts of database creation, manipulation of data and data retrieval and apply them in real database applications.
CO3. Design and implement various data constraints on a database for a given problem.
CO4. Solve queries using concepts like joins, subqueries, aggregate functions, triggers etc.
CO5. Prepare PL/SQL blocks.

Modules	Blooms level*	Number of hours
Lab Session 1 Introduction of RDBMS, Oracle, SQL and data types.	L1 and L2	2
Lab Session 2 Basic concept of database creation and manipulation of data.	L1and L3	2
Lab Session 3 Working with SELECT query.	L1 and L3	2
Lab Session 4 To apply data constraints on a table-Primary Key, Not Null, Unique.	L1 and L3	2
Lab Session 5 Working with Foreign Key and Check Constraint.	L1 and L3	2
Lab Session 6 To implement the basic concept of Aggregate and Grouping Functions.	L1 and L3	2
Lab Session 7 To apply various set operators on data.	L1 and L3	2

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Lab Session 8 Concept of Nested queries in database and its application in database.	L1 and L3	2
Lab Session 9 Implementation different types of JOINS in database.	L1 and L3	2
Lab Session 10 Basic concepts of Triggers and Procedures and related queries.	L1 and L3	2
Lab Session 11 Introduction to PL/SQL and basic syntax.	L1 and L3	2
Lab Session 12 Write programs in PL/SQL Using Control Structures.	L3	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text Books

- Ivan Bayross , "SQL, PL/SQL the Programming Language of Oracle", 4th Ed., BPB Publications,2009.
- Lynn Beighley, "Head First SQL", 1st Ed., O′Reilly, 2007.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	-	-
CO2	**1**	-	**2**	--	--	**3**	--	--	--	--	--	**2**	**1**	--	**1**	-
CO3	**1**	-	**1**	--	--	**3**	--	--	--	--	--	**2**	**1**	**1**	**2**	-
CO4	**1**	-	**2**	--	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO5	**1**	-	**2**	--	--	--	--	--	**2**	--	--	--	**1**	**1**	--	-

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Course Code: ECE2424	SEMICONDUCTOR TECHNOLOGY EQUIPMENT MAINTENANCE	L	T	P	C
Version: 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

In this course, students will know about the various faults that occurs in different electronic components and equipments. It will educate and explain the troubleshooting, testing, faults in passive components, ICs, semiconductor devices and mount assemblies. This course includes the repair and maintenance of different electronic components.

Course Objectives

The objective of this course is to:

1. Provide the knowledge about faults and their causes in different electronic components
2. Familiarize the student with the different testing techniques/ procedures to rule out the faults.
3. Provide the information about the repair and maintenance mechanism of different electronic components and equipment..

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the troubleshooting procedures, failures with their causes and troubleshooting techniques in electronic equipment.

CO2. Explain the testing methods, failures and precautions for different passive components like resistor, inductor and capacitor.

CO3. Describe causes, types and diagnosis of failures in semiconductor devices.

CO4. Explain the troubleshooting methods, testing, faults and handling precautions of digital ICs and digital circuits.

CO5. Describe the semiconductor packages, repair and rework of mount assemblies.

Modules	Blooms Level*	Number of hours
Module 1 Fundamental Troubleshooting Procedures Inside An Electronic Equipment: Reading Drawings And Diagrams – Block Diagram, Circuit Diagram, Wiring Diagram; Dis-assembly and re-assembly of equipment, Equipment Failures and causes, Nature of faults, Fault location procedure, Fault finding aids, Test and Measuring instruments, special tools Troubleshooting techniques, Approaching components for tests, Grounding systems in Electronic Equipment, Temperature sensitive Intermittent problems Corrective actions, Situations where repairs should not be attempted.	L4,L5,L6	10

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Module 2 Passive Components and Their Testing Passive Components- Resistors, Capacitors, Inductors Failures in fixed resistors, testing of resistors, variable resistors, potentiometers, LDRs and Thermistors. Types of capacitors and their performance, Failures in capacitors, testing of capacitors, Testing of inductors and inductance measurement	L1, L3, L4	8
Module 3 Testing of Semiconductor Devices Types of semiconductor devices, Causes of failure in Semiconductor Devices, Types of failure Test procedures for Diodes, special types of Diodes, Bipolar Junction Transistors, Field Effect Transistors, Thyristors Operational Amplifiers, Fault diagnosis in op-amp circuits	L2, L3, L4	5
Module 4 Logic IC families, Packages in Digital ICs, IC identification, IC pin-outs, Handling ICs, Digital troubleshooting methods – typical faults, testing digital ICs with pulse generators Logic clip, Logic Probe, Logic Pulser, Logic Current Tracer, Logic Comparator Handling precautions for ICs sensitive to static electricity, Testing flip-flops, counters, registers, multiplexers and de-multiplexers, encoders and decoders; Tri-state logic.	L3, L4	7
Module5 Rework and Repair of Surface Mount Assemblies Surface Mount Technology and surface mount devices Surface Mount Semiconductor packages types, Packaging of Passive Components.	L4, L5	6

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Khandpur, "Modern Electronic Equipment: Troubleshooting, Repair and Maintenance " TMH 2006.
2. R. G. Gupta, " Electronic Instruments and Systems: Principles, Maintenance and Troubleshooting", Tata McGraw Hill Edition 2001

Reference Books

1. David L Terrell, "Student Reference Manual for Electronic Instrumentation", Butterworth-Heinemann Laboratories
2. G. C. Loveday, A. H " Electronic Testing and Fault Diagnosis" Wheeler Publishing
3. J.G. Joshi, " Electronic Measurement and Instrumentation", Khanna Publishing House

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Course Code: ECE2425	IOT PLATFORMS AND SYSTEM DESIGN	L	T	P	C
Version : 2023.1	**Date of Approval:** March 2023	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

Course Objective:

This program aims to train students to be equipped with a solid theoretical foundation, systematic professional knowledge and strong practical skills in the IoT Platform and System Design. The course focuses on understanding the vision of IoT from a global perspective, understand its applications, determine its market perspective, using gateways, devices and data management, building a state of art architecture in IoT and its applications in commercial building automation and real-world design constraints.

Modules	Blooms level*	Number of hours
Module I IoT Networking Core Technologies involved in IoT development, Internet web and Networking technologies, Infrastructure, Overview of IoT supported Hardware platforms such as: Raspberry pi, ARM Cortex Processors, Arduino and Intel Galileo boards, Wireless networking equipment and configurations, accessing hardware and device file interactions.	L1, L2 and L3	6
Module II M2M to IoT Role of M2M in IoT, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations	L1,L2, L3	5
Module III IoT Architecture -State of the Art IoT reference Model and Architecture- Functional View, Information View, Deployment and Operational View, Other Relevant architectural views, Middleware Introduction-FiWare etc., Remote monitoring and sensing, remote controlling and performance analysis, layering concepts, communication pattern, 6LoWPAN, Sensors and sensor Node and interfacing using any Embedded target boards (Raspberry Pi / Intel Galileo/ARM Cortex/ Arduino) .	L1,L2, L3	5
Module IV IoT Application Development Application protocols: MQTT, REST/HTTP, CoAP, MySQL, Back-end Application Designing Apache for handling HTTP Requests, MongoDB Object type Database, HTML, CSS & jQuery for UI Designing, JSON lib for data processing, Security & Privacy during development	L1, L2 L3	4

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Module V IoT Security and case studies Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities	L1, L2	4

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	**5**	**15**	**5**	**5**	**70**

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Texts & References:

Texts:

- Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1 st Edition, VPT, 2014
- Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", November 2013, John Wiley and Sons.

References:

- Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1 st Edition, Apress Publications, 2013
- Cuno Pfister, Getting Started with the Internet of Things, O'Reilly Media, 2011, ISBN: 978-1-4493- 9357-1
- Zach Shelby, Carsten Bormann, "6LoWPAN: The Wireless Embedded Internet", John Wiley and Sons.
- Dr. Ovidiu Vermesan, Dr. Peter Friess "Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS O 1**	**PS O 2**	**PS O 3**
CO 1	**1**	**2**	**3**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**--**
CO 2	**1**	**--**	**--**		**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**
CO 3	**1**	**2**	**3**	**3**		**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**--**
CO 4	**1**	**2**	**3**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**--**
CO 5	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**

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Syllabus - Fifth Semester

ECE2501	DIGITAL CIRCUITS & SYSTEMS	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course explores the theory and operation of the basic building blocks of digital electronics which includes combinational and sequential circuits. This course also explains the logic families and data convertors. The concepts learnt in the studies of sequential circuits will be applied in the design and analysis of Melay and Moore machines.

Course Objectives

The objective of this course is to

- Provide the basic knowledge of digital logic levels and application of combinational and sequential circuits.
- Equip with the understanding of logic family and data convertors.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the various logic gates, Boolean algebra and solve the k-map & tabulation method to simplify the logical function.

CO2: Explain the adder & subtractor; Apply and analyze multiplexer, decoder & encoder to design Boolean function.

CO3: Describe flip flops, shift registers & Design counters and synchronous sequential circuits.

CO4: Explain & compare different logic families and explain data convertors.

Modules	Blooms level*	Number of hours
MODULE 1: BOOLEAN FUNCTIONS Analog & digital signals, AND, OR, NOT, NAND, NOR , XOR & XNOR gates, Boolean algebra, DeMorgan's theorems, Implementation of logical function using only NAND/NOR gates, 1`s complement and 2`s complement, BCD to Gray and Gray to BCD code conversion, Standard representation of logical functions (SOP and POS forms), K-map representation and simplification of logical function up to five variables, don't care conditions, XOR & XNOR simplifications of K-maps, Tabulation method.	L1,L2 and L3	6

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MODULE 2: COMBINATIONAL CIRCUITS Adders, Subtractors, Implementation of full adder using half adder, full subtractor using half subtractor, Multiplexer, de-multiplexer, decoder & encoder, code converters, 1 & 2 bit comparators, BCD to seven segment decoder/encoder, Implementation of logic functions using multiplexer/de-multiplexer and decoder, Implementation of 16×1 MUX using 4×1 MUX, 4×16 decoder using 3×8 decoder etc., logic implementations using PROM, PLA & PAL.	L1, L2,L3 and L4	6
MODULE 3: SEQUENTIAL CIRCUITS Difference between combinational and sequential circuits, Latch, Flip-flops: SR, JK, D & T flip flops – Truth table, Excitation table, Conversion of flip-flops, set up and hold time, race around condition, Master Slave flip flop, Shift registers: SIPO, PISO, PIPO, SIPO, Bi-directional, 4-bit universal shift register; Counters: Asynchronous/ripple & synchronous counters – up/down, Ring counter, sequence detector.	L2,L3, L4 and L5	7
MODULE 4: LOGIC FAMILIES&DATA CONVERTERS Logic families: Special characteristics (Fan out, Power dissipation, propagation delay, noise margin), working of RTL, DTL, TTL, ECL and CMOS families; Data converters: Special characteristics, ADC – successive approximation, linear ramp, dual slope; DAC – Binary Weighted, R-2R ladder type.	L1, L2,L3 and L4	5

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- Anand Kumar, "Fundamentals of Digital Circuits", 2nd Edition, Prentice-Hall, 2004
- Moris Mano, "Digital Design", 2nd Edition, Pearson Education,2007.
- R.P. Jain, "Modern Digital Electronics", 2nd Edition, Tata Mcgraw Hill, 2003

Reference Books

- Thomas L. Floyd, "Digital Fundamentals", 11th Edition, Pearson Education, 2015
- Malvino and Leech, "Digital Principles & Applications", 1st Edition, Tata McGraw Hill, 1993

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2	PS O 3	PSO 4
CO 1	1	2	3	--	--	--	--	--	--	--	--	--	1	--	--	--
CO 2	1	2	3	--	--	--	--	--	--	--	--	2	1	--	--	3
CO 3	1	2	1	--	--	--	--	--	--	--	--	2	1	--	--	3
CO 4	2	3	3	--	--	--	--	--	--	--	--	--	1	--	--	3

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ECE2502	DIGITAL COMMUNICATION	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	2	0	0	2
Pre-requisites/Exposure	Signal and System				
Co-requisites					

Catalog Description

The purpose of this course is to introduce students to the basic principles of the design and analysis of digital communication systems.It will provide a thorough study of digital modulation techniques and receiver design.

Course Objectives

The objective of this course is to

- Provide a thorough introduction to digital communications
- Provide in depth study of various analog and digital modulation techniques.
- Introduce students to basics of multiplexing in digital signals.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define and distinguish analog and digital communication systems.

CO2. Compare different analog and digital modulation techniques and their receiver design.

CO3. Explain the concepts of digital multiplexing.

Modules	Blooms level*	Number of hours
MODULE I: DIGITAL COMMUNICATION SYSTEM BASICS Basic building blocks of Digital communications, analog versus digital communication, Advantages disadvantages of digital communications.	L1 and L2	4
MODULE II: DIGITAL BASEBAND TRANSMISSION Pulse code modulation, Signal to quantization ratio, non-uniform quantization companding, BW calculations.	L1, L2, and L4	8
MODULE III: TRANSMISSION OF ANALOG SAMPLES Delta Modulation, Adaptive delta-modulation, DPCM, ADCM, ADPCM, Matched Filter Receiver, Derivation of Its Impulse Response and Peak Pulse Signal to Noise Ratio. Correlator receiver, Decision Threshold and Error Probability For, Unipolar (ON-OFF) Signaling, ISI, Nyquist Criterion For Zero ISI & Raised Cosine Spectrum	L1, L2 and L4	9

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MODULE IV: DIGITAL MODULATION TECHNIQUES Gram-Schmidt Orthogonalization Procedure, Types of Digital Modulation, Wave forms for Amplitude, Frequency and Phase Shift Keying, Method of Generation and Detection of Coherent & Non-Coherent Binary ASK, FSK & PSK Differential Phase Shift Keying, Quadrature Modulation Techniques QPSK, Probability of Error and Comparison of Various Digital Modulation Techniques.	L1, L2 and L4	6
MODULE V: DIGITAL MULTIPLEXING Fundamentals of Time Division Multiplexing, Electronic Commutator, Bit, Byte Interleaving T1 Carrier System, Synchronization and Signaling of T1, TDM, PCM Hierarchy, T1 to T4 PCM TDM System (DS1 to DS4 Signals)	L1 and L2	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- B. P. Lathi and Zhi Ding ,"Modern Digital and Analog Coimmunication Systems", Fourth Edition, Oxford University Press, 2009
- Wayne Tomasi, "Electronic Communication systems", 5th edition, Pearson Education,2008

Reference Books

- Simon Haykin, "Communication Systems", Third Edition, John Wiley & Sons,2007
- Taub and schilling, "Principles of Communication Systems", Third Edition, TMH,2008

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2	PS O 3	PS O 4
CO 1	1	--	_	--	_	2	--	--	--	--	--	--	1	--	2	--
CO 2	1	3	2	--	--	2	--	--	--	--	--	--	1	--	2	--
CO 3	1	3	2	--	--	2	--	--	--	--	--	--	1	--	2	--

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ECE2503	CONTROL SYSTEM	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	2	1	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description
This course provides the students the core knowledge of control systems. This introduces the methods of mathematical modeling of control systems with time & frequency domain analysis along with concepts of stability.

Course Objectives
The objective of this course is to
- Equip the students with concepts of Control System.
- Provide the students in depth knowledge of time domain, frequency domain and concepts of stability.

Course Outcomes
On completion of this course, the students will be able to
CO1. Understand and compare between types of control system and find mathematical model of control system.
CO2. Understand, explain and solve problems on time domain analysis.
CO3. Understand, explain and solve problems on frequency domain analysis.
CO4: Analysis of control system stability

Modules	Blooms level*	Number of hours
Module 1: **Input / Output Relationship** Introduction of open loop and closed loop control systems, mathematical modeling and representation of physical systems (Electrical Mechanical and Thermal), derivation of transfer function for different types of systems, block diagram & signal flow graph, Reduction Technique, Mason's Gain Formula.	L1, L2, L3 and L4	12
Module 2: **Time – Domain Analysis** Time domain performance criteria, transient response of first, second & higher order systems, steady state errors and static error constants in unity feedback control systems, error criteria, generalized error constants, performance indices, response with P, PI and PID Controllers.	L1, L2 and L3	12
Module 3: **Frequency Domain Analysis** Polar and inverse polar plots, frequency domain specifications, Logarithmic plots (Bode Plots), gain and phase margins, relative stability, Correlation with time domain, constant close loop frequency responses, from open loop response, Nyquist Plot.	L1, L2 and L3	12

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Module 4: **Concept of Stability** Asymptotic stability and conditional stability, Routh – Hurwitz criterion, Root Locus plots and their applications. Compensation Techniques:Concept of compensation, Lag, Lead and Lag-Lead networks, design of closed loop systems using compensation techniques. P, PI, PID controllers.	L1, L2, L3 and L4	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- Dr. N.K Jain, 2005,"Automatic Control System Engineering", Dhanpat Rai Publication.
- J. Nagrath & M. Gopal, 2000, "Control System Engineering", New Age International.

References Books:

- B. C. Kuo, 2001, "Automatic Control system, Prentice Hall of India.
- M, K. Ogata, 2002, "Modern Control Engineering, PHI.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	1	-	2	3	-	-	-	-	-	-	3	-	1	-	2
CO2	1	1	-	3	3	-	-	-	-	-	-	3	-	1	-	3
CO3	1	1	-	3	3	-	-	-	-	-	-	3	-	1	-	3
CO4	1	1	-	2	3	-	-	-	-	-	-	3	-	1	-	2

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ECE2509	MICROPROCESSOR SYSTEMS	L	T	P	C
Version: 2019.1	Date of Approval: May 21, 2019	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course deals with the systematic study of the Architecture and programming issues of microprocessor family and its applications. The aim of this course is

- To introduce students with the architecture and operation of typical microprocessors.
- To familiarize the students with the programming and interfacing of microprocessors
- To provide the basic knowledge of the microprocessor needed to develop the embedded system based products as a solution to real time problems.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the architecture, pin configuration, addressing modes, control words, timing diagram, instruction set of 8085 microprocessors and Interfacing ICs

CO2. Explain the architecture, pin configuration, addressing modes, control words of 8086, 8087 and other 16 bit microprocessors and Interfacing ICs

CO3. Develop the assembly language program using 8085 using stacks & subroutines.

CO4. Design circuitry to the Microprocessor I/O ports in order to interface the processor to external devices so as to provide solutions real-world control problems

Modules	Blooms level*	Number of hours
Module I: Introduction to Microcomputer Systems Introduction to Microprocessors and microcomputers, Study of 8 bit Microprocessor, 8085 pin configuration, Internal Architecture and operations,interrupts, Stacks and subroutines, various data transfer schemes.	L1, L2, L3,L4	6
Module II: ALP and timing diagrams Introduction to 8085 instruction set, advance 8085 programming, Addressing modes, Counters and time Delays, Instruction cycle, machine cycle, T-states, timing diagram for 8085 instruction.	L4,L5,L6	8
Module III: Memory System Design & I/O Interfacing Memory interfacing with 8085. Interfacing with input/output devices (memory mapped, peripheral I/O), Cache memory system. Study of following peripheral devices 8255, 8253, 8257, 8259, 8251.	L3,L4, L5,L6	9

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Module IV: Architecture of 16-Bit Microprocessor Difference between 8085 and 8086, Block diagram and architecture of 8086 family, pin configuration of 8086, minimum mode & maximum mode Operation, Bus Interface Unit, Register Organization, Instruction Pointer, Stack & Stack pointer, merits of memory segmentation, Execution Unit, Register Organization.	L2, L3, L4	7
Module V: Pentium Processors Internal architecture of 8087, Operational overview of 8087, Introduction to 80186, 80286, 80386 & 80486 processors, Pentium processor (P-II, P-III, P-IV). .	L1,L2	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- Douglas Hall, Microprocessor and Interfacing:, Tata McGraw Hill, 2017
- Gaonkar R. S , Microprocessor Architecture, Programming and Applications, Wiley

Reference Books

- Yu Cheng Liu & Glen A. Gibson, Microcomputer Systems: 8086/8088 family Architecture, Programming and Design, PHI Publication, 2016.
- Ram B., Fundamentals of Microprocessors and Microcomputers, DhanpatRai& Sons, 2017

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO4
CO1	1	2	--	--	--	--	--	--	--	--	--	--	3	2	1	
CO2	1	1	2	3	--	--	--	--	--	--	--	--	3	3	2	
CO3	-	-	-	1	2	3	--	--	--	--	--	--		2	2	1
CO4	-	-	-	1	--	2	--	--	2	3	3	--		2	2	1

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ECE2504	DIGITAL CIRCUITS AND SYSTEMS LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

In this Lab course the combination and sequential circuits are designed and their functionality is verified using truth table. Concepts covered would enable them to create complex circuits related to digital design. The objective of this course is to explore and implement the various features of digital logic using basic logic gates.

Course Objectives

The objective of this course is to

- Provide a basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
- Equip with understanding of different combinational and sequential circuits.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Demonstrate the basic concept of logic gates;
CO 2: Illustrate the adder and subtractors.
CO 3: Demonstrate the code convertors.
CO 4: Demonstrate the combinational and sequential circuits.

Modules/Topics Covered**	Blooms level*	Number of hours
1. To verify the truth tables of NOT, OR, AND, NOR, NAND, XOR, XNOR gates.	L3, L5	2
2. To obtain half adder, full adder using gates and verify their truth tables.	L3, L5	2
3. To obtain half subtractor, full subtractor using gates and verify their truth tables.	L3, L5	2
4. To implement control circuit using multiplexer.	L3, L5	2
5. To convert BCD code into excess 3 code and verify the truth table.	L3, L5	2
6. To verify the truth tables of RS, D, JK and T flip- flops.	L3, L5	2
7. To implement and verify 3-bit bi-directional shift register.	L3, L5	2
8. To design and study asynchronous/ripple counter.	L3, L5	2
9. To design and study synchronous counter.	L3, L5	2
10. To design and study a sequence detector.	L3, L5	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	**70**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE- External Exam

Text Books

- Anand Kumar, "Fundamentals of Digital Circuits", 2nd Edition, Prentice-Hall, 2004
- Moris Mano, "Digital Design", 2nd Edition, Pearson Education,2007.
- R.P. Jain, "Modern Digital Electronics", 2nd Edition, Tata Mcgraw Hill, 2003

Reference Books

- Thomas L. Floyd, "Digital Fundamentals", 11th Edition, Pearson Education, 2015
- Malvino and Leech, "Digital Principles & Applications", 1st Edition, Tata McGraw Hill, 1993

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	3	1	--	--	--	--	--	--	--	--	--	--	1	--	--	3
CO2	3	1	--	--	--	--	--	--	--	--	--	--	1	--	--	3
CO3	3	1	--	--	--	--	--	--	--	--	--	--	1	--	--	3
CO4	2	1	--	--	--	--	--	--	--	--	--	--	1	--	--	3

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ECE2505	MICROPROCESSOR SYSTEMS LAB	L	T	P	C
Version: 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course focuses on the systematic study of the Architecture and programming of microprocessor family and its applications. The objectives of this course are:

- To introduce students with the architecture operation and instruction set of 8085 and 8086 microprocessors.
- To familiarize the students with the programming and interfacing of 8085 and 8086 microprocessors.
- To provide the basic knowledge of the microprocessor needed to develop the embedded system based products as a solution to real time problems.

Course Outcomes

On completion of this course, the students will be able to

CO1. Set up programming strategies and select proper mnemonics and run their program on the training boards

CO2. Develop assembly language programs for various problems keeping in mind technical issues and evaluate possible causes of discrepancy in practical experimental observations in comparison.

CO3. Understand the concepts related to I/O and memory interfacing and design interfacing circuits with 8085 by making use of different peripheral devices.

Modules	Blooms level*	Number of hours
Lab Session 1: ALP using 8085: 1. Write at least three different programs for addition of two 8 bit numbers assuming carry may or may not be generated. 2. Write at least three different programs for subtraction of two 8 bit numbers assuming borrow may or may not be generated. 3. Write two different programs for 16 bit addition, one using instruction DAD and another without using instruction DAD. 4. Write assembly language program for 8 bit multiplication and division.	L2, L3,L4	4
Lab Session II: To study, understand, interface and two peripheral devices with 8085.	L4,L5,L6	2
Lab session III: Any three programs using 8085 based on block of data.	L4	1
Lab session IV: ALP using 8086: 1. Write an ALP to add list of 10 given numbers. 2. Write an ALP to sum the numbers from 1-100. 3. Write an ALP to count negative numbers from a given list of 10 numbers. 4. Write an ALP to check number of vowels in a given string.	L2, L3, L4	5

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva

Text Books

- Douglas Hall, Microprocessor and Interfacing:, Tata McGraw Hill, 2017
- Gaonkar R. S , Microprocessor Architecture, Programming and Applications, Wiley

Reference Books

- Yu Cheng Liu & Glen A. Gibson, Microcomputer Systems: 8086/8088 family Architecture, Programming and Design, PHI Publication, 2016.
- Ram B., Fundamentals of Microprocessors and Microcomputers, DhanpatRai& Sons, 2017

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO4
CO1	1	2	--	--	--	--	--	--	--	--	--	--	3	2	1	
CO2	1	1	2	3	--	--	--	--	--	--	--	--	3	2	1	1
CO3	-	-	-	1	2	3	--	--	--	--	--	--		2	2	1

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ECE2506	CONTROL SYSTEM LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	MATLAB Basics				
Co-requisites	Nil				

Catalog Description

Control System has become an important field for research and development in science and engineering. This course provides the students the core knowledge of control systems. This course introduces the Practical of control system with time & frequency domain analysis along with stability of control systems on kits and MATLAB.

Course Objectives

The objective of this course is to
Perform experiments of control system.
Time & frequency domain analysis along with stability of control systems on kits and MATLAB

Course Outcomes

On completion of this course, the students will be able to
CO1. Perform and analyse experiments on time domain of control system.
CO2. Perform and analyse experiments on frequency domain of control system.
CO3. Perform and analyse experiments for stability of control system.

Modules	Blooms level*	Number of hours
Lab Session 1 1. Study and draw a) Step response of open Loop system (linear 1st order, 2nd order b) Step response of closed loop systems (1st order) 2. Study and draw temperature control system the open loop response and closed loop response with different values of gains	L2, L3 and L5	3
Lab Session 2 1. Study of operations and characteristics of a stepper motor 2. To Study a D.C. motor speed control system.	L2, L3 and L5	3
Lab Session 3 1. Performance evaluation and design of PID controller. 2. To design a suitable cascade compensator for the given system and verify the resulting improvement.	L2, L3 and L5	3

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Lab Session 4 1. Note: three experiments in MATLAB have to be performed in the slot of MATLAB. Using MATLAB obtain the unit-step response and unit impulse response of the following system: $\frac{C(s)}{R(s)} = \frac{16}{s^2 + 1.6s + 16}$ 2. For a 2nd order transfer function using MATLAB a) Bode Plot b)Root locus plot c)Nyquist plot.	L2, L3 and L5	3

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text Books

- Dr. N.K Jain, 2005,"Automatic Control System Engineering", Dhanpat Rai Publication.
- J. Nagrath & M. Gopal, 2000, "Control System Engineering", New Age International.
- Rudra Pratap, "Getting started with MATLAB", Oxford University Press.

References Books:

- B. C. Kuo, 2001, "Automatic Control system, Prentice Hall of India.
- M, K. Ogata, 2002, "Modern Control Engineering, PHI.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	-	3	2	--	--	--	--	--	--	2	-	1	-	3
CO2	1	2	-	3	2	--	--	--	--	--	--	2	-	1	-	3
CO3	1	2	-	3	2	--	--	--	--	--	--	2	-	1	-	3

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ECE2535	SUMMER INTERNSHIP EVALUATION I	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	0	3
Pre-requisites/Exposure	Basic Concepts of Programming Language and Electronics				
Co-requisites	Nil				

Catalog Description

There are certain phases of every Intern's professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship program can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal classroom situations. These attributes are intellectual ability, professional judgment and decision-making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc. In order to achieve these objectives, each student will maintain a file (**Internship File**). The Internship File aims to encourage students to keep a personal record of their learning and achievement throughout the Programme. It can be used as the basis for lifelong learning and for job applications. Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development. The report will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and their own personal contribution to the organization.

Course Objectives

The objective of this course is to

- Equip the students with concepts of new technologies and practical exposure
- Provide an overview ofpresentation and preparation of report.

Course Outcomes

On completion of this course, the students will be able to

CO1: Study the literature and identify the problem statement

CO2: Work on a real world problem and solve it using latest technology

CO3: Prepare a detailed report of the project

CO4: Prepare a brief presentation of their project

CO5: Present and explain the project for evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	V	PPT	R	IM	EM
Weightage (%)	10	10	10	30	70

V – Viva, PPT-Power Point Presentation, R – Report, IP-Internal Marks, EM-External Marks

Text Books

- As per topic of summer internship project is chosen and discussion with guide.

Reference Books

- As per topic of summer internship project is chosen and discussion with guide.

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	2	--	--	--	--	--	--	--	--	--	-		1	2
CO2	1	2	2	-	--	--	--	--	--	--	--	--	-	-	1	1
CO3	1	2	-	--	--	--	--	--	--	--	--	--	-	-	1	1
CO4	1	2	3	--	--	--	--	--	--	--	--	--	-	-	1	1

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ECE2507	OPERATING SYSTEMS	L	T	P	C
Version: 2019.1	Date of Approval: May 21, 2019	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

In this course Operating System, its generic types, characteristics and functions are discussed in detail. Concepts covered would enable students to identify various categories of operating systems, with details about concepts of process management and scheduling. Contents will be helpful in identifying deadlocks in the system and designated approaches used to prevent, handle or recover from them. Further it covers the concepts of managing memory, devices and mechanisms for providing security to system and files using operating system.

Course Objectives

The objective of this course is to

- Equip the students with the knowledge about categories of operating systems and their functions.
- Provide detailed knowhow about functions of operating system like process, memory and device management along with file system security and protection.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define and explain operating systems and their evolution, also differentiate among its various types.

CO2: Explain concepts of process and inter-process communication and synchronization. Identify solutions to detect, prevent and handle deadlocks occurring in the operating systems. Solve synchronization and CPU scheduling problems related to processes.

CO3: Define and explain concepts of memory management like fragmentation, paging and segmentation. Solve problems related to memory management using page replacement algorithms.

CO4: Describe the concepts of device management and list various disk allocation methods. Determine solutions for disk scheduling problems using available disk scheduling algorithms.

CO5: State the concept of file and file system security, also distinguish among various file allocation methods.

Modules	Blooms level*	Number of hours
MODULE 1: INTRODUCTION TO OPERATING SYSTEM Operating system and function, Evolution of operating system, Batch, Interactive, multiprogramming, Time Sharing and Real Time System, multiprocessor system, Distributed system, System protection. Operating System structure, Operating System Services, System Program and calls	L1, L2 and L4	6

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MODULE 2: PROCESS MANAGEMENT Process concept, State model, process scheduling, job and process synchronization, structure of process management, Threads Interprocess Communication and Synchronization: Principle of Concurrency, Producer Consumer Problem, Critical Section problem, Semaphores, Hardware Synchronization, Critical Regions, Conditional critical region, Monitor, Inter Process Communication. CPU Scheduling: Job scheduling functions, Process scheduling, Scheduling Algorithms, Non-Preemptive and preemptive Strategies, Algorithm Evaluation, Multiprocessor Scheduling. Deadlock: System Deadlock Model, Deadlock Characterization, Methods for handling deadlock, Prevention strategies, Avoidance and Detection, Recovery from deadlock combined approach	L1, L2 and L3	12
MODULE 3: MEMORY MANAGEMENT Single Contiguous Allocation: H/W support, S/W support, Advantages and disadvantages, Fragmentation, Paging, Segmentation, Virtual memory concept, Demand paging, Performance, Paged replaced algorithm, Allocation of frames, Thrashing, Cache memory, Swapping, Overlays	L1, L2 and L3	7
MODULE 4: DEVICE MANAGEMENT Principles of I/O hardware, Device controller, Device Drivers, Memory mapped I/O, Direct Access Memory, Interrupts, Interrupt Handlers, Application I/O interface, I/O Scheduling, Buffering, Caching, Spooling, Disk organization, Disk space management, Disk allocation Method, Disk Scheduling, Disk storage	L1, L2 and L3	7
MODULE 5: FILE SYSTEM AND PROTECTION AND SECURITY File Concept, File Organization and Access Mechanism, File Directories, Basic file system, File Sharing, Allocation method, Free space management. Policy Mechanism, Authentication, Internal excess Authorization	L1 and L2	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- Milenekovic, "Operating System Concepts", McGraw Hill
- Silberschatz, P.B. Galvin "Operating System Concepts", John Willey & son

Reference Books

- Dietel, "An introduction to operating system", Addision Wesley
- Tannenbaum, "Operating system design and implementation", PHI
- Operating System, A Modern Perspection, Gary Nutt, Pearson Edu. 2000
- A. S Tanenbaum, Modern Operating System, 2nd Edition, PHI
- Willam Stalling "Operating system" Pearson Education

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	--	--	--	--	--	--	--	--	--	1	2	--	--
CO2	1	2	3	--	--	--	--	--	--	--	--	--	1	2	--	--
CO3	1	2	3	--	--	--	--	--	--	--	--	--	1	2	--	--
CO4	1	2	3	--	--	--	--	--	--	--	--	--	1	2	--	--
CO5	1	--	2	--	--	--	--	--	--	--	--	--	1	--	--	--

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ECE2513	COMPUTER NETWORKS	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The course provides a unified and fundamental view of the broad field of computer networks. The objective is to acquaint the students with the basics of networking The world of computer networking is introduced in a top down Approach. A structured approach to explain how networks work from the inside out is being covered. In-depth application coverage includes email, the domain name system; the World Wide Web (both client- and server-side); and multimedia (including voice over IP.

Course Objectives

The objective of this course is to

- To provide an overview of data transmission and computer networks.
- To familiarize with the basic taxonomy and terminology of computer networking area.
- **T**o equip with the knowledge of different protocols and different layers of computer networks.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain different concepts of data transmission and apply the knowledge of encoding techniques.

CO2. Illustrate the concepts and applications of different data communication methods.

CO3. Explain different concepts of computer networks and its layers.

CO4: Compare and contrast different layers and protocols used at different layers.

Modules	Blooms level*	Number of hours
Module 1: **Data Transmission** Analog and Digital transmission, transmission media, line configuration, data communications codes, error detection and correlation methods. Data encoding methods: analog to digital, digital to analog etc.	L1,L2 and L3	6
Module 2: **Data Communication Methods** Data communication interface, line control unit, UART, USRT, Serial interface, terminal types. SDLC, HDLC, Addressing Switched networks, circuit switching, packet switching, broadcast networks. IEEE 802 LAN Standards, framing, error control, flow control.	L1, L2, L3	7
Module 3: **Introduction to Computer Networking** Internet, Circuit switching vs Packet switching, Network Access and Physical Media, ISPs, Delay and Loss in Packet Switched Networks, Five Layer concept and their PDUs .	L1, L2, L3	5

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Module 4: **Application layer and Transport layer** Application Layer Protocols: Web and HTTP, FTP, SMTP, DNS, brief overview of socket Programming with TCP and UDP Multiplexing and Demultiplexing, UDP, Reliable Data Transfer, UDP segment structure, Reliable Data Transfer, TCP, TCP segment Structure, Basics of Congestion Control	L2, L3 and L4	7
Module 5: **Network Layer** Datagram and virtual circuit, link state routing, distance vector routing, Heirarchical Routing, IP, Ipv4 Addressing, Ipv6	L2, L3 and L4	4
Module VI: **Link Layer and Physical Layer** Services Provided, Error Detection and Correction, Mulple Access Protocols, TDM, FDM and CDMA, ALOHA, CSMA, LANs, Ethernet, Hubs, Bridges and Switches, Introduction to PPP The physical layer: Theoretical basis for data communication, transmission media, wireless transmission, telecom infrastructure, PSTN, communication satellites, mobile telephone system	L2, L3 and L4	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- James F. Kurose, "Computer Networking: A Top-Down Approach Featuring the Internet", Pearson Education India
- Forouzan, B. A.,"Data Communication & networking", McGraw Hill Education.

Reference Books

- Tanenbaum,"Computer Networks" Prentice Hall.
- W. Tomasi, "Advanced Electronic Communication Systems", Pearson Education India.
- James Martin, "Telecommunications & the Computer", 3rd Edition, PHI. 2001
- P. C. Gupta, "Data Communications, PHI, 2001.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	1	2	--	--	--	--	--	--	--	--	--	--	--	--	1	--
CO2	1	2	3	--	--	--	--	--	--	--	--	--	--	--	1	--
CO3	1	2	2	3	3	--	--	--	--	--	--	--	--	--	1	--
CO4	1	1	2	3	--	--	--	--	--	--	--	--	--	--	1	--

1: strongly related, 2: moderately related and 3: weakly related

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ECE2508	COMPUTER ARCHITECTURE	L	T	P	C
Version: 2019.1	Date of Approval: May 21, 2019	3	0	0	3
Pre-requisites/Exposure	Logic Gates				
Co-requisites	nil				

Catalog Description

Computer architecture is concerned with the structure and behavior of the various functional modules of the computer and how they interact to provide the processing needs of the user. It includes basic register transfer language and computer organization and design. Complete insight on the working of CPU, Memory and I/O communication will be provided. Pipeling and related topics will also be discussed.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of computer architectures and their modules.
2. Provide an overview of various algorithms used and hardware implementation computer.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain about Register transfer language and various micro operations of arithmetic logic unit.
CO2. Explain about the organization of computer modules and their details.
CO3. Explain in details of central processing unit like general purpose register, accumulator etc. and computer arithmetic.
CO4. Explain memory organization of computer and their interconnections. Details of direct memory access.
CO5. Explain parallel processing and pipeline techniques.

Modules	Blooms level*	Number of hours
Module I: Register Transfer Language Register Transfer, Bus and Memory Transfers, Arithmetic Micro-operations, Logic Micro-operations, Shift Micro-operations, Arithmetic Logic shift Unit.	L1, L2 and L3	10
Module II: Basic Computer Organizations and Design Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt, Design of Accumulator Logic. Hardwired and Microprogrammed control: Control Memory, Address Sequencing, Design of Control Unit	L1,L2	9

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Module III: Central Processing Unit Introduction, General Register Organization, Stack Organization, Instruction representation, Instruction Formats, Instruction type, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer RISC and CISC Computer Arithmetic: Introduction, Addition and Subtraction Algorithm,Multiplication Algorithms, Booth Multiplication, Division Algorithms, Floating-Point Arithmetic Operations	L1,L2, L3	10
Module IV: Memory and Intersystem Communication and Input output organisation Memory: Memory types and organization Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory with mapping techniues, Virtual Memory, Memory Management Hardware Intrasystem communication and I/O: Peripheral Devices, Input-Output Controller and I/O driver, IDE for hard disk, I/O port and Bus concept, Bus cycle, Synchronous and asynchronous transfer,Modes of Transfer, DMA, DMA Transfer, DMA Controller, I/O Processor, CPU-IOP Communication	L1,L2, L3.	10
Module V: Pipelining, Vector Processing and Multiprocessors Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline Multiprocessors: Characteristics of Multiprocessors	L1 and L2	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	ATT	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

ATT: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination.

Text Book:

- Morris Mano, Computer System Architecture, 3rd Edition – 1999, Prentice-Hall of India Private Limited.
- Harry & Jordan, Computer Systems Design & Architecture, Edition 2000, Addison Wesley, Delhi.

References Books:

- WIliam Stallings, Computer Organization and Architecture, 4th Edition-2000, Prentice-Hall of India Private Limited.
- Kai Hwang-McGraw-Hill, Advanced Computer Architecture.
- John D. Carpinelli, Computer system Organization & Architecture, Edition 2001, Addison Wesley, Delhi
- M. Morris Mano and Charles, Logic and Computer Design Fundamentals, 2nd Edition Updated, Pearson Education, ASIA.

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	1	2	3	3	--	--	--	--	--	--	--	--	2	1	--
CO2	1	--	--		--	--	--	--	--	--	--	--	--	2	--
CO3	1	2	3	3		--	--	--	--	--	--	--	2	1	--
CO4	1	2	3	3	--	--	--	--	--	--	--	--	2	1	--
CO5	1	--	--	--	--	--	--	--	--	--	--	--	--	1	--

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ECE2514	FUZZY LOGIC & GENETIC ALGORITHM	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	3	0	0	3
Pre-requisites/Exposure	Basic Computer Concepts				
Co-requisites	Nil				

Catalog Description

In this course the concepts of fuzzy logic and genetic algorithm are discussed in detail. This course will provide an understanding of fuzzy logic and genetic algorithm and an outlook on the applications of these techniques to solve real world problems. It also provides an understanding of fuzzy-genetic based machine learning.

Course Objectives

The objective of this course is to

- Provide the student with the basic understanding of genetic algorithm and fuzzy logic fundamentals, program and design the related systems.
- Equip the students with concepts of fuzzy logic based solutions.
- Provide an overview of performance of genetic algorithm, simulated annealing and tabu search.

Course Outcomes

On completion of this course, the students will be able to

CO1: Develop the skills to gain a basic understanding of genetic algorithm and fuzzy logic theory.
CO2: Appreciate the learning and adaptation capability of neural and fuzzy systems.
CO3: Apply various operators to optimize. Perform mathematical calculation of the GA
CO4: Able to identify the present application areas of fuzzy logic and GA
CO5: Explain the working principle and compare the performance with other methods –Simulated annealing and Tabu search.

Modules	Blooms level*	Number of hours
MODULE 1: Crisp sets: Overview, Fuzzy sets : Basic types and concepts, Characteristics and significance of paradigm shift, Fuzzy sets vs Crisp sets, Representation of fuzzy sets	L1, L2 and L3	8
MODULE 2: Types of operations, Fuzzy complements, Fuzzy intersection: t-norms, Fuzzy union: t-conorms, Combination of operations, Aggregation operation, Fuzzy numbers , Linguistic variables, Arithmetic operations on intervals, Arithmetic operations on Fuzzy numbers, Lattice of Fuzzy numbers, Fuzzy equation.	L2, L3 and L6	10
MODULE 3: General discussion, Fuzzy controller: Overview and example, Fuzzy systems and neural networks, Fuzzy neural network, Fuzzy automata. Pattern recognition in fuzzy logic, Database and information retrieval in fuzzy logic, decision making in fuzzy logic, engineering applications and fuzzy logic, Fuzzy logic in Medicine and Economics	L1, L3 and L4	10

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MODULE 4: Fundamentals of genetic algorithm: A brief history of evolutionary computation, biological terminology, search space encoding, reproduction elements of genetic algorithm genetic modelling, comparison of GA and traditional search methods. The Fundamental Theorem, Schema Processing at work, Two-armed and k-armed Bandit problem, The Building block hypothesis.	L1, L3 and L4	10
MODULE 5: Genetic technology:- steady state algorithm, fitness scaling, inversion. Genetic programming:- Genetic Algorithm in problem solving, Implementing a Genetic Algorithm:- computer implementation, operator (reproduction, crossover and Mutation, Fitness Scaling, Coding, Discretization). Knowledge based techniques in Genetic Algorithm. Advanced operators and techniques in genetic search:-Dominance, Diploidy and Abeyance. Inversion and other reordering operators, Niche and speciation.	L3, L4 and L6	10
MODULE 5: Genetic Algorithm in engineering and optimization-natural evolution – Simulated annealing and Tabu search -Genetic Algorithm in scientific models and theoretical foundations. Applications of Genetic based machine learning-Genetic Algorithm and parallel processors- composite laminates- constraint optimization- multilevel optimization- real life problem.	L3,L4,L6	05

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- Fuzzy Logic with Engineering Applications, 3rd Ed., T. J. Ross, Wiley India Pvt. Ltd., India, 2011.
- Fuzzy Logic Intelligence Control & Information, John Yen and Reza Langari, Pearson Education Limited, India, 2007.
- David E.Goldberg, "Genetic Algorithms in search , Optimization & Machine Learning"
- Melanie Mitchell- 'An introduction to Genetic Algorithm'- Prentice-Hall of India

Reference Books

- Understanding Neural Networks and Fuzzy Logic, S. V. Kartalopoulas, IEEE Press and Prentice Hall India, India, 2000.
- Neuro-Fuzzy and Soft Computing – A Computational Approach to Learning and Machine Intelligence, Prentice Hall India, India, 2009.
- William B. Langdon, Riccardo Poli,"Foundations of Genetic Programming"
- P. J. Fleming, A. M. S. Zalzala "Genetic Algorithms in Engineering Systems "
- David A. Coley, "An Introduction to Genetic Algorithms for Scientists and Engineers ".

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**	**-**
CO2	**1**	**--**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**--**	**-**
CO3	**1**	**2**	**3**	**3**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**-**
CO4	**1**	**1**	**2**	**--**	**--**	**--2**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**2**
CO5	**1**	**1**	**2**	**--**	**-2-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**-**	**2**	**1**

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Course Code: ECE2516	VACUUM TECHNOLOGY	L	T	P	C
Version: 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

In this course, the students get basic knowledge of gas kinetic theory with an emphasis on vacuum pumps. This course gives a detailed insight of vacuum pumps, their design, problem solving and applications.

Course Objectives

The objective of this course is to:

1. Build from basic knowledge of gas theory to vacuum pumps.
2. Familiarize the student with the design, working principles and problem solving of vacuum pumps.
3. Provide the scope of applications of vacuum pumps in different domains.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the basic terminologies, mechanisms and surface interactions in gas theory.

CO2. Describe problem solving and leak detection in vacuum pumps.

CO3. Explain the different applications of vacuum like in Micro fabrication, Display technologies, X-ray tubes and space simulation.

Modules	Blooms Level*	Number of hours
Module 1 Unit 1 Basic Theory: Gas kinetic theory, pressure, conductance, gas flow regimes, vapour pressure, pumping speed, throughput. Gas surface interactions: physisorption, chemi-sorption, condensation.	L1, L2	9
Module 2 Vacuum Pumps: Mechanical, diffusion, molecular drag, turbo molecular, cryopumps, ion pumps - general working principles, operating regimes. Vacuum Instrumentation: Vacuum gauges, gas regulators, flow meters, residual gas analyzers, interpretation of data.	L4, L5	9
Module 3 Design Concepts: Materials, chambers, components, joins, seals, valves. Overall system design and integration.	L4	6
Module 4 Problem Solving: Leak detection and detectors, gas signatures.	L4, L6	4
Module 5 Vacuum Applications: Micro fabrication Chemical vapour deposition, physical vapour deposition, sputtering, reactive ion etching, implantation, packaging, Display technologies, X-ray tubes, cryogenic insulation, space simulation.	L3, L6	8

**Bloom's Level:*

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L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. M. H. Hablanian, H. H. Hablanian "High-vacuum Technology: A Practical Guide" 2nd Edition, CRC Press, 1997.
2. A.D. Tripathi , A. Gupta , "Ultra High Vacuum Techniques", Allied Publishers Private Limited, 2002

Reference Books

1. A Roth , "Vacuum Technology", Third Edition , Eleciever Science
2. Pramod K Naik, " Vacuum Science, Technology and Applications", CRC Press
3. V.V. Rao, T.B. Ghosh, K.L. Chopra, " Vacuum Science and Technology", Allied Publishers

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Course Code: ECE2517	INTRODUCTION TO RASPBERRY PI	L	T	P	C
Version 2023.1	Date of Approval: March 2023	2	0	0	2
Pre-requisites/Exposure	Raspberry Pi Basics				
Co-requisites	NIL				

Catalog Description

Course Objectives

This program aims to train students to be equipped with a solid theoretical foundation, systematic professional knowledge and strong practical skills in the Raspberry Pi and Arduino. The course focuses on higher-level operating systems, advanced networking, user interfaces, multimedia and uses more computing intensive IoT applications as examples using Raspberry Pi running Linux as the platform of choice, while also exposing the student to other comparable platforms like Arduino. After doing this course, students should be able to design and deploy multiple IoT devices that could connect to the gateway.

Modules	Blooms level*	Number of hours
Module 1: : Getting Started with Raspberry Pi Basic functionality of Raspberry Pi B+ board, setting up the board, configuration and use, implications of an operating system on the behaviour of the Raspberry Pi as an IoT device, booting Raspberry Pi 3, Downloading an Operating System, format an SD card and booting the OS. Basics of Linux and its use, main features including navigating the file system and managing processes, text-based user interface through the shell, overview of the graphic user interface for Raspbian Linux distribution	L2 and L3	5
Module 2: Interfacing Hardware with the Raspberry Pi, Raspberry Pi Remote Access, operate the Raspberry Pi in "headless mode", Bash Command line, operating Raspberry Pi without needing a GUI interface Implications of an operating system on the behaviour of the Raspberry Pi, Overview of Linux and its internal command, aptget-update, navigating the file system and managing processes, text-based user interface through the shell, overview of graphical user interface.	L2 and L3	5
Module 3: Basics of the Python programming language, programming on the Raspberry Pi. Python on Raspberry Pi, Python Programming Environment, Python Expressions, Strings, Functions and Function arguments, Lists, List Methods, Control Flow	L2 and L3	4
Module 4: Communication with devices through the pins of the Raspberry Pi, RPi. GPIO library, Python Functions, setting up the pins, General purpose IO Pins, Protocol Pins, GPIO Access, applying digital voltages, and generating Pulse Width Modulated signals, Tkinter Python library, accessing pins through a graphic user interface.	L2and L3	5
Module 5: Making noise: Playing tones, playing a melody, Types of motors DC, Servo, Motor Drivers, Speed and direction control	L2 and L3	5

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Text & References:

Text:

- Simon Monk, "Programming the Raspberry Pi: Getting Started with Python", January 2012, McGraw Hill Professional

References:

- Eben Upton and Gareth Halfacree, "Raspberry Pi User Guide", August 2016, 4th edition, John Wiley & Sons
- Alex Bradbury and Ben Everard, "Learning Python with Raspberry Pi", Feb 2014, John Wiley & Sons

Examination Scheme:

Components	CT1	Assignment/ Viva	Attendance	EE
Weightage (%)	15	10	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3	PSO 4
CO 1	--	1	2	--	--	--	--	--	--	--	--	--	1	--	--	--
CO 2	1	--	2	3	--	--	--	--	--	--	4	--	1	2	--	--
CO 3	--	1	--	--	--	--	--	--	--	2	3	--	-	1	2	--
CO 4	-	1	-	--	2	--	--	--	--	--	--	--	2	1	--	--
CO 5	--	--	1	--	--	--	--	--	2	--	--	--	--	--	--	1

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Course Code: ECE2518	INTRODUCTION TO RASPBERRY PI LAB	L	T	P	C
Version 2023.1	**Date of Approval: March 2023**	0	0	2	1
Pre-requisites/Exposure	Basics installation of Raspberry Pi				
Co-requisites	NIL				

Course Objectives

.Modules/Topics Covered**	Blooms level*	Number of hours
Programming Language: Python List of Programs: Session 1-2. Getting started with Raspberry Pi, Install Raspian on your SD card Session 3-4 Linux basic commands. Session-5-6. Coding simple programs in Python. Session 7-9 How to use Python-based IDE (integrated development environments) for the Raspberry Pi and how to trace and debug Python code on the device Session 10-12 How to have your Raspberry Pi interact with online services through the use of public APIs and SDKs. .	L3, L5	12

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	--	--	1	--	1	--	--	--	--	1	--	--	1	--	--	--
CO 2	--	--	2	--	2	--	--	--	--	1	--	--	1	--	--	--
CO 3	--	--	1	--	1	--	--	--	--	2	--	--	1	--	--	--
CO 4	--	--	2	--	1	--	--	--	--	2	--	--	1	--	--	--
CO 5	--	--	1	--	2	--	--	--	2	1	--	--	1	1	--	2

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Syllabus - Sixth Semester

ECE2601	VLSI DESIGN	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	3	0	0	3
Pre-requisites/Exposure	Basics of semiconductor and analog electronics				
Co-requisites	Nil				

Catalog Description

This course deals with basic theories and techniques of digital VLSI design in CMOS technology. It covers the fundamental concepts and structures of designing digital VLSI systems which include CMOS devices and circuits, standard CMOS fabrication processes, CMOS design rules, static and dynamic logic structures, CMOS chip layout, simulation and testing, low power techniques, design tools and methodologies and Stick Diagrams.

Course Objectives

The objective of this course is to

- Provide a deep understanding of the concepts, techniques and design of complex digital VLSI circuits.
- Apply mathematical methods and circuit analysis models to analyse CMOS digital circuits, and their logic components.

Course Outcomes

On completion of this course, the students will be able to

CO1.Explain the characteristics of Basic VLSI components.

CO2. Apply the knowledge of various CMOS inverters to compare their performance.

CO3. To design and realize basic combinational and sequential functions using CMOS logic.

CO4. Design circuit Layout and Stick diagrams of CMOS logics.

Modules	Blooms level*	Number of hours
Module I: Devices and the wire Dynamic and transient behavior of Diode, Diffusion capacitance, SPICE Diode model, MOSFET basic, depletion and enhancement device. MOSFET static behavior, Threshold voltage and its dependence on V_{SB} MOSFET Operation in resistive and saturation region, channel length modulation, Velocity saturation and its impact on sub micron devices, sub threshold conduction, Model for manual analysis, Equivalent resistance for MOSFET in (velocity) saturated region, comparison of equations for PMOS and NMOS. Dynamic behavior, Channel capacitance in different regions of operation, junction capacitance, Level 1 SPICE models for MOS transistors. The Wire, Interconnect parameters: resistance, capacitance and Inductance, Lumped RC model, Elmore Delay.	L1, L2	8

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Module II: CMOS Inverter VTC of an ideal inverter, Switching Model of the CMOS inverter: NMOS /PMOS discharge and charge, VTC of CMOS inverter : PMOS and NMOS operation in various regions including velocity saturation, Switching threshold, (W/L)p/(W/L)n ratio for setting desired V_M with and without velocity saturation, Noise Margins, buffer. Ratioed logic: Pseudo NMOS inverter and PMOS to NMOS ratio for performance, tri-state inverter, Resistive load inverter. Load Capacitance calculations: fan out capacitance, self capacitance calculations: Miller effect, wire capacitance; Improving delay calculation with input slope, Propagation delay: first order analysis, analysis from a design perspective, sizing a chain of inverters for minimum delay, choosing optimum number of stages, Power, Energy and Energy Delay: Dynamic power consumption, Static power, Glitches and power dissipation due to direct path currents, power and delay trade off, Transistor sizing for energy minimization.	L3, L4	8
Module III: Combinational circuits CMOS LOGIC: Good 0 and Poor 0, series and parallel N and P switches, Two and Higher input NAND and NOR gates, Functions of the type (AB+C(D+E)) and their complements, XOR and XNOR gates, 2 input Multiplexer, Full Adder; Transistor sizing in CMOS logic for optimal delay, Pseudo NMOS NAND NOR and other gates and the transistor sizing, Introduction to DSVCL logic, CPL AND/NAND, OR/NOR, XOR/XNOR gates, Logical effort, Electrical Effort, Branching effort, Examples of sizing Combinational logic chains for minimum delay, Pass-transistor logic, pass gate configurations for NMOS and PMOS, 2 input and 4 input MUX, XOR, XNOR and implementation of general functions like AB+AB*C+A*C*, Robust and Efficient PTL Design, Delay of Transmission Gate chain. Dynamic CMOS design: Pre-charge and Evaluation, charge leakage, bootstrapping, charge sharing, Cascading Dynamic Gates, DOMINO Logic, Optimization of Domino Logic Gates, simple example circuit implementations of DOMINO logic.	L2,L3,L4	10
Module IV: Sequential Logic circuits Principle of bistability, NAND and NOR based SR latch, and clocked SR Latch, JK latch, example of master slave flip flop, CMOS D latch, , MUX based Latches, master slave edge triggered register, Static Timing Analysis – setup, hold time, clock skew, clock period, non ideal clocks, clock overlap, C2MOS register, TSPCR Register, Schmitt Trigger, Pipelining and NORA CMOS	L2,L3,L4	5
Module V: Layout Design Rules Introduction to CMOS Process technology, Latch up and its prevention Layout of CMOS inverter, CMOS NAND and NOR gates, Concept of Euler path, and stick diagrams for functions like (AB+E+CD)*.	L2,L3,L4	5

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester

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Examination; Att: Attendance

Text Books

- **Jan M Rabaey**,Digital Integrated Circuits ,Second Edition, Pearson.
- **David Hodges** , Analysis and Design of Digital ICs, McGrew Hill
- **Sung-MoKang,**CMOS Digital ICs,third edition,2008

Reference Books

- **Weste Niel and Harris**,CMOS VLSI design. A Circuits And Systems Perspective, 3/E,Pearson
- **Weste and Eshragian**, Principles of CMOS VLSI Design: a systems perspective, Addison-Wesley Publishing Company, 01-Jan-1993

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	3	--	--	--	--	--	--	--	--	--	--	2	1	-	-
CO2	3	1	3	--	1	--	--	--	--	--	--	2	2	1	-	2
CO3	3	2	1	2	--	--	--	--	--	--	--	2	2	1	-	2
CO4	2	2	1	-	--	--	--	--	--	--	--	--	2	1	-	-

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ECE2602	DIGITAL SIGNAL PROCESSING	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	2	1	0	3
Pre-requisites/Exposure	Hands on knowledge of MATLAB Programming				
Co-requisites	Basic signals & Systems				

Catalog Description

This course deals in Digital signal processing with significant skills in advance methods for modification, analysis, classification & sampling of signals. It provides the broad knowledge of design, and realization of digital signal processing systems. The problems based on transformation of domains and filter design will be focused on.

Course Objectives

The objective of this course is to

- Equip the students with concepts of signals and systems.
- Provide in-depth knowledge of various transformations and filtering concepts.

Course Outcomes

On completion of this course, the students will be able to

CO1: Represent, analyze & categorize discrete-time signals and systems in time domain.
CO2: Apply the transformations to solve the problems related to computational complexity.
CO3: Explain the technique for conversion of real life signals to processing ready signals.
CO4: Design a digital filter with desired response and specifications.

Modules	Blooms level*	Number of hours
Module 1: **Discrete Time Signals And Systems In Time Domain** Classification of signal, signal processing operations, classification of systems, discrete time systems, examples of types of signal, sampling process, time domain characterization of LTI discrete- time systems, state space representation of LTI discrete time systems.	L1,L2 and L4	10
Module 2: **Discrete Time Signals In Transform Domain** DTFT, properties, applications, inverse DTFT, DFT, properties, applications, inverse DFT, Z-transform, properties, applications, inverse Z-transform, frequency response, transfer function, Fast Fourier transform algorithms: DIT algorithm, DIF algorithm.	L2,L3	16
Module 3: **Discrete Time Processing Of Continuous Time Signals** Discrete time processing of continuous time signal sampling, analog filter design, anti-aliasing filter design	L2,L4 and L5	10

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Module 4: **Discrete Time Processing Of Discrete- Time Signals** Digital filters: Digital filter structure: FIR filter structure, IIR filter structure Digital filter design: Impulse invariance method, bilinear transform method of IIR filter design, FIR filter design.	L2,L3 and L5	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- **Proakis, Manolakis**, Digital Signal processing, 4th edition, Pearson, 2007.
- **Oppenheim & Schaffer**, Digital Signal Processing, 1st edition, Pearson, 1975.

Reference Books

- **Fafael C. Gonzalez, Richard E. Woods,** Digital Image Processing, Pearson, 2009.
- **Anil Kumar Jain,** Fundamentals of Digital Image Processing, 1st edition, Prentice Hall Information and System Sciences Series.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2	PS O 3	PS O 4
CO 1	1	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--
CO 2	2	1	--	--	2	--	--	--	--	--	--	--	2	1	--	--
CO 3	1	2	2	--	2	--	--	--	--	--	--	3	2	1	--	3
CO 4	--	2	1	--	2	--	--	--	--	--	--	3	2	1	--	3

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ECE2615	ANTENNA AND MICROWAVE ENGINEERING	L	T	P	C
Version 2022.1	Date of Approval: May 20, 2022	3	0	0	3
Pre-requisites/Exposure	Basic Electronics and Electromagnetic Theory				
Co-requisites	Nil				

Catalog Description

The basic objective of this course is to provide the core knowledge of antenna and wave propagation. The course also focuses on measurements of the antenna parameters**.** Microwaves are important when we are going to the high frequency regime. By studying this course students will be able to know about the microwave components and devices, microwave generators and their characteristics, microwave applications and measurement. Also, they will be familiar about the rectangular and circular waveguides, their equations and the modes existing in these waveguides.

Course Objectives

The objective of this course is to

1. Provide the basic knowledge of antenna fundamentals and Equip with the understanding various antenna types and measurements of antenna parameters .
2. Provide the fundamental knowledge of microwave frequencies, behavior of circuits at high frequencies and waveguides.
3. Provide the knowledge about microwave components and tubes.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the antenna working principle, its parameters and use of arrays for improving them.

CO2: Describe the design equations of the practical antennas and their applications and Explain measurement methods of the antenna parameters.

CO3: Describe the microwave frequencies and behavior of circuits at high frequencies and waveguides.

CO4: Describe and analysis of rectangular and circular waveguides and Categorize various microwave components and describe them on basis of their parameters.

Modules	Blooms level*	Number of hours
MODULE I: ANTENNA Antenna Principles: Radiation from Monopole & Half Wave Dipole, power radiated by current element, radiation resistance. Directional Properties of Dipole Antenna. Antenna parameters: Radiation intensity, Radiation pattern, beam area, beam efficiency Antenna Gain, Directivity, Effective Area, Antenna Efficiency, Antenna Terminal Impedance, Antenna Temperature and Signal to Noise Ratio.	L1and L2	9

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MODULE II: PRACTICAL ANTENNAS & MEASUREMENTS Antennas Arrays: Two Element Array, Radiation Patterns in Broadside Arrays & Linear Arrays, Multiplication of patterns, Practical Antenna, their principle, geometrical equations, parameters & applications : Loop Antennas, Yagi-Uda array: Parabolic Reflectors, Horn Antenna, Log periodic antenna, spiral antenna, Microstrip antennas. Measurements: Radiation Pattern measurement, Gain Measurement: Comparison method, Near field method, Polarization measurement.	L1,L2 and L3	10
MODULE III: WAVE PROPAGATION Modes of Propagation, Plane Earth Reflection, Space wave and Surface Wave, Reflection and refraction waves by the Ionosphere Tropospheric Wave. Ionosphere Wave Propagation in the Ionosphere, Virtual Height, MUF Critical frequency, Skip Distance, Duct Propagation, Space wave	L1, L2 and L3	10
MODULE IV: MICROWAVE & WAVEGUIDES Microwave frequencies, standard frequency bands, behaviour of circuits at conventional and microwave frequencies, microwave application. Overview of guided waves, TE, TM and TEM modes in rectangular	L1, L2 and L3	9
MODULE V: MICROWAVE COMPONENTS AND DEVICES Scattering matrix and its properties, Microwave bench & its components E-plane Tee, H-plane Tee, Magic Tee, Phase-Shifter, Directional Coupler, Resonator and circulators, Microwave tubes: Gunn effect & Gunn diode, Two-cavity Klystrons, Reflex Klystron, TWT and Magnetrons.	L1, L2 and L3, L4	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- S. Y. Liao, Microwave Devices and Circuits, 4th Edition PHI, 2001.
- Antennas: For All Applications by Kraus, John D. & Mashefka, Ronald J., Tata McGraw Hill, 3rd Ed.
- Antennas and Wave Propagation by Prasad, K.D. Khanna Publications.
- O.P. Gandhi, Microwave Engineering and Application, New York, Maxwell Macmillan Pub, 1981.

Reference Books

- E. S. Yang, Microelectronic Devices, Ma Graw Hill -Education, 1988.
- A. G. Milness, Semiconductor Devices and Integrated Electronics, Springer, 2012.
- K. C. Gupta, Microwave Engineering, John Wiley & Sons, 1980.

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	--	_	--	_	2	--	--	--	--	--	--	1	--	1	--
CO2	1	3	2	--	--	2	--	--	--	--	--	--	1	--	1	--
CO3	1	3	2	--	--	2	--	--	--	--	--	--	1	--	1	--
CO4	1	2	2	--	--	3	--	--	--	--	--	--	1	--	1	--

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ECE2616	ANTENNA AND MICROWAVE ENGINEERING LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Basic Electronics and Electromagnetic Theory.				
Co-requisites	Nil				

Catalog Description

Antennas are used to transmit electromagnetic energy and Microwaves are important when we are going to the high frequency regime. By studying this course students will be able to understand antenna design parameters and know about the microwave components and devices, microwave generators and their characteristics, microwave applications and measurement.

Course Objectives

The objective of this course is to

- Provide knowledge about Radiation phenomena and pattern and characteristics of different types of antennas.
- Provide the fundamental knowledge of microwave frequencies and components of microwave bench.
- Provide the knowledge about microwave components, tunes and oscillators.

Course Outcomes

On completion of this course, the students will be able to

CO1: Analyze the radiation mechanisms of antennas and Demonstrate knowledge of antennas in communication systems.

CO2: Describe the characteristics of microwave oscillators and Explain and study the working of the various microwave tees.

CO3: Analyse microwave frequency signal and Categorize various microwave components and study their operations.

Course Content

Experiments	Blooms level*	Number of hours
1. To study and design dipole antenna, horn antenna and yadi uda antenna in Simulation software like ANSYS HFSS. 2. To design a rectangular microstrip patch antenna in Simulation software and draw its hardware on LPKF Protomat PCB machine.	L1 L2 and L3	4
1. To measure frequency and guided wavelength of a microwave signal. 2. To measure the impedance of a given load. 3. To measure various parameters of a directional coupler.	L1 L2 and L3	3
1. To study the characteristic and functions of an isolator. 2. To study and simulate the characteristic and functions of a circulator. 3. To study and simulate the characteristic and functions of various tees.	L1 L2 and L3	3

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1. To study the characteristics of reflex klystron. 2. To study the characteristic of Gunn diode.	L1 L2 and L3	2

*Bloom's Level: L1: Knowledge; L2: Comprehension; L3: Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA – Internal Assessment, EE - External Exam, PR - Performance, LR – Lab Record, V – Viva.

Text Books

- S. Y. Liao, Microwave Devices and Circuits, 4th Edition PHI, 2001.
- O.P. Gandhi, Microwave Engineering and Application, New York, Maxwell Macmillan Pub, 1981.

Reference Books

- E. S. Yang, Microelectronic Devices, Ma Graw Hill -Education, 1988.
- A. G. Milness, Semiconductor Devices and Integrated Electronics, Springer, 2012.
- K. C. Gupta, Microwave Engineering, John Wiley & Sons, 1980.

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	-	-	-	-	-	-	-	-	-	-	-	2	-	1	1
CO2	1	2	-	-	-	3	-	-	-	-	-	-	2	-	1	1
CO3	1	2	3	-	-	3	-	-	-	-	--	-	2	-	1	1

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ECE2605	VLSI DESIGN LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Hands on knowledge of analog electronics				
Co-requisites	Basic concepts of Digital electronics				

Catalog Description

In this Lab course the designing of VLSI circuits using Mentor Graphics software are implemented and demonstrated. Concepts covered would enable them to create complex applications related to VLSI design. The objective of this course is to explore and implement the various features of VLSI design and analyze the dc and transient analysis.

Course Objectives

The objective of this course is to

Provide a deep understanding of CMOS logic using Mentor Graphics tool.

Analyze, design concepts of different combinational and sequential circuits and their simulation.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Demonstrate the basic concept of MOSFET;

CO 2: Illustrate the static and switching characteristics of inverters using CMOS with varying capacitance, width and channel Length of CMOS using Mentor Graphics tool.

CO 3: Demonstrate and create models of moderately sized CMOS circuits that realize specified digital functions using Mentor graphics Tool.

CO 4: Demonstrate the layout and stick diagrams using Mentor graphics Tool.

CO 5: Demonstrate the power consumption during transient analysis.

Modules/Topics Covered**	Blooms level*	Number of hours
1. MOSFET characteristics with varying VGS for both pmos and nmos.	L3, L5	2
2. Effect on VTC of CMOS inverter with variation of W and L.	L3, L5	2
3. Transient analysis of CMOS inverter with varying capacitive load, W and L. Rise time, fall time power dissipation, propagation delay calculation of CMOS inverter with the variation of capacitive load, W and L.	L3, L5	4
4. NOR and NAND gate - Transient analysis	L3, L5	2
5. XOR/XNOR gate - Transient analysis	L3, L5	2
6. 2:1 MUX and XOR gate with P.T.L.- Transient analysis	L3, L5	2
7. D type latch and flip flop - Transient analysis	L3, L5	2
8. 3 input NAND gate implementation with DOMINO (precharge and evaluation).	L3, L5	2
9. 4 inverter chain to derive capacitive load.	L3, L5	2

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	**70**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE- External Exam

Text

- Neil Weste and K. Eshragian, "Principles of CMOS VLSI Design: A System Perspective," 2nd edition, Pearson Education (Asia) Pvt. Ltd., 2000.
- D.A Pucknell and Eshraghain, " Basic VLSI Design", PHI, India, 1995.

References:

- Mentor Graphics user Manual

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	3	1	--	--	--	--	--	--	--	--	--	--	2	1	--	--
CO2	3	1	--	--	--	--	--	--	--	--	--	--	1	1	--	--
CO3	3	1	--	--	--	--	--	--	--	--	--	--	1	1	--	--
CO4	3	1	--	--	--	--	--	--	--	--	--	--	2	1	--	--
CO5	3	1	--	--	--	--	--	--	--	--	--	--	1	1	--	--

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ECE2609	DIGITAL SIGNAL PROCESSING LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Basics of MATLAB				
Co-requisites					

Catalog Description

Signal processing has become an important tool for research and investigation in many areas of science and engineering. This course is designed to provide the students an understanding of the basic concepts of digital signal processing and various techniques used in it. Students will perform practical on MATLAB to demonstrate the theoretical concepts of the subject.

Course Objectives

The objective of this course is to

- Make students demonstrate the basic concepts of digital signal processing.
- Design filters and determine its coefficients.

Course Outcomes

On completion of this course, the students will be able to

CO1. Practically apply the theoretical concepts of digital signal processing.
CO2. Design analog and digital filters using different techniques.
CO3. Verify FFT algorithm in decimation in time and decimation in frequency domain.

Modules	Blooms level*	Number of hours
Lab Session 1 1. To generate unit step sequence, exponential sequence and sinusoidal sequence. 2. To determine convolution of two given sequences. 3. To compute DFT and IDFT of a given sequence. 4. To determine the circular convolution of two given sequences. 5. To determine z and inverse z transform of a given sequence	L3	4
Lab Session 2 6. To design various analog filters. 7. To design FIR filter using Hamming window. 8. To convert Analog filter into Digital Filter using bilinear transformation. 9. To plot the frequency response of an FIR system	L3 and L4	4

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Lab Session 3 10. To verify 8 points FFT algorithm in decimation in time (DIT) & decimation in frequency (DIF). 11. To determine the filter coefficient using Ramez exchange algorithm. 12. To design an IIR digital filter and its parallel realization.	L3 and L4	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text Books

- Proakis, Manolakis, Digital Signal processing, 4th edition, Pearson, 2007.
- Oppenheim & Schaffer, Digital Signal Processing, 1st edition, Pearson, 1975.

References:

- Fafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Pearson, 2009.
- Anil Kumar Jain, Fundamentals of Digital Image Processing, 1st edition, Prentice Hall Information and System Sciences Series.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	--	--	--	2	--	--	--	--	--	--	2	1	--	-	-
CO2	1	-	3	--	2	--	--	--	--	--	--	2	1	3	--	-
CO3	1	-	3	--	2	--	--	--	--	--	--	2	1	3	--	3

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ECE2637	MINOR PROJECT	L	T	P	C
Version : 2019.1	Date of Approval: May 21, 2019	0	0	0	2
Pre-requisites/Exposure	Basics of Electronics and Communication				
Co-requisites	Nil				

Catalog Description

Minor Project is a professional problem-solving activity included in the curriculum. It provides exposure to research methodology, practical skill enhancement and an opportunity to work closely with latest technology for development of solution of real-world problems. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation. This course develops attributes like intellectual ability, professional judgment and decision-making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility.

Course Objectives

The objective of this course is to

- Equip the students with concepts of new technologies and practical exposure
- Provide an overview of presentation and preparation of report

Course Outcomes

On completion of this course, the students will be able to

CO1: Study the literature and identify the problem statement

CO2: Work on a real world problem and solve it using latest technology

CO3: Prepare a brief report of the project

CO4: Present and explain the project for evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	V	PPT	R	IM	EM
Weightage (%)	10	10	10	30	70

V – Viva, PPT-Power Point Presentation, R – Report, IP-Internal Marks, EM-External Marks

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	1	2	1	2	2	2	2	2	3	3	2	1	1	1	2
CO2	1	2	1	1	1	2	2	2	2	3	3	2	1	1	1	1
CO3	1	2	3	3	2	3	3	2	2	2	3	2	1	1	1	1
CO4	1	2	3	3	2	3	3	2	2	1	3	2	1	1	1	1

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ECE2607	ADVANCED JAVA PROGRAMMING	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	2	0	0	2
Pre-requisites/Exposure	Basics of Java Programming				
Co-requisites	NIL				

Catalog Description

In this course the advanced features of contemporary java are discussed in detail. Concepts covered would enable them to handle complex programs relating to managing data and processes over the network. Discussion will be on relating to concepts of remote method invocation to working with swings architecture. Further practical implementation of database connectivity and using them in servlet and jsp based applications will be made.

Course Objectives

The objective of this course is to

- Equip the students with the advanced feature of contemporary java required in solving complex problems.
- Provide a practical knowhow and implementation of advanced java programming concepts like database programming with servlets and jsp.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define and explain concept of an Remote method invocation application, demonstrate swing based application developed using concepts of remote method invocation

CO2: Distinguish between various java and open database connectivity drivers and able to solve complex programming problems involving database interaction.

CO3: Describe servlet and its lifecycle, along with demonstrate and design solutions for some complex dynamic web applications using servlets.

CO4: Explain jsp scripting and Differentiate between processing of servlets and jsp scripting pages. Apply knowledge of servlets and jsp scripting to create some new dynamic web applications.

CO5: Explain the architecture of Model View Controller and struts. Demonstrate applications based on java beans and struts.

Modules	Blooms level*	Number of hours
MODULE 1: **DISTRIBUTED COMPUTING** Introduction to Java RMI, RMI services, RMI client, Running client and server, Introduction of Swing, Swing Components, Look and Feel for Swing Components, Introduction to Multimedia Programming.	L1, L2 and L3	6
MODULE 2: **DATABASE CONNECTIVITY** ODBC and JDBC Drivers, Connecting to Database with the java.sql Package, Using JDBC Terminology, JDBC with mysql, postgresql. .	L2 and L3	7

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MODULE 3: **SERVLET PROGRAMMING** Introduction to Servlets, Servlet Life Cycle, Servlet based Applications, Servlet and HTML.Filters, jdbc with servelets, session Management techniques in detail.	L2, L3 and L5	8
MODULE 4: **JSP PROGRAMMING** JSP: Introduction to JSP, JSP implicit objects, JSP based Applications, Java. Net. Login & Logout Example, jdbc with jsp.	L2, L3, L4 and L5	8
MODULE 5: **J2EE WEB APPLICATION** The Model-View-Controller Architecture What is Struts, Struts Tags, Creating Beans, Other Bean Tags, Bean Output, Creating HTML Forms, The Action Form class The Action class, Simple Struts: a simple Struts application; Introduction to EJB.	L2 and L3	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- J. Jaworski, Java 1.2 Unleashed, Techmedia – SAMS, 1998, United States
- S. Allamaraju, Professional Java Server Programming, Wrox Press Limited, 2001, United States.
- J. Goodwill and B. Morgan, Developing Java Servlets, Techmedia – SAMS, 2017, United States

Reference Books

- D. Flanagan, J. Parley, W. Crawford and K. Magnusson, Java Enterprise in a nutshell - A desktop Quick reference, O'REILLY, 2003, USA.
- S. Ausbury and S. R. Weiner, Developing Java Enterprise Applications, John Wiley and Sons, 2001, USA.
- J. Hunder and W. Crawford, Java Servlet Programming, O'REILLY, 2002, USA

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	--	--	--	--	--	--	--	--	--	--	2	--	--	--
CO2	3	1	--	--	--	--	--	--	--	--	--	--	1	2	--	--
CO3	2	1	2	--	--	--	--	--	--	--	--	--	1	2	--	--
CO4	1	3	2	--	--	--	--	--	--	--	--	--	2	--	2	--
CO5	1	3	--	--	--	--	--	--	--	--	--	--	1	--	--	--

1: strongly related, 2: moderately related and 3: weakly related

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ECE2610	ADVANCED JAVA PROGRAMMING LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Basics of Java and Advanced Java Programming				
Co-requisites	NIL				

Catalog Description

In this Lab course the advanced features of contemporary java are implemented and demonstrated. Concepts covered would enable them to create complex applications related to data management. Problems or programs will be related to concepts of remote method invocation, swings, servlets, jsp and java beans.

Course Objectives

The objective of this course is to

- Make the students apply knowledge of various advanced java features required in solving complex problems.
- Provide a demonstration of advanced java programming concepts like database programming with servlets, jsp and creating java beans.

Course Outcomes

On completion of this course, the students will be able to

CO1: Apply the knowledge of swings architecture and remote method invocation used to provide solution to distributed computing problems

CO2: Demonstrate the use of JDBC connectivity along with swings based architecture, thereby handling data management.

CO3: Apply the knowledge of servlets and server programming to construct dynamic web applications using web servers.

CO4: Demonstrate the differences between creating and deploying dynamic web applications using jsp concepts and servlets.

CO5: Demonstrate usage of applications involving java beans and jdbc programming to handle data management.

Modules/Topics Covered**	Blooms level*	Number of hours
1. Sample Programs using swings architecture and remote method invocation (a) Write a program using swings creating tabbed panes and menu over a frame and handle their associated events (b) Write a program using swings List control containing list of cities, allowing the user to choose any one of them and display using event handing. (c) Demonstrate an application showcasing the use of remote method invocation(RMI) for designing a distributed application. (d) Create an application using concepts of RMI to depict a client server based interaction.	L3, L5	6

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2.Sample Programs using JDBC and swings (a) Create an application demonstrating the use of swings, having a menu over a frame and jdbc programming to perform insert and select operations by handling menu related events. (b) Create an application using swings, having a design providing features for iterating over a dataset performing operations like forward, backward, start and end with help of jdbc programming.	L3, L5	4
(c) Sample Programs using servlets with jdbc, html and swings 1. Create an application using servlets to perform redirection based on validating user data entered through a web form. 2. Design an application to fetch data from database using servlets and display it using its post method. 3. Demonstrate the process of writing cookies using a servlet and display a message after writing. 4. Write a program to create a session object for the username fetched from user using a servlet, further access that session value on another servlet invoked by redirection.	L3, L5	6
5. Sample Programs using JSP with jdbc, html and swings (a) Write a program using jsp to demonstrate the features of jsp elements used to declare, define and display sum of two integers. (b) Create an application using jsp to calculate and display the greatest out of two integers using if else statements. Integer numbers should be entered using a web form. (c) Demonstrate with a jsp program mechanism to retrieve checkbox data accessed using multiple value parameters fetching approach. (d) Write a program to demonstrate the use of jsp forward action tag used with parameters and processed using another jsp page.	L3, L5	6
6. Sample Programs using jsp, java beans and swings (a) Demonstrate the use of jsp include action tag for including an html and another jsp page in initial jsp resource. (b) Write a program creating Java bean class and setting its properties using required jsp action tags. Output should also display the retrieved property values.	L3, L5	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Modes of Evaluation: Lab Record /Viva- Via /Performance/Written Examination

Examination Scheme:

IA					EE
Components	**A**	**PR**	**LR**	**V**	**70**
Weightage (%)	5	10	10	5	

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

Text Books

- J. Jaworski, Java 1.2 Unleashed, Techmedia – SAMS, 1998, United States
- S. Allamaraju, Professional Java Server Programming, Wrox Press Limited, 2001, United States
- J. Goodwill and B. Morgan, Developing Java Servlets, Techmedia – SAMS, 2017, United States

Reference Books

- D. Flanagan, J. Parley, W. Crawford and K. Magnusson, Java Enterprise in a nutshell - A desktop Quick reference, O'REILLY, 2003, USA

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- S. Ausbury and S. R. Weiner, Developing Java Enterprise Applications, John Wiley and Sons, 2001, USA
- J. Hunder and W. Crawford, Java Servlet Programming, O'REILLY, 2002, USA

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	--	--	--	--	--	--	--	--	--	--	2	--	--	--
CO2	3	1	--	--	--	--	--	--	--	--	--	--	1	2	--	--
CO3	2	1	2	--	--	--	--	--	--	--	--	--	1	2	--	--
CO4	1	3	2	--	--	--	--	--	--	--	--	--	2	--	2	--
CO5	1	3	--	--	--	--	--	--	--	--	--	--	1	--	--	--

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ECE2617	IOT & WIRELESS SENSOR NETWORKS	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	3	0	0	3
Pre-requisites/Exposure	Circuit Theory				
Co-requisites	Nil				

Catalog Description

This course covers the fundamentals of IoT systems with emphasis on translating theoretical bases into practical network design and technologies. It covers the bigger picture of IoT systems with a focus on wireless IoT technologies, network design, system architecture, Overview of Wireless Sensor Networks and Communication Protocols.

Course Objective:

The objective of this course is to

Introduction and description of core concepts of IoT, role and scope of smart sensors for insuring convergence of Technologies and multidisciplinary engineering practices, Machine Intelligence Quotient.

Course Outcomes

On completion of this course, the students will be able to

CO1: Introduction and description of core concepts of IoT, role and scope.
CO2: Architecture and Design Principles of internet network for IoT based system applications.
CO3: Introduction to physical devices used in IoT based systems.
CO4: Recognize upcoming challenges in Sensor Networks.
CO5: To identify communication protocols employed in WSNs.

Course Contents:

Modules	Blooms level*	Number of hours
Module 1 Overview of Internet of Things IoT Conceptual Framework, IoT Architectural View, Technology Behind IoT, Sources of IoT,M2M communication, Examples of IoT. Modified OSI Model for the IoT/M2M Systems, data enrichment, data consolidation and device management at IoT/M2M Gateway, web communication protocols used by connected IoT/M2M devices, Message communication protocols (CoAP-SMS, CoAP-MQ, MQTT,XMPP) for IoT/M2M devices.	L1 and L2	8
Module-2 Architecture and Design Principles for IoT Internet connectivity, Internet-based communication,IPv4, IPv6, 6LoWPAN protocol, IP Addressing in the IoT, Application layer protocols: HTTP, HTTPS,FTP,TELNET and ports Data Collection, Storage and Computing using a Cloud Platform**:** Introduction, Cloud computing paradigm for data collection, storage and computing, Cloud service models, IoT Cloud- based data collection, storage and computing services using Nimbits.	L2 and L3	10

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Module-3: IoT Physical Devices and Endpoints Arduino UNO: Introduction to Arduino, Arduino UNO, Installing the Software, Fundamentals of Arduino Programming. IoT Physical Devices and Endpoints RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi with Python, Wireless Temperature Monitoring System Using Pi, DS18B20 Temperature Sensor, Connecting Raspberry Pi via SSH, Accessing Temperature from DS18B20 sensors, Remote access to RaspberryPi, Smart and Connected Cities, An IoT Strategy for Smarter Cities, Smart City IoT Architecture, Smart City Security Architecture, Smart City Use-Case Examples.	L2 and L4	10
Module-4 Overview of Wireless Sensor Networks Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks. Architectures: Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture-Sensor Network Scenarios, Optimization Goals and Figures of Merit, Design principles for WSNs, Service interfaces of WSNs Gateway Concepts.	L3 and L4	10
Modue-5 Communication Protocols: Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Contention based protocols(CSMA,PAMAS), Schedule based protocols (LEACH, SMACS, TRAMA) Address and Name Management in WSNs, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing, Hierarchical networks by clustering.	L1 and L2	10

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books:

- Raj Kamal, "Internet of Things-Architecture and design principles", McGraw Hill Education, 2017.
- Holger Karl & Andreas Willig, "Protocols And Architectures for Wireless Sensor Networks", John Wiley, 2005.
- Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.
- David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1 st Edition, Pearson Education.

Reference Books:

- Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1 stEdition, VPT, 2014.
- Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks Technology, Protocols, And Applications", John Wiley, 2007.

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**3**													**2**	
CO2		**2**													**3**	
CO3	**2**	**1**			**2**						**3**				**2**	**2**
CO4		**2**			**1**						**3**				**1**	**2**
CO5	**1**											**3**			**2**	

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ECE2618	DATA MINING	L	T	P	C
Version 2019.1	Date of Approval: 14 July 2019	3	0	0	3
Pre-requisites/Exposure	Concept of Database and Data Mining				
Co-requisites	Nil				

Catalog Description

Data Mining serve as one of the most important courses for postgraduate students, since it builds computational abilities, inferential thinking, and practical skills for tackling core data scientific challenges. The students will get a comprehensive understanding of different data mining techniques that can be used for prediction and for discovering patterns, be prepared to select the right technique for a given data problem and will be able to create a general-purpose analytic process.

Course Objectives

The objective of this course is to

- Provide students with an in-depth knowledge of data mining. To introduce students to basic applications, concepts, and techniques of data mining.
- Develop skills for using recent data mining software to solve practical problems and prediction in a variety of disciplines and
- Gain experience doing independent study and research.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain concepts of Data mining, predictive analytics and analyses architecture of data mining. Differentiate between supervised and unsupervised methods

CO 2: Apply classification techniques on different data sets and solve cost –benefit analysis numerical. Analyze decision tree methods.

CO 3: Implement various clustering algorithm on different data sets and describe these algorithms.

CO 4: Prepare data representation for market basket analysis and determine the usefulness of association rules. Interpret supervised and unsupervised learning methods.

CO 5: Predict market trends and outline different factors associated mail marketing.

Course Content

Modules	Bloom's level	Number of Hours
Module I Data Preparation An introduction to data mining and predictive analytics, Data Pre-processing Exploratory Data Analysis, Dimension- Reduction Methods.	**L1, L2**	**8**
Module II Classification k- Nearest Neighbour Algorithm, Decision Trees, Model Evaluation Technique, Cost –Benefit Analysis Using Data Driven Cost.	**L1, L2, L3**	**7**
Module III Clustering Hierarchical and k- Means Clustering, Kohenen Networks, Birch Clustering, Measuring Cluster Goodness.	**L1, L2, L3,L4**	**8**

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Module IV Association Rules Affinity Analysis and Market Basket Analysis, Data Representation for Market Basket Analysis, Support, Confidence, Frequent Item sets, and the a Priori Property, How Does a Priori Algorithm Work? Generating Frequent Item sets, Generating Association Rules, Extension from Flag Data to General Categorical Data, Information-Theoretic Approach: Generalized Rule Induction Method, J-Measure, Association Rules are Easy to do Badly, how can we Measure the Usefulness of Association Rules? Do Association Rules Represent Supervised or Unsupervised Learning?	**L1, L2, L3,L6**	**9**
Module IV Case Study: Predicting Response to Direct Mail Marketing Business Understanding, Data Preparation, and Eda, Clustering and Principal Components Analysis, Modelling and Evaluation for Performance and Interpretability, Modelling and Evaluation for High Performance.	**L2, L3, L4, l5**	**8**

Bloom's Level:
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- Daniel T. Larose, Chantal D. Larose, "Data Mining and Predictive Analytics", John Wiley & Sons, Inc., Hoboken, New Jersey, 2015.
- Jiawei Han and Micheline Kamber, "Data mining: concepts and techniques", Morgan Kaufmann, Second Edition, 2006.

Reference Books

- Alex Berson, Data Warehousing, Data Mining, and Olap, Tata McGraw Hill, 2014.
- Markus Hofmann, Ralf Klinkenberg, "Rapid-Miner: Data Mining Use Cases and Business Analytics Applications", Chapman and Hall/CRC, 2016.
- George M Marakas, Modern Data Warehousing, Mining & Visualization Core Concepts, Pearson Education.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	**2**	**2**	**3**
CO2	**1**	**1**	**2**		--	--	--	--	--	--	--	--	**1**	**2**	**3**	**3**
CO3	**1**	**2**	**3**	**3**	**3**	--	--	--	--	--	--	--	**1**	**2**	**2**	**2**
CO4	**1**	**1**	**2**	--	--	**3**	--	--	--	--	--	**3**	**1**	**1**	**2**	**3**
CO5	**1**	**1**	**2**	--	--	**2**	--	--	--	--	--	**3**	**1**	**3**	**2**	**1**

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ECE2613	EMBEDDED SYSTEM	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	2	0	0	2
Pre-requisites/Exposure	Hands on knowledge of Microcontrollers, their interfacing, and programing, and Embedded Systems				
Co-requisites					

Course Description:
The syllabus is divided into two parts, the first one deals with 8051 architecture and its interfacing with other devices. Second part of the syllabus deals with the basic embedded system and it's design. This course will provide an introduction of the basic concepts of embedded systems design, RTOSs, various types of microcontrollers, communication with 8051 microcontroller, RS 232, analog-digital interface, and A/D and D/A conversions. This course also provides the knowledge of C-language programing for microcontrollers. The syllabus makes student perfect in assembly language programming, addressing modes etc. apart from it input-output programming is discussed in detail. In the second part Embedded systems and it's application is discussed. Real Time Operating System is also explained at length.8051 C programming is also incorporated in the syllabus.

Course Objectives:
The objective of this course is to;

- Provide the basic knowledge of introduction to an embedded systems design and RTOS, OS Services, I/O Subsystems, Interrupt Routines in RTOS Environment, RTOS Task Scheduling model.
- Equip with the understanding of various types of microcontrollers, arithmetic instructions and programs, and several application based programing.
- Equip with the understanding of basics of communication, overview of RS-232, I2C Bus, UART, USB, IEEE 488 (GPIB), and analog-digital interfacing.
- Provide the basic knowledge of 8051 C, 8051 memory constitution, Data interface, and A/D and D/A conversions.
- Provide the knowledge of advance microcontrollers, PIC microcontrollers, AVR microcontrollers, and ARM microcontrollers.

Course Outcomes:
On completion of this course, the students will be able to:

CO1: Explain the design of embedded systems and RTOS, and RTOS Task Scheduling model.
CO2: Describe the fundamentals of various types of microcontrollers, and their several applications based programing.
CO3: Describe fundamentals of communication of 8051 microcontroller, RS-232, I2C Bus, 8051 C, 8051, analog-digital interfacing, and A/D and D/A conversions.
CO4: Explain the fundamentals of advance microcontrollers, PIC microcontrollers, AVR microcontrollers, and ARM microcontrollers.

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Modules	Blooms level*	Number of hours
Module1: **Introduction to an embedded systems design & RTOS** Introduction to Embedded system, Processor in the System, Microcontroller, Memory Devices, Embedded System Project Management, ESD and Co-design issues in System development Process, Design cycle in the development phase for an embedded system, Use of target system or its emulator and In-circuit emulator, Use of software tools for development of an ES.Inter-process Communication and Synchronization of Processes, Tasks and Threads, Problem of Sharing Data by Multiple Tasks, Real Time Operating Systems: OS Services, I/O Subsystems, Interrupt Routines in RTOS Environment, RTOS Task Scheduling model, Interrupt Latency and Response times of the tasks.	L1, L2, L3, and L4	8
Module 2: **Overview of Microcontroller** Microcontroller and Embedded Processors, Overview of 8051 Microcontroller family: Architecture, basic assembly language programming concepts, The program Counter and ROM Spaces in the 8051, Data types, 8051 Flag Bits ad PSW Register, 8051 Register Banks and Stack Instruction set, Loop and Jump Instructions, Call Instructions, Time delay generations and calculations, I/O port programming Addressing Modes, accessing memory using various addressing modes, Arithmetic instructions and programs, Logical instructions, BCD and ASCII application programs, Single-bitinstruction programming, Reading input pins vs. port Latch, Programming of 8051 Timers, Counter Programming.	L1, L2, L3, and L4	8
Module 3: Communication with 8051 Basics of Communication, Overview of RS-232, I2C Bus, UART, USB, IEEE 488 (GPIB). Parallel input output applications. (Stepper motor Sequencer program, Strobed input/output). Interrupt driven applications (real time clock, serial input/output with interrupt). Analog-digital interfacing (Pulse width modulator, 8-bit ADC).	L1, L2. L3, and L5	7
Module 4: 8051 C Programming Introduction to 8051 C, 8051 memory constitution, Constants, variables and data types. Arrays structures and unions, pointers, Loops and decisions, Functions, Modules and programs, Data interface, Timer control, Interrupt operations, Digital operations, A/D and D/A conversions.	L1, L2 L3, and L5	7
Module 5: Introduction to Advance Microcontrollers Introduction to PIC microcontrollers, Introduction to AVR Microcontrollers, Introduction to ARM microcontrollers.	L1, L2 L3, and L4	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

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Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books:

- Raj Kamal, 2004, "Embedded Systems", TMH.
- James W. Stewart and Kai X. Miao, 2en Edition. "The 8051 microcontroller" Pearson Edu. Prentice Hall.
- M.A. Mazidi and J. G. Mazidi, 2004 "The 8051 Microcontroller and Embedded Systems", PHI.

References Books:

- David E. Simon,1999, "An Embedded Software Primer", Pearson Education
- K.J. Ayala, 1991, "The 8051 Microcontroller", Penram International.
- Dr. Rajiv Kapadia, "8051 Microcontroller & Embedded Systems", Jaico Press
- Dr. Prasad, 2004, "Embedded Real Time System", Wiley Dreamtech.

CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	3	2	--	--	--	--	--	--	--	--	--	--	1	--	--
CO 2	1	3	2	--	2	--	--	--	--	--	--	--	--	1	--	--
CO 3	1	3	2	--	2	--	--	--	--	--	--	--	--	1	--	--
CO 4	1	3	2	--	2	--	--	--	--	--	--	--	--	1	--	--

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ECE2614	EMBEDDED SYSTEM LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Basics of Microcontroller (8051), its programing and interfacing				
Co-requisites					

Course Description:
This course will provide the practical introduction of microcontroller 8051, its interfacing and programming for various applications, and also designing of microcontrollers.

Course Objectives:
The objective of this course is to;

- Provide the practical knowledge of microcontrollers (specially 8051), and its interfacing and programming.
- Equip with the understanding of designing of a model of microcontroller.
- Equip with understanding of parallel data communication, interfacing microcontroller with a LCD.

Course Outcomes:
On completion of this laboratory course work, the students will be able to:

CO1: Explain the interfacing of microcontroller 8051, and its programming for several applications.
CO2: Describe the fundamentals of design of microcontroller model, and their several applications based programing.
CO3: Describe fundamentals of parallel data communication by interfacing microcontroller (8051) with a LCD.

Modules	Blooms level*	Number of hours
Lab Session 1 13. Write a program to add two 8-bit numbers using microcontroller 8051. 14. Write a program to multiply two 8-bit numbers using microcontroller 8051.	L1 and L3	2
Lab Session 2 15. Write a program to divide two 8-bit numbers using microcontroller 8051. 16. Write a program to subtract two 8-bit numbers using microcontroller 8051.	L1, L3, and L4	2

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Lab Session 3 17. Write a program to generate a geometric progression using microcontroller 8051. 18. Write a program to generate a square wave using microcontroller 8051.	L1, L3, and L4	4
Lab Session 4 19. Write a program to generate a delay of 5 ms using microcontroller 8051. 20. Study and implement serial communication by interfacing microcontroller with a computer.	L1, L3, and L4	2
Lab Session 5 9. Study and implement parallel data communication by interfacing microcontroller with a LCD. 10. Study of temperature measurement.	L1, L3, and L4	2
Lab Session 5 *Student has to submit working model based on 8051 and its interfaces.	L1, L3, and L4	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text Books:

- Raj Kamal, 2004, "Embedded Systems", TMH.
- James W. Stewart and Kai X. Miao, 2en Edition. "The 8051 microcontroller" Pearson Edu. Prentice Hall.
- M.A. Mazidi and J. G. Mazidi, 2004 "The 8051 Microcontroller and Embedded Systems", PHI.

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CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	--	1	--	2	--	--	--	2	--	--	--	--	1	--	3
CO 2	2	--	1	--	2	--	--	--	2	--	--	--	--	1	--	3
CO 3	2	--	1	--	2	--	--	--	2	--	--	--	--	1	--	3

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Course Code: ECE2620	SEMICONDUCTOR PACKAGING, TESTING AND ASSEMBLY	L	T	P	C
Version: 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The course deals with electronics systems packaging – a multidisciplinary area. The course will discuss all the vital features of Electronic packaging at three major levels, namely, chip level, board level and system level. This course covers the technology advancements of microelectronic packaging from design to fabrication; assembly and testing.

Course Objectives

The objective of this course is to:

1. Build overview of electronic systems packaging and the electrical issues encountered while doing it.
2. Familiarize student with the chip level packaging, IC Assembly – Purpose, Requirements, Technologies and its types.
3. Provide the knowledge and understanding of PCB, Surface Mount Technology and Thermal Considerations
4. Deals with the testing aspects of the IC technology.

Course Outcomes

At the end of the course learners will be able to

CO.1. Discuss the various packaging types

CO.2. Design of packages which can withstand higher temperature, vibrations and shock

CO.3. Design of PCBs which minimize the EMI and operate at higher frequency

CO.4. Analyze the concepts of testing methods.

CO.5. Discuss the various packaging types

Modules	Blooms Level*	Number of hours
Module 1-Overview of Electronic Systems Packaging Functions of Electronic Packaging, Packaging Hierarchy, IC packaging: MEMS packaging,consumer electronics packaging, medical electronics packaging, Trends and Challenges,Driving Forces on Packaging Technology, Materials for Microelectronic packaging, PackagingMaterial Properties, Ceramics, Polymers, and Metals in Packaging, Material for high densityinterconnect substrates	L1, L2	5
Module 2- Electrical Issues in Packaging Electrical Issues of Systems Packaging, Signal Distribution, Power Distribution,Electromagnetic Interference, Transmission Lines, Clock Distribution, Noise Sources, Digitaland RF Issues. Design Process Electrical Design: Interconnect Capacitance, Resistance andInductance fundamentals; Packaging roadmaps – Hybrid circuits – Resistive, Capacitive andInductive parasitics.	L1, L2,L4	6

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Module 3- Chip Level Packaging IC Assembly – Purpose, Requirements, Technologies, Wire bonding, Tape AutomatedBonding, Flip Chip, Wafer Level Packaging, reliability, wafer level burn – in and test. Singlechip packaging: functions, types, materials processes, properties, characteristics, trends. Multichip packaging: types, design, comparison, trends. System – in – package (SIP); Passives:discrete, integrated, and embedded.	L1, L2,L4	5
Module 4-PCB, Surface Mount Technology and Thermal Considerations Printed Circuit Board: Anatomy, CAD tools for PCB design, Standard fabrication, Micro viaBoards. Board Assembly: Surface Mount Technology, Through Hole Technology, ProcessControl and Design challenges. Thermal Management, Heat transfer fundamentals, Thermalconductivity and resistance, Conduction, convection and radiation – Cooling requirements	L1, L2,L4	7
Module 5- Testing Reliability, Basic concepts, Environmental interactions. Thermal mismatch and fatigue –failures – 181hermos mechanically induced – electrically induced – chemically induced. ElectricalTesting: System level electrical testing, Interconnection tests, Active Circuit Testing, Designfor Testability.	L1, L2	7

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Tummala, Rao R., "Fundamentals of Microsystems Packaging", McGraw Hill, 2001.
2. Blackwell (Ed), "The electronic packaging handbook", CRC Press, 2000.

Reference Books

1. Tummala, Rao R, "Microelectronics packaging handbook", McGraw Hill, 2008.
2. Bosshart, "Printed Circuit Boards Design and Technology", TataMcGraw Hill, 1988.
3. R.G. Kaduskar and V.B.Baru, "Electronic Product design", Wiley India, 2011
4. R.S.Khandpur, "Printed Circuit Board", Tata McGraw Hill, 2005

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Syllabus - Seventh Semester

ECE2719	RADAR AND SATELLITE COMMUNICATIONS	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	3	0	0	3
Pre-requisites/Exposure	Basic Electronics and Communication systems				
Co-requisites	Nil				

Catalog Description
This course builds basic knowledge of different types of Radar systems and satellite communication along with link designing & application. It also covers different modulation schemes & channels used.

Course Objectives
The objective of this course is to
- Provide the fundamental knowledge of Radar and its types.
- Provide the knowledge about satellite communication and its components.

Course Outcomes
On completion of this course, the students will be able to
CO1. Describe the working of Radar and its equation.
CO2. Describe the various types of radars and their applications.
CO3. Explain the satellite communications and the components used in this communication.
CO4. Explain the various access techniques used in communication and the satellite link budget.

Course Content

Modules	Blooms level*	Number of hours
MODULE I: Introductionto Radar Principle of detection and ranging, Radar frequencies and bands. Applications, Radar block diagram and operation. Radar Range Equation: Range prediction, Minimum detectable signal, Receiver noise SNR, Integration of radar pulses, Radar cross section of targets, Transmitter Power, PRF and system losses & Propagation effects.	L1 and L2	6
MODULE II: CW FM Radar Doppler effect, CW Radar, Frequency-modulated CW Radar, Multiple-frequency CW Radar. MTI and Pulse Doppler Radar: MTI delay lines, Delay line Cancellers, Coherent and Non-Coherent MTI, Pulse Doppler Radar.	L1 and L2	7
MODULE III: Introduction to Satellite Communication satellites, Orbiting satellites, Frequencies and bands, Satellite multiple access formats. Satellite Channel: Power flow, Polarization, Atmospheric losses, Receiver noise, CNR, Satellite link analysis for uplinks and downlinks. Overview of Coaxial cable system and optical Network (SONET); Overview of WLL (Wireless loop)	L1 and L2	8
MODULE IV: Satellite Transponder Transponder model, Satellite signal processing RF-RF translation, IF demodulation.	L2 L3 and L4	7

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Module V: Multiple-Access FDMA; amplification with multiple FDMA carriers, AM/FM Conversion with FDMA, Switched FDMA, Synchronization, SS-TDMA; CDMA; DS CDMA, Frequency- hopped, CDMA. Carrier recovery & bit timing. Satellite link budget analysis	L2 L3 and L4	8

*Bloom's Level: L1: Knowledge; L2: Comprehension; L3: Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- M.I. Skolnik. Introduction to Radar Systems, 2nd EditionTata Mc Graw-Hill.
- T. Pratt & C.W. Boston,Satellite Communications, New York, John Wiley & Sons, 1986.

Reference Books

- Tri Ha, Digital Satellite Communication, Tata Mc Graw-Hill , 1990-03
- Harry and Vam Trees, Satellite Communication, IEEE Proceeding, 1979.

CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	-	-	-	-	-	-	-	-	-	-	-	2	-	1	-
CO 2	1	2	-	-	-	3	-	-	-	-	-	-	2	-	1	-
CO 3	1	2	3	-	-	3	-	-	-	-	--	-	2	-	1	-
CO 4	1	2	-	-	-	2	-	-	-	-	-	-	2	-	1	-

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ECE2720	ADVANCED MOBILE COMMUNICATIONS	L	T	P	C
Version: 2019.1	Date of Approval: May 21, 2019	2	0	0	2
Pre-requisites/Exposure	Communication systems, Digital Communication				
Co-requisites	NIL				

Catalog Description

This course introduces fundamental concepts of mobile communications and global system for mobile. This course enables the student to understand the technical functionality of a mobile network. This course also gives mathematical formulations to calculate losses using different propagation models.

Course Objectives

The objective of this course is to

- Make students familiar with fundamentals of mobile communication systems
- Understand different multiple access systems like TDMA, FDMA, CDMA with respect to complexity, installation cost, speed of transmission, channel properties etc.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define and explain the concepts of mobile communications.
CO2: Explain and compare different multiple access techniques
CO3: Obtain propagation losses for a given transmission system.
CO4: Explain fundamentals of GSM system.

Modules	Blooms level*	Number of hours
MODULE 1: **Introduction to Wireless Communication System** Evolution of mobile radio communication, Mobile radiotelephony in U.S., Mobile radio system around the world, second generation (2G) cellular network, evolution to 2.5G wireless network, evolution for 2.5G TDMA standards, third generation (3G) and forth generation wireless networks.	L1 and L2	4
MODULE 2: **The Cellular Concept** System design fundamentals, frequency reuse channel assignment strategies, Hand off strategies, Interference and system capacity, improving coverage and capacity in cellular system.	L2 and L3	10
MODULE 3: **Propagation Model and Spread Spectrum Modulation Techniques** Longley rice model, okumara model, hata model, pcs extension to hata model, wolfish and bertoni model, Pseudo Noise (PN) sequence, Direct sequence spread spectrum (DSSS), frequency hopped spread spectrum (FHSS).	L2 and L4	12

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MODULE 4: **Multiple Access Techniques for Wireless Communication** Introduction to multiple access, Frequency division multiple access (FDMA), Time division Multiple access (TDMA), Spread spectrum multiple access, Packet Radio.	L2 and L3	6
MODULE 5: **Global System for Mobile** Global system for mobile (GSM), GSM system architecture, GSM radio subsystem, GSM channel types, Example of a GSM cell, Frame structure of GSM.	L2	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination

Textbooks

Text:

- Theodore S. Rappaport, "Wireless Communication", 2nd edition, Pearson Education, 2009.

References:

- William Stallings," Wireless Communications & Networks", 2nd edition, Pearson Education, 2009.
- Gerry Christensen, Robert Duncan, Paul G. Florack, "Wireless Intelligent Networking" , 2nd edition , Artec House Publication 2011.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	2	--	--	--	--	--	--	3	--	--	--	3	--	1	--
CO 2	1	2	--	--	--	--	--	--	--	--	--	--	2		1	--
CO 3	1	2	--	--	--	--	--	--	3	--	--	--	--	--	1	--
CO 4	1	2	--	--	--	--	--	--	3	--	--	--	--	--	1	--

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ECE2721	EMBEDDED SYSTEM WITH ARM PROCESSORS	L	T	P	C
Version: 2019.1	Date of Approval: May 21, 2019	2	0	0	2
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course introduces the concept of architecture and programming of advanced embedded microcontrollers i.e, ARM family of microcontrollers that are widely used in design of real time sophisticated embedded systems like tablets, hand held devices, automation and industrial control systems.

Course Objectives

The objective of this course is to

- Provide an overview of embedded system and real time operating system.
- Equip the students with concepts of ARM microcontroller and its interfacing with external devices.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain and analyse the architecture of ARM microcontroller, Debugging and programming techniques.

CO2: Explain and classify embedded systems and its applications.

CO3: Explain hardware and software design concepts of embedded system.

CO4: Explain real time operating system for embedded system.

Modules	Blooms level*	Number of hours
Module 1 **ARM Microcontroller** A brief history of ARM evolution, ARM-32 bit Microcontroller: Thumb-2 technology and applications of ARM, Architecture of ARM Cortex M3, Various Units in the architecture, Debugging support, General Purpose Registers, Special Registers, exceptions, interrupts, stack operation, reset sequence ARM Cortex M3 Instruction Sets and Programming: Assembly basics, Instruction list and description, Useful instructions, Memory mapping, Bit-band operations and CMSIS, Assembly and C language Programming	L1, L2, L3 and L4	9

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Module2 **Embedded System Components** Embedded Vs General computing system, Classification of Embedded systems, Major applications and purpose of ES. Core of an Embedded System including all types of processor/controller, Memory, Sensors, Actuators, LED, 7 segment LED display, Optocoupler, Relay, Piezo buzzer, Push button switch, Communication Interface (onboard and external types), Embedded firmware, Other system components.	L1, L2 and L4	9
Module 3 **Embedded System Design Concepts** Characteristics and Quality Attributes of Embedded Systems, Operational and non-operational quality attributes, Embedded 86 Systems-Application and Domain specific, Hardware Software Co-Design and Program Modelling (excluding UML), Embedded firmware design and development (excluding C language).	L1 and L2	9
Module 4 **RTOS and IDE for Embedded System Design** Operating System basics, Types of operating systems, Task, process and threads (Only POSIX Threads with an example program), Thread preemption, Preemptive Task scheduling techniques, Task Communication, Task synchronization issues – Racing and Deadlock, Concept of Binary and counting semaphores (Mutex example without any program), How to choose an RTOS, Integration and testing of Embedded hardware and firmware, Embedded system Development Environment – Block diagram (excluding Keil), Disassembler/decompiler, simulator, emulator and debugging techniques.	L1 and L2	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books:

- Joseph Yiu, "The Definitive Guide to the ARM Cortex-M3", 2nd Edition, Newnes, (Elsevier), 2010.
- Shibu K V, "Introduction to Embedded Systems", Tata McGraw Hill Education Private Limited, 2nd Edition, 2009.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**3**	-	**2**	**2**	--	--	--	--	--	--	**2**	-	-	**1**	**3**
CO2	**1**	**2**	-	**2**	**2**	--	--	--	--	--	--	**2**	-	-	**1**	**3**
CO3	**1**	**2**	-	**2**	**2**	--	--	--	--	--	--	**2**	-	-	**1**	**3**
CO4	**1**	**2**	-	**2**	**2**							**2**				

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ECE2722	RADAR AND SATELLITE COMMUNICATIONS LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Basic Electronics and Communication systems				
Co-requisites	Nil				

Catalog Description

This course builds basic knowledge and practical skills for different types of Radar systems and satellite communication along with link designing & application. It also covers different modulation schemes & channels used.

Course Objectives

The objective of this course is to

1. Provide the fundamental knowledge of Radar and its types.
2. Provide the knowledge about modulation techniques.

Course Outcomes

On completion of this course, the students will be able to

CO1. Describe the working of AM transmitter and receiver.
CO2. Describe the working of FM transmitter and receiver.
CO3. Explain the satellite communications and the components used in this communication.
CO4. Explain the various access techniques used in communication.

Course Content

Modules	Blooms level*	Number of hours
1. To study AM transmitter and receiver.	L1 and L2	1
2. To study FM transmitter and receiver.	L1 and L2	1
3. To implement the following circuits. - AM Transmitter - FM Transmitter - AM Receiver - FM Receiver - Remote Control - Wireless Mic System	L1 and L2	3
4. To study RF portion of satellite receiver. - Study of dish antenna and section N.B section - Study of tuner - Study of R.F modulator section	L2 L3 and L4	3

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5. To study the base-band portion of satellite receiver - study of video section - study of sound section - study of signal indictor - study of power supply section	L2 L3 and L4	4

*Bloom's Level: L1: Knowledge; L2: Comprehension; L3: Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- 1.M.I. Skolnik. Introduction to Radar Systems, 2nd EditionTata Mc Graw-Hill.
- 2.T. Pratt & C.W. Boston,Satellite Communications, New York, John Wiley & Sons, 1986.

Reference Books

- Tri Ha, Digital Satellite Communication, Tata Mc Graw-Hill , 1990-03
- Harry and Vam Trees**,** Satellite Communication, IEEE Proceeding, 1979.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	-	-	-	-	-	-	-	-	-	-	-	2	-	1	-
CO 2	1	2	-	-	-	3	-	-	-	-	-	-	2	-	1	-
CO 3	1	2	3	-	-	3	-	-	-	-	--	-	2	-	1	-
CO 4	1	2	-	-	-	2	-	-	-	-	-	-	2	-	1	-

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ECE2723	PYTHON LAB	L	T	P	C
Version : 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Python programming platform basics				
Co-requisites	Nil				

Catalog Description

Python has become an important programming tool for research and development in science and engineering. It can be used for programming very easily using various already available packages. This course provides the students the knowledge of python programming. This course introduces the experiments related to logic design using python.

Course Objectives

The objective of this course is

- Demonstration of python tool for programming.
- Practice of logic development using python.

Course Outcomes

On completion of this course, the students will be able to

CO1. Use python platform for programming purpose.

CO2. Perform experiments and analyze output for various logics.

CO3. Simulate and analyze real problems using python.

Modules	Blooms level*	Number of hours
Lab Session 1 • Compute the GCD of two numbers. • Find the square root of a number (Newton‘s method) • Exponentiation (power of a number)	L2, L3,L4 and L5	3
Lab Session 2 • Find the maximum of a list of numbers • Linear search and Binary search • Selection sort, Insertion sort	L2, L3,L4 and L5	3
Lab Session 3 • Merge sort • First n prime numbers • Multiply matrices • Programs that take command line arguments (word count)	L2, L3,L4 and L5	3
Lab Session 4 • Find the most frequent words in a text read from a file • Simulate elliptical orbits in Pygame • Simulate bouncing ball using Pygame	L2, L3,L4 and L5	3

**Bloom’s Level:*

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L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text Books

- Chun, J Wesley, Core Python Programming, Second Edition, Pearson, 2007 Reprint 2010
- Barry, Paul, Head First Python, 2nd Edition, O Rielly, 2010

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**2**	**3**	**-**	**3**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**-**	**1**	**-**	**3**
CO2	**1**	**2**	**-**	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**-**	**1**	**-**	**3**
CO3	**1**	**2**	**-**	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**-**	**1**	**-**	**3**

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ECE2735	SUMMER INTERNSHIP EVALUATION-II	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	0	3
Pre-requisites/Exposure	NA				
Co-requisites	Nil				

Catalog Description

There are certain phases of every Intern's professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship program can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal classroom situations. These attributes are intellectual ability, professional judgment and decision-making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc. In order to achieve these objectives, each student will maintain a file (**Internship File**). The Internship File aims to encourage students to keep a personal record of their learning and achievement throughout the Programme. It can be used as the basis for lifelong learning and for job applications. Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development. The report will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and their own personal contribution to the organization.

Course Objectives

The objective of this course is to

- Equip the students with concepts of new technologies and practical exposure
- Provide an overview ofpresentation and preparation of report.

Course Outcomes

On completion of this course, the students will be able to

CO1: Study the literature and identify the problem statement

CO2: Work on a real world problem and solve it using latest technology

CO3: Prepare a detailed report of the project

CO4: Prepare a brief presentation of their project

CO5: Present and explain the project for evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	V	PPT	R	IM	EM
Weightage (%)	10	10	10	30	70

V – Viva, PPT-Power Point Presentation, R – Report, IP-Internal Marks, EM-External Marks

Text Books

As per topic of summer internship project is chosen and discussion with guide.

Reference Books

As per topic of summer internship project is chosen and discussion with guide.

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**2**	**2**	--	--	--	--	--	--	--	--	--	-		**1**	**2**
CO2	**1**	**2**	**2**	-	--	--	--	--	--	--	--	--	-	-	**1**	**1**
CO3	**1**	**2**	-	--	--	--	--	--	--	--	--	--	-	-	**1**	**1**
CO4	**1**	**2**	**3**	--	--	--	--	--	--	--	--	--	-	-	**1**	**1**

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ECE2706	OPTICAL COMMUNICATION	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	2	0	0	2
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course deals with the study of fundamentals of optical communication. This includes the properties of optical fibers and how they are used to establish optical links for communication systems. The aim of this course is

- To introduce students with the basics of optical communication system through the wave propagation principles in optical fiber, different sources and detectors used for formation of optical links.
- To familiarize the students with the different degradation factors for quality of transmission.
- To gives exposure of advanced Communication use in present optical communication networks through advanced multiplexing technologies, networking and system set up.

Course Outcomes

On completion of this course, the students will be able to

CO1: Demonstrate basics of optical fiber communication link, structure, propagation and transmission properties of an optical fiber.

CO2: Describe the principles of optical sources and detectors and power launching-coupling methods.

CO3: Estimate the losses and analyze the propagation characteristics of an optical signal in different types of fibers

CO4: Identify the applications of optical fiber communication links in various fields.

Modules	Blooms level*	Number of hours
Module I: Fundamentals of Fiber Optics Different generations of optical fiber communication systems, Optical fiber structure, light propagation- total internal reflection, acceptance angle and numerical aperture, signal attenuation and dispersion. Modes in an optical fiber, Optical fibers: step-index, Graded-index, Single and Multimode, other types of fibers.	L1, L2, L3, L4	5
Module II: Optical Sources LED-spontaneous emission- material used in LED, LED efficiency, surface emitting LED, edge emitters, stimulated emission, spontaneous emission, Structure of various LED's, LASER: stimulated emission, double heterostructure LASER, LASER tuning and degradation, driver for LED and LASER.	L2, L3	4
Module III: Photo Detectors Characteristics of photo detector, direct and indirect band gap semiconductors, homo junction and hetro junction photodiodes, p-i-n photodiode, avalanche photodiode, phototransistor, optocouplers	L2, L3	4
Module IV: Fiber Properties Fiber end preparation, fiber splicing, fiber connectors, connection losses, fiber couplers, fiber materials, fiber fabrication, mechanical properties of fibers, different fiber cables.	L2	3

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Module V: Fiber Optic Communication System Basic communication components, coupling to and from the fiber, multiplexing and coding, repeaters, bandwidth and rise time budgets, noise, bit error rate and eye pattern.	L3, L4, L5	5
Module VI: Application of Fiber Optics Long haul communication, LAN, medical application, undersea communication, military application, coherent optical communication, Fiber optic sensors- Intensity modulated sensor, Phase sensor, Diffraction Grating sensors.	L3, L4	3

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- G. Keiser, Optical fiber Communication. Mc. Graw Hill, 2017.

Reference Books

- J. Senior, Optical Fiber Communications- principles & practice., PHI, 2010.
- G.P. Agrawal, Fiber-Optic Communication Systems.,Wiley, 2007.

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1		2			2		1					3		1	
CO2	2	3	3										3		1	
CO3	2	1		1		2	3							3	1	2
CO4		3			2	2	2		3		2				1	2

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ECE2716	OPTICAL COMMUNICATIONS LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course deals with the practical aspects of fundamentals of optical communication. This includes the properties of optical fibers and how they are used to establish optical links for communication systems. The aim of this course is

- To introduce students with the basics of optical communication system through the basics of optical waveguides, their parameters and link set up using different type of fibers.
- To familiarize the students with the different degradation factors for quality of transmission.
- To gives exposure of multiplexing techniques, coding, coupling techniques used in present optical communication networks

Course Outcomes

On completion of this course, the students will be able to

CO1: Analyze different types of optical waveguides for their properties like Numerical Aperture, basic properties, coupling and transmission characteristic of optical fibres.

CO2: Identify and estimate the losses in optical fiber that affect the performance of transmission systems.

CO3: Design the basic optical links through digital and analog links, different modulation and coding techniques.

Modules	Blooms level*	Number of hours
Lab Session 1: To measure the Numerical Aperture of a multimode fiber	L1,L2	1
Lab Session II: To measure attenuation by cut Back technique.	L4	1
Lab session III: To study the model properties of a multimode fiber.	L1,L2	1
Lab session IV: To couple the light into a single mode fiber & measure the far-field power distribution	L2, L3, L4	1
Lab session V: To measure various fiber alignment losses.	L3,L4	1
Lab session VI: To estimate the power budget for a fiber optic system.	L3,L4	1
Lab session VII: To set up a fiber optic analog link.	L3	1
Lab session VIII: To set up a fiber optic digital link.	L3	1
Lab session IX: To study Time Division Multiplexing of signals.	L3	1
Lab session X: To study Manchester Coding.	L3	1
Lab session XI To study voice digitization	L3	1

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Lab session XII: To simulate optical fiber wave guide.	L4, L5	1

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva

Text Books

- G. Keiser, Optical fiber Communication. Mc. Graw Hill, 2017.

Reference Books

- J. Senior, Optical Fiber Communications- principles & practice., PHI, 2010.
- G.P. Agrawal, Fiber-Optic Communication Systems.,Wiley, 2007.

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1		2			2		1					3		1	
CO2	2	3	3										3		1	
CO3	2	1		1		2	3							3	1	2
CO4		3			2	2	2		3		2				1	2

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ECE2712	DIGITAL IMAGE PROCESSING	L	T	P	C
Version: 2019.1	Date of Approval: May 21, 2019	2	0	0	2
Pre-requisites/Exposure	Basics of Signal Processing				
Co-requisites	NIL				

Catalog Description

Image processing has become an important tool for research and investigation in many areas of science and engineering. It takes full advantage of the computational technology of Mathematics and utilization of various tools. This course gives a detailed insight of Image Processing with different techniques used for different purposes.

Course Objectives

The objective of this course is to

- Equip the students with concepts of digital image processing.
- Provide in-depth knowledge of various techniques used at different steps of image processing.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define and explain the fundamentals of image and its histogram.
CO2: Explain different techniques of image restoration and enhancement.
CO3: Apply coding techniques to remove different types of redundancies in image.
CO4: Represent and recognize the image.

Modules	Blooms level*	Number of hours
MODULE 1: **Introduction to Digital Image Fundamentals** The origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamentals Steps in Image Processing, Elements of Digital Image Processing Systems, Image Sampling and Quantization, Some basic relationships like Neighbors, Connectivity, Distance Measures between pixels, Linear and Non Linear Operations. **Image Enhancement in the Spatial Domain:** Some basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic and Logic operations, Basics of Spatial Filters, Smoothening and Sharpening Spatial Filters, Combining Spatial Enhancement Methods.	L1 and L2	7

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MODULE 2: **Image Enhancement in Frequency Domain** Introduction to Fourier Transform and the frequency Domain, Smoothing and Sharpening Frequency Domain Filters, Homomorphic Filtering. **Image Restoration:** A model of The Image Degradation / Restoration Process, Noise Models, Restoration in the presence of Noise Only Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear Position-Invariant Degradations, Estimation of Degradation Function, Inverse filtering, Wiener filtering, Constrained Least Square Filtering, Geometric Mean Filter, Geometric Transformations.	L2 and L3	13
MODULE 3: **Image Compression** Coding, Interpixel and Psychovisual Redundancy, Image Compression models, Elements of Information Theory, Error free comparison, Lossy compression, Image compression standards. *Image Segmentation:*Detection of Discontinuities, Edge linking and boundary detection, Thresholding, Region Oriented Segmentation, Motion based segmentation	L1 and L2	12
MODULE 4: **Representation and Description** Representation, Boundary Descriptors, Regional Descriptors, Use of Principal Components for Description, Introduction to Morphology, Some basic Morphological Algorithms. **Object Recoginition:** Patterns and Pattern Classes, Decision-Theoretic Methods, Structural Methods.	L2 and L3	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination

Text Books

Text:

- Rafael C. Gonzalez & Richard E. Woods, "Digital Image Processing", 2nd edition, Pearson Education.
- A. K. Jain, "Fundamental of Digital Image Processing", PHI.

References:

- Maher A. Sid-Ahmed, "Image Processing Theory, Algorithms and Architectures", McGraw-Hill, 1995.
- William K. Pratt, "Digital Image Processing", Wiley-Interscience publication, Second Edition, 1991.
- R. Arthyr, "Fundamentals of Electronic Image Processing", PHI.
- Image processing, Analysis, and Machine vision by Milan Sonka vaclan Halavac Roger Boyle, Vikas Publishing House

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	2	--	--	3	--	--	--	--	--	--	--	1	--	--	--
CO 2	1	2	--	--	3	--	--	--	--	--	--	--	1	2	--	--
CO 3	1	2	--	--	3	--	--	--	3	--	--	--	1	3	2	--
CO 4	1	2	--	--	--	--	--	--	--	--	--	--	1	--	2	--

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ECE2713	DIGITAL IMAGE PROCESSING LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Basics of MATLAB				
Co-requisites					

Catalog Description

Image processing has become an important tool for research and investigation in many areas of science and engineering. This course is designed to provide the students an understanding of the basic concepts of digital image processing and various techniques used in it. Students will perform practical on hardware kit as well as on software.

Course Objectives

The objective of this course is to

1. Make students demonstrate the concepts of image processing.
2. Apply the different techniques to process image.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the basic image processing tools and commands.
CO2. Apply the filters to remove noise in spatial & frequency domain.
CO3. Apply image processing techniques for compression, segementation and restoration.

Modules	Blooms level*	Number of hours
Lab Session 1 1. To study about the basic image processing tools. 2. Write program for histogram processing.	L3	3
Lab Session 2 3. Write program for filtering in frequency domain. 4. Write program for filtering in spatial domain.	L3 and L4	3
Lab Session 3 5. Write programs for different compression schemes. 6. Write program image restoration.	L3 and L4	3
Lab Session 4 7. Write program for performing different morphological operations. 8. Write program for image segmentation.	L3 and L4	3

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

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Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text Books

- Rafael C. Gonzalez & Richard E. Woods, "Digital Image Processing", 2nd edition, Pearson Education.
- A. K. Jain, "Fundamental of Digital Image Processing", PHI.

References:

- Maher A. Sid-Ahmed, "Image Processing Theory, Algorithms and Architectures", McGraw-Hill, 1995.
- William K. Pratt, "Digital Image Processing", Wiley-Interscience publication, Second Edition, 1991.
- R. Arthyr, "Fundamentals of Electronic Image Processing", PHI.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	--	--	--	2	--	--	--	--	--	--	2	1	--	-	-
CO2	1	-	3	--	2	--	--	--	--	--	--	2	1	3	--	-
CO3	1	-	3	--	2	--	--	--	--	--	--	2	1	3	--	3

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ECE2724	ROBOTIC PROCESS AUTOMATION DESIGN & DEVELOPMENT	L	T	P	C
Version 2019.1	Date of Approval: 14 July 2019	3	0	0	3
Pre-requisites/Exposure	Basic Networking Concepts				
Co-requisites	Nil				

Catalog Description

This course aims at providing knowledge of basic concepts of Robotic Process Automation to University students. It further builds on these concepts and introduces key RPA Design and Development strategies and methodologies specifically in context of UiPath products. The student undergoing the course shall develop the competence to design and develop a robot for a defined process.

Course Objectives

The objective of this course is to

- Equip the students with concepts of robotic process automation
- Provide an overview of designing with uipath software.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain key terms and trends around the robotic process automation along with its physical and logical design

CO2: Understand the potential and value of the robotic process automation .

CO3: Describe the technologies used for the robotic process automation and mobile devices, including (passive and active) sensors, the physical communications layer, communications protocols, programming frameworks,.

CO4: Design programs and have hands on experience on uipath software

CO5:Develop RPA programs of moderate complexity for a well-used robotic automation process using uipath.

Modules	Blooms level*	Number of hours
Module I: Programming Basic and Recap **Programming Concepts Basics I -** Understanding the application, Basic Web Concepts, Protocols, Email Clients, Data Structures, Data Tables, Algorithms, Software Processes, Software Design, SDLC. **Programming Concepts Basics 2-** Scripting, Net Framework, Net Fundamentals, XML, Control structures and functions, XML, HTML, CSS, Variables & Arguments.	L1, L2	8

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Module II: RPA Concepts **RPA Basics -** History of Automation, what is RPA, RPA vs Automation, Processes & Flowcharts, Programming Constructs in RPA, What Processes can be Automated, Types of Bots, Workloads which can be automated. **RPA Advanced Concepts -** Standardization of processes, RPA Development methodologies, Difference from SDLC, Robotic control flow architecture, RPA business case, RPA Team, Process Design Document/Solution Design Document, Industries best suited for RPA, Risks & Challenges with RPA, RPA and emerging ecosystem	L2, L3 and L4	8
Module III: UiPath Introduction & Basics **Introduction to UiPath-** Installing UiPath Studio community edition, The User Interface, Keyboard Shortcuts, About Updating, About Automation Projects, Introduction to Automation Debugging, Managing Activation Packages, Reusing Automations Library, Installing the Chrome Extension, Installing the Firefox Extension, Connecting your project to a source control system, Activities Guide. **Variables**, **Control Flow** **Data Manipulation-** Data Manipulation Introduction, Scalar variables, collections and Tables, Text Manipulation, Data Manipulation, Gathering and Assembling Data. **Recording and Advanced UI Interaction -** Recording Introduction, Basic and Desktop Recording, Web Recording, Input/Output Methods, Screen Scraping, Data Scraping, Scraping advanced techniques. Selectors.	L2, L3 and L4	8
Module IV: UiPath Advanced Automation concepts and techniques Image, Text & Advanced Citrix Automation- Introduction to Image & Text Automation, Image based automation, Keyboard based automation, Information Retrieval, Advanced Citrix Automation challenges, Best Practices, using tab for Images, Starting Apps. Excel Data Tables & PDF - Data Tables in RPA, Excel and Data Table basics, Data Manipulation in excel, Extracting Data from PDF, extracting a single piece of data, Anchors, Using anchors in PDF. Email Automation- Email Automation, Incoming Email automation, Sending Email automation	L2, L3 and L4	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- "Learning Robotic Process Automation" By Alok Mani Tripathi,Packt Publications,Ist Edition,2018

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**--**	**--**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**1**	**1**	**-**	**-**
CO2	**1**	**--**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**-**	**1**	**-**	**-**
CO3	**1**	**--**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**-**	**1**	**-**	**2**
CO4	**1**	**--**	**--**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**-**	**2**

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ECE2727	NANO ELECTRONICS	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course will help the students earn the basic understanding of nano electronics followed with advanced understanding of the fabrication at nano-micro level. It provides an in-depth study of device electronics for integrated circuits, a foundation for the device fabrication and various applications in the field of sensors technology, optoelectronics, communication and nanotechnology etc.

Course Objectives

The objective of this course is to

- Equip the students with fundamentals of Nanoelectronics and Nanostructures.
- Provide in depth knowledge of fabrication steps and process.
- Throw light on different applications in the field of sensors technology, optoelectronics, communication and nanotechnology

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the fundamentals of Nanoelectronics and Nanostructures.
CO2. Illustrate different steps and process involved in fabrication of nanostructures.
CO3. Explain the applications of nanoelectronics in context of sensors technology, logic devices, communication and optoelectronics.

Modules	Blooms level*	Number of hours
Module 1: **Introduction to Nanoelectronics** Overview of nanoscience and engineering, development milestones in microfabrication and electronic industry, Moore's law and continued miniaturization, Classification of Nanostructures, Electronic properties of atoms and solids: Isolated atom, Bonding between atoms, Giant molecular solids, Free electron models and energy bands, crystalline solids, Periodicity of crystal lattices, Electronic conduction, effects of nanometerlength scale, Fabrication methods: Top down processes, Bottom up processes methods for templating the growth of nanomaterials, ordering of nanosystems	L1 and L2	6

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Module 2: **Fabrication techniques** Requirements of ideal semiconductor, epitaxial growth of quantum wells, lithography and etching, cleaved-edge over growth, growth of vicinal substrates, strain induced dots and wires, electro statically induced dots and wires, Quantum well width fluctuations, thermally annealed quantum wells, semiconductor nanocrystals, collidal quantum dots, self-assembly techniques. Physical processes: modulation doping, quantum hall effect, resonant tunneling, charging effects, ballistic carrier transport, Inter band absorption, intra band absorption, Light emission processes, phonon bottleneck, quantum confined stark effect, nonlinear effects, coherence and dephasing, characterization of semiconductor nanostructures: optical electrical and structural	L1, L2	9
Module 3: **Carbon Nanostructures & Nanosenors** Carbon molecules, Carbon Clusters, Carbon Nanotubes, application of Carbon Nanotubes Nanosensors: Introduction, What is Sensor and Nanosensors?, What makes them Possible?, Nanosensors Based On Quantum Size Effects, Electrochemical Sensors, Sensors Based On Physical Properties, Nanobiosensors, Smartdust-Sensor for the future.	L1, L2	8
Module 4: **Logic Devices & Applications** Logic Devices-Silicon MOSFETs-Ferroelectric Field Effect Transistors-Quantum Transport Devices Based on Resonant Tunneling-Single-Electron Devices for Logic Applications: Injection lasers, quantum cascade lasers, single-photon sources, biological tagging, optical memories, coulomb blockade devices, photonic structures, QWIP's, NEMS, MEMS	L1, L2	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- Ed Robert Kelsall, Ian Hamley, Mark Geoghegan, "Nanoscale Science and Technology", John Wiley, 2007.
- Charles P Poole, Jr, Frank J Owens, "Introduction to Nanotechnology", John Wiley, Copyright 2006, Reprint 2011.
- T Pradeep, "Nano: The essentials-Understanding Nanoscience and Nanotechnology", Tata Mcgraw Hill.

Reference Books

- Ed William A Goddard III, Donald W Brenner, Sergey E. Lyshevski, Gerald J

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Iafrate, “Hand Book of Nanoscience Engineering and Technology”, CRC press, 2003.
- Jaap Hoekstra, “Introduction to Nanoelectronic Single-Electron Circuit Design”, Pan Stanford Publishing 2010.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	1	2	--	--	--	--	--	--	--	--	--	--	3	--	1	--
CO2	2	--	3	--	1	--	--	--	--	--	--	--	3	--	1	--
CO3	1	2	--	--	3	--	--	--	--	--	--	3	3	--	1	--

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Course Code: ECE2728	Introduction to MEMS	L	T	P	C
Version: 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The course deals with the introduction to Micro Electro Mechanical Systems(MEMS). The course will discuss all the vital features and fundamental principles of Sensing and actuation. It also deals with the fabrication processes and materials used in the process. This course covers the the various types of sensors, working principles and applications. In the final module, the course focusses on the case studies dealing with MEMS products.

Course Objectives

The objective of this course is to:

1. Build overview of fabrication of MEMS systems
2. Familiarize student with the processes of Machning, Etching and bonding.
3. Provide the knowledge and understanding of Micro-actuators and Micro-sensors.
4. Deals with the testing aspects of the Materials, Mechanics and design of micro-systems. It also involves the case studies in MEMS

Course Outcomes

At the end of this course, students will demonstrate the ability to

1. Understand fundamental principles of sensing and actuation and corresponding scaling laws in MEMS.

2. Gain a comprehensive perspective of various fabrication processes and materials used in microfabrication.

3. Understand the principle, design, and fabrication techniques of leading exemplary devices in the MEMS industry.

4. Design basic MEMS devices using relevant mechanical/electrical/fluidic engineering principles.

Modules	Blooms Level*	Number of hours
Introduction to MEMS: Historical Background, Scaling Effects. Micro/Nano Sensors, Review of Basic MEMS fabrication modules, Oxidation, Deposition Techniques, Lithography (LIGA), and Etching.	L1, L2	5
Micromachining, Surface Micromachining, sacrificial layer processes, Stiction, Bulk Micromachining, Isotropic Etching, and Anisotropic Etching, Wafer Bonding, Mechanics of solids in MEMS/NEMS.	L1, L2,L4	6

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Micro-actuators and Micro-sensors: Micro-sensors, acoustic wave sensors, biomedical and nano-sensors, chemical sensors, optical sensors, pressure sensors, thermal sensors, micro-actuation through thermal forces, SMA-Piezo electric crystals, and electrostatic forces, magnetic actuation, micro-grippers, micro-motors, micro-valves,micropumps, micro-accelerometers.	L1, L2,L4	5
Materials, Mechanics and design of micro-systems: Silicon as a substrate, compounds, piezo-resistors, polymers, and packaging materials, micro-fabrication and micro-etching: static bending of thin plates, thermo mechanics and thin film mechanics.	L1, L2,L4	7
Case studies of MEMS Products: Micro-fluidic devices, micro/nano transducers, blood pressure sensors, microphone-acceleration sensors, gyroscope, an overview of micro-system packaging.	L1, L2	7

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

1, Marc Madou, "Fundamentals of Microfabrication and Nanotechnology" 3 rd edition

2. Stephen D. Senturia, Microsystem Design.

.**Reference Books**

3. Gregory T.A. Kovacs, Micromachined Transducers.

4. Guozhong Cao,Ying, Nanostructure and Nano materials, synthesis, properties and applications, World Scientific Publishing Co. 2011.

5. Chang Liu, Foundation of MEMS, Pearson Education, ISBN (978-81-317-6475-6)

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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ECE2731	TERM PAPER	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	0	2
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

Term paper evaluation course requires the students to study about the current technology topic in detail. The students have to read research papers, books and other study sources and finalize the topics for their presentation. Then the student has to prepare it in detail and write a detailed a research paper mentioning all the content related to the topic. The evaluation is later done and a presentation is also to be prepared.

Course Objectives

The objective of this course is to

- To increase the knowledge and the understanding of a particular topic.
- To introduce the students about how to write technical papers/research papers.

It trains the students to make use of research tools and material available both in print and digital formats.

Course Outcomes

On completion of this course, the students will be able to

CO1: Study the literature and identify the current technical topic

CO2: Study the identified topic in detail

CO3: Prepare a detailed report including the introduction, architecture, advantages, disadvantages etc

CO4: Prepare a brief presentation of the concerned topic

CO5: Present and explain the topic for evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	V	PPT	R	IM	EM
Weightage (%)	10	10	10	30	70

V – Viva, PPT-Power Point Presentation, R – Report, IP-Internal Marks, EM-External Marks

Text Books

As per topic of term paper and discussion with guide.

Reference Books

As per topic of term paper and discussion with guide.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	--	--	--	--	--	--	--	--	--	--	2	-	-	1
CO2	2	1	--	--	--	--	--	--	--	--	--	--	2	-	-	1
CO3	2	2	-	--	--	--	--	--	--	--	--	1	2	-	-	1
CO4	2	2	--	--	--	--	--	--	--	--	1	1	2	-	-	1
CO5	2	2	--	--	--	--	--	--	--	--	1	1	2	-	-	1

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ECE2732	Project (With Presentation & Evaluation)	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	0	2
Pre-requisites/Exposure	Basics of Electrical & Electronics				
Co-requisites	Nil				

Catalog Description

Project/Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology, practical skill enhancement and an opportunity to work closely with a industry external guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation. Students require professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship program can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal classroom situations. These attributes are intellectual ability, professional judgment and decision-making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility

Course Objectives

The objective of this course is to

- Equip the students with concepts of new technologies and practical exposure
- Provide an overview of presentation and preparation of report

Course Outcomes

On completion of this course, the students will be able to

CO1: Study the literature and identify the problem statement
CO2: Work on a real world problem and solve it using latest technology
CO3: Prepare a detailed report of the project
CO4: Prepare a brief presentation of their project
CO5: Present and explain the project for evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	V	PPT	R	IM	EM
Weightage (%)	10	10	10	30	70

V – Viva, PPT-Power Point Presentation, R – Report, IP-Internal Marks, EM-External Marks

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	2	2	--	--	--	--	--	--	--	--	1	2	-	-	1
CO2	2	2	2	-	1	--	--	--	--	3	--	1	2	-	-	1
CO3	2	2	-	--	--	--	--	--	--	3	--	1	2	-	-	1
CO4	2	2	3	--	--	--	--	--	--	--	1	1	2	-	-	1

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Syllabus - Eighth Semester

ECE2837	PROJECT (DISSERTATION)	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	0	8
Pre-requisites/Exposure	Basics of Electronics and Communication				
Co-requisites	Nil				

Catalog Description

Major Project/Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology, practical skill enhancement and an opportunity to work closely with a industry external guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation. Students require professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship program can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal classroom situations. These attributes are intellectual ability, professional judgment and decision-making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility

Course Objectives

The objective of this course is to

1. Equip the students with concepts of new technologies and practical exposure
2. Provide an overview ofpresentation and preparation of report

Course Outcomes

On completion of this course, the students will be able to

CO1: Study the literature and identify the problem statement
CO2: Work on a real world problem and solve it using latest technology
CO3: Prepare a detailed report of the project
CO4: Prepare a brief presentation of their project
CO5: Present and explain the project for evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	V	PPT	R	IM	EM
Weightage (%)	10	10	10	30	70

V – Viva, PPT-Power Point Presentation, R – Report, IP-Internal Marks, EM-External Marks

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	2	--	--	--	--	--	--	--	--	--	-		1	2
CO2	1	2	2	-	--	--	--	--	--	--	--	--	-	-	1	1
CO3	1	2	-	--	--	--	--	--	--	--	--	--	-	-	1	1
CO4	1	2	3	--	--	--	--	--	--	--	--	--	-	-	1	1

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ECE2815	INFORMATION THEORY AND CODING	L	T	P	C
Version 2019.1	Date of Approval: 14 July 2019	3	0	0	3
Pre-requisites/Exposure	Communication System				
Co-requisites					

Catalog Description
The purpose of this course is to introduce students to the basics of coding used in communication system. The course aims to discuss the different entropies, channel capacity and purpose of encoding

Course Objectives
The objective of this course is to
- Provide a thorough introduction to coding used in communication system.
- Provide in depth study of entropies, channel capacity and purpose of encoding.

Course Outcomes
On completion of this course, the students will be able to
CO1. Measure entropy in terms of probability and mutual information.
CO2 Explain shannon fano and Huffman coding.
CO3. Prepare linear and cyclic codes for communication system.
CO4 Synthesize different BCH and convolutional codes for information source.

Modules	Blooms level*	Number of hours
MODULE I: **Basic Concepts of Information Theory** A measure of Uncertainty, Binary Sources, Measure of Information for two – dimensional discrete finite probability Scheme, Noise characteristics of channel, Basic relationship among different entropies, Measure of mutual information channel capacity, Capacity of channel with symmetric noise structure BSC and BEC.	L1 and L2	7
MODULE II: **Element of Encoding** Propose of encoding separable binary codes, Shannon Fano encoding , Noiseless coding Theorem of decidability, Mc Millen's Theorem, Average length of encoding massage, Shannon's Binary encoding, Fundamental Theorem of discrete Noiseless coding, Huffman's Minimum Redundancy codes. **Coding for Reliable Digital Transmission & Storage** Introduction, types of codes, Modulation and Demodulation, Maximum likelihood decoding, types of error, error control strategies.	L1 and L2	9

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MODULE III: **Introduction to Algebra** Groups, Fields Binary field Arithmetic, Construction of Galois field GF (2m), Basic Properties of Galois Field GF (2m), Vector Spacer, Matrices. Linear Block Codes: Introduction to Linear Block codes, Syndrome and Error detection, Minimum distance of block code, error detecting and Error correcting capability a block code Hamming Code. **Cyclic Codes:** Description of Cyclic codes, Generator and parity cheek matrices of cyclic codes, encoding of cyclic codes syndrome computation & error detection decoding of cyclic codes, Error trapping decoding of cyclic codes, Goley Codes.	L1, L2, L3and L4	10
MODULE IV: **BCH Codes** Description of codes, Decoding of BCH codes, Implementation of Galoes Field Arithmetic, Implementation of error connection, **Convolution Codes:** Encoding of convolution codes, structural properties of Convolution codes, distance properties of Convolution codes, Distance Properties of convolution codes, Maximum likelihood decoding of convolution codes. **Automatics Repeat Request Strategies** Stop and wait, Go back and selective repeat ARQ strategies, Hybrid ARQ Schemes.	L1, L2, L3 and L4	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- F.M. Reza, "An introduction to Information Theory", McGraw Hill, 2000.
- Viterbi A and Omura J K, "Principles of Digital Communication and Coding", McGraw Hill, 1979

Reference Books

- Cover T M and Thomas J A, "Elements of Information theory", 2nd edition, John Wiley & Sons, 2006
- Roth R, "Introduction to Coding theory", Cambridge University Press, 2006.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**2**	**2**	**1**	**--**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**3**	**--**	**--**	**--**
CO2	**2**	**3**	**1**	**--**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**--**	**--**
CO3	**2**	**3**	**1**	**--**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**3**	**--**	**--**	**--**
CO4	**2**	**3**	**2**	**--**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**3**	**--**	**--**	**--**

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ECE2805	RTOS PROGRAMMING	L	T	P	C
Version 2019.1	Date of Approval: 14, July 2019	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The syllabus introduces real time operating systems and resource analysis. It introduces the concepts of Processing, I/O Resources, Memory, Multi-resource, Soft Real-Time Services, Embedded System components, Debugging Components, Performance Tuning, High availability and Reliability Design.

Course Objectives

The objective of this course is to

- Provide an overview of real time operating system.
- Equip the students with concepts of Resources ,debugging techniques, performance tuning and reliability analysis.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain history of real time operating system and the concepts of resource analysis.
CO2: Explain the concepts of processing and I/O resources.
CO3: Explain the concept of memory, multi-resource and soft real-time services.
CO4: Explain embedded system components and apply debugging techniques.
CO5: Explain performance tuning, high availability and the concepts of reliability design.

Modules	Blooms level*	Number of hours
Module-1 **Introduction to Real-Time Embedded Systems:** Brief history of Real Time Systems, A brief history of Embedded Systems, System Resources: Resource Analysis, Real-Time Service Utility, Scheduling Classes, The Cyclic Executive, Scheduler Concepts, Preemptive Fixed Priority Scheduling Policies, Real-Time OS, Thread Safe Reentrant Functions.	L1 and L2	7
Module-2 **Processing and I/O Resources:** Preemptive Fixed-Priority Policy, Feasibility, Rate Monotonic least upper bound, Necessary and Sufficient feasibility, Deadline – Monotonic Policy, Dynamic priority policies, I/O Resources: Worst-case Execution time, Intermediate I/O, Execution efficiency, I/O Architecture.	L1 and L2	8

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Module-3 **Memory, Multi-resource and Soft Real-Time Services:** Physical hierarchy, Capacity and allocation, Shared Memory, ECC Memory, Flash file systems, Multi-resource Services: Blocking, Deadlock and livestock, Critical sections to protect shared resources, priority inversion, Soft Real-Time Services: Missed Deadlines, QoS, Alternatives to rate monotonic policy, Mixed hard and soft real-time services.	L1 and L2	8
Module-4 **Embedded System and Debugging Components:** Firmware components, RTOS system software mechanisms, Software application components, Debugging Components**:** Execptions assert, Checking return codes, Single-step debugging, kernel scheduler traces, Test access ports, Trace ports, Power-On self test and diagnostics, External test equipment, Application-level debugging.	L1, L2 and L3	7
Module-5 **Performance Tuning, High availability and Reliability Design:** Basic concepts of drill-down tuning, hardware – supported profiling and tracing, Building performance monitoring into software, Path length, Efficiency, and Call frequency, Fundamental optimizations. High availability and Reliability Design: Reliability and Availability, Similarities and differences, Reliability, Reliable software, Available software, Design tradeoffs, Hierarchical applications for Fail-safe design.	L1, L2, L3 and L4	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books:

- "Real-Time Embedded Systems and Components", Sam Siewert, Cengage Learning India Edition, 2007.
- "Programming and Customizing the PIC microcontroller", Myke Predko, 3rd Ed, TMH, 2008.

Reference Books:

- "Programming for Embedded Systems", Dreamtech Software Team, Jhon Wiley, India Pvt. Ltd., 2008.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**2**	**2**	**-**	**-**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**3**			
CO2	**1**	**2**	**-**	**-**	**2**	**--**	**--**	**--**	**-**	**--**	**--**	**2**			
CO3	**1**	**2**	**-**	**-**	**2**	**--**	**--**	**--**	**--**	**--**	**-**	**2**			
CO4	**1**	**2**	**-**	**-**	**2**	**-**	**--**	**--**	**-**	**--**	**-**	**2**			
CO5	**1**	**2**	**-**	**-**	**1**	**-**	**--**	**--**	**-**	**--**	**-**	**2**			

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ECE2806	VERILOG PROGRAMMING	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	2	0	0	2
Pre-requisites/Exposure	Basic Digital Electronics				
Co-requisites	Nil				

Catalog Description

This course discusses fundamental Verilog concepts of today's most advanced digital design techniques. it offers broad coverage of Verilog HDL from a practical design perspective. Introduces students to gate, dataflow (RTL), behavioural, and switch level modeling, describes leading logic synthesis methodologies; explains timing and delay simulation; and introduces many other essential techniques for creating tomorrows complex digital designs

Course Objectives

The objective of this course is to

- Provide the fundamental knowledge of Verilog HDL for practical designs.
- Introduces the knowledge logic synthesis and design methodologies.

Course Outcomes

On completion of this course, the students will be able to

CO1. Describe the basic concepts of Verilog HDL.
CO2. Design and solve the Gate level and dataflow modeling of various circuits.
CO3. Solve the circuits using Behavioural modeling.
CO4. Utilize the circuital knowledge on advanced Verilog topics.

Course Content

Modules	Blooms level*	Number of hours
MODULE I: : Introduction to Verilog HDL and Basic Concepts Emergence of HDL, typical design flow, trends in HDL, Modeling concept Design methodologies, modules, instances, simulation, design block and stimulus block Lexical conventions, Data Types. System Tasks and Compiler Directives, Modules and Ports	L1 and L2	6
MODULE II: Gate-Level Modeling and Dataflow Modeling Gate Types. Gate Delays, Continuous Assignments. Delays. Expressions, Operators, and Operands. Operator Types. Examples for combinational and sequential circuit using Gate level and Data-flow modeling.	L1 and L2	5
MODULE III: Behavioural Modeling Structured Procedures. Procedural Assignments. Timing Controls. Conditional Statements. Multiway Branching. Loops. Sequential and Parallel Blocks. Generate Blocks. Examples	L1 and L2	6
MODULE IV: Tasks and Functions and Useful Modeling Techniques Difference between Tasks and Functions. Tasks. Functions. Procedural Continuous Assignments. Overriding Parameters. Conditional Compilation and Execution. Time Scales. Useful System Tasks	L1 and L2	7

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MODULE V: Advanced Verilog Topics Timing and Delays. Switch Level Modeling, User-Defined Primitives, Logic Synthesis with Verilog HDL, Advanced Verification Techniques.	L2, L3 and L5	6

*Bloom's Level: L1: Knowledge; L2: Comprehension; L3: Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- Samir Palnitkar, Verilog HDL, 2nd Edition Pearson Education, 1996.
- Donald Thomas, Philip moorby, The Verilog hardware Description language, 5th Edition, Kluwer Academic publishers,2002.

Reference Books

- J. Bhasker, Verilog HDL Synthesis: A Practical Primer, Star Galaxy publications,1998.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO 2	1	1	-	-	-	3	-	-	-	-	-	-	1	-	-	-
CO 3	1	2	3	-	-	3	-	-	-	-	--	-	1	1	-	-
CO 4	1	1	-	-	-	2	-	-	-	-	-	-	1	1	-	-

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ECE2813	VERILOG PROGRAMMING LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Basic digital electronics				
Co-requisites	Nil				

Catalog Description

This course discusses fundamental Verilog concepts of today's most advanced digital design techniques. it offers broad coverage of Verilog HDL from a practical design perspective. Introduces students to gate, dataflow (RTL), behavioral, and switch level modeling, describes leading logic synthesis methodologies; explains timing and delay simulation; and introduces many other essential techniques for creating tomorrows complex digital designs

Course Objectives

The objective of this course is to

- Provide the fundamental knowledge of designing digital circuits in Verilog HDL.
- Provide the knowledge logic synthesis methodologies of digital circuits.

Course Outcomes

On completion of this course, the students will be able to

CO1. Describe the codes for various combinational circuits.
CO2. Write the codes for various sequential circuits.
CO3. Model circuits using behavioral and dataflow methods.
CO4. Synthesize the circuits using various methodologies.

Course Content

Experiments	Blooms level*	Number of hours
1. Write a Verilog code to realize all the logic gates. 2. Write a Verilog code to implement Half Adders, Full adders and Subtracters using Gates.	L1 and L2	2
3. Write a Verilog code to describe the function of Multiplexer and Demultiplexer using different modelling styles. 4. Write a Verilog code to realize D Flip-Flop and D Latch.	L1 and L2	2
5. Write a Verilog code to implement 2:1 Mux and D Latch using Switches. 6. Write a Verilog code to implement Encoders and Decoders Using if-else Statement and case Statement.	L1 and L2	2
7. Write a Verilog code to implement SR Flip Flop using UDP (User Defined Program). 8. Write the Verilog code for a JK Flip-flop, and its test bench. Use all possible combinations of inputs to test its working.	L1 and L2	3

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9. Write the hardware description of a 8-bit register with parallel load, shift left and shift right modes of operation and test its operation. 10. Write a Verilog code to realize Up/Down Counter and Divide by 4.5 Counter. Write a Verilog code to describe the function of Synchronous FIFO. 11. Write a Verilog code using FSM to realize a sequence detector (101101).	L1 and L2	3

*Bloom's Level: L1: Knowledge; L2: Comprehension; L3: Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA – Internal Assessment, EE - External Exam, PR - Performance, LR – Lab Record, V – Viva.

Text Books

- Samir Palnitkar, Verilog HDL, 2nd Edition Pearson Education, 1996.
- Donald Thomas, Philip moorby, The Verilog hardware Description language, 5th Edition, Kluwer Academic publishers,2002.

Reference Books

- J. Bhasker, Verilog HDL Synthesis: A Practical Primer, Star Galaxy publications,1998.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	-	-	-	-	-	-	-	-	-	-	-	2	-	1	1
CO 2	1	2	-	-	-	3	-	-	-	-	-	-	2	-	1	1
CO 3	1	2	3	-	-	3	-	-	-	-	--	-	2	-	1	1
CO 4	1	2	-	-	-	2	-	-	-	-	-	-	2	-	1	1

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ECE2818	WIRELESS COMMUNICATION	L	T	P	C
Version : 2019.1	Date of Approval: May 21, 2019	3	0	0	3
Pre-requisites/Exposure	Communication System				
Co-requisites	Nil				

Course Objective:
The objective of the course is to provide an overview of Wireless Communication networks area and its applications in communication engineering. The contribution of Wireless Communication networks to overall technological growth and the various terminology, principles, devices, schemes, concepts, algorithms and different methodologies used in Wireless Communication Networks are described.

Course Objectives
The objective of this course is to
- To introduce advanced wireless communication systems.
- To learn the wireless channel characteristics and models.

Course Outcomes
On completion of this course, the students will be able to
CO1: Evolution of mobile radio communications and comparative study of 2G, 3G.
CO2: Explain cellular concepts, fading, wireless networks and Wireless standards.
CO3: Apply the TDMA, FDMA and CDMA techniques for a given network application.
CO4: Comparison based on various parameters of wireless, telephone and ISDN networks.
CO5: Study the advanced concepts of Intelligent cell concept and application.

Course Contents:

Modules	Blooms level*	Number of hours
Module 1 Introduction to Wireless Communication Systems Evolution of mobile radio communications, examples of wireless comm. systems, paging systems, Cordless telephone systems, comparison of various wireless systems. Modern Wireless Communication Systems: Second generation cellular networks, third generation wireless networks, wireless in local loop, wireless local area networks, Blue tooth and Personal Area networks.	L1 and L2	8
Module 2 Introduction to Cellular Mobile Systems Spectrum Allocation, basic Cellular Systems, performance Criteria, Operation of cellular systems, analog cellular systems, digital Cellular Systems. Ellular System Design Fundamentals: Frequency Reuse, channel assignment strategies, handoff Strategies, Interference and system capacity, tracking and grade off service, improving coverage and capacity.	L2 and L3	10

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Module 3 Multiple Access Techniques For Wireless Communication Introduction to Multiple Access, FDMA, TDMA, Spread Spectrum multiple Access, space division multiple access, packet ratio, capacity of a cellular systems.	L2 and L4	10
Module 4 Wireless Networking Difference between wireless and fixed telephone networks, development of wireless networks, fixed network transmission hierarchy, traffic routing in wireless networks, wireless data services, common channel signaling, ISDN (Integrated Services digital Networks), advanced intelligent networks.	L3 and L4	10
Module 5 Intelligent cell concept and application Intelligent cell concept, applications of intelligent micro-cell Systems, in-Building Communication, CDMA cellular Radio Networks.	L1 and L2	10

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books:

1. Theodore S. Rappaport, Wireless Communications, Pearson, 2010.
2. W.C.Y.Lee, Mobile Cellular Telecommunication, Tata McGraw Hill, 2010.

Reference Book:

1. Jochen Schiller, Mobile Communications, Pearson, 2011.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2													2	
CO2		3									2				1	3
CO3	2				3						2				2	3
CO4		3													3	
CO5	2		3												1	

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ECE2816	ADVANCED ROBOTIC PROCESS AUTOMATION DESIGN & DEVELOPMENT	L	T	P	C
Version 2019.1	Date of Approval: 14 July 2019	3	0	0	3
Pre-requisites/Exposure	Basic Networking Concepts				
Co-requisites	Nil				

Catalog Description

This course aims at providing knowledge of basic concepts of Robotic Process Automation to University students. It further builds on these concepts and introduces key RPA Design and Development strategies and methodologies specifically in context of UiPath products. The student undergoing the course shall develop the competence to design and develop a robot for a defined process.

Course Objectives

The objective of this course is to

- Equip the students with concepts of robotic process automation
- Provide an overview of designing with uipath software.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain key terms and trends around the robotic process automation along with its physical and logical design

CO2: Understand the potential and value of the robotic process automation .

CO3: Describe the technologies used for the robotic process automation and mobile devices, including (passive and active) sensors, the physical communications layer, communications protocols, programming frameworks,.

CO4: Design programs and have hands on experience on uipath software

CO5:Develop RPA programs of moderate complexity for a well-used robotic automation process using uipath.

Modules	Blooms level*	Number of hours
Module 1: Exception handling and Best Practices **Debugging and Exception Handling- Debugging** Tools, Strategies for solving issues, Catching errors. **Project Organization-** Concept of project organization, Best practices, Avoiding pitfalls, Invoke Activity.	L1, L2	8
Module II: Introduction to Orchestrator Orchestrator, Tenants, Authentication, Users, Roles, Robots, Environments, Queues & Transactions, Schedules.	L2, L3 and L4	8
Module III: merging and Future Trends in IT Artificial Intelligence, Machine Learning, Agent awareness, Natural Language Processing Computer Vision	L2, L3 and L4	8

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Module IV: Capstone Project Real life case studies which can be used to apply the concepts learnt during the course. The projects shall test student's skills right from process transformation and documentation to the design and development of the actual robot	L2, L3 and L4	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- "Learning Robotic Process Automation" By Alok Mani Tripathi,Packt Publications,Ist Edition,2018

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	--	--	**3**	--	--	--	--	--	--	**2**	--	**1**	**1**	-	-
CO2	**1**	--	**1**	**2**	--	--	--	--	--	--	--	--	-	**1**	-	-
CO3	**1**	--	**1**	**2**	--	--	--	--	--	--	--	--	-	**1**	-	**2**
CO4	**1**	--	--	**2**	--	--	--	--	--	--	--	--	**1**	**1**	-	**2**

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ECE2812	ADVANCED VLSI DESIGN	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	3	0	0	3
Pre-requisites/Exposure	VLSI Design				
Co-requisites	Nil				

Catalog Description

This course explores the theory and operation of the basic building blocks of VLSI design which includes current mirror and Op-amp. This course also explains the designing of OTA and their types. The concepts learnt in the studies of OTA will be applied in the design and analysis of filters and oscillators.

Course Objectives

The objective of this course is to

- Provide the advanced knowledge of VLSI design with building blocks and designing of OTA.
- Equip with the understanding various types of OTA with their noise analysis.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the basic operation of MOS transistor, cascade transistors and noise performances.

CO2: Explain the CMOS inverter with DC characteristics, active load and current mirrors.

CO3: Describe gain margin and phase margin; Design and analysis of OTA and explanation on CMRR, offset and PSRR.

CO4: Explain & design cascade and folded OTA.

Modules	Blooms level*	Number of hours
MODULE 1: **Review of Elementary Transistor Stages** MOST single transistor amplifying phase, BJT single transistor, Source and emitter follower and their noise performance, Cascade transistors and noise performance.	L1 and L2	8
MODULE 2: **Inverter stage and Building Blocks** CMOS inverter, DC analysis, low frequency gain, bandwidth, current capacity, slew rate, amplifying phase, BJT inverter stage and Noise performance, Cascade and its Bandwidth, active load, differential stages, current mirrors and their noise output.	L1, L2 and L3	10
MODULE 3: **Op amp Design: Introduction** Design of single transistor OTA: GBW and phase margin, Miller CMOS OTA: GBW and phase margin, Full Dc analysis: Common mode input voltage range versus current supply, output range versus supply voltage, maximum output current, source and sink, Noise analysis of OTAs.	L2,L3, L4 and L5	10

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MODULE 4: **Op amp Design: Matching specifications** Transistor mismatch, Offset voltage definition, Mismatch definition, differential stage with active load, Offset drift, CMRR, Offset and CMRR of Miller OTA, Offset in BJT and JFET, Power Supply rejection ratio of simple and Miller OTA.	L1, L2,L3 and L4	10
MODULE 5: **Design of OTAs and design Options** Symmetrical, Cascade OTA, Folded Cascade OTA, Operational Current Amplifier, design for optimum GBW and SR, CMOS Configurations, Bipolar op amp configurations.	L1, L2,L3 and L4	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- Behzad Razavi, "Design of Analog CMOS Integrated Circuits", 2nd Edition, Tata Mcgraw Hill, 2017
- Gray, Hurst, Lewis and Meyer, "Analysis and design of Analog ICs", 5th Edition, Wiley publication, 2008

Reference Books

- Meyer Gray, Hurst, Lewis , "Analysis and Design of Analog Integrated Circuits", 5th Edition, Wiley publication, 2009
- Allen, "CMOS Analog Circuit Design", 3rd Edition, Oxford University Press,2013.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2	PS O 3	PSO 4
CO 1	3	2	3	--	--	--	--	--	--	--	--	--	--	1	--	--
CO 2	3	2	3	--	--	--	--	--	--	--	--	2	--	1	--	3
CO 3	3	2	1	--	1	--	--	--	--	--	--	2	--	1	--	3
CO 4	2	3	3	--	1	--	--	--	--	--	--	--	--	1	--	3

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ECE2814	POWER ELECTRONICS	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course introduces students to the theory of Power Electronics. It includes basics of Thyristor family devices with its firing circuits. It includes the design concepts of Converter, Inverter, Chopper, AC voltage controller, cycloconverter along with some basic application based on power electronics.

Course Objectives

The objective of this course is to

- Equip the students with concepts of Power Electronics Devices.
- Provide in depth knowledge so that they can design applications based on Power Electronic concepts.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain concept of various triggering elements.

CO2. Explain and solve problems on thyristor, its rating, protection and firing circuits as well as compare and design firing circuits of thyristor.

CO3. Analyze and solve the problems of Converter, Inverter, Chopper, AC voltage controller and Cycloconverter for different types of load.

CO4: Explain design concept of power electronic applications.

Modules	Blooms level*	Number of hours
Module 1: **Triggering Devices** Triggering devices, Unijunction Transistor, Characteristics and applications of UJT, Programmable Unijunction Transistor, DIAC, Silicon Controlled Switch, Silicon Unilateral Switch, silicon Silicon bilateral Switch, Shockley diode.	L1 and L2	6
Module 2: **Thyristor Firing Circuits, Turn on systems** Two transistor model of Thyristor, Method of Triggering a thyristor, Thyristor Types, Requirement for triggering circuits, Thyristor Firing Circuits, Fullwave control of Ac with one thryristor, Light activated SCrs (LASCR), Control Circuit, dv/dt and di/dt protection of Thyristor, Pulse Transformer triggering, Firing SCR by UJT, TRIAC firing circuit, Phase control of SCR by pedestal and Ramp.	L1, L2, L3, L4 and L5	9

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Module 3: **Controlled Rectifiers** Types of Converters, effect of inductive load, Commutating diode or free wheeling diode, controlled rectifiers, Bi phase half wave, single phase full wave phase controlled converter using bridge principle, harmonics.	L1, L2, L3 and L4	8
Module 4: **Inverters** Types of Inverters, Bridge Inverters, Voltage Source Inverters, Pulse Width Modulation Inverters, Current source Inverters.	L1, L2, L3 and L4	6
Module 5: **AC Voltage Controllers** Types of AC voltage Controllers, AC Phase Voltage controllers, single Phase Voltage Controller with RL load, harmonic analysis of single phase full wave controller with RL load.	L1, L2, L3 and L4	5
Module VI: **DC to DC Converters** DC choppers, Chopper classification, two quadrant chopper, Four quadrant chopper.	L1, L2, L3 and L4	5
Module VII: **Cyclo Converter** Single phase and three phase cycloconverters.	L1, L2, L3 and L4	4
Module VIII: **Industrial Applications** One shot Thyristor trigger Circuit, over voltage protection, simple battery charger, battery charging regulator, AC static switches, DC static switch	L1 and L2	5

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- Michael Jacob "Power Electronics: Principles and Applications", Thomson Press (India) Ltd
- P. S. Bimbhara, "Power Electronics" Khanna Publications

Reference Books

- H. C. Rai, "Power Electronics Devices, Circuits, Systems and Application", Galgotia, 3rd Ed.
- M. H. Rashid, "Power Electronics Devices, Circuits and Applications", Pearson Education India

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	--	--	--	--	--	--	--	--	--	--	3	--	3
CO2	1	1	2	--	--	--	--	--	--	--	--	3		2	--	2
CO3	1	1	--	--	--	--	--	--	--	--	--	3		2	--	2
CO4	1	1	3	--	--	-	--	--	--	--	--	3		2	--	2

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Course Code: ECE2820	ELECTRONIC SYSTEM ASSEMBLY	L	T	P	C
Version: 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The course deals with electronics systems assembly area. The course will discuss all the vital features of Electronic assembly, Printed circuit board(PCB) & its different aspects ranging from circuit design to manufacturing. This course covers the PCB design of assembly systems and safety & product handling.

Course Objectives

The objective of this course is to:

1. Build overview of electronic systems industry and its various aspects.
2. Familiarize student with the introduction to printed circuit assembly (pca) and its defects.
3. Provide the knowledge and understanding of Design of Assembly Systems
4. Deals with the testing aspects of the safety & product handling in printed circuit assembly.

Course Outcomes

At the end of the course learners will be able to

CO.1. Discuss the various aspects of Electronic Industry.
CO.2. Understanding of Printed Circuit assembly, assembly and soldering.
CO.3. Comprehension of PCA defects and IPC standards.
CO.4. Design of Assembly systems.
CO.5. Discuss the various safety and product handling methods.

Modules	Blooms Level*	Number of hours
Unit- 1 : INTRODUCTION TO THE ELECTRONICS INDUSTRY • Distinguish Class 1, 2, and 3 electronics products • Types of components used in electronic assemblies • Distinguish between component polarity and orientation • Differentiate between wires, cables, and harnesses • Identify types of terminals used in electronic assemblies • Identify types of hardware used in electronic assemblies	L1, L2	5
Unit-2 : INTRODUCTION TO PRINTED CIRCUIT ASSEMBLY (PCA) •common features of a Printed Circuit Board (PCB) • Common components of a Printed Circuit Assembly (PCA) • Different attachment methods used in printed circuit assembly ASSEMBLY AND SOLDERING PROCESSES • assembly process of Surface Mount Technology (SMT) •Assembly process of Through Hole (TH) Technology • Identify the different post-processes within the electronics assembly process	L1, L2,L4	6

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Unit- 3 : BASIC PCB/PCA DEFECTS • Quality in electronics manufacturing • Different quality conditions specified in IPC-A-610 and IPC-A-600 • PCB and PCA defects according to IPC standards • Use quality condition criteria to determine component acceptability IPC STANDARDS • Define IPC standards in reference to the electronic manufacturing industry • Identify the most common IPC standards relevant to assembly operators • Compare IPC Certification programs with IPC Certificate programs • Explain how assembly drawings are used in the assembly process • Identify common measurement tools and symbols used in the assembly process	L1, L2,L4	5
Unit-4: Design of Assembly Systems • design for effective manual assembly, Apply the DFMA Methodology to assess ease of manual assembly • Learn how to design for high speed automatic assembly• Understand the need to 'balance' an assembly line for equitable task allocation.• Parts feeding and orienting: vibratory and non-vibratory, orienting devices; escapements. Robot assembly.	L1, L2,L4	7
Unit-5 : SAFETY & PRODUCT HANDLING Standard safety signs and symbols relevant to assembly operators . Standard safety procedures for protecting assembly operators, equipment, and products Potential risks and hazards of standard materials used by assembly operators . Safety concerns of using standard assembly equipment •Electrostatic discharge (ESD) in electronics assembly handling procedures for PCBs and PCAs .Cause and prevention of foreign object debris (FOD)	L1, L2	7

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Khandpur, Raghbir Singh. "Printed circuit boards: design, fabrication, assembly and testing", Tata McGraw-Hill Education, 2006.
2. Marks, Leonard, and James Caterina, "Printed circuit assembly design", McGraw-Hill Education, 2000.

Reference Books

3. Boothroyd, Geoffrey, Peter Dewhurst, and Winston A. Knight, "Product design for manufacture and assembly". CRC press, 2010.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Curriculum & Scheme of Examination

2023

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BME2104	INTRODUCTION TO COMPUTERS AND PROGRAMMING IN C	L	T	P	C
Version: 2019.1	Date of Approval: May 21, 2019	2	1	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The objective of this course module is to acquaint the students with the basics of computers system, its components, data representation inside computer and to get them familiar with various important features of procedure-oriented programming language i.e. C.

Course Objectives

The objective of this course is to

- Equip the students with concepts of Programming through C Language
- Provide an overview of advanced programming concepts like Structure, Union and File Handling

Course Outcomes

On completion of this course, the students will be able to

After the completion of course, the students will be able to,

CO 1:Define the purpose and structure of C Program for programming; identify and distinguish various data types and operators; conditional and control statement; Apply if-else, Switch and loops to rewrite basic C program for problem solving.

CO 2: Compare and contrast various Array types, its declaration and implementation; differentiate between Call by Value and Reference if Functions; apply the concepts to rewrite C Programs

CO 3: Differentiate between various String Handling Functions; describe the concept of Pointers in C Language

CO 4: Explain the concept of Structure and Union; apply the concept of File Handling to provide data storage support to the programs.

CO 5: Apply the concept of Computer Graphics using C programming concepts for implementing line drawing, circle drawing algorithms.

Modules	Blooms level*	Number of hours
Module I: Introduction Introduction to computer, history, von-Neumann architecture, memory system (hierarchy, characteristics and types), H/W concepts (I/O Devices), S/W concepts (System S/W & Application S/W, utilities). Data Representation: Number systems, character representation codes, Binary, octal, hexadecimal and their interconversions. Binary arithmetic, floating point arithmetic, signed and unsigned numbers, Memory storage unit.	L1, L2 and L3	7

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Module II: Programming in C History of C, Introduction of C, Basic structure of C program, Concept of variables, constants and data types in C, Operators and expressions: Introduction, arithmetic, relational, Logical, Assignment, Increment and decrement operator, Conditional, bitwise operators, Expressions, Operator precedence and associativity. Managing Input and output Operation, formatting I/O.	L2, L3 and L4	7
Module III: Fundamental Features in C C Statements, conditional executing using if, else, nesting of if, switch and break Concepts of loops, example of loops in C using for, while and do-while, continue and break. Storage types (automatic, register etc.), predefined processor, Command Line Argument.	L2, L3 and L4	7
Module IV: Arrays and Functions One dimensional arrays and example of iterative programs using arrays, 2-D arrays Use in matrix computations. Concept of Sub-programming, functions Example of user defined functions. Function prototype, Return values and their types, calling function, function argument, function with variable number of argument, recursion.	L2 and L3	7
Module V: Advanced features in C Pointers, relationship between arrays and pointers Argument passing using pointers, Array of pointers. Passing arrays as arguments.Strings and C string library.Structure and Union. Defining C structures, Giving values to members, Array of structure, Nested structure, passing strings as arguments. File Handling.	L2, L3 and L4	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6:Evaluation

Text Books

1. E Balagurusamy, "Programming in ANSI C", Seventh Edition, Tata McGraw Hill Education private limited, July 2017.
2. Yashwant Kanetkar, "Let Us C", 16th Edition, BPB Publication, June 2017.

Reference Books

1. Brain W Kernighan and Dennis M Ricchie, "The C Programming Language", 2nd Edition, Pearson Publication, Jan 2015.
2. Byron Gottfried, "Programming with C", Third Edition, Tata McGraw Hill Education private limited, July 2017.
3. E Balagurusamy, "Computer Concepts & Programming in C", Seventh Edition, Tata McGraw Hill Education private limited, July 2011.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**2**	**--**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**1**	**--**
CO2	**1**	**1**	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**1**	**--**
CO3	**1**	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**1**	**--**
CO4	**1**	**1**	**2**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**1**	**--**
CO5	**1**	**1**	**2**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**1**	**--**

1: strongly related, 2: moderately related and 3: weakly related

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BME2109	PROGRAMMING IN C LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The primary objective of this course is to understand all the components of C, including the C language, the C Preprocessor, and the C Standard Library. An understanding of some advanced practical issues, including memory management, testing and debugging, complex declarations and expression evaluation, building and using libraries, and evaluating tradeoffs, such as size vs. speed and speed vs. complexity. The ability to write C code and create and manipulate logical programs.

Course Objectives

The objective of this course is to

- Equip the students with concepts of Programming through C Language
- Provide an overview of advanced programming concepts like Structure, Union and File Handling.

Course Outcomes

After the completion of course, the students will be able to,

CO 1:Demonstrate the use of various data types and operators in C programs; Solve various problems using conditional control statements (if-else, Switch case).

CO 2: Construct C programs related to problems involving the usage of loops, arrays and functions.

CO 3: Apply the concept of Pointers for efficient memory management and construct C programs using string handling functions.

CO 4: Demonstrate the use of Structure, Union and concept of File Handling to provide data storage support to the programs.

Modules	Blooms level*	Number of hours
LABORATORY SESSSION 1 OPERATORS, EXPRESSIONS and DECISION MAKING 1. Write a program to calculate simple interest and amount. 2. Write a program to swap two numbers using third variable. 3. Write a program to demonstrate Greatest of 3 nos and to print the given no in ascending order. 4. Write a program to check if the number is even or odd. 5. Write a program to perform arithmetic operations using Switch Case statement. 6. Write a program to calculate area of circle, rectangle, square and triangle using Switch Case statement.	L3	5

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LABORATORY SESSSION 2 LOOPING 1. Write a program to find factorial of given no using do while statement. 2. Write a program to print prime numbers up to 'n'. 3. Write a program to sum of n natural no. 4. Write a program to print Fibonacci series. 5. Write a program to reverse a number. 6. Write a program to print the following pattern using for loop 1 2 2 3 3 3 4 4 4 4 7. Write a program to print the following pattern using for loop A A B A B C A B C D	L3	6
LABORATORY SESSSION 3 ARRAYS and FUNCTIONS 1. Write a program to read n num of students and 5 subjects marks. 2. Write a program to swap two numbers using call by value. 3. Write a program to convert all lower case to uppercase characters 4. Write a program to find the factorial of a number using recursion. 5. Write a program to print the add/product of two matrices of any order.	L3	5
LABORATORY SESSSION 4 POINTERS AND STRING 1. Write a program to perform operations on strings using string handling in-built functions (concatenation, reversal, copy etc.) 2. Write a program to swap two numbers using call by reference. 3. Write a program to perform dynamic memory allocation and de-allocation. 4. Write a program to print elements of array using pointers.	L3	4
LABORATORY SESSSION 5 STRUCTURE,UNION & FILE HANDLING 1. WAP program to display student information by initializing structures. 2. WAP program to find the total salary of employee and employee details using structure. 3. Write a program to store and display information using Union. 4. Program to write data into file and read data from file.	L3	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- E Balagurusamy, "Programming in ANSI C", Seventh Edition, Tata McGraw Hill Education private limited, July 2017.
- Yashwant Kanetkar, "Let Us C", 16th Edition, BPB Publication, June 2017.

Reference Books

1. Brain W Kernighan and Dennis M Ricchie, "The C Programming Language", 2nd Edition, Pearson Publication, Jan 2015.

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2. Byron Gottfried, “Programming with C”, Third Edition, Tata McGraw Hill Education private limited, July 2017.
3. E Balagurusamy, “Computer Concepts & Programming in C”, Seventh Edition, Tata McGraw Hill Education private limited, July 2011.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	**1**	**2**	--	**2**	--	--	--	--	--	--	--	--	**1**	--	**2**	--
CO 2	**1**	**1**	**2**	**2**	--	--	--	--	--	--	--	--	**1**	--	**2**	--
CO 3	**1**	**1**	**2**	**3**	--	--	--	--	--	--	--	--	**1**	--	**2**	--
CO 4	**1**	**1**	**2**	**2**	**3**	--	--	--	--	--	--	--	**1**	--	**2**	--

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BME2111	ELEMENTS OF MECHANICAL ENGINEERING LAB	L	T	P	C
Version 2019.1	Date of Approval: May 16, 2019	0	0	2	1
Pre-requisites/Exposure					
Co-requisites					

Pre –Requisite: Elements ofMechanical Engineering

Catalog Description

In this course the concepts of various prime movers like I C Engine, Gas Turbine, Steam Turbine, and Hydraulic Turbine are discussed in detail. Concept of power absorbing devices and power transmission devices are discussed in detail. Elementary concept of mechanics of material and machine tool also discussed in detail. The aim of this course is to make the students familiar with the basic mechanical engineering.

Course Objectives:

The objective of this course is to

1. Equip the students with practical concepts of Boiler, Turbine, IC Engine and Machine tools.
2. Understand the elements of mechanical engineering by working models and experiments.

Course Outcomes (COs): After studying this course the students will be able to:

CO 1- Define the basics of working of boilers, Steam turbines.

CO 2- Explain the principle and working of two strokes and four strokes internal combustion engines.

CO 3- Explain the working of Pelton wheel Turbine, Francis Turbine and Kaplan Turbine.

CO 4 - Describe the tensile test and power transmission derives.

CO 5- Identify and demonstrate the machine tools and lathe operation.

List of Experiments	Blooms level*	Number of hours
• To Study the Cochran and Babcock & Wilcox boilers.	L1, L2 and L3	2
• To study the working of impulse and reaction steam turbines	L1, L2 and L3	2
• To study Two-Stroke & Four-Stroke Diesel Engines.	L1, L2 and L3	2
• To Study Two-Stroke & Four-Stroke Petrol Engines.	L1, L2 and L3	2
• To study the constructional features and working of Pelton wheel Turbine, Francis Turbine and Kaplan Turbine.	L1, L2 and L3	2
• To perform tensile test, plot the stress-strain diagram and evaluate the tensile properties of a given metallic specimen.	L1, L2 and L3	2
• To Study the different power transmission drives.	L1, L2 and L3	2
• To Study different types of machine tools (lathe, milling, drilling & shaper).	L1, L2 and L3	2

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• To perform the metal cutting operation on Lathe machine.	L1, L2 and L3	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Rajput, R.K. Elements of Mechanical Engineering, Lakmi Publication, Delhi, 2013. .
- Jain, V. Basics of Mechanical Engineering, Dhanpat Rai Publication, Delhi , 2011.
- Kumar, D.S. Elements of Mechanical Engineering, S.K. Kataria and Sons Publications, Delhi 2013.

Reference Books

- Ganesan, V. Internal Combustion Engine , New-Delhi : Tata McGraw Hill, New delhi, 2017.
- Heine, R.W. Loper and P.C. Rosenthal, Principles of metal casting, McGraw Hill, New-Delhi, 2001
- Nag, P.K. Engineering thermodynamics,: Tata McGraw Hill, New-Delhi, 2013.
- Kumar, D.S.Thermal Engineering, S.K. Kataria and Sons Publications, New-Delhi, 2013.
- Hazra, S.K. and Chaudhary, A.K. Workshop Technology Vol. II . Asian Book Comp, New-Delhi, 2012

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BME2205	OBJECT ORIENTED PROGRAMMING USING C++	L	T	P	C
Version 2019.1	Date of Approval: May 16, 2019	2	1	0	3
Pre-requisites/Exposure	Hands on knowledge of C Programming				
Co-requisites	Basic concepts of C Programming				

Catalog Description

The objective of this course is to introduce object-oriented programming. To explore and implement the various features of OOP such as inheritance, polymorphism, Exceptional handling using programming language C++. After completing this course student can easily identify the basic difference between the programming approaches like procedural and object oriented.

Course Objectives

The objective of this course is

1. Equip the students with the basic features of C++ supporting object-oriented programming. Perform object oriented programming to develop solutions to problems demonstrating usage of control structures, modularity, I/O. and other standard language constructs.
2. Provide the overview of major object-oriented concepts to implement object oriented programs in C++ like encapsulation, inheritance and polymorphism, stream I/O, templates and operator overloading

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain the basic principles of object-oriented programming approach; Differentiate it with procedural programming approach and also discuss difference between C and C++.

CO 2: Illustrate the different ways to define a member function inline and explain how the private members of a class can be accessed. Explain how the objects can be instantiated and destroyed with static data member?

CO 3: Explain the concept of inheritance, types and implementation with suitable examples; find out ambiguity problem in inheritance; use the concept of overriding and constructors in inheritance.

CO 4: Explain polymorphism in detail and implement the concept of overloading in functions as well as in operators. Write the programs for virtual function and pointer with objects.

CO 5: Explain the exception handling mechanism. Design the programs for class and function Template. Compare and contrast various formatted and unformatted i/o function in file handling.

Modules	Blooms level*	Number of hours
MODULE 1: INTRODUCTION Review of C, Difference between C and C++, Procedure Oriented and Object Oriented Approach. Basic Concepts: Objects, classes, Principals like Abstraction, Encapsulation, Inheritance and Polymorphism. Dynamic Binding, Message Passing. Characteristics of Object-Oriented Languages. Introduction to Object-Oriented Modeling techniques (Object, Functional and Dynamic Modeling).	L1 and L2	5

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MODULE 2: CLASSES AND OBJECTS Abstract data types, Object & classes, attributes, methods, C++ class declaration, Local Class and Global Class, State identity and behaviour of an object, Local Object and Global Object, Scope resolution operator, Friend Functions, Inline functions, Constructors and destructors, instantiation of objects, Types of Constructors, Static Class Data, Array of Objects, Constant member functions and Objects, Memory management Operators.	L1, L2 and L3	7
MODULE 3: INHERITANCE Inheritance, Types of Inheritance, access modes – public, private & protected, Abstract Classes, Ambiguity resolution using scope resolution operator and Virtual base class, Aggregation, composition vs classification hiérarchies, Overriding inheritance methods, Constructors in derived classes, Nesting of Classes	L2, L3 and L4	8
MODULE 4: POLYMORPHISM Polymorphism, Type of Polymorphism – Compile time and runtime, Function Overloading, Operator Overloading (Unary and Binary) Polymorphism by parameter, Pointer to objects, this pointer, Virtual Functions, pure virtual functions.	L2, L3 and L4	8
MODULE 5: STRINGS, FILES AND EXCEPTION HANDLING Manipulating strings, Streams and files handling, formatted and Unformatted Input output. Exception handling, Generic Programming – function template, class Template Standard Template Library: Standard Template Library, Overview of Standard Template Library, Containers, Algorithms, Iterators, Other STL Elements, The Container Classes, General Theory of Operation, Vectors.	L2, L3 and L4	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. A.R. Venugopal, Rajkumar, T. Ravishanker "Mastering C++", TMH, 1997
2. R. Lafore, "Object Oriented Programming using C++", BPB Publications, 2004.
3. E. Balagurusamy ,"Object Oriented Programming with C++", Mc Graw Hill,6th Edition,2013.
4. Schildt Herbert, "C++: The Complete Reference", Wiley DreamTech, 2005.

Reference Book

1. Parasons, "Object Oriented Programming with C++", BPB Publication, 1999.
2. Steven C. Lawlor, "The Art of Programming Computer Science with C++", Vikas Publication, 2002.
3. Yashwant Kanethkar, "Object Oriented Programming using C++", BPB, 2004

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/ Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**2**	**--**
CO2	**1**	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**1**	**2**
CO3	**1**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**2**	**2**
CO4	**1**	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**	**2**
CO5	**1**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**	**1**

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Course Code: BME2208	ENGINEERING GRAPHICS LAB	L	T	P	C
Version 2019.1	Date of Approval: May 16, 2019	0	0	4	2
Pre-requisites/Exposure	Concepts Mathematics (especially Trigonometry and Geometry)				
Co-requisites	Machine Drawing & CAD				

Catalog Description:
A freshman level course which provides the undergraduate engineering students with a background in descriptive geometry, orthographic projection, engineering drawing standards and annotation,computer-aided engineering graphics. The concepts ofpoint, line and plane relationships in projection, multi-view engineering drawings, auxiliary and section views, basic dimensioning and annotation, engineering applications of drawings are also discussed.

Course Objective:
The objective of this course is to

- Equip the students with the in-depth knowledge of drawings of points, straight line, planes, cylinders, prisms, pyramids, parabola, ellipse etc.
- Draw different figures manually and will be capable of using various instruments involved in drawings.

Course Outcomes (COs):
At the end of the course, the student shall be able to:
CO 1 - Define and explain basic principles of projections of points and lines.
CO 2 - Define, describe and construct the different orientations and projections of planes.
CO 3 – Explain and construct the projections of solids and sectioning of solids in different orientations.
CO 4 - State and draw the concepts of development of surfaces and introduction to auto CAD.
CO 5 – Define and construct orthographic and isometric view of an object.

Modules	Blooms level*	Number of hours
Module I: Introduction Importance, significance and scope of engineering drawing, drawing instruments and their use, lettering, dimensioning, scales, sense of proportioning, different types of projections, B.I.S. Specifications.	L1 and L2	8
Module II: Projection of points, lines and plane surface Principal planes, principles of orthographic projections, Projection of points in all quadrants, Projection methods - First angle & third angle projection, Projections of straight lines (first angle projection) inclined to both the planes, true lengths and traces, projection of planes, projection of planes in simple position and inclined to both the principal planes, auxiliary planes and views	L1, L2 and L3	12
Module III: Projection of solids & section of solids Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to both of the principal planes, Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other, obtaining true shape of section	L1, L2 and L3	12

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Module IV: Development of surfaces & Isometric projections Development of surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones, Principles of isometric projection, isometric scale, Isometric projections of simple solids and truncated solids, Prisms, pyramids, cylinders, cones, Conversion of Orthographic Views to Isometric Views and Vice-versa.	L1, L2 and L3	8
Module V: Introduction to CAD Introduction to CAD and use of its commands, practice of some 2D figures using CAD.	L1, L2 and L3	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	50	20

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text Books:

- PS Gill, 2013, Engineering Drawing, Kataria Publication.
- ND Bhatt, 2014, Engineering Drawing, Charotar publications.

References Books:

- N Sidheshwar, 2014 Machine Drawing Drawing, Tata McGraw Hill
- M.B. Shah & B.C. Rana, 2007, Engineering Drawing, Pearson Education.
- CADFolks, AutoCAD 2018 For Beginners, CreateSpace Independent *Publishing* Platform; 6 edition.

CO, PO and PSO mapping:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--
CO2	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--
CO3	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--
CO4	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--
CO5	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--

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BME2209	OBJECT ORIENTED PROGRAMMING USING C++ LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Turbo C++				
Co-requisites	NIL				

Catalog Description

The objective of this course is to introduce object-oriented programming. To explore and implement the various features of OOP such as inheritance, polymorphism, Exceptional handling using programming language C++. After completing this course student can easily identify the basic difference between the programming approaches like procedural and object oriented.

Course Objectives

The objective of this course is

1. Perform object-oriented programming to develop solutions to problems demonstrating usage of control structures, modularity, I/O. and other standard language constructs.
2. Demonstrate adeptness of object-oriented programming in developing solutions to problems demonstrating usage of data abstraction, encapsulation, and inheritance.
3. Demonstrate ability to implement one or more patterns involving realization of an abstract interface and utilization of polymorphism in the solution of problems which can take advantage of dynamic dispatching, syntax, features of, and how to utilize the Standard Template Library.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Define and identify the basic principles of object-oriented programming approach; Differentiate it with procedural programming approach.

CO 2: Determine the different ways to define a member function inline and explain how the private members of a class can be accessed. Solve how the objects can be instantiated and destroyed with static data member?

CO 3: Apply the concept of inheritance, types and implementation with suitable examples; find outambiguity problem in inheritance; use the concept of overriding and constructors in inheritance.

CO 4: Relate the concept polymorphism with overloading in detail and implement the concept of overloading in functions as well as in operators. Write the programs for virtual function and pointer with objects.

CO 5: Determine the exception handling mechanism. Design the programs for class and function Template. Compare and contrast various formatted and unformatted i/o function in filehandling.

Modules/Topics Covered**	Blooms level*	Number of hours
1. Sample Programs using objects and classes (a) Write a program to illustrate the concept of one class with two objects by taking student data. (b) Write a program to show the relationship of class and object to display roll no., grade and fee paid by student.	L1, L3, L5	4

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2. Sample Programs for different use of private, public member variables and functions and friend functions (a) Write a program to define the member function outside and inside the class. (b) Write a program to read and display the information of N persons to illustrate the concept of array of objects. (c) Write a program to add two numbers to illustrate the use of friend function.	L1, L3, L5	4
3. Sample Programs using constructors and destructors (a) Write a program to assign and copy values to illustrate the concept of parametrized and copy constructor. (b) Write a program to show the order of constructor and destructor.	L1, L3, L5	4
4. Sample Programs using operator overloading (a) Write a program to add two numbers using binary operator overloading. (b) Write a program to illustrate the assignment operator overloading.	L1, L3, L5	4
5. Sample Programs using inheritance in and accessing objects of different derived classes (a) Write a program to compute the marks explaining the concept of multiple inheritance. (b) Write a program to find the factorial of a number using inheritance.	L1, L3, L5	4
6. Sample Programs using polymorphism and virtual functions (using pointers) and File Handling (a) Write a program to find the volume of cylinder and cuboid using function overloading. (b) Write a program to reverse a string using pointers. (c) Write a program to explain the relationship of inheritance and virtual function. (d) Write a program to read the student name and fee paid using read() function from the file.	L1, L3, L4, L5	4

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

1. A.R. Venugopal, Rajkumar, T. Ravishanker "Mastering C++", TMH, 1997
2. R. Lafore, "Object Oriented Programming using C++", BPB Publications, 2004.
3. "Object Oriented Programming with C++" By E. Balagurusamy.
4. Schildt Herbert, "C++: The Complete Reference", Wiley DreamTech, 2005.

Reference Book

1. Parasons, "Object Oriented Programming with C++", BPB Publication, 1999.
2. Steven C. Lawlor, "The Art of Programming Computer Science with C++", Vikas Publication, 2002.
3. Yashwant Kanethkar, "Object Oriented Programming using C++", BPB, 2004

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	**70**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**3**	**1**	**2**	--	--	--	--	--	--	--	--	--	**2**	--	--	--
CO2	**3**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO3	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO4	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO5	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--

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BME2302	ANALOG ELECTRONICS I	L	T	P	C
Version: 2019.1	Date of Approval: May 21, 2019	3	0	0	3
Pre-requisites/Exposure	Elementary Resistive Circuit, Theorems and Analysis Techniques: KCL. KVL, Nodal & Mesh Analysis, Thevenin & Norton Equivalents, Maximum Power Transfer.				
Co-requisites	Semiconductor Physics				

Catalog Description

This is the first course in Electronics and Communication Engineering, to educate and explain the methods used for biasing circuits in a graphical analysis of non linear electronic circuits and also includes small signal transistor models, parameters and their frequency responses. Following this, analyzing different types of feedback amplifiers, and power amplifiers using transistor and designing of different electronic circuits are included in the course. This course also considers the mathematical modelling of active solid state devices their analysis and design of single state circuits. Topics covered include the study of device characteristics and applications of p-n-junction diodes, bipolar junction transistors, and field effect transistors.

Course Objectives

The objective of this course is to

1. build from basic knowledge of Semiconductor Physics to an understanding of basic devices and their models
2. familiarize the student with the analysis and design of basic transistor amplifier circuits, feedback amplifiers and wave shaping circuits
3. build a foundation for Analog Electronics-II, Digital Circuits and Systems I & II, VLSI de-sign and analog CMOS IC Design

Course Outcomes

On completion of this course, the students will be able to

CO1. explain different types of diodes and demonstrate wave shaping circuits
CO2.exlain operating principal of Bipolar Junction Transistor, its properties, biasing techniques and stability
CO3. describe low and high frequency transistor amplifiers along with single and multi-stage am-plifier
CO4. explain operating principal of JFET, MOSFET, its properties, and biasing techniques
CO5. solve and analyse different negative feedback amplifiers configurations
CO6. describe and outline power amplifiers and their application.

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Modules	Blooms level*	Number of hours
Module I: Semiconductor Diode and Diode Circuits Different types of diodes: Zener, Schottky, LED. Zener as voltage regulator, Diffusion capacitance, Drift capacitance, the load line concept, half wave, full wave rectifiers, clipping and clamping circuits.	L1 L2 & L3	6
Module II: Bipolar Junction Transistor Bipolar junction transistor: Introduction, Transistor, construction, transistor operations, BJT characteristics, load line, operating point, leakage currents, saturation and cut off mode of operations. Bias stabilization: Need for stabilization, fixed Bias, emitter bias, self bias, bias stability with respect to variations in $I_{co,}$ V_{BE}&□, Stabilization factors, thermal stability.	L1 L2 & L3	9
Module III: Small signal Analysis of transistor and Multistage Amplifier Hybrid model for transistors at low frequencies, Analysis of transistor amplifier using h parameters, emitter follower, Miller's theorem, THE CE amplifier with an emitter resistance, Hybrid π model, Hybrid π Conducatnces and Capacitances, CE short circuit current gain, CE short circuit current gain with R_L Multistage amplifier: Cascading of Amplifiers, Coupling schemes(RC coupling and Transformer coupling)	L2 & L3	6
Module IV: Field Effect Transistors Field effect transistor (JFET, MOSFET): volt-ampere characteristics, small signal model –common drain, common source, common gate, operating point, MOSFET, enhancement and -depletion mode, Common source amplifier, Source follower	L1, L2 & L3	5
Module V: Feedback Amplifiers Feedback concept, Classification of Feedback amplifiers, Properties of negative Feedback amplifiers, Impedance considerations in different Configurations, Examples of analysis of feedback Amplifiers.	L1, L2, L3 & L4	6
Module VI: Power amplifiers Power dissipation in transistors, difference with voltage amplifiers, Amplifier classification (Class A, Class B, Class C, Class AB) class AB push pull amplifier, collector efficiency of each, cross over distortion.	L1 & L2	4

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

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Text Books

1. Jacob Millman, Christos Halkias, Chetan Parikh, Millman's Integrated Electronics, McGraw Hill Education, 2nd Edition, New Delhi
2. Sanjeev Gupta, Electronic Devices and Circuits, Dhanpat Rai Publications, 2010
3. Theraja B.L., Sedha R.S, Principles of Electronic Devices and Circuits, S Chand & Compa-ny, First Edition, New Delhi, 2002

Reference Books

1. Robert L. Boylestad: Electronic Devices and Circuits, Pearson Education, 11th Edition, 2013
2. Robert F. Pierret, Semiconductor Device Fundamentals, Pearson Education, 1st Edition, 2006
3. Nagrath I.J, Electronics: Analog and Digital, Prentice Hall India Learning Private Limited, Second Edition, 2013

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	3	--	--	--	--	--	--	--	--	3	1	--	--	3
CO2	1	2	--	--	--	--	--	--	--	--	--	3	1	3	--	3
CO3	1	2	3	--	--	--	--	--	--	--	--	--	1	-	--	--
CO4	1	2	--	--	--	--	--	--	--	--	--	3	1	3	--	3
CO5	1	2	3	--	--	--	--	--	--	--	--	3	1	--	--	3
CO6	1	3	--	--	--	--	--	--	--	--	--	3	1	--	--	3

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BME2303	CIRCUITS AND SYSTEMS	L	T	P	C
Version 2019.1	Date of Approval: May 16, 2019	2	1	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

In this course the concepts of circuits analysis based on Resistance, Inductance and Capacitance are discussed in detail. voltage- current relationship of basic circuit elements – resistors, inductors, capacitors, dependent and independent voltage and current sources; apply Kirchhoff's current and voltage laws to circuits in order to determine voltage, current and power in branches of any circuits excited by DC voltages and current sources will be discussed. Concept learnt in the studies will be applied to solve DC circuit problems using basic circuit theorems and structured methods like node voltage and mesh current analysis.

Course Objectives

The objective of this course is to

1. Equip the students with concepts basic network analysis of electrical circuits using KVL and KCL.

2. Provide an overview of one port and two port network analysis in time and frequency domain.

Course Outcomes

On completion of this course, the students will be able to

CO1: Expiation of graph theory for solving complex electrical circuits.

CO2: Analysis of RL, RC and RLC circuits using time domain approach.

CO3: Apply Laplace transform to solve RL, RC and RLC circuits in frequency domain.

CO4: Explanation and application of various network theorems to solve the given circuit.

CO5: Synthesis of RL, RC and RLC electrical circuits and explanation of two port network parameters.

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Modules	Blooms level*	Number of hours
Module 1: Graph Theory and Network equations Graph of a network, Trees, Co-trees and loops, cut set matrix, Tie set matrix, number of possible trees of a graph, duality, Loop Analysis and Node Analysis.	L1 and L2	8
Module 2: Analysis of circuits using classical Method Time and Frequency domain analysis of RL, RC and RLC circuits, Linear constant coefficient differential equation.	L2 and L3	10
Module 3: Signals and Laplace Transforms Unit step signal, Ramp signal, impulse signal, Laplace transformations and its properties, Gate function, Inverse Laplace transformations, Application of Laplace Transforms in circuit analysis.	L3 and L4	10
Module 4: Network Theorems Reciprocity theorem, Superposition theorem, Thevenin's and Norton's theorems, Millman's theorem, Maximum power transfer theorem, Compensation theorem, Tellegan's theorem.	L2 and L3	10
Module 5: Two port Network & Network Functions Introduction, two port z-, y-, T-, h-parameters, Inter-relations among parameters, Condition for reciprocity and symmetry, Interconnections of two port networks, Driving point and transfer functions, Poles, Zeros and nECE2ssary condition for driving point and transfer function.	L1, L3	10
Module 6: Network Synthesis Hurwitz polynomial, Positive real functions, synthesis of LC, RC, RL immittance functions.	L1 and L5	

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. M.E. Valkenburg, "Network analysis", 3 ed, Pearson Education, 2015.

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2. D. R. Choudhary, “Networks and Systems”, 2 ed, New Age International, 2013.
3. K.M. Soni, “Circuits and Systems”, S.K. Kataria & Sons Delhi, 2013.

Reference Books

4. Bhise, Chadda, Kulshreshtha, “Engineering network analysis and filter design”, Umesh Publication, 2012.
5. F.F. Kuo, “Network Analysis and Synthesis”, 2 ed, Wiley India Pvt. Ltd, 2006.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att:
Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	3	--	--	--	2	--	--	--	--	--	--	--	--	2	--	--
CO2	1	--	3	--	--	--	--	--	--	--	--	--	2	1	3	3
CO3	1	--	3	--	1	--	--	--	--	--	--	--	--	1	--	--
CO4	2	3	--	--	--	--	--	--	--	--	--	--	3	1	3	3
CO5	2	3	2	--	--	--	--	--	--	--	--	--	--	1	--	--

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BME2314	MEDICAL IMAGING TECHNIQUES-I	L	T	P	C
Version 1.1	Date of Approval: May 16, 2019	3	0	0	3
Pre-requisites/Exposure	Basic Electronic, Biology for Engineers, Physics				
Co-requisites	General Science				

Catalog Description

This course helps the students to understand various diagnostic imaging modalities used in medical profession e.g. X-Rays, CT scan, MRI, Ultrasound, and PET, Optical imaging, Near-Infra-red Imaging etc. etc. The content of the course will also speak about the artefacts and other problems related to the machines. The course also stresses the importance of radiation safety, ethics and legal considerations as well as professionalism.

Course Objectives

The objective of this course is to

The objective of this course is to

1. To provide an overview of medical imaging principles and machine.
2. To serve as a foundation for clinical significance of medical images.

Course Outcomes

On completion of this course, the students develop capabilities of:

CO1. *Identify* various component of Ultrasound and Doppler machine and *explain* the working principle of ultrasound and its different operating modes.

CO2. *Describe*the principle of production of X-Rays and *identify* function of various component of X-Ray machine.

CO3. *List* various component of CT-Scan, *explain* principle of CT-Scan imaging.

CO4. *List* the MRI hardware components, *explain* principles of MRI imaging, and *determine* the cause of artefact by observing the MRI images.

CO5. *Explain* the principles of PET, Optical imaging and Infrared Imaging and *determine* application of each for various pathological situation.

Course Content

Modules	Blooms level*	Number of hours
MODULE I: **Ultrasonic and Doppler Imaging** Basic of Imaging techniques and Clinical Application Introduction to Ultrasonic and Doppler Medical imaging modalities, Physics of ultrasound, Principles of image formation, Capture and display, Principles of A-Mode, B-Mode, M-Mode, Scan convertersFrame grabbers, Single line and multi-line monitoring of ultrasound displays. Various Application of Ultrasound and Doppler imaging.	L1 and L2	8

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MODULE II: **X-Ray and Angiography Imaging** Principles and production of soft and hard X- rays, Photon Interaction and K-shell, Details of radiographic and fluoroscopic images in X-Ray systems. Screen-film and image intensifier systems, Different generation of x-rays, X-Ray machine, Clinical significance of X-ray images, Digital Subtraction Angiography and its application.	L1 and L2	7
MODULE III: **CT-Scanner** Principle of CT-Scan, Evolution of CT Machines, CT image formation, Conversion of X-Ray data into scan image, Mathematical details of various algorithms, Spiral CT, Transverse Tomography, CT Angiography.	L1 and L2	5
MODULE IV: **Magnetic Resonance Imaging** MRI Hardware, Principle of MRI, Lamour Frequency, Mathematical Equation Governing MRI, Bloch equation, Time of Echo (TE) and Repetition Time(TR) and its significance, Image acquisition in magnetic resonance imaging, T1, T2, proton density weighted images, , Artifacts in imaging, Various Application of T1, T2 and PD weighted images, NMR spectroscopy	L2 and L3	10
MODULE V: **Other Advance Imaging techniques** Principles and Application of PET, Infrared Imaging, Optical Imaging.	L1 L2 and L3	6

*Bloom's Level:
L1: Knowledge; L2: Comprehension; L3: Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- Khandpur R.S, Handbook of Biomedical Instrumentation, Tata McGraw-Hill, 2008
- Webb, S., The Physics of Medical Imaging, Adern Hilger, Bristol & Philadelphia. 2013
- Hay.B.A. Edtd., Medical Images, Formation, Perception and Measurement, John Wiley, 2008

Reference Books

1. Rabiner and Gold, *Digital Signal Processing,*
2. A.C. KAK, Principles of Computed Tomography, IEEE Press, New York

Other readings:

- http://www.learningradiology.com/itunesfeed.htm

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO-PO-PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	2											1	2		
CO 2	1	2											1	2		
CO 3	1	2										3	1	2		
CO 4	1	2										3	1	2		
CO 5	1	2										3	1	2		

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BME2351	HUMAN ANATOMY AND PHYSIOLOGY	L	T	P	C
Version 1.1	Date of Approval: 16,MAY,2019	3	0	0	3
Pre-requisites/Exposure	Biology for Engineers				
Co-requisites	General Science				

Catalog Description

This course provides students a basic understanding of the human body structure and functioning. Students will be able to relate basic human body systems and life processes, name the major body systems and their functions, understand the anatomy of various body systems, including musclo-skeletal System, nervous system, cardiovascular system, Renal system, etc.. This course covers the basic anatomy and physiology topics for better understanding of the human body. This is the first part of this course which is continued in the next semester.

Course Objectives

The objective of this course is to

1. To provide the student with an in-depth study of anatomy and physiology (structure and function) of the human body.
2. To explain and identify biological levels of organization: i.e. cells to tissues, tissues to organs.
3. To identify and develop understanding of major organ systems, list the organs found in each, and their primary functions.
4. To identify the basic structural and functional principles of human organ systems including repair systems.

Course Outcomes

On completion of this course, the students develop capabilities of:

CO6. *Outline*cell organization and *describe* the physiology of various cell functioning.

CO7. *List*various muscles, bone and joint and *distinguish* between joint functioning & Structure.

CO8. *List and Describe* various structure and functioning of blood component and functioning of heart. *Apply* Einthoven's triangle to heart functioning to obtain ECG.

CO9. *Explain* the physiology of respiratory and digestive system and *determine* respiratory clinical parameters.

CO10. *Outline and describe* anatomy and physiology of nervous and renal system in interaction with endocrine gland.

Course Content

Modules	Blooms level*	Number of hours
MODULE I: **Basic Cell Structure and physiology** Basic cell structure, various cell organelles and their functions, Cell, cell membrane, polarization and repolarisation, resting membrane potential, Nernst equation, Donnans equilibrium, Goldman equation, action potential and its propagation, synaptic transmission. Tissues- their types, structure and function, structure and function of skin.	L1 and L2	6

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MODULE II: **Musclo-Skeletal System and Its Physiology** Different types of muscles and their function, General description of bones, their structure and function, types of joints and their structure and function.1. Functional aspect of bones and joints 2. Shoulder joint, Elbor joint 3. Radioulnar and wrist joint 4. Joints of hand 5. Hip joint 6. Knee joint 7. Ankle and foot	L1 and L2	7
MODULE III: **Cardiovascular System and its Physiology** Blood, Lymph and circulation: blood composition, properties and function. Structure and functions of RBCs, WBCs and platelets, Blood types, Homeostasis, Immune mechanisms, Lymph, Heart position, structure and functions, Heartbeat, electrical excitation, Einthoven's triangle, Cardiac and peripheral regulation, blood pressure and its regulation, blood flow and its regulation	L1, L2 and L3	7
MODULE IV: **Respiratory System and Digestive System** Respiratory System: position and functions. Mechanics of respiration, Lung volumes and capacities, Gas exchange between lungs and tissues, regulation of respiration. Digestive system: Different parts of digestive system, functions of each organ, digestion of proteins, carbohydrates, fats, vitamins and minerals.	L2 and L3	8
MODULE V: **Nervous System, Renal System and endocrine system** Nervous system: Basic functions and structure of CNS,ventricles, and CSF, ANS. Organs of vision,hearing,taste, and smell. Mechanism of sight, colored vision,hearing,reflex action and reflex arc. Renal system: parts of the renal system , its structure and function , formation and composition of urine . Endocrine System and Reproductive system: basic knowledge of endocrine glands, functions of male and female reproductive parts and contraception.	L1 and L2	8

*Bloom's Level:
L1: Knowledge; L2: Comprehension; L3: Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Guyton A.C and J.E. Hall, "Text book of Medical Physiology "Harcourt India Pvt. Ltd.
2. Principles of Human Anatomy and Physiology , Tortora , Wiley
3. Ross and Wilson," Anatomy and Physiology in Health and Illness" by Anne Waugh and Allison Grant.

Reference Books

1. Ganong W.F. " Review of Medical Physiology" , Prentice Hall
2. Gray's Anatomy for Students - Gray's Anatomy by A. Wayne Vogl, Richard Drake, Adam W. M. Mitchell

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

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Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO-PO-PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1												1	3		
CO 2	1	3											1	3		
CO 3	1												1	3		
CO 4	1	3											1	3		
CO 5	1												1	3		

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BME2306	ANALOG ELECTRONICS - I LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course provides the practical implementation and verification of the theoretical facts studied in theory course. It includes studying the characteristics of diodes, rectifiers, transistors and amplifiers.

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Course Objectives

The objective of this course is to

1. Provide a demonstration of various analog components like diodes, rectifiers etc.
2. Equip with understanding of different circuits like BJT, JFET, MOSFET and amplifiers.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Demonstrate the characteristics of pn junction and zener diode.

CO 2: Obtain and analyze the output of clipper-clamper circuit and rectifiers with various filters.

CO 3: Plot the characteristics of BJT, JFET and MOSFET.

CO 4: Obtain the gain and demonstrate the frequency response of single stage and double stage amplifiers.

Modules/Topics Covered**	Blooms level*	Number of hours
Lab Session-1 1. To study and plot the characteristics of a junction diode. 2. To study Zener diode I-V characteristics.	L3, L5	2
Lab Session-1I 3. To study diode based clipping and clamping circuits. 4. To study half wave, full wave and bridge rectifier with filters.	L3, L5	2
Lab Session-1II 5. To study the input and output characteristics of a transistor in its various configurations (CE and CB). 6. To study various types of Bias Stabilization for a transistor. 7. To study and plot the characteristics of a MOSFET in its various configurations. 8. To study and plot the characteristics of a JFET in its various configurations .	L3, L5	6

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Lab Session-1V . 9. To study the gain and plot the frequency response of a single stage transistor amplifier. 10. To measure gain and plot the frequency response of double stage RC coupled amplifier.	L3, L5	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Anand Kumar, "Fundamentals of Digital Circuits", 2nd Edition, Prentice-Hall, 2004
- Moris Mano, "Digital Design", 2nd Edition, Pearson Education,2007.
- R.P. Jain, "Modern Digital Electronics", 2nd Edition, Tata Mcgraw Hill, 2003

Reference Books

1. Thomas L. Floyd, "Digital Fundamentals", 11th Edition, Pearson Education, 2015
2. Malvino and Leech, "Digital Principles & Applications", 1st Edition, Tata McGraw Hill, 1993

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA					**EE**
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	**70**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**3**	**1**	--	--	--	--	--	--	**3**	--	--	**2**	--	**1**	--	**3**
CO2	**3**	**1**	--	--	--	--	--	--	**3**	--	--	**2**	--	**1**	--	**3**
CO3	**3**	**1**	--	--	--	--	--	--	**3**	--	--	**2**	--	**1**	--	**3**
CO4	**3**	**1**	--	--	--	--	--	--	**3**	--	--	**2**	--	**1**	--	**3**

1: strongly related, 2: moderately related and 3: weakly related

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COMPUTER AIDED GRAPHIC DESIGN LAB

Course Code: BME2315 **Credit Units : 01**

Course Contents:

1. To study and introduction to 3-D CAD Software to develop 3-D CAD model of Rectangular beam
2. To develop a 3-D CAD model of Hollow shaft.
3. To develop a 3-D CAD model of Nut & Bolt.
4. To develop a 3-D CAD model of Blood Vessels.
5. To develop a 3-D CAD model of Ball & Socket Joint.
6. To develop a 3-D CAD model of Knuckle Joint.
7. To develop a 3-D CAD model of Cotter Joint.
8. To study 3D rendering and develop 3D model from 2D stack of DICOM images.
9. Introduction to finishing tools for medical 3D rendered model.
10. To analyse wall-thickness, curvature analysis and part comparison.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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BME2316	MEASUREMENT AND MEASURING INSTRUMENTS	L	T	P	C
Version 2017.1	Date of Approval: 16 May ,2019	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course provides a brief knowledge of measurements and measuring instruments related to engineering. It introduces measuring elements of instruments, characteristics of measuring instruments, error analysis, transducers and its classification, measurement of resistance, capacitance and inductance, principles of analog and digital meters and different display techniques.

Course Objectives

The objective of this course is to

- Equip the students with concepts of measurement, measuring elements and challenges in measurement.
- Provide in depth knowledge of each element of measurement system.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain measuring elements and characteristics of measurement system and solve problems related with measurement errors.

CO2. Classify different types of transducers and solve problems related with transducers.

CO3. Solve problems of resistance, capacitance and inductance measurement.

CO4: Explain and solve problems on different types of analog and digital meters suitable for voltage and current measurement.

CO5: Explain display devices used in measurement system and analyze the signals on CRO.

Course Content

Modules	Blooms level*	Number of hours
Module 1: **BasicsofMeasurementSystems** Elements of Generalized Measurement System; Static & Dynamic Characteristics of Instruments; Errorsin Measurements–Sources and Types of Errors; Statistical Treatment of Data–Mean, Measures of Dispersion, Rejection of database don confidence interval	L1, L2 and L3	5
Module 2: **Transducers** Classification; Selection of Transducers; Resistive Transducers – Potentiometer, Strain gauge, Rosettes, Thermistors and RTD; Capacitive Transducers– Measurementof Liquid level by change invariation of dielectric constant; Variable Inductance Transducers–self-generating type and passive type; Piezoelectric Transducers; Photoelectric Transducers; Digital Transducer	L1, L2, L3 and L4	9

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Module 3: **Measurement of Resistance, Inductance and Capacitance** D.C.Bridges: Wheatstone's bridge, Sensitivity & Limitations; Carey Foster Bridge; Kelvindoublebridge; Megaohm bridge. A.C.Bridges:Maxwell'sInductanceCapacitanceBridge;AndersonsBridge; DeSauty'sBridge;Schering Bridge.	L1, L2, and L3	8
Module 4: **AnalogandDigitalMeters** Analogmeters:PMMCmeters-construction, torqueequation, ammetershunts,multirangeammeter,voltmeter multiplier, sensitivity, ohmmeters, multimeters; Construction &general equation of moving iron, electrodynamometer,hotwireinstruments. Digitalmeters:Digitalvoltmeter– ramptype,integratingtype,potentiometertype,Applications	L1, L2, and L3	8
Module 5: **DisplayDevicesandRecorders** LED,LCD,ColdCathodedisplays,IncandescentDisplays,F luorescentDisplays,LVD,VDU CathodeRayOscillioscope:Basicfunctioning,MeasurementofVoltag e,Current,PhaseandFrequency.	L1, L2, L3	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Electronic Instrumentation Technology by MMS Anand, PHI Pvt. Ltd., New Delhi Ed. 2005.
- Electronics Instrumentation by H.S. Kalsi TMH Ed. 2004.

Reference Books

- Electronics Instrumentation & Measurement Techniques by W.D. Cooper & A.D. Helfrick, PHI 3rd Ed.
- Electronics Measurement & Instrumentation by Oliver & Cage Mc-Graw Hill.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	**--**	**2**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**3**	**2**	**--**	**1**	**--**
CO2	**1**	**1**	**--**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**2**	**--**	**1**	**--**
CO3	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**2**	**--**	**1**	**--**
CO4	**1**	**2**	**--**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**--**	**2**	**--**
CO5	**1**	**2**	**--**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**--**	**2**	**--**

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BME2317	MEASUREMENT AND MEASURING INSTRUMENTS LAB	L	T	P	C
Version 2019.1	Date of Approval: May 16, 2019	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Course Contents:

1. To Study various Temperature Measuring Instruments and to Estimate their Response times.
2. To study the working of Bourdon Pressure Gauge and to check the calibration of the gauge in a dead-weight pressure gauge calibration set up
3. To study a Linear Variable Differential Transformer (LVDT) and use it in a simple Experimental set up to measure a small displacement.
4. To measure load (tensile/compressive) using load cell on a tutor.
5. To measure torque of a rotating shaft using torsion meter/strain gauge torque transducer.
6. To measure the speed of a motor shaft with the help of non-contact type pickups (magnetic or photoelectric).
7. Measurement of distance using capacitive pick up
8. Measurement of temperature using RTD.
9. Measurement of pressure using piezoelectric pick up.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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BME2318	VIRTUAL INSTRUMENTATION	L	T	P	C
Version 2019.1	Date of Approval: May 16, 2019	2	0	0	2
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This Course introduces virtual instrumentation and its comparison over conventional instrumentation. In this course, LabVIEW has been adopted as the platform of virtual instrumentation programming. System hardware and its interfacing techniques are introduced. Applications of virtual instrumentation are explained in various field e.g. Aviation, Automotive Defence, Medical etc.

Course Objectives

The objective of this course is to

1. To provide the core knowledge of Virtual Instruments used in research and industry.
2. To provide a LabVIEW platform on which low cost virtual instruments can be designed in very short time.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain virtual instrumentation and compare it with tradition instruments.

CO2. Explain components of LabVIEW, apply programming concept and design basic virtual instruments using LabVIEW software.

CO3. Explain the concepts of LabVIEW system hardware including input, output and interfacing devices.

CO4: Explain applications of virtual instrumentation in industries.

Course Content

Modules	Blooms level*	Number of hours
Module 1: **Introduction to Virtual Instrumentation** Introduction, Historical perspective, advantages, block diagram and architecture of a virtual instrument, conventional vs. virtual instrumentation.	L1, L2 and L4	4
Module 2: **Introduction to Software** Introduction to Lab VIEW, Front panel, back panel representations, Block diagram, Menus, Palettes, VI and Sub VI, Editing and Debugging VI, Structures, Arrays, Clusters, Charts and Graphs, Data acquisition, Instrument Control, Signal Generation and Signal Processing Examples	L1, L2, L3, L4 and L5	9

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Module 3: **Introduction to systems hardware** ADC, DAC, D/O, counters and timer, PC hardware structure, timing, interrupts, DMA, software and hardware installation, Configuring data acquisition hardware using the drives in application software, use of DAQ library functions for different analog and digital input/output operations. Input/output devices & functions like data gloves, joysticks, CRT etc.	L1 and L2	6
Module 4: **Application of Virtual Instrumentation in various fields** Aviation, Automotive, High Voltage, Defense, Chemical, Industrial, Marine, Medical, Mining, Nuclear Energy, Virtual landscapes.	L1 and L2	5

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Learning with LabVIEW 7 Express – R.H. Bishop, Pearson Education, Delhi.
2. Virtual Instrumentation Using LabVIEW- Sanjay Gupta & Joseph John, TMG; 2005.

Reference Book

1. LabVIEW Basic 1 Course Manual, National Instruments
2. LabVIEW for everyone -Wells Lisa K and Travis Jeffrey, Prentice Hall.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	--	-	-	--	--	--	--	--	--	**3**	--	--	**1**	**2**
CO2	**1**	**1**	**2**	**2**	--	--	--	--	--	--	--	**2**	--	--	**1**	**2**
CO3	**1**	**2**	--	--	--	--	--	--	--	--	--	**2**	--	--	**1**	**2**
CO4	**1**	**2**	--	-	--	--	--	--	--	--	--	**2**	--	--	**1**	**2**

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BME2319	VIRTUAL INSTRUMENTATION LAB	L	T	P	C
Version 2019.1	Date of Approval: 16 May 2019	0	0	2	1
Pre-requisites/Exposure	Signal and System				
Co-requisites					

List of Experiments:

1. To open, and explore the components of LabView.
2. To build a simple VI that converts a Celsius temperature reading to Fahrenheit.
3. (a) To create an icon and a connector pane so you can use a VI as a subVI.
   (b) To build a VI and create its icon and connector pane so you can use it as a subVI.
4. To build a VI to generate 4*5 two dimensional array of random numbers (between 1 to2).
5. To Build a VI that generate Fibonacci series starting from '0'.
6. To build a VI which finds roots of quadratic equation using formula node.
7. To build a VI that reverses the contents of an array.
8. To build a VI that can be used for sorting of numeric array i.e. in ascending or descending order.
9. To build a VI for 4*1 multiplexer operation.
10. To build a VI for 3*8 Decoder operation.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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BME2408	DIGITAL ELECTRONICS	L	T	P	C
Version 2019.1	Date of Approval: May 16, 2019	2	1	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course explores the theory and operation of the basic building blocks of digital electronics which includes combinational and sequential circuits. This course also explains the logic families and data convertors. The concepts learnt in the studies of sequential circuits will be applied in the design and analysis of Melay and Moore machines.

Course Objectives

The objective of this course is to

1. Provide the basic knowledge of digital logic levels and application of combinational and sequential circuits.
2. Equip with the understanding of logic family and data convertors.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the various logic gates, Boolean algebra and solve the k-map & tabulation method to simplify the logical function.

CO2: Explain the adder & subtractor; Apply and analyze multiplexer, decoder & encoder to design Boolean function.

CO3: Describe flip flops, shift registers & Design counters and synchronous sequential circuits.

CO4: Explain & compare different logic families and explain data convertors.

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Modules	Blooms level*	Number of hours
MODULE 1: BOOLEAN FUNCTIONS Analog & digital signals, AND, OR, NOT, NAND, NOR , XOR & XNOR gates, Boolean algebra, DeMorgan's theorems, Implementation of logical function using only NAND/NOR gates, 1`s complement and 2`s complement, BCD to Gray and Gray to BCD code conversion, Standard representation of logical functions (SOP and POS forms), K-map representation and simplification of logical function up to five variables, don't care condi- tions, XOR & XNOR simplifications of K-maps, Tabulation method	L1,L2 and L3	6
MODULE 2: COMBINATIONAL CIRCUITS Adders, Subtractors, Implementation of full adder using half adder, full subtractor using half subtractor, Multiplexer, de-multiplexer, decoder & encoder, code converters, 1 & 2 bit comparators, BCD to seven segment decoder/encoder, Implementation of logic functions using multiplexer/de-multiplexer and decoder, Implementation of 16×1 MUX using 4×1 MUX, 4×16 decoder using 3×8 decoder etc., logic implementations using PROM, PLA & PAL.	L1, L2,L3 and L4	6
MODULE 3: SEQUENTIAL CIRCUITS Difference between combinational and sequential circuits, Latch, Flip-flops: SR, JK, D & T flip flops – Truth table, Excitation table, Conversion of flip-flops, set up and hold time, race around condition, Master Slave flip flop, Shift registers: SIPO, PISO, PIPO, SIPO, Bi-directional, 4-bit universal shift register; Counters: Asynchronous/ripple & synchronous counters – up/down, Ring counter, sequence detector.	L2,L3, L4 and L5	7
MODULE 4: LOGIC FAMILIES & DATA CONVERTERS Logic families: Special characteristics (Fan out, Power dissipation, propa- gation delay, noise margin), working of RTL, DTL, TTL, ECL and CMOS families; Data converters: Special characteristics, ADC – successive ap-	L1, L2,L3 and L4	5

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proximation, linear ramp, dual slope; DAC – Binary Weighted, R-2R ladder type.		

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Anand Kumar, "Fundamentals of Digital Circuits", 2nd Edition, Prentice-Hall, 2004
2. Moris Mano, "Digital Design", 2nd Edition, Pearson Education,2007.
3. R.P. Jain, "Modern Digital Electronics", 2nd Edition, Tata Mcgraw Hill, 2003

Reference Books

1. Thomas L. Floyd, "Digital Fundamentals", 11th Edition, Pearson Education, 2015
2. Malvino and Leech, "Digital Principles & Applications", 1st Edition, Tata McGraw Hill, 1993

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO4**
CO1	**1**	**2**	**3**	--	--	--	--	--	--	--	--	--	**1**	--	--	--
CO2	**1**	**2**	**3**	--	--	--	--	--	--	--	--	**2**	**1**	--	--	**3**
CO3	**1**	**2**	**1**	--	--	--	--	--	--	--	--	**2**	**1**	--	--	**3**
CO4	**2**	**3**	**3**	--	--	--	--	--	--	--	--	--	**1**	--	--	**3**

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BME2412	BIOMATERIALS	L	T	P	C
Version 1.1	Date of Approval: MAY 16,2019	3	0	0	0
Pre-requisites/Exposure	Anatomy & physiology, Engineering Physics, Element of Mechanical Engineering, Engineering Mechanics				
Co-requisites	General Science				

Catalog Description

The course is about the biomaterials used in biomedical implants. It includes the concept of biocompatibility and toxicity test. Various biomaterial used in specific applications are content of course. It consist of metallic, polymer, ceramics and biological tissues. Course also provide understanding with material testing and sterilisation techniques.

Course Objectives

After successfully completing this course, students will be able to:

1. Understand the fundamental principals in biomedical engineering, material science and chemistry, and how they contribute to biomaterial development and performance.
2. Apply the math, science, and engineering knowledge gained in the course to biomaterial selection and design.
3. Critically review papers from the scientific literature and identify areas of research opportunities

Course Outcomes

On completion of this course, the students develop capabilities of:

CO11. *Define* the biomaterials and its requirements. *Explain* the metallic implant properties. .

CO12. *Define* the polymer and ceramic biomaterial and *describe* their application in various implants.

CO13. *Describe* methodology to enhance biomaterial properties for better compatibility with biological tissues. *Setup* test for Biocompatibility and toxicological aspect of material.

CO14. *Explain*sterilization techniques and *determine* mechanical testing setup for biomaterials for various application.

Course Content

Modules	Blooms level*	Number of hours
MODULE I: **Introduction** Definition of biomaterials, requirements of biomaterials, classification of biomaterials, Comparison of properties of some common biomaterials. Effects of physiological fluid on the properties of biomaterials,Surface properties, physical properties and mechanical properties of materials. Host tissue reactions to biomaterials **Metallic implant materials**: Stainless steel, Co-based alloys, Ti and Ti-based alloys. Importance of stress-corrosion cracking,corrosion behavior and the importance of passive films for tissue adhesion. Hard tissue replacement implant: Orthopedic implants and Dental implants. Soft tissue replacement implants: Percutaneous,skin implants and vascular implants,	L1 and L2	9

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MODULE II: **Polymeric implant materials** Classification of polymers according to thermosets, thermoplastics and elastomers : Polyolefins, polyamides, acrylic polymers, fluorocarbon polymers, silicon rubbers, acetals. Physiochemical characteristics of biopolymers. Biodegradable polymers for medical purposes, Biopolymers in controlled release systems,Synthetic polymeric membranes and their biological applications. **Ceramic implant materials:** Definition of bioceramics. Common types of bioceramics: Aluminium oxides, Glass ceramics, Carbons. Bioresorbable and bioactive ceramics	L1 and L2	9
MODULE III: **Composite implant materials**: Mechanics of improvement of properties by incorporating different elements. Composite theory of fiber reinforcement (short and long fibers, fibers pull out). Polymers filled with osteogenic fillers (e.g. hydroxyapatite). Host tissue reactions to composite materials.. **Biocompatibility & toxicological screening of biomaterials**: Definition of biocompatibility, blood compatibility and tissue compatibility. Toxicity tests: acute and chronic toxicity studies (in situ implantation, tissue culture, haemolysis, thrombogenic potential tests, systemic toxicity, intracutaneous irritation test), sensitization, carcinogenicity, mutagenicity and special tests.	L1, L2 and L3	9
MODULE IV: **Sterilisation Techniques:** Defination of sterilization, Types of sterilization: autoclaving, ETO and gamma radiation. Effects of sterilization on the properties of materials**.** **Testing of biomaterials/Implants**: In vitro testing (Mechanical testing): tensile, compression, wears, fatigue, corrosion studies and fracture toughness. In-vivo testing (animals studies): biological performance of implants. Ex-vivo testing: in vitro testing simulating the in vivo conditions. Standards of implant materials.	L2 and L3	9

*Bloom's Level:
L1: Knowledge; L2: Comprehension; L3: Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Biomaterials Science: An Introduction to Materials in Medicine, by Buddy D. Ratner, et. al. (Academic Press, San Diego, 1996)
2. Biomaterials - Science and Engineering by J B Park, (Plenum Press, 1984)
3. Biomaterials, An interfacial Approach: Hench L.L. Ethridge E.C
4. Encylopedia of Medical Devices and Instruments. I-IV: John G.Webster, Bols
5. Vol.I Biocompatibility of Clinical implantws materials: David F. Williams
6. A text book of Biomedical Engineering: Kennedy R.M.

Reference Books

1. Text book of Polymer Sciences: Fred W. Billmeyer Jr.
2. The Biomedical Engineering Hand book, CRC Press 1995: Bronzins J.D.
3. Biomaterials by Lawrence Stark & Gyan Agarwal 2. Biomaterials - An Interfacial approach by L. Hench & E. C. Ethridge
4. Biomedical Engineering Fundamentals by Joseph D. Bronzino (Publisher CRC)

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO-PO-PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	2										3			1	3
CO2	1	2										3			1	3
CO3	1	2										3		2	1	3
CO4	1	2										3		2	1	3

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BME2413	SIGNALS AND SYSTEMS	L	T	P	C
Version 2019.1	Date of Approval: May 16, 2019	2	1	0	3
Pre-requisites/Exposure	Differentiation & Integration concepts				
Co-requisites					

Catalog Description

This course deals in Digital signal processing with significant skills in advance methods for modifi-cation, analysis, classification & sampling of signals. It provides the broad knowledge of design, and realization of digital signal processing systems. The problems based on transformation of do-mains and filter design will be focused on.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of signals and systems.
2. Provide in-depth knowledge of representation of signals in frequency & z-domain.

Course Outcomes

On completion of this course, the students will be able to

CO1: Represent, analyze & categorize discrete-time signals and systems in time domain with an emphasis on linear time invariant systems.

CO2: Apply the fourier series expansion to signals and obtain its constituent frequencies.

CO3: Convert the signals from time domain to frequency domain using fourier transform.

CO4: Apply the z- transform on discrete signals to solve the problems related to computational complexity.

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Modules	Blooms level*	Number of hours
Module 1: **Signals And Systems** Introduction of signals and systems; classification of signal, continuous time and discrete time signals, operations performed on them, even and odd signals, periodic and non periodic signals, deterministic and random signals, energy signals, power signals, elementary signals: impulse, step, ramp and exponentials, classification of systems.	L1,L2 and L4	8
Module 2: **LTI System** Response of LTI system for continuous and discrete time systems, Impulse response, Step response, properties of continuous LTI and discrete LTI systems, LTI systems described by differential and difference equation, analysis of LTI Systems, interconnection of systems.	L1,L2 and L4	6
Module 3: **Fourier Series** Representation of continuous time periodic signal, properties of continuous time Fourier series, representation of discrete time periodic signals, convergence of the Fourier series, properties of discrete time Fourier series, Fourier series and LTI systems.	L2,L3	7
Module 4: **Fourier Transform** Continuous time Fourier transform, properties of continuous time Fourier transform, discrete time Fourier transform, properties of discrete time Fourier transform; applications; Bandwidth determination of signals and systems.	L2,L3	7
Module 4: **z-Transform** Definition of z-transform, region of convergence, properties of z-transform, first order system, second order system, inverse z-transform, analysis of LTI system using z-transform.	L2,L3	8

**Bloom's Level:*

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L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. **Proakis, Manolakis**, Digital Signal processing, 4th edition, Pearson, 2007.
2. **Oppenheim & Schaffer**, Digital Signal Processing, 1st edition, Pearson, 1975.

Reference Books

1. **Simon Haykin**, Signals and Systems, 2nd Edition, Willy Publications.
2. **B.P.Lathi**, Linear Systems & Signals, 2nd Edition, Oxford Publication.
3. **Roberts**, Fundamentals of Signals and Systems, Tata Mcgraw Hills Publication.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--
CO2	2	1	--	--	2	--	--	--	--	--	--	--	2	1	--	--
CO3	2	1	--	--	2	--	--	--	--	--	--	--	2	1	--	--
CO4	2	1	--	--	2	--	--	--	--	--	--	--	2	1	--	--

1: strongly related, 2: moderately related and 3: weakly related

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BME2451	BIO-INSTRUMENTATION	L	T	P	C
Version 1.1	Date of Approval: 16, May 2017	3	0	0	3
Pre-requisites/Exposure	Anatomy &Physiology and Electronic Circuit				
Co-requisites	General Science				

Catalog Description

Bio-instruments comprise of all equipment use in healthcare system for diagnosis and therapy. This course is consist of diagnosis equipment using various physiological parameters. Courseinculcate an understanding of the measurement principles of medical instrumentation, including biochemical sensors, bio-potential amplifiers, bioelectrical signals (ECG, EEG), measurement of respiratory function, cardiac variables, blood pressure, blood flow as well as medical devices.

Course Objectives

The objective of this course is to

3. To provide an overview of bio-instrumentation principles and constraint.
4. To serve as a foundation for design and use of medical instruments.

Course Outcomes

On completion of this course, the students develop capabilities of:

CO15. *Identify* appropriate transducer and electrode to *estimate* specific physiological parameter.

CO16. *List* electro-physiological signal (ECG, EEG, EMG) specification and *construct* device to analysis signal characteristics.

CO17. *List* various respiratory parameter and *demonstrate* the use of electrical impedance tomography for plethysmography.

CO18. *Explain* the principle of oximetry and *construct* oximeter device.

CO19. *Explain*and *demonstrate* the principle of non-invasive blood pressure measurement.

Course Content

Modules	Blooms level*	Number of hours
MODULE I: **Introduction to Bio-Instrumentation** Transducers and Reference electrodes: classification of transducers, temperature transducers, displacement transducer, pressure transducer. Magnetic induction transducer, photoelectric transducer, piezoelectric transducer, magnetic induction.Electrode theory, biopotential electrodes, microelectrodes, skin surface electrodes, needle electrodes.	L1 and L2	10
MODULE II: **Electrophysiological Signals and Measurement Devices** ECG: electrodes and conversion of ionic potentials to electric potential, ECG instrumentation amplifiers, driven right leg circuitry.Introduction and characteristics of bio signals (EEG, ECG, EMG), removal of artifacts, event detection and correlation analysis of ECG signals.	L1, L2 and L3	8
MODULE III: **Respiratory System and Measurement Devices** Respiratory System: position and functions. Methods to measure residual volumes, Introduction to respiration measurement using electrical impedance plethysmography, Electrical impedance changes during breathing, 2 and 4 electrode measurement, 4 electrode technique.	L1, L2 and L3	6

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MODULE IV: **Oximetry and Measurement devices** Introduction to Oxygen saturation using pulse oximetry, optical characteristics of oxygenated and deoxygenated blood, amplifiers.Principles of pulse oximetry, circuits of pulse oximetry, constant current source, current – voltage converter	L2 and L3	6
MODULE V: **Blood Pressure measurement techniques** Theories of Non-invasive blood pressure measurement, Korotkoff sounds and circuitry for method based on oscillometry. Fino-sphygmomanometer principles and limitation.	L2 and L3	6

*Bloom's Level:
L1: Knowledge; L2: Comprehension; L3: Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- Khandpur R.S, Handbook of Biomedical Instrumentation, Tata McGraw-Hill, 2008
- Leslie Cromwell, Fred J. Weibell, Erich A Pfeiffer, Biomedical Instrumentation and Measurements , PHI , 2nd Edition , 2004.

Reference Books

3. John G.Webster, Medical Instrumentation : Application and Design, 3rd Edition , John Wiley & Sons , New York , 1998 .

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO-PO-PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1												1		
CO2		1		2										1		
CO3	1		2											1		
CO4		1	2											1		
CO5		1	2											1		

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BME2403	BIO-INSTRUMENTATION LAB	L	T	P	C
Version 2019.1	Date of Approval: 16, May 2019	0	0	2	1
Pre-requisites/Exposure	Anatomy &Physiology and Electronic Circuit				
Co-requisites	General Science				

Course Objectives

The objective of this course is to

- To provide hands-on practice with medical signal analysis.
- To serve as a foundation for design of medical device.

Course Outcomes

On completion of this course, the students will be able to

CO20. Designing of medical device component as amplifier, sensors, power supplies, filters etc.

CO21. Design and measure the physiological signal in real time.

Catalog Description

This course helps the students to do hands-on practice with various medical equipment as pulse oximeter, ECG, EMG etc. Course also help student to build capacity to design components for medical devices as, electronic filter, power supplies, amplifiers, etc. with desire output. Course included the basic demonstration of transducer and sensors use for measurement. It consists of signal analysis and visual presentation of analyzed result.

Course Content

Laboratory Session 1: 2 hours

1. Study of pulmonary function analyzer using spirogram.

Laboratory Session 2: 2 hours

2. To study finger-tip oximeter.

Laboratory Session 3: 2 hours

3. Designing of instrumentation amplifier.

Laboratory Session 4: 2 hours

4. Designing of notch filter.

Laboratory Session 5: 2 hours

5. To study voltage regulator IC 7805, 7809, 7812 series.

Laboratory Session 6: 2 hours

6. To determine Bradycardia and Tachycardia using ECG Training Kit.

Laboratory Session 7: 2 hours

7. To determine heart rate using ECG simulator Kit.

Laboratory Session 8: 2 hours

8. Circuitry explanation for patient leakage current.

Laboratory Session 9: 2 hours

9. To determine balancing condition for thermistor using wheat stone bridge.

Laboratory Session 10: 2 hours

10. Study of pressure changes using strain gauge.

Text Books

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- Khandpur R.S, Handbook of Biomedical Instrumentation, Tata McGraw-Hill, 2008
- Webb, S., The Physics of Medical Imaging, Adern Hilger, Bristol & Philadelphia. 2013
- Hay.B.A. Edtd., Medical Images, Formation, Perception and Measurement, John Wiley, 2008
- Lab Practical Manual

Reference Books

- Rabiner and Gold, *Digital Signal Processing*,
- A.C. KAK, Principles of Computed Tomography, IEEE Press, New York

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	IA				EE	
	A	PR	LR	V	PR	V
Weightage (%)	5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO-PO-PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1												1		
CO2		1		2										1		

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BME2409	DIGITAL ELECTRONICS LAB	L	T	P	C
Version 2019.1	Date of Approval: 16, May 2019	0	0	2	1
Pre-requisites/Exposure	Signal and System				
Co-requisites	Nil				

List of Experiments:

1. To verify the truth tables of NOT, OR, AND, NOR, NAND, XOR, XNOR gates.
2. To obtain half adder, full adder using gates and verify their truth tables.
3. To obtain half subtractor, full subtractor using gates and verify their truth tables.
4. To implement control circuit using multiplexer.
5. To convert BCD code into excess 3 code and verify the truth table.
6. To verify the truth tables of RS, D, JK and T flip- flops.
7. To implement and verify 3-bit bi-directional shift register.
8. To design and study asynchronous/ripple counter.
9. To design and study synchronous counter.
10. To design and study a sequence detector.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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BME2414	SIGNALS & SYSTEMS LAB	L	T	P	C
Version 1.1	Date of Approval: 16, May 2019	0	0	2	1
Pre-requisites/Exposure	Basic knowledge of Matlab				
Co-requisites					

Course Objectives

The objective of this course is to

1. To equip the students with the signal processing tool of Matlab through practical exposure.
2. To provide sound foundation of the basic signal generation and its various operations in Matlab.

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand the concepts of basic signals and write matlab code to generate them.

CO2. Write programs related to various operations performed between two signals like correlation & convolution.

CO3. Write programs for transforming the signal from time domain to frequency domain & z-domain.

CO4. Use Matlab as a computation and visualization tool in the study of signals and systems.

Catalog Description

This lab exercises provide opportunities for applying & implementing basic signal and system concepts. Topics include signal generation, convolution, correlation, discrete Fourier Transforms and z transforms with an emphasis on using computer software (Matlab) for analysis and simulation.

Course Content

Laboratory Session 1: 4 hours

1. To Study auto correlation of two signals.
2. To study cross correlation of two sequences.

Laboratory Session2: 2 hours

3. To study convolution of two sequences.
4. To study impulse response.

Laboratory Session 3: 4 hours

5. To study z transform of a a) sinusoidal signal, b) step function.
6. To compare fourier and z transform of a signal.

Laboratory Session 4: 2 hours

7. To study convolution theorem in time and frequency domain

.**Text Books**

1. Alan.V Oppenheim, Signals and Systems, 4th Edition 2007, Pearson Prentice Hall Publication.
2. K.M. Soni, Signals and Systems; 3rd Edition, S.K. Kataria & Sons Publication.
3. P.Ramesh Babu, Signal and Systems, 3rd Edition, Scitech Publications (INDIA) Pvt. Ltd.

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Reference Books

1. Simon Haykin, Signals and Systems, 2nd Edition, Willy Publications.
2. B.P.Lathi, Linear Systems & Signals, 2nd Edition, Oxford Publication.
3. Roberts, Fundamentals of Signals and Systems, TMH Publication.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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BME2407	ANALOG ELECTRONICS- II	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	3	0	0	3
Pre-requisites/Exposure	Basic Electronics and Circuital Analysis				
Co-requisites	Nil				

Catalog Description
This course introduces the application of semiconductor devices in linear analog circuits. The course stresses on circuit designs using the operational amplifier, active filters and oscillators. The course also provides the overview on the

Course Objectives
The objective of this course is to
1. Provide the fundamental knowledge of linear analog circuits.
2. Provide the knowledge about practical circuit designs using OP Amp.

Course Outcomes
On completion of this course, the students will be able to
CO1. Describe the circuits having BJT and Operational Amplifiers.
CO2. Solve the Linear and Non-linear circuits and analyze them in terms of their parameters and applications.
CO3. Categorize the waveform generation circuits and apply them in laboratory projects.
CO4. Analyze the circuital knowledge to Linear ICs and filters and apply them for industry problem.

Course Content

Modules	Blooms level*	Number of hours
MODULE I: Building Blocks of Analog ICs 6 lecture hours Differential amplifier, Op-amp Model, op-amp DC & AC parameters, virtual ground, Current mirrors, Active loads, Level shifters and output stages.	L1 and L2	6
MODULE II: Operational amplifiers Introduction, open loop and closed loop configuration, op-amp parameters (input offset current, output offset current, i/p bias current, CMRR, PSRR, null adjustment range, etc,)	L1 and L2	5

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Inverting and non-inverting configuration, voltage gain of inverting and non inverting configurations.		
MODULE III: Linear & Non Linear Wave shaping Adders, Voltage to current, current to voltage Converter, Integrators, Differentiators**,** Voltage follower (voltage buffer), summer, subtractor, Comparators, log/antilog circuits using Op-amps, precision rectifiers.	L2, L3 and L4	6
MODULE IV: Waveform Generations Damped and undamped oscillations, Barkhausen criterion for sustained oscillation. Tank circuit generator Astable multi Vibrators, OTA-C Oscillators, Crystal oscillator**.** Types of oscillators: LC-Hartley and Colpitts, RC-RC phase shift and Wien bridge oscillator, Basics of tuned Amplifiers, Voltage Controlled Oscillator.	L2 L3 and L4	7
MODULE V: Active RC Filters & Applications of Linear Circuits Idealistic & Realistic response of filters (LP, BP, and HP), Butter worth & Chebyshev approximation filter functions, LP,BP,HP and All pass, Notch Filter, Operational transconductance amplifier (OTA)-C filters.	L2, L3 and L4	6
MODULE VI: Applications of IC Analog Multiplier & Timer IC phase locked loops, 555 Timer, IC voltage regulators-(fixed, variable) 78xx, 79xx series and adjustable.	L3 and L4	6

*Bloom's Level:

L1: Knowledge; L2: Comprehension; L3: Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. **Ramakant Gaekwad,** Op-Amps and Linear Integrated Circuits, 4thEdition PHI, 2001.
2. **D. Roy Choudhury and Shail B. Jain,** Linear Integrated Circuits, 2ndEdition, New ageInternational, 2006.

Reference Books

1. **Adel S. Sedra and K. C. Smith** Microelectronic Circuits, Sixth Edition, Oxford University Press,2013.

2. **George Clayton and Steve Winder**, Operational Amplifiers, 5th Edition, Elsevier, 2008.

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	1	1	-	-	-	3	-	-	-	-	-	-	1	-	-	-
CO3	1	2	3	-	-	3	-	-	-	-	--	-	1	1	-	-
CO4	1	1	-	-	-	2	-	-	-	-	-	-	1	1	-	-

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BME2417	ANALOG ELECTRONICS-II LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Circuit Theory				
Co-requisites	Nil				

Catalog Description
In this course the concepts of Analog Electronics are discussed. Design and analysis of efficient circuits using op-amp like adder, subtractor, filters and oscillators.

Course Objectives
The objective of this course is to

1. To provide the basic skills required to understand, develop, and design of various engineering applications involving Analog Electronic & Circuits.
2. To provide basic laboratory exposures for Analog Circuits and applications.

Course Outcomes
On completion of this course, the students will be able to

CO1: Construct adder, subtractor, an inverting and non-inverting amplifier.
CO2: Design transistor-based RC oscillator (Wien bridge and RC phase shift oscillator) circuit.
CO3: Construct astable and mono-stable mode timer circuit using IC 555.
CO4: Design of Integrator, differentiator and low pass & high pass active filter circuit using Op-Amp (I.C-741)

List of Experiments:

Modules	Blooms level*	Number of hours
1. To study the op amp as an inverting and non inverting amplifier. 2. To use the op amp as an adder, subtractor, integrator and differentiator. 3. To design a ramp and a square wave generator. 4. To study the IC-555 timer as stable and bistable multivibrator.	L1, L2	8
5. To design low pass, high pass and band pass filters using op- amp. and plot their frequency response. 6. To design and study class a power amplifier. 7. To design and study a class B push pull amplifier.	L3 and L4	10

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8. To study various feedbacks such as voltage series feedback. 9. To design RC phase shift and Wein bridge oscillators using op amplifier. 10. To design and study Colpitt and Hartley oscillators.	L2, L4	10

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**2**		**3**										**1**			
CO2		**2**	**3**										**3**			
CO3	**3**												**2**			
CO4	**3**	**2**	**2**								**2**		**1**			

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BME2416	MEDICAL IMAGING TECHNIQUES-II	L	T	P	C
Version 1.1	Date of Approval: 16 May, 2019	3	1	0	3
Pre-requisites/Exposure	Basic Electronic, Biology for Engineers, Physics				
Co-requisites	General Science				

Catalog Description

This course helps the students to understand various advance techniques imaging modalities used in medical profession e.g. MRI, MRI Pulse Sequenses, Diffision, Perfusion, Contrast imaging, ,etc. The content of the course will also speak about the artefacts and other problems related to the machines. The course also stresses the importance of radiation safety, ethics and legal considerations as well as professionalism.

Course Objectives

The objective of this course is to

1. To provide an overview of advance medical imaging principles and machine.
2. To serve as a foundation for research in field of medical imaging.

Course Outcomes

On completion of this course, the students develop capabilities of:

CO22. *Explain* basic component of Pulse sequence and *design* and *stimulate* Echoes.
CO23. *Describe* advance techniques of pulse sequences, and able to *differentiate* between them
CO24. *Describe* various contrast imaging principles and *analyses* clinical parameters.
CO25. *Illustrate* MRS and MRE and *compile* processed data.
CO26. *Describe* application of MRI in field of clinical research and diagnosis.

Course Content

Modules	Blooms level*	Number of hours
MODULE I: **Basic of Magnetic Resonance Pulse Sequences** Basic Classification, Response to a single RF Pulse: Saturation and inverse recovery, Spin Echo, Spin-echo equation, General Response of two or more RF pulses: Stimulated Echoes.	L2, L3, and L4	8
MODULE II: **Advance Techniques of Pulse Sequences** Review of the main classes of imaging pulse sequence, Gradient Echo-Pulse sequence(GRE), Rapid-GRE, Echo-planar and spiral imaging, Interleaved and hybrid sequence, Multislice vs 'True-3D' sequence for volume imaging, Acquisition Strategies in k-space, Gating, Parallel imaging. Other imaging Methods with Historical Interest: Points Methods and Line Scanning Methods	L2 and L3	10

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MODULE III: **Image contrast Mechanism and Quantitative Imaging** General Principles of Quantitative Imaging(QI), Relaxation Times and Dynamic contrast enhance MRI, Flow, ,Diffusion and Perfusion, Susceptibility and functional MRI, Ultra-Short TE imaging, Magnetic transfer and polarisation Transfer, Chemical shift Imaging, Current-Density Imaging, Imaging of nuclei other than Hydrogen	L2, L3 and L4	15
MODULE IV: **MR Spectroscopy and MR elastrography** Introduction to MRS, Chemical –Shifted Spectroscopy, 1D Spectroscopy data processing, Introduction to MRE and its typical application.	L2 and L3	8
MODULE V: **Application of MR in Medicine** Cancer, Neurology, Cardiology, Interventional Procedures and Monitoring of Therapy, Other Medical Applications, Molecular and Cellular Imaging, Genetic Phenotyping for Pre-Clinical Imaging	L1 and L2	7

*Bloom's Level:
L1: Knowledge; L2: Comprehension; L3: Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- Khandpur R.S, Handbook of Biomedical Instrumentation, Tata McGraw-Hill, 2008
- Webb, S., The Physics of Medical Imaging, Adern Hilger, Bristol & Philadelphia. 2013
- Hay.B.A. Edtd., Medical Images, Formation, Perception and Measurement, John Wiley, 2008

Reference Books

- Rabiner and Gold, *Digital Signal Processing*,
- A.C. KAK, Principles of Computed Tomography, IEEE Press, New York

Other readings:

- http://www.learningradiology.com/itunesfeed.htm

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO-PO-PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
CO 1		1	2									3		1	2	3
CO 2		2	1									3		1	2	3
CO 3		2	1									3		1	2	3
CO 4		2	1									3		1	2	3
CO 5		2	2	1								3		1	2	3

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BME2418	ARTIFICIAL NEURAL NETWORK	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	2	0	0	2
Pre-requisites/Exposure	Basic Knowledge of Brain functioning				
Co-requisites	Nil				

Catalog Description

The course provides introduction to neural network and a deep insight into the basics of brain & its functioning basics of various neural models & neural schema used for learning. With this course students would be able to know the basics of each introductory feature of human brain and its features which would prove to be very helpful throughout their degree and would prove helpful in understanding other related subjects also.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of learning of brain problem solving techniques and develop proficiency in creating neural structures using the MATLAB.
2. Provide an overview of various control statements, data structures, packages related to image addition, graphics, different types of neural models.

Course Outcome

On completion of this course, the students will be able to

CO 1: Define Artificial Neural Network & its similarity to biological neural network and explain its application in our day to day life.

CO 2: Analyze ANN learning, Error correction learning, Hebbian learning, Competitive learning and Boltzman Learning.

CO 3: Implement simple perceptron, Perceptron Learning rule, modified perceptron learning rule, feed forward neural network & feedback Neural Network.

CO 4: Explain self-organizing Map, Hopfield network, Adaptive resonance theory and its various learning rules.

CO 5: Analyze memory-based learning, Associative learning, Bi-directional learning and Auto associative learning.

Modules	Blooms level*	Number of hours
Module-I Artificial Neural Networks (ANN) and biological neural networks, supervised and unsupervised learning rules, neural network applications	L1, L2 and L3	6
Module-II Unsupervised learning:- Hebbian learning and competitive learning. Supervised learning:- Back propagation algorithms, Learning rule:- Delta learning rule, Widrow-Hoff learning rule, Winner-Take-All learning rule	L1, L2 and L3	6
Module-III Feed forward neural network, feed backward neural network, Perceptron and its learning law, single-layer perceptron, multi-layer perceptron.	L2, L3 and L4	6

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Module-IV Self organizing networks: Kohonen algorithm, Hopfield Networks: Hopfield network algorithm, Adaptive resonance theory: Network and learning rules.	L2, L3 and L4	6
Module V Associative memory, auto-associative memory, bi-directional associative memory.	L2, L3 and L4	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

TextBook:

1. Kenji Suzuki (ed.) - InTech **,** 2013
2. Todd Troyer **-** University of Texas at San Antonio**,** 2005.

Reference Book:

1. MATLAB 2017 Book released by MATWORS

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**												**1**			
CO2	**1**												**1**		**1**	
CO3		**1**	**2**										**1**			
CO4		**1**	**2**	**1**									**1**		**1**	
CO5			**2**										**1**			

1: strongly related, 2: moderately related and 3: weakly related

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BME2419	ARTIFICIAL NEURAL NETWORK LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Basics of MATLAB				
Co-requisites	NIL				

Catalog Description
In this Lab course first student should learn about advanced level of software used for easy calculation and toolbox used for software like MATLAB.

Course Objectives
The objective of this course is to
- Make the students apply knowledge of various neural models required for solving complex problems.
- Provide a demonstration of different types of image processing techniques through MATAB toolbox.

Course Outcomes
On completion of this course, the students will be able to
CO1: Acquiring knowledge of Basics of High-end calculation software and need in Computer Science & engineering
CO2: Demonstrate the All preliminary functions in MATLAB
CO3: Apply the knowledge of all the basics function and toolbox knowledge of MATLAB
CO4: Demonstrate the Neural Network model in MATLAB
CO5: Demonstrate usage of applications involving with Image processing & Its Toolbox used by MATLAB

Modules/Topics Covered**	Blooms level*	Number of hours
7. Introduction of MATLAB (a) Basic Variable deceleration & its operation (b) Function use & its application	L3, L5	4
8. Sample Programs in MATLAB (a) Basic use of Matrix and Graph Plotting (b) Different type of graph plotting with use of different -2 type of data	L3, L5	6
9. Sample Programs using MATLAB functions (a) Create a basic program MATLAB using functions (b) Use of basic function Image processing (c) Practice on Basic function of Image processing tool box.	L3, L5	6
10. Sample programs of ANN functions (a) Practice on ANN toolbox function in MATLAB (b) Write a program for training a small network in MATLAB	L3, L5	6
11. Sample Programs using ANN tool box & Image processing toolboix (a) Demonstrate the use of ANN tool box & Image processing toolbox and write a program after combining it.	L3, L5	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

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Text Books

- Kenji Suzuki (ed.) - InTech , 2013
- Todd Troyer - University of Texas at San Antonio , 2005

Reference Books

1. MATLAB 2017 Book realeased by MATWORS.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA					EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	**70**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE- External Exam

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**2**	**1**	--	--	--	--	--	--	--	--	--	--	**2**	--	--	--
CO2	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO3	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO4	**1**	**3**	**2**	--	--	--	--	--	--	--	--	--	**2**	--	**2**	--
CO5	**1**	**3**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--

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BME2501	MICROPROCESSOR SYSTEMS	L	T	P	C
Version: 2019.1	Date of Approval: May 21, 2019	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course deals with the systematic study of the Architecture and programming issues of microprocessor family and its applications. The aim of this course is

1. To introduce students with the architecture and operation of typical microprocessors.
2. To familiarize the students with the programming and interfacing of microprocessors
3. To provide the basic knowledge of the microprocessor needed to develop the embedded system based products as a solution to real time problems.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the architecture, pin configuration, addressing modes, control words, timing diagram, instruction set of 8085 microprocessors and Interfacing ICs

CO2. Explain the architecture, pin configuration, addressing modes, control words of 8086, 8087 and other 16 bit microprocessors and Interfacing ICs

CO3. Develop the assembly language program using 8085 using stacks & subroutines.

CO4. Design circuitry to the Microprocessor I/O ports in order to interface the processor to external devices so as to provide solutions real-world control problems

Modules	Blooms level*	Number of hours
Module I: Introduction to Microcomputer Systems Introduction to Microprocessors and microcomputers, Study of 8 bit Microprocessor, 8085 pin configuration, Internal Architecture and operations,interrupts, Stacks and subroutines, various data transfer schemes.	L1, L2, L3,L4	6
Module II: ALP and timing diagrams Introduction to 8085 instruction set, advance 8085 programming, Addressing modes, Counters and time Delays, Instruction cycle, machine cycle, T-states, timing diagram for 8085 instruction.	L4,L5,L6	8
Module III: Memory System Design & I/O Interfacing Memory interfacing with 8085. Interfacing with input/output devices (memory mapped, peripheral I/O), Cache memory system. Study of following peripheral devices 8255, 8253, 8257, 8259, 8251.	L3,L4, L5,L6	9

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Module IV: Architecture of 16-Bit Microprocessor Difference between 8085 and 8086, Block diagram and architecture of 8086 family, pin configuration of 8086, minimum mode & maximum mode Operation, Bus Interface Unit, Register Organization, Instruction Pointer, Stack & Stack pointer, merits of memory segmentation, Execution Unit, Register Organization.	L2, L3, L4	7
Module V: Pentium Processors Internal architecture of 8087, Operational overview of 8087, Introduction to 80186, 80286, 80386 & 80486 processors, Pentium processor (P-II, P-III, P-IV). .	L1,L2	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Douglas Hall, Microprocessor and Interfacing:, Tata McGraw Hill, 2017
2. Gaonkar R. S , Microprocessor Architecture, Programming and Applications, Wiley

Reference Books

- Yu Cheng Liu & Glen A. Gibson, Microcomputer Systems: 8086/8088 family Architecture, Programming and Design, PHI Publication, 2016.
- Ram B., Fundamentals of Microprocessors and Microcomputers, DhanpatRai& Sons, 2017

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO4
CO1	1	2	--	--	--	--	--	--	--	--	--	--	3	2	1	
CO2	1	1	2	3	--	--	--	--	--	--	--	--	3	3	2	
CO3	-	-	-	1	2	3	--	--	--	--	--	--		2	2	1
CO4	-	-	-	1	--	2	--	--	2	3	3	--		2	2	1

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BME2513	MEDICAL IMAGE PROCESSING	L	T	P	C
Version 1.1	Date of Approval: 21 May, 2019	3	0	0	3
Pre-requisites/Exposure	Engineering Mathematics				
Co-requisites	General Science				

Catalog Description

Course give introduction to digital image processing and its application with clinical image. Course consists of image enhancement, denoise, filtering in spatial and frequency domain etc. techniques. Its include image segmentation and feature extraction methods. Besides, course gives the insight in the process of registration and its application. Course provide the foundation for medical image constriction, to develop complex algorithm and application of machine learning. Furthermore, course develop a life long learning capabilities in the students.

Course Objectives

The objective of this course is to

- To provide an overview of medical image processing and its constraint.
- To serve as a foundation for design and develop complex medical image processing algorithms.

Course Outcomes

On completion of this course, the students develop capabilities of:

CO27. *Identify*the relation between pixels in an image, and coceots of quantization, resolution inn images.

CO28. *Apply* intensity transformation and spatial filter for various application of Image Processing.

CO29. *Develop and Apply* various frequency domain operation on an image for filtering, and analyzing.

CO30. *Deploy* the programming skill of segmentation of RoI using various algorithm.

CO31. *Deploy* the programming skill of Registration of images using various algorithm

Course Content

Modules	Blooms level*	Number of hours
MODULE I: **Introduction to Medical Imaging** Digital image processing, fundamental steps in digital image processing, Component of Image processing. Simple Image Formation Model, Image Sampling and Quantization,Representing Digital Images, Spatial and Intensity Resolution, Image Interpolation, Some Basic Relationships between Pixels, An Introduction to the Mathematical Tools Used in Digital Image Processing, Medical Imaging History, Various Projection or View of Medical Imaging, Fundamental Principles of Medical imaging, DICOM images format.	L1 and L2	10
MODULE II: **Intensity Transformations and Spatial Filtering** The Basics of Intensity Transformations and Spatial Filtering, Some Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Noise model and noise filtering, Application	L1, L2 and L3	8

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MODULE III: **Filtering in the Frequency Domain Filtering in the Frequency Domain** The brief Introduction to Fourier Series and Transform, The Basics of Filtering in the Frequency Domain Image Smoothing Using Frequency Domain Filters , Image Sharpening Using Frequency Domain Filters, Noise filtering in frequency domain, Application.	L1, L2 and L3	6
MODULE IV: **Segmentation** Morphological Image Processing: Erosion and Dilation, Opening and Closing and its segmentation application. Point, Line, and Edge Detection, Thresholding Region-Based Segmentation; Region Growing, Hough Transformation.	L2 and L3	6
MODULE V: **Registration** Geometric Transformation, Intensity interpolation, Similarity measure, Sum of Square difference, Correlation coefficient, Mutual Information, Structural Similarity Index, Feature based registration, Least Square Fit.	L2 and L3	6

*Bloom's Level:
L1: Knowledge; L2: Comprehension; L3: Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- Rafael C., Gonzalez and Richard E. Woods, *Digital Image Processin*g, Pearson Education Asia, 2001

Reference Books

- Anil K. Jain, *Fundamentals of Digital Image Processing*, Prentice Hall of India, 1997
- William K. Pratt, *Digital Image Processing*, John Wiley, NJ, 1987.
- Albert Macouski, *Medical Imaging systems*, Prentice Hall, New Jersey.1983.
- Sid Ahmed M.A., *Image Processing Theory, Algorithm and Architectures*, McGraw Hill, 1995.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO-PO-PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
CO 1			2		1										1	
CO 2				2	1										1	
CO 3			2		1										1	
CO 4			2		1										1	
CO 5			2		1										1	

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BME2514	MACHINE LEARNING	L	T	P	C
Version 1.1	Date of Approval: 16, May 2020	3	0	0	3
Pre-requisites/Exposure	Engineering Mathematics				
Co-requisites	General Science				

Catalog Description

Machine learning is the science of getting computers to act without being explicitly programmed. In the past decade, machine learning has given us self-driving cars, practical speech recognition, effective web search, and a vastly improved understanding of the human genome. Machine learning is so pervasive today that you probably use it dozens of times a day without knowing it. Many researchers also think it is the best way to make progress towards human-level AI. In this class, you will learn about the most effective machine learning techniques, and gain practice implementing them and getting them to work for yourself. More importantly, student will learn about not only the theoretical underpinnings of learning, but also gain the practical know-how needed to quickly and powerfully apply these techniques to new problems. Finally, student will learn about some of Silicon Valley's best practices in innovation as it pertains to machine learning and AI.

This course provides a broad introduction to machine learning, datamining, and statistical pattern recognition. Topics include: (i) Supervised learning (parametric/non-parametric algorithms, support vector machines, kernels, neural networks). (ii) Unsupervised learning (clustering, dimensionality reduction, recommender systems, deep learning). (iii) Best practices in machine learning (bias/variance theory; innovation process in machine learning and AI). The course will also draw from numerous case studies and applications, so that you'll also learn how to apply learning algorithms to building smart robots (perception, control), text understanding (web search, anti-spam), computer vision, medical informatics, audio, database mining, and other areas.

Course Objectives

The objective of this course is to

- To provide an overview of Machine Learning and its constraint.
- To serve as a foundation for design and develop complex ML algorithms.

Course Outcomes

On completion of this course, the students develop capabilities of:

CO32. *Identify* the constrain of ML, *differentiate* between supervised and unsupervised learning; *develop* function for regression and cost function.
CO33. *Apply* the concept of ML and *deploy* gradient descent algorithm for logistic regression.
CO34. *Apply* the regularization parameters to optimize the ML algorithm.
CO35. *Develop* the Algorithm using Neural network principle.
CO36. *Deploy* the principle of ML for Optimization and rectification of output error.

Course Content

Modules	Blooms level*	Number of hours

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MODULE I: **Introduction to Machine Learning** What is Machine Learning? Supervised Learning, Unsupervised Learning; Linear **Regression with One Variable:**Model Representation, Cost Function, Cost Function - Intuition I, Cost Function - Intuition II, Gradient Descent, Gradient Descent Intuition, Gradient Descent For Linear Regression; **Linear Algebra Review:**Matrices and Vectors, Addition and Scalar Multiplication, Matrix Vector Multiplication, Matrix Multiplication, Matrix Multiplication Properties, Inverse and Transpose	L1 and L3	10
MODULE II: Linear Regression with Multiple Variables Multiple Features: Gradient Descent for Multiple Variables, Gradient Descent in Practice I - Feature Scaling, Gradient Descent in Practice II - Learning Rate, Features and Polynomial Regression, Normal Equation, Normal Equation Noninvertibility; Logistic Regression: Classification, Hypothesis Representation, Decision Boundary, Cost Function, Simplified Cost Function and Gradient Descent, Advanced Optimization, Multiclass Classification: One-vs-all	L1, L2 and L3	8
MODULE III: Regularization The Problem of Overfitting, Cost Function, Regularized Linear Regression, Regularized Logistic Regression	L1, L2 and L3	6
MODULE IV: Neural Networks: Representation Non-linear Hypotheses, Neurons and the Brain, Model Representation I, Model Representation II, Examples and Intuitions I, Examples and Intuitions II, Multiclass Classification Neural Networks: Learning Cost Function, Backpropagation Algorithm, Backpropagation Intuition, Implementation Note: Unrolling Parameters, Gradient Checking, Random Initialization, Putting It Together	L2 and L3	6
MODULE V: Practical Aspects for Applying Machine Learning Deciding What to Try Next, Evaluating a Hypothesis, Model Selection and Train/Validation/Test Sets, Diagnosing Bias vs. Variance, Regularization and Bias/Variance, Learning Curves, Deciding What to Do Next Revisited Machine Learning System Design Prioritizing What to Work On, Error Analysis, Error Metrics for Skewed Classes, Trading Off Precision and Recall, Data For Machine Learning	L2 and L3	6

*Bloom's Level:
L1: Knowledge; L2: Comprehension; L3: Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- Ethem Alpaydin, Introduction to Machine Learning, Second Edition , http://mitpress.mit.edu/catalog/item/default.asp?ttype=2&tid=12012. This book will cover all the material in the course.
- https://www.coursera.org/learn/machine-learning#enroll (One of the online platform, where students could get every for learning. Mentioned course is design and delivered by

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Andrew Ng(Stanford University))

Reference Books

- Stephen Marsland, Machine Learning: An Algorithmic Perspective. http://www.amazon.com/Machine-Learning-Algorithmic-PerspectiveRecognition/dp/1420067184
- Christopher M. Bishop, Pattern Recognition and Machine Learning. http://research.microsoft.com/en-us/um/people/cmbishop/prml/.
- Tom Mitchell, Machine Learning, http://www.cs.cmu.edu/~tom/mlbook.html.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Course CO-PO-PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
CO 1			2		1										1	2
CO 2			2		1										1	2
CO 3			2		1										1	2
CO 4			2		1										1	2
CO 5			2		1										1	2

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BME2504	MICROPROCESSOR SYSTEMS LAB	L	T	P	C
Version: 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course focuses on the systematic study of the Architecture and programming of microprocessor family and its applications. The objectives of this course are:

1. To introduce students with the architecture operation and instruction set of 8085 and 8086 microprocessors.
2. To familiarize the students with the programming and interfacing of 8085 and 8086 microprocessors.
3. To provide the basic knowledge of the microprocessor needed to develop the embedded system based products as a solution to real time problems.

Course Outcomes

On completion of this course, the students will be able to

CO1. Set up programming strategies and select proper mnemonics and run their program on the training boards

CO2. Develop assembly language programs for various problems keeping in mind technical issues and evaluate possible causes of discrepancy in practical experimental observations in comparison.

CO3. Understand the concepts related to I/O and memory interfacing and design interfacing circuits with 8085 by making use of different peripheral devices.

Modules	Blooms level*	Number of hours
Lab Session 1: ALP using 8085: 1. Write at least three different programs for addition of two 8 bit numbers assuming carry may or may not be generated. 2. Write at least three different programs for subtraction of two 8 bit numbers assuming borrow may or may not be generated. 3. Write two different programs for 16 bit addition, one using instruction DAD and another without using instruction DAD. 4. Write assembly language program for 8 bit multiplication and division.	L2, L3,L4	4
Lab Session II: To study, understand, interface and two peripheral devices with 8085.	L4,L5,L6	2
Lab session III: Any three programs using 8085 based on block of data.	L4	1
Lab session IV: ALP using 8086: 1. Write an ALP to add list of 10 given numbers. 2. Write an ALP to sum the numbers from 1-100. 3. Write an ALP to count negative numbers from a given list of 10 numbers. 4. Write an ALP to check number of vowels in a given string.	L2, L3, L4	5

**Bloom's Level:*

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L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

3. Douglas Hall, Microprocessor and Interfacing:, Tata McGraw Hill, 2017
4. Gaonkar R. S , Microprocessor Architecture, Programming and Applications, Wiley

Reference Books

- Yu Cheng Liu & Glen A. Gibson, Microcomputer Systems: 8086/8088 family Architecture, Programming and Design, PHI Publication, 2016.
- Ram B., Fundamentals of Microprocessors and Microcomputers, DhanpatRai& Sons, 2017

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO4
CO1	1	2	--	--	--	--	--	--	--	--	--	--	3	2	1	
CO2	1	1	2	3	--	--	--	--	--	--	--	--	3	2	1	1
CO3	-	-	-	1	2	3	--	--	--	--	--	--		2	2	1

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BME2515	MACHINE LEARNING LAB	L	T	P	C
Version 1.1	Date of Approval: 21 May 2019	0	0	2	1
Pre-requisites/Exposure	Matlab, Engineering Mathematics				
Co-requisites					

Pre –Requisite: Matlab Programming

Catalog Description

This course helps the students to do hands-on practice with various machine learning techniques. Machine Learning is known to be future electricity and a key need in medical data processing. Course built the foundation for develop software program for medical data processing. It also lay down the foundation for deep Learning and Artificial intelligence for life-long learning.

The objective of this course is to

- To provide hands-on practice with machine learning.
- To serve as a foundation for develop critical thinking for developing software program for medical data processing.

Course Outcomes

On completion of this course, the students will be able to

CO1. *Develop*machine learning programming program for data classification, using linear regression and logistic regression.

CO2. *Optimization* of machine learning program using regularization techniques.

CO3. *Develop* Neural Network program for identification and multi level classification.

CO4. *Analysis* of error and rectify algorithm for accurate classification using machine learning concept.

List of Experiments	**Blooms level***	**Number of hours**
• Write program of basic matrix operation in using MATLAB.	L1, L2 and L3	2
• Write a program to learning programming using loops and decision structure in MATLAB	L1, L2 and L3	2
• To write Function to compute the cost of linear regression. • To write Function to run gradient descent. • To write function to normalize features. • To writes function to compute normal equation.	L1, L2 and L3	2
• To write and execute program Function to plot 2D classifcation data • To write and execute program Sigmoid Function • To write and execute program Logistic Regression Cost Function • To write and execute program Logistic Regression Prediction Function • To write and execute program Regularized Logistic Regression Cost for geometric transformation of image	L1, L2 and L3	2
• To write and execute program Logistic regression cost function • To write and execute program Train a one-vs-all multi-class classi_er • To write and execute program Predict using a one-vs-all multi-class classifier	L1, L2 and L3	2

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• Write and execute programs Neural network prediction function	L1, L2 and L3	2

Text Books

- Rafael C., Gonzalez and Richard E. Woods, *Digital Image Processi*ng Using MATLAB, Pearson Education Asia, 2001
- Lab Practical Manual

Reference Books

- William K. Pratt, Digital Image Processing, John Wiley, NJ, 1987.
- Albert Macouski, *Medical Imaging systems*, Prentice Hall, New Jersey.1983.
- Sid Ahmed M.A., *Image Processing Theory, Algorithm and Architectures*, McGraw Hill, 1995.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO4**
CO1	--	--	**2**	--	**1**	--	--	--	--	--	--	--		--	**1**	**2**
CO2	--	--	**2**	--	**1**	--	--	--	--	--	--	--		--	**1**	**2**
CO3	--	--	**2**	--	**1**	--	--	--	--	--	--	--		--	**1**	**2**
CO4	--	--	**2**	--	**1**	--	--	--	--	--	--	--		--	**1**	**2**
CO5	--	--	**2**	--	**1**	--	--	--	--	--	--	--		--	**1**	**2**

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BME2516	MEDICAL IMAGE PROCESSING LAB	L	T	P	C
Version 1.1	Date of Approval: 21 May 2019	0	0	2	1
Pre-requisites/Exposure					
Co-requisites					

Pre –Requisite: Matlab Programming

Catalog Description

This course helps the students to do hands-on practice with various medical image processing techniques. Medical imaging and post processing is a key need for diagnostic techniques. Course built the foundation for develop software program for medical image enhancement, denoising, segmentation and registration. It also includes the use of MatLab image processing toolbox use for medical images post processing.

The objective of this course is to

- To provide hands-on practice with medical images.
- To serve as a foundation for develop critical thinking for developing software program for medical imaging.

Course Outcomes

On completion of this course, the students will be able to

CO5. Develop program to enhance, denoise and better visualization in medical image (Region of Interest) ROI.

CO6. Develop program for image segmentation and registration for selection of ROI and using MatLab Image Processing Toolbox.

List of Experiments	Blooms level*	Number of hours
• Write program to read and display digital image using MATLAB.	L1, L2 and L3	2
• Write a program to perform convolution operation for 1D and 2D data in MATLAB	L1, L2 and L3	2
• To write and execute programs for image arithmetic operations • To write and execute programs for image logical operations	L1, L2 and L3	2
• To write and execute program for geometric transformation of image	L1, L2 and L3	2
• To understand various image noise models and to write programs for image restoration	L1, L2 and L3	2
• Write and execute programs to remove noise using spatial filters	L1, L2 and L3	2
• Write and execute programs for image frequency domain filtering	L1, L2 and L3	2
• Write a program in MATLAB for edge detection using quick mask	L1, L2 and L3	2
• Write a program in MATLAB for histogram calculation and equalization. • Write and execute programs of image manipulation Zoom and Shrink	L1, L2 and L3	2

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• To process image using image processing toolbox	L1, L2 and L3	2

Text Books

- Rafael C., Gonzalez and Richard E. Woods, *Digital Image Processi*ng Using MATLAB, Pearson Education Asia, 2001
- Lab Practical Manual

Reference Books

- William K. Pratt, Digital Image Processing, John Wiley, NJ, 1987.
- Albert Macouski, *Medical Imaging systems*, Prentice Hall, New Jersey.1983.
- Sid Ahmed M.A., *Image Processing Theory, Algorithm and Architectures*, McGraw Hill, 1995.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO4**
CO1	--	--	**2**	--	**1**	--	--	--	--	--	--	--	**1**	--	**3**	--
CO2	--	--	**2**	--	**1**	--	--	--	--	--	--	--	**1**	--	**3**	--
CO3	--	--	**2**	--	**1**	--	--	--	--	--	--	--	**1**	--	**3**	--
CO4	--	--	**2**	--	**1**	--	--	--	--	--	--	--	**1**	--	**3**	--
CO5	--	--	**2**	--	**1**	--	--	--	--	--	--	--	**1**	--	**3**	--

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BME2535	SUMMER INTERNSHIP EVALUATION I	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	0	3
Pre-requisites/Exposure	Basic Concepts of Programming Language and Electronics				
Co-requisites	Nil				

Catalog Description

There are certain phases of every Intern's professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship program can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal classroom situations. These attributes are intellectual ability, professional judgment and decision-making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc. In order to achieve these objectives, each student will maintain a file (**Internship File**). The Internship File aims to encourage students to keep a personal record of their learning and achievement throughout the Programme. It can be used as the basis for lifelong learning and for job applications. Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development. The report will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and their own personal contribution to the organization.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of new technologies and practical exposure
2. Provide an overview ofpresentation and preparation of report.

Course Outcomes

On completion of this course, the students will be able to

CO1: Study the literature and *identify* the problem statement

CO2: Work on a real world problem and *solve* it using latest technology

CO3: *Prepare* a detailed report of the project

CO4: *Prepare* a brief presentation of their project

CO5: Present and e*xplain* the project for evaluation

Text Books

As per topic of summer internship project is chosen and discussion with guide.

Reference Books

As per topic of summer internship project is chosen and discussion with guide.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	V	PPT	R	IM	EM
Weightage (%)	10	10	10	30	70

V – Viva, PPT-Power Point Presentation, R – Report, IP-Internal Marks, EM-External Marks

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	--	--	--	--	1	--	--	--	--	--	--	--	-		2	1
CO2	--	--	--	-	1	--	--	--	--	--	--	--	-	-	2	1
CO3	--	--	--	--	1	--	--	--	--	--	--	--	-	-	2	1
CO4	--	--	--	--	1	--	--	--	--	--	--	--	-	-	2	1

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BME2503	CONTROL SYSTEMS	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	2	1	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description
This course provides the students the core knowledge of control systems. This introduces the methods of mathematical modeling of control systems with time & frequency domain analysis along with concepts of stability.

Course Objectives
The objective of this course is to
- Equip the students with concepts of Control System.
- Provide the students in depth knowledge of time domain, frequency domain and concepts of stability.

Course Outcomes
On completion of this course, the students will be able to
CO1. Understand and compare between types of control system and find mathematical model of control system.
CO2. Understand, explain and solve problems on time domain analysis.
CO3. Understand, explain and solve problems on frequency domain analysis.
CO4: Analysis of control system stability

Modules	Blooms level*	Number of hours
Module 1: **Input / Output Relationship** Introduction of open loop and closed loop control systems, mathematical modeling and representation of physical systems (Electrical Mechanical and Thermal), derivation of transfer function for different types of systems, block diagram & signal flow graph, Reduction Technique, Mason's Gain Formula.	L1, L2, L3 and L4	9
Module 2: **Time – Domain Analysis** Time domain performance criteria, transient response of first, second & higher order systems, steady state errors and static error constants in unity feedback control systems, error criteria, generalized error constants, performance indices, response with P, PI and PID Controllers.	L1, L2 and L3	9
Module 3: **Frequency Domain Analysis** Polar and inverse polar plots, frequency domain specifications, Logarithmic plots (Bode Plots), gain and phase margins, relative stability, Correlation with time domain, constant close loop frequency responses, from open loop response, Nyquist Plot.	L1, L2 and L3	9

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Module 4: **Concept of Stability** Asymptotic stability and conditional stability, Routh – Hurwitz criterion, Root Locus plots and their applications. Compensation Techniques:Concept of compensation, Lag, Lead and Lag-Lead networks, design of closed loop systems using compensation techniques. P, PI, PID controllers.	L1, L2, L3 and L4	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Dr. N.K Jain, 2005,"Automatic Control System Engineering", Dhanpat Rai Publication.
2. J. Nagrath & M. Gopal, 2000, "Control System Engineering", New Age International.

References Books:

1. B. C. Kuo, 2001, "Automatic Control system, Prentice Hall of India.
2. M, K. Ogata, 2002, "Modern Control Engineering, PHI.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	1	-	2	3	-	-	-	-	-	-	3	-	1	-	2
CO2	1	1	-	3	3	-	-	-	-	-	-	3	-	1	-	3
CO3	1	1	-	3	3	-	-	-	-	-	-	3	-	1	-	3
CO4	1	1	-	2	3	-	-	-	-	-	-	3	-	1	-	2

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BME2512	CONTROL SYSTEM LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	MATLAB Basics				
Co-requisites	Nil				

Catalog Description

Control System has become an important field for research and development in science and engineering. This course provides the students the core knowledge of control systems. This course introduces the Practical of control system with time & frequency domain analysis along with stability of control systems on kits and MATLAB.

Course Objectives

The objective of this course is to

Perform experiments of control system.

Time & frequency domain analysis along with stability of control systems on kits and MATLAB

Course Outcomes

On completion of this course, the students will be able to

CO1. Perform and analyse experiments on time domain of control system.

CO2. Perform and analyse experiments on frequency domain of control system.

CO3. Perform and analyse experiments for stability of control system.

Modules	Blooms level*	Number of hours
Lab Session 1 1. Study and draw a) Step response of open Loop system (linear 1st order, 2nd order b) Step response of closed loop systems (1st order) 2. Study and draw temperature control system the open loop response and closed loop response with different values of gains	L2, L3 and L5	3
Lab Session 2 1. Study of operations and characteristics of a stepper motor 2. To Study a D.C. motor speed control system.	L2, L3 and L5	3
Lab Session 3 1. Performance evaluation and design of PID controller. 2. To design a suitable cascade compensator for the given system and verify the resulting improvement.	L2, L3 and L5	3

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Lab Session 4 1. Note: three experiments in MATLAB have to be performed in the slot of MATLAB. Using MATLAB obtain the unit-step response and unit impulse response of the following system: $\frac{C(s)}{R(s)} = \frac{16}{s^2 + 1.6s + 16}$ 2. For a 2nd order transfer function using MATLAB a) Bode Plot b)Root locus plot c)Nyquist plot.	L2, L3 and L5	3

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Dr. N.K Jain, 2005,"Automatic Control System Engineering", Dhanpat Rai Publication.
- J. Nagrath & M. Gopal, 2000, "Control System Engineering", New Age International.
- Rudra Pratap, "Getting started with MATLAB", Oxford University Press.

References Books:

- B. C. Kuo, 2001, "Automatic Control system, Prentice Hall of India.
- M, K. Ogata, 2002, "Modern Control Engineering, PHI.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	-	3	2	--	--	--	--	--	--	2	-	1	-	3
CO2	1	2	-	3	2	--	--	--	--	--	--	2	-	1	-	3
CO3	1	2	-	3	2	--	--	--	--	--	--	2	-	1	-	3

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BME2507	DIGITAL CIRCUITS & SYSTEMS	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course explores the theory and operation of the basic building blocks of digital electronics which includes combinational and sequential circuits. This course also explains the logic families and data convertors. The concepts learnt in the studies of sequential circuits will be applied in the design and analysis of Melay and Moore machines.

Course Objectives

The objective of this course is to

1. Provide the basic knowledge of digital logic levels and application of combinational and sequential circuits.
2. Equip with the understanding of logic family and data convertors.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the various logic gates, Boolean algebra and solve the k-map & tabulation method to simplify the logical function.

CO2: Explain the adder & subtractor; Apply and analyze multiplexer, decoder & encoder to design Boolean function.

CO3: Describe flip flops, shift registers & Design counters and synchronous sequential circuits.

CO4: Explain & compare different logic families and explain data convertors.

Modules	Blooms level*	Number of hours
MODULE 1: BOOLEAN FUNCTIONS Analog & digital signals, AND, OR, NOT, NAND, NOR , XOR & XNOR gates, Boolean algebra, DeMorgan's theorems, Implementation of logical function using only NAND/NOR gates, 1`s complement and 2`s complement, BCD to Gray and Gray to BCD code conversion, Standard representation of logical functions (SOP and POS forms), K-map representation and simplification of logical function up to five variables, don't care conditions, XOR & XNOR simplifications of K-maps, Tabulation method.	L1,L2 and L3	6

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MODULE 2: COMBINATIONAL CIRCUITS Adders, Subtractors, Implementation of full adder using half adder, full subtractor using half subtractor, Multiplexer, de-multiplexer, decoder & encoder, code converters, 1 & 2 bit comparators, BCD to seven segment decoder/encoder, Implementation of logic functions using multiplexer/de-multiplexer and decoder, Implementation of 16×1 MUX using 4×1 MUX, 4×16 decoder using 3×8 decoder etc., logic implementations using PROM, PLA & PAL.	L1, L2,L3 and L4	6
MODULE 3: SEQUENTIAL CIRCUITS Difference between combinational and sequential circuits, Latch, Flip-flops: SR, JK, D & T flip flops – Truth table, Excitation table, Conversion of flip-flops, set up and hold time, race around condition, Master Slave flip flop, Shift registers: SIPO, PISO, PIPO, SIPO, Bi-directional, 4-bit universal shift register; Counters: Asynchronous/ripple & synchronous counters – up/down, Ring counter, sequence detector.	L2,L3, L4 and L5	7
MODULE 4: LOGIC FAMILIES&DATA CONVERTERS Logic families: Special characteristics (Fan out, Power dissipation, propagation delay, noise margin), working of RTL, DTL, TTL, ECL and CMOS families; Data converters: Special characteristics, ADC – successive approximation, linear ramp, dual slope; DAC – Binary Weighted, R-2R ladder type.	L1, L2,L3 and L4	5

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Anand Kumar, "Fundamentals of Digital Circuits", 2nd Edition, Prentice-Hall, 2004
- Moris Mano, "Digital Design", 2nd Edition, Pearson Education,2007.
- R.P. Jain, "Modern Digital Electronics", 2nd Edition, Tata Mcgraw Hill, 2003

Reference Books

1. Thomas L. Floyd, "Digital Fundamentals", 11th Edition, Pearson Education, 2015
2. Malvino and Leech, "Digital Principles & Applications", 1st Edition, Tata McGraw Hill, 1993

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2	PS O 3	PSO 4
CO 1	1	2	3	--	--	--	--	--	--	--	--	--	1	--	--	--
CO 2	1	2	3	--	--	--	--	--	--	--	--	2	1	--	--	3
CO 3	1	2	1	--	--	--	--	--	--	--	--	2	1	--	--	3
CO 4	2	3	3	--	--	--	--	--	--	--	--	--	1	--	--	3

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BME2509	DIGITAL CIRCUITS AND SYSTEMS LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

In this Lab course the combination and sequential circuits are designed and their functionality is verified using truth table. Concepts covered would enable them to create complex circuits related to digital design. The objective of this course is to explore and implement the various features of digital logic using basic logic gates.

Course Objectives

The objective of this course is to

1. Provide a basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
2. Equip with understanding of different combinational and sequential circuits.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Demonstrate the basic concept of logic gates;
CO 2: Illustrate the adder and subtractors.
CO 3: Demonstrate the code convertors.
CO 4: Demonstrate the combinational and sequential circuits.

Modules/Topics Covered**	Blooms level*	Number of hours
1. To verify the truth tables of NOT, OR, AND, NOR, NAND, XOR, XNOR gates.	L3, L5	2
2. To obtain half adder, full adder using gates and verify their truth tables.	L3, L5	2
3. To obtain half subtractor, full subtractor using gates and verify their truth tables.	L3, L5	2
4. To implement control circuit using multiplexer.	L3, L5	2
5. To convert BCD code into excess 3 code and verify the truth table.	L3, L5	2
6. To verify the truth tables of RS, D, JK and T flip- flops.	L3, L5	2
7. To implement and verify 3-bit bi-directional shift register.	L3, L5	2
8. To design and study asynchronous/ripple counter.	L3, L5	2
9. To design and study synchronous counter.	L3, L5	2
10. To design and study a sequence detector.	L3, L5	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Anand Kumar, "Fundamentals of Digital Circuits", 2nd Edition, Prentice-Hall, 2004
- Moris Mano, "Digital Design", 2nd Edition, Pearson Education,2007.
- R.P. Jain, "Modern Digital Electronics", 2nd Edition, Tata Mcgraw Hill, 2003

Reference Books

- Thomas L. Floyd, "Digital Fundamentals", 11th Edition, Pearson Education, 2015
- Malvino and Leech, "Digital Principles & Applications", 1st Edition, Tata McGraw Hill, 1993

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	**70**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE- External Exam

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	3	1	--	--	--	--	--	--	--	--	--	--	1	--	--	3
CO2	3	1	--	--	--	--	--	--	--	--	--	--	1	--	--	3
CO3	3	1	--	--	--	--	--	--	--	--	--	--	1	--	--	3
CO4	2	1	--	--	--	--	--	--	--	--	--	--	1	--	--	3

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BME2517	DATA STRUCTURES WITH C ++	L	T	P	C
Version:2017.1	Date of Approval: 2020	3	1	2	5
Pre-requisites/Exposure	Basic Knowledge of C++ Programming				
Co-requisites	Nil				

Catalog Description

This course covers the design, analysis, and implementation of data structures and algorithms to solve engineering problems using C++ programming language. Topics include elementary data structures, (including arrays, stacks, queues, and lists), advanced data structures (including trees and graphs), the algorithms used to manipulate these structures, and their application to solving practical engineering problems. At the end of this course student will gain knowledge about different kinds of file structures and their related operations.

Course Objectives

The objective of this course is to

1. Equip the students with knowledge of algorithms, different types of data structures and analysis of space and time complexity.
2. Provide an overview of various algorithms of data structures like stack and queues and related operations and implementation.
3. Provide an overview of dynamic Data Structure like linked list and its related operations, algorithms and programs. Demonstrate practical use of dynamic data structure to solve engineering problems.
4. Equip the students with knowledge of algorithms and operations related to tree and graph data structures and their practical applications.
5. Provide an overview of Sorting, Searching and file structures and its related algorithms and techniques.

Course Outcomes

On completion of this course, the students will be able to

CO 1:Identify operations on array, multidimensional, string and their implementation and analyze space and time complexity of algorithms.

CO 2: Explain various algorithms and operations of data structures like stack and queues and analyze complexity of each operation.

CO 3: Explain dynamic data structures and various algorithms and operations of data structures like linked list and their applications in computer science.

CO 4: Illustrate the algorithms and operations related to tree and graph data structures, their practical applications and analyze complexity of algorithm associated with each operations.

CO5: Explain Sorting, Searching and file organization and its related techniques.

Modules	Blooms level*	Number of hours
Module I: Introduction to Data structures Data structures: Definition, Types. Algorithm design, Complexity, Time-Space Tradeoffs. Use of pointers in data structures. Array Definition and Analysis, Representation of Linear Arrays in Memory, Traversing of Linear Arrays, Insertion and Deletion, Single Dimensional Arrays, Two Dimensional Arrays, Multidimensional Arrays, Function Associated with Arrays, Character String in C++, Character String Operations, Arrays as parameters, Implementing One Dimensional Array, Sparse matrix.	L1, L2	7

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Module II: Introduction to Stacks and queue Stack: Definition, Array representation of stacks, Operations Associated with Stacks- Push & Pop, Polish expressions, Conversion of infix to postfix, infix to prefix (and vice versa),Application of stacks recursion, polish expression and their compilation, conversion of infix expression to prefix and postfix expression, Tower of Hanoi problem. Queue: Definition, Representation of Queues, Operations of queues- QInsert, QDelete, Priority Queues, Circular Queue, Deque.	L1, L2, L3, L4	8
Module III: Dynamic Data Structure Linked list: Introduction to Singly linked lists: Representation of linked lists in memory, Traversing, Searching, Insertion into, Deletion from linked list, doubly linked list, circular linked list, generalized list. Applications of Linked List-Polynomial representation using linked list and basic operation. Stack and queue implementation using linked list.	L1, L3 and L4	7
Module IV: Trees and Graphs Trees: Basic Terminology, Binary Trees and their representation, expression evaluation, Complete Binary trees, extended binary trees, Traversing binary trees, Searching, Insertion and Deletion in binary search trees, General trees, AVL trees, Threaded trees, B trees. Graphs: Terminology and Representations, Graphs & Multigraphs, Directed Graphs, Sequential representation of graphs, Adjacency matrices, Transversal Connected Component and Spanning trees.	L1, L3 and L5	7
Module V: Sorting and Searching and file structures Sorting: Insertion Sort, Bubble sort, Selection sort, Quick sort, two-way Merge sort, Heap sort, Partition exchange sort, Shell sort, Sorting on different keys, External sorting. Searching: Linear search, Binary search File structures: Physical storage media, File Organization, Linked organization of file, Inverted file, Organization records into blocks, Sequential blocks, Hash function, Indexing & Hashing, Multilevel indexing, Tree Index, Random file, Primary Indices, Secondary Indices, B tree index files.	L1, L4, L5	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. D. S. Malik, Data Structure Using C++, 2nd Edition, Course Technology, Cangage Learning, Boston, 2004
2. Data structures and algorithms‖ – Schaum Series.
3. File Structures An object-Oriented Approach with C++ by Michael J. Folk, Bill Zoellick, Breg Riccardi, Published by Addison Wesley (1st ISE Reprint,1999).

Reference Books

1. J. P. Tremblay and P. G. Sorenson, Introduction to Data Structures with Applications, McGraw – Hill
2. Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Published by Prentice-Hall
3. India(1999).
4. Data Structures Using C and C++ second edition by Yeddidyah Langsam, Moshe J.Augenstein, Aaron M. Tenen Baum, Published by Prentice-Hall India
5. Data Structures and Algorithm analysis in C++ by Mark Allen Weiss, Published by Addison Wesley (3rd Indian Reprint 2000).
6. Data Structures‖ – R. S. Salaria

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

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Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

1: strongly related, 2: moderately related and 3: weakly related

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	1	--	--	--	--	--	--	--	--	--	2	--	--	-
CO2	1	2	2	--	--	--	--	--	--	--	--	--	2	2	1	-
CO3	1	2	2	1	--	--	--	--	--	--	--	--	2	2	1	-
CO4	1	2	2	1	--	--	--	--	--	--	--	--	2	2	1	
CO5	1	2	2	1	--	--	--	--	--	--	--	--	2	2	2	

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BME2518	DATA STRUCTURES WITH C++ LAB	L	T	P	C
2017.1	Date of Approval: 2020	0	0	2	1
Pre-requisites/Exposure	Basic Knowledge of C++ Programming				
Co-requisites	Nil				

Catalog Description

This course covers the design, analysis, and implementation of data structures and algorithms to solve engineering problems using C++ programming language. Topics include elementary data structures, (including arrays, stacks, queues, and lists), advanced data structures (including trees and graphs), the algorithms used to manipulate these structures, and their application to solving practical engineering problems. At the end of this course student will gain knowledge about different kinds of file structures and their related operations.

Course Objectives

The objective of this course is to

1. Equip the students with knowledge of algorithms, different types of data structures and analysis of space and time complexity.
2. Provide an overview of various algorithms of data structures like stack and queues and related operations and implementation.
3. Provide an overview of dynamic Data Structure like linked list and its related operations, algorithms and programs. Demonstrate practical use of dynamic data structure to solve engineering problems.
4. Equip the students with knowledge of algorithms and operations related to tree and graph data structures and their practical applications.
5. Provide an overview of Sorting, Searching and file structures and its related algorithms and techniques.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Identify operations and their implementation on array and multidimensional, string and estmation space and time complexity.

CO 2: Explain various algorithm and operations of data structures like stack and queues and analyze complexity of each operation.

CO 3: Explain dynamic data structures and various algorithms and operations of data structures like linked list and their applications in computer science.

CO 4: Illustrate the algorithms and operations related to tree and graph data structures, their practical applications and analyze complexity of algorithm associated with each operations.

CO5: Explain Sorting, Searching and file organization and its related techniques.

Modules	Blooms level*	Number of hours

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Module I: Introduction to Data structures 1. Write a program to copy one string into another without using library functions. 2. Write a program to demonstrate array and linked list implementation of sparse matrix. 3. Write a program to multiply two 2D matrix.	L3,L5	2
Module II: Introduction to Stacks and queue 1. Write a program to implement push and pop operations on the stack. 2. Write a program to demonstrate conversion of infix to postfix. 3. Write a program to implement simple queue and perform insertion and deletion operation on it. 4. Write a program to implement circular queue and perform insertion and deletion operation on it. 5. Write a program to implement dqueue and perform insertion and deletion operations on it. 6. Write a program to implement priority queue and perform insertion and deletion operation on it.	L3,L5	4
Module III: Dynamic Data Structure 1. Write a program to implement singly linked list and perform following operations on it. • Insertion at end • Insertion at last • Insertion at desired place. 2. Write a program to implement singly linked list and perform following operations on it. • Deletion at end • Deletion at last • Deletion at desired place. 3. Write a program to implement doubly linked list and perform following operations on it. • Insertion at end • Insertion at last • Insertion at desired place. 4. Write a program to implement singly linked list and perform addition of two polynomials.	L3,L5	4
Module IV: Trees and Graphs 1. Write a program to calculate in order, preorder and post order traversal on binary tree. 2. Write a program to construct binary search tree and perform following operations on it. • Deletion of element • Insertion of elements. 3. Write a program to construct binary search tree and search an element in it. 4. Write a program to implement kruskal's algorithm to find out minimum spanning tree.	L3,L5	6

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Module V: Sorting and Searching and file structures 1. Write program to implement insertion sort. 2. Write a program to search an element in array using binary search. 3. Write a program to implement merge sort. 4. Write a program to implement quick sort. 5. Write a program to implement heap sort.	L3,L5	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. D. S. Malik, Data Structure Using C++, 2nd Edition, Course Technology, Cangage Learning, Boston, 2004
2. Data structures and algorithms‖ – Schaum Series.
3. File Structures An object-Oriented Approach with C++ by Michael J. Folk, Bill Zoellick, Breg Riccardi, Published by Addison Wesley (1st ISE Reprint,1999).

Reference Books

1. J. P. Tremblay and P. G. Sorenson, Introduction to Data Structures with Applications, McGraw – Hill.
2. Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Published by Prentice-Hall India(1999).
3. Data Structures Using C and C++ second edition by Yeddidyah Langsam, Moshe J.Augenstein, Aaron M. Tenen Baum, Published by Prentice-Hall India
4. Data Structures and Algorithm analysis in C++ by Mark Allen Weiss, Published by Addison Wesley (3rd Indian Reprint 2000).
5. Data Structures‖ – R. S. Salaria

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

1: strongly related, 2: moderately related and 3: weakly related

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	**1**	--	--	--	--	--	--	--	--	--	**2**	--	--	-
CO2	**1**	**2**	**2**	--	--	--	--	--	--	--	--	--	**2**	**2**	**1**	-
CO3	**1**	**2**	**2**	**1**	--	--	--	--	--	--	--	--	**2**	**2**	**1**	-
CO4	**1**	**2**	**2**	**1**	--	--	--	--	--	--	--	--	**2**	**2**	**1**	-
CO5	**1**	**2**	**2**	**1**	--	--	--	--	--	--	--	--	**2**	**2**	**2**	-

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BME2519	FUZZY LOGIC & GENETIC ALGORITHM	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	3	0	0	3
Pre-requisites/Exposure	Basic Computer Concepts				
Co-requisites	Nil				

Catalog Description

In this course the concepts of fuzzy logic and genetic algorithm are discussed in detail. This course will provide an understanding of fuzzy logic and genetic algorithm and an outlook on the applications of these techniques to solve real world problems. It also provides an understanding of fuzzy-genetic based machine learning.

Course Objectives

The objective of this course is to

1. Provide the student with the basic understanding of genetic algorithm and fuzzy logic fundamentals, program and design the related systems.
2. Equip the students with concepts of fuzzy logic based solutions.
3. Provide an overview of performance of genetic algorithm, simulated annealing and tabu search.

Course Outcomes

On completion of this course, the students will be able to

CO1: Develop the skills to gain a basic understanding of genetic algorithm and fuzzy logic theory.
CO2: Appreciate the learning and adaptation capability of neural and fuzzy systems.
CO3: Apply various operators to optimize. Perform mathematical calculation of the GA
CO4: Able to identify the present application areas of fuzzy logic and GA
CO5: Explain the working principle and compare the performance with other methods –Simulated annealing and Tabu search.

Modules	Blooms level*	Number of hours
MODULE 1: Crisp sets: Overview, Fuzzy sets : Basic types and concepts, Characteristics and significance of paradigm shift, Fuzzy sets vs Crisp sets, Representation of fuzzy sets	L1, L2 and L3	8
MODULE 2: Types of operations, Fuzzy complements, Fuzzy intersection: t-norms, Fuzzy union: t-conorms, Combination of operations, Aggregation operation, Fuzzy numbers , Linguistic variables, Arithmetic operations on intervals, Arithmetic operations on Fuzzy numbers, Lattice of Fuzzy numbers, Fuzzy equation.	L2, L3 and L6	10
MODULE 3: General discussion, Fuzzy controller: Overview and example, Fuzzy systems and neural networks, Fuzzy neural network, Fuzzy automata. Pattern recognition in fuzzy logic, Database and information retrieval in fuzzy logic, decision making in fuzzy logic, engineering applications and fuzzy logic, Fuzzy logic in Medicine and Economics	L1, L3 and L4	10

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MODULE 4: Fundamentals of genetic algorithm: A brief history of evolutionary computation, biological terminology, search space encoding, reproduction elements of genetic algorithm genetic modelling, comparison of GA and traditional search methods. The Fundamental Theorem, Schema Processing at work, Two-armed and k-armed Bandit problem, The Building block hypothesis.	L1, L3 and L4	10
MODULE 5: Genetic technology:- steady state algorithm, fitness scaling, inversion. Genetic programming:- Genetic Algorithm in problem solving, Implementing a Genetic Algorithm:- computer implementation, operator (reproduction, crossover and Mutation, Fitness Scaling, Coding, Discretization). Knowledge based techniques in Genetic Algorithm. Advanced operators and techniques in genetic search:-Dominance, Diploidy and Abeyance. Inversion and other reordering operators, Niche and speciation.	L3, L4 and L6	10
MODULE 5: Genetic Algorithm in engineering and optimization-natural evolution – Simulated annealing and Tabu search -Genetic Algorithm in scientific models and theoretical foundations. Applications of Genetic based machine learning-Genetic Algorithm and parallel processors- composite laminates- constraint optimization- multilevel optimization- real life problem.	L3,L4,L6	05

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Fuzzy Logic with Engineering Applications, 3rd Ed., T. J. Ross, Wiley India Pvt. Ltd., India, 2011.
2. Fuzzy Logic Intelligence Control & Information, John Yen and Reza Langari, Pearson Education Limited, India, 2007.
3. David E.Goldberg, "Genetic Algorithms in search , Optimization & Machine Learning"
4. Melanie Mitchell- 'An introduction to Genetic Algorithm'- Prentice-Hall of India

Reference Books

1. Understanding Neural Networks and Fuzzy Logic, S. V. Kartalopoulas, IEEE Press and Prentice Hall India, India, 2000.
2. Neuro-Fuzzy and Soft Computing – A Computational Approach to Learning and Machine Intelligence, Prentice Hall India, India, 2009.
3. William B. Langdon, Riccardo Poli,"Foundations of Genetic Programming"
4. P. J. Fleming, A. M. S. Zalzala "Genetic Algorithms in Engineering Systems "
5. David A. Coley, "An Introduction to Genetic Algorithms for Scientists and Engineers ".

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	--	--	--	--	--	--	--	--	1	3	--	-
CO2	1	--	2	3	--	--	--	--	--	--	--	1	2	--	-
CO3	1	2	3	3	3	--	--	--	--	--	--	--	1	2	-
CO4	1	1	2	--	--	--2	--	--	--	--	--	--	1	1	2
CO5	1	1	2	--	-2-	--	--	--	--	--	--	--	-	2	1

1: strongly related, 2: moderately related and 3: weakly related

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BME2601	MICROCONTROLLER AND ITS BIOMEDICAL APPLICATIONS	L	T	P	C
Version 2017.1	Date of Approval: July 2017	3	1	0	4
Pre-requisites/Exposure	Digital Electronics, Microprocessor				
Co-requisites	Nil				

Catalog Description

In this course the 8051 microcontroller is discussed in detail. Assembly language programming concepts are introduced to program 8051 as a timer and to provide serial communication. Further, the use of microcontroller in biomedical engineering has been described. The concepts learnt in the assembly language programming has been applied in the studies and interfacing of ADC, DAC and 8255. The overall educational objective is to provide hands-on experiences of how an embedded system could be used to solve biomedical application based problems.

Course Objectives

The objective of this course is to

- Provide the knowledge of 8051 microcontroller and with a basic understanding of instruction sets & assembly language programming.
- Inculcate a working knowledge of the necessary steps and methods used to interface a microcontroller system to devices such as DAC, sensors, ADC etc.
- Provide the general knowledge of the microcontroller architecture in biomedical applications.

Course Outcomes

On completion of this course, the students will be able to

CO1: List the main features of 8051 microcontroller; Distinguish between microprocessor and microcontroller; Describe the block and pin diagram of 8051.

CO2: Explain the various addressing modes of 8051; Describe the instruction set; Apply the branching instruction to generate delay.

CO3: Describe the timer modes; Apply timers to generate square wave; Calculation of delay; Explain the concept of interrupt and apply concept of interrupt in serial interface.

CO4: Explain the memory interfacing; Demonstrate a working knowledge of the necessary steps and methods used to interface a microcontroller system to devices such as DAC, LCD, ADC and 8255.

CO5: List the use of microcontroller in biomedical application; Explain the use of computer in biomedical engineering; apply the general knowledge of microcontroller in biomedical applications

Modules	Blooms level*	Number of hours
MODULE 1: INTRODUCTION 8051, Comparison with microprocessor, pin diagram explanation, internal diagram 8051.	L1 and L2	10

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MODULE 2: INSTRUCTION SET Addressing mode, data transfer instruction, logical, arithmetic instruction, bit instruction, branching instruction.	L1, L2 and L3	10
MODULE 3: TIMERS AND INTERRUPTS Mode of timers, simple programming, generation of square wave. 8051connection to RS 232, Interrupt priority in 8051, generation of waveforms using interrupt, serial interface using interrupt	L1, L2,L3 and L4	10
MODULE 4: INTERFACING Interfacingof memory, intelligent LCD, 8255, ADC, DAC, LED display.	L2 and L3	10
MODULE 5: APPLICATIONS Introduction to DSP processor, Applications of microcontrollers and computersin biomedical engineering, microcontrollers in embedded biomedical applications.	L1, L2 and L3	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- M.A. Mazidi and J. G. Mazidi, "The 8051 Microcontroller and Embedded Systems", 2nd Edition, Prentice-Hall, 2004
- Raj Kamal, "Embedded Systems", 1st Edition,Tata McGraw-Hill, 2004
- Peter Atkins James W. Stewart and Kai X. Miao, "The 8051 microcontroller", 2nd Edition, Pearson Education, 2008

Reference Books

- David E. Simon, "An Embedded Software Primer", 1st Edition, Pearson Education, 1999
- K.J. Ayala, "The 8051 Microcontroller", 2nd Edition, Penram International, 1999
- Rajiv Kapadia, "8051 Microcontroller & Embedded Systems", 1st Edition, Jaico Press, 2004

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS O 1**	**PS O 2**	**PS O 3**	**PS O 4**
CO 1	**1**	**3**	--	--	--	--	--	--	--	--	--	--	--	--	**1**	--
CO 2	**1**	**2**	**1**	--	--	--	--	--	--	--	--	--	--	--	**1**	--
CO 3	**1**	**2**	**1**	**3**	--	--	--	--	--	--	--	--	--	--	**1**	**3**
CO 4	**2**	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	**3**
CO 5	--	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--

1: strongly related, 2: moderately related and 3: weakly related

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BME2651	BIOMECHANICS	L	T	P	C
Version 1.1	Date of Approval: 16, May 2019	3	0	0	3
Pre-requisites/Exposure	Medical Imaging Techniques, Medical Image Processing				
Co-requisites	Engineering Mathematics, General Science				

Catalogue Description

This course is intended for engineering students to make them understand the various components of biomechanics which deals with the application of mechanics to biology. Mechanics is a branch of applied mathematics that deals with movement and tendency to movement.. it entails the study of the action of external and internalforces on the living body, especially on the skeletal system. A biomechanist is often interested in the physiology underlying movement (muscle physiology, nervous control, for example) and also the biological role of the movement)and ergonomics that is the analysis of a human performing for a given task and the design of appropriate tools. One part of this analysis is to understand the mechanics of the person and any interactions with surroundings.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of the basics of bone movement , gait analysis and mechanics of bone and muscles
2. To provide the overview of Structure and composition of bone , microstructure of bone, muscle. Joint motions and various forces implied, basic mechanical models , injuries and factors affecting biomechanical properties of human body

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the human body joints, axes of planes and motions, degree of freedom and related matrixes calculations.

CO2: Derive equations and solve problems related to Inverse Dyanamics to calculate resultant force and momentum

CO3: Analyze gait cycle, angular kinematics of hip, knee and ankle

CO4: Describe microstructure of bone, skeletal muscle, mechanism of muscle, viscoelasticity and other related issues

Modules	Blooms level*	Number of hours
Module I: Joint motion: relative position of two bones meeting at a joint , description of a rigid body , degrees of freedom , euler angles , rotation matrices, rotation angle anatomical directions , anatomical planes ,	L-1, L-2, L-3	**12**
Module II : Inverse Dyanamics to calculate resultant force and momentum within the body link segment models , intersegmental force and moment ,	L-1, L-2, L-3	**12**

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Module III : Human Gait analysis , gait cycle , angular kinematics of hip , knee and ankle , force plates and ground reaction force , gait abnormalities .	L-1, L-2, L-3	**12**
Module IV : Structure and composition of bone , microstructure of bone , skeletal muscle , mechanism of muscle contraction , force length and force velocity relationships , basic muscle models , tendons and ligaments , their basic mechanical models , injuries and factors affecting biomechanical properties , Cartilage , viscoeleasticity and viscoelastic models .	L-1, L-2, L-3	**12**

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- M Nordin and VH Frankel; Lea& Febiger, Basic biomechanics of the musculoskeletal system, London 1989)
- BM Nigg, W Herzog, Biomechanics of the musculo-skeletal system, John Wiley & Sons, Chichester 1994)
- DA Winter; Biomechanics and motor control of human movement John Wiley &Sons, Chichester, 1990

References Books

- Christine Gunn, Bones and Joints: A Guide for Students.. Churchill Livingstone,Edinburgh 1996
- G.J. Tortora, Principles of Human Anatomy. Harper & Row, New York, 1983
- R.S. Snell. Clinical Anatomy for Medical Students., Little, Brown, and Company, Boston 1995.
- J.D. Currey, Bones: Structure and Mechanics. Princeton University Press, 2002.
- RS Snell. Little, Brown and Co., Clinical Anatomy for Medical Students. Boston 1995
- TA McMahon, Muscles, Reflexes, and Locomotion.. Princeton University Press, 1984
- Hazelman, B., Riley, G. and Speed, C. (eds.) Soft tissue rheumatology.Oxford University Press, 2004
- Margareta Nordin, Victor Hirsch, Basic biomechanics of the musculoskeletal system, Lippincott Williams & Wilkins, 2001

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PS) 4
CO1	**1**	**1**	**--**	**--**	**3**	**-3-**	**--**	**--**	**--**	**3**	**--**	**--**		**3**	**1**	
CO2	**1**	**1**	**2**	**3**	**--**	**-3**	**--**	**--**	**--**	**--**	**--**	**--**		**3**	**1**	
CO3	**1**	**2**	**3**	**3**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**		**3**	**1**	
CO4	**1**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**		**3**	**1**	

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BME2609	CLINICAL NEED ASSESSMENT AND MINI PROJECT	L	T	P	C
Version 1.1	Date of Approval:2020	2	0	0	2
Pre-requisites/Exposure	Anatomy &Physiology, Biomedical Instrumentation				
Co-requisites	General Science				

Catalog Description

This course helps the students to understand various requirements of hospital and healthcare systems including all stakeholders of hospital system. Various department of hospital get exposed by student to understand needs and its drive students to find solutions for them. The content of the course will also give opportunities to interact with end user of medical equipment to find out their concern and what difficulties they face. The course also familiar students with working culture of hospital including safety standards, ethical and legal considerations as well as professionalism.

Students will learn techniques for improving the flexibility and originality of their thinking and will explore approaches used by managers and organizations to create and sustain high levels of innovation. Topics include: personal thinking preferences, everyday creativity and eliminating mental blocks, creative thinking techniques, idea selection approaches, teaming techniques for creativity, conditions that promote creativity, design for interaction, disruptive technologies, and intellectual property. The course uses fun and hands-on activities to stimulate innovation.

Course Objectives

The objective of this course is to

- To provide an overview of hospital equipment and requirements.
- To serve as a foundation for innovation in healthcare by understanding the difficulties of hospital system.

Course Outcomes

On completion of this course, the students will be able to

CO37. Identify and explain the requirements and difficulties of hospital system.

CO38. Provide the innovative solution for healthcare system with understanding of present need.

CO39. Demonstrate the capability of critical thinking, brainstorming, presentation and team building process.

Course Content

Modules	Blooms level*	Number of hours
MODULE I: **Introduction to Innovation** IntroductionMaking a case for creativity, Creative thinking as a skill, Valuing diversity in thinking, Thinking preferences, Creativity styles,Recognizing and avoiding mental blocks, Avoiding mindsets, Risk taking, Paradigm shift and paradigm paralysis, Individual and teamwork	L2, L3 and L4	4
MODULE II: **Creativity and Problem Solving** Creativity in problem solving, Problem Definition, Understanding, Representing, Pattern Breaking, Thinking differently, Changing your point of view, Watching for paradigm shift, Challenging conventional wisdom, Lateral thinking, provocation (escape, random word), Mind stimulation: games, brain-twisters and puzzles	L2, L3 and L4	4

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MODULE III: **Ideation and Solution** Decision and Evaluation, Focused thinking framework, Six thinking hats, PMI, Ethical considerations, Design for Interaction, Introduction to design for interaction,	L2, L3 and L4	4
MODULE III: **Project and Peer Review** Each student must spend 3 hours per week or 6 hours every two weeks observing and shadowing a doctor in a hospital environment. The visits will be organized by ASET. Students will be exposed to practical implementation of biomedical engineering. Students will be required to identify some key clinical needs in the hospitals and come up with a biomedical engineering solution for the same. Students will have to present their findings and solutions in the form of a presentation at the end of the term	L2, L3 and L4	12

Reference Books

- Khandpur R.S, Handbook of Biomedical Instrumentation, Tata McGraw-Hill, 2008
- Webb, S., The Physics of Medical Imaging, Adern Hilger, Bristol & Philadelphia. 2013
- Hay.B.A. Edtd., Medical Images, Formation, Perception and Measurement, John Wiley, 2008
- Rabiner and Gold, Digital Signal Processing,
- A.C. KAK, Principles of Computed Tomography, IEEE Press, New York
- H. S. Fogler and S.E. LeBlanc, *Strategies for Creative Problem Solving*, Prentice Hall, 1995.
- E. Sickafus, Unified Structured Inventive Thinking, Ntelleck, 1997.
- E. Lumsdaine and M. Lumsdaine, Creative Problem Solving, McGraw Hill, 1995.
- Kaplan, Introduction to TRIZ, Ideation International, Inc., 1995.
- G. Altschuller, Creativity as an Exact Science, 1983.
- The Art of Inventing (And Suddenly The Inventor Appeared).
- 40 Principles, Keys to Technical Innovation, Technical Innovation Center, 1997.
- E. de Bono, The Use of Lateral Thinking, Penguin Books, 1990.
- De Bono's Thinking Course, Facts on File, 1981.
- Serious Creativity, Harper Collins, 1992.
- Six Thinking Hats, Little, Brown & Co., 1985.
- CoRT Thinking, Advanced Practical Thinking Training, Inc., 1995.
- Tony Buzon, Use Both Sides of Your Brain, Dutton, 1983.
- Scott G. Isaksen, Brian Dorval, and Donald Treffinger, Creative Approaches to Problem Solving, Kendall Hunt, 1994.
- F. Osborn, Applied Imagination: Principles and Procedures of Creative Problem Solving, Charles Scribner's Sons, 1979.
- D. Tanner, Total Creativity in Business and Industry, Advanced Practical ◆ Thinking Training, 1997.
- D. Pressman, Patent It Yourself, NOLO Press, 2006.
- T. Kelley. The Art of Innovation. Doubleday, 2001.
- T. Kelley. The Ten Faces of Innovation. Doubleday, 2005.
- J. Goldenberg and D. Mazursky, Creativity in product innovation. Cambridge University Press, 2002.

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**F**	**R**	**P**
Weightage (%)	20	40	40

F: Feedback from hospital, R: Report, P: Presentation

CO-PO-PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
CO 1					3						2	1		2	2	1
CO 2					3						2	1		2	2	1
CO 3					3						2	1		2	2	1

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BME2610	MEDICAL IMAGING AND RECONSTRUCTION ALGORITHM LAB	L	T	P	C
Version 1.1	Date of Approval: 16 May 2019	0	0	2	1
Pre-requisites/Exposure	Matlab, Engineering Mathematics, Medical Image Processing				
Co-requisites					

Pre –Requisite: MatLab Programming

Catalog Description

Fundamentals and applications of medical image reconstruction and processing. Reconstruction from non-uniformly sampled data, projection data, regularly/randomly undersampled data. Parallel imaging and compressed sensing for medical imaging. Improving image quality, denoising, deconvolution, off-resonance correction. Post-processing of images, image registration, image segmentation. Examples from magnetic resonance imaging (MRI), X-ray computed tomography (CT), and magnetic particle imaging (MPI)..

The objective of this course is to

- To provide hands-on practice with Image Reconstruction Algorithm specific with Ct and MRI.
- To serve as a foundation for to develop an advanced medical image reconstruction or processing technique.

Course Outcomes

On completion of this course, the students will be able to

CO7. Develop various reconstruction algorithm for CT-Scan raw images.
CO8. Develop various restructuring algorithm for quantitative data extraction from MRI images.
CO9. Develop Neural Network program for reconstruction of images.
CO10. Develop 3D rendering algorithm for medical image stack.

List of Experiments	**Blooms level***	**Number of hours**
• Write program of basic Fourier transformation.	L1, L2 and L3	2
• Write a program for Radon Transformation to reconstruct images.	L1, L2 and L3	2
• To write Function for 3D rendering of stack of imaging • To writes function to compute T2 Mapping.	L1, L2 and L3	2
1. To writes function to compute T1 Mapping.	L1, L2 and L3	2
2. To writes function to compute T1-Values.	L1, L2 and L3	2
3. To writes function to compute T2-Values.	L1, L2 and L3	2
4. To writes function to compute PD weighted-Values.	L1, L2 and L3	2
5. To write and execute program for Neural style Learning (Using Deep Learning Concept)	L1, L2 and L3	2

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6. Advance Deep Learning Programming for reconstruct T1 weighted Images from PD-Weighted	L1, L2 and L3	2

Text Books

- John L Semmlow, Biosignal and Biomedical Image Processing: MATLAB based Application, 3rd Edition, 2004, Marcel Dekker, Inc.
- Gengsheng Lawrence Zeng, Medical Image reconstruction, Springer 2009

Reference Books

1. https://humanhealth.iaea.org/HHW/MedicalPhysics/NuclearMedicine/ImageAnalysis/3Dimagereconstruction/index.html
2. Zhang, H.M. and Dong, B., 2020. A review on deep learning in medical image reconstruction. Journal of the Operations Research Society of China, pp.1-30
3. William K. Pratt, Digital Image Processing, John Wiley, NJ, 1987.
4. Albert Macouski, *Medical Imaging systems*, Prentice Hall, New Jersey.1983.
5. Sid Ahmed M.A., *Image Processing Theory, Algorithm and Architectures*, McGraw Hill, 1995.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO4**
CO1		**2**	--	--	**1**	--	--	--	--	--	--	--		**2**	**1**	--
CO2		**2**	--	--	**1**	--	--	--	--	--	--	--		**2**	**1**	--
CO3		**2**	--	--	**1**	--	--	--	--	--	--	--		**2**	**1**	--
CO4		**2**	--	--	**1**	--	--	--	--	--	--	--		**2**	**1**	--
CO5		**2**	--	--	**1**	--	--	--	--	--	--	--		**2**	**1**	--

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BME2607	HOSPITAL MANAGEMENT SYSTEM	L	T	P	C
Version 1.1	Date of Approval: 16 May, 2019	3	0	0	3
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description

This course provides students a basic understanding of the working, regulations and management of a hospital environment.

Course Objectives

The objective of this course is

- To develop the basic awareness of management functions and various dimensions of organizational life.
- To make the students aware of the various functional aspects of management.
- To develop the understanding of the functioning and management of the hospital in general and also aware about the critical issues related to managing a hospital.
- To make the student understand the health environment in India and also the regulatory mechanisms involved in promoting the health programs.

Course Outcomes

On completion of this course, the students will be able to

CO1. Identify the working and management of a hospital environment.

CO2. Identify the role of the manager in healthcare and how organizations and people work within the healthcare system.

CO3. Evaluate and use measurement tools for quality and safety.

CO4. List the various departments in hospital.

Course Content

Modules	Blooms level*	Number of hours
MODULE I: **Introduction to Hospital Architecture** Classification of hospital & architecture: General hospital, specialized hospital, primary health care –their role and functions. Aspects of hospital services: inpatient, outpatient and emergency, location and environment of hospital, hierarchy of medical and paramedical staff & their functions and responsibilities. Modern Hospital Architecture- space in a hospital building, design of ward, intensive care units, air conditioning, plumbing & sanitation, gas supply, waste disposal, cleaning, dietary, sterilizing, laundry, storage and operation theatre systems, Radiology, Central labs, Blood banks, OPD, Casualty, etc	L1 and L2	14
MODULE II: **Hospital Air and Gas Supply** Air conditioning & gas supply systems: Air conditioning and refrigeration systems for small and large areas, Air changes, filtering, and sterility, Deodorization, disinfection, dehumidification, cryogenic systems, Centralized supply of air, oxygen, nitrous oxide & vacuum, Principle of production of liquid oxygen. Management lifts fire fighting equipments	L1 and L2	8

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MODULE III: **Hospital engineering & Management:** Definition of biomedical Engineering, clinical engineering &hospital engineering. Importance of BME department – servicing and maintenance, testing, acceptance & maintenance protocols, computerized preventive maintenance planning, MROs, Training of men for medical equipments preventive and periodical maintenance procedures. Preparation of estimates, specifications, tender details etc. Importance of ISO 9000 Certificates: Obtaining ISO certificates in hospitals, proposed protocols. Necessity for standardization, FDA, AERB, Joint Commission on Accreditation of hospitals, ICRP and other standard organization, methods to monitor the standards.	L1and L2	7
MODULE IV: **Hospital Information system:** Role of database in HIS, Need of networking in HIS, overview of Networking, topologies and its configuration, structuring medical records to carry out functions like admissions, discharges, treatment history etc. , Computerization in pharmacy & billing, automated clinical laboratory systems & radiology information system. Need for evolving health policy, health organization in state, health financing system, health education, health insurance, health legislation.	L1 and L2	7

*Bloom's Level:
L1: Knowledge; L2: Comprehension; L3: Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. P.E. Stanley, Handbook of hospital safety, CRC Press (UNIT II)
2. Arun Kumar, Hospital Management, Anmol Publications Pvt. Ltd., Jan 2000 , 1st.ed (UNITS IV & V)
3. Harold E. Smalley, "Hospital Management Engineering – A guide to the improvement of hospital management system", PHI
4. Sharma, Essentials for Hospital Support Services and Physical Infrastructure, 1/e, Jaypee Medical Publishers 2003
5. Hospital Engineering And Facilities Management 2007 - Report, Fifth official report of the International Federation of Hospital Engineering (IFHE), January 2007

Reference Books

1. Gupta, Kant, Chandrashekhar, Satpathy, Modern Trends in Planning and Designing of Hospitals Principles and Practice with CD-ROM, Jaypee Medical publishers, 1/e, 2007
2. Sakharkar, Principles of Hospital Administration and Planning, Jaypee Medical publishers 1/e, Reprint 2004.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination Examination Scheme:

Components	A	CT	S/V/ Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO-PO-PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1									1	1				2		1
CO 2				2						1				2		1
CO 3			2						1					2		1
CO 4			2							1				2		1
CO 5			2							1				2		1

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BME2611	THREPUETIC AND SURGICAL EQUIPMENT	L	T	P	C
Version 1.1	Date of Approval: 16 May 2019	3	0	0	3
Pre-requisites/Exposure	Bio-instrumentation				
Co-requisites	Engineering Mathematics, General Science				

Catalog Description

Therapeutic medical instruments are widely used in the field of biomedical engineering. The students studying the subject are supposed to learn the therapy for any disease after diagnosing it. The course in addition, will provide knowledge of principle and constructional features of various therapeutic medical equipments. The course will also deal with different advance Therapeutic Technology..

Course Objectives

The objective of this course is to

- To provide an overview of Threpuetic and Surgical Equipments.
- To serve as a foundation for design and develop a new insight in Medical Equipment use in Surgrey.

Course Outcomes

On completion of this course, the students develop capabilities of:

CO40. *Identify* appropriate design aspects of defibrillator and Pacemaker.
CO41. *Identify* various electro-Surgical equipment and its application.
CO42. *Identify* various monitor and control parameters of ventilator and *design* aspects custom built ventilator.
CO43. *Explain* the principle of Hemodialysis machine and its component.
CO44. *Explain* and *demonstrate* the principle of physiotherapy machine.

Course Content

Modules	Blooms level*	Number of hours
MODULE I: **Pacemaker and Defibrillator** Need of Pacemaker, External and Implantable Pacemaker, Various type of pacemaker as per clinical need, Recent Advancement in Pacemaker; Need of Defibrillator, Type as of Defibrillator, Mono-phasic and Bi-Phasic Defibrillator, Physiological mechanism of therapy	L1 and L2	10
MODULE II: **Surgical Equipment** Principle of Surgical Diathermy, Surgical Diathermy Machine, Safety aspects in Electro-Surgical Units	L1 and L2	7
MODULE III: Ventilator Introduction to Ventilator, Basic therapeutic mechanism of ventilators; Types of Ventilators, Ventilator monitoring and Control Parameters, Ventilator design and machine,	L1, L2 and L3	7

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MODULE IV: Hemodialysis Machine Functioning of Kidney, Artificial Kidney, Dialyzers, Membrane of Hemodialysis , dialysis machine	L1 and L2	5
MODULE IV: Physiotherapy and Electrotherapy Equipment High Frequency Heat Therapy, Short-wave Diathermy, Microwave Diathermy, Ultrasonic Therapy Unit, Electrodiagnostic/Therapeutic Apparatus, Pain Relief Through Electrical Stimulation	L1 and L2	7

*Bloom's Level:
L1: Knowledge; L2: Comprehension; L3: Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- R. S. Khandpur, Biomedical Instrumentation: technology and Application, 2nd Edition, 2003, Tata McGraw-Hill.

Reference Books

- Leslie Cromwell, Fred J. Weibell, Erich A Pfeiffer, Biomedical Instrumentation and Measurements , PHI , 2nd Edition , 2004.
- John G.Webster, Medical Instrumentation : Application and Design, 3rd Edition , John Wiley & Sons , New York , 1998 .

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO-PO-PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	1												1		
CO 2		1		2										1		
CO 3	1		2											1		
CO 4		1	2											1		
CO 5		1	2											1		

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BME2612	DATA MINING	L	T	P	C
Version 2019.1	Date of Approval: 15 May 2019	3	0	0	3
Pre-requisites/Exposure	Concept of Database and Data Mining				
Co-requisites	Nil				

Catalog Description

Data Mining serve as one of the most important courses for postgraduate students, since it builds computational abilities, inferential thinking, and practical skills for tackling core data scientific challenges. The students will get a comprehensive understanding of different data mining techniques that can be used for prediction and for discovering patterns, be prepared to select the right technique for a given data problem and will be able to create a general-purpose analytic process.

Course Objectives

The objective of this course is to

- Provide students with an in-depth knowledge of data mining. To introduce students to basic applications, concepts, and techniques of data mining.
- Develop skills for using recent data mining software to solve practical problems and prediction in a variety of disciplines and
- Gain experience doing independent study and research.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain concepts of Data mining, predictive analytics and analyses architecture of data mining. Differentiate between supervised and unsupervised methods

CO 2: Apply classification techniques on different data sets and solve cost –benefit analysis numerical. Analyze decision tree methods.

CO 3: Implement various clustering algorithm on different data sets and describe these algorithms.

CO 4: Prepare data representation for market basket analysis and determine the usefulness of association rules. Interpret supervised and unsupervised learning methods.

CO 5: Predict market trends and outline different factors associated mail marketing.

Course Content

Modules	Bloom's level	Number of Hours
Module I Data Preparation An introduction to data mining and predictive analytics, Data Pre-processing Exploratory Data Analysis, Dimension- Reduction Methods.	**L1, L2**	**8**
Module II Classification k- Nearest Neighbour Algorithm, Decision Trees, Model Evaluation Technique, Cost –Benefit Analysis Using Data Driven Cost.	**L1, L2, L3**	**7**
Module III Clustering Hierarchical and k- Means Clustering, Kohenen Networks, Birch Clustering, Measuring Cluster Goodness.	**L1, L2, L3,L4**	**8**

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Module IV Association Rules Affinity Analysis and Market Basket Analysis, Data Representation for Market Basket Analysis, Support, Confidence, Frequent Item sets, and the a Priori Property, How Does a Priori Algorithm Work? Generating Frequent Item sets, Generating Association Rules, Extension from Flag Data to General Categorical Data, Information-Theoretic Approach: Generalized Rule Induction Method, J-Measure, Association Rules are Easy to do Badly, how can we Measure the Usefulness of Association Rules? Do Association Rules Represent Supervised or Unsupervised Learning?	**L1, L2, L3,L6**	**9**
Module IV Case Study: Predicting Response to Direct Mail Marketing Business Understanding, Data Preparation, and Eda, Clustering and Principal Components Analysis, Modelling and Evaluation for Performance and Interpretability, Modelling and Evaluation for High Performance.	**L2, L3, L4, l5**	**8**

Bloom's Level:

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Daniel T. Larose, Chantal D. Larose, "Data Mining and Predictive Analytics", John Wiley & Sons, Inc., Hoboken, New Jersey, 2015.
2. Jiawei Han and Micheline Kamber, "Data mining: concepts and techniques", Morgan Kaufmann, Second Edition, 2006.

Reference Books

1. Alex Berson, Data Warehousing, Data Mining, and Olap, Tata McGraw Hill, 2014.
2. Markus Hofmann, Ralf Klinkenberg, "Rapid-Miner: Data Mining Use Cases and Business Analytics Applications", Chapman and Hall/CRC, 2016.
3. George M Marakas, Modern Data Warehousing, Mining & Visualization Core Concepts, Pearson Education.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	--	--	--	--	--	--	--	--	--	--		**2**	**1**	**3**
CO2	**1**	**1**	**2**		--	--	--	--	--	--	--	--		**2**	**1**	**3**
CO3	**1**	**2**	**3**	**3**	**3**	--	--	--	--	--	--	--		**2**	**1**	**2**
CO4	**1**	**1**	**2**	--	--	**3**	--	--	--	--	--	**3**		**1**	**1**	**3**
CO5	**1**	**1**	**2**	--	--	**2**	--	--	--	--	--	**3**		**3**	**1**	**1**

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BME2710	EMBEDDED SYSTEM WITH RECENT TECHNOLOGY	L	T	P	C
Version: 2019.1	Date of Approval: May 16, 2019	2	0	0	2
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This practical course is designed to quickly take students from beginner to basic functional knowledge of the Arduino microcontroller in three weekend 5-hour sessions. You can expect to learn a) how to write and upload simple code for the Arduino to perform basic logic functions like reading a switch to change a motors direction, b) how to integrate a variety of physical inputs including knobs, distance sensors, and light sensors, c) how to integrate a variety of physical outputs such as motors, lights, and speakers, and d) how to put all of these together to build simple self-contained low-cost low-power systems.

Course Objectives

The objective of this course is to

- Provide an overview of embedded system and real time operating system.
- Equip the students with concepts of Arduino microcontroller and its interfacing with external devices.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain and analyse the architecture of Arduino microcontroller, Debugging and programming techniques.

CO2: Explain and classify embedded systems and its applications.

CO3: Explain hardware and software design concepts of embedded system.

CO4: Explain real time operating system for embedded system.

Modules	Blooms level*	Number of hours
Module 1 **Introduction to Arduino** The Arduino Platform, Block diagram, Architecture, Pin functions, overview of main features such as I/O Ports, Timers, interrupts serial port, PWM, ADC, etc. Introduction to Arduino IDE, writing, saving, compiling and uploading sketches.	L1, L2, L3 and L4	8
Module2 **Introduction to Arduino IDE** Introduction to Arduino IDE, writing, saving, compiling and uploading sketches.		8

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Module3 **Arduino and Interfaces** Interfacing discrete LEDs, Binary counter, Seven Segment LEDs. Interfacing LCD, switch Interface. Interfacing with different type of sensors and communication modules	L1, L2 and L4	8

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books:

1. Jeremy Blum, "Exploring Arduino: Tools and Techniques for Engineering Wizardry", 2nd Edition, Wiley, 2010.
2. John Nassey, "Arduino for Dummies" 3rd Edition, Wiley, 2009.

Reference:

1.https://www.coursera.org/learn/arduino-platform

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	1	3	-	2	2	--	--	--	--	--	--	2	-	-	1	3
CO2	1	2	-	2	2	--	--	--	--	--	--	2	-	-	1	3
CO3	1	2	-	2	2	--	--	--	--	--	--	2	-	-	1	3
CO4	1	2	-	2	2							2			1	3

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BME2711	ARTIFICIAL ORGANS AND REHABILITATION ENGINEERING	L	T	P	C
Version	Date of Approval: 16 May 2019	3	0	-	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is intended for Biomedical engineering students to make them understand the various techniques developed to restore the functionalities of malfunctioning organs/organ system. It entails information of different health parameters by restoring the biochemical/ biophysical and physiological processing which might have undergone deterioration due to some disease or accidental injuries. The subject is designed to introduce the initial level of details about various artificial engineering instruments or devices which are used to maintain vital functions such as blood circulation, renal activities, breathing supporting measure,. &Wheeled and seated mobility devices.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of Artificial organs, prosthetics and engineering solution for various impairments
2. Provide an over view of Artificial Heart, artificial kidney, Artificial heart lung machine, Wheeled and seated mobility devices (WSMDs), Audimetric devices & associated assisting devices

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain concepts of modern artificial organs, Biomaterials, Rheological properties of blood

CO2: Explain functioning and design of Artificial heart lung machine, artificial artificial heart lung devices, Oxygenators, artificial pancreas , blood and skin .

CO3: Describe Audiometry :Wheeled and seated mobility devices (WSMDs) & ergonomics of wheelchair propulsion , power wheelchair electrical systems .

CO4: Explain the concepts of Impairments , disabilities and handicaps, engineering concepts in sensory and motor rehabilitation

Modules	Blooms level*	Number of hours
Module I: Introduction to artificial organs , biomaterials , inflammation , rejection , correction . Rheological properties of blood , blood viscosity , effect of shear rate , haematocrit , temperature and protein contents . Casson equation , flow of blood thorugh blood vessels , problems of extracorporeal blood flow.	L-1, L-2, L-3	8

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Module II: Artificial heart lung machine : brief explanation of gas exchange , artificial heart lung devices , Oxygenators : bubble , film oxygenators and membrane oxygenator . Liver support system , artificial pancreas , blood and skin .	L-1, L-2, L-3	10
Module III: Audiometry : air conduction , bone conduction , masking , functional diagram of audiometer . Wheeled mobility : categories of wheelchairs , wheelchair structure and component design , ergonomics of wheelchair propulsion , power wheelchair electrical systems .	L-1, L-2, L-3	8
Module IV Rehabilitation Engineering : Impairments , disabilities and handicaps , engineering concepts in sensory and motor rehabilitation . Rehab for locomotion , vision , speech and hearing . Artificial limbs , prosthetic heart valves . Externally powered and controlled prosthetics . Spinal rehabilitation and Marcus study .	L-1, L-2, L-3	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Robbinson C.J.,Rehabilitation engineering . CRC press 1995
2. Gerald E.Miller , Artificial Organs , Morgan & Claypool Publishers ,2006.
3. Bronzino Joseph , Handbook of biomedical engineering . CRC 2nd edition ,1999
4. R.S. Khandpur , Handbook of biomedical instrumentation . Tata McGraw Hill Publishers
5. Ballabio E.et.al , Rehabilitation engineering . IOS press 1993

References Books

1. Donald A. Neumann, **Kinesiology of the Musculoskeletal System - E-Book: Foundations for Rehabilitation** 2nd Edition**Publisher:** Mosby; 2 edition, 2013
2. **Michael Lysaght, Thomas J. Webster,** Biomaterials for Artificial Organs-A volume in Woodhead Publishing Series in Biomaterials **2011**
3. Saverio Affatato, Wear of Orthopaedic Implants and Artificial JointsA volume in Woodhead Publishing Series in Biomaterials, 2012

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**1**	--	--	**3**	**-3-**	--	--	--	**3**	--	--	**2**	--	**1**	--
CO2	**1**	**1**	**2**	**3**	--	**-3**	--	--	--	--	--	--	**2**	--	**1**	--
CO3	**1**	**2**	**3**	**3**	**3**	--	--	--	--	--	--	--	**2**	--	**1**	--
CO4	**1**	**1**	**2**	--	--	--	--	--	--	--	--	--	**2**	--	**1**	--
CO5	**1**	**1**	**2**	--	--	**3**	--	--	--	**2**	--	**3**	**2**	--	**1**	**3**

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BME2712	CLINICAL ELECTRICAL SAFETY HAZARDS	L	T	P	C
Version 1.1	Date of Approval:16, May 2020	2	0	0	2
Pre-requisites/Exposure	Anatomy &Physiology				
Co-requisites	Electronic Circuit				

Catalog Description

The objective of the course is to provide a brief knowledge of Clinical Electrical Hazards, safety standards and Safety procedures. Curriculum introduce students with safety testing method and equipment.

Course Objectives

The objective of this course is to

- To provide an overview of clinical electrical hazards and safety.
- To introduces and overview of various safety standard and organization

Course Outcomes

On completion of this course, the students develop capabilities of:

On completion of this course, the students will be able to

CO45. Differentiate various electrical hazards with effect of level of currents.

CO46. Deploy various safety techniques with knowledge of various medical standard, in designing of medical equipment.

CO47. Conduct various test to confirm safety standards for medical device and clinical setup.

Course Content

Modules	Blooms level*	Number of hours
MODULE I: **Clinical Electrical Hazard** Introduction to electrical safety; Various effect of current flowing from one contact point to another: Sensitivity Limits, Let-go current, Muscles Contraction, Suffocation, Cardiac fibrillation, Burn; Difference between Macro-shocks and Micro-shocks	L1 and L2	4
MODULE II: **Electrical Safety** Physical Test, electrical Safety Analyzer Setup, Ground Wire Resistance, Insulation Test, Equipment Leakage Current (Direct, Differential, Alternative), Patient Applied part leakage current, Leads Isolation Test/Mains applied part Leakage.	L1, L2 and L3	4
MODULE III: **Type of Test** Physical Test, electrical Safety Analyzer Setup, Ground Wire Resistance, Insulation Test, Equipment Leakage Current (Direct, Differential, Alternative), Patient Applied part leakage current, Leads Isolation Test/Mains applied part Leakage.	L1, L2 and L3	4

*Bloom's Level:

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L1: Knowledge; L2: Comprehension; L3: Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- Electrical Safety Practice and Standards: CRC Press Publication

Reference Books

1. Electrical Safety Handbook by John Cadick, P.E., Mary Capelli-Schellpfeffer, M.D., M.P.A.,, Dennis K. Neitzel, C.P.E.,, Al Winfield, Publisher: McGraw-Hill

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO-PO-PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
CO 1		3	1										3	1		
CO 2		3	1										3	1		
CO 3		2	1										3	1		

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BME2713	BIOMECHANICS SIMULATION LAB	L	T	P	C
Version 1.1	Date of Approval: 16 May, 2019	0	0	2	1
Pre-requisites/Exposure	Engineering Mathematics, Medical Image Processing,				
Co-requisites					

Pre –Requisite: Matlab Programming

Catalog Description

This course helps the students to do hands-on practice with various simulation techniques use for Biomechanics. Biomechanics simulations study are known to be one of efficient techniques for various application of healthcare. Course built the foundation for develop software program for medical data processing.

The objective of this course is to

- To provide hands-on practice with 3D Modelling Tools.
- To provide hands-on practice with FEA Modelling.

Course Outcomes

On completion of this course, the students will be able to

CO11. Develop an efficient 3D model of human body part from 3D stackes of images.

CO12. Develop a FEA Model for solve an approximate solution on Medical Data.

List of Experiments	**Blooms level***	**Number of hours**
• To Develop a Bone3D modeling using 3D rendering Software.	L1, L2 and L3	2
• To operate smoothening function on 3D model using 3D rendering Software.	L1, L2 and L3	2
• To operate wrapping function on 3D model using 3D rendering Software.	L1, L2 and L3	2
7. To operate error analysis and rectification on 3D model using 3D rendering Software.	L1, L2 and L3	2
8. To operate 3D analysis Tool on 3D model using 3D rendering Software.	L1, L2 and L3	2
9. To develop assembly of 3D bone.	L1, L2 and L3	2
10. To Assign material properties to each component of 3D model.	L1, L2 and L3	2
11. To develop meshed 3D model.	L1, L2 and L3	2
12. To apply boundary condition and force component on 3D surfaces.	L1, L2 and L3	2
13. To simulate for FEA modelling.	L1, L2 and L3	2

Text Books

- By Christopher C. Pollitt, The Illustrated Horse's Foot - E-Book: A comprehensive guide, Elsevier Health Sciences, 16-Nov-2015 - Medical - 272 pages

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- Moaveni Saeed Finite Element Analysis : theory and Application with Ansys, 3rd Edition, Pearson Education, 2010
- Lab Practical Manual

Reference Books

- https://www.materialise.com/en/medical/mimics-innovation-suite/mimics
- https://www.ansys.com/solutions/solutions-by-industry/healthcare

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO4**
CO1		**2**	--	--	**1**	--	--	--	--	--	--	--		**-3**	1	--
CO2		**2**	--	--	**1**	--	--	--	--	--	--	--		3	**1**	--
CO3		**2**	--	--	**1**	--	--	--	--	--	--	--		3	**1**	--
CO4		**2**	--	--	**1**	--	--	--	--	--	--	--		3	**1**	--
CO5		**2**	--	--	**1**	--	--	--	--	--	--	--		3	**1**	--

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BME2714	EMBEDDED SYSTEM WITH RECENT TECHNOLOGY LAB	L	T	P	C
Version 1.1	Date of Approval: 16, May 2019	0	0	2	1
Pre-requisites/Exposure	Engineering Mathematics, Medical Image Processing,				
Co-requisites					

Catalog Description

This practical course is designed to quickly take students from beginner to basic functional knowledge of the Arduino microcontroller in three weekend 5-hour sessions. You can expect to learn a) how to write and upload simple code for the Arduino to perform basic logic functions like reading a switch to change a motors direction, b) how to integrate a variety of physical inputs including knobs, distance sensors, and light sensors, c) how to integrate a variety of physical outputs such as motors, lights, and speakers, and d) how to put all of these together to build simple self-contained low-cost low-power systems.

Course Objectives

The objective of this course is to

- Provide an overview of embedded system and real time operating system.
- Equip the students with concepts of Arduino microcontroller and its interfacing with external devices.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain and analyse the architecture of Arduino microcontroller, Debugging and programming techniques.

CO2: Explain and classify embedded systems and its applications.

CO3: Explain hardware and software design concepts of embedded system.

CO4: Explain real time operating system for embedded system.

List of Experiments	**Blooms level***	**Number of hours**
14. Designing a push button to turn ON and OFF a LED.	L1, L2 and L3	2
15. Designing a potentiometer to change the resistance values of an LED.	L1, L2 and L3	2
16. using the PWM pins on Arduino to increase or decrease the intensity of the LED.	L1, L2 and L3	2
17. Design a scrolling LED loop where 6 LEDs blink, one at a time, back and forth.	L1, L2 and L3	2
18. Designing a Bar graph by using Potentiometer and LEDs	L1, L2 and L3	2
19. Arduino-based data acquisition into Excel, LabVIEW, and MATLAB	L1, L2 and L3	2
20. Arduino Interface with GSM kit	L1, L2 and L3	2
21. Arduino interface with electronic Motor	L1, L2 and L3	2

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22. Arduino interfaces with Sensor	L1, L2 and L3	2
23. A low Budget Arduino Project	L1, L2 and L3	2

Text Books:

- Jeremy Blum, "Exploring Arduino: Tools and Techniques for Engineering Wizardry", 2nd Edition, Wiley, 2010.
- John Nassey, "Arduino for Dummies" 3rd Edition, Wiley, 2009.

Reference:

1.https://www.coursera.org/learn/arduino-platform

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO4**
CO1	**1**	**2**	--	--	--	--	--	--	--	--	--	--		--	**1**	--
CO2	**1**	**2**	--	--	--	--	--	--	--	--	--	--		--	**1**	--
CO3	**1**	**2**	--	--	--	--	--	--	--	--	--	--		--	**1**	--
CO4	**1**	**2**	--	--	--	--	--	--	--	--	--	--		--	**1**	--
CO5	**1**	**2**	--	--	--	--	--	--	--	--	--	--		--	**1**	--

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BME2735	SUMMER INTERNSHIP EVALUATION-II	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	0	3
Pre-requisites/Exposure	NA				
Co-requisites	Nil				

Catalog Description

There are certain phases of every Intern's professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship program can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal classroom situations. These attributes are intellectual ability, professional judgment and decision-making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc. In order to achieve these objectives, each student will maintain a file (**Internship File**). The Internship File aims to encourage students to keep a personal record of their learning and achievement throughout the Programme. It can be used as the basis for lifelong learning and for job applications. Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development. The report will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and their own personal contribution to the organization.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of new technologies and practical exposure
2. Provide an overview ofpresentation and preparation of report.

Course Outcomes

On completion of this course, the students will be able to

CO1: Study the literature and identify the problem statement

CO2: Work on a real world problem and solve it using latest technology

CO3: Prepare a detailed report of the project

CO4: Prepare a brief presentation of their project

CO5: Present and explain the project for evaluation

Text Books

As per topic of summer internship project is chosen and discussion with guide.

Reference Books

As per topic of summer internship project is chosen and discussion with guide.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	V	PPT	R	IM	EM
Weightage (%)	10	10	10	30	70

V – Viva, PPT-Power Point Presentation, R – Report, IP-Internal Marks, EM-External Marks

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1				--	--	--	--	--	1	2	2	--	-	2	2	1
CO2				-	--	--	--	--	1	2	2	--	-	2	2	1
CO3				--	--	--	--	--	1	2	-	--	-	2	2	1
CO4				--	--	--	--	--	1	2	3	--	-	2	2	1

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BME2737	PROJECT- DISSERTATION-I	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	0	8
Pre-requisites/Exposure	Whole Curriculum				
Co-requisites	Nil				

Catalog Description

Major Project/Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology, practical skill enhancement and an opportunity to work closely with a industry external guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation. Students require professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship program can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal classroom situations. These attributes are intellectual ability, professional judgment and decision-making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility

Course Objectives

The objective of this course is to

1. Equip the students with concepts of new technologies and practical exposure
2. Provide an overview ofpresentation and preparation of report

Course Outcomes

On completion of this course, the students will be able to

CO1: Study the literature and identify the problem statement

CO2: Work on a real world problem and solve it using latest technology

CO3: Prepare a detailed report of the project

CO4: Prepare a brief presentation of their project

CO5: Present and explain the project for evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	V	PPT	R	IM	EM
Weightage (%)	10	10	10	30	70

V – Viva, PPT-Power Point Presentation, R – Report, IP-Internal Marks, EM-External Marks

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	2	--	--	--	--	--	--	--	--	--	-			1
CO2	1	2	2	-	--	--	--	--	--	--	--	--	-	-		1
CO3	1	2	-	--	--	--	--	--	--	--	--	--	-	-		1
CO4	1	2	3	--	--	--	--	--	--	--	--	--	-	-		1

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BME2715	CLINICAL SCIENCES	L	T	P	C
Version 1.1	Date of Approval:16, May, 2019	3	0	0	3
Pre-requisites/Exposure	Anatomy &Physiology				
Co-requisites					

Catalog Description

The objective of the course is to provide a brief knowledge of Clinical Science. It is to provide the students of biomedical, a clinical aspects of Nephrology, General Surgery and Gastroenterology and cardiology. Engineering student able to understand clinical related issue and develop foundation to built futuristic solution for them.

Course Objectives

The objective of this course is to

- To provide an overview of clinical science.
- To develop the foundation to provide solution with understanding of clinical aspects of problems.

Course Outcomes

On completion of this course, the students develop capabilities of:
On completion of this course, the students will be able to
CO48. Identify various clinical aspects and issue related to Nephrology.
CO49. Identify various clinical aspects and issue related to general surgery.
CO50. Identify various clinical aspects and issue related to Cardiology.

Course Content

Modules	Blooms level*	Number of hours
MODULE I: **Nephrology-I** Diseases in Nephrology, Principles of dialysis, Haemodialysis, Acetate dialysis, Bicarbonate dialysis. Peritonial dialysis, Chronic ambulatory peritonealdialysis, Haemoperfusion, Sequential ultra-filtration. Haemofiltration, Adequacy ofdialysis, Clearance, dialysance, Components of dialysing system, Dialysate, compositionof dialysate, Types of dialysers, controls and monitoring devices for dialysers. Clinicalsignificance. Renal transplantation: Basic principles.	L1 and L2	9
MODULE II: **Nephrology-II** Diseases of nervous system, Electroencephalography, Pneumoencephalography, neuromuscular stimulation, Electromyography, Clinical applications. Motor neuron disorders, the electrical study of reflexes, the silent period. The F response, The H reflex, the axion reflexes, Disorders of neuromuscular transmission	L1 and L2	9

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MODULE III: **General Surgery and Gastroenterology** Pre- operative preparation for surgical patient, Study and operation of surgical equipment, safety aspects in electro-surgical units, Anatomy and physiology of G.I.T. Nutritional support and parenteral therapy, Height and weight estimations according to age. Intravenous cannulae, stomach wash tubes, Introduction to Hypertension and Diabetes..	L1 and L2	9
MODULE IV: **Cardiology:** Cardio vascular measurements, Normal and abnormal ECG, interpretation of ECG, Prosthetic devices, Monitors, Heart lung machine applications and Clinical significance, CVP and SWAN catheters. Diagnostic applications, Cardiac pacing. Diagnostic indications. Criteria for selection. Therapeutic indications.	L1 and L2	9

*Bloom's Level:
L1: Knowledge; L2: Comprehension; L3: Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- Strauss, Maurice B. & Louis G. Welt. Disease of Kidney, Vol 1 & 2 Little Brown. 1997
- James G. Mcleopd, Physiological Approach to Clinical Neurology, Butterworth Heinemann Lt., 3rd edition, 1981

Reference Books

- Robert F Rushmer, Cardio vascular Dynamics. WB Saunders, 1976.
- T.L Dent. W.E. Stodel, J. G. Turcotte, Surgical Endoscopy, year book Medical pub, 1985.
- Jones DB, Wu JS, Soper NJ, Laproscopic surgery: Principles and Procedures, 2nd Ed, Marcel Dekker, 2004

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Course CO-PO-PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1		3	1										3	1		
CO 2		3	1										3	1		
CO 3		2	1										3	1		

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BME2716	NEURAL NETWORK AND FUZZY LOGIC	L	T	P	C
Version 1.1	Date of Approval:16, May, 2019	3	0	0	3
Pre-requisites/Exposure	Machine Learning				
Co-requisites					

Catalog Description

Course has been divided in to two parts: Neural Networks and Fuzzy Logic. Neural networks part aims at introducing the fundamental theory and concepts of biological and artificial neural network and their applications in the area of machine intelligence. This part also offers knowledge of learning rules and architecture of various neural nets. The second part covers fuzzy logic: Fuzzy logic is a tool that can be applied to ambiguous problems, which cannot easily solved by classical techniques. Course discusses the fundamental of fuzzy set theory and fuzzy logic. In addition, this course also introduces applications of fuzzy logic in several areas such as fuzzy control and fuzzy decision making.

Course Objectives

The objective of this course is to

1. To cater the knowledge of Neural Networks and Fuzzy Logic Control and use these for controlling real time systems.

Course Outcomes

On completion of this course, the students will be able to

CO51. Demonstrate the concepts of feed forward neural networks
CO52. Demonstrate adequate knowledge about feedback networks.
CO53. Apply the concept of fuzziness involved in various systems.
CO54. Demonstrate adequate knowledge about fuzzy set theory
CO55. Apply fuzzy logic control to real time systems.

Course Content

Modules	Blooms level*	Number of hours
MODULE I: **Architecture** Introduction –Biological neuron-Artificial neuron-Neuron modeling Learning rules-Single layer-Multi layer feed forward network-Back propagation-Learning factors.	L1 and L2	7
MODULE II: **Neural Network for Control** Feedback networks-Discrete time hop field networks-Schemes of neuro – control, identification and control of dynamical systems-case studies (Inverted Pendulum, Articulation Control).	L1 and L2	7
MODULE III: **Fuzzy System** Classical sets-Fuzzy sets-Fuzzy relations-Fuzzification – Defuzzification-Fuzzy rules.	L1 and L2	7

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MODULE IV: **Fuzzy Logic Control** Membership function – Knowledge base-Decision –making logic – Optimizations of membership function using neural networks-Adaptive fuzzy systems-Introduction to generate to genetic algorithm.	L1 and L2	8
MODULE IV: Application of FLC Fuzzy logic control-Inverted pendulum-Image processing-Home Heating system-Blood pressure during anesthesia-Introduction to neuro fuzzy controller	L1 and L2	7

*Bloom's Level:
L1: Knowledge; L2: Comprehension; L3: Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Kosko, B, "Neural Networks and Fuzzy Systems: A Dynamical Approach to Machine Intelligence", PrenticeHall, NewDelhi, 2004.
2. Timothy J Ross, "Fuzzy Logic with Engineering Applications", John Willey and Sons, West Sussex, England, 2005.

Reference Books

1. Jack M. Zurada, "Introduction to Artificial Neural Systems", PWS Publishing Co., Boston, 2002
2. Klir G.J. &Folger T.A., "Fuzzy sets, Uncertainty and Information", Prentice –Hall of India Pvt. Ltd., New Delhi, 2008.
3. Zimmerman H.J., "Fuzzy set theory and its Applications", Kluwer Academic Publishers Dordrecht, 2001.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO-PO-PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO1		3			1										1	3
CO2		3			1										1	3
CO3		2			1										1	3
CO4		2			1										1	3
CO54		2			1										1	3

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BME2717	VIRTUAL REALITY	L	T	P	C
Version: 2019.1	Date of Approval: 16 May 2019	3	-	-	3
Pre-requisites/Exposure	Basic Knowledge of C++ Programming				
Co-requisites	Nil				

Catalog Description

This course covers understanding of software and hardware related to computer graphics systems. Topics include an introduction to the basic concepts, 2-D and 3-D modeling and transformations, viewing transformations, clipping, color filling, projections, rendering techniques, visible surface detection and elimination algorithms, graphical software packages and graphics systems. Students will use a standard computer graphics API to reinforce concepts and study fundamental computer graphics algorithms. Last module covers elementary image processing techniques and various library function in C to build animations.

Course Objectives

The objective of this course is to

1. Equip the students with fundamental concepts of graphics system and standards.
2. Equip the students with mathematical concepts of graphics algorithms to draw objects using C language.
3. Provide an overview of various 2D & 3D transformation, clipping operations, algorithms related to hidden surface detection and elimination and their implementation.
4. Provide an overview of various elementary image processing techniques and basic library function in C to create animation sequence.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain applications of computer graphics and define various standards and components in development of computer graphics.

CO 2: Explain generation of graphics primitives and analyze their problems and solutions. Demon strate solid filling algorithms. Demonstrate polygon clipping and line clipping algorithm and analyze their problems and solutions.

CO 3: Apply 2D geometric transformations on 2D graphics objects with their practical implement - ation. Illustrate use of window to viewport transformation in computer graphics.

CO4: Apply 3D geometric transformations on 3D objects with their practical implementation.

CO 5: Illustrate the use of 3D object modeling, Visible Surface detection and elimination algorithm and analyze their problems and solutions.

Modules	Blooms level*	Number of hours
Module I: Introduction to Graphics and Graphics Hardware System Application of computer graphics, Video Display Devices, Raster Scan Display, Random Scan Display, Input Devices, Graphic Software and graphics standards, Numerical based on Raster and Random scan display, Frame buffer, Display processor.	L1, L2	5

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Module II: Output Primitives and Clipping operations Algorithms for drawing 2D Primitives lines (DDA and Bresenham's line algorithm), circles (Bresenham's and midpoint circle algorithm), ellipses (midpoint ellipse algorithm), Antialiasing and filtering techniques. Line clipping (cohen-sutherland algorithm), Curve clipping algorithm, and polygon clipping with Sutherland Hodgeman algorithm, Area fill algorithms for various graphics primitives: Scanline fill algorithm, boundary fill algorithm, flood fill algorithm, Polygon representation, various method of Polygon Inside test: Even-Odd method, winding number method, Character generation techniques.	L2, L3, L4	6
Module III: 2D Geometric transformation 2D Transformation: Basic transformation, Translation, Rotation, Rotation relative to an arbitrary point, scaling, Matrix Representations and Homogeneous coordinates, window to viewport transformation.	L3 and L4	6
Module IV:3D Geometric transformation 3D Concepts: Parallel projection and Perspective projection, 3D Transformations, composite 3D transformation, co-ordinate transformation, Inverse transformation	L3 and L5	7
Module V: object modelling and Visible Surface detection fractal geometry methods, fractal dimensions, Geometric construction of deterministic self-similar fractals, Iterated function system to generate fractals. Bezier curves and Bezier surfaces, Bspline curves and surfaces, Visible surface detection method: Basic illumination, diffuse reflection, specular reflection, shadows. Ray tracing method, Depth-buffer method, A-buffer method, Depth-sorting method (painter's algorithm), Binary search partition method, Scan line method,	L4, L5	7
Module VI: Introduction to multimedia Design of animation sequences, Computer Animation languages, Elementary filtering techniques and elementary Image Processing techniques, graphics library functions used in animation design	L2, L3, L5	5

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1.Udit Agrawal,"Principles of Computer Graphics", 2nd Edition, DhanpatRaiPublications,New Delhi, 2017.
2.Hughes, Van Dam, et al. "Computer Graphics Principles and Practice", 3rd Edition, Pearson, 2014.
3.Hearn and Baker, "Computer Graphics with OpenGL", 3rd Edition, Prentice Hall, 2004.
4.Donald Hearn & M. Pauline Baker, "Computer Graphics C Version", Pearson Education, New Delhi, 2004.

Reference Books

1. James D. Foley, Andries van Dam, Steven K. Feiner, John Hughes, "Computer Graphics: Principles and Practice", 2nd Edition, Pearson Education, 2007.
2. F.S. Hill, "Computer Graphics using OPENGL",2nd edition, Pearson Education, 2003.
3. David F. Rogers; "Procedural Elements for Computer Graphics" TMH. Publications.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

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Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	_	-	--	--	--	--	--	--	--	--	--		--	1	2
CO2	1	1	1	--	--	--	--	--	--	--	--	--		--	1	2
CO3	1	1	1	3	--	--	--	--	--	--	--	--		3	1	1
CO4	1	1	2	2	--	1	--	--	--	--	--	--		--	1	2
CO5	1	3	2	1	1	2	--	--	--	--	--	--		3	1	2
CO6	1	2	3	--	1	2	--	--	--	--	--	--	2	3	2	

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BME2718	ROBOTIC PROCESS AUTOMATION DESIGN & DEVELOPMENT	L	T	P	C
Version 2019.1	Date of Approval: 16May, 2019	3	0	0	3
Pre-requisites/Exposure	Basic Networking Concepts				
Co-requisites	Nil				

Catalog Description

This course aims at providing knowledge of basic concepts of Robotic Process Automation to University students. It further builds on these concepts and introduces key RPA Design and Development strategies and methodologies specifically in context of UiPath products. The student undergoing the course shall develop the competence to design and develop a robot for a defined process.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of robotic process automation
2. Provide an overview of designing with uipath software.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain key terms and trends around the robotic process automation along with its physical and logical design

CO2: Understand the potential and value of the robotic process automation .

CO3: Describe the technologies used for the robotic process automation and mobile devices, including (passive and active) sensors, the physical communications layer, communications protocols, programming frameworks,.

CO4: Design programs and have hands on experience on uipath software

CO5:Develop RPA programs of moderate complexity for a well-used robotic automation process using uipath.

Modules	Bloom s level*	Numbe r of hours
Module 1: Programming Basic and Recap **Programming Concepts Basics I -** Understanding the application, Basic Web Concepts, Protocols, Email Clients, Data Structures, Data Tables, Algorithms, Software Processes, Software Design, SDLC. **Programming Concepts Basics 2-** Scripting, Net Framework, Net Fundamentals, XML, Control structures and functions, XML, HTML, CSS, Variables & Arguments.	L1, L2	8

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Module II: RPA Concepts **RPA Basics -** History of Automation, what is RPA, RPA vs Automation, Processes & Flowcharts, Programming Constructs in RPA, What Processes can be Automated, Types of Bots, Workloads which can be automated. **RPA Advanced Concepts -** Standardization of processes, RPA Development methodologies, Difference from SDLC, Robotic control flow architecture, RPA business case, RPA Team, Process Design Document/Solution Design Document, Industries best suited for RPA, Risks & Challenges with RPA, RPA and emerging ecosystem	L2, L3 and L4	8
Module III: UiPath Introduction & Basics **Introduction to UiPath-** Installing UiPath Studio community edition, The User Interface, KeyboardShortcuts,AboutUpdating,AboutAutomationProjects,IntroductiontoAutomation Debugging, Managing Activation Packages, Reusing Automations Library, Installing the Chrome Extension, Installing the Firefox Extension, Connecting your project to a source control system, Activities Guide. **Variables**, **Control Flow** **DataManipulation-** DataManipulationIntroduction,Scalarvariables,collectionsandTables, Text Manipulation, Data Manipulation, Gathering and AssemblingData. **Recording and Advanced UI Interaction -** Recording Introduction, Basic and Desktop Recording, Web Recording, Input/Output Methods, Screen Scraping, Data Scraping,Scraping advanced techniques.Selectors.	L2, L3 and L4	8
Module IV: UiPath Advanced Automation concepts and techniques Image, Text & Advanced Citrix Automation- Introduction to Image & Text Automation, Image based automation, Keyboard based automation, Information Retrieval, Advanced Citrix Automation challenges, Best Practices, using tab for Images, Starting Apps. Excel Data Tables & PDF - Data Tables in RPA, Excel and Data Table basics, Data Manipulation in excel, Extracting Data from PDF, extracting a single piece of data, Anchors, Using anchors in PDF. Email Automation- Email Automation, Incoming Email automation, Sending Email automation	L2, L3 and L4	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- "Learning Robotic Process Automation" By Alok Mani Tripathi,Packt Publications,Ist Edition,2018

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	--	--	**3**	--	--	--	--	--	--	**2**	--	**1**	**1**	-	-
CO2	**1**	--	**1**	**2**	--	--	--	--	--	--	--	--	-	**1**	-	-
CO3	**1**	--	**1**	**2**	--	--	--	--	--	--	--	--	-	**1**	-	**2**
CO4	**1**	--	--	**2**	--	--	--	--	--	--	--	--	**1**	**1**	-	**2**

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BME2837	PROJECT- DISSERTATION-II	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	0	8
Pre-requisites/Exposure	Whole Curriculum				
Co-requisites	Nil				

Catalog Description

Major Project/Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology, practical skill enhancement and an opportunity to work closely with a industry external guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation. Students require professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship program can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal classroom situations. These attributes are intellectual ability, professional judgment and decision-making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility

Course Objectives

The objective of this course is to

- Equip the students with concepts of new technologies and practical exposure
- Provide an overview ofpresentation and preparation of report

Course Outcomes

On completion of this course, the students will be able to

CO1: Study the literature and identify the problem statement

CO2: Work on a real world problem and solve it using latest technology

CO3: Prepare a detailed report of the project

CO4: Prepare a brief presentation of their project

CO5: Present and explain the project for evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	V	PPT	R	IM	EM
Weightage (%)	10	10	10	30	70

V – Viva, PPT-Power Point Presentation, R – Report, IP-Internal Marks, EM-External Marks

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	2	--	--	--	--	--	--	--	--	--	-			1
CO2	1	2	2	-	--	--	--	--	--	--	--	--	-	-		1
CO3	1	2	-	--	--	--	--	--	--	--	--	--	-	-		1
CO4	1	2	3	--	--	--	--	--	--	--	--	--	-	-		1

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BME2803	MEDICAL INFORMATICS	L	T	P	C
Version 1.1	Date of Approval: 16, May 2019	3	0	0	3
Pre-requisites/Exposure	Engineering Physics, Biomedical Instrumentation				
Co-requisites	Anatomy and Physiology				

Catalog Description

Collecting, storing and using information has always been an integral part of the practice of medicine. It has, however, become more complex and technology-based thereby creating an increasing need for biomedical graduates to be competent in information handling skills ranging from simple record-keeping to accessing and using computer-based data. As well as having the technical skills to undertake such tasks it is important that graduates appreciate the role of informatics in the day-to-day care of medical equipment and the advancement of medical science in general.

Course Objectives

The objective of course is to

- To provide an overview of computers and multimedia applications in medical field to develop educational / training packages.
- To serve as a foundation for the study of components of virtual reality and virtual reality applications in medicine.

Course Outcomes

On completion of this course, the students will be able to

CO1. Identify and Explain requirements of the implementation of medical database.
CO2. Outline and explain the visual basic tools for medical information system.
CO3. Identify and explain various requirement of Computer, multimedia systems and its algorithm for Medical informatics.
CO4. Explain the role of Computer in Medical research.

Course Content

Modules	Blooms level*	Number of hours
MODULE I: **Medical Database Implementation** Medical data acquisition and database systems: PC based multichannel data acquisition system; storage, analysis and retrieval techniques	L1 and L2	6
MODULE II: **Visual Basic** Visual programming concepts; visual Basic environment, tools and controls; Dynamic data exchange; VB based Medical Information System	L1 and L2	6
MODULE III: **Computers in system design** Hospital Information System its design and functional characteristics; Principles and application of Artificial Intelligence, Pattern Recognition, Neural Network and Fuzzy Logic in Medicine	L1 and L2	6

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MODULE IV: **Multimedia and virtual reality applied to medicine** Basic concepts of Multimedia; Design of Multimedia information systems; Components of virtual reality; Virtual reality applications in medicine	L1 and L2	8
MODULE V: **Computers in medical research** Medical Informatics and its levels; Design and development of educational packages on medical sciences; Integrated design concepts; Interactive multimedia, Virtual and digital libraries, Internet and its applications.	L1 and L2	10

*Bloom's Level:
L1: Knowledge; L2: Comprehension; L3: Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- R.D.Lele, Computer in Medicine , Tata McGraw-Hill, New Delhi, 1997
- Tay Vaughan, Multimedia making it work, Tata McGraw-Hill, New Delhi, 1997.
- Davis Chapman, Teach Yourself Visual Basic 6 in 21 days, New Delhi, 1997.

Reference Books

1. Harold Sackman, Biomedical Information Technology, Academic Press, New York, 1997.
2. Mary Brth Fecko, Electronics Resources: Access and Issues, Bowker and Saur, London, 1997

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO-PO-PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	1													1	2
CO 2	2	1													1	2
CO 3	2	1													1	2
CO 4	2	1													1	2
CO 5	2	1													1	2

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BME2804	RECENT ADVANCEMENT IN BIOMEDICAL MODALITIES	L	T	P	C
Version 1.1	Date of Approval: May 16, 2019	3	0	0	3
Pre-requisites/Exposure	Engineering Physics, Biomedical Instrumentation				
Co-requisites	Anatomy and Physiology				

Catalog Description

This course provide insight in the recent development in the field of Biomedical Equipment. It is a open ended course for final semester students where recent on going research and newly adapt technologies in market would be discuss. Course largely help student to develop carrier path and a lifelong learning opportunities.

Course Objectives

The objective of course is to

- To provide an insight in recent development in field of Biomedical.
- To serve as a foundation for life-long learning in field of biomedical.

Course Outcomes

On completion of this course, the students will be able to

CO5. Identify the new development in field of MRI.
CO6. Identify the new development in field of CT-Scan.
CO7. Identify the new development in field of Artificial Intelligence in Medicine.
CO8. Identify the new development in field of robotic surgery.

Course Content

Modules	Blooms level*	Number of hours
MODULE I: **Recent Advancements in Field of MRI** Medical data acquisition and database systems: PC based multichannel data acquisition system; storage, analysis and retrieval techniques	L1 and L2	9
MODULE II: **Recent Advancement in Field of CT-Scan** Visual programming concepts; visual Basic environment, tools and controls; Dynamic data exchange; VB based Medical Information System	L1 and L2	9
MODULE III: **Recent Advancement in aspect of Artificial Intelligence in Medical Equipments** Hospital Information System its design and functional characteristics; Principles and application of Artificial Intelligence, Pattern Recognition, Neural Network and Fuzzy Logic in Medicine	L1 and L2	9
MODULE IV: **Robotic Surgery and its technolgy** Basic concepts of Multimedia; Design of Multimedia information systems; Components of virtual reality; Virtual reality applications in medicine	L1 and L2	9

*Bloom's Level:

L1: Knowledge; L2: Comprehension; L3: Application; L4: Analysis; L5: Synthesis, L6: Evaluation

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Text Books

- R.D.Lele, Computer in Medicine , Tata McGraw-Hill, New Delhi, 1997
- Tay Vaughan, Multimedia making it work, Tata McGraw-Hill, New Delhi, 1997.
- PubMed

Reference Books

- Harold Sackman, Biomedical Information Technology, Academic Press, New York, 1997.
- Mary Brth Fecko, Electronics Resources: Access and Issues, Bowker and Saur, London, 1997

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO-PO-PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	1												1		2
CO 2	2	1												1		2
CO 3	2	1													1	2
CO 4	2	1												1		2

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BME2805	ADVANCED ROBOTIC PROCESS AUTOMATION DESIGN & DEVELOPMENT	L	T	P	C
Version 2019.1	Date of Approval: 16May 2019	3	0	0	3
Pre-requisites/Exposure	Basic Networking Concepts				
Co-requisites	Nil				

Catalog Description

This course aims at providing knowledge of basic concepts of Robotic Process Automation to University students. It further builds on these concepts and introduces key RPA Design and Development strategies and methodologies specifically in context of UiPath products. The student undergoing the course shall develop the competence to design and develop a robot for a defined process.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of robotic process automation
2. Provide an overview of designing with uipath software.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain key terms and trends around the robotic process automation along with its physical and logical design

CO2: Understand the potential and value of the robotic process automation .

CO3: Describe the technologies used for the robotic process automation and mobile devices, including (passive and active) sensors, the physical communications layer, communications protocols, programming frameworks,.

CO4: Design programs and have hands on experience on uipath software

CO5:Develop RPA programs of moderate complexity for a well-used robotic automation process using uipath.

Modules	Blooms level*	Number of hours
Module 1: Exception handling and Best Practices **Debugging and Exception Handling- Debugging** Tools, Strategies for solving issues, Catching errors. **Project Organization-** Concept of project organization, Best practices, Avoiding pitfalls, Invoke Activity.	L1, L2	8
Module II: Introduction to Orchestrator Orchestrator, Tenants, Authentication, Users, Roles, Robots, Environments, Queues & Transactions, Schedules.	L2, L3 and L4	8
Module III: merging and Future Trends in IT Artificial Intelligence, Machine Learning, Agent awareness, Natural Language Processing Computer Vision	L2, L3 and L4	8
Module IV: Capstone Project Real life case studies which can be used to apply the concepts learnt during the course. The projects shall test student's skills right from process transformation and documentation to the design and development of the actual robot	L2, L3 and L4	12

**Bloom's Level:*

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L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

"Learning Robotic Process Automation" By Alok Mani Tripathi,Packt Publications,Ist Edition,2018

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	--	--	3	--	--	--	--	--	--	2	--	1		1	-
CO2	1	--	1	2	--	--	--	--	--	--	--	--	-		1	-
CO3	1	--	1	2	--	--	--	--	--	--	--	--	-		1	2
CO4	1	--	--	2	--	--	--	--	--	--	--	--	1		1	2

1: strongly related, 2: moderately related and 3: weakly related

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Curriculum & Scheme of Examination

2023

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AIE6104	INTRODUCTION TO COMPUTERS AND PROGRAMMING IN C	L	T	P	C
Version: 2020.1	Date of Approval: July 2020	2	1	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The objective of this course module is to acquaint the students with the basics of computers system, its components, data representation inside computer and to get them familiar with various important features of procedure-oriented programming language i.e. C.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of Programming through C Language
2. Provide an overview of advanced programming concepts like Structure, Union and File Handling

Course Outcomes

On completion of this course, the students will be able to

After the completion of course, the students will be able to,

CO 1:Define the purpose and structure of C Program for programming; identify and distinguish various datatypes and operators; conditional and control statement; Apply if-else, Switch and loops to rewrite basic C program for problem solving.

CO 2: Compare and contrast various Array types, its declaration and implementation; differentiate between Call by Value and Reference if Functions; apply the concepts to rewrite C Programs

CO 3: Differentiate between various String Handling Functions; describe the concept of Pointers in C Language

CO 4: Explain the concept of Structure and Union; apply the concept of File Handling to provide data storage support to the programs.

CO 5: Apply the concept of Computer Graphics using C programming concepts for implementing line drawing, circle drawing algorithms.

Modules	Blooms level*	Number of hours
Module I: Introduction Introduction to computer, history, von-Neumann architecture, memory system (hierarchy, characteristics, and types), H/W concepts (I/O Devices), S/W concepts (System S/W & Application S/W, utilities). Data Representation: Number systems, character representation codes, Binary, octal, hexadecimal and their interconversions. Binary arithmetic, floating point arithmetic, signed and unsigned numbers, Memory storage unit.	L1, L2 and L3	7
Module II: Programming in C History of C, Introduction of C, Basic structure of C program, Concept of variables, constants and data types in C, Operators and expressions: Introduction, arithmetic, relational, Logical, Assignment, Increment and decrement operator, Conditional, bitwise operators, Expressions, Operator precedence and associativity. Managing Input and output Operation, formatting I/O.	L2, L3 and L4	7

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Module III: Fundamental Features in C C Statements, conditional executing using if, else, nesting of if, switch and break Concepts of loops, example of loops in C using for, while and do-while, continue and break. Storage types (automatic, register etc.), predefined processor, Command Line Argument.	L2, L3 and L4	7
Module IV: Arrays and Functions One dimensional arrays and example of iterative programs using arrays, 2-D arrays Use in matrix computations. Concept of Sub-programming, functions Example of user defined functions. Function prototype, Return values and their types, calling function, function argument, function with variable number of argument, recursion.	L2 and L3	7
Module V: Advanced features in C Pointers, relationship between arrays and pointers Argument passing using pointers, Array of pointers. Passing arrays as arguments. Strings and C string library. Structure and Union. Defining C structures, Giving values to members, Array of structure, Nested structure, passing strings as arguments. File Handling.	L2, L3 and L4	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6:Evaluation

Text Books

1. E Balagurusamy, "Programming in ANSI C", Seventh Edition, Tata McGraw Hill Education private limited, July 2017.
2. Yashwant Kanetkar, "Let Us C", 16th Edition, BPB Publication, June 2017.

Reference Books

1. Brain W Kernighan and Dennis M Ricchie, "The C Programming Language", 2nd Edition, Pearson Publication, Jan 2015.
2. Byron Gottfried, "Programming with C", Third Edition, Tata McGraw Hill Education private limited, July 2017.
3. E Balagurusamy, "Computer Concepts & Programming in C", Seventh Edition, Tata McGraw Hill Education private limited, July 2011.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	--	**2**	--	--	--	--	--	--	--	--	**1**	--	**1**	--
CO2	**1**	**1**	**2**	**2**	--	--	--	--	--	--	--	--	**1**	--	**1**	--
CO3	**1**	**1**	**2**	**3**	--	--	--	--	--	--	--	--	**1**	--	**1**	--
CO4	**1**	**1**	**2**	**2**	**3**	--	--	--	--	--	--	--	**1**	--	**1**	--
CO5	**1**	**1**	**2**	**2**	**3**	--	--	--	--	--	--	--	**1**	--	**1**	--

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AIE6106	PROGRAMMING IN C LAB	L	T	P	C
Version 2020.1	Date of Approval: July, 2020	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The primary objective of this course is to understand all the components of C, including the C language, the C Preprocessor, and the C Standard Library. An understanding of some advanced practical issues, including memory management, testing, and debugging, complex declarations and expression evaluation, building and using libraries, and evaluating tradeoffs, such as size vs. speed and speed vs. complexity. The ability to write C code and create and manipulate logical programs.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of Programming through C Language
2. Provide an overview of advanced programming concepts like Structure, Union and File Handling.

Course Outcomes

After the completion of course, the students will be able to,

CO 1:Demonstrate the use of various data types and operators in C programs; Solve various problems using conditional control statements (if-else, Switch case).

CO 2: Construct C programs related to problems involving the usage of loops, arrays and functions.

CO 3: Apply the concept of Pointers for efficient memory management and construct C programs using string handling functions.

CO 4: Demonstrate the use of Structure, Union and concept of File Handling to provide data storage support to the programs.

Modules	Blooms level*	Number of hours
LABORATORY SESSSION 1 OPERATORS, EXPRESSIONS and DECISION MAKING 1. Write a program to calculate simple interest and amount. 2. Write a program to swap two numbers using third variable. 3. Write a program to demonstrate Greatest of 3 nos and to print the given no in ascending order. 4. Write a program to check if the number is even or odd. 5. Write a program to perform arithmetic operations using Switch Case statement. 6. Write a program to calculate area of circle, rectangle, square and triangle using Switch Case statement.	L3	5

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LABORATORY SESSSION 2 LOOPING 1. Write a program to find factorial of given no using do while statement. 2. Write a program to print prime numbers up to 'n'. 3. Write a program to sum of n natural no. 4. Write a program to print Fibonacci series. 5. Write a program to reverse a number. 6. Write a program to print the following pattern using for loop 1 2 2 3 3 3 4 4 4 4 7. Write a program to print the following pattern using for loop A A B A B C A B C D	L3	6
LABORATORY SESSSION 3 ARRAYS and FUNCTIONS 1. Write a program to read n num of students and 5 subjects marks. 2. Write a program to swap two numbers using call by value. 3. Write a program to convert all lower case to uppercase characters 4. Write a program to find the factorial of a number using recursion. 5. Write a program to print the add/product of two matrices of any order.	L3	5
LABORATORY SESSSION 4 POINTERS AND STRING 1. Write a program to perform operations on strings using string handling in-built functions (concatenation, reversal, copy etc.) 2. Write a program to swap two numbers using call by reference. 3. Write a program to perform dynamic memory allocation and deallocation. 4. Write a program to print elements of array using pointers.	L3	4
LABORATORY SESSSION 5 STRUCTURE,UNION & FILE HANDLING 1. WAP program to display student information by initializing structures. 2. WAP program to find the total salary of employee and employee details using structure. 3. Write a program to store and display information using Union. 4. Program to write data into file and read data from file.	L3	4

**Bloom's Level:L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. E Balagurusamy, "Programming in ANSI C", Seventh Edition, Tata McGraw Hill Education private limited, July 2017.
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3. E Balagurusamy, "Computer Concepts & Programming in C", Seventh Edition, Tata McGraw Hill Education private limited, July 2011.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	--	**2**	--	--	--	--	--	--	--	--	**1**	--	**2**	--
CO2	**1**	**1**	**2**	**2**	--	--	--	--	--	--	--	--	**1**	--	**2**	--
CO3	**1**	**1**	**2**	**3**	--	--	--	--	--	--	--	--	**1**	--	**2**	--
CO4	**1**	**1**	**2**	**2**	**3**	--	--	--	--	--	--	--	**1**	--	**2**	--

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AIE6204	OBJECT ORIENTED PROGRAMMING USING C++	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	2	1	0	3
Pre-requisites/Exposure	Hands on knowledge of C Programming				
Co-requisites	Basic concepts of C Programming				

Catalog Description

The objective of this course is to introduce object-oriented programming. To explore and implement the various features of OOP such as inheritance, polymorphism, Exceptional handling using programming language C++. After completing this course student can easily identify the basic difference between the programming approaches like procedural and object oriented.

Course Objectives

The objective of this course is

1. Equip the students with the basic features of C++ supporting object-oriented programming. Perform object oriented programming to develop solutions to problems demonstrating usage of control structures, modularity, I/O. and other standard language constructs.
2. Provide the overview of major object-oriented concepts to implement object oriented programs in C++ like encapsulation, inheritance and polymorphism, stream I/O, templates and operator overloading

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain the basic principles of object-oriented programming approach; Differentiate it with procedural programming approach and also discuss difference between C and C++.

CO 2: Illustrate the different ways to define a member function inline and explain how the private members of a class can be accessed. Explain how the objects can be instantiated and destroyed with static data member?

CO 3: Explain the concept of inheritance, types and implementation with suitable examples; find out ambiguity problem in inheritance; use the concept of overriding and constructors in inheritance.

CO 4: Explain polymorphism in detail and implement the concept of overloading in functions as well as in operators. Write the programs for virtual function and pointer with objects.

CO 5: Explain the exception handling mechanism. Design the programs for class and function Template. Compare and contrast various formatted and unformatted i/o function in file handling.

Modules	Blooms level*	Number of hours
MODULE 1: INTRODUCTION Review of C, Difference between C and C++, Procedure Oriented and Object Oriented Approach. Basic Concepts: Objects, classes, Principals like Abstraction, Encapsulation, Inheritance and Polymorphism. Dynamic Binding, Message Passing. Characteristics of Object-Oriented Languages. Introduction to Object-Oriented Modeling techniques (Object, Functional and Dynamic Modeling).	L1 and L2	5

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MODULE 2: CLASSES AND OBJECTS Abstract data types, Object & classes, attributes, methods, C++ class declaration, Local Class and Global Class, State identity and behaviour of an object, Local Object and Global Object, Scope resolution operator, Friend Functions, Inline functions, Constructors and destructors, instantiation of objects, Types of Constructors, Static Class Data, Array of Objects, Constant member functions and Objects, Memory management Operators.	L1, L2 and L3	7
MODULE 3: INHERITANCE Inheritance, Types of Inheritance, access modes – public, private & protected, Abstract Classes, Ambiguity resolution using scope resolution operator and Virtual base class, Aggregation, composition vs classification hiérarchies, Overriding inheritance methods, Constructors in derived classes, Nesting of Classes	L2, L3 and L4	8
MODULE 4: POLYMORPHISM Polymorphism, Type of Polymorphism – Compile time and runtime, Function Overloading, Operator Overloading (Unary and Binary) Polymorphism by parameter, Pointer to objects, this pointer, Virtual Functions, pure virtual functions.	L2, L3 and L4	8
MODULE 5: STRINGS, FILES AND EXCEPTION HANDLING Manipulating strings, Streams and files handling, formatted and Unformatted Input output. Exception handling, Generic Programming – function template, class Template Standard Template Library: Standard Template Library, Overview of Standard Template Library, Containers, Algorithms, Iterators, Other STL Elements, The Container Classes, General Theory of Operation, Vectors.	L2, L3 and L4	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. A.R. Venugopal, Rajkumar, T. Ravishanker "Mastering C++", TMH, 1997
2. R. Lafore, "Object Oriented Programming using C++", BPB Publications, 2004.
3. E. Balagurusamy ,"Object Oriented Programming with C++", Mc Graw Hill,6th Edition,2013.
4. Schildt Herbert, "C++: The Complete Reference", Wiley DreamTech, 2005.

Reference Book

1. Parasons, "Object Oriented Programming with C++", BPB Publication, 1999.
2. Steven C. Lawlor, "The Art of Programming Computer Science with C++", Vikas Publication, 2002.
3. Yashwant Kanethkar, "Object Oriented Programming using C++", BPB, 2004

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/ Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	2	--	--	--	--	--	--	--	--	--	--	1	--	2	--
CO 2	1	1	2	3	--	--	--	--	--	--	--	--	1	--	1	2
CO 3	1	1	2	--	--	--	--	--	--	--	--	--	1	--	2	2
CO 4	1	1	2	3	--	--	--	--	--	--	--	--	1	1	--	2
CO 5	1	1	2	--	--	--	--	--	--	--	--	--	1	1	--	1

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AIE6208	OBJECT ORIENTED PROGRAMMING USING C++ LAB	L	T	P	C
Version 2020.1	Date of Approval: JULY, 2020	0	0	1	1
Pre-requisites/Exposure	Turbo C++				
Co-requisites	NIL				

Catalog Description

The objective of this course is to introduce object-oriented programming. To explore and implement the various features of OOP such as inheritance, polymorphism, Exceptional handling using programming language C++. After completing this course student can easily identify the basic difference between the programming approaches like procedural and object oriented.

Course Objectives

The objective of this course is

1. Perform object-oriented programming to develop solutions to problems demonstrating usage of control structures, modularity, I/O. and other standard language constructs.
2. Demonstrate adeptness of object-oriented programming in developing solutions to problems demonstrating usage of data abstraction, encapsulation, and inheritance.
3. Demonstrate ability to implement one or more patterns involving realization of an abstract interface and utilization of polymorphism in the solution of problems which can take advantage of dynamic dispatching, syntax, features of, and how to utilize the Standard Template Library.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Define and identify the basic principles of object-oriented programming approach; Differentiate it with procedural programming approach.

CO 2: Determine the different ways to define a member function inline and explain how the private members of a class can be accessed. Solve how the objects can be instantiated and destroyed with static data member?

CO 3: Apply the concept of inheritance, types and implementation with suitable examples; find out ambiguity problem in inheritance; use the concept of overriding and constructors in inheritance.

CO 4: Relate the concept polymorphism with overloading in detail and implement the concept of overloading in functions as well as in operators. Write the programs for virtual function and pointer with objects.

CO 5: Determine the exception handling mechanism. Design the programs for class and function Template. Compare and contrast various formatted and unformatted i/o function in file handling.

Modules/Topics Covered**	Blooms level*	Number of hours
1. Sample Programs using objects and classes (a) Write a program to illustrate the concept of one class with two objects by taking student data. (b) Write a program to show the relationship of class and object to display roll no., grade and fee paid by student.	L1, L3, L5	4

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2. Sample Programs for different use of private, public member variables and functions and friend functions (a) Write a program to define the member function outside and inside the class. (b) Write a program to read and display the information of N persons to illustrate the concept of array of objects. (c) Write a program to add two numbers to illustrate the use of friend function.	L1, L3, L5	4
3. Sample Programs using constructors and destructors (a) Write a program to assign and copy values to illustrate the concept of parametrized and copy constructor. (b) Write a program to show the order of constructor and destructor.	L1, L3, L5	4
4. Sample Programs using operator overloading (a) Write a program to add two numbers using binary operator overloading. (b) Write a program to illustrate the assignment operator overloading.	L1, L3, L5	4
5. Sample Programs using inheritance in and accessing objects of different derived classes (a) Write a program to compute the marks explaining the concept of multiple inheritance. (b) Write a program to find the factorial of a number using inheritance.	L1, L3, L5	4
6. Sample Programs using polymorphism and virtual functions (using pointers) and File Handling (a) Write a program to find the volume of cylinder and cuboid using function overloading. (b) Write a program to reverse a string using pointers. (c) Write a program to explain the relationship of inheritance and virtual function. (d) Write a program to read the student name and fee paid using read() function from the file.	L1, L3, L4, L5	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

1. A.R. Venugopal, Rajkumar, T. Ravishanker "Mastering C++", TMH, 1997
2. R. Lafore, "Object Oriented Programming using C++", BPB Publications, 2004.
3. "Object Oriented Programming with C++" By E. Balagurusamy.
4. Schildt Herbert, "C++: The Complete Reference", Wiley DreamTech, 2005.

Reference Book

1. Parasons, "Object Oriented Programming with C++", BPB Publication, 1999.
2. Steven C. Lawlor, "The Art of Programming Computer Science with C++", Vikas Publication, 2002.
3. Yashwant Kanethkar, "Object Oriented Programming using C++", BPB, 2004

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA					EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	**70**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**3**	**1**	**2**	--	--	--	--	--	--	--	--	--	**2**	--	--	--
CO2	**3**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO3	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO4	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO5	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--

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AIE6211	ENGINEERING GRAPHICS LAB	L	T	P	C
Version 2019.1	Date of Approval: July 14, 2019	0	0	4	2
Pre-requisites/Exposure	Concepts Mathematics (especially Trigonometry and Geometry)				
Co-requisites	Machine Drawing & CAD				

Catalog Description:
A freshman level course which provides the undergraduate engineering students with a background in descriptive geometry, orthographic projection, engineering drawing standards and annotation, computer-aided engineering graphics. The concepts of point, line and plane relationships in projection, multi-view engineering drawings, auxiliary and section views, basic dimensioning and annotation, engineering applications of drawings are also discussed.

Course Objective:
The objective of this course is to

- Equip the students with the in-depth knowledge of drawings of points, straight line, planes, cylinders, prisms, pyramids, parabola, ellipse etc.
- Draw different figures manually and will be capable of using various instruments involved in drawings.

Course Outcomes (COs):
At the end of the course, the student shall be able to:
CO 1 - Define and explain basic principles of projections of points and lines.
CO 2 - Define, describe and construct the different orientations and projections of planes.
CO 3 – Explain and construct the projections of solids and sectioning of solids in different orientations.
CO 4 - State and draw the concepts of development of surfaces and introduction to auto CAD.
CO 5 – Define and construct orthographic and isometric view of an object.

Modules	Blooms level*	Number of hours
Module I: Introduction Importance, significance and scope of engineering drawing, drawing instruments and their use, lettering, dimensioning, scales, sense of proportioning, different types of projections, B.I.S. Specifications.	L1 and L2	8
Module II: Projection of points, lines and plane surface Principal planes, principles of orthographic projections, Projection of points in all quadrants, Projection methods - First angle & third angle projection, Projections of straight lines (first angle projection) inclined to both the planes, true lengths and traces, projection of planes, projection of planes in simple position and inclined to both the principal planes, auxiliary planes and views	L1, L2 and L3	12
Module III: Projection of solids & section of solids Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to both of the principal planes, Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other, obtaining true shape of section	L1, L2 and L3	12

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Module IV: Development of surfaces & Isometric projections Development of surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones, Principles of isometric projection, isometric scale, Isometric projections of simple solids and truncated solids, Prisms, pyramids, cylinders, cones, Conversion of Orthographic Views to Isometric Views and Vice-versa.	L1, L2 and L3	8
Module V: Introduction to CAD Introduction to CAD and use of its commands, practice of some 2D figures using CAD.	L1, L2 and L3	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	50	20

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text Books:

- PS Gill, 2013, Engineering Drawing, Kataria Publication.
- ND Bhatt, 2014, Engineering Drawing, Charotar publications.

References Books:

- N Sidheshwar, 2014 Machine Drawing Drawing, Tata McGraw Hill
- M.B. Shah & B.C. Rana, 2007, Engineering Drawing, Pearson Education.
- CADFolks, AutoCAD 2018 For Beginners, CreateSpace Independent *Publishing* Platform; 6 edition.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--
CO2	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--
CO3	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--
CO4	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--
CO5	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--

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AIE6213	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

In this course, students will become familiar with basic electrical circuits. The students will learn practical aspects and implementation of theorems related to electrical circuits, law's related to flow of current, voltages, transformer and transistors.

Course Objectives

The objective of this course is to:

- Provide the overview of concept of flow of current/voltage of electrical circuits.
- Provide the basic knowledge about the concepts of electrical circuits and BJTs.

Course Outcomes

On completion of this course, the students will be able to:

CO1. Explain the fundamental theorems and laws related to the electrical circuits and experimentally verify the basic circuit theorems

CO2. Explain the working principle and estimate the performance of single phase transformers.

CO3. Understand 3 phase balanced and unbalanced, star and delta connected supply and load and to measure power in 3 phase circuits

CO4. Able to design circuit with Bipolar Junction Transistor in CB, CE & CC configurations

Modules	Blooms level*	Number of hours
Lab Session 1: Network Analysis Techniques & Theorems 1. To verify KVL & KCL in the given network. 2. To verify Superposition Theorem. 3. To verify Maximum Power Transfer Theorem. 4. To verify Reciprocity Theorem. 5. To determine and verify R_{Th}, V_{Th}, R_N, I_N in a given network.	L1 , L2 and L3	6
Lab session II: Transformers and transistors 1. To perform open circuit & short circuit test on a single-phase transformer. 2. To perform regulation, ratio & polarity test on a single-phase transformer. 3. To obtain the characteristics of a transistor under common base (CB) and common emitter (CE) configuration.	L1, L2 and L3	3

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Lab session III: Alternating Current Circuits 1. To study transient response of a given RLC Circuit. 2. To measure power & power factor in a three phase circuit by two wattmeter method. 3. To measure power & power factor in a three phase load using three ammeter & three voltmeter method.	L1, L2 and L3	3

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text Books

- V K Mehta and Rohit Mehta, Principles of Electrical Engineering and Electronics, 3rd edition, S. Chand Publications, 2014, New Delhi
- D. P. Kothari and I. J. Nagrath, Theory and Problem of Basic Electrical Engineering, PHI Learning Pvt. Ltd., 2015, New Delhi.
- J B Gupta, Electrical Science, S K Kataria and Sons, 2015, New Delhi.

Reference Books

- R J Smith and R C Dorf, Circuits Devices and Systems, 5th Edition, John Wiley
- B.L. Thareja, Basic Electronics, 5th edition, S. Chand Publishing, 2011, New Delhi
- V. Del Toro, Electrical Engineering fundamentals, PHI, 2016
- Mahmood Nahvi, Joseph Edminister, Electric Circuits, 7th edition, McGraw-Hill Education, 2017

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	1	2	--	--	--	--	--	--	--	--	--	--	1	-	-
CO2	1	1	2	3	--	--	--	--	--	--	--	--	1	-	-
CO3	1	1	3	3	-	--	--	--	--	--	--	--	1	-	-
CO4	1	1	2	--	--	--	--	--	--	--	--	--	1	-	-

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AIE6302	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
Version 2020.1	Date of Approval: July, 2020	3	1	0	4
Pre-requisites/Exposure	Computer Fundamentals and Mathematics Set Theory				
Co-requisites	Nil				

Catalog Description

This course is design to get students familiar with the fundamentals & basic concepts in Data Base Management Systems and their use. This course discusses architecture of Database Systems with concept of different types of available database model, concurrency techniques and new applications of the DBMS. The techniques for database design, normalization, database recovery and protection will enable students to work easily and efficiently on real databases.

Course Objectives

The objective of this course is

1. To make students familiar with the fundamental and necessary concepts of DBMS.
2. Provide an overview of normalization, concurrency techniques and database recovery with examples.

Course Outcomes

On completion of this course, the students will be able to

CO1. Differentiate between traditional data processing system and database management system and understand characteristics and applications of DBMS in real world.

CO2. Explain and use different data models such as Entity Relationship Model, Network, and Relational Model etc.

CO3. Solve queries using relational algebra, relational calculus and SQL.

CO4. Illustrate normalization concepts and apply them in real database applications.

CO5. Explain database concurrency techniques and recovery mechanisms.

Modules	Blooms level*	Number of hours
Module I: Introduction Concept and goals of DBMS, Database Languages, Database Users, Database Abstraction. Basic Concepts of ER Model, Relationship sets, Keys, Mapping, Design of ER Model.	L1, L2 and L6	9
Module II: Hierarchical model &Network Model Concepts, Data definition, Data manipulation and implementation. Network Data Model, DBTG Set Constructs, and Implementation	L1and L2	9
Module III: Relational Model Relational database, Relational Algebra, Relational & Tuple Calculus.	L1 and L3	10

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Module IV: Relational Database Design and Query Language SQL, QUEL, QBE, Normalization using Functional Dependency, Multivalued dependency and Join dependency.	L2, L3 and L4	10
Module V: Concurrency Control and New Applications Transaction basics: ACID property, Lifecycle of Transcation, Why Concurrency Control, Schedule, Serializability, Lock Based Protocols, Time Stamped Based Protocols, Deadlock Handling, Crash Recovery. Distributed Database, Objective Oriented Database, Multimedia Database, Data Mining, Digital Libraries.	L2, L3 and L4	10

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. Korth, Silberschatz, "Database System Concepts", TMH, 4th Ed., 2000.
2. Elmsari and Navathe, "Fundamentals of Database Systems", A. Wesley, 6th Ed., 2004

Reference Books

1. Date C. J., "An Introduction to Database Systems", Narosa Publishing, 7th Ed., 2004

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	--	--	--	--	--	--	--	--	--	1	--	-	-
CO2	1	1	2	3	--	--	--	--	--	--	--	--	1	--	--	--
CO3	1	2	2	3	--	--	--	--	--	--	--	--	1	2	--	--
CO4	--	1	2	--	--	2	--	3	--	--	--	--	1	1	-	-
CO5	1	1	3	--	--	--	--	--	2	--	--	--	1	--	-	3

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AIE6307	DATABASE MANAGEMENT SYSTEMS LAB	L	T	P	C
Version 2020.1	Date of Approval: July, 2020	0	0	2	1
Pre-requisites/Exposure	Basic Concepts of DBMS				
Co-requisites	Relational Algebra and Relational Calculus				

Catalog Description

This course is designed to get students familiar with the basic concepts of SQL including DDL, DML and DCL statements. The course also explains the basic concepts of PL/SQL. Students will learn practical on Oracle software and hence can work on any RDBMS software in future.

Course Objectives

The objective of this course is

1. To make students familiar with the concepts and working of SQL.
2. Provide an overview of PL/SQL.

Course Outcomes

On completion of this course, the students will be able to

CO1. Illustrate SQL basic concepts like languages DDL, DML etc., data types and working.
CO2. Explain concepts of database creation, manipulation of data and data retrieval and apply them in real database applications.
CO3. Design and implement various data constraints on a database for a given problem.
CO4. Solve queries using concepts like joins, subqueries, aggregate functions, triggers etc.
CO5. Prepare PL/SQL blocks.

Modules	Blooms level*	Number of hours
Lab Session 1 Introduction of RDBMS, Oracle, SQL and data types.	L1 and L2	2
Lab Session 2 Basic concept of database creation and manipulation of data.	L1and L3	2
Lab Session 3 Working with SELECT query.	L1 and L3	2
Lab Session 4 To apply data constraints on a table-Primary Key, Not Null, Unique.	L1 and L3	2
Lab Session 5 Working with Foreign Key and Check Constraint.	L1 and L3	2
Lab Session 6 To implement the basic concept of Aggregate and Grouping Functions.	L1 and L3	2

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Lab Session 7 To apply various set operators on data.	L1 and L3	2
Lab Session 8 Concept of Nested queries in database and its application in database.	L1 and L3	2
Lab Session 9 Implementation different types of JOINS in database.	L1 and L3	2
Lab Session 10 Basic concepts of Triggers and Procedures and related queries.	L1 and L3	2
Lab Session 11 Introduction to PL/SQL and basic syntax.	L1 and L3	2
Lab Session 12 Write programs in PL/SQL Using Control Structures.	L3	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1,Ivan Bayross , "SQL, PL/SQL the Programming Language of Oracle", 4th Ed., BPB Publications,2009.
2.Lynn Beighley, "Head First SQL", 1st Ed., O′Reilly, 2007.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	-	-
CO2	**1**	-	**2**	--	--	**3**	--	--	--	--	--	**2**	**1**	--	**1**	-
CO3	**1**	-	**1**	--	--	**3**	--	--	--	--	--	**2**	**1**	**1**	**2**	-
CO4	**1**	-	**2**	--	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO5	**1**	-	**2**	--	--	--	--	--	**2**	--	--	--	**1**	**1**	--	-

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AIE6303	OPERATING SYSTEMS	L	T	P	C
Version 2020.1	Date of Approval: July 2020	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

In this course Operating System, its generic types, characteristics and functions are discussed in detail. Concepts covered would enable students to identify various categories of operating systems, with details about concepts of process management and scheduling. Contents will be helpful in identifying deadlocks in the system and designated approaches used to prevent, handle or recover from them. Further it covers the concepts of managing memory, devices and mechanisms for providing security to system and files using operating system.

Course Objectives

The objective of this course is to

1. Equip the students with the knowledge about categories of operating systems and their functions.
2. Provide detailed knowhow about functions of operating system like process, memory and device management along with file system security and protection.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define and explain operating systems and their evolution, also differentiate among its various types.

CO2: Explain concepts of process and inter-process communication and synchronization. Identify solutions to detect, prevent and handle deadlocks occurring in the operating systems. Solve synchronization and CPU scheduling problems related to processes.

CO3: Define and explain concepts of memory management like fragmentation, paging and segmentation. Solve problems related to memory management using page replacement algorithms.

CO4: Describe the concepts of device management and list various disk allocation methods. Determine solutions for disk scheduling problems using available disk scheduling algorithms.

CO5: State the concept of file and file system security, also distinguish among various file allocation methods.

Modules	Blooms level*	Number of hours
MODULE 1: INTRODUCTION TO OPERATING SYSTEM Operating system and function, Evolution of operating system, Batch, Interactive, multiprogramming, Time Sharing and Real Time System, multiprocessor system, Distributed system, System protection. Operating System structure, Operating System Services, System Program and calls	L1, L2 and L4	6

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MODULE 2: PROCESS MANAGEMENT Process concept, State model, process scheduling, job and process synchronization, structure of process management, Threads Interprocess Communication and Synchronization: Principle of Concurrency, Producer Consumer Problem, Critical Section problem, Semaphores, Hardware Synchronization, Critical Regions, Conditional critical region, Monitor, Inter Process Communication. CPU Scheduling: Job scheduling functions, Process scheduling, Scheduling Algorithms, Non-Preemptive and preemptive Strategies, Algorithm Evaluation, Multiprocessor Scheduling. Deadlock: System Deadlock Model, Deadlock Characterization, Methods for handling deadlock, Prevention strategies, Avoidance and Detection, Recovery from deadlock combined approach	L1, L2 and L3	12
MODULE 3: MEMORY MANAGEMENT Single Contiguous Allocation: H/W support, S/W support, Advantages and disadvantages, Fragmentation, Paging, Segmentation, Virtual memory concept, Demand paging, Performance, Paged replaced algorithm, Allocation of frames, Thrashing, Cache memory, Swapping, Overlays	L1, L2 and L3	7
MODULE 4: DEVICE MANAGEMENT Principles of I/O hardware, Device controller, Device Drivers, Memory mapped I/O, Direct Access Memory, Interrupts, Interrupt Handlers, Application I/O interface, I/O Scheduling, Buffering, Caching, Spooling, Disk organization, Disk space management, Disk allocation Method, Disk Scheduling, Disk storage	L1, L2 and L3	7
MODULE 5: FILE SYSTEM AND PROTECTION AND SECURITY File Concept, File Organization and Access Mechanism, File Directories, Basic file system, File Sharing, Allocation method, Free space management. Policy Mechanism, Authentication, Internal excess Authorization	L1 and L2	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Milenekovic, "Operating System Concepts", McGraw Hill
2. Silberschatz, P.B. Galvin "Operating System Concepts", John Willey & son

Reference Books

1. Dietel, "An introduction to operating system", Addision Wesley
2. Tannenbaum, "Operating system design and implementation", PHI
3. Operating System, A Modern Perspection, Gary Nutt, Pearson Edu. 2000
4. A. S Tanenbaum, Modern Operating System, 2nd Edition, PHI
5. Willam Stalling " Operating system" Pearson Education

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	--	--	--	--	--	--	--	--	--	1	2	--	--
CO2	1	2	3	--	--	--	--	--	--	--	--	--	1	2	--	--
CO3	1	2	3	--	--	--	--	--	--	--	--	--	1	2	--	--
CO4	1	2	3	--	--	--	--	--	--	--	--	--	1	2	--	--
CO5	1	--	2	--	--	--	--	--	--	--	--	--	1	--	--	--

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AIE6308	UNIX PROGRAMMING LAB	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	0	0	2	1
Pre-requisites/Exposure	Basic knowledge of Operating System				
Co-requisites					

Catalog Description

This course introduces the UNIX operating system commands, shell programming. Explores the use of operating system utilities such as vi text editors, filters, process handling etc.

Course Objectives

The objective of this course is to

1. Provide knowledge of working on Unix.
2. Provide sound foundation of writing Shell scripts.
3. Implement features like piping, filters and redirection.

Course Outcomes

On completion of this course, the students will be able to

CO1: To implement various Unix commands.
CO2: To demonstrate the use of Vi Editor and other editors of UNIX.
CO3: To write simple Shell scripts.

Modules	Blooms level*	Number of hours
1. UNIX structure, history, basic commands.	L1,L3	10
2. Working of Vi Editor and its commands.	L1,L3	4

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3. Shell Script i. Write shell script to find largest among three numbers. ii. Write shell script to print multiplication table of any number. iii. Write a shell script that copies multiple files into directory. iv. Write a shell script to find number of words and characters in a given file. v. Write a shell script to find the sum, the average and the product of the four integers entered. vi. Write a shell script to calculate the factorial of a number. vii. Write a shell script to generate Fibonacci series. viii. Write a shell script that computes the gross salary of employee. ix. Write a shell script that takes a command –line argument and reports on whether it is directory, a file, or something else. x. Write a shell script which receives two file names as arguments. It should check whether the two file contents are same or not. If they are same then second file should be deleted. xi. Write a shell script to calculate gcd of two numbers. xii. Write a shell script to concatenate two strings and find the length of the resultant string.	L1,L3	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. " Unix Concepts and application" Das Sumitabha Tata Mcgraw Hill

Reference Books

1. "Unix Programming Environment" The Kernighan and Pike Prentice – Hall of India

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	--	**1**	--	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO2	**1**	--	**1**	--	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO3	**1**	--	**1**	--	--	--	--	--	--	--	--	--	**1**	**1**	--	--

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AIE6304	DATA STRUCTURES USING C	L	T	P	C
Version:2020.1	Date of Approval: JULY, 2020	3	1	0	4
Pre-requisites/Exposure	Basic Knowledge of C++ Programming				
Co-requisites	Nil				

Catalog Description

This course covers the design, analysis, and implementation of data structures and algorithms to solve engineering problems using C programming language. Topics include elementary data structures, (including arrays, stacks, queues, and lists), advanced data structures (including trees and graphs), the algorithms used to manipulate these structures, and their application to solving practical engineering problems. At the end of this course student will gain knowledge about different kinds of file structures and their related operations.

Course Objectives

The objective of this course is to

1. Equip the students with knowledge of algorithms, different types of data structures and analysis of space and time complexity.
2. Provide an overview of various algorithms of data structures like stack and queues and related operations and implementation.
3. Provide an overview of dynamic Data Structure like linked list and its related operations, algorithms and programs. Demonstrate practical use of dynamic data structure to solve engineering problems.
4. Equip the students with knowledge of algorithms and operations related to tree and graph data structures and their practical applications.
5. Provide an overview of Sorting, Searching and file structures and its related algorithms and techniques.

Course Outcomes

On completion of this course, the students will be able to

CO 1:Identify operations on array, multidimensional, string and their implementation and analyze space and time complexity of algorithms.

CO 2: Explain various algorithms and operations of data structures like stack and queues and analyze complexity of each operation.

CO 3: Explain dynamic data structures and various algorithms and operations of data structures like linked list and their applications in computer science.

CO 4: Illustrate the algorithms and operations related to tree and graph data structures, their practical applications and analyze complexity of algorithm associated with each operations.

CO5: Explain Sorting, Searching and file organization and its related techniques.

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Modules	Blooms level*	Number of hours
Module I: Introduction to Data structures Data structures: Definition, Types. Algorithm design, Complexity, Time-Space Tradeoffs. Use of pointers in data structures. Array Definition and Analysis, Representation of Linear Arrays in Memory, Traversing of Linear Arrays, Insertion and Deletion, Single Dimensional Arrays, Two Dimensional Arrays, Multidimensional Arrays, Function Associated with Arrays, Character String in C, Character String Operations, Arrays as parameters, Implementing One Dimensional Array, Sparse matrix.	L1, L2	7
Module II: Introduction to Stacks and queue Stack: Definition, Array representation of stacks, Operations Associated with Stacks- Push & Pop, Polish expressions, Conversion of infix to postfix, infix to prefix (and vice versa),Application of stacks recursion, polish expression and their compilation, conversion of infix expression to prefix and postfix expression, Tower of Hanoi problem. Queue: Definition, Representation of Queues, Operations of queues- QInsert, QDelete, Priority Queues, Circular Queue, Deque.	L1, L2, L3, L4	8
Module III: Dynamic Data Structure Linked list: Introduction to Singly linked lists: Representation of linked lists in memory, Traversing, Searching, Insertion into, Deletion from linked list, doubly linked list, circular linked list, generalized list. Applications of Linked List-Polynomial representation using linked list and basic operation. Stack and queue implementation using linked list.	L1, L3 and L4	7
Module IV: Trees and Graphs Trees: Basic Terminology, Binary Trees and their representation, expression evaluation, Complete Binary trees, extended binary trees, Traversing binary trees, Searching, Insertion and Deletion in binary search trees, General trees, AVL trees, Threaded trees, B trees. Graphs: Terminology and Representations, Graphs & Multigraphs, Directed Graphs, Sequential representation of graphs, Adjacency matrices, Transversal Connected Component and Spanning trees.	L1, L3 and L5	7
Module V: Sorting and Searching and file structures Sorting: Insertion Sort, Bubble sort, Selection sort, Quick sort, two-way Merge sort, Heap sort, Partition exchange sort, Shell sort, Sorting on different keys, External sorting. Searching: Linear search, Binary search File structures: Physical storage media, File Organization, Linked organization of file, Inverted file, Organization records into blocks, Sequential blocks, Hash function, Indexing & Hashing, Multilevel indexing, Tree Index, Random file, Primary Indices, Secondary Indices, B tree index files.	L1, L4, L5	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Horowitz and Sahani, ― Fundamentals of Data structures‖, Ga lgotia publicat ions.
2. R.L. Kruse, B.P. Leary, C.L. Tondo, ―Data structure and program design in C, PHI
3. Data structures and algorithms‖ – Schaum Series.

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4. File Structures An object-Oriented Approach with C++ by Michael J. Folk, Bill Zoellick, Breg Riccardi, Published by Addison Wesley (1st ISE Reprint,1999).

Reference Books

1. J. P. Tremblay and P. G. Sorenson, Introduction to Data Structures with Applications, McGraw – Hill
2. Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Published by Prentice-Hall
3. India(1999).
4. Data Structures Using C and C++ second edition by Yeddidyah Langsam, Moshe J.Augenstein, Aaron M. Tenen Baum, Published by Prentice-Hall India
5. Data Structures and Algorithm analysis in C++ by Mark Allen Weiss, Published by Addison Wesley (3rd Indian Reprint 2000).
6. Data Structures‖ – R. S. Salaria

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1	2	1	--	--	--	--	--	--	--	--	--	2	--	--
CO2	1	2	2	--	--	--	--	--	--	--	--	--	2	2	1
CO3	1	2	2	1	--	--	--	--	--	--	--	--	2	2	1
CO4	1	2	2	1	--	--	--	--	--	--	--	--	2	2	1
CO5	1	2	2	1	--	--	--	--	--	--	--	--	2	2	2

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AIE6305	DATA STRUCTURES USING C LAB	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	0	0	2	1
Pre-requisites/Exposure	Basic Knowledge of C Programming				
Co-requisites	Nil				

Catalog Description

This course covers the design, analysis, and implementation of data structures and algorithms to solve engineering problems using C programming language. Topics include elementary data structures, (including arrays, stacks, queues, and lists), advanced data structures (including trees and graphs), the algorithms used to manipulate these structures, and their application to solving practical engineering problems. At the end of this course student will gain knowledge about different kinds of file structures and their related operations.

Course Objectives

The objective of this course is to

1. Equip the students with knowledge of algorithms, different types of data structures and analysis of space and time complexity.
2. Provide an overview of various algorithms of data structures like stack and queues and related operations and implementation.
3. Provide an overview of dynamic Data Structure like linked list and its related operations, algorithms and programs. Demonstrate practical use of dynamic data structure to solve engineering problems.
4. Equip the students with knowledge of algorithms and operations related to tree and graph data structures and their practical applications.
5. Provide an overview of Sorting, Searching and file structures and its related algorithms and techniques.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Identify operations and their implementation on array and multidimensional, string and estmation space and time complexity.

CO 2: Explain various algorithm and operations of data structures like stack and queues and analyze complexity of each operation.

CO 3: Explain dynamic data structures and various algorithms and operations of data structures like linked list and their applications in computer science.

CO 4: Illustrate the algorithms and operations related to tree and graph data structures, their practical applications and analyze complexity of algorithm associated with each operations.

CO5: Explain Sorting, Searching and file organization and its related techniques.

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Modules	Blooms level*	Number of hours
Module I: Introduction to Data structures 1. Write a program to copy one string into another without using library functions. 2. Write a program to demonstrate array and linked list implementation of sparse matrix. 3. Write a program to multiply two 2D matrix.	L3,L5	2
Module II: Introduction to Stacks and queue 1. Write a program to implement push and pop operations on the stack. 2. Write a program to demonstrate conversion of infix to postfix. 3. Write a program to implement simple queue and perform insertion and deletion operation on it. 4. Write a program to implement circular queue and perform insertion and deletion operation on it. 5. Write a program to implement dqueue and perform insertion and deletion operations on it. 6. Write a program to implement priority queue and perform insertion and deletion operation on it.	L3,L5	4
Module III: Dynamic Data Structure 1. Write a program to implement singly linked list and perform following operations on it. • Insertion at end • Insertion at last • Insertion at desired place. 2. Write a program to implement singly linked list and perform following operations on it. • Deletion at end • Deletion at last • Deletion at desired place. 3. Write a program to implement doubly linked list and perform following operations on it. • Insertion at end • Insertion at last • Insertion at desired place. **4.** Write a program to implement singly linked list and perform addition of two polynomials.	L3,L5	4

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Module IV: Trees and Graphs 1. Write a program to calculate in order, preorder and post order traversal on binary tree. 2. Write a program to construct binary search tree and perform following operations on it. • Deletion of element • Insertion of elements. 3. Write a program to construct binary search tree and search an element in it. 4. Write a program to implement kruskal's algorithm to find out minimum spanning tree.	L3,L5	6
Module V: Sorting and Searching and file structures 1. Write program to implement insertion sort. 2. Write a program to search an element in array using binary search. 3. Write a program to implement merge sort. 4. Write a program to implement quick sort. 5. Write a program to implement heap sort.	L3,L5	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Horowitz and Sahani, ―Fundamentals of Data structures‖, Ga lgotia publicat ions.
2. R.L. Kruse, B.P. Leary, C.L. Tondo, ―Data structure and program design in C, PHI
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4. File Structures an Object-Oriented Approach with C++ by Michael J. Folk, Bill Zoellick, Breg Riccardi, Published by Addison Wesley (1st ISE Reprint,1999).

Reference Books

1. J. P. Tremblay and P. G. Sorenson, Introduction to Data Structures with Applications, McGraw – Hill.
2. Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Published by Prentice-Hall India(1999).
3. Data Structures Using C and C++ second edition by Yeddidyah Langsam, Moshe J.Augenstein, Aaron M. Tenen Baum, Published by Prentice-Hall India
4. Data Structures and Algorithm analysis in C++ by Mark Allen Weiss, Published by Addison Wesley (3rd Indian Reprint 2000).
5. Data Structures‖ – R. S. Salaria

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	**1**	**2**	**1**	--	--	--	--	--	--	--	--	--	**2**	--	--
CO2	**1**	**2**	**2**	--	--	--	--	--	--	--	--	--	**2**	**2**	**1**
CO3	**1**	**2**	**2**	**1**	--	--	--	--	--	--	--	--	**2**	**2**	**1**
CO4	**1**	**2**	**2**	**1**	--	--	--	--	--	--	--	--	**2**	**2**	**1**
CO5	**1**	**2**	**2**	**1**	--	--	--	--	--	--	--	--	**2**	**2**	**2**

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AIE6313	DIGITAL ELECTRONICS	L	T	P	C
Version 2020.1	Date of Approval: JULY, 2020	2	0	0	2
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course explores the theory and operation of the basic building blocks of digital electronics which includes combinational and sequential circuits. This course also explains the logic families and data convertors. The concepts learnt in the studies of sequential circuits will be applied in the design and analysis of Melay and Moore machines.

Course Objectives

The objective of this course is to

1. Provide the basic knowledge of digital logic levels and application of knowledge to understand combinational and sequential circuits.
2. Explain the operation of logic family and data convertors.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the difference between analog and digital signal; Describe the Boolean algebra; Analyze the SOP & POS form of Boolean function; Solve k-map and tabulation method to simplify the logical function; Apply universal gates to implement the given logic.

CO2: Define the multiplexer and decoder; Explain the adder & subtractor; Apply multiplexer to design Boolean function; Analyze the difference between decoder and encoder.

CO3: Define flip flops; Compare combinational and sequential circuits; Describe shift registers; Design counters and synchronous sequential circuits.

CO4: Explain the logic families; Compare the RTL, DTL, TTL and ECL logic families.

CO5: Define data convertors; Explain analog to digital convertor and digital to analog convertor.

Modules	Blooms level*	Number of hours
MODULE 1: BOOLEAN FUNCTIONS Analog & digital signals, AND, OR, NOT, NAND, NOR & XOR gates, Boolean algebra, Standard representation of logical functions, K-map representation and simplification of logical function, don't care conditions, XOR & XNOR simplifications of K-maps, Tabulation method.	L1,L2 and L3	6
MODULE 2: COMBINATIONAL CIRCUITS Adders, Subtractors, Multiplexer, de-multiplexer, decoder & encoder, code converters, Comparators, decoder / driver for display devices, Implementation of logic functions using multiplexer / de-multiplexer.	L1, L2,L3 and L4	6

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MODULE 3: SEQUENTIAL CIRCUITS Flip-flops: SR, JK, D & T flip flops – Truth table, Excitation table, Conversion of flip-flops, race around condition, Master Slave flip flop, Shift registers: SIPO, PISO, PIPO, SIPO, Bi-directional; Counters: ripple & synchronous counters – up / down; Synchronous Sequential circuit: design procedure.	L1, L2,L4 and L5	8
MODULE 4: LOGIC FAMILIES RTL, DTL, TTL, ECL.	L2 and L4	2
MODULE 5: DATA CONVERTERS ADC – successive approximation, linear ramp, dual slope; DAC – Binary Weighted, R-2R ladder type.	L1 and L2	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Anand Kumar, "Fundamentals of Digital Circuits", 2nd Edition, Prentice-Hall, 2004
2. Moris Mano, "Digital Design", 2nd Edition, Pearson Education,2007.
3. R.P. Jain, "Modern Digital Electronics", 2nd Edition, Tata Mcgraw Hill, 2003

Reference Books

1. Thomas L. Floyd, "Digital Fundamentals", 11th Edition, Pearson Education, 2015
2. Malvino and Leech, "Digital Principles & Applications", 1st Edition, Tata McGraw Hill, 1993

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS O 1**	**PS O 2**	**PS O 3**	**PSO 4**
CO 1	**1**	**2**	**1**	--	--	--	--	--	--	--	--	--	**1**	--	--	--
CO 2	**1**	**2**	**1**	**2**	--	--	--	--	--	--	--	--	**1**	**2**	--	**3**
CO 3	**1**	**2**	**1**	**2**	--	--	--	--	--	--	--	--	**1**	--	--	**3**
CO 4	**2**	**3**	**3**	**3**	--	--	--	--	--	--	--	--	**1**	--	--	--
CO 5	**2**	**3**	**3**	**3**	--	--	--	--	--	--	--	--	**1**	--	--	**3**

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AIE6314	DIGITAL ELECTRONICS LAB	L	T	P	C
Version 2020.1	Date of Approval: July 2020	0	0	2	1
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

In this Lab course the combination and sequential circuits are designed, and their functionality is verified using truth table. Concepts covered would enable them to create complex circuits related to digital design. The objective of this course is to explore and implement the various features of digital logic using basic logic gates.

Course Objectives

The objective of this course is to

1.Provide a basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.

2. Equip with understanding of different combinational and sequential circuits.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Demonstrate the basic concept of logic gates;

CO 2: Illustrate the adder and subtractors.

CO 3: Demonstrate the code convertors.

CO 4: Demonstrate the combinational and sequential circuits.

Modules/Topics Covered**	**Blooms level***	**Number of hours**
1. To verify the truth tables of NOT, OR, AND, NOR, NAND, XOR, XNOR gates.	L3, L5	2
2. To obtain half adder, full adder using gates and verify their truth tables.	L3, L5	2
3. To obtain half subtractor, full subtractor using gates and verify their truth tables.	L3, L5	2
4. To implement control circuit using multiplexer.	L3, L5	2
5. To convert BCD code into excess 3 code and verify the truth table.	L3, L5	2
6. To verify the truth tables of RS, D, JK and T flip- flops.	L3, L5	2
7. To implement and verify 3-bit bi-directional shift register.	L3, L5	2
8. To design and study asynchronous/ripple counter.	L3, L5	2
9. To design and study synchronous counter.	L3, L5	2
10. To design and study a sequence detector.	L3, L5	2

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Anand Kumar, "Fundamentals of Digital Circuits", 2nd Edition, Prentice-Hall, 2004

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- Moris Mano, “Digital Design”, 2nd Edition, Pearson Education,2007.
- R.P. Jain, “Modern Digital Electronics”, 2nd Edition, Tata Mcgraw Hill, 2003

Reference Books

- Thomas L. Floyd, “Digital Fundamentals”, 11th Edition, Pearson Education, 2015
- Malvino and Leech, “Digital Principles & Applications”, 1st Edition, Tata McGraw Hill, 1993

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA					**EE**
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	**70**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	**3**
CO 2	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	**3**
CO 3	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	**3**
CO 4	**2**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	**3**

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AIE6311	ELECTRONIC DEVICES & CIRCUITS	L	T	P	C
Version:2020.1	Date of Approval: July 2020	2	0	0	2
Pre-requisites/Exposure	Elementary Resistive Circuit, Theorems and Analysis Techniques: KCL. KVL, Nodal & Mesh Analysis, Thevenin & Norton Equivalents, Maximum Power Transfer.				
Co-requisites	Semiconductor Physics				

Catalog Description

This is the first course in Electronics and Communication Engineering, to educate and explain the methods used for biasing circuits in a graphical analysis of non-linear electronic circuits and also includes small signal transistor models, parameters and their frequency responses. Following this, analyzing different types of feedback amplifiers, and power amplifiers using transistor and designing of different electronic circuits are included in the course. This course also considers the mathematical modeling of active solid state devices their analysis and design of single state circuits. Topics covered include the study of device characteristics and applications of p-n-junction diodes, bipolar junction transistors, and field effect transistors.

Course Objectives

The objective of this course is to

1. build from basic knowledge of Semiconductor Physics to an understanding of basic devices and their models
2. familiarize the student with the analysis and design of basic transistor amplifier circuits, feedback amplifiers and wave shaping circuits
3. build a foundation for Analog Electronics-II, Digital Circuits and Systems I & II, VLSI design and analog CMOS IC Design.

Course Outcomes

On completion of this course, the students will be able to

CO1. explain different types of diodes and demonstrate wave shaping circuits

CO2. explain operating principal of Bipolar Junction Transistor, its properties, biasing techniques and stability

CO3. describe low and high frequency transistor amplifiers along with single and multi-stage amplifier

CO4. explain operating principal of JFET, MOSFET, its properties, and biasing techniques

CO5. solve and analyse different negative feedback amplifiers configurations

CO6. describe and outline power amplifiers and their application.

Modules	Blooms level*	Number of hours
Module I: Semiconductor Diode and Diode Circuits Different types of diodes: Zener, Schottky, LED. Zener as voltage regulator, Diffusion capacitance, Drift capacitance, the load line concept, half wave, full wave rectifiers, clipping and clamping circuits.	L1 L2 & L3	6

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Module II: Bipolar Junction Transistor Bipolar junction transistor: Introduction, Transistor, construction, transistor operations, BJT characteristics, load line, operating point, leakage currents, saturation and cut off mode of operations. Bias stabilization: Need for stabilization, fixed Bias, emitter bias, self bias, bias stability with respect to variations in $I_{co,}$ V_{BE} &β, Stabilization factors, thermal stability.	L1 L2 & L3	9
Module III: Small signal Analysis of transistor and Multistage Amplifier Hybrid model for transistors at low frequencies, Analysis of transistor amplifier using h parameters, emitter follower, Miller's theorem, THE CE amplifier with an emitter resistance, Hybrid π model, Hybrid π Conducatnces and Capacitances, CE short circuit current gain, CE short circuit current gain with R_L Multistage amplifier: Cascading of Amplifiers, Coupling schemes(RC coupling and Transformer coupling)	L2 & L3	6
Module IV: Field Effect Transistors Field effect transistor (JFET, MOSFET): volt-ampere characteristics, small signal model –common drain, common source, common gate, operating point, MOSFET, enhancement and -depletion mode, Common source amplifier, Source follower	L1, L2 & L3	5
Module V: Feedback Amplifiers Feedback concept, Classification of Feedback amplifiers, Properties of negative Feedback amplifiers, Impedance considerations in different Configurations, Examples of analysis of feedback Amplifiers.	L1, L2, L3 & L4	6
Module VI: Power amplifiers Power dissipation in transistors, difference with voltage amplifiers, Amplifier classification (Class A, Class B, Class C, Class AB) class AB push pull amplifier, collector efficiency of each, cross over distortion.	L1 & L2	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Jacob Millman, Christos Halkias, Chetan Parikh, Millman's Integrated Electronics, McGraw Hill Education, 2nd Edition, New Delhi
2. Sanjeev Gupta, Electronic Devices and Circuits, Dhanpat Rai Publications, 2010
3. Theraja B.L., Sedha R.S, Principles of Electronic Devices and Circuits, S Chand & Company, First Edition, New Delhi, 2002

Reference Books

1.Robert L. Boylestad: Electronic Devices and Circuits, Pearson Education, 11th Edition, 2013
2.Robert F. Pierret, Semiconductor Device Fundamentals, Pearson Education, 1st Edition, 2006
3. Nagrath I.J, Electronics: Analog and Digital, Prentice Hall India Learning Private Limited, Second Edition, 2013

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	3	--	--	--	--	--	--	--	--	3	1	--	--	3
CO2	1	2	--	--	--	--	--	--	--	--	--	3	1	3	--	3
CO3	1	2	3	--	--	--	--	--	--	--	--	--	1	-	--	--
CO4	1	2	--	--	--	--	--	--	--	--	--	3	1	3	--	3
CO5	1	2	3	--	--	--	--	--	--	--	--	3	1	--	--	3
CO6	1	3	--	--	--	--	--	--	--	--	--	3	1	--	--	3

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AIE6310	E-COMMERCE AND ERP	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure	Knowledge of basic computer				
Co-requisites	Nil				

Catalog Description

This course examines the evolution of enterprise resource planning (ERP) systems - from internally focused client/server systems to externally focused e-business. This class studies the types of issues that managers will need to consider in implementing cross-functional integrated ERP systems. The objective of this course is to make students aware of the potential and limitations of ERP systems. This objective will be reached through hands-on experience, case studies, lectures, guest speakers and a group project. The course would equip students with the basics of E-Commerce, technologies involved with it and various issues associated with.

Course Objectives

The objective of this course is to

1. Understand the students with the role of consultants, vendors and employees.
2. Provide an overview of various phases in ERP implementation and identify various technologies used in ERP.

Course Outcomes

On completion of this course, the students will be able to

CO1: Describe the key features of Internet, Intranets and Extranets and explain how they relate to each other. Demonstrate an understanding of the foundations and importance of E-commerce and assess electronic payment systems.

CO2: Understand concepts of reengineering, data mining, data warehousing and how they relate to ERP system implementations.

CO3: Explain the challenges associated with implementing enterprise systems and their impacts on organizations.

CO4: Describe the selection, acquisition and implementation of enterprise systems and demonstrate an ability to work independently and in a group.

CO5: Identify and describe typical functionality in an ERP system.

CO 6: Analyze the strategic options for ERP identification and adoption.

Modules	Blooms level*	Number of hours

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MODULE 1: INTRODUCTION AND CONCEPTS: Networks and commercial transactions - Internet and other novelties; Networks and electronic transactions today, Model for commercial transactions; Internet environment - internet advantage, world wide web and other internet sales venues; Online commerce solutions. Security Technologies: Why is internet insecure? A brief introduction to Cryptography; Public key solution. Digital payment systems; First virtual internet payment system; cyber cash model Operational process of Digicash, Ecash Trail; Using Ecash; Smart cards; Electronic Data Interchange: Its basics; EDI versus Internet and EDI over Internet.	L1, L2 and L3	8
MODULE 2: INTRODUCTION ERP An Overview, Enterprise-An Overview, Benefits of ERP, ERP and Related Technologies, Business Process Reengineering (BPR), Data Warehousing, Data Mining, On-line Analytical Processing (OLAP), Supply Chain Management, Management Information systems (MIS), Decision support system (DSS), Executive Information systems (EIS). ERP – A Manufacturing Perspective Materials Requirement Planning (MRP), Bill of Material (Bom), Distribution Requirements Planning (DRP), JIT & Kanban, CAD/CAM, Product Data Management (PDM), Benefits of PDM, MTO, MTS, ATO, ETO, CTO.	L1,L2 and L3	10
MODULE 3: ERP IMPLEMENTATION To be or not to be, ERP Implementation Lifecycle, Implementation Methodology, Not all Packages are Created Equal!, ERP Implementation-The Hidden Costs, Organizing the Implementation, Vendors, Consultants and Users, Contracts with Vendors, Consultants and Employees, Project Management and Monitoring, After ERP Implementation.	L1,L2 and L3	8
MODULE 4: THE BUSINESS MODULES Business Modules in an ERP Package, Finance, Manufacturing (Production), Human Resources, Plant Maintenance, Materials Management, Quality Management, Sales and Distribution	L1,L2 and L3	8
MODULE 5: THE ERP MARKET ERP Market Place, SAP AG, PeopleSoft, Baan Company, JD Edwards World Solutions Company, Oracle Corporation, QAD, System Software Associates, Inc (SSA) ERP-Present and Future Turbo Charge the ERP System, Enterprise Integration Applications (EIA), ERP and E-Commerce, ERP and Internet, Future Directions in ERP, Appendices"	L2, L3 and L4	8

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MODULE 6: BENEFITS OF ERP Time Reduction, Resource Utilization, Performance, Customer Satisfaction, Flexibility, Quality, Accuracy.	L1,L2 and L3	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

1.Alexis Leon, "**Enterprise Resource Planning**", 4th Edition, TMH,2012.

Reference Books

1. Daniel E.O'Leary, "**Enterprise Resource Planning Systems**," Cambridge University Press, 2012.
2. Ellen Monk, Bret Wagner, "**Concepts in Enterprise resource planning**," Cengage learning, 4th edition, 2012.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	--	**2**	--	--	--	--	--	**3**	--	--	**1**	**2**	--	**1**	**2**	--
CO 2	--	--	--	-	--	--	--	--	--	--	**1**	**2**	--	**1**	**2**	--
CO 3	--	**2**	--	-	-	--	--	--	**2**	--	**1**	**2**	--	--	**1**	--
CO 4	**1**	**1**	**2**	--	--	--	--	--	**1**	**1**	**1**	**2**	--	--	**1**	--
CO 5	--	**1**	**1**	--	--	--	--	--	--	**1**	**1**	**2**	**3**	--	--	**2**
CO 6	--	--	--	--	--	--	--	--	--	**1**	**1**	**3**	--	--	**1**	--

1: strongly related, 2: moderately related and 3: weakly related

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AIE6404	ARTIFICIAL INTELLIGENCE	L	T	P	C
Version 2020.1	Date of Approval: July 2020	3	0	0	3
Pre-requisites/Exposure	Exposure to data structure and programming and an ability to discuss algorithms is the only pre-requisite.				
Co-requisites	Nil				

Catalog Description

Introduction to computational models of thought and construction of intelligent information systems. Topics include search algorithms, data dependencies and truth-maintenance systems, approaches to knowledge representation, automated deduction, reasoning under uncertainty, and machine learning. The field of Robotics is a multi-disciplinary as robots are amazingly complex system comprising mechanical, electrical, electronic H/W and S/W and issues germane to all these.

Course Objectives

The objective of this course is to

1. Provide an overview of problem solving skills methods using Artificial Intelligence.
2. Equip the students with the study of programming languages that is used to develop an Intelligence System.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain how Artificial Intelligence enables capabilities that are beyond conventional technology, for example, chess-playing computers, self-driving cars, robotic vacuum cleaners and Understand the various searching techniques.

CO2: Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning.

CO3: Acquire the knowledge of real world Knowledge representation. Apply concept Natural Language processing to problems leading to understanding of cognitive computing.

CO4: Use different machine learning techniques to design AI machine and Write algorithms and implement programs in 'Prolog' language.

CO5: Explain some of the more advanced topics of AI such as Robotics and Explain what constitutes "Artificial" Intelligence and how to identify systems with Artificial Intelligence.

Modules	Blooms level*	Number of hours

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MODULE 1: PROBLEM SOLVING AND SCOPE OF AI Introduction to Artificial Intelligence. Applications- Games, theorem proving, natural language processing, vision and speech processing, robotics, expert systems. AI techniques- search knowledge, abstraction. PROBLEM SOLVING State space search; Production systems, search space control: depth-first, breadth-first search. Heuristic search - Hill climbing, best-first search, branch and bound. Problem Reduction, Constraint Satisfaction End, Means-End Analysis. LA* Algorithm, L(AO*) Algorithm.	L1, L2, L3 and L4	10
MODULE 2: KNOWLEDGE REPRESENTATION Knowledge Representation issues, first order predicate calculus, Horn Clauses, Resolution, Semantic Nets, Frames, Partitioned Nets, Procedural Vs Declarative knowledge, Forward Vs Backward Reasoning.	L1, L2 and L4	6
MODULE 3: UNDERSTANDING NATURAL LANGUAGES Introduction to NLP, Basics of Syntactic Processing, Basics of Semantic Analysis, Basics of Parsing techniques, context free and transformational grammars, transition nets, augmented transition nets, Shanks Conceptual Dependency, Scripts, Basics of grammar free analyzers, Basics of sentence generation, and Basics of translation.	L1, L2 and L4	7
MODULE 4: EXPERT SYSTEM Need and justification for expert systems, knowledge acquisition, Case studies: MYCIN, R1 LEARNING Concept of learning, learning automation, genetic algorithm, learning by inductions, neural nets. Programming Language: Introduction to programming Language, LISP and PROLOG. HANDLING UNCERTAINTIES Non-monotonic reasoning, Probabilistic reasoning, use of certainty factors, Fuzzy logic.	L1, L2, L4 and L5	7
MODULE 5: INTRODUCTION TO ROBOTICS Fundamentals of Robotics, Robot Kinematics: Position Analysis, Dynamic Analysis and Forces, Robot Programming languages & systems: Introduction, the three levels of robot programming, requirements of a robot programming language, problems peculiar to robot programming languages.	L1, L2 and L3	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. E. Rich and K. Knight, "Artificial intelligence", TMH, 2nd ed., 1992.
2. N.J. Nilsson, "Principles of AI", Narosa Publ. House, 1990.
3. John J. Craig, "Introduction to Robotics", Addison Wesley publication.
4. Richard D. Klafter, Thomas A. Chmielewski, Michael Negin, "Robotic Engineering – An integrated approach", PHI Publication.

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5. Tsuneo Yoshikawa, “Foundations of Robotics”, PHI Publication

Reference Books

1. D.W. Patterson, “Introduction to AI and Expert Systems”, PHI, 1992.
2. Peter Jackson, “Introduction to Expert Systems”, AWP, M.A., 1992.
3. R.J. Schalkoff, “Artificial Intelligence - an Engineering Approach”, McGraw Hill Int. Ed., Singapore, 1992.
4. M. Sasikumar, S. Ramani, “Rule Based Expert Systems”, Narosa Publishing House, 1994.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**3**	--	**1**	**1**	--	--	--	--	--	--	**2**	**1**	**2**	--	--
CO2	**1**	**2**	--	**1**	--	--	--	--	--	--	**3**	--	**2**	**1**	--	**2**
CO3	**1**	**3**	--	**1**	**1**	--	--	--	--	--	**3**	**2**	--	--	**1**	**2**
CO4	**1**	--	**1**	**3**	**1**	--	--	--	**3**	--	--	**2**	**2**	**1**	--	--
CO5	**1**	**1**	**1**	**2**	--	**2**	**3**	--	--	--	--	--	--	**1**	**2**	--

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AIE6406	ARTIFICIAL INTELLIGENCE LAB	L	T	P	C
Version 2020.1	Date of Approval: July, 2020	0	0	2	1
Pre-requisites/Exposure	Basic Concepts of C and C++				
Co-requisites	Nil				

Catalog Description

PROLOG programs tell the computer what to do (declarative programming) rather than how to do it (procedural programming). PROLOG does this by making deductions and derivations, instigated by user-defined queries, from facts and rules stored in a database. The module teaches PROLOG as a practical programming tool, useful in solving various interesting problems especially in the Artificial Intelligence domain.

Course Objectives

The objective of this course is to

1. Provide an overview of a programming paradigm: programming by means of logic (also known as logic programming)
2. Provide an experience with development of AI application using PROLOG.

Course Outcomes

On completion of this course, the students will be able to

CO1: Use the basic knowledge of PROLOG programming in order to write simple PROLOG programs and explore more sophisticated PROLOG code on their own.

CO2: Use Prolog for developing artificial intelligence applications.

Modules/Topics Covered**	Blooms level*	Number of hours
1: INTRODUCTION TO PROLOG- SIMPLE FACTS, FACTS WITH ARGUMENTS. **PROBLEM STATEMENT 1:** • Convert the following into Prolog Equivalent: It is raining. This is a book. **PROBLEM STATEMENT 2:** • Convert the following into Prolog Equivalent: 1. The cakes are delicious. 2. Priya relishes coffee. 3. Edwin plays badminton.	L1 and L3	4

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2: DEFINING VARIABLES, MATCHING AND BACKTRACKING. **PROBLEM STATEMENT 3:** • Convert the sentences into Prolog Equivalent and answer the following questions: 1. Sun rises in east. 2. Dovey is a good girl. 3. Dora likes books. 4. Chin is an intelligent student? Query 1: Who is a good girl? Query 2: Dora likes What? **PROBLEM STATEMENT 4:** • Consider the following facts: 1. parent (pam, bob). 2. parent (tom, bob). 3. parent (bob, ann). 4. parent (tom, liz). Query: Who is the parent of Whom? Or Find X and Y such that X is the parent of Y.	L1, L3 and L5	4
3: RULES. **PROBLEM STATEMENT 5:** • Consider the given knowledge. Represent the knowledge into the PROLOG equivalence and answer the question using rules. Joy is father of Jay. Jay is father of Sam. Sam is brother of Sue. Alvin is father of Ali. Sim is mother of Sam. Sis is mother of Alvin. Question: Who are Sue's parent?	L1, L3 and L5	2
4: INPUT AND OUTPUT PREDICATES. **PROBLEM STATEMENT 6:** • Write a code to print a message on the screen. • Write a program to perform addition of two numbers.	L1 and L3	2
5: CONTROL SRRUCTURES AND RECURSION. **PROBLEM STATEMENT 7:** • Write a code in PROLOG to design a calculator. **PROBLEM STATEMENT 8:** • Write a code in PROLOG to find the largest number among two numbers. • Write a code in PROLOG to find the largest number among three numbers. **PROBLEM STATEMENT 9:** • Write a code in PROLOG to find the factorial of a number. **PROBLEM STATEMENT 10:** • Write a code in PROLOG to print the Fibonacci series.	L1, L3 and L5	8
6: Data Structure and Operations. **PROBLEM STATEMENT 11:** • Create a LIST of 10 elements and print Head and Tail. • Write a code in PROLOG to concatenate two strings. **PROBLEM STATEMENT 12:** • Write a code in PROLOG to search an item from a given LIST.	L1 and L3	4

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

** Sample Programs provided are not limited to these only, can include others as desired.

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Text Books

1.E. Rich and K. Knight, "Artificial intelligence", TMH, 2nd ed., 1992.

2.Bratko, "PROLOG Programming for A.I*".*, 3rd Ed Ed., Addison Wesley, 2001.

Reference Books

1. D.W. Patterson, "Introduction to AI and Expert Systems", PHI, 1992.
2. R.J. Schalkoff, "Artificial Intelligence - an Engineering Approach", McGraw Hill Int. Ed., Singapore, 1992.

Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	**70**

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	--	--	--	**2**	**1**	--	--	--	--	--	--	**3**	--	**1**	--	--
CO2	--	--	**1**	**2**	--	**3**	--	--	**2**	--	**3**	--	--	**1**	**2**	--

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AIE6414	DATA COMMUNICATION & COMPUTER NETWORKS	L	T	P	C
Version : 2020.1	Date of Approval: July 2020	3	0	0	3
Pre-requisites/Exposure	Basics of Computers				
Co-requisites	NIL				

Catalog Description

The objective is to acquaint the students with the basics of data communication and networking. A structured approach to explain how networks work from the inside out is being covered. The physical layer of networking, computer hardware and transmission systems have been explained. In-depth application coverage includes email, the domain name system; the World Wide Web (both client- and server-side); and multimedia (including voice over IP.

Course Objectives

The objective of this course is to

1. To provide an overview of data communication and computer networks, network specific protocols, networking devices, OSI /TCP-IP Layer concepts.
2. To familiarize with the basic taxonomy and terminology of computer networking area.
3. To experience the designing and managing of communication protocols while getting a good exposure to the TCP/IP protocol suite.

Course Outcomes

On completion of this course, the students will be able to

CO1. State the functions of data component in communication, networking devices, characteristics of topologies and describe the functionality of layers in OSI model.

CO2. Explain Error correction and detection techniques; Differentiate between different type of protocols used at data link layer.

CO3. Describe channel allocation problem and illustrate the working and applications of different wireless LANs and WANs standards

CO4. Compare and Contrast different routing algorithms; discuss the frame format of IPv4 and IPv6

CO5. Compare and contrast different transport layer protocols and explain various protocols used at application layer.

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Modules	Blooms level*	Number of hours
Module I: Introduction Introduction to computer networks, evolution of computer networks and its uses, reference models, example networks The physical layer: Theoretical basis for data communication, transmission media, wireless transmission, telecom infrastructure, PSTN, communication satellites, mobile telephone system	L1, L2	8
Module II: The data link layer Data link layer design issues, error detection and correction, data link protocols, sliding window protocols, example of data link protocols-HDLC, PPP Access .	L2, L3 and L4	8
Module III: Medium access layer Channel allocation problem, multiple access protocols, ALOHA, CSMA/CD, CSMA/CA, IEEE Standard 802 for LAN and MAN, Bridges, Wireless LANs. Introduction to wireless WANs: Cellular Telephone and Satellite Networks, SONETISDH, Virtual-Circuit Networks: Frame Relay and ATM.	L2, L3	9
Module IV: The network layer Network layer concepts, design issues, static and dynamic routing algorithms, shortest path routing, flooding, distance vector routing, link state routing, distance vector routing, multicast routing, congestion control and quality of service, internetworking, Ipv4	L2, L3 and L4	6
Module VI: The transport layer The transport services, elements of transport protocols, TCP and UDP. The application layer: Brief introduction to presentation and session layer, DNS,E-mail**,** WWW	L2, L3and L4	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text & References:

Text:

1. Computer networks: Tanenbaum, Andrew S, Prentice Hall
2. Data communication & Networking: Forouzan, B. A.

References:

1. Computer network protocol standard and interface: Uyless, Black
2. Data and Computer Communications, Seventh Edition (7th.) William Stallings Publisher: Prentice Hall
3. Computer Networking: A Top-Down Approach Featuring the Internet (3rd Edition) by James F. Kurose

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	--	--	--	--	--	--	--	--	--	1	3	--	--
CO2	1	2	3	--	--	--	--	--	--	--	--	--	1	1	--	--
CO3	1	1	2	3	3	--	--	--	--	--	--	--	1	2	--	--
CO4	1	1	2	3	--	--	--	--	--	--	--	--	1	1	2	---
CO5	1	1	2	3	--	--	--	--	--	--	--	--	1	2	1	---

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AIE6415	DATA COMMUNICATION AND COMPUTER NETWORKS LAB	L	T	P	C
Version 2020.1	Date of Approval: July 2020	0	0	2	1
Pre-requisites/Exposure					
Co-requisites	Nil				

Catalog Description

The objective is to acquaint the students with the basics of data communication and networking. A structured approach to explain how networks work from the inside out is being covered. The physical layer of networking, computer hardware and transmission systems have been explained. In-depth application coverage includes email, the domain name system; the World Wide Web (both client- and server-side), routing protocols and data link layer protocols.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of data communication and networking.
2. Provide an overview of various protocols and their configurations using networking devices and servers.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Demonstrate the use of Command Line Interface (CLI) and other features and Cisco Packet Tracer; describe and distinguish networking devices and transmission media.

CO 2: Apply various application layer protocols capability on server device including DNS, DHCP, HTTP, SMTP and POP.

CO 3: Construct network topology and operate routing protocols (RIP, OSPF and EIGRP) for end-to-end connectivity.

CO 4: Illustrate the use of data link protocols-HDLC and PPP; determine network connectivity issues and fix them.

Modules	Blooms level*	Number of hours
LABORATORY SESSION 1 THE PHYSICAL LAYER 1. Introduction to different types of transmission media and cables. 2. Introduction to various networking devices and equipment. 3. Construct network topology and understand configuration of devices using Cisco Packet Tracer (tool).	L2, L3	6

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LABORATORY SESSION 2 THE APPLICATION LAYER 1. Configuration of Domain Name System (DNS) server using Cisco Packet Tracer. 2. Configuration of Dynamic Host Configuration Protocol (DHCP) server using Cisco Packet Tracer. 3. Configuration of mail server using Cisco Packet Tracer. 4. Configuration of web server using Cisco Packet Tracer.	L3	6
LABORATORY SESSION 3 THE NETWORK LAYER 1. Configure Routing Information Protocol (RIP) using Cisco Packet Tracer. 2. Configure Open Shortest Path First (OSPF) routing protocol using Cisco Packet Tracer. 3. Configure Enhanced Interior Gateway Routing Protocol (EIGRP) using Cisco Packet Tracer.	L3	6
LABORATORY SESSION 4 DATA LINK LAYER 1. Configure and Analyze the working of data link control protocols-HDLC and PPP access. 2. Configure PPP security protocols-PAP and CHAP using Cisco Packet Tracer. 3. Determine various issues in network connectivity and communication using troubleshooting commands.	L3,L4	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Cisco Networking Academy Programme CCNA 3 & 4 Lab Companion, 3rd Edition, Pearson Education, 2003.

Reference Books

1. Scott Empson, CCNA Routing and Switching portable command guide, 3rd Edition, Cisco Press, 2016.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	--	--	--	--	--	--	--	--	--	1	3	--	--
CO2	1	2	3	--	--	--	--	--	--	--	--	--	1	3	--	--
CO3	1	1	2	3	--	--	--	--	--	--	--	--	1	3	--	--
CO4	1	1	2	3	3	--	--	--	--	--	--	--	1	3	--	--
CO5	1	1	2	3	3	--	--	--	--	--	--	--	1	3	--	--

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AIE6411	ARTIFICIAL NEURAL NETWORK	L	T	P	C
Version 2020.1	Date of Approval: July 2020	2	-	-	2
Pre-requisites/Exposure	Basic Knowledge of Brain functioning				
Co-requisites	Nil				

Catalog Description

The course provides introduction to neural network and a deep insight into the basics of brain & its functioning basics of various neural models & neural schema used for learning. With this course students would be able to know the basics of each introductory feature of human brain and its features which would prove to be very helpful throughout their degree and would prove helpful in understanding other related subjects also.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of learning of brain problem solving techniques and develop proficiency in creating neural structures using the MATLAB.
2. Provide an overview of various control statements, data structures, packages related to image addition, graphics, different types of neural models.

Course Outcome

On completion of this course, the students will be able to

CO 1: Define Artificial Neural Network & its similarity to biological neural network and explain its application in our day to day life.

CO 2: Analyze ANN learning, Error correction learning, Hebbian learning, Competitive learning and Boltzman Learning.

CO 3: Implement simple perceptron, Perceptron Learning rule, modified perceptron learning rule, feed forward neural network & feedback Neural Network.

CO 4: Explain self-organizing Map, Hopfield network, Adaptive resonance theory and its various learning rules.

CO 5: Analyze memory-based learning, Associative learning, Bi-directional learning and Auto associative learning.

Modules	Blooms level*	Number of hours
Module-I Artificial Neural Networks (ANN) and biological neural networks, supervised and unsupervised learning rules, neural network applications	L1, L2 and L3	6
Module-II Unsupervised learning:- Hebbian learning and competitive learning. Supervised learning:- Back propagation algorithms, Learning rule:- Delta learning rule, Widrow-Hoff learning rule, Winner-Take-All learning rule	L1, L2 and L3	6

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Module-III Feed forward neural network, feed backward neural network, Perceptron and its learning law, single-layer perceptron, multi-layer perceptron.	L2, L3 and L4	6
Module-IV Self organizing networks: Kohonen algorithm, Hopfield Networks: Hopfield network algorithm, Adaptive resonance theory: Network and learning rules.	L2, L3 and L4	6
Module V Associative memory, auto-associative memory, bi-directional associative memory.	L2, L3 and L4	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation
Text Book:

- Kenji Suzuki (ed.) - InTech **,** 2013
- Todd Troyer **-** University of Texas at San Antonio**,** 2005.

Reference Book:

- MATLAB 2017 Book released by MATWORS

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**												**1**			
CO2	**1**												**1**		**1**	
CO3		**1**	**2**										**1**			
CO4		**1**	**2**	**1**									**1**		**1**	
CO5			**2**										**1**			

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AIE6412	ARTIFICIAL NEURAL NETWORK LAB	L	T	P	C
Version 2020.1	Date of Approval: July 2020	0	0	1	1
Pre-requisites/Exposure	Basics of MATLAB				
Co-requisites	NIL				

Catalog Description

In this Lab course first student should learn about advanced level of software used for easy calculation and toolbox used for software like MATLAB.

Course Objectives

The objective of this course is to

1. Make the students apply knowledge of various neural models required for solving complex problems.
2. Provide a demonstration of different types of image processing techniques through MATAB toolbox.

Course Outcomes

On completion of this course, the students will be able to

CO1: Acquiring knowledge of Basics of High-end calculation software and need in Computer Science & engineering

CO2: Demonstrate the All preliminary functions in MATLAB

CO3: Apply the knowledge of all the basics function and toolbox knowledge of MATLAB

CO4: Demonstrate the Neural Network model in MATLAB

CO5: Demonstrate usage of applications involving with Image processing & Its Toolbox used by MATLAB

Modules/Topics Covered**	Blooms level*	Number of hours
1. Introduction of MATLAB (a) Basic Variable deceleration & its operation (b) Function use & its application	L3, L5	4
2. Sample Programs in MATLAB (a) Basic use of Matrix and Graph Plotting (b) Different type of graph plotting with use of different -2 type of data	L3, L5	6
3. Sample Programs using MATLAB functions (a) Create a basic program MATLAB using functions (b) Use of basic function Image processing (c) Practice on Basic function of Image processing tool box.	L3, L5	6
4. Sample programs of ANN functions (a) Practice on ANN toolbox function in MATLAB (b) Write a program for training a small network in MATLAB	L3, L5	6

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5. Sample Programs using ANN tool box & Image processing toolboix (a) Demonstrate the use of ANN tool box & Image processing toolbox and write a program after combining it.	L3, L5	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

1. Kenji Suzuki (ed.) - InTech , 2013
2. Todd Troyer - University of Texas at San Antonio , 2005

Reference Books

1. MATLAB 2017 Book realeased by MATWORS.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	**70**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**2**	**1**	--	--	--	--	--	--	--	--	--	--	**2**	--	--	--
CO2	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO3	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO4	**1**	**3**	**2**	--	--	--	--	--	--	--	--	--	**2**	--	**2**	--
CO5	**1**	**3**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--

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AIE6407	COMMUNICATION SYSTEM	L	T	P	C
Version 2020.1	Date of Approval: July, 2020	2	0	0	2
Pre-requisites/Exposure	Signal and System				
Co-requisites					

Catalog Description

The purpose of this course is to introduce students to the basic principles of the design and analysis of modern communication systems. It will provide a thorough study of both analog and digital modulation and demodulation schemes. The performance analysis of various techniques based on requirements of noise and bandwidth will also be explained. It also introduces the students to the information theory and coding for basic understanding of mobile communication system.

Course Objectives

The objective of this course is to

1. Provide a thorough introduction to analog and digital communications
2. Provide in depth study of various modulation and demodulation techniques.
3. Introduce students to basics of information theory and coding for applications in mobile communication.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define and Distinguish analog and digital communication systems.

CO2. Differentiate modulation and demodulation techniques of AM and FM systems and compare them in terms of Bandwidth and noise.

CO3. Distinguish and categorize various digital modulation techniques.

CO4. Describe Information theory and coding for applications in mobile communication system by solving different encoding problems.

Modules	Blooms level*	Number of hours
MODULE I: INTRODUCTION Communication Process, Source of Information, base-band and pass-band signals, Review of Fourier transforms, Random variables, different types of PDF, need of modulation process, analog versus digital communications	L1 and L2	4

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MODULE II: AMPLITUDE MODULATION Amplitude modulation with full carrier, suppressed carrier systems, single side band transmission, switching modulators, synchronous detection, envelope detection, effect of frequency and phase errors in synchronous detection, comparison of various AM systems, vestigial side band transmission.	L1, L2, L3and L4	8
MODULE III: ANGLE MODULATION Narrow and wide band FM, BW calculations using Carson rule, Direct & Indirect FM generations, phase modulation, Demodulation of FM signals, noise reduction using pre & de-emphasis.	L1, L2, L3and L4	9
MODULE IV: PULSE MODULATION Pulse amplitude, width & position modulation, generation & detection of PAM, PWM & PPM, Comparison of frequency division and time division multiplexed systems. Basics of Digital Communications: ASK, PSK, FSK, QPSK basics & waveform with brief mathematical introduction	L1, L2, L3 and L4	6
MODULE V: NOISE Different types of noise, noise calculations, equivalent noise band width, noise figures, effective noise temperature, noise figure.	L1 and L2	4
MODULE VI: INTRODUCTION TO INFORMATION THEORY Measurement of Information, mutual, Shannon's theorem, Source coding, channel coding and channel capacity theorem, Huffman code	L1, L2 and L3	5

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. B. P. Lathi and Zhi Ding ,"Modern Digital and Analog Communication Systems", Fourth Edition, Oxford University Press, 2009
2. Wayne Tomasi, "Electronic Communication systems", 5th edition, Pearson Education,2008

Reference Books

1. Simon Haykin, "Communication Systems", Third Edition, John Wiley & Sons,2007
2. Taub and schilling, "Principles of Communication Systems", Third Edition, TMH,2008

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

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Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	--	**_**	--	**_**	**2**	--	--	--	--	--	--	**1**	--	**1**	--
CO2	**1**	**3**	**2**	--	--	**2**	--	--	--	--	--	--	**1**	--	**1**	--
CO3	**1**	**3**	**2**	--	--	**2**	--	--	--	--	--	--	**1**	--	**1**	--
CO4	**1**	**2**	**2**	--	--	**3**	--	--	--	--	--	--	**1**	--	**1**	--

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AIE6408	COMMUNICATION SYSTEMS LAB	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	0	0	2	1
Pre-requisites/Exposure	Signal and System				
Co-requisites	Nil				

Catalog Description

To impart knowledge on Amplitude Modulation and Angle modulation principles, generation, and its types. Also, to understand the basic concepts of pulse modulation techniques like PCM and PSK.

Course Objectives

The objective of this course is to

1. To provide the basic skills required to understand, develop, and design of various engineering applications involving analog communication theory. To provide basic laboratory exposures for communication principles and applications.

Course Outcomes

On completion of this course, the students will be able to

CO1: Study the carrier modulation techniques like AM and FM modulation.

CO2: Study digital carrier modulation techniques using amplitude shift keying and Frequency shift keying.

CO3: Demonstrate various pulse modulation techniques (PCM), DM, ASK, DPSK and QPSK.

List of Experiments:

Modules	Blooms level*	Number of hours
1. To study the sampling and reconstruction of a given signal. 2. To study amplitude modulation and demodulation. 3. To study frequency modulation and demodulation. 4. To study time division multiplexing.	L1, L2	8
5. To study pulse amplitude modulation. 6. To study delta and adaptive delta modulation and demodulation. 7. To study carrier modulation techniques using amplitude shift keying and Frequency shift keying.	L3 and L4	10

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8. To study carrier modulation techniques using binary phase shift keying and differential shift keying. 9. To study pulse code modulation & differential pulse code modulation as well as relevant demodulations. 10. To study quadrature phase shift keying & quadrature amplitude modulation.	L2, L4	10

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2													2	
CO2	2	2			2										2	
CO3	2										2				2	

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AIE6417	WEB DESIGNING TECHNOLOGIES	L	T	P	C
Version: 2020.1	Date of Approval: JULY 2020	2	0	0	2
Pre-requisites/Exposure	knowledge of Internet fundamentals				
Co-requisites	NIL				

Catalog Description

The objective of this course is to introduce the basic concepts of HTML5 and CSS3. To explore and implement the various concepts of website design using HTMLwith the concept of the tags, script, and code that create web pages. To understand how the web and web pages work and web pages styles using CSS3.After completing this course students can easily develop static web sites and style them using CSS3.

Course Objectives

The objective of this course is

1. Understand the advanced features of HTML5 which includes images, links, tables, frames and forms etc and gives an overview of CSS3 which is used to add style to the web pages.
2. Demonstrate the application of HTML5 in developing solutions to web site creation and understanding how CSS will affect web page creation.
3. Design a responsive web site using HTML5 and CSS3.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain the basic concepts of HTML, structure of HTML. Apply the different tags for images, hypertext and lists in web pages.

CO 2: Illustrate the different ways to use styles in web pages using CSS? Apply CSS style sheets for formatting text in web pages.

CO 3: Explain the layout of CSS style and describe how to add audio and video in html web pages.

CO 4: Demonstrate the use of Table and frames in web pages and setting properties for tables and frames.

CO 5: Explain the writing scripts in web pages and publishing Webpages on web.

Modules	Blooms level*	Number of hours
Module I History of HTML, Basic HTML Structure, Creating title, Creating header and footer, Adding Comments, Formatting Text, Specifying time, Indicating citations/references, quotes, abbreviations, pre-formatted text, Inserting Images, Creating Image Links, Scaling images with the browser, setting icons for web page, Creating hypertext, anchor tag, Creating List, Creating Definition List, Creating Hyper Text Links, Creating Link Lists.	L2 and L3	8

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Module II CSS building blocks, working with style sheets, Creating different types of style sheets- External , embedded and inline style sheets, defining selectors , Selecting on basis of class and id, selecting elements based on the attributes, combining selectors, Formatting text with styles, setting font properties.	L3 and L4	7
Module III CSS: Layout with style, changing the background color, setting border, changing the cursor, style sheets for mobile to desktop, working with web fonts, creating forms, organizing the form elements. Adding audio , video and other multi-media .	L2 and L3	7
Module IV Tables and frames, Creating Tables, Table Element, Adding Border, Adding Column Headings, Adding Spacing and Padding, Adding a Caption, Setting the table Width and Height, Add Row Headings, Aligning Cell contents, Setting Column Width, Centering a Table, Inserting and Image, Spanning Columns, Spanning Rows Assigning Background Colors, Frame Elements, Creation of Frame Based Pages.	L3	7
Module V: Working with scripts : Loading an external script, testing & debugging web pages, publishing your web page on the web.	L2	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books:

1. HTML HTML5 and CSS3, Seventh Edition: Visual QuickStart Guide ,Elizabeth Castro and Bruce Hyslop.
2. HTML, XHTML and CSS Bible, Steven M. Schefar, Wiley Publishing, Inc.

Reference Books:

1. HTML & CSS: The Complete Reference, Fifth Edition ,Thomas A. Powell, Tata McGraw Hill.
2. HTML5: Up and Running ,Mark Pilgrim, O'Reilly Media, Inc.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	--	--	1	--	1	--	--	--	--	1	--	--	1	--	--	--
CO 2	--	--	2	--	2	--	--	--	--	1	--	--	1	--	--	--
CO 3	--	--	1	--	1	--	--	--	--	2	--	--	1	--	--	--
CO 4	--	--	2	--	1	--	--	--	--	2	--	--	1	--	--	--
CO 5	--	--	1	--	2	--	--	--	2	1	--	--	1	1	--	2

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AIE6418	WEB DESIGNING TECHNOLOGIES LAB	L	T	P	C
Version: 2020.1	Date of Approval: JULY 2020	0	0	2	1
Pre-requisites/Exposure	knowledge of Internet fundamentals				
Co-requisites	NIL				

Catalog Description

The objective of this course is to introduce the basic concepts of HTML5 and CSS3. To explore and implement the various concepts of website design using HTML with the concept of the tags, script, and code that create web pages. To understand how the web and web pages work and web pages styles using CSS3.After completing this course students can easily develop static web sites and style them using CSS3.

Course Objectives

The objective of this course is

1. Understand the advanced features of HTML5 which includes images, links, tables, frames and forms etc and gives an overview of CSS3 which is used to add style to the web pages.
2.Demonstrate the application of HTML5 in developing solutions to web site creation and understanding how CSS will affect web page creation.
3.Design a responsive web site using HTML5 and CSS3.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain the basic concepts of HTML, structure of HTML. Apply the different tags for images, hypertext and lists in web pages.
CO 2: Illustrate the different ways to use styles in web pages using CSS? Apply CSS style sheets for formatting text in web pages.
CO 3: Explain the layout of CSS style and describe how to add audio and video in html web pages.
CO 4: Demonstrate the use of Table and frames in web pages and setting properties for tables and frames.
CO 5: Explain the writing scripts in web pages and publishing Webpages on web.

Modules	Blooms level*	Number of hours
Module I **Programs based on :** • Basic HTMLStructure, Creating title, Creating header and footer, Adding Comments, • Formatting Text, Specifying time, Indicating citations/references, quotes, abbreviations, • pre-formatted text, Inserting Images, Creating Image Links, Scaling images with the browser, • setting icons for web page, Creating hypertext, anchor tag, Creating List, • Creating Definition List, Creating Hyper Text Links, Creating Link Lists.	L2 and L3	6

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Module II & Module III **Programs based on:** • CSS style sheets, Creating different types of style sheets- External , embedded and inline style sheets, • Selection on basis of class and id, selecting elements based on the attributes, combining selectors, • Formatting text with styles, setting font properties. • Changing the background color, setting border, changing the cursor, • style sheets for mobile to desktop, • working with web fonts, creating forms, organizing the form elements. Adding audio , video and other multi-media .	L2,L3 and L4	4
Module IV **Programs based on:** • Tables and frames, Creating Tables, Table Element, Adding Border, Adding Column Headings, • Adding Spacing and Padding, Adding a Caption, Setting the table Width and Height, Add Row Headings, • Aligning Cell contents, Setting Column Width, Centering a Table, Inserting and Image, • Spanning Columns, Spanning Rows Assigning Background Colors, • Frame Elements, Creation of Frame Based Pages.	L3	4
Module V: **Programs based on** Working with scripts : Loading an external script, testing & debugging web pages, publishing your web page on the web.	L2	1

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books:
1. HTML HTML5 and CSS3, Seventh Edition: Visual QuickStart Guide ,Elizabeth Castro and Bruce Hyslop.
2. HTML, XHTML and CSS Bible, Steven M. Schefar, Wiley Publishing, Inc.

Reference Books:
1. HTML & CSS: The Complete Reference, Fifth Edition ,Thomas A. Powell, Tata McGraw Hill.
2. HTML5: Up and Running ,Mark Pilgrim, O'Reilly Media, Inc.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/ Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	--	--	1	--	1	--	--	--	--	1	--	--	1	--	--	--
CO 2	--	--	2	--	2	--	--	--	--	1	--	--	1	--	--	--
CO 3	--	--	1	--	1	--	--	--	--	2	--	--	1	--	--	--
CO 4	--	--	2	--	1	--	--	--	--	2	--	--	1	--	--	--
CO 5	--	--	1	--	2	--	--	--	2	1	--	--	1	1	--	2

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AIE6502	COMPUTER ARCHITECTURE	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure	Logic Gates				
Co-requisites	nil				

Catalog Description

Computer architecture is concerned with the structure and behavior of the various functional modules of the computer and how they interact to provide the processing needs of the user. It includes basic register transfer language and computer organization and design. Complete insight on the working of CPU, Memory and I/O communication will be provided. Pipeling and related topics will also be discussed.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of computer architectures and their modules.
2. Provide an overview of various algorithms used and hardware implementation computer.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain about Register transfer language and various micro operations of arithmetic logic unit.
CO2. Explain about the organization of computer modules and their details.
CO3. Explain in details of central processing unit like general purpose register, accumulator etc. and computer arithmetic.
CO4. Explain memory organization of computer and their interconnections. Details of direct memory access.
CO5. Explain parallel processing and pipeline techniques.

Modules	Blooms level*	Number of hours
Module I: Register Transfer Language Register Transfer, Bus and Memory Transfers, Arithmetic Micro-operations, Logic Micro-operations, Shift Micro-operations, Arithmetic Logic shift Unit.	L1, L2 and L3	10
Module II: Basic Computer Organizations and Design Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt, Design of Accumulator Logic. Hardwired and Microprogrammed control: Control Memory, Address Sequencing, Design of Control Unit	L1,L2	9

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Module III: Central Processing Unit Introduction, General Register Organization, Stack Organization, Instruction representation, Instruction Formats, Instruction type, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer RISC and CISC Computer Arithmetic: Introduction, Addition and Subtraction Algorithm,Multiplication Algorithms, Booth Multiplication, Division Algorithms, Floating-Point Arithmetic Operations	L1,L2, L3	10
Module IV: Memory and Intersystem Communication and Input output organisation Memory: Memory types and organization Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory with mapping techniues, Virtual Memory, Memory Management Hardware Intrasystem communication and I/O: Peripheral Devices, Input-Output Controller and I/O driver, IDE for hard disk, I/O port and Bus concept, Bus cycle, Synchronous and asynchronous transfer,Modes of Transfer, DMA, DMA Transfer, DMA Controller, I/O Processor, CPU-IOP Communication	L1,L2, L3.	10
Module V: Pipelining, Vector Processing and Multiprocessors Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline Multiprocessors: Characteristics of Multiprocessors	L1 and L2	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Book:

1. Morris Mano, Computer System Architecture, 3rd Edition – 1999, Prentice-Hall of India Private Limited.
2. Harry & Jordan, Computer Systems Design & Architecture, Edition 2000, Addison Wesley, Delhi.

References Books:

1. WIliam Stallings, Computer Organization and Architecture, 4th Edition-2000, Prentice-Hall of India Private Limited.
2. Kai Hwang-McGraw-Hill, Advanced Computer Architecture.
3. John D. Carpinelli, Computer system Organization & Architecture, Edition 2001, Addison Wesley, Delhi
4. M. Morris Mano and Charles, Logic and Computer Design Fundamentals, 2nd Edition Updated, Pearson Education, ASIA.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	ATT	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

ATT: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination.

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	**1**	**2**	**3**	**3**	--	--	--	--	--	--	--	--	**2**	**1**	--
CO2	**1**	--	--		--	--	--	--	--	--	--	--	--	**2**	--
CO3	**1**	**2**	**3**	**3**		--	--	--	--	--	--	--	**2**	**1**	--
CO4	**1**	**2**	**3**	**3**	--	--	--	--	--	--	--	--	**2**	**1**	--
CO5	**1**	--	--	--	--	--	--	--	--	--	--	--	--	**1**	--

1: strongly related, 2: moderately related and 3: weakly related

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AIE6503	JAVA PROGRAMMING	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure	Basics of Programming				
Co-requisites	NIL				

Catalog Description

The objective is to impart programming skills used in this object-oriented language java. The course explores all the basic concepts of core java programming like object, classes, data types, features, operators, control structures, interfaces, packages, applets, awt, swings and socket programming. The students are expected to learn it enough so that they can develop the basic applications as well as web solutions like creating applets etc.

Course Objectives

The objective of this course is to

1. Equip the students with the basic feature of contemporary java required in solving complex problems.
2. Provide a practical knowhow and implementation of java programming concepts like classes, objects, packages, swings, socket programming.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define and explain concept of byte code and platform independence, demonstrate basic java-based application development using operators, if-else, loops and arrays.

CO2: Distinguish between various types of inheritances, polymorphisms and other concepts and able to solve complex programming problems involving class objects, inheritances, and packages.

CO3: Describe hierarchy of exception classes and thread life cycle along with demonstrate and design solutions for some simple and complex applications using exception and multithreading concepts.

CO4: Explain event delegation model and describe AWT class hierarchy; Apply knowledge of event handling and AWT controls create some new dynamic graphical applications.

CO5: Explain the architecture of applet and concept of swing package. Demonstrate applications based on java applets and swings.

Modules	Blooms level*	Number of hours
Module I: Java Basics Concepts of OOP, Features of Java, How Java is different from C++, Environmental setup, Basic syntax, Objects and classes, Basic Data Types, Variable Types, Modifier Types, Basic operators, Loop Control, Decision Making, Strings and Arrays, Methods, I/O.	L1, L2 and L3	6
Module II: Java Object Oriented Inheritance, Overriding, Polymorphism, Abstraction, Encapsulation, Interfaces, Packages, Exploring java.util package. .	L2 and L3	7

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Module III: Exception Handling and Threading Exception Hierarchy, Exception Methods, Catching Exceptions, Multiple catch Clauses, Uncaught Exceptions Java's Built-in Exception. Creating, Implementing and Extending thread, thread priorities, synchronization suspending, resuming and stopping Threads, Multi-threading.	L2, L3 and L5	8
Module IV: Event Handling And AWT Event handling Mechanism, Event Model, Event Classes, Sources of Events, Event Listener Interfaces, AWT: Working with Windows, AWT Controls, Layout Managers	L2, L3, L4 and L5	8
Module V: Java Advanced Applet Class, Architecture, Skeleton, Display Methods. Swings: Japplet, Icons, labels, Text Fields, Buttons, Combo Boxes. Socket Programming: Socket methods, Server Socket methods, Socket Client and Socket Server examples.	L2 and L3	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text:

1. "JAVA The Complete Reference" by Patrick Naughton & Herbert Schild, 10th Edition,TMH
2. "Introduction to JAVA Programming a primer", E.Balaguruswamy,4th Edition,TMH

References:

1. "Introduction to JAVA Programming" By Daniel/Young PHI
2. "Java Script", By Jeff Frentzen and Sobotka, Tata McGraw Hill,1999

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**2**	**1**	--	--	--	--	--	--	--	--	--	--	**2**	--	--	--
CO2	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO3	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO4	**1**	**3**	**2**	--	--	--	--	--	--	--	--	--	**2**	--	**2**	--
CO5	**1**	**3**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--

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AIE6507	JAVA PROGRAMMING LAB	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	0	0	2	1
Pre-requisites/Exposure	Basics of Programming				
Co-requisites	NIL				

Catalog Description

In this Lab course the basic features of contemporary java are implemented and demonstrated. Problems or programs will be related to concepts of classes, objects, threads, packages, exception handling, applets, AWT control, swings and socket programming. Concepts covered would enable them to create basic and complex console and graphical based applications for desktop and Internet

Course Objectives

The objective of this course is to

1. Equip the students to apply knowledge of various basic java features required in solving basic and complex problems.
2. Provide a demonstration of basic java programming concepts like classes, objects, threads, packages, exception handling, applets, AWT control, swings and socket programming

Course Outcomes

On completion of this course, the students will be able to

CO1: Apply the concepts learned of operators, if-else, loops and arrays to java based application development.

CO2: Demonstrate the use of various types of inheritances, polymorphisms, class objects, inheritances, packages and other concepts to basic and complex java programming problems.

CO3: Apply the knowledge of exception handling and multithreading concepts for some simple and complex applications.

CO4: Apply knowledge of event handling and AWT controls to create some new dynamic graphical applications.

CO5: Demonstrate graphical applications based on java applets, swings and event handling.

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Modules/Topics Covered**	Blooms level*	Number of hours

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5. Sample Programs using Objects and classes, Variable Types, Modifier Types, operators, Loops Decision Making, Strings and Arrays, (a) WAP to display "Hello, it's a first program in java". (b) WAP to find sum of two integers taken as input from user at runtime. (c) WAP to find sum of two float numbers taken as command line arguments (d) WAP to find changed case of entered character. (e) WAP to find maximum of 3 integer numbers taken as input from user at runtime. (f) WAP in java to find out the greatest out of ten numbers stored using arrays. (g) WAP to create class with "name" as String and "age" as integer data members. The class should have two methods to take input from user and display the data. (h) WAP to find factorial of a number using class and object.	L3, L5	6
6. Sample Programs using Inheritance, Overriding, Polymorphism, Interfaces, Packages a. WAP in java to illustrate the concept of interfaces. b. WAP to create a package as MyPack having a class with three methods: max, fact and show. Use it in other folder with setting classpath and without setting class path. c. Write a program in java to showcase uses of super keyword	L3, L5	4
1. Sample Programs using exception handling and threads a) Write a program to demonstrate the use of nesting of try-catch block b) WAP in java to illustrate the concept of using multiple catch clauses to handle different types of exceptions. c) WAP in java to create a user defined Exception and throw it explicitly. d) Demonstrate thread using Thread class and Runnable interface e) Demonstrate various thread methods using a program	L3, L5	6

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(a) Sample Programs using event handling and AWT controls (b) Write a program to display "hello" in different color where user clicks left mouse button and "world" where right mouse button is clicked. Use black background. (c) WAP in java to create a Frame and handle window-closing event implementing the WindowListener interface. (d) WAP to create an Applet having various different buttons, recognizing them using action command string method and handling click event generated by them. (e) WAP to create a frame and illustrate the concept of using an adapter class in place of interfaces for handling various mouse events generated over frame window. (f) WAP in java to create a frame with AWT controls (like label, push buttons, Checkbox, Checkbox Group) and handle various events generated by them. (g) WAP in java to create a frame with various AWT controls (like choice, list, TextField and Buttons) and handle the events thrown by them.	L3, L5	6
7. Sample Programs using applets, swings and stream socket a) . Write an applet which will display "HAPPY" and "DEEPAVALI" as: The word "HAPPY" will roll from top to bottom and "DEEPAVLI" from bottom to "top" . Both will run at the same speed and stop simultaneously at the center of the applet. b) Write an applet to display last 32 shades of red, green and blue in equal sized square grid accompanied by appropriate labels like" Last 32 shades of Red/Green/Blue color". Make use of BorderFactory to apply border for each individual shade. c) Create an applet with one single button with caption "Click". On clicking the button will open a new Frame with title "Factorial". The frame will have two three controls :TextField, Label and button. On clicking button calculate the factorial entered in TextField control. d) Create Java programs to demonstrate day time client and server e) Create java programs to create echo client and server	L3, L5	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Text:

1. "JAVA The Complete Reference" by Patrick Naughton & Herbert Schild, 10th Edition,TMH
2. "Introduction to JAVA Programming a primer", E. Balaguruswamy,4th Edition, TMH

References:

1. "Introduction to JAVA Programming" By Daniel/Young PHI .
2. "Java Script", By Jeff Frentzen and Sobotka, Tata McGraw Hill,1999

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

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IA					EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	35

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE- External Exam

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**2**	**1**	--	--	--	--	--	--	--	--	--	--	**2**	--	--	--
CO2	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO3	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO4	**1**	**3**	**2**	--	--	--	--	--	--	--	--	--	**2**	--	**2**	--
CO5	**1**	**3**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--

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AIE6509	ADVANCED DATA STRUCTURES & ALGORITHMS LAB	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	0	0	2	1
Pre-requisites/Exposure	Application of Data Structures				
Co-requisites	Nil				

Catalog Description

Designing an algorithm is an important component of computer science. The objective of this course is to make students aware of various techniques used to evaluate the efficiency of a particular algorithm. Students eventually should learn to design efficient algorithm for a particular program.

Course Objectives

The objective of this course is to

1. Equip the students with the concepts of complexity and analysis of algorithms.
2. Provide an understanding of different techniques used in designing algorithms for a variety of problems.
3. Equip the students with the concepts of complexity classes of different problems.

Course Outcomes

On completion of this course, the students will be able to

CO1: State and explain the meaning of algorithm, analysis and design; apply the algorithmic concepts to analyze a given algorithm and compute its time complexity.

CO2: Explain and apply the concept of Divide and Conquer approach in designing algorithms; analyze a divide and conquer algorithm; explain and apply the concept of Greedy approach in designing algorithms for optimization problems.

CO3: Explain and apply the concept of Dynamic Programming in designing algorithms for optimization problems; compare and contrast the Dynamic Programming with Greedy approach and Divide and Conquer approach.

CO4: State and explain Elementary Graph Algorithms; explain and apply the concept of Branch & Bound and Backtracking in designing algorithms for different problems.

CO5: Define and explain the concept of computational complexity, Polynomialy Bounded Algorithms, Class NP, Class NP Hard and Class NP Complete.

Modules	Blooms level*	Number of hours
MODULE 1: Implementation of the following algorithms: • Insertion Sort • Bubble Sort • Counting Number of Inversions	L1, L2, L3, and L4	3

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MODULE 2: Implementation of the following algorithms: • Binary Search (Divide & Conquer) • Merge Sort (Divide & Conquer) • Quick Sort (Divide & Conquer) • Strassen's Matrix Multiplication (Divide & Conquer) • Graph Representation Graph Searching	L1, L2, and L3, and L4	5
MODULE 3: Implementation of the following algorithms: • Breadth First Dearch • Depth First Search • Strongly Connected Components • Topological Sort • Fractional Knapsack Problem (Greedy Approach)	L1, L2, L3, and L4	6
MODULE 4: Implementation of the following algorithms: • Kruskal's Algorithm. (Greedy Approach) • Prim's Algorithm (Greedy Approach) • Dijkstra's Algorithm (Greedy Approach) • Bellmanford Algorithm (Greedy Approach)	L1, L2, L3, and L4	6
MODULE 5: • 0/1-Knapsack Problem (Dynamic programming) • Matrix Chain Multiplication (Dynamic programming) • N-Queens Problem (Backtracking)	L1 and L2	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books:

1. T. H. Cormen, Leiserson, Rivest and Stein, "Introduction of Computer algorithm, MIT Press, ISBN-(ISBN: 978-0262033848)
2. E. Horowitz, S. Sahni, and S. Rajsekaran, "Fundamentals of Computer Algorithms," Galgotia Publication

Reference Books

1. Sara Basse, A. V. Gelder, "Computer Algorithms," Pearson.
2. J.E Hopcroft, J.D Ullman, "Design and analysis of algorithms," Addison-Wesley

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**1**	**1**	**1**	**1**	**1**	--	--	--	--	--	--	**1**	**1**	**3**	**2**
CO2	**1**	**1**	**1**	**1**	**1**	**1**	--	--	--	--	--	--	**1**	**1**	**3**	**2**
CO3	**1**	**1**	**1**	**1**	**1**	**1**	--	--	--	--	--	--	**1**	**1**	**3**	**2**
CO4	**1**	**1**	**1**	**1**	**1**	**1**	--	--	--	--	--	--	**1**	**1**	**3**	**2**
CO5	**1**	**1**	**2**	**2**	**3**	**3**	--	--	--	--	--	--	**1**	**1**	**3**	**2**

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AIE6515	MICROPROCESSOR	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	2	1	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course deals with the systematic study of the architecture and programming issues of 8085-microprocessor family. Explanation of microprocessor in terms of ALP and timing diagrams,Memory System Design & I/O Interfacing, peripheral devices and advance Pentium Processors.

Course Objectives

The objective of this course is to

1. Equip with concepts of microprocessor and interfacing with peripheral devices.
2. Provide an overview of advance microprocessors.

Course Outcomes

On completion of this course, the students will be able to

CO1: Describe the architecture of 8085 microprocessor.

CO2:Describe assembly language programming and show timing diagram for 8085 microprocessors.

CO3: Explain the input output interfacing with peripheral devices and design of memory system for 8085 microprocessors.

CO4: Describe the architecture of 8086 microprocessor and compare with 8085 microprocessors.

CO5: Explain the working principles and architecture of 8087, 80x86 and Pentium processors.

Modules	Blooms level*	Number of hours
Module I: Introduction to Microcomputer Systems Introduction to Microprocessors and microcomputers, Study of 8-bit Microprocessor, 8085 pin configuration, Internal Architecture and operations, interrupts, Stacks and subroutines, various data transfer schemes.	L1 and L2	8
Module II: ALP and timing diagrams Introduction to 8085 instruction set, advance 8085 programming, Addressing modes, Counters and time Delays, Instruction cycle, machine cycle, T-states, timing diagram for 8085 instruction.	L2 and L3	10

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Module III: Memory System Design & I/O Interfacing Interfacing with 8085.Interfacing with input/output devices (memory mapped, peripheral I/O), Cache memory system. Study of following peripheral devices 8255, 8253, 8257, 8255, 8251.	L1 and L5	10
Module IV: Architecture of 16-Bit Microprocessor Difference between 8085 and 8086, Block diagram and architecture of 8086 family, pin configuration of 8086, Minimum mode & Maximum mode Operation. Internal architecture of 8086, Bus Interface Unit, Register Organization, Instruction Pointer, Stack & Stack pointer, merits of memory segmentation, Execution Unit, Register Organization.	L1 and L2	10
Module V: Pentium Processors .Internal architecture of 8087, Operational overview of 8087, Introduction to 80186, 80286, 80386 & 80486 processors, Pentium processor.	L1 and L2	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Ramesh. S. Gaonkar, "Microprocessor architecture Programming and Application with 8085" Penram International Publishing, 4th Edition
2. B. Ram, "Fundamentals of microprocessors and microcomputer" Dhanpat Rai, 5th Edition.

Reference Books

1. M. Rafiquzzaman, "Microprocessor Theory and Application" PHI – 10th Indian Reprint.
2. Naresh Grover, "Microprocessor comprehensive studies Architecture, Programming and Interfacing" Dhanpat Rai, 2003.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**2**	**3**												**1**	**1**	
CO2	**1**	**2**	**3**		**3**									**3**	**1**	**3**
CO3			**1**		**2**						**3**	**3**		**2**	**1**	**3**
CO4	**1**	**2**	**3**												**1**	**3**
CO5	**1**	**2**	**3**												**1**	**3**

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AIE6517	MICROPROCESSOR LAB	L	T	P	C
Version: 2020.1	Date of Approval: JULY 2020	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course focuses on the systematic study of the Architecture and programming of microprocessor family and its applications. The objectives of this course are:

1. To introduce students with the architecture operation and instruction set of 8085 and 8086 microprocessors.
2. To familiarize the students with the programming and interfacing of 8085 and 8086 microprocessors.
3. To provide the basic knowledge of the microprocessor needed to develop the embedded system based products as a solution to real time problems.

Course Outcomes

On completion of this course, the students will be able to

CO1. Set up programming strategies and select proper mnemonics and run their program on the training boards

CO2. Develop assembly language programs for various problems keeping in mind technical issues and evaluate possible causes of discrepancy in practical experimental observations in comparison.

CO3. Understand the concepts related to I/O and memory interfacing and design interfacing circuits with 8085 by making use of different peripheral devices.

Modules	Blooms level*	Number of hours
Lab Session 1: ALP using 8085: 1. Write at least three different programs for addition of two 8 bit numbers assuming carry may or may not be generated. 2. Write at least three different programs for subtraction of two 8 bit numbers assuming borrow may or may not be generated. 3. Write two different programs for 16 bit addition, one using instruction DAD and another without using instruction DAD. 4. Write assembly language program for 8 bit multiplication and division.	L2, L3,L4	4
Lab Session II: To study, understand, interface and two peripheral devices with 8085.	L4,L5,L6	2
Lab session III: Any three programs using 8085 based on block of data.	L4	1

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Lab session IV: ALP using 8086: 1. Write an ALP to add list of 10 given numbers. 2. Write an ALP to sum the numbers from 1-100. 3. Write an ALP to count negative numbers from a given list of 10 numbers. 4. Write an ALP to check number of vowels in a given string.	L2, L3, L4	5

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Douglas Hall, Microprocessor and Interfacing:, Tata McGraw Hill, 2017
2. Gaonkar R. S , Microprocessor Architecture, Programming and Applications, Wiley

Reference Books

1. Yu Cheng Liu & Glen A. Gibson, Microcomputer Systems: 8086/8088 family Architecture, Programming and Design, PHI Publication, 2016.
2. Ram B., Fundamentals of Microprocessors and Microcomputers, DhanpatRai& Sons, 2017

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO4
CO1	1	2	--	--	--	--	--	--	--	--	--	--	3	2	1	
CO2	1	1	2	3	--	--	--	--	--	--	--	--	3	2	1	1
CO3	-	-	-	1	2	3	--	--	--	--	--	--		2	2	1

1: strongly related, 2: moderately related and 3: weakly related

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AIE6508	PYTHON PROGRAMMING LAB	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	0	0	2	1
Pre-requisites/Exposure	Hands on knowledge of C and C++ Programming				
Co-requisites	Basic concepts of OOP Programming				

Catalog Description

The course is designed to provide an introduction to the Python programming language. The focus of the course is to provide students with an introduction to programming, I/O, and visualization using the Python programming language.

Course Objectives

The objective of this course is

1. Equip the students with the basic feature of python required in solving complex problems and build GUI applications
2. Provide a practical knowledge of implementation/demonstration of python programming concepts like of lists, tuples, dictionaries, Object Oriented Programming concepts in Python, Strings and Files in Python.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Demonstrate the basics of python programming using if-else, loops and List, Dictionary, tuples.

CO 2: Demonstrate the concept of inheritances, polymorphisms and other concepts and able to solve complex programming problems involving class objects.

CO 3: Demonstrate the ability to write database applications in Python

CO 4: Demonstrate Files Handling in Python.

CO 5: Demonstrate database operation and GUI applications in python.

Modules	Blooms level*	Number of hours
1. Write a program which will find all such numbers which are divisible by 7 but are not a multiple of 5,between 2000 and 3200 (both included). The numbers obtained should be printed in a comma-separated sequence on a single line. 2. Create a program that asks the user to enter their name and their age. Print out a message addressed to them that tells them the year that they will turn 100 years old. 3. Define a function max() that takes two numbers as arguments and returns the largest of them. Use the if-then-else construct available in Python. (It is true that Python has the max() function built in, but writing it yourself is nevertheless a good exercise.) 4. Define a function max_of_three() that takes three numbers as arguments and returns the largest of them.	L1,L2 and L3	4

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5. Define a function that computes the length of a given list or string. (It is true that Python has the len() function built in, but writing it yourself is nevertheless a good exercise.) 6. Write a function that takes a character (i.e. a string of length 1) and returns True if it is a vowel, False otherwise. 7. Write a function translate() that will translate a text into "rövarspråket" (Swedish for "robber's language"). That is, double every consonant and place an occurrence of "o" in between. For example, translate("this is fun") should return the string "tothohisosisosfofunon". 8. Define a function sum() and a function multiply() that sums and multiplies (respectively) all the numbers in a list of numbers. For example, sum([1, 2, 3, 4]) should return 10, and multiply([1, 2, 3, 4]) should return 24. 9. Define a function reverse() that computes the reversal of a string. For example, reverse("I am testing") should return the string "gnitset ma I".	L2 and L3	6
10. Ask the user for a number. Depending on whether the number is even or odd, print out an appropriate message to the user 11. Take a list, say for example this one: a = [1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89] and write a program that prints out all the elements of the list that are less than 5. 12. Create a program that asks the user for a number and then prints out a list of all the divisors of that number. (If you don't know what a divisor is, it is a number that divides evenly into another number. For example, 13 is a divisor of 26 because 26 / 13 has no remainder.) 13. Take two lists, say for example these two: a = [1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89] b = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13] and write a program that returns a list that contains only the elements that are common between the lists (without duplicates). Make sure your program works on two lists of different sizes.	L2, L3, L4 and L5	4
14. Ask the user for a string and print out whether this string is a palindrome or not. (A palindrome is a string that reads the same forwards and backwards.) 15. Let's say I give you a list saved in a variable: a = [1, 4, 9, 16, 25, 36, 49, 64, 81, 100]. Write one line of Python that takes this list a and makes a new list that has only the even elements of this list in it. 16. Make a two-player Rock-Paper-Scissors game. (Hint: Ask for player plays (using input), compare them, print out a message of congratulations to the winner, and ask if the players want to start a new game) **Remember the rules:** • Rock beats scissors • Scissors beats paper • Paper beats rock	L2, L3 and L4	4

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14. Write a program that asks the user how many Fibonnaci numbers to generate and then generates them. Take this opportunity to think about how you can use functions. Make sure to ask the user to enter the number of numbers in the sequence to generate.(Hint: The Fibonnaciseqence is a sequence of numbers where the next number in the sequence is the sum of the previous two numbers in the sequence. The sequence looks like this: 1, 1, 2, 3, 5, 8, 13, …) 15. Write a program (function!) that takes a list and returns a new list that contains all the elements of the first list minus all the duplicates. **16.** Write a function that takes an ordered list of numbers (a list where the elements are in order from smallest to largest) and another number. The function decides whether or not the given number is inside the list and returns (then prints) an appropriate boolean.	L2, L3 and L4	1

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Michael Urban and Joel Murach, Python Programming, Shroff/Murach, 2016
2. Mark Lutz, Programming Python, O`Reilly, 4th Edition, 2010
3. Patrick Naughton & Herbert Schild ,"JAVA The Complete Reference", 10th Edition , TMH

Reference Book

4. Daniel/Young , Introduction to JAVA Programming" , PHI.
5. Jeff Frentzen and Sobotka, "Java Script", Tata McGraw Hill,1999.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/ Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	1	--	--	--	--	--	--	--	--	--	--	1	2	--	--
CO 2	3	1	--	--	--	--	--	--	--	--	--	--	1	1	--	--
CO 3	1	3	2	--	--	--	--	--	--	--	--	--	1	2	3	--
CO 4	1	3	2	--	--	--	--	--	--	--	--	--	1	1	--	--
CO 5	1	3	--	--	--	--	--	--	--	--	--	--	1	2	--	1

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AIE6535	SUMMER INTERNSHIP EVALUATION-I	L	T	P	C
Version: 2020.1	Date of Approval: JULY 2020	0	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The objective of this course is to provide practical training on some live projects that will increase capability to work on actual problem in industry. This training may undergo in an industrial environment or may be an in-house training on some latest software which is in high demand in market. This training will be designed such that it will useful for their future employment in industry.

Course Objectives

The objective of this course is to

1. Provide practical training on live projects
2. Increase technical capabilities on solving real life problems in company environment

Course Outcomes

On completion of this summer internship, the students will be able to:

CO1: Develop communication, interpersonal and other critical skills in the job interview process.

CO2: Design and develop software and hardware projects

CO3: Assess interests and abilities in their field of study.

CO4: Demonstrate excellent technical and communication skills to acquire employment contacts leading directly to a full-time job following graduation from college.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	1	2	2	--	--	--	1	--	--	--	1	1	1	1
CO2	1	1	2	2	2	--	--	--	1	--	--	--	1	1	1	1
CO3	1	1	2	3	2	--	--	--	1	--	--	--	1	1	1	1
CO4	1	1	2	2	2	--	--	--	1	--	--	--	1	1	1	1

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VHDL PROGRAMMING

Course Code: AIE6512 **Credit Units: 02**

Course Objective:
VHDL is commonly used as a design-entry language for field-programmable gate arrays and application-specific integrated circuits in electronic design automation of digital circuits. The course aims to discuss the syntax of the language to model a digital system.

Course Contents:
Module I
Fundamental VHDL Units, LIBRARY Declarations, ENTITY, ARCHITECTURE, Introductory Examples, Specification of combinational systems using VHDL, Introduction to VHDL, Basic language element of VHDL, Behavioural Modeling, Data flow modeling, Structural modeling, Subprograms and overloading, VHDL description of gates.

Module II
Data Types; Pre-Defined Data Types, User-Defined Data Types, Subtypes, Arrays, Port Array, Records, Signed and Unsigned Data Types, Data Conversion

Module III: Sequential codes
PROCESS: Signals and Variables, IF, WAIT, CASE, LOOP, CASE versus IF, CASE versus WHEN, Bad Clocking, Using Sequential Code to Design Combinational Circuits
Description and design of sequential circuits using VHDL,

Module IV
Standard combinational modules, Design of a Serial Adder with Accumulator, State Graph for Control Network, design of a Binary Multiplier, Multiplication of a Signed Binary Number, Design of a Binary Divider.
Module V
Micro programmed Controller, Structure of a micro programmed controller, Basic component of a micro system, memory subsystem. Overview of PAL, PLA, FPGA, CPLD.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:

3. J. Bhaskar, "A VHDL Primer", Addison Wesley, 1999.
4. Volnei A. Padroni, "Circuit Design with VHDL."
5. M. Ercegovac, T. Lang and L.J. Moreno, "Introduction to Digital Systems", Wiley,2000
6. C. H. Roth, "Digital System Design using VHDL", Jaico Publishing, 2001

References:

- VHDL Programming by Examples by Douglas L. Perry, TMH, 2000
- Hardware Description Languages by Sumit Ghose, PHI, 2000
- The Designer Guide to VHDL by P.J. Ashendern; Morgan Kaufmann Pub. 2000
- Digital System Design with VHDL by Mark Zwolinski; Prentice Hall Pub. 1999
- Designing with FPGA & CPLDs by Zeidman; CMP Pub. 1999
- HDL Chip Design by Douglas J. Smith; Doone Pub. 2001

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VHDL PROGRAMMING LAB

Course Code: AIE6513 **Credit Units : 01**

Software Required: Mentor Graphics

Topics covered in lab will include:

- Designing Basic Gates.
- Designing Combinational circuits like adder, multiplexer, PLA
- Designing Sequent ional Circuits like flip-flops, counters, registers.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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AIE6518	ADVANCED WEB DESIGNING TECHNOLOGIES	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	0	0	2	1
Pre-requisites/Exposure	Knowledge of Internet fundamentals				
Co-requisites	NIL				

Catalog Description

This course is aimed to provide a fundamental understanding of JavaScript and two of its related library: Bootstrap and React for dynamic web site client side scripting. Javascript is a famous scripting language for client side. The bootstrap and react libraries are rich API for creating dynamic websites. The course builds strong foundation for client-side scripting for creating dynamic websites

Course Objectives

The objective of this course is

1. Equip the students with basic and advanced features of javascript and bootstrap library to create dynamic web sites
2. Provide an overview of basic features of react library to design dynamic websites.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain basic concepts of java scripts and apply them to create basic scripts

CO2: Explain the fundamentals of client side scripting ,document object model and apply them to create dynamic websites.

CO3: Apply basic APIs of bootstrap library to create dynamic websites

CO4: Demonstrate bootstrap java plugins and its use in designing sample websites.

CO5: Explain and apply react APIs in client side scripting

Modules	Blooms level*	Number of hours
Module 1: Basics Introduction to JavaScript, JavaScript Core Features—Overview, Data Types and Variables, Operators, Expressions, and Statements, Functions, Objects, Array, Date, Math, and Type-Related Objects, Regular Expressions	L2 and L3	8
Module 2:Fundamental of Client-Side JavaScript JavaScript Object Models, The Standard Document Object Model, Event Handling, Controlling Windows and Frames, Handling Documents, Form Handling, Dynamic Effects: Rollovers, Positioning, and Animation, Navigation and Site Visit Improvements, Browser and Capabilities Detection Advanced Topics: JavaScript and Embedded Objects, Remote JavaScript, JavaScript and XML	L2 and L3	7

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Module 3: Introduction to Bootstrap (Part 1) **Bootstrap Scaffolding:** What Is Bootstrap?**,** Bootstrap File Structure**,** Basic HTML template**,** Global Styles Default: Grid System, Basic Grid HTML, Offsetting Columns, Nesting Column, Fluid Grid System, Container Layouts **Bootstrap CSS:** Typography, Code, Tables, **Bootstrap Layout Components:** Dropdown Menus, Button Groups, Buttons with Dropdowns, Navigation Elements, Navbar, Breadcrumbs Pagination, Labels, Badges, Typographic Elements	L2 and L3	7
Module 4: Introduction to Bootstrap (Part 2) **Bootstrap JavaScript Plugins:** Overview**,** Transitions **,**Modal **,**Dropdown**,** Scrollspy**,** Toggleable Tabs**,** Tooltips**,** Popover	L2and L3	7
Module 5: The React Library Writing Your First React App, Thinking in React, Server Communication, JSX and the Virtual DOM, Advanced Components, Forms in React.	L2 and L3	7

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books:

1. "Javascript: The Complete Reference",Thomas Powell ,Fritz Schneider,Oreilly, 2004.
2. "Bootstrap", Jake Spurlok, Orielly, 2013.
3. "Full Stack React", Anthony Accamozo, Fullstack, 2017.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/ Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS O 1**	**PS O 2**	**PS O 3**	**PS O 4**
CO 1	--	**1**	**1**	--	**1**	--	--	--	--	**1**	--	--	**1**	--	--	--
CO 2	--	**1**	**2**	--	**2**	--	--	--	--	**1**	--	--	**1**	--	--	--
CO 3	--	**1**	**1**	--	**1**	--	--	--	--	**2**	--	--	**1**	--	--	--
CO 4	--	**1**	**2**	--	**1**	--	--	--	--	**2**	--	--	**1**	--	--	--
CO 5	--	**1**	**1**	--	**2**	--	--	--	**2**	**1**	--	--	**1**	**1**	--	**2**

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AIE6519	ADVANCED WEB DESIGNING TECHNOLOGIES LAB	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	0	0	2	1
Pre-requisites/Exposure	Knowledge of Internet fundamentals				
Co-requisites	NIL				

Catalog Description

This course is aimed to provide a fundamental understanding of JavaScript and two of its related library: Bootstrap and React for dynamic web site client side scripting. Javascript is a famous scripting language for client side. The bootstrap and react libraries are rich API for creating dynamic websites. The course builds strong foundation for client-side scripting for creating dynamic websites

Course Objectives

The objective of this course is

1. Equip the students with basic and advanced features of javascript and bootstrap library to create dynamic web sites
2. Provide an overview of basic features of react library to design dynamic websites.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain basic concepts of java scripts and apply them to create basic scripts

CO2: Explain the fundamentals of client side scripting ,document object model and apply them to create dynamic websites.

CO3: Apply basic APIs of bootstrap library to create dynamic websites

CO4: Demonstrate bootstrap java plugins and its use in designing sample websites.

CO5: Explain and apply react APIs in client side scripting

Modules	Blooms level*	Number of hours
Module 1: Basics **Programs based on:** • JavaScript Core Features—Overview, • Data Types and Variables, Operators, Expressions, and Statements, Functions, • Objects, Array, Date, Math, Type-Related Objects, • Regular Expressions	L2 and L3	2

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Module 2:Fundamental of Client-Side JavaScript **Programs based on:** • JavaScript Object Models, The Standard Document Object Model, • Event Handling, Controlling Windows and Frames, Handling Documents, • Form Handling, Dynamic Effects: Rollovers, Positioning, and Animation, • Navigation and Site Visit Improvements, Browser and Capabilities • Detection Advanced Topics: JavaScript and Embedded Objects, Remote JavaScript, JavaScript and XML	L2 and L3	3
Module 3: Introduction to Bootstrap (Part 1) **Programs based on:** • Bootstrap File Structure**,** Basic HTML template**,** Global Styles • Default: Grid System, Basic Grid HTML, Offsetting Columns, Nesting Column, Fluid Grid System, Container Layouts • Typography, Code, Tables, • Dropdown Menus, Button Groups, Buttons with Dropdowns, Navigation Elements, Navbar, • Breadcrumbs Pagination, Labels, Badges, Typographic Elements	L2 and L3	3
Module 4: Introduction to Bootstrap (Part 2) **Programs based on:** • Transitions **,**Modal **,**Dropdown**,** • Scrollspy**,** Toggleable Tabs**,** • Tooltips**,** Popover	L2and L3	2
Module 5: The React Library • Writing Your First React App, • Thinking in React, Server Communication, • JSX and the Virtual DOM, • Advanced Components, • Forms in React.	L2 and L3	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books:

1. "Javascript: The Complete Reference",Thomas Powell ,Fritz Schneider,Oreilly, 2004.
2. "Bootstrap", Jake Spurlok, Orielly, 2013.
3. "Full Stack React", Anthony Accamozo, Fullstack, 2017.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/ Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	--	1	1	--	1	--	--	--	--	1	--	--	1	--	--	--
CO 2	--	1	2	--	2	--	--	--	--	1	--	--	1	--	--	--
CO 3	--	1	1	--	1	--	--	--	--	2	--	--	1	--	--	--
CO 4	--	1	2	--	1	--	--	--	--	2	--	--	1	--	--	--
CO 5	--	1	1	--	2	--	--	--	2	1	--	--	1	1	--	2

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AIE6603	ADVANCED JAVA PROGRAMMING	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure	Basics of Java Programming				
Co-requisites	NIL				

Catalog Description

In this course the advanced features of contemporary java are discussed in detail. Concepts covered would enable them to handle complex programs relating to managing data and processes over the network. Discussion will be on relating to concepts of remote method invocation to working with swings architecture. Further practical implementation of database connectivity and using them in servlet and jsp based applications will be made.

Course Objectives

The objective of this course is to

1. Equip the students with the advanced feature of contemporary java required in solving complex problems.
2. Provide a practical knowhow and implementation of advanced java programming concepts like database programming with servlets and jsp.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define and explain concept of an Remote method invocation application, demonstrate swing based application developed using concepts of remote method invocation

CO2: Distinguish between various java and open database connectivity drivers and able to solve complex programming problems involving database interaction.

CO3: Describe servlet and its lifecycle, along with demonstrate and design solutions for some complex dynamic web applications using servlets.

CO4: Explain jsp scripting and Differentiate between processing of servlets and jsp scripting pages. Apply knowledge of servlets and jsp scripting to create some new dynamic web applications.

CO5: Explain the architecture of Model View Controller and struts. Demonstrate applications based on java beans and struts.

Modules	Blooms level*	Number of hours
MODULE 1: DISTRIBUTED COMPUTING Introduction to Java RMI, RMI services, RMI client, Running client and server, Introduction of Swing, Swing Components, Look and Feel for Swing Components, Introduction to Multimedia Programming.	L1, L2 and L3	6
MODULE 2: DATABASE CONNECTIVITY ODBC and JDBC Drivers, Connecting to Database with the java.sql Package, Using JDBC Terminology, JDBC with mysql, postgresql. .	L2 and L3	7

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MODULE 3: SERVLET PROGRAMMING Introduction to Servlets, Servlet Life Cycle, Servlet based Applications, Servlet and HTML.Filters, jdbc with servelets, session Management techniques in detail.	L2, L3 and L5	8
MODULE 4: JSP PROGRAMMING JSP: Introduction to JSP, JSP implicit objects, JSP based Applications, Java. Net. Login & Logout Example, jdbc with jsp.	L2, L3, L4 and L5	8
MODULE 5: J2EE WEB APPLICATION The Model-View-Controller Architecture What is Struts, Struts Tags, Creating Beans, Other Bean Tags, Bean Output, Creating HTML Forms, The Action Form class The Action class, Simple Struts: a simple Struts application; Introduction to EJB.	L2 and L3	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

1. J. Jaworski, Java 1.2 Unleashed, Techmedia – SAMS, 1998, United States
2. S. Allamaraju, Professional Java Server Programming, Wrox Press Limited, 2001, United States.
3. J. Goodwill and B. Morgan, Developing Java Servlets, Techmedia – SAMS, 2017, United States

Reference Books

1. D. Flanagan, J. Parley, W. Crawford and K. Magnusson, Java Enterprise in a nutshell - A desktop Quick reference, O'REILLY, 2003, USA.
2. S. Ausbury and S. R. Weiner, Developing Java Enterprise Applications, John Wiley and Sons, 2001, USA.
3. J. Hunder and W. Crawford, Java Servlet Programming, O'REILLY, 2002, USA

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	--	--	--	--	--	--	--	--	--	--	2	--	--	--
CO2	3	1	--	--	--	--	--	--	--	--	--	--	1	2	--	--
CO3	2	1	2	--	--	--	--	--	--	--	--	--	1	2	--	--
CO4	1	3	2	--	--	--	--	--	--	--	--	--	2	--	2	--
CO5	1	3	--	--	--	--	--	--	--	--	--	--	1	--	--	--

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AIE6608	ADVANCED JAVA PROGRAMMING LAB	L	T	P	C
Version 2020.1	Date of Approval: JULY2020	0	0	2	1
Pre-requisites/Exposure	Basics of Java and Advanced Java Programming				
Co-requisites	NIL				

Catalog Description

In this Lab course the advanced features of contemporary java are implemented and demonstrated. Concepts covered would enable them to create complex applications related to data management. Problems or programs will be related to concepts of remote method invocation, swings, servlets, jsp and java beans.

Course Objectives

The objective of this course is to

1. Make the students apply knowledge of various advanced java features required in solving complex problems.
2. Provide a demonstration of advanced java programming concepts like database programming with servlets, jsp and creating java beans.

Course Outcomes

On completion of this course, the students will be able to

CO1: Apply the knowledge of swings architecture and remote method invocation used to provide solution to distributed computing problems

CO2: Demonstrate the use of JDBC connectivity along with swings based architecture, thereby handling data management.

CO3: Apply the knowledge of servlets and server programming to construct dynamic web applications using web servers.

CO4: Demonstrate the differences between creating and deploying dynamic web applications using jsp concepts and servlets.

CO5: Demonstrate usage of applications involving java beans and jdbc programming to handle data management.

Modules/Topics Covered**	Blooms level*	Number of hours
1.Sample Programs using swings architecture and remote method invocation (a) Write a program using swings creating tabbed panes and menu over a frame and handle their associated events (b) Write a program using swings List control containing list of cities, allowing the user to choose any one of them and display using event handing. (c) Demonstrate an application showcasing the use of remote method invocation(RMI) for designing a distributed application. (d) Create an application using concepts of RMI to depict a client server based interaction.	L3, L5	6

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2.Sample Programs using JDBC and swings (a) Create an application demonstrating the use of swings, having a menu over a frame and jdbc programming to perform insert and select operations by handling menu related events. (b) Create an application using swings, having a design providing features for iterating over a dataset performing operations like forward, backward, start and end with help of jdbc programming.	L3, L5	4
(c) Sample Programs using servlets with jdbc, html and swings 3. Create an application using servlets to perform redirection based on validating user data entered through a web form. 4. Design an application to fetch data from database using servlets and display it using its post method. 5. Demonstrate the process of writing cookies using a servlet and display a message after writing. 6. Write a program to create a session object for the username fetched from user using a servlet, further access that session value on another servlet invoked by redirection.	L3, L5	6
7. Sample Programs using JSP with jdbc, html and swings (a) Write a program using jsp to demonstrate the features of jsp elements used to declare, define and display sum of two integers. (b) Create an application using jsp to calculate and display the greatest out of two integers using if else statements. Integer numbers should be entered using a web form. (c) Demonstrate with a jsp program mechanism to retrieve checkbox data accessed using multiple value parameters fetching approach. (d) Write a program to demonstrate the use of jsp forward action tag used with parameters and processed using another jsp page.	L3, L5	6
8. Sample Programs using jsp, java beans and swings (a) Demonstrate the use of jsp include action tag for including an html and another jsp page in initial jsp resource. (b) Write a program creating Java bean class and setting its properties using required jsp action tags. Output should also display the retrieved property values.	L3, L5	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

1. J. Jaworski, Java 1.2 Unleashed, Techmedia – SAMS, 1998, United States
2. S. Allamaraju, Professional Java Server Programming, Wrox Press Limited, 2001, United States
3. J. Goodwill and B. Morgan, Developing Java Servlets, Techmedia – SAMS, 2017, United States

Reference Books

1. D. Flanagan, J. Parley, W. Crawford and K. Magnusson, Java Enterprise in a nutshell – A desktop Quick reference, O'REILLY, 2003, USA
2. S. Ausbury and S. R. Weiner, Developing Java Enterprise Applications, John Wiley and Sons, 2001, USA
3. J. Hunder and W. Crawford, Java Servlet Programming, O'REILLY, 2002, USA

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Modes of Evaluation: Lab Record /Viva- Via /Performance/Written Examination
Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	**70**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE- External Exam

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**2**	**1**	--	--	--	--	--	--	--	--	--	--	**2**	--	--	--
CO2	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO3	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO4	**1**	**3**	**2**	--	--	--	--	--	--	--	--	--	**2**	--	**2**	--
CO5	**1**	**3**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--

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AIE6604	ADVANCE DATABASE MANAGEMENT SYSTEM	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure	Basic knowledge of DBMS				
Co-requisites	NIL				

Catalog Description

The objective of this course is to expose the students to the implementation techniques of database system. This course explains techniques for query processing and optimization with transaction and concurrency control techniques.

Course Objectives

The objective of this course is to

- To understand the basic concepts and terminology related to DBMS and Relational Database Design
- To design and understand Distributed, parallel and object oriented Databases.
- To understand advanced DBMS techniques to handle and optimize queries in database.

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand the basics of database management system and implementation of relational database.

CO2. Knowhow of the file organization, Query Optimization, Transaction management, and database administration techniques.

CO3. Understand and design Distributed, parallel and object oriented Databases models and possible methods of proving them.

Modules	Blooms level*	Number of hours
MODULE 1: **Relational Database** Integrity Constraints revisited, Extended ER diagram, Relational Algebra & Calculus, Functional, Muiltivalued and Join Dependency, Normal Forms, Rules about functional dependencies.	L1, L2 and L3	8

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MODULE 2: **Query Processing and Optimization** Valuation of Relational Operations, Transformation of Relational Expressions, Indexing and Query Optimization, Limitations of Relational Data Model, Null Values and Partial Information. **Objected Oriented and Object Relational Databases** Modeling Complex Data Semantics, Specialization, Generalization, Aggregation and Association, Objects, Object Identity, Equality and Object Reference, Architecture of Object Oriented and Object Relational Databases	L1,L2,l3	9
MODULE 3: **Parallel and Distributed Databases** Distributed Data Storage – Fragmentation & Replication, Location and Fragment Transparency Distributed Query Processing and Optimization, Distributed Transaction Modeling and concurrency Control, Distributed Deadlock, Commit Protocols, Design of Parallel Databases, and Parallel Query Evaluation. **Advanced Transaction Processing** Nested and Multilevel Transactions, Compensating Transactions and Saga, Long Duration Transactions, Weak Levels of Consistency, Transaction Work Flows, Transaction Processing Monitors.	L1, L2 and L3	10
MODULE 4: Multimedia databases, Databases on the Web and Semi–Structured Data , Case Study: Oracle Xi	L1, L2	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Elmarsi, Navathe, Somayajulu, Gupta, "Fundamentals of Database Systems", 4th Edition, Pearson Education, 2007
2. Garcia, Ullman, Widom, "Database Systems, The complete book", PearsonEducation, 2007
3. R. Ramakrishnan, "Database Management Systems", McGraw Hill International Editions, 1998

Reference Books

1. Date, Kannan, Swaminathan, "An Introduction to Database Systems", 8th Edition Pearson Education, 2007
2. Singh S.K., "Database System Concepts, design and application", Pearson Education, 2006.
3. Silberscatz, Korth, Sudarshan, "Database System Concepts", Mcgraw Hill, 6th Edition, 2006
4. W. Kim, "Modern Database Systems", 1995, ACM Press, Addision – Wesley,
5. D. Maier, "The Theory of Relational Databases", 1993, Computer Science Press, Rokville, Maryland
6. Ullman, J. D., "Principals of database systems", Galgotia publications, 1999
7. Oracle Xi Reference Manual
8. Dietrich, and Urban, "An Advanced Course in Database Systems", Pearson, 2008.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

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Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2	PS O 3	PSO 4
CO 1	2	-	3	--	--	--	--	--	--	--	--	--	2	2	-	-
CO 2	2	2	3	-	--	--	--	--	--	--	--	--	2	1	-	-
CO 3	2	-	3	-	-	--	--	--	--	--	--	--	2	1	-	-

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AIE6609	ADVANCE DATABASE MANAGEMENT SYSTEM LAB	L	T	P	C
Version 2020.1	Date of Approval: JULY2020	0	0	1	1
Pre-requisites/Exposure	Basic knowledge of DBMS				
Co-requisites	Nil				

Catalog Description

The objective of this course is to expose the students to the implementation techniques of database system. This course explains techniques for query processing and optimization with transaction and concurrency control techniques.

Course Objectives

The objective of this course is

1. Equip the students with the different issues involved in the design and implementation of a database system.
2. Provide a practical knowledge of implementation/demonstration of data manipulation language to query, update, and manage a database.

Course Outcomes

On completion of this course, the students will be able to

CO1. Demonstrate and analyze and apply common SQL statements including DDL, DML and DCL statements to perform different operations.

CO2. Demonstrate and Apply different types of constraints on the database.

CO3. Design different views of tables for different users and to apply embedded and nested queries.

CO4. Design and implement a database for a given problem according to well known design principles that balance data retrieval performance with data consistency.

Modules	Blooms level*	Number of hours
Module1: 1. Introduction to SQL and understand basic commands 2. Understand various DDl and DML commands. 3. To understand joins in SQL.	L1,L2 and L3	4
Module 2: 1. To understand constraints SQL 2. Wild cards and aggregate functions in SQL 3. To understand and execute procedures and views in SQL	L2 and L3	6
Module 3: 1. To understand and execute triggers in SQL 2. To develop a database application to demonstrate the representation of multi valued attributes and use of nested tables to represent complex objects. Write suitable queries	L2, L3, L4 and L5	4
Module 4: 1. To understand and execute Indexes in SQL	L2, L3 and L4	4

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Module 5: 1. To understand the concept of Exception handling in SQL 2. Query Evaluation Plans 3. Concurrency and Transactions	L2, L3 and L4	1

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", 6th edition, Tata McGraw Hill, 2011
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", 4th Edition, Pearson/Addision wesley, 2007

Reference Book

1. Database System Concepts by A. Silberschatz, H.F. Korth and S. Sudarshan, 3rdedition, 1997, McGrawHill, International Edition.
2. Introduction to Database Management system by Bipin Desai, 1991, Galgotia Pub.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/ Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS O 1**	**PS O 2**	**PS O 3**	**PS O 4**
CO 1	**2**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO 2	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO 3	**1**	**3**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	**3**	--
CO 4	**1**	**3**	**2**	--	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO 5	**1**	**3**	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--	**1**

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AIE6605	DIGITAL COMPUTER ORGANIZATION	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The Objective of this course is to expose the students to the fundamentals and the concepts of Digital & Computer Organization and Representation of Information and Basic Building Blocks, Basic Organization, Memory Organization, Input-Output Organization, Processor Organization etc. This course is designed to understand the concepts of Computer Organization for Research & Development as well as for application.

Course Objectives

The objective of this course is to

- An understanding of a machine's instruction set architecture (ISA) including basic instruction fetch and execute cycles, instruction formats, control ow, and operand addressing modes.

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand and Interpret the functional architecture of computing systems.
CO2. Identify, compare and assess issues related to ISA, memory, control and I/O functions.
CO3. Understand the general concepts in digital logic design, including logic elements, and their use in combinational and sequential logic circuit design.
CO4. Design and analyze solutions in the area of computer architecture.

Modules	Blooms level*	Number of hours
MODULE 1: **Representation of Information and Basic Building Blocks** Overview of Computer hardware generation, Number Systems, Binary, Octal, Hexadecimal, Character Codes (BCD, ASCII, EBCDIC), Logic gates, Boolean algebra, K-map Simplification, Half adder, Full adder, Decoders, Multiplexes, Binary Counters, Flip/Flops, Registers, Counters (Synchronous & Asynchronous), ALU, Micro-Operation, ALU-chip, Faster Algorithm and Implementation (multiplication & Division).	L1, L2 and L3	7
MODULE 2: **Basic Organization** Von Neumann Machine (IAS Computer), Operational flow chart (Fetch, Execute), Instruction Cycle, Organization of Central Processing Unit, Hardwired and Micro programmed control unit, Single Organization, General Register Organization, Stack Organization, Addressing Modes, Instruction Formats, Data transfer & Manipulation, I/O organization, Bus Architecture, Programming Registers.	L1,L2,l3	8

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MODULE 3: **Memory Organization** Memory hierarchy, Main Memory (RAM/ROM chips), Auxiliary memory, Associative memory, Virtual memory, Cache memory, Memory management hardware, hit/miss ratio, Magnetic disk and its performance, Magnetic Tapes etc.	L1, L2 and L3	8
MODULE 4: **Input-Output organization** Peripheral devices, I/O interface, Direct memory access, Modes of transfer, Priority Interrupt, I/O Processors, Serial Communication, Asynchronous data transfer, Strobe Control, Handshaking, I/O Controllers.	L1, L2	7
MODULE 5: **Processor Organization** Basic Concept of 8/16-bit microprocessor (8085/8086), Assembly Instruction Set, Assembly Language Program of 8085/8086: Addition of two numbers, Subtraction, Block Transfer, Find greatest number, Table search, Numeric manipulation, Introductory Concept of pipeline, Flynn's Classification, Parallel Architectural classification.	L2,L4	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. M. Moris Mano, "Computer Systems Architecture", 4th Edition, Pearson/PHI, ISBN:10:0131755633
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, "Computer Organization", 5 th Edition, McGraw Hill

.

Reference Books

1. Computer Organization: Vrarsie, Zaky&Hamacher (TMH Publication).
2. Tannenbaum, "Structured Computer Organization", PHI.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS O 1**	**PS O 2**	**PS O 3**	**PSO 4**
CO 1	**2**	**-**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**-**	**-**
CO 2	**2**	**2**	**3**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**2**	**-**
CO 3	**2**	**-**	**3**	**-**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**2**	**-**
CO 4	**2**	**-**	**3**	**-**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**		**-**

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AIE6614	SOFTWARE ENGINEERING	L	T	P	C
Version 2019.1	Date of Approval: 15 May 2019	3		0	3
Pre-requisites/Exposure	Basic Knowledge of software development				
Co-requisites	Nil				

Catalog Description

In this course the concepts of Software development are discussed in detail. Various models of SDLC are introduced along with its application. Students will be able to apply these concepts in real time software project development.

Course Objectives

The objective of this course is to

1. Gain the knowledge of how Analysis, Design, Implementation, Testing and Maintenance processes are conducted in a software project.
2. Apply their foundations in software engineering to adapt to readily changing environments using the appropriate theory, principles and processes.

Course Outcomes

On completion of this course, the students will be able to

CO1: Apply current theories, models, and techniques that provide a basis for the software lifecycle.

CO2: Enable the students to apply a systematic application of scientific knowledge in creating and building cost effective software solutions to business and other types of problems.

CO3: Be able to elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of a software development.

CO4: Be able to evaluate the impact of potential solutions to software engineering problems in a global society, using the knowledge of contemporary issues and emerging software engineering trends, models, tools, and techniques.

CO5: Work as an individual and as part of a multidisciplinary team to design, develop and deliver quality software.

Modules	Blooms level*	Number of hours
MODULE 1: **Introduction** Software life cycle models: Waterfall, Prototype, Evolutionary and Spiral models, Overview of Quality Standards like ISO 9001, SEI-CMM	L1, L2 and L4	5
MODULE 2: **Software Metrics and Project Planning** Size Metrics like LOC, Token Count, Function Count, Design Metrics, Data Structure Metrics, Information Flow Metrics. Cost estimation, static, Single and multivariate models, COCOMO model, Putnam Resource Allocation Model, Risk management.	L2, L3 and L6	7

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MODULE 3: **Software Requirement Analysis, design and coding** Problem Analysis, Software Requirement and Specifications, Behavioural and non-behavioural requirements, Software Prototyping Cohesion & Coupling, Classification of Cohesiveness & Coupling, Function Oriented Design, Object Oriented Design, User Interface Design Top-down and bottom-up Structured programming, Information hiding.	L2, L3 and ,L5	8
MODULE 4: **Software Reliability, Testing and Maintenance**Failure and Faults, Reliability Models: Basic Model, Logarithmic Poisson Model, Software process, Functional testing: Boundary value analysis, Equivalence class testing,Structural testing: path testing, Data flow and mutation testing, unit testing, integration and system testing, Debugging, Testing Tools, & Standards.Management of maintenance, Maintenance Process, Maintenance Models, Reverse Engineering, Software RE-engineering	L2, L3 and L4,L6	10
MODULE 5: **UML**Introduction to UML,Use Case Diagrams, Class Diagram: State Diagram in UMLActivity Diagram in UMLSequence Diagram in UMLCollaboration Diagram in UML, Domain, Component Diagram and Deployment Diagram	L3,L4,L5	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books:

1. K. K. Aggarwal & Yogesh Singh, "Software Engineering", 2nd Ed, New Age International, 2005.
2. R. S. Pressman, "Software Engineering – A practitioner's approach", 5th Ed., McGraw Hill Int. Ed., 2001.

Reference Books:

1. R. Fairley, "Software Engineering Concepts", Tata McGraw Hill, 1997.
2. P. Jalote, "An Integrated approach to Software Engineering", Narosa, 1991.
3. Stephen R. Schach, "Classical & Object -Oriented Software Engineering", IRWIN, 1996.
4. James Peter, W. Pedrycz, "Software Engineering", John Wiley & Sons.
5. Sommerville, "Software Engineering", Addison Wesley, 1999.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	--	1	2	--	--	--	--	--	--	--	--	--	1	--	--	--
CO 2	1	--	2	3	--	--	--	--	--	--	4	--	1	2	--	--
CO 3	--	1	--	--	--	--	--	--	--	2	3	--	-	1	2	--
CO 4	-	1	-	--	2	--	--	--	--	--	--	--	2	1	--	--
CO 5	--	--	1	--	--	--	--	--	2	--	--	--	--	--	--	1

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AIE6616	SOFTWARE ENGINEERING LAB	L	T	P	C
Version 2017.1	Date of Approval: 15 May 2019	0	0	1	1
Pre-requisites/Exposure	Basics of Software Engineering				
Co-requisites	NIL				

Catalog Description

The course provides introduction to the fundamental's principles of software engineering. The organization broadly based on the classical analysis-design-implementation framework. Software Engineering is the systematic approach to the development, operation, maintenance, and retirement of software. Rational Rose Enterprise Edition software is used to serve the objectives. Students will be able to design models according to user requirement.

Course Objectives

The objective of this course is to

1. The basic objective of Software Engineering is to develop methods and procedures for software development that can scale up for large systems and that can be used to consistently produce high-quality software at low cost and with a small cycle time.
2. Apply basic techniques of modeling computer systems.

Course Outcomes

On completion of this course, the students will be able to

CO1: collect requirements and prepare their scenarios

CO2: Construct various UML models (including use case diagrams, class diagrams, interaction diagrams, state chart diagrams, activity diagrams, and implementation diagrams) using the appropriate notation

CO3: Demonstrate the role and function of each UML model in developing objectoriented software.

CO4: Recognize the difference between various object relationships: inheritance, association, whole-part, and dependency relationships.

Modules/Topics Covered**	Blooms level*	Number of hours
1. Introduction to Rational Rose Enterprise Edition tool and SRS (c) Explain features and characteristics of Rational Rose tool along with screenshots. (d) Create Software requirement specification document for Website application of educational institute.	L1, L2	4
2. Concept of UML and Use case diagram (c) Design Use case Diagram of ATM machine (d) Show dependencies and relationships through Use case diagram of Banking Management System	L1, L3	4

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3. Class Diagrams and object diagram concepts (d) Design class diagram of Flight Reservation system (e) Design class diagram of student Management system (f) Design object diagram of courier service system (g) Design object diagram of Train Reservation system	L3, L1	8
4. Sequence, Activity, Collaboration, State chart diagram concepts (h) Design Activity diagram of Library Management system (i) Design Sequence diagram of Food Ordering system (j) Design Collaboration diagram of Hotel Management system (k) Design State chart diagram of Turing Machine	L3, L1	8
.		

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

1.Rambugh,Grady Booch, Unified Modeling Language User Guide, Pearson Education 1998.

2.K.K. agrawal,Yogesh Singh, Software Engineering,

Reference Books

1. Martin Fowler,UML distilled:A Brief Guide to the Standard Object Modeling Language,Addison We sely,1997.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	**70**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	--	**1**	**2**	**3**	**4**	--	--	--	--	--	--	--	**1**	--	--	--
CO2	--	--	**1**	**2**	**3**	--	--	--	--	--	--	--	**1**	**2**	--	--
CO3	--	**1**	**2**	**3**	--	--	--	--	--	**4**	--	--	-	**2**	**3**	--
CO4	--	**1**	**2**	**3**	--	--	--	--	**4**	--	--	--	**3**	--	**1**	**2**

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AIE6637	MINOR PROJECT-I	L	T	P	C
Version: 2019.1	Date of Approval: 15 May 2019	0	0	0	2
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The objective of this course is to provide practical training on some live/demo projects that will increase capability to work on actual problem in industry. It will be an in house training on some latest software which is in high demand in market. This training will be designed such that it will useful for their future employment in industry.

Course Objectives

The objective of this course is to

1. Provide practical training on live projects
2. Increase technical capabilities on solving real life problems in company environment

Course Outcomes

On completion of this minor project, the students will be able to:

CO1: Demonstrate a sound technical knowledge of their selected project topic.

CO2: Design and develop engineering solutions to complex problems utilising a systems approach.

CO3: Analyse various approaches for solving a complex engineering problem using different tools and techniques

CO4: Demonstrate the knowledge, skills and attitudes of a professional engineer.

CO5: Apply technical skills and knowledge in completing the project.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	--	--	--	--	--	1	--	--	--	--	--	1	1
CO2	1	1	--	--	--	--	--	--	1	--	--	--	--	--	1	1
CO3	1	1	--	--	--	--	--	--	1	--	--	--	--	--	1	1
CO4	1	1	--	--	--	--	--	--	1	--	--	--	--	--	1	1
C05	1	1	--	--	--	--			1	-	-	-	--	--	1	1

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AIE6612	VLSI DESIGN	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	0	0	0
Pre-requisites/Exposure	Basics of semiconductor and analog electronics				
Co-requisites	Nil				

Catalog Description

This course deals with basic theories and techniques of digital VLSI design in CMOS technology. It covers the fundamental concepts and structures of designing digital VLSI systems which include CMOS devices and circuits, standard CMOS fabrication process, CMOS design rules, static and dynamic logic structures, CMOS chip layout, simulation and testing, low power techniques, design tools and methodologies and Stick Diagrams.

Course Objectives

The objective of this course is to

- Provide a deep understanding of the concepts, techniques and design of complex digital VLSI circuits.
- Apply mathematical methods and circuit analysis models to analyse CMOS digital circuits, and their logic components.

Course Outcomes

On completion of this course, the students will be able to

CO1.Explain the characteristics of Basic VLSI components.

CO2. Apply the knowledge of various CMOS inverters to compare their performance.

CO3. To design and realize basic combinational and sequential functions using CMOS logic.

CO4. Design circuit Layout and Stick diagrams of CMOS logics.

Modules	Blooms level*	Number of hours
Module I: Devices and the wire Dynamic and transient behavior of Diode, Diffusion capacitance, SPICE Diode model, MOSFET basic, depletion and enhancement device. MOSFET static behavior, Threshold voltage and its dependence on V_{SB} MOSFET Operation in resistive and saturation region, channel length modulation, Velocity saturation and its impact on sub micron devices, sub threshold conduction, Model for manual analysis, Equivalent resistance for MOSFET in (velocity) saturated region, comparison of equations for PMOS and NMOS. Dynamic behavior, Channel capacitance in different regions of operation, junction capacitance, Level 1 SPICE models for MOS transistors. The Wire, Interconnect parameters: resistance, capacitance and Inductance, Lumped RC model, Elmore Delay.	L1, L2	8

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Module II: CMOS Inverter VTC of an ideal inverter, Switching Model of the CMOS inverter: NMOS /PMOS discharge and charge, VTC of CMOS inverter : PMOS and NMOS operation in various regions including velocity saturation, Switching threshold, (W/L)p/(W/L)n ratio for setting desired V_M with and without velocity saturation, Noise Margins, buffer. Ratioed logic: Pseudo NMOS inverter and PMOS to NMOS ratio for performance, tri-state inverter, Resistive load inverter. Load Capacitance calculations: fan out capacitance, self capacitance calculations: Miller effect, wire capacitance; Improving delay calculation with input slope, Propagation delay: first order analysis, analysis from a design perspective, sizing a chain of inverters for minimum delay, choosing optimum number of stages, Power, Energy and Energy Delay: Dynamic power consumption, Static power, Glitches and power dissipation due to direct path currents, power and delay trade off, Transistor sizing for energy minimization.	L3, L4	8
Module III: Combinational circuits CMOS LOGIC: Good 0 and Poor 0, series and parallel N and P switches, Two and Higher input NAND and NOR gates, Functions of the type (AB+C(D+E)) and their complements, XOR and XNOR gates, 2 input Multiplexer, Full Adder; Transistor sizing in CMOS logic for optimal delay, Pseudo NMOS NAND NOR and other gates and the transistor sizing, Introduction to DSVCL logic, CPL AND/NAND, OR/NOR, XOR/XNOR gates, Logical effort, Electrical Effort, Branching effort, Examples of sizing Combinational logic chains for minimum delay, Pass-transistor logic, pass gate configurations for NMOS and PMOS, 2 input and 4 input MUX, XOR, XNOR and implementation of general functions like AB+AB*C+A*C*, Robust and Efficient PTL Design, Delay of Transmission Gate chain. Dynamic CMOS design: Pre-charge and Evaluation, charge leakage, bootstrapping, charge sharing, Cascading Dynamic Gates, DOMINO Logic, Optimization of Domino Logic Gates, simple example circuit implementations of DOMINO logic.	L2,L3,L4	10
Module IV: Sequential Logic circuits Principle of bistability, NAND and NOR based SR latch, and clocked SR Latch, JK latch, example of master slave flip flop, CMOS D latch, , MUX based Latches, master slave edge triggered register, Static Timing Analysis – setup, hold time, clock skew, clock period, non ideal clocks, clock overlap, C2MOS register, TSPCR Register, Schmitt Trigger, Pipelining and NORA CMOS	L2,L3,L4	5
Module V: Layout Design Rules **I**ntroduction to CMOS Process technology, Latch up and its prevention Layout of CMOS inverter, CMOS NAND and NOR gates, Concept of Euler path, and stick diagrams for functions like (AB+E+CD)*.	L2,L3,L4	5

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. **Jan M Rabaey**,Digital Integrated Circuits ,Second Edition, Pearson.
2. **David Hodges**, Analysis and Design of Digital ICs, McGrew Hill
3. **Sung-MoKang,**CMOS Digital ICs,third edition,2008

Reference Books

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1. **WesteNiel and Harris**,CMOS VLSI design.A Circuits And Systems Perspective, 3/E,Pearson
2. **Weste and Eshragian**,Principles of CMOS VLSI Design: a systems perspective, Addison-Wesley Publishing Company, 01-Jan-1993

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	**1**	**3**	--	--	--	--	--	--	--	--	--	--	**2**	**1**	-	-
CO 2	**3**	**1**	**3**	--	**1**	--	--	--	--	--	--	**2**	**2**	**1**	-	**2**
CO 3	**3**	**2**	**1**	**2**	--	--	--	--	--	--	--	**2**	**2**	**1**	-	**2**
CO 4	**2**	**2**	**1**	-	--	--	--	--	--	--	--	--	**2**	**1**	-	-

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AIE6613	VLSI DESIGN LAB	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	0	0	2	1
Pre-requisites/Exposure	Hands on knowledge of analog electronics				
Co-requisites	Basic concepts of Digital electronics				

Catalog Description

In this Lab course the designing of VLSI circuits using Mentor Graphics software are implemented and demonstrated. Concepts covered would enable them to create complex applications related to VLSI design. The objective of this course is to explore and implement the various features of VLSI design and analyze the dc and transient analysis.

Course Objectives

The objective of this course is to

Provide a deep understanding of CMOS logic using Mentor Graphics tool.

Analyze, design concepts of different combinational and sequential circuits and their simulation.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Demonstrate the basic concept of MOSFET;

CO 2: Illustrate the static and switching characteristics of inverters using CMOS with varying capacitance, width and channel Length of CMOS using Mentor Graphics tool.

CO 3: Demonstrate and create models of moderately sized CMOS circuits that realize specified digital functions using Mentor graphics Tool.

CO 4: Demonstrate the layout and stick diagrams using Mentor graphics Tool.

CO 5: Demonstrate the power consumption during transient analysis.

Modules/Topics Covered**	Blooms level*	Number of hours
1. MOSFET characteristics with varying VGS for both pmos and nmos.	L3, L5	2
2. Effect on VTC of CMOS inverter with variation of W and L.	L3, L5	2
3. Transient analysis of CMOS inverter with varying capacitive load, W and L. Rise time, fall time power dissipation, propagation delay calculation of CMOS inverter with the variation of capacitive load, W and L.	L3, L5	4
4. NOR and NAND gate - Transient analysis	L3, L5	2
5. XOR/XNOR gate - Transient analysis	L3, L5	2
6. 2:1 MUX and XOR gate with P.T.L.- Transient analysis	L3, L5	2
7. D type latch and flip flop - Transient analysis	L3, L5	2
8. 3 input NAND gate implementation with DOMINO (precharge and evaluation).	L3, L5	2
9. 4 inverter chain to derive capacitive load.	L3, L5	2

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text

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1. Neil Weste and K. Eshragian, "Principles of CMOS VLSI Design: A System Perspective," 2nd edition, Pearson Education (Asia) Pvt. Ltd., 2000.
2. D.A Pucknell and Eshraghain, " Basic VLSI Design", PHI, India, 1995.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	**70**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	3	1	--	--	--	--	--	--	--	--	--	--	2	1	--	--
CO2	3	1	--	--	--	--	--	--	--	--	--	--	1	1	--	--
CO3	3	1	--	--	--	--	--	--	--	--	--	--	1	1	--	--
CO4	3	1	--	--	--	--	--	--	--	--	--	--	2	1	--	--
CO5	3	1	--	--	--	--	--	--	--	--	--	--	1	1	--	--

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AIE6617	OPEN SOURCE TECHNOLOGIES	L	T	P	C
Version :2020.1	Date of Approval: JULY 2020	2	0	0	2
Pre-requisites/Exposure	Basic Knowledge of HTML				
Co-requisites	Nil				

Catalog Description

The course includes the content about PHP and its Programming Concepts. It includes basic architecture of running a PHP Script. It also includes the concepts about Conditional, Control Statements, Array, Associative Array, String Functions and Concepts of Functions : Call by Value and Reference. The course also includes concepts related to Object Oriented Programming in PHP and website design support along with Database Support concepts which will be useful to design Backend for the website.

Course Objectives

The objective of this course is:

1. To provide a fundamental understanding of Dynamic Website Design in PHP.
2. To provide knowledge about various Frameworks build for Website Designing.

Course Outcomes

On completion of this course, the students will be able to

After completing the course, the students will be able to,

CO 1: Explain the basic concepts of PHP programming and write PHP scripts usin Strings and functions

CO 2: Explain and write PHP scripts based on Conditional statements, control staemnts and Arrays.

CO 3: Apply Object Oriented and Web Design concepts of PHP in order to create responsive web pages and websites

CO 4: Apply the concepts of Database and Database connectivity in order to provide backend support to website to make them Dynamic in nature

CO 5: Demonstrate the website designing process on various PHP Frameworks.

Modules	Blooms level*	Number of hours
Module I: Introduction to Open Source and PHP programming Introduction to Open Sources Technologies, Introduction to PHP, installation and configuration, Advantages and Disadvantages of PHP, Client Side Scripting, Server Side Scripting, Variables, data types, various types of function, creating your own function, Strings in PHP, String Functions.	L1, L2 and L3	4

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Module II: Operators, Loops, Array, Exception and Error Handling Operators, Conditions, Loops, Using for each, Creating and Using Arrays, Multidimensional Array, Associative Array. Error Handling in PHP, Errors and Exceptions, Exception class, try/catch block, throwing an exception, defining your own Exception subclass.	L1, L2, L3	5
Module III: Classes, File system, Passing Information between pages Object oriented programming with Php, Working with Datetime, code re-use, require (), include(), and the include_path; Understanding PHP file permissions, File reading and writing functions, File system functions, File uploads, Sending mail & use of email server. HTTP, GET arguments, POST arguments, Using Session in PHP, cookies, The setcookie() function, Deleting Cookies and Reading Cookies.	L2, L3 and L4	7
Module IV: Working with database HTML Tables and Database tables, Databasemanipulation(Select, Insert, Update, Delete), validating User Input usingJavascript. MYSQL, Introducing MySQL; database design concepts; the Structured Query Language (SQL); communicating with a MySQL backend via the PHP, MySQL APIBuilding Database Applications, Developing PHP scripts for dynamic web page like feedback form, online admission form and online test.	L2, L3 and L4	5
Module V: Working with Frameworks Working with Mambo, Working with Joomla, Working with framework. Working with wordpress, Working with drupal, Use of Joomla in rapid development of website. Developing of simple website using joomla.	L2, L3 and L4	3

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Steven Holzner **"PHP : The Complete Reference",** Mc Graw Hill Education, 2007.
2. Ivan Bayross, **"Web enabled commercial Application Development using HTML, Javascript, DHTML and PHP",** 4th Edition, BPB Publication, 2010.
3. Laura Thomson, **"PHP and MySQL Web Development",** 5th Edition, Pearson Education, 2016.

Reference Books

1. Robin Nixon, **"Learning PHP, MySQL and Javascript",** Shroff Publishers and Distributers private limited, 2015.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	**1**	**3**	**1**	--	--	--	--	--	--	--	--	--			
CO2	**1**	**1**	**1**	--	--	--	--	--	--	--	--	--			
CO3	**1**	**1**	**1**	**3**	**2**	--	--	--	--	--	--	--			
CO4	**1**	**1**	**2**	**2**	**2**	--	--	--	--	--	--	--			
CO5	**1**	**3**	**2**	**1**	**1**	--	--	--	--	--	--	--			

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AIE6618	OPEN SOURCE TECHNOLOGIES LAB	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	0	0	2	1
Pre-requisites/Exposure	Basic Knowledge of HTML				
Co-requisites	Nil				

Catalog Description

The course includes PHP Programming Concepts. Conditional, Control Statements, Array, Associative Array, String Functions and Concepts of Functions: Call by Value and Reference are implemented. The course also includes concepts related to Object Oriented Programming in PHP and website design support along with Database Support concepts which will be useful to design Backend for the website.

Course Objectives

The objective of this course is:

1. To provide a fundamental understanding of Dynamic Website Design in PHP.
2. To provide knowledge about various Frameworks build for Website Designing.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Apply the basic concepts of PHP programming to rewrite PHP scripts using Strings and Functions

CO 2: Demonstrate the concept of Conditional & Control Statements and 1 D, 2 D & Associative Array using PHP scripts

CO 3: Apply Object Oriented and Web Design concepts of PHP in order to prepare responsive web pages and websites

CO 4: Apply the concepts of Database and Database connectivity to prepare backend support for website.

Lab Sessions	Blooms level*	Number of hours
1. PHP Scripts on Basic Concepts • Write the process of installation of web server. • Write programs to print all details of your php server. Use phpinfo(). • Write a program to give demo of ECHO and PRINT command. • Write a program to implement the string functions.	L1,L3	2
2. PHP Script on Conditional and Control Statements • Write a script to print Fibonacci series upto a given number. • Write a menu driven program to implement a calculator which performs only addition, subtraction, multiplication and division. The operation should happen based on user choice. • Write a script to calculate Factorial of a given number	L1,L3	4

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3. PHP Scripts on Arrays: 1D, 2D, Associative • Write a program sort ten number by using array. • Write a program to demonstrate the concept of associative array. • Write a program to demonstrate the concept of multidimensional array.	L1,L3	4
4. PHP Scripts on Object Oriented Programming and File Handling Concepts • Write a program to demonstrate the concept of Classes & objects. • Write a php script including all the file handling functions.	L1,L3	2
• **PHP Scripts on Webpage and Website Design Concepts** • Create a login form with two text fields called "login" and "password". When user enters "Amity"as a user name and "university" as a password it should be redirected to a Welcome.HTML page or toSorry.HTML in case of wrong username/password. • Write a program to design login form in which find the greatest number amongst three numbers. • WAP for Marksheet generation. • Design a webpage for entering the student details with all the validations applied on it. • Create a form with a text box asking to enter your favorite city with a submit button when the user enters the city and clicks the submit button another php page should be opened displaying "Welcometo the city".	L1,L3	6
5. PHP Scripts on Database Creation aConnectivity • Create a database in MySql and connect that database from PHP. • Write a program to Update, insert and delete the values of table in database.	L1,L3	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Steven Holzner "PHP : The Complete Reference", Mc Graw Hill Education, 2007.
2. Ivan Bayross, "Web enabled commercial Application Development using HTML, Javascript, DHTML and PHP", 4th Edition, BPB Publication, 2010.
3. Laura Thomson, "PHP and MySQL Web Development", 5th Edition, Pearson Education, 2016.

Reference Books

1. Robin Nixon, "Learning PHP, MySQL and Javascript", Shroff Publishers and Distributers private limited, 2015.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

PR: Practical, LR: Lab Record, V: Viva, EE: End Semester Examination, A: Attendance, IA: Internal Assessment

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**3**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**2**	**--**
CO2	**1**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**2**	**--**
CO3	**1**	**1**	**1**	**3**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**1**	**2**
CO4	**1**	**1**	**2**	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**1**	**2**

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AIE6619	DATA MINING	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure	Concept of Database and Data Mining				
Co-requisites	Nil				

Catalog Description

Data Mining serve as one of the most important courses for postgraduate students, since it builds computational abilities, inferential thinking, and practical skills for tackling core data scientific challenges. The students will get a comprehensive understanding of different data mining techniques that can be used for prediction and for discovering patterns, be prepared to select the right technique for a given data problem and will be able to create a general-purpose analytic process.

Course Objectives

The objective of this course is to

- Provide students with an in-depth knowledge of data mining. To introduce students to basic applications, concepts, and techniques of data mining.
- Develop skills for using recent data mining software to solve practical problems and prediction in a variety of disciplines and
- Gain experience doing independent study and research.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain concepts of Data mining, predictive analytics and analyses architecture of data mining. Differentiate between supervised and unsupervised methods

CO 2: Apply classification techniques on different data sets and solve cost –benefit analysis numerical. Analyze decision tree methods.

CO 3: Implement various clustering algorithm on different data sets and describe these algorithms.

CO 4: Prepare data representation for market basket analysis and determine the usefulness of association rules. Interpret supervised and unsupervised learning methods.

CO 5: Predict market trends and outline different factors associated mail marketing.

Course Content

Modules	Bloom's level	Number of Hours
Module I Data Preparation An introduction to data mining and predictive analytics, Data Pre-processing Exploratory Data Analysis, Dimension- Reduction Methods.	**L1, L2**	**8**
Module II Classification k- Nearest Neighbour Algorithm, Decision Trees, Model Evaluation Technique, Cost –Benefit Analysis Using Data Driven Cost.	**L1, L2, L3**	**7**

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Module III Clustering Hierarchical and k- Means Clustering, Kohenen Networks, Birch Clustering, Measuring Cluster Goodness.	**L1, L2, L3,L4**	**8**
Module IV Association Rules Affinity Analysis and Market Basket Analysis, Data Representation for Market Basket Analysis, Support, Confidence, Frequent Item sets, and the a Priori Property, How Does a Priori Algorithm Work? Generating Frequent Item sets, Generating Association Rules, Extension from Flag Data to General Categorical Data, Information-Theoretic Approach: Generalized Rule Induction Method, J-Measure, Association Rules are Easy to do Badly, how can we Measure the Usefulness of Association Rules? Do Association Rules Represent Supervised or Unsupervised Learning?	**L1, L2, L3,L6**	**9**
Module IV Case Study: Predicting Response to Direct Mail Marketing Business Understanding, Data Preparation, and Eda, Clustering and Principal Components Analysis, Modelling and Evaluation for Performance and Interpretability, Modelling and Evaluation for High Performance.	**L2, L3, L4, l5**	**8**

Bloom's Level:

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Daniel T. Larose, Chantal D. Larose, "Data Mining and Predictive Analytics", John Wiley & Sons, Inc., Hoboken, New Jersey, 2015.
2. Jiawei Han and Micheline Kamber, "Data mining: concepts and techniques", Morgan Kaufmann, Second Edition, 2006.

Reference Books

1. Alex Berson, Data Warehousing, Data Mining, and Olap, Tata McGraw Hill, 2014.
2. Markus Hofmann, Ralf Klinkenberg, "Rapid-Miner: Data Mining Use Cases and Business Analytics Applications", Chapman and Hall/CRC, 2016.
3. George M Marakas, Modern Data Warehousing, Mining & Visualization Core Concepts, Pearson Education.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**2**	**3**
CO2	**1**	**1**	**2**		**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**3**	**3**
CO3	**1**	**2**	**3**	**3**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**2**	**2**
CO4	**1**	**1**	**2**	**--**	**--**	**3**	**--**	**--**	**--**	**--**	**--**	**3**	**1**	**1**	**2**	**3**
CO5	**1**	**1**	**2**	**--**	**--**	**2**	**--**	**--**	**--**	**--**	**--**	**3**	**1**	**3**	**2**	**1**

1: strongly related, 2: moderately related and 3: weakly related

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AIE6702	COMPUTER GRAPHICS	L	T	P	C
Version: 2020.1	Date of Approval: JULY 2020	3	-	-	3
Pre-requisites/Exposure	Basic Knowledge of C++ Programming				
Co-requisites	Nil				

Catalog Description

This course covers understanding of software and hardware related to computer graphics systems. Topics include an introduction to the basic concepts, 2-D and 3-D modeling and transformations, viewing transformations, clipping, color filling, projections, rendering techniques, visible surface detection and elimination algorithms, graphical software packages and graphics systems. Students will use a standard computer graphics API to reinforce concepts and study fundamental computer graphics algorithms. Last module covers elementary image processing techniques and various library function in C to build animations.

Course Objectives

The objective of this course is to

1. Equip the students with fundamental concepts of graphics system and standards.
2. Equip the students with mathematical concepts of graphics algorithms to draw objects using C language.
3. Provide an overview of various 2D & 3D transformation, clipping operations, algorithms related to hidden surface detection and elimination and their implementation.
4. Provide an overview of various elementary image processing techniques and basic library function in C to create animation sequence.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain applications of computer graphics and define various standards and components in development of computer graphics.

CO 2: Explain generation of graphics primitives and analyze their problems and solutions. Demonstrate solid filling algorithms. Demonstrate polygon clipping and line clipping algorithm and analyze their problems and solutions.

CO 3: Apply 2D geometric transformations on 2D graphics objects with their practical implement - ation. Illustrate use of window to viewport transformation in computer graphics.

CO4: Apply 3D geometric transformations on 3D objects with their practical implementation.

CO 5: Illustrate the use of 3D object modeling, Visible Surface detection and elimination algorithm and analyze their problems and solutions.

Modules	Blooms level*	Number of hours

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Module I: Introduction to Graphics and Graphics Hardware System Application of computer graphics, Video Display Devices, Raster Scan Display, Random Scan Display, Input Devices, Graphic Software and graphics standards, Numerical based on Raster and Random scan display, Frame buffer, Display processor.	L1, L2	5
Module II: Output Primitives and Clipping operations Algorithms for drawing 2D Primitives lines (DDA and Bresenham's line algorithm), circles (Bresenham's and midpoint circle algorithm), ellipses (midpoint ellipse algorithm), Antialiasing and filtering techniques. Line clipping (cohen-sutherland algorithm), Curve clipping algorithm, and polygon clipping with Sutherland Hodgeman algorithm, Area fill algorithms for various graphics primitives: Scanline fill algorithm, boundary fill algorithm, flood fill algorithm, Polygon representation, various method of Polygon Inside test: Even-Odd method, winding number method, Character generation techniques.	L2, L3, L4	6
Module III: 2D Geometric transformation 2D Transformation: Basic transformation, Translation, Rotation, Rotation relative to an arbitrary point, scaling, Matrix Representations and Homogeneous coordinates, window to viewport transformation.	L3 and L4	6
Module IV: 3D Geometric transformation 3D Concepts: Parallel projection and Perspective projection, 3D Transformations, composite 3D transformation, co-ordinate transformation, Inverse transformation	L3 and L5	7
Module V: object modelling and Visible Surface detection fractal geometry methods, fractal dimensions, Geometric construction of deterministic self-similar fractals, Iterated function system to generate fractals. Bezier curves and Bezier surfaces, Bspline curves and surfaces, Visible surface detection method: Basic illumination, diffuse reflection, specular reflection, shadows. Ray tracing method, Depth-buffer method, A-buffer method, Depth-sorting method (painter's algorithm), Binary search partition method, Scan line method,	L4, L5	7
Module VI: Introduction to multimedia Design of animation sequences, Computer Animation languages, Elementary filtering techniques and elementary Image Processing techniques, graphics library functions used in animation design	L2, L3, L5	5

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1.Udit Agrawal,"Principles of Computer Graphics", 2nd Edition, DhanpatRaiPublications,New Delhi, 2017.
2.Hughes, Van Dam, et al. "Computer Graphics Principles and Practice", 3rd Edition, Pearson, 2014.
3.Hearn and Baker, "Computer Graphics with OpenGL", 3rd Edition, Prentice Hall, 2004.
4.Donald Hearn & M. Pauline Baker, "Computer Graphics C Version", Pearson Education, New Delhi, 2004.

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Reference Books

1. James D. Foley, Andries van Dam, Steven K. Feiner, John Hughes, "Computer Graphics: Principles and Practice", 2nd Edition, Pearson Education, 2007.
2. F.S. Hill, "Computer Graphics using OPENGL",2nd edition, Pearson Education, 2003.
3. David F. Rogers; "Procedural Elements for Computer Graphics" TMH. Publications.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2		PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1	_		-	--	--	--	--	--	--	--	--	--	2	--	2
CO2	1	1		1	--	--	--	--	--	--	--	--	--	2	--	2
CO3	1	1		1	3	--	--	--	--	--	--	--	--	1	3	1
CO4	1	1		2	2	--	1	--	--	--	--	--	--	2	--	1
CO5	1	3		2	1	1	2	--	--	--	--	--	--	2	3	2
CO6	1	2		3	--	1	2	--	--	--	--	--	--	2	3	2

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AIE6706	COMPUTER GRAPHICS LAB	L	T	P	C
Versionn: 2020.1	Date of Approval: JULY 2020	0	0	2	1
Pre-requisites/Exposure	Basic Knowledge of C++ Programming				
Co-requisites	Nil				

Catalog Description

This course covers understanding of software and hardware related to computer graphics systems. Topics include an introduction to the basic concepts, 2-D and 3-D modeling and transformations, viewing transformations, clipping, color filling, projections, rendering techniques, visible surface detection and elimination algorithms, graphical software packages and graphics systems. Students will use a standard computer graphics API to reinforce concepts and study fundamental computer graphics algorithms. Last module covers elementary image processing techniques and various library function in C to build animations.

Course Objectives

The objective of this course is to

1. Equip the students with fundamental concepts of graphics system and standards.
2. Equip the students with mathematical concepts of graphics algorithms to draw objects using C language.
3. Provide an overview of various 2D & 3D transformation, clipping operations, algorithms related to hidden surface detection and elimination and their implementation.
4. Provide an overview of various elementary image processing techniques and basic library function in C to create animation sequence.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain applications of computer graphics and define various standards and components in development of computer graphics.

CO 2: Explain generation of graphics primitives and analyze their problems and solutions. Demon strate solid filling algorithms. Demonstrate polygon clipping and line clipping algorithm and analyze their problems and solutions.

CO 3: Apply 2D geometric transformations on 2D graphics objects with their practical implementa tion. Illustrate use of window to viewport transformation in computer graphics.

CO4: Apply 3D geometric transformations on 3D objects with their practical implementation.

CO 5: Illustrate the use of 3D object modeling, Visible Surface detection and elimination algorithmsand analyze their problems and solutions.

CO 6: Explain Elementary filtering techniques and elementary Image Processing techniques. Apply C++graphics library functions to design animation sequence.

Modules	Blooms level*	Number of hours

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Module I: Introduction to Graphics and Graphics Hardware System 1. Demonstrate the use of graphics library functions to draw various graphics objects. 2. Demonstrate the use of graphics library functions to draw pie chart. 3. Demonstrate the use of graphics library functions to draw bar chart on screen.	L3,L5	2
Module II: Output Primitives and Clipping operations 1. Demonstrate the use of DDA line drawing algorithm to draw line on the screen when m<=1 and m>1. 2. Demonstrate the use of DDA line drawing algorithm to draw line on the screen when m<=1 and m>1. 3. Demonstrate the use of Breshenham's line drawing algorithm to draw line on the screen when m<=1 and m>1. 4. Demonstrate the use of circle drawing algorithm to draw circle on the screen. 5. Write a program to draw characters on screen using bitmap character generation method. 6. Write a program to fill a polygon using boundary fill algorithm. 7. Write a program to fill a polygon using flood fill algorithm. 8. Write a program to demonstrate line clipping algorithm to clip a line where line slop is m<=1.	L3,L5	6
Module III: 2D Geometric transformation 1. Write a program to translate a triangle where translation factors are tx=20 and ty=30. 2. Write a program to rotate a triangle in clock-wise and anti-clock-wise direction where rotation angle is 300. 3. Write a program to scale a square where scaling factors are Sx=2 and Sy=3. 4. Write a program to reflect a triangle about X axis. 5. Demonstrate combine 2D transformation after applying translation, rotation and scaling transformations. 6. Write a program to demonstrate fix point scaling where scaling factors are Sx=2 and Sy=3. 7. Write a program to demonstrate window to viewport transformation and liner mapping of the object coordinates in viewport where size of viewport is half to the size of window.	L3,L5	6
Module IV:3D Geometric transformation 1. Write a program to translate a 3D triangle where translation factors are tx=20 and ty=30. 2. Write a program to rotate a 3D triangle in clock-wise and anti-clock-wise direction where rotation angle is 300. 3. Write a program to scale a 3D square where scaling factors are Sx=2 and Sy=3. 4. Demonstrate combine 3D transformation after applying translation, rotation and scaling transformations.	L3,L5	4

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Module V: Object modelling and Visible Surface detection 1. Write a program to draw Bezier curve on the screen with 4 control points. 2. Write a program to draw spline curve on screen using 6 control points. 3. Write a program to implement fractal objects using Iterated Function System.	L3,L5	3
Module VI: Introduction to multimedia 1. Create animation Sequence using C++ Graphics Library Function. 2. Write a program to generate histogram of an image.	L3,L5	3

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Udit Agrawal, "Principles of Computer Graphics",2nd Edition, Dhanpat Rai Publications, New Delhi, 2017.
2. Hughes, Van Dam, et al. "Computer Graphics Principles and Practice", 3rd Edition, Pearson, 2014.
3. Hearn and Baker, "Computer Graphics with OpenGL", 3rd Edition, Prentice Hall, 2004.
4. Donald Hearn & M. Pauline Baker, "Computer Graphics C Version", Pearson Education, New Delhi, 2004.

Reference Books

1. James D. Foley, Andries van Dam, Steven K. Feiner, John Hughes, "Computer Graphics: Principles and Practice", 2nd Edition, Pearson Education, 2007.
2. F.S. Hill, "Computer Graphics using OPENGL",2nd edition, Pearson Education, 2003.
3. David F. Rogers; "Procedural Elements for Computer Graphics" TMH. Publications.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**1**	**_**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**2**
CO2	**1**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**2**
CO3	**1**	**1**	**1**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**1**
CO4	**1**	**1**	**2**	**2**	**--**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**1**
CO5	**1**	**3**	**2**	**1**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**3**	**2**
CO6	**1**	**2**	**3**	**--**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**3**	**2**

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AIE6704	ADVANCED COMPUTER NETWORKS	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure	Basics of Computer Network				
Co-requisites	Nil				

Catalog Description

Advanced Computer Networks provides the knowledge of computer networks and related current research topics. This course illustrates the OSI and TCP-IP layers, services, devices, cables, protocols, network security, network performance parameters etc .This course focuses on advanced computer network concepts in theory as well as in real life applications in networking.

Course Objectives

The objective of this course is to

- Equip the students with the advanced networking concepts.
- Explain the different techniques of error detection and correction methods used at various layers.
- Provide an overview of various algorithms involved in advanced computer networks at OSI and TCP-IP Layers.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the concept of reference model, wireless Ethernet standards, protocols and applications of networks.

CO2: Describe network Layer design issues, routing algorithms, IP addressing.

CO3: State Multicasting issues and multicast routing protocol. Describe mobile IP and its use in Multicasting.

CO4: State transport and application layers and explain services, protocols, performance parameters in these layers. Also describe DNS, Email and www with applications of each in computer network.

CO5: State network security and describe various types of computer network security, the digital signature, security algorithms. Explain the social issues related to network security and web security.

Modules	Blooms level*	Number of hours
MODULE 1: Uses computer networks, Reference Models, TCP/IP suite of protocols, MAC protocols for high-speed LANS, MANs, and wireless LANs. (For example, FDDI, DQDB, HIPPI, Gigabit Ethernet, Wireless Ethernet, etc.)Fast access technologies. (For example, ADSL, Cable Modem, etc.)	L1, L2	6

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MODULE 2: Network Layer Design Issues, Routing Algorithms, Congestion Control Algorithms, Quality of Service, Internet Working, Network Layer in Internet. IPv6 basic protocol, extensions and options, support for QoS, security, etc., Changes to other protocols, Application Programming Interface for IPv6.	L2, L3	8
MODULE 3: Mobile IP, IP Multicasting. Multicast routing protocols, address assignments, session discovery, etc.	L1, L2	8
MODULE 4: The Transport Protocol: The Transport Service, Elements of transport protocol, a simple Transport Protocol, Internet Transport Protocols UDP, Internet Transport Protocols TCP, TCP extensions for high-speed networks, transaction-oriented applications Performance Issues. The Application Layer: DNS-(Domain Name System), Electronic Mail, World Wide Web Multimedia.	L1, L2, and L3	8
MODULE 5: Overview of network security, Secure-HTTP, SSL, ESP, Key distribution protocols. Digital signatures, digital certificates-mail Security, Web security, Social Issues..	L1, L2	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. William Stallings, Cryptography & Network Security: Principles and Practices, Prentice Hall, 2005, (ISBN: 978-0131873162).

Reference Books

1. Behrouz A. Forouzan, Cryptography & Network Security, McGraw-Hill, 2007, USA. (ISBN: 0073327530 9780073327532).
2. Douglas R. Stinson, Chapman and Hall, Cryptography Theory & Practice, CRC Press, 2005.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	-	-	-	-	--	--	--	--	--	--	--	**1**	--	-	--
CO2	**1**	-	-	-	3	--	3	--	--	--	--	--	**1**	--	-	--
CO3	**1**	-	-	-	3	--	3	--	--	--	--	--	**2**	1	-	--
CO4	**1**	-	-	--	2	--	2	--	3	--	--	--	2	**1**	-	--
CO5	**1**	-	-	-	1	-	1	--	2	--	--	--	**1**	**2**	-	--

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AIE6707	ADVANCED COMPUTER NETWORKS LAB	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	0	0	1	1
Pre-requisites/Exposure	Basics of Computer Networks				
Co-requisites	Nil				

Catalog Description

Advanced Computer Networks Lab provides the knowledge of various installations & connections of LAN, WAN, etc, study of Cisco Packet Tracer Tool and its implementations, simulation of flow-control protocols such as Sliding Window, Stop & Wait with help of programming languages. This course focuses on real-life applications in networking and its software implementation in the laboratory.

Course Objectives

The objective of this course is to

- Equip the students with the advanced networking concepts.
- Explain the different techniques of error detection and correction methods used at various layers.
- Provide an overview of various algorithms involved in advanced computer networks at OSI and TCP-IP Layers.

Course Outcomes

On completion of this course, the students will be able to

CO1: Understand fundamental underlying principles of computer networking
CO2: Understand details and functionality of CISCO router
CO3:Demonstrate and configure details and functionality of DHCP server
CO4: Analyze performance of various communication protocols.
CO5: Compare routing algorithms

Modules	Blooms level*	Number of hours
MODULE 1: 1. Configuration and logging to a CISCO Router and introduction to the basic user Interfaces. Introduction to the basic router configuration and basic commands. 2. Configuration of IP addressing for a given scenario for a given set of topologies.	L1, L2	2
MODULE 2: 1. Configure a DHCP Server to serve contiguous IP addresses to a pool of four IP devices with a default gateway and a default DNS address. Integrate the DHCP server with a BOOTP demon to automatically serve Windows and Linux OS Binaries based on client MAC address	L2, L3	2

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MODULE 3: 1. Configure, implement and debug the following: Use open source tools for debugging and diagnostics. a. ARP/RARP protocols b. RIP routing protocols c. BGP routing d. OSPF routing protocols e. Static routes (check using netstat)	L1, L2	3
MODULE 4: 1. Configure DNS: Make a caching DNS client, and a DNS Proxy; implement reverse DNS and forward DNS, using TCP dump/Wireshark characterise traffic when the DNS server is up and when it is down. 2. Configure FTP Server on a Linux/Windows machine using a FTP client/SFTP client characterise file transfer rate for a cluster of small files 100k each and a video file of 700mb.Use a TFTP client and repeat the experiment	L1, L2, and L3	3
MODULE 5: 1. Configure a mail server for IMAP/POP protocols and write a simple SMTP client in C/C++/Java client to send and receive mails. 2. Implement Open NMS+ SNMPD for checking Device status of devices in community MIB of a linux PC. Using yellow pages and NIS/NFS protocols implement Network Attached Storage Controller (NAS). Extend this to serve a windows client using SMB. Characterise the NAS traffic using wireshark.	L1, L2	3

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. William Stallings, Cryptography & Network Security: Principles and Practices, Prentice Hall, 2005, (ISBN: 978-0131873162).

Reference Books

2.Behrouz A. Forouzan, Cryptography & Network Security, McGraw-Hill, 2007, USA. (ISBN: 0073327530 9780073327532).

3. Douglas R. Stinson, Chapman and Hall, Cryptography Theory & Practice, CRC Press, 2005.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	-	-	-	-	--	--	--	--	--	--	--	**1**	--	-	--
CO2	**1**	-	-	-	3	--	3	--	--	--	--	--	**1**	--	-	--
CO3	**1**	-	-	-	3	--	3	--	--	--	--	--	**1**	2	2	--
CO4	**1**	-	-	--	2	--	2	--	3	--	--	--	**2**	**1**	-	--
CO5	**1**	-	-	-	1	-	1	--	2	--	--	--	**2**	**1**	-	--

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AIE6713	CRYPTOGRAPHY & NETWORK SECURITY	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	2	1	0	3
Pre-requisites/Exposure	Basic Mathematics				
Co-requisites	Nil				

Catalog Description

In this course the concepts of cryptography and network security are discussed in detail. Substitution and transposition techniques, symmetric and asymmetric cryptographic algorithms, their applications, differences will be introduced. As a precursor to the study of cryptography studies will be made on impact of various network and web security protocols. The concepts learnt in the studies of cryptography & network security will be applied in the studies and analysis of authentication, integrity and security related protocols.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of cryptography & network security through problem solving and analytical approach.
2. Provide an overview of various network attacks and related security mechanism , various algorithms for modular arithmetic, symmetric and asymmetric cryptography and web and network security

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain, describe and distinguish various security attacks; Describe and solve block and stream ciphers and its applications in cryptography; Solve problems based on substitution and transposition ciphers.

CO2: Explain the basic mathematics of cryptography; Solve problems of groups, modular arithmetic ,gcd and inverse algorithm, chinese remainder theorem and its application in cryptography;Applying algorithms for solving problems in cryptography

CO3: Describing the concept of public key cryptosystems and its related algorithm; Explain and solve problems related to hash functions, digital signature and its applications in cryptography; Compare symmetric and asymmetric key cryptography.

CO4: Explain management,distribution,secure exchange of keys and authentication certificate and its applications in real life. Explain, compare various authentication protocols used in cryptography and network security, also solve problems based on these protocols.

CO5: Explain various security protocols: IPSec, SSL,TLS,SET; Describing malicious software's and illustrating various design approaches to Firewall.

Modules	Blooms level*	Number of hours

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MODULE 1: Introduction to security attacks, services and mechanism, Classical encryption techniques: substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers. Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard (DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES	L1, L2 and L3	7
MODULE 2: Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relativeprime numbers, Extended Euclidean Algorithm,Advanced Encryption Standard (AES) encryption and decryption, Fermat's and Euler's theorem, Primaliry testing, Chinese Remainder theorem, DiscreteLogarithmic Problem,Principals of public key crypto systems, RSA algorithm, security of RSA.	L1,L2, L3	6
MODULE 3: Message Authentication Codes: Authentication requirements, authentication functions, messageauthentication code, hash functions, birthday attacks, security of hash functions, Secure hash-algorithm (SHA)Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signaturestandards (DSS).	L1,L2, L3 and L5	7
MODULE 4: Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure. Authentication Applications: Kerberos	L1, L2 and L3	7
MODULE 5: IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Viruses and related threats, Firewalls	L1, L2	9

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. William Stallings,**"Cryptography & Network Security"**,4th Edition, Pearson Education,NewDelhi, 2017.
2. Behrouz A. Forouzan, "**Cryptography & Network Security**", 2ndEdition,Tata Mcgraw Hills,New Delhi, 2015

Reference Books

1. Douglas R.Stinsons, **"Cryptography Theory and Practice"**, 3rd Edition, McMillan Publications, Londan, 2003
2. Atul Kahate, **"Cryptography & Network Security"**, 3rd Edition, Tata Mcgraw Hills,New Delhi, 2017

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	1	1	--	--	--	--	--	--	--	--	--	1	1	3	-
CO 2	1	1	1	--	--	--	--	--	--	--	--	--	1	1	3	-
CO 3	1	1	1	--	-	--	--	--	--	--	--	--	1	1	3	-
CO 4	1	2	3	--	--	--	--	--	--	--	--	--	1	1	3	-
CO 5	1	2	3	--	--	--	--	--	--	--	--	--	2	2	3	-

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AIE6714	SYSTEM PROGRAMMING AND COMPILER CONSTRUCTION	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	1	0	4
Pre-requisites/Exposure	Fundamental concept of computer architecture and operating system and theory of automata				
Co-requisites	Basics of programming languages				

Catalog Description

This course includes the concept of system programming and compiler construction in which all the system applications and programming concepts will be discussed. All the phases of compiler construction will be discussed in detail with some brief description of context free grammar. Using Basic Parsing Techniques efficient Parsers can be constructed with the help of error detection and recovery techniques.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of system programming and working of system utilities.
2. Provide an overview of estimation of performance of compiler design in real time compilation with error handling techniques during compilation.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Describe the basics of compiler design and its co-relation with the subject computation theory of automation in terms of lexical analyzer.

CO 2: Explain the working of assembler and macro processor with all the phases of it. And also describe the concept of loader and other system utilities of system software at the time of program translation.

CO 3: Explain and differentiate the construction of parser through top-down and bottom up parsing techniques.

CO 4: Explain and analyze the automatic construction of different parsing table which do not allow any ambiguity and backtracking in the given grammar.

CO 5: Explain the process of syntax analyzer and identify any error occurs in this phase and also generate the three-address code the given grammar and the postfix translation.

Modules	Blooms level*	Number of hours
MODULE 1: **Introduction** Phases, FSM & RE's and their application to Lexical Analysis, Implementation of Lexical Analysers, The Syntactic specification of Languages: CFG, Derivation and Parse Trees, Capabilities of CFG.	L1 and L2	4

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MODULE 2: **System Programming** Editors: Introduction to system Programming Line editor, Full screen editor and multi window editor, First pass and second pass of assembler and their algorithms. Assemblers for CISC Machines: case study x85 & x86 machines. Bootstrapping for compilers, Introduction to. Design of a compiler in C++ as Prototype. Basic Macro Processor functions- Macro definition & expansion – Macro Processor Algorithm & Data Structures, conditional – Macro Expansion, Keyword Macro Parameters, Macro with in Macro Implementation, Linkers and Loaders Concept of linking. Case study of Linker in x86 machines. Loading of various loading schemes.Booting techniques and sub-routines.	L1 and L2	11
MODULE 3: **Basic Parsing Techniques** Parsers, Shift Reduce Parsing, Operator precedence parsing, topdown Parsing, Predictive Parsers.	L2, L3 and L4	9
MODULE 4: **Automatic Construction of efficient Parsers** LR Parsers, the canonical collection of LR(0) items, constructing SLR Parsing Tables, Constructing canonical LR Parsing tables and LALR parsing tables, An Automatic Parser Generator, Implementation of LR parsingTables, Constructing LALR sets of items.	L2, L3 and L4	8
MODULE 5: **Syntax Directed Translation** Syntax directed Translation Schemes, Implementation of Syntax directed translators,Intermediate Code, Postfix notation, Parse Trees and Syntax Trees, Three address Code, Quadruple & Triples, Translation of Assignment Statements, Postfix Translation.	L2 and L3	9
MODULE 6: **Error detection and Recovery** Lexical phase errors, syntax phase errors, semantic errors Code Optimization: Loop optimization, the DAG representation of basic blocks, value numbers and Algebraic Laws, Global Data – Flow Analysis.	L1, L2 and L3	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Alfread V. Aho, Ravi Sethi & J.D. Ullman, "Compiler Design", Addison Wesley
2. Ullman, Principles of Compiler Design, Narosa publications.
3. Donovan J.J., Systems Programming, New York, Mc-Graw Hill, 1972.

Reference Books

1. Dhamdhere, D.M., Introduction to Systems Software, Tata Mc-Graw Hill 1996.
2. D.M. Dhamdhere, "Compiler Construction – Principles & Practice", Macmillan India Ltd.
3. Holub, "Compiler Design in C", PHI.
4. Tremblay K.P & Sorenson P.G., "The Theory and practice of Compiler writing" McGraw Hill

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--
CO 2	1	--	2	--	--	--	--	--	--	--	--	--	--	1	--	--
CO 3	--	--	1	--	--	--	--	--	--	--	--	--	--	2	1	--
CO 4	--	--	1	2	--	--	--	--	--	--	--	--	--	2	1	--
CO 5	--	--	1	--	--	--	--	--	--	--	--	--	2	1	--	
CO 6	2	2	3	--	--	--	--	--	--	--	--	--	2	1	--	3

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AIE6716	SYSTEM PROGRAMMING & COMPILER CONSTRUCTION LAB	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	0	0	2	1
Pre-requisites/Exposure	concept of pointer and file handling of C/C++ programming languages				
Co-requisites	NIL				

Catalog Description

In this Lab course the concept of system programming and compiler construction are implemented and demonstrated. Concepts covered would enable them to create and solve complex problems. Problems or programs will be related to concepts of assembler, macro processor, text editor and parser.

Course Objectives

The objective of this course is to

1.
2. Make the students apply knowledge of various system programming concepts such as assembler, macro processor and text editor.
3. Provide a demonstration of compiler concepts like parsing techniques and implementation.

Course Outcomes

On completion of this course, the students will be able to

CO1: Apply the knowledge of regular languages and context free grammar.
CO2: Demonstrate the use of lexical analyzer and concept of editors.
CO3: Apply the knowledge of compiler design to covert the given expression into acceptable form of compiler.
CO4: Demonstrate the concept of assemble and macro-processor and their calling and expansion.
CO5: Demonstrate and apply the knowledge of compiler parsing techniques to construct parse tree for the given expression.

Modules/Topics Covered**	Blooms level*	Number of hours
1. Sample Programs using the theory of computation concepts of regular language. (a) WAP to check whether string is accepted or not for entered grammar. (b) WAP to convert NFA to DFA. (c) WAP to convert Regular Expression to NFA.	L3, L5	6
2. Sample Programs using context free grammar and editors (a) WAP to find no of Tokens in an expression. (b) Write a program to implement Text Editor.	L3, L5	4

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3. Sample Programs using the notation conversion and their usage in parsing. (a) WAP to convert Infix to Postfix notation. (b) WAP to convert Infix to Prefix notation.	L3, L5	2
4. Sample Programs using the concept of assemble and macro processor (a) Write a program to implement Assembler Pass one and Pass two. (b) Write a program to implement Macro-processor.	L3, L5	4
5. Sample Programs using the compiler parsing techniques (a) WAP to implement symbol table. (b) WAP calculate FIRST and FOLLOW of a grammar. (c) WAP to implement shift reduce parser.	L3, L5	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

1. Alfread V. Aho, Ravi Sethi & J.D. Ullman, "Compiler Design", Addison Wesley
2. Ullman, Principles of Compiler Design, Narosa publications.
3. Donovan J.J., Systems Programming, New York, Mc-Graw Hill, 1972.

Reference Books

1. Dhamdhere, D.M., Introduction to Systems Software, Tata Mc-Graw Hill 1996.
2. D.M. Dhamdhere, "Compiler Construction – Principles & Practice", Macmillan India Ltd.
3. Holub, "Compiler Design in C", PHI.
4. Tremblay K.P & Sorenson P.G., "The Theory and practice of Compiler writing" McGraw Hill

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	**70**
Weightage (%)	5	10	10	5	

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	1	--	--	--	--	--	--	--	--	--	--	1	--	--	--
CO 2	2	1	--	--	--	--	--	--	--	--	--	--	2	1	--	--
CO 3	2	3	1	--	--	--	--	--	--	--	--	--	3	2	1	--
CO 4	3	1	2	--	--	--	--	--	--	--	--	--	2	--	1	--
CO 5	--	3	1	--	--	--	--	--	--	--	--	--	3	2	3	--

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AIE6708	MATLAB PROGRAMMING	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	0	0	4	2
Pre-requisites/Exposure	C Programming				
Co-requisites	Basic knowledge of Programming				

Catalog Description

The objective of this course is to expose the students to the implementation techniques of Mat Lab Programming.

Course Objectives

The objective of this course is to

1. To understand the basic concepts and terminology related to Mat Lab.
2. Application of Mat Lab in field of Signal Processing and Control systems.

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand the basics of Matlab programming environment.

CO2. Analysis of given LTI System and verifying its physical reliability and stability properties.

CO3. Waveform synthesis using Laplace Transforms and z-transform of a given signal and system.

Modules	Blooms level*	Number of hours
1. To write a MATLAB program to perform some basic operation on matrices such as addition, subtraction, multiplication. 2. To write a "MATLAB" Program to generate various signals and sequences, such as unit impulse, unit step, unit ramp, sinusoidal, square, saw tooth, triangular, sinc signals. 3. To performs operations on signals and sequences such as addition, multiplication, scaling, shifting, folding, computation of energy and average power. 4. Write a program for finding even and odd parts of sequences Using MATLAB Software& program for finding real and imaginary parts of sequences Using MATLAB Software.	L1, L2 and L3	8
5. Write a program to find the out put with linear convolution operation Using MATLAB Software 6. Write a program to compute auto correlation and cross correlation between signals and Sequences. 7. Write a program to compute linearity and time invariance properties of a given continuous /discrete System.	L1,L2,l3	6

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8. Write a program to Unit Step And Sinusoidal Response Of The Given LTI System And Verifying Its physical reliability and stability properties. 9. Write a program to demonstrate Gibbs Phenomenon using MATLAB. 10. Write a program to obtain Fourier Transform and Inverse Fourier Transform of a given signal / sequence and to plot its Magnitude and Phase Spectra **11.** Write a program to perform waveform synthesis using Laplace Transforms of a given signal.	L1, L2 and L3	8
12. Write a program to locating the zeros and poles and plotting the pole zero maps in s-plane and z-plane 13. for the given transfer function. 14. Write a program to Generate Gaussian Noise and to Compute its Mean, M.S. Values, Skew, kurtosis, 15. PS and PDF 16. Write a program to demonstrate Sampling Theorem and aliasing effect using MATLAB. 17. Write a program for removal of noise by auto correlation/cross correlation.	L1, L4	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

Amos Gilat, "MATLAB: An Introduction with Applications", Wiley; Fourth edition (2012)4ed.

Reference Books

1. Bansal, Goel and Sharma, MATLAB and its Applications in Engineering"Pearson Education India; Second edition (1 March 2016).

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	**2**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO 2	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO 3	**1**	**3**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	**3**	--

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AIE6735	SUMMER INTERNSHIP EVALUATION-II	L	T	P	C
Version: 2020.1	Date of Approval: JULY 2020	0	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The objective of this course is to provide practical training on some live projects that will increase capability to work on actual problem in industry. This training may undergo in an industrial environment or may be an in-house training on some latest software which is in high demand in market. This training will be designed such that it will useful for their future employment in industry.

Course Objectives

The objective of this course is to

1. Provide practical training on live projects
2. Increase technical capabilities on solving real life problems in company environment

Course Outcomes

On completion of this summer internship, the students will be able to:

CO1: Develop communication, interpersonal and other critical skills in the job interview process.

CO2: Design and develop software and hardware projects

CO3: Assess interests and abilities in their field of study.

CO4: Demonstrate excellent technical and communication skills to acquire employment contacts leading directly to a full-time job following graduation from college.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	1	2	2	--	--	--	1	--	--	--	1	1	1	1
CO2	1	1	2	2	2	--	--	--	1	--	--	--	1	1	1	1
CO3	1	1	2	3	2	--	--	--	1	--	--	--	1	1	1	1
CO4	1	1	2	2	2	--	--	--	1	--	--	--	1	1	1	1

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AIE6737	MINOR PROJECT-II	L	T	P	C
Version: 2020.1	Date of Approval: JULY 2020	0	0	0	2
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The objective of this course is to provide practical training on some live/demo projects that will increase capability to work on actual problem in industry. It will be an in house training on some latest software which is in high demand in market. This training will be designed such that it will useful for their future employment in industry.

Course Objectives

The objective of this course is to

1. Provide practical training on live projects
2. Increase technical capabilities on solving real life problems in company environment

Course Outcomes

On completion of this minor project, the students will be able to:

CO1: Demonstrate a sound technical knowledge of their selected project topic.
CO2: Design and develop engineering solutions to complex problems utilising a systems approach.
CO3: Analyse various approaches for solving a complex engineering problem using different tools and techniques
CO4: Demonstrate the knowledge, skills and attitudes of a professional engineer.
CO5: Apply technical skills and knowledge in completing the project.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**2**	--	--	--	--	--	--	**1**	--	--	--	--	--	**1**	**1**
CO2	**1**	**1**	--	--	--	--	--	--	**1**	--	--	--	--	--	**1**	**1**
CO3	**1**	**1**	--	--	--	--	--	--	**1**	--	--	--	--	--	**1**	**1**
CO4	**1**	**1**	--	--	--	--	--	--	**1**	--	--	--	--	--	**1**	**1**
C05	**1**	**1**	--	--	--	--			**1**	-	-	-	--	--	**1**	**1**

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AIE6710	MOBILE COMPUTING	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure	Basic Networking				
Co-requisites	Nil				

Catalog Description

The objective of this consortium is to shape and expand a full-scale and sound mobile computing system market. To achieve this, cooperation is required of interests related to communication (network), computer hardware/software, system integrators (including service providers), and the media.

Course Objectives

The objective of this course is to

1. Give a general overview of the cellular technology and the associated terms and discuss the generations of the mobile technologies starting from 1G to 3G techniques.
2. Illustrate the GPRS and WAP model for 2G internet connectivity in detail.
3. Elaborate the third-generation mobile services
4. Describe the Global Mobile Satellite Systems in detail and basic architecture of Bluetooth technology and advanced topics in mobile computing.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the basic concepts mobile technology, computing and basic architecture of PCS and GSM.

CO2: Describe the mobile networking Infrastructure through 2G technologies (GSM, GPRS, WAP).

CO3: Explain the basic concepts of 3G technologies (WCDMA, CDMA 2000) and WLL.

CO4: Discuss the working of mobile satellite systems like IRIDIUM and GLOBALSTAR.

CO5: Explain the concepts of Bluetooth technology, its working and protocols, virtual networks and enterprise networks.

Modules	Blooms level*	Number of hours
Module I: Introduction to Personal Communications Services (PCS) PCS Architecture, Mobility management, Networks signalling. Global System for Mobile Communication (GSM) system overview: GSM Architecture, Mobility management, Network signalling.	L1, L2 and L3	8

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Module II: General Packet Radio Services (GPRS) &Wireless Application Protocol (WAP) GPRS Architecture, GPRS Network Nodes. Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 standard, Mobile IP. Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, wireless mark up Languages (WML).	L1,L2	10
Module III: Third Generation (3G) Mobile Services Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G. Wireless Local Loop (WLL): Introduction to WLL Architecture, wireless Local Loop Technologies.	L1, L2	7
Module IV: Global Mobile Satellite Systems Global Mobile Satellite Systems; case studies of the IRIDIUM and GLOBALSTAR systems.	L1, L2	7
Module V: Enterprise Networks Introduction to Virtual Networks, Blue tooth technology, Blue tooth Protocols. Advanced techniques in mobile computing.	L1, L2	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. "Wireless and Mobile Networks Architectures", by Yi-Bing Lin & Imrich Chlamtac, John Wiley & Sons, 2001.
2. "Mobile and Personal Communication systems and services", by Raj Pandya, Prentice Hall of India, 2001.

Reference Books

1. "Wireless Web Development", Ray Rischpater, Springer Publishing, 2000.
2. "The Wireless Application Protocol", by Sandeep Singhal, Pearson Education Asia, 2000.
3. "Third Generation Mobile Telecommunication systems", by P.Stavronlakis, Springer Publishers, 2001.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**2**	**2**	--	--	--	--	--	--	--	--	--	**1**	**-**	**3**	**-**
CO2	**1**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**-**	**3**	--
CO3	**1**	**2**	**-**	--	**-**	--	--	--	--	--	--	--	**1**	**-**	--	--
CO4	**1**	**2**	**-**	--	--	--	--	--	--	--	--	--	**1**	**-**	--	--
CO5	**1**	**2**	**3**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--

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AIE6717	ROBOTIC PROCESS AUTOMATION DESIGN & DEVELOPMENT	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure	Basic Networking Concepts				
Co-requisites	Nil				

Catalog Description

This course aims at providing knowledge of basic concepts of Robotic Process Automation to University students. It further builds on these concepts and introduces key RPA Design and Development strategies and methodologies specifically in context of UiPath products. The student undergoing the course shall develop the competence to design and develop a robot for a defined process.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of robotic process automation
2. Provide an overview of designing with uipath software.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain key terms and trends around the robotic process automation along with its physical and logical design

CO2: Understand the potential and value of the robotic process automation .

CO3: Describe the technologies used for the robotic process automation and mobile devices, including (passive and active) sensors, the physical communications layer, communications protocols, programming frameworks,.

CO4: Design programs and have hands on experience on uipath software

CO5:Develop RPA programs of moderate complexity for a well-used robotic automation process using uipath.

Modules	Blooms level*	Number of hours
Module 1: Programming Basic and Recap **Programming Concepts Basics I -** Understanding the application, Basic Web Concepts, Protocols, Email Clients, Data Structures, Data Tables, Algorithms, Software Processes, Software Design, SDLC. **Programming Concepts Basics 2-** Scripting, Net Framework, Net Fundamentals, XML, Control structures and functions, XML, HTML, CSS, Variables& Arguments.	L1, L2	8

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Module II: RPA Concepts **RPA Basics -** History of Automation, what is RPA, RPA vs Automation, Processes & Flowcharts, Programming Constructs in RPA, What Processes can be Automated, Types of Bots, Workloads which can be automated. **RPA Advanced Concepts -** Standardization of processes, RPA Development methodologies, Difference from SDLC, Robotic control flow architecture, RPA business case, RPA Team, Process Design Document/Solution Design Document, Industries best suited for RPA, Risks & Challenges with RPA, RPA and emerging ecosystem	L2, L3 and L4	8
Module III: UiPath Introduction & Basics **Introduction to UiPath-** Installing UiPath Studio community edition, The User Interface, KeyboardShortcuts,AboutUpdating,AboutAutomationProjects,IntroductiontoAutomation Debugging, Managing Activation Packages, Reusing Automations Library, Installing the Chrome Extension, Installing the Firefox Extension, Connecting your project to a source control system, Activities Guide. **Variables**, **Control Flow** **DataManipulation-**Data Manipulation Introduction ,Scalarvariables ,collections and Tables, Text Manipulation, Data Manipulation, Gathering and Assembling Data. **Recording and Advanced UI Interaction -** Recording Introduction, Basic and Desktop Recording, Web Recording, Input/Output Methods, Screen Scraping, Data Scraping, Scraping advanced techniques. Selectors.	L2, L3 and L4	8
Module IV: UiPath Advanced Automation concepts and techniques Image, Text & Advanced Citrix Automation- Introduction to Image & Text Automation, Image based automation, Keyboard based automation, Information Retrieval, Advanced Citrix Automation challenges, Best Practices, using tab for Images, Starting Apps. Excel Data Tables & PDF - Data Tables in RPA, Excel and Data Table basics, Data Manipulation in excel, Extracting Data from PDF, extracting a single piece of data, Anchors, Using anchors in PDF. Email Automation- Email Automation, Incoming Email automation, Sending Email automation	L2, L3 and L4	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

"Learning Robotic Process Automation" By Alok Mani Tripathi,Packt Publications,Ist Edition,2018

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**--**	**--**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**1**	**1**	**-**	**-**
CO2	**1**	**--**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**-**	**1**	**-**	**-**
CO3	**1**	**--**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**-**	**1**	**-**	**2**
CO4	**1**	**--**	**--**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**-**	**2**

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AIE6718	RESPONSIVE WEB DESIGN	L	T	P	C
Version : 2020.1	Date of Approval: JULY 2020	2	0	0	2
Pre-requisites/Exposure	knowledge of website design				
Co-requisites	NIL				

Catalog Description

This course is aimed to provide a fundamental understanding of JavaScript and two of its related library: Bootstrap and React for dynamic web site client side scripting. Javascript is a famous scripting language for client side. The bootstrap and react libraries are rich API for creating dynamic websites. The course builds strong foundation for client-side scripting for creating dynamic websites

Course Objectives

The objective of this course is

1. Equip the students with basic and advanced features of javascript and bootstrap library to create dynamic web sites
2. Provide an overview of basic features of react library to design dynamic websites.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define the and explain concept of responsive web design and responsive content.

CO2 Explain HTML and CSS contents for responsive websties; Design and Create responsive websites using html, css and media queries.

CO3: Explain the concept of responsive workflow and working with responsive web design tools; Creating responsive websites that work on variety of devices.

CO4: Designing responsive websites using the concepts of typography, navigation and header layout; Evaluating performance of responsive websites .

Modules	Blooms level*	Number of hours
Module 1: Foundations of responsive design **What Is Responsive Design?:** Just the Basics ,A Short History, Why Responsive Design **Responsive Content:** Content Strategy ,Managing Content, Developing Content, Content Parity, Content Governance, Adaptive Content	L2 and L3	8

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Module 2: Creating Responsive Websites **HTML for Responsive Sites:** Working with HTML, Basic Page Structure Viewport, Structural Elements, Creating a Page, Clean and Semantic HTML **CSS for Responsive Sites:** How CSS Works,Versions of CSS, Where CSS Goes, The Cascade, Using the Cascade, Comments, Organizing Your Stylesheet, The Box Model, display, Positioning, float and clear, Basic Styles **Media Queries:** What's a Media Query? Media Query Structure, Using Media Queries in Stylesheet Links, Other Ways to Use Media Queries, What We Can Query, Browser Support, Breakpoints, Design Ranges, Designing Responsively, Using Media Queries, Two-Column Layout, Setting a Maximum Width, How to Choose Breakpoints Images: Ways to Display Images, Alt Text, Image File Formats, Optimizing Images, Content Images, Background Images Responsive Images	L2 and L3	8
Module 3: Working Responsively **Responsive Workflow:** Strategy and Planning, Content Before Layout Thinking About Layout, Prototypes, Visual Design, Responsive Design Tools, Selling Responsive Design, Working with Clients **Mobile and Beyond:** User Experience , Device-Agnostic Design, Focusing on Mobile First, Do What You Can, Types of Devices, Touch, Screen Size, Accessibility (Universal Design), Deciding Which Devices to Support Why Use Real Devices for Testing, Testing	L2 and L3	8
Module 4:Designing Responsive Websites **Typography:** Start with HTML, Typefaces, Using Fonts, Sizing Text, Line Length, Whitespace, Margins and Padding, Changing Typeface for Screen Size **Navigation and Header Layout**: Responsive Navigation , Branding, Navigation Links, Navigation Patterns, Header **Performance:** Why Performance Matters, Performance as Design ,How Web Pages Are Loaded and Rendered, Measuring Performance Cleaning Up Your Code, Minimizing HTTP Requests, Server Stuff JavaScript, CSS, Hosting, Conditionally Loading Content, Reflows and Repaints, RESS	L2and L3	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books:

1. "Learning Responsive Web Design A Beginner's Guide",Clarissa Peterson, Orielly, 2014

Reference Books:

1. "Responsive Web Design with HTML5 and CSS3",Ben Frain, Packt, 2012
2. "Responsive Web Design by Example", Farhaan Hussain, Packt, 2017

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/ Q	HA	EE

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Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS O 1**	**PS O 2**	**PS O 3**	**PS O 4**
CO 1	--	**1**	**1**	--	**1**	--	--	--	--	**1**	--	--	**1**	--	--	--
CO 2	--	**1**	**2**	--	**2**	--	--	--	--	**1**	--	--	**1**	--	--	--
CO 3	--	**1**	**1**	--	**1**	--	--	--	--	**2**	--	--	**1**	--	--	--
CO 4	--	**1**	**2**	--	**1**	--	--	--	--	**2**	--	--	**1**	--	--	--

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AIE6719	RESPONSIVE WEB DESIGN LAB	L	T	P	C
Version : 2020.1	Date of Approval: JULY 2020	0	0	2	1
Pre-requisites/Exposure	Knowledge of website design				
Co-requisites	NIL				

Catalog Description

This course is aimed to provide a fundamental understanding of JavaScript and two of its related library: Bootstrap and React for dynamic web site client side scripting. Javascript is a famous scripting language for client side. The bootstrap and react libraries are rich API for creating dynamic websites. The course builds strong foundation for client-side scripting for creating dynamic websites

Course Objectives

The objective of this course is

1. Equip the students with basic and advanced features of javascript and bootstrap library to create dynamic web sites
2. Provide an overview of basic features of react library to design dynamic websites.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define the and explain concept of responsive web design and responsive content.

CO2 Explain HTML and CSS contents for responsive websties; Design and Create responsive websites using html, css and media queries.

CO3: Explain the concept of responsive workflow and working with responsive web design tools; Creating responsive websites that work on variety of devices.

CO4: Designing responsive websites using the concepts of typography, navigation and header layout; Evaluating performance of responsive websites .

Modules	Blooms level*	Number of hours
Module 1: Foundations of responsive design **Programs based on:** • Content Strategy ,Managing Content, • Developing Content, Content Parity, • Content Governance, Adaptive Content	L2 and L3	3

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Module 2: Creating Responsive Websites **Programs based on:** • Working with HTML, Basic Page Structure Viewport, Structural Elements, Creating a Page, Clean and Semantic HTML • The Cascade, Using the Cascade, Comments, Organizing Your Stylesheet, The Box Model, display, Positioning, float and clear, Basic Styles • Media Query Structure, Using Media Queries in Stylesheet Links, Other Ways to Use Media Queries, • What We Can Query, Browser Support, Breakpoints, Design Ranges, Designing Responsively, Using Media Queries, Two-Column Layout, Setting a Maximum • Width, How to Choose Breakpoints Images: Ways to Display Images, Alt Text, Image File Formats, Optimizing Images, Content Images, Background Images Responsive Images	L2 and L3	3
Module 3: Working Responsively **Programs based on:** • **Responsive Workflow**, Visual Design, Responsive Design Tools, Selling Responsive Design, Working with Clients • **Mobile and Beyond:** User Experience , Device-Agnostic Design, Focusing on Mobile First, Do What You Can, • Types of Devices, Touch, Screen Size, Accessibility (Universal Design), Deciding Which Devices to Support Why Use Real Devices for Testing, Testing	L2 and L3	3
Module 4:Designing Responsive Websites • **Typography:** Start with HTML, Typefaces, Using Fonts, Sizing Text, Line Length, Whitespace, Margins and Padding, • Changing Typeface for Screen Size • **Navigation and Header Layout**: Responsive Navigation , Branding, Navigation Links, Navigation Patterns, Header • **Performance:** Why Performance Matters, Performance as Design ,How Web Pages Are Loaded and Rendered, • Measuring Performance Cleaning Up Your Code, Minimizing HTTP Requests, Server Stuff JavaScript, CSS, Hosting, Conditionally Loading Content, Reflows and Repaints, RESS	L2and L3	3

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books:

1. "Learning Responsive Web Design A Beginner's Guide",Clarissa Peterson, Orielly, 2014

Reference Books:

1. "Responsive Web Design with HTML5 and CSS3",Ben Frain, Packt, 2012
2. "Responsive Web Design by Example", Farhaan Hussain, Packt, 2017

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

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Components	A	CT	S/V/ Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2	PS O 3	PS O 4
CO 1	--	1	1	--	1	--	--	--	--	1	--	--	1	--	--	--
CO 2	--	1	2	--	2	--	--	--	--	1	--	--	1	--	--	--
CO 3	--	1	1	--	1	--	--	--	--	2	--	--	1	--	--	--
CO 4	--	1	2	--	1	--	--	--	--	2	--	--	1	--	--	--

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AIE6809	RESEARCH METHODOLOGY AND TECHNICAL REPORT WRITING	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	2	0	0	2
Pre-requisites/Exposure	NIL				
Co-requisites	NIL				

Catalogue Description

This course deals with types of research, significance and characteristics and planning a research proposal, population and sample, parameter and statistic, sampling and data collection, sampling design: steps, types, sample size, sampling methods. It deals with univariate, bivariate and multivariate analysis, measure of dispersion of data, standard deviation, variance, coefficient of variation and degree of freedom. Hypothesis testing: parametric tests and non-parametric tests, regression analysis and curve fitting, method of least-squares, explained and unexplained variations, coefficient of correlation of determination. The course also deals with technical/scientific/research report writing: referencing and bibliography and footnotes. Publication of research papers, citations, intellectual property rights and copy rights, plagiarism, patent and patent laws, commercialization and ethical issues.

Course Objectives

The objective of this course is to:

1. Deals with types of research, significance and characteristics and planning a research proposal and to enhance scientific and technical writing and research skills.
2. Impart knowledge about various stages of research process, statistical analysis and tools & their applications in decision making by hypothesis testing and regression analysis.
3. It also deals with intellectual property rights and copy rights, plagiarism, patent and patent laws, commercialization and ethical issues.

Course Outcomes

On completion of this course, the students will be able to:

CO1. Classify different research types, explain steps in research process and planning research proposal.

CO2. Describe sampling methods, sampling steps and design, carry out data processing and analysis.

CO3. Explain hypothesis testing, parametric and non-parametric tests, carry out regression analysis, curve fitting.

CO4. Demonstrate technical and scientific report writing skills, describe plagiarism, patent laws and intellectual property rights.

Course Content

Modules	Blooms level*	Number of hours

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Module I: Introduction and Research Planning Introduction to research: Definition, motivation, need, objectives, significance and characteristics of research; types of research; steps in research process; planning a research proposal; literature review, web searching.	L1, L2	**4**
Module II: Sampling Methods Measurement scales, population and sample, parameter and statistic, sampling and data collection, sampling design: steps, types, sample size, sampling methods, data processing and analysis. Sampling surveys and questionnaire designing, primary and secondary data.	L1, L2, L3	**5**
Module III: Hypothesis Testing and Regression Analysis Univariate, bivariate and multivariate analysis, means-arithmetic, geometric and harmonic; measure of dispersion of data, standard deviation, variance, coefficient of variation and degree of freedom. Hypothesis testing: kinds errors in hypothesis testing, significance and confidence levels, parametric tests and non-parametric tests, one-tailed and two-tailed tests, analysis of variance. Regression analysis and curve fitting, method of least-squares, explained and unexplained variations, coefficient of correlation of determination.	L1, L3, L4	**10**
Module IV: Technical Report Writing and Plagiarism Technical/scientific/research report writing: structure and components of scientific reports, formats of dissertations, research report, report writing skills, report preparation, referencing and bibliography and footnotes. Publication of research papers, citations, making presentation-use of visual aids and PPTs. Intellectual property rights and copy rights, plagiarism, patent and patent laws, commercialization and ethical issues.	L1, L3, L4	**5**

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books:

- Blake, G. and Bly, R.W. The Elements of Technical Writing. MacMillan, New York, 1993.
- Chawla, D and Sondhi, N. Research Methodology- Concepts and Cases. Vikas Publishing House PVT LTD. New Delhi, 2016.
- Kothari, C.R. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi. 2008.

Reference Books:

- Montomery, Douglas C, Design and Analysis of Experiments, 5th Ed, Wiley India.2005.
- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt.Ltd., New Delhi, 2009
- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd, Delhi, 2009.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3	PSO4
CO1	1	1	2	2	3	-	-	-	-	-	-	1	3	1	2	-
CO2	1	3	1	3	3	-	-	-	-	-	-	1	3	1	2	-
CO3	1	3	1	-	-	-	-	-	-	-	-	1	3	3	2	-
CO4	1	3	2	-	3	-	-	-	-	-	-	1	3	1	2	3
CO5	2	1	1	-	-	-	-	-	-	-		1	3	1	2	-

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AIE6837	MAJOR PROJECT	L	T	P	C
Version: 2020.1	Date of Approval: JULY 2020	0	0	0	8
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The objective of this course is to provide practical training on some live/demo projects that will increase capability to work on actual problem in industry. It will be an in house training on some latest software which is in high demand in market. This training will be designed such that it will useful for their future employment in industry.

Course Objectives

The objective of this course is to

1. Provide practical training on live projects
2. Increase technical capabilities on solving real life problems in company environment

Course Outcomes

On completion of this summer internship, the students will be able to:

CO1: Demonstrate a sound technical knowledge of their selected project topic.

CO2: Design and develop engineering solutions to complex problems utilising a systems approach.

CO3: Analyse various approaches for solving a complex engineering problem using different tools and techniques

CO4: Demonstrate the knowledge, skills and attitudes of a professional engineer.

CO5: Apply technical skills and knowledge in completing the project.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	--	--	--	--	--	1	--	--	--	--	--	1	1
CO2	1	1	--	--	--	--	--	--	1	--	--	--	--	--	1	1
CO3	1	1	--	--	--	--	--	--	1	--	--	--	--	--	1	1
CO4	1	1	--	--	--	--	--	--	1	--	--	--	--	--	1	1
C05	1	1	--	--	--	--			1	-	-	-	--	--	1	1

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RBE6801	FUNDAMENTALS OF ROBOTIC SYSTEM AND ROBOT PROGRAMMING	L	T	P	C
Version 2020.1	Date of Approval: JUY 2020	3	0	0	3
Pre-requisites/Exposure	Basic knowledge of control system and programming				
Co-requisites	Nil				

Catalog Description
Enlighten the students about the fundamentals of robotic systems make them to understand the basics of robot, robot transformations and sensors, micro/nano robotic systems and to program them for functioning.

Course Objectives
The objective of this course is to
1. Equip the students with the basic knowledge and designing of robotics.
2. Implement their concept in robotics and design robot for various applications of engineering.

Course Outcomes
On completion of this course, the students will be able to
CO1: Explain and Understand the design and functionality of robots
CO2: Describe the control system with the help of sensor and robot transformations.
CO3:Undersand and robot cell design and implement in micro/nano robotics system
CO4: Explain and Understand the robotic programming language and use in design of robot.

Modules	Blooms level*	Number of hours
MODULE 1: INTRODUCTION Robot anatomy-Definition, law of robotics, History and Terminology of Robotics-Accuracy and repeatability of Robotics-Simple problems-Specifications of Robot-Speed of Robot-Robot joints and links-Robot classifications-Architecture of robotic systems-Robot Drive systems-Hydraulic, Pneumatic and Electric system.	L1 and L2	5
MODULE 2: END EFFECTORS AND ROBOT CONTROLS Mechanical grippers-Slider crank mechanism, Screw type, Rotary actuators, cam type-Magnetic grippers-Vacuum grippers-Air operated grippers-Gripper force analysis-Gripper design-Simple problems-Robot controls-Point to point control, Continuous path control, Intelligent robot-Control system for robot joint-Control actions-Feedback devices-Encoder, Resolver, LVDT-Motion Interpolations-Adaptive control.	L1, L2 and L3	7

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MODULE 3: ROBOT TRANSFORMATIONS AND SENSORS Robot kinematics-Types- 2D, 3D Transformation-Scaling, Rotation, Translation- Homogeneous coordinates, multiple transformation-Simple problems. Sensors in robot – Touch sensors-Tactile sensor – Proximity and range sensors – Robotic vision sensor-Force sensor-Light sensors, Pressure sensors.	L1 and L2	5
MODULE 4: ROBOT CELL DESIGN AND MICRO/NANO ROBOTICS SYSTEM Robot work cell design and control-Sequence control, Operator interface, Safety monitoring devices in Robot-Mobile robot working principle, actuation using MATLAB, NXT Software Introductions-Robot applications- Material handling, Machine loading and unloading, assembly, Inspection, Welding, Spray painting and undersea robot. Micro/Nanorobotics system overview-Scaling effect-Top down and bottom up approach- Actuators of Micro/Nano robotics system-Nanorobot communication techniques-Fabrication of micro/nano grippers-Wall climbing micro robot working principles-Biomimetic robot-Swarm robot-Nanorobot in targeted drug delivery system.	L1, L2, L3,L4 and L5	8
MODULE 5: BASICS OF ROBOT PROGRAMMING Robot programming-Introduction-Types- Flex Pendant- Lead through programming, Coordinate systems of Robot, Robot controller- major components, functions-Wrist Mechanism-Interpolation-Interlock commands-Operating mode of robot, Jogging-Types, Robot specifications- Motion commands, end effectors and sensors commands.	L1, L2 and L3	5
MODULE 6: VAL,VAL-II, RAPID AND AML LANGUAGE Robot Languages-Classifications, Structures- VAL- language commands motion control, hand control, program control, pick and place applications, palletizing applications using VAL, Robot welding application using VAL program-WAIT, SIGNAL and DELAY command for communications using simple applications. RAPID- language basic commands- Motion Instructions-Pick and place operation using Industrial robot- manual mode, automatic mode, subroutine command based programming. Move-master command language- Introduction, syntax, simple problems. VAL-II programming-basic commands, applications- Simple problem using conditional statements-Simple pick and place applications-Production rate calculations using robot. AML Language-General description, elements and functions, Statements, constants and variables-Program control statements-Operating systems, Motion, Sensor commands-Data processing.	L1, L2 and L3	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Craig. J. J. "Introduction to Robotics mechanics and control", Addison- Wesley,1999.

Reference Books

1. S.R. Deb, Robotics Technology and flexible automation, Tata McGraw-Hill Education., 2009

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2. Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, Technology programming and Applications, McGraw Hill, 2012
3. Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, Robotics Engineering an Integrated Approach, Phi Learning.,
4. 2009.
5. Deb. S. R. "Robotics technology and flexible automation", Tata McGraw Hill publishing company limited, 1994
6. Mikell. P. Groover, "Industrial Robotics Technology", Programming and Applications, McGraw Hill Co, 1995.
7. Klafter. R.D, Chmielewski.T.A. and Noggin's., "Robot Engineering : An Integrated Approach", Prentice Hall of India Pvt. Ltd.,1994.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	1	2	1	3	--	--	--	--	--	--	-	1	2	-
CO2	1	1	2	1	1	--	--	--	--	--	--	--	1	--	-	3
CO3	1	2	1	1	1	3	--	--	--	--	--	--	1	2	-	-
CO4	1	2	2	2	3	3	--	--	--	--	--	--	-	--	2	3

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RBE6802	ADVANCED CONTROL SYSTEMS & DRIVES FOR ROBOTS	L	T	P	C
Version 2020.1	Date of Approval: JUY 2020	3	0	0	3
Pre-requisites/Exposure	Basic concepts of control system				
Co-requisites					

Catalog Description
This course provides comprehensive and insight knowledge of Digital control systems. Objective of the course is to provide the students the core knowledge of Stability theory of Digital systems and State Variable analysis of Digital System

Course Objectives
The objective of this course is to

- Equip the students with concepts of basic control system and its stability.
- Provide a thorough understanding of control system model by considering standard examples.
- Give an insight of state variable methods for control systems.

Course Outcomes
On completion of this course, the students will be able to
CO1: Explain the fundamentals of a digital control system.
CO2: Apply the standard methods to check the stability of a control system.
CO3: Design model for digital control system for an application with given requirements.
CO4: Analyze the analog and digital control systems using state variable method.

Modules	Blooms level*	Number of hours
Module 1: **Introduction** Configuration of the basic Digital Control Systems, types of sampling operations, Sample and Hold operations, Sampling theorem, Basic discrete time signals.	L1,L2,L4	12
Module 2: **Stability Methods** Mapping between s-plane and z-plane, stability methods: Modified Routh Criterion, Jury's method, modified Schur-Cohn criterion.	L3	6
Module 3: **Models Of Digital Control Systems** Digital temperature control System, Digital position control system, stepping motors and their control. Design of Digital compensator using frequency response plots.	L5	6

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Module 4: **Control Systems Analysis Using State Variable Methods** State variable representation, conversion of state variable models to transfer function and vice-versa, Eigen values and eigen vectors, Solution of state equations, Concepts of controllability and observability.	L3	6
Module 5: **State Variable Analysis Of Digital Control Systems** State variable description of digital control systems, conversion of state variable models to pulse transfer function and vice versa, solution of state difference equations, controllability and observability.	L3	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. M. Gopal, Digital Control and State Variable Methods,4th edition, Tata Mc-Graw-Hill.
2. K.Ogata, Discrete Time Control Systems, Pearson Education, (Singapore) (Thomson Press India).
3. B.C Kuo, Digital Control Systems, Prentice Hall.

Reference Books

1. I.J. Nagrath & M.Gopal, Control System Engg., John Wiley & sons.
2. K.K. Aggarwal, Control System Analysis and Design, Khanna Publishers.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS O 1**	**PS O 2**	**PS O 3**	**PS O 4**
CO 1	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--
CO 2	**1**	--	--	**2**	--	--	--	--	--	--	--	--	**1**	--	--	**3**
CO 3	--	--	**1**	--	**3**	--	--	--	--	--	--	--	**3**	**1**	--	--
CO 4	**2**	**1**	**2**	--	**3**	--	--	--	--	--	--	--	**1**	--	--	

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RBE6803	MICROPROCESSOR AND INTERFACING	L	T	P	C
Version 2020.1	Date of Approval: JUY 2020	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course deals with the systematic study of the Architecture and programming issues of microprocessor family and its applications. The aim of this course is

1. To introduce students with the architecture and operation of typical microprocessors.
2. To familiarize the students with the programming and interfacing of microprocessors
3. To provide expertise in designing the embedded system based products as a solution to real time problems.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the architecture, pin configuration, addressing modes, control words of various microprocessors and Interfacing ICs

CO2. Develop the assembly language program using 8085 and 8086 using stacks & subroutines, procedures, segments, interrupts and interfacing.

CO3. Analyze assembly language programs; select appropriate assemble into machine across assembler utility of a microprocessor and solve various automation based problems of power system.

CO4. Design circuitry to the Microprocessor I/O ports in order to interface the processor to external devices so as to provide solutions real-world control problems

Modules	Blooms level*	Number of hours
Module I: Microprocessor Intel 8085 - Introduction, register structure, memory Addressing, Addressing Modes, Instruction Set, Timing Methods, CPU Pins and Associated Signals, Instruction timing and execution. programming I/O. Interrupt System, DMA, SID & SOD lines, Instruction set, 8085 based system design.	L1, L2, L3,L4	8
Module II: Intel 8086 Introduction, Architecture, Addressing modes, instruction set, memory management, assembler dependent instructions, Input/Output, system design using 8086.	L2,L3,L4	7
Module III: Pentium Processors Internal Architecture of 8087, operational overview of 8087, Introduction to 80186,80286, 80386 & 80486 processors and Pentium Processors.	L2,L3	6

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Module IV: Peripheral Interfacing Parallel versus serial transmission, synchronous and asynchronous serial data transmission. Interfacing or hexadecimal keyboard and display unit, interfacing of cassette recorders and parallel, serial interface standards. Study of Peripheral Devices 8255, 8253,8257, 8251, 8259	L3,L4, L5,L6	7
Module V: Microprocessor applications to Power Engineering **Protective Relaying:** over-current, impedance, MHO, reactance, bi-directional relays. **Measurements:** Frequency, power angle & power factor, Voltage and Current, KVA, KW, & KVAR, maximum demand. Resistance, Reactance, Temperature Controls.	L4,L5,L6	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Douglas Hall, Microprocessor and Interfacing:, Tata McGraw Hill, 2017
- Gaonkar R. S , Microprocessor Architecture, Programming and Applications, Wiley

Reference Books

- Yu Cheng Liu & Glen A. Gibson, Microcomputer Systems: 8086/8088 family Architecture, Programming and Design, PHI Publication, 2016.
- Ram B., Fundamentals of Microprocessors and Microcomputers, DhanpatRai& Sons, 2017

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO4**
CO1	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**			
CO2	**1**	**1**	**2**	**3**	--	--	--	--	--	--	--	--	**1**	**2**		
CO3	-	-	-	**1**	**2**	**3**	--	--	--	--	--	--		**1**	**2**	
CO4	-	-	-	**1**	--	**2**	--	--	**2**	**3**	**3**	--		**2**	**1**	**3**

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RBE6804	KINEMATICS AND DYNAMICS OF ROBOTS	L	T	P	C
Version 2020.1	Date of Approval: JUY 2020	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course deals with the systematic study of the Architecture and programming issues of robotic moments and design. The aim of this course is

1. To introduce students with the architecture and operation of robots.
2. To familiarize the students with the programming and interfacing of Robots
3. To provide expertise in designing the embedded system and kinematics of a robot based on real time problems.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the architecture, kinematic analysis for axis in Robot Design.
CO2. Understand the Workspace, Analysis And tracjectory planning
CO3. Understand the Dynamic Moments and Mathematical modeling of various forces in Moments of robotic machine
CO4. Design a robot with understanding of dynamic kinematics.

Modules	Blooms level*	Number of hours
Module I: Introduction Introduction, position and orientation of objects, objects coordinate frame Rotation matrix, Euler angles Roll, pitch and yaw angles coordinate Transformations, Joint variables and position of end effectors, Dot and cross products, coordinate frames, Rotations, Homogeneous coordinates	L1, L2, L3,L4	7
Module II: Direct Kinematics Link coordinates D-H Representation, The ARM equation. Direct kinematic analysis for Four axis, SCARA Robot and three, five and six axis Articulated Robots.	L2,L3,L4	6
Module III: Inverse Kinematics The inverse kinematics problem, General properties of solutions. Tool configuration, Inverse kinematics of four axis SCARA robot and three and five axis, Articulated robot.	L2,L3	6
Module IV: Workspace Analysis And Tracjectory Planning Workspace Analysis, work envelope of a Four axis SCARA robot and five axis articulated robot workspace fixtures, the pick and place operations, Joint space technique - continuous path motion, Interpolated motion, straight line motion and Cartesian space technique in trajectory planning.	L3,L4, L5,L6	8

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Module V: Manipulator Dynamics Introduction, Lagrange's equation kinetic and potential energy. Link inertia Tensor, link Jacobian Manipulator inertia tensor. Gravity, Generalized forces, Lagrange-Euler Dynamic model, Dynamic model of a Two-axis planar robot, Newton Euler formulation, Lagrange - Euler formulation, problems.	L4,L5,L6	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text & References:

1. Robert J. Schilling, Fundamentals of Robotics Analysis and Control, PHI Learning., 2009.
2. Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, Robotics Engineering an Integrated Approach, Phi Learning., 2009.
3. P.A. Janaki Raman, Robotics and Image Processing An Introduction, Tata Mc Graw Hill Publishing company Ltd., 1995.
4. Francis N-Nagy Andras Siegler, Engineering foundation of Robotics, Prentice Hall Inc., 1987.
5. Bernard Hodges, Industrial Robotics, Second Edition, Jaico Publishing house, 1993.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO4**
CO1	**1**	**-**	**--**	**--**	**--**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**1**			
CO2	**1**	**1**	**-**	**-**	**2**	**--**	**--**	**3**	**--**	**--**	**--**	**--**	**1**	**2**		
CO3	**1**	**-**	**-**	**2**	**-**	**3**	**--**	**--**	**--**	**--**	**--**	**--**		**1**	**2**	**3**
CO4	**-**	**-**	**-**	**1**	**--**	**2**	**--**	**--**	**2**	**-**	**3**	**--**		**2**	**1**	**3**

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RBE6806	FUNDAMENTAL OF ROBOTICS SYSTEM AND ROBOT PROGRAMMING LAB	L	T	P	C
Version 2020.1	Date of Approval: JUY 2020	0	0	2	1
Pre-requisites/Exposure					
Co-requisites	Nil				

Catalog Description
The objective of this course is to enlighten the students about the fundamentals of robotic systems. To understand the basics of robot, Robot Transformations and Sensors, Micro/Nano robotic systems and to program them for functioning.

Course Objectives
The objective of this course is to
1. Equip the students with the basic knowledge and designing of robotics.
2. Implement their concept in robotics and design robot for various applications of engineering.

Course Outcomes
On completion of this course, the students will be able to
CO1: Understand and be able to apply a variety of techniques to solve problems in areas such as robot control and navigation
CO2: program a robot to perform a specified task (e.g obstacle avoidance or wall following) in a target environment.
CO3: Understand how simulations of robots work, where they can be useful and where they can break down.

Modules	Blooms level*	Number of hours
Lab Session 1: Study of different types of robots based on configuration and application.	L1. L2 and L3	4
Lab Session 2: Study of different type of links and joints used in robots	L1. L2, L3 and L4	4
Lab Session 3: Study of components of robots with drive system and end effectors.	L1. L2, L3 and L4	4
Lab Session 4 Determination of maximum and minimum position of links.	L3 and L4	2
Lab Session 5 Verification of transformation (Position and orientation) with respect to gripper and world coordinate system	L3 and L4	4
Lab Session 6 Estimation of accuracy, repeatability and resolution.	L3 and L4	2

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Lab Session 7 Robot programming exercises	L1, L2, L3 and L4	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text & References:
Text:-
1. Craig. J. J. "Introduction to Robotics mechanics and control", Addison- Wesley,1999.
References:-
1. S.R. Deb, Robotics Technology and flexible automation, Tata McGraw-Hill Education., 2009
2. Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, Technology programming and Applications, McGraw Hill, 2012
3. Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, Robotics Engineering an Integrated Approach, Phi Learning.,
4. 2009.
5. Deb. S. R. "Robotics technology and flexible automation", Tata McGraw Hill publishing company limited, 1994
6. Mikell. P. Groover, "Industrial Robotics Technology", Programming and Applications, McGraw Hill Co, 1995.
7. Klafter. R.D, Chmielewski.T.A. and Noggin's., "Robot Engineering : An Integrated Approach", Prentice Hall of India Pvt. Ltd.,1994.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**1**	--	**3**	--	--	--	--	--	--	--	--	**1**	1	--	**3**
CO2	**2**	**2**	--	**3**	**1**	--	--	--	--	--	--	--	**1**	**1**	--	**3**
CO3	**2**	--	--	--	--	**1**	**3**	--	--	--	--	--	**2**	**1**	--	**3**

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RBE6807	ADVANCED CONTROL SYSTEMS & DRIVES FOR ROBOTS LAB	L	T	P	C
Version 2020.1	Date of Approval: JUY 2020	0	0	2	1
Pre-requisites/Exposure	Basic Concepts of Control Systems				
Co-requisites					

Catalog Description

This course is designed to get students an understanding of the basic concepts of control systems and its major applications. The course also includes some interdisciplinary applications like digital electronics and mechanical devices. Students will perform practical on hardware kit as well as on software.

Course Objectives

The objective of this course is to

1. Make students demonstrate the concepts of control systems.
2. Apply the concepts of control systems in various applications.

Course Outcomes

On completion of this course, the students will be able to

CO1. Practically verify the theoretical concepts of control systems.

CO2. Design various digital logic gates using programmable logic controller.

CO3. Analyse and explain the response of Process Control Simulator, Magnetic amplifier, Synchros, Servomotor and compensators.

Modules	Blooms level*	Number of hours
Lab Session 1 Determination of Transfer functions of an Electrical System	L3	1
Lab Session 2 Time Response Characteristics of a Second order System (Typical RLC network).	L3 and L4	1
Lab Session 3 Characteristics of Synchros: (a) Synchro transmitter characteristics. (b) Implementation of error detector using synchro pair	L3 and L4	2
Lab Session 4 Determination of Magnetic Amplifier Characteristics with different possible connections.	L3 and L4	2

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Lab Session 5 Process Control Simulator: (a) To determine the time constant and transfer function of first order process. (b) To determine the time response of closed loop second order process with Proportional Control. (c) To determine the time response of closed loop second order process with Proportional Integral Control. (d) To determine the time response of closed loop second order process with Proportional Integral-Derivative Control. (e) To determine the effect of disturbances on a process.	L3 and L4	6
Lab Session 6 To study the compensation of the second order process by using: (a) Lead Compensator. (b) Lag Compensator. (c) Lead- Lag Compensator	L3 and L4	2
Lab Session 7 Realization of AND, OR, NOT gates, other derived gates and ladder logic on Programmable Logic Controller with computer interfacing.	L3 and L5	2
Lab Session 8 To determination of AC servomotor Characteristics	L3 and L4	2
Lab Session 9 To study the position control of DC servomotor with P, PI control actions.	L3	2
Lab Session 10 Analog Computer: (a) To examine the operation of potentiometer and adder. (b) To examine the operation of integrator	L3	2
Lab Session 11 To solve a second order differential equation.	L3	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. M. Gopal, Digital Control and State Variable Methods,4th edition, Tata Mc-Graw-Hill.
2. K.Ogata, Discrete Time Control Systems, Pearson Education, (Singapore) (Thomson Press India).
3. B.C Kuo, Digital Control Systems, Prentice Hall.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	--	--	--	**2**	--	--	--	--	--	--	**2**	**1**	--	-	-
CO2	**1**	-	**3**	--	**2**	--	--	--	--	--	--	**2**	**1**	**3**	--	-
CO3	**1**	-	**2**	--	**2**	--	--	--	--	--	--	**2**	**1**	**3**	--	**3**

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RBE6808	MICROPROCESSOR & INTERFACING LAB	L	T	P	C
Version 2020.1	Date of Approval: JUY 2020	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course deals with the systematic study of the Architecture and programming issues of microprocessor family and its applications. The aim of this course is to give the students detailed knowledge of the above microprocessor needed to develop the systems using.

Course Objectives

The objective of this course is to

1. To expose students to the operation of typical microprocessor trainer kit.
2. Learn the design aspects of I/O and Memory Interfacing circuits.
3. To provide solid foundation on interfacing the external devices to the processor according to the user requirements to create novel products and solutions for the real time problems

Course Outcomes

On completion of this course, the students will be able to

CO1: Developing of assembly level programs and providing the basics of the processors

CO2: write programs like ASCII conversion, searching and sorting elements, reverse given string and compute nCr .

CO3: Understand the concepts related to I/O and memory interfacing

Modules	Blooms level*	Number of hours
Lab Session 1: To load the numbers 49H and 53H ion memory location 9510 & 9511.	L3 and L4	2
Lab Session 2: Respectively and add the contents of memory location 9601.	L3 and L4	2
Lab Session 3: To write the Assembly Language Programming for 8 bit addition with and without carry.	L3 and L4	2
Lab Session 4 To write the Assembly Language Programming for 8 bit subtraction with and without borrow.	L1, L2, and L3	2
Lab Session 5 To write the Assembly Language Programming for 8 bit Multiplication and Division.	L1, L2, and L3	2

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Lab Session 6 To write the Assembly Language Programming for sorting an array of numbers in Ascending & Decending order.	L3 and L4	2
Lab Session 7 To write the Assembly Language Programming with Additional Instructions.	L3 and L4	2
Lab Session 8 To write and execute a program using Stacks.	L3 and L4	2
Lab Session 9 To study and program the programmable Peripheral interface (8255 board).	L1, L2 and L3	2
Lab Session 10 To study and program the programmable interval timer (8253 board).	L1, L2, L3 and L4	2
Lab Session 11 To study and program the programmable DMA Controller (8257 board).	L1, L2, L3 and L4	2
Lab Session 12 i) To study and program the programmable Interrupt Controller (8259 board). ii) To study of programmable Serial Communication interface (8251 board).	L1, L2, L3 and L4	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text & References:

1. Rafiquzzaman, M. Theory & Applications PHI Publications 1993.
2. Gaonkar R. S. Microprocessor Architecture, Programming and Applications John Wiley 1989.
3. Ram B. Fundamentals of Microprocessors and Microcomputers, Dhanpat Rai & Sons 1995.
4. Liu Yu Cheng and Gibson, G.A. PHI 1992.
5. Leventhal, L.A. Introduction to Microprocessors: Software, Hardware, Programming.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**2**	**3**	**2**	**2**	**--**	**1**	**--**		**--**	**--**	**--**	**--**	**1**		**--**	**--**
CO2	**1**	**1**	**1**	**2**	**--**	**--**	**--**	**2**	**--**	**--**	**--**	**3**	**1**	**2**	**--**	**--**
CO3	**1**	**2**	**2**	**3**	**--**	**--**	**-**	**--**	**--**	**--**	**--**	**--**		**2**	**1**	**3**

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RBE6809	DIGITAL IMAGE PROCESSING	L	T	P	C
Version: 2020.1	Date of Approval: JULY 2020	2	0	0	2
Pre-requisites/Exposure	Basics of Computer Graphics				
Co-requisites	NIL				

Catalog Description

This course gives students an insight into the basics of Image Processing along with visualization of real concept of Image processing. Concepts covered would enable students to define and differentiate among various types of image refinement. Further they would be able to gain insights about various Image restoration and modification technique.

Course Objectives

Processing color and grayscale images or other two-dimensional signals has become an important tool for research and investigation in many areas of science and engineering. Digital Image Processing is designed to give professionals and students a powerful collection of fundamental and advanced image processing tools on the desktop. Digital Image Processing takes full advantage of the computational technology of Mathematica.

Course Outcomes

On completion of this course, the students will be able to
CO1: Define and explain introductory part of Digital Image Processing
CO2: List out the Image Enhancement techniques in the Spatial Domain
CO3: Explain concepts of Image Enhancement in the Frequency Domain
CO4: Describe the architecture Image Compression
CO5: Explain the basics of Representation and Description

Modules	Blooms level*	Number of hours
MODULE 1: **Introduction and Digital Image Fundamentals** The origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamentals Steps in Image Processing, Elements of Digital Image Processing Systems, Image Sampling and Quantization, Some basic relationships like Neighbors, Connectivity, Distance Measures between pixels, Linear and Non Linear Operations.	L1 and L2	8

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MODULE 2: **Image Enhancement in the Spatial Domain** Some basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic and Logic operations, Basics of Spatial Filters, Smoothening and Sharpening Spatial Filters, Combining Spatial Enhancement Methods.	L2 and L3	8
MODULE 3: **Image Enhancement in the Frequency Domain** Introduction to Fourier Transform and the frequency Domain, Smoothing and Sharpening Frequency Domain Filters, Homomorphism Filtering.	L1 and L2	10
MODULE 4: **Image Compression** Coding, Interpixel and Psychovisual Redundancy, Image Compression models, Elements of Information Theory, Error free comparison, Lossy compression, Image compression standards. **Image Segmentation** Detection of Discontinuities, Edge linking and boundary detection, Threshold, Region Oriented Segmentation, Motion based segmentation.	L2 and L3	12
MODULE 5: **Representation and Description** Representation, Boundary Descriptors, Regional Descriptors, Use of Principal Components for Description, Introduction to Morphology, Some basic Morphological Algorithms. **Object Recognition** Patterns and Pattern Classes, Decision-Theoretic Methods, Structural Methods.	L2 and L3	10

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

Text:

- Rafael C. Conzalez & Richard E. Woods, "Digital Image Processing", 2nd edition, Pearson Education.
- A. K. Jain, "Fundamental of Digital Image Processing", PHI.

References:

- Rosefield Kak, "Digital Picture Processing",
- W.K. Pratt, "Digital Image Processing",

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	2	--	--	--	--	--	--	--	--	--	--	1	--	--	--
CO 2	1	--	2	--	--	--	--	--	--	--	--	--	1	2	--	--
CO 3	3	--	1	--	2	--	--	--	--	--	--	--	1	3	2	--
CO 4	3	--	2	--	1	--	--	--	--	--	--	--	1	--	2	--
CO 5	3	--	2	--	1	--	--	--	--	--	--	--	1	--	2	--

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RBE6810	DIGITAL IMAGE PROCESSING LAB	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	0	0	2	1
Pre-requisites/Exposure	Basics of MATLAB				
Co-requisites	NIL				

Catalog Description
In this Lab course first student should learn about advanced level of software used for easy calculation and toolbox used for software like MATLAB.

Course Objectives
The objective of this course is to

1. Make the students apply knowledge of various Image processing & pattern recognition required for solving complex problems.
2. Provide a demonstration of different types of image processing techniques through MATAB toolbox.

Course Outcomes
On completion of this course, the students will be able to
CO1: Acquiring knowledge of Basics of High-end calculation software and need in Computer Science & engineering
CO2: Demonstrate the All preliminary functions in MATLAB
CO3: Apply the knowledge of all the basics function and toolbox knowledge of MATLAB
CO4: Demonstrate the Use of MATLAB in image Processing
CO5: Demonstrate usage of applications involving with Image processing & Recognition Its Toolbox used by MATLAB

Modules/Topics Covered**	Blooms level*	Number of hours
1. Introduction of MATLAB (e) Basic Variable deceleration & its operation (f) Function use & its application	L3, L5	4
2. Sample Programs in MATLAB (e) Basic use of Matrix and Graph Plotting (f) Different type of graph plotting with use of different -2 type of data	L3, L5	6
3. Sample Programs using MATLAB functions (l) Create a basic program MATLAB using functions (m) Use of basic function Image processing (n) Practice on Basic function of Image processing tool box.	L3, L5	6
4. Sample programs of ANN functions (c) Practice on Pattern Recognition functions in MATLAB (d) Write a program for training a small network in MATLAB	L3, L5	6

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5. Sample Programs using ANN toolbox & Image processing toolbox (b) Demonstrate the use of ANN tool box & Image processing toolbox and write a program after combining it.	L3, L5	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

Text & References:

- Rafael C. Gonzalez & Richard E. Woods, "Image Processing Using MATLAB", 2nd edition, Pearson Education.
- "Pattern classifications**"**, Richard O. Duda, PeterE. Hart, David G. Stroke. Wiley student edition, Second Edition

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	**70**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**2**	**1**	--	--	--	--	--	--	--	--	--	--	**2**	--	--	--
CO2	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO3	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO4	**1**	**3**	**2**	--	--	--	--	--	--	--	--	--	**2**	--	**2**	--
CO5	**1**	**3**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--

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RBE6811	DOT NET PROGRAMMING	L	T	P	C
Version:2020.1	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure	C#.NET, HTML and CSS				
Co-requisites	Nil				

Catalog Description
This course provides knowledge regarding Creating Dynamic Web Pages with the help of ASP.NET framework. Various topics

Course Objectives
The objective of this course is to
1. Equip the students with concepts of ASP.NET web applications including State management, Web Controls and ADO.NET.
2. Provide knowledge to develop secure ASP.NET web applications using C#.NET programming language.

Course Outcomes
On completion of this course, the students will be able to
CO1: Explain the components of .NET framework and create basic ASP.NET web page.
CO2: Use various standard and advance web controls for developing ASP.NET dynamic web pages and also create custom controls.
CO3: Establish database connectivity and perform various operations on database through ASP.NET web pages.
CO4: Maintain states at client and server site both.
CO5: Develop and use web services.

Modules	Blooms level*	Number of hours
MODULE 1: **.NET FRAMEWORK** .NET Framework and its features CLR, MSIL,CTS, .NET class library, .NET Languages, CTS, assemblies, manifest, and metadata, What is ASP.NET?, Difference between ASP and ASP.NET	L1, L2	4
MODULE 2: WEB CONTROLS Standard Controls, Validation controls, Adv. Controls, Custom Controls .	L2, L3 and L4	14
MODULE 3: ADO.NET ADO.NET,ADO.NET Architecture Data Adapters, Datasets, Command, Data Reader Data Reader Data bind Controls Displaying data in data grid XML in ADO.NET	L2, L3 and L4	7

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MODULE 4: SECURITY ASP.NET applications : Security, Error Handling	L2 and L3	2
MODULE 5: STATE MANAGEMENT State Management : View State, Session State, Web Services	L2, L3 and L4	5

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Stephen Walther, ASP.NET Unleashed, SAMS Publication
2. Matthew MacDonald, Beginning with ASP.NET 4.5 in C#, Apress Publications

Reference Books

1. Imar Spaanjaars, Beginning with ASP.NET 4.5.1 in C# and VB, Worx Publication
2. Jesse Liberty, Dan Hurwitz, Programming ASP.NET, OReilly.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	--	--	--	--	--	--	--	--	--	--	--	2	3	--	--
CO2	2	2	1	2	1	--	--	--	--	--	--	--	2	2	3	--
CO3	2	2	1	2	2	--	--	--	--	--	--	--	2	2	3	--
CO4	2	1	1	2	1	--	--	--	--	--	--	--	2	2	2	--
CO5	2	1	1	2	2	--	--	--	--	--	--	--	2	2	2	--

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RBE6812	DOT NET PROGRAMMING LAB	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	0	0	1	1
Pre-requisites/Exposure	C#.NET, HTML and CSS				
Co-requisites	Nil				

Catalog Description

This lab course covers development of Web applications using ASP.NET. The concepts are designed to impart the knowledge of ASP.NET framework concepts at implementation level. The major topic covered includes theme, state management, web controls and database connectivity using ADO.NET and web services.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of ASP.NET web applications including State management, Web Controls and ADO.NET.
2. Provide knowledge to develop secure ASP.NET web applications using C#.NET programming language.

Course Outcomes

On completion of this course, the students will be able to

CO1: Use various standard and advance web controls for developing ASP.NET dynamic web pages and also create custom controls.

CO2: Maintain states at client and server site both.

CO3: Establish database connectivity and perform various operations on database through ASP.NET web pages.

CO4: Develop and use web services.

Modules	Blooms level*	Number of hours
1. Basics of ASP.NET Page a) Write a program to implement C#.NET class with properties and methods. b) Design a Login Page, which displays a Welcome Page on successful Login and an error message in case of invalid Id/Password. c) Design a form and apply themes (design time and dynamically).	L1, L2	4
2. State Management a) Implement state management for Login page which move to welcome page when credentials are correct. The welcome page displays a welcome message along with the user Id. b) Implement various state management methods using a suitable web form.		2

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3. Built-in Controls, Custom Controls a) Design any web form and apply various validation controls. b) Create a web form which can work in Hindi and English language both. c) Design a web form to upload an image to server. d) Design a custom control, Numeric Textbox, which should accept only integer value for a particular range. The range should be customizable.	L2, L3 and L4	6
4. ADO.NET a) Create any database table and apply basic operations (Insert/Delete/Update) on it using ASP.NET application. b) Implement various methods of execution of SQL command. c) Display data in a Grid and perform basic database operations.	L2, L3 and L4	4
5. Security, Web Services a) Develop any web application to illustrate SQL Injection attack and redesign it to prevent the attack. b) Develop a web application to illustrate XSS attack and redesign it to prevent the attack	L2 and L3	2
6. Web Application Create a small web application having some application.	L2, L3 and L4	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Stephen Walther, ASP.NET Unleashed, SAMS Publication
2. Matthew MacDonald, Beginning with ASP.NET 4.5 in C#, Apress Publications

Reference Books

1. Imar Spaanjaars, Beginning with ASP.NET 4.5.1 in C# and VB, Worx Publication
2. Jesse Liberty, Dan Hurwitz, Programming ASP.NET, OReilly.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	1	--	--	--	--	--	--	--	--	--	--	2	2	2	--
CO 2	2	1	--	--	--	--	--	--	--	--	--	--	2	2	2	--
CO 3	1	1	--	--	--	--	--	--	--	--	--	--	2	1	1	--
CO 4	1	1	--	--	--	--	--	--	--	--	--	--	2	1	1	--

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RBE6813	ADVANCED ROBOTIC PROCESS AUTOMATION DESIGN & DEVELOPMENT	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure	Basic Networking Concepts				
Co-requisites	Nil				

Catalog Description

This course aims at providing knowledge of basic concepts of Robotic Process Automation to University students. It further builds on these concepts and introduces key RPA Design and Development strategies and methodologies specifically in context of UiPath products. The student undergoing the course shall develop the competence to design and develop a robot for a defined process.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of robotic process automation
2. Provide an overview of designing with uipath software.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain key terms and trends around the robotic process automation along with its physical and logical design

CO2: Understand the potential and value of the robotic process automation.

CO3: Describe the technologies used for the robotic process automation and mobile devices, including (passive and active) sensors, the physical communications layer, communications protocols, programming frameworks.

CO4: Design programs and have hands on experience on uipath software

CO5:Develop RPA programs of moderate complexity for a well-used robotic automation process using uipath.

Modules	Blooms level*	Number of hours
Module 1: Exception handling and Best Practices **Debugging and Exception Handling- Debugging** Tools, Strategies for solving issues, Catching errors. **Project Organization-** Concept of project organization, Best practices, Avoiding pitfalls, Invoke Activity.	L1, L2	8
Module II: Introduction to Orchestrator Orchestrator, Tenants, Authentication, Users, Roles, Robots, Environments, Queues & Transactions, Schedules.	L2, L3 and L4	8
Module III: merging and Future Trends in IT Artificial Intelligence, Machine Learning, Agent awareness, Natural Language Processing Computer Vision	L2, L3 and L4	8

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Module IV: Capstone Project Real life case studies which can be used to apply the concepts learnt during the course. The projects shall test student's skills right from process transformation and documentation to the design and development of the actual robot	L2, L3 and L4	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- "Learning Robotic Process Automation" By Alok Mani Tripathi, Packt Publications,Ist Edition,2018

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	--	--	3	--	--	--	--	--	--	2	--	1	1	-	-
CO2	1	--	1	2	--	--	--	--	--	--	--	--	-	1	-	-
CO3	1	--	1	2	--	--	--	--	--	--	--	--	-	1	-	2
CO4	1	--	--	2	--	--	--	--	--	--	--	--	1	1	-	2

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MLE6802	DATA MINING AND PREDICTIVE ANALYSIS	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure	Concept of Database and Data Mining				
Co-requisites					

Course Objectives

The objective of this course is to

- Provide students with an in-depth knowledge of data mining. To introduce students to basic applications, concepts, and techniques of data mining.
- Develop skills for using recent data mining software to solve practical problems and prediction in a variety of disciplines and
- Gain experience doing independent study and research.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain concepts of Data mining, predictive analytics and analyses architecture of data mining. Differentiate between supervised and unsupervised methods

CO 2: Apply classification techniques on different data sets and solve cost –benefit analysis numerical. Analyze decision tree methods.

CO 3: Implement various clustering algorithm on different data sets and describe these algorithms.

CO 4: Prepare data representation for market basket analysis and determine the usefulness of association rules. Interpret supervised and unsupervised learning methods.

CO 5: Predict market trends and outline different factors associated mail marketing.

Catalog Description

Data Mining and Predictive analytics serve as one of the most important courses for postgraduate students, since it builds computational abilities, inferential thinking, and practical skills for tackling core data scientific challenges. The students will get a comprehensive understanding of different data mining techniques that can be used for prediction and for discovering patterns, be prepared to select the right technique for a given data problem and will be able to create a general-purpose analytic process.

Course Content

Modules	Bloom's level	Number of Hours
Module I Data Preparation An introduction to data mining and predictive analytics, Data Pre-processing Exploratory Data Analysis, Dimension- Reduction Methods.	**L1, L2**	**8**
Module II Classification k- Nearest Neighbour Algorithm, Decision Trees, Model Evaluation Technique, Cost –Benefit Analysis Using Data Driven Cost.	**L1, L2, L3**	**7**

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Module III Clustering Hierarchical and k- Means Clustering, Kohenen Networks, Birch Clustering, Measuring Cluster Goodness.	**L1, L2, L3**	**8**
Module IV Association Rules Affinity Analysis and Market Basket Analysis, Data Representation for Market Basket Analysis, Support, Confidence, Frequent Item sets, and the a Priori Property, How Does a Priori Algorithm Work? Generating Frequent Item sets, Generating Association Rules, Extension from Flag Data to General Categorical Data, Information-Theoretic Approach: Generalized Rule Induction Method, J-Measure, Association Rules are Easy to do Badly, how can we Measure the Usefulness of Association Rules? Do Association Rules Represent Supervised or Unsupervised Learning?	**L1, L2, L3**	**9**
Module IV Case Study: Predicting Response to Direct Mail Marketing Business Understanding, Data Preparation, and Eda, Clustering and Principal Components Analysis, Modelling and Evaluation for Performance and Interpretability, Modelling and Evaluation for High Performance.	**L2, L3, L4, l5**	**8**

Bloom's Level:

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Daniel T. Larose, Chantal D. Larose, "Data Mining and Predictive Analytics", John Wiley & Sons, Inc., Hoboken, New Jersey, 2015.
2. Jiawei Han and Micheline Kamber, "Data mining: concepts and techniques", Morgan Kaufmann, Second Edition, 2006.

Reference Books

1. Alex Berson, Data Warehousing, Data Mining, and Olap, Tata McGraw Hill.
2. Markus Hofmann, Ralf Klinkenberg, "Rapid-Miner: Data Mining Use Cases and Business Analytics Applications", Chapman and Hall/CRC, 2016.
3. George M Marakas, Modern Data Warehousing, Mining & Visualization Core Concepts, Pearson Education.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**3**	**--**	**--**	**--**
CO2	**1**	**1**	**2**		**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**3**	**--**
CO3	**1**	**2**	**3**	**3**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**3**	**--**	**--**	**--**
CO4	**1**	**1**	**2**	**--**	**--**	**3**	**--**	**--**	**--**	**--**	**--**	**3**	**--**	**2**	**--**	**--**
CO5	**1**	**1**	**2**	**--**	**--**	**2**	**--**	**--**	**--**	**--**	**--**	**-3**	**1**	**--**	**--**	**--**

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MLE6803	DATA WAREHOUSING AND MULTIDIMENSIONAL MODELING	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure	Basic Knowledge of Database				
Co-requisites	Nil				

Catalog Description

In this course the concepts of basic concepts of Multi-dimensional database are discussed in detail. As a precursor to the study of the course it provide an in depth understanding of basic concepts of data warehouse which includes its architecture, data warehouse operations, data marts, metadata. The concept further enhances the understanding of advance concepts that cover the slowly and rapidly changing dimensions, indexes in OLAP and concept hierarchies. It also include the different application of data warehouse

Course Objectives

The objective of this course is to

1. Equip the students with concepts of Multi-dimensional database, its need and various applications.
2. It provides an overview of some basic concepts in data warehouse such as its architecture, OLAP applications, and metadata. It also includes some advance concepts such as OLAP hierarchies, OLAP changing dimensions.
3. **Course Outcomes**

On completion of this course, the students will be able to

CO1: Explain the concept of Multi-dimensional database and its importance.

CO2: Analyse the fundamental concept of data warehouse which include OLAP operations, architecture.

CO 3: Explain the different types of dimensions that exist in data warehouse.

CO4: Explain the advance concepts of data warehouse which include OLAP indexing.

Modules	Blooms level*	Number of hours
MODULE 1: **Introduction***:* Multidimensional Data Management, Multidimensional History, Related Terminology	L1 and L2	8
MODULE 2: **Fundamental Concepts** : Cubes ,Dimensions, Facts, Measures, Relational Representations, Star Schemas, Snowflake Schemas, Data Warehouses And Data Marts, Multidimensional Modelling Process, Analysis And Querying ,Roll Up, Drill Down, Drill Out, Slicing And Dicing, Drill Across, Pivot Tables, Ranking, Multi-Dimensional Querying in MDX and SQL, Graphical Querying and Visualizations .	L1, L2 and L3	8

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MODULE 3: **Advance Concepts** Slowly Changing Dimensions, The Problem, Solutions, Other Special Kinds Of Dimensions, Mini dimensions, Outriggers, Degenerate Dimensions, Junk Dimensions, Time Dimensions, Data Quality Dimensions, Advanced Hierarchies, Parent-Child Hierarchies, Unbalanced Hierarchies, Non Covering Hierarchies , Non –Strict Hierarchies, Multiple Hierarchies And Parallel Hierarchies.	L2, L3 and L4	10
MODULE 4: **Module IV: Implementation Issues** Materialized Views, Indexing, Indexing Overview, Bitmap Indices, Join Indices, Query Processing, OLAP Implementations, Extract-Transform-Load.	L3, L4 and L5	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books:

1. Jiawei Han &Micheline Kamber,"Data Mining Concepts And Techniques",3rd Edition,Morgan Kaufmann Publication,An Imprint of Elsevier, 2015.
2. Vipin Kumar,Pang Ning "Introduction to Data Mining",3rd Edition,Pearson Publication,Chennai, 2016.
3. Mohammed,Wagner " Data Mining and Analysis", 4th Edition, Cambridge University Press,Brazil, 2018.

Reference Books:

1. Daneil,D. Larose "Data Mining and Predictive Analytics", 2nd Edition, John wiley and Sons,Canada, 2015.
2. Paulraj "Data Warehousing Fundamental for IT Professional", 2nd Edition, John Wiley and Sons, Canada, 2010.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	**1**	**2**	**3**	--	--	--	-	--	--	--	--	--	-	--	-	-
CO 2	**1**	--	**2**	-	--	--	--	--	--	--	--	--	-	--	--	--
CO 3	**1**	**2**	**2**	--	--	--	--	--	--	--	--	--	--	--	--	--
CO 4	**1**	**1**	**2**	--	--	--	**3**	--	--	--	--	--	--	--	--	--

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MLE6808	R PROGRAMMING Lab	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	0	0	4	2
Pre-requisites/Exposure	Basic knowledge of statistics				
Co-requisites	Nil				

Catalog Description

This lab will provide a basic introduction to the R programming Language and the use of R to perform basic statistics and programming tasks. The main objectives of this lab is to impart the students with the knowledge of R Programming, Machine Learning using R Mining from streaming Data, Mining from Distributed Data.

Course Objectives

The objective of this course is

1. To make students familiar with R Programming Language and its concepts.
2. Equip the students with knowledge of R Programming, Machine Learning using R Mining from streaming Data, Mining from Distributed Data.

Course Outcomes

On completion of this course, the students will be able to

CO1. Install and configure R Studio and R packages.

CO2. Explain concepts of Structured Data, data types, data structures and Use R for mathematical operations

CO3. Describe the use of R functions, control statements, Loop constructs and apply to iterate functions across data.

CO4. Understand basic regular expressions graphics. Use of R for descriptive statistics and inferential statistics

CO5. Predict/Score new data using models, understand basic non-linear functions in models and how to link data, statistical methods.

Modules	Blooms level*	Number of hours
Lab Session 1 Installation & Configuration steps of R Studio. • use of the R interactive environment • Expand R by installing R packages • Explore and understand how to use the R documentation.	L1 and L2	2

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Lab Session 2-3 Read Structured Data into R from various sources • Understand the different data types in R • Understand the different data structures in R • Understand how to use dates in R • Use R for mathematical operations	L1and L3	4
Lab Session 4-5 • Use of vectorised calculations • Write user-defined R functions • Use control statements • Write Loop constructs in R • Use Apply to iterate functions across data	L1 and L3	4
Lab Session 6-8 Reshape data to support different analyses • Understand split-apply-combine (group-wise operations) in R • Deal with missing data • Manipulate strings in R • Understand basic regular expressions in R • Understand base R graphics	L1 and L3	6
Lab Session 9-10 Focus on GGplot2 graphics for R • Be familiar with trellis (lattice) graphics • Use R for descriptive statistics • Use R for inferential statistics • Write multivariate models in R	L1 and L3	4
Lab Session 11-12 • Understand confounding and adjustment in multivariate models • Understand interaction in multivariate models • Predict/Score new data using models • Understand basic non-linear functions in models • Understand how to link data, statistical methods, and actionable questions	L1 and L3	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Torsten Hothorn and Brian S. Everitt , "A Handbook of Statistical Analyses Using R", Chapman and Hall/CRC, 2006.

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	--	--	**3**	--	--	--	--	--	--	--	--	**1**	**1**	**-**
CO2	**1**	**-**	--	--	**2**	--	--	--	--	--	--	**2**	--	**1**	**1**	**-**
CO3	**1**	**-**	**1**	--	--	--	--	--	--	--	--	**2**	--	**1**	**1**	**-**
CO4	**1**	**-**	**2**	--	--	--	--	--	--	--	--	--	---	**1**	**1**	**--**
CO5	**1**	**-**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	**-**

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MLE6804	BIG DATA TECHNOLOGIES	L	T	P	C
Version 2020	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure	Basics of DBMS and SQL				
Co-requisites	Nil				

Catalog Description

This course brings together several key big data technologies used for storage, analysis and manipulation of data. It also introduces the students the key concepts of Hadoop framework, MapReduce, Pig, Hive, and No-SQL. Students will learn to work on Hadoop platform. The concepts learnt will make students capable of working on big data projects easier.

Course Objectives

The objective of this course is

1. To make students familiar with big data technologies.
2. Provide an overview of Hadoop architecture and its working with other open source technologies.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain importance and applications of Big Data Analytics.
CO2. Differentiate among analytics technologies.
CO3. Demonstrate architecture of Hadoop and Mapreduce framework.
CO4. Illustrate Hadoop installation process and commands.
CO5. Introduce concepts of Hive and Pig.

Modules	Blooms level*	Number of hours
Module I: Introduction to Big Data Big Data and its Importance – Four V's of Big Data – Drivers for Big Data – Introduction to Big Data Analytics – Big Data Analytics applications.	L1 and L2	5
Module II: Big Data Technologies Hadoop's Parallel World – Data discovery – Open source technology for Big Data Analytics – cloud and Big Data –Predictive Analytics – Mobile Business Intelligence and Big Data – Crowd Sourcing Analytics – Inter- and Trans-Firewall Analytics - Information Management.	L2 and L5	4
Module III: Processing Big Data Integrating disparate data stores - Mapping data to the programming framework - Connecting and extracting data from storage - Transforming data for processing - Subdividing data in preparation for Hadoop Map Reduce.	L1 and L3	8

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Module IV: Hadoop Map Reduce Employing Hadoop Map Reduce - Creating the components of Hadoop Map Reduce jobs - Distributing data processing across server farms –Executing Hadoop Map Reduce jobs - Monitoring the progress of job flows - The Building Blocks of Hadoop Map Reduce - Distinguishing Hadoop daemons - Investigating the Hadoop Distributed File System Selecting appropriate execution modes: local, pseudo-distributed, fully distributed.	L2, L3 and L4	9
Module V Big Data Tools and Techniques Installing and Running Pig – Comparison with Databases – Pig Latin – User-Define Functions – Data Processing Operators – Installing and Running Hive – Hive QL – Tables – Querying Data – User- Defined Functions – Oracle Big Data**.**	L2 and L3	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Michael Minelli, Michehe Chambers, Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business", 1st Edition, Wiley CIO Series, 2013.
2. Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'reilly, 2012.
3. Arvind Sathi, "Big Data Analytics: Disruptive Technologies for Changing the Game", 1st Edition, IBM Corporation, 2012.
4. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", 1st Edition, Wiley and SAS Business Series, 2012.

Reference Books

1. Anil Maheshwari, "Big Data", McGraw Hill
2. Mayank Bhushan, "Big Data and Hadoop- Learn by Example", BPB Publications

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	--	**2**	--	--	--	--	--	--	--	--	--	**1**	--	**2**	**-**
CO2	**1**	**2**	--	**3**	**3**	--	--	--	--	--	--	--	**1**	--	**2**	**-**
CO3	**1**	--	**1**	**2**	--	--	--	--	--	--	--	--	**1**	--	**2**	**-**
CO4	**1**	**1**	**2**	--	--	**2**	--	--	--	--	**3**	--	**-**	--	**1**	**3**
CO5	**1**	--	**1**	--	**1**	**3**	--	--	--	--	**3**	--	**1**	**-**	**-**	**-**

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MLE6806	DATA MINING AND PREDICTIVE ANALYTICS LAB	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	0	0	2	1
Pre-requisites/Exposure	Basic knowledge of Database				
Co-requisites	NIL				

Catalog Description

Data Mining and Predictive analytics serve as one of the most important courses for postgraduate students, since it builds computational abilities, inferential thinking, and practical skills for tackling core data scientific challenges. The students will get a comprehensive understanding of different data mining techniques that can be used for prediction and for discovering patterns, be prepared to select the right technique for a given data problem and will be able to create a general-purpose analytic process.

Course Objectives

The objective of this course is to

- Provide students with an in-depth knowledge of data mining. To introduce students to basic applications, concepts, and techniques of data mining.
- Develop skills for using recent data mining software to solve practical problems and prediction in a variety of disciplines and
- Gain experience doing independent study and research.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain concepts of Data mining, predictive analytics and analyses architecture of data mining. Differentiate between supervised and unsupervised methods

CO 2: Apply classification techniques on different data sets and solve cost –benefit analysis numerical. Analyze decision tree methods.

CO 3: Implement various clustering algorithm on different data sets and describe these algorithms.

CO 4: Prepare data representation for market basket analysis and determine the usefulness of association rules. Interpret supervised and unsupervised learning methods.

CO 5: Predict market trends and outline different factors associated mail marketing.

Modules/Topics Covered**	Blooms level*	Number of hours
1. To understand the basic features of Data Warehousing.	L1, L2	2

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2. Explore WEKA Data Mining/Machine Learning Toolkit (a) Downloading and/or installation of WEKA data mining toolkit. (b) Understand the features of WEKA tool kit such as Explorer, Knowledge flow interface, Experimenter, command-line interface. (c) Navigate the options available in the WEKA (deselect attributes panel, preprocess panel, classify panel, cluster panel, associate panel and visualize). (d) Study the ARFF file format.	L2, L3, L5	2
3. To understand the working of datasets in WEKA & to perform demonstration of preprocessing on dataset weather.arff .	L3, L4, L5	2
4. To apply Numeric Transform (data preprocessing step) on Iris Dataset.	L3, L4, L5	2
5. To understand the importance of CSV data and then load student academic record (CSV format) in Weka.	L3, L4, L5	2
6. To understand the concept of discretization and to perform discretization on the dataset airline.arff.	L3, L4, L5	2
7. To create Training, Validation and Test dataset for iris.arff.	L3, L4, L5	2
8. To perform decision tree classification using J48 algorithm on weather.arff	L3, L4, L5	2
9. To apply Apriori technique on the dataset and to generate association rules.	L3, L4, L5	2
10. (a) Demonstration of classification rule process on dataset student.arff using j48 algorithm. (b) Demonstration of classification rule process on dataset employee.arff using j48 algorithm.	L3, L4, L5	2
11. Demonstration of classification rule process on dataset employee.arff using naïve bayes algorithm	L3, L4, L5	4

**Bloom's Level:* *L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation.*

** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

1. Bostjan Kaluza, "Instant Weka How-to", Packt Publishing Limited, 2013.
2. Daniel T. Larose, Chantal D. Larose, "Data Mining and Predictive Analytics", John Wiley & Sons, Inc., Hoboken, New Jersey, 2015.
3. Jiawei Han and Micheline Kamber, "Data mining: concepts and techniques", Morgan Kaufmann, Second Edition, 2006.

Reference Books

4. Yuan Mei Yu, Data Mining and Machine Learning: WEKA Applied Technology and Practice (Chinese Edition) Paperback 2014.
5. Alex Berson, Data Warehousing, Data Mining, and Olap, Tata McGraw Hill, 2014.
6. Markus Hofmann, Ralf Klinkenberg, "Rapid-Miner: Data Mining Use Cases and Business Analytics Applications", Chapman and Hall/CRC, 2016.
7. George M Marakas, Modern Data Warehousing, Mining & Visualization Core Concepts, Pearson Education.

Modes of Evaluation: Performance/Viva/ Lab Record/Written Examination

Examination Scheme:

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IA					EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	**70**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE- External Exam

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	**2**	**2**	**3**
CO2	**1**	**1**	**2**		--	--	--	--	--	--	--	--	**1**	**2**	**3**	**3**
CO3	**1**	**2**	**3**	**3**	**3**	--	--	--	--	--	--	--	**1**	**2**	**2**	**2**
CO4	**1**	**1**	**2**	--	--	**3**	--	--	--	--	--	**3**	**1**	**1**	**2**	**3**
CO5	**1**	**1**	**2**	--	--	**2**	--	--	--	--	--	**3**	**1**	**3**	**2**	**1**

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MLE6807	DATA WAREHOUSING AND MULTIDIMENSIONS MODELLING LAB	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	0	0	2	1
Pre-requisites/Exposure	Basic Knowledge of Database				
Co-requisites	NIL				

Catalog Description

In this Lab course Data warehousing and Multidimensional modeling programs are implemented and demonstrated using a SQL Server and ETL Tools. The Concepts that are covered would enable them to analyze the working of ETL tools and enable them to understand the following topics namely SQL Statements, SQL Built-in Functions, PL/SQL Cursors , Exception handling, Procedure, Functions, Trigger and concurrency control. Programs will be related to concepts of understanding the working of ETL tools on multidimensional data.

Course Objectives

The objective of this course is to

1. Make the students apply knowledge of Database by analyzing the different database concepts in SQL Server.
2. Provide a demonstration of ETL tools to organize the data sets.

Course Outcomes

On completion of this course, the students will be able to

CO1: Apply the knowledge of transaction processing to gain analysis on different data sets through concurrency control mechanism.

CO2: Demonstrate the use of SQL Built-in Functions, PL/SQL Cursors,Exception handling and Procedures.

CO3: To implement the different warehousing concepts on the given ETL tools.

CO4: Demonstrate the working of basic SQL statements and triggers.

Modules/Topics Covered**	Blooms level*	Number of hours
1. To understand the basic of SQL statements (g) Perform the following SQL statements on the table that perform the following query on the database • Create, update ,alter and delete a record • Joins and constraints on the table. • Wild card operators.	L1,L3,L4	4
2. Sample Programs to execute the concept of Procedures (g) Preliminary introduction of Procedures their Syntax and usage (h) Write a procedural program to find out minimum of two numbers. (i) Write a program to print the reverse of a number using looping construct in PL/SQL Procedures. (j) Write a procedural program to find out the factorial of number.	L3, L4,L5	4

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3. Sample Programs to implement the concept of Triggers (a) Preliminary introduction of Triggers their Syntax and usage (b) Create a Trigger on Employee record that automatically updates the salary of an Employee after each financial year. (c) Create a Trigger for the following events: • Deletion of a record • Updating of a record • Insertion of a new record.	L3, L4,L5	4
4. Sample Programs to implement the concept of Cursors and Exception Handling. (a) Write a program to demonstrate the concept of Cursors in PL/SQL (b) Write a program that handles an exception that incurred in the given program.	L3,L4, L5	6
5. To perform demonstration to understand the working of ETL tools (c) Preliminary introduction of ETL Tools their features and importance. (d) Perform validation on the data set by applying the ETL tools. (e) Perform the following operations using ETL tools • Source to target mapping • Data checks on source data • Packages and schema validation • Data verification in the target system • Data integrity and quality checks in the target system	L4,L5,L6	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Text Books:

- Jiawei Han &Micheline Kamber,"Data Mining Concepts And Techniques",3rd Edition,Morgan Kaufmann Publication,An Imprint of Elsevier, 2015.
- Vipin Kumar,Pang Ning "Introduction to Data Mining",3rd Edition,Pearson Publication,Chennai, 2016.
- Mohammed,Wagner " Data Mining and Analysis", 4th Edition, Cambridge University Press,Brazil, 2018.

Reference Books:

- Daneil,D. Larose "Data Mining and Predictive Analytics", 2nd Edition, John wiley and Sons,Canada, 2015.
- Paulraj "Data Warehousing Fundamental for IT Professional", 2nd Edition, John Wiley and Sons, Canada, 2010.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	1	3	--	--	--	--	--	--	--	--	--	2	1	--	--
CO 2	2	1	3	--	--	--	--	--	--	--	--	--	2	1	--	--
CO 3	1	1	2	--	1	--	--	--	--	--	--	--	2	1	--	--
CO 4	2	1	3	--	--	--	--	--	--	--	--	--	2	1	--	--

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AIE6935	SUMMER INTERNSHIP EVALUATION-III	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	0	0	0	6
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The objective of this course is to provide practical training on some live projects that will increase capability to work on actual problem in industry. This training may undergo in an industrial environment or may be an in-house training on some latest software which is in high demand in market. This training will be designed such that it will useful for their future employment in industry.

Course Objectives

The objective of this course is to

1. Provide practical training on live projects
2. Increase technical capabilities on solving real life problems in company environment

Course Outcomes

On completion of this summer internship, the students will be able to:

CO1: Develop communication, interpersonal and other critical skills in the job interview process.

CO2: Design and develop software and hardware projects

CO3: Assess interests and abilities in their field of study.

CO4: Demonstrate excellent technical and communication skills to acquire employment contacts leading directly to a full-time job following graduation from college.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	1	2	2	--	--	--	1	--	--	--	1	1	1	1
CO2	1	1	2	2	2	--	--	--	1	--	--	--	1	1	1	1
CO3	1	1	2	3	2	--	--	--	1	--	--	--	1	1	1	1
CO4	1	1	2	2	2	--	--	--	1	--	--	--	1	1	1	1

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AIE6937	PROJECT DISSERTATION-I	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	0	0	0	5
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The objective of this course is to provide practical training on some live/demo projects that will increase capability to work on actual problem in industry. It will be an in house training on some latest software which is in high demand in market. This training will be designed such that it will useful for their future employment in industry.

Course Objectives

The objective of this course is to

1. Provide practical training on live projects
2. Increase technical capabilities on solving real life problems in company environment

Course Outcomes

On completion of this summer internship, the students will be able to:

CO1: Demonstrate a sound technical knowledge of their selected project topic.

CO2: Design and develop engineering solutions to complex problems utilising a systems approach.

CO3: Analyse various approaches for solving a complex engineering problem using different tools and techniques

CO4: Demonstrate the knowledge, skills and attitudes of a professional engineer.

CO5: Apply technical skills and knowledge in completing the project.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	--	--	--	--	--	1	--	--	--	--	--	1	1
CO2	1	1	--	--	--	--	--	--	1	--	--	--	--	--	1	1
CO3	1	1	--	--	--	--	--	--	1	--	--	--	--	--	1	1
CO4	1	1	--	--	--	--	--	--	1	--	--	--	--	--	1	1
C05	1	1	--	--	--	--			1	-	-	-	--	--	1	1

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RBE6901	AUTOMATION IN MANUFACTURING SYSTEMS	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure	Production system, Manufacturing System				
Co-requisites	Automation in production and manufacturing system				

Catalog Description:
In this course the concepts and procedure for Automation of Manufacturing systems and the technology behind the automation of a manufacturing system andconcepts of computer aided manufacturing are discussed in detail. The concepts of computer aided process planning (CAPP), Hardware components for automation, group technology (GT), cellular manufacturing, automated guided vehicle system, flexible manufacturing system (FMS), Automated inspection and just in time are also discussed in detail.

Course Objectives:
The overall objective of this course is
1. To equip the students with basic and essential concepts of Automation in manufacturing system to usually increases production rate and labor productivity.
2. To provide high caliber engineering students with an in-depth understanding of cellular manufacturing, flexible manufacturing system (FMS) and computer aided process planning.

Course Outcomes (COs):
At the end of the course, the student shall be able to:
CO1 - Define and describe the basic fundamentals of Automation in manufacturing system, computer aided manufacturing and computer integrated manufacturing.
CO2 – State, explain and demonstrate computer aided process planning, automated production lines and assembly systems.
CO3 – Outline, interpret and apply concepts of group technology and cellular manufacturing.
CO4 – Define, explain and apply knowledge of flexible manufacturing systems and industrial robotics in industries.

Modules	Blooms level*	Number of hours
Module I **Over view of Manufacturing and Automation:** Production systems, Automation in production systems, Automation principles and strategies, Manufacturing operations, production facilities. Basic elements of an automated system, levels of automation; Hardware components for automation and process control, programmable logic controllers and personal computers.	L1 and L2	7

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Module II **Material Handling And Identification Technologies:** Material handling, equipment, Analysis. Storage systems, performance and location strategies, Automated storage systems, AS/RS, types. Automatic identification methods, Barcode technology, RFID	L1, L2, and L3	6
Module III **Manufacturing Systems And Automated Production Lines:** Manufacturing systems: components of a manufacturing system, Single station manufacturing cells; Manual Assembly lines, line balancing Algorithms, Mixed model Assembly lines, Alternative Assembly systems. Automated production lines, Applications, Analysis of transfer lines	L1, L2 and L3	8
Module IV **Automated Assembly Systems:** Fundamentals, Analysis of Assembly systems. Cellular manufacturing, part families, cooling, production flow analysis. Group Technology and flexible Manufacturing systems, Quantitative Analysis.	L1, L2 and L3	9
Module V **Quality Control And Support Systems:** Quality in Design and manufacturing, inspection principles and strategies, Automated inspection, contact Vs non contact, CMM. Manufacturing support systems. Quality function deployment, computer aided process planning, concurrent engineering, shop floor control, just in time and lean production.	L1, L2 and L3	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text books:

1. Mikell.P.Groover (2008), Automation, Production Systems and Computer Integrated Manufacturing, Prentice Hall of India.
2. N. Viswanandham, Y. Narhari "Performance Modeling of Automated Manufacturing Systems" Prentice-Hall.

Reference books:

1. M. Groover (2003), CAD/CAM Pearson Education; 1 edition.
2. S J Martin (1974), Numerical control of Machine Tools, Butterworth-Heinemann.
3. P N Rao (2017), CAD/CAM: Principles and Applications, Tata McGraw Hill Education; 3 editions.
4. Chang, Wysk & Wang (2005), Computer Aided Manufacturing, Prentice Hall of India.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	--	--	--	--	--	--	--	--	--	--	1	2	--
CO2	1	2	--	--	--	--	--	--	--	--	--	--	--	1	2	--
CO3	1	2	--	--	--	--	--	--	--	--	--	--	--	1	2	--
CO4	1	2	--	--	--	--	--	--	--	--	--	--	--	1	2	--

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RBE6902	ROBOTIC SENSORS, VISIONS AND HARDWARE IMPLEMENTATION	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure	Knowledge of basics of Artificial Intelligence concepts, Sensors and basic Robotics hardware required.				
Co-requisites	Nil				

Catalog Description

Robotics sensors find many applications in the areas of robotics, visions, Artificial Intelligence, pattern recognition, controls etc. Robotics sensors offer fundamentally different types of high capable sensors. Many image processing techniques are learnt. These robotics hardware design, architecture, mapping and localization can be applied to many complicated problems of Artificial Intelligence and other applications in Real World Computing. This course provides a comprehensive treatment of robotics sensors, visions and robotics hardware required.

Course Objectives:

The objective of this course is to

1. Introduces the basics of Robot visions and image processing sensors.
2. It deals with actual hardware implementation of robots

Course Outcomes:

On completion of this course, the students will be able to

CO1: Understand the principles of smart sensors and transducers, need and usage of sensors.

CO2: comparison various visions in robotics robotic functions, robotic views and robotic parts in simulations.

CO3: Understand concept of image processing techniques which can be applied torobotic perception, robotic movements, dynamics and controls of robotic movement, with which they can be able to apply the conceptual things to the robotic software architecture and applications.

CO4: Get thorough knowledge in robotics orientation and feature extraction.

CO5: Design multicontrolled sensors robot assembly.

Modules	Blooms level*	Number of hours
MODULE 1: SENSORS IN ROBOTICS An Introduction to sensors and Transducers, History and definitions, Smart Sensing, AI sensing, Need of sensors in Robotics. Position sensors – optical, non-optical, Velocity sensors, Accelerometers, Proximity Sensors – Contact, non-contact, Range Sensing, touch and Slip Sensors, Force and Torque Sensors. Different sensing variables – smell, Heat or Temperature, Humidity, Light, Speech or Voice recognition Systems, Tele-presence and related technologies.	L1, L2	4

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MODULE 2: VISIONS IN ROBOTICS The Nature of Vision- Robot vision – Need, Applications - image acquisition –illumination techniques- Point sensor, line sensor, planar sensor, camera transfer characteristic, Raster scan, Image capture time, volume sensors, Image representation, picture coding techniques. Robot Control through Vision sensors, Robot vision locating position, Robot guidance with vision system, End effector camera Sensor.	L1, L2, L3 and L4	10
MODULE 3:ELEMENTS OF IMAGE PROCESSING TECHNIQUES Discretization, Neighbours of a pixel-connectivity- Distance measures - pre-processing Neighbourhood averaging, Median filtering. Smoothening of binary Images- Image Enhancement- Histogram Equalization-Histogram Specification –Local Enhancement-Edge detection- Gradient operator-Laplace operators-Thresholding-Morphological image processing.	L1, L3, L4 and L5	5
MODULE 4:OBJECT ORIENTATION AND FEATURE EXTRACTION Image segmentation- Edge linking-Boundary detection-Region growing-Region splitting and merging- Boundary Descriptors-Freeman chain code-Regional Descriptors- recognition-structural methods- Recognition procedure, mahalanobic procedure.	L1, L2, L3, and L4	7
MODULE 5:COLLISIONS FRONTS ALGORITHM Introduction, skeleton of objects. Gradients, propagation, Definitions, propagation algorithm, Thinning Algorithm, Skeleton lengths of Top most objects.	L2, L3, L4 and L5	5
MODULE 6:MULTISENSORS CONTROLLED ROBOT ASSEMBLY Control Computer, Vision Sensor modules, Software Structure, Vision Sensor software, Robot programming, Handling, Gripper and Grippingmethods, accuracy – A Case study.	L2, L3, L4 and L5	5

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text & References:-

1. Paul W Chapman, "*Smart Sensors*", an Independent Learning Module Series, 1996.
2. Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, Robotics Engineering an Integrated Approach, Phi Learning., 2009.
3. John Iovice, "*Robots, Androids and Animatrons*", Mc Graw Hill, 2003.
4. K.S. Fu, R.C. Gonzalez, C.S.G. Lee, "*Robotics – Control Sensing, Vision and Intelligence*", Tata McGraw-Hill Education, 2008.
5. Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, Technology programming and Applications, Tata McGraw-Hill Education, 2012.
6. Sabrie Soloman, Sensors and Control Systems in Manufacturing, McGraw-Hill Professional Publishing, 2nd Edition, 2009.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**3**	--	**1**	--	--	--	--	--	--	--	--	**1**	--	**2**	--
CO2	**1**	**3**	--	**2**	--	--	--	**2**	--	--	--	--	**1**	**2**	--	**1**
CO3	**1**	**2**	**2**	**4**	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO4	**1**	**2**	**2**	**2**	--	---	--	--	--	--	--	--	**1**	**2**	--	--
CO5	**1**	3	**2**	**1**	--	--	--	--	--	--	--	--	**1**	**1**	--	**4**

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RBE6903	PATTERN RECOGNITION & IMAGE PROCESSING	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure	Basics of Digital Image Processing				
Co-requisites	NIL				

Catalog Description

This course gives students an insight into the basics of Image Processing along with Pattern Recognition. Concepts covered would enable students to define and differentiate among various types of image refinement. Further they would be able to gain insights about various Image restoration and modification technique.

Course Objectives

This course covers the theory and methods for learning from data, with an emphasis on pattern classification. Digital Image Processing is designed to give professionals and students a powerful collection of fundamental and advanced image processing tools on the desktop.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define and explain introductory part of Pattern recognition Concepts & Bayesian decision theory

CO2: List out the Univariate and Multivariate density

CO3: Explain concepts of Un-supervised learning and clustering

CO4: Describe the Image Fundamentals and Transforms

CO5: Explain the basics of Image Segmentation and Edge Detection

Modules	Blooms level*	Number of hours
MODULE 1: **Introduction of Pattern recognition and Bayesian Decision Theory** Machine perception, pattern recognition example, pattern recognition systems, the design cycle, learning and adaptation Introduction, continuous features – two categories classifications, minimum error-rate classification- zero–one loss function, classifiers, discriminant functions, and decision surfaces	L1 and L2	8
MODULE 2: **Normal density** Univariate and multivariate density, discriminant functions for the normal density-different cases, Bayes decision theory – discrete features, compound Bayesian decision theory and context	L2 and L3	8
MODULE 3: **Un-supervised learning and clustering** Introduction, mixture densities and Identifiability, maximum likelihood estimates, application to normal mixtures, K-means clustering. Date description and clustering, similarity measures, criteria function for clustering	L1 and L2	10

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MODULE 4: **Image Fundamentals and Transforms** Elements of visual perception – Image sampling and quantization, Basic relationship between pixels, Some basic grayscale transformations, Introduction to Fourier Transform and DFT, Properties of 2D Fourier Transform, FFT, Separable Image Transforms, Walsh, Hadamard, Discrete Cosine Transform, Haar, Slant, Karhunen, Loeve transforms.	L2 and L3	12
MODULE 5: **Image Segmentation and Edge Detection** Region Operations, Crack Edge Detection, Edge Following, Gradient operators, Compass and laplace operators. Threshold detection methods, optimal thresholding, multispectral thresholding, thresholding in hierarchical data structures; edge based image segmentation- edge image thresholding, edge relaxation, border tracing, border detection,	L2 and L3	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

Text & References:

Text:

1. "Fundamentals of speech Recognition", Lawerence Rabiner, Biing – Hwang Juang Pearson education.
2. "Pattern classifications", Richard O. Duda, PeterE. Hart, David G. Stroke. Wiley student edition, Second Edition.
3. R.C Gonzalez and R.E. Woods, "Digital Image Processing", Addison Wesley.

References:

1. "Pattern Recognition and Image Analysis" – Earl Gose, Richard John baugh, Steve Jost
2. A.K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India.
3. "Digital Image Processing"– M. Anji Reddy, BS Publications.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--
CO 2	**1**	--	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO 3	**3**	--	**1**	--	**2**	--	--	--	--	--	--	--	**1**	**3**	**2**	--
CO 4	**3**	--	**2**	--	**1**	--	--	--	--	--	--	--	**1**	--	**2**	--
CO 5	**3**	--	**2**	--	**1**	--	--	--	--	--	--	--	**1**	--	**2**	--

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RBE6905	PATTERN RECOGNITION AND IMAGE PROCESSING LAB	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	0	0	1	1
Pre-requisites/Exposure	Basics of MATLAB				
Co-requisites	NIL				

Catalog Description
In this Lab course first student should learn about advanced level of software used for easy calculation and toolbox used for software like MATLAB.

Course Objectives
The objective of this course is to

- Make the students apply knowledge of various Image processing & pattern recognition required for solving complex problems.
- Provide a demonstration of different types of image processing techniques through MATAB toolbox.

Course Outcomes
On completion of this course, the students will be able to
CO1: Acquiring knowledge of Basics of High-end calculation software and need in Computer Science & engineering
CO2: Demonstrate the All preliminary functions in MATLAB
CO3: Apply the knowledge of all the basics function and toolbox knowledge of MATLAB
CO4: Demonstrate the Use of MATLAB in image Processing
CO5: Demonstrate usage of applications involving with Image processing & Recognition Its Toolbox used by MATLAB

Modules/Topics Covered**	Blooms level*	Number of hours
6. Introduction of MATLAB (h) Basic Variable deceleration & its operation (i) Function use & its application	L3, L5	4
7. Sample Programs in MATLAB (k) Basic use of Matrix and Graph Plotting (l) Different type of graph plotting with use of different -2 type of data	L3, L5	6
8. Sample Programs using MATLAB functions (o) Create a basic program MATLAB using functions (p) Use of basic function Image processing (q) Practice on Basic function of Image processing tool box.	L3, L5	6
9. Sample programs of ANN functions (e) Practice on Pattern Recognition functions in MATLAB (f) Write a program for training a small network in MATLAB	L3, L5	6

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10. Sample Programs using ANN toolbox & Image processing toolbox (f) Demonstrate the use of ANN tool box & Image processing toolbox and write a program after combining it.	L3, L5	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

Text & References:

- Rafael C. Gonzalez & Richard E. Woods, "Image Processing Using MATLAB", 2nd edition, Pearson Education.
- "Pattern classifications", Richard O. Duda, PeterE. Hart, David G. Stroke. Wiley student edition, Second Edition

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	**70**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**2**	**1**	--	--	--	--	--	--	--	--	--	--	**2**	--	--	--
CO2	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO3	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO4	**1**	**3**	**2**	--	--	--	--	--	--	--	--	--	**2**	--	**2**	--
CO5	**1**	**3**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--

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RBE6904	ROBOTICS SENSORS, VISION AND HARDWARE IMPLEMENTATION LAB	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	0	0	2	1
Pre-requisites/Exposure	MATLAB and concepts of Artificial Intelligence				
Co-requisites	Nil				

Catalog Description

Robotics sensors find many applications in the areas of robotics, visions, Artificial Intelligence, pattern recognition, controls etc. Robotics sensors offer fundamentally different types of high capable sensors. Many image processing techniques are learnt. These robotics hardware design, architecture, mapping and localization can be applied to many complicated problems of Artificial Intelligence and other applications in Real World Computing. This course provides a comprehensive treatment of robotics sensors, visions and robotics hardware required.

Course Objectives

The objective of this course is to

1. To become familiar with basics of robot visions, image processing sensors.
2. Understand and analyse concepts of hardware implementations in robotics.

Course Outcomes

On completion of this course, the students will be able to

CO1: Understand the principles of smart sensors and transducers, need and usage of sensors.

CO2: comparison various visions in robotics robotic functions, robotic views and robotic parts in simulations.

CO3: Understand concept of image processing techniques which can be applied to robotic perception, robotic movements, dynamics and controls of robotic movement, with which they can be able to apply the conceptual things to the robotic software architecture and applications.

CO4: Get thorough knowledge in robotics orientation and feature extraction.

Modules	Blooms level*	Number of hours
Lab Session 1:Generation in robot languages Learning of robot language structure, on line and offline programming	L3 and L4	2
Lab Session 2:Cartesian Trajectories Study of Joint space planning, Cartesian trajectories, path primitives, coordinate systems used to determine the positions of TCP and direction of tools	L3 and L4	4
Lab Session 3:Basic Syntax Learning of RAPID i.e. data objects, expression, function. WAIT, SIGNAL AND DELAY command.	L3 and L4	6
Lab Session 4:Routine and subroutine Write subroutine, task module, input-output interrupts, priority interrupts, and task modules. Study of built-in subroutines in RAPID.	L1, L2, and L3	2

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Lab Session 5:optical sensors To study Photodiodes, phototransistors and photo resistors based sensors, light-to-light detectors, Infrared sensors (thermal, PIR, AFIR, thermopiles).	L1, L2, and L3	4
Lab Session 6: Magnetic and Electromagnetic Sensors and Actuators Study on Motors as actuators (linear, rotational, stepping motors), magnetic valves, inductive sensors (eddy current, LVDT, RVDT, Proximity, switches), Hall Effect sensors, Magneto resistive sensors.	L3 and L4	2
Lab Session 7:Mechanical Sensors Accelerometers, Force sensors (strain gauges, tactile sensors), Pressure sensors (semiconductor, piezo resistive, capacitive, VRP).	L3 and L4	2
Lab Session 8:Industrial Networks and Fields Bus Types of bus – DN, PB, ProfiNet, Eth/IP Interfacing to Controller: Connecting sensors to controller directly or through fieldbus. Configuration of digital, group, and analog IO. Use of instructions and logic. Strobing and handshaking with PLC as master, Encoder and Resolvers.	L1, L2, and L3	2
Lab Session 9:PLC Various hardware types of PLC (CPU and I/O modules).Centralized configuration of PLC.On-line with PLC (using serial port).Various languages and its over-view. Sample program down-load, Task configuration. Configuration of IP address & sample program download. Decentralized configuration of PLC (Profibus protocol).Configuration I/O modules on Profi-bus protocol. Mod-bus configuration (Master & Slave configuration). Mod-bus RTU (Remote Telemetry Unit) and Mod-bus TCP/IP communication with PCbased software .	L2, L3, and L4	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text & References:-

1. Paul W Chapman, "Smart Sensors", an Independent Learning Module Series, 1996.
2. Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, Robotics Engineering an Integrated Approach, Phi Learning., 2009.
3. John Iovice, "Robots, Androids and Animatrons", Mc Graw Hill, 2003.
4. K.S. Fu, R.C. Gonzalez, C.S.G. Lee, "Robotics – Control Sensing, Vision and Intelligence", Tata McGraw-Hill Education, 2008.
5. Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, Technology programming and Applications, Tata McGraw-Hill Education, 2012.
6. Sabrie Soloman, Sensors and Control Systems in Manufacturing, McGraw-Hill Professional Publishing, 2nd Edition, 2009.

Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	**70**
Weightage (%)	5	10	10	5	

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**2**	**3**	--	--	--	--	**3**	--	--	--	--	**1**	**2**	--	--
CO2	**1**	--	**2**	**2**	--	--	--	**3**	--	--	--	--	**1**	**2**	--	--
CO3	**1**	**2**	**2**	**3**	--	--	**3**	--	--	--	--	--	**1**	--	--	**3**

1: strongly related, 2: moderately related and 3: weakly related

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RBE6905	PATTERN RECOGNITION AND IMAGE PROCESSING LAB	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	0	0	1	1
Pre-requisites/Exposure	Basics of MATLAB				
Co-requisites	NIL				

Catalog Description
In this Lab course first student should learn about advanced level of software used for easy calculation and toolbox used for software like MATLAB.

Course Objectives
The objective of this course is to

1. Make the students apply knowledge of various Image processing & pattern recognition required for solving complex problems.
2. Provide a demonstration of different types of image processing techniques through MATAB toolbox.

Course Outcomes
On completion of this course, the students will be able to
CO1: Acquiring knowledge of Basics of High-end calculation software and need in Computer Science & engineering
CO2: Demonstrate the All preliminary functions in MATLAB
CO3: Apply the knowledge of all the basics function and toolbox knowledge of MATLAB
CO4: Demonstrate the Use of MATLAB in image Processing
CO5: Demonstrate usage of applications involving with Image processing & Recognition Its Toolbox used by MATLAB

Modules/Topics Covered**	Blooms level*	Number of hours
11. Introduction of MATLAB (j) Basic Variable deceleration & its operation (k) Function use & its application	L3, L5	4
12. Sample Programs in MATLAB (m) Basic use of Matrix and Graph Plotting (n) Different type of graph plotting with use of different -2 type of data	L3, L5	6
13. Sample Programs using MATLAB functions (r) Create a basic program MATLAB using functions (s) Use of basic function Image processing (t) Practice on Basic function of Image processing tool box.	L3, L5	6
14. Sample programs of ANN functions (g) Practice on Pattern Recognition functions in MATLAB (h) Write a program for training a small network in MATLAB	L3, L5	6

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15. Sample Programs using ANN toolbox & Image processing toolbox (g) Demonstrate the use of ANN tool box & Image processing toolbox and write a program after combining it.	L3, L5	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

Text & References:

- Rafael C. Gonzalez & Richard E. Woods, "Image Processing Using MATLAB", 2nd edition, Pearson Education.
- "Pattern classifications", Richard O. Duda, PeterE. Hart, David G. Stroke. Wiley student edition, Second Edition

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	**70**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**2**	**1**	--	--	--	--	--	--	--	--	--	--	**2**	--	--	--
CO2	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO3	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO4	**1**	**3**	**2**	--	--	--	--	--	--	--	--	--	**2**	--	**2**	--
CO5	**1**	**3**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--

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RBE6906	OPTIMIZATION TECHNIQUES	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The purpose of this course is to develop a knowledge in the field of optimization techniques their basic concepts, ,principles. linear programming and queuing theory.

Course Objectives

After successful completion of the course, student will be able to understand importance of optimization of industrial process management , apply basic concepts of mathematics to formulate an optimization problem , analyse and appreciate variety of performance measures for various optimization problems.

Course Outcomes

On completion of this course, the students will be able to

CO1: Understand importance of optimization of industrial process management.
CO2: Apply basic concepts of mathematics to formulate an optimization problem
CO3: Analyse and appreciate variety of performance measures for various optimization problems
CO4: Use classical optimization techniques and numerical methods of optimization
CO5: Apply knowledge of optimization to formulate and solve engineering problems

Modules	Blooms level*	Number of hours
MODULE 1: INTRODUCTION Introduction to optimization – adequate and optimum design – principles of optimization – statement of an optimization problem – classification – formulation of objective function, design constraints.	L1, L2	4
MODULE 2: CLASSICAL OPTIMIZATION TECHNIQUES Single variable optimization –multivariable optimization with no constraints – exhaustive search, Fibonacci method, golden selection, Random, pattern and gradient search methods – Interpolation methods: quadratic and cubic, direct root method.	L1, L2, L3 and L5 , L6	12
MODULE 3:MULTIVARIABLE – UNCONSTRAINED AND CONSTRAINED OPTIMIZATION Direct search methods – descent methods – conjugate gradient method. Indirect methods – Transformation techniques, penalty function method	L1, L3 and L4	8

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MODULE 4:NON – TRADITIONAL OPTIMIZATION TECHNIQUES Genetic Algorithms -steady state algorithm, fitness scaling, inversion. Genetic programming:- Genetic Algorithm in problem solving, Implementing a Genetic Algorithm:- computer implementation, operator (reproduction, crossover and Mutation, Fitness Scaling, Coding, Discretization). Knowledge based techniques in Genetic Algorithm. Advanced operators and techniques in genetic search:-Dominance, Diploidy and Abeyance. Inversion and other reordering operators, Niche and speciation and Tabu search methods.	L1, L3, and L4	10
MODULE 5:OPTIMUM DESIGN OF MACHINE Desirable and undesirable effects – functional requirement – material and geometrical parameters – Design of simple axial, transverse loaded members for minimum cost and minimum weight.	L3 and L4	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text & References:

1. Rao, S.S., "*Optimization – Theory and Applications*", Wiley Eastern, New Delhi, 1978
2. Fox, R.L., Optimization Methods for Engineering Design, Addition – Wesley, Reading, Mass, 1971.
3. Wilde, D.J., "*Optimum Seeking Methods*", Prentice Hall, Englewood Cliffs, New Jersey, 1964

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**3**	--	**1**	--	--	--	--	--	--	--	--	**1**	--	**2**	--
CO2	**1**	**3**	--	**2**	--	--	--	--	--	--	--	--	**1**	**2**	--	**1**
CO3	**1**	**2**	**2**	**4**	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO4	**1**	**2**	**2**	**2**	--	---	--	--	--	--	--	--	**1**	**2**	--	--
CO5	**1**	3	**2**	**1**	--	--	--	--	--	--	--	--	**1**	**1**	--	**4**

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RBE6908	NEURAL NETWORK AND FUZZY LOGIC	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure	Linear algebra, advanced calculus, discrete mathematics, Boolean algebra or equivalent.				
Co-requisites	Nil				

Catalog Description

Fuzzy sets and fuzzy logic find many applications in the areas of stability theory, pattern recognition, controls etc. Neural Networks offer fundamentally alternative approaches to procedural programming. These systems proved their applicability to the problems where there are missing data or information or the problems which could not be defined in an algorithm. The integration of fuzzy systems and neural networks gives a tremendous potential which can be applied to many complicated problems of Artificial Intelligence and other applications in Real World Computing. This course provides a comprehensive treatment of neural network architectures and learning algorithms, with an in-depth look at problems in data mining and in knowledge discovery.

Course Objectives

The objective of this course is to

1. Introduces the basics of Neural Networks and essentials of Artificial Neural Networks with Single Layer and Multilayer Feed Forward Networks.
2. It deals with Associate Memories and introduces Fuzzy sets and Fuzzy Logic system component

Course Outcomes

On completion of this course, the students will be able to

CO1: Understand the principles of neural networks and fuzzy Logic fundamentals.
CO2: compare analysis between human and computer, Artificial Neural Networks models, characteristics of ANN's learning strategies, learning rules and basics of fuzzy logic.
CO3: Understand concept of classical and fuzzy sets, fuzzification and defuzzification, with which they can be able to apply the conceptual things to the real world electrical and electronics problems and applications.
CO4: Get thorough knowledge in biological neuron and artificial neurons.
CO5: Design the required and related systems

Modules	Blooms level*	Number of hours
MODULE 1: Basic neural computation models: Network and node properties. Inference and learning algorithms.Unsupervised learning: Signal hebbian learning and competitive learning. Supervised learning: Back propagation algorithms.	L1, L2	4

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MODULE 2: Self organizing networks: Kohonen algorithm, bi-directional associative memories. Hopfield Networks: Hopfield network algorithm. Adaptive resonance theory: Network and learning rules. Neural network applications.	L1, L2, L3 and L4	10
MODULE 3: Fuzzy Sets: Operations and properties. Fuzzy Relations: Cardinality, Operations and properties. Value Assignments: Cosine amplitude and max-min method. Fuzzy classification: Cluster analysis and validity, Fuzzy e-means clustering, hardening the Fuzzy e-partition.	L1, L3, L4 and L5	6
MODULE 4: Fuzzification, Membership value assignments: Inference, rank ordering and angular Fuzzy sets, defuzzification methods, fuzzy logic, approximate reasoning. Fuzzy –based systems: Canonical rule forms, decomposition of compound rules, likelihood and truth qualification, aggregation of Fuzzy rules, graphical techniques of inference.	L1, L2, L3, and L4	9
MODULE 5:OPTIMUM DESIGN OF MACHINE Non linear simulation using Fuzzy rule-based systems, Fuzzy associative memories. Decision making under Fuzzy states and Fuzzy actions. Fuzzy grammar and syntactic recognition. General Fuzzy logic controllers, special forms of Fuzzy logic control system models, examples of Fuzzy control system design and control problems, industrial applications.	L2, L3, L4 and L5	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text & References:

1. Limin Fu. "Neural Networks in Computer Intelligence" McGraw Hill, 1995.
2. Freeman J. A., and Skapura D. Mu. "Neural Networks Algorithms applications and Programming Techniques", Addison Wesley New York, 1991.
3. Timoty J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill1997.
4. Bart Kosho "Neural Network and Fuzzy Systems", Prentice Hall of India,1994

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**3**	--	**1**	--	--	--	--	--	--	--	--	**1**	--	**2**	--
CO2	**1**	**3**	--	**2**	--	--	--	**2**	--	--	--	--	**1**	**2**	--	**1**
CO3	**1**	**2**	**2**	**4**	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO4	**1**	**2**	**2**	**2**	--	---	--	--	--	--	--	--	**1**	**2**	--	--
CO5	**1**	3	**2**	**1**	--	--	--	--	--	--	--	--	**1**	**1**	--	**4**

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RBE6909	NEURAL NETWORK AND FUZZY LOGIC LAB	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	0	0	2	1
Pre-requisites/Exposure	C/C++/MATLAB				
Co-requisites	Nil				

Catalog Description

Neural Networks offer fundamentally alternative approaches to procedural programming. Fuzzy sets and fuzzy logic find many applications in the areas of stability theory, pattern recognition, controls etc. These systems proved their applicability to the problems where there are missing data or information or the problems which could not be defined in an algorithm.

Course Objectives

The objective of this course is to

1. To become familiar with neural networks learning algorithms from available examples and give design methodologies for artificial neural networks.
2. Understand and analyse concepts of fuzzy set and use fuzzy set operations to implement current computing techniques used in fuzzy computing.

Course Outcomes

On completion of this course, the students will be able to

CO1: Understand the difference between learning and programming and explore practical applications of Neural Networks (NN).

CO2: To analyse and appreciate the applications which can use fuzzy logic.

CO3: Understand the efficiency of a hybrid system and how Neural Network and fuzzy logic can be hybridized to form a Neuro-fuzzy network and its various applications and they will be able to design inference systems

Modules	Blooms level*	Number of hours
Lab Session 1: Write a program to implement single layer perception algorithm.	L3 and L4	2
Lab Session 2: Write a program to implement back propagation learning algorithm	L3 and L4	4
Lab Session 3: Design multilayer feed forward network using back-propogation algorithm	L3 and L4	6
Lab Session 4 Study of fuzzy inference system	L1, L2, and L3	2
Lab Session 5 To study fuzzy logic controller using fuzzy logic toolbox	L1, L2, and L3	4

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Lab Session 6 Write a program to implement SDPTA	L3 and L4	2
Lab Session 7 Write a program to implement RDPTA	L3 and L4	2
Lab Session 8 To Study various defuzziification techniques	L1, L2, and L3	2
Lab Session 9 Write a program to implement of fuzzy set operation	L2, L3, and L4	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text & References:

1. Limin Fu. "Neural Networks in Computer Intelligence" McGraw Hill, 1995.
2. Freeman J. A., and Skapura D. Mu. "Neural Networks Algorithms applications and Programming Techniques", Addison Wesley New York, 1991.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	**3**	--	--	--	--	**3**	--	--	--	--	**1**	**2**	--	--
CO2	**1**	--	**2**	**2**	--	--	--	**3**	--	--	--	--	**1**	**2**	--	--
CO3	**1**	**2**	**2**	**3**	--	--	**3**	--	--	--	--	--	**1**	--	--	**3**

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RBE6910	DECISION MAKING SYSTEM	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure	Basic Networking Concepts				
Co-requisites	Nil				

Catalog Description

To develop semantic-based and context-aware systems to acquire, organize process, share and use the knowledge embedded in multimedia content. Research will aim to maximize automation of the complete knowledge lifecycle and achieve semantic interoperability between Web resources and services. The field of Robotics is a multi disciplinary as robots are amazingly complex system comprising mechanical, electrical, electronic H/W and S/W and issues germane to all these.

Course Objectives

The objective of this course is to

1. To provide an overview of problem solving skills methods using decision making systems .
2. To serve as a foundation for the study of programming languages that is used to develop an Intelligence System

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand the concept of artificial intelligence.

CO2. Differentiate between linear and non-linear problems and Learn various problem solving techniques using neural networks

CO3. Understand the concept of fuzzy logic and apply to various problems

CO4. Able to learn concepts of genetic algorithm

Modules	Blooms level*	Number of hours
Module I: Soft Computing Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing. Artificial Intelligence : Introduction, Various types of production systems, characteristics of production systems, breadth first search, depth first search techniques, other Search Techniques like hill Climbing, Best first Search, A* algorithm, AO* Algorithms and various types of control strategies. Knowledge representation issues, Prepositional and predicate logic, monotonic and non monotonic reasoning, forward Reasoning, backward reasoning, Weak & Strong Slot & filler structures, NLP.	L1, L2	12

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Module II: Neural Network Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural net, Difference between ANN and human brain, characteristics and applications of ANN, single layer network, Perceptron training algorithm, Linear separability, Widrow & Hebb;s learning rule/Delta rule, ADALINE, MADALINE, AI v/s ANN. Introduction of MLP, different activation functions, Error back propagation algorithm, derivation of BBPA, momentum, limitation, characteristics and application of EBPA	L2, L3 and L4	10
Module III Counter propagation network, architecture, functioning & characteristics of counter Propagation network, Hopfield/ Recurrent network, configuration, stability constraints, associative memory, and characteristics, limitations and applications. Hopfield v/s Boltzman machine. Adaptive Resonance Theory: Architecture, classifications, Implementation and training. Associative Memory.	L2, L3 and L4	8
Module IV: Fuzzy Logic Fuzzy set theory, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, Fuzzy systems: crisp logic, fuzzy logic, introduction & features of membership functions, Fuzzy rule base system : fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making & Applications of fuzzy logic.	L2, L3 and L4	7
Module V: Genetic algorithm Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional methods.	L2, L4	3

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books & References:

1. S, Rajasekaran & G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & Applications, PHI Publication.
2. S.N. Sivanandam & S.N. Deepa, Principles of Soft Computing, Wiley Publications
3. Rich E and Knight K, Artificial Intelligence, TMH, New Delhi.
4. Bose, Neural Network fundamental with Graph , Algo.& Appl, TMH
5. Kosko: Neural Network & Fuzzy System, PHI Publication
6. Klir & Yuan, Fuzzy sets & Fuzzy Logic: Theory & Appli.,PHI Pub.
7. Hagen, Neural Network Design, Cengage Learning

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	--	--	3	--	--	--	--	--	--	2	--	--	2	--	--
CO2	1	--	1	2	--	--	--	--	--	--	--	--	1	--	1	2
CO3	1	--	1	2	--	--	--	--	--	--	--	--	--	--	--	3
CO4	1	--	--	2	--	--	--	--	--	--	--	--	1	--	2	--
CO5	1	--	2	3	--	--	--	--	--	--	--	--	1	2	--	--
CO6	1	--	--	--	2	3	--	--	--	--	--	--	--	--	2	--

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RBE6911	DECISION MAKING SYSTEM LAB	L	T	P	C
Version 2020.1	Date of Approval: JULY2020	0	0	2	1
Pre-requisites/Exposure	C/C++/MATLAB				
Co-requisites	Nil				

Catalog Description

This lab course covers development and designing of implementing basic neural networks, fuzzy systems, and optimization algorithms concepts and their relations. It aims to develop the concepts and techniques and foster the students' abilities in designing and implementing soft computing based solutions for real-world and engineering problems.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of Soft Computing which includes Neural networks, Fuzzy logic and genetic algorithms.
2. Provide knowledge to develop Soft computing programs in Matlab.

Course Outcomes

On completion of this course, the students will be able to

CO1: Implement various neural networks using MATLAB.

CO2: Illustrate use of fuzzy in real applications.

CO3: Apply genetic algorithm to basic problems.

Modules	Blooms level*	Number of hours
Lab Session 1: Study of Biological Neural Network	L1 , L2 and L3	2
Lab Session 2: Study of Artificial Neural Network	L1, L2 and L3	1
Lab Session 3: Write a program of Perceptron Training Algorithm.	L3 and L4	2
Lab Session 4 Write a program to implement Hebb's Rule	L3, and L4	2
Lab Session 5 Write a program to implement of Delta Rule.	L3, and L3	2
Lab Session 6 Write a program to implement back propagation learning algorithm.	L3 and L4	2
Lab Session 7 Study of fuzzy inference system	L1, L2 and L3	1

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Lab Session 8 To study fuzzy logic controller using fuzzy logic toolbox	L1, L2, L3 and L4	2
Lab Session 9 Write a program to implement SDPTA	L3 and L4	2
Lab Session 10 Write a program to implement RDPTA	L3 and L4	2
Lab Session 11 To Study various defuzziification techniques	L1, L2, L3 and L4	1
Lab Session 12 Write a program to implement of fuzzy set operation	L3 and L4	2
Lab Session 13 Study of genetic algorithm	L1, L2, L3 and L4	1
Lab Session 14 Study of Genetic programming and solve a real life problem	L1, L2, L3, and L4	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text & References:

1. Limin Fu. "Neural Networks in Computer Intelligence" McGraw Hill, 1995.
2. Freeman J. A., and Skapura D. Mu. "Neural Networks Algorithms applications and Programming Techniques", Addison Wesley New York, 1991.
3. S, Rajasekaran & G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & Applications, PHI Publication.
4. S.N. Sivanandam & S.N. Deepa, Principles of Soft Computing, Wiley Publications
5. Rich E and Knight K, Artificial Intelligence, TMH, New Delhi.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	**3**	--	--	--	--	**3**	--	--	--	--	**1**	**2**	--	--
CO2	**1**	--	**2**	**2**	--	--	--	**3**	--	--	--	--	**1**	**2**	--	--
CO3	**1**	--	**3**	**2**	--	**3**	**3**	--	--	--	--	--	**1**	--	--	**3**

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MLE6901	PATTERN RECOGNITION & IMAGE PROCESSING	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure	Basics of Digital Image Processing				
Co-requisites	NIL				

Catalog Description

This course gives students an insight into the basics of Image Processing along with Pattern Recognition. Concepts covered would enable students to define and differentiate among various types of image refinement. Further they would be able to gain insights about various Image restoration and modification technique.

Course Objectives

This course covers the theory and methods for learning from data, with an emphasis on pattern classification. Digital Image Processing is designed to give professionals and students a powerful collection of fundamental and advanced image processing tools on the desktop.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define and explain introductory part of Pattern recognition Concepts & Bayesian decision theory

CO2: List out the Univariate and Multivariate density

CO3: Explain concepts of Un-supervised learning and clustering

CO4: Describe the Image Fundamentals and Transforms

CO5: Explain the basics of Image Segmentation and Edge Detection

Modules	Blooms level*	Number of hours
MODULE 1: **Introduction of Pattern recognition and Bayesian Decision Theory** Machine perception, pattern recognition example, pattern recognition systems, the design cycle, learning and adaptation Introduction, continuous features – two categories classifications, minimum error-rate classification- zero–one loss function, classifiers, discriminant functions, and decision surfaces	L1 and L2	8
MODULE 2: **Normal density** Univariate and multivariate density, discriminant functions for the normal density-different cases, Bayes decision theory – discrete features, compound Bayesian decision theory and context	L2 and L3	8
MODULE 3: **Un-supervised learning and clustering** Introduction, mixture densities and Identifiability, maximum likelihood estimates, application to normal mixtures, K-means clustering. Date description and clustering, similarity measures, criteria function for clustering	L1 and L2	10

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MODULE 4: **Image Fundamentals and Transforms** Elements of visual perception – Image sampling and quantization, Basic relationship between pixels, Some basic grayscale transformations, Introduction to Fourier Transform and DFT, Properties of 2D Fourier Transform, FFT, Separable Image Transforms, Walsh, Hadamard, Discrete Cosine Transform, Haar, Slant, Karhunen, Loeve transforms.	L2 and L3	12
MODULE 5: **Image Segmentation and Edge Detection** Region Operations, Crack Edge Detection, Edge Following, Gradient operators, Compass and laplace operators. Threshold detection methods, optimal thresholding, multispectral thresholding, thresholding in hierarchical data structures; edge based image segmentation- edge image thresholding, edge relaxation, border tracing, border detection,	L2 and L3	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

Text & References:

Text:

- "Fundamentals of speech Recognition", Lawerence Rabiner, Biing – Hwang Juang Pearson education.
- "Pattern classifications", Richard O. Duda, PeterE. Hart, David G. Stroke. Wiley student edition, Second Edition.
- R.C Gonzalez and R.E. Woods, "Digital Image Processing", Addison Wesley.

References:

- "Pattern Recognition and Image Analysis" – Earl Gose, Richard John baugh, Steve Jost
- A.K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India.
- "Digital Image Processing"– M. Anji Reddy, BS Publications.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--
CO 2	**1**	--	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO 3	**3**	--	**1**	--	**2**	--	--	--	--	--	--	--	**1**	**3**	**2**	--
CO 4	**3**	--	**2**	--	**1**	--	--	--	--	--	--	--	**1**	--	**2**	--
CO 5	**3**	--	**2**	--	**1**	--	--	--	--	--	--	--	**1**	--	**2**	--

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MLE6904	PATTERN RECOGNITION AND IMAGE PROCESSING LAB	L	T	P	C
Version 2019.1	Date of Approval: 15 May 2019	0	0	1	1
Pre-requisites/Exposure	Basics of MATLAB				
Co-requisites	NIL				

Catalog Description

In this Lab course first student should learn about advanced level of software used for easy calculation and toolbox used for software like MATLAB.

Course Objectives

The objective of this course is to

1. Make the students apply knowledge of various Image processing & pattern recognition required for solving complex problems.
2. Provide a demonstration of different types of image processing techniques through MATAB toolbox.

Course Outcomes

On completion of this course, the students will be able to

CO1: Acquiring knowledge of Basics of High-end calculation software and need in Computer Science & engineering

CO2: Demonstrate the All preliminary functions in MATLAB

CO3: Apply the knowledge of all the basics function and toolbox knowledge of MATLAB

CO4: Demonstrate the Use of MATLAB in image Processing

CO5: Demonstrate usage of applications involving with Image processing & Recognition Its Toolbox used by MATLAB

Modules/Topics Covered**	Blooms level*	Number of hours
16. Introduction of MATLAB (l) Basic Variable deceleration & its operation (m) Function use & its application	L3, L5	4
17. Sample Programs in MATLAB (o) Basic use of Matrix and Graph Plotting (p) Different type of graph plotting with use of different -2 type of data	L3, L5	6
18. Sample Programs using MATLAB functions (u) Create a basic program MATLAB using functions (v) Use of basic function Image processing (w) Practice on Basic function of Image processing tool box.	L3, L5	6
19. Sample programs of ANN functions (i) Practice on Pattern Recognition functions in MATLAB (j) Write a program for training a small network in MATLAB	L3, L5	6

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20. Sample Programs using ANN toolbox & Image processing toolbox (h) Demonstrate the use of ANN tool box & Image processing toolbox and write a program after combining it.	L3, L5	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

Text & References:

- Rafael C. Gonzalez & Richard E. Woods, "Image Processing Using MATLAB", 2nd edition, Pearson Education.
- "Pattern classifications", Richard O. Duda, PeterE. Hart, David G. Stroke. Wiley student edition, Second Edition

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	**70**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**2**	**1**	--	--	--	--	--	--	--	--	--	--	**2**	--	--	--
CO2	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO3	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO4	**1**	**3**	**2**	--	--	--	--	--	--	--	--	--	**2**	--	**2**	--
CO5	**1**	**3**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--

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MLE6902	NEURAL NETWORK AND FUZZY LOGIC	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure	Linear algebra, advanced calculus, discrete mathematics, Boolean algebra or equivalent.				
Co-requisites	Nil				

Catalog Description

Fuzzy sets and fuzzy logic find many applications in the areas of stability theory, pattern recognition, controls etc. Neural Networks offer fundamentally alternative approaches to procedural programming. These systems proved their applicability to the problems where there are missing data or information or the problems which could not be defined in an algorithm. The integration of fuzzy systems and neural networks gives a tremendous potential which can be applied to many complicated problems of Artificial Intelligence and other applications in Real World Computing. This course provides a comprehensive treatment of neural network architectures and learning algorithms, with an in-depth look at problems in data mining and in knowledge discovery.

Course Objectives

The objective of this course is to

1. Introduces the basics of Neural Networks and essentials of Artificial Neural Networks with Single Layer and Multilayer Feed Forward Networks.
2. It deals with Associate Memories and introduces Fuzzy sets and Fuzzy Logic system component

Course Outcomes

On completion of this course, the students will be able to

CO1: Understand the principles of neural networks and fuzzy Logic fundamentals.

CO2: compare analysis between human and computer, Artificial Neural Networks models, characteristics of ANN's learning strategies, learning rules and basics of fuzzy logic.

CO3: Understand concept of classical and fuzzy sets, fuzzification and defuzzification, with which they can be able to apply the conceptual things to the real world electrical and electronics problems and applications.

CO4: Get thorough knowledge in biological neuron and artificial neurons.

CO5: Design the required and related systems

Modules	Blooms level*	Number of hours
MODULE 1: Basic neural computation models: Network and node properties. Inference and learning algorithms. Unsupervised learning: Signal hebbian learning and competitive learning. Supervised learning: Back propagation algorithms.	L1, L2	4

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MODULE 2: Self organizing networks: Kohonen algorithm, bi-directional associative memories. Hopfield Networks: Hopfield network algorithm. Adaptive resonance theory: Network and learning rules. Neural network applications.	L1, L2, L3 and L4	10
MODULE 3: Fuzzy Sets: Operations and properties. Fuzzy Relations: Cardinality, Operations and properties. Value Assignments: Cosine amplitude and max-min method. Fuzzy classification: Cluster analysis and validity, Fuzzy e-means clustering, hardening the Fuzzy e-partition.	L1, L3, L4 and L5	6
MODULE 4: Fuzzification, Membership value assignments: Inference, rank ordering and angular Fuzzy sets, defuzzification methods, fuzzy logic, approximate reasoning. Fuzzy –based systems: Canonical rule forms, decomposition of compound rules, likelihood and truth qualification, aggregation of Fuzzy rules, graphical techniques of inference.	L1, L2, L3, and L4	9
MODULE 5:OPTIMUM DESIGN OF MACHINE Non linear simulation using Fuzzy rule-based systems, Fuzzy associative memories. Decision making under Fuzzy states and Fuzzy actions. Fuzzy grammar and syntactic recognition. General Fuzzy logic controllers, special forms of Fuzzy logic control system models, examples of Fuzzy control system design and control problems, industrial applications.	L2, L3, L4 and L5	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text & References:

- Limin Fu. "Neural Networks in Computer Intelligence" McGraw Hill, 1995.
- Freeman J. A., and Skapura D. Mu. "Neural Networks Algorithms applications and Programming Techniques", Addison Wesley New York, 1991.
- Timoty J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill1997.
- Bart Kosho "Neural Network and Fuzzy Systems", Prentice Hall of India,1994

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**3**	--	**1**	--	--	--	--	--	--	--	--	**1**	--	**2**	--
CO2	**1**	**3**	--	**2**	--	--	--	**2**	--	--	--	--	**1**	**2**	--	**1**
CO3	**1**	**2**	**2**	**4**	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO4	**1**	**2**	**2**	**2**	--	---	--	--	--	--	--	--	**1**	**2**	--	--
CO5	**1**	3	**2**	**1**	--	--	--	--	--	--	--	--	**1**	**1**	--	**4**

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MLE6905	NEURAL NETWORK AND FUZZY LOGIC LAB	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	0	0	2	1
Pre-requisites/Exposure	C/C++/MATLAB				
Co-requisites	Nil				

Catalog Description

Neural Networks offer fundamentally alternative approaches to procedural programming. Fuzzy sets and fuzzy logic find many applications in the areas of stability theory, pattern recognition, controls etc. These systems proved their applicability to the problems where there are missing data or information or the problems which could not be defined in an algorithm.

Course Objectives

The objective of this course is to

1. To become familiar with neural networks learning algorithms from available examples and give design methodologies for artificial neural networks.
2. Understand and analyse concepts of fuzzy set and use fuzzy set operations to implement current computing techniques used in fuzzy computing.

Course Outcomes

On completion of this course, the students will be able to

CO1: Understand the difference between learning and programming and explore practical applications of Neural Networks (NN).

CO2: To analyse and appreciate the applications which can use fuzzy logic.

CO3: Understand the efficiency of a hybrid system and how Neural Network and fuzzy logic can be hybridized to form a Neuro-fuzzy network and its various applications and they will be able to design inference systems

Modules	Blooms level*	Number of hours
Lab Session 1: Write a program to implement single layer perception algorithm.	L3 and L4	2
Lab Session 2: Write a program to implement back propagation learning algorithm	L3 and L4	4
Lab Session 3: Design multilayer feed forward network using back-propogation algorithm	L3 and L4	6
Lab Session 4 Study of fuzzy inference system	L1, L2, and L3	2
Lab Session 5 To study fuzzy logic controller using fuzzy logic toolbox	L1, L2, and L3	4

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Lab Session 6 Write a program to implement SDPTA	L3 and L4	2
Lab Session 7 Write a program to implement RDPTA	L3 and L4	2
Lab Session 8 To Study various defuzziification techniques	L1, L2, and L3	2
Lab Session 9 Write a program to implement of fuzzy set operation	L2, L3, and L4	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text & References:

- Limin Fu. "Neural Networks in Computer Intelligence" McGraw Hill, 1995.
- Freeman J. A., and Skapura D. Mu. "Neural Networks Algorithms applications and Programming Techniques", Addison Wesley New York, 1991.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	**3**	--	--	--	--	**3**	--	--	--	--	**1**	**2**	--	--
CO2	**1**	--	**2**	**2**	--	--	--	**3**	--	--	--	--	**1**	**2**	--	--
CO3	**1**	**2**	**2**	**3**	--	--	**3**	--	--	--	--	--	**1**	--	--	**3**

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MLE6903	NATURAL LANGUAGE PROCESSING	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure	Basics of Python				
Co-requisites	Nil				

Catalog Description

In this course general introduction including the use of state automata for language processing and syntax including a basic parse for natural language processing are discussed in detail. Basic features like regular expressions, Text Normalization, Edit Distance, n-gram model and advanced feature like feature structures and realistic parsing methodologies, part of speech tagging will be introduced. The concepts learnt in the studies of natural language processing will be applied in jupyter notebook using python for developing small to medium level applications.

Course Objectives

The objective of this course is to

- Equip the students with concepts of natural language processing through problem solving and practical approach.
- Provide an overview of various tools in the field of natural language processing to gain practical understanding of the concepts.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain, knowledge in speech recognition, models and algorithms; Explain regular expressions and solve related problems; Explain and solve problems related to lemmatization and stemming, minimum edit distance.

CO2: Explain language models and compare their performance on datasets; Solve some problems on naïve bayes algorithm.

CO3: Explain logistic regression, similarity, language modelling and solve problems based on them.

CO4:.Describe ANN and Part of speech tagging; Solve problems based on them.

CO5: Describe RNN models and distinguish between simple ANN and RNN;

Modules	Blooms level*	Number of hours

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MODULE 1: Knowledge in Speech and Language Processing ,Ambiguity ,Models and Algorithms Language, Thought, and Understanding ,The State of the Art and The Near-Term Future Some Brief History, Regular Expressions, Words ,Corpora,Text Normalization ,Minimum Edit Distance	L1, L2 ,L3	7
MODULE 2: Evaluating Language Models, Generalization and Zeros, Smoothing, Kneser-Ney Smoothing, The Web and Stupid Backoff, Advanced: Perplexity's Relation to Entropy, Naive Bayes Classifiers, Training the Naive Bayes Classifier, Worked example, Optimizing for Sentiment Analysis, Naive Bayes for other text classification tasks, Naive Bayes as a Language Model, Evaluation: Precision, Recall, F-measure, Test sets and Cross-validation, Statistical Significance Testing Advanced: Feature Selection.	L1,L2, L3	8
MODULE 3: Classification: the sigmoid, Learning in Logistic Regression, The cross-entropy loss function, Gradient Descent, Regularization, Multinomial logistic regression, Interpreting models, Advanced: Deriving the Gradient Equation, Lexical Semantics, Vector Semantics, Words and Vectors, Cosine for measuring similarity, TF-IDF: Weighing terms in the vector, Applications of the tf-idf vector model, Optional: Pointwise Mutual Information (PMI), Word2vec, Visualizing Embeddings, Semantic properties of embeddings, Bias and Embeddings, Evaluating Vector Models.	L1,L2, L3	8
MODULE 4: Units,The XOR problem, Feed-Forward Neural Networks, Training Neural Nets, Neural Language Models, (Mostly) English Word Classes, The Penn Treebank Part-of-Speech Tagset, Part-of-Speech Tagging , HMM Part-of-Speech Tagging, Maximum Entropy Markov Models, Bidirectionality, Part-of-Speech Tagging for Other Languages.	L1, L2 and L3	6
MODULE 5: Simple Recurrent Networks, Applications of RNNs, Deep Networks: Stacked and Bidirectional RNNs, Managing Context in RNNs: LSTMs and GRUs, Words, Characters and Byte-Pairs.	L1, L2,L3	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text & References:

1. Daniel Jurafsky & James H.Martin, "Speech and Language Processing", 2nd Edition, Pearson Education, 2009.

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2. James Allen, "Natural Language Understanding", 2nd Edition, Pearson Education, 2008.
3. Manning, Christopher D and Hinrich Schütze, “Foundations of Statistical Natural Language Processing”, Cambridge, 1st Edition, MA: MIT Press, 1999.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	1	1	--	--	--	--	--	--	--	--	--	1	1	3	-
CO2	1	1	1	--	--	--	--	--	--	--	--	--	1	1	3	-
CO3	1	1	1	--	-	--	--	--	--	--	--	--	1	1	3	-
CO4	1	2	3	--	--	--	--	--	--	--	--	--	1	1	3	-
CO5	1	2	3	--	--	--	--	--	--	--	--	--	2	2	3	-

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MLE6906	HADOOP LAB	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	0	0	4	2
Pre-requisites/Exposure	Basic Concepts of DBMS				
Co-requisites	Relational Algebra and Relational Calculus				

Catalog Description

This course brings together several key big data technologies used for storage, analysis and manipulation of data. It also introduces the students the key concepts of Hadoop framework, MapReduce, Pig, Hive, and No-SQL. Students will learn to work on Hadoop platform. The concepts learnt will make students capable of working on big data projects easier.

Course Objectives

The objective of this course is

- To make students familiar with big data technologies.
- Provide an overview of Hadoop architecture and its working with other open source technologies.

Course Outcomes

On completion of this course, the students will be able to

CO1. Install and configure Hadoop and various tools like Pig, Hive etc.
CO2. Explain concepts of files and directories in HDFS and apply them in real database applications.
CO3. Design and implement mapreduce programs for a given problem.
CO4. Solve queries using concepts of Hive and Pig.
CO5. Perform operations using HBase.

Modules	Blooms level*	Number of hours
Lab Session 1 1. Installation & Configuration steps of Hadoop	L1 and L2	2
Lab Session 2-3 1. Working with HDFS commands :mkdir, rmdir, rm, mv, ls, du, put, rm-r, cat, tail etc 2. Working with vi editor	L1and L3	4
Lab Session 4-5 Working with Java Map Reduce : Map Class, Reduce Class, Drier Class, map side joins, reduce side joins	L1 and L3	4

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Lab Session 6-8 1. Working with Hive : Queries for Hive : Create table, describe database, describe table, describe extended table, describe formatted table, drop table, drop database, display table, where clause 2. Commands : Load Files on table : Load from HDFS, load from local 3. Command :CTAS Create table as select 4. Queries to create external tables 5. Working with commands like : Order by, group by, like, upper, lower, max, min	L1 and L3	6
Lab Session 9-10 1. Working with PIG : Order by, group by, co group, like, upper, lower, Joins, Union, Cartesian, Product, Pig Scripts	L1 and L3	4
Lab Session 11-12 Working with HBase : Start the hbase, data insert, modify, multiple version insertion, describe, delete truncate, drop etc. Working with Foreign Key and Check Constraint.	L1 and L3	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Jeffrey Aven, "SAMS Teach Yourself Hadoop in 24 Hours", 1st Ed., Pearson ,2017.
2. Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'reilly, 2012.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	--	--	**3**	--	--	--	--	--	--	--	--	**1**	**1**	**-**
CO2	**1**	**-**	--	--	**2**	--	--	--	--	--	--	**2**	--	**1**	**1**	**-**
CO3	**1**	**-**	**1**	--	--	--	--	--	--	--	--	**2**	--	**1**	**1**	**-**
CO4	**1**	**-**	**2**	--	--	--	--	--	--	--	--	--	---	**1**	**1**	**--**
CO5	**1**	**-**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	**-**

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MLE6907	DESCRIPTIVE ANALYSIS	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure					
Co-requisites	Nil				

Catalog Description

This course introduces some elementary statistical methods of analysis of data and compute various measurements of central tendency, dispersion, skewness and kurtosis. Also discusses computation of the correlation coefficient from ungrouped bivariate data and interpret them and analyse data pertaining to attributes and to interpret results.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of descriptive statistics through problem solving and practical approach.
2. Provide an overview of various tools in the field of statistics to gain practical understanding of the concepts.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain data sampling and solve related problems; Explain and solve problems related to discrete frequency distribution and continuous frequency distribution.

CO2: Explain data samples and compare their performance on datasets

CO3: Explain regression modelling and solve problems based on them.

CO4: Describe Concept of central tendency of statistical data and solve problems based on them.

CO5: Describe Concept of dispersion and distinguish between concepts of central tendency of statistical data

Modules	Blooms level*	Number of hours
MODULE 1: Definitions: Webster's and Secrist's definition of Statistics, Importance of Statistics, Scope of Statistics: In the field of Industry, Biological Sciences, Medical Sciences, Economics Sciences, Social, Sciences, Management Sciences, Agriculture, Insurance, Actuarial Science, Education and Psychology.	L1, L2 ,L3	4

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MODULE 2: Types of characteristics: Attributes: Nominal scale, ordinal scale. Variables: Interval scale, ratio scale, discrete and continuous variables, Types of data: Primary data, Secondary data, Notion of a statistical population: Finite population, infinite population, homogeneous population and heterogeneous population. Notion of sample, random sample and non-random sample, Methods of sampling: Simple random sampling with and without replacement (SRSWR and SRWOR) stratified random sampling, systematic sampling, cluster sampling and two-stage sampling.	L1,L2, L3	6
MODULE 3: Classification: Raw data and its classification, Discrete frequency distribution, Sturge's rule, continuous frequency distribution, inclusive and exclusive methods of classification, Open end classes, cumulative frequency distribution and relative frequency distribution, Graphical Presentation of Data: Histogram, frequency curve, frequency polygon, ogive curves, stem and leaf chart, Check sheet, Parato diagram, Examples and Problems.	L1,L2, L3	6
MODULE 4: Concept of central tendency of statistical data, Arithmetic Mean (A.M.), combined mean of a number of groups, merits and demerits, Geometric Mean (G.M.), Harmonic Mean (H.M.), Weighted Mean, Weighted A.M., G.M. and H.M. , Mode, Median, Empirical relation between mean, median and mode, Order relation between arithmetic mean, geometric mean, harmonic mean.	L1, L2 and L3	6
MODULE 5: Concept of dispersion, characteristics of good measure of dispersion, Range, Mean deviation, Mean square definition, Variance and standard deviation, Combined variance, Combined standard deviation, generalization for n groups, Measures of dispersion for comparison: coefficient of range, coefficient of quartile deviation and coefficient of mean deviation, coefficient of variation.	L1, L2,L3	6
MODULE 6: Concept of skewness of frequency distribution, positive skewness, negative skewness, symmetric frequency distribution, Bowley's coefficient of skewness, interpretation using Box plot, Karl Pearson's coefficient of skewness, Measures of skewness based on moments ($\beta 1$, $\gamma 1$), Concepts of kurtosis, leptokurtic, mesokurtic and platykurtic frequency distributions, Measures of kurtosis based on moments, ($\beta 2$, $\gamma 2$).	L1, L2 ,L3	4

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MODULE 7: Bivariate data, bivariate frequency distribution, Concept of correlation between two variables, positive correlation, negative correlation, Scatter diagram, conclusion about the type of correlation from scatter diagram, Covariance between two variables, Karl Pearson's coefficient of correlation, Spearman's rank correlation coefficient, In case of ties, compute Karl Pearson's correlation coefficient between ranks. Regression: lines of regression, fitting of lines of regression by the least squares method, interpretation of slope and intercept. 9.2 Regression coefficient (byx, bxy), Effect of change of origin and scale, Angle between the two lines of regression, Mean residual sum of squares , Residual plot and its interpretation.	L1, L2 ,L3	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text & References:

1. Goon A.M.,Gupta M. K., Dasgupta B.(1998): Fundamentals of Statistics (V-1),World Press.
2. Miller and Fruend: Modern Elementary Statistics.
3. Snedecor and Cochran: Statistical Methods, Oxford and IBH Publishers.
4. Mukhopadhyay, P: Mathematical Statistics (1996), New Central Book Agency, Calcutta.
5. Introduction to Mathematical Statistics, Ed. 4 (1989), MacMillan Publishing Co. New York.
6. Gupta and Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi.
7. Neil Weiss: Introductory Statistics: Pearson Publishers.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**1**	**1**	--	--	--	--	--	--	--	--	--	**1**	**1**	**3**	-
CO2	**1**	**1**	**1**	--	--	--	--	--	--	--	--	--	**1**	**1**	**3**	-
CO3	**1**	**1**	**1**	--	-	--	--	--	--	--	--	--	**1**	**1**	**3**	-
CO4	**1**	**2**	**3**	--	--	--	--	--	--	--	--	--	**1**	**1**	**3**	-
CO5	**1**	**2**	**3**	--	--	--	--	--	--	--	--	--	**2**	**2**	**3**	-

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MLE6908	OPTIMIZATION TECHNIQUES	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description
The purpose of this course is to develop a knowledge in the field of optimization techniques their basic concepts, ,principles. linear programming and queuing theory.

Course Objectives
After successful completion of the course, student will be able to understand importance of optimization of industrial process management , apply basic concepts of mathematics to formulate an optimization problem , analyse and appreciate variety of performance measures for various optimization problems.

Course Outcomes
On completion of this course, the students will be able to
CO1: Understand importance of optimization of industrial process management.
CO2: Apply basic concepts of mathematics to formulate an optimization problem
CO3: Analyse and appreciate variety of performance measures for various optimization problems
CO4: Use classical optimization techniques and numerical methods of optimization
CO5: Apply knowledge of optimization to formulate and solve engineering problems

Modules	Blooms level*	Number of hours
MODULE 1: INTRODUCTION Introduction to optimization – adequate and optimum design – principles of optimization – statement of an optimization problem – classification – formulation of objective function, design constraints.	L1, L2	4
MODULE 2: CLASSICAL OPTIMIZATION TECHNIQUES Single variable optimization –multivariable optimization with no constraints – exhaustive search, Fibonacci method, golden selection, Random, pattern and gradient search methods – Interpolation methods: quadratic and cubic, direct root method.	L1, L2, L3 and L5 , L6	12
MODULE 3:MULTIVARIABLE – UNCONSTRAINED AND CONSTRAINED OPTIMIZATION Direct search methods – descent methods – conjugate gradient method. Indirect methods – Transformation techniques, penalty function method	L1, L3 and L4	8

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MODULE 4:NON – TRADITIONAL OPTIMIZATION TECHNIQUES Genetic Algorithms -steady state algorithm, fitness scaling, inversion. Genetic programming:- Genetic Algorithm in problem solving, Implementing a Genetic Algorithm:- computer implementation, operator (reproduction, crossover and Mutation, Fitness Scaling, Coding, Discretization). Knowledge based techniques in Genetic Algorithm. Advanced operators and techniques in genetic search:-Dominance, Diploidy and Abeyance. Inversion and other reordering operators, Niche and speciation and Tabu search methods.	L1, L3, and L4	10
MODULE 5:OPTIMUM DESIGN OF MACHINE Desirable and undesirable effects – functional requirement – material and geometrical parameters – Design of simple axial, transverse loaded members for minimum cost and minimum weight.	L3 and L4	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text & References:

1. Rao, S.S., "*Optimization – Theory and Applications*", Wiley Eastern, New Delhi, 1978
2. Fox, R.L., Optimization Methods for Engineering Design, Addition – Wesley, Reading, Mass, 1971.
3. Wilde, D.J., "*Optimum Seeking Methods*", Prentice Hall, Englewood Cliffs, New Jersey, 1964

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**3**	--	**1**	--	--	--	--	--	--	--	--	**1**	--	**2**	--
CO2	**1**	**3**	--	**2**	--	--	--	--	--	--	--	--	**1**	**2**	--	**1**
CO3	**1**	**2**	**2**	**4**	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO4	**1**	**2**	**2**	**2**	--	---	--	--	--	--	--	--	**1**	**2**	--	--
CO5	**1**	3	**2**	**1**	--	--	--	--	--	--	--	--	**1**	**1**	--	**4**

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MLE6909	SOCIAL NETWORK DATA ANALYTICS	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure	Basis of Database and Networking				
Co-requisites					

Catalog Description

This course gives an introduction to social network analysis, with a focus on modelling. It provides an overview of research questions connected to social networks, and of descriptive measures, models, and methods of analysis that can be used to analyze empirical social network data. It helps to understand the online interactive demonstrations and hands-on analysis of real-world data sets.

Course Objectives

The objective of this course is to

- To provide students effective data-driven intelligence to improve their decisions making and systematically estimate the expected impact on relevant performance objectives
- To equip the students with data-driven intelligence tools, the basics of data mining techniques and develop a data-analytical approach to problem-solving with their application

Course Outcomes

On completion of this course, the students will be able to

CO1. Know the basic notation and terminology used in network science
CO2. Be able to visualize, summarize and compare networks.
CO3. Learn the basic principles behind network analysis algorithms
CO4. Develop practical skills of network analysis in R programming language
CO5: Be capable of analysing real work networks

Course Content

Modules	Bloom's level	Number of Hours
Module I Introduction Overview: Social network data-Formal methods- Paths and Connectivity-Graphs to represent social relations-Working with network data- Network Datasets-Strong and weak ties - Closure, Structural Holes, and Social Capital.	**L1, L2**	**6**

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Module II Community Discovery in Social Networks: Applications, Methods and Engineering Trends Introduction, Communities in Context, Core Methods, Quality Functions, The Kernighan-Lin (Kl) Algorithm, Agglomerative/Divisive Algorithms, Spectral Algorithms, Multi-Level Graph Portioning, Markov Clustering. Other Approaches, Emerging Fields and Problems, Community Discovery in Dynamic Networks, Community Discovery in Heterogeneous Networks, Community Discovery in Directed Networks, Coupling Content and Relationship Information for Community Discovery,	**L1, L2, L3**	**7**
Module III Information Networks and the World Wide Web The Structure of the Web- World Wide Web- Information Networks, Hypertext, and Associative Memory- Web as a Directed Graph, Bow-Tie Structure of the Web- Link Analysis and Web Search, Searching the Web: Ranking, Link Analysis using Hubs and Authorities- Page Rank- Link Analysis in Modern Web Search, Applications, Spectral Analysis, Random Walks, and Web Search.	**L1, L2, L3**	**5**
Module IV Node Classifications in Social Networks Introduction, Problem Formulation, Representing Data As A Graph, The Node Classification Problem, Methods Using Local Classifiers, Iterative Classification Method, Random Walk Based Methods, Label Propagation, Graph Regularization, Adsorption, Applying Node Classification To Large Social Networks, Basic Approaches, Second-Order Methods, Implementation Within Map-Reduce, Inference Using Graphical Models, Metric Labelling, Spectral Partitioning, Graph Clustering, Variations on Node Classification	**L1, L2, L3**	**6**
Module V Data and Text Mining in Social Media Data Mining In Nutshell, Social Media, Motivations For Data Mining In Social Media, Data Mining Methods For Social Media, Data Representation, Data Mining- A Process, Social Networking Sites: Illustrative Examples, Related Efforts, Ethnography And Netnography, Event Maps, Text Mining: Keyword Search, Query Semantics And Answer Ranking, Keyword Search over Xmland Relational Data, Keyword Search Over Graph Data, Classification Algorithms, Clustering Algorithms, Transfer Learning in Heterogeneous Networks.	**L1, L3, L4**	**6**
Module VI Overview of Social Tagging Introduction, Problems With Metadata Generation and Fixed Taxonomies, Tags: Why And What?, Different User Tagging Motivations, Kinds Of Tags, Linguistic Classifications Of Tags, Game-Based Tagging, Tag Generation Models, Tagging System Design, Tag Analysis, Tagging Distributions ,Identifying Tag Semantics, Tags Versus Keywords, Visualization Of Tags, Tag Clouds For Browsing/Search, Tag Selection For Tag Clouds, Tag Hierarchy Generation, Tag Cloud Display Formats, Tag Evolution Visualization.	**LI, L2**	**6**

Bloom's Level:

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Easley and Kleinberg, "Networks, Crowds, and Markets: Reasoning about a highly connected world", Cambridge Univ. Press, 2010.
2. Charu C. Aggarwal, "Social Network Data Analytics", Springer, 2011.
3. Robert A. Hanneman and Mark Riddle, "Introduction to social network methods", University of California, 2005.

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Reference Books

1. Jure Leskovec, Anand Rajaraman, and Jeffrey D. Ullman, "Mining of Massive Datasets", Cambridge University Press, 2nd edition, 2014.
2. Wasserman, S., & Faust, K, "Social Network Analysis: Methods and Applications", Cambridge University Press; 1st edition, 1994.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	--	--	--	--	--	--	--	--	--	1	3	1	1
CO2	1	--	2	3	--	--	--	--	--	--	--	--	1	3	1	2
CO3	1	1	2	3	3	--	--	--	--	--	--	--	1	2	1	2
CO4	1	1	3	--	--	--	--	--	--	--	--	--	1	2	1	1
CO5	1	2	2	--	--	--	--	--	--	--	--	--	1	1	1	1

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MLE6910	AGENT BASED INTELLIGENT SYSTEMS	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	3	0	0	3
Pre-requisites/Exposure	Basics of Python				
Co-requisites	Nil				

Catalog Description

This course provides students basic knowledge of employing intelligent agents in solving complex problems and gives the awareness of the building blocks of agents and working of different types of agents. It also analyses the reasons for uncertainty and ability to design agents to handle them.

Course Objectives

The objective of this course is to

1. Equip the students with the knowledge of intelligent agents in solving complex problems.
2. Provide an overview of Building Agents, Knowledge Based Agents, Planning Agents and Higher Level Agents.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the concept of knowledge intelligent agents and use in solving complex problems.
CO2: Describe the concept of Concepts for Building Agents and Knowledge Based Agents.
CO3: Explain the concept of Planning Agents and Higher Level Agents.
CO4:.Describe the concept of Agents and Uncertainty and Higher Level Agents.

Modules	Blooms level*	Number of hours
MODULE 1: Definitions – History – Hybrid Intelligent Agents – Agents vs Multi Agent Systems– Structure – Environment – Basic Problem Solving Agents – Complex Problem Solving Agents – Formulating Search Strategies – Intelligent Search.	L1, L2 ,L3	7
MODULE 2: Situated Agents: Actions and Percepts - Proactive and Reactive Agents: Goals and Events- Challenging Agent Environments: Plans and Beliefs - Social Agents - Agent Execution Cycle.	L1,L2, L3	8
MODULE 3: Knowledge Representation – Logic – First Order Logic – Reflex Agent – Building a Knowledge Base – General Ontology – Interference – Logical Recovery.	L1,L2, L3	7

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MODULE 4: Situational Calculus – Representation of Planning – Partial Order Planning – Practical Planners– Conditional Planning - Preplanning Agents.	L1, L2 and L3	5
MODULE 5: Acting under uncertainty – Probability – Baye's Rule – Belief Networks – Utility Theory - Decision Network- Value of Information – Decision Theoretic Agent Design.	L1, L2,L3	5
MODULE 6: Learning Agents – General Model – Inductive Learning – Learning Decision Tree – Reinforcement Learning – Knowledge in Learning – Communicative Agents – Types of Communicative Agents – Future of AI.	L1, L2 and L3	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text & References:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 3rd Edition, Prentice Hall, 2010.
2. Lin Padgham, Michael Winikoff, "Developing Intelligent Agent Systems: A Practical Guide", 1st Edition, John Wiley & Sons, 2004.
3. ZiliZhang,Chengqi Zhang, "Agent-Based Hybrid Intelligent Systems: An Agent- Based Framework for Complex Problem Solving", 1st Edition, Springer-Verlag New York, LLC , 2004.
4. Ngooc Thanh Nguyaaen, Lakhmi C. Jain, "Intelligent Agents in the Evolution of Web and Applications", 4th Edition, Springer, 2009.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	1	1	--	--	--	--	--	--	--	--	--	1	1	3	-
CO2	1	1	1	--	--	--	--	--	--	--	--	--	1	1	3	-
CO3	1	1	1	--	-	--	--	--	--	--	--	--	1	1	3	-
CO4	1	2	3	--	--	--	--	--	--	--	--	--	1	1	3	-
CO5	1	2	3	--	--	--	--	--	--	--	--	--	2	2	3	-

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AIE6037	PROJECT DISSERTATION-II	L	T	P	C
Version 2020.1	Date of Approval: JULY 2020	0	0	0	15
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The objective of this course is to provide practical training on some live/demo projects that will increase capability to work on actual problem in industry. It will be an in house training on some latest software which is in high demand in market. This training will be designed such that it will useful for their future employment in industry.

Course Objectives

The objective of this course is to

1. Provide practical training on live projects
2. Increase technical capabilities on solving real life problems in company environment

Course Outcomes

On completion of this summer internship, the students will be able to:

CO1: Demonstrate a sound technical knowledge of their selected project topic.

CO2: Design and develop engineering solutions to complex problems utilising a systems approach.

CO3: Analyse various approaches for solving a complex engineering problem using different tools and techniques

CO4: Demonstrate the knowledge, skills and attitudes of a professional engineer.

CO5: Apply technical skills and knowledge in completing the project.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**2**	--	--	--	--	--	--	**1**	--	--	--	--	--	**1**	**1**
CO2	**1**	**1**	--	--	--	--	--	--	**1**	--	--	--	--	--	**1**	**1**
CO3	**1**	**1**	--	--	--	--	--	--	**1**	--	--	--	--	--	**1**	**1**
CO4	**1**	**1**	--	--	--	--	--	--	**1**	--	--	--	--	--	**1**	**1**
CO5	**1**	**1**	--	--	--	--			**1**	-	-	-	--	--	**1**	**1**

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Curriculum & Scheme of Examination

2023

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INTRODUCTION TO COMPUTERS AND PROGRAMMING IN C

Course Code: DSE6104 **Credit Units: 03**

Course Objective:
The objective of this course module is to acquaint the students with the basics of computers system, its components, data representation inside computer and to get them familiar with various important features of procedure oriented programming language i.e. C.

Course Contents:

Module I: Introduction
Introduction to computer, history, von-Neumann architecture, memory system (hierarchy, characteristics and types), H/W concepts (I/O Devices), S/W concepts (System S/W & Application S/W, utilities). Data Representation: Number systems, character representation codes, Binary, octal, hexadecimal and their interconversions. Binary arithmetic, floating point arithmetic, signed and unsigned numbers, Memory storage unit.

Module II: Programming in C
History of C, Introduction of C, Basic structure of C program, Concept of variables, constants and data types in C, Operators and expressions: Introduction, arithmetic, relational, Logical, Assignment, Increment and decrement operator, Conditional, bitwise operators, Expressions, Operator precedence and associativity. Managing Input and output Operation, formatting I/O.

Module III: Fundamental Features in C
C Statements, conditional executing using if, else, nesting of if, switch and break Concepts of loops, example of loops in C using for, while and do-while, continue and break. Storage types (automatic, register etc.), predefined processor, Command Line Argument.

Module IV: Arrays and Functions
One dimensional arrays and example of iterative programs using arrays, 2-D arrays Use in matrix computations.
Concept of Sub-programming, functions Example of user defined functions. Function prototype, Return values and their types, calling function, function argument, function with variable number of argument, recursion.

Module V: Advanced features in C
Pointers, relationship between arrays and pointers Argument passing using pointers, Array of pointers. Passing arrays as arguments.
Strings and C string library.
Structure and Union. Defining C structures, Giving values to members, Array of structure, Nested structure, passing strings as arguments.
File Handling.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- "ANSI C" by E Balagurusamy
- Yashwant Kanetkar, "Let us C", BPB Publications, 2nd Edition, 2001.
- Herbert Schildt, "C: The complete reference", Osbourne Mcgraw Hill, 4th Edition, 2002.

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References*:*

- Kernighan & Ritchie, “C Programming Language”, The (Ansi C Version), PHI, 2nd Edition.
- J. B Dixit, “Fundamentals of Computers and Programming in ‘C’.
- P.K. Sinha and Priti Sinha, “Computer Fundamentals”, BPB publication.

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PROGRAMMING IN C LAB

Course Code: DSE6106 **Credit Units: 01**

Software Required: Turbo C

Course Contents:

- C program involving problems like finding the nth value of cosine series, Fibonacci series. Etc.
- C programs including user defined function calls
- C programs involving pointers, and solving various problems with the help of those.
- File handling

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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ENGINEERING GRAPHICS LAB

Course Code: DSE6211 **Credit Units: 01**

Course Objective:
This course will provide students concepts on the drawings of different curves like straight line, parabola, ellipse etc. After completion of this course, students will be able to draw different figures manually and will be capable of using various instruments involved in drawings.

Course Contents:

Module I: General
Importance, Significance and scope of engineering drawing, Lettering, Dimensioning, Scales, Sense of proportioning, Different types of projections, Orthographic Projection, B.I.S. Specifications.

Module II: Projections of Point and Lines
Introduction of planes of projection, Reference and auxiliary planes, projections of points and Lines in different quadrants, traces, inclinations, and true lengths of the lines, projections on Auxiliary planes, shortest distance, intersecting and non-intersecting lines.

Module III: Planes other than the Reference Planes
Introduction of other planes (perpendicular and oblique), their traces, inclinations etc., Projections of points and lines lying in the planes, conversion of oblique plane into auxiliary Plane and solution of related problems.

Module IV: Projections of Plane Figures
Different cases of plane figures (of different shapes) making different angles with one or both reference planes and lines lying in the plane figures making different given angles (with one of both reference planes). Obtaining true shape of the plane figure by projection.

Module V: Projection of Solids
Simple cases when solid is placed in different positions, Axis faces and lines lying in the faces of the solid making given angles.

Module VI: Development of Surface
Development of simple objects with and without sectioning. Isometric Projection

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text & References:
- M.B. Shah & B.C. Rana, Engineering Drawing, Pearson Education, 2007
- PS Gill, Engineering Drawing, Kataria Publication
- ND Bhatt, Engineering Drawing, Charotar publications
- N Sidheshwar, Engineering Drawing, Tata McGraw Hill
- CL Tanta, Mechanical Drawing, "Dhanpat Rai"

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OBJECT ORIENTED PROGRAMMING USING C++

Course Code: DSE6204 **Credit Units: 03**

Course Objective:
The objective of this module is to introduce object oriented programming. To explore and implement the various features of OOP such as inheritance, polymorphism, Exceptional handling using programming language C++. After completing this course student can easily identify the basic difference between the programming approaches like procedural and object oriented.

Course Contents:

Module I: Introduction
Review of C, Difference between C and C++, Procedure Oriented and Object Oriented Approach. Basic Concepts: Objects, classes, Principals like Abstraction, Encapsulation, Inheritance and Polymorphism. Dynamic Binding, Message Passing. Characteristics of Object-Oriented Languages. Introduction to Object-Oriented Modeling techniques (Object, Functional and Dynamic Modeling).

Module II: Classes and Objects
Abstract data types, Object & classes, attributes, methods, C++ class declaration, Local Class and Global Class, State identity and behaviour of an object, Local Object and Global Object, Scope resolution operator, Friend Functions, Inline functions, Constructors and destructors, instantiation of objects, Types of Constructors, Static Class Data, Array of Objects, Constant member functions and Objects, Memory management Operators.

Module III: Inheritance
Inheritance, Types of Inheritance, access modes – public, private & protected, Abstract Classes, Ambiguity resolution using scope resolution operator and Virtual base class, Aggregation, composition vs classification hiérarchies, Overriding inheritance methods, Constructors in derived classes, Nesting of Classes.

Module IV: Polymorphism
Polymorphism, Type of Polymorphism – Compile time and runtime, Function Overloading, Operator Overloading (Unary and Binary) Polymorphism by parameter, Pointer to objects, this pointer, Virtual Functions, pure virtual functions.

Module V: Strings, Files and Exception Handling
Manipulating strings, Streams and files handling, formatted and Unformatted Input output. Exception handling, Generic Programming – function template, class Template Standard Template Library: Standard Template Library, Overview of Standard Template Library, Containers, Algorithms, Iterators, Other STL Elements, The Container Classes, General Theory of Operation, Vectors.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

Text & References:
Text:

- A.R. Venugopal, Rajkumar, T. Ravishanker "Mastering C++", TMH, 1997
- R. Lafore, "Object Oriented Programming using C++", BPB Publications, 2004.
- "Object Oriented Programming with C++" By E. Balagurusamy.
- Schildt Herbert, "C++: The Complete Reference", Wiley DreamTech, 2005.

References:

- Parasons, "Object Oriented Programming with C++", BPB Publication, 1999.
- Steven C. Lawlor, "The Art of Programming Computer Science with C++", Vikas Publication, 2002.
- Yashwant Kanethkar, "Object Oriented Programming using C++", BPB, 2004

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OBJECT ORIENTED PROGRAMMING USING C++ LAB

Course Code: DSE6208 **Credit Units: 01**

Software Required: Turbo C++

Course Contents:

- Creation of objects in programs and solving problems through them.
- Different use of private, public member variables and functions and friend functions.
- Use of constructors and destructors.
- Operator overloading
- Use of inheritance in and accessing objects of different derived classes.
- Polymorphism and virtual functions (using pointers).
- File handling.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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BASICS OF ELECTRICAL & ELECTRONICS ENGINEERING LAB

Course Code: DSE6213 **Credit Units: 01**

List of Experiments:

1. To verify KVL & KCL in the given network.
2. To verify Superposition Theorem.
3. To verify Maximum Power Transfer Theorem.
4. To verify Reciprocity Theorem.
5. To determine and verify RTh, VTh, RN, IN in a given network.
6. To perform open circuit & short circuit test on a single-phase transformer.
7. To study transient response of a given RLC Circuit.
8. To perform regulation, ratio & polarity test on a single-phase transformer.
9. To measure power & power factor in a three phase circuit by two wattmeter method.
10. To measure power & power factor in a three phase load using three ammeter & three voltmeter method.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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DATABASE MANAGEMENT SYSTEMS

Course Code: DSE6302 **Credit Units: 04**

Course Objective:
The objective of this course is to get students familiar with Databases and their use. They can identify different types of available database model, concurrency techniques and new applications of the DBMS.

Course Contents:

Module I: Introduction
Concept and goals of DBMS, DBMS Architecture, Database Languages, Database Users, Database Abstraction.
Basic Concepts of ER Model: Entity Type, Entity Set, Relationship type, Relationship sets, Constraints: Cardinality Ratio and Participation Constarint, Keys, Mapping, Design of ER Model

Module II: Hierarchical model &Network Model
Concepts, Data definition, Data manipulation and implementation.
Network Data Model, DBTG Set Constructs, and Implementation

Module III: Relational Model
Relational database, Relational Algebra, Relational Calculus, Tuple Calculus.

Module IV: Relational Database Design and Query Language
SQL, QUEL, QBE, Normalization using Functional Dependency, 1NF, 2NF, 3NF, BCNF, Multivalued dependency and Join dependency.

Module V: Concurrency Control and New Applications
Transaction basics: ACID property, Lifecycle of Transcation, Why Concurrency Control, Schedule, Serializability, Lock Based Protocols, Time Stamped Based Protocols, Deadlock Handling, Crash Recovery. Distributed Database, Objective Oriented Database, Multimedia Database, Data Mining, Digital Libraries.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- Korth, Silberschatz, "Database System Concepts", 4th Ed., TMH, 2000.
- Steve Bobrowski, "Oracle & Architecture", TMH, 2000

References:
- Date C. J., "An Introduction to Database Systems", 7th Ed., Narosa Publishing, 2004
- Elmsari and Navathe, "Fundamentals of Database Systems", 4th Ed., A. Wesley, 2004
- Ullman J. D., "Principles of Database Systems", 2nd Ed., Galgotia Publications, 1999.

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OPERATING SYSTEMS

Course Code: DSE6303 **Credit Units: 03**

Course Objective:
Operating Systems serve as one of the most important courses for undergraduate students, since it provides the students with a new sight to envision every computerized systems especially general purpose computers. Therefore, the students are supposed to study, practice and discuss on the major fields discussed in the course to ensure the success of the education process. The outcome of this course implicitly and explicitly affects the abilities the students to understand, analyze and overcome the challenges they face with in the other courses and the real world.

Course Contents:

Module I: Introduction to operating system
Operating system and function, Evolution of operating system, Batch, Interactive, multiprogramming, Time Sharing and Real Time System, multiprocessor system, Distributed system, System protection. Operating System structure, Operating System Services, System Program and calls.

Module II: Process Management
Process concept, State model, process scheduling, job and process synchronization, structure of process management, Threads, Inter-process Communication and Synchronization:Principle of Concurrency, Producer Consumer Problem, Critical Section problem, Semaphores, Hardware Synchronization, Critical Regions, Conditional critical region, Monitor, Inter Process Communication.
CPU Scheduling: Job scheduling functions, Process scheduling, Scheduling Algorithms, Non Preemptive and preemptive Strategies, Algorithm Evaluation, Multiprocessor Scheduling.
Deadlock: System Deadlock Model, Deadlock Characterization, Methods for handling deadlock, Prevention strategies, Avoidance and Detection, Recovery from deadlock combined approach.

Module III: Memory Management
Single Contiguous Allocation: H/W support, S/W support, Advantages and disadvantages, Fragmentation, Paging, Segmentation, Virtual memory concept, Demand paging, Performance, Paged replaced algorithm, Allocation of frames, Thrashing, Cache memory, Swapping, Overlays

Module IV: Device management
Principles of I/O hardware, Device controller, Device Drivers, Memory mapped I/O, Direct Access Memory, Interrupts, Interrupt Handlers, Application I/O interface, I/O Scheduling, Buffering, Caching, Spooling,
Disk organization, Disk space management, Disk allocation Method, Disk Scheduling, Disk storage.

Module V: File System and Protection and security
File Concept, File Organization and Access Mechanism, File Directories, Basic file system, File Sharing, Allocation method, Free space management.
Policy Mechanism, Authentication, Internal excess Authorization.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- Milenekovic, "Operating System Concepts", McGraw Hill
- A. Silberschatz, P.B. Galvin "Operating System Concepts", John Willey & son

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References:

- Dietel, “An introduction to operating system”, Addision Wesley
- Tannenbaum, “Operating system design and implementation”, PHI
- Operating System, A Modern Perspection, Gary Nutt, Pearson Edu. 2000
- A. S Tanenbaum, Modern Operating System, 2nd Edition, PHI.
- Willam Stalling “ Operating system” Pearson Education
- B. W. Kernighan & R. Pike, “The UNIX Programming Environment” Prentice Hall of India, 2000
- Sumitabha Das “ Your UNIX The ultimate guide” Tata Mcgraw Hill
- “Design of UNIX Operating System “ The Bach Prentice – Hall of India

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DATA STRUCTURES USING C

Course Code: DSE6304 **Credit Units: 04**

Course Objective:

Data structure deals with organizing large amount of data in order to reduce space complexity and time requirement. This course gives knowledge of algorithms, different types of data structures and the estimation space and time complexity.

Course Contents:

Module I: Introduction to Data structures

Data structures: Definition, Types. Algorithm design, Complexity, Time-Space Trade- offs. Use of pointers in data structures.Array Definition and Analysis, Representation of Linear Arrays in Memory, Traversing of Linear Arrays, Insertion And Deletion, Single Dimensional Arrays, Two Dimensional Arrays, Multidimensional Arrays, Function Associated with Arrays, Character String in C, Character String Operations, Arrays as parameters, Implementing One Dimensional Array, Sparse matrix.

Module II: Introduction to Stacks and queue

Stack: Definition, Array representation of stacks, Operations Associated with Stacks- Push & Pop, Polish expressions, Conversion of infix to postfix, infix to prefix (and vice versa),Application of stacks recursion, polish expression and their compilation, conversion of infix expression to prefix and postfix expression, Tower of Hanoi problem.

Queue: Definition, Representation of Queues, Operations of queues- QInsert, QDelete, Priority Queues, Circular Queue, Deque.

Module III: Dynamic Data Structure

Linked list: Introduction to Singly linked lists: Representation of linked lists in memory, Traversing, Searching, Insertion into, Deletion from linked list, doubly linked list, circular linked list, generalized list. Applications of Linked List-Polynomial representation using linked list and basic operation. Stack and queue implementation using linked list.

Module IV: Trees and Graphs

Trees: Basic Terminology, Binary Trees and their representation, expression evaluation, Complete Binary trees, extended binary trees, Traversing binary trees, Searching, Insertion and Deletion in binary search trees, General trees, AVL trees, Threaded trees, B trees.

Graphs: Terminology and Representations, Graphs & Multigraphs, Directed Graphs, Sequential representation of graphs, Adjacency matrices, Transversal Connected Component and Spanning trees.

Module V: Sorting and Searching and file structures

Sorting: Insertion Sort, Bubble sort, Selection sort, Quick sort, two-way Merge sort, Heap sort, Partition exchange sort, Shell sort, Sorting on different keys, External sorting.

Searching: Linear search, Binary search, File structures: Physical storage media, File Organization, Linked organization of file, Inverted file, Organization records into blocks, Sequential blocks, Hash function, Indexing & Hashing, Multilevel indexing, Tree Index, Random file, Primary Indices, Secondary Indices, B tree index files.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- Horowitz and Sahani, "Fundamentals of Data structures", Galgotia publications
- Tannenbaum, "Data Structures", PHI
- R.L. Kruse, B.P. Leary, C.L. Tondo, "Data structure and program design in C" PHI
- "Data structures and algorithms" – Schaum Series.

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DATA STRUCTURES USING C LAB

Course Code: DSE6305 **Credit Units: 01**

Software Required: Turbo C++

Assignment will be provided for following:

- Practical application of sorting and searching algorithm.
- Practical application of various data structure like linked list, queue, stack, tree

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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DATA COMMUNICATION AND COMPUTER NETWORKS LAB

Course Code: DSE6415 **Credit Units: 01**

Equipments Required:
Switch Network Cables, Patch Chord- Fiber optical and twisted pair cable, LAN cards, RJ-45 connectors etc.
Platforms required: Linux Server

Course Contents:
- Introduction and Installation of Linux
- Administrating Linux
- Setting up a Local Area Network
- Connecting to the Internet
- Setting up Print Server
- Setting up File Server
- Setting up Mail Server
- Setting up FTP Server
- Setting up Web Server
- Setting up MySQL Database Server

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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DATABASE MANAGEMENT SYSTEMS LAB

Course Code: DSE6307 **Credit Units: 01**

Software Required: Oracle 9i

Topics covered in lab will include:

- Database Design
- Data Definition (SQL)
- Data Retrieval (SQL)
- Data Modification (SQL)
- Views
- Triggers and Procedures
- PL\SQL

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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UNIX PROGRAMMING LAB

Course Code: DSE6308 **Credit Units: 01**

Software Required: UNIX SCO

Assignments will be provided for the following

- Introduction to UNIX Commands
- Introduction to vi editor
- Programming in shell script
- Introduction to programming in C Shell

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text & References:

- "Unix Programming Environment" The Kernighan and Pike Prentice – Hall of India
- "Unix –Shell Programming" Kochar
- " Unix Concepts and application" Das Sumitabha Tata Mcgraw Hill

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E-COMMERCE AND ERP

Course Code: DSE6310 **Credit Units: 03**

Course Objective:
This course examines the evolution of enterprise resource planning (ERP) systems - from internally focused client/server systems to externally focused e-business. This class studies the types of issues that managers will need to consider in implementing cross-functional integrated ERP systems. The objective of this course is to make students aware of the potential and limitations of ERP systems. This objective will be reached through hands-on experience, case studies, lectures, guest speakers and a group project. The course would equip students with the basics of E-Commerce, technologies involved with it and various issues associated with.

Course Contents:

Module I: Introduction E-commerce and ERP
E-commerce and its types, EDI and its basics, Digital payment systems, Enterprise-An Overview, Benefits of ERP, ERP and Related Technologies-Business Process Reengineering (BPR), Data Warehousing, Data Mining, On-line Analytical Processing (OLAP), Supply Chain Management, Management Information systems (MIS), Decision support system (DSS), Executive Information systems (EIS). ERP – A Manufacturing Perspective Materials Requirement Planning (MRP), Bill of Material (Bom), Distribution Requirements Planning (DRP), JIT &Kanban, CAD/CAM, Product Data Management (PDM), Benefits of PDM, MTO, MTS, ATO, ETO, CTO.

Module II: ERP Modules
Business Modules in an ERP Packag- Finance, Manufacturing (Production), Human Resources, Plant Maintenance, Materials Management, Quality Management, Sales and Distribution.

Module III: Benefits of ERP
Time Reduction, On time shipment, Improved Resource Utilization, Performance, Customer Satisfaction, Flexibility, information accuracy and decision making capability, reduction in quality costs, Accuracy.

Module IV: ERP Implementation
ERP Implementation Lifecycle, Implementation Methodology, In-house implementation-Pros and cons, Vendors, Consultants and Users and their roles, Project Management and Monitoring after ERP Implementation.

Module V: The ERP Market and Future Directions
ERP Market Place- SAP AG, PeopleSoft, Baan Company, JD Edwards World Solutions Company, Oracle Corporation, QAD, System Software Associates, Inc. (SSA).Future directions in ERP.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- Alexis Leon, "Enterprise Resource Planning", Tata McGraw Hill 2001
- Bajaj, Kamlesh K. and Nag, Debjani, E-Commerce: The Cutting Edge of Business, Tata McGraw-Hill Publishing Company

References:

- Loshin, Pete and Murphy, Paul, *Electronic Commerce*, Second edition, 1990, Jaico Publishing House, Mumbai.
- S. Sadagopan, "Enterprise Resource Planning", Tata McGraw Hill 2000

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ELECTRONIC DEVICES & CIRCUITS

Course Code: DSE6311 **Credit Units: 02**

Course Objective:
This course builds from basic knowledge of Semiconductor Physics to an understanding of basic devices and their models. This course builds a foundation for courses on VLSI design and analog CMOS IC Design.

Course Contents:

Module I: Semeconductor physics: Mobility & conductivity, Charge densities in a semiconductor, Fermi dirac distribution, carrier concentration and Fermi levels in semiconductor, generation and recombination of charges, diffuse and continuity equations, Hall effect.

Module II: Semiconductor Diode and Diode Circuits
Junction diode, Diode as circuit element,Different types of diodes: Zener, Schottky, LED. Zener as voltage regulator, Diffusion capacitance, Drift capacitance, the load line concept, half wave, full wave rectifiers, clipping and clamping circuits.

Module III: Bipolar Junction Transistor
Bipolar junction transistor: Introduction, Transistor, construction, transistor operations, BJT characteristics, load line, operating point, leakage currents, saturation and cut off mode of operations. Bias stabilization: Need for stabilization, fixed Bias, emitter bias, self bias, bias stability with respect to variations in $I_{co,}$ V_{BE} &β, Stabilization factors, thermal stability.

Module IV: Small signal Analysis of transistor and Multistage Amplifier
Hybrid model for transistors at low frequencies, Analysis of transistor amplifier using h parameters, emitter follower, Miller's theorem, THE CE amplifier with an emitter resistance, Hybrid π model, Hybrid π Conducatnces and Capacitances, CE short circuit current gain, CE short circuit current gain with R_L Multistage amplifier: Cascading of Amplifiers, Coupling schemes(RC coupling and Transformer coupling)

Module V: Field Effect Transistors
Field effect transistor (JFET, MOSFET): volt-ampere characteristics, small signal model –common drain, common source, common gate, operating point, MOSFET, enhancement and -depletion mode, Common source amplifier, Source follower

Module VI: Feedback Amplifiers
Feedback concept, Classification of Feedback amplifiers, Properties of negative Feedback amplifiers, Impedance considerations in different Configurations, Examples of analysis of feedback Amplifiers.

Module VII: Power Amplifiers
Power dissipation in transistors, difference with voltage amplifiers, Amplifier classification (Class A, Class B, Class C, ClassAB) class AB push pull amplifier, collector efficiency of each, cross over distortion.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Robert F. Pierret: Semiconductor Device Fundamentals, Pearson Education.
- Millman and Halkias: Electronic Devices and circuits, Tata McGraw.
- Boylestad: Electronic Devices and Circuits, Pearson Education.

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DIGITAL ELECTRONICS

Course Code: DSE6313 **Credit Units: 02**

Course Objective:
This course is an introduction to the basic principles of digital electronics. At the conclusion of this course, the student will be able to quantitatively identify the fundamentals of computers, including number systems, logic gates, logic and arithmetic subsystems, and integrated circuits. They will gain the practical skills necessary to work with digital circuits through problem solving and hands on laboratory experience with logic gates, encoders, flip-flops, counters, shift registers, adders, etc. The student will be able to analyze and design simple logic circuits using tools such as Boolean Algebra and Karnaugh Mapping, and will be able to draw logic diagrams.

Course Contents:

Module I: Boolean Functions
Analog & digital signals, AND, OR, NOT, NAND, NOR & XOR gates, Boolean algebra, Standard representation of logical functions, K-map representation and simplification of logical function, don't care conditions, XOR & XNOR simplifications of K-maps, Tabulation method.

Module II: Combinational Circuits
Adders, Subtractors, Multiplexer, de-multiplexer, decoder & encoder, code converters, Comparators, decoder / driver for display devices, Implementation of logic functions using multiplexer / de-multiplexer,.

Module III: Sequential Circuits
Flip-flops: SR, JK, D & T flip flops – Truth table, Excitation table, Conversion of flip-flops, race around condition, Master Slave flip flop, Shift registers: SIPO, PISO, PIPO, SIPO, Bi-directional; Counters: ripple & synchronous counters – up / down; Synchronous Sequential circuit: design procedure.

Module IV: Logic families
Logic families: RTL, DTL, TTL, ECL

Module V: Data Converters
Data converters: ADC – successive approximation, linear ramp, dual slope; DAC – Binary Weighted, R-2R ladder type

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
- Moris Mano: Digital Circuits Systems
- R. P. Jain: Digital Logic & Circuits
- Thomas L. Floyd: Digital Fundamentals
- Malvino and Leech: Digital Principles & Applications

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ARTIFICIAL INTELLIGENCE

Course Code: DSE6404 **Credit Units: 03**

Course Objective:
To develop semantic-based and context-aware systems to acquire, organize process, share and use the knowledge embedded in multimedia content. Research will aim to maximize automation of the complete knowledge lifecycle and achieve semantic interoperability between Web resources and services. The field of Robotics is a multi disciplinary as robots are amazingly complex system comprising mechanical, electrical, electronic H/W and S/W and issues germane to all these.

Course Contents:

Module I: Problem solving and Scope of AI
Introduction to Artificial Intelligence. Applications- Games, theorem proving, natural language processing, vision and speech processing, robotics, expert systems. AI techniques- search knowledge, abstraction.
Problem Solving
State space search; Production systems, search space control: depth-first, breadth-first search. Heuristic search - Hill climbing, best-first search, branch and bound. Problem Reduction, Constraint Satisfaction End, Means-End Analysis. LA* Algorithm, L(AO*) Algorithm.

Module II: Knowledge Representation
Knowledge Representation issues, first order predicate calculus, Horn Clauses, Resolution, Semantic Nets, Frames, Partitioned Nets, Procedural Vs Declarative knowledge, Forward Vs Backward Reasoning.

Module III: Understanding Natural Languages
Introduction to NLP, Basics of Syntactic Processing, Basics of Semantic Analysis, Basics of Parsing techniques, context free and transformational grammars, transition nets, augmented transition nets, Shanks Conceptual Dependency, Scripts ,Basics of grammar free analyzers, Basics of sentence generation, and Basics of translation..

Module IV
Expert System: Need and justification for expert systems, knowledge acquisition, Case studies: MYCIN,R1
Learning: Concept of learning, learning automation, genetic algorithm, learning by inductions, neural nets. **Programming Language:** Introduction to programming Language, LISP and PROLOG.
Handling Uncertainties: Non-monotonic reasoning, Probabilistic reasoning, use of certainty factors, Fuzzy logic.

Module V: Introduction to Robotics
Fundamentals of Robotics, Robot Kinematics: Position Analysis, Dynamic Analysis and Forces, Robot Programming languages & systems: Introduction, the three levels of robot programming, requirements of a robot programming language, problems peculiar to robot programming languages.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- E. Rich and K. Knight, "Artificial intelligence", TMH, 2nd ed., 1992.
- N.J. Nilsson, "Principles of AI", Narosa Publ. House, 1990.

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- John J. Craig, “Introduction to Robotics”, Addison Wesley publication
- Richard D. Klafter, Thomas A. Chmielewski, Michael Negin, “Robotic Engineering – An integrated approach”, PHI Publication
- Tsuneo Yoshikawa, “Foundations of Robotics”, PHI Publication

References:

- D.W. Patterson, “Introduction to AI and Expert Systems”, PHI, 1992.
- Peter Jackson, “Introduction to Expert Systems”, AWP, M.A., 1992.
- R.J. Schalkoff, “Artificial Intelligence - an Engineering Approach”, McGraw Hill Int. Ed., Singapore, 1992.
- M. Sasikumar, S. Ramani, “Rule Based Expert Systems”, Narosa Publishing House, 1994.

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DIGITAL ELECTRONICS LAB

Course Code: DSE6314 **Credit Units: 01**

List of Experiments:

1. To verify the truth tables of OR, AND, NOR, NAND, EX-OR, EX-NOR gates.
2. To obtain half adder, full adder and subtractor using gates and verify their truth tables.
3. To verify the truth tables of RS, JK and D flip- flops.
4. To design and study a binary counter.
5. To design and study synchronous counter.
6. To design and study ripple counter.
7. To convert BCD number into excess 3 form
8. To design and study a decade counter.
9. To design and study a sequence detector.
10. To implement control circuit using multiplexer.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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ARTIFICIAL INTELLIGENCE LAB

Course Code: DSE6406 **Credit Units: 01**

Course Contents:

Assignments will be provided for the following:

- Programming in Prolog
- Programming for Robotics

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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COMMUNICATION SYSTEMS

Course Code: DSE6407 **Credit Units: 02**

Course Objective:
The purpose of this course is to provide a thorough introduction to analog and digital communications with an in depth study of various modulation techniques, Random processes are discussed, and information theory is introduced.

Course Contents:

Module I: Introduction
Communication Process, Source of Information, Communication channels, base-band and pass-band signals, Review of Fourier transforms, Random variables, different types of PDF, need of modulation process, primary communication resources, analog versus digital communications

Module II: Amplitude modulation
Amplitude modulation with full carrier, suppressed carrier systems, single side band transmission, switching modulators, synchronous detection, envelope detection, effect of frequency and phase errors in synchronous detection, comparison of various AM systems, vestigial side band transmission.

Module III: Angle Modulation
Narrow and wide band FM, BW calculations using Carlson rule, Direct & Indirect FM generations, phase modulation, Demodulation of FM signals, noise reduction using pre & de-emphasis.

Module IV: Pulse Modulation
Pulse amplitude, width & position modulation, generation & detection of PAM, PWM & PPM, Comparison of frequency division and time division multiplexed systems,
Basics of digital communications: ASK, PSK, FSK, QPSK basics & wavform with brief mathematical introduction

Module V: Noise
Different types of noise, noise calculations, equivalent noise band width, noise figures, effective noise temperature, noise figure.

Module VI: Introduction to Information Theory
Measurement of Information, mutual, Shannon's theorem, Source coding, channel coding and channel capacity theorem, Huffman code

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- B. P. Lathi: "Modern analog & digital communication", OXFORD Publications
- Wayne Tomasi: "Electronic Communication systems", Pearson Education, 5th edition

References:
- Simon Haykin, "Communication Systems", John Wiley & Sons, 1999, Third Edition.
- Taub and schilling, "Principles of Communication Systems" TMH

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COMMUNICATION SYSTEMS LAB

Course Code: DSE6408 **Credit Units: 01**

List of Experiments:

- To study the sampling and reconstruction of a given signal.
- To study amplitude modulation and demodulation.
- To study frequency modulation and demodulation.
- To study time division multiplexing.
- To study pulse amplitude modulation.
- To study delta and adaptive delta modulation and demodulation.
- To study carrier modulation techniques using amplitude shift keying and Frequency shift keying.
- To study carrier modulation techniques using binary phase shift keying and differential shift keying.
- To study pulse code modulation & differential pulse code modulation as well as relevant demodulations.
- To study quadrature phase shift keying & quadrature amplitude modulation.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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OPEN SOURCE TECHNOLOGIES

Course Code: DSE6617 **Credit Units: 02**

Course Objective:
This course is aimed to provide a fundamental understanding of dynamic web site creation. PHP is the language used for development of most common web sites. Syllabus includes basic and advanced features of PHP which includes detailed introduction of PHP and MYSQL, Arrays, Loops and variables etc. It also gives an overview open source framework like JOOMLA, ZEND etc.

Course Contents:
Module I: Introduction to Open Source and PHP programming
Introduction to Open Sources Technologies, Introduction to PHP, installation and configuration, Advantages and Disadvantages of PHP, Client Side Scripting, Server Side Scripting, Variables, data types, various types of function, creating your own function, Strings in PHP, String Functions.

Module II: Operator, Loops, Array, Exception and Error Handling
Operators, Conditions, Loops, Using for each, Creating and Using Arrays, Multidimensional Array, Associative Array.
Error Handling in PHP, Errors and Exceptions, Exception class, try/catch block, throwing an exception, defining your own Exception subclass.

Module III: Classes, File system, Passing Information between pages
Object orientedprogrammingwithPhp, Working with Datetime, code re-use, require (), include(), and the include_path; Understanding PHP file permissions, File reading and writing functions, File system functions, File uploads, Sending mail & use of email server.
HTTP, GET arguments, POST arguments, Using Session in PHP, cookies, The setcookie() function, Deleting Cookies and Reading Cookies.

Module IV: Workingwithdatabase
HTML Tables and Database tables, Databasemanipulation(Select, Insert, Update, Delete), validating User Input usingJavascript.
MYSQL, Introducing MySQL; database design concepts; the Structured Query Language (SQL); communicating with a MySQL backend via the PHP, MySQL APIBuilding Database Applications, Developing PHP scripts for dynamic web page like feedback form, online admission form and online test.

Module V: WorkingwithFrameworks
Working with Mambo, Working with Joomla, Working with framework. Working with wordpress, Woprking with drupal, Use of Joomla in rapid development of website. Developing of simple website using joomla.

Examination Scheme:

Components	CT1	A/C/Q	ATTD.	EE
Weightage (%)	15	10	5	70

Text & References:
Text:
- Beginning PHP, Apache, MySQL Web Development, Michael K. Glass, Yann Le Scouarnec, Elizabeth Naramore, Gary Mailer, Jeremy Stolz, Jason Gerner, published by Wiley, wrox
- PHP, MySQL and Apache Julie C Meloni Pearson Education ISBN : 81-297-0443-9

References:
- The Complete Reference PHP, by Steven Holzner, Tata McGraw-Hill Publication
- Beginning PHP and MYSQL, by W. Jason Gilmore, Apress Publication

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OPEN SOURCE TECHNOLOGIES LAB

Course Code: DSE6618 **Credit Units: 01**

Course Contents:

1. Write the process of installation of web server.
2. Write programs to print all details of your php server. Use phpinfo().
3. Write a program to give demo of ECHO and PRINT command.
4. Write a program to implement the string functions.
5. Write a program to print Fibonacci series upto a given number using recursion.
6. Write a menu driven program to implement a calculator which performs only addition, subtraction, multiplication and division. The operation should happen based on user choice.
7. Write a program sort ten number by using array.
8. Write a program to demonstrate the concept of associative array.
9. Write a program to demonstrate the concept of multidimensional array.
10. Write a program to demonstrate the concept of Classes & objects.
11. Create a login form with two text fields called “login” and “password”. When user enters “Amity”as a user name and “university” as a password it should be redirected to a Welcome.HTML page or toSorry.HTML in case of wrong username/password.
12. How to work with sessions in PHP?
13. Introduction to Mysql creating databases, tables, using command line and gui interface, phpmyadmin
14. How to connect to MySQL using PHP ? Write programs for insertion, deletion updates and other sql queries. Design front end using html, css and write php scripts for processing of data. Try all different methods of connecting from php to MySQL
15. Make a small project with mysql and php to perform CRUD operations. Use Session also.
16. Create a form with a text box asking to enter your favorite city with a submit button when the user enters the city and clicks the submit button another php page should be opened displaying “Welcometo the city”.
17. Write a program to design login form in which find the greatest number amongst three numbers.
18. WAP for Marksheet generation.
19. Design a webpage for entering the student details with all the validations applied on it.
20. Write a php script to print current date and time.
21. Write a pp script to use include and require functions.
22. Write a php script including all the file handling functions.
23. Design a website using Wordpress /Joomla/Drupal
24. Introduction to Laravel frame work and one simple project.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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ARTIFICIAL NEURAL NETWORK

Course Code: DSE6411 **Credit Units: 02**

Course Objective:
Aim of this course is to introduce the students fundamentals concepts of Nural network and its various application in computer science.

Module I:-
Artificial Neural Networks (ANN) and biological neural networks, supervised and unsupervised learning rules, neural network applications.

Module II:-
Unsupervised learning:- Hebbian learning and competitive learning. Supervised learning:- Back propagation algorithms,
Learning rule:-
Delta learning rule, Widrow-Hoff learning rule, Winner-Take-All learning rule.

Module III:-
Feed forward neural network, feed backward neural network, Perceptron and its learning law, single-layer perceptron, multi-layer perceptron.

Module IV:-
Self organizing networks: Kohonen algorithm, Hopfield Networks: Hopfield network algorithm, Adaptive resonance theory: Network and learning rules.

Module V:-
Associative memory, auto-associative memory, bi-directional associative memory.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Book:

- Kenji Suzuki (ed.) - InTech , 2013
- Todd Troyer - University of Texas at San Antonio , 2005

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ARTIFICIAL NEURAL NETWORK LAB

Course Code: DSE6412 **Credit Units: 01**

Course Objective
The aim of this lab to gain the practical knowledge of basic neuron models and learning algorithms.

Lab Assignment
To study some basic neuron models and learning algorithms by using Matlab's neural network toolbox

Examination Scheme

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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SOFTWARE ENGINEERING

Course Code: DSE6614 **Credit Units: 03**

Course Objective:
The basic objective of Software Engineering is to develop methods and procedures for software development that can scale up for large systems and that can be used to consistently produce high-quality software at low cost and with a small cycle time. Software Engineering is the systematic approach to the development, operation, maintenance, and retirement of software.The course provides a thorough introduction to the fundamentals principles of software engineering. The organization broadly be based on the classical analysis-design-implementation framework.

Course Contents:

Module I: Introduction
Software life cycle models: Waterfall, Prototype, Evolutionary and Spiral models, Overview of Quality Standards like ISO 9001, SEI-CMM

Module II: Software Metrics and Project Planning
Size Metrics like LOC, Token Count, Function Count, Design Metrics, Data Structure Metrics, Information Flow Metrics. Cost estimation, static, Single and multivariate models, COCOMO model, Putnam Resource Allocation Model, Risk management.

Module III: Software Requirement Analysis, design and coding
Problem Analysis, Software Requirement and Specifications, Behavioural and non-behavioural requirements, Software Prototyping Cohesion & Coupling, Classification of Cohesiveness & Coupling, Function Oriented Design, Object Oriented Design, User Interface Design Top-down and bottom-up Structured programming, Information hiding,

Module IV: Software Reliability, Testing and Maintenance
Failure and Faults, Reliability Models: Basic Model, Logarithmic Poisson Model, Software process, Functional testing: Boundary value analysis, Equivalence class testing,Structural testing: path testing, Data flow and mutation testing, unit testing, integration and system testing, Debugging, Testing Tools, & Standards.Management of maintenance, Maintenance Process, Maintenance Models, Reverse Engineering, Software RE-engineering

Module V: UML
Introduction to UML,Use Case Diagrams, Class Diagram: State Diagram in UMLActivity Diagram in UMLSequence Diagram in UMLCollaboration Diagram in UML, Domain,Component Diagram and Deployement Diagram

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:

- K. K. Aggarwal & Yogesh Singh, "Software Engineering", 2nd Ed, New Age International, 2005.
- R. S. Pressman, "Software Engineering – A practitioner's approach", 5th Ed., McGraw Hill Int. Ed., 2001.

References:

- R. Fairley, "Software Engineering Concepts", Tata McGraw Hill, 1997.

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- P. Jalote, “An Integrated approach to Software Engineering”, Narosa, 1991.
- Stephen R. Schach, “Classical & Object Oriented Software Engineering”, IRWIN, 1996.
- James Peter, W. Pedrycz, “Software Engineering”, John Wiley & Sons.
- Sommerville, “Software Engineering”, Addison Wesley, 1999.

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COMPUTER ARCHITECTURE

Course Code: DSE6502 **Credit Units: 04**

Course Objective:
This course deals with computer architecture as well as computer organization and design. Computer architecture is concerned with the structure and behaviour of the various functional modules of the computer and how they interact to provide the processing needs of the user. Computer organization is concerned with the way the hardware components are connected together to form a computer system. Computer design is concerned with the development of the hardware for the computer taking into consideration a given set of specifications.

Course Contents:
Module I: Register Transfer Language
Register Transfer, Bus and Memory Transfers, Arithmetic Micro-operations, Logic Micro-operations, Shift Micro-operations, Arithmetic Logic shift Unit.

Module II: Basic Computer Organizations and Design
Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt, Design of Accumulator Logic. Hardwired and Microprogrammed control: Control Memory, Address Sequencing, Design of Control Unit

Module III: Central Processing Unit
Introduction, General Register Organization, Stack Organization, Instruction representation, Instruction Formats, Instruction type, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer RISC and CISC. Computer Arithmetic: Introduction, Addition and Subtraction Algorithm,Multiplication Algorithms, Booth Multiplication, Division Algorithms, Floating-Point Arithmetic Operations

Module IV: Memory and Intrasystem Communication and Input output organisation
Memory: Memory types and organization Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory with mapping techniues, Virtual Memory, Memory Management Hardware, **Intrasystem communication and I/O:** Peripheral Devices, Input-Output, Controller and I/O driver, IDE for hard disk, I/O port and Bus concept, Bus cycle, Synchronous and asynchronous transfer,Modes of Transfer, DMA, DMA Transfer, DMA Controller, I/O Processor, CPU-IOP Communication

Module V: Introduction to Pipelining and Multi-Processor
Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Multiprocessors: Characteristics of Multiprocessors

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:
- Morris Mano, Computer System Architecture, 3rd Edition – 1999, Prentice-Hall of India Private Limited.
- Harry &Jordan, Computer Systems Design & Architecture, Edition 2000, Addison Wesley, Delhi.

References:
- WIliam Stallings, Computer Organization and Architecture, 4th Edition-2000, Prentice-Hall of India Private Limited.

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- Kai Hwang-McGraw-Hill, Advanced Computer Architecture.
- Kai Hwang & Faye a Briggs, McGrew Hill, inc., Computer Architecture & Parallel Processing.
- John D. Carpinelli, Computer system Organization & Architecture, Edition 2001, Addison Wesley, Delhi
- John P Hayes, McGraw-Hill Inc, Computer Architecture and Organization.
- M. Morris Mano and Charles, Logic and Computer Design Fundamentals, 2nd Edition Updated, Pearson Education, ASIA.
- Hamacher, "Computer Organization," McGraw hill.
- Tennenbaum," Structured Computer Organization," PHI
- B. Ram, "Computer Fundamentals architecture and organization," New age international Gear C. w., "Computer Organization and Programming, McGraw hill

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JAVA PROGRAMMING

Course Code: DSE6503 **Credit Units: 03**

Course Objective:
The objective is to impart programming skills used in this object oriented language java.The course explores all the basic concepts of core java programming. The students are expected to learn it enough so that they can develop the web solutions like creating applets etc.

Course Contents:
Module I: Java Basics
Concepts of OOP, Features of Java, How Java is different from C++, Environmental setup, Basic syntax, Objects and classes, Basic Data Types, Variable Types, Modifier Types, Basic operators, Loop Control, Decision Making, Strings and Arrays, Methods, I/O.

Module II: Java Object Oriented
Inheritance, Overriding, Polymorphism, Abstraction, Encapsulation, Interfaces, Packages, Exploring java.util package.

Module III: Exception Handling and Threading
Exception Hierarchy, Exception Methods, Catching Exceptions, Multiple catch Clauses, Uncaught Exceptions Java's Built-in Exception.
Creating, Implementing and Extending thread, thread priorities, synchronization suspending, resuming and stopping Threads, Multi-threading.

Module IV : Event Handling And AWT
Event handling Mechanism, Event Model, Event Classes, Sources of Events, Event Listener Interfaces, AWT: Working with Windows, AWT Controls, Layout Managers

Module V: Java Advanced
AppletClass, Architecture, Skeleton, Display Methods., Swings: Japplet, Icons, labels, Text Fields, Buttons, Combo Boxes., Socket Programming: Socket methods, Server Socket methods, Socket Client and Socket Server examples.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- JAVA The Complete Reference by Patrick Naughton & Herbert Schild, TMH
- Introduction to JAVA Programming a primar, Balaguruswamy.

References:
- "Introduction to JAVA Programming" Daniel/Young PHI
- Jeff Frentzen and Sobotka, "Java Script", Tata McGraw Hill,1999

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SOFTWARE ENGINEERING LAB

Course Code: DSE6616 **Credit Units: 01**

Software Required: Rational Rose

Assignments will be provided for the following:

- Use of Rational Rose for visual modeling.
- Creating various UML diagrams such as use case, sequence, collaboration, activity, state diagram, and class diagrams.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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JAVA PROGRAMMING LAB

Course Code: DSE6507 **Credit Units: 01**

Software Required: JDK1.3

Assignments will be provided for the following:

- Java programs using classes & objects and various control constructs such as loops etc, and data structures such as arrays, structures and functions
- Java programs for creating Applets for display of images and texts.
- Programs related to Interfaces & Packages.
- Input/Output and random files programs in Java.
- Java programs using Event driven concept.
- Programs related to network programming.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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ADVANCE DATA STRUCTURES AND ALGORITHM LAB

Course Code: DSE6509 **Credit Units: 01**

Programs based on Implementation of Graphs using Adjacency Matrix, Linked List , implementation of graph algorithms like BFS,DFS, Minimum Spanning Tree, Binary Search Tree, Knapsack Problem using Greedy Algorithm, Dynamic Programming, Shortest Path Algo (Dijkstra's), Implementing B-Tree,AVL Tree ,Red Black Tree. Implementing Sets, Dictionaries, Priority Queue using Heap.

Recommended Software: Java/C++/C/Python

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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PYTHON PROGRAMMING LAB

Course Code: DSE6508 **Credit Units: 01**

Course Contents:

- Setting up python on Windows/Linux/Mac
- First program in python
- Programs related to basic input/ouput.
- Programs related to variables,strings,numbers
- Programs related to Lists and Tuples
- Programs related toFunctions
- Programs related to If Statements
- Programs related to While Loops and Input
- Programs related to Basic Terminal Apps
- Programs related to Dictionaries
- Programs related to Classes
- Programs related to Exceptions
- Programs related to GUI programming
- Using Word, Excel, PDF files in python.
- Web programming in python,
- Case study of application areas of python.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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SUMMER INTERNSHIP EVALUATION-I

Course Code: DSE6535 **Credit Units: 03**

Course Objective:
The objective of this course is to provide practical training on some live projects that will increase capability to work on actual problem in industry. This training may undergo in an industrial environment or may be an in house training on some latest software which is in high demand in market. This training will be designed such that it will useful for their future employment in industry.

Examination Scheme:

Feedback from industry/work place	20
Training Report	40
Viva	15
Presentation	25
Total	**100**

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VHDL PROGRAMMING

Course Code: DSE6512 **Credit Units: 02**

Course Objective:
VHDL is commonly used as a design-entry language for field-programmable gate arrays and application-specific integrated circuits in electronic design automation of digital circuits. The course aims to discuss the syntax of the language to model a digital system.

Course Contents:

Module I
Fundamental VHDL Units, LIBRARY Declarations, ENTITY, ARCHITECTURE, Introductory Examples, Specification of combinational systems using VHDL, Introduction to VHDL, Basic language element of VHDL, Behavioural Modeling, Data flow modeling, Structural modeling, Subprograms and overloading, VHDL description of gates.

Module II
Data Types; Pre-Defined Data Types, User-Defined Data Types, Subtypes, Arrays, Port Array, Records, Signed and Unsigned Data Types, Data Conversion

Module III: Sequential codes
PROCESS: Signals and Variables, IF, WAIT, CASE, LOOP, CASE versus IF, CASE versus WHEN, Bad Clocking, Using Sequential Code to Design Combinational Circuits
Description and design of sequential circuits using VHDL,

Module IV
Standard combinational modules, Design of a Serial Adder with Accumulator, State Graph for Control Network, design of a Binary Multiplier, Multiplication of a Signed Binary Number, Design of a Binary Divider.

Module V
Micro programmed Controller, Structure of a micro programmed controller, Basic component of a micro system, memory subsystem. Overview of PAL, PLA, FPGA, CPLD.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- J. Bhaskar, "A VHDL Primer", Addison Wesley, 1999.
- Volnei A. Padroni, "Circuit Design with VHDL."
- M. Ercegovac, T. Lang and L.J. Moreno, "Introduction to Digital Systems", Wiley,2000
- C. H. Roth, "Digital System Design using VHDL", Jaico Publishing, 2001

References:
- VHDL Programming by Examples by Douglas L. Perry, TMH, 2000
- Hardware Description Languages by Sumit Ghose, PHI, 2000
- The Designer Guide to VHDL by P.J. Ashendern; Morgan Kaufmann Pub. 2000
- Digital System Design with VHDL by Mark Zwolinski; Prentice Hall Pub. 1999
- Designing with FPGA & CPLDs by Zeidman; CMP Pub. 1999
- HDL Chip Design by Douglas J. Smith; Doone Pub. 2001

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VHDL PROGRAMMING LAB

Course Code: DSE6513 **Credit Units: 01**

Software Required: Mentor Graphics

Topics covered in lab will include:

- Designing Basic Gates.
- Designing Combinational circuits like adder, multiplexer, PLA
- Designing Sequent ional Circuits like flip-flops, counters, registers.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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MICROPROCESSOR

Course Code: DSE6515 **Credit Units: 03**

Course Objective:
This course deals with the systematic study of the Architecture and programming issues of 8085-microprocessor family. The aim of this course is to give the students basic knowledge of the above microprocessor needed to develop the systems using it.

Course Contents:
Module I: Introduction to Microcomputer Systems
Introduction to Microprocessors and microcomputers, Study of 8 bit Microprocessor, 8085 pin configuration, Internal Architecture and operations,interrupts, Stacks and subroutines, various data transfer schemes.

Module II: ALP and timing diagrams
Introduction to 8085 instruction set, advance 8085 programming, Addressing modes, Counters and time Delays, Instruction cycle, machine cycle, T-states, timing diagram for 8085 instruction.

Module III: Memory System Design & I/O Interfacing
Interfacing with 8085.Interfacing with input/output devices (memory mapped, peripheral I/O), Cache memory system. Study of following peripheral devices 8255, 8253, 8257, 8255, 8251.

Module IV: Architecture of 16-Bit Microprocessor
Difference between 8085 and 8086, Block diagram and architecture of 8086 family, pin configuration of 8086, Minimum mode & Maximum mode Operation. Internal architecture of 8086, Bus Interface Unit, Register Organization, Instruction Pointer, Stack & Stack pointer, merits of memory segmentation, Execution Unit, Register Organization.

Module V: Pentium Processors
Internal architecture of 8087, Operational overview of 8087, Introduction to 80186, 80286, 80386 & 80486 processors, Pentium processor.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- Ramesh. S. Gaonkar, "Microprocessor architecture Programming and Application with 8085" Penram International Publishing, 4th Edition
- B. Ram, "Fundamentals of microprocessors and microcomputer" Dhanpat Rai, 5th Edition.]
- Douglas V Hall.

References:
- M. Rafiquzzaman, "Microprocessor Theory and Application" PHI – 10th Indian Reprint.
- Naresh Grover, "Microprocessor comprehensive studies Architecture, Programming and Interfacing" Dhanpat Rai, 2003.
- Gosh," 0000 to 8085" PHI.

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SYSTEM PROGRAMMING AND COMPILER CONSTRUCTION

Course Code: DSE6714 **Credit Units: 03**

Course Objective:
This course provides knowledge to design various system programs.

Course Contents:
Module I: Introduction
Definition, Evolution, Components**,** Editors: Introduction to system Programming Line editor, Full screen editor and multi window editor. Case study MS-Word, DOS Editor and vi editor.

Module II: Assemblers
First pass and second pass of assembler and their algorithms. Assemblers for CISC Machines: case study x85 & x86 machines.

Module III: Compilers & Macro Processor
Introduction to various translators. Various phases of compiler. Bootstrapping for compilers, Introduction to. Design of a compiler in C++ as Prototype. Basic Macro Processor functions- Macro definition & expansion – Macro Processor Algorithm & Data Structures, conditional – Macro Expansion, Keyword Macro Parameters, Macro with in Macro Implementation, case study MASM and ANSI C Macro language.

Module IV: Debuggers, Loaders and Linkers
Introduction to various debugging techniques. Case study:- Debugging in Turbo C++ IDE. Linkers and Loaders Concept of linking. Case study of Linker in x86 machines. Loading of various loading schemes.

Module V: Operating System
Booting techniques and sub-routines. Design of kernel and various management for OS. Design of Shell and other utilities, (**Overview of Unix OS, Difference Between Unix and Linux, Commands in Unix.)-changes made**

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- Donovan J.J., Systems Programming, New York, Mc-Graw Hill, 1972.
- Dhamdhere, D.M., Introduction to Systems Software, Tata Mc-Graw Hill 1996.

References:
- Aho A.V. and J.D. Ullman Principles of compiler Design Addison Wesley/ Narosa 1985.

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ADVANCED JAVA PROGRAMMING

Course Code: DSE6603 **Credit Units: 03**

Course Objective:
The objective is to equip the students with the advanced feature of contemporary java which would enable them to handle complex programs relating to managing data and processes over the network. The major objective of this course is to provide a sound foundation to the students on the concepts, precepts and practices, in a field that is of immense concern to the industry and business.

Course Contents:

Module I: Distributed Computing
Introduction to Java RMI, RMI services, RMI client, Running client and server, Introduction of Swing, Swing Components, Look and Feel for Swing Components, Introduction to Multimedia Programming.

Module II: Database Connectivity
ODBC and JDBC Drivers, Connecting to Database with the java.sql Package, Using JDBC Terminology, JDBC with mysql, postgresql.

Module III: Servlet Programming
Introduction to Servlets, Servlet Life Cycle, Servlet based Applications, Servlet and HTML.Filters, jdbc with servelets, session Management techniques in detail.

Module IV: JSP Programming
JSP: Introduction to JSP, JSP implicit objects, JSP based Applications, Java. Net. Login & Logout Example, jdbc with jsp.

Module V: JEE Web Appliaction
The Model-View-Controller Architecture What is Struts, Struts Tags, Creating Beans, Other Bean Tags, Bean Output, Creating HTML Forms, The Action Form class The Action class, Simple Struts: a simple Struts application; Introduction to EJB.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- Java 2 Unleashed (Techmedia – SAMS), Jamie Jaworski
- Professional Java Server Programming (a Press), Allamaraju
- Developing Java Servlets (Techmedia – SAMS), James Goodwill sing Java 1.2 Special Edition (PHI), Webber

References:
- David Flanagan,Jim Parley, William Crawford & Kris Magnusson, Java Enterprise in a nutshell - A desktop Quick reference - O'REILLY, 2003
- Stephen Ausbury and Scott R. Weiner, Developing Java Enterprise Applications, Wiley-2001
- Jaison Hunder & William Crawford, Java Servlet Programming, O'REILLY, 2002
- Dietal and Deital, "JAVA 2" PEARSON publication

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ADVANCE DATABASE MANAGEMENT SYSTEM

Course Code: DSE6604 **Credit Units: 03**

Course Objective:

The objective of this course is to expose the students to the implementation techniques of database system. This course explains techniques for query processing and optimization with transaction and concurrency control techniques

Course Contents:

Module I: Relational Databases

Integrity Constraints revisited, Extended ER diagram, Relational Algebra & Calculus, Functional, Muiltivalued and Join Dependency, Normal Forms, Rules about functional dependencies.

Module II: Query Processing and Optimization

Valuation of Relational Operations, Transformation of Relational Expressions, Indexing and Query Optimization, Limitations of Relational Data Model, Null Values and Partial Information.

Objected Oriented and Object Relational Databases

Modeling Complex Data Semantics, Specialization, Generalization, Aggregation and Association, Objects, Object Identity, Equality and Object Reference, Architecture of Object Oriented and Object Relational Databases

Module III: Parallel and Distributed Databases

Distributed Data Storage – Fragmentation & Replication, Location and Fragment
Transparency Distributed Query Processing and Optimization, Distributed Transaction Modeling and concurrency Control, Distributed Deadlock, Commit Protocols, Design of Parallel Databases, Parallel Query Evaluation.

Advanced Transaction Processing

Nested and Multilevel Transactions, Compensating Transactions and Saga, Long Duration Transactions, Weak Levels of Consistency, Transaction Work Flows, Transaction Processing Monitors.

Module IV

Multimedia databases,Databases on the Web and Semi–Structured Data
Case Study: Oracle Xi

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

***Text*:**

- Elmarsi, Navathe, Somayajulu, Gupta, "Fundamentals of Database Systems", 4th Edition, Pearson Education, 2007
- Garcia, Ullman, Widom, "Database Systems, The complete book", Pearson Education, 2007
- R. Ramakrishnan, "Database Management Systems", McGraw Hill International Editions, 1998

***References*:**

- Date, Kannan, Swaminathan, "An Introduction to Database Systems", 8th Edition Pearson Education, 2007
- Singh S.K., "Database System Concepts, design and application", Pearson Education, 2006.
- Silberscatz, Korth, Sudarshan, "Database System Concepts", Mcgraw Hill, 6th Edition, 2006
- W. Kim, "Modern Database Systems", 1995, ACM Press, Addision – Wesley,
- D. Maier, "The Theory of Relational Databases", 1993, Computer Science Press, Rokville, Maryland
- Ullman, J. D., "Principals of database systems", Galgotia publications, 1999
- Oracle Xi Reference Manual
- Dietrich, and Urban, "An Advanced Course in Database Systems", Pearson, 2008.

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DIGITAL COMPUTER ORGANIZATION

Course Code: DSE6605 **Credit Units: 03**

Course Objective:
The Objective of this course is to expose the students to the fundamentals and the concepts of Digital & Computer Organization and Representation of Information and Basic Building Blocks, Basic Organization, Memory Organization, Input-Output Organization, Processor Organization etc. This course is designed to understand the concepts of Computer Organization for Research & Development as well as for application.

Course Contents:
Module I: Representation of Information and Basic Building Blocks
Number Systems, Binary, Octal, Hexadecimal, Character Codes (BCD, ASCII, EBCDIC), Logic gates, Boolean algebra, K-map Simplification, Half adder, Full adder, Decoders, Multiplexes, Binary Counters, Flip/Flops: SR FF, JK FF, Master Slave FF, T and D FF, Registers: Parallel and Serial Registers, Counters (Synchronous & Asynchronous), ALU, Micro-Operation, ALU-chip.

Module II: Basic Organization
Von Neumann Machine (IAS Computer), Operational flow chart (Fetch, Execute), Instruction Cycle, Organization of Central Processing Unit, Hardwired and Micro programmed control unit, Single Organization, General Register Organization, Stack Organization, Addressing Modes, Instruction Formats, Data transfer & Manipulation, I/O organization, Bus Architecture, Programming Registers.

Module III: Memory Organization
Memory hierarchy, Main Memory (RAM/ROM chips) with mapping, Auxiliary memory, Associative memory and its mapping, Virtual memory, Cache memory with mapping techniques, Memory management hardware.

Module IV: Input-Output organization
Peripheral devices, I/O interface, Direct memory access, Modes of transfer, Priority Interrupt, I/O Processors, Serial Communication, Asynchronous data transfer, Strobe Control, Handshaking, I/O Controllers, CPU-IOP Communication.

Module V: Processor Organization
Introductory Concept of pipeline, Flynn's Classification, Parallel processing. RISC and CISC characterstics, arithmetic pipeline with example.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- Computer System Architecture: M. Mano (PHI Publication)
- William Stalling, "Computer Organization & Architecture", Pearson education Asia.
- B. Ram, "Computer Fundamental Architecture & Organization" New Age.

References:
- Computer Organization: Vrarsie, Zaky & Hamacher (TMH Publication).
- Tannenbaum, "Structured Computer Organization", PHI.

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MICROPROCESSOR LAB

Course Code: DSE6517 **Credit Units: 01**

Course Contents:

- To load the numbers 49H and 53H in the memory location 9510 and 9511
- respectively and add the contents of memory location 9601
- To write assembly language programming for 8 bit addition with and without carry.
- To write assembly language programming for 8 bit subtraction with and without borrow.
- To write assembly language programming for 8 bit multiplication and division.
- To write assembly language programming for sorting an array of numbers in ascending and descending order.
- To write assembly language programming with additional instructions.
- To write and execute a program using stacks.
- To study and program the programmable peripheral interface (8255) board.
- To study and program the programmable interval timer (8253) board.
- To study and program the programmable DMA controller (8257) board.
- To study and program the programmable interrupt controller (8259) board.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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SYSTEM PROGRAMMING AND COMPILER CONSTRUCTION LAB

Course Code: DSE6716 **Credit Units: 01**

Software Required: Turbo C++

Assignment will be provided for following:

- WAP to determine the length of the machine instructions.
- WAP to differentiate between symbols, literals and tokens.
- WAP to implement Symbol table.
- WAP to implement base table.
- WAP to find the relative addresses.
- Design a macro to perform add operation.
- On the basis of above program display the values of PC, LC and IR.
- Perform programming on loader based programme.
- Perform programming on linker based programme.
- Perform Programming on editor based programme.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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ADVANCED JAVA PROGRAMMING LAB

Course Code: DSE6608 **Credit Units: 01**

Programming Language: Java

1. WAP to display label on a frame with the help of JFrame
2. WAP to display six buttons on a panel using JFrame.
3. WAP. To display an image and a string in a label on the JFrame.
4. WAP that implement a JApplet that display a simple label
5. WAP that implement a JApplet and display the following frame
   a. Customer name
   b. Customer number
   c. Age
   d. Address
6. WAP to access a table Product Master from MS-Access using Java code.
7. WAP that implement a simple servlet program.
8. WAP for authentication, which validate the login-id and password by the servlet code.
9. WAP to connecting a database using user-id and password.
10. WAP to insert data into the database using the prepared statement.
11. WAP to read data from the database using the Resulset.
12. WAP to read data send by the client (HTML page) using servlet.
13. WAP to include a HTML page into a JSP page.
14. WAP to handle the JSPException.
15. WAP to read data send by a client (HTML page) using JSP.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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ADVANCE DATABASE MANAGEMENT SYSTEM LAB

Course Code: DSE6609 **Credit Units: 01**

Programs should be based on following topics:

Quick Review of Simple SQL Statements, SQL Built-in Functions, Primary Key, Foreign Key,Normalization, Joins View, Union. **Emphasis** on PL/SQL, Cursors 8. Exception handling, Procedure, Functions ,Trigger, concurrency control, transaction processing. Introduction to SQLite. Recommended Software: PostGreSQL, MySQL, Oracle.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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CRYPTOGRAPHY AND NETWORK SECURITY

Course Code: DSE6713 **Credit Units: 03**

Course Objective:
The objective here is to acquaint the students with the application of networking. Detail description of the various TCP/IP protocols and the working of ATM and its performance, Network security and authentication, and various algorithms related to it has been dealt, to get a practical approach.

Course Contents:

Module I: Advanced TCP/IP
TCP Services, TCP format and connection management, Encapsulation in IP, UDP Services, Format and Encapsulation in IP, IP Services, Header format and addressing, Fragmentation and reassembly, Migration to IPv6, Protocols: BOOTP, DHCP, ICMP, IGMP; Internet Routing Protocols: OSPF, RIP, EIGRP, BGP.

Module II: High Speed Networks
Packet Switching Networks; Frame Relay Networks; Asynchronous Transfer Mode (ATM); ATM protocol Architecture; ATM logical connections; ATM cells; ATM Service categories; ATM Adaptation Layer; QoS in ATM and Frame Relay

Module III: High Speed LANs
LAN Ethernet, fast Ethernet, gigabit Ethernet, FDDI, DSL, ADSL

Module IV: Wireless communication
Wireless networks, wireless channels, channel access, network architecture, IEEE 802.11, Bluetooth, Satellite Networks.

Module V: Network Security and Management
Principles of cryptography, Authentication, integrity, key distribution and certification, Access control andFirewalls, attacks and counter measures, security in manylayers. Infrastructure for network management, The internet standard managementframework, SMI, MIB, SNMP, Security and administration.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- William Stallings, "High-Speed Networks and Internets, Performance and Quality of Service", Pearson Education.
- High performance communication networks by: J. Walrand & Pravin Varaiya, Morgan Kaufman, 1999.
- Internetworking with TCP/IP Vol.1: Principles, Protocols, and Architecture (4th Edition) by Douglas E. Comer
- ATM networks: Concepts, Protocols, Applications by: Handel, Addision Wesseley.
- Cryptography & Networks Security Stallings, William 3rd edition

References:

- Computer networks:Tanenbaum, Andrew S, Prentice Hall
- Data communication & networking: Forouzan, B. A.
- Computer network protocol standard and interface Uyless, Black

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VLSI DESIGN

Course Code: DSE6612 **Credit Units: 02**

Course Objective:

In the recent years, IC manufacturing technology has gone through dramatic evolution and changes, continuously scaling to ever smatter dimensions. This scaling has a double impact on the design of ICs. First, the complexity of the designs that can be put on a single die has increased dramatically which led to new design methodologies. At the same time, this plunge into deep submicron space causes devices to behave differently and brings challenging issues to forefront. This course along with the course of Digital Circuits and Systems II and Analog CMOS IC design will give you many of the basic essentials to work in the area of Circuit Design. Since this course takes the latest trends in the industry into account, you will find yourself at a definite edge.

Course Contents:

Module I: Devices and the wire

Diode, dynamic and transient behaviour-diffusion capacitance, SPICE diode model.

MOSFET STATIC BEHAVIOUR: Threshold voltage and its dependence on V_{SB} MOSFET Operation in resistive and saturation region, channel length modulation, Velocity saturation and its impact on sub micron devices, sub threshold conduction, Model for manual analysis, Equivalent resistance for MOSFET in (velocity) saturated region, comparison of equations for PMOS and NMOS, depletion and enhancement device

DYNAMIC BEHAVIOUR: Channel capacitance in different regions of operation, junction capacitance, Level 1 SPICE MODELS for MOS transistors

The Wire: Interconnect parameters: resistance, capacitance and Inductance, Lumped RC model, Elmore Delay

Module II: CMOS Inverter

VTC of an ideal inverter, Switching Model of the CMOS inverter: nMOS /pMOS discharge and charge, VTC of CMOS inverter: PMOS AND NMOS operation in various regions including velocity saturation, Switching threshold, (W/L)p/(W/L)n ratio for setting desired V_M with and without velocity saturation, Noise Margins, buffer

Ratioed logic: Pseudo NMOS inverter and PMOS to NMOS ratio for performance, tristate inverter, Resistive load inverter.

Load Capacitance calculations: fan out capacitance, self capacitance calculations: Miller effect, wire capacitance; Improving delay calculation with input slope, Propagation delay: first order analysis, analysis from a design perspective, sizing a chain of inverters for minimum delay, choosing optimum number of stages

Power, Energy and Energy Delay: Dynamic power consumption, Static power, Glitches and power dissipation due to direct path currents, power and delay trade off, Transistor sizing for energy minimization

Module III: Combinational circuits

CMOS LOGIC: Good 0 and poor 0, Goo1 and poor 1, series and parallel N and P switches, 2 and Higher input NAND and NOR gates, Functions of the type (AB+C(D+E)) and their complements, XOR and XNOR gates, 2 input Multiplexer, Full Adder; Transistor sizing in CMOS logic for optimal delay,

Pseudo NMOS NAND NOR and other gates and the transistor sizing, Introduction to DSVCL logic, CPL AND/NAND, OR/NOR, XOR/XNOR gates

Logical effort, Electrical Effort, Branching effort, Examples of sizing Combinational logic chains for minimum delay. Pass-transistor logic, pass gate configurations for nmos and pmos, 2 input and 4 input MUX, XOR, XNOR and implementation of general functions like AB+AB*C+A*C*, Robust and Efficient PTL Design, Delay of Transmission Gate chain

Dynamic CMOS design: Precharge and Evaluation, charge leakage, bootstrapping, charge sharing, Cascading Dynamic Gates, DOMINO Logic, Optimization of Domino Logic Gates, simple example circuit implementations of DOMINO logic

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Module IV: Sequential Logic circuits
Principle of Bistability, NAND and NOR based SR latch, and clocked SR Latch, JK latch, example of master slave flip flop, CMOS D latch, MUX based Latches, master slave edge triggered register, non ideal clocks, clock overlap, C2MOS register, TSPCR Register, Schmitt Trigger, Pipelining and NORA CMOS

Module V: Layout Design Rules
Introduction to CMOS Process technology, Layout of CMOS inverter, CMOS NAND and NOR gates, Concept of Euler path, and stick diagrams for functions like (AB+E+CD)*

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
- Jan M Rabaey: Digital Integrated Circuits
- David Hodges et al: Analysis and Design of Digital ICs
- Kang: CMOS Digital ICs
- Weste and Harris: CMOS VLSI design
- Weste and Eshragian: Principles of CMOS VLSI Design

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VLSI DESIGN LAB

Course Code: DSE6613 **Credit Units: 01**

Course Contents:

- Using Design architect and simulate V vs time for CMOS inverter using same W/L ratio for PMOS and NMOS.
- Design and simulate again by Sizing PMOS to NMOS appropriately and repeat experiment 1
- Design and simulate V vs t for 2 input NAND and Nor gates.
- Design and Simulation for general CMOS functions
- One bit full adder simulation
- 2:1 MUX using pass transistor logic
- Other functions using pass transistor logic
- Layout of CMOS inverter
- Layout of NAND and NOR gates
- Design and Simulation SR latch using NAND and NOR representations
- Design and simulate D flip flop

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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DATA MINING

Course Code: DSE6619 **Credit Units: 03**

Course Objective:
The objective of this course is to introduce students to Data Warehousing & Data mining technologies that will helpTo Inspect, Control and Secure Information through Databases.

Course Contents:
Module I: Introduction to Data Warehousing
The need for data ware housing, Operational & Informational Data Stores, Data Warehouse definition & Characteristics, Data Warehouse role & Structure, The cost of warehousing data, Foundation & Roots of Data,

Module II: Data Warehousing Components& Architecture:
Stores, warehouses and marts, Data warehouse database, Sourcing, acquisition, clean up & transformation tools, meta data, Access tools, Data ware house administration & management,.
operational & External Database layer, Information access layer, data access layer, metadata layer, process management layer, Application messaging layer, Physical DW layer, Data staging layer.

Module III: Building a Data Warehouse:
Business, Design, Technical & Implementation Considerations, DW project plan.
Overview of Mapping the DW to Multiprocessor Architecture, & DBMS Schemas for Decision Support.

Module IV: Metadata and OLAP:
METADATA: Definition, repository, management & trends.
OLAP: Need, guidelines, Multi Relational & Multi-Dimensional: MOLAP, ROLAP, OLAP Tools.

Module V: Data Mining & Visualization:
Techniques to mine the data, Market Basket analysis, Measuring data mining effectiveness, embedding data mining to business process, current limitations and challenges in DM.
Introduction to EIS, The future of Data Mining, Warehousing & Virtualization, Applications: PowerBuilder, Forte. Technical Exposure to Data Mining

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

TEXT BOOKS:
- Alex Berson, Data Warehousing, Data Mining, and Olap, Tata McGraw Hill.
- George M Marakas, Modern Data Warehousing, Mining & Visualization Core Concepts, Pearson Education.

References:
- (Berry, Michael)Data Mining Techniques.
- (Sharma, Gajendra)Data Mining, Data Warehousing and OLAP.
- (Gupta, GK) Data Mining with Case Studies.
- (Han & Kamber)Data Mining: Concepts and Techniques.
- (Paulraj Ponniah) Datawarehousing Fundamentals.

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COMPUTER GRAPHICS

Course Code: DSE6702 **Credit Units: 03**

Course Objective:
The objective of the course is to provide the understanding of the fundamental graphical operations and the implementation on computer, the mathematics behind computer graphics, including the use of spline curves and surfaces. It gives the glimpse of recent advances in computer graphics, user interface issues that make the computer easy, for the novice to use.

Course Contents:

Module I: Introduction to Graphics and Graphics Hardware System
Application of computer graphics, Video Display Devices, Raster Scan Display, Random Scan Display, Input Devices, Graphic Software and graphics standards, Numerical based on Raster and Random scan display, Frame buffer, Display processor.

Module II: Output Primitives and Clipping operations
Algorithms for drawing 2D Primitives lines (DDA and Bresenham's line algorithm), circles (Bresenham's and midpoint circle algorithm), Antialiasing and filtering techniques. Line clipping (cohen-sutherland algorithm), Curve clipping algorithm, and polygon clipping with Sutherland Hodgeman algorithm, Area fill algorithms for various graphics primitives: Scanline fill algorithm, boundary fill algorithm, flood fill algorithm, Polygon representation, various method of Polygon Inside test: Even-Odd method, winding number method, Character generation techniques.

Module III: 2D Geometric transformation
2D Transformation: Basic transformat ion, Translation, Rotation, Rotation relative to an arbitrary point, scaling, Matrix Representations and Homogeneous coordinates, window to viewport transformation.

Module IV: 3D Geometric transformation
3D Concepts: Parallel projection and Perspective projection, 3D Transformations, composite 3D transformation, co-ordinate transformation, Inverse transformation

Module V: Object modeling and Visible Surface detection
fractal geometry methods, fractal dimensions, Geometric construction of deterministic self-similar fractals, Iterated function system to generate fractals. Bezier curves and Bezier surfaces, Bspline curves and surfaces, Visible surface detection method: Basic illumination, diffuse reflection, specular reflection, shadows. Ray tracing method, Depth-buffer method, A-buffer method, Depth-sorting method (painter's algorithm), Binary search partition method, Scan line method,

Module VI: Introduction to multimedia
Design of animation sequences, Computer Animation languages, Elementary filtering techniques and elementary Image Processing techniques, graphics library functions used in animation design

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References*:*

Text:

- Foley et. al., "Computer Graphics Principles & practice", 2nd ed. AWL, 2000.
- D. Hearn and P. Baker, "Computer Graphics", Prentice Hall, 1986.

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- R. Plastock and G. Kalley, “Theory and Problems of Computer Graphics”, Schaum’s Series, McGraw Hill, 1986

References:

- R.H. Bartels, J.C. Beatty and B.A. Barsky, “An Introduction to Splines for use in Computer Graphics and Geometric Modeling”, Morgan Kaufmann Publishers Inc., 1987.
- C.E. Leiserson, T.H. Cormen and R.L. Rivest, “Introduction to Algorithms”, McGraw-Hill Book Company, 1990.
- W. Newman and R. Sproul, “Principles of Interactive Computer Graphics, McGraw-Hill, 1973.
- F.P. Preparata and M.I. Shamos, “Computational Geometry: An Introduction”, Springer-Verlag New York Inc., 1985.
- D. Rogers and J. Adams, “Mathematical Elements for Computer Graphics”, MacGraw-Hill International Edition, 1989
- David F. Rogers, “Procedural Elements for Computer Graphics”, McGraw Hill Book Company, 1985.
- Alan Watt and Mark Watt, “Advanced Animation and Rendering Techniques”, Addison-Wesley, 1992

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ADVANCED COMPUTER NETWORKS

Course Code: DSE6704 **Credit Units: 03**

Course Objective:
The objective of the course is to provide thorough understanding & in-depth knowledge of concepts in computer networks Such as Internet protocols and routing, local area networks, wireless communications and networking, performance analysis, congestion control, TCP, network address translation, multimedia over IP, switching and routing, mobile IP, multicasting, IPv6. Peer-to-peer networking, network security, and other current research topics. A focus will be placed on wireless networking, reflecting rapid advances in this area. This course motivates the students to explore current research areas in the same field.

Course Contents:

Module I : Introduction to Networks
Networking introduction, Reference Models, TCP/IP, OSI, Addressing, Protocol Layering, Transmission impairment, performance, Switching, Transmission Media, Introduction to MAC, Channel allocation, MAC protocol classification for LAN's, MAN's, MAC protocols for Adhoc N/ws, MAC Protocol for WLAN's(adhoc and sensor n/ws), Introduction to Ethernet protocol (Fast, Gigabit and standard Ethernet).

Module II: Network Layer
Network Layer Design Issues, Routing Algorithms, Congestion Control Algorithms, Quality of Service, Internet Working, Network Layer in Internet.
IPv6 basic protocol, extensions and options, support for QoS, security, etc., Changes to other protocols, Application Programming Interface for IPv6.

Module III : Mobile IP
Mobile IP, IP Multicasting. Multicast routing protocols, address assignments, session discovery, etc.

Module IV : Transport Layer and Application Layer
The Transport Protocol: The Transport Service, Elements of transport protocol, a simple Transport Protocol, Internet Transport Protocols UDP, Internet Transport Protocols TCP, TCP extensions for high-speed networks, transaction-oriented applications Performance Issues.
The Application Layer: DNS-(Domain Name System), Electronic Mail, World Wide Web Multimedia.

Module V : Network Security
Overview of network security, Secure-HTTP, SSL, ESP, Key distribution protocols. Digital signatures, digital certificates-mail Security, Web security, Social Issues.

Examination Scheme:

Components	A	CT	H	V/S/Q	EE
Weightage (%)	5	10	7	8	70

Text & References:
Text:
- Computer Networks - Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI
- Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

***References*:**
- Computer Communications and Networking Technologies –Michael A.Gallo, William M .Hancock - Thomson Publication.
- W. Stallings. Cryptography and Network Security: Principles and Practice, 2nd Edition, Prentice Hall, 1998.
- W. R. Stevens. TCP/IP Illustrated, Volume 1: The protocols, Addison Wesley, 1994.
- C. E. Perkins, B. Woolf, and S. R. Alpert. Mobile IP: Design Principles and Practices, Addison Wesley, 1997.

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COMPUTER GRAPHICS LAB

Course Code: DSE6706 **Credit Units: 01**

Software Required: Turbo C++

Course Contents:

Assignments will be provided for the following:

- Geometrical shapes based on graphics algorithms
- 2D Geometric transformation translation, rotation, scaling, reflection.
- Clipping
- Animation

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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ADVANCED COMPUTER NETWORKS LAB

Course Code: DSE6707 **Credit Units: 01**

Course Contents:

Various installations and connections of LAN, WAN, ETC

Working on NS2.

Socket Programming using C Language on Linux

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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MATLAB PROGRAMMING

Course Code: DSE6708 **Credit Units: 02**

Understanding The MATLAB Environment, Using the Help System in MATLAB, MATLAB Basics,Linear Algebra; Vectors and Matrices and various operations on them, M files; Scripts and User-defined functions, Plotting, Flow Control and Loops; For and While Loops, If and Case statements, structures, writing basic programs using the above, study of various toolboxes available in matlab and case study of any one tool box.

Recommended Software: MATLAB/Octave

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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SUMMER INTERNSHIP EVALUATION-II

Course Code: DSE6735 **Credit Units: 03**

Guidelines:

There are certain phases of every Intern's professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship program can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal classroom situations. These attributes are intellectual ability, professional judgment and decision-making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc.

In order to achieve these objectives, each student will maintain a file (**Internship File**). The Internship File aims to encourage students to keep a personal record of their learning and achievement throughout the Programme. It can be used as the basis for lifelong learning and for job applications. Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development.

The File will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and their own personal contribution to the organization.

The **layout guidelines** for the Project & Seminar Report:

1. File should be in the following specification:
A4 size paper
Font: Arial (10 points) or Times New Roman (12 points)
Line spacing: 1.5
Top & bottom margins: 1 inch/ 2.5 cm
Left & right margins: 1.25 inches/ 3 cm

2. Report Layout: The report should contain the following components:
Front Page
Table of Content
Acknowledgement
Student Certificate
Company Profile (optional)
Introduction
Main Body
References / Bibliography

The File will include ***five sections*** in the order described below. The content and comprehensiveness of the main body and appendices of the report should include the following:

1. **The Title Page**--Title - An Internship Experience Report For (Your Name), name of internship organization, name of the Supervisor/Guide and his/her designation, date started and completed, and number of credits for which the report is submitted.
2. **Table of Content**--an outline of the contents by topics and subtopics with the page number and location of each section.
3. **Introduction**--short, but should include how and why you obtained the internship experience position and the relationship it has to your professional and career goals.
4. **Main Body**--should include but not be limited to daily tasks performed. Major projects contributed to, dates, hours on task, observations and feelings, meetings attended and their purposes, listing of tools and materials and their

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suppliers, and photographs if possible of projects, buildings and co-workers.
5. **References / Bibliography** --This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system

ASSESSMENT OF THE INTERNSHIP FILE
The student will be provided with the Student Assessment Record (SAR) to be placed in front of the Internship File. Each item in the SAR is ticked off when it is completed successfully. The faculty will also assess each item as it is completed. The SAR will be signed by the student and by the faculty to indicate that the File is the student's own work. It will also ensure regularity and meeting the delaines.

STUDENT ASSESSMENT RECORD (SAR)

1. **Range of Research Methods used to obtain information**

2. **Execution of Research**

3. **Data Analysis**
   - Analyse Quantitative/ Qualitative information
   - Control Quality

4. **Draw Conclusions**

Examination Scheme:

Components	V	S	R	FP
Weightage (%)	20	20	20	40

V – Viva, S – Synopsis, FP – Final Presentation, R - Report

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MOBILE COMPUTING

Course Code: DSE6710 **Credit Units: 03**

Course Objective:
The objective of this consortium is to shape and expand a full-scale and sound mobile computing system market. To achieve this, cooperation is required of interests related to communication (network), computer hardware/software, system integrators (including service providers), and the media.

Course Contents:

Module I: Introduction to Personal Communications Services (PCS)
PCS Architecture, Mobility management, Networks signaling.
Global System for Mobile Communication (GSM) system overview: GSM Architecture, Mobility management, Network signaling.

Module II: General Packet Radio Services (GPRS) &Wireless Application Protocol (WAP)
GPRS Architecture, GPRS Network Nodes.
Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 standard, Mobile IP.
Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, wireless mark up Languages (WML).

Module III:Third Generation (3G) Mobile Services
Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G.
Wireless Local Loop(WLL): Introduction to WLL Architecture, wireless Local Loop Technologies.

Module IV: Global Mobile Satellite Systems
Global Mobile Satellite Systems; case studies of the IRIDIUM and GLOBALSTAR systems.

Module V:Enterprise Networks
Introduction to Virtual Networks, Blue tooth technology, Blue tooth Protocols. Advanced techniques in mobile computing.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- "Wireless and Mobile Networks Architectures", by Yi-Bing Lin & Imrich Chlamtac, John Wiley & Sons, 2001.
- "Mobile and Personal Communication systems and services", by Raj Pandya, Prentice Hall of India, 2001.

References:
- "Guide to Designing and Implementing wireless LANs", by Mark Ciampa, Thomson learning, Vikas Publishing House, 2001.
- "Wireless Web Development", Ray Rischpater, Springer Publishing, 2000.
- "The Wireless Application Protocol", by Sandeep Singhal, Pearson Education Asia, 2000.
- "Third Generation Mobile Telecommunication systems", by P.Stavronlakis, Springer Publishers, 2001.

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DATA MINING AND PREDICTIVE ANALYTICS

Course Code: DSE6802 **Credit Units: 03**

Course Objective: This course introduces the topics of Data Mining, and Data Analytics by providing a basic, practical foundation that allows the students to participate in Data Analytics projects. The course incorporates an introduction to the Data Analytics lifecycle, Machine Learning (ML), Data Mining algorithms and computational paradigms that allow computers to find patterns and regularities in databases, perform prediction and forecasting, and generally improve their performance through interaction with data.

Course Contents:

Module I: Data Preparation
An introduction to data mining and predictive analytics, Data Pre-processing Exploratory Data Analysis, Dimension- Reduction Methods.

Module II: Classification
k- Nearest Neighbour Algorithm, Decision Trees, Model Evaluation Technique, Cost –Benefit Analysis Using Data Driven Cost.

Module III: Clustering
Hierarchical and k- Means Clustering, Kohenen Networks, Birch Clustering, Measuring Cluster Goodness.

Module IV: Association Rules
Affinity Analysis and Market Basket Analysis, Data Representation for Market Basket Analysis, Support, Confidence, Frequent Item sets, and the a Priori Property, How Does a Priori Algorithm Work ? Generating Frequent Item sets, Generating Association Rules, Extension from Flag Data to General Categorical Data, Information-Theoretic Approach: Generalized Rule Induction Method, *J*-Measure, Association Rules are Easy to do Badly, How can we Measure the Usefulness of Association Rules? Do Association Rules Represent Supervised or Unsupervised Learning?

Module V: Case Study: Predicting Response to Direct Mail Marketing
Business Understanding, Data Preparation, and Eda, Clustering and Principal Components Analysis, Modelling and Evaluation for Performance and Interpretability, Modelling and Evaluation for High Performance.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Daniel T. Larose, Chantal D. Larose, “Data Mining and Predictive Analytics”, John Wiley & Sons, Inc., Hoboken, New Jersey, 2015.
- Thomas W. Miller, “Modelling Techniques in Predictive Analytics”, Pearson FT Press, 2013.
- Markus Hofmann, Ralf Klinkenberg, “Rapid-Miner: Data Mining Use Cases and Business Analytics Applications”, Chapman and Hall/CRC, 2016

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DATA WAREHOUSING AND MULTIDIMENSIONS MODELLING

Course Code: DSE6803 **Credit Units: 03**

Course Objective:
This course focuses on the fundamentals of data warehousing and multidimensional Modelling. Data warehouse development life cycle, Data warehouse analysis, CUBE, ROLL UP and STAR queries, Data Warehouse Design - Massive de -normalisation, STAR schema design, Data ware house Architecture, OLAP, ROLAP and MOLAP, concepts of Fact and dimension table are the major areas of coverage of this course. This course also deals with the issues while implementing the multidimensional models

Course Contents:

Module I: Introduction
Multidimensional Data Management, Multidimensional History, Related Terminology,

Module II: Fundamental Concepts
Cubes ,Dimensions, Facts, Measures, Relational Representations, Star Schemas, Snowflake Schemas, Data Warehouses And Data Marts, Multidimensional Modelling Process, Analysis And Querying ,Roll Up, Drill Down, Drill Out, Slicing And Dicing, Drill Across, Pivot Tables, Ranking, Multi-Dimensional Querying in MDX and SQL, Graphical Querying and Visualizations .

Module III: Advance Concepts
Slowly Changing Dimensions, The Problem, Solutions, Other Special Kinds Of Dimensions, Mini dimensions, Outriggers, Degenerate Dimensions, Junk Dimensions, Time Dimensions, Data Quality Dimensions, Advanced Hierarchies, Parent-Child Hierarchies, Unbalanced Hierarchies, Non Covering Hierarchies , Non –Strict Hierarchies, Multiple Hierarchies And Parallel Hierarchies.

Module IV: Implementation Issues
Materialized Views, Indexing, Indexing Overview, Bitmap Indices, Join Indices, Query Processing, OLAP Implementations, Extract-Transform-Load.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Christian S. Jensen, Christian Thomsen, and Professor Torben Pedersen, “Multidimensional Databases and Data Warehousing”, Morgan & Claypool Publisher, 2010.
- Ralph Kimball, Margy Ross, "The Data Warehouse Toolkit: The Definitive Guide”, 3rd Edition, John Wiley & Sons, 2013.
- Len Silverston, Paul Agnew, “The Data Model Resource Book: Volume 3: Universal Patterns for Data Modeling”, John Wiley & Sons., 2009.

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DATABASE AND KNOWLEDGE BASE SYSTEM

Course Code: DSE6804 **Credit Units: 03**

Course Objective:

This course discusses design methodology for databases to verify their structural correctness and implements databases. It also provides applications software primarily in the relational model using querying languages, primarily SQL, and other database supporting software applying the theory behind various database models and query languages implementing security and integrity policies relating to databases and preparation for data analytics working in group settings to design and implementing database projects.

Course Contents:

Module I: Introduction

Database Languages, Object-Base Systems, Knowledge-base Systems, History and Perspective, Data Models for Database Systems: Data Models, The Entity-relationship Model, The Relational Data Model, Operations in the Relational Data Model, The Network Data Model, The Hierarchical Data Model, An Object-Oriented Model, Logic as a Data Model: The Datalog Data Model, Evaluating Non- recursive Rules, Computing the Meaning of Recursive Rules, Incremental Evaluation of Least Fixed Points, Negations in Rule Bodies, Relational Algebra and Logic, Relational Calculus, Tuple Relational Calculus.

Module II: Relational Query and Object-Oriented Database Language

ISBL: A "Pure" Relational Algebra Language, QUEL: A Tuple Relational Calculus Language, Query-by-Example: A DRC Language, Data Definition in QBE, The Query Language SQL, Data Definition in SQL, The DBTG Data Definition language, The DBTG Query Language, The DBTG Database Modification Commands, Data Definition in IMS, A Hierarchical Data Manipulation Language, Data Definition in OPAL, Data Manipulation in OPAL

Module III: Physical Data Organization and Design of Relational Databases

The Physical Data Model, The Heap Organization, Hashed Files, Indexed Files, B-trees, Files with a Dense Index, Secondary Indices, Data Structures in DBTG Databases, Data Structures for Hierarchies, Data Structures for Relations, A Search Tree Structure, Functional Dependencies, Lossless-Join Decomposition, Normalization, Generalized Dependencies.

Module IV: Transaction Management

Basic Concepts, A Simple Transaction Model, The Two-phase Locking Protocol, a Model with Read and write-Locks, Lock Modes, A Read-Only, Write-Only Model, Concurrency for Hierarchically Structured Items, Handling Transaction Failures, Aggressive and Conservative Protocols, Recovery From Crashes, Timestamp-based Concurrency Control.

Module V: Distributed Database Management

Distributed Databases, Distributed Locking, Distributed Two-phase Locking, Distributed Commitment, A Nonblocking Commit Protocol, Timestamp-based, Distributed Concurrency, Recovery of Nodes, Distributed Deadlocks.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Jeffrey D. Ullman"Principles of Database and Knowledge-Base Systems", Vol. 1, Computer Science Press, USA, 1988.
- Avi Silberschatz, Henry F. Korthand S. Sudarshan, "Database System Concepts", Mcgraw Hill Education, 2000.
- Ngoc Thanh Nguyen, Edward Szczerbicki, "Intelligent Systems for Knowledge Management", Springer-verlag Gmbh, 2009.

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BIG DATA TECHNOLOGIES

Course Code: DSE6805 **Credit Units: 03**

Course Objective:
This course brings together several key big data technologies used for storage, analysis and manipulation of data. It also introduces the students the key concepts of Hadoop framework, MapReduce, Pig, Hive, and No-SQL. Students will prepare a sample project in Hadoop.

Course Contents:

Module I: Introduction to Big Data
Big Data and its Importance – Four V's of Big Data – Drivers for Big Data – Introduction to Big Data Analytics – Big Data Analytics applications.

Module II: Big Data Technologies
Hadoop's Parallel World – Data discovery – Open source technology for Big Data Analytics – cloud and Big Data –Predictive Analytics – Mobile Business Intelligence and Big Data – Crowd Sourcing Analytics – Inter- and Trans-Firewall Analytics - Information Management.

Module III: Processing Big Data
Integrating disparate data stores - Mapping data to the programming framework - Connecting and extracting data from storage - Transforming data for processing - Subdividing data in preparation for Hadoop Map Reduce.

Module IV: Hadoop Map Reduce
Employing Hadoop Map Reduce - Creating the components of Hadoop Map Reduce jobs - Distributing data processing across server farms –Executing Hadoop Map Reduce jobs - Monitoring the progress of job flows - The Building Blocks of Hadoop Map Reduce - Distinguishing Hadoop daemons - Investigating the Hadoop Distributed File System Selecting appropriate execution modes: local, pseudo-distributed, fully distributed.

Module V: Big Data Tools and Techniques
Installing and Running Pig – Comparison with Databases – Pig Latin – User- Define Functions – Data Processing Operators – Installing and Running Hive – Hive QL – Tables – Querying Data – User-Defined Functions – Oracle Big Data.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Michael Minelli, Michehe Chambers, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business", 1st Edition, Ambiga Dhiraj, Wiely CIO Series, 2013.
- Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'reilly, 2012.
- Arvind Sathi, "Big Data Analytics: Disruptive Technologies for Changing the Game", 1st Edition, IBM Corporation, 2012.
- Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", 1st Edition, Wiley and SAS Business Series, 2012.

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RESEARCH METHODOLOGY AND TECHNICAL REPORT WRITING

Course Code: DSE6809 **Credit Units: 02**

Course Objectives:
The course will enhance scientific, technical and research writing skills and impart knowledge about various stages of research process, statistical analysis, statistical tests and their applications in statistical decision making.

Course Contents:
Module I: Introduction to research: Definition, motivation, need, objectives, significance and characteristics of research; types of research; steps in research process; planning a research proposal; literature review, web searching.

Module II: Population and sample, parameter and statistic, sampling and data collection, sampling design: steps, types, sample size, sampling methods, large and small samples, primary and secondary data, data processing and analysis. Sample surveys and questionnaire designing, scaling techniques.

Module III: Dependent and independent variables, univariate, bivariate and multivariate analysis, means-arithmetic, geometric and harmonic; measure of dispersion of data, standard deviation, variance, coefficient of variation and degree of freedom. Hypothesis testing: null hypothesis and alternate hypothesis, errors in hypothesis testing, significance and confidence levels, parametric tests and non-parametric tests, one-tailed and two-tailed tests, analysis of variance. Regression analysis and curve fitting, method of least-squares, explained and unexplained variations, coefficient of correlation, coefficient of determination**.**

Module IV: Technical/scientific/research report writing: structure and components of scientific reports, formats of dissertations, research report, report writing skills, report preparation, referencing , bibliography and footnotes. Making presentation-use of visual aids and PPTs. Publication of research papers, citations,. Intellectual property rights and copy rights, plagiarism, patents and patent laws, commercialization and ethical issues.

Examination Scheme:

Attendance	Assignment/Library consultation / Thesis writing	Class test	Final Exam	Total
5	15	10	70	100

Text Books:

- Blake, G. and Bly, R.W. 1993, The Elements of Technical Writing. MacMillan, New York
- Booth, V. 1981. Writing a Scientific Paper and Speaking at Scientific Meetings. The Biochemical Society, London
- Chawla,D and Sondhi, N. 2016, Research Methodology- Concepts and Cases. Vikas Publishing House Pvt Ltd. New Delhi
- Kothari, C.R.2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.

Reference Books:

- Geode, Millian J.& Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Montomery, Douglas C.(2007), 5th Ed. Design and Analysis of Experiments, Wiley India.
- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt.Ltd., New Delhi-110001
- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patpargang, Delhi- 110092

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APPLIED STATISTICAL ANALYSIS LAB

Course Code: DSE6806 **Credit Units: 01**

Programs should be based on following topics:

Quick Review of interpretation of mathematical models such as formulas, graphs, tables, and schematics, and draw inferences from them;
Representation of mathematical information symbolically, visually, numerically, and verbally;
Use of arithmetic, algebraic, geometric, and statistical methods to solve problems;
Estimation and check answers to mathematical problems in order to determine reasonableness,
Identification of alternatives, and select optimal results; and recognize the limitations of mathematical and statistical models.

Recommended Software: SPSS (IBM).

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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DATA MINING AND PREDICTIVE ANALYTICS LAB

Course Code: DSE6807 **Credit Units: 01**

Course Objective:

- To analyse the data using statistical methods.
- To understand and demonstrate data mining using any open source data mining tool.

Recommended Software: ORANGE, Rapid Miner

List of Experiments

1. Data Analysis- Getting to know the Data (Using ORANGE, Rapid Miner)
   - Parametric - Means, T-Test, Correlation
   - Prediction for numerical outcomes - Linear regression
   - Correlation analysis
   - Preparing data for analysis
   - Pre-processing techniques

2. Data Mining (Using ORANGE, Rapid Miner or any open source data mining tool)
   - Implement clustering algorithm
   - Implement classification using
   - Decision tree
   - Back propagation
   - Visualization methods.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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DATA WAREHOUSING AND MULTIDIMENSIONS MODELLING LAB

Course Code: DSE6808 **Credit Units: 01**

Programs should be based on following topics:
Quick Review SQL Statements, SQL Built-in Functions,**Emphasis** on PL/SQL,Cursors 8. Exception handling, Procedure, Functions,Trigger, concurrency control, transaction processing. Introduction to ETL Tools:Talend Open Source Data Integrator, Scriptella, KETL
Pentaho Data Integrator - Kettle, Jaspersoft ETL, GeoKettle, CloverETL, HPCC Systems

Recommended Software: SQL Server, ETL Tools (Open Source)

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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MAJOR PROJECT

Course Code: DSE6837 **Credit Units: 08**

GUIDELINES FOR PROJECT FILE

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage.

The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

In general, the File should be comprehensive and include

A short account of the activities that were undertaken as part of the project;

A statement about the extent to which the project has achieved its stated goals.

A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;

Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project;

Any problems that have arisen that may be useful to document for future reference.

- **Report Layout**

The report should contain the following components:

- **Title or Cover Page**

The title page should contain the following information: Project Title; Student's Name; Course; Year; Supervisor's Name.

- **Acknowledgements**(optional)

Acknowledgment to any advisory or financial assistance received in the course of work may be given.

- **Abstract**

A good"Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project

- **Table of Contents**

Titles and subtitles are to correspond exactly with those in the text.

- **Introduction**

Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

- **Materials and Methods**

This section should aim at experimental designs, materials used. Methodology should be mentioned in details including modifications if any.

- **Results and Discussion**

Present results, discuss and compare these with those from other workers, etc. In writing these section, emphasis should be given on what has been performed and achieved in the course of the work, rather than discuss in detail

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what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

Note that in writing the various secions, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary never write in "point" form.

- **Conclusion**

A conclusion should be the final section in which the outcome of the work is mentioned briefly.

- **Future prospects**

- **Appendices**

The Appendix contains material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

- **References / Bibliography**

This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Examples

For research article

Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichia coli* O157: H7. *Clin Microbiol Infect*, **8** (suppl 1): 116–117.

For book

Kowalski,M.(1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67

ASSESSMENT OF THE PROJECT FILE

Essentially, marking will be based on the following criteria: the quality of the report, the technical merit of the project and the project execution.
Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project.
Project execution is concerned with assessing how much work has been put in.
The File should fulfill the following ***assessment objectives:***

Range of Research Methods used to obtain information

Execution of Research

Data Analysis
Analyse Quantitative/ Qualitative information
Control Quality

Draw Conclusions

Examination Scheme:

Dissertation	50	
Viva Voce	50	
Total		**100**

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DESCRIPTIVE ANALYSIS

Course Code: DSE6901 **Credit Units: 03**

Course Objective:
This course introduces some elementary statistical methods of analysis of data and compute various measurements of central tendency, dispersion, skewness and kurtosis. Also discusses computation of the correlation coefficient from ungrouped bivariate data and interpret them and analyse data pertaining to attributes and to interpret results.

Course Contents:

Module I: Introduction to Statistics:
Definitions: Webster's and Secrist's definition of Statistics, Importance of Statistics, Scope of Statistics: In the field of Industry, Biological Sciences, Medical Sciences, Economics Sciences, Social, Sciences, Management Sciences, Agriculture, Insurance, Actuarial Science, Education and Psychology.

Module II: Population and Sample
Types of characteristics: Attributes: Nominal scale, ordinal scale. Variables: Interval scale, ratio scale, discrete and continuous variables, Types of data: Primary data, Secondary data, Notion of a statistical population: Finite population, infinite population, homogeneous population and heterogeneous population. Notion of sample, random sample and non-random sample, Methods of sampling: Simple random sampling with and without replacement (SRSWR and SRWOR) stratified random sampling, systematic sampling, cluster sampling and two-stage sampling.

Module III: Presentation of Data
Classification: Raw data and its classification, Discrete frequency distribution, Sturge's rule, continuous frequency distribution, inclusive and exclusive methods of classification, Open end classes, cumulative frequency distribution and relative frequency distribution, Graphical Presentation of Data: Histogram, frequency curve, frequency polygon, ogive curves, stem and leaf chart, Check sheet, Parato diagram, Examples and Problems.

Module IV: Measures of Central Tendency
Concept of central tendency of statistical data, Arithmetic Mean (A.M.), combined mean of a number of groups, merits and demerits, Geometric Mean (G.M.), Harmonic Mean (H.M.), Weighted Mean, Weighted A.M., G.M. and H.M. , Mode, Median, Empirical relation between mean, median and mode, Order relation between arithmetic mean, geometric mean, harmonic mean.

Module V: Measures of Dispersion
Concept of dispersion, characteristics of good measure of dispersion, Range, Mean deviation, Mean square definition, Variance and standard deviation, Combined variance, Combined standard deviation, generalization for n groups, Measures of dispersion for comparison: coefficient of range, coefficient of quartile deviation and coefficient of mean deviation, coefficient of variation.

Module VI: Skewness and Kurtosis
Concept of skewness of frequency distribution, positive skewness, negative skewness, symmetric frequency distribution, Bowley's coefficient of skewness, interpretation using Box plot, Karl Pearson's coefficient of skewness, Measures of skewness basked on moments ($\beta 1$, $\gamma 1$), Concepts of kurtosis, leptokurtic, mesokurtic and platykurtic frequency distributions, Measures of kurtosis based on moments, ($\beta 2$, $\gamma 2$).

Module VII: Correlation & Regression
Bivariate data, bivariate frequency distribution, Concept of correlation between two variables, positive correlation, negative correlation, Scatter

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diagram, conclusion about the type of correlation from scatter diagram, Covariance between two variables, Karl Pearson's coefficient of correlation, Spearman's rank correlation coefficient, In case of ties, compute Karl Pearson's correlation coefficient between ranks. Regression: lines of regression, fitting of lines of regression by the least squares method, interpretation of slope and intercept. 9.2 Regression coefficient (byx, bxy), Effect of change of origin and scale, Angle between the two lines of regression, Mean residual sum of squares , Residual plot and its interpretation.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text and References :

- Goon A.M.,Gupta M. K., Dasgupta B.(1998): Fundamentals of Statistics (V-1),World Press.
- Miller and Fruend: Modern Elementary Statistics.
- Snedecor and Cochran: Statistical Methods, Oxford and IBH Publishers.
- Mukhopadhyay, P: Mathematical Statistics (1996), New Central Book Agency, Calcutta.
- Introduction to Mathematical Statistics, Ed. 4 (1989), MacMillan Publishing Co. New York.
- Gupta and Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi.
- Neil Weiss: Introductory Statistics: Pearson Publishers.

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LEARNING AND REASONING WITH BAYESIAN NETWORKS

Course Code: DSE6902 **Credit Units: 04**

Course Objective:

This course provides an in-depth exposition of knowledge representation, reasoning, and machine learning under uncertainty using the framework of Bayesian networks. Both theoretical underpinnings and practical considerations will be covered, with a special emphasis on constructing and learning graphical models, and on various exact and approximate inference algorithms.

Course Contents:

Module I: Introduction

Reasoning about beliefs using Logic and Probability Propositional Logic, Probability Calculus and Bayesian Reasoning, Bayesian Networks,: Syntax and Semantics, Building Bayesian Networks.

Module II: Bayesian Networks Inference

Inference by variable elimination, Inference by Factor Elimination (Jointree), Compiling Bayesian Networks, Complexity of probabilistic inference, compiling bayesian networks.

Module III: Approximate Inference

Inference by Belief Propagation: Algorithm, Iterative belief propagation, semantics of IBP, Join graphs, edge-detection semantics, Approximate Inference by Stochastic Sampling: Simulating a Bayesian network, direct sampling, expectations, estimating a conditional probability, Markov chain simulation.

Module IV: Learning: The Maximum Likelihood Approach

Introduction, estimating parameters from complete data, estimating parameters from incomplete data, learning network structure, searching for network structure.

Module V: Learning: The Bayesian Approach

Introduction, Meta Networks, Learning with Discrete Parameter Sets, Learning with Continuous Parameter Sets, Learning Network Structure

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Adnan Darwiche, Modelling and Reasoning with Bayesian Networks. Cambridge University Press 2009
- Richard E. Neapolitan, “Learning Bayesian networks”, Prentice Hall Series in Artificial Intelligence, 2004.
- Timo Koski, John Noble, “Bayesian Networks: An Introduction”, Wiley series in Probability and Statistics, 2009.
- Finn V. Jensen and Thomas Nielsen. Bayesian Networks and Decision Graphs. Springer 2007.

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SOCIAL NETWORK DATA ANALYTICS

Course Code: DSE6903 **Credit Units: 03**

Course Objective:
This course gives an introduction to social network analysis, with a focus on modelling. It provides an overview of research questions connected to social networks, and of descriptive measures, models, and methods of analysis that can be used to analyse empirical social network data. It helps to understand the online interactive demonstrations and hands-on analysis of real-world data sets

Course Contents:

Module I: Introduction
Overview: Social network data-Formal methods- Paths and Connectivity-Graphs to represent social relations-Working with network data- Network Datasets-Strong and weak ties - Closure, Structural Holes, and Social Capital.

Module II: Community Discovery in Social Networks: Applications, Methods and Engineering Trends
Introduction, Communities In Context, Core Methods, Quality Functions, The Kernighan-Lin (Kl) Algorithm, Agglomerative/Divisive Algorithms, Spectral Algorithms, Multi-Level Graph Portioning, Markov Clustering. Other Approaches, Emerging Fields and Problems, Community Discovery in Dynamic Networks, Community Discovery in Heterogeneous Networks, Community Discovery in Directed Networks, Coupling Content and Relationship Information for Community Discovery,

Module III: Information Networks and the World Wide Web
The Structure of the Web- World Wide Web- Information Networks, Hypertext, and Associative Memory- Web as a Directed Graph, Bow-Tie Structure of the Web- Link Analysis and Web Search, Searching the Web: Ranking, Link Analysis using Hubs and Authorities- Page Rank- Link Analysis in Modern Web Search, Applications, Spectral Analysis, Random Walks, and Web Search. Module IV

Module IV: Node Classifications in Social Networks
Introduction, Problem Formulation, Representing Data As A Graph, The Node Classification Problem, Methods Using Local Classifiers, Iterative Classification Method, Random Walk Based Methods, Label Propagation, Graph Regularization, Adsorption, Applying Node Classification To Large Social Networks, Basic Approaches, Second-Order Methods, Implementation Within Map-Reduce, Inference Using Graphical Models, Metric Labelling, Spectral Partitioning, Graph Clustering, Variations on Node Classification.

Module V: Data and Text Mining In Social Media
Data Mining In Nutshell, Social Media, Motivations For Data Mining In Social Media, Data Mining Methods For Social Media, Data Representation, Data Mining- A Process, Social Networking Sites: Illustrative Examples, Related Efforts, Ethnography And Netnography, Event Maps, Text Mining: Keyword Search, Query Semantics And Answer Ranking, Keyword Search over Xmland Relational Data, Keyword Search Over Graph Data, Classification Algorithms, Clustering Algorithms, Transfer Learning in Heterogeneous Networks.

Module VI: Overview of Social Tagging
Introduction, Problems With Metadata Generation and Fixed Taxonomies, Tags: Why And What?, Different User Tagging Motivations, Kinds Of Tags, Linguistic Classifications Of Tags, Game-Based Tagging, Tag Generation Models, Tagging System Design, Tag Analysis, Tagging Distributions ,Identifying Tag Semantics, Tags Versus Keywords, Visualization Of Tags, Tag Clouds For Browsing/Search, Tag Selection For Tag Clouds, Tag Hierarchy Generation, Tag Cloud Display Formats, Tag Evolution Visualization.

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Easley and Kleinberg, "Networks, Crowds, and Markets: Reasoning about a highly connected world", Cambridge Univ. Press, 2010.
- Charu C. Aggarwal, "Social Network Data Analytics", Springer, 2011.
- Robert A. Hanneman and Mark Riddle, "Introduction to social network methods", University of California, 2005.
- Jure Leskovec, Anand Rajaraman, and Jeffrey D. Ullman, "Mining of Massive Datasets", Cambridge University Press, 2 edition, 2014.
- Wasserman, S., & Faust, K, "Social Network Analysis: Methods and Applications", Cambridge University Press; 1 edition, 1994.

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R PROGRAMMING LAB

Course Code: DSE6904 **Credit Units: 01**

Course Objective:
This lab will provide a basic introduction to the R programming Language and the use of R to perform basic statistics and programming tasks. The main objectives of this lab is to impart the students with the knowledge of R Programming, Machine Learning using R Mining from streaming Data, Mining from Distributed Data.

R Programming Objective

- Master the use of the R interactive environment
- Expand R by installing R packages
- Explore and understand how to use the R documentation
- Read Structured Data into R from various sources
- Understand the different data types in R
- Understand the different data structures in R
- Understand how to use dates in R
- Use R for mathematical operations
- Use of vectorised calculations
- Write user-defined R functions
- Use control statements
- Write Loop constructs in R
- Use Apply to iterate functions across data
- Reshape data to support different analyses
- Understand split-apply-combine (group-wise operations) in R
- Deal with missing data
- Manipulate strings in R
- Understand basic regular expressions in R
- Understand base R graphics
- Focus on GGplot2 graphics for R
- Be familiar with trellis (lattice) graphics
- Use R for descriptive statistics
- Use R for inferential statistics
- Write multivariate models in R
- Understand confounding and adjustment in multivariate models
- Understand interaction in multivariate models
- Predict/Score new data using models
- Understand basic non-linear functions in models
- Understand how to link data, statistical methods, and actionable questions

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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HADOOP LAB

Course Code: DSE6905 **Credit Units: 02**

Course Objective:

- To provide an overview of several key technologies used in manipulating, storing, and analysing big data.
- To understand the fundamentals of Hadoop.
- To apply the learning specific problems in various domains.

Recommended Tools

Big Data Tools and Technology [Learning and Demonstration of Big Data Ecosystem]

- Hadoop
- HBase
- NoSQL
- Hive
- Pig

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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WEB TECHNOLOGY

Course Code: DSE6906 **Credit Units: 03**

Course Objectives:
This course provides knowledge on Core technologies that are needed for the web likeHTML and XML and facilitate how to build XML applications with DTD and style sheets thatspan multiple domains ranging from finance to vector graphics to genealogy for use with legacy browsers.

Course Contents:
MODULE I: Introduction
HTML Common tags, Cascading Style sheets - Introduction to Java Scripts - Objects in Java Script - Dynamic HTML with Java Script.

MODULE II: Vbscript Language Elements
Constants - Variables and Data Types - Mathematical Operations – LogicalOperators - Looping and Decision Structures - VBScript Functions and Objects:Data Conversion Functions - Mathematical Functions - Data FormattingFunctions -Text Manipulation Functions - Data and Time Functions - Built-in
Objects.

MODULE III: ASP Fundamentals
Using Server – Side Includes- Learning the SSI Directives – Creating ModularASP Code -Using the Request Object: Using Form Information - Using QueryString Information – Using Server Variables - Using the Response Object:Create Output – Managing Output – Managing the Connection.

MODULE IV: Using Cookies
Introduction to Cookies: Cookies and Your Browser – Creating a Cookie –Modifying and removing Cookies – Tracking Preferences with Cookies Usingthe Application, Session and Server Objects: The application Object – TheSession Object – The Server Object –Using the global .asa file - Active DataObjects Essentials: Microsoft's Universal Data Access Strategy – TheConnection Object – The Record set and Field Objects – The Command andParameter Objects – Using the Errors Collection.

MODULE V: Introducing XML
XML: The Life of an XML documents - Related technologies- First XMLDocument: Hello XML – Exploring the Simple XML Document – AssigningMeaning to XML Tags – Writing a Style Sheet for an XML Document – Attachinga Style Sheet to an XML Document – Style Languages: CSS Style Sheets,CSS Layouts, CSS Text Styles.

MODULE VI: Attributes, Empty Tags & XSL
Attributes – Attributes versus Elements – Empty Elements and Empty ElementTags – XSL-DTDs and Validity: Document Type Definitions – ElementDeclarations – DTD Files – Document Type Declarations – Validating Againsta DTD-Element Declaration - Entity Declarations: What Is an Entity – InternalGeneral Entities – External General Entities – Internal Parameter Entities –External Parameter Entities – Building a Document from Places-AttributeDeclaration: What is an Attribute – Declaring Attributes in DTDs – DeclaringMultiple Attributes – Specifying Default Values for Attributes – Attribute Types –Predefined Attributes – A DTD for Attribute- Based Baseball Statistics.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Dave Mercer, "ASP 3.0 Beginners Guide", Tata McGraw-Hill Edition, Sixthreprint, 2004.

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- Rajkamal, “Web Technology”, 1st Edition, Tata McGraw - Hill, 2001.

SERVICE ORIENTED ARCHITECTURE

Course Code: DSE6907 **Credit Units: 03**

Course Objective:
The subject gives an introduction to the fundamentals and issues relating to Service Oriented Architecture and bring out the importance of service orientation and web services. It also teaches appropriate tools as technique on how to build the Service Oriented Architecture with web services.

Course Contents:

Module I: Introduction
Basic definition - Fundamentals of SOA - Characteristics and misperceptions about SOA-Benefits and pitfalls of SOA.

Module II: Evolution of SOA
The evolution of SOA - Web service and primitive SOA - The extension of SOA - Web service extension.

Module III: Web Service and Contemporary SOA
Message Exchange Pattern- Service Activity- Coordination- Atomic Transaction- Business Activity- Orchestration – Choreography- Addressing- Reliable Messaging- Correlation and Policies- Meta data Exchange- Security- Notification and Eventing.

Module IV: Principles of Service Orientation
Principles of service orientation -Building SOA-Planning and Analysis- SOA delivery strategies - Service Oriented Analysis Introduction -Service Modelling of Service Oriented Analysis.

Module V: Service Oriented Design
Introduction to service oriented design - WSDL related XML Schema language Basics - WSDL Language Basics - SOAP Language Basics - Service interface design tools - Steps to composing SOA - Consideration for choosing service layers, positioning core SOA standards and choosing SOA extension – Service design and business process design.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Thomas Erl, “Service Oriented Architecture, Concepts, Technology and Design”, Pearson Education, 2009.
- Shankar Kambhampaty, “Service Oriented Architecture for Enterprise Architecture for Enterprise Application”, 1st Edition, Wiley Publication, 2008.

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NATURAL LANGUAGE PROCESSING

Course Code: DSE6908 **Credit Units: 03**

Course Objective:
This course provides a general introduction including the use of state automata for language processing and syntax including a basic parse. It explains advanced feature like feature structures and realistic parsing methodologies. It also gives concepts of remotes processing and detail information about a typical natural language processing applications.

Course Contents:

Module-I: Introduction
Introduction: Knowledge in speech and language processing - Ambiguity - Models and Algorithms - Language, Thought and Understanding- Regular Expressions and automata: Regular expressions - Finite-State automata. Morphology and Finite-State Transducers: Survey of English morphology - Finite-State Morphological parsing - Combining FST lexicon and rules - Lexicon- Free FSTs: The porter stammer - Human morphological processing.

Module-II: Syntax Analysis
Word classes and part-of-speech tagging: English word classes - Tagsets for English - Part-of-speech tagging - Rule-based part-of-speech tagging - Stochastic part-of-speech tagging - Transformation-based tagging – Other issues - Context-Free Grammars for English: Constituency - Context-Free rules and trees - Sentence-level constructions - The noun phrase -
Coordination - Agreement - The verb phase and sub categorization – Auxiliaries - Spoken language syntax - Grammars equivalence and normal form - Finite- State and Context-Free grammars - Grammars and human processing. Parsing with Context-Free Grammars: Parsing as search - A Basic Top-Down parser - Problems with the basic Top-Down parser - The early algorithm - Finite-State parsing methods.

MODULE-III: Advanced Features and Syntax
Features and Unification: Feature structures - Unification of feature structures
- Features structures in the grammar - Implementing unification - Parsing with unification constraints - Types and Inheritance. Lexicalized and Probabilistic
Parsing: Probabilistic context-free grammar - Problems with PCFGs -
Probabilistic lexicalized CFGs - Dependency Grammars - Human parsing.

MODULE-IV: Semantic
Representing Meaning: Computational desiderata for representations – Meaning structure of language - First order predicate calculus - Some linguistically relevant concepts - Related representational approaches – Alternative approaches to meaning. Semantic Analysis: Syntax-Driven semantic analysis - Attachments for a fragment of English - Integrating semantic analysis into the early parser - Idioms and compositionality - Robust semantic analysis. Lexical semantics: relational among lexemes and their senses - WordNet: A database of lexical relations - The Internal structure of words - Creativity and the lexicon.

MODULE-V: Natural Language Generation
Introduction to language generation - Architecture for generation – Surface realization - Discourse planning - Other issues- Machine Translation: Language similarities and differences - The transfer metaphor - The interlingua idea: Using meaning - Direct translation - Using statistical techniques – Usability and system development.

Examination Scheme:

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Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Daniel Jurafsky & James H.Martin, “Speech and Language Processing", 2nd Edition, Pearson Education, 2009.
- James Allen, "Natural Language Understanding", 2nd Edition, Pearson Education, 2008.
- Manning, Christopher D and Hinrich Schütze, “Foundations of Statistical Natural Language Processing”, Cambridge, 1st Edition, MA: MIT Press, 1999.

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AGENT BASED INTELLIGENT SYSTEMS

Course Code: DSE6909 **Credit Units: 03**

Course Objective:
This course provides students basic knowledge of employing intelligent agents in solving complex problems and gives the awareness of the building blocks of agents and working of different types of agents. It also analyses the reasons for uncertainty and ability to design agents to handle them.

Course Contents:

Module I: Introduction
Definitions – History – Hybrid Intelligent Agents – Agents vs Multi Agent Systems– Structure – Environment – Basic Problem Solving Agents – Complex Problem Solving Agents – Formulating Search Strategies – Intelligent Search.

Module II: Concepts for Building Agents
Situated Agents: Actions and Percepts - Proactive and Reactive Agents: Goals and Events- Challenging Agent Environments: Plans and Beliefs - Social Agents - Agent Execution Cycle.

Module III: Knowledge Based Agents
Knowledge Representation – Logic – First Order Logic – Reflex Agent – Building a Knowledge Base – General Ontology – Interference – Logical Recovery.

Module IV: Planning Agents
Situational Calculus – Representation of Planning – Partial Order Planning – Practical Planners– Conditional Planning - Preplanning Agents.

Module V: Agents and Uncertainty
Acting under uncertainty – Probability – Baye's Rule – Belief Networks – Utility Theory - Decision Network- Value of Information – Decision Theoretic Agent Design.

Module VI: Higher Level Agents
Learning Agents – General Model – Inductive Learning – Learning Decision Tree – Reinforcement Learning – Knowledge in Learning – Communicative Agents – Types of Communicative Agents – Future of AI.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text and References:

- Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 3rd Edition, Prentice Hall, 2010.
- Lin Padgham, Michael Winikoff, "Developing Intelligent Agent Systems: A Practical Guide", 1st Edition, John Wiley & Sons, 2004.
- Zili Zhang,Chengqi Zhang, "Agent-Based Hybrid Intelligent Systems: An Agent- Based Framework for Complex Problem Solving", 1st Edition, Springer-Verlag New York, LLC , 2004.
- Ngooc Thanh Nguyaaen, Lakhmi C. Jain, "Intelligent Agents in the Evolution of Web and Applications", 4th Edition, Springer, 2009.

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SUMMER INTERNSHIP EVALUATION-III

Course Code: DSE6935 **Credit Units: 06**

Guidelines:

There are certain phases of every Intern's professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship program can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal classroom situations. These attributes are intellectual ability, professional judgment and decision-making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc.

In order to achieve these objectives, each student will maintain a file (**Internship File**). The Internship File aims to encourage students to keep a personal record of their learning and achievement throughout the Programme. It can be used as the basis for lifelong learning and for job applications. Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development.

The File will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and their own personal contribution to the organization.

The **layout guidelines** for the Project & Seminar Report:

1. File should be in the following specification:
A4 size paper
Font: Arial (10 points) or Times New Roman (12 points)
Line spacing: 1.5
Top & bottom margins: 1 inch/ 2.5 cm
Left & right margins: 1.25 inches/ 3 cm

2. Report Layout: The report should contain the following components:
Front Page
Table of Content
Acknowledgement
Student Certificate
Company Profile (optional)
Introduction
Main Body
References / Bibliography

The File will include ***five sections*** in the order described below. The content and comprehensiveness of the main body and appendices of the report should include the following:

1. **The Title Page**--Title - An Internship Experience Report For (Your Name), name of internship organization, name of the Supervisor/Guide and his/her designation, date started and completed, and number of credits for which the report is submitted.
2. **Table of Content**--an outline of the contents by topics and subtopics with the page number and location of each section.
3. **Introduction**--short, but should include how and why you obtained the internship experience position and the relationship it has to your professional and career goals.
4. **Main Body**--should include but not be limited to daily tasks performed. Major projects contributed to, dates, hours on task, observations and feelings, meetings attended and their purposes, listing of tools and materials and their

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suppliers, and photographs if possible of projects, buildings and co-workers.
5. **References / Bibliography** --This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system

ASSESSMENT OF THE INTERNSHIP FILE

The student will be provided with the Student Assessment Record (SAR) to be placed in front of the Internship File. Each item in the SAR is ticked off when it is completed successfully. The faculty will also assess each item as it is completed. The SAR will be signed by the student and by the faculty to indicate that the File is the student's own work. It will also ensure regularity and meeting the delaines.

STUDENT ASSESSMENT RECORD (SAR)

5. Range of Research Methods used to obtain information

6. Execution of Research

7. Data Analysis

- Analyse Quantitative/ Qualitative information
- Control Quality

8. Draw Conclusions

Examination Scheme:

Components	V	S	R	FP
Weightage (%)	20	20	20	40

V – Viva, S – Synopsis, FP – Final Presentation, R - Report

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PROJECT-DISSERTATION-II

Course Code: DSE6037 **Credit Units: 15**

GUIDELINES FOR DISSERTATION

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage.

The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

In general, the File should be comprehensive and include

A short account of the activities that were undertaken as part of the project;

A statement about the extent to which the project has achieved its stated goals.

A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;

Any activities planned but not yet completed as part of the DISSERTION, or as a future initiative directly resulting from the project;

Any problems that have arisen that may be useful to document for future reference.

- Report Layout

The report should contain the following components:

- **Title or Cover Page**

The title page should contain the following information: Project Title; Student's Name; Course; Year; Supervisor's Name.

- **Acknowledgements** (optional)

Acknowledgment to any advisory or financial assistance received in the course of work may be given.

- **Abstract**

A good"Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project

- **Table of Contents**

Titles and subtitles are to correspond exactly with those in the text.

- **Introduction**

Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

- **Materials and Methods**

This section should aim at experimental designs, materials used. Methodology should be mentioned in details including modifications if any.

- **Results and Discussion**

Present results, discuss and compare these with those from other workers, etc. In writing these section, emphasis should be given on what has been performed and achieved in the course of the work, rather than discuss in detail

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what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

Note that in writing the various secions, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary never write in "point" form.

- **Conclusion**

A conclusion should be the final section in which the outcome of the work is mentioned briefly.

- **Future prospects**

- **Appendices**

The Appendix contains material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

- **References / Bibliography**

This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Examples

For research article

Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichia coli* O157: H7. *Clin Microbiol Infect*, **8** (suppl 1): 116–117.

For book

Kowalski,M.(1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67

ASSESSMENT OF THE DISSERTATION FILE

Essentially, marking will be based on the following criteria: the quality of the report, the technical merit of the project and the project execution.
Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project.
Project execution is concerned with assessing how much work has been put in.
The File should fulfill the following ***assessment objectives:***

Range of Research Methods used to obtain information

Execution of Research

Data Analysis
Analyse Quantitative/ Qualitative information
Control Quality

Draw Conclusions

Examination Scheme:

Dissertation	50
Viva Voce	50
Total	**100**

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data, leading to production of a structured report.

Selecting the Dissertation Topic
It is usual to give you some discretion in the choice of topic for the dissertation and the approach to be adopted. You will need to ensure that your dissertation is related to your field of specialization.

Deciding this is often the most difficult part of the dissertation process, and perhaps, you have been thinking of a topic for some time.

It is important to distinguish here between 'dissertation topic' and 'dissertation title'. The topic is the specific area that you wish to investigate. The title may not be decided until the dissertation has been written so as to reflect its content properly.

Few restrictions are placed on the choice of the topic. Normally we would expect it to be:

- relevant to business, defined broadly;
- related to one or more of the subjects or areas of study within the core program and specialisation stream;
- clearly focused so as to facilitate an in-depth approach, subject to the availability of adequate sources of information and to your own knowledge;
- of value and interest to you and your personal and professional development.

Planning the Dissertation
This will entail following:

- Selecting a topic for investigation.
- Establishing the precise focus of your study by deciding on the aims and objectives of the dissertation, or formulating questions to be investigated. Consider very carefully what is worth investigating and its feasibility.
- Drawing up initial dissertation outlines considering the aims and objectives of the dissertation. Workout various stages of dissertation
- Devising a timetable to ensure that all stages of dissertation are completed in time. The timetable should include writing of the dissertation and regular meetings with your dissertation guide.

The Dissertation plan or outline
It is recommended that you should have a dissertation plan to guide you right from the outset. Essentially, the dissertation plan is an outline of what you intend to do, chapter wise and therefore should reflect the aims and objectives of your dissertation.

There are several reasons for having a dissertation plan

- It provides a focus to your thoughts.
- It provides your faculty-guide with an opportunity, at an early stage of your work, to make constructive comments and help guide the direction of your research.
- The writing of a plan is the first formal stage of the writing process, and therefore helps build up your confidence.
- In many ways, the plan encourages you to come to terms with the reading, thinking and writing in a systematic and integrated way, with plenty of time left for changes.
- Finally, the dissertation plan generally provides a revision point in the development of your dissertation report in order to allow appropriate changes in the scope and even direction of your work as it progresses.

Keeping records
This includes the following:

- Making a note of everything you read; including those discarded.
- Ensuring that when recording sources, author's name and initials, date of publication, title, place of publication and publisher are included. (You may consider starting a card index or database from the outset). Making an accurate note of all quotations at the time you read them.

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- Make clear what is a direct a direct quotation and what is your paraphrase.

Dissertation format

All students must follow the following rules in submitting their dissertation.

- Front page should provide title, author, Name of degree/diploma and the date of submission.
- Second page should be the table of contents giving page references for each chapter and section.
- The next page should be the table of appendices, graphs and tables giving titles and page references.
- Next to follow should be a synopsis or abstract of the dissertation (approximately 500 words)
- Next is the 'acknowledgements'.
- Chapter I should be a general introduction, giving the background to the dissertation, the objectives of the dissertation, the rationale for the dissertation, the plan, methodological issues and problems. The limitations of the dissertation should also be hinted in this chapter.
- Other chapters will constitute the body of the dissertation. The number of chapters and their sequence will usually vary depending on, among others, on a critical review of the previous relevant work relating to your major findings, a discussion of their implications, and conclusions, possibly with a suggestion of the direction of future research on the area.
- After this concluding chapter, you should give a list of all the references you have used. These should be cross - references with your text. For articles from journals, the following details are required e.g.

  Draper P and Pandyal K. 1991, The Investment Trust Discount Revisited, Journal of Business Finance and Accounting, Vol18, No6, Nov, pp 791-832.

  For books, the following details are required:
  Levi, M. 1996, International Financial Management, Prentice Hall, New York, 3rd Ed, 1996

- Finally, you should give any appendices. These should only include relevant statistical data or material that cannot be fitted into the above categories.

The Layout Guidelines for the Dissertation

- A4 size Paper
- Font: Arial (10 points) or Times New Roman (12 points)
- Line spacing: 1.5
- Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

Guidelines for the assessment of the Dissertation

While evaluating the dissertation, faculty guide will consider the following aspects:

1. Has the student made a clear statement of the objective or objective(s).
2. If there is more than one objective, do these constitute parts of a whole?
3. Has the student developed an appropriate analytical framework for addressing the problem at hand.
4. Is this based on up-to-date developments in the topic area?
5. Has the student collected information / data suitable to the frameworks?
6. Are the techniques employed by the student to analyse the data / information appropriate and relevant?
7. Has the student succeeded in drawing conclusion form the analysis?
8. Do the conclusions relate well to the objectives of the project?
9. Has the student been regular in his work?
10. Layout of the written report.

Assessment Scheme:

Continuous Evaluation: 40%
(Based on Abstract, Regularity,
Adherence to initial plan, Records etc.)
Final Evaluation: Based on, 60%

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Contents & Layout of the Report,	20
Conceptual Framework,	05
Objectives & Methodology and	05
Implications & Conclusions	10
Viva & Presentation	20

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Curriculum & Scheme of Examination

2023

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INTRODUCTION TO COMPUTERS AND PROGRAMMING IN C

Course Code: NCE6104 **Credit Units : 03**

Course Objective:
The objective of this course module is to acquaint the students with the basics of computers system, its components, data representation inside computer and to get them familiar with various important features of procedure oriented programming language i.e. C.

Course Contents:
Module I: Introduction
Introduction to computer, history, von-Neumann architecture, memory system (hierarchy, characteristics and types), H/W concepts (I/O Devices), S/W concepts (System S/W & Application S/W, utilities). Data Representation: Number systems, character representation codes, Binary, octal, hexadecimal and their interconversions. Binary arithmetic, floating point arithmetic, signed and unsigned numbers, Memory storage unit.

Module II: Programming in C
History of C, Introduction of C, Basic structure of C program, Concept of variables, constants and data types in C, Operators and expressions: Introduction, arithmetic, relational, Logical, Assignment, Increment and decrement operator, Conditional, bitwise operators, Expressions, Operator precedence and associativity. Managing Input and output Operation, formatting I/O.

Module III: Fundamental Features in C
C Statements, conditional executing using if, else, nesting of if, switch and break Concepts of loops, example of loops in C using for, while and do-while, continue and break. Storage types (automatic, register etc.), predefined processor, Command Line Argument.

Module IV: Arrays and Functions
One dimensional arrays and example of iterative programs using arrays, 2-D arrays Use in matrix computations.
Concept of Sub-programming, functions Example of user defined functions. Function prototype, Return values and their types, calling function, function argument, function with variable number of argument, recursion.

Module V: Advanced features in C
Pointers, relationship between arrays and pointers Argument passing using pointers, Array of pointers. Passing arrays as arguments.
Strings and C string library.
Structure and Union. Defining C structures, Giving values to members, Array of structure, Nested structure, passing strings as arguments.
File Handling.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- "ANSI C" by E Balagurusamy
- Yashwant Kanetkar, "Let us C", BPB Publications, 2nd Edition, 2001.
- Herbert Schildt, "C: The complete reference", Osbourne Mcgraw Hill, 4th Edition, 2002.
- V. Raja Raman, "Computer Programming in C", Prentice Hall of India, 1995.

References*:*

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- Kernighan & Ritchie, “C Programming Language”, The (Ansi C Version), PHI, 2nd Edition.
- J. B Dixit, “Fundamentals of Computers and Programming in ‘C’.
- P.K. Sinha and Priti Sinha, “Computer Fundamentals”, BPB publication.

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PROGRAMMING IN C LAB

Course Code: NCE6106 **Credit Units : 01**

Software Required: Turbo C

Course Contents:

- C program involving problems like finding the nth value of cosine series, Fibonacci series. Etc.
- C programs including user defined function calls
- C programs involving pointers, and solving various problems with the help of those.
- File handling

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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ENGINEERING GRAPHICS LAB

Course Code: NCE6211 **Credit Units : 01**

Course Objective:
This course will provide students concepts on the drawings of different curves like straight line, parabola, ellipse etc. After completion of this course, students will be able to draw different figures manually and will be capable of using various instruments involved in drawings.

Course Contents:

Module I: General
Importance, Significance and scope of engineering drawing, Lettering, Dimensioning, Scales, Sense of proportioning, Different types of projections, Orthographic Projection, B.I.S. Specifications.

Module II: Projections of Point and Lines
Introduction of planes of projection, Reference and auxiliary planes, projections of points and Lines in different quadrants, traces, inclinations, and true lengths of the lines, projections on Auxiliary planes, shortest distance, intersecting and non-intersecting lines.

Module III: Planes other than the Reference Planes
Introduction of other planes (perpendicular and oblique), their traces, inclinations etc., Projections of points and lines lying in the planes, conversion of oblique plane into auxiliary Plane and solution of related problems.

Module IV: Projections of Plane Figures
Different cases of plane figures (of different shapes) making different angles with one or both reference planes and lines lying in the plane figures making different given angles (with one of both reference planes). Obtaining true shape of the plane figure by projection.

Module V: Projection of Solids
Simple cases when solid is placed in different positions, Axis faces and lines lying in the faces of the solid making given angles.

Module VI:Development of Surface
Development of simple objects with and without sectioning. Isometric Projection

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text & References:

- M.B. Shah & B.C. Rana, Engineering Drawing, Pearson Education, 2007
- PS Gill, Engineering Drawing, Kataria Publication
- ND Bhatt, Engineering Drawing, Charotar publications
- N Sidheshwar, Engineering Drawing, Tata McGraw Hill
- CL Tanta, Mechanical Drawing, "Dhanpat Rai" Delhi, 2012.

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NCE6213	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB	L	T	P	C
Version 2019.1	Date of Approval: May 21, 2019	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

In this course, students will become familiar with basic electrical circuits. The students will learn practical aspects and implementation of theorems related to electrical circuits, law's related to flow of current, voltages, transformer and transistors.

Course Objectives

The objective of this course is to:

- Provide the overview of concept of flow of current/voltage of electrical circuits.
- Provide the basic knowledge about the concepts of electrical circuits and BJTs.

Course Outcomes

On completion of this course, the students will be able to:

CO1. Explain the fundamental theorems and laws related to the electrical circuits and experimentally verify the basic circuit theorems

CO2. Explain the working principle and estimate the performance of single phase transformers.

CO3. Understand 3 phase balanced and unbalanced, star and delta connected supply and load and to measure power in 3 phase circuits

CO4. Able to design circuit with Bipolar Junction Transistor in CB, CE & CC configurations

Modules	Blooms level*	Number of hours
Lab Session 1: Network Analysis Techniques & Theorems 1. To verify KVL & KCL in the given network. 2. To verify Superposition Theorem. 3. To verify Maximum Power Transfer Theorem. 4. To verify Reciprocity Theorem. 5. To determine and verify R_{Th}, V_{Th}, R_N, I_N in a given network.	L1 , L2 and L3	6
Lab session II: Transformers and transistors 1. To perform open circuit & short circuit test on a single-phase transformer. 2. To perform regulation, ratio & polarity test on a single-phase transformer. 3. To obtain the characteristics of a transistor under common base (CB) and common emitter (CE) configuration.	L1, L2 and L3	3
Lab session III: Alternating Current Circuits 1. To study transient response of a given RLC Circuit. 2. To measure power & power factor in a three phase circuit by two wattmeter method. 3. To measure power & power factor in a three phase load using three ammeter & three voltmeter method.	L1, L2 and L3	3

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

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Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text Books

- V K Mehta and Rohit Mehta, Principles of Electrical Engineering and Electronics, 3rd edition, S. Chand Publications, 2014, New Delhi
- D. P. Kothari and I. J. Nagrath, Theory and Problem of Basic Electrical Engineering, PHI Learning Pvt. Ltd., 2015, New Delhi.
- J B Gupta, Electrical Science, S K Kataria and Sons, 2015, New Delhi.

Reference Books

- R J Smith and R C Dorf, Circuits Devices and Systems, 5th Edition, John Wiley
- B.L. Thareja, Basic Electronics, 5th edition, S. Chand Publishing, 2011, New Delhi
- V. Del Toro, Electrical Engineering fundamentals, PHI, 2016
- Mahmood Nahvi, Joseph Edminister, Electric Circuits, 7th edition, McGraw-Hill Education, 2017

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	1	2	--	--	--	--	--	--	--	--	--	--	1	-	-
CO2	1	1	2	3	--	--	--	--	--	--	--	--	1	-	-
CO3	1	1	3	3	-	--	--	--	--	--	--	--	1	-	-
CO4	1	1	2	--	--	--	--	--	--	--	--	--	1	-	-

1: strongly related, 2: moderately related and 3: weakly related

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OBJECT ORIENTED PROGRAMMING USING C++

Course Code: NCE6204 **Credit Units : 03**

Course Objective:
The objective of this module is to introduce object oriented programming. To explore and implement the various features of OOP such as inheritance, polymorphism, Exceptional handling using programming language C++. After completing this course student can easily identify the basic difference between the programming approaches like procedural and object oriented.

Course Contents:
Module I: Introduction
Review of C, Difference between C and C++, Procedure Oriented and Object Oriented Approach. Basic Concepts: Objects, classes, Principals like Abstraction, Encapsulation, Inheritance and Polymorphism. Dynamic Binding, Message Passing. Characteristics of Object-Oriented Languages. Introduction to Object-Oriented Modeling techniques (Object, Functional and Dynamic Modeling).

Module II: Classes and Objects
Abstract data types, Object & classes, attributes, methods, C++ class declaration, Local Class and Global Class, State identity and behaviour of an object, Local Object and Global Object, Scope resolution operator, Friend Functions, Inline functions, Constructors and destructors, instantiation of objects, Types of Constructors, Static Class Data, Array of Objects, Constant member functions and Objects, Memory management Operators.

Module III: Inheritance
Inheritance, Types of Inheritance, access modes – public, private & protected, Abstract Classes, Ambiguity resolution using scope resolution operator and Virtual base class, Aggregation, composition vs classification hiérarchies, Overriding inheritance methods, Constructors in derived classes, Nesting of Classes.

Module IV: Polymorphism
Polymorphism, Type of Polymorphism – Compile time and runtime, Function Overloading, Operator Overloading (Unary and Binary) Polymorphism by parameter, Pointer to objects, this pointer, Virtual Functions, pure virtual functions.

Module V: Strings, Files and Exception Handling
Manipulating strings, Streams and files handling, formatted and Unformatted Input output. Exception handling, Generic Programming – function template, class Template Standard Template Library: Standard Template Library, Overview of Standard Template Library, Containers, Algorithms, Iterators, Other STL Elements, The Container Classes, General Theory of Operation, Vectors.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

Text & References:
Text:
- A.R. Venugopal, Rajkumar, T. Ravishanker "Mastering C++", TMH, 1997
- R. Lafore, "Object Oriented Programming using C++", BPB Publications, 2004.
- "Object Oriented Programming with C++" By E. Balagurusamy.
- Schildt Herbert, "C++: The Complete Reference", Wiley DreamTech, 2005.

References:
- Parasons, "Object Oriented Programming with C++", BPB Publication, 1999.
- Steven C. Lawlor, "The Art of Programming Computer Science with C++", Vikas Publication, 2002.
- Yashwant Kanethkar, "Object Oriented Programming using C++", BPB, 2004

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OBJECT ORIENTED PROGRAMMING USING C++ LAB

Course Code: NCE6208 **Credit Units : 01**

Software Required: Turbo C++

Course Contents:

- Creation of objects in programs and solving problems through them.
- Different use of private, public member variables and functions and friend functions.
- Use of constructors and destructors.
- Operator overloading
- Use of inheritance in and accessing objects of different derived classes.
- Polymorphism and virtual functions (using pointers).
- File handling.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab

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DATABASE MANAGEMENT SYSTEMS

Course Code: NCE6302 **Credit Units : 04**

Course Objective:
The objective of this course is to get students familiar with Databases and their use. They can identify different types of available database model, concurrency techniques and new applications of the DBMS.

Course Contents:

Module I: Introduction
Concept and goals of DBMS, DBMS Architecture, Database Languages, Database Users, Database Abstraction. Basic Concepts of ER Model: Entity Type, Entity Set, Relationship type, Relationship sets, Constraints: Cardinality Ratio and Participation Constarint, Keys, Mapping, Design of ER Model

Module II: Hierarchical model &Network Model
Concepts, Data definition, Data manipulation and implementation.
Network Data Model, DBTG Set Constructs, and Implementation

Module III: Relational Model
Relational database, Relational Algebra, Relational Calculus, Tuple Calculus.

Module IV: Relational Database Design and Query Language
SQL, QUEL, QBE, Normalization using Functional Dependency, 1NF, 2NF, 3NF, BCNF, Multivalued dependency and Join dependency.

Module V: Concurrency Control and New Applications
Transaction basics: ACID property, Lifecycle of Transcation, Why Concurrency Control, Schedule, Serializability, Lock Based Protocols, Time Stamped Based Protocols, Deadlock Handling, Crash Recovery. Distributed Database, Objective Oriented Database, Multimedia Database, Data Mining, Digital Libraries.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- Korth, Silberschatz, "Database System Concepts", 4th Ed., TMH, 2000.
- Steve Bobrowski, "Oracle & Architecture", TMH, 2000

References:
- Date C. J., "An Introduction to Database Systems", 7th Ed., Narosa Publishing, 2004
- Elmsari and Navathe, "Fundamentals of Database Systems", 4th Ed., A. Wesley, 2004
- Ullman J. D., "Principles of Database Systems", 2nd Ed., Galgotia Publications, 1999.

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OPERATING SYSTEMS

Course Code: NCE6303 **Credit Units : 03**

Course Objective:
Operating Systems serve as one of the most important courses for undergraduate students, since it provides the students with a new sight to envision every computerized systems especially general purpose computers. Therefore, the students are supposed to study, practice and discuss on the major fields discussed in the course to ensure the success of the education process. The outcome of this course implicitly and explicitly affects the abilities the students to understand, analyze and overcome the challenges they face with in the other courses and the real world.

Course Contents:

Module I: Introduction to operating system
Operating system and function, Evolution of operating system, Batch, Interactive, multiprogramming, Time Sharing and Real Time System, multiprocessor system, Distributed system, System protection. Operating System structure, Operating System Services, System Program and calls.

Module II: Process Management
Process concept, State model, process scheduling, job and process synchronization, structure of process management, Threads, Inter-process Communication and Synchronization:Principle of Concurrency, Producer Consumer Problem, Critical Section problem, Semaphores, Hardware Synchronization, Critical Regions, Conditional critical region, Monitor, Inter Process Communication.
CPU Scheduling: Job scheduling functions, Process scheduling, Scheduling Algorithms, Non Preemptive and preemptive Strategies, Algorithm Evaluation, Multiprocessor Scheduling.
Deadlock: System Deadlock Model, Deadlock Characterization, Methods for handling deadlock, Prevention strategies, Avoidance and Detection, Recovery from deadlock combined approach.

Module III: Memory Management
Single Contiguous Allocation: H/W support, S/W support, Advantages and disadvantages, Fragmentation, Paging, Segmentation, Virtual memory concept, Demand paging, Performance, Paged replaced algorithm, Allocation of frames, Thrashing, Cache memory, Swapping, Overlays

Module IV: Device management
Principles of I/O hardware, Device controller, Device Drivers, Memory mapped I/O, Direct Access Memory, Interrupts, Interrupt Handlers, Application I/O interface, I/O Scheduling, Buffering, Caching, Spooling,
Disk organization, Disk space management, Disk allocation Method, Disk Scheduling, Disk storage.

Module V: File System and Protection and security
File Concept, File Organization and Access Mechanism, File Directories, Basic file system, File Sharing, Allocation method, Free space management.
Policy Mechanism, Authentication, Internal excess Authorization.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:

- Milenekovic, "Operating System Concepts", McGraw Hill
- A. Silberschatz, P.B. Galvin "Operating System Concepts", John Willey & son

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References:

- Dietel, “An introduction to operating system”, Addision Wesley
- Tannenbaum, “Operating system design and implementation”, PHI
- Operating System, A Modern Perspection, Gary Nutt, Pearson Edu. 2000
- A. S Tanenbaum, Modern Operating System, 2nd Edition, PHI.
- Willam Stalling “ Operating system” Pearson Education
- B. W. Kernighan & R. Pike, “The UNIX Programming Environment” Prentice Hall of India, 2000
- Sumitabha Das “ Your UNIX The ultimate guide” Tata Mcgraw Hill
- “Design of UNIX Operating System “ The Bach Prentice – Hall of India

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DATA STRUCTURES USING C

Course Code: NCE6304 **Credit Units : 04**

Course Objective:
Data structure deals with organizing large amount of data in order to reduce space complexity and time requirement. This course gives knowledge of algorithms, different types of data structures and the estimation space and time complexity.

Course Contents:
Module I: Introduction to Data structures
Data structures: Definition, Types. Algorithm design, Complexity, Time-Space Trade- offs. Use of pointers in data structures.Array Definition and Analysis, Representation of Linear Arrays in Memory, Traversing of Linear Arrays, Insertion And Deletion, Single Dimensional Arrays, Two Dimensional Arrays, Multidimensional Arrays, Function Associated with Arrays, Character String in C, Character String Operations, Arrays as parameters, Implementing One Dimensional Array, Sparse matrix.

Module II: Introduction to Stacks and queue
Stack: Definition, Array representation of stacks, Operations Associated with Stacks- Push & Pop, Polish expressions, Conversion of infix to postfix, infix to prefix (and vice versa),Application of stacks recursion, polish expression and their compilation, conversion of infix expression to prefix and postfix expression, Tower of Hanoi problem.
Queue: Definition, Representation of Queues, Operations of queues- QInsert, QDelete, Priority Queues, Circular Queue, Deque.

Module III: Dynamic Data Structure
Linked list: Introduction to Singly linked lists: Representation of linked lists in memory, Traversing, Searching, Insertion into, Deletion from linked list, doubly linked list, circular linked list, generalized list. Applications of Linked List-Polynomial representation using linked list and basic operation.
Stack and queue implementation using linked list.

Module IV: Trees and Graphs
Trees: Basic Terminology, Binary Trees and their representation, expression evaluation, Complete Binary trees, extended binary trees, Traversing binary trees, Searching, Insertion and Deletion in binary search trees, General trees, AVL trees, Threaded trees, B trees.
Graphs: Terminology and Representations, Graphs & Multigraphs, Directed Graphs, Sequential representation of graphs, Adjacency matrices, Transversal Connected Component and Spanning trees.

Module V: Sorting and Searching and file structures
Sorting: Insertion Sort, Bubble sort, Selection sort, Quick sort, two-way Merge sort, Heap sort, Partition exchange sort, Shell sort, Sorting on different keys, External sorting.
Searching: Linear search, Binary search, File structures: Physical storage media, File Organization, Linked organization of file, Inverted file, Organization records into blocks, Sequential blocks, Hash function, Indexing & Hashing, Multilevel indexing, Tree Index, Random file, Primary Indices, Secondary Indices, B tree index files.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:

- Horowitz and Sahani, "Fundamentals of Data structures", Galgotia publications
- Tannenbaum, "Data Structures", PHI
- R.L. Kruse, B.P. Leary, C.L. Tondo, "Data structure and program design in C" PHI
- "Data structures and algorithms" – Schaum Series.

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DATA STRUCTURES USING C LAB

Course Code: NCE6305 **Credit Units : 01**

Software Required: Turbo C++

Assignment will be provided for following:

- Practical application of sorting and searching algorithm.
- Practical application of various data structure like linked list, queue, stack, tree

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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DATABASE MANAGEMENT SYSTEMS LAB

Course Code: NCE6307 **Credit Units : 01**

Software Required: Oracle 9i

Topics covered in lab will include:

- Database Design
- Data Definition (SQL)
- Data Retrieval (SQL)
- Data Modification (SQL)
- Views
- Triggers and Procedures
- PL\SQL

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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UNIX PROGRAMMING LAB

Course Code: NCE6308 **Credit Units : 01**

Software Required: UNIX SCO

Assignments will be provided for the following

- Introduction to UNIX Commands
- Introduction to vi editor
- Programming in shell script
- Introduction to programming in C Shell

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text & References:

- "Unix Programming Environment" The Kernighan and Pike Prentice – Hall of India
- "Unix –Shell Programming" Kochar
- " Unix Concepts and application" Das Sumitabha Tata Mcgraw Hill

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E-COMMERCE AND ERP

Course Code: NCE6310 **Credit Units : 03**

Course Objective:
This course examines the evolution of enterprise resource planning (ERP) systems - from internally focused client/server systems to externally focused e-business. This class studies the types of issues that managers will need to consider in implementing cross-functional integrated ERP systems. The objective of this course is to make students aware of the potential and limitations of ERP systems. This objective will be reached through hands-on experience, case studies, lectures, guest speakers and a group project. The course would equip students with the basics of E-Commerce, technologies involved with it and various issues associated with.

Course Contents:

Module I: Introduction E-commerce and ERP
E-commerce and its types, EDI and its basics, Digital payment systems, Enterprise-An Overview, Benefits of ERP, ERP and Related Technologies-Business Process Reengineering (BPR), Data Warehousing, Data Mining, On-line Analytical Processing (OLAP), Supply Chain Management, Management Information systems (MIS), Decision support system (DSS), Executive Information systems (EIS). ERP – A Manufacturing Perspective Materials Requirement Planning (MRP), Bill of Material (Bom), Distribution Requirements Planning (DRP), JIT &Kanban, CAD/CAM, Product Data Management (PDM), Benefits of PDM, MTO, MTS, ATO, ETO, CTO.

Module II: ERP Modules
Business Modules in an ERP Packag- Finance, Manufacturing (Production), Human Resources, Plant Maintenance, Materials Management, Quality Management, Sales and Distribution.

Module III: Benefits of ERP
Time Reduction, On time shipment, Improved Resource Utilization, Performance, Customer Satisfaction, Flexibility, information accuracy and decision making capability, reduction in quality costs, Accuracy.

Module IV: ERP Implementation
ERP Implementation Lifecycle, Implementation Methodology, In-house implementation-Pros and cons, Vendors, Consultants and Users and their roles, Project Management and Monitoring after ERP Implementation.

Module V: The ERP Market and Future Directions
ERP Market Place- SAP AG, PeopleSoft, Baan Company, JD Edwards World Solutions Company, Oracle Corporation, QAD, System Software Associates, Inc. (SSA).Future directions in ERP.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- Alexis Leon, "Enterprise Resource Planning", Tata McGraw Hill 2001
- Bajaj, Kamlesh K. and Nag, Debjani, E-Commerce: The Cutting Edge of Business, Tata McGraw-Hill Publishing Company

References:

- Loshin, Pete and Murphy, Paul, *Electronic Commerce*, Second edition, 1990, Jaico Publishing House, Mumbai.
- S. Sadagopan, "Enterprise Resource Planning", Tata McGraw Hill 2000

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ELECTRONIC DEVICES & CIRCUITS

Course Code: NCE6311 **Credit Units : 02**

Course Objective:
This course builds from basic knowledge of Semiconductor Physics to an understanding of basic devices and their models. This course builds a foundation for courses on VLSI design and analog CMOS IC Design.

Course Contents:
Module I: Semeconductor physics: Mobility & conductivity, Charge densities in a semiconductor, Fermi dirac distribution, carrier concentration and Fermi levels in semiconductor, generation and recombination of charges, diffuse and continuity equations, Hall effect.

Module II: Semiconductor Diode and Diode Circuits
Junction diode, Diode as circuit element,Different types of diodes: Zener, Schottky, LED. Zener as voltage regulator, Diffusion capacitance, Drift capacitance, the load line concept, half wave, full wave rectifiers, clipping and clamping circuits.

Module III: Bipolar Junction Transistor
Bipolar junction transistor: Introduction, Transistor, construction, transistor operations, BJT characteristics, load line, operating point, leakage currents, saturation and cut off mode of operations. Bias stabilization: Need for stabilization, fixed Bias, emitter bias, self bias, bias stability with respect to variations in $I_{co,}$ V_{BE} &β, Stabilization factors, thermal stability.

Module IV: Small signal Analysis of transistor and Multistage Amplifier
Hybrid model for transistors at low frequencies, Analysis of transistor amplifier using h parameters, emitter follower, Miller's theorem, THE CE amplifier with an emitter resistance, Hybrid π model, Hybrid π Conducatnces and Capacitances, CE short circuit current gain, CE short circuit current gain with R_L Multistage amplifier: Cascading of Amplifiers, Coupling schemes(RC coupling and Transformer coupling)

Module V: Field Effect Transistors
Field effect transistor (JFET, MOSFET): volt-ampere characteristics, small signal model –common drain, common source, common gate, operating point, MOSFET, enhancement and -depletion mode, Common source amplifier, Source follower

Module VI: Feedback Amplifiers
Feedback concept, Classification of Feedback amplifiers, Properties of negative Feedback amplifiers, Impedance considerations in different Configurations, Examples of analysis of feedback Amplifiers.

Module VII: Power Amplifiers
Power dissipation in transistors, difference with voltage amplifiers, Amplifier classification (Class A, Class B, Class C, ClassAB) class AB push pull amplifier, collector efficiency of each, cross over distortion.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
- Robert F. Pierret: Semiconductor Device Fundamentals, Pearson Education.
- Millman and Halkias: Electronic Devices and circuits, Tata McGraw.
- Boylestad: Electronic Devices and Circuits, Pearson Education.

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ELECTRONIC DEVICES & CIRCUITS LAB

Course Code: NCE6312 **Credit Units : 01**

Course Contents:

1. To study and plot the characteristics of a junction diode.
2. To study Zener diode as a voltage regulator.
3. To study diode based clipping and clamping circuits.
4. To study half wave, full wave and bridge rectifier with filters.
5. To study the input and output characteristics of a transistor in its various configurations.
6. To study and plot the characteristics of a JFET in its various configurations.
7. To study and plot the characteristics of a MOSFET in its various configurations.
8. To study various types of Bias Stabilization for a transistor.
9. To study the gain and plot the frequency response of a single stage transistor amplifier.
10. To measure gain and plot the frequency response of double stage RC coupled amplifier.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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DIGITAL ELECTRONICS

Course Code: NCE6313 **Credit Units : 02**

Course Objective:
This course is an introduction to the basic principles of digital electronics. At the conclusion of this course, the student will be able to quantitatively identify the fundamentals of computers, including number systems, logic gates, logic and arithmetic subsystems, and integrated circuits. They will gain the practical skills necessary to work with digital circuits through problem solving and hands on laboratory experience with logic gates, encoders, flip-flops, counters, shift registers, adders, etc. The student will be able to analyze and design simple logic circuits using tools such as Boolean Algebra and Karnaugh Mapping, and will be able to draw logic diagrams.

Course Contents:

Module I: Boolean Functions
Analog & digital signals, AND, OR, NOT, NAND, NOR & XOR gates, Boolean algebra, Standard representation of logical functions, K-map representation and simplification of logical function, don't care conditions, XOR & XNOR simplifications of K-maps, Tabulation method.

Module II: Combinational Circuits
Adders, Subtractors, Multiplexer, de-multiplexer, decoder & encoder, code converters, Comparators, decoder / driver for display devices, Implementation of logic functions using multiplexer / de-multiplexer,.

Module III: Sequential Circuits
Flip-flops: SR, JK, D & T flip flops – Truth table, Excitation table, Conversion of flip-flops, race around condition, Master Slave flip flop, Shift registers: SIPO, PISO, PIPO, SIPO, Bi-directional; Counters: ripple & synchronous counters – up / down; Synchronous Sequential circuit: design procedure.

Module IV: Logic families
Logic families: RTL, DTL, TTL, ECL

Module V: Data Converters
Data converters: ADC – successive approximation, linear ramp, dual slope; DAC – Binary Weighted, R-2R ladder type

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
- Moris Mano: Digital Circuits Systems
- R. P. Jain: Digital Logic & Circuits
- Thomas L. Floyd: Digital Fundamentals
- Malvino and Leech: Digital Principles & Applications

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ARTIFICIAL INTELLIGENCE

Course Code: NCE6404 **Credit Units : 03**

Course Objective:
To develop semantic-based and context-aware systems to acquire, organize process, share and use the knowledge embedded in multimedia content. Research will aim to maximize automation of the complete knowledge lifecycle and achieve semantic interoperability between Web resources and services. The field of Robotics is a multi disciplinary as robots are amazingly complex system comprising mechanical, electrical, electronic H/W and S/W and issues germane to all these.

Course Contents:

Module I: Problem solving and Scope of AI
Introduction to Artificial Intelligence. Applications- Games, theorem proving, natural language processing, vision and speech processing, robotics, expert systems. AI techniques- search knowledge, abstraction.
Problem Solving
State space search; Production systems, search space control: depth-first, breadth-first search. Heuristic search - Hill climbing, best-first search, branch and bound. Problem Reduction, Constraint Satisfaction End, Means-End Analysis. LA* Algorithm, L(AO*) Algorithm.

Module II: Knowledge Representation
Knowledge Representation issues, first order predicate calculus, Horn Clauses, Resolution, Semantic Nets, Frames, Partitioned Nets, Procedural Vs Declarative knowledge, Forward Vs Backward Reasoning.

Module III: Understanding Natural Languages
Introduction to NLP, Basics of Syntactic Processing, Basics of Semantic Analysis, Basics of Parsing techniques, context free and transformational grammars, transition nets, augmented transition nets, Shanks Conceptual Dependency, Scripts ,Basics of grammar free analyzers, Basics of sentence generation, and Basics of translation..

Module IV
Expert System: Need and justification for expert systems, knowledge acquisition, Case studies: MYCIN,R1
Learning: Concept of learning, learning automation, genetic algorithm, learning by inductions, neural nets. **Programming Language:** Introduction to programming Language, LISP and PROLOG.
Handling Uncertainties: Non-monotonic reasoning, Probabilistic reasoning, use of certainty factors, Fuzzy logic.

Module V: Introduction to Robotics
Fundamentals of Robotics, Robot Kinematics: Position Analysis, Dynamic Analysis and Forces, Robot Programming languages & systems: Introduction, the three levels of robot programming, requirements of a robot programming language, problems peculiar to robot programming languages.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:

- E. Rich and K. Knight, "Artificial intelligence", TMH, 2nd ed., 1992.
- N.J. Nilsson, "Principles of AI", Narosa Publ. House, 1990.
- John J. Craig, "Introduction to Robotics", Addison Wesley publication

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- Richard D. Klafter, Thomas A. Chmielewski, Michael Negin, “Robotic Engineering – An integrated approach”, PHI Publication
- Tsuneo Yoshikawa, “Foundations of Robotics”, PHI Publication

References:

- D.W. Patterson, “Introduction to AI and Expert Systems”, PHI, 1992.
- Peter Jackson, “Introduction to Expert Systems”, AWP, M.A., 1992.
- R.J. Schalkoff, “Artificial Intelligence - an Engineering Approach”, McGraw Hill Int. Ed., Singapore, 1992.
- M. Sasikumar, S. Ramani, “Rule Based Expert Systems”, Narosa Publishing House, 1994.

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DIGITAL ELECTRONICS LAB

Course Code: NCE6314 **Credit Units : 01**

List of Experiments:

1. To verify the truth tables of OR, AND, NOR, NAND, EX-OR, EX-NOR gates.
2. To obtain half adder, full adder and subtractor using gates and verify their truth tables.
3. To verify the truth tables of RS, JK and D flip- flops.
4. To design and study a binary counter.
5. To design and study synchronous counter.
6. To design and study ripple counter.
7. To convert BCD number into excess 3 form
8. To design and study a decade counter.
9. To design and study a sequence detector.
10. To implement control circuit using multiplexer.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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ARTIFICIAL INTELLIGENCE LAB

Course Code: NCE6406 **Credit Units : 01**

Course Contents:

Assignments will be provided for the following:

- Programming in Prolog
- Programming for Robotics

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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COMMUNICATION SYSTEMS

Course Code: NCE6407 **Credit Units : 02**

Course Objective:
The purpose of this course is to provide a thorough introduction to analog and digital communications with an in depth study of various modulation techniques, Random processes are discussed, and information theory is introduced.

Course Contents:

Module I: Introduction
Communication Process, Source of Information, Communication channels, base-band and pass-band signals, Review of Fourier transforms, Random variables, different types of PDF, need of modulation process, primary communication resources, analog versus digital communications

Module II: Amplitude modulation
Amplitude modulation with full carrier, suppressed carrier systems, single side band transmission, switching modulators, synchronous detection, envelope detection, effect of frequency and phase errors in synchronous detection, comparison of various AM systems, vestigial side band transmission.

Module III: Angle Modulation
Narrow and wide band FM, BW calculations using Carlson rule, Direct & Indirect FM generations, phase modulation, Demodulation of FM signals, noise reduction using pre & de-emphasis.

Module IV: Pulse Modulation
Pulse amplitude, width & position modulation, generation & detection of PAM, PWM & PPM, Comparison of frequency division and time division multiplexed systems,
Basics of digital communications: ASK, PSK, FSK, QPSK basics & wavform with brief mathematical introduction

Module V: Noise
Different types of noise, noise calculations, equivalent noise band width, noise figures, effective noise temperature, noise figure.

Module VI: Introduction to Information Theory
Measurement of Information, mutual, Shannon's theorem, Source coding, channel coding and channel capacity theorem, Huffman code

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- B. P. Lathi: "Modern analog & digital communication", OXFORD Publications
- Wayne Tomasi: "Electronic Communication systems", Pearson Education, 5th edition

References:
- Simon Haykin, "Communication Systems", John Wiley & Sons, 1999, Third Edition.
- Taub and schilling, "Principles of Communication Systems" TMH

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COMMUNICATION SYSTEMS LAB

Course Code: NCE6408 **Credit Units : 01**

List of Experiments:

- To study the sampling and reconstruction of a given signal.
- To study amplitude modulation and demodulation.
- To study frequency modulation and demodulation.
- To study time division multiplexing.
- To study pulse amplitude modulation.
- To study delta and adaptive delta modulation and demodulation.
- To study carrier modulation techniques using amplitude shift keying and Frequency shift keying.
- To study carrier modulation techniques using binary phase shift keying and differential shift keying.
- To study pulse code modulation & differential pulse code modulation as well as relevant demodulations.
- To study quadrature phase shift keying & quadrature amplitude modulation.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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ARTIFICIAL NEURAL NETWORK

Course Code: NCE6411 **Credit Units : 02**

Course Objective:
Aim of this course is to introduce the students fundamentals concepts of Nural network and its various application in computer science.

Course Contents:
Module I:-
Artificial Neural Networks (ANN) and biological neural networks, supervised and unsupervised learning rules, neural network applications.

Module II:-
Unsupervised learning:- Hebbian learning and competitive learning. Supervised learning:- Back propagation algorithms,
Learning rule:-
Delta learning rule, Widrow-Hoff learning rule, Winner-Take-All learning rule.

Module III:-
Feed forward neural network, feed backward neural network, Perceptron and its learning law, single-layer perceptron, multi-layer perceptron.

Module IV:-
Self organizing networks: Kohonen algorithm, Hopfield Networks: Hopfield network algorithm, Adaptive resonance theory: Network and learning rules.

Module V:-
Associative memory, auto-associative memory, bi-directional associative memory.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Book:

- Kenji Suzuki (ed.) - InTech , 2013
- Todd Troyer - University of Texas at San Antonio , 2005

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ARTIFICIAL NEURAL NETWORK LAB

Course Code: NCE6412 **Credit Units : 01**

Course Objective

The aim of this lab to gain the practical knowledge of basic neuron models and learning algorithms.

Lab Assignment

To study some basic neuron models and learning algorithms by using Matlab's neural network toolbox

Examination Scheme :

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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NCE6417	WEB DESIGNING TECHNOLOGIES	L	T	P	C
Version: 2019.1	Date of Approval: 15 May 2019	2	0	2	3
Pre-requisites/Exposure	knowledge of Internet fundamentals				
Co-requisites	NIL				

Catalog Description

The objective of this course is to introduce the basic concepts of HTML5 and CSS3. To explore and implement the various concepts of website design using HTML with the concept of the tags, script, and code that create web pages. To understand how the web and web pages work and web pages styles using CSS3.After completing this course students can easily develop static web sites and style them using CSS3.

Course Objectives

The objective of this course is

1. Understand the advanced features of HTML5 which includes images, links, tables, frames and forms etc and gives an overview of CSS3 which is used to add style to the web pages.
2. Demonstrate the application of HTML5 in developing solutions to web site creation and understanding how CSS will affect web page creation.
3. Design a responsive web site using HTML5 and CSS3.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain the basic concepts of HTML, structure of HTML. Apply the different tags for images, hypertext and lists in web pages.

CO 2: Illustrate the different ways to use styles in web pages using CSS? Apply CSS style sheets for formatting text in web pages.

CO 3: Explain the layout of CSS style and describe how to add audio and video in html web pages.

CO 4: Demonstrate the use of Table and frames in web pages and setting properties for tables and frames.

CO 5: Explain the writing scripts in web pages and publishing Webpages on web.

Modules	Blooms level*	Number of hours
Module I History of HTML, Basic HTML Structure, Creating title, Creating header and footer, Adding Comments, Formatting Text, Specifying time, Indicating citations/references, quotes, abbreviations, pre-formatted text, Inserting Images, Creating Image Links, Scaling images with the browser, setting icons for web page, Creating hypertext, anchor tag, Creating List, Creating Definition List, Creating Hyper Text Links, Creating Link Lists.	L2 and L3	8
Module II CSS building blocks, working with style sheets, Creating different types of style sheets- External , embedded and inline style sheets, defining selectors , Selecting on basis of class and id, selecting elements based on the attributes, combining selectors, Formatting text with styles, setting font properties.	L3 and L4	7
Module III CSS: Layout with style, changing the background color, setting border, changing the cursor, style sheets for mobile to desktop, working with web fonts, creating forms, organizing the form elements. Adding audio , video and other multi-media .	L2 and L3	7

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Module IV Tables and frames, Creating Tables, Table Element, Adding Border, Adding Column Headings, Adding Spacing and Padding, Adding a Caption, Setting the table Width and Height, Add Row Headings, Aligning Cell contents, Setting Column Width, Centering a Table, Inserting and Image, Spanning Columns, Spanning Rows Assigning Background Colors, Frame Elements, Creation of Frame Based Pages.	L3	7
Module V: Working with scripts : Loading an external script, testing & debugging web pages, publishing your web page on the web.	L2	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books:

1. HTML HTML5 and CSS3, Seventh Edition: Visual QuickStart Guide ,Elizabeth Castro and Bruce Hyslop.
2. HTML, XHTML and CSS Bible, Steven M. Schefar, Wiley Publishing, Inc.

Reference Books:

1. HTML & CSS: The Complete Reference, Fifth Edition ,Thomas A. Powell, Tata McGraw Hill.
2. HTML5: Up and Running ,Mark Pilgrim, O'Reilly Media, Inc.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	--	--	**1**	--	**1**	--	--	--	--	**1**	--	--	**1**	--	--	--
CO 2	--	--	**2**	--	**2**	--	--	--	--	**1**	--	--	**1**	--	--	--
CO 3	--	--	**1**	--	**1**	--	--	--	--	**2**	--	--	**1**	--	--	--
CO 4	--	--	**2**	--	**1**	--	--	--	--	**2**	--	--	**1**	--	--	--
CO 5	--	--	**1**	--	**2**	--	--	--	**2**	**1**	--	--	**1**	**1**	--	**2**

1: strongly related, 2: moderately related and 3: weakly related

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NCE6418	WEB DESIGNING TECHNOLOGIES LAB	L	T	P	C
Version: 2019.1	Date of Approval: 15 May 2019	0	0	2	1
Pre-requisites/Exposure	knowledge of Internet fundamentals				
Co-requisites	NIL				

Catalog Description

The objective of this course is to introduce the basic concepts of HTML5 and CSS3. To explore and implement the various concepts of website design using HTML with the concept of the tags, script, and code that create web pages. To understand how the web and web pages work and web pages styles using CSS3.After completing this course students can easily develop static web sites and style them using CSS3.

Course Objectives

The objective of this course is

1. Understand the advanced features of HTML5 which includes images, links, tables, frames and forms etc and gives an overview of CSS3 which is used to add style to the web pages.
2.Demonstrate the application of HTML5 in developing solutions to web site creation and understanding how CSS will affect web page creation.
3.Design a responsive web site using HTML5 and CSS3.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain the basic concepts of HTML, structure of HTML. Apply the different tags for images, hypertext and lists in web pages.
CO 2: Illustrate the different ways to use styles in web pages using CSS? Apply CSS style sheets for formatting text in web pages.
CO 3: Explain the layout of CSS style and describe how to add audio and video in html web pages.
CO 4: Demonstrate the use of Table and frames in web pages and setting properties for tables and frames.
CO 5: Explain the writing scripts in web pages and publishing Webpages on web.

Modules	Blooms level*	Number of hours
Module I **Programs based on :** • Basic HTML Structure, Creating title, Creating header and footer, Adding Comments, • Formatting Text, Specifying time, Indicating citations/references, quotes, abbreviations, • pre-formatted text, Inserting Images, Creating Image Links, Scaling images with the browser, • setting icons for web page, Creating hypertext, anchor tag, Creating List, • Creating Definition List, Creating Hyper Text Links, Creating Link Lists.	L2 and L3	6

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Module II & Module III **Programs based on:** • CSS style sheets, Creating different types of style sheets- External , embedded and inline style sheets, • Selection on basis of class and id, selecting elements based on the attributes, combining selectors, • Formatting text with styles, setting font properties. • Changing the background color, setting border, changing the cursor, • style sheets for mobile to desktop, • working with web fonts, creating forms, organizing the form elements. Adding audio , video and other multi-media .	L2,L3 and L4	4
Module IV **Programs based on:** • Tables and frames, Creating Tables, Table Element, Adding Border, Adding Column Headings, • Adding Spacing and Padding, Adding a Caption, Setting the table Width and Height, Add Row Headings, • Aligning Cell contents, Setting Column Width, Centering a Table, Inserting and Image, • Spanning Columns, Spanning Rows Assigning Background Colors, • Frame Elements, Creation of Frame Based Pages.	L3	4
Module V: **Programs based on** Working with scripts : Loading an external script, testing & debugging web pages, publishing your web page on the web.	L2	1

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books:

1. HTML HTML5 and CSS3, Seventh Edition: Visual QuickStart Guide ,Elizabeth Castro and Bruce Hyslop.
2. HTML, XHTML and CSS Bible, Steven M. Schefar, Wiley Publishing, Inc.

Reference Books:

1. HTML & CSS: The Complete Reference, Fifth Edition ,Thomas A. Powell, Tata McGraw Hill.
2. HTML5: Up and Running ,Mark Pilgrim, O'Reilly Media, Inc.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	--	--	**1**	--	**1**	--	--	--	--	**1**	--	--	**1**	--	--	--
CO 2	--	--	**2**	--	**2**	--	--	--	--	**1**	--	--	**1**	--	--	--
CO 3	--	--	**1**	--	**1**	--	--	--	--	**2**	--	--	**1**	--	--	--
CO 4	--	--	**2**	--	**1**	--	--	--	--	**2**	--	--	**1**	--	--	--
CO 5	--	--	**1**	--	**2**	--	--	--	**2**	**1**	--	--	**1**	**1**	--	**2**

1: strongly related, 2: moderately related and 3: weakly related

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COMPUTER ARCHITECTURE

Course Code: NCE6502 **Credit Units : 04**

Course Objective:
This course deals with computer architecture as well as computer organization and design. Computer architecture is concerned with the structure and behaviour of the various functional modules of the computer and how they interact to provide the processing needs of the user. Computer organization is concerned with the way the hardware components are connected together to form a computer system. Computer design is concerned with the development of the hardware for the computer taking into consideration a given set of specifications.

Course Contents:

Module I: Register Transfer Language
Register Transfer, Bus and Memory Transfers, Arithmetic Micro-operations, Logic Micro-operations, Shift Micro-operations, Arithmetic Logic shift Unit.

Module II: Basic Computer Organizations and Design
Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt, Design of Accumulator Logic. Hardwired and Microprogrammed control: Control Memory, Address Sequencing, Design of Control Unit

Module III: Central Processing Unit
Introduction, General Register Organization, Stack Organization, Instruction representation, Instruction Formats, Instruction type, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer RISC and CISC. Computer Arithmetic: Introduction, Addition and Subtraction Algorithm,Multiplication Algorithms, Booth Multiplication, Division Algorithms, Floating-Point Arithmetic Operations

Module IV: Memory and Intrasystem Communication and Input output organisation
Memory: Memory types and organization Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory with mapping techniues, Virtual Memory, Memory Management Hardware, **Intrasystem communication and I/O:** Peripheral Devices, Input-Output, Controller and I/O driver, IDE for hard disk, I/O port and Bus concept, Bus cycle, Synchronous and asynchronous transfer,Modes of Transfer, DMA, DMA Transfer, DMA Controller, I/O Processor, CPU-IOP Communication

Module V: Introduction to Pipelining and Multi-Processor
Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Multiprocessors: Characteristics of Multiprocessors

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- Morris Mano, Computer System Architecture, 3rd Edition – 1999, Prentice-Hall of India Private Limited.
- Harry &Jordan, Computer Systems Design & Architecture, Edition 2000, Addison Wesley, Delhi.

References:

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- WIliam Stallings, Computer Organization and Architecture, 4th Edition-2000, Prentice-Hall of India Private Limited.
- Kai Hwang-McGraw-Hill, Advanced Computer Architecture.
- Kai Hwang & Faye a Briggs, McGrew Hill, inc., Computer Architecture & Parallel Processing.
- John D. Carpinelli, Computer system Organization & Architecture, Edition 2001, Addison Wesley, Delhi
- John P Hayes, McGraw-Hill Inc, Computer Architecture and Organization.
- M. Morris Mano and Charles, Logic and Computer Design Fundamentals, 2nd Edition Updated, Pearson Education, ASIA.
- Hamacher, "Computer Organization," McGraw hill.
- Tennenbaum," Structured Computer Organization," PHI
- B. Ram, "Computer Fundamentals architecture and organization," New age international Gear C. w., "Computer Organization and Programming, McGraw hill

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JAVA PROGRAMMING

Course Code: NCE6503 **Credit Units : 03**

Course Objective:
The objective is to impart programming skills used in this object oriented language java.The course explores all the basic concepts of core java programming. The students are expected to learn it enough so that they can develop the web solutions like creating applets etc.

Course Contents:
Module I: Java Basics
Concepts of OOP, Features of Java, How Java is different from C++, Environmental setup, Basic syntax, Objects and classes, Basic Data Types, Variable Types, Modifier Types, Basic operators, Loop Control, Decision Making, Strings and Arrays, Methods, I/O.

Module II: Java Object Oriented
Inheritance, Overriding, Polymorphism, Abstraction, Encapsulation, Interfaces, Packages, Exploring java.util package.

Module III: Exception Handling and Threading
Exception Hierarchy, Exception Methods, Catching Exceptions, Multiple catch Clauses, Uncaught Exceptions Java's Built-in Exception.
Creating, Implementing and Extending thread, thread priorities, synchronization suspending, resuming and stopping Threads, Multi-threading.

Module IV : Event Handling And AWT
Event handling Mechanism, Event Model, Event Classes, Sources of Events, Event Listener Interfaces, AWT: Working with Windows, AWT Controls, Layout Managers

Module V: Java Advanced
AppletClass, Architecture, Skeleton, Display Methods., Swings: Japplet, Icons, labels, Text Fields, Buttons, Combo Boxes., Socket Programming: Socket methods, Server Socket methods, Socket Client and Socket Server examples.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- JAVA The Complete Reference by Patrick Naughton & Herbert Schild, TMH
- Introduction to JAVA Programming a primar, Balaguruswamy.

References:
- "Introduction to JAVA Programming" Daniel/Young PHI
- Jeff Frentzen and Sobotka, "Java Script", Tata McGraw Hill,1999

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JAVA PROGRAMMING LAB

Course Code: NCE6507 **Credit Units : 01**

Software Required: JDK1.3

Assignments will be provided for the following:

- Java programs using classes & objects and various control constructs such as loops etc, and data structures such as arrays, structures and functions
- Java programs for creating Applets for display of images and texts.
- Programs related to Interfaces & Packages.
- Input/Output and random files programs in Java.
- Java programs using Event driven concept.
- Programs related to network programming.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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PYTHON PROGRAMMING LAB

Course Code: NCE6508 **Credit Units : 01**

Course Contents:

- Setting up python on Windows/Linux/Mac
- First program in python
- Programs related to basic input/ouput.
- Programs related to variables,strings,numbers
- Programs related to Lists and Tuples
- Programs related toFunctions
- Programs related to If Statements
- Programs related to While Loops and Input
- Programs related to Basic Terminal Apps
- Programs related to Dictionaries
- Programs related to Classes
- Programs related to Exceptions
- Programs related to GUI programming
- Using Word, Excel, PDF files in python.
- Web programming in python,
- Case study of application areas of python.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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SUMMER INTERNSHIP EVALUATION-I

Course Code: NCE6535 **Credit Units : 03**

Course Objective:

The objective of this course is to provide practical training on some live projects that will increase capability to work on actual problem in industry. This training may undergo in an industrial environment or may be an in house training on some latest software which is in high demand in market. This training will be designed such that it will useful for their future employment in industry.

Examination Scheme:

Feedback from industry/work place	20
Training Report	40
Viva	15
Presentation	25
Total	**100**

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VHDL PROGRAMMING

Course Code: NCE6512 **Credit Units : 02**

Course Objective:
VHDL is commonly used as a design-entry language for field-programmable gate arrays and application-specific integrated circuits in electronic design automation of digital circuits. The course aims to discuss the syntax of the language to model a digital system.

Course Contents:

Module I
Fundamental VHDL Units, LIBRARY Declarations, ENTITY, ARCHITECTURE, Introductory Examples, Specification of combinational systems using VHDL, Introduction to VHDL, Basic language element of VHDL, Behavioural Modeling, Data flow modeling, Structural modeling, Subprograms and overloading, VHDL description of gates.

Module II
Data Types; Pre-Defined Data Types, User-Defined Data Types, Subtypes, Arrays, Port Array, Records, Signed and Unsigned Data Types, Data Conversion

Module III: Sequential codes
PROCESS: Signals and Variables, IF, WAIT, CASE, LOOP, CASE versus IF, CASE versus WHEN, Bad Clocking, Using Sequential Code to Design Combinational Circuits
Description and design of sequential circuits using VHDL,

Module IV
Standard combinational modules, Design of a Serial Adder with Accumulator, State Graph for Control Network, design of a Binary Multiplier, Multiplication of a Signed Binary Number, Design of a Binary Divider.

Module V
Micro programmed Controller, Structure of a micro programmed controller, Basic component of a micro system, memory subsystem. Overview of PAL, PLA, FPGA, CPLD.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- J. Bhaskar, "A VHDL Primer", Addison Wesley, 1999.
- Volnei A. Padroni, "Circuit Design with VHDL."
- M. Ercegovac, T. Lang and L.J. Moreno, "Introduction to Digital Systems", Wiley,2000
- C. H. Roth, "Digital System Design using VHDL", Jaico Publishing, 2001

References:
- VHDL Programming by Examples by Douglas L. Perry, TMH, 2000
- Hardware Description Languages by Sumit Ghose, PHI, 2000
- The Designer Guide to VHDL by P.J. Ashendern; Morgan Kaufmann Pub. 2000
- Digital System Design with VHDL by Mark Zwolinski; Prentice Hall Pub. 1999
- Designing with FPGA & CPLDs by Zeidman; CMP Pub. 1999
- HDL Chip Design by Douglas J. Smith; Doone Pub. 2001

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VHDL PROGRAMMING LAB

Course Code: NCE6513 **Credit Units : 01**

Software Required: Mentor Graphics

Topics covered in lab will include:

- Designing Basic Gates.
- Designing Combinational circuits like adder, multiplexer, PLA
- Designing Sequent ional Circuits like flip-flops, counters, registers.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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MICROPROCESSOR

Course Code: NCE6515 **Credit Units : 03**

Course Objective:
This course deals with the systematic study of the Architecture and programming issues of 8085-microprocessor family. The aim of this course is to give the students basic knowledge of the above microprocessor needed to develop the systems using it.

Course Contents:
Module I: Introduction to Microcomputer Systems
Introduction to Microprocessors and microcomputers, Study of 8 bit Microprocessor, 8085 pin configuration, Internal Architecture and operations,interrupts, Stacks and subroutines, various data transfer schemes.

Module II: ALP and timing diagrams
Introduction to 8085 instruction set, advance 8085 programming, Addressing modes, Counters and time Delays, Instruction cycle, machine cycle, T-states, timing diagram for 8085 instruction.

Module III: Memory System Design & I/O Interfacing
Interfacing with 8085.Interfacing with input/output devices (memory mapped, peripheral I/O), Cache memory system. Study of following peripheral devices 8255, 8253, 8257, 8255, 8251.

Module IV: Architecture of 16-Bit Microprocessor
Difference between 8085 and 8086, Block diagram and architecture of 8086 family, pin configuration of 8086, Minimum mode & Maximum mode Operation. Internal architecture of 8086, Bus Interface Unit, Register Organization, Instruction Pointer, Stack & Stack pointer, merits of memory segmentation, Execution Unit, Register Organization.

Module V: Pentium Processors
Internal architecture of 8087, Operational overview of 8087, Introduction to 80186, 80286, 80386 & 80486 processors, Pentium processor.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- Ramesh. S. Gaonkar, "Microprocessor architecture Programming and Application with 8085" Penram International Publishing, 4th Edition
- B. Ram, "Fundamentals of microprocessors and microcomputer" Dhanpat Rai, 5th Edition.]
- Douglas V Hall.

References:
- M. Rafiquzzaman, "Microprocessor Theory and Application" PHI – 10th Indian Reprint.
- Naresh Grover, "Microprocessor comprehensive studies Architecture, Programming and Interfacing" Dhanpat Rai, 2003.
- Gosh," 0000 to 8085" PHI.

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SYSTEM PROGRAMMING AND COMPILER CONSTRUCTION

Course Code: NCE6714 **Credit Units : 03**

Course Objective:
This course provides knowledge to design various system programs.

Course Contents:

Module I: Introduction
Definition, Evolution, Components**,** Editors: Introduction to system Programming Line editor, Full screen editor and multi window editor. Case study MS-Word, DOS Editor and vi editor.

Module II: Assemblers
First pass and second pass of assembler and their algorithms. Assemblers for CISC Machines: case study x85 & x86 machines.

Module III: Compilers & Macro Processor
Introduction to various translators. Various phases of compiler. Bootstrapping for compilers, Introduction to. Design of a compiler in C++ as Prototype. Basic Macro Processor functions- Macro definition & expansion – Macro Processor Algorithm & Data Structures, conditional – Macro Expansion, Keyword Macro Parameters, Macro with in Macro Implementation, case study MASM and ANSI C Macro language.

Module IV: Debuggers, Loaders and Linkers
Introduction to various debugging techniques. Case study:- Debugging in Turbo C++ IDE. Linkers and Loaders Concept of linking. Case study of Linker in x86 machines. Loading of various loading schemes.

Module V: Operating System
Booting techniques and sub-routines. Design of kernel and various management for OS. Design of Shell and other utilities, (**Overview of Unix OS, Difference Between Unix and Linux, Commands in Unix.)-changes made**

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- Donovan J.J., Systems Programming, New York, Mc-Graw Hill, 1972.
- Dhamdhere, D.M., Introduction to Systems Software, Tata Mc-Graw Hill 1996.

References:
- Aho A.V. and J.D. Ullman Principles of compiler Design Addison Wesley/ Narosa 1985.

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ADVANCED JAVA PROGRAMMING

Course Code: NCE6603 **Credit Units : 03**

Course Objective:
The objective is to equip the students with the advanced feature of contemporary java which would enable them to handle complex programs relating to managing data and processes over the network. The major objective of this course is to provide a sound foundation to the students on the concepts, precepts and practices, in a field that is of immense concern to the industry and business.

Course Contents:

Module I: Distributed Computing
Introduction to Java RMI, RMI services, RMI client, Running client and server, Introduction of Swing, Swing Components, Look and Feel for Swing Components, Introduction to Multimedia Programming.

Module II: Database Connectivity
ODBC and JDBC Drivers, Connecting to Database with the java.sql Package, Using JDBC Terminology, JDBC with mysql, postgresql.

Module III: Servlet Programming
Introduction to Servlets, Servlet Life Cycle, Servlet based Applications, Servlet and HTML.Filters, jdbc with servelets, session Management techniques in detail.

Module IV: JSP Programming
JSP: Introduction to JSP, JSP implicit objects, JSP based Applications, Java. Net. Login & Logout Example, jdbc with jsp.

Module V: JEE Web Appliaction
The Model-View-Controller Architecture What is Struts, Struts Tags, Creating Beans, Other Bean Tags, Bean Output, Creating HTML Forms, The Action Form class The Action class, Simple Struts: a simple Struts application; Introduction to EJB.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- Java 2 Unleashed (Techmedia – SAMS), Jamie Jaworski
- Professional Java Server Programming (a Press), Allamaraju
- Developing Java Servlets (Techmedia – SAMS), James Goodwill sing Java 1.2 Special Edition (PHI), Webber

References:
- David Flanagan,Jim Parley, William Crawford & Kris Magnusson, Java Enterprise in a nutshell - A desktop Quick reference - O'REILLY, 2003
- Stephen Ausbury and Scott R. Weiner, Developing Java Enterprise Applications, Wiley-2001
- Jaison Hunder & William Crawford, Java Servlet Programming, O'REILLY, 2002
- Dietal and Deital, "JAVA 2" PEARSON publication

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ADVANCE DATABASE MANAGEMENT SYSTEMS

Course Code: NCE6604 **Credit Units : 03**

Course Objective:
The objective of this course is to expose the students to the implementation techniques of database system. This course explains techniques for query processing and optimization with transaction and concurrency control techniques

Course Contents:
Module I: Relational Databases
Integrity Constraints revisited, Extended ER diagram, Relational Algebra & Calculus, Functional, Muiltivalued and Join Dependency, Normal Forms, Rules about functional dependencies.

Module II: Query Processing and Optimization
Valuation of Relational Operations, Transformation of Relational Expressions, Indexing and Query Optimization, Limitations of Relational Data Model, Null Values and Partial Information.
Objected Oriented and Object Relational Databases
Modeling Complex Data Semantics, Specialization, Generalization, Aggregation and Association, Objects, Object Identity, Equality and Object Reference, Architecture of Object Oriented and Object Relational Databases

Module III: Parallel and Distributed Databases
Distributed Data Storage – Fragmentation & Replication, Location and Fragment
Transparency Distributed Query Processing and Optimization, Distributed Transaction Modeling and concurrency Control, Distributed Deadlock, Commit Protocols, Design of Parallel Databases, Parallel Query Evaluation.
Advanced Transaction Processing
Nested and Multilevel Transactions, Compensating Transactions and Saga, Long Duration Transactions, Weak Levels of Consistency, Transaction Work Flows, Transaction Processing Monitors.

Module IV
Multimedia databases,Databases on the Web and Semi–Structured Data
Case Study: Oracle Xi
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance
Text & References:
***Text*:**

- Elmarsi, Navathe, Somayajulu, Gupta, "Fundamentals of Database Systems", 4th Edition, Pearson Education, 2007
- Garcia, Ullman, Widom, "Database Systems, The complete book", Pearson Education, 2007
- R. Ramakrishnan, "Database Management Systems", McGraw Hill International Editions, 1998

***References*:**

- Date, Kannan, Swaminathan, "An Introduction to Database Systems", 8th Edition Pearson Education, 2007
- Singh S.K., "Database System Concepts, design and application", Pearson Education, 2006.
- Silberscatz, Korth, Sudarshan, "Database System Concepts", Mcgraw Hill, 6th Edition, 2006
- W. Kim, "Modern Database Systems", 1995, ACM Press, Addision – Wesley,
- D. Maier, "The Theory of Relational Databases", 1993, Computer Science Press, Rokville, Maryland
- Ullman, J. D., "Principals of database systems", Galgotia publications, 1999
- Oracle Xi Reference Manual
- Dietrich, and Urban, "An Advanced Course in Database Systems", Pearson, 2008.

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DIGITAL COMPUTER ORGANIZATION

Course Code: NCE6605 **Credit Units : 03**

Course Objective:
The Objective of this course is to expose the students to the fundamentals and the concepts of Digital & Computer Organization and Representation of Information and Basic Building Blocks, Basic Organization, Memory Organization, Input-Output Organization, Processor Organization etc. This course is designed to understand the concepts of Computer Organization for Research & Development as well as for application.

Course Contents:

Module I: Representation of Information and Basic Building Blocks
Number Systems, Binary, Octal, Hexadecimal, Character Codes (BCD, ASCII, EBCDIC), Logic gates, Boolean algebra, K-map Simplification, Half adder, Full adder, Decoders, Multiplexes, Binary Counters, Flip/Flops: SR FF, JK FF, Master Slave FF, T and D FF, Registers: Parallel and Serial Registers, Counters (Synchronous & Asynchronous), ALU, Micro-Operation, ALU-chip.

Module II: Basic Organization
Von Neumann Machine (IAS Computer), Operational flow chart (Fetch, Execute), Instruction Cycle, Organization of Central Processing Unit, Hardwired and Micro programmed control unit, Single Organization, General Register Organization, Stack Organization, Addressing Modes, Instruction Formats, Data transfer & Manipulation, I/O organization, Bus Architecture, Programming Registers.

Module III: Memory Organization
Memory hierarchy, Main Memory (RAM/ROM chips) with mapping, Auxiliary memory, Associative memory and its mapping, Virtual memory, Cache memory with mapping techniques, Memory management hardware.

Module IV: Input-Output organization
Peripheral devices, I/O interface, Direct memory access, Modes of transfer, Priority Interrupt, I/O Processors, Serial Communication, Asynchronous data transfer, Strobe Control, Handshaking, I/O Controllers, CPU-IOP Communication.

Module V: Processor Organization
Introductory Concept of pipeline, Flynn's Classification, Parallel processing. RISC and CISC characterstics, arithmetic pipeline with example.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- Computer System Architecture: M. Mano (PHI Publication)
- William Stalling, "Computer Organization & Architecture", Pearson education Asia.
- B. Ram, "Computer Fundamental Architecture & Organization" New Age.

References:
- Computer Organization: Vrarsie, Zaky & Hamacher (TMH Publication).
- Tannenbaum, "Structured Computer Organization", PHI.

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MICROPROCESSOR LAB

Course Code: NCE6517 **Credit Units : 01**

Course Contents:

- To load the numbers 49H and 53H in the memory location 9510 and 9511
- respectively and add the contents of memory location 9601
- To write assembly language programming for 8 bit addition with and without carry.
- To write assembly language programming for 8 bit subtraction with and without borrow.
- To write assembly language programming for 8 bit multiplication and division.
- To write assembly language programming for sorting an array of numbers in ascending and descending order.
- To write assembly language programming with additional instructions.
- To write and execute a program using stacks.
- To study and program the programmable peripheral interface (8255) board.
- To study and program the programmable interval timer (8253) board.
- To study and program the programmable DMA controller (8257) board.
- To study and program the programmable interrupt controller (8259) board.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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SYSTEM PROGRAMMING AND COMPILER CONSTRUCTION LAB

Course Code: NCE6715 **Credit Units : 01**

Software Required: Turbo C++

Assignment will be provided for following:

- WAP to determine the length of the machine instructions.
- WAP to differentiate between symbols, literals and tokens.
- WAP to implement Symbol table.
- WAP to implement base table.
- WAP to find the relative addresses.
- Design a macro to perform add operation.
- On the basis of above program display the values of PC, LC and IR.
- Perform programming on loader based programme.
- Perform programming on linker based programme.
- Perform Programming on editor based programme.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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ADVANCED JAVA PROGRAMMING LAB

Course Code: NCE6608 **Credit Units : 01**

Programming Language: Java

1. WAP to display label on a frame with the help of JFrame
2. WAP to display six buttons on a panel using JFrame.
3. WAP. To display an image and a string in a label on the JFrame.
4. WAP that implement a JApplet that display a simple label
5. WAP that implement a JApplet and display the following frame

a. Customer name
b. Customer number
c. Age
d. Address

6. WAP to access a table Product Master from MS-Access using Java code.
7. WAP that implement a simple servlet program.
8. WAP for authentication, which validate the login-id and password by the servlet code.
9. WAP to connecting a database using user-id and password.
10. WAP to insert data into the database using the prepared statement.
11. WAP to read data from the database using the Resulset.
12. WAP to read data send by the client (HTML page) using servlet.
13. WAP to include a HTML page into a JSP page.
14. WAP to handle the JSPException.
15. WAP to read data send by a client (HTML page) using JSP.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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ADVANCE DATABASE MANAGEMENT SYSTEM LAB

Course Code: NCE6609 **Credit Units : 01**

Programs should be based on following topics:

Quick Review of Simple SQL Statements, SQL Built-in Functions, Primary Key, Foreign Key,Normalization, Joins View, Union. **Emphasis** on PL/SQL, Cursors 8. Exception handling, Procedure, Functions ,Trigger, concurrency control, transaction processing. Introduction to SQLite. Recommended Software: PostGreSQL, MySQL, Oracle.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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CRYPTOGRAPHY AND NETWORK SECURITY

Course Code: NCE6713 **Credit Units : 03**

Course Objective:
The objective here is to acquaint the students with the application of networking. Detail description of the various TCP/IP protocols and the working of ATM and its performance, Network security and authentication, and various algorithms related to it has been dealt, to get a practical approach.

Course Contents:

Module I: Advanced TCP/IP
TCP Services, TCP format and connection management, Encapsulation in IP, UDP Services, Format and Encapsulation in IP, IP Services, Header format and addressing, Fragmentation and reassembly, Migration to IPv6, Protocols: BOOTP, DHCP, ICMP, IGMP; Internet Routing Protocols: OSPF, RIP, EIGRP, BGP.

Module II: High Speed Networks
Packet Switching Networks; Frame Relay Networks; Asynchronous Transfer Mode (ATM); ATM protocol Architecture; ATM logical connections; ATM cells; ATM Service categories; ATM Adaptation Layer; QoS in ATM and Frame Relay

Module III: High Speed LANs
LAN Ethernet, fast Ethernet, gigabit Ethernet, FDDI, DSL, ADSL

Module IV: Wireless communication
Wireless networks, wireless channels, channel access, network architecture, IEEE 802.11, Bluetooth, Satellite Networks.

Module V: Network Security and Management
Principles of cryptography, Authentication, integrity, key distribution and certification, Access control andFirewalls, attacks and counter measures, security in manylayers. Infrastructure for network management, The internet standard managementframework, SMI, MIB, SNMP, Security and administration.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- William Stallings, "High-Speed Networks and Internets, Performance and Quality of Service", Pearson Education.
- High performance communication networks by: J. Walrand & Pravin Varaiya, Morgan Kaufman, 1999.
- Internetworking with TCP/IP Vol.1: Principles, Protocols, and Architecture (4th Edition) by Douglas E. Comer
- ATM networks: Concepts, Protocols, Applications by: Handel, Addision Wesseley.
- Cryptography & Networks Security Stallings, William 3rd edition

References:
- Computer networks: Tanenbaum, Andrew S, Prentice Hall
- Data communication & networking: Forouzan, B. A.
- Computer network protocol standard and interface Uyless, Black

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VLSI DESIGN

Course Code: NCE6612 **Credit Units : 02**

Course Objective:

In the recent years, IC manufacturing technology has gone through dramatic evolution and changes, continuously scaling to ever smatter dimensions. This scaling has a double impact on the design of ICs. First, the complexity of the designs that can be put on a single die has increased dramatically which led to new design methodologies. At the same time, this plunge into deep submicron space causes devices to behave differently and brings challenging issues to forefront. This course along with the course of Digital Circuits and Systems II and Analog CMOS IC design will give you many of the basic essentials to work in the area of Circuit Design. Since this course takes the latest trends in the industry into account, you will find yourself at a definite edge.

Course Contents:

Module I: Devices and the wire

Diode, dynamic and transient behaviour-diffusion capacitance, SPICE diode model.

MOSFET STATIC BEHAVIOUR: Threshold voltage and its dependence on V_{SB} MOSFET Operation in resistive and saturation region, channel length modulation, Velocity saturation and its impact on sub micron devices, sub threshold conduction, Model for manual analysis, Equivalent resistance for MOSFET in (velocity) saturated region, comparison of equations for PMOS and NMOS, depletion and enhancement device

DYNAMIC BEHAVIOUR: Channel capacitance in different regions of operation, junction capacitance, Level 1 SPICE MODELS for MOS transistors

The Wire: Interconnect parameters: resistance, capacitance and Inductance, Lumped RC model, Elmore Delay

Module II: CMOS Inverter

VTC of an ideal inverter, Switching Model of the CMOS inverter: nMOS /pMOS discharge and charge, VTC of CMOS inverter: PMOS AND NMOS operation in various regions including velocity saturation, Switching threshold, (W/L)p/(W/L)n ratio for setting desired V_M with and without velocity saturation, Noise Margins, buffer

Ratioed logic: Pseudo NMOS inverter and PMOS to NMOS ratio for performance, tristate inverter, Resistive load inverter.

Load Capacitance calculations: fan out capacitance, self capacitance calculations: Miller effect, wire capacitance; Improving delay calculation with input slope, Propagation delay: first order analysis, analysis from a design perspective, sizing a chain of inverters for minimum delay, choosing optimum number of stages

Power, Energy and Energy Delay: Dynamic power consumption, Static power, Glitches and power dissipation due to direct path currents, power and delay trade off, Transistor sizing for energy minimization

Module III: Combinational circuits

CMOS LOGIC: Good 0 and poor 0, Goo1 and poor 1, series and parallel N and P switches, 2 and Higher input NAND and NOR gates, Functions of the type (AB+C(D+E)) and their complements, XOR and XNOR gates, 2 input Multiplexer, Full Adder; Transistor sizing in CMOS logic for optimal delay,

Pseudo NMOS NAND NOR and other gates and the transistor sizing, Introduction to DSVCL logic, CPL AND/NAND, OR/NOR, XOR/XNOR gates

Logical effort, Electrical Effort, Branching effort, Examples of sizing Combinational logic chains for minimum delay. Pass-transistor logic, pass gate configurations for nmos and pmos, 2 input and 4 input MUX, XOR, XNOR and implementation of general functions like AB+AB*C+A*C*, Robust and Efficient PTL Design, Delay of Transmission Gate chain

Dynamic CMOS design: Precharge and Evaluation, charge leakage, bootstrapping, charge sharing, Cascading Dynamic Gates, DOMINO Logic, Optimization of Domino Logic Gates, simple example circuit implementations of DOMINO logic

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Module IV: Sequential Logic circuits

Principle of Bistability, NAND and NOR based SR latch, and clocked SR Latch, JK latch, example of master slave flip flop, CMOS D latch, MUX based Latches, master slave edge triggered register, non ideal clocks, clock overlap, C2MOS register, TSPCR Register, Schmitt Trigger, Pipelining and NORA CMOS

Module V: Layout Design Rules

Introduction to CMOS Process technology, Layout of CMOS inverter, CMOS NAND and NOR gates, Concept of Euler path, and stick diagrams for functions like (AB+E+CD)*

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Jan M Rabaey: Digital Integrated Circuits
- David Hodges et al: Analysis and Design of Digital ICs
- Kang: CMOS Digital ICs
- Weste and Harris: CMOS VLSI design
- Weste and Eshragian: Principles of CMOS VLSI Design

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VLSI DESIGN LAB

Course Code: NCE6613 **Credit Units : 01**

Course Contents:

- Using Design architect and simulate V vs time for CMOS inverter using same W/L ratio for PMOS and NMOS.
- Design and simulate again by Sizing PMOS to NMOS appropriately and repeat experiment 1
- Design and simulate V vs t for 2 input NAND and Nor gates.
- Design and Simulation for general CMOS functions
- One bit full adder simulation
- 2:1 MUX using pass transistor logic
- Other functions using pass transistor logic
- Layout of CMOS inverter
- Layout of NAND and NOR gates
- Design and Simulation SR latch using NAND and NOR representations
- Design and simulate D flip flop

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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DATA MINING

Course Code: NCE6618 **Credit Units : 03**

Course Objective:
The objective of this course is to introduce students to Data Warehousing & Data mining technologies that will helpTo Inspect, Control and Secure Information through Databases.

Course Contents:
Module I: Introduction to Data Warehousing
The need for data ware housing, Operational & Informational Data Stores, Data Warehouse definition & Characteristics, Data Warehouse role & Structure, The cost of warehousing data, Foundation & Roots of Data,

Module II: Data Warehousing Components& Architecture:
Stores, warehouses and marts, Data warehouse database, Sourcing, acquisition, clean up & transformation tools, meta data, Access tools, Data ware house administration & management,.
operational & External Database layer, Information access layer, data access layer, metadata layer, process management layer, Application messaging layer, Physical DW layer, Data staging layer.

Module III: Building a Data Warehouse:
Business, Design, Technical & Implementation Considerations, DW project plan.
Overview of Mapping the DW to Multiprocessor Architecture, & DBMS Schemas for Decision Support.

Module IV: Metadata and OLAP:
METADATA: Definition, repository, management & trends.
OLAP: Need, guidelines, Multi Relational & Multi-Dimensional: MOLAP, ROLAP, OLAP Tools.

Module V: Data Mining & Visualization:
Techniques to mine the data, Market Basket analysis, Measuring data mining effectiveness, embedding data mining to business process, current limitations and challenges in DM.
Introduction to EIS, The future of Data Mining, Warehousing & Virtualization, Applications: PowerBuilder, Forte. Technical Exposure to Data Mining

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

TEXT BOOKS:
- Alex Berson, Data Warehousing, Data Mining, and Olap, Tata McGraw Hill.
- George M Marakas, Modern Data Warehousing, Mining & Visualization Core Concepts, Pearson Education.

References:
- (Berry, Michael)Data Mining Techniques.
- (Sharma, Gajendra)Data Mining, Data Warehousing and OLAP.
- (Gupta, GK) Data Mining with Case Studies.
- (Han & Kamber)Data Mining: Concepts and Techniques.
- (Paulraj Ponniah) Datawarehousing Fundamentals.

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COMPUTER GRAPHICS

Course Code: NCE6702 **Credit Units : 03**

Course Objective:
The objective of the course is to provide the understanding of the fundamental graphical operations and the implementation on computer, the mathematics behind computer graphics, including the use of spline curves and surfaces. It gives the glimpse of recent advances in computer graphics, user interface issues that make the computer easy, for the novice to use.

Course Contents:

Module I: Introduction to Graphics and Graphics Hardware System
Application of computer graphics, Video Display Devices, Raster Scan Display, Random Scan Display, Input Devices, Graphic Software and graphics standards, Numerical based on Raster and Random scan display, Frame buffer, Display processor.

Module II: Output Primitives and Clipping operations
Algorithms for drawing 2D Primitives lines (DDA and Bresenham‘s line algorithm), circles (Bresenham‘s and midpoint circle algorithm), Antialiasing and filtering techniques. Line clipping (cohen-sutherland algorithm), Curve clipping algorithm, and polygon clipping with Sutherland Hodgeman algorithm, Area fill algorithms for various graphics primitives: Scanline fill algorithm, boundary fill algorithm, flood fill algorithm, Polygon representation, various method of Polygon Inside test: Even-Odd method, winding number method, Character generation techniques.

Module III: 2D Geometric transformation
2D Transformation: Basic transformat ion, Translation, Rotation, Rotation relative to an arbitrary point, scaling, Matrix Representations and Homogeneous coordinates, window to viewport transformation.

Module IV: 3D Geometric transformation
3D Concepts: Parallel projection and Perspective projection, 3D Transformations, composite 3D transformation, co-ordinate transformation, Inverse transformation

Module V: object modeling and Visible Surface detection
fractal geometry methods, fractal dimensions, Geometric construction of deterministic self-similar fractals, Iterated function system to generate fractals. Bezier curves and Bezier surfaces, Bspline curves and surfaces, Visible surface detection method: Basic illumination, diffuse reflection, specular reflection, shadows. Ray tracing method, Depth-buffer method, A-buffer method, Depth-sorting method (painter‘s algorithm), Binary search partition method, Scan line method,

Module VI: Introduction to multimedia
Design of animation sequences, Computer Animation languages, Elementary filtering techniques and elementary Image Processing techniques, graphics library functions used in animation design

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References*:*

Text:

- Foley et. al., “Computer Graphics Principles & practice”, 2nd ed. AWL, 2000.
- D. Hearn and P. Baker, “Computer Graphics”, Prentice Hall, 1986.
- R. Plastock and G. Kalley, “Theory and Problems of Computer Graphics”, Schaum’s Series, McGraw Hill, 1986

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References:

- R.H. Bartels, J.C. Beatty and B.A. Barsky, "An Introduction to Splines for use in Computer Graphics and Geometric Modeling", Morgan Kaufmann Publishers Inc., 1987.
- C.E. Leiserson, T.H. Cormen and R.L. Rivest, "Introduction to Algorithms", McGraw-Hill Book Company, 1990.
- W. Newman and R. Sproul, "Principles of Interactive Computer Graphics, McGraw-Hill, 1973.
- F.P. Preparata and M.I. Shamos, "Computational Geometry: An Introduction", Springer-Verlag New York Inc., 1985.
- D. Rogers and J. Adams, "Mathematical Elements for Computer Graphics", MacGraw-Hill International Edition, 1989
- David F. Rogers, "Procedural Elements for Computer Graphics", McGraw Hill Book Company, 1985.
- Alan Watt and Mark Watt, "Advanced Animation and Rendering Techniques", Addison-Wesley, 1992

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ADVANCED COMPUTER NETWORKS

Course Code: NCE6704 **Credit Units : 03**

Course Objective:
The objective of the course is to provide thorough understanding & in-depth knowledge of concepts in computer networks Such as Internet protocols and routing, local area networks, wireless communications and networking, performance analysis, congestion control, TCP, network address translation, multimedia over IP, switching and routing, mobile IP, multicasting, IPv6. Peer-to-peer networking, network security, and other current research topics. A focus will be placed on wireless networking, reflecting rapid advances in this area. This course motivates the students to explore current research areas in the same field.

Course Contents:
Module I : Introduction to Networks
Networking introduction, Reference Models, TCP/IP, OSI, Addressing, Protocol Layering, Transmission impairment, performance, Switching, Transmission Media, Introduction to MAC, Channel allocation, MAC protocol classification for LAN's, MAN's, MAC protocols for Adhoc N/ws, MAC Protocol for WLAN's(adhoc and sensor n/ws), Introduction to Ethernet protocol (Fast, Gigabit and standard Ethernet).

Module II: Network Layer
Network Layer Design Issues, Routing Algorithms, Congestion Control Algorithms, Quality of Service, Internet Working, Network Layer in Internet.
IPv6 basic protocol, extensions and options, support for QoS, security, etc., Changes to other protocols, Application Programming Interface for IPv6.

Module III : Mobile IP
Mobile IP, IP Multicasting. Multicast routing protocols, address assignments, session discovery, etc.

Module IV : Transport Layer and Application Layer
The Transport Protocol: The Transport Service, Elements of transport protocol, a simple Transport Protocol, Internet Transport Protocols UDP, Internet Transport Protocols TCP, TCP extensions for high-speed networks, transaction-oriented applications Performance Issues.
The Application Layer: DNS-(Domain Name System), Electronic Mail, World Wide Web Multimedia.

Module V : Network Security
Overview of network security, Secure-HTTP, SSL, ESP, Key distribution protocols. Digital signatures, digital certificates-mail Security, Web security, Social Issues.

Examination Scheme:

Components	A	CT	H	V/S/O	EE
Weightage (%)	5	10	7	8	70

Text & References:
Text:
- Computer Networks - Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI
- Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

***References*:**
- Computer Communications and Networking Technologies –Michael A.Gallo, William M .Hancock - Thomson Publication.
- W. Stallings. Cryptography and Network Security: Principles and Practice, 2nd Edition, Prentice Hall, 1998.
- W. R. Stevens. TCP/IP Illustrated, Volume 1: The protocols, Addison Wesley, 1994.
- C. E. Perkins, B. Woolf, and S. R. Alpert. Mobile IP: Design Principles and Practices, Addison Wesley, 1997.

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COMPUTER GRAPHICS LAB

Course Code: NCE6706 **Credit Units : 01**

Software Required: Turbo C++

Course Contents:

Assignments will be provided for the following:

- Geometrical shapes based on graphics algorithms
- 2D Geometric transformation translation, rotation, scaling, reflection.
- Clipping
- Animation

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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ADVANCED COMPUTER NETWORKS LAB

Course Code: NCE6707 **Credit Units : 01**

Course Contents:

Various installations and connections of LAN, WAN, ETC

Working on NS2.

Socket Programming using C Language on Linux

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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MATLAB PROGRAMMING

Course Code: NCE6708 **Credit Units : 02**

Understanding The MATLAB Environment, Using the Help System in MATLAB, MATLAB Basics,Linear Algebra; Vectors and Matrices and various operations on them, M files; Scripts and User-defined functions, Plotting, Flow Control and Loops; For and While Loops, If and Case statements, structures, writing basic programs using the above, study of various toolboxes available in matlab and case study of any one tool box.

Recommended Software: MATLAB/Octave

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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SUMMER INTERNSHIP EVALUATION-II

Course Code: NCE6735 **Credit Units : 03**

Guidelines:

There are certain phases of every Intern's professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship program can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal classroom situations. These attributes are intellectual ability, professional judgment and decision-making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc.

In order to achieve these objectives, each student will maintain a file (**Internship File**). The Internship File aims to encourage students to keep a personal record of their learning and achievement throughout the Programme. It can be used as the basis for lifelong learning and for job applications. Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development.

The File will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and their own personal contribution to the organization.

The **layout guidelines** for the Project & Seminar Report:

1. File should be in the following specification:
A4 size paper
Font: Arial (10 points) or Times New Roman (12 points)
Line spacing: 1.5
Top & bottom margins: 1 inch/ 2.5 cm
Left & right margins: 1.25 inches/ 3 cm

2. Report Layout: The report should contain the following components:
Front Page
Table of Content
Acknowledgement
Student Certificate
Company Profile (optional)
Introduction
Main Body
References / Bibliography

The File will include ***five sections*** in the order described below. The content and comprehensiveness of the main body and appendices of the report should include the following:

1. **The Title Page**--Title - An Internship Experience Report For (Your Name), name of internship organization, name of the Supervisor/Guide and his/her designation, date started and completed, and number of credits for which the report is submitted.
2. **Table of Content**--an outline of the contents by topics and subtopics with the page number and location of each section.
3. **Introduction**--short, but should include how and why you obtained the internship experience position and the relationship it has to your professional and career goals.
4. **Main Body**--should include but not be limited to daily tasks performed. Major projects contributed to, dates, hours on task, observations and feelings, meetings attended and their purposes, listing of tools and materials and their suppliers, and photographs if possible of projects, buildings and co-workers.

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5. **References / Bibliography** --This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system

ASSESSMENT OF THE INTERNSHIP FILE

The student will be provided with the Student Assessment Record (SAR) to be placed in front of the Internship File. Each item in the SAR is ticked off when it is completed successfully. The faculty will also assess each item as it is completed. The SAR will be signed by the student and by the faculty to indicate that the File is the student's own work. It will also ensure regularity and meeting the delaines.

STUDENT ASSESSMENT RECORD (SAR)

1. **Range of Research Methods used to obtain information**

2. **Execution of Research**

3. **Data Analysis**
   - Analyse Quantitative/ Qualitative information
   - Control Quality

4. **Draw Conclusions**

Examination Scheme:

Components	**V**	**S**	**R**	**FP**
Weightage (%)	20	20	20	40

V – Viva, S – Synopsis, FP – Final Presentation, R - Report

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MOBILE COMPUTING

Course Code: NCE6710 **Credit Units : 03**

Course Objective:
The objective of this consortium is to shape and expand a full-scale and sound mobile computing system market. To achieve this, cooperation is required of interests related to communication (network), computer hardware/software, system integrators (including service providers), and the media.

Course Contents:

Module I: Introduction to Personal Communications Services (PCS)
PCS Architecture, Mobility management, Networks signaling.
Global System for Mobile Communication (GSM) system overview: GSM Architecture, Mobility management, Network signaling.

Module II: General Packet Radio Services (GPRS) &Wireless Application Protocol (WAP)
GPRS Architecture, GPRS Network Nodes.
Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 standard, Mobile IP.
Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, wireless mark up Languages (WML).

Module III: Third Generation (3G) Mobile Services
Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G.
Wireless Local Loop(WLL): Introduction to WLL Architecture, wireless Local Loop Technologies.

Module IV: Global Mobile Satellite Systems
Global Mobile Satellite Systems; case studies of the IRIDIUM and GLOBALSTAR systems.

Module V:Enterprise Networks
Introduction to Virtual Networks, Blue tooth technology, Blue tooth Protocols. Advanced techniques in mobile computing.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- "Wireless and Mobile Networks Architectures", by Yi-Bing Lin & Imrich Chlamtac, John Wiley & Sons, 2001.
- "Mobile and Personal Communication systems and services", by Raj Pandya, Prentice Hall of India, 2001.

References:
- "Guide to Designing and Implementing wireless LANs", by Mark Ciampa, Thomson learning, Vikas Publishing House, 2001.
- "Wireless Web Development", Ray Rischpater, Springer Publishing, 2000.
- "The Wireless Application Protocol", by Sandeep Singhal, Pearson Education Asia, 2000.
- "Third Generation Mobile Telecommunication systems", by P.Stavronlakis, Springer Publishers, 2001.

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NETWORK AND WIRELESS SECURITY

Course Code: NCE6802 **Credit Units : 03**

Course Contents:

Module-I: INTRODUCTION

Network concepts – Threats in networks – Network security controls – Importance of security – Threat models – Security concepts – Common mitigation methods

Why is Wireless Different? Introduction ,Protecting the Means Of Communication Protecting Privacy, Promoting Safety ,The Personal and the Public ,Shaking Up the Status Quo ,Understanding Wireless Forecasts ,Reasonable Degrees of Security, Regulatory Environments and Issues ,Security-Related Regulations ,Security Related Market Factors, Guidelines for Security Measures, Cellular Networks and Bearer Technologies ,First-Generation Wireless (1G), Second-Generation Wireless (2G), Spread Spectrum ,Code Division Multiple Access (CDMA) ,Time Division Multiple Sccess (TDMA) ,Global System for Mobile Communications (GSM) ,Third-Generation Wireless (3G) ,Short Message Service (SMS) ,Fourth-Generation Wireless (4G)

Module-II: The Wireless Local Area Network (WLAN)

Wireless Transmission Media ,Infrared Systems ,Narrowband Radio Systems ,Wideband Radio Systems: SpreadSpectrum ,Frequency-Hopping Spread Spectrum (FHSS) ,Direct-Sequence Spread Spectrum (DSSS) ,WLAN Products and Standards—Today's Leaders? ,802.11 Security? ,IEEE 802.11b ,Securing WLANs ,Eavesdropping ,Unauthorized Access ,Interference and Jamming ,Physical Threats ,Countermeasures ,Frequency-Hopping Spread Spectrum (FHSS), Direct-Sequence Spread Spectrum (DSSS) ,Infrared (IR) ,Narrowband ,The Infamous WEP ,Encryption ,Authentication ,Wired Equivalency Protocol Flaws Too Public ,Other Authentication Techniques ,Physical Security.

Module-III: Wireless Application Protocol(WAP)

Comparison of the TCP/IP, OSI, and WAP Models, How WAP Works ,The Security Status of WAP ,Viruses ,Authorization ,Non-repudiation ,Authentication ,Secure Sessions ,Security Products ,Securant Technologies ClearTrust Control ,WAP Security Architecture ,Marginal Security ,Wireless Access to the Internet ,Wireless Middleware

Module-IV: Wireless Transport Layer Security (WTLS)

Secure Socket Layer, Record Protocol, SSL Handshake Protocol ,Transport Layer Security, Advantages and Disadvantages of SSL/TLS ,Netscape ,Microsoft ,Entrust ,EAP-TLS ,Alternatives to SSL/TLS ,
IP Security (IPSec) ,Authentication Header Protocol (AH) ,Encapsulating Security Payload (ESP) ,Transport and Tunnel Modes, Secure Shell (SSH) ,SSH Transport Layer Protocol ,SSH Versus TLS Implementations ,Light Extensible Authentication Protocol (LEAP) ,Wireless Transport Layer Security and WAP ,Understanding Wireless Transport Layer Security ,WTLS Handshake Protocol ,WTLS Alert Protocol ,WTLS Change Cipher Protocol ,Pros and Cons of WTLS ,WTLS Vulnerabilities ,Implementations of WTLS

Module-V: Bluetooth Security

Bluetooth Basic Specifications ,Bluetooth Technology, Bluetooth Specification Development ,Design Decisions ,Piconets ,Bluetooth Security Architecture ,Scatternets ,The Bluetooth stack ,Security Functions at the Baseband Layer ,Security Functions of the Service Discovery Protocol ,Security Functions at the Link Layer ,Frequency-Hopping ,
Channel Establishment ,Security Manager ,Authentication,Authentication with the SAFER1 Block Cipher ,Encryption ,Encryption Modes ,Key Length Negotiation ,Encryption With the E0 Stream

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Cipher ,Threats to Bluetooth Security ,Jamming ,Bluetooth holes

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Nichols and Lekka, “Wireless Security-Models, Threats and Solutions”, Tata McGraw – Hill, New Delhi, 2006.
- Charles P. Fleeger, "Security in Computing", Prentice Hall, New Delhi, 2009
- Merritt Maxim and David Pollino, ”Wireless Security”, Osborne/McGraw Hill, New Delhi, 2005.

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CYBER CRIME AND IT LAW

Course Code: NCE6803 **Credit Units : 03**

Course Contents:

Module-I: Power of Arrest Without Warrant Under the IT Act, 2000: A Critique
Crimes of this Millennium, Section 80 of the IT Act, 2000 – A Weapon or a Farce, Forgetting the Line Between Cognizable and Non-Cognizable Offences, Necessity of Arrest without Warrant from Any Place, Public or Otherwise, Checks and Balances Against Arbitrary Arrests, Arrest for "About to Commit" an Offence Under the IT Act: A Tribute to Draco, Arrest, But No Punishment!

Module-II: Cyber Crime and Criminal Justice: Penalties, Adjudication and Appeals Under the IT Act, 2000
Concept of 'Cyber Crime' and the IT Act, 2000, Hacking, Teenage Web vandals, Cyber Fraud and Cyber cheating, Virus on the Internet, Defamation, Harassment and E-mail Abuse, Cyber Pornography, Other IT Act Offences, Monetary Penalties, Adjudication and Appeals Under IT Act, 2000, Network Service Providers, Jurisdiction and cyber Crimes, Nature of Cyber Criminality, Strategies to Tackle Cyber Crime and Trends, Criminal Justice in India and Implications on Cyber Crime.

Module-III: Jurisdiction in the Cyber World
Questioning the Jurisdiction and Validity of the Present Law of Jurisdiction, Civil Law of Jurisdiction in India, Cause of Action, Jurisdiction and the Information Technology Act,2000, Foreign Judgments in India, Place of Cause of Action in Contractual and IPR Disputes, Exclusion Clauses in Contracts, Abuse of Exclusion Clauses, Objection of Lack of Jurisdiction, Misuse of the Law of Jurisdiction, Legal Principles on Jurisdiction in the United States of America, Jurisdictional Disputes W.R.T. the Internet in the United States of America.

Module-IV: Battling Cyber Squatters and copyright Protection in the Cyber World
Concept of Domain Name and Reply to Cyber Squatters, Meta-Tagging, Legislative and Other Innovative Moves Against Cyber Squatting, The Battle Between Freedom and Control on the Internet, Works in Which Copyright Subsists and Meaning of Copyright, Copyright Ownership and Assignment, Licence of Copyright, Copyright Term and Respect for Foreign Works, Copyright Infringement, Remedies and Offences, Copyright Protection of Content on the Internet; Copyright Notice, Disclaimer and Acknowledgement, Downloading for Viewing Content on the Internet, Hyper-linking and Framing, Liability of ISPs for Copyright violations in the Cyber World: Legal Developments in the US, Napster and its Cousins: A Revolution on the Internet but a Crisis for Copyright Owners, Computer Software Piracy.

Module-V: Protection of Cyber Consumers in India
Are Cyber consumers Covered Under the Consumer Protection Act, Goods and Services, Consumer Complaint, Defect in Goods and Deficiency in Services, Restrictive and Unfair Trade Practices, Instances of Unfair Trade Practices, Reliefs Under CPA, Beware Consumers, Consumer Foras, Jurisdiction and Implications on Cyber Consumers in India, Applicability of CPA to Manufacturers, Distributors, Retailers and Service Providers Based in Foreign Lands Whose Goods are Sold or Services Provided to a consumer in India.

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- "Cyber Law Simplified" , Vivek Sood, TMH, 2001
- "Cyber Security, Cyber Crime and Cyber Forensics: Applications and Perspectives" Raghu Santanam, M. Sethumadhavan, Information Science Reference
- Cyberlaw – The Indian Perspective By Pavan Duggal, Saakshar Law Publications.
- Jonathan Rosenoer,"Cyber Law: The law of the Internet", Springer-Verlag, 1997

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CYBER CRIME INVESTIGATON & FORENSICS

Course Code: NCE6804 **Credit Units : 03**

Course Contents:

Module-I: Computer Forensics and Investigations as a Profession, Understanding
Computer Forensics ,Computer Forensics Versus Other Related Disciplines ,A Brief History of Computer Forensics, Understanding Case Law ,Developing Computer Forensics Resources ,Preparing for Computer Investigations, Understanding Law Enforcement Agency Investigations, Following the Legal Processes, Understanding Corporate Investigations, Establishing Company Policies, Displaying Warning Banners ,Designating an Authorized Requester, Conducting Security Investigations, Distinguishing Personal and Company Property ,Maintaining Professional Conduct.

Module-II: Understanding Computer Investigations
Preparing a Computer Investigation, An Overview of a Computer Crime ,An Overview of aCompanyPolicy Violation ,Taking a Systematic Approach ,Assessing the Case ,Planning Your Investigation ,Securing Your Evidence ,Procedures for Corporate High-Tech Investigations, Employee Termination Cases,InternetAbuse Investigations-mail Abuse Investigations, Attorney-Client Privilege Investigations, Media Leak Investigations, Industrial Espionage Investigations, Interviews and Interrogations in High-Tech Investigations ,Understanding Data Recovery Workstations and Software, Setting Up Your Workstation for Computer Forensics ,Conducting an Investigation, Gathering the Evidence ,Understanding Bit-stream Copies ,Acquiring an Image of EvidenceMedia,UsingProDiscoverBasic to Acquire a USB Drive ,Analyzing Your Digital Evidence, Completing the Case, Critiquing the Case

Module-III: Data Acquisition
Understanding Storage Formats for Digital Evidence, Raw Format, Proprietary Formats,
Advanced Forensic Format ,Determining the Best Acquisition Method, Contingency Planning for Image Acquisitions ,Using Acquisition Tools ,Windows XP Write-Protection with USB Devices, Acquiring Data with a Linux Boot CD,Capturing an Image with ProDiscover Basic ,Capturing an Image with Access Data FTK Imager ,Validating Data Acquisitions ,Linux Validation Methods, Windows Validation Methods ,Performing RAID Data Acquisitions ,Understanding RAID ,Acquiring RAID Disks ,Using Remote Network Acquisition Tools ,Remote Acquisition with ProDiscover,Remote Acquisition with EnCase Enterprise , Remote Acquisition with R-Tools R-Studio ,Remote Acquisition with WetStone Livewire, Remote Acquisition with F-Response ,Remote Acquisition with Runtime Software ,Using Other Forensics Acquisition Tools,SnapBack DatArrest ,NTI SafeBack,DIBS USA RAID ,Look Investigator I imager ,ASRData SMART ,Australian Department of Defence PyFlag,

Module-IV: Processing Crime and Incident Scenes
Identifying Digital Evidence, Understanding Rules of Evidence ,Collecting Evidence in Private-Sector Incident Scenes, Processing Law Enforcement Crime Scenes ,Understanding Concepts and Terms Used in Warrants ,Preparing for a Search ,Identifying the Nature of the Case, Identifying the Type of Computing System, Determining Whether You Can Seize a Computer, Obtaining a Detailed Description of theLocation,Determining Who Is in Charge, Using Additional Technical Expertise ,Determining the Tools You Need ,Preparing the Investigation Team, Securing a Computer Incident or Crime Scene ,Seizing Digital Evidence at the Scene ,Preparing to Acquire Digital Evidence, Processing an IncidentorCrime Scene ,Processing Data Centers with RAID Systems ,Using a Technical Advisor, Documenting Evidence in the Lab,Processing and Handling Digital Evidence ,Storing Digital Evidence, Evidence Retention and Media Storage Needs, Documenting Evidence ,Obtaining a Digital

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Hash, Reviewing a Case ,Sample Civil Investigation ,Sample Criminal Investigation ,Reviewing Background Information for a Case ,Identifying the Case Requirements, Planning the Investigation ,Conducting the Investigation: Acquiring Evidence withAccessData FTK

Module-V: Current Computer Forensics Tools,

Evaluating Computer Forensics Tool Needs ,Types of Computer Forensics Tools ,Tasks Performed by Computer Forensics Tools, Tool Comparisons ,Other Considerations for Tools ,Computer Forensics Software Tools, Command-Line Forensics Tools, UNIX/Linux Forensics Tools ,Other GUI Forensics Tools, Computer Forensics Hardware Tools, Forensic Workstations,

Using a Write-Blocker, Recommendations for a Forensic Workstation,Validating and Testing Forensics Software ,Using National Institute of Standards and Technology (NIST) Tools ,Using Validation Protocols

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Recommended Books:

- Nelson Phillips and Enfinger Steuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.
- Kevin Mandia, Chris Prosise, Matt Pepe, "Incident Response and Computer Forensics ", Tata McGraw -Hill, New Delhi, 2006.
- Robert M Slade," Software Forensics", Tata McGraw - Hill, New Delhi, 2005.
- Bernadette H Schell, Clemens Martin, "Cybercrime", ABC – CLIO Inc, California, 2004.
- "Understanding Forensics in IT ", NIIT Ltd, 2005.

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INTRUSION DETECTION AND PREVENTION SYSTEM

Course Code: NCE6805 **Credit Units : 03**

Course Contents:

Module-I: Network Attacks: Attack Taxonomies,Probes: IPSweep and PortSweep, NMap , MScan, SAINT , Satan Privilege Escalation Attacks:Buffer Overflow Attacks, Misconfiguration Attacks , Race-condition Attacks , Man-in-the-Middle Attacks.Social Engineering Attacks**.** Denial of Service (DoS) and Distributed Denial of Service(DDoS) Attacks: Detection Approaches for DoS and DDoS Attacks **,** Prevention and Response for DoS and DDoS Attacks **,** Examples of DoS and DDoS Attacks. Worms Attacks **:**Modeling and Analysis of Worm Behaviors, Detection and Monitoring of Worm Attacks **,** Worms Containment**,** Examples of Well Known Worm Attacks. Routing Attacks:OSPF Attacks,BGP Attacks.

Module-II: Detection Approaches: Misuse Detection: Pattern Matching,Rule-based Techniques, State-based Techniques,Techniques based on Data Mining Anomaly Detection:Advanced Statistical Models,Rule based Techniques,Biological Models,Learning Models Specification-based Detection, Hybrid Detection

Module-III: Theoretical Foundation of Detection: Taxonomy of Anomaly Detection Systems, Fuzzy Logic, Bayes Theory, Artificial Neural Networks, Support Vector Machine (SVM), Evolutionary Computation, Association Rules, Clustering, Signal Processing Techniques Based Models, Comparative Study of Anomaly Detection Techniques.

Module-IV: Architecture and Implementation: Centralized, Distributed, Cooperative Intrusion Detection,Alert Management and Correlation: Data Fusion, Alert Correlation, Cooperative Intrusion Detection

Module-V: Evaluation Criteria & Intrusion Response:
Accuracy, Performance, Completeness, Timely Response, Adaptation and Cost-Sensitivity, Intrusion Tolerance and Attack Resistance, Test, Evaluation and Data Sets.
Response Type, Response Approach, Survivability and Intrusion Tolerance, case study of any commercial IDS.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Recommended Books:

- Ali A. Ghorbani, Wei Lu, "Network Intrusion Detection and Prevention: Concepts and Techniques",
- Springer, 2010.
- Carl Enrolf, Eugene Schultz, Jim Mellander, "Intrusion detection and Prevention", McGraw Hill, 2004
- Paul E. Proctor, "The Practical Intrusion Detection Handbook ",Prentice Hall , 2001.
- Ankit Fadia and Mnu Zacharia, "Intrusiion Alert", Vikas Publishing house Pvt., Ltd, 2007.
- Earl Carter, Jonathan Hogue, "Intrusion Prevention Fundamentals", Pearson Education, 2006.

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CRYPTOGRAPHY FOUNDATION LAB

Course Code: NCE6806 **Credit Units : 01**

Course Contents:

- Program to implement division theorem
- checking number is prime or composite using simple logic
- Implement Miller Rabin Primality Algorithm
- Implement Euclid and Extended Algorithm.
- Implement Chinese Remainder Theorem
- Implement Baby Step Giant Step Algorithm.
- Implement at least 2 algorithms for random number generation. One is Blum Blum Shub.
- Implement Modular Exponentiation Algorithm
- Implement algorithm for modular linear equation solver.
- Implement Fermat's and Euler's theorem.
- Implement Fermat's Factorization method.
- Few programs based on Probability Theory and theorems

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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WEB SECURITY LAB

Course Code: NCE6807 **Credit Units : 01**

Exercises related to SQL injection attacks, XSS attacks, writing java script files for launching and preventing XSS attacks, Stored and Reflected XSS Attacks,URLinterpretation attack, input validation attack, buffer overflow attacks, impersonation attacks, password-based attacks, denial of service attacks, session hijacking
Use Apache Web Server or Xamp Server and create a temporary site for performing attacks.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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NETWORK & WIRELESS SECURITY LAB

Course Code: NCE6808 **Credit Units : 01**

Course Contents:

- Learn to install wine / virtual box/vmware or any other equivalent software on the host os.
- Perform an experiment to grab a banner with telnet and perform the task using netcat utility.
- Banner grabbing is a technique to determine which application or service is running on the specified port by attempting to make a connection to this host.
- Perform an experiment for port scanning with nmap, superscan or any other software.
- Using nmap 1)find open ports on a system 2) find the machines which are active 3)find the version of remote os on other systems 4) find the version of s/w installed on other system
- Perform an experiment on active and passive fingerprinting using xprobe2 and nmap.
- Performa an experiment to demonstrate how to sniff for router traffic by using the tool wireshark
- Perform an experiment how to use dumpsec.
- Perform an wireless audit of an access point / router and decrypt wep and wpa.
- Perform an experiment to sniff traffic using arp poisoning.
- Generating password hashes with openssl

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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RESEARCH METHODOLOGY AND TECHNICAL REPORT WRITING

Course Code: NCE6809 **Credit Units : 02**

Course Objectives:

The course will enhance scientific , technical and research writing skills and impart knowledge about various stages of research process, statistical analysis, statistical tests and their applications in statistical decision making.

Course Contents:

Module I: Introduction to research: Definition, motivation, need, objectives, significance and characteristics of research; types of research; steps in research process; planning a research proposal; literature review, web searching.

Module II: Population and sample, parameter and statistic, sampling and data collection, sampling design: steps, types, sample size, sampling methods, large and small samples, primary and secondary data, data processing and analysis. Sample surveys and questionnaire designing, scaling techniques.

Module III: Dependent and independent variables, univariate, bivariate and multivariate analysis, means-arithmetic, geometric and harmonic; measure of dispersion of data, standard deviation, variance, coefficient of variation and degree of freedom. Hypothesis testing: null hypothesis and alternate hypothesis, errors in hypothesis testing, significance and confidence levels, parametric tests and non-parametric tests, one-tailed and two-tailed tests, analysis of variance. Regression analysis and curve fitting, method of least-squares, explained and unexplained variations, coefficient of correlation, coefficient of determination**.**

Module IV: Technical/scientific/research report writing: structure and components of scientific reports, formats of dissertations, research report, report writing skills, report preparation, referencing , bibliography and footnotes. Making presentation-use of visual aids and PPTs. Publication of research papers, citations,. Intellectual property rights and copy rights, plagiarism, patents and patent laws, commercialization and ethical issues.

Examination Scheme:

Attendance	Assignment/Library consultation / Thesis writing	Class test	Final Exam	Total
5	15	10	70	100

Text Books:

- Blake, G. and Bly, R.W. 1993, The Elements of Technical Writing. MacMillan, New York
- Booth, V. 1981. Writing a Scientific Paper and Speaking at Scientific Meetings. The Biochemical Society, London
- Chawla,D and Sondhi, N. 2016, Research Methodology- Concepts and Cases. Vikas Publishing House Pvt Ltd. New Delhi
- Kothari, C.R.2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.

Reference Books:

- Geode, Millian J.& Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Montomery, Douglas C.(2007), 5th Ed. Design and Analysis of Experiments, Wiley India.
- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt.Ltd., New Delhi-110001
- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patpargang, Delhi- 110092

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MAJOR PROJECT

Course Code: NCE6837 **Credit Units : 08**

GUIDELINES FOR PROJECT FILE

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage.

The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

In general, the File should be comprehensive and include

A short account of the activities that were undertaken as part of the project;

A statement about the extent to which the project has achieved its stated goals.

A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;

Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project;

Any problems that have arisen that may be useful to document for future reference.

- **Report Layout**

The report should contain the following components:

- **Title or Cover Page**

The title page should contain the following information: Project Title; Student's Name; Course; Year; Supervisor's Name.

- **Acknowledgements**(optional)

Acknowledgment to any advisory or financial assistance received in the course of work may be given.

- **Abstract**

A good"Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project

- **Table of Contents**

Titles and subtitles are to correspond exactly with those in the text.

- **Introduction**

Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

- **Materials and Methods**

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This section should aim at experimental designs, materials used. Methodology should be mentioned in details including modifications if any.

- **Results and Discussion**

Present results, discuss and compare these with those from other workers, etc. In writing these section, emphasis should be given on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

Note that in writing the various secions, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary never write in "point" form.

- **Conclusion**

A conclusion should be the final section in which the outcome of the work is mentioned briefly.

- **Future prospects**

- **Appendices**

The Appendix contains material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

- **References / Bibliography**

This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Examples

For research article

Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichia coli* O157: H7. *Clin Microbiol Infect*, **8** (suppl 1): 116–117.

For book

Kowalski,M.(1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67

ASSESSMENT OF THE PROJECT FILE

Essentially, marking will be based on the following criteria: the quality of the report, the technical merit of the project and the project execution.
Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project.
Project execution is concerned with assessing how much work has been put in.
The File should fulfill the following ***assessment objectives:***

Range of Research Methods used to obtain information

Execution of Research

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Data Analysis
Analyse Quantitative/ Qualitative information
Control Quality

Draw Conclusions

Examination Scheme:

Dissertation	50
Viva Voce	50
Total	**100**

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BIOMETRIC SYSTEMS AND BIOMETRIC IMAGE PROCESSING

Course Code: NCE6901 **Credit Units : 03**

Course Contents:

Module-I:
Introduction: Biometric fundamentals – Biometric technologies – Biometrics Vs traditional techniques – Characteristics of a good biometric system – Benefits of biometrics – Key biometric processes:verification, identification and biometric matching – Performance measures in biometric systems, FAR,FRR, FTE rate, EER and ATV rate, Applications of Biometric Systems, Security and Privacy Issues.
Physiological Biometrics : Leading technologies : Finger-scan – Facial-scan – Iris-scan – Voice-scan – components, working principles, competing technologies, strengths and weaknesses – Other physiological biometrics : Hand-scan, Retina-scan – components, working principles, competing technologies, strengths and weaknesses – Automated fingerprint identification systems.

Module-II:
Behavioral Biometrics: Leading technologies: Signature-scan – Keystroke scan – components, working principles, strengths and weaknesses.
Privacy and Standards in Biometrics: Assessing the Privacy Risks of Biometrics – Designing Privacy-Sympathetic Biometric Systems – Need for standards – different biometric standards.

Module-III:
Fundamentals of Image Processing: Digital Image representation - Fundamental steps in Image Processing Image Enhancement: The Spatial Domain Methods, The Frequency Domain Methods – Image Segmentation: Pixel Classification by Thresholding, Histogram Techniques, Smoothing and Thresholding - Gradient Based Segmentation: Gradient Image, Boundary Tracking, Laplacian Edge Detection.

Module-IV:
Fingerprint Biometrics: Fingerprint Patterns, Fingerprint Features, Fingerprint Image, width between two ridges - Fingerprint Image Processing - Minutiae Determination - Fingerprint Matching: Fingerprint Classification, Matching policies.

Module-V:
Iris Biometrics: Iris System Architecture, Definitions and Notations - Iris Recognition: Iris location, Doubly Dimensionless Projection, Iris code, Comparison - Coordinate System: Head Tilting Problem, Basic Eye Model, Searching Algorithm, Texture Energy Feature.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Recommended Books:

- Anil K Jain, Patrick Flynn, Arun A Ross, "Handbook of Biometrics", Springer, 2008
- Anil K Jain, Arun A Ross, Karthik Nandakumar, "Introduction to Biometrics", Springer, 2011
- Rafael C.Gonzalez, Richard E.Woods, Steven L.Eddins, "Digital Image Processing", Pearson
- Education, New Delhi, 2009

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SOFTWARE VULNERABILITY ANALYSIS

Course Code: NCE6902 **Credit Units : 04**

Course Contents:

Module-I: Introduction to Software Security
It's All about the Software, Dealing with Widespread Security Failures, Bugtraq, CERT Advisories, RISKS Digest, Technical Trends Affecting Software Security, The ilities, What is Security?, Isn't That Just Reliability?, Penetrate and Patch Is Bad, On Art and Engineering, Security Goals, Prevention, Traceability and Auditing, Monitoring, Privacy and Confidentiality, Multilevel Security, Anonymity, Authentication, Integrity, Know Your Enemy: Common Software Security Pitfalls, Software Project Goals, Conclusion. **Managing Software Security Risk:** An Overview of Software Risk Management for Security, The Role of Security Personnel, Software Security Personnel in the Life Cycle, Deriving Requirements, Risk Assessment, Design for Security, Implementation, Security Testing, A dose of Reality, Getting People to Think about Security, Software Risk management in Practice, When Development Goes Astray, When Security Analysis Goes Astray, The Common Criteria.

Module-II: On Open Source and Closed Source
Security by Obscurity, Reverse Engineering, Code Obfuscation, Security for Shrink-Wrapped Software, Security by Obscurity Is No Panacea, The Flip Side: Open- Source Software, Is the "Many-Eyeballs Phenomenon" Real?. Why Vulnerability Detection Is Hard, Other Worries, On Publishing Cryptographic Algorithms, Two More Open-Source Fallacies, The Microsoft Fallacy, The Java Fallacy, An Example: GNU Mailman Security, More Evidence: Trojan Horses, To Open Source or Not to Open Source, Another Security Lesson from Buffer Overflows, Beating the Drum.
Guiding Principles for Software Security: Principle1: Secure the Weakest Link, Principle 2: Practice Defense in Depth, Principle 3: Fail Securely, Principle 4: Follow the Principle of Least Privilege, Principle 5: Compartmentalize, Principle 6: Keep It Simple, Principle 7: Promote Privacy, Principle 8: Remember That Hiding Secrets is Hard, Principle 9: Be Reluctant to Trust, Principle 10: Use Your Community Resources Conclusion.

Module-III: Buffer Overflows & Access Control
What Is a Buffer Overflow?, Why Are Buffer Overflows a Security Problem?, Defending against Buffer Overflow, Major Gotchas, Internal Buffer Overflows, More Input Overflows, Other Risks, Tools That Can Help, Smashing Heaps and Stacks, Heap Overflows, Stack Overflows, Decoding the Stack, To Infinity … and Beyond!, Attack Code, A UNIX Exploit, What About Windows?The UNIX Access Control Model, How UNIX Permissions Work, Modifying File Attributes, Modifying Ownership, The unask, The Programmatic Interface, Setuid Programming, Access Control in Windows NT, Compartmentalization, Fine-Grained Privileges.

Module-IV: NETWORKING
OSI Model, Sockets, Socket Functions, Socket Addresses, Network Byte Order, Internet Address Conversion, A Simple Server Example, A Web Client Example, A Tinyweb Server, Peeling Back the Lower Layers, Data-Link Layer, Network Layer, Transport Layer , Network Sniffing, Raw Socket Sniffer, libpcap Sniffer, Decoding the Layers, Active Sniffing, Denial of Service, SYN Flooding, The Ping of Death, Teardrop, Ping Flooding, Amplification Attacks, Distributed DoS Flooding, TCP/IP Hijacking, RST Hijacking, Continued Hijacking, Port Scanning, Stealth SYN Scan, FIN, X-mas, and Null Scans, Spoofing Decoys, Idle Scanning, Proactive Defense (shroud), Reach Out and Hack Someone, Analysis with GDB, Almost Only Counts with Hand Grenades, Port-Binding Shellcode.

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Module-V: SHELLCODE

Assembly vs. C, Linux System Calls in Assembly, The Path to Shellcode, Assembly Instructions Using the Stack, Investigating with GDB, Removing Null Bytes, Shell-Spawning Shellcode, A Matter of Privilege, And Smaller Still, Port-Binding Shellcode, Duplicating Standard File Descriptors, Branching Control Structures, Connect-Back Shellcode.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Recommended Books:

- "Building Secure Software: How to Avoid Security Problems the Right Way" John Viega, Gary R. Tata McGraw Hill
- Michael Howard, David LeBlanc, John Viega: 19 Deadly Sins of Software Security: Programming Flaws and How to Fix Them (Security One-off) (Addison-Wesley Professional Computing Series)
- Richard Sinn " Software Security , Theory Programming and Practice" Cengage Learning

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APPLIED CRYPTOGRAPHY

Course Code: NCE6903 **Credit Units : 03**

Course Contents:

Module-I:
Introduction to security attacks, services and mechanism, Classical encryption techniques: substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers. Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard (DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES

Module-II:
Advanced Encryption Standard (AES) encryption and decryption, Analysis, Principals of public key crypto systems, RSA algorithm, security of RSA. Rabin cryptosystem, Elgamal cryptosystem, Elliptical Curve cryptography,

Module-III:
Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, Random Oracle Model , hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA),SHA-512, Whirlpool, Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS).

Module-IV:
Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure. Entity authentication, Authentication Applications: Kerberos,

Module-V:
IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Introduction to Secure Socket Layer, Secure electronic transaction (SET).

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Recommended books:

- "Cryptography & Network Security", William Stallings, PHI
- "Cryptography & Network Security", Behrouz A. Forouzan, TMH
- "Cryptography & Network Security", Atuk Kahate, PHI

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BIOMETRIC IMAGE PROCESSING LAB

Course Code: NCE6904 **Credit Units : 01**

List of Exercises

Basic exercises on image loading, manipulation, edge finding, features extraction, face recognition, segmentation, fingerprint, iris, signature recognition.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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APPLIED CRYPTOGRAPHY LAB

Course Code: NCE6905 **Credit Units : 02**

Course Contents:

- Program to implement Ceaser Cipher.
- Program to implement Ceaser Cipher for any value of shift parameter.
- Programs to implement Playfair cipher, affine cipher, vegnere cipher.
- Program to implement Vernam Cipher.
- Program to implement Hill Cipher.
- Program to implement Rail fence and Columnar transposition cipher.
- Program to implement DES/AES/IDEA algorithm
- Program to implement RSA algorithm
- Program to implement Rabin Cryptosystem and Elgamal Cryptsystem.
- Program to implement Digital Signature using RSA/Elgamal.
- Implementation study of MD5/SHA-1.
- Programs to implement ECB/CBC/OFB modes of operation.

Software: C/C++/Python/Java

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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WEB APPLICATION & PENETRATION TESTING

Course Code: NCE6906 **Credit Units : 03**

Course Contents:

Module-I: Introduction to Web Applications and Security
The Web Application Architecture ,A Brief Word about HTML ,Transport: HTTP ,The Web Client ,The Web Server,The Web Application ,The Database ,Complications and Intermediaries ,The New Model: Web Services ,Potential Weak Spots ,The Methodology of Web Hacking ,Profile the Infrastructure ,Attack Web Servers ,Survey the Application,Attack the Authentication Mechanism ,Attack the Authorization Schemes , Perform a Functional Analysis,Exploit the Data Connectivity,Attack the Management Interfaces,Attack the Client,Launch a Denial-of-Service Attack Profiling: Server Discovery,Intuition ,Internet Footprinting, DNS Interrogation Ping,Discovery Using Port Scanning , Dealing with Virtual Servers, Service Discovery , Server Identification,Dealing with SSL.

Module-II: Hacking Web Servers
Common Vulnerabilities by Platform ,Apache,Microsoft Internet Information Server (IIS), Attacks Against IIS Components, Attacks Against IIS, Escalating Privileges on IIS, Netscape Enterprise Server , Other Web Server Vulnerabilities , Miscellaneous Web Server Hacking Techniques , Automated Vulnerability Scanning Software ,Whisker, Nikto , twwwscan/arirang , Stealth HTTP Scanner, Typhon , WebInspect , AppScan , FoundScan Web Module , Denial of Service Against Web Servers,

Module-III: Surveying the Application
Documenting Application Structure , Manually Inspecting the Application , Statically and Dynamically Generated Pages, Directory Structure , Helper Files , Java Classes and Applets , HTML Comments and Content ,Forms, Query Strings , Back-End Connectivity , Tools to Automate the Survey, lynx , Wget,Teleport Pro, Black Widow, WebSleuth, Common Countermeasures , A Cautionary Note, Protecting Directories,Protecting Include Files, Miscellaneous Tips. Authentication: Authentication Mechanisms, HTTP Authentication: Basic and Digest, Forms-Based Authentication, Microsoft Passport, Attacking Web Authentication,Password Guessing, Session ID Prediction and Brute Forcing, Subverting Cookies,Bypassing SQL-Backed Login Forms,Bypassing Authentication.

Module-IV: Authorization
The Attacks, Role Matrix, The Methodology , Query String, POST Data , Hidden Tags, URI,HTTP Headers,Cookies, Final Notes,Case Study: Using Curl to Map Permissions, Apache Authorization, IIS AuthorizationAttacking Session State Management:Client-Side Techniques, Hidden Fields, The URL,HTTP Headers and Cookies, Server-Side Techniques, Server-Generated Session IDs, Session Database, SessionID Analysis, Content Analysis, Time Windows.

Module-V: Input Validation Attacks
Expecting the Unexpected, Input Validation EndGame, Where to Find Potential Targets,Bypassing Client-Side Validation Routines , Common Input Validation Attacks , Buffer Overflow, Canonicalization (dot-dot-slash),Script Attacks , Boundary Checking, Manipulating the Application , SQL Injection and Datastore Attacks,Command Execution, Common Side Effects,Common Countermeasures. Attacking Web Datastores: A SQL Primer,SQL Injection, Common Countermeasures. Web Client Hacking :The Problem of Client-Side Security,Attack Methodologies ,Active Content Attacks ,Java and JavaScript ,ActiveX,Cross-Site Scripting,Cookie Hijacking ,Case Study #: From the URL to the Command Line and Back,Case Study #: The Cross-Site Scripting Calendar

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Recommended Books:

- "Hacking Exposed Web Applications", 3rd edition, JOEL SCAMBRAY, VINCENT LIU, CALEB SIMA.
- "The Web Application Hacker's Handbook Discovering and Exploiting Security Flaws" Dafydd Stuttard, Marcus Pinto
- Rich Bowen, Ken Coar, "Apache Cookbook", O'Reilly

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MALWARE ANALYSIS IN NETWORK SECURITY

Course Code: NCE6907 **Credit Units : 03**

Course Contents:

Module-I: BASIC STATIC TECHNIQUES

Antivirus Scanning: A Useful First Step, Hashing: A Fingerprint for Malware, Finding Strings, Packed and Obfuscated Malware, Packing Files, Detecting Packers with PEiD, Portable Executable File Format, Linked Libraries and Functions, Static, Runtime, and Dynamic Linking, Exploring Dynamically Linked Functions with Dependency Walker, Imported Functions, Exported Functions , Static Analysis in Practice, PotentialKeyloggerexe: An Unpacked Executable, PackedProgramexe: A Dead End, The PE File Headers and Sections, Examining PE Files with PEview, Viewing the Resource Section with Resource Hacker, Using Other PE File Tools, PE Header Summary

Module-II: VIRTUAL MACHINES & DYNAMIC ANALYSIS

The Structure of a Virtual Machine, Creating Your Malware Analysis Machine, Configuring VMware, Using Your Malware Analysis Machine, Connecting Malware to the Internet, Connecting and Disconnecting Peripheral Devices, Taking Snapshots, Transferring Files from a Virtual Machine, The Risks of Using VMware for Malware Analysis, Record/Replay: Running Your Computer in Reverse, Sandboxes: The Quick-and-Dirty Approach Using a Malware Sandbox , Sandbox Drawbacks, Running Malware, Monitoring with Process Monitor, The Procmon Display, Filtering in Procmon, Viewing Processes with Process Explorer, The Process Explorer Display, Using the Verify Option, Comparing Strings, Using Dependency Walker, Analyzing Malicious Documents, Comparing Registry Snapshots with Regshot, Faking a Network, Using ApateDNS, Monitoring with Netcat, Packet Sniffing with Wireshark, Using INetSim, Basic Dynamic Tools in Practice,

Module-III: RECOGNIZING C CODE CONSTRUCTS IN ASSEMBLY

Overview of working with IDA Pro, Global vs Local Variables, Disassembling Arithmetic Operations, Recognizing if Statements, Analyzing Functions Graphically with IDA Pro, Recognizing Nested if Statements, Recognizing Loops, Finding for Loops, Finding while Loops, Understanding Function Call Conventions, Cdecl, Stdcall, fastcall , Push vs Move ,Analyzing switch Statements ,If Style ,Jump Table ,Disassembling Arrays ,Identifying Structs ,Analyzing Linked List Traversal ,

Module-IV: ANALYZING MALICIOUS WINDOWS PROGRAMS

The Windows API, Types and Hungarian Notation, Handles, File System Functions, Special Files, The Windows Registry, Registry Root Keys, Regedit , Programs that Run Automatically, Common Registry Functions, Analyzing Registry Code in Practice, Registry Scripting with reg Files , Networking APIs , Berkeley Compatible Sockets, The Server and Client Sides of Networking, The WinINet API , Following Running Malware, DLLs , Processes, Threads ,Interprocess Coordination with Mutexes , Services , The Component Object Model , Exceptions: When Things Go Wrong ,Kernel vs User Mode , The Native API ,

Module-V: MALWARE BEHAVIOR & COVERT MALWARE LAUNCHING

Downloaders and Launchers, Backdoors, Reverse Shell, RATs, Botnets, RATs and Botnets Compared, Credential Stealers, GINA Interception, Hash Dumping, Keystroke Logging, Persistence Mechanisms, The Windows Registry, Trojanized System Binaries, DLL Load-Order Hijacking, Privilege Escalation, Using SeDebugPrivilege, Covering Its Tracks—User-Mode Rootkits, IAT Hooking, Inline Hooking, Launchers, Process Injection, DLL Injection, Direct Injection, Process Replacement, Hook Injection , Local and Remote Hooks, Keyloggers Using Hooks, Using SetWindowsHookEx, Thread

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Targeting, Detours, APC Injection, APC Injection from User Space, APC Injection from Kernel Space .

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Recommended Books:

- "Practical Malware Analysis" by Michael Sikorski and Andrew Honig
- "The Rootkit Arsenal: Escape and Evasion in the Dark Corners of the System" Second Edition by Reverend Bill Blunden
- "Rootkits: Subverting the Windows Kernel" by Jamie Butler and Greg Hoglund
- "Practical Reverse Engineering" by Dang, Gazet, Bachaalany

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WEB SECURITY

Course Code: NCE6908 **Credit Units : 03**

Course Contents:

Module-I: The E-Commerce Playground
Web Languages: The Babylon of the 21st Century, Languages of the Web, HTML, Dynamic HTML (DHTML).XML,XHTML,Perl,PHP,ColdFusion,Active Server Pages,CGI,Java. Web and Database Servers: Web Servers,Apache,Microsoft's Internet Information Server (IIS),Database Servers,Microsoft SQL Server, Oracle.

Module-II: Shopping Carts and Payment Gateways
Evolution of the Storefront,Electronic Shopping,Shopping Cart Systems,Scope and Lifetime of an Electronic Shopping Cart,Collecting, Analyzing, and Comparing Selected Components,Keeping Track of the Total Cost,Change of Mind,Processing the Purchase,Implementation of a Shopping Cart Application,Product Catalog,Session Management,Database Interfacing,Integration with the Payment Gateway,Examples of Poorly Implemented Shopping Carts,Carello Shopping Cart,DCShop Shopping Cart,Hassan Consulting's Shopping Cart,Cart32 and Several Other Shopping Carts,Processing Payments,Finalizing the Order,Method of Payment,Verification and Fraud Protection,Order Fulfillment and Receipt Generation,Overview of the Payment Processing System,Innovative Ways to Combat Credit Card Fraud,Order Confirmation Page,Payment Gateway Interface,Transaction Database Interface,Interfacing with a Payment Gateway—An Example,Payment System Implementation Issues,Integration,Temporary Information,SSL,Storing User Profiles,Vulnerabilities Caused by Poor Integration of Shopping Cart and Payment Gateway,PayPal—Enabling Individuals to Accept Electronic Payments,

Module-III: HTTP and HTTPS: The Hacking Protocols,Protocols of the Web,HTTP,HTTPS (HTTP over SSL).
URL: The Web Hacker's Sword: URL Structure,Web Hacker Psychology,URLs and Parameter Passing.
URL Encoding, Meta-Characters,Specifying Special Characters on the URL String.,Meta-Characters and Input Validation,Unicode Encoding,The Acme Art, Inc. Hack,Abusing URL Encoding,Unicode Encoding and Code Red's Shell Code,Unicode Vulnerability,The Double-Decode or Superfluous Decode Vulnerability,HTML Forms,Anatomy of an HTML Form,Input Elements,Parameter Passing Via GET and POST,Case Study: Reconnaissance Leaks Corporate Assets.

Module-IV: Web: Under (the) Cover.
The Components of a Web Application,The Front-End Web Server,The Web Application ExecutioEnvironment. The Database Server,Wiring the Components,The Native Application Processing Environment.,Web Server APIs and Plug-Ins,URL Mapping and Internal Proxying,Proxying with a Back-End Application Server.Examples. Connecting with the Database,The Craftiest Hack of Them All,Using Native Database APIs.Examples.
Using ODBC,Using JDBC,Specialized Web Application Servers,Identifying Web Application Components from URLs,The Basics of Technology Identification,Examples,More Examples,Advanced Techniques for Technology Identification,Examples,Identifying Database Servers,Countermeasures, Rule 1: Minimize Information Leaked from the HTTP Header,Rule 2: Prevent Error Information from Being Sent to the Browser.

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Module-V: Reading Between the Lines.

Information Leakage Through HTML,What the Browsers Don't Show You,Netscape Navigator—View | Page Source,Internet Explorer—View | Source,Clues to Look For,HTML Comments,Revision History,Developer or Author Details,Cross-References to Other Areas of the Web Application,Reminders and Placeholders, Comments Inserted by Web Application Servers,Old "Commented-Out" Code,Internal and External Hyperlinks,E-mail Addresses and Usernames,UBE, UCE, Junk Mail, and Spam,Keywords and Meta Tags,Hidden Fields,Client-Side Scripts,Automated Source Sifting Techniques,Using wget,Using grep,Sam Spade, Black Widow, and Teleport Pro.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Recommended Books:

- McClure, Stuart, Saumil Shah, and Shreeraj Shah. Web Hacking:attacks and defense. AddisonWesley. 2003.
- Garms, Jess and Daniel Somerfield. Professional Java Security. Wrox. 2001.

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DIGITAL WATERMARKING & STAGENOGRAPHY

Course Code: NCE6909 **Credit Units : 03**

Course Contents:

Module-I: Introduction Applications and Properties
Information Hiding, Steganography, and Watermarking , History of Watermarking , History of Steganography , Importance of Digital Watermarking , Importance of Steganography ,Applications of Watermarking , Applications of Steganography Steganography for Dissidents, Steganography for Criminals , Properties of Watermarking Systems , Evaluating Watermarking Systems , Properties of Steganographic and Steganalysis Systems , Evaluating and Testing Steganographic Systems

Module-II: Models of Watermarking
Notation , Communications ,Communication-Based Models of Watermarking , Geometric Models of Watermarking , Modeling Watermark Detection by Correlation
Watermarking with side information: Informed Embedding, Watermarking Using Side Information, Dirty-Paper Codes

Module-III: Practical Dirty-Paper Codes
Practical Considerations for Dirty-Paper Codes , Broad Approaches to Dirty-Paper Code Design , Implementing DM with a Simple Lattice Code , Typical Tricks in Implementing Lattice Codes
Coding with Better Lattices ,Making Lattice Codes Survive Valumetric Scaling Dirty-Paper Trellis Codes
Watermark Security : Security Requirements **,**Watermark Security and Cryptography Some Significant Known Attacks

Module-IV: Steganography
Steganographic Communication , The Channel , The Building Blocks , Notation and Terminology , Information-Theoretic Foundations of Steganography , Cachin's Definition of Steganographic Security , Practical Steganographic Methods , Statistics Preserving Steganography , Model-Based Steganography Masking Embedding as Natural Processing , Minimizing the Embedding Impact , Matrix Embedding, Nonshared Selection Rule,

Module-V: Steganalysis
Steganalysis Scenarios , Detection , Forensic Steganalysis , The Influence of the Cover Work on Steganalysis , Some Significant Steganalysis Algorithms , LSB Embedding and the Histogram Attack , Sample Pairs Analysis , Blind Steganalysis of JPEG Images Using Calibration, Blind Steganalysis in the Spatial Domain.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Recommended Books:

- "Digital Watermarking and Steganography"Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, Ton Kalker, , Margan Kaufmann Publishers, New York, 2008.
- "Digital Watermarking", Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Margan KaufmannPublishers, New York, 2003.
- "Techniques and Applications of Digital Watermarking and Contest Protection", Michael Arnold, Martin Schmucker, Stephen D. Wolthusen, Artech House, London, 2003.

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SUMMER INTERNSHIP EVALUATION-III

Course Code: NCE6935 **Credit Units : 06**

Guidelines:
There are certain phases of every Intern's professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship program can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal classroom situations. These attributes are intellectual ability, professional judgment and decision-making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc.

In order to achieve these objectives, each student will maintain a file (**Internship File**). The Internship File aims to encourage students to keep a personal record of their learning and achievement throughout the Programme. It can be used as the basis for lifelong learning and for job applications. Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development.

The File will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and their own personal contribution to the organization.

The **layout guidelines** for the Project & Seminar Report:

1. File should be in the following specification:
A4 size paper
Font: Arial (10 points) or Times New Roman (12 points)
Line spacing: 1.5
Top & bottom margins: 1 inch/ 2.5 cm
Left & right margins: 1.25 inches/ 3 cm

2. Report Layout: The report should contain the following components:
Front Page
Table of Content
Acknowledgement
Student Certificate
Company Profile (optional)
Introduction
Main Body
References / Bibliography

The File will include ***five sections*** in the order described below. The content and comprehensiveness of the main body and appendices of the report should include the following:

1. **The Title Page**--Title - An Internship Experience Report For (Your Name), name of internship organization, name of the Supervisor/Guide and his/her designation, date started and

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completed, and number of credits for which the report is submitted.
2. **Table of Content**--an outline of the contents by topics and subtopics with the page number and location of each section.
3. **Introduction**--short, but should include how and why you obtained the internship experience position and the relationship it has to your professional and career goals.
4. **Main Body**--should include but not be limited to daily tasks performed. Major projects contributed to, dates, hours on task, observations and feelings, meetings attended and their purposes, listing of tools and materials and their suppliers, and photographs if possible of projects, buildings and co-workers.
5. **References / Bibliography** --This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system

ASSESSMENT OF THE INTERNSHIP FILE

The student will be provided with the Student Assessment Record (SAR) to be placed in front of the Internship File. Each item in the SAR is ticked off when it is completed successfully. The faculty will also assess each item as it is completed. The SAR will be signed by the student and by the faculty to indicate that the File is the student's own work. It will also ensure regularity and meeting the delaines.

STUDENT ASSESSMENT RECORD (SAR)

5. **Range of Research Methods used to obtain information**

6. **Execution of Research**

7. **Data Analysis**
    - Analyse Quantitative/ Qualitative information
    - Control Quality

8. **Draw Conclusions**

Examination Scheme:

Components	**V**	**S**	**R**	**FP**
Weightage (%)	20	20	20	40

V – Viva, S – Synopsis, FP – Final Presentation, R - Report

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PROJECT-DISSERTATION-II

Course Code: NCE6037 **Credit Units: 15**

GUIDELINES FOR DISSERTATION

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage.

The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

In general, the File should be comprehensive and include

A short account of the activities that were undertaken as part of the project;

A statement about the extent to which the project has achieved its stated goals.

A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;

Any activities planned but not yet completed as part of the DISSERTION, or as a future initiative directly resulting from the project;

Any problems that have arisen that may be useful to document for future reference.

- Report Layout

The report should contain the following components:

- **Title or Cover Page**

The title page should contain the following information: Project Title; Student's Name; Course; Year; Supervisor's Name.

- **Acknowledgements** (optional)

Acknowledgment to any advisory or financial assistance received in the course of work may be given.

- **Abstract**

A good"Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project

- **Table of Contents**

Titles and subtitles are to correspond exactly with those in the text.

- **Introduction**

Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

- **Materials and Methods**

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This section should aim at experimental designs, materials used. Methodology should be mentioned in details including modifications if any.

- **Results and Discussion**

Present results, discuss and compare these with those from other workers, etc. In writing these section, emphasis should be given on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

Note that in writing the various secions, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary never write in "point" form.

- **Conclusion**

A conclusion should be the final section in which the outcome of the work is mentioned briefly.

- **Future prospects**

- **Appendices**

The Appendix contains material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

- **References / Bibliography**

This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Examples

For research article

Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichia coli* O157: H7. *Clin Microbiol Infect*, **8** (suppl 1): 116–117.

For book

Kowalski,M.(1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67

ASSESSMENT OF THE DISSERTATION FILE

Essentially, marking will be based on the following criteria: the quality of the report, the technical merit of the project and the project execution.
Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project.
Project execution is concerned with assessing how much work has been put in.
The File should fulfill the following ***assessment objectives:***

Range of Research Methods used to obtain information

Execution of Research

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Data Analysis
Analyse Quantitative/ Qualitative information
Control Quality

Draw Conclusions

Examination Scheme:

Dissertation	50
Viva Voce	50
Total	**100**

ata, leading to production of a structured report.

Selecting the Dissertation Topic
It is usual to give you some discretion in the choice of topic for the dissertation and the approach to be adopted. You will need to ensure that your dissertation is related to your field of specialization.

Deciding this is often the most difficult part of the dissertation process, and perhaps, you have been thinking of a topic for some time.

It is important to distinguish here between 'dissertation topic' and 'dissertation title'. The topic is the specific area that you wish to investigate. The title may not be decided until the dissertation has been written so as to reflect its content properly.

Few restrictions are placed on the choice of the topic. Normally we would expect it to be:
- relevant to business, defined broadly;
- related to one or more of the subjects or areas of study within the core program and specialisation stream;
- clearly focused so as to facilitate an in-depth approach, subject to the availability of adequate sources of information and to your own knowledge;
- of value and interest to you and your personal and professional development.

Planning the Dissertation
This will entail following:
- Selecting a topic for investigation.
- Establishing the precise focus of your study by deciding on the aims and objectives of the dissertation, or formulating questions to be investigated. Consider very carefully what is worth investigating and its feasibility.
- Drawing up initial dissertation outlines considering the aims and objectives of the dissertation. Workout various stages of dissertation
- Devising a timetable to ensure that all stages of dissertation are completed in time. The timetable should include writing of the dissertation and regular meetings with your dissertation guide.

The Dissertation plan or outline
It is recommended that you should have a dissertation plan to guide you right from the outset. Essentially, the dissertation plan is an outline of what you intend to do, chapter wise and therefore should reflect the aims and objectives of your dissertation.

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There are several reasons for having a dissertation plan

- It provides a focus to your thoughts.
- It provides your faculty-guide with an opportunity, at an early stage of your work, to make constructive comments and help guide the direction of your research.
- The writing of a plan is the first formal stage of the writing process, and therefore helps build up your confidence.
- In many ways, the plan encourages you to come to terms with the reading, thinking and writing in a systematic and integrated way, with plenty of time left for changes.
- Finally, the dissertation plan generally provides a revision point in the development of your dissertation report in order to allow appropriate changes in the scope and even direction of your work as it progresses.

Keeping records

This includes the following:

- Making a note of everything you read; including those discarded.
- Ensuring that when recording sources, author's name and initials, date of publication, title, place of publication and publisher are included. (You may consider starting a card index or database from the outset). Making an accurate note of all quotations at the time you read them.
- Make clear what is a direct a direct quotation and what is your paraphrase.

Dissertation format

All students must follow the following rules in submitting their dissertation.

- Front page should provide title, author, Name of degree/diploma and the date of submission.
- Second page should be the table of contents giving page references for each chapter and section.
- The next page should be the table of appendices, graphs and tables giving titles and page references.
- Next to follow should be a synopsis or abstract of the dissertation (approximately 500 words)
- Next is the 'acknowledgements'.
- Chapter I should be a general introduction, giving the background to the dissertation, the objectives of the dissertation, the rationale for the dissertation, the plan, methodological issues and problems. The limitations of the dissertation should also be hinted in this chapter.
- Other chapters will constitute the body of the dissertation. The number of chapters and their sequence will usually vary depending on, among others, on a critical review of the previous relevant work relating to your major findings, a discussion of their implications, and conclusions, possibly with a suggestion of the direction of future research on the area.
- After this concluding chapter, you should give a list of all the references you have used. These should be cross - references with your text. For articles from journals, the following details are required e.g.

  Draper P and Pandyal K. 1991, The Investment Trust Discount Revisited, Journal of Business Finance and Accounting, Vol18, No6, Nov, pp 791-832.

  For books, the following details are required:
  Levi, M. 1996, International Financial Management, Prentice Hall, New York, 3rd Ed, 1996

- Finally, you should give any appendices. These should only include relevant statistical data or material that cannot be fitted into the above categories.

The Layout Guidelines for the Dissertation

- A4 size Paper
  - Font: Arial (10 points) or Times New Roman (12 points)
  - Line spacing: 1.5

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- Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

Guidelines for the assessment of the Dissertation
While evaluating the dissertation, faculty guide will consider the following aspects:

1. Has the student made a clear statement of the objective or objective(s).
2. If there is more than one objective, do these constitute parts of a whole?
3. Has the student developed an appropriate analytical framework for addressing the problem at hand.
4. Is this based on up-to-date developments in the topic area?
5. Has the student collected information / data suitable to the frameworks?
6. Are the techniques employed by the student to analyse the data / information appropriate and relevant?
7. Has the student succeeded in drawing conclusion form the analysis?
8. Do the conclusions relate well to the objectives of the project?
9. Has the student been regular in his work?
10. Layout of the written report.

Assessment Scheme:

Continuous Evaluation:		40%
(Based on Abstract, Regularity, Adherence to initial plan, Records etc.)		
Final Evaluation: Based on,		60%
Contents & Layout of the Report,	20	
Conceptual Framework,	05	
Objectives & Methodology and	05	
Implications & Conclusions	10	
Viva & Presentation	20	

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Amity School of Engg. & Technology

Master of Technology - Data Science Engineering

FLEXILEARN

-Freedom to design your degree



Curriculum & Scheme of Examination

2023

AMITY UNIVERSITY HARYANA

GURUGRAM

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Manesar, Gurugram
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ADVANCED DATABASE MANAGEMENT SYSTEMS

Course Code: DSE4102 **Credit Units: 03**

Course Objective:
The objective of this course is to expose the students to the implementation techniques of database system. This course explains techniques for query processing and optimization with transaction and concurrency control techniques

Course Contents:
Module I: Relational Databases
Integrity Constraints revisited, Extended ER diagram, Relational Algebra & Calculus, Functional, Muiltivalued and Join Dependency, Normal Forms, Rules about functional dependencies.

Module II: Query Processing and Optimization
Valuation of Relational Operations, Transformation of Relational Expressions, Indexing and Query Optimization, Limitations of Relational Data Model, Null Values and Partial Information.
Objected Oriented and Object Relational Databases
Modeling Complex Data Semantics, Specialization, Generalization, Aggregation and Association, Objects, Object Identity, Equality and Object Reference, Architecture of Object Oriented and Object Relational Databases

Module III: Parallel and Distributed Databases
Distributed Data Storage – Fragmentation & Replication, Location and Fragment
Transparency Distributed Query Processing and Optimization, Distributed Transaction Modeling and concurrency Control, Distributed Deadlock, Commit Protocols, Design of Parallel Databases, Parallel Query Evaluation.
Advanced Transaction Processing
Nested and Multilevel Transactions, Compensating Transactions and Saga, Long Duration Transactions, Weak Levels of Consistency, Transaction Work Flows, Transaction Processing Monitors.

Module IV
Multimedia databases,Databases on the Web and Semi–Structured Data. Case Study: Oracle Xi
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance
Text & References:
***Text*:**
- Elmarsi, Navathe, Somayajulu, Gupta, "Fundamentals of Database Systems", 4th Edition, Pearson Education, 2007
- Garcia, Ullman, Widom, "Database Systems, The complete book", Pearson Education, 2007
- R. Ramakrishnan, "Database Management Systems", McGraw Hill International Editions, 1998

***References*:**
- Date, Kannan, Swaminathan, "An Introduction to Database Systems", 8th Edition Pearson Education, 2007
- Singh S.K., "Database System Concepts, design and application", Pearson Education, 2006.
- Silberscatz, Korth, Sudarshan, "Database System Concepts", Mcgraw Hill, 6th Edition, 2006
- W. Kim, "Modern Database Systems", 1995, ACM Press, Addision – Wesley,
- D. Maier, "The Theory of Relational Databases", 1993, Computer Science Press, Rokville, Maryland
- Ullman, J. D., "Principals of database systems", Galgotia publications, 1999
- Oracle Xi Reference Manual
- Dietrich, and Urban, "An Advanced Course in Database Systems", Pearson, 2008.

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ADVANCED COMPUTER NETWORKS

Course Code: DSE4104 **Credit Units: 03**

Course Objective:
The objective of the course is to provide thorough understanding & in-depth knowledge of concepts in computer networks Such as Internet protocols and routing, local area networks, wireless communications and networking, performance analysis, congestion control, TCP, network address translation, multimedia over IP, switching and routing, mobile IP, multicasting, IPv6. Peer-to-peer networking, network security, and other current research topics. A focus will be placed on wireless networking, reflecting rapid advances in this area. This course motivates the students to explore current research areas in the same field.

Course Contents:

Module I
Uses computer networks, Reference Models, TCP/IP suite of protocols, MAC protocols for high-speed LANS, MANs, and wireless LANs. (For example, FDDI, DQDB, HIPPI, Gigabit Ethernet, Wireless Ethernet, etc.)Fast access technologies. (For example, ADSL, Cable Modem, etc.)

Module II
Network Layer Design Issues, Routing Algorithms, Congestion Control Algorithms, Quality of Service, Internet Working, Network Layer in Internet.
IPv6 basic protocol, extensions and options, support for QoS, security, etc., Changes to other protocols, Application Programming Interface for IPv6.

Module III
Mobile IP, IP Multicasting. Multicast routing protocols, address assignments, session discovery, etc.

Module IV
The Transport Protocol: The Transport Service, Elements of transport protocol, a simple Transport Protocol, Internet Transport Protocols UDP, Internet Transport Protocols TCP, TCP extensions for high-speed networks, transaction-oriented applications Performance Issues.
The Application Layer: DNS-(Domain Name System), Electronic Mail, World Wide Web Multimedia.

Module V
Overview of network security, Secure-HTTP, SSL, ESP, Key distribution protocols. Digital signatures, digital certificates-mail Security, Web security, Social Issues.

Examination Scheme:

Components	A	CT	H	V/S/O	EE
Weightage (%)	5	10	7	8	70

Text & References:
Text:
- Computer Networks - Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI
- Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

***References*:**
- Computer Communications and Networking Technologies –Michael A.Gallo, William M .Hancock - Thomson Publication.
- W. Stallings. Cryptography and Network Security: Principles and Practice, 2nd Edition, Prentice Hall, 1998.
- W. R. Stevens. TCP/IP Illustrated, Volume 1: The protocols, Addison Wesley, 1994.
- C. E. Perkins, B. Woolf, and S. R. Alpert. Mobile IP: Design Principles and Practices, Addison Wesley, 1997.

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DIGITAL COMPUTER ORGANIZATION

Course Code: DSE4103 **Credit Units: 03**

Course Objective:
With increase in availability of system resources, concept of parallel architecture has obtained immense popularity. This course provides a comprehensive study of scalable and parallel computer architectures for achieving a proportional increase in performance with increasing system resources. In this course we have discussed the theory, technology, architecture (hardware) and software aspects of parallel computer and Vector computers.

Course Contents:
Module I: Parallel computer models
The state of computing, Multiprocessors and multicomputers, Multivector and SIMD computers, Architectural development tracks
Program and network properties: Conditions of parallelism, Data and resource dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain size and latency, Program flow mechanisms, Control flow versus data flow, Data flow architecture, Demand driven mechanisms, Comparisons of flow mechanisms

Module II: System Interconnect Architectures
Network properties and routing, Static interconnection networks, Dynamic interconnection Networks, Multiprocessor system interconnects, Hierarchical bus systems, Crossbar switch and multiport memory, Multistage and combining network.

Module III: Processors and Memory Hierarchy
Advanced processor technology, Instruction-set Architectures,CISC Scalar Processors, RISC Scalar Processors, Superscalar Processors,VLIW Architectures, Vector and Symbolic processors
Memory Technology: Hierarchical memory technology, Inclusion, Coherence and Locality, Memory capacity planning, Virtual Memory Technology

Module IV: Backplane Bus System
Backplane bus specification, Addressing and timing protocols, Arbitration transaction and interrupt, Pipelining: Linear pipeline processor, Nonlinear pipeline processor, Instruction pipeline design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch handling techniques, Arithmetic Pipeline Design,Computer airthmetic principles.

Module V: Vector Processing Principles
Vector instruction types, Vector-access memory schemes.
Synchronous Parallel Processing: SIMD Architecture and Programming Principles, SIMD Parallel Algorithms

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- Kai Hwang, "Advanced computer architecture"; TMH, 2000.

References:
- J.P. Hayes, "computer Architecture and organization", MGH, 1998.
- M.J Flynn, "Computer Architecture, Pipelined and Parallel Processor Design", Narosa Publishing, 1998.
- D.A. Patterson, J.L. Hennessy, "Computer Architecture: A quantitative approach", Morgan Kauffmann, 2002.
- Hwang and Briggs, "Computer Architecture and Parallel Processing"; MGH,

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ADVANCED DATABASE MANAGEMENT SYSTEM LAB

Course Code: DSE4106 **Credit Units: 01**

Programs should be based on following topics:

Quick Review of Simple SQL Statements, SQL Built-in Functions,Primary Key, Foreign Key, Normalization,Joins View, Union. **Emphasis** on PL/SQL,Cursors 8. Exception handling,Procedure, Functions, Trigger, concurrency control, transaction processing. Introduction to SQLite.

Recommended Software: PostGreSQL, MySQL, Oracle.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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ADVANCED COMPUTER NETWORK LAB

Course Code: DSE4107 **Credit Units: 01**

Course Contents:

1. Study of different types of networking cables, and implement cross and straight cable using clamping tool
2. Implementation of Stop and Wait Protocol and Sliding Window Protocol.
3. Study of Socket Programming and Client
4. Write a code simulating ARP /RARP protocols.
5. Write a code simulating PING and TRACEROUTE commands
6. Create a socket for HTTP for web page upload and download.
7. Write a program to implement RPC (Remote Procedure Call)
8. Implementation of Subnetting
9. Applications using TCP Sockets like Echo client and echo server, Chat Server, File Transfer, Applications using TCP and UDP Sockets ,DNS,SNMP
10. Study of Network simulator (NS).and Simulation of Congestion Control Algorithms using NS.
11. Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer Link State routing, Flooding, Distance vector.

Recommend Software:C/C++ on Linux/Unix, NS, Packet Tracer

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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MATLAB PROGRAMMING

Course Code: DSE4108 **Credit Units: 02**

Understanding The MATLAB Environment, Using the Help System in MATLAB, MATLAB Basics,Linear Algebra; Vectors and Matrices and various operations on them, M files; Scripts and User-defined functions, Plotting, Flow Control and Loops; For and While Loops, If and Case statements, structures, writing basic programs using the above, study of various toolboxes available in matlab and case study of any one tool box.

Recommended Software: MATLAB/Octave

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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PYTHON PROGRAMMING LAB

Course Code: DSE4109 **Credit Units: 01**

Course Contents:

1. Setting up python on Windows/Linux/Mac
2. First program in python
3. Programs related to basic input/ouput.
4. Programs related to variables,strings,numbers
5. Programs related to Lists and Tuples
6. Programs related to.Functions
7. Programs related to If Statements
8. Programs related to While Loops and Input
9. Programs related to Basic Terminal Apps
10. Programs related to Dictionaries
11. Programs related to Classes
12. Programs related to Exceptions
13. Programs related to GUI programming
14. Using Word, Excel, PDF files in python.
15. Web programming in python,
16. Case study of application areas of python.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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DATA MINING AND PREDICTIVE ANALYTICS

Course Code: DSE4202 **Credit Units: 03**

Course Objective: This course introduces the topics of Data Mining, and Data Analytics by providing a basic, practical foundation that allows the students to participate in Data Analytics projects. The course incorporates an introduction to the Data Analytics lifecycle, Machine Learning (ML), Data Mining algorithms and computational paradigms that allow computers to find patterns and regularities in databases, perform prediction and forecasting, and generally improve their performance through interaction with data.

Course Contents:

Module-I: Data Preparation
An introduction to data mining and predictive analytics, Data Pre-processing Exploratory Data Analysis, Dimension- Reduction Methods.

Module-II: Classification
k- Nearest Neighbour Algorithm, Decision Trees, Model Evaluation Technique, Cost –Benefit Analysis Using Data Driven Cost.

Module-III: Clustering
Hierarchical and k- Means Clustering, Kohenen Networks, Birch Clustering, Measuring Cluster Goodness.

Module-IV: Association Rules
Affinity Analysis and Market Basket Analysis, Data Representation for Market Basket Analysis, Support, Confidence, Frequent Item sets, and the a Priori Property, How Does a Priori Algorithm Work ? Generating Frequent Item sets, Generating Association Rules, Extension from Flag Data to General Categorical Data, Information-Theoretic Approach: Generalized Rule Induction Method, *J*-Measure, Association Rules are Easy to do Badly, How can we Measure the Usefulness of Association Rules? Do Association Rules Represent Supervised or Unsupervised Learning?

Module-V: Case Study: Predicting Response to Direct Mail Marketing
Business Understanding, Data Preparation, and Eda, Clustering and Principal Components Analysis, Modelling and Evaluation for Performance and Interpretability, Modelling and Evaluation for High Performance.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Daniel T. Larose, Chantal D. Larose, "Data Mining and Predictive Analytics", John Wiley & Sons, Inc., Hoboken, New Jersey, 2015.
- Thomas W. Miller, "Modelling Techniques in Predictive Analytics", Pearson FT Press, 2013.
- Markus Hofmann, Ralf Klinkenberg, "Rapid-Miner: Data Mining Use Cases and Business Analytics Applications", Chapman and Hall/CRC, 2016

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DATA WAREHOUSING AND MULTIDIMENSIONS MODELLING

Course Code: DSE4203 **Credit Units: 03**

Course Objective: This course focuses on the fundamentals of data warehousing and multidimensional Modelling. Data warehouse development life cycle, Data warehouse analysis, CUBE, ROLL UP and STAR queries, Data Warehouse Design - Massive de -normalisation, STAR schema design, Data ware house Architecture, OLAP, ROLAP and MOLAP, concepts of Fact and dimension table are the major areas of coverage of this course. This course also deals with the issues while implementing the multidimensional models

Course Contents:

Module I Introduction
Multidimensional Data Management, Multidimensional History, Related Terminology,

Module II Fundamental Concepts
Cubes ,Dimensions, Facts, Measures, Relational Representations, Star Schemas, Snowflake Schemas, Data Warehouses And Data Marts, Multidimensional Modelling Process, Analysis And Querying ,Roll Up, Drill Down, Drill Out, Slicing And Dicing, Drill Across, Pivot Tables, Ranking, Multi-Dimensional Querying in MDX and SQL, Graphical Querying and Visualizations .

Module III Advance Concepts
Slowly Changing Dimensions, The Problem, Solutions, Other Special Kinds Of Dimensions, Mini dimensions, Outriggers, Degenerate Dimensions, Junk Dimensions, Time Dimensions, Data Quality Dimensions, Advanced Hierarchies, Parent-Child Hierarchies, Unbalanced Hierarchies, Non Covering Hierarchies , Non –Strict Hierarchies, Multiple Hierarchies And Parallel Hierarchies.

Module IV Implementation Issues
Materialized Views, Indexing, Indexing Overview, Bitmap Indices, Join Indices, Query Processing, OLAP Implementations, Extract-Transform-Load.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Christian S. Jensen, Christian Thomsen, and Professor Torben Pedersen, “Multidimensional Databases and Data Warehousing”, Morgan & Claypool Publisher, 2010.
- Ralph Kimball, Margy Ross, "The Data Warehouse Toolkit: The Definitive Guide”, 3rd Edition, John Wiley & Sons, 2013.
- Len Silverston, Paul Agnew, “The Data Model Resource Book: Volume 3: Universal Patterns for Data Modeling”, John Wiley & Sons., 2009.

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DATABASE AND KNOWLEDGE BASE SYSTEMS

Course Code: DSE4204 **Credit Units: 03**

Course Objective: This course discusses design methodology for databases to verify their structural correctness and implements databases. It also provides applications software primarily in the relational model using querying languages, primarily SQL, and other database supporting software applying the theory behind various database models and query languages implementing security and integrity policies relating to databases and preparation for data analytics working in group settings to design and implementing database projects.

Course Contents:

Module-I: Introduction

Database Languages, Object-Base Systems, Knowledge-base Systems, History and Perspective, Data Models for Database Systems: Data Models, The Entity-relationship Model, The Relational Data Model, Operations in the Relational Data Model, The Network Data Model, The Hierarchical Data Model, An Object-Oriented Model, Logic as a Data Model: The Datalog Data Model, Evaluating Non- recursive Rules, Computing the Meaning of Recursive Rules, Incremental Evaluation of Least Fixed Points, Negations in Rule Bodies, Relational Algebra and Logic, Relational Calculus, Tuple Relational Calculus.

Module-II: Relational Query and Object-Oriented Database Language

ISBL: A "Pure" Relational Algebra Language, QUEL: A Tuple Relational Calculus Language, Query-by-Example: A DRC Language, Data Definition in QBE, The Query Language SQL, Data Definition in SQL, The DBTG Data Definition language, The DBTG Query Language, The DBTG Database Modification Commands, Data Definition in IMS, A Hierarchical Data Manipulation Language, Data Definition in OPAL, Data Manipulation in OPAL

Module-III: Physical Data Organization and Design of Relational Databases

The Physical Data Model, The Heap Organization, Hashed Files, Indexed Files, B-trees, Files with a Dense Index, Secondary Indices, Data Structures in DBTG Databases, Data Structures for Hierarchies, Data Structures for Relations, A Search Tree Structure, Functional Dependencies, Lossless-Join Decomposition, Normalization, Generalized Dependencies.

Module-IV: Transaction Management

Basic Concepts, A Simple Transaction Model, The Two-phase Locking Protocol, a Model with Read and write-Locks, Lock Modes, A Read-Only, Write-Only Model, Concurrency for Hierarchically Structured Items, Handling Transaction Failures, Aggressive and Conservative Protocols, Recovery From Crashes, Timestamp-based Concurrency Control.

Module-V: Distributed Database Management

Distributed Databases, Distributed Locking, Distributed Two-phase Locking, Distributed Commitment, A Nonblocking Commit Protocol, Timestamp-based, Distributed Concurrency, Recovery of Nodes, Distributed Deadlocks.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Jeffrey D. Ullman"Principles of Database and Knowledge-Base Systems", Vol. 1, Computer Science Press, USA, 1988.
- AviSilberschatz, Henry F. Korth and S. Sudarshan, "Database System Concepts", Mcgraw Hill Education, 2000.
- Ngoc Thanh Nguyen, Edward Szczerbicki, "Intelligent Systems for Knowledge Management", Springer-verlagGmbh, 2009.

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BIG DATA TECHNOLOGIES

Course Code: DSE4205 **Credit Units: 03**

Course Objective:
This course brings together several key big data technologies used for storage, analysis and manipulation of data. It also introduces the students the key concepts of Hadoop framework, MapReduce, Pig, Hive, and No-SQL. Students will prepare a sample project in Hadoop.

Course Contents:

Module I: Introduction to Big Data
Big Data and its Importance – Four V's of Big Data – Drivers for Big Data – Introduction to Big Data Analytics – Big Data Analytics applications.

Module II: Big Data Technologies
Hadoop's Parallel World – Data discovery – Open source technology for Big Data Analytics – cloud and Big Data –Predictive Analytics – Mobile Business Intelligence and Big Data – Crowd Sourcing Analytics – Inter- and Trans-Firewall Analytics - Information Management.

Module III: Processing Big Data
Integrating disparate data stores - Mapping data to the programming framework - Connecting and extracting data from storage - Transforming data for processing - Subdividing data in preparation for Hadoop Map Reduce.

Module IV: Hadoop Map Reduce
Employing Hadoop Map Reduce - Creating the components of Hadoop Map Reduce jobs - Distributing data processing across server farms –Executing Hadoop Map Reduce jobs - Monitoring the progress of job flows - The Building Blocks of Hadoop Map Reduce - Distinguishing Hadoop daemons - Investigating the Hadoop Distributed File System Selecting appropriate execution modes: local, pseudo-distributed, fully distributed.

Module V: Big Data Tools and Techniques
Installing and Running Pig – Comparison with Databases – Pig Latin – User- Define Functions – Data Processing Operators – Installing and Running Hive – Hive QL – Tables – Querying Data – User-Defined Functions – Oracle Big Data.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Michael Minelli, Michehe Chambers, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business", 1st Edition, AmbigaDhiraj, Wiely CIO Series, 2013.
- Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'reilly, 2012.
- Arvind Sathi, "Big Data Analytics: Disruptive Technologies for Changing the Game", 1st Edition, IBM Corporation, 2012.
- Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", 1st Edition, Wiley and SAS Business Series, 2012.

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RESEARCH METHODOLOGY AND TECHNICAL REPORT WRITING

Course Code: DSE4206 **Credit Units: 02**

Course Objectives: The course will enhance scientific , technical and research writing skills and impart knowledge about various stages of research process, statistical analysis, statistical tests and their applications in statistical decision making.

Course Contents:

Module I: Introduction to research: Definition, motivation, need, objectives, significance and characteristics of research; types of research; steps in research process; planning a research proposal; literature review, web searching.

Module II: Population and sample, parameter and statistic, sampling and data collection, sampling design: steps, types, sample size, sampling methods, large and small samples, primary and secondary data, data processing and analysis. Sample surveys and questionnaire designing, scaling techniques.

Module III: Dependent and independent variables, univariate, bivariate and multivariate analysis, means-arithmetic, geometric and harmonic; measure of dispersion of data, standard deviation, variance, coefficient of variation and degree of freedom. Hypothesis testing: null hypothesis and alternate hypothesis, errors in hypothesis testing, significance and confidence levels, parametric tests and non-parametric tests, one-tailed and two-tailed tests, analysis of variance. Regression analysis and curve fitting, method of least-squares, explained and unexplained variations, coefficient of correlation, coefficient of determination**.**

Module IV: Technical/scientific/research report writing: structure and components of scientific reports, formats of dissertations, research report, report writing skills, report preparation, referencing , bibliography and footnotes. Making presentation-use of visual aids and PPTs. Publication of research papers, citations,. Intellectual property rights and copy rights, plagiarism, patents and patent laws, commercialization and ethical issues.

Examination Scheme:

Attendance	Assignment/Library consultation / Thesis writing	Class test	Final Exam	Total
5	15	10	70	100

Text Books:

- Blake, G. and Bly, R.W. 1993, The Elements of Technical Writing. MacMillan, New York
- Booth, V. 1981. Writing a Scientific Paper and Speaking at Scientific Meetings. The Biochemical Society, London
- Chawla,D and Sondhi, N. 2016, Research Methodology- Concepts and Cases. Vikas Publishing House Pvt Ltd. New Delhi
- Kothari, C.R.2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.

Reference Books:

- Geode, Millian J.& Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Montomery, Douglas C.(2007), 5th Ed. Design and Analysis of Experiments, Wiley India.
- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt.Ltd., New Delhi-110001
- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patpargang, Delhi- 110092

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DATA MINING AND PREDICTIVE ANALYTICS LAB

Course Code: DSE4208 **Credit Units: 01**

Course Objective:

- To analyse the data using statistical methods.
- To understand and demonstrate data mining using any open source data mining tool.

Recommended Software: ORANGE, Rapid Miner

List of Experiments

1. Data Analysis- Getting to know the Data (Using ORANGE, Rapid Miner)
    - Parametric - Means, T-Test, Correlation
    - Prediction for numerical outcomes - Linear regression
    - Correlation analysis
    - Preparing data for analysis
    - Pre-processing techniques

2. Data Mining (Using ORANGE, Rapid Miner or any open source data mining tool)
    - Implement clustering algorithm
    - Implement classification using
    - Decision tree
    - Back propagation
    - Visualization methods.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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DATA WAREHOUSING AND MULTIDIMENSIONAL MODELLING LAB

Course Code: DSE4209 **Credit Units: 01**

Programs should be based on following topics:
Quick Review SQL Statements, SQL Built-in Functions,**Emphasis** on PL/SQL,Cursors 8. Exception handling, Procedure, Functions,Trigger, concurrency control, transaction processing. Introduction to ETL Tools:Talend Open Source Data Integrator, Scriptella, KETL
Pentaho Data Integrator - Kettle, Jaspersoft ETL, GeoKettle, CloverETL, HPCC Systems

Recommended Software: SQL Server, ETL Tools (Open Source)

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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INFORMATION MANAGEMENT SYSTEM

Course Code: DSE4210 **Credit Units: 03**

Course Objective:
This course exposes students with the basics of managing the information and explores the various aspects of database design and modelling. It examines the basic issues in information governance and information integration and also helps to understand the information architecture

Course Contents:

Module-I: Database Modelling, Management and Development
Database design and modelling – Business Rules and Relationship; Java database Connectivity (JDBC), Database connection Manager, Stored Procedures. Trends in Big Data systems including NoSQL – Hadoop HDFS, MapReduce, Hive, and enhancements.

Module-II: Data Security and Privacy
Program Security, Malicious code and controls against threats; OS level protection; Security – Firewalls, Network Security Intrusion detection systems. Data Privacy principles. Data Privacy Laws and compliance.

Module-III: Information Governance
Master Data Management (MDM) – Overview, Need for MDM, Privacy, regulatory requirements and compliance. Data Governance – Synchronization and data quality management.

Module-IV: Information Architecture
Principles of Information architecture and framework, Organizing information, Navigation systems and Labelling systems, Conceptual design, Granularity of Content.

Module-V: Information Lifecycle Management
Data retention policies; Confidential and Sensitive data handling, lifecycle management costs. Archive data using Hadoop; Testing and delivering big data applications for performance and functionality; Challenges with data administration;

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Jeffrey A. Hoffer, HeikkiTopi, V Ramesh – MODERN DATABASE MANAGEMENT, 10 Edition, PEARSON, 2012.
- Alex Berson, Larry Dubov MASTER DATA MANAGEMENT AND DATA GOVERNANCE, 2/E, Tata McGraw Hill, 2011.
- Security in Computing, 4/E, Charles P. Pfleeger, Shari Lawrence Pfleeger, Prentice Hall; 2006
- Information Architecture for the World Wide Web; Peter Morville, Louis Rosenfeld ; O'Reilly Media; 1998.
- http://ibm.com/big-data – Four dimensions of big data and other ebooks on Big Data Analytics

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INFORMATION SYSTEM SECURITY

Course Code: DSE4211 **Credit Units: 03**

Course Objective:
This course provides a deep and comprehensive study of the security principles and practices of information systems. Topics include basic information security concepts, common attacking techniques, common security policies, basic cryptographic tools, authentication, access control, software security, operating system security, and legal and ethical issues in information systems security

Course Contents:

Module-I: Introduction
Computer Security Concepts, Threats, Attacks, and Assets Security Functional Requirements A Security Architecture for Open Systems Computer Security Trends.

Module-II: COMPUTER SECURITY TECHNOLOGY AND PRINCIPLES
Cryptographic Tools, User Authentication, Access Control, Database Security, Malicious Software, Denial-of-Service Attacks.

Module-III: SOFTWARE SECURITY
Buffer Overflow: Stack Overflows, Defending Against Buffer Overflows, Other Forms of Overflow Attacks, Software Security: Software Security Issues, Handling Program Input, Writing Safe Program Code, Interacting with the Operating System and Other Programs, Handling Program Output

Module-IV: TRUSTED SYSTEMS SECURITY
Operating System Security: Introduction to Operating System Security, System Security Planning, Operating Systems Hardening, Application Security, Security Maintenance, Linux/Unix Security, Windows Security, Virtualization Security. Trusted Computing and Multilevel Security: Bell-LaPadula Model for Computer Security, Other Formal Models for Computer Security, Concept of Trusted Systems, Application of Multilevel Security, Trusted Computing and the Trusted Platform Module, Common Criteria for Information Technology Security Evaluation, Assurance and Evaluation

Module-V: MANAGEMENT ISSUES
IT Security Management and Risk Assessment, IT Security Controls, Plans, and Procedures, Physical and Infrastructure Security, Human Resources Security, Security Auditing, Legal and Ethical Aspects

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- W. Stallings, "Computer Security: Principles and Practice," 2st Edition, Prentice Hall, ISBN: 0132775069, 2011.
- M. Stamp, "Information Security: Principles and Practice," 2st Edition, Wiley, ISBN: 0470626399, 2011.
- M. E. Whitman and H. J. Mattord, "Principles of Information Security," 4st Edition, Course Technology, ISBN: 1111138214, 2011.
- M. Bishop, "Computer Security: Art and Science," Addison Wesley, ISBN: 0-201-44099-7, 2002.
- Elmsari and Navathe, "Fundamentals of Database Systems", 4th Ed., A. Wesley, 2004
- Ullman J. D., "Principles of Database Systems", 2nd Ed., Galgotia Publications, 1999.

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DESCRIPTIVE ANALYSIS

Course Code: DSE4301 **Credit Units: 03**

Course Objective:

This course introduces some elementary statistical methods of analysis of data and compute various measurements of central tendency, dispersion, skewness and kurtosis. Also discusses computation of the correlation coefficient from ungrouped bivariate data and interpret them and analyse data pertaining to attributes and to interpret results.

Course Contents:

Module-I: Introduction to Statistics

Definitions: Webster's and Secrist's definition of Statistics, Importance of Statistics, Scope of Statistics: In the field of Industry, Biological Sciences, Medical Sciences, Economics Sciences, Social, Sciences, Management Sciences, Agriculture, Insurance, Actuarial Science, Education and Psychology.

Module-II: Population and Sample

Types of characteristics: Attributes: Nominal scale, ordinal scale. Variables: Interval scale, ratio scale, discrete and continuous variables, Types of data: Primary data, Secondary data, Notion of a statistical population: Finite population, infinite population, homogeneous population and heterogeneous population. Notion of sample, random sample and non-random sample, Methods of sampling: Simple random sampling with and without replacement (SRSWR and SRWOR) stratified random sampling, systematic sampling, cluster sampling and two-stage sampling.

Module-III: Presentation of Data

Classification: Raw data and its classification, Discrete frequency distribution, Sturge's rule, continuous frequency distribution, inclusive and exclusive methods of classification, Open end classes, cumulative frequency distribution and relative frequency distribution, Graphical Presentation of Data: Histogram, frequency curve, frequency polygon, ogive curves, stem and leaf chart, Check sheet, Parato diagram, Examples and Problems.

Module-IV: Measures of Central Tendency

Concept of central tendency of statistical data, Arithmetic Mean (A.M.), combined mean of a number of groups, merits and demerits, Geometric Mean (G.M.), Harmonic Mean (H.M.), Weighted Mean, Weighted A.M., G.M. and H.M. , Mode, Median, Empirical relation between mean, median and mode, Order relation between arithmetic mean, geometric mean, harmonic mean.

Module-V: Measures of Dispersion

Concept of dispersion, characteristics of good measure of dispersion, Range, Mean deviation, Mean square definition, Variance and standard deviation, Combined variance, Combined standard deviation, generalization for n groups, Measures of dispersion for comparison: coefficient of range, coefficient of quartile deviation and coefficient of mean deviation, coefficient of variation.

Module-VI: Skewness and Kurtosis

Concept of skewness of frequency distribution, positive skewness, negative skewness, symmetric frequency distribution, Bowley's coefficient of skewness, interpretation using Box plot, Karl Pearson's coefficient of skewness, Measures of skewness basked on moments ($\beta 1$, $\gamma 1$), Concepts of kurtosis, leptokurtic, mesokurtic and platykurtic frequency distributions, Measures of kurtosis based on moments, ($\beta 2$, $\gamma 2$).

Module-VII: Correlation & Regression

Bivariate data, bivariate frequency distribution, Concept of correlation between two variables, positive correlation, negative correlation, Scatter diagram, conclusion about the type of correlation from scatter diagram, Covariance between two variables, Karl Pearson's coefficient of correlation, Spearman's rank correlation coefficient, In case of ties, compute Karl Pearson's correlation coefficient between ranks. Regression: lines of regression,

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fitting of lines of regression by the least squares method, interpretation of slope and intercept. 9.2 Regression coefficient (byx, bxy), Effect of change of origin and scale, Angle between the two lines of regression, Mean residual sum of squares, Residual plot and its interpretation.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text and References :

- Goon A.M.,Gupta M. K., Dasgupta B.(1998): Fundamentals of Statistics (V-1),World Press.
- Miller and Fruend: Modern Elementary Statistics.
- Snedecor and Cochran: Statistical Methods, Oxford and IBH Publishers.
- Mukhopadhyay, P: Mathematical Statistics (1996), New Central Book Agency, Calcutta.
- Introduction to Mathematical Statistics, Ed. 4 (1989), MacMillan Publishing Co. New York.
- Gupta and Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi.
- Neil Weiss: Introductory Statistics: Pearson Publishers.

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LEARNING AND REASONING WITH BAYESIAN NETWORKS

Course Code: DSE4302 **Credit Units: 04**

Course Objective:
This course provides an in-depth exposition of knowledge representation, reasoning, and machine learning under uncertainty using the framework of Bayesian networks. Both theoretical underpinnings and practical considerations will be covered, with a special emphasis on constructing and learning graphical models, and on various exact and approximate inference algorithms.

Course Contents:

Module-I: Introduction
Reasoning about beliefs using Logic and Probability Propositional Logic, Probability Calculus and Bayesian Reasoning, Bayesian Networks,: Syntax and Semantics, Building Bayesian Networks.

Module-II: Bayesian Networks Inference
Inference by variable elimination, Inference by Factor Elimination (Jointree), Compiling Bayesian Networks, Complexity of probabilistic inference, compiling bayesian networks.

Module-III: Approximate Inference
Inference by Belief Propagation: Algorithm, Iterative belief propagation, semantics of IBP, Join graphs, edge-detection semantics, Approximate Inference by Stochastic Sampling: Simulating a Bayesian network, direct sampling, expectations, estimating a conditional probability, Markov chain simulation.

Module-IV: Learning: The Maximum Likelihood Approach
Introduction, estimating parameters from complete data, estimating parameters from incomplete data, learning network structure, searching for network structure.

Module-V: Learning: The Bayesian Approach
Introduction, Meta Networks, Learning with Discrete Parameter Sets, Learning with Continuous Parameter Sets, Learning Network Structure

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Adnan Darwiche, Modelling and Reasoning with Bayesian Networks. Cambridge University Press 2009
- Richard E. Neapolitan, "Learning Bayesian networks", Prentice Hall Series in Artificial Intelligence, 2004.
- TimoKoski, John Noble, "Bayesian Networks: An Introduction", Wiley series in Probability and Statistics, 2009.
- Finn V. Jensen and Thomas Nielsen. Bayesian Networks and Decision Graphs. Springer 2007.

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SOCIAL NETWORK DATA ANALYTICS

Course Code: DSE4303 **Credit Units: 03**

Course Objective:
This course gives an introduction to social network analysis, with a focus on modelling. It provides an overview of research questions connected to social networks, and of descriptive measures, models, and methods of analysis that can be used to analyse empirical social network data. It helps to understand the online interactive demonstrations and hands-on analysis of real-world data sets

Course Contents:

Module-I: Introduction
Overview: Social network data-Formal methods- Paths and Connectivity-Graphs to represent social relations-Working with network data- Network Datasets-Strong and weak ties - Closure, Structural Holes, and Social Capital.

Module-II: Community Discovery in Social Networks: Applications, Methods and Engineering Trends
Introduction, Communities In Context, Core Methods, Quality Functions, The Kernighan-Lin (Kl) Algorithm, Agglomerative/Divisive Algorithms, Spectral Algorithms, Multi-Level Graph Portioning, Markov Clustering. Other Approaches, Emerging Fields and Problems, Community Discovery in Dynamic Networks, Community Discovery in Heterogeneous Networks, Community Discovery in Directed Networks, Coupling Content and Relationship Information for Community Discovery,

Module-III: Information Networks and the World Wide Web
The Structure of the Web- World Wide Web- Information Networks, Hypertext, and Associative Memory- Web as a Directed Graph, Bow-Tie Structure of the Web- Link Analysis and Web Search, Searching the Web: Ranking, Link Analysis using Hubs and Authorities- Page Rank- Link Analysis in Modern Web Search, Applications, Spectral Analysis, Random Walks, and Web Search. Module IV

Module-IV: Node Classifications in Social Networks
Introduction, Problem Formulation, Representing Data As A Graph, The Node Classification Problem, Methods Using Local Classifiers, Iterative Classification Method, Random Walk Based Methods, Label Propagation, Graph Regularization, Adsorption, Applying Node Classification To Large Social Networks, Basic Approaches, Second-Order Methods, Implementation Within Map-Reduce, Inference Using Graphical Models, Metric Labelling, Spectral Partitioning, Graph Clustering, Variations on Node Classification.

Module-V: Data and Text Mining In Social Media
Data Mining In Nutshell, Social Media, Motivations For Data Mining In Social Media, Data Mining Methods For Social Media, Data Representation, Data Mining- A Process, Social Networking Sites: Illustrative Examples, Related Efforts, Ethnography And Netnography, Event Maps, Text Mining: Keyword Search, Query Semantics And Answer Ranking, Keyword Search over Xmland Relational Data, Keyword Search Over Graph Data, Classification Algorithms, Clustering Algorithms, Transfer Learning in Heterogeneous Networks.

Module-VI: Overview of Social Tagging
Introduction, Problems With Metadata Generation and Fixed Taxonomies, Tags: Why And What?, Different User Tagging Motivations, Kinds Of Tags, Linguistic Classifications Of Tags, Game-Based Tagging, Tag Generation Models, Tagging System Design, Tag Analysis, Tagging Distributions ,Identifying Tag Semantics, Tags Versus Keywords, Visualization Of Tags, Tag Clouds For Browsing/Search, Tag Selection For Tag Clouds, Tag Hierarchy Generation, Tag Cloud Display Formats, Tag Evolution Visualization.

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Easley and Kleinberg, "Networks, Crowds, and Markets: Reasoning about a highly connected world", Cambridge Univ. Press, 2010.
- Charu C. Aggarwal, "Social Network Data Analytics", Springer, 2011.
- Robert A. Hanneman and Mark Riddle, "Introduction to social network methods", University of California, 2005.
- Jure Leskovec, AnandRajaraman, and Jeffrey D. Ullman, "Mining of Massive Datasets", Cambridge University Press, 2 edition, 2014.
- Wasserman, S., & Faust, K, "Social Network Analysis: Methods and Applications", Cambridge University Press; 1 edition, 1994.

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R PROGRAMMING LAB

Course Code: DSE4304 **Credit Units: 01**

Course Objective:
This lab will provide a basic introduction to the R programming Language and the use of R to perform basic statistics and programming tasks. The main objectives of this lab is to impart the students with the knowledge of R Programming, Machine Learning using R Mining from streaming Data, Mining from Distributed Data.

R Programming Objective

- Master the use of the R interactive environment
- Expand R by installing R packages
- Explore and understand how to use the R documentation
- Read Structured Data into R from various sources
- Understand the different data types in R
- Understand the different data structures in R
- Understand how to use dates in R
- Use R for mathematical operations
- Use of vectorised calculations
- Write user-defined R functions
- Use control statements
- Write Loop constructs in R
- Use Apply to iterate functions across data
- Reshape data to support different analyses
- Understand split-apply-combine (group-wise operations) in R
- Deal with missing data
- Manipulate strings in R
- Understand basic regular expressions in R
- Understand base R graphics
- Focus on GGplot2 graphics for R
- Be familiar with trellis (lattice) graphics
- Use R for descriptive statistics
- Use R for inferential statistics
- Write multivariate models in R
- Understand confounding and adjustment in multivariate models
- Understand interaction in multivariate models
- Predict/Score new data using models
- Understand basic non-linear functions in models
- Understand how to link data, statistical methods, and actionable questions

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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HADOOP LAB

Course Code: DSE4305 **Credit Units: 02**

Course Objective:

- To provide an overview of several key technologies used in manipulating, storing, and analysing big data.
- To understand the fundamentals of Hadoop.
- To apply the learning specific problems in various domains.

Recommended Tools

Big Data Tools and Technology [Learning and Demonstration of Big Data Ecosystem]

- Hadoop
- HBase
- NoSQL
- Hive
- Pig

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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SUMMER INTERNSHIP EVALUATION

Course Code: DSE4335 **Credit Units: 06**

Guidelines:

There are certain phases of every Intern's professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship program can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal classroom situations. These attributes are intellectual ability, professional judgment and decision-making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc.

In order to achieve these objectives:

- **Each student will be allotted a supervisor** for proper guidance.
- **Student will first submit synopsis in the format given by coordinator/supervisor.**
- Student will maintain a file (**Internship File/Project Report**). **Further, coordinator will provide NTCC project guidelines and sample to help in preparation of file.** The Internship File aims to encourage students to keep a personal record of their learning and achievement throughout the Programme. It can be used as the basis for lifelong learning and for job applications. Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development. The File will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and their own personal contribution to the organization.

The **layout guidelines** for the Project Report

1. File should be in the following specification

- A4 size paper
- **Font**

For normal text Font Type and Size must be- Times New Roman, 12 pt. The minimum font size of materials within a table or a figure can be 10 point.

- **Margins**

A margin of 3.75 cm (1½ inch) is to be given on the binding edge while on the other sides it is to be 2.5 cm (1 inch). The text of the report, including headings, figures, tables, and notes, but excluding page numbers, must be accommodated within the page area.

- **Line Spacing**

The line spacing in the main text must be between one-and-a-half (1.5). Single line spacing should be given for figure captions, table titles, figure legends, and footnotes. Equations, tables, figures, and quotations should be set off from the main text with adequate space (not less than the normal line spacing adopted for the main text). Two consecutive paragraphs should be separated by a spacing which must be larger than the line spacing adopted for the text.

- **Tables and Figures**

Each sketch, drawing, graph and photograph should have a figure number and title below the figure etc. Numbering should be sequential, chapter wise. For instance, if there are 24 figures chapter 3 spread over all of its sections the figure numbers run from Figure 3.1 through Figure 3.24. In figures experimental data should typically be represented by centered symbols, and theoretical data by continuous curves.

Each table should have a table number and caption above the table. Numbering should be sequential, chapter wise, as in the case of Figure numbers. For instance, if there are 18 tables in chapter 3 the table numbers run from Figure 3.1 through Figure 3.18.

Make sure that figures and tables are complete in other respects such as legends, references

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(if any) and coordinate labels with units. Each figure and table must be explicitly referred to in the text and located where its first reference occurs, preferably after the reference.

- **Drawings**

All engineering drawings must conform to relevant Standards and should include a title block. If drawings are large they should be included at the back of the report in a separate pocket. In case drawings are made using CAD packages, a CD ROM should be included which contains all the files and details of the packages used.

- **Equations**

The numbering of equations should be sequential, chapter wise. Numbered equations must be explicitly referred to in the text.

2. Report Size: The maximum number of pages of the Report should be preferably between 50-80 pages.

3. Report Layout: The report should contain the following components

Front Page
Table of Content
Acknowledgement
Student Certificate
Company Profile (optional)
Introduction
Main Body
References / Bibliography

The File will include ***five sections*** in the order described below. The content and comprehensiveness of the main body and appendices of the report should include the following:

1. **The Title Page**--Title - An Internship Experience Report For (Your Name), name of internship organization, name of the Supervisor/Guide and his/her designation, date started and completed, and number of credits for which the report is submitted.

2. **Declaration by the Students-**This is page number (i), the beginning of the small case Roman numeral page numbers. The student has to give a declaration to the effect that the data used for the work, the work depicted in the report, and the written material contained in the report are not copied from others and that due permission has been taken from, and due credit has been given to, the sources whenever they are used.

3. Certificate-This is page number (ii). The certificate will be signed by the Faculty Supervisor(s) before the viva-voce after verifying the format and by the Head of the Department after review with the Supervisor(s).

4. Acknowledgements-This is page number (iii). Keep this brief and avoid using informal language. This page must be signed by the candidate.

5. Abstract and **Keywords-**This is page number (iv). The abstract (preferably one page) should contain the context/relevance of the problem at hand, a description of what was done and a gist of the significant observations/results.

The keywords (maximum 6) are a hint that what is contained in the report.

7. Contents-This is page number (v). The table of Contents should be titled just *Contents* (not Table of Contents). Try to fit it into one or two pages.

8. **Introduction**--short, but should include how and why you obtained the internship experience position and the relationship it has to your professional and career goals.

9. **Main Body**--should include but not be limited to daily tasks performed. Major projects contributed to, dates, hours on task, observations and feelings, meetings attended and their purposes, listing of tools and materials and their suppliers, and photographs if possible of projects, buildings and co-workers.

10. **References / Bibliography** --This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

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ASSESSMENT OF THE INTERNSHIP FILE

Continuous Internal Assessment	Final Assessment
40 Marks	60 Marks

Continuous Internal Assessment consists of topic relevance, progress report and synopsis marks. Final Assessment includes viva, presentation and report marks.

Examination Scheme:

Components	V	S	R	PR	FP
Weightage (%)	20	20	20	20	20

V – Viva, S – Synopsis, FP – Final Presentation, R – Report, PR-Progress Report

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PROJECT-DISSERTATION-I

Course Code: DSE4337 **Credit Units: 05**

GUIDELINES FOR DISSERTATION

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage.

The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

In general, the File should be comprehensive and include

A short account of the activities that were undertaken as part of the project;

A statement about the extent to which the project has achieved its stated goals.

A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;

Any activities planned but not yet completed as part of the DISSERTION, or as a future initiative directly resulting from the project;

Any problems that have arisen that may be useful to document for future reference.

- **Report Layout**

The report should contain the following components:

- **Title or Cover Page**

The title page should contain the following information: Project Title; Student's Name; Course; Year; Supervisor's Name.

- **Acknowledgements** (optional)

Acknowledgment to any advisory or financial assistance received in the course of work may be given.

- **Abstract**

A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project

- **Table of Contents**

Titles and subtitles are to correspond exactly with those in the text.

- **Introduction**

Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

- **Materials and Methods**

This section should aim at experimental designs, materials used. Methodology should be mentioned in details including modifications if any.

- **Results and Discussion**

Present results, discuss and compare these with those from other workers, etc. In writing these section, emphasis should be given on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

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Note that in writing the various secions, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary never write in "point" form.

- **Conclusion**

A conclusion should be the final section in which the outcome of the work is mentioned briefly.

- **Future prospects**
- **Appendices**

The Appendix contains material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

- **References / Bibliography**

This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Examples
For research article
Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichia coli* O157: H7. *Clin Microbiol Infect*, **8** (suppl 1): 116–117.

For book
Kowalski,M.(1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67

ASSESSMENT OF THE DISSERTATION FILE

Essentially, marking will be based on the following criteria: the quality of the report, the technical merit of the project and the project execution.
Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project.
Project execution is concerned with assessing how much work has been put in.
The File should fulfill the following ***assessment objectives:***

Range of Research Methods used to obtain information

Execution of Research
Data Analysis
Analyse Quantitative/ Qualitative information
Control Quality

Draw Conclusions
Examination Scheme:

Dissertation	50
Viva Voce	50
Total	**100**

ata, leading to production of a structured report.

Selecting the Dissertation Topic
It is usual to give you some discretion in the choice of topic for the dissertation and the approach to be adopted. You will need to ensure that your dissertation is related to your field of specialization.

Deciding this is often the most difficult part of the dissertation process, and perhaps, you have been thinking of a topic for some time.

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It is important to distinguish here between 'dissertation topic' and 'dissertation title'. The topic is the specific area that you wish to investigate. The title may not be decided until the dissertation has been written so as to reflect its content properly.

Few restrictions are placed on the choice of the topic. Normally we would expect it to be:

- relevant to business, defined broadly;
- related to one or more of the subjects or areas of study within the core program and specialisation stream;
- clearly focused so as to facilitate an in-depth approach, subject to the availability of adequate sources of information and to your own knowledge;
- of value and interest to you and your personal and professional development.

Planning the Dissertation

This will entail following:

- Selecting a topic for investigation.
- Establishing the precise focus of your study by deciding on the aims and objectives of the dissertation, or formulating questions to be investigated. Consider very carefully what is worth investigating and its feasibility.
- Drawing up initial dissertation outlines considering the aims and objectives of the dissertation. Workout various stages of dissertation
- Devising a timetable to ensure that all stages of dissertation are completed in time. The timetable should include writing of the dissertation and regular meetings with your dissertation guide.

The Dissertation plan or outline

It is recommended that you should have a dissertation plan to guide you right from the outset. Essentially, the dissertation plan is an outline of what you intend to do, chapter wise and therefore should reflect the aims and objectives of your dissertation.

There are several reasons for having a dissertation plan

- It provides a focus to your thoughts.
- It provides your faculty-guide with an opportunity, at an early stage of your work, to make constructive comments and help guide the direction of your research.
- The writing of a plan is the first formal stage of the writing process, and therefore helps build up your confidence.
- In many ways, the plan encourages you to come to terms with the reading, thinking and writing in a systematic and integrated way, with plenty of time left for changes.
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Keeping records

This includes the following:

- Making a note of everything you read; including those discarded.
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- Make clear what is a direct a direct quotation and what is your paraphrase.

Dissertation format

All students must follow the following rules in submitting their dissertation.

- Front page should provide title, author, Name of degree/diploma and the date of submission.
- Second page should be the table of contents giving page references for each chapter and section.
- The next page should be the table of appendices, graphs and tables giving titles and page references.
- Next to follow should be a synopsis or abstract of the dissertation (approximately 500 words)
- Next is the 'acknowledgements'.

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- Chapter I should be a general introduction, giving the background to the dissertation, the objectives of the dissertation, the rationale for the dissertation, the plan, methodological issues and problems. The limitations of the dissertation should also be hinted in this chapter.
- Other chapters will constitute the body of the dissertation. The number of chapters and their sequence will usually vary depending on, among others, on a critical review of the previous relevant work relating to your major findings, a discussion of their implications, and conclusions, possibly with a suggestion of the direction of future research on the area.
- After this concluding chapter, you should give a list of all the references you have used. These should be cross - references with your text. For articles from journals, the following details are required e.g.

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- Finally, you should give any appendices. These should only include relevant statistical data or material that cannot be fitted into the above categories.

The Layout Guidelines for the Dissertation

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5. Has the student collected information / data suitable to the frameworks?
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7. Has the student succeeded in drawing conclusion form the analysis?
8. Do the conclusions relate well to the objectives of the project?
9. Has the student been regular in his work?
10. Layout of the written report.

Assessment Scheme:

Continuous Evaluation:		40%
(Based on Abstract, Regularity, Adherence to initial plan, Records etc.)		
Final Evaluation: Based on,		60%
Contents & Layout of the Report,	20	
Conceptual Framework,	05	
Objectives & Methodology and	05	
Implications & Conclusions	10	
Viva & Presentation	20	

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WEB TECHNOLOGY

Course Code: DSE4306 **Credit Units: 03**

Course Objectives:
This course provides knowledge on Core technologies that are needed for the web likeHTML and XML and facilitate how to build XML applications with DTD and style sheets thatspan multiple domains ranging from finance to vector graphics to genealogy for use with legacy browsers.

Course Contents:
MODULE-I: Introduction
HTML Common tags, Cascading Style sheets - Introduction to Java Scripts - Objects in Java Script - Dynamic HTML with Java Script.

MODULE-II: Vbscript Language Elements
Constants - Variables and Data Types - Mathematical Operations – LogicalOperators - Looping and Decision Structures - VBScript Functions and Objects:Data Conversion Functions - Mathematical Functions - Data FormattingFunctions -Text Manipulation Functions - Data and Time Functions - Built-in
Objects.

MODULE-III: ASP Fundamentals
Using Server – Side Includes- Learning the SSI Directives – Creating ModularASP Code -Using the Request Object: Using Form Information - Using QueryString Information – Using Server Variables - Using the Response Object:Create Output – Managing Output – Managing the Connection.

MODULE-IV: Using Cookies
Introduction to Cookies: Cookies and Your Browser – Creating a Cookie –Modifying and removing Cookies – Tracking Preferences with Cookies Usingthe Application, Session and Server Objects: The application Object – TheSession Object – The Server Object –Using the global .asa file - Active DataObjects Essentials: Microsoft's Universal Data Access Strategy – TheConnection Object – The Record set and Field Objects – The Command andParameter Objects – Using the Errors Collection.

MODULE-V: Introducing XML
XML: The Life of an XML documents - Related technologies- First XMLDocument: Hello XML – Exploring the Simple XML Document – AssigningMeaning to XML Tags – Writing a Style Sheet for an XML Document – Attachinga Style Sheet to an XML Document – Style Languages: CSS Style Sheets,CSS Layouts, CSS Text Styles.

MODULE-VI: Attributes, Empty Tags & XSL
Attributes – Attributes versus Elements – Empty Elements and Empty ElementTags – XSL-DTDs and Validity: Document Type Definitions – ElementDeclarations – DTD Files – Document Type Declarations – Validating Againsta DTD-Element Declaration - Entity Declarations: What Is an Entity – InternalGeneral Entities – External General Entities – Internal Parameter Entities –External Parameter Entities – Building a Document from Places-AttributeDeclaration: What is an Attribute – Declaring Attributes in DTDs – DeclaringMultiple Attributes – Specifying Default Values for Attributes – Attribute Types –Predefined Attributes – A DTD for Attribute- Based Baseball Statistics.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Dave Mercer, "ASP 3.0 Beginners Guide", Tata McGraw-Hill Edition, Sixthreprint, 2004.
- Rajkamal, "Web Technology", 1st Edition, Tata McGraw - Hill, 2001.

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SERVICE ORIENTED ARCHITECTURE

Course Code: DSE4307 **Credit Units: 03**

Course Objective:
The subject gives an introduction to the fundamentals and issues relating to Service Oriented Architecture and bring out the importance of service orientation and web services. It also teaches appropriate tools as technique on how to build the Service Oriented Architecture with web services.

Course Contents:

Module I: Introduction
Basic definition - Fundamentals of SOA - Characteristics and misperceptions about SOA-Benefits and pitfalls of SOA.

Module II: Evolution of SOA
The evolution of SOA - Web service and primitive SOA - The extension of SOA - Web service extension.

Module III: Web Service and Contemporary SOA
Message Exchange Pattern- Service Activity- Coordination- Atomic Transaction- Business Activity- Orchestration – Choreography- Addressing- Reliable Messaging- Correlation and Policies- Meta data Exchange- Security- Notification and Eventing.

Module IV: Principles of Service Orientation
Principles of service orientation -Building SOA-Planning and Analysis- SOA delivery strategies - Service Oriented Analysis Introduction -Service Modelling of Service Oriented Analysis.

Module V: Service Oriented Design
Introduction to service oriented design - WSDL related XML Schema language Basics - WSDL Language Basics - SOAP Language Basics - Service interface design tools - Steps to composing SOA - Consideration for choosing service layers, positioning core SOA standards and choosing SOA extension – Service design and business process design.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Thomas Erl, "Service Oriented Architecture, Concepts, Technology and Design", Pearson Education, 2009.
- Shankar Kambhampaty, "Service Oriented Architecture for Enterprise Architecture for Enterprise Application", 1st Edition, Wiley Publication, 2008.

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NATURAL LANGUAGE PROCESSING

Course Code: DSE4308 **Credit Units: 03**

Course Objective:
This course provides a general introduction including the use of state automata for language processing and syntax including a basic parse. It explains advanced feature like feature structures and realistic parsing methodologies. It also gives concepts of remotes processing and detail information about a typical natural language processing applications.

Course Contents:

Module-I: Introduction
Introduction: Knowledge in speech and language processing - Ambiguity - Models and Algorithms - Language, Thought and Understanding- Regular Expressions and automata: Regular expressions - Finite-State automata. Morphology and Finite-State Transducers: Survey of English morphology - Finite-State Morphological parsing - Combining FST lexicon and rules - Lexicon- Free FSTs: The porter stammer - Human morphological processing.

Module-II: Syntax Analysis
Word classes and part-of-speech tagging: English word classes - Tagsets for English - Part-of-speech tagging - Rule-based part-of-speech tagging - Stochastic part-of-speech tagging - Transformation-based tagging – Other issues - Context-Free Grammars for English: Constituency - Context-Free rules and trees - Sentence-level constructions - The noun phrase -
Coordination - Agreement - The verb phase and sub categorization – Auxiliaries - Spoken language syntax - Grammars equivalence and normal form - Finite- State and Context-Free grammars - Grammars and human processing. Parsing with Context-Free Grammars: Parsing as search - A Basic Top-Down parser - Problems with the basic Top-Down parser - The early algorithm - Finite-State parsing methods.

MODULE-III: Advanced Features and Syntax
Features and Unification: Feature structures - Unification of feature structures
- Features structures in the grammar - Implementing unification - Parsing with unification constraints - Types and Inheritance. Lexicalized and Probabilistic
Parsing: Probabilistic context-free grammar - Problems with PCFGs -
Probabilistic lexicalized CFGs - Dependency Grammars - Human parsing.

MODULE-IV: Semantic
Representing Meaning: Computational desiderata for representations – Meaning structure of language - First order predicate calculus - Some linguistically relevant concepts - Related representational approaches – Alternative approaches to meaning. Semantic Analysis: Syntax-Driven semantic analysis - Attachments for a fragment of English - Integrating semantic analysis into the early parser - Idioms and compositionality - Robust semantic analysis. Lexical semantics: relational among lexemes and their senses - WordNet: A database of lexical relations - The Internal structure of words - Creativity and the lexicon.

MODULE-V: Natural Language Generation
Introduction to language generation - Architecture for generation – Surface realization - Discourse planning - Other issues- Machine Translation: Language similarities and differences - The transfer metaphor - The interlingua idea: Using meaning - Direct translation - Using statistical techniques – Usability and system development.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
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Text & References:

- Daniel Jurafsky& James H.Martin, “Speech and Language Processing", 2nd Edition, Pearson Education, 2009.
- James Allen, "Natural Language Understanding", 2nd Edition, Pearson Education, 2008.
- Manning, Christopher D and HinrichSchütze, “Foundations of Statistical Natural Language Processing”, Cambridge, 1st Edition, MA: MIT Press, 1999.

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AGENT BASED INTELLIGENT SYSTEMS

Course Code: DSE4309 **Credit Units: 03**

Course Objective:
This course provides students basic knowledge of employing intelligent agents in solving complex problems and gives the awareness of the building blocks of agents and working of different types of agents. It also analyses the reasons for uncertainty and ability to design agents to handle them.

Course Contents:

Module-I: Introduction
Definitions – History – Hybrid Intelligent Agents – Agents vs Multi Agent Systems– Structure – Environment – Basic Problem Solving Agents – Complex Problem Solving Agents – Formulating Search Strategies – Intelligent Search.

Module-II: Concepts for Building Agents
Situated Agents: Actions and Percepts - Proactive and Reactive Agents: Goals and Events- Challenging Agent Environments: Plans and Beliefs - Social Agents - Agent Execution Cycle.

Module-III: Knowledge Based Agents
Knowledge Representation – Logic – First Order Logic – Reflex Agent – Building a Knowledge Base – General Ontology – Interference – Logical Recovery.

Module-IV: Planning Agents
Situational Calculus – Representation of Planning – Partial Order Planning – Practical Planners– Conditional Planning - Preplanning Agents.

Module-V: Agents and Uncertainty
Acting under uncertainty – Probability – Baye's Rule – Belief Networks – Utility Theory - Decision Network- Value of Information – Decision Theoretic Agent Design.

Module-VI: Higher Level Agents
Learning Agents – General Model – Inductive Learning – Learning Decision Tree – Reinforcement Learning – Knowledge in Learning – Communicative Agents – Types of Communicative Agents – Future of AI.

Examination Scheme:

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Text and References:

- Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 3rd Edition, Prentice Hall, 2010.
- Lin Padgham, Michael Winikoff, "Developing Intelligent Agent Systems: A Practical Guide", 1st Edition, John Wiley & Sons, 2004.
- ZiliZhang,Chengqi Zhang, "Agent-Based Hybrid Intelligent Systems: An Agent- Based Framework for Complex Problem Solving", 1st Edition, Springer-Verlag New York, LLC , 2004.
- Ngooc Thanh Nguyaaen, Lakhmi C. Jain, "Intelligent Agents in the Evolution of Web and Applications", 4th Edition, Springer, 2009.

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PROJECT-DISSERTATION-II

Course Code: DSE4437 **Credit Units: 15**

GUIDELINES FOR DISSERTATION

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage.

The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

In general, the File should be comprehensive and include

A short account of the activities that were undertaken as part of the project;

A statement about the extent to which the project has achieved its stated goals.

A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;

Any activities planned but not yet completed as part of the DISSERTION, or as a future initiative directly resulting from the project;

Any problems that have arisen that may be useful to document for future reference.

- **Report Layout**

The report should contain the following components:

- **Title or Cover Page**

The title page should contain the following information: Project Title; Student's Name; Course; Year; Supervisor's Name.

- **Acknowledgements** (optional)

Acknowledgment to any advisory or financial assistance received in the course of work may be given.

- **Abstract**

A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project

- **Table of Contents**

Titles and subtitles are to correspond exactly with those in the text.

- **Introduction**

Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

- **Materials and Methods**

This section should aim at experimental designs, materials used. Methodology should be mentioned in details including modifications if any.

- **Results and Discussion**

Present results, discuss and compare these with those from other workers, etc. In writing these section, emphasis should be given on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available

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in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

Note that in writing the various secions, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary never write in "point" form.

- **Conclusion**

A conclusion should be the final section in which the outcome of the work is mentioned briefly.

- **Future prospects**

- **Appendices**

The Appendix contains material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

- **References / Bibliography**

This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Examples

For research article

Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichia coli* O157: H7. *Clin Microbiol Infect*, **8** (suppl 1): 116–117.

For book

Kowalski,M.(1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67

ASSESSMENT OF THE DISSERTATION FILE

Essentially, marking will be based on the following criteria: the quality of the report, the technical merit of the project and the project execution.
Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project.
Project execution is concerned with assessing how much work has been put in.
The File should fulfill the following ***assessment objectives:***

Range of Research Methods used to obtain information

Execution of Research

Data Analysis

Analyse Quantitative/ Qualitative information
Control Quality

Draw Conclusions

Examination Scheme:

Dissertation	50
Viva Voce	50
Total	**100**

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- relevant to business, defined broadly;
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- Has the student collected information / data suitable to the frameworks?
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- Has the student succeeded in drawing conclusion form the analysis?
- Do the conclusions relate well to the objectives of the project?
- Has the student been regular in his work?
- Layout of the written report.

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Assessment Scheme:

Continuous Evaluation: (Based on Abstract, Regularity, Adherence to initial plan, Records etc.)		40%
Final Evaluation: Based on,		60%
Contents & Layout of the Report,	20	
Conceptual Framework,	05	
Objectives & Methodology and	05	
Implications & Conclusions	10	
Viva & Presentation	20	

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Amity School of Engg. & Technology

Master of Technology - Artificial Intelligence

FLEXILEARN
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Curriculum & Scheme of Examination

2023

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Course Code: AIE4102	ADVANCED DATABASE MANAGEMENT SYSTEMS	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	3	0	0	3
Pre-requisites/Exposure	Basic knowledge of DBMS				
Co-requisites	NIL				

Catalog Description

The objective of this course is to expose the students to the implementation techniques of database system. This course explains techniques for query processing and optimization with transaction and concurrency control techniques.

Course Objectives

The objective of this course is to

1. To understand the basic concepts and terminology related to DBMS and Relational Database Design
2. To design and understand Distributed, parallel and object oriented Databases.
3. To understand advanced DBMS techniques to handle and optimize queries in database.

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand the basics of database management system and implementation of relational database.

CO2. Knowhow of the file organization, Query Optimization, Transaction management, and database administration techniques.

CO3. Understand and design Distributed, parallel and object oriented Databases models and possible methods of proving them.

Modules	Blooms level*	Number of hours
MODULE 1: **Relational Database** Integrity Constraints revisited, Extended ER diagram, Relational Algebra & Calculus, Functional, Muiltivalued and Join Dependency, Normal Forms, Rules about functional dependencies.	L1, L2 and L3	8

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MODULE 2: **Query Processing and Optimization** Valuation of Relational Operations, Transformation of Relational Expressions, Indexing and Query Optimization, Limitations of Relational Data Model, Null Values and Partial Information. **Objected Oriented and Object Relational Databases** Modeling Complex Data Semantics, Specialization, Generalization, Aggregation and Association, Objects, Object Identity, Equality and Object Reference, Architecture of Object Oriented and Object Relational Databases	L1,L2,l3	9
MODULE 3: **Parallel and Distributed Databases** Distributed Data Storage – Fragmentation & Replication, Location and Fragment Transparency Distributed Query Processing and Optimization, Distributed Transaction Modeling and concurrency Control, Distributed Deadlock, Commit Protocols, Design of Parallel Databases, and Parallel Query Evaluation. **Advanced Transaction Processing** Nested and Multilevel Transactions, Compensating Transactions and Saga, Long Duration Transactions, Weak Levels of Consistency, Transaction Work Flows, Transaction Processing Monitors.	L1, L2 and L3	10
MODULE 4: Multimedia databases, Databases on the Web and Semi–Structured Data , Case Study: Oracle Xi	L1, L2	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Elmarsi, Navathe, Somayajulu, Gupta, "Fundamentals of Database Systems", 4th Edition, Pearson Education, 2007
2. Garcia, Ullman, Widom, "Database Systems, The complete book", PearsonEducation, 2007
3. R. Ramakrishnan, "Database Management Systems", McGraw Hill International Editions, 1998

Reference Books

1. Date, Kannan, Swaminathan, "An Introduction to Database Systems", 8th Edition Pearson Education, 2007
2. Singh S.K., "Database System Concepts, design and application", Pearson Education, 2006.
3. Silberscatz, Korth, Sudarshan, "Database System Concepts", Mcgraw Hill, 6th Edition, 2006
4. W. Kim, "Modern Database Systems", 1995, ACM Press, Addision – Wesley,
5. D. Maier, "The Theory of Relational Databases", 1993, Computer Science Press, Rokville, Maryland
6. Ullman, J. D., "Principals of database systems", Galgotia publications, 1999
7. Oracle Xi Reference Manual
8. Dietrich, and Urban, "An Advanced Course in Database Systems", Pearson, 2008.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

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Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	-	3	--	--	--	--	--	--	--	--	--	2	2	-	-
CO 2	2	2	3	-	--	--	--	--	--	--	--	--	2	1	-	-
CO 3	2	-	3	-	-	--	--	--	--	--	--	--	2	1	-	-

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Course Code: AIE4103	DIGITAL COMPUTER ORGANIZATION	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The Objective of this course is to expose the students to the fundamentals and the concepts of Digital & Computer Organization and Representation of Information and Basic Building Blocks, Basic Organization, Memory Organization, Input-Output Organization, Processor Organization etc. This course is designed to understand the concepts of Computer Organization for Research & Development as well as for application.

Course Objectives

The objective of this course is to

An understanding of a machine's instruction set architecture (ISA) including basic instruction fetch and execute cycles, instruction formats, control ow, and operand addressing modes.

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand and Interpret the functional architecture of computing systems.

CO2. Identify, compare and assess issues related to ISA, memory, control and I/O functions.

CO3. Understand the general concepts in digital logic design, including logic elements, and their use in combinational and sequential logic circuit design.

CO4. Design and analyze solutions in the area of computer architecture.

Modules	Blooms level*	Number of hours
MODULE 1: **Parallel computer models** The state of computing, Multiprocessors and multicomputers, Multivector and SIMD computers, Architectural development tracks Program and network properties: Conditions of parallelism, Data and resource dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain size and latency, Program flow mechanisms, Control flow versus data flow, Data flow architecture, Demand driven mechanisms, Comparisons of flow mechanisms	L1, L2 and L3	7
MODULE 2: **System Interconnect Architectures** Network properties and routing, Static interconnection networks, Dynamic interconnection Networks, Multiprocessor system interconnects, Hierarchical bus systems, Crossbar switch and multiport memory, Multistage and combining network.	L1,L2,l3	8

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MODULE 3: **Processors and Memory Hierarchy** Advanced processor technology, Instruction-set Architectures,CISC Scalar Processors, RISC Scalar Processors, Superscalar Processors,VLIW Architectures, Vector and Symbolic processors Memory Technology: Hierarchical memory technology, Inclusion, Coherence and Locality, Memory capacity planning, Virtual Memory Technology	L1, L2 and L3	8
MODULE 4: **Backplane Bus System** Backplane bus specification, Addressing and timing protocols, Arbitration transaction and interrupt, Cache addressing models, Direct mapping and associative caches. Pipelining: Linear pipeline processor, Nonlinear pipeline processor, Instruction pipeline design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch handling techniques, Arithmetic Pipeline Design, Computer arithmetic principles, Static arithmetic pipeline, Multifunctional arithmetic pipelines	L1, L2	7
MODULE 5: **Vector Processing Principles** Vector instruction types, Vector-access memory schemes. Synchronous Parallel Processing: SIMD Architecture and Programming Principles, SIMD Parallel Algorithms, SIMD Computers and Performance Enhancement	L2,L4	6

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. M. Moris Mano, "Computer Systems Architecture", 4th Edition, Pearson/PHI, ISBN:10:0131755633

2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, "Computer Organization", 5 th Edition, McGraw Hill

Reference Books

1. J.P. Hayes, "computer Architecture and organization", MGH, 1998.
2. M.J Flynn, "Computer Architecture, Pipelined and Parallel Processor Design", Narosa Publishing, 1998.
3. D.A. Patterson, J.L. Hennessy, "Computer Architecture: A quantitative approach", Morgan Kauffmann, 2002.
4. Hwang and Briggs, "Computer Architecture and Parallel Processing"; MGH, 2000.

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	-	3	--	--	--	--	--	--	--	--	--	2	1	-	-
CO 2	2	2	3	-	--	--	--	--	--	--	--	--	2	1	2	-
CO 3	2	-	3	-	-	--	--	--	--	--	--	--	2	1	2	-
CO 4	2	-	3	-	-	--	--	--	--	--	--	--	2	1		-

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Course Code: AIE4104	ADVANCED COMPUTER NETWORKS	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	3	0	0	3
Pre-requisites/Exposure	Basics of Computer Network				
Co-requisites	Nil				

Catalog Description

Advanced Computer Networks provides the knowledge of computer networks and related current research topics. This course illustrates the OSI and TCP-IP layers, services, devices, cables, protocols, network security, network performance parameters etc .This course focuses on advanced computer network concepts in theory as well as in real life applications in networking.

Course Objectives

The objective of this course is to

- Equip the students with the advanced networking concepts.
- Explain the different techniques of error detection and correction methods used at various layers.
- Provide an overview of various algorithms involved in advanced computer networks at OSI and TCP-IP Layers.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the concept of reference model, wireless Ethernet standards, protocols and applications of networks.
CO2: Describe network Layer design issues, routing algorithms, IP addressing.
CO3: State Multicasting issues and multicast routing protocol. Describe mobile IP and its use in Multicasting.
CO4: State transport and application layers and explain services, protocols, performance parameters in these layers. Also describe DNS, Email and www with applications of each in computer network.
CO5: State network security and describe various types of computer network security, the digital signature, security algorithms. Explain the social issues related to network security and web security.

Modules	Blooms level*	Number of hours
MODULE 1: Uses computer networks, Reference Models, TCP/IP suite of protocols, MAC protocols for high-speed LANS, MANs, and wireless LANs. (For example, FDDI, DQDB, HIPPI, Gigabit Ethernet, Wireless Ethernet, etc.)Fast access technologies. (For example, ADSL, Cable Modem, etc.)	L1, L2	6
MODULE 2: Network Layer Design Issues, Routing Algorithms, Congestion Control Algorithms, Quality of Service, Internet Working, Network Layer in Internet. IPv6 basic protocol, extensions and options, support for QoS, security, etc., Changes to other protocols, Application Programming Interface for IPv6.	L2, L3	8
MODULE 3: Mobile IP, IP Multicasting. Multicast routing protocols, address assignments, session discovery, etc.	L1, L2	8

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MODULE 4: The Transport Protocol: The Transport Service, Elements of transport protocol, a simple Transport Protocol, Internet Transport Protocols UDP, Internet Transport Protocols TCP, TCP extensions for high-speed networks, transaction-oriented applications Performance Issues. The Application Layer: DNS-(Domain Name System), Electronic Mail, World Wide Web Multimedia.	L1, L2, and L3	8
MODULE 5: Overview of network security, Secure-HTTP, SSL, ESP, Key distribution protocols. Digital signatures, digital certificates-mail Security, Web security, Social Issues..	L1, L2	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. William Stallings, Cryptography & Network Security: Principles and Practices, Prentice Hall, 2005, (ISBN: 978-0131873162).

Reference Books

1. Behrouz A. Forouzan, Cryptography & Network Security, McGraw-Hill, 2007, USA. (ISBN: 0073327530 9780073327532).
2. Douglas R. Stinson, Chapman and Hall, Cryptography Theory & Practice, CRC Press, 2005.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	-	-	-	-	--	--	--	--	--	--	--	1	--	-	--
CO2	1	-	-	-	3	--	3	--	--	--	--	--	1	--	-	--
CO3	1	-	-	-	3	--	3	--	--	--	--	--	2	1	-	--
CO4	1	-	-	--	2	--	2	--	3	--	--	--	2	1	-	--
CO5	1	-	-	-	1	-	1	--	2	--	--	--	1	2	-	--

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Course Code: AIE4106	ADVANCED DATABASE MANAGEMENT SYSTEM LAB	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	0	0	2	1
Pre-requisites/Exposure	Basic knowledge of DBMS				
Co-requisites	Nil				

Catalog Description

The objective of this course is to expose the students to the implementation techniques of database system. This course explains techniques for query processing and optimization with transaction and concurrency control techniques.

Course Objectives

The objective of this course is

1. Equip the students with the different issues involved in the design and implementation of a database system.
2. Provide a practical knowledge of implementation/demonstration of data manipulation language to query, update, and manage a database.

Course Outcomes

On completion of this course, the students will be able to

CO1. Demonstrate and analyze and apply common SQL statements including DDL, DML and DCL statements to perform different operations.

CO2. Demonstrate and Apply different types of constraints on the database.

CO3. Design different views of tables for different users and to apply embedded and nested queries.

CO4. Design and implement a database for a given problem according to well known design principles that balance data retrieval performance with data consistency.

Modules	Blooms level*	Number of hours
Module1: 1. Introduction to SQL and understand basic commands 2. Understand various DDl and DML commands. 3. To understand joins in SQL.	L1,L2 and L3	4
Module 2: 1. To understand constraints SQL 2. Wild cards and aggregate functions in SQL 3. To understand and execute procedures and views in SQL	L2 and L3	6
Module 3: 1. To understand and execute triggers in SQL 2. To develop a database application to demonstrate the representation of multi valued attributes and use of nested tables to represent complex objects. Write suitable queries	L2, L3, L4 and L5	4
Module 4: 1. To understand and execute Indexes in SQL	L2, L3 and L4	4

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Module 5: 1. To understand the concept of Exception handling in SQL 2. Query Evaluation Plans 3. Concurrency and Transactions	L2, L3 and L4	1

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", 6th edition, Tata McGraw Hill, 2011
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", 4th Edition, Pearson/Addision wesley, 2007

Reference Book

1. Database System Concepts by A. Silberschatz, H.F. Korth and S. Sudarshan, 3rdedition, 1997, McGrawHill, International Edition.
2. Introduction to Database Management system by Bipin Desai, 1991, Galgotia Pub.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/ Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2	PS O 3	PS O 4
CO 1	2	1	--	--	--	--	--	--	--	--	--	--	1	2	--	--
CO 2	3	1	--	--	--	--	--	--	--	--	--	--	1	1	--	--
CO 3	1	3	2	--	--	--	--	--	--	--	--	--	1	2	3	--
CO 4	1	3	2	--	--	--	--	--	--	--	--	--	1	1	--	--
CO 5	1	3	--	--	--	--	--	--	--	--	--	--	1	2	--	1

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Course Code: AIE4107	ADVANCED COMPUTER NETWORKS LAB	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	0	0	2	1
Pre-requisites/Exposure	Basics of Computer Networks				
Co-requisites	Nil				

Catalog Description

Advanced Computer Networks Lab provides the knowledge of various installations & connections of LAN, WAN, etc, study of Cisco Packet Tracer Tool and its implementations, simulation of flow-control protocols such as Sliding Window, Stop & Wait with help of programming languages. This course focuses on real-life applications in networking and its software implementation in the laboratory.

Course Objectives

The objective of this course is to

- Equip the students with the advanced networking concepts.
- Explain the different techniques of error detection and correction methods used at various layers.
- Provide an overview of various algorithms involved in advanced computer networks at OSI and TCP-IP Layers.

Course Outcomes

On completion of this course, the students will be able to

CO1: Understand fundamental underlying principles of computer networking
CO2: Understand details and functionality of CISCO router
CO3:Demonstrate and configure details and functionality of DHCP server
CO4: Analyze performance of various communication protocols.
CO5: Compare routing algorithms

Modules	Blooms level*	Number of hours
MODULE 1: 1. Configuration and logging to a CISCO Router and introduction to the basic user Interfaces. Introduction to the basic router configuration and basic commands. 2. Configuration of IP addressing for a given scenario for a given set of topologies.	L1, L2	2
MODULE 2: 1. Configure a DHCP Server to serve contiguous IP addresses to a pool of four IP devices with a default gateway and a default DNS address. Integrate the DHCP server with a BOOTP demon to automatically serve Windows and Linux OS Binaries based on client MAC address	L2, L3	2

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MODULE 3: 1. Configure, implement and debug the following: Use open source tools for debugging and diagnostics. a. ARP/RARP protocols b. RIP routing protocols c. BGP routing d. OSPF routing protocols e. Static routes (check using netstat)	L1, L2	3
MODULE 4: 1. Configure DNS: Make a caching DNS client, and a DNS Proxy; implement reverse DNS and forward DNS, using TCP dump/Wireshark characterise traffic when the DNS server is up and when it is down. 2. Configure FTP Server on a Linux/Windows machine using a FTP client/SFTP client characterise file transfer rate for a cluster of small files 100k each and a video file of 700mb.Use a TFTP client and repeat the experiment	L1, L2, and L3	3
MODULE 5: 1. Configure a mail server for IMAP/POP protocols and write a simple SMTP client in C/C++/Java client to send and receive mails. 2. Implement Open NMS+ SNMPD for checking Device status of devices in community MIB of a linux PC. Using yellow pages and NIS/NFS protocols implement Network Attached Storage Controller (NAS). Extend this to serve a windows client using SMB. Characterise the NAS traffic using wireshark.	L1, L2	3

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

2. William Stallings, Cryptography & Network Security: Principles and Practices, Prentice Hall, 2005, (ISBN: 978-0131873162).

Reference Books

3. Behrouz A. Forouzan, Cryptography & Network Security, McGraw-Hill, 2007, USA. (ISBN: 0073327530 9780073327532).
4. Douglas R. Stinson, Chapman and Hall, Cryptography Theory & Practice, CRC Press, 2005.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	-	-	-	-	--	--	--	--	--	--	--	1	--	-	--
CO2	1	-	-	-	3	--	3	--	--	--	--	--	1	--	-	--
CO3	1	-	-	-	3	--	3	--	--	--	--	--	1	2	2	--
CO4	1	-	-	--	2	--	2	--	3	--	--	--	2	1	-	--
CO5	1	-	-	-	1	-	1	--	2	--	--	--	2	1	-	--

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Course Code: AIE4108	MATLAB PROGRAMMING	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	0	0	4	2
Pre-requisites/Exposure	C Programming				
Co-requisites	Basic knowledge of Programming				

Catalog Description

The objective of this course is to expose the students to the implementation techniques of Mat Lab Programming.

Course Objectives

The objective of this course is to

4. To understand the basic concepts and terminology related to Mat Lab.
5. Application of Mat Lab in field of Signal Processing and Control systems.

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand the basics of Matlab programming environment.

CO2. Analysis of given LTI System and verifying its physical reliability and stability properties.

CO3. Waveform synthesis using Laplace Transforms and z-transform of a given signal and system.

Modules	Blooms level*	Number of hours
1. To write a MATLAB program to perform some basic operation on matrices such as addition, subtraction, multiplication. 2. To write a "MATLAB" Program to generate various signals and sequences, such as unit impulse, unit step, unit ramp, sinusoidal, square, saw tooth, triangular, sinc signals. 3. To performs operations on signals and sequences such as addition, multiplication, scaling, shifting, folding, computation of energy and average power. 4. Write a program for finding even and odd parts of sequences Using MATLAB Software& program for finding real and imaginary parts of sequences Using MATLAB Software.	L1, L2 and L3	8
5. Write a program to find the out put with linear convolution operation Using MATLAB Software 6. Write a program to compute auto correlation and cross correlation between signals and Sequences. 7. Write a program to compute linearity and time invariance properties of a given continuous /discrete System.	L1,L2,l3	6

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8. Write a program to Unit Step And Sinusoidal Response Of The Given LTI System And Verifying Its physical reliability and stability properties. 9. Write a program to demonstrate Gibbs Phenomenon using MATLAB. 10. Write a program to obtain Fourier Transform and Inverse Fourier Transform of a given signal / sequence and to plot its Magnitude and Phase Spectra **11.** Write a program to perform waveform synthesis using Laplace Transforms of a given signal.	L1, L2 and L3	8
12. Write a program to locating the zeros and poles and plotting the pole zero maps in s-plane and z-plane 13. for the given transfer function. 14. Write a program to Generate Gaussian Noise and to Compute its Mean, M.S. Values, Skew, kurtosis, 15. PS and PDF 16. Write a program to demonstrate Sampling Theorem and aliasing effect using MATLAB. 17. Write a program for removal of noise by auto correlation/cross correlation.	L1, L4	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

Amos Gilat, "MATLAB: An Introduction with Applications", Wiley; Fourth edition (2012)4ed.

Reference Books

Bansal, Goel and Sharma, MATLAB and its Applications in Engineering"Pearson Education India; Second edition (1 March 2016).

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2	PS O 3	PSO 4
CO 1	2	1	--	--	--	--	--	--	--	--	--	--	1	2	--	--
CO 2	3	1	--	--	--	--	--	--	--	--	--	--	1	1	--	--
CO 3	1	3	2	--	--	--	--	--	--	--	--	--	1	2	3	--

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Course Code: AIE4109	PYTHON PROGRAMMING LAB	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	0	0	2	1
Pre-requisites/Exposure	Hands on knowledge of C and C++ Programming				
Co-requisites	Basic concepts of OOP Programming				

Catalog Description

The course is designed to provide an introduction to the Python programming language. The focus of the course is to provide students with an introduction to programming, I/O, and visualization using the Python programming language.

Course Objectives

The objective of this course is

- Equip the students with the basic feature of python required in solving complex problems and build GUI applications
- Provide a practical knowledge of implementation/demonstration of python programming concepts like of lists, tuples, dictionaries, Object Oriented Programming concepts in Python, Strings and Files in Python.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Demonstrate the basics of python programming using if-else, loops and List, Dictionary, tuples.

CO 2: Demonstrate the concept of inheritances, polymorphisms and other concepts and able to solve complex programming problems involving class objects.

CO 3: Demonstrate the ability to write database applications in Python

CO 4: Demonstrate Files Handling in Python.

CO 5: Demonstrate database operation and GUI applications in python.

Modules	Blooms level*	Number of hours
Write a program which will find all such numbers which are divisible by 7 but are not a multiple of 5,between 2000 and 3200 (both included). The numbers obtained should be printed in a comma-separated sequence on a single line. Create a program that asks the user to enter their name and their age. Print out a message addressed to them that tells them the year that they will turn 100 years old. Define a function max() that takes two numbers as arguments and returns the largest of them. Use the if-then-else construct available in Python. (It is true that Python has the max() function built in, but writing it yourself is nevertheless a good exercise.) Define a function max_of_three() that takes three numbers as arguments and returns the largest of them.	L1,L2 and L3	4

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Define a function that computes the length of a given list or string. (It is true that Python has the len() function built in, but writing it yourself is nevertheless a good exercise.) Write a function that takes a character (i.e. a string of length 1) and returns True if it is a vowel, False otherwise. Write a function translate() that will translate a text into "rövarspråket" (Swedish for "robber's language"). That is, double every consonant and place an occurrence of "o" in between. For example, translate("this is fun") should return the string "tothohisosisosfofunon". Define a function sum() and a function multiply() that sums and multiplies (respectively) all the numbers in a list of numbers. For example, sum([1, 2, 3, 4]) should return 10, and multiply([1, 2, 3, 4]) should return 24. Define a function reverse() that computes the reversal of a string. For example, reverse("I am testing") should return the string "gnitset ma I".	L2 and L3	6
Ask the user for a number. Depending on whether the number is even or odd, print out an appropriate message to the user Take a list, say for example this one: a = [1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89] and write a program that prints out all the elements of the list that are less than 5. Create a program that asks the user for a number and then prints out a list of all the divisors of that number. (If you don't know what a divisor is, it is a number that divides evenly into another number. For example, 13 is a divisor of 26 because 26 / 13 has no remainder.) Take two lists, say for example these two: a = [1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89] b = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13] and write a program that returns a list that contains only the elements that are common between the lists (without duplicates). Make sure your program works on two lists of different sizes.	L2, L3, L4 and L5	4
Ask the user for a string and print out whether this string is a palindrome or not. (A palindrome is a string that reads the same forwards and backwards.) Let's say I give you a list saved in a variable: a = [1, 4, 9, 16, 25, 36, 49, 64, 81, 100]. Write one line of Python that takes this list a and makes a new list that has only the even elements of this list in it. Make a two-player Rock-Paper-Scissors game. (Hint: Ask for player plays (using input), compare them, print out a message of congratulations to the winner, and ask if the players want to start a new game) **Remember the rules:** Rock beats scissors Scissors beats paper • Paper beats rock	L2, L3 and L4	4

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Write a program that asks the user how many Fibonnaci numbers to generate and then generates them. Take this opportunity to think about how you can use functions. Make sure to ask the user to enter the number of numbers in the sequence to generate.(Hint: The Fibonnaciseqence is a sequence of numbers where the next number in the sequence is the sum of the previous two numbers in the sequence. The sequence looks like this: 1, 1, 2, 3, 5, 8, 13, …) Write a program (function!) that takes a list and returns a new list that contains all the elements of the first list minus all the duplicates. Write a function that takes an ordered list of numbers (a list where the elements are in order from smallest to largest) and another number. The function decides whether or not the given number is inside the list and returns (then prints) an appropriate boolean.	L2, L3 and L4	1

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Michael Urban and Joel Murach, Python Programming, Shroff/Murach, 2016
2. Mark Lutz, Programming Python, O`Reilly, 4th Edition, 2010
3. Patrick Naughton & Herbert Schild ,"JAVA The Complete Reference", 10th Edition , TMH

Reference Book

1. Daniel/Young , Introduction to JAVA Programming" , PHI.
2. Jeff Frentzen and Sobotka, "Java Script", Tata McGraw Hill,1999.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/ Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2	PS O 3	PS O 4
CO 1	2	1	--	--	--	--	--	--	--	--	--	--	1	2	--	--
CO 2	3	1	--	--	--	--	--	--	--	--	--	--	1	1	--	--
CO 3	1	3	2	--	--	--	--	--	--	--	--	--	1	2	3	--
CO 4	1	3	2	--	--	--	--	--	--	--	--	--	1	1	--	--
CO 5	1	3	--	--	--	--	--	--	--	--	--	--	1	2	--	1

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Course Code: AIE4206	RESEARCH METHODOLOGY AND TECHNICAL REPORT WRITING	L	T	P	C
Version 2019.1	Date of Approval: 19 July 2020	2	0	0	2
Pre-requisites/Exposure	NIL				
Co-requisites	NIL				

Catalogue Description

This course deals with types of research, significance and characteristics and planning a research proposal, population and sample, parameter and statistic, sampling and data collection, sampling design: steps, types, sample size, sampling methods. It deals with univariate, bivariate and multivariate analysis, measure of dispersion of data, standard deviation, variance, coefficient of variation and degree of freedom. Hypothesis testing: parametric tests and non-parametric tests, regression analysis and curve fitting, method of least-squares, explained and unexplained variations, coefficient of correlation of determination. The course also deals with technical/scientific/research report writing: referencing and bibliography and footnotes. Publication of research papers, citations, intellectual property rights and copy rights, plagiarism, patent and patent laws, commercialization and ethical issues.

Course Objectives

The objective of this course is to:

- Deals with types of research, significance and characteristics and planning a research proposal and to enhance scientific and technical writing and research skills.
- Impart knowledge about various stages of research process, statistical analysis and tools & their applications in decision making by hypothesis testing and regression analysis.
- It also deals with intellectual property rights and copy rights, plagiarism, patent and patent laws, commercialization and ethical issues.

Course Outcomes

On completion of this course, the students will be able to:

CO1. Classify different research types, explain steps in research process and planning research proposal.

CO2. Describe sampling methods, sampling steps and design, carry out data processing and analysis.

CO3. Explain hypothesis testing, parametric and non-parametric tests, carry out regression analysis, curve fitting.

CO4. Demonstrate technical and scientific report writing skills, describe plagiarism, patent laws and intellectual property rights.

Course Content

Modules	Blooms level*	Number of hours
Module I: Introduction and Research Planning Introduction to research: Definition, motivation, need, objectives, significance and characteristics of research; types of research; steps in research process; planning a research proposal; literature review, web searching.	L1, L2	**4**

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Module II: Sampling Methods Measurement scales, population and sample, parameter and statistic, sampling and data collection, sampling design: steps, types, sample size, sampling methods, data processing and analysis. Sampling surveys and questionnaire designing, primary and secondary data.	L1, L2, L3	**5**
Module III: Hypothesis Testing and Regression Analysis Univariate, bivariate and multivariate analysis, means-arithmetic, geometric and harmonic; measure of dispersion of data, standard deviation, variance, coefficient of variation and degree of freedom. Hypothesis testing: kinds errors in hypothesis testing, significance and confidence levels, parametric tests and non-parametric tests, one-tailed and two-tailed tests, analysis of variance. Regression analysis and curve fitting, method of least-squares, explained and unexplained variations, coefficient of correlation of determination.	L1, L3, L4	**10**
Module IV: Technical Report Writing and Plagiarism Technical/scientific/research report writing: structure and components of scientific reports, formats of dissertations, research report, report writing skills, report preparation, referencing and bibliography and footnotes. Publication of research papers, citations, making presentation-use of visual aids and PPTs. Intellectual property rights and copy rights, plagiarism, patent and patent laws, commercialization and ethical issues.	L1, L3, L4	**5**

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books:

Blake, G. and Bly, R.W. The Elements of Technical Writing. MacMillan, New York, 1993.
Chawla, D and Sondhi, N. Research Methodology- Concepts and Cases. Vikas Publishing House PVT LTD. New Delhi, 2016.
Kothari, C.R. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi. 2008.

Reference Books:

Montomery, Douglas C, Design and Analysis of Experiments, 5th Ed, Wiley India.2005.
Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt.Ltd., New Delhi, 2009
Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd, Delhi, 2009.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3	PSO4
CO1	1	1	2	2	3	-	-	-	-	-	-	1	3	1	2	-
CO2	1	3	1	3	3	-	-	-	-	-	-	1	3	1	2	-
CO3	1	3	1	-	-	-	-	-	-	-	-	1	3	3	2	-
CO4	1	3	2	-	3	-	-	-	-	-	-	1	3	1	2	3
CO5	2	1	1	-	-	-	-	-	-	-		1	3	1	2	-

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Course Code: RBE4201	FUNDAMENTALS OF ROBOTIC SYSTEM AND ROBOT PROGRAMMING	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	3	0	0	3
Pre-requisites/Exposure	Basic knowledge of control system and programming				
Co-requisites	Nil				

Catalog Description

Enlighten the students about the fundamentals of robotic systems make them to understand the basics of robot, robot transformations and sensors, micro/nano robotic systems and to program them for functioning.

Course Objectives

The objective of this course is to

- Equip the students with the basic knowledge and designing of robotics.
- Implement their concept in robotics and design robot for various applications of engineering.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain and Understand the design and functionality of robots

CO2: Describe the control system with the help of sensor and robot transformations.

CO3:Undersand and robot cell design and implement in micro/nano robotics system

CO4: Explain and Understand the robotic programming language and use in design of robot.

Modules	Blooms level*	Number of hours
MODULE 1: INTRODUCTION Robot anatomy-Definition, law of robotics, History and Terminology of Robotics-Accuracy and repeatability of Robotics-Simple problems-Specifications of Robot-Speed of Robot-Robot joints and links-Robot classifications-Architecture of robotic systems-Robot Drive systems-Hydraulic, Pneumatic and Electric system.	L1 and L2	5
MODULE 2: END EFFECTORS AND ROBOT CONTROLS Mechanical grippers-Slider crank mechanism, Screw type, Rotary actuators, cam type-Magnetic grippers-Vacuum grippers-Air operated grippers-Gripper force analysis-Gripper design-Simple problems-Robot controls-Point to point control, Continuous path control, Intelligent robot-Control system for robot joint-Control actions-Feedback devices-Encoder, Resolver, LVDT-Motion Interpolations-Adaptive control.	L1, L2 and L3	7
MODULE 3: ROBOT TRANSFORMATIONS AND SENSORS Robot kinematics-Types- 2D, 3D Transformation-Scaling, Rotation, Translation- Homogeneous coordinates, multiple transformation-Simple problems. Sensors in robot – Touch sensors-Tactile sensor – Proximity and range sensors – Robotic vision sensor-Force sensor-Light sensors, Pressure sensors.	L1 and L2	5

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MODULE 4: ROBOT CELL DESIGN AND MICRO/NANO ROBOTICS SYSTEM Robot work cell design and control-Sequence control, Operator interface, Safety monitoring devices in Robot-Mobile robot working principle, actuation using MATLAB, NXT Software Introductions-Robot applications- Material handling, Machine loading and unloading, assembly, Inspection, Welding, Spray painting and undersea robot. Micro/Nanorobotics system overview-Scaling effect-Top down and bottom up approach- Actuators of Micro/Nano robotics system-Nanorobot communication techniques-Fabrication of micro/nano grippers-Wall climbing micro robot working principles-Biomimetic robot-Swarm robot-Nanorobot in targeted drug delivery system.	L1, L2, L3,L4 and L5	8
MODULE 5: BASICS OF ROBOT PROGRAMMING Robot programming-Introduction-Types- Flex Pendant- Lead through programming, Coordinate systems of Robot, Robot controller- major components, functions-Wrist Mechanism-Interpolation-Interlock commands-Operating mode of robot, Jogging-Types, Robot specifications- Motion commands, end effectors and sensors commands.	L1, L2 and L3	5
MODULE 6: VAL,VAL-II, RAPID AND AML LANGUAGE Robot Languages-Classifications, Structures- VAL- language commands motion control, hand control, program control, pick and place applications, palletizing applications using VAL, Robot welding application using VAL program-WAIT, SIGNAL and DELAY command for communications using simple applications. RAPID- language basic commands- Motion Instructions-Pick and place operation using Industrial robot- manual mode, automatic mode, subroutine command based programming. Move-master command language- Introduction, syntax, simple problems. VAL-II programming-basic commands, applications- Simple problem using conditional statements-Simple pick and place applications-Production rate calculations using robot. AML Language-General description, elements and functions, Statements, constants and variables-Program control statements-Operating systems, Motion, Sensor commands-Data processing.	L1, L2 and L3	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Craig. J. J. "Introduction to Robotics mechanics and control", Addison- Wesley,1999.

Reference Books

1. S.R. Deb, Robotics Technology and flexible automation, Tata McGraw-Hill Education., 2009
2. Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, Technology programming and Applications, McGraw Hill, 2012
3. Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, Robotics Engineering an Integrated Approach, Phi Learning.,
4. 2009.
5. Deb. S. R. "Robotics technology and flexible automation", Tata McGraw Hill publishing company limited, 1994
6. Mikell. P. Groover, "Industrial Robotics Technology", Programming and Applications, McGraw Hill Co, 1995.

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7. Klafter. R.D, Chmielewski.T.A. and Noggin's., "Robot Engineering : An Integrated Approach", Prentice Hall of India Pvt. Ltd.,1994.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	1	2	1	3	--	--	--	--	--	--	-	1	2	-
CO2	1	1	2	1	1	--	--	--	--	--	--	--	1	--	-	3
CO3	1	2	1	1	1	3	--	--	--	--	--	--	1	2	-	-
CO4	1	2	2	2	3	3	--	--	--	--	--	--	-	--	2	3

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Course Code: RBE4202	ADVANCED CONTROL SYSTEMS DRIVERS FOR ROBOTS	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	3	0	0	3
Pre-requisites/Exposure	Basic concepts of control system				
Co-requisites					

Catalog Description

This course provides comprehensive and insight knowledge of Digital control systems. Objective of the course is to provide the students the core knowledge of Stability theory of Digital systems and State Variable analysis of Digital System

Course Objectives

The objective of this course is to

- Equip the students with concepts of basic control system and its stability.
- Provide a thorough understanding of control system model by considering standard examples.
- Give an insight of state variable methods for control systems.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the fundamentals of a digital control system.
CO2: Apply the standard methods to check the stability of a control system.
CO3: Design model for digital control system for an application with given requirements.
CO4: Analyze the analog and digital control systems using state variable method.

Modules	Blooms level*	Number of hours
Module 1: **Introduction** Configuration of the basic Digital Control Systems, types of sampling operations, Sample and Hold operations, Sampling theorem, Basic discrete time signals.	L1,L2,L4	12
Module 2: **Stability Methods** Mapping between s-plane and z-plane, stability methods: Modified Routh Criterion, Jury's method, modified Schur-Cohn criterion.	L3	6
Module 3: **Models Of Digital Control Systems** Digital temperature control System, Digital position control system, stepping motors and their control. Design of Digital compensator using frequency response plots.	L5	6
Module 4: **Control Systems Analysis Using State Variable Methods** State variable representation, conversion of state variable models to transfer function and vice-versa, Eigen values and eigen vectors, Solution of state equations, Concepts of controllability and observability.	L3	6

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Module 5: **State Variable Analysis Of Digital Control Systems** State variable description of digital control systems, conversion of state variable models to pulse transfer function and vice versa, solution of state difference equations, controllability and observability.	L3	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. M. Gopal, Digital Control and State Variable Methods,4th edition, Tata Mc-Graw-Hill.
2. K.Ogata, Discrete Time Control Systems, Pearson Education, (Singapore) (Thomson Press India).
3. B.C Kuo, Digital Control Systems, Prentice Hall.

Reference Books

1. I.J. Nagrath & M.Gopal, Control System Engg., John Wiley & sons.
2. K.K. Aggarwal, Control System Analysis and Design, Khanna Publishers.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	2	--	--	--	--	--	--	--	--	--	--	1	--	--	--
CO 2	1	--	--	2	--	--	--	--	--	--	--	--	1	--	--	3
CO 3	--	--	1	--	3	--	--	--	--	--	--	--	3	1	--	--
CO 4	2	1	2	--	3	--	--	--	--	--	--	--	1	--	--	

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Course Code: RBE4203	MICROPROCESSOR AND INTERFACING	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course deals with the systematic study of the Architecture and programming issues of microprocessor family and its applications. The aim of this course is

1. To introduce students with the architecture and operation of typical microprocessors.
2. To familiarize the students with the programming and interfacing of microprocessors
3. To provide expertise in designing the embedded system based products as a solution to real time problems.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the architecture, pin configuration, addressing modes, control words of various microprocessors and Interfacing ICs

CO2. Develop the assembly language program using 8085 and 8086 using stacks & subroutines, procedures, segments, interrupts and interfacing.

CO3. Analyze assembly language programs; select appropriate assemble into machine across assembler utility of a microprocessor and solve various automation based problems of power system.

CO4. Design circuitry to the Microprocessor I/O ports in order to interface the processor to external devices so as to provide solutions real-world control problems

Modules	Blooms level*	Number of hours
Module I: Microprocessor Intel 8085 - Introduction, register structure, memory Addressing, Addressing Modes, Instruction Set, Timing Methods, CPU Pins and Associated Signals, Instruction timing and execution. programming I/O. Interrupt System, DMA, SID & SOD lines, Instruction set, 8085 based system design.	L1, L2, L3,L4	8
Module II: Intel 8086 Introduction, Architecture, Addressing modes, instruction set, memory management, assembler dependent instructions, Input/Output, system design using 8086.	L2,L3,L4	7
Module III: Pentium Processors Internal Architecture of 8087, operational overview of 8087, Introduction to 80186,80286, 80386 & 80486 processors and Pentium Processors.	L2,L3	6
Module IV: Peripheral Interfacing Parallel versus serial transmission, synchronous and asynchronous serial data transmission. Interfacing or hexadecimal keyboard and display unit, interfacing of cassette recorders and parallel, serial interface standards. Study of Peripheral Devices 8255, 8253,8257, 8251, 8259	L3,L4, L5,L6	7

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Module V: Microprocessor applications to Power Engineering **Protective Relaying:** over-current, impedance, MHO, reactance, bi-directional relays. **Measurements:** Frequency, power angle & power factor, Voltage and Current, KVA, KW, & KVAR, maximum demand. Resistance, Reactance, Temperature Controls.	L4,L5,L6	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Douglas Hall, Microprocessor and Interfacing:, Tata McGraw Hill, 2017
2. Gaonkar R. S , Microprocessor Architecture, Programming and Applications, Wiley

Reference Books

1. Yu Cheng Liu & Glen A. Gibson, Microcomputer Systems: 8086/8088 family Architecture, Programming and Design, PHI Publication, 2016.
2. Ram B., Fundamentals of Microprocessors and Microcomputers, DhanpatRai& Sons, 2017

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO4
CO1	1	2	--	--	--	--	--	--	--	--	--	--	1			
CO2	1	1	2	3	--	--	--	--	--	--	--	--	1	2		
CO3	-	-	-	1	2	3	--	--	--	--	--	--		1	2	
CO4	-	-	-	1	--	2	--	--	2	3	3	--		2	1	3

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Course Code: RBE4204	KINEMATICS AND DYNAMICS OF ROBOTS	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course deals with the systematic study of the Architecture and programming issues of robotic moments and design. The aim of this course is

1. To introduce students with the architecture and operation of robots.
2. To familiarize the students with the programming and interfacing of Robots
3. To provide expertise in designing the embedded system and kinematics of a robot based on real time problems.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the architecture, kinematic analysis for axis in Robot Design.
CO2. Understand the Workspace, Analysis And tracjectory planning
CO3. Understand the Dynamic Moments and Mathematical modeling of various forces in Moments of robotic machine
CO4. Design a robot with understanding of dynamic kinematics.

Modules	Blooms level*	Number of hours
Module I: Introduction Introduction, position and orientation of objects, objects coordinate frame Rotation matrix, Euler angles Roll, pitch and yaw angles coordinate Transformations, Joint variables and position of end effectors, Dot and cross products, coordinate frames, Rotations, Homogeneous coordinates	L1, L2, L3,L4	7
Module II: Direct Kinematics Link coordinates D-H Representation, The ARM equation. Direct kinematic analysis for Four axis, SCARA Robot and three, five and six axis Articulated Robots.	L2,L3,L4	6
Module III: Inverse Kinematics The inverse kinematics problem, General properties of solutions. Tool configuration, Inverse kinematics of four axis SCARA robot and three and five axis, Articulated robot.	L2,L3	6
Module IV: Workspace Analysis And Tracjectory Planning Workspace Analysis, work envelope of a Four axis SCARA robot and five axis articulated robot workspace fixtures, the pick and place operations, Joint space technique - continuous path motion, Interpolated motion, straight line motion and Cartesian space technique in trajectory planning.	L3,L4, L5,L6	8

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Module V: Manipulator Dynamics Introduction, Lagrange's equation kinetic and potential energy. Link inertia Tensor, link Jacobian Manipulator inertia tensor. Gravity, Generalized forces, Lagrange-Euler Dynamic model, Dynamic model of a Two-axis planar robot, Newton Euler formulation, Lagrange - Euler formulation, problems.	L4,L5,L6	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text & References:

1. Robert J. Schilling, Fundamentals of Robotics Analysis and Control, PHI Learning., 2009.
2. Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, Robotics Engineering an Integrated Approach, Phi Learning., 2009.
3. P.A. Janaki Raman, Robotics and Image Processing An Introduction, Tata Mc Graw Hill Publishing company Ltd., 1995.
4. Francis N-Nagy Andras Siegler, Engineering foundation of Robotics, Prentice Hall Inc., 1987.
5. Bernard Hodges, Industrial Robotics, Second Edition, Jaico Publishing house, 1993.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO4
CO1	1	-	--	--	--	2	--	--	--	--	--	--	1			
CO2	1	1	-	-	2	--	--	3	--	--	--	--	1	2		
CO3	1	-	-	2	-	3	--	--	--	--	--	--		1	2	3
CO4	-	-	-	1	--	2	--	--	2	-	3	--		2	1	3

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: RBE4206	FUNDAMENTAL OF ROBOTICS SYSTEM AND ROBOT PROGRAMMING LAB	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	0	0	2	1
Pre-requisites/Exposure					
Co-requisites	Nil				

Catalog Description

The objective of this course is to enlighten the students about the fundamentals of robotic systems. To understand the basics of robot, Robot Transformations and Sensors, Micro/Nano robotic systems and to program them for functioning.

Course Objectives

The objective of this course is to

1. Equip the students with the basic knowledge and designing of robotics.
2. Implement their concept in robotics and design robot for various applications of engineering.

Course Outcomes

On completion of this course, the students will be able to

CO1: Understand and be able to apply a variety of techniques to solve problems in areas such as robot control and navigation

CO2: program a robot to perform a specified task (e.g obstacle avoidance or wall following) in a target environment.

CO3: Understand how simulations of robots work, where they can be useful and where they can break down.

Modules	Blooms level*	Number of hours
Lab Session 1: Study of different types of robots based on configuration and application.	L1. L2 and L3	4
Lab Session 2: Study of different type of links and joints used in robots	L1. L2, L3 and L4	4
Lab Session 3: Study of components of robots with drive system and end effectors.	L1. L2, L3 and L4	4
Lab Session 4 Determination of maximum and minimum position of links.	L3 and L4	2
Lab Session 5 Verification of transformation (Position and orientation) with respect to gripper and world coordinate system	L3 and L4	4
Lab Session 6 Estimation of accuracy, repeatability and resolution.	L3 and L4	2
Lab Session 7 Robot programming exercises	L1, L2, L3 and L4	4

**Bloom's Level:*

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L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text & References:

Text:-

1. Craig. J. J. "Introduction to Robotics mechanics and control", Addison- Wesley,1999.

References:-

1. S.R. Deb, Robotics Technology and flexible automation, Tata McGraw-Hill Education., 2009
2. Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, Technology programming and Applications, McGraw Hill, 2012
3. Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, Robotics Engineering an Integrated Approach, Phi Learning.,
4. 2009.
5. Deb. S. R. "Robotics technology and flexible automation", Tata McGraw Hill publishing company limited, 1994
6. Mikell. P. Groover, "Industrial Robotics Technology", Programming and Applications, McGraw Hill Co, 1995.
7. Klafter. R.D, Chmielewski.T.A. and Noggin's., "Robot Engineering : An Integrated Approach", Prentice Hall of India Pvt. Ltd.,1994.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	1	--	3	--	--	--	--	--	--	--	--	1	1	--	3
CO2	2	2	--	3	1	--	--	--	--	--	--	--	1	1	--	3
CO3	2	--	--	--	--	1	3	--	--	--	--	--	2	1	--	3

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Course Code: RBE4207	ADVANCED CONTROL SYSTEMS & DRIVES FOR ROBOTS LAB	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	0	0	2	1
Pre-requisites/Exposure	Basic Concepts of Control Systems				
Co-requisites					

Catalog Description

This course is designed to get students an understanding of the basic concepts of control systems and its major applications .The course also includes some interdisciplinary applications like digital electronics and mechanical devices. Students will perform practical on hardware kit as well as on software.

Course Objectives

The objective of this course is to

1. Make students demonstrate the concepts of control systems.
2. Apply the concepts of control systems in various applications.

Course Outcomes

On completion of this course, the students will be able to

CO1. Practically verify the theoretical concepts of control systems.

CO2. Design various digital logic gates using programmable logic controller.

CO3. Analyse and explain the response of Process Control Simulator, Magnetic amplifier, Synchros, Servomotor and compensators.

Modules	Blooms level*	Number of hours
Lab Session 1 Determination of Transfer functions of an Electrical System	L3	1
Lab Session 2 Time Response Characteristics of a Second order System (Typical RLC network).	L3 and L4	1
Lab Session 3 Characteristics of Synchros: (a) Synchro transmitter characteristics. (b) Implementation of error detector using synchro pair	L3 and L4	2
Lab Session 4 Determination of Magnetic Amplifier Characteristics with different possible connections.	L3 and L4	2

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Lab Session 5 Process Control Simulator: (a) To determine the time constant and transfer function of first order process. (b) To determine the time response of closed loop second order process with Proportional Control. (c) To determine the time response of closed loop second order process with Proportional Integral Control. (d) To determine the time response of closed loop second order process with Proportional Integral-Derivative Control. (e) To determine the effect of disturbances on a process.	L3 and L4	6
Lab Session 6 To study the compensation of the second order process by using: (a) Lead Compensator. (b) Lag Compensator. (c) Lead- Lag Compensator	L3 and L4	2
Lab Session 7 Realization of AND, OR, NOT gates, other derived gates and ladder logic on Programmable Logic Controller with computer interfacing.	L3 and L5	2
Lab Session 8 To determination of AC servomotor Characteristics	L3 and L4	2
Lab Session 9 To study the position control of DC servomotor with P, PI control actions.	L3	2
Lab Session 10 Analog Computer: (a) To examine the operation of potentiometer and adder. (b) To examine the operation of integrator	L3	2
Lab Session 11 To solve a second order differential equation.	L3	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- M. Gopal, Digital Control and State Variable Methods,4th edition, Tata Mc-Graw-Hill.
- K.Ogata, Discrete Time Control Systems, Pearson Education, (Singapore) (Thomson Press India).
- B.C Kuo, Digital Control Systems, Prentice Hall.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	--	--	--	2	--	--	--	--	--	--	2	1	--	-	-
CO2	1	-	3	--	2	--	--	--	--	--	--	2	1	3	--	-
CO3	1	-	2	--	2	--	--	--	--	--	--	2	1	3	--	3

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Course Code: RBE4208	MICROPROCESSOR & INTERFACING LAB	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course deals with the systematic study of the Architecture and programming issues of microprocessor family and its applications. The aim of this course is to give the students detailed knowledge of the above microprocessor needed to develop the systems using.

Course Objectives

The objective of this course is to

1. To expose students to the operation of typical microprocessor trainer kit.
2. Learn the design aspects of I/O and Memory Interfacing circuits.
3. To provide solid foundation on interfacing the external devices to the processor according to the user requirements to create novel products and solutions for the real time problems

Course Outcomes

On completion of this course, the students will be able to

CO1: Developing of assembly level programs and providing the basics of the processors

CO2: write programs like ASCII conversion, searching and sorting elements, reverse given string and compute nCr .

CO3: Understand the concepts related to I/O and memory interfacing

Modules	Blooms level*	Number of hours
Lab Session 1: To load the numbers 49H and 53H ion memory location 9510 & 9511.	L3 and L4	2
Lab Session 2: Respectively and add the contents of memory location 9601.	L3 and L4	2
Lab Session 3: To write the Assembly Language Programming for 8 bit addition with and without carry.	L3 and L4	2
Lab Session 4 To write the Assembly Language Programming for 8 bit subtraction with and without borrow.	L1, L2, and L3	2
Lab Session 5 To write the Assembly Language Programming for 8 bit Multiplication and Division.	L1, L2, and L3	2
Lab Session 6 To write the Assembly Language Programming for sorting an array of numbers in Ascending & Decending order.	L3 and L4	2

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Lab Session 7 To write the Assembly Language Programming with Additional Instructions.	L3 and L4	2
Lab Session 8 To write and execute a program using Stacks.	L3 and L4	2
Lab Session 9 To study and program the programmable Peripheral interface (8255 board).	L1, L2 and L3	2
Lab Session 10 To study and program the programmable interval timer (8253 board).	L1, L2, L3 and L4	2
Lab Session 11 To study and program the programmable DMA Controller (8257 board).	L1, L2, L3 and L4	2
Lab Session 12 i) To study and program the programmable Interrupt Controller (8259 board). ii) To study of programmable Serial Communication interface (8251 board).	L1, L2, L3 and L4	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text & References:

1. Rafiquzzaman, M. Theory & Applications PHI Publications 1993.
2. Gaonkar R. S. Microprocessor Architecture, Programming and Applications John Wiley 1989.
3. Ram B. Fundamentals of Microprocessors and Microcomputers, Dhanpat Rai & Sons 1995.
4. Liu Yu Cheng and Gibson, G.A. PHI 1992.
5. Leventhal, L.A. Introduction to Microprocessors: Software, Hardware, Programming.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	3	2	2	--	1	--		--	--	--	--	1		--	--
CO2	1	1	1	2	--	--	--	2	--	--	--	3	1	2	--	--
CO3	1	2	2	3	--	--	-	--	--	--	--	--		2	1	3

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Course Code: RBE4209	FUNDAMENTALS OF ARITIFICAL INTELLIGENCE FOR ROBOTICS	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	3	0	0	3
Pre-requisites/Exposure	Basic knowledge of computer system				
Co-requisites	Nil				

Catalog Description

Expose the students to the fundamentals of AI and expert systems and its application in Robotics and familiarize to the students with the Fundamental concept of AI and expert system.

Course Objectives

The objective of this course is to

- Equip the students with the artificial technique concepts used in robotics.
- Provide an overview of various technique and design the expert system with the help of these technique.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain and Understand artificial intelligence techniques and their limitation.
CO2: Describe the various searching techniques to solve the problem of different field.
CO3:Implement artificial intelligence based program in various application using basic AI language.
CO4: Understand and design the expert system for inter-dispensary engineering system.

Modules	Blooms level*	Number of hours
MODULE 1: INTRODUCTION :- Introduction – History, Definition of AI, Emulation of human cognitive process, Intelligent agents – The concept of rationality, the nature of environments, the structure of agents.	L1 and L2	6
MODULE 2: SEARCH METHODS :- Problem – Solving Agents : Problem Definitions, Formulating Problems, Searching for solutions – Measuring Problem – Solving Performance with examples. Search Strategies : Uninformed search strategies – Breadth – first Search, Uniform – Cost Search, depth –first search, depth – limited search, Iterative deepening depth – first search, bidirectional search, comparing uniformed search strategies. Informed search strategies – Heuristic information, Hill climbing methods, best – first search, branch – and – bound search, optimal search and A* and Iterative deepening A*.	L1, L2 and L3	9

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MODULE 3: PROGRAMMING AND LOGICS IN ARTIFICIAL INTELLIGENCE :- LISP and other programming languages – Introduction to LISP, Syntax and numerical function, LISP and PROLOG distinction, input, output and local variables, interaction and recursion, property list and arrays alternative languages, formalized symbolic logics – properties of WERS, non-deductive inference methods.	L1, L2 and L3	11
MODULE 4: EXPERT SYSTEM :- Expert system – Introduction, difference between expert system and conventional programs, basic activities of expert system – Interpretation, Prediction, Diagnosis, Design, Planning, Monitoring, Debugging, Repair, Instruction, Control. Basic aspects of expert system – Acquisition module, Knowledge base – Production rules, semantic net, frames. Inference engine – Backward chaining and forward chaining. Explanatory interface.	L1, L2, L3,L4 and L5	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Russell Stuart, Norvig Peter, "Artificial Intelligence Modern Approach", Pearson Education series in AI, 3rd Edition, 2010.

Reference Books

1. Dan.W.Patterson, "Introduction to Artificial Intelligence and Expert Systems", PHI Learning, 2009.
2. Donald.A.Waterman, "A guide to Expert Systems", Pearson, 2002.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	1	2	1	--	--	--	--	--	--	--	-	2	3	-
CO2	1	1	2	1	1	--	--	--	--	--	--	--	1	--	2	-
CO3	1	2	1	1	1	--	--	--	--	--	--	--	-	2	3	-
CO4	1	2	2	2	3	--	--	--	--	--	--	--	1	--	2	3

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Course Code: RBE4210	ROBOTICS SIMULATIONS AND SIMULTANEOUS LOCALIZATION MAPPING	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	3	0	0	3
Pre-requisites/Exposure	Knowledge of basics of Artificial Intelligence concepts, Robotics and simulations required.				
Co-requisites	Nil				

Catalog Description

Robotics Simulations find many applications in the areas of Artificial Intelligence, pattern recognition, controls etc. Robotics Simulations offer fundamentally alternative approaches to simulation. These robotics design, architecture, mapping and localization can be applied to many complicated problems of Artificial Intelligence and other applications in Real World Computing. This course provides a comprehensive treatment of robotics, location mapping, simulation techniques, robotic motion, robotic parts etc.

Course Objectives

The objective of this course is to

- Introduces the basics of Robotics and Artificial Intelligence.

2. It deals with essentials of techniques of simulations for robot design and location mapping.

Course Outcomes

On completion of this course, the students will be able to

CO1: Understand the principles of robotics and robotics movements, robotics simulations and robotics design.

CO2: comparison robotic functions, robotic views and robotic parts in simulations.

CO3: Understand concept of robotic perception, robotic movements, dynamics and controls of robotic movement, with which they can be able to apply the conceptual things to the robotic software architecture and applications.

CO4: Get thorough knowledge in robotics packages and robotic linkages.

CO5: Design the required and related systems

Modules	Blooms level*	Number of hours
MODULE 1: INTRODUCTIONS Robotics systems, robot movements, quality of simulation, types of simulation, robotics applications, robotics simulation displays. Simulation notation, Auto lisp functions, Features, Command syntax, writing design functions.	L1, L2	4
MODULE 2: ROBOTIC PRINCIPLES Straight lines, Angles and optimal moves circular interpolation, Robotic functions Geometrical commands, Edit commands. Selecting robot views, standard Robot part, using the parts in a simulation.	L1, L2, L3 and L4	10

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MODULE 3:LOCALIZATION AND MAPPINGS Introduction, Robotic perception – localization, mappings planning to move – configuration space, cell decomposition methods, skeletonization methods, Planning uncertain movements – Robust methods. Moring –dynamics and control, Potential Field control, reactive control, Robotics software architecture, Applications.	L1, L3, L4 and L5	5
MODULE 4:ROBOTIC SIMULATION Simulation packages, Loading the simulation, Simulation editors, delay, Resume commands. Slide commands, program flow control. Robot motion control, Analysis of robot elements, Robotic linkages.	L1, L2, L3, and L4	7
MODULE 5:ROBOTIC MOTION Solids construction, Solid animation. Types of motion, velocity and acceleration, Types of simulation motion Harmonic motion, parabolic motion, and uniform motion velocity and acceleration analysis for robots.	L2, L3, L4 and L5	5
MODULE 6:ROBOT DESIGN Linkages, Types, Transmission elements Flexible connectors, pulley-and-Belt drives, variable speed transmission. Design of Robot for particular applications – A case study.	L2, L3, L4 and L5	5

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text & References:

- "Robotics Simulations "Daniel L. Ryan, CRC Press Inc., 1994.
- "Robotics Engineering an Integrated Approach", Richard D.Klafter, Thomas A, Chri Elewski, Micheal Negin, Phi Learning 2009.
- "Fundamentals of Robotics Analysis and Control", Robert schilling PHI Learning, 2009.
- " Industrial Robotics, Technology programming and Applications",Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, McGraw Hill, 2012.

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**3**	**--**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**2**	**--**
CO2	**1**	**3**	**--**	**2**	**--**	**--**	**--**	**2**	**--**	**--**	**--**	**--**	**1**	**2**	**--**	**1**
CO3	**1**	**2**	**2**	**4**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**	**--**
CO4	**1**	**2**	**2**	**2**	**--**	**---**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**--**	**--**
CO5	**1**	**3**	**2**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**	**4**

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Course Code : MLE4202	DATA MINING AND PREDICTIVE ANALYTICS	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	3	0	0	3
Pre-requisites/Exposure	Concept of Database and Data Mining				
Co-requisites					

Course Objectives

The objective of this course is to

- Provide students with an in-depth knowledge of data mining. To introduce students to basic applications, concepts, and techniques of data mining.
- Develop skills for using recent data mining software to solve practical problems and prediction in a variety of disciplines and
- Gain experience doing independent study and research.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain concepts of Data mining, predictive analytics and analyses architecture of data mining. Differentiate between supervised and unsupervised methods

CO 2: Apply classification techniques on different data sets and solve cost –benefit analysis numerical. Analyze decision tree methods.

CO 3: Implement various clustering algorithm on different data sets and describe these algorithms.

CO 4: Prepare data representation for market basket analysis and determine the usefulness of association rules. Interpret supervised and unsupervised learning methods.

CO 5: Predict market trends and outline different factors associated mail marketing.

Catalog Description

Data Mining and Predictive analytics serve as one of the most important courses for postgraduate students, since it builds computational abilities, inferential thinking, and practical skills for tackling core data scientific challenges. The students will get a comprehensive understanding of different data mining techniques that can be used for prediction and for discovering patterns, be prepared to select the right technique for a given data problem and will be able to create a general-purpose analytic process.

Course Content

Modules	Bloom's level	Number of Hours
Module I Data Preparation An introduction to data mining and predictive analytics, Data Pre-processing Exploratory Data Analysis, Dimension- Reduction Methods.	**L1, L2**	**8**
Module II Classification k- Nearest Neighbour Algorithm, Decision Trees, Model Evaluation Technique, Cost –Benefit Analysis Using Data Driven Cost.	**L1, L2, L3**	**7**

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Module III Clustering Hierarchical and k- Means Clustering, Kohenen Networks, Birch Clustering, Measuring Cluster Goodness.	**L1, L2, L3**	**8**
Module IV Association Rules Affinity Analysis and Market Basket Analysis, Data Representation for Market Basket Analysis, Support, Confidence, Frequent Item sets, and the a Priori Property, How Does a Priori Algorithm Work? Generating Frequent Item sets, Generating Association Rules, Extension from Flag Data to General Categorical Data, Information-Theoretic Approach: Generalized Rule Induction Method, J-Measure, Association Rules are Easy to do Badly, how can we Measure the Usefulness of Association Rules? Do Association Rules Represent Supervised or Unsupervised Learning?	**L1, L2, L3**	**9**
Module IV Case Study: Predicting Response to Direct Mail Marketing Business Understanding, Data Preparation, and Eda, Clustering and Principal Components Analysis, Modelling and Evaluation for Performance and Interpretability, Modelling and Evaluation for High Performance.	**L2, L3, L4, l5**	**8**

Bloom's Level:

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Daniel T. Larose, Chantal D. Larose, "Data Mining and Predictive Analytics", John Wiley & Sons, Inc., Hoboken, New Jersey, 2015.
2. Jiawei Han and Micheline Kamber, "Data mining: concepts and techniques", Morgan Kaufmann, Second Edition, 2006.

Reference Books

1. Alex Berson, Data Warehousing, Data Mining, and Olap, Tata McGraw Hill.
2. Markus Hofmann, Ralf Klinkenberg, "Rapid-Miner: Data Mining Use Cases and Business Analytics Applications", Chapman and Hall/CRC, 2016.
3. George M Marakas, Modern Data Warehousing, Mining & Visualization Core Concepts, Pearson Education.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**3**	--	--	--
CO2	**1**	**1**	**2**		--	--	--	--	--	--	--	--	--	--	**3**	--
CO3	**1**	**2**	**3**	**3**	**3**	--	--	--	--	--	--	--	**3**	--	--	--
CO4	**1**	**1**	**2**	--	--	**3**	--	--	--	--	--	**3**	--	**2**	--	--
CO5	**1**	**1**	**2**	--	--	**2**	--	--	--	--	--	**-3**	**1**	--	--	--

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: MlE4203	DATA WAREHOUSING AND MULTIDIMENSIONAL MODELING	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	3	0	0	3
Pre-requisites/Exposure	Basic Knowledge of Database				
Co-requisites	Nil				

Catalog Description

In this course the concepts of basic concepts of Multi-dimensional database are discussed in detail. As a precursor to the study of the course it provide an in depth understanding of basic concepts of data warehouse which includes its architecture, data warehouse operations, data marts, metadata. The concept further enhances the understanding of advance concepts that cover the slowly and rapidly changing dimensions, indexes in OLAP and concept hierarchies. It also include the different application of data warehouse

Course Objectives

The objective of this course is to

- Equip the students with concepts of Multi-dimensional database, its need and various applications.
- It provides an overview of some basic concepts in data warehouse such as its architecture, OLAP applications, and metadata. It also includes some advance concepts such as OLAP hierarchies, OLAP changing dimensions.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the concept of Multi-dimensional database and its importance.

CO2: Analyse the fundamental concept of data warehouse which include OLAP operations, architecture.

CO 3: Explain the different types of dimensions that exist in data warehouse.

CO4: Explain the advance concepts of data warehouse which include OLAP indexing.

Modules	Blooms level*	Number of hours
MODULE 1: **Introduction***:* Multidimensional Data Management, Multidimensional History, Related Terminology	L1 and L2	8
MODULE 2: **Fundamental Concepts** : Cubes ,Dimensions, Facts, Measures, Relational Representations, Star Schemas, Snowflake Schemas, Data Warehouses And Data Marts, Multidimensional Modelling Process, Analysis And Querying ,Roll Up, Drill Down, Drill Out, Slicing And Dicing, Drill Across, Pivot Tables, Ranking, Multi-Dimensional Querying in MDX and SQL, Graphical Querying and Visualizations .	L1, L2 and L3	8

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MODULE 3: **Advance Concepts** Slowly Changing Dimensions, The Problem, Solutions, Other Special Kinds Of Dimensions, Mini dimensions, Outriggers, Degenerate Dimensions, Junk Dimensions, Time Dimensions, Data Quality Dimensions, Advanced Hierarchies, Parent-Child Hierarchies, Unbalanced Hierarchies, Non Covering Hierarchies , Non –Strict Hierarchies, Multiple Hierarchies And Parallel Hierarchies.	L2, L3 and L4	10
MODULE 4: **Module IV: Implementation Issues** Materialized Views, Indexing, Indexing Overview, Bitmap Indices, Join Indices, Query Processing, OLAP Implementations, Extract-Transform-Load.	L3, L4 and L5	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books:

1. Jiawei Han &Micheline Kamber,"Data Mining Concepts And Techniques",3rd Edition,Morgan Kaufmann Publication,An Imprint of Elsevier, 2015.
2. Vipin Kumar,Pang Ning "Introduction to Data Mining",3rd Edition,Pearson Publication,Chennai, 2016.
3. Mohammed,Wagner " Data Mining and Analysis", 4th Edition, Cambridge University Press,Brazil, 2018.

Reference Books:

1. Daneil,D. Larose "Data Mining and Predictive Analytics", 2nd Edition, John wiley and Sons,Canada, 2015.
2. Paulraj "Data Warehousing Fundamental for IT Professional", 2nd Edition, John Wiley and Sons, Canada, 2010.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	**1**	**2**	**3**	--	--	--	-	--	--	--	--	--	-	--	-	-
CO 2	**1**	--	**2**	-	--	--	--	--	--	--	--	--	-	--	--	--
CO 3	**1**	**2**	**2**	--	--	--	--	--	--	--	--	--	--	--	--	--
CO 4	**1**	**1**	**2**	--	--	--	**3**	--	--	--	--	--	--	--	--	--

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Course Code:- MLE4204	BIG DATA TECHNOLOGIES	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	3	0	0	3
Pre-requisites/Exposure	Basics of DBMS and SQL				
Co-requisites	Nil				

Catalog Description

This course brings together several key big data technologies used for storage, analysis and manipulation of data. It also introduces the students the key concepts of Hadoop framework, MapReduce, Pig, Hive, and No-SQL. Students will learn to work on Hadoop platform. The concepts learnt will make students capable of working on big data projects easier.

Course Objectives

The objective of this course is

1. To make students familiar with big data technologies.
2. Provide an overview of Hadoop architecture and its working with other open source technologies.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain importance and applications of Big Data Analytics.
CO2. Differentiate among analytics technologies.
CO3. Demonstrate architecture of Hadoop and Mapreduce framework.
CO4. Illustrate Hadoop installation process and commands.
CO5. Introduce concepts of Hive and Pig.

Modules	Blooms level*	Number of hours
Module I: Introduction to Big Data Big Data and its Importance – Four V's of Big Data – Drivers for Big Data – Introduction to Big Data Analytics – Big Data Analytics applications.	L1 and L2	5
Module II: Big Data Technologies Hadoop's Parallel World – Data discovery – Open source technology for Big Data Analytics – cloud and Big Data –Predictive Analytics – Mobile Business Intelligence and Big Data – Crowd Sourcing Analytics – Inter- and Trans-Firewall Analytics - Information Management.	L2 and L5	4
Module III: Processing Big Data Integrating disparate data stores - Mapping data to the programming framework - Connecting and extracting data from storage - Transforming data for processing - Subdividing data in preparation for Hadoop Map Reduce.	L1 and L3	8
Module IV: Hadoop Map Reduce Employing Hadoop Map Reduce - Creating the components of Hadoop Map Reduce jobs - Distributing data processing across server farms –Executing Hadoop Map Reduce jobs - Monitoring the progress of job flows - The Building Blocks of Hadoop Map Reduce - Distinguishing Hadoop daemons - Investigating the Hadoop Distributed File System Selecting appropriate execution modes: local, pseudo-distributed, fully distributed.	L2, L3 and L4	9

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Module V Big Data Tools and Techniques Installing and Running Pig – Comparison with Databases – Pig Latin – User-Define Functions – Data Processing Operators – Installing and Running Hive – Hive QL – Tables – Querying Data – User- Defined Functions – Oracle Big Data.	L2 and L3	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Michael Minelli, Michehe Chambers, Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business", 1st Edition, Wiley CIO Series, 2013.
2. Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'reilly, 2012.
3. Arvind Sathi, "Big Data Analytics: Disruptive Technologies for Changing the Game", 1st Edition, IBM Corporation, 2012.
4. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", 1st Edition, Wiley and SAS Business Series, 2012.

Reference Books

1. Anil Maheshwari, "Big Data", McGraw Hill
2. Mayank Bhushan, "Big Data and Hadoop- Learn by Example", BPB Publications

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	--	**2**	--	--	--	--	--	--	--	--	--	**1**	--	**2**	**-**
CO2	**1**	**2**	--	**3**	**3**	--	--	--	--	--	--	--	**1**	--	**2**	**-**
CO3	**1**	--	**1**	**2**	--	--	--	--	--	--	--	--	**1**	--	**2**	**-**
CO4	**1**	**1**	**2**	--	--	**2**	--	--	--	--	**3**	--	**-**	--	**1**	**3**
CO5	**1**	--	**1**	--	**1**	**3**	--	--	--	--	**3**	--	**1**	**-**	**-**	**-**

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Course Code: MLE4206	DATA MINING AND PREDICTIVE ANALYSIS LAB	L	T	P	C
Version 2020.1	Date of Approval: 19 July, 2020	0	0	2	1
Pre-requisites/Exposure	Basic knowledge of Database				
Co-requisites	NIL				

Catalog Description

Data Mining and Predictive analytics serve as one of the most important courses for postgraduate students, since it builds computational abilities, inferential thinking, and practical skills for tackling core data scientific challenges. The students will get a comprehensive understanding of different data mining techniques that can be used for prediction and for discovering patterns, be prepared to select the right technique for a given data problem and will be able to create a general-purpose analytic process.

Course Objectives

The objective of this course is to

- Provide students with an in-depth knowledge of data mining. To introduce students to basic applications, concepts, and techniques of data mining.
- Develop skills for using recent data mining software to solve practical problems and prediction in a variety of disciplines and
- Gain experience doing independent study and research.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain concepts of Data mining, predictive analytics and analyses architecture of data mining. Differentiate between supervised and unsupervised methods

CO 2: Apply classification techniques on different data sets and solve cost –benefit analysis numerical. Analyze decision tree methods.

CO 3: Implement various clustering algorithm on different data sets and describe these algorithms.

CO 4: Prepare data representation for market basket analysis and determine the usefulness of association rules. Interpret supervised and unsupervised learning methods.

CO 5: Predict market trends and outline different factors associated mail marketing.

Modules/Topics Covered**	Blooms level*	Number of hours
1. To understand the basic features of Data Warehousing.	L1, L2	2
2. Explore WEKA Data Mining/Machine Learning Toolkit (a) Downloading and/or installation of WEKA data mining toolkit. (b) Understand the features of WEKA tool kit such as Explorer, Knowledge flow interface, Experimenter, command-line interface. (c) Navigate the options available in the WEKA (deselect attributes panel, preprocess panel, classify panel, cluster panel, associate panel and visualize). (d) Study the ARFF file format.	L2, L3, L5	2
3. To understand the working of datasets in WEKA & to perform demonstration of preprocessing on dataset weather.arff .	L3, L4, L5	2

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4. To apply Numeric Transform (data preprocessing step) on Iris Dataset.	L3, L4, L5	2
5. To understand the importance of CSV data and then load student academic record (CSV format) in Weka.	L3, L4, L5	2
6. To understand the concept of discretization and to perform discretization on the dataset airline.arff.	L3, L4, L5	2
7. To create Training, Validation and Test dataset for iris.arff.	L3, L4, L5	2
8. To perform decision tree classification using J48 algorithm on weather.arff	L3, L4, L5	2
9. To apply Apriori technique on the dataset and to generate association rules.	L3, L4, L5	2
10. (a) Demonstration of classification rule process on dataset student.arff using j48 algorithm. (b) Demonstration of classification rule process on dataset employee.arff using j48 algorithm.	L3, L4, L5	2
11. Demonstration of classification rule process on dataset employee.arff using naïve bayes algorithm	L3, L4, L5	4

***Bloom's Level:** *L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation.*

** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

3. Bostjan Kaluza, "Instant Weka How-to", Packt Publishing Limited, 2013.
4. Daniel T. Larose, Chantal D. Larose, "Data Mining and Predictive Analytics", John Wiley & Sons, Inc., Hoboken, New Jersey, 2015.
5. Jiawei Han and Micheline Kamber, "Data mining: concepts and techniques", Morgan Kaufmann, Second Edition, 2006.

Reference Books

1. Yuan Mei Yu, Data Mining and Machine Learning: WEKA Applied Technology and Practice (Chinese Edition) Paperback 2014.
2. Alex Berson, Data Warehousing, Data Mining, and Olap, Tata McGraw Hill, 2014.
3. Markus Hofmann, Ralf Klinkenberg, "Rapid-Miner: Data Mining Use Cases and Business Analytics Applications", Chapman and Hall/CRC, 2016.
4. George M Marakas, Modern Data Warehousing, Mining & Visualization Core Concepts, Pearson Education.

Modes of Evaluation: Performance/Viva/ Lab Record/Written Examination

Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	**70**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	--	--	--	--	--	--	--	--	--	1	2	2	3
CO2	1	1	2		--	--	--	--	--	--	--	--	1	2	3	3
CO3	1	2	3	3	3	--	--	--	--	--	--	--	1	2	2	2
CO4	1	1	2	--	--	3	--	--	--	--	--	3	1	1	2	3
CO5	1	1	2	--	--	2	--	--	--	--	--	3	1	3	2	1

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Course Code : MLE4207	DATA WAREHOUSING AND MULTIDIMENSIONS MODELLING LAB	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	0	0	4	2
Pre-requisites/Exposure	Basic Knowledge of Database				
Co-requisites	NIL				

Catalog Description

In this Lab course Data warehousing and Multidimensional modeling programs are implemented and demonstrated using a SQL Server and ETL Tools. The Concepts that are covered would enable them to analyze the working of ETL tools and enable them to understand the following topics namely SQL Statements, SQL Built-in Functions, PL/SQL Cursors , Exception handling, Procedure, Functions, Trigger and concurrency control. Programs will be related to concepts of understanding the working of ETL tools on multidimensional data.

Course Objectives

The objective of this course is to

- Make the students apply knowledge of Database by analyzing the different database concepts in SQL Server.
- Provide a demonstration of ETL tools to organize the data sets.

Course Outcomes

On completion of this course, the students will be able to

CO1: Apply the knowledge of transaction processing to gain analysis on different data sets through concurrency control mechanism.

CO2: Demonstrate the use of SQL Built-in Functions, PL/SQL Cursors,Exception handling and Procedures.

CO3: To implement the different warehousing concepts on the given ETL tools.

CO4: Demonstrate the working of basic SQL statements and triggers.

Modules/Topics Covered**	Blooms level*	Number of hours
1. To understand the basic of SQL statements (a) Perform the following SQL statements on the table that perform the following query on the database • Create, update ,alter and delete a record • Joins and constraints on the table. • Wild card operators.	L1,L3,L4	4
2. Sample Programs to execute the concept of Procedures (a) Preliminary introduction of Procedures their Syntax and usage (b) Write a procedural program to find out minimum of two numbers. (c) Write a program to print the reverse of a number using looping construct in PL/SQL Procedures. (d) Write a procedural program to find out the factorial of number.	L3, L4,L5	4

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3. Sample Programs to implement the concept of Triggers (a) Preliminary introduction of Triggers their Syntax and usage (b) Create a Trigger on Employee record that automatically updates the salary of an Employee after each financial year. (c) Create a Trigger for the following events: • Deletion of a record • Updating of a record • Insertion of a new record.	L3, L4,L5	4
4. Sample Programs to implement the concept of Cursors and Exception Handling. (a) Write a program to demonstrate the concept of Cursors in PL/SQL (b) Write a program that handles an exception that incurred in the given program.	L3,L4, L5	6
5. To perform demonstration to understand the working of ETL tools (a) Preliminary introduction of ETL Tools their features and importance. (b) Perform validation on the data set by applying the ETL tools. (c) Perform the following operations using ETL tools • Source to target mapping • Data checks on source data • Packages and schema validation • Data verification in the target system • Data integrity and quality checks in the target system	L4,L5,L6	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Text Books:

2. Jiawei Han &Micheline Kamber,"Data Mining Concepts And Techniques",3rd Edition,Morgan Kaufmann Publication,An Imprint of Elsevier, 2015.
2. Vipin Kumar,Pang Ning "Introduction to Data Mining",3rd Edition,Pearson Publication,Chennai, 2016.
3. Mohammed,Wagner " Data Mining and Analysis", 4th Edition, Cambridge University Press,Brazil, 2018.

Reference Books:

3. Daneil,D. Larose "Data Mining and Predictive Analytics", 2nd Edition, John wiley and Sons,Canada, 2015.
4. Paulraj "Data Warehousing Fundamental for IT Professional", 2nd Edition, John Wiley and Sons, Canada, 2010.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	1	3	--	--	--	--	--	--	--	--	--	2	1	--	--
CO 2	2	1	3	--	--	--	--	--	--	--	--	--	2	1	--	--
CO 3	1	1	2	--	1	--	--	--	--	--	--	--	2	1	--	--
CO 4	2	1	3	--	--	--	--	--	--	--	--	--	2	1	--	--

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MLE4208	R PROGRAMMING LAB	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	0	0	4	2
Pre-requisites/Exposure	Knowledge of statistics				
Co-requisites	Nil				

Catalog Description

This lab will provide a basic introduction to the R programming Language and the use of R to perform basic statistics and programming tasks. The main objectives of this lab is to impart the students with the knowledge of R Programming, Machine Learning using R Mining from streaming Data, Mining from Distributed Data.

Course Objectives

The objective of this course is

- To make students familiar with R Programming Language and its concepts.
- Equip the students with knowledge of R Programming, Machine Learning using R Mining from streaming Data, Mining from Distributed Data.

Course Outcomes

On completion of this course, the students will be able to

CO1. Install and configure R Studio and R packages.

CO2. Explain concepts of Structured Data, data types, data structures and Use R for mathematical operations

CO3. Describe the use of R functions, control statements, Loop constructs and apply to iterate functions across data.

CO4. Understand basic regular expressions graphics. Use of R for descriptive statistics and inferential statistics

CO5. Predict/Score new data using models, understand basic non-linear functions in models and how to link data, statistical methods.

Modules	Blooms level*	Number of hours
Lab Session 1 • Installation & Configuration steps of R Studio. • use of the R interactive environment • Expand R by installing R packages • Explore and understand how to use the R documentation.	L1 and L2	2
Lab Session 2-3 • Read Structured Data into R from various sources • Understand the different data types in R • Understand the different data structures in R • Understand how to use dates in R • Use R for mathematical operations	L1and L3	4

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Lab Session 4-5 • Use of vectorised calculations • Write user-defined R functions • Use control statements • Write Loop constructs in R • Use Apply to iterate functions across data	L1 and L3	4
Lab Session 6-8 • Reshape data to support different analyses • Understand split-apply-combine (group-wise operations) in R • Deal with missing data • Manipulate strings in R • Understand basic regular expressions in R • Understand base R graphics	L1 and L3	6
Lab Session 9-10 • Focus on GGplot2 graphics for R • Be familiar with trellis (lattice) graphics • Use R for descriptive statistics • Use R for inferential statistics • Write multivariate models in R	L1 and L3	4
Lab Session 11-12 • Understand confounding and adjustment in multivariate models • Understand interaction in multivariate models • Predict/Score new data using models • Understand basic non-linear functions in models • Understand how to link data, statistical methods, and actionable questions	L1 and L3	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Jeffrey Aven, "SAMS Teach Yourself Hadoop in 24 Hours", 1st Ed., Pearson ,2017.
2. Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'reilly, 2012.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	**--**	**--**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**-**
CO2	**1**	**-**	**--**	**--**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**1**	**1**	**-**
CO3	**1**	**-**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**1**	**1**	**-**
CO4	**1**	**-**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**---**	**1**	**1**	**--**
CO5	**1**	**-**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**-**

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Course Code : MLE4209	DATABASE AND KNOWLEDGE BASE SYSTEMS	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	3	0	0	0
Pre-requisites/Exposure	Basic Knowledge of Database AND AI				
Co-requisites	NIL				

Catalog Description

This course discusses design methodology for databases to verify their structural correctness and implements databases. It also provides applications software primarily in the relational model using querying languages, primarily SQL, and other database supporting software applying the theory behind various database models and query languages implementing security and integrity policies relating to databases and preparation for data analytics working in group settings to design and implementing database projects.

Course Objectives

The objective of this course is to

- To understand the basic concepts and terminology related to DBKBS and Relational Database Design.
- To design and implement Distributed Databases and Knowledge base.

Course Outcomes

CO1: Write complex queries including full outer joins self-join, sub queries, and set theoretic queries and do their optimization.
CO2: Know how Optimization, Transaction management, Query and database administration is done in distributed databases.
CO3: Learning various types of deadlines in real-time database.
CO4: Familiarizing with the present applications of knowledge base.
CO5: Understand the concepts of multilevel transactions in databases.

Modules	Blooms level*	Number of hours
MODULE 1: Database Languages, Object-Base Systems, Knowledge-base Systems, History and Perspective, Data Models for Database Systems: Data Models, The Entity-relationship Model, The Relational Data Model, Operations in the Relational Data Model, The Network Data Model, The Hierarchical Data Model, An Object-Oriented Model, Logic as a Data Model: The Datalog Data Model, Evaluating Non- recursive Rules, Computing the Meaning of Recursive Rules, Incremental Evaluation of Least Fixed Points, Negations in Rule Bodies, Relational Algebra and Logic, Relational Calculus, Tuple Relational Calculus.	L1, L2 and L3	8

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MODULE 2: ISBL: A "Pure" Relational Algebra Language, QUEL: A Tuple Relational Calculus Language, Query-by-Example: A DRC Language, Data Definition in QBE, The Query Language SQL, Data Definition in SQL, The DBTG Data Definition language, The DBTG Query Language, The DBTG Database Modification Commands, Data Definition in IMS, A Hierarchical Data Manipulation Language, Data Definition in OPAL, Data Manipulation in OPAL.	L2, L3 and L6	10
MODULE 3: The Physical Data Model, The Heap Organization, Hashed Files, Indexed Files, B-trees, Files with a Dense Index, Secondary Indices, Data Structures in DBTG Databases, Data Structures for Hierarchies, Data Structures for Relations, A Search Tree Structure, Functional Dependencies, Lossless-Join Decomposition, Normalization, Generalized Dependencies.	L1, L3 and L4	10
MODULE 4: Basic Concepts, A Simple Transaction Model, The Two-phase Locking Protocol, a Model with Read and write-Locks, Lock Modes, A Read-Only, Write-Only Model, Concurrency for Hierarchically Structured Items, Handling Transaction Failures, Aggressive and Conservative Protocols, Recovery From Crashes, Timestamp-based Concurrency Control.	L1, L3 and L4	10
MODULE 5: Distributed Databases, Distributed Locking, Distributed Two-phase Locking, Distributed Commitment, A Nonblocking Commit Protocol, Timestamp-based, Distributed Concurrency, Recovery of Nodes, Distributed Deadlocks.	L3, L4 and L6	10

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Jeffrey D. Ullman"Principles of Database and Knowledge-Base Systems", Vol. 1, Computer Science Press, USA, 1988.
2. Ngoc Thanh Nguyen, Edward Szczerbicki, "Intelligent Systems for Knowledge Management", Springer-verlagGmbh, 2009.

Reference Books

5. AviSilberschatz, Henry F. Korth and S. Sudarshan, "Database System Concepts", Mcgraw Hill Education, 2000.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	--	--	--	--	--	--	--	--	--	-	--	2	
CO2	1	--	2	3	--	--	--	--	--	--	--	--	1	--	-	
CO3	1	2	3	3	3	--	--	--	--	--	--	--	-	--	-	3
CO4	1	1	2	--	--	--2	--	--	--	--	--	--	-	2	-	3
CO5	1	1	2	--	-2-	--	--	--	--	--	--	--	1	--	-	

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Course Code : MLE4210	INFORMATION MANAGEMENT SYSTEM	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

Information management systems includes basics of managing the information and explores the various aspects of database design and modelling. It examines the basic issues in information governance and information integration and also helps to understand the information architecture.

Course Objectives

The objective of this course is to

1. Understand the basic principles and working of information technology.
2. Provide the role of information technology and information system in business.
3. To contrast and compare how internet and other information technologies support business systems.

Course Outcomes

On completion of this course, the students will be able to

CO1: State and explain the fundamental concepts of information management systems.
CO2: Develop the knowledge about management of information systems.
CO3: Interpret and recommend the use of information technology to solve business problems.
CO4: Apply a framework and process for aligning organizations IT objective with business strategies.

Modules	Blooms level*	Number of hours
Module I:**Database Modelling, Management and Development** Database design and modelling – Business Rules and Relationship; Java database Connectivity (JDBC), Database connection Manager, Stored Procedures. Trends in Big Data systems including NoSQL – Hadoop HDFS, MapReduce, Hive, and enhancements.	L1 and L2	6
MODULE II:Data **Security and Privacy** Program Security, Malicious code and controls against threats; OS level protection; Security – Firewalls, Network Security Intrusion detection systems. Data Privacy principles. Data Privacy Laws and compliance.	L1, L2, and L3	8
MODULE III: **Information Governance** Master Data Management (MDM) – Overview, Need for MDM, Privacy, regulatory requirements and compliance. Data Governance – Synchronization and data quality management.	L1, L2 and L3	7

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MODULE IV: **Information Architecture** Principles of Information architecture and framework, Organizing information, Navigation systems and Labelling systems, Conceptual design, Granularity of Content.	L1, L2, and L3	8
Module V: **Information Lifecycle Management** Data retention policies; Confidential and Sensitive data handling, lifecycle management costs. Archive data using Hadoop; Testing and delivering big data applications for performance and functionality; Challenges with data administration;	L1 and L2	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Jeffrey A. Hoffer, HeikkiTopi, V Ramesh – MODERN DATABASE MANAGEMENT, 10 Edition, PEARSON, 2012.
2. Alex Berson, Larry Dubov MASTER DATA MANAGEMENT AND DATA GOVERNANCE, 2/E, Tata McGraw Hill, 2011.

Reference Books

1. Security in Computing, 4/E, Charles P. Pfleeger, Shari Lawrence Pfleeger, Prentice Hall; 2006
2. Information Architecture for the World Wide Web; Peter Morville, Louis Rosenfeld ; O'Reilly Media; 1998.
3. http://ibm.com/big-data – Four dimensions of big data and other ebooks on Big Data Analytics

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**3**	**2**	**3**	**3**	--	--	--	--	--	--	--	**1**	--	**3**	--
CO2	**1**	**1**	**1**	**1**	**1**	--	--	--	--	--	--	--	**1**	--	**3**	--
CO3	**1**	**1**	**1**	**1**	**1**	--	--	--	--	--	--	--	**1**	--	**3**	--
CO4	**1**	**1**	**2**	**2**	**1**	--	--	--	--	--	--	--	**1**	--	**3**	--

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Course Code: MLE4211	FUNDAMENTALS OF ARITIFICAL INTELLIGENCE	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	3	0	0	3
Pre-requisites/Exposure	Basic knowledge of computer system				
Co-requisites	Nil				

Catalog Description

Expose the students to the fundamentals of AI and expert systems and its application in Robotics and familiarize to the students with the Fundamental concept of AI and expert system.

Course Objectives

The objective of this course is to

- Equip the students with the artificial technique concepts used in robotics.
- Provide an overview of various technique and design the expert system with the help of these technique.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain and Understand artificial intelligence techniques and their limitation.
CO2: Describe the various searching techniques to solve the problem of different field.
CO3:Implement artificial intelligence based program in various application using basic AI language.
CO4: Understand and design the expert system for inter-dispensary engineering system.

Modules	Blooms level*	Number of hours
MODULE 1: INTRODUCTION :- Introduction – History, Definition of AI, Emulation of human cognitive process, Intelligent agents – The concept of rationality, the nature of environments, the structure of agents.	L1 and L2	6
MODULE 2: SEARCH METHODS :- Problem – Solving Agents : Problem Definitions, Formulating Problems, Searching for solutions – Measuring Problem – Solving Performance with examples. Search Strategies : Uninformed search strategies – Breadth – first Search, Uniform – Cost Search, depth –first search, depth – limited search, Iterative deepening depth – first search, bidirectional search, comparing uniformed search strategies. Informed search strategies – Heuristic information, Hill climbing methods, best – first search, branch – and – bound search, optimal search and A* and Iterative deepening A*.	L1, L2 and L3	9

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MODULE 3: PROGRAMMING AND LOGICS IN ARTIFICIAL INTELLIGENCE :- LISP and other programming languages – Introduction to LISP, Syntax and numerical function, LISP and PROLOG distinction, input, output and local variables, interaction and recursion, property list and arrays alternative languages, formalized symbolic logics – properties of WERS, non-deductive inference methods.	L1, L2 and L3	11
MODULE 4: EXPERT SYSTEM :- Expert system – Introduction, difference between expert system and conventional programs, basic activities of expert system – Interpretation, Prediction, Diagnosis, Design, Planning, Monitoring, Debugging, Repair, Instruction, Control. Basic aspects of expert system – Acquisition module, Knowledge base – Production rules, semantic net, frames. Inference engine – Backward chaining and forward chaining. Explanatory interface.	L1, L2, L3,L4 and L5	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

2. Russell Stuart, Norvig Peter, "Artificial Intelligence Modern Approach", Pearson Education series in AI, 3rd Edition, 2010.

Reference Books

1. Dan.W.Patterson, "Introduction to Artificial Intelligence and Expert Systems", PHI Learning, 2009.
2. Donald.A.Waterman, "A guide to Expert Systems", Pearson, 2002.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	**1**	**2**	**1**	--	--	--	--	--	--	--	**-**	**2**	**3**	**-**
CO2	**1**	**1**	**2**	**1**	**1**	--	--	--	--	--	--	--	**1**	--	**2**	**-**
CO3	**1**	**2**	**1**	**1**	**1**	--	--	--	--	--	--	--	**-**	**2**	**3**	**-**
CO4	**1**	**2**	**2**	**2**	**3**	--	--	--	--	--	--	--	**1**	--	**2**	**3**

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Course Code : AIE4335	SUMMER INTERNSHIP EVALUATION	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	0	0	0	6
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The objective of this course is to provide practical training on some live projects that will increase capability to work on actual problem in industry. This training may undergo in an industrial environment or may be an in-house training on some latest software which is in high demand in market. This training will be designed such that it will useful for their future employment in industry.

Course Objectives

The objective of this course is to

1. Provide practical training on live projects
2. Increase technical capabilities on solving real life problems in company environment

Course Outcomes

On completion of this summer internship, the students will be able to:
CO1: Develop communication, interpersonal and other critical skills in the job interview process.
CO2: Design and develop software and hardware projects
CO3: Assess interests and abilities in their field of study.
CO4: Demonstrate excellent technical and communication skills to acquire employment contacts leading directly to a full-time job following graduation from college.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	1	2	2	--	--	--	1	--	--	--	1	1	1	1
CO2	1	1	2	2	2	--	--	--	1	--	--	--	1	1	1	1
CO3	1	1	2	3	2	--	--	--	1	--	--	--	1	1	1	1
CO4	1	1	2	2	2	--	--	--	1	--	--	--	1	1	1	1

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Course Code :- AIE4337	PROJECT DISSERTATION-I	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	0	0	0	5
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The objective of this course is to provide practical training on some live/demo projects that will increase capability to work on actual problem in industry. It will be an in house training on some latest software which is in high demand in market. This training will be designed such that it will useful for their future employment in industry.

Course Objectives

The objective of this course is to

1. Provide practical training on live projects
2. Increase technical capabilities on solving real life problems in company environment

Course Outcomes

On completion of this summer internship, the students will be able to:

CO1: Demonstrate a sound technical knowledge of their selected project topic.

CO2: Design and develop engineering solutions to complex problems utilising a systems approach.

CO3: Analyse various approaches for solving a complex engineering problem using different tools and techniques

CO4: Demonstrate the knowledge, skills and attitudes of a professional engineer.

CO5: Apply technical skills and knowledge in completing the project.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**2**	--	--	--	--	--	--	**1**	--	--	--	--	--	**1**	**1**
CO2	**1**	**1**	--	--	--	--	--	--	**1**	--	--	--	--	--	**1**	**1**
CO3	**1**	**1**	--	--	--	--	--	--	**1**	--	--	--	--	--	**1**	**1**
CO4	**1**	**1**	--	--	--	--	--	--	**1**	--	--	--	--	--	**1**	**1**
C05	**1**	**1**	--	--	--	--			**1**	-	-	-	--	--	**1**	**1**

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Course Code: RBE4301	AUTOMATION IN MANUFACTURING SYSTEMS	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	3	0	0	3
Pre-requisites/Exposure	Production system, Manufacturing System				
Co-requisites	Automation in production and manufacturing system				

Catalog Description:
In this course the concepts and procedure for Automation of Manufacturing systems and the technology behind the automation of a manufacturing system andconcepts of computer aided manufacturing are discussed in detail. The concepts of computer aided process planning (CAPP), Hardware components for automation, group technology (GT), cellular manufacturing, automated guided vehicle system, flexible manufacturing system (FMS), Automated inspection and just in timeare also discussed in detail.

Course Objectives:
The overall objective of this course is
1. To equip the students with basic and essential concepts of Automation in manufacturing system to usually increases production rate and labor productivity.
2. To provide high caliber engineering students with an in-depth understanding of cellular manufacturing, flexible manufacturing system (FMS) and computer aided process planning.

Course Outcomes (COs):
At the end of the course, the student shall be able to:
CO1 - Define and describe the basic fundamentals of Automation in manufacturing system, computer aided manufacturing and computer integrated manufacturing.
CO2 – State, explain and demonstrate computer aided process planning, automated production lines and assembly systems.
CO3 – Outline, interpret and apply concepts of group technology and cellular manufacturing.
CO4 – Define, explain and apply knowledge of flexible manufacturing systems and industrial robotics in industries.

Modules	Blooms level*	Number of hours
Module I **Over view of Manufacturing and Automation:** Production systems, Automation in production systems, Automation principles and strategies, Manufacturing operations, production facilities. Basic elements of an automated system, levels of automation; Hardware components for automation and process control, programmable logic controllers and personal computers.	L1 and L2	7
Module II **Material Handling And Identification Technologies:** Material handling, equipment, Analysis. Storage systems, performance and location strategies, Automated storage systems, AS/RS, types. Automatic identification methods, Barcode technology, RFID	L1, L2, and L3	6

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Module III **Manufacturing Systems And Automated Production Lines:** Manufacturing systems: components of a manufacturing system, Single station manufacturing cells; Manual Assembly lines, line balancing Algorithms, Mixed model Assembly lines, Alternative Assembly systems. Automated production lines, Applications, Analysis of transfer lines	L1, L2 and L3	8
Module IV **Automated Assembly Systems:** Fundamentals, Analysis of Assembly systems. Cellular manufacturing, part families, cooling, production flow analysis. Group Technology and flexible Manufacturing systems, Quantitative Analysis.	L1, L2 and L3	9
Module V **Quality Control And Support Systems:** Quality in Design and manufacturing, inspection principles and strategies, Automated inspection, contact Vs non contact, CMM. Manufacturing support systems. Quality function deployment, computer aided process planning, concurrent engineering, shop floor control, just in time and lean production.	L1, L2 and L3	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text books:

1. Mikell.P.Groover (2008), Automation, Production Systems and Computer Integrated Manufacturing, Prentice Hall of India.
2. N. Viswanandham, Y. Narhari "Performance Modeling of Automated Manufacturing Systems" Prentice-Hall.

Reference books:

1. M. Groover (2003), CAD/CAM Pearson Education; 1 edition.
2. S J Martin (1974), Numerical control of Machine Tools, Butterworth-Heinemann.
3. P N Rao (2017), CAD/CAM: Principles and Applications, Tata McGraw Hill Education; 3 editions.
4. Chang, Wysk & Wang (2005), Computer Aided Manufacturing, Prentice Hall of India.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	--	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--
CO2	**1**	**2**	--	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--
CO3	**1**	**2**	--	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--
CO4	**1**	**2**	--	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--

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Course Code: RBE4302	ROBOTIC SENSORS, VISIONS AND HARDWARE IMPLEMENTATION	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	3	0	0	3
Pre-requisites/Exposure	Knowledge of basics of Artificial Intelligence concepts, Sensors and basic Robotics hardware required.				
Co-requisites	Nil				

Catalog Description

Robotics sensors find many applications in the areas of robotics, visions, Artificial Intelligence, pattern recognition, controls etc. Robotics sensors offer fundamentally different types of high capable sensors. Many image processing techniques are learnt. These robotics hardware design, architecture, mapping and localization can be applied to many complicated problems of Artificial Intelligence and other applications in Real World Computing. This course provides a comprehensive treatment of robotics sensors, visions and robotics hardware required.

Course Objectives:

The objective of this course is to

- Introduces the basics of Robot visions and image processing sensors.
- It deals with actual hardware implementation of robots

Course Outcomes:

On completion of this course, the students will be able to

CO1: Understand the principles of smart sensors and transducers, need and usage of sensors.

CO2: comparison various visions in robotics robotic functions, robotic views and robotic parts in simulations.

CO3: Understand concept of image processing techniques which can be applied torobotic perception, robotic movements, dynamics and controls of robotic movement, with which they can be able to apply the conceptual things to the robotic software architecture and applications.

CO4: Get thorough knowledge in robotics orientation and feature extraction.

CO5: Design multicontrolled sensors robot assembly.

Modules	Blooms level*	Number of hours
MODULE 1: SENSORS IN ROBOTICS An Introduction to sensors and Transducers, History and definitions, Smart Sensing, AI sensing, Need of sensors in Robotics. Position sensors – optical, non-optical, Velocity sensors, Accelerometers, Proximity Sensors – Contact, non-contact, Range Sensing, touch and Slip Sensors, Force and Torque Sensors. Different sensing variables – smell, Heat or Temperature, Humidity, Light, Speech or Voice recognition Systems, Tele-presence and related technologies.	L1, L2	4

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MODULE 2: VISIONS IN ROBOTICS The Nature of Vision- Robot vision – Need, Applications - image acquisition –illumination techniques- Point sensor, line sensor, planar sensor, camera transfer characteristic, Raster scan, Image capture time, volume sensors, Image representation, picture coding techniques. Robot Control through Vision sensors, Robot vision locating position, Robot guidance with vision system, End effector camera Sensor.	L1, L2, L3 and L4	10
MODULE 3:ELEMENTS OF IMAGE PROCESSING TECHNIQUES Discretization, Neighbours of a pixel-connectivity- Distance measures - pre-processing Neighbourhood averaging, Median filtering. Smoothening of binary Images- Image Enhancement- Histogram Equalization-Histogram Specification –Local Enhancement-Edge detection- Gradient operator-Laplace operators-Thresholding-Morphological image processing.	L1, L3, L4 and L5	5
MODULE 4:OBJECT ORIENTATION AND FEATURE EXTRACTION Image segmentation- Edge linking-Boundary detection-Region growing-Region splitting and merging- Boundary Descriptors-Freeman chain code-Regional Descriptors- recognition-structural methods- Recognition procedure, mahalanobic procedure.	L1, L2, L3, and L4	7
MODULE 5:COLLISIONS FRONTS ALGORITHM Introduction, skeleton of objects. Gradients, propagation, Definitions, propagation algorithm, Thinning Algorithm, Skeleton lengths of Top most objects.	L2, L3, L4 and L5	5
MODULE 6:MULTISENSORS CONTROLLED ROBOT ASSEMBLY Control Computer, Vision Sensor modules, Software Structure, Vision Sensor software, Robot programming, Handling, Gripper and Grippingmethods, accuracy – A Case study.	L2, L3, L4 and L5	5

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text & References:-

1. Paul W Chapman, "*Smart Sensors*", an Independent Learning Module Series, 1996.
2. Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, Robotics Engineering an Integrated Approach, Phi Learning., 2009.
3. John Iovice, "*Robots, Androids and Animatrons*", Mc Graw Hill, 2003.
4. K.S. Fu, R.C. Gonzalez, C.S.G. Lee, "*Robotics – Control Sensing, Vision and Intelligence*", Tata McGraw-Hill Education, 2008.
5. Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, Technology programming and Applications, Tata McGraw-Hill Education, 2012.
6. Sabrie Soloman, Sensors and Control Systems in Manufacturing, McGraw-Hill Professional Publishing, 2nd Edition, 2009.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**3**	--	**1**	--	--	--	--	--	--	--	--	**1**	--	**2**	--
CO2	**1**	**3**	--	**2**	--	--	--	**2**	--	--	--	--	**1**	**2**	--	**1**
CO3	**1**	**2**	**2**	**4**	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO4	**1**	**2**	**2**	**2**	--	---	--	--	--	--	--	--	**1**	**2**	--	--
CO5	**1**	3	**2**	**1**	--	--	--	--	--	--	--	--	**1**	**1**	--	**4**

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Course Code: RBE4303	PATTERN RECOGNITION & IMAGE PROCESSING	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	3	0	0	3
Pre-requisites/Exposure	Basics of Digital Image Processing				
Co-requisites	NIL				

Catalog Description

This course gives students an insight into the basics of Image Processing along with Pattern Recognition. Concepts covered would enable students to define and differentiate among various types of image refinement. Further they would be able to gain insights about various Image restoration and modification technique.

Course Objectives

This course covers the theory and methods for learning from data, with an emphasis on pattern classification. Digital Image Processing is designed to give professionals and students a powerful collection of fundamental and advanced image processing tools on the desktop.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define and explain introductory part of Pattern recognition Concepts & Bayesian decision theory

CO2: List out the Univariate and Multivariate density

CO3: Explain concepts of Un-supervised learning and clustering

CO4: Describe the Image Fundamentals and Transforms

CO5: Explain the basics of Image Segmentation and Edge Detection

Modules	Blooms level*	Number of hours
MODULE 1: **Introduction of Pattern recognition and Bayesian Decision Theory** Machine perception, pattern recognition example, pattern recognition systems, the design cycle, learning and adaptation Introduction, continuous features – two categories classifications, minimum error-rate classification- zero–one loss function, classifiers, discriminant functions, and decision surfaces	L1 and L2	8
MODULE 2: **Normal density** Univariate and multivariate density, discriminant functions for the normal density-different cases, Bayes decision theory – discrete features, compound Bayesian decision theory and context	L2 and L3	8
MODULE 3: **Un-supervised learning and clustering** Introduction, mixture densities and Identifiability, maximum likelihood estimates, application to normal mixtures, K-means clustering. Date description and clustering, similarity measures, criteria function for clustering	L1 and L2	10

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MODULE 4: **Image Fundamentals and Transforms** Elements of visual perception – Image sampling and quantization, Basic relationship between pixels, Some basic grayscale transformations, Introduction to Fourier Transform and DFT, Properties of 2D Fourier Transform, FFT, Separable Image Transforms, Walsh, Hadamard, Discrete Cosine Transform, Haar, Slant, Karhunen, Loeve transforms.	L2 and L3	12
MODULE 5: **Image Segmentation and Edge Detection** Region Operations, Crack Edge Detection, Edge Following, Gradient operators, Compass and laplace operators. Threshold detection methods, optimal thresholding, multispectral thresholding, thresholding in hierarchical data structures; edge based image segmentation- edge image thresholding, edge relaxation, border tracing, border detection,	L2 and L3	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text & References:

Text:

1. "Fundamentals of speech Recognition", Lawerence Rabiner, Biing – Hwang Juang Pearson education.
2. "Pattern classifications", Richard O. Duda, PeterE. Hart, David G. Stroke. Wiley student edition, Second Edition.
3. R.C Gonzalez and R.E. Woods, "Digital Image Processing", Addison Wesley.

References:

1. "Pattern Recognition and Image Analysis" – Earl Gose, Richard John baugh, Steve Jost
2. A.K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India.
3. "Digital Image Processing"– M. Anji Reddy, BS Publications.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	2	--	--	--	--	--	--	--	--	--	--	1	--	--	--
CO 2	1	--	2	--	--	--	--	--	--	--	--	--	1	2	--	--
CO 3	3	--	1	--	2	--	--	--	--	--	--	--	1	3	2	--
CO 4	3	--	2	--	1	--	--	--	--	--	--	--	1	--	2	--
CO 5	3	--	2	--	1	--	--	--	--	--	--	--	1	--	2	--

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: RBE4304	ROBOTICS SENSORS, VISION AND HARDWARE IMPLEMENTATION LAB	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	0	0	4	2
Pre-requisites/Exposure	MATLAB and concepts of Artificial Intelligence				
Co-requisites	Nil				

Catalog Description

Robotics sensors find many applications in the areas of robotics, visions, Artificial Intelligence, pattern recognition, controls etc. Robotics sensors offer fundamentally different types of high capable sensors. Many image processing techniques are learnt. These robotics hardware design, architecture, mapping and localization can be applied to many complicated problems of Artificial Intelligence and other applications in Real World Computing. This course provides a comprehensive treatment of robotics sensors, visions and robotics hardware required.

Course Objectives

The objective of this course is to

1. To become familiar with basics of robot visions, image processing sensors.
2. Understand and analyse concepts of hardware implementations in robotics.

Course Outcomes

On completion of this course, the students will be able to

CO1: Understand the principles of smart sensors and transducers, need and usage of sensors.

CO2: comparison various visions in robotics robotic functions, robotic views and robotic parts in simulations.

CO3: Understand concept of image processing techniques which can be applied to robotic perception, robotic movements, dynamics and controls of robotic movement, with which they can be able to apply the conceptual things to the robotic software architecture and applications.

CO4: Get thorough knowledge in robotics orientation and feature extraction.

Modules	Blooms level*	Number of hours
Lab Session 1:Generation in robot languages Learning of robot language structure, on line and offline programming	L3 and L4	2
Lab Session 2:Cartesian Trajectories Study of Joint space planning, Cartesian trajectories, path primitives, coordinate systems used to determine the positions of TCP and direction of tools	L3 and L4	4
Lab Session 3:Basic Syntax Learning of RAPID i.e. data objects, expression, function. WAIT, SIGNAL AND DELAY command.	L3 and L4	6
Lab Session 4:Routine and subroutine Write subroutine, task module, input-output interrupts, priority interrupts, and task modules. Study of built-in subroutines in RAPID.	L1, L2, and L3	2

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Lab Session 5:optical sensors To study Photodiodes, phototransistors and photo resistors based sensors, light-to-light detectors, Infrared sensors (thermal, PIR, AFIR, thermopiles).	L1, L2, and L3	4
Lab Session 6: Magnetic and Electromagnetic Sensors and Actuators Study on Motors as actuators (linear, rotational, stepping motors), magnetic valves, inductive sensors (eddy current, LVDT, RVDT, Proximity, switches), Hall Effect sensors, Magneto resistive sensors.	L3 and L4	2
Lab Session 7:Mechanical Sensors Accelerometers, Force sensors (strain gauges, tactile sensors), Pressure sensors (semiconductor, piezo resistive, capacitive, VRP).	L3 and L4	2
Lab Session 8:Industrial Networks and Fields Bus Types of bus – DN, PB, ProfiNet, Eth/IP Interfacing to Controller: Connecting sensors to controller directly or through fieldbus. Configuration of digital, group, and analog IO. Use of instructions and logic. Strobing and handshaking with PLC as master, Encoder and Resolvers.	L1, L2, and L3	2
Lab Session 9:PLC Various hardware types of PLC (CPU and I/O modules).Centralized configuration of PLC.On-line with PLC (using serial port).Various languages and its over-view. Sample program down-load, Task configuration. Configuration of IP address & sample program download. Decentralized configuration of PLC (Profibus protocol).Configuration I/O modules on Profi-bus protocol. Mod-bus configuration (Master & Slave configuration). Mod-bus RTU (Remote Telemetry Unit) and Mod-bus TCP/IP communication with PCbased software .	L2, L3, and L4	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text & References:-

1. Paul W Chapman, "Smart Sensors", an Independent Learning Module Series, 1996.
2. Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, Robotics Engineering an Integrated Approach, Phi Learning., 2009.
3. John Iovice, "Robots, Androids and Animatrons", Mc Graw Hill, 2003.
4. K.S. Fu, R.C. Gonzalez, C.S.G. Lee, "Robotics – Control Sensing, Vision and Intelligence", Tata McGraw-Hill Education, 2008.
5. Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, Technology programming and Applications, Tata McGraw-Hill Education, 2012.
6. Sabrie Soloman, Sensors and Control Systems in Manufacturing, McGraw-Hill Professional Publishing, 2nd Edition, 2009.

Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	**70**
Weightage (%)	5	10	10	5	

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	3	--	--	--	--	3	--	--	--	--	1	2	--	--
CO2	1	--	2	2	--	--	--	3	--	--	--	--	1	2	--	--
CO3	1	2	2	3	--	--	3	--	--	--	--	--	1	--	--	3

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Course Code: RBE4305	PATTERN RECOGNITION AND IMAGE PROCESSING LAB	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	0	0	2	1
Pre-requisites/Exposure	Basics of MATLAB				
Co-requisites	NIL				

Catalog Description
In this Lab course first student should learn about advanced level of software used for easy calculation and toolbox used for software like MATLAB.

Course Objectives
The objective of this course is to

- Make the students applyknowledge of various Image processing & pattern recognition required for solving complex problems.
- Provide a demonstration of different types of image processing techniques through MATAB toolbox.

Course Outcomes
On completion of this course, the students will be able to
CO1: Acquiring knowledge of Basics of High-end calculation software and need in Computer Science & engineering
CO2: Demonstrate the All preliminary functions in MATLAB
CO3: Apply the knowledge of all the basics function and toolbox knowledge of MATLAB
CO4: Demonstrate the Use of MATLAB in image Processing
CO5: Demonstrate usage of applications involving with Image processing & Recognition Its Toolbox used by MATLAB

Modules/Topics Covered**	Blooms level*	Number of hours
1. Introduction of MATLAB (b) Basic Variable deceleration & its operation (c) Function use & its application	L3, L5	4
2. Sample Programs in MATLAB (e) Basic use of Matrix and Graph Plotting (f) Different type of graph plotting with use of different -2 type of data	L3, L5	6
3. Sample Programs using MATLAB functions (a) Create a basic program MATLAB using functions (b) Use of basic function Image processing (c) Practice on Basic function of Image processing tool box.	L3, L5	6
4. Sample programs of ANN functions (a) Practice on Pattern Recognition functions in MATLAB (b) Write a program for training a small network in MATLAB	L3, L5	6

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5. Sample Programs using ANN toolbox & Image processing toolbox (d) Demonstrate the use of ANN tool box & Image processing toolbox and write a program after combining it.	L3, L5	2

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

Text & References:

- Rafael C. Gonzalez & Richard E. Woods, "Image Processing Using MATLAB", 2nd edition, Pearson Education.
- "Pattern classifications", Richard O. Duda, PeterE. Hart, David G. Stroke. Wiley student edition, Second Edition

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	**70**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	--	--	--	--	--	--	--	--	--	--	2	--	--	--
CO2	3	1	--	--	--	--	--	--	--	--	--	--	1	2	--	--
CO3	2	1	2	--	--	--	--	--	--	--	--	--	1	2	--	--
CO4	1	3	2	--	--	--	--	--	--	--	--	--	2	--	2	--
CO5	1	3	--	--	--	--	--	--	--	--	--	--	1	--	--	--

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: RBE4306	OPTIMIZATION TECHNIQUES	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The purpose of this course is to develop a knowledge in the field of optimization techniques their basic concepts, ,principles. linear programming and queuing theory.

Course Objectives

After successful completion of the course, student will be able to understand importance of optimization of industrial process management , apply basic concepts of mathematics to formulate an optimization problem , analyse and appreciate variety of performance measures for various optimization problems.

Course Outcomes

On completion of this course, the students will be able to

CO1: Understand importance of optimization of industrial process management.
CO2: Apply basic concepts of mathematics to formulate an optimization problem
CO3: Analyse and appreciate variety of performance measures for various optimization problems
CO4: Use classical optimization techniques and numerical methods of optimization
CO5: Apply knowledge of optimization to formulate and solve engineering problems

Modules	Blooms level*	Number of hours
MODULE 1: INTRODUCTION Introduction to optimization – adequate and optimum design – principles of optimization – statement of an optimization problem – classification – formulation of objective function, design constraints.	L1, L2	4
MODULE 2: CLASSICAL OPTIMIZATION TECHNIQUES Single variable optimization –multivariable optimization with no constraints – exhaustive search, Fibonacci method, golden selection, Random, pattern and gradient search methods – Interpolation methods: quadratic and cubic, direct root method.	L1, L2, L3 and L5 , L6	12
MODULE 3:MULTIVARIABLE – UNCONSTRAINED AND CONSTRAINED OPTIMIZATION Direct search methods – descent methods – conjugate gradient method. Indirect methods – Transformation techniques, penalty function method	L1, L3 and L4	8
MODULE 4:NON – TRADITIONAL OPTIMIZATION TECHNIQUES Genetic Algorithms -steady state algorithm, fitness scaling, inversion. Genetic programming:- Genetic Algorithm in problem solving, Implementing a Genetic Algorithm:- computer implementation, operator (reproduction, crossover and Mutation, Fitness Scaling, Coding, Discretization). Knowledge based techniques in Genetic Algorithm. Advanced operators and techniques in genetic search:-Dominance, Diploidy and Abeyance. Inversion and other reordering operators, Niche and speciation and Tabu search methods.	L1, L3, and L4	10

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MODULE 5:OPTIMUM DESIGN OF MACHINE Desirable and undesirable effects – functional requirement – material and geometrical parameters – Design of simple axial, transverse loaded members for minimum cost and minimum weight.	L3 and L4	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text & References:

1. Rao, S.S., "*Optimization – Theory and Applications*", Wiley Eastern, New Delhi, 1978
2. Fox, R.L., Optimization Methods for Engineering Design, Addition – Wesley, Reading, Mass, 1971.
3. Wilde, D.J., "*Optimum Seeking Methods*", Prentice Hall, Englewood Cliffs, New Jersey, 1964

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	3	--	1	--	--	--	--	--	--	--	--	1	--	2	--
CO2	1	3	--	2	--	--	--	--	--	--	--	--	1	2	--	1
CO3	1	2	2	4	--	--	--	--	--	--	--	--	1	1	--	--
CO4	1	2	2	2	--	---	--	--	--	--	--	--	1	2	--	--
CO5	1	3	2	1	--	--	--	--	--	--	--	--	1	1	--	4

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COMPUTER NUMERICAL CONTROL (CNC) MACHINES AND ADAPTIVE CONTROL

Course Code: RBE4307 **Credit Units: 03**

Course Objective:
This course objective is to understand NC,CNC and DNC manufacturing and generate manual part program for CNC machining. Concept of adaptive control and its various applications

Module-I
Concepts of NC, CNC, DNC. Classification of CNC machines, Machine configurations, Types of control, CNC controllers characteristics, Interpolators. Cutting tool materials, carbide inserts classification, qualified, semi qualified and preset tooling, tooling system for Machining centre and Turning centre, work holding devices, of CNC Machines.

Module-II
Programming CNC machines, Part print analysis and Process planning, Advanced Programming features , Canned cycles, Subroutines, Macros, special cycles etc. APT part programming using CAD/CAM, Parametric Programming. Manual part programming for CNC turning, milling and machining center. Computer assisted part programming techniques , Conversational and Graphics based software, Solids based part programming. Freeform surface machining. Simulation and Verification of CNC programs.

Module-III
Robot anatomy, robot configuration, motions joint notation work volume, robot drive system, control system and dynamic performance, precision of movement. Robot activation and feedback components. MOTION ANALYSIS AND CONTROL: Manipulator kinematics, position representation forward transformation, homogeneous transformation, manipulator path control, robot dynamics, configuration
of robot controller.

Module-IV
END EFFECTORS: Grippers-types, operation, mechanism, force analysis, tools as end effectors consideration in gripper selection and design. SENSORS: Desirable features, tactile, proximity and range sensors, uses sensors in robotics. Positions sensors, velocity sensors, actuators sensors, power transmission system.
MACHINE VISION: Functions, Sensing and Digitizing-imaging, Devices, Lighting
techniques, Analog to digital single conversion, image storage, Image processing and Analysis-image

Module-V
Review of Lyapunov analysis, model Reference Adaptive Control, Composite Adaptation, Parameter Convergence: Persistency of Excitation /Uniform Complete Observe-ability, Adaptive Control in the Presence of Input Constraints, Direct MRAC for Nonlinear systems with Matched Structured Nonlinearities, Robustness of MRAC: Parameter Drift, Adaptive Control in the Presence of Uniformly Bounded Residual Nonlinearity, Disturbance Rejection, Input-to-State Stability,
fast adaptation.

Examination Scheme:

Components	CT	H	V/S/Q	EE
Weightage (%)	10	07	08	70

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Text & References:

1. Krar, S., and Gill, A., “CNC Technology and Programming”, McGraw Hill publ Co, 1990.
2. Gibbs, D., “An Introduction to CNC Machining”, Casell, 1987.
3. Seames, W.S., “Computer Numerical Control Concepts and Programming”, Delmar Publishers, 1986.
4. Lynch, M., “Computer Numerical Control for Machining”, McGraw Hill, 1992.
5. Koren Y, “Computer Control of Manufacturing Systems”, McGraw, 1986.

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Course Code: RBE4308	NEURAL NETWORK AND FUZZY LOGIC	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	3	0	0	3
Pre-requisites/Exposure	Linear algebra, advanced calculus, discrete mathematics, Boolean algebra or equivalent.				
Co-requisites	Nil				

Catalog Description

Fuzzy sets and fuzzy logic find many applications in the areas of stability theory, pattern recognition, controls etc. Neural Networks offer fundamentally alternative approaches to procedural programming. These systems proved their applicability to the problems where there are missing data or information or the problems which could not be defined in an algorithm. The integration of fuzzy systems and neural networks gives a tremendous potential which can be applied to many complicated problems of Artificial Intelligence and other applications in Real World Computing. This course provides a comprehensive treatment of neural network architectures and learning algorithms, with an in-depth look at problems in data mining and in knowledge discovery.

Course Objectives

The objective of this course is to

1. Introduces the basics of Neural Networks and essentials of Artificial Neural Networks with Single Layer and Multilayer Feed Forward Networks.
2. It deals with Associate Memories and introduces Fuzzy sets and Fuzzy Logic system component

Course Outcomes

On completion of this course, the students will be able to

CO1: Understand the principles of neural networks and fuzzy Logic fundamentals.
CO2: compare analysis between human and computer, Artificial Neural Networks models, characteristics of ANN's learning strategies, learning rules and basics of fuzzy logic.
CO3: Understand concept of classical and fuzzy sets, fuzzification and defuzzification, with which they can be able to apply the conceptual things to the real world electrical and electronics problems and applications.
CO4: Get thorough knowledge in biological neuron and artificial neurons.
CO5: Design the required and related systems

Modules	Blooms level*	Number of hours
MODULE 1: Basic neural computation models: Network and node properties. Inference and learning algorithms.Unsupervised learning: Signal hebbian learning and competitive learning. Supervised learning: Back propagation algorithms.	L1, L2	4
MODULE 2: Self organizing networks: Kohonen algorithm, bi-directional associative memories. Hopfield Networks: Hopfield network algorithm. Adaptive resonance theory: Network and learning rules. Neural network applications.	L1, L2, L3 and L4	10

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MODULE 3: Fuzzy Sets: Operations and properties. Fuzzy Relations: Cardinality, Operations and properties. Value Assignments: Cosine amplitude and max-min method. Fuzzy classification: Cluster analysis and validity, Fuzzy e-means clustering, hardening the Fuzzy e-partition.	L1, L3, L4 and L5	6
MODULE 4: Fuzzification, Membership value assignments: Inference, rank ordering and angular Fuzzy sets, defuzzification methods, fuzzy logic, approximate reasoning. Fuzzy –based systems: Canonical rule forms, decomposition of compound rules, likelihood and truth qualification, aggregation of Fuzzy rules, graphical techniques of inference.	L1, L2, L3, and L4	9
MODULE 5:OPTIMUM DESIGN OF MACHINE Non linear simulation using Fuzzy rule-based systems, Fuzzy associative memories. Decision making under Fuzzy states and Fuzzy actions. Fuzzy grammar and syntactic recognition. General Fuzzy logic controllers, special forms of Fuzzy logic control system models, examples of Fuzzy control system design and control problems, industrial applications.	L2, L3, L4 and L5	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text & References:

- Limin Fu. "Neural Networks in Computer Intelligence" McGraw Hill, 1995.
- Freeman J. A., and Skapura D. Mu. "Neural Networks Algorithms applications and Programming Techniques", Addison Wesley New York, 1991.
- Timoty J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill1997.
- Bart Kosho "Neural Network and Fuzzy Systems", Prentice Hall of India,1994

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	3	--	1	--	--	--	--	--	--	--	--	1	--	2	--
CO2	1	3	--	2	--	--	--	2	--	--	--	--	1	2	--	1
CO3	1	2	2	4	--	--	--	--	--	--	--	--	1	1	--	--
CO4	1	2	2	2	--	---	--	--	--	--	--	--	1	2	--	--
CO5	1	3	2	1	--	--	--	--	--	--	--	--	1	1	--	4

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Course Code: RBE4309	NEURAL NETWORK AND FUZZY LOGIC LAB	L	T	P	C
Version 2020.1	Date of Approval: 20 July 2020	0	0	2	1
Pre-requisites/Exposure	C/C++/MATLAB				
Co-requisites	Nil				

Catalog Description

Neural Networks offer fundamentally alternative approaches to procedural programming. Fuzzy sets and fuzzy logic find many applications in the areas of stability theory, pattern recognition, controls etc. These systems proved their applicability to the problems where there are missing data or information or the problems which could not be defined in an algorithm.

Course Objectives

The objective of this course is to

To become familiar with neural networks learning algorithms from available examples and give design methodologies for artificial neural networks.

2. Understand and analyse concepts of fuzzy set and use fuzzy set operations to implement current computing techniques used in fuzzy computing.

Course Outcomes

On completion of this course, the students will be able to

CO1: Understand the difference between learning and programming and explore practical applications of Neural Networks (NN).

CO2: To analyse and appreciate the applications which can use fuzzy logic.

CO3: Understand the efficiency of a hybrid system and how Neural Network and fuzzy logic can be hybridized to form a Neuro-fuzzy network and its various applications and they will be able to design inference systems

Modules	Blooms level*	Number of hours
Lab Session 1: Write a program to implement single layer perception algorithm.	L3 and L4	2
Lab Session 2: Write a program to implement back propagation learning algorithm	L3 and L4	4
Lab Session 3: Design multilayer feed forward network using back-propogation algorithm	L3 and L4	6
Lab Session 4 Study of fuzzy inference system	L1, L2, and L3	2
Lab Session 5 To study fuzzy logic controller using fuzzy logic toolbox	L1, L2, and L3	4
Lab Session 6 Write a program to implement SDPTA	L3 and L4	2
Lab Session 7 Write a program to implement RDPTA	L3 and L4	2

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Lab Session 8 To Study various defuzziification techniques	L1, L2, and L3	2
Lab Session 9 Write a program to implement of fuzzy set operation	L2, L3, and L4	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text & References:

1. Limin Fu. "Neural Networks in Computer Intelligence" McGraw Hill, 1995.
2. Freeman J. A., and Skapura D. Mu. "Neural Networks Algorithms applications and Programming Techniques", Addison Wesley New York, 1991.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	3	--	--	--	--	3	--	--	--	--	1	2	--	--
CO2	1	--	2	2	--	--	--	3	--	--	--	--	1	2	--	--
CO3	1	2	2	3	--	--	3	--	--	--	--	--	1	--	--	3

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Course Code:RBE4310	DECISION MAKING SYSTEMS	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	3	0	0	3
Pre-requisites/Exposure	Basic Networking Concepts				
Co-requisites	Nil				

Catalog Description

To develop semantic-based and context-aware systems to acquire, organize process, share and use the knowledge embedded in multimedia content. Research will aim to maximize automation of the complete knowledge lifecycle and achieve semantic interoperability between Web resources and services. The field of Robotics is a multi disciplinary as robots are amazingly complex system comprising mechanical, electrical, electronic H/W and S/W and issues germane to all these.

Course Objectives

The objective of this course is to

1. To provide an overview of problem solving skills methods using decision making systems .
2. To serve as a foundation for the study of programming languages that is used to develop an Intelligence System

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand the concept of artificial intelligence.

CO2. Differentiate between linear and non-linear problems and Learn various problem solving techniques using neural networks

CO3. Understand the concept of fuzzy logic and apply to various problems

CO4. Able to learn concepts of genetic algorithm

Modules	Blooms level*	Number of hours
Module I: Soft Computing Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing. Artificial Intelligence : Introduction, Various types of production systems, characteristics of production systems, breadth first search, depth first search techniques, other Search Techniques like hill Climbing, Best first Search, A* algorithm, AO* Algorithms and various types of control strategies. Knowledge representation issues, Prepositional and predicate logic, monotonic and non monotonic reasoning, forward Reasoning, backward reasoning, Weak & Strong Slot & filler structures, NLP.	L1, L2	12

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Module II: Neural Network Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural net, Difference between ANN and human brain, characteristics and applications of ANN, single layer network, Perceptron training algorithm, Linear separability, Widrow & Hebb;s learning rule/Delta rule, ADALINE, MADALINE, AI v/s ANN. Introduction of MLP, different activation functions, Error back propagation algorithm, derivation of BBPA, momentum, limitation, characteristics and application of EBPA	L2, L3 and L4	10
Module III Counter propagation network, architecture, functioning & characteristics of counter Propagation network, Hopfield/ Recurrent network, configuration, stability constraints, associative memory, and characteristics, limitations and applications. Hopfield v/s Boltzman machine. Adaptive Resonance Theory: Architecture, classifications, Implementation and training. Associative Memory.	L2, L3 and L4	8
Module IV: Fuzzy Logic Fuzzy set theory, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, Fuzzy systems: crisp logic, fuzzy logic, introduction & features of membership functions, Fuzzy rule base system : fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making & Applications of fuzzy logic.	L2, L3 and L4	7
Module V: Genetic algorithm Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional methods.	L2, L4	3

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books & References:

1. S, Rajasekaran & G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & Applications, PHI Publication.
2. S.N. Sivanandam & S.N. Deepa, Principles of Soft Computing, Wiley Publications
3. Rich E and Knight K, Artificial Intelligence, TMH, New Delhi.
4. Bose, Neural Network fundamental with Graph , Algo.& Appl, TMH
5. Kosko: Neural Network & Fuzzy System, PHI Publication
6. Klir & Yuan, Fuzzy sets & Fuzzy Logic: Theory & Appli.,PHI Pub.
7. Hagen, Neural Network Design, Cengage Learning

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	--	--	3	--	--	--	--	--	--	2	--	--	2	--	--
CO2	1	--	1	2	--	--	--	--	--	--	--	--	1	--	1	2
CO3	1	--	1	2	--	--	--	--	--	--	--	--	--	--	--	3
CO4	1	--	--	2	--	--	--	--	--	--	--	--	1	--	2	--
CO5	1	--	2	3	--	--	--	--	--	--	--	--	1	2	--	--
CO6	1	--	--	--	2	3	--	--	--	--	--	--	--	--	2	--

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: RBE4311	DECISION MAKING SYSTEM LAB	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	0	0	2	1
Pre-requisites/Exposure	C/C++/MATLAB				
Co-requisites	Nil				

Catalog Description

This lab course covers development and designing of implementing basic neural networks, fuzzy systems, and optimization algorithms concepts and their relations. It aims to develop the concepts and techniques and foster the students' abilities in designing and implementing soft computing based solutions for real-world and engineering problems.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of Soft Computing which includes Neural networks, Fuzzy logic and genetic algorithms.
2. Provide knowledge to develop Soft computing programs in Matlab.

Course Outcomes

On completion of this course, the students will be able to

CO1: Implement various neural networks using MATLAB.

CO2: Illustrate use of fuzzy in real applications.

CO3: Apply genetic algorithm to basic problems.

Modules	Blooms level*	Number of hours
Lab Session 1: Study of Biological Neural Network	L1 , L2 and L3	2
Lab Session 2: Study of Artificial Neural Network	L1, L2 and L3	1
Lab Session 3: Write a program of Perceptron Training Algorithm.	L3 and L4	2
Lab Session 4 Write a program to implement Hebb's Rule	L3, and L4	2
Lab Session 5 Write a program to implement of Delta Rule.	L3, and L3	2
Lab Session 6 Write a program to implement back propagation learning algorithm.	L3 and L4	2
Lab Session 7 Study of fuzzy inference system	L1, L2 and L3	1
Lab Session 8 To study fuzzy logic controller using fuzzy logic toolbox	L1, L2, L3 and L4	2
Lab Session 9 Write a program to implement SDPTA	L3 and L4	2

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Lab Session 10 Write a program to implement RDPTA	L3 and L4	2
Lab Session 11 To Study various defuzziification techniques	L1, L2, L3 and L4	1
Lab Session 12 Write a program to implement of fuzzy set operation	L3 and L4	2
Lab Session 13 Study of genetic algorithm	L1, L2, L3 and L4	1
Lab Session 14 Study of Genetic programming and solve a real life problem	L1, L2, L3, and L4	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text & References:

1. Limin Fu. "Neural Networks in Computer Intelligence" McGraw Hill, 1995.
2. Freeman J. A., and Skapura D. Mu. "Neural Networks Algorithms applications and Programming Techniques", Addison Wesley New York, 1991.
3. S, Rajasekaran & G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & Applications, PHI Publication.
4. S.N. Sivanandam & S.N. Deepa, Principles of Soft Computing, Wiley Publications
5. Rich E and Knight K, Artificial Intelligence, TMH, New Delhi.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	3	--	--	--	--	3	--	--	--	--	1	2	--	--
CO2	1	--	2	2	--	--	--	3	--	--	--	--	1	2	--	--
CO3	1	--	3	2	--	3	3	--	--	--	--	--	1	--	--	3

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Course Code: MLE4301	PATTERN RECOGNITION & IMAGE PROCESSING	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	3	0	0	3
Pre-requisites/Exposure	Basics of Digital Image Processing				
Co-requisites	NIL				

Catalog Description

This course gives students an insight into the basics of Image Processing along with Pattern Recognition. Concepts covered would enable students to define and differentiate among various types of image refinement. Further they would be able to gain insights about various Image restoration and modification technique.

Course Objectives

This course covers the theory and methods for learning from data, with an emphasis on pattern classification. Digital Image Processing is designed to give professionals and students a powerful collection of fundamental and advanced image processing tools on the desktop.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define and explain introductory part of Pattern recognition Concepts & Bayesian decision theory

CO2: List out the Univariate and Multivariate density

CO3: Explain concepts of Un-supervised learning and clustering

CO4: Describe the Image Fundamentals and Transforms

CO5: Explain the basics of Image Segmentation and Edge Detection

Modules	Blooms level*	Number of hours
MODULE 1: **Introduction of Pattern recognition and Bayesian Decision Theory** Machine perception, pattern recognition example, pattern recognition systems, the design cycle, learning and adaptation Introduction, continuous features – two categories classifications, minimum error-rate classification- zero–one loss function, classifiers, discriminant functions, and decision surfaces	L1 and L2	8
MODULE 2: **Normal density** Univariate and multivariate density, discriminant functions for the normal density-different cases, Bayes decision theory – discrete features, compound Bayesian decision theory and context	L2 and L3	8
MODULE 3: **Un-supervised learning and clustering** Introduction, mixture densities and Identifiability, maximum likelihood estimates, application to normal mixtures, K-means clustering. Date description and clustering, similarity measures, criteria function for clustering	L1 and L2	10

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MODULE 4: **Image Fundamentals and Transforms** Elements of visual perception – Image sampling and quantization, Basic relationship between pixels, Some basic grayscale transformations, Introduction to Fourier Transform and DFT, Properties of 2D Fourier Transform, FFT, Separable Image Transforms, Walsh, Hadamard, Discrete Cosine Transform, Haar, Slant, Karhunen, Loeve transforms.	L2 and L3	12
MODULE 5: **Image Segmentation and Edge Detection** Region Operations, Crack Edge Detection, Edge Following, Gradient operators, Compass and laplace operators. Threshold detection methods, optimal thresholding, multispectral thresholding, thresholding in hierarchical data structures; edge based image segmentation- edge image thresholding, edge relaxation, border tracing, border detection,	L2 and L3	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

Text & References:

Text:

4. "Fundamentals of speech Recognition", Lawerence Rabiner, Biing – Hwang Juang Pearson education.
5. "Pattern classifications", Richard O. Duda, PeterE. Hart, David G. Stroke. Wiley student edition, Second Edition.
6. R.C Gonzalez and R.E. Woods, "Digital Image Processing", Addison Wesley.

References:

4. "Pattern Recognition and Image Analysis" – Earl Gose, Richard John baugh, Steve Jost
5. A.K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India.
6. "Digital Image Processing"– M. Anji Reddy, BS Publications.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	2	--	--	--	--	--	--	--	--	--	--	1	--	--	--
CO 2	1	--	2	--	--	--	--	--	--	--	--	--	1	2	--	--
CO 3	3	--	1	--	2	--	--	--	--	--	--	--	1	3	2	--
CO 4	3	--	2	--	1	--	--	--	--	--	--	--	1	--	2	--
CO 5	3	--	2	--	1	--	--	--	--	--	--	--	1	--	2	--

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: MLE4302	NEURAL NETWORK AND FUZZY LOGIC	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	3	0	0	3
Pre-requisites/Exposure	Linear algebra, advanced calculus, discrete mathematics, Boolean algebra or equivalent.				
Co-requisites	Nil				

Catalog Description

Fuzzy sets and fuzzy logic find many applications in the areas of stability theory, pattern recognition, controls etc. Neural Networks offer fundamentally alternative approaches to procedural programming. These systems proved their applicability to the problems where there are missing data or information or the problems which could not be defined in an algorithm. The integration of fuzzy systems and neural networks gives a tremendous potential which can be applied to many complicated problems of Artificial Intelligence and other applications in Real World Computing. This course provides a comprehensive treatment of neural network architectures and learning algorithms, with an in-depth look at problems in data mining and in knowledge discovery.

Course Objectives

The objective of this course is to

1. Introduces the basics of Neural Networks and essentials of Artificial Neural Networks with Single Layer and Multilayer Feed Forward Networks.
2. It deals with Associate Memories and introduces Fuzzy sets and Fuzzy Logic system component

Course Outcomes

On completion of this course, the students will be able to

CO1: Understand the principles of neural networks and fuzzy Logic fundamentals.
CO2: compare analysis between human and computer, Artificial Neural Networks models, characteristics of ANN's learning strategies, learning rules and basics of fuzzy logic.
CO3: Understand concept of classical and fuzzy sets, fuzzification and defuzzification, with which they can be able to apply the conceptual things to the real world electrical and electronics problems and applications.
CO4: Get thorough knowledge in biological neuron and artificial neurons.
CO5: Design the required and related systems

Modules	Blooms level*	Number of hours
MODULE 1: Basic neural computation models: Network and node properties. Inference and learning algorithms.Unsupervised learning: Signal hebbian learning and competitive learning. Supervised learning: Back propagation algorithms.	L1, L2	4
MODULE 2: Self organizing networks: Kohonen algorithm, bi-directional associative memories. Hopfield Networks: Hopfield network algorithm. Adaptive resonance theory: Network and learning rules. Neural network applications.	L1, L2, L3 and L4	10

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MODULE 3: Fuzzy Sets: Operations and properties. Fuzzy Relations: Cardinality, Operations and properties. Value Assignments: Cosine amplitude and max-min method. Fuzzy classification: Cluster analysis and validity, Fuzzy e-means clustering, hardening the Fuzzy e-partition.	L1, L3, L4 and L5	6
MODULE 4: Fuzzification, Membership value assignments: Inference, rank ordering and angular Fuzzy sets, defuzzification methods, fuzzy logic, approximate reasoning. Fuzzy –based systems: Canonical rule forms, decomposition of compound rules, likelihood and truth qualification, aggregation of Fuzzy rules, graphical techniques of inference.	L1, L2, L3, and L4	9
MODULE 5:OPTIMUM DESIGN OF MACHINE Non linear simulation using Fuzzy rule-based systems, Fuzzy associative memories. Decision making under Fuzzy states and Fuzzy actions. Fuzzy grammar and syntactic recognition. General Fuzzy logic controllers, special forms of Fuzzy logic control system models, examples of Fuzzy control system design and control problems, industrial applications.	L2, L3, L4 and L5	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text & References:

- Limin Fu. "Neural Networks in Computer Intelligence" McGraw Hill, 1995.
- Freeman J. A., and Skapura D. Mu. "Neural Networks Algorithms applications and Programming Techniques", Addison Wesley New York, 1991.
- Timoty J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill1997.
- Bart Kosho "Neural Network and Fuzzy Systems", Prentice Hall of India,1994

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	3	--	1	--	--	--	--	--	--	--	--	1	--	2	--
CO2	1	3	--	2	--	--	--	2	--	--	--	--	1	2	--	1
CO3	1	2	2	4	--	--	--	--	--	--	--	--	1	1	--	--
CO4	1	2	2	2	--	---	--	--	--	--	--	--	1	2	--	--
CO5	1	3	2	1	--	--	--	--	--	--	--	--	1	1	--	4

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Course Code: MLE4304	PATTERN RECOGNITION AND IMAGE PROCESSING LAB	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	0	0	2	1
Pre-requisites/Exposure	Basics of MATLAB				
Co-requisites	NIL				

Catalog Description

In this Lab course first student should learn about advanced level of software used for easy calculation and toolbox used for software like MATLAB.

Course Objectives

The objective of this course is to

- Make the students apply knowledge of various Image processing & pattern recognition required for solving complex problems.
- Provide a demonstration of different types of image processing techniques through MATAB toolbox.

Course Outcomes

On completion of this course, the students will be able to

CO1: Acquiring knowledge of Basics of High-end calculation software and need in Computer Science & engineering

CO2: Demonstrate the All preliminary functions in MATLAB

CO3: Apply the knowledge of all the basics function and toolbox knowledge of MATLAB

CO4: Demonstrate the Use of MATLAB in image Processing

CO5: Demonstrate usage of applications involving with Image processing & Recognition Its Toolbox used by MATLAB

Modules/Topics Covered**	Blooms level*	Number of hours
6. Introduction of MATLAB (d) Basic Variable deceleration & its operation (e) Function use & its application	L3, L5	4
7. Sample Programs in MATLAB (g) Basic use of Matrix and Graph Plotting (h) Different type of graph plotting with use of different -2 type of data	L3, L5	6
8. Sample Programs using MATLAB functions (d) Create a basic program MATLAB using functions (e) Use of basic function Image processing (f) Practice on Basic function of Image processing tool box.	L3, L5	6
9. Sample programs of ANN functions (c) Practice on Pattern Recognition functions in MATLAB (d) Write a program for training a small network in MATLAB	L3, L5	6
10. Sample Programs using ANN toolbox & Image processing toolbox (e) Demonstrate the use of ANN tool box & Image processing toolbox and write a program after combining it.	L3, L5	2

**Bloom's Level:*

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L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

Text & References:

- Rafael C. Gonzalez & Richard E. Woods, "Image Processing Using MATLAB", 2nd edition, Pearson Education.
- "Pattern classifications", Richard O. Duda, PeterE. Hart, David G. Stroke. Wiley student edition, Second Edition

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	**70**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	--	--	--	--	--	--	--	--	--	--	2	--	--	--
CO2	3	1	--	--	--	--	--	--	--	--	--	--	1	2	--	--
CO3	2	1	2	--	--	--	--	--	--	--	--	--	1	2	--	--
CO4	1	3	2	--	--	--	--	--	--	--	--	--	2	--	2	--
CO5	1	3	--	--	--	--	--	--	--	--	--	--	1	--	--	--

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: MLE4305	NEURAL NETWORK AND FUZZY LOGIC LAB	L	T	P	C
Version 2020.1	Date of Approval: 20 July 2020	0	0	2	1
Pre-requisites/Exposure	C/C++/MATLAB				
Co-requisites	Nil				

Catalog Description

Neural Networks offer fundamentally alternative approaches to procedural programming. Fuzzy sets and fuzzy logic find many applications in the areas of stability theory, pattern recognition, controls etc. These systems proved their applicability to the problems where there are missing data or information or the problems which could not be defined in an algorithm.

Course Objectives

The objective of this course is to

- To become familiar with neural networks learning algorithms from available examples and give design methodologies for artificial neural networks.
- Understand and analyse concepts of fuzzy set and use fuzzy set operations to implement current computing techniques used in fuzzy computing.

Course Outcomes

On completion of this course, the students will be able to

CO1: Understand the difference between learning and programming and explore practical applications of Neural Networks (NN).

CO2: To analyse and appreciate the applications which can use fuzzy logic.

CO3: Understand the efficiency of a hybrid system and how Neural Network and fuzzy logic can be hybridized to form a Neuro-fuzzy network and its various applications and they will be able to design inference systems

Modules	Blooms level*	Number of hours
Lab Session 1: Write a program to implement single layer perception algorithm.	L3 and L4	2
Lab Session 2: Write a program to implement back propagation learning algorithm	L3 and L4	4
Lab Session 3: Design multilayer feed forward network using back-propogation algorithm	L3 and L4	6
Lab Session 4 Study of fuzzy inference system	L1, L2, and L3	2
Lab Session 5 To study fuzzy logic controller using fuzzy logic toolbox	L1, L2, and L3	4
Lab Session 6 Write a program to implement SDPTA	L3 and L4	2
Lab Session 7 Write a program to implement RDPTA	L3 and L4	2
Lab Session 8 To Study various defuzziification techniques	L1, L2, and L3	2

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Lab Session 9 Write a program to implement of fuzzy set operation	L2, L3, and L4	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text & References:

3. Limin Fu. "Neural Networks in Computer Intelligence" McGraw Hill, 1995.
4. Freeman J. A., and Skapura D. Mu. "Neural Networks Algorithms applications and Programming Techniques", Addison Wesley New York, 1991.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	3	--	--	--	--	3	--	--	--	--	1	2	--	--
CO2	1	--	2	2	--	--	--	3	--	--	--	--	1	2	--	--
CO3	1	2	2	3	--	--	3	--	--	--	--	--	1	--	--	3

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Course Code: MLE4306	HADOOP LAB	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	0	0	4	2
Pre-requisites/Exposure	Basic Concepts of DBMS				
Co-requisites	Relational Algebra and Relational Calculus				

Catalog Description

This course brings together several key big data technologies used for storage, analysis and manipulation of data. It also introduces the students the key concepts of Hadoop framework, MapReduce, Pig, Hive, and No-SQL. Students will learn to work on Hadoop platform. The concepts learnt will make students capable of working on big data projects easier.

Course Objectives

The objective of this course is

- To make students familiar with big data technologies.
- Provide an overview of Hadoop architecture and its working with other open source technologies.

Course Outcomes

On completion of this course, the students will be able to

CO1. Install and configure Hadoop and various tools like Pig, Hive etc.
CO2. Explain concepts of files and directories in HDFS and apply them in real database applications.
CO3. Design and implement mapreduce programs for a given problem.
CO4. Solve queries using concepts of Hive and Pig.
CO5. Perform operations using HBase.

Modules	Blooms level*	Number of hours
Lab Session 1 1. Installation & Configuration steps of Hadoop	L1 and L2	2
Lab Session 2-3 1. Working with HDFS commands :mkdir, rmdir, rm, mv, ls, du, put, rm-r, cat, tail etc 2. Working with vi editor	L1and L3	4
Lab Session 4-5 Working with Java Map Reduce : Map Class, Reduce Class, Drier Class, map side joins, reduce side joins	L1 and L3	4

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Lab Session 6-8 1. Working with Hive : Queries for Hive : Create table, describe database, describe table, describe extended table, describe formatted table, drop table, drop database, display table, where clause 2. Commands : Load Files on table : Load from HDFS, load from local 3. Command :CTAS Create table as select 4. Queries to create external tables 5. Working with commands like : Order by, group by, like, upper, lower, max, min	L1 and L3	6
Lab Session 9-10 1. Working with PIG : Order by, group by, co group, like, upper, lower, Joins, Union, Cartesian, Product, Pig Scripts	L1 and L3	4
Lab Session 11-12 Working with HBase : Start the hbase, data insert, modify, multiple version insertion, describe, delete truncate, drop etc. Working with Foreign Key and Check Constraint.	L1 and L3	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Jeffrey Aven, "SAMS Teach Yourself Hadoop in 24 Hours", 1st Ed., Pearson ,2017.
- Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'reilly, 2012.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	--	3	--	--	--	--	--	--	--	--	1	1	-
CO2	1	-	--	--	2	--	--	--	--	--	--	2	--	1	1	-
CO3	1	-	1	--	--	--	--	--	--	--	--	2	--	1	1	-
CO4	1	-	2	--	--	--	--	--	--	--	--	--	---	1	1	--
CO5	1	-	2	--	--	--	--	--	--	--	--	--	--	1	--	-

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: MLE4308	OPTIMIZATION TECHNIQUES	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The purpose of this course is to develop a knowledge in the field of optimization techniques their basic concepts, ,principles. linear programming and queuing theory.

Course Objectives

After successful completion of the course, student will be able to understand importance of optimization of industrial process management , apply basic concepts of mathematics to formulate an optimization problem , analyse and appreciate variety of performance measures for various optimization problems.

Course Outcomes

On completion of this course, the students will be able to

CO1: Understand importance of optimization of industrial process management.
CO2: Apply basic concepts of mathematics to formulate an optimization problem
CO3: Analyse and appreciate variety of performance measures for various optimization problems
CO4: Use classical optimization techniques and numerical methods of optimization
CO5: Apply knowledge of optimization to formulate and solve engineering problems

Modules	Blooms level*	Number of hours
MODULE 1: INTRODUCTION Introduction to optimization – adequate and optimum design – principles of optimization – statement of an optimization problem – classification – formulation of objective function, design constraints.	L1, L2	4
MODULE 2: CLASSICAL OPTIMIZATION TECHNIQUES Single variable optimization –multivariable optimization with no constraints – exhaustive search, Fibonacci method, golden selection, Random, pattern and gradient search methods – Interpolation methods: quadratic and cubic, direct root method.	L1, L2, L3 and L5 , L6	12
MODULE 3:MULTIVARIABLE – UNCONSTRAINED AND CONSTRAINED OPTIMIZATION Direct search methods – descent methods – conjugate gradient method. Indirect methods – Transformation techniques, penalty function method	L1, L3 and L4	8

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MODULE 4:NON – TRADITIONAL OPTIMIZATION TECHNIQUES Genetic Algorithms -steady state algorithm, fitness scaling, inversion. Genetic programming:- Genetic Algorithm in problem solving, Implementing a Genetic Algorithm:- computer implementation, operator (reproduction, crossover and Mutation, Fitness Scaling, Coding, Discretization). Knowledge based techniques in Genetic Algorithm. Advanced operators and techniques in genetic search:-Dominance, Diploidy and Abeyance. Inversion and other reordering operators, Niche and speciation and Tabu search methods.	L1, L3, and L4	10
MODULE 5:OPTIMUM DESIGN OF MACHINE Desirable and undesirable effects – functional requirement – material and geometrical parameters – Design of simple axial, transverse loaded members for minimum cost and minimum weight.	L3 and L4	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text & References:

1. Rao, S.S., "*Optimization – Theory and Applications*", Wiley Eastern, New Delhi, 1978
2. Fox, R.L., Optimization Methods for Engineering Design, Addition – Wesley, Reading, Mass, 1971.
3. Wilde, D.J., "*Optimum Seeking Methods*", Prentice Hall, Englewood Cliffs, New Jersey, 1964

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	--	--	--	--	--	--	--	--	--	1	3	1	1
CO2	1	--	2	3	--	--	--	--	--	--	--	--	1	3	1	2
CO3	1	1	2	3	3	--	--	--	--	--	--	--	1	2	1	2
CO4	1	1	3	--	--	--	--	--	--	--	--	--	1	2	1	1
CO5	1	2	2	--	--	--	--	--	--	--	--	--	1	1	1	1

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Course Code: MLE4309	SOCIAL NETWORK DATA ANALYTICS	L	T	P	C
Version 2020.1	Date of Approval: 19th July 2020	3	0	0	3
Pre-requisites/Exposure	Basis of Database and Networking				
Co-requisites					

Catalog Description

This course gives an introduction to social network analysis, with a focus on modelling. It provides an overview of research questions connected to social networks, and of descriptive measures, models, and methods of analysis that can be used to analyze empirical social network data. It helps to understand the online interactive demonstrations and hands-on analysis of real-world data sets.

Course Objectives

The objective of this course is to

- To provide students effective data-driven intelligence to improve their decisions making and systematically estimate the expected impact on relevant performance objectives
- To equip the students withdata-driven intelligence tools, the basics of data mining techniques and develop a data-analytical approach to problem-solving with their application

Course Outcomes

On completion of this course, the students will be able to

CO1. Know the basic notation and terminology used in network science
CO2. Be able to visualize, summarize and compare networks.
CO3. Learn the basic principles behind network analysis algorithms
CO4. Develop practical skills of network analysis in R programming language
CO5: Be capable of analyzing real work networks

Course Content

Modules	Bloom's level	Number of Hours
Module I Introduction Overview: Social network data-Formal methods- Paths and Connectivity-Graphs to represent social relations-Working with network data- Network Datasets-Strong and weak ties - Closure, Structural Holes, and Social Capital.	**L1, L2**	**6**
Module II Community Discovery in Social Networks: Applications, Methods and Engineering Trends Introduction, Communities in Context, Core Methods, Quality Functions, The Kernighan-Lin (Kl) Algorithm, Agglomerative/Divisive Algorithms, Spectral Algorithms, Multi-Level Graph Portioning, Markov Clustering. Other Approaches, Emerging Fields and Problems, Community Discovery in Dynamic Networks, Community Discovery in Heterogeneous Networks, Community Discovery in Directed Networks, Coupling Content and Relationship Information for Community Discovery,	**L1, L2, L3**	**7**

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Module III Information Networks and the World Wide Web The Structure of the Web- World Wide Web- Information Networks, Hypertext, and Associative Memory- Web as a Directed Graph, Bow-Tie Structure of the Web- Link Analysis and Web Search, Searching the Web: Ranking, Link Analysis using Hubs and Authorities- Page Rank- Link Analysis in Modern Web Search, Applications, Spectral Analysis, Random Walks, and Web Search.	**L1, L2, L3**	**5**
Module IV Node Classifications in Social Networks Introduction, Problem Formulation, Representing Data As A Graph, The Node Classification Problem, Methods Using Local Classifiers, Iterative Classification Method, Random Walk Based Methods, Label Propagation, Graph Regularization, Adsorption, Applying Node Classification To Large Social Networks, Basic Approaches, Second-Order Methods, Implementation Within Map-Reduce, Inference Using Graphical Models, Metric Labelling, Spectral Partitioning, Graph Clustering, Variations on Node Classification	**L1, L2, L3**	**6**
Module V Data and Text Mining in Social Media Data Mining In Nutshell, Social Media, Motivations For Data Mining In Social Media, Data Mining Methods For Social Media, Data Representation, Data Mining- A Process, Social Networking Sites: Illustrative Examples, Related Efforts, Ethnography And Netnography, Event Maps, Text Mining: Keyword Search, Query Semantics And Answer Ranking, Keyword Search over Xmland Relational Data, Keyword Search Over Graph Data, Classification Algorithms, Clustering Algorithms, Transfer Learning in Heterogeneous Networks.	**L1, L3, L4**	**6**
Module VI Overview of Social Tagging Introduction, Problems With Metadata Generation and Fixed Taxonomies, Tags: Why And What?, Different User Tagging Motivations, Kinds Of Tags, Linguistic Classifications Of Tags, Game-Based Tagging, Tag Generation Models, Tagging System Design, Tag Analysis, Tagging Distributions ,Identifying Tag Semantics, Tags Versus Keywords, Visualization Of Tags, Tag Clouds For Browsing/Search, Tag Selection For Tag Clouds, Tag Hierarchy Generation, Tag Cloud Display Formats, Tag Evolution Visualization.	**LI, L2**	**6**

Bloom's Level:

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Easley and Kleinberg, "Networks, Crowds, and Markets: Reasoning about a highly connected world", Cambridge Univ. Press, 2010.
2. Charu C. Aggarwal, "Social Network Data Analytics", Springer, 2011.
3. Robert A. Hanneman and Mark Riddle, "Introduction to social network methods", University of California, 2005.

Reference Books

1. Jure Leskovec, Anand Rajaraman, and Jeffrey D. Ullman, "Mining of Massive Datasets", Cambridge University Press, 2nd edition, 2014.
2. Wasserman, S., & Faust, K, "Social Network Analysis: Methods and Applications", Cambridge University Press; 1st edition, 1994.

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	--	--	--	--	--	--	--	--	--	1	3	1	1
CO2	1	--	2	3	--	--	--	--	--	--	--	--	1	3	1	2
CO3	1	1	2	3	3	--	--	--	--	--	--	--	1	2	1	2
CO4	1	1	3	--	--	--	--	--	--	--	--	--	1	2	1	1
CO5	1	2	2	--	--	--	--	--	--	--	--	--	1	1	1	1

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Course Code: MLE4310	AGENT BASED INTELLIGENT SYSTEMS	L	T	P	C
Version 2020.1	Date of Approval: 19th July,2020	3	0	0	3
Pre-requisites/Exposure	Basics of Python				
Co-requisites	Nil				

Catalog Description

This course provides students basic knowledge of employing intelligent agents in solving complex problems and gives the awareness of the building blocks of agents and working of different types of agents. It also analyses the reasons for uncertainty and ability to design agents to handle them.

Course Objectives

The objective of this course is to

1. Equip the students with the knowledge of intelligent agents in solving complex problems.
2. Provide an overview of Building Agents, Knowledge Based Agents, Planning Agents and Higher Level Agents.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the concept of knowledge intelligent agents and use in solving complex problems.
CO2: Describe the concept of **Concepts for Building Agents and Knowledge Based Agents.**
CO3: Explain the concept of **Planning Agents and Higher Level Agents**.
CO4:.Describe the concept of **Agents and Uncertainty and Higher Level Agents.**

Modules	Blooms level*	Number of hours
MODULE 1: Definitions – History – Hybrid Intelligent Agents – Agents vs Multi Agent Systems– Structure – Environment – Basic Problem Solving Agents – Complex Problem Solving Agents – Formulating Search Strategies – Intelligent Search.	L1, L2 ,L3	7
MODULE 2: Situated Agents: Actions and Percepts - Proactive and Reactive Agents: Goals and Events- Challenging Agent Environments: Plans and Beliefs - Social Agents - Agent Execution Cycle.	L1,L2, L3	8
MODULE 3: Knowledge Representation – Logic – First Order Logic – Reflex Agent – Building a Knowledge Base – General Ontology – Interference – Logical Recovery.	L1,L2, L3	7
MODULE 4: Situational Calculus – Representation of Planning – Partial Order Planning – Practical Planners– Conditional Planning - Preplanning Agents.	L1, L2 and L3	5

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MODULE 5: Acting under uncertainty – Probability – Baye's Rule – Belief Networks – Utility Theory - Decision Network- Value of Information – Decision Theoretic Agent Design.	L1, L2,L3	5
MODULE 6: Learning Agents – General Model – Inductive Learning – Learning Decision Tree – Reinforcement Learning – Knowledge in Learning – Communicative Agents – Types of Communicative Agents – Future of AI.	L1, L2 and L3	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text & References:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 3rd Edition, Prentice Hall, 2010.
2. Lin Padgham, Michael Winikoff, "Developing Intelligent Agent Systems: A Practical Guide", 1st Edition, John Wiley & Sons, 2004.
3. ZiliZhang,Chengqi Zhang, "Agent-Based Hybrid Intelligent Systems: An Agent- Based Framework for Complex Problem Solving", 1st Edition, Springer-Verlag New York, LLC , 2004.
4. Ngooc Thanh Nguyaaen, Lakhmi C. Jain, "Intelligent Agents in the Evolution of Web and Applications", 4th Edition, Springer, 2009.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	1	1	--	--	--	--	--	--	--	--	--	1	1	3	-
CO2	1	1	1	--	--	--	--	--	--	--	--	--	1	1	3	-
CO3	1	1	1	--	-	--	--	--	--	--	--	--	1	1	3	-
CO4	1	2	3	--	--	--	--	--	--	--	--	--	1	1	3	-
CO5	1	2	3	--	--	--	--	--	--	--	--	--	2	2	3	-

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Course Code :- AIE4437	PROJECT DISSERTATION-II	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	0	0	0	15
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The objective of this course is to provide practical training on some live/demo projects that will increase capability to work on actual problem in industry. It will be an in house training on some latest software which is in high demand in market. This training will be designed such that it will useful for their future employment in industry.

Course Objectives

The objective of this course is to

1. Provide practical training on live projects
2. Increase technical capabilities on solving real life problems in company environment

Course Outcomes

On completion of this summer internship, the students will be able to:

CO1: Demonstrate a sound technical knowledge of their selected project topic.

CO2: Design and develop engineering solutions to complex problems utilising a systems approach.

CO3: Analyse various approaches for solving a complex engineering problem using different tools and techniques

CO4: Demonstrate the knowledge, skills and attitudes of a professional engineer.

CO5: Apply technical skills and knowledge in completing the project.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	--	--	--	--	--	1	--	--	--	--	--	1	1
CO2	1	1	--	--	--	--	--	--	1	--	--	--	--	--	1	1
CO3	1	1	--	--	--	--	--	--	1	--	--	--	--	--	1	1
CO4	1	1	--	--	--	--	--	--	1	--	--	--	--	--	1	1
C05	1	1	--	--	--	--			1	-	-	-	--	--	1	1

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Course Code: NCE4102	ADVANCED DATABASE MANAGEMENT SYSTEMS	L	T	P	C
Version 2020.1	Date of Approval: 19 July2020	3	0	0	3
Pre-requisites/Exposure	Basic knowledge of DBMS				
Co-requisites	NIL				

Catalog Description

The objective of this course is to expose the students to the implementation techniques of database system. This course explains techniques for query processing and optimization with transaction and concurrency control techniques.

Course Objectives

The objective of this course is to

1. To understand the basic concepts and terminology related to DBMS and Relational Database Design
2. To design and understand Distributed, parallel and object oriented Databases.
3. To understand advanced DBMS techniques to handle and optimize queries in database.

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand the basics of database management system and implementation of relational database.

CO2. Knowhow of the file organization, Query Optimization, Transaction management, and database administration techniques.

CO3. Understand and design Distributed, parallel and object oriented Databases models and possible methods of proving them.

Modules	Blooms level*	Number of hours
MODULE 1: **Relational Database** Integrity Constraints revisited, Extended ER diagram, Relational Algebra & Calculus, Functional, Muiltivalued and Join Dependency, Normal Forms, Rules about functional dependencies.	L1, L2 and L3	8
MODULE 2: **Query Processing and Optimization** Valuation of Relational Operations, Transformation of Relational Expressions, Indexing and Query Optimization, Limitations of Relational Data Model, Null Values and Partial Information. **Objected Oriented and Object Relational Databases** Modeling Complex Data Semantics, Specialization, Generalization, Aggregation and Association, Objects, Object Identity, Equality and Object Reference, Architecture of Object Oriented and Object Relational Databases	L1,L2,l3	9

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MODULE 3: **Parallel and Distributed Databases** Distributed Data Storage – Fragmentation & Replication, Location and Fragment Transparency Distributed Query Processing and Optimization, Distributed Transaction Modeling and concurrency Control, Distributed Deadlock, Commit Protocols, Design of Parallel Databases, and Parallel Query Evaluation. **Advanced Transaction Processing** Nested and Multilevel Transactions, Compensating Transactions and Saga, Long Duration Transactions, Weak Levels of Consistency, Transaction Work Flows, Transaction Processing Monitors.	L1, L2 and L3	10
MODULE 4: Multimedia databases, Databases on the Web and Semi–Structured Data , Case Study: Oracle Xi	L1, L2	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Elmarsi, Navathe, Somayajulu, Gupta, "Fundamentals of Database Systems", 4th Edition, Pearson Education, 2007
2. Garcia, Ullman, Widom, "Database Systems, The complete book", PearsonEducation, 2007
3. R. Ramakrishnan, "Database Management Systems", McGraw Hill International Editions, 1998

Reference Books

1. Date, Kannan, Swaminathan, "An Introduction to Database Systems", 8th Edition Pearson Education, 2007
2. Singh S.K., "Database System Concepts, design and application", Pearson Education, 2006.
3. Silberscatz, Korth, Sudarshan, "Database System Concepts", Mcgraw Hill, 6th Edition, 2006
4. W. Kim, "Modern Database Systems", 1995, ACM Press, Addision – Wesley,
5. D. Maier, "The Theory of Relational Databases", 1993, Computer Science Press, Rokville, Maryland
6. Ullman, J. D., "Principals of database systems", Galgotia publications, 1999
7. Oracle Xi Reference Manual
8. Dietrich, and Urban, "An Advanced Course in Database Systems", Pearson, 2008.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	-	3	--	--	--	--	--	--	--	--	--	2	2	-	-
CO 2	2	2	3	-	--	--	--	--	--	--	--	--	2	1	-	-
CO 3	2	-	3	-	-	--	--	--	--	--	--	--	2	1	-	-

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Course Code: NCE4103	DIGITAL COMPUTER ORGANIZATION	L	T	P	C
Version 2020.1	Date of Approval: 19 July2020	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The Objective of this course is to expose the students to the fundamentals and the concepts of Digital & Computer Organization and Representation of Information and Basic Building Blocks, Basic Organization, Memory Organization, Input-Output Organization, Processor Organization etc. This course is designed to understand the concepts of Computer Organization for Research & Development as well as for application.

Course Objectives

The objective of this course is to

An understanding of a machine's instruction set architecture (ISA) including basic instruction fetch and execute cycles, instruction formats, control ow, and operand addressing modes.

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand and Interpret the functional architecture of computing systems.

CO2. Identify, compare and assess issues related to ISA, memory, control and I/O functions.

CO3. Understand the general concepts in digital logic design, including logic elements, and their use in combinational and sequential logic circuit design.

CO4. Design and analyze solutions in the area of computer architecture.

Modules	Blooms level*	Number of hours
MODULE 1: **Parallel computer models** The state of computing, Multiprocessors and multicomputers, Multivector and SIMD computers, Architectural development tracks Program and network properties: Conditions of parallelism, Data and resource dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain size and latency, Program flow mechanisms, Control flow versus data flow, Data flow architecture, Demand driven mechanisms, Comparisons of flow mechanisms	L1, L2 and L3	7
MODULE 2: **System Interconnect Architectures** Network properties and routing, Static interconnection networks, Dynamic interconnection Networks, Multiprocessor system interconnects, Hierarchical bus systems, Crossbar switch and multiport memory, Multistage and combining network.	L1,L2,l3	8

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MODULE 3: **Processors and Memory Hierarchy** Advanced processor technology, Instruction-set Architectures,CISC Scalar Processors, RISC Scalar Processors, Superscalar Processors,VLIW Architectures, Vector and Symbolic processors Memory Technology: Hierarchical memory technology, Inclusion, Coherence and Locality, Memory capacity planning, Virtual Memory Technology	L1, L2 and L3	8
MODULE 4: **Backplane Bus System** Backplane bus specification, Addressing and timing protocols, Arbitration transaction and interrupt, Cache addressing models, Direct mapping and associative caches. Pipelining: Linear pipeline processor, Nonlinear pipeline processor, Instruction pipeline design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch handling techniques, Arithmetic Pipeline Design, Computer arithmetic principles, Static arithmetic pipeline, Multifunctional arithmetic pipelines	L1, L2	7
MODULE 5: **Vector Processing Principles** Vector instruction types, Vector-access memory schemes. Synchronous Parallel Processing: SIMD Architecture and Programming Principles, SIMD Parallel Algorithms, SIMD Computers and Performance Enhancement	L2,L4	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. M. Moris Mano, "Computer Systems Architecture", 4th Edition, Pearson/PHI, ISBN:10:0131755633
2. Carl Hamacher, ZvonkoVranesic, SafwatZaky, "Computer Organization", 5 th Edition, McGraw Hill

.

Reference Books

1. J.P. Hayes, "computer Architecture and organization", MGH, 1998.
2. M.J Flynn, "Computer Architecture, Pipelined and Parallel Processor Design", Narosa Publishing, 1998.
3. D.A. Patterson, J.L. Hennessy, "Computer Architecture: A quantitative approach", Morgan Kauffmann, 2002.
4. Hwang and Briggs, "Computer Architecture and Parallel Processing"; MGH, 2000.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2	PS O 3	PSO 4
CO 1	2	-	3	--	--	--	--	--	--	--	--	--	2	1	-	-
CO 2	2	2	3	-	--	--	--	--	--	--	--	--	2	1	2	-
CO 3	2	-	3	-	-	--	--	--	--	--	--	--	2	1	2	-
CO 4	2	-	3	-	-	--	--	--	--	--	--	--	2	1		-

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: NCE4104	ADVANCED COMPUTER NETWORKS	L	T	P	C
Version 2020.1	Date of Approval: 19 July2020	3	0	0	3
Pre-requisites/Exposure	Basics of Computer Network				
Co-requisites	Nil				

Catalog Description

Advanced Computer Networks provides the knowledge of computer networks and related current research topics. This course illustrates the OSI and TCP-IP layers, services, devices, cables, protocols, network security, network performance parameters etc .This course focuses on advanced computer network concepts in theory as well as in real life applications in networking.

Course Objectives

The objective of this course is to

- Equip the students with the advanced networking concepts.
- Explain the different techniques of error detection and correction methods used at various layers.
- Provide an overview of various algorithms involved in advanced computer networks at OSI and TCP-IP Layers.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the concept of reference model, wireless Ethernet standards, protocols and applications of networks.

CO2: Describe network Layer design issues, routing algorithms, IP addressing.

CO3: State Multicasting issues and multicast routing protocol. Describe mobile IP and its use in Multicasting.

CO4: State transport and application layers and explain services, protocols, performance parameters in these layers. Also describe DNS, Email and www with applications of each in computer network.

CO5: State network security and describe various types of computer network security, the digital signature, security algorithms. Explain the social issues related to network security and web security.

Modules	Blooms level*	Number of hours
MODULE 1: Uses computer networks, Reference Models, TCP/IP suite of protocols, MAC protocols for high-speed LANS, MANs, and wireless LANs. (For example, FDDI, DQDB, HIPPI, Gigabit Ethernet, Wireless Ethernet, etc.)Fast access technologies. (For example, ADSL, Cable Modem, etc.)	L1, L2	6
MODULE 2: Network Layer Design Issues, Routing Algorithms, Congestion Control Algorithms, Quality of Service, Internet Working, Network Layer in Internet. IPv6 basic protocol, extensions and options, support for QoS, security, etc., Changes to other protocols, Application Programming Interface for IPv6.	L2, L3	8
MODULE 3: Mobile IP, IP Multicasting. Multicast routing protocols, address assignments, session discovery, etc.	L1, L2	8

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MODULE 4: The Transport Protocol: The Transport Service, Elements of transport protocol, a simple Transport Protocol, Internet Transport Protocols UDP, Internet Transport Protocols TCP, TCP extensions for high-speed networks, transaction-oriented applications Performance Issues. The Application Layer: DNS-(Domain Name System), Electronic Mail, World Wide Web Multimedia.	L1, L2, and L3	8
MODULE 5: Overview of network security, Secure-HTTP, SSL, ESP, Key distribution protocols. Digital signatures, digital certificates-mail Security, Web security, Social Issues..	L1, L2	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- William Stallings, Cryptography & Network Security: Principles and Practices, Prentice Hall, 2005, (ISBN: 978-0131873162).

Reference Books

1. Behrouz A. Forouzan, Cryptography & Network Security, McGraw-Hill, 2007, USA. (ISBN: 0073327530 9780073327532).
2. Douglas R. Stinson, Chapman and Hall, Cryptography Theory & Practice, CRC Press, 2005.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	-	-	-	-	--	--	--	--	--	--	--	**1**	--	-	--
CO2	**1**	-	-	-	3	--	3	--	--	--	--	--	**1**	--	-	--
CO3	**1**	-	-	-	3	--	3	--	--	--	--	--	**2**	1	-	--
CO4	**1**	-	-	--	2	--	2	--	3	--	--	--	2	**1**	-	--
CO5	**1**	-	-	-	1	-	1	--	2	--	--	--	**1**	**2**	-	--

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Course Code: NCE4106	ADVANCED DATABASE MANAGEMENT SYSTEM LAB	L	T	P	C
Version 2020.1	Date of Approval: 19 July2020	0	0	2	1
Pre-requisites/Exposure	Basic knowledge of DBMS				
Co-requisites	Nil				

Catalog Description

The objective of this course is to expose the students to the implementation techniques of database system. This course explains techniques for query processing and optimization with transaction and concurrency control techniques.

Course Objectives

The objective of this course is

1. Equip the students with the different issues involved in the design and implementation of a database system.
2. Provide a practical knowledge of implementation/demonstration of data manipulation language to query, update, and manage a database.

Course Outcomes

On completion of this course, the students will be able to

CO1. Demonstrate and analyze and apply common SQL statements including DDL, DML and DCL statements to perform different operations.

CO2. Demonstrate and Apply different types of constraints on the database.

CO3. Design different views of tables for different users and to apply embedded and nested queries.

CO4. Design and implement a database for a given problem according to well known design principles that balance data retrieval performance with data consistency.

Modules	Blooms level*	Number of hours
Module1: 1. Introduction to SQL and understand basic commands 2. Understand various DDl and DML commands. 3. To understand joins in SQL.	L1,L2 and L3	4
Module 2: 1. To understand constraints SQL 2. Wild cards and aggregate functions in SQL 3. To understand and execute procedures and views in SQL	L2 and L3	6
Module 3: 1. To understand and execute triggers in SQL 2. To develop a database application to demonstrate the representation of multi valued attributes and use of nested tables to represent complex objects. Write suitable queries	L2, L3, L4 and L5	4
Module 4: 1. To understand and execute Indexes in SQL	L2, L3 and L4	4

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Module 5: 1. To understand the concept of Exception handling in SQL 2. Query Evaluation Plans 3. Concurrency and Transactions	L2, L3 and L4	1

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", 6th edition, Tata McGraw Hill, 2011
2. RamezElmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", 4th Edition, Pearson/Addisionwesley, 2007

Reference Book

1. Database System Concepts by A. Silberschatz, H.F. Korth and S. Sudarshan, 3rdedition, 1997, McGrawHill, International Edition.
2. Introduction to Database Management system by Bipin Desai, 1991, Galgotia Pub.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/ Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS O 1**	**PS O 2**	**PS O 3**	**PS O 4**
CO 1	**2**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO 2	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO 3	**1**	**3**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	**3**	--
CO 4	**1**	**3**	**2**	--	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO 5	**1**	**3**	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--	**1**

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Course Code: NCE4107	ADVANCED COMPUTER NETWORKS LAB	L	T	P	C
Version 2020.1	Date of Approval: 19 July2020	0	0	2	1
Pre-requisites/Exposure	Basics of Computer Networks				
Co-requisites	Nil				

Catalog Description

Advanced Computer Networks Lab provides the knowledge of various installations & connections of LAN, WAN, etc, study of Cisco Packet Tracer Tool and its implementations, simulation of flow-control protocols such as Sliding Window, Stop & Wait with help of programming languages. This course focuses on real-life applications in networking and its software implementation in the laboratory.

Course Objectives

The objective of this course is to

1. Equip the students with the advanced networking concepts.
2. Explain the different techniques of error detection and correction methods used at various layers.
3. Provide an overview of various algorithms involved in advanced computer networks at OSI and TCP-IP Layers.

Course Outcomes

On completion of this course, the students will be able to

CO1: Understand fundamental underlying principles of computer networking
CO2: Understand details and functionality of CISCO router
CO3:Demonstrate and configure details and functionality of DHCP server
CO4: Analyze performance of various communication protocols.
CO5: Compare routing algorithms

Modules	Blooms level*	Number of hours
MODULE 1: 1. Configuration and logging to a CISCO Router and introduction to the basic user Interfaces. Introduction to the basic router configuration and basic commands. 2. Configuration of IP addressing for a given scenario for a given set of topologies.	L1, L2	2
MODULE 2: 1. Configure a DHCP Server to serve contiguous IP addresses to a pool of four IP devices with a default gateway and a default DNS address. Integrate the DHCP server with a BOOTP demon to automatically serve Windows and Linux OS Binaries based on client MAC address	L2, L3	2

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MODULE 3: 1. Configure, implement and debug the following: Use open source tools for debugging and diagnostics. a. ARP/RARP protocols b. RIP routing protocols c. BGP routing d. OSPF routing protocols e. Static routes (check using netstat)	L1, L2	3
MODULE 4: 1. Configure DNS: Make a caching DNS client, and a DNS Proxy; implement reverse DNS and forward DNS, using TCP dump/Wireshark characterise traffic when the DNS server is up and when it is down. 2. Configure FTP Server on a Linux/Windows machine using a FTP client/SFTP client characterise file transfer rate for a cluster of small files 100k each and a video file of 700mb.Use a TFTP client and repeat the experiment	L1, L2, and L3	3
MODULE 5: 1. Configure a mail server for IMAP/POP protocols and write a simple SMTP client in C/C++/Java client to send and receive mails. 2. Implement Open NMS+ SNMPD for checking Device status of devices in community MIB of a linux PC. Using yellow pages and NIS/NFS protocols implement Network Attached Storage Controller (NAS). Extend this to serve a windows client using SMB. Characterise the NAS traffic using wireshark.	L1, L2	3

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- William Stallings, Cryptography & Network Security: Principles and Practices, Prentice Hall, 2005, (ISBN: 978-0131873162).

Reference Books

- Behrouz A. Forouzan, Cryptography & Network Security, McGraw-Hill, 2007, USA. (ISBN: 0073327530 9780073327532).
- Douglas R. Stinson, Chapman and Hall, Cryptography Theory & Practice, CRC Press, 2005.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	-	-	-	-	--	--	--	--	--	--	--	**1**	--	-	--
CO2	**1**	-	-	-	3	--	3	--	--	--	--	--	**1**	--	-	--
CO3	**1**	-	-	-	3	--	3	--	--	--	--	--	**1**	2	2	--
CO4	**1**	-	-	--	2	--	2	--	3	--	--	--	**2**	**1**	-	--
CO5	**1**	-	-	-	1	-	1	--	2	--	--	--	**2**	**1**	-	--

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Course Code: NCE4108	MATLAB PROGRAMMING	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	0	0	4	2
Pre-requisites/Exposure	C Programming				
Co-requisites	Basic knowledge of Programming				

Catalog Description

The objective of this course is to expose the students to the implementation techniques of Mat Lab Programming.

Course Objectives

The objective of this course is to

- To understand the basic concepts and terminology related to Mat Lab.
- Application of Mat Lab in field of Signal Processing and Control systems.

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand the basics of Matlab programming environment.

CO2. Analysis of given LTI System and verifying its physical reliability and stability properties.

CO3. Waveform synthesis using Laplace Transforms and z-transform of a given signal and system.

Modules	Blooms level*	Number of hours
1. To write a MATLAB program to perform some basic operation on matrices such as addition, subtraction, multiplication. 2. To write a "MATLAB" Program to generate various signals and sequences, such as unit impulse, unit step, unit ramp, sinusoidal, square, saw tooth, triangular, sinc signals. 3. To performs operations on signals and sequences such as addition, multiplication, scaling, shifting, folding, computation of energy and average power. 4. Write a program for finding even and odd parts of sequences Using MATLAB Software& program for finding real and imaginary parts of sequences Using MATLAB Software.	L1, L2 and L3	8
5. Write a program to find the out put with linear convolution operation Using MATLAB Software 6. Write a program to compute auto correlation and cross correlation between signals and Sequences. 7. Write a program to compute linearity and time invariance properties of a given continuous /discrete System.	L1,L2,l3	6

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8. Write a program to Unit Step And Sinusoidal Response Of The Given LTI System And Verifying Its physical reliability and stability properties. 9. Write a program to demonstrate Gibbs Phenomenon using MATLAB. 10. Write a program to obtain Fourier Transform and Inverse Fourier Transform of a given signal / sequence and to plot its Magnitude and Phase Spectra **11.** Write a program to perform waveform synthesis using Laplace Transforms of a given signal.	L1, L2 and L3	8
12. Write a program to locating the zeros and poles and plotting the pole zero maps in s-plane and z-plane 13. for the given transfer function. 14. Write a program to Generate Gaussian Noise and to Compute its Mean, M.S. Values, Skew, kurtosis, 15. PS and PDF 16. Write a program to demonstrate Sampling Theorem and aliasing effect using MATLAB. 17. Write a program for removal of noise by auto correlation/cross correlation.	L1, L4	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

4. Amos Gilat, "MATLAB: An Introduction with Applications", Wiley; Fourth edition (2012)4ed.

Reference Books

9. Bansal, Goel and Sharma, MATLAB and its Applications in Engineering"Pearson Education India; Second edition (1 March 2016).

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS O 1**	**PS O 2**	**PS O 3**	**PSO 4**
CO 1	**2**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO 2	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO 3	**1**	**3**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	**3**	--

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Course Code: NCE4109	PYTHON PROGRAMMING LAB	L	T	P	C
Version 2020.1	Date of Approval: 19 July2020	0	0	2	1
Pre-requisites/Exposure	Hands on knowledge of C and C++ Programming				
Co-requisites	Basic concepts of OOP Programming				

Catalog Description

The course is designed to provide an introduction to the Python programming language. The focus of the course is to provide students with an introduction to programming, I/O, and visualization using the Python programming language.

Course Objectives

The objective of this course is

- Equip the students with the basic feature of python required in solving complex problems and build GUI applications
- Provide a practical knowledge of implementation/demonstration of python programming concepts like of lists, tuples, dictionaries, Object Oriented Programming concepts in Python, Strings and Files in Python.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Demonstrate the basics of python programming using if-else, loops and List, Dictionary, tuples.

CO 2: Demonstrate the concept of inheritances, polymorphisms and other concepts and able to solve complex programming problems involving class objects.

CO 3: Demonstrate the ability to write database applications in Python

CO 4: Demonstrate Files Handling in Python.

CO 5: Demonstrate database operation and GUI applications in python.

Modules	Blooms level*	Number of hours
4. Write a program which will find all such numbers which are divisible by 7 but are not a multiple of 5,between 2000 and 3200 (both included). The numbers obtained should be printed in a comma-separated sequence on a single line. 5. Create a program that asks the user to enter their name and their age. Print out a message addressed to them that tells them the year that they will turn 100 years old. 6. Define a function max() that takes two numbers as arguments and returns the largest of them. Use the if-then-else construct available in Python. (It is true that Python has the max() function built in, but writing it yourself is nevertheless a good exercise.) 7. Define a function max_of_three() that takes three numbers as arguments and returns the largest of them.	L1,L2 and L3	4

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8. Define a function that computes the length of a given list or string. (It is true that Python has the len() function built in, but writing it yourself is nevertheless a good exercise.) 9. Write a function that takes a character (i.e. a string of length 1) and returns True if it is a vowel, False otherwise. 10. Write a function translate() that will translate a text into "rövarspråket" (Swedish for "robber's language"). That is, double every consonant and place an occurrence of "o" in between. For example, translate("this is fun") should return the string "tothohisosisosfofunon". 11. Define a function sum() and a function multiply() that sums and multiplies (respectively) all the numbers in a list of numbers. For example, sum([1, 2, 3, 4]) should return 10, and multiply([1, 2, 3, 4]) should return 24. 12. Define a function reverse() that computes the reversal of a string. For example, reverse("I am testing") should return the string "gnitset ma I".	L2 and L3	6
13. Ask the user for a number. Depending on whether the number is even or odd, print out an appropriate message to the user 14. Take a list, say for example this one: a = [1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89] and write a program that prints out all the elements of the list that are less than 5. 15. Create a program that asks the user for a number and then prints out a list of all the divisors of that number. (If you don't know what a divisor is, it is a number that divides evenly into another number. For example, 13 is a divisor of 26 because 26 / 13 has no remainder.) 16. Take two lists, say for example these two: a = [1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89] b = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13] and write a program that returns a list that contains only the elements that are common between the lists (without duplicates). Make sure your program works on two lists of different sizes.	L2, L3, L4 and L5	4
17. Ask the user for a string and print out whether this string is a palindrome or not. (A palindrome is a string that reads the same forwards and backwards.) 18. Let's say I give you a list saved in a variable: a = [1, 4, 9, 16, 25, 36, 49, 64, 81, 100]. Write one line of Python that takes this list a and makes a new list that has only the even elements of this list in it. 19. Make a two-player Rock-Paper-Scissors game. (Hint: Ask for player plays (using input), compare them, print out a message of congratulations to the winner, and ask if the players want to start a new game) **Remember the rules:** • Rock beats scissors • Scissors beats paper • Paper beats rock	L2, L3 and L4	4

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20. Write a program that asks the user how many Fibonnaci numbers to generate and then generates them. Take this opportunity to think about how you can use functions. Make sure to ask the user to enter the number of numbers in the sequence to generate.(Hint: The Fibonnaciseqence is a sequence of numbers where the next number in the sequence is the sum of the previous two numbers in the sequence. The sequence looks like this: 1, 1, 2, 3, 5, 8, 13, …) 21. Write a program (function!) that takes a list and returns a new list that contains all the elements of the first list minus all the duplicates. **22.** Write a function that takes an ordered list of numbers (a list where the elements are in order from smallest to largest) and another number. The function decides whether or not the given number is inside the list and returns (then prints) an appropriate boolean.	L2, L3 and L4	1

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Michael Urban and Joel Murach, Python Programming, Shroff/Murach, 2016
2. Mark Lutz, Programming Python, O`Reilly, 4th Edition, 2010
3. Patrick Naughton & Herbert Schild ,"JAVA The Complete Reference", 10th Edition , TMH

Reference Book

1. Daniel/Young , Introduction to JAVA Programming" , PHI.
2. Jeff Frentzen and Sobotka, "Java Script", Tata McGraw Hill,1999.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	1	--	--	--	--	--	--	--	--	--	--	1	2	--	--
CO 2	3	1	--	--	--	--	--	--	--	--	--	--	1	1	--	--
CO 3	1	3	2	--	--	--	--	--	--	--	--	--	1	2	3	--
CO 4	1	3	2	--	--	--	--	--	--	--	--	--	1	1	--	--
CO 5	1	3	--	--	--	--	--	--	--	--	--	--	1	2	--	1

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: NCE4202	NETWORK AND WIRELESS SECURITY	L	T	P	C
Version 2020.1	Date of Approval: 19, July 2020	3	0	0	3
Pre-requisites/Exposure	Basics of Network				
Co-requisites	Nil				

Catalog Description

In this course the concepts of network and wireless security are discussed in detail. The wireless technologies, techniques and methodologies will be introduced. The studies will be made on impact of the thoughtfulness and longevity of implementations. The concepts learnt in the studies of wireless application protocols and other protocols will be applied in the studies and analysis of security issues in wireless networks.

Course Objectives

The objective of this course is to

- Equip the students with concepts of network wireless security.
- Provide an overview of spread spectrum, cellular network, WLAN, WAP, WTLS, SSH, Bluetooth security.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain wireless security issues and its recent trends in wireless networks, cellular networks and all generations of wireless technologies.

CO2: Describe wireless transmission media, spread spectrum and its techniques, wireless standards and various threats and countermeasures in network security. Write the steps of authentication techniques.

CO3: Demonstrate the working of WAP Model and comparison with TCP/IP, OSI models; state the terminologies: viruses, authorization, non repudiation, secure sessions, security products; Construct WAP security architecture and elaborate its fields; determine issues related to marginal security.

CO4: Describe secure socket layer and transport layer security; Design SSL in OSI reference model. Draw authentication header format and describe each field of AH; Distinguish SSL/TLS; Explain WTLS and fix vulnerabilities of WTLS; Discuss LEAP with reference to WTLS.

CO5: Design and configure Bluetooth security technology; Designing its security architecture; determine security functions of the service discovery protocol. Discuss issues related encryption with ciphers. Compare threats to Bluetooth security. Write Bluetooth holes in Bluetooth technology.

Modules	Blooms level*	Number of hours

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MODULE 1: Network concepts – Threats in networks – Network security controls – Importance ofsecurity – Threat models – Security concepts – Common mitigation methods **Why is Wireless Different?** Introduction ,Protecting the Means Of Communication Protecting Privacy, Promoting Safety ,The Personal and the Public ,Shaking Up the Status Quo ,Understanding Wireless Forecasts ,Reasonable Degrees of Security, Regulatory Environments and Issues, Security-Related Regulations ,Security Related Market Factors, Guidelines for Security Measures, Cellular Networks and Bearer Technologies ,First-Generation Wireless (1G), Second-Generation Wireless (2G), Spread Spectrum, Code Division Multiple Access (CDMA) ,Time Division Multiple Sccess (TDMA) , Global System for Mobile Communications (GSM) ,Third-Generation Wireless (3G) ,Short Message Service (SMS) ,Fourth-Generation Wireless (4G)	L1, L2 and L3	6
MODULE 2: **The Wireless Local Area Network (WLAN)** Wireless Transmission Media, Infrared Systems ,Narrowband Radio System, Wideband Radio Systems: Spread Spectrum, Frequency-Hopping Spread Spectrum (FHSS) ,Direct-Sequence Spread Spectrum (DSSS) ,WLAN Products and Standards—Today's Leaders?,802.11 Security? IEEE 802.11b ,Securing WLANs ,Eavesdropping ,Unauthorized Access , Interference and Jamming ,Physical Threats ,Countermeasures, Frequency-Hopping Spread Spectrum (FHSS), Direct-Sequence Spread Spectrum (DSSS) ,Infrared (IR) ,Narrowband ,The Infamous WEP ,Encryption ,Authentication, Wired Equivalency Protocol Flaws Too Public , Other Authentication Techniques ,Physical Security	L1, L2 and L3	8
MODULE 3: **Wireless Application Protocol(WAP)** Comparison of the TCP/IP, OSI, and WAP Models, How WAP Works ,The Security Status of WAP , Viruses ,Authorization ,Non-repudiation ,Authentication, Secure Sessions ,Security Products ,Securant Technologies Clear Trust Control, WAP Security Architecture ,Marginal Security ,Wireless Access to the Internet, Wireless Middleware	L1, L2 and L3	8
MODULE 4: **Wireless Transport Layer Security (WTLS)** Secure Socket Layer, Record Protocol, SSL Handshake Protocol ,Transport Layer Security, Advantages and Disadvantages of SSL/TLS, Netscape ,Microsoft ,Entrust ,EAP-TLS ,Alternatives to SSL/TLS IP Security (IPSec) ,Authentication Header Protocol (AH) ,Encapsulating Security Payload (ESP) ,Transport and Tunnel Modes, Secure Shell (SSH) ,SSH Transport Layer Protocol ,SSH Versus TLS Implementations ,Light Extensible Authentication Protocol (LEAP) ,Wireless Transport Layer Security and WAP ,Understanding Wireless Transport Layer Security , WTLS Handshake Protocol ,WTLS Alert Protocol ,WTLS Change Cipher Protocol ,Pros and Cons of WTLS ,WTLS Vulnerabilities ,Implementations of WTLS	L2, L3 and L4	8

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MODULE 5: **Bluetooth Security** Bluetooth Basic Specifications ,Bluetooth Technology, Bluetooth Specification Development ,Design Decisions ,Piconets ,Bluetooth Security Architecture ,Scatternets ,The Bluetooth stack, Security Functions at the Baseband Layer ,Security Functions of the Service Discovery Protocol ,Security Functions at the Link Layer, Frequency-Hopping , Channel Establishment ,Security Manager ,Authentication, Authentication with the SAFER1 Block Cipher ,Encryption ,Encryption Modes ,Key Length Negotiation ,Encryption With the E0 Stream Cipher ,Threats to Bluetooth Security ,Jamming ,Bluetooth holes.	L1, L2 and L3	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Nichols and P. Lekka, Wireless Security Models, Threats and Solutions, Tata McGrawHill, Edition 2, 2006.
2. Charles P. Fleeger, Security in Computing, Prentice Hall, edition 2, 2009, New Delhi,

Reference Books

1. Behrouz A. Forouzan, Data Communication and Networking, Tata McGraw-Hill, Edition 4, 2007.
2. William Stallings, "Cryptography and Network security", Edition 6, 2013.
3. Behrouz A. Forouzan, "Cryptography and Network security", Edition 3, 6July 2015.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	**2**	--	--	--	--	--	--	--	--	--	**1**	--	-	-
CO2	**1**	**2**	**2**	-	--	--	--	--	--	--	--	--	**1**	--	-	-
CO3	**1**	**2**	**3**	--	--	--	--	--	--	--	--	--	**1**	**2**	-	**3**
CO4	**1**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	-	**3**
CO5	**1**	**3**	**2**	--	--	--	--	--	--	--	--	--	**1**	--	-	**2**

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Course Code: NCE4203	CYBER CRIME INVESTIGATONS & IT LAW	L	T	P	C
Version 2020.1	Date of Approval: 19 July2020	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

Level of security which is related to the safety of computer systems, data and network is very important in today era. If cyber-crime comes in the frame, how it detect, react and measure on our network and system. The police and law related to each cyber crimetoday. This course focuses on different types of attacks and its policies.

Course Objectives

The objective of this course is to

- Equip the students with the laws and its safety concepts used in cyber crime.
- Provide an overview of different attacks and prevention technique in a network.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain and Understand the Cyber Crime and its Investigations as a Profession.
CO2: Describe the different type of attacks and cyber crime.
CO3 : Conduct the computer investigations and implement the laws for its solution.
CO4: Processing cyber-crime in investigation according to the law.
CO5: Apply diverse viewpoints to ethical dilemmas in the information technology field and recommend appropriate actions.

Modules	Blooms level*	Number of hours
MODULE 1: **POWER OF ARREST WITHOUT WARRANT UNDER THE IT ACT, 2000: A CRITIQUE** Crimes of this Millennium, Section 80 of the IT Act, 2000 – A Weapon or a Farce, Forgetting the Line Between Cognizable and Non-Cognizable Offences, Necessity of Arrest without Warrant from Any Place, Public or Otherwise, Checks and Balances Against Arbitrary Arrests, Arrest for "About to Commit" an Offence Under the IT Act: A Tribute to Draco, Arrest, But No Punishment.	L1, L2 and L3	7
MODULE 2: **CYBER CRIME AND CRIMINAL JUSTICE: PENALTIES, ADJUDICATION AND APPEALS UNDER THE IT ACT, 2000** Concept of 'Cyber Crime' and the IT Act, 2000, Hacking, Teenage Web vandals, Cyber Fraud and Cyber cheating, Virus on the Internet, Defamation, Harassment and E-mail Abuse, Cyber Pornography, Other IT Act Offences, Monetary Penalties, Adjudication and Appeals Under IT Act, 2000, Network Service Providers, Jurisdiction and cyber Crimes, Nature of Cyber Criminality, Strategies to Tackle Cyber Crime and Trends, Criminal Justice in India and Implications on Cyber Crime.	L1, L2 and L3	8

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MODULE 3: **JURISDICTION IN THE CYBER WORLD** Questioning the Jurisdiction and Validity of the Present Law of Jurisdiction, Civil Law of Jurisdiction in India, Cause of Action, Jurisdiction and the Information Technology Act,2000, Foreign Judgments in India, Place of Cause of Action in Contractual and IPR Disputes, Exclusion Clauses in Contracts, Abuse of Exclusion Clauses, Objection of Lack of Jurisdiction, Misuse of the Law of Jurisdiction, Legal Principles on Jurisdiction in the United States of America, Jurisdictional Disputes W.R.T. the Internet in the United States of America.	L1, L2 L3 and L4	9
MODULE 4: **BATTLING CYBER SQUATTERS AND COPYRIGHT PROTECTION IN THE CYBER WORLD** Concept of Domain Name and Reply to Cyber Squatters, Meta-Tagging, Legislative and Other Innovative Moves Against Cyber Squatting, The Battle Between Freedom and Control on the Internet, Works in Which Copyright Subsists and Meaning of Copyright, Copyright Ownership and Assignment, Licence of Copyright, Copyright Term and Respect for Foreign Works, Copyright Infringement, Remedies and Offences, Copyright Protection of Content on the Internet; Copyright Notice, Disclaimer and Acknowledgement, Downloading for Viewing Content on the Internet, Hyper-linking and Framing, Liability of ISPs for Copyright violations in the Cyber World: Legal Developments in the US, Napster and its Cousins: A Revolution on the Internet but a Crisis for Copyright Owners, Computer Software Piracy.	L1, L2, L3,L4,L5 and L6	7
MODULE 5: **PROTECTION OF CYBER CONSUMERS IN INDIA** Are Cyber consumers Covered Under the Consumer Protection Act, Goods and Services, Consumer Complaint, Defect in Goods and Deficiency in Services, Restrictive and Unfair Trade Practices, Instances of Unfair Trade Practices, Reliefs Under CPA, Beware Consumers, Consumer Foras, Jurisdiction and Implications on Cyber Consumers in India, Applicability of CPA to Manufacturers, Distributors, Retailers and Service Providers Based in Foreign Lands Whose Goods are Sold or Services Provided to a consumer in India	L1, L2, and L3	5

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. **"**Cyber Law Simplified" ,VivekSood, TMH, 2001

Reference Books

1. "Cyber Security, Cyber Crime and Cyber Forensics: Applications and Perspectives" Raghu Santanam, M. Sethumadhavan, Information Science Reference.
2. Cyberlaw – The Indian Perspective ByPavanDuggal, Saakshar Law Publications.
3. Jonathan Rosenoer,"Cyber Law: The law of the Internet", Springer-Verlag, 1997

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	1	1	-	-	1	-	-	1	-	-	1	1	-	1	-
CO 2	1	2	-	-	-	-	-	-	-	-	-	1	-	-	1	2
CO 3	-	2	1	1	1	-	-	-	-	-	-	-	-	1	1	-
CO 4	1	-	-	-	2	-	1	-	-	2	-	-	-	-	1	2
CO 5	-	-	-	-	-	-	1	2	1	3	1	-	-	-	1	1

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Course Code: NCE4204	CYBER CRIME INVESTIGATONS & FORENSICS	L	T	P	C
Version 2020.1	Date of Approval: 19 July2020	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

Level of security which is related to the safety of computer systems, data and network is very important in today era. If cyber crime come in the frame, how it detect, react and measure on our network and system. The police and law related to each cyber crime today. This course focuses on different type attack and investigation level, police comes under the parameter of cyber law on network which can be applied in designing secure network applications in the modern computing environment.

Course Objectives

The objective of this course is to

- Equip the students with the investigation concepts used in cyber crime.
- Provide an overview of different attacks and prevention technique in a network.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain and Understand the Computer Forensics and Investigations as a Profession.
CO2: Describe the different type of attacks and cyber crime.
CO3 : Conduct the computer investigations and implement data acquisition concept in investigation.
CO4: Processing cyber crime and incident scenes in investigation according to the law.
CO5: Use the different -2 computer forensics tools in modern era according to the type of crime

Modules	Blooms level*	Number of hours
MODULE 1: COMPUTER FORENSICS AND INVESTIGATIONS AS A PROFESSION, UNDERSTANDING Computer Forensics ,Computer Forensics Versus Other Related Disciplines ,A Brief History of Computer Forensics, Understanding Case Law ,Developing Computer Forensics Resources ,Preparing for Computer Investigations, Understanding Law Enforcement Agency Investigations, Following the Legal Processes, Understanding Corporate Investigations, Establishing Company Policies, Displaying Warning Banners ,Designating an Authorized Requester, Conducting Security Investigations, Distinguishing Personal and Company Property ,Maintaining Professional Conduct.	L1, L2 and L3	7

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MODULE 2: UNDERSTANDING COMPUTER INVESTIGATIONS Preparing a Computer Investigation, An Overview of a Computer Crime ,An Overview of a Company Policy Violation ,Taking a Systematic Approach ,Assessing the Case ,Planning Your Investigation ,Securing Your Evidence ,Procedures for Corporate High-Tech Investigations, Employee Termination Cases, InternetAbuse Investigations-mail Abuse Investigations, Attorney-Client Privilege Investigations, Media Leak Investigations, Industrial Espionage Investigations, Interviews and Interrogations in High-Tech Investigations ,Understanding Data Recovery Workstations and Software, Setting Up Your Workstation for Computer Forensics ,Conducting an Investigation, Gathering the Evidence ,Understanding Bit-stream Copies ,Acquiring an Image of Evidence Media, Using Pro-Discover Basic to Acquire a USB Drive ,Analyzing Your Digital Evidence, Completing the Case, Critiquing the Case	L1, L2 and L3	8
MODULE 3: DATA ACQUISITION Understanding Storage Formats for Digital Evidence, Raw Format, Proprietary Formats,Advanced Forensic Format ,Determining the Best Acquisition Method, Contingency Planning for Image Acquisitions ,Using Acquisition Tools ,Windows XP Write-Protection with USB Devices, Acquiring Data with a Linux Boot CD, Capturing an Image with Pro-Discover Basic ,Capturing an Image with Access Data FTK Imager ,Validating Data Acquisitions ,Linux Validation Methods, Windows Validation Methods ,Performing RAID Data Acquisitions ,Understanding RAID ,Acquiring RAID Disks ,Using Remote Network Acquisition Tools ,Remote Acquisition with Pro Discover, Remote Acquisition with EnCase Enterprise , Remote Acquisition with R-Tools R-Studio ,Remote Acquisition with WetStone Livewire, Remote Acquisition with F-Response ,Remote Acquisition with Runtime Software ,Using Other Forensics Acquisition Tools, SnapBackDatArrest ,NTI Safe Back,DIBS USA RAID ,Look Investigator I imager ,ASR Data SMART ,Australian Department of DefencePyFlag,	L1, L2 L3 and L4	9

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MODULE 4: PROCESSING CRIME AND INCIDENT SCENES Identifying Digital Evidence, Understanding Rules of Evidence ,Collecting Evidence in Private-Sector Incident Scenes, Processing Law Enforcement Crime Scenes ,Understanding Concepts and Terms Used in Warrants ,Preparing for a Search ,Identifying the Nature of the Case, Identifying the Type of Computing System, Determining Whether You Can Seize a Computer, Obtaining a Detailed Description of the Location, Determining Who Is in Charge, Using Additional Technical Expertise ,Determining the Tools You Need ,Preparing the Investigation Team, Securing a Computer Incident or Crime Scene ,Seizing Digital Evidence at the Scene ,Preparing to Acquire Digital Evidence, Processing an Incidentor Crime Scene ,Processing Data Centers with RAID Systems ,Using a Technical Advisor, Documenting Evidence in the Lab, Processing and Handling Digital Evidence ,Storing Digital Evidence, Evidence Retention and Media Storage Needs, Documenting Evidence ,Obtaining a Digital Hash, Reviewing a Case ,Sample Civil Investigation ,Sample Criminal Investigation ,Reviewing Background Information for a Case ,Identifying the Case Requirements, Planning the Investigation ,Conducting the Investigation: Acquiring Evidence with AccessData FTK	L1, L2, L3,L4,L5 and L6	7
MODULE 5: CURRENT COMPUTER FORENSICS TOOLS Evaluating Computer Forensics Tool Needs ,Types of Computer Forensics Tools ,Tasks Performed by Computer Forensics Tools, Tool Comparisons ,Other Considerations for Tools ,Computer Forensics Software Tools, Command-Line Forensics Tools, UNIX/Linux Forensics Tools ,Other GUI Forensics Tools, Computer Forensics Hardware Tools, Forensic Workstations, Using a Write-Blocker, Recommendations for a Forensic Workstation,Validating and Testing Forensics Software ,Using National Institute of Standards and Technology (NIST) Tools ,Using Validation Protocols	L1, L2, and L3	5

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Nelson Phillips and EnfingerSteuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.

Reference Books

1. Kevin Mandia, Chris Prosise, Matt Pepe, "Incident Response and Computer Forensics ", Tata McGraw -Hill, New Delhi, 2006.
2. Robert M Slade," Software Forensics", Tata McGraw - Hill, New Delhi, 2005.
3. Bernadette H Schell, Clemens Martin, "Cybercrime", ABC – CLIO Inc, California, 2004.
4. "Understanding Forensics in IT ", NIIT Ltd, 2005

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**2**	**1**	**2**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**3**	
CO2	**1**	**1**	**2**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**-**	**2**
CO3	**1**	**2**	**1**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**-**	**--**	**3**	
CO4	**1**	**2**	**2**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**3**	
CO5	**1**	**2**	**2**	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**3**	

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Course Code: NCE4205	INTRUSION DETECTION AND PREVENTION SYSTEM	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	3	0	0	3
Pre-requisites/Exposure	Basic Networking				
Co-requisites	Nil				

Catalog Description

Intrusion Detection System (IDS) is a rapidly growing field that deals with detecting and responding to malicious network traffic and computer misuse. Intrusion detection is the process of identifying and (possibly) responding to malicious activities targeted at computing and network resources. Any hardware or software automation that monitors, detects or responds to events occurring in a network or on a host computer is considered relevant to the intrusion detection approach. This course introduces various network malicious activities, detection techniques and evaluation criteria.

Course Objectives

The objective of this course is to

- Equip the students with various network attacks and their examples.
- Provide knowledge of various approaches to develop IDS and also to evaluate them.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the network attacks and their possible reasons.

CO2: Compare currently available detection approaches to detect intrusion and anomalous activities.

CO3: Understand strengths and weaknesses of machine learning and data mining approached to choose the best approach to design and develop IDS.

CO4: Apply number of approaches to evaluate IDS using various evaluation criteria.

Modules	Blooms level*	Number of hours
MODULE 1:NETWORK ATTACKS Attack Taxonomies, Probes: IPSweep and PortSweep, NMap ,MScan, SAINT , Satan, Privilege Escalation Attacks:Buffer Overflow Attacks, Misconfiguration Attacks , Race-condition Attacks , Man-in-the-Middle Attacks. Social Engineering Attacks**.** Denial of Service (DoS) and Distributed Denial of Service (DDoS) Attacks: Detection Approaches for DoS and DDoS Attacks, Prevention and Response for DoS and DDoS Attacks, Examples of DoS and DDoS Attacks.Worms Attacks:Modeling and Analysis of Worm Behaviors, Detection and Monitoring of Worm Attacks, Worms Containment**,** Examples of Well Known Worm Attacks. Routing Attacks: OSPF Attacks, BGP Attacks.	L1 and L2	6
MODULE 2: DETECTION APPROACHES Misuse Detection: Pattern Matching, Rule-based Techniques, State-based Techniques, Techniques based on Data Mining Anomaly Detection: Advanced Statistical Models,Rule based Techniques, Biological Models, Learning Models Specification-based Detection, Hybrid Detection	L1 and L2	8

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MODULE 3: THEORETICAL FOUNDATION OF DETECTION Taxonomy of Anomaly Detection Systems, Fuzzy Logic, Bayes Theory, Artificial Neural Networks, Support Vector Machine (SVM), Evolutionary Computation, Association Rules, Clustering, Signal Processing Techniques Based Models, Comparative Study of Anomaly Detection Techniques	L1, L2 and L3	10
MODULE 4: ARCHITECTURE AND IMPLEMENTATION Centralized, Distributed, Cooperative Intrusion Detection, Alert Management and Correlation: Data Fusion, Alert Correlation, Cooperative Intrusion Detection	L1 and L2	4
MODULE 5: EVALUATION CRITERIA & INTRUSION RESPONSE Accuracy, Performance, Completeness, Timely Response, Adaptation and Cost-Sensitivity, Intrusion Tolerance and Attack Resistance, Test, Evaluation and Data Sets. Response Type, Response Approach, Survivability and Intrusion Tolerance, Case study of any commercial IDS.	L2 and L4	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Ali A. Ghorbani, Wei Lu, "Network Intrusion Detection and Prevention: Concepts and Techniques", Springer, 2010.
- Matthew MacDonald, Beginning with ASP.NET 4.5 in C#, Apress Publications

Reference Books

1. Carl Enrolf, Eugene Schultz, Jim Mellander, "Intrusion detection and Prevention", McGraw Hill, 2004
2. Paul E. Proctor, "The Practical Intrusion Detection Handbook ", Prentice Hall , 2001.
3. Earl Carter, Jonathan Hogue, "Intrusion Prevention Fundamentals", Pearson Education, 2006.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS O 1**	**PS O 2**	**PS O 3**	**PS O 4**
CO 1	--	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	**3**	--
CO 2	**1**	**1**	**3**	--	**5**	--	--	--	--	--	--	--	**1**	--	**3**	--
CO 3	**1**	**1**	**2**	--	**5**	--	--	--	--	--	--	--	**1**	--	**3**	--
CO 4	**1**	**2**	--	--	**1**	--	--	--	--	--	--	--	**1**	--	**3**	--

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: NCE4206	RESEARCH METHODOLOGY AND TECHNICAL REPORT WRITING	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	2	0	0	2
Pre-requisites/Exposure	NIL				
Co-requisites	NIL				

Catalogue Description

This course deals with types of research, significance and characteristics and planning a research proposal, population and sample, parameter and statistic, sampling and data collection, sampling design: steps, types, sample size, sampling methods. It deals with univariate, bivariate and multivariate analysis, measure of dispersion of data, standard deviation, variance, coefficient of variation and degree of freedom. Hypothesis testing: parametric tests and non-parametric tests, regression analysis and curve fitting, method of least-squares, explained and unexplained variations, coefficient of correlation of determination. The course also deals with technical/scientific/research report writing: referencing and bibliography and footnotes. Publication of research papers, citations, intellectual property rights and copy rights, plagiarism, patent and patent laws, commercialization and ethical issues.

Course Objectives

The objective of this course is to:

- Deals with types of research, significance and characteristics and planning a research proposal and to enhance scientific and technical writing and research skills.
- Impart knowledge about various stages of research process, statistical analysis and tools & their applications in decision making by hypothesis testing and regression analysis.
- It also deals with intellectual property rights and copy rights, plagiarism, patent and patent laws, commercialization and ethical issues.

Course Outcomes

On completion of this course, the students will be able to:

CO1. Classify different research types, explain steps in research process and planning research proposal.

CO2. Describe sampling methods, sampling steps and design, carry out data processing and analysis.

CO3. Explain hypothesis testing, parametric and non-parametric tests, carry out regression analysis, curve fitting.

CO4. Demonstrate technical and scientific report writing skills, describe plagiarism, patent laws and intellectual property rights.

Course Content

Modules	Blooms level*	Number of hours

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Module I: Introduction and Research Planning Introduction to research: Definition, motivation, need, objectives, significance and characteristics of research; types of research; steps in research process; planning a research proposal; literature review, web searching.	L1, L2	**4**
Module II: Sampling Methods Measurement scales, population and sample, parameter and statistic, sampling and data collection, sampling design: steps, types, sample size, sampling methods, data processing and analysis. Sampling surveys and questionnaire designing, primary and secondary data.	L1, L2, L3	**5**
Module III: Hypothesis Testing and Regression Analysis Univariate, bivariate and multivariate analysis, means-arithmetic, geometric and harmonic; measure of dispersion of data, standard deviation, variance, coefficient of variation and degree of freedom. Hypothesis testing: kinds errors in hypothesis testing, significance and confidence levels, parametric tests and non-parametric tests, one-tailed and two-tailed tests, analysis of variance. Regression analysis and curve fitting, method of least-squares, explained and unexplained variations, coefficient of correlation of determination.	L1, L3, L4	**10**
Module IV: Technical Report Writing and Plagiarism Technical/scientific/research report writing: structure and components of scientific reports, formats of dissertations, research report, report writing skills, report preparation, referencing and bibliography and footnotes. Publication of research papers, citations, making presentation-use of visual aids and PPTs. Intellectual property rights and copy rights, plagiarism, patent and patent laws, commercialization and ethical issues.	L1, L3, L4	**5**

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books:

1. Blake, G. and Bly, R.W. The Elements of Technical Writing. MacMillan, New York, 1993.
2. Chawla, D and Sondhi, N. Research Methodology- Concepts and Cases. Vikas Publishing House PVT LTD. New Delhi, 2016.
3. Kothari, C.R. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi. 2008.

Reference Books:

1. Montomery, Douglas C, Design and Analysis of Experiments, 5th Ed, Wiley India.2005.
2. Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt.Ltd., New Delhi, 2009
3. Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd, Delhi, 2009.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3	PSO4
CO1	**1**	**1**	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**1**	**2**	**-**
CO2	**1**	**3**	**1**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**1**	**2**	**-**
CO3	**1**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**3**	**2**	**-**
CO4	**1**	**3**	**2**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**1**	**2**	**3**
CO5	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**		**1**	**3**	**1**	**2**	**-**

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Course Code: NCE4207	CRYPTOGRAPHY FOUNDATION LAB	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

Modern cryptography applies theory from mathematics and computer science to design and implement strong encryption methods which are so important to the safety of computer systems today. This course focuses on building strong mathematical foundations which can be applied in designing secure cryptographic applications in the modern computing environment.

Course Objectives

The objective of this course is to

- Equip the students with the mathematical concepts used in cryptography.
- Provide an overview of different mathematical structures used in designing cryptographic algorithms.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain and apply the concept of modular arithmetic in cryptographic applications.
CO2: State and apply the algorithms for primality testing and quadratic congruence.
CO3: Describe the different algebraic structures and apply them in cryptographic applications.
CO4: State the Shannon's Theory and explain its applications in cryptography.
CO5: Describe the concept of pseudorandom number generation and apply it in designing pseudorandom number generators.

Modules	Blooms level*	Number of hours
MODULE 1: 1. Program to implement division theorem 2. checking number is prime or composite using simple logic 3. Implement Miller Rabin Primality Algorithm	L1, L2 and L3	3
MODULE 2: 4.Implement Euclid and Extended Algorithm. 5. Implement Chinese Remainder Theorem 6. Implement Baby Step Giant Step Algorithm.	L1, L2, L3 and L4	3
MODULE 3: 7. Implement at least 2 algorithms for random number generation. One is Blum BlumShub. 8. Implement Modular Exponentiation Algorithm 9. Implement algorithm for modular linear equation solver.	L1, L2 and L3	3
10.Implement Fermat's and Euler's theorem. 11. Implement Fermat's Factorization method. 12. Few programs based on Probability Theory and theorems	L1, L2, and L3	3

**Bloom's Level:*

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L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- William Stallings, Cryptography & Network Security: Principles and Practices, Prentice Hall, 2005,(ISBN: 978-0131873162).

Reference Books

1. Behrouz A. Forouzan, Cryptography & Network Security, McGraw-Hill, 2007, USA. (ISBN: 0073327530 9780073327532).
2. Douglas R. Stinson, Chapman and Hall, Cryptography Theory & Practice, CRC Press, 2005.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	2	1	2	1	--	--	--	--	--	--	--	1	--	3	--
CO 2	1	1	2	1	1	--	--	--	--	--	--	--	1	--	3	--
CO 3	1	2	1	1	1	--	--	--	--	--	--	--	1	--	3	--
CO 4	1	2	2	2	3	--	--	--	--	--	--	--	1	--	3	--
CO 5	1	2	2	2	2	--	--	--	--	--	--	--	1	--	3	--

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Course Code: NCE4208	WEB SECURITY LAB	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	0	0	2	1
Pre-requisites/Exposure	Basics of Computer Networks				
Co-requisites	Nil				

Catalog Description
Web security isan important component of computer science. The objective of this course is to make students aware of various techniques and simulations used to understand building blocks of Web security.

Course Objectives
The objective of this course is to
- Equip the students with the practical aspects of concepts of web security.
- Provide an understanding of different techniques used in web security.
- Equip the students with the working knowledge of different tools and simulators used in web security.

Course Outcomes
On completion of this course, the students will be able to
CO1: State, explain, and apply SQL injection , XSS attacks.
CO2: State, explain, and write java script files for XSS attacks..
CO3: State, explain, and perform URL Interpretation, Input validation, Buffer overflow attacks.
CO4: Perform password based attacks.
CO5: Apply DoS and hijacking.

Modules	Blooms level*	Number of hours
MODULE 1: • Exercises related to SQL injection attacks, • XSS attacks	L1, L2, and L3	3
MODULE 2: writing java script files • for launching and preventing XSS attacks • Stored and Reflected XSS Attacks,	L1, L2, and L3	5
MODULE 3: • Perform URLinterpretation attack, • Perform input validation attack, • buffer overflow attacks	L1, L2, and L3	6
MODULE 4: • Perform impersonation attacks • Perform password-based attacks	L1, L2, and L3	6
MODULE 5: • Perform an experiment for denial of service attacks • Perform an experiment for session hijacking	L1, L2, and L3	6

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Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	1	1	1	1	1	--	--	1	--	--	--	1	1	3	2
CO 2	1	1	1	1	1	1	--	1	--	--	2	--	1	1	3	2
CO 3	1	1	1	1	1	1	--	--	--	2	--	--	1	1	3	2
CO 4	1	1	1	1	1	1	1	3	--	--	3	1	1	1	3	2
CO 5	1	1	2	2	3	3	--	--	2	--	1	--	1	1	3	2

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Course Code: NCE4209	NETWORK SECURITY LAB	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	0	0	2	1
Pre-requisites/Exposure	Basics of Computer Networks				
Co-requisites	Nil				

Catalog Description

Network and wireless security isan important component of computer science. The objective of this course is to make students aware of various techniques and simulations used to understand building blocks of network and wireless security.

Course Objectives

The objective of this course is to

- Equip the students with the practical aspects of concepts of network and wireless security.
- Provide an understanding of different techniques used in network and wireless security.
- Equip the students with the working knowledge of different tools and simulators used in network security.

Course Outcomes

On completion of this course, the students will be able to

CO1: State, explain, and apply wine / virtual box/vmware in security simulations.
CO2: State, explain, and apply nmap, superscan, and nmap1 in security simulations.
CO3: State, explain, and apply xprobe2 and wiresharkin security simulations.
CO4: State, explain, and apply dumpsecin security simulations.
CO5: State, explain, and apply arp poisoning and opensslin security simulations.

Modules	Blooms level*	Number of hours
MODULE 1: • Learn to install wine / virtual box/vmware or any other equivalent software on the host os. • Perform an experiment to grab a banner with telnet and perform the task using netcat utility. Banner grabbing is a technique to determine which application or service is running on the specified port by attempting to make a connection to this host. •	L1, L2, and L3	3
MODULE 2: • Perform an experiment for port scanning with nmap, superscan or any other software. • Using nmap 1)find open ports on a system 2) find the machines which are active 3)find the version of remote os on other systems 4)find the version of s/w installed on other system	L1, L2, and L3	5

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MODULE 3: • Perform an experiment on active and passive fingerprinting using xprobe2 and nmap. • Performa an experiment to demonstrate how to sniff for router traffic by using the tool wireshark	L1, L2, and L3	6
MODULE 4: • Perform an experiment how to use dumpsec. • Perform an wireless audit of an access point / router and decrypt wep and wpa.	L1, L2, and L3	6
MODULE 5: • Perform an experiment to sniff traffic using arp poisoning. • Generating password hashes with openssl	L1, L2, and L3	6

**Bloom's Level:*

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	1	1	1	1	1	--	--	--	--	--	--	1	1	3	2
CO 2	1	1	1	1	1	1	--	--	--	--	--	--	1	1	3	2
CO 3	1	1	1	1	1	1	--	--	--	--	--	--	1	1	3	2
CO 4	1	1	1	1	1	1	--	--	--	--	--	--	1	1	3	2
CO 5	1	1	2	2	3	3	--	--	--	--	--	--	1	1	3	2

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Course Code: NCE4210	BIG DATA SYSTEMS	L	T	P	C
Version 2020.1	Date of Approval: 19, July 2020	3	0	0	3
Pre-requisites/Exposure	Data Base				
Co-requisites	Nil				

Catalog Description

This course brings together several key big data technologies used for storage, analysis and manipulation of data. It also introduces the students the key concepts of Hadoop framework, MapReduce, Pig, Hive, and No-SQL. Students will learn to work on Hadoop platform. The concepts learnt will make students capable of working on big data projects easier.

Course Objectives

The objective of this course is to:

- To make students familiar with big data technologies.
- Provide an overview of Hadoop architecture and its working with other open source technologies.

Course Outcomes

On completion of this course, the students will be able to:

CO1. Explain importance, applications and challenges of Big Data Analytics.
CO2. Different analytics technologies.
CO3. Demonstrate architecture of Hadoop and Mapreduce framework.
CO4. Illustrate Hadoop I/O commands.
CO5. Introduce concepts Distributed File systems.

Modules	Blooms level*	Number of hours
MODULE 1: **A NEW PARADIGM FOR BIG DATA** Scaling with a traditional database NoSQL is not a panacea, First principles, Desired properties of a Big Data system , The problems with fully incremental architectures, Lambda Architecture, Recent trends in technologyExample application: SuperWebAnalyticscom, data model for big data: , data model for big data: illustration	L1, L2 and L3	6
MODULE 2: **Hadoop & MapReduce** Data! ,Data Storage and Analysis ,Comparison with Other Systems ,RDBMS ,Grid Computing ,Volunteer Computing ,A Brief History of Hadoop ,Apache Hadoop and the Hadoop Ecosystem , Hadoop Releases ,A Weather Dataset, Data Format ,Analyzing the Data with Unix Tools , Analyzing the Data with Hadoop ,Map and Reduce ,Java MapReduce ,Scaling Out ,Data Flow , Combiner Functions ,Running a Distributed MapReduce Job , Hadoop Streaming ,Ruby ,Python, Hadoop Pipes ,Compiling and Running.	L1, L2 and L3	8

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MODULE 3: **The Hadoop Distributed Filesystem** The Design of HDFS ,HDFS Concepts ,Blocks ,Namenodes and Datanodes ,HDFS Federation ,HDFS High-Availability ,The Command-Line Interface ,Basic Filesystem Operations ,HadoopFilesystems , Interfaces ,The Java Interface ,Reading Data from a Hadoop URL ,Reading Data Using the FileSystem API ,Writing Data ,Directories ,Querying the Filesystem ,Deleting Data ,Data Flow ,Anatomy of a File Read ,Anatomy of a File Write ,Coherency Model ,Parallel Copying with distcp ,Keeping an HDFS Cluster Balanced ,Hadoop Archives ,Using Hadoop Archives ,Limitations.	L1, L2 and L3	8
MODULE 4: **Hadoop I/O** Data Integrity ,Data Integrity in HDFS ,Local Filesystem ,Checksum Filesystem ,Compression,Codecs ,Compression and Input Splits ,Using Compression in MapReduce, Serialization ,The Writable Interface ,Writable Classes ,Implementing a Custom Writable ,Serialization Frameworks ,Avro ,File-Based Data Structures ,Sequence File ,Map File.	L2, L3 and L4	8
MODULE 5: **Developing a MapReduce Application** The Configuration API ,Combining Resources ,Variable Expansion ,Configuring the Development Environment ,Managing Configuration ,GenericOptionsParser, Tool, and ToolRunner ,Writing a Unit Test ,Mapper ,Reducer ,Running Locally on Test Data ,Running a Job in a Local Job Runner , Testing the Driver ,Running on a Cluster ,Packaging ,Launching a Job ,The MapReduce Web UI ,Retrieving the Results ,Debugging a Job ,Hadoop Logs ,Remote Debugging ,Tuning a Job ,Profiling Tasks ,MapReduce Workflows ,Decomposing a Problem into MapReduce Jobs ,JobControl ,Apache Oozie.	L1, L2 and L3	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Big Data: Principles and best practices of scalable realtime data systems",NathanMatz, Manning Publications, 2015
2. "Hadoop: The Definitive Guide: Storage and Analysis at Internet Scale" Tom White, Oreilly.
3. "High-Performance Big-Data Analytics, Computing Systems and Approaches" Raj, P., Raman, A., Nagaraj, D., Duggirala, S.,Springer.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	**2**	**--**	**--**	**--**	**1**	**--**	**2**	**--**	**--**	**--**	**1**	**--**	**2**	**-**
CO2	**1**	**2**	**2**	**-**	**3**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**2**	**-**
CO3	**1**	**2**	**3**	**1**	**2**	**--**	**--**	**--**	**2**	**--**	**--**	**--**	**1**	**2**	**2**	**3**
CO4	**1**	**1**	**2**	**--**	**--**	**--**	**--**	**1**	**--**	**--**	**3**	**--**	**-**	**2**	**2**	**3**
CO5	**1**	**3**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**3**	**--**	**1**	**--**	**-**	**2**

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Course Code: NCE4211	DISTRIBUTED SYSTEMS SECURITY	L	T	P	C
Version 2020.1	Date of Approval: 19 July2020	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

Distributed Systems Security serve as one of the most important courses for postgraduate students, since it provides an in-depth coverage of security threats and issues across the 4 tiers-Host, Application, Infrastructure, Service layers. Therefore, the students are supposed to study, practice and discuss on the major fields discussed in the course to ensure the success of the education process. The outcome of this course implicitly and explicitly affects the abilities the students to understand and analyze design and working of distributed systems security.

Course Objective

The objective of this course is to:

1. equip the students to identify the security issues and techniques to cope up with the threats.
2. provide the overview of various threats and vulnerabilities, also solutions to handle those threats.

Course Outcomes

After completing the course, the students will be able to,

CO 1: describe the distributed system security issues and techniques and build a secure system using security development lifecycle.

CO 2: apply the knowledge by doing practical work for the host and network level threats like worms, virus.

CO 3: explain the use cryptographic techniques. Also describe the application level threats such as cross site scripting, error handling.

CO 4: conclude the ways to handle host, network level threats with the help of sandboxing, resource management, etc.

CO 5: Design solutions after having knowledge of standards and policies for security. And also go through the case studies like cloud computing, IBE.

Modules	Blooms level*	Number of hours
MODULE 1: **Introduction** Distributed Systems, Distributed Systems Security. Security in Engineering: Secure Development Lifecycle Processes - A Typical Security Engineering Process – Security Engineering Guidelines and Resources. Common Security Issues and Technologies: Security Issues, Common Security Techniques	L1and L2	5
MODULE 2: **Host-level Threats and Vulnerabilities** Transient code Vulnerabilities - Resident Code Vulnerabilities - Malware: Trojan Horse – Spyware - Worms/Viruses – Eavesdropping – Job Faults. Infrastructure-Level Threats and Vulnerabilities: Network-Level Threats and Vulnerabilities - Grid Computing Threats and Vulnerabilities – Storage Threats and Vulnerabilities – Overview of Infrastructure Threats and Vulnerabilities.	L1, L2, L3 and L6	7

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MODULE 3: **Application-Level Threats and Vulnerabilities** Application-Layer Vulnerabilities –Injection Vulnerabilities - Cross-Site Scripting (XSS) - Improper Session Management - Improper Error Handling - Improper Use of Cryptography - Insecure Configuration Issues - Denial of Service - Canonical Representation Flaws - Overflow Issues. Service-Level Threats and Vulnerabilities: SOA and Role of Standards - Service-Level Security Requirements - Service-Level Threats and Vulnerabilities - Service-Level Attacks – Services Threat Profile	L1, L2, L3, L4 and L6	9
MODULE 4: **Host-Level Solutions** Sandboxing – Virtualization - Resource Management - Proof-Carrying Code - Memory Firewall – Antimalware. Infrastructure-Level Solutions: Network-Level Solutions - Grid-Level Solutions - Storage-Level Solutions. Application-Level Solutions: Application-Level Security Solutions.	L2, L3, L5	7
MODULE 5: **Service-Level Solutions** Services Security Policy - SOA Security Standards Stack – Standards in Dept - Deployment Architectures for SOA Security - Managing Service-Level Threats - Compliance in Financial Services - SOX Compliance - SOX Security Solutions – Multilevel Policy-Driven Solution Architecture - Case Study: Grid - The Financial Application – Security Requirements Analysis. Future Directions – Cloud Computing Security – Security Appliances - Usercentric Identity Management - Identity-Based Encryption (IBE) - Virtualization in Host Security.	L3, L5 and L6	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Abhijit Belapurakar, AnirbanChakrabarti and et al.,**"Distributed Systems Security: Issues, Processes and solutions"**,1st Edition, Wiley, Ltd., Publications,New Delhi, 2009.
- S.S.Dara, "**AtextbookofEngineeringChemistry**",10th Edition,SChand&Co.Ltd., New Delhi, 2014.

Reference Books

- RachidGuerraoui and Franck Petit, "**Stabilization, Safety, and Security of Distributed Systems**", Springer, 2010.
- R Bengaluru, 2015.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	--	--	--	--	--	--	3	--	--	--	--	1	--	3	-
CO2	--	2	--	--	--	1	--	3	--	--	--	--	1	--	3	-
CO3	--	2	--	--	--	--	--	3	--	--	--	--	1	--	3	-
CO4	--	--	2	--	--	1	--	--	--	--	--	--	1	--	3	-
CO5	--	--	2	--	--	--	--	--	--	--	--	--	1	--	3	-

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: NCE4212	BLOCKCHAIN TECHNOLOGY	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	3	0	0	3
Pre-requisites/Exposure	Basic Networking and Data Structure Concepts				
Co-requisites	Nil				

Catalog Description

Blockchain is an emerging technology platform for developing decentralized applications and data storage, over and beyond its role as the technology underlying the cryptocurrencies. The basic tenet of this platform is that it allows one to create a distributed and replicated ledger of events, transactions, and data generated through various IT processes with strong cryptographic guarantees of tamper resistance, immutability, and verifiability. This course will enable the graduate students to gain the knowledge of this emerging technology and will update them with the required employability skills.

Course Objectives

The objective of this course is to:

- Familiarise the functional/operational aspects of blockchain and cryptocurrency.
- Understand emerging abstract models for Blockchain Technology.
- Identify major research challenges and technical gaps existing between theory and practice in cryptocurrency domain.

Course Outcomes

On completion of this course, the students will be able to:

CO1. Understand and explain the mechanism of Blockchain Technology.
CO2. Identify and describe the cryptographic techniques used in blockchain technology.
CO3. Understand and explain the bitcoin blockchain.
CO4. Understand and apply the different models of blockchain.
CO5. Understand and explain the concept of Ethereum and Hyperledger.

Modules	Blooms level*	Number of hours
MODULE 1: INTRODUCTION Basic ideas behind blockchain, how it is changing the landscape of digitalization, peer-to-peer network, Blockchain Mechanism, Blockchain vs Distributed Systems, introduction to cryptographic concepts required, Hashing, public key cryptosystems, private vs public blockchain and use cases, Hash Puzzles, Introduction to Bitcoin Blockchain, Centralization vs. Decentralization, Security of Blockchain	L1, L2	8
MODULE 2: CRYPTOGRAPHIC BASICS FOR CRYPTOCURRENCY A short overview of Hashing, SHA 256, signature schemes, encryption schemes, Elliptic Curve Mathematics, Point Addition, Point Doubling, Elliptic Curve Cryptography, Security of Elliptic Curve Cryptography	L1, L2	7

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MODULE 3: BITCOIN BLOCKCHAIN Distributed consensus, Consensus without identity using a block chain, Incentives and proof of work, Mining, Mechanics of Bitcoin, Bitcoin and blocks, Bitcoin Mining, Bitcoin and Anonymity, Bitcoin - Wallet - Blocks - Merkley Tree - hardness of mining - transaction verifiability - anonymity - forks - double spending - mathematical analysis of properties of Bitcoin.	L1, L2	8
MODULE 4: BLOCKCHAIN MODELS Abstract Models for BLOCKCHAIN - GARAY model - RLA Model - Proof of Work (PoW) as random oracle - formal treatment of consistency, liveness and fairness - Proof of Stake (PoS) based Chains - Hybrid models (PoW + PoS)	L1, L2, L3	7
MODULE 5: ETHEREUM AND HYPERLEDGER Ethereum - Ethereum Virtual Machine (EVM) - Wallets for Ethereum - Solidity - Smart Contracts - some attacks on smart contracts, Hyperledger, Zero Knowledge proofs and protocols in Blockchain	L1,L2	6

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016. (Free download available).
2. Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy, 2015

Reference Books

1. R.Pass et al, Analysis of Blockchain protocol in Asynchronous networks , EUROCRYPT 2017, (eprint.iacr.org/2016/454).
2. R.Pass et al, Fruitchain, a fair blockchain, PODC 2017 (eprint.iacr.org/2016/916).
3. Eric Traub, Learn Blockchain Programming with JavaScript, Packt, 2018.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2	PS O 3	PSO 4
CO 1	2	2	3	--	--	--	--	--	--	--	--	--	2	1	-	2
CO 2	2	2	3	-	--	--	--	--	--	--	--	--	2	1	-	2
CO 3	2	2	3	-	-	--	--	--	--	--	--	--	2	1	-	3
CO 4	1	2	3	-	2	--	--	--	--	--	--	--	2	1	1	2
CO 5	2	3	3	-	-	--	--	--	--	--	--	--	2	1	1	3

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Course Code: NCE4301	BIOMETRIC SYSTEMS AND BIOMETRIC IMAGE PROCESSING	L	T	P	C
Version 2020.1	Date of Approval: 19 July2020	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

Biometric systems and biometric image processing aims at designing and implementing algorithms which are so important for the secure source of authentication today. This course focuses on building strong mathematical foundations which can be applied in designing a vast range of applications like broadcast monitoring, copy control.

Course Objectives

The objective of this course is to

1. Enable the students with the technical and non-technical concepts used in Biometric systems and biometric image processing
2. Provide an overview of different case studies used in designing biometrics.

Course Outcomes

On completion of this course, the students will be able to

CO1: Grasp the nontechnical but very important basics of Biometric systems and biometric image processing which will make their foundation for application creation.

CO2: Elaborate and apply the algorithms, by studying different examples of biometric systems.

CO3:Learn about essentials of image processing and the application areas of image processing

CO4:Build and study the models of fingerprint biometrics and learn all the concepts for building finger print based authentication system.

CO5: Build and study the models of iris biometrics and learn all the concepts for building iris based authentication system.

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Modules	Blooms level*	Number of hours
MODULE 1: **Introduction:** Biometric fundamentals – Biometric technologies – Biometrics Vs traditional techniques –Characteristics of a good biometric system – Benefits of biometrics – Key biometric processes:verification, identification and biometric matching – Performance measures in biometric systems, FAR,FRR, FTE rate, EER and ATV rate, Applications of Biometric Systems, Security and Privacy Issues. **Physiological Biometrics :** Leading technologies : Finger-scan – Facial-scan – Iris-scan – Voice-scan –components, working principles, competing technologies, strengths and weaknesses – Other physiological biometrics : Hand-scan, Retina-scan – components, working principles, competing technologies, strengths and weaknesses – Automated fingerprint identification systems.	L1, L2 AND L3	8

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MODULE 2: **Behavioral Biometrics:** Leading technologies: Signature-scan – Keystroke scan – components, workingprinciples, strengths and weaknesses. **Privacy and Standards in Biometrics**: Assessing the Privacy Risks of Biometrics – Designing Privacy-Sympathetic Biometric Systems – Need for standards – different biometric standards.	L1, L2, L3	8
MODULE 3: **Fundamentals of Image Processing:** Digital Image representation - Fundamental steps in Image Processing Image Enhancement: The Spatial Domain Methods, The Frequency Domain Methods –ImageSegmentation: Pixel Classification by Thresholding, Histogram Techniques, Smoothing and Thresholding- Gradient Based Segmentation: Gradient Image, Boundary Tracking, Laplacian Edge Detection.	L1, L2 and L3	8
MODULE 4: **Fingerprint Biometrics:** Fingerprint Patterns, Fingerprint Features, Fingerprint Image, width betweentwo ridges - Fingerprint Image Processing - Minutiae Determination - Fingerprint Matching: FingerprintClassification, Matching policies.	L1, L2, and L3	4
MODULE 5: **Iris Biometrics:** Iris System Architecture, Definitions and Notations - Iris Recognition: Iris location,Doubly Dimensionless Projection, Iris code, Comparison - Coordinate System: Head Tilting Problem,Basic Eye Model, Searching Algorithm, Texture Energy Feature.	L1, L2, and L3	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

Recommended Books:

- Anil K Jain, Patrick Flynn, Arun A Ross, "Handbook of Biometrics", Springer, 2008

Reference Books

- "2. Anil K Jain, Arun A Ross, KarthikNandakumar, "Introduction to Biometrics", Springer, 2011
- Rafael C.Gonzalez, Richard E.Woods, Steven L.Eddins, "Digital Image Processing", Pearson Education, New Delhi, 2009

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	2	1	1	--	--	--	--	--	--	--	--	3	3	2	2
CO2	2	2	1	1	--	--	--	--	--	--	--	--	2	2	2	2
CO3	2	2	1	1	--	--	--	--	--		--	--	2	2	2	2
CO4	2	2	2	1	--	--	--	--	--	--	--	--	--	2	2	2	2
CO5	2	2	1	1	--	--	--	--	--	--	--	--	--	2	2	2	2

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Course Code: NCE4302	SOFTWARE VULNERABILITY ANALYSIS	L	T	P	C
Version 2020.1	Date of Approval: 19 July2020	3	1	0	4
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course focuses on the foundations of software security and considers important software vulnerabilities and attacks that exploit them such as buffer overflows, SQL injection, and session hijacking. This course helps to prevent or mitigate these attacks, including advanced testing and program analysis techniques.

Course Objectives

The purpose of this course is to provide understanding of the main issues related to security in modern software security systems. In addition, this course will present different domains of code exploitation and how they can be used together to test the security of an application.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the concept of software security, goals of software security and management of software security risk.

CO2:Describe the principles of software security and methods of security violation in software system.

CO3:State and apply the knowledge of different types of overflow attack and access control in different operating system.

CO4: Explain the basic knowledge of network layers and various types of hijacking, flooding attacks.

CO5: Implement the concept of shell code.

Modules	Blooms level*	Number of hours
MODULE 1: **Introduction to Software Security** It's All about the Software, Dealing with Widespread Security Failures, Bugtraq, CERT Advisories, RISKS Digest, Technical Trends Affecting Software Security, The ilities, What is Security?, Isn't That Just Reliability?, Penetrate and Patch Is Bad, On Art and Engineering, Security Goals, Prevention, Traceability and Auditing, Monitoring, Privacy and Confidentiality, Multilevel Security, Anonymity, Authentication, Integrity, Know Your Enemy: Common Software Security Pitfalls, Software Project Goals, Conclusion. **Managing Software Security Risk:** An Overview of Software Risk Management for Security, The Role of Security Personnel, Software Security Personnel in the Life Cycle, Deriving Requirements, Risk Assessment, Design for Security, Implementation, Security Testing, A dose of Reality, Getting People to Think about Security, Software Risk management in Practice, When Development Goes Astray, When Security Analysis Goes Astray, The Common Criteria.	L1, L2 and L3	12

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MODULE 2: **On Open Source and Closed Source** Security by Obscurity, Reverse Engineering, Code Obfuscation, Security for Shrink-Wrapped Software, Security by Obscurity Is No Panacea, The Flip Side: Open- Source Software, Is the "Many-Eyeballs Phenomenon" Real? Why Vulnerability Detection Is Hard, Other Worries, On Publishing Cryptographic Algorithms, Two More Open-Source Fallacies, The Microsoft Fallacy, The Java Fallacy, An Example: GNU Mailman Security, More Evidence: Trojan Horses, To Open Source or Not to Open Source, Another Security Lesson from Buffer Overflows, Beating the Drum. **Guiding Principles for Software Security:** Principle1: Secure the Weakest Link, Principle 2: Practice Defence in Depth, Principle 3: Fail Securely, Principle 4: Follow the Principle of Least Privilege, Principle 5: Compartmentalize, Principle 6: Keep It Simple, Principle 7: Promote Privacy, Principle 8: Remember That Hiding Secrets is Hard, Principle 9: Be Reluctant to Trust, Principle 10: Use Your Community Resources Conclusion.	L1, L2, L3 and L4	10
MODULE 3: **Buffer Overflows & Access Control** What Is a Buffer Overflow?, Why Are Buffer Overflows a Security Problem?, Defending against Buffer Overflow, Major Gotchas, Internal Buffer Overflows, More Input Overflows, Other Risks, Tools That Can Help, Smashing Heaps and Stacks, Heap Overflows, Stack Overflows, Decoding the Stack, To Infinity … and Beyond!, Attack Code, A UNIX Exploit, What About Windows?The UNIX Access Control Model, How UNIX Permissions Work, Modifying File Attributes, Modifying Ownership, The unask, The Programmatic Interface, Setuid Programming, Access Control in Windows NT, Compartmentalization, Fine-Grained Privileges.	L1, L3 and L4	8
MODULE 4: **NETWORKING** OSI Model, Sockets, Socket Functions, Socket Addresses, Network Byte Order, Internet Address Conversion, A Simple Server Example, A Web Client Example, A Tinyweb Server, Peeling Back the Lower Layers, Data-Link Layer, Network Layer, Transport Layer , Network Sniffing, Raw Socket Sniffer, libpcap Sniffer, Decoding the Layers, Active Sniffing, Denial of Service, SYN Flooding, The Ping of Death, Teardrop, Ping Flooding, Amplification Attacks, Distributed DoS Flooding, TCP/IP Hijacking, RST Hijacking, Continued Hijacking, Port Scanning, Stealth SYN Scan, FIN, X-mas, and Null Scans, Spoofing Decoys, Idle Scanning, Proactive Defense (shroud), Reach Out and Hack Someone, Analysis with GDB, Almost Only Counts with Hand Grenades, Port-Binding Shellcode.	L1, L3, and L4	10
MODULE 5: **SHELLCODE** Assembly vs. C, Linux System Calls in Assembly, The Path to Shellcode, Assembly Instructions Using the Stack, Investigating with GDB, Removing Null Bytes, Shell-Spawning Shellcode, A Matter of Privilege, And Smaller Still, Port-Binding Shellcode, Duplicating Standard File Descriptors, Branching Control Structures, Connect-Back Shellcode.	L1, L2, and L3	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Recommended Books:

1. "Building Secure Software: How to Avoid Security Problems the Right Way" John Viega, Gary R. Tata McGraw Hill
2. Michael Howard, David LeBlanc, John Viega: 19 Deadly Sins of Software Security: Programming Flaws and How to Fix Them (Security One-off) (Addison-Wesley

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Professional Computing Series)

3. Richard Sinn " Software Security , Theory Programming and Practice" Cengage Learning

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	1	--	--	--	--	--	--	--	--	1	--	2	--
CO2	1	2	--	2	--	--	--	--	--	--	--	--	1	1	--	1
CO3	1	1	3	3	--	--	--	--	--	--	--	--	1	1	--	--
CO4	1	1	3	1	--	---	--	--	--	--	--	--	1	1	--	--
CO5	1	2	3	1	--	--	--	--	--	--	--	--	1	1	--	3

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Course Code: NCE4303	APPLIED CRYPTOGRAPHY	L	T	P	C
Version 2020.1	Date of Approval: 19 July2020	3	0	3	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

In this course the concepts of cryptography and network security are discussed in detail. Substitution and transposition techniques, symmetric and asymmetric cryptographic algorithms, their applications, differences will be introduced. As a precursor to the study of cryptography studies will be made on impact of various network and web security protocols. The concepts learnt in the studies of cryptography & network security will be applied in the studies and analysis of authentication, integrity and security related protocols.

Course Objectives

The objective of this course is to

- Equip the students with concepts of cryptography & network security through problem solving and analytical approach.
- Provide an overview of various network attacks and related security mechanism , various algorithms for modular arithmetic, symmetric and asymmetric cryptography and web and network security

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain, describe and distinguish various security attacks; Describeand solve block and stream ciphers and its applications in cryptography; Solve problems based on substitution and transposition ciphers.

CO2: Explain the basic mathematics of cryptography; Solve problems of groups, modular arithmetic ,gcd and inverse algorithm, chinese remainder theorem and its application in cryptography;Applying algorithms for solving problems in cryptography

CO3: Describing the concept of public key cryptosystems and its related algorithm; Explain and solve problems related to hash functions, digital signature and its applications in cryptography; Compare symmetric and asymmetric key cryptography.

CO4: Explain management ,distribution ,secure exchange of keys and authentication certificate and its applications in real life. Explain , compare various authentication protocols used in cryptography and network security, also solve problems based on these protocols.

CO5: Explain various security protocols :IPSec, SSL,TLS,SET; Describing malicious softwares and illustrating various design approaches to Firewell

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Modules	Blooms level*	Number of hours

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MODULE 1: Introduction to security attacks, services and mechanism, Classical encryption techniques: substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers. Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard (DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES	L1, L2 AND L3	8
MODULE 2: Advanced Encryption Standard (AES) encryption and decryption, Analysis, Principals of public key crypto systems, RSA algorithm, security of RSA. Rabin cryptosystem, Elgamal cryptosystem, Elliptical Curve cryptography,	L1, L2, L3	8
MODULE 3: Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, Random Oracle Model , hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA),SHA-512, Whirlpool, Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS).	L1, L2 and L3	8
MODULE 4: Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure. Entity authentication, Authentication Applications: Kerberos,	L1, L2, and L3	4
MODULE 5: IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Introduction to Secure Socket Layer, Secure electronic transaction (SET).	L1, L2, and L3	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. William Stallings,**"Cryptography & Network Security"**,4th Edition, Pearson Education,NewDelhi, 2017.
2. Behrouz A. Forouzan, "**Cryptography & Network Security**", 2ndEdition,Tata McgrawHills,NewDelhi, 2015

Reference Books

1. Douglas R.Stinsons, **"Cryptography Theory and Practice"**, 3rd Edition, McMillan Publications, Londan, 2003
2. AtulKahate, **"Cryptography & Network Security"**, 3rd Edition, Tata McgrawHills,New Delhi, 2017

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2	PS O 3	PS O 4
CO 1	1	1	1	--	--	--	--	--	--	--	--	--	1	1	3	-
CO 2	1	1	1	--	--	--	--	--	--	--	--	--	1	1	3	-
CO 3	1	1	1	--	-	--	--	--	--	--	--	--	1	1	3	-
CO 4	1	2	3	--	--	--	--	--	--	--	--	--	1	1	3	-
CO 5	1	2	3	--	--	--	--	--	--	--	--	--	2	2	3	-

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NCE4304	BIOMETRIC IMAGE PROCESSING LAB	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	0	0	2	1
Pre-requisites/Exposure	Basics of MATLAB				
Co-requisites					

Catalog Description

Biometric Image processing has become an important tool for research and investigation in many areas of science and engineering. This course is designed to provide the students an understanding of the basic concepts of digital image processing and various techniques used in it. Students will perform practical on hardware kit as well as on software.Students will do basic exercises on image loading, manipulation, edge finding, features extraction, face recognition, segmentation, fingerprint, iris, signature recognition.

Course Objectives

The objective of this course is to

1. Make students demonstrate the concepts of image processing.
2. Apply the different techniques to process image.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the basic image processing tools and commands.

CO2. Apply the filters to remove noise in spatial & frequency domain.

CO3. Apply image processing techniques for compression, segmentation and restoration.

Modules	Blooms level*	Number of hours
Lab Session 1 1. To study about the basic image processing tools. 2. Write program for histogram processing.	L3	3
Lab Session 2 3. Write program for filtering in frequency domain. 4. Write program for filtering in spatial domain.	L3 and L4	3
Lab Session 3 5. Write programs for different compression schemes. 6. Write program image restoration.	L3 and L4	3

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Lab Session 4 7. Write program for performing different morphological operations. 8. Write program for image segmentation.	L3 and L4	3

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Rafael C. Gonzalez & Richard E. Woods, "Digital Image Processing", 2nd edition, Pearson Education.
- A. K. Jain, "Fundamental of Digital Image Processing", PHI.

References:

- Maher A. Sid-Ahmed, "Image Processing Theory, Algorithms and Architectures", McGraw-Hill, 1995.
- William K. Pratt, "Digital Image Processing", Wiley-Interscience publication, Second Edition, 1991.
- R. Arthyr, "Fundamentals of Electronic Image Processing", PHI.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	--	--	--	2	--	--	--	--	--	--	2	1	--	-	-
CO2	1	-	3	--	2	--	--	--	--	--	--	2	1	3	--	-
CO3	1	-	3	--	2	--	--	--	--	--	--	2	1	3	--	3

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Course Code: NCE4305	APPLIED CRYPTOGRAPHY LAB	L	T	P	C
Version 2020.1	Date of Approval: 19 July 2020	0	0	4	2
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

In this course the concepts of cryptography and network security are discussed in detail. Substitution and transposition techniques, symmetric and asymmetric cryptographic algorithms, their applications, differences will be introduced. As a precursor to the study of cryptography studies will be made on impact of various network and web security protocols. The concepts learnt in the studies of cryptography & network security will be applied in the studies and analysis of authentication, integrity and security related protocols.

Course Objectives

The objective of this course is to

- Equip the students with concepts of cryptography & network security through problem solving and analytical approach.
- Provide an overview of various network attacks and related security mechanism , various algorithms for modular arithmetic, symmetric and asymmetric cryptography and web and network security

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain, describe and distinguish various security attacks; Describeand solve block and stream ciphers and its applications in cryptography; Solve problems based on substitution and transposition ciphers.

CO2: Explain the basic mathematics of cryptography; Solve problems of groups, modular arithmetic ,gcd and inverse algorithm, chinese remainder theorem and its application in cryptography;Applying algorithms for solving problems in cryptography

CO3: Describing the concept of public key cryptosystems and its related algorithm; Explain and solve problems related to hash functions, digital signature and its applications in cryptography; Compare symmetric and asymmetric key cryptography.

CO4: Explain management ,distribution ,secure exchange of keys and authentication certificate and its applications in real life. Explain , compare various authentication protocols used in cryptography and network security, also solve problems based on these protocols.

CO5: Explain various security protocols :IPSec, SSL,TLS,SET; Describing malicious softwares and illustrating various design approaches to Firewell

Modules	Blooms level*	Number of hours
MODULE 1: 1.Program to implement Ceaser Cipher. 2. Program to implement Ceaser Cipher for any value of shift parameter. 3. Programs to implement Playfair cipher, affine cipher, vegnere cipher	L1, L2 and L3	3

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MODULE 2: 4.Program to implement Vernam Cipher. 5. Program to implement Hill Cipher. 6. Program to implement Rail fence and Columnar transposition cipher	L1, L2, L3 and L4	3
MODULE 3: 7.Program to implement DES/AES/IDEA algorithm 8. Program to implement RSA algorithm 9. Program to implement Rabin Cryptosystem and ElgamalCryptsystem.	L1, L2 and L3	3
10.Program to implement Digital Signature using RSA/Elgamal. 11. Implementation study of MD5/SHA-1. 12. Programs to implement ECB/CBC/OFB modes of operation.	L1, L2, and L3	3

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- William Stallings, Cryptography & Network Security: Principles and Practices, Prentice Hall, 2005,(ISBN: 978-0131873162).

Reference Books

- Behrouz A. Forouzan, Cryptography & Network Security, McGraw-Hill, 2007, USA. (ISBN: 0073327530 9780073327532).
- Douglas R. Stinson, Chapman and Hall, Cryptography Theory & Practice, CRC Press, 2005.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3	PS O 4
CO 1	1	2	1	2	1	--	--	--	--	--	--	--	1	--	3	--
CO 2	1	1	2	1	1	--	--	--	--	--	--	--	1	--	3	--
CO 3	1	2	1	1	1	--	--	--	--	--	--	--	1	--	3	--
CO 4	1	2	2	2	3	--	--	--	--	--	--	--	1	--	3	--
CO 5	1	2	2	2	2	--	--	--	--	--	--	--	1	--	3	--

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Course Code : NCE4335	SUMMER INTERNSHIP EVALUATION	L	T	P	C
Version: 2020.1	Date of Approval: 19 July 2020	0	0	0	6
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The objective of this course is to provide practical training on some live projects that will increase capability to work on actual problem in industry. This training may undergo in an industrial environment or may be an in-house training on some latest software which is in high demand in market. This training will be designed such that it will useful for their future employment in industry.

Course Objectives

The objective of this course is to

1. Provide practical training on live projects
2. Increase technical capabilities on solving real life problems in company environment

Course Outcomes

On completion of this summer internship, the students will be able to:
CO1: Develop communication, interpersonal and other critical skills in the job interview process.
CO2: Design and develop software and hardware projects
CO3: Assess interests and abilities in their field of study.
CO4: Demonstrate excellent technical and communication skills to acquire employment contacts leading directly to a full-time job following graduation from college.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	1	2	2	--	--	--	1	--	--	--	1	1	1	1
CO2	1	1	2	2	2	--	--	--	1	--	--	--	1	1	1	1
CO3	1	1	2	3	2	--	--	--	1	--	--	--	1	1	1	1
CO4	1	1	2	2	2	--	--	--	1	--	--	--	1	1	1	1

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Course Code: NCE4337	PROJECT DISSERTATION-I	L	T	P	C
Version: 2020.1	Date of Approval: 19 July 2020	0	0	0	5
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The objective of this course is to provide practical training on some live/demo projects that will increase capability to work on actual problem in industry. It will be an in house training on some latest software which is in high demand in market. This training will be designed such that it will useful for their future employment in industry.

Course Objectives

The objective of this course is to

1. Provide practical training on live projects
2. Increase technical capabilities on solving real life problems in company environment

Course Outcomes

On completion of this summer internship, the students will be able to:

CO1: Demonstrate a sound technical knowledge of their selected project topic.

CO2: Design and develop engineering solutions to complex problems utilising a systems approach.

CO3: Analyse various approaches for solving a complex engineering problem using different tools and techniques

CO4: Demonstrate the knowledge, skills and attitudes of a professional engineer.

CO5: Apply technical skills and knowledge in completing the project.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**2**	--	--	--	--	--	--	**1**	--	--	--	--	--	**1**	**1**
CO2	**1**	**1**	--	--	--	--	--	--	**1**	--	--	--	--	--	**1**	**1**
CO3	**1**	**1**	--	--	--	--	--	--	**1**	--	--	--	--	--	**1**	**1**
CO4	**1**	**1**	--	--	--	--	--	--	**1**	--	--	--	--	--	**1**	**1**
C05	**1**	**1**	--	--	--	--			**1**	-	-	-	--	--	**1**	**1**

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Course Code: NCE4306	WEB APPLICATION & PENETRATION TESTING	L	T	P	C
Version 2020.1	Date of Approval: 19 July2020	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The Web Application and Penetration Testing course provides all the advanced skills necessary to carry out a thorough and professional penetration test against modern web applications.

Course Objectives

The objective of this course is to

1. help students move beyond push-button scanning to professional, thorough, high-value web application penetration testing.
2. enable students to assess a web application's security posture and convincingly demonstrate the impact of inadequate security that plagues most organizations

Course Outcomes

On completion of this course, the students will be able to

CO1: Grasp the nontechnical but very important basics of web application and penetration testing which will make their foundation for application creation.
CO2: Elaborate and apply the attacks, by studying different techniques of hacking.
CO3:Learn about essentials of web application structure, Apache, authentication mechanisms.
CO4:Learn IIS authentication, and various attacks and security issues.
CO5: Study the models input validation checks and associated case studies.

Modules	Blooms level*	Number of hours
MODULE 1: **Introduction to Web Applications and Security** The Web Application Architecture ,A Brief Word about HTML ,Transport: HTTP ,The Web Client ,The Web Server,The Web Application ,The Database ,Complications and Intermediaries ,The New Model: Web Services ,Potential Weak Spots ,The Methodology of Web Hacking ,Profile the Infrastructure ,Attack Web Servers ,Survey the Application,Attack the Authentication Mechanism ,Attack the Authorization Schemes , Perform a Functional Analysis,Exploit the Data Connectivity,Attack the Management Interfaces,Attack the Client,Launch a Denial-of-Service Attack Profiling: Server Discovery,Intuition ,Internet Footprinting, DNS Interrogation Ping,Discovery Using Port Scanning , Dealing with Virtual Servers, Service Discovery , Server Identification,Dealing with SSL.	L1, L2 AND L3	8

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MODULE 2: **Hacking Web Servers** Common Vulnerabilities by Platform ,Apache,Microsoft Internet Information Server (IIS), Attacks AgainstIIS Components, Attacks Against IIS, Escalating Privileges on IIS, Netscape Enterprise Server , Other Web Server Vulnerabilities , Miscellaneous Web Server Hacking Techniques , Automated Vulnerability Scanning Software ,Whisker, Nikto , twwwscan/arirang , Stealth HTTP Scanner, Typhon , WebInspect , AppScan, FoundScan Web Module , Denial of Service Against Web Servers,	L1, L2, L3	8
MODULE 3: Documenting Application Structure , Manually Inspecting the Application , Statically and Dynamically Generated Pages, Directory Structure , Helper Files , Java Classes and Applets , HTML Comments and Content ,Forms, Query Strings , Back-End Connectivity , Tools to Automate the Survey, lynx , Wget,TeleportPro,Black Widow, WebSleuth, Common Countermeasures , A Cautionary Note, Protecting Directories,Protecting Include Files, Miscellaneous Tips. Authentication: Authentication Mechanisms, HTTP Authentication: Basic and Digest, Forms-Based Authentication, Microsoft Passport, Attacking Web Authentication,Password Guessing, Session ID Prediction and Brute Forcing, Subverting Cookies,Bypassing SQL-Backed Login Forms,Bypassing Authentication.	L1, L2 and L3	8
MODULE 4: The Attacks, Role Matrix, The Methodology , Query String, POST Data , Hidden Tags, URI,HTTP Headers,Cookies, Final Notes,Case Study: Using Curl to Map Permissions, Apache Authorization, IIS AuthorizationAttacking Session State Management:Client-Side Techniques, Hidden Fields, The URL,HTTP Headers and Cookies, Server-Side Techniques, Server-Generated Session IDs, Session Database, SessionID Analysis, Content Analysis, Time Windows.	L1, L2, and L3	4
MODULE 5: **Input Validation Attacks** Expecting the Unexpected, Input Validation EndGame, Where to Find Potential Targets,Bypassing Client-Side Validation Routines , Common Input Validation Attacks , Buffer Overflow, Canonicalization (dot-dot-slash),Script Attacks , Boundary Checking, Manipulating the Application , SQL Injection and DatastoreAttacks,Command Execution, Common Side Effects,Common Countermeasures. Attacking Web Datastores: A SQL Primer,SQL Injection, Common Countermeasures. Web Client Hacking :The Problem of Client-Side Security,Attack Methodologies ,Active Content Attacks ,Java and JavaScript ,ActiveX,Cross-Site Scripting,Cookie Hijacking ,Case Study #: From the URL to the Command Line and Back,Case Study #: The Cross-Site Scripting Calendar	L1, L2, and L3	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

Recommended Books:

1. Hacking Exposed Web Applications", 3rd edition, JOEL SCAMBRAY, VINCENT LIU, CALEB SIMA.
2. "The Web Application Hacker's Handbook Discovering and Exploiting Security Flaws" DafyddStuttard, Marcus Pinto
3. Rich Bowen, Ken Coar, "Apache Cookbook", O'Reilly

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	2	1	1	--	--	--	--	--	--	--	--	3	3	2	2
CO2	2	2	1	1	--	--	--	--	--	--	--	--	2	2	2	2
CO3	2	2	1	1	--	--	--	--	--		--	--	2	2	2	2
CO4	2	2	2	1	--	--	--	--	--	--	--	--	--	2	2	2	2
CO5	2	2	1	1	--	--	--	--	--	--	--	--	--	2	2	2	2

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Course Code: NCE4307	MALWARE ANALYSIS IN NETWORK SECURITY	L	T	P	C
Version 2020.1	Date of Approval: 19 July2020	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

Malware Analysis in Network Security lays the Groundwork for the course by presenting the key tools andtechniques malware analyst use to examine malicious programs. Students will learn how tosave time by Exploring malware in two phases. Behavioral analysis focuses on the Specimen's interactionwith its Environment such as Registry, Network, the File system Code Analysis focuses on the specimen's code and make use of a disassembler and a debugger.

Course Objectives

The objective of this course is to

1. Enable the students how to extract host- and network-based indicators from a malicious program using dynamic and static analysis techniques.
2. Learn the basics of finding the functionality of a program by analyzing disassembly and by watching how it modifies a system as it runs in a debugger.

Course Outcomes

On completion of this course, the students will be able to

CO1: Grasp the nontechnical but very important basics of Malware analysis like antivirus scanning etc.

CO2: Elaboratevirtual machines & dynamic analysis; study the structure of a virtual machine.

CO3:Recognizing C Code Constructs in Assembly and understanding function conventions

CO4:Study and Analyzing Malicious Windows Program, handling file systems.

CO5: Study Malware behavior& covert malware launching in network

Modules	Blooms level*	Number of hours
MODULE 1:**BASIC STATIC TECHNIQUES** Antivirus Scanning: A Useful First Step, Hashing: A Fingerprint for Malware, Finding Strings, Packed and Obfuscated Malware, Packing Files, Detecting Packers with PEiD, Portable Executable File Format, Linked Libraries and Functions, Static, Runtime, and Dynamic Linking, Exploring Dynamically Linked Functions with Dependency Walker, Imported Functions, Exported Functions , Static Analysis in Practice, PotentialKeyloggerexe: An Unpacked Executable, PackedProgramexe: A Dead End, The PE File Headers and Sections, Examining PE Files with PEview, Viewing the Resource Section with Resource Hacker, Using Other PE File Tools, PE Header Summary	L1, L2 AND L3	8

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MODULE 2:**VIRTUAL MACHINES & DYNAMIC ANALYSIS** The Structure of a Virtual Machine, Creating Your Malware Analysis Machine, Configuring VMware, Using Your Malware Analysis Machine, Connecting Malware to the Internet, Connecting and Disconnecting Peripheral Devices, Taking Snapshots, Transferring Files from a Virtual Machine, The Risks of Using VMware for Malware Analysis, Record/Replay: Running Your Computer in Reverse, Sandboxes: The Quick-and-Dirty Approach Using a Malware Sandbox , Sandbox Drawbacks, Running Malware, Monitoring with Process Monitor, The Procmon Display, Filtering in Procmon, Viewing Processes with Process Explorer, The Process Explorer Display, Using the Verify Option, Comparing Strings, Using Dependency Walker, Analyzing Malicious Documents, Comparing Registry Snapshots with Regshot, Faking a Network, Using ApateDNS, Monitoring with Netcat, Packet Sniffing with Wireshark, Using INetSim, Basic Dynamic Tools in Practice	L1, L2, L3	8
MODULE 3:**RECOGNIZING C CODE CONSTRUCTS IN ASSEMBLY** Overview of working with IDA Pro, Global vs Local Variables, Disassembling Arithmetic Operations, Recognizing if Statements, Analyzing Functions Graphically with IDA Pro, Recognizing Nested if Statements, Recognizing Loops, Finding for Loops, Finding while Loops, Understanding Function Call Conventions, Cdecl, Stdcall, fastcall , Push vs Move ,Analyzing switch Statements ,If Style ,Jump Table ,Disassembling Arrays ,Identifying Structs ,Analyzing Linked List Traversal ,	L1, L2 and L3	8
MODULE 4:**ANALYZING MALICIOUS WINDOWS PROGRAMS** The Windows API, Types and Hungarian Notation, Handles, File System Functions, Special Files, The Windows Registry, Registry Root Keys, Regedit , Programs that Run Automatically, Common Registry Functions, Analyzing Registry Code in Practice, Registry Scripting with reg Files , Networking APIs , Berkeley Compatible Sockets, The Server and Client Sides of Networking, The WinINet API , Following Running Malware, DLLs , Processes, Threads ,Interprocess Coordination with Mutexes , Services , The Component Object Model , Exceptions: When Things Go Wrong ,Kernel vs User Mode , The Native API	L1, L2, and L3	4
MODULE 5:**: MALWARE BEHAVIOR & COVERT MALWARE LAUNCHING** Downloaders and Launchers, Backdoors, Reverse Shell, RATs, Botnets, RATs and Botnets Compared, Credential Stealers, GINA Interception, Hash Dumping, Keystroke Logging, Persistence Mechanisms, The Windows Registry, Trojanized System Binaries, DLL Load-Order Hijacking, Privilege Escalation, Using SeDebugPrivilege, Covering Its Tracks—User-Mode Rootkits, IAT Hooking, Inline Hooking, Launchers, Process Injection, DLL Injection, Direct Injection, Process Replacement, Hook Injection , Local and Remote Hooks, Keyloggers Using Hooks, Using SetWindowsHookEx, Thread Targeting, Detours, APC Injection, APC Injection from User Space, APC Injection from Kernel Space .	L1, L2, and L3	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Recommended Books:

1. "Practical Malware Analysis" by Michael Sikorski and Andrew Honig
2. "The Rootkit Arsenal: Escape and Evasion in the Dark Corners of the System" Second Edition by Reverend Bill Blunden
3. "Rootkits: Subverting the Windows Kernel" by Jamie Butler and Greg Hoglund
4. "Practical Reverse Engineering" by Dang, Gazet, Bachaalany

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Examination Scheme:

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	2	1	1	--	--	--	--	--	--	--	--	3	3	2	2
CO2	2	2	1	1	--	--	--	--	--	--	--	--	2	2	2	2
CO3	2	2	1	1	--	--	--	--	--		--	--	2	2	2	2
CO4	2	2	2	1	--	--	--	--	--	--	--	--	2	2	2	2
CO5	2	2	1	1	--	--	--	--	--	--	--	--	2	2	2	2

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Course Code: NCE4308	WEB SECURITY	L	T	P	C
Version 2020.1	Date of Approval: 19 July2020	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

Modern cryptography applies theory from mathematics and computer science to design and implement strong encryption methods which are so important to the safety of computer systems today. This course focuses on introducing students to the issues of WEB security, especially in terms of business systems' dependence on communication. Acquisition of knowledge about dangers that threaten the Internet and how to protect oneself from them. Introduction to practical methods, measures and resources that can be applied in the construction and development of WWW security system

Course Objectives

The objective of this course is to

1. Identify domain space and security challenges of the web and information systems based on web technologies, classify threats and ways to deal with them for individuals and information systems.
2. Propose ways for technical and legal protection of systems based on web technologies.

Course Outcomes

On completion of this course, the students will be able to

CO1:Analyse and apply legal regulations in the field of electronic business, electronic trade, digital signature, protection of personal data, etc

CO2: Determine the most suitable security protocol to protect web applications

CO3: Identify domain space and security challenges of the web.

CO4: Explain the operating principles of web information systems.

CO5: Understand the technicalities of mails i.e. junk or spam mails.

Modules	Blooms level *	Number of hours
MODULE 1: **The E-Commerce Playground** Web Languages: The Babylon of the 21st Century, Languages of the Web, HTML, Dynamic HTML (DHTML).XML,XHTML,Perl,PHP,ColdFusion,Active Server Pages,CGI,Java. Web and Database Servers: Web Servers,Apache,Microsoft's Internet Information Server (IIS),Database Servers,Microsoft SQL Server,Oracle.	L1, L2 and L3	8

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MODULE 2: **Shopping Carts and Payment Gateways** Evolution of the Storefront,ElectronicShopping,Shopping Cart Systems,Scope and Lifetime of an Electronic Shopping Cart,Collecting, Analyzing, and Comparing Selected Components,Keeping Track of the Total Cost,Change of Mind,Processing the Purchase,ImplementationofaShoppingCartApplication,ProductCatalog,SessionManagement,DatabaseInterfacing,Integration with the Payment Gateway,Examples of Poorly Implemented Shopping Carts,Carello Shopping Cart,DCShop Shopping Cart,Hassan Consulting's Shopping Cart,Cart32 and Several Other Shopping Carts,ProcessingPayments,Finalizing the Order,Method of Payment,Verification and Fraud Protection,OrderFulfillment and Receipt Generation,Overview of the Payment Processing System,Innovative Ways to Combat Credit Card Fraud,Order Confirmation Page,Payment Gateway Interface,Transaction Database Interface,Interfacing with a Payment GatewayAnExample,PaymentSystemImplementationIssues,Integration,TemporaryInformation,SSL,Storing User Profiles,Vulnerabilities Caused by Poor Integration of Shopping Cart and Payment Gateway,PayPal—Enabling Individuals to Accept Electronic Payments,	L1, L2, L3 and L4	8
MODULE 3: **HTTP and HTTPS: The Hacking Protocols,Protocols of the Web,HTTP,HTTPS (HTTP over SSL).** URL: The Web Hacker's Sword: URL Structure,Web Hacker Psychology,URLs and Parameter Passing. URL Encoding, Meta-Characters,Specifying Special Characters on the URL String.,Meta-Characters and Input Validation,UnicodeEncoding,The Acme Art, Inc. Hack,Abusing URL Encoding,Unicode Encoding and Code Red's Shell Code,UnicodeVulnerability,The Double-Decode or Superfluous Decode Vulnerability,HTMLForms,Anatomy of an HTML Form,InputElements,Parameter Passing Via GET and POST,Case Study: Reconnaissance Leaks Corporate Assets.	L1, L2 and L3	8
MODULE 4: **Web: Under (the) Cover.** The Components of a Web Application,The Front-End Web Server,The Web Application ExecutioEnvironment. The Database Server,Wiring the Components,The Native Application Processing Environment.,Web Server APIs and Plug-Ins,URL Mapping and Internal Proxying,Proxying with a Back-End Application Server.Examples. Connecting with the Database,The Craftiest Hack of Them All,Using Native Database APIs.Examples.UsingODBC,UsingJDBC,Specialized Web Application Servers,Identifying Web Application Components from URLs,The Basics of Technology Identification,Examples,MoreExamples,Advanced Techniques for Technology Identification,Examples,Identifying Database Servers,Countermeasures, Rule 1: Minimize Information Leaked from the HTTP Header,Rule 2: Prevent Error Information from Being Sent to the Browser.	L1, L2, and L3	4

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MODULE 5: **Reading Between the Lines.** Information Leakage Through HTML,What the Browsers Don't Show You,Netscape Navigator—View | Page Source,Internet Explorer—View | Source,Clues to Look For,HTMLComments,RevisionHistory,Developer or Author Details,Cross-References to Other Areas of the Web Application,Reminders and Placeholders, Comments Inserted by Web Application Servers,Old "Commented-Out" Code,Internal and External Hyperlinks,E-mail Addresses and Usernames,UBE, UCE, Junk Mail, and Spam,Keywords and Meta Tags,HiddenFields,Client-Side Scripts,Automated Source Sifting Techniques,Usingwget,Usinggrep,Sam Spade, Black Widow, and Teleport Pro.	L1, L2, and L3	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- McClure, Stuart, Saumil Shah, and Shreeraj Shah. Web Hacking:attacks and defense. AddisonWesley. 2003.
- 2. Garms, Jess and Daniel Somerfield. Professional Java Security. Wrox. 2001.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2	PS O 3	PS O 4
CO 1	1	2	1	2	1	--	--	--	--	--	--	--	1	--	3	--
CO 2	1	1	2	1	1	--	--	--	--	--	--	--	1	--	3	--
CO 3	1	2	1	1	1	--	--	--	--	--	--	--	1	--	3	--
CO 4	1	2	2	2	3	--	--	--	--	--	--	--	1	--	3	--
CO 5	1	2	2	2	2	--	--	--	--	--	--	--	1	--	3	--

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: NCE4309	DIGITAL WATERMARKING & STAGENOGRAPHY	L	T	P	C
Version 2020.1	Date of Approval: 19 July2020	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

Modern Digital watermarking and steganography apply theory from mathematics, digital signal processing, image processing and computer science to design and implement algorithms which are so important for the secure communication today. This course focuses on building strong mathematical foundations which can be applied in designing a vast range of applications like broadcast monitoring, copy control.

Course Objectives

The objective of this course is to

- Enable the students with the technical and non-technical concepts used in Digital Watermarking and Steganography.
- Provide an overview of different mathematical structures used in designing digital watermarking and steganographic algorithms.

Course Outcomes

On completion of this course, the students will be able to

CO1: grasp the nontechnical but very important basics of Digital Watermarking and Steganography which will make their foundation for application creation.

CO2: Elaborate and apply the algorithms, by studying different models of watermarking systems.

CO3:Learn about one of the main tools Dirty Paper Codes that are needed for optimal watermarking of Gaussian signals they will study about the different security techniques need and used in Watermarking systems.

CO4:Build and study the models of Steganography and how to optimize the use of embedding techniques.

CO5: Describe the concept of stegnalysis, and applying steganographic algorithms to design the required application.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction Applications and Properties Information Hiding, Steganography, and Watermarking , History of Watermarking , History of Steganography , Importance of Digital Watermarking , Importance of Steganography ,Applications of Watermarking , Applications of Steganography Steganography for Dissidents, Steganography for Criminals, Properties of Watermarking Systems , Evaluating Watermarking Systems , Properties of Steganographic and Steganalysis Systems , Evaluating and Testing Steganographic Systems	L1, L2 AND L3	8

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MODULE 2: MODELS OF WATERMARKING Notation,Communications ,Communication-Based Models of Watermarking , Geometric Models of Watermarking , Modeling Watermark Detection by Correlation Watermarking with side information: Informed Embedding, Watermarking Using Side Information, Dirty-Paper Codes	L1, L2, L3	8
MODULE 3: PRACTICAL DIRTY-PAPER CODES Practical Considerations for Dirty-Paper Codes , Broad Approaches to Dirty-Paper Code Design	L1, L2 and L3	8
MODULE 4: STEGANOGRAPHYSteganographic Communication , The Channel , The Building Blocks , Notation and Terminology,Information-Theoretic Foundations of Steganography , Cachin's Definition of Steganographic Security , Practical Steganographic Methods , Statistics Preserving Steganography , Model-Based Steganography , Masking Embedding as Natural Processing , Minimizing the Embedding Impact , Matrix Embedding , Nonshared Selection Rule ,	L1, L2, and L3	4
MODULE 5: STEGNALYSIS Steganalysis Scenarios , Detection , Forensic Steganalysis , The Influence of the Cover Work on Steganalysis , Some Significant Steganalysis Algorithms , LSB Embedding and the Histogram Attack , Sample Pairs Analysis , Blind Steganalysis of JPEG Images Using Calibration , Blind Steganalysis in the Spatial Domain.	L1, L2, and L3	4

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. William Stallings, Cryptography & Network Security: Principles and Practices, Prentice Hall, 2005, (ISBN: 978-0131873162).

Reference Books

1. "Digital Watermarking and Steganography"Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, Ton Kalker, ,Margan Kaufmann Publishers, New York, 2008.
2. "Digital Watermarking", Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, MarganKaufmannPublishers, New York, 2003.
3. "Techniques and Applications of Digital Watermarking and Contest Protection", Michael Arnold, Martin Schmucker, Stephen D. Wolthusen, Artech House, London, 2003.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	2	1	1	--	--	--	--	--	--	--	--	3	3	2	2
CO2	2	2	1	1	--	--	--	--	--	--	--	--	2	2	2	2
CO3	2	2	1	1	--	--	--	--	--		--	--	2	2	2	2
CO4	2	2	2	1	--	--	--	--	--	--	--	--	--	2	2	2	2
CO5	2	2	1	1	--	--	--	--	--	--	--	--	--	2	2	2	2

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Course Code: NCE4437	PROJECT DISSERTATION-II	L	T	P	C
Version: 2020.1	Date of Approval: 19 July 2020	0	0	0	15
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The objective of this course is to provide practical training on some live/demo projects that will increase capability to work on actual problem in industry. It will be an in house training on some latest software which is in high demand in market. This training will be designed such that it will useful for their future employment in industry.

Course Objectives

The objective of this course is to

1. Provide practical training on live projects
2. Increase technical capabilities on solving real life problems in company environment

Course Outcomes

On completion of this summer internship, the students will be able to:

CO1: Demonstrate a sound technical knowledge of their selected project topic.

CO2: Design and develop engineering solutions to complex problems utilising a systems approach.

CO3: Analyse various approaches for solving a complex engineering problem using different tools and techniques

CO4: Demonstrate the knowledge, skills and attitudes of a professional engineer.

CO5: Apply technical skills and knowledge in completing the project.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	--	--	--	--	--	1	--	--	--	--	--	1	1
CO2	1	1	--	--	--	--	--	--	1	--	--	--	--	--	1	1
CO3	1	1	--	--	--	--	--	--	1	--	--	--	--	--	1	1
CO4	1	1	--	--	--	--	--	--	1	--	--	--	--	--	1	1
C05	1	1	--	--	--	--			1	-	-	-	--	--	1	1

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Amity School of Engg. & Technology

Bachelor of Science (Honors/ Honors with Research) in Information Technology

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Curriculum & Scheme of Examination

2023

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Bachelor of Science (Honors/ Honors with Research) in Information Technology
SEMESTER-I

DIFT2151	COMPUTER PROGRAMMING WITH C LANGUAGE	L	T	P	C
Version : 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course is aimed to provide a fundamental understanding of programming concepts. C Language is the language which used to write solution for the basic computational problem in the form of instructions and programs. The basic and advanced features of C Language including Data types, Operators, Conditional & Control Statements, Arrays, Strings, Structure & Union and File Handling will be introduced.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of Programming through C Language
2. Provide an overview of advanced programming concepts like Structure, Union and File Handling

Course Outcomes

On completion of this course, the students will be able to

After the completion of course, the students will be able to,

CO 1: Define the purpose and structure of C Program for programming; identify and distinguish various datatypes and operators for arithmetic, logical relational operations; solve the problems related to finding errors and output in program.

CO 2: Describe conditional and control statement; apply if-else, Switch and loops to rewrite basic C program for problem solving.

CO 3: Compare and contrast various Array types, its declaration and implementation; differentiate between Call by Value and Reference if Functions; apply the concepts to rewrite C Programs

CO 4: Differentiate between various String Handling Functions; describe the concept of Pointers in C Language

CO 5: Explain the concept of Structure and Union; apply the concept of File Handling to provide data storage support to the programs.

Modules	Blooms level*	Number of hours
Module I: Introduction to 'C' Language History of C, Introduction of C, Basic structure of C program, Concept of variables, constants and data types in C, Operators and expressions: Introduction, arithmetic, relational, Logical, Assignment, Increment and decrement operator, Conditional, bitwise operators, Expressions, Operator precedence and associatively. Managing Input and output Operation, formatting I/O.	L1, L2 and L3	6
Module II: Decision making and looping Decision making in program, Relational Logical operators example, if statements, if -else, nested if-else statements, Switch, case loop, Do-While, While, for loop and nesting of loop, continue and break , Storage types , predefined processor.	L2 and L3	8

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Module III: Arrays and Functions One Dimensional Arrays, Arrays Manipulation, Sorting, Searching, Function declaration, example & calling a function. Passing Arguments, call by value and call by references, Recursive function, .Recursion.	L2, L3 and L4	7
Module IV: Pointers and String Pointers: Declaration, Pointer assignments, initialization, Pointers and Dynamic Memory Allocation, Array of Pointers, strings, string handler functions.	L2, L3 and L4	8
Module V: Structure Union & file handling Structure definition, Declaration, structure Assignments, Arrays in structure, Structure Arrays, Pointer Structure, Nested Structure, Arrays of Structure, Union declaration, assignments & example programs, Difference between structure & union, file handling and the related functions.	L2 and L3	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. E Balagurusamy, "Programming in ANSI C", Seventh Edition, Tata McGraw Hill Education private limited, July 2017.
2. Yashwant Kanetkar, "Let Us C", 16th Edition, BPB Publication, June 2017.

Reference Books

1. Brain W Kernighan and Dennis M Ricchie, "The C Programming Language", 2nd Edition, Pearson Publication, Jan 2015.
2. Byron Gottfried, "Programming with C", Third Edition, Tata McGraw Hill Education private limited, July 2017.
3. E Balagurusamy, "Computer Concepts & Programming in C", Seventh Edition, Tata McGraw Hill Education private limited, July 2011.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**1**	**2**	--	**2**	--	--	--	--	--	--	--	--	**1**	--	**2**
CO2	**1**	**1**	**2**	**2**	--	--	--	--	--	--	--	--	**1**	--	**2**
CO3	**1**	**1**	**2**	**3**	--	--	--	--	--	--	--	--	**1**	---	**2**
CO4	**1**	**1**	**2**	**2**	**3**	--	--	--	--	--	--	--	**1**	--	**2**
CO5	**1**	**1**	**2**	**2**	**3**	--	--	--	--	--	--	--	**1**	--	**2**

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DIFT2101	COMPUTER FUNDAMENTALS	L	T	P	C
Version 2023.1	Date of Approval:	1	0	0	1
Pre-requisites/Exposure	Basis of Computers				
Co-requisites	Nil				

Catalog Description

Examines key computational abstraction levels below modern high-level languages; number representation, assembly language, memory management, the operating-system process model, high-level machine architecture including the memory hierarchy, and how high-level languages are implemented. This course is aimed to provide a fundamental understanding of computer science for the students in their early stages of academic career. Various computer nomenclatures regarding to hardware and software are introduced in this course to develop an in-depth realization of several subjects and their significant roles in the field.

Course Objectives

The objective of this course is to

1. Give students an in-depth understanding of why computers are essential components in business, education and society.
2. Introduce the fundamentals of computing devices and reinforce computer vocabulary, particularly with respect to personal use of computer hardware and software, the Internet, networking and mobile computing.
3. Provide hands-on use of Microsoft Office 2013 applications Word, Excel, Access and PowerPoint.

Course Outcomes

On completion of this course, the students will be able to

CO1: Describe the usage of computers and why computers are essential components in business and society.
CO2: Utilize the Internet Web resources and evaluate on-line e-business system.
CO3: Solve common business problems using appropriate Information Technology applications and systems.
CO4: Identify categories of programs, system software and applications. Organize and work with files and folders.
CO5: Describe various types of networks standards and communication software.

Modules	Blooms level*	Number of hours
MODULE 1: Computer and its characteristics, application of computers, digital and analog computer, Generation of computers, Storage devices: primary storage devices (RAM,ROM,PROM,EPROM,EEPROM) , secondary storage devices(Floppy disk, Hard disk, optical disk, magnetic tapes), Input and output devices (keyboard, mouse, light pen, joystick, scanner, monitor, printers etc.)	L1, L2, L3	7
MODULE 2: Software and its types (System Software, Application Software, Firmware Software's) Computer Languages and its types (Machine Language, Assembly Language, High Level Language: advantages and disadvantages of computer	L1, L2	8

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languages), Translators: Compiler, Linker, Interpreter, Number system and its types, conversion from one base to another and vice versa. .		
MODULE 3: Word Processor and its features, Editing of Text, Find and Replace, Bullets and Numbering, Spell Checker, Grammar Checker, Auto Correct, Auto Complete, Auto Text, Header and footer, tables, mail merge, border and shading, page setup, printing.	L2, L3 and L4	7
MODULE 4: Spread sheet and its features, Entering Information in Worksheet, Editing Cell Entry, Moving and Copying Data, deleting or Inserting Cells, Rows and Columns, Custom Numeric Formats, Using Formulas and functions, Creating charts.	L2, L3, L4	7
MODULE 5: Presentation Software and its uses, steps for creating PowerPoint Presentation, PowerPoint Views, Assigning Slide Transitions, Using Preset Animations, Hiding Slides, Slide Show, Controlling the Slide Show with a Keyboard, Setting Slide Show Timings.	L3, L5 and L6	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. P.K Sinha & Priti Sinha, Computer Fundamentals, BPB Publications.
2. Peter Nortan, Introduction to Computers, Tata Mcgraw Hill.

Reference Books

1. Suresh K. Basandra, Computer Systems Today, Galgotia Publications.
2. Joyce Coax , Joan Preppernau,,Steve Lambert and Curtis Frye,2007 Microsoft Office System step by step, Microsoft Press.
3. R.K. Taxali, PC Software for Windows, Tata Mcgraw Hill.
4. Alexix Leon, Mathewes Leon, Fundamentals of Information Technology, Vikas Publishing.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**1**	**3**	**--**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**3**	**1**	**--**
CO2	**1**	**2**	**--**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**3**	**--**	**3**	**1**	**--**
CO3	**1**	**3**	**--**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**3**	**2**	**3**	**1**	**--**
CO4	**1**	**--**	**1**	**3**	**1**	**--**	**--**	**--**	**3**	**--**	**--**	**2**	**3**	**1**	**--**
CO5	**1**	**1**	**1**	**2**	**--**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**3**	**1**	**--**

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DIGITAL ELECTRONICS

Course Code: DIFT2103 **Credit Units: 02**

Course Objective:
An entry level course in digital electronics covering number systems, binary mathematics, digital codes, logic gates, Boolean algebra, Karnaugh maps, and combinational logic. Emphasis will be on circuit logic analysis and design of digital circuits. The student will explain the operation of digital logic gates and use Boolean algebra and Karnaugh mapping to express logic operations and minimize logic circuits in design. The student will construct, analyze combinational logic circuits & sequential circuits; create a truth table for standard digital logic gates; and add, subtract, multiply and divide using the binary numbering system. Student will also be able to understand about digital to analog conversion and vice versa.

Course Contents:

Module I: Number System
Decimal, Binary, Octal, Hexadecimal Number Systems and Conversion of the bases, Complements: r's complement, (r-1)'s complement, Binary codes: Grey code, BCD Code, Excess-3 code
Introduction to logic systems
Positive and negative logic, Logic functions - NOT, AND, OR, NOR, EX-OR, EX NOR
Truth tables Boolean algebra, De Morgan's theorems Standard forms for Logical Expressions - Sum of Products, Product of Sums Specification of Logical functions in terms of Minterms and Maxterms, Karnaugh Maps, Simplification of Logical functions, Introduction of "don't care" states.

Module II: Combinational Building Blocks
Multiplexers, De-multiplexers, Decoders, Encoders
Arithmetic circuits
Half Adders and Full Adders**,** Half Subtractor and Full Subtractor

Module III: Flip-flops
The RS latch, the clocked RS flip-flop, JK Flip Flop, the Master-Slave JK flip-flop, Delay and Toggle flip-flops
Flip-flops in counter circuits Asynchronous (ripple) Counters (UP/DOWN), Synchronous Counter design (UP/DOWN), Non Sequential Counting

Module IV: Shift Registers
Shift registers in general, Ring Counters, Johnson Counter
Introduction to Memory
Primary: RAM, Static RAM, Dynamic RAM, ROM, PROM, EAPROM, Secondary: Floppy Disk, Hard Disk, CDROM

Module V: Introduction to Logic Families, DACs and ADCs
Introduction to logic families-TTL, RTL,ECL,CMOS,DTL,IIL
Binary weighted resistor DAC, Resolution, linearity and settling time of DACs, Successive approximation ADC

Examination Scheme:

Components	CT1	A/C/Q	Attd	EE
Weightage (%)	15	10	5	70

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Text & References:

Text:

- R.P Jain, Mordern Digital Electronics, Tata Mcgraw Hill.

References:

- Malvino & Leach, Digital Electronics, Tata Mcgraw Hill,2006,Edition 6.
- Floyd, Digital Fundamentals,Pearson,2015.
- M.M Mano, Digital Logic and Computer Design,Pearson.

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DIFT2152	COMPUTER PROGRAMMING WITH C LANGUAGE LAB	L	T	P	C
Version 2023.1	Date of Approval:	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The primary objective of this course is to understand all the components of C, including the C language, the C Preprocessor, and the C Standard Library. An understanding of some advanced practical issues, including memory management, testing and debugging, complex declarations and expression evaluation, building and using libraries, and evaluating tradeoffs, such as size vs. speed and speed vs. complexity. The ability to write C code and create and manipulate logical programs.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of Programming through C Language
2. Provide an overview of advanced programming concepts like Structure, Union and File Handling

Course Outcomes

After the completion of course, the students will be able to,

CO 1: Demonstrate the use of various data types and operators in C programs; Solve various problems using conditional control statements (if-else, Switch case).

CO 2: Construct C programs related to problems involving the usage of loops, arrays and functions.

CO 3: Apply the concept of Pointers for efficient memory management and construct C programs using string handling functions.

CO 4: Demonstrate the use of Structure, Union and concept of File Handling to provide data storage support to the programs.

Modules	Blooms level*	Number of hours
LABORATORY SESSSION 1 OPERATORS, EXPRESSIONS and DECISION MAKING 1. Write a program to calculate simple interest and amount. 2. Write a program to swap two numbers using third variable. 3. Write a program to demonstrate Greatest of 3 nos and to print the given no in ascending order. 4. Write a program to check if the number is even or odd. 5. Write a program to perform arithmetic operations using Switch Case statement. 6. Write a program to calculate area of circle, rectangle, square and triangle using Switch Case statement.	L3	5
LABORATORY SESSSION 2 LOOPING 1. Write a program to find factorial of given no using do while statement. 2. Write a program to print prime numbers up to ‘n’.	L3	6

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3. Write a program to sum of n natural no. 4. Write a program to print Fibonacci series. 5. Write a program to reverse a number. 6. Write a program to print the following pattern using for loop 1 2 2 3 3 3 4 4 4 4 7. Write a program to print the following pattern using for loop A A B A B C A B C D		
LABORATORY SESSSION 3 ARRAYS and FUNCTIONS 1. Write a program to read n num of students and 5 subjects marks. 2. Write a program to swap two numbers using call by value. 3. Write a program to convert all lower case to uppercase characters 4. Write a program to find the factorial of a number using recursion. 5. Write a program to print the add/product of two matrices of any order.	L3	5
LABORATORY SESSSION 4 POINTERS AND STRING 1. Write a program to perform operations on strings using string handling in-built functions (concatenation, reversal, copy etc.) 2. Write a program to swap two numbers using call by reference. 3. Write a program to perform dynamic memory allocation and deallocation. 4. Write a program to print elements of array using pointers.	L3	4
LABORATORY SESSSION 5 STRUCTURE,UNION & FILE HANDLING 1. WAP program to display student information by initializing structures. 2. WAP program to find the total salary of employee and employee details using structure. 3. Write a program to store and display information using Union. 4. Program to write data into file and read data from file.	L3	4

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. E Balagurusamy, "Programming in ANSI C", Seventh Edition, Tata McGraw Hill Education private limited, July 2017.
2. Yashwant Kanetkar, "Let Us C", 16th Edition, BPB Publication, June 2017.

Reference Books

1. Brain W Kernighan and Dennis M Ricchie, "The C Programming Language", 2nd Edition, Pearson Publication, Jan 2015.
2. Byron Gottfried, "Programming with C", Third Edition, Tata McGraw Hill Education private limited, July 2017.
3. E Balagurusamy, "Computer Concepts & Programming in C", Seventh Edition, Tata McGraw

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DIFT2102	COMPUTER FUNDAMENTALS LAB	L	T	P	C
Version 2023.1	Date of Approval:	0	0	2	1
Pre-requisites/Exposure	Knowledge of Computer				
Co-requisites	NIL				

Catalog Description

This course is aimed to provide a fundamental understanding of computer science for the students in their early stages of academic career. Various computer nomenclatures regarding hardware and software will be introduced for students to develop an in-depth realization of several subjects and their significant roles in the field. After this course, the students will be able to understand and apply the fundamental concepts of computer.

Course Objectives

The objective of this course is

1. Give students an in-depth understanding of why computers are essential components in business, education and society.
2. Introduce the fundamentals of computing devices and reinforce computer vocabulary, particularly with respect to personal use of computer hardware and software, the Internet, networking and mobile computing.
3. Provide hands-on use of Microsoft Office 2016 applications Word, Excel, Access and PowerPoint. Completion of the assignments will result in MS Office applications knowledge and skills.

Course Outcomes

On completion of this course, the students will be able to:

CO 1: Outline the usage of computers and why computers are essential components in business and society. Creating the folder and apply it where necessary.

CO 2: Identify the features of windows operating system. Determine the operations of taskbar of Windows and Set the wall paper, screen saver and date/time.

CO 3: State and demonstrate the use of word document and relate its applications with the day to day use of files.

CO 4: Identify and relate the concept of macros and mail merging. Design and work with files and folders.

CO 5: List the features of the excel document and apply and relate its calculation part with the real world. Design a document for resume writing.

Modules/Topics Covered**	Blooms level*	Number of hours
1. Create a new folder and do the following: a. Make a word document in it. b. Make an Excel document in it. c. Make a new folder in it d. Rename the initial folder e. Move the initial folder f. Copy the initial folder. g. Delete the initial folder	L1, L3 and L5	4
2. Implement the various well known features of Windows operating system such as Notepad, WordPad, Paint, System tools, Entertainment etc. enclosed in Start→Programs→Accessories.	L1, L3	4

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3. Implement various display properties by right clicking on the Windows Desktop. 4. Explore the taskbar of Windows. 5. Set the wall paper and screen saver. 6. Set the date/time.		
7. Create a document and a. Put Bullets and Numbers b. Apply various Font parameters. c. Apply Left, Right, and Centre alignments. d. Apply hyperlinks. e. Insert pictures f. Insert ClipArt g. Show the use of WordArt h. Add Borders and Shading i. Show the use of Find and Replace. j. Apply header/footers	L1, L3, L5	4
8. Create any document and show the use of File→versions. 9. Create any document and show the difference between paste and paste special. 10. Create a document to show the use of Washout/Watermark. 11. Implement the concept of mail merge.	L1, L3, L5	4
12. Implement the concept of macros. 13. Implement the concept of importing a file/document. 14. Implement the concept of merging the documents.	L1, L3, L5	4
15. Create a student table and do the following: a. Insert new row and fill data b. Delete any existing row c. Resize rows and columns d. Apply border and shading e. Apply merging/splitting of cells f. Apply sort g. Apply various arithmetic and logical formulas. 16. Create your resume using General Templates.	L1, L3, L4, L5	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

[1] P. S. Pradeep K. Sinha, Computer Fundamentals, BPB Publications, 2017.

[2] P. Nortan, Introduction To Computers, Tata Mcgraw Hill Publishing Co Ltd, 2017.

Reference Book

[1] S. K. Basandra, Computer Today, Galgotia Publications Pvt. Ltd., 2010.

[2] J. P. J. C. S. L. Curtis Frye, 2007 Microsoft Office System Step by Step (Step by Step (Microsoft)), Microsoft, 2007.

[3] R. Taxali, Pc Software For Windows Made Simple, Tata Mcgraw Hill Publishing Co Ltd, 2000.

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	**70**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE- External Exam

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**--**
CO2	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**--**
CO3	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**3**
CO4	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**--**
CO5	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**

1: strongly related, 2: moderately related and 3: weakly related

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SEMESTER-II

DIFT 2251	DATA STRUCTURE	L	T	P	C
Version 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Hands on knowledge of C Programming				
Co-requisites	Basic concepts of C Programming				

Catalog Description

This course is an introduction to the use, design, and analysis of data structures in computer programs. The very commonly used data structures like arrays, stacks, queues, lists, trees, and graphs will be discussed in detail. Sorting and hashing are important topics in the study of algorithms. They are also closely related to the design of data structures. Several algorithms to implement these techniques are included in the syllabus.

Course Objectives

The objective of this course is to

1. Equip the students with the basic concepts of data structures and algorithms
2. Understand concepts about searching and sorting techniques
3. Understand basic concepts about stacks, queues, lists, trees and graphs

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain fundamental data structures and algorithms and summarize their typical uses, strengths, and weaknesses; Address calculation, application of 1D and 2D arrays and various operations applied on arrays.

CO 2: Explain Stack and Queue data structure, various types of Queues; Representation of stack and queue in memory; Applications of stack and queue.

CO 3: Explain and compare link list with other linear data structure; Advantage, disadvantages, types, application and memory representation of link list.

CO 4: Explain Binary search tree and its types. Applying in-order, pre-order and post order traversal to create the tree; application of tree in searching and storing huge amount of data.

CO 5: Analyze and compare the complexity different searching and sorting algorithms. Evaluate algorithms and data structures in terms of time and memory complexity of basic operations.

CO 6: Explain different types of graphs and their representation in memory.Appling BFS and DFS graph traversal scheme to find shortest path. Determine minimum spanning tree using Kruskal and Prim's method.

Modules	Blooms level*	Number of hours
MODULE 1: BASIC CONCEPTS AND ARRAY Definition Accessing the address of a variable, Declaring and initializing pointers. Accessing a variable through its pointer. Meaning of static and dynamic memory allocation. Memory allocation functions : malloc, calloc, free and realloc. Representation of arrays single and multi dimensional arrays. Address calculation using column and rows major ordering. Various operations on arrays, Application of arrays: matrix multi multiplication.	L1, L2 and L3	5

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MODULE 2: STACKS AND QUEUES Definition, Array representation of stack.Operations on stack: Infix, prefix and postfix notations.Conversion of an arithmetic expression from Infix to postfix. Evaluation of postfix expression using stacks. Definition, Array representation of Queue. Types of queue: Simple queue, circular queue, double ended queue (deque), priority queue, operations on all types of Queues.	L2, L3 and L4	7
MODULE 3: LINKED LIST Definition, Components of linked list, Representation of linked list, Advantages and Disadvantages of linked list. Types of linked list : Singly linked list, Doubly linked list, Circular linked list and circular doubly linked list. Operations on singly linked list : creation, insertion, deletion, search and display (based on the different position as specified by the user).Linked representation of Stacks & Queues.	L2, L3 and L4	7
MODULE 4: TREES Definition : Tree, Binary tree, Complete binary tree, Binary search tree, Heap Tree terminology : Root, Node, Degree of a node and tree, Terminal nodes, Non terminal nodes, Siblings, Level, Edge, Path, depth, Parent node, ancestors of a node. Binary tree : Array representation of tree, Creation of binary tree. Traversal of Binary Tree: Preorder, Inorder and post order. Representation of trees and its application, Binary search tree: Insertion & deletion in BST. Height balanced (AVL) tree	L2, L3, L4and L5	6
MODULE 5: SEARCHING, SORTING AND COMPLEXITY Searching: Sequential and binary search, Comparison between linear and binary search. Sorting: insertion, selection, bubble, quick, merge, heap sort.	L2, L3 and L4	5
MODULE 6: GRAPHS Graph representation: adjacency list, adjacency matrix. Types of Graphs: Directed & Undirected Graph .Traversal scheme: Depth first search, Breadth first search. Spanning tree: definition, minimal spanning tree algorithms.	L2, L3 and L4	6

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Seymour Lipschutz , "**Data Structures**", Schaum outlines, Revised 1st Edition
2. R.L. Kruse, B.P. Leary, C.L. Tondo, **"Data structure and program design in C**", PHI
3. A.V. Aho, J. E. Hopcroft, and J. D. Ullman, **"Data Structures and Algorithms"**, 1st Edition, Pearson Education, Reprint 2003.

Reference Books

1. J. P. Tremblay and P. G. Sorenson, **Introduction to Data Structures with Applications**, McGraw – Hill Computer Science Series, Mc-Graw – Hill New York, 1984
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest,**" Algorithms"**, Prentice-Hall India(1999).
3. Yeddidyah Langsam, Moshe J.Augenstein, Aaron M. Tenen Baum, "**Data Structures Using C and C++",** 2nd Edition, Prentice-Hall India
4. Mark Allen Weiss,"**Data Structures and Algorithm analysis in C++** ",Addison Wesley (3rd Indian Reprint 2000).

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2	PS O 3
CO 1	1	2	2	--	--	--	--	--	--	--	--	--	1	3	--
CO 2	1	--	2	3	--	--	--	--	--	--	--	--	1	3	--
CO 3	1	2	3	--	--	--	--	--	--	--	--	--	1	3	--
CO 4	1	2	1	--	--	--	--	--	--	--	--	--	1	3	--
CO 5	1	2	1	--	--	--	--	--	--	--	--	--	1	3	2
CO 6	1	1	2	2	--	--	--	--	--	--	--	--	1	3	2

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DIFT2201	JAVA PROGRAMMING	L	T	P	C
Version 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Basics of Programming				
Co-requisites	NIL				

Catalog Description

The objective is to impart programming skills used in this object oriented language java.The course explores all the basic concepts of core java programming like object,classes,data types, features, operators, control structures, interfaces, packages, applets, awt, swings and socket programming. The students are expected to learn it enough so that they can develop the basic applications as well as web solutions like creating applets etc.

Course Objectives

The objective of this course is to

1. Equip the students with the basic feature of contemporary java required in solving complex problems.
2. Provide a practical knowhow and implementation of java programming concepts like classes , objects, packages, swings ,socket programming

Course Outcomes

On completion of this course, the students will be able to

CO1: Define and explain concept of byte code and platform independence, demonstrate basic java based application development using operators, if-else, loops and arrays.

CO2: Distinguish between various types of inheritances, polymorphisms and other concepts and able to solve complex programming problems involving class objects, inheritances, and packages

CO3: Describe hierarchy of exception classes and thread life cycle along with demonstrate and design solutions for some simple and complex applications using exception and multithreading concepts.

CO4: Explain event delegation model anddescribe AWT class hierarchy; Apply knowledge of event handling and AWT controls create some new dynamic graphical applications.

CO5: Explain the architecture of applet and concept of swing package. Demonstrate applications based on java applets and swings.

Modules	Blooms level*	Number of hours
Module I:Java Basics Concepts of OOP, Features of Java, How Java is different from C++, Environmental setup, Basic syntax, Objects and classes, Basic Data Types, Variable Types, Modifier Types, Basic operators, Loop Control, Decision Making, Strings and Arrays, Methods, I/O.	L1, L2 and L3	6
Module II: Java Object Oriented Inheritance, Overriding, Polymorphism, Abstraction, Encapsulation, Interfaces, Packages, Exploring java.util package. .	L2 and L3	7
Module III: Exception Handling and Threading Exception Hierarchy, Exception Methods, Catching Exceptions, Multiple catch Clauses, Uncaught Exceptions Java's Built-in Exception. Creating, Implementing and Extending thread, thread priorities, synchronization suspending, resuming and stopping Threads, Multi-threading.	L2, L3 and L5	8

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Module IV : Event Handling And AWT Event handling Mechanism, Event Model, Event Classes, Sources of Events, Event Listener Interfaces AWT: Working with Windows, AWT Controls, Layout Managers	L2, L3, L4 and L5	8
Module V: Java Advanced AppletClass, Architecture, Skeleton, Display Methods. **Swings: Japplet, Icons, labels, Text Fields, Buttons, Combo Boxes.** Socket Programming: Socket methods, Server Socket methods, Socket Client and Socket Server examples	L2 and L3	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text:

1. "JAVA The Complete Reference" by Patrick Naughton & Herbert Schild, 10thEdition,TMH
2. "Introduction to JAVA Programming a primer", E.Balaguruswamy,4thEdition,TMH

References:

1. "Introduction to JAVA Programming" By Daniel/Young PHI
2. "Java Script", By Jeff Frentzen and Sobotka ,Tata McGraw Hill,1999

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**2**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**--**
CO2	**3**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**--**
CO3	**2**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**--**
CO4	**1**	**3**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**2**
CO5	**1**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**--**

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DIFT2202	JAVA PROGRAMMING LAB	L	T	P	C
Version 2023.1	Date of Approval:	0	0	2	1
Pre-requisites/Exposure	Basics of Programming				
Co-requisites	NIL				

Catalog Description

In this Lab course the basic features of contemporary java are implemented and demonstrated. Problems or programs will be related to concepts of classes, objects, threads, packages, exception handling, applets, AWT control, swings and socket programming. Concepts covered would enable them to create basic and complex console and graphical based applications for desktop and Internet.

Course Objectives

The objective of this course is to

1. Equip the students to apply knowledge of various basic java features required in solving basic and complex problems.
2. Provide a demonstration of basic java programming concepts like classes, objects, threads, packages, exception handling, applets, AWT control, swings and socket programming

Course Outcomes

On completion of this course, the students will be able to

CO1: Apply the concepts learned of operators, if-else, loops and arrays to java based application development.

CO2: Demonstrate the use of various types of inheritances, polymorphisms, class objects, inheritances, packages and other concepts to basic and complex java programming problems.

CO3: Apply the knowledge of exception handling and multithreading concepts for some simple and complex applications.

CO4: Apply knowledge of event handling and AWT controls tocreate some new dynamic graphical applications.

CO5: Demonstrate graphical applications based on java applets, swings and event handling.

Modules/Topics Covered**	Blooms level*	Number of hours
Sample Programs using Objects and classes, Variable Types, Modifier Types, operators, LoopsDecision Making, Strings and Arrays, 1. WAP to display “Hello, it’s a first program in java”. 2. WAP to find sum of two integers taken as input from user at runtime. 3. WAP to find sum of two float numbers taken as command line arguments 4. WAP to find changed case of entered character. 5. WAP to find maximum of 3 integer numbers taken as input from user at runtime. 6. WAP in java to find out the greatest out of ten numbers stored using arrays. 7. WAP to create class with “name” as String and “age” as integer data members. The class should have two methods to take input from user and display the data. 8. WAP to find factorial of a number using class and object.	L3, L5	6

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Sample Programs using Inheritance, Overriding, Polymorphism, Interfaces, Packages 1. WAP in java to illustrate the concept of interfaces. 2. WAP to create a package as MyPack having a class with three methods: max, fact and show. Use it in other folder with setting classpath and without setting class path. 2. Write a program in java to showcase uses of super keyword	L3, L5	4
Sample Programs using exception handling and threads 1. Write a program to demonstrate the use of nesting of try-catch block 2. WAP in java to illustrate the concept of using multiple catch clauses to handle different types of exceptions. 3. WAP in java to create a user defined Exception and throw it explicitly. 4. Demonstrate thread using Thread class and Runnable interface 5. Demonstrate various thread methods using a program	L3, L5	6
Sample Programs using event handling and AWT controls 1. Write a program to display "hello" in different color where user clicks left mouse button and "world" where right mouse button is clicked. Use black background. 2. WAP in java to create a Frame and handle window-closing event implementing the WindowListener interface. 3. WAP to create an Applet having various different buttons, recognizing them using action command string method and handling click event generated by them. 4. WAP to create a frame and illustrate the concept of using an adapter class in place of interfaces for handling various mouse events generated over frame window. 5. WAP in java to create a frame with AWT controls (like label, push buttons, Checkbox, Checkbox Group) and handle various events generated by them. 6. WAP in java to create a frame with various AWT controls (like choice, list, TextField and Buttons) and handle the events thrown by them.	L3, L5	6
Sample Programs using applets, swings and stream socket 1. Write an applet which will display "HAPPY" and "DEEPAVALI" as: The word "HAPPY" will roll from top to bottom and "DEEPAVLI" from bottom to "top" . Both will run at the same speed and stop simultaneously at the center of the applet. 2. Write an applet to display last 32 shades of red, green and blue in equal sized square grid accompanied by appropriate labels like" Last 32 shades of Red/Green/Blue color". Make use of BorderFactory to apply border for each individual shade. 3. Create an applet with one single button with caption "Click". On clicking the button will open a new Frame with title "Factorial". The frame will have two three controls :TextField, Label and button. On clicking button calculate the factorial entered in TextField control. 4. Create Java programs to demonstrate day time client and server. 5. Create java programs to create echo client and server	L3, L5	2

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

** Sample Programs provided are not limited to these only, can include others as desired.

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Text:

3. "JAVA The Complete Reference" by Patrick Naughton & Herbert Schild, 10th Edition,TMH
4. "Introduction to JAVA Programming a primer", E.Balaguruswamy,4th Edition,TMH

References:

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA					EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	35

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE- External Exam

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O 1**	**PS O 2**	**PS O 3**
CO 1	**2**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**--**
CO 2	**3**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**--**
CO 3	**2**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**--**
CO 4	**1**	**3**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**2**
CO 5	**1**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**--**

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DIFT2252	DATA STRUCTURE LAB		L	T	P	C
Version 2023.1	Date of Approval:		0	0	2	1
Pre-requisites/Exposure	Hands on knowledge of C Programming					
Co-requisites	Basic concepts of C Programming					

Catalog Description

The course is designed to develop skills to design and analyse simple linear and non- linear data structures like arrays, stacks, queues, lists, trees, and graphs. It strengthen the ability of the students to identify and apply the suitable data structure for the given real world problem. It enables them to gain knowledge in practical applications of data structures.

Course Objectives

The objective of this course is to

1. Equip the students to apply knowledge of basic concepts of data structures in solving complex problems.
2. Provide demonstration of the data structure concepts like stacks, queues, lists, trees, graphs and various searching and sorting techniques

Course Outcomes

On completion of this course, the students will be able to

CO 1: Apply the knowledge of basic fundamentals of data structures in order to analyze the time and space efficiency of the data structure

CO 2: Demonstrate the use and applications of Stack and Queue data structure along with various types of Queues.

CO 3: Demonstrate and compare link list with other linear data structure; Advantage, disadvantages, types and application of link list.

CO 4: Apply the knowledge of trees and heaps and demonstrate the application of tree in searching and storing huge amount of data.

CO 5: Apply algorithm for solving problems like sorting, searching, insertion and deletion of data.

CO 6: Demonstrate the usage of graphs and their applications of BFS and DFS to find shortest path.

Modules	Blooms level*	Number of hours
1. Sample programs of 1D and 2-D arrays (a) Write a program to insert an element at any position in an array (b) Write a program to perform addition of matrix for order 3*3 (c) Write a program to perform multiplication of matrix of any order	L1, L2 and L3	4
2. Sample Programs of stack and queues. (a) Write a program that perform the following function i) Create stack of integers. ii) PUSH operation on stack iii) POP operation on stack (b) Write a program that perform the following function i) Create Queue of integers. ii) Insert operation on Queue	L2, L3	4

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iii) Delete operation on Queue (c) Write a program that perform the following function i) Create Circular Queue of integers. ii) Insert operation on Circular Queue iii) Delete operation on Circular Queue		
3. Sample Programs of Linked List **(a)** Write a C program that perform the following: i) Create a singly linked list of integers. ii) Delete a given integer from the above linked list. iii) Display the contents of the above list after deletion **(b)** Write a C program that performs the following: a) Create a doubly linked list of integers. b) Delete a given integer from the above doubly linked list. c) Display the contents of the above list after deletion .	L2, L3 and L4	6
4. Sample Programs of trees (a) Write a C program that uses functions to perform the following: i) Create a binary search tree of characters. ii) Traverse the above Binary search tree recursively in Postorder.	L2, L3, L4and L5	2
5. Sample programs on sorting and searching (a) Write C programs for implementing the Bubble Sort (b) Write C programs for implementing the Selection Sort (c) Write C programs for implementing the Insertion Sort (d) Write a program to perform linear Search (e) Write a program to perform binary Search	L2, L3 and L4	6
6. Sample programs on graphs (a) Write C programs for implementing the graph traversal algorithms: Depth first traversal **(b) Write C programs for implementing the graph traversal algorithms: Breadth first traversal**	L3, L4 and L6	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Seymour Lipschutz , "**Data Structures**", Schaum outlines, Revised 1st Edition
2. R.L. Kruse, B.P. Leary, C.L. Tondo, **"Data structure and program design in C**", PHI
3. A.V. Aho, J. E. Hopcroft, and J. D. Ullman, **"Data Structures and Algorithms"**, 1st Edition, Pearson Education, Reprint 2003.

Reference Books

1. J. P. Tremblay and P. G. Sorenson, **Introduction to Data Structures with Applications**, McGraw – Hill Computer Science Series, Mc-Graw – Hill New York, 1984
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest,**" Algorithms"**, Prentice-Hall India(1999).
3. Yeddidyah Langsam, Moshe J.Augenstein, Aaron M. Tenen Baum, "**Data Structures Using C and C++",** 2nd Edition, Prentice-Hall India
4. Mark Allen Weiss,"**Data Structures and Algorithm analysis in C++** ",Addison Wesley (3rd Indian Reprint 2000).

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA					EE
Components	**A**	**PR**	**LR**	**V**	**70**
Weightage (%)	5	10	10	5	

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE- External Exam

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1	**1**	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**2**
CO 2	**1**	**--**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**
CO 3	**1**	**--**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**
CO 4	**1**	**2**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**
CO 5	**1**	**2**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**2**
CO 6	**1**	**1**	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**2**

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SEMESTER-III

DIFT2351	OPERATING SYSTEM	L	T	P	C
Version 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

To study and apply concepts relating to operating systems, such as concurrency and control of asynchronous processes, deadlocks, memory management, processor and disk scheduling, parallel processing, and file system organization and Demonstrate an understanding of the differences between processes and threads, the different process or thread synchronization methods and the, the different memory management techniques used in Operating Systems, the different I/O management techniques used in Operating Systems, the tradeoffs in design and implementation concepts used in the development of Operating Systems.

Course Objectives

The objective of this course is to

- Equip the students with the knowledge about categories of operating systems and their functions.
- Provide detailed knowhow about functions of operating system like process, memory and device management along with file system security and protection.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define and explain operating systems and their evolution also differentiate among its various types.

CO2: Explain concepts of process and inter-process communication and synchronization. Identify solutions to detect, prevent and handle deadlocks occurring in the operating systems. Solve synchronization and CPU scheduling problems related to processes.

CO3: Define and explain concepts of memory management like fragmentation, paging and segmentation. Solve problems related to memory management using page replacement algorithms.

CO4: Describe the concepts of device management and list various disk allocation methods. Determine solutions for disk scheduling problems using available disk scheduling algorithms.

CO5: State the concept of file and file system security, also distinguish among various file allocation methods.

Modules	Blooms level*	Number of hours
MODULE 1: **INTRODUCTION AND SYSTEM STRUCTURE** What is an operating system, History of OS, OS concepts, Types of OS, OS Structure, OS Operations. System calls, Types of System Calls, System Programs, OS Structure, Virtual Machines, System Boot	L1, L2 and L4	6
MODULE 2: **PROCESS MANAGEMENT** Process Concept, Process Scheduling, Scheduling Criteria, Scheduling Algorithms, Overview of Thread Scheduling and Multiprocessor scheduling, Operations on	L1, L2 and L3	6

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Processes, Interprocess communication with example. Client-server Communication, Overview of Multithreaded programming models		
MODULE 3: **PROCESS COORDINATION** Overview of Process Synchronization, Critical Section Problem, Semaphores, Classic problems. Deadlock- Prevention, Avoidance, Detection, Recovery, Algorithms	L1, L2 and L3	6
MODULE 4: **MEMORY MANAGEMENT** Memory Management Strategies-Introduction, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Virtual Memory Management- Demand Paging, Thrashing, Page Replacement	L1, L2 and L3	6
MODULE 5: **STORAGE MANAGEMENT** Overview of File System, Access Methods, Directory and Disk Structures, File Sharing, Protection, Disk Scheduling, Disk Management, I/O hardware	L1 and L2	6
MODULE 6: **PROTECTION AND SECURITY** Goals and Principles of Protection, Access Matrix, Security Problem, Program Threats, System and Network Threats, Overview of Cryptography, Overview of User Authentication and Security Defense.	L1 and L2	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Milenekovic, "Operating System Concepts", McGraw Hill
2. Silberschatz, P.B. Galvin "Operating System Concepts", John Willey & son

Reference Books

- Dietel, "An introduction to operating system", Addision Wesley
- Tannenbaum, "Operating system design and implementation", PHI
- Operating System, A Modern Perspection, Gary Nutt, Pearson Edu. 2000
- A. S Tanenbaum, Modern Operating System, 2nd Edition, PHI
- Willam Stalling " Operating system" Pearson Education

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CT1	A	Attd	EE
Weightage (%)	15	10	5	70

CT: Class Test, A: Assignment, Attd: Attendance , EE: End Semester Examination

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1	2	--	--	--	--	--	--	--	--	--	--	1	--	--
CO2	1	2	3	--	--	--	--	--	--	--	--	--	2	--	--
CO3	1	2	3	--	--	--	--	--	--	--	--	--	2	--	--
CO4	1	2	3	--	--	--	--	--	--	--	--	--	1	--	--
CO5	1	--	2	--	--	--	--	--	--	--	--	--	1	--	--

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DIFT2352	OPERATING SYSTEM LAB	L	T	P	C
Version 2023.1	Date of Approval:	0	0	2	1
Pre-requisites/Exposure	Basic knowledge of Operating System				
Co-requisites					

Catalog Description

This course introduces the UNIX operating system commands, shell programming. Explores the use of operating system utilities such as vi text editors, filters, process handling etc.

Course Objectives

The objective of this course is to

1. Provide knowledge of working on Unix OS.
2. Provide sound foundation of writing Shell scripts.
3. Implement features like piping, filters and redirection.

Course Outcomes

On completion of this course, the students will be able to

CO1: To implement various UNIX commands.
CO2: To demonstrate the use of Vi Editor and other editors of UNIX.
CO3: To write simple Shell scripts.

Modules	Blooms level*	Number of hours
1. UNIX structure, history, basic commands.	L1,L3	4
2. Working of Vi Editor and its commands.	L1,L3	4
Shell Script 1. Write a Shell Script that takes a search string and filename from the terminal & displays the results. 2. Write a Shell Script that takes pattern and filename as command line arguments and displays the results appropriately i.e. pattern found/pattern not found. 3. Write a Shell Script that accepts only three arguments from the command line. The first argument is the pattern string, the second argument is the filename in which the pattern is to be searches and the third argument is the filename in which the result is to be stored. 4. Write a Shell Script which creates the following menu and prompts for choice from user and runs the chosen command. Today's date Process of user List of files Quit to UNIX 5. Write a Shell Script that computes the factorial of a given number 6. Write a Shell Script that changes the extension of a group of files from txt to doc 7. Write a Shell Script that accepts both filename and a set of patterns as positional parameters to a script. 8. Write a Shell Script which will redirect the output of the date command without	L1,L3	16

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the time into a file. 9. Write a Shell Script (using while loop) to execute endlessly (until terminated by user) a loop which displays contents of current directory, disk space status, sleep for 30 seconds and display the users currently logged in on the screen. 10. Write a Shell Script that receives two filenames as arguments. It should check whether content of the two files is same or not. If they are same, second file should be deleted. 11. If a number is input through the keyboard, WASS to calculate sum of its digits. 12. Write a Shell Script which takes a command line argument of Kms and by default converts that number into meters. Also provide options to convert km to dm and km to cm. 13. Write a Shell Script using for loop, which displays the message "Welcome to the UNIX System" 14. Write a Shell Script to change the filename of all files in a directory from lower-case to upper-case. 15. Write a Shell Script that examines each file in the current directory. Files whose names end in **old** are moved to a directory named **old files** and files whose names end in **.c** are moved to directory named **cprograms.** 16. Write a Shell Script which searches all files in the given directory (to be taken as command line argument) for the file having the title (to be taken as command line argument), as the first line in the file. a) Display the contents of the searched file. b) In the end, printthe the file is ###, where ### is small-sized if total no. of lines is <50 ### is medium-sized if total no. of lines between 50&100 ### is large-sized. 17. Write a shell script which reports names and sizes of all files in a directory (directory would be supplied as an argument to the shell script) whose size is exceeding 1000 bytes. The filenames should be printed in descending order of their sizes. The total number of such files should also be reported. 18. Write a shell script to calculate and print the first ***m*** Fibonacci numbers. 19. Write a shell script to compute the **GCD** and **LCM** of two numbers. 20. Write a shell script to generate all combinations of 1, 2 and 3 using for loop.		

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6:Evaluation

Text Books

1. **"** Unix Concepts and application" Das Sumitabha Tata Mcgraw Hill

Reference Books

1. **"**Unix Programming Environment" The Kernighan and Pike Prentice – Hall of India

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, A- Attendance, LR – Lab Record, V – Viva, PR- Performance, EE- External Exam

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	**1**	--	**1**	--	--	--	--	--	--	--	--	--	**1**	--	--
CO2	**1**	--	**1**	--	--	--	--	--	--	--	--	--	**1**	--	--
CO3	**1**	--	**1**	--	--	--	--	--	--	--	--	--	**1**	--	--

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DIFT2301	OBJECT ORIENTED PROGRAMMING	L	T	P	C
Version 2023.1	Date of Approval	3	0	0	3
Pre-requisites/Exposure	Hands on knowledge of C Programming				
Co-requisites	Basic concepts of C Programming				

Catalog Description

This course is aimed at developing Programming skills using Object Oriented Technology in C++. This purpose of this subject is to improve the programming approach and development of software using OOPS technology. The Subject involves various concepts of Object Oriented Programming such as Classes, Objects, Polymorphism, Inheritance, Exception Handling etc. needed for a better approach towards software development.

Course Objectives

The objective of this course is

1. Perform object oriented programming to develop solutions to problems demonstrating usage of control structures, modularity, I/O. and other standard language constructs.
2. Demonstrate the application of object oriented programming in developing solutions to problems demonstrating usage of data abstraction, encapsulation, and inheritance.
3. Demonstrate ability to implement one or more patterns involving realization of an abstract interface and utilization of polymorphism in the solution of problems which can take advantage of dynamic dispatching, syntax and features.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain the basic principles of object oriented programming approach; Differentiate it with procedural programming approach and also discuss difference between C and C++.

CO 2: Illustrate the different ways to define a member function inline and explain how the private members of a class can be accessed .Explain how the objects can be instantiated and destroyed with static data member.

CO 3: Explain the concept of inheritance, types and implementation with suitable examples; find out ambiguity problem in inheritance ; use the concept of overriding and constructors in inheritance.

CO 4: Explain polymorphism in detail and implement the concept of overloading in functions as well as in operators. Write the programs for virtual function and pointer with objects.

CO 5: Demonstrate the exception handling mechanism. Compare and contrast various formatted and unformatted i/o function in file handling.

Modules	Blooms level*	Number of hours
Module I: Overview of C++ What is Object Oriented Programming, Characteristics of OOP, Difference between C and C++. Basics:-Input/Output in C++ using cin/cout, Preprocessor Directives, Data Types-Integer, Float, character, Enumerations, library functions, comments, storage classes, manipulators, operators in C++, scope resolution operator , memory management operator. arrays and strings .	L1 and L2	5
Module II: Classes and objects	L1, L2 and L3	7

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Functions: Simple functions, passing arguments to functions, returning values from functions, reference arguments, returning by reference, Overloaded functions, Inline functions, friend function , Structures and class. Classes and objects: A simple class, C++ objects as physical objects, objects as function arguments, returning objects from functions, static class data, array as class data member, array of objects.		
Module III: Inheritance Inheritance, Types of Inheritance, access modes – public, private & protected, Abstract Classes, Ambiguity resolution using scope resolution operator and Virtual base class, Constructors, Types of constructors, Destructors.	L2, L3 and L4	8
Module IV: Polymorphism Polymorphism, Type of Polymorphism – Compile time and runtime, Function Overloading, Operator Overloading (Unary and Binary) Polymorphism by parameter, Pointer to objects, this pointer, Virtual Functions, pure virtual functions	L2, L3 and L4	8
Module V: Files and Exception Handling and I/O Files and Streams: streams, string I/O, character I/O, file pointer, error handling, command line arguments. formatted and Unformatted Input output, Introduction of Exception handling, Try Catch block, Rethrowing an Exception.	L2, L3 and L4	8

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text

- Programming with C++, Ravi Chandran, TMH Publisher.
- Object Oriented Programming with C++, E Balagurusamy, Tata Mc Graw Hill
- Programming in C++, John R Hubbard, SCHAUM's series.

References:

- The complete reference C++, Herbert Schildt, TMH Publisher.

Turbo C++, Robert Lafore, Galgotia Publications.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/ Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS O 1**	**PS O 2**	**PS O 3**
CO 1	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**
CO 2	**1**	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**
CO 3	**1**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**
CO 4	**1**	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**
CO 5	**1**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**

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DIFT2302	OBJECT ORIENTED PROGRAMMING LAB	L	T	P	C
Version 2023.1	Date of Approval:	0	0	2	1
Pre-requisites/Exposure	Hands on knowledge of C Programming				
Co-requisites	Basic concepts of C Programming				

Catalog Description

In this Lab course the object oriented programming using C++ is are implemented and demonstrated. Concepts covered would enable them to create complex applications related to object oriented programming. The objective of this course is to explore and implement the various features of OOP such as inheritance, polymorphism, Exceptional handling using programming language C++.

Course Objectives

The objective of this course is to

1. Perform object oriented programming to develop solutions to problems demonstrating usage of control structures, modularity, I/O. and other standard language constructs.
2. Demonstrate the application of object oriented programming in developing solutions to problems demonstrating usage of data abstraction, encapsulation, and inheritance.
3. Demonstrate ability to implement one or more patterns involving realization of an abstract interface and utilization of polymorphism in the solution of problems which can take advantage of dynamic dispatching, syntax and features.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Demonstrate the basic programming structure of C++ program;

CO 2:Illustrate the different ways to write a program for member function inline and explain how the private members of a class can be accessed .Demonstrate how the objects can be instantiated and destroyed with static data member?

CO 3:Demonstrate the concept of inheritance, types and implementation with suitable examples; find out ambiguity problem in inheritance ; use the concept of overriding and constructors in inheritance.

CO 4: Demonstrate polymorphism in detail and implement the concept of overloading in functions as well as in operators. Write the programs for virtual function and pointer with objects.

CO 5: Demonstrate the exception handling mechanism. Compare and contrast various formatted and unformatted i/o function in file handling.

Modules/Topics Covered**	Blooms level*	Number of hours
1. Sample Programs for basic structure of program in C++ using Cout and Cin. a) WAP to print Fibonacci series of 'n' numbers, where n is given by the programmer. b) WAP to read a set of numbers in an array and to find the largest of them. c) WAP to sort a list of names in ascending order. d) WAP to sort an array of integers using functions. e) WAP to exchange contents of two variables using call by value and call by reference.	L3, L5	6
2. Sample Programs using concept of class and object.	L3, L5	4

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(a) WAP to maintain the student record which contains Roll number, Name, Marks1, Marks2,Marks3 as data member and getdata(), display() and setdata() as member functions. (b) WAP to add two complex numbers using friend function. (c) Write a program to exchange values between two classes using friend function. (d) Calculate area of different geometrical figures (circle, rectangle, square, triangle) using function overloading. (e) Create a class Complex for performing all arithmetic operations with complex numbers using inline function. (f) Write a class bank, containing data member: Name of Depositor, A/c type, Type of A/c, Balance amount. Member function: To assign initial value, To deposit an amount, to withdraw an amount after checking the balance (which should be greater than Rs. 500), To display name & balance.		
3. Sample Programs using inheritance. (a) Declare a class of vehicle. Derived classes are two-wheeler, three-wheeler & four-wheeler. Display the properties of each type of vehicle using member functions of classes. (b) Create two classes namely Employee and Qualification. Using multiple inheritance derive two classes Scientist and Manager. Take suitable attributes & operations. WAP to implement this class hierarchy. (c) Consider an example of book shop which sells books and video tapes. These two classes are inherited from base class called media. The media class has command data members such as title and publication. The Book class has data members for storing number of pages in a book and tape class has playing time in a tape. Each class will have member functions such as read() and show().In the base class ,these members have to be defined as virtual functions. Write a program to model the class hierarchy for book shop and process objects of these classes using pointers to base class.	L3, L5	6
4. Sample Programs using concepts of polymorphism. operator overloading (a) Write a program to Subtract two Complex numbers using operator overloading. (b) Write a program to add and multiply two time values by overloading + and * operators respectively. (c) Write a class string to compare two strings, overload (= =) operator. (d) Write a program to compare age of two persons using this pointer. (e) write a program to implement the concept of pointer to object and pointer to derived class.	L3, L5	5
5. Sample Programs using exception handling and file handling. (a) Demonstrate the concept of exception handling for simple try catch block and multiple catch. (b) Write the programs using file handling.	L3, L5	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Text

- Programming with C++, Ravi Chandran, TMH Publisher.
- Object Oriented Programming with C++, E Balagurusamy, Tata Mc Graw Hill
- Programming in C++, John R Hubbard, SCHAUM's series.

References:

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	**70**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE- External Exam

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**2**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**--**
CO2	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**
CO3	**2**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**
CO4	**1**	**3**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**--**
CO5	**1**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**

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SIFT2301	ROBOTIC PROCESS AUTOMATION	L	T	P	C
Version 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Basic Networking Concepts				
Co-requisites	Nil				

Catalog Description

This course aims at providing knowledge of basic concepts of Robotic Process Automation to University students. It further builds on these concepts and introduces key RPA Design and Development strategies and methodologies specifically in context of UiPath products. The student undergoing the course shall develop the competence to design and develop a robot for a defined process.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of robotic process automation
2. Provide an overview of designing with uipath software.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain key terms and trends around the robotic process automation along with its physical and logical design

CO2: Understand the potential and value of the robotic process automation.

CO3: Describe the technologies used for the robotic process automation and mobile devices, including (passive and active) sensors, the physical communications layer, communications protocols, programming frameworks,

CO4: Design programs and have hands on experience on uipath software

CO5: Develop RPA programs of moderate complexity for a well-used robotic automation process using uipath.

Modules	Blooms level*	Number of hours
Module 1: Programming Basic and Recap **Programming Concepts Basics I -** Understanding the application, Basic Web Concepts, Protocols, Email Clients, Data Structures, Data Tables, Algorithms, Software Processes, Software Design, SDLC. **Programming Concepts Basics 2-** Scripting, Net Framework, Net Fundamentals, XML, Control structures and functions, XML, HTML, CSS, Variables & Arguments.	L1, L2	8
Module II: RPA Concepts **RPA Basics -** History of Automation, what is RPA, RPA vs Automation, Processes & Flowcharts, Programming Constructs in RPA, What Processes can be Automated, Types of Bots, Workloads which can be automated. **RPA Advanced Concepts -** Standardization of processes, RPA Development methodologies, Difference from SDLC, Robotic control flow architecture, RPA business case, RPA Team, Process Design Document/Solution Design Document, Industries best suited for RPA, Risks & Challenges with RPA, RPA, and emerging ecosystem	L2, L3 and L4	8
Module III: UiPath Introduction & Basics	L2, L3 and L4	8

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Introduction to UiPath- Installing UiPath Studio community edition, The User Interface, Keyboard Shortcuts, About Updating, About Automation Projects, Introduction to Automation Debugging, Managing Activation Packages, Reusing Automations Library, Installing the Chrome Extension, Installing the Firefox Extension, Connecting your project to a source control system, Activities Guide. **Variables**, **Control Flow** **Data Manipulation-** Data Manipulation Introduction, Scalar variables, collections and Tables, Text Manipulation, Data Manipulation, Gathering and Assembling Data. **Recording and Advanced UI Interaction -** Recording Introduction, Basic and Desktop Recording, Web Recording, Input/Output Methods, Screen Scraping, Data Scraping, Scraping advanced techniques. Selectors.		
Module IV: **UiPath Advanced Automation concepts and techniques** Image, Text & Advanced Citrix Automation- Introduction to Image & Text Automation, Image based automation, Keyboard based automation, Information Retrieval, Advanced Citrix Automation challenges, Best Practices, using tab for Images, Starting Apps. Excel Data Tables & PDF - Data Tables in RPA, Excel and Data Table basics, Data Manipulation in excel, Extracting Data from PDF, extracting a single piece of data, Anchors, Using anchors in PDF. Email Automation- Email Automation, Incoming Email automation, Sending Email automation	L2, L3 and L4	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books
"Learning Robotic Process Automation" By Alok Mani Tripathi,Packt Publications,Ist Edition,2018

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	--	--	**3**	--	--	--	--	--	--	**2**	--	**1**	**1**	-	-
CO2	**1**	--	**1**	**2**	--	--	--	--	--	--	--	--	-	**1**	-	-
CO3	**1**	--	**1**	**2**	--	--	--	--	--	--	--	--	-	**1**	-	**2**
CO4	**1**	--	--	**2**	--	--	--	--	--	--	--	--	**1**	**1**	-	**2**

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SEMESTER-IV

DIFT2451	INTRODUCTION TO DATABASE MANAGEMENT SYSTEM	L	T	P	C
Version 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course is to expose the students to the fundamentals & basic concepts in Data Base Management Systems. This course discusses architecture of Database Systems with concept of relational model & ER model. This course explains techniques for database design, Normalization and database recovery and protection.

Course Objectives

This objectives of the course is to expose the students to

1. The fundamentals & basic concepts in Data Base Management Systems.
2. Architecture of Database Systems with concept of relational model & ER model.
3. The techniques for database design, Normalization and database recovery and protection.

Course Outcomes

After completing the course, the student will be able to:

CO1: Define and list the basic terminologies used in database
CO2: Explain and describe the relational model and relational algebra
CO3: Apply and construct the concepts used in modelling
CO4: Compare and illustrate different concurrency control protocols
CO5: Design the ER Model and SQL queries
CO6: Assess and interpret different issues associated with database systems

Modules	Blooms level*	Number of hours
MODULE 1: **Introduction to DBMS** Definition of DBMS, Data Independence, DBMS Architecture, Levels, Database Administrator, File System Approach Vs DBMS Approach, Advantages of Using a DBMS, Data Models, Schemas, and Instances.	L1, L2	8
MODULE 2: **Relational Database & ER Model** Relational System, Codd's Rule, Relational Model, Optimization, Tables and Views, Entity, Types of Entity, Weak Entity Attributes, Entity sets, Entity – Relationship Diagrams.	L1, L2, L3	7

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MODULE 3: **Relational Model Objects** Domains and Relations, Relations and predicates, Relational Data Integrity; Primary Key, Candidate Key, Foreign Key and their rules; Relational operators, Relational Algebra, Relational Calculus, SQL Language, Data definition, Data retrieval and update operations.	L1, L2, L3	8
MODULE 4: **Database Design** Definition Of Functional Dependencies, Process Of Normalization, First Normal Form, Second Normal Form, Third Normal Form. Boycee Codd Normal Form, Fourth Normal Form, Fifth Normal Form.	L3, L4	5
MODULE 5: **Data Recovery & Protection** Transaction ACID Properties ,Recovery- Transaction recovery, System recovery, Media Recovery, Concurrency Control Techniques Lost Update Problem , Dirty Read Problem, Locking, Dead Lock, Serializability; Security- Introduction.	L3, L4, L5, L6	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Elmasari, Navathe, "Fundamentals of Database Systems", Addision Wesley.
2. Korth, Silbertz, Sudarshan, "Database Concepts". McGraw Hill.

Reference Books

1. Majumdar & Bhattacharya, "Database Management System", Tata McGraw Hill.
2. Date C J." An Introduction to Database Systems", Addision Wesley.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**1**	--	--	--	--	--	--	--	--	--	--	--	**1**	--	--
CO2	**1**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	--	--
CO3	**1**	**1**	**1**	**1**	--	--	--	--	--	--	--	--	**1**	--	--
CO4	**1**	--	--	**1**	--	--	--	--	--	--	--	--	**1**	--	--
CO5	**1**	**1**	**1**	**1**	**1**	--	--	--	--	--	--	--	**1**	--	--
CO6	**1**	-	-	-	**1**	--	--	--	--	--	--	--	**1**	--	--

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DIFT2401	DESIGN & ANALYSIS OF ALGORITHM	L	T	P	C
Version 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Basic knowledge of Data Structure				
Co-requisites	Nil				

Catalog Description

The designing of algorithm is an important component of computer science. The objective of this course is to make students aware of various techniques used to evaluate the efficiency of a particular algorithm. Students eventually should learn to design efficient algorithm for a particular problem.

Course Objectives

The objective of this course is to

1. Analyze the asymptotic performance of algorithms.
2. Demonstrate a familiarity with major algorithms and data structures.
3. Apply important algorithmic design paradigms and methods of analysis.
4. Synthesize efficient algorithms in technical design situations.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain use of asymptotic notations and principles of Divide and Conquer algorithms and solve various problems using that strategy.

CO2: Explain principles of Greedy Algorithms and Dynamic Programming and apply the strategy to solve various problems.

CO3: Explain basic concepts of graphs and apply various design strategies to solve graph related problems.

CO4: Apply the various algorithms in different areas of Computer Science.

Modules	Blooms level*	Number of hours
Module I: Introduction Algorithm Design paradigms - motivation, concept of algorithmic efficiency, concept of running time, analysis of algorithms, Growth of Functions, Asymptotic Notations, Structure of divide-and-conquer algorithms, analysis of divide-and-conquer algorithms, example algorithms - Quick Sort, Merge Sort, Strassen Multiplication, Recurrences- Substitution Method, Recursion Tree Method, Iteration Method , Master's Method.	L1, L2 and L3	8
Module II: Advanced Design Techniques Greedy Algorithms - Introduction, elements of greedy strategy, Fractional Knapsack Problem, activity selection problem, Dynamic Programming - Overview, difference between dynamic programming and divide and conquer, Matrix Chain Multiplication, Longest Common Sub-sequence, 0/1 - Knapsack Problem. Difference between Greedy and Dynamic Programming Approach.	L2, L3 and L4	10
Module III: Graph Algorithms	L2, L3 and L4	10

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Representation of Graphs, Graph Traversal - BFS and DFS, Topological Sort, Strongly Connected Components. Minimum Spanning Tree, Kruskal's Algorithm, Prim's Algorithm, , Single Source Shortest Paths, Dijkstra's Algorithm, Bellmanford Algorithm, All Pair Shortest Path Problem, Floyd Warshall's Algorithm.		
Module IV: Selected Topics Back tracking - Introduction, n-Queens Problem, NP-Completeness – Definition and examples of Class P, NP, NP-Hard and NP Complete, Polynomial reduction. Approximation Algorithms – Introduction, Performance Bounds, Example Problems – Vertex Cover Problem, Travelling Salesperson Problem. Randomized Algorithms. Application of algorithms in different areas of Computer Science.	L2, L3 and L4	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evallllluation

Text Books

1. T. H. Cormen, Leiserson, Rivest and Stein, "Introduction of Computer algorithm"
2. E. Horowitz, S. Sahni, and S. Rajsekaran, "Funadmentals of Computer Algorithms," Galgotia Publication

Reference Books

1. Sara Basse, A. V. Gelder, "Computer Algorithms," Addison Wesley
2. J.E Hopcroft, J.D Ullman, "Design and analysis of algorithms"., Addison Wesley
3. D. E. Knuth, " The art of Computer Program, Addison Wesley

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**
CO2	**1**	**--**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**
CO3	**1**	**2**	**3**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**
CO4	**1**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**
CO5	**1**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**--**

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DIFT2402	DESIGN & ANALYSIS OF ALGORITHM LAB	L	T	P	C
Version 2023.1	Date of Approval:	0	0	2	1
Pre-requisites/Exposure	C Programming				
Co-requisites	Basic knowledge of Data Structure				

Catalog Description

This course is intended to implement the various algorithm strategies for solving the problems using programming language.

Course Objectives

The objective of this course is to

1. equip the students with implementation of various algorithms.
2. provide sound foundation of design strategies for problem solving.
3. measure and compare the performance of different algorithms.

Course Outcomes

On completion of this course, the students will be able to

CO1: Implement the concept of Divide and Conquer algorithms to solve various problems.
CO2: Demonstrate the use of Greedy Algorithms to solve various problems.
CO3: Apply the principle of Dynamic Programming to solve various problems.
CO4: Apply various design strategies to solve graph related problems.

Modules	Blooms level*	Number of hours
1. Programs on sorting algorithms using Divide and Conquer technique. • To implement Merge Sort. • To implement Quick Sort.	L1,L3	2
2. Programs on algorithm based on Greedy Method. • Implement Fractional knapsack. • Demonstrate the Activity Selection Problem.	L1,L3	4
3. Programs on algorithm based on Dynamic programming. • Implement 0/1 Knapsack problem. • Compute the minimum number of multiplication for given set of matrices using Matrix Chain Multiplication. • Compute the length of longest common subsequence for given sequences using LCS.	L1,L3	6
4. Programs on Graph Algorithms. • Print all the nodes reachable from a given starting node in a digraph using BFS method. • Check whether a given graph is connected or not using DFS Method. • Find minimum spanning tree of a given graph using Prim's algorithm. • Find minimum spanning tree of a given graph using Kruskal's algorithm.	L1,L3	10

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• Implement Single Source Shortest Path problem using Dijkstra's algorithm.		

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. T. H. Cormen, Leiserson, Rivest and Stein, "Introduction of Computer algorithm"
2. E. Horowitz, S. Sahni, and S. Rajsekaran, "Funadmentals of Computer Algorithms," Galgotia Publication.

Reference Books

1. Sara Basse, A. V. Gelder, "Computer Algorithms," Addison Wesley
2. J.E Hopcroft, J.D Ullman, "Design and analysis of algorithms"., Addison Wesley
3. D. E. Knuth, " The art of Computer Program, Addison Wesley

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**1**	--	**1**	--	--	--	--	--	--	--	--	--	**1**	--	--
CO2	**1**	--	**1**	--	--	--	--	--	--	--	--	--	**1**	--	--
CO3	**1**	--	**1**	--	--	--	--	--	--	--	--	--	**1**	--	--
CO4	**1**	--	**1**	--	--	--	--	--	--	--	--	--	**1**	--	--

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DIFT2452	INTRODUCTION TO DATABASE MANAGEMENT SYSTEM LAB	L	T	P	C
Version 2023.1	Date of Approval:	0	0	2	1
Pre-requisites/Exposure	Basic Concepts of DBMS				
Co-requisites	Relational Algebra and Relational Calculus				

Catalog Description

This course is design to get students familiar with the basic concepts of SQL including DDL, DML and DCL statements. The course also explains the basic concepts of PL/SQL. Students will learn practical on Oracle software and hence can work on any RDBMS software.

Course Objectives

The objective of this course is

1. To make students familiar with the concepts and working of SQL.
2. Provide an overview of PL/SQL.

Course Outcomes

On completion of this course, the students will be able to

CO1. Illustrate SQL basic concepts like languages DDL, DML etc., data types and working.
CO2. Explain concepts of database creation, manipulation of data and data retrieval and apply them in real database applications.
CO3. Design and implement various data constraints on a database for a given problem.
CO4. Solve queries using concepts like joins, subqueries, aggregate functions, triggers etc.
CO5. Prepare PL/SQL blocks.

Modules	Blooms level*	Number of hours
Lab Session 1 Introduction of RDBMS, Oracle, SQL and data types.	L1 and L2	2
Lab Session 2 Basic concept of database creation and manipulation of data.	L1and L3	2
Lab Session 3 Working with SELECT query.	L1 and L3	2
Lab Session 4 To apply data constraints on a table-Primary Key, Not Null, Unique.	L1 and L3	2
Lab Session 5 Working with Foreign Key and Check Constraint.	L1 and L3	2
Lab Session 6 To implement the basic concept of Aggregate and Grouping Functions.	L1 and L3	2
Lab Session 7 To apply various set operators on data.	L1 and L3	2
Lab Session 8 Concept of Nested queries in database and its application in database.	L1 and L3	2
Lab Session 9 Implementation different types of JOINS in database.	L1 and L3	2

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Lab Session 10 Basic concepts of Triggers and Procedures and related queries.	L1 and L3	2
Lab Session 11 Introduction to PL/SQL and basic syntax.	L1 and L3	2
Lab Session 12 Write programs in PL/SQL Using Control Structures.	L3	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Ivan Bayross , "SQL, PL/SQL the Programming Language of Oracle", 4th Ed., BPB Publications,2009.
2. Lynn Beighley, "Head First SQL", 1st Ed., O'Reilly, 2007.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**-**
CO2	**1**	**-**	**2**	**--**	**--**	**3**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**--**	**2**
CO3	**1**	**-**	**1**	**--**	**--**	**3**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**--**	**2**
CO4	**1**	**-**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**2**
CO5	**1**	**-**	**2**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**--**	**--**	**1**	**--**	**--**

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NETWORK DESIGN AND MANAGEMENT

Course Code: SIFT2401 **Credit Units: 03**

Course Contents:

Module I: Network Devices & Hardware
Introduction to Computer components- CPU, Motherboard types, NIC, RAM categories, storage devices, IOS and CMOS, boot process, Installation, configuration and troubleshooting of system components.
Introduction to Network hardware- Workstation, printer, Server, UPS. Cable types, Networking devices and their role- Hub, repeater, amplifier, bridge, switch, router, gateway, firewall, multiplexer, demultiplexer, modem, wireless Access Point.

MODULE 2:
Goals and applications of networks, Categories of networks,
Organization of the Internet, ISP, Network structure and architecture (layering principles, services, protocols and standards), The OSI reference model, TCP/IP protocol suite, Network devices and components.

Module 3: Configuring and Troubleshooting
Configuring CISCO devices –IOS basics, applying a Basic Configuration using CISCO IOS, Verifying Connectivity; Common symptoms and problems with hardware. Isolating problems using error codes, POST audible/visual codes. Troubleshooting procedures, Troubleshooting commands for IOS.

Module 4: Security and Troubleshooting
Security Fundamentals: WLAN vulnerabilities, WLAN threats, Basic WLAN Security Technologies: Wired equivalent privacy (WEP), Authentication and association; Wi-FiProtected Access (WPA), Cisco Wireless LAN Security, Modes of unauthorized access in WLAN, Security measures to prevent unauthorized access in WLAN, Configuring BasicWLAN Security, Using VPNs; Other Enterprise Security Services: VLANs, Spanningtree, General Approach to Preparing for network failure,Network and fault management

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

REFERENCES:
1. Data Communications and Networking by Behrouz Forouzan, 3e, Tata McGraw-Hill
2. Computer Networks by Andrews S. Tanenbaum, 4e, Pearson Education.
3. Computer Networking for LANS to WANS: Hardware, Software and Security by Kenneth C. Mansfield, Jr., James L.

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SEMESTER-V

DIFT2551	DATA COMMUNICATION AND COMPUTER NETWORKS	L	T	P	C
Version 2023.1	Date of Approval:	3	0	-	3
Pre-requisites/Exposure	Basics of Computers				
Co-requisites					

Catalog Description

The goal is to acquaint the students with the basics of data communication and networking. A structured approach to explain how networks work from the inside out is being covered. The physical layer of networking, computer hardware and transmission systems have been explained. In-depth includes routing process, error detection techniques, noisy protocols and various applications of layers of OSI model.

Course Objectives

The objective of this course is to

1. To provide an overview of data communication and computer networks, network specific protocols, networking devices, OSI /TCP-IP Layer concepts.
2. To serve as a foundation for the study of advanced networking concepts.

Course Outcomes

On completion of this course, the students will be able to

CO1. State the functions of data component in communication, networking devices, characteristics of topologies and describe the functionality of layers in OSI model.
CO2. Explain parallel and serial transmission; Differentiate between periodic and aperiodic signals including data encoding techniques.
CO3. Illustrate the working and applications of guided and unguided media. Explain working of ISDN.
CO4. Explain flow control and error control protocols.
CO5. Compare and Contrast different routing algorithms; discuss the frame format of IPv4 and IPv6 with working of TCP protocol.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Data Communication, Networks-protocols, advantages, disadvantages & applications, Line Configuration, topology, Transmission mode, Classification of networks. OSI Model, functionality of layers in OSI model, Protocols at each layer, encapsulation, peer-to-peer communication.	L1, L2	8
MODULE 2: Parallel & Serial Transmissions, Analog & Digital Signals, Periodic & Aperiodic Signals, Data encoding techniques-Digital data-digital signals, Digital data-Analog signals, Analog data- Digital signals, Analog data-Analog signals, Multiplexing.	L2, L3 and L4	8
MODULE 3: Transmission Media-Twisted Pair Cable, Coaxial Cable, Fiber-Optics Cable, Radio frequency Allocation, Terrestrial Microwave, Infrared rays, Satellite Communication, Cellular Telephony. Introduction to ISDN.	L3 and L4	6

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MODULE 4: Framing, Switching, Types of Errors, Error Detection & Correction (VRC, LRC, CRC, Checksum, Hamming Code), Flow Control (Stop-and-wait & Sliding Window), Error Control (Stop & Wait ARQ, Sliding Window ARQ using Go-back n method and Selective-Reject), IEEE Standards-802.3, Token Bus (802.4), Token Ring (802.5), FDDI.	L2, L3 and L4	6
MODULE 5: Routing process, Routing Algorithms-Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Addressing-IPv4, IPv6, Internetworking, Connection–oriented Vs Connectionless protocols-TCP,UDP.	L2, L3 and L4	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Data Communication and Networking by Behrouz Forouzan,Fourth Edition,TMH.
2. Computer Networks by A.S. Tanenbaum, Fifth Edition, Prentice Hall.

References Books

1. Data and Computer Communications by W. Stallings, Prentice Hall.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**
CO2	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**
CO3	**1**	**1**	**2**	**3**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**
CO4	**1**	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**
CO5	**1**	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**

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DIFT2552	DATA COMMUNICATION AND COMPUTER NETWORKS LAB	L	T	P	C
Version 2023.1	Date of Approval :	-	-	2	1
Pre-requisites/Exposure	Basics of CISCO router				
Co-requisites	NIL				

Catalog Description

The course familiarizes with the equipment applications and protocols installed in enterprise networks, with a focus on switched networks, IP Telephony requirements, and security. It also introduces advanced routing protocols such as Enhanced Interior Gateway Routing Protocol (EIGRP) and Open Shortest Path First (OSPF) Protocol. Hands-on exercises include configuration, installation, and troubleshooting.

Course Objectives

The objective of this course is to

1. Make the students understand configuration of routing protocols.
2. Provide a demonstration of troubleshooting of different protocols.

Course Outcomes

On completion of this course, the students will be able to

CO1. Apply the knowledge of CISCO router to understand its basic configuration, Enterprise network and implement inter -VLAN routing.
CO2. Demonstrate the configuration of OSPF and RIP protocol.
CO3. Demonstrate the configuration of EIGRP and BGP protocol.
CO4. Apply the knowledge of basic WAN connections using HDLC and PPP protocol.
CO5. Demonstrate the standard and extended ACL on router.

Modules	Blooms level*	Number of hours
1. Drawing an Enterprise Network for Amity University showing its different campuses across the country. 2. Configuring all the devices (PCs, Servers, Switches) to create a LAN within campuses of the Enterprise Network. 3. Configuring Virtual LANs (VLANs) in an Enterprise Network. 4. Configuring Trunking and Inter-VLAN Routing in an Enterprise Network.	L3, L5	4
5.Implementing RIP (Routing Information Protocol) to enable communication between different LANs. 6. Implementing OSPF (Open Shortest Path First) to enable communication between different LANs. .	L3, L5	2

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7.Implement EIGRP (Interior Routing Protocol) to establish connectivity within domestic campuses of the Enterprise Network. **8.** Implement BGP (Border Gateway Protocol) and Redistribution to establish connectivity between different campuses of the Enterprise Network.	L3, L5	2
9. Configuring WAN connectivity using protocols-HDLC and PPP. 10. Implementing Frame-Relay to configure WAN service provider cloud.	L3, L5	2
11. Configuring Standard and Extended ACLs on a Router. **12.** Troubleshooting Switching, Routing and ACL issues.	L3, L5	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Data Communication and Networking by Behrouz Forouzan,Fourth Edition,TMH.
2. Computer Networks by A.S. Tanenbaum, Fifth Edition, Prentice Hall.

References Books

1. Data and Computer Communications by W. Stallings, Prentice Hall.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.
Software : Packet tracer.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**
CO2	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**
CO3	**1**	**1**	**2**	**3**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**
CO4	**1**	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**
CO5	**1**	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**

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DIFT2501	SOFTWARE ENGINEERING	L	T	P	C
Version 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The purpose of this course is to acquaint students with the concepts and methods available for software development in industrial environments. Students will be exposed to a variety of topics such as design notations, costing techniques, and testing methods, as well as to the tools, which are available to support software specification, design, testing, and maintenance.

Course Objectives

The objective of this course is to

1. Have knowledge of basic SW engineering methods and practices, and their appropriate application.
2. Describe software engineering layered technology and Process framework.
3. give a general understanding of software process models such as the waterfall and evolutionary models.
4. Understanding of the role of project management including planning, scheduling, risk management, etc.
5. Understanding on quality control and how to ensure good quality software.

Course Outcomes

On completion of this course, the students will have

CO1. Basic knowledge and understanding of the analysis and design of complex systems.
CO 2. Ability to apply software engineering principles and techniques.
CO 3. Ability to develop, maintain and evaluate large-scale software systems.
CO 4. Knowledge to produce efficient, reliable, robust and cost-effective software solutions.
CO 5. Ability to work as an effective member or leader of software engineering teams.

Modules	Blooms level*	Number of hours
MODULE 1: Software Development Life Cycle Evolution of Software Engineering, Software Problems, Issues Involved in Software Engineering, Fundamental Qualities of a Software Product, Approaches to Software Engineering, Planning the development Process, Development/Product Life-Cycle Model, Kinds of Software Life-Cycle Model	L1, L2 and L3	8
MODULE 2: Project Management Project Management Concepts, Project Management Activities, Size Metrics. Software Requirement analysis and Specification, Cost Models.	L2, L3 and L6	10
MODULE 3: System Design Design Objectives, Design Principles, Effective Modular Design (Functional Independence, Coupling, and Cohesion), Design Tools and Techniques, Prototyping, Structured Programming.	L1, L3 and L4	10

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MODULE 4: Coding Programming Practices, Verification, Monitoring and Control.	L1, L3 and L4	10
MODULE 5: Software Testing Testing Fundamentals, Test case design, Functional Testing, Structural Testing, Test Plan, Activities during testing, Unit System, Integration Testing, Software Maintenance.	L3, L4 and L6	10
MODULE 6: Software Reliability Concept of Software Reliability, Software Repair and Availability, Software Errors, Failure and Faults.	L3,L4,L6	05

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. F Software Engineering, A Practitioner's Approach - Roger S. Pressman. Tata Mc Graw Hill.

Reference Books

1. U · An Integrated Approach to Software Engineering, Pankaj Jalote., Narosa Publishing House
2. Software Engineering Concepts, Richard Fairley, Tata Mc Graw Hill

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**
CO2	**1**	**--**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**--**
CO3	**1**	**2**	**3**	**3**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**
CO4	**1**	**1**	**2**	**--**	**--**	**--2**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**
CO5	**1**	**1**	**2**	**--**	**-2-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**-**	**2**

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DIFT2503	WEB TECHNOLOGY	L	T	P	C
Version 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course is aimed to provide a fundamental understanding of web site creation. Hypertext Markup Language (HTML) is the language used for designing most basic web pages (static). The basic and advanced features of HTML including lists, images, hyperlinks, tables, frames and forms will be introduced. It will also provide an overview of Cascading Style Sheets (CSS) and Extensible Markup Language (XML) which can be used with HTML for better data organization and presentation of content on website.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of website design through Hypertext Markup Language and basics of Javascript.
2. Provide an overview of Cascading Style Sheets and Extensible Markup Language for better management of website content.

Course Outcomes

After the completion of course, the students will be able to,

CO 1: Define the purpose and structure of HTML for website development; identify and distinguish various HTML tags for background settings, text-formatting, HTML lists, image insertion and hyperlinks; prepare web page/website content using basic HTML tags and attributes.

CO 2: Describe HTML table, its structure and attributes; Apply table, frameset and frame elements to web-site design.

CO 3: Compare and contrast various form controls; design various kinds of form for user related information and apply front-level validations using Javascript.

CO 4: Differentiate between Inline, Internal and external CSS; modify the website content presentation by incorporating Cascading style sheet properties to existing HTML files.

CO 5: Demonstrate the use of XML document Type Declaration; differentiate between well-formed or Valid XML document.

Modules	Blooms level*	Number of hours
MODULE 1: **INTRODUCTION TO HTML** History of HTML, Structure of HTML, HTML Basic: Elements, Tags and Attributes. Adding Comments, Adding Title, HTML Background: using plain color, using image, Formatting Text : Paragraph, inserting line break, Heading Style, Bold text, Italicized text, Underlined text, Teletype text, Strikeout, Superscript, Subscript, Important text, Emphasized text, Inserted text, Deleted text, Larger text, Smaller text. Working with Text: Changing font Sizes and Colors.	L1, L2 and L3	10

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Creating List: Ordered List, Unordered List, Definition List, Nested List. Inserting image, Creating Hyper Text Links, Creating Image Links, Horizontal Rules, Marquee Tag. Address Tag.		
MODULE 2: **TABLES AND FRAMES** Tables: Creating Tables, Table Element, Adding Border, Adding Column Headings, Cellspacing and Cellpadding, Adding a Caption, Setting the table Width and Height, Add Row Headings, Aligning Cell contents, Setting Column Width, Centering a Table, Inserting Image, Rowspan, Colspan, Assigning Background Colors. Frames: Frameset Element, Frame Element, Noframes Element, Specifying Target,Inline Frames.	L2 and L3	8
MODULE 3: **FORMS AND VALIDATION** Forms: Introduction to Forms, Form Elements, Text Field, Password Field, Label, Check Box, Radio Button, Selection List, Text Area, Button. Front level validations using JavaScript: Checking a Non-empty Text/Password Field, Restricting Length of Text/Password Field.	L4 and L5	8
MODULE 4: **CASCADING STYLE SHEETS** Overview of style sheets, Advantages, Different ways to use style sheet: External style sheet, Internal style sheet, Inline style sheet. Selectors: Element selector, Id selector, Class selector, Grouping selector. Adding style to a Document, Adding Comments in CSS.	L4 and L5	5
MODULE 5: **XML** Introduction to XML, XML Basics, XML Structure, XML Tags, XML Elements, XML Attributes, Adding Comments, XML Document Type Declaration: Internal DTD and External DTD. Well formed XML Documents and Valid XML Document	L3 and L4	5

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Ivan Bayross , "HTML, DHTML, JavaScript, Perl, CGI",4th revised edition, BPB Publication, 2010, New Delhi.
2. Uttam.K.Roy, "Web Technologies", Oxford University Press, 2011, New Delhi.

Reference Books

1. Thomas A. Powell, "HTML & XHTML: The Complete Reference", 4th Edition, Tata McGraw-Hill Publishing Company Limited, 2003, New Delhi.
2. Thomas A. Powell, "HTML & CSS: The Complete Reference", 5th Edition, Tata McGraw-Hill digital, 2010, New Delhi.
3. Heather Williamson , "XML: The Complete Reference", 1st edition, McGraw-Hill Osborne Media, 2001, New Delhi**.**

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

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Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1	2	--	--	--	--	--	--	--	--	--	--	1	--	3
CO2	1	2	3	--	--	--	--	--	--	--	--	--	1	--	3
CO3	1	2	1	3	--	--	--	--	--	--	--	--	1	--	3
CO4	1	1	2	2	3	--	--	--	--	--	--	--	1	--	3
CO5	1	1	2	2	3	--	--	--	--	--	--	--	1	--	3

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DIFT2505	INTERNET OF THINGS	L	T	P	C
Version 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Basic Networking Concepts				
Co-requisites	Nil				

Catalog Description

The Internet is evolving to connect people to physical things and also physical things to other physical things all in real time. It's becoming the Internet of Things (IoT). The course enables student to understand the basics of Internet of things and protocols. It introduces some of the application areas where Internet of Things can be applied. Students will learn about the working of Internet of Things.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of internet-of-things
2. Provide an overview of designing iot devices

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain key terms and trends around the Internet of Things along with its physical and logical design

CO2: Understand the potential and value of the Internet of Things and Smart Services.

CO3: Describe the technologies used for the Internet of Things and mobile devices, including (passive and active) sensors, the physical communications layer, communications protocols, programming frameworks,.

CO4: Design python programs and have hands on experience on python programming

CO5:Develop IoT application of moderate complexity for a well-used mobile platform.using python, raspberry Pi and arduino programming

Modules	Blooms level*	Number of hours
Module I: Introduction to Internet of Things Definition & characteristics of IoT, physical design of IoT-things in IoT, IoT protocols, logical design of IoT- IoT functional block, IoT communication models, IoT communication APIs, IoT enabling technologies-wireless sensor networks, cloud computing, big data analytics, communication protocols, embedded systems,IoT levels and deployment templates, IoT application	L1, L2	8
MODULE 2: IoT and M2M Introduction to M2M , difference between IoT and M2M, SDN (software defined networking) and NFV (Network Function Virtualization) and their applications for IoT.	L2, L3 and L4	8
MODULE 3: IoT system management with NETCONF-YANG Need for IoT systems management, SNMP and its limitations, Network Operator Requirements, Introduction to NETCONF and YANG.	L2, L3 and L4	8
MODULE 4: Developing Internet of Things IoT Design Methodology,Logical design using Python- Python data types & data structures, control flow, functions, modules, packages, classes, file handling, Python packages for IoTJSON, XML,	L2, L3 and L4	12

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HTTPLib, URLLib, SMTPLib, IoT end devices-building blocks, Introduction to Raspberry Pi.		
MODULE 5: Case Studies of IoT Home Automation- Smart Lighting, Home Intrusion Dectection, Cities- Smart Parking	L2, L4	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Internet of Things: A Hands-On Approach by Arshdeep Bahga, Vijay Madisetti.
- Designing the Internet of Things by Adrian McEwen, Hakim Cassimally

Reference Books

- From Machine-to-Machine to the Internet of Things: Introduction to a New Age by Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	--	--	**3**	--	--	--	--	--	--	**2**	--	**1**	**1**	-	-
CO2	**1**	--	**1**	**2**	--	--	--	--	--	--	--	--	-	**1**	-	-
CO3	**1**	--	**1**	**2**	--	--	--	--	--	--	--	--	-	**1**	-	**2**
CO4	**1**	--	--	**2**	--	--	--	--	--	--	--	--	**1**	**1**	-	**2**

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DIFT2506	INTERNET OF THINGS LAB	L	T	P	C
Version 2023.1	Date of Approval:	0	0	2	1
Pre-requisites/Exposure	Raspberry Pi Basics				
Co-requisites	NIL				

Course Objectives

This program aims to train students to be equipped with a solid theoretical foundation, systematic professional knowledge and strong practical skills in the Raspberry Pi and Arduino. The course focuses on higher-level operating systems, advanced networking, user interfaces, multimedia and uses more computing intensive IoT applications as examples using Raspberry Pi running Linux as the platform of choice, while also exposing the student to other comparable platforms like Arduino. After doing this course, students should be able to design and deploy multiple IoT devices that could connect to the gateway.

Modules	Blooms level*	Number of hours
Module 1: : Getting Started with Raspberry Pi Basic functionality of Raspberry Pi B+ board, setting up the board, configuration and use, implications of an operating system on the behaviour of the Raspberry Pi as an IoT device, booting Raspberry Pi 3, Downloading an Operating System, format an SD card and booting the OS. Basics of Linux and its use, main features including navigating the file system and managing processes, text-based user interface through the shell, overview of the graphic user interface for Raspbian Linux distribution	L2 and L3	5
Module 2: Interfacing Hardware with the Raspberry Pi, Raspberry Pi Remote Access, operate the Raspberry Pi in "headless mode", Bash Command line, operating Raspberry Pi without needing a GUI interface Implications of an operating system on the behaviour of the Raspberry Pi, Overview of Linux and its internal command, aptget-update, navigating the file system and managing processes, text-based user interface through the shell, overview of graphical user interface.	L2 and L3	5
Module 3: Basics of the Python programming language, programming on the Raspberry Pi. Python on Raspberry Pi, Python Programming Environment, Python Expressions, Strings, Functions and Function arguments, Lists, List Methods, Control Flow	L2 and L3	4
Module 4: Communication with devices through the pins of the Raspberry Pi, RPi. GPIO library, Python Functions, setting up the pins, General purpose IO Pins, Protocol Pins, GPIO Access, applying digital voltages, and generating Pulse Width Modulated signals, Tkinter Python library, accessing pins through a graphic user interface.	L2and L3	5
Module 5: Making noise: Playing tones, playing a melody, Types of motors DC, Servo, Motor Drivers, Speed and direction control	L2 and L3	5

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Text & References:

Text:

- Simon Monk, "Programming the Raspberry Pi: Getting Started with Python", January 2012, McGraw Hill Professional

References:

- Eben Upton and Gareth Halfacree, "Raspberry Pi User Guide", August 2016, 4th edition, John Wiley & Sons
- Alex Bradbury and Ben Everard, "Learning Python with Raspberry Pi", Feb 2014, John Wiley & Sons

Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	--	1	2	--	--	--	--	--	--	--	--	--	1	--	--	--
CO 2	1	--	2	3	--	--	--	--	--	--	4	--	1	2	--	--
CO 3	--	1	--	--	--	--	--	--	--	2	3	--	-	1	2	--
CO 4	-	1	-	--	2	--	--	--	--	--	--	--	2	1	--	--
CO 5	--	--	1	--	--	--	--	--	2	--	--	--	--	--	--	1

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DIFT2504	WEB TECHNOLOGY LAB	L	T	P	C
Version 2023.1	Date of Approval:	-	-	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course is aimed to provide a fundamental understanding of web site creation. Hypertext Markup Language (HTML) is the language used for designing most basic web pages (static). The basic and advanced features of HTML including lists, images, hyperlinks, tables, frames and forms will be introduced. It will also provide an overview of Cascading Style Sheets (CSS) and Extensible Markup Language (XML) which can be used with HTML for better data organization and presentation of content on website.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of website design through Hypertext Markup Language and basics of Javascript.
2. Provide an overview of Cascading Style Sheets and Extensible Markup Language for better management of website content.

Course Outcomes

After the completion of course, the students will be able to,

CO 1: Prepare web page/website content various HTML elements including tags and attributes for background settings, text-formatting, HTML lists, image insertion and hyperlinks, Moving content across screen.

CO 2: Apply table, frameset and frame elements to web-site design.

CO 3: Construct various kinds of forms to take user related information and apply front-level validations using Javascript.

CO 4: Design and modify the website content presentation by incorporating inline, internal and external Cascading style sheets to existing HTML files.

CO 5: Demonstrate the use of well-formed or Valid XML document.

Modules	Blooms level*	Number of hours
LABORATORY SESSION 1 INTRODUCTION TO HTML 1. Design a webpage to show various tags used for formatting text. 2. Design a webpage to show usage of various heading tags, font tag and background color. 3. Design a webpage to insert image as an inline element and in the background. 4. Design a webpage to show usage of ordered list, unordered list and definition list. 5. Design a webpage to show the use of hyperlink (Text & Image) and image map. 6. Design a webpage to show scrolling text and scrolling image using marquee tag.	L3	6
LABORATORY SESSION 2 TABLES AND FRAMES 1. Design a table using rowspan, colspan, cell padding, cell spacing, grouping, caption and border.	L3	4

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2. Divide a webpage into various frames (row or col wise) and populate them with web content.		
LABORATORY SESSION 3 FORMS AND VALIDATION 1. Create a log-in form/sign-up/feedback/registration form using various elements of form. 2. Write Javascript code to perform basic arithmetic operations, calculate factorial and other such functions using loops, if-else, switch etc. 3. Write javascript code to perform front-end validations (basic and data format validations) on HTML forms. 4. Prepare HTML code to perform form validations using HTML 5.0 elements.	L3	8
LABORATORY SESSION 4 CASCADING STYLE SHEETS 1. Apply Inline Cascading style sheet properties to enhance the appearance and outlook of webpage. 2. Modify the placement and styling of web page content (pictures, hyperlinks, images, videos, lists etc.) using Internal and/or External CSS file.	L3 and L5	4
LABORATORY SESSION 5 XML 1. Create an XML document for saving student details (Name, Enrollment number, Course, CGPA, and Contact No.)	L3	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Ivan Bayross , "HTML, DHTML, JavaScript, Perl, CGI",4th revised edition, BPB Publication, 2010, New Delhi.
2. Uttam.K.Roy, "Web Technologies", Oxford University Press, 2011, New Delhi.

Reference Books

1. Thomas A. Powell, "HTML & XHTML: The Complete Reference", 4th Edition, Tata McGraw-Hill Publishing Company Limited, 2003, New Delhi.
2. Thomas A. Powell, "HTML & CSS: The Complete Reference", 5th Edition, Tata McGraw-Hill digital, 2010, New Delhi.
3. Heather Williamson , "XML: The Complete Reference", 1st edition, McGraw-Hill Osborne Media, 2001, New Delhi.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**3**
CO2	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**3**
CO3	**1**	**2**	**1**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**3**
CO4	**1**	**1**	**2**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**3**
CO5	**1**	**1**	**2**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**3**

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SEMESTER-VI
AI AND EXPERT SYSTEMS

Course Code: DIFT2651 **Credit Units: 03**

Course Contents:

Module-I: INTRODUCTION
Introduction: History, Definition of AI, Emulation of human cognitive process, knowledge search trade off, stored knowledge, semantic nets. An abstract view of modelling, elementary knowledge. Computational logic, analysis of compound statements using simple logic connectives, predicate logic, knowledge organization and manipulation, knowledge acquisition.

Module-II: PROGRAMMING AND LOGICS IN ARTIFICIAL INTELLIGENCE
LISP and other programming languages- introduction to LISP, syntax and numerical function, LISP and PROLOG distinction, input output and local variables, Interaction and recursion, property list and arrays alternative languages, formalized symbolic logicsproperties of WFRS, non-deductive inference methods. Inconsistencies and uncertainties Truth maintenance systems, default reasoning and closed world assumption, Model and temporary logic.

Module-III: SEARCH METHODS AND KNOWLEDGE REPRESENTATION
Fuzzy logic - concepts, Introduction to Fuzzy logic with examples, probabilistic reasoning, Bayesian probabilistic inference, Dempstor Shafer theory, possible world representation, AdHoc methods. Structure knowledge: Graph, frames and related structures, Object oriented representation- object classes, message and methods, simulation examples using OOPS programs, OOP languages. Search and control strategies - Concepts, search problems, uniformed or Blined search, searching AND – OR graphs.

Module-IV: KNOWLEDGE ORGANISATION AND COMMUNICATION IN EXPERT SYSTEMS
Matching techniques- Need for matching, matching problem, partial matching, Fuzzy matching, RETE matching algorithm. Knowledge organization- Indexing and retrieval techniques, integration of knowledge in memory organization systems, Perception, communication and Expert systems. Overview of Linguistics, Basic passim techniques, semantic analysis and representation structures, natural language generation and system.

Module-V: PATTERN RECOGNITION AND LEARNING TECHNIQUES
Pattern recognition system- understanding speech recognition, Image transformation, low level processing, medium and high level processing, vision system architecture, Rule based system architecture, knowledge acquisition and validation, knowledge system building tools, use of AI and ES in manufacturing and design, types of learning- general learning model, performance measures, learning automate genetic algorithm, learning by induction - LEX,ID3,INDUCE systems.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

REFERENCES:

1. **https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SMRA3003.pdf**
2. Finlay J, Dix A. An Introduction to Artificial Intelligence. UCL Press, London. 1996
3. Bowerman RG, Glover DE. Putting Expert Systems into Practice. Van Nostrand Reinhold, New York, 1988

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AI AND EXPERT SYSTEM LAB

Course Code: DIFT2652 **Credit Units: 01**

EXPERIMENT LIST:

1	1)History of AI 2)Study of AI programming languages 3)Comparison between AI programming languages
2	To study basic concepts of prolog 1)Fact 2)Rule 3)Queries 4)Variables 5)Constant 6)List
3	Convert the sentences into Prolog Equivalent and answer the following questions: 1)burger is a food 2)sandwich is a food 3)pizza is a food 4)sandwich is a lunch 5)pizza is a dinner Rules 6)Every food is a meal OR Anything is a meal if it is a food Query 1: Is pizza a food? Query 2: Which food is meal and lunch?
4	Consider the following facts: 1)studies(olivia, csc135). 2)studies(jack, csc131). 3)studies(arthur, csc134). 4)teaches(kirke, csc135). 5)teaches(collins, csc131). 6)teaches(collins, csc171). 7)teaches(juniper, csc134). *Rules professor(X, Y) :- teaches(X, C), studies(Y, C). Query: olivia studies what? Or Who are the students of professor Kirke?
5	Consider the given knowledge. Represent the knowledge into the PROLOG equivalence and answer the question using rules. Joy is father of Jay. Jay is father of Sam. Sam is brother of Sue. Alvin is father of Ali. Sim is mother of Sam. Sis is mother of Alvin. Question: Who are Sue's parent?
6	Write a code to print a message on the screen.
7	Write a code in PROLOG to design a calculator.

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8	Write a code in PROLOG to find the largest number among two numbers.
9	Write a code in PROLOG to find the factorial of a number.
10	Write a code in PROLOG to print the Fibonacci series.
11	Create a list of 10 elements and print Head and Tail. Write a code in prolog to concatenate two strings.
12	Create a list of 10 elements and print Head and Tail.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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DIFT2601	DATA WAREHOUSING AND MINING	L	T	P	C
Version 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Introduction to Database Management System				
Co-requisites	Nil				

Catalog Description

In this course the concepts of Data warehouse and Data Mining are discussed in detail. The different data mining techniques such as clustering, classification, association are introduced. As a precursor to the study of data warehouse its architecture, types of OLAP Servers, and usage of OLAP are studied in detail. The concepts further enhances the concept of different attributes supported by data mining process, application of data mining in marketing,banking,retail sector and other areas are analyzed. .

Course Objectives

The objective of this course is to

1. Equip the students with concepts of data mining techniques namely classification, clustering and association.
2. Provide an overview of data warehouse which include the usage of OLAP ,its characteristics, OLAP architecture.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the concept of Datawarehouse, its characterstics, Metadata concepts and its importance, The schemas of Data warehouse with their application areas.

CO2: Explain the architectural components of data warehouse and the challenges the data warehousing is facing.

CO3: Explain the indexing of OLAP, the different OLAP operations performed on the data cube.

CO4: Explain the concept of Data mining, its application and advantages

CO5: Explain the concept of different data mining techniques like association, clustering and classification. The implement of these techniques on the different data sets.

Modules	Blooms level*	Number of hours
MODULE 1: **Data Warehousing:** Data Warehouse definition & Characteristics, The need for data ware housing, Operational and Informational Data Stores, Difference between Data warehouse and DBMS, Benefits of Data warehousing,Data mart, Meta Data, Conceptual Modeling of Data Warehouses: star schemas, Snowflake, Fact Constellations with example each.	L1 and L2	8
MODULE 2: **Data Warehousing Components& Architecture** Data Warehouse Architecture, Components of Data Warehouse Architecture, Data Warehousing Topologies, Meta Data, Components of Meta data, Mapping Meta Data. Challenges with Data Warehousing.	L2, L3 and L4	8
MODULE 3: **On Line Analytical Processing (OLAP)**	L2 and L3	10

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Definition: OLAP, Difference between OLTP and OLAP, OLAP Server Architecture, OLAP Operations, Multi Relational & Multi Dimensional: MOLAP, ROLAP, OLAP Tools, Metadata Repository, Data Warehouse Back-End Tools and Utilities.		
MODULE 4: **Data Mining** Introduction to Data Mining, Applications, Limitations, Techniques, Association Rules: Apriori Algorithm, Classification: Decision Tree Cluster Analysis: Features, Types of Cluster Analysis Methods: Partitional, Hierarchical, Density Based, Grid based Methods, , Web Data Mining, Search Engine, Case Study, Limitations	L2, L3 and L4	10

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books:

1. Jiawei Han &Micheline Kamber,"Data Mining Concepts And Techniques",3rd Edition,Morgan Kaufmann Publication,An Imprint of Elsevier, 2015.
2. Vipin Kumar,Pang Ning "Introduction to Data Mining",3rd Edition,Pearson Publication,Chennai, 2016.
3. Mohammed,Wagner " Data Mining and Analysis", 4th Edition, Cambridge University Press,Brazil, 2018.

Reference Books:

1. Daneil,D. Larose "Data Mining and Predictive Analytics", 2nd Edition, John wiley and Sons,Canada, 2015.
2. Paulraj "Data Warehousing Fundamental for IT Professional", 2nd Edition, John Wiley and Sons, Canada, 2010.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS O 1**	**PS O 2**	**PS O 3**
CO 1	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	--
CO 2	**1**	**1**	**2**	**3**	--	--	--	--	--	--	--	--	**1**	--	--
CO 3	**1**	**2**	**3**	--	--	--	--	--	--	--	--	--	**1**	--	--
CO 4	**1**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**3**	--
CO 5	**1**	**1**	**2**	**3**	--	--	--	--	--	--	--	--	**1**	**3**	--

1: strongly related, 2: moderately related and 3: weakly related

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DIFT2603	COMPUTER GRAPHICS	L	T	P	C
Version 2023.1	Date of Approval:	3	-	-	3
Pre-requisites/Exposure	Basic Knowledge of C Programming				
Co-requisites	Nil				

Catalog Description

This course presents basic principles for the design, use and understanding of computer graphics systems. This course includes various standard algorithms and their complexity to draw graphics objects. This course also teaches the students about different algorithms for 2D /3D transformation, clipping operations on objects, hidden surface removal and detection.

Course Objectives

The objective of this course is to

1. Equip the students with mathematical concepts of graphics algorithms to draw Graphics objects using C language and standard algorithms.
2. Provide an overview of various 2D & 3D transformation, clipping operations, algorithms related to hidden surface detection and elimination and their implementation.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Define various standards and components in development of computer graphics.
CO 2: Explain generation of graphics primitives and analyze their problems and solutions.
CO 3: Demonstrate solid filling using polygon fill algorithm with interior region testing methods.
CO 4: Apply 2D geometric transformations on 2D graphics objects with their practical implementation.
CO 5: Illustrate use of coordinate mapping and their transformation and analyze use of line and polygon clipping algorithms.
CO 6: Apply 3D geometric transformations on 3D objects with their practical implementation and assess logic behind visible surface detection algorithms with practical implementation of 3D transformations.

Modules	Blooms level*	Number of hours
Module I: Introduction of Graphics Development of Computer Graphics, Basic Graphics System and Standards. Graphics Devices: Raster and Random Scan Devices, Continual Refresh and Storage Displays, Display Processor, Color Display Techniques, Frame Buffer, Concepts in Raster Graphics and color generation.	L1, L2 and L3	6
Module II: Graphics Primitives Points, Pixels, Scan Conversion, Line Drawing Algorithms, Circle Drawing Algorithms, Anti-aliasing Technique, Methods of Character generator. Polygon Polygon representation, Polygon Filling algorithm, Inside/Outside Testing .	L1, L2 and L3	7
Module III: Transformation	L2, L3 and L4	7

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Scaling, Translation, Rotation, Composite Transformation , Fix point scaling , Rotation about arbitrary point, Reflection, Shears, Composite Transformation, Modeling and Coordinate Transformation Viewing: Interactive Picture Construction Techniques, Interactive Input/Output Devices		
Module IV: Segment Segment Table, Creating Deleting and Renaming a Segment, Visibility and Image Transformation Windowing and Clipping: Window, View-port, Line clipping, polygon clipping, Window to viewport transformation, polygon clipping using Sutherland Hodgman Algorithm.	L2, L3 and L4	8
Module V: 3-D Transformation and Visible surface detection 3-D Transformation: shearing, scaling, translation. Rotation, Homogeneous coordinates. Visible surface detection: Z - buffer algorithm, Scaline Visible surface detection algorithm, paintess algorithm, fractal and its. Properties	L2, L3 and L4	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Udit Agrawal, "Principles of Computer Graphics", 2nd Edition, Dhanpat Rai Publications, New Delhi, 2017.
2. Hughes, Van Dam, et al. "Computer Graphics Principles and Practice", 3rd Edition, Pearson, 2014.
3. Hearn and Baker, "Computer Graphics with OpenGL", 3rd Edition, Prentice Hall, 2004.

Reference Books

1. James D. Foley, Andries van Dam, Steven K. Feiner, John Hughes, "Computer Graphics: Principles and Practice", 2nd Edition, Pearson Education, 2007.
2. F.S. Hill, "Computer Graphics using OPENGL", 2nd edition, Pearson Education, 2003.
3. David F. Rogers; "Procedural Elements for Computer Graphics" TMH. Publications.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping
1: strongly related, 2: moderately related and 3: weakly related

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**1**	**3**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**2**
CO2	**1**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**2**
CO3	**1**	**1**	**1**	**3**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**1**
CO4	**1**	**1**	**2**	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**1**
CO5	**1**	**3**	**2**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**3**	**2**

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DIFT2604	COMPUTER GRAPHICS LAB	L	T	P	C
Version 2023.1	Date of approval:	-	-	2	1
Pre-requisites/Exposure	Basic Knowledge of C Programming				
Co-requisites	Nil				

Catalog Description

This course presents basic principles for the design, use and understanding of computer graphics systems. This course includes various standard algorithms and their complexity to draw graphics objects. This course also teaches the students about different algorithms for 2D /3D transformation, clipping operations on objects, hidden surface removal and detection.

Course Objectives

The objective of this course is to

1. Equip the students with mathematical concepts of graphics algorithms to draw Graphics objects using C language and with standard algorithms.
2. Provide an overview of various 2D & 3D transformation, clipping operations, algorithms related to hidden surface detection and elimination and their implementation.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Define various standards and components in development of computer graphics.

CO 2: Explain generation of graphics primitives and analyze their problems and solutions. Demonstrate solid filling in objects using polygon fill algorithm with interior region testing methods.

CO 3: Apply 2D geometric transformations on 2D graphics objects with their practical implementation.

CO4: Illustrate use of coordinate mapping and their transformation and analyze use of line and polygon clipping algorithms with their practical implementation.

CO 5: Apply 3D geometric transformations on 3D objects with their practical implementation and assess logic behind visible surface detection algorithms with practical implementation of 3D transformations. Illustrate use of fractal and iterated function system and analyze the use of illumination model in 3D graphics.

Modules	Blooms level*	Number of hours
Module I: Introduction of Graphics 1. Demonstrate the use of graphics library functions to draw various graphics objects. 2. Demonstrate the use of graphics library functions to draw pie chart. 3. Demonstrate the use of graphics library functions to draw bar chart on screen.	L3,L5	2

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Module II: Graphics Primitives 1. Demonstrate the use of DDA line drawing algorithm to draw line on the screen when m<=1 and m>1. 2. Demonstrate the use of DDA line drawing algorithm to draw line on the screen when m<=1 and m>1. 3. Demonstrate the use of Breshenham's line drawing algorithm to draw line on the screen when m<=1 and m>1. 4. Demonstrate the use of circle drawing algorithm to draw circle on the screen. 5. Write a program to draw characters on screen using bitmap character generation method. 6. Write a program to fill a polygon using boundary fill algorithm. 7. Write a program to fill a polygon using flood fill algorithm.	L3,L5	6
Module III: Transformation 1. Write a program to translate a triangle where translation factors are tx=20 and ty=30. 2. Write a program to rotate a triangle in clock-wise and anti-clock-wise direction where rotation angle is 300. 3. Write a program to scale a square where scaling factors are Sx=2 and Sy=3. 4. Write a program to reflect a triangle about X axis. 5. Demonstrate combine 2D transformation after applying translation, rotation and scaling transformations. 6. Write a program to demonstrate fix point scaling where scaling factors are Sx=2 and Sy=3.	L3,L5	6
Module IV: Segment 1. Write a program to demonstrate line clipping algorithm to clip a line where line slop is m<=1. 2. Write a program to demonstrate window to viewport transformation and liner mapping of the object coordinates in viewport where size of viewport is half to the size of window. 3. Write a program to clip a polygon using Sutherland hodgeman polygon clipping algorithm.	L3,L5	4
Module V: 3-D Transformation and Visible surface detection 1. Write a program to translate a 3D triangle where translation factors are tx=20 and ty=30. 2. Write a program to rotate a 3D triangle in clock-wise and anti-clock-wise direction where rotation angle is 300. 3. Write a program to scale a 3D square where scaling factors are Sx=2 and Sy=3. 4. Demonstrate combine 3D transformation after applying translation, rotation and scaling transformations. 5. Write a program to draw Bezier curve and spline curve on the screen with 4 control points. 6. Write a program to generate fractals using iterated function system.	L3,L5	6

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

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- Udit Agrawal, "Principles of Computer Graphics", 2nd Edition, Dhanpat Rai Publications, New Delhi, 2017.
- Hughes, Van Dam, et al. "Computer Graphics Principles and Practice", 3rd Edition, Pearson, 2014.
- Hearn and Baker, "Computer Graphics with OpenGL", 3rd Edition, Prentice Hall, 2004.
- Donald Hearn & M. Pauline Baker, "Computer Graphics C Version", Pearson Education, New Delhi, 2004.

Reference Books

- James D. Foley, Andries van Dam, Steven K. Feiner, John Hughes, "Computer Graphics: Principles and Practice", 2nd Edition, Pearson Education, 2007.
- F.S. Hill, "Computer Graphics using OPENGL", 2nd edition, Pearson Education, 2003.
- David F. Rogers; "Procedural Elements for Computer Graphics" TMH. Publications.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**1**	**3**	**1**	--	--	--	--	--	--	--	--	--	**2**	--	**2**
CO2	**1**	**1**	**1**	--	--	--	--	--	--	--	--	--	**2**	--	**2**
CO3	**1**	**1**	**1**	**3**	**2**	--	--	--	--	--	--	--	**1**	**3**	**1**
CO4	**1**	**1**	**2**	**2**	**2**	--	--	--	--	--	--	--	**2**	--	**1**
CO5	**1**	**3**	**2**	**1**	**1**	--	--	--	--	--	--	--	**2**	**3**	**2**

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WEB TECHNOLOGY USING NODE JS AND MONGO DB

Course Code: DIFT2607 **Credit Units: 03**

Course Contents:

Module 1: Introduction to Web Development and Node.js
- Introduction to web technologies
- Basics of HTML, CSS, and JavaScript
- Setting up a development environment (Node.js, Visual Studio Code)
- Introduction to Node.js and its role in web development
- Writing and running basic Node.js scripts
- Asynchronous programming in Node.js

Module 2: Building a Server with Node.js
- Creating a basic HTTP server with Node.js
- Handling HTTP requests and responses
- Routing and URL parameters
- RESTful API design principles
- Error handling and middleware
- Introduction to Express.js

Module 3: Working with MongoDB and Data Modeling
- Introduction to MongoDB and NoSQL databases
- Installing and setting up MongoDB
- CRUD operations in MongoDB
- Schemaless data modeling
- Connecting Node.js to MongoDB
- Data validation and error handling

Module 4: Front-end Development and User Authentication
- Front-end development using HTML, CSS, and JavaScript
- Using template engines (e.g., EJS or Handlebars)
- Building dynamic web pages
- User registration and authentication
- Session management and security
- Implementing authentication with Passport.js

Module 5: Advanced Topics and Deployment
- Real-time web applications with WebSockets
- Web application security and best practices
- Deployment strategies for Node.js applications
- Performance optimization techniques
- Load balancing and scaling
- Project development and presentations

REFERENCES:

[1]. https://developer.mozilla.org/en-US/

[2]. https://docs.mongodb.com/

[3]. https://nodejs.org/docs/

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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WEB TECHNOLOGY USING NODE JS AND MONGO DB LAB

Course Code: DIFT2608 **Credit Units: 01**

P2:C1

LAB EXERCISES:

1: Setting Up the Development Environment
2: Building a Simple Node.js Server
3:: Handling Routes and Requests with Express.js
4: Connecting to MongoDB
5: Building a RESTful API
6: User Registration and Authentication
7: Real-Time Chat Application with WebSockets
8: Security and Input Validation
9: Deployment and Hosting
10: Performance Optimization

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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DIFT2609	CRYPTOGRAPHY & NETWORK SECURITY	L	T	P	C
Version 2023.1	Date of Approval:	3	-	-	3
Pre-requisites/Exposure	Basic Mathematics				
Co-requisites	Nil				

Catalog Description

In this course the concepts of cryptography and network security are discussed in detail. Substitution and transposition techniques, symmetric and asymmetric cryptographic algorithms, their applications, differences will be introduced. As a precursor to the study of cryptography studies will be made on impact of various network and web security protocols. The concepts learnt in the studies of cryptography & network security will be applied in the studies and analysis of authentication, integrity and security related protocols.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of cryptography & network security through problem solving and analytical approach.
2. Provide an overview of various network attacks and related security mechanism , various algorithms for modular arithmetic, symmetric and asymmetric cryptography and web and network security

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain, describe and distinguish various security attacks; Describe and solve block and stream ciphers and its applications in cryptography; Solve problems based on substitution and transposition ciphers.

CO2: Explain the basic mathematics of cryptography; Solve problems of groups, modular arithmetic ,gcd and inverse algorithm, chinese remainder theorem and its application in cryptography; Applying algorithms for solving problems in cryptography

CO3: Describing the concept of public key cryptosystems and its related algorithm; Explain and solve problems related to hash functions, digital signature and its applications in cryptography; Compare symmetric and asymmetric key cryptography.

CO4: Explain management ,distribution ,secure exchange of keys and authentication certificate and its applications in real life. Explain , compare various authentication protocols used in cryptography and network security, also solve problems based on these protocols.

CO5: Explain various security protocols : IPSec, SSL,TLS,SET; Describing malicious softwares and illustrating various design approaches to Firewell

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to security attacks, services and mechanism, Classical encryption techniques: substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers. Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard (DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES	L1, L2 and L3	7
MODULE 2:	L1,L2, L3	6

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Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relativeprime numbers, Extended Euclidean Algorithm,Advanced Encryption Standard (AES) encryption and decryption, Fermat's and Euler's theorem, Primaliry testing, Chinese Remainder theorem, DiscreteLogarithmic Problem,Principals of public key crypto systems, RSA algorithm, security of RSA.		
MODULE 3: Message Authentication Codes: Authentication requirements, authentication functions, messageauthentication code, hash functions, birthday attacks, security of hash functions, Secure hashalgorithm (SHA)Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signaturestandards (DSS).	L1,L2, L3 and L5	7
MODULE 4: Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure. Authentication Applications: Kerberos	L1, L2 and L3	7
MODULE 5: IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Viruses and related threats, Firewalls	L1, L2	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. William Stallings, **"Cryptography & Network Security"**, 4th Edition, Pearson Education, New Delhi, 2017.
2. Behrouz A. Forouzan, "**Cryptography & Network Security**", 2nd Edition, Tata Mcgraw Hills,New Delhi, 2015

Reference Books

1. Douglas R.Stinsons, **"Cryptography Theory and Practice"**, 3rd Edition, McMillan Publications, Londan, 2003
2. Atul Kahate, **"Cryptography & Network Security"**, 3rd Edition, Tata Mcgraw Hills,New Delhi, 2017

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**1**	**1**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**3**
CO2	**1**	**1**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**3**
CO3	**1**	**1**	**1**	--	-	--	--	--	--	--	--	--	--	**1**	**3**
CO4	**1**	**2**	**3**	--	--	--	--	--	--	--	--	--	--	**1**	**3**
CO5	**1**	**2**	**3**	--	--	--	--	--	--	--	--	--	--	**2**	**3**

1: strongly related, 2: moderately related and 3: weakly related

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CRYPTOGRAPHY AND NETWORK SECURITY LAB

Course Code: DIFT2610 **Credit Units: 01**

EXPERTIMENT LIST:

1. WAP FOR CASEAR CIPHER
2. WAP FOR MONOALPHABETIC CIPHER
3. WAP FOR POLYALPHABETIC CIPHER
4. WAP FOR PLAYFAIR CIPHER
5. WAP FOR RAILFENCE CIPHER
6. WAP FOR COLUMNAR CIPHER
7. WAP FOR DES ALGORITHM
8. WAP FOR RSA ALGORITHM
9. WAP DIGITAL SIGNATURE
10. WAP AES ALGORITHM
11. WAP MODES OF OPERATIONS

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

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SEMESTER-VII

DIFT2701	CLOUD COMPUTING	L	T	P	C
Version 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	General Networking and basics of virtualization				
Co-requisites	Nil				

Catalog Description

The course introduces the basic concepts and methods of Cloud computing and develops the concepts and skills necessary to build applications in Cloud environments. The course starts by explaining the concepts of cloud computing, cloud architecture, model and the concepts of Virtualization. It then explains how such ideas form the basis for creating Computing Clouds where the concept of resources is virtualized. Case studies are used to show how applications can be run in a Cloud and the principles of creating images to run in Clouds are explained. The programming skills for business models that underlie Cloud Computing are also presented.

Course Objectives

The objective of this course is to

1. Equip the students with concepts virtualization and Cloud
2. Provide an overview of security issues and various tools available in Cloud

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain and differentiate between different types of computing and also determine them with the upcoming Cloud Computing environment.

CO 2: Identify the different layers in the architecture of Cloud and explain the different services, deployment models and types of virtualization available.

CO 3: Explain the power of scalability and fault tolerant system and other features of cloud, analyzing the management of cloud in business.

CO 4: Explain, apply and compare the various security issues and their solutions and policies for security in Cloud environment.

CO 5: Analyze programming Models, its workings and comparing them with each other.

Modules	Blooms level*	Number of hours
MODULE 1: Overview of Client/Server Computing, Peer to Peer Computing, Distributed Computing, Col-laborative Computing, Cloud Computing; Behaviour of Cloud Computing; Pros and Cons of Cloud Computing.	L1, L2 ,L3	8
MODULE 2: Understanding of Cloud Architecture, Cloud Storage, Cloud Services; Types of Cloud service development; Software as a Service, Platform as a Service, Web Services, On Demand Com-puting; Virtualization: Fundamental concepts of compute storage, Network virtualization; Pros and Cons of Cloud Service Development; Case study with Cloud Services Development Service and Tools.	L1,L2, L3	8

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MODULE 3: Introduction to Scalability and Fault Tolerance with Cloud Computing; Cloud Solutions; Cloud Ecosystems; Cloud Business Process Management; Portability and Interoperability.	L1, L2 and L4	6
MODULE 4: Security Overview; Cloud Computing Security Challenges; Security Policy Implementation, Computer Intrusion Detection and Response, Virtualization Security Management and Virtu-al Threats; Cloud Security Controls; Cloud Computing Attacks; Cloud Security services; Se-cure Cloud Software requirements; Policy Implementation.	L2, L3 and L4	8
MODULE 5: Map Reduce; Hadoop ; Analyzing the data with Hadoop; Case Study on Google App Engine, Microsoft Azure and Hadoop.	L2, L4	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Kai Hwang, Geoffrey C Fox & Jack G Dongarra, "**Distributed and Cloud Computing, From Parallel Processing to the Internet of Things**", Morgan Kaufmann Publishers, 2012.
- Michael Miller, "**Cloud Computing**", Pearson,2008.
- Anthony T. Velte, Toby J. Velte & Robert Elsenpeter, **"Cloud Computing- A practical Approach",** Mc Graw Hill, Chennai, 2017.

Reference Books

1. John W.Rittinghouse and James F.Ransome, "**Cloud Computing: Implementation, Management, and Security**", CRC Press, 2010
2. Toby Velte, Anthony Velte, Robert Elsenpeter, "**Cloud Computing, A Practical Ap-proach**", TMH, 2009.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**--**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**1**	**1**	**-**	**-**
CO2	**1**	**2**	**3**	**--**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**-**	**-**
CO3	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**-**	**1**	**-**	**2**
CO4	**1**	**--**	**3**	**--**	**2**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**-**	**1**	**-**	**2**
CO5	**1**	**--**	**2**	**--**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**		**1**	**-**	**-**

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CLOUD COMPUTING LAB

Course Code: DIFT2702 **Credit Units: 01**

EXPERIMENT LIST

1. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create hello world app and other simple web applications using python/java.
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
8. Install Hadoop single node cluster and run simple applications like wordcount.

REFERENCES:

1. https://cloud.google.com/learn/what-is-a-virtual-machine
2. https://cloud.google.com/dataproc/docs/concepts/configuring-clusters/single-node-clusters
3. https://www.geeksforgeeks.org/what-is-google-app-engine-gae/

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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BLOCKCHAIN TECHNOLOGY

Course Code: DIFT2703 **Credit Units: 03**

Course Objective: To introduce the students about the knowledge of basic concepts of blockchain and cryptocurrency.

Course Contents:

Module-I: Introduction to Blockchain

Basic ideas behind blockchain, how it is changing the landscape of digitalization, peer-to-peer network, Blockchain Mechanism, Blockchain vs Distributed Systems, introduction to cryptographic concepts required, Hashing, public key cryptosystems, private vs public blockchain and use cases, Hash Puzzles, Introduction to Bitcoin Blockchain, Centralization vs. Decentralization, Security of Blockchain

Module-II: BLOCKCHAIN DATA STRUCTURE & BITCOIN BLOCKCHAIN

Cryptographic Hash Functions, Digital Signatures, Public Keys as Identities, Hash Pointers and Hash chain and Merkel Tree, Consensus Mechanisms, Decentralized Identity Management, Transactions, Distributed consensus, Consensus without identity using a block chain, Incentives and proof of work, Mining.

Module-III: BLOCKCHAIN MODELS & APPLICATIONS

Abstract Models for BLOCKCHAIN - GARAY model - RLA Model - Proof of Work (PoW) as random oracle - formal treatment of consistency, liveness and fairness - Proof of Stake (PoS) based Chains - Hybrid models (PoW + PoS) Application of Blockchain in Privacy and Security, IoT and Smart Cities, Business and Industry, Data Management, e-Governance

Module-IV: ETHEREUM AND HYPERLEDGER

Ethereum - Ethereum Virtual Machine (EVM) - Wallets for Ethereum - Solidity - Smart Contracts - some attacks on smart contracts, Hyperledger, Hyperledger Stack, Multichain Blockchain. Innovation in Hyperledger, Distributed applications in Hyperledger, Zero Knowledge proofs and protocols in Blockchain.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books:

[T1] Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016. (Free download available).

[T2] Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy, 2015

Reference Books:

[R1] R.Pass et al, Analysis of Blockchain protocol in Asynchronous networks , EUROCRYPT 2017, (eprint.iacr.org/2016/454).

[R2] Eric Traub, Learn Blockchain Programming with JavaScript, Packt, 2018.

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BLOCKCHAIN TECHNOLOGY LAB

Course Code: DIFT2704 **Credit Units: 01**

EXPERIMENT LIST

1 Creating Merkle tree
2 Creation of Block
3 Blockchain implementation
4 Creating ERC20 token
5 Blockchain implementation using Merkle Trees
6 Mining in Blockchain
7 Peer-to-Peer implementation using Blockchain
8 Creating Crypto-currency Wallet

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

REFERENCES

[1]https://mrcet.com/pdf/Lab%20Manuals/BLOCKCHAIN%20TECHNOLOGY%20Lab%20manual.pdf
[2] https://www.coursehero.com/file/64537186/BC-Lab-Manual-With-Solutions-pdfpdf

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DIFT2706	MULTIMEDIA	L	T	P	C
Version 2023.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course is intended to describe technical characteristics and performance of multimedia system and terminals. It will help in designing creative approach in application of multimedia devices, equipment and systems. . Also provide students to interpret and analyze measurement results obtained on the multimedia system and components. It provides to test multimedia communication systems and equipment in real conditions.

Course Objectives

The objective of the course is

1. to provide an overview of different multimedia technologies like audio and video including multimedia devices.
2. to include some practical sessions on these technologies.

Course Outcomes

After the completion of course, the students will be able to,

CO1. Identify and Describe basic principles of multimedia communication systems and its application.

CO2. Identify and define concepts of digital audio representation and processing using computer techniques and tools for creating and editing the Interactive multimedia applications.

CO3. Identify and describe video technology including Raster Scanning Principles.

CO4. Identify and describe video technology including Raster Scanning Principles, Sensors for T.V.Cameras, Color Fundamentals, color Video, Video Equipments and Worldwide Television Standards.

CO5. Identify and describe Multimedia Devices, Presentation Services and the User Interface. Apply multimedia in different field of life.

Modules	Blooms level*	Number of hours
Module I: Introduction Introduction: Objectives – History of Multimedia – Its market – Content copyright – Resources for multimedia developers – Types of produces – Evaluation – Hardware Architecture – OS and Software – Multimedia Architecture – Software library – Drivers.	L1, L2 and L3	8
Module II: Digital Audio Representation and Processing Uses of audio in computer applications, digital representation of sound, transmission of digital sound, digital audio signal processing, digital audio and the computer.	L2 and L3	7
Module III: Video Technology Raster scanning principles, sensors for T.V. cameras, color fundamentals, color video, video equipment, worldwide television standards.	L4 and L5	7
Module IV: Digital Video and Image Compression Evaluating a compression system, redundancy and visibility, video compression techniques, the JPEG image compression standards, the MPEG motion video	L4 and L5	5

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compression standard, DVI technologies, Time Based Media Representation and Delivery.		
Module V: Multimedia Devices, Presentation Services and the User Interface- Introduction .Multimedia services and Window systems, client control of continuous media, device control, temporal co ordination and composition, hyper application.	L3 and L4	5
Module VI: Application of Multimedia Intelligent multimedia system, desktop virtual reality, multimedia conferencing.	L3 and L4	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text & Reference Books

1. Multimedia systems John F. Koegal Buford Addison- Wesley

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS O 1**	**PS O 2**	**PS O 3**
CO 1	**1**	--	**3**	--	--	--	--	--	--	**1**	--	**1**	--	**2**	**3**
CO 2	**1**	--	**3**	--	--	--	--	--	--	**1**	--	**1**	--	**2**	**3**
CO 3	**1**	--	--	--	--	--	--	--	--	**1**	--	**1**	--	**2**	**3**
CO 4	**1**	--	--	--	--	--	--	--	--	**1**	--	**1**	--	**2**	**3**
CO 5	**1**	--	--	--	--	--	--	--	--	**1**	--	**1**	--	**2**	**3**

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DIFT2705	MOBILE COMPUTING	L	T	P	C
Version 2023.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure	Basic knowledge of Computer Networks				
Co-requisites	Nil				

Catalog Description

The objective of this consortium is to shape and expand a full-scale and sound mobile computing system market. To achieve this, cooperation is required of interests related to communication (network), computer hardware/software, system integrators (including service providers), and the media.

Course Objectives

The objective of this course is to

1. Give a general overview of the cellular technology and the associated terms and discuss the generations of the mobile technologies starting from 1G to 3G techniques.
2. Illustrate the GPRS and WAP model for 2G internet connectivity in detail.
3. Elaborate the third-generation mobile services
4. Describe the Global Mobile Satellite Systems in detail and basic architecture of Bluetooth technology and advanced topics in mobile computing.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the basic concepts mobile technology, computing and basic architecture of PCS and GSM.
CO2: Describe the mobile networking Infrastructure through 2G technologies (GSM, GPRS, WAP).
CO3: Explain the basic concepts of 3G technologies (WCDMA, CDMA 2000) and WLL.
CO4: Discuss the working of mobile satellite systems like IRIDIUM and GLOBALSTAR.
CO5: Explain the concepts of Bluetooth technology, its working and protocols, virtual networks and enterprise networks.

Modules	Blooms level*	Number of hours
Module I: Introduction to Personal Communications Services (PCS) PCS Architecture, Mobility management, Networks signaling. Global System for Mobile Communication (GSM) system overview: GSM Architecture, Mobility management, Network signaling.	L1, L2 and L3	8
Module II: General Packet Radio Services (GPRS) & Wireless Application Protocol (WAP) GPRS Architecture, GPRS Network Nodes. Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 standard, Mobile IP. Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, wireless mark up Languages (WML).	L1 and L2	10
Module III: Third Generation (3G) Mobile Services	L1 and L2	7

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Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G. Wireless Local Loop(WLL): Introduction to WLL Architecture, wireless Local Loop Technologies.		
Module IV: Global Mobile Satellite Systems Global Mobile Satellite Systems; case studies of the IRIDIUM and GLOBALSTAR systems.	L1 and L2	7
Module V: Enterprise Networks Introduction to Virtual Networks, Blue tooth technology, Blue tooth Protocols. Advanced techniques in mobile computing.	L1 and L2	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evallllluation

Text Books

1. "Wireless and Mobile Networks Architectures", by Yi-Bing Lin & Imrich Chlamtac, John Wiley & Sons, 2001.
2. "Mobile and Personal Communication systems and services", by Raj Pandya, Prentice Hall of India, 2001.

Reference Books

1. "Wireless Web Development", Ray Rischpater, Springer Publishing, 2000.
2. "The Wireless Application Protocol", by Sandeep Singhal, Pearson Education Asia, 2000.
3. "Third Generation Mobile Telecommunication systems", by P.Stavronlakis, Springer Publishers, 2001.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**1**	**2**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--
CO2	**1**	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--
CO3	**1**	**2**	--	--	--	--	--	--	--	--	--	--	--	**1**	--
CO4	**1**	**2**	--	--	--	--	--	--	--	--	--	--	--	**1**	--
CO5	**1**	**2**	--	--	--	--	--	--	--	--	--	--	--	**1**	--

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DIFT2739	BASICS OF RESEARCH METHODOLOGY, ETHICS, AND RESEARCH COMMUNICATION	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description

This course aims to provide students with a comprehensive understanding of conducting ethical research, utilizing proper research methodologies, and effectively communicating research findings. The course includes a final project where students will write a Literature Review on a topic chosen in consultation with the teacher(s).

This course is designed to equip students with essential skills and knowledge to conduct ethical research, employ proper research methodologies, and effectively communicate scientific information (with focus on writing a literature review). The course will cover topics such as research design, data collection and analysis, research ethics, and science communication strategies. Through a combination of lectures, discussions, case studies, and practical exercises, students will develop a deeper understanding of the research process and its ethical implications.

Course Objectives

The objective of this course is to impart knowledge about various stages of research process, research ethics and different ways of research communication.

The aim of this course is to impart research skills to the beginners and help to improve the quality of research by the existing researchers. It also encompasses the understanding and application of appropriate research design, statistics, and the use of the computer for reference management, report writing, research paper writing and presentation. The course also introduces the key conceptual issues of each research method, as well as giving practical guidance. It covers the series of research methodology contents: from problem formulation, to design, to data collection, analysis, reporting and dissemination. The course has the dual aims of equipping students with conceptual understandings of current academic debates regarding different methods, and the practical skills to put those methods into practice.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define criteria of good research, steps in research process, and data collection.

CO2. Identify different types of sampling and its purpose.

CO3. Conduct hypothesis testing for different types of samples and interpret the results.

CO4: Learn the importance of literature review, write research paper/thesis, use reference management software.

Course Content :

Module	Topic	**Blooms level***	Hours
1	**Research Methodology** Understanding the research process: From research questions to conclusions	L1, L2	10

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	Types of research: Qualitative and quantitative research Exploratory, descriptive, experimental, and correlational studies Scientific Thinking: Subjective Vs. Objective Thinking Logical Reasoning: Inductive Vs. Deductive Reasoning Formulating research hypotheses and objectives Purpose of a good research, Criteria of good research		
2	**Descriptive Statistics** Data, Types of Data, Methods of data collection, Benefits and drawbacks, Graphical representation of data and interpretation. Measures of Central Tendency: Arithmetic Mean, Median, Mode, Measures of Dispersion: Range, Standard Deviation, Variance, Coefficient of Variation.	L1, L2, L3	15
3	**Inferential Statistics** Sampling: Basic concepts, Process of Sampling, Sample Size, Types of Samples, Sampling and non- sampling errors, Statistics and Parameters, Sampling Distribution of Means and Proportion, **Hypothesis Testing**, steps in testing of hypothesis, errors in hypothesis testing, z test and t test.	L1, L2, L3	15
4	**Research Ethics** Plagiarism, Fabrication, Falsification, Ethics with respect to human and Animal Research	L1, L2	5
5	**Communication** Characteristics of a good Research paper, Systematics Literature Review (choosing a topic, preparing outline, gathering authentic & appropriate references, avoiding plagiarism, use of reference management systems), Writing a good literature review, Structure of report (Introduction, Methodology, Analysis, Results, Discussions, Conclusions, Recommendations), Writing Quality Research Paper, Publishing Research Work in Quality Journals, Reference Management Software	L1, L2, L3	15

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional Exam	End Term Examination
Weightage (%)	5	10	15	70

Project based assignment: Student teams (2-3 students per team) will write a literature review on a topic of choice, in consultation with the teacher.

Text books/ Reference books

- Research Methodology for Natural Sciences by Soumitro Banerjee, Publisher: IISc Press (1 January 2022); ISBN-10: 8194835178; ISBN-13: 978-8194835172

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- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt. Ltd., New Delhi-110001
- Geode, Millian J.& Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Kothari, C.R.2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.
- Levin R I., Rubin D S. Statistics for Management. Sixth Edition, PHI
- Kapoor & Gupta. Probability & Statistics. S Chand Publishers, New Delhi.
- Montomery, Douglas C.(2007), 5th Ed. Design and Analysis of Experiments, Wiley India.
- Cooper, Donald R. and Pamels Schindler, Business Research Methods, Tata McGraw Hills, New Delhi
- Krishnaswamy, K.N. Sivakumar. Appa lyer and Mathiranjan M. 2006, Management Research Methodology: Integration of Principles, Methods and Techniques, Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Sachdeva, J.K. 2008. Business Research methodology. Himalaya Publishing House, New Delhi.
- Shekharan, Uma, Business Research Methods, Miley Education, Singapore.
- Zikmund, Millian G., Business Research Methods, Thomson Learning, Bombay**.**

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SEMESTER-VIII

DATA SCIENCE

Course Code: DIFT2801 **Credit Units: 03**

Course Contents:

Module 1: Python
Environment set-up, Jupyter overview, Python Numpy, Python Pandas, Python Matplotlib

Module 2: R
An introduction to R, Data structures in R, Data visualization with R, Data analysis with R

Module 3: Statistics
Important statistical concepts used in data science, Difference between population and sample, Types of variables,, Measures of central tendency, Measures of variability, Coefficient of variance, Skewness and Kurtosis

Module 4: Inferential statistics, Normal distribution, Test hypotheses, Central limit theorem, Confidence interval, T-test, Type I and II errors, Student's T distribution

Module 5: Regression and Anova
Regression, ANOVA,R square, Correlation and causation, Data visualization, Missing value analysis, The correction matrix, Outlier detection analysis

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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DATA SCIENCE LAB

Course Code: DIFT2802 **Credit Units: 01**

EXPERIEMENTS LIST:

1. Download, install and explore the features of NumPy, SciPy, Jupyter, Statsmodels and Pandas packages.
2. Working with Numpy arrays
3. Working with Pandas data frames
4. Reading data from text files, Excel and the web and exploring various commands for doing descriptive analytics on the Iris data set. CS3361 Data Science Laboratory
5. Use the diabetes data set from UCI and Pima Indians Diabetes data set for performing the following:

a. Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis.
b. Bivariate analysis: Linear and logistic regression modeling
c. Multiple Regression analysis
d. Also compare the results of the above analysis for the two data sets.

6. Apply and explore various plotting functions on UCI data sets.

a. Normal curves
b. Density and contour plots
c. Correlation and scatter plots
d. Histograms CS3361 Data Science Laboratory Lab Manual
e. Three dimensional plotting

7. Visualizing Geographic Data with Basemap

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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DIFT2803	MACHINE LEARNING	L	T	P	C
Version: 2023.1	Date of Approval:	3	-	-	3
Pre-requisites/Exposure	Basic Knowledge of Programming				
Co-requisites	Nil				

Catalog Description

Python is a general-purpose high level programming language that is being increasingly used in data science and in designing machine learning algorithms. This course introduces Python and its libraries like numpy, pandas, matplotlib and explains how it can be applied to develop machine learning algorithms that solve real world problems.

This course starts with Python language followed by machine learning and covers concepts of python and all important concepts such as exploratory data analysis, data preprocessing, data visualization and clustering, classification, regression and model performance evaluation etc. This course covers all three types of machine learning algorithms including Supervise, Unsupervised and Reinforcement learning.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of programming and problem solving and develop proficiency in creating applications using the Python Programming Language.
2. Provide knowledge of various types of machine learning models, its algorithms and development of the models using Python programming language.

Course Outcomes

On completion of this course, the students will be able to

CO1: Develop programs in Python to develop algorithmic solutions to computational problems.

CO2: Manage data in python using available data structures such as string, list, and dictionary and file handling operations.

CO3: Apply functions to decompose python program and develop modules and packages.

CO4: Preprocess and analyze data before applying suitable machine learning models.

CO5: Understand basic concepts and techniques of Machine Learning and apply machine learning algorithms to develop machine learning models for solving real word problems.

Modules	Blooms level*	Number of hours
Module-I Python basis: Installing Anaconda, Basics of Python: basic syntax, interactive shell, editing, saving, and running a script. Working with jupyter notebook, data types, operators, conditional statements, String, functions, Lists, tuples, and dictionaries; basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing, and replacing values; traversing dictionaries. modules and packages.	L1, L2 and L3	6
Module-II Arrays and Matrices: The NumPy Module, Creating Arrays and Matrices, Copying, Arithmetic Operations, Cross product & Dot product, Saving and Restoring, Matrix inversion, Vectorized Functions.	L1, L2 and L3	7

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Data Visualization: The Matplotlib Module, Histograms, Bar charts Density Plots, Box Plots, Scatter Plots, Heat Maps etc. Data Frames: Pandas, loading data from different sources, Concept of Data Frames, Working with Data frames such as selecting, filtering, grouping, joining etc. Dealing with missing values		
Module-III Introduction to Machine Learning: Introduction, Applications, Framework for developing machine learning models Supervised Learning: Linear regression, ridge and lasso regression Multiple linear regression, logistic regression, classification and regression trees, decision tree, Ensemble techniques, Support Vector Machines, K-nearest neighbors, naive bayes classifier. Representing Data and Engineering Features. Categorical Variables One-Hot-Encoding (Dummy Variables), Label encoding	L2, L3 and L4	6
Module IV Preprocessing and Scaling, Different Kinds of Preprocessing, Applying Data Transformations Overfitting, underfitting, bias-variance tradeoff. Various metrics for regression, classification, confusion matrix, cross validation, precision-recall curve, ROC-AUC curve, grid search, Algorithm chains and pipeline.	L2, L3 and L4	7
Module-V Unsupervised Learning: Introduction to Clustering, k-means clustering Hierarchical clustering, Dimensionality Reduction, Feature Selection, PCA, factor analysis, manifold learning.	L2, L3 and L4	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Pilgrim, Dive, "Introduction to Python", 3rd Edition, Apress, 2009.
2. Allen Downey, Jeffrey Elkner, Chris Meyers, "How to Think Like a Computer Scientist Learning with Python" 2nd Edition Green Tea Press,2002.
3. Manaranjan Pradhan and U Dinesh Kumar, "Machine Learning using Python" , Wiley Publication
4. Andreas C. Müller & Sarah Guido "Introduction to Machine Learning using python",Oreilly Publications.

Reference Books

1. John V. Guttag, "Introduction to Computation and Programming using Python", Prentice Hall of India, 2014.
2. Mark Lutz, "Learning Python: Powerful Object-Oriented Programming‖", Fifth Edition, O'Reilly, Shroff Publishers and Distributors, 2013.
3. Michale Bowles "Machine Learning in Python: Essential Techniques for Predictive Analysis" Wiley Publication.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	3	2	2	--	--	--	--	--	--	--	--	1	1	2	--
CO 2	1	3	2	2	--	--	--	--	--	--	--	--	1	1	2	--
CO 3	1	3	2	1	2	--	--	--	--	--	--	--	1	1	2	--
CO 4	1	1	1	1	1	2	--	--	--	--	--	--	1	--	1	--
CO 5	1	1	1	1	1	2	--	--	--	--	--	--	1	--	1	---

1: strongly related, 2: moderately related and 3: weakly related

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DIFT2804	MACHINE LEARNING LAB	L	T	P	C
Version: 2023.1	Date of Approval:	0	0	2	1
Pre-requisites/Exposure	Basic Knowledge of Programming				
Co-requisites	Nil				

Catalog Description

Python is a general-purpose high level programming language that is being increasingly used in data science and in designing machine learning algorithms. This course introduces Python and its libraries like numpy, pandas, matplotlib and explains how it can be applied to develop machine learning algorithms that solve real world problems.

Course Objectives

The objective of this course is to

- Equip the students with concepts of programming and problem solving and develop proficiency in creating applications using the Python Programming Language.
- Provide knowledge of various types of machine learning models, its algorithms and development of the models using Python programming language.

Course Outcomes

On completion of this course, the students will be able to

CO1: Develop programs in Python to develop algorithmic solutions to computational problems.
CO2: Manage data in python using available data structures such as string, list, and dictionary and file handling operations.
CO3: Apply functions to decompose python program and develop modules and packages.
CO4: Preprocess and analyze data before applying suitable machine learning models.
CO5: Understand basic concepts and techniques of Machine Learning and apply machine learning algorithms to develop machine learning models for solving real word problems.

Modules	Blooms level*	Number of hours
Lab Session 1 and 2 a) The probability that it is Friday and that a student is absent is 3 %. Since there are5 school days in a week, the probability that it is Friday is 20 %. What is theprobability that a student is absent given that today is Friday? Apply Baye's rule in python to get the result. (Ans: 15%). b) Extract the data from database using python.	L1, L2 and L3	6
Lab Session 3 & 4 a) Implement k-nearest neighbours classification using python. b) Given the following data, which specify classifications for nine combinations of VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of kmeans clustering with 3 means (i.e., 3 centroids) **periments**	L1, L2 and L3	7

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VAR1 VAR2 CLASS 1.713 1.586 0 0.180 1.786 1 0.353 1.240 1 0.940 1.566 0 1.486 0.759 1 1.266 1.106 0 1.540 0.419 1 0.459 1.799 1 0.773 0.186 1		
Lab Session 5 & 6 a) The following training examples map descriptions of individuals onto high,medium and low credit-worthiness. medium skiing design single twenties no -> highRiskhigh golf trading married forties yes -> lowRisk low speedway transport married thirties yes -> medRiskmedium football banking single thirties yes -> lowRisk high flying media married fifties yes -> highRisk low football security single twenties no -> medRisk medium golf media single thirties yes -> medRisk medium golf transport married forties yes -> lowRiskhigh skiing banking single thirties yes -> highRisk low golf unemployed married forties yes -> highRisk Input attributes are (from left to right) income, recreation, job, status, age-group, home-owner. Find the unconditional probability of `golf' and the conditional probability of `single' given `medRisk' in the dataset? b) Implement linear regression using python.	L2, L3 and L4	6
Lab Session 7 & 8 a) Implement Naïve Bayes theorem to classify the English text b) Implement an algorithm to demonstrate the significance of genetic algorithm	L2, L3 and L4	7
Lab Session 9 & 10 a) Implement the finite words classification system using Back-propagation algorithm. b) **Additional Experiments:** Find-S and Candidate Elimination Algorithms	L2, L3 and L4	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- Pilgrim, Dive, "Introduction to Python", 3rd Edition, Apress, 2009.
- Allen Downey, Jeffrey Elkner, Chris Meyers, "How to Think Like a Computer Scientist Learning with Python" 2nd Edition Green Tea Press,2002.
- Manaranjan Pradhan and U Dinesh Kumar, "Machine Learning using Python" , Wiley Publication
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Reference Books

- John V. Guttag, "Introduction to Computation and Programming using Python", Prentice Hall of India, 2014.
- Mark Lutz, "Learning Python: Powerful Object-Oriented Programming‖", Fifth Edition, O'Reilly, Shroff Publishers and Distributors, 2013.
- Michale Bowles "Machine Learning in Python: Essential Techniques for Predictive Analysis" Wiley Publication.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	**1**	**3**	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**2**	**--**
CO 2	**1**	**3**	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**2**	**--**
CO 3	**1**	**3**	**2**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**2**	**--**
CO 4	**1**	**1**	**1**	**1**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**1**	**--**
CO 5	**1**	**1**	**1**	**1**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**1**	**---**

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CYBER SECURITY

Course Code: DIFT2805 **Credit Units: 04**

Course Contents

MODULE 1: Introduction
Cyber Attacks, Defense strategies and techniques, Computer Networking Primer: Introduction to LANs, IPv4, IPv6, ICMP, TCP/UDP, DNS, HTTP, etc.

MODULE 2: Mathematical Background for Cryptography
Modulo Arithmetic, GCD (Euclids Algorithm), Algebraic Structures (Groups), Chinese Remainder Theorem

MODULE 3: Basics of Cryptography
Elementary Ciphers (Substitution, Transposition and their Properties, Secret Key Cryptography: DES (Data Encryption Standard), MAC (Message Authentication Codes) and other applications, Attacks, Public Key Cryptography: RSA

MODULE 4: Cryptographic Hash
Properties, Applications, Performance, Birthday Attack, Key Management: Digital Certificates, PKI (Public Key Infrastructure), Authentication: One-Way Authentication, Mutual Authentication, Dictionary Attacks, Kerberos, Non-cryptographic Protocol Vulnerabilities: DoS and DDoS, Session Highjacking and Spoofing, ARP Spoofing and Attacks on DNS, Viruses, Worms, and other Malware

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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SOFTWARE DEFINED NETWORKING

Course Code: DIFT2806 **Credit Units: 04**

Course Contents

Module-I: INTRODUCING SDN
SDN Origins and Evolution – Introduction – Why SDN? - Centralized and Distributed Control and Data Planes - The Genesis of SDN

Module-II: SDN ABSTRACTIONS
How SDN Works - The Openflow Protocol - SDN Controllers: Introduction - General Concepts - VMware - Nicira - VMware/Nicira - OpenFlow-Related - Mininet - NOX/POX - Trema - Ryu - Big Switch Networks/Floodlight - Layer 3 Centric - Plexxi - Cisco OnePK

Module-III: PROGRAMMING SDN'S
Network Programmability - Network Function Virtualization - NetApp Development, Network Slicing

Module-IV: SDN APPLICATIONS AND USE CASES
SDN in the Data Center - SDN in Other Environments - SDN Applications - SDN Use Cases - The Open Network Operating System 3

Module-V: SDN'S FUTURE AND PERSPECTIVES
SDN Open Source - SDN Futures - Final Thoughts and Conclusions

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

REFERENCES:

- Software Defined Networks: A Comprehensive Approach by Paul Goransson and Chuck Black, Morgan Kaufmann Publications, 2014
- SDN - Software Defined Networks by Thomas D. Nadeau & Ken Gray, O'Reilly, 2013
- Software Defined Networking with OpenFlow By SiamakAzodolmolky, Packt Publishing, 2013

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DIFT2839	DATA ANALYSIS & VISUALISATION USING SOFTWARE	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	Class X Mathematics				
Co-requisites					

Catalog Description

The implosion of available data has made visualization more critical but also more challenging. Data analysis and Data Visualization are essential tools for business analysis, engineers, policymakers, and decision-makers. Developed originally for "small data", visualization techniques have been met with varied success in the past centuries and decades. There are a few well-known visualizations that are very effective in capturing the essence of the data, and of course, there are many infamous negative examples of poor visuals. An effective visual is critical for decision making it, but it also requires a lot of work, customization, attention to detail, and refinements.

Course Objectives

The course is designed to help students develop skills and knowledge in the following area(s):

- Develop an understanding of what is a good visualization for a given purpose
- Learn visualization theory & techniques
- Build a substantial data analytic project
- Apply data analysis and visualization with Excel, SPSS, R, Python, NVivo and MATLAB

Course Outcomes

On completion of this course, the students will be able to

CO1. Students will be able to articulate meaningful lines of inquiry that might be explored through the collection, organization, visualization, and analysis of data in a context associated with their primary field of study using (as appropriate) numerical, textual, spatial, and/ or visual data.

CO2. Student will understand what data are, how they are collected, and how to assess the quality/ reliability of data.

CO3. Students will demonstrate intermediate proficiency in the visualization of data to communicate information and patterns that exist in the data.

CO4: Students will be able to use at beginning level of proficiency the tools of statistics and machine learning to ask questions of and explore patterns in data.

Course Content :

Module	Topics Covered	Blooms Level	Contact Hours
1	**Module-1: Introduction to Excel** Data Analysis using Excel, Curve fitting, Correlation, Linear Regression, Multiple regression, Principal Component Analysis and Factor Analysis, Hypothesis testing **Introduction to Excel and SPSS** Introduction to SPSS and Types of Data, Importing, exporting and data handling in SPSS; Exploratory data analysis using SPSS and data visualization; Introduction to statistical inference and various	L1, L2, L3, L4	20 hours

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	univariate tests by using SPSS; Analysis of Variance (One Way ANOVA, Two Way ANOVA and ANCOVA); Correlation, Simple and Multiple linear Regression Analysis; Principal Component Analysis and Factor Analysis		
2	**Module-2: VOS Viewer** **Web of Science, Scopus, Dimensions, Lens, and PubMed.** Co-authorship networks, citation-based networks, and co-occurrence networks can be created based on data downloaded from Web of Science, Scopus, Dimensions, and Lens. Co-authorship networks and co-occurrence networks can also be created based on PubMed data. **Crossref, Europe PMC, and OpenAlex**. Networks can also be created based on data retrieved through the APIs of Crossref, Europe PMC, and OpenAlex, These APIs can be queried interactively in VOS viewer. **Semantic Scholar, Open Citations, and Wiki Data.** For a given set of DOIs, networks can also be created based on data retrieved through the APIs of Semantic Scholar, Open Citations and Wiki Data.	L1, L2, L3, L4	10 Hours
3	**Faculty of Management Studies & Behavioural Sciences** **Module 3: Domain Specific Software** **- Structural Equation Modelling** **Smart PLS** Introduction to Structural Equation Modelling (SEM), Introduction to the software's AMOS and SPSS, SMART PLS, Testing of Statistical assumptions, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), common method bias (CMB) test, Measurement Model Assessment, Discussing Fit Indices, Reliability and Validity Testing, Structural Model Assessment identifying multivariate outlier, Construct Validity: Convergent and Discriminant Validity, Measurement Model & Structural Equation Modelling, Mediation and Moderation Effects, Multi-Group Analysis.	L1, L2, L3, L4	30 Hours
	Faculty of Arts **N Vivo** 1. Import text, audio, video, emails, images, spreadsheets, online surveys, web content, and social media from various sources into a simple, intuitive interface. 2. Create and NVivo project, import and organise qualitative and quantitative data		

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	3.Manage a literature review in NVivo 4. Autocode structured data deductively and identify themes inductively 5. Generate and falsify hypotheses 6. Combine data in sets for analysis 7. Seek patterns and identify relationships across codes and cases 8. Present findings using visualisations 9. Export data out of NVivo 10. Coordinate teamwork.		
	Faculty of Science Engineering and Technology **Faculty of Health & Allied Sciences** **R programming / Python/ MATLAB** **R Programming-** Introduction to R, Variables and datatypes in R, Dataframes, Recasting and joining of dataframes, Arithmetic, logical and matrix operations in R, Functions in R, Control structure in R, Data visualization in R. **Python Programming-** Basics of programming, data structure and algorithm using Python, Strings, lists, control, functions, manipulating lists, loops, arrays, selection sort, insertion sort, recursion, sorting, dictionaries, exception handling, file handling, string processing, data analysis using Python **MATLAB Programming-** Introduction, basic features, managing workspace, mathematical functions, basic plotting, Matrices, array operations and linear equations, MATLAB programming- M files script, M-file functions, control flow and operations.		

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional (Theory/ Practical)	End Term Examination
Weightage (%)	5	10	15	70

References:

- David Houcque, 2005. Introduction to MATLAB programming for Engineering students., Northwestern University, E- Book **https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf**
- Mark Lutz, 2009. Learning Python. O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.
- Emmanuel Paradis, 2005. R for Beginners. E book. **https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf**
- A Handbook of Statistical Analysis using SPSS by Dr. Brijesh Awasthi, Redshine Publication.

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Amity School of Engg. & Technology

Bachelor of Computer Application
(Honors/ Honors with Research)

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Curriculum & Scheme of Examination

2023

AMITY UNIVERSITY HARYANA

GURUGRAM

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Bachelor of Computer Application (Honors/ Honors with Research)
SEMESTER-I

DIFT2151	COMPUTER PROGRAMMING WITH C LANGUAGE	L	T	P	C
Version : 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course is aimed to provide a fundamental understanding of programming concepts. C Language is the language which used to write solution for the basic computational problem in the form of instructions and programs. The basic and advanced features of C Language including Data types, Operators, Conditional & Control Statements, Arrays, Strings, Structure & Union and File Handling will be introduced.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of Programming through C Language
2. Provide an overview of advanced programming concepts like Structure, Union and File Handling

Course Outcomes

On completion of this course, the students will be able to

After the completion of course, the students will be able to,

CO 1: Define the purpose and structure of C Program for programming; identify and distinguish various datatypes and operators for arithmetic, logical relational operations; solve the problems related to finding errors and output in program.

CO 2: Describe conditional and control statement; apply if-else, Switch and loops to rewrite basic C program for problem solving.

CO 3: Compare and contrast various Array types, its declaration and implementation; differentiate between Call by Value and Reference if Functions; apply the concepts to rewrite C Programs

CO 4: Differentiate between various String Handling Functions; describe the concept of Pointers in C Language

CO 5: Explain the concept of Structure and Union; apply the concept of File Handling to provide data storage support to the programs.

Modules	Blooms level*	Number of hours
Module I: Introduction to 'C' Language History of C, Introduction of C, Basic structure of C program, Concept of variables, constants and data types in C, Operators and expressions: Introduction, arithmetic, relational, Logical, Assignment, Increment and decrement operator, Conditional, bitwise operators, Expressions, Operator precedence and associatively. Managing Input and output Operation, formatting I/O.	L1, L2 and L3	6
Module II: Decision making and looping Decision making in program, Relational Logical operators example, if statements, if -else, nested if-else statements, Switch, case loop, Do-While, While, for loop and nesting of loop, continue and break , Storage types , predefined processor.	L2 and L3	8

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Module III: Arrays and Functions One Dimensional Arrays, Arrays Manipulation, Sorting, Searching, Function declaration, example & calling a function. Passing Arguments, call by value and call by references, Recursive function, .Recursion.	L2, L3 and L4	7
Module IV: Pointers and String Pointers: Declaration, Pointer assignments, initialization, Pointers and Dynamic Memory Allocation, Array of Pointers, strings, string handler functions.	L2, L3 and L4	8
Module V: Structure Union & file handling Structure definition, Declaration, structure Assignments, Arrays in structure, Structure Arrays, Pointer Structure, Nested Structure, Arrays of Structure, Union declaration, assignments & example programs, Difference between structure & union, file handling and the related functions.	L2 and L3	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. E Balagurusamy, "Programming in ANSI C", Seventh Edition, Tata McGraw Hill Education private limited, July 2017.
2. Yashwant Kanetkar, "Let Us C", 16th Edition, BPB Publication, June 2017.

Reference Books

1. Brain W Kernighan and Dennis M Ricchie, "The C Programming Language", 2nd Edition, Pearson Publication, Jan 2015.
2. Byron Gottfried, "Programming with C", Third Edition, Tata McGraw Hill Education private limited, July 2017.
3. E Balagurusamy, "Computer Concepts & Programming in C", Seventh Edition, Tata McGraw Hill Education private limited, July 2011.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**1**	**2**	--	**2**	--	--	--	--	--	--	--	--	**1**	--	**2**
CO2	**1**	**1**	**2**	**2**	--	--	--	--	--	--	--	--	**1**	--	**2**
CO3	**1**	**1**	**2**	**3**	--	--	--	--	--	--	--	--	**1**	---	**2**
CO4	**1**	**1**	**2**	**2**	**3**	--	--	--	--	--	--	--	**1**	--	**2**
CO5	**1**	**1**	**2**	**2**	**3**	--	--	--	--	--	--	--	**1**	--	**2**

1: strongly related, 2: moderately related and 3: weakly related

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DIFT2101	COMPUTER FUNDAMENTALS	L	T	P	C
Version 2023.1	Date of Approval:	1	0	0	1
Pre-requisites/Exposure	Basis of Computers				
Co-requisites	Nil				

Catalog Description

Examines key computational abstraction levels below modern high-level languages; number representation, assembly language, memory management, the operating-system process model, high-level machine architecture including the memory hierarchy, and how high-level languages are implemented. This course is aimed to provide a fundamental understanding of computer science for the students in their early stages of academic career. Various computer nomenclatures regarding to hardware and software are introduced in this course to develop an in-depth realization of several subjects and their significant roles in the field.

Course Objectives

The objective of this course is to

1. Give students an in-depth understanding of why computers are essential components in business, education and society.
2. Introduce the fundamentals of computing devices and reinforce computer vocabulary, particularly with respect to personal use of computer hardware and software, the Internet, networking and mobile computing.
3. Provide hands-on use of Microsoft Office 2013 applications Word, Excel, Access and PowerPoint.

Course Outcomes

On completion of this course, the students will be able to

CO1: Describe the usage of computers and why computers are essential components in business and society.
CO2: Utilize the Internet Web resources and evaluate on-line e-business system.
CO3: Solve common business problems using appropriate Information Technology applications and systems.
CO4: Identify categories of programs, system software and applications. Organize and work with files and folders.
CO5: Describe various types of networks standards and communication software.

Modules	Blooms level*	Number of hours
MODULE 1: Computer and its characteristics, application of computers, digital and analog computer, Generation of computers, Storage devices: primary storage devices (RAM,ROM,PROM,EPROM,EEPROM) , secondary storage devices(Floppy disk, Hard disk, optical disk, magnetic tapes), Input and output devices (keyboard, mouse, light pen, joystick, scanner, monitor, printers etc.)	L1, L2, L3	7
MODULE 2: Software and its types (System Software, Application Software, Firmware Software's) Computer Languages and its types (Machine Language, Assembly Language, High Level Language: advantages and disadvantages of computer	L1, L2	8

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languages), Translators: Compiler, Linker, Interpreter, Number system and its types, conversion from one base to another and vice versa. .		
MODULE 3: Word Processor and its features, Editing of Text, Find and Replace, Bullets and Numbering, Spell Checker, Grammar Checker, Auto Correct, Auto Complete, Auto Text, Header and footer, tables, mail merge, border and shading, page setup, printing.	L2, L3 and L4	7
MODULE 4: Spread sheet and its features, Entering Information in Worksheet, Editing Cell Entry, Moving and Copying Data, deleting or Inserting Cells, Rows and Columns, Custom Numeric Formats, Using Formulas and functions, Creating charts.	L2, L3, L4	7
MODULE 5: Presentation Software and its uses, steps for creating PowerPoint Presentation, PowerPoint Views, Assigning Slide Transitions, Using Preset Animations, Hiding Slides, Slide Show, Controlling the Slide Show with a Keyboard, Setting Slide Show Timings.	L3, L5 and L6	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. P.K Sinha & Priti Sinha, Computer Fundamentals, BPB Publications.
2. Peter Nortan, Introduction to Computers, Tata Mcgraw Hill.

Reference Books

1. Suresh K. Basandra, Computer Systems Today, Galgotia Publications.
2. Joyce Coax , Joan Preppernau,,Steve Lambert and Curtis Frye,2007 Microsoft Office System step by step, Microsoft Press.
3. R.K. Taxali, PC Software for Windows, Tata Mcgraw Hill.
4. Alexix Leon, Mathewes Leon, Fundamentals of Information Technology, Vikas Publishing.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**1**	**3**	**--**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**3**	**1**	**--**
CO2	**1**	**2**	**--**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**3**	**--**	**3**	**1**	**--**
CO3	**1**	**3**	**--**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**3**	**2**	**3**	**1**	**--**
CO4	**1**	**--**	**1**	**3**	**1**	**--**	**--**	**--**	**3**	**--**	**--**	**2**	**3**	**1**	**--**
CO5	**1**	**1**	**1**	**2**	**--**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**3**	**1**	**--**

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DIGITAL ELECTRONICS

Course Code: DIFT2103 **Credit Units: 02**

Course Objective:
An entry level course in digital electronics covering number systems, binary mathematics, digital codes, logic gates, Boolean algebra, Karnaugh maps, and combinational logic. Emphasis will be on circuit logic analysis and design of digital circuits. The student will explain the operation of digital logic gates and use Boolean algebra and Karnaugh mapping to express logic operations and minimize logic circuits in design. The student will construct, analyze combinational logic circuits & sequential circuits; create a truth table for standard digital logic gates; and add, subtract, multiply and divide using the binary numbering system. Student will also be able to understand about digital to analog conversion and vice versa.

Course Contents:

Module I: Number System
Decimal, Binary, Octal, Hexadecimal Number Systems and Conversion of the bases, Complements: r's complement, (r-1)'s complement, Binary codes: Grey code, BCD Code, Excess-3 code
Introduction to logic systems
Positive and negative logic, Logic functions - NOT, AND, OR, NOR, EX-OR, EX NOR
Truth tables Boolean algebra, De Morgan's theorems Standard forms for Logical Expressions - Sum of Products, Product of Sums Specification of Logical functions in terms of Minterms and Maxterms, Karnaugh Maps, Simplification of Logical functions, Introduction of "don't care" states.

Module II: Combinational Building Blocks
Multiplexers, De-multiplexers, Decoders, Encoders
Arithmetic circuits
Half Adders and Full Adders**,** Half Subtractor and Full Subtractor

Module III: Flip-flops
The RS latch, the clocked RS flip-flop, JK Flip Flop, the Master-Slave JK flip-flop, Delay and Toggle flip-flops
Flip-flops in counter circuits Asynchronous (ripple) Counters (UP/DOWN), Synchronous Counter design (UP/DOWN), Non Sequential Counting

Module IV: Shift Registers
Shift registers in general, Ring Counters, Johnson Counter
Introduction to Memory
Primary: RAM, Static RAM, Dynamic RAM, ROM, PROM, EAPROM, Secondary: Floppy Disk, Hard Disk, CDROM

Module V: Introduction to Logic Families, DACs and ADCs
Introduction to logic families-TTL, RTL,ECL,CMOS,DTL,IIL
Binary weighted resistor DAC, Resolution, linearity and settling time of DACs, Successive approximation ADC

Examination Scheme:

Components	CT1	A/C/Q	Attd	EE
Weightage (%)	15	10	5	70

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Text & References:

Text:

- R.P Jain, Mordern Digital Electronics, Tata Mcgraw Hill.

References:

- Malvino & Leach, Digital Electronics, Tata Mcgraw Hill,2006,Edition 6.
- Floyd, Digital Fundamentals,Pearson,2015.
- M.M Mano, Digital Logic and Computer Design,Pearson.

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DIFT2152	COMPUTER PROGRAMMING WITH C LANGUAGE LAB	L	T	P	C
Version 2023.1	Date of Approval:	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The primary objective of this course is to understand all the components of C, including the C language, the C Preprocessor, and the C Standard Library. An understanding of some advanced practical issues, including memory management, testing and debugging, complex declarations and expression evaluation, building and using libraries, and evaluating tradeoffs, such as size vs. speed and speed vs. complexity. The ability to write C code and create and manipulate logical programs.

Course Objectives

The objective of this course is to

- Equip the students with concepts of Programming through C Language
- Provide an overview of advanced programming concepts like Structure, Union and File Handling

Course Outcomes

After the completion of course, the students will be able to,

CO 1: Demonstrate the use of various data types and operators in C programs; Solve various problems using conditional control statements (if-else, Switch case).

CO 2: Construct C programs related to problems involving the usage of loops, arrays and functions.

CO 3: Apply the concept of Pointers for efficient memory management and construct C programs using string handling functions.

CO 4: Demonstrate the use of Structure, Union and concept of File Handling to provide data storage support to the programs.

Modules	Blooms level*	Number of hours
LABORATORY SESSSION 1 OPERATORS, EXPRESSIONS and DECISION MAKING 1. Write a program to calculate simple interest and amount. 2. Write a program to swap two numbers using third variable. 3. Write a program to demonstrate Greatest of 3 nos and to print the given no in ascending order. 4. Write a program to check if the number is even or odd. 5. Write a program to perform arithmetic operations using Switch Case statement. 6. Write a program to calculate area of circle, rectangle, square and triangle using Switch Case statement.	L3	5
LABORATORY SESSSION 2 LOOPING 1. Write a program to find factorial of given no using do while statement. 2. Write a program to print prime numbers up to ‘n’.	L3	6

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3. Write a program to sum of n natural no. 4. Write a program to print Fibonacci series. 5. Write a program to reverse a number. 6. Write a program to print the following pattern using for loop 1 2 2 3 3 3 4 4 4 4 7. Write a program to print the following pattern using for loop A A B A B C A B C D		
LABORATORY SESSSION 3 ARRAYS and FUNCTIONS 1. Write a program to read n num of students and 5 subjects marks. 2. Write a program to swap two numbers using call by value. 3. Write a program to convert all lower case to uppercase characters 4. Write a program to find the factorial of a number using recursion. 5. Write a program to print the add/product of two matrices of any order.	L3	5
LABORATORY SESSSION 4 POINTERS AND STRING 1. Write a program to perform operations on strings using string handling in-built functions (concatenation, reversal, copy etc.) 2. Write a program to swap two numbers using call by reference. 3. Write a program to perform dynamic memory allocation and deallocation. 4. Write a program to print elements of array using pointers.	L3	4
LABORATORY SESSSION 5 STRUCTURE,UNION & FILE HANDLING 1. WAP program to display student information by initializing structures. 2. WAP program to find the total salary of employee and employee details using structure. 3. Write a program to store and display information using Union. 4. Program to write data into file and read data from file.	L3	4

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. E Balagurusamy, "Programming in ANSI C", Seventh Edition, Tata McGraw Hill Education private limited, July 2017.
2. Yashwant Kanetkar, "Let Us C", 16th Edition, BPB Publication, June 2017.

Reference Books

1. Brain W Kernighan and Dennis M Ricchie, "The C Programming Language", 2nd Edition, Pearson Publication, Jan 2015.
2. Byron Gottfried, "Programming with C", Third Edition, Tata McGraw Hill Education private limited, July 2017.
3. E Balagurusamy, "Computer Concepts & Programming in C", Seventh Edition, Tata McGraw

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DIFT2102	COMPUTER FUNDAMENTALS LAB	L	T	P	C
Version 2023.1	Date of Approval:	0	0	2	1
Pre-requisites/Exposure	Knowledge of Computer				
Co-requisites	NIL				

Catalog Description

This course is aimed to provide a fundamental understanding of computer science for the students in their early stages of academic career. Various computer nomenclatures regarding hardware and software will be introduced for students to develop an in-depth realization of several subjects and their significant roles in the field. After this course, the students will be able to understand and apply the fundamental concepts of computer.

Course Objectives

The objective of this course is

1. Give students an in-depth understanding of why computers are essential components in business, education and society.
2. Introduce the fundamentals of computing devices and reinforce computer vocabulary, particularly with respect to personal use of computer hardware and software, the Internet, networking and mobile computing.
3. Provide hands-on use of Microsoft Office 2016 applications Word, Excel, Access and PowerPoint. Completion of the assignments will result in MS Office applications knowledge and skills.

Course Outcomes

On completion of this course, the students will be able to:

CO 1: Outline the usage of computers and why computers are essential components in business and society. Creating the folder and apply it where necessary.

CO 2: Identify the features of windows operating system. Determine the operations of taskbar of Windows and Set the wall paper, screen saver and date/time.

CO 3: State and demonstrate the use of word document and relate its applications with the day to day use of files.

CO 4: Identify and relate the concept of macros and mail merging. Design and work with files and folders.

CO 5: List the features of the excel document and apply and relate its calculation part with the real world. Design a document for resume writing.

Modules/Topics Covered**	Blooms level*	Number of hours
1. Create a new folder and do the following: a. Make a word document in it. b. Make an Excel document in it. c. Make a new folder in it d. Rename the initial folder e. Move the initial folder f. Copy the initial folder. g. Delete the initial folder	L1, L3 and L5	4
2. Implement the various well known features of Windows operating system such as Notepad, WordPad, Paint, System tools, Entertainment etc. enclosed in Start→Programs→Accessories. 3. Implement various display properties by right clicking on the Windows Desktop.	L1, L3	4

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4. Explore the taskbar of Windows. 5. Set the wall paper and screen saver. 6. Set the date/time.		
7. Create a document and a. Put Bullets and Numbers b. Apply various Font parameters. c. Apply Left, Right, and Centre alignments. d. Apply hyperlinks. e. Insert pictures f. Insert ClipArt g. Show the use of WordArt h. Add Borders and Shading i. Show the use of Find and Replace. j. Apply header/footers	L1, L3, L5	4
8. Create any document and show the use of File→versions. 9. Create any document and show the difference between paste and paste special. 10. Create a document to show the use of Washout/Watermark. 11. Implement the concept of mail merge.	L1, L3, L5	4
12. Implement the concept of macros. 13. Implement the concept of importing a file/document. 14. Implement the concept of merging the documents.	L1, L3, L5	4
15. Create a student table and do the following: a. Insert new row and fill data b. Delete any existing row c. Resize rows and columns d. Apply border and shading e. Apply merging/splitting of cells f. Apply sort g. Apply various arithmetic and logical formulas. 16. Create your resume using General Templates.	L1, L3, L4, L5	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

[1] P. S. Pradeep K. Sinha, Computer Fundamentals, BPB Publications, 2017.

[2] P. Nortan, Introduction To Computers, Tata Mcgraw Hill Publishing Co Ltd, 2017.

Reference Book

[1] S. K. Basandra, Computer Today, Galgotia Publications Pvt. Ltd., 2010.

[2] J. P. J. C. S. L. Curtis Frye, 2007 Microsoft Office System Step by Step (Step by Step (Microsoft)), Microsoft, 2007.

[3] R. Taxali, Pc Software For Windows Made Simple, Tata Mcgraw Hill Publishing Co Ltd, 2000.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

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IA					EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	**70**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE- External Exam

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**2**	--	--	--	--	--	--	--	--	--	--	--	**1**	--	--
CO2	**3**	--	--	--	--	--	--	--	--	--	--	--	**1**	--	--
CO3	**3**	--	--	--	--	--	--	--	--	--	--	--	**1**	--	**3**
CO4	**3**	--	--	--	--	--	--	--	--	--	--	--	**1**	--	--
CO5	**2**	**3**	--	--	--	--	--	--	--	--	--	--	**1**	**1**	--

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SEMESTER-II

DIFT2251	DATA STRUCTURE	L	T	P	C
Version 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Hands on knowledge of C Programming				
Co-requisites	Basic concepts of C Programming				

Catalog Description

This course is an introduction to the use, design, and analysis of data structures in computer programs. The very commonly used data structures like arrays, stacks, queues, lists, trees, and graphs will be discussed in detail. Sorting and hashing are important topics in the study of algorithms. They are also closely related to the design of data structures. Several algorithms to implement these techniques are included in the syllabus.

Course Objectives

The objective of this course is to

1. Equip the students with the basic concepts of data structures and algorithms
2. Understand concepts about searching and sorting techniques
3. Understand basic concepts about stacks, queues, lists, trees and graphs

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain fundamental data structures and algorithms and summarize their typical uses, strengths, and weaknesses; Address calculation, application of 1D and 2D arrays and various operations applied on arrays.

CO 2: Explain Stack and Queue data structure, various types of Queues; Representation of stack and queue in memory; Applications of stack and queue.

CO 3: Explain and compare link list with other linear data structure; Advantage, disadvantages, types, application and memory representation of link list.

CO 4: Explain Binary search tree and its types. Applying in-order, pre-order and post order traversal to create the tree; application of tree in searching and storing huge amount of data.

CO 5: Analyze and compare the complexity different searching and sorting algorithms. Evaluate algorithms and data structures in terms of time and memory complexity of basic operations.

CO 6: Explain different types of graphs and their representation in memory.Appling BFS and DFS graph traversal scheme to find shortest path. Determine minimum spanning tree using Kruskal and Prim's method.

Modules	Blooms level*	Number of hours
MODULE 1: BASIC CONCEPTS AND ARRAY Definition Accessing the address of a variable, Declaring and initializing pointers. Accessing a variable through its pointer. Meaning of static and dynamic memory allocation. Memory allocation functions : malloc, calloc, free and realloc. Representation of arrays single and multi dimensional arrays. Address calculation using column and rows major ordering. Various operations on arrays, Application of arrays: matrix multi multiplication.	L1, L2 and L3	5

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MODULE 2: STACKS AND QUEUES Definition, Array representation of stack.Operations on stack: Infix, prefix and postfix notations.Conversion of an arithmetic expression from Infix to postfix. Evaluation of postfix expression using stacks. Definition, Array representation of Queue. Types of queue: Simple queue, circular queue, double ended queue (deque), priority queue, operations on all types of Queues.	L2, L3 and L4	7
MODULE 3: LINKED LIST Definition, Components of linked list, Representation of linked list, Advantages and Disadvantages of linked list. Types of linked list : Singly linked list, Doubly linked list, Circular linked list and circular doubly linked list. Operations on singly linked list : creation, insertion, deletion, search and display (based on the different position as specified by the user).Linked representation of Stacks & Queues.	L2, L3 and L4	7
MODULE 4: TREES Definition : Tree, Binary tree, Complete binary tree, Binary search tree, Heap Tree terminology : Root, Node, Degree of a node and tree, Terminal nodes, Non terminal nodes, Siblings, Level, Edge, Path, depth, Parent node, ancestors of a node. Binary tree : Array representation of tree, Creation of binary tree. Traversal of Binary Tree: Preorder, Inorder and post order. Representation of trees and its application, Binary search tree: Insertion & deletion in BST. Height balanced (AVL) tree	L2, L3, L4and L5	6
MODULE 5: SEARCHING, SORTING AND COMPLEXITY Searching: Sequential and binary search, Comparison between linear and binary search. Sorting: insertion, selection, bubble, quick, merge, heap sort.	L2, L3 and L4	5
MODULE 6: GRAPHS Graph representation: adjacency list, adjacency matrix. Types of Graphs: Directed & Undirected Graph .Traversal scheme: Depth first search, Breadth first search. Spanning tree: definition, minimal spanning tree algorithms.	L2, L3 and L4	6

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Seymour Lipschutz , "**Data Structures**", Schaum outlines, Revised 1st Edition
2. R.L. Kruse, B.P. Leary, C.L. Tondo, **"Data structure and program design in C**", PHI
3. A.V. Aho, J. E. Hopcroft, and J. D. Ullman, **"Data Structures and Algorithms"**, 1st Edition, Pearson Education, Reprint 2003.

Reference Books

- J. P. Tremblay and P. G. Sorenson, **Introduction to Data Structures with Applications**, McGraw – Hill Computer Science Series, Mc-Graw – Hill New York, 1984
- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest,**" Algorithms"**, Prentice-Hall India(1999).
- Yeddidyah Langsam, Moshe J.Augenstein, Aaron M. Tenen Baum, "**Data Structures Using C and C++",** 2nd Edition, Prentice-Hall India
- Mark Allen Weiss,"**Data Structures and Algorithm analysis in C++** ",Addison Wesley (3rd Indian Reprint 2000).

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	2	2	--	--	--	--	--	--	--	--	--	1	3	--
CO 2	1	--	2	3	--	--	--	--	--	--	--	--	1	3	--
CO 3	1	2	3	--	--	--	--	--	--	--	--	--	1	3	--
CO 4	1	2	1	--	--	--	--	--	--	--	--	--	1	3	--
CO 5	1	2	1	--	--	--	--	--	--	--	--	--	1	3	2
CO 6	1	1	2	2	--	--	--	--	--	--	--	--	1	3	2

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DIFT2252	DATA STRUCTURE LAB		L	T	P	C
Version 2023.1	Date of Approval:		0	0	2	1
Pre-requisites/Exposure	Hands on knowledge of C Programming					
Co-requisites	Basic concepts of C Programming					

Catalog Description

The course is designed to develop skills to design and analyse simple linear and non- linear data structures like arrays, stacks, queues, lists, trees, and graphs. It strengthen the ability of the students to identify and apply the suitable data structure for the given real world problem. It enables them to gain knowledge in practical applications of data structures.

Course Objectives

The objective of this course is to

1. Equip the students to apply knowledge of basic concepts of data structures in solving complex problems.
2. Provide demonstration of the data structure concepts like stacks, queues, lists, trees, graphs and various searching and sorting techniques

Course Outcomes

On completion of this course, the students will be able to

CO 1: Apply the knowledge of basic fundamentals of data structures in order to analyze the time and space efficiency of the data structure

CO 2: Demonstrate the use and applications of Stack and Queue data structure along with various types of Queues.

CO 3: Demonstrate and compare link list with other linear data structure; Advantage, disadvantages, types and application of link list.

CO 4: Apply the knowledge of trees and heaps and demonstrate the application of tree in searching and storing huge amount of data.

CO 5: Apply algorithm for solving problems like sorting, searching, insertion and deletion of data.

CO 6: Demonstrate the usage of graphs and their applications of BFS and DFS to find shortest path.

Modules	Blooms level*	Number of hours
1. Sample programs of 1D and 2-D arrays (a) Write a program to insert an element at any position in an array (b) Write a program to perform addition of matrix for order 3*3 (c) Write a program to perform multiplication of matrix of any order	L1, L2 and L3	4
2. Sample Programs of stack and queues. (a) Write a program that perform the following function i) Create stack of integers. ii) PUSH operation on stack iii) POP operation on stack (b) Write a program that perform the following function i) Create Queue of integers. ii) Insert operation on Queue iii) Delete operation on Queue	L2, L3	4

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(c) Write a program that perform the following function i) Create Circular Queue of integers. ii) Insert operation on Circular Queue iii) Delete operation on Circular Queue		
3. Sample Programs of Linked List **(a)** Write a C program that perform the following: i) Create a singly linked list of integers. ii) Delete a given integer from the above linked list. iii) Display the contents of the above list after deletion **(b)** Write a C program that performs the following: a) Create a doubly linked list of integers. b) Delete a given integer from the above doubly linked list. c) Display the contents of the above list after deletion .	L2, L3 and L4	6
4. Sample Programs of trees (a) Write a C program that uses functions to perform the following: i) Create a binary search tree of characters. ii) Traverse the above Binary search tree recursively in Postorder.	L2, L3, L4and L5	2
5. Sample programs on sorting and searching (a) Write C programs for implementing the Bubble Sort (b) Write C programs for implementing the Selection Sort (c) Write C programs for implementing the Insertion Sort (d) Write a program to perform linear Search (e) Write a program to perform binary Search	L2, L3 and L4	6
6. Sample programs on graphs (a) Write C programs for implementing the graph traversal algorithms: Depth first traversal **(b) Write C programs for implementing the graph traversal algorithms: Breadth first traversal**	L3, L4 and L6	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Seymour Lipschutz , "**Data Structures**", Schaum outlines, Revised 1st Edition
2. R.L. Kruse, B.P. Leary, C.L. Tondo, **"Data structure and program design in C**", PHI
3. A.V. Aho, J. E. Hopcroft, and J. D. Ullman, **"Data Structures and Algorithms"**, 1st Edition, Pearson Education, Reprint 2003.

Reference Books

1. J. P. Tremblay and P. G. Sorenson, **Introduction to Data Structures with Applications**, McGraw – Hill Computer Science Series, Mc-Graw – Hill New York, 1984
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest,**" Algorithms"**, Prentice-Hall India(1999).
3. Yeddidyah Langsam, Moshe J.Augenstein, Aaron M. Tenen Baum, "**Data Structures Using C and C++",** 2nd Edition, Prentice-Hall India
4. Mark Allen Weiss,"**Data Structures and Algorithm analysis in C++** ",Addison Wesley (3rd Indian Reprint 2000).

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	**70**
Weightage (%)	5	10	10	5	

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE- External Exam

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1	**1**	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**2**
CO 2	**1**	**--**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**
CO 3	**1**	**--**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**
CO 4	**1**	**2**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**
CO 5	**1**	**2**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**2**
CO 6	**1**	**1**	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**2**

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DIFT2203	INTRODUCTION TO DATABASE MANAGEMENT SYSTEM	L	T	P	C
Version : 2023.1	Date of Approval: 14th June 2023	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course is to expose the students to the fundamentals & basic concepts in Data Base Management System. This course discusses architecture of Database Systems with concept of relational model & ER model. This course explains techniques for database design, Normalization and database recovery and protection.

Course Objectives

This objectives of the course is to expose the students to

- The fundamentals & basic concepts in Data Base Management Systems.
- Architecture of Database Systems with concept of relational model & ER model.
- The techniques for database design, Normalization and database recovery and protection.

Course Outcomes

After completing the course, the student will be able to:

CO1: Define and list the basic terminologies used in database
CO2: Explain and describe the relational model and relational algebra
CO3: Apply and construct the concepts used in modelling
CO4: Compare and illustrate different concurrency control protocols
CO5: Design the ER Model and SQL queries
CO6: Assess and interpret different issues associated with database systems

Modules	Blooms level*	Number of hours
MODULE 1: **Introduction to DBMS** Definition of DBMS, Data Independence, DBMS Architecture, Levels, Database Administrator, File System Approach Vs DBMS Approach, Advantages of Using a DBMS, Data Models, Schemas, and Instances.	L1, L2	8
MODULE 2: **Relational Database & ER Model** Relational System, Codd's Rule, Relational Model, Optimization, Tables and Views, Entity, Types of Entity, Weak Entity Attributes, Entity sets, Entity – Relationship Diagrams.	L1, L2, L3	7

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MODULE 3: **Relational Model Objects** Domains and Relations, Relations and predicates, Relational Data Integrity; Primary Key, Candidate Key, Foreign Key and their rules; Relational operators, Relational Algebra, Relational Calculus, SQL Language, Data definition, Data retrieval and update operations.	L1, L2, L3	8
MODULE 4: **Database Design** Definition Of Functional Dependencies, Process Of Normalization, First Normal Form, Second Normal Form, Third Normal Form. Boycee Codd Normal Form, Fourth Normal Form, Fifth Normal Form.	L3, L4	5
MODULE 5: **Data Recovery & Protection** Transaction ACID Properties ,Recovery- Transaction recovery, System recovery, Media Recovery, Concurrency Control Techniques Lost Update Problem , Dirty Read Problem, Locking, Dead Lock, Serializability; Security- Introduction.	L3, L4, L5, L6	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Elmasari, Navathe, "Fundamentals of Database Systems", Addision Wesley.
2. Korth, Silbertz, Sudarshan, "Database Concepts". McGraw Hill.

Reference Books

1. Majumdar & Bhattacharya, "Database Management System", Tata McGraw Hill.
2. Date C J." An Introduction to Database Systems", Addision Wesley.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PS O 4**
CO1	**1**	--	--	--	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO2	**1**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO3	**1**	**1**	**1**	**1**	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO4	**1**	--	--	**1**	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO5	**1**	**1**	**1**	**1**	**1**	--	--	--	--	--	--	--	**1**	**1**	--	--
CO6	**1**	-	-	-	**1**	--	--	--	--	--	--	--	**1**	**1**	--	--

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DIFT2204	INTRODUCTION TO DATABASE MANAGEMENT SYSTEM LAB	L	T	P	C
Version 2023.1	Date of Approval: 2023	0	0	2	1
Pre-requisites/Exposure	Basic Concepts of DBMS				
Co-requisites	Relational Algebra and Relational Calculus				

Catalog Description

This course is design to get students familiar with the basic concepts of SQL including DDL, DML and DCL statements. The course also explains the basic concepts of PL/SQL. Students will learn practical on Oracle software and hence can work on any RDBMS software.

Course Objectives

The objective of this course is

1. To make students familiar with the concepts and working of SQL.
2. Provide an overview of PL/SQL.

Course Outcomes

On completion of this course, the students will be able to

CO1. Illustrate SQL basic concepts like languages DDL, DML etc., data types and working.
CO2. Explain concepts of database creation, manipulation of data and data retrieval and apply them in real database applications.
CO3. Design and implement various data constraints on a database for a given problem.
CO4. Solve queries using concepts like joins, subqueries, aggregate functions, triggers etc.
CO5. Prepare PL/SQL blocks.

Modules (Lab Sessions)	Blooms level*	Number of hours
Lab Session 1 Introduction of RDBMS, Oracle, SQL and data types.	L1 and L2	2
Lab Session 2 Basic concept of database creation and manipulation of data.	L1and L3	2
Lab Session 3 Working with SELECT query.	L1 and L3	2
Lab Session 4 To apply data constraints on a table-Primary Key, Not Null, Unique.	L1 and L3	2
Lab Session 5 Working with Foreign Key and Check Constraint.	L1 and L3	2
Lab Session 6 To implement the basic concept of Aggregate and Grouping Functions.	L1 and L3	2
Lab Session 7 To apply various set operators on data.	L1 and L3	2

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Lab Session 8 Concept of Nested queries in database and its application in database.	L1 and L3	2
Lab Session 9 Implementation different types of JOINS in database.	L1 and L3	2
Lab Session 10 Basic concepts of Triggers and Procedures and related queries.	L1 and L3	2
Lab Session 11 Introduction to PL/SQL and basic syntax.	L1 and L3	2
Lab Session 12 Write programs in PL/SQL Using Control Structures.	L3	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Ivan Bayross , "SQL, PL/SQL the Programming Language of Oracle", 4th Ed., BPB Publications,2009.
2. Lynn Beighley, "Head First SQL", 1st Ed., O′Reilly, 2007.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	-	-
CO2	**1**	-	**2**	--	--	**3**	--	--	--	--	--	**2**	--	--	**1**	-
CO3	**1**	-	**1**	--	--	**3**	--	--	--	--	--	**2**	--	**1**	**1**	-
CO4	**1**	-	**2**	--	--	--	--	--	--	--	--	--	---	**1**	**1**	--
CO5	**1**	-	**2**	--	--	--	--	--	**2**	--	--	--	--	**1**	--	-

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EMESTER-III

DIFT2353	CONCEPTS OF OBJECT ORIENTED PROGRAMMING	L	T	P	C
Version 2023.1	Date of Approval: Date, Month 2023	3	0	0	3
Pre-requisites/Exposure	Hands on knowledge of C Programming				
Co-requisites	Basic concepts of C Programming				

Catalog Description

This course provides in-depth coverage of object-oriented programming principles and techniques using C++. Topics include classes, overloading, data abstraction, information hiding, encapsulation, inheritance, polymorphism, file processing, templates, exceptions, container classes, and low-level language features.

Course Objectives

The objective of this course is

1. Equip the students with the basic features of C++ supporting object oriented programming. Perform object oriented programming to develop solutions to problems demonstrating usage of control structures, modularity, I/O. and other standard language constructs.
2. Provide the overview of major object-oriented concepts to implement object oriented programs in C++ like encapsulation, inheritance and polymorphism , stream I/O, templates and operator overloading

Course Outcomes

On completion of this course, the students will be able to

CO 1: Explain the basic principles of object oriented programming approach; Differentiate it with procedural programming approach and also discuss difference between C and C++.

CO 2: Illustrate the different ways to define a member function inline and explain how the private members of a class can be accessed .Explain how the objects can be instantiated and destroyed with static data member?

CO 3: Explain the concept of inheritance, types and implementation with suitable examples; find out ambiguity problem in inheritance; use the concept of overriding and constructors in inheritance.

CO 4: Explain polymorphism in detail and implement the concept of overloading in functions as well as in operators. Write the programs for virtual function and pointer with objects.

CO 5: Explain the exception handling mechanism. Design the programs for class and function Template. Compare and contrast various formatted and unformatted i/o function in file handling.

Modules	Blooms level*	Number of hours
MODULE 1: **OVERVIEW OF PROGRAMMING:** What is Object Oriented Programming, Characteristics of OOP, Difference between C and C++. Basics:-Input/Output in C++ using cin/cout, Pre-processor Directives, Data Types-Integer, Float, character, Enumerations, library functions, comments, storage classes, manipulators, operators in C++, scope resolution operator , memory management operator. arrays and strings .	L1 and L2	5
MODULE 2: **CLASSES AND OBJECTS**	L1, L2 and L3	7

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Functions: Simple functions, passing arguments to functions, returning values from functions, reference arguments, returning by reference, Overloaded functions, Inline functions, friend function , Structures and class. Classes and objects: A simple class, C++ objects as physical objects, objects as function arguments, returning objects from functions, static class data, array as class data member, array of objects		
MODULE 3: **INHERITANCE** Inheritance, Types of Inheritance, access modes – public, private & protected, Abstract Classes, Ambiguity resolution using scope resolution operator and Virtual base class, Constructors, Types of constructors, Destructors.	L2, L3 and L4	8
MODULE 4: **POLYMORPHISM** Polymorphism, Type of Polymorphism – Compile time and runtime, Function Overloading, Operator Overloading (Unary and Binary) Polymorphism by parameter, Pointer to objects, this pointer, Virtual Functions, pure virtual functions.	L2, L3 and L4	8
MODULE 5: **FILES AND EXCEPTION HANDLING AND I/O** Files and Streams: streams, string I/O, character I/O, file pointer, error handling, command line arguments. Formatted and Unformatted Input output, Introduction of Exception handling, Try Catch block, Re-throwing an Exception.	L2, L3 and L4	8

**B'loom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. A.R. Venugopal, Rajkumar, T. Ravishanker "Mastering C++", TMH, 1997
2. R. Lafore, "Object Oriented Programming using C++", BPB Publications, 2004.
3. E. Balagurusamy ,"Object Oriented Programming with C++", Mc Graw Hill,6th Edition,2013.
4. Schildt Herbert, "C++: The Complete Reference", Wiley DreamTech, 2005.

Reference Book

1. Parasons, "Object Oriented Programming with C++", BPB Publication, 1999.
2. Steven C. Lawlor, "The Art of Programming Computer Science with C++", Vikas Publication, 2002.
3. Yashwant Kanethkar, "Object Oriented Programming using C++", BPB, 2004

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/ Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2	PS O 3	PS O 4
CO 1	1	2	--	--	--	--	--	--	--	--	--	--	1	--	2	--
CO 2	1	1	2	3	--	--	--	--	--	--	--	--	1	--	1	2
CO 3	1	1	2	--	--	--	--	--	--	--	--	--	1	--	2	2
CO 4	1	1	2	3	--	--	--	--	--	--	--	--	1	1	--	2
CO 5	1	1	2	--	--	--	--	--	--	--	--	--	1	1	--	1

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DIFT2354	CONCEPTS OF OBJECT-ORIENTED PROGRAMMING LAB	L	T	P	C
Version 2023.1	Date of Approval: 14th June 2023	0	0	2	1
Pre-requisites/Exposure	Basic knowledge of C				
Co-requisites	NIL				

Catalog Description

This lab course provides in-depth coverage of object-oriented programming principles and techniques using C++. To explore and implement the various features of OOP including classes, overloading, data abstraction, information hiding, encapsulation, inheritance, polymorphism, file processing, exceptions, container classes, and low-level language features.

Course Objectives

The objective of this course is

1. Equip the students with the basic features of C++ supporting object-oriented programming. Perform object-oriented programming to develop solutions to problems demonstrating usage of control structures, modularity, I/O. and other standard language constructs.
2. Provide the overview of major object-oriented concepts to implement object oriented programs in C++ like encapsulation, inheritance and polymorphism , stream I/O, templates and operator overloading
3. Perform object-oriented programming to develop solutions to problems demonstrating usage of control structures, modularity, I/O. and other standard language constructs.
4. Demonstrate adeptness of object-oriented programming in developing solutions to problems demonstrating usage of data abstraction, encapsulation, and inheritance.
5. Demonstrate ability to implement one or more patterns involving realization of an abstract interface and utilization of polymorphism in the solution of problems which can take advantage of dynamic dispatching, syntax, features of, and how to utilize the Standard Template Library.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Demonstrate object-oriented programming concepts in developing solutions to problems

CO 2: Demonstrate the different ways to define a member function inline and explain how the private members of a class can be accessed. Solve how the objects can be instantiated and destroyed with static data member?

CO 3: Apply the concept of inheritance, types and implementation with suitable examples; find out ambiguity problem in inheritance; use the concept of overriding and constructors in inheritance.

CO 4: Demonstrate the concept polymorphism with overloading in detail and implement the concept of overloading in functions as well as in operators. Write the programs for virtual function and pointer with objects.

CO 5: Apply advanced features of C++ specifically stream I/O, templates and operator overloading

Modules/Topics Covered**	Blooms level*	Number of hours
1. Sample Programs using objects and classes 17. Write a program to illustrate the concept of one class with two objects by taking student data. 18. Write a program to show the relationship of class and object to display roll no., grade and fee paid by student.	L1, L2 and L3	4
2. Sample Programs for different use of private, public member variables and functions and friend functions	L1, L3, L5	4

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(a) Write a program to define the member function outside and inside the class. (b) Write a program to read and display the information of N persons to illustrate the concept of array of objects. (c) Write a program to add two numbers to illustrate the use of friend function.		
3. Sample Programs using constructors and destructors (a) Write a program to assign and copy values to illustrate the concept of parametrized and copy constructor. (b) Write a program to show the order of constructor and destructor.	L1, L3, L4	4
4. Sample Programs using operator overloading (a) Write a program to add two numbers using binary operator overloading. (b) Write a program to illustrate the assignment operator overloading.	L1, L3, L4	4
5. Sample Programs using inheritance in and accessing objects of different derived classes (a) Write a program to compute the marks explaining the concept of multiple inheritance. (b) Write a program to find the factorial of a number using inheritance.	L1, L3,	4
6. Sample Programs using polymorphism and virtual functions (using pointers) and File Handling (a) Write a program to find the volume of cylinder and cuboid using function overloading. (b) Write a program to reverse a string using pointers. (c) Write a program to explain the relationship of inheritance and virtual function. (d) Write a program to read the student name and fee paid using read() function from the file.	L2,L3 and L4	4

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

1. A.R. Venugopal, Rajkumar, T. Ravishanker "Mastering C++", TMH, 1997

2. R. Lafore, "Object Oriented Programming using C++", BPB Publications, 2004.

Reference Book

1. Parasons, "Object Oriented Programming with C++", BPB Publication, 1999.

2. Steven C. Lawlor, "The Art of Programming Computer Science with C++", Vikas Publication, 2002.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA					EE
Components	**A**	**PR**	**LR**	**V**	**70**
Weightage (%)	5	10	10	5	

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE- External Exam

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**3**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	--	--	--
CO2	**3**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO3	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO4	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO5	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	**2**

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DIFT2303	INTRODUCTION TO OPERATING SYSTEM	L	T	P	C
Version 2023.1	Date of Approval:	2	0	0	2
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

To study and apply concepts relating to operating systems, such as concurrency and control of asynchronous processes, deadlocks, memory management, processor and disk scheduling, parallel processing, and file system organization and Demonstrate an understanding of the differences between processes and threads, the different process or thread synchronization methods and the, the different memory management techniques used in Operating Systems, the different I/O management techniques used in Operating Systems, the tradeoffs in design and implementation concepts used in the development of Operating Systems.

Course Objectives

The objective of this course is to

- Equip the students with the knowledge about categories of operating systems and their functions.
- Provide detailed knowhow about functions of operating system like process, memory and device management along with file system security and protection.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define and explain operating systems and their evolution also differentiate among its various types.

CO2: Explain concepts of process and inter-process communication and synchronization. Identify solutions to detect, prevent and handle deadlocks occurring in the operating systems. Solve synchronization and CPU scheduling problems related to processes.

CO3: Define and explain concepts of memory management like fragmentation, paging and segmentation. Solve problems related to memory management using page replacement algorithms.

CO4: Describe the concepts of device management and list various disk allocation methods. Determine solutions for disk scheduling problems using available disk scheduling algorithms.

CO5: State the concept of file and file system security, also distinguish among various file allocation methods.

Modules	Blooms level*	Number of hours
MODULE 1: **INTRODUCTION AND SYSTEM STRUCTURE** What is an operating system, History of OS, OS concepts, Types of OS, OS Structure, OS Operations. System calls, Types of System Calls, System Programs, OS Structure, Virtual Machines, System Boot	L1, L2 and L4	6
MODULE 2: **PROCESS MANAGEMENT** Process Concept, Process Scheduling, Scheduling Criteria, Scheduling Algorithms, Overview of Thread Scheduling and Multiprocessor scheduling, Operations on Processes, Interprocess communication with example. Client-server Communication, Overview of Multithreaded programming models	L1, L2 and L3	6

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MODULE 3: **PROCESS COORDINATION** Overview of Process Synchronization, Critical Section Problem, Semaphores, Classic problems. Deadlock- Prevention, Avoidance, Detection, Recovery, Algorithms	L1, L2 and L3	6
MODULE 4: **MEMORY MANAGEMENT** Memory Management Strategies-Introduction, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Virtual Memory Management- Demand Paging, Thrashing, Page Replacement	L1, L2 and L3	6
MODULE 5: **STORAGE MANAGEMENT** Overview of File System, Access Methods, Directory and Disk Structures, File Sharing, Protection, Disk Scheduling, Disk Management, I/O hardware	L1 and L2	6
MODULE 6: **PROTECTION AND SECURITY** Goals and Principles of Protection, Access Matrix, Security Problem, Program Threats, System and Network Threats, Overview of Cryptography, Overview of User Authentication and Security Defense.	L1 and L2	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Milenekovic, "Operating System Concepts", McGraw Hill
- Silberschatz, P.B. Galvin "Operating System Concepts", John Willey & son

Reference Books

- Dietel, "An introduction to operating system", Addision Wesley
- Tannenbaum, "Operating system design and implementation", PHI
- Operating System, A Modern Perspection, Gary Nutt, Pearson Edu. 2000
- A. S Tanenbaum, Modern Operating System, 2nd Edition, PHI
- Willam Stalling " Operating system" Pearson Education

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CT1	A	Attd	EE
Weightage (%)	15	10	5	70

CT: Class Test, A: Assignment, Attd: Attendance , EE: End Semester Examination

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1	2	--	--	--	--	--	--	--	--	--	--	1	--	--
CO2	1	2	3	--	--	--	--	--	--	--	--	--	2	--	--
CO3	1	2	3	--	--	--	--	--	--	--	--	--	2	--	--
CO4	1	2	3	--	--	--	--	--	--	--	--	--	1	--	--
CO5	1	--	2	--	--	--	--	--	--	--	--	--	1	--	--

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DIFT2304	LINUX ADMINISTRATION	L	T	P	C
Version	Date of Approval:	1	0	0	1
Pre-requisites/Exposure	Basics of OS				
Co-requisites	Nil				

Catalog Description

The Objective of this course is to explore the idea of Linux platform to graduate students. The fundamentals concepts of Linux Operating System, commands and Shell Programming will be prepared by the students to work on Linux platform, which is the requirement of each industry and in academic The syllabus will cover the study of scripting languages such as PERL, TCL/TK and BASH Creation of programs in the Linux environment, the principles of scripting languages and usage of scripting languages in IC design flow.

Course Objectives

The objective of this course is

1. Ability to create and run scripts using Perl / TCL.
2. Ability to use Linux environment and write programs.

Course Outcomes

On completion of this course, the students will be able to

CO1. Outline basics of UNIX OS and Linux security system.
CO2. Describe Linux file system and related commands.
CO3. Illustrate implementation of Linux networking concepts.
CO4. Demonstrate Perl and Tcl/tk scripts.

Modules	Blooms level*	Number of hours
Module I: Introduction History of Operating System, Types of Operating Systems, History of Linux and Unix, UNIX Family, Unix System Architecture, Kernel, Shell: Types of shells, Files and Directories, Absolute Path and Relative Path, root and hierarchical file structure of Unix, telnet, Introduction to Linux server security and administration.	L1 and L2	6
Module II: Linux Basics Introduction to Linux, File System of the Linux, General usage of Linux kernel & basic commands, Linux users and group, Permissions for file, directory and users, Searching a file & directory, zipping and unzipping concepts.	L2 and L3	6
Module III: Linux Networking Introduction to Networking in Linux, Network basics & tools, File transfer protocol in Linux, Network file system, Domain Naming Services, Dynamic hosting configuration Protocol & Network information Services.	L1 and L3	6
Module IV: Perl Scripting and Tcl/tk Scripting Introduction to Perl Scripting, working with Simple Values, Lists and Hashes, Loops and Decisions, Regular Expressions;Data Structures, Control Flow Commands, Procedures and Scope, Evel, Working With UNIX, Reflection and Debugging, Script Libraries, Tk Fundamentals, Tk by Examples, The Pack Geometry Manager, Binding Commands to XEvents, Buttons and Menus, Simple Tk Widgets, Entry and Listbox Widgets Focus, Grabs and Dialog.	L2, L3 and L4	6

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

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1. Sumitabha Das, "UNIX: Concepts and Application", TMH, 4th Edition.
2. Kanetkar. "UNIX Shell Programming", BPB
3. Richard Petersen, "Linux: The Complete Reference", Mcgraw Hill Education, ISBN: 9780070222946, 0070222940, 6th Edition.

Reference Books

1. Red Hat Enterprise Linux 4: System Administration Guide Copyright 2005 Red Hat, Inc.
2. Randal K. Michael., "Mastering Unix Shell Scripting: Bash, Bourne, and Korn Shell Scripting for Programmers, System Administrators, and UNIX Gurus.", Wiley
3. James K L, "Linux: Learning the Essentials", Phi Learning Private Limited, ISBN: 9788120344754, 8120344758, Edition: 2011.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1	--	2	--	--	--	--	--	--	--	--	--	1	--	-
CO2	1	2	1	--	--	--	--	--	--	--	--	--	-	1	-
CO3	1	2	1	--	--	3	--	--	--	--	--	--	1	1	-
CO4	1	1	--	--	--	3	--	--	--	--	--	--	1	--	2

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DIFT2305	LINUX ADMINISTRATION LAB	L	T	P	C
Version 2017.1	Date of Approval: 14 June 2017	0	0	2	1
Pre-requisites/Exposure	Basic Concepts of OS				
Co-requisites					

Catalog Description

This course is designed to get students familiar with the advance concepts of Linux. The course provides familiarity to concepts like C Programming in Linux, Perl and TCL scripting. Students will learn practical on Linux and hence can work on any application based on Linux advanced concepts.

Course Objectives

The objective of this course is

1. To make students familiar with the advance concepts and working of Linux.
2. Provide an overview of Perl and TCL scripting.

Course Outcomes

On completion of this course, the students will be able to

CO1. Illustrate Linux basic concepts like shell scripts and working.
CO2. Explain concepts of C programming in Linux and apply them in real applications.
CO3. Design and implement various Perl scripts for a given problem.
CO4. Work on TCL scripts.

Modules	Blooms level*	Number of hours
Lab Session 1-2 Review of UNIX Commands, Redirection, Piping and shell programming.	L1 and L2	4
Lab Session 3-5 Writing shell scripts.	L1and L3	6
Lab Session 6-8 Writing Perl Script.	L1 and L3	6
Lab Session 9-10 To prepare C programs in Linux	L1 and L3	4
Lab Session 11-12 Working with Foreign Key and Check Constraint.	L1 and L3	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Sumitabha Das, "UNIX: Concepts and Application", TMH.
2. Kanetkar. "UNIX Shell Programming", BPB
3. TCL Tutorial: https://www.guru99.com/tcl-tutorial.html
4. Randal L. Schwartz "Learning Perl: Making Easy Things Easy and Hard Things Possible", O'Reilly.

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**1**	**1**	**2**	**--**	**--**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**2**
CO2	**1**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**-**
CO3	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**-**
CO4	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**1**

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SIFT2301	ROBOTIC PROCESS AUTOMATION	L	T	P	C
Version 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Basic Networking Concepts				
Co-requisites	Nil				

Catalog Description

This course aims at providing knowledge of basic concepts of Robotic Process Automation to University students. It further builds on these concepts and introduces key RPA Design and Development strategies and methodologies specifically in context of UiPath products. The student undergoing the course shall develop the competence to design and develop a robot for a defined process.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of robotic process automation
2. Provide an overview of designing with uipath software.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain key terms and trends around the robotic process automation along with its physical and logical design

CO2: Understand the potential and value of the robotic process automation.

CO3: Describe the technologies used for the robotic process automation and mobile devices, including (passive and active) sensors, the physical communications layer, communications protocols, programming frameworks,

CO4: Design programs and have hands on experience on uipath software

CO5: Develop RPA programs of moderate complexity for a well-used robotic automation process using uipath.

Modules	Blooms level*	Number of hours
Module 1: Programming Basic and Recap **Programming Concepts Basics I -** Understanding the application, Basic Web Concepts, Protocols, Email Clients, Data Structures, Data Tables, Algorithms, Software Processes, Software Design, SDLC. **Programming Concepts Basics 2-** Scripting, Net Framework, Net Fundamentals, XML, Control structures and functions, XML, HTML, CSS, Variables & Arguments.	L1, L2	8
Module II: RPA Concepts **RPA Basics -** History of Automation, what is RPA, RPA vs Automation, Processes & Flowcharts, Programming Constructs in RPA, What Processes can be Automated, Types of Bots, Workloads which can be automated. **RPA Advanced Concepts -** Standardization of processes, RPA Development methodologies, Difference from SDLC, Robotic control flow architecture, RPA business case, RPA Team, Process Design Document/Solution Design Document, Industries best suited for RPA, Risks & Challenges with RPA, RPA, and emerging ecosystem	L2, L3 and L4	8
Module III: UiPath Introduction & Basics	L2, L3 and L4	8

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Introduction to UiPath- Installing UiPath Studio community edition, The User Interface, Keyboard Shortcuts, About Updating, About Automation Projects, Introduction to Automation Debugging, Managing Activation Packages, Reusing Automations Library, Installing the Chrome Extension, Installing the Firefox Extension, Connecting your project to a source control system, Activities Guide. **Variables**, **Control Flow** **Data Manipulation-** Data Manipulation Introduction, Scalar variables, collections and Tables, Text Manipulation, Data Manipulation, Gathering and Assembling Data. **Recording and Advanced UI Interaction -** Recording Introduction, Basic and Desktop Recording, Web Recording, Input/Output Methods, Screen Scraping, Data Scraping, Scraping advanced techniques. Selectors.		
Module IV: **UiPath Advanced Automation concepts and techniques** Image, Text & Advanced Citrix Automation- Introduction to Image & Text Automation, Image based automation, Keyboard based automation, Information Retrieval, Advanced Citrix Automation challenges, Best Practices, using tab for Images, Starting Apps. Excel Data Tables & PDF - Data Tables in RPA, Excel and Data Table basics, Data Manipulation in excel, Extracting Data from PDF, extracting a single piece of data, Anchors, Using anchors in PDF. Email Automation- Email Automation, Incoming Email automation, Sending Email automation	L2, L3 and L4	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books
"Learning Robotic Process Automation" By Alok Mani Tripathi,Packt Publications,Ist Edition,2018

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	--	--	**3**	--	--	--	--	--	--	**2**	--	**1**	**1**	-	-
CO2	**1**	--	**1**	**2**	--	--	--	--	--	--	--	--	-	**1**	-	-
CO3	**1**	--	**1**	**2**	--	--	--	--	--	--	--	--	-	**1**	-	**2**
CO4	**1**	--	--	**2**	--	--	--	--	--	--	--	--	**1**	**1**	-	**2**

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SEMESTER-IV

DIFT2453	COMPUTER NETWORKS	L	T	P	C
Version :	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Basics of Computers				
Co-requisites					

Catalog Description

The goal is to acquaint the students with the basics of data communication and networking. A structured approach to explain how networks work from the inside out is being covered. The physical layer of networking, computer hardware and transmission systems have been explained. In-depth includes routing process, error detection techniques, noisy protocols and various applications of layers of OSI model.

Course Objectives

The objective of this course is to

1. To provide an overview of data communication and computer networks, network specific protocols, networking devices, OSI /TCP-IP Layer concepts.
2. To serve as a foundation for the study of advanced networking concepts.

Course Outcomes

On completion of this course, the students will be able to

CO1. State the functions of data component in communication, networking devices, characteristics of topologies and describe the functionality of layers in OSI model.
CO2. Explain parallel and serial transmission; Differentiate between periodic and aperiodic signals including data encoding techniques.
CO3. Illustrate the working and applications of guided and unguided media. Explain working of ISDN.
CO4. Explain flow control and error control protocols.
CO5. Compare and Contrast different routing algorithms; discuss the frame format of IPv4 and IPv6 with working of TCP protocol.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Data Communication, Networks-protocols, advantages, disadvantages & applications, Line Configuration, topology, Transmission mode, Classification of networks. OSI Model, functionality of layers in OSI model, Protocols at each layer, encapsulation, peer-to-peer communication.	L1, L2	8
MODULE 2: Parallel & Serial Transmissions, Analog & Digital Signals, Periodic & Aperiodic Signals, Data encoding techniques-Digital data-digital signals, Digital data-Analog signals, Analog data- Digital signals, Analog data-Analog signals, Multiplexing.	L2, L3 and L4	8
MODULE 3:	L3 and L4	6

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Transmission Media-Twisted Pair Cable, Coaxial Cable, Fiber-Optics Cable, Radio frequency Allocation, Terrestrial Microwave, Infrared rays, Satellite Communication, Cellular Telephony. Introduction to ISDN.		
MODULE 4: Framing, Switching, Types of Errors, Error Detection & Correction (VRC, LRC, CRC, Checksum, Hamming Code), Flow Control (Stop-and-wait & Sliding Window), Error Control (Stop & Wait ARQ, Sliding Window ARQ using Go-back n method and Selective-Reject), IEEE Standards-802.3, Token Bus (802.4), Token Ring (802.5), FDDI.	L2, L3 and L4	6
MODULE 5: Routing process, Routing Algorithms-Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Addressing-IPv4, IPv6, Internetworking, Connection–oriented Vs Connectionless protocols-TCP,UDP.	L2, L3 and L4	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Data Communication and Networking by Behrouz Forouzan, FourthEdition, MH.
2. Computer Networks by A.S. Tanenbaum, Fifth Edition, Prentice Hall.

References Books

1. Data and Computer Communications by W. Stallings, Prentice Hall.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	**3**	--	--
CO2	**1**	**2**	**3**	--	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO3	**1**	**1**	**2**	**3**	**3**	--	--	--	--	--	--	--	**1**	**2**	--	--
CO4	**1**	**1**	**2**	**3**	--	--	--	--	--	--	--	--	**1**	**1**	**2**	---
CO5	**1**	**1**	**2**	**3**	--	--	--	--	--	--	--	--	**1**	**2**	**1**	---

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DIFT2454	COMPUTER NETWORKS LAB	L	T	P	C
Version	Date of Approval :	0	0	2	1
Pre-requisites/Exposure	Basics of Computers				
Co-requisites	NIL				

Catalog Description

The course familiarizes with the equipment applications and protocols installed in enterprise networks, with a focus on switched networks, IP Telephony requirements, and security. It also introduces advanced routing protocols such as Enhanced Interior Gateway Routing Protocol (EIGRP) and Open Shortest Path First (OSPF) Protocol. Hands-on exercises include configuration, installation, and troubleshooting.

Course Objectives

The objective of this course is to

1. Make the students understand configuration of routing protocols.
2. Provide a demonstration of troubleshooting of different protocols.

Course Outcomes

On completion of this course, the students will be able to

CO1. Apply the knowledge of CISCO router to understand its basic configuration, Enterprise network and implement inter -VLAN routing.
CO2. Demonstrate the configuration of OSPF and RIP protocol.
CO3. Demonstrate the configuration of EIGRP and BGP protocol.
CO4. Apply the knowledge of basic WAN connections using HDLC and PPP protocol.
CO5. Demonstrate the standard and extended ACL on router.

Modules (Lab Sessions)	Blooms level*	Number of hours
1. Drawing an Enterprise Network for Amity University showing its different campuses across the country. 2. Configuring all the devices (PCs, Servers, Switches) to create a LAN within campuses of the Enterprise Network. 3. Configuring Virtual LANs (VLANs) in an Enterprise Network. 4. Configuring Trunking and Inter-VLAN Routing in an Enterprise Network.	L3, L5	4
5. Implementing RIP (Routing Information Protocol) to enable communication betweendifferent LANs. 6. Implementing OSPF (Open Shortest Path First) to enable communication betweendifferent LANs.	L3, L5	2
7. .Implement EIGRP (Interior Routing Protocol) to establish connectivity within domestic campuses of the Enterprise Network. 8. Implement BGP (Border Gateway Protocol) and Redistribution to establish connectivity between different campuses of the Enterprise Network.	L3, L5	2
9. 9. Configuring WAN connectivity using protocols-HDLC and PPP. 10. Implementing Frame-Relay to configure WAN service provider cloud.	L3, L5	2

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11. Configuring Standard and Extended ACLs on a Router. 12. Troubleshooting Switching, Routing and ACL issues.	L3, L5	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books
1. Data Communication and Networking by Behrouz Forouzan,Fourth Edition,TMH.
2. Computer Networks by A.S. Tanenbaum, Fifth Edition, Prentice Hall.

References Books
1. Data and Computer Communications by W. Stallings, Prentice Hall.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.
Software : Packet tracer.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**	**--**
CO2	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**	**--**
CO3	**1**	**1**	**2**	**3**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**--**	**--**
CO4	**1**	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**2**	**--**
CO5	**1**	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**1**	**--**

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DIFT2403	ANALYSIS & DESIGN OF ALGORITHM	L	T	P	C
Version 2023.1	Date of Approval:	2	0	0	2
Pre-requisites/Exposure	Basic knowledge of Data Structure				
Co-requisites	Nil				

Catalog Description

The designing of algorithm is an important component of computer science. The objective of this course is to make students aware of various techniques used to evaluate the efficiency of a particular algorithm. Students eventually should learn to design efficient algorithm for a particular problem.

Course Objectives

The objective of this course is to

1. Analyze the asymptotic performance of algorithms.
2. Demonstrate a familiarity with major algorithms and data structures.
3. Apply important algorithmic design paradigms and methods of analysis.
4. Synthesize efficient algorithms in technical design situations.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain use of asymptotic notations and principles of Divide and Conquer algorithms and solve various problems using that strategy.

CO2: Explain principles of Greedy Algorithms and Dynamic Programming and apply the strategy to solve various problems.

CO3: Explain basic concepts of graphs and apply various design strategies to solve graph related problems.

CO4: Apply the various algorithms in different areas of Computer Science.

Modules	Blooms level*	Number of hours
Module I: Introduction Algorithm Design paradigms - motivation, concept of algorithmic efficiency, concept of running time, analysis of algorithms, Growth of Functions, Asymptotic Notations, Structure of divide-and-conquer algorithms, analysis of divide-and-conquer algorithms, example algorithms - Quick Sort, Merge Sort, Strassen Multiplication, Recurrences- Substitution Method, Recursion Tree Method, Iteration Method , Master's Method.	L1, L2 and L3	8
Module II: Advanced Design Techniques Greedy Algorithms - Introduction, elements of greedy strategy, Fractional Knapsack Problem, activity selection problem, Dynamic Programming - Overview, difference between dynamic programming and divide and conquer, Matrix Chain Multiplication, Longest Common Sub-sequence, 0/1 - Knapsack Problem. Difference between Greedy and Dynamic Programming Approach.	L2, L3 and L4	10
Module III: Graph Algorithms	L2, L3 and L4	10

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Representation of Graphs, Graph Traversal - BFS and DFS, Topological Sort, Strongly Connected Components. Minimum Spanning Tree, Kruskal's Algorithm, Prim's Algorithm, , Single Source Shortest Paths, Dijkstra's Algorithm, Bellmanford Algorithm, All Pair Shortest Path Problem, Floyd Warshall's Algorithm.		
Module IV: Selected Topics Back tracking - Introduction, n-Queens Problem, NP-Completeness – Definition and examples of Class P, NP, NP-Hard and NP Complete, Polynomial reduction. Approximation Algorithms – Introduction, Performance Bounds, Example Problems – Vertex Cover Problem, Travelling Salesperson Problem. Randomized Algorithms. Application of algorithms in different areas of Computer Science.	L2, L3 and L4	8

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evalllluation

Text Books

1. T. H. Cormen, Leiserson, Rivest and Stein, "Introduction of Computer algorithm"
2. E. Horowitz, S. Sahni, and S. Rajsekaran, "Funadmentals of Computer Algorithms," Galgotia Publication

Reference Books

1. Sara Basse, A. V. Gelder, "Computer Algorithms," Addison Wesley
2. J.E Hopcroft, J.D Ullman, "Design and analysis of algorithms"., Addison Wesley
3. D. E. Knuth, " The art of Computer Program, Addison Wesley

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**
CO2	**1**	**--**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**
CO3	**1**	**2**	**3**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**
CO4	**1**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**
CO5	**1**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**--**

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DIFT2404	ANALYSIS & DESIGN OF ALGORITHM LAB	L	T	P	C
Version 2023.1	Date of Approval:	0	0	2	1
Pre-requisites/Exposure	C Programming				
Co-requisites	Basic knowledge of Data Structure				

Catalog Description

This course is intended to implement the various algorithm strategies for solving the problems using programming language.

Course Objectives

The objective of this course is to

1. equip the students with implementation of various algorithms.
2. provide sound foundation of design strategies for problem solving.
3. measure and compare the performance of different algorithms.

Course Outcomes

On completion of this course, the students will be able to

CO1: Implement the concept of Divide and Conquer algorithms to solve various problems.
CO2: Demonstrate the use of Greedy Algorithms to solve various problems.
CO3: Apply the principle of Dynamic Programming to solve various problems.
CO4: Apply various design strategies to solve graph related problems.

Modules	Blooms level*	Number of hours
1. Programs on sorting algorithms using Divide and Conquer technique. • To implement Merge Sort. • To implement Quick Sort.	L1,L3	2
2. Programs on algorithm based on Greedy Method. • Implement Fractional knapsack. • Demonstrate the Activity Selection Problem.	L1,L3	4
3. Programs on algorithm based on Dynamic programming. • Implement 0/1 Knapsack problem. • Compute the minimum number of multiplication for given set of matrices using Matrix Chain Multiplication. • Compute the length of longest common subsequence for given sequences using LCS.	L1,L3	6
4. Programs on Graph Algorithms. • Print all the nodes reachable from a given starting node in a digraph using BFS method. • Check whether a given graph is connected or not using DFS Method. • Find minimum spanning tree of a given graph using Prim's algorithm. • Find minimum spanning tree of a given graph using Kruskal's algorithm.	L1,L3	10

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• Implement Single Source Shortest Path problem using Dijkstra's algorithm.		

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. T. H. Cormen, Leiserson, Rivest and Stein, "Introduction of Computer algorithm"
2. E. Horowitz, S. Sahni, and S. Rajsekaran, "Funadmentals of Computer Algorithms," Galgotia Publication.

Reference Books

1. Sara Basse, A. V. Gelder, "Computer Algorithms," Addison Wesley
2. J.E Hopcroft, J.D Ullman, "Design and analysis of algorithms"., Addison Wesley
3. D. E. Knuth, " The art of Computer Program, Addison Wesley

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**1**	--	**1**	--	--	--	--	--	--	--	--	--	**1**	--	--
CO2	**1**	--	**1**	--	--	--	--	--	--	--	--	--	**1**	--	--
CO3	**1**	--	**1**	--	--	--	--	--	--	--	--	--	**1**	--	--
CO4	**1**	--	**1**	--	--	--	--	--	--	--	--	--	**1**	--	--

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DIFT2405	STATISTICS & PROBABILITY THEORY	L	T	P	C
Version	Date of Approval:	1	0	0	1
Pr-requisites/Exposure	NIL				
Co-requisites					

Course Objective:

The course give a basic introduction to the concepts of statistics and probability theory. Students are going to learn the core concepts of statistics and probability with hands on exercies. The course enables students to apply the learned concepts in solving varieties of real life problems**.**

Course Outcomes

After completing the course the student will be able to:

CO1 A good understanding of elementary probability theory and statistical population and data.

CO2 Calculate the central tendency, AM,GM, and HM.

CO3 Demonstrate understanding of basic probability axioms and rules and the moments of discrete and continous random variables as well as be familiar with common named discrete and continous random variables.

CO4 Calculate probabilities, and derive the marginal and conditional distributions of bivariate random variables.

Course Content

Modules	Blooms level*	Number of hours
Course Contents: **ModuleI:** Definition and scope of statistics, Type of statistics, Concept of statistical population and sample Data, Quantitative and Qualitative attributes, Variables, Scales of Measurement, Presentation of data, Bivarite data: Definition, Scatter diagram.	L1, L4	12
ModuleII: Mesures of Central Tendency: Mathematical and positional. Measures of Dispersion: Range, Quartile deviation, Mean deviation, Standered deviation, Coefficients of variation, Skewness and kurtosis, Correlation: Simple, Partial Multiple and Ranke correlation, Simple linear regression, Principle of least squares and fitting of polynomials.	L1, L3	14
Module III: Probability: Introduction, Random experiments, sample space, Events and algebra of events, Conditional Probability, Laws of addition and multiplication, Independent events, Theorem of Total Probability, Bayes's theorem and its Applications.	L1,L2, L3	10

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**1**	**3**		**1**	**1**	**1**	**1**					**1**	**1**	**1**	**1**
CO2	**1**	**1**	**1**	**3**	**2**	**2**	**2**	**2**					**1**	**1**	**1**	**2**
CO3	**1**	**3**	**2**	**3**	**3**	**3**	**3**	**3**					**1**	**2**	**1**	**3**

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SEMESTER-V

DIFT2553	INTERNET OF THINGS AND WIRELESS SENSOR NETWORK	L	T	P	C
Version 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Basic Networking Concepts				
Co-requisites	Nil				

Catalog Description

The Internet is evolving to connect people to physical things and also physical things to other physical things all in real time. It's becoming the Internet of Things (IoT). The course enables student to understand the basics of Internet of things and protocols. It introduces some of the application areas where Internet of Things can be applied. Students will learn about the working of Internet of Things.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of internet-of-things
2. Provide an overview of designing iot devices

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain key terms and trends around the Internet of Things along with its physical and logical design

CO2: Understand the potential and value of the Internet of Things and Smart Services.

CO3: Describe the technologies used for the Internet of Things and mobile devices, including (passive and active) sensors, the physical communications layer, communications protocols, programming frameworks,.

CO4: Design python programs and have hands on experience on python programming

CO5:Develop IoT application of moderate complexity for a well-used mobile platform.using python, raspberry Pi and arduino programming

Modules	Blooms level*	Number of hours
Module I: Introduction to Internet of Things Definition & characteristics of IoT, physical design of IoT-things in IoT, IoT protocols, logical design of IoT- IoT functional block, IoT communication models, IoT communication APIs, IoT enabling technologies-wireless sensor networks, cloud computing, big data analytics, communication protocols, embedded systems,IoT levels and deployment templates, IoT application	L1, L2	8
MODULE 2: IoT and M2M Introduction to M2M , difference between IoT and M2M, SDN (software defined networking) and NFV (Network Function Virtualization) and their applications for IoT.	L2, L3 and L4	8
MODULE 3: IoT system management with NETCONF-YANG Need for IoT systems management, SNMP and its limitations, Network Operator Requirements, Introduction to NETCONF and YANG.	L2, L3 and L4	8
MODULE 4: Developing Internet of Things IoT Design Methodology,Logical design using Python- Python data types & data structures, control flow, functions,	L2, L3 and L4	12

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modules, packages, classes, file handling, Python packages for IoTJSON, XML, HTTPLib, URLLib, SMTPLib, IoT end devices-building blocks, Introduction to Raspberry Pi.		
MODULE 5: Introduction of WSN and Architectural Framework Motivation for a Network of Wireless Sensor Nodes, Classification of sensor networks, Hardware architecture, Applications: Structural Health Monitoring, Traffic Control, Health Care, Pipeline Monitoring, Precision Agriculture, Active Volcano, Underground Mining Node Architecture	L2, L4	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Internet of Things: A Hands-On Approach by Arshdeep Bahga, Vijay Madisetti.
- Designing the Internet of Things by Adrian McEwen, Hakim Cassimally

Reference Books

- From Machine-to-Machine to the Internet of Things: Introduction to a New Age by Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	--	--	**3**	--	--	--	--	--	--	**2**	--	**1**	**1**	-	-
CO2	**1**	--	**1**	**2**	--	--	--	--	--	--	--	--	-	**1**	-	-
CO3	**1**	--	**1**	**2**	--	--	--	--	--	--	--	--	-	**1**	-	**2**
CO4	**1**	--	--	**2**	--	--	--	--	--	--	--	--	**1**	**1**	-	**2**

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DIFT2554	INTERNET OF THINGS AND WIRELESS SENSOR NETWORK LAB	L	T	P	C
Version 2023.1	Date of Approval:	0	0	2	1
Pre-requisites/Exposure	Raspberry Pi Basics				
Co-requisites	NIL				

Course Objectives

This program aims to train students to be equipped with a solid theoretical foundation, systematic professional knowledge and strong practical skills in the Raspberry Pi and Arduino. The course focuses on higher-level operating systems, advanced networking, user interfaces, multimedia and uses more computing intensive IoT applications as examples using Raspberry Pi running Linux as the platform of choice, while also exposing the student to other comparable platforms like Arduino. After doing this course, students should be able to design and deploy multiple IoT devices that could connect to the gateway.

Modules	Blooms level*	Number of hours
Module 1: : Getting Started with Raspberry Pi Basic functionality of Raspberry Pi B+ board, setting up the board, configuration and use, implications of an operating system on the behaviour of the Raspberry Pi as an IoT device, booting Raspberry Pi 3, Downloading an Operating System, format an SD card and booting the OS. Basics of Linux and its use, main features including navigating the file system and managing processes, text-based user interface through the shell, overview of the graphic user interface for Raspbian Linux distribution	L2 and L3	5
Module 2: Interfacing Hardware with the Raspberry Pi, Raspberry Pi Remote Access, operate the Raspberry Pi in "headless mode", Bash Command line, operating Raspberry Pi without needing a GUI interface Implications of an operating system on the behaviour of the Raspberry Pi, Overview of Linux and its internal command, aptget-update, navigating the file system and managing processes, text-based user interface through the shell, overview of graphical user interface.	L2 and L3	5
Module 3: Basics of the Python programming language, programming on the Raspberry Pi. Python on Raspberry Pi, Python Programming Environment, Python Expressions, Strings, Functions and Function arguments, Lists, List Methods, Control Flow	L2 and L3	4
Module 4: Communication with devices through the pins of the Raspberry Pi, RPi. GPIO library, Python Functions, setting up the pins, General purpose IO Pins, Protocol Pins, GPIO Access, applying digital voltages, and generating Pulse Width Modulated signals, Tkinter Python library, accessing pins through a graphic user interface.	L2and L3	5
Module 5: Making noise: Playing tones, playing a melody, Types of motors DC, Servo, Motor Drivers, Speed and direction control	L2 and L3	5

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Text & References:

Text:

- Simon Monk, "Programming the Raspberry Pi: Getting Started with Python", January 2012, McGraw Hill Professional

References:

- Eben Upton and Gareth Halfacree, "Raspberry Pi User Guide", August 2016, 4th edition, John Wiley & Sons
- Alex Bradbury and Ben Everard, "Learning Python with Raspberry Pi", Feb 2014, John Wiley & Sons

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	--	1	2	--	--	--	--	--	--	--	--	--	1	--	--	--
CO 2	1	--	2	3	--	--	--	--	--	--	4	--	1	2	--	--
CO 3	--	1	--	--	--	--	--	--	--	2	3	--	-	1	2	--
CO 4	-	1	-	--	2	--	--	--	--	--	--	--	2	1	--	--
CO 5	--	--	1	--	--	--	--	--	2	--	--	--	--	--	--	1

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DIFT2503	WEB TECHNOLOGY	L	T	P	C
Version 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course is aimed to provide a fundamental understanding of web site creation. Hypertext Markup Language (HTML) is the language used for designing most basic web pages (static). The basic and advanced features of HTML including lists, images, hyperlinks, tables, frames and forms will be introduced. It will also provide an overview of Cascading Style Sheets (CSS) and Extensible Markup Language (XML) which can be used with HTML for better data organization and presentation of content on website.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of website design through Hypertext Markup Language and basics of Javascript.
2. Provide an overview of Cascading Style Sheets and Extensible Markup Language for better management of website content.

Course Outcomes

After the completion of course, the students will be able to,

CO 1: Define the purpose and structure of HTML for website development; identify and distinguish various HTML tags for background settings, text-formatting, HTML lists, image insertion and hyperlinks; prepare web page/website content using basic HTML tags and attributes.

CO 2: Describe HTML table, its structure and attributes; Apply table, frameset and frame elements to web-site design.

CO 3: Compare and contrast various form controls; design various kinds of form for user related information and apply front-level validations using Javascript.

CO 4: Differentiate between Inline, Internal and external CSS; modify the website content presentation by incorporating Cascading style sheet properties to existing HTML files.

CO 5: Demonstrate the use of XML document Type Declaration; differentiate between well-formed or Valid XML document.

Modules	Blooms level*	Number of hours
MODULE 1: **INTRODUCTION TO HTML** History of HTML, Structure of HTML, HTML Basic: Elements, Tags and Attributes. Adding Comments, Adding Title, HTML Background: using plain color, using image, Formatting Text : Paragraph, inserting line break, Heading Style, Bold text, Italicized text, Underlined text, Teletype text, Strikeout, Superscript, Subscript, Important text, Emphasized text, Inserted text, Deleted text, Larger text, Smaller text. Working with Text: Changing font Sizes and Colors. Creating List: Ordered List, Unordered List, Definition List, Nested List. Inserting image, Creating Hyper Text Links, Creating Image Links, Horizontal Rules, Marquee Tag. Address Tag.	L1, L2 and L3	10

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MODULE 2: **TABLES AND FRAMES** Tables: Creating Tables, Table Element, Adding Border, Adding Column Headings, Cellspacing and Cellpadding, Adding a Caption, Setting the table Width and Height, Add Row Headings, Aligning Cell contents, Setting Column Width, Centering a Table, Inserting Image, Rowspan, Colspan, Assigning Background Colors. Frames: Frameset Element, Frame Element, Noframes Element, Specifying Target,Inline Frames.	L2 and L3	8
MODULE 3: **FORMS AND VALIDATION** Forms: Introduction to Forms, Form Elements, Text Field, Password Field, Label, Check Box, Radio Button, Selection List, Text Area, Button. Front level validations using JavaScript: Checking a Non-empty Text/Password Field, Restricting Length of Text/Password Field.	L4 and L5	8
MODULE 4: **CASCADING STYLE SHEETS** Overview of style sheets, Advantages, Different ways to use style sheet: External style sheet, Internal style sheet, Inline style sheet. Selectors: Element selector, Id selector, Class selector, Grouping selector. Adding style to a Document, Adding Comments in CSS.	L4 and L5	5
MODULE 5: **XML** Introduction to XML, XML Basics, XML Structure, XML Tags, XML Elements, XML Attributes, Adding Comments, XML Document Type Declaration: Internal DTD and External DTD. Well formed XML Documents and Valid XML Document	L3 and L4	5

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Ivan Bayross , "HTML, DHTML, JavaScript, Perl, CGI",4th revised edition, BPB Publication, 2010, New Delhi.
2. Uttam.K.Roy, "Web Technologies", Oxford University Press, 2011, New Delhi.

Reference Books

- Thomas A. Powell, "HTML & XHTML: The Complete Reference", 4th Edition, Tata McGraw-Hill Publishing Company Limited, 2003, New Delhi.
- Thomas A. Powell, "HTML & CSS: The Complete Reference", 5th Edition, Tata McGraw-Hill digital, 2010, New Delhi.
- Heather Williamson , "XML: The Complete Reference", 1st edition, McGraw-Hill Osborne Media, 2001, New Delhi**.**

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**3**
CO2	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**3**
CO3	**1**	**2**	**1**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**3**
CO4	**1**	**1**	**2**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**3**
CO5	**1**	**1**	**2**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**3**

1: strongly related, 2: moderately related and 3: weakly related

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DIFT2504	WEB TECHNOLOGY LAB	L	T	P	C
Version 2023.1	Date of Approval:	-	-	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course is aimed to provide a fundamental understanding of web site creation. Hypertext Markup Language (HTML) is the language used for designing most basic web pages (static). The basic and advanced features of HTML including lists, images, hyperlinks, tables, frames and forms will be introduced. It will also provide an overview of Cascading Style Sheets (CSS) and Extensible Markup Language (XML) which can be used with HTML for better data organization and presentation of content on website.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of website design through Hypertext Markup Language and basics of Javascript.
2. Provide an overview of Cascading Style Sheets and Extensible Markup Language for better management of website content.

Course Outcomes

After the completion of course, the students will be able to,

CO 1: Prepare web page/website content various HTML elements including tags and attributes for background settings, text-formatting, HTML lists, image insertion and hyperlinks, Moving content across screen.

CO 2: Apply table, frameset and frame elements to web-site design.

CO 3: Construct various kinds of forms to take user related information and apply front-level validations using Javascript.

CO 4: Design and modify the website content presentation by incorporating inline, internal and external Cascading style sheets to existing HTML files.

CO 5: Demonstrate the use of well-formed or Valid XML document.

Modules	Blooms level*	Number of hours
LABORATORY SESSION 1 INTRODUCTION TO HTML 1. Design a webpage to show various tags used for formatting text. 2. Design a webpage to show usage of various heading tags, font tag and background color. 3. Design a webpage to insert image as an inline element and in the background. 4. Design a webpage to show usage of ordered list, unordered list and definition list. 5. Design a webpage to show the use of hyperlink (Text & Image) and image map. 6. Design a webpage to show scrolling text and scrolling image using marquee tag.	L3	6
LABORATORY SESSION 2 TABLES AND FRAMES	L3	4

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1. Design a table using rowspan, colspan, cell padding, cell spacing, grouping, caption and border. 2. Divide a webpage into various frames (row or col wise) and populate them with web content.		
LABORATORY SESSION 3 FORMS AND VALIDATION 1. Create a log-in form/sign-up/feedback/registration form using various elements of form. 2. Write Javascript code to perform basic arithmetic operations, calculate factorial and other such functions using loops, if-else, switch etc. 3. Write javascript code to perform front-end validations (basic and data format validations) on HTML forms. 4. Prepare HTML code to perform form validations using HTML 5.0 elements.	L3	8
LABORATORY SESSION 4 CASCADING STYLE SHEETS 1. Apply Inline Cascading style sheet properties to enhance the appearance and outlook of webpage. 2. Modify the placement and styling of web page content (pictures, hyperlinks, images, videos, lists etc.) using Internal and/or External CSS file.	L3 and L5	4
LABORATORY SESSION 5 XML 1. Create an XML document for saving student details (Name, Enrollment number, Course, CGPA, and Contact No.)	L3	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Ivan Bayross , "HTML, DHTML, JavaScript, Perl, CGI",4th revised edition, BPB Publication, 2010, New Delhi.
2. Uttam.K.Roy, "Web Technologies", Oxford University Press, 2011, New Delhi.

Reference Books

1. Thomas A. Powell, "HTML & XHTML: The Complete Reference", 4th Edition, Tata McGraw-Hill Publishing Company Limited, 2003, New Delhi.
2. Thomas A. Powell, "HTML & CSS: The Complete Reference", 5th Edition, Tata McGraw-Hill digital, 2010, New Delhi.
3. Heather Williamson , "XML: The Complete Reference", 1st edition, McGraw-Hill Osborne Media, 2001, New Delhi.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**3**
CO2	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**3**
CO3	**1**	**2**	**1**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**3**
CO4	**1**	**1**	**2**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**3**
CO5	**1**	**1**	**2**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**3**

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DIFT2501	SOFTWARE ENGINEERING	L	T	P	C
Version 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The purpose of this course is to acquaint students with the concepts and methods available for software development in industrial environments. Students will be exposed to a variety of topics such as design notations, costing techniques, and testing methods, as well as to the tools, which are available to support software specification, design, testing, and maintenance.

Course Objectives

The objective of this course is to

1. Have knowledge of basic SW engineering methods and practices, and their appropriate application.
2. Describe software engineering layered technology and Process framework.
3. give a general understanding of software process models such as the waterfall and evolutionary models.
4. Understanding of the role of project management including planning, scheduling, risk management, etc.
5. Understanding on quality control and how to ensure good quality software.

Course Outcomes

On completion of this course, the students will have

CO1. Basic knowledge and understanding of the analysis and design of complex systems.
CO 2. Ability to apply software engineering principles and techniques.
CO 3. Ability to develop, maintain and evaluate large-scale software systems.
CO 4. Knowledge to produce efficient, reliable, robust and cost-effective software solutions.
CO 5. Ability to work as an effective member or leader of software engineering teams.

Modules	Blooms level*	Number of hours
MODULE 1: Software Development Life Cycle Evolution of Software Engineering, Software Problems, Issues Involved in Software Engineering, Fundamental Qualities of a Software Product, Approaches to Software Engineering, Planning the development Process, Development/Product Life-Cycle Model, Kinds of Software Life-Cycle Model	L1, L2 and L3	8
MODULE 2: Project Management Project Management Concepts, Project Management Activities, Size Metrics. Software Requirement analysis and Specification, Cost Models.	L2, L3 and L6	10
MODULE 3: System Design Design Objectives, Design Principles, Effective Modular Design (Functional Independence, Coupling, and Cohesion), Design Tools and Techniques, Prototyping, Structured Programming.	L1, L3 and L4	10

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MODULE 4: Coding Programming Practices, Verification, Monitoring and Control.	L1, L3 and L4	10
MODULE 5: Software Testing Testing Fundamentals, Test case design, Functional Testing, Structural Testing, Test Plan, Activities during testing, Unit System, Integration Testing, Software Maintenance.	L3, L4 and L6	10
MODULE 6: Software Reliability Concept of Software Reliability, Software Repair and Availability, Software Errors, Failure and Faults.	L3,L4,L6	05

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. F Software Engineering, A Practitioner's Approach - Roger S. Pressman. Tata Mc Graw Hill.

Reference Books

1. U · An Integrated Approach to Software Engineering, Pankaj Jalote., Narosa Publishing House
2. Software Engineering Concepts, Richard Fairley, Tata Mc Graw Hill

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**
CO2	**1**	**--**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**--**
CO3	**1**	**2**	**3**	**3**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**
CO4	**1**	**1**	**2**	**--**	**--**	**--2**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**
CO5	**1**	**1**	**2**	**--**	**-2-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**-**	**2**

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DIFT2502	SOFTWARE ENGINEERING LAB	L	T	P	C
Version 2017.1	Date of Approval: 15 May 2019	0	0	2	1
Pre-requisites/Exposure	Basics of Software Engineering				
Co-requisites	NIL				

Catalog Description

The course provides introduction to the fundamental's principles of software engineering. The organization broadly based on the classical analysis-design-implementation framework. Software Engineering is the systematic approach to the development, operation, maintenance, and retirement of software. Rational Rose Enterprise Edition software is used to serve the objectives. Students will be able to design models according to user requirement.

Course Objectives

The objective of this course is to

1. The basic objective of Software Engineering is to develop methods and procedures for software development that can scale up for large systems and that can be used to consistently produce high-quality software at low cost and with a small cycle time.
2. Apply basic techniques of modeling computer systems.

Course Outcomes

On completion of this course, the students will be able to

CO1: collect requirements and prepare their scenarios

CO2: Construct various UML models (including use case diagrams, class diagrams, interaction diagrams, state chart diagrams, activity diagrams, and implementation diagrams) using the appropriate notation

CO3: Demonstrate the role and function of each UML model in developing objectoriented software.

CO4: Recognize the difference between various object relationships: inheritance, association, whole-part, and dependency relationships.

Modules/Topics Covered**	Blooms level*	Number of hours
1. Introduction to Rational Rose Enterprise Edition tool and SRS 19. Explain features and characteristics of Rational Rose tool along with screenshots. 20. Create Software requirement specification document for Website application of educational institute.	L1, L2	4
2. Concept of UML and Use case diagram (d) Design Use case Diagram of ATM machine (e) Show dependencies and relationships through Use case diagram of Banking Management System	L1, L3	4
3. Class Diagrams and object diagram concepts (c) Design class diagram of Flight Reservation system (d) Design class diagram of student Management system (e) Design object diagram of courier service system (f) Design object diagram of Train Reservation system	L3, L1	8
4. Sequence, Activity, Collaboration, State chart diagram concepts	L3, L1	8

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(g) Design Activity diagram of Library Management system (h) Design Sequence diagram of Food Ordering system (i) Design Collaboration diagram of Hotel Management system (j) Design State chart diagram of Turing Machine		
.		

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

1.Rambugh,Grady Booch, Unified Modeling Language User Guide, Pearson Education 1998.
2.K.K. agrawal,Yogesh Singh, Software Engineering,

Reference Books

1. Martin Fowler, UML distilled: A Brief Guide to the Standard Object Modeling Language, Addison We sely,1997.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	**70**
Weightage (%)	5	10	10	5	

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE- External Exam

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	--	**1**	**2**	**3**	**4**	--	--	--	--	--	--	--	**1**	--	--	--
CO2	--	--	**1**	**2**	**3**	--	--	--	--	--	--	--	**1**	**2**	--	--
CO3	--	**1**	**2**	**3**	--	--	--	--	--	**4**	--	--	-	**2**	**3**	--
CO4	--	**1**	**2**	**3**	--	--	--	--	**4**	--	--	--	**3**	--	**1**	**2**

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DIFT2507	NUMERICAL METHODS	L	T	P	C
Version 1.1	Date of Approval: Date 2017	3	0	0	3
Pre-requisites/Exposure					
Co-requisites					

Course Objectives: The objective of this course is to expose the students to the fundamentals and the concepts of Mathematics including application of derivatives, partial differentiations and vector calculus. This course is designed to understand the basic mathematical logic as a foundation of computer science and applications.

Course Outcomes: On completion of this course, the students will be able to
CO1: Apply the concept of Rolle's Theorem, Mean Value theorem, Lagrange's and Cauchy's theorem.
CO2: Apply the concept of maxima and minima of one variable functions, Partial differentiation.
CO3: Solve problems based on vector calculus.
CO4: Apply the numerical analysis for different problems.

Catalog Description
In this course, all theorems, maxima and minima shall be discussed. Differentiation of vectors, directional derivatives, integration of vectors and its applications will also be discussed in detail. Students will be taught to numerical methods will be discussed.

Course Content

Modules	Blooms level*	Number of hours
Module I: Application of Derivatives: Rolle's theorem, Mean value theorem, Langrange's form, Cauchy's form, Generalized Mean value theorem, Taylor's theorem, Indeterminate form, Taylor's infinite series, Maclaurian's series, Power Series expension of some standard functions: e.g., sin x, cos x, log (1+x), etc., Maxima and minima of one variable functions, Partial differentiation, Euler's theorem for homogeneous functions.	L1, L2, L3	12
Module II: Vector calculus: Differentiation of vectors, scalar and vector point function. Gradient of a scalar field, Directional derivative, Divergence and Curl of a vector field and their physical interpretations, Integration of vectors, Line Integral, Surface Integral, Volume Integral.	L1, L2, L3	11
Module III: Numerical Methods: Solution of Algebric & Transcedental Equations, Bisection Method, Regula-Falsi Method and Newton Raphson Method, Numerical Integration: Trapezoidal Rule, Simpson's One Third Rule, Simpson's Three Eight Rule's, Solution of ODE: Euler's Method, Runge-Kutta Method.	L1, L2, L3	13

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	CT1	A/C/Q	Attd	EE
Weightage (%)	15	10	5	70

A: Attendance, CT: Class Test, HA: Home Assisgnment or Quiz, EE: End Semester Exam

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Text / References:

- J.P. Chauhan, BCA Mathematics-I, Krishana Educational Publishers.
- N.P. Bali and M. Goyal, Engineering Mathematics-I Lakxmi Publication Private Limited.
- S. Gupta and A. Sharma, Numerical Analysis, S.K. Kataria & Sons Publisher.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	-	-	-	-	-	1	3	-	-	2	1	2	1	-	-	2
CO2	-	-	-	-	-	1	3	-	-	2	1	2	1	-	-	2
CO3	-	-	-	-	-	1	3	-	-	2	1	2	1	-	-	3
CO4	-	-	-	-	-	1	3	-	-	2	1	2	1	-	-	2
CO5	-	-	-	-	-	1	3	-	-	2	1	2	1	-	-	2

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DIFT2508	NUMERICAL METHODS LAB	L	T	P	C
Version 1.1	Date of Approval: Date 2017	0	0	2	1
Pre-requisites/Exposure					
Co-requisites					

Course Objectives: The objective of this course is to expose the students to the fundamentals and the concepts of Mathematics including application of derivatives, partial differentiations and vector calculus. This course is designed to understand the basic mathematical logic as a foundation of computer science and applications.

Course Outcomes: On completion of this course, the students will be able to
CO1: Apply the concept of Rolle's Theorem, Mean Value theorem, Lagrange's and Cauchy's theorem.
CO2: Apply the concept of maxima and minima of one variable functions, Partial differentiation.
CO3: Solve problems based on vector calculus.
CO4: Apply the numerical analysis for different problems.

Catalog Description
In this course, all theorems, maxima and minima shall be discussed. Differentiation of vectors, directional derivatives, integration of vectors and its applications will also be discussed in detail. Students will be taught to numerical methods will be discussed.

Course Content

Practicals	Blooms level*	Number of hours
1. TO FIND THE ROOTS OF NON-LINEAR EQUATION USING BISECTION	L1, L2, L3	12
2. TO FIND THE ROOTS OF NON-LINEAR EQUATION USING NEWTON'S	L1, L2, L3	13
3. CURVE FITTING BY LEAST – SQUARE APPROXIMATIONS.	L1, L2, L3	
4. TO SOLVE THE SYSTEM OF LINEAR EQUATIONS USING GAUSS -	L1, L2, L3	
5. TO SOLVE THE SYSTEM OF LINEAR EQUATIONS USING GAUSS-	L1, L2, L3	

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text / References:
- J.P. Chauhan, BCA Mathematics-I, Krishana Educational Publishers.
- N.P. Bali and M. Goyal, Engineering Mathematics-I Lakxmi Publication Private Limited.
- S. Gupta and A. Sharma, Numerical Analysis, S.K. Kataria & Sons Publisher.

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Examination Scheme:

Components	CT1	A/C/Q	Attd	EE
Weightage (%)	15	10	5	70

A: Attendance, CT: Class Test, HA: Home Assisgnment or Quiz, EE: End Semester Exam

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	-	-	-	-	-	1	3	-	-	2	1	2	1	-	-	2
CO2	-	-	-	-	-	1	3	-	-	2	1	2	1	-	-	2
CO3	-	-	-	-	-	1	3	-	-	2	1	2	1	-	-	3
CO4	-	-	-	-	-	1	3	-	-	2	1	2	1	-	-	2
CO5	-	-	-	-	-	1	3	-	-	2	1	2	1	-	-	2

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SEMESTER-VI

AI AND EXPERT SYSTEMS

Course Code: DIFT2651 **Credit Units: 03**

Course Contents:

Module-I: INTRODUCTION
Introduction: History, Definition of AI, Emulation of human cognitive process, knowledge search trade off, stored knowledge, semantic nets. An abstract view of modelling, elementary knowledge. Computational logic, analysis of compound statements using simple logic connectives, predicate logic, knowledge organization and manipulation, knowledge acquisition.

Module-II: PROGRAMMING AND LOGICS IN ARTIFICIAL INTELLIGENCE
LISP and other programming languages- introduction to LISP, syntax and numerical function, LISP and PROLOG distinction, input output and local variables, Interaction and recursion, property list and arrays alternative languages, formalized symbolic logicsproperties of WFRS, non-deductive inference methods. Inconsistencies and uncertainties Truth maintenance systems, default reasoning and closed world assumption, Model and temporary logic.

Module-III: SEARCH METHODS AND KNOWLEDGE REPRESENTATION
Fuzzy logic - concepts, Introduction to Fuzzy logic with examples, probabilistic reasoning, Bayesian probabilistic inference, Dempstor Shafer theory, possible world representation, AdHoc methods. Structure knowledge: Graph, frames and related structures, Object oriented representation- object classes, message and methods, simulation examples using OOPS programs, OOP languages. Search and control strategies - Concepts, search problems, uniformed or Blined search, searching AND – OR graphs.

Module-IV: KNOWLEDGE ORGANISATION AND COMMUNICATION IN EXPERT SYSTEMS
Matching techniques- Need for matching, matching problem, partial matching, Fuzzy matching, RETE matching algorithm. Knowledge organization- Indexing and retrieval techniques, integration of knowledge in memory organization systems, Perception, communication and Expert systems. Overview of Linguistics, Basic passim techniques, semantic analysis and representation structures, natural language generation and system.

Module-V: PATTERN RECOGNITION AND LEARNING TECHNIQUES
Pattern recognition system- understanding speech recognition, Image transformation, low level processing, medium and high level processing, vision system architecture, Rule based system architecture, knowledge acquisition and validation, knowledge system building tools, use of AI and ES in manufacturing and design, types of learning- general learning model, performance measures, learning automate genetic algorithm, learning by induction - LEX,ID3,INDUCE systems.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

REFERENCES:

1. **https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SMRA3003.pdf**
2. Finlay J, Dix A. An Introduction to Artificial Intelligence. UCL Press, London. 1996
3. Bowerman RG, Glover DE. Putting Expert Systems into Practice. Van Nostrand Reinhold, New York, 1988

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AI AND EXPERT SYSTEM LAB

Course Code: DIFT2652 **Credit Units: 01**

EXPERIMENT LIST:

1	1)History of AI 2)Study of AI programming languages 3)Comparison between AI programming languages
2	To study basic concepts of prolog 1)Fact 2)Rule 3)Queries 4)Variables 5)Constant 6)List
3	Convert the sentences into Prolog Equivalent and answer the following questions: 1)burger is a food 2)sandwich is a food 3)pizza is a food 4)sandwich is a lunch 5)pizza is a dinner Rules 6)Every food is a meal OR Anything is a meal if it is a food Query 1: Is pizza a food? Query 2: Which food is meal and lunch?
4	Consider the following facts: 1)studies(olivia, csc135). 2)studies(jack, csc131). 3)studies(arthur, csc134). 4)teaches(kirke, csc135). 5)teaches(collins, csc131). 6)teaches(collins, csc171). 7)teaches(juniper, csc134). *Rules professor(X, Y) :- teaches(X, C), studies(Y, C). Query: olivia studies what? Or Who are the students of professor Kirke?
5	Consider the given knowledge. Represent the knowledge into the PROLOG equivalence and answer the question using rules. Joy is father of Jay. Jay is father of Sam. Sam is brother of Sue. Alvin is father of Ali. Sim is mother of Sam. Sis is mother of Alvin. Question: Who are Sue's parent?
6	Write a code to print a message on the screen.
7	Write a code in PROLOG to design a calculator.

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8	Write a code in PROLOG to find the largest number among two numbers.
9	Write a code in PROLOG to find the factorial of a number.
10	Write a code in PROLOG to print the Fibonacci series.
11	Create a list of 10 elements and print Head and Tail. Write a code in prolog to concatenate two strings.
12	Create a list of 10 elements and print Head and Tail.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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DIFT2601	DATA WAREHOUSING AND DATA MINING	L	T	P	C
Version 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Introduction to Database Management System				
Co-requisites	Nil				

Catalog Description

In this course the concepts of Data warehouse and Data Mining are discussed in detail. The different data mining techniques such as clustering, classification, association are introduced. As a precursor to the study of data warehouse its architecture, types of OLAP Servers, and usage of OLAP are studied in detail. The concepts further enhances the concept of different attributes supported by data mining process, application of data mining in marketing,banking,retail sector and other areas are analyzed. .

Course Objectives

The objective of this course is to

1. Equip the students with concepts of data mining techniques namely classification, clustering and association.
2. Provide an overview of data warehouse which include the usage of OLAP ,its characteristics, OLAP architecture.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the concept of Datawarehouse, its characterstics, Metadata concepts and its importance, The schemas of Data warehouse with their application areas.

CO2: Explain the architectural components of data warehouse and the challenges the data warehousing is facing.

CO3: Explain the indexing of OLAP, the different OLAP operations performed on the data cube.

CO4: Explain the concept of Data mining, its application and advantages

CO5: Explain the concept of different data mining techniques like association, clustering and classification. The implement of these techniques on the different data sets.

Modules	Blooms level*	Number of hours
MODULE 1: **Data Warehousing:** Data Warehouse definition & Characteristics, The need for data ware housing, Operational and Informational Data Stores, Difference between Data warehouse and DBMS, Benefits of Data warehousing,Data mart, Meta Data, Conceptual Modeling of Data Warehouses: star schemas, Snowflake, Fact Constellations with example each.	L1 and L2	8
MODULE 2: **Data Warehousing Components& Architecture** Data Warehouse Architecture, Components of Data Warehouse Architecture, Data Warehousing Topologies, Meta Data, Components of Meta data, Mapping Meta Data. Challenges with Data Warehousing.	L2, L3 and L4	8
MODULE 3: **On Line Analytical Processing (OLAP)**	L2 and L3	10

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Definition: OLAP, Difference between OLTP and OLAP, OLAP Server Architecture, OLAP Operations, Multi Relational & Multi Dimensional: MOLAP, ROLAP, OLAP Tools, Metadata Repository, Data Warehouse Back-End Tools and Utilities.		
MODULE 4: **Data Mining** Introduction to Data Mining, Applications, Limitations, Techniques, Association Rules: Apriori Algorithm, Classification: Decision Tree Cluster Analysis: Features, Types of Cluster Analysis Methods: Partitional, Hierarchical, Density Based, Grid based Methods, , Web Data Mining, Search Engine, Case Study, Limitations	L2, L3 and L4	10

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books:

1. Jiawei Han &Micheline Kamber,"Data Mining Concepts And Techniques",3rd Edition,Morgan Kaufmann Publication,An Imprint of Elsevier, 2015.
2. Vipin Kumar,Pang Ning "Introduction to Data Mining",3rd Edition,Pearson Publication,Chennai, 2016.
3. Mohammed,Wagner " Data Mining and Analysis", 4th Edition, Cambridge University Press,Brazil, 2018.

Reference Books:

1. Daneil,D. Larose "Data Mining and Predictive Analytics", 2nd Edition, John wiley and Sons,Canada, 2015.
2. Paulraj "Data Warehousing Fundamental for IT Professional", 2nd Edition, John Wiley and Sons, Canada, 2010.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS O 1**	**PS O 2**	**PS O 3**
CO 1	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**--**
CO 2	**1**	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**--**
CO 3	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**--**
CO 4	**1**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**
CO 5	**1**	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**

1: strongly related, 2: moderately related and 3: weakly related

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DIFT2605	RELATIONAL DATABASE MANAGEMENT SYSTEM	L	T	P	C
Version 2017.1	Date of Approval: 14 June 2017	3	0	0	3
Pre-requisites/Exposure	Computer Fundamentals and Mathematics Set Theory				
Co-requisites	Nil				

Catalog Description

This course is design to get students familiar with the fundamentals & basic concepts in Data Base Management Systems and their use. This course discusses architecture of Database Systems with concept of different types of available database model, concurrency techniques and new applications of the DBMS. The techniques for database design, normalization, database recovery and protection will enable students to work easily and efficiently on real databases.

Course Objectives

The objective of this course is

- To make students familiar with the fundamental and necessary concepts of DBMS.
- Provide an overview of normalization, concurrency techniques and database recovery with examples.

Course Outcomes

On completion of this course, the students will be able to

CO1. Differentiate between traditional data processing system and database management system and understand characteristics and applications of DBMS in real world.

CO2. Explain and use different data models such as Entity Relationship Model, Network, and Relational Model etc.

CO3. Solve queries using relational algebra, relational calculus and SQL.

CO4. Illustrate normalization concepts and apply them in real database applications.

CO5. Explain database concurrency techniques and recovery mechanisms.

Modules	Blooms level*	Number of hours
Module I: Introduction Concept and goals of DBMS, Database Languages, Database Users, Database Abstraction. Basic Concepts of ER Model, Relationship sets, Keys, Mapping, Design of ER Model.	L1, L2 and L6	9
Module II: Hierarchical model & Network Model Concepts, Data definition, Data manipulation and implementation. Network Data Model, DBTG Set Constructs, and Implementation	L1and L2	9
Module III: Relational Model Relational database, Relational Algebra, Relational & Tuple Calculus.	L1 and L3	10
Module IV: Relational Database Design and Query Language	L2, L3 and L4	10

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SQL, QUEL, QBE, Normalization using Functional Dependency, Multivalued dependency and Join dependency.		
Module V: Concurrency Control and New Applications Transaction basics: ACID property, Lifecycle of Transcation, Why Concurrency Control, Schedule, Serializability, Lock Based Protocols, Time Stamped Based Protocols, Deadlock Handling, Crash Recovery. Distributed Database, Objective Oriented Database, Multimedia Database, Data Mining, Digital Libraries.	L2, L3 and L4	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Korth, Silberschatz, "Database System Concepts", TMH, 4th Ed., 2000.
2. Elmsari and Navathe, "Fundamentals of Database Systems", A. Wesley, 6th Ed., 2004

Reference Books

- Date C. J., "An Introduction to Database Systems", Narosa Publishing, 7th Ed., 2004

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	--	--	--	--	--	--	--	--	--	--	1	--	-	-
CO2	1	1	2	3	--	--	--	--	--	--	--	--	1	--	--	--
CO3	1	2	2	3	--	--	--	--	--	--	--	--	1	2	--	--
CO4	--	1	2	--	--	2	--	3	--	--	--	--	1	1	-	-
CO5	1	1	3	--	--	--	--	--	2	--	--	--	1	--	-	3

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DIFT2606	RELATIONAL DATABASE MANAGEMENT SYSTEM LAB	L	T	P	C
Version 2017.1	Date of Approval: 14 June 2017	0	0	2	1
Pre-requisites/Exposure	Basic Concepts of DBMS				
Co-requisites	Relational Algebra and Relational Calculus				

Catalog Description

This course is designed to get students familiar with the basic concepts of SQL including DDL, DML and DCL statements. The course also explains the basic concepts of PL/SQL. Students will learn practical on Oracle software and hence can work on any RDBMS software in future.

Course Objectives

The objective of this course is

1. To make students familiar with the concepts and working of SQL.
2. Provide an overview of PL/SQL.

Course Outcomes

On completion of this course, the students will be able to

CO1. Illustrate SQL basic concepts like languages DDL, DML etc., data types and working.
CO2. Explain concepts of database creation, manipulation of data and data retrieval and apply them in real database applications.
CO3. Design and implement various data constraints on a database for a given problem.
CO4. Solve queries using concepts like joins, subqueries, aggregate functions, triggers etc.
CO5. Prepare PL/SQL blocks.

Modules	Blooms level*	Number of hours
Lab Session 1 Introduction of RDBMS, Oracle, SQL and data types.	L1 and L2	2
Lab Session 2 Basic concept of database creation and manipulation of data.	L1and L3	2
Lab Session 3 Working with SELECT query.	L1 and L3	2
Lab Session 4 To apply data constraints on a table-Primary Key, Not Null, Unique.	L1 and L3	2
Lab Session 5 Working with Foreign Key and Check Constraint.	L1 and L3	2
Lab Session 6 To implement the basic concept of Aggregate and Grouping Functions.	L1 and L3	2
Lab Session 7 To apply various set operators on data.	L1 and L3	2

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Lab Session 8 Concept of Nested queries in database and its application in database.	L1 and L3	2
Lab Session 9 Implementation different types of JOINS in database.	L1 and L3	2
Lab Session 10 Basic concepts of Triggers and Procedures and related queries.	L1 and L3	2
Lab Session 11 Introduction to PL/SQL and basic syntax.	L1 and L3	2
Lab Session 12 Write programs in PL/SQL Using Control Structures.	L3	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1,Ivan Bayross , "SQL, PL/SQL the Programming Language of Oracle", 4th Ed., BPB Publications,2009.
2.Lynn Beighley, "Head First SQL", 1st Ed., O′Reilly, 2007.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	-	-
CO2	**1**	-	**2**	--	--	**3**	--	--	--	--	--	**2**	**1**	--	**1**	-
CO3	**1**	-	**1**	--	--	**3**	--	--	--	--	--	**2**	**1**	**1**	**2**	-
CO4	**1**	-	**2**	--	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO5	**1**	-	**2**	--	--	--	--	--	**2**	--	--	--	**1**	**1**	--	-

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MOBILE APP DEVELOPMENT

Course Code: DIFT2611 **Credit Units: 03**

Course Objectives:

- To make the student understand the basic concepts of mobile application development, be aware of Characteristics of mobile applications, User-interface design, basics of graphics and multimedia.
- To gain knowledge about testing and publishing of Android application

Course Outcomes:

- To explain the basics of mobile application development
- Develop Android application with User interface, networking and animation.
- Use simulator tools to test and publish the application.

Course Contents:

Module-I

Mobile Application Development - Mobile Applications and Device Platforms - Alternatives for Building Mobile Apps -Comparing Native vs. Hybrid Applications -The Mobile Application Development Lifecycle-The Mobile Application Front-End-The Mobile Application Back-EndKey Mobile Application Services-What is Android-Android version history-Obtaining the Required Tools- Launching Your First Android Application-Exploring the IDE-Debugging Your Application-Publishing Your Application

Module-II

Understanding Activities-Linking Activities Using Intents-Fragments-Displaying NotificationsUnderstanding the Components of a Screen-Adapting to Display Orientation-Managing Changes to Screen Orientation- Utilizing the Action Bar-Creating the User Interface Programmatically Listening for UI Notifications

Module-III

Using Basic Views-Using Picker Views -Using List Views to Display Long Lists-Understanding Specialized Fragments - Using Image Views to Display Pictures -Using Menus with Views Using WebView-Saving and Loading User Preferences-Persisting Data to Files-Creating and Using Databases.

Module-IV

Sharing Data in Android-Creating Your Own Content Providers -Using the Content ProviderSMS Messaging - Sending Email-Displaying Maps- Getting Location Data- Monitoring a Location.

Module-V

Consuming Web Services Using HTTP-Consuming JSON Services- Creating Your Own Services - Binding Activities to Services -Understanding Threading .

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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TEXT BOOK:

1. Jerome DiMarzio, “Beginning Android Programming with Android Studio”, 4th Edition.

REFERENCE BOOKS:

1. Dawn Griffiths, David Griffiths, “Head First Android Development: A Brain-Friendly Guide”, 2017.
2. Neil Smyth , “Android Studio 3.0 Development Essentials: Android”, 8th Edition.
3. Pradeep Kothari, “Android Application Development (With Kitkat Support)”, Black Book 2014.

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- https://en.wikipedia.org/wiki/Android_10
- Develop App for Free
- https://flutter.dev/
- http://ai2.appinventor.mit.edu
- https://en.wikipedia.org/wiki/Android_version_history
- https://aws.amazon.com/mobile/mobile-application-development/ (Unit 1)
- **https://en.wikipedia.org/wiki/Mobile_app_developmen**

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MOBILE APP DEVELOPMENT LAB

Course Code: DIFT2612 **Credit Units: 01**

List of Experiments

1 Installation of Android studio.
2 Development Of Hello World Application
3 Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button
4 Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button (use any layout)
5 Design an android application to create page using Intent and one Button and pass the Values from one Activity to second Activity
6 Design an android application Send SMS using Intent
7 Create an android application using Fragments
8 Design an android application Using Radiobuttons
9 Design an android application for menu.
10 Create a user registration application that stores the user details in a database table.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Reference Books

1. Dawn Griffiths, David Griffiths, “Head First Android Development: A Brain-Friendly Guide”, 2017.
2. Neil Smyth , “Android Studio 3.0 Development Essentials: Android”, 8th Edition.
3. Pradeep Kothari, “Android Application Development (With Kitkat Support)”, Black Book 2014.

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COMPUTER VISION

Course Code: DIFT2613 **Credit Units: 03**

Course Contents:

Introduction to Computer Vision: Introduction to computer vision, History and applications and Human and computer vision

Image Formation:- Image formation and representation, Color spaces, Cameras and imaging systems, Image acquisition and preprocessing, Image Enhancement and Filtering, Spatial and frequency domain filtering, Image enhancement techniques, Image deblurring, Noise reduction

Feature Extraction and Selection:-Edge detection,Corner and keypoint detection,Blob detection,Feature descriptors

Image Segmentation,Thresholding,Region:- based segmentation,Edge-based segmentation,Watershed segmentation

Image Recognition and Object Detection:Template matching,Object detection algorithms (e.g., Haar cascades, YOLO), Feature-based object recognition,Deep learning for object detection

3D Vision and Stereo Vision:-3D image formation,Stereo vision principles,Depth perception,3D reconstruction

Motion Analysis: Optical flow,Motion estimation,Object tracking,Video analysis

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Reference Books

[1] R. Szeliski, "Computer Vision: Algorithms and Applications," 1st ed. London, England: Springer, 2010.

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COMPUTER VISION LAB

Course Code: DIFT2614 **Credit Units: 01**

Computer vision lab exercises are hands-on practical assignments that complement the theoretical knowledge taught in computer vision courses. These exercises are designed to give students hands-on experience with various computer vision concepts and tools. Here are some example lab exercises for a computer vision course:

1. Image Processing Basics:
   - Load an image using a programming library like OpenCV.
   - Apply basic image processing operations like resizing, cropping, and rotating.
   - Implement grayscale conversion and histogram analysis.

2.Image Filtering:
   - Apply various image filters such as Gaussian, Sobel, and Canny edge detectors.
   - Experiment with different filter sizes and understand their effects on the output.

3. Feature Detection and Description:
   - Detect and draw keypoints on images using algorithms like SIFT, SURF, or ORB.
   - Compute and match feature descriptors.

4. Image Segmentation:
   - Implement simple image segmentation techniques like thresholding and contour detection.
   - Apply more advanced segmentation algorithms such as watershed or graph cuts.

5. Object Detection:
   - Implement object detection using Haar cascades or other methods.
   - Train a simple object detector for a specific object or pattern.

6. Optical Flow:
   - Calculate and visualize optical flow between consecutive frames of a video.
   - Use optical flow for motion analysis and object tracking.

7. Deep Learning for Computer Vision:
   - Train a convolutional neural network (CNN) for image classification.
   - Fine-tune a pre-trained model for a specific task.
   - Implement image style transfer using neural networks.

8. Stereo Vision:
   - Work with stereo image pairs to calculate depth maps.
   - Implement 3D reconstruction from stereo images.

9. Face Detection and Recognition:
   - Implement face detection and recognition using OpenCV or a deep learning framework.
   - Build a face recognition system that can identify known faces in images or videos.

10. Object Tracking:
   - Implement object tracking using algorithms like Mean-Shift, Kalman Filter, or DeepSORT.
   - Track objects in video sequences.

11. Image and Video Processing Applications:
   - Develop a simple augmented reality application.
   - Implement a real-time video processing pipeline (e.g., applying filters to a webcam feed).

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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SEMESTER-VII

DIFT2701	CLOUD COMPUTING	L	T	P	C
Version 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	General Networking and basics of virtualization				
Co-requisites	Nil				

Catalog Description

The course introduces the basic concepts and methods of Cloud computing and develops the concepts and skills necessary to build applications in Cloud environments. The course starts by explaining the concepts of cloud computing, cloud architecture, model and the concepts of Virtualization. It then explains how such ideas form the basis for creating Computing Clouds where the concept of resources is virtualized. Case studies are used to show how applications can be run in a Cloud and the principles of creating images to run in Clouds are explained. The programming skills for business models that underlie Cloud Computing are also presented.

Course Objectives

The objective of this course is to

1. Equip the students with concepts virtualization and Cloud
2. Provide an overview of security issues and various tools available in Cloud

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain and differentiate between different types of computing and also determine them with the upcoming Cloud Computing environment.

CO 2: Identify the different layers in the architecture of Cloud and explain the different services, deployment models and types of virtualization available.

CO 3: Explain the power of scalability and fault tolerant system and other features of cloud, analyzing the management of cloud in business.

CO 4: Explain, apply and compare the various security issues and their solutions and policies for security in Cloud environment.

CO 5: Analyze programming Models, its workings and comparing them with each other.

Modules	Blooms level*	Number of hours
MODULE 1: Overview of Client/Server Computing, Peer to Peer Computing, Distributed Computing, Col-laborative Computing, Cloud Computing; Behaviour of Cloud Computing; Pros and Cons of Cloud Computing.	L1, L2 ,L3	8
MODULE 2: Understanding of Cloud Architecture, Cloud Storage, Cloud Services; Types of Cloud service development; Software as a Service, Platform as a Service, Web Services, On Demand Com-puting; Virtualization: Fundamental concepts of compute storage, Network virtualization; Pros and Cons of Cloud Service Development; Case study with Cloud Services Development Service and Tools.	L1,L2, L3	8

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MODULE 3: Introduction to Scalability and Fault Tolerance with Cloud Computing; Cloud Solutions; Cloud Ecosystems; Cloud Business Process Management; Portability and Interoperability.	L1, L2 and L4	6
MODULE 4: Security Overview; Cloud Computing Security Challenges; Security Policy Implementation, Computer Intrusion Detection and Response, Virtualization Security Management and Virtu-al Threats; Cloud Security Controls; Cloud Computing Attacks; Cloud Security services; Se-cure Cloud Software requirements; Policy Implementation.	L2, L3 and L4	8
MODULE 5: Map Reduce; Hadoop ; Analyzing the data with Hadoop; Case Study on Google App Engine, Microsoft Azure and Hadoop.	L2, L4	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Kai Hwang, Geoffrey C Fox & Jack G Dongarra, "**Distributed and Cloud Computing, From Parallel Processing to the Internet of Things**", Morgan Kaufmann Publishers, 2012.
- Michael Miller, "**Cloud Computing**", Pearson,2008.
- Anthony T. Velte, Toby J. Velte & Robert Elsenpeter, **"Cloud Computing- A practical Approach",** Mc Graw Hill, Chennai, 2017.

Reference Books

1. John W.Rittinghouse and James F.Ransome, "**Cloud Computing: Implementation, Management, and Security**", CRC Press, 2010
2. Toby Velte, Anthony Velte, Robert Elsenpeter, "**Cloud Computing, A Practical Ap-proach**", TMH, 2009.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**	**--**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**1**	**1**	**-**	**-**
CO2	**1**	**2**	**3**	**--**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**-**	**-**
CO3	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**-**	**1**	**-**	**2**
CO4	**1**	**--**	**3**	**--**	**2**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**-**	**1**	**-**	**2**
CO5	**1**	**--**	**2**	**--**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**		**1**	**-**	**-**

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CLOUD COMPUTING LAB

Course Code: DIFT2702 **Credit Units: 01**

EXPERIMENT LIST

1. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create hello world app and other simple web applications using python/java.
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
8. Install Hadoop single node cluster and run simple applications like wordcount.

REFERENCES:

1**.** https://cloud.google.com/learn/what-is-a-virtual-machine
2. https://cloud.google.com/dataproc/docs/concepts/configuring-clusters/single-node-clusters
3. https://www.geeksforgeeks.org/what-is-google-app-engine-gae/

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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BLOCKCHAIN TECHNOLOGY

Course Code: DIFT2703 **Credit Units: 03**

Course Objective: To introduce the students about the knowledge of basic concepts of blockchain and cryptocurrency.

Course Contents:

Module-I: Introduction to Blockchain

Basic ideas behind blockchain, how it is changing the landscape of digitalization, peer-to-peer network, Blockchain Mechanism, Blockchain vs Distributed Systems, introduction to cryptographic concepts required, Hashing, public key cryptosystems, private vs public blockchain and use cases, Hash Puzzles, Introduction to Bitcoin Blockchain, Centralization vs. Decentralization, Security of Blockchain

Module-II: BLOCKCHAIN DATA STRUCTURE & BITCOIN BLOCKCHAIN

Cryptographic Hash Functions, Digital Signatures, Public Keys as Identities, Hash Pointers and Hash chain and Merkel Tree, Consensus Mechanisms, Decentralized Identity Management, Transactions, Distributed consensus, Consensus without identity using a block chain, Incentives and proof of work, Mining.

Module-III: BLOCKCHAIN MODELS & APPLICATIONS

Abstract Models for BLOCKCHAIN - GARAY model - RLA Model - Proof of Work (PoW) as random oracle - formal treatment of consistency, liveness and fairness - Proof of Stake (PoS) based Chains - Hybrid models (PoW + PoS) Application of Blockchain in Privacy and Security, IoT and Smart Cities, Business and Industry, Data Management, e-Governance

Module-IV: ETHEREUM AND HYPERLEDGER

Ethereum - Ethereum Virtual Machine (EVM) - Wallets for Ethereum - Solidity - Smart Contracts - some attacks on smart contracts, Hyperledger, Hyperledger Stack, Multichain Blockchain. Innovation in Hyperledger, Distributed applications in Hyperledger, Zero Knowledge proofs and protocols in Blockchain.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books:

[T1] Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016. (Free download available).

[T2] Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy, 2015

Reference Books:

[R1] R.Pass et al, Analysis of Blockchain protocol in Asynchronous networks , EUROCRYPT 2017, (eprint.iacr.org/2016/454).

[R2] Eric Traub, Learn Blockchain Programming with JavaScript, Packt, 2018.

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BLOCKCHAIN TECHNOLOGY LAB

Course Code: DIFT2704 **Credit Units: 01**

EXPERIMENT LIST

1 Creating Merkle tree
2 Creation of Block
3 Blockchain implementation
4 Creating ERC20 token
5 Blockchain implementation using Merkle Trees
6 Mining in Blockchain
7 Peer-to-Peer implementation using Blockchain
8 Creating Crypto-currency Wallet

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

REFERENCES

[1]https://mrcet.com/pdf/Lab%20Manuals/BLOCKCHAIN%20TECHNOLOGY%20Lab%20manual.pdf
[2] https://www.coursehero.com/file/64537186/BC-Lab-Manual-With-Solutions-pdfpdf

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DIFT2706	MULTIMEDIA	L	T	P	C
Version 2023.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course is intended to describe technical characteristics and performance of multimedia system and terminals. It will help in designing creative approach in application of multimedia devices, equipment and systems. . Also provide students to interpret and analyze measurement results obtained on the multimedia system and components. It provides to test multimedia communication systems and equipment in real conditions.

Course Objectives

The objective of the course is

1. to provide an overview of different multimedia technologies like audio and video including multimedia devices.
2. to include some practical sessions on these technologies.

Course Outcomes

After the completion of course, the students will be able to,

CO1. Identify and Describe basic principles of multimedia communication systems and its application.

CO2. Identify and define concepts of digital audio representation and processing using computer techniques and tools for creating and editing the Interactive multimedia applications.

CO3. Identify and describe video technology including Raster Scanning Principles.

CO4. Identify and describe video technology including Raster Scanning Principles, Sensors for T.V.Cameras, Color Fundamentals, color Video, Video Equipments and Worldwide Television Standards.

CO5. Identify and describe Multimedia Devices, Presentation Services and the User Interface. Apply multimedia in different field of life.

Modules	Blooms level*	Number of hours
Module I: Introduction Introduction: Objectives – History of Multimedia – Its market – Content copyright – Resources for multimedia developers – Types of produces – Evaluation – Hardware Architecture – OS and Software – Multimedia Architecture – Software library – Drivers.	L1, L2 and L3	8
Module II: Digital Audio Representation and Processing Uses of audio in computer applications, digital representation of sound, transmission of digital sound, digital audio signal processing, digital audio and the computer.	L2 and L3	7
Module III: Video Technology Raster scanning principles, sensors for T.V. cameras, color fundamentals, color video, video equipment, worldwide television standards.	L4 and L5	7
Module IV: Digital Video and Image Compression Evaluating a compression system, redundancy and visibility, video compression techniques, the JPEG image compression standards, the MPEG motion video	L4 and L5	5

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compression standard, DVI technologies, Time Based Media Representation and Delivery.		
Module V: Multimedia Devices, Presentation Services and the User Interface- Introduction .Multimedia services and Window systems, client control of continuous media, device control, temporal co ordination and composition, hyper application.	L3 and L4	5
Module VI: Application of Multimedia Intelligent multimedia system, desktop virtual reality, multimedia conferencing.	L3 and L4	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text & Reference Books

1. Multimedia systems John F. Koegal Buford Addison- Wesley

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS O 1**	**PS O 2**	**PS O 3**
CO 1	**1**	--	**3**	--	--	--	--	--	--	**1**	--	**1**	--	**2**	**3**
CO 2	**1**	--	**3**	--	--	--	--	--	--	**1**	--	**1**	--	**2**	**3**
CO 3	**1**	--	--	--	--	--	--	--	--	**1**	--	**1**	--	**2**	**3**
CO 4	**1**	--	--	--	--	--	--	--	--	**1**	--	**1**	--	**2**	**3**
CO 5	**1**	--	--	--	--	--	--	--	--	**1**	--	**1**	--	**2**	**3**

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DIFT2705	MOBILE COMPUTING	L	T	P	C
Version 2023.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure	Basic knowledge of Computer Networks				
Co-requisites	Nil				

Catalog Description

The objective of this consortium is to shape and expand a full-scale and sound mobile computing system market. To achieve this, cooperation is required of interests related to communication (network), computer hardware/software, system integrators (including service providers), and the media.

Course Objectives

The objective of this course is to

1. Give a general overview of the cellular technology and the associated terms and discuss the generations of the mobile technologies starting from 1G to 3G techniques.
2. Illustrate the GPRS and WAP model for 2G internet connectivity in detail.
3. Elaborate the third-generation mobile services
4. Describe the Global Mobile Satellite Systems in detail and basic architecture of Bluetooth technology and advanced topics in mobile computing.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the basic concepts mobile technology, computing and basic architecture of PCS and GSM.
CO2: Describe the mobile networking Infrastructure through 2G technologies (GSM, GPRS, WAP).
CO3: Explain the basic concepts of 3G technologies (WCDMA, CDMA 2000) and WLL.
CO4: Discuss the working of mobile satellite systems like IRIDIUM and GLOBALSTAR.
CO5: Explain the concepts of Bluetooth technology, its working and protocols, virtual networks and enterprise networks.

Modules	Blooms level*	Number of hours
Module I: Introduction to Personal Communications Services (PCS) PCS Architecture, Mobility management, Networks signaling. Global System for Mobile Communication (GSM) system overview: GSM Architecture, Mobility management, Network signaling.	L1, L2 and L3	8
Module II: General Packet Radio Services (GPRS) & Wireless Application Protocol (WAP) GPRS Architecture, GPRS Network Nodes. Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 standard, Mobile IP. Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, wireless mark up Languages (WML).	L1 and L2	10
Module III: Third Generation (3G) Mobile Services	L1 and L2	7

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Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G. Wireless Local Loop(WLL): Introduction to WLL Architecture, wireless Local Loop Technologies.		
Module IV: Global Mobile Satellite Systems Global Mobile Satellite Systems; case studies of the IRIDIUM and GLOBALSTAR systems.	L1 and L2	7
Module V: Enterprise Networks Introduction to Virtual Networks, Blue tooth technology, Blue tooth Protocols. Advanced techniques in mobile computing.	L1 and L2	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evallllluation

Text Books

1. "Wireless and Mobile Networks Architectures", by Yi-Bing Lin & Imrich Chlamtac, John Wiley & Sons, 2001.
2. "Mobile and Personal Communication systems and services", by Raj Pandya, Prentice Hall of India, 2001.

Reference Books

1. "Wireless Web Development", Ray Rischpater, Springer Publishing, 2000.
2. "The Wireless Application Protocol", by Sandeep Singhal, Pearson Education Asia, 2000.
3. "Third Generation Mobile Telecommunication systems", by P.Stavronlakis, Springer Publishers, 2001.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**1**	**2**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--
CO2	**1**	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--
CO3	**1**	**2**	--	--	--	--	--	--	--	--	--	--	--	**1**	--
CO4	**1**	**2**	--	--	--	--	--	--	--	--	--	--	--	**1**	--
CO5	**1**	**2**	--	--	--	--	--	--	--	--	--	--	--	**1**	--

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DIFT2739	BASICS OF RESEARCH METHODOLOGY, ETHICS, AND RESEARCH COMMUNICATION	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description

This course aims to provide students with a comprehensive understanding of conducting ethical research, utilizing proper research methodologies, and effectively communicating research findings. The course includes a final project where students will write a Literature Review on a topic chosen in consultation with the teacher(s).

This course is designed to equip students with essential skills and knowledge to conduct ethical research, employ proper research methodologies, and effectively communicate scientific information (with focus on writing a literature review). The course will cover topics such as research design, data collection and analysis, research ethics, and science communication strategies. Through a combination of lectures, discussions, case studies, and practical exercises, students will develop a deeper understanding of the research process and its ethical implications.

Course Objectives

The objective of this course is to impart knowledge about various stages of research process, research ethics and different ways of research communication.

The aim of this course is to impart research skills to the beginners and help to improve the quality of research by the existing researchers. It also encompasses the understanding and application of appropriate research design, statistics, and the use of the computer for reference management, report writing, research paper writing and presentation. The course also introduces the key conceptual issues of each research method, as well as giving practical guidance. It covers the series of research methodology contents: from problem formulation, to design, to data collection, analysis, reporting and dissemination. The course has the dual aims of equipping students with conceptual understandings of current academic debates regarding different methods, and the practical skills to put those methods into practice.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define criteria of good research, steps in research process, and data collection.

CO2. Identify different types of sampling and its purpose.

CO3. Conduct hypothesis testing for different types of samples and interpret the results.

CO4: Learn the importance of literature review, write research paper/thesis, use reference management software.

Course Content :

Module	Topic	**Blooms level***	Hours
1	**Research Methodology** Understanding the research process: From research questions to conclusions	L1, L2	10

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	Types of research: Qualitative and quantitative research Exploratory, descriptive, experimental, and correlational studies Scientific Thinking: Subjective Vs. Objective Thinking Logical Reasoning: Inductive Vs. Deductive Reasoning Formulating research hypotheses and objectives Purpose of a good research, Criteria of good research		
2	**Descriptive Statistics** Data, Types of Data, Methods of data collection, Benefits and drawbacks, Graphical representation of data and interpretation. Measures of Central Tendency: Arithmetic Mean, Median, Mode, Measures of Dispersion: Range, Standard Deviation, Variance, Coefficient of Variation.	L1, L2, L3	15
3	**Inferential Statistics** Sampling: Basic concepts, Process of Sampling, Sample Size, Types of Samples, Sampling and non- sampling errors, Statistics and Parameters, Sampling Distribution of Means and Proportion, **Hypothesis Testing**, steps in testing of hypothesis, errors in hypothesis testing, z test and t test.	L1, L2, L3	15
4	**Research Ethics** Plagiarism, Fabrication, Falsification, Ethics with respect to human and Animal Research	L1, L2	5
5	**Communication** Characteristics of a good Research paper, Systematics Literature Review (choosing a topic, preparing outline, gathering authentic & appropriate references, avoiding plagiarism, use of reference management systems), Writing a good literature review, Structure of report (Introduction, Methodology, Analysis, Results, Discussions, Conclusions, Recommendations), Writing Quality Research Paper, Publishing Research Work in Quality Journals, Reference Management Software	L1, L2, L3	15

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional Exam	End Term Examination
Weightage (%)	5	10	15	70

Project based assignment: Student teams (2-3 students per team) will write a literature review on a topic of choice, in consultation with the teacher.

Text books/ Reference books

- Research Methodology for Natural Sciences by Soumitro Banerjee, Publisher: IISc Press (1 January 2022); ISBN-10: 8194835178; ISBN-13: 978-8194835172

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- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt. Ltd., New Delhi-110001
- Geode, Millian J.& Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Kothari, C.R.2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.
- Levin R I., Rubin D S. Statistics for Management. Sixth Edition, PHI
- Kapoor & Gupta. Probability & Statistics. S Chand Publishers, New Delhi.
- Montomery, Douglas C.(2007), 5th Ed. Design and Analysis of Experiments, Wiley India.
- Cooper, Donald R. and Pamels Schindler, Business Research Methods, Tata McGraw Hills, New Delhi
- Krishnaswamy, K.N. Sivakumar. Appa lyer and Mathiranjan M. 2006, Management Research Methodology: Integration of Principles, Methods and Techniques, Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Sachdeva, J.K. 2008. Business Research methodology. Himalaya Publishing House, New Delhi.
- Shekharan, Uma, Business Research Methods, Miley Education, Singapore.
- Zikmund, Millian G., Business Research Methods, Thomson Learning, Bombay**.**

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SEMESTER-VIII

DATA SCIENCE

Course Code: DIFT2801 **Credit Units: 03**

Course Contents:

Module 1: Python
Environment set-up, Jupyter overview, Python Numpy, Python Pandas, Python Matplotlib

Module 2: R
An introduction to R, Data structures in R, Data visualization with R, Data analysis with R

Module 3: Statistics
Important statistical concepts used in data science, Difference between population and sample, Types of variables,, Measures of central tendency, Measures of variability, Coefficient of variance, Skewness and Kurtosis

Module 4: Inferential statistics, Normal distribution, Test hypotheses, Central limit theorem, Confidence interval, T-test, Type I and II errors, Student's T distribution

Module 5: Regression and Anova
Regression, ANOVA,R square, Correlation and causation, Data visualization, Missing value analysis, The correction matrix, Outlier detection analysis

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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DATA SCIENCE LAB

Course Code: DIFT2802 **Credit Units: 01**

EXPERIEMENTS LIST:

1. Download, install and explore the features of NumPy, SciPy, Jupyter, Statsmodels and Pandas packages.
2. Working with Numpy arrays
3. Working with Pandas data frames
4. Reading data from text files, Excel and the web and exploring various commands for doing descriptive analytics on the Iris data set. CS3361 Data Science Laboratory
5. Use the diabetes data set from UCI and Pima Indians Diabetes data set for performing the following:
a. Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis.
b. Bivariate analysis: Linear and logistic regression modeling
c. Multiple Regression analysis
d. Also compare the results of the above analysis for the two data sets.
6. Apply and explore various plotting functions on UCI data sets.
a. Normal curves
b. Density and contour plots
c. Correlation and scatter plots
d. Histograms CS3361 Data Science Laboratory Lab Manual
e. Three dimensional plotting
7. Visualizing Geographic Data with Basemap

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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DIFT2803	MACHINE LEARNING	L	T	P	C
Version: 2023.1	Date of Approval:	3	-	-	3
Pre-requisites/Exposure	Basic Knowledge of Programming				
Co-requisites	Nil				

Catalog Description

Python is a general-purpose high level programming language that is being increasingly used in data science and in designing machine learning algorithms. This course introduces Python and its libraries like numpy, pandas, matplotlib and explains how it can be applied to develop machine learning algorithms that solve real world problems.

This course starts with Python language followed by machine learning and covers concepts of python and all important concepts such as exploratory data analysis, data preprocessing, data visualization and clustering, classification, regression and model performance evaluation etc. This course covers all three types of machine learning algorithms including Supervise, Unsupervised and Reinforcement learning.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of programming and problem solving and develop proficiency in creating applications using the Python Programming Language.
2. Provide knowledge of various types of machine learning models, its algorithms and development of the models using Python programming language.

Course Outcomes

On completion of this course, the students will be able to

CO1: Develop programs in Python to develop algorithmic solutions to computational problems.

CO2: Manage data in python using available data structures such as string, list, and dictionary and file handling operations.

CO3: Apply functions to decompose python program and develop modules and packages.

CO4: Preprocess and analyze data before applying suitable machine learning models.

CO5: Understand basic concepts and techniques of Machine Learning and apply machine learning algorithms to develop machine learning models for solving real word problems.

Modules	Blooms level*	Number of hours
Module-I Python basis: Installing Anaconda, Basics of Python: basic syntax, interactive shell, editing, saving, and running a script. Working with jupyter notebook, data types, operators, conditional statements, String, functions, Lists, tuples, and dictionaries; basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing, and replacing values; traversing dictionaries. modules and packages.	L1, L2 and L3	6
Module-II Arrays and Matrices: The NumPy Module, Creating Arrays and Matrices, Copying, Arithmetic Operations, Cross product & Dot product, Saving and Restoring, Matrix inversion, Vectorized Functions. Data Visualization: The Matplotlib Module, Histograms, Bar charts Density Plots, Box Plots, Scatter Plots, Heat Maps etc.	L1, L2 and L3	7

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Data Frames: Pandas, loading data from different sources, Concept of Data Frames, Working with Data frames such as selecting, filtering, grouping, joining etc. Dealing with missing values		
Module-III Introduction to Machine Learning: Introduction, Applications, Framework for developing machine learning models Supervised Learning: Linear regression, ridge and lasso regression Multiple linear regression, logistic regression, classification and regression trees, decision tree, Ensemble techniques, Support Vector Machines, K-nearest neighbors, naive bayes classifier. Representing Data and Engineering Features. Categorical Variables One-Hot-Encoding (Dummy Variables), Label encoding	L2, L3 and L4	6
Module IV Preprocessing and Scaling, Different Kinds of Preprocessing, Applying Data Transformations Overfitting, underfitting, bias-variance tradeoff. Various metrics for regression, classification, confusion matrix, cross validation, precision-recall curve, ROC-AUC curve, grid search, Algorithm chains and pipeline.	L2, L3 and L4	7
Module-V Unsupervised Learning: Introduction to Clustering, k-means clustering Hierarchical clustering, Dimensionality Reduction, Feature Selection, PCA, factor analysis, manifold learning.	L2, L3 and L4	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Pilgrim, Dive, "Introduction to Python", 3rd Edition, Apress, 2009.
2. Allen Downey, Jeffrey Elkner, Chris Meyers, "How to Think Like a Computer Scientist Learning with Python" 2nd Edition Green Tea Press,2002.
3. Manaranjan Pradhan and U Dinesh Kumar, "Machine Learning using Python" , Wiley Publication
4. Andreas C. Müller & Sarah Guido "Introduction to Machine Learning using python",Oreilly Publications.

Reference Books

1. John V. Guttag, "Introduction to Computation and Programming using Python", Prentice Hall of India, 2014.
2. Mark Lutz, "Learning Python: Powerful Object-Oriented Programming‖", Fifth Edition, O'Reilly, Shroff Publishers and Distributors, 2013.
3. Michale Bowles "Machine Learning in Python: Essential Techniques for Predictive Analysis" Wiley Publication.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	3	2	2	--	--	--	--	--	--	--	--	1	1	2	--
CO 2	1	3	2	2	--	--	--	--	--	--	--	--	1	1	2	--
CO 3	1	3	2	1	2	--	--	--	--	--	--	--	1	1	2	--
CO 4	1	1	1	1	1	2	--	--	--	--	--	--	1	--	1	--
CO 5	1	1	1	1	1	2	--	--	--	--	--	--	1	--	1	---

1: strongly related, 2: moderately related and 3: weakly related

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DIFT2804	MACHINE LEARNING LAB	L	T	P	C
Version: 2023.1	Date of Approval:	0	0	2	1
Pre-requisites/Exposure	Basic Knowledge of Programming				
Co-requisites	Nil				

Catalog Description

Python is a general-purpose high level programming language that is being increasingly used in data science and in designing machine learning algorithms. This course introduces Python and its libraries like numpy, pandas, matplotlib and explains how it can be applied to develop machine learning algorithms that solve real world problems.

Course Objectives

The objective of this course is to

- Equip the students with concepts of programming and problem solving and develop proficiency in creating applications using the Python Programming Language.
- Provide knowledge of various types of machine learning models, its algorithms and development of the models using Python programming language.

Course Outcomes

On completion of this course, the students will be able to

CO1: Develop programs in Python to develop algorithmic solutions to computational problems.

CO2: Manage data in python using available data structures such as string, list, and dictionary and file handling operations.

CO3: Apply functions to decompose python program and develop modules and packages.

CO4: Preprocess and analyze data before applying suitable machine learning models.

CO5: Understand basic concepts and techniques of Machine Learning and apply machine learning algorithms to develop machine learning models for solving real word problems.

Modules	Blooms level*	Number of hours
Lab Session 1 and 2 a) The probability that it is Friday and that a student is absent is 3 %. Since there are5 school days in a week, the probability that it is Friday is 20 %. What is theprobability that a student is absent given that today is Friday? Apply Baye's rule in python to get the result. (Ans: 15%). b) Extract the data from database using python.	L1, L2 and L3	6
Lab Session 3 & 4 a) Implement k-nearest neighbours classification using python. b) Given the following data, which specify classifications for nine combinations of VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of kmeans clustering with 3 means (i.e., 3	L1, L2 and L3	7

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centroids) **periments** VAR1 VAR2 CLASS 1.713 1.586 0 0.180 1.786 1 0.353 1.240 1 0.940 1.566 0 1.486 0.759 1 1.266 1.106 0 1.540 0.419 1 0.459 1.799 1 0.773 0.186 1		
Lab Session 5 & 6 a) The following training examples map descriptions of individuals onto high,medium and low credit-worthiness. medium skiing design single twenties no -> highRiskhigh golf trading married forties yes -> lowRisk low speedway transport married thirties yes -> medRiskmedium football banking single thirties yes -> lowRisk high flying media married fifties yes -> highRisk low football security single twenties no -> medRisk medium golf media single thirties yes -> medRisk medium golf transport married forties yes -> lowRiskhigh skiing banking single thirties yes -> highRisk low golf unemployed married forties yes -> highRisk Input attributes are (from left to right) income, recreation, job, status, age-group, home-owner. Find the unconditional probability of `golf' and the conditional probability of `single' given `medRisk' in the dataset? b) Implement linear regression using python.	L2, L3 and L4	6
Lab Session 7 & 8 a) Implement Naïve Bayes theorem to classify the English text b) Implement an algorithm to demonstrate the significance of genetic algorithm	L2, L3 and L4	7
Lab Session 9 & 10 a) Implement the finite words classification system using Back-propagation algorithm. b) **Additional Experiments:** Find-S and Candidate Elimination Algorithms	L2, L3 and L4	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- Pilgrim, Dive, "Introduction to Python", 3rd Edition, Apress, 2009.
- Allen Downey, Jeffrey Elkner, Chris Meyers, "How to Think Like a Computer Scientist Learning with Python" 2nd Edition Green Tea Press,2002.
- Manaranjan Pradhan and U Dinesh Kumar, "Machine Learning using Python" , Wiley Publication

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- Andreas C. Müller & Sarah Guido “Introduction to Machine Learning using python”,Oreilly Publications.

Reference Books

- John V. Guttag, “Introduction to Computation and Programming using Python”, Prentice Hall of India, 2014.
- Mark Lutz, “Learning Python: Powerful Object-Oriented Programming‖”, Fifth Edition, O‘Reilly, Shroff Publishers and Distributors, 2013.
- Michale Bowles “Machine Learning in Python: Essential Techniques for Predictive Analysis” Wiley Publication.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE
A	**PR**	**LR**	**V**	**70**
5	10	10	5	

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	**1**	**3**	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**2**	**--**
CO 2	**1**	**3**	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**2**	**--**
CO 3	**1**	**3**	**2**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**2**	**--**
CO 4	**1**	**1**	**1**	**1**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**1**	**--**
CO 5	**1**	**1**	**1**	**1**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**1**	**---**

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CYBER SECURITY

Course Code: DIFT2805 **Credit Units: 04**

Course Contents

MODULE 1: Introduction
Cyber Attacks, Defense strategies and techniques, Computer Networking Primer: Introduction to LANs, IPv4, IPv6, ICMP, TCP/UDP, DNS, HTTP, etc.

MODULE 2: Mathematical Background for Cryptography
Modulo Arithmetic, GCD (Euclids Algorithm), Algebraic Structures (Groups), Chinese Remainder Theorem

MODULE 3: Basics of Cryptography
Elementary Ciphers (Substitution, Transposition and their Properties, Secret Key Cryptography: DES (Data Encryption Standard), MAC (Message Authentication Codes) and other applications, Attacks, Public Key Cryptography: RSA

MODULE 4: Cryptographic Hash
Properties, Applications, Performance, Birthday Attack, Key Management: Digital Certificates, PKI (Public Key Infrastructure), Authentication: One-Way Authentication, Mutual Authentication, Dictionary Attacks, Kerberos, Non-cryptographic Protocol Vulnerabilities: DoS and DDoS, Session Highjacking and Spoofing, ARP Spoofing and Attacks on DNS, Viruses, Worms, and other Malware

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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SOFTWARE DEFINED NETWORKING

Course Code: DIFT2806 **Credit Units: 04**

Course Contents

Module-I: INTRODUCING SDN
SDN Origins and Evolution – Introduction – Why SDN? - Centralized and Distributed Control and Data Planes - The Genesis of SDN

Module-II: SDN ABSTRACTIONS
How SDN Works - The Openflow Protocol - SDN Controllers: Introduction - General Concepts - VMware - Nicira - VMware/Nicira - OpenFlow-Related - Mininet - NOX/POX - Trema - Ryu - Big Switch Networks/Floodlight - Layer 3 Centric - Plexxi - Cisco OnePK

Module-III: PROGRAMMING SDN'S
Network Programmability - Network Function Virtualization - NetApp Development, Network Slicing

Module-IV: SDN APPLICATIONS AND USE CASES
SDN in the Data Center - SDN in Other Environments - SDN Applications - SDN Use Cases - The Open Network Operating System 3

Module-V: SDN'S FUTURE AND PERSPECTIVES
SDN Open Source - SDN Futures - Final Thoughts and Conclusions

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

REFERENCES:

- Software Defined Networks: A Comprehensive Approach by Paul Goransson and Chuck Black, Morgan Kaufmann Publications, 2014
- SDN - Software Defined Networks by Thomas D. Nadeau & Ken Gray, O'Reilly, 2013
- Software Defined Networking with OpenFlow By SiamakAzodolmolky, Packt Publishing, 2013

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DIFT2839	DATA ANALYSIS & VISUALISATION USING SOFTWARE	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	Class X Mathematics				
Co-requisites					

Catalog Description

The implosion of available data has made visualization more critical but also more challenging. Data analysis and Data Visualization are essential tools for business analysis, engineers, policymakers, and decision-makers. Developed originally for "small data", visualization techniques have been met with varied success in the past centuries and decades. There are a few well-known visualizations that are very effective in capturing the essence of the data, and of course, there are many infamous negative examples of poor visuals. An effective visual is critical for decision making it, but it also requires a lot of work, customization, attention to detail, and refinements.

Course Objectives

The course is designed to help students develop skills and knowledge in the following area(s):

- Develop an understanding of what is a good visualization for a given purpose
- Learn visualization theory & techniques
- Build a substantial data analytic project
- Apply data analysis and visualization with Excel, SPSS, R, Python, NVivo and MATLAB

Course Outcomes

On completion of this course, the students will be able to

CO1. Students will be able to articulate meaningful lines of inquiry that might be explored through the collection, organization, visualization, and analysis of data in a context associated with their primary field of study using (as appropriate) numerical, textual, spatial, and/ or visual data.

CO2. Student will understand what data are, how they are collected, and how to assess the quality/ reliability of data.

CO3. Students will demonstrate intermediate proficiency in the visualization of data to communicate information and patterns that exist in the data.

CO4: Students will be able to use at beginning level of proficiency the tools of statistics and machine learning to ask questions of and explore patterns in data.

Course Content :

Module	Topics Covered	Blooms Level	Contact Hours
1	**Module-1: Introduction to Excel** Data Analysis using Excel, Curve fitting, Correlation, Linear Regression, Multiple regression, Principal Component Analysis and Factor Analysis, Hypothesis testing **Introduction to Excel and SPSS** Introduction to SPSS and Types of Data, Importing, exporting and data handling in SPSS; Exploratory data analysis using SPSS and data visualization; Introduction to statistical inference and various	L1, L2, L3, L4	20 hours

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	univariate tests by using SPSS; Analysis of Variance (One Way ANOVA, Two Way ANOVA and ANCOVA); Correlation, Simple and Multiple linear Regression Analysis; Principal Component Analysis and Factor Analysis		
2	**Module-2: VOS Viewer** **Web of Science, Scopus, Dimensions, Lens, and PubMed.** Co-authorship networks, citation-based networks, and co-occurrence networks can be created based on data downloaded from Web of Science, Scopus, Dimensions, and Lens. Co-authorship networks and co-occurrence networks can also be created based on PubMed data. **Crossref, Europe PMC, and OpenAlex**. Networks can also be created based on data retrieved through the APIs of Crossref, Europe PMC, and OpenAlex, These APIs can be queried interactively in VOS viewer. **Semantic Scholar, Open Citations, and Wiki Data.** For a given set of DOIs, networks can also be created based on data retrieved through the APIs of Semantic Scholar, Open Citations and Wiki Data.	L1, L2, L3, L4	10 Hours
3	**Faculty of Management Studies & Behavioural Sciences** **Module 3: Domain Specific Software** **- Structural Equation Modelling** **Smart PLS** Introduction to Structural Equation Modelling (SEM), Introduction to the software's AMOS and SPSS, SMART PLS, Testing of Statistical assumptions, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), common method bias (CMB) test, Measurement Model Assessment, Discussing Fit Indices, Reliability and Validity Testing, Structural Model Assessment identifying multivariate outlier, Construct Validity: Convergent and Discriminant Validity, Measurement Model & Structural Equation Modelling, Mediation and Moderation Effects, Multi-Group Analysis.	L1, L2, L3, L4	30 Hours
	Faculty of Arts **N Vivo** 1. Import text, audio, video, emails, images, spreadsheets, online surveys, web content, and social media from various sources into a simple, intuitive interface. 2. Create and NVivo project, import and organise qualitative and quantitative data		

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	3.Manage a literature review in NVivo 4. Autocode structured data deductively and identify themes inductively 5. Generate and falsify hypotheses 6. Combine data in sets for analysis 7. Seek patterns and identify relationships across codes and cases 8. Present findings using visualisations 9. Export data out of NVivo 10. Coordinate teamwork.		
	Faculty of Science Engineering and Technology **Faculty of Health & Allied Sciences** **R programming / Python/ MATLAB** **R Programming-** Introduction to R, Variables and datatypes in R, Dataframes, Recasting and joining of dataframes, Arithmetic, logical and matrix operations in R, Functions in R, Control structure in R, Data visualization in R. **Python Programming-** Basics of programming, data structure and algorithm using Python, Strings, lists, control, functions, manipulating lists, loops, arrays, selection sort, insertion sort, recursion, sorting, dictionaries, exception handling, file handling, string processing, data analysis using Python **MATLAB Programming-** Introduction, basic features, managing workspace, mathematical functions, basic plotting, Matrices, array operations and linear equations, MATLAB programming- M files script, M-file functions, control flow and operations.		

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional (Theory/ Practical)	End Term Examination
Weightage (%)	5	10	15	70

References:

- David Houcque, 2005. Introduction to MATLAB programming for Engineering students., Northwestern University, E- Book **https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf**
- Mark Lutz, 2009. Learning Python. O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.
- Emmanuel Paradis, 2005. R for Beginners. E book. **https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf**
- A Handbook of Statistical Analysis using SPSS by Dr. Brijesh Awasthi, Redshine Publication.

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Curriculum & Scheme of Examination

2023

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IFT4101	DATA COMMUNICATION AND COMPUTER NETWORKS	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	3	0	0	3
Pre-requisites/Exposure	Basics of Computer Network				
Co-requisites	Nil				

Catalog Description

In this course the concepts of basic data communication and networking concepts are discussed in details. The concepts related to routing/switching hardware, security, distributed client/server applications and architecture, intranets and intranet servers and browsers, networks and network servers, LANs/WANs, internetworking technologies will be introduced. The studies will be made on impact of the OSI reference model for networking protocols, CSMA/CD, TCP/IP implementation, frame relay, FDDI, X-25, ISDN services This course will assist in developing the skills in basics of computer networks. The outcome of this course implicitly and explicitly affects the abilities to understand and analyze the networking concepts

Course Objectives

The objective of this course is to

- Equip the students with concepts of data communication and computer network.
- Provide an overview of networking OSI, TCP/IP models, devices, media, protocols and layer concepts.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain OSI model, Layers in OSI model and TCP/IP protocol suit. Describe topologies with their advantages and disadvantages and transmission media.

CO2: Describe data transmission and data encoding schemes. Elaborate multiplexing and types of spread spectrum.

CO3: Demonstrate various switching techniques. Also explain Frame Relay, ATM, Error Detection Correction techniques, Flow Control- Stop and Wait mechanisms..

CO4: Describe the meaning of routers and issues in designing Routing Algorithms; Discuss logical addressing, Ipv4 and IPv6.

CO5: Describe Transport Services, TCP, UDP, SCTP. Explain Congestion control and Quality of Service.

Modules	Blooms level*	Number of hours
MODULE 1: **Introduction** Computer Network, Advantages and Disadvantages of Computer Network, Communication system, Classification of networks, Network models- OSI model, Layers in OSI model, TCP/IP protocol suite, Transmission mode, LAN Architecture, LAN topologies-Bus, Tree, Ring, Star, Mesh, Wireless LAN, Transmission Media- Twisted pair cable, Coaxial cable, Optical Fiber, Wireless transmission media.	L1 and L2	6

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MODULE 2: **Data Transmission:** Analog and Digital Signals, Periodic and Aperiodic Signals, Transmission impairments, Data rate limits-noiseless channel and noisy channel, Performance characteristics. **Data Encoding:** Digital data-digital signals, Digital data-Analog signals, Analog data- Digital signals, Analog data- Analog signals. **Multiplexing:** Frequency Division Multiplexing, Wavelength Division Multiplexing, Synchronous Time Division Multiplexing, Statistical Time Division Multiplexing. **Spread Spectrum:** Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS).	L1, L2	8
MODULE 3: **Data Link Layer** Switching- Circuit switching Vs Packet Switching, Virtual Circuits- Permanent Virtual Circuit Vs Switched Virtual Circuit, Frame Relay, ATM, Error Detection and Correction, Flow Control- Stop and Wait, Sliding Window, Error Detection, Error Control, HDLC,PPP	L1, L2	8
MODULE 4: **Network Layer** Routers, Routing Algorithms-Unicast routing algorithms-Distance vector routing, Link state routing, Path vector routing, multicast routing algorithms, Logical addressing- IPv4, IPv6, transition from IPv4 to IPv6, Address mapping, ICMP, IGMP.	L1, L2	8
Module V: **Transport layer** Transport Services, TCP, UDP, SCTP, Congestion control, Quality of Service (QoS).	L1, L2	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text :

1. B.Forouzan, Data Communications and Computer Networks, TH McGraw-Hill, 4th edition,2006.

References:

1. K. Feher , Wi reless Digi tal Communicat ion, Jochen Schiller, Mobile Communication, Pearson Education, PH 1995.
2. Data and Computer Communications, William Stallings Publisher:Prentice Hall, Seventh Edition, 2005.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**CT1**	**A/C/Q**	**Attd**	**EE**
Weightage (%)	15	10	5	70

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	2	2	--	--	--	--	--	--	--	--	--	1	1	-	-
CO 2	1	2	2	-	--	--	--	--	--	--	--	--	1	2	-	-
CO 3	1	2	-	--	--	--	--	--	--	--	--	--	1	2	-	--
CO 4	1	2	3	--	--	--	--	--	--	--	--	--	1	2	-	-
CO 5	1	2	2	--	--	--	--	--	--	--	--	--	1	2	-	-

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IFT4105	DATA COMMUNICATION AND COMPUTER NETWORKS LAB	L	T	P	C
Version: 2020.1	Date of Approval : 19, July 2020	0	0	2	1
Pre-requisites/Exposure	Basics of CISCO router				
Co-requisites	NIL				

Catalog Description

The course familiarizes with the equipment applications and protocols installed in enterprise networks, with a focus on switched networks, IP Telephony requirements, and security. It also introduces advanced routing protocols such as Enhanced Interior Gateway Routing Protocol (EIGRP) and Open Shortest Path First (OSPF) Protocol. Hands-on exercises include configuration, installation, and troubleshooting.

Course Objectives

The objective of this course is to

1. Make the students understand configuration of routing protocols.
2. Provide a demonstration of troubleshooting of different protocols.

Course Outcomes

On completion of this course, the students will be able to

CO1. Apply the knowledge of CISCO router to understand its basic configuration, Enterprise network and implement inter-VLAN routing.
CO2. Demonstrate the configuration of OSPF and RIP protocol.
CO3. Demonstrate the configuration of EIGRP and BGP protocol.
CO4. Apply the knowledge of basic WAN connections using HDLC and PPP protocol.
CO5. Demonstrate the standard and extended ACL on router.

Modules	Blooms level*	Number of hours
1. Drawing an Enterprise Network for Amity University showing its different campuses across the country. 2. Configuring all the devices (PCs, Servers, Switches) to create a LAN within campuses of the Enterprise Network. 3. Configuring Virtual LANs (VLANs) in an Enterprise Network. 4. Configuring Trunking and Inter-VLAN Routing in an Enterprise Network.	L3, L5	4
5. Implementing RIP (Routing Information Protocol) to enable communication between different LANs. 6. Implementing OSPF (Open Shortest Path First) to enable communication between different LANs.	L3, L5	2

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7. Implement EIGRP (Interior Routing Protocol) to establish connectivity within domestic campuses of the Enterprise Network. 8. Implement BGP (Border Gateway Protocol) and Redistribution to establish connectivity etween different campuses of the Enterprise Network.	L3, L5	2
9. Configuring WAN connectivity using protocols-HDLC and PPP. 10. Implementing Frame-Relay to configure WAN service provider cloud.	L3, L5	2
11. Configuring Standard and Extended ACLs on a Router. 12. Troubleshooting Switching, Routing and ACL issues.	L3, L5	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Data Communication and Networking by BehrouzForouzan,FourthEdition,TMH.
2. Computer Networks by A.S. Tanenbaum, Fifth Edition, Prentice Hall.

References Books

1. Data and Computer Communications by W. Stallings, Prentice Hall.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –InternalAssessment, EE- ExternalExam, PR- Performance, LR – Lab Record, V – Viva.
Software : Packet tracer.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	**3**	--	--
CO 2	**1**	**2**	**3**	--	--	--	--	--	--	--	--	--	**1**	**1**	--	--
CO 3	**1**	**1**	**2**	**3**	**3**	--	--	--	--	--	--	--	**1**	**2**	--	--
CO 4	**1**	**1**	**2**	**3**	--	--	--	--	--	--	--	--	**1**	**1**	**2**	--
CO 5	**1**	**1**	**2**	**3**	--	--	--	--	--	--	--	--	**1**	**2**	**1**	--

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IFT4103	SOFTWARE ENGINEERING	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	3	-	-	3
Pre-requisites/Exposure	Basic Knowledge of software development				
Co-requisites	Nil				

Catalog Description

In this course the concepts of Software development are discussed in detail. Various models of SDLC are introduced along with its application. Students will be able to apply these concepts in real time software project development.

Course Objectives

The objective of this course is to

- Gain the knowledge of how Analysis, Design, Implementation, Testing and Maintenance processes are conducted in a software project.
- Apply their foundations in software engineering to adapt to readily changing environments using the appropriate theory, principles and processes

Course Outcomes

On completion of this course, the students will be able to

CO1: Apply current theories, models, and techniques that provide a basis for the software Lifecycle.

CO2: Enable the students to apply a systematic application of scientific knowledge in creating and building cost effective software solutions to business and other types of problems.

CO3:Be able to elicit, analyze and specify software requirements through a productive Working relationship with various stakeholders of a software development

CO4:Be able to evaluate the impact of potential solutions to software engineering problems in a global society, using the knowledge of contemporary issues and emerging software engineering trends, models, tools, and techniques.

CO5:Work as an individual and as part of a multidisciplinary team to design, develop and deliver quality software

Modules	Blooms level*	Number of hours
MODULE 1: Introduction Software life cycle models: Waterfall, Prototype, Evolutionary and Spiral models, Overview of Quality Standards like ISO 9001, SEI-CMM	L1, L2 and L4	5
MODULE 2: Software Metrics and Project PlanningSize Metrics like LOC, Token Count, Function Count, Design Metrics, Data Structure Metrics, Information Flow Metrics. Cost estimation, static, Single and multivariate models, COCOMO model, Putnam Resource Allocation Model, Risk management	L2, L3 and L6	7

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MODULE 3: Software Requirement Analysis, design and coding Problem Analysis, Software Requirement and Specifications, Behavioural and non-behavioural requirements, Software Prototyping Cohesion & Coupling, Classification of Cohesiveness & Coupling, Function Oriented Design, Object Oriented Design, User Interface Design Top-down and bottom-up Structured programming, Information hiding	L2, L3 and ,L5	8
MODULE 4: Software Reliability, Testing and Maintenance Failure and Faults, Reliability Models: Basic Model, Logarithmic Poisson Model, Software process, Functional testing: Boundary value analysis, Equivalence class testing,Structural testing: path testing, Data flow and mutation testing, unit testing, integration and system testing, Debugging, Testing Tools, & Standards.Management of maintenance, Maintenance Process, Maintenance Models, Reverse Engineering, Software RE-engineering	L2, L3 and L4,L6	10
MODULE 5: UML Introduction to UML,Use Case Diagrams, Class Diagram: State Diagram in UMLActivity Diagram in UMLSequence Diagram in UMLCollaboration Diagram in UML, Domain, Component Diagram and Deployment Diagram	L3,L4,L5	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books:

1. K. K. Aggarwal&Yogesh Singh, "Software Engineering", 2nd Ed, New Age International, 2005.
2. R. S. Pressman, "Software Engineering – A practitioner's approach", 5th Ed., McGraw Hill Int. Ed., 2001.

Reference Books:

- R. Fairley, "Software Engineering Concepts", Tata McGraw Hill, 1997.
- P. Jalote, "An Integrated approach to Software Engineering", Narosa, 1991.
- Stephen R. Schach, "Classical & Object Oriented Software Engineering", IRWIN, 1996.
- James Peter, W. Pedrycz, "Software Engineering", John Wiley & Sons.
- Sommerville, "Software Engineering", Addison Wesley, 1999.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	--	1	2	--	--	--	--	--	--	--	--	--	1	--	--	--
CO 2	1	--	2	3	--	--	--	--	--	--	4	--	1	2	--	--
CO 3	--	1	--	--	--	--	--	--	--	2	3	--	-	1	2	--
CO 4	-	1	-	--	2	--	--	--	--	--	--	--	2	1	--	--
CO 5	--	--	1	--	--	--	--	--	2	--	--	--	--	--	--	1

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IFT4104	COMPUTER GRAPHICS & MULTIMEDIA SYSTEMS	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	3	-	-	3
Pre-requisites/Exposure	Basic Knowledge of C Programming				
Co-requisites	NIL				

Catalog Description

This course presents basic principles for the design, use and understanding of computer graphics systems. This course includes various algorithms and their complexity to draw graphics objects. This course also teaches the students about different algorithms for 2D /3D transformation, clipping operations on objects, hidden surface removal and detection. This course is intended to describe technical characteristics and performance of multimedia system and terminals.

Course Objectives

The objective of this course is to

- Equip the students with mathematical concepts of graphics algorithm and their implementation to draw objects using C language.
- Provide an overview of various color filling algorithms, 2D & 3D transformation, clipping operations, algorithms related to hidden surface detection and elimination and their implementation.
- Provide an overview of different multimedia technologies like audio and video including multimedia devices. The course also includes some practical sessions on these technologies.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define various standards and components in development of computer graphics.
CO2: Explain generation of graphics primitives and analyse their problems and solutions.
CO3: Demonstrate solid filling using polygon fill algorithm with interior region testing methods.
CO4: Apply 2D geometric transformations on 2D graphics objects with their practical implementation.
CO5: Illustrate use of coordinate mapping and their transformation and analyse use of line and polygon clipping algorithms.
CO6: Apply 3D geometric transformations on 3D objects with their practical implementation and assess logic behind visible surface detection algorithms with practical implementation of 3D transformations.
CO7: Describe basic principles of multimedia systems, animation and graphics library functions used in animation design.

Modules/Topics Covered**	Blooms level*	Number of hours
Module I: Overview of Graphics System Application of computer graphics, Video Display Devices, Raster Scan Display, Random Scan Display, Input Devices, Graphic Software and graphics standards, Numerical based on Raster and Random scan display, Frame buffer, Display processor, picture construction technique in interactive computer graphics.	L1, L2 and L3	5

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Module II: Output Primitives Scan conversion, Points and Lines, Line-Drawing Algorithm, Circle Generation Algorithms, Ellipse Generation Algorithm, Area fill algorithms for various graphics primitives: Scan line fill algorithm, boundary fill algorithm, flood fill algorithm, Polygon representation, various method of Polygon Inside test: Even-Odd method, winding number method, Various techniques for character generation.	L1, L2 and L3	5
Module III: Two Dimensional Geometric Transformations Basic Transformations, Composite Transformation, Translation, Rotation, Scaling, General Pivot-Point Rotation, General Fixed Point Scaling, General Scaling Directions, Reflection, Shear, Raster Methods for Transformations.	L2, L3 and L4	5
Module IV: Two-Dimensional Viewing Window to view Port Co-ordinate Transformation, Anti aliasing and filtering techniques, Clipping Operations, Cohen Sutherland Line Clipping algorithm, Sutherland Hodgeman Polygon Clipping algorithm, fractal geometry methods, fractal dimensions, Geometric construction of deterministic self-similar fractals, Iterated function system to generate fractals.	L2, L3 and L4	6
Module V: Three Dimensional Geometric and Modeling Transformations 3D viewing: 3 dimensional viewing parameters, Homogeneous coordinate representation, Advantages and disadvantages of homogeneous coordinate system, Translation, Rotation, Scaling, Other 3DTransformations, Composite Transformation, and Projections: Parallel projections, perspective projections, and oblique projection.	L2, L3 and L4	6
Module VI: Visible- Surface Detection Methods Bezier curves and Bezier surfaces, B-spline curves and surfaces, Overview of Visible Surface Detection Algorithm, Concept of light source, secular and diffuse reflection, Illumination through light source, Shadow and its types, Depth-Buffer Method, A Buffer Method, Scan-Line Method, Binary search partition method, painter's algorithm or depth sorting method.	L2, L3 and L4	6
Module VII: Introduction to multimedia Elementary image processing techniques, Introduction to Animation, software used in animation, Design of animation sequence, graphics library functions used in animation design.	L1, L2 and L3	3

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

- Computer Graphics, Donald Hearn, M Pauline Baker, 2nd Edition, PHI 1999
- Schaum Series**,** Computer Graphics

Reference Books

- Computer Graphics, N. Krishnamurthy, TMH

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	CT1	PR.	ATTD.	EE
Weightage (%)	15	10	5	70

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	3	1	--	--	--	--	--	--	--	--	--	2	--	--	--
CO 2	1	1	1	--	--	--	--	--	--	--	--	--	2	2	3	--
CO 3	1	1	1	3	2	--	--	--	--	--	--	--	3	2	2	--
CO 4	1	1	2	2	2	--	--	--	--	--	--	--	2	2	2	--
CO 5	1	3	2	1	1	--	--	--	--	--	--	--	3	2	2	--
CO 6	1	3	2	1	1	--	--	--	--	--	--	--	2	2	2	
CO 7	1	3	1	--	--	--	--	--	--	--	--	--	2	--	--	--

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IFT4107	COMPUTER GRAPHICS & MULTIMEDIA SYSTEMS LAB	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	-	-	2	1
Pre-requisites/Exposure	Basic Knowledge of C Programming				
Co-requisites	Nil				

Catalog Description

This course presents basic principles for the design, use and understanding of computer graphics and multimedia systems. This course includes various algorithms and their complexity to draw graphics objects. This course also teaches the students about different algorithms for 2D /3D transformation, clipping operations on objects, hidden surface removal and detection.

Course Objectives

The objective of this course is to

- Equip the students with mathematical concepts of graphics algorithm to draw objects using C language.
- Provide an overview of various 2D & 3D transformation, clipping operations, algorithms related to hidden surface detection and elimination and their implementation.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Define various standards and components in development of computer graphics.

CO 2: Explain generation of graphics primitives and analyze their problems and solutions. Demonstrate solid filling using polygon fill algorithm with interior region testing methods.

CO 3: Apply 2D geometric transformations on 2D graphics objects with their practical implementation.

CO4: Illustrate use of coordinate mapping and their transformation and analyze use of line and polygon clipping algorithms.

CO 5: Apply 3D geometric transformations on 3D objects with their practical implementation and assess logic behind spline curves and surfaces.

Modules	Blooms level*	Number of hours
Module I: Introduction of Graphics 1. Demonstrate the use of graphics library functions to draw various graphics objects. 2. Demonstrate the use of graphics library functions to draw pie chart. 3. Demonstrate the use of graphics library functions to draw bar chart on screen.	L3,L5	2

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Module II: Graphics Primitives 1. Demonstrate the use of DDA line drawing algorithm to draw line on the screen when m<=1 and m>1. 2. Demonstrate the use of DDA line drawing algorithm to draw line on the screen when m<=1 and m>1. 3. Demonstrate the use of Breshenham's line drawing algorithm to draw line on the screen when m<=1 and m>1. 4. Demonstrate the use of circle drawing algorithm to draw circle on the screen. 5. Write a program to draw characters on screen using bitmap character generation method. 6. Write a program to fill a polygon using boundary fill algorithm. 7. Write a program to fill a polygon using flood fill algorithm.	L3,L5	6
Module III: Transformation 1. Write a program to translate a triangle where translation factors are tx=20 and ty=30. 2. Write a program to rotate a triangle in clock-wise and anti-clock-wise direction where rotation angle is 300. 3. Write a program to scale a square where scaling factors are Sx=2 and Sy=3. 4. Write a program to reflect a triangle about X axis. 5. Demonstrate combine 2D transformation after applying translation, rotation and scaling transformations. 6. Write a program to demonstrate fix point scaling where scaling factors are Sx=2 and Sy=3.	L3,L5	6
Module IV: Segment 1. Write a program to demonstrate line clipping algorithm to clip a line where line slop is m<=1. 2. Write a program to demonstrate window to viewport transformation and liner mapping of the object coordinates in viewport where size of viewport is half to the size of window. 3. Write a program to clip a polygon using Sutherland hodgeman polygon clipping algorithm.	L3,L5	4

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Module V: 3-D Transformation and Visible surface detection 1. Write a program to translate a 3D triangle where translation factors are tx=20 and ty=30. 2. Write a program to rotate a 3D triangle in clock-wise and anti-clock-wise direction where rotation angle is 300. 3. Write a program to scale a 3D square where scaling factors are Sx=2 and Sy=3. 4. Demonstrate combine 3D transformation after applying translation, rotation and scaling transformations. 5. Write a program to draw Bezier curve and spline curve on the screen with 4 control points.	L3,L5	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Computer Graphics, Donald Hearn, M Pauline Baker, 2nd Edition, PHI 1999
2. Schaum Series**,** Computer Graphics

Reference Books

1. Computer Graphics, N. Krishnamurthy, TMH

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

1: strongly related, 2: moderately related and 3: weakly related

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	**1**	**3**	**1**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO 2	**1**	**1**	**1**	--	--	--	--	--	--	--	--	--	**2**	**1**	--	--
CO 3	**1**	**1**	**1**	**3**	**2**	--	--	--	--	--	--	--	**1**	**2**	**1**	--
CO 4	**1**	**1**	**2**	**2**	**2**	--	--	--	--	--	--	--	**2**	--	**1**	--
CO 5	**1**	**3**	**2**	**1**	**1**	--	--	--	--	--	--	--	**2**	**3**	**2**	--

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IFT4201	MOBILE COMPUTING	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	3	0	0	3
Pre-requisites/Exposure	Basic knowledge of Computer Networks				
Co-requisites	Nil				

Catalog Description

The objective of this consortium is to shape and expand a full-scale and sound mobile computing system market. To achieve this, cooperation is required of interests related to communication (network), computer hardware/software, system integrators (including service providers), and the media.

Course Objectives

The objective of this course is to

- Give a general overview of the cellular technology and the associated terms and discuss the generations of the mobile technologies starting from 1G to 3G techniques.
- Illustrate the GPRS and WAP model for 2G internet connectivity in detail.
- Elaborate the third-generation mobile services
- Describe the Global Mobile Satellite Systems in detail and basic architecture of Bluetooth technology and advanced topics in mobile computing.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the basic concepts mobile technology, computing and basic architecture of PCS and GSM.
CO2: Describe the mobile networking Infrastructure through 2G technologies (GSM, GPRS, WAP).
CO3: Explain the basic concepts of 3G technologies (WCDMA, CDMA 2000) and WLL.
CO4: Discuss the working of mobile satellite systems like IRIDIUM and GLOBALSTAR.
CO5: Explain the concepts of Bluetooth technology, its working and protocols, virtual networks and enterprise networks.

Modules	Blooms level*	Number of hours
Module I:Introduction to Personal Communications Services (PCS) PCS Architecture, Mobility management, Networks signaling. Global System for Mobile Communication (GSM) system overview: GSM Architecture, Mobility management, Network signaling.	L1, L2 and L3	8
Module II: General Packet Radio Services (GPRS) &Wireless Application Protocol (WAP) GPRS Architecture, GPRS Network Nodes. Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 standard, Mobile IP. Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, wireless mark up Languages (WML).	L1 and L2	10

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Module III:Third Generation (3G) Mobile Services Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G. Wireless Local Loop(WLL): Introduction to WLL Architecture, wireless Local Loop Technologies.	L1 and L2	7
Module IV: Global Mobile Satellite Systems Global Mobile Satellite Systems; case studies of the IRIDIUM and GLOBALSTAR systems.	L1 and L2	7
Module V:Enterprise Networks Introduction to Virtual Networks, Blue tooth technology, Blue tooth Protocols. Advanced techniques in mobile computing.	L1 and L2	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evallllluation

Text Books

1. "Wireless and Mobile Networks Architectures", by Yi-Bing Lin &ImrichChlamtac, John Wiley & Sons, 2001.
2. "Mobile and Personal Communication systems and services", by Raj Pandya, Prentice Hall of India, 2001.

Reference Books

1. "Wireless Web Development", Ray Rischpater, Springer Publishing, 2000.
2. "The Wireless Application Protocol", by Sandeep Singhal, Pearson Education Asia, 2000.
3. "Third Generation Mobile Telecommunication systems", by P.Stavronlakis, Springer Publishers, 2001.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	**1**	**2**	**2**	--	--	--	--	--	--	--	--	--	**1**	--	**3**	--
CO 2	**1**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	--	**1**	--
CO 3	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	**2**	--
CO 4	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	**1**	--
CO 5	**1**	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	**1**	--

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IFT4202	PROGRAMMING WITH JAVA	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	3	0	-	3
Pre-requisites/Exposure	Hands on Knowledge of C Programming				
Co-requisites	Basic concepts of C Programming				

Catalog Description

The objective is to impart programming skills used in this object oriented language java.The course explores all the basic concepts of core java programming like object,classes,data types, features, operators, control structures, interfaces, packages, applets, awt, swings and socket programming. The students are expected to learn it enough so that they can develop the basic applications as well as web solutions like creating applets etc.

Course Objectives

The objective of this course is to

1. Equip the students with the basic feature of contemporary java required in solving complex problems.
2. Provide a practical knowhow and implementation of java programming concepts like classes , objects, packages, swings.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define and explain concept of byte code and platform independence, demonstrate basic java based application development using operators, if-else, loops and arrays. Distinguish between various types of inheritances, polymorphisms and other concepts and able to solve complex programming problems involving class objects, inheritances, and packages.

CO2: Explain event delegation model and describe AWT class hierarchy; Apply knowledge of event handling and AWT controls create some new dynamic graphical applications.

CO3: Describe hierarchy of exception classes and thread life cycle along with demonstrate and design solutions for some simple and complex applications using exception and multithreading concepts.

CO4: Explain the JDBC architecture, ODBC and JDBC Drivers, Connecting to Database with the java.sql Package, Using JDBC Terminology.

CO5: Explain the steps of user defined packages ; Explain the concept of swings, swing package. Demonstrate applications based on java applets and swings. Descibe Servlets, Servlet Life Cycle, Servlet based Applications, jdbc with servelets.

Modules/Topics Covered**	Blooms level*	Number of hours

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Module I: Overview of Java Introduction to Java, Java features, An Overview of Java, Data Types, Variables, Arrays, Operators, and Control Statements, Introducing Classes, A Closer look at Methods and Classes, Inheritance, Packages and Interfaces, Exception Handling, Multithreaded Programming, I/O, and Applets, Creating threads, implementing threads, threads priorities, suspending, stopping & resuming threads, String Handling.	L1, L2 and L3	7
Module II: Java AWT and Swings Introducing the AWT: AWT Controls, Working with Windows, Layout Managers, and working with Swing, Event Handling Mechanism, Events, classes, sources of events, Networking, and Event Handling.	L1, L2 and L3	7
Module III: Collections and Generics What are Generics? A Generic Class with Two Type Parameters, The General Form of a Generic Class, Bounded Types, Creating a Generic Method, Generic Constructors, Generic Interfaces, Generic Class Hierarchies, Collections Overview, The Collection Interfaces, The Collection Classes, Accessing a Collection via an Iterator, The Random access Interface.	L2, L3 and L4	8
Module IV: JDBC Overview of JDBC architecture, ODBC and JDBC Drivers, Connecting to Database with the java.sql Package, Using JDBC Terminology.	L2, L3 and L4	7
Module V: JSP and servlets Introduction to Servlets, Servlet Life Cycle, Servlet based Applications, jdbc with servelets, session Management techniques in detail, JSP: Introduction to JSP, JSP implicit objects, JSP based Applications, Java. Net. Login & Logout Example, jdbc with jsp.	L2, L3 and L4	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

1. Patrick Naughtan and Herbert Scheldt The Complete Reference, Java 2, TMH

Reference Books

1. Java 2 Unleashed (Techmedia – SAMS), Jamie Jaworski
2. Developing Java Servlets (Techmedia – SAMS), James Goodwill sing Java 1.2 Special Edition (PHI), Webber

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CT1	PR.	ATTD.	EE
Weightage (%)	15	10	5	70

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4
CO1	2	1	3	--	--	--	--	--	--	--	--	--	2	--	--	--
CO2	1	3	2	--	--	--	--	--	--	--	--	--	2	2	--	--
CO3	1	3	3	--	--	--	--	--	--	--	--	--	2	2	1	--
CO4	1	3	2	--	--	--	--	--	--	--	--	--	2	2	2	--
CO5	1	3	--	--	--	--	--	--	--	--	--	--	1	1	--	--

1: strongly related, 2: moderately related and 3: weakly related

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IFT4205	PROGRAMMING WITH JAVA LAB	L	T	P	C
2017.1	__	0	-	4	2
Pre-requisites/Exposure	Hands on knowledge of C and C++ Programming				
Co-requisites	Basic concepts of OOP Programming				

Catalog Description

The objective is to impart programming skills used in this object oriented language java. The course explores all the basic concepts of core java programming like object, classes, data types, features, operators, control structures, interfaces, packages, applets, awt, swings and socket programming. The students are expected to learn it enough so that they can develop the basic applications as well as web solutions like creating applets etc.

Course Objectives

The objective of this course is to

- Equip the students with the basic feature of contemporary java required in solving complex problems.
- Provide a practical knowledge of implementation/demonstration of java programming concepts like classes, objects, packages, swings.

Course Outcomes

On completion of this course, the students will be able to

CO1: Demonstrate the basic java based application development using operators, if-else, loops and arrays.

CO2: Demonstrate the concept of inheritances, polymorphisms and other concepts and able to solve complex programming problems involving class objects.

CO3: Apply knowledge of event handling and AWT controls create some new dynamic graphical applications.

CO4: Demonstrate and design solutions for some simple and complex applications using exception and multithreading concepts, Database connectivity.

CO 5: Apply the knowledge of swing, io packages to implement various application programs. Demonstrate applications based on java applets and swings.

Modules	Blooms level*	Number of hours
1. Sample programs of basic java a) Write a program & execute to display "hello java" in java. b) Write a program & execute to demonstrate command line arguments in java. c) Write a program & execute to find maximum of command line arguments in java. d) Write a program & execute to find sum of two numbers in java, take input from user.	L1, L2 and L3	4

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2. Sample programs of Inheritance, String classes, abstract function and interface a) Write a program & execute in java to perform area and volume calculations in java using concept of inheritance. b) Write a program & execute in java to demonstrate abstract class in java c) Write a program & execute in java to perform complex number arithmetic using class and object. d) Write a program & execute to make use of interface in java Write a program & execute in java to sort an array of strings using string class functions.	L2, L3 and L4	4
3. Sample programs of AWT and event handling a) Write your first applet in java b) Write a program & execute to find maximum of two numbers in java using applet. c) Write a program & execute to draw basic shapes in java using graphics d) Write a program & execute to handle various mouse events	L2, L3, L4 and L5	4
4. Sample programs of exception handling, multithreading and JDBC Connectivity a) Write a program & execute to demonstrate threads in java b) Write a program & execute to demonstrate synchronization in threads in java. c) Write a program & execute to create your own exception and use it in java d) WAP to connecting a database using user-id and password. c) WAP to insert data into the database using the prepared statement	L2, L3 and L4	6
5. Sample programs on java packages and Servlets a) Create your own package to create two simple functions in different/same classes and access them in and outside the package. b) Write a program to create servlets based applications. c) WAP for authentication, which validate the login-id and password by the servlet code d) WAP to include a HTML page into a JSP page,WAP to handle the JSPException	L2, L3 and L4	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

3. Computer Graphics, Donald Hearn, M Pauline Baker, 2nd Edition, PHI 1999
4. Schaum Series**,** Computer Graphics

Reference Books

2. Computer Graphics, N. Krishnamurthy, TMH

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4
CO1	1	3	1	--	--	--	--	--	--	--	--	--	1	2	--	--
CO2	1	1	1	--	--	--	--	--	--	--	--	--	2	1	--	---
CO3	1	1	1	3	2	--	--	--	--	--	--	--	1	2	1	---
CO4	1	1	2	2	2	--	--	--	--	--	--	--	2	--	1	---
CO5	1	3	2	1	1	--	--	--	--	--	--	--	2	3	2	--

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IFT4203	SOFTWARE PROJECT MANAGEMENT	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	3	0	0	3
Pre-requisites/Exposure	Software Engineering Concepts				
Co-requisites	Nil				

Catalog Description

This course introduces the concepts to understand the fundamental principles of Software Project management & provides a good knowledge of responsibilities of project manager and how to handle these. It also discusses the different methods and techniques/tools used for project management.

Course Objectives

The objective of this course is to

- To understand the working and functioning of the process of the software development so that the project can be managed accordingly.
- To understand the engineering activities in the project life cycle
- To implement the management tools and quality standards

Course Outcomes

On completion of this course, the students will be able to

CO1: Describe fundamental principles of Software project management

CO2: Identify the key activities in managing a software project

CO3: evaluate and relate different software processes, system models

CO4: Plan software projects, including risk and quality management

CO5: Utilize technology tools for communication, collaboration, information management, and decision support.

CO6: Apply software quality practices in software project.

Modules	Blooms level*	Number of hours
MODULE 1: INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT Definition of a Software Project (SP), SP Vs. other types of projects activities covered by SPM, categorizing SPs, project as a system, management control, requirement specification, information and control in organization.	L1, L2	6
MODULE 2: STEPWISE PROJECT PLANNING Introduction, selecting a project, identifying project scope and objectives, identifying project infrastructure, analyzing project characteristics, identifying project products and activities, estimate efforts each activity, identifying activity risk, allocate resources, review/ publicize plan. .	L1, L2 and L3	8

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MODULE 3: PROJECT EVALUATION & ESTIMATION Cost benefit analysis, cash flow forecasting, cost benefit evaluation techniques, risk evaluation. Selection of an appropriate project report; Choosing technologies, choice of process model, structured methods, rapid application development, water fall-, V-process-, spiral- models, Prototyping, delivery. Albrecht function point analysis.	L3, L4,and L6	9
MODULE 4: ACTIVITY PLANNING & RISK MANAGEMENT Objectives of activity planning, project schedule, projects and activities, sequencing and scheduling activities, network planning model, representation of lagged activities, adding the time dimension, backward and forward pass, identifying critical path, activity throat, shortening project , precedence networks. Risk Management: Introduction, the nature of risk, managing risk, risk identification, risk analysis, reducing the risks, evaluating risks to the schedule, calculating the z values**.**	L2, L3 and L5	10
MODULE 5: RESOURCE ALLOCATION & MONITORING THE CONTROL Introduction, the nature of resources, identifying resource requirements, scheduling resources creating critical paths, counting the cost, being specific, publishing the resource schedule, cost schedules, the scheduling sequence. Monitoring the control: Introduction, creating the frame work, collecting the data, visualizing progress, cost monitoring, earned value, prioritizing monitoring, getting the project back to target, and change control.	L2, L3 and L5	10
MODULE 6: SOFTWARE QUALITY Introduction, the place of software quality in project planning, the importance of software quality, defining software quality, ISO 9126, Practical software quality measures, product versus process quality management, external standards, techniques to help enhance software quality.	L2,L3 and L6	5

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Software Project Management (2nd Edition), by Bob Hughes and Mike Cotterell, 1999, TMH
2. Software Engineering – A Practitioner's approach, Roger S. Pressman (5th edi), 2001, MGH
3. Software Project Management, Walker Royce, 1998, Addison Wesley.

Reference Books

1. Nasib Singh Gill, "Software Engineering", Khanna Book Publishing Co. (P) Ltd.
2. Jumpstart to Software Quality Assurance by Vishnuvarthanan Moorthy - Smashwords , 2013

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

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CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO, PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	**1**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**-**	**--**	**-**
CO2	**-**	**1**	**2**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**--**
CO3	**--**	**-**	**1**	**2**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**--**	**----**
CO4	**-**	**1**	**-**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**3**	**--**
CO5	**-**	**-**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**2**	**----**	**--**	**--**	**4**
CO6	**--**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**--**	**--**	**--**	**4**

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IFT4206	SOFTWARE PROJECT MANAGEMENT LAB	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	0	0	2	1
Pre-requisites/Exposure	Software Engineering Concepts				
Co-requisites	NIL				

Catalog Description

Study practical approaches for managing, planning, organizing and implementing Information Systems projects using modern management techniques. Complete hands-on projects requiring management of project resources, scope, time-line, cost, scheduling, human and other resources. Use Microsoft Project and other project monitoring tools. In this Lab course MS Project tool is used

Course Objectives

The objective of this course is to

- Demonstrate students to Manage the phases and infrastructure of IT projects
- Use project management software to control the design, implementation, closure, and evaluation of IT projects
- Estimate, plan, calculate, and adjust project variables

Course Outcomes

On completion of this course, the students will be able to

CO1: Create plans at the level of detail that is appropriate for software project

CO2: Create and manage tasks, costs, work, and resources in a software project

CO3: Track and monitor project performance throughout its life-cycle

CO4: Explain quality management and process improvement in the context of software development projects.

Modules/Topics Covered**	Blooms level*	Number of hours
1. Introduction of tool including creating project (a) Set file properties and calendar settings (b) Create Gantt Chart for SDLC process. (c) Create Pert chart for SDLC process .	L3, L4	8
2. Key activities of software Project Management (a) Create a Gantt chart of wedding planning event management which includes minimum of 12 activities.. (b) In the same Gantt chart split the tasks,copy ,move and paste tasks.	L3, L4	4
3. Checkpoints , milestones and Critical path concepts (a) Create Gantt Chart of all testing activities which includes checkpoints and milestones (b) In the same project review critical path.	L3, L4,L5	4

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4. Work Breakdown Structure (a) Create Gantt chart of Agile approaches, also create work breakdown structure of same (b) Add different type of resources in same project (c) Perform the time estimations of tasks and set task dependencies.	L3, L5,L6	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

- Software Project Management (2nd Edition), by Bob Hughes and Mike Cotterell, 1999, TMH
- Software Engineering – A Practitioner's approach, Roger S. Pressman (5th edi), 2001, MGH
- Software Project Management, Walker Royce, 1998, Addison Wesley.

Reference Books

- Step By Step Microsoft Project 2010 by Carl S. Chatfield, Timothy D. Johnson,2002
- Jumpstart to Software Quality Assurance by Vishnuvarthanan Moorthy - Smashwords , 2013

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA					EE
Components	**A**	**PR**	**LR**	**V**	**70**
Weightage (%)	5	10	10	5	

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	-	1	2	3	--	--	--	--	--	--	4	--	1	--	--	--
CO 2	1	--	3	--	2	--	--	--	3	--	2	--	--	1	2	--
CO 3	--	--	--	1	2	--	--	--	--	3	--	--	--	1	2	--
CO 4	-	2	--	--	--	--	--	--	--	--	1	--	--	--	1	3

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IFT4204	ARTIFICIAL INTELLIGENCE	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	3	0	0	3
Pre-requisites/Exposure	Basic Knowledge of Searching Techniques				
Co-requisites	Nil				

Catalog Description

In this course the concepts of basic principles, techniques, and applications of Artificial Intelligence are discussed in detail. As a precursor to the study of the course it provide an in depth understanding of basic areas of artificial intelligence, search techniques, knowledge representation, learning and their applications in design and implementation of intelligent agents for a variety of task. The concepts further enhances the understanding of key components of intelligent agents of moderate complexity in Prolog and evaluate their performance.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of Artificial Intelligence, its application, importance and characteristics.
2. It Provide an overview of different concepts such as searching, knowledge, Learning, Robotics, Expert System and Prolog

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the concept of Artificial Intelligence, its application, importance of Artificial Intelligence.
CO2: Analyze the different searching technique and understanding their applications.
CO 3: Explain the concept of knowledge representation, the different techniques, handling uncertainty in knowledge and making different types of decisions.
CO4: Explain the concept of Expert System and its application areas.
CO5: Explain the concept of NLP and the functionality of Robots

Modules	Blooms level*	Number of hours
MODULE 1: **Problem solving and Scope of AI***:* Introduction to Artificial Intelligence. AI-Applications- Games, theorem proving, natural language processing (NLP), vision and speech processing, robotics, expert systems. Solving Problems by Searching, beyond classical search, adversarial Search, constraint satisfaction problems	L1 and L2	8

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MODULE 2: **Knowledge and Representation**: Logical Agents, First-Order Logic, Inference in First-Order Logic, Classical Planning, Planning and Acting in the Real World, Knowledge Representation. **Uncertain Knowledge and Reasoning-** Quantifying Uncertainty, Probabilistic Reasoning , Probabilistic Reasoning over Time , Making Simple Decisions, Making Complex Decisions.	L2, L3 and L4	14
MODULE 3: **Expert System:** Need and justification for expert systems, knowledge acquisition, Case studies: MYCIN, RI. **Learning:-**Learning from Examples, Knowledge in Learning, Learning Probabilistic Models, Reinforcement Learning.	L2, L3 and L4	10
MODULE 4: **Module IV: Communicating, Perceiving, and Acting** NLP-Natural Language Processing, Natural Language for Communication, Perception. **Robotics:-** Fundamentals of Robotics, Sensors and vision system, Robot Programming languages & systems	L3,L4 and L5	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books:

1. Stuart Russell, Peter Norvig "Artificial Intelligence: A Modern Approach",3rd Edition,Pearson Publication,Edinburgh,2014.
2. E. Rich and K. Knight, "Artificial intelligence",3rd Edition, McGraw-Hill Education Publication,Delhi,2009

Reference Books:

1. P. H. Winston, "Artificial Intelligence",3rd Edition, Pearson Education Publication , 2002.
2. R. J. Schalkoff, "Artificial Intelligence – An Engineering Approach", 1st Edition,McGraw Hill Int. Ed. Publication, Singapore, 1992.

.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	**1**	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**3**	**--**
CO2	**1**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**3**	**--**
CO3	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**3**	**--**
CO4	**1**	**1**	**2**	**--**	**--**	**--**	**2**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**3**	**--**
CO5	**1**	**1**	**2**	**--**	**--**	**--**	**2**	**--**	**--**	**--**	**--**	**--**	**3**	**1**	**3**	**--**

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IFT4207	ARTIFICIAL INTELLIGENCE LAB	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	0	0	2	1
Pre-requisites/Exposure	Basics of C Concepts				
Co-requisites	NIL				

Catalog Description

In this Lab course Prolog programs are implemented and demonstrated. The Concepts that are covered would enable them to achieve the desired goal by creating facts and rules. Programs will be related to concepts of creating facts, facts with argument, backtracking, arithmetic operations in prolog, nesting condition, looping condition and List handling.

Course Objectives

The objective of this course is to

1. Make the students apply knowledge of Prolog to attain goal by creating and matching rules and facts developed in the knowledge base.
2. Provide a demonstration of Prolog programming concepts like facts with arguments,Backtracking

Course Outcomes

On completion of this course, the students will be able to

CO1: Apply the knowledge of Prolog programming to provide solution to the given AI problem.

CO2: Demonstrate the use of List handling in Prolog by performing various functions which are based on finding the element, replacing an element and appending the two lists.

CO3: Apply the knowledge of Facts and Rules in Prolog to reach a particular goal by implementing different concepts such as facts with arguments, backtracking, and looping conditions.

Modules/Topics Covered**	Blooms level*	Number of hours
5. Sample Programs using Basic of Prolog Programming (d) Write a program to understand the basic structure of Prolog programming. (e) Write a program to create simple facts using prolog. (f) Demonstrate an application of facts with arguments by showcasing the use of facts to reach a particular goal.	L1,L3, L5	4
6. Sample Programs using Rules based Programming in Prolog (c) Create an rule based programs in Prolog (d) Write a program to implement the concept of backtracking which matches each rules with a query	L3, L5	4

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7. Sample Programs to implement the concept of input/output operation in Prolog (c) Create a Prolog program which accept a user input and display back the result. (d) Design an application to fetch data in the form of numeric data and display the given result (e) Demonstrate the process of arithmetic operations in Prolog Programming. (f) Demonstrate the working of menu driven calculator to perform different arithmetic operations.	L3, L5	6
8. Sample Programs to implement the concept of nesting and looping condition in Prolog (d) Write a prolog program to demonstrate the looping condition by implementing the concept of finding out the factorial of a given number. (e) Write a prolog program to demonstrate the conditional statement in Prolog by implementing the concept of finding out the maximum of three numbers, to calculate the area of a cube.	L3, L5	6
9. Sample Programs using List Handling in Prolog (a) Demonstrate the use of List handling in Prolog which include finding an element, replacing an element (b) Write a program to append two givsen list created in Prolog Programming.	L3, L5	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Text Books:

1. Stuart Russell, Peter Norvig "Artificial Intelligence: A Modern Approach",3rd Edition,Pearson Publication,Edinburgh,2014.
2. E. Rich and K. Knight, "Artificial intelligence",3rd Edition, McGraw-Hill Education Publication,Delhi,2009

Reference Books:

1. P. H. Winston, "Artificial Intelligence",3rd Edition, Pearson Education Publication , 2002.
2. R. J. Schalkoff, "Artificial Intelligence – An Engineering Approach", 1st Edition,McGraw Hill Int. Ed. Publication, Singapore, 1992.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	**70**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	1	3	--	--	--	--	--	--	--	--	--	2	1	--	--
CO 2	3	1	3	--	--	--	--	--	--	--	--	--	2	1	--	--
CO 3	2	1	2	--	--	--	--	--	--	--	--	--	2	1	--	--

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IFT4238	SEMINAR	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	0	0	0	3
Pre-requisites/Exposure	Basics of Networks				
Co-requisites	Nil				

Catalog Description

The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal classroom situations. These attributes are intellectual ability, professional judgment and decision-making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc. In this course the concepts of different new ideas will be explored by the seminar presentation.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of new technologies.
2. Equip students with Report writing and Presentation skills.

Course Outcomes

On completion of this course, the students will be able to

CO1: Make a report on relevant topic by the study of literatures.

CO2: Demonstrate the topic of seminar by use of power presentation.

CO3: Demonstrate the challenges and applications of the topic of the seminar.

Text Books

As per topic of seminar.

Reference Books

As per topic of seminar.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	V	PPT	R	IM
Weightage (%)	20	20	30	30

V – Viva, PPT-Power Point Presentation, R – Report, IM-Internal Marks

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	2	--	--	--	--	--	2	--	--	--	2	2	2	2
CO2	--	--	--	--	--	--	--	--	2	--	--	--	2	2	1	2
CO3	2	2	2	--	--	--	--	--	2	1	--	--	2	2	2	2

1: strongly related, 2: moderately related and 3: weakly related

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IFT4301	DATA WAREHOUSING AND DATA MINING	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	3	0	0	3
Pre-requisites/Exposure	Basic Knowledge on Database				
Co-requisites	Nil				

Catalog Description

In this course the concepts of Data warehouse and Data Mining are discussed in detail. The different data mining techniques such as clustering, classification, association are introduced. As a precursor to the study of data warehouse its architecture, types of OLAP Servers, and usage of OLAP are studied in detail. The concepts further enhances the concept of different attributes supported by data mining process, application of data mining in marketing, banking, retail sector and other areas are analyzed. .

Course Objectives

The objective of this course is to

- Equip the students with concepts of data mining techniques namely classification, clustering and association.
- Provide an overview of data warehouse which include the usage of OLAP, its characteristics, OLAP architecture.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the concept of Datawarehouse, its characterstics, Metadata concepts and its importance, The schemas of Data warehouse with their application areas.

CO2: Explain the architectural components of data warehouse and the challenges the data warehousing is facing.

CO3: Explain the indexing of OLAP, the different OLAP operations performed on the data cube.

CO4: Explain the concept of different data mining techniques like association, clustering and classification and analyze these techniques on the different data sets.

CO5: Explain the concept of Web Mining and understanding the features of different types of database.

Modules	Blooms level*	Number of hours
MODULE 1: **Data Warehousing:** Data Warehouse definition & Characteristics, The need for data ware housing, Operational and Informational Data Stores, Difference between Data warehouse and DBMS, Benefits of Data warehousing, Data mart, Meta Data, Conceptual Modeling of Data Warehouses: star schemas, Snowflake, Fact Constellations with example each.	L1, L2 and L3	8

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MODULE 2: **On Line Analytical Processing (OLAP)** Definition: OLAP, Difference between OLTP and OLAP, OLAP Server Architecture, OLAP Operations, Multi Relational & Multi Dimensional: MOLAP, ROLAP, OLAP Tools, Metadata Repository, Data Warehouse Back-End Tools and Utilities.	L2, L3 and L4	10
MODULE 3: **Data Mining** Introduction to Data Mining, Applications, Limitations, Techniques, Association Rules: Priori Algorithm, Direct Hashing and Pruning (DHP), Classification: Decision Tree, Split Algorithm based on Information Theory, Bayes Method.	L2, L3 and L4	10
Module 4: **Cluster Analysis: Concepts and Methods** Cluster Analysis: Features, Types of Cluster Analysis Methods: Partitional, Hierarchical, Density Based, Grid based Methods, , Web Data Mining, Search Engine, Case Study, Limitations.		8
Module 5: **Web Mining** Introduction, Classifying Web pages, extracting knowledge from the web. Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Databases, Multimedia Databases, Time Series and Sequence Data, Text Databases, World Wide Web, Applications and Trends in Data Mining		6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books:

1. Jiawei Han &Micheline Kamber,"Data Mining Concepts And Techniques",3rd Edition,Morgan Kaufmann Publication,An Imprint of Elsevier, 2015.
2. Vipin Kumar,Pang Ning "Introduction to Data Mining",3rd Edition,Pearson Publication,Chennai, 2016.
3. Mohammed,Wagner " Data Mining and Analysis", 4th Edition, Cambridge University Press,Brazil, 2018.

Reference Books:

1. Daneil,D. Larose "Data Mining and Predictive Analytics", 2nd Edition, John wiley and Sons,Canada, 2015.
2. Paulraj "Data Warehousing Fundamental for IT Professional", 2nd Edition, John Wiley and Sons, Canada, 2010.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

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CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**--**	**--**
CO2	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**--**	**--**
CO3	**1**	**2**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**--**	**--**
CO4	**1**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**	**1**
CO5	**1**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**3**	**--**	**1**

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IFT4305	DATA WAREHOUSING & DATA MINING LAB	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	0	0	2	1
Pre-requisites/Exposure	Basics of Statistics Concepts				
Co-requisites	NIL				

Catalog Description

In this Lab course Data Mining programs are implemented and demonstrated using a Weka Tool. The Concepts that are covered would enable them to analyze the working of different data mining techniques namely clustering, association, regression. Programs will be related to concepts of understanding the architecture of data warehouse ,creating a knowledge base in Weka and apply preprocessing on the dataset, developing programs to specify the different types of attributes supported by Weka tool, Performing the implementation of clustering, association techniques.

Course Objectives

The objective of this course is to

- Make the students apply knowledge of Data Mining by analyzing the different data mining techniques.
- Provide a demonstration of Preprocessing technique on the data set by removing noisy data

Course Outcomes

On completion of this course, the students will be able to

CO1: Apply the knowledge of Data Mining to gain analysis on different data sets and their related attributes.

CO2: Demonstrate the use of Data preprocessing technique by handling the data efficiently by removing noise and outliers from the given data sets.

CO3: To implement the different data mining concepts namely binning, histogram analysis, numeric transform and discretization.

CO4: Demonstrate the working of different data mining techniques namely clustering, association analysis, regression, classification techniques.

Modules/Topics Covered**	Blooms level*	Number of hours
1. To understand the basic feature of Data warehouse and Introduction to Weka Tool a) Understanding the concept of importance of data warehouse and its characteristics b) Applications of Data warehouse and 3-tier Architecture of Data warehouse c) Weka tool installation and basic introduction	L1,L2	4
2.Sample Programs to apply Pre-Processing technique on the data set a) Apply a pre-processing technique on the weather.arff dataset b) Create a student data set into arff format and then apply pre-processing on the data set.	L3, L4,L5	4

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3. Sample Programs to implement the concept of Numeric transform and Discretization (a) Create a Weka program to apply a numeric transform on Iris dataset. (b) Design an application program to apply a feature selection method for game playing. arff dataset. (c) Write a program to implement the concept of Equal frequency and Equal width binning for the given dataset.	L3, L4,L5	6
4. Sample Programs to implement the concept of Training and Validating the dataset (a) Write a prolog program to demonstrate the concept of validation in Weka dataset. (b) Design an CSV dataset using Weka.	L3,L4, L5	6
5. Sample Programs to analyze the different data mining techniques a) Write a program to implement the concept of clustering in Weka. b) Write a program to apply Apriori technique on the dataset and to generate association rules. c) Write a program to apply classification technique on the given dataset.	L3, L4,L5	4

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

** Sample Programs provided are not limited to these only, can include others as desired.

Text Books:

1. Jiawei Han &Micheline Kamber,"Data Mining Concepts And Techniques",3rd Edition,Morgan Kaufmann Publication,An Imprint of Elsevier, 2015.
2. Vipin Kumar,Pang Ning "Introduction to Data Mining",3rd Edition,Pearson Publication,Chennai, 2016.
3. Mohammed,Wagner " Data Mining and Analysis", 4th Edition, Cambridge University Press,Brazil, 2018.

Reference Books:

1. Daneil,D. Larose "Data Mining and Predictive Analytics", 2nd Edition, John wiley and Sons,Canada, 2015.
2. Paulraj "Data Warehousing Fundamental for IT Professional", 2nd Edition, John Wiley and Sons, Canada, 2010.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4
CO1	**2**	**1**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**--**	**--**
CO2	**2**	**1**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**--**	**--**
CO3	**2**	**1**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**--**	**--**
CO4	**2**	**1**	**3**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**--**	**--**

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IFT4302	PROGRAMMING WITH DOT NET FRAMEWORK	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	4	0	0	4
Pre-requisites/Exposure	Basic Programming, HTML and CSS				
Co-requisites	Nil				

Catalog Description

.NET framework is most commonly used framework for developing various applications and it supports many languages. C#.NET is one of the most commonly used languages in the software industries. Students in this course will study to develop; Console and GUI based applications using C#.NET. The course also provides knowledge regarding Creating Dynamic Web Pages with the help of ASP.NET framework. Various topics included in this course impart the knowledge of ASP.NET framework concepts at implementation level. The major topic covered includes theme, state management, web controls, AJAX, database connectivity using ADO.NET, web services and deploying web applications.

Course Objectives

The objective of this course is to

- Equip the students with .NET framework and its programming constructs.
- Provide knowledge to develop to console based and GUI based applications using C#.NET language.
- Equip the students with concepts of ASP.NET web applications including State management, Web Controls and ADO.NET.
- Provide knowledge to develop, configure and deploy secure ASP.NET web applications using C#.NET programming language.

Course Outcomes

On completion of this course, the students will be able to

CO1: Understand the components of .NET framework.
CO2: Use object-oriented concepts to write programs using C#.NET programming language.
CO3: Develop GUI based applications.
CO4: Use various standard and advance web controls for developing ASP.NET dynamic web pages and also create custom controls.
CO5: Establish database connectivity and perform various operations on database through ASP.NET web pages.

Modules	Blooms level*	Number of hours

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MODULE I: **NET FRAMEWORK:** Overview of .NET and .NET Framework, .NET Compliant Languages, Common Language Specification (CLS),Common Type System (CTS),Framework Class Library (FCL),Base Class Library (BCL),Common Language Runtime (CLR) Visual Studio IDE, Microsoft Intermediate Language (MSIL), Understanding CLR and Execution of .NET Application, Components of CLR. **C#.NET BASICS** C# Programming Language Features, Hello World Program, General Structure of a C# Program, Conceptual Overview of C#.Net, Data Types, Modifiers (Access Modifiers),Casting and Type Conversion, Boxing and Unboxing Modifiers, Selection Statements, Looping Statement, Array- Single Dimensional and Multi-Dimensional, Declaring Arrays, Initializing Arrays, Accessing Array Members, Arrays are Objects, Using for each with Arrays, Jagged Arrays	L1, L2	4
MODULE II: **OOP:** Class, Interfaces: Defining and Implementing Single & Multiple Interfaces, Abstract Class, Delegates, Exception Handling, Reflection, Assembly, Types of Assemblies, Components of Assemblies. **COLLECTIONS:** Non-Generic Collection: Array List, Stack, Queue, Hash Table. Generic Collection: List, Dictionary, Queue, Stack.	L2 and L3	14
Module III: **WINDOWS FORMS** Create and populate Windows Forms, controls in a Windows Forms application, Menus in a Windows Forms application, Multiple Document Interface (MDI) applications, User input validation in a Windows Forms application **ASP.NET FRAMEWORK & WEB FORMS** Introduction to Microsoft ASP.NET, ASP.NET execution model, Themes, Creating an ASP.NET Web application user interface, Implementing event handlers by using code-behind files, Clint-side and Server-side controls, events, Using Controls, Validating Data, Navigating Between Forms , Custom and User Controls, Implementing Master Pages	L2 and L3	7
MODULE IV: **AJAX:** Introduction to AJAX, AJAX Toolkit, Partial page update using AJAX, Extending an ASP.NET Web Forms Application by Using the Ajax Control Toolkit. **STATE MANAGEMENT:** The Various Means to Manage State, Request object, Application object, Cache object, Session object, Server-side state management, using session for server-side and client-side state management. **XML WEB SERVICES:** Need of XML Web services, Understanding the Web Service Model, Creating an ASP.NET Web Service, Creating & Consuming Web Services with Visual Studio .NET.	L2 and L3	2
MODULE V: **ADO.NET** Architecture of ADO.NET: Connected, Disconnected, Sql Connection class, SqlCommand class, Data Reader class, Sql Data Adapter class, Data Set class, Data grid view with DML Operations like sorting, paging etc.	L2, L3 and L4	5

**Bloom's Level:*

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L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Professional C#.NET 4.5 , Wrox Publications
- Stephen Walther, ASP.NET Unleashed, SAMS Publication

Reference Books

- Andrew Stellman and Jennifer Greene, Head First C#, O'Reilly
- E. Balagurusamy, Programming in C#.Net, Tata McGraw-Hill Publisher
- Matthew MacDonald, Beginning with ASP.NET 4.5 in C#, Apress Publications
- Imar Spaanjaars, Beginning with ASP.NET 4.5.1 in C# and VB, Worx Publication
- Jesse Liberty, Dan Hurwitz, Programming ASP.NET, OReilly.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4
CO1	3	--	--	--	--	--	--	--	--	--	--	--	2	3	--	--
CO2	2	2	1	2	1	--	--	--	--	--	--	--	--	1	2	--
CO3	2	2	1	2	2	--	--	--	--	--	--	--	--	1	2	--
CO4	2	1	1	2	1	--	--	--	--	--	--	--	--	1	1	--
CO5	2	1	1	2	2	--	--	--	--	--	--	--	--	1	1	--
CO6	2	2	2	2	1	---	--	--	--	--	--	--	--	2	1	--

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IFT4306	PROGRAMMING WITH DOT NET FRAMEWORK LAB	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	-	-	4	2
Pre-requisites/Exposure	Basic Programming, HTML and CSS				
Co-requisites	Nil				

Catalog Description

.NET framework is most commonly used framework for developing various applications and it supports many languages. C#.NET is one of the most commonly used languages in the software industries. Students in this course will study to develop; Console and GUI based applications using C#.NET. The course also provides knowledge regarding Creating Dynamic Web Pages with the help of ASP.NET framework. Various topics included in this course impart the knowledge of ASP.NET framework concepts at implementation level. The major topic covered includes theme, state management, web controls, AJAX, database connectivity using ADO.NET, web services and deploying web applications.

Course Objectives

The objective of this course is to

- Equip the students with .NET framework and its programming constructs.
- Provide knowledge to develop to console based and GUI based applications using C#.NET language.
- Equip the students with concepts of ASP.NET web applications including State management, Web Controls and ADO.NET.
- Provide knowledge to develop, configure and deploy secure ASP.NET web applications using C#.NET programming language.

Course Outcomes

On completion of this course, the students will be able to

CO1: Understand the components of .NET framework.

CO2: Use object-oriented concepts to write programs using C#.NET programming language.

CO3: Develop GUI based applications.

CO4: Use various standard and advance web controls for developing ASP.NET dynamic web pages and also create custom controls.

CO5: Establish database connectivity and perform various operations on database through ASP.NET web pages.

Modules/Topics Covered**	Blooms level*	Number of hours

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Module-I: I/O, Selection and Looping Statements Sample Programs a) Program to get a number and display the number with its reverse b) Program to check inputted no. is prime or composite. 1. Array, Jagged Array, String & Command Line Arguments Sample Programs a) Write a program to sort an array of n strings in ascending order. b) Program to find out sum of numbers passed through command line arguments. c) Program to Demonstrate Jagged Arrays d) Program to Search an element from an Array. e) Program to find the frequency of alphabet in a string.	L2, L3 and L4	4
Module-II: Class & Properties, Overloading Sample Programs a) Define a class student with MarksofCS, MarksofJava, MarksofDBMS, name as its data member. Enter the marks, find average and percentage for that. Use appropriate properties. b) Define a class 'Number'and define overloaded method add () with one, two and three arguments to implement method overloading. c) Define a class with two datamembers: num1 as constant and num2 as readonly. Display the values of both on the console and state the difference between them. Constructor, Garbage Collector, Static Members Sample Programs a) Create a class distance have km and m as its data members and create various constructors to initialize the data members. b) Program to demonstrate static data members. Operator Overloading , Delegates Sample Programs a) Create a class ComplexNumber with two data members real and imaginary. Overload +,–,>,<, >=,<= and == operators for it. b) Program to implement delegate. Inheritance, Interface, Abstract class Dynamic Polymorphism Sample Programs a) Create a class Student and inherit two classes UgStudent and Pgstudent from it to illustrate the concept of inheritance. Use appropriate data members, constructors, methods and properties. b) Write a program to implement the concept of dynamic binding using appropriate classes. Exception Handling, Custom Exceptions Sample Programs a) Write a program to find out square root of number. Handel all exceptions that may occur in this program. b) Create a 'NegativeValueException' that should be raised when a function received negative value in parameter. Generic Class, Collections (Non Generic & Generic) Sample Programs a) Create a generic class with an array of n elements. Write the method to find out greatest and average of elements of array. b) Write a program to store the City name and its temperature. Access the temperature using city name. Use appropriate collection. Assembly, Reflection Sample Programs a) Program to create and use private and shared assembly. b) Program to display methods of a class at runtime.	L2, L3 and L4	6

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Module-III: Developing GUI Applications & Controls Sample Programs a) Design a calculator and implement its operations. b) Program to move the contents of a list box to another list box. Also write code to add and delete elements from any list box. c) To display message box for confirmation while closing a form. ASP.NET Forms Sample Programs a) Design a Login Page, which displays a Welcome Page on successful Login and an error message in case of invalid Id/Password. b) Design a form and apply themes (design time and dynamically). c) Design any web form and apply various validation controls. d) Create a web form which can work in Hindi and English language both. e) Design a web form to upload an image to server. f) Design a custom control, Numeric Textbox, which should accept only integer value for a particular range. The range should be customizable.	L2, L3 and L4	6
Module-IV: a) Implement state management for Login page which move to welcome page when credentials are correct. The welcome page displays a welcome message along with the user Id. b) Implement various state management methods using a suitable web form. c) Create a web service and demonstrate its use in any web application. d) Design a Web forma and implement partial refreshing using AJAX.	L2, L3 and L4	4
Module-V: a) Create a database table and design appropriate form for it. Implement basic operations like insert, delete and update using ADO.NET. b) Implement various methods of execution of SQL command. c) Display data in a Grid and perform basic database operations. d) Develop any web application to illustrate SQL Injection attack and redesign it to prevent the attack. e) Develop a web application to illustrate XSS attack and redesign it to prevent the attack	L2, L3 and L4	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Professional C#.NET 4.5 , Wrox Publications
- Stephen Walther, ASP.NET Unleashed, SAMS Publication

Reference Books

- Andrew Stellman and Jennifer Greene, Head First C#, O'Reilly
- E. Balagurusamy, Programming in C#.Net, Tata McGraw-Hill Publisher
- Matthew MacDonald, Beginning with ASP.NET 4.5 in C#, Apress Publications
- Imar Spaanjaars, Beginning with ASP.NET 4.5.1 in C# and VB, Worx Publication
- Jesse Liberty, Dan Hurwitz, Programming ASP.NET, OReilly.

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

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CO, PO and PSO mapping

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CO1	3	--	--	--	--	--	--	--	--	--	--	--	2	3	--	--
CO2	2	2	1	2	1	--	--	--	--	--	--	--	--	1	2	--
CO3	2	2	1	2	2	--	--	--	--	--	--	--	--	1	2	--
CO4	2	1	1	2	1	--	--	--	--	--	--	--	--	1	1	--
CO5	2	1	1	2	2	--	--	--	--	--	--	--	--	1	1	--
CO6	2	2	2	2	1	---	--	--	--	--	--	--	--	2	1	--

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IFT4303	NETWORK SECURITY & CRYPTOGRAPHY	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	3	1	0	4
Pre-requisites/Exposure	Basic Mathematics				
Co-requisites	Nil				

Catalog Description

In this course the concepts of cryptography and network security are discussed in detail. Substitution and transposition techniques, symmetric and asymmetric cryptographic algorithms, their applications, differences will be introduced. As a precursor to the study of cryptography studies will be made on impact of various network and web security protocols. The concepts learnt in the studies of cryptography & network security will be applied in the studies and analysis of authentication, integrity and security related protocols.

Course Objectives

The objective of this course is to

- Equip the students with concepts of cryptography & network security through problem solving and analytical approach.
- Provide an overview of various network attacks and related security mechanism , various algorithms for modular arithmetic, symmetric and asymmetric cryptography and web and network security

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain, describe and distinguish various security attacks; Describeand solve block and stream ciphers and its applications in cryptography; Solve problems based on substitution and transposition ciphers.

CO2: Explain the basic mathematics of cryptography; Solve problems of groups, modular arithmetic ,gcd and inverse algorithm, chinese remainder theorem and its application in cryptography; Applying algorithms for solving problems in cryptography

CO3: Describing the concept of public key cryptosystems and its related algorithm; Explain and solve problems related to hash functions, digital signature and its applications in cryptography; Compare symmetric and asymmetric key cryptography.

CO4: Explain management, distribution ,secure exchange of keys and authentication certificate and its applications in real life. Explain , compare various authentication protocols used in cryptography and network security, also solve problems based on these protocols.

CO5: Explain various security protocols : IPSec, SSL,TLS,SET; Describing malicious softwares and illustrating various design approaches to Firewell

Modules	Blooms level*	Number of hours

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MODULE 1: Introduction to security attacks, services and mechanism, Classical encryption techniques: substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers. Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard (DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES	L1, L2 and L3	9
MODULE 2: Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relativeprime numbers, Extended Euclidean Algorithm,Advanced Encryption Standard (AES) encryption and decryption, Fermat's and Euler's theorem, Primaliry testing, Chinese Remainder theorem, DiscreteLogarithmicProblem,Principals of public key crypto systems, RSA algorithm, security of RSA,ECC	L1,L2, L3	9
MODULE 3: Message Authentication Codes: Authentication requirements, authentication functions, messageauthentication code, hash functions, birthday attacks, security of hash functions, Secure hashalgorithm (SHA)Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signaturestandards (DSS).	L1,L2, L3 and L5	9
MODULE 4: Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure. Authentication Applications: Kerberos,Needham Schroeder protocol	L1, L2 and L3	9
MODULE 5: IP Security: Architecture, Authentication header, Encapsulating security payloads, SSL, HTTPS,SET,3-D Secure , Viruses, Worms, Malware, Botnets, Firewall and its types.	L1, L2	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. William Stallings,"Cryptography & Network Security",4th Edition, Pearson Education,NewDelhi, 2017.
2. Behrouz A. Forouzan, "Cryptography & Network Security", 2ndEdition,Tata McgrawHills,New Delhi, 2015

Reference Books

1. Douglas R.Stinsons, "Cryptography Theory and Practice", 3rd Edition, McMillan Publications, Londan, 2003
2. Atul Kahate, "Cryptography & Network Security", 3rd Edition, Tata McgrawHills,New Delhi, 2017

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

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Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	1	1	--	--	--	--	--	--	--	--	--	1	1	3	-
CO 2	1	1	1	--	--	--	--	--	--	--	--	--	1	1	3	-
CO 3	1	1	1	--	-	--	--	--	--	--	--	--	1	1	3	-
CO 4	1	2	3	--	--	--	--	--	--	--	--	--	1	1	3	-
CO 5	1	2	3	--	--	--	--	--	--	--	--	--	2	2	3	-

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IFT4304	SOFT COMPUTING	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

To develop semantic-based and context-aware systems to acquire, organize process, share and use the knowledge embedded in multimedia content. Research will aim to maximize automation of the complete knowledge lifecycle and achieve semantic interoperability between Web resources and services. The field of Robotics is a multi disciplinary as robots are amazingly complex system comprising mechanical, electrical, electronic H/W and S/W and issues germane to all these

Course Objectives

The objective of this course is to

1. To provide an overview of problem solving skills methods using Soft Computing.
2. To serve as a foundation for the study of programming languages that is used to develop an Intelligence System

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand the concept of artificial intelligence.

CO2. Differentiate between linear and non-linear problems and Learn various problem solving techniques using neural networks

CO3. Understand the concept of fuzzy logic and apply to various problems

CO4. Illustrate concepts of genetic algorithm

Modules	Blooms level*	Number of hours
Module I: Soft Computing Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing. Artificial Intelligence : Introduction, Various types of production systems, characteristics of production systems, breadth first search, depth first search techniques, other Search Techniques like hill Climbing, Best first Search, A* algorithm, AO* Algorithms and various types of control strategies. Knowledge representation issues, Prepositional and predicate logic, monotonic and non monotonic reasoning, forward Reasoning, backward reasoning, Weak & Strong Slot & filler structures, NLP.	L1, L2	12

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Module II: Neural Network Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural net, Difference between ANN and human brain, characteristics and applications of ANN, single layer network, Perceptron training algorithm, Linear separability, Widrow & Hebb;s learning rule/Delta rule, ADALINE, MADALINE, AI v/s ANN. Introduction of MLP, different activation functions, Error back propagation algorithm, derivation of BBPA, momentum, limitation, characteristics and application of EBPA	L2, L3 and L4	10
Module III Counter propagation network, architecture, functioning & characteristics of counter Propagation network, Hopfield/ Recurrent network, configuration, stability constraints, associative memory, and characteristics, limitations and applications. Hopfield v/s Boltzman machine. Adaptive Resonance Theory: Architecture, classifications, Implementation and training. Associative Memory.	L2, L3 and L4	8
Module IV: Fuzzy Logic Fuzzy set theory, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, Fuzzy systems: crisp logic, fuzzy logic, introduction & features of membership functions, Fuzzy rule base system : fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making & Applications of fuzzy logic.	L2, L3 and L4	7
Module V: Genetic algorithm Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional methods.	L2, L4	3

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- S, Rajasekaran& G.A. VijayalakshmiPai, Neural Networks, Fuzzy Logic & GeneticAlgorithms, Synthesis & applications, PHI Publication.

Reference Books :

- Rich E and Knight K, Artificial Intelligence, TMH, New Delhi.
- Bose, Neural Network fundamental with Graph , Algo.&Appl, TMH
- Kosko: Neural Network & Fuzzy System, PHI Publication

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	--	--	3	--	--	--	--	--	--	2	--	1	-	1	-
CO 2	1	--	1	2	--	--	--	--	--	--	--	--	1	-	1	-
CO 3	1	--	1	2	--	--	--	--	--	--	--	--	1	-	1	-
CO 4	1	--	--	2	--	--	--	--	--	--	--	--	1	-	1	-

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IFT4307	SOFT COMPUTING LAB	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This lab course covers development and designing of implementing basic neural networks, fuzzy systems, and optimization algorithms concepts and their relations. It aims to develop the concepts and techniques and foster the students' abilities in designing and implementing soft computing based solutions for real-world and engineering problems.

Course Objectives

The objective of this course is to

- Equip the students with concepts of Soft Computing which includes Neural networks, Fuzzy logic and genetic algorithms.
- Provide knowledge to develop Soft computing programs in Matlab.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain and apply concepts of MATLAB.
CO2: Implement various neural networks using MATLAB.
CO3: Illustrate use of fuzzy in real applications.
CO4: Apply genetic algorithm to basic problems.

Modules	Blooms level*	Number of hours
Fuzzy Logic a) Write a program in MATLAB to perform Union, Intersection and Complement operations. b) Write a program in MATLAB to implement De-Morgan's Law. c) Write a program in MATLAB to plot various membership functions. d) Generate XOR function using McCulloch-Pitts neural net by MATLAB program.	L1, L2,L3	4
Neural Network a) Write a MATLAB program for Hebb Net to classify two dimensional input patterns in bipolar with targets. b) Generate ANDNOT function using McCulloch-Pitts neural net by MATLAB program. c) Write a MATLAB program for Perceptron net for an AND function with bipolar inputs and targets. d) Write a M-file to calculate the weights for the following patterns using hetero-associative neural net for mapping e) Write an M-file to store the vector, find the weight matrix with no self-connection. Test this using a discrete Hopfield net.	L2,L3and L4	2

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Genetic Algorithm a) Solve travelling salesman problem using Genetic algorithm. b) Solve clustering problem using GA. c) Solve classification using GA.	L2, L3 and L4	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

Text Book.

- S.N. Sivanandam & S.N. Deepa, Principles of Soft Computing, Wiley Publications
- Matthew MacDonald, Beginning with MATLAB, Apress Publications

Reference Books

- S, Rajasekaran & G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & Applications, PHI Publication.
- Bose, Neural Network fundamental with Graph , Algo.& Appl, TMH
- Kosko: Neural Network & Fuzzy System, PHI Publication
- Klir & Yuan, Fuzzy sets & Fuzzy Logic: Theory & Appli.,PHI Pub.
- Hagen, Neural Network Design, Cengage Learning

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**	**PS O4**
C O1	**2**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**2**	**1**	**--**
C O2	**2**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**2**	**1**	**--**
C O3	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**1**	**--**
C O4	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**1**	**--**

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IFT4335	SUMMER INTERNSHIP EVALUATION	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	0	0	0	5
Pre-requisites/Exposure	Basics of Networks				
Co-requisites	Nil				

Catalog Description

There are certain phases of every Intern's professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship program can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal classroom situations. These attributes are intellectual ability, professional judgment and decision-making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc. In order to achieve these objectives, each student will maintain a file (**Internship File**). The Internship File aims to encourage students to keep a personal record of their learning and achievement throughout the Programme. It can be used as the basis for lifelong learning and for job applications. Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development. The report will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and their own personal contribution to the organization.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of new technologies.
2. Provide project management and presentation skills.

Course Outcomes

On completion of this course, the students will be able to

CO1: Make a report on relevant topic by the study of literatures.

CO2: Demonstrate the topic of summer project topic by use of power presentation.

CO3: Demonstrate the aim, challenges, applications, literatures, result and analysis of the topic of project report

CO4: Explain the meaning of references/Bibiliography.

Text Books

As per topic of summer internship project.

Reference Books

As per topic of summer internship project.

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Examination Scheme:
Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	V	PPT	R	Exe	IM
Weightage (%)	12	15	18	15	40

V – Viva, PPT-Power Point Presentation, R – Report, IP-Internal Marks, Exe-Execution, IM: Internal Marks by Guide

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	2	--	--	--	--	--	--	--	--	--	-		1	1
CO2	1	2	2	-	--	--	--	--	--	--	--	--	-	-	1	1
CO3	1	2	-	--	--	--	--	--	--	--	--	--	-	-	1	1
CO4	1	2	3	--	--	--	--	--	--	--	--	--	-	-	1	2

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IFT4308	ANDROID PROGRAMMING	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	3	0	0	3
Pre-requisites/Exposure	Java Programming				
Co-requisites	Database concepts				

Catalog Description

This course introduces mobile application development for the Android platform. Android is a software stack for mobile devices that includes an operating system, middleware and key applications. The Android SDK provides the tools and APIs necessary to begin developing applications on the Android platform using the Java programming language. Students will learn skills for creating and deploying Android applications.

Course Objectives

The objective of this course is to

1. To introduce Android platform and its architecture.
2. Provide the knowledge of mobile apps development.

Course Outcomes

On completion of this course, the students will be able to

CO1: Describe Android platform, Architecture and features.
CO2: Design User Interface and develop activity for Android App.
CO3: Design and implement Database Application and Content providers.
CO4: Use Intent, Broadcast receivers and Internet services in Android App.
CO5: Use Internet, multimedia, camera and Location based, SMS services etc, in Android App.
CO6: Manage, Develop and Implement Mobile app project.

Modules	Blooms Level	Number of hours
MODULE 1: Introduction to Android Introduction to Android Platform, Android Stack Android Versions and Installing Android SDK and updating SDK components, Eclipse, IDEs and ADT plug-in Using the Emulator, Android vs. Other mobile platforms **Your First Android Application:** Application Life Cycle, Application Components, Activity life cycle, Manifest File, Layout XML Code Strings, The R File, Java Source Code, Java based layout vs. xml based layout Eclipse Visual Layout Editor, Logging.	L1 and L2	4

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MODULE 2: UI Design for Android Using different layouts – LinearLayout, TableLayout and others, Drawable Resources Resolution and density independence, Working with common widgets, Working with ListView and Adapters, Creating and using option menu, Working with preferences Working with Dialogs and Toasts, Working with Graphics and Animation, Intents ,Intent filters, Invoking activities by class name and URI, Sharing data using Extras Bundle and URI parameters,Working with Tabs and Fragments,	L1,L2and L3	8
MODULE 3: Files, Database & Working in Background Using File System, Introducing SQLite on Android, Database Connectivity, Cursors and content values, Using ContentProvider to share data,Understanding Security model, Introducing Service and its life cycle,Creating and starting a service, Types of services, Working with multi-threading and AsyncTask,Broadcast receivers,Triggering receivers with intents,Responding to system events using Broadcast receivers,Using Alarm.	L1, L2 and L3	8
MODULE 4: Using System Services and Web Services Using Location based Services,Telephony and SMS services,Bluetooth, Network and WiFi, Multimedia and Camera,Accessing Internet and Web Services from Android Applications.	L1, L2 and L3	6
MODULE 5: Project Understanding the requirement, Designing the interface and architecture, Best practices regarding application design and development, Writing code and testing it, Preparing application for Publishing, Publishing to Play Store and Physical device.	L3, L4 and L5	6

Bloom's Level:
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. "Android Programming: The Big Nerd Ranch Guide" By Bill Phillips & Brian Hardy, Big Nerd Ranch, Inc. Pearson Technology Group.
2. "Head First Android Development", By Anthony J.F. Griffiths and David Griffiths, Oreilly.

Reference Books

1. "Android Programming for Beginners", By John Horton,Packt Publishing

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO4
CO 1	3	--	--	--	--	--	--	--	--	--	--	--	2	1	1	--
CO 2	1	2	1	--	--	--	--	--	--	--	--	--	2	1	1	--
CO 3	1	2	1	--	--	--	--	--	--	--	--	--	2	1	1	--
CO 4	1	2	1	--	--	--	--	--	--	--	--	--	--	--	--	--
CO 5	1	2	1	--	--	--	--	--	--	--	--	--	--	--	--	--
CO 6	1	1	1	2	--	--	--	--	--	--	--	--	--	--	--	--

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IFT4309	ANDROID PROGRAMMING LAB	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	0	0	2	1
Pre-requisites/Exposure	Java Programming				
Co-requisites	Nil				

Catalog Description

This lab course provides a platform to the students for understanding the basic concepts of Android. This practical background will help students to gain confidence in creating /developing Android Applications.

Course Objectives

The objective of this course is to

- Equip the students with concepts of Android Programming UI Design, Database connectivity, File System, System Services and Web Services
- Provide knowledge to develop secure Android Mobile applications.

Course Outcomes

On completion of this course, the students will be able to
On completion of this course, the students will be able to
CO1: Describe Android platform, Architecture and features.
CO2: Design User Interface and develop activity for Android App.
CO3: Design and implement Database Application and Content providers.
CO4: Use Intent, Broadcast receivers and Internet services in Android App.
CO5: Use Internet, multimedia, camera and Location based, SMS services etc, in Android App.
CO6: Manage, Develop and Implement Mobile app project.

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Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Android g) Introduction to Android Operating System h) Hello world program using android i) Program to demonstrate Activity life cycle of android.	L1, L2 and L3	4
MODULE 2: UI Design for Android e) Working with different layouts – LinearLayout, TableLayout and others. programs related to Drawable Resources. f) Working with common widgets g) Working with ListView and Adapters, Creating and using option menu, Working with preferences h) Working with Dialogs and Toasts, i) Working with Graphics and Animation, Intents ,Intent filters,	L2 and L3	4
MODULE 3: Files, Database & Working in Background a) Database programming in android	L2 and L3	6
MODULE 4: Using System Services and Web Services a) Program related to Service and its life cycle b) ProgramsUsing Location based Services,Telephony and SMS services,Bluetooth, Network and WiFi, c) Programs related to Multimedia and Camera, a) Programs related to Accessing Internet and Web Services from Android Applications.	L2 and L3	4
MODULE 5: Project a) Small application to understand complete application development and management based on specific requirements.	L2, L3 and L4	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. "Android Programming: The Big Nerd Ranch Guide" By Bill Phillips & Brian Hardy, Big Nerd Ranch, Inc. Pearson Technology Group.
2. "Head First Android Development", By Anthony J.F. Griffiths and David Griffiths, Oreilly.

Reference Books

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO4
CO 1	3	--	--	--	--	--	--	--	--	--	--	--	2	1	1	--
CO 2	1	2	1	--	--	--	--	--	--	--	--	--	2	1	1	--
CO 3	1	2	1	--	--	--	--	--	--	--	--	--	2	1	1	--
CO 4	1	2	1	--	--	--	--	--	--	--	--	--	2	1	1	--
CO 5	1	2	1	--	--	--	--	--	--	--	--	--	2	1	1	--
CO 6	1	1	1	2	--	--	--	--	--	--	--	--	2	1	1	1

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IFT4310	DIGITAL IMAGE PROCESSING	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	3	0	0	3
Pre-requisites/Exposure	Basics of Computer Graphics				
Co-requisites	NIL				

Catalog Description

This course gives students an insight into the basics of Image Processing along with visualization of real concept of Image processing. Concepts covered would enable students to define and differentiate among various types of image refinement. Further they would be able to gain insights about various Image restoration and modification technique.

Course Objectives

The objective of this course is to

Give provide knowledge of powerful collection of fundamental and advanced image processing tools on the desktop by taking advantage of the computational technology of Mathematics.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define and explain Digital Image Processing.
CO2: Apply Image Enhancement techniques in the Spatial Domain.
CO3: Use the concepts of Image Enhancement in the Frequency Domain.
CO4: Understand the architecture Image Compression.
CO5: Apply algorithms of Image Representation and Description and Object Recognization.

Modules	Blooms level*	Number of hours
MODULE 1: **Introduction and Digital Image Fundamentals** The origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamentals Steps in Image Processing, Elements of Digital Image Processing Systems, Image Sampling and Quantization, Some basic relationships like Neighbors, Connectivity, Distance Measures between pixels, Linear and Non Linear Operations.	L1 and L2	4
MODULE 2: **Image Enhancement in the Spatial Domain** Some basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic and Logic operations, Basics of Spatial Filters, Smoothening and Sharpening Spatial Filters, Combining Spatial Enhancement Methods.	L2 and L3	6

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MODULE 3: **Image Enhancement in the Frequency Domain** Introduction to Fourier Transform and the frequency Domain, Smoothing and Sharpening Frequency Domain Filters, Homomorphism Filtering.	L1 and L2	8
MODULE 4: **Image Compression** Coding, Interpixel and Psychovisual Redundancy, Image Compression models, Elements of Information Theory, Error free comparison, Lossy compression, Image compression standards. **Image Segmentation** Detection of Discontinuities, Edge linking and boundary detection, Threshold, Region Oriented Segmentation, Motion based segmentation.	L2 and L3	10
MODULE 5: **Representation and Description** Representation, Boundary Descriptors, Regional Descriptors, Use of Principal Components for Description, Introduction to Morphology, Some basic Morphological Algorithms. **Object Recognition** Patterns and Pattern Classes, Decision-Theoretic Methods, Structural Methods.	L2 and L3	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Rafael C. Conzalez & Richard E. Woods, "Digital Image Processing", 2nd edition, Pearson Education.
2. A. K. Jain, "Fundamental of Digital Image Processing", PHI.

References:

1. Rosefield Kak, "Digital Picture Processing",
2. W.K. Pratt, "Digital Image Processing",

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4
CO1	1	--	--	--	--	--	--	--	--	--	--	--	2	3	--	--
CO2	1	1	1	2	1	--	--	--	--	--	--	--	1	1	1	--
CO3	1	1	1	2	1	--	--	--	--	--	--	--	1	1	1	--
CO4	1	2	2	--	1	--	--	--	--	--	--	--	1	2	2	--
CO5	1	1	1	1	1	--	--	--	--	--	--	--	1	1	1	--

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IFT4311	DIGITAL IMAGE PROCESSING LAB	L	T	P	C
Version 2020.1	Date of Approval: 19, July 2020	0	0	2	1
Pre-requisites/Exposure	Basics of MATLAB				
Co-requisites	NIL				

Catalog Description

This course gives students an insight into the basics of Image Processing along with visualization of real concept of Image processing. In this Lab course student will learn practicals of image processing using MATLAB programming.

Course Objectives

The objective of this course is to

1. Make the students apply knowledge of various Image processing techniques & pattern recognition required for solving complex problems.
2. Provide demonstration of different types of image processing techniques through MATAB toolbox.

Course Outcomes

On completion of this course, the students will be able to

CO1: Acquiring knowledge of Basics of High-end calculation software and need in Computer Science & engineering

CO2: Demonstrate the All preliminary functions in MATLAB

CO3: Apply the knowledge of all the basics function and toolbox knowledge of MATLAB

CO4: Demonstrate the Use of MATLAB in image Processing

Modules/Topics Covered**	Blooms level*	Number of hours
Introduction of MATLAB (g) Basic Variable deceleration & its operation (h) Function use & its application	L3, L5	4
Sample Programs in MATLAB a) Basic use of Matrix and Graph Plotting b) Different type of graph plotting with use of different -2 type of data	L3, L5	6
Sample Programs using MATLAB functions a) Create a basic program MATLAB using functions b) Use of basic function Image processing c) Practice on Basic function of Image processing tool box.	L3, L5	6
Programs of ANN functions a) Practice on Pattern Recognition functions in MATLAB b) Write a program for training a small network in MATLAB	L3, L5	6
Programs using ANN toolbox& Image processing toolbox a) Demonstrate the useof ANN tool box& Image processing toolbox and write a program after combining it.	L3, L5	2

**Bloom's Level:*

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L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation
** Sample Programs provided are not limited to these only, can include others as desired.

Text Books

1.Rafael C. Conzalez & Richard E. Woods, "Digital Image Processing", 2nd edition, Pearson Education.
2.K. Jain, "Fundamental of Digital Image Processing", PHI.

References:

1.Rosefield Kak, "Digital Picture Processing",
2.W.K. Pratt, "Digital Image Processing",

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

	IA				EE
Components	**A**	**PR**	**LR**	**V**	
Weightage (%)	5	10	10	5	**70**

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	**2**	**1**	--	--	--	--	--	--	--	--	--	--	**2**	--	--	--
CO 2	**3**	**1**	--	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO 3	**2**	**1**	**2**	--	--	--	--	--	--	--	--	--	**1**	**2**	--	--
CO 4	**1**	**3**	**2**	--	--	--	--	--	--	--	--	--	**2**	--	**2**	--
CO 5	**1**	**3**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--

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IFT4312	BIG DATA	L	T	P	C
Version: 2020.1	Date of Approval:19, July 2020	3	0	0	3
Pre-requisites/Exposure	Basics of DBMS				
Co-requisites	SQL				

Catalog Description

This course brings together several key big data technologies used for storage, analysis and manipulation of data. It also introduces the students the key concepts of Hadoop framework, MapReduce, Pig, Hive, and No-SQL. Students will learn to work on Hadoop platform. The concepts learnt will make students capable of working on big data projects easier.

Course Objectives

The objective of this course is

- To make students familiar with big data technologies.
- Provide an overview of Hadoop architecture and its working with other open source technologies.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain importance, applications and challenges of Big Data Analytics.
CO2. Differentiate among various analytics technologies.
CO3. Demonstrate architecture of Hadoop and MapReduce framework.
CO4. Illustrate Hadoop commands.
CO5. Introduce concepts of Hive, HBase and Pig.

Modules	Blooms level*	Number of hours
Module I: Introduction to Big Data Big Data : Definition, Sources, Importance & Applications, 5 V's of Big Data, Complexity of Big Data, Big data processing architecture, Big Data Analytics, Big data problems & challenges.	L1 and L2	5
Module II: Working with Hadoop Hadoop concepts : History, comparison with other systems : RDBMS, Grid computing, Cluster Computing, Cloud Computing, Hadoop Architecture, Hadoop Distributed file system : Data node, Name node, job tracker, task tracker, Moving data in and out of Hadoop, Common Hadoop shell commands.	L2and L5	4
Module III: Working with Map Reduce Map Reduce framework, Working of MapReduce: Job Scheduling, Shuffle and Sort, Task Execution, MapReduce Types, Formats and Features.	L1 and L3	8
Module IV: Working with Hive, HBase, PIG Working with Pig: Pig Latin, User Defined Functions and Operators Hive: Architecture, Comparison with traditional database, Hive QL- querying data, sorting & aggregation, joins & subqueries HBase : Fundamentals of HBase, HBase Versus RDBMS, Schema design	L2and L3	9

**Bloom's Level:*

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L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

1. Michael Minelli, Michehe Chambers, Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business", 1st Edition, Wiley CIO Series, 2013.
2. Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'reilly, 2012.
3. Arvind Sathi, "Big Data Analytics: Disruptive Technologies for Changing the Game", 1st Edition, IBM Corporation, 2012.
4. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", 1st Edition, Wiley and SAS Business Series, 2012.

Reference Books

1.Anil Maheshwari, "Big Data", McGraw Hill

2.Mayank Bhushan,"Big Data and Hadoop- Learn by Example", BPB Publications

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CT1	A/C/Q	Attd	EE
Weightage (%)	15	10	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4
CO1	1	--	2	--	--	--	--	--	--	--	--	--	1	--	2	-
CO2	1	2	--	3	3	--	--	--	--	--	--	--	1	--	2	-
CO3	1	--	1	2	--	--	--	--	--	--	--	--	1	--	2	-
CO4	1	1	2	--	--	2	--	--	--	--	3	--	-	--	1	3
CO5	1	--	1	--	1	3	--	--	--	--	3	--	1	-	-	-

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IFT4313	BIG DATA LAB	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	0	0	2	1
Pre-requisites/Exposure	Basic Concepts of DBMS				
Co-requisites	Relational Algebra and Relational Calculus				

Catalog Description

This course brings together several key big data technologies used for storage, analysis and manipulation of data. It also introduces the students the key concepts of Hadoop framework, MapReduce, Pig, Hive, and No-SQL. Students will learn to work on Hadoop platform. The concepts learnt will make students capable of working on big data projects easier.

Course Objectives

The objective of this course is

- To make students familiar with big data technologies.
- Provide an overview of Hadoop architecture and its working with other open source technologies.

Course Outcomes

On completion of this course, the students will be able to

CO1. Install and configure Hadoop and various tools like Pig, Hive etc.
CO2.Explain concepts of files and directories in HDFS and apply them in real database applications.
CO3. Design and implement mapreduce programs for a given problem.
CO4. Solve queries using concepts of Hive and Pig.
CO5. Perform operations using HBase.

Modules	Blooms level*	Number of hours
Lab Session 1 1. Installation & Configuration steps of Hadoop	L1 and L2	2
Lab Session 2-3 1. Working with HDFS commands :mkdir, rmdir, rm, mv, ls, du, put, rm-r, cat, tail etc 2. Working with vi editor	L1and L3	4
Lab Session 4-5 1. Working with Java Map Reduce : Map Class, Reduce Class, Drier Class, map side joins, reduce side joins	L1 and L3	4

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Lab Session 6-8 Working with Hive : Queries for Hive : Create table, describe database, describe table, describe extended table, describe formatted table, drop table, drop database, display table, where clause 1. Commands : Load Files on table : Load from HDFS, load from local 2. Command :CTAS Create table as select 3. Queries to create external tables 4. Working with commands like : Order by, group by, like, upper, lower, max, min	L1 and L3	4
Lab Session 9-10 1. Working with PIG : Order by, group by, co group, like, upper, lower,Joins, Union, Cartesian, Product, Pig Scripts	L1 and L3	6
Lab Session 11-12 Working with HBase : Start the hbase, data insert, modify, multiple version insertion, describe, delete truncate, drop etc. Working with Foreign Key and Check Constraint.	L1 and L3	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Jeffrey Aven, "SAMS Teach Yourself Hadoop in 24 Hours", 1st Ed., Pearson ,2017.
- Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'reilly, 2012.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**	**2**	--	--	**3**	--	--	--	--	--	--	--	--	**1**	**1**	-
CO2	**1**	-	--	--	**2**	--	--	--	--	--	--	**2**	--	**1**	**1**	-
CO3	**1**	-	**1**	--	--	--	--	--	--	--	--	**2**	--	**1**	**1**	-
CO4	**1**	-	**2**	--	--	--	--	--	--	--	--	--	---	**1**	**1**	--
CO5	**1**	-	**2**	--	--	--	--	--	--	--	--	--	--	**1**	--	-

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IFT4331	TERM PAPER	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	0	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

Term paper evaluation course requires the students to study about the current technology topic in detail. The students have to read research papers, books and other study sources and finalize the topics for their presentation, Student has to prepare it in detail research paper mentioning all the content related to the topic. The evaluation is later done and a presentation is also to be prepared.

Course Objectives

The objective of this course is to

1. To increase the knowledge and the understanding of a particular phenomenon/topic.
2. To introduce student about how to write technical papers/research papers.

Course Outcomes

On completion of this course, the students will be able to

CO1: Study the literature and identify the current technical topic

CO2: Study the identified topic in detail

CO3:Prepare a detailed report including the introduction, architecture, advantages, disadvantages etc

CO4: Prepare a brief presentation of the concerned topic

Text Books

As per topic of summer internship project is chosen and discussion with guide.

Reference Books

As per topic of summer internship project is chosen and discussion with guide.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	V	PPT	R	IM	EM
Weightage (%)	20	20	30	30	70

V – Viva, PPT-Power Point Presentation, R – Report, IP-Internal Marks, EM-External Marks

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	2	--	--	--	--	--	--	--	--	--	-		1	2
CO2	1	2	2	-	--	--	--	--	--	--	--	--	-	-	1	1
CO3	1	2	-	--	--	--	--	--	--	--	--	--	-	-	1	1
CO4	1	2	3	--	--	--	--	--	--	--	--	--	-	-	1	1

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IFT4401	MACHINE LEARNING USING PYTHON	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	3	-	-	3
Pre-requisites/Exposure	Basic Knowledge of Programming				
Co-requisites	Nil				

Catalog Description

Python is a general-purpose high level programming language that is being increasingly used in data science and in designing machine learning algorithms. This course provides an introduction to Python and its libraries like numpy, pandas, matplotlib and explains how it can be applied to develop machine learning algorithms that solve real world problems.

This course starts with Python language followed by machine learning and covers concepts of python and all important concepts such as exploratory data analysis, data preprocessing, data visualization and clustering, classification, regression and model performance evaluation etc. This course covers all three types of machine learning algorithms including Supervise, Unsupervised and Reinforcement learning.

Course Objectives

The objective of this course is to

- Equip the students with concepts of programming and problem solving and develop proficiency in creating applications using the Python Programming Language.
- Provide knowledge of various types of machine learning models, its algorithms and development of the models using Python programming language.

Course Outcomes

On completion of this course, the students will be able to

CO1: Develop programs in Python to develop algorithmic solutions to computational problems.

CO2: Manage data in python using available data structures such as string, list, and dictionary and file handling operations.

CO3: Apply functions to decompose python program and develop modules and packages.

CO4: Preprocess and analyze data before applying suitable machine learning models.

CO5: Understand basic concepts and techniques of Machine Learning and apply machine learning algorithms to develop machine learning models for solving real word problems.

Modules	Blooms level*	Number of hours

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Module-I **Python basis:** Installing Python; basic syntax, interactive shell, editing, saving, and running a script. The concept of data types; variables, assignments; immutable variables; numerical types; arithmetic operators and expressions; comments in the program; understanding error messages Conditions, boolean logic, logical operators; ranges; Control statements: if-else, loops (for, while); short-circuit (lazy) evaluation **Data handling:** String, Lists, tuples, and dictionaries; basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries.	L1, L2 and L3	6
Module-II **Files Handling**: manipulating files and directories, os and sys modules; text files: reading/writing text and numbers from/to a file; creating and reading a formatted file (csv or tab-separated). **Design with functions:** hiding redundancy, complexity; arguments and return values; formal vs actual arguments, named arguments. Program structure and design. Recursive functions. **Python Modules and Packages:** designing modules and package, Different ways to import Packages. **OOP:** classes, objects, attributes and methods, persistent storage of objects , constructor, inheritance, polymorphism, operator overloading (_eq_, _str_, etc); abstract classes, exception handling	L1, L2 and L3	7
Module-III **Arrays and Matrices:** The NumPy Module, Creating Arrays and Matrices, Copying, Arithmetic Operations, Cross product & Dot product , Saving and Restoring, Matrix inversion, Vectorized Functions **Data Visualization:** The Matplotlib Module, Histograms, Bar charts Density Plots, Box Plots, Scatter Plots, Heat Maps etc. **DataFrames:** Pandas , Loading data from different sources, Concept of DataFrames,Working with Dataframes such as selecting, filtering, grouping, joining etc. Dealing with missing values	L2, L3 and L4	6
Module-IV **Introduction to Machine Learning**: Introduction, Applications, Framework for developing machine learning models **Supervised Learning:**Linear regression, Multiple linear regression, logistic regression, classification and regression trees,Support Vector Machines, K-nearest neighbors Preprocessing and Scaling , Different Kinds of Preprocessing ,Applying Data Transformations Overfitting, underfitting, bias-variance tradeoff.	L2, L3 and L4	7
Module-V **Unsupervised Learning**: Introduction to Clustering, k-means clustering Hierarchical clusting, Dimensionality Reduction, Feature Selection, PCA, factor analysis, manifold learning. **Reinforcement Learning**: Value iteration; policy iteration; TD learning; Q learning; actor-critic	L2, L3 and L4	6

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

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1. Pilgrim, Dive, “Introduction to Python”, 3rd Edition, Apress, 2009.
2. Allen Downey, Jeffrey Elkner, Chris Meyers, “How to Think Like a Computer Scientist Learning with Python” 2nd Edition Green Tea Press,2002.
3. Manaranjan Pradhan and U Dinesh Kumar, “Machine Learning using Python” , Wiley Publication

Reference Books

1. John V. Guttag, “Introduction to Computation and Programming using Python”, Prentice Hall of India, 2014.
2. Mark Lutz, “Learning Python: Powerful Object-Oriented Programmingl”, Fifth Edition, O‘Reilly, Shroff Publishers and Distributors, 2013.
3. Michale Bowles “Machine Learning in Python: Essential Techniques for Predictive Analysis” Wiley Publication.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4
CO1	1	3	2	2	--	--	--	--	--	--	--	--	1	1	2	--
CO2	1	3	2	2	--	--	--	--	--	--	--	--	1	1	2	--
CO3	1	3	2	1	2	--	--	--	--	--	--	--	1	1	2	--
CO4	1	1	1	1	1	2	--	--	--	--	--	--	1	--	1	--
CO5	1	1	1	1	1	2	--	--	--	--	--	--	1	--	1	---

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IFT4403	MACHINE LEARNING USING PYTHON LAB	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	0	-	4	2
Pre-requisites/Exposure	Basic Knowledge of Programming				
Co-requisites	Nil				

Catalog Description

Python is a language with a simple syntax, and a powerful set of libraries. It is an interpreted language, with a rich programming environment, including a robust debugger and profiler. While it is easy for beginners to learn, it is widely used in many scientific areas for data exploration. This course is an introduction to the Python programming language for students without prior programming experience. We cover data types, control flow, object-oriented programming, and graphical user interface-driven applications. The examples and problems used in this course are drawn from diverse areas such as text processing, simple graphics creation and image manipulation, HTML and web programming.

Course Objectives

The objective of this course is to

- Equip the students with concepts of programming and problem solving and develop proficiency in creating applications using the Python Programming Language.
- Provide an overview of various control statements, data structures, object oriented programming, packages related to image processing, graphics, event driven programming, socket applications.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain various operators and control structures in python and their uses to develop algorithmic solutions to simple computational problems.

CO2: Describe string, python packages and related functions for various file handling operations.

CO3: Apply functions to decompose python program and represent compound data using Python lists, tuples, and dictionaries.

CO4: Analyze graphics, image processing and object oriented programming concept to create applications and analyze exceptions during program execution.

CO5: Create GUI based applications using python packages and network client/server programming.

Modules	Blooms level*	Number of hours

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Module-I

1. Write a program to read and store the name of three different cities in three different variables and print all the contents of variables on the console.
2. Write a program to read the radius of a circle and print the area of circle.
3. Write a program to calculate the distance between two points using distance formula.
4. Write a program to reverse a four digit number using % and // operators.
5. Apply control statements of python to create following pattern.

1
1 2
1 2 3
1 2 3 4
1 2 3 4 5

6. Apply control statement in python to construct a program to prompt a user to read the marks of five different subjects. Calculate the total marks and percentage of the marks and display the message according to the range of percentage given table.

Percentage	Message
Per>=90	Distinction
Per>=80 && per<90	First Class
Per>=70 && per<80	Second Class
Per>=60 && per<70	Third Class
Per<60	Fail

L3,L5

4

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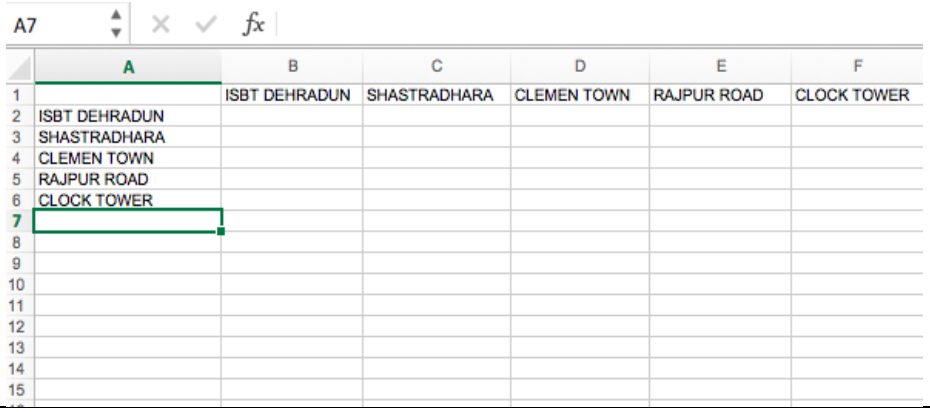
Module-II

1. Write the function replacevowels(word) which removes all the vowels (‘a’,’e’,’i’,’o’,’u’) in a word and returns the remaining letters in the word.
2. Write a function Eliminate_Letter (Word, Letter) which takes a word and a letter as arguments and removes all the occurrence of that particular letter from the word. The function will return the remaining letters in the world.
3. Write a program to count number of characters from a file.
4. Generate 50 random numbers within a range 500 to 1000 and write them to file using function.
5. Write a program to insert a string like “1, 2, 3, 4” and print sum of all the numbers of the list using split function.
6. Write a program to write in excel file in following format using python.



L3,L5 | 6

Module-III

1. Creating 1-D, 2-D , 3-D numpy arrays and performing arithmetic on them.
2. Program on Boolean arrays and conditional selecting items from array.
3. Stacking and reshaping array
4. Selecting common items between two arrays
5. Plotting simple plots in matplotlib: line, scatter, boxplot, bar,
6. Working with various parameters available in plot function
7. Using magic commands in jupyter notebook
8. Working with series and data frames in pandas
9. Reading and writing CSV and excel files
10. Conditional selection and indexing in DataFrame
11. Adding and removing columns in DataFrame
12. Cleaning data columns using regular expressions

L3,L5 | 6

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Module-IV 1. Write python program for following image processing operations ➢ Convert image in to grayscale image ➢ Display size of image ➢ Rotate an image ➢ Paste one image on another image. ➢ Crop an image. 2. Implement logistic regression and knn classification on iris dataset using scikit-learn 3. Perform linear regression and multiple feature linear regression on any dataset using scikit-learn 4. Implement gradient descent algorithm to optimize linear regression and logistic regression algorithm 5. Apply various evaluation metrics on breast cancer data set from scikit learn after performing logistic regression. 6. In exercise 5 plot decision boundary using matplotlib 7. Implement RandomForest and Decision tree algorithms on external and internal data sets 8. Show use of Scalers techniques available in scikit-learn	L3,L5	4
Module V 1. Implement feature scaling in scikit learn 2. Implement PCA on breast cancer dataset using scikit learn 3. Draw two-dimensional scatter plot of the Breast Cancer dataset using the first twoprincipal components as done in exercise 2. 4. Apply TSNE algorithm to mnist dataset (manifold learning) 5. Implement MDP and Q-learning in python.	L3,L5	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Pilgrim, Dive, "Introduction to Python", 3rd Edition, Apress, 2009.
2. Allen Downey, Jeffrey Elkner, Chris Meyers, "How to Think Like a Computer Scientist Learning with Python" 2nd Edition Green Tea Press,2002.
3. Manaranjan Pradhan and U Dinesh Kumar, "Machine Learning using Python" , Wiley Publication

Reference Books

1. John V. Guttag, "Introduction to Computation and Programming using Python", Prentice Hall of India, 2014.
2. Mark Lutz, "Learning Python: Powerful Object-Oriented Programming‖", Fifth Edition, O'Reilly, Shroff Publishers and Distributors, 2013.
3. Michale Bowles "Machine Learning in Python: Essential Techniques for Predictive Analysis" Wiley Publication.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA	EE

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Components	A	PR	LR	V	
Weightage (%)	5	10	10	5	70

Note: IA –Internal Assessment, A – Attendance, PR – Performance, LR – Lab Record, V – Viva, EE-External Exam

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4
CO1	1	3	2	2	--	--	--	--	--	--	--	--	1	1	2	--
CO2	1	3	2	2	--	--	--	--	--	--	--	--	1	1	2	--
CO3	1	3	2	1	2	--	--	--	--	--	--	--	1	1	2	--
CO4	1	1	1	1	1	2	--	--	--	--	--	--	1	--	1	--
CO5	1	1	1	1	1	2	--	--	--	--	--	--	1	--	1	---

1: strongly related, 2: moderately related and 3: weakly related

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IFT4402	CLOUD COMPUTING	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	3	0	0	3
Pre-requisites/Exposure	Basics of Distributed Computing				
Co-requisites	NIL				

Catalog Description

This course gives students an insight into the basics of cloud computing along with virtualization. Concepts covered would enable students to define and differentiate among various distributed computing platforms. Further they would be able to gain insights about various cloud simulators like CloudSim, Green Cloud and VMWare for simulating cloud and virtualization based environments.

Course Objectives

The objective of this course is to

- Equip the students with the features and concepts of Virtualization and Cloud Computing.
- Provide basic knowhow about cloud implementation, deployment models or layers and about cloud simulators like CloudSim, GreenCloud and VMWare.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define and explain Cloud Computing with its characteristics, benefits and limitations.

CO2: List and distinguish among various cloud deployment models along with service delivery layers.

CO3: Explain concepts of Virtualization with its need and limitations, distinguish between types of hardware virtualization and list types of desktop virtualization.

CO4: Describe the architecture and demonstrate working mechanism for CloudSim and Green Cloud simulators.

CO5: Explain the basics of VMWare Simulator and demonstrate implementation of Virtual machines.

Modules	Blooms level*	Number of hours
MODULE 1: CLOUD COMPUTING OVERVIEW Origins of Cloud computing – Cloud components - Essential characteristics – On-demand self-service, Broad network access, Location independent resource pooling, Rapid elasticity, measured service, Roots of cloud computing, Architectural influences – High-performance computing, Utility and Enterprise grid computing, Cloud scenarios – Benefits: scalability, simplicity, vendors, security, Limitations	L1 and L2	8
MODULE 2: CLOUD ARCHITECTURE- LAYERS AND MODELS The cloud reference model: Architecture, Software as a Service (SaaS), features of SaaS and benefits, Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features and benefits of IaaS, Service providers, challenges and risks in cloud adoption, Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing .	L1 and L2	8

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MODULE 3: VIRTUALIZATION Virtualization and cloud computing - Need of virtualization – cost, administration, fast deployment, reduce infrastructure cost – limitations, Characteristics of virtualized environments Types of hardware virtualization: Full virtualization - partial virtualization - para virtualization. Desktop virtualization: Software virtualization – Memory virtualization – Storage virtualization – Data virtualization – Network virtualization	L1 and L2	10
MODULE 4: CLOUD SIMULATORS- CLOUDSIM AND GREENCLOUD Introduction to Simulator, understanding CloudSim simulator, CloudSim Architecture(User code, CloudSim, GridSim, SimJava) Understanding Working platform for CloudSim, Introduction to GreenCloud.	L2 and L3	12
MODULE 5: INTRODUCTION TO VMWARE SIMULATOR Basics of VMWare, advantages of VMware virtualization, using Vmware workstation, creating virtualmachines-understanding virtual machines, create a new virtual machine on local host, cloning virtual machines, virtualize a physical machine, starting and stopping a virtual machine.	L2 and L3	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010
- Mastering Cloud Computing- Foundations and Applications Programming - RajkumarBuyya , Christian Vecchiola and S. ThamaraiSelvi, Tata McGraw Hill, New Delhi, India, 2013
- Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008

Reference Books

- Cloud computing for dummies- Judith Hurwitz , Robin Bloor , Marcia Kaufman ,Fern Halper, Wiley Publishing, Inc, 2010
- Cloud Computing (Principles and Paradigms), Edited by RajkumarBuyya, James Broberg, AndrzejGoscinski, John Wiley & Sons, Inc. 2011

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4
CO1	1	2	--	--	--	--	--	--	--	--	--	--	1	--	--	--
CO2	1	--	2	--	--	--	--	--	--	--	--	--	1	2	--	--
CO3	3	--	1	--	2	--	--	--	--	--	--	--	1	3	2	--
CO4	3	--	2	--	1	--	--	--	--	--	--	--	1	--	2	--
CO5	3	--	2	--	1	--	--	--	--	--	--	--	1	--	2	--

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IFT4437	MAJOR PROJECT/ DISSERTATION	L	T	P	C
Version: 2020.1	Date of Approval: 19, July 2020	0	0	0	30
Pre-requisites/Exposure	Programming/Networking/Testing etc.				
Co-requisites	Nil				

Catalog Description

There are certain phases of every Intern's professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship program can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal classroom situations. These attributes are intellectual ability, professional judgment and decision-making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc. In order to achieve these objectives, each student will maintain a file . The Report aims to encourage students to keep a personal record of their learning and achievement throughout the Programme. It can be used as the basis for lifelong learning and for job applications. Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development. The report will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and their own personal contribution to the organization.

Course Objectives

The objective of this course is to

1. Equip the students with new technologies and industrial requirements.
2. Equip students with Project Management, Documentation and Presentation skills.

Course Outcomes

On completion of this course, the students will be able to

CO1: Demonstrate skill and knowledge of current information and technological tools and techniques specific to the field of study.

CO2: Identify, analyze, and solve problems creatively through sustained critical investigation.

CO3: Use effectively oral, written and visual communication.

CO4: Understand Project management and team work skills.

Text Books

As per topic of major project.

Reference Books

As per topic of major project.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

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Examination Scheme:

Components	V	PPT	R	Exe	IM
Weightage (%)	16	8	12	14	50

V – Viva, PPT-Power Point Presentation, R – Report, IM-Internal Marks, Exe-Execution

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	1	1	1	1	--	--	--	--	--	--	--	-	--	1	2
CO 2	2	2	2	2	1	--	--	--	--	--	--	--	-	-	1	2
CO 3	2	2	2	--	--	--	--	--	1	1	--	--	-	-	1	2
CO 4	1	2	3	--	--	--	--	--	1	1	--	--	-	-	1	1

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Amity School of Engineering & Technology

Master of Science Renewable Energy (Part-Time)

FLEXILEARN
-Freedom to design your degree



Programme Structure

Curriculum & Scheme of Examination

2023

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Programme Specific Outcomes (PSOs) of M Sc RE Regular & Part Time Program.

PSO1: Apply knowledge and understanding of the scientific principles, physics and engineering to analyze relevant current technologies, and applications of the key engineering principles and practices related to renewable energy technology and management.
PSO2: Understand the advanced technical knowledge, current available software, modelling techniques, computational methods, management skills and other applications and using them to solve the real-world problems in renewable energy sector following the standard codes of practice.
PSO3: Ability to understand and evaluate user needs, including considerations such as energy policy requirement, energy availability & management, associated risks, etc. and design of renewable energy power generation systems. Keeping in view the environmental issues, risk assessment, social, safety and sustainability by functioning in multidisciplinary teams.
PSO4: Understanding the need of high level professional, management techniques including project management which can be used in technological and management practices in construction following the ethical code of conduct as well as understanding the impact of engineering practices on societal, global, commercial and economic scenario.

Programme Outcomes (POs) of M Sc RE Regular & Part Time Program.

PO1: Evaluation of basic engineering processes for various alternative modes of energy generation.
PO2: Development and constraints on carbon and non-carbon based energy resources.
PO3: Economics planning of energy supply-demand chain.
PO4: Appreciate the policy, financing and regulatory frameworks within which decisions on energy future are made.
PO5: Assimilate and acquire the skills for design and engineering of solar thermal and solar photovoltaic technology and systems.
PO6: Analyze the technoeconomics interaction of developments in the energy systems.
PO7. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12.Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

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PSO1	PSO2			PSO3		PSO4	
Apply knowledge and understanding of the scientific principles, physics and engineering to analyze relevant current technologies, and applications of the key engineering principles and practices related to renewable energy technology and management.	Understand the advanced technical knowledge, current available software, modelling techniques, computational methods, management skills and other applications and using them to solve the real-world problems in renewable energy sector following the standard codes of practice.			Ability to understand and evaluate user needs, including considerations such as energy policy requirement, energy availability & management, associated risks, etc. and design of renewable energy power generation systems keeping in view the environmental issues, risk assessment, social, safety and sustainability by functioning in multidisciplinary teams.		Understanding the need of high level professional, management techniques including project management which can be used in technological and management practices in construction following the ethical code of conduct as well as understanding the impact of engineering practices on societal, global, commercial and economic scenario.	
Basic Engineering/ Renewable Energy Technology	**Technology**	**Energy Management & Project Finance**	**Applications**	**Energy Planning & Risk Management**	**Designing Simulation**	**NTCC Courses**	**Value Added Courses**
Renewable Energy Conversion systems	Solar Thermal Systems	Energy Management	Renewable energy for heat applications	Risk management in renewable energy projects	Modelling and simulation of solar thermal systems	Summer Internship	Basics of Communication
Introduction to Solar PV	Fabrication of solar cells: Material & Designing aspects	Financial Evaluation of renewable energy systems	Organic Photovoltaic	Energy Access and Planning	Designing of solar rooftop grid/off grid pv systems	Lab Project	Self Development & Interpersonal Skills
Introduction to Solar Thermal Technology	Solar Energy storage		Solar and wind energy meteorology	Energy policy	Large Scale Grid Integration of Renewable energy Sources	Dissertation /Seminar & Progress Report /Comprehensive Viva	Corporate Communication
Instrumental Techniques and Characterization	Wind Energy		Green Buildings			Field work I & II	Behavioral Communication & Relationship Management
	Solar PV & thermal lab				Designing of Solar projects		Interpersonal Communication
	Solar Radiation Measure				Smart Grids and		Leading Through Teams

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	& Analysis Lab				Renewables		
	Biofuels & Biomethanation						
	Thermoelectric Systems and Devices				Solar Power Generation Lab		
	Advanced Energy Systems						

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RWP4101	RENEWABLE ENERGY CONVERSION SYSTEMS	L	T	P	C
Version 1.1	Date of Approval: Date, Aug 2016	2	0	0	3
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

The objective of the course is to provide introduction to different Renewable energy sources and Analyze the full coverage of Renewable energy supplies needed for modern economies. Course covers scientific aspects of power generation from Sun, wind, and biomass & ocean thermal routes.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Describe the various renewable energy sources and the possible conversion paths to a useful form of energy.

CO2: Describe the aerodynamics of wind turbines and calculate their power, energy production, output and their environmental impact.

CO3: Explain how geothermal is currently used as a source of energy, its future potential both in providing energy and in producing alternative fuels.

CO4: Explain the physical principles of Solar energy and photovoltaic energy conversion route.

Catalog Description

This course aims to make the students understand the importance renewable energy conversion systems and also explains the significance of energy supply from renewables as an essential component of every nation's strategy, especially when there is responsibility for the environment and for sustainability.

Course Content

Modules	Blooms level*	Number of hours
Module I: Introduction to Renewable Energy Renewable and Non-Renewable Energy, World energy scenario; Fossil fuel resources - estimates and duration; India's energy scenario; Synergy between energy and environment, global environment issues, greenhouse gas emission, global warming, green energy solutions, technical and social implications of renewable energy	L1, L2	7
Module II: Solar Concepts Introduction, Sun as the source of radiation, Earth and Solar constant, Extra-terrestrial solar radiation, components of radiation, effects of earth's atmosphere, Introduction to solar PV, Introduction to solar Thermal.	L1, L2	8
Module III: Biofuels, Wind Energy Biofuels- Definition, generations and types; Wind-Characteristics, Sources of wind, components of wind turbines, advantages and environmental aspects of wind energy	L1, L2	7
Module IV: Hydro Energy, Tidal Energy	L1, L2	7

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Hydro- Principles, hydro-turbines, social and environmental aspects. Tidal- The nature of the resource, physics, power generation, technical factors, environmental factors, tidal energy potential, tidal barrage, tidal stream, tidal current turbines.		
Module V: Geothermal, OTEC, Nuclear Energy Geothermal- Principles, suitable sites and criteria, Advantages and disadvantages; OTEC- Principles, Open and closed systems, Nuclear fusion, fission, various types of nuclear fuels and nuclear reactors.	L1, L2	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- J. W. Twidell, T Weir, Renewable energy resources, 3rd edition, Routledge, Taylor and Francis group, 2015
- G. N. Tiwari , Solar Energy: Fundamentals, design, modeling and applications, Narosa, 2002. ISBN-10: 0849324092
- V.V. N. Kishore, Renewable Energy Engineering and Technology: Principles and Practice, The Energy and Resources Institute, TERI, 2010. ISBN-10: 9788179932216.

Reference Books

- J. A. Duffie and W. A. Beckmann, Solar Engineering of Thermal Processes, 4th edition, Wiley, 2013. ISBN: 978-0-470-87366-3
- P. Gipe, Wind Energy Comes of Age, 1st edition, Wiley, 1995.
- Directory, Indian Windpower 2004, CECL, Bhopal.
- R. Murray, K. E. Holbert, Nuclear energy: An introduction to the concepts, systems and applications of nuclear processes, 7th edition, Butterworth-Heinemann, 2014

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Relationship between the Course Outcomes (COs) , Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	PO 2	PO 3	PO 4	PSO 1	PSO 2	PSO3	PSO4
CO1	1	3	2	3	1	3	2	-
CO2	1	3	2	3	1	3	2	-
CO3	1	3	2	-	1	3	2	-
CO4	1	3	2	-	1	3	2	-
CO5	1	3	2	-	1	3	2	-

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RWP4102	INTRODUCTION TO SOLAR PHOTOVOLTA-ICS	L	T	P	C
Version 1.1	Date of Approval: 25 July, 2016	2	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

The objective of this course are as follows

- This course covers the design and engineering of solar cells along with their different material aspects, electrical, thermal & optical characteristics for better efficiency.
- To understand the role of solar energy in the context of regional and global energy system, its economic, social and environmental connotations, and the impact of technology on a local and global context.
- To understand the physical principles of the photovoltaic (PV) solar cell and what are its sources of losses.
- To understand and apply the basic concepts of solar radiation necessary for dimensioning (sizing) PV systems installation.

Course Outcomes

On completion of this course, the students will be able to

CO1. To know some practical applications that use solar photovoltaic systems and be able to do specify, analyze and design.

CO2. To know and be able to analyze the behavior of a self-consumption demand and the measurement of network management.

CO3. To carry out a basic engineering project related to energy supply using solar photovoltaic technology.

CO4. To know the main lines of research in the field of photovoltaic technology and solar energy and to bring innovative ideas in the field of solar photovoltaic energy.

Catalog Description

This course covers the concepts of basic engineering project related to energy supply using solar photovoltaic technology. Also, to make students understand the practical applications that use solar photovoltaic systems and be able to do specify, analyze and design.

Course Content

Modules	Blooms level*	Number of hours
Module I: Thin film solar cell technologies Generic advantages of thin film technologies, material in thin film technologies, thin film deposition techniques, Amorphous Si solar cell technology, CdTe solar cell technology, CIGS solar cell technology, thin film epitaxial Si solar cell technology.	L1, L2	7

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Module II: Concentrating PV Cells and systems Light concentration, concentration ratio, series resistance optimization, optics for concentrator PV, tracking requirement of CPV, cooling requirements, high concentration solar cells	L1, L2	8
Module III: Emerging Solar Cells technologies and concepts Organic solar cells, Dye-sensitized solar cells, GaAs solar cells, Thermo-photovoltaic, approaches to overcome single junction efficiency limits, Solar photovoltaic modules, spectrum modification approaches, hot carrier solar cells.	L2, L3	7
Module IV: Solar PV Modules Solar PV modules from solar cells, mismatch in series connection, mismatch in parallel connections, design and structure of PV modules, PV module power output and factors affecting its performance.	L3, L4	7
Module V: Balance of Solar PV systems Battery for energy storage in solar PV system, factors affecting battery performance, DC-DC converters, charge controllers, Dc-AC converters, Maximum Power Point Tracking, stand alone SPV system, design methodology of PV systems, wire sizing , hybrid PV, grid connected PV, life cycle costing.	L5, L6	7

Bloom's Level:
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- Solar Photovoltaics (Fundamentals, Technologies and Application) by Chetan Singh Solanki, PHI publications, 5th Edition.
- Handbook of Photovoltaic Science and Engineering by Antonio Luque& Steven Hegedus – John Wiley and Sons.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Relationship between the Course Outcomes (COs) , Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	PO 2	PO 3	PO 4	PSO 1	PSO 2	PSO3	PSO4
CO1	1	3	2	3	1	3	2	-
CO2	1	2	2	3	1	3	2	-
CO3	1	2	2	-	1	3	2	-
CO4	1	2	2	-	1	3	2	-
CO5	1	3	2	-	1	3	2	-

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RWP4103	INTRODUCTION TO SOLAR THERMAL TECHNOLOGY	L	T	P	C
Version 1.1	Date of Approval: Date, Aug 2016	2	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

The objective of this course is to introduce materials relevant to the engineering of solar thermal systems. Students will develop the skills to analysis the thermal performance of solar thermal systems. Many of these calculations will be based on solar applications in different area. Finally the concepts of engineering economics applied to solar energy will also be introduced.

Course Outcomes

On completion of this course, the students will be able to

CO1. Conduct the thermal Analysis of a solar thermal devices.

CO2. Explain working mechanism of solar thermal collectors

CO3. Design a solar thermal system based on the requirement.

Catalog Description

In this course, the various modes of heat transfer shall be discussed. The different types of errors, accuracy of the numerical methods are also discussed in detail. Students will taught to calculate the amount of incident solar flux on horizontal and tilted surfaces. Thermal analysis of flat plate collector and concentrating collectors will be taught. The energy storage systems and the different components of solar systems will be discussed. The various water heating, air heating systems and its application to space heating and cooling and other solar devices will be discussed. Solar thermal power generation will be taught in this course.

Course Content

Modules	Blooms level*	Number of hours
Module 1:Introduction Solar spectrum, Sun-Earth angles, Solar time, measurement of solar radiations (pyrheliometers, pyranometers), solar radiation on horizontal surface (estimation of average solar radiation, estimation of clear sky radiation).	L1, L2	7
Module 2: Flat plate collector Liquid flat plate collectors, Materials (glazing material, collector plates), classification (evacuated tubular collectors, Types of FPCs), Performance Analysis, efficiency of collectors and Testing of FPC, Effects of various parameters on performance, Analysis of Unconventional FPCs, air heating collectors.	L1, L2	8
Module 3: Solar Concentrator Characteristic parameters, classification of concentrators, tracking concentrator and non-tracking concentrators, cylindrical parabolic collector, compound parabolic collector, paraboloid dish collector, central receiver collector	L2, L3	7
Module 4: Solar Water Heating	L3, L4	7

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Introduction, Swimming pool heating, types (built-in-storage type, separate storage type), Performance predictions.		

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- J. W. Twidell, T Weir, Renewable energy resources, 3rd edition, Routledge, Taylor and Francis group, 2015
- G. N. Tiwari , Solar Energy: Fundamentals, design, modeling and applications, Narosa, 2002. ISBN-10: 0849324092
- V.V. N. Kishore, Renewable Energy Engineering and Technology: Principles and Practice, The Energy and Resources Institute, TERI, 2010. ISBN-10: 9788179932216.

Reference Books

1. J. A. Duffie and W. A. Beckmann, Solar Engineering of Thermal Processes, 4th edition, Wiley, 2013. ISBN: 978-0-470-87366-3

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Relationship between the Course Outcomes (COs) , Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PSO 1**	**PSO 2**	**PSO3**	**PSO4**
CO1	**1**	**3**	**2**	**3**	**1**	**3**	**2**	**-**
CO2	**1**	**2**	**2**	**3**	**1**	**3**	**2**	**-**
CO3	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO4	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO5	**1**	**3**	**2**	**-**	**1**	**3**	**2**	**-**

1: strongly related, 2: moderately related and 3: weakly related

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RWP4104	SOLAR RADIATION MEASUREMENT AND ANALYSIS LAB	L	T	P	C
Version 1.1	Date of Approval: 14 July 2016	0	0	2	1
Pre-requisites/ Exposure	Solar PV lab				
Co-requisites	Solar thermal lab				

Course Objectives

The objective of this course is to

- To understand the various aspects of various instruments viz. Lux meter, AC/DC clamp meter, multimeter, Anemometer, potentiometer etc. by carrying out the experiment on latest technological equipments in the area of interest of the students.
- To describe the basics of operation of solar radiation measurement, wind sped and solar energy absorption and collecting devices.
- To understands and describe the applications of various experimental studies in practical life to analyze the various parameters in the field of solar photovoltaic energy conversion.

Course Outcomes

On completion of this course, the students will be able to

- CO1. To describe the basics of operation of solar radiation measurement, wind sped and solar energy absorption and collecting devices.
- CO2. To examine different areas viz. variation of various pollutants and contaminants present in the atmosphere and the effect of solar radiations falling on various solar photovoltaic energy conversion systems.
- CO3. To understand the component of solar radiation responsible for the working of solar PV technology and investigate the efficiency/performance parameters of all equipments.

Catalog Description

In today's competitive environment an understanding is required which will facilitate the implementation of basic principles, tools and techniques used in the field of solar photovoltaic engineering. This course is designed for the students who want to understand the basics of solar PV and thermal energy conversion engineering. A student is supposed to have a basic knowledge of mathematical modeling and tools. The subject will further enhance the knowledge regarding the various methods and techniques used for solving various problems related to practical designing of solar power systems.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Solar radiation measurement To measure solar radiation on horizontal surface and estimation To measure solar radiation on tilted surface and estimation To measure Albedo solar radiation and estimation	L1, L2	7
Module 2: Solar cell properties To study the IV and PV curve of a solar panel indoor and outdoor To study the effect of tilt on the output of a solar panel To study the effect of illumination on the output of a solar panel To study the effect of shading on the output of a solar panel	L1, L2	8

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To demonstrate bypass and blocking diodes when connected with a solar panel		
Module 3: Stand-alone system To study battery charging and discharging characteristics. To demo the system using a DC load in connection with a battery To demo the system using a AC load in connection with a battery To demo the system using both AC and DC loads in connection with a battery	L2, L3	7

1.

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- J. W. Twidell, T Weir, Renewable energy resources, 3rd edition, Routledge, Taylor and Francis group, 2015
- G. N. Tiwari , Solar Energy: Fundamentals, design, modeling and applications, Narosa, 2002. ISBN-10: 0849324092
- V.V. N. Kishore, Renewable Energy Engineering and Technology: Principles and Practice, The Energy and Resources Institute, TERI, 2010. ISBN-10: 9788179932216.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Relationship between the Course Outcomes (COs) , Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PSO 1**	**PSO 2**	**PSO3**	**PSO4**
CO1	**1**	**3**	**2**	**3**	**1**	**3**	**2**	**-**
CO2	**1**	**2**	**2**	**3**	**1**	**3**	**2**	**-**
CO3	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO4	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO5	**1**	**3**	**2**	**-**	**1**	**3**	**2**	**-**

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RWP4105	FIELD WORK-I/SEMINAR-I	L	T	P	C
Version 1.1	Date of Approval: 14 July 2016	0	0	0	1
Pre-requisites/ Exposure	Solar PV lab				
Co-requisites	Solar thermal lab				

Course Objectives

The objective of this course is to

- To understand the various aspects of various instruments viz. solar dryer, solar concentrator, solar water heater by carrying out the experiment on latest technological equipments in the area of interest of the students.
- To describe the basics of operation of solar radiation measurement, wind sped and solar energy absorption and collecting devices.
- To understands and describe the applications of various experimental studies in practical life to analyze the various parameters of environment.

Course Outcomes

On completion of this course, the students will be able to

- CO1. To describe the basics of operation of solar radiation measurement, wind sped and solar energy absorption and collecting devices.
- CO2. To examine different areas viz. variation of various pollutants and contaminants present in the atmosphere and the effect of solar radiations on their concentration.

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- CO3. To understand the component of solar radiation responsible for the working of solar thermal technology and investigate the efficiency/performance parameters of all equipments.

Catalog Description

In today's competitive environment an understanding is required which will facilitate the implementation of basic principles, tools and techniques used in the field of solar photovoltaic engineering. This course is designed for the students who want to understand the basics of solar PV and thermal energy conversion engineering. A student is supposed to have a basic knowledge of mathematical modeling and tools. The subject will further enhance the knowledge regarding the various methods and techniques used for solving various problems related to practical designing of solar power systems.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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Relationship between the Course Outcomes (COs) , Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	PO 2	PO 3	PO 4	PSO 1	PSO 2	PSO3	PSO4
CO1	1	3	2	3	1	3	2	-
CO2	1	2	2	3	1	3	2	-
CO3	1	2	2	-	1	3	2	-
CO4	1	2	2	-	1	3	2	-
CO5	1	3	2	-	1	3	2	-

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RWP4201	SOLAR THERMAL SYSTEMS	L	T	P	C
Version 1.1	Date of Approval: Date, Aug 2016	2	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

The objective of this course is to introduce materials relevant to the engineering of solar thermal systems. Students will develop the skills to analysis the thermal performance of solar thermal systems. Many of these calculations will be based on solar applications in different area. Finally the concepts of engineering economics applied to solar energy will also be introduced.

Course Outcomes

On completion of this course, the students will be able to

CO1. Conduct the thermal Analysis of a solar thermal devices.

CO2. Explain working mechanism of solar thermal collectors

CO3. Design a solar thermal system based on the requirement.

Catalog Description

In this course, the various modes of heat transfer shall be discussed. The different types of errors, accuracy of the numerical methods are also discussed in detail. Students will taught to calculate the amount of incident solar flux on horizontal and tilted surfaces. Thermal analysis of flat plate collector and concentrating collectors will be taught. The energy storage systems and the different components of solar systems will be discussed. The various water heating, air heating systems and its application to space heating and cooling and other solar devices will be discussed. Solar thermal power generation will be taught in this course.

Course Content

Modules	Blooms level*	Number of hours
Module I: Solar Cookers Introduction, Types of solar cookers, Performance of box type solar cooker, Testing of a solar cooker.	L1, L2	7
Module II: Solar Desalination Introduction, Simple solar still, basics of solar stills, Material problems, Performance prediction of basin type still, Experiments on solar stills: wick type, Regenerative type; Solar disinfection.	L1, L2	8
Module III: Solar drying of food Introduction, Basics of solar drying, Types of solar dryers: Natural convection, Mixed mode, Fixed circulation type; Simulation models of drying: thin layer drying. Deep bed drying, continuous flow dryers.	L2, L3	7
Module IV: Solar Furnaces Introduction, Types of solar furnaces, Components: Concentrator, Heliostat, Sun tracking; Typical designs: Single concentrator, Single Heliostat, Multiple heliostats; Measuring instruments in solar furnace.	L4, L5	7

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Module V: Hybrid Solar systems Case studies of Power systems: Solar PV, Solar Thermal, Wind, Biomass; Industrial process heating-cooking and space heating; Hybrid car.	L5, L6	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- J. W. Twidell, T Weir, Renewable energy resources, 3rd edition, Routledge, Taylor and Francis group, 2015
- G. N. Tiwari , Solar Energy: Fundamentals, design, modeling and applications, Narosa, 2002. ISBN-10: 0849324092
- V.V. N. Kishore, Renewable Energy Engineering and Technology: Principles and Practice, The Energy and Resources Institute, TERI, 2010. ISBN-10: 9788179932216.

Reference Books

1. J. A. Duffie and W. A. Beckmann, Solar Engineering of Thermal Processes, 4th edition, Wiley, 2013. ISBN: 978-0-470-87366-3

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Relationship between the Course Outcomes (COs) , Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	PO 2	PO 3	PO 4	PSO 1	PSO 2	PSO3	PSO4
CO1	1	3	2	3	1	3	2	-
CO2	1	2	2	3	1	3	2	-
CO3	1	2	2	-	1	3	2	-
CO4	1	2	2	-	1	3	2	-
CO5	1	3	2	-	1	3	2	-

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RWP4202	FABRICATION OF SOLAR CELLS: MATERIAL AND DESIGNING ASPECTS	L	T	P	C
Version 1.1	Date of Approval: 25 July, 2016	2	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

The objective of this course are as follows

- This course covers the design and engineering of solar cells along with their different material aspects, electrical, thermal & optical characteristics for better efficiency.
- To understand the role of solar energy in the context of regional and global energy system, its economic, social and environmental connotations, and the impact of technology on a local and global context.
- To understand the physical principles of the photovoltaic (PV) solar cell and what are its sources of losses.
- To understand and apply the basic concepts of solar radiation necessary for dimensioning (sizing) PV systems installation.

Course Outcomes

On completion of this course, the students will be able to

CO1. To know some practical applications that use solar photovoltaic systems and be able to do specify, analyze and design.

CO2. To know and be able to analyze the behavior of a self-consumption demand and the measurement of network management.

CO3. To carry out a basic engineering project related to energy supply using solar photovoltaic technology.

CO4. To know the main lines of research in the field of photovoltaic technology and solar energy and to bring innovative ideas in the field of solar photovoltaic energy.

Catalog Description

This course covers the concepts of basic engineering project related to energy supply using solar photovoltaic technology. Also, to make students understand the practical applications that use solar photovoltaic systems and be able to do specify, analyze and design.

Course Content

Modules	Blooms level*	Number of hours
Module I: Thin film solar cell technologies Generic advantages of thin film technologies, material in thin film technologies, thin film deposition techniques, Fabrication of Amorphous Si solar cell, Fabrication of CdTe solar cell, Fabrication of CIGS solar cell , thin film epitaxial Si solar cell technology.	L1, L2	7
Module II: Concentrating PV Cells and systems Light concentration, concentration ratio, series resistance optimization, optics for concentrator PV, tracking requirement of CPV, cooling requirements, high concentration solar cells	L2, L3	8

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Module III: Emerging Solar Cells technologies and concepts Fabrication of Organic solar cells, Fabrication of Dye-sensitized solar cells, Fabrication of GaAs solar cells, Thermo-photovoltaic, approaches to overcome single junction efficiency limits, Solar photovoltaic modules, spectrum modification approaches, hot carrier solar cells.	L3, L4	7
Module IV: Solar PV Modules Solar PV modules from solar cells, mismatch in series connection, mismatch in parallel connections, design and structure of PV modules, PV module power output and factors affecting its performance.	L4, L5	7
Module V: Balance of Solar PV systems Battery for energy storage in solar PV system, factors affecting battery performance, DC-DC converters, charge controllers, Dc-AC converters, Maximum Power Point Tracking, stand alone SPV system, design methodology of PV systems, wire sizing , hybrid PV, grid connected PV, life cycle costing.	L5, L6	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- Chetan Singh Solanki, Solar Photovoltaics (Fundamentals, Technologies and Application), PHI Publications, 5th Edition.
- Antonio Luque& Steven Hegedus, Handbook of Photovoltaic Science and Engineering, Joh Wiley and Sons.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Relationship between the Course Outcomes (COs) , Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PSO 1**	**PSO 2**	**PSO3**	**PSO4**
CO1	**1**	**3**	**2**	**3**	**1**	**3**	**2**	**-**
CO2	**1**	**2**	**2**	**3**	**1**	**3**	**2**	**-**
CO3	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO4	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO5	**1**	**3**	**2**	**-**	**1**	**3**	**2**	**-**

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RWP4205	SOLAR PHOTOVOLTAIC AND THERMAL LAB	L	T	P	C
Version 1.1	Date of Approval: 26 June,2020	0	0	2	1
Pre-requisites/ Exposure	Solar PV lab				
Co-requisites	Solar thermal lab				

Course Objectives

The objective of this course is to

- To understand the various aspects of various instruments viz. Lux meter, AC/DC clamp meter, multimeter, Anemometer, potentiometer etc. by carrying out the experiment on latest technological equipments in the area of interest of the students.
- To describe the basics of operation of solar radiation measurement, wind sped and solar energy absorption and collecting devices.
- To understands and describe the applications of various experimental studies in practical life to analyze the various parameters in the field of solar photovoltaic energy conversion.

Course Outcomes

On completion of this course, the students will be able to

- CO1. To describe the basics of operation of solar radiation measurement, wind sped and solar energy absorption and collecting devices.
- CO2. To examine different areas viz. variation of various pollutants and contaminants present in the atmosphere and the effect of solar radiations falling on various solar photovoltaic energy conversion systems.
- CO3. To understand the component of solar radiation responsible for the working of solar PV technology and investigate the efficiency/performance parameters of all equipments.

Catalog Description

In today's competitive environment an understanding is required which will facilitate the implementation of basic principles, tools and techniques used in the field of solar photovoltaic engineering. This course is designed for the students who want to understand the basics of solar PV and thermal energy conversion engineering. A student is supposed to have a basic knowledge of mathematical modeling and tools. The subject will further enhance the knowledge regarding the various methods and techniques used for solving various problems related to practical designing of solar power systems.

Course Content

Modules	Blooms level*	Number of hours

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Module 1 : Inverters • Observe the output voltage waveform of inverter in auto mode. • Observe the output voltage with manual control. • 180 degree control • 120 degree control. • Observe the RMS value and waveform of output voltage with both 180 and 120 degree control. **(The experiment to be carried out can be performed by taking on-line data from www.nrel.com)**	L1, L2	7
Module 2 : Solar Thermal Systems • To study the performance analysis of an Evacuated Tube Collecter • To find the overallloss coefficient of a liquidstorage tank • To determine the Performance(UL, FR, η) of the Parabolic Trough collector with varying Solar Radiation with water as heat removal medium (Forced mode)	L2, L3	8
Module 3: Solar thermal Systems • To determine the Performance (UL, FR, η) of the Parabolic Trough collector with water as heat removal medium (Forced mode) with • fixed input parameters • different flow rates • To determine the Performance (UL, FR, η) of the Parabolic Trough collector for different flow rates and Solar Radiation. • To determine the Performance (UL, FR, η) of the Parabolic Trough collector with different inlet water temperature (Forced mode)	L3, L4	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- Solar Photovoltaics (Fundamentals, Technologies and Application) by Chetan Singh Solanki;
- Handbookof Photovoltaic Science and Engineering by Antonio Luque& Steven Hegedus - Wiley; Lecture notes.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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Relationship between the Course Outcomes (COs) , Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	PO 2	PO 3	PO 4	PSO 1	PSO 2	PSO3	PSO4
CO1	1	3	2	3	1	3	2	-
CO2	1	2	2	3	1	3	2	-
CO3	1	2	2	-	1	3	2	-
CO4	1	2	2	-	1	3	2	-
CO5	1	3	2	-	1	3	2	-

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RWP4206	RISK MANAGEMENT IN RENEWABLE ENERGY PROJECTS	L	T	P	C
Version 1.1	Date of Approval: Date, Aug 2016	2	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

This module will help participants to understand the risks involved in the project and the loan application evaluation process to be followed.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define project parameters, project scope, stakeholders, project phases, Time & Resource requirements and limitations

CO2. Identify risks associated with the project viz Social, environmental, economic, political, technological risks to name a few

CO3. Plan the strategy for risk mitigation

CO4: Measure the impact of the risks associated with the project

Catalog Description

The course is designed for the students to prepare them for the working in various renewable energy projects right from conceptualization to delivery of project. Students will discover the renewable energy project life cycle and learn how to build a successful project from pre implementation to completion. It will introduce project management topics such as resources, costs, time constraints and project scopes. The students will learn about the various risks associated with RE projects. Identify them and decide suitable measures for risk mitigation.

Course Content

Modules	Blooms level*	Number of hours

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Module 1: Conventional energy projects and related uncertainties Introduction, the study, challenges in RE projects, risk associated with conventional energy projects, risk management approach in energy policies	L1, L2	7
Module II: Uncertainties in RES projects RES project characteristics, Risk associated with specific RES technologies. Risk: Definition and types, Risk analysis, Risk Identification, Risk impact assessment, Risk prioritization, Risk tracking, Risk mitigation planning, implementation and progress monitoring, tools for risk mitigation, Case study for managing risks in industries.	L2, L3	8
Module III: Recommended Risk Management methodology Project definition & requirement, risk identification, risk evaluation, risk control, risk follow up, risk feedback, risk management implementation in RES investment lifecycle	L3, L4	7
Module IV: Support measures Measures to address political risk, Measures to address economic risks, Measures to address technical risks, Measures to address social risks, generic interventions, Conclusions & recommendation	L4, L5	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1.) The Owner's Role in Project Risk Management. National Academic Press
2.) Risk Analysis in Project Management, by J. Raftery

Reference Books

1.) Financial risk management instruments for RE projects. UNEP Report
2.) Prasanna, C. (2008). Projects, Planning, Analysis, Selection, Financing, Implementation and Review. Tata McGraw-Hill Publishing Company Limited.
3.) Finnerty, J. D. (2013). Project financing: Asset-based financial engineering. John Wiley & Sons.
4.) Frigenti, E., & Comninos, D. (2002). The Practice of Project Management: a guide to the business focused approach. Kogan Page Publishers.
5.) Lewis, J. P. (2002). Fundamentals of project management: developing core competencies to help outperform the competition. AMACOM Div American Mgmt Assn.
6.) Scott, B. (2005). The Art of Project Management. California USA. O'Relly Media Inc.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Relationship between the Course Outcomes (Cos) , Programme Outcomes (Pos) and Program Specific Outcomes

	PO 1	PO 2	PO 3	PO 4	PSO 1	PSO 2	PSO3	PSO4
CO1	1	3	2	3	1	3	2	-
CO2	1	2	2	3	1	3	2	-
CO3	1	2	2	-	1	3	2	-
CO4	1	2	2	-	1	3	2	-
CO5	1	3	2	-	1	3	2	-

1: strongly related, 2: moderately related and 3: weakly related

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RWP4207	WIND ENERGY	L	T	P	C
Version 1.1	Date of Approval: 25 July, 2016	2	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

The objective of this course are as follows:

- The objective of this Course is to provide you with the conceptual framework necessary to understand above challenges in wind energy conversion systems installation and the techniques to manage them efficiently and effectively. It starts with quality site survey which leads to the understanding of establishing a wind energy system with minimum cost and minimum payback period.
- Evaluate the traditional planning for wind energy system set up and monitoring the activities of energy output evaluation.
- Calculate factors like high quality, wide reach and productive activities in wind energy conversion area of renewable energy.
- Identification and application of different wind turbines along with their advantages and disadvantages, used in the conversion of high speed wind into useful electrical output. To apply capital budgeting tools and techniques to optimize the output of wind energy system.

Course Outcomes

On completion of this course, the students will be able to

- CO1. To know some practical applications that conceptualizes the framework necessary to understand challenges in wind energy conversion systems installation and the techniques to manage them efficiently and effectively. It starts with quality site survey which leads to the understanding of establishing a wind energy system with minimum cost and minimum payback period.
- CO2. To carry out traditional planning for wind energy system set up and monitoring the activities of energy output evaluation.
- CO3. To understand the Calculate factors like high quality, wide reach and productive activities in wind energy conversion area of renewable energy.
- CO4. This course covers the various aspects of different wind turbines along with their advantages and disadvantages, used in the conversion of high speed wind into useful electrical output.

Catalog Description

At the end of the course the students should be able to understand some practical applications that conceptualize the framework necessary to understand the insight into the context and importance of wind energy sources and their potential, present status, fundamental principles, applications and environmental aspects.

Course Content

Modules	Blooms level*	Number of hours
Module I: Wind characteristics: Sources of wind, wind classificatio in flat terrain, sitting in non-flat terrain, ecological indicators of site su site resource assessment: anemometer, met towers, wind map, wind r	L1, L2	5
Module II: Wind energy system: Bernoulli's equation and significance; Euler's energy equation for turbomachines, energy and power in wind, different types of rotors: horizontal and vertical; wind turbine components, electric power generation, Fixed and variable speed; and storage.	L1, L2	9

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Module III: Applied aerodynamics: Airfoil structure, aerodynamics of airfoil: lift, drag and stall; lift based wind turbines, drag machines, pitch concept, yaw concept, slip coefficient, Betz law, axial momentum theory, tip speed ratio, forces and moments due to vertical wind gradient. Role of dynamics in wind power- cross wind axis machines, wind axis machines- general momentum theory- vortex strip theory, forces and moments due to vertical wind gradient, control mechanism.	L1, L2, L3	8
Module IV: Towers and systems installation: Specific types of towers, tower height, tower and system raising, wiring, lightening protection, installation, maintenance of other equipments.	L4, L5, L6	10
Module V: **Wind energy conversion systems:** Specification and characteristics of commercial water-pumping wind mills, electricity producing wind energy, conversion systems, selection of system case study, Environment aspects.	L3, L4, L6	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text Books

- P. Gipe, Wind Energy Comes of Age, 1st edition, John Wiley & Sons Inc.1995
- L. L. Freris, Wind Energy Conversion System, Prentice Hall, 1990

Reference Books

- Tony Burton, David Sharpe, Nick Jenkins Ervin Bossanyi, Garrad Hassan & Partners, Wind energy Hand Book, John Wiley & Sons Inc. 2001
- Directory Indian Windpower 2018, CECL, Bhopal.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Relationship between the Course Outcomes (COs), Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PSO 1**	**PSO 2**	**PSO3**	**PSO4**
CO1	**1**	**3**	**2**		**1**	**2**	**3**	**-**
CO2	**3**	**2**	**3**	**1**	**3**	**2**	**1**	**-**
CO3	**3**	**2**	**3**	**1**	**3**	**2**	**1**	**-**
CO4	**2**	**2**	**3**	**1**	**3**	**2**	**1**	**-**

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RWP4208	FUNDAMENTALS OF NUCLEAR POWER GENERATION-I	L	T	P	C
Version 1.1	Date of Approval: 1st July, 2019	2	0	0	4
Pre-requisites/Exposure	Basic UG-level Heat Transfer & Fluid Mechanics, fundamentals of Physics				
Co-requisites					

Course Objectives

To expose students to the various aspects of basic nuclear properties, create awareness about nuclear energy and power generation fundamentals.

Course Outcomes

Upon completion of the course, students can

- **CO 1**. Define the basic elements of nuclear power production and technology.
- **CO 2.** They are thus able to describe the physical processes as well as the different components of a nuclear power plant.
- **CO 3**. Students can also describe different elements of nuclear power technology deployment such as safety, environmental and health related issues.

Catalog Description

The depleting stock of fossil fuels and global concern over the preservation of environment has projected nuclear energy as a very relevant option, particularly considering the near-zero emission and huge resource availability. From technological point of view, nuclear power production is quite different from the conventional thermal plants and therefore it is the need of the hour to grasp the essentials at an early level. Present course introduces the students to the fundaments of Nuclear Physics. Starting from the atomic structure, students will be gradually familiarized with different concepts, finally leading to the Introduction to Nuclear Power generation.

Course Content

Modules	Blooms level*	Number of hours
Module I: Nuclear Properties, Radioactive Decays & Interaction of Radiation With Matter **Nuclear Properties** Constituents of nucleus, Nuclear mass and binding energy, features of binding energy versus mass number curve, nuclear radius **Radioactive Decays** Modes of decay of radioactive nuclides and decay Laws, Stability of heavy nuclei against break up, Geiger-Nuttal law, barrier penetration as applied to alpha decay **Interaction of Radiation With Matter** Primary radiation – Chemical Process, Direct interaction of radiation with matter, ionization, excitation, neutron impact. Basic reactions involving active species produced in the primary act, and Radiation dosimetry.	L1, L2	12

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Module II Nuclear Reactions Nuclear Reactions Types of nuclear reactions, reactions cross section, Kinematics of nuclear reaction, Q-value and its physical significance, Compound nucleus and Direct reactions (elastic, inelastic, transfer, break-up)	L1, L2	12
Module III Nuclear fission & Nuclear Fusion **Nuclear fission:** experimental features, spontaneous fission, barrier penetration, Chart of nuclides/neutron sources- Neutron reactions statistical model, Chain reactions **Nuclear Fusion:** Fusion power generation, concept of cross section, mean free path and collision frequency. Radiation losses, fusion reactor energy, system energy balance, plasma heating, Lawson criterion. Open magnetic confinement –magnetic and kinetic pressure, Closed magnetic systems-Torroidal fields, Tokamak features, particle trapping. Tokamaks-devices**,** Laser induced fusion	L1, L2, L3	12
Module IV Fundamentals of nuclear power Nuclear Material Structure of a power plant, Requirements of reactor materials-fuel materials- plutonium, uranium and thorium and their alloys and compound core materials-beryllium, graphite control and shielding materials- magnesium and its alloys, Aluminum and its alloys-Coolant used in reactors radiation embrittlement- corrosion reactor materials-Mechanical properties of materials	L1, L2, L4	12

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text Books

1. K. Hyde, Basic ideas and Concepts in Nuclear Physics, 3rd edition, CRC Press 2004
2. H.A. Enge, Introduction to Nuclear Physics, Addison-Wesley (1983)
3. I. Kaplan, Nuclear Physics, 2nd edition, Addison Wesley Publishing Company, 1962
4. E. Segre, Nuclei and Particles: An Introduction to nuclear and subnuclear physics, 2nd edition, W A Benjamin Inc. 1977, https://archive.org/details/Nuclei Particles1st.Ed./page/n3

References

1. B.K. Agrawal : Nuclear Physics, Lokbharti Pub, Allahabad. 1989
2. RR Roy and B.P.Nigam, Nuclear Physics, Willey-Easter, 1979

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Relationship between the Course Outcomes (COs), Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PSO 1**	**PSO 2**	**PSO3**	**PSO4**
CO1	**1**	**3**	**2**		**1**	**2**	**-**	**-**
CO2	**1**	**2**	**-**	**-**	**1**	**2**	**-**	**-**
CO3	**1**	**2**	**-**	**-**	**1**	**2**	**-**	**-**

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RWP4301	MODELLING AND SIMULATION OF SOLAR THERMAL SYSTEMS	L	T	P	C
Version 1.1	Date of Approval: Date, JULY,2016	2	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

This course covers the design and engineering of solar thermal systems. The objective of this course is to introduce materials relevant to solar thermal power generation, refrigeration and air conditioning. Students will develop the skills to analysis the thermal performance of these systems. They will also learn to simulate solar thermal systems and predict the performance of the systems in different environmental conditions. Finally the concepts of engineering economics applied to solar energy will also be introduced.

Course Outcomes

On completion of this course, the students will be able to

CO1. Conduct the thermal Analysis of a solar thermal systems.

CO2. Explain the working mechanism of solar thermal air conditioners & refrigerators

CO3. Explain the design considerations of various solar power plants and its working mechanism.

CO4: Simulate solar thermal projects and predict performance of systems

Catalog Description

In this course, the various solar thermal systems like solar stills, solar cooker, air conditioners and refrigerators shall be discussed. Thermal performance analysis of these systems will be taught and numerical based on the theory will be solved in class. The course also covers solar thermal power generation in which students will learn the various design consideration of such systems. Students will be taught various components of solar thermal power plant and its function. Thermal performance testing procedure for solar thermal power plants will also be taught.

Course Content

Modules	Blooms level*	Number of hours
Module I: Solar thermal systems- Solar cookers, performance analysis of cookers, solar stills, thermal analysis of solar stills	L1, L2	10
Module II: Solar cooling systems, Application of solar energy in Refrigeration and air conditioning, Solar air heaters, description, design, application	L2, L3	12
Module III: Solar Thermo- Mechanical Power: Principles of solar engines, solar heat engines, steam engines, turbines, Stirling engines, Brayton Engines, Solar thermal power generation, central receiver power plant, parabolic trough power plants.	L3, L4	14

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Module IV: Modelling & simulation of solar thermal systems, f chart method, f chart for liquid systems, f chart for air systems, design of active systems by utilizability methods, hourly utilizability,daily utilizability, the φ, f chart method	L4, L5	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- J. W. Twidell, T Weir, Renewable energy resources, 3rd edition, Routledge, Taylor and Francis group, 2015
- G. N. Tiwari , Solar Energy: Fundamentals, design, modeling and applications, Narosa, 2002. ISBN-10: 0849324092
- V.V. N. Kishore, Renewable Energy Engineering and Technology: Principles and Practice, The Energy and Resources Institute, TERI, 2010. ISBN-10: 9788179932216.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Relationship between the Course Outcomes (COs) , Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	PO 2	PO 3	PO 4	PSO 1	PSO 2	PSO3	PSO4
CO1	1	3	2	3	1	3	2	-
CO2	1	2	2	3	1	3	2	-
CO3	1	2	2	-	1	3	2	-
CO4	1	2	2	-	1	3	2	-
CO5	1	3	2	-	1	3	2	-

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RWP4303	BIOMASS	L	T	P	C
Version 1.1	Date of Approval: 25 July, 2016	1	0	0	2
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

The objective of this course are as follows:

- To understands the various renewable feedstocks, their availability and attributes for biofuel production
- To describe the biomass conversion processes and devices
- To examine different biomass energy conversion technologies in the energy Sector and develop to select appropriate methodologies from the range of different biomass energy technologies
- To understands and describe the capital costs, and cost effectiveness of Biomass energy compared with traditional sources.

Course Outcomes

On completion of this course, the students will be able to

- CO1. To know some practical applications that conceptualizes the framework necessary to understand above thermochemical energy processes (combustion, gasification, pyrolysis, reforming), mechanical and chemical processes (oil extraction and trans-esterification), finally biochemical processes (fermentation and anaerobic digestion)
- CO2. To carry out a basic engineering project related to financial evaluation of renewable energy systems.
- CO3. To understand the basic principles of the designing of a bio-energy thermo-chemical conversion process.
- CO4. This course covers the various aspects of Biofuel, biomethanation and their production technologies.

Catalog Description

At the end of the course the students should be able to understand some practical applications that conceptualizes the framework necessary to understand above thermochemical energy processes (combustion, gasification, pyrolysis, reforming), mechanical and chemical processes (oil extraction and trans-esterification), finally biochemical processes (fermentation and anaerobic digestion).

Course Content

Modules	Blooms level*	Number of hours
Module I- : Introduction Introduction, Properties of biomass, sources of biomass, broad classification of biomass, agro and forestry residues; Techniques of biomass assessment, biomass estimation, Biodegradation and biodegradability of subtrate	L1, L2	10
Module II- Biochemistry of biomass	L2, L3	12

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Introduction of bio-molecules: carbohydrates, proteins, Amino ac-ids, lipids and Nucleic acid. Enzymes: Definition with examples of holoenzyme, apoenzyme, coenzymes, cofactors, activators, inhib-itors, active site, units of enzyme activity, specific enzymes, En-zyme Kinetics, Factors affecting enzyme activity: enzyme concen-tration, substrate concentration, pH and temperature		
Module III- Biofuel Definition and types of Biofuels: Biogas, Biodiesel, Algal biofuel, Ethanol, Methanol etc.; Photosynthesis, fermentation, anaerobic digestion, Biodiesel pro-duction from oil seeds (edible and non-edible), waste oils and algae, Quality standards for biodiesel, En-vironmental impacts of biofuel production	L3, L4	14
Module IV- Bioreactors Introduction, Microbial growth curve, Types of bioreactors: Batch, plug low re-actor (PFR), continuous stirred rank reactors (CSTR), fluidized bed reactor bub-ble column, fixed film reactors, air lift fermentor, Photo bioreactor etc.	L4, L5	12
Module V: Government Polices Biofuel policy, Supporting programs and policies on biogas, bio-hydrogen, bio-diesel and bioethanol, biogas purification technology and waste to energy pro-gram.	L5, L6	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation
Text Books

- Francisco RosilloCallé, Frank Rosillo-Calle, The Biomass Assessment Handbook: Bioenergy for a Sustainable Environment, PHI Publication,1996.
- Ashok Pandey, Christian Larroche, Steven C. Ricke, Claude-Gilles Dussap, Edgard Gnansounou, Biofuels: Alternative Feedstocks and Conversion Processes, TMH, 2003.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Relationship between the Course Outcomes (COs) , Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PSO 1**	**PSO 2**	**PSO3**	**PSO4**
CO1	**1**	**3**	**2**	**3**	**1**	**3**	**2**	**-**
CO2	**1**	**2**	**2**	**3**	**1**	**3**	**2**	**-**
CO3	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO4	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO5	**1**	**3**	**2**	**-**	**1**	**3**	**2**	**-**

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RWP4305	DESIGNING OF SOLAR PROJECTS	L	T	P	C
Version 1.1	Date of Approval: 25 July, 2016	2	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

The objective of this course are as follows:

- This course covers the design and engineering of solar power system along with their different material aspects, electrical, thermal & optical characteristics for better efficiency.
- To understand the role of solar energy in the context of regional and global energy system, it's economic, social and environmental connotations, and the impact of technology on a local and global context.
- To understand the physical principles of the photovoltaic (PV) solar cell and what are its sources of losses.
- To understand and apply the basic concepts of solar radiation necessary for dimensioning (sizing) PV systems installation.

Course Outcomes

On completion of this course, the students will be able to

- CO1. To know some practical applications that use solar photovoltaic systems and be able to do specify, analyze and designing of real time systems.
- CO2. To know and be able to analyze the behavior of a self-consumption demand and the measurement of network management.
- CO3. To carry out a basic engineering project related to energy supply using solar photovoltaic technology.
- CO4. To know the main lines of research in the field of photovoltaic technology and solar energy. To bring innovative ideas in the field of solar photovoltaic energy.

Catalog Description

At the end of the course the students should be able to understand some practical applications that conceptualize the framework necessary to design and engineering of solar power system along with their different material aspects, electrical, thermal & optical characteristics for better efficiency.

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Course Content

Modules	Blooms level*	Number of hours
Module I: Applications of Solar Energy Solar Photovoltaic applications -Solar home lighting systems, Solar water pumping systems, Solar power plants; Solar Thermal applications-Solar water heating systems. Factors to be considered in Solar System Design: Solar Radiation, Atmospheric effect on Solar Radiation, Daily and Seasonal Temperature Variations, Physical parameters, Availability of Land foundation needs, Orientation and Obstructions, Proximity of power Evacuation, Water availability, Any industries of pollution nearby, Power supply for construction. Typical Site Evaluation Methodology	L1, L2	10

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Module II: System Design of Solar Photovoltaic Systems Load Analysis- Accurate sizing, Peak current loads, Worst case scenarios, Plan for future, Compatibility issues, Determining design margins. Solar Array Design- Collector size, Selection of most appropriate module, Dust and Other contaminating effects, Orientation and Tilt issues, Design of Balance of Systems (BOS). Battery Design- Physical and Performance Requirement, Reserve Capacity, temperature and Ageing duration, Regulation and Charge control.	L2, L3	12
Module III: Designing Solar Home Lighting Systems (Case study) Case description, Assessment of load profile, Typical System Design, Assumptions in System Design, Battery Design, PV Array Design, Inverter Capacity, Charge Controller, Overall System Design, Request for Quotation, Evaluation of Quotations, Negotiation with the Parties, Finalization of Order, Inspection of goods Received, Parameters to be checked during Installation	L3, L4	14
Module IV: Designing Solar PV Water pumping system (Case study) System Design Methodology, Typical System Design, Case Description, Assumptions in System Design, Insolation Availability, Pumping Flow Requirement, Pumping Head Requirement (Static), Pumping Head Requirement (Dynamic), Pumping Energy Requirement, Pump Selection PV Array Design, Request for Quotation, Evaluation of Quotations, Negotiation with the Parties Finalization of Order, Inspection of goods Received, Parameters to be checked during Installation	L4, L5	12
Module V: Designing Solar Thermal Water Heating System (Case study) Case Description Typical System Design, Assumptions in System Design, Energy required for heating water, Collector Area Required, Request for Quotation, Evaluation of Quotations, Negotiation with the Parties, Finalization of Order, inspection of goods Received, Parameters to be checked during Installation.	L5, L6	12
Module VI:- Introduction To Smart Grids Concept of smart grid, smart grid control, Communications and Sensing in a Smart Grid, Hardware Architecture, Software architecture, Protocol detail, Discrete control and Analog control, application & benefits, PLCs Vs RTUs, IED's, RTU Block diagram, PMU communication interface, Future trends.	L5, L6	8
Module VI: Designing of various applications using MATLAB and PVSYST software Introduction to MATLAB, arithmetic operations on MATLAB, designing of solar photovoltaic power system on MATLAB, load estimation, Introduction to PVSYST, locational aspects of solar PV power point installation, designing of SPV power plant using PVSYST.	L3, L4	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

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Text Books

- Dr. P Jayakumar, Solar Energy Resource Assessment Handbook ,APCTT, 2008.
- Introduction to MATLAB: Katsons publications.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Relationship between the Course Outcomes (COs) , Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	PO 2	PO 3	PO 4	PSO 1	PSO 2	PSO3	PSO4
CO1	1	3	2	3	1	3	2	-
CO2	1	2	2	3	1	3	2	-
CO3	1	2	2	-	1	3	2	-
CO4	1	2	2	-	1	3	2	-
CO5	1	3	2	-	1	3	2	-

1: strongly related, 2: moderately related and 3: weakly related

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RWP4306	LARGE SCALE GRID INTEGRATION OF RE-NEWABLE ENERGY SOURCES	L	T	P	C
Version 1.1	Date of Approval: 25 July, 2018	2	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

The objective of this course is to

- To aware students about the present situation of Grid Integration.
- To covers the challenges, technology and application of large scale grid integration of renewable energy sources.

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand the drivers behind the grid integration.
CO2. Learn about RE generation Technology, Transmission technology.
CO3. To Future technical solutions for integrating more large-capacity RE.
CO4. To introduce Smart Grids.

Catalog Description

This course covers the challenges, technology and application of large scale grid integration of renewable energy sources. This also gives the introduction to Smart Grids

Course Content

Modules	Blooms level*	Number of hours
Module I: RE generation: The present, the future and the integration challenges Introduction, Drivers of RE development, Present status of RE generation and future projections, Demand side management: peak clipping, valley filling, load shifting, RE grid integration challenges, RE generation Technology, Transmission technology, Operational technologies and practices	L1, L2	10
Module II: Future technical solutions for integrating more large-capacity RE Introduction to fundamentals of Grid interaction, Grid-Friendly RE generation, improved flexibility in conventional generation, Transmission expansion, Operational enhancement, Demand response	L2, L3	12
Module III: Application of Large Capacity Electrical Energy Storage to support RE integration Introduction to Promising large –capacity Electrical Energy Storage (EES) technologies, Roles of RE integration, Technology needs of large –Capacity EES applications, General, Present situation, Future needs	L3, L4	14

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Module IV:-Smart Grids Concept of smart grid, smart grid control, Communications and Sensing in a Smart Grid, Advance metering Infrastructure and smart meters, Hardware Architecture, Software architecture, Protocol detail, Discrete control and Analog control, application & benefits, PMU communication interface, Future trends.	L4, L5	12

Text Books

- Smart Grid & Renewables- A Guide for Effective Development- IRENA
- Antonio Luque & Steven Hegedus – Handbook of Photovoltaic Science and Engineering JohnWiley; Lecture notes.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Relationship between the Course Outcomes (COs) , Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PSO 1**	**PSO 2**	**PSO3**	**PSO4**
CO1	**1**	**3**	**2**	**3**	**1**	**3**	**2**	**-**
CO2	**1**	**2**	**2**	**3**	**1**	**3**	**2**	**-**
CO3	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO4	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO5	**1**	**3**	**2**	**-**	**1**	**3**	**2**	**-**

1: strongly related, 2: moderately related and 3: weakly related

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RWP4307	WIND ENERGY: ENERGY CONVERSION AND DESIGN OF TURBINES	L	T	P	C
Version 1.1	Date of Approval: 1st July, 2019	2	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

The objectives of this course are as follows:

- The objective of this Course is to provide you with the conceptual framework necessary to understand above challenges in wind energy conversion systems installation and the techniques to manage them efficiently and effectively. It starts with quality site survey which leads to the understanding of establishing a wind energy system with minimum cost and minimum payback period.
- Evaluate the traditional planning for wind energy system set up and monitoring the activities of energy output evaluation.
- Calculate factors like high quality, wide reach and productive activities in wind energy conversion area of renewable energy.
- Identification and application of different wind turbines along with their advantages and disadvantages, used in the conversion of high speed wind into useful electrical output. To apply capital budgeting tools and techniques to optimize the output of wind energy system.

Course Outcomes

On completion of this course, the students will be able to

- **CO1**. To know some practical applications that conceptualizes the framework necessary to understand challenges in wind energy conversion systems installation and the techniques to manage them efficiently and effectively. It starts with quality site survey which leads to the understanding of establishing a wind energy system with minimum cost and minimum payback period.
- **CO2.** To carry out traditional planning for wind energy system set up and monitoring the activities of energy output evaluation.
- **CO3**. To understand the Calculate factors like high quality, wide reach and productive activities in wind energy conversion area of renewable energy.
- **CO4**. This course covers the various aspects of different wind turbines along with their advantages and disadvantages, used in the conversion of high speed wind into useful electrical output.

Catalog Description

At the end of the course the students should be able to understand some practical applications that conceptualize the framework necessary to understand the insight into the context and importance of wind energy sources and their potential, present status, fundamental principles, applications and environmental aspects.

Course Content

Modules	Blooms level*	Number of hours
Module I: Aerodynamics of blade and rotor Aerodynamics of aero foil, Lift; drag and stall, Effect of Reynold's number, Actuator disc, Momentum theory and Betz coefficient, Effect of Reynold's number, Actuator disc momentum theory, Blade element theory, wake analysis, Strip theory, Vortex theory.	L1, L2	5
	L1, L2	9

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Module II: Design of wind turbine blade Effect of stall and blade pitch on coefficient of power vs tip speed ratio and coefficient of torque vs tip speed ratio characteristics, Optimal choice of cut-in, rated and cut-out wind speeds, Blade materials.		
Module III: Wind turbine design Vertical and horizontal axis turbines, Design characteristics, Multiple stream tube theory, Vortex wake structure, Tip losses, Rotational sampling.	L1, L2, L3	8
Module IV: Wind turbine design programs Aerodynamic loads, Tower shadow; wind shear, Blade coning, gyroscopic, transient and extreme loads, Aerodynamic damping and stability, teetering motion, stiff and soft, towers, Power train dynamics.	L4, L5, L6	10
Module V: Control Mechanisms Pitch control and yaw control, Electrical and Mechanical aerodynamic braking, teeter mechanism, Wind turbine dynamics with DC and AC generators: induction and synchronous generators.	L3, L4, L6	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text Books

- P. Gipe, Wind Energy Comes of Age, 1st edition, John Wiley & Sons Inc.1995
- L. L. Freris, Wind Energy Conversion System, Prentice Hall, 1990

Reference Books

- Tony Burton, David Sharpe, Nick Jenkins Ervin Bossanyi, Garrad Hassan & Partners, Wind energy Hand Book, John Wiley & Sons Inc. 2001
- Directory Indian Windpower 2018, CECL, Bhopal.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Relationship between the Course Outcomes (COs), Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO 1	PO 2	PO 3	PO 4	PSO 1	PSO 2	PSO3	PSO4
CO1	1	3	2		1	2	3	-
CO2	3	2	3	1	3	2	1	-
CO3	3	2	3	1	3	2	1	-
CO4	2	2	3	1	3	2	1	-

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RWP4308	FUNDAMENTALS OF NUCLEAR POWER GENERATION-II	L	T	P	C
Version 1.1	Date of Approval: 1st July, 2019	2	0	0	4
Pre-requisites/Exposure	RWE 4210				
Co-requisites					

Course Objectives

To expose students Design of different reactors. Important topics such as nuclear waste management, biological impact of radiation and safety issues pertinent to handling nuclear fuels will also be discussed.

Course Outcomes

The students completing the course will have ability to

- describe the design and construction of nuclear reactors and nuclear waste management practices
- choose nuclear reactor materials
- design systems to separate nuclear reactor products and dispose nuclear wastes

Course Content

Modules	Blooms level*	Number of hours
Module I: **Introduction:** Systems in nuclear reactor- Reactor fuels: Natural and enriched fuels, sources, merits and demerits of different fuels for reactor use, fabrication, handling of fuels and irradiated fuels, fuel management, storage, reprocessing of irradiated fuels. Reactor shutdown systems: Materials for reactor control and choices, liquid vs. solid shut down systems, design aspect- fall safe features, loading consideration, actuation methodology. Primary heat transport (cooling) system: Heat generation and distribution, Coolant characteristics, Selection of coolants, Coolant Circuit, Core thermal hydraulics, design aspects, radioactivity generation. Decay heat removal system: Functional requirements, cooling circuits, Design aspects, Loading considerations, Passive features.	L1, L2	12
Module - II: **Reactor structure:** Core composition, Reflector, Reactor vessel, Safety vessel, Shielding. Thermal, biological, Shield cooling system, Neutron flux monitoring and control, instrumentations. Moderator system: Materials, Selection, Design consideration, Circuit, Radioactivity aspects. Cover gas system: Purpose, Selection of material, Design considerations, Circuit. Reactor regulating system: Purpose, Methodology, Design considerations, Actuating mechanism. Auxiliary cooling circuit: Functions, Design considerations, cooling circuit. Containment and ventilation system: Functions, Types, Arrangement, Design considerations, loading, Testing.	L1, L2	12
Module- III: **Reactor Design:** Principles, Safety classifications, Seismic quality group, Loading considerations under normal operations, anticipated operational occurrences, design basis accidents such as earthquake, loss of coolant accident (LOCA),blackout, flood, missiles, operator	L1, L2, L3	12

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error, duel failures as applicable, Safety features for server accidents, standards, software, verifications etc. **Nuclear power plants:** Types .Thermal reactors: BWR, PWR, PHWR, GCR, APWR, AHWR etc. Fast reactors Breeders; Fusion power; Off-land NPPs:- space power unit, nuclear ships, submarines. Economics of NPPs: Various costs, ROI, Sizing and Operational characteristics.		
Module- IV : **Interaction of Radiation With Matter**: Primary radiation – Chemical Process, Direct interaction of radiation with matter, ionization, excitation, neutron impact. Basic reactions involving active species produced in the primary act, and Radiation dosimetry. **Radiation protection and Radioactive Waste Management**: Radiation hazard, Exposures, Exposure pathways, dose unit, measurement, and radiation protection. CRP and other guidance document etc. Radioactive Waste Management: Waste categorization, Generation, Handling of wastes, Liquid, gaseous and solid, Short term / long term storage / disposed. **Reactor Stages and Safety Assurances**- Nuclear safety assurance	L4, L5, L6	12

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text Books

- P.K. Nag. Power Plant Engineering Steam & Nuclear, Tata Mcgraw Hill Publishing Co. Ltd, 2001
- A.K. Raja, A.P. Srivastava and M. Dwivedi, An Introduction on Nuclear Engineering, New Age International Limited Publishers, https://engineeringstudymaterial.net/ebook/power-plant-engineering-by-ak-raja/
- T. J. Cannoly, Fundamentals of nuclear Engineering, John Wiley & Sons Inc 1978.
- J.G Collier and G.F Hewitt, Introduction to Nuclear power, Hemisphere publishing, New York, 1987.
- K Miyamoto, Plasma physics and controlled nuclear fusion, Springer, 2005
- J. P. Freidberg, Plasma physics and fusion energy, Cambridge University Press, 2007

Reference Books:

- S. Glasstone & A. Sesonske- Nuclear Reactor Engineering: Reactor system engineering, 4th edition, Springer, 2013.
- Domkundwar, Arora and Domkundwar, Power Plant Engineering, Dhanpat Rai & Co.2016

Relationship between the Course Outcomes (COs), Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO 1	PO 2	PO 3	PO 4	PSO 1	PSO 2	PSO3	PSO4
CO1	1	3	2		1	2	3	-
CO2	3	2	3	1	3	2	1	-
CO3	3	2	3	1	3	2	1	-
CO4	2	2	3	1	3	2	1	-

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RWP4407	INSTRUMENTAL TECHNIQUES AND CHARACTERIZATION	L	T	P	C
Version 1.1	Date of Approval: 25 July, 2016	2	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

The objective of this course are as follows:

- This course aims to make the students understand the importance and understanding of various sophisticated analytical techniques and their applications to characterize nanomaterials.
- Describe the various measurement techniques, instruments and designing aspects of various measuring instruments.
- Describe the transducer classification, static and dynamic characteristics of transducers.
- Explain how thin film deposition by physical/chemical vapor deposition plays an important role in the field of instrumentation.
- Explain the physical principles of various characterization methods.

Course Outcomes

On completion of this course, the students will be able to

- CO1. To know some practical applications that use the basic instrumentation technique used to measure humidity, pressure, temperature and other physical quantities.
- CO2. To carry out a basic engineering project related to measurement techniques related to vacuum tubes and vacuum gauges used in the area of engineering.
- CO3. To understand the basic principles of the spectroscopic characterization techniques like UV-VIS-IR Spectrophotometer, Principle of operation and application for band gap measurements. Photoelectron spectroscopy, Raman spectroscopy, FTIR.
- CO4. This course covers the various aspects of scanning and Transmission electron microscopy, AFM, XRD (Single Crystal) used to examine the particle characteristics.

Catalog Description

At the end of the course the students should be able to understand the factors that influence the use of various instruments used in the measurement of physical quantities like temperature, humidity, pressure, etc. know the various spectroscopic techniques and thin film coating technologies. The outcome will be measured by the performance of students in various class tests/assignments in addition to the End Semester Examination (ESE) that contains significant number of questions on problems related to the measurement of various physical quantities in the areas of engineering and technology.

Course Content

Modules	Blooms level*	Number of hours
Module I Basic Measurement Concepts, Error analysis, Transducer classification, Static and dynamic characteristics of transducers, Real time Monitoring and data processing.	L1, L2	7
Module II	L2, L3	8

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Energy audit instruments, measuring temperature, humidity, radiation, flow, pressure, thermal conductivity, Specific Heat , measurement of electrical quantities i.e. current, voltage; Power, power factor		
Module III: Vacuum and thin film coating techniques Vacuum ranges (low, high and ultrahigh vacuum) and their application, vacuum pumps (rotary, diffusion, ion, turbomolecular pumps	L3, L4	7
Module IV: Spectroscopic Characterization Technique UV-VIS-IR Spectrophotometer, Principle of operation and application for band gap measurements. Photoelectron spectroscopy, Raman spectroscopy	L4, L5	7
Module V: Structural Analysis Techniques Scanning and Transmission electron microscopy, AFM, XRD (Single Crystal), XRF, - detailed principle, operation and applications.	L5, L6	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- Sayer and Mansingh, Measurement, instrumentation and experiment design in physics and engineering, PHI publications, 1999.
- B C Nakra and K.KChaudhary, Instrumentation, Measurement and Analysis, Tata McGraw – Hill Publishing House, New Delhi,
- J Michael Hollas, Modern Spectroscopy, John Wiley International.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Relationship between the Course Outcomes (COs) , Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PSO 1**	**PSO 2**	**PSO3**	**PSO4**
CO1	**1**	**3**	**2**	**3**	**1**	**3**	**2**	**-**
CO2	**1**	**2**	**2**	**3**	**1**	**3**	**2**	**-**
CO3	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO4	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO5	**1**	**3**	**2**	**-**	**1**	**3**	**2**	**-**

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RWP4408	ENERGY STORAGE	L	T	P	C
Version 1.1	Date of Approval: 25 July, 2016	1	0	0	3
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

The objective of this course is to

- This course covers the various options of energy storage ranging from conventional batteries to super-capacitors. These storage systems are applicable for solar PV, Solar thermal and wind energy systems
- To understand the role of various energy storage systems in the context of regional and global energy system, its economic, social and environmental connotations, and the impact of technology on a local and global context.
- To understand the basic principles of the battery storage, capacitor storage and various electric and magnetic energy storage systems.
- To understand and apply the basic concepts of application areas of solar energy storage systems along with sizing of an autonomous battery banks and super-capacitor systems.

Course Outcomes

On completion of this course, the students will be able to

- CO1. To know some practical applications that use solar photovoltaic systems and be able to do specify, analyze and design
- CO2. To carry out a basic engineering project related to energy supply using solar photovoltaic storage technology.
- CO3. To understand the basic principles of the battery storage, capacitor storage and various electric and magnetic energy storage systems.
- CO4. This course covers the various options of energy storage ranging from conventional batteries to super-capacitors. These storage systems are applicable for solar PV, Solar thermal and wind energy systems.

Catalog Description

At the end of the course the students should be able to understand the factors that influence the use of solar radiation as an energy source; know the various active and passive technologies that are available for collecting solar energy, have the ability to apply design principles to selection of an appropriate solar energy installation to meet requirements.

Course Content

Modules	Blooms level*	Number of hours

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Module 1: Energy Storage Need of energy storage; Different modes of Energy Storage. Potential energy: Pumped hydro storage; KE and Compressed gas system: Flywheel storage, compressed air energy storage; Electrical and magnetic energy storage: Capacitors, electromagnets	L1, L2	7
Module 2: Electrochemical Energy Storage Systems Batteries: Primary, Secondary, Lithium, Solid-state and molten solvent batteries; Lead Lead acid batteries; Nickel Cadmium Batteries; Advanced Batteries	L2, L3	8
Module 3: Magnetic and Electric Energy Storage Systems Superconducting Magnet Energy Storage (SMES) systems; Capacitor and Batteries: Comparison and application; Super capacitor: Electrochemical Double Layer Capacitor (EDLC), principle of working, structure	L3, L4	7
Module 4: Sensible Heat Storage SHS mediums; Stratified storage systems; Rock-bed storage systems; Thermal storage in buildings; Earth storage; Energy storage in aquifers.	L4, L5	7
Module 5: Hydrogen Energy storage and Fuel cells Modes of hydrogen storage, safety aspects of hydrogen energy storage, fuel cells and types of fuel cells, Basic Fuel cell design and its characterization, Nano materials engineering for electrode preparation in biobatteries	L5, L6	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- J. A. Duffie and W. A. Beckmann, Solar Engineering of Thermal Processes, 4th edition, Wiley, 2013. ISBN: 978-0-470-87366-3
- S P Sukhatme and J K Nayak, Solar Energy, Principles of Thermal Collection and Storage- Tata McGraw Hill Edu.Pvt. Ltd, 2nd Edition.
- John F. Kreider and Frank Kreith, Solar Heating and Cooling, 2nded., Hemisphere Publishing Corp, 1982

Reference Books

- The Passive Solar Energy Book" by Edward Mazria, Rodale Press, 1979
- Solar Radiation Data Manual for Flat-Plate and Concentrating Collectors" National Renewable Energy Laboratory, 1994,
- Modeling Daylight Availability and Irradiance Components from Direct and Global Irradiance" by R. Perez, P. Ineichen, R. Seals, J. Michalsky and R. Stewart, Solar Energy 44 (5) pp. 271-289
- 2009 ASHRAE Handbook – Fundamentals (Inch-Pound Edition), American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (Stevens E-book on line)

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

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Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Relationship between the Course Outcomes (COs) , Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	PO 2	PO 3	PO 4	PSO 1	PSO 2	PSO3	PSO4
CO1	1	3	2	3	1	3	2	-
CO2	1	2	2	3	1	3	2	-
CO3	1	2	2	-	1	3	2	-
CO4	1	2	2	-	1	3	2	-
CO5	1	3	2	-	1	3	2	-

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RWP4404	FIELD WORK II/ MINOR PROJECT / SEMINAR II	L	T	P	C
Version 1.1	Date of Approval: 14 July 2016	0	0	0	2
Pre-requisites/ Exposure	Solar PV lab				
Co-requisites	Solar thermal lab				

Course Objectives

The objective of this course is to

- To understand the various aspects of various instruments viz. solar dryer, solar concentrator, solar water heater by carrying out the experiment on latest technological equipments in the area of interest of the students.
- To describe the basics of operation of solar radiation measurement, wind sped and solar energy absorption and collecting devices.
- To understands and describe the applications of various experimental studies in practical life to analyze the various parameters of environment.

Course Outcomes

On completion of this course, the students will be able to

- CO1. To describe the basics of operation of solar radiation measurement, wind sped and solar energy absorption and collecting devices.
- CO2. To examine different areas viz. variation of various pollutants and contaminants present in the atmosphere and the effect of solar radiations on their concentration.
- CO3. To understand the component of solar radiation responsible for the working of solar thermal technology and investigate the efficiency/performance parameters of all equipments.

Catalog Description

In today's competitive environment an understanding is required which will facilitate the implementation of basic principles, tools and techniques used in the field of solar photovoltaic engineering. This course is designed for the students who want to understand the basics of solar PV and thermal energy conversion engineering. A student is supposed to have a basic knowledge of mathematical modeling and tools. The subject will further enhance the knowledge regarding the various methods and techniques used for solving various problems related to practical designing of solar power systems.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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Relationship between the Course Outcomes (COs) , Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	PO 2	PO 3	PO 4	PSO 1	PSO 2	PSO3	PSO4
CO1	1	3	2	3	1	3	2	-
CO2	1	2	2	3	1	3	2	-
CO3	1	2	2	-	1	3	2	-
CO4	1	2	2	-	1	3	2	-
CO5	1	3	2	-	1	3	2	-

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RWP4401	FINANCIAL EVALUATION OF RENEWABLE ENERGY SYSTEMS	L	T	P	C
Version 1.1	Date of Approval: 25 July, 2013	2	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

The objectives of this course are as follows:

- The objective of this course is to provide you with the conceptual framework necessary to understand above financial issues and the techniques to manage them efficiently and effectively. Whether you choose a career in manufacturing companies, non-governmental or service sector, investment banks or management consultancy, or want to be an entrepreneur, a thorough learning of the art of corporate finance is a must. The topics covered are time value of money, capital budgeting, depreciation and cash flow formation.
- Evaluate the time value of money of a particular financial decision.
- Calculate maturity amount and present investment amount.
- Identification and application of different depreciation methods.
- Apply capital budgeting tools and techniques to evaluate a project.

Course Outcomes

On completion of this course, the students will be able to

- **CO1.** To know some practical applications that conceptualizes the framework necessary to understand above financial issues and the techniques to manage them efficiently and effectively.
- **CO2.** To carry out a basic engineering project related to financial evaluation of renewable energy systems.
- **CO3.** To understand the basic principles of the payback period, impact assessment of solar photovoltaic conversion system, solar thermal systems and other renewable energy systems.
- **CO4.** This course covers the various aspects of depreciation methods, straight line depreciation, declining balance method, sum of the year digits method of depreciation.

Catalog Description

At the end of the course the students should be able to understand the factors that influence the use of various depreciation methods, straight line depreciation, declining balance method, sum of the year digits method of depreciation. The outcome will be measured by the performance of students in various class tests/assignments in addition to the End Semester Examination (ESE) that contains significant number of questions on problems related to the financial Mathematics- cash flow diagrams, interest formula relating present & future worth of single amount, uniform series compound amount factor, uniform series sinking fund factor, uniform series present worth factor, uniform series capital recovery factor, interest formulae with continuous compounding.

Course Content

Modules	Blooms level*	Number of hours
Module I: Introduction, Economic efficiency, time value of money, interest, inflation	L1, L2	5
Module II: Basic formulae of financial Mathematics- cash flow diagrams, interest formula relating present & future worth of single amount, uniform series compound amount factor, uniform series	L1, L2	9

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sinking fund factor, uniform series present worth factor, uniform series capital recovery factor, interest formulae with continuous compounding. Interest formulae for uniform or arithmetic gradient of cash flows.		
Module III: Indicators of Financial Performance- Simple & discounted payback periods, net present value (NPV), equivalent uniform annual worth, benefit cost ratio method, interest rate of return (IRR), computation of IRR, multiple values of IRR.	L1, L2, L3	8
Module IV: Incremental Analysis of Investment Projects- incremental analysis, incremental analysis in Net Present Value Method, incremental analysis in Equivalent Uniform Annual Worth method, incremental analysis in Benefit Cost Ratio method, incremental analysis in Internal Rate of return method	L5, L6	10
Module V: Depreciation & Depreciation Accounting- Definitions, Depreciation methods, straight line Depreciation, declining balance method, sum of the year digits method of Depreciation	L3, L4, L6	8
Module VI: Case studies of financial evaluation of renewable energy technologies- solar distillation, domestic solar water heating, solar PV lanterns	L3, L4, L6	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text Books

- T C Kandpal, H P Garg, Financial Evaluation of Renewable Energy Technologies, MacMillan Publishers of India 2003.
- Charles W Donovan, Renewable Energy Finance: Powering the future, Imperial College Press, London, 2015
- B Simkins, R Simkins, Energy Finance & Economics: Analysis and Valuation, Risk Management & the future of Energy. 1st Ed. John Wiley & Sons 2013.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Relationship between the Course Outcomes (COs), Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO 1	PO 2	PO 3	PO 4	PSO 1	PSO 2	PSO3	PSO4
CO1	3	3	1	2	3	2	1	2
CO2	3	3	1	2	3	2	1	2
CO3	3	3	1	1	3	2	1	2
CO4	3	3	1	2	3	2	1	2

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RWP4405	ENERGY ACCESS AND PLANNING	L	T	P	C
Version 1.1	Date of Approval: 25 July, 2016	2	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

The objective of this course are as follows

- The objective of this Course is to provide you with the conceptual framework necessary to understand above energy access issues and the techniques to manage them efficiently and effectively. Whether you choose a career in manufacturing companies, non-governmental or service sector, investment banks or management consultancy, or want to be an entrepreneur, a thorough learning of the art of corporate finance is a must. The topics covered are time value of money, capital budgeting, depreciation and cash flow formation.
- Evaluate the traditional planning for energy demands, grid and off grid energy generation issues.
- Calculate factors like high quality, wide reach and productive activities in various areas of renewable energy.
- Identification and application of different depreciation methods.
- Apply capital budgeting tools and techniques to evaluate a project.

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Course Outcomes

On completion of this course, the students will be able to

- CO1. Evaluate the traditional planning for energy demands, grid and off grid energy generation issues.
- CO2. To calculate factors like high quality, wide reach and productive activities in various areas of renewable energy.
- CO3. Identification and application of different depreciation methods.
- CO4. The objective of this Course is to provide you with the conceptual framework necessary to understand above energy access issues and the techniques to manage them efficiently and effectively. Whether you choose a career in manufacturing companies, non-governmental or service sector, investment banks or management consultancy, or want to be an entrepreneur, a thorough learning of the art of corporate finance is a must.

Catalog Description

Energy access planning is aimed at developing a socially inclusive energy supply system that gives both the poor and the rich sustainable access to at least the minimum amount of energy for their basic needs. This type of planning is also done to identify environmentally sound and climate-friendly technologies and resource options for providing energy access, and the associated investment opportunities.

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Course Content

Modules	Blooms level*	Number of hours
Module I: Sustainable Energy Access Planning Framework Background, Objectives of this Study, Elements of Sustainable Energy Access Planning, Key Steps in Sustainable Energy Access Planning and Linkages between Assessments	L1, L2	7
Module II: Energy Poverty Assessment Introduction, Energy Poverty Defined, Approaches to Energy Poverty Assessment , Energy Poverty Assessment Approaches for Use in Sustainable Energy Access Planning , Data Requirements	L2, L3	8
Module III: Demand & Resource Assessment Introduction, Approaches to Assessing Energy Demand, Demand Assessment Methodology for Sustainable Energy Access Planning, Dimensions of Resource Assessment , Approaches to Resource Assessment, Data Requirements	L3, L4	7
Module IV: Cost & Benefit Assessment Introduction, Review of Cost Assessment Models, Proposed Sustainable Energy Access Planning Methodology, Incremental Cost of Energy Access, Applications of the Incremental Energy Access Cost, with Case Studies, Potential Benefits of an Energy Access Program, Approaches to Benefit Assessment, Data Requirements	L4, L5	7
Module V: Sustainability & Affordability Assessment Introduction, Approaches to Sustainability Assessment, Methodologies for Sustainability Assessment, Different Forms of the Affordability Problem, Approaches to Affordability Assessment, Assessment of Support Programs to Make Energy Services Affordable, Data Requirements	L5, L6	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- Smart Grid & Renewables- A Guide for Effective Development- IRENA
- Ram M Shrestha and Jiwan S Acharya, Asian Development Bank,Sustainable Energy Access Planning- A Framework- ISBN:978-92-9254-965-7.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Relationship between the Course Outcomes (COs) , Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	PO 2	PO 3	PO 4	PSO 1	PSO 2	PSO3	PSO4
CO1	1	3	2	3	1	3	2	-
CO2	1	2	2	3	1	3	2	-
CO3	1	2	2	-	1	3	2	-
CO4	1	2	2	-	1	3	2	-
CO5	1	3	2	-	1	3	2	-

1: strongly related, 2: moderately related and 3: weakly related

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RWP4406	THERMOELECTRIC SYSTEMS AND DEVICES	L	T	P	C
Version 1.1	Date of Approval: 25 July, 2016	2	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

The objective of this course are as follows

- To discuss the current status of usage of thermoelectric generator, cooler and a heat pump in day to day life along with their respective advantages and disadvantages.
- To understand the technical implications of thermoelectric generator, heat pump and cooler for practical applications.
- To discuss the technical solutions for integrating thermoelectric devices with other energy sources like solar PV and solar thermal.
- To discuss role of performance analysis and evaluation of thermoelectric systems.
- To identify factors affecting grid integration of renewable energy viz netmetering, energy costing, automation of energy generation monitoring/control of energy generation by various renewable energy sources.

Course Outcomes

On completion of this course, the students will be able to

- CO1. To discuss the technical solutions for integrating thermoelectric devices with other energy sources like solar PV and solar thermal.
- CO2. To understand the technical implications of thermoelectric generator, heat pump and cooler for practical applications.
- CO3. To understand the technical implications of thermoelectric generator, heat pump and cooler for practical applications.
- CO4. To discuss the current status of usage of thermoelectric generator, cooler and a heat pump in day to day life along with their respective advantages and disadvantages.

Catalog Description

This course To understand the fundamentals of thermoelectric generators , coolers and heat pump; to apply to the optimum design problems in order to experience state-of-the-art technologies in the fields.

Course Content

Module I: Introduction: Smart Grids and Renewables

Making the Transition to a Smarter Grid, Start with Pilot and Demonstration, Projects, Specific Technology Recommendations, Costs and Benefits: Making the Business Case for Smart Grid Technologies, Recognise and Respond to Technological conservatism, Leverage the Need for Private Sector, Investment, Recognise the Continual Nature of Technological Change, Regulation

Module II:How Smart Grids Enable Renewables

Smart Grids and Variability, Smart Grids and Distributed Generation, Smart Grids and Capital Intensity, Improved Consumer Information, Control, and Choice, Improved Transmission and Distribution System Monitoring and Control, Integration of New Resources,

Module III: Nontechnical Barriers to Smart Grids

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Data Ownership and Privacy, Grid Security, Control of Distributed Resources, The Role of New Private Sector Grid Players, The Need for Standards

Module IV:Smart Grid Technologies
Advanced Metering Infrastructure, Advanced Electricity Pricing, Demand Response, Distribution Automation, Renewable Resource Forecasting, Smart Inverters, Distributed Storage, Microgrids and Virtual Power Plants, Bulk Power Technologies

Text Books
- Smart Grid & Renewables- A Guide for Effective Development- IRENA
- Handbookof Photovoltaic Science and Engineering by Antonio Luque& Steven Hegedus - Wiley; Lecture notes.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Relationship between the Course Outcomes (COs) , Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PSO 1**	**PSO 2**	**PSO3**	**PSO4**
CO1	**1**	**3**	**2**	**3**	**1**	**3**	**2**	**-**
CO2	**1**	**2**	**2**	**3**	**1**	**3**	**2**	**-**
CO3	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO4	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO5	**1**	**3**	**2**	**-**	**1**	**3**	**2**	**-**

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RWP4501	SOLAR AND WIND ENERGY METEOROLOGY	L	T	P	C
Version 1.1	Date of Approval: 25 July, 2016	2	0	0	3
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

The objective of this course is to

- To make students understand about the various aspects of wind and solar forecasting/meteorology enhances the performance of various operating systems
- To recognize how the phenomenon of wind and solar forecasts is carried out.
- To distinguish approaches for implementing forecasting systems and collecting necessary data for its operation.
- To covers the challenges, technology and application of protocols and standards of designing the green buildings using passive sources for heating and cooling.

Course Outcomes

On completion of this course, the students will be able to

CO1. To identify the policies and other actions to support the implementation of forecasting systems.
CO2. Compute the relative humidity from either the mixing ratio or the vapor pressure.
CO3. Describe how atmospheric stability affects vertical motion of air and cloud formation.
CO4. List the various lifting processes that operate within the atmosphere.

Catalog Description

1. This course covers the concepts of identifying the principal reservoirs in the global water cycle and to distinguish among the various phase changes of water. Also lead to describe the role of latent heat in phase changes of water.

Course Content

Modules	Blooms level*	Number of hours
Module I: An Overview Importance of meteorology, various branches of meteorology and their applications Earth Sun relationship, Ecliptic and equatorial plane, Rotation and revolution of the earth Equinoxes, Solstices, Perihelion and Aphelion, Causes of seasons, Seasonal and latitudinal variation of insolation. Weather, climate, Elements of weather, climate controls, weather phenomena, Semi-diurnal variation of pressure, Diurnal variation of temperature, Pressure and wind belts, Distribution of pressure and temperature over the surface of the earth.	L1, L2	10
Module II: Surface Energy Balance (longwave/thermal)	L2, L3	12

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Stefan's law, emissivity. Greenhouse effect. Surface energy balance: net radiation, ground heat flux, sensible and latent heat flux. Sensors and instrumentation. Other applications: Building heating, ventilation, and air conditioning (HVAC). Evapotranspiration and irrigation.		
Module III: Atmospheric boundary layer Mean Boundary Layer characteristics (*Definition, depth and structure, turbulent transport, Taylor's hypothesis*); Mathematical and Conceptual tools (*Turbulence spectrum, spectral gap, kinematic flux, eddy flux, basic governing equations to turbulent flow*); Turbulence Kinetic Energy, Stability and Scaling (*TKE budget, stability concepts, Richardson number, Obukhov length*)	L3, L4	14
Module IV: Measuring Climate Data & Estimation: Introduction (History, scales, units, climate change); Measuring climate data (climate stations, measurement accuracy, measuring temperature, humidity, wind, rainfall, irradiance, evaporation, archiving, analyzing climate data); Climate Resources (Solar radiation – nature, attenuation, measurement, linkage to climate change; windcauses, profiles, frequency, spatial variation, wind power); Precipitation – processes, spatial and temporal variation of rainfall, dew, snow, linkage to climate change).	L4, L5	12
Module V: **Wind power meteorology** Wind Energy Meteorology: Introduction, turbines types and terms, linear momentum and basic theory, dynamic matching, stream tube theory, characteristics of wind, Atmospheric flow and boundary layer, Mean velocity profile. Wind resource assessment. Flow over hills. Low-level jet.Sensors and instrumentation, Indian wind atlas.	L5, L6	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation
Text Books

- J. W. Twidell, T Weir, Renewable energy resources, 3rd edition, Routledge, Taylor and Francis group, 2015
- G. N. Tiwari , Solar Energy: Fundamentals, design, modeling and applications, Narosa, 2002. ISBN-10: 0849324092
- V.V. N. Kishore, Renewable Energy Engineering and Technology: Principles and Practice, The Energy and Resources Institute, TERI, 2010. ISBN-10: 9788179932216.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Relationship between the Course Outcomes (COs) , Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	PO 2	PO 3	PO 4	PSO 1	PSO 2	PSO3	PSO4
CO1	1	3	2	3	1	3	2	-
CO2	1	2	2	3	1	3	2	-
CO3	1	2	2	-	1	3	2	-
CO4	1	2	2	-	1	3	2	-
CO5	1	3	2	-	1	3	2	-

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RWP4505	DESIGNING OF SOLAR ROOFTOP PV SYSTEM	L	T	P	C
Version 1.1	Date of Approval: 25 July, 2016	2	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

The objective of this course are as follows

- This course covers the design and engineering of solar cells along with their different material aspects, electrical, thermal & optical characteristics for better efficiency.
- To understand the role of solar energy in the context of regional and global energy system, its economic, social and environmental connotations, and the impact of technology on a local and global context.
- To understand the physical principles of the photovoltaic (PV) solar cell and what are its sources of losses.
- To understand and apply the basic concepts of solar radiation necessary for dimensioning (sizing) PV systems installation.

Course Outcomes

On completion of this course, the students will be able to

CO1. To know some practical applications that use solar photovoltaic systems and be able to do specify, analyze and design.

CO2. To know and be able to analyze the behavior of a self-consumption demand and the measurement of network management.

CO3. To carry out a basic engineering project related to energy supply using solar photovoltaic technology.

CO4. To know the main lines of research in the field of photovoltaic technology and solar energy and to bring innovative ideas in the field of solar photovoltaic energy.

Catalog Description

This course covers the concepts of basic engineering project related to energy supply using solar photovoltaic technology. Also, to make students understand the practical applications that use solar photovoltaic systems and be able to do specify, analyze and design.

Course Content

Modules	Blooms level*	Number of hours
Module I: Introduction of Design and Engineering of Solar Cells Various Commercialized, Un-commercialized Designs of Solar Cells (Homo-junction, multi-junction and concentrator solar cells; c- / a- / pc- / mc- Si solar cells, CIGS, CIS, CdTe, quantum dots, organic, inorganic-organic hybrid, dye-sensitized solar cells), Various Processes for Maximizing the Light-Trapping and Absorption in Solar Cells, Anti-reflection coating & Surface texturing, Back surface reflector, Self-cleaning surface.	L1, L2	10
Module II:	L2, L3	12

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Packaging of Solar Photovoltaic Modules Cell matrix, Layers of modules, Lamination, post-lamination and curing, Special modules batteries, charge controls, net power meters. PV array installation, operation, costs, reliability.		
Module III: **Electrical & Optical Performance of Solar Photovoltaic Modules** Electrical & thermal characteristics, Fabrication spread and Mismatch losses, Local shading and Hot spot formation, Field performance of module,Maximizing the efficiency of SPV modules, Study of Maximum power point tracking techniques for PV modules Troubleshooting of solar cells.	L3, L4	14
Module IV: **Module Manufacturing of Commercialized Solar Cells** Module manufacturing of a-Si solar cells (Continuous roll-to-roll manufacturing, a-Si on glass substrate, manufacturing cost, safety & other issues, module performance), Module manufacturing of CIGS, CIS, CdTe solar cells.	L4, L5	12
Module V: Photovoltaic Power System Configuration and their Applications Grid-independent PV system for small devices and appliances, PV systems for remote consumers, Decentralized grid-connected PV systems, Centralized grid-connected PV systems.Case studies of energy system optimization – Application - Analysis and design of solar thermal and photovoltaic systems. Stand-alone PV system designing for an isolated place using MATLAB software.	L5, L6	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- Chetan Singh Solanki, Solar Photovoltaics (Fundamentals, Technologies and Application), PHI Publications, 5th Edition.
- Antonio Luque& Steven Hegedus, Handbook of Photovoltaic Science and Engineering, Joh Wiley and Sons

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Relationship between the Course Outcomes (COs) , Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PSO 1**	**PSO 2**	**PSO3**	**PSO4**
CO1	**1**	**3**	**2**	**3**	**1**	**3**	**2**	**-**
CO2	**1**	**2**	**2**	**3**	**1**	**3**	**2**	**-**
CO3	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO4	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO5	**1**	**3**	**2**	**-**	**1**	**3**	**2**	**-**

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RWP4503	SOLAR POWER GENERATION LAB	L	T	P	C
Version 1.1	Date of Approval: 26 June,2020	0	0	2	1
Pre-requisites/ Exposure	Solar PV lab				
Co-requisites	Solar thermal lab				

Course Objectives

The objective of this course is to

- To understand the various aspects of various instruments viz. Lux meter, AC/DC clamp meter, multi-meter, Anemometer, potentiometer etc. by carrying out the experiment on latest technological equipments in the area of interest of the students.
- To describe the basics of operation of solar radiation measurement, wind sped and solar energy absorption and collecting devices.
- To understands and describe the applications of various experimental studies in practical life to analyze the various parameters in the field of solar photovoltaic energy conversion with the help of MATLAB and PVSYST softwares.

Course Outcomes

On completion of this course, the students will be able to

- CO1. To describe the basics of operation of solar radiation measurement, wind sped and solar energy absorption and collecting devices.
- CO2. To examine different areas viz. variation of various pollutants and contaminants present in the atmosphere and the effect of solar radiations falling on various solar photovoltaic energy conversion systems.
- CO3. To understand the component of solar radiation responsible for the working of solar PV technology and investigate the efficiency/performance parameters of all equipments.

Catalog Description

In today's competitive environment an understanding is required which will facilitate the implementation of basic principles, tools and techniques used in the field of solar photovoltaic engineering. This course is designed for the students who want to understand the basics of solar PV and thermal energy conversion engineering. A student is supposed to have a basic knowledge of mathematical modeling and tools. The subject will further enhance the knowledge regarding the various methods and techniques used for solving various problems related to practical designing of solar power systems.

Course Content

Modules	Blooms level*	Number of hours

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Module 1 : Maximum Power Point Tracking Finding MPP by varying the resistive load across the PV panel. Finding MPP by varying the duty cycle of DC-DC converter. Using MPPT algorithm find the V_{max} , I_{max} and P_{max} and duty cycle at which MPP occurs. Perform the experiment (3) with different values of perturbation (delta D) .Observe the response of P_{max} with the P_{max} observed in exp -3. Perform the experiment no 1 to no 4, with battery in the circuit.	L1, L2	10
Module II: • To demonstrate and generate the I-V and P-V Characteristics of PV Module with varying solar radiation level in MATLAB software. • To demonstrate and generate the I-V and P-V Characteristics of PV Module with varying temperature level in MATLAB software. • To demonstrate and generate the I-V and P-V Characteristics of PV Module with varying tilt angles or solar angle of incidences in PVSYST software. • To realize the model of a solar module in MATLAB software and generate its I-V characteristics using single diode model. • To realize the model of a solar module in MATLAB software and generate its P-V characteristics using single diode model. • To study performance analysis of off grid Solar PV Power Plant • To study performance of a solar thermal power plant	L2, L3	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- Solar Photovoltaics (Fundamentals, Technologies and Application) by Chetan Singh Solanki;
- Handbookof Photovoltaic Science and Engineering by Antonio Luque& Steven Hegedus - Wiley; Lecture notes.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Relationship between the Course Outcomes (COs) , Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PSO 1**	**PSO 2**	**PSO3**	**PSO4**
CO1	**1**	**3**	**2**	**3**	**1**	**3**	**2**	**-**
CO2	**1**	**2**	**2**	**3**	**1**	**3**	**2**	**-**
CO3	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO4	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO5	**1**	**3**	**2**	**-**	**1**	**3**	**2**	**-**

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RWP4502	BIOFUELS & BIOMETHANATION	L	T	P	C
Version 1.1	Date of Approval: 25 July, 2016	2	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

The objective of this course are as follows:

- To introduce the concepts essential to the understanding of Biofuel, biomethanation and their production technologies.
- To understands and analyze the designing of a bio-energy thermo-chemical conversion process.
- To examine thermo-chemical energy processes (combustion, gasification, pyrolysis, reforming), mechanical and chemical processes (oil extraction and trans-esterification), finally biochemical processes (fermentation and anaerobic digestion)

Course Outcomes

On completion of this course, the students will be able to

- CO1. To know some practical applications that conceptualizes the framework necessary to understand above thermochemical energy processes (combustion, gasification, pyrolysis, reforming), mechanical and chemical processes (oil extraction and trans-esterification), finally biochemical processes (fermentation and anaerobic digestion)
- CO2. To carry out a basic engineering project related to financial evaluation of renewable energy systems.
- CO3. To understand the basic principles of the designing of a bio-energy thermo-chemical conversion process.
- CO4. This course covers the various aspects of Biofuel, biomethanation and their production technologies.

Catalog Description

At the end of the course the students should be able to understand some practical applications that conceptualizes the framework necessary to understand above thermochemical energy processes (combustion, gasification, pyrolysis, reforming), mechanical and chemical processes (oil extraction and trans-esterification), finally biochemical processes (fermentation and anaerobic digestion).

Course Content

Modules	Blooms level*	Number of hours
Module I- Bio Fuels & Bio Reactors Enzymatic conversion of biomass**,** Enzyme kinetics, Biochemistry and process parameters of bio methanation; Biogas digester types; Digester design and biogas utilization; Economics of biogas plant with their environmental and social impacts; Bioconversion of substrates into alcohol: Methanol & ethanol Production, organic acids, solvents, amino acids, antibiotics etc.	L1, L2	10

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Batch, plug low reactor (PFR), continuous stirred rank reactors (CSTR), fluidized bed reactor bubble column, fixed film reactors, air lift fermenter etc. concept of ideal and non-ideal reactor		
Module II- Design and analysis of Reactors Residence time distribution, models of non-ideal reactor-plug flow reactor for microbial processes, optimization of reactor systems. Multiphase bioreactors –packed bed with immobilized enzymes and or microbial cells. Three phase fluidized bed tricking bed reactor, Design and analysis of above reactor systems.	L2, L3	12
Module III- Bioreactors Gas liquid reactors, unconventional bioreactors like Hollow fiber reactor, membrane reactor, reactors for biofuels. Reactor stability, various biogas reactors.	L3, L4	14
Module IV- Reactor Engineering and its optimization Thermodynamic and stoichiometric aspects of microbial processes, engineering analysis of metabolic pathways, optimization of fermentation media, kinetic modeling of enzyme and microbial processes, mass transfer in bio-chemical processes, scales up concept, bath fed bath and continuous microbial reactors.	L4, L5	12
Module V- Separation technologies and process control Distillation, cryogenic, adsorption and absorption, PSA and membrane separation process, sensors for monitoring bioprocess parameters. Bioprocess control and computer coupled bioreactors. Growth and production formation by recombinant cells.	L3, L4	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- Francisco RosilloCallé, Frank Rosillo-Calle, The Biomass Assessment Handbook: Bioenergy for a Sustainable Environment, PHI Publication,1996.
- Ashok Pandey, Christian Larroche, Steven C. Ricke, Claude-Gilles Dussap, Edgard Gnansounou, Biofuels: Alternative Feedstocks and Conversion Processes, TMH, 2003.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Relationship between the Course Outcomes (COs) , Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PSO 1**	**PSO 2**	**PSO3**	**PSO4**
CO1	**1**	**3**	**2**	**3**	**1**	**3**	**2**	**-**
CO2	**1**	**2**	**2**	**3**	**1**	**3**	**2**	**-**
CO3	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO4	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO5	**1**	**3**	**2**	**-**	**1**	**3**	**2**	**-**

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RWP4504	SMART GRIDS AND RENEWABLES	L	T	P	C
Version 1.1	Date of Approval: 25 July, 2016	2	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

The objective of this course are as follows

- To discuss the current status of smart grid technology and its implementation aspects in India and World.
- To discuss the technical solutions for integrating more large capacity renewable energy in current energy generation scenario.
- To discuss role of Smart Grid in electricity grid connection..
- To identify factors affecting grid integration of renewable energy viz. net-metering, energy costing, automation of energy generation monitoring/control of energy generation by various renewable energy sources.

Course Outcomes

On completion of this course, the students will be able to

CO1. To identify factors affecting grid integration of renewable energy viz. net-metering, energy costing, automation of energy generation monitoring/control of energy generation by various renewable energy sources.

CO2. To know and be able to analyze the behavior of a self-consumption demand and the measurement of network management.

CO3. To carry out a basic engineering project related to energy supply using smart grid and SCADA technology.

CO4. To know the main lines of research in the field of photovoltaic technology and solar energy and to bring innovative ideas in the field of solar photovoltaic energy in smart grid systems.

Catalog Description

This course provides an introduction to how in developed countries, smart grid technologies can be used to upgrade, modernize or extend old grid systems, while at the same time providing opportunities for new, innovative solutions to be implemented.

Course Content

Modules	Blooms level*	Number of hours
Module I: Introduction: Smart Grids and Renewables Making the Transition to a Smarter Grid, Start with Pilot and Demonstration, Projects, Specific Technology Recommendations, Costs and Benefits: Making the Business Case for Smart Grid Technologies, Recognise and Respond to Technological conservatism, Leverage the Need for Private Sector, Investment, Recognise the Continual Nature of Technological Change, Regulation	L1, L2	10
Module II:How Smart Grids Enable Renewables	L2, L3	12

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Smart Grids and Variability, Smart Grids and Distributed Generation, Smart Grids and Capital Intensity, Improved Consumer Information, Control, and Choice, Improved Transmission and Distribution System Monitoring and Control, Integration of New Resources,		
Module III: Nontechnical Barriers to Smart Grids Data Ownership and Privacy, Grid Security, Control of Distributed Resources, The Role of New Private Sector Grid Players, The Need for Standards	L3, L4	14
Module IV:Smart Grid Technologies Advanced Metering Infrastructure, Advanced Electricity Pricing, Demand Response, Distribution Automation, Renewable Resource Forecasting, Smart Inverters, Distributed Storage, Microgrids and Virtual Power Plants, Bulk Power Technologies	L4, L5	12

Text Books

- Smart Grid & Renewables- A Guide for Effective Development- IRENA
- Antonio Luque & Steven Hegedus – Handbook of Photovoltaic Science and Engineering JohnWiley; Lecture notes.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Relationship between the Course Outcomes (COs) , Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PSO 1**	**PSO 2**	**PSO3**	**PSO4**
CO1	**1**	**3**	**2**	**3**	**1**	**3**	**2**	**-**
CO2	**1**	**2**	**2**	**3**	**1**	**3**	**2**	**-**
CO3	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO4	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO5	**1**	**3**	**2**	**-**	**1**	**3**	**2**	**-**

1: strongly related, 2: moderately related and 3: weakly related

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RWP4506	ADVANCED ENERGY SYSTEMS	L	T	P	C
Version 1.1	Date of Approval: Date, Month 2017	2	0	0	4
Pre-requisites/Exposure	B.Sc(Phy/Chemistry/Maths)				
Co-requisites	Basic understanding of Mathematics, Physics & Chemistry				

Course Objectives

The objective of this course is to

1. Provide students with comprehensive and systematic knowledge to support the integration and use of hydrogen, electro-technical power sources and fuel cells in the energy sector. In particular, the module will focus on the opportunities for using hydrogen, how it is produced and fuel cell technology.
2. The course covers the essential understanding for the hydrogen economy and fuel cell technology, in particular the opportunities for using hydrogen; the use of hydrogen in a hydrogen economy; hydrogen production / generation, storage and distribution of hydrogen as a fuel; future potential methods for generating hydrogen based on renewable energy or fuels. The module also addresses thermodynamic & kinetic principles of electrochemical power sources and fuel cells, and current fuel cell technologies available.

Course Outcomes

Having successfully completed this course, students will be able to demonstrate

CO1. Knowledge and understanding of FUEL cells and Hydrogen Energy Generation/ Production , Storage and Transporation in details

- Electrochemical routes to energy conversion
- The relative merits of batteries, fuel cells and redox flow cells
- Explain how a fuel cell works and describe the main components and their function.
- Describe the different fuel cell types with respect to electrolyte and electrode materials, operating temperature, electrode reactions, and applications.
- Explain and implement the relation between cell voltage, power density and efficiency of the fuel cell.
- Calculate an equilibrium potential, and explain and implement the relation between electrode potential, over potential and cell voltage. Describe the different irreversible losses occurring in fuel cells.
- Determine the electric as well as the total efficiency for the fuel cell thermodynamically
- Compare the advantages and disadvantages of different fuel cell types and from this suggest and motivate the choice of a certain fuel cell for a given application.
- Decide what system components (fuel reformer, fuel cell type, power converter etc) that are preferred for a given application, and schematically illustrate such a system

CO2.Subject Specific Intellectual and Research Skills

- Tackle simple problems of theoretical energy conversion
- Relate cell current to materials conversion rates
- Suggest an appropriate fuel cell or battery technology for a particular application

CO3. Transferable and Generic Skills

- Access the literature on fuel cells and write reports on their development
- Appreciate an industrial perspective of technology development
- To develop student's written and communication skills

CO4. Subject Specific Practical Skills

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- Apply knowledge & understanding to the fuel cells and hydrogen energy production, storage and transportation systems into industry
- Listening, identifying learning needs, evaluating sources and data, interpretation of data, problem solving, problem analysis
- To enables students, to develop their analytic and problem solving skill

CO5. Analyze and interpret information in order to communicate solutions to unpredictable and sometimes complex problems in the field of Renewable Energy Sectors

Catalog Description

Fuel-cell, operation, and materials. Electrochemistry and electrocatalysis, various types of Fuel cell technologies (PEM, SOFC, MCFC, AFC, PAFC etc.). nature of fuel-cell electrodes and electrolytes, fuels, and fuel processing. Provides broad insight into fuel-cell science, technology, system design, and operation. A brief idea of various energy storage devices like battery and supercapacitor is also discussed. Hydrogen production technologies with and without CO_2 production as a by-product, hydrogen storage and distribution technologies, basic electrochemical principles of the hydrogen fuel cells, how fuel cells are used for every day purposes: road, water and air transport vehicles, portable and stationary use are also discussed.

Course Content

Modules	Blooms level*	Number of hours
Module I: Fuel Cells: Introduction, electrochemistry, alkaline fuel cells, phosphoric acid fuel cells, solid oxide fuel cells, direct methonal fuel cells, fuel processing, proton exchange membrane fuel cells, fuel processing, hydrogen storage, life cycle assessment of fuel cell systems. Thermodynamics and Performance of Fuel cells and their applications.	L1, L2	10
Module II: Introduction of Hydrogen Energy Systems: Hydrogen pathways introduction – current uses, General introduction to infrastructure requirement for hydrogen production, storage, dispensing and utilization, and Hydrogen production power plants.	L2, L3	6
Module III: Hydrogen Production Processes: Thermal-Steam Reformation – Thermo chemical Water Splitting – Gasification – Pyrolysis, Nuclear thermo catalytic and partial oxidation methods. Electrochemical – Electrolysis – Photo electro chemical. Biological – Photo Biological – Anaerobic Digestion – Fermentative Micro-organisms.	L3, L4	10
Module IV: Hydrogen Storage: Physical and chemical properties – General storage methods, compressed storage – Composite cylinders – Glass micro sphere storage - Zeolites, Metal hydride storage, chemical hydride storage and cryogenic storage.	L4, L5	8
Module V: Hydrogen Utilization: Overview of Hydrogen utilization: I.C. Engines, gas turbines, hydrogen burners, power plant, refineries, domestic and marine applications. Hydrogen fuel quality, performance, COV, emission and combustion characteristics of Spark Ignition engines for hydrogen, back firing, knocking, volumetric efficiency, hydrogen manifold and direct injection, fumigation, NOx controlling techniques, dual fuel engine, durability studies, field trials, emissions and climate change		8
Module VI: Hydrogen Safety: Safety barrier diagram, risk analysis, safety in handling and refueling station, safety in vehicular and stationary applications, fire detecting system, safety management, and simulation of crash tests.		4

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text & References:

- Fuel Cells – Principles and Applications – B. Vishwanathan and M. A. Scibioh
- Introduction to fuel cells and hydrogen technology by Brian Cook

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- Various study materials from NREL & MNRE and International Renewable Energy Agency Reports and other research articles

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	HA	**EE**
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Relationship between the Course Outcomes (COs) , Programme Outcomes (POs) and Program Specific Outcomes
CO, PO and PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**	**PS O4**
CO 1	**1**	**3**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--
CO 2	**1**	--	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--
CO 3	**1**	**3**	--	--	--	--	--	--	--	--	--	--	**1**	--	--	--
CO 4	**1**	**2**	**3**	--	--	--	--	--	--	--	--	--	**1**	--	--	--

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RWP4601	ENERGY POLICY	L	T	P	C
Version 1.1	Date of Approval: Date, Aug 2016	1	0	0	3
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

The course aims at imparting knowledge about the different national policies, regulations and guidelines given by the government for installing a PV system. It provides the knowledge of the approval requirements and safety regulations given by the State.

Course Outcomes

On completion of this course, the students will

CO1. Know about global energy scenario, RE global market and its growth

CO2. Requirement of energy policy and its components

CO3. Know the policy instruments and the methodology to evaluate energy policy

CO4: knowledge of various treaties

Catalog Description

"Energy policy is the manner in which a given entity (Government of India) decides to address issues of energy development including energy production, distribution and consumption. The attributes of energy policy may include legislation, international treaties, incentives to investment, guidelines for energy conservation, measures for environmental protection, taxation and other public policy techniques."

Therefore, the course aims to sensitize students on:

- The important role of energy in industrial, and economic development of the country and in providing a better quality of life to people
- The present and projected energy scenarios in the country depicting the energy requirements, availability, dependence on imports, resource & technological constraints, socioeconomic issues etc
- Need for an appropriate energy policy in the country based on the major driving forces influencing our policy such as rapidly growing economy, exponential growth in energy demand, limited indigenous fossil fuel reserves, meager contribution from renewable energy sources, large importer of energy and increasing emissions from energy use
- Energy policy issues of energy independence, energy security, sustainable development, energy conservation, subsidy and taxation etc.
- Energy use has detrimental effects on environment- students will be apprised about the ill effects and the control measures required and the international protocols in vogue

Course Content

Modules	Blooms level*	Number of hours
Module 1 : Renewables In The Global Energy Economy: Today And Tomorrow Introduction, Leading Renewable Energy Resources and its growth, RE global market, Resources and Technology Summaries, Energy Policy-Purpose, Perspective, Contents and Formulation: Contents of energy policy, Features of good policy making, Drivers of energy policy, Policy instruments, Environmen-	L1, L2	12

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tal, Social and Economic Considerations, Energy-Environment Linkage, pollutants from energy uses and control measures, Greenhouse Gases, Greenhouse Effect, Global Warming, Climate Change.		
Module II: Energy and Welfare Economics Evaluation of policy instruments, Energy return on investment, Concept of welfare economics, Energy goods and energy services, Renewable Energy in Developing Countries, World Energy Council Action Plan.	L2, L3	12
Module III: Renewable Energy Policy Frame work Importance of renewable energy policies, avantages and interaction with other policies ; Designing a regulatory/support mechanism: approaches and types ; regulatory policies, country specific case study. Renewable energy (RE) market, RE targets, RE support policies comparison, RE and Energy Efficiency action plans, national RE action plan, national EE action plan, case studies.	L3, L4	12
Module IV :Regulations and Guidelines Identification of relevant statutory regulations of India and other countries-Electricity Act, National Electricity Policy, Tariff Policy, National Mission for Enhanced Energy Efficiency; Inter Governmental Panel on Climate Change (IPCC), Montreal Protocol, Kyoto Protocol, Emission Trading, Clean Development Mechanism, National Action Plan on Climate Change (NAPCC), National Solar Mission (NSM), National Mission on Enhanced Energy Efficiency (NMEEE), **National Mission on Sustainable Habitat (NMSH), Paris Agreement**	L4, L5	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. India Energy Policy, Laws and Regulations Handbook, By IBP, Inc
2. Europe Renewable Energy Policy Handbook 2015

Reference Books

1. Report of the Expert Group on Integrated Energy Policy, Planning Commission
2. Web sites of Ministries of Coal, Petroleum, MNRE, IREADA, MOEF, PCRA, BEE, DAE, Planning Commission, GEF, IPCC
3. India Energy Book 2007, World Energy Council,
4. Energy policies of IEA countries, special 30th Anniversary edition, International Energy Agency
5. France's Energy Policy
6. India's Energy Security, Edited by Ligia Noronha and Anant Sudarshan, Routledge, ISBN 13:978-0-415-46838-8
7. Energy Issues and options for developing countries, published for and on behalf of United Nationa, Taylor & Francis, ISBN 0-8448-1578-0

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

Relationship between the Course Outcomes (COs) , Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	PO 2	PO 3	PO 4	PSO 1	PSO 2	PSO3	PSO4
CO1	1	3	2	3	1	3	2	-
CO2	1	2	2	3	1	3	2	-
CO3	1	2	2	-	1	3	2	-
CO4	1	2	2	-	1	3	2	-
CO5	1	3	2	-	1	3	2	-

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RWP4602	ENERGY MANAGEMENT	L	T	P	C
Version 1.1	Date of Approval: Date, Month 2016	2	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

The objective of this course is to

1. To develop the knowledge and understanding of renewable energy economics both rural and urban including energy management, auditing and policies.
2. To demonstarte a comprehensive knowledge and understanding of the Economic Benefits of Solar Energy, cost effectiveness including concepts of solar panels, solar cooling etc. To understands the concept of Solar Industrial Economics and as an alternative source of future energy including integration with industrial process as well as with grid, storage of energy, economics.
3. To develop the knowledge and understanding of Planning of Energy Efficient Building with the concept of solar heating systems.

Course Outcomes

On completion of this course, the students will be able to

CO1. Demonstrate a critical understanding of Energy economics including both rural and urban, environmental and energy policies.

CO2. Address the desirable features of Energy management and auditing (energy audit instruments, energy audit report writing).

CO3. Demonstrate the ability to investigate critically the knowledge about economic Benefits of Solar Energy and cost effectiveness as well as to understand the concept of Solar Industrial Economics

CO4. To develop the concept of Planning of Energy Efficient Building and its design with the understanding of both active and passive solar heating systems.

Catalog Description

This course covers the basic principles of energy management, economics of solar energy and design of energy efficient building.

Course Content

Modules	Blooms level*	Number of hours
Module I: Renewable Energy Economics Energy scenario, environmental policies, energy policies, economics of energy infrastructure, rural renewable energy economics.	L1, L2	10
Module II: Energy Management & Audit Energy management: objectives, necessary steps and general principles of energy agement, Energy Manager: functions, qualities, duties and guidelines. Energy Au Surveying, Audit: Purpose, Definition and Objectives, types of energy audit-preli and detailed; questionnaire, energy audit instruments, energy audit report writing.	L2, L3	12

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conservation schemes, energy index, cost index, pie charts, Sankey diagrams, loa files (histograms)		
Module III: Economic Benefits of Solar Energy Solar energy benefits, environmental benefits, solar energy cost and economic impact, understanding the cost of solar energy, economics of installing solar panel, solar cooling concepts and economic benefits.	L3, L4	14
Module IV: Solar Industrial Economics Solar power plants, integration with industrial process, integration with grid, storage of energy, economics.	L4, L5	12
Module V: Planning of Energy Efficient Building Green building design, solar heating, passive solar heating homes and concepts, other lightening methods, use of bio-energy; energy, water and material efficiency, cost analysis. Various Energy Efficiency Rating Systems for Buildings- LEEDS, BEE & GRIHA, case study.	L4,L5	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation
ExaminationScheme:

Components	CT(2)	Assignment	V(1)	Attendance	EE(1)
Weightage (%)	15	5	5	5	70

Text & References:
1. Godfrey Boyle, Renewable Energy: Power For A Sustainable Future, Second Ed. ,2005.
2. J. A. Duffie, W. A. Beckman , Solar Engineering Of Thermal Processes.
3. Handbook on Energy Audit and Environment Management: YP Abbi and Shashank Jain, (TERI Press, 2006)

Relationship between the Course Outcomes (COs) , Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	PO 2	PO 3	PO 4	PSO 1	PSO 2	PSO3	PSO4
CO1	**1**	**3**	**2**	**3**	**1**	**3**	**2**	**-**
CO2	**1**	**2**	**2**	**3**	**1**	**3**	**2**	**-**
CO3	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO4	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO5	**1**	**3**	**2**	**-**	**1**	**3**	**2**	**-**

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RWP4403	GREEN BUILDINGS	L	T	P	C
Version 1.1	Date of Approval: 25 July, 2016	2	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

The objective of this course is to

- To make students understand about the various designing aspects of green buildings .
- To covers the challenges, technology and application of protocols and standards of designing the green buildings using passive sources for heating and cooling.

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand the policies, protocols and rating agencies of green buildings.
CO2. Learn about certification guidelines of LEED, GRIHA, IGBC and BEE in the area of green buildings.
CO3. Various factors that affect the designing parameters, economical aspects and socio-economical constraints of design, operation and maintenance of green buildings.
CO4. To introduce the policy and protocols for certification of green buildings in real world.

Catalog Description

This course covers the challenges, technology and application of green buildings covering designing parameters, economical aspects and socio-economical constraints of design, operation and maintenance in longer term.

Course Content

Modules	Blooms level*	Number of hours
Module I: Climate Introduction, Climate & its Component, Factor Affecting Climate, Climatic Zones and their characteristics, Urban Climate, Microclimate.	L1, L2	12
Module II: Green Building- Concepts, Design and Performance. Building, Implications of climate on building design, Green Buildings, Objective & Essential Characteristics of Green Buildings (i.e. Building Envelope, Passive Heating, Passive Cooling, Day lighting, Building Materials, Heat Transfer, Solar Radiation, Simplified Method for Performance Estimation), solar rooftop, solar water heating	L2, L3	12
Module III: Green Building Rating System Various green building rating National and International stage, USGBC, IGBC, GRIHA, BREAM, STAR RATING.	L3, L4	12

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Module IV: Policies & Examples Different policies (National & International), Energy Conservation Act 2005, ECBC, BEE Different example at National and International stage	L4, L5	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- J. W. Twidell, T Weir, Renewable energy resources, 3rd edition, Routledge, Taylor and Francis group, 2015
- G. N. Tiwari , Solar Energy: Fundamentals, design, modeling and applications, Narosa, 2002. ISBN-10: 0849324092
- V.V. N. Kishore, Renewable Energy Engineering and Technology: Principles and Practice, The Energy and Resources Institute, TERI, 2010. ISBN-10: 9788179932216.

Reference Books

- Sustainable Building Design Book edited and published by SB05 TOKYO
- Green Building – Guidebook for Sustainable Architecture Authored By Michael Bauer
- Climate Responsive Architecture: A Design Handbook for Energy Efficient Buildings Authored Arvind Krishan

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Relationship between the Course Outcomes (COs) , Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PSO 1**	**PSO 2**	**PSO3**	**PSO4**
CO1	**1**	**3**	**2**	**3**	**1**	**3**	**2**	**-**
CO2	**1**	**2**	**2**	**3**	**1**	**3**	**2**	**-**
CO3	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO4	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO5	**1**	**3**	**2**	**-**	**1**	**3**	**2**	**-**

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RWP4637	DISSERTATION /SEMINAR & PROGRESS REPORT /COMPREHENSIVE VIVA	L	T	P	C
Version 1.1	Date of Approval: 14 July 2016	0	0	0	10
Pre-requisites/ Exposure					
Co-requisites					

Course Objectives

The objective of this course is to

- To emphasize on the importance of practical experience in life is integral part of learning of the various concepts of set up of renewable energy systems.
- To describe the basics of designing and innovative idea reproduction ethics.
- To examine different industrial areas viz. biomass energy conversion technologies, green building aspects in the energy sector, solar power plants and develop to select appropriate methodologies from the range of different technologies
- To understands and describe the payback period, investment cost and cost effectiveness of renewable energy compared with traditional sources.
- To start a step stone in the direction of make students think like entrepreneurs and energy auditors/managers.
- The students pursue three months industrial training dealing in the area of renewable energy and present their comprehensive learning for evaluation.

Course Outcomes

On completion of this course, the students will be able to

- CO1. To examine different industrial areas viz. biomass energy conversion technologies, green building aspects in the energy sector, solar power plants and develop to select appropriate methodologies from the range of different technologies
- CO2. To emphasize on the importance of practical experience in life is integral part of learning of the various concepts of set up of renewable energy systems.

CO3. The students pursue three months industrial training dealing in the area of renewable energy and present their comprehensive learning for evaluation.

Catalog Description

In today's competitive environment an understanding is required which will facilitate the implementation of basic principles, tools and techniques used in the field of solar photovoltaic engineering. This course is designed for the students who want to understand the basics of solar PV and thermal energy conversion engineering. A student is supposed to have a basic knowledge of mathematical modeling and tools. The subject will further enhance the knowledge regarding the various methods and techniques used for solving various problems related to practical designing of solar power systems.

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

	REPORT	**PRE-SENTSA-TION**	**VIVA**	**ANALY-SIS**	**CONTENT**
	30	30	10	15	15

Relationship between the Course Outcomes (COs) , Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PSO 1**	**PSO 2**	**PSO3**	**PSO4**
CO1	**1**	**3**	**2**	**3**	**1**	**3**	**2**	**-**
CO2	**1**	**2**	**2**	**3**	**1**	**3**	**2**	**-**
CO3	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO4	**1**	**2**	**2**	**-**	**1**	**3**	**2**	**-**
CO5	**1**	**3**	**2**	**-**	**1**	**3**	**2**	**-**

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AEROSPACE ENGINEERING

Programme Structure-2022

Course Code	Course Title	Lecture (L) Hours Per	Tutorial (T) Hours Per Week	Practical (P) Hours Per	Total Credits
ASE2153	Elements of Aeronautics	3	-	-	3
ASE2253	Elements of Astronautics	3	-	-	3
ASE2353	Theory of Flight	3	-	-	3
ASE2453	Principles of Stability and Control	3	-	-	3
ASE2553	Introduction to Flight Vehicle Design	3	-	-	3
ASE2653	Principles of Aerospace Propulsion	3	-	-	3
	TOTAL				**18**

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AEROSPACE ENGINEERING

Syllabus – First Semester

ASE2153	Elements of Aeronautics	L	T	P	C
Version 2019-1	Date of Approval: May 2019	3	0	0	3
Pre-requisites/ Exposure	Physics, Engineering Mechanics, Chemistry				
Co-requisites					

Course Catalog

This course provides basic knowledge and understanding of various kinds of flight vehicles and their classifications based on various aspects. Knowledge of basic physics is crucial to comprehend the contents of this course. This course also provides introductory knowledge to the students about various components and systems of flight vehicles which serve as a foundation for better understanding of advanced course.

Course Objectives

The objective of this course is to

1. Provide introductory knowledge to the students regarding the basic science and principles as applicable to various flight vehicles and their structure.
2. Provide education to the students about the aerodynamics, propulsion, and systems of different types of flight vehicles.

Course Outcomes

On completion of this course, the students will be able to

CO1. List, explain, and categorize amongst various kinds of flight vehicles and their design.
CO2. List, explain, and compare amongst various structural components of flight vehicles and loads acting on them.
CO3. List, explain, categorize, and apply the basic concepts of flight and properties of atmosphere.
CO4. List, explain, categorize, and apply the basic concepts of propulsion and propulsion systems.
CO5. List, explain, categorize, and apply the basic concepts of various types of aerospace systems and instrumentations.

Course Content:

Modules	Blooms level*	Number of hours
Module 1: Introduction to Flight Vehicles History and development of flying machines; Classification of flight vehicles; Introduction to prominent design features of - Airplanes, helicopter and other flying machines.	L1, L2, L4	7

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Module 2: Aerospace Structure Importance of Strength/Weight Ratio of Materials; Monocoque, Semi-Monocoque and Truss Type Construction; Detailed Description of the Fuselage, Wing and Tail Structures; Loads on Different Parts of the Aerospace Vehicles; Types of Undercarriages.	L1, L2, L4	7
Module 3: Principles of Flight International Standard Atmosphere; Relationship between Temperature, Pressure and Altitude; Bernoulli's Principle; Propagation of Sound; Mach Number; Aerodynamic forces and moments on airfoil; Lift and drag; Roll, Pitch and yaw, Wing Planform; Control surfaces.	L1, L2, L4	7
Module 4: Principles of Propulsion Newton's Third Law of Motion and its Application in Propulsion; Propulsive Force; Air-Breathing Propulsion; Types of Air-Breathing Engines; Rocket Propulsion; Thrust Equation; Propulsion System Design Criteria.	L1, L2, L4	8
Module 5: Aerospace Systems and Instrumentation Introduction to Mechanical, Electrical and Avionics Systems; Conventional Control; Powered Control; Actuation Systems; Environmental Control Systems; Air Data Systems; Communication Systems; Navigation Systems.	L1, L2, L4	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books:

Text:

- A. C. Kermode, "Mechanics of Flight", 11th Edition, Prentice Hall, 2006.
- A. C. Kermode, "Aeroplane Structures", 2nd Edition, Pitman Publications, UK, 1986.
- M. J. Kroes, J. Rardon, M. Nolan, "Aircraft Basic Science", 8th Edition, McGraw-Hill Education, 2013.
- J. D. Anderson Jr., "Fundamentals of Aerodynamics", 5th Edition, McGraw Hill Education, 2010.
- E. L. Houghten, P. W. Carpenter, "Aerodynamics for Engineering Students", 5th Edition, Butterworth-Heinemann, 2003.

Reference:

- M. J. Kroes, T. W. Wild, "Aircraft Power Plants", 7th Edition, McGraw Hill Education, 1994.
- I. E. Treager, "Aircraft Gas Turbine Engine Technology", 3rd Edition, McGraw Hill Education, 2017.
- J. G. Bertin, R. M. Cummings, "Aerodynamics for Engineers", 6th Edition, Pearson Education, 2013.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1
CO2	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1
CO3	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1
CO4	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1
CO5	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1

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Syllabus – Second Semester

ASE2253	Elements of Astronautics	L	T	P	C
Version 2019-1	Date of Approval: May 2019	3	0	0	3
Pre-requisites/ Exposure	Elements of Aeronautics				
Co-requisites					

Course Catalog

This course deals with the techniques of numerical analysis, which gives the solution to applied problem when ordinary analytical method fails. The given techniques can be used in design of engineering and scientific problems. This course provides the basic knowledge and fundamentals related to the concepts of engineering mathematics, errors and approximation theory, interpolation, graph fitting and statistical computation.

Course Objectives

The objective of this course is to

1. Provide an understanding to the students about the space, celestial bodies, trajectories, orbits, and orbital mechanics.
2. Equip the students with knowledge about various types of rockets, satellites and spacecraft, their crucial systems and subsystems.

Course Outcomes

On completion of this course, the students will be able to

CO1. List and explain the various peculiarities and properties of space, celestial bodies, manned and unmanned spaceflight.

CO2. State and explain elements, principles and laws associated with the motion of orbiting bodies.

CO3. Define, explain and compare amongst the various elements and properties related to maneuvering of artificial satellites in orbits.

CO4. List, explain, distinguish and compare amongst the different types of rockets and satellites, their design and operation.

CO5. Define, explain, distinguish and compare amongst the different systems and subsystems of spacecraft.

Course Content:

Modules	Blooms level*	Number of hours
Module 1: Introduction Planet/Solar Systems; History of Spaceflight; Peculiarities of Space Environment, Challenges in Space Environment; Interstellar Flights; Manned Space Missions.	L1, L2	7

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Module 2: Orbital Principles Motion of Planets and Satellites; History of Various Models; Trajectory and Orbits; Circular and Elliptical Orbits; Orbital Elements and Properties; Kepler's Laws of Planetary Motion and Proof of the Laws; Newton's Universal Law of Gravitation; Total Energy of an Orbiting Body; Orbital Velocity.	L1, L2	7
Module 3: Orbital Maneuvers Orbit Establishment; Orbital Perturbations and Corrections; Orbital Maneuvers; Single-Impulse Maneuvers; Delta-V and Delta-V Requirements; Hohmann Transfer; Simple Plane Changes.	L1, L2, L4	7
Module 4: Rockets and Satellites Rockets; Missiles; Satellite Launch Vehicles; PSLV, GSLV; Propellant & Rocket Propulsion Systems; Thermal Protection; Natural and Artificial Satellites; Different Types of Satellites; Communication Satellites; Radio Wave Propagation, Modulation And Demodulation; Remote Sensing Satellites.	L1, L2, L4	7
Module 5: Spacecraft Systems Spacecraft Launch Site Selection; Attitude Reference and Control Subsystem; Power Subsystem; Thermal Subsystem; Propulsion Subsystem; Onboard Computer Subsystem.	L1, L2, L4	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books

Text:

- A. K. Maini, V. Agrawal, "Satellite Technology, Principles and Applications", 3rd Edition, Wiley, 2014.
- P. Fortescue, G. Swinerd, J. Stark, "Space Systems Engineering", Wiley, 2011.
- S. G. Gould, "Getting Started with Amateur Satellites", 2003.

Reference Books

- B. G. Evans, "Satellite Communication Systems", 3rd Edition, The Institution of Engineering and Technology, 1999.
- B. A. Campbell, S. W. McCandless, "Introduction to Space Sciences and Spacecraft Applications", Gulf publishing, 1996.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance; CT: Class Test; S/V/Q: Seminar/Viva/Quiz; HA: Home Assignment; EE: End Semester Examination

CO, PO and PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1
CO2	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1
CO3	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1
CO4	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1
CO5	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1

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Syllabus – Third Semester

ASE2353	Theory of Flight	L	T	P	C
Version 2019-1	Date of Approval: May 2019	3	0	0	3
Pre-requisites/ Exposure	Physics, Elements of Aeronautics				
Co-requisites					

Course Catalog

This course contains Fundamental characteristics of standard atmosphere which are crucial for aerodynamic characteristics of airfoil and airplane. The course is designed to make students to understand aerodynamic forces and moments in steady, accelerated flight and in maneuvers for different flight modes and conditions.

Course Objectives

The objective of this course is to

1. Provide an insight to students about the characteristics of atmosphere.
2. Equip students about different forces on airfoil and wing due to immersion in free stream of air in flight.

Course Outcomes

On completion of this course, the students will be able to

- **CO1.** Define and explain parameters of International Standard Atmosphere.
- **CO2.** State, explain and apply the physical principle in estimation of aerodynamic drag over flight vehicles.
- **CO3.** Describe, apply and analyze the aerodynamic characteristics over airfoils and wings of flight vehicles.
- **CO4.** Explain and apply the basic equations and principles to analyze the airplane mechanics in steady flight.
- **CO5.** Explain and apply the basic equations and principles to analyze the airplane performance in accelerated flight and maneuvers.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Standard Atmosphere Standard atmosphere, pressure, temperature and density altitudes, Relation for stratosphere and troposphere, Stability of atmosphere, Measurement of air-speed: true airspeed, indicated airspeed and equivalent airspeed, Airspeed indicator	L1, L2	7
Module 2: Aerodynamic Drag Drag and its effects, Types of drag and affecting factors, Drag polar, Compressibility drag, Design for minimum drag, Terminal velocity	L1, L2, L3	7

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Module 3: Aerodynamic Characteristics Force and Moments coefficients, dimensional analysis, Pressure distribution over 2D airfoil, Variation with angle of attack, Center of pressure, Aerodynamic center and connected problems, Lift, Drag and moment coefficients; Relations between lift and drag, Effect of span, Aspect ratio, plan form, sweep, taper and twist on aerodynamic characteristics of a lifting surface.	L2, L3, L4	7
Module 4: Airplane Mechanics in Steady Flight Straight and Level flight, stalling speed; Variation of drag with flight, Speed conditions for minimum drag, minimum power conditions; Gliding flight, Sinking speed, Minimum sinking speed, Time of descent, Climbing flight Time to flight, Maximum rate of climb.	L2, L3, L4	7
Module 5: Airplane Performance in Accelerated Flight Take-off and landing, Calculations of take-off ground run, Take-off distances, Minimum ground run, assisted take-off, Calculation of landing ground run, Range and endurance and problems, Turning flight.	L2, L3, L4	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books:

Text:

- D. O. Dommasch, S. S. Sherby & T. F. Connolly, "Airplane Aerodynamics", 4th Ed. Pitman Publishing Group, 1998.
- E. L. Houghton and A. E. Brock, "Aerodynamics for Engineering Students", Edward Arnolds, 1986.
- R. S. Shevell, "Fundamentals of Flight", 3rd Ed. Prentice Hall, 1999.
- J. D. Anderson, "Introduction to Flight", McGraw Hill, 3rd Ed, 2004.

References:

- J. J. Bertin and M. L. Smith, "Aerodynamics for Engineers", 2nd Ed., Prentice Hall.
- C. D. Perkins, and R. E. Hage, "Airplane Performance, Stability and Control", John Wiley, 1949.

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

CO, PO, PSO Mapping

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CO2	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1
CO3	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1
CO4	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1
CO5	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1

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Syllabus – Fourth Semester

ASE2453	Principles of Stability & Control	L	T	P	C
Version 2019-1	Date of Approval: May 2019	3	0	0	3
Pre-requisites/ Exposure	Introduction to Aerospace Engineering, Flight Mechanics, Low Speed Aerodynamics				
Co-requisites					

Course Catalog

This course provides the fundamental knowledge of stability and control of an aircraft. Students will understand the importance of different components of an aircraft in providing stability and giving control to aircraft motion. This course also provides understanding of mathematics behind the designing of aircraft and its components. The content of this course serves as a foundation for advance course of aircraft designing.

Course Objectives

The objective of this course is to

1. Provide understanding of various aspects of stability of an aircraft in flight and how geometric features of control surfaces and their proper angular movements achieve it.
2. Provide an analytical understanding of longitudinal, lateral and directional stability and measures that can be taken to control the same.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define and explain the concepts of stability and control as applicable to flight vehicles.
CO2. Define, explain, apply and compare the various fundamentals and aspects of stick fixed static longitudinal stability.
CO3. Define, explain, apply and compare the various fundamentals and aspects of stick free static longitudinal stability.
CO4. Define, explain, apply and compare the various fundamentals and aspects of directional stability and control of flight vehicles.
CO5. Define, explain, apply and compare the various fundamentals and aspects of lateral stability and control of flight vehicles.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Introduction Overview of Static and Dynamic Stability of Flight Vehicles; Positive, Negative and Neutral Stability; Types of Moments; Role of Tailplane in Stability and Balancing of Aircraft;	L1, L2	7

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Module 2: Stick Fixed Static Longitudinal Stability Introduction to Stick Fixed Longitudinal Stability; Conditions for Longitudinal Stability; Contribution of Wing and Tail; Neutral Point; Centre of Gravity Limits; In-flight Measurement of Stick Fixed Neutral Point.	L1, L2, L3, L4	8
Module 3: Stick Free Static Longitudinal Stability Control Surface Hinge Moments; Floating and Restoring Tendencies; The Tab; Effect of Free Elevator on Airplane Stability; Elevator Control Force; Stick Force Gradients; Neutral Point; Controls Free Center of Gravity Limit; In-Flight Measurement of Stick Free Neutral Point.	L1, L2, L3, L4	7
Module 4: Directional Stability and Control Asymmetric Flight; Feather Cock Stability; Conditions for Directional Stability; Contribution of Wing and Tail; Rudder Fixed and Rudder Free Static Directional Stability.	L1, L2, L3, L4	7
Module 5: Lateral Stability and Control Dihedral Effect, Conditions for Lateral Stability; Contribution of Wing and Tail; Aileron Control Power, Adverse Yaw; Roll Control.	L1, L2, L3, L4	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books:

Text:

- C. D. Perkins, R. E. Hage, "Airplane Performance Stability and Control", John Wiley & Sons, 1949.
- B. Dickinson, "Aircraft Stability and control for Pilots and Engineers", Pitman, 1968.
- B. N. Pamadi, "Performance, Stability, Dynamics and Control of Airplanes", 2nd Edition, American Institute of Aeronautics & Astronautics, 2004.
- R. Nelson, "Flight Stability and Automatic Control", McGraw Hill Education, 2017.

Reference:

- M. V. Cook, "Flight Dynamics Principles: A Linear Systems Approach to Aircraft Stability and Control", Wiley, 1997.
- J. Roskam, "Airplane Flight Dynamics and Automatic Flight Controls", Roskam Aviation and Engineering Corporation, 2001.
- B. Etkin, L. D. Reid, "Dynamics of Flight: Stability and Control", 3rd Edition, Wiley, 1995.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1
CO2	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1
CO3	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1
CO4	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1
CO5	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1

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Syllabus – Fifth Semester

ASE2553	Introduction to Flight Vehicle Design	L	T	P	C
Version 2019-1	Date of Approval: May 2019	3	0	0	3
Pre-requisites/ Exposure	Introduction to Aerospace Engineering, Flight Mechanics, Low Speed Aerodynamics				
Co-requisites					

Course Catalog

This course provides basic knowledge and understanding of various aspects and processes of aircraft design. This course provides in-depth knowledge to the students about flow process of carrying out the designing of aircraft, its associated loads and the safety requirements. Based on this course, students will be able to investigate new and emerging design aspects

Course Objectives

The objective of this course is to

1. Provide introductory knowledge to the students regarding the fundamentals of aircraft designing and its structural analysis
2. Provide education to the students about the concepts of different structural members and various associated loads

Course Outcomes

On successful completion of this course, the students will be able to

CO1. List and describe the basics of aircraft system design and aircraft structures
CO2. Identify, explain and analyze the applicability of design aspects and different aircraft loads.
CO3. Identify and explain the design considerations of wings and high lift devices.
CO4. Identify, correlate and apply the numerical and theoretical knowledge to investigate new and emerging design aspects

Course Content

Modules	Blooms level*	Number of hours
Module 1: Introduction Aircraft design, requirements and specifications, Different design phases, Importance of each phase. Weight, its importance. Aerodynamic and structural design considerations. Classifications of airplane.	L1, L2	8
Module 2: Air Loads during Flight Ground Loads, Airframe loads, maneuvering loads in flight, Load factor, V-n diagram, gust loads, and estimation of gust loads.	L1, L2, L4	6
Module 3: Wing Design Consideration Selection of airfoil and planform. Span wise air loads variation, BMD and SFD. Weight distribution.	L1, L2	8

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Module 4: High Lift Systems Airfoil's maximum lift coefficient, leading and trailing edge devices, effect of sweep back. Stall and the deep stall. Effect of Re, V/STOL configurations.	L1, L2	7
Module 5: Conceptual Design of Airplane & Layout Preparation of 3-views and layout. Estimation of take-off, landing, climbing and cruise performance. Flight envelope.	L1, L2, L3	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books:

Text:

- D.P. Raymer, "Airplane Design-A Conceptual Approach", 3rd Edition, AIAA Education Series, 1999.
- D. Stinton, "The Design of Airplane", 1st edition, Granada, UK, 2000.

References:

- L.M. Nikolai, "Fundamentals of Aircraft Design", 2nd Edition, Univ. of Dayton Ohio, 1975.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1
CO2	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1
CO3	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1
CO4	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1
CO5	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1

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Syllabus – Sixth Semester

ASE2653	Principles of Aerospace Propulsion	L	T	P	C
Version 2019-1	Date of Approval: May 2019	3	0	0	3
Pre-requisites/ Exposure	Elements of Aeronautics, Elements of Astronautics				
Co-requisites					

Course Catalog

This course covers the fundamentals of spacecraft propulsion and discusses advanced concepts in space propulsion ranging from chemical to electrical engines. Topics include conventional and advanced propulsion systems, physics and engineering of spacecraft propulsion, and various schemes for accelerating propellants.

Course Objectives

The objective of this course is to

1. Provide introductory knowledge to the students regarding the basic science and principles as applicable to various flight vehicles and their structure.
2. Provide education to the students about the aerodynamics, propulsion, and systems of different types of flight vehicles.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define, explain, and apply the different theoretical aspects and associated mathematical principles to spacecraft propulsion.

CO2. List, explain, and compare amongst various types, systems and subsystems of chemical propulsion.

CO3. Outline, describe, and contrast amongst various types, systems and subsystems of electric propulsion.

CO4. Identify, explain, and compare amongst various types, systems and subsystems of nuclear propulsion.

CO5. List, summarize and contrast amongst the different advanced propulsion concepts for interstellar travels.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Introduction to Spacecraft Propulsion Overview of Spacecraft Propulsion; Basic Theory of Thermal Jet/Rocket Engines; Launch Vehicle Selection; Newton's Third Law and Rocket Equation; Tsiolkovsky's Rocket Equation.	L1, L2, L3	6

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Module 2: Chemical Propulsion Basic Configuration of -Liquid Propellant Engines; Types and Examples; Solid Propellant Rockets; Types and Examples; Hybrid Rocket Motors; Types and Examples; Cryogenic Engines; Types and Examples; Specific Impulse; Propulsive Efficiency.	L1, L2, L4	6
Module 3: Electric Propulsion Overview of Electric Propulsion; Basics and Classification; Principles of Electric Propulsion; Electrothermal Thrusters; Electrostatic Thrusters; Electromagnetic Thrusters; Electrical Power Generation; Applications of Electric Propulsion.	L1, L2, L4	9
Module 4: Nuclear Propulsion Nuclear Propulsion Basics; Nuclear Fission Concept; Principle of Nuclear Thermal Propulsion; Fuel Elements; Exhaust Velocity of Nuclear Thermal Rocket; Radiation; Potential Applications; Operational Issues.	L1, L2, L4	9
Module 5: Advanced Concepts Interstellar Distances; Energy Requirements; Propulsion Systems requirements; Improving Efficiency; Single Stage to Orbit; Air-breathing Engines.	L1, L2, L4	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books:

Text:

- G. P. Sutton, O. Biblarz, "Rocket Propulsion Elements", 7th Edition, John Wiley & Sons, Inc., 2001.
- M. J. L. Turner, "Rocket and Spacecraft Propulsion", 3rd Edition, Praxis Publishing, Springer, 2009.

Reference:

- A. K. Gupta, D. G. Lilley, "Advances in Chemical Propulsion", CRC Press, 2001.
- G. C. Oates, "Aerothermodynamics of Gas Turbine and Rocket Propulsion", 3rd Edition, American Institute of Aeronautics and Astronautics, Inc., 1997.
- M. Tajmar, "Advanced Space Propulsion Systems", Springer Science & Business Media, 2012.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1
CO2	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1
CO3	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1
CO4	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1
CO5	-	-	-	-	-	3	-	-	3	2	2	1	-	-	2	1

1: strongly related, 2: moderately related and 3: weakly related

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ARTIFICIAL INTELLIGENCE

Programme Structure

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits
CSE2351	Basics of Artificial Intelligence	3	-	-	3
CSE2451	Artificial Neural Networks	3	-	-	3
CSE 2551	Fuzzy Logic	3	-	-	3
CSE2651	Introduction to Genetic Algorithm	3	-	-	3
CSE2751	Soft Computing	3	-	-	3
CSE2851	Project (Artificial Intelligence)	3	-	-	3
	TOTAL				**18**

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ARTIFICIAL INTELLIGENCE

Syllabus

BASICS OF ARTIFICIAL INTELLIGENCE

Course Code: CSE2351 **Credit Units: 03**

Course Objective:
To develop semantic-based and context-aware systems to acquire, organize process, share and use the knowledge embedded in multimedia content. Research will aim to maximize automation of the complete knowledge lifecycle and achieve semantic interoperability between Web resources and services. The field of Robotics is a multi disciplinary as robots are amazingly complex system comprising mechanical, electrical, electronic H/W and S/W and issues germane to all these.

MODULE- I
AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

MODULE-II
Searching- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A* ,AO* Algorithms, Problem reduction, Game Playing-Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions**.**

MODULE-III
Knowledge representation issues, predicate logic- logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty, review of probability, Baye's probabilistic interferences and dempstershafer theory.

MODULE- IV
First order logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, Learning from observation Inductive learning,Decisiontrees,Explanationbasedlearning,Statistical Learning methods ,Reinforcement Learning.

MODULE- V
Expert systems:- Introduction, basic concepts, structure of expert systems, the human element in expert systems how expert systems works, problem areas addressed by expert systems, expert systems success factors, types of expert systems, expert systems and the internet interacts web, knowledge engineering, scope of knowledge, difficulties, in knowledge acquisition methods of knowledge acquisition, machine learning, intelligent agents, selecting an appropriate knowledge acquisition method, societal impacts reasoning in artificial intelligence, inference with rules, with frames: model based reasoning, case based reasoning, explanation & meta knowledge inference with uncertainty representing uncertainty.

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Reference Books:-

1. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", SecondEdition, Pearson Education
2. David Poole, Alan Mackworth, Randy Goebel, "Computational Intelligence : a logical approach", Oxford University Press.
3. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problemsolving", Fourth Edition, Pearson Education.
4. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers.

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ARTIFICIAL NEURAL NETWORKS

Course Code: CSE2451 **Credit Units: 03**

Module-I

Artificial Neural Networks (ANN) and their biological roots and motivations. ANNs as numerical data/signal/image processing devices.a summing dendrite, synapses and their weights, pre- and post-synaptic signals, activation potential and activation function. Excitatory and inhibitory synapses. The biasing input. Types of activating functions.Encoding (training phase) and decoding (active phase). Taxonomy of neural networks:-feedforward and recurrent networks with supervised and unsupervised learning laws, static &dynamic processing systems, basic data structures: mapping of vector spaces, clusters, principal components.

Module-II

Linear Networks:-Adaline - the adaptive linear element, Linear regression. The Wiener-Hopf equation.The Least-Mean-Square (Widrow-Hoff) learning algorithm.Method of steepest descent.Adaline as a linear adaptive filter.A sequential regression algorithm.

Multi-Layer Feedforward Neural Networks:- Multi-Layer Perceptrons. Supervised Learning.Approximation and interpolation of functions.Back-Propagation Learning law. Fast training algorithms. Applications of multilayer perceptrons: Image coding, Paint-quality inspection, Nettalk.

Module-III

Self-Organising Systems:-Unsupervised Learning,Pattern clustering , Topological mapping , Kohonen's self-organizing map , Local learning laws-GeneralisedHebbian Algorithm. The Oja's and Sanger's rules. Principal component analysis - Karhunen-Loeve transform.

Module-IV

Feedback neural networks:- Pattern storage and retrieval, Hopfield model, Boltzmann machine, Recurrent neural networks.

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Module-V

Radial basis function networks:- Regularization theory, RBF networks for function approximation, RBF networks for pattern classification.

Kernel methods for pattern analysis:- Statistical learning theory, Support vector machines for pattern classification, Support vector regression for function approximation, Relevance vector machines for classification and regression.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Reference Books:-

1. B.Yegnanarayana, Artificial Neural Networks, Prentice Hall of India.
2. Satish Kumar, Neural Networks – A Classroom Approach, Tata McGraw-Hill.
3. S.Haykin, Neural Networks – A Comprehensive Foundation, Prentice Hall.

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FUZZY LOGIC

Course Code: CSE2551 **Credit Units: 03**

MODULE- I

Introduction: Background, Uncertainty and imprecision, Statistics and random processes, Uncertainty in information, Fuzzy sets and membership, Chance versus ambiguity, Classical sets - operations on classical sets to functions, Fuzzy sets-fuzzy set operations, Properties of fuzzy sets, sets as points in hypercube.

MODULE-II

Classical Relations And Fuzzy Relations: Cartesian product, Crisp relations-cardinality of crisp relations, Operations on crisp relations, Properties of crisp relations, Compositions, Fuzzy relations-cardinality of fuzzy relations, Operations on fuzzy relations, Properties of fuzzy relations, Fuzzy Cartesian product and composition, Non interactive fuzzy sets, Tolerance and equivalence relations-crisp equivalence relation, Crisp tolerance relation, Fuzzy tolerance, Max-min Method, other similarity methods.

MODULE-III

Membership Functions: Features of the membership function, Standards forms and boundaries, fuzzification, Membership value assignments-intuition, Inference, Rank ordering, Angular fuzzy sets.

MODULE- IV

Fuzzy-To-Crisp Conversions And Fuzzy Arithmetic: Lambda-cuts for fuzzy sets, Lambda-cuts for fuzzy relations, Defuzzification methods. Extension principle-crisp functions, Mapping and relations, Functions of fuzzy sets-extension principle, Fuzzy transform (Mapping), Fuzzy numbers Interval analysis in Arithmetic.

MODULE- V

Fuzzy Logic &Fuzzy Rule-Based Systems: Fuzzy logic, approximate reasoning, Fuzzy tautologies, Contradictions, Equivalence and logical proofs. Natural language, Linguistic hedges, Rule-based system-canonical rule forms, Decomposition of compound rules, Likelihood and truth qualification, Aggregation of fuzzy rules.

MODULE- VI

Fuzzy Decision Making, Classification & Hybrid formation: Fuzzy synthetic evaluation, Fuzzy ordering, Preference and consensus, Multiobjective decision making under fuzzy states and fuzzy actions. Classification by equivalence relations-crisp relations, Fuzzy relations cluster analysis, neuro fuzzy and fuzzy genetic system, applications to engineering problems.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Reference Books:-

- Neural Networks and Fuzzy Logic System by Bart Kosko, PHI Publications.
- Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan andRai – PHI Publication.
- Fuzzy Sets, Fuzzy Logic, and Fuzzy Systems by Lotfi A. Zadeh
- Fuzzy logic with engineering application by Timothy J. Ross-wiley

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INTRODUCTION TO GENETIC ALGORITHM

Course Code: CSE2651 **Credit Units: 03**

Module-I
Fundamentals of genetic algorithm: A brief history of evolutionary computation, biological terminology, search space encoding, reproduction elements of genetic algorithmgenetic modeling, comparison of GA and traditional search methods. The Fundamental Theorem, Schema Processing at work, Two-armed and k-armed Bandit problem, The Building block hypothesis.

Module-II
Genetic technology:- steady state algorithm, fitness scaling, inversion.Geneticprogramming:- Genetic Algorithm in problem solving, Implementing a Genetic Algorithm:- computer implementation, operator (reproduction, crossover and Mutation, Fitness Scaling, Coding, Discretization). Knowledge based techniques in Genetic Algorithm.Advanced operators and techniques in genetic search:-Dominance, Diploidy and Abeyance. Inversion and other reordering operators, Niche and speciation.

Module-III
Genetic Algorithm in engineering and optimization-natural evolution –Simulated annealing and Tabu search -Genetic Algorithm in scientific models and theoretical foundations.

Module-IV
Introduction to genetics - based machine learning: Classifier system, Rule and Message system, Apportionment of credit, Knowledge based Techniques, Genetic Algorithms and parallel. processors.

Module-V
Applications of Genetic based machine learning-Genetic Algorithm and parallel processors- composite laminates- constraint optimization- multilevel optimization- real life problem.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Book:-
David E.Goldberg, "Genetic Algorithms in search , Optimization & Machine Learning"

Reference Books:-
1. William B. Langdon, Riccardo Poli,"Foundations of Genetic Programming"
2. P. J. Fleming, A. M. S. Zalzala "Genetic Algorithms in Engineering Systems “
3. David A. Coley, "An Introduction to Genetic Algorithms for Scientists and Engineers ".
4. Melanie Mitchell- ’An introduction to Genetic Algorithm’- Prentice-Hall of India

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SOFT COMPUTING

Course Code: CSE2751 **Credit Units: 03**

Module-I

Introduction of soft computing, soft computing vs. hard computing,various types of soft computing techniques,applications of soft computing. Artificial Intelligence: Introduction,Various types of production systems, characteristics of production systems,breadth first search, depth first search techniques, other Search Techniques like hill Climbing, Best first Search, A* algorithm, AO* Algorithms and various types of control strategies. Knowledge representation issues, Prepositional and predicate logic, monotonic and non monotonic reasoning,forward Reasoning, backward reasoning, Weak & Strong Slot & filler structures, NLP.

Module-II

Structure and Function of a single neuron:Biological neuron,artificial neuron, definition of ANN,Taxonomy of neural net,Difference b/w ANN and human brain,characteristic and applications of ANN, single layer network, Perceptron training algorithm,Linear separability, Delta rule.Introduction of MLP,different activation functions,Error back propagation algorithm,derivation of BBPA, momentum, limitation, characteristics and application of EBPA.

Module-III

Counter propagation network:-Architecture,functioning & characteristics of counter Propagation network,Hop field/ Recurrent network,configuration, stability constraints, associative memory, and characteristics,limitations and applications.

Module-IV

Fuzzy set theory, Fuzzy set versus crisp set, Crisp relation & fuzzy relations,Fuzzy systems: crisp logic, fuzzy logic, introduction & features of membership functions,Fuzzy rule base system : fuzzy propositions, formation,decomposition & aggregation of fuzzy Rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making.

Module-V

Genetic algorithm:Fundamental,basic concepts,working, principle,encoding, fitnessfunction, reproduction,Genetic modeling:Inheritance operator,cross over,inversion & deletion,mutation operator,Bitwise operator,Generational Cycle,Convergence of GA, Applications & advances in GA,Differences & similarities between GA & other traditional methods.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Reference Books :

- S, Rajasekaran & G.A. VijayalakshmiPai, Neural Networks, Fuzzy Logic & GeneticAlgorithms, Synthesis & applications, PHI Publication.
- Rich E and Knight K, Artificial Intelligence, TMH, New Delhi.
- Bose, Neural Network fundamental with Graph , Algo.&Appl, TMH
- Kosko: Neural Network & Fuzzy System, PHI Publication

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PROJECT (ARTIFICIAL INTELLIGENCE)

Course Code: CSE2851 **Credit Units: 03**

Methodology

Topics of project are to be based on the latest trends in Artificial Intelligence, verifying engineering concepts in Artificial Intelligence /principals and should involve elementary research work. The projects may involve design, fabrications, testing, computer modeling, and analysis of any engineering problem. On completion of the project, the students are to present a report covering various aspects learnt by them and give a presentation on same.

Examination Scheme:

Literature study/ Fabrication/ Experimentation	40
Written Report	20
Viva	15
Presentation	25
Total	**100**

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BIOMEDICAL

Programme Structure

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits
BME2351	Human Anatomy and Physiology-I	3	-	-	3
BME2451	Bioinstrumentation	3	-	-	3
BME2551	Tissue Engineering	3	-	-	3
BME2651	Biomechanic	3	-	-	3
BME2751	Medical Image Processing	3	-	-	3
BME2851	Seminar –Biomedical Engineering	3	-	-	3
	TOTAL				**18**

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BIOMEDICAL

Syllabus

HUMAN ANATOMY AND PHYSIOLOGY-I

Course Code: BME2351 **Credit Units: 03**

Course Objective:
To provide students a basic understanding of the human body structure and functioning. Students will be able to relate basic human body systems and life processes, name the major body systems and their functions , understand the anatomy of various body systems .

Course Contents:
Module I:
Basic cell structure , various cell organelles and their functions , Tissue- their types , structure and function , structure and function of skin , Different types of muscles and their function , General description of bones , their structure and function , types of joints and their structure and function .

Module II:
Cell , cell membrane , polarisation and repolarisation , resting membrane potential , Nernst equation , Donnans equilibrium , Goldman equation action potential and its proapagation , synaptic transmission ,

Module III
Blood , Lymph and circulation : blood composition , properties and function . Structure and functions of RBCs, WBCs and platelets , Blood types , Homeostasis , Immune mechanisms , Lymph., Heart position , structure and functions , Heartbeat , electrical excitation , Einthovens triangle , Cardiac and peripheral regulation , blood pressure and its regulation , blood flow and its regulation.

Module IV
Respiratory System : position and functions . Mechanics of respiration , Lung volumes and capacities , Gas exchange between lungs and tissues , regulation of respiration .Digestive system : Different parts of digestive system , functions of each organ , digestion of proteins , carbohydrates , fats , vitamins and minerals.

Module V
Osteology , Bone , brief introduction to different bones in skull , vertebral column , upper extremity , hands , lower extremity , foot .

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Text and References

- Guyton A.C and J.E. Hall , " Text book of Medical Physiology " Harcourt India Pvt. Ltd.
- Principles of Human Anatomy and Physiology , Tortora , Wiley
- Ganong W.F. " Review of Medical Physiology" , Prentice Hall
- Gray's Anatomy for Students - Gray's Anatomy by A. Wayne Vogl, Richard Drake, Adam W. M. Mitchell

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BIOINSTRUMENTATION

Course Code : BME2451 **Credit Units: 03**

Course Objective:
To enable the student to understand the working and construction of various equipments used in the medical field.

Course Contents:

Module I:
Transducers and Reference electrodes: classification of transducers, temperature transducers , displacement transducer , pressure tranducer , catheter transducer , photoelectric transducer , piezoelectric transducer . po2 electrodes , membrane electrodes , blood gas analysis , Ion specific electrodes .

Module II :
ECG : electrodes and conversion of ionic potentials to electric potential , ECG instrumentation amplifiers, driven right leg circuitry.Introduction and characteristics of bio signals (EEG , ECG , EMG) . , removal of artefacts , event detection and correlation analysis of ECG signals .

Module III :
Respiration measurement using electrical impedance plethysmography : electrical impedance changes during breathing , 2 and 4 electrode measurement , 4 electrode technique .

Module IV :
Oxygen saturation using pulse oximetry : optical characteristics of oxygenated and deoxygenated blood , principles of pulse oximetry , circuits of pulse oximetry , constant current source , current – voltage converter , amplifiers .

Module V :
Non invasive blood pressure measurement : theory and circuitry of method using Korotkoff sounds and method based on oscillometry .

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Leslie Cromwell , Fred J. Weibell , Erich A Pfeiffer , Biomedical Instrumentation and Measurements , PHI , 2nd Edition , 2004.
- R.S. Khandpur , Handbook of Biomedical Instrumentation , Tata McGraw Hill 2004 .
- John G.Webster , Medical Instrumentation : Application and Design, 3rd Edition , John Wiley & Sons , New York , 1998 .

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TISSUE ENGINEERING

Course Code: BME2551 **Credit Units: 03**

Course Objective:
To enable students to understand the principles of tissue engineering and learn the basics of cell culture , tissue culture ,scaffolding , types of bioreactors and mass transfer reactions .

Course Contents:
Module I:
Cell culture: Different cell types, progenitor cells and cell differentiations, different kind of matrix, cell-cell interaction. Aspect of cell culture: cell expansion, cell transfer, cell storage and cell characterization, Bioreactors.

Module II :
Molecular biology aspects: Cell signaling molecules, growth factors, hormone and growth factor signaling, growth factor delivery in tissue engineering, cell attachment: differential cell adhesion, receptor-ligand binding, and Cell surface markers.**Module III** :

Module III :
Scaffold and transplant: Engineering biomaterials for tissue engineering, Degradable materials (collagen, silk and polylactic acid), porosity, mechanical strength, 3-D architecture and cell incorporation. Engineering tissues for replacing bone, cartilage, tendons, ligaments, skin and liver. Basic transplant immunology, stems cells: introduction, hepatopoiesis.

Module IV :
Cryopreservation of cells and tissues, Transport in biological system, Mass transport through cell membranes, Mathematical modelling of mass transfer in engineered tissues

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
- Clemens van Blitterswijk, Tissue Engineering, Academic Press, 2008
- Principles of tissue engineering, Robert. P.Lanza, Robert Langer & William L. Chick,Academic press.
- The Biomedical Engineering –Handbook, Joseph D. Bronzino, CRC press.
- Tissue Engineering, B. Palsson, J.A. Hubbell, R.Plonsey & J.D. Bronzino, CRC- Taylor &Francis

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BIOMECHANICS

Course Code: BME2651 **Credit Units: 03**

Course Objective:
To enable students to understand the basics of bone movement , gait analysis and mechanics of bone and muscles

Course Contents:
Module I:
Joint motion: relative position of two bones meeting at a joint , description of a rigid body , degrees of freedom , euler angles , rotation matrices, rotation angle anatomical directions , anatomical planes ,

Module II :
Inverse Dyanamics to calculate resultant force and momentum within the body link segment models , intersegmental force and moment ,

Module III :
Human Gait analysis , gait cycle , angular kinematics of hip , knee and ankle , force plates and ground reaction force , gait abnormalities .

Module IV :
Structure and composition of bone , microstructure of bone , skeletal muscle , mechanism of muscle contraction , force length and force celocity relationships , basic muscle models , tendons and ligaments , their basic mechanical models , injuries and factors affecting biomechanical properties , Cartilage , viscoeleasticity and viscoelastic models .

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Basic biomechanics of the musculoskeletal system (M Nordin and VH Frankel; Lea& Febiger, London 1989)
- Biomechanics of the musculo-skeletal system (BM Nigg, W Herzog (eds); John Wiley & Sons, Chichester 1994)
- Biomechanics and motor control of human movement (DA Winter; John Wiley &Sons, Chichester 1990)
- Bones and Joints: A Guide for Students. Christine Gunn. Churchill Livingstone,Edinburgh 1996 (3rd ed.)

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MEDICAL IMAGE PROCESSING

Course Code: BME2751 **Credit Units: 03**

Course Objective:
To enable students to understand techniques used in imaging in the medical profession , the artefacts and other problems experience in doing so .

Course Contents:
Module I:
Digital image fundamental : Elements of digital image processing systems, Elements of Visual perception, Image sampling and quantization,– Some Basic relationships between pixels, Matrix and Singular Value representation of discrete images

Module II :
Image transforms1DDFT, 2D DFT, Cosine, Sine Hadamard, Haar, Slant, KL transform and their properties

Module III :
Image enhancement : Histogram – Modification and specification techniques, Enhancement by point processing Image smoothening,Image sharpening, generation of spatial masks from frequency domain specification, Homomorphic filtering,and color image processing.

Module IV :
Image segmentation : spatial feature extraction , transforms features , segmentation techniques , analysis techniques,application of matlab for digital image processing .

Module V
Run length, Huffman coding, arithmetic coding, Pixel coding, transform coding, JPEG Standard, predictivetechniques, Application of image processing techniques in thermography, SPECT, PET images.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Rafael C., Gonzalez and Richard E. Woods, *Digital Image Processin*g, Pearson Education Asia, 2001
- Anil K. Jain, *Fundamentals of Digital Image Processing*, Prentice Hall of India, 1997
- William K. Pratt, *Digital Image Processing*, John Wiley, NJ, 1987.
- Albert Macouski, *Medical Imaging systems*, Prentice Hall, New Jersey.1983.
- Sid Ahmed M.A., *Image Processing Theory, Algorithm and Architectures*, McGraw Hill, 1995.

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CLOUD COMPUTING

Programme Structure

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits
CSE2353	Computer Networks	3	-	-	3
CSE2453	Distributed System	3	-	-	3
CSE2553	High Performance Computing	3	-	-	3
CSE2653	Information Storage Management	3	-	-	3
CSE2753	Interfacing with Virtualization	3	-	-	3
CSE2853	Cloud Computing Tools & Techniques	3	-	-	3
	TOTAL				**18**

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CLOUD COMPUTING

Syllabus

COMPUTER NETWORKS

Course Code: CSE2353 **Credit Units: 03**

Course Objective:
The course provides a unified and fundamental view of the broad field of computer networks. Furthermore, the easy to understand and extremely relevant world of Computer Net working is introduced in a top down Approach. Introduction to intranets and intranet servers and browsers, networks and network servers, LANs/WANs, internetworking technologies, the OSI reference model for networking protocols, CSMA/CD, TCP/IP implementation

Course Contents:
Module I: Introduction
Introduction to computer networks, evolution of computer networks and its uses, Advantages and Disadvantages of Computer Network, reference models: OSI reference Models, TCP/IP Protocol Suit Networking fundamentals: Internet, Circuit switching vs Packet switching, ISPs, Delay and Loss in Packet Switched Networks

Module II: Local Area Network
LAN Architecture, LAN topologies- Bus/ Tree LAN, Ring LAN, Star LAN, Wireless LAN, Ethernet and Fast Ethernet, Token Ring

Module III: Application layer and data link layer
Application Layer Protocols: HTTP, FTP, SMTP, DNS
Data link layer design issues, Flow Control- Stop and Wait, Error Detection, Error Control, error detection and correction, data link layer protocols, sliding window protocols, example of data link protocol- HDLC

Module IV: Medium access layer
Channel allocation problem, multiple access protocols, Introduction to ALOHA, CSMA/CD, CSMA/CA

Module V: The network layer
Introduction, Routers, Network layer concepts, shortest path routing, flooding, distance vector routing, link state routing (without algorithms), congestion control and quality of service, internetworking, IP, Ipv4 Addressing vs Ipv6

Module VI: The transport layer
The transport layer services, elements of transport protocols, TCP and UDP, Brief introduction to presentation and session layer, E-mail

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

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Text & References:

Text:

- Data Communication & networking: Forouzan, B. A.
- Data and Computer Communications, W. Stallings, Prentice Hall of India

References:

- Computer Networks: Tanenbaum, Andrew S, Prentice Hall

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DISTRIBUTED SYSTEM

Course Code: CSE2453 **Credit Unit: 03**

Course Objective:
It serves as one of the important courses in terms of having an understanding about the basic concepts about distributed systems, their types or categories with some concepts about basic networking and various different directions in which it is useful and applicable. The outcome of the course implicitly and explicitly affects the abilities of students to have a good understanding of the upcoming other related courses.

Course Contents:

Module 1: Introduction to Distributed System
Introduction, Goals of Distributed System Examples of distributed systems , Trends in distributed systems , Resource sharing in distributed system, Challenges faced, System Models basics, types of System Models, Physical models , Architectural models , Fundamental models.

Module 2: Networking and Internetworking
Introduction to networking, Networking issues for distributed systems, Types of network (LAN, MAN, WAN, WLAN, WMAN, WWAN, internetworks), Network principles, Internet protocols, Basics of Inter-Process communication, Multicast Communication, Network virtualization: overlay networks, Remote invocation, Remote Procedure Call, Remote method invocation.

Module 3: Operating System Support, Web Services and Security
Introduction , Operating System layer, Operating System Architecture, Virtualization at Operating System level, Introduction to web services, Service descriptions and IDL for web services, Applications of web services, Overview of Security Techniques, Cryptographic algorithms , Digital signatures, Needham–Schroeder, Kerberos techniques.

Module 4: Distributed File Systems and Distributed Transactions
Introduction (URI, URL's) , Name services and the Domain Name System(NameSpace, Name Resolution, DNS), Directory services, Transactions , Nested transactions , Locks , Optimistic concurrency control, Flat and nested distributed transactions , Atomic commit protocols , Concurrency control in distributed transactions , Distributed deadlocks.

Module 5: Distributed Multimedia System and Distributed Algorithms
Characteristics of multimedia data, Quality of service management, Resource management, Stream adaptation, Introduction to communication protocols, Balanced sliding window protocol, Routing algorithms, Destination based routing, APP problem, Deadlock free Packet switching.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

Text & References:

Text:

- Coulouris, Dollimore, Kindberg, Blair, "Distributed System: Concepts and Design", Fifth Edition, Pearson Ed.
- Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill

References:

- Andrew S. Tanenbaum, "Computer Networks", 4th ed., Prentice Hall
- Gerald Tel, "Distributed Algorithms", Cambridge University Press

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HIGH PERFORMANCE COMPUTING

Course Code: CSE2553 **Credit Units: 03**

Course Objective:
This course gives an insight about Cluster and Grid computing. The major objective of this course is to provide a sound foundation to the students on the concepts, percepts and practices in a field that is of immense concern to the industry and business. This would be helpful to students for understanding a subject related to but a bit higher in its hierarchy.

Course Contents:
Module 1: Parallel and Distributed Programming Models
Introduction to high performance computing, basic definitions: cluster, grid, meta-computing, middleware etc., examples of representative applications. Programming models: shared memory, message passing, peer-to-peer. Development of parallel and distributed applications, Design phases, Common parallel patterns, Performance metrics and profiling.

Module 2: Overview of Cluster Computing
The Role of Clusters, Definition and Taxonomy, Distributed Computing, Limitations, Architecture of cluster-based systems, Design Decisions, Network Hardware, Network Software, Protocols Distributed File Systems, Virtualization technologies, Issues in cluster design: performance, single-system-image, fault tolerance, manageability, programmability, load balancing, security, storage.

Module 3: Introduction of Grid Computing
Introduction, Evolution of the Grid, Definitions of Grid Computing, Infrastructure of hardware and software, Grid models, Applications, Examples of usage, Research possibilities / scope in Grid Computing, HPC and Grids, Scheduling HPC applications in Grids, Grid Monitoring Architecture (GMA) – An Overview of Grid Monitoring Systems.

Module 4: Integrating task parallelism with data parallelism
Introduction and motivation, A model for integrating task parallelism into data parallel programming platforms, Integration of the model into ARC, Design and implementation applications, performance analysis, guidelines for composing user programs, related work.
Anonymous remote computing and communication model: Introduction, Location in dependent inter task communication with DP, DP model of iterative grid computations, Design and implementation of distributed pipes.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

Text & References:
Text:
- "Grid Computing a Research Monograph" by D. Janakiram, Tata McGraw hill publications

References:
- Joshy Joseph & Craig Fellenstein, "Grid Computing", Pearson Education
- "Grid Computing: A Practical Guide to technology and Applications" by Ahmar Abbas, Charles River media

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INFORMATION STORAGE MANAGEMENT

Course Code: CSE2653 **Credit Units: 03**

Course Objective:
The course provides detailed knowledge, practical training and insight into the implementation and management of various storage technologies with a focus towards applying these technologies in an information lifecycle paradigm. This course focuses on evolution of storage and implementation models, Storage devices principles, Storage classes (SAN, NAS. CAS) and Backup, Business Continuity, and Disaster Recovery principles

Course Contents:
Module 1: Introduction to Storage Technology
Information Storage - Data, Types of Data, Information, Storage, Evolution of Storage Technology and Architecture, Data Center Infrastructure, Key Challenges in Managing Information, Information Lifecycle -Information Lifecycle Management, ILM Implementation, ILM Benefits.

Module 2: Data Protection & Intelligent Storage System
Components of a Storage System Environment, RAID -Implementation of RAID, RAID Array Components, RAID levels, RAID Impact on Disk Performance, Components of an Intelligent Storage System, Intelligent Storage Array-High-end Storage Systems, Midrange Storage System

Module 3: Storage Networking Technologies & Virtualization
Direct-Attached Storage and Introduction to SCSI- Types of DAS, DAS Benefits and Limitations, Disk Drive Interfaces, Introduction to Parallel SCSI, Storage Area Networks- Fibre Channel: Overview, SAN and its evolution, Components of SAN, Network-Attached Storage- General Purpose Servers vs. NAS Devices, Benefits of NAS, Components of NAS.

Module 4: CAS and Business Continuity
CAS: Fixed Content and Archives, Types of Archives, Features and Benefits of CAS, CAS Architecture, Object Storage and Retrieval in CAS.
Introduction to Business Continuity: Information Availability, BC Terminology, BC Planning Lifecycle, Failure Analysis.

Module 5: Backup, Recovery & Replication
Backup and Recovery : Backup Purpose, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Process, Backup and Restore Operations, Backup Topologies, Backup Technologies.
Replication: Local Replication- Uses of Local Replicas, Data Consistency, Local Replication Technologies, Remote Replication- Modes of Remote Replication, Remote Replication Technologies.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

Text & References:
Text:
- Information Storage and Management, Wiley Publication ISBN: 978-81-265-2147-0

References:
- Marc Farley Osborne, "Building Storage Networks", Tata McGraw Hill
- Robert Spalding, "Storage Networks: The Complete Reference", Tata McGraw Hill

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INTERFACING WITH VIRTUALIZATION

Course Code: CSE2753 **Credit Units: 03**

Course Objective:
This course gives students an insight into the basics of cloud computing along with virtualization, cloud computing is one of the fastest growing domain from a while now. It will provide the students basic understanding about cloud and virtualization along with it how one can migrate over it.

Course Contents:
Module-I: Introduction to Virtualization
Virtualization and cloud computing - Need of virtualization – cost, administration, fast deployment, reduce infrastructure cost – limitations
Types of hardware virtualization: Full virtualization - partial virtualization - para virtualization
Desktop virtualization: Software virtualization – Memory virtualization - Storage virtualization – Data virtualization – Network virtualization

Module-II: Hypervisors and Virtual machines
Server Virtualization: Understanding Server Virtualization, types of server virtualization, Virtual machine basics, types of virtual machines, hypervisor concepts and types

Module-III: Virtualization Solutions
Understanding Microsoft's Virtualization solutions: Microsoft's Infrastructure Optimization Model, Virtualization and the Infrastructure Optimization Model, Benefits of Virtualization, Achieving the Benefits of Datacenter Virtualization, Achieving the Benefits of Client Virtualization, Achieving the Benefits of Cloud Virtualization

Module-IV: Migrating into a Cloud
Introduction, Challenges while migrating to Cloud, Broad approaches to migrating into the cloud- why migrate -deciding on cloud migration, the Seven-step model of migration into a cloud, Migration Risks and Mitigation, Enterprise cloud computing paradigm, relevant Deployment Models for Enterprise Cloud Computing, Adoption and Consumption Strategies, issues for enterprise applications on the cloud

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

Text & References:
Text:
- David Marshall, Wade A. Reynolds, Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center, Auerbach
- Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008

References:
- Publications, 2006. Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011
- Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010

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CLOUD COMPUTING TOOLS AND TECHNIQUES

Course Code: CSE2853 **Credit Units: 03**

Course Objective:
This course gives students an insight into the basics of cloud computing along with virtualization, cloud computing is one of the fastest growing domain from a while now. It will provide the students basic understanding about cloud and virtualization along with it how one can migrate over it.

Course Contents:
Module-I: Cloud Computing Overview
Origins of Cloud computing – Cloud components - Essential characteristics – On-demand self-service, Broad network access, Location independent resource pooling ,Rapid elasticity , Measured service, Comparing cloud providers with traditional IT service providers, Roots of cloud computing.

Module-II: Cloud Insights
Architectural influences – High-performance computing, Utility and Enterprise grid computing, Cloud scenarios – Benefits: scalability ,simplicity ,vendors ,security, Limitations – Sensitive information - Application development- security level of third party - security benefits, Regularity issues: Government policies.

Module-III: Cloud Architecture- Layers and Models
Layers in cloud architecture, Software as a Service (SaaS), features of SaaS and benefits, Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits, Service providers, challenges and risks in cloud adoption.
Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing.

Module-IV: Cloud Simulators- CloudSim and GreenCloud
Introduction to Simulator, understanding CloudSim simulator, CloudSim Architecture(User code, CloudSim, GridSim, SimJava) Understanding Working platform for CloudSim, Introduction to GreenCloud

Module-V: Introduction to VMWare Simulator
Basics of VMWare, advantages of VMware virtualization, using Vmware workstation, creating virtual machines-understanding virtual machines, create a new virtual machine on local host, cloning virtual machines, virtualize a physical machine, starting and stopping a virtual machine.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

Text & References:
Text:
- Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010
- Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008

References:
- Cloud computing for dummies- Judith Hurwitz , Robin Bloor , Marcia Kaufman ,Fern Halper, Wiley Publishing, Inc, 2010
- Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011

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EMBEDDED SYSTEM

Programme Structure

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits
ECE2352	Introduction to Microprocessor System	3	-	-	3
ECE2452	Microcontroller	3	-	-	3
ECE2552	PCB Fabrication	3	-	-	3
ECE2652	Robotics and Automation	3	-	-	3
ECE2752	Simulation and Modelling Processing	3	-	-	3
ECE2852	Project (Embedded System)	3	-	-	3
	TOTAL				**18**

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EMBEDDED SYSTEM

Syllabus

INTRODUCTION TO MICROPROCESSOR SYSTEMS

Course Code: ECE2352 **Credit Units: 03**

Course Objective:
This course deals with the systematic study of the Architecture and programming issues of 8085-microprocessor family. The aim of this course is to give the students basic knowledge of the above microprocessor needed to develop the systems using it.

Course Contents:

Module I: Introduction to Microcomputer Systems
Introduction to Microprocessors and microcomputers, Study of 8 bit Microprocessor, 8085 pin configuration, Internal Architecture and operations,interrupts, Stacks and subroutines, various data transfer schemes.

Module II: ALP and timing diagrams
Introduction to 8085 instruction set, advance 8085 programming , Addressing modes, Counters and time Delays, , Instruction cycle, machine cycle, T-states, timing diagram for 8085 instruction.

Module III: Memory System Design & I/O Interfacing
Memory interfacing with 8085. Interfacing with input/output devices (memory mapped, peripheral I/O), Cache memory system. Study of following peripheral devices 8255, 8253, 8257, 8259, 8251.

Module IV: Architecture of 16-Bit Microprocessor
Difference between 8085 and 8086, Block diagram and architecture of 8086 family, pin configuration of 8086, minimum mode & maximum mode Operation, Bus Interface Unit, Register Organization, Instruction Pointer, Stack & Stack pointer, merits of memory segmentation, Execution Unit, Register Organization.

Module V: Pentium Processors
.Internal architecture of 8087, Operational overview of 8087, Introduction to 80186, 80286, 80386 & 80486 processors, Pentium processor (P-II, P-III, P-IV).

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Text & References:

- Ramesh. S. Gaonkar, "Microprocessor architecture Programming and Application with 8085" Penram International Publishing, 4th Edition
- B.Ram, "Fundamentals of microprocessors and microcomputer" DhanpatRai, 5th Edition.]
- Douglas V Hall.
- M. Rafiquzzaman, "Microprocessor Theory and Application" PHI – 10th Indian Reprint.
- Naresh Grover, "Microprocessor comprehensive studies Architecture, Programming and Interfacing" DhanpatRai, 2003.
- Gosh," 0000 to 8085" PHI.

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MICROCONTROLLER

Course Code: ECE2452 **Credit Units: 03**

Course Objective:
The syllabus deals with 8051 architecture and its interfacing with other devices. A microcontroller is an integrated circuit that is programmable. The syllabus makes student perfect in assembly language programming, addressing modes etc apart from it input-output programming is discussed in detail. In the second part Embedded systems and it's application is discussed. 8051 C programming is also incorporated in the syllabus.

Course Contents:

Module I: Overview of Microcontroller
Microcontroller and Embedded Processors, Overview of 8051 Microcontroller family: Architecture, basic assembly language programming concepts, The program Counter and ROM Spaces in the 8051, Data types, 8051 Flag Bits ad PSW Register, 8051 Register Banks and Stack Instruction set, Loop and Jump Instructions, Call Instructions, Time delay generations and calculations, I/O port programming Addressing Modes, accessing memory using various addressing modes, Arithmetic instructions and programs, Logical instructions, BCD and ASCII application programs, Single-bit instruction programming, Reading input pins vs. port Latch, Programming of 8051 Timers, Counter Programming.

Module II: Communication with 8051
Basics of Communication, Overview of RS-232, I2C Bus, UART, USB, IEEE 488 (GPIB). Parallel input output applications. (Stepper motor Sequencer program, Strobed input/output). Interrupt driven applications (real time clock, serial input/output with interrupt). Analog-digital interfacing (Pulse width modulator, 8-bit ADC).

Module III: Basics of 8051 C Programming
Introduction to 8051 C, 8051 memory constitution, Constants, variables and data types.Arrays structures and unions, pointers, Loops and decisions, Functions, Modules and programs.

Module IV: 8051 C Programming
Data interface, Timer control, Interrupt operations, Digital operations, A/D and D/A conversions, Common control problem examples (Centronics parallel interface,Printer interace, Memory access, Key matrix scanning, Stepper motor control and digital clock.).

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Text & References:

Text:

- Raj Kamal, 2004, “Embedded Systems”, TMH.
- James W. Stewart and Kai X. Miao, 2en Edition. “The 8051 microcontroller” Pearson Edu. Prentice Hall.
- M.A. Mazidi and J. G. Mazidi, 2004 “The 8051 Microcontroller and Embedded Systems”, PHI.

References:

- David E. Simon,1999, “An Embedded Software Primer”, Pearson Education
- K.J. Ayala, 1991, “The 8051 Microcontroller”, Penram International.
- Dr. Rajiv Kapadia, “8051 Microcontroller & Embedded Systems”, Jaico Press
- Dr. Prasad, 2004, “Embedded Real Time System”, Wiley Dreamtech

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PCB FABRICATION

Course Code: ECE2552 **Credit Units: 03**

Aim: To equip the students with the knowledge of PCB design and fabrication processes.
Objective:

- To make familiar with PCB design and various processes involved.
- To provide in-depth core knowledge in design, performance analysis and fabrication of Printed Circuit Boards.
- To provide the knowledge in PCB fabrication process and factors affecting PCB performance.

Module I: Introduction to the PCB
Definition and Evolution of the Printed Circuit Board (PCB), Purposes of a PCB, Applications, Market Drivers, Typical Development Flow for a PCB, Printed Circuit Technology, Basic Electronic Components, Resistors, Capacitors, Inductors, Diodes, Transistors, Relays, Connectors, Integrated Circuits: How a silicon wafer becomes an IC, Printed Circuit Board Characteristics, PCB Materials, Fillers, resins, laminates, base material characteristics, Dielectric, conductors, Engineering References

Module II: Design and Analyses
Design and Environmental Requirements: Functional, Thermal, Vibration, Shock, EMI/EMC; Electrical Engineering: Analog and digital signals, Signal integrity, Grounding concepts, Current carrying capacity, CAD, Schematics, Layout rules of thumb; Mechanical Engineering: Panels, Standard board sizes, Packaging, Thermal Design, Heat transfer basics, Convection, Conduction, PCB Thermal Design Features, Thermal modeling, Cycling and fatigue , Component Vibration Fatigue, Vibration Models and Terminology, Combined Thermal and Structural Fatigue

Module III: Contamination Control/Environmental Control
Contamination Control, Conformal Coatings, Polluting Agents, Safety Controls, Pollution Controls, Recycling, Standards; Manufacturing: PCB Manufacturing Information, PCB Layout and Artwork; Fabrication: Machining Operations, Blanking, Cutting, Punching, Drilling, Laminating Techniques, Plating, Etching, Surface Finishing, Conformal Coatings, Inspection and Checkout, Specifications and Standards

Module IV: Assembly
PCB Assembly Drawing Examples, Component Considerations, Component mounting and support , Mechanical Devices, Soldering Technology, Nonsolder Connections, Cleaning, Parts Staking, Conformal Coating Removal, Repair and Rework, Safety Considerations, ESD protection, Specifications and Standards

Module V: Testing & Quality Assurance
Common PCB Production Faults, Bare Board Testing, Electrical Performance Testing, Assembled PCB Testing, Quality Assurance in Design, FMEA – Failure Mode and Effects Analysis, Software Tools, Quality Assurance in Manufacturing and in Assembly, Specifications and Standards

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Text & References:

Text &References:

- Jon Uarteresian, 2002, “Fabricating Printed Circuit Boards”, Newnes (Elsevier Science)
- RS Khandpur, 2008, “Printed Circuit Boards”, Tata McGraw-Hill Education
- Christopher T Robertson, 2004, “Printed Circuit Board: Designer's Reference, Basics”, Prentice Hall Professional, 2004

Charles Harper, 2000, “High Performance Printed Circuit Boards”, McGraw-Hill Education

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ROBOTICS AND AUTOMATION

Course Code: ECE2652 **Credit Units: 03**

Aim: To equip the students with the knowledge of Robotics, Automation and their applications.
Objective:

- To make students familiar with the field of robotics.
- To provide in-depth core knowledge in design and performance analysis of bots.
- To provide the knowledge in sensors, actuators, motion planning and kinematics & dynamics of robots.

Module-I: Introduction to Robotics
History, Robots, Robot Usage, Robot Subsystems, Robot Classification by Application, Robot Classification by Coordinate System, Robot Classification by Actuation System, Robot Classification by Control Method, Robot Classification by Programming Method

Module-II: Actuators and Sensors
Pneumatic Actuators, Hydraulic Actuators, Electric Actuators, Selection of Motors, Sensor Classification, Internal Sensors, External Sensors, Vision System, Sensor Selection,

Module-III: Transformations and Kinematics
Robot Architecture, Pose of a Rigid Body, Coordinate Transformation, Denavit and Hartenberg (DH) Parameters,, Forward Position Analysis, Inverse Position Analysis, Velocity Analysis: The Jacobian Matrix, Link Velocities *133*, Jacobian Computation, Jacobian Using the DeNOC, Singularity, Acceleration Analysis,

Module-IV: Statics and Dynamics
Forces and Moment Balance, Recursive Calculation, Equivalent Joint Torques, Role of Jacobian in Statics, Force Ellipsoid, Inertia Properties, Euler–Lagrange Formulation, Newton—Euler Formulation, Recursive Newton–Euler Algorithm, Dynamics Algorithms

Module-V: Recursive Robot Dynamics and Control
Dynamic Modelling, Analytical Expressions, Recursive Inverse Dynamics using RIDIM, Recursive Forward Dynamics and Simulation, Control Techniques, Second-Order Linear Systems, Feedback Control, Performance of Feedback Control Systems, A Robotic Joint, Joint Controller, Non-linear Trajectory Control, State-space Representation and Control, Stability, Cartesian and Force Controls

Module-VI: Motion Planning
Joint Space Planning, Cartesian Space Planning, Position and Orientation Trajectories, Point-to-Point Planning, Continuous Path Generation

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- John J. Craig, 2004, "Introduction to Robotics: Mechanics and Control" Prentice Hall,3rd Edition
- S K Saha, 2008, "Introduction to Robotics", McGraw-Hill Education (India)
- Thomas R. Kurfess, 2004, "Robotics and Automation Handbook", CRC Press

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SIMULATION & MODELLING LAB

Course Code: ECE2752 **Credit Units: 03**

Course Contents:

List of Experiments:

1. Layout & Simulation of CMOS Inverter using CAD Tools.
2. Layout & Simulation of NAND & NOR Gates with Optimal Aspect Ratio.
3. Design & Simulation of SR Latch using NAND & NOR Representations.
4. Design & Simulation of JK Flip Flop using SR Latch.
5. Design & Simulation of Master Slave JK Flip Flop.
6. Design & Simulation of R2R Ladder DAC.
7. Design & Simulation of ADC using DAC.

Examination Scheme:

IA				**EE**	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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GEOTECHNICAL ENGINEERING

Programme Structure

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits
CIV2351	Engineering Geology	3	-	-	3
CIV2451	Geo informatics	3	-	-	3
CIV2551	Geotechnical Engineering-I	3	-	-	3
CIV2651	Geotechnical Engineering-II	3	-	-	3
CIV2751	Project (Geotechnical Engineering)	3	-	-	3
CIV2851	Seminar (Geotechnical Engineering)	3	-	-	3
	TOTAL				**18**

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GEOTECHNICAL ENGINEERING

Syllabus

ENGINEERING GEOLOGY

Course Code: CIV2351 **Credit Units: 03**

Course Objective:
The student is given an introduction to basics of Geology genesis and characteristic of rocks: Geological structure and other effects of civil engineering structures. Geology of India is introduced.

Course Contents:
Module I: Branches and scope of geology
Physical geology
Geological agents and their action, weathering, volcanism, earthquake and plate tectonics

Module II: Elements of crystallography and mineralogy
Petrology
Types of rocks, genesis and physical and chemical characters, Building stones

Module III: Structural geology
Types of structures and classification and their effect on civil engineering projects and Geological mapping
Hydrogeology
Groundwater and occurrence, investigations, quality, artificial recharge

Module IV: Geology in Civil Engineering
Tunnels, dams, reservoirs, bridges, Runways, Roads and Buildings.
Slope failures and landslides. Investigations, Remote sensing and GIS applications
Geology of India
Types, age and occurrence of rock formations and economic importance

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Parbin Singh, Engineering & General Geology, S.K. Kataria & Sons, New Delhi (2008)
- Bangar, K.M., Principles of Engineering Geology, Standard Publishers Distributors, Delhi (2009)
- Billings, Marland P., Structural Geology, 3rd ed., Prentice-Hall India, New Delhi.
- Todd, D.K., Ground Water Hydrology, 2nd ed., Wiley India, New Delhi (2008)

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GEOINFORMATICS

Course Code: CIV2451 **Credit Units**: **03**

Course Objective:
Geoinformatics is an important data system for all civil engineering activities including construction of structures, dams, water systems etc. Correct and reliable information and geographical data are a requirement today. The course thus addresses this issue.

Course Contents:
Module I
Triangulation - principle - reconnaissance - selection of site for base line - selection of stations - orders of triangulation - triangulation figures - scaffolds and signals - marking of stations - intervisibility and heights of stations - satellite stations - base line measurement - equipment and corrections - adjustment of observations.

Module II
Survey adjustments and theory of errors – introduction – laws of accidental errors –probability curve – principle of least squares – laws of weights – probable error – normal equation – most probable value – method of correlates – angle adjustment – station adjustment – figure adjustment – adjustment of triangles – adjustment of a geodetic quadrilateral.

Module III
Curves - types of curves - elements of a curve - simple curves - different methods of setting out – introduction to compound curves - reverse curves, transition curves, vertical curves -hydrographic survey - scope - shoreline survey - river survey - soundings – sounding equipment - methods - ranges - locating sounding - plotting - three point problem.

Module IV
Photogrammetry – terrestrial and aerial photogrammetry – heights and distances from Photographs – flight planning – elements of stereoscopy – photo mosaic – photo interpretation – applications of photogrammetry. GNSS – GPS – differential GPS.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Texts & References:
- S.K Duggal, Sruveying Vol. I and II, 2nd ed., Tata McGraw Hill, New Delhi (2004).
- Arora K.R., Surveying Vol. I & II, Standard Book House, New Delhi (2008)
- Punmia B.C., Ashok Kr. Jain, Arun Kr. Jain, Surveying Vol. I &II, Laxmi Pub, New Delhi (2004)

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GEOTECHNICAL ENGINEERING-I

Course Code: CIV2551 **Credit Units: 04**

Course Objective:
Soil mechanics and related topics are important areas in Civil Engineering and the first part of Geotechnical Engineering deals with soils and their characteristics.

Course contents:
Module I: Nature of soil and functional relationships
Soil type -Concepts of single grained, honey combed and flocculent structure and their effects on the basic soil properties - 3 phase system - void ratio - specific gravity - dry density - porosity - water content - saturated unit weight - submerged unit weight - degree of saturation. Laboratory and field identification of soils: Determination of water content by oven drying -Specific gravity using pycnometer and specific gravity bottle - Grain size analysis by sieve analysis, hydrometer analysis and pipette analysis - Atterberg limits and indices – Visual identification by simple field tests - Field density by core cutter, sand replacement and wax coating methods. Classification of soils: Necessity -Principles of classification - I.S. classification – Plasticity charts - Group index.

Module II: Soil Water, Permeability and Stress Distribution
Soil water: Types - Effective stress - Total stress - Pore pressure - Pressure diagrams. Permeability: Definition - Darcy's law - Factors affecting permeability – Laboratory determination - Stratified soils: average permeability. Stress distribution: Boussinesq's equations for vertical pressure due to point loads- Assumptions and limitations - pressure bulb – Influence diagram - Vertical pressure due to uniformly distributed loads, line loads and strip loads - Newmark charts and their use - Westergaard's solution.

Module III: Consolidation and Compation
Consolidation: Definition - Concepts of coefficient of compressibility - Coefficient of volume change and compression index - e-log p curves - Terzaghi's theory of one dimensional consolidation – Determination of coefficient of consolidation- pre-consolidation pressure difference between consolidation and compaction. Compaction: Definition and objectives of compaction - Proctor test and modified proctor test - Concept of OMC and maximum dry density - Zero air voids line -Factors influencing compaction.- Effect of compaction on soil properties - Field compaction methods - Proctor needle for field control.

Module IV: Shear Strength and Stability of Slopes
Shear Strength: Definition - Mohr's strength and stress circles - origin of planes - Mohr's envelope - Mohr-Coulomb strength theory -Direct, triaxial and UCC tests - Drainage conditions - Measurement of pore pressure - Vane shear tests -Total and effective stress -strength parameters – Stress path, Liquefaction of sand - Choice of test conditions for field problems. Stability of slopes: Slope failure, base failure and toe failure - Swedish circle method - $\varphi=0$ analysis and $c=0$ analysis - Friction circle method - Taylor's stability number -Stability charts - Sliding block analysis.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Text & References:

- Terzaghi K. & Peck R.B., Soil Mechanics in Engineering Practice, John Wiley Sons, 1967.
- Alam Singh, Soil Engineering-Theory and Practice, Asia Pub, 1967.
- Punmia B.C., Soil Mechanics and Foundations, Saurabh,1992.
- Murthy V.N.S., Soil Mechanics and Foundation Engineering, Dhanpat Rai, 1984
- Khan I.H., Text Book of Geotechnical Engineering, Prentice Hall of India

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GEOTECHNICAL ENGINEERING-II

Course Code: CIV2651 **Credit Units: 04**

Course Objective:
Advanced topics of soil mechanics and the design of foundations are covered in this course.

Course Contents:
Module I: Earth pressure
Earth pressure at rest. Active and passive earth pressure for cohesionless and cohesive soils. Coulomb's and Rankine's theories. Point of application of earth pressure for cases of with and without surcharge in cohesionless and cohesive soils. Culmann's and Rebhan's graphical construction for active earth pressure. Friction circle method for active earth pressure. Site investigation and soil exploration: Objectives. Planning. Reconnaissance. Depth of exploration. Methods of subsurface exploration. Test pits. Auger borings. Wash boring. Rotary drilling. Percussion drilling. Core drilling. Sampling. Types of soil samples. Splitspoon sampler. Thin walled sampler. Piston sampler. Denison sampler. Hand cut samples. Location of water table. S.P.T. Field vane shear test. Introduction to geophysical methods. Boring log. Soil profile.

Module II: Bearing capacity
Ultimate and allowable bearing capacity. Terzaghi's equation for bearing capacity for continuous circular and square footings. Types of shear failures. Bearing capacity factors and charts. Effect of water table on bearing capacity. Meyerhoff's bearing capacity heory. Skempton's formulae. Bearing capacity from field tests. Bearing capacity from building codes. Net bearing pressure. Methods of improvement of soil bearing capacity: vibro flotation and sand drains.
Settlement analysis: Distribution of contact pressure. Immediate and consolidation settlement. Estimation of initial and final settlement under building loads. Limitations in settlement computation. Causes of . Permissible, total and differential settlements. Cracks and effects of settlement.

Module III: Foundations
General considerations: Functions of foundations. Requisites of satisfactory foundations. Different types of foundations. Definition of shallow and deep foundation. Selection of type of foundation. Advantages and limitations of various types of foundations. Design considerations . Footings subjected to eccentric loading. Conventional procedure for proportioning footings for equal settlements.
Open excavation: Open foundation excavations with unsupported slopes. Supports for shallow and deep excavations. Stress distribution in sheeting and bracing of shallow and deep excavations. Stability of bottom of excavations. Raft foundations: Bearing capacity equations. Design considerations. Conventional design procedure for rigid mat. Uplift pressures. Methods of resisting uplift. Floating foundations.

Module IV: Pile foundations
Uses of piles. Classification of piles based on purpose and material. Determination of type and length of piles. Determination of bearing capacity of axially loaded. Single vertical pile. Static and dynamic formulae. Determination of bearing capacity by penetration tests and pile load tests (IS methods). Negative skin friction. Group action and pile spacing. Analysis of pile groups. Load distribution by Culmann's method. Caissons and piers: Open (well) caissons. Box (floating) caissons. Pneumatic caissons. Construction details and design considerations of well foundations. Drilled piers and their construction details.

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Joseph E. & Bowles, Foundation Analysis & Design, McGraw Hill
- Leonards G.A., Foundation Engineering, McGraw Hill
- Punmia B.C., Soil Mechanics & Foundations, Laxmi, 1988.
- Tomlinson M.J., Foundation Design & Construction, Pitman, 1963.
- Terzaghi & Peck, Soil Mechanics in Engineering Practice, Asia Publishing
- Arora K.R., Soil Mechanics & Foundation Engg., Standard Publications, 1987.
- Murthy V.N.S., Soil Mechanics & Foundations**.**

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PROJECT (Geotechnical Engineering)

Course Code: CIV2751 **Credit Units: 03**

Methodology

The topic for the project work can be a design/experimental/field / analytical/simulation project in any topic of Geotechnical Engineering area. The work can be done individually or by a group of students under the guidance of a faculty of the Department. On completion of the project, the students are to present a report covering various aspects learnt by them and give a presentation on same.

Examination Scheme:

Literature study/ Fabrication/ Experimentation	40
Written Report	20
Viva	15
Presentation	25
Total	**100**

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SEMINAR (GEOTECHNICAL ENGINEERING)

Course Code: CIV2851 **Credit Units: 03**

Objectives:
To enable the students to acquire knowledge for searching compilation and to
Develop skills for presentation in the form of the seminar

Contents:
The seminar comprises the selection of an appropriate research proposal and developing research proposals. The student is required to organize and analyze the data/ information collected and write a complete document and presenting the document in the form of seminar.

Text Book:
Relevant technical/ professional material and references in Geotechnical Engineering courses and journals.

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INSTRUMENTATION ENGINEERING

Programme Structure

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits
ECE2351	Basic Instrumentation	3	-	-	3
ECE2451	Virtual Instrumentation	3	-	-	3
ECE2551	Biomedical Instrumentation	3	-	-	3
ECE2651	Analytical Instrumentation	3	-	-	3
ECE2751	Industrial Process Control	3	-	-	3
ECE2851	Project (Instrumentation Engineering)	3	-	-	3
	TOTAL				**18**

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INSTRUMENTATION ENGINEERING

Syllabus

BASIC INSTRUMENTATION

Course Code: ECE2351 **Credit Units: 03**

Introduction
Review of measurement and measuring systems. Functional elements of a measuring system.Input-output configuration of instrumentation systems.Methods of correction for interfering and modifying inputs.Errors and uncertainty in measurements, Statistical analysis of errors. Loading effects, Generalised impedance and stiffness.

Generalized Performance Characteristics
Static and Dynamic performance characteristics, Characteristic of periodic and transient inputs and the response of measuring system to these inputs.Response of measuring system to random inputs, Frequency spectra, auto correlation, cross correlation spectral density, Experimental determination of system parameters, requirement of instrument transfer function to ensure accurate measurement.

Measurement System
Introduction, principle, design of various active and passive transducers.Introduction to semiconductor sensors and its applications, design of signal conditioning circuits for various Resistive, Capacitive and Inductivetransducers and piezoelectric transducer, Analog to Digital and Digital to Analog converters, modulation – types, filters – active, passive, digital, Data transmission and telemetry-classification, Recorders – Types of recorders, XY-Plotters, Ultraviolet, magnetic and digital recording.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

LABORATORY/FIELD EXPERIENCES
1. Experimental determination of system parameters.
2. Study and verification of transducer characteristics.
3. Study of signal conditioning techniques.
4. Verification of dynamic performance characteristics of a given system.
5. Case study of a real life measuring system in an industry.
6. Various data acquisition software.

BOOKS RECOMMENDED
- Measurement System, Applications, and Design, E.O. Doeblin. McGraw-Hill International.
- Introduction to Instrumentation & Control, A.K Ghosh, Prentice Hall of India.
- Principles of Measurement and Instrumentation, Alan S Morris, Prentice Hall of India
- Tranducers and Instrumentation, DVS Murthy, Prentice Hall of India
- Electrical and Electronics Measurement and instrumentation, A.K. Sawhney, DhanpatRai& Sons. Delhi

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VIRTUAL INSTRUMENTATION

Course Code: ECE2451 **Credit Units: 03**

Course Contents:

Introduction to Virtual Instrumentation: Introduction,Historical perspective, advantages, block diagram and architecture of a virtual instrument, conventional vs. virtual instrumentation.

Introduction to Software : Introduction to Lab VIEW, Front panel, back panel representations, Block diagram, Menus, Palettes, VI and Sub VI, Editing and Debugging VI, Structures, Arrays, Clusters, Charts and Graphs, Data acquisition, Instrument Control, Signal Generation and Signal Processing Examples

Introduction to systems hardware:ADC, DAC, D/O, counters and timer, PC hardware structure, timing, interrupts, DMA, software and hardware installation, Configuring data acquisition hardware using the drives in application software, use of DAQ library functions for different analog and digital input/output operations. Input/output devices & functions like data gloves, joysticks, CRT etc.

Application of Virtual Instrumentation in various fields: Aviation, Automotive, High Voltage, Defense, Chemical, Industrial, Marine, Medical, Mining, Nuclear Energy, Virtual landscapes.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

LABORATORY / FIELD EXPERIENCES

1. Geographical programming using Lab VIEW
2. Applications of Lab VIEW

BOOKS RECOMMENDED

- Learning with LabVIEW 7 Express – R.H. Bishop, Pearson Education, Delhi.
- LabVIEW Basic 1 Course Manual, National Instruments
- Virtual Instrumentation Using LabVIEW- Sanjay Gupta & Joseph John, TMG; 2005.
- LabVIEW for everyone -Wells Lisa K and Travis Jeffrey, Prentice Hall.

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BIOMEDICAL INSTRUMENTATION

Course Code: ECE2551 **Credit Units: 03**

Course Contents:

Sensors and Transducers for biological applications

Types, properties, characteristics and selection of transducers for biological instrumentation.

Measurement of electrical parameters

Leads and electrodes, electrocardiography, electrical activity of the heart, equivalent cardiac generator. Einthoven lead system, standardization of recording and display of ECT (Electrocardiogram), EEG (Electroencephalogram), EMG (Electromyogram), EOG (Electrooccculogram), ERG (Electroretinogram), EGG (Electrogastogram).

Measurement of non-electrical parameters

Blood flow, drop recorder, electromagnetic flow meter, measurement of systolic and diastolic pressures, blood pressure instruments, intraocular pressure, lung air pressure, Audiometers.Measurement of body temperature, thermography. Cardiac tachometer, respiration rate phonocardiogram, heart sounds electrical stethoscope pulmonary function analysers. CO2 - O2 - Concentration in exhaled air, blood and lungs, pH value of blood, impedance pletnysmography blood gas analysers, blood cell counters.

Medical Imaging Systems

Medical display systems, medical thermography X-Ray, diathermy equipment.Ultrasonics in biomedical application for diagnostic and therapeutic, CAT, MRI, Laser applications in biomedical field.

Patient safety

Electrical Safety of Medical Equipments, Shock Hazards from Electrical Equipment, Methods of Accident Prevention, Test Instruments for checking Safety parameters of biomedical equipments.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

BOOKS RECOMMENDED

- Biomedical Instrumentation and Measurements; L.C. Cronwell F.J. Weibell. E.A. Pfeiffer, PHI.
- Principles of applied instrumentation: Gaddes and Baker, John Wiley & Sons.
- Handbook of Bio-medical Instrumentation; R.S. Khandpur, McGraw Hill
- Medical Instrumentation – Application & Design, John G. Webster, Editor, John Wiley & Sons.

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ANALYTICAL INSTRUMENTATION

Course Code: ECE2651 **Credit Units: 03**

Course Contents:

Analytical Methods of Measurements

Physical methods of chemical analysis, special methods of analysis, basic techniques, terminologies, units, Interaction of electromagnetic radiations with matter, emission, absorption and scattering techniques. Instrumentation related to X-Ray, Ultraviolet and Infrared techniques.

Special Analysis

Various light sources, spectrometer, detectors and data processing, comparison of various spectral analytical techniques, refractometry, nuclear magnetic resonance spectrometry. Analytical techniques based on separation method: Basics of chromatography liquid, gas and HPLC Mass Spectrometry and related instrumentation.

Electrometric Methods of Analysis

Techniques and related instrumentations for pH and selective potentiometery, Voltametery, Colometery and Conductometery, Analytical data presentation. Error analysis, Design considerations of an analytical laboratory, automated analysis, Atomic absorption, spectrometry, polarmetery, Turbidimetery, Nophelometry.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

BOOKS RECOMMENDED

- Instrumental Methods of Chemical analysis; Galen W. Ewing, McGraw-Hill, Koga Kusha Ltd.
- Instrumental Methods of Analysis: HW Willard, LynnelMerriktt. Jr John A. Dean, F.A. Settle, Jr. Wadsworth Publishing Co. U.S.A.
- Introduction to Instrumentation Analysis: Robert D.Braun McGraw Hill Co. International Ed.
- Analytical Instrumentation HandBook: Galen W.Ewing, Marcel Decker Inc, USA.
- Instrumental Methods of Chemical Analysis: GurdeepChetwal, Sham Anand Himalaya Publishing House.
- Instrumental Methods of Chemical Analysis: B.K. Sharma, Goel Publishing House, Meerut.
- Instrumentation Engineers Hand Book-Process Control, BG Liptak, Butterworth Heinemann.

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INDUSTRIAL PROCESS CONTROL

Course Code: ECE2751 **Credit Units: 03**

Course Contents:

Process Characteristics: Process, Process variable, mathematical modeling of liquid, gas, thermal, mechanical and chemical system. Linearizing techniques, liquid level control in a tank. Dynamics of manometer, response of non-interacting and interacting first order elements in series.

Controller characteristics: Characteristics of on-off, proportional, integral, derivative modes and their combinations.

Automatic control: Single and combined modes in closed loop, static error, velocity error. Dynamic behavior of feedback control processes for different modes. IAE, ISE, IATE criteria. Tuning of controllers.

Controllers: Electronics, pneumatic, hydraulic controllers implementing. Single and composite mode of controllers. Latest trends in industrial controllers employing PLCs & other logic devices such as fuzzy logic control DCS & Computer based systems etc.

Final control elements:

Types & function of Control valves. Electrical, Pneumatic, hydraulic actuators.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Books recommended:

- Instrument Engineers' Handbook of Process Control; Bela G. Liptak; 3rd Edn. Chilton Book Company Randor Pennsylvania
- Process Control Instrumentation Technology; CD Johnson 8th Edn; PHI 2006
- Automatic Process Control; D.P.Eckman; 1992 Wiley Eastern Ltd.
- Industrial Instrumentation; D.P. Eckman; Wiley Eastern Ltd.
- Principles of Industrial Process Control; D.P.Eckman;Wiley Eastern Ltd.
- Process System analysis & control; D.R.Coughanowr; 2nd Edn; 1991;McGraw International Edn.
- Principles of Process Control; D. Patranabis; 2nd Edn.1998 TMH
- Process Control; Peter Harriot; 2000, TMH
- Chemical Process Control; G. Stephanopoulus; 2002; PHI

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LASER SYSTEM

Programme Structure

Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
LOE2351	Basics of Lasers	2	-	2	3
LOE2451	Laser Technology & Applications	3	-	-	3
LOE2551	Laser Systems & Devices	3	-	-	3
LOE2651	Lasers in Defense Applications	3	-	-	3
LOE2751	Lasers in Industrial Applications	3	-	-	3
LOE2851	Lasers in Atmospheric Studies	3	-	-	3
	TOTAL				**18**

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LASER SYSTEM

Syllabus

BASICS OF LASERS

Course Code: LOE2351 **Credit Units: 3**

Course Objective:
The basic aim of this Course is to make students (with Physics &Maths background up to 12th standard) appreciate the fundamentals of lasers and their diversified applications. The approach will stress more on the concepts & fundamentals with very simple or sometimes no mathematical equations. The outcome of this Course will make the students/trainees more excited to more about lasers and their applications in specific fields of their interest.

- **Overview of Lasers :**History, Types and Applications of Lasers
- **Nature of Light**: Corpuscular Theory, Wave Theory, Electromagnetic Spectrum, Qunatum nature of light, Dual nature of nature, De Broglies's hypothesis, wavelength associated with particle, momentum of photon, Energy-mass relation, Momentum of photon. Mass of photon.
- **Matter:** Structure of Atoms & Molecules. Energy Levels, Electronic, Vibrational and Rotational Energy Levels with Examples. Two-level representation.
- **Interaction of Radiation with Matter:** Absorption, Spontaneous Emission, Stimulated Emission, Einstein's A & B Coefficients of Transitions, Maxwell Boltzmann Distribution, Planck's law of blackbody radiation.
- **Principle of Laser action:** Population inversion, metastable states, gain medium, Pumping mechanisms, feedback mechanism, threshold condition for laser beam generation.
- **Optical Resonators :**Types of Resonators, Stability Criteriia, g-parameters.
- **Characteristics of Laser Beams:**Monochromaticicity, Directionality, Brightness, Coherence: temporal & spatial, Focusability, Ultra-short pulse generation.
- **Types of Lasers:**Three- level and Four-level Lasers, Solid, Liquid and Gas Lasers. Brief description of Ruby, He-Ne, Nd:YAG, Carbon Dioxide Lasers, Semiconductor Lasers. X-Ray Lasers, Free-electron Lasers. Fiber Lasers.
- **Longitudinal & Transverse Modes** : Temporal modes, Spatial Modes & characteristics.
- **Application of Lasers:** General Applications of Lasers, Laser Applications in Industry, Defence, Medicine, Entertainment etc.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Laser Principles, Types & Applications: K R Nambiar, New Age International, 2004.
- Lasers: Theory and Applications : A K Ghatak and K Thyagarajan, McMillan, 2003.

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LASER TECHNOLOGY & APPLICATIONS

Course Code: LOE2451 **Credit Units: 3**

Course Objective: The aim of this Course is to make students/traineesunderstand the fundamentals of lasers, laser systems, their characteristics and diversified applications including industry, medicine & Defence. The approach will be to stress more on the fundamentals with the help of very simple mathematical equations. The outcome of this Course will prepare the students/trainees to use this knowledge for applications of lasers in specific fields of their interest.

Module I: INTERACTION OF LIGHT WITH MATTER Einstein coefficients, Relation between these coefficients, Lifetime of excited state, Line Broadening mechanisms, Population inversion, Threshold condition for Laser, Laser-Rate equations for three-level and four-level systems, Conditions for CW and pulsed laser action.

Module II: DIFFERENT POPULATION INVERSION TECHNIQUES WITH EXAMPLES
Optically pumped lasers, solid state lasers, dye lasers, electrical-discharge pumped lasers, gas lasers, chemical lasers, gas dynamic lasers, semiconductor lasers, free-electron lasers, gamma ray lasers, fiber lasers (only introductory description of these lasers).

Module III: OPTICAL RESONATORS
General considerations, Laser resonators,General conditions of stability, Plane and spherical mirror cavities, Modes and optical resonators, Gaussian beam propagation,Theory of Q-switching and experimental methods - Theory of Mode locking and experimental methods. Frequency stabilization of laser beams.Multimode oscillation.

Module-IV: CHARACTERISTICS OF LASER BEAMS AND APPLICATIONS
Monochromaticity, Spatial & temporal coherence, temporal coherence & monochromaticity relation, connection between spatial coherence and directionality, rightness, Focusability, ultra-short pulse generation. Peak Power, Average Power, Duty Cycle in Pulsed Lasers.

Module V: TYPES OF LASERS
Solid, Liquid and Gas Lasers. Brief description of Ruby, He-Ne, Nd:YAG, Nd:glass, Er:glass, Er:YAG, Carbon Dioxide Lasers, Nitrogen Lasers, Semiconductor Lasers. X-Ray Lasers, Free-electron Lasers. Fiber Lasers, Femtosecond lasers, Raman Lasers.

Module VI: APPLICATION OF LASERS
General Applications of Lasers including Industry, Defence, Medicine, Entertainment etc.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

REFERENCES:

- Laser Principles, Types & Applications: K R Nambiar, New Age International, 2004.
- Lasers: Theory and Applications : A K Ghatak and K Thyagarajan, McMillan, 2003.
- Lecture Notes on “Laser Technology & Applications” (LOE2451) by Prof. (Dr.) Jai Paul Dudeja

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LASER SYSTEMS & DEVICES

Course Code: LOE2551 **Credit Units: 3**

Course Objective: This course describes in details the principles, energy level diagrams, block diagrams and operation of various types of laser systems: solid, semiconductor, liquid and gas lasers. These laser systems are further classified according to the pumping schemes employed and systems output characteristics of each laser system are then explained. This course will make the students understand the actual functioning of various laser systems.

Module I: OPTICAL MATERIALS
Optical materials for IR to UV wavelengths

Module II: LASER COMPONENTS
(a) MLD Components: metal coated, multilayer dielectric coated, AR coated, thin film polarizers, narrow-band filters.
(b) Optical Components: Polarizers, beam splitters, beam expanders and collimators, gratings, graticules.
(c) Arc/Flash Lamps: Electrical and spectral characteristics of arc/flash lamps, pulse forming networks for flash lamps.

Module III: LASER POWER SUPPLIES
Simple DC high-voltage power supplies, switch-mode power supply (SMPS), constant current power supply. High-voltage fast switches: spark gaps, SCR, thyratrons, krytrons, saturable magnetic core, avalanche transistors. Pulsed power supplies for lasers: Marx generators for CO_2 lasers, pulsed circuits for nitrogen, copper, excimer and semiconductor lasers,

Module IV: DESIGN OF OPTICALLY-PUMPED LASERS
(a) Optically Pumped Lasers: Ruby, Nd:YAG, Er:glass, Dye lasers, FIR lasers, Raman shifted lasers
(b) Electrical Discharged Lasers: He-Ne, Nitrogen, Various types of CW and Pulsed Carbodioxide lasers, argon-ion, copper and copper compound lasers, Excimer lasers.
(c) Brief Description of Other Lasers: Chemical Lasers, Semiconductor Lasers, Free electron laser, X-ray laser, Fiber Lasers.

Module V: LASER PARAMETRS MEASUREMENTS
Types of detectors (for UV, IR and visible wavelenghths) and their characteristics, Measurement laser average power, peak power, energy, wavelength, frequency, linewidth, pulse duration, pulse repetition rate, beam quality, divergence, beam diameter etc. Choppers, Monocromators, Lock-in Amplifiers, Box-car averagers, Spectroradiometers, Spectrophotometers, spectrum analyzers, wavemeters, densitometers.

Module VI: LASER HAZARDS AND SAFETY MEASURES
Types of hazards, hazards to eyes and skin, Maximum Permissible Exposure (MPE), Classification of lasers, from the point of view of hazards, safety measures, NOHD, buffer zone, laser safety measures.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

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Text & References:

- Laser Principles, Types and Applications , K R Nambiar, New Age International 2004.
- Laser Fundamentals, William T Sifvast, Cambridge University Press, 2004
- J. Verdeyen, Laser Electronics, Prentice Hall, 1995
- Solid State Laser Engineering, W. Koechner, Springer Series in Optical Sciences, Vo. 1, Springer Verlag

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LASERS IN DEFENSE APPLICATIONS

Course Code: LOE2651 **Credit Units: 3**

Course Objective: This course describes various applications of lasers Defence.

Module I: LASER BEAM PROPAGATION THROUGH ATMOSPHERE
Atmospheric absorption and scattering by molecules and aerosols, Atmospheric transmission, Beer's law, atmospheric windows. Absorption of laser radiation by carbon dioxide, ozone and water molecules.Scattering of laser radiation by air molecules, haze particles, fog droplets, cloud droplets and rain drops. Types of atmospheric scattering : Rayleigh, Mie scattering, diffraction theory. Atmospheric attenuation coefficient.Visibility of the atmosphere.Atmospheric turbulence and turbidity.Refractive-index structure coefficient. Nonlinear effects in the atmosphere: thermal blooming, beam bending, kinetic cooling, bleaching, self-induced transparency, Air breakdowm.

Module II: LASER RANGE FINDERS
Solid-state (Nd:glass, Nd:YAG and Er:glass) laser rangefinders (LRFs), Waveguide carbondioxide LRFs, Semiconductor LRFs. Discussion in each about the laser transmitter, receiver, signal processing unit, optical arrangement. Laser range equation, maximum and minimum ranges, range accuracy, range blocking, first echo/last echo logic, field of view, boresighting. Eye safe laser rangefinders.Optoelectronic proximity fuze, Satellite to Submarine Laser Range Finders.

Module III: LASER TARGET DESIGNATORS AND LASER-GUIDED WEAPONS
Laser Guidance, Laser target designators, laser guided missiles, laser guided bomb. Laser beam riding of missiles.Laser & electro-optic surveillance systems.IR guidance.

Module IV: LASER WEAPONS : Laser blinding gun, gas dynamic laser-baser weapon, COIL-based lassr weapon, HF/DF laser based weapon.

Module V: LASER GYROSCOPES & SENSORS: Laser ring gyro, optical fiber gyro, optical sensors (including fiber-optic sensors) in tanks, ships, aircraft etc.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text& References:

- Laser Principles, Types and Applications , K R Nambiar, New Age International 2004.
- Laser Fundamentals, William T Sifvast, Cambridge University Press, 2004
- J. Verdeyen, Laser Electronics, Prentice Hall, 1995

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LASERS IN INDUSTRIAL APPLICATIONS

Course Code: LOE2751 **Credit Units: 3**

Course Objective: To endow the students with knowledge about industrial laser systems and interaction of laser radiation with matter and applications of lasers in various materials processing like cutting, welding, surface treatment etc.

MODULE I INDUSTRIAL LASER SYSTEMS
High power laser systems - Focusing optics - Steering optics - Mechanisms - Overview of industrial lasers - CW &pulsed - Q-switched and Mode locked.

MODULE II THERMAL PROCESSES IN INTERACTION ZONE
Depth of penetration with respect to laser energy density - Reflectivity of Metals with respect to wavelength - Rate of heating and cooling - Maximum temperature rise and depth of hardened layer - Different gases used during laser materials processing - Operational parameters in laser materials processing - Key hole effect.

MODULE III SURFACE TREATMENT
Surface modification:- surface cladding - surface alloying - Hard facing - Shock hardening - laser parameters for surface alloying - process variables - Beam profiles - Different methods to obtain desired penetration depths - Experimental set-up.

MODULE IV LASER WELDING
Different modes of laser beam welding - Comparison between laser beam and electron beam welding - Influence of different parameters - Absorptivity - Welding speed - Focussing conditions - Advantages and limitations of laser welding - Laser welding of industrial materials - Recent developments in laser welding techniques

MODULE V LASER CUTTING AND DRILLING
Laser energy density for cutting and drilling - Melt flashing mechanism - Various assisting gases and their importance - Advantages of laser cutting - Laser instrumentation for cutting and drilling - Factors affecting cutting rates - Effect of laser pulse energy on diameter and depth of drilled hole.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

TEXTS & REFERENCES:

- Reddy J.F., 'High Power Laser Applications', Academic Press, 1977.
- Ian W. Boyd, 'Laser Processing of Thin Films and Microstructures', Springer - Verlag, 1987.
- Duley W.W., 'Laser Processing and Analysis of Materials', Plenum Press, New York, 1983.

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LASERS IN ATMOSPHERIC STUDIES

Course Code: LOE2851 **Credit Units: 3**

Course Objective:
This course aims to train the students on the basics of applications of lasers and various laser-based techniques to remotely detect and measure the concentration and size etc. of various constituents of the atmosphere including aerosols, pollutants and other toxic agents.

MODULE I: Introduction and Overview of Laser-Based Remote Sensing Techniques
Why Lasers for Remote Sensing of Environment. Aerosols, Pollutants, CBW Agents, Toxicity Levels, Non-Laser based Detection Techniques.

MODULE II: Lidar Techniques

Aerosol Lidar Differential Absorption Lidar (DIAL), Heterodyne Lidar, Micro-Pulse Lidar, LIF-Based Lidar, Raman Lidar, Doppler Lidar, Space Borne Lidar

MODULE III: Laser Sources for Remote Detection
Nd: YAG Laser, Carbondioxide Laser, UV Lasers, Tunable Lasers, Semiconductor Lasers

MODULE IV: Detectors and Telescopes and Data Processing:
Various Types of Detectors and their characteristics for different wavelengths and applications, Telescopes, Data acquisition and processing systems

MODULE V: Laser Based Techniques forStandoff Detection of Explosive Materials
Laser Induced Breakdown Spectroscopy (LIBS). Laser Induced Fluorescence (LIF). Raman Techniques, Hybrid (Integrated) Sensors.

Examination Scheme:

Components	A	MP	EE
Weightage (%)	5	25	70

MP: Mini Project, EE: End Semester Examination; A: Attendance

TEXTS & REFERENCES:
Laser Remote Sensing: Fundamentals and Applications. RM Measures. John Wiley

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MECHANICAL ENGINEERING

Programme Structure

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits
MAE2352	Thermodynamics	3	-	-	3
MAE2452	Fluid Power Systems	3	-	-	3
MAE2552	KOM	3	-	-	3
MAE2652	DOM	3	-	-	3
MAE2752	Meteorology	3	-	-	3
MAE2852	Project (Mechanical Engineering)	3	-	-	3
	TOTAL				**18**

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MECHANICAL ENGINEERING

Syllabus

THERMODYNAMICS

Course Code: MAE2352 **Credit Units: 03**

Course Objective:
Objective of this course is to impart in depth understanding of the principles of thermodynamics and heat transfer. This course also helps students understand the application of basic fluid mechanics, thermodynamic, and heat transfer principles and techniques, including the use of empirical data, to the analysis of representative fluid and thermal energy components and systems encountered in the practice of electrical, electronic, industrial, and related disciplines of engineering.

Course Contents:

Module I: Basic concepts
Thermodynamic system, intensive and extensive properties, cyclic process, Zeroth Law of Thermodynamics, Work and heat, Flow work

Module II: First Law of Thermodynamics
Mechanical equivalent of heat, internal energy, Analysis of non-flow system, flow process and control volume, steady flow, energy equation, flow processes

Module III: Second Law of Thermodynamics and Entropy
Heat Engine, heat pump, Kelvin Planck and Clausius statement of Second Law of Thermodynamics, Perpetual motion machine, Reversible cycle- Carnot Cycle, Clausius inequality, entropy, Principle of entropy increase, concepts of availability, irreversibility.

Module IV: Air-Cycles
Carnot cycle, Otto cycle, Diesel cycle, Dual cycle, Stirling cycle, Erricsson cycle, Brayton cycle; Reversed Carnot cycle.

Module V: Properties of Steam
Use of steam tables, wet steam, superheat steam, different processes of vapour, Mollier Diagram.

Module VI: Reciprocating Air compressors
Single stage compressor, Isothermal efficiency, adiabatic efficiency, clearance volume, volumetric efficiency, and multi-stage compression with intercooling.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- P.K. Nag, "Engineering Thermodynamics", Tata McGraw Hill
- Incropera, "Engineering Thermodynamics", John Willy

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References:

- Engel, T. and Reid, P., Thermodynamics, Statistical Thermodynamics & Kinetics, Pearson Education, 2006
- Cengel & Boles, "Thermodynamics", Tata McGraw Hill.
- Sonntag/Vanhylene, Fundamentals of Thermodynamics, Wiley
- Rahul Gupta, Engineering Thermodynamics, Asian Books P. Ltd.
- Y.V.C. Rao, Engineering Thermodynamics, Khanna Publications
- Onkar Singh, Applied Thermodynamics, New Age Publications.
- Dhomkundwar Kothandaraman, "A Course in Thermal Engineering", Dhanpat Rai Publications

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FLUID POWER SYSTEMS

Course Code: MAE2452 **Credit Units: 03**

Course Objective:
Fluid power systems cover generation, transmission, and control applications of power by using pressurized fluids. This course imparts the knowledge of different fluid power systems (pneumatic and hydraulic) which are used in industries and hydropower plants.

Course Contents:

Module I: Introduction
Euler's equations for turbo machines; impulse and reaction forces due to fluid systems on stationery and moving system of vanes; jet propulsion.

Module II: Water Turbines
Classification: Pelton, Francis, Propeller and Kaplan turbines; velocity triangles; efficiency; draft tubes, governing.

Module III: Pumps
Centrifugal pumps, velocity triangles, efficiency, turbine pumps, axial and mixed flow pumps.

Module IV: Performance of Fluid Machines
Similarity laws applied to rotodynamic machines; specific speed, unit quantities; characteristic curves; use of models; cavitations and attendant problems in turbo machines; selection of turbines hydroelectric plants.

Module V: Hydraulic Power Transmission
Transmission of hydraulic power through pipe lines; water hammer; precautions against water hammer in turbine and pump installations: hydraulic ram.

Module VI: Power Hydraulics
Positive pumps: gear, vane, screw, pump, variable delivery valves: flow control, pressure control, direction control, solenoid operated valve, hydraulic circuits, fluid coupling and torque converter.
Pneumatic Power: Basic principles, comparison of pneumatic and hydraulic Systems.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:
- Gupta, S. C., Fluid Mechanics and Hydraulic Machines, Pearson Education, 2007
- R.K. Bansal, "Fluid Mechanics & Hydraulic Machines", Laxmi Publications (P) Ltd., 2002.

References:
- Dr. D.S. Kumar, "Fluid Mechanics & Fluid Power Engineering", S.K. Kataria & Sons,2001
- D.R. Malhotra & N.K. Malhotra, "The Fluid Mech. & Hydraulics", Satya Prakashan, 2001
- V.P. Gupta, Alam Singh, Manish Gupta, "Fluid Mechanics, Fluid Mechanics & Hydraulics", CBS Publishers; 1999.

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BASICS OF KIMEMATICS OF MACHINE

Course Code: MAE2552 **Credit Units: 04**

Module-I

Introduction

Links-types, Kinematics pairs-classification, Constraints-types, Degrees of freedom of planar mechanism, Grubler's equation, linkage mechanisms, inversions of four bar chain, slider crank chain and double slider crank chain

Velocity in Mechanisms

Velocity of point in mechanism, relative velocity method, Velocities in four bar mechanism, slider crank mechanism and quick return motion mechanism, Rubbing velocity at a pin joint, Instantaneous center method, Types & location of instantaneous centers, Kennedy's theorem, Velocities in four bar mechanism & slider crank mechanism

Module-II

Acceleration in Mechanisms

Acceleration of a point on a link, Acceleration diagram, Coriolis component of acceleration, Crank and slotted lever mechanism, Klein's construction for Slider Crank mechanism and Four Bar mechanism, Analytical method for slider crank mechanism

Mechanisms with Lower Pairs

Pantograph, Exact straight line motion mechanisms-Peaucellier's, Hart and Scott Russell mechanisms, Approximate straight line motion mechanisms–Grass-Hopper, Watt and Tchebicheff mechanisms, Analysis of Hooke's joint, Davis and Ackermann steering gear mechanisms.

Module-III

FRICTION

Laws of friction, Friction on inclined plane, Efficiency on inclined plane, Friction in journal bearing-friction circle, Pivots and collar friction-uniform pressure and uniform wear, Belt and pulley drive, Length of open and cross belt drive, Ratio of driving tensions for flat belt drive, centrifugal tension, condition for maximum power transmission, V belt drive

Brakes & Dynamometers

Shoe brake, Band brake, Band and Block brake, Absorption and transmission type dynamometers

Module-IV

CAMS

Cams and Followers - Classification & terminology, Cam profile by graphical methods with knife edge and radial roller follower for uniform velocity, simple harmonic and parabolic motion of followers, Analytical methods of cam design – tangent cam with roller follower and circular cams with flat faced follower

Module-V

Gears & Gear Trains

Classification & terminology, law of gearing, tooth forms & comparisons, Systems of gear teeth, Length of path of contact, contact ratio, interference & under cutting in involute gear teeth, minimum number of teeth on gear and pinion to avoid interference, simple, compound, reverted and planetary gear trains, Sun and planet gear.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

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Books and References:

1. Theory of Machines - Thomas Bevan
2. Theory of Machines and Mechanisms- Shigley
3. Theory of Machines and Mechanisms-Ghosh & Mallik
4. Theory of Machines and Mechanisms- Rao & Dukkipati
5. Theory of Machines-S.S. Rattan
6. Kinematics of Machines-Dr. Sadhu singh
7. Mechanics of Machines – V. Ramamurti
8. Theory of Machines – Khurmi & Gupta
9. Theory of Machines – R. K. Bansal
10. Theory of Machines – V. P. Singh
11. Theory of Machines – Malhotra & Gupta

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BASICS OF DYNAMICS OF MACHINES

Course Code: MAE2652 **Credit Units: 04**

Module 1.
Static Force Analysis: Static force analysis of planer mechanisms, Free body diagrams, dynamic force analysis including inertia and frictional forces of planer mechanisms
Inertia forces: D-Alembert's Principle, Velocity and acceleration of piston, Torque exerted on the crank shaft when friction and inertia of moving parts are neglected, Forces on the reciprocating parts of an engine considering friction and inertia of moving parts, Turning moment on crank shaft, Dynamically equivalent system, Torque exerted on the crank shaft, considering the weight of the connecting rod.

Module 2.
Balancing of rotating masses: Balancing of single rotating mass, Balancing of several masses rotating in the same plane, Balancing of several masses rotating in different planes.

Balancing of reciprocating masses: Balancing of reciprocating engine, Partial balancing of primary force, Partial balancing of locomotives, Variation of tractive force, swaying couple, hammer blow, coupled locomotive, primary balance of multi-cylinder inline engine, Secondary balance of multi-cylinder in line engines, Method of direct and reverse cranks, V-engines balancing.

Module 3.
Governors: Types of Governor, Watt Governor, Porter governor, Proell Governor, Hartnell Governor, Wilson-Hartnell governor, Sensitivity, Stability, Isochronism, Hunting, Governor Effort and Power, controlling force

Module4.
Gyroscopic effect and Gyroscope: Spinning and precession, gyroscopic couple, Effect of gyroscopic couple on the stability of automotive vehicles: Stability of four wheelers, Stability of two wheelers, Gyroscopic effects on ships and aero planes.
Module 5.
Vibration: Vibration analysis of SDOF systems, natural, damped, forced vibrations, base-excited vibrations, transmissibility ratio

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- PL Ballaney, Theory of Machines,
- Hams Crone and Roggers, Theory of Machines
- Shigley, Theory of Machines
- J. Lal, Theory of Machines
- SS Rattan, Theory of Machines
- Ghosh and Mallick, Mechanisms and Machines, EWP publication.
- R.S. Khurmi, Theory of Machine, S. Chand.

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METEOROLOGY

Course Code: MAE2752 **Credit Units: 03**

Course Objective:
The main objective of this course is to give the student: a basic understanding of the physical loss governing metrology and tolerance design. Gain and appreciation for the capabilities and applications of metrology through hands own experiences.

Course Contents:

Module I: Principles of measurement
Definition of Metrology, difference between precision and accuracy. Sources of errors: Controllable and Random Errors, Effects of Environment and Temperature, Effects of support, alignment errors.
Length Standards: Line standards, end standards and wavelength standards, transfer from line standards to end standards. Numerical based on line standards. Slip gauges – its use and care, methods of building different heights using different sets of slip gauges.
Limits, fits and tolerances: Various definitions, different types of fits and methods to provide these fits. Numerical to calculate the limits, fits and tolerances, ISO system of limits and fits; Gauges and its types, limit gauges – plug and ring gauges. Gauge Design – Taylor's Principle, wear allowance on gauges.

Module II: Comparators
Principles and working of Mechanical, Electrical, Optical and Pneumatic Comparators.
Angular Measurement: Sine Bar – different types of sine bars, use of sine bars in conjunction with slip gauges, Use of angle gauges, spirit level, errors in use of sine bars. Numericals. Principle and working of autocollimator.

Module III: Straightness and flatness
Definition of Straightness and Flatness error. Numericals based on determination of straightness error of straight edge with the help of spirit level and auto collimator
Screw Thread Measurement: Errors in threads, Measurement of elements of screw threads –major diameter, minor diameter, pitch, flank angle and effective diameter (Two and three wire methods). Effect of errors in pitch and flank angles
Gear Measurement: Measurement of tooth thickness – Gear tooth vernier caliper, Constant chord method, base tangent method and derivation of mathematical formulae for each method. Parkinson Gear Tester.

Module IV
Machine Tool Alignment: Machine tool tests and alignment tests on lathe. Alignment tests on milling machine. Alignment tests on a radial drilling machine, Interferometry.
Surface texture: Introduction, types of irregularities, Elements of surface
Texture, Measurement of surface finish, Examination of surface Roughness.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:
- R.K. Jain, "Engineering Metrology", Khanna Publishers, Delhi
- I.C. Gupta, "Engineering Metrology", Dhanpat Rai Publications, Delhi

References:
- F.W. Galyer & C.R. Shotbolt, "Metrology for Engineers", ELBS edition.

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NANOTECHNOLOGY

Programme Structure-2022

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits
NAT2152	Basics of Nanoscience	3	-	-	3
NAT2251	Properties of Nanomaterials	3	-	-	3
NAT2353	Synthesis of Nanomaterials	2	-	2	3
NAT2453	Characterization Techniques	3	-	-	3
NAT2553	Vacuum Science & Clean Room Technology	2	-	2	3
NAT2652	Industrial Applications of Nanomaterials	3	-	-	3
	TOTAL				**18**

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NANOTECHNOLOGY

Syllabus - Semester First

BASICS OF NANOSCIENCE

Course Code: NAT2152 **Credit Units: 03**

Course Objective:
To enable the students to understand the science of nanomaterials.

Module I: Introduction to Quantum Mechanics & Crystal structure
De-Broglie hypothesis, Uncertainty Principle, Schrödinger Equation, Operator, Particle in a 1D box, Particle in a3D box (qualitative), Crystal structure, Crystal orientation, Crystal planes, Bravaislattice, Miller Indices, Atomic Packing Density, crystal symmetry ,ZnS, Diamondand NaCl crystalstructure, Melting point, Coordination number, Atomic Bonding.

Module II: Introduction to Nanoscience
Emergence of Nanoscience with special reference to Feynman and Drexler, Role of particle size, Spatial and temporal scale, Exciton, Concept of confinement, strong and weak confinement with suitable examples, Development of quantum structures, Basic concept of quantum well, quantum wire and quantumdot. Density of states of1D, 2D & 3Dstructure, surface effect,

Module III: Types of Nanomaterials
Nanoclusters, Solid solutions, Thin film, Nanocomposites (Metal Oxide and Polymer based), Core Shell Nanostructure, Buckyballs, Carbon nano tubes and, Zeolites minerals, Dendrimers, Micelles, Liposomes, Block Copolymers, Porous Materials, Metal Nanocrystals, Semiconductor nanomaterials, Hydrogels

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage(%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Material Science & Engineering–An Introduction by William D. CallisterJr.
- Grain growth and control of microstructure and lecture in polycrystalline materials by V.Lu. Novikov & Vladimi Novikov
- Nanoscale Materials –Liz Marzan & Kamat
- Introduction to Nanotechnology by Charles P. Poole, Jr., FrankJ. Owens

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Syllabus - Semester Second

PROPERTIES OF NANOMATERIALS

Course Code: NAT2251 **Credit Units: 03**

Course Objective:
To enable students to understand properties of bulk and nanomaterials

Course Contents:

Module I: Electronic & Magnetic
Classification of materials: Metal, Semiconductor, Insulator, B and structures, Brillouinzones, Mobility, resistivity, relaxation time, and recombination centers, Hall effect Quantum Hall effect. Quantum Tunneling, Coulomb Blockade, single electron transistor. Origin of magnetic Moment in materials, Revisit to Different kind of magnetism in nature: Dia, para, ferro magnetic, Domain structure, antiferro, feri & super paramagnetism, nanomagnetic materials: Fe,Fe_3O_4,Ferrites, Ferro-fluids

Module II: Optical &Thermal
Photo-conductivity, Photovoltaic effect, optical absorption & transmission, photoluminescence, fluorescence, phosphorescence, electroluminescence, LED, Concept of phonon, thermal conductivity, specific heat, exothermic & endothermic heat, Thermoelectric effect, Thermoelectric material (TEM) properties.

Module III: Mechanical
Stress- Strain curve, True Stress True strain, Hardness, compressive & tensile strengths, Fracture toughness Fatigue, Creep and other lastic properties of materials, Deformation behavior of Nanomaterials

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage(%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Processing & properties of structural nanomaterials by Leon L. Shaw (editor)
- Chemistry of nanomaterials: Synthesis, properties and applications by CNR Raoet.al. Wiley VCHV erlag Gmbh & Co, Weinheim
- Nanostructure and Nanomaterials: Synthesis, Properties and Application by G.Cao, Imperial College Press,2004

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Syllabus - Semester Third

SYNTHESIS OF NANOMATERIALS

Course Code: NAT2353 **Credit Units: 03**

Course Objective:
To enable students to understand the different methods of synthesis of nonmaterial

Course Contents:

Module I: Physical Methods:
Physcal Vapour Deposition (PVD), Inertgascondensation, Arcdischarge, DCsputtering, Ionsputtering, RF & Magnetron sputtering , Pulse Laser Deposition (PLD), Ball Milling, Molecular beamepitaxy, Electro-deposition, Fundamentals of film growth. Physical vapour Deposition (PVD): Evaporation molecular beamepitaxy (MBE), Sputtering, Comparison of Evaporation and sputtering. Chemical Vapour Depostion (CVD) : Typical chemical reactions, Reaction kinetics, transport phenomena, CVD methods, diamond films by CVD

Module II: Chemical Methods:
Metal nanocrystals by reduction, Sol-gel, Solvothermal synthesis, Photochemical synthesis, Electrochemical synthesis, Nanocrystals of semiconductors and other materials by arrested precipitation, Thermolysis routes, Liquid-liquid interface.

Module III: Features of nanoscale growth
Specific Features of Nanoscale Growth – Introduction - Thermodynamics of Phase Transitions Dynamics of Phase Transitions - Thermodynamics of Spinodal Decomposition Thermodynamics of Nucleation – Growth - Size Control - Triggering the Phase Transition- Application to Solid Nanoparticles - Controlling Nucleation - Controlling Growth - Controlling Aggregation. Stability of Colloidal Dispersions - Breaking Matter into Pieces.

Examination Scheme:

Components	CT	HA	A	S/V/Q	EE
Weightage(%)	15	5	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Handbook of nanoscience, Eng. & Technology by W.Gaddand, D.Bernner, S.L.Solnki & G.J.Infrate (Eds), CRC press 2002
- Nanostructure and Nanomaterials: Synthesis, Properties and Application by G.Cao, Imperial College Press, 2004
- Nanoscience & Technology: Novel structure and phenomena by Ping Sheng (Editor)
- Nano Engineering in Science & Technology: An introduction to the world of nanodesign by Michael Rieth.

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Syllabus - Semester Fourth

CHARACTERIZATION TECHNIQUES

Course Code: NAT2453 **Credit Units: 03**

Course Objective:
To enable students to understand the instrumental techniques for characterization of nanomaterials

Course Contents:

Module I: Structural characterization techniques
X-ray diffraction (XRD) technique, particle size determination using XRD, Applications of XRD, Electron diffraction and its application, neutron diffraction and its applications

Module II: Optical and Electron Microscopy
Introduction to Optical microscopy, Scanning Electron Microscopy, Transmission Electron Microscopy, Scanning Tunneling Microscopy, Atomic Force Microscopy, Confocal Microscopy, SPR

Module III: Spectroscopic Techniques
UV visible spectroscopy ,Infrared Spectroscopy and Fourier Transform Infrared Spectroscopy, Raman Spectroscopy, Photoluminescence (PL), Photoelectron Spectroscopy (X-Ray Photoelectron Spectroscopy, Auger Electron Spectroscopy & Ultra Violet Photoelectron Spectroscopy)

Examination Scheme:

Components	CT	HA	A	S/V/Q	EE
Weightage(%)	15	5	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Elements of X-ray diffraction, BDCullity- Addison-Wesley Publishing Company, Inc.
- Encyclopedia of Materials Characterization, C.Richard Brundleand Charles A.Evans, Jr
- Web based different sources
- Willard, Merritt, Dean, Settle-Instrumental Methods of Analysis, 7th edition

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Syllabus - Semester Fifth

VACUUM SCIENCE AND CLEAN ROOM TECHNOLGY

Course Code: NAT2553 **Credit Units: 03**

Course Objective:
To enable students to understand vacuum science, their production, measurement, about clean room technology

Course Contents:

Module I: Vacuum Science and Technology
Vacuum and its different units, Kinetic Theory of Gases, Gas flow in vacuum systems, Physical Parameters at low pressure, classification of vacuum ranges, Application of Vacuum technology, Throught put & pumping speed, flow rate &conductance in vacuum system

Module II: Production & Measurement of Vacuum
Types of Vacuum Pumps (Rotary, diffusion, Turbo, Cryo & Ion) - Basic Principles and applications, Production of low, medium high and ultrahigh vacuum, Vacuum gauges, Leak detection techniques

Module III: Clean Room Technology
Clean rooms: Introduction, needs and Types, Basics of clean room standards, design of clean room &clean air devices, High efficiency air filtration, Clean room disciplines, Cleaning of clean room, Quality control, Industrial and Scientific application of clean room

Examination Scheme:

Components	CT	HA	A	S/V/Q	EE
Weightage(%)	15	5	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Tex t& References:

- Vacuum Science and Technology, VV Rao, TB Ghosh, KL Chopra-Allied Publishers Pvt. Ltd.
- Handbook of Vacuum Science and Technology, Dorothy M.H off man, Academic Press, An Imprint of Elsevier
- Clean Room Technology: Fundamental of Design, testing &operation by William Whyte; John Wiley & Sons 2002

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Syllabus - Semester Sixth

INDUSTRIAL APPLICATION OF NANOMATERIALS

Course Code: NAT2652 **Credit Units: 03**

Course Objective:
To enable students to understand the applications of nano materials and associated technology in industrial sector

Course Contents:

Module I: Nano-Electronic Technologies
Nanolithography, Data storage, Nano-photonics, Nano electronic and Magnetic devices, Spintronic, Carbon based materials: Carbon Nano-tube (CNC), Graphene. Sensors &Nano-sensors, NEMS.

Module II: Sustainable energy technologies
Solar energy, Hydrogen energy and Nano-materials, Carbon nanotube fuel cells, Hydrogen storage, Thermoelectricity, Re-chargeable batteries, Energy savings, Nano-lubricants, Nano-composites and Nano-catalysts. power semiconductor chips, fuel cells, superconductors, solar cells, energy storage and other alternative power sources. Solar cells, Thin film Si solar cells, Chemical semiconductor solar cells, Dye sensitized solar cells, Polymer solar cells, Nano quantum dot solar cells, Hybrid nano-polymer solar Cells

Module III: Applications of Nanotechnology in industrial, environmental and medical
Nano-biosensors in food and agriculture Industry, biological and environmental applications, drug delivery

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage(%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Bharat Bhushan:. Handbook of Nanotechnology, Springer
- Jurgen Schulte: Nanotechnology: Global Strategies,Industry Trends and Applications Graham
- TSmith: Industrial Metrology, BingZhou: Nanotechnology in Catalysis
- Luisa Filipponi and Duncan Sutherland: Nanotechnologies: principles, applications, implications and hands on activities
- JoséA. Rodríguez and Marcos Fernández-García: Synthesis, properties and applications of oxidenano particles wiley
- Mick Wilson: Nanotechnology: Basic Science and Emerging Technologies, Chapman and hall/ CRC Press
- http://www.nano.gov/you/nanotechnology-benefits

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UNMANNED AERIAL VEHICLES

Programme Structure-2021

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits
ASE2352	Introduction to UAVs and Applications	2	1	-	3
ASE2452	Principles of UAV's Flight	2	1	-	3
ASE2552	Aerial Imagery: Hardware and Software	2	1	-	3
ASE2652	Embedded Systems for UAVs	2	1	-	3
ASE2752	Research Project-I Drone Development	-	-	-	3
ASE2852	Research Project-II Drone Troubleshooting, Testing and Deployment	-	-	-	3
	TOTAL				**18**

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Prerequisites

- The course is offered to both engineering and non-engineering students. Knowledge of Intermediate (Class 12) level science is a prerequisite to comprehend the contents of this course.
- The course can be taken up by the students of B. Tech. (Aerospace Engineering) as it will increase their knowledge and employability in this domain.

S. No.	Course	Course Prerequisites
1	Introduction to UAVs and Applications	Basic Physics, Mathematics
2	Principles of UAV's Flight	Basic Physics, Mathematics, Introduction to UAVs and Applications
3	Aerial Imagery: Hardware and Software	Basic Physics, Mathematics
4	Embedded Systems for UAVs	Basic Physics, Mathematics, Basics of Computer Languages
5	Research Project 1- Drone Development	Courses of Semester 1-4
6	Research Project 2- Drone Troubleshooting, Testing and Deployment	Courses of Semester 1-5

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UNMANNED AERIAL VEHICLES

Syllabus

ASE2352	Introduction to UAVs and Applications	L	T	P	C
Version 2021-1	Date of Approval: June 2021	2	1	0	3
Pre-requisites/ Exposure	Basic Physics, Mathematics				
Co-requisites					

Course Catalog

This course provides basic knowledge and understanding of various kinds of UAVs and their classifications based on various aspects. Knowledge of basic physics is crucial to comprehend the contents of this course. This course also provides introductory knowledge to the students about various components and systems of UAVs which serve as a foundation for better understanding of the advanced course.

Course Objectives

The objective of this course is to

- Provide introductory knowledge to the students regarding the basic science and principles as applicable to UAVs and their structure.
- Provide education to the students about the construction, payload, and safe operations of UAVs.

Course Outcomes

On completion of this course, the students will be able to

CO1. List, explain, and categorize amongst various kinds of UAVs, their classifications and application areas.

CO2. List, explain, and describe basics of flight, structure, and control of UAVs.

CO3. List, explain, categorize, and apply the basic concepts of payloads and payload controls of UAVs.

CO4. List, explain, and apply the fundamental concepts of safe operation of UAVs.

CO5. Explain and apply the engineering fundamentals and principles to practical design and testing UAVs.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Introduction to UAVs Overview of UAVs and their Systems; Examples of UAV Systems; Nano UAVs; Micro UAVs, Small UAVs; Medium UAVs; Large UAVs; Different types of drones and their applications.	L1, L2, L4	6
Module 2: Concepts of Flight and UAV Construction and Control Basics of flight: lift, drag, thrust and weight balance. Basic structure and loads; construction materials; propulsion systems for UAVs; modes of control; UAV piloting; remote piloting; autopilot-assisted control; complete autonomous flights.	L1, L2, L3	6

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Module 3: Payloads and Payload Control Types of payloads; payload capacity and control, imaging sensors; target detection, recognition, and identification; atmospheric, radiological, and environmental monitoring; armed utility UAVs, controlling payloads; signal relay payloads.	L1, L2, L4	6
Module 4: Safe UAV Operations Regulating authority; homeland regulatory agencies and foreign regulatory agencies, general safety regulations and guidelines; restricted airspace; risk assessment; severity classifications; risk mitigation; do's and don'ts of UAV flying.	L1, L2, L3	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Tutorial/Laboratory/Field Experiences			
1	Drone Systems and Assembly	L2, L3, L5	6
2	Demo Flying, Test Flight	L2, L3, L5	6

Text & Reference Books:

Text:

- P. Fahlstorm, T. Gleason, "Introduction to UAV Systems", 4th Edition, John Wiley & Sons, Inc., 2012.
- "DGCA RPAS Guidance Manual", Director General of Civil Aviation, Revision-1, 2019.
- Handbook of Unmanned Aerial Vehicles, Editors: Valavanis, K., Vachtsevanos, George J. (Eds.), Springer, 2015

Reference:

- K. P. Valavanis, G. J. Vachtsevanos, "Handbook of Unmanned Aerial Vehicles", 1st Edition, Springer, 2015.
- R. E. Weibel, R. J. Hansman, "Safety Considerations for Operation of Unmanned Aerial Vehicles in the National Airspace System", Report No. ICAT-2005-1, MIT International Center for Air Transportation, 2005.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	3	3	-	-	-	-	-	2	2	3	3	1	1	1	2
CO2	1	3	3	-	-	-	-	-	2	2	3	3	1	1	1	2
CO3	1	3	3	-	-	-	-	-	2	2	3	3	1	1	1	2
CO4	1	3	3	-	-	-	-	-	2	2	3	3	1	1	1	2
CO5	1	3	3	-	-	-	-	-	2	2	3	3	1	1	1	2

1: strongly related, 2: moderately related and 3: weakly related

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ASE2452	Principles of UAV's Flight	L	T	P	C
Version 2021-1	Date of Approval: June 2021	2	1	0	3
Pre-requisites/ Exposure	Basic Physics, Mathematics, Introduction to UAVsand Applications				
Co-requisites					

Course Catalog

This course provides basic knowledge and understanding of aerodynamics, propulsion, stability and control of the UAVs. Knowledge of basic physics and engineering mechanics is crucial to comprehend the contents of this course. This course also provides essential knowledge to the students about the efficient and stable flight of the UAVs.

Course Objectives

The objective of this course is to

- Provide fundamental knowledge to the students regarding the aerodynamics and propulsion systems of the UAVs.
- Provide education to the students about the stability and control of UAVs.

Course Outcomes

On completion of this course, the students will be able to

CO1. List, explain, and apply the governing equations to the operation of UAVs.
CO2. List, explain, and describe basics of UAVs aerodynamics.
CO3. List, explain, and apply the basic concepts of propulsion and propulsion systems to UAVs.
CO4. List, explain, and apply the fundamental concepts of stability and control of UAVs.
CO5. Explain and apply the engineering fundamentals and principles to design and test UAVs.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Introduction Introduction to incompressible flow, Continuity, momentum, energy and other governing equations; pitot-static tube, pressure coefficient, Mach number their significance.	L1, L2, L4	6
Module 2: UAV Aerodynamics Symmetric and cambered airfoils; Airfoil nomenclature and characteristics; aerodynamic forces and moments; calculations for airfoil lift and drag; center of pressure; aerodynamic center; Modern low-speed airfoils; characteristics of low speed airfoils; Finite and infinite wings; Flow Separation; Stall.	L1, L2, L3	6
Module 3: Propulsion Systems Propulsive thrust; nomenclature and geometry; thrust to weight ratio; types and classifications; propeller and basic principles; different type of propellers; propeller safety; propeller lift and angle of attack; propeller pitch; fixed pitch propellers; propeller materials; propeller installations and operation; battery of a drone; motors; different types of engines; fuel, hybrid, fuel cells; solar powered UAVs.	L1, L2, L4	6

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Module 4: Stability and Control Overview of standard atmosphere; static and dynamic stability; principal axes and rotation of aerial systems; equilibrium; flight control and control surfaces; their significance and autopilot usage.	L1, L2, L3	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Tutorial/Laboratory/Field Experiences			
1	Simulator-based flying training	L2, L3, L5	6
2	Drone pilot training on field	L2, L3, L5	6

Text & Reference Books:

Text:

- Anderson, J. D., Jr., "Fundamentals of Aerodynamics", 2nd Edition, McGraw Hill, 1990.
- Houghton, E. L. and Carpenter, P. W., "Aerodynamics of Engineering Students", 4th Edition, CBS Publishers & Distributors, 2005.
- Kermode, A. C., "Mechanics of Flight", 10th Edition, Pearson Education, 2006.

Reference:

- Bertin, J. G. and Cummings, R. M., "Aerodynamics for Engineers", 6th Edition, Pearson, 2013.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

CO, PO, PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	1	3	3	-	-	-	-	-	2	2	3	3	1	1	1	2
CO2	1	3	3	-	-	-	-	-	2	2	3	3	1	1	1	2
CO3	1	3	3	-	-	-	-	-	2	2	3	3	1	1	1	2
CO4	1	3	3	-	-	-	-	-	2	2	3	3	1	1	1	2
CO5	1	3	3	-	-	-	-	-	2	2	3	3	1	1	1	2

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ASE2552	Aerial Imagery: Hardware and Software	L	T	P	C
Version 2021-1	Date of Approval: June 2021	2	1	0	3
Pre-requisites/ Exposure	Basic Physics, Basic Electronics				
Co-requisites					

Course Catalog

This course provides basic knowledge and understanding of aerial imagery, remote sensing and AI using UAVs. Knowledge of basic physics and basic electronics is crucial to comprehend the contents of this course. This course also provides essential knowledge to the students about the efficient and effective aerial imagery and remote observations using UAVs and image processing using software.

Course Objectives

The objective of this course is to

- Provide fundamental knowledge to the students regarding the basics of imagery and remote sensing using UAVs.
- Provide education and practice to the students about image processing, AI and global positioning.

Course Outcomes

On completion of this course, the students will be able to

CO1. List, explain, and apply the basics of aerial imagery using UAVs.

CO2. List, explain, and apply the basics of image processing using fundamental principles and relevant software.

CO3. List, explain, and apply the basic concepts of remote sensing, GIS and GPs in operation of UAVs.

CO4. List, explain, and apply the fundamental concepts of image enhancement and AI.

CO5. Explain and apply the engineering fundamentals and principles to practical applications of remote sensing using UAVs.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Basics of Aerial Imagery Introduction to aerial image acquisition; types of cameras; payload weight; consumption of battery with different payloads; manual and autonomous capture of pictures and videos by UAVs; limitation with aerial photography; image distortion; FOV; lighting; understanding of aerial views and flight planning.	L1, L2, L4	5
Module 2: Introduction to Image Processing Various steps involved in image processing; concepts of digital image; some basic relationships like neighborhoods; connectivity; distance measure between pixels; histogram: definition; decision of contrast based on histogram; operations based on histograms like image stretching.	L1, L2, L3	5

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Module 3: Remote Sensing, GIS and GPS Introduction to remote sensing technology; satellite vs drone imagery; Geographical Information System; Global Positioning System; Introduction to measurement and measuring systems; functional elements of a measuring system; errors and uncertainty in measurements; methods of minimization of the errors.	L1, L2, L4	5
Module 4: Image Enhancement, Morphology and Segmentation Image enhancement techniques (spatial and frequency domain); Morphological operations; Image segmentation techniques.	L1, L2, L3	5
Module 5. Artificial Intelligence General introduction to AI; application of AI for guidance & control; image processing.	L1, L2, L3	4

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Tutorial/Laboratory/Field Experiences			
1	Analysis of aerial images of various terrains	L2, L3, L5	4
2	Image processing using suitable software applications	L2, L3, L5	4
3	Analysis of GIS and GPS mark embedded aerial images	L2, L3, L5	4

Text & References:

Text:

- Drone Photography Basics: Your Guide to the Camera in the Sky, Justin Moore, SBN:9781682034088, 1682034089, Page count:128, Published:2019, Format:Paperback, Publisher: Amherst Media,
- Remote Sensing Technology, Imaging, Image Processing, Geographical Information System, Global Positioning System, acquiring information for civil & military applications
- Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", Pearson Reprint, 2001.

Reference:

- Drone Photography: Art and techniques, Jake Sugden · 2020, ISBN:9781785006906, 1785006908 24th February 2020, Format:E-book, Publisher: Crowood
- Anil K. Jain, "Fundamentals of Digital Image Processing", Prentice-Hall of India, New Delhi, 2001.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	3	3	-	-	-	-	-	2	2	3	3	1	1	1	2
CO2	1	3	3	-	-	-	-	-	2	2	3	3	1	1	1	2
CO3	1	3	3	-	-	-	-	-	2	2	3	3	1	1	1	2
CO4	1	3	3	-	-	-	-	-	2	2	3	3	1	1	1	2
CO5	1	3	3	-	-	-	-	-	2	2	3	3	1	1	1	2

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ASE2652	Embedded Systems for UAVs	L	T	P	C
Version 2021-1	Date of Approval: June 2021	2	1	0	3
Pre-requisites/ Exposure	Basic of Computer, Basic Electronics				
Co-requisites					

Course Catalog

This course provides basic knowledge and understanding of digital electronics and embedded systems in application in UAVs. Knowledge of computer fundamentals and basic electronics is crucial to comprehend the contents of this course. This course also provides essential knowledge to the students about the involvement of sensors and actuators and IOT in the application of UAVs.

Course Objectives

The objective of this course is to

- Provide fundamental knowledge to the students regarding the basics of digital electronics and control boards for UAV applications.
- Provide education and practice to the students about Sensors, actuators and IoT as applicable in UAV operations.

Course Outcomes

On completion of this course, the students will be able to

CO1. List, explain, and apply the basics of digital electronics in UAV applications.
CO2. List, explain, and apply the basics of embedded systems and programming of control boards.
CO3. List, explain, and apply the basic concepts of sensors and actuators interfacing in UAVs.
CO4. List, explain, and apply the fundamental concepts of using IoT in UAV applications.
CO5. Explain and apply the engineering fundamentals and principles to practical applications of embedded systems in UAVs.

Course Content

Modules	Blooms level*	Number of hours
Module1: Basics of Digital Electronics Introduction to digital electronics; logic gates; basic laws and theorems of Boolean algebra; introduction to combinational circuits; concept of memory cell and introduction to Flip-flops.	L1, L2, L4	6
Module 2: Introduction to Arduino, Raspberry Pi Introduction to embedded systems; introduction to various Arduino boards; introduction to Arduino IDE; 3DR PixHawk; introduction to Python programming language; introduction to Raspberry Pi development boards.	L1, L2, L3	6
Module 3: Interfacing with Sensors and Actuators Interfacing of temperature sensor; LIDAR; pressure sensors; humidity sensor; vision sensor with Arduino/Raspberry Pi; Interfacing of various actuators like DC motor; servo motor; stepper motor; ESC programming.	L1, L2, L4	6

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Module 4: Introduction to IOT IoT definition; characteristics; IoT functional blocks; physical design of IoT; implementation of IoT with Arduino and Raspberry Pi; cloud computing; fog computing;surveillance applications; other IoT applications.	L1, L2, L3	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Tutorial/Laboratory/Field Experiences			
1	Programming Arduino/Raspberry Pi	L2, L3, L5	3
2	Sensor/Actuator interfacing	L2, L3, L5	3
3	Design of IoT applications	L2, L3, L5	3
4	Drone programming and control	L2, L3, L5	3

Text & References:

Text:

- R.P. Jain, "Modern Digital Electronics", 2nd Edition, Tata Mcgraw Hill, 2003
- D. Norris, Arduino and Raspberry Pi Sensor Projects for the Evil Genius, McGraw-Hill Education, 2014
- V.Madisetti and A.Bahga, "Internet of Things (A Hands-onApproach)", 1st Edition, VPT, 2014

Reference:

- M. Mano, "Digital Design", 2nd Edition, Pearson Education,2007.
- S. Monk, Hacking Electronics: Learning Electronics with Arduino and Raspberry Pi, 2nd Edition

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	3	3	-	-	-	-	-	2	2	3	3	1	1	1	2
CO2	1	3	3	-	-	-	-	-	2	2	3	3	1	1	1	2
CO3	1	3	3	-	-	-	-	-	2	2	3	3	1	1	1	2
CO4	1	3	3	-	-	-	-	-	2	2	3	3	1	1	1	2
CO5	1	3	3	-	-	-	-	-	2	2	3	3	1	1	1	2

1: strongly related, 2: moderately related and 3: weakly related

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ASE2752	Research Project-I Drone Development	L	T	P	C
Version 2021-1	Date of Approval: June 2021	0	0	0	3
Pre-requisites/ Exposure					
Co-requisites					

Course Catalog

The minor project provides the student with an opportunity to apply knowledge and skills learned in the classroom in carrying out a project. The research project 1 is an in-house training on real-time project or on latest software. The experience and skills that come with carrying out research project 1 build a foundation and aptitude in students to conduct meaningful research towards a practical outcome. The research project 1 aims to impart necessary training to the students that is a value addition for their employability.

Course Objectives

The objective of this course is to

- Provide practical training on small-scale projects that will increase the capability of the students to work individually or in teams on actual problems in industry.
- Provide students with capabilities to design systems, analyze results, write technical reports and engage in life-long learning practices.

Course Outcomes

On completion of this course, the students will be able to

CO1. Relate and apply the acquired classroom knowledge with technical and real-time environment.

CO2. Relate and demonstrate capabilities to create and review technological solutions to complex engineering problems of relevant domains.

CO3. Apply the acquired knowledge to demonstrate the skills to create and compile technical reports pertaining to a given project.

CO4. Demonstrate the skills to work ethically and professionally in a team and engage in life-long learning.

Course Content

Guidelines

In order to achieve the objectives:

- Each student will be allotted a supervisor for proper guidance.
- Student will first submit details of company, external guide, project title to coordinator/supervisor as per given schedule.
- For internal assessment purpose, students will submit an industry feedback and a progress report.
- Student will maintain a file (Internship File/Project Report) which he/she will submit after completion of internship. Further, coordinator will provide Non-Teaching Credit Course project guidelines and sample to help in preparation of file. The Internship File aims to encourage students to keep a personal record of their learning and achievement throughout the Programme. It can be used as the basis for lifelong learning and for job applications. Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development. The file will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and their own personal contribution to the organization.

The **layout guidelines** for the Project Report

1. File should be in the following specification

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- A4 size paper
- Spiral Binding

- **Font**

For normal text Font Type and Size must be- Times New Roman, 12 pt. The minimum font size of materials within a table or a figure can be 10 point.

- **Margins**

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- **Tables and Figures**

Each sketch, drawing, graph and photograph should have a figure number and title below the figure etc. Numbering should be sequential, chapter wise. For instance, if there are 24 figures chapter 3 spread over all of its sections the figure numbers run from Figure 3.1 through Figure 3.24. In figures experimental data should typically be represented by centered symbols, and theoretical data by continuous curves.

Each table should have a table number and caption above the table. Numbering should be sequential, chapter wise, as in the case of Figure numbers. For instance, if there are 18 tables in chapter 3 the table numbers run from Figure 3.1 through Figure 3.18.

Make sure that figures and tables are complete in other respects such as legends, references (if any) and coordinate labels with units. Each figure and table must be explicitly referred to in the text and located where its first reference occurs, preferably after the reference.

- **Drawings**

All engineering drawings must conform to relevant Standards and should include a title block. If drawings are large they should be included at the back of the report in a separate pocket. In case drawings are made using CAD packages, a CD ROM should be included which contains all the files and details of the packages used.

- **Equations**

The numbering of equations should be sequential, chapter wise. Numbered equations must be explicitly referred to in the text.

2. Report Size: The maximum number of pages of the Report should be preferably between 40-70 pages.

3. Report Layout: The report should contain the following components

- Front Page
- Declaration
- Student Certificate (University)
- Certificate(Company)
- Acknowledgement
- Abstract
- Contents
- List of Figures
- List of Tables
- Company Profile (optional)
- Chapters
- Appendices(optional)
- References / Bibliography

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The above components are described below:

- **Title Page** - Format will be given by coordinator/supervisor.
- **Declaration by the Students -** This is page number (i), the beginning of the small case Roman numeral page numbers. The student has to give a declaration to the effect that the data used for the work, the work depicted in the report, and the written material contained in the report are not copied from others and that due permission has been taken from, and due credit has been given to, the sources whenever they are used.
- **Certificate** - This is page number (ii). It is given by the Institute.The certificate will be signed by the Faculty Supervisor(s) before the viva-voce after verifying the format and by the Head of the Department after review with the Supervisor(s).
- **Company Certificate -** This is a certificate, which the company gives to the students.
- **Contents -** This is page number (iii). The table of Contents should be titled just *Contents* (not Table of Contents). Try to fit it into one or two pages.
- **Acknowledgement -** This is page number (iv). Keep this brief and avoid using informal language. This page must be signed by the candidate.
- **Abstract and Keywords -** This is page number (v). The abstract (preferably one page) should contain the context/relevance of the problem at hand, a description of what was done and a gist of the significant observations/results.
- The keywords (maximum 6) are a hint that what is contained in the report.
- **Company Profile -** A Company Profile corresponds to a file with company-specific data. Company data can be stored there and included in a booking when needed.
- **Chapters-** Introduction, Literature Review/Background Study etc. as given by coordinator/supervisor.
- **References / Bibliography -** This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Modes of Evaluation: Viva/Progress Report/Presentation/Final Report

Continuous Internal Assessment	Final Assessment
50 Marks	50 Marks

Examination Scheme

Internal and Final Assessment (50)													
S. No.	Name of the Student	Project Title	Guide	Co-guide	Well defined problem, objectives and methodology (5)	Individual Contribution by the student to the project work (5)	Subject Knowledge / skill related to project work (10)	Presentation skills (5)	Thesis Report (7)	Presentation (6)	Execution (6)	Viva Voce (6)	Total (50)

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CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	2	-	-	-	-	-	-	-	-	-	1	1	-	-
CO2	2	2	-	1	3	-	-	-	-	-	-	-	1	1	1	-
CO3	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	1
CO4	-	-	-	-	-	-	-	1	1	-	1	1	-	-	-	1

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ASE2852	Research Project-II Drone Troubleshooting, Testing and Deployment	L	T	P	C
Version 2021-1	Date of Approval: June 2021	0	0	0	3
Pre-requisites/ Exposure					
Co-requisites					

Course Catalog

The minor project provides the student with an opportunity to apply knowledge and skills learned in the classroom in carrying out a project. The research project 1 is an in-house training on real-time project or on latest software. The experience and skills that come with carrying out research project 1 build a foundation and aptitude in students to conduct meaningful research towards a practical outcome. The research project 1 aims to impart necessary training to the students that is a value addition for their employability.

Course Objectives

The objective of this course is to

- Provide practical training on small-scale projects that will increase the capability of the students to work individually or in teams on actual problems in industry.
- Provide students with capabilities to design systems, analyze results, write technical reports and engage in life-long learning practices.

Course Outcomes

On completion of this course, the students will be able to

CO5. Relate and apply the acquired classroom knowledge with technical and real-time environment.

CO6. Relate and demonstrate capabilities to create and review technological solutions to complex engineering problems of relevant domains.

CO7. Apply the acquired knowledge to demonstrate the skills to create and compile technical reports pertaining to a given project.

CO8. Demonstrate the skills to work ethically and professionally in a team and engage in life-long learning.

Course Content

Guidelines

In order to achieve the objectives:

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Modes of Evaluation: Viva/Progress Report/Presentation/Final Report

Continuous Internal Assessment	Final Assessment
50 Marks	50 Marks

Examination Scheme

Internal and Final Assessment (50)													
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CO, PO, PSO Mapping

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CO3	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	1
CO4	-	-	-	-	-	-	-	1	1	-	1	1	-	-	-	1

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RENEWABLE ENERGY

Programme Structure-2022

Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
SAE2152	Fundamental of Solar Photovoltaic, Battery & Inverter	2	-	2	3
SAE2252	Solar PV Installation	2	-	2	3
SAE2352	Solar PV Design	2	-	2	3
SAE2452	Solid Waste Management and Power Generation	3	-	-	3
SAE2552	Solar Thermal Systems	3	-	-	3
SAE2651	Energy Audit and Energy Management	3	-	-	3
	TOTAL				**18**

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Overview

India's growing energy needs mixed with world's order for reducing environmental emissions by fossil energy sources require the use of environmentally friendly new and renewable energy sources having no environmental emissions. The thrust given by the Govt. of India under National Climate Plan and Jawahar Lal Nehru National Solar Mission has suddenly created the need to train large human resource in the field of new and renewable energy especially with expertise in solar energy.

Renewable Energy open track is designed to equip under graduates and working professionals in understanding of energy flow from Solar and biomass and the ways to harness the renewable forms of energy and its optimal usage. The curriculum gives and overall knowledge of solar PV fundamentals, battery, inverters, cables, solar PV designing, energy from wastes and waste management, environmental impact and energy audit and management. The course is especially designed to enhance the skills of the students and make them industry ready.

Programme Objectives (PO's)

The students will

- **PO1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- **PO2. Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- **PO3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- **P04. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **PO5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- **PO6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- **PO7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- **PO8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- **PO9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- **PO10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **PO11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- **PO12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

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Programme Specific Outcomes (PSOs)

On completion of the Renewable Energy Track, the student will be able to:
PSO1: Apply knowledge and understanding of the electrical engineering in dealing with the renewable energy systems. The students will learn to relate the electrical engineering concepts to design a solar PV system.

PSO2: Understand the working of solar PV cells, modules, battery, inverters and cables. They will be able to design and install an off grid solar PV power plant for meeting the demands of a household.

PSO3: Ability to understand the energy generation in a solar thermal system and its application in industry. They will also learn the role of these systems for sustainable energy development. They will also learn the techniques to manage the solid wastes and how energy can be generated from solid wastes and the associated challenges.

PSO4: Understanding the need of high level professional, management techniques including project management which can be used in technological and management practices in construction following the ethical code of conduct as well as understanding the impact of engineering practices on societal, global, commercial and economic scenario.

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RENEWABLE ENERGY

Syllabus

SAE2152	FUNDAMENTAL OF SOLAR PHOTOVOLTAIC, BATTERY & INVERTER	L	T	P	C
Version 1.1	Date of Approval:	2	0	2	3
Pre-requisites/Exposure					
Co-requisites					

Course Description

This course covers the concepts of basic engineering project related to energy supply using solar photovoltaic technology. Also, to make students understand the practical applications that use solar photovoltaic systems and be able to do specify, analyze and design.

Course Objectives

The objective of this course are as follows

·This course covers the fundamental concepts of electrical engineering that is required for solar PV system designing.

·To understand the physical principles of the photovoltaic (PV) solar cell and modules. The parameters used to measure the performance of solar PV cells and modules. The course also covers the sources of losses.

·To understand the different types of batteries and inverters used for solar applications and the working of these systems.

Course Outcomes

On completion of this course, the students will be able to

CO1. To compute the current, voltage and power in a circuit. Have understanding about resistance, power and energy.

CO2. To do the IV characteristic of solar PV cells and PV modules. They will be able to connect modules in series and parallel.

CO3. Identify the different types of batteries and inverters available in the market. They will be able to judge the performance of the battery and inverters based on their specifications.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Basics of Electricity Introduction to Electricity, current, voltage, danger with high voltage and current levels, resistance, power and energy.	L1, L2	12

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Module II: Basics of Solar Photovoltaics Cells Solar Cells, types of solar cells, electricity generation from solar cells, parameters of solar cells, factors affecting electricity generation from solar cells.	L1, L2	12
Module III: Solar PV Modules Solar PV module, Standard PV module parameters, factors affecting electricity generation from solar PV modules, measuring module parameters, series and parallel connection.	L1, L2	12
Module IV: Batteries & Inverters Basics about batteries, charging and discharging of batteries, components of battery, types of battery, parameters of batteries. Inverters, types of inverters, Inverter specifications, working principle.	L1, L2, L3	12

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text Books

- Solar Photovoltaics (Fundamentals, Technologies and Application) by Chetan Singh Solanki; 3rd edition 2015.
- Handbook of Photovoltaic Science and Engineering by Antonio Luque& Steven Hegedus - Wiley; Lecture notes, 2003.

Lab Syllabus

List of Experiments	**Blooms level***	**Number of hours**
1. Measure the V-I characteristics of a Photovoltaic cell	L1, L2	1
2. To study the illumination characteristics, power load characteristics, areal characteristics of a solar cell.	L1, L2	1
3. Measure the V-I characteristics of a Photovoltaic Panel subjected to variable load.	L1, L2	1
4. To study the effect of angle of the panel on V-I characteristic of a Photovoltaic Panel.	L1, L2	1
5. Measure the V-I characteristics of a Photovoltaic Panels connected in series and parallel without load.	L1, L2	1
6. Measure the V-I characteristics of a Photovoltaic Panels connected in series and parallel with load.	L1, L2	1
7. To understand the Safety norms and its importance, PPEs, Safety Signs, Safety Slogans, Safety Rules, Fire Extinguishers	L1, L2	1
8. Charging and discharging of battery	L1, L2	1

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

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Examination Scheme:

	IA				EE	
Components	**CT**	**Assignment**	**LR**	**Attendance**	**Theory**	**Practical**
Weightage (%)	10	5	10	5	40	30

Note: IA –Internal Assessment, EE- External Exam, CT- Class Test, LR – Lab Record.

Relationship between the Course Outcomes (COs), Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO3**	**PSO4**
CO1	**1**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**		**1**	**1**	**-**	**-**
CO2	**1**	**3**	**2**	**3**									**2**	**1**	**-**	**-**
CO3	**1**	**2**	**2**	**-**									**1**	**2**	**-**	**-**

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SAE2252	SOLAR PV INSTALLATION	L	T	P	C
Version 1.1	Date of Approval:	2	0	2	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course covers the concepts of basic concepts of installation of standalone solar PV systems. The students will be able to learn and understand the requirement of charge controllers, MPPT and different cables, structures in designing and installation of standalone PV system.

Course Objectives

The objective of this course are as follows

- ·To understand and apply the basic concepts of solar radiation necessary for sizing solar PV systems installation.
- ·To learn the different types of solar PV systems and their characteristics.
- ·To learn the need of balance of systems, charge controllers and MPPT in solar PV systems.
- ·To learn the different types of wires and cables used in solar PV installation and the losses through these cables.
- ·To learn to design and installation of standalone PV system based on the energy requirement.

Course Outcomes

On completion of this course, the students will be able to

CO1. To know some practical applications that use solar photovoltaic systems and be able to do specify, analyze and design.

CO2. To know and be able to analyze the behavior of a self-consumption demand and the measurement of network management.

CO3. To carry out a basic engineering project related to energy supply using solar photovoltaic technology.

Course Content:

Modules	Blooms level*	Number of hours
Module I-: Solar Radiation & solar PV systems Solar radiation, Peak sun hours, sun earth angles, site survey, shading, Types of Solar PV systems, standalone systems, grid connected systems, hybrid systems.	L1, L2	12
Module I-I: Charge controller, MPPT & Inverters Need of Balance of System, charge controllers, working of charge controllers, features of charge controllers, it's specifications. Power output from PV module, need of MPPT, MPPT chargecontroller, specifications.	L1, L2	12

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Module III: Wires Importance of choice of wires, Ohm's law, resistance & resistivity, types of wire, wire sizing	L1, L2	12
Module IV: Fundamentals of solar PV design and Installation of standalone system- case study System description under study, energy flow diagram, load estimation, sizing and choice of electronics components. Structures used for installation, site requirements, installation of the system.	L1, L2, L3	12

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Lab Syllabus

List of Experiment	**Blooms level***	**Number of hours**
Sun Earth Angles 1.Find the declination angle for all the days of the year. Find the variation of declination angle over the year. 2. Find solar altitude angle, azimuth angle and zenith angle for a location at a given time.	L2, L3	2
3. Conduct Site survey	L1, L2, L3	2
Maximum Power Point Tracking 4. Finding MPP by varying the resistive load across the PV panel. 5.Finding MPP by varying the duty cycle of DC-DC converter.	L1, L2, L3	4
6. Cable sizing for standalone PV system	L1, L2, L3	2
7. Demonstration of installation of standalone PV system	L1, L2	2

Text Books

- Solar Photovoltaics (Fundamentals, Technologies and Application) by Chetan Singh Solanki;2015.
- Handbook of Photovoltaic Science and Engineering by Antonio Luque & Steven Hegedus - Wiley; Lecture notes, 2003.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

	IA				**EE**	
Components	**CT**	**Assignment**	**LR**	**Attendance**	**Theory**	**Practical**
Weightage (%)	10	5	10	5	40	30

Note: IA –Internal Assessment, EE- External Exam, CT- Class Test, LR – Lab Record.

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Relationship between the Course Outcomes (COs), Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3	PSO4
CO1	**1**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**		**1**	**1**	**-**	**-**
CO2	**1**	**3**	**2**	**3**									**2**	**1**	**-**	**-**
CO3	**1**	**2**	**2**	**-**									**1**	**2**	**-**	**-**

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SAE2352	SOLAR PHOTOVOLTAIC DESIGN	L	T	P	C
Version 1.1	Date of Approval:	2	0	2	3
Pre-requisites/Exposure					
Co-requisites					

Course Objectives
The objective of the course is to demonstrate an understanding of how solar photovoltaic system designing can be effectively carried out with PVSYST software

Course Outcomes
On completion of this course, the students will be able to:
CO1: Illustrate the effective application of PVSYST software in capability design of practical SPV plants.

CO2: Demonstrate an understanding of how PVSYST software can impact on the development of practical SPV plants along with all the aspects of design analysis.

CO3. To carry out a basic practical solar photovoltaic power plant designing projects using PVSYST software.

Catalog Description
This course aims to make the students understand the importance of solar photovoltaic power plant designing with the help of PVSYST software.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to PVSYST software Creating a new site, Understanding the design flow, generation of PV installation site report, Basics of designing aspects	L1, L2	7
Module II: Understanding of losses in the PV system Definition, calculation, and application of all losses, engineering logic behind thumb rules, understanding the loss diagram.	L1, L2	8
Module III: Performing a Site Assessment Prerequisites of a site visit, studying obstructions & electrical diagrams, creating rough sketches of the site and SLD, and unforeseen scenarios.	L1, L2	7
Module IV: Understanding Sub-Arrays and Report Analysis Definition of sub-arrays, designing a detailed sub-array system, and report analysis.	L1, L2	7

**Bloom's Level:*

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L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Lab Syllabus

List of Experiments	**Blooms level***	**Number of hours**
1. Design a solar photovoltaic power plant understanding geographical location and the meteorological data. 2. Design a solar photovoltaic power plant understanding orientation of the PV modules, the required power or available area and the type of PV modules and inverters.	L1, L2	4
3. Designing of SPV plants with the shading analysis.	L2, L3	2
4. Design the loss diagram of SPV plant with various loss parameters. 5.Carry out the economic evaluation of SPV plant.	L1, L2, L3	4

Text Books

- Srivastava JP; Step by Step Guide to Solar Simulation Software PVsyst: Practical Approach to Solar Simulation Kindle Edition, 2021
- PVSYST tutorials:https://www.pvsyst.com/pdf-tutorials

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

	IA				**EE**	
Components	**CT**	**Assignment**	**LR**	**Attendance**	**Theory**	**Practical**
Weightage (%)	10	5	10	5	40	30

Note: IA –Internal Assessment, EE- External Exam, CT- Class Test, LR – Lab Record.

Relationship between the Course Outcomes (COs), Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO3**	**PSO4**
CO1	**1**	**2**	**2**	**3**	-	-	-	-	-	-	-		**1**	**1**	-	-
CO2	**1**	**3**	**2**	**3**									**2**	**1**	-	-
CO3	**1**	**2**	**2**	-									**1**	**2**	-	-

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SAE2452	SOLID WASTE MANAGEMENT AND POWER GENERATION	L	T	P	C
Version 1.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

The objective of the course is to provide insights into waste management options by reducing the waste destined for disposal and encouraging the use of waste as a resource for alternate energy production. This course is designed to provide an understanding of the various aspects of Waste to Energy. The various sources of waste generation isanalysed with a focus on its potential for energy production. The need for characterization of wastes will be discussed along with the existing norms for waste utilization for alternate energy source. Various Technological options available for the production of energy form waste will delineated along with economics of using alternate sources.

Course Objectives

- To enable students to understand of the concept of Waste to Energy.
- To link legal, technical and management principles for production of energy form waste.
- To learn about the best available technologies for waste to energy.

Course Outcomes

On successful completion of this course the students will be able to:
CO1: Apply the knowledge about the operations of Waste to Energy Plants.
CO2: Analyse the various aspects of Waste to Energy Management Systems.
CO3: Learn the various methods for harnessing energy from waste.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction The Principles of Waste Management and Waste Utilization. Waste Management Hierarchy and 3R Principle of Reduce, Reuse and Recycle. Waste as a Resource and Alternate Energy source. Rules for solid waste management in India.	L1, L2	7
Module II: Waste Sources & Characterization Waste production in different sectors such as domestic, industrial, agriculture, postconsumer, waste etc. Classification of waste – agro based, forest residues, domestic waste, industrial waste (hazardous and non-hazardous). Characterization of waste for energy utilization. Waste Selection criteria.	L1, L2	8

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Module III: Technologies for Waste to Energy Biochemical Conversion – Energy production from organic waste through anaerobic digestion and fermentation. Thermo-chemical Conversion – Combustion, Incineration and heat recovery, Pyrolysis, Gasification	L1, L2	7
Module IV: Waste to Energy Options Landfill gas, collection and recovery. Refuse Derived Fuel (RDF) – fluff, briquettes, pellets. Alternate Fuel Resource (AFR) – production and use in Cement plants, Thermal power plants and Industrial boilers. Conversion of wastes to fuel resources for other useful energy applications, Hydrogen production from wastes, algae as a source of energy	L1, L2	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books, Reference Books & Journals

- Industrial and Urban Waste Management in India, TERI Press.
- Wealth from Waste: Trends and Technologies by Banwari Lal and Patwardhan, TERI Press.
- Fundamentals of waste and Environmental Engineering, S.N Mukhopadhyay, TERI Press.
- Gazette Notification on Waste Management Rules 2016.
- CPCB Guidelines for Co-processing in Cement/Power/Steel Industry
- Waste-to-Energy in Austria – White Book – Figures, Data Facts, 2nd edition , May 2010
- Report of the task Force on Waste to Energy, NitiAyog (Formerly Planning Commission) 2014.
- Municipal Solid Waste Management Manual, CPHEEO, 2016
- Biomass for renewable energy, fuels and chemicals by Donald L. Klass
- Biorenewable Resources: Engineering New Products from Agriculture. Robert C. Brown. Wiley-Blackwell Publishing (2003).
- https://nptel.ac.in/courses/103107125

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Relationship between the Course Outcomes (COs), Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3	PSO4
CO1	**1**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**		**-**	**-**	**1**	**2**
CO2	**1**	**3**	**2**	**3**										**-**	**1**	**2**
CO3	**1**	**2**	**2**	**-**											**1**	**2**

1: strongly related, 2: moderately related and 3: weakly related

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SAE2552	SOLAR THERMAL SYSTEMS	L	T	P	C
Version 1.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

The objective of this course is to introduce materials relevant to the engineering of solar thermal systems. Students will develop the skills to analysis the thermal performance of solar thermal systems. Many of these calculations will be based on solar applications in different area. Finally the concepts of engineering economics applied to solar energy will also be introduced.

Course Outcomes

On completion of this course, the students will be able to

CO1. Conduct thermal Analysis of solar thermal collectors (FPC & CPCs).

CO2. Explain working mechanism of solar thermal collectors

CO3. To understand the working mechanism of solar air heater, solar crop drying, solar distillation, solar house, solar water heating systems, swimming pool heating by solar.

Catalog Description

In this course, the various modes of heat transfer shall be discussed. The different types of errors, accuracy of the numerical methods are also discussed in detail. Students will taught to calculate the amount of incident solar flux on horizontal and tilted surfaces. Thermal analysis of flat plate collector and concentrating collectors will be taught. The energy storage systems and the different components of solar systems will be discussed. The various water heating, air heating systems and its application to space heating and cooling and other solar devices will be discussed. Solar thermal power generation will be taught in this course.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction: Solar spectrum, solar radiation, instruments (pyrheliometers, pyranometers), solar radiation on horizontal surface, solar thermal energy conversion.	L1, L2	7
Module II: Flat plate collector Flat plate collector (FPC) (glazing material, collector plates), classification (evacuated tubular collectors, Types of FPCs), testing of collectors, heat losses, thermal analysis of FPC.	L1, L2	9

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Module III: Solar Concentrator Concentrating Collector Designs: Classification, design and performance parameters; Tracking systems; Compound parabolic concentrators; Parabolic trough concentrators; Concentrators with point focus; Heliostats; Comparison of various designs: Central receiver systems, parabolic trough systems, Solar power plant; Solar furnaces.	L1, L2	9
Module IV: Applications Solar air heater, solar crop drying, solar distillation, Solar Energy for Industrial Process Heat: Industrial process heat: Temperature requirements, consumption pattern; Applications of solar flat plate water heater & air heater for industrial process heat. Hybridization of systems	L1, L2,L3	11

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text Books

- Solar Energy: Fundamentals, design, modeling and applications, Authored by G. N. Tiwari ,2013
- Renewable Energy Engineering and Technology, Edited by V.V. N. Kishore, 2010.

Reference Books

- Solar Engineering of Thermal Processes, Duffie and Beckmann, 4th Edition. 2013.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Relationship between the Course Outcomes (COs) ,Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3	PSO4
CO1	1	3	2	3	-	-	-	-	-	-	-		-	-	1	2
CO2	1	3	2	3										-	1	2
CO3	1	2	2	-											1	2

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SAE2651	ENERGY AUDIT AND ENERGY MANAGEMENT	L	T	P	C
Version 1.1	Date of Approval: 2014	3	0	0	3
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

The objective of this course is to

- To develop the knowledge and understanding of renewable energy economics both rural and urban including energy management, auditing and policies.
- To demonstrate a comprehensive knowledge and understanding of the Economic Benefits of Solar Energy, cost effectiveness including concepts of solar panels, solar cooling etc. To understands the concept of Solar Industrial Economics and as an alternative source of future energy including integration with industrial process as well as with grid, storage of energy, economics.
- To develop the knowledge and understanding of Planning of Energy Efficient Building with the concept of solar heating systems.

Course Outcomes

On completion of this course, the students will be able to

CO1. Demonstrate a critical understanding of Energy economics including both rural and urban, environmental and energy policies.

CO2. Address the desirable features of Energy management and auditing (energy audit instruments, energy audit report writing).

CO3. Demonstrate the ability to investigate critically the knowledge about economic Benefits of Solar Energy and cost effectiveness as well as to understand the concept of Solar Industrial Economics

CO4. To develop the concept of Planning of Energy Efficient Building and its design with the understanding of both active and passive solar heating systems.

Catalog Description

This course covers the basic principles of energy management, economics of solar energy and design of energy efficient building.

Course Content:

Modules	Blooms level*	Number of hours
Module I-: Renewable Energy Economics Energy scenario, environmental policies, energy policies, economics of energy infrastructure, rural renewable energy economics.	L1, L2	5

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Module II: Energy Management Energy management: objectives, necessary steps and general princi energy management, Energy Manager: functions, qualities, duties a guidelines.	L1, L2	9
Module III: Energy Auditing Energy Auditing: Surveying, Audit: Purpose, Definition and Objectives, types of energy audit-preliminary and detailed; questionnaire, energy audit instruments, energy audit report writing. Energy conservation schemes, energy index, cost index, pie charts, Sankey diagrams, load profiles (histograms)	L1, L2	11
Module IV: Energy Audit of Building- Case study **Electrical Energy Management**: Methods to minimize supply demand gap; renovation and modernization of power plants, reactive power management, HVDC and FACTS; Conservation in motors, pumps and fan systems; energy efficient motors **Thermal Energy Management:** Energy conservation in boilers, steam turbines and industrial heating systems; Application of FBC; Cogeneration and waste heat recovery; thermal insulation; heat exchangers and heatpumps; building energy management.	L1, L2,L3	11

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Examination Scheme:

Components	CT(2)	Assignment	V(1)	Attendance	EE(1)
Weightage (%)	15	5	5	5	70

Text & References:

- Renewable Energy: Power For A Sustainable Future, Second Ed. Edited By Godfrey Boyle
- Solar Engineering Of Thermal Processes - J. A. Duffie, W. A. Beckman, Solar Energy Laboratory Lecture Notes
- Handbook on Energy Audit and Environment Management: YP Abbi and Shashank Jain, (TERI Press, 2006)

Relationship between the Course Outcomes (COs), Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3	PSO4
CO1	1	3	2	3	2	-	-	-	-	-	-			3	2	1
CO2	1	3	2	3	2									3	2	1
CO3	1	2	2	-	2									3	2	1
CO4	1	2	2	-	2									3	2	1

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IC MANUFACTURING

Programme Structure-2023

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits
ECE2153	Basic Electronics	3	-	-	3
ECE2253	VLSI Fabrication	3	-	-	3
ECE2353	Clean Room Technologies	3	-	-	3
ECE2453	Semiconductor Technology Equipment Maintenance	3	-	-	3
ECE2553	Vacuum Technology	3	-	-	3
ECE2653	Semiconductor Packaging, Testing and Assembly	3	-	-	3
	TOTAL				**18**

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IC MANUFACTURING

Syllabus

Course Code: ECE2153	BASIC ELECTRONICS	L	T	P	C
Version: 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

In this course, students will become familiar with basic semiconductor devices and electronic circuits. It will educate and explain the basics of semiconductor devices, the study of device characteristics and applications of p-n-junction diodes, bipolar junction transistors, and field effect transistors. This course explores the theory and operation of the basic building blocks of digital electronics which includes combinational and sequential circuits.

Course Objectives

The objective of this course is to:

- Build from basic knowledge of Semiconductor Physics to an understanding of basic devices and their models
- Familiarize student with the analysis and design of basic transistor amplifier circuits, feedback amplifiers and wave shaping circuits
- Provide the basic knowledge of digital logic levels and application of combinational and sequential circuits.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the operation, characteristic and application of PN Junction Diode, Rectifiers, Zener Diode, Bipolar Junction Transistor, MOSFET etc.

CO2. Design circuit with Bipolar Junction Transistor in CB, CE & CC configurations.

CO3. Describe different transistor amplifiers along with single and multi-stage amplifier, different feedback configurations.

CO4. Explain Boolean algebra, flip flops, shift registers & Design counters and synchronous sequential circuits.

Course Content:

Modules	Blooms Level*	Number of hours

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Module I Review of conductors, semi-conductors and insulators and their energy band diagrams, PN junction diode, Ideal diode and its characteristics, LED, Zener and Tunnel Diode and their characteristics, Applications of diodes-Rectifiers (Half and full wave, Bridge).	L1, L2	6
Module II BJT-construction and characteristics, Transistor as an amplifier, CE, CB and CC configurations, Transistor biasing, Introduction to FET and MOSFET.	L3, L4	9
Module III Cascaded amplifiers, RC coupled Amplifiers, Transformer coupling, Frequency response of RC, TC and their merits and demerits, Introduction to feedback-Positive and negative, Introduction to oscillators, Barkhausen criterion.	L5	7
Module IV OPAMP characteristics and specifications, OPAMP as inverting and non-inverting amplifier in open and closed loop mode, Applications of OPAMP.	L3,L4	6
Module V Introduction to digital electronics, logic gates, basic laws and theorems of Boolean algebra, single bit latch, flip flops-RS, JK, T, D, Master Slave, Counters, and Registers	L1,L2	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Jacob Millman, Christos Halkias, Chetan Parikh, Millman's Integrated Electronics, McGraw Hill Education, 2nd Edition, New Delhi
- Theraja B.L., Sedha R.S, Principles of Electronic Devices and Circuits, S Chand &Compa-ny, First Edition, New Delhi, 2002
- Moris Mano, "Digital Design", 2nd Edition, Pearson Education,2007.
- R.P. Jain, "Modern Digital Electronics", 2nd Edition, Tata Mcgraw Hill, 2003

Reference Books

- Robert L. Boylestad: Electronic Devices and Circuits, Pearson Education, 11th Edition, 2013
- Nagrath I.J, Electronics: Analog and Digital, Prentice Hall India Learning Private Limited, Second Edition, 2013
- Thomas L. Floyd, "Digital Fundamentals", 11th Edition, Pearson Education, 2015

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**	
Weightage (%)	5	10	8	7	70	

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Course Code: ECE2253	VLSI FABRICATION	L	T	P	C
Version: 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

In this course, students will become familiar with introduction to VLSI fabrication processes. It will educate and explain the basics of VLSI fabrication processes like Oxidation, lithography. Diffusion, Thin film deposition, etching and overview of interconnects. This course explores the theory and operation of the behind the Integrated circuit manufacturing.

Course Objectives

The objective of this course is to:

- Build from introduction of VLSI design to all processes in IC fabrication.
- Familiarize the student with the history of IC fabrication and oxidation methods, types and oxidation systems.
- Provide the Overview of lithography, its types and diffusion modeling in IC fabrication.
- To enhance the knowledge related to Thin Film deposition and etching methods.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the historical aspects of IC fabrication and the various methods used in it.
CO2. Compare the various oxidation methods.
CO3. Describe the lithography methods and the diffusion processes.
CO4. Explain the thin film deposition processes and etching methods used in IC technology.Give the overview of the interconnects

Course Content:

Modules	Blooms Level*	Number of hours
Module-I Introduction: History of IC's; Operation & Models for Devices of Interest: CMOS and MEMS. Electronic Materials: Crystal Structures, Defects in Crystals, Si, Poly Si, Si Crystal Growth. Clean room and Wafer Cleaning: Definition, Need of Clean Room, RCA cleaning of Si.	L1, L2	5
Module-II Oxidation: Dry and Wet Oxidation, Kinetics of Oxidation, Oxidation Rate Constants, Dopant Redistribution, Oxide Charges, Device Isolation, LOCOS, Oxidation System	L1, L2	6

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Module-III Lithography: Overview of Lithography, Radiation Sources, Masks, Photoresist, Components of Photoresist Optical Aligners, Resolution, Depth of Focus, Advanced Lithography: E-beam Lithography, X-ray Lithography, Ion Beam Lithography	L1, L2	5
Module-IV Diffusion: Pre-Deposition and Drive-in Diffusion Modeling, Dose, 2-Step Diffusions, Successive Diffusion, Lateral Diffusion, Series Resistance, Junction Depth, Irvin's Curves, Diffusion System. Ion Implantation System, Post Implantation Annealing, Ion Channeling, Multi Energy Implantation	L1, L2,L4	7
Module-V Thin Film Deposition: Physical Vapor Deposition: Thermal evaporation, Resistive Evaporation, Electron beam evaporation, Laser ablation, Sputtering Chemical Vapor Deposition	L1, L2,L4	5
Module-VI Etching: Anisotropy, Selectivity, Wet Etching, Plasma Etching, Reactive Ion Etching.	L1, L2	4
Module-VII Overview of Interconnects: Contacts, Metal gate/Poly Gate, Metallization, Problems in Aluminum Metal contacts, Al spike, Electromigration, Metal Silicides, Multi-Level Metallization, Planarization, Inter Metal Dielectric	L1, L2	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Plummer, Deal and Griffin, "Silicon VLSI Technology", Pearson Education , 1st edition ,2009
- Sze and May, "Fundamental of Semiconductor Fabrication", Wiley India , 2nd edition, 2009

Reference Books

- S K Gandhi, " Silicon Process Technology", Wiley India , 2nd edition , 2009

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Course Code: ECE2353	CLEAN ROOM TECHNOLOGIES	L	T	P	C
Version: 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

In this course, students will become familiar with clean room technologies, particle technology, behavior of clean room operation professional and clean room equipment rules. It will educate and explain the about the clean room hygiene rules, defects in particle technology, fundamentals of sedimentation technology, behavior of professionals and quality management in clean room technology.

Course Objectives

The objective of this course is to:

- Build from basic knowledge of clean room technology and fundamentals of hygiene cleaning.
- Familiarize the student with the particle technology and effects of particle defects on yield.
- Provide the knowledge about fundamentals of sedimentation and filtration technology.
- Educate about professional behavior and rules in clean rooms.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the clean room technology and the performance requirements.
CO2. Introduce the particle technology and is analyze effect of particle defects on yield.
CO3. Describe the fundamentals of sedimentation, filtration technology and their applications.
CO4. Explain the rules and regulations clean room technology and the design methodology used for quality management in clean rooms.

Course Content:

Modules	Blooms Level*	Number of hours
Module-I Cleanroom Technology: construction technology Cleanroom design; heating, ventilation, airconditioning and refrigeration equipment; lighting, cleanroom components Safety cabinets,air locks and air showers, floor systems, garments Fundamentals of hygiene cleaning,disinfection and sterilization; decontamination: garment basics, Performance Requirementsfor Clean-Room Garments, Clean-Room garment materials.	L1, L2,L4	5
Module-II Introduction to particle technology, Defects Caused by Particles &lts Probability ofDefect Formation, Quantitative Effect of Particle Defects on Yield, Particle characterization, particle size distributions, Properties of Particles, Ways to Express Particle Size, Properties of Aerosols, Particle Statics and Dynamics.	L1, L2,L3	6

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Module-III Fundamentals of sedimentation, Filtration technology Introduction to Filtration Mechanisms,Filter Properties, Pressure Drop, Particle Collection, Filter types and their applications,Measurement and Minimization of Particles in Process Gases and Process Liquids, ultra-purewater systems and distribution.	L1, L2	5
Module-IV Cleanroom operation Professional behaviour in cleanrooms, air locks and air showers;measurement exercises; regulations and personnel training, Equipment Cleaning to MinimizeParticle Deposition, Equipment Cleaning Methods.	L1, L2,L4	7
Module-V Clean Equipment Design Rules and the SMIF Isolation Concept, Cleanroom Qualificationand validation, User requirements, quality management, Cleanroom Quality management byDesign methodology and tools Cleanroom Monitoring Measurement techniques for the onlinemonitoring of cleanrooms Regulations and audits Standards and legal regulations;	L1, L2	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Donovan, "R. P -Particle Control for Semiconductor Manufacturing", CRC press
- W Whyte , "Clean room design", JOHN WILEY

Reference Books

- Matts Ramstorp, " Introduction to Contamination Control and Cleanroom Technology",

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Course Code: ECE2453	SEMICONDUCTOR TECHNOLOGY EQUIPMENT MAINTENANCE	L	T	P	C
Version: 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

In this course, students will know about the various faults that occurs in different electronic components and equipments. It will educate and explain the troubleshooting, testing, faults in passive components, ICs, semiconductor devices and mount assemblies. This course includes the repair and maintenance of different electronic components.

Course Objectives

The objective of this course is to:

- Provide the knowledge about faults and their causes in different electronic components
- Familiarize the student with the different testing techniques/ procedures to rule out the faults.
- Provide the information about the repair and maintenance mechanism of different electronic components and equipment.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the troubleshooting procedures, failures with their causes and troubleshooting techniques in electronic equipment.

CO2. Explain the testing methods, failures and precautions for different passive components like resistor, inductor and capacitor.

CO3. Describe causes, types and diagnosis of failures in semiconductor devices.

CO4. Explain the troubleshooting methods, testing, faults and handling precautions of digital ICs and digital circuits.

CO5. Describe the semiconductor packages, repair and rework of mount assemblies.

Course Content:

Modules	Blooms Level*	Number of hours
Module-I Fundamental Troubleshooting Procedures Inside An Electronic Equipment: Reading Drawings And Diagrams – Block Diagram, Circuit Diagram, Wiring Diagram; Dis-assembly and re-assembly of equipment, Equipment Failures and causes, Nature of faults, Fault location procedure, Fault finding aids, Test and Measuring instruments, special tools Troubleshooting techniques, Approaching components for tests, Grounding systems in Electronic Equipment, Temperature sensitive Intermittent problems Corrective actions, Situations where repairs should not be attempted.	L4,L5,L6	10

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Module-II Passive Components and Their Testing Passive Components- Resistors, Capacitors, Inductors Failures in fixed resistors, testing of resistors, variable resistors, potentiometers, LDRs and Thermistors. Types of capacitors and their performance, Failures in capacitors, testing of capacitors, Testing of inductors and inductance measurement	L1, L3, L4	8
Module-III Testing of Semiconductor Devices Types of semiconductor devices, Causes of failure in Semiconductor Devices, Types of failure Test procedures for Diodes, special types of Diodes, Bipolar Junction Transistors, Field Effect Transistors, Thyristors Operational Amplifiers, Fault diagnosis in op-amp circuits	L2, L3, L4	5
Module-IV Logic IC families, Packages in Digital ICs, IC identification, IC pin-outs, Handling ICs, Digital troubleshooting methods – typical faults, testing digital ICs with pulse generators Logic clip, Logic Probe, Logic Pulser, Logic Current Tracer, Logic Comparator Handling precautions for ICs sensitive to static electricity, Testing flip-flops, counters, registers, multiplexers and de-multiplexers, encoders and decoders; Tri-state logic.	L3, L4	7
Module-V Rework and Repair of Surface Mount Assemblies Surface Mount Technology and surface mount devices Surface Mount Semiconductor packages types, Packaging of Passive Components.	L4, L5	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Khandpur, "Modern Electronic Equipment: Troubleshooting, Repair and Maintenance " TMH 2006.
- R. G. Gupta, " Electronic Instruments and Systems: Principles, Maintenance and Troubleshooting", Tata McGraw Hill Edition 2001

Reference Books

- David L Terrell, "Student Reference Manual for Electronic Instrumentation", Butterworth-Heinemann Laboratories
- G. C. Loveday, A. H " Electronic Testing and Fault Diagnosis" Wheeler Publishing
- J.G. Joshi, " Electronic Measurement and Instrumentation", Khanna Publishing House

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Course Code: ECE2553	VACUUM TECHNOLOGY	L	T	P	C
Version: 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

In this course, the students get basic knowledge of gas kinetic theory with an emphasis on vacuum pumps. This course gives a detailed insight of vacuum pumps, their design, problem solving and applications.

Course Objectives

The objective of this course is to:

- Build from basic knowledge of gas theory to vacuum pumps.
- Familiarize the student with the design, working principles and problem solving of vacuum pumps.
- Provide the scope of applications of vacuum pumps in different domains.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the basic terminologies, mechanisms and surface interactions in gas theory.

CO2. Describe problem solving and leak detection in vacuum pumps.

CO3. Explain the different applications of vacuum like in Micro fabrication, Display technologies, X-ray tubes and space simulation.

Course Content:

Modules	Blooms Level*	Number of hours
Module-I Basic Theory: Gas kinetic theory, pressure, conductance, gas flow regimes, vapour pressure, pumping speed, throughput. Gas surface interactions: physisorption, chemi-sorption, condensation.	L1, L2	9
Module-II Vacuum Pumps: Mechanical, diffusion, molecular drag, turbo molecular, cryopumps, ion pumps - general working principles, operating regimes. Vacuum Instrumentation: Vacuum gauges, gas regulators, flow meters, residual gas analyzers, interpretation of data.	L4, L5	9
Module-III Design Concepts: Materials, chambers, components, joins, seals, valves. Overall system design and integration.	L4	6
Module-IV Problem Solving: Leak detection and detectors, gas signatures.	L4, L6	4

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Module-V Vacuum Applications: Micro fabrication Chemical vapour deposition, physical vapour deposition, sputtering, reactive ion etching, implantation, packaging, Display technologies, X-ray tubes, cryogenic insulation, space simulation.	L3, L6	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

- M. H. Hablanian, H. H. Hablanian "High-vacuum Technology: A Practical Guide" 2nd Edition, CRC Press, 1997.
- A.D. Tripathi , A. Gupta , "Ultra High Vacuum Techniques", Allied Publishers Private Limited, 2002

Reference Books

- A Roth , "Vacuum Technology", Third Edition , Eleciever Science
- Pramod K Naik, " Vacuum Science, Technology and Applications", CRC Press
- V.V. Rao, T.B. Ghosh, K.L. Chopra, " Vacuum Science and Technology", Allied Publishers

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Course Code: ECE2653	SEMICONDUCTOR PACKAGING, TESTING AND ASSEMBLY	L	T	P	C
Version: 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The course deals with electronics systems packaging – a multidisciplinary area. The course will discuss all the vital features of Electronic packaging at three major levels, namely, chip level, board level and system level. This course covers the technology advancements of microelectronic packaging from design to fabrication; assembly and testing.

Course Objectives

The objective of this course is to:

- Build overview of electronic systems packaging and the electrical issues encountered while doing it.
- Familiarize student with the chip level packaging, IC Assembly - Purpose, Requirements, Technologies and its types.
- Provide the knowledge and understanding of PCB, Surface Mount Technology and Thermal Considerations
- Deals with the testing aspects of the IC technology.

Course Outcomes

At the end of the course learners will be able to

CO.1. Discuss the various packaging types

CO.2. Design of packages which can withstand higher temperature, vibrations and shock

CO.3. Design of PCBs which minimize the EMI and operate at higher frequency

CO.4. Analyze the concepts of testing methods.

CO.5. Discuss the various packaging types

Course Content:

Modules	Blooms Level*	Number of hours
Module-I: Overview of Electronic Systems Packaging Functions of Electronic Packaging, Packaging Hierarchy, IC packaging: MEMS packaging,consumer electronics packaging, medical electronics packaging, Trends and Challenges,Driving Forces on Packaging Technology, Materials for Microelectronic packaging, PackagingMaterial Properties, Ceramics, Polymers, and Metals in Packaging, Material for high densityinterconnect substrates	L1, L2	5

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Module-II: Electrical Issues in Packaging Electrical Issues of Systems Packaging, Signal Distribution, Power Distribution,Electromagnetic Interference, Transmission Lines, Clock Distribution, Noise Sources, Digitaland RF Issues. Design Process Electrical Design: Interconnect Capacitance, Resistance andInductance fundamentals; Packaging roadmaps - Hybrid circuits - Resistive, Capacitive andInductive parasitics.	L1, L2,L4	6
Module-III: Chip Level Packaging IC Assembly - Purpose, Requirements, Technologies, Wire bonding, Tape AutomatedBonding, Flip Chip, Wafer Level Packaging, reliability, wafer level burn – in and test. Singlechip packaging: functions, types, materials processes, properties, characteristics, trends. Multichip packaging: types, design, comparison, trends. System – in - package (SIP); Passives:discrete, integrated, and embedded.	L1, L2,L4	5
Module-IV: PCB, Surface Mount Technology and Thermal Considerations Printed Circuit Board: Anatomy, CAD tools for PCB design, Standard fabrication, Micro viaBoards. Board Assembly: Surface Mount Technology, Through Hole Technology, ProcessControl and Design challenges. Thermal Management, Heat transfer fundamentals, Thermalconductivity and resistance, Conduction, convection and radiation – Cooling requirements	L1, L2,L4	7
Module-V: Testing Reliability, Basic concepts, Environmental interactions. Thermal mismatch and fatigue –failures – thermo mechanically induced – electrically induced – chemically induced. Electrical Testing: System level electrical testing, Interconnection tests, Active Circuit Testing, Design for Testability.	L1, L2	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Tummala, Rao R., "Fundamentals of Microsystems Packaging", McGraw Hill, 2001.
- Blackwell (Ed), "The electronic packaging handbook", CRC Press, 2000.

Reference Books

- Tummala, Rao R, "Microelectronics packaging handbook", McGraw Hill, 2008.
- Bosshart, "Printed Circuit Boards Design and Technology", TataMcGraw Hill, 1988.
- R.G. Kaduskar and V.B.Baru, "Electronic Product design", Wiley India, 2011
- R.S.Khandpur, "Printed Circuit Board", Tata McGraw Hill, 2005

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

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VLSI DESIGN

Programme Structure-2023

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits
VDE2151	Basic Electronics	3	-	-	3
VDE2251	VLSI Design	3	-	-	3
VDE2351	Analog IC Design	3	-	-	3
VDE2451	Verilog Programming	3	-	-	3
VDE2551	RTL Design and Verification	3	-	-	3
VDE2651	VLSI Testing	3	-	-	3
	TOTAL				**18**

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VLSI DESIGN

Syllabus

Course Code: VDE2151	BASIC ELECTRONICS	L	T	P	C
Version: 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

In this course, students will become familiar with basic semiconductor devices and electronic circuits. It will educate and explain the basics of semiconductor devices, the study of device characteristics and applications of p-n-junction diodes, bipolar junction transistors, and field effect transistors. This course explores the theory and operation of the basic building blocks of digital electronics which includes combinational and sequential circuits.

Course Objectives

The objective of this course is to:

- Build from basic knowledge of Semiconductor Physics to an understanding of basic devices and their models
- Familiarize the student with the analysis and design of basic transistor amplifier circuits, feedback amplifiers and wave shaping circuits
- Provide the basic knowledge of digital logic levels and application of combinational and sequential circuits.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the operation, characteristic and application of PN Junction Diode, Rectifiers, Zener Diode, Bipolar Junction Transistor, MOSFET etc.

CO2. Design circuit with Bipolar Junction Transistor in CB, CE & CC configurations.

CO3. Describe different transistor amplifiers along with single and multi-stage amplifier, different feedback configurations.

CO4. Explain Boolean algebra, flip flops, shift registers & Design counters and synchronous sequential circuits.

Course Content:

Modules	Blooms Level*	Number of hours

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Module I Review of conductors, semi-conductors and insulators and their energy band diagrams, PN junction diode, Ideal diode and its characteristics, LED, Zener and Tunnel Diode and their characteristics, Applications of diodes-Rectifiers (Half and full wave, Bridge).	L1,L2	6
Module II BJT-construction and characteristics, Transistor as an amplifier, CE, CB and CC configurations, Transistor biasing, Introduction to FET and MOSFET.	L3,L4	9
Module III Cascaded amplifiers, RC coupled Amplifiers, Transformer coupling, Frequency response of RC, TC and their merits and demerits, Introduction to feedback-Positive and negative, Introduction to oscillators, Barkhausen criterion.	L5	7
Module IV OPAMP characteristics and specifications, OPAMP as inverting and non-inverting amplifier in open and closed loop mode, Applications of OPAMP.	L3,L4	6
Module V Introduction to digital electronics, logic gates, basic laws and theorems of Boolean algebra, single bit latch, flip flops-RS, JK, T, D, Master Slave, Counters, and Registers	L1,L2	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Jacob Millman, Christos Halkias, Chetan Parikh, Millman's Integrated Electronics, McGraw Hill Education, 2nd Edition, New Delhi
- Theraja B.L., Sedha R.S, Principles of Electronic Devices and Circuits, S Chand & Compa-ny, First Edition, New Delhi, 2002
- Moris Mano, "Digital Design", 2nd Edition, Pearson Education,2007.
- R.P. Jain, "Modern Digital Electronics", 2nd Edition, Tata Mcgraw Hill, 2003

Reference Books

- Robert L. Boylestad: Electronic Devices and Circuits, Pearson Education, 11th Edition, 2013
- Nagrath I.J, Electronics: Analog and Digital, Prentice Hall India Learning Private Limited, Second Edition, 2013
- Thomas L. Floyd, "Digital Fundamentals", 11th Edition, Pearson Education, 2015

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Course Code: VDE2251	VLSI DESIGN	L	T	P	C
Version: 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

This course deals with basic theories and techniques of digital VLSI design in CMOS technology. It covers the fundamental concepts and structures of designing digital VLSI systems which include CMOS devices and circuits, standard CMOS fabrication processes, CMOS design rules, static and dynamic logic structures, CMOS chip layout, simulation and testing, low power techniques, design tools and methodologies and Stick Diagrams.

Course Objectives

The objective of this course is to

- Provide a deep understanding of the concepts, techniques and design of complex digital VLSI circuits.
- Apply mathematical methods and circuit analysis models to analyse CMOS digital circuits, and their logic components.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the characteristics of basic VLSI components.
CO2. Apply the knowledge of various CMOS inverters to compare their performance.
CO3. To design and realize basic combinational and sequential functions using CMOS logic.
CO4. Design circuit layout and Stick diagrams of CMOS logics.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Devices and the wire: Dynamic and transient behavior of Diode, Diffusion capacitance, SPICE Diode model, MOSFET, MOSFET static and dynamic behaviour, comparison of equations for PMOS and NMOS, Level 1 SPICE models for MOS transistors. The Wire, Interconnect parameters: resistance, capacitance and Inductance, Lumped RC model, Elmore Delay.	L1, L2	8

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Module II: CMOS Inverter: VTC of an ideal inverter, Switching Model of the CMOS inverter: NMOS /PMOS discharge and charge, VTC of CMOS inverter : PMOS and NMOS operation in various regions including velocity saturation, Switching threshold, (W/L)p/(W/L)n ratio for setting desired V_M with and without velocity saturation, Noise Margins, buffer. Rationed logic: Pseudo NMOS inverter and PMOS to NMOS ratio for performance, tri-state inverter, Resistive load inverter.	L3, L4	8
Module III: Combinational circuits: CMOS LOGIC: Good 0 and Poor 0, series and parallel N and P switches, Two and Higher input NAND and NOR gates, Functions of the type (AB+C(D+E)) and their complements, XOR and XNOR gates, 2 input Multiplexer, Full Adder, Full subtractor.	L2,L3,L4	10
Module IV: Sequential Logic circuits: Principle of bistability, NAND and NOR based SR latch, and clocked SR Latch, JK latch, example of master slave flip flop, CMOS D latch, MUX based Latches.	L2,L3,L4	5
Module V: Layout Design Rules: Introduction to CMOS Process technology, Latch up and its prevention Layout of CMOS inverter, CMOS NAND and NOR gates, Concept of Euler path, and stick diagrams for functions like (AB+E+CD)*.	L2,L3,L4	5

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Jan M Rabaey,Digital Integrated Circuits ,Second Edition, Pearson.
- David Hodges , Analysis and Design of Digital ICs, McGrew Hill
- Sung-MoKang,CMOS Digital ICs,third edition,2008

Reference Books

- Weste Niel and Harris,CMOS VLSI design. A Circuits And Systems Perspective, 3/E,Pearson
- Weste and Eshragian, Principles of CMOS VLSI Design: a systems perspective, Addison-Wesley Publishing Company, 01-Jan-1993

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Course Code: VDE2351	ANALOG IC DESIGN	L	T	P	C
Version: 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The course offers important topics for analog, digital and mixed-signal integrated circuits. It covers circuit operation, circuit analysis, design techniques and methodologies, implementation approaches, low voltage low-power CMOS circuit design, and key building blocks for integrated circuit de-signs.

Course Objectives

The objective of this course is to

- Equip the students with concepts associated with high performance Mixed Signal VLSI Circuits.
- Underlying methodologies for analysis and design of fundamental CMOS Analog and Mixed signal Circuits like Current and Voltage references, Single stage Amplifiers, Operational Amplifiers, Data Converters.

Course Outcomes

On completion of this course, the students will be able to

CO1: Differentiate between Analog, Digital and Mixed Signal CMOS Integrated Circuits.
CO2: Analyze and design current sources and voltage references for given specifications.
CO3: Analyze and design of single stage MOS Amplifiers.
CO4: Analyze and design Operational Amplifiers.
CO5: Analyze and design data converter circuits like ADC and DAC.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction and Circuit Models Introduction to analog design, Levels of abstraction, Robust analog design, MOS transistor, Second-order Effects, transconductance, intrinsic Gate source and Gate Drain Capacitance, input resistance, output resistance, MOS small signal model, Parasitic Elements in the small signal model, Mos Transistor Frequency response, weak inversion in Mos transistor	L1, L2 and L3	8
Module II: Single-Stage Amplifier& Differential Amplifiers Single stage amplifier, Basic concepts, Common source stage, CS with Resistive Load, CS with diode connected Load, CS with Current-Source-Load, CS with Triode Load, Cs with Source Degeneration, Source follower, common gate stage, Folded cascode, Differential amplifiers, Single ended and differential operation, common mode response, Differential pair with MOS loads, Gilbert Cell	L2, L3 and L4	8

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Module III: Current mirror & CMOS Operational amplifier Current mirror, Cascode Current mirrors, Active Current mirrors, Operational Transconductance Amplifier, Op amp Performance parameters, one and two stage op amps, Gain Boosting, Common mode Feedback, Input range limitations, Slew rate, Single and multi pole Systems, Phase margin, Frequency Compensation, Buffered Op amplifiers, High speed/ Frequency Op amplifier	L2,L3,L4	8
Module IV: Dynamic Analog Circuits MOSFET Switch, Speed consideration, Precision Considerations, Charge injection cancellation switched Capacitor Circuits, Basic operation and analysis, Two stage open loop Comparator, High speed Comparator	L2,L3,L4	6
Module V: Data Converter Fundamentals Analog versus Discrete Time Signals, Converting Analog Signals to Digital Signals, Sample and Hold(S/H) Characteristics, Digital to Analog converter (DAC), Specifications, Analog to Digital Converter (ADC) specifications	L2,L3,L4	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Allen, CMOS Analog Circuit Design, Oxford University Press, 2 edition.
- B. Razavi, Design of Analog CMOS Integrated Circuits, McGraw-hill,2001.

Reference Books

- D.A.Johns and K.Martin, Analog Integrated Circuits Design, Wiley, 1997.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Course Code: VDE2451	VERILOG PROGRAMMING	L	T	P	C
Version -2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Basic Digital Electronics				
Co-requisites	Nil				

Catalog Description:
This course discusses fundamental Verilog concepts of today's most advanced digital design techniques. it offers broad coverage of Verilog HDL from a practical design perspective. Introduces students to gate, dataflow (RTL), behavioural, and switch level modeling, describes leading logic synthesis methodologies; explains timing and delay simulation; and introduces many other essential techniques for creating tomorrows complex digital designs

Course Objectives
The objective of this course is to
- Provide the fundamental knowledge of Verilog HDL for practical designs.
- Introduces the knowledge logic synthesis and design methodologies.

Course Outcomes
On completion of this course, the students will be able to
CO1. Describe the basic concepts of Verilog HDL.
CO2. Design and solve the Gate level and dataflow modeling of various circuits.
CO3. Solve the circuits using Behavioural modeling.
CO4. Utilize the circuital knowledge on advanced Verilog topics.

Course Content :

Modules	Blooms level*	Number of hours
MODULE I: : Introduction to Verilog HDL and Basic Concepts Emergence of HDL, typical design flow, trends in HDL, Modeling concept Design methodologies, modules, instances, simulation, design block and stimulus block Lexical conventions, Data Types. System Tasks and Compiler Directives, Modules and Ports	L1 and L2	8
MODULE II: Gate-Level Modeling and Dataflow Modeling Gate Types. Gate Delays, Continuous Assignments. Delays. Expressions, Operators, and Operands. Operator Types. Examples for combinational and sequential circuit using Gate level and Data-flow modeling.	L1 and L2	6
MODULE III: Behavioural Modeling Structured Procedures. Procedural Assignments. Timing Controls. Conditional Statements. Multiway Branching. Loops. Sequential and Parallel Blocks. Generate Blocks. Examples	L1 and L2	8

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MODULE IV: Tasks and Functions and Useful Modeling Techniques Difference between Tasks and Functions. Tasks. Functions. Procedural Continuous Assignments. Overriding Parameters. Conditional Compilation and Execution. Time Scales. Useful System Tasks	L1 and L2	8
MODULE V: Advanced Verilog Topics Timing and Delays. Switch Level Modeling, User-Defined Primitives, Logic Synthesis with Verilog HDL, Advanced Verification Techniques.	L2, L3 and L5	6

*Bloom's Level: L1: Knowledge; L2: Comprehension; L3: Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- Samir Palnitkar, Verilog HDL, 2nd Edition Pearson Education, 1996.
- Donald Thomas, Philip moorby, The Verilog hardware Description language, 5th Edition, Kluwer Academic publishers, 2002.

Reference Books

- J. Bhasker, Verilog HDL Synthesis: A Practical Primer, Star Galaxy publications, 1998.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Course Code: VDE2551	RTL DESIGN AND VERIFICATION	L	T	P	C
Version: 2023.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Course Objectives:

The objective of this course is to

- Provide a thorough introduction to digital systems designing using system Verilog.
- Provide in depth study of various complex digital circuits at several level of abstractions.

Course Outcomes:

On completion of this course, the students will be able to

CO1. Basic understanding of system Verilog and verification.
CO2. Introducing the concept of object oriented in system verification
CO3. Demonstrate the concept of Universal Verification Methodology.
CO4. Implementation of Transaction Level Modeling.

Course Content:

Modules	Blooms level*	Number of hours
Module-I: Introduction to Verification ASIC Design Flow, Introduction to Verification, Verification Flow, Testbench Architecture, Verification Plan, Migrating from Verilog to System Verilog.	L1, L2	6
Module-II: System Verilog Basics & Riding SV on Chariot of OOPs Operations with 4-state Logic, Arrays, Structures, Unions, packed, unpacked, tagged. Need for Interface, Interface ports, mod ports, clocking, blocks, procedural blocks, Creating Instances, Connecting, DUT and TB via Interfaces, Fork-join and its controls, Semaphore, Mailbox. Need for OOPs in testbench, OOPs Terminology, Principles of OOPs, Inheritance, Polymorphism, Copy (Shallow/Deep copy), Specialized classes, parameterized classes.	L1,L2	7
Module-III: Randomization and Constraints Need for Randomization, Controlling randomization, Constraints, Inline Constraints, Controlling constraints.	L2	4

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Module-IV: Introduction to UVM Need of Methodology, Constrained Random Verification, Verification Concepts. UVM Class Library, UVM Testbench, UVM Test, UVM Environment, UVM Scoreboard, UVM Agent, UVM Sequencer, UVM Sequence, UVM Driver, UVM Monitor. UVM Class Hierarchy, UVM Factory, UVM Config-db, UVM Callbacks, Parameterizing, Transactions, Phases, Event-pool, Field-macros, Messaging, Components vs Object	L3,L4	10
Module-V: Transaction Level Modelling Basic TLM Communications, Communication Between Processes, UVM Analysis Communication	L1,L2	5
Module-VI: Verification Component/Architecture Development Data Item for Generation, Transaction Modelling, Driver Implementation, Sequencer, Monitor, Agent, Scoreboard, Environment, Test case, Top module	L4,L5	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books:

- Hardware Design Verification: Simulation and Formal Method-Based Approaches: By William K. Lam, Prentice Hall.
- System Verilog Assertions and Functional Coverage: Guide to Language, Methodology and Applications 3rd Edition, Kindle Edition by Ashok B. Mehta ,Springer; 3rd edition.

Reference Books:

- Chris Spear, System Verilog for Verification: A Guide to Learning the Testbench Language Features, Springer-Verlag New York, Inc. Secaucus, NJ, USA, 2012
- Mintz, Mike, Ekendahl, Robert, Hardware Verification with System Verilog, XXII, 314 p., Springer, ISBN: 978-0-387-71738-8 2007

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

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Course Code: VDE2651	VLSI TESTING	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	VLSI Design				
Co-requisites	Nil				

Catalog Description

This course explores different aspects of VLSI testing. This course also covered combinational and sequential logic testing and different testability schemes such as BIST (Built-In-Self-Test) & scan path design. The concepts learnt in the studies of sequential circuits testing will be applied in the testing of memory.

Course Objectives

The objective of this course is to

- Provide the basic knowledge of different types of faults in digital circuits at the gate level.
- Equip with the understanding of automatic test pattern generation algorithms with respect to search space, speed and fault coverage.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the need of testing and its types; stuck at faults.
CO2: Explain faults in digital circuits and test generation for combinational circuits.
CO3: Explain test generation for sequential circuits; testing methods for ADC & DAC.
CO4: Explain delay test and IDDQ testing methods.
CO5: Explain built in self test and JTAG.

Course Content:

Modules	Blooms level*	Number of hours
MODULE-I: BASICS OF TESTING AND FAULT MODELING Introduction – Need for testing, VLSI Testing Process And Test Equipment, Types of testing – ATE – ADVANTEST model T6682-Block Diagram and Specification– Electrical Parametric testing , AC and DC Test, Economics – Fault Molding-Stuck at faults, Calculation of DCR and ECR.	L1,L2 and L3	8
MODULE-II: TEST GENERATION FOR COMBINATIONAL CIRCUITS Faults in digital circuits-failures and faults Modeling of faults, Temporary faults, Test generation for combinational logic circuits, combinational ATPG Boolean difference method, and Testable combinational logic circuit design. Algorithm for true value simulation and for fault simulation.	L1, L2,L3	8

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MODULE-III: TEST GENERATION AND TESTABILITY OF SEQUENTIAL CIRCUITS Test generation for sequential circuits, Design of testable sequential circuits-sequential ,ATPG- Implementation and complexity- Time Frame Expansion-simulation method, DSP based testing – Static ADC & DAC testing methods, Testable memory design –Reduced Functional Faults- MARCH and MAT+ algorithm. Analog and Mixed signal tests.	L1, L2,L3	8
MODULE-IV: MEMORY, DELAY FAULT AND IDDQ TESTING Delay test – Path delay test and fault models, Transition faults – delay test methodologies , practical Consideration – IDDQ testing – Testing methods - Limitations of IDDQ testing – DFT IDDQ.	L1, L2,L3	6
MODULE-V: BUILT-IN SELF-TEST DFT – Scan Design – Partial scan design – BIST- TPG for BIST – output response analysis, BIST Architectures- Random Logic BIST – Memory and delay fault BIST – JTAG – System test and core based design.	L1,L2,L3	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Parag.K.Lala "Digital Circuit Testing and Testability" 1st Edition, Academic Press, 1997.
- Viswani D. Agarval Michael L. Bushnell, "Essentials of Electronic Testing for Digital Memory & Mixed Signal VLSI Circuit", 1st Edition, Kluwer Academic Publications, 1999.

Reference Books

- G.W.Zobrist, VLSI Fault Modeling and Testing Techniques, 1st Edition, Albex Publishers. 1995.
- F. Lombardi and M. Sami, Kluwer, Testing and Diagnosis of VLSI and ULSI, 1st Edition, Academic Publishers. 1996.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

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DEFENCE TECHNOLOGY

Programme Structure-2023

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours	Total Credits
DTE2151	Systems and Warfare Platforms	3	-	-	3
DTE2251	Combat System Engineering	3	-	-	3
DTE2351	Combat Vehicle Dynamics	3	-	-	3
DTE2451	Warfare Simulations & Strategies	3	-	-	3
DTE2551	Digital & Satellite Communication and Navigation from Space	3	-	-	3
DTE2651	Aerospace System Configuration, Design & Simulation	3	-	-	3
	TOTAL				**18**

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DEFENCE TECHNOLOGY

Syllabus - First Semester

SYSTEMS AND WARFARE PLATFORMS

Course Code: DTE2151 **Credit Units: 3**

Course Objectives:

The main objective of the course is to provide knowledge to the students about various types of military platforms used in air, naval & land warfare. Students will also be apprised for weapon system and self-protection strategies and techniques.

Course Outcomes:

At the end of the course the student should be able to

- Understand types of warfare platform used for Army, Air and Marine and their design fundamentals.
- Understand the weapon systems like guns, ordnance, missiles projectiles, mines/ countermines, lasers, undersea weapons, air-launched weapons, anti- aircraft, anti-ship and anti-submarine.

Course Content:

Module	Contents	Contact Hrs.
1.	Types of platforms: land, sea, air; Lifecycle: concept, design, pre-production, production, operations, support.	6
2.	Ship design fundamentals: buoyancy, stability, ship resistance, survivability; damage control, NBCD, crew numbers, power requirements. Submarine design: buoyancy, stability, hull/tank design, air interdependence.	7
3.	Mechanics of flight: fixed and rotary wing, straight and level flight of aircraft, aircraft control and movement, aircraft control surfaces, aerodynamics, power requirements, range; speed, ceiling, survivability, payload.	7
4.	Military vehicle fundamentals: tracked, wheeled, A, B and C vehicles.	5
5.	Weapon systems: guns, ordnance, missiles, rockets, bombs, sub-munitions, projectiles, mines/ countermines, lasers, undersea weapons, air-launched weapons, anti-aircraft, anti-personnel, anti-ship, anti-submarine.	6
6.	Self defence and Protection systems: Armour, smoke, chaff, decoys; Introduction to instrumentation, lab tests and flight trials.	5
Total		36

References / Suggested Books:

- "Light And Heavy Vehicle Technology ", by Nunney. Publisher Elsevier.
- "Practical approach to motor vehicle engineering and maintenance", by Bonnick Allan et. Al. Publisher: Yesdee.

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- "Automotive Vibration Control Technology: Fundamentals, Materials, Construc- tion, Simulation, and Applications", by Trelleborg.
- "An Introduction to Weapons Systems", by Yacov Bar-Shlomo. Publisher : Create Space Independent Publishing Platform.
- "Heavy Vehicle Mechanics", by Ian Nicholson.Publisher : McGraw-Hill Education Europe.
- "Military Laser Technology for Defense: Technology for Revolutionizing 21st Century Warfare", by Alastair D. McAulay. Publisher : Wiley-Interscience; 1st edition.
- Literature / books suggested by respective course Lecturers.

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Syllabus – Second Semester

COMBAT SYSTEM ENGINEERING

Course Code: DTE2251 **Credit Units: 3**

Course Objectives:

The main objective of the course is to provide knowledge to the students about the basic principles, processes and products of combat systems engineering, sensor technologies. They will also be introduced to weapons of mass destruction.

Course Outcome:

At the end of the course the student should be able to:

- Understand principles of design of combat systems.
- Learn how to design, build, and maintain systems that control differentkinds of weapons, including nuclear, chemical, and biological weapons.
- Understand sensor systems, such as radar and sonar.
- Understand risks and threats to combat systems.

Course Content:

Module	Contents	Contact Hrs.
1.	Engineering principles to the design of combat systems with emphasis on detection, tracking, and identification systems	5
2.	Threat Spectrum, Battle Field Environment.	5
3.	Vehicle Configuration, Man Machine Interface.	6
4.	Sensor technologies (radars, ESM, active and passive sonar, infrared, electro-optical, and magnetic/electric/gravity field sensors).	7
5.	Introduction to information warfare and weapons (including electronic warfare).	6
6.	Directed energy weapons, weapons of mass destruction (nuclear, chemical, biological, and radiological), and nonlethal weapons.	7
Total		36

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References / Suggested Books:

- "Warship Combat System Engineering Management Software" by Zhao Xiao Zhe**.**
- "Measurement, Instrumentation and sensor Handbook", by John G Webster. Publisher: CRC Press, Florida 2nd edition.
- "Engineering Principles of Combat Modeling and Distributed Simulation", by Andreas Tolk. Publisher: Wiley Publication.
- "Sensors and Transducers", by Patranabis D. Publisher: Prentice Hall IndiaLimited.
- "Magnetic Sensors Principles and Applications" by Author Kuang.
- Literature / books suggested by respective course Lecturers.

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Syllabus – Third Semester

COMBAT VEHICLE DYNAMICS

Course Code: DTE2351 **Credit Units: 3**

Course Objectives:

The main objective of the course is to provide knowledge to the students about important concepts of combat vehicle dynamics, terrain modeling, vehicle sus- pension systems, wheeled & tracked vehicles.

Course Outcomes

At the end of the course the student should be able to

- Carry out terrain modeling.
- Carry out simulation and testing of suspension system.
- Carry out design of military vehicles.
- Understand longitudinal dynamic response during acceleration and braking,
- Vertical dynamic response to analyze ride, pitch and roll.

Course Content:

Module	Contents	ContactHrs.
1.	Human response to vibration (HRV).	5
2.	Terrain modeling.	6
3.	Selection and design for military vehicles.	5
4.	Suspension types, modeling, simulation and testing of suspension systems and components, this includes transient, frequency random response.	7
5.	Spring and damper types, selection and characteristics, effects of noise Tires for military and civilian vehicles and their behavior.	7
6.	Wheeled and tracked vehicles at low and high speed including steady state and transient response.	6
Total		36

References / Suggested Books:

- "Vehicle Refinement: Controlling Noise and Vibration in Road Vehicles", by Mat-thew Harrison. Publisher : Butterworth-Heinemann .
- "Vehicle Noise and Vibration Refinement", by Xu Wang. Publisher : Woodhead Publishing.
- "Noise and Torsional Vibration Analysis of Hybrid Vehicles (Synthesis Lectures on Advances in Automotive Technology)", by Xiaolin Tang, Yanjun Huang. Pub- lisher : Morgan & Claypool Publishers.
- "Principles of Vibration Analysis with Applications in Automotive", by C.Q. Liu. Publisher : SAE International.
- Literature / books suggested by respective course Lecturers.

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Syllabus – Fourth Semester

WARFARE SIMULATIONS & STRATEGIES

Course Code: DTE2451 **Credit Units: 3**

Course Objectives:

The main objective of the course is to provide knowledge to the students about warfare system and affluent them with combat modeling using mathematical modeling.

Course Outcomes:

At the end of the course the student should be able to

- Understand the systems used in warfare scenario
- Understand combat simulation & modelling
- Understand the war gaming simulation & modelling and human factor representation.

Course Content

Module	Contents	Contact Hrs.
1.	Introduction to Warfare systems: air, surface, subsurface, littoral, electronic	6
2.	Military capabilities: air warfare, surface warfare, sub surface warfare, littoral warfare	6
3.	Introduction to the methods used in modeling combat and their application in support of defence decision making and training, Combat simulation.	7
4.	War gaming/interactive simulation, Lanchester‟s equations, Mathematical models of combat.	6
5.	War gaming and combat modeling in practice, manual war gaming.	6
6.	Human factors representation in war gaming and combat modeling.	5
	Total	36

References / Suggested Books:

- “Defense Modeling, Simulation, and Analysis: Meeting the Challenge”. Publisher: National Academies Press (October 22, 2006).
- “Introduction to Electronic Warfare Modeling and Simulation” by David L. Adamy”. Publisher : Artech Print on Demand (October 31, 2002).
- “Engineering Principles of Combat Modeling and Distributed Simulation”, by Andreas Tolk (Editor), Old Dominion University. Publisher : John Wiley & Sons.
- Literature / books suggested by respective course Lecturers.

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Syllabus – Fifth Semester

DIGITAL & SATELLITE COMMUNICATION AND NAVIGATION FROM SPACE

Course Code: DTE2551 **Credit Units: 3**

Course Objectives

The main objective of the course is to provide knowledge to the students on the analogue and digital communication systems, optical communication, satellite communications systems, modulations techniques, signal propagation effects, navigation techniques.

Course Outcomes:

At the end of the course the student should be able to:

- Understand the communication techniques
- Evaluate the performance of communication systems
- Design the analogue and digital communication systems
- Understand and analyse the signal transmission effects
- Understand the different types of navigation techniques

Course Content

Module	Contents	Contact Hrs.
1.	Elements of a communications system and their relationship to system performance.	5
2.	Free space optical communication, Fiber optics communication, Wireless/cellular communications.	6
3.	Fundamental concepts such as current/voltage relationships, time and frequency domains, power spectral density, random signals, Communications system components and functions, analog and digital communications systems,	7
4.	Modulation transmission and reception; baseband and passband digital modulation; system, noise, transmission lines, waveguides and antennas, FEC techniques for mitigating channel errors.	7
5.	Propagation effects on signal transmission; end-to-end path calculations for wire/coax, and RF systems including terrestrial ground links and satellite communications, Spread spectrum, conecpt of frequency hoping.	6
6.	Navigation techniques from space regarding functioning of GPS, GLONASS, IRNSS & Galileo	5
Total		36

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References / Suggested Books:

- "Satellite communication", by T. Pratt, C. W. Bostian, J. E.Allnut. Publisher: John
- Willey and sons
- "Satellite Communications Systems: systems, techniques and technology", by G.
- Maral, M. Bousquet, Z. Sun. Publisher:John Willy and sons
- "Digital Communications: Fundamentals and Applications", B. Sklar . Prentice-
- Hall, Inc.
- "Understanding of GPS/GNSS: Principles and Applications",by E. Kaplan and C.
- Hegarty. Publisher: Artech House Publishers.
- Literature / books suggested by respective course Lecturers.

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Syllabus – Sixth Semester

AEROSPACE SYSTEM CONFIGURATION, DESIGN AND SIMULATION

Course Code: DTE2651 **Credit Units: 3**

Course Objectives

The main objective of the course is to provide knowledge to the students about the process & techniques of aerospace system design, meeting the specified design requirements. They will also learn about carrying structural and aerodynamic analysis, performance evaluation of aircraft and stability analysis.

Course Outcomes:

At the end of the course the student should be able to:

- Understand the concept of missile system and its design requirements and process.
- Design an aerospace vehicle and articulate its benefits in written and verbal forms.
- Understand the methods for aero-elastic analysis, computational fluid analysis and advances in aero-dynamics.
- Understand the air to air, ground to air, air to ground weapon system, UAV mounted GW and UCAVs.

Course Content:

Module	Contents	Contact Hrs.
1.	Introduction (aero-elastic phenomena and design requirements), Introduction to missiles & systems, Design process.	5
2.	Structural requirement, Structural and aerodynamic stiffness, Static aero-elasticity: torsional divergence, Structural vibration and modal analysis.	5
3.	Aerodynamic loads on an oscillating lifting surface, Characteristics of flutter and important design parameters, Methods for aero-elastic analysis, Computational fluid dynamics, advances in aero dynamics (Hypersonic Flows and Aerodynamic Heating).	7
4.	Aircraft performance (cruising, climb, descent, takeoff, landing, maneuver, flight path).	6
5.	System's stability & control, aerodynamics control, Introduction to dynamic stability, first and second order responses, Equations of motion and modal characteristics.	7
6.	Introduction to air to air, ground to air, air to ground weapon systems, UAV mounted GW and UCAVs.	6
	Total	36

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References / Suggested Books:

- "Aircraft design: a conceptual approach", by D. Raymer
- "Flight Dynamics Principles", by Michael V. Cook
- "Introduction to Structural Dynamics and Aeroelasticity", by Dewey H. Hodges, G. Alvin Pierce
- "Airplane Aerodynamics and Performance", by Chuan Tau Edward Lan
- "Fundamentals of Structural Dynamics", by Roy R. Craig Jr., Andrew J. Kurdila.
- Literature / books suggested by respective course Lecturers.

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Amity School of Applied Sciences

Bachelor of Science (Honors/ Honors with Research) in Chemistry

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Curriculum & Scheme of Examination

2023

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GURUGRAM

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Bachelor of Science (Honors/ Honors with Research) in Chemistry
SEMESTER-I

Course Code: DCHY2151	INORGANIC CHEMISTRY-I	L	T	P	C
		3	0	0	3

Catalog Description

This course is designed to provide an insight on some fundamental concepts of inorganic chemistry at the undergraduate level. The main objective is to impart essential theoretical knowledge on atomic structure, acids & bases and periodic properties.

Course Objectives

The objective of this course is to provide an insight on some fundamental concepts of inorganic chemistry at the undergraduate level. The main objective is to impart essential theoretical knowledge on atomic structure, acids & bases and periodic properties. This will give the students a basic understanding of various theories like VSEPR to explain the bond formation and structure of different compounds.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain salient features of atomic Structure.
CO2. Describe salient features periodicity of elements.
CO3. Summarize the different bonding theories & chemistry of s- block elements.

Course Contents:

Modules	Blooms level*	Number of hours
Module I: Atomic Structure Bohr's theory, its limitations and atomic spectrum of hydrogen atom. Wave mechanics: de Broglie equation, Heisenberg's uncertainty principle and its significance, Schrodinger's wave equation, significance of ψ and ψ^2. Requirement of quantum numbers. Radial and angular wave functions. Radial and angular distribution curves. Shapes of *s, p, d* and *f* orbitals. Common rule to write electronic configuration (Pauli's exclusion principle, Hund's rule of maximum multiplicity, Aufbau's principle and its limitations).	L1, L2, L3	12
Module II: Periodicity Properties: Size: Trends in the atomic/ionic radii, Ionization energy (IE): Definition, factors affecting IEs; trends in IEs; variation in the 1st IEs of the elements. Electron affinity(EA): Definition, some values; determination of EA (Born-Haber cycle); Electronegativity: Definition, Pauling's scale, graphical representation of % ionic character vs. E.N. differences; Mulliken's scale; relation between Pauling's and Mulliken's values; Allred Rochows method, Fajan's rules. Solubility of ionic solids - lattice and solvation energies. Use of reduction potentials. Reduction potential (Latimer) diagram, Specific illustrative examples.	L1, L2, L3	8

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Module III: Chemical bonding: Ionic bond: Packing of ions in crystals, radius ratio rule, Born-Landé equation, Kapustinskii expression, Madelung constant, Born-Haber cycle, solvation energy, polarizing power and polarizability; Fajan's rules; Covalent bond: Lewis structure, valence bond theory. Hybridization, molecular orbital theory, molecular orbital diagrams of diatomic and simple polyatomic molecules and ions; Multiple bonding (σ and π bond approach) and bond lengths; van der Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions, instantaneous dipole-induced dipole interactions, hydrogen bonding; Effect of intermolecular forces on melting and boiling points, solubility energetics of dissolution process; Bond dipole, dipole moment, and molecular polarizabilities; VSEPR theory and shapes of molecules; ionic solids.	L1, L2, L3	8
MODULE IV: Chemistry of s-block elements General properties of s and p block elements. Inert pair effect, Relative stability of different oxidation states, diagonal relationship and anomalous behavior of first member of each group. Allotropy and catenation. Complex formation tendency of *s* and *p* block elements, Hydrides and their classification ionic, covalent and interstitial.	L1, L2, L3	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested readings

1. Lee, J.D. *Concise Inorganic Chemistry*, ELBS, 1991.
2. Douglas, B.E. and Mc Daniel, D.H., *Concepts & Models of Inorganic Chemistry*, Oxford, 1970
3. Atkins, P.W. & Paula, J. *Physical Chemistry*, Oxford Press, 2006.
4. Day, M.C. and Selbin, J. *Theoretical Inorganic Chemistry*, ACS Publications 1962.
5. Huheey, J.E. *Inorganic Chemistry*, Prentice Hall 1993
6. Douglas, B.E. and Mc Daniel, D.H., *Concepts & Models of Inorganic Chemistry*, Oxford1970
7. Lee, J.D. *Concise Inorganic Chemistry*, ELBS (1991)
8. Shriver & Atkins, *Inorganic Chemistry*, Third Edition, Oxford Press 1994.
9. H.W. Porterfield, *Inorganic Chemistry*, Second Edition, Academic Press, 2005.

CO, PO and PSO mapping:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO5**	**PSO6**
CO1	**1**	**3**					**1**		**2**			
CO2	**1**	**3**					**1**		**2**			
CO3	**1**	**3**					**1**		**2**			

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: DCHY2152	INORGANIC CHEMISTRY LAB-I	L	T	P	C
		0	0	2	1

Course Objectives

The objective of this course is to

1. Develop the practical knowledge for the preparation of standards solution and what are primary standard and secondary standard.
2. Make students learn about the different titration methods.

Course Outcomes

On completion of this course, the students will be able to

CO1 Calibrate instruments and prepare standard solutions.

CO2 Estimate the presence of inorganic ions.

CO3 Estimate metal ions using redox and complexometric titration.

Course Content : (Minimum 10 experiments to be performed)

Modules	Blooms level*	Number of hours
[I] Titrimetric Analysis (i) Calibration and use of apparatus (i) Preparation of solutions of different Molarity/Normality of titrants	L1, L2, L3	4
[II] Acid- Base Titrations (i) Estimation of carbonate and hydroxide present together in mixture. (ii) Estimation of carbonate and bicarbonate present together in a mixture. (ii) Estimation of free alkali present in different soaps/detergents	L1, L2, L3, L4	5
[III] Oxidation- Reduction/complexometric Titrimetry (i) Estimation of Fe(II) and oxalic acid using standardized $KMnO_4$ solution. (ii) Estimation of oxalic acid and sodium oxalate in a given mixture. (iii) Estimation of Fe(II) with $K_2Cr_2O_7$ using internal (diphenylamine, anthranilic acid) and external indicator. (iv) Estimation of Cu (II) and K2Cr2 O7 Using sodium thiosulphate solution (iodometrically). (v) Estimation of (i) arsenite and (ii) antimony in tartar-emetic iodimetrically (vi) Estimation of available chlorine in bleaching powder iodometrically. (vii) Complexometric estimation of (i) Mg2+ (ii) Zn2+ using EDTA (viii) Estimation of total hardnesss of water samples (ix) Estimation of Ca2+ in solution by (substitution method) using Erio-chrome black-T as indicator. (x) Estimation of Ca/Mg in drugs and Biological samples. (xi) Hands on training on characterization of compounds given in the syllabus by analytical techniques (FT-IR, NMR, UV-VIS, Mass, GC, Fluorescence)	L1, L2, L3, L4	15

**Bloom's Level:*

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L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

***MSDS – Compilation of MSDS of chemicals used by students in each experiment is compulsory.**

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Suggested readings

1. Vogel, A.I. A Textbook of Quantitative Inorganic Analysis, ELBS.
2. Pandey O.P., Bajpai, D. N., Giri, S. Practical Chemistry, S. Chand.
3. Singh J., Singh R. K. P., Singh J., Yadav L. D. S., Siddiqui I. R., Srivastava J. Advanced Practical Chemistry, Pragati Prakashan.
4. Pandey O.P., Bajpai, D. N., Giri, S. Practical Chemistry, S. Chand.
5. Singh J., Singh R. K. P., Singh J., Yadav L. D. S., Siddiqui I. R., Srivastava J. Advanced Practical Chemistry, Pragati Prakashan.

CO, PO and PSO mapping:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO5**	**PSO6**
CO1	**2**	**1**					**2**	**1**				
CO2	**2**	**1**					**2**	**1**				
CO3	**2**	**1**					**2**	**1**				

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Course Code: DCHY2101	GREEN CHEMISTRY	L	T	P	C
		3	0	0	3

Course Objective: To know the basics of Green Chemistry and its developments. The primary goal of this course is to make students aware of how chemical processes can be designed, developed and run in a sustainable way.

Course Outcomes

On completion of this course, the students will be able to

CO1 Explain the principles of green chemistry and various non-conventional synthetic methods.

CO2 Describe the protocols involved in green synthetic reactions.

CO3 Define and explain the role of green solvents in organic reactions.

Course Contents:

Modules	Blooms level*	Number of hours
MODULE I: Introduction Need for green chemistry – principles of green chemistry – atom economy – definition_with example (ibuprofen synthesis) – green oxidant – hydrogen peroxide. Microwave assisted organic synthesis – apparatus required – examples of MAOS (synthesis of fused anthroquinones/heterocycles, acetalization of a byproduct of sugar industry, 1, 3-dipolar cycloaddition of nitrones to fluorinated dipolarophiles, Leukart reductive amination of ketones) – advantages and disadvantages of MAOS.	L1, L2, L3	12
MODULE II: Green aspects of chemical Reactions Acetylation of primary amine, base catalyzed aldol condensation (synthesis of dibenzalpropanone), halogen addition to C=C bond (bromination of trans-stilbene), [4+2] cycloaddition reaction (Diels-Alder reaction between furan and maleic acid). Rearrangement reaction (benzyl-benzilic acid rearrangement), coenzyme catalyzed benzoin condensation (thiamine hydrochloride catalyzed synthesis of benzoin, Pechmann condensation for coumarin synthesis (clay catalyzed solid state synthesis of 7-hydroxy-4-methylcoumarin). Electrophilic aromatic substitution reactions (nitration of phenol, bromination of acetanilide) – green oxidation reactions (synthesis of adipic acid, preparation of manganese (III) acetylacetonate) – zeolite catalyzed Friedel-Crafts acylation.	L1, L2, L3	12
MODULE III: Green Solvents Ionic liquids: simple preparation – types – properties and application – ionic liquids in organic reactions (Heck reaction, Suzuki reactions, epoxidation), industrial (battery) and analytical chemistry (matrices for MALDI-TOF MS, gas chromatography stationary phases – advantages and disadvantages. Super critical CO_2 – preparation, properties and applications (decaffeination, dry cleaning) – environmental impact.	L1, L2, L3, L5	12

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Diels-Alder reaction in water – catalysis in water (aerobic oxidation of alcohols catalyzed by Pd(II) / bathophenanthroline).		

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

1. Sanghi, R.; Srinivatava, M.M. *Green Chemistry Environment Friendly Alternatives*, Narosa Publishing House, New Delhi, 1st Edition (2003), ISBN 978-8173195235.
2. Ahluwalia, V.K. *Green Chemistry*, Narosa Publishing House Pvt. Ltd. (2013) ISBN 8184872011.
3. Tundo, P.; Perosa, A.; Zechini, F. *Methods and Reagents for Green Chemistry*, John Wiley & Sons Inc. (2007) ISBN 978-0-471-75400-8.

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO5	PSO6
CO1	1						3		1			
CO2	1						3		1			
CO3	1						3		1			

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Course Code: DCHY2102	GREEN CHEMISTRY LAB	L	T	P	C
		0	0	2	1

Course Content : (Minimum 10 experiments to be performed)

Modules	Blooms level*	Number of hours
1. Acetylation of primary amine (Preparation of acetanilide) by zinc dust- acetic acid (no use of chlorinated solvents) 2. Diels-Alder reaction between furan and maleic acid)- principle of atom economy. 3. Bromination of trans-stilbene by NaBr-$NaBrO_3$. 4. Synthesis of benzopinacol from benzophenone (photochemical) 5. Cis- trans isomerization reaction (photochemical) 6. Synthesis of heterocycle using microwave assisted organic synthesis.	L1, L2, L3	8
7. Transesterification reaction (Synthesis of biodiesel) by using green precursors. 8. Ester synthesis catalyzed by an acidic ion-exchange resin (Amberlyst 15). 9. Benzil –Benzillic acid rearrangement (solvent free) 10. Clay catalyzed solid state synthesis of 7-hydroxy-4-methylcoumarin from resorcinol & EAA. 11. Synthesis of any heterocyclic compound. 12. Synthesis of anthranillic acid derivatives.	L1, L2, L3, L4	8
13. Synthesis of dibenzal acetone. 14. Synthesis of chalcone in microwave. 15. Preparation of Manganese(III) acetylacetone, $Mn(acac)_3$. 16. Synthesis of adipic acid from cyclohexene. 17. Hands on training on characterization of compounds given in the syllabus by analytical techniques (FT-IR, NMR, UV-VIS, Mass, GC, Fluorescence)	L1, L2, L3, L4	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

***MSDS – Compilation of MSDS of chemicals used by students in each experiment is compulsory.**

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Suggested readings

1. Ahluwalia, V.K. *Green Chemistry*, Narosa Publishing House Pvt. Ltd. (2013) ISBN 8184872011.
2. Anastas, P. the Handbook of Green Chemistry, vol 5, reactions in water.

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SEMESTER-II

Course Code: DCHY2251	PHYSICAL CHEMISTRY-I	L	T	P	C
		3	0	0	3

Course Objective: Objective of the course is to make students well aware of different states of matters and their properties. The course covers the basic physical principles that are the foundation of essentially all chemistry. Topics include gaseous state, behavior of real gases, liquid states with the focus on the phenomenon of viscosity and surface tension, surface chemistry. Course gives a fundamental understanding of Ionic and chemical equilibria in solution and gaseous state. Other than this, student will also learn about the different concepts of Acids and Bases. The students will also learn how we can calculate the pH of a solution, hydrolysis and solubility product of different types of salts.

Course Outcomes

On completion of this course, the students will be able to

CO1 Explain the basic concepts of gaseous state.

CO2 Describe different properties of liquids.

CO3 Explain defects in solids and law of equipartition of energy.

CO4 Identify the molecular basis of heat capacities and Maxwell distribution and equillibrium.

Course Contents:

Modules	Blooms level*	Number of hours
MODULE I: Gaseous State Kinetic molecular model of a gas: postulates and derivation of the kinetic gas equation; collision frequency; collision diameter; mean free path and viscosity of gases, including their temperature and pressure dependence, relation between mean free path and coefficient of viscosity. Deviations from ideal gas behavior, compressibility factor *Z*, and its variation with pressure for different gases. Causes of deviation from ideal behavior. Van der Waals equation of state, its derivation and application in explaining real gas behavior, virial equation of state; van der Waals equation expressed in virial form and calculation of Boyle temperature. Isotherms of real gases and their comparison with van der Waals isotherms, continuity of states, critical state, relation between critical constants and van der Waals constants, law of corresponding states.	L1, L2, L3	7
MODULE II: Liquid State Qualitative treatment of the structure of the liquid state; physical properties of liquids; vapor pressure, surface tension and coefficient of viscosity, and their determination. Effect of addition of various solutes on surface tension and viscosity. Temperature variation of viscosity of liquids and comparison with that of gases.	L1, L2, L3	7
MODULE III: Solid State	L1, L2, L3	7

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Nature of the solid state, Miller indices, elementary ideas of symmetry, symmetry elements and symmetry operations, qualitative idea of point and space groups, seven crystal systems and fourteen, Bravais lattices; X-ray diffraction, Bragg's law, a simple account of rotating crystal method and powder pattern method. Analysis of powder diffraction patterns of NaCl, CsCl and KCl. Defects in crystals.		
MODULE IV: Ionic equilibria Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect; dissociation constants of mono-, di- and tri- protic acids (exact treatment).Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions; derivation of Henderson equation and its applications; buffer capacity, buffer range, buffer action and applications of buffers in analytical chemistry and biochemical processes in the human body. Solubility and solubility product of sparingly soluble salts Theory of acid – base indicators; selection of indicators and their limitations.	L1, L2, L3	7
MODULE V: Chemical equilibrium: Criteria of thermodynamic equilibrium, degree of advancement of reaction, chemical equilibriun ideal gases, concept of fugacity. Thermodynamic derivation of relation between Gibbs free energy of reaction and reaction quotient, Coupling of exothermic and endothermic reactions, Equilibrium constants and their quantitative dependence on temperature, pressure and concentration. Free energy of mixing and spontaneity; thermodynamic derivation of relations between the various equilibrium constants *Kp*, *Kc* and *Kx*. Le Chatelier principle (quantitative treatment); equilibrium between ideal gases and a pure condensed phase.	L1, L2, L3	8

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

1. Atkins, P.; de Paula, J. *Atkins' Physical Chemistry*, Oxford University Press, International Eleventh Edition (2018) ISBN 978-0198814740.
2. Ball, D.W. *Physical Chemistry*, Cengage India Private Limited, 2nd Edition (2007) ISBN 8131533433.
3. Castellan, G.W. *Physical Chemistry*, Narosa, 4th Edition (2004) ISBN 8185015597.
4. Mortimer, R.G. *Physical Chemistry*, Academic Press, 3rd Edition (2008) ISBN 978-0123706171.

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CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	**1**						**1**		**2**			
CO2	**1**						**1**		**2**			
CO3	**1**						**1**		**2**			
CO4	**1**						**1**		**2**			

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: DCHY2252	PHYSICAL CHEMISTRY LAB-I	L	T	P	C
		0	0	2	1

Course Objectives

The objective of this course is to

1. To develop the practical knowledge for the determination of surface tension and viscosity of different samples.
2. Also to teach how we can measure the pH of any solution.

Course Outcomes

On completion of this course, the students will be able to

CO1 Determine surface tension of unknown liquid.

CO2 Determine viscosity of unknown liquid.

CO3 Calibrate pH meter and use it in the measurement of pH of different buffer solutions.

Course Contents: (Minimum 10 experiments to be performed)

Modules	Blooms level*	Number of hours
(I) Surface tension measurements (use of organic solvents excluded). 1. Determine the surface tension by drop number method. 2. Determine the surface tension by drop weight method. 3. Study the variation of surface tension of detergent solutions with concentration	L1, L2, L3, L4	8
(II) Viscosity measurement using Ostwald's viscometer (use of organic solvents excluded). 4. Study the effect of the addition of solutes such as polymer. 5. Study the effect of the addition of solutes such as ethanol. 6. Study the effect of the addition of solutes such as sodium chloride on the viscosity of water at room temperature. 7. Study the effect of variation of viscosity of an aqueous solution with the concentration of solute.	L1, L2, L3, L4	8
(III) pH measurements 8. Measurement of pH of different solutions using pH-meter. 9. Preparation of Sodium acetate-acetic acid buffer solutions. 10. Preparation of Ammonium chloride-ammonium hydroxide. 11. Measurement of the pH of buffer solutions and comparison of the values. 12. Hands on training on characterization of compounds given in the syllabus by analytical techniques (FT-IR, NMR, UV-VIS, Mass, GC, Fluorescence).	L1, L2, L3, L4	8

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

***MSDS – Compilation of MSDS of chemicals used by students in each experiment is compulsory.**

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Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Suggested Readings:

1. Pandey, O.P.; Bajpai, D. N.; Giri, S. *Practical Chemistry*, S. Chand & Co. Ltd., (2010) ISBN 9788121908122.
2. Singh, J.; Singh, R. K. P.; Singh, J.; Yadav, L. D. S.; Siddiqui, I. R.; Srivastava, J. *Advanced Practical Chemistry*, Pragati Prakashan, 9th Edition (2019) ISBN: 978-93-88925-70-9.

Suggested Readings:

1. Jeffery, G.H.; Bassett, J.; Mendham, J.; Denney, R.C. *Vogel's Textbook of Quantitative Chemical Analysis*, Longman Scientific & Technical, 5th Edition (1989) ISBN 0-582-44693-7

CO, PO and PSO mapping:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	**2**	**1**					**3**	**1**	**2**			
CO2	**2**	**1**					**3**	**1**	**2**			
CO3	**2**	**1**					**3**	**1**	**2**			

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: DCHY2201	SPECTROSCOPY	L	T	P	C
		3	1	0	4

Course Objective: The course is designed to give students the basis of compound characterization. The student will be able to analyze and interpret spectroscopic data collected by the methods discussed in the course. They will be able to solve problems related to the structure, purity and concentration of chemicals and to study molecular interactions by choosing suitable spectroscopic methods and interpreting corresponding data. This course will help the students to understand the importance of several characterization techniques.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the basis of various spectroscopic techniques.
CO2. Describe the working and application of UV-Visible spectroscopy.
CO3. Summarize the principle and modes of vibration in IR spectroscopy.
CO4. Explain the basis and application of Raman spectroscopy.
CO5 Interpret the structure of organic compounds by NMR spectroscopy.

Course Content

Modules	Blooms level*	Number of hours
MODULE I: Definition of spectrum - Electromagnetic radiation - quantization of different forms of energies in molecules (translational, rotational, vibrational and electronic). Microwave Spectroscopy - theory of microwave spectroscopy - selection rule - Calculation of moment of inertia and bond length of diatomic molecules.	L1, L2, L3	08
MODULE II: UV - Visible Spectroscopy Absorption laws. Calculations involving Beer Lambert's law - instrumentation - Sources of radiation, wavelength selectors, sample cells, detectors- Photo tube, Photomultiplier tube, Photovoltaic cell, Silicon Photodiode. spectrophotometer- block diagrams with description of components - theory - types of electronic transitions - chromophore and auxochromes - Absorption bands and intensity - factors governing absorption maximum and intensity.	L1, L2, L3	07
MODULE III: I.R. Spectroscopy Principle - modes of vibration of diatomic, triatomic linear (CO_2) and nonlinear triatomic molecules (H_2O) - stretching and bending vibrations - selection rules. Expression for vibrational frequency (derivation not needed), instrumentation - Sources of radiation, wavelength selectors, detectors - Golay cell, Bolometer, Thermocouple, Thermistor, Pyroelectric detector, sampling techniques. Applications of IR Spectroscopy – interpretation of the spectra of alcohols, aldehydes, ketones and esters – aliphatic and aromatic. Hydrogen bonding.	L1, L2, L3	07

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MODULE IV: Raman Spectroscopy Rayleigh and Raman scattering, stokes and antistokes lines. Differences between Raman and I.R. Spectroscopy. Rotational Raman spectra of Non-centrosymmetric molecules (HCl). Mutual exclusion principle (CO_2 and N_2O)	L1, L2, L3	06
MODULE V: NMR Spectroscopy Basic principles of Proton Magnetic Resonance, NMR instrumentation, chemical shift and factors influencing it, equivalent and non equivalent protons.; Spin relaxation: Longitudinal relaxation, Transverse relaxation, measuring T1and T2, mechanisms of relaxation, Spin – Spin coupling and coupling constant; Anisotropic effects in alkene, alkyne, aldehydes and aromatics, Interpretation of NMR spectra of simple compounds. Applications of FT-IR, UV and NMR for identification of simple organic molecules.	L1, L2, L3	08

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

1. Subramanian, P.S.; Gopalan, R.; Rangarajan, K. *Elements of Analytical Chemistry*, Sultan Chand and Sons, New Delhi (2004) ISBN 978-8180547652.
2. Khopkar, S. M. *Basic Concepts of Analytical Chemistry*, New Age International Pvt. Ltd. Publishers (2008) ISBN 978-8122420920.
3. Chatwal, G.R.; Anand, S. *Instrumental Methods of Chemical Analysis*, Himalaya Publishing House (2011) ISBN 978-9350248362.
4. Usharani, S. *Analytical Chemistry*, Macmillan India Limited (2008) ISBN 9780333933893.
5. Willard, H. H.; Merritt, Jr, L. L.; Dean, J A; Settle, Jr, F. A. *Instrumental Methods of Analysis*, Saunders College Publication 7th Edition (1988).
6. Janarthanam, P.B. *Physicochemical Techniques of Analysis Vol I & II*, Asia Publishing House (1973) ISBN 978-0210225301.
7. Instrumental Methods of Chemical Analysis, Krishna Prakashan Media p Ltd; 1/e Edition (2011) ISBN 978-8182830998.
8. Kalsi, P. S. *Spectroscopy of Organic Compounds*, New Age International Publishers, 8th Edition, 2020, ISBN 978-81-943696-8-4.

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	**1**	**2**					**1**		**3**			
CO2	**1**	**2**					**1**		**3**			
CO3	**1**	**2**					**1**		**3**			
CO4	**1**	**2**					**1**		**3**			
CO5	**1**	**2**					**1**		**3**			

1: strongly related, 2: moderately related and 3: weakly related

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SEMESTER-III

Course Code: CHY2351	ORGANIC CHEMISTRY-I	L	T	P	C
		3	0	0	3

Course Objective: This course is intended to give the students the requisite knowledge of fundamentals of organic chemistry. The students will learn about reaction mechanism, concept of nucleophile, electrophile, types of reagents used in synthesis of organic compounds, stereochemistry and the structure of various hydrocarbons and their derivatives.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain salient features of structure and bonding.
CO2. Describe important attributes about different types of reagents, reactions and mechanisms
CO3. Apply the concept of isomerism with the focus on stereoisomerism.
CO4. Identify the important synthetic preparative methods, physical and chemical characteristics of alkanes, alkenes, alkynes & aromatics.

Course Content

Modules	Blooms level*	Number of hours
MODULE I: General Organic Chemistry Hybridizations, shape of molecules, localized and delocalized chemical bonds, van-der Waals interactions, Electronic displacements: inductive, hyperconjugation, electromeric, resonance, mesomeric, field effects, Homolytic & Heterolytic fission. Electrophiles and nucleophiles. Reaction intermediates: carbocations, carbanions, free radicals, carbenes, benzynes and nitrenes.	L1, L2, L3	6
MODULE II: Stereochemistry Curved arrow notations, drawing electron movement with arrows, half headed and double headed arrow, relative and absolute configurations, sequence rules, D & L, R & S, systems of nomenclature, syn & anti, E & Z notations with C.I.P rules, Newman and Sawhorse projection, Fischer and Flying wedge formulae & their interconversion, optical & geometrical isomers, optical activity, elements of symmetry, chiral and achiral molecules with two stereogenic centres, molecular chirality, enantiomers, properties of enantiomers, diastereomers, mesocompounds, resolution of enantiomers, inversion, retention and racemization, Conformational isomers.	L1, L2, L3	6
MODULE III: Alkanes, Alkenes and Alkynes IUPAC nomenclature, classification, sources and methods of preparation (with special reference to Wurtz, Kolbe, Corey House reactions and decarboxylation of carboxylic acids). Physical properties and chemical reactions of alkanes. Mechanism of free radical halogenation of alkanes.	L1, L2, L3	10

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Formation of alkenes and alkynes by elimination reactions, Mechanism of E1, E2, E1cb reactions. Saytzeff and Hofmann eliminations. Reactions of alkenes: Electrophilic additions their mechanisms (Markownikoff/Anti Markownikoff addition), mechanism of oxymercuration-demercuration, hydroboration-oxidation, ozonolysis, reduction (catalytic and chemical), syn and anti-hydroxylation (oxidation). 1, 2- and 1, 4- addition reactions in conjugated dienes, Diels-Alder reaction; Allylic and benzylic bromination and mechanism, e.g. propene, 1-butene, toluene, ethyl benzene. Reactions of alkynes: Acidity, Electrophilic and Nucleophilic additions. Hydration to form carbonyl compounds, Alkylation of terminal alkynes.		
MODULE IV: Cycloalkanes & their conformational analysis Types of cycloalkanes nomenclature, methods of preparations and relative stability, Baeyer strain and Pitzer strain theory and its limitations, ring strain in cyclopropane and cyclobutanes. Theory of stainless rings chemical reactions, Energy diagrams of cyclohexane: Chair, Boat and Twist boat forms.	L1, L2, L3	6
MODULE V: Aromatic Hydrocarbons Nomenclature of aromatic compounds, History of Kekule structure and Dewer benzene. Stability and carbon-carbon bond lengths of benzene, Aromaticity: Huckel's rule, Aromatic, anti-aromatic and non-aromatic molecules /ions, ortho effect, steric inhibition of resonance, MO picture, Aromatic electrophilic substitution reactions, Directing effects of groups, Side chain reactions of benzene derivatives. Activating and deactivating substituents. Birch reduction. Methods of formation and chemical reactions of alkylbenzenes, alkynylbenzenes and biphenyls.	L1, L2, L3	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

1. Morrison, R. N.; Boyd, R. N. *Organic Chemistry*, Pearson Education India, 6th Edition (2016) ISBN 978-8177581690.
2. Finar, I. L. *Organic Chemistry* (*Volume 1*), Dorling Kindersley (India) Pvt. Ltd. Pearson Education India, 6th edition (2002) ISBN 978-8177585421.
3. Finar, I. L. *Organic Chemistry* (*Volume 2: Stereochemistry and the Chemistry of Natural Products*), Pearson Education India, (2001) ISBN 978-8177585414.
4. Eliel, E. L.; Wilen, S. H. *Stereochemistry of Organic Compounds*, Wiley: London, (1994) ISBN 978-0-471-01670-0.
5. Kalsi, P. S. *Stereochemistry: Conformation and Mechanism*; New Age International Publishers (1990) ISBN 9788122435641.

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CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	**1**	**3**					**1**	**3**	**2**			
CO2	**1**	**3**					**1**	**3**	**2**			
CO3	**1**	**3**					**1**	**3**	**2**			
CO4	**1**	**3**					**1**	**3**	**2**			

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Course Code: CHY2352	ORGANIC CHEMISTRY LAB-I	L	T	P	C
		0	0	2	1

Course Objective : This course will help the students to understand important fundamental concepts of Organic chemistry Lab at the undergraduate level. The main objective is to prepare students for the study of the basic Organic chemistry laboratory techniques. Also, to provide experience in separation techniques of mixture of organic compounds by means of thin layer chromatography and paper chromatography. Also it gives students a hands on experience involving preparation of synthetically important organic compounds.

Course Outcomes

On completion of this course, the students will be able to

CO1. Calibrate thermometer and purify organic compounds via crystallization, sublimation and distillation.
CO2. Determine melting points of organic compounds.
CO3. Determine boiling points of organic compounds.
CO4. Separate organic compounds by chromatographic techniques.

Course Content : (Minimum 10 experiments to be performed)

Modules	Blooms level*	Number of hours
1.Calibration of the thermometer.	L1, L2 L3	2
2. Recrystallization of organic compounds by using the solvents: Water, Alcohol, Alcohol-Water 3. Purification by Distillation, Decolouration (Charcoal treatment) and Sublimation.	L1, L2, L3	4
4. Determination of the melting points of crude and crystalized compounds and unknown organic compounds (Kjeldahl method and electrically heated melting point apparatus) 5. To study the effect of impurities on the melting point – mixed melting point of two unknown organic compounds. 6. Determination of boiling point of liquid compounds. (Boiling point lower than and more than 100° C by distillation and capillary method)	L1, L2, L3	8
7. Determination of R_f values by thin layer chromatography (TLC). 8. Separation of green leaf pigments (spinach leaves may be used) by TLC. 9. Preparation and separation of 2,4 - dinitrophenylhydrazones of acetone, 2-butanone, hexane-2 and 3-one using toluene and light petroleum (40:60) as solvent system by TLC. 10. Separation of a mixture of dyes using cyclohexane and ethylacetate (8.5:1.5) as solvent system by TLC. 11. Separation of a mixture of o- and p-nitrophenol or o- and p-aminophenol by thin layer chromatography (TLC)/ 12. Determination of R_f values by Paper Chromatography: Ascending and Circular. 13. Separation of a mixture of two sugars by ascending paper chromatography. 14. Separation of a mixture of two amino acids by ascending and horizontal paper chromatography.	L1, L2, L3, L4	10

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15. Separation of a mixture of phenylalanine and glycine. Alanine and aspartic acid. Leucine and glutamic acid. Spray reagent-ninhydrin. 16. Separation of a mixture of D, L-alanine, glycine and L-Leucine using *n*-butanol:acetic acid : water (4:1:5) Spray reagent-ninhydrin. 17. Separation of monosaccharides- A mixture of D-galactose and D-fructose using n-butanol:acetone:water (4:1:5) Spray reagent aniline hydrogen phthalate. 18. Hands on training on characterization of compounds given in the syllabus by analytical techniques (FT-IR, NMR, UV-VIS, Mass, GC, Fluorescence)		

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

***MSDS – Compilation of MSDS of chemicals used by students in each experiment is compulsory.**

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Suggested Readings:

1. Ahluwalia, V. K., Aggarwal, R. *Comprehensive Practical Organic Chemistry*, Universities Press (2001) ISBN 8173712735.
2. Pandey, O.P.; Bajpai, D. N.; Giri, S. *Practical Chemistry*, S. Chand & Co. Ltd., (2010) ISBN 9788121908122.
3. Mann, F. G.; Saunders, B. C. *Practical Organic Chemistry*, Pearson Education, India, 4th edition (2009) ISBN 978-8131727102.
4. Singh, J.; Singh, R. K. P.; Singh, J.; Yadav, L. D. S.; Siddiqui, I. R.; Srivastava, J. *Advanced Practical Chemistry*, Pragati Prakashan, 9th Edition (2019) ISBN 978-93-88925-70-9.

CO, PO and PSO mapping:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	**2**	**1**					**2**	**1**				
CO2	**2**	**1**					**2**	**1**				
CO3	**2**	**1**					**2**	**1**				
CO4	**2**	**1**					**2**	**1**				

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Course Code: DCHY2301	**ANALYTICAL CHEMISTRY**	L	T	P	C
		3	0	0	3

Course Objective: This course is intended to give the students the basic knowledge of various instrumentation techniques used for separation, purification, qualitative and quantitative analysis. A student will be able to assess and suggest a suitable analytical method for a specific purpose, and evaluate sensitivity, important sources of interferences and errors.

Course Outcomes

On completion of this course, the students will be able to

CO1 Describe various aspects of data analysis.

CO2 Apply and summarize different purification techniques.

CO3 Describe various titrimetric methods of analysis.

CO4 Summarize different aspects of gravimetric analysis.

Course Contents:

Modules	**Blooms level***	**Number of hours**
MODULE I: Data analysis – theory of errors – idea of significant figures and its importance with examples – precision – accuracy – methods of expressing accuracy. Error analysis – minimizing errors – method of expressing precision – average deviation –standard deviation.	L1, L2, L3	9
MODULE II: Separation and Purification Techniques **General purification techniques** Purification of solid organic compounds, recrystallization, use of miscible solvents, use of drying agents and their properties, sublimation. Purification of liquids. Experimental techniques of distillation, fractional distillation, distillation under reduced pressure. Extraction, use of immiscible solvents, solvent extraction. Chemical methods of purification and test of purity. **Chromatography** Principle and application of adsorption, partition chromatography, Column chromatography, Thin Layer Chromatography, Paper chromatography, Ion exchange chromatography, Gas Chromatography.	L1, L2, L3	9
MODULE III: Titrimetric Methods of Analysis **General Introduction:** General principle. Types of titrations. Requirements for titrimetric analysis. Concentration systems: Molarity, formality, normality, wt% ppm, milli equivalence and millimoles-problems. Primary and secondary standards, criteria for primary standards, preparation of standard solutions, standardization of solutions. Limitation of volumetric analysis, endpoint and equivalence point. **Acid-base Equilibria:** pH of strong and weak acid solutions. Buffer solutions. Henderson equations. Preparation of acidic and basic buffers. Relative strength of acids and bases from Ka and Kb values.	L1, L2, L3	9

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Neutralization-titration curve, theory of indicators, choice of indicators. Use of phenolphthalein and methyl orange. **Complexometric titrations:** Stability of complexes, titration involving EDTA. Metal ion indicators and characteristics.		
MODULE IV: Solubility Equilibria **General Separation Techniques:** Solubility and solubility products, expressions for solubility products. Determination of solubility from solubility products. **Precipitation titrations:** Argentometric titrations, indicators for precipitation titrations involving silver. Determination of chloride by Volhard's method. Adsorption indicators. **Gravimetric methods of analysis:** Separation by precipitation, factors affecting solubility, gravimetric factor. Purity of precipitates, von Weiman ratio. Co-precipitation, post precipitation.	L1, L2, L3	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

1. Skoog, D. A.; West, D. M.; Holler, F. J. *Fundamentals of Analytical Chemistry*, BrookslColl'-Thomson Learning, 8th edition, (2004) ISBN 978-0-03-035523-3.
2. Subramanian, P.S.; Gopalan, R.; Rangarajan, K. *Elements of Analytical Chemistry*, Sultan Chand and Sons, New Delhi (2004) ISBN 978-8180547652.
3. Sharma, Y.R. *Elementary Organic Spectroscopy: Principles and Chemical Applications*, S. Chand & Co., Ltd, 5th Edition (2013) ISBN 978-8121928847.
4. Srivastava, V.K.; Srivastava, K. K. *Introduction to Chromatography: Theory and Practice*, S. Chand & Co., Ltd, (1991).
5. Srivastava, A.K.; Jain, P.C. *Instrumental Approach to Chemical Analysis* for B.Sc. and M.Sc. students, S. Chand & Co., Ltd, Ram Nagar, New Delhi (2010).
6. Khopkar, S. M. *Basic Concepts of Analytical Chemistry*, New Age International Pvt. Ltd. Publishers (2008) ISBN 978-8122420920.
7. Chatwal, G.R.; Anand, S. *Instrumental Methods of Chemical Analysis*, Himalaya Publishing House (2011) ISBN 978-9350248362.

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1	2					1	3	2			
CO2	1	2					1	3	2			
CO3	1	2					1	3	2			
CO4	1	2					1	3	2			

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Course Code: DCHY2302	ANALYTICAL CHEMISTRY LAB	L	T	P	C
		0	0	2	1

Course Objectives

The objective of the course is to

1. Provide students with and insight of different types of chromatographic techniques used for the separation of different compounds.
2. Demonstrate different extraction techniques required in an analytical lab.

Course Outcomes

On completion of this course, the students will be able to

CO1 Do the chromatographic separation of metal ions, sugar molecules and dyes

CO2 Analyze soil, juices and metal salts.

CO3 Apply ion exchange method for the separation and purification of ions and organic compounds.

CO4 Determine DO, COD and BOD of water sample.

Course Contents: (Minimum 10 experiments to be performed)

Modules	Blooms level*	Number of hours
MODULE I: Separation Techniques 1. Separation of mixtures: Paper chromatographic separation of Fe^{3+}, Al^{3+}, and Cr^{3+} 2. Separate and identify the monosaccharides present in the given mixture (glucose & fructose) by paper chromatography. Report the R_f values. 3. Separate a mixture of Sudan yellow and Sudan Red by TLC technique and identify them on the basis of their Rf values. 4. Chromatographic separation of the active ingredients of plants, flowers and juices by TLC 5. To separate a mixture of Ni^{2+}& Fe^{3+} by complexing with DMG and extracting the Ni^{2+} DMG complex in chloroform, and determine its concentration with spectrophotometry.	L1, L2, L3	8
6. Determine the pH of given aerated drinks fruit juices, shampoos and soaps. 7. Determination of pH of soil. 8. Determination of Total soluble salt of soil. 9. Estimation of calcium, magnesium, phosphate, nitrate of soil. 10. Determination of exchange capacity of cation exchange resins and anion exchange resins. 11. Separation of metal ions from their binary mixture. 12. Separation of amino acids from organic acids by ion exchange chromatography.	L1, L2, L3, L4	8
13.Determination of pKa values of indicator using spectrophotometry. 14. Determination of dissolved oxygen in water. 15. Determination of chemical oxygen demand (COD). 16. Determination of Biological oxygen demand (BOD).	L1, L2, L3, L4, L6	8

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17. Detection of food adulterant in milk, turmeric & oil. 18. Hands on training on characterization of compounds given in the syllabus by analytical techniques (FT-IR, NMR, UV-VIS, Mass, GC, Fluorescence)		

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation
***MSDS – Compilation of MSDS of chemicals used by students in each experiments is compulsory.**

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Suggested Reading:
1. Pandey O.P., Bajpai, D. N., Giri, S. Practical Chemistry, S. Chand.
2. Singh J., Singh R. K. P., Singh J., Yadav L. D. S., Siddiqui I. R., Srivastava J. Advanced Practical Chemistry, Pragati Prakashan.

CO, PO and PSO mapping:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	**3**	**1**						**1**	**2**			
CO2	**3**	**1**						**1**	**2**			
CO3	**3**	**1**						**1**	**2**			
CO4	**3**	**1**						**1**	**2**			

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: SCHY2301	RUBBER TECHNOLOGY	L	T	P	FW/ Proj	C
		3	0	0	0	3

Course Objectives

At the end of the course students should be able to understand different types of rubbers, additives used in rubber industries to improve its end use performance, different techniques for the compounding of rubber, manufacturing of tyres and design of tyres.

Course Outcomes (COs):

On completion of this course, the students will be able to

CO1 Define Rubber, Natural and Synthetic and additives to improve the properties.

CO2 Understand how the rubber is manufactured.

CO3 Conceive and develop an idea for different types of rubber and their applications.

CO4 Apply knowledge and understanding of various characterization parameters of rubber.

CO5 Explain testing parameters of rubber products.

Course Content:

Modules	Blooms level*	Number of hours
MODULE-I: Rubber Technology: Introduction, natural rubber- composition, extraction, processing, mastication, smoke rubber, crape rubber, Structure-properties relationship and applications.	**L1, L2, L3**	9
MODULE-II: Synthetic rubbers- Manufacture, properties and applications of nitrile rubber, chloroprene rubber, diene rubber, SBR rubbers, silicon-based rubbers, Thermoplastic elastomers.	**L1, L2, L3**	9
MODULE III: Additives used in rubber industries, filler systems, stabilizer systems, colorants, UV absorber, Antioxidants, blowing agent, flame retardant, antistatic agents, plasticizers, release agents, vulcanization system, compounding Techniques.	**L3, L4, L5**	9
MODULE-IV: Introduction to Tyres, Development of tyres, classification and types of tyres, tyre components, pneumatic tyres. Conveyer, V- belt, cable & hoses, Footwear, cellular & rubber molded products, Latex products & adhesives	**L3, L4, L5**	9
MODULE-V: Testing of rubber products- Mechanical Testing, Tensile, Flexural, Compression, Abrasion resistance, Creep resistance, Fatigue resistance, Thermal Testing, Electrical, Environmental Stress Cracking, Morphological.	**L3, L4, L5, L6**	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

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Examination Scheme:

Components	MT	A	Assignment	EE
Weightage (%)	15	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

Text Books

1. Handbook of Plastics Testing & Failure Analysis, Vishu Shah, Wiley Interscience.
2. Polymer Testing & Evaluation of Plastics, Mathur & Bhardwaj, Allied Publishers.
3. Encyclopedia of Polymer Science & Technology, Herman F. Mark, Wiley Interscience
4. Fatigue, Testing & Analysis, Lee, Elsevier
5. Introduction to Plastics & Composites, E. Miller, Marcel Dekker

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	--	2	--	--	--	--	--	1	2	2	2
CO2	--	2	--	--	--	--	--	1	2	2	2
CO3	--	2	--	--	--	--	--	1	2	2	2
CO4	--	2	2	--	--	--	--	1	--	2	2
CO5	--	--	2	--	--	--	1	1	2	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-IV

Course Code: DCHY2451	INORGANIC CHEMISTRY-II	L	T	P	C
		3	0	0	3

Course Objective: The course is designed to make students well aware of different types of bonds leading to formation of compounds. This course will promote understanding of facts and concepts in inorganic chemistry. This will give the students a basic understanding of VBT to explain the bond formation and structure of different compounds.

Course Outcomes

On completion of this course, the students will be able to

CO1 Explain the chemistry of s, p, d & f block elements and also corresponding acid bases.

CO2 Describe the synthesis and structure of inorganic compounds.

CO3 List the chemical properties of first transition series.

CO4 Summarize the chemical properties of second and third transition series.

Course Contents:

Modules	Blooms level*	Number of hours
MODULE I: Chemistry of main group elements (9) **s-block elements**: **Alkali Metal Family**: Solutions of alkali metals in liquid ammonia. Chemistry of oxides: complexation tendency (complexes, crowns and cryptands). **Alkaline earth metal family**: Chemistry of hydrides; structure of BeH_2; complexation tendency of Be & Mg [examples of $[Be_4O(Ac)_6]$, $[Be_4O(NO_3)_6]$ and chlorophyll]. Stability of oxo-salts. **(b) p-block elements**: **Boron Family:** Hydrides: Structures of $Li[AlH_4]$, $Na[BH_4]$, $Al(BH_4)_3$, $Be(BH_4)_2$, B_2H_6; Halides: Structures of BF_3, BCl_3 and $AlCl_3$ (dimer); Oxides / oxyacids: Structures of H_3BO_3 (with and without H-bonding), metaborate (chain, ring forms), Borax and peroxoborate ion. **Carbon Family:** Principles of silicate structures; structures of: orthosilicate, pyrosilicate, cyclic silicates ($Si_3O_9^{6-}$, $Si_6O_{18}^{12-}$); **Nitrogen Family:** Hydrides: Electronic structures (VB Theory) of the tri-hydrides; structure of hydrazine, NH_2OH and HN_3. Halides: Structure of: PCl_5 (gas and solid). Oxides and oxoacids: Structures of oxides of N (+I to +V states); P_4O_6, P_4O_{10}, Oxo-acids of P. **Oxygen Family:** Oxides and oxo-acids: structures of (i) oxides (SO_2, SeO_2, SO_3), (ii) oxoacids of sulphur or their anions; (iii) H_2O_2 (gas-phase), and (iv) halides (MX_6, MX_4, and MX_2 series). **Halogen Family:** Structures of (i) oxygen fluorides (OF_2, O_2F_2, O_4F_2), (ii) halogen oxides (Cl_2O, Br_2O, ClO_2, BrO_2, I_2O_5, Cl_2O_6, ClO_3, Cl_2O_7), (iii) oxo-acids (HOX, HXO_2, HXO_3, HXO_4), (iv) Inter halogens [ClF_3, BrF_3, $(ICl_3)_2$, ClF_5, BrF_5, IF_5, IF_7] and (v) polyhalides (I_3^-, Icl_2^-, Icl_4^-) **Noble gases:** Structures of Xe compounds: XeF_2, XeF_4, XeF_6, XeO_3, XeO_2F_2, $XeOF_4$, XeO_4, XeO_3F_2 and $[XeO_6]^{4-}$.	L1, L2, L3	9

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MODULE II. Chemistry of d-block Elements Characteristic properties & electronic configuration of d-block elements, Chemistry of Elements of Second and Third Transition Series: General characteristics, comparative treatment with their 3d analogues in respect of ionic radii, oxidation states. Magnetic behaviour, spectral properties.	L1, L2, L3	9
MODULE III. Chemistry of f-block Elements (a) **Lanthanides**: Electronic configuration, oxidation states and ionic radii and lanthanide contraction & its consequences, complex formation, colour, spectral and magnetic properties, occurrence and isolation of lanthanide compounds. (b) **Actinides:** General features, electronic configuration, oxidation states and chemistry of actinides, chemistry of separation of Np, Pu, and Am from U, similarities between the later actinides and the later lanthanides.	L1, L2, L3	9
MODULE IV: Acids and Bases: Arrhenius Theory, Bronsted-Lowry concept of acid-base reaction, solvated proton, relative strength of acids, types of acid-base reactions, levelling solvents, Lewis acid-base concept, Classification of Lewis acids, Hard and Soft Acids and Bases (HSAB) Application of HSAB principle.	L1, L2, L3	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested readings

1. Lee, J.D. *Concise Inorganic Chemistry*, ELBS, 1991.
2. Douglas, B.E. and Mc Daniel, D.H., *Concepts & Models of Inorganic Chemistry*, Oxford, 1970
3. Atkins, P.W. & Paula, J. *Physical Chemistry*, Oxford Press, 2006.
4. Day, M.C. and Selbin, J. *Theoretical Inorganic Chemistry*, ACS Publications 1962.
5. Huheey, J.E. *Inorganic Chemistry*, Prentice Hall 1993
6. Douglas, B.E. and Mc Daniel, D.H., *Concepts & Models of Inorganic Chemistry*, Oxford1970
7. Lee, J.D. *Concise Inorganic Chemistry*, ELBS (1991)
8. Shriver & Atkins, *Inorganic Chemistry*, Third Edition, Oxford Press 1994.
9. H.W. Porterfield, *Inorganic Chemistry*, Second Edition, Academic Press, 2005.

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1						1		2			
CO2	1						1		2			
CO3	1						1		2			
CO4	1						1		2			

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: DCHY2452	INORGANIC CHEMISTRY LAB-II	L	T	P	C
		0	0	2	1

Course Objectives

The objective of this course is to

1. Provide students an experience in qualitative analysis of various cations in a given mixture.
2. Provide students an experience in qualitative analysis of anions in a given mixture.

Course Outcomes

On completion of this course, the students will be able to

CO1. Identify cations and anions in mixture of salts.

Course Content :

Modules	Blooms level*	Number of hours
Cation Analysis (Group 1-6) Using H_2S/PTC/Thioacetamide or any other reagent. Identification of cations and simple anions in a mixture of salts containing not more than six ions (Three cations and three anions) interfering anions using semimicro scheme of analysis. If combination of cations or anions is given in the mixture, insoluble should be avoided. Spot tests should be carried out for final identifications wherever feasible. Pb^{2+}, Bi^{3+} Cu^{2+}, Cd^{2+}, As^{3+}, Sb^{3+}, Sn^{2+} or Sn^{4+}, Fe^{2+} OR Fe^{3+}, Al^{3+}, Cr^{3+},Co^{2+}, Ni^{2+}, Zn^{2+}, Mn^{2+}, Ba^{2+}, Sr^{2+}, Ca^{2+}, Mg^{2+}, NH^{4+}, K^+	L1, L2, L3	8
Anion Analysis CO_3^{2-}, SO_3^{2-}, CO_3^{2-}, SO_3^{2-}, S^{2-}, NO_2^-, CH_3COO^-, NO_3^-, Cl^-, Br^-, I^-, SO_4^{2-}, PO_4^{3-}, BO_3^{3-}, F^-, $C_2O_2^{-4}$	L1, L2, L3	8
Paper Chromatography Paper Chromatographic separation of Ni (II) and Co(II); Cu(II) and Cd(II) ions	L1, L2, L3	8

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Suggested readings

1. Vogel, A.I. A Textbook of Quantitative Inorganic Analysis, ELBS.
2. Pandey O.P., Bajpai, D. N., Giri, S. Practical Chemistry, S. Chand.
3. Singh J., Singh R. K. P., Singh J., Yadav L. D. S., Siddiqui I. R., Srivastava J. Advanced Practical Chemistry, Pragati Prakashan.
4. Pandey O.P., Bajpai, D. N., Giri, S. Practical Chemistry, S. Chand.

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5. Singh J., Singh R. K. P., Singh J., Yadav L. D. S., Siddiqui I. R., Srivastava J. Advanced Practical Chemistry, Pragati Prakashan.

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	**2**	**1**						**1**	**3**			

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Course Code: DCHY2401	ORGANIC CHEMISTRY-II	L	T	P	C
		3	0	0	3

Course Objective: This course is designed to teach students concept of aromaticity and various reactions of aromatic as well as non-aromatic compounds. This course also imparts the knowledge of different functional groups and the way to incorporate the desired functionality in a given compound. This course will promote understanding of facts and concepts in organic chemistry. This will give the students a basic understanding of nomenclature, reaction mechanism and conformation of organic compounds. Other than this, student will also learn the chemistry of alcohols, phenols, ethers, epoxides and halogenated hydrocarbons.

Course Outcomes

After completing of this course, the students will be able to

CO1 Recognize and explain the properties of halogenated compounds.

CO2 Explain various methods and chemical reactions alcohols, phenols, ethers and epoxides.

CO3 Identify the methods and chemical reactions of carbonyls and carboxylic acids and derivatives.

CO4 Describe the chemistry of amines.

Course Contents:

Modules	Blooms level*	Number of hours
MODULE I: Chemistry of Halogenated hydrocarbons: Alkyl halides: Methods of preparation, nucleophilic substitution reactions – S_N1, S_N2 and S_Ni mechanisms with stereochemical aspects and effect of solvent etc.; nucleophilic substitution vs elimination. Aryl halides: Preparation, including preparation from diazonium salts. nucleophilic aromatic substitution; S_NAr, Benzyne mechanism Relative reactivity of alkyl, allyl/benzyl, vinyl and aryl halides towards nucleophilic substitution reactions. Organometallic compounds of Li, Mg, Cu, Zn, Preparation and their applications in organic synthesis, Synthesis of DDT and BHC, Freon.	L1, L2 L3	9
MODULE II: Alcohols, Phenols, Ethers and epoxides: Alcohols: preparation, properties and relative reactivity of $1^{\circ}2^{\circ}$, 3° alcohols, Bouvaelt-Blanc Reduction; Preparation and properties of glycols: Oxidation by periodic acid and lead tetraacetate, Phenols: Preparation and properties; Acidity and factors effecting it, Ring substitution reactions, Reimer – Tiemann and Kolbe's – Schmidt Reactions, Fries and Claisen rearrangements with Mechanism. Ethers and Epoxides: Preparation and reactions with acids. Reactions of epoxides with alcohols, ammonia derivatives and $LiAlH_4$	L1, L2, L3	9
MODULE III: Carbonyl Compounds: structure, properties & applications Structure, reactivity and preparation; Nucleophilic additions, Nucleophilic addition-elimination reactions with ammonia derivatives with mechanism; Mechanisms of Aldol and Benzoin condensation, Knoevenagel condensation, Claisan-Schmidt, Perkin, Cannizzaro and Wittig reaction, Beckmann and Benzil-Benzilic acid rearrangements, haloform reaction and	L1, L2, L3	9

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Baeyer Villiger oxidation, α-substitution reactions, oxidations and reductions (Clemmensen, Wolff-Kishner, $LiAlH_4$, $NaBH_4$, MPV, PDC and PGC); Addition reactions of unsaturated carbonyl compounds: Michael addition, Active methylene compounds, Keto-enol tautomerism, Preparation and synthetic applications of diethyl malonate and ethyl acetoacetate, (Pinacol- Pinacolone rearrangement).		
MODULE IV: Carboxylic Acids and their Derivatives: structure, properties & applications Preparation, physical properties and reactions of monocarboxylic acids: Typical reactions of dicarboxylic acids, hydroxy acids and unsaturated acids: succinic/phthalic, lactic, malic, tartaric, citric, maleic and fumaric acids. Preparation and reactions of acid chlorides, anhydrides, esters and amides; Comparative study of nucleophilic substitution at acyl group - Mechanism of acidic and alkaline hydrolysis of esters, Claisen condensation, Dieckmann and Reformatsky reactions, Hofmann-bromamide degradation and Curtius rearrangement. **MODULE V: Nitrogen Containing Functional Groups** Preparation and important reactions of nitro and compounds, nitriles and isonitriles Amines: Effect of substituent and solvent on basicity; Preparation and properties: Gabriel phthalimide synthesis, Carbylamine reaction, Mannich reaction, Hoffmann's exhaustive methylation, Hofmann-elimination reaction; Distinction between 1^0, 2^0 and 3^0 amines with Hinsberg reagent and nitrous acid; Diazonium Salts: Preparation and their synthetic applications.	L1, L2, L3	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

1. Morrison, R. N. and Boyd, R. N. *Organic Chemistry*, Prentice Hall, India Pearson Education India, (2001) ISBN 8120307658.
2. Finar, I. L. *Organic Chemistry* (*Volume 1*), Dorling Kindersley (India) Pvt. Ltd. Pearson Education India; 6th edition (2002) ISBN 978-8177585421.

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1	3					1		2			
CO2	1	3					1		2			
CO3	1	3					1		2			
CO4	1	3					1		2			

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: DCHY2402	ORGANIC CHEMISTRY LAB-II	L	T	P	C
		0	0	2	1

Course Objective: The students will get training for systematic qualitative analysis of simple organic compounds. This course will provide experience in practical aspects of qualitative analysis of unknown heteroatom (extra elements) and detection of functional groups present.

Course Outcomes

On completion of this course, the students will be able to

CO1 Systematically analyze extra elements in the given unknown compounds

CO2 Tests the presence of functional groups in organic compounds.

CO3 Qualitatively analyze different types of organic compounds.

Course Contents: (Minimum 10 experiments to be performed)

Modules	Blooms level*	Number of hours
1. Systematic analysis of extra elements in the given unknown compounds 2. Functional group determination. 3. Qualitative analysis of the following types of unknown organic compounds: Carboxylic acids. 4. Qualitative analysis of the following types of unknown organic compounds: Phenols. 5. Qualitative analysis of the following types of unknown organic compounds: Qualitative analysis of the following types of unknown organic compounds: Carboxylic acids :Alcohols. 6. Qualitative analysis of the following types of unknown organic compounds: Qualitative analysis of the following types of unknown organic compounds: Aldehydes. 7. Qualitative analysis of the following types of unknown organic compounds: Qualitative analysis of the following types of unknown organic compounds: Ketones.	L1, L2, L3, L4	8
8. Qualitative analysis of the following types of unknown organic compounds: Qualitative analysis of the following types of unknown organic compounds: Esters 9. Qualitative analysis of the following types of unknown organic compounds: Qualitative analysis of the following types of unknown organic compounds: Carbohydrates 10. Qualitative analysis of the following types of unknown organic compounds: Qualitative analysis of the following types of unknown organic compounds: Primary, secondary and tertiary amines 11.Qualitative analysis of the following types of unknown organic compounds: Qualitative analysis of the following types of unknown organic compounds: Nitro compounds.	L1, L2, L3, L4	8

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12.Qualitative analysis of the following types of unknown organic compounds: Qualitative analysis of the following types of unknown organic compounds: Amides. 13. Qualitative analysis of the following types of unknown organic compounds: Qualitative analysis of the following types of unknown organic compounds: Aryl halides. 14. Qualitative analysis of the following types of unknown organic compounds: Qualitative analysis of the following types of unknown organic compounds: Hydrocarbons. 15. Hands on training on characterization of compounds given in the syllabus by analytical techniques (FT-IR, NMR, UV-VIS, Mass, GC, Fluorescence)	L1, L2, L3, L4	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

***MSDS – Compilation of MSDS of chemicals used by students in each experiment is compulsory.**
Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Suggested Readings:

1. Ahluwalia, V. K., Aggarwal, R. *Comprehensive Practical Organic Chemistry*, Universities Press (2001) ISBN 8173712735.
2. Pandey, O.P.; Bajpai, D. N.; Giri, S. *Practical Chemistry*, S. Chand & Co. Ltd., (2010) ISBN 9788121908122.
3. Mann, F. G.; Saunders, B. C. *Practical Organic Chemistry*, Pearson Education, India, 4th edition (2009) ISBN 978-8131727102.
4. Singh, J.; Singh, R. K. P.; Singh, J.; Yadav, L. D. S.; Siddiqui, I. R.; Srivastava, J. *Advanced Practical Chemistry*, Pragati Prakashan, 9th Edition (2019) ISBN 978-93-88925-70-9.

CO, PO and PSO mapping:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	**1**	**2**						**1**	**3**			
CO2	**1**	**2**						**1**	**3**			
CO3	**1**	**2**						**1**	**3**			

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: SCHY2401	INDUSTRIAL APPLICATIONS OF CARBON-NANOCOMPOSITES	L	T	P	FW/ Proj	C
		3	0	0	0	3

Course Objectives

At the end of the course students should be able to understand nanocomposites their synthesis with special emphasis on carbon nanocomposites and their applications and high-end usages in industries.

Course Outcomes (COs):

On completion of this course, the students will be able to

CO1 Define carbon nanocomposites, multiwalled carbon nanotube.

CO2 Understand different forms of carbon and types of nanocomposites.

CO3 Conceive and develop an idea for synthesis, functionalization & processing of carbon nanocomposites.

CO4 Explain the processing methods of carbon nanocomposites.

CO5 Apply knowledge and understanding of carbon nanocomposites in daily life in different fields such as of sensing, energy storage devices etc.

Course Content:

Modules	Blooms level*	Number of hours
MODULE I: Introduction to Carbon Carbon molecules, nature of the carbon bond, new carbon structures, discovery of C60/C70 structure of C60/C70 and its crystal, from a Graphene Sheet to a Nanotube, Single wall and Multi walled Nanotubes, Zigzag and Armchair Nanotubes, Nomenclature, Euler's Theorem.	**L1, L2, L3**	9
MODULE II: Carbon Nano-composite: Definition of nanocomposites, Constituent of nanocomposites, General characteristics of particle reinforced composites- classification, Terminology used in fiber reinforced composites, Classification based on matrix and topology: Carbon nanotube (CNT) based nanocomposites, Graphene based nanocomposites, Carbon nano-diamond based nanocomposites, Hard nanocomposite coatings with amorphous carbon, Core-Shell nanocomposites.	**L1, L2, L3**	9
MODULE III: Synthesis of Carbon-nanocomposites: Covalent functionalization, non-covalent functionalization, wet synthesis, dry synthesis.	**L3, L4, L5**	9
MODULE IV: Nanocomposite Processing Methods: Nanocomposite processing: In-situ polymerization technique, Solution casting, Electro spinning, melt mixing, Filament Winding, Injection and compression molding, Vacuum bag moulding Method, Pultrusion Process	**L3, L4, L5**	9
MODULE V: Applications of Carbon-nanocomposite: Catalysis, super capacitor, biosensor, solar cells, radar absorbing materials, field emission, energy storage, conductive plastics.	**L3, L4, L5, L6**	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

1. Carbon Nanotubes: Properties and Applications- Michael J. O'Connell.

2. Carbon Nanotechnology- Liming Dai.

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3. Nanotubes and Nanowires- CNR Rao and A Govindaraj RCS Publishing.
4. Physical properties of Carbon Nanotube-R Satio. NSC 480: Basics of Nanotechnology in Tissue Engineering
5.Composite Polymeric Materials – Sheldon.
6. Lubin - Handbook of composites – (Van Nostrand, 1982)
7. Carbon Nanotube and Graphene Device Physics, by H.-S. Philip Wong (Author), Deji Akinwande (Author)
8. K. Chawla, Composite Materials – Science & Engg., Springer- Veslag, New York, 1988.
9. Mohr - SPIE Handbook of Technology and Engineering of Reinforced Plastics/Composites – (Van Nostrand, 1998)

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**MT**	**A**	**Assignment**	**EE**
Weightage (%)	15	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	--	2	--	--	2	--	--	1	2	2	2
CO2	--	2	--	--	--	--	--	1	2	2	2
CO3	--	2	--	2	--	--	--	1	2	2	2
CO4	--	2	--	2	--	--	--	1	--	2	2
CO5	--	--	--	--	--	--	1	1	2	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-V

Course Code: DCHY2501	PHYSICAL CHEMISTRY-II	L	T	P	C
		3	0	0	3

Course Objective: This course will provide an insight into some thermodynamic aspects of chemical reactions. Course gives students an overview of thermodynamics involved in various processes in our surrounding, relation between heat and energy, different laws of thermodynamics, thermochemistry, different variable influencing state of a system and their interrelation.

Course Outcomes

On completion of this course, the students will be able to

CO1 Describe the basic concepts of thermodynamics

CO2 Solve questions based on thermochemistry.

CO3 Explain the concept of entropy.

CO4 Relate the spontaneity of a process with free energy equations.

CO5 Explain the chemical kinetics and its role.

Course Contents:

Modules	Blooms level*	Number of hours
MODULE I: Chemical thermodynamics Intensive and extensive variables; state and path functions; isolated, closed and open systems; zeroth law of thermodynamics. *First law:* Concept of heat, *q*, work, *w*, internal energy *U* and statement of first law; enthalpy (*H*), relation between heat capacities, calculations of *q*, *w*, *U* and *H* for reversible, irreversible and free expansion of gases (ideal and van der Waals) under isothermal and adiabatic conditions.	L1, L2, L3	8
MODULE II: Thermochemistry Heats of reactions: standard states; enthalpy of formation of molecules and ions and enthalpy of combustion and its applications; calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data, effect of temperature (Kirchoff's equations) and pressure on enthalpy of reactions, Adiabatic flame temperature, explosion temperature.	L1, L2, L3	8
MODULE III: Second and Third Law of Thermodynamics *Second Law:* Concept of entropy; thermodynamic scale of temperature, statement of the second law of thermodynamics; molecular and statistical interpretation of entropy, Calculation of entropy change for reversible and irreversible processes. *Third Law:* Statement of third law, concept of residual entropy, calculation of absolute entropy of molecules.	L1, L2, L3	8
MODULE IV: Chemical Kinetics I Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction concentration, temperature, pressure, solvent, light, catalyst concentration dependence of rates, mathematical characteristics	L1, L2, L3	6

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of simple chemical reactions- zero. order, pseudo order, half - life and mean life Determination of the order of reaction differential method, method of integration, method of half - life period and isolation method.		
MODULE V: Chemical Kinetics-II Theories of chemical kinetics: effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy. Simple collision theory based on hard sphere model, transition state theory (equilibrium hypothesis) Expression for the rate constant based on equilibrium constant and thermodynamic aspects	L1, L2, L3	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

1. Atkins, P.; de Paula, J. *Atkins' Physical Chemistry*, Oxford University Press, International Eleventh Edition (2018) ISBN 978-0198814740.
2. Castellan, G.W. *Physical Chemistry*, Narosa, 4th Edition (2004) ISBN 8185015597.
3. Engel, T.; Reid, P. *Thermodynamics, Statistical Thermodynamics, & Kinetics* Pearson; 3rd Edition (2019) ISBN 978-0321815330.
4. McQuarrie, D. A.; Simon, J. D. *Molecular Thermodynamics* Viva Books Pvt. Ltd, New Delhi (2004) ISBN 978-8176498630.

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1						1		3			
CO2	1						1		3			
CO3	1						1		3			
CO4	1						1		3			
CO5	1						1		3			

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: DCHY2502	PHYSICAL CHEMISTRY LAB-II	L	T	P	C
		0	0	2	1

Course Objective: To provide training in practical aspects of **physical chemistry** including determination of heat capacity, enthalpy of ionization, enthalpy of hydration, enthalpy of dissolution of given compound. The course also involves determination of basicity/proticity of a polyprotic acid by the thermochemical method. Apart from this students will also learn about X-ray diffraction pattern and phase diagram.

Course Outcomes

On completion of this course, the students will be able to

CO1 Perform various thermochemical experiments.

CO2 Explain the changes in conductance in systems like strong acid-strong base, weak acid-strong base and mixture of strong acid and weak acid-strong base

CO3 Describe the kinetics of reactions by Initial rate method.

CO4 Describe the kinetics of reactions by Integrated rate method.

Course Contents: (All experiments to be performed)

Modules	Blooms level*	Number of hours
1. Thermochemistry 2. Determination of heat capacity of a calorimeter for different volumes using change of enthalpy data of a known system (method of back calculation of heat capacity of calorimeter from known enthalpy of solution or enthalpy of neutralization). 3. Determination of heat capacity of the calorimeter and enthalpy of neutralization of hydrochloric acid with sodium hydroxide.	L1, L2, L3, L4	12
4. To determine the enthalpy of neutralization of a weak acid/ week base versus base/ strong acid and determine the enthalpy of ionization of the weak acid base. 5. Study the kinetics of the reactions: Initial rate method: Iodide-persulphate reaction	L1, L2, L3, L4	4
6. Study the kinetics of the reactions Integrated rate method: Acid hydrolysis of methyl acetate with hydrochloric acid, volumetrically. 7. Study the kinetics of the reactions Integrated rate method: Iodide-persulphate reaction.	L1, L2, L3, L4	4
8. Study the kinetics of the reactions Integrated rate method: Saponification of ethyl acetate. 9. Study the kinetics of the reactions Integrated rate method: Acid hydrolysis of methyl acetate with hydrochloric acid, conductometrically. 10. Hands on training on characterization of compounds given in the syllabus by analytical techniques (FT-IR, NMR, UV-VIS, Mass, GC, Fluorescence).	L1, L2, L3, L4	4

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**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation
***MSDS – Compilation of MSDS of chemicals used by students in each experiment is compulsory.**
Any other experiment carried out in the class.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Suggested Readings:

1. Pandey, O.P.; Bajpai, D. N.; Giri, S. *Practical Chemistry*, S. Chand & Co. Ltd., (2010) ISBN 9788121908122.
2. Singh, J.; Singh, R. K. P.; Singh, J.; Yadav, L. D. S.; Siddiqui, I. R.; Srivastava, J. *Advanced Practical Chemistry*, Pragati Prakashan, 9th Edition (2019) ISBN: 978-93-88925-70-9.

CO, PO and PSO mapping:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	**1**	**2**						**1**	**3**			
CO2	**1**	**2**						**1**	**3**			
CO3	**1**	**2**						**1**	**3**			
CO4	**1**	**2**						**1**	**3**			

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: DCHY2503	ORGANIC CHEMISTRY-III	L	T	P	C
		3	0	0	3

Course Objective: The main objective of this course is to transfer knowledge to students regarding synthesis and application of some selected organometallic compounds. This course will help the students to understand the properties and reactions of polynuclear, Sulphur containing and heterocyclic compounds. Their types and application are also included in this course.

Course Outcomes

On completion of this course, the students will be able to

CO1 Explain the importance of alkaloids & heterocyclic compounds in organic chemistry.

CO2 List various methods of structural elucidation of terpenes.

CO3 Describe the synthesis and chemical reactivity of Polynuclear hydrocarbons.

CO4 Identify types, preparation and uses of dye.

Course Content

Modules	Blooms level*	Number of hours
MODULE I: Heterocyclic Compounds Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole. Introduction to condensed five and six membered heterocycles. Preparation and reactions of Indole, quinoline and isoquinolme with special reference to Fischer indole synthesis and Bischler-Napieral. Mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline.	L1, L2, L3,	9
MODULE II: Alkaloids Natural occurrence, General structural features, Isolation and their physiological action, Hoffmann's exhaustive methylation, Emde's modification, Structure elucidation and synthesis of Hygrine and Nicotine. Medicinal importance of Nicotine, Hygrine, Quinine, Morphine, Cocaine, and Reserpine.	L1, L2, L3	9
MODULE III: Terpenes Occurrence, classification, isoprene rule; Elucidation of structure and synthesis of Citral, Neraland α- terpineol	L1, L2, L3	9
MODULE IV: Polynuclear Hydrocarbons Reactions of naphthalene phenanthrene and anthracene Structure, Preparation and structure elucidation and important derivatives of naphthalene and anthracene, Polynuclear hydrocarbons.	L1, L2, L3	9
MODULE V: Dyes Classification, Color and constitution; Mordant and Vat Dyes; Chemistry of dyeing; Synthesis and applications of: Azo dyes – Methyl Orange and Congo Red		

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(mechanism of Diazo Coupling); Triphenyl Methane Dyes - Malachite Green, Rosaniline and Crystal Violet; Phthalein Dyes – Phenolphthalein and Fluorescein; Natural dyes –structure elucidation and synthesis of Alizarin and Indigotin; Edible Dyes with examples.		

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

1. Morrison, R. N.; Boyd, R. N. *Organic Chemistry*, Pearson Education India, 6th Edition (2016) ISBN 978-8177581690.
2. Finar, I. L. *Organic Chemistry, Volume 1*, Dorling Kindersley (India) Pvt. Ltd. Pearson Education India, 6th edition (2002) ISBN 978-8177585421.
3. Finar, I. L. *Organic Chemistry, Volume 2: Stereochemistry and the Chemistry Natural Products*, Dorling Kindersley (India) Pvt. Ltd., Pearson Education India; 5th Edition (2002) ISBN 978-8177585414.

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1	3					1		2			
CO2	1	3					1		2			
CO3	1	3					1		2			
CO4	1	3					1		2			

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Course Code: DCHY2504	ORGANIC CHEMISTRY LAB-III	L	T	P	C
		0	0	2	1

Course Objective: To provide practical experience in some one-step organic preparation of azobenzene, benzpinacol and some other selected valuable organic compounds. This course also provides students with practical knowledge of few quantitative estimations. This course will help the students to get the practical knowledge for the many chemical reactions like reduction, Diels Alder, Benzoin condensation and photochemical reductions.

Course Outcomes

On completion of this course, the students will be able to

CO1 Describe the synthesis and mechanism of many organic reactions.

CO2 Explain the estimation of organic compounds in a solution.

Course Content: (Minimum 10 experiments to be performed including at least two estimations)

Modules	Blooms level*	Number of hours
Organic Preparations 1. Diels-Alder reaction between anthracene and maleic anhydride 2. Reduction: nitrobenzene to azobenzene (TLC of the mixture), m-dinitrobenzene to m-nitroaniline 3. S-benzylisothiuranum salts of any one water soluble and one water insoluble acid:acetic acid, phenyl acetic acid, oxalic acid, benzoic acid, phthalic acid 4. Photochemical reduction of benzophenone to benzopinacol 5. Benzoin condensation of benzaldehyde (using thiamine hydrochloride) 6. Condensation of p-toluidine with benzaldehyde/salicylaldehyde/2-hydroxy-3-methoxy benzadehyde to get Schiff's base (solventless condensation) 7. Acetylation of amines and phenols. 8. Benzolyation of amines and phenols by Schotten-Baumann reaction. 9. Hydrolysis of amides and esters to obtain benzoic acid. 10. 2,4-DNP, semicarbazone and oxime derivative of carbonyl compound. 11. Nitration of nitrobenzene, chlorobenzene & bromobenzene. 12. Oxidation of the benzaldehyde, benzyl alcohol, acetophenone to benzoic	L1, L2, L3, L4	16
Estimations 13. Estimation of Phenol and aniline by bromination with potassium bromate-potassium bromide method 14.Estimation of Glycine by formylation method 15. Estimation of Saponification value of an oil/fat. 16. Hands on training on characterization of compounds given in the syllabus by analytical techniques (FT-IR, NMR, UV-VIS, Mass, GC, Fluorescence)	L1, L2, L3, L4	8

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

***MSDS – Compilation of MSDS of chemicals used by students in each experiment is compulsory.**

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Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Suggested Readings:

1. Ahluwalia, V. K., Aggarwal, R. *Comprehensive Practical Organic Chemistry*, Universities Press (2001) ISBN 8173712735.
2. Pandey, O.P.; Bajpai, D. N.; Giri, S. *Practical Chemistry*, S. Chand & Co. Ltd., (2010) ISBN 9788121908122.
3. Mann, F. G.; Saunders, B. C. *Practical Organic Chemistry*, Pearson Education, India, 4th edition (2009) ISBN 978-8131727102.
4. Singh, J.; Singh, R. K. P.; Singh, J.; Yadav, L. D. S.; Siddiqui, I. R.; Srivastava, J. *Advanced Practical Chemistry*, Pragati Prakashan, 9th Edition (2019) ISBN 978-93-88925-70-9.

CO, PO and PSO mapping:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	**2**	**1**						**1**	**2**			
CO2	**2**	**1**						**1**	**2**			

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Course Code: DCHY2551	INTRODUCTION TO LAB SAFETY AND TRAINING	L	T	P	C
		3	1	0	4

Course Objective: To provide information about standard operating procedure for laboratory for safe working atmosphere.

Course Outcomes

On completion of this course, the students will be able to

CO1 Describe hazards associated with chemicals and their safe usage.

CO2 Explain various safety and precautionary measures.

CO3 Apply knowledge of radiation safety and guidelines

Course Contents:

Modules	Blooms level*	Number of hours
MODULE I: Standard Operating Procedures for the Laboratory Chemical Name, Hazard Rating, Hazards, Label Requirements, Exposure Limits, Personal protection equipment and personal Attire required, Precautionary Statements	L1, L2, L3	09
MODULE II: Laboratory Safety-I Biological Safety, Chemical Hygiene, Compressed Gas Safety, Electrical Safety, Emergency Response, Fire and Life Safety, Hazard Communication, Hazardous Waste Management	L1, L2, L3, L5	09
MODULE-III: Laboratory Safety-II Acid Safety, Laboratory Equipment Safety, Laser Safety, Mercury Safety, Needle Stick and Needle Safety, Personal Protection Equipment, Reactive Chemicals and Pyrophoric Safety	L1, L2, L3	09
MODULE IV: Laboratory Safety III Radiation Safety, Recombinant DNA Materials, Respiratory Protection, Shipping Biological Materials	L1, L2, L3	09

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

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CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	**1**	**2**						**1**	**3**			
CO2	**1**	**2**						**1**	**3**			
CO3	**1**	**2**						**1**	**3**			

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Course Code: DCHY2505	**BIOINORGANIC CHEMISTRY**	L	T	P	C
		3	1	0	4

Course Objective: Course objective is to give students an understanding of types of metals and their usefulness in biological systems. This course will enable students to learn about the structure and function of several enzymes that activates small molecules. The students will learn about the goals and methods of chemists that aim to mimic biological systems. Course also describes selected organometallic and inorganic complexes that do a good job of mimicking biological catalysis.

Course Outcomes

On completion of this course, the students will be able to

CO1 Describe the role of inorganic elements on biological systems.

CO2 Apply principles of coordination chemistry to explain how nature tailors properties of metal centers for specific applications (eg. Metalloporphyrins)

CO3 Answer critical questions on the importance of metals in enzymatic process.

CO4 Summarize the role of metals in medicine.

Course Contents:

Modules	**Blooms level***	**Number of hours**
MODULE I: Role of metal ions in biological system Elements of life: essential major, trace and ultratrace elements. Basic chemical reactions in the biological systems and the role of metal ions (specially Na+ , K+ , Mg2+, Ca2+, Fe3+/ 2+, Cu2+/ + , and Zn2+).Metal ion transport across biological membrane Na+ /K+ ion pump, ionophores. Toxic metal ions and their effects, chelation therapy (examples only)	L1, L2, L3	9
MODULE II: Metalloporphyrins Biological functions of haemoglobin, myoglobin and hemocynin, cytochromes and ferredoxins, carbonate bicarbonate buffering system and carbonic anhydrase. Biological nitrogen fixation, Photosynthesis: (Photosystem-I and Photosystem-II), chlorophyll and related elementary ideas	L1, L2, L3	9
MODULE III: Metalloenzymes Copper enzymes, superoxide dismutase, cytochrome oxidase and ceruloplasmin; Coenzymes; Molybdenum enzyme: xanthine oxidase; Zinc enzymes: carbonic anhydrase, carboxy peptidase and interchangeability of zinc and cobalt in enzymes; Vitamin B12 and B12 coenzymes; Iron storage, transport, biomineralization and siderophores, ferritin and transferrins.	L1, L2, L3	9
MODULE IV: Metals in Medicine Metal deficiency of Fe, Cu & Zn and disease; toxicity of mercury, cadmium, lead, beryllium, selenium and arsenic; biological defence mechanisms; chelation therapy; metals used for diagnosis and chemotherapy, platinum complexes as anticancer drugs, history of platinum anticancer drug, Pt-DNA binding, bioinorganic chemistry of platinum anticancer drug, complexes of gold, copper, zinc, mercury, arsenic and antimony as drugs.	L1, L2, L3	9

**Bloom's Level:*

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L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

1. Lippard, S. J. Berg, J. M. *Principles of Bioinorganic Chemistry*, University Science Books, Mill Valley, California (1994) ISBN 0-935702-73-3.
2. Ochiai, E. *Bioinorganic Chemistry an Introduction*, Allyn and Bacon, Inc., Boston, Mass., (1977). DOI 10.1080/00945717708069739
3. Hughes, R. P. *The Inorganic Chemistry of Biological Processes*, Wiley (1981) ISBN 9780471278153.
4. Hanzlik, R.P. *Inorganic Aspects of Biological and Organic Chemistry*, Elsevier (1976) ISBN: 9780323151160.
5. Kraatz, H.-B. Metzler-Nolte, N. *Concepts and Models in Bioinorganic Chemistry*, Wiley (2006) DOI 10.1002/cbic.200600395.
6. Bertini, I.; Gray, H. B.; Dippard, S. J.; Valentine, J. S. *Bioinorganic Chemistry*, Viva Books Pvt. Ltd. (2004).
7. Addison, A.W.; Cullen, W.R.; Dolphin, D.; James, B.R. *Biological Aspects of Inorganic Chemistry*, John Wiley (1977).
8. Martel, A. E. *Inorganic Chemistry in Biology and Medicine*, ACS Symp. Series, ACS (1980).
9. Lippard, S. J. *Progress in Inorganic Chemistry: Bioinorganic Chemistry*, Vol. 38, John Wiley (1990).
10. Kaim, N.; Schwederski, B. *Bioinorganic Chemistry: Inorganic Elements in the Chemistry of Life*, John Wiley (1994).

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1	3					3		1			
CO2	1	3					3		1			
CO3	1	3					3		1			
CO4	1	3					3		1			

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Course Code: DCHY2506	**AGRICULTURE CHEMISTRY**	L	T	P	C
		3	1	0	4

Course Objectives

The objective of this course is to

1. Explain the students of the importance of chemistry in agricultural.
2. Analyses and find a suitable method to cultivate and promote agricultural production.

Course Outcomes

On completion of this course, the students will be able to

CO1 Describe preliminary ideas about soil chemistry.

CO2 Explain how fertility and productivity of soil can be enhanced.

CO3 Summarize the role of pesticides in agricultural productivity and their adverse effects.

CO4 Identify various herbicides and their applications

Course Contents:

Modules	**Blooms level***	**Number of hours**
MODULE I Definition of Soil, Chemical (elemental) composition of the earth's crust and soils. Soil forming rocks and minerals, Development of Soil, Soil profile, Soil formation, factors affecting soil formation, soil forming processes. Soil reaction and its measurements and significance. Soil colloids: inorganic and organic colloids – origin of charge, concept of point of zero-charge (PZC) and its dependence on variable-charge soil components, surface charge characteristics of soils; diffuse double layer theories of soil colloids, zeta potential, stability, coagulation/ flocculation and peptization of soil colloids;	L1, L2 , L3	9
MODULE II Physical properties of soil and their significance. Chemical properties of soil, cation and anion exchange phenomenon and their importance in agriculture Chemistry of clay minerals with special reference to Kaorinite, Montmorillonite and illite, Soil organic matter, humus formation and its importance in soil fertility, clay-organic interactions.	L1, L2, L3	9
MODULE II Physical properties of soil and their significance. Chemical properties of soil, cation and anion exchange phenomenon and their importance in agriculture Chemistry of clay minerals with special reference to Kaorinite, Montmorillonite and illite, Soil organic matter, humus formation and its importance in soil fertility, clay-organic interactions.	L1, L2, L3	10
MODULE IV Potassium, phosphate and ammonium fixation in soils covering specific and non-specific sorption; Chemistry of acid soils; active and potential acidity; lime potential, Chemistry of salt-affected soils and amendments; soil pH, ECe, ESP, SAR and important relations; soil management and amendments.	L1, L2, L3	10

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MODULE V Occurrence, Soil Microorganisms- its distribution and functions. Biological Nitrogen Fixation, Nitrification, Microbial decomposition of organic Matter in soil, Classification and use of Insecticide, Fungicides and herbicides e.g. BHC, DDT, Malathion etc. its effects on soil.	L1, L2, L3	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

- Textbook of Soil Chemistry by Saroj Kumar Sanyal, Daya Publishing House (1 January 2020); Daya Publishing House
- Soil Physical Chemistry by Donald L. Sparks, CRC-Press.
- Chemistry Of The Soil 2Nd Ed by F.E. Bear, Scientific publishers (India)
- Principles of Soil Chemistry 4th Edition By Kim H. Tan, CRC Press

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1						3		1			
CO2	1						3		1			
CO3	1						3		1			
CO4	1						3		1			

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Course Code: DCHY2507	MATERIAL CHEMISTRY	L	T	P	C
		3	1	0	4

Course Objective: To introduce and give an insight into the fascinating area of materials science and solid-state chemistry. This course will help the students to understand the different kind of property arises due to diverse structures solid state materials. They will also learn the synthesis and characterization of solid-state material using different techniques and various important applications of solid state materials.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the structures of solids.
CO2. Describe preparative methods and characterization of solids.
CO3. Explain electrical and optical properties of solids.
CO4. Explain magnetic properties of solids.
CO5. Describe the spectral properties of solids and liquid crystals.

Course Contents:

Modules	Blooms level*	Number of hours
MODULE I: Structures of solids Introduction to solids – crystalline and amorphous. Unit cell, Crystal Systems, Concepts of Symmetry, Lattice, Bravais Lattice, Miller Indices, Description of Crystal Structures. Radius ratio rules – coordination number. Packing arrangement -different structure types in solids – rock salt, zinc blende, wurtzite, fluorite and antifluorite, spinel and inverse-spinel and perovskite structures.	L1, L2, L3	08
MODULE II: Preparative methods and crystallization techniques Preparative methods: Solid state reactions – ceramic method. Low temperature methods - sol-gel, hydrothermal, reverse microemulsion methods, microwave synthesis, use of homogeneous single source precursors, chemical vapour deposition, high pressure methods. Crystallization techniques: Czochralski method, Zone refining, and Bridgman and Stockbarger methods.	L1, L2, L3, L5	08
MODULE III Characterization Techniques X-ray Crystallography- Introduction to Powder XRD and Single crystal XRD. Indexing powder XRD patterns. Brief description of principles and applications of energy dispersive X-ray diffraction, X-ray photoelectron spectroscopy, thermogravimetric techniques, density measurements and neutron diffraction, introduction to electron microscopy.	L1, L2, L3	08
MODULE IV: Electrical and optical properties Defects in solid state – point defects – Frenkel and Schottky defects and non-stoichiometric defects. Introduction to electrical properties in metals and organic materials. Concept of superconductivity, introduction to dielectric materials, ferroelectrics, pyroelectrics and piezoelectrics.	L1, L2, L3	08

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Semiconductors and the concept of bandgap. Applications of semiconducting materials in chemical catalysis, photocatalysis and photoelectrocatalysis.		
MODULE V: Magnetic properties Magnetic properties – classification - diamagnetic, paramagnetic, antiferromagnetic, ferro and ferri magnetic — magnetic susceptibility. Variation with temperature – Curie-Wiess law, Curie temperature and Neel temperature. Permanent and temporary magnets. Multiferroic materials.	L1, L2, L3	08
MODULE VI: Special materials Introduction and applications of superconducting materials, liquid crystals and ion batteries.	L1, L2, L3	08

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

1. Smart, L.; Moore, E. *Solid State Chemistry-An Introduction*, Chapman Hall, London (1992) ISBN 0-412-40040-5.
2. Shriver, D.F.; Atkins, P. W.; Langford, C. H. *Inorganic Chemistry*, Oxford University Press (1990) ISBN 978-0198552314.
3. West, A.R. Solid State Chemistry and its applications, Wiley; 2nd edition (2014) ISBN 978-1119942948.
4. Emeleus, H.J.; Anderson, J.S.; Sharpe, Alan G. *Modern aspects of Inorganic Chemistry*, Routledge & Kegan Paul PLC; Revised Edition A. G. Sharp Edition (1973) ISBN 978-0710075215.
5. Kittel, C. *Solid State Physics*, John Wiley & Sons; 7th edition (1995) ISBN 978-0471111818.

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1						3		1			
CO2	1						3		1			
CO3	1						3		1			
CO4	1						3		1			
CO5	1						3		1			

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SEMESTER-VI

Course Code: DCHY2601	INORGANIC CHEMISTRY-III	L	T	P	C
		3	0	0	3

Course Objectives

The objective of this course is to

1. Make students well aware of chemistry of coordination complexes.
2. Understand the theories of metal ligand bonding in coordination complexes, spectral and magnetic properties of complexes.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the chemistry of coordination complexes.
CO2. List the theories of metal ligand bonding in coordination complexes.
CO3 Describe the thermodynamics and kinetic aspects of metal complexes.
CO4 Summarize the spectral and magnetic properties of complexes and bioinorganic chemistry.

Course Contents:

Modules	Blooms level*	Number of hours
MODULE I: Coordination Chemistry: IUPAC nomenclature of coordination compounds, isomerism in coordination compounds. Stereochemistry of complexes with 4 and 6 coordination numbers. Chelate effect, polynuclear complexes. Labile and inert complexes. Werner's theory, valence bond theory (inner and outer orbital complexes), electroneutrality principle and back bonding. Crystal field theory, measurement of 10 Dq, CFSE in weak and strong fields, pairing energies, factors effecting the magnitude of 10 Dq. Octahedral vs. tetrahedral coordination, tetragonal distortions from octahedral geometry, Jahn-Teller theorem, square planar geometry. Qualitative aspect of ligand field and MO theory.	L1, L2, L3	10
MODULE II: Chemistry of d-block elements Characteristic properties & electronic configuration of d-block elements, Properties of first transition series. Chemistry of Elements of Second and Third Transition Series: General characteristics, comparative treatment with their 3d analogues in respect of ionic radii, oxidation states. magnetic behaviour, spectral properties. VBT, CFT, Limitation of VBT and crystal field theory, molecular orbital theory, octahedral, tetrahedral and square planar complexes, p-bonding and molecular orbital theory.	L1, L2, L3	08
MODULE III: Spectra and magnetic properties of coordination compounds Spectroscopic ground states, correlation. Orgel and Tanabe-Sugano diagrams for transition metal complexes (d^1-d^9 states), B and β parameters, charge transfer spectra, anomolous magnetic moments, Orbital contribution to magnetic	L1, L2, L3	10

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moment, magnetic exchange coupling and spin crossover. discussion of the electronic spectrum of $[Ti(H_2O)_6]^{3+}$.		
MODULE IV: Bioinorganic Chemistry: Essentials and trace elements of life; basic reactions in the biological systems and the role of metal ions, especially Fe^{2+}, and Zn^{2+}; structure and function of myoglobin, hemoglobin and carbonic anhydrase, Na-K pump.	L1, L2, L3, L4	08

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

References

1. Lee, J.D. *Concise Inorganic Chemistry*, ELBS, 1991.
2. Douglas, B.E. and Mc Daniel, D.H., *Concepts & Models of Inorganic Chemistry*, Oxford, 1970
3. Atkins, P.W. & Paula, J. *Physical Chemistry*, Oxford Press, 2006.
4. Day, M.C. and Selbin, J. *Theoretical Inorganic Chemistry*, ACS Publications 1962.
1. Huheey, J.E. *Inorganic Chemistry*, Prentice Hall 1993
2. Douglas, B.E. and Mc Daniel, D.H., *Concepts & Models of Inorganic Chemistry*, Oxford1970
3. Lee, J.D. *Concise Inorganic Chemistry*, ELBS (1991)
4. Shriver & Atkins, *Inorganic Chemistry*, Third Edition, Oxford Press 1994.
5. H.W. Porterfield, *Inorganic Chemistry*, Second Edition, Academic Press, 2005.

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1	3					1		2			
CO2	1	3					1		2			
CO3	1	3					1		2			
CO4	1	3					1		2			

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Course Code: DCHY2602	INORGANIC CHEMISTRY LAB-III	L	T	P	C
		0	0	2	1

Course Objectives

The objective of this course is to

1. Provide training and experience in practical aspects of inorganic chemistry including preparation of some important inorganic compounds and estimation of some ions like Cu (II) ion, Ni(II) ion etc

Course Outcomes

On completion of this course, the students will be able to

CO1 Synthesize coordination complexes of Tetraammine copper (II) sulphate, $[Cu(NH_3)_4]SO_4H_2O$ and Potassium trisoxalatochromate (III), $K_3[Cr(C_2O_4)_3]$

CO2 Quantitative analyze metal ions by precipitation method.

CO3 Estimate metal ions in a given solution.

Course Content : Minimum 10 experiments to be performed

Modules	Blooms level*	Number of hours
Inorganic preparations 1. Tetraammine copper (II) sulphate, $[Cu(NH_3)_4]SO_4H_2O$ 2. Potassium trisoxalatochromate (III), $K_3[Cr(C_2O_4)_3]$ 3. Cis and trans $K[Cr(C_2O_4)_2(H_2O)_2]$ Potassium dioxalatodiaquachromate 4. Pentaammine carbonato Cobalt(III) ion 5. Preparation of Aluminium Potassium sulphate $KAl(SO_4)_2.12H_2O$ (Potash alum) or Chrome alum.	L1, L2, L3, L4	10
Estimations 6. Estimation of nickel(II) using Dimethylglyoxime as the precipitant. 7. Estimation of copper as CuSCN 8. Estimation of iron as Fe_2O_3 by precipitating iron as $Fe(OH)_3$ through (i)Heterogeneous and (ii) Homogeneous media. 9. Estimation of Al (III) by precipitating with oxine and weighing as $Al(oxine)_3$ (aluminium oxinate). 10. Spectrophotometric estimation of Ferrous ions by using 1,10 phenanthroline.	L1, L2, L3, L4	10
Argentometry 11. Estimation of Cl^- (i) By Mohr's method, (ii) By Vohlard's method, (iii) By Fajan's method. 12. Hands on training on characterization of compounds given in the syllabus by analytical techniques (FT-IR, NMR, UV-VIS, Mass, GC, Fluorescence)	L1, L2, L3, L4	4

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**

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5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Suggested Reading

1. Vogel, A.I. A Textbook of Quantitative Inorganic Analysis, ELBS.
2. Pandey O.P., Bajpai, D. N., Giri, S. Practical Chemistry, S. Chand.
3. Singh J., Singh R. K. P., Singh J., Yadav L. D. S., Siddiqui I. R., Srivastava J. Advanced Practical Chemistry, Pragati Prakashan.
4. Pandey O.P., Bajpai, D. N., Giri, S. Practical Chemistry, S. Chand.
5. Singh J., Singh R. K. P., Singh J., Yadav L. D. S., Siddiqui I. R., Srivastava J. Advanced Practical Chemistry, Pragati Prakashan.

CO, PO and PSO mapping:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	**2**	**1**						**1**	**3**			
CO2	**2**	**1**						**1**	**3**			
CO3	**2**	**1**						**1**	**3**			

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: DCHY2603	PHYSICAL CHEMISTRY-III	L	T	P	C
		3	0	0	3

Course Objective: Course gives students an in-depth knowledge of rate of reactions. The course is designed to give students knowledge about colloids and equilibria between different phases of one component systems such as water, CO_2 and sulfur. This course also imparts students with basic knowledge regarding various properties of solution Course gives students in-depth knowledge of electrochemistry dealing with faraday's law of electrolysis, concept of electrochemical cells and redox potential, feasibility of a reaction. The course also provides knowledge about topics such as conductance, and photochemistry.

This course also imparts students with basic knowledge regarding various properties of solution such as relative lowering of vapor pressure, elevation of boiling point, depression of freezing point and osmotic pressure. Other than this, student will also learn about the different concepts of Acids and Bases. The students will also learn how we can calculate the pH of a solution, hydrolysis and solubility product of different types of salt

Course Outcomes

On completing of this course, the students will be able to

CO1 Explain colloidal states and classify emulsifiers on the bases of their properties.

CO2 Describe the phase equilibrium for one component system.

CO3 Summarize colligative properties.

CO4 Explain electrochemistry, conductance & photochemistry.

Course Content

Modules	Blooms level*	Number of hours
MODULE I : Colloidal State Definition of colloids, classification of colloids, Solids in liquids (sols): properties-Kinetic, optical and electrical; stability of colloids, protective action, Hardy-Schulz law, gold number. Liquids in liquids (emulsions) types of emulsions, preparation. Emulsifier. Liquids in solids (gels): classification, preparation and properties, inhibition, genera applications of colloids.	L1, L2, L3	6
MODULE II: Phase Equilibrium Statement and meaning of the terms - phase, component and degree of freedom, derivation of Gibbs phase rule, phase equilibria of one component system - water, CO_2 and sulphur system.	L1, L2, L3	6
MODULE III: Solutions and colligative properties: Dilute solutions, Raoult's and Henry's Laws and their applications, Excess thermodynamic functions. Thermodynamic derivation using chemical potential to derive relations between the four colligative properties. Applications in calculating molar masses of normal, dissociated and associated solutes in solution.	L1, L2, L3	6
MODULE IV: Electrochemistry Quantitative aspects of Faraday's laws of electrolysis, rules of oxidation/reduction of ions based on half-cell potentials, applications of electrolysis in metallurgy and	L1, L2, L3	6

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industry. Chemical cells, reversible and irreversible cells with examples. Electromotive force of a cell and its measurement, Nernst equation; Standard electrode (reduction) potential and its application to different kinds of half-cells. Application of EMF measurements		
MODULE V : Conductance Arrhenius theory of electrolytic dissociation, Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes. Molar conductivity at infinite dilution. Kohlrausch law of independent migration of ions. Debye-Huckel-Onsager equation, Debye-Falkenhagen effect, Walden's rules, Ionic velocities, mobilities and their determinations, transport numbers and their relation to ionic mobilities, determination of transport numbers using Hittorf and Moving Boundary methods. Applications of conductance measurement	L1, L2, L3	6
MODULE VI: Photochemistry Laws, of photochemistry, quantum yield, examples of low and high quantum yields, photochemical equilibrium and the differential rate of photochemical reactions, photosensitized reactions, quenching.	L1, L2, L3	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

1. Atkins, P.; de Paula, J. *Atkins' Physical Chemistry*, Oxford University Press, International Eleventh Edition (2018) ISBN 978-0198814740.
2. Mortimer, R.G. *Physical Chemistry*, Academic Press, 3rd Edition (2008) ISBN 978-0123706171.
3. Castellan, G.W. *Physical Chemistry*, Narosa, 4th Edition (2004) ISBN 8185015597.
4. Ball, D.W. *Physical Chemistry*, Cengage India Private Limited, 2nd Edition (2007) ISBN 8131533433.

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1	3					1		2			
CO2	1	3					1		2			
CO3	1	3					1		2			
CO4	1	3					1		2			

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Course Code: DCHY2604	PHYSICAL CHEMISTRY LAB-III	L	T	P	C
		0	0	2	1

Course Objective: This course will help the students to get the practical knowledge for the kinetic studies using integrated rate method by acid hydrolysis of ester. It also deals with the conductance measurement of different systems like strong acid-strong base and weak acid-strong base.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the changes in conductance in systems like strong acid-strong base, weak acid-strong base and mixture of strong acid and weak acid-strong base

CO2. Describe& verify the Lambert-Beer's Law.

CO3. Identify the formation of a complex between ferric and thiocyanate (or salicylate) ions.

Course Contents: (Minimum 10 experiments to be performed)

Modules	Blooms level*	Number of hours
(I)To study changes in conductance in the following systems 1. strong acid-strong base 2. weak acid-strong base and 3. mixture of strong acid and weak acid-strong base (II) Transition Temperature 4. Determination of the transition temperature of the given substance by thermometric method(e.g.$MnCl_2.4H_2O$/$SrBr_2.H_2O$). (III) Spectroscopy 5. Verification of Lambert-Beer's Law 6. Determination of pK (indicator) for phenolphthalein or methyl red 7. Study the formation of a complex between ferric and thiocyanate (or salicylate) ions. 8. Study the kinetics of interaction of crystal violet with sodium hydroxide calorimetrically. 9. Record the UV spectrum of p-nitrophenol (in 1:4 ethanol:water mixture). Repeat after adding a small crystal of NaOH. Comment on the difference, if any. 10. Record the U.V. spectrum of a given compound (acetone) in cyclohexane 11. Plot transmittance *versus* wavelength. 12. Plot absorbance *versus* wavelength. (IV) Potentiometric titration 13. Find out base strength by titrating against with strong acid potentiometrically. (V) Electrochemistry 14.Prove Debye Huckel Onsager Equations	L1, L2, L3, L4	24

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15. Prove Kaulraush law, Calculate equivalent conductance of acetic acid at infinite dilution 16. Hands on training on characterization of compounds given in the syllabus by analytical techniques (FT-IR, NMR, UV-VIS, Mass, GC, Fluorescence) *Any other experiment carried out in the class.*		

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

***MSDS – Compilation of MSDS of chemicals used by students in each experiment is compulsory.**

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Suggested Readings:

1. Pandey, O.P.; Bajpai, D. N.; Giri, S. *Practical Chemistry*, S. Chand & Co. Ltd., (2010) ISBN 9788121908122.
2. Singh, J.; Singh, R. K. P.; Singh, J.; Yadav, L. D. S.; Siddiqui, I. R.; Srivastava, J. *Advanced Practical Chemistry*, Pragati Prakashan, 9th Edition (2019) ISBN 978-93-88925-70-9.

CO, PO and PSO mapping:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	**2**	**1**						**1**	**3**			
CO2	**2**	**1**						**1**	**3**			
CO3	**2**	**1**						**1**	**3**			

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Course Code: DCHY2651	BASICS OF POLYMER CHEMISTRY	L	T	P	C
		3	1	0	4

Course Objectives

The objective of this course is to know about the basic concept of polymers, polymerization techniques and uses of commercial polymers. To find the molecular weight of polymers meaning and their types such as Number average, weight average, sedimentation and viscosity, average molecular weights.

Course Outcomes

On completion of this course, the students will be able to

CO1 Explain the elementary concepts of polymerization.
CO2 Calculate different types of molecular weights for a polymer.
CO3 Distinguish between different polymerization techniques.
CO4 Summarize the chemistry of commercial polymer.
CO5 Describe advance polymers and explain their characteristics.

Course Contents:

Modules	Blooms level*	Number of hours
Module I: Polymers Basic Concept, monomers, polymers, mechanism of polymerization, classification of polymers on the basis of structures and applications. Distinction among plastics, elastomers, and fibers, Homo and hetero polymers, copolymers, types of copolymers, properties of polymers, glass transition temp. (T_g) - definition, factors affecting T_g, Relationship between Tg and molecular weight.	L1, L2, L3	10
Module II: Molecular Weight of Polymers Number average MW, weight average MW, sedimentation and viscosity, average molecular weights, Molecular weights and degree of polymerization. Reactions - Hydrolysis, Hydrogenation, addition, substitution, cross linking - vulcanization and cyclisation.	L1, L2, L3, L6	10
Module III: Polymerization Techniques Bulk, solution, suspension & emulsion polymerization, melt polycondensation, Basics of Polymer processing, extrusion molding, injection molding, calendaring, die casting, rotational casting.	L1, L2, L3	10
Module IV: Chemistry of Commercial Polymers General methods of preparation, properties and uses of the following – polyethylene, polypropylene, Teflon, polystyrene, polyesters, poly amides, polycarbonates and PVC.	L1, L2, L3, L5	9
Module V: Advances in Polymers Bio-Polymers, biomaterials, polymers in medical field, High temperature and fire resistant polymers – synthesis, structural aspects and applications	L1, L2, L3	9

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of silicones and siloxanes. Borazines, silicates and phosphazenes and polysulphates.		

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

1. Billmeyer, F.W. *Text Book of Polymer Science*, John Wiley & Sons (1984) ISBN: 978-0-471-03196-3.
2. Gowarikar. V.R.; Viswanathan, N.V.; Sreedhar, J. *Polymer Science*, Halsted Press (John Wiley & Sons), New York (1986) ISBN 0-470-20322-6.
4. Sharma, B.K. *Polymer Chemistry* Goel Publishing House (an imprint of Krishna Publication), Meerut, 6th Edition (1989) ISBN: 9789389181227.
5. Polymer Chemistry. Arora M.G. Vadar M.S. - Anmol publications Pvt. Ltd., New Delhi (1989) ISBN 9788126114122.
7. Stevens, M. P. *Polymer chemistry: An introduction* Oxford University Press, New York, (2nd edition, (1990) ISBN 0-19-506646-2.

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1	3					3		1			
CO2	1	3					3		1			
CO3	1	3					3		1			
CO4	1	3					3		1			
CO5	1	3					3		1			

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Course Code: DCHY2606	BIOCHEMISTRY	L	T	P	C
		3	1	0	4

Course Objective: The course is designed to equip students with a broad understanding of the chemical and molecular events involved in biological processes. It provides a foundation for career in medicine, biotechnology, or research in all branches of the biological sciences. The general objective is to ensure that the students learn the necessary chemical and physio-chemical background of naturally occurring compounds such as carbohydrate, proteins, lipids, nucleic acids and amino acids.

Course Outcomes

On completion of this course, the students will be able to

CO1 Explain various synthetic methods and reactions of carbohydrates.
CO2 Describe the synthesis and role of amino acids.
CO3 Summarize the properties, structure and classification of proteins.
CO4 List the functions and characteristics of lipids.
CO5 Describe the chemistry and importance of nucleic acids.

Course Contents:

Modules	Blooms level*	Number of hours
Module I: Chemistry of Carbohydrates Definition and classification of carbohydrates, open chain, cyclic structure of monosaccharides (Haworth formula) for glucose and fructose. Disaccharides-sucrose and lactose. Physical properties-mutarotation and Killiani Fischer synthesis and Ruff degradation. Synthesis. chemical properties-Oxidation, reduction, osazone formation. Disaccharide-sucrose and lactose-occurrence, structure; Physical and chemical properties. Polysaccharides: starch and cellulose-occurrence, structure, physical and chemical properties.	L1, L2, L3	10
Module II: Chemistry of Amino acids Definition and classification of amino acids, common properties of aminoacids, amphoteric nature, isoelectric point, iselectric pH and Zwitter ion. Reaction with ninhydrin, 1-fluoro-2, 4-dinitronitrobenzene (FDNB) and Sieg Fried—s carbamino reaction.	L1, L2, L3	10
Module III: Chemistry of Proteins Classifications-shape and size, solubility and physical properties and functional properties. Physical properties: salting in and salting out, denaturation, peptide bond. Structure of protein: primary, secondary, tertiary and quaternary. N-terminal determination-Edman-s and Dansyl chloride method.C-terminal determination-Van-Slyke reaction, Phosgene reaction. Protein folding-unfolding, Enzyme Kinetics	L1, L2, L3	10
Module IV: Chemistry of Lipids Definition, classification and functions. Occurrence, chemistry and biological functions-simple lipids: tertiary compound lipids (e.g. phospholipids), derived lipids: steroids (e.g. cholesterol). Saturated fatty	L1, L2, L3	9

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acids: arachidic acid. Unsaturated fatty acids: linolenic acid, Physical property-emulsification.Chemical properties-saponification, rancidity, definition of acid number, saponification number, Iodine number and Reichert-Meisslnumber. Bile acid and bile salt functions.		
Module V: Chemistry of Nucleic acids Definition, nucleoside, nucleotide and polynucleotide, Double helical model of DNA and its biological functions. Structure of RNA: tRNA, mRNA and rRNA-occurrence, chemistry and its biological functions. Differences between DNA and RNA properties: cot curve and cot value, Tm, hypo and hyper chromicity.	L1, L2, L3	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

1. Nelson, D. L.; MCox, M. ***Lehninger Principles of Biochemistry****: International Edition*, 8th Edition,W.H.Freeman& Co Ltd (2021) ISBN 978-1319381493.
2. Rodwell, V. W.; Bender. D.; Botham, K. M., Kennelly, P. J.; Weil, P. Anthony; *Harper's Illustrated Biochemistry Thirty-First Edition*, McGraw Hill / Medical; 31st edition (2018) ISBN 978-1259837937.
3. Jain, J. L.; Jain, S.; Jain N. *Fundamentals of Biochemistry*, S. Chand, 7th Edition (2016) ISBN 978-8121924535.
4. Krishan De, A. *Biochemistry*, S. Chand & Co., Ltd. New Delhi.

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1						1		3			
CO2	1						1		3			
CO3	1						1		3			
CO4	1						1		3			
CO5	1						1		3			

1: strongly related, 2: moderately related and 3: weakly related

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SEMESTER-VII

Course Code: DCHY2701	ADVANCED INORGANIC CHEMISTRY	L	T	P	C
		3	0	0	3

Course Objective: The main objective of this advance level inorganic chemistry course is to provide higher order understanding of inorganic chemistry and complex topics such as group theory. Moreover, some important inorganic compounds and complexes also will be covered.

Course Outcomes

On completion of this course, the students will be able to
CO1 Explain symmetry elements, operation in group theory.
CO2 Describe chemistry of Boron and its clusters.
CO3 Summarize and understand metal pi complexes.

Course Contents:

Modules	Blooms level*	Number of hours
MODULE I: GROUP THEORY Symmetry in nature, symmetry elements and symmetry operations. Symmetry properties of atomic orbitals. Elements of group theory. Elements of group theory: groups, sub-groups, classes and characters, classes of symmetry operations, symmetry point groups; representation of groups by matrices. Representation of symmetry operator transformation of basis vector, Symmetry transformation of operators The Great Orthogonality Theorem (without proof) and its consequences; construction and applications of character tables, representation of cyclic groups. direct product and projection operator and their applications; symmetry adapted linear combination (SALC)sThe Great Orthogonality Theorem: statement and interpretation, proof of important corollaries; construction of character tables, cyclic groups and construction of their character tables. Mulliken Symbols, Use of the character table.	L1, L2, L3	12
MODULE II: CHEMISTRY OF BORONS Higher boron hydrides-structures and reactions, equation of balance, Lipscomb topological diagrams, polyhedral skeletal electron pair theory (PSEPT), carboranes, metalloboranes and heteroboranes, metallocarboranes, zintl ions, chevrel compounds, infinite metal chains, cluster-surface analogy, cluster compounds in catalysis.	L1, L2, L3	12
MODULE III: METAL π-COMPLEXES Metal carbonyl, structure and bonding, 18 elctron rule, vibrational spectra of metal carbonyls for bonding and structural elucidation, important reactions of metal carbonyls; preparation, bonding structure and important reaction of transition metal nitrosyl, dinitrogen and dioxgen complexes; tertiary phosphine as ligand.	L1, L2, L3	12

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Amity University Haryana
Manesar Gurgaon-122413

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings

1. Inorganic Chemistry: Principles of Structure and Reactivity (4th Edition) by James E. Huheey, Ellen A. Keiter, Richard L. Keiter, Hardcover: 964 pages, Publisher: Benjamin Cummings
2. Advanced Inorganic Chemistry 6th Edition F. Albert Cotton , Geoffrey Wilkinson , Carlos A. Murillo , Manfred Bochmann
3. Chemical Applications of Group Theory, 3rd EditionF. Albert Cotton
4. Basic Organometallic Chemistry: Concepts, Syntheses, and Applications of Transition Metals; **BD Gupta**, **Anil J. Elias**, University Press

References

1. Lee, J.D. *Concise Inorganic Chemistry*, ELBS, 1991.
2. Douglas, B.E. and Mc Daniel, D.H., *Concepts & Models of Inorganic Chemistry*, Oxford, 1970
3. Atkins, P.W. & Paula, J. *Physical Chemistry*, Oxford Press, 2006.
4. Day, M.C. and Selbin, J. *Theoretical Inorganic Chemistry*, ACS Publications 1962.
1. Huheey, J.E. *Inorganic Chemistry*, Prentice Hall 1993
2. Douglas, B.E. and Mc Daniel, D.H., *Concepts & Models of Inorganic Chemistry*, Oxford1970
3. Lee, J.D. *Concise Inorganic Chemistry*, ELBS (1991)
4. Shriver & Atkins, *Inorganic Chemistry*, Third Edition, Oxford Press 1994.
5. H.W. Porterfield, *Inorganic Chemistry*, Second Edition, Academic Press, 2005.

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1						1		3			
CO2	1						1		3			
CO3	1						1		3			

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Course Code: DCHY2702	ADVANCED INORGANIC CHEMISTRY LAB	L	T	P	C
		0	0	2	1

Course Objective: This course will help the students to get the practical knowledge of various preparation and characterization of inorganic compounds by spectrophotometric techniques

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the Preparation and Characterizations of inorganic compounds by spectral methods

CO2. Describe determination of metal ions by Spectrophotometry.

CO3. Identify and testing of anions in water using UV-Vis spectroscopy.

Course Contents:

Modules	Blooms level*	Number of hours
Preparation and Characterizations/study by spectral methods 1. Trialkoxyboanes. 2. Tin (IV) chloride. 3. Sodium tetrathionate. 4. Fe(II) chloride and its application as catalyst in Friedel-Craft reaction. 5. Ferrocene.	L1, L2, L3	12
Spectrophotometry: 6. Preparation of calibration for metal ligand binding. 7. Spectrophotometric determination of Fe (II) using 1, 10-Phenanthroline. 8. Kinetic study of Cr(III) with a multidentate ligand (EDTA). 9. Spectrophotometric determination of phosphates in water. 10. Determination of Nitrate ions in water using UV-Vis spectroscopy. 11.Hands on training on characterization of compounds given in the syllabus by analytical techniques (FT-IR, NMR, UV-VIS, Mass, GC, Fluorescence)	L1, L2, L3	12

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Suggested Readings

1. Vogel, A.I. A Textbook of Quantitative Inorganic Analysis, ELBS.
2. Pandey O.P., Bajpai, D. N., Giri, S. Practical Chemistry, S. Chand.
3. Singh J., Singh R. K. P., Singh J., Yadav L. D. S., Siddiqui I. R., Srivastava J. Advanced Practical Chemistry, Pragati Prakashan.
4. Pandey O.P., Bajpai, D. N., Giri, S. Practical Chemistry, S. Chand.

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5. Singh J., Singh R. K. P., Singh J., Yadav L. D. S., Siddiqui I. R., Srivastava J. Advanced Practical Chemistry, Pragati Prakashan.

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	**2**	**1**						**1**	**3**			
CO2	**2**	**1**						**1**	**3**			
CO3	**2**	**1**						**1**	**3**			

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: DCHY2703	ADVANCED ORGANIC CHEMISTRY	L	T	P	C
		3	0	0	3

Course Objective: The main objective of this organic chemistry course is to give a good idea of different important chemical reactions. Synthetic organic chemistry plays an important role in our daily life due to the importance of synthesis of various organic compounds for the prevention of various diseases. It course includes the disconnection approach, synthons and umpolung reactions and applications of complex metal hydrides. This course also covers the various important reagent such as LDA, PPA, diazomethane, ozone phase transfer catalyst etc. It also includes invited lectures on the recent development of synthetic organic chemistry reactions.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain salient features of synthons and synthetic equivalent and their importance
CO2. Describe important attributes about disconnection.
CO3. Apply the use of protecting group in synthesis.
CO4. Identify the use of reagents for synthesis.

Course Content:

Modules	Blooms level*	Number of hours
MODULE I : SYNTHONS AND UMPOLUNG An introduction to Synthons and synthetic equivalents, importance of the order of events in organic synthesis, chemoselectivity, regioselectivity, Diels Alder reaction, Michael addition and Robinson annulations, Reversal of polarity (Umpolung).	L1, L2, L3	9
MODULE II: DISCONNECTION APPROACH Introduction to disconnection approach, functional group interconversions. Introduction to Retrosynthesis of aromatic Heterocycles and 3, 4, 5 and 6 membered carbocyclic. Retro- synthesis of Alkene, acetylenes, aliphatic, nitro, alcohols and carbonyl compounds (saturated and unsaturated), amines.	L1, L2, L3	9
MODULE III : INTRODUCTION TO PROTECTING GROUPS AND APPLICATIONS a) Protecting Groups: Principle of protection of alcohol, amine, carbonyl and carboxylgroups b) Application of the following in synthesis Merrifield resin, polymeric reagents. Solid phase synthesis of polypeptide &oligonucleotides, electro organic synthesis, enzyme catalyzed reaction in synthesis &resolution of racemic mixtures.	L1, L2, L3	9
MODULE IV: APPLICATION OF FOLLOWING REAGENTS &REACTION IN SYNTHESIS Complex metal hydrides, lithium dialkylcuprate, lithium diisopropylamide (LDA) Dicyclohexylcarbodiimide(DCC), Trimethyl	L1, L2, L3	9

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silyl iodide, tributyltin hydride, peracids, lead tetra acetate, PPA, Diazomethane, ozone phase transfer catalyst, woodward-prevost hydroxylation, Barton and Shapiro reaction Hoffmann – Loffler- Fretag, Peterson synthesis. Selenium dioxide, crown ethers, DDQ, Dess-Martin periodinane, periodic acid &Iodoisobenzyl diacetate. Application of following metal in organic synthesis Pd, Hg, and Rh, Tl and Si		

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

1. Warren, S.; Designing Organic Syntheses: A Programmed Introduction to the Synthon Approach;Wiley; 1st edition (1978); ISBN: 978-0471996125
2. Carruthres, W.;Some Modern Methods of Organic Synthesis; Cambridge University Press; 3rd edition (1987); ISBN: 978-0521322348
3. Fuhrhop, J.; Penzlin, G.; Organic Synthesis; Wiley VCH; 2nd Edition; (1993); ISBN: 978- 3527290741 4. Fieser, L. F.; Fieser, M.; Ho, T.; Reagent in organic synthesis; Wiley (2006);ISBN: 9780471750468
5. Richard O.C. Norman, R.O.C.; Coxon, J.M.;Principles of Organic Synthesis; CRC Press; Third edition (1993); ISBN: 978-0748761623
6. Barton, S.D.; Ollis, W. D.; Comprehensive Organic Chemistry; DA Information Services 1979); ISBN: 978-0080213194
7. Adams, H.R.S.R.; Bachmann, W.E.; Fieser, L.F.; Johnson, J.R.; Organic Reactions; John Wiley & Sons; n edition (1947)
8. Carey, F.A.; Sundberg, R.J.; Advanced Organic Chemistry; Springer; Fifth edition (2007); ISBN: 978-0387683461

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1	3					1	3	2			
CO2	1	3					1	3	2			
CO3	1	3					1	3	2			
CO4	1	3					1	3	2			

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Course Code: DCHY2704	ADVANCED ORGANIC CHEMISTRY LAB	L	T	P	C
		0	0	2	1

Course Objective: This course will help the students to get the practical knowledge of various separation and purification techniques and preparative TLCs and study of reactions involving different reactive intermediates.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain and measure optical rotation and specific rotation.
CO2. Describe TLC and separate mixture of products
CO3. Preparation and identification of organic compounds.

Course Contents: (Minimum 10 experiments to be performed)

Modules	Blooms level*	Number of hours
1.Measurement of optical rotation values, calculation of ee/de ratios and determination of specific rotation 2.Chemical resolution of racemic mixtures of acids with chiral amines or amines with chiral acids 3. Analytical and preparative TLCs (mixtures containing three or more compounds, natural extracts and use of different developing agents) 4. Preparations involving stereochemical aspects (geometrical isomers and steroisomers) and different reactive intermediates. 5. Condensation reaction, 6. Bromine addition, 7. Carbene addition, 8. Nucleophilic aromatic/aliphatic substitution reaction, 9. Rearrangement reactions involving carbocations and carbanions, 10. Applications of UV and CD spectroscopy . 11. Hands on training on characterization of compounds given in the syllabus by analytical techniques (FT-IR, NMR, UV-VIS, Mass, GC, Fluorescence)	L1, L2, L3	24

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Suggested Readings:

1. Ahluwalia, V. K., Aggarwal, R. *Comprehensive Practical Organic Chemistry*, Universities Press (2001) ISBN 8173712735.
2. Pandey, O.P.; Bajpai, D. N.; Giri, S. *Practical Chemistry*, S. Chand & Co. Ltd., (2010) ISBN 9788121908122.

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3. Mann, F. G.; Saunders, B. C. *Practical Organic Chemistry*, Pearson Education, India, 4th edition (2009) ISBN 978-8131727102.
4. Singh, J.; Singh, R. K. P.; Singh, J.; Yadav, L. D. S.; Siddiqui, I. R.; Srivastava, J. *Advanced Practical Chemistry*, Pragati Prakashan, 9th Edition (2019) ISBN 978-93-88925-70-9.

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	**2**	**1**						**1**	**3**			
CO2	**2**	**1**						**1**	**3**			
CO3	**2**	**1**						**1**	**3**			

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Course Code: DCHY2705	CHEMISTRY: STATISTICAL METHOD AND DATA ANALYSIS	L	T	P	C
		3	1	0	4

Course Objective: The objective of this course is to give the students an insight about the statistical treatment on the data collected from different techniques.

Course Outcomes

At the end of this course student will be:

CO1 Familiar with the correct techniques for collecting data

CO2 Familiar with interpretation and use of analytical data,

CO3 Familiar with the significance of different analytical techniques and their applications,

CO4 Understand the reliability of data reported on different forums.

Course Contents:

Modules	Blooms level*	Number of hours
MODULE I: Basics of Chemical Analysis, Analytical Chemistry, Qualitative and quantitative analysis, Analytical methodology. Calibration of glass wares, recording laboratory data.	L1, L2, L3	10
MODULE II: Different Methods of Chemical Analysis, Titrimetric method: volumetric titrations, standard solution, titrimetric curve, calculations for titrations. Gravimetric method: precipitation gravimetry, calculation and applications of gravimetry; and Spectrometric methods: introduction, principle and instrument, working quantitative aspects Absorbance spectrophotometry, applications in chemical analysis.	L1, L2, L3	10
MODULE III: Statistical Method of Chemical Analysis Accuracy and Precision, Comparison of precision, Errors, Distribution of random errors, propagation of errors, measurement of errors, significant figures, inter laboratory error, methods of least square analysis of variance, Q test, Z test, T test, statistical treatment of finite sample, recommendations for treating outliers. Minimising errors in analytical procedure.	L1, L2, L3	10
MODULE IV: Data Analysis and Validation Confidence interval, Testing of hypothesis, plotting of data, least square method, Figures of merit: sensitivity, detection limit, linear dynamic range, control test, upper control limit and lower control limit, Validation, reporting analytical results and significant figures	L1, L2, L3	9

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MODULE V: Sampling, Standardisation, Labelling and Calibration Importance and significance of sampling, sample size, constituent sample, real samples, sample handling, preparing laboratory samples, automated sample handling, lab on chip and General laboratory principles, recording laboratory data, standards, comparison of standards, internal standard, external standards calibration, least square method, and multivariant calibration.	L1, L2, L3	9

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested readings:

1. Dey, R. A. and Underwood, A. L., Quantitative Analysis, 6th Edition, Pearson.
2. Skoog, D. A., West, D. M., Holler, F. J., Crouch, S. R., Fundamental Analytical chemistry, Thomson Asia Ltd.
2. Encyclopaedia of Analytical chemistry: Applications, Theory, and Instrumentation, R A Meyor (Eds.), Wiley and Sons (2000).

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1	3					1	3	2			
CO2	1	3					1	3	2			
CO3	1	3					1	3	2			
CO4	1	3					1	3	2			

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Course Code: DCHY2706	REAGENTS IN ORGANIC SYNTHESIS	L	T	P	C
		3	1	0	4

Course objective: The course encompasses a comprehensive and diverse array of reagents employed in organic synthesis. It specifically centers on analyzing the mechanisms of action of various reagents used in organic synthesis. Emphasis is placed on understanding regioselectivity, stereochemical considerations, and the judicious selection of reagents for the purpose of designed synthesis.

Course Outcomes

On completion of this course, the students will be able to

CO1 Develop the deep understanding about the reagent and applications.

CO2 Interpret the different roles of reagent for carrying specific reactions.

CO3 Develop the ability to logically think and explain the process and mechanism of use of reagents

CO4 Analyse and solve the simple problems related to specific reagents.

Course Contents:

MODULE I: Reagents for Reduction

General introduction, Birch reduction, Wolf-Kishner reduction, Clemension reduction, Wilkinson's catalyst, MPV reduction, reagents for hydrogenolysis of C to heteroatom bonds and cyclopropane rings.

Hydride reduction of organic compounds using- Sodium borohydride, sodium cyanoborohydride, lithium aluminium hydride and alkoxy substituted LAH reducing agents, DIBAL; Applications of hydroboration (reductions, oxidations and cabonylations): diborane, diisoamylborane, thexylborane, 9-BBN, isopinocamphenyl and diisopinocamphenyl borane.

MODULE II: Reagents for Oxidation

Sharpless epoxidation, ozonolysis, diol formation, Woofward and Prevost reaction, OsO_4, Lemieux–Johnson reagent, glycolic bond cleavage, $KMnO_4$, oxidation of phenol, Pummer's ketone formation, usnic acid formation, epoxide formation and cleavage, Collin's reagent, PCC, MnO_2, NiO_2, PDC, SeO_2, CAN.

MODULE III: Organometallic Reagents

Organomagnesium compounds: the Grignard reagents-formation, structure and chemical reactions, Organozinc compounds: formation, chemical reactions and their limitations. Organolithlum compounds: formation, chemical reactions and their limitations, special emphasis to n-BuLi and Gilman's reagent.

MODULE IV: Miscellaneous Reagents

2,3-Dichloro-5,6-dicyano-1,4-benzoquinone (or DDQ), 1,3-dithiane (umpolung), Lithium diisopropylamide (LDA), N,N′-Dicyclohexylcarbodiimide (DCC or DCCD), P_2O_5, Tri-n-butyl tinhydride, use of PCl_5, PCl_3, $SOCl_2$, HNO_2, Aquous and Alcoholic KOH, KCN, and KNO_2 in conversions, reduction of aliphatic and aromatic nitro compounds.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

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Suggested Readings:

1. Clayden, J.; Greeves, N.; Warren, S.; Wothers, P. *Organic Chemistry* Oxford University Press; 2nd edition (2012) ISBN 978-0199270293.
2. Morrison, R. N.; Boyd, R. N. *Organic Chemistry*, Pearson Education India, 6th Edition (2016) ISBN 978-8177581690.
3. Sanyal, S.N; *Reactions, Rearrangements and Reagents*, Bharati Bhawan Publishers & Distributors, India (2013 edition) ISBN 978-8177096057.
4. Carey, Francis A.; Sundberg, Richard J.; *Advanced Organic Chemistry, Part A: Structure and Mechanisms* Springer, 5th Edition (2013 edition) ISBN 978-0387683461.
5. Finar, I. L. *Organic Chemistry, Volume 1*, Dorling Kindersley (India) Pvt. Ltd. Pearson Education India, 6th edition (2002) ISBN 978-8177585421.
6. Finar, I. L. *Organic Chemistry, Volume 2: Stereochemistry and the Chemistry Natural Products*, Dorling Kindersley (India) Pvt. Ltd., Pearson Education India; 5th Edition (2002) ISBN 978-8177585414.

CO, PO and PSO mapping:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	**2**	**1**					**2**	**1**				
CO2	**2**	**1**					**2**	**1**				
CO3	**2**	**1**					**2**	**1**				
CO4	**2**	**1**					**2**	**1**				

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CHEMISTRY OF MEDICINES IN DAILY LIFE

Course Code: DCHY2708 **Credit Units: 04**

Course Objectives: The course is designed to study the basic details about various medicines of general Used for various diseases. This course also gives the knowledge of active component in some medicines, their synthesis; therapeutic effect. Medicines are essential for a healthy day-to-day life and therefore this

Course Contents:

MODULE I: General Introduction of medicines & related terms

Introduction-Health, disease, drugs, chemotherapy, approaches in drug designing, classification of drugs and their origin.

MODULE II

Different class of medicines

Structure of active ingredients, uses, dosage, side effects and their natural remedies:

Analgesics and antipyretics- Aspirin, paracetamol, ibuprofen, morphine, codeine

Antibiotics- Amoxicillin, norfloxacin, ciprofloxacin

Antihistamines or antiallergics- Cetrizine and Levocetrizine (role of stereoisomers)

Antiparasitic- Albendazole

Antidiabetics- Insulin, Glipizide and metformin

Antihypertensive – Amlodipine and its natural remedies- Rauwolfia.

Diuretic- Lasix

Antidepressant-Zoloft and its natural treatment

Antifungal – fluconazole, Itraconazole

Antacids- Ideal properties of antacids, combinations of antacids, Sodium 40 Bicarbonate, rantidine, milk of magnesia, aluminium hydroxide gel

Anticoagulants/antiplatelet drugs- Warfarin, heparin and Ecosprin

Anaesthetics- Atracurium, Desflurane

Poison and Antidote: Sodium thiosulphate, Activated charcoal, Sodium nitrite

Astringents: Zinc Sulphate, Potash Alum

Supplements- zinc and calcium, Iron, vitamins

MODULE III

Synthesis of drugs

Synthesis of small molecule drugs like aspirin and paracetamol and their mode of action

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested readings

1. Patrick, G. L. (2001) Introduction to Medicinal Chemistry, Oxford University Press.

2. Lemke, T. L. & William, D. A. (2002), Foye's Principles of Medicinal Chemistry, 5th Ed., USA,

3. Singh H.; Kapoor V.K. (1996), Medicinal and Pharmaceutical Chemistry, Vallabh Prakashan.

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4. Chatwal, G.R. (2010), Pharmaceutical chemistry, inorganic (vol. 1), Himalayan publishing house

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	**1**	**3**					**1**	**3**	**2**			
CO2	**1**	**3**					**1**	**3**	**2**			
CO3	**1**	**3**					**1**	**3**	**2**			
CO4	**1**	**3**					**1**	**3**	**2**			

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: DCHY2709	ADVANCED POLYMER CHEMISTRY	L	T	P	C
		3	1	0	4

Course Objective: This course is introduced to make students familiar with kinetics of polymer reactions with a special focus on methods of polymerization to be adopted during synthesis of various types of polymers. In addition, the students will also learn about various types of reactors and reaction engineering. Further, they will also familiarize themselves with different types of characterizations techniques used for characterizing polymers. Finally, they will acquire comprehensive knowledge on various commercial polymers and different types of useful polymer processing as well.

Course Contents:

MODULE I: Kinetics and Polymerization
Basic introduction to Kinetics of chemical reactions; Types of polymerizations: Chain growth or addition polymerization, step growth or condensation polymerization – their kinetics with examples; Concept of copolymerization & kinetics.

MODULE II: Methods of Polymerization Systems and Reactions
Homogeneous polymerizations – Bulk & solution polymerization, Heterogeneous polymerizations – Suspension and emulsion polymerization; Reactor and reaction engineering; Chemical reactions of polymers.

MODULE III: Characterization of Polymers
Preliminary analysis: solubility, flame test, Lassaigne's test, heating test and melting point test (LDPE and HDPE). Analysis of polystyrene (dye test). Viscosity-average molecular weight determination using Ostwald/Ubbelohde viscometer.
Physical properties: stress-strain behavior in tension, fatigue, impact strength, tear resistance. Optical properties: transmittance, reflectance.
Electrical properties – dielectric strength (only theory excluding experimental details).
Applications of FTIR, NMR (proton and C-13) and X-ray diffraction in characterization.
Thermal analyses: differential thermal analysis (DTA), thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC).

MODULE IV: Selective Commercial Polymers & Polymer Processing
Olefin-based polymers and co-polymers; Natural rubber and other polyisoprene; Acrylic Polymers; High temperature resistance polymers; Epoxy resins and polyurethanes; Silicone polymers.
Polymer processing: General introduction; Additives & Compounding; Spinning; Vulcanization, Reinforcement.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

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Suggested Readings:

1. G. Odian, *Principles of polymerization*, 3 rd edition, John Wiley &Sons.
2. Billmeyer, F.W. *Textbook of Polymer Science*, John Wiley & Sons (1984) ISBN: 978-0-471-03196-3.
3. Gowarikar. V.R.; Viswanathan, N.V.; Sreedhar, J. *Polymer Science*, Halsted Press (John Wiley & Sons), New York (1986) ISBN 0-470-20322-6.
4. Stevens, M. P. *Polymer chemistry: An introduction* Oxford University Press, New York, (2nd edition, (1990) ISBN 0-19-506646-2.
5. Premamoy Ghosh, *Polymer Science & Technology*, 3rd edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
6. Siddaramaiah, *Practicals in Polymer Science*, CBS Publishers & Distributors, New Delhi.
7. G. S. Misra, *Introductory Polymer Chemistry* New Age International Publishers & Distributors, New Delhi.

CO, PO and PSO mapping:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	**1**	**3**					**1**	**2**	**2**			
CO2	**1**	**3**					**1**	**2**	**2**			
CO3	**1**	**3**					**1**	**2**	**2**			
CO4	**1**	**3**					**1**	**2**	**2**			

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: DCHY2710	RADIOCHEMISTRY IN ENERGY, MEDICINE & ENVIRONMENT	L	T	P	C
		3	1	0	4

Course Objectives: The objective of this course is to give students thought of basic of radiochemistry and nuclear concepts. It will help to gain the fundamental knowledge about radioisotopes and its applications in the field of diagnostic techniques, nuclear medicine, energy, research, and environment.

Course Contents:

Module-I: Introduction

Atoms, composition of nucleus, mass number, isotopes, Radioactivity, Nuclear emissions, nuclear transformations, nuclear stability, radioactive decay, radioactivity in nature: natural and artificial radioisotopes, elementary particles, radioactive decay (α, β and γ decay), half-life period, types of nuclear reactions: nuclear fission and nuclear fusion.

Module-II: Nuclear power generation

Extraction of Uranium, Nuclear fission of uranium, The production of energy by nuclear fission, Nuclear Power generation from uranium ore (energy production and nuclear waste), Nuclear Reactor for power generation and weapons

Module-III: Applications of radiochemistry

C 14 decay and radio-carbon dating, irradiation of food, radiotracers for studying chemical reactions (photosynthesis, metabolic studies of drugs, metabolism of organisms, fundamental properties of genetic material), Nuclear Medicine: Radiotherapy, (use in cancer, hyperthyroidism, blood disorders), Radiolabelled Isotopes: Application of Radiopharmaceuticals, Radioisotopes in diagnosis-Iodine-131, Sodium-24, Iron-59, Cobalt-60, Hydrogen-3

Module-IV: Environment radioactivity

Natural radioactivity, natural process that release radioactive material in environment-high level radioactive wastes, the diffusion, migration, sorption in environmental media and taking up by plants and aquatic animals of weakly sorbed, man-made events like Chernobyl disaster, nuclear test, use of radiotracers in environmental studies.

Module-V: Radioactive pollution and safety management

Types of nuclear waste, disposal or management of nuclear waste, National/International guidelines for nuclear waste disposal, Source of nuclear radiation, Radiation protection standards, basics of radiation hazards, Regulation regarding safety measure, nuclear disaster and it's managements, Effect of radiation on health: Biological Effects of Ionizing Radiation on the Human Body, radiation monitors, Radiation Doses and Radiation Effects.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

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References:

1. Nuclear and Radiochemistry : Fundamentals and Applications, Karl Heinrich Lieser VCH Publishers, Inc., New York, NY (USA).
2. Radiochemistry and Nuclear Chemistry, 2001, by Gregory Choppin, Jan Rydberg, Jan-Olov Liljenzin
3. Nuclear and radiochemistry, Konya J., Nagy N. 2nd Edition, Elsevier
4. Radiochemistry and Nuclear Chemistry, 4th Edition, Choppin G., Lilijenzin J-O, Rydberg J., Ekberg C. Elsevier.

CO, PO and PSO mapping:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	**1**	**3**					**1**	**3**	**2**			
CO2	**1**	**3**					**1**	**3**	**2**			
CO3	**1**	**3**					**1**	**3**	**2**			
CO4	**1**	**3**					**1**	**3**	**2**			

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Course Code: DCHY2713	ENERGY AND ENVIRONMENT	L	T	P	C
		3	1	0	4

Course Objective: This course is designed to make students aware of the environment and the environmental related issues. In addition, the students will also be able to develop a basic understanding of energy and its related issues. Further, the students will also learn about the importance of energy in terms of economy, health, and the environment. Moreover, the students will get familiarized with the adverse effects of pollution, and its possible remediations. In addition, green fuels will also be introduced to make the environment sustainable. At the end of the course, they will also be able to differentiate between renewable and non-renewable sources of energy and their potential uses for making the environment greener.

Course Contents:

MODULE I: Introduction

Introduction to chemistry and energy, conversion of chemical energy to electrical energy, Carbon cycle, Carbon footprint, zero-carbon or low-carbon energy, Greenhouse gases, Global warming and climate change, Various types of Energy – such as Electrical energy and steam energy, Energy Alternatives, Costs of Energy.

MODULE II: Non-renewable energy sources

Production methods for electric power: Non-Renewable (conventional) sources of energy: Fossil fuels: Coal, petroleum and Natural gas. Energy transformation.

MODULE III: Renewable energy sources

Production methods for electric power: Renewable energy sources: solar, hydropower, wind, geothermal, wave, ocean thermal, tidal, ocean currents, nuclear energy, biomass.

MODULE IV: Green energy

Renewable (green) energy, conversion and storage systems. Nuclear fusion, Hydrogen fuels, photovoltaic solar cells, hydroelectric. Sustainable energy, biomass, Biofuels, production of biofuels, advantages, blending of biofuels with conventional fuels, Carbon Capture and Reuse, Waste to Energy Technologies.

MODULE V: Pollution

Air Pollution, Urban and Indoor Air Pollution, Pollution and waste reduction measures, chemical remediation of air pollution. Effect of pollution on health and economy.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

1. Rao, C S., Environment pollution control Engineering, New Age International reprint 2015, 2nd edition
2. Bharucha, E., Textbook of Environmental Studies, Universities Press (2005)
3. Wright, R.T., Environmental Science-Towards a sustainable Future, Prentice Hall (2008) 9 th edition.
4. Ahluwalia, V. K., Energy and Environment, The Energy and Resources Institute (TERI) (2019).
5. Nawneet V., Environment, Energy and Climate Change (2020) 1st Edition.
6. De, A.K., Environmental Chemistry (2016) 1st Edition.

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CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	**1**	**3**					**1**	**3**	**3**			
CO2	**1**	**3**					**1**	**3**	**3**			
CO3	**1**	**3**					**1**	**3**	**3**			
CO4	**1**	**3**					**1**	**3**	**3**			

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Course Code: DCHY2714	CHEMISTRY OF HETEROCYCLES	L	T	P	C
		3	1	0	4

Course objective: The course gives a broad discussion about heterocyclic chemistry. Emphasis is given on the most important heterocyclic systems, such as coumarines, indoles, pyrimidines, imidazoles, aziridines and oxiranes etc. For each group, ring synthesis, chemical properties and characteristic reactions will be discussed.

Course Contents:

MODULE I: Nomenclature and Aromaticity

Replacement and systematic nomenclature (Hantzsch-Widman system) for monocyclic, fused and bridged heterocycles. **Aromatic Hetreocycles:** General chemical behaviour of aromatic heterocycles. Classification (structural type), criteria of aromaticity (bond lengths, ring current and chemical shifts in ^{1}HNMR spectra. Empirical resonance energy, delocalization energy and Heteroaromatic reactivity and tautomerism in aromatic hetreocycles.

MODULE II: Non-aromatic Heterocycles

Strain-bond angle and torisional strains and their consequences in small ring heterocycles.

Conformation of six-membered heterocycles with reference to molecular geometry, barrier to ring inversion, pyramidal inversion and 1,3-diaxial interaction. Stereo-electronic effects anomeric and related effects, attractive interaction – hydrogen bonding and intermolecular nucleophilic interactions. **Heterocyclic Synthesis:** Principle of heterocyclic synthesis involving cyclization reactions and cycloaddition reactions.

MODULE III: Three, Four, Five and Six-membered Heterocycles

Methods of synthesis and chemical reactions of aziridines, oxiranes, thiiranes, azetidines, oxetanes. Methods of Synthesis and chemical reactions with emphasis on the mechanism of electrophilic substitutionof pyrrol, thiophene and furan. Synthesis and reactions of pyridine with emphasis on nucleophilic substitution reactions. Synthesis and chemical reactions of five membered ring with two heteroatoms; pyrazole, imidazole, and oxazole.

MODULE IV: Benzofused Five and Six-membered Heterocycles

Introduction to benzofused five membered heterocycles like benzopyrroles, benzofurans and benzothiophenes. Preparation and reactions of indole with special reference to Fischer-indole synthesis, Skraup synthesis and BischierNapieralski synthesis. Synthesis and chemical reactions of benzofused six membered heterocycles like quinoline and isoquinoline, coumarins, and phenazines with special reference to Skraup synthesis and BischierNapieralski synthesis.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

- Gupta, R.R.; Kumar, M.; Gupta, V. *Heterocyclic Chemistry: Volume I: Principles, Three- and Four-Membered Heterocycles*, Springer; 1st Edition (1998) ISBN 978-3642722783.

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- Gupta, R.R.; Kumar, M.; Gupta, V. *Heterocyclic Chemistry: Volume II: Five-Membered Heterocycles*, Springer; 1st Edition (1999) ISBN 978-3540652526.

- Finar, I. L. *Organic Chemistry, Volume 1*, Dorling Kindersley (India) Pvt. Ltd. Pearson Education India, 6th edition (2002) ISBN 978-8177585421.
- Finar, I. L. *Organic Chemistry, Volume 2: Stereochemistry and the Chemistry Natural Products*, Dorling Kindersley (India) Pvt. Ltd., Pearson Education India; 5th Edition (2002) ISBN 978-8177585414.

CO, PO and PSO mapping:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	**1**	**2**					**1**	**2**	**2**			
CO2	**1**	**2**					**1**	**2**	**2**			
CO3	**1**	**2**					**1**	**2**	**2**			
CO4	**1**	**3**					**1**	**2**	**2**			

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Course Code: DCHY2739	BASICS OF RESEARCH METHODOLOGY, ETHICS, AND RESEARCH COMMUNICATION	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description

This course aims to provide students with a comprehensive understanding of conducting ethical research, utilizing proper research methodologies, and effectively communicating research findings. The course includes a final project where students will write a Literature Review on a topic chosen in consultation with the teacher(s).

This course is designed to equip students with essential skills and knowledge to conduct ethical research, employ proper research methodologies, and effectively communicate scientific information (with focus on writing a literature review). The course will cover topics such as research design, data collection and analysis, research ethics, and science communication strategies. Through a combination of lectures, discussions, case studies, and practical exercises, students will develop a deeper understanding of the research process and its ethical implications.

Course Objectives

The objective of this course is to impart knowledge about various stages of research process, research ethics and different ways of research communication.

The aim of this course is to impart research skills to the beginners and help to improve the quality of research by the existing researchers. It also encompasses the understanding and application of appropriate research design, statistics, and the use of the computer for reference management, report writing, research paper writing and presentation. The course also introduces the key conceptual issues of each research method, as well as giving practical guidance. It covers the series of research methodology contents: from problem formulation, to design, to data collection, analysis, reporting and dissemination. The course has the dual aims of equipping students with conceptual understandings of current academic debates regarding different methods, and the practical skills to put those methods into practice.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define criteria of good research, steps in research process, and data collection.

CO2. Identify different types of sampling and its purpose.

CO3. Conduct hypothesis testing for different types of samples and interpret the results.

CO4: Learn the importance of literature review, write research paper/thesis, use reference management software.

Course Content :

Module	Topic	**Blooms level***	Hours
1	**Research Methodology**	L1, L2	10

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	Understanding the research process: From research questions to conclusions Types of research: Qualitative and quantitative research Exploratory, descriptive, experimental, and correlational studies Scientific Thinking: Subjective Vs. Objective Thinking Logical Reasoning: Inductive Vs. Deductive Reasoning Formulating research hypotheses and objectives Purpose of a good research, Criteria of good research		
2	**Descriptive Statistics** Data, Types of Data, Methods of data collection, Benefits and drawbacks, Graphical representation of data and interpretation. Measures of Central Tendency: Arithmetic Mean, Median, Mode, Measures of Dispersion: Range, Standard Deviation, Variance, Coefficient of Variation.	L1, L2, L3	15
3	**Inferential Statistics** Sampling: Basic concepts, Process of Sampling, Sample Size, Types of Samples, Sampling and non- sampling errors, Statistics and Parameters, Sampling Distribution of Means and Proportion, **Hypothesis Testing**, steps in testing of hypothesis, errors in hypothesis testing, z test and t test.	L1, L2, L3	15
4	**Research Ethics** Plagiarism, Fabrication, Falsification, Ethics with respect to human and Animal Research	L1, L2	5
5	**Communication** Characteristics of a good Research paper, Systematics Literature Review (choosing a topic, preparing outline, gathering authentic & appropriate references, avoiding plagiarism, use of reference management systems), Writing a good literature review, Structure of report (Introduction, Methodology, Analysis, Results, Discussions, Conclusions, Recommendations), Writing Quality Research Paper, Publishing Research Work in Quality Journals, Reference Management Software	L1, L2, L3	15

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional Exam	End Term Examination
Weightage (%)	5	10	15	70

Project based assignment: Student teams (2-3 students per team) will write a literature review on a topic of choice, in consultation with the teacher.

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Text books/ Reference books

- Research Methodology for Natural Sciences by Soumitro Banerjee, Publisher: IISc Press (1 January 2022); ISBN-10: 8194835178; ISBN-13: 978-8194835172
- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt. Ltd., New Delhi-110001
- Geode, Millian J.& Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Kothari, C.R.2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.
- Levin R I., Rubin D S. Statistics for Management. Sixth Edition, PHI
- Kapoor & Gupta. Probability & Statistics. S Chand Publishers, New Delhi.
- Montomery, Douglas C.(2007), 5th Ed. Design and Analysis of Experiments, Wiley India.
- Cooper, Donald R. and Pamels Schindler, Business Research Methods, Tata McGraw Hills, New Delhi
- Krishnaswamy, K.N. Sivakumar. Appa lyer and Mathiranjan M. 2006, Management Research Methodology: Integration of Principles, Methods and Techniques, Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Sachdeva, J.K. 2008. Business Research methodology. Himalaya Publishing House, New Delhi.
- Shekharan, Uma, Business Research Methods, Miley Education, Singapore.
- Zikmund, Millian G., Business Research Methods, Thomson Learning, Bombay.

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SEMESTER-VIII

Course Code: DCHY2801	ADVANCED PHYSICAL CHEMISTRY	L	T	P	C
		3	0	0	3

Course Objective:
This course is intended to give the students the requisite knowledge of advances in physical chemistry with the focus on enhancing their problem-solving ability. A knowledge of photochemistry, electrochemistry and quantum mechanics is necessary. This course will give the students a better understanding of the various aspects and application of physical chemistry.

Course Outcomes
On completing of this course, the students will be able to
CO1 Explain Classical Statistical mechanics.
CO2 Describe the Photochemistry and associated spectroscopy.
CO3 Summarize the chemical dynamics and emulsions.
CO4 Explain ion-ion interactions existing in solution phase.

Course Contents:

Modules	Blooms level*	Number of hours
MODULE I: CLASSICAL AND STATISTICAL MECHANICS (i) *Classical and Classical Statistical mechanics*: equation of motion in Newton, Lagrange and forms. Phase space. Concept of ensembles – micro-canonical, canonicaland grand-canonical. (ii) Quantum Statistical Mechanics:Maxwell-Boltzmann statistics, Bose-Einstein (BE) and Fermi-Dirac (FD) distribution. Partition functions. Relationship of partition function with thermodynamics properties	L1, L2, L3	9
MODULE II: Photochemistry Interaction of radiation with matter. Spontaneous and stimulated emission, Einstein A and B coefficients. Principle of the LASER. Different types of lasers. Uses of laser. The salient features of Raman spectroscopy, 'Resonance Raman' spectroscopy, second harmonic generation, 'Surface Enhanced Raman' spectroscopy. Photoelectron spectroscopy (XPES, UPES).	L1, L2, L3	9
MODULE III: CHEMICAL DYNAMICS AND EMULSIONS: Collision theory of reaction rates, steric factors, activated complex theory and RRKM, collisional dynamics. Arrhenius equation, reactions in solution ion, Kinetic salt effects, steady state kinetics, kinetic and thermodynamic control of reactions, treatment of unimolecular reactions, homogenous catalysis and kinetics of enzyme catalysis Emulsions: macro- and micro-emulsions; aging and stabilization of emulsions; Phase behaviour of micro emulsions. Colloids, vesicles, lipid	L1, L2, L3	9

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bilayer membrane: structure and properties, monolayers, liquid crystals, foams and aerosols.		
MODULE IV: **ION-ION INTERACTIONS:** Ion Transport in solutions: Ionic movement under the influence of an electric field , mobility of ions, ionic drift velocity and its relation with current density, Einstein relation between the absolute mobility and diffusion coefficient, the Stokes- Einstein relation , the Nernst -Einstein equation, Waldens rule, the Rate- Process approach to ionic migration , the Rate process equation for equivalent conductivity, total driving force for ionic transport, Nernst - Planck Flux equation, ionic drift and diffusion potential , the Onsager phenomenological equations. The basic equation for the diffusion, Planck- Henderson equation for the diffusion potential.	L1, L2, L3	9

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

1. Atkins, P. W. & Paula, J. de *Atkin's Physical Chemistry* 8th Ed., OxfordUniversity Press (2006).
2. Ball, D. W. *Physical Chemistry* Thomson Press, India (2007).
3. Castellan, G. W. *Physical Chemistry* 4th Ed. Narosa (2004).
4. Mortimer, R. G. *Physical Chemistry* 3rd Ed. Elsevier: NOIDA, UP (2009).
5. Huang K.S. *Statistical Mechanics*3rd ED. Wiley
6. Huang K.S. *Statistical Mechanics*3rd ED. Wiley

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1						1		2			
CO2	1						1		2			
CO3	1						1		2			
CO4	1						1		2			

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Course Code: DCHY2802	ADVANCED PHYSICAL CHEMISTRY LAB	L	T	P	C
		0	0	2	1

Course Objectives

The objective of this course is to develop the practical knowledge for the determination of surface tension and viscosity of different samples. Also to teach how we can measure the pH of any solution.

Course Outcomes

On completion of this course, the students will be able to

CO1 Explain & determine the distribution coefficient, kinetics and dynamics of reactions.

CO2 Determine strength of strong and weak acids by conductometric titration.

CO3 Calibrate pH meter and use it in the measurement of pH of different buffer solutions. And estimate acids, bases and salts by potentiometric titration

Course contents: (Minimum 10 Experiments to be performed)

Modules	Blooms level*	Number of hours

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Phase Equilibria: 1. Determination of mutual solubility curve of phenol and water and find consolute point. 2. To determine the distribution coefficient of I_2 between two immiscible solvents(CCl_4 andH_2O). **Chemical Kinetics:** 3. To study kinetically the alkaline hydrolysis of ethyl acetate. 4. To study the kinetics of reaction between $K_2S_2O_8$ and KI.: a. Determination of the rate constant and order of reaction. b. To study the influence of ionic strength on the rate constant. 5. Determination of the effects of change of temperature, concentration of reactant and and ionic strength of the media on the velocity constant of hydrolysis of an ester **Electrochemistry:** 6. Determination of the velocity constant, order of the reaction and energy of activation for saponification of ethyl acetate by sodium hydroxide conductomertically. 7. Determine the equivalent conductance of weak electrolyte at infinite dilution by Kohlrausch law. 8. Determination of solubility and solubility product of sparingly soluble salts (e.g., $PbSO_4$, $BaSO_4$) conductometrically. 9. Determination of the strength of strong and weak acids in a given mixture conductomerically. **Potentiometry:** 10. Measurement of pH of buffer solution 11. Determination of the strength of strong and weak acids in a given mixture using a potentiometer/pH meter. 12. Acid base titration in a non-aqueous media using a pH meter. **Adsorption** 13. Determine the adsorption isotherms of acetic acid from aqueous solutions by charcoal and verify Freundlich adsorbtion isotherm. 14. Hands on training on characterization of compounds given in the syllabus by analytical techniques (FT-IR, NMR, UV-VIS, Mass, GC, Fluorescence)	L1, L2, L3	24

***MSDS -Compilation of MSDS of chemicals used by students in each experiment is compulsory**

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Suggested Readings

1. A.Finlay and J.A.Kitchener, “Practical Physical Chemistry, Longman
2. F.Daniels and J.H.Mathews, “Experimental Physical Chemistry”, Longman
3. H.H.Willard, L.L.Merritt and J.A.Dean, “Instrumental Methods of Analysis”, Affiliated East-West Press

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4. D.P.Shoemaker and C.W.Garland, “Experimental Physical Chemistry”, McGraw-Hill
5. A.I.Vogel, “A Textbook of Quantitative Inorganic Chemistry”, Longman
6. J.B.Yadav, “Advanced Practical Chemistry”, Goel Publishing House
7. J.J.Lingane, “Electroanalytical Chemistry”, Interscience
8. L.Meites, H.C.Thomas and R.P.Bauman, “Advanced Analytical Chemistry McGraw Hill.

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	**3**	**1**						**1**	**3**			
CO2	**3**	**1**						**1**	**3**			
CO3	**3**	**1**						**1**	**3**			

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Course Code: DCHY2803	CHEMISTRY OF FRAGRANCES & FLAVOURS	L	T	P	C
		3	1	0	4

Course objective: This course aims to understand the applications of chemistry in the realms of flavors, scents, and perfumes. It specially centers to develop the synthesis of various fragrance and flavor components, employing various methods for their separation, purification, and isolation. Additionally, it also insights into the formulation process within the fragrance and flavor industry, exploring the impact of handling and other variables. Emphasis will also be placed on upholding safety regulations and implementing quality processes, with a focus on the legal aspects and the imperative for quality control in perfume manufacturing.

Course Outcomes

On completion of this course, the students will be able to

CO1 Explain various characteristics of aromatic compounds.
CO2 Describe the green chemistry principle with relevance in fragrance.
CO3 Summarize the properties, structure and classification of proteins.
CO4 List the flavoring agents and chemical formulations.
CO5 Describe the process of extraction of flavoring compounds.

Course Contents:

Modules	Blooms level*	Number of hours
MODULE I: Fragrances Introduction to fragrances, types of fragrances (Fragrance families and classification), History of perfumes, Perfumery raw materials, classification of odour, odour type and Odorants. India in the context of Fragrance Industry. ABCs of perfumery, odour aspects of perfumes, fragrance pyramid, fragrance families. Some basic chemical knowledge to provide a better understanding of the structure of molecules possessing a sensory power. The volatility and solubility of sensory molecules. Chemistry of aromatic compounds in perfume making. Composition of fragrances, current trends in fragrances, sensory analysis of different products. Study of the raw materials used in perfumery (origin, extraction method, and olfaction). Key chemical reactions for conversion of raw materials to fragrances. Extraction of essential oils used in perfumery. Difference between alcohol and oil-based perfumes. Outline of health, safety and sustainability parameters in perfumer.	L1, L2, L3	12
MODULE II: Sustainable Fragrance by Design The challenges of sustainability and how it impacts the industry, Sustainability charter, Green chemistry principles, Commitment to Biodiversity.	L1, L2, L3	12
MODULE III: Flavours Introduction to flavours, types of flavours, flavour raw materials. Understanding of terms like, Flavour and Flavouring agents. Attributes of flavour, taste, odour, odour stimulation, basic tastes and the human	L1, L2, L3	12

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olfactory system. Stability of flavour in food, sensory evaluation of flavours in foods, Various flavour formulation. Systematic approach to understanding flavour formation during food processing, food matrix, interaction of added flavours. Flavour enhancers, modifiers, precursors, suppressors, solvents. Key chemical reactions for conversion of raw materials to flavours. Forms of flavour and the manufacturing processes involving all types of flavours. Aroma recovery during processing. Biogenesis of flavours in fruits and vegetables, reaction flavours, off flavours. Stability of flavor in food, sensory evaluation of flavours in foods. Selection and application of flavours in foods and beverages. Legal aspects (natural flavours and natural flavouring substances, nature identical flavouring substances, artificial flavouring substances), and the FSSA act.		
MODULE IV: Extraction, Isolation and Purification of Perfumes and Flavour Compounds Extraction techniques for the separation of volatile oils from natural source - including. Distillation, Evaporation, Crystallization and Adsorption, supercritical fluid extraction methods of isolation of important ingredients.	L1, L2, L3	12

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

1. Arctander, S. *Perfume and Flavour Materials of Natural Origin*, Allured Publishing Corporation, USA, (2008).
2. Arctander, S. *Volume I and II, Perfume and Flavour Chemicals, (Aroma Chemicals)*, Allured Publishing Corporation, USA, (2017).
3. Curtis, T.; Williams, D. C., *An Introduction to Perfumery*, Micelle Press, USA, 2nd Edition, (2001).
4. Sell, C. *Understanding Fragrance Chemistry*, Allured Publishing Corporation, USA, (2008).
5. Calkin, R.R.; Jellinek, J. S. *Perfumery: Practice and Principles*, John Wiley & Sons Inc.
6. Gimelli, S.P. *Aroma Science*, Micelle Press, USA, (2001).
7. Arctander, S. Perfume and Flavour Materials of Natural Origin, Orchard Innovations, (2019).
8. https://www.beyondbenign.org/lessons/essential-oil-extraction-using-liquid-co2/

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1						1		2			
CO2	1						1		2			
CO3	1						1		2			
CO4	1						1		2			

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Course Code: DCHY2804	ORGANOMETALLICS	L	T	P	C
		3	1	0	4

Course Objective: The main idea of this course is to give students a brief idea about Bioinorganic chemistry that examines the role of metals in biology. It includes the study of both natural phenomena such as the behaviour of metalloproteins as well artificially introduced metals, including those that are non-essential, in medicine and toxicology. Many biological processes such as respiration depend upon molecules that fall within the realm of inorganic chemistry. The discipline also includes the study of inorganic models or mimics that imitate the behavior of metalloproteins. It also covers organometallic chemistry which is the study of chemical compounds containing bonds between carbon and a metal. Since many compounds without such bonds are chemically similar, an alternative may be compounds containing metal-element bonds of a largely covalent character. Organometallic chemistry combines aspects of inorganic chemistry and organic chemistry.

Course Outcomes

On completion of this course, the students will be able to

CO1 Describe the role of organometallics

CO2 Apply principles of organometallics for explaining structure and reactivity of metallocenes

CO3 Answer critical questions on the importance of organometallic complexes.

CO4 Summarize the role of metals pi complexes.

Course Contents:

Modules	Blooms level*	Number of hours
MODULE I: Importance & history of organometallic compounds Introduction, definition, history of important organometallic compounds starting from the first compound in the series,	L1, L2, L3	10
MODULE II: METALLOCENE Metallocenes, Structure and synthesis of cyclopentadienyl complexes, Covalent vs Ionic bonding in metallocenes, Arene complexes	L1, L2, L3	10
MODULE III: REACTIONS IN ORGANOMETALLIC CHEMISTRY Substitution reactions in carbonyl complexes, Oxidative addition and reductive elimination, Insertion and elimination, Nucleophilic and electrophillic attack of coordinated ligands, Synthesis of ferrocenes derivatives, carbonylate anion as nucleophile. Introduction to carbenes, types of carbenes (Fischer type and Schrock type carbene complexes, synthesis, structure, bonding and reactions of carbenes.	L1, L2, L3	10
MODULE IV: APPLICATIONS OF ORGANOMETALLICS IN CATALYSIS (b) In Catalysis: Asymmetric hydrogenation; synthesis of acetic acid (Monsanto) Cativa process; Arylation/vinylation of olefins (Heck reaction); Wacker process (olefin oxidation); Asymmetric epoxidation.	L1, L2, L3	9

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MODULE- V: METAL π-COMPLEXES Metal carbonyl, structure and bonding, 18 elctron rule, vibrational spectra of metal carbonyls for bonding and structural elucidation, important reactions of metal carbonyls; preparation, bonding structure and important reaction of transition metal nitrosyl, dinitrogen and dioxgen complexes; tertiary phosphine as ligand.	L1, L2, L3	9

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

1. Elschenbroich, C.; Organomettalics, Wiley-VCH Publication, 3 rd Edition (2006) ISBN 3-527-29390-6.
2. Elschenbroich, C.; Salzer, A.; Organometallics, VCH Publication, 2 nd edition (1992) ISBN 0895739836.
3. Mathey, F.; Sevin, A.; Molecular Chemistry of the Transition Elements, John Wiley (1996) ISBN: 978-0-471-95687-7.
4. Cotton, F.A.; Wilkinson, G.; Advanced Inorganic Chemistry, John Wiley (1988) ISBN 0- 471849979. 5. Mehrotra, R.C.; Singh, A.; Organometallic Chemistry: A Unified Approach, New Age International (2000) ISBN 81-224-1258-0.

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1	3					1		2			
CO2	1	3					1		2			
CO3	1	3					1		2			
CO4	1	3					1		2			

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Course Code: DCHY2805	SOLUTIONS, COLLIGATIVE PROPERTIES, PHASE EQUILIBRIA AND ADSORPTION	L	T	P	C
		3	1	0	4

Course Objectives

To make the students understand the various properties of dilute solutions. To make the students understand the thermodynamic basis of colligative properties. To explain the concept of phase, co-existence of phases, phase diagram for various types of system, CST and distribution law. To introduce the concept of adsorption, its dependence on various conditions and applications.

Course Outcomes

On completion of this course, the students will be able to

CO1 Define and explain various law's applicable to solvents and colligative properties.

CO2 Describe various aspects of chemical equilibrium

CO3 Explain the various kind of adsorption and related isotherms.

Course Contents:

Modules	Blooms level*	Number of hours
MODULE-I: Solutions and Colligative Properties Dilute solutions; lowering of vapour pressure, Raoult's law, Henry's law. Thermodynamic basis of the colligative properties - lowering of vapour pressure, elevation of Boiling Point, Depression of Freezing point and Osmotic pressure and derivation of expressions for these using chemical potential. Application of colligative properties in calculating molar masses of normal, dissociated and associated solutes in solutions, van't Hoff factor and its applications.	L1, L2, L3	16
MODULE-II: Phase Equilibria Concept of phases, components and degrees of freedom, derivation of Gibbs Phase Rule for nonreactive and reactive systems; Clausius-Clapeyron equation and its applications to solid-liquid, liquid-vapour and solid-vapour equilibria, phase diagram for one component systems (H2O and S), with applications. Phase diagrams for systems of solid-liquid equilibria involving eutectic, congruent and incongruent melting points, solid solutions (excluding partial miscibility). Binary solutions: Gibbs-Duhem-Margules equation, its derivation and applications to fractional distillation of binary miscible liquids (ideal and nonideal), Konovalov's laws, azeotropes, lever rule, partial miscibility of liquids, CST, miscible	L1, L2, L3	16

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pairs, steam distillation. Nernst distribution law: its derivation and applications.		
MODULE-III: Surface chemistry Physical adsorption, chemisorption, adsorption isotherms (Langmuir and Freundlich). Nature of adsorbed state. Multilayer adsorption, BET equation derivation, thermodynamic treatment of adsorption-Gibbs equation.	L1, L2, L3	16

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested readings:

1. Peter, A.; Paula, J. de. (2011), Physical Chemistry, 9th Edition, Oxford University Press.
2. Castellan, G. W. (2004), Physical Chemistry, 4th Edition, Narosa.
3. Kapoor, K.L. (2015), A Textbook of Physical Chemistry, Vol 3, 6th Edition, McGraw Hill Education.
4. Kapoor, K.L. (2015),A Textbook of Physical Chemistry, Vol 5, 6th Edition, McGraw Hill Education.
5. Ball, D. W. (2017), Physical Chemistry, 2nd Edition, Cengage Learning, India.

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1	3					1		2			
CO2	1	3					1		2			
CO3	1	3					1		2			

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Course Code: DCHY2806	APPLICATION OF COMPUTERS IN CHEMISTRY	L	T	P	C
		3	1	0	4

Course Objectives

The objective of this course is to introduce the basics of computers. Learn C language and its applications in solving problems in Chemistry.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the characteristics of an object-oriented programming language in a program.
CO2. Apply the basic object-oriented design principles in computer problem solving.
CO3. Apply computer programming in strength of solution and electronegativity.
CO4 Apply computer programming in solving problems in calculation of pH, solubility product etc.

Course Contents:

Modules	Blooms level*	Number of hours
MODULE I: Chemoinformatics I Chemical Structure: Databases, Formats, Drawing Tools and Structure Visualizations, Introduction to drugs, Chemical structural data files, Structure-based drug design, Ligand-Based Design and *De novo* Drug Design Virtual screening/docking of ligands. Pharmacophore Design, Molecular similarity and molecular descriptors. Prediction of Binding Modes, Protein–Ligand binding free energies, ADMET prediction.	L1, L2, L3	12
MODULE II: Fundamentals of Structural Bioinformatics Fundamentals of X-ray diffraction, NMR spectroscopy of macromolecules Protein Structure: Primary, Secondary, Super Secondary, Domains, Tertiary, Quaternary, Ramachandran plot.	L1, L2, L3	12
MODULE III: Basics of Bioinformatics Nucleic acid databases (NCBI, DDBJ, and EMBL). Protein databases (Primary, Composite, and Secondary). Specialized Genome databases: (SGD, TIGR, and ACeDB). Structure databases (CATH, SCOP, and PDBsum), File Format (Genbank, DDBJ, FASTA, PDB, SwissProt), Local alignment and Global alignment (algorithm and example), Pairwise alignment (BLAST and FASTA Algorithm) and multiple sequence alignment (Clustal W algorithm).Molecular docking and Molecular dynamic simulation	L1, L2, L3	12

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MODULE IV: Fundamentals of computer programming for Chemistry Basics of programming in C. Writing simple programs for chemistry applications including but not limited to drawing graphs, finding roots of quadratic equations etc.	L1, L2, L3	12

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	**1**										**1**	
CO2	**1**										**1**	
CO3	**1**										**1**	
CO4	**1**										**1**	

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Course Code: DCHY2807	NANOCHEMISTRY	L	T	P	C
		3	1	0	4

Course Objective:
This course will help the students to understand basics of nanomaterials, synthetic routes for their preparation, techniques of characterization and their applications. They will also learn the important physical and chemical properties of these materials. Apart from this, student will learn the important characterization techniques for nanomaterials.

Course Outcomes
On completion of this course, the students will be able to
CO1. Explain the fundamentals of nanochemistry.
CO2. List the techniques for the synthesis of nanoparticles.
CO3. Summarize the synthesis of inorganic nanoparticles.
CO4 Describe the preparation of nanomaterials
CO5 List the instrumentation techniques required for nanomaterial characterization.

Course Contents:

Modules	Blooms level*	Number of hours
MODULE I: Basics of Nanochemistry Introduction – definition – length scales – unique properties of nanoscale materials, concept of quantum confinement. Overview of applications.	L1, L2, L3	09
MODULE II: Synthetic techniques for preparing nanomaterials Techniques to synthesize nanoparticles – top down and bottom up approaches. Ball milling, vapor deposition techniques, sol-gel, hydrothermal, reverse microemulsion techniques in detail. Case studies of synthesis of metal and semiconducting nanomaterials.	L1, L2, L3	09
MODULE III: Characterization of nanomaterials Powder X-ray crystallography: determination of phase purity and estimation of crystallite size. Introduction to electron microscopy: scanning electron microscopes (SEM) – transmission electron microscopes (TEM), Scanning transmission electron microscopy (STEM). Determination of surface area: BET techniques. Determination of surface morphology (use of atomic force microscopy- AFM). Thermogravimetric techniques, Diffused reflectance spectroscopy, Raman spectroscopy	L1, L2, L3. L5	10
MODULE IV: Properties of Nanomaterials Properties of semiconducting nanomaterials: quantum dots. Metallic nanomaterials: Au, Ag nanoparticles. Phenomenon of SPR and SERS. Effect of size, shape and anisotropy on properties.	L1, L2, L3	10
MODULE V: Applications of Nanomaterials	L1, L2, L3, L4	10

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Applications of nanomaterials to (1) Solar energy harvesting (2) Catalysis including chemical, electro, photo and photoelectrocatalysis (3) Medicine. Case studies and extensive literature review. Effects of nanomaterial toxicity.		

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

1. Shanmugam, S. *Nanotechnology*, MJP Publishers, Chennai 1st Edition (2019).
2. Salomon, P. *A Handbook on Nanochemistry*, Dominant Publishers and Distributers, New Delhi, 1st Edition (1993) ISBN 978-8178885605.
3. Balaji, S. *Nanobiotechnology*, MJP Publishers, Chennai 1st Edition (2021) ISBN 978-8180940200.
4. Rao, C. N. R.; Müller, A.; Cheetham, Anthony K. *The Chemistry of Nanomaterial: Synthesis, Properties and Applications, Vol. I and II*, Wiley-VCH; 1st edition (2004) ISBN 978-3527306862.
5. Wilson, M.; Kannangara, K.; Smith, G.; Simmons, M.; Raguse, B. *Nanotechnology: Basic Science and Emerging Technologies*, Chapman and Hall/CRC; 1st edition (2002) ISBN 978-1584883395.
6. Klabunde, K.; Sergeev, G. *Nanochemistry*, Elsevier, 1st Edition (2006) ISBN 9780080459905.
7. Pradeep, T. *Nano: The Essentials*, Tata Mc-Graw Hill, New Delhi (2007) ISBN 9780071638890.

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1						3		1			
CO2	1						3		1			
CO3	1						3		1			
CO4	1						3		1			
CO5	1						3		1			

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Course Code: DCHY2808	NAME REACTIONS IN ORGANIC CHEMISTRY	L	T	P	C
		3	1	0	4

Course objective: The course encompasses a comprehensive and diverse array of named organic reactions employed in organic synthesis. It specifically centers on analyzing the mechanisms of action of various name reactions. Emphasis is also placed on understanding regioselectivity, stereochemical considerations, and employability of name reactions in various organic conversions.

Course Outcomes

On completion of this course, the students will be able to

CO1 Describe special kind of rearrangement reactions in organic chemistry.
CO2 Explain mechanism of rearrangement reactions in organic chemistry.
CO3 Summarize the role of condensation reactions in organic synthesis.
CO4 Identify miscellaneous Reactions and explain their mechanism.

Course Contents:

Modules	Blooms level*	Number of hours
MODULE I: Rearrangement Reactions-I General Mechanistic considerations – nature of migration, migratory aptitude, memory effects. A detailed study of the following rearrangements: Pinacol-Pinacolone, Wagner-Meerwein, Damjanob, Hydroperoxide rearrangement, Dakin reaction, Beckman, Dienone-Phenol rearrangement, Fries rearrangement, Fridel-Craft reaction, benzil-benzilic acid rearrangement, Favorskii rearrangement, Hoffman rearrangement, Curtius rearrangement, Schmidt rearrangement.	L1, L2, L3	12
MODULE II: Rearrangement Reactions-II Neber rearrangement, Steben rearrangement, Sommelet-Haucher rearrangement, Stiglit rearrangement, Orton rearrangement, Hoffman-Martius rearrangement, Fisher-Hepp rearrangement, Benzedene rearrangement, Von-Richter rearrangement, Smiles rearrangement.	L1, L2, L3	12
MODULE III: Condensation Reactions Stork-Enamine reaction, Acyloin condensation, Knoevenagel condensation, Dieckmann condensation, Stobbe condensation, Claisen-ester condensation, Perkin condensation, Benzoin condensation, Aldol condensation (vs Cannizaro), Mannich condensation, Michael addition, Robinson annulation reaction.	L1, L2, L3	12
MODULE IV: Miscellaneous Reactions Shapiro reaction, Kolbe electrolysis, Wurtz, Fittig, Ullmann coupling, Hofmann-Loffler-Freytag reaction, Barton reaction, Reimer-Tieman	L1, L2, L3	12

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reaction, Wittig reaction, hydroboration, carbylamine reaction, Hoffman mustard oil reaction, Ritter reaction, Strecker reaction, Nef reaction, McMurry reaction. Reformatsky reaction, Simmons–Smith reaction, Stille coupling, Mizoroki-Heck coupling, Suzuki-Miyaura coupling.		

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

1. Clayden, J.; Greeves, N.; Warren, S.; Wothers, P. *Organic Chemistry* Oxford University Press; 2nd edition (2012) ISBN 978-0199270293.
2. Morrison, R. N.; Boyd, R. N. *Organic Chemistry*, Pearson Education India, 6th Edition (2016) ISBN 978-8177581690.
3. Sanyal, S.N; *Reactions, Rearrangements and Reagents*, Bharati Bhawan Publishers & Distributors, India (2013 edition) ISBN 978-8177096057.
4. Carey, Francis A.; Sundberg, Richard J.; *Advanced Organic Chemistry, Part A: Structure and Mechanisms* Springer, 5th Edition (2013 edition) ISBN 978-0387683461.
5. Finar, I. L. *Organic Chemistry, Volume 1*, Dorling Kindersley (India) Pvt. Ltd. Pearson Education India, 6th edition (2002) ISBN 978-8177585421.
6. Finar, I. L. *Organic Chemistry, Volume 2: Stereochemistry and the Chemistry Natural Products*, Dorling Kindersley (India) Pvt. Ltd., Pearson Education India; 5th Edition (2002) ISBN 978-8177585414.

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1						1		2			
CO2	1						1		2			
CO3	1						1		2			
CO4	1						1		2			

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Course Code: DCHY2809	INDUSTRIAL CHEMISTRY	L	T	P	C
		3	1	0	4

Course Objective: This course is designed to enable a student to understand the generation of energy from various types of fuels. This course will help students know the various manufacturing methods and types of glass, and cements. Student will also able to understand the cleansing action of soap and detergent.

Course Outcomes

On completion of this course, the students will be able to

CO1 Explain the basic concepts of industrial fuels.

CO2 Describe the manufacturing, types and properties of glass.

CO3 Describe the manufacturing, types and properties of cements.

CO4 Identify the concept of Soaps and detergents.

CO5 List the process in sugar refining and different sugar substitutes.

Course Contents:

Modules	Blooms level*	Number of hours
MODULE I: Industrial fuels **Energy:** Sources: non-renewable, classification of fuels: solid, liquid and gaseous, Calorific value of fuels and its determination. **Solid fuels:** Coal: types – properties and uses – lignite, sub-bituminous coal, bituminous coal andanthracite Coking and non-coking coal. **Liquid fuels:** Refining of crude petroleum and uses of fractions, Hydrodesulphurization, Cracking: thermal and catalytic (fixed bed and fluidized bed catalysis), Octane number, Cetane number. **Gaseous fuels:** Natural gas and gobar gas: production, composition and uses, gobar electric cell, coal gas, producer gas.	L1, L2, L3	10
MODULE II: Glass industry Introduction, classification of glass, basic raw materials of glass, manufacturing processes including chemical reactions, some special glasses: optical glass, colored glass, fiber glass, laminate glass, safety glass, photosensitive glass, photochromatic glass, lead glass, borosilicate glass and glass wool & glass fiber.	L1, L2, L3	10
MODULE III: Cement industry Types of cement, manufacture of Portland cement, composition, setting and hardening of cement, Mortars and concrete, estimation of silica, alumina, calcium oxide and sulphates in Portland cement, gypsum, Plaster of Paris, setting and hardening of Plaster of Paris.	L1, L2, L3	10
MODULE IV: Soaps and synthetic detergents	L1, L2, L3	9

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Manufacture of detergent, types of detergents, anionic, cationic, nonionic and amphoteric detergents, Critical Micelle Concentration, Hydrophilic Lipophilic Balance, manufacture of soap, Liquid soap**.**		
MODULE V: Sugar industry Manufacturing of Sugar from Sugarcane, Double sulphitation process, Refining and grading of sugar, Saccharin: synthesis and use as a sugar substitute – aspartame, Ethanol: manufacture from molasses by fermentation.	L1, L2, L3	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

1. R. Norris Shreve and A. Joseph ,*Chemical process industries*, 4th ed.; Mc graw – hill Kogakusha, ltd: 1977.
2. George t. Austin. *Shreve's chemical process industries*, 5th ed.; Mc graw – hill: 1984.
3 P. C. Jain and M. Jain, *Engineering chemistry*, 10th ed.; Dhanpat Rai and sons, 1993.
4. P. Kamaraj, R. Jeyalakshmi and V. Narayanan, *Chemistry in engineering and technology*; sudhandhira publications, 2001.
5. J.C. Kuriakose and J. Rajaram, *Chemistry in engineering and technology. Vol 2.; M*c Graw-hill: new delhi, 1988.
6. Jugal Kishore Agrawal, *Practicals in Engineering Chemistry*; Oxford and IBH Publishing Co., New Delhi, 1976.
7. Organic Chemistry Vol.2 IL Finar 5th Edn. Longmans 1975
8.Industrial Chemistry by BK Sharma, Goel Publishing house Meerut.

CO, PO and PSO mapping:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	**1**	**3**					**3**		**1**			
CO2	**1**	**3**					**3**		**1**			
CO3	**1**	**3**					**3**		**1**			
CO4	**1**	**3**					**3**		**1**			
CO5	**1**	**3**					**3**		**1**			

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: DCHY2810	QUANTUM CHEMISTRY	L	T	P	C
		3	1	0	4

Course Objective: To obtain knowledge about quantum mechanics and LCAO-MO treatment of single electron system hydrogen.

Course Contents:

Module I:
Postulates of quantum mechanics, quantum mechanical operators, Schrodinger equation and its application to free particle and "particle-in-a-box" (rigorous treatment), quantization of energy levels, zero-point energy and Heisenberg Uncertainty principle; wave functions, probability distribution functions, nodal properties, Extension to two and three dimensional boxes, separation of variables, degeneracy.

Module II:
Angular momentum: Commutation rules, quantization of square of total angular momentum and z-component, Qualitative treatment of hydrogen atom and hydrogen-like ions: setting up of Schrodinger equation in spherical polar coordinates, radial part, quantization of energy (only final energy expression), radial distribution functions of 1*s*, 2*s*, 2*p*, 3*s*, 3*p* and 3*d* orbitals. Average and most probable distances of electron from nucleus.

Module III:
Covalent bonding, valence bond and molecular orbital approaches, LCAO-MO treatment of H^{2+}.Bonding and antibonding orbitals, Qualitative extension to H_2.
Comparison of LCAO-MO and VB treatments of H_2 and their limitations. Refinements of the two approaches (Configuration Interaction for MO, ionic terms in VB).Qualitative description of LCAO-MO treatment of homonuclear and heteronuclear diatomic molecules (HF, LiH). Localised and non-localised molecular orbitals treatment of triatomic (BeH_2, H_2O) molecules. Qualitative MO theory and its application to AH_2 type molecules. Simple Huckel Molecular Orbital (HMO) theory and its application to simple polyenes (ethene, butadiene).

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & Reference:

- Banwell, C. N. & McCash, E. M. *Fundamentals of Molecular Spectroscopy* 4th Ed.Tata McGraw-Hill: New Delhi (2006).
- Chandra, A. K. *Introductory Quantum Chemistry* Tata McGraw-Hill (2001).
- House, J. E. *Fundamentals of Quantum Chemistry* 2nd Ed. Elsevier: USA (2004).
- Lowe, J. P. & Peterson, K. *Quantum Chemistry* Academic Press (2005).

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Course Code: DCHY2811	GREEN CHEMISTRY IN ORGANIC SYNTHESIS	L	T	P	C
		3	1	0	4

Course Objective: To know the basics of Green Chemistry and its developments. The primary goal of this course is to make students aware of how chemical processes can be designed, developed and run in a sustainable way.

Course Outcomes

On completion of this course, the students will be able to

CO1 Explain the principles of green chemistry and various non-conventional synthetic methods.

CO2 Describe the protocols involved in green synthetic reactions.

CO3 Define and explain the role of green solvents in organic reactions.

Course Contents:

Modules	Blooms level*	Number of hours
MODULE I: Introduction Definition & objectives of green chemistry, basic principles of green techniques, Green chemistry in day – to – day life, organic Synthesis and environmental pollution, green reagents : dimethyl carbonate and polymer supported reagents, green catalysts: acid and basic catalysts, oxidation catalysts and polymer supported catalysts, green solvents, green reactions, aqueous phase reactions and photochemical reactions.	L1, L2, L3	12
MODULE II: Phase Transfer Catalyzed (PTC) reactions in green synthesis Introduction, definition and mechanism of PTC reactions, types of phase transfer catalysts, PT reactions and advantages, Crown ethers: Nomenclature and special features, Application of Phase transfer catalysis in green synthesis.	L1, L2, L3	12
MODULE III: green synthesis methods. microwave assisted reactions: Introduction, Principle of microwave assisted reactions, Microwave technology and equipment: microwave ovens and reactors, advantages limitations and precautions to be taken, Microwave assisted reactions in water and organic solvents, Solvent free (solid state) reactions. Ultrasound assisted synthesis: Introduction, Instrumentation, physical aspects and types of sonochemical reactions, Synthetic applications of ultrasound. Organic synthesis in solid state: Introduction, Solvent free synthesis, Solid supported organic synthesis - General techniques, supports and linkers for solid phase synthesis, advantages of polymer supported reagents, Synthetic applications. Biocatalysts in organic synthesis	L1, L2, L3	12

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Introduction, Biochemical oxidations and reductions, Enzymes catalyzed hydrolytic processes.		
MODULE IV: Synthesis using green solvents Ionic liquids as green solvents, Introduction, Reactions in acidic Ionic liquids, Reactions in neutral Ionic liquids : Hydrogenation, Diels – Alder, Heck reaction, O - and N - alkylation and methylene insertion reaction. Chemical synthesis using supercritical fluids, Introduction, Supercritical Fluids (SCF) as media for chemical reactions, Practical aspects of reactions, Phase behaviour and solubility, Industrial uses of SCF's as reaction media, Extraction, separation, precipitation, crystallization and microemulsion techniques, Stoichiometric organic reactions in SCF.	L1, L2, L3	12

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

1 *Introduction to Green Chemistry*, Albert S. Matlack, Marcel Dekker, Inc., New York, 2001. 2 Green Chemistry: *Frontiers in benign chemical synthesis and processes*, Paul T. Anastas and Tracy C. Williamson (Eds.), Oxford University Press, Oxford, 1998.

3. Sanghi, R.; Srinivatava, M.M. *Green Chemistry Environment Friendly Alternatives*, Narosa Publishing House, New Delhi, 1st Edition (2003), ISBN 978-8173195235.

4. Ahluwalia, V.K. *Green Chemistry*, Narosa Publishing House Pvt. Ltd. (2013) ISBN 8184872011.

5. Tundo, P.; Perosa, A.; Zechini, F. *Methods and Reagents for Green Chemistry*, John Wiley & Sons Inc. (2007) ISBN 978-0-471-75400-8.

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1						3		1			
CO2	1						3		1			
CO3	1						3		1			

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Course Code: DCHY2812	NATURAL PRODUCT CHEMISTRY	L	T	P	C
		3	1	0	4

Course objective: The course provides an understanding of important natural products. Using selected examples, this course describes the process of identification and isolation of natural products from natural sources, their chemical synthesis and structure elucidation.

Course Outcomes

On completion of this course, the students will be able to,

CO1 Explain the synthesis and classification of Terpenoids.

CO2 Describe organic reaction for structure elucidation of some Alkaloids.

CO3 Explain steroids their structure and functions.

CO4 Explain the structure and synthesis of natural color pigments.

Course Contents:

Modules	Blooms level*	Number of hours
MODULE I: Terpenoids and Carotenoids Classification, nomenclature, occurrence, isolation, general methods of structure determination, isoprene rule. Structure determination, stereochemistry and synthesis of the following representative molecules: Citral, Geraniol, Menthol, α-Terpeneol and β-Carotene	L1, L2, L3	12
MODULE II: Alkaloids Definition, nomenclature and physiological action, occurrence, isolation, general methods of structure elucidation, degradatin, classification based on nitrogen heterocyclic ring, role of alkaloids in plants. Structure, stereochemistry and synthesis of the following: Coniine, Nicotine, and Atropine.	L1, L2, L3	12
MODULE III: Steroids Occurrence, nomenclature, basic skeleton. Diel's hydrocarbon and stereochemistry. Isolation, structure determination and synthesis of Cholesterol, Bile acids, Androsterone, Testosterone, Progestrone, Aldosterone.	L1, L2, L3	12
MODULE IV: Plant Pigments Occurrence, nomenclature, and general methods of structure determination. Isolation and synthesis of Apigenin, Luteolin, Quercetin, Diadzein, Cyanidin, Biosynthesis of flavonoids: Acetate pathway and Shikimic acid pathway. **Porphyrins:** Structure and synthesis of Haemoglobin and Chlorophyll.	L1, L2, L3	12

Examination Scheme:

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Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

1. Mann, J.; Davidson, R.S.; Hobbs, J. B.; Banthrope, D.V.; Harborne, J. B. *Natural Products- Chemistry and Biological Significance*, Longman Pub Group; First Edition (1994) ISBN 978-0582060098.
2. Finar, I. L. *Organic Chemistry, Volume 1*, Dorling Kindersley (India) Pvt. Ltd. Pearson Education India, 6th edition (2002) ISBN 978-8177585421.
3. Finar, I. L. *Organic Chemistry, Volume 2: Stereochemistry and the Chemistry Natural Products*, Dorling Kindersley (India) Pvt. Ltd., Pearson Education India; 5th Edition (2002) ISBN 978-8177585414.

CO, PO and PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	1						1		2			
CO2	1						1		2			
CO3	1						1		2			
CO4	1						1		2			

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Course Code: DCHY2839	DATA ANALYSIS & VISUALISATION USING SOFTWARE	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	Class X Mathematics				
Co-requisites					

Catalog Description

The implosion of available data has made visualization more critical but also more challenging. Data analysis and Data Visualization are essential tools for business analysis, engineers, policymakers, and decision-makers. Developed originally for "small data", visualization techniques have been met with varied success in the past centuries and decades. There are a few well-known visualizations that are very effective in capturing the essence of the data, and of course, there are many infamous negative examples of poor visuals. An effective visual is critical for decision making it, but it also requires a lot of work, customization, attention to detail, and refinements.

Course Objectives

The course is designed to help students develop skills and knowledge in the following area(s):

- Develop an understanding of what is a good visualization for a given purpose
- Learn visualization theory & techniques
- Build a substantial data analytic project
- Apply data analysis and visualization with Excel, SPSS, R, Python, NVivo and MATLAB

Course Outcomes

On completion of this course, the students will be able to

CO1. Students will be able to articulate meaningful lines of inquiry that might be explored through the collection, organization, visualization, and analysis of data in a context associated with their primary field of study using (as appropriate) numerical, textual, spatial, and/ or visual data.

CO2. Student will understand what data are, how they are collected, and how to assess the quality/ reliability of data.

CO3. Students will demonstrate intermediate proficiency in the visualization of data to communicate information and patterns that exist in the data.

CO4: Students will be able to use at beginning level of proficiency the tools of statistics and machine learning to ask questions of and explore patterns in data.

Course Content :

Module	Topics Covered	Blooms Level	Contact Hours
1	**Module-1: Introduction to Excel** Data Analysis using Excel, Curve fitting, Correlation, Linear Regression, Multiple regression, Principal Component Analysis and Factor Analysis, Hypothesis testing **Introduction to Excel and SPSS**	L1, L2, L3, L4	20 hours

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	Introduction to SPSS and Types of Data, Importing, exporting and data handling in SPSS; Exploratory data analysis using SPSS and data visualization; Introduction to statistical inference and various univariate tests by using SPSS; Analysis of Variance (One Way ANOVA, Two Way ANOVA and ANCOVA); Correlation, Simple and Multiple linear Regression Analysis; Principal Component Analysis and Factor Analysis		
2	**Module-2: VOS Viewer** **Web of Science, Scopus, Dimensions, Lens, and PubMed.** Co-authorship networks, citation-based networks, and co-occurrence networks can be created based on data downloaded from Web of Science, Scopus, Dimensions, and Lens. Co-authorship networks and co-occurrence networks can also be created based on PubMed data. **Crossref, Europe PMC, and OpenAlex**. Networks can also be created based on data retrieved through the APIs of Crossref, Europe PMC, and OpenAlex, These APIs can be queried interactively in VOS viewer. **Semantic Scholar, Open Citations, and Wiki Data.** For a given set of DOIs, networks can also be created based on data retrieved through the APIs of Semantic Scholar, Open Citations and Wiki Data.	L1, L2, L3, L4	10 Hours
3	**Faculty of Management Studies & Behavioural Sciences** **Module 3: Domain Specific Software** **- Structural Equation Modelling** **Smart PLS** Introduction to Structural Equation Modelling (SEM), Introduction to the software's AMOS and SPSS, SMART PLS, Testing of Statistical assumptions, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), common method bias (CMB) test, Measurement Model Assessment, Discussing Fit Indices, Reliability and Validity Testing, Structural Model Assessment identifying multivariate outlier, Construct Validity: Convergent and Discriminant Validity, Measurement Model & Structural Equation Modelling, Mediation and Moderation Effects, Multi-Group Analysis.	L1, L2, L3, L4	30 Hours
	Faculty of Arts **N Vivo** 1. Import text, audio, video, emails, images, spreadsheets, online surveys, web content, and social		

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	media from various sources into a simple, intuitive interface. 2. Create and NVivo project, import and organise qualitative and quantitative data 3.Manage a literature review in NVivo 4. Autocode structured data deductively and identify themes inductively 5. Generate and falsify hypotheses 6. Combine data in sets for analysis 7. Seek patterns and identify relationships across codes and cases 8. Present findings using visualisations 9. Export data out of NVivo 10. Coordinate teamwork.		
	Faculty of Science Engineering and Technology **Faculty of Health & Allied Sciences** **R programming / Python/ MATLAB** **R Programming-** Introduction to R, Variables and datatypes in R, Dataframes, Recasting and joining of dataframes, Arithmetic, logical and matrix operations in R, Functions in R, Control structure in R, Data visualization in R. **Python Programming-** Basics of programming, data structure and algorithm using Python, Strings, lists, control, functions, manipulating lists, loops, arrays, selection sort, insertion sort, recursion, sorting, dictionaries, exception handling, file handling, string processing, data analysis using Python **MATLAB Programming-** Introduction, basic features, managing workspace, mathematical functions, basic plotting, Matrices, array operations and linear equations, MATLAB programming- M files script, M-file functions, control flow and operations.		

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional (Theory/ Practical)	End Term Examination
Weightage (%)	5	10	15	70

References:

- David Houcque, 2005. Introduction to MATLAB programming for Engineering students., Northwestern University, E- Book **https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf**
- Mark Lutz, 2009. Learning Python. O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.

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- Emmanuel Paradis, 2005. R for Beginners. E book. **https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf**
- A Handbook of Statistical Analysis using SPSS by Dr. Brijesh Awasthi, Redshine Publication.

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Amity School of Applied Sciences

Bachelor of Science (Honors/ Honors with Research) in Mathematics

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Curriculum & Scheme of Examination

2023

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GURUGRAM

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Bachelor of Science (Honors/ Honors with Research) in Mathematics
SEMESTER-I

APPLIED CALCULUS

Course Code: DMTH2151 **Credit Units: 03**

Course Objectives: The objective of this course is to introduce the concepts of successive differentiation, higher order differentiation, partial differentiation and their applications; fundamentals of curve tracing.

Course Outcomes: On completion of this course, the students will be able to
CO1 : Learn the concept of successive differentiation and application of Leibnitz method.
CO2 : Learn the concept curvature and asymptotes.
CO3 : Learn how to trace the curve
CO4 : How to solve Partial differentiation, Euler's theorem and theorem for higher orderderivatives
CO5 : How to solve Taylor's expansion of a function in two variables, Jacobian and its properties,Maxima and minima of a function in two variables, Method of Lagrange's multipliers.

Course Contents:

Module-I: Differentiations
The real line and its geometrical representation. limit and continuity. Differentiability and differentials. Successive differentiation and Leibnitz Theorem, Rolle's Theorem, Mean Value Theorem, Taylor and Maclaurin's expansions. Partial differentiations& its applications: Homogeneous functions, Euler's Theorem, Toal Derivative, Composite function, Jacobians,Maxima & Minima for a function of two variables, Lagrange's method of undetermined multipliers.

Module-II: Applications
Asymptotes in cartesian coordinates, Intersection of curve and its asymptotes,Curvature,Radius of curvature (for cartesian curves, parametric curves, polar curves, pedal curves), Centre of curvature, Circle of curvature, Chord of curvature. Tracing of curves in Cartesian and polar coordinates.

Module-III: Multiple Integral
Review of integrals, Reduction formulae, Beta-Gamma functions,Double integral and evaluation,change of order of integration, change of variable, Triple integral and evaluation, Area using double integration, Volume as double and triple integration, Volume of solid by double integration.

Module-IV: Vector Calculus
Vector differentiation, directional derivatives, Gradient of a scalar point function, Divergence and curl of vector point function, Gradient, divergence and curl of sums and product and their related vector identities. Laplacian operator, Vector integration; Line integral, Surface integral, Volume integral, Theorems of Gauss, Green & Stokes (without proof) and problems based on these theorems.

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

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APPLIED CALCULUS LAB

Course Code: DMTH2152 **Credit Units: 01**

Course Outcomes:

CO1: The main objective of the course is to make students familiar with MATLAB.
CO2: Students will be able to solve mathematical problems using the MATLAB software interface.CO3: Students will learn various inbuilt MATLAB functions related to calculus.
CO3: Students will be able to solve mathematical problems with help of coding.

Program No	Program Title	CO mapping
1.	Introduction to the software and basic commands of MATLAB	CO1
2.	To declare, initiate, save and run a function in MATLAB	CO1, CO2
3.	To use commands of Symbolic toolbox such as *diff, limit, int etc*	CO2, CO3
4.	To plot graphs using MATLAB.	CO3, CO4
5.	To find gradient, divergence and curl of a function using MATLAB.	CO2, CO3, CO4
6.	To compute area using double integration.	CO2, CO3, CO4
7.	To compute Volume using triple integration	CO2, CO3, CO4
8.	To find nth order derivative of trigonometric functions.	CO2, CO3
9.	To find nth order derivative of algebraic functions.	CO2, CO3
10.	To find Taylor's and Maclaurin's expansions of a given function.	CO2, CO3

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Suggested Readings:

1. Hunt, B. R., Lipsman, R. L., & Rosenberg, J. M. (2014). *A guide to MATLAB: for beginners andexperienced users*. Cambridge university press.
2. Lyshevski, S. E. (2003). *Engineering and scientific computations using MATLAB*. John Wiley & Sons.
3. Kattan, P. I. (2008). *Matlab for Beginners: A gentle approach*. Petra books.

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DMTH2101	LINEAR ALGEBRA	L	T	P	C
Version	Date of Approval:Date, Month 2019	3	1	0	4

Course Objectives:

1. Fundamental of linear algebra
2. Fundamental of matrix theory

Catalog Description

The course will provide the how the system of equation can be solved. How a set can be formed vector space, subspace, null space, rank space. What is the relation between dimension, null space and rank space. How linear transformation related to matrix theory.

Course Outcomes : On completion of this course, the students will be able

CO1 : How to solve system of linear equation using elimination method (homogeneous and nonhomogeneous)

CO2 : Compute the inverse of matrix using Guass Jordan method

CO3 : Solve the polynomial matrix, characterstics equation, eigen value , eigen vectors

CO4 : Analyze various statement proof related to vector space

CO5 : Analyze rigorous mathematical proofs of statements related linear trasfromation and realtionwith matrix.

Course Content

Modules	Blooms Level*	Hours
Module-I Euclidean space R^n, and Matrices Fundamental operation with vectors in Euclidean R^n, Linear combination ofvectors, Dot product and their properties, Cauchy-Schwarz inequality, Triangle inequality, Projection vectors, Some elementary results on vectors in R^n.Matrices:Rank of matrix, Row echelon form, Normal form, Application of rank to solve homogenous and non-homogenous systems of linear equations. Eigen values, Eigen vectors, Cayley Hamilton theorem and its application, Diagonalization of matrices,	**L1, L2, L3, L4**	**12**
Module-II: Vector Spaces Vector space and its examples, Subspaces, linear spans space of a matrix , a spanning set for an eigenspace, Linear independence and linear dependence of vectors, Basis and dimension of a vector space, Maximal linearly independent sets, Minimal spanning sets. .	**L1, L2, L3, L4**	**12**

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Module-III: Linear Transformations Linear transformations: Definition and examples, Elementary properties, Kernel and range of a linear transformation, Dimension theorem, Singularand Nonsingular linear transformation, Isomorphism. Matrix representation of a linear transformation. Change of basis.	**L1, L2, L3, L4**	**12**
Module-IV: Inner product spaces and Orthogonality Inner Product Spaces, Examples of Inner Product Spaces. Cauchy –Schwarz Inequality, Orthogonal and orthonormal vectors, Orthogonal and orthonormal bases, Orthogonal complement, Projection theorem, Orthogonal projection onto a subspace. Gram-Schmidt Orthogonalization Process.	**L1, L2, L3, L4**	**12**

Text Book

1 D. C. Lay, S. R. Lay and J. J. McDonald, Linear Algebra and Its Applications, Pearson; 5edition, 2015.

2. Hoffman and R. Kunze, Linear algebra, second edition, Prentice Hall India LearningPrivate Limited.

3. K. Singh, Linear Algebra: Step by Step, Oxford University Press; 1 edition, 2013

Reference Book

1.G. Strang, Introduction to Linear Algebra, Wellesley-Cambridge Press; Fifth Edition, 2016..

2.S. Lipschutz, M. Lipson, Schaum's Outline of Linear Algebra, 5th Edition, 2012.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**
C02	**1**	**2**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
C03	**1**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
C04	**1**	**-**	**-**	**1**	**1**	**1**	**-**	**-**	**2**	**1**	**1**
C05	**1**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**1**	**1**

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SEMESTER-II

DMTH2251	ORDINARY DIFFERENTIAL EQUATIONS	L	T	P	C
Version	Date of Approval:Date, Month 2019	2	1	0	3
Pre-requisites/Exposure	Differentiation and Integration				
Co-requisites					

Course Objectives : After completing the course, students will be able to solve various type of ordinary differential equations. arising from changes in physical world.

Catalog Description
The course will provide how to solve various differential equations using various methods.

Course Outcomes : On completion of this course, the students will be able to
CO1 : Learn how to formulate differential equation and solution of linear differential equation.
CO2 : Learn how to sole differential equation of first order but not first degree.**CO3 :** Learn how to solve the differential equation with constant coefficients. **CO4 :** Learn how to solve simultaneous differential equations.

Course Content

Modules	Blooms level*	Number of hours
Module I: Review & Equations of First order and First degree differential equations: Differential equations, Order and Degree of Differential Equations, Complete primitive (general solution, particular solution and singular solutions). Differential equations of first order and first degree, Separation of variables, Homogeneous Equations, Equations of the form dy/dx = ax+by+c/a1x+b1y+c1, Linear Equations, Equation reducible to the linear form, Exact differential equations, Equations reducible to exact form by using integrating factors	L1, L3, L4	12
Module II: Equation of First order but not of first degree & Trajectories Equation of First order but not of first degree, Various cases and various methods of solution, Clairauts form, Singular solutions, Trajectory, Orthogonal Trajectory, Self-Orthogonal family of Curves.	L1, L3	12

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Module III: Module II: Equation of First order but not of first degree & Trajectories: Linear equations with constant coefficients, Complementary function, Particular integral, Working rule for finding solution for various cases, Homogeneous linear differential equations, Equations reducible to homogeneous form.	L1, L3	12
Module IV: Simultaneous Differential Equations & Linear Equations of Second Order with variable coefficients : Simultaneous differential equations, Differential equations of the form dx/P = dy/Q = dz/R where P, Q, R are functions of x, y, z. Linear Equations of second order with variable coefficients, following methods: (a) the complete solution in terms of a known integral, (b) finding one integral in C.F. by inspection, (c) removal of first derivative, (d) method of variation of parameters.	L1, L3	12

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

Text & References:

Text:

- Earl A. Coddington and Norman Levinson: Theory of Ordinary Differential Equations, TataMcGraw-Hill Publishing Company (1998).
- Shepley L. Ross: Differential Equations, Wiley (1984).
- Ravi P. Agarwal: Ordinary and Partial Differential Equations, Springer, 1993.

Reference:

- L. Elsgolts: Differential Equations and Calculus of Variations, Mir Publishers, 1970.
- M D Raisinghania: Ordinary & Partial Differential Equation, S. Chand Publishing; Nineteenedition, 2017.

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	--	2	--	--	1	1	2	3	2
CO2	1	1	1	1	2	2	1	1	1	2	2
CO3	1	2	2	2	3	--	1	2	1	3	2
CO4	1	2	2	--	--	2	1	2	1	2	2

1: strongly related, 2: moderately related and 3: weakly related

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Course Outcomes Assessment

There will be a midterm exams and a comprehensive final. The midterm exams will be given during lecture time **.**Final exam questions in the course will address the outcomes. Instructorswill provide copies of questions.Weekly homework assignments will be given to the students.

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ORDINARY DIFFERENTIAL EQUATIONS LAB

Course Code: DMTH2252 **Credit Units: 01**

Course Outcomes:

CO1: Students will be able to declare and solve differential equation problems using the MATLAB software interface.

CO2: Students will learn various inbuilt MATLAB functions related to differential equations.CO3: Students will be able to solve differential equationsusing functions.

CO4:- Students will be able to make models using Simulink tool

Program No	Program Title	CO mapping
1.	To declare differential equation and initial conditions in MATLAB	CO1,
2	To solve differential equation using inbuilt commands	CO1, CO2, CO3
3.	To solve differential equations using various solvers used in MATLAB	CO1, CO2,
		CO3
4.	To plot solution of differential equation using MATLAB.	CO1, CO2, CO3
5.	To solve simultaneous differential equation using inbuilt commands	CO1, CO2, CO3
6.	To solve simultaneous differential equations using various solvers used in MATLAB	CO1, CO2, CO3
7	To plot solution of simultaneous differential equation using MATLAB.	CO1, CO2, CO3
8.	To make a Simulink model for differential equation using Simulink toolbox	CO4
9.	To make a Simulink model for differential equation using Simulink toolbox	C04
10.	Graphical comparisonof mathematical solution with simulation	CO2, CO3 CO4,

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Suggested Readings:

1. Dingyu X, and Yangquan C. (2009). *Solving applied mathematics problems with MATLAB.* CRC PRESS.
2. Lyshevski, S. E. (2003). *Engineering and scientific computations using MATLAB*. John Wiley & Sons.
3. Kattan, P. I. (2008). *Matlab for Beginners: A gentle approach*. Petra books.
4. Stevan. T. K (2006). *Introduction to Simulink with engineering applications*. Orchard Publications

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DMTH2201	GROUP AND RING THEORY	L	T	P	C
Version	Date of Approval: Date, Month 2019	3	1	0	4
Pre-requisites/Exposure	Basic Set theory				
Co-requisites					

Course Objectives:

1. Fundamental theorems and applications relevant to the study of Group, rings and fields
2. Analyze rigorous mathematical proofs of statements related to groups, rings and fields..

Course Outcomes:

On completion of this course, the students will be able to
CO1 : Learn the concept of Group and various groups.
CO2 : Learn fundamental theorems of group theory.
CO3 : Analyze rigorous mathematical proofs of statements related to groups**CO4 :** Analyze rigorous mathematical proofs of statements related to Rings **CO5 :** Analyze rigorous mathematical proofs of statements related to Field **Catalog Description**
The course will provide the how set theory is extended further and provides way to learning variousproofs of statements of groups, rings and fields.

Course Content

Modules	Blooms level*	Number of hours
Module I: Basics and Review Sets, Subsets, Operations on sets, Index set and family of sets, Relations, Equivalence relations and partitions, Mappings. Infinite sets and cardinality, Congruence modulo-n., Laws of composition.	L1, L3, L4	10
Module II: Groups Binary operation and Algebraic structure, Groups, Subgroups, Generators of a group, Permutation groups, Cyclic groups, Coset decomposition, Lagrange theorem and its consequences, Homomorphism and Isomorphism, Normal subgroups, Quotient group, Cayley's theorem	L1, L3	12
Module III: Groups Contd Fundamental theorems on homomorphism and isomorphism, Automorphism and inner automorphism, Automorphism groups and their computation, Normaliser and center of group, Group actions, Stabilizers and orbits, Finite groups, Commutor subgroups.	L1, L3	12

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Module IV: Rings & Ideals Rings, Various types of rings, Rings with Moduley, Rings without zero divisors, Properties of rings, Sub rings, Characteristic of a ring. Ideals,	L1, L3	14
Quotient rings, Principal ideals, Maximal ideals, Prime ideals, Principal ideal domains.		

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

Text & References:

Text:

1. N. Herstein : Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975
2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal : Basic Abstract Algebra (2nd edition), 1994.

Reference:

3. Vivek Sahai and Vikas Bist : Algebra, Narosa Publishing House, 1999.
4. Joseph A. Gallian: Abstract Algebra, Narosa Publishing, 2011

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	3	3	3	3	1	1	1	1	2	3
CO2	1	2	2	2	1	1	1	1	1	-1	2
CO3	1	2	1	2	1	1	1	1	2	1	3
CO4	1	2	1	2	2	1	1	1	2	1	2
CO5	1	2	2	2	1	1	1	1	1	1	2

1: strongly related, 2: moderately related and 3: weakly related

Course Outcomes Assessment

There will be a midterm exams and a comprehensive final. The midterm exams will be given during lecture time .Final exam questions in the course will address the outcomes. Instructors will provide copies of questions.Weekly homework assignments will be given to the students.

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SEMESTER-III

DMTH2351	PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	C
Version	Date of Approval: 2019	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objectives : The objective of this course is to

1. Upon successful completion of this course, the student will be able to: (Knowledge based)
2. Classify partial differential equations and transform into canonical form;
3. Solve Non linear partial differential e using Charpit's method & Jacobi's method

Course Outcomes : On completion of this course, students should

CO1 : Classify partial differential equations and transform into canonical form.
CO2 : Student will be introduce to fundamentals of partial differential equations
CO3 : Learn solving linear PDEs using classical methods.
CO4 : Solve Non linear partial differential equation using Charpit's method & Jacobi's method..

Catalog Description

The student will be able to Solve Second order PDE with constant coefficients, Linear second order PDE with variable coefficients, classification of second order PDE& Homogeneous Differential equation. the student will be able to Transport Equation, Quasi linear equation, Laplace's equation, Analytic solutions of Laplace Equation in 2D Cartesian and polar coordinates, Interior & Exterior Dirichlet's problem, Neumann problem.

Heat equation, solution by method of characteristics, solution by separation of variables. Heat equation, solution by method of characteristics, solution by separation of variables.Students should be able to transform Laplace's equation from rectangular coordinate to radial coordinate and solve the resulting partial differential equation. the student will be able to Non linear first order PDE, generalizations, Non linear waves and shocks, conservation laws and shocks

Course Content

Modules	Blooms level*	Number of hours
Module I: Definition of Partial differential equation, order of partial differential equation, Formation of partial differential equations (a) by elimination of arbitrary constants (b) by elimination of arbitrary function, Linear and Quasilinear first-order PDEs. Complete solution, particular solution,	L1, L2, L4	12

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singular solution, general solution. Lagrangeâ€™s method to solve linear PDEs.		
Module II: Linear homogeneous & non-homegeneous PDE with constant coefficient: Homogeneous Equations: Rules for finding complementary function, few shortcut methods to find particular integral for standard form of functions, and few general methods for specific forms. Non- Homogeneous Equations: Rules for finding complementary function, few shortcut methods to find particular integral for standard form of functions, and few general methods for specific forms; equations reducible to PDEs with constant coefficients.	L1, L3	12
Module III: Linear Differential equations with variable coefficients: Partial differential equations reducible to equations with constant coefficients, Reducible linear PDEs with variable coefficients, Solution of reducible Linear PDEs with variable coefficients, Monge's method, Monge's method for solving $Rr \square Ss \square Tt = V$, Monge's Method for solving $Rr \square Ss \square Tt \square U(rt \square s^2) = V$.	L1, L2, L4	12
Module IV: Classification of second order PDEs and representative equations: Classification of PDEs of second order, Boundary value problems, the principle of superposition, method of separation of variables, its application to solve wave equation, D'Alembert's solution of wave equation in various cases. Solution of heat equation in one dimension in various cases, and solution of Laplace equation in Cartesian coordinates and its conversion into polar coordinates	L1, L3, L4	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

Recommended Books:

1. D. A. Murray, Introductory Course in Differential Equations, Orient Longman (India), 1967 .
2. H. T. H Piaggio, Elementary Treatise on Differential Equations and their Applications, C.B.S.Publisher and Distributors, Delhi 1985.
3. M.D. Raisinghania, Ordinary and Partial Differential Equations, S Chand, 18th Edition, 2005.
4. Schaumâ€™s Outline series of Partial Differential equations

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**1**	**3**	**3**	**3**	**3**	**1**	**1**	**1**	**1**	**2**	**3**
CO2	**1**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**-1**	**2**
CO3	**1**	**2**	**1**	**2**	**1**	**1**	**1**	**1**	**2**	**1**	**3**
CO4	**1**	**2**	**1**	**2**	**2**	**1**	**1**	**1**	**2**	**1**	**2**

1: strongly related, 2: moderately related and 3: weakly related

Course Outcomes Assessment

This course contributes towards the learning outcomes, 'Science and Mathematics and 'Partialdifferential equation' The outcome will be measured by the performance of students in various class tests/assignments in addition to the End Semester Examination (ESE) that containssignificant number of questions on roblems related to the Partial

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DMTH2301	MATHEMATICAL METHODS	L	T	P	C
Version		3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Contents:

Module I Series solution of differential equations, Power series method, Definitions of Betaand Gamma functions. Bessel equation and its solution: Bessel functions and their properties- Convergence, recurrence, Relations and generating functions, Orthogonality of Bessel functions.
Module II Existence theorems for Laplace transforms, Linearity of Laplace transform and their properties, Laplace transform of the derivatives, Initial and final value theorems and Evaluation of Integrals of a function
Module III Inverse Laplace transforms, Linearity of Inverse Laplace transform, Shifting theorems (first and second), Convolution theorem. Solution of the differential equations using Laplace transforms.
Module IV Fourier series, Fourier expansion of piecewise monotonic functions, Half and full rangeexpansions, Fourier transforms (finite and infinite), Application of Fourier Transform in initialand boundary value problem. Fourier integral.

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

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SMTH2301	FUNDAMENTALS OF C PROGRAMMING	L	T	P	C
Version		2	0	0	2
Pr-requisites/Exposure					
Co-requisites					

Course Outcomes : On successful completion of this course, all students will be able to:
CO1 : Understand binary, hexadecimal and octal number systems and their arithmetic.
CO2 : Define the purpose and structure of C Program for programming; identify and distinguish various datatypes and operators; conditional and control statement; Apply if-else, Switch and loops to rewrite basic C program for problem solving.
CO3 : Compare and contrast various Array types, its declaration and implementation; differentiate between Call by Value and Reference if Functions; apply the concepts to rewrite C Programs
CO4 : Differentiate between various String Handling Functions;

Catalog Description
This course is aimed to provide a fundamental understanding of programming concepts. C Language is the language which used to write solution for the basic computational problem in the form of instructions and programs.The basic and advanced features of C Language including Data types, Operators, Conditional & Control Statements, Arrays, Strings, Structure & Union and File Handling will be introduced.

Course Content

Modules	Blooms level*	Number of hours
Module-I: Computers fundamentals: definition, block diagram, diagram with components and characteristics, classification of computers History of C: Introduction of C, Basic structure of C program, Concept of problem solving, program design, debugging, Types of errors in programming, Number systems, Binary, octal, hexadecimal and their inter conversions.	L1, L2 and L3	08
Module-II: Element used in C, Header file, key words, identifiers, concept of variables, constants and data types in C, Input/output function, arithmetic, relational	L1,L2 and L3	08
and bitwise operator, increment and decrement operator, unary operator, type casting, operator hierarchy, Conditional operator		
Module-III: Decision making with if statement, else statement, if-else statement, nesting if, switch and break, go to statement. Decision making statement concepts of loops like while loop, do while loop, for loop, nested for loops, jumps in loop.	L1, L2 and L3	10

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Module-IV: Functions: - use of inbuilt function, user defined functions, arrays:- one dimensional and n dimensional array, initialization of array, iterative programs using arrays, uses of array with combination of decision making operator, Function prototype, Return values and their types, function argument, recursion, Strings, array of strings.	L2, L3 and L4	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

Text & References Books :

1. E Balagurusamy, ANSI C, McGraw Hill Education India Private Limited; Seventh edition (2017).
2. Yashwant Kanetkar, Let us C, BPB Publications, 2nd Edition, 2001.
3. Herbert Schildt, C: The complete reference, OsbourneMcgraw Hill, 4th Edition, 2002.
4. V. RajaRaman, Computer Programming in C, Prentice Hall of India, 1995.
5. Kernighan & Ritchie, C Programming Language, The (Ansi C Version), PHI, 2nd Edition.

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	2	--	3	3	3	--	3	--	1	1
CO2	1	--	--	2	3	3	3	2	3	1	1
CO3	1	--	--	2	3	3	3	2	3	1	1
CO4	1	--	--	2	3	3	3	2	3	1	1

1: strongly related, 2: moderately related and 3: weakly related

Course Outcomes Assessment

There will be a midterm exams and a comprehensive final. The midterm exams will be given during lecture time. Final exam questions in the course will address the outcomes. Instructors will provide copies of questions. Weekly homework assignments will be given to the students.

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SMTH2302	C PROGRAMMING LAB	L	T	P	C
Version		0	0	2	1
Pre-requisites/Exposure					
Co-requisites	NIL				

Catalog Description

The primary objective of this course is to understand all the components of C, including the Clanguage, the C Preprocessor, and the C Standard Library.

Course Objectives : The objective of this course is to

1. Equip the students with concepts of Programming through C Language
2. Provide an overview of programming concepts like Functions, Arrays and String Handling

Course Outcomes : On completion of this course, the students will be able to

CO1 : Demonstrate the use of various data types and operators in C programs; Solve variousproblems using conditional control statements (if-else, Switch case).

CO2 : Construct C programs related to problems involving the usage of loops, arrays andfunctions.

CO3 : Construct C programs using string handling functions.

Modules/Topics Covered**	Blooms level*	Number of hours
1. Basic programming to understand the working of C a. Write a program to calculate simple interest and amount. b. Write a program to swap two numbers using third variable. c. Write a program to calculate area of circle	L3	2
2. Programs using if, else if statements, switch case a. Write a program to check if the number is even or odd. b. Write a program to perform arithmetic operations using Switch Case statement. c. Write a program to demonstrate Greatest of 3 nos	L3	2
3. Programs using loops like while and do while (a) Write a program to find factorial of given no using do while statement. (b) Write a program to print prime numbers up to 'n'. (c) Write a program to sum of n natural no.	L3	2

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4. Pattern programs using loops and multiple loops a. Write a program to print the following pattern using for loop 1 2 2 3 3 3 4 4 4 4 b. Write a program to print the following pattern using for loop	L3	2
A A B A B C a. A B C D		
5. Simple programs with the help of function a. Write a program to swap two numbers using call by value. b. Write a program to find factorial of a number with return with argument.	L3	2
6. Simple programs involving array and strings a. Write a program to read nnum of students and 5 subjects marks. b. Write a program to add two 3* 3 matix. c. Write a program to perform operations on strings using string handling in-built functions (concatenation, reversal, copy etc.)	L3	2

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text & References

1. E Balagurusamy, ANSI C, McGraw Hill Education India Private Limited; Seventh edition(2017).
2. YashwantKanetkar, Let us C, BPB Publications, 2nd Edition, 2001.
3. Herbert Schildt, C: The complete reference, OsbourneMcgraw Hill, 4th Edition, 2002.
4. V. RajaRaman, Computer Programming in C, Prentice Hall of India, 1995.
5. Kernighan & Ritchie, C Programming Language, The (Ansi C Version), PHI, 2nd Edition.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**1**	**2**	**--**	**3**	**3**	**3**	**--**	**3**	**--**	**1**	**1**
CO2	**1**	**--**	**--**	**2**	**3**	**3**	**3**	**2**	**3**	**1**	**1**
CO3	**1**	**--**	**--**	**2**	**3**	**3**	**3**	**2**	**3**	**1**	**1**
CO4	**1**	**--**	**--**	**2**	**3**	**3**	**3**	**2**	**3**	**1**	**1**

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SEMESTER-IV

DMTH2451	OPTIMIZATION TECHNIQUES	L	T	P	C
Version		2	1	0	3
Pre-requisites/Exposure					
Co-requisites	NIL				

Course Objective:

The problems in optimization are the most common applications of mathematics. The main aim of this course is to present different methods of solving optimization problems in the areas of linear programming.

Course Contents:

Module I: Introduction to Optimization techniques (OT)

Historical Development of OT models and advantages, Engineering applications of OT, Design vector and constraints, Classifications of Optimization problems

Module II: Linear Programming Problems (LPP)

Definition of LPP, General Structure of Linear Programming, Objective Function, Constraints, Constraint Surface, Formulation of LPP, Advantages and Limitations of Linear Programming, Graphical Solutionsof Linear Programming Problems. Simplex Method, Big M Method and Two-Phase Method, Degeneracy, Duality

Module III: Transportation and Assignment Problems

Introduction to Transportation Model, Degeneracy in TP, Solution Techniques of TP, Different Methods for Obtaining Initial Basic Feasible Solutions viz. Northwest corner rule, Matrix Minima Method, Row Minima Method, Column Minima Methods, Vogel's Approximation Method, Techniques for Obtaining Optimal Basic Feasible Solution – MODI Method.

Assignment Problems: Definition, Types of Assignment Problems, Hungarian Method for AP.

Module IV: Game Theory

Concept of Game problem. Rectangular games. Pure strategy and Mixed strategy. Saddle point and its existence. Optimal strategy and value of the game. Algebraic method, Graphical method and Dominance method of solving rectangular games. Inter-relation between the theory of Games and L.P.P

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

References:

1. Operations Research, S D Sharma, KNRN Publication
2. Operations Research, P.K. Gupta and D. S. Hira, Sultan Chand Ltd.
3. Introduction to Operations Research, Hamdy A Taha, PHI Limited, New Delhi.
4. Operations Research, J K Sharma, Macmillan Publication

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DMTH2452	OPTIMIZATION TECHNIQUES LAB	L	T	P	C
Version		0	0	2	1
Pre-requisites/Exposure					
Co-requisites	NIL				

Course Outcomes:

CO1: The main objective of the course is to make students familiar with tools for OptimizationTechniques using software interface.

CO2: Students will be able to visualize the mathematical problems graphically.

CO3: Students will learn various inbuilt functions related to Optimization Techniques.CO3: Students will be able to solve mathematical problems with help of coding.

Program No	Program Title	CO mapping
1.	Introduction to the software and basic commands of the interface	CO1
2.	To create objective function and constraint equations	CO1, CO2
3.	To plot the graphical solution of linear programming problems	CO2, CO3
4.	To solve the optimization problem using Simplex Method	CO3, CO4
5.	To solve the optimization problem using Big M Method and Two Phase Method.	CO2, CO3, CO4
6.	To implement dual simplex method.	CO2, CO3, CO4
7.	To construct a code for Transportation problem using Northwest corner rule.	CO3, CO4
8.	To find the row minima and row maxima in the transportation and assignment problems.	CO3, CO4
9.	To implement the procedure of elimination of rows in assignment problem.	CO1, CO3, CO4
10.	To solve and assignment problem using MATLAB.	CO3, CO4

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Suggested Readings:

1. Hunt, B. R., Lipsman, R. L., & Rosenberg, J. M. (2014). A guide to MATLAB: for beginners andexperienced users. Cambridge university press.
2. Operations Research, S D Sharma, KNRN Publication
3. Operations Research, P.K. Gupta and D. S. Hira, Sultan Chand Ltd.
4. Introduction to Operations Research, Hamdy A Taha, PHI Limited, New Delhi.
5. Operations Research, J K Sharma, Macmillan Publication

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DMTH2401	REAL ANALYSIS-I	L	T	P	C
Version	Date of Approval: 2019	3	1	0	4
Pr-requisites/Exposure					
Co-requisites					

Course Objectives: To expose the students to the basics of real analysis required for their subsequentcourse work. This course is intended to expose the basic ideas of Real Analysis. In particular,
To understand the basics of Real analysis
Have the knowledge of the sequence and series of real numbers, convergence, limits of functions, infinite products and their properties.
To make the students understand the fundamentals, study examples, memorize definitions and theorems and learn certain proof techniques.
Development of the mathematical skills to solve problems
Explain your solutions to others and present your ideas to other students.

Course Outcomes: On successful completion of this course, all students will have developed knowledge, understanding and their ability to apply knowledge of mathematics to the analysis.
CO1 : Describe fundamental properties of the real numbers that lead to the formal development of real analysis.
CO2 : Demonstrate an understanding of limits and how they are used in sequences, series, infinite product. Define and recognize the sequence and series of real numbers and convergence with examples.
CO3 : Construct rigorous mathematical proofs of basic results in real analysis. Understand and perform simple proofs.
CO4 : Appreciate how abstract ideas and rigorous methods in mathematical analysis can be applied to important practical problems.

Catalog Description
Mathematical analysis is central to mathematics curricula not only because it is a stepping-stone to the study of advanced analysis, but also because of its applications to other branches of mathematics, physics, and engineering at both the undergraduate and graduate levels.
To introduce students to the fundamentals of mathematical analysis. At the end of this course, students should: understand the axiomatic foundation of the real number system, understand the concepts of limits, continuity, compactness, differentiability, and integrability.

Course Content

Modules	Blooms level*	Number of hours
Module-I: Real Number System Algebraic and order properties of , Absolute value of a real number;	L1, L3	10

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Bounded above and bounded below sets, Supremum and infimum of a nonempty subset of R.		
Module-II: Properties of R The completeness property of , Archimedean property, Density of rational numbers in ; Definition and types of intervals, Nested intervals property; Neighborhood of a point in , Open and closed sets in R .	L1, L3	12
Module III: Sequences in R Convergent sequence, Limit of a sequence, Bounded sequence, Limit theorems, Monotone sequences, Monotone convergence theorem, Subsequences, Bolzano-Weierstrass theorem for sequences, Limit superior and limit inferior for bounded sequence, Cauchy sequence, Cauchy's convergence criterion.	L1, L2, L4	12
Module IV: Infinite Series Convergence and divergence of infinite series of real numbers, Necessary condition for convergence, Cauchy criterion for convergence; Tests for convergence of positive term series: Integral test, Basic comparison test, Limit comparison test, D'Alembert's ratio test, Cauchy's nth root test; Alternating series, Leibniz test, Absolute and conditional convergence.	L1, L3, L4	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

Text & References Books:

- Bartle, Robert G., & Sherbert, Donald R. (2015). Introduction to Real Analysis (4th ed.). WileyIndia Edition. New Delhi.
- *Bilodeau, Gerald G., Thie, Paul R., & Keough, G. E. (2010). An Introduction to Analysis (2nded.). Jones and Bartlett India Pvt. Ltd. Student Edition. Reprinted 2015.*
- Denlinger, Charles G. (2011). Elements of Real Analysis. Jones and Bartlett India Pvt. Ltd.Student Edition. Reprinted 2015.
- *S. C. Malik and S. Arora, Mathematical Analysis, New Age International (P) Limited,New Delhi, 2008.*

Additional Readings:

- Ross, Kenneth A. (2013). Elementary Analysis: The theory of calculus (2nd ed.). UndergraduateTexts in Mathematics, Springer. Indian Reprint.
- Thomson, Brian S., Bruckner, Andrew. M., & Bruckner, Judith B. (2001). Elementary RealAnalysis. Prentice Hall.

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	--	2	--	--	1	1	2	3	3
CO2	1	1	1	1	2	-2	1	1	-1	2	2
CO3	1	2	2	2	3	--	1	2	1	3	2
CO4	1	2	2	--	--	2	1	2	1	2	3

1: strongly related, 2: moderately related and 3: weakly related

Course Outcomes Assessment

There will be a midterm exams and a comprehensive final. The midterm exams will be given during lecture time. Final exam questions in the course will address the outcomes. Instructors will provide copies of questions.Weekly homework assignments will be given to the students.

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SMTH2401	PROGRAMMING WITH MATLAB	L	T	P	C
Version		0	0	6	3
Pre-requisites/Exposure	Algorithms and basic knowledge of programming				
Co-requisites					

Course Objectives : MATLAB is a scientific computing tool which covers almost all area of science and engineering. Students will be using MATLAB environment to solve various types of mathematicalproblems.

Course Outcomes : On completion of this course, the students will be able to
CO1 : Learn the basic concept of MATLAB
CO2 : Learn how to use matrix theory in MATLAB.
CO3 : Learn how to plot functions using plot functions and m file
CO4 : How to make script file and function file CO5 : How to use if, while, do while, for loop etc

Catalog Description
The course will provides the students how to use MATALB in scientific and mathematical way

Course Content

Programs	Blooms Level	Hours
1. Generating arrays and matrices and their manipulations 2. Introduction on few builtin functions 3. 2D and 3D plots, multiple plots using figure and subplot commands 4. Annotation of plots 5. Simple script files and editing them 6. Programs using If, else, nested if else, statements 7. Programs using switch case 8 Programs using loop structures 9 Introduction of function files 10 Introducing notion of sub-functions and nested functions 11 Solving IVPs using ode45 and other solvers	**L1, L2, L3, L4**	

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Text Book:

- R. Pratap, Getting started with MATLAB, Oxford publication, 2016
- Gilat, MATLAB-An introduction with application, wiley publication, 2014

Reference:

- S. Swapna Kumar and S. V. B. Lenina, MATLAB easy way of learning, Prentice-Hall ofIndia Pvt.Ltd

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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SEMESTER-V

DMTH2501	COMPLEX ANALYSIS	L	T	P	C
Version 1.1	Date of Approval: 2019	3	1	0	4
Pre-requisites/Exposure	Basic of Complex variable				
Co-requisites					

Course Objectives: The objective of this course module is toacquaint the students with the mathematics involved in basics of Complex Numbers, Analytic Function, Complex Integration, Theoremsand to get them familiar with various important applications in evaluating real integrals.

Course Outcomes : On completion of this course, the students will be able to
CO1 : Describe fundamental properties of the complex numbers that lead to the formaldevelopment of complex analysis.
CO2 : Demonstrate an understanding of De-Moivers Theorem and its applications, Exponential, Logarithm of a complex number and how they are used in further step. Provebasic results in complex analysis.
CO3 : Define and recognize the sequence and series of complex numbers and convergence withexamples. Determine whether a given function is differentiable, and if so
find its derivative. Use power series and line integrals to construct differentiable functions.
CO4 : Use Cauchy's integral theorem to compute line integrals. Define Taylor's and Laurent series, and determine residues. Use the residue theorem to compute several kinds of real integrals.
CO5 : Construct conformal mappings between many kinds of domain.

Catalog Description
This course is intended for giving knowledge of the Basic Concepts of complex variable and its properties, complex integration and describes the real integrals applications. To acquaint the students with the fundamental concepts of analyticity and make them capable of to solve any given related problems. To describe the conformal mapping and its applications to daily life problems.

Course Content

Modules	Blooms level*	Number of hours

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Module I: Review of Analytic Functions Complex Numbers: De-Moivres Theorem and its applications, Exponential, Sine, Cosine and Logarithm of a complex number. Definition of a z ($a \neq 0$), Inverse circular and hyperbolic functions.	L1, L2 and L3	10
Module-II: Review of complex plane, sequences and series, analytic polynomials, analytic functions, Cauchy-Riemann equations, analyticity in an arbitrary open set, functions exp(z) , sin z and cos z.	L1,L2, L3	12
Module-III: Power series, Line integrals and their properties, closed curve theorem for entire functions, Cauchy integral formula and Taylor expansions for entire functions, Liouvilles theorem, types of singularities, poles, residues and application of residues to evaluate real integrals.	L1,L2, L3 and L5	14
Module-IV: Uniqueness theorem, definitions and examples of conformal mappings, bilinear transformations, Fourier series, Fourier expansion for complex functions.	L1, L2 L3, L4 and L5	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Reference Books

- Gamelin,T.W.,"ComplexAnalysis",Springer-Verlag,2001.
- Lang,S.,"ComplexAnalysis",SpringerVerlag,2003.
- R.V.ChurchillandJ.W.Brown,ComplexVariablesandApplications,5thedition,McGrawHill,1990
- Conway,J.B.,Functionsofonecomplexvariable,NarosaPublishing,2000
- Priestly,H.A.,Introduction toComplexAnalysisClaredonPress,Orford,1990.
- MarkJ.AblewitzandA.S.Fokas,ComplexVariables:Introduction&Applications,CambridgeUniversityPress,SouthAsianEdition,1998.
- LiangshinHann&BernardEpstein,ClassicalComplexAnalysis,JonesandBartlettPublishersInternational,London,1996.
- .J.E.MarsdenandM.J.Homan,Basiccomplexanalysis,3rdEdn.,W.H.Freeman,1999.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO1	**1**	**1**	**1**	**1**	**2**	**2**	**1**	**1**	**1**	**1**	**1**
CO2	**1**	**1**	**1**	**1**	**3**	**3**	**1**	**1**	**2**	**1**	**1**
CO3	**1**	**1**	**1**	**1**	**3**	**2**	**1**	**1**	**1**	**1**	**1**
CO4	**1**	**1**	**1**	**1**	**2**	**2**	**1**	**1**	**1**	**1**	**1**
CO5	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**1**	**1**	**1**

1: strongly related, 2: moderately related and 3: weakly related

Course Outcomes Assessment

This course contributes towards the learning outcomes of subject, There will be a midterms and a comprehensive final Exam. The midterm exams will be given during lecture time. Final exam questionsin the course will address the outcomes. Instructors will provide copies of questions.Weekly homework assignments will be given to the students based on subject. Finally, outcome will be measured by the performance of students in various class tests/assignments in addition to the End Semester Examination (ESE) that contains significant number of questions on problems related to the particular subject.

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DMTH2502	NUMERICAL METHODS	L	T	P	C
Version	Date of Approval: 2019	2	1	0	3
Pre-requisites/Exposure					
Co-requisites					

Course Objectives: This course aims to introduce various techniques for finding approximate numerical solutions to mathematical problems for which exact or analytical solutions are either unavailable or practically inappropriate to use.
1. To learn various methods to solve mathematical, real life problems numerically.
2. Specifically to attain an insight about the concepts of calculus of finite differences, divided differences, numerical integration and differentiation.
3. To learn various numerical tools to algebraic and transcendental equations.

Course Outcomes : On successful completion of this course unit students will be able to
Students will be able to understand the nature and operations of Numerical Analysis, demonstrate familiarity with theories and concepts used in Numerical Analysis and identify the steps required to carry out a piece of research on a topic in Numerical Analysis, derivation of the Numerical Methods, studying their convergence rate and performance, applicability of the methods on different test examples. In particular,
C01 : Apply appropriate algorithms to solve selected problems, both manually and by writing computer programs.
C02 : Compare different algorithms with respect to accuracy and efficiency of solution.
C03 : Analyze the errors obtained in the numerical solution of problems.
C04 : Using appropriate numerical methods, determine the solutions to given system of linear equations.C05 : Using appropriate numerical methods, determine approximate solutions to algebraic and transcendental equations.
C06 : Using appropriate numerical methods, determine approximately integration and differentiation Of functions.

Catalog Description
Numerical methods are mathematical methods that are used to approximate the solution of complicated problems so that the solution consists of only addition, subtraction and multiplication operations. Numerical methods are very useful because they are suitable for the use with computers because computer processors can only add, subtract and multiply. Numerical methods, is approximation fast solution for mathematical problems. Such problems can be in any field in engineering and science.

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Course Content

Modules	Blooms level*	Number of hours
Module-I: Solution of system of linear equations: **Direct methods**: Cramer's rule, Matrix inverse method, Gauss elimination and Gauss-Jordan method **Iterative methods**: Jacobi's method, Gauss-Seidal method.	L1, L3	12
Module-II: Solution of Transcendental equations: Initial approximation of the roots, Bisection method, Method of false position, secant method, iteration method, Newton-Raphson method and its convergence.	L1, L3	12
Module-III: Finite differences and interpolation: finite difference operators, their properties and their interrelations, finite difference tables, Newton's forward and Newton's backward interpolation formula, various central difference formulae including Stirling's formula, Bessel's formula. Divided differences: Operators and difference table, Newton's divided difference formula, Lagrange's interpolation formula.	L1, L3	12
Module-IV: Numerical differentiation and integration: Differentiation using Newtons forward and backward formula, Newton-Cotes quadrature formula - derivations & comparison of Trapezoidal rule, Simpsons 1/3 and 3/8 rules. Numerical solution of first order differential equations: Euler's method,modified Euler's method, Runge-KuttaIInd order and IVth order methods	L1, L3, L4	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

Text & References:

Text:

1. Numerical methods in Engineering & Science by B. S. Grewal, Khanna Publishers, 2013

References:

2. An Introduction to Numerical Analysis by EndreSuli, David F. Mayers, Cambridge UniversityPress, 2003
3. Elements of Numerical Analysis by R. S. Gupta, Macmillan India Ltd, 2009.
4. Numerical methods for Scientific and Engineering Computation by Jain, Iyengar, Jain, New AgeInternational Publishers, 2004

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO1	1	1	1	2	--	3	2	1	1	2	2
CO2	1	--	1	--	--	--	2	1	1	2	2
CO3	1	1	1	--	1	--	2	1	1	2	2
CO4	1	1	1	2	1	--	2	1	1	2	2
CO5	1	2	1	3	2	--	2	1	1	2	2
CO6	1	2	1	3	2	--	2	1	1	2	2

1: strongly related, 2: moderately related and 3: weakly related

Course Outcomes Assessment

There will be a midterm exams and a comprehensive final. The midterm exams will be given during lecture time. Final exam questions in the course will address the outcomes. Instructors will provide copies of questions. Weekly homework assignments will be given to the students.

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DMTH2503	NUMERICAL METHODS LAB	L	T	P	C
Version		0	0	2	1
Pre-requisites/Exposure					
Co-requisites					

Course Objective:
The objective of the course is to explain the most common numerical methods used in engineering analysis, when to use each method, and how to implement basic methods in a structured manner using C/ MATLAB's programming language.

Course Outcomes
On completion of this course, the students will be able to
CO1:Solve the Algebraic and Transcendental Equation by implementing Numerical methods using C.
CO2:Solve the sets of linear simultaneous equations and solve the problems using direct methods like Gauss – elimination method and iterative methods like Jacobi method, Gauss-Seidel iterationmethods by using
CO3: Solve integration problems by using Trapezoidal and Simpson's Rule ($1/3^{rd}$ and $3/8^{th}$) in CCO4: Solve differential equations by using Runga-Kutta method and Euler's Method in C.

Course Content

1. Write a program to solve the system of equations Ax = b using Gauss elimination method.
2. Write a program to solve the system of equations Ax = b using Jacobi Iteration method.
3. Write a program to solve the system of equations Ax = b using Gauss-Seidel method.
4. Write a program to find an initial approximation to solve transcendental equation of the form f (x) = 0.
5. Write a program to find the roots of an equation f (x) = 0 using Bisection method.
6. Write a program to find the roots of an equation f (x) = 0 using Iteration method.
7. Write a program to find the roots of f (x) = 0 using Newton Raphson method.
8. Write a program to find the roots of f (x) = 0 using Secant method.
9. Write a program to find the integral of a function using Trapezoidal rule.
10. Write a program to find the integral of a function using Simpson's 1/3rd and 3/8th rule.

Text Books:

1. Applied Numerical Methods with Matlab for Engineers and Scientists by Steven Chapra,McGraw Hill.
2. MATLAB: An introduction with applications: Amos Gilat, 5th Edition, Wiley India.
3. Getting Started with MATLAB: A Quick Introduction for Scientists

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and Engineers by RudraPratap, Oxford University Press.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PS O 1**	**PS O 2**	**PS O 3**	**PSO 4**
CO1	**1**	**2**		**1**				**2**		**1**		
CO2	**1**	**2**		**1**				**2**		**1**		
CO3	**1**	**2**		**1**				**2**		**1**		
CO4	**1**	**2**		**1**				**2**		**1**		

1: strongly related, 2: moderately related and 3: weakly related

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DMTH2504	NUMBER THEORY	L	T	P	C
Version	Date of Approval: 2019	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalogue Description

Number theory is a branch of pure mathematics devoted primarily to the study of the integers and integer-valued functions. It is a vast and fascinating field of mathematics, sometimes called "higher arithmetic," consisting of the study of the properties of whole numbers. This course is intended for people who wantto gain knowledge about fundamentals of numbers.

Course Objectives : To introduce the students to the fundamental ideas of Number Theory: Students willbe able to understand the concept of encryption and decryption, Euler's Theorem and residues. This course will encourage students to think clearly and critically and to begin to be able to prove simple statements on their own. Students will be able to know about number system and how to solve a single equation with two or three unknowns.

Course Outcomes : On successful completion of this course unit students will be able to

CO1 : Define and interpret the concepts of divisibility, congruence, greatest common divisor, prime, and prime-factorization,

CO2 : Define Number theoretic functions and their properties.

CO3 : Apply the Law of Quadratic Reciprocity and other methods to classify numbers as primitive roots, quadratic residues, and quadratic non-residues,

CO4 : Solve the problems of encryption and decryptions.

CO5 : Produce rigorous arguments (proofs) centered on the material of number theory, most notably in the use of Mathematical Induction and/or the Well Ordering Principal in the proof of theorems.

Course Content

Modules	Blooms level*	Number of hours

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Module I: Divisibility, Euclidean algorithm, Linear Diophantine equations, Prime numbers, Fundamental theorem of arithmetic, Prime number theorem (statement only).	L1, L2,L3,L4	10

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Module II: Congruences, solutions of linear congruences, Chinese Remainder Theorem, Eulerstotient function, Euler-Fermat theorem, Wilson's theorem, non-linear congruences, Hensel's lemma, primitive roots and power residues.	L1,L2 L3,L4	14
Module III: Quadratic residues, quadratic reciprocity, the Jacobi symbols. The greatest integer function, Arithmetic functions, Mobius function and Mobius inversion formula.	L1,L2 L3, L4	12
Module IV: Finite continued fractions, infinite continued fractions, approximation to irrational numbers. Introduction to cryptography, public key cryptography, RSA.	L1, L2,L3, L4	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

Text & References:

Text :

1. S.K. Pundir and D. Pundir, Theory of Numbers, PragatiPrakashan, 2012
2. M. Burton, Elementary Number Theory (6th Edition), Tata McGraw-Hill Edition,Indian reprint, 2007.
3. Neville Robinns, Beginning Number Theory (2nd Edition), Narosa Publishing HousePvt. Limited, Delhi, 2007.

Reference:

1. Niven, I., Zuckerman, S.H., Montgomery, L.H., An Introduction to the Theory ofNumbers, John Wiley and Sons. New York, 1991
2. K. Ireland, M. Rosen. A Classical Introduction to Modern Number Theory, SpringerVerlage, 1990.
3. N. Koblitz. Course in Number Theory and Cryptography, Springer, 1994.

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	**1**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**-**	**2**	**2**
CO2	**1**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**-**	**2**	**2**
CO3	**1**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**-**	**2**	**2**
CO4	**1**	**1**	**3**	**1**	**3**	**3**	**3**	**2**	**-**	**2**	**2**
CO5	**1**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**-**	**2**	**2**

1: strongly related, 2: moderately related and 3: weakly related

Course Outcomes Assessment

There will be a midterm exams and a comprehensive final. The midterm exams will be given during lecture time .Final exam questions in the course will address the outcomes. Instructors will provide copies of questions. Weekly homework assignments will be given to the students.

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DMTH2551	PROBABILITY THEORY	L	T	P	C
Version		3	1	0	4
Pre-requisites/Exposure	Basics knowledge of Statistics				
Co-requisites					

Course Objectives: The course aims to shape the attitudes of learners regarding the field of statistics. Specifically, the course aim to i) Motivate in students an intrinsic interest in statistical thinking. ii) Instil the belief that statistics is important for scientific research.

Course Contents:

Module-I: Measures of Central Tendency Arithmetic Mean (A.M.) Definition, Mode, Median, Partition Values: Quartiles, Deciles and Percentiles, Box Plot, Percentile ranks, Geometric Mean (G.M.) Definition, merits and demerits, Harmonic Mean (H.M.), Weighted Mean: Weighted A.M., G.M. and H.M., Combined mean.

Module II: Measures of Dispersion, Range, Quartile deviation, Mean deviation, Mean square deviation, Variance and standard Deviation, Combined variance (derivation for 2 groups), Combined standard deviation, generalization for n groups. Moments, Skewness, Kurtosis.

Module III: Probability Theory: Random experiments, sample point and sample space, event, algebra of events. Definition of Probability classical and relative frequency approach to probability; probability axioms, real random variables (discrete and continuous), cumulative distribution function, probability mass/density functions, Conditional probability, Baye's Theorem, mathematical expectation, moments, moment generating function, characteristic function.

Module-IV: Discrete and Continuous Distributions: Standard univariate discrete distributions such as binomial, Poisson, geometric, negative binomial, hypergeometric, and their properties; Standard continuous distributions such as normal, exponential, Beta distribution of first and second kind, Gamma distribution

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

Recommended Books:

1. S. C. Gupta & V. K. Kapoor, Fundamental of Mathematical Statistics, 9 th Edition, Sultan Chand& Sons, New Delhi, 1994.
2. P. R. Vittal, Mathematical Statistics, Margham Publications, Chennai, 2002
3. Sheldon Ross, Introduction to Probability Models (9th Edition), Academic Press, Indian Reprint,2007.
4. Meyer P.L., Introduction to Probability and Statistical Applications, Oxford & IBH (2007).
5. Goon, A.M., Gupta, M.K. and Dasgupta, B., An Outline of Statistical Theory, Vol. I the WorldPress Pvt. Ltd. (2000).

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DMTH2505	DISCRETE MATHEMATICS	L	T	P	C
Version		3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objectives : The objective of the course is to introduce the fundamentals of Discrete Mathematics which includes Mathematical Logic, Boolean algebra and its Applications, Switching circuit & Logic Gates, Graphs and Trees. The students shall also be introduced to computational andalgorithmic aspects of Mathematical Logic,
Boolean Algebra, Graphs and Trees in the field of Computer sciences and its applicationsFollowing are the striking features of this course:

1. In theoretical computer science courses the discrete mathematics is used quite extensively
2. Discrete mathematics has really come into its own with the development of computer.
3. To develop logical thinking and its application to computer science (to emphasize the importance of proving statements correctly and de-emphasize the hand-waving approach towards correctness of an argument). The subject enhances one's ability to reason and ability to present a coherent and mathematically accurate argument.

Course Outcomes : On successful completion of this course unit students will be able to
C01 : Write an argument using logical notation and determine if the argument is or is not valid.
The subject enhances one's ability to reason and ability to present a coherent and mathematically accurate argument.
C02 : Simplify and evaluate basic logic statements including compound statements, implications, inverses, converses, and contrapositives using truth tables and the properties of logic. Be skillful in expressing mathematical properties formally via the formal language of propositional logic and redicate logic.
C03 : Determine if a given graph is simple or a multigraph, directed or undirected, cyclic or acyclic, and determine the connectivity of a graph. Represent a graph using an adjacency list and an adjacency matrix and apply graph theory to application problems such as computer networks. Determine if a graph has an Euler or a Hamilton path or circuit.
C04 : Determine if a graph is a binary tree, N-ary tree, or not a tree; use the properties of trees to classify trees, identify ancestors, descendants, parents, children, and siblings; determine the level of a node, the height of a tree or subtree and apply counting theorems to the edges and vertices of a tree.
C05 : Perform tree traversals using preorder, inorder, and postorder traversals and apply these traversalsto application problems; use binary search trees or decision trees to solve problems.

Catalog Description
Discrete mathematics is the study of mathematical structures that are fundamentally discrete rather than continuous. In contrast to real numbers that have the property of varying "smoothly", the objects studied in discrete mathematics – such as integers, graphs, and statements in logic– do not vary smoothly in this way, but have distinct, separated values. Discrete mathematics therefore excludes topics in "continuous mathematics" such as calculus or Euclidean geometry. Discrete objects can often be enumerated by integers. It is

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increasingly being applied in the practical fields of mathematics and computer science.

Course Content

Modules	Blooms level*	Number of hours
Module-I: Propositional Logic : Proposition, Propositional Calculus- Propositional Variables and Compound Propositions, Basic Logical Operations: -Conjunction, Disjunction, Negation, Conditional, Biconditional. Compound Statements, Equivalence, Duality, Algebra of Statements,Valid and Invalid Arguments, Tautologies, Contradiction, Contingency.	L1, L3	12
Module-II: Boolean Algebra: Boolean Algebra, Various Boolean Identities, Boolean Function, Boolean forms and their Equivalence. Min-term Boolean forms, Sum of product Canonical forms. Minimization of Boolean functions, Algebraic Method, The Karnaugh Map method.	L1, L3	12
Module-III: Graphs: Graph, Finite graph, Infinite graph, connected graph, disconnected graph, Null graph, Sub-graph, Incidence edge, Adjacency of vertex, Degree, Directed Graph, Walk, Path, Circuit, Wheel, complete graphs, bipartite graphs, Matrix Representation of graphs. Hand -shaking Lemma.	L1, L3,L4	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluatio

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

Text & References:

Text:

1. C. L. Liu, Elements of Discrete Mathematics, Tata McGraw-Hill Publishing Co. Ltd, New Delhi.

References:

2. J. P. Trembley& R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, McGraw-Hill Book Co., 1997.
3. J. L. Gersting, Mathematical Structure for Computer Science (3rd ed.), Computer SciencePress, 2006.
4. Seymour Lipschutz, Finite Mathematics, McGraw-Hill Book Co. New York, 1966.
5. J. E. Hopcroft and J.D. Ullman, Introduction to Automata Theory Languages & Computation, Narosa Publishing House, Delhi, 1995.
6. N. Deo, Graph Theory with Applications to Engineering and Computer

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Sciences, Prentice Hall ofIndia, New Delhi, 1979

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	1	1	2	--	3	--	--	2	1	1	2
CO 2	1	--	1	--	--	--	3	--	2	1	1	2
CO 3	1	1	1	--	1	--	--	--	2	1	1	2
CO 4	1	1	1	2	1	--	--	--	2	1	1	2
CO 5	1	2	1	3	2	--	--	--	2	1	1	2

1: strongly related, 2: moderately related and 3: weakly related

Course Outcomes Assessment

There will be a midterm exams and a comprehensive final. The midterm exams will be given during lecture time .Final exam questions in the course will address the outcomes. Instructors will provide copies of questions.Weekly homework assignments will be given to the students.

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SEMESTER-VI

DMTH2601	REAL ANALYSIS-II	L	T	P	C
Version 2019.1	Date of Approval: 2019	3	1	0	4
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalogue Description

This course provides an introduction to the integration and Riemann integral, Integrability ofcontinuous and The Fundamental theorem of integral calculus. Topics discussed in the courseinclude Improper integrals and their convergence, Dirichlet's tests, Frullani's integral, Integral, Continuity, Differentiability and integrability of an integral of a function of a parameter and theirproperties with examples. Also topics discussed metric spaces, neighborhoods, limit points,interior points, open and closed sets, closure and interior, boundary points, Cauchy sequences,completeness, Cantor's intersection theorem, Baire's category theorem and their properties. Tostudy of application metric space: Continuous functions, compactness for metric spaces,sequential compactness, Bolzano-Weierstrass property, finite intersection property, continuity in relation with compactness, connectedness.

Course Objectives : At the end of this course, students should: understand the axiomatic foundation of integration of real valued function and convergence of improper integral. Students will be able to deal with abstract concepts of metric space and related concepts.

Course Outcomes : After completing the course, the students will be able to

CO1 : Explain the basic concepts of Integration. Describe Riemann integral, Integrability of continuous and monotonic functions.

CO2 : Knowledge and Understanding: Learn the theory of differentiability.

CO3 : Knowledge Understanding of Improper integrals and their convergence and Test: Comparison tests, Abel's and Dirichlet's tests, etc.

CO4 : Determine if a function on a metric space is discontinuous, continuous, or uniformly continuous.

CO5 : Apply your understanding of the concepts, formulas, and problem solving procedures to thoroughly investigate relevant physical models and Intellectual Skills: Develop a reasonedargument in handling problems about functions.

Course Content

Modules	Blooms level*	Number of hour

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Module I: Limits of functions ,sequential criterion for limits, Limit theorems, Infinite limits & limits at infinity. Continuous functions, sequential criterion for continuity & discontinuity. Algebra of continuous functions. Continuous functions on closed intervals,, intermediate value theorem, Uniform continuity .	L1, L2, L3, L4, L6	10
Module II: Differentiability of a function at a point & in an interval, algebra of differentiable functions. Increasing and decreasing functions,. Rolle's theorem, Mean value theorem, Cauchy's mean value theorem, Darboux's theorem. Applications of mean value theorem to inequalities.	L1, L2, L3, L4, L6	12
Module III: Definition of Riemann integration, Inequalities for upper and lower Darboux sums, Necessary and sufficient conditions for the Riemann integrability, Definition of Riemann integration by Riemann sum and equivalence of the two definitions, Riemann integrability of monotone functions and continuous functions, Properties of Riemann integrable functions, Definitions of piecewise continuous and piecewise monotone functions and their Riemann integrability, intermediate value theorem for integrals, Fundamental theorems (I and II) of calculus, and the integration byparts.	L1, L2, L3, L4, L6	14
Module IV: Improper integrals of Type-I, Type-II and mixed type, Convergence of Beta and Gamma functions, and their properties.	L1, L2, L3, L4, L6, L5	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

References:

- *Bartle, Robert G., & Sherbert, Donald R. (2015). Introduction to Real Analysis (4th ed.).Wiley India Edition. Delhi.*
- Denlinger, Charles G. (2011). Elements of Real Analysis. Jones and Bartlett (StudentEdition). First Indian Edition. Reprinted 2015.
- *Ghorpade, Sudhir R. & Limaye, B. V. (2006). A Course in Calculus and Real Analysis.Undergraduate Texts in Mathematics, Springer (SIE). First Indian reprint.*
- Ross, Kenneth A. (2013). Elementary Analysis: The Theory of Calculus (2nd ed.).
- *Undergraduate Texts in Mathematics, Springer.*

Modes of Evaluation: Quiz/Assignment/ Seminar/Written

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PS O1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**
CO2	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**2**	**2**
CO3	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**
CO4	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**
CO5	**1**	**1**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**2**

1: strongly related, 2: moderately related and 3: weakly related

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DMTH2651	MATHEMATICAL STATISTICS	L	T	P	C
Version		2	1	0	3
Pre-requisites/Exposure	Basics knowledge of Statistics				
Co-requisites					

Course Objective: To introduce the fundamentals of probability theory and random processes. The main objective of this course is to acquaint students with some basic concepts in Statistics. They will be introduced to some elementary statistical methods of analysis of data.

Course Contents:

Module-I: Covariance and correlation between two variables, scatter diagram , Karl Pearson's coefficient of correlation, Rank correlation coefficient, Multiple correlation, Curve fitting, Linearand nonlinear regression, Simple linear regression.

Module II: Convergence in Probability Modes of convergence of sequences of random variables, Independent and Identically Distributed Variables, Weak and Strong laws of large numbers, Central limit theorems, Chebychevs Inequality, Markov Inequality, Kolmogorov Inequality

Module III: Random Sampling: Introduction, types of sampling, standard error, Test of significance, critical region, level of significance, error in sampling, Sampling distributions chi- square, T and F distributions. Testing of Hypothesis: Null hypothesis, alternative hypothesis, Important tests based on normal, Chi-square, T and F distributions. One way ANOVA; Two-wayANOVA.

Module IV: Point Estimation: Probabilities of point estimates, Cramer Rao Inequality, Methodof maximum likelihood, method of moments, least square methods, Unbiasedness, Efficiency, Sufficient, Consistency.

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

Recommended Books:

1. S. C. Gupta & V. K. Kapoor, Fundamental of Mathematical Statistics, 9 th Edition,Sultan Chand & Sons, New Delhi, 1994.
2. P. R. Vittal, Mathematical Statistics, Margham Publications, Chennai, 2002

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3. Sheldon Ross, Introduction to Probability Models (9th Edition), Academic Press, IndianReprint, 2007.
4. Meyer P.L., Introduction to Probability and Statistical Applications, Oxford & IBH(2007).
5. Goon, A.M., Gupta, M.K. and Dasgupta, B., An Outline of Statistical Theory, Vol. I theWorld Press Pvt. Ltd. (2000).

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DMTH2652	STATISTICS BASED LAB	L	T	P	C
Version		0	0	2	1
Pre-requisites/Exposure	Basics knowledge of Statistics				
Co-requisites					

Catalog Description

This course is intended for students to learn different statistical tools. .

Course Objectives:

The objective of this course is to:

Acquaint students to use statistical software in computation and interpretationof various statistical results.

Course Outcomes:

On successful completion of this course, students will be able to:

CO1: Compute the mean, median, mode, correlation and regression.

CO2: Solve discrete and continuous Probability Distribution.

CO3: Interprete the significance of the sample.

CO4: Compute Eigen values and Eigenvectors of amatrix.

Course Content

Modules		
1. Measurement of CentralTendencies 2. Measurement of Dispersion 3. Measurement of Skewness &Kurtosis 4. Analysis of Correlation &Regression		
5. Binomial distribution 6. Poisson distribution 7. Normal distribution		
8. T- Test, 9. F-test,		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis,L6-Evaluation*

Text Books : -

1. V. K. Rohatgi and A. K. Md. E. Saleh, An Introduction to Probability and Statistics, 2ndEdn., Wiley, 2001.
2. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Edn.,Wiley, 1968.

Reference Books:

1. R. Hogg, R., J. Mckean, A. and Craig, :Introduction to Mathematical Statistics, 7th edition, Pearson Education

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Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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DMTH2604	ANALYTICAL GEOMETRY	L	T	P	C
Version	Date of Approval: 2019	3	1	0	4
Pre-requisites/Exposure	Basic knowledge of geometry				
Co-requisites					

Course Objectives : The objective of this course is to provide a numeric description of thesegeometric objects and their properties

Course Outcomes : On completion of this course, the students will be able to
CO1 : Learn the concept of planes and geometrical applications.
CO2 : Define the concept of lines, skew lines and shortest distance between lines.
CO3 : Apply the concept of sphere and cone in practical problems.
CO4 : Apply the concept of cylinders in daily life

Catalog Description
The course will provide how to deal the object like polygonal line, a polygon, a polyhedron. Some curvilinear forms are also considered: a circle, a cylinder, a cone, a sphere, and three dimensiosnal objects.

Course Content

Modules	Blooms level*	Number of hours
Module I: Vectors: Three dimensional vectors: direction cosines, resolution of vectors, section formula, dot and cross products, triple products, geometrical and physical applications. Planes: Equation of a plane, normal to a plane, distance from a point to a plane, parallel planes, planes through the intersection of two planes, planes bisecting the angle between two planes, planes through three given non-collinear points, geometrical applications.	L1, L3	12
Module II: Lines: equation of a straight line in different forms; condition for a line to lie on a plane; condition for two lines to intersect; skew lines; equation and magnitude of the shortest distance between two skew lines	L1, L3	12
Module III: Sphere, Cone, Cylinder: Equation of a sphere, tangent plane and normal at a point of the sphere, orthogonal spheres, equation of a cone with guiding curve a circle, ellipse etc., equation of a right circular cylinder.	L1, L3, L4	12

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Module IV: Quadric surfaces: Ellipsoid, hyperboloid of one sheet and two sheets, Elliptic paraboloid. Surface of revolution, ellipsoid of revolution, paraboloid of revolution	L1, L3, L4	12

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

Text & References:

Text:

- Thomas, B.G., and Finny R.L.: Calculus and Analytical geometry, Pearson education Asia, AddisonWesley; 9 edition (August 14, 1995).
- Jonathan B. Cabero, et al : Analytic Geometry, National Book Store, Inc, 2012

Reference:

- B. S. Grewal: Higher Engg. Mathematics, Khanna Publishers, 44th Edition, 2014

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO4
CO1	1	1	--	2	--	--	1	1	2	3	3
CO2	1	1	1	1	2	2	1	1	1	2	2
CO3	1	2	2	2	3	--	1	2	1	3	3
CO4	1	2	2	--	--	2	1	2	1	2	2

1: strongly related, 2: moderately related and 3: weakly related

Course Outcomes Assessment

There will be a midterm exams and a comprehensive final. The midterm exams will be given during lecture time **.**Final exam questions in the course will address the outcomes. Instructors will provide copies of questions.Weekly homework assignments will be given to the students.

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DMTH2603	MATHEMATICAL MODELING	L	T	P	C
Version	Date of Approval: Date, Month 2019	3	1	0	4
Pre-requisites/Exposure	Mathematical modeling through Differential equations				
Co-requisites					

Course Objectives : Mathematical modeling is a process of creating a mathematical representation of some phenomenon in order to gain a better understanding of that phenomenon. The main goal of this course is to learn how to make a creative use of some mathematical tools such as difference equations, ordinary and partial differential equations, Numerical analysis to build a mathematical description of some physical problems.

Course Outcomes : On completion of this course, the students will be able to:
CO1 : Understand what functionals are, and have some appreciation of their applications.
CO2 : Apply the formula that determines stationary paths of a functional to deduce thedifferential equations for stationary paths in simple cases.
CO3 : Use the Euler-Lagrange equation or its first integral to find differential equations forstationary paths.
CO4 : Solve differential equations for stationary paths, subject to boundary conditions, instraightforward cases.
CO5 : Distinguish between the different types of integral equations, relate these integral equations to corresponding initial or boundary value problems and solve Fredholm integral equations of the second kind with degenerate kernel.
CO6 : Formulate boundary value problems modelling waves on a string, and apply theNeumann series solution for a corresponding Fredholm integral equation of the second kind to analyze scattering of waves in one dimension.

Catalog Description
This course is a basic course offered to PG students of Engineering/Science background. It contains Mathematical modelling through Ordinary Differential Equations. Therefore, it has tremendous applications in diverse fields in engineering sciences.

Course Content

Modules	Bloom slevel*	Numbe r of hours
Module I: Mathematical modelling through Ordinary Differential Equations and Systems of Oridnary Equations of First Order : Linear Growth and Decay Models, Non-linear growth and Decay models, Compartment models, Mathematical Modelling in Population Dynamics, Mathematical modeling of Epidemics, Mathematical modeling in medicine, arms race battles and international trade, Mathematical modeling in dynamics.	L1, L3 ,L4	12

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Module-II: Modeling with difference equations, overview of basic concepts concerning matrices, eigenvalues and eigenvectors, The Harrod Model,the cobweb model, Samuelsons interaction model, application to Actuarial Science, Application to population dynamics and genetics.	L1, L3	12
Module-III: Queuing models: Poisson Process, Pure birth death process M/M/1, M/M/c, M/Ek/1 queuing models, steady state probabilities, waiting time distribution.Cost consideration in network models.	L1, L3 ,L4	12
Module-IV: Mathematical modeling through mathematical programming maximum principle: Linear programming models in harvesting of animal populations, forest management, transportation and assignment models, Non-linear programming models in optimal portfolio selection, information theory, non-linear programming models arising from pollution control, Pontryagins maximum principle, solution of a simple time-optimal problem, optimal harvesting of animal populations	L1, L3 ,L4	12

**Bloom's Level:*

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

Text & References:

Text:

- J N Kapur, Mathematical Modeling", New Age International (P) Ltd., Publishers, NewDelhi, 2005
- Barnes, B. and Fulford, G. R., Mathematical Modelling with Case Studies", CRCPress, Taylor and Francis Group, 2009
- Edsberg, L., Introduction to Computation and Modeling for Differential Equations",John Wiley and Sons, 2008

References:

- F R Giordano, M D Weir, and W P Fox, A First Course in Mathematical Modeling",Cengage Learning; 4th edition, 2008
- M M Gibbons, A Concrete Approach to Mathematical Modeling", John Wiley andSons, 2007.
- P.E. Wellstead, Introduction to Physical System Modeling", Academic Press, 1977.

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DMTH2602	FINANCIAL MATHEMATICS	L	T	P	C
Version	Date of Approval: Date, Month 2019	3	1	0	4
Pre-requisites/Exposure	Mathematical modeling through Differential equations				
Co-requisites					

Course Objective : The course introduces fundamental concepts of Financial Mathematics such as cash flows, present value, future value, yield and probability that form the basis for further advanced learning.

Course Outcomes : After completing the course the student will be able to
CO1 : Demonstrate understanding of basic concepts in linear algebra, relating to linear equations,matrices, and optimization.
CO2 : Demonstrate understanding of concepts relating to functions and annuities
CO3 : Employ methods related to these concepts in a variety of financial applications.

Course Content

Modules	Blooms level*	Number of hours
Module I: Random Variable Discrete and Continuous, Probability Distributions Binomial, Poisson and Normal, Basics of Stochastic Process, Markov Process, Martingales.	L1, L4	10
Module II: Derivative Securities, time value of money, Cash flow, money market, coupon bonds, Money market account.	L1, L3	8
Module III : Forward and futures contracts Forward price formula, value of a forward contract,. Futures contract, Futures pricing. Swaps, value of commodity swaps.	L1,L2,L3	8

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Module IV: Theory of option pricing Put-Call parity, behaviour of option prices with respect to variables, Pay-off curves, Single period and multi period binomial lattice model for option pricing, existence of risk neutral probability measure, pricing American options: A binomial lattice model, notion of complete markets, the CRR model, Black- Scholes formula for dividend paying stock, the Greeks. Portfolio optimization â€“Risk and return of an asset, two assets portfolio optimization, multi asset portfolio optimization, Capital Asset Pricing Model (CAPM)“ as a pricing formula,as a factor model.	L1,L3,L6	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

Text / References:

- S. Chandra, S. Dharmaraja, Aparna Mehra, R. Khemchandani, An Introduction to Financial Mathematics, Narosa Publishing House Pvt. Ltd, 2013.
- Financial Economics: Advanced Financial Mathematics, Louis J. Lombardi, 2008.
- M. Baxter, A. Rennie, Financial Calculus. An Introduction to derivative pricing" CambridgeUniversity Press, 1996.
- J. Cvitanic and F. Zapatero, Introduction to the Economics and Mathematics of Financial Markets,MIT Press, 2003.
- J. Medi, Stochastic processes, New Age International, 1994.

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DMTH2605	FUZZY THEORY	L	T	P	C
Version	Date of Approval : 2019	3	1	0	4
Pre-requisities / Exposures	Basic Set Theory				
Co-requisites					

Course Objectives: The objective of this course is to understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, fuzzy logics and other applications of fuzzy logic.

Course Outcomes : On completion of this course, the students will be able to
CO1 : Learn crisp and fuzzy set theory and decide the difference between crisp set and fuzzy set theory.
CO2 : Make calculation on fuzzy set theory.
CO3 : Recognize fuzzy membership function and its application.
CO4 : Analyse statistical data by using fuzzy logic method.
CO5 : Evaluate fuzzy statistic applications.

Catalog Description
The course will providean understanding of the basic mathematical elements of the theory of fuzzy sets. Provide an emphasis on the differences and similarities between fuzzy sets and classical sets theories. The main objective of this course is to establish thorough background knowledge on fuzzy sets in under graduate students and enable them to pursue individual research in solving real world optimization problems.

Course Content

Modules	Blooms Level*	Number of Hours
Module I: Background of fuzzy sets, Crisp sets-operation on crisp sets, fuzzy sets, fuzzy set operation, Properties of fuzzy sets, Expansion of fuzzy set, Interval value fuzzy set, Type-2 fuzzy set, L-fuzzy set, Level-2 fuzzy set. Membership functions, Features to membership functions.	**L1, L2, L3, L4, L6**	**8**
Module II: Alpha cut set, additional properties of Alpha -cut, Support, Core and height of -cut set, Cardinality of fuzzy set, First and second decomposition theorem, Functions of fuzzy sets-extensionprinciple, Cartesian product, Extension principle on Cartesian product.	**L1, L2, L3, L4, L6**	**8**

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Module III: Crisp relations-cardinality of crisp relations, Operations on crisp relations, Properties of crisp relations, Compositions, Fuzzy relations-cardinality of fuzzy relations, Operations on fuzzy relations, Properties of fuzzy relations, max-min composition, fuzzy equivalence relations, transitive maxmin closure, Projections and Cylindrical Extensions, Fuzzy Relation Equations.	**L1, L2, L3, L4, L5**	**10**
Module IV: Classical Logic and fuzzy logic: Classical predicate logic-tautologies, Contradictions, Equivalence, Exclusive or an exclusive nor, Logical proofs, Deductive Inferences, Fuzzy logic, Fuzzy proposition and its types, Fuzzy quantifiers, Equivalence and logical proofs, Modifiers, inference from conditional and qualified fuzzy proposition.	**L1, L2, L3, L4**	**10**

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis,L6:Evaluation*

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

Text Books:

- H.J. Zimmermann, "Fuzzy set theory and its Applications "Allied Publishers Ltd., New Delhi, 1991(For Units I & II).

Reference:

- T.J.Ross, Fuzzy Logic with Engineering Applications, McGraw-Hill, Hightstown, NJ,1995.
- .Kaufmann and M. M. Gupta, Introduction to Fuzzy Arithmetic Theory and Application,Van Nostrand Reinhold, New York, 1991.
- .G. J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, PrenticeHall, Upper Saddle River, NJ, 1995.

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	1	2	1	1	--	3	1	1	3	3
CO2	1	1	2	1	1	--	2	1	1	2	2
CO3	2	2	2	2	2	--	2	1	1	2	2

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CO4	**2**	**2**	**2**	**2**	**2**	**--**	**2**	**3**	**2**	**2**	**2**
CO5	**2**	**2**	**1**	**1**	**1**	**--**	**2**	**2**	**2**	**2**	**2**

1: strongly related, 2: moderately related and 3: weakly related

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SEMESTER-VII

DMTH2701	MEASURE THEORY	L	T	P	C
Version	Date of Approval: 2017	3	1	0	4
Pre-requisites/Exposure	Riemann integral, convergence of sequence and series				
Co-requisites	NONE				

Catalog Description

The course introduces the students to the fundamental ideas of uniform convergence Measure of a set, measurable sets and Lebesgue Integral. The module should encourage students to think clearly and critically and to begin to be able to prove simple statements on their own.

Course Objective*:*

By the end of the course, students will have learned the basics of measure theory and have a solid understanding ofLebesgue integrable functions and Lebesgue measurable sets.

Course Outcomes:

On successful completion of this course, students will be able to:
After completed course, the students are expected to be able to:
CO1-Describe basic properties of sigma-algebras and the Lebesgue integral
CO2 -Explain the construction of the Lebesgue measure on Euclidean space
CO3- Describe the relationship between continuous functions and general integrable functions
CO4- Work with Lebesgue-Stieltjes integral on the real line.
CO5- Determine questions related to different kinds of convergence, like Lp-convergence, convergencein measure and convergence almost everywhere
CO6 - Describe the main ideas of the proofs for the Fubini-and Radon-Nikodym theorem

Course Content

Modules	Blooms level*	Number of hours
Module-I: Sequences and series of functions, Pointwise and uniform convergence, Cauchy criterion for uniform convergence, Uniform convergence and continuity, Uniform convergence and differentiation, Weierstrass approximation theorem.	L1, L2,L3	12

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Module-II: Set functions, intuitive idea of measure, Elementary properties of measure, Measurable sets and their fundamental properties. Lebesgue measure of sets of real numbers, Algebra of measurable sets; Borel sets, Equivalent formulation of measurable sets in terms of open, Closed, Fo and Gs sets, Non measurable sets.	L1,L2 L3	12
Module-III: Measurable functions and their equivalent formulations, Properties of measurable functions. Approximation of measurable functions by sequences of simple functions, Measurable functions as nearly continuous functions, Egoroff's theorem, Lusin's theorem, Convergence in measure and F Riesz theorem for convergence in measure. Almost uniform convergence.	L1, L2 L3, L4, *L5*	12
Module-IV: Shortcomings of Riemann Integral, Lebesgue Integral of a bounded function over a set of finite measure and its properties. Lebesgue integral as a generalization of Reimann integral, Bounded - convergence theorem, Lebesgue theorem regarding points of discontinuities of Riemann integral. functions, Integral of non-	L1, L2,L3, L4 , *L5*	12

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis,L6-Evaluation*

Text Books:

1. W. Rudin, Principles of Mathematical Analysis, McGraw Hill Publishing Company Ltd., 1964
2. S. Ponnusamy, Foundations of Mathematical Analysis, Springer, 2010.
3. S. C. Malik and S. Arora, Mathematical Analysis, New Age International (P) Limited, NewDelhi, 2008.

Reference Books:

1. R. R. Goldberg, Real Analysis. Oxford & I. B. H. Publishing Co., New Delhi 1970.
2. T. M. Apostol, Mathematical Analysis, Narosa Publishing House. New Delhi, 1985.
3. P. K. Jain and S. K. Kaushik, An Introduction to Real Analysis, S. Chand & Co. New Delhi,2000.
4. Shanti Narayan, A Course in Mathematical Analysis, S. Chand and Company, New Delhi.
5. R.Wrede, M. R. Spiegel, Theory and Problems of Advanced Calculus, Schaum's Outline Series,McGraw Hill , New York, 3rd edition, 2010

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**	**1**		**2**					**1**			
CO2	**1**	**1**		**2**					**1**			
CO3	**1**	**1**		**2**					**1**			
CO4	**1**	**1**		**2**					**1**			
CO5	**1**	**1**		**2**					**1**			
CO6	**1**	**1**		**2**					**1**			

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DMTH2702	ABSTRACT ALGEBRA	L	T	P	C
Version	Date of Approval: 2017	3	1	0	4
Pre-requisites/Exposure	Basic algebra				
Co-requisites					

Catalog Description

The course will provide the knowledge about nature of groups, subgroups, quotient groups, rings, subrings, ideals, quotient rings, fields and the associated mappings and modules.

Course Objectives:

The objective of the course is to:

Analyze the concept of groups, rings and modules.

Course Outcomes

On completion of this course, the students will be able to:

CO1. Describe the concept of groups and fundamental theorem and also Sylow's Theorems for abelian andnon abelian groups.

CO2. Explain the concept of solvable groups, nilpotent groups, direct product of groups, structure theorem for finite abelian groups

CO3. Describe the fundamentals of rings and related theorems, ideals, maximal ideals, quotient rings, Integral Domains, Fields.

CO4: Explain the concept of Modules, Definition and examples, Direct sum, Free modules, Quotient modules, Simple modules .

Course Content

Modules	Blooms level*	Number of hours
Module- Groups, symmetric groups, Cayleys theorem, Normal subgroups, center of a group, quotient groups, Fundamental theorem on homomorphisms, Class equation of groups, Cauchys Theorems for abelian and non abelian groups, Sylow's Theorems for abelian and non abelian groups, solvable groups	L1, L2, L3, L4	12
Module-II: Maximal groups, composition Series of a group, Jordan Holder Theorem, solvable groups, nilpotent groups, direct product of groups, structure theorem for finite abelian groups.	L1, L2, L3, L4	12

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Module-III Rings, homomorphism of rings, ideals, maximal ideals, quotient rings, Integral Domains, Fields, Euclidean domains, PID, UFD, Polynomial rings, polynomial over the rational fields, Gauss lemma, Eisenstein criterion.	L1, L2, L3, L4	12
Module-IV: Modules, Definition and examples, Direct sum, Free modules, Quotient modules, Simple modules, Modules over Principle ideal domains, Modules with chain conditions, Artenian Modules, Noetherian Modules, Hilberts basis theorem	L1, L2, L3, L4	12

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis,L6-Evaluation*

Text Books:

- I.N. Herstein, Topics in Algebra", 2nd Ed., John Wiley & Sons, 2004.
- J.B. Fraleigh, First Course in Abstract Algebra", 7th Ed., Pearson Education, 2003.

Reference:

- J.A. Gallian , Contemporary Abstract Algebra", 8th Ed., Cengage Learning, 2013.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	1	--	1	--	--	--	2				1
CO2	1	1	--	1	--	--	--	2				1
CO3	1	1	--	2	--	--	--	2				1
CO4	1	1	--	2	--	--	--	2				1

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DMTH2704	MECHANICS	L	T	P	C
Version	Date of Approval:2017	3	1	0	4
Pre-requisites/Exposure	Electricity and Magnetism, Statistical Mechanics, and Quantum Mechanics, Condensed matter Physics and Material Science				
Co-requisites	Basic understanding of Mathematics e.g. Basic Calculus is needed				

Catalog Description

This course provides basic knowledge and understanding of Netonian mechanics and focuses on educating the students about various physical laws such as virial's theorem, D'Alembert's Law and Liouville's theorem etc. Knowledge of basic Classical mechanics is crucial to comprehend the contents of this course. This course serves as a prerequisite for better understanding of advanced dynamical problems.

Course Objectives

The objective of this course is to:
A detailed exposition of classical mechanics for the student, opting for physics is sovitally important for a clear understanding of recent intricate theories of quantum mechanics, modern physics and research for they are built an well developed and conceptualized foundation.

Course Outcomes

On completion of this course, the students will be able to:
CO1: Describe Lagrangian approach to solve advanced problem involving the dynamic motionof classical mechanical systems.
CO2: Define the Hamiltonian approach for solving the dynamic motion of the systems and todemonstrate an intermediate knowledge of central -force motion
CO3: Explain how to Apply advanced methods to complex central-force motion problems. CO4: Describe how to use conservation of energy and linear & angular momentum to solve dynamics problems. Describe the conservation laws and to apply them for solving numericalproblems.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Lagrangian Formulation Mechanics of a system of particles, constraints, D'Alembert's principle, Variational calculus and itsapplications, Hamiltonsvariational Principle, Lagrangian equations, applications of Lagrangian formulation, conservation theorems and symmetry properties, applications of Lagrangian formulation	L1, L2	10

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Module 2: Central Force Problem Reduction to one body problem, equation of motion and first integral, one dimensional problem and classification of orbits, Differential equation for the orbit, Kepler problem and planetary motion, Rutherford formula, scattering in central force field, transformation to laboratory frames.	L3, L4	8
Module 3: Rigid Body and Vibrating System Euler angles, tensor of inertia, kinetic energy of a rotat- ing body, symmetric top and applications. Vibrating string, solution wave equation, normal vibrations, dispersion, coupled vibrating system. Non linear Dynamics, phase trajectories.	L2, L3, L4	10
Module 4: Hamiltonian Formulation Hamiltonian equation of motion, Hamiltons equation in differentco-ordinate systems example in Hamiltonian dynamics, two- dimensional harmonic oscillator the equations of canonical transformations, cyclic coordinates, phase space and Liouvilles theorem, Poisson bracket. Lagrange brackets, general poisson bracket under canonicaltransformation.	L2, L3	12

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text & Reference Books:

Text:

1. H. Goldstein, Classical Mechanics, 2nd edition, Narosa Publishing House (1994)
2. W. Greiner, Classical Mechanics, Springer-Verlag (2003).
3. Classical mechanics – S.L.Gupta, MeenakshiPrakashan, 1970, New Delhi.

Reference:

1. R.G.Takwall and P.S.Puranik, Introduction to classical mechanics, Tata – McGraw Hill,1980, New Delhi.
2. N.C.Rana and P.S.Joag, Classical mechanics, Tata McGraw Hill, 1991, New Delhi.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

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CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1			1			1	1	1	2		
CO2	1			1			1	1	1	2		
CO3	1			1			1	1	1	2		
CO4	1			1			1	1	1	2		
CO5	1			1			1	1	1	2		

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DMTH2705	ADVANCED DIFFERENTIAL EQUATIONS	L	T	P	C
Version		3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Contents:

Module-I:
Existence and uniqueness theorem, Lipschitz condition, Solution of linear differential equations, Wronskian.

Module-II:
Solution of linear differential equations of second order, series solution, Legendre function,Bessel function and hypergeometric function.

Module-III:
Second order PDE equations with variable coefficients, Classification and canonical forms of second order equations in two variables. Classification of second order equations in n variables. Characteristic curves of second order equations in two variables.

Module-IV:
One and two dimensional wave equation, solution by method of characteristics and Fourier seriesmethod. solution of homogeneous and non-homogeneous diffusion equation, Duhamel's principle.

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

Text Books

1. T. Amarnath, An Elementary Course in Partial Differential Equations, Narosa PublishingHouse (II Edition), 2012.
2. E. A. Coddington, Ordinary differential equation, Tata MacGraw Hill, 2002.
3. Ordinary and Partial differential equations, S. Chand & Company Ltd, New Delhi,1976.
4. K.S. Rao, Introduction to Partial Differential Equations, PHI Learning Pvt. Ltd. (2ndEdition), 2012
5. L.C. Evans, Partial Differential Equations, American Mathematical Society 2010.

Reference Books

1. I.N. Sneddon, Elements of Partial Differential Equations, McGraw-Hill Book Company,1998.
2. M. Braun, Differential Equations and Their Applications, 4th Ed., Springer, 2011.

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DMTH2706	SCIENTIFIC WRITING WITH LATEX	L	T	P	C
Version	1	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objectives:
The objective of this course is to learn Typesetting of journal articles, technical reports,thesis, books, and slide presentations. Control over large documents containing sectioning, cross-references, tables and figures. Typesetting of complexmathematical formulae.

Course Contents:

Module 1: Introduction of LaTex, Installation of Latex, Required Components of aLATEX Document, Document Structure: Page Numbering and Headings, Creatingtitle page, Abstracts, Sections, subsectionupto level 3, Cross-References,Table of Contents.

Module 2: Mathematical Typesetting: Mathematical Formulas, Superscripts and Subscripts, Above and Below, Functions, Text in Math Displays,spacing: Spacing Between Words, Double spacing, Numbering/Listing: Enumerate command, Itemize command, Nested.

Module 3: Tables: Construction of table, Multi column, multi-row command in table, sideways, caption of table, resize of tables, Graphics: Figure, sub-figure, combined figure,wrap figure with text, caption of figure, labelling of figure, Bibliography, Hyperlinking. Application: CV writing, Journal/conferencetemplates, book writing.

Module 4: Presentation: Introduction of beamer, frame, blocks, style, fonts, colour,Wrap figure with text, Minipage, footnote.

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

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DMTH2707	NUMBER THEORY & CRYPTOGRAPHY	L	T	P	C
Version 1.1	Date of Approval: 2017	3	1	0	4
Pre-requisites/Exposure	Basic Knowledge of abstract algebra				
Co-requisites					

Course Objectives:
The course provides an introduction to basic number theory, where the focus is oncomputational aspects with applications in cryptography. Moreover, the course provides an introduction to some basic cryptographic techniques to understand fundamental mathematical concepts underlying digital signatures, public key encryption, and key establishment protocols.

Course Outcomes:-After completion of course student will able to
CO1: Define the various fundamental theorems of arithmetic.
CO2: Discuss Combinatorial Study of $\phi(n)$, Formulae for d(n) and $\sigma(n)$, MultiplicativeArithmetic Functions, The Mobius Inversion Formula.
CO3:Describe cryptographic Hash Functions Hash functions and data integrity, securityof Hash functions
CO4: Solve different Fuzzy Applications.

Course Contents:

Modules	Blooms Level*	Hours
Module-I: Euclid's division lemma, Divisibility, The Linear Diophantine Equation, The fundamental theorem of Arithmetic, Fermat's Little theorem, Wilson's Theorem, Generating functions. Congruences, Residue Systems, The Theorems ofFermat and Wilson Revisited, The Chinese Remainder Theorem.	**L1, L2, L3**	**10**
Module-II: Combinatorial Study of $\phi(n)$, Formulae for $d(n)$ and $\sigma(n)$, Multiplicative Arithmetic Functions, The Mobius	**L1, L2,L3**	**12**
Inversion Formula, Primitive Roots Modulo p, Tchebychev's Theorem. Euler's Criterion, the Legendre Symbol, The Quadratic Reciprocity Law, Consecutive Residues and Non-residues.		

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Module-III: Cryptographic Hash Functions Hash functions anddata integrity, security of Hash functions, The random oracle model, algorithms in random oracle model, comparison of security criteria, Compression functions from encryption functions, Hash functions from compression functions.	**L1, L2, L3,**	**14**
Module-IV: Fuzzy Applications Introduction, application in civil engineering, mechanical engineering and computer engineering, brief introduction to fuzzy systems and Genetic algorithms.	**L1, L2, L3, L4**	**12**

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis,L6-Evaluation*

Text Books

- I. Niven, S.H. Zuckerman and L.H. Montgomery, An Introduction to the Theory of Numbers,John Wiley and Sons. New York,1991
- K. Ireland and M. Rosen. A Classical Introduction to Modern Number Theory, SpringerVerlage,1990.
- R.S. Douglas, Cryptography Theory and Practice, Third edition, Chaman & Hall/CRC,2005

Reference Books

- Johannes Buchmann. Introduction to Cryptography, Second edition, Springer,2004.
- N. Koblitz. Course in Number Theory and Cryptography, Springer,1994.

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

CO, PO, and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	1		2				2		1		2
CO2	1	1		2				2		1		2
CO3	1	1		2				2		1		2
CO4	1	1		2				2		1		2

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DMTH2703	INTEGRAL EQUATIONS AND CALCULUS OF VARIATIONS	L	T	P	C
Version	Date of Approval: 2017	3	1	0	4
Pre-requisites/Exposure	Solutions of Differential equations, Evaluation of definite integrals				
Co-requisites					

Catalog Description

This course is a basic course offered to PG students of Engineering/Science background. It contains Fredholm and Volterra integral equations and their solutions using various methods such as Neumann series, resolvent kernels, Green's function approach and transform methods. It also contains extrema of functional, the Brachistochrone problem, Euler's equation, variational derivative and invariance of Euler's equations. It plays an important role for solving various engineering sciences problems. Therefore, it has tremendous applications in diverse fields in engineering sciences.

Course Objectives:

The objective of this course is to:

- Cover important techniques namely, variation technique, Transforms and Integral equationsmethods.
- Solution of ordinary and partial differential equations involving initial and boundary valueconditions.

Course Outcomes:

On completion of this course, the students will be able to:

CO1. Identify what functional are and have some appreciation of their applications.

CO2. Explain the formula that determines stationary paths of a functional to deduce the differential equations for stationary paths in simple cases.

CO3. Describe the Euler-Lagrange equation or its first integral to find differential equations for stationary paths.

CO4. Solve the differential equations for stationary paths, subject to boundary conditions and determine the solution of Fredholm integral equations of the second kind with degenerate kernel.

Course Content

Modules	Blooms level*	Number of hours

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Module I-Definition and classification of linear integral equations. Conversion of initial and boundary value problems into integral equations. Conversion of integral equations into differential equations. Integro differential equations.	L1, L3, L4	12
Module-II :Fredholm Integral Equations: Solution of integralequations with separable kernels, Eigenvalues and Eigenfunctions. Solution by the successive approximations, Numann series and resolvent kernel. Solution of integral equations with symmetric kernels, Hilbert-Schmidt theorem, Green's function approach.	L1, L3	12
Module-III Volterra Integral Equations: Successive approximations, Neumann series and resolvent kernel. Equations with convolution type kernels.	L1, L3, L4	12
Module-IV: Calculus of Variations: Basic concepts of the calculus of variations such as functionals, extremum, variations, function spaces. Necessary condition for an extremum, Euler's equation with the cases of one variable and several variables. Invariance of Euler's equations. Functionals dependent on one or two functions and relatedproblems.	L1, L3, L4	12

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis,L6-Evaluation*

Text Books:

1. A.J. Jerry, Introduction to Integral Equations with Applications, Wiley Publishers, 2nd Edition, 1999.
2. R.P. Kanwal, Linear Integral Equations, BirkhuserBosten, 2nd Edition, 1997.

Reference Book

1. I.M. Gelfand,S.V.Fomin, Calculus of Variations, Dover Books, 2000

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

CO, PO and PSO mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**1**									**1**		
CO2	**1**									**1**		
CO3	**1**									**1**		

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CO4	**1**									**1**		

1: strongly related, 2: moderately related and 3: weakly related

DMTH2710	**STATISTICS INFERENCE WITH LAB**	L	T	P	C
Version	Date of Approval	3	0	1	4
Pre-requisites/Exposure					
Co-requisites					

Course Objective: The course aims at providing an introduction to statistical inference and itsapplication to predictive statistical models.

Learning Outcome: After completing the course, the student will be able to:
CO1:Demonstrate knowledge and understanding of: Test a hypothesis concerning the distribution ofa random variable.
CO2: Derive suitable point estimators of the parameters of the distribution of a random variable andgive a measure of their precision.
CO3:Use computational methods to obtain and evaluate estimators.
CO4: Demonstrate the use of various software on sampling distribution.

Course Content

Modules
Module-I Random Sampling: Introduction, types of sampling, standard error, Test of significance, critical region, level of significance, error in sampling, Testing of Hypothesis: Null hypothesis, alternative hypothesis, Sampling distributions chi-square, T and F distributions. , One way ANOVA; Two-way ANOVA
Module-II: Convergence in Probability Modes of convergence of sequences of random variables, Independent and Identically Distributed Variables, Weak and Strong laws of large numbers, Central limit theorems, Chebychevs Inequality, Markov Inequality, Kolmogorov Inequality.
Module-III: Point Estimation: Probabilities of point estimates,
Cramer Rao Inequality, Method of maximum likelihood, method of moments, least square methods, Unbiasedness, Efficiency, Sufficient,Consistency.

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Module IV: By using MATLAB/ Mathematica/Maple:

1. To test one -sample and two sample hypothesis testingproblems by using t-test.
2. To test one -sample and two sample hypothesis testingproblems by using Chi-square Test.
3. To test one -sample and two sample hypothesis testingproblems by F-test.
4. To analyze the data using one- way analysis of variance(ANOVA).
5. To analyze the data using two- way analysis of variance(ANOVA).

Text & References:

- A.M. Mood, F.A. Graybill and D.C. Boes, Introduction to the theory of Statistics, McGrawHill, 1974.
- A.M. Goon, M.K. Gupta, and B. Das Gupta, Fundamentals of Statistics, Vol-II, 1991.
- R.V. Hogg and A.T. Craig, Introduction to Mathematical Statistics, Pearson; 7 edition,2012.
- S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand &Sons, 2002.

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

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DMTH2708	SCIENTIFIC TOOLS FOR RESEARCH	L	T	P	C
Version	Date of Approval	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objective:
The course aims to provide in-depth knowledge of research design and methodology and to train the student in writing a study plan and critically reviewing scientificlitterature.

Course Outcomes:
On completion of the course, the student should be able to:
CO1:Searchliterature review, different scientific research designs and methods
CO2: understand about the various software like MS word, LaTex, Mendeley, Jabref etc.
CO3: Understand correct ways to refer to and cite from scientific literature.
CO4: prepare a Latex document, to make scientific article and project report.

Modules		
Module I: Introduction about the journal, conferences, books, books proceedings, Introduction about the literature, literature search, how to download literatures, reviewing the literatures.		
Module II: Introduction of LaTex, Installation of Latex, Required Components of a LATEX Document, Document Structure: Page Numbering and Headings, Creating title page, Abstracts, Sections, subsection upto level 3, Cross-References, Table ofContents.		
Module III: Mathematical Typesetting: Equations, Tables,figures, Bibliography, Hyperlinking. Application: CV writing, Journal/conference templates, book writing.Presentation: Introduction of beamer, frame, blocks, style, fonts, colour, Wrap figure withtext, Minipage, footnote.		
Module IV: Introduction about the references/ Biblography, Introduction of the Jabref/Mendeley for the references formation in documents,		

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

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DMTH2739	BASICS OF RESEARCH METHODOLOGY, ETHICS, AND RESEARCH COMMUNICATION	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description

This course aims to provide students with a comprehensive understanding of conducting ethical research, utilizing proper research methodologies, and effectively communicating research findings. The course includes a final project where students will write a Literature Review on a topic chosen in consultation with the teacher(s).

This course is designed to equip students with essential skills and knowledge to conduct ethical research, employ proper research methodologies, and effectively communicate scientific information (with focus on writing a literature review). The course will cover topics such as research design, data collection and analysis, research ethics, and science communication strategies. Through a combination of lectures, discussions, case studies, and practical exercises, students will develop a deeper understanding of the research process and its ethical implications.

Course Objectives

The objective of this course is to impart knowledge about various stages of research process, research ethics and different ways of research communication.

The aim of this course is to impart research skills to the beginners and help to improve the quality of research by the existing researchers. It also encompasses the understanding and application of appropriate research design, statistics, and the use of the computer for reference management, report writing, research paper writing and presentation. The course also introduces the key conceptual issues of each research method, as well as giving practical guidance. It covers the series of research methodology contents: from problem formulation, to design, to data collection, analysis, reporting and dissemination. The course has the dual aims of equipping students with conceptual understandings of current academic debates regarding different methods, and the practical skills to put those methods into practice.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define criteria of good research, steps in research process, and data collection.
CO2. Identify different types of sampling and its purpose.
CO3. Conduct hypothesis testing for different types of samples and interpret the results.
CO4: Learn the importance of literature review, write research paper/thesis, use reference management software.

Course Content :

Module	Topic	**Blooms level***	Hours
1	**Research Methodology** Understanding the research process: From research questions to conclusions	L1, L2	10

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	Types of research: Qualitative and quantitative research Exploratory, descriptive, experimental, and correlational studies Scientific Thinking: Subjective Vs. Objective Thinking Logical Reasoning: Inductive Vs. Deductive Reasoning Formulating research hypotheses and objectives Purpose of a good research, Criteria of good research		
2	**Descriptive Statistics** Data, Types of Data, Methods of data collection, Benefits and drawbacks, Graphical representation of data and interpretation. Measures of Central Tendency: Arithmetic Mean, Median, Mode, Measures of Dispersion: Range, Standard Deviation, Variance, Coefficient of Variation.	L1, L2, L3	15
3	**Inferential Statistics** Sampling: Basic concepts, Process of Sampling, Sample Size, Types of Samples, Sampling and non- sampling errors, Statistics and Parameters, Sampling Distribution of Means and Proportion, **Hypothesis Testing**, steps in testing of hypothesis, errors in hypothesis testing, z test and t test.	L1, L2, L3	15
4	**Research Ethics** Plagiarism, Fabrication, Falsification, Ethics with respect to human and Animal Research	L1, L2	5
5	**Communication** Characteristics of a good Research paper, Systematics Literature Review (choosing a topic, preparing outline, gathering authentic & appropriate references, avoiding plagiarism, use of reference management systems), Writing a good literature review, Structure of report (Introduction, Methodology, Analysis, Results, Discussions, Conclusions, Recommendations), Writing Quality Research Paper, Publishing Research Work in Quality Journals, Reference Management Software	L1, L2, L3	15

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional Exam	End Term Examination
Weightage (%)	5	10	15	70

Project based assignment: Student teams (2-3 students per team) will write a literature review on a topic of choice, in consultation with the teacher.

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Text books/ Reference books

- Research Methodology for Natural Sciences by Soumitro Banerjee, Publisher: IISc Press (1 January 2022); ISBN-10: 8194835178; ISBN-13: 978-8194835172
- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt. Ltd., New Delhi-110001
- Geode, Millian J.& Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Kothari, C.R.2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.
- Levin R I., Rubin D S. Statistics for Management. Sixth Edition, PHI
- Kapoor & Gupta. Probability & Statistics. S Chand Publishers, New Delhi.
- Montomery, Douglas C.(2007), 5th Ed. Design and Analysis of Experiments, Wiley India.
- Cooper, Donald R. and Pamels Schindler, Business Research Methods, Tata McGraw Hills, New Delhi
- Krishnaswamy, K.N. Sivakumar. Appa lyer and Mathiranjan M. 2006, Management Research Methodology: Integration of Principles, Methods and Techniques, Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Sachdeva, J.K. 2008. Business Research methodology. Himalaya Publishing House, New Delhi.
- Shekharan, Uma, Business Research Methods, Miley Education, Singapore.
- Zikmund, Millian G., Business Research Methods, Thomson Learning, Bombay.

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SEMESTER-VIII

DMTH2801	ADVANCED COMPLEX ANALYSIS	L	T	P	C
Version 1.1	Date of Approval: 2017	3	1	0	4
Pre-requisites/Exposure	Basic properties of Complex variable				
Co-requisites					

Catalog Description

This course is intended for giving knowledge of the basic concepts of complex variable and its properties, complintegration and describes the real integrals applications. To acquaint the students with the fundamental concepts analyticity and make them capable of to solve any given related problems. To describe the conformal mapping and applications to daily life problems likes' steady temperature, electro static potential, two dimensional fluid flows, a stream function problems. It gives the exposure of the applications of residue/contour integration like Poisson integrformula, and Dirichlet problem in the unit disc.

Course Objectives

The objective of this course is to:

- Acquaint the students with the mathematics involved in basics of complex numbers, analytic function, complintegration, theorem.
- Get them familiar with various important applications in evaluating real integrals.

Course Outcomes

On completion of this course, the students will be able to:

CO1. Define the basic concepts of analytic function and their properties with examples.

CO2. Describe the students the fundamental concepts of complex integration such as Cauchy's Integral Formula (CIF) atheir properties. Also application of CIF: Cauchy Inequality, Liouville's Theorem, Fundamental Theorem of Algebra.

CO3. Describe the conformal mapping and its applications: Bilinear Transformations and mappings from disc to disc, dito half plane, and half plane to half plane

CO4. Apply Cauchy's integral theorem to compute line integrals. Define Taylor's, Laurent series and to determine residuof function. Use the residue theorem to compute several kinds of real integrals.

Course Content

Modules	Blooms level*	Number of hours

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Module 1: Review of Analytic Functions Complex Number, Limit, Continuity and Differentiability of Complex Functions, Branches of Multiple-valued Functions, Sequences and Series of Complex Number, Analytic functions: C-R equations; Sufficient Condition for Analyticity, Analyticity of Elementary Functions, Conjugate Function, Laplace's Equation, Harmonic Functions, Milne-Thomson's Method, Simply and Multi-ConnectedRegion, Line Integral, Cauchy's Theorem and its Application in Line Integral.	L1, L2 and L3	10
Module 2: Complex Integration Cauchy's Integral Formula, Cauchy's Integral Formula for Derivative and higher order Derivative; Morera's Theorem, Cauchy Inequality, Liouville's Theorem, Generalized version of Liouville's Theorem, Picard's Theorem, Fundamental Theorem of Algebra, Uniqueness Theorem and Identity Theorem, Maximum Modulus and Minimum Modulus Theorem, Schwarz's Lemma and Examplesbased on the above all Theorems.	L1, L2, L3	14
Module 3: Bilinear Transformations and Power Series Bilinear Transformations, Cross Ratios, Fixed Point Invariants; Standard Forms of Bilinear Transformations: Translation, Rotation, Magnification, Inversion; Mappings from: Disc to Disc, Disc to half Plane, and half Plane to half Plane, Mappings of Standard Transformations and their Applications. Conformal Mappings and its Properties. Power Series: Radius of Convergence of Series, Expansion of Complex Function, Operations on Power Series, Taylor's Theorem and Laurent's Theorem (with proof and examples).	L1, L2, L3, L4	12
Module 4: Residues and Evaluation of Real Integrals Classification of Singularities, Residue: Residue at Pole, Cauchy's Residue Theorem and its applications in Evaluating Real Integrals, Improper Integrals, Evaluation of a Real Integral round the Unit Circle, Improper Integrals involving Elementary Functions, Argument Principle, Rouche's Theorem. Meromorphic functions and it Properties and Riemann Mapping Theorem (without proof).	L1, L2 L3, L4	12

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluatio*

Text Books:

- T.W Gamelin, Complex Analysis, Springer-Verlag, 2001
- S. Lang, Complex Analysis, Springer-Verlag, 2013.

Reference Books:

- S. Ponnusamy and H. Silverman, Complex Variables with Applications, Springer, 2006.
- S. Ponnusamy, Foundations Of Complex Analysis, Narosa Publication, New Delhi, 2002.
- R.V. Churchill and J.W. Brown, Complex Variables and Applications, 5th edition, McGraw Hill, 199
- J. B. Conway, Functions of one complex variable- I & II, Narosa Publishing, 2000.
- J. B. Conway, Functions of one complex variable, Narosa Publishing, 2000.S. Ponnusamy, H. 6Gamelin, T. W., Complex Analysis, Springer-Verlag, 2001.

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	1							1			
CO2	1	1			-	-			1			
CO3	1	1			-				1			
CO4	1	1							1			

1: strongly related, 2: moderately related and 3: weakly related

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DMTH2802	FRACTIONAL CALCULUS	L	T	P	C
Version	Date of Approval:2022	3	1	0	4
Pre-requisites/ Exposure	Nil				

Course Objectives:

1.To study special functions and their properties.
2 To study Riemann–Liouville differential and integral operators.3 To study Caputo fractional derivative.
4 To examine existence and uniqueness for Riemann–Liouville fractional differential equations.5 To find exact solution of some fractional differential equations.
6 To use numerical methods to find approximate solution of fractional differential equations. 7 To recognize some new nonclassical definitions of fractional derivatives and integrals.

Course Outcomes: On successful completion of this course unit students will be able to:
CO1:Master the basic concepts of some special functions.
CO2: List some properties of Riemann–Liouville fractional derivative and integral.
CO3: Define Caputo and Grunwald–Letnikov Operators.
CO4: Recognize some new nonclassical definitions of fractional derivatives and integrals.
CO5: Find Laplace transform of fractional derivatives.

Catalog Description

The course introduces basic concepts of fractional calculus and the concepts associated Special Functions of the Fraction Calculus, Riemann–Liouville Differential and Integral Operators, Grunwald– Letnikov Operators, Definition and Bas Properties of Caputo Fractional Derivative, Mittag-Leffler Functions, Existence and Uniqueness of Fractional Different Equations (FDEs), Exact and Numerical Solution of FDEs, Nonclassical Definitions of Fractional Derivatives and Integra

Course Content

Modules	Blooms level*	Number of hour

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Module I Gamma Function: Definition of the Gamma function, Some properties of the Gammafunction, Limit Representation of the Gamma function, BetaFunction, Contour Integral Representation, Contour Integral Representation of $\frac{1}{\Gamma(z)}$. Mittag-Leffler Function: Definition and Relation to some other functions, The Laplace transformation of the Mittag-Leffler Function in two parameters, Derivative of the Mittag-Leffler Function, Differential Equations for the Mittag-Leffler Function, Summation Formulas, Integration of the Mittag-Leffler function.	L1, L2, L3, L4, L6	10
Module-II: GrunwaldLetnikov Fractional derivatives: Unification of Integer-order Derivativesand integrals, Integrals of Arbitrary Order, Derivatives of Arbitrary order, Fractional Derivativeof Composition with integer-order Derivatives, Composition with Fractional Derivatives.consequences. Normed Spaces of Operators. Dual S.	L1, L2, L3, L4, L6	12
Module-III: Riemann Liouville Fractional Derivatives: Unification of integral-order Derivatives and Integrals,Integrals of ArbitraryOrder, Derivatives of Arbitrary Order Composition with Integer-Order Derivatives, Composition with Fractional Derivatives, Link oftheGrtunwald-letnikov Approach, Caputo's Fractional Derivative, Generalized Functions Approach, Sequential Fractional Derivatives, Leftand Right Fractional Derivatives.	L1, L2, L3, L4, L6	14
Module-IV: Properties of fractional Derivatives:Linearity, The Leibniz Rule for Fractional Derivatives,Fractional Derivative of a CompositeFunction, Riemann Liouville fractional Differentiation of anIntegral depending on a Parameter, Behaviour near the Lower terminal, Behaviour far from the Lower terminal.	L1, L2, L3, L4, L6, L5	12

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text & References:

1. K.S. Miller and B. Rose, An Introduction to the Fractional Calculus and Fractional Differential Equations, JohnWiley & sons Inc., New York, 1993.
2. Igor Podlubny, Fractional Differential Equations, Academic Press, USA,1999.

3 OLDHAM, Keith B., SPNIER, Jerome. The Fractional Calculus. London: Academic Pressc1974.

References:

1. J. Hadamard. Lectures on Cauchys problem in Linear Partial Fractional Equations. Yale Univ. press, New haven,1923.
2. A. Carpinteri and F. Mainardi (eds.), Fractals and Fractional Calculus in Continuum Mechanics, Springer verlag,Vienna-New York, 1997.

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Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	1	1	1	1	1	1	1	1	2	2
CO2	1	1	1	1	1	1	1	2	1	2	2
CO3	1	1	1	1	1	1	1	2	1	1	2
CO4	1	1	1	1	1	1	1	1	1	2	2
CO5	1	1	2	2	1	1	1	1	1	2	2

1: strongly related, 2: moderately related and 3: weakly related

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DMTH2803	FLUID DYNAMICS	L	T	P	C
Version 1.1	Date of Approval: 2012	3	1	0	4
Pre-requisites/Exposure	Basic Knowledge of Vector Calculus				
Co-requisites					

Course Description

The course of fluid dynamics is an interdisciplinary and widely used by scientist as well as engineers.

Course Objectives

- Fluids have the ability to transport matter and its properties as well as transmit force.
- Develop fundamental knowledge and understanding of the mechanics of fluid both at rest and in motion.

Course Outcomes

On completion of this course, the students will be able to

CO1. Describe Concept of fluid and its physical properties

CO2. Explain General theory of stress for Newtonian Fluid

CO3. Discuss the velocity potential, Irrotational flow, Some theorems about rotational and irrotational flows, Stoketheorem, Kelvin's minimum energy theorem, Gauss theorem, Kelvin's circulation theorem.

CO4. Discuss Incompressible viscous fluid flows

Course Content

Modules	Blooms level*	Number of hours
Module-I Definition: Fluid, Fluid Dynamics, Stress (shear stress and normal stress), strain, viscosity (dynamic and kinematic). Variation of viscosity with temperature for liquids and gases. Continuum hypothesis, No-slip boundary condition, application areas of fluid dynamics. Kinematics: Different types of forces: Viscous and inertial forcesSome common non-dimensional parameters and their physical significance: Reynolds number, Froude number and Mach number.	L1, L2, L3	10
Module-II: Newton's law of viscosity, Classification of fluids:	L1, L2,	12

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Newtonian and Non-Newtonian fluid, compressible and incompressible fluid. Inviscid , ideal and real fluid. Different types of flow: Uniform and non-uniform, steady and unsteady, rotational and irrotational flow, Laminar, Turbulent and Transient flow. Flow description: Eulerian and Lagrangian description of fluid motion. Fluid element trajectories: Streamline, pathline, streakline, timeline.	L3	
Module-III: Introduction to Tensors: Definition, rank of tensor, Einstein notation or indical notation, free and dummy indices. Vector operations and calculus operations using index notation (Einstein notation). Cauchy stress tensor, deviatoric stress tensor, volumetric stress tensor. Deformation of fluid-elements: derivation of rate of translation vector, rate of rotation, vorticity vector, linear strain rate, strain rate tensor, deformation tensor.	L1, L2,L3	14
Module-IV: Bernoulli's equation - assumptions and applications. Differential Analysis: Differential equations of mass and momentum for incompressible flows: inviscid - Euler equation and viscous flows - Navier-Stokes equations, concept of fluid rotation, vorticity, stream function, Exact solutions of Navier-Stokes equation for Couette Flow and Poiseuille flow.	L1, L2, L3, L4	12

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluatio*

Text Books:

1. S. W. Yuan, Foundations of Fluid Mechanics, Chapters- 1, 3, 4, 5, 6, 7, 8.
2. R. K. Rathy, An Introduction of Fluid Dynamics, Oxford and IBH Publishing company, New Delhi, 1976.

Reference Books:

1. G. K. Betchelor, An Introduction of Fluid Mechanics, Oxford University Books, New Delhi, 1994.
2. F. Charlton, Text Book of Fluid Dynamics, C.B.S. Publishers, Delhi. 1985

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2										1

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CO2	**1**	**2**										**1**
CO3	**1**	**2**										**1**
CO4												

1: strongly related, 2: moderately related and 3: weakly related

DMTH2804	**FUNCTIONAL ANALYSIS**	L	T	P	C
Version	Date of Approval:2017	3	1	0	4
Pre-requisites/Exposure	Metric space ,normed space, vector space.				
Co-requisites	None				

Catalog Description

The course introduces basic concepts of functional analysis and the concepts associated with the dual of a linear spaceStudent will learn the basic properties of norm (Banach) and inner product (Hilbert) spaces as well as fundamentals linear operator theory. They will also develop an understanding to use these concepts in various mathematical application in pure mathematics such as representation theory

Course Outcomes:

On successful completion of this course unit students will be able to:

CO1. Explain basic concepts and results in functional analysis.

CO2. Describe duality in various contexts and theoretical results from the course in concrete situations and theapplications appearing

CO3. Compute examples and counterexamples illustrating the mathematical concepts presented in the course.

CO4. Solve an important theorems and be able to explain the key steps in proofs, sometimes with variation and develop skills in applying the techniques of the course to unseen situations.

Course Content:

Modules	**Blooms level***	**Number of hours**

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Module-I: Prerequisites for the Course: Metric Space Further Examples of Metric Spaces Open Set, Closed Set, Neighborhood Convergence, Cauchy Sequence, Completeness Examples. Completeness Proofs Completion of Metric Spaces. Vector Space, Further Properties of Vector spaces	L1, L2,L3	12
Module-II: Normed linear spaces, Banach spaces Further Properties of Normed Spaces. Finite Dimensional Normed Spaces and Subspaces . Compactness and Finite Dimension continuous linear transformations, equivalent norms Bounded and Continuous Linear Operators .Linear Functionals Linear Operators and Functionals on Finite Dimensional Spaces, Normed Spaces, the Hahn-Banach theorem and its consequences. Normed Spaces of Operators. Dual Space	L1,L2 L3	12
Module-III: Conjugate space and second conjugate space .The open mapping Theorem, The closed graph theorem, The conjugate of an operator, The uniform boundedness principle, Definition and examples and simple properties of Hilbert spaces	L1, L2 L3, L4, *L5*	10
Module-IV: Orthogonal complements, The projection theorem, orthogonal sets, The Bessels inequality, Fourier expansion and Parseval's equation, separable Hilbert spaces, The conjugate space, Riesz's theorem, The adjoint of an operator, Self adjoint operators, Normal and unitary operators, Projections, The spectral theorem on a finite dimensional Hilbert space.	L1, L2,L3, L4 , *L5*	14

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluatio*

Text Books

1. G.F. Simons, Introduction to Topology and Modern Analysis, McGraw Hill, 2004.
2. S. Ponnusamy S., Foundation of Functional Analysis, Narosa Publication, 2002.
3. P.K. Jain and O.P. Ahuja, Functional Analysis, New Age International Publishers, 2010.

Reference

1. M.T. Nair, Functional Analysis: A First Course", PHI Pvt. Ltd, 2004.
2. J.B. Conway, A Course in Functional Analysis", Springer - Verlag, New York, 1990.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

CO, PO and PSO mapping

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	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**1**								**1**			
CO2	**1**								**1**			
CO3	**1**								**1**			
CO4	**1**								**1**			

1: strongly related, 2: moderately related and 3: weakly related

DMTH2806	**NUMERICAL SOLUTIONS TO DIFFERENTIAL EQUATIONS**	L	T	P	C
Version	Date of Approval: 2017	3	1	0	4
Pre-requisites/Exposure	Basic Numerical Analysis				
Co-requisites					

Catalog Description: The problems in Numerical solution of equations are the most important and common application ofMathematics. The main aim of this course is to present different methods of solving ordinary and partial differential equations like, linear and non linear differential equations, heat equation, Laplace equation using Numerical methods anMATLAB. In addition to the theoretical treatments, there will be some introduction to numerical methods by using MATLAB.

Course Objectives:
The course covers few classical and contemporary methods for solving initial and boundary value problems. Different finite difference operators and their application to solve various types of Partial Differential Equationsshall be introduced in the course.

Course Outcomes:
On successful completion of this course unit students will be able to:
CO1. Illustrate the concept of solution of Linear & Non-linear equations using Numerical methods.
CO2. Describe the concept of solution of ordinary differential equations by different numerical methods.
CO3. Explain the concept of using MATLAB for solving different equations.
CO4. Compute the error approximations and solution of specific equations.

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Course Content

Modules	Blooms level*	Number ofhours
Module-I: Iterative solvers for nonlinear equations and system of linear equations: Iterative method and Newtons method for system of nonlinear equations; Iterative methods to solve system of linear equations including Gauss-Seidal and Jacobis method with pivoting; Concept of norms and condition number; Application of these methods for test problems using MATLAB codes.	L1, L2,L3, L4, L5	13
Module-II: Initial value Problems Single-step methods: General definitions and Lipschitz condition, Derivations and stability analysis for Taylor series method, Eulers method and its variants, RungeKutta second order and fourth order	L1,L3, L4, L5	11

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methods; Implementation of these methods for various test problems using MATLAB.		
Module-III: Initial value Problems Multi-step methods: General definitions and derivations of Adams Bash-forth, Adams Moulton methods, Predictor-corrector method; stability analysis of these methods and application of these methods for some test problems using MATLAB.	L1, L2 L3, L4, *L5*	12
Module-IV: Introduction to Finite difference methods General concepts of truncation error and stability for a finite difference scheme; Numerical solution of one-dimensional heat equation, including Explicit Euler, Backward Euler, Crank-Nicolson schemes with various type of boundary and initial conditions; Laplace Equations and Poissons equations with different type of boundary and initial conditions.	L1, L2,L3, L4 , *L5*	12

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1								1			
CO2	1								1			
CO3	1								1			
CO4	1								1			

1: strongly related, 2: moderately related and 3: weakly related

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DMTH2805	TOPOLOGY	L	T	P	C
Version	Date of Approval:2017	3	1	0	4
Pre-requisites/Exposure	Basic Set theory				
Co-requisites	None				

Catalog Description

Topology is a modern branch of geometry. It serves to lay the strong foundations of concepts for study in analysis andgeometry. It is also a prerequisite for many concepts related to Analysis. The course is designed to develop understanding of topological ideas & techniques and their role in analysis.

Course Objectives:

Students will learn:

- The fundamentals of point-set topology and algebraic topology.
- Countability and separation axiom, compactness and connectedness.

Course Outcomes:

On successful completion of this course unit students will be able to:

CO1. Define and illustrate the concept of topological spaces and continuous functions,

CO2. Define and illustrate the concept of product topology and quotient topology, connectedness and compactneand prove a selection of related theorems.

CO3. Explain theorems concerning topological spaces, continuous functions, product topologies, and quotietopologies,

CO4. Describe the concepts of the separation axioms, connectedness and compactness.

Modules	Blooms level*	Number of hours
Module I: Definition and examples of topological space Base and sub base for a topology, Subspaces and relative topology, Closed sets, Neighbourhoods, interior, exterior, boundary, contact and limit points of sets, derived sets, dense sets and nowhere dense subsets. Alternate methods of defining a topologyin terms of Kuratowski Closure Operator and Neighborhood Systems, Homeomorphism:Definition and properties of continuous function, open functions, closed functions, Homeomorphisms uniform continuous functions. Product spaces:Box topology, weak topology, Tychonoff topology	L1, L2,L3	12

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Module II: Countability and Separation Axiom First and Second Countable spaces, Lindeloff spaces, Separable spaces. Their relationship among themselves and other basis properties, To, T1, T2, regular and T3, completely regular and T3½, normal and T4 separation axioms, their Characterizations and basic properties. Urysohn's lemma. Tietze extension theorem.	L1,L2 L3	10
Module III: Compactness Continuous functions and compact sets. Basic properties of compactness. Compactness and finite intersection property, Sequentially and countable compact sets. Compactness in metric spaces. Equivalence of compactness, countable compactness and sequential compactness in metric spaces. Tychonoff's Product Theorem. Local compactness, Compactification, one point and Stone - Cech compactification	L1, L2 L3, L4, *L5*	14
Module IV: Connected Spaces Separated sets, Connected and disconnected sets, continuity and connectedness, components, totally disconnected spaces, Connectedness and the real line, locally connected spaces.	L1, L2,L3, L4 , *L5*	12

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluatio*

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

Text Book

- R. Munkres, Topology, A First Course, Pearson. N. Delhi, 2000.
- W. J. Pervin, Foundation of General Topology, Academic Press Inc., New York, 1964

Reference Books:

- N. Bourbaki, Topology I and II, Springer Verlag, New Delhi
- S. Willard, General Topology, Addison-Wesley, Reading, 1970. Reprinted by Dover
- J. Dugundji, Topology, Allyn and Bacon, 1966 (Reprinted in India by PHI).
- J. L. Kelley, General Topology, D Van Nostrand Reinhold Co. New York 1955 (Reprinted by Springer VerlaNew York.
- K D Joshi, Introduction to General Topology, New Age International (p) Ltd, 1983
- L. A. Steen and J ASeebach, Counter Examples in Topology, Holt, Reinhart and Winston, Inc. New York, 1970.

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CO, PO and PSO mapping

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CO1	1	2										3
CO2	1	2										1
CO3	1	2										1
CO4	1	2										2

1: strongly related, 2: moderately related and 3: weakly related

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DMTH2807	NATURE INSPIRED OPTIMIZATION TECHNIQUES	L	T	P	C
Version		3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objective:

The problems in optimization are the most common applications of mathematics. The main aim of this course is to solve different types of optimization problems using algorithms that are inspired by naturally occurring phenomena. This will be done primarily through the knowledge of evolutionary computation and swarm intelligence.

Natural Computation is the study of computational systems that use ideas and get inspiration from a variety of natural systems. Describe different nature-inspired search and optimization methods and explain how they are applied to solve real world problems.

Course Outcome:

- Understand the need of optimization and its different types.
- Understand the working of Nature inspired algorithm.
- Understand and implement classic and nature inspired optimization algorithms.
- Evaluate the performance of algorithm by implementing it.

Course Contents:

Module I:

Introduction to Algorithms and Optimization Introduction to algorithm, fundamental of Optimization, Types of optimization problems, example of optimization, formulation of optimization problem and classification of optimization algorithm, Classical optimization algorithm like graphical, simplex method, Overview of dynamical and integer programming. applications of nature inspired optimization algorithm. Travelling salesman Problem

Module II: Introduction to Metaheuristic and Evolutionary algorithm

Difficulty with classical optimization problem, Metaheuristic algorithm, Single solution-based metaheuristics, Population based metaheuristic, Evolutionary algorithm,

Module III: Optimization Schemes

Basics of Particle Swarm optimization (PSO), Basics of Genetic Algorithm, example of PSO and GA. Application of different optimization algorithms.

Module IV: Case studies

Unimodal Benchmark Function, Multimodal Benchmark function, Application of GA and PSOon real life problems like welded beam problem, spring design problem, pressure vessel problem

Examination Scheme

Components	A	CT	S/V/Q	HA	EE

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Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE:End Semester Exam, A: Attendance

References:

- Kochenderfer, M. J., & Wheeler, T. A. (2019). Algorithms for optimization. Mit Press.
- Yang, X. S. (2020). Nature-inspired optimization algorithms. Academic Press.
- Kumar, K., & Davim, J. P. (Eds.). (2019). Optimization using evolutionary algorithms and metaheuristics: applications in engineering. CRC Press.
- Deb, K. (2011). Multi-objective optimisation using evolutionary algorithms: an introduction. In Multi-objective evolutionary optimisation for product design andmanufacturing (pp. 3-34). London: Springer London.
- Evolutionary Optimization Algorithms by Dan Simon Latest Edition, Wiley
- Nature Inspired Optimization Algorithm by Xin-She Yang First Edition, Elsevier
- Swarm Intelligence and Bio-Inspired Computing by Yang , Cui, XIao, Gandomi, Karamanoglu First Edition, Elsevier.

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DMTH2839	DATA ANALYSIS & VISUALISATION USING SOFTWARE	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	Class X Mathematics				
Co-requisites					

Catalog Description

The implosion of available data has made visualization more critical but also more challenging. Data analysis and Data Visualization are essential tools for business analysis, engineers, policymakers, and decision-makers. Developed originally for "small data", visualization techniques have been met with varied success in the past centuries and decades. There are a few well-known visualizations that are very effective in capturing the essence of the data, and of course, there are many infamous negative examples of poor visuals. An effective visual is critical for decision making it, but it also requires a lot of work, customization, attention to detail, and refinements.

Course Objectives

The course is designed to help students develop skills and knowledge in the following area(s):

- Develop an understanding of what is a good visualization for a given purpose
- Learn visualization theory & techniques
- Build a substantial data analytic project
- Apply data analysis and visualization with Excel, SPSS, R, Python, NVivo and MATLAB

Course Outcomes

On completion of this course, the students will be able to

CO1. Students will be able to articulate meaningful lines of inquiry that might be explored through the collection, organization, visualization, and analysis of data in a context associated with their primary field of study using (as appropriate) numerical, textual, spatial, and/ or visual data.

CO2. Student will understand what data are, how they are collected, and how to assess the quality/ reliability of data.

CO3. Students will demonstrate intermediate proficiency in the visualization of data to communicate information and patterns that exist in the data.

CO4: Students will be able to use at beginning level of proficiency the tools of statistics and machine learning to ask questions of and explore patterns in data.

Course Content :

Module	Topics Covered	Blooms Level	Contact Hours
1	**Module-1: Introduction to Excel** Data Analysis using Excel, Curve fitting, Correlation, Linear Regression, Multiple regression, Principal Component Analysis and Factor Analysis, Hypothesis testing	L1, L2, L3, L4	20 hours

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	Introduction to Excel and SPSS Introduction to SPSS and Types of Data, Importing, exporting and data handling in SPSS; Exploratory data analysis using SPSS and data visualization; Introduction to statistical inference and various univariate tests by using SPSS; Analysis of Variance (One Way ANOVA, Two Way ANOVA and ANCOVA); Correlation, Simple and Multiple linear Regression Analysis; Principal Component Analysis and Factor Analysis		
2	**Module-2: VOS Viewer** **Web of Science, Scopus, Dimensions, Lens, and PubMed.** Co-authorship networks, citation-based networks, and co-occurrence networks can be created based on data downloaded from Web of Science, Scopus, Dimensions, and Lens. Co-authorship networks and co-occurrence networks can also be created based on PubMed data. **Crossref, Europe PMC, and OpenAlex**. Networks can also be created based on data retrieved through the APIs of Crossref, Europe PMC, and OpenAlex, These APIs can be queried interactively in VOS viewer. **Semantic Scholar, Open Citations, and Wiki Data.** For a given set of DOIs, networks can also be created based on data retrieved through the APIs of Semantic Scholar, Open Citations and Wiki Data.	L1, L2, L3, L4	10 Hours
3	**Faculty of Management Studies & Behavioural Sciences** **Module 3: Domain Specific Software** **- Structural Equation Modelling** **Smart PLS** Introduction to Structural Equation Modelling (SEM), Introduction to the software's AMOS and SPSS, SMART PLS, Testing of Statistical assumptions, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), common method bias (CMB) test, Measurement Model Assessment, Discussing Fit Indices, Reliability and Validity Testing, Structural Model Assessment identifying multivariate outlier, Construct Validity: Convergent and Discriminant Validity, Measurement Model & Structural Equation Modelling, Mediation and Moderation Effects, Multi-Group Analysis.	L1, L2, L3, L4	30 Hours

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	Faculty of Arts **N Vivo** 1. Import text, audio, video, emails, images, spreadsheets, online surveys, web content, and social media from various sources into a simple, intuitive interface. 2. Create and NVivo project, import and organise qualitative and quantitative data 3.Manage a literature review in NVivo 4. Autocode structured data deductively and identify themes inductively 5. Generate and falsify hypotheses 6. Combine data in sets for analysis 7. Seek patterns and identify relationships across codes and cases 8. Present findings using visualisations 9. Export data out of NVivo 10. Coordinate teamwork.		
	Faculty of Science Engineering and Technology **Faculty of Health & Allied Sciences** **R programming / Python/ MATLAB** **R Programming-** Introduction to R, Variables and datatypes in R, Dataframes, Recasting and joining of dataframes, Arithmetic, logical and matrix operations in R, Functions in R, Control structure in R, Data visualization in R. **Python Programming-** Basics of programming, data structure and algorithm using Python, Strings, lists, control, functions, manipulating lists, loops, arrays, selection sort, insertion sort, recursion, sorting, dictionaries, exception handling, file handling, string processing, data analysis using Python **MATLAB Programming-** Introduction, basic features, managing workspace, mathematical functions, basic plotting, Matrices, array operations and linear equations, MATLAB programming- M files script, M-file functions, control flow and operations.		

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation
Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

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Components	A	CT	Sessional (Theory/ Practical)	End Term Examination
Weightage (%)	5	10	15	70

References:

- David Houcque, 2005. Introduction to MATLAB programming for Engineering students., Northwestern University, E- Book **https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf**
- Mark Lutz, 2009. Learning Python. O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.
- Emmanuel Paradis, 2005. R for Beginners. E book. **https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf**
- A Handbook of Statistical Analysis using SPSS by Dr. Brijesh Awasthi, Redshine Publication.

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NMTH2837	Research Project	L	T	P	C
Version 1.1	Date of Approval: 2017	0	0	0	12
Pre-requisites/Exposure	Basic mathematical knowledge, presentation and writing skills				
Co-requisites					

Course Description

This course deals with both the theoretical and practical aspects of designing dissertation research and successfully defending the design in a proposal hearing. The purpose of the course is to assist studentsthrough the proposal and dissertation writing processes.

Course Objectives

The objective of this course is to:

- Training of students as an independents researcher before entering academics or industries.
- Develop interest for genuine exploration of the unknown that leads to new knowledge whichoften warrants publication.
- Provide exposure of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Course Outcomes

On completion of this course, the students will be able to

CO1. Recognize independent skills of critical investigation

CO2. Explain the problem systematically. They will able to relate problem with available methodologies and evidence.

CO3. Determine appropriate techniques and draw concluding remarks.

CO4. Describe and communicate research concepts and contexts clearly and effectively both in writing and orally.

Course Content

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Modules	Blooms level*	Numb erof hours
GUIDELINES FOR PROJECT FILE AND PROJECT REPORT Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure toresearch methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation. Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student. Sufficient time should be allowed for satisfactory completionof reports, taking into account that initial drafts should be critically analyzed by the faculty guide and corrected by the student at each stage. **PROJECT FILE** The Project File may be a very useful tool for undertaking an assignment along-with a normal semester, an exploratory study, sponsored projects, a project undertaken during summer period or any other period as per curriculae where the researcher is working with a company/organization. The project/ assignment may also bea part of the bigger research agenda being pursued by a faculty/ institution/ department The Project File is the principal means by which the work carriedout will be assessed and therefore great care should be taken in itspreparation. This file may be considered in continuous assessment. In general, the File should be comprehensive and include: **PROJECT REPORT** The Project Report is the final research report that the student prepares on the project assigned to him. In case of sponsored project the layout of the project could be as prescribed by the sponsoring organization. However, in other cases the following components should be included in the project report:	L2,L4,L5,L6	NTCC

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• **Title or Cover Page**
  o The title page should contain Project Title; Students Name; Programme; Year and Semester and Name of the Faculty Guide.
• **Acknowledgement(s)**
  o Acknowledgment to any advisory or financial assistance received in the course of work may begiven. It is incomplete without student's signature.
• **Abstract**
  o A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard tothe objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project. It should not exceed more than 1000 words.
• **Table of Contents**
• Titles and subtitles are to correspond exactly with those in the text.
• **Introduction**
  o Here a brief introduction to the problem that is centralto the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.
• **Materials and Methods**
  o This section should aim at experimental designs, materials used (wherever applicable). Methodology should be mentioned in details including modifications undertaken, if any. It includes organization site(s), sample, instruments used with itsvalidation, procedures followed and precautions.
• **Results and Discussion**
  o Present results, discuss and compare these with those from other workers, etc. In writing this section, emphasis should be laid on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from sectionto section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.		

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Note that in writing the various sections, all figures andtables should as far as possible be next to the associated text,in the same orientation as the main text, numbered, andgiven appropriate titles or captions. All major equations should also be numbered and unless it is really necessary, do not write in "point" form.

While presenting the results, write at length about the various statistical tools used in the data interpretation. The result interpretation should be simple but full of data and statistical analysis. This data interpretation should be in congruence with the written objectives and the inferences should be drawn on data and not on impression. Avoid writing straight forward conclusion rather; it should lead to generalization of data on the chosen sample.

Results and its discussion should be supporting/contradictingwith the previous research work in the given area. Usually one should not use more than two researches in either case ofsupporting or contradicting the present case of research.

- **Conclusion(s) &Recommendations**

  A conclusion should be the final section in which the outcome of the work is mentionedbriefly. Check that your work answers the following questions:

  Did the research project meet its aims (check back to introductionfor stated aims)?

  What are the main findings of the research?Are there any recommendations?

  Do you have any conclusion on the research process itself?

- **Implications for Future Research**

  This should bring out further prospects for the study either thrown open by the present work or with the purpose of making it more comprehensive.

- **Appendices**

  The Appendices contain material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

- **References**

References should include papers, books etc. referred to in the body of the

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report. These should be written in the alphabetical order of the author's surname. The titles of journals preferably should not beabbreviated; if they are, abbreviations must comply with an internationally recognized • **The Layout Guidelines for the Project File & Project Report:** A4 size Paper Font: Arial (10 points) or Times New Roman (12points) • Line spacing: 1.5 • Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3cm **ASSESSMENT OF THE PROJECT FILE AND THE PROJECT REPORT** Essentially, the assessment will be based on the quality of the report, the technical merit of the project and the project execution. Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project. Projectexecution is concerned with assessing how much work has been put in. The Project should fulfill the following *assessment to objectives:* • Range of Research Methods used to obtaining formation • Execution of Research • Data Analysis (Analyze Quantitative/ Qualitative information) • Quality Control • Conclusions		

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Evaluation Scheme:

Continuous Evaluation	Final Report	Final Presentation	Supervisor Assessment	Total
30	20	20	30	100

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4
CO1								1			1	
CO2								1			1	
CO3								1			1	
CO4								1			1	

1: strongly related, 2: moderately related and 3: weakly related.

Amity School of Applied Sciences

Bachelor of Science (Honors/ Honors with Research) in Physics

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Curriculum & Scheme of Examination

2023

AMITY UNIVERSITY HARYANA

GURUGRAM

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Bachelor of Science (Honors/ Honors with Research) in Physics
SEMESTER-I

MECHANICS

Course Code: DPHY2151 **Credit Units: 03**

Course Objective:
This course has been so framed that the students are exposed to the topics of conservation laws, dynamics of rigid bodies and inverse-square law of forces in the framework of Newtonian Mechanics. Fluid Mechanics (Surface Tension and viscosity) and elasticity are also included here.

Course Contents:

Module I: Conservation Laws
Coordinate systems and motion of a particle, velocity, and acceleration in Cartesian and Spherical coordinate systems, Solid angle. Frames of reference, Inertial and non-inertial frames, Space-Time Symmetry, Work-Energy Theorem, Conservative and nonconservative forces, Force as a gradient of potential energy, Conservation Laws: Relationship of conservation laws and symmetries of space and time.

Module II: Elastic and Inelastic Scattering
Types of scattering and conservation laws, Laboratory and center of mass systems, the collision of particles that stick together, and General elastic collision of particles of different masses.

Module III: Inverse-Square-Law of Forces
Central and non-central forces, Inverse square force, Centre of mass. Two-body problem – reduced mass, angular momentum in a central force field, Moment of inertia. Flywheel, Theory of compound pendulum and determination of g. Equation of motion under a force law, Newton's Law of Gravitation, Various forces in nature (qualitative)., Orbits and their eccentricity, Kepler's laws., The motion of Geo-synchronous and geostationary satellites, The basic idea of the global positioning system (GPS)

Module IV: Elasticity
Hooke's Law Stress - Strain Diagram - Elastic moduli - Relation between elastic constants - Poisson's Ratio - Expressions for Poisson's ratio in terms of elastic constants - Work done in stretching and twisting a wire - Twisting couple on a cylinder- Rigidity modulus by static torsion - Torsional pendulum - Rigidity modulus and moment of inertia. Cantilever - Expression for bending moment - Expression for depression - Cantilever oscillations - Expression for the time period - Experiment to find Young's modulus - Non-uniform bending - - Uniform bending - Expression for elevation.

Module V: Elementary Fluids Dynamics:
Surface Tension: Definition and dimensions of surface tension - Excess of pressure over curved surfaces - Application to spherical and cylindrical drops and bubbles. *Viscosity*: Co-efficient of viscosity and its dimensions - Rate of flow of liquid in a capillary tube - Poiseuille's' formula, Variation of viscosity of a liquid with temperature - Applications of viscosity. *Fluids* and their properties, Basic kinematics of moving fluids. Ideal fluid in motion, Equation of continuity, Bernoulli's Theorem, The flow of real fluids

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

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Text & References:

- Mathematical Methods for Physics and Engineering: K.F. Riley, M.P. Hobson and S.J.Bence (Cambridge University Press) (1998).
- Mechanics (Berkeley) Physics Course I: Charles Kittle, Walter D. Knight, M. Alvin and A. Ruderman (Tata McGraw Hill) (1981).
- Mechanics: H.S. Hans and S.P. Puri (Tata McGraw Hill) (2003).
- Introduction to Classical Mechanics: R.G. Takwale & P.S.Puranik (Tata-McGraw-Hill) (2000)
- Mechanics and General Properties of Matter by P.K. Chakrabarty - Books & Allied (P) Ltd., 2001.
- General properties of Matter by Newman and Searle
- The Feynman Lectures on Physics, Vol I (Addison – Wesley).

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DEMONSTRATIVE ASPECTS IN MECHANICS

Course Code: DPHY2152 **Credit Units: 01**

LIST OF EXPERIMENTS

Measure length (or diameter) using a Vernier caliper, screw gauge, and traveling microscope.
To determine the Moment of Inertia of a Flywheel.
To determine the value of acceleration due to gravity, g using a Bar Pendulum.
To determine the Coefficient of the Viscosity of water by the Capillary Flow Method (Poiseuille's method).
To determine the elastic Constants of a wire by Searle's method.
To determine the height of a building using a Sextant.
To determine the value of acceleration due to gravity in the laboratory using the Kater pendulum.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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MATHEMATICAL PHYSICS-I

Course Code DPHY2101 **Credit Units: 04**

Course Objectives

This course aims at exposing the students to basic Mathematics which will be useful for them to solve the problems of Physics.

Course Contents:

Module 1 Vector Calculus

Dot and cross product of vectors, Gradient, divergence, and curl, their physical significance, Laplacian, vector identities, Line integral, surface integral and volume integral, Gauss divergence theorem, Stokes theorem.

Module 2 Orthogonal curvilinear coordinates

Orthogonal curvilinear coordinates, line element, gradient, divergence and curl in curvilinear coordinates, Cartesian coordinate system, Polar coordinates, Cylindrical coordinate system, Spherical polar coordinate system.

Module 3 Fourier Series

Periodic functions, Fourier series, Euler‟ 's formulae, Even functions, Half range series, Change of interval and functions having an arbitrary period, Summing of Infinite Series: Parseval Identity, practical harmonics analysis.

Module 4 Special integrals

Beta and Gamma Functions and the Relation between them. Expression of Integrals in Terms of Gamma Functions.

Module 5 Partial Differential Equations

Solutions to partial differential equations, using separation of variables: Laplace's Equation in problems of rectangular geometry. Solution of the wave equation for vibrational modes of a stretched string, rectangular and circularmembranes. Solution of 1D heat flow equation (equation not to be derived).

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Introduction to Mathematical Physics - C. Harper (Prentice-Hall of India).
- Mathematical Methods - M. C. Potter and J. Goldberg (Prentice-Hall of India).
- Vector Analysis - M. R. Spiegel, (Schaum's Outline Series) (Tata McGraw-Hill).
- Tatwiya Padartha Bidyar Bhumika – S. Sengupta, Asok Ghosh and D. P. Roychaudhuri (W.B State Book Board (WBSBB).
- Mathematical Physics – P.K. Chattopadhyay (Wiley Easte)

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SEMESTER-II

THERMODYNAMICS

Course Code: DPHY2251 **Credit Units: 03**

Course Objective:
This course aims to expose the students to the basic laws of thermodynamics and its applications in everyday life.

Course Contents:

Module I: Kinetic Theory
Postulates of Kinetic theory of gases; Pressure exerted by ideal gas; Deduction of Boyle's law, Charles law, Avogadro's hypothesis; Degree of freedom; Law of equipartition of energy; Brownian motion; Specific heat; Relation between Specific heat and degrees of freedom; Specific heat of mono, di, polyatomic gas; Critical constants for a gas; Van der Waals equation of state; Estimation of critical constants and critical coefficient; Reduced equation of state; Mean free path and its derivation, Sphere of influence, Collision cross section; Elementary treatment of transport phenomena.

Module II: Laws of Thermodynamics
Zeroth law of thermodynamics, concept of temperature, Absolute temperature. Thermodynamic processes (isothermal, adiabatic, and isobaric), P-V diagram, and Work done in a thermodynamic process. Ist law of thermodynamics, Reversible and irreversible processes, Examples irreversibility, Carnot's cycle, and Carnot's theorem. The second law of thermodynamics, various statements of the second law, Concept of Entropy, Entropy change in reversible and irreversible processes. Entropy and disorder, Principle of increase of entropy, Entropy and unavailable energy, Entropy of ideal gases, Entropy as a thermodynamic variable, S-T diagram, Maxwell's relations.

Module III: Low Temperature
The third law of thermodynamics, Nernst heat theorem. Cooling produced by adiabatic stretching, adiabatic compression, Liquefaction of gases by Joule-Thomson expansion: thermodynamic analysis, Production of low temperature by adiabatic demagnetization, First order phase transitions: Clausius-Clapeyron equation, Phase transition, Coexistence of phases, Triple point.

Module IV: Transmission of Heat
Modes of heat transmission, Conduction in solids: Lee's disc method, Convection of heat. Radiation: Black body, Black body radiation, Stefan-Boltzmann law, Stefan's constant, Newton's law of cooling, Kirchhoff's law of thermal radiation, solar constant, temperature of the Sun, solar spectrum, distribution of energy in the spectrum of a black body, Planck's quantum theory of radiation (qualitative)

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- A Treatise on Heat: M.N. Saha and B.N. Srivastava (Indian Press, Allahabad, 1972).
- Thermal Physics: C. Kittel & H. Kroemer (CBS Pub.) (1987).
- Thermal Physics: S.C. Garg, R. M. Bansal & C.K. Ghosh (Tata McGraw Hill) (2000).
- Thermal Physics: B.K. Agarwal.
- A Treatise on Heat: M.N. Saha and B.N. Srivastava.
- Heat and Thermodynamics: Brij Lal and N. Subramanyam.

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DEMONSTRATIVE ASPECTS IN THERMODYNAMICS

Course Code: DPHY2252 **Credit Units: 1**

List of Experiments to be performed in Lab Aligned to Thermodynamics

To determine the thermal conductivity of a bad conductor (glass) in the form of a disc using Lee's method.
To determine the Coefficient of Thermal Conductivity of Copper by Searle's apparatus.
To study the variation of Thermo-Emf of a Thermocouple with Difference of temperature of its Two Junctions.

In addition, some of the experiments that can be taken into consideration during the lab are

To determine the Stefan's constant
To determine the Rydberg's constant

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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ELECTRICITY & MAGNETISM

Course Code: DPHY2201 **Credit Units: 04**

Course Objective:
This course aims to teach the students basics of electronics and electric current after making them comfortable with the mathematical tools involved in the study of electricity and magnetism.

Course Contents:

Module-I: Static Electric Fields and Potential
Coulomb's Law, Electric Field, Electric Flux, Gauss's law, Electric Field for Spherical, Plane and Cylindrical Distribution of Charges (applications of Gauss law), Differential form of Gauss's Law; Electric Potential; Potential for Charge Distributions: Equipotential Surfaces, Potential due to Charged Wire and Charged Disc, Energy Associated with Electric Field; Divergence and Curl of Electrostatic Field, Scalar Potential, Poisson's and Laplace equation in Cartesian Coordinates,

Module-II: Electric Fields in Materials:
Review of capacitors, Dielectric Material in an Electric Field, Polarization, Gauss's Law in Dielectric Medium, relation between D, E and P, Displacement Vector, Boundary Conditions on D and E; Dielectric Material between Capacitor Plates, Energy stored in a capacitor having dielectric medium.

Module-III: Electric current and its magnetic effects:
Electric Currents: Charge Transport and Current Density, Equation of Continuity, Ohm's Law in vector form.
Magnetic Field: Divergence of Magnetic Field, Ampere's Law and its Applications to Straight Wire, Solenoid and Toroid; Force on a Charged Particle Moving in Electric and Magnetic Fields, Current Loop and Magnetic Dipoles, Magnetic Dipole Moment. Magnetization; Diamagnetic, Paramagnetic and Ferromagnetic materials; Field of a magnetized Object; bound current; Ampere's law in Magnetized materials.

Module-IV: Basic of Electromagnetism
Faraday's Laws of Electromagnetic Induction, Lenz's Law, Self and Mutual Inductance, Self Inductance for Solenoid, Mutual Inductance of Coupled Solenoids, Energy Stored in the Magnetic Field; Transformer as an application of EMI. Static and time varying field, Ampere's circuital law, Maxwell's equations, significance and applications.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Electricity and Magnetism (Berkley, Phys. Course 2): E.M. Purcell (Tata McGraw Hill) (1981).
- Elements of Electromagnetics : M.N.O.Sadiku (Oxford University Press) (2001).
- Electricity and Magnetism: A.S. Mahajan & A.A. Rangwala (Tata- McGraw Hill) (1988).
- Electricity and Magnetism: A.N. Matveev (Mir)
- Feynman Lectures in Physics, vol.1, Vol.2

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SEMESTER-III
WAVES AND OPTICS

Course Code: DPHY2351 **Credit Units: 03**

Course Overview: Simple Harmonic Motion, Damped Harmonic Motion, Forced Harmonic Motion, Interference by division of amplitude and division of wavefront, Single slit, and N-slit diffraction, Polarization by reflection and double refraction, Nicol prism, Laser, fiber optics.

Course Contents:

Module I: Free and Forced Oscillations

Simple Harmonic Motion: Simple Harmonic Motion and its differential equation. Energy of SHO, amplitude and frequency of SHM. Mechanical simple harmonic oscillator: Mass suspended to spring (Horizontal and vertical vibrations). Damped Harmonic Motion: Damped oscillations, derivation of decaying amplitude. Discussion of three cases viz; over damping, critical damping and under damping. Power dissipation, relaxation time, quality factor. Forced Harmonic Oscillations: Resonance, mathematical formulation of FHO, amplitude resonance, resonant driving frequency, sharpness of resonance. Power absorbed by a forced oscillator, bandwidth of resonance, quality factor of FHO. Standing and progressive waves.

Module II: Interference

Spatial and temporal coherence. Division of wavefront (Fresnel's Biprism). Division of amplitude (Newton's Rings). Michelson Interferometer. High reflection, and antireflection coatings.

Module III: Diffraction

Types of Diffraction, Fraunhofer diffraction by a single slit. Fraunhofer diffraction by N- Slits, Grating spectra, Absent spectra. Dispersive power and Resolving Power of grating.

Module IV: Polarization

Polarization by refraction and reflection. Double refraction, Nicol prism, Quarter and half wave plates, Polarimetry; Optical and specific rotation, Laurent's half shade polarimeter, Applications of polarization.

Module V: Laser and Fiber Optics

Spontaneous and stimulated emission, Einstein Coefficients, Laser action, Characteristics of laser beam, Types of lasers, He-Ne laser, Laser applications (Manufacturing, medical, metrology, communication, data storage etc.) Concept of optical fibers, Propagation of light in optical fiber, Numerical Aperture, Types of fibers (single and multimode), V-number, Attenuation, and dispersion in fibers

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Textbook of Vibrations and Waves: S.P. Puri (Macmillan India) (2004)
- The Physics of Vibrations and Waves: H.J. Pain (Wiley and ELBS, 1976)
- Waves and Oscillations - Rathin N. Chaudhury (New Age Publ.).
- Waves- J R Crawford (Tata McGraw Hill)
- D.J.Griffith, Introduction to Electrodynamics, (Prentice Hall Publ., 2013)
- Ghatak, Optics (Tata McGraw-Hill Publ., 2015)
- R. Resnik, D. Halliday, and J Walker, Fundamentals of Physics (Wiley; 7th Edition, 2004)
- Ghatak and **S.** Lokanathan, Quantum Mechanics: Theory and Applications, (Springer Netherlands,2004)
- Beiser, Concepts of Modern Physics, (McGraw-Hill, 2003)

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DEMONSTRATIVE ASPECTS IN WAVES AND OPTICS

Course Code: DPHY2352 **Credit Units: 01**

Course Objective:
The objective of the course is to enable students to understand the aspects of Optics and Waves. This will enable students to demonstrate the conceptual knowledge through various experiments in Laboratory.

Course Contents:
List of Experiments to be performed in Lab
To determine the wavelength of sodium light by Newton's ring apparatus.
To determine the dispersive power of material of prism with the help of spectrometer.
To determine the specific rotation of sugar solution by Bi-quartz or Laurent half shade polarimeter.
To determine the wavelength of prominent spectral lines of mercury by plane diffraction grating in first and second order spectrum.
To determine the wavelength of He-Ne laser light using single slit.
To determine the frequency of an electrically maintained tuning fork by Melde's method.
To determine the frequency of AC mains using sonometer.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text & References:
- B.Sc. Practical Physics by C. L. Arora. S. Chand Publication

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CLASSICAL MECHANICS

Course Code: DPHY2301 **Credit Units: 02**

Course Objective:
This course aims at exposing the students to let them understand the basics of Classical Mechanics

Course Contents:

Module I: Lagrangian formulation of classical mechanics
Mechanics of a system of particles; constraints & degrees of freedom, Generalised coordinates, momentum, force & energy. D' Alembart's principle; variational technique; Hamilton's variational principle; Lagrange's equation for conservative systems and its application to simple cases: simple and spherical pendulum, one dimensional and isotropic oscillator etc.

Module II: Hamiltonian formulation of classical mechanics and old quantum theory
Hamilton's canonical equations of motion; Idea of cyclic coordinates, its relation with conservation principles, applications of Hamiltonian formulation to simple cases, Variational principle and least action; contact transformations; poisson bracket; Hamilton Jacoby theory.

Module III: Mechanics problems using the Lagrangian formulation
Central force problem: Two body problem; reduced mass; motion under central force; constants of motion; Virial theorem; Kepler's laws of planetary motion.
Rigid body dynamics: moment of inertia, Angular momentum and kinetic energy of motion about a point; introduction about tensors

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Classical Mechanics – J. Goldstein (Narosa Publ. House).
- Introduction to Classical Mechanics - R. G. Takwale and P. S. Puranik (Tata McGraw-Hill).
- Classical Mechanics – N. C. Rana and P. S. Joag (Tata McGraw-Hill).
- Introductory Quantum Mechanics - S. N. Ghoshal (Calcutta Book House).
- A Textbook of Quantum Mechanics – P. M. Mathews and K. Venkatesan.

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STATISTICAL MECHANICS

Course Code: DPHY2302 **Credit Units: 02**

Course Objective:
This course introduces assumptions, principles and practices of statistical mechanics.

Course Contents:
Module I: Thermodynamics in connection to statistical mechanics
Contact between statistics and thermodynamics, Thermodynamic equilibrium, and Thermodynamic potentials. Entropy and thermodynamic probability, Classical entropy expression, Gibbs paradox, the entropy of mixing, correct Boltzmann's counting, law of equipartition of energy, applications to specific heat and its limitations.

Module II: Classical and Quantum Theory of Radiation:
Elements of ensemble theory, micro-canonical, canonical and grand canonical ensemble, partition function, fluctuations, Planck's law of black body radiation, deduction of Wien's radiation formula, Rayleigh-Jeans law, Stefan-Boltzmann law and Wien's displacement law from Planck's law,

Module III: Bose-Einstein Statistics
B-E distribution law, B-E condensate, difference between B-E condensation and normal condensation, thermodynamic functions of an ideal weakly degenerate gas, , Bose-Einstein condensation properties of liquid He (qualitative description)

Module IV: Fermi- Dirac Statistics
Fermi-Dirac distribution law, Fermi energy, Fermi Temperature, thermodynamic functions of an ideal weakly degenerate Fermi gas, electron gas in a metal, white dwarf stars (qualitative description), Chandrasekhar mass limit(qualitative description)

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Statistical Physics, Thermodynamics and Kinetic Theory: V.S. Bhatia (Vishal Publ., Jalandhar, 2003)
- Statistical Mechanics by K. Huang
- Statistical Mechanics by R. K. Patharia
- Statistical Mechanics by B. K. Aggarwal and M. Eisner
- Statistical Physics by Landau and Lifshitz.

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FUNDAMENTALS OF C PROGRAMMING

Course Code: SPHY2301 **Credit Units: 02**

Course Objective:

The objective of this course module is to acquaint the students with the basics of computers system, its components, data representation inside computer and to get them familiar with various important features of procedure oriented programming language i.e. C.

Course Contents:

Module I: Introduction

Introduction to computer, history, von-Neumann architecture, memory system (hierarchy, characteristics and types), H/W concepts (I/O Devices), S/W concepts (System S/W & Application S/W, utilities). Data Representation: Number systems, character representation codes, Binary, octal, hexadecimal and their interconversions. Binary arithmetic, floating point arithmetic, signed and unsigned numbers, Memory storage unit.

Module II: Programming in C

History of C, Introduction of C, Basic structure of C program, Concept of variables, constants and data types in C, Operators and expressions: Introduction, arithmetic, relational, Logical, Assignment, Increment and decrement operator, Conditional, bitwise operators, Expressions, Operator precedence and associativity. Managing Input and output Operation, formatting I/O.

Module III: Fundamental Features in C

C Statements, conditional executing using if, else, nesting of if, switch and break Concepts of loops, example of loops in C using for, while and do-while, continue and break. Storage types (automatic, register etc.), predefined processor, Command Line Argument.

Module IV: Arrays and Functions

One dimensional arrays and example of iterative programs using arrays, 2-D arrays Use in matrix computations .Concept of Sub-programming, functions Example of user defined functions. Function prototype, Return values and their types, calling function, function argument, function with variable number of argument, recursion.

Module V: Advanced features in C

Pointers, relationship between arrays and pointers Argument passing using pointers, Array of pointers. Passing arrays as arguments. Strings and C string library. Structure and Union. Defining C structures, Giving values to members, Array of structure, Nested structure, passing strings as arguments. File Handling.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

References:

- "ANSI C" by E Balagurusamy
- Yashwant Kanetkar, "Let us C", BPB Publications, 2nd Edition, 2001.
- Herbert Schildt, "C: The complete reference", Osbourne Mcgraw Hill, 4th Edition, 2002.
- V. Raja Raman, "Computer Programming in C", Prentice Hall of India, 1995.
- Kernighan & Ritchie, "C Programming Language", The (Ansi C Version), PHI, 2nd Edition.
- J. B Dixit, "Fundamentals of Computers and Programming in „C".
- P.K. Sinha and Priti Sinha, "Computer Fundamentals", BPB publication.

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SEMESTER-IV

BASICS OF ELECTRONICS

Course Code: DPHY2451 **Credit Units: 03**

Course Objective:
This course aims at exposing the students to Semiconductors, to give concepts of Electronics which are useful for research and industrial application.

Course Contents:

Module I: Junction Diodes and their Applications
P, N semiconductor, Formation of PN junction, Depletion region, Junction capacitance Transition and diffusion capacitance, Energy level diagrams and built in potential, diffusion and drift velocity of carriers, Diode equation, V-I characteristics, temperature dependence,
Applications Half-wave Rectifiers & Full-wave Rectifiers, Calculation of Ripple Factor and Rectification Efficiency. Low pass filter and High pass filter, Qualitative idea of C, L and π - Filters. Zener Diode and Voltage Regulation. Clipper, Tunnel Diode, Clamper, Varactor Diode, AC and DC Power Supplies

Module II: Circuit Analysis
Kirchhoff's Laws (KCL and KVL), Mesh and Node analysis of dc and ac Circuits, Superposition theorem, Thevenin's and Norton's theorem, reciprocity theorem, Linear resistive 2- ports and interconnections, Z, Y, L, S,T, H' and H" representations/Parameters,

Module III: Transistors
PNP and NPN junction transistors, transistor current components, CB, CC and CE Configurations, transfer characteristics, Transistor as switch and applications, Transistor biasing, fixed bias, emitter-stabilised biasing, Voltage-divider biasing, Field Effect Transistor (JFET), JFET V-I Characteristics, Application of FET as voltage variable resistor. Advantages of FET over BJT. MOSFET: construction, working & Application.

Module-IV: Operational Amplifiers: Differential amplifier-circuit configurations, Positive and negative feedback, CMRR. Operational amplifier: characteristics, frequency response, slew rate. Inverting and non-inverting amplifiers, Applications: Op-amp as Adder, subtractor, integrator, differentiator, Schmitt trigger amplifiers, current to voltage and voltage to current conversion, Voltage follower.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- J. Milman and C.C. Halkias, Electronic Devices and Circuits, McGraw-Hill (New Edition).
- A.P. Malvino, Electronics: Principles and Applications, Tata McGraw-Hill (New Edition).
- Introduction to Semiconductor Devices by M. S. Tyagi
- R. A. Gayakwad, op-Amps and Linear IC'S, Pearson Education (2003).
- Balbir Kumar Shail B. Jain, Electronic device and circuits, PHI (2009)
- Electronic Devices and Circuits : A. Mottershead (Prentice Hall)

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DEMONSTRATIVE ASPECTS IN ELECTRONICS

Course Code: DPHY2452 **Credit Units: 01**

Course Objective:
The objective of the course is to enable students to understand the aspects of Electronics. This will enable students to demonstrate conceptual knowledge through various experiments in Laboratory.

Course Contents: List of Experiments to be performed in Lab
To investigate the use of an op-amp as an Integrator.
To investigate the use of an op-amp as a Differentiator.
To study Amplitude Modulation using Transistor.
To study Pulse Width / Pulse Position and Pulse Amplitude Modulation using ICs.
To verify the basic logic gates using logic gate trainer kit.
To design and verify the following digital circuits using basic gates:
S-R flip-flops, ii) J-K flip-flops.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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QUANTUM MECHANICS-I

Course Code: DPHY2401 **Credit Units: 04**

Course Objective: This course aims to expose the students to Quantum Mechanics and its applications in Physics.

Course Contents:

Module I: Failure of Classical Mechanics and Origin of Quantum Mechanics

Limitations of Classical Physics, Particle properties of waves: Black Body Radiation and Planck's Quantum hypothesis, Photoelectric effect, Compton Effect, Wave properties of particles: De-Broglie waves, physically acceptable wave functions, Probabilistic interpretation, Wave equation, phase and group velocity, Particle diffraction, Davisson and Germer experiment, Heisenberg uncertainty principle, Applications of uncertainty principle.

Module II: Time-dependent Schrodinger equation:

Time-dependent Schrodinger equation and dynamical evolution of a quantum state; Properties of Wave Function. Interpretation of Wave Function Probability and probability current densities in three dimensions; Conditions for Physical Acceptability of Wave Functions. Normalization. Linearity and Superposition Principles. Eigenvalues and Eigenfunctions. Position, momentum and Energy operators; commutator of position and momentum operators; Expectation values of position and momentum. Wave Function of a Free Particle.

Module III: Time-independent Schrodinger equation-

Hamiltonian, stationary states and energy eigenvalues; expansion of an arbitrary wavefunction as a linear combination of energy eigenfunctions; General solution of the time-dependent Schrodinger equation in terms of linear combinations of stationary states; Application to spread of Gaussian wave-packet for a free particle in one dimension; wave packets, Fourier transforms and momentum space wavefunction; Position-momentum uncertainty principle.

Module IV: Simple applications of Quantum Mechanics

Free particle, Particle in one dimensional and three dimensional box , Potential step. boundary conditions, bound and unbound states, Reflection and transmission coefficients for a rectangular barrier in one dimension, Tunnel effect, alpha decay, Linear harmonic oscillator (qualitative), The hydrogen atom problem (qualitative).

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Quantum Mechanics: J.L. Powell, B. Crasemann (Narosa Publishing House).
- Introduction to Quantum Mechanics, 2 nd edition, D.J. Griffiths (Pearson)
- Modern quantum mechanics; J. J. Sakurai.
- Quantum Mechanics – A. K. Ghatak and S. Lokenathan (Macmillan, Delhi).
- A Textbook of Quantum Mechanics – P. M. Mathews and K. Venkatesan (Tata Mc Graw Hill).
- Concepts of Modern Physics: Arthur Beiser (Tata Mcgraw Hill)

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INSTRUMENTATION PHYSICS

Course Code SPHY2401 **Credit Units: 03**

Course Objective:
This course aims at exposing the students to the instrumentation of some of the main experimental techniques used in Physics

Course Contents:
Module I: Error analysis and Vacuum technology
Description of error analysis, reporting and usage of uncertainties, Propagation of uncertainties, Error analysis: Instrumental and statistical uncertainties, propagation of errors, Estimation of Mean and Errors, Least Square Fitting, Calibration.
Introduction to Vacuum Systems, Kinetic Theory of Gases, Production of Vacuums, Vacuum Pumps – Rotary, Diffusion, Terbo-molecular, Pressure Measurement, Leak Detection, Specimen handling.

Module II: Instrumentation of Diffraction and Microscopic Techniques
X-ray Sources – Crookes Tubes, Coolidge Tubes, Filters, monochromator crystals, Multi-layered monochromators and mirrors, Detectors-Photographic film, Gas detectors, Solid detectors, Diffractometers-The Debye-Scherrer and Hull diffractometer, Bragg-Brentano diffractometers, An introduction to surface diffractometry.
Scanning Electron Microscope Instrumentation- Electron Beam Parameters, Electron. Optical Parameters-Beam Energy, Beam Diameter, Beam Current, Beam Solid Angle. SEM Imaging Modes- High Current Mode, Resolution Mode, Low Voltage Modes. TEM instrumentation, AFM instrumentation

Module III: Instrumentation of Spectroscopic Techniques
Gas Discharge Lamps, Spectral Lamps and Shapes of Spectral Lines-Low Pressure Spectral Lamps, Shape of Spectral Lines.
Optical Filters, Polarizers and Phase Plates. Monochromators – Prism Monochromator, Grating Monochromators

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- John R. Taylor, An introduction to error analysis: a study of uncertainties in physical measurements, University Science Books California). 1997.
- P E J Flewitt, RK Wild, Physical Methods for Materials Characterization, IOP Publishing 2003.
- R. Guinebretière, X-ray Diffraction by Polycrystalline Materials, LAVOISIER 2006.
- Joseph I Goldstein, Scanning Electron Microscopy and X-ray Microanalysis, Springer 2018.
- Hans Kuzmany, Solid- State Spectroscopy an Introduction, Springer 2009.

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SEMESTER-V

MATHEMATICAL PHYSICS-II

Course code DPHY2501 **Credit Units: 04**

Course Objective:
The course introduces the students to the fundamentals of Complex numbers and complex variables, Fourier and Laplace transformation and partial differential equations.
This course aims at exposing the students to some part of Mathematics useful for them to solve typical problems of Physics.

Course Contents:
Module 1: Complex numbers
Complex numbers, Argand diagram, Modulus and argument, addition and multiplication, Exponential and circular functions of complex variables, De Movire's theorem, Real and imaginary parts of circular and hyperbolic functions, Logarithmic function of a complex variable.

Module 2 Integral transform
Fourier Transforms: Fourier Integral theorem(Statement only). Fourier Transform. Fourier sine and cosine transform, Fourier transform of derivatives, Inverse Fourier transform, Convolution theorem. Properties of Fourier transforms.

Module 3 Laplace transform
Laplace Transform (LT) of Elementary functions. Properties of LTs: Change of Scale Theorem, Shifting Theorem. LTs of 1st and 2nd order Derivatives and Integrals of Functions, Derivatives and Integrals of LTs. LT of Unit Step function, Periodic Functions. Convolution Theorem. Inverse LT. Application of Laplace Transforms to 2nd order Differential Equations

Module 4 Dirac delta function
Definition and properties. Representation of Dirac delta function as a Fourier Integral. Laplace and Fourier Transform of Dirac delta function

Module 5 Frobenius Method and special functions
Singular Points of Second Order Linear Differential Equations and their importance. Frobenius method and its applications to differential equations. Legendre, Bessel, Hermite and Laguerre Differential Equations. Properties of Legendre Polynomials: Rodrigues Formula, Generating Function, Orthogonality. Simple recurrence relations. Expansion of function in a series of Legendre Polynomials. Bessel Functions of the First Kind: Generating Function, simple recurrence relations. Zeros of Bessel Functions ($J_o(x)$ and $J_1(x)$) and Orthogonality

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Reference and Text Books

- Mathematical Physics – P.K. Chattopadhyay (Wiley Easte)
- Mathematical Methods for Physicists,G.B.Arfken, H.J.Weber, F.E.Harris,2013, 7th Edn., Elsevier.
- Mathematical Methods for Physics and Engineers, K.F Riley, M.P. Hobson and S. J. Bence, 3rd ed., 2006, Cambridge University Press
- Mathematical Physics- Dr. B S Rajput

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ATOMIC AND MOLECULAR PHYSICS

Course Code: DPHY2502 **Credit Units: 03**

Course Objective:
The aim of the course is to provide theoretical and practical knowledge on the many powerful methods provided by modern atomic- and molecular spectroscopy regarding basic studies as well as practical applications.

Course Contents:

Module I: Atomic Spectrum
Atomic structure, Hydrogen spectra, Bohr's model of one electron atom, Bohr-Sommerfield model, Good quantum numbers, Stern-Gerlach experiment and spin as an intrinsic quantum number. Incompatibility of spin with classical ideas. Fine structure. Study of fine structure by Michelson interferometer.

Module II: Vector atom model and many electron atoms
Magnetic moment of the electron, Landau's g factor. Vector model – space quantization. L-S and j-j coupling scheme, Spectroscopic terms of many electron atoms in the ground state, Zeeman effect and its explanation using vector atom model. Stark effect, selection rules for Zeeman and stark effect. L-S and j-j coupling-Interaction with electromagnetic radiation and with static fields.

Module III: Molecular Structure and Spectroscopy
Types of molecular spectra (Basics ideas), experimental study, Theory of pure rotational spectra, theory of rotational vibrational spectra, the Born-Oppenheimer approximation, Molecular rotations and vibrations, Molecular electronic transitions, Diatomic molecules–rotational and vibrational energy levels. Raman effect and its application to molecular spectroscopy (qualitative discussion). Molecular orbital theory.

Module IV: X-rays:
Production of X-rays, characteristic and continuous spectrum of X-rays, Mosley's law and its applications, difference between optical and X-ray spectra.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:
- Physics of Atoms and Molecules – B. H. Bransden and C. J. Joachain (Pearson Education).
- Atomic and Nuclear Physics – S. K. Sharma (Pearson Education).
- Optics and Atomic Physics – B. P. Khandelwal (Siblal Agarwala).

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DEMONSTRATIVE ASPECTS IN MODERN PHYSICS-I

Course Code: DPHY2503 **Credit Units: 01**

Course Objective:

The objective of the course is to enable students to understand the aspects of modern physics through experiments. This will enable students to demonstrate the conceptual knowledge through various experiments in Laboratory.

Course Contents: List of Experiments to be performed in Lab

To determine a Low Resistance by Carey Foster's Bridge.
To determine a Low Resistance by a Potentiometer.
To determine High Resistance by Leakage of a Capacitor.
To study the response curve of a Series LCR circuit and determine its (a) Resonant Frequency, (b) Impedance at Resonance and (c) Quality Factor Q, and (d) Band Width.
To study the response curve of a Parallel LCR circuit and determine its (a) Resonant Frequency and (b) Quality Factor Q.
To study (a) Half-wave Rectifier and (b) Full-wave Bridge Rectifier.
To study the Forward and Reverse characteristics of a Zener Diode and to study its use as a Voltage Regulator.
To study the CE Characteristics of a PNP Transistor.
To study the characteristics curves of PN junction diode in forward and reversed bias.
To study the Frequency Response of Voltage Gain of a RC-Coupled Amplifier.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text & References:

- B.Sc Practical Physics by C. L. Arora. S. Chand Publication

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RENEWABLE ENERGY RESOURCES

Course Code: DPHY2504 **Credit Units: 04**

Course Objective:
This is an introductory course to renewable energy technologies and potentials for Science and engineering students aiming to explain basic concepts of Renewable Energy resources.

Course Contents:

Module I: Energy & Thermodynamics & Environmental impact
Heat Transfer in Renewable Energy Systems - conduction, convection and radiation, thermal aspects of energy generation Work, heat, and the first law of thermodynamics. Heat engines and the second law of thermodynamics. The Carnot cycle. Applications of the second law to various energy transformation processes: heat pumps and refrigerators; different engine cycles. Use of fossil fuel, Energy crisis, Global Warming, Carbon emission and climate change. Need for sustainable development and Renewable Energy

Module II: Solar Energy (Thermal and Photovoltaic)
Solar energy option, Environmental impact of solar power, physics of the sun, Thermonuclear reactions, Black body radiation, Spectral distribution, the solar constant, radiation on titled surface / Earth, Solar Thermal Energy, Application of solar energy in Solar thermal and solar photovoltaic system, Brief introduction to generations of Solar cells

Module III: Ocean, tidal, wave energy
Principle of ocean thermal energy conversion (OTEC), setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Fundamentals of tidal power, Potential and conversion techniques, mini-hydel power plants. Use of tidal energy, Limitations of tidal energy conversion systems.

Module IV: Geothermal and Wind Energy
Structure of earth's interior, earthquakes & volcanoes, Geothermal resources, Hot springs, Steam ejection, Principal of working, Types of the geothermal station with schematic representation, Applications.
Properties of wind, Availability of wind energy in India, wind velocity, Wind machine fundamentals; types of wind machines and their characteristics, Horizontal and Vertical axis windmills, Elementary design principles, Coefficient of performance of a windmill rotor, Aerodynamic considerations in windmill design, Recent developments and applications

Module V: Hydrogen Energy and Biogas
Properties of hydrogen in respect of it's use as a source of renewable energy, Sources of hydrogen, Production of hydrogen; electrolysis of water, thermal decomposition of water, thermochemical production biochemical production. Storage Issues of Hydrogen, Applications of hydrogen energy. Biomass: Raw materials, Properties/ characteristics of biogas, Principles of Bio-Conversion; Photosynthesis, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion, Transportation of biogas, biogas plant technology & status, Biomass cogeneration Energy recovery from urban waste, Power generation from liquid waste, and Biogas applications.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

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Text & References:

- Aldo V. da Rosa, ―Fundamentals of Renewable Energy Processes‖, 2005, Academic Press
- Bansal Keemann, Meliss," Renewable energy sources and conversion technology", Tata Mc Graw Hill.
- Kothari D.P., ―Renewable energy resources and emerging technologies‖, Prentice Hall of India Pvt. Ltd.
- Rai G.D, "Non-Conventional energy Sources", Khanna Publishers.
- Ashok V. Desai, "Nonconventional Energy", New Age International Publishers Ltd.
- Tiwari and Ghosal, ―Renewable energy resources‖ Narosa Publication.
- K Mittal ―Non-Conventional Energy Systems‖ , Wheeler Publication
- Twidell & Weir, ―Renewable Energy Sources‖
- Ramesh & Kumar, ―Renewable Energy Technologies‖, Narosa Publications

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NUMERICAL METHODS

Course Code: DPHY2505 **Credit Units: 04**

Course Objective:

This course is aimed to provide a fundamental understanding of Computer Oriented Numerical Analysis for students in their early stages of academic careers.Several concepts such as Solution of Linear Algebraic Equations, Solutions of Algebraic and Transcendental equations, Interpolation, Curve fitting, etc. will be introduced to students. After this course, you will be able to understand fundamental concepts of Numerical Analysis, which will prove highly beneficial to them in understanding more complicated topics of computer science.

Course Contents:

Module I: Introduction & Numerical Solution to ODE

Introduction to Numerical Analysis, Application Area of N.A., Basic Definition, Taylor Series Method, Euler's Method, Modified Euler's Method, Runga Kutta Method

Module II: Solution of Algebraic and Transcendental Equations

Introduction, Bisection Method, regular False Method, Iteration Method, Newton Raphson Method, Generalized Secant Raphson Method.

Module III: Interpolation and Curve Fitting

Basic Definition, Forward Differences, backward Differences, Central Differences, Newton Forward Differences Formula, Newton"s Divided Difference Formula, Lagrange's Method. Curve Fitting Techniques

Module IV: Numerical Differentiation & Integration

Numerical Differentiation based on Interpolation Formula, Numerical Integration, Trapezoidal Rules, Simpson's 1/3 rule, Simpson's 3/8 Rule

Module V: Statistical Computation

Frequency chart, Curve fitting by method of least squares, fitting of straight lines, polynomials, exponential curves etc, Data fitting with Cubic splines.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

Text:

- Numerical Analysis V. Raja Raman
- Numerical Methods by B.S. Garewal

References:

- Numerical Solutions M.K. Jain & R.K. Jain

Related Lab

Software Required: Turbo C++

- Write a program to find the roots of an equation f (x) = 0 using Bisection method.

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- Write a program to find the simple/multiple roots of f (x) = 0 using Newton – Raphson method.
- Write a program to find the roots of f(x) = 0 using Secant method.
- Write a program to find the integral of a function using Trapezoidal rule.
- Write a program to find the integral of a function using Simpson's 1/3rd and 3/8th rule using switch case.
- Write a program to find the integral of a function using adaptive Simpson method
- Write a program to solve the system of equations Ax = b in tridiagonal form using Thomas Algorithm.
- Write a program to solve the system of equations Ax = b using Gauss elimination method.
- Write a program to solve the system of equations Ax = b using Jacobi Iteration method.
- Write a program to solve the system of equations Ax = b using Gauss-Seidel method
- Write a program to find the largest (or smallest) Eigen value and corresponding Eigen vector of a square matrix using power (or inverse power) method.
- Write a program to solve first and second order ordinary differential equations (initial value problem) using Runge-Kutta fourth order method.
- Write a program to solve first order ordinary differential equations (initial value problem) using adaptive Runge-Kutta method.
- Write a program to solve second order ordinary differential equations (boundary value problem) using shooting method based on adaptive Runge-Kutta method and Newton-Raphson method.

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LASER AND FIBRE OPTICS

Course Code: DPHY2506 **Credit Units: 04**

Course Objective:
This course aims at students to give them basic understanding of Laser, Fibre Optics and their applications.

Course Contents:

Module I: Laser's Basics and components
Introduction, mono chromaticity, temporal and spatial coherence, Einstein's coefficients, possibility of light amplification, rate equations for two, three and four level systems, shape and width of spectral lines: line broadening mechanism, natural, collision and Doppler broadening.
Different methods of pumping, Resonators, modes of a resonator, number of modes per unit volume, open resonators, confocal resonator (qualitative), quality factor, losses inside the cavity, threshold condition, Laser pulsed output: Q switching, and mode-locking.

Module II: Types of Lasers
He-Ne laser, Nitrogen Laser, CO2 laser, Ruby laser, semiconductor lasers: intrinsic semiconductor lasers, doped semiconductors, condition for laser action, dye lasers.

Module III Optical Fiber Fundamentals
Historical development, Basic optics, Optical fiber wave guides Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Skew rays. Cylindrical fibers- Modes Fiber materials, Fiber fabrication techniques, Classification of Optical Fibers: Single mode fibers, Graded Index fibers

Module IV: Signal distortion in optical fibers Optical fiber Connectors:
Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses. Information capacity determination, Group delay, Types of Dispersion - Material dispersion, Wave-guide dispersion, Polarization mode dispersion, Intermodal dispersion, pulse broadening.
Connector types, Single mode fiber connectors, Connector return loss. Introduction to Optical Fibers splicing

Module V: Applications of Laser and Fibers
Holography, non-linear optics: harmonic generation, second harmonic generation, phase matching and optical mixing, brief qualitative description of some experiments of fundamental importance.
Fundamentals of Fiber Optical Communication Components and System

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Beiser Concept of the Modern Physics McGraw-Hill 2008
- Lasers and Non-linear Optics: B.B. Laud. (Wiley Eastern).
- Principles of Lasers: O. Svelto (Plenum Press).
- An Introduction to Lasers and their applications: D.C.O"Shea, W. Russell and W.T. Rhodes (Addition –Wesley).
- Laser Theory and Applications :Thyagarajan and A. Ghatak (MacMillan)
- Fiber-Optic Communication Systems, 3rd ed. Wiley by GOVIND P. AGRAWAL
- Introduction to Fiber Optics: A. Ghatak and Thyagarajan; Cambridge University Press

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SCIENTIFIC COMPUTING

Course Code: DPHY2507 **Credit Units: 04**

Course Objective: MATLAB is a scientific computing tool that can be used to solve many real-life problems coming from various areas of science and engineering. The course introduces the basics of MATLAB; how to effectively use a few commonly used built-in functions; hands-on experience of MATLAB programming and its applications to various practical problems.

Course Contents:

Module-I: Introduction to MATLAB: vector and matrix generation, subscripting and the colon notation, matrix and array operations and their manipulations, introduction to some inbuilt functions. m-files: scripts and functions, editing, saving m-files.

Module-II: Two & three-dimensional graphics: basic plots, change in axes and annotation in a figure, multiple plots in a figure, saving and printing figures, mesh plots, surface plots, and their variants.

Module-III: Relational and logical operators: flow control using various statements and loops including If-End statement, If-Else-End statement, nested If-Else-End statement, For-End and While-End loops with Break commands.

Module-IV: Applications of MATLAB: Solving a linear system of equations, calculus of polynomials using inbuilt functions, solving equations in one variable, solving ordinary differential equations using inbuilt functions.

1. Generating arrays and matrices and their manipulations
2. Introduction on few built-in functions
3. 2D and 3D plots, multiple plots using figure and subplot commands
4. Annotation of plots
5. Simple script files and editing them
6. Introduction of function files
7. Introducing notion of sub-functions and nested functions
8. Solving IVPs using ode45 and other solvers
9. Solving system of linear equations using built in functions

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components (Internal)	A	Performance	Lab Record	Viva
Weightage (%)	5	15	5	5

Components (EE)	Performance	Viva
Weightage	35	35

TextBook:

- R. Pratap, Getting started with MATLAB, Oxford publication, 2016
- Gilat, MATLAB-An introduction with application, wiley publication, 2014

Reference:

- S. Swapna Kumar and S. V. B. Lenina, MATLAB easy way of learning, Prentice-Hall of India Pvt.Ltd

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SEMESTER-VI

SOLID STATE PHYSICS

Course Code: DPHY2601 **Credit Units: 03**

Course Objective:

The aim of this course is to increase understanding of Physics principles as applied to solid-state materials and to enhance problem-solving and critical thinking skills.

Course Contents:

Module I: Crystal Structure

Crystalline and amorphous solids, Translational symmetry. Elementary ideas about crystal structure, lattice and bases, unit cell, Reciprocal lattice, fundamental types of lattices, Miller indices, lattice planes, simple cubic, f.c.c. and b.c.c. lattices. Laue and Bragg equations. Determination of crystal structure with X-rays. Bragg diffraction. Crystal Structures: sc, fcc, bcc, hcp, diamond, NaCl, CsCl & ZnS.

Module II: Bonding of solids

Different types of bonding- ionic, covalent, metallic, Van der Waals and hydrogen bond, their properties.

Module III: Band theory of solids

Elementary Band theory of solids, Periodic potential and Bloch theorem, Kronig-Penny model, energy band structure. Band structure in conductors, direct and indirect semiconductors and insulators (qualitative discussions), Free electron theory of metals, effective mass, drift current, mobility and conductivity, Weidman-Franz law, Heavy fermions, Hall Effect in metals and Semiconductors: Phenomenology and implication (Qualitative Discussion Only)

Module IV: Dielectric properties of materials and Lattice Vibrations

Polarization. Local Electric Field at an Atom. Depolarization Field. Dielectric Constant. Electric Susceptibility. Polarizability. Classical Theory of Electric Polarizability. Clausius Mosotti Equation. Normal and Anomalous Dispersion.

Lattice Vibrations and Phonons: Linear Monoatomic and Diatomic Chains. Acoustical and Optical Phonons. Qualitative Description of the Phonon Spectrum in Solids. Einstein and Debye Theories of Specific Heat of Solids. T^3 Law.

Module V: Magnetic properties of materials

Dia, para and ferro-magnetic properties of solids. Langevins theory of diamagnetism and paramagnetism. Quantum theory of paramagnetism, Curie's law. Ferromagnetism, Spontaneous magnetization and domain structure; temperature dependence of spontaneous magnetization; Curie- Weiss law, Explanation of hysteresis.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Introduction to Solid State Physics: C. Kittel (Wiley, VII ed.)
- Introduction to Solids : L.V. Azaroff (Tata McGraw Hill)
- Solid State Physics : A.J. Dekker (Prentice-Hall)
- Elements of Materials Science and Engineering: L.H. Van Vlack (Addison-Wesley)

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DEMONSTRATIVE ASPECTS IN MODERN PHYSICS-II

Course Code DPHY2602 **Credit Units: 01**

Course Objective:

The objective of the course is to enable students to understand the aspects of modern physics through experiments. This will enable students to demonstrate the conceptual knowledge through various experiments in Laboratory.

Course Contents: List of Experiments to be performed in Lab

Experiment 1:

To measure the Resistivity of a Ge Crystal with temperature by Four-Probe Method (from room temperature to 200° C) and to determine the Band Gap E_g for it.

Experiment 2:

To determine the Hall Coefficient of a Semiconductor.

Experiment 3:

To study the Hysteresis loop (B-H) of ferromagnetic material.

Experiment 4:

To measure magnetic susceptibility of a solution of a paramagnetic salt in water for 3 different concentrations by using Quincke's method.

Experiment 5:

To study the characteristics of Photovoltaic cell.

Experiment 6:

To measure the dielectric constant of a ferroelectric material as a function of temperature.

Experiment 7:

To study the Forward and Reverse characteristics of a Zener Diode and to study its use as a Voltage Regulator.

Experiment 8:

To determine the velocity of ultrasonic waves using interferometer as a function of temperature.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text & References:

- B.Sc Practical Physics by C. L. Arora. S. Chand Publication

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NUCLEAR & PARTICLE PHYSICS

Course Code: DPHY2603 **Credit Units: 04**

Course Objective: The course aims to introduce students to the fundamental concepts of nuclear and sub-nuclear physics and introduction to the physics behind particle detectors.

Course Contents:

Module I: Nuclear Properties

Constituents of nucleus, Non-existence of electrons in nucleus, Nuclear mass and binding energy, features of binding energy versus mass number curve, nuclear radius, angular momentum and parity, qualitative discussion of two-body nuclear forces, nuclear moments, magnetic dipole moment and electric quadrupole moment,

Module II: Radioactive Decays

Modes of decay of radioactive nuclides and decay Laws, Beta decays: β^{-}, β^{+} and electron capture decays, , Parity violation in βdecay. Alpha decay: Stability of heavy nuclei against break up, Geiger- Nuttal law, barrier penetration as applied to alpha decay, Gamma transitions: Excited levels, Radio carbon dating, Nuclear Power generation (Fission& Fusion Process) & Nuclear Reactor (if time permits)

Module III Nuclear Reactions and Nuclear Models

Types of nuclear reactions, reactions cross section, conservation laws, Kinematics of nuclear reaction, Q-value and its physical significance, compound nucleus. Liquid drop model, semi-empirical mass formula, condition of stability, evidence for nuclear magic numbers, Shell model, energy level scheme (Introductory).

Module IV: Elementary Particles, their Properties and reactions

Historical introduction, Cosmology, fermions and bosons, particles and antiparticles, Classification of elementary particles, types of interactions, electromagnetic, weak, strong interactions, gravitational interactions, Quantum numbers and conservation laws, isospin, charge conjugation, Yukawa theory, Introduction to quarks and qualitative discussion of the quark model and 3 generation of Quarks qualitatively).

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Basic ideas and Concepts in Nuclear Physics by K. Hyde
- Introduction to Nuclear Physics : H.A. Enge
- Nuclear Physics : I. Kaplan (Addison Wesley)
- Nuclei and Particles by E. Segre
- Introduction to High energy Physics by D.H. Perkins
- Elementary Particles by I.S. Hughe

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MATERIALS SCIENCE

Course Code: DPHY2651 **Credit Units: 04**

Course Objective: The course should enable the students to understand basics of the materials science, different type of materials and explain different types of the phase diagrams, and other related and important topics.

Module I: Different type of materials
Metals and alloys (ferrous and non-ferrous), Ceramics and their properties, Polymers and their properties, Composites, Types of Composites and their Properties, Discussion on advanced materials viz: Superalloys, Shape memory alloys. Nano materials.

Module II: Diffusion and dislocation defects
Diffusion, Types of diffusion, diffusion mechanisms, Factors that influence diffusion, Laws of Diffusion, Diffusion Coefficient, Kirkendall Effect. Dislocation and Strengthening Mechanism: Dislocations and Slip Systems, Slip in single crystals, plastic deformation in polycrystalline materials, strengthening by grain size reduction, solid solution strengthening, strain hardening, precipitation hardening and age hardening, recovery, recrystallization and grain growth.

Module III: Phase diagrams and Phase Transformations
Phase diagram: Basic terms, Gibb's phase rule, Unary phase diagram, Binary phase diagrams and types, Eutectic point, Hume-Rothery's conditions, Lever rule, Interpretation of the phase diagrams. Nucleation, Nucleation kinetics, Homogeneous and Heterogeneous nucleation, Growth and over all transformation kinetics, Development of microstructure, Martensitic Phase Transformation, Continuous cooling transformation diagrams, Applications

Module V: Material Failure
Elastic and Plastic Deformation, Mechanism of Plastic Deformation, ductile to brittle transition, Fracture and its types, fracture toughness, methods of protection against fracture. Fatigue: cyclic stresses, S-N curve, crack initiation and propagation, factors that affect fatigue life. Creep: Generalized creep behavior, stress and temperature effects, Mechanism of creep, creep resistant materials.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Material Science & Engineering –V. Raghvan, Prentice Hall of India Pvt. Ltd, New Delhi Introduction to ceramics- W. D. Kinger y, H. K.Bowen and D. R.. Ublmann; Weily & sons.
- Engineering Materials: Kenneth G. Budinski, Prentice Hall of India, New Delhi Elements of Material Science and Engineering: VanVlack, Wesley Pub. Comp. Introduction to Engineering Materials: B. Agarwal, McGraw Hill Publication
- Materials Science, M S Vijaya and G Rangrajan, Tata McGrawhill, 2011.

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SEMICONDUCTOR PHYSICS AND OPTOELECTRONIC DEVICES

Course Code: DPHY2604 **Credit Units:04**

Course Contents :

Module I: Formation of Energy bands
Formation of Energy bands, Electron effective mass, Concept of holes, Density of states function, Fermi-Dirac probability function and distribution, Equilibrium distribution of electrons and holes in intrinsic semiconductors, the no and po equations, intrinsic Fermi level position, dopant energy levels, Equilibrium distribution of electrons and holes in extrinsic semiconductors, Degenerated, Non-degenerated semiconductors.

Module II: Semiconductor Physics
Drift current density, Mobility Effect, Conductivity, Diffusion Current Density, Total Current Density, the Einstein relation, The Hall Effect, Carrier Generation and Recombination, Continuity Equations, time dependent diffusion equation, Basics of ambipolar effect and its transport equation, Haynes-Shockley Experiment.

Module III: Optoelectronic Devices
Visible and Infrared LEDs (Device structure and Working principle), photoconductor and photodiode (device structure and working principle), p-i-n photodiodes, responsivity, noise and sensitivity, photodiode materials, Tunnel diodes, Impatt diodes and its static and dynamic characteristics, negative differential resistance, PN junction solar cells.

Module IV: Metal-semiconductor contact
MOSFET structure and principle of operation, MOSFET current-voltage characteristics. MOS structure and its energy band diagram, Depletion layer thickness, work function differences, Flat band voltage - charge distribution, capacitance-voltage characteristics and frequency effects.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Semiconductor Physics and Devices (Third Edition) by Donald A. Neame, Tata McGraw-Hill Publishing Co.
- Semiconductor Devices Physics and Technology (2nd edition) by S.M. Sze (Wiley Student edition).
- Hand Book of Electronics, Gupta & Kumar, Pragati Prakashan.
- Integrated Electronics: Analog and Digital Circuits and Systems, Jacob Millman and Christos C. Halkias, Tata McGraw-Hill.

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INTRODUCTION TO ASTRONOMY & ASTROPHYSICS

Course Code: DPHY2605 **Credit Units: 04**

Course Objective: This course aims at students to get acquainted with big bang picture, dark energy and cosmology.

Course Contents:

Module I: Distance measurement and overview:
Spectrum of EM radiation, Atmospheric absorption, Overview of Astronomy, magnitude, distances, various methods to measure distances. Different types of telescope, Limit of Resolution and resolving power. Overview of major contents of universe, Black body radiation, specific intensity, flux density, luminosity, Apparent and absolute magnitudes,

Module II: Sun and the Stars
Sun as a star, Structure of the Sun, types of stars, Color magnitude diagram, main sequence stars, evolution of stars. White dwarf, neutron star and black holes.

Module III: Galaxies and Extragalactic Astronomy
Milky way galaxy, dynamics of stars, types of galaxies, Hubble classification, the local group, clusters of galaxies.

Module IV: Big Bang Theory & Dark Matter
Morphological classification of galaxies; rotation curve and idea of dark matter; Active galaxies (basic understanding); clusters of galaxies and large scale distribution. Expansion of the universe; Hubble law and Hubble constant; Big-bang picture and Cosmic microwave background radiation (qualitative discussion).

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- The Physical Universe: An introduction to Astronomy by Frank H. Shu
- Astrophysical concepts by Harwit Martin
- Astrophysics for Physicists by Arnab Rai Choudhuri

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LOW TEMPERATURE PHYSICS AND SUPERCONDUCTIVITY

Course Code: DPHY2606 **Credit Units: 04**

Course Objective:

The aim of this course is to get acquainted the students with physics of ultra low temperatures, physics of materials at zero resistance and their applications in our real world.

Course Contents:

Module I: Superconductivity

Basic properties of superconductors, thermodynamics, superconductors in magnetic fields The London equations, electromagnetic properties, penetration depth, Ginzburg-Landau theory, coherence length, type I and type II superconductors, BCS theory, second quantization, Cooper- pairing, energy gap Tunneling, Josephson effects and SIS tunneling, High Tc superconductors, structure, d-wave symmetry, phase diagrams, Coexistence of superconductivity and Magnetism

Module II: Superfluidity

Two – Fluid Model, Bose – Einstein Condensation, Macroscopic Quantum State, Properties of liquid helium-4, Phenomena near The Lambda Point, phase diagrams, Superfluidity: Superfluid phenomena, rollin film, fountain effect, second sound Excitations and vortices in superfluids, Properties of liquid helium-3, the phase diagram, Symmetry properties of superfluid helium-3, Macroscopic Quantum Interference – Josephson Effect, Normal Fluid Density – Quasiparticle Scattering , Collective Excitations, Sound Propagation.

Module III: Cryogenics

Thermal and electrical properties for different materials at low temperature, Thermodynamic Properties, Liquefaction of gases. Regenerative principle Cooling methods above 1K, Joule- Thompson, Gifford-McMahon, evaporation cooling, Cooling methods below 1K, dilution & refrigeration, Methods of liquefaction of gases (Laser Cooling, Cascade process, Linde's process, and adiabatic demagnetization process) – Measurement of cryogenic temperatures.

Module IV: Applications

Overview of applications, squids, microwave devices, power applications of Superconductivity, Applications of Cryogenics and superfluidity

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Basic Superfluids **by** Tony Guenault
- Superfluidity and Superconductivity :David R. Tilley, John Tilley (Ph. D.)
- Amorphous solids: low-temperature properties:William Andrew Phillips
- An introduction to liquid helium**:**John Wilks, David Sheridan Betts**.**

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PHYSICS IN DAILY LIFE

Course Code: DPHY2607 **Credit Units: 04**

Course Objective:
Through this course, students can appreciate their surroundings by understanding the basic rules of Nature and able to connect some daily life observations to Physics principles.

Course Contents:
Module 1 GPS (8 hours)
Satellites, Artificial satellites, Global positioning system. Geo stationary satellite.

Module 2 Physics of Climate Change (8 hours)
Paleoclimate, Part 2. Time series and random processes in climate, Role of the atmosphere in climate, Ocean carbon system, Atmospheric chemistry and climate, Ocean physics and climate

Module 3: Home Electricity (8 hours)
AC and DC current, two-way switch, electrical units, paying for electricity, wiring a three pin plug, electrical safety, an electrical fault, earth wire, fuse, Electrostatics, electric potential, current, and resistance, ohm's law, electric power, refrigeration, electric safety

PHYSICS IN DAILY LIFE (PRACTICAL)

List of Experiments
Determining the capacitance of a plate capacitor - Measuring the charge with the electrometer amplifier
Determining the Faraday constant
Investigating the charge distribution on the surface of electrical conductors
Charging and discharging a capacitor when switching DC on and off
Hot-cathode emission in a vacuum: determining the polarity and estimating the specific charge of the emitted charge carriers
Basic electrostatics experiments with the electrometer amplifier
Experiments with a three-phase revolving-armature generator
Working model

Text & References:
"Physics Beyond the Comfort Zone" by Peter Watson. T, Peter Watson, 2014
"Household Electricity and Appliances" by **Dr S C BHARGAVA**, BSP Books, 2020

Examination Scheme:

	Theory (70)		Practical (30)	
Evaluation Components	Internal	End Term	Internal	End Term
Weightage (%)	20	50	10	20

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SEMESTER-VII

QUANTUM MECHANICS-II

Course Code: DPHY2701 **Credit Units: 03**

Course Objective: The course is intended to introduce the concept of quantum mechanics to students at the advanced level so that they can solve problem of various branches of Physical Sciences.

Course Contents:

Module I: Spin & Identical Particles, Hydrogen Atom and Angular Momentum

Spin, Stern-Gerlach experiment, Pauli spin matrices, eigenvalues of J^2 and Jz, addition of angular momenta, Clebsh-Gordan coefficients. Identical particles, particle exchange operator, symmetric and anti-symmetric wave functions, Pauli principle and Slater determinant, Schrodinger equation in three dimensions (spherical coordinates), separation of variables, radial equation, angular equation, spherical harmonics, angular momentum and their commutation relation, $L^2$and L_z operators, Ladder operator. Spin functions for a system with more than one electron.

Module II: Perturbation theory

Time-independent perturbation theory: Basic concepts, Non-degenerate energy levels, degenerate perturbation theory, fine structure of Hydrogen, Spin-orbit coupling, Zeeman effect. Time-dependent perturbation theory: 1st order perturbation, Fermi's Golden rule, absorption and emission of radiation, Einstein A and B coefficient.

Module III: Variational principle and WKB approximation

Theory of Variational principle; Ground state energy for 1D harmonic oscillator, Delta function potential, and He. WKB approximation, classical region, tunneling, Gamow's theory of alpha decay, connection formula.

Module IV: Scattering theory and relativistic quantum mechanics:

Formulation of scattering theory, scattering amplitude, cross section, Partial wave analysis, optical theorem, Centre of Mass frame, Laboratory frame, partial wave, scattering by a central potential (partial wave analysis), Born approximation: Phase shifts, scattering length and effective range, Low energy scattering Born approximation and its validity. Klien-Gordon equation and its interpretation, Dirac equation for a free particle.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Reference Books:

1. J. J. Sakurai and J. Napolitano Modern Quantum Mechanics (2 nd Ed.) Addison Wesley Publishing Company (2011)
2. R. Shankar, Principles of Quantum Mechanics (Plenum Press, 2011)
3. P.M. Mathews and K. Venkatesan, A Text book of Quantum Mechanics, Tata Mc Graw-Hill, New Delhi.
4. L.I. Schiff, Quantum Mechanics, McGraw-Hill
5. David J. Griffiths, Introduction to Quantum mechanics, Pearson.
6. A. Zee, Group Theory in a Nutshell for Physicists, Princeton University Press (2016).
7. V. Devanathan, Quantum Mechanics, Narosa Publishing House, New Delhi.
8. P.A.M. Dirac, The Principles of Quantum Mechanics, Oxford University Press, London.
9. B.K. Agarwal, Quantum Mechanics and Field Theory, Lokbharti Publications, India.
10. Satya Prakash, Advanced Quantum mechanics, Ramnath Kedarnath Publication, Delhi

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MATHEMATICAL PHYSICS-III

Course Code: DPHY2702 **Credit Units: 04**

Course Objective:
The course introduces the students to the fundamentals of Complex analysis, Matrix and Applications, probability and probability distribution and tensors.

Course Contents:

Module-I: Complex Analysis
Brief Revision of Complex Numbers and their Graphical Representation. Euler's formula, De Moivre's theorem, Roots of Complex Numbers. Functions of Complex Variables. Analyticity and Cauchy-Riemann Conditions. Examples of analytic functions. Singular functions: poles and branch points, order of singularity, branch cuts. Integration of a function of a complex variable. Cauchy's Inequality. Cauchy's Integral formula. Simply and multiply connected region. Laurent and Taylor's expansion. Residues and Residue Theorem.Application in solving Definite Integrals.

Module-II: Matrix and Applications
Elementary transformations and Elementary matrices, Inverse of Matrix using Elementary Transformations, Normal form of a matrix, Linear dependence and independence of vectors, Rank of a matrix, Solution of system of Linear Equations, Definition ,Properties and computation of Eigen values and Eigenvectors, Cayley - Hamilton theorem and its applications, Reduce to diagonal form.

Module-III: Probability and Probability Distributions
Probability, Probability Distribution: Random variable, probability mass function (pmf) and probability density function (pdf), Cumulative distribution function (cdf). Properties and application of Binomial, Poisson and Normal distributions

Module-IV: Tensors
Tensor: Special Coordinate systems; Spherical and Cylindrical coordinates; Tensor analysis; Contraction and Direct Product; Quotient rule, Covariant and Contravariant tensors, Einstein summation convention; Levi-Civita symbols; Metric Tensor.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Reference and Text Books

- Mathematical Physics – P.K. Chattopadhyay (Wiley Easte)
- Mathematical Methods for Physicists,G.B.Arfken, H.J.Weber, F.E.Harris,2013, 7th Edn., Elsevier.
- Mathematical Methods for Physics and Engineers, K.F Riley, M.P. Hobson and S. J. Bence, 3rd ed., 2006, Cambridge University Press
- Mathematical Physics- Dr. B S Rajput

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DEMONSTRATIVE ASPECTS IN MODERN PHYSICS-III

Course Code: DPHY2703 **Credit Units: 01**

Course Objective:

The objective of the course is to enable students to understand the aspects of modern physics through experiments. This will enable students to demonstrate the conceptual knowledge through various experiments in Laboratory.

Course Contents: List of Experiments to be performed in Lab

Elastic Constants for the material of a given wire by Searle's method
Determination of coefficient of viscosity of water by Poiseuille's flow method
Thermal conductivity of copper by Searle's method.
To determine the height of the tank or building or tower or any object with the help of a sextant.
To determine the variation of Thermo-EMF with temperature
Laser Diode Intensity Modulation and Demodulation Trainer.
Single & Double slit /X-Z long Translational stage silicon Detector with digital Microammeter.
To determine the Stefan's constant
To determine the Rydberg's constant
To study the complete working operation of Metallurgical Microscope

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text & References:

- B.Sc Practical Physics by C. L. Arora. S. Chand Publication

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DIGITAL ELECTRONICS & MICROPROCESSOR

Course Code: DPHY2704 **Credit Units: 04**

Course Objectives

This course gives a comprehensive view of Digital Electronics- Number Systems and combinational Circuits. It covers the basics of microprocessors.

Course Contents :

Module I: Number Systems and Combinational Logic

Review of Number System, Decimal, binary, octal and hexadecimal number systems. Conversion from one system to another. Definitions, symbols and truth table of NOT, OR, AND, NAND, NOR, XOR, gates, De Morgan's theorems; The Gray Code, Realization of basic gates using universal gates; Simplifying simple Boolean expressions, Karnaugh-maps.

Arithmetic and Logic Units (ALU)

Half adder, full adder, and 4-bit binary adder, Half subtractor, full subtractor, adder subtractor using full adder IC.

Module II: Flip-Flops, Counters and Shift Registers

Sequential and combinational circuits, Latch, flip-flops, clock signal, Build a flip-flop circuit using elementary gates (RS, clocked RS, D-type, JK), Build a 4 bit counter using D-type JK flip-flop, Make a shift register from D type flip-flop, Serial in Serial out, Serial in Parallel out, Parallel in Serial out, Parallel in Parallel out shift registers.

Module III: Microprocessors

Introduction to Microprocessors, microcomputer organization, 8-bit, microprocessor-Intel 8085 microprocessor, main features, architecture, data and address buses, CPU, ALU, flags and register organization, stack pointer, program counter, timing signals, instruction sets, addressing modes.

Module IV: Interrupts and Interfacing in Microprocessors

8085 interrupts and its classification, Software and hardware interrupts, vectored and non-vectored interrupts, priorities of interrupts. Interfacing memory and I/O devices. Interfacing devices-programmable peripheral interface,

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Hand Book of Electronics, Gupta & Kumar, Pragati Prakashan.
- Integrated Electronics: Analog and Digital Circuits and Systems, Jacob Millman and Christos C. Halkias, Tata McGraw-Hill.
- Digital Principles and Applications by A.P. Malvino and D.P. Leach, Tata McGraw-Hill, Publishing Co., New Delhi.
- Text Book of Electronics by S. Chattopadhyay, New Central Book Agency P.Ltd., Kolkata, 2006.
- Electronics Principles by Malvino, 6th Edition, Tata McGraw-Hill Publishing Co., New Delhi, 2001.
- Electronics Principles and Applications by A.B. Bhattacharya, New Central Book Agency P.Ltd., Kolkata, 2007.
- Introduction to Microprocessors, Dhanpat Roy & Sons.

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ADVANCED STATISTICAL MECHANICS

Course Code: DPHY2705 **Credit Units: 04**

Course Objectives

The objective of this course is to Introduction to the microscopic formulation of thermal physics, generally known as statistical mechanics. General principles, from which emerge an understanding of the microscopic significance of entropy and temperature and range of applications to simple models of crystalline solids, classical gases, quantum gases and blackbody radiation.

Course Contents:

Module I

Kinetic theory of gas (Revision), Probability concepts in statistical mechanics, Random walk problem, General Aspects of Probability Distributions

The Statistical Basis of Thermodynamics, The macroscopic and the microscopic states, Contact between statistics and thermodynamics, Entropy on microscopic scale, physical significance of the number Ω(N,V,E), Thermodynamic equilibrium, Mechanical equilibrium, Chemical equilibrium, Review of phase space, Liouville's theorem, basic postulates of statistical mechanics, The classical ideal gas, The entropy of mixing and Gibb's paradox, Sackur tetrode equation of entropy, Correct Boltzmann counting

Module II Elements of ensemble theory, microcanonical, canonical, grand canonical ensemble, quantum states and the phase space, equilibrium between system and a heat reservoir, partition function, physical significance of the various statistical quantities in the canonical ensemble, The classical systems, energy fluctuations in the canonical ensemble, statistics of paramagnetism, Boltzmann's equation, Maxwell & Boltzmann statistics, Equipartition theorem and its Simple applications, Virial theorem,. Maxwell velocity distribution, related distributions and mean values.

Module III Equilibrium between a system and a particle- energy reservoir, density and energy fluctuations in Grand canonical ensemble, formulation of quantum statistics, Fermi-Dirac and Bose-Einstein statistics. Applications of the formalism to: (a) Ideal Bose gas, The field of sound waves, Einstein and Debye theory of specific heat, properties of black-body radiation, Bose- Einstein condensation, experiments on atomic BEC,(b) Ideal Fermi gas, properties of simple metals, Pauli paramagnetism, electronic specific heat, Compressibility of Fermi gas, A relativistic degenerate electron gas.

Module IV Phase transition, non-equilibrium statistical mechanics, Ising model, fluctuation-dissipation.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

This course does not follow a particular text. The following are useful reference books:

- Huang, Kerson. **Statistical Mechanics**. 2nd ed. Wiley, 1987. ISBN: 9780471815181.
- Pathria, R. K. **Statistical Mechanics**. Pergamon Press, 1972. ISBN: 9780080189949.
- Pippard, A. B. **The Elements of Classical Thermodynamics for Advanced Students of Physics**. University Press, 1966.
- Ma, Shang-keng. **Statistical Mechanics**. Translated by M. K. Fung. World Scientific Publishing Company, 1985. ISBN: 9789971966065.
- Landau, L. D., and E. M. Lifshitz. **Statistical Physics, Part 1**. 3rd ed. Pergamon Press, 1980. ISBN: 9780080230382.
- Reif, Frederick, ed. **Fundamentals of Statistical and Thermal Physics**. McGraw-Hill, 1988.

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- Feynman, Richard Phillips. **Statistical Mechanics: A Set of Lectures**. Westview Press, 1998. ISBN: 9780201360769.]
- Kardar, Mehran. **Statistical Physics of Particles**. Cambridge University Press, 2007. ISBN 9780521873420.

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ENERGY PHYSICS & ADVANCED ENERGY SYSTEMS

Course Code: DPHY2706 **Credit Units: 04**

Course Contents:

Module I: Need of energy storage - flywheel storage- electrical and magnetic energy storage- capacitors - electromagnets- chemical energy storage- thermo chemical- photochemical- Photovoltaic, biochemical - electrochemical- fossil fuels and synthetic fuels- hydrogen for energy storage -Ragone plot of energy storage devices

Module II: Charge transport properties, capacitance density, impedance, Power density, Review of Faraday's laws, Faradaic and Non-Faradaic processes, conductivity of electrolytes, ionic mobility, Ostwald dilution law, Electrode potentials, Polarization of Electrode, Batteries-classification of batteries-difference between primary and secondary batteries- manganese dioxide batteries -lead acid batteries - nickel cadmium batteries- lithium ion batteries- applications of batteries.

Module III: Materials for energy storage- Applications of Nanomaterials, carbon nanomaterials, graphene, graphene dots, carbon nano tubes, Silicon, Oxide nanomaterials for transparent electrode, Electroluminescence, Solid-state lighting, White light emitting diode, Phosphors materials,

Module IV: Energy applications-, Electrochemical cells, C-V measurement, EIS measurement, Photovoltaic cell, Characteristic of the Photovoltaic Cell, Thin film Solar cell, DSSC, Solar photovoltaic system design and power generation, energy converters, Magnetic and electric energy storage systems Superconducting magnet energy storage system(SMES) -concept of supercapacitor- classification of supercapacitors- working of electrochemical double layer capacitors (EDLC), Pseudo capacitors and hybrid supercapacitors - difference between capacitor, supercapacitor and battery - advantages, disadvantages and applications of supercapacitors. Direct energy conversion devices-thermoelectric effects-thermoelectric power generator, Advantages and Disadvantage magneto hydro dynamic (MHD) generation-MHD generator , power output of MHD generator-advantages and disadvantages MHD system.

Module V: Fuel Cells & Hydrogen Energy Production and Storage

Introduction, electrochemistry, alkaline fuel cells, phosphoric acid fuel cells, solid oxide fuel cells, direct methanol fuel cells, fuel processing, proton exchange membrane fuel cells, fuel processing, Hydrogen pathways, General introduction to infrastructure requirement for hydrogen production, storage, dispensing and utilization, Physical and chemical properties of storage materials – General storage methods, compressed storage – Composite cylinders – Glass micro sphere storage - Zeolites, Metal hydride storage, chemical hydride storage and cryogenic

Module VI: Global Energy scenario, Indian Scenario, energy crises, Industrial demands, impact on human life,

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

References:

- ENERGY SCIENCE: principles, technologies, and impacts, John Andrews and Nick Jelley, Oxford University Press.
- Fundamentals of Energy Storage, J. Jensen , B. Squrensen, John Wiley, NY
- Electrochemical Power Sources: Primary and Secondary Batteries , P. Peregrines, IEE
- Supercapacitors: Materials, Systems, and Applications ,Kindle Edition, Francois Beguin , Elzbieta Frackowiak ,Wiley-VCH

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ACCELERATORS & DETECTORS

Course Code: DPHY2707 **Credit Units: 04**

Course Contents:

Module I: Interaction of radiation and charged particles with matter

Introduction to radiations, Ionizing and nonionizing radiation, Energy loss of electrons and positrons, Positron annihilation in condensed media, Stopping power and range of heavier charged particles, derivation of Bethe-Bloch formula, interaction of gamma rays with matter, neutron classifications, sources of neutrons, neutron detectors.

Module II: Nuclear radiation detection

Gas-filled detectors, proportional and Geiger-Muller counters, Scintillation detectors, solid-state detectors, Cherenkov effect, specialized detectors, solid state nuclear track detectors, Wilson Cloud Chamber, bubble chambers, nuclear emulsions,

Module III: Accelerators

Van de Graaff Accelerator, Linear accelerators, cyclic accelerators, Cyclotron, Betatron, Synchrocyclotron, ion sources, CERN Super Proton Synchrotron (SPS). Large Hadron Collider (LHC)

Module IV: Applications

Applications in Research, material physics research, medical applications (Synchrotron radiation sources and neutron spallation sources) and radiation protection, Applications in Nuclear and Particle Physics

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Edward J.N. Wilson "Ann introduction to Paricle Accelerators", Oxford University Press,2003.
- James Rosenzweig "Fundamentals of Beam Physics", Oxford University Press,2001.
- P N Cooper "Introduction to Nuclear Radiation Detectors", Cambridge University press, 1986.
- Kapoor S S and Ramamurthy V S "Nuclear Radiation Detectors", Wiley Eastern, new Delhi, 1986.
- Knoll G. F., Radiation Detection and Measurement, John Wiley & Sons (1989).
- Krane K. S., Introductory Nuclear Physics, John Wiley & Sons (1975).
- Singuru R. M., Introduction to experimental nuclear physics, Wiley Eastern Publications (1987)

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SENSORS

Course Code: DPHY2708 **Credit Units: 04**

Course Objective:
To enable students about sensors and nano sensors.

Course Contents:

Module I: Introduction
Introduction to sensor and transducer; sensor Characteristics, Scaling Considerations, Uncertainty, Calibration, Hysteresis, Nonlinearity, Saturation, Repeatability, Resolution, Transfer Functions, Classification of measurement error

Module II: Physical Principle of sensing
Electric charge, field and potential; Capacitance, Magnetism, Induction, Resistance, Hall Effect, Temperature and thermal properties of material; Thermoelectric Effects

Module III: Applications of sensors
Temperature Sensors, Smoke, Fire; Gas sensors, Chemical and Humidity. Light Detectors, Image Sensors; Humidity and Moisture Sensors, Microphones, Flow Sensors, Pressure Sensors, Force and Strain, Velocity and Acceleration, Presence, Displacement, and Level, Pulse Oximeter, Glucometers, DNA sensor and Immunosensor

Module IV: Nanosensor
Introduction to nanosensors; Classification; MEMS and NEMS, Materials used for nano sensors; Production methods; Photolithography; nanosensors using quantum dots; Application of nano sensor.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Handbook of Modern Sensors: Physics, Designs, and Applications Fraden Jacob.
- Biosensors, Jonathan M. Cooper, Anthony E. G. Cass, Jon. Cooper, A. E. G. Cass.
- Fundamentals of sensors For engineering and science, Patric F Dunn, CRC Press 2012
- Sensors, Actuators, and their Interfaces A Multidisciplinary Introduction Nathan Ida SciTech Publishing 2014

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RADIATION PHYSICS AND ITS APPLICATIONS

Course Code: DPHY2709 **Credit Units: 04**

Course Objective: The objective of the course on Radiation Physics is to expose the students of M.Sc. class to the concepts of different kinds of radiations, their interaction with matter, radiation detection and radiation dosimetry. The course will enable students to understand that interaction of matter with different kinds of radiations such as charged particles, electrons, neutrons, EM waves etc. and further their technological applications primarily as radiological applications.

Course Contents:

Module 1: Radiation Sources
Basic units and definitions, Fast electron sources: beta decay, internal conversion & Auger electrons; Heavy charged particle sources: Alpha decay & spontaneous fission; Sources of electromagnetic radiation: Gamma rays following beta decay, Annihilation radiation, Bremsstrahlung, Characteristic X-rays & Synchrotron radiations; Neutron sources: Radioisotope sources & photoneutron sources

Module 2: Radiation Interaction
Interaction of heavy charged particles: Nature of interaction, stopping power, energy loss characteristics, The Bragg curve, Energy straggling, Range & Range straggling, Energy loss in thin absorbers; Interaction of fast electrons: Specific energy loss, Electron range and transmission curves, Interaction of gamma rays: Photoelectric absorption, Compton scattering, Pair production; Interaction of neutrons: Slow neutron & fast neutron interaction; Radiation exposure and dose: Gamma ray exposures, Absorbed Dose, Dose equivalent,

Module 3: Radiation Detectors and Spectroscopy:
General characteristics of detectors: Detector model, Modes of detector operation, Energy resolution, Detector efficiency; Gas filled detectors, Organic and inorganic scintillation detectors, Semi-conductor detectors [Si(Li), Ge(Li) HPGe]. Photomultiplier tubes, Gamma ray spectrometers, Gamma ray spectrometry with NaI(Tl) scintillation and semiconductor detectors; Background and detector shielding.

Module 4: Radiation Dosimetry
Radiation dosimetry, its types and applications: Environmental, space, personal and medical dosimetry; General properties of dosimeter; Thermoluminescence (TL) and its mechanism; TL dosimetry: TL glow curve and TL spectra; Concept of trapping parameters: activation energy, order of kinetics & frequency factor; TLD protocols, optically stimulated luminescence (OSL) based dosimetry

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text Books

- Nuclear Radiation Detectors: S. S. Kapoor and V. S. Ramamurthy, New Age, International, New Delhi.
- Introduction to Radiological Physics and Radiation Dosimetry: Frank Herbert Attix, Wiley-VCH
- The Atomic Nucleus: R.D. Evans, Tata Mc Graw Hill, New Delhi
- Thermoluminescence of Solids, S. W. S. Mckeever, Cambridge University Press

Reference Books

- Radiation Detection and Measurements: G. F. Knoll, Wiley & Sons, New Delhi.
- Introductory Nuclear Physics: K. S. Krane, Wiley & Sons, New Delhi.

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- An Introduction to X-ray Spectrometry: Ron Jenkin, Wiley.
- Techniques for Nuclear and Particle Physics Experiments: W. R. Leo, Narosa Publishing House, New Delhi.
- Thermally and Optically Stimulated Luminescence: R Chen, V. Pagonis, John Wiley & Sons.

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VACUUM TECHNOLOGY

Course Code: DPHY2710 **Credit Units: 04**

Course Objective:
Through this course, students will be able to appreciate the basic theories of vacuum technology and the equipment that is used in vacuum- and thin film technology. Students will be able to use the vacuum-based tools in an adequate way and they will have an understanding of vacuum and related issues such as pressure measurement, pumping mechanisms and pumping speed, mean free path etc.

Course Contents:

Module-I: Physics of Rarefied gases (12 hours)
Kinetic Theory of Gases, Gas Laws, Mean free path, Transport processes, viscosity of gases, diffusion of gases, resistance and conductance of vacuum pipework, Gas flow in pipework, pump-down time, adsorption and desorption of gases, solubility of gases, vapor pressure,

Module-II: Production of vacuum (12 hours)
Action & Construction of Rotary Vane pump, Rotary piston pump, Diffusion pump and Roots Blower, Screw/Diaphragm/Claw/Scroll pumps for dry vacuum production, Turbomolecular, Ion & Cryopumps for ultra-high vacuum production, Selection criteria of vacuum pumps for different applications.

Module-III: Vacuum Measurements: (12 hours)
Measurement of Vacuum using Primary & Secondary gauges (U Tube / McLeod / Bourdon / Pirani / Penning / Ionization / Capacitance)

Module-IV: Vacuum Systems and Components: (12 hours)
Vacuum Materials, Valves & Components, Mechanical design of Vacuum vessels, Fabrication and testing of Vacuum chambers, Degassing procedures, Design aspects of Vacuum systems for different applications, Complete design of Vacuum furnace for Metallurgical processing as an example tutorial

Module-V: Applications of Vacuum Technology (12 hours)
Application of Vacuum Technology in Chemical/Pharmaceutical/Food processing and packing/Medical/Solar thermal/Wood processing/Precise lifting applications, Application of Vacuum Technology in Electrical/coating/Electronics/semiconductor and Metallurgical processes, Vacuum aspects of IC chip/Solar PV cell/Mobile/TV/Computer manufacturing, Application of Vacuum in Space (ISRO) and Nuclear (DAE) applications, Nuclear fusion for future clean energy, Space simulation chambers for satellite and space shuttle testing

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Overview of Vacuum Technology By **Timothy A. Gessert**, AIP Publishing LLC DOI: **https://doi.org/10.1063/9780735422254**, ISBN electronic: 978-0-7354-2225-4, ISBN print: 978-0-7354-2222-3, 2021
- Basic Vacuum Technology, 2nd edition, By **A. Chambers**, ISBN 9780750304955, 20 B/W Illustrations, Published January 1, 1998 by CRC Press

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Course Code: DPHY2739	BASICS OF RESEARCH METHODOLOGY, ETHICS, AND RESEARCH COMMUNICATION	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description

This course aims to provide students with a comprehensive understanding of conducting ethical research, utilizing proper research methodologies, and effectively communicating research findings. The course includes a final project where students will write a Literature Review on a topic chosen in consultation with the teacher(s).

This course is designed to equip students with essential skills and knowledge to conduct ethical research, employ proper research methodologies, and effectively communicate scientific information (with focus on writing a literature review). The course will cover topics such as research design, data collection and analysis, research ethics, and science communication strategies. Through a combination of lectures, discussions, case studies, and practical exercises, students will develop a deeper understanding of the research process and its ethical implications.

Course Objectives

The objective of this course is to impart knowledge about various stages of research process, research ethics and different ways of research communication.

The aim of this course is to impart research skills to the beginners and help to improve the quality of research by the existing researchers. It also encompasses the understanding and application of appropriate research design, statistics, and the use of the computer for reference management, report writing, research paper writing and presentation. The course also introduces the key conceptual issues of each research method, as well as giving practical guidance. It covers the series of research methodology contents: from problem formulation, to design, to data collection, analysis, reporting and dissemination. The course has the dual aims of equipping students with conceptual understandings of current academic debates regarding different methods, and the practical skills to put those methods into practice.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define criteria of good research, steps in research process, and data collection.

CO2. Identify different types of sampling and its purpose.

CO3. Conduct hypothesis testing for different types of samples and interpret the results.

CO4: Learn the importance of literature review, write research paper/thesis, use reference management software.

Course Content :

Module	Topic	**Blooms level***	Hours
1	**Research Methodology** Understanding the research process: From research questions to conclusions	L1, L2	10

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	Types of research: Qualitative and quantitative research Exploratory, descriptive, experimental, and correlational studies Scientific Thinking: Subjective Vs. Objective Thinking Logical Reasoning: Inductive Vs. Deductive Reasoning Formulating research hypotheses and objectives Purpose of a good research, Criteria of good research		
2	**Descriptive Statistics** Data, Types of Data, Methods of data collection, Benefits and drawbacks, Graphical representation of data and interpretation. Measures of Central Tendency: Arithmetic Mean, Median, Mode, Measures of Dispersion: Range, Standard Deviation, Variance, Coefficient of Variation.	L1, L2, L3	15
3	**Inferential Statistics** Sampling: Basic concepts, Process of Sampling, Sample Size, Types of Samples, Sampling and non- sampling errors, Statistics and Parameters, Sampling Distribution of Means and Proportion, **Hypothesis Testing**, steps in testing of hypothesis, errors in hypothesis testing, z test and t test.	L1, L2, L3	15
4	**Research Ethics** Plagiarism, Fabrication, Falsification, Ethics with respect to human and Animal Research	L1, L2	5
5	**Communication** Characteristics of a good Research paper, Systematics Literature Review (choosing a topic, preparing outline, gathering authentic & appropriate references, avoiding plagiarism, use of reference management systems), Writing a good literature review, Structure of report (Introduction, Methodology, Analysis, Results, Discussions, Conclusions, Recommendations), Writing Quality Research Paper, Publishing Research Work in Quality Journals, Reference Management Software	L1, L2, L3	15

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional Exam	End Term Examination
Weightage (%)	5	10	15	70

Project based assignment: Student teams (2-3 students per team) will write a literature review on a topic of choice, in consultation with the teacher.

Text books/ Reference books

- Research Methodology for Natural Sciences by Soumitro Banerjee, Publisher: IISc Press (1 January 2022); ISBN-10: 8194835178; ISBN-13: 978-8194835172

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- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt. Ltd., New Delhi-110001
- Geode, Millian J.& Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Kothari, C.R.2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.
- Levin R I., Rubin D S. Statistics for Management. Sixth Edition, PHI
- Kapoor & Gupta. Probability & Statistics. S Chand Publishers, New Delhi.
- Montomery, Douglas C.(2007), 5th Ed. Design and Analysis of Experiments, Wiley India.
- Cooper, Donald R. and Pamels Schindler, Business Research Methods, Tata McGraw Hills, New Delhi
- Krishnaswamy, K.N. Sivakumar. Appa lyer and Mathiranjan M. 2006, Management Research Methodology: Integration of Principles, Methods and Techniques, Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Sachdeva, J.K. 2008. Business Research methodology. Himalaya Publishing House, New Delhi.
- Shekharan, Uma, Business Research Methods, Miley Education, Singapore.
- Zikmund, Millian G., Business Research Methods, Thomson Learning, Bombay**.**

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SEMESTER-VIII

ELECTRODYNAMICS

Course Code: DPHY2801 **Credit Units: 04**

Course Objective:

This course aims to broaden your view and deepen your understanding of time-dependent electrodynamic fields, electromagnetic phenomena and wave properties. Students will develop a fairly complete picture of electromagnetism waves and radiations and their interaction with matter.

Course Contents:

Module I: Electric Field in Matter (Electrostatic and Potentials)

Dirac-delta function. Green's theorem Electrostatics: Laplace and Poisson equations; Uniqueness theorem, Dirichlet and Neumann boundary conditions; Method of images (point charge near a conducting plane and a sphere); Separation of variables in Cartesian and spherical coordinates. Boundary conditions on E,

Module II: Magnetic Field in Matter

Magnetic flux, Magnetic effect in static and time dependent field, The Divergence and Curl of a magnetic field; Magnetic Vector Potential; magnetic scaler potential, Divergence of vector potential, potential.

Module III: Electromagnetic Field and potential

Revisit of Basic Electromagnetic Laws and Maxwell equations; Displacement current, Continuity Equation, Electrodynamics potentials, inhomogeneous and homogeneous electrodynamic wave equations, Gauge transformations, Lorentz and Coulomb gauge; Potential and Field of a moving charge. Electromagnetic Wave equations in free space (one dimension)

Module IV: Electromagnetic energy and wave

Poynting's Theorem and Poynting vector; Energy density, energy & momentum of EM waves, plane electromagnetic wave, properties, Propagation of plane electromagnetic wave in matter, conducting medium, dielectric, skin depth, Electromagnetic wave in Ionosphere, reflection and transmission in conducting media;

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Electromagnetic by B. B. Laud.
- Classical Electricity and Magnetism by Panofsky and Phillips.
- Electromagnetic Theory and Electrodynamics by Satya Prakash.
- Electromagnetic fields and Waves by V. V. Sarwate.
- Classical Electrodynamics by Jackson J D
- Feynman Lectures in Physics, Vol.2
- Electrodynamics by Gupta S. L., Singh S. P. and Kumar.

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INTRODUCTION TO NANOTECHNOLOGY

Course Code: DPHY2802 **Credit Units: 04**

Course Objective:
This course aims at students to get acquainted with introductory knowledge of Nanotechnology.

Course Contents:

Module I Introduction
Nanoscience and Nanotechnology, Classification of nanostructured materials, Nanoparticles, Length scales, Bohr exciton radius, confinement regimes, Nanomaterials and their types, 1D, 2D and 3D confinement and Concept of quantum dots, quantum wires and quantum wells; Density of states for bulk materials, quantum wells, wires and dots; Importance of size distribution control, size measurement and size selection .The concept of surface energy, Surface to volume ratio, Ultra thin films-multilayered materials,

Module II: Preparation Methods
Bottom-up synthesis, Top-down approach: Mechanical milling, Sputtering, Evaporation. Material processing by Sol – Gel method, Chemical Vapour deposition and Physical Vapour deposition ,Microwave Synthesis of materials, Synthesis of metal & semiconductor nanoparticles by colloidal route, homo- and hetero-nucleation growth methods, Microemulsions, , Gas Phase Synthesis of Nanopowders: – Vapor (or solution) – liquid – solid (VLS or SLS) growth – the Need for Gas/vapor State Processing – Main Stages of Gas Phase Synthesis Lithographic technique

Module III: Characterization Techniques
X-ray diffraction technique, Scanning Electron Microscopy, Tunneling Electron Microscopy, Surface Analysis Techniques- AFM, SPM STM, ESCA.

Module-IV: Properties and Applications of Nanomaterials
Physical and Mechanical properties of nanomaterials, Optical Properties: Optical Properties of metal nanoparticles and Surface Plasmon Resonance; Optical properties of semiconducting nanoparticles: Effect of nanostructure formation on the band gap and photoluminescence, Applications based on band gap engineering Electronic properties: Nanocapacitor and Coulomb blockade in Nanocapacitor, Tunnel Junction, Single Electron Tunneling Oscillations, Single Electron Transistor, Applications based on SET Magnetic Properties: Nanomagnets, Dynamics of nanomagnets, super-paramagnetism, ferrofluids; Applications based on Nanomagnets

Module-V: Special Nanomaterials and their Applications
Details of carbon-based nanostructured materials, Importance, properties and application of CNT, Graphene and Fullerenes, Applications of carbon-based nanomaterials, Zeolites and their applications, Aerogel, Aerosol, Porous nanomaterials along with their applications.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- T. Pradeep, NANO The Essential, understanding Nanoscience and Nanotechnology, Tata McGraw-Hill Publishing Company Limited, 2007.
- Charles P.Poole Jr., Introduction to Nanotechnology, John Willey & Sons, 2003.
- Nanotechnology by Mark Ratner and Daniel Ratner, Pearson Education.
- Nanomaterials by A.K. Bandyopadhyay; New Age International Publishers.

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THIN FILM TECHNOLOGY

Course Code: DPHY2803 **Credit Units: 04**

Course Objective:
To make the students understand the difference between bulk and thin film, the optical, electrical, and dielectric properties of thin film, the theories explaining the formation of thin film and the fabrication and advantages of thin film devices.

Course Contents:
Module-I: Preparation Methods
Physical methods: Thermal evaporation, Cathodic sputtering, Molecular beam epitaxy and Laser ablation methods. Chemical methods: Electrolytic deposition, Chemical vapor deposition.

Module-II: Thickness Measurement and Characterization
Electrical, Mechanical, Optical, Microbalance, Quartz crystal methods. Analytical techniques of characterization: X-ray diffraction, Electron microscopy, High and low energy electron diffraction, Auger emission spectroscopy.

Module-III: Growth and Structure of Films
General Features, Nucleation theories, Effect of electron bombardment on film structure, post-nucleation growth, Epitaxial film growth, Structural defects.

Module-IV: Properties of Thin Films
Understanding the electrical and superconducting behaviour of thin films and hence to draw a valuable conclusion regarding the properties of the material. Mechanical properties: Elastic and Plastic behaviour. Optical properties: Reflectance and transmittance spectra, Absorbing films, Optical constants of film material, Multilayer films, Anisotropic and isotropic films. Electrical properties: Conductivity in metal, Semiconductor and Insulating films, Discontinuous films, Superconducting films.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- K.L. Chopra, "Thin Film Phenomena", First Edition, McGraw-Hill, 1969.
- George Hass, "Physics of Thin Films", Volumes 1, Academic Press Inc., 1963.

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PHYSICS OF SOLAR PHOTOVOLTAICS

Course Code: DPHY2804 **Credit Units: 04**

Course Objective:
In this course, one would learn about the fundamentals of photoelectric conversion: charge excitation, conduction, separation, and collection. Students will become familiar with commercial and emerging photovoltaic (PV) technologies and various cross-cutting themes in PV: conversion efficiencies, loss mechanisms, characterization, manufacturing, systems, reliability, life-cycle analysis

Course Contents*:*

Module I: Solar Cells and Sunlight
Outline of solar cell development, physical source of sunlight, review of solar intensity at the Earth's surface, solar insolation data,

Module II: Review of Semiconductor Properties
Crystal structures and orientations, forbidden energy gaps, dynamics of electrons and holes, carrier density, carrier transport, generation and recombination of carriers due to light, direct and in-direct band gap semiconductors, basic device physics, p-n junction diode,

Module III: Standard Silicon Solar Cell Technology (1st generation solar cells)
Photovoltaic effect, solar cell output parameters, characteristic lifetime, diffusion length, diffusion coefficient, absorption coefficient, efficiency limits, losses, and measurements. Review of fabrication technology, polysilicon and single crystal silicon cell technologies. Design of Solar Cells, Solar cells to solar module, Development of commercial Si solar cells, process flow of commercial Si cell technology, processes used in solar cell technologies, high efficiency Si solar cells

Module IV: Thin Film Solar cells (2nd – Generation)
Poly-silicon silicon, amorphous silicon, gallium arsenide solar cells, copper sulfide and cadmium sulfide solar cells, potential & drawbacks of currently manufactured technologies (single- and multicrystalline silicon, CdTe, CIGS, CPV)

Module V: Emerging Solar Cells technologies and Concepts (3rd –Generation)
Organic solar cells, Dye-sensitized solar cells, Perovskite solar cells, GaAs solar cells, Thermo-photovoltaic approaches to overcome single junction efficiency limits, spectrum modification approaches, hot carrier solar cells, Quantum Dot solar cells, life-cycle analysis of various solar cells technology

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Solar Photovoltaics (Fundamentals, Technologies and Application) by Chetan Singh Solanki
- Martin A. Green, Solar Cells-Operating Principles, Technology, and System Applications
- M. S. Tyagi, Introduction to Semiconductor Materials and Devices
- Third Generation Photovoltaics (Advanced Solar Energy Conversion) By Martin A. Green; Lecture Notes

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ATMOSPHERIC & ENVIRONMENTAL PHYSICS

Course Code: DPHY2805 **Credit Units: 04**

Course Contents:

Module I: General features of Earth's atmosphere: Thermal structure of the Earth's Atmosphere, Composition of atmosphere, Hydrostatic equation, Potential temperature, Atmospheric Thermodynamics, Greenhouse effect, Local winds, monsoons, fogs, clouds, precipitation, Atmospheric boundary layer, Sea breeze and land breeze. Instruments for meteorological observations including RS/RW, meteorological processes and convective systems, fronts, Cyclones and anticyclones, and thunderstorms.

Module II: Atmospheric Dynamics: Scale analysis, Fundamental forces, Basic conservation laws, The Vectorial form of the momentum equation in a rotating coordinate system, scale analysis of equation of motion, Applications of the basic equations, Circulations and vorticity, atmospheric oscillations, Quasi biennial oscillation, annual and semi-annual oscillations, Mesoscale circulations, The general circulations, Tropical dynamics.

Module III: Atmospheric Waves: Surface water waves, wave dispersion, acoustic waves, buoyancy waves, propagation of atmospheric gravity waves (AGWs) in a non-homogeneous medium, Lamb wave, Rossby waves and its propagation in three dimensions and sheared flow, wave absorption, non-linear consideration.

Module IV: Atmospheric Radar and Lidar: Radar equation and return signal, Signal processing and detection, Various types of atmospheric radars, Applications of radars to study atmospheric phenomena, Lidar and its applications, Application of Lidar to study atmospheric phenomenon. Data analysis tools and techniques. Atmospheric Aerosols: Spectral distribution of the solar radiation, Classification and properties of aerosols, Production and removal mechanisms, Concentrations and size distribution, Radiative and health effects, Observational techniques for aerosols, Absorption and scattering of solar radiation, Rayleigh scattering and Mie scattering, Bouguert-Lambert law, Principles of radiometry, Optical phenomena in the atmosphere, Aerosol studies using Lidars.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Reference Books:

- Fundamental of Atmospheric Physics, M.L Salby; Academic Press, Vol 61, 1996
- The Physics of Atmosphere – John T. Houghton; Cambridge University press; 3rd edn. 2002.
- An Introduction to dynamic meteorology – James R Holton; Academic Press, 2004
- Radar for meteorological and atmospheric observations – S Fukao and K Hamazu, Springer Japan, 2014

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PLASMA PHYSICS

Course Code: DPHY2806 **Credit Units: 04**

Course Objective: This course aims at exposing the students to the basic knowledge of plasma physics, plasma parameters, to distinguish plasma from a gas, the motion of charged particles under different electric and magnetic field conditions. To study this course, the students will be able to understand the collective behavior of plasma, the techniques of plasma production and diagnostics.

Course Contents:

Module –I: Introduction to Plasma Physics

Plasma state, Natural Plasma, fundamental concepts, concept of temperature, Quasi-neutrality in plasma, density of plasma, electron and ion temperatures, mobility of charged particles, Debye shielding, criteria for ionized gas to be a plasma, dielectric constant of plasma, optical properties of plasma.

Module –II: Orbit Theory of Plasma

Effect of magnetic field on mobility of electrons, Particle motion in a static uniform magnetic field, in uniform force, uniform electric fields, motion in gravitational fields, Grad- B drift, curvature drift, polarization drift, particle in non-uniform magnetic and electric fields, particle in time varying electric and magnetic fields.

Module –III: Fluid description of plasma

Relation of plasma physics and electromagnetic, equation of motion for fluid, equation of continuity, single fluid equations, fluid-drifts perpendicular and parallel to magnetic field, magnetic pressure, magnetic tension, plasma approximation.

Module –IV: Waves in a fluid plasma

Representation of waves, plasma oscillations, electron plasma waves, ion plasma waves, Sound waves, Ion waves, plasma approximation, electrostatic electron waves perpendicular to magnetic, electrostatic ion waves perpendicular to B, Lower frequency waves, Electromagnetic waves, Magnetosonic and Hydromagnetic waves.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text &Reference Books:

- Introduction to Plasma Physics and Controlled Fusion, Francis F. Chen, Springer.
- Fundamentals of Plasma Physics, J. A. Bittencourt, Elsevier.
- Fundamentals of Plasma Physics, Paul Murray Bellan, Cambridge.
- Textbook of Plasma Physics, Suresh Chandra, CBS Pvt Ltd.

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BIOPHYSICS

Course Code: DPHY2807 **Credit Units: 04**

Course Objective:
This course aims at exposing the students to basic Biophysics concepts which will be useful for them to solve the integrated problems of Biology and Physics.

Course Contents:

Module I: General Biophysics and Techniques in Biophysics
Fundamentals of Biophysics, Surface tension, Adsorption, Osmosis, Osmotic pressure, Dialysis, Colloids, Colloidal systems of life, Buffer, Buffer capacity, Buffers in life system, pH, its importance, Basics of spectroscopy, X-ray crystallography, NMR, UV etc

Module II: Molecular Biophysics
Protein structure, Primary, secondary, tertiary and quaternary structure. Main chain and side chain torsion angles, Alpha helix, beta sheet, turns. Ramachandran plot, Allowed conformations for a pair of linked peptide units, Motifs and domains.

Module III: Thermodynamics of Biological System
The first and second laws of thermodynamics, are activation energy. Biological systems as open, non-equilibrium systems, Concept of free energy, unavailable energy and entropy, the heat content of food, bomb calorimetry, Enthalpy, and Negative entropy as applicable to biological systems. thermodynamics of passive and active transport, glycolytic oscillations, biological clocks

Module IV: Biomedical Instrumentation
Basic concepts in medical instrumentation, Basic sensors-principles, transducers, amplifiers, measurement of blood pressure, blood volume, blood flow, respiratory measurements, cardiac output measurements, patient monitoring equipment, audiometers, cardiac pacemakers, surgical diathermy, hemodialysis machine, automated drug delivery systems, ICU and Operation theatre equipment, blood bank instrumentation.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Biophysics by W Hoope Edtr., Springer – Verlag New York.
- Molecular Biophysics by R B Setlaw & EC Pollard, Addison Wesley Reading MA
- Essentials of Biophysics by P Narayanan, New Age International Publishers
- Medical Instrumentation applications and design by John G. Webster

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GROUP THEORY AND CRYSTALLOGRAPHY

Course Code: DPHY2808 **Credit Units: 04**

Course Objective: Mathematical Applications of Symmetry to an object to obtain knowledge of its physical properties.

Course Contents:

Module I: Basics of Group theory:
Theorems of Group Theory, Properties of Group and examples, subgroups, classes. Molecular Symmetry and the Symmetry Groups: Symmetry elements and operations: symmetry planes and reflections, the inversion Center, proper axes and proper rotation, and improper axes and improper rotations, products of symmetry operations, equivalent symmetry elements and equivalent atoms, General relations among symmetry elements and operations, Symmetry elements and optical isomerism, symmetry point groups, symmetries with multiple high- order axes, classes of symmetry operations, a systematic procedure for symmetry classification of molecules. Representations of Groups: Comments on matrices and vectors, representation of groups, Great Orthogonality Theorem and its consequences, character tables, representation for cyclic groups

Module II: Crystallographic point groups: Point group, Hermann-Mauguin symbols for point groups. Basic properties of groups (group axioms, order, multiplication tables, etc.). Subgroups, index, coset decompositions, Development of 32 crystallographic point groups. Stereographic projection and its use for the derivation of crystallographic point groups. Laue classes.

Module III: Space groups: General introduction. Space group operators, The Symmorphic and non-symmorphic space groups, Matrix-column presentation of screw axes and glide planes, Structure of space groups: point groups of space groups. Coset decomposition of the space group concerning its translation subgroup, Space-group diagrams. General and special positions, site-symmetry groups, Derivation of space groups, Orthogonal projections of space groups. (Exercises on space-group diagrams from Volume A of the International Tables for Crystallography).

Module IV: Fundamental principles of X-ray diffraction : Scattering of x-ray by electron, atom and small crystal, Structure factor and Intensity. Typical crystal structure determinations from x-ray powder diffraction data. Determination of crystallite size and strain from x-ray diffraction patterns. ***Fourier Analysis***: Fourier transforms; the relationship between diffraction data and the electron density distribution within a crystal; the phase problem; Fourier maps.

Module V: **Structure Solution and Refinement:** Methods of structure solution, including Patterson maps, direct methods, and the charge-flipping algorithm; structure models and their refinement; validation and critique of structure refinements.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text &References:

- G. Burns and A. M. Glazer, *Space Group for Solid State Scientist*,, Academic Press, USA, 2013.
- J. F. Nye, *Physical properties of crystals*, Oxford Science Publication, Oxford University Press: New York, 2004.
- B. E. Warren, *X-ray diffraction*,, Addison-Wesley Publishing Company, London, 1969.
- C. Suryanarayana, M. Grant Norton, *X-ray diffraction: A practical approach*, Plenum Press, New York, 1998.

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Course Code: DPHY2839	DATA ANALYSIS & VISUALISATION USING SOFTWARE	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	Class X Mathematics				
Co-requisites					

Catalog Description

The implosion of available data has made visualization more critical but also more challenging. Data analysis and Data Visualization are essential tools for business analysis, engineers, policymakers, and decision-makers. Developed originally for "small data", visualization techniques have been met with varied success in the past centuries and decades. There are a few well-known visualizations that are very effective in capturing the essence of the data, and of course, there are many infamous negative examples of poor visuals. An effective visual is critical for decision making it, but it also requires a lot of work, customization, attention to detail, and refinements.

Course Objectives

The course is designed to help students develop skills and knowledge in the following area(s):

- Develop an understanding of what is a good visualization for a given purpose
- Learn visualization theory & techniques
- Build a substantial data analytic project
- Apply data analysis and visualization with Excel, SPSS, R, Python, NVivo and MATLAB

Course Outcomes

On completion of this course, the students will be able to

CO1. Students will be able to articulate meaningful lines of inquiry that might be explored through the collection, organization, visualization, and analysis of data in a context associated with their primary field of study using (as appropriate) numerical, textual, spatial, and/ or visual data.

CO2. Student will understand what data are, how they are collected, and how to assess the quality/ reliability of data.

CO3. Students will demonstrate intermediate proficiency in the visualization of data to communicate information and patterns that exist in the data.

CO4: Students will be able to use at beginning level of proficiency the tools of statistics and machine learning to ask questions of and explore patterns in data.

Course Content :

Module	Topics Covered	Blooms Level	Contact Hours
1	**Module-1: Introduction to Excel** Data Analysis using Excel, Curve fitting, Correlation, Linear Regression, Multiple regression, Principal Component Analysis and Factor Analysis, Hypothesis testing **Introduction to Excel and SPSS** Introduction to SPSS and Types of Data, Importing, exporting and data handling in SPSS; Exploratory data analysis using SPSS and data visualization;	L1, L2, L3, L4	20 hours

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	Introduction to statistical inference and various univariate tests by using SPSS; Analysis of Variance (One Way ANOVA, Two Way ANOVA and ANCOVA); Correlation, Simple and Multiple linear Regression Analysis; Principal Component Analysis and Factor Analysis		
2	**Module-2: VOS Viewer** **Web of Science, Scopus, Dimensions, Lens, and PubMed.** Co-authorship networks, citation-based networks, and co-occurrence networks can be created based on data downloaded from Web of Science, Scopus, Dimensions, and Lens. Co-authorship networks and co-occurrence networks can also be created based on PubMed data. **Crossref, Europe PMC, and OpenAlex**. Networks can also be created based on data retrieved through the APIs of Crossref, Europe PMC, and OpenAlex, These APIs can be queried interactively in VOS viewer. **Semantic Scholar, Open Citations, and Wiki Data.** For a given set of DOIs, networks can also be created based on data retrieved through the APIs of Semantic Scholar, Open Citations and Wiki Data.	L1, L2, L3, L4	10 Hours
3	**Faculty of Management Studies & Behavioural Sciences** **Module 3: Domain Specific Software** **- Structural Equation Modelling** **Smart PLS** Introduction to Structural Equation Modelling (SEM), Introduction to the software's AMOS and SPSS, SMART PLS, Testing of Statistical assumptions, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), common method bias (CMB) test, Measurement Model Assessment, Discussing Fit Indices, Reliability and Validity Testing, Structural Model Assessment identifying multivariate outlier, Construct Validity: Convergent and Discriminant Validity, Measurement Model & Structural Equation Modelling, Mediation and Moderation Effects, Multi-Group Analysis.	L1, L2, L3, L4	30 Hours
	Faculty of Arts **N Vivo** 1. Import text, audio, video, emails, images, spreadsheets, online surveys, web content, and social media from various sources into a simple, intuitive interface.		

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	2. Create and NVivo project, import and organise qualitative and quantitative data 3.Manage a literature review in NVivo 4. Autocode structured data deductively and identify themes inductively 5. Generate and falsify hypotheses 6. Combine data in sets for analysis 7. Seek patterns and identify relationships across codes and cases 8. Present findings using visualisations 9. Export data out of NVivo 10. Coordinate teamwork.		
	Faculty of Science Engineering and Technology **Faculty of Health & Allied Sciences** **R programming / Python/ MATLAB** **R Programming-** Introduction to R, Variables and datatypes in R, Dataframes, Recasting and joining of dataframes, Arithmetic, logical and matrix operations in R, Functions in R, Control structure in R, Data visualization in R. **Python Programming-** Basics of programming, data structure and algorithm using Python, Strings, lists, control, functions, manipulating lists, loops, arrays, selection sort, insertion sort, recursion, sorting, dictionaries, exception handling, file handling, string processing, data analysis using Python **MATLAB Programming-** Introduction, basic features, managing workspace, mathematical functions, basic plotting, Matrices, array operations and linear equations, MATLAB programming- M files script, M-file functions, control flow and operations.		

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional (Theory/ Practical)	End Term Examination
Weightage (%)	5	10	15	70

References:

- David Houcque, 2005. Introduction to MATLAB programming for Engineering students., Northwestern University, E- Book **https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf**
- Mark Lutz, 2009. Learning Python. O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.
- Emmanuel Paradis, 2005. R for Beginners. E book. **https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf**

A Handbook of Statistical Analysis using SPSS by Dr. Brijesh Awasthi, Redshine Publication.

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Amity School of Applied Sciences

Bachelor of Science (Honors/ Honors with Research) in Forensic Science

FLEXILEARN
-Freedom to design your degree



Curriculum & Scheme of Examination

2023

AMITY UNIVERSITY HARYANA

GURUGRAM

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Bachelor of Science (Honors/ Honors with Research) in Forensic Science
SEMESTER-I

DFCH2151	FUNDAMENTAL OF FORENSIC SCIENCE	L	T	P	C
Version 1.1	Date of Approval: December 2023	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description:

This course is designed to provide an insight on the fundamentals of forensic science and crime scene investigation at the undergraduate level. It will provide the basic experimental knowledge of working in undergraduate laboratory, i.e., investigation and sketching of indoor and outdoor crime scene, notes making, searching and packaging and forwarding of evidence.

Course Objective:

The course focuses on the following objectives-

- Developing an understanding and appreciation for the scope of Forensic Science in the investigation of cases.
- Develop brief knowledge of the functions and services provided by the Forensic Science Laboratories and Mobile Forensic Units.
- Develop comprehensive knowledge on the concept of Crime Scene Investigation and Reconstruction.
- Develop an understanding on giving an Expert's testimony in court of law.

Course Outcomes:

On the completion of this course, the students will be able to:

CO1. Explain the importance of forensic science and its functioning.
CO2. Acquire skills in securing and preserving the crime scene.
CO3. Identify and recognize physical evidence.
CO4. Investigate and reconstruct the scene of crime and form expert opinion.

Course Contents:

Modules	Blooms level*	Number of hours
Module I: Introduction of Forensic Science Forensic Science: Concept, Need and Scope, Principles. History of Forensic Science. Organizational Structure of Central, State, and Regional Forensic Science Laboratories, Divisions/Sections, Roles and Responsibilities of Laboratory Personels. Role of Directorate of Forensic Science Services. Mobile Forensic Science Units – Function, Need, Utility.	L1, L2	12
Module II: Crime Scene Defining a Crime and Crime Scene, Importance of Crime Scene. Types of Crime Scenes: Primary, Secondary, Mobile, Indoor, Outdoor. Types of Physical Evidences, Problems associated with investigating the Crime Scenes. Role of Investigating Officer.	L1, L2	10

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Module III: Crime Scene Management and Reconstruction Introduction to Crime Scene Management, Preservation of Crime Scene, Handling clues and evidence. Crime Scene Documentation: Photography, Videography, Sketching, Notes Making. Methods to Search Crime Scene. Procedure and requirement for Crime Scene Reconstruction.	L1, L2, L3, L4, L6	12
Module IV: Evidence Applicability in Court Definition, Types of Evidence, Laws of Evidence, Expert's testimony and admissibility of scientific evidence in Court of Law.	L1, L3, L6	10

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Modes of Evaluation: Assignment/ Seminar/ Quiz/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination.

CO, PO and PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**1**	**1**	**-**	**2**
CO2	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**1**	**1**	**-**	**2**
CO3	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**1**	**1**	**-**	**2**
CO4	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**1**	**1**	**-**	**2**

1: Strongly related; 2: Moderately related; 3: Weakly related

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DFCH2152	CRIME SCENE MANAGEMENT LAB	L	T	P	C
Version 1.1	Date of Approval: December 2023	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description

This course will give students the basic experimental knowledge of working in undergraduate lab i.e. investigation and sketching of indoor and outdoor crime scene, notes making, searching and packaging and forwarding of evidence.

Course Objective:

The students will understand & perform experiments relating to:

- Investigation of crime scene.
- Sketching of outdoor/ indoor scene of crime
- Packaging and forwarding of Evidence

Course Outcomes

On completion of this course, the students will be able to

CO: Investigate indoor crime scene.

CO2:Investigate outdoor crime scene.

CO3Search, package and preserve the evidence from crime scene.

S. No.	List of Experiments	Blooms level*	Number of hours
1.	Investigation and sketching of indoor scene of crime.	L1, L3, L4	4
2.	Investigation and sketching of outdoor scene of crime.	L1, L3, L4	4
3.	Crime scene photography: indoor, outdoor.	L1, L3, L4	4
4.	Searching of crime scene.	L1, L3, L4	4
5.	Notes making.	L1, L3, L4	4
6.	Packaging and forwarding of physical evidences.	L1, L3, L4	4
7.	Envelop making and druggist fold method.	L1, L3, L4	4
8.	To study the sealing procedure of physical evidence.	L1, L3, L4	2

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Suggested Readings:

- Dupras TL, Schultz JJ, Wheeler SM, Williams LJ. Forensic Science: An Introduction to Scientific and Investigative Techniques, 4th edn. Boca Raton, Florida: CRC Press; 2014.
- Fisher BAJ, Fisher DR. Techniques of Crime Scene Investigation, 9th edn. Boca Raton, Florida: CRC Press; 2022.
- Krishnamurthy R. An Introduction to Forensic Science in Criminal Investigation, 3rd edn. New Delhi, India: Selective & Scientific Books.; 2022.
- Kubic T, Petraco N. Forensic Science Laboratory Manual and Workbook, 3rd edn. Boca Raton, Florida: CRC Press; 2009.
- Mirakovits K, Londino-Smolar G. The Basics of Investigating Forensic Science: A Laboratory Manual, 2nd edn. London, UK: CRC Press, Taylor and Francis Group Humana Totowa; 2021.
- Mozayani A, Noziglia C. The Forensic Laboratory Handbook Procedures and Practice, 2nd edn. New Jersey, US: Humana Totowa; 2011.
- Nabar BS. Forensic Science in Crime Investigation, 3rd edn. Hyderabad, India: Asia Law House; 2019.
- Saferstein R. Criminalistics: An Introduction to Forensic Science, 13th edn. London, UK: Pearson; 2021.

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- Sharma BR. Forensic Science in Criminal Investigation and Trials, 6th edn. New Delhi, India: Universal Law Publishing; 2020.

Examination Scheme:

		IA			EE	
Components	**A**	**PR**	**LR**	**V**	**PR**	**V**
Weightage (%)	5	10	10	5	35	35

A: Attendance, IA: Internal Assessment, LR: Lab Record, PR: Performance, V: Viva, EE: External Examination.

CO, PO and PSO Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**1**	**1**	**-**	**2**
CO2	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**1**	**1**	**-**	**2**
CO3	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**1**	**1**	**-**	**2**
CO4	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**1**	**1**	**-**	**2**

1: Strongly related; 2: Moderately related; 3: Weakly related

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DFCH2101	PHYSICAL EVIDENCES	L	T	P	C
Version 1.1	Date of Approval: December 2023	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description

This course will help the students to learn the collection, packaging, preservation and analysis of physical evidence from indoor, outdoor and mobile crime scenes.

Course Objective: The course focuses on following objectives-

1. Developing an understanding and application of Forensic Science and significance of various physical evidence.
2. Develop an understanding on Expert's testimony.
3. Develop comprehensive knowledge on Procedure and examination in the Court of Law.

Course Outcomes

On completion of this course, the students will be able to

CO1. Recognise and identify best methods of handling and processing of physical evidence.
CO2. Distinguish between types of crime scenes and linking suspects to crime scene.
CO3. Apply advanced knowledge and forensic concepts in crime solving.
CO4. Examine and prepare report and expert opinion.

Course Contents:

Module	Blooms level*	Number of hours
Module I: Introduction and Handling of Physical Evidence Definition, Types and Significance of Physical Evidence, Collection, Packaging, Preservation and Forwarding of evidence: Biological (urine, blood, semen, saliva, hair, fiber), Chemicals, Poisons, Firearms, Fingerprints, Tool Marks, Soil and Glass.	L1, L2, L3	12
Module II: Introduction to various marks Definition, types, and significance of tool marks, tyre marks, skid marks, tread marks, shoeprints and foot print.	L1, L2	12
Module III: Crime and Suspect Linking a Crime Scene with the suspect through field notes, witnesses and interrogation, Reconstruction of crime scene and associative/ corroborative evidence.	L2	12
Module IV: Documentation of Physical evidence Examinations, report making, chain of custody, report closing. Search and seizure, privilege against self-incrimination, Subpoenas deposition, Miranda rights, Condemned of court, FIR, Types of cognizable and non-cognizable offences.	L1, L2	12
Module V: Examination in the Court	L2, L3	12

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Direct examination, cross- examination and re-examination of Prosecution lawyer and Defence lawyer and Court presentation, Law of evidence: testimonial and real evidence.		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Suggested Reading:

1. Bodziak, W., Footwear Impression Evidence (2nd Ed.) CRC Press, Boca Raton, Florida, 2000.
2. DeForest, P., Gaensslen, R., and Lee, H., Forensic Science; An Introduction to Criminalistics, McGraw Hill, New York, 1983.
3. Fisher, B., Techniques of Crime Scene Investigation (6thEdn.) CRC Press, Boca Raton, Florida, 2000.
4. James, S. H. And Nordby, J. J. (Eds), Forensic Science - An Introduction to Scientific and Investigative Techniques, CRC Press, London, 2003.
5. James, S., and Eskerc, W., Interpretation of Blood Stain Evidence at Crime Scenes, (2ndEdn) CRC Press, Boca Raton, Florida. 1999.
6. Sharma, B.R., Forensic Science in Criminal Investigation and Trials (3rd Ed) Universal Law Publishing Co. Ltd., New Delhi, 2001.
7. **https://www.intechopen.com/chapters/77222**
8. https://blog.ipleaders.in/all-you-need-to-know-about-physical-evidence/

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	2	--	--	--	--	1	--	-	3	-
CO2	1	2	--	-	--	--	1	-	-	3	-
CO3	1	2	--	--	--	--	1	-	-	3	-
CO4	1	2	--	--	--	--	1	-	-	3	-

1: strongly related, 2: moderately related and 3: weakly related

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DFCH2102	PHYSICAL EVIDENCE LAB	L	T	P	C
Version 1.1	Date of Approval: December 2023	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description
This course introduces students to the experiments of chemical and physical methods of physical evidence

Course Objective: - The students will understand & perform experiments relating to:
1. Analysis of physical evidence
2. Identifying different Physical evidence on the basis of their physical properties.
3. Determine pH, density and refractive index of various physical evidence

Course Outcomes
On completion of this course, the students will be able to
CO1. Identify various types of physical evidence.
CO2. Distinguish and match the crime scene exhibits.
CO3. Examine chemical properties of evidence.
CO4. Examine physical properties of evidence.

Course Contents

Course Contents: Lab/Practical	Blooms level*	Number of hours
1. Collection of various types of physical evidences 2. Collection of negative control sample 3. Packaging of physical evidence 4. Sealing of physical evidence 5. Forwarding of physical evidence	L1, L2	10
6. Microscopic examination of physical properties of soil 7. Solubility examination of soil sample. 8. Determination of percentage of loss of moisture content from soil. 9. Determination of pH of soil samples	L3, L4	8
10. Comparative analysis of glass fragments by mechanical fit method 11. Examination of glass fractures 12. Comparison of density of glass fragments by floatation method	L3. L4	6
13. Comparison of paint chips on the basis of physical characteristics using microscope.	L2	2
14. Microscopic examination of hair samples.	L2, L3	2
15. Comparison of tool marks.	L4	2

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Suggested Readings:

1. Thomas Kubic, Nicholas Petraco Forensic Science Laboratory Manual and Workbook, Third Edition 2009.
2. Kathy Mirakovits, Gina Londino, The Basics of Investigating Forensic Science: A Laboratory Manual 2015.

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination
Examination Scheme:

A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA–Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva. A-Attendance.

CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**1**	**--**	**-**	**3**	
CO2	**1**	**2**	**--**	**-**	**--**	**--**	**1**	**-**	**-**	**3**	
CO3	**1**	**2**	**--**	**--**	**--**	**--**	**1**	**-**	**-**	**3**	
CO4	**1**	**2**	**--**	**--**	**--**	**--**	**1**	**-**	**-**	**3**	

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SEMESTER-II

DFCH2251	FINGERPRINT SCIENCE	L	T	P	C
Version 1.1	Date of Approval: December 2023	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description

This course is designed to provide an insight on the science of dermatoglyphics or ridge patterns at the undergraduate level. The main objective is to impart essential theoretical and practical knowledge of ridge patterns with special focus on fingerprints among other.

Course Objective:

1. The course provides an in-depth understanding of fingerprints and other dermal patterns.
2. Students will learn about patterns, genetics, and correlations of fingerprints and skin patterns.
3. The course covers the use of these patterns in criminal investigations and identity verification.
4. Students will employ the knowledge practically.

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand the fundamentals of Dermatoglyphics and its history.

CO2: Classifying different types of ridge patterns.

CO3: The physical and chemical techniques of developing fingerprints on crime scene evidence.

CO4: Develop ability to analyze and interpret Dermatoglyphic data from case studies and real-life scenarios.

Course Contents:

Modules	Blooms level*	Number of hours
Module I: Introduction to Dermatoglyphics Basics of Fingerprinting- Introduction and history. Formation of ridges Insights into fingerprints, palm prints, and footprints: Their significance in personal identification, Introduction to the Fingerprint Bureau	L1	8
Module II: Ridge Patterns and Forensic Science Biological basis of fingerprints. Fundamental principles of fingerprinting. Types of fingerprints. Fingerprint patterns. Fingerprint characters/minutiae. Plain and rolled fingerprints. Classification and cataloguing of fingerprint record (Henry's, Batley's etc.). Automated Fingerprint Identification System. Significance of poroscopy and edgeoscopy.	L1, L2	10
Module III: Fingerprint Developing Methods Chemistry of latent fingerprint residue, factor contributing to latent fingerprints, Methods of Development of latent fingerprints using conventional methods–Physical- Powder method (Black and grey, fluorescent and magnetic), Iodine Fuming method, Vacuum Metal Deposition (VMD) Method, Chemical method (Ninhydrin, Silver Nitrate). Lifting and preservation, Photography.	L1, L3, L4	6

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Module IV: Other Impressions Importance of footprints. Casting of footprints, Electrostatic lifting of latent footprints. Lip prints - Nature, classification, collection, and examination of lip prints. Ear prints and their significance. Palm prints and their importance.	L1, L3, L4	

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Suggested Readings:

- David R. Ashbaugh (1999) Quantitative and Qualitative Friction Ridge Analysis, CRC Press.
- E. Roland Menzel (1999) Fingerprint Detection with Lasers, 2nd Ed., Marcel Dekker, Inc. USA.
- James F. Cowger (1993) Friction Ridge skin, CRC Press London.
- Mehta, M.K (1980) Identification of Thumb Impression & Cross Examination of Fingerprints, N.M. Tripathi Pub. Bombay.

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	2	--	--	--	--	1	2	-	3	
CO2	1	2	--	-	--	--	1	2	-	3	
CO3	1	2	--	--	--	--	1	2	-	3	
CO4	1	2					1	2		3	

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DFCH2252	FINGERPRINT SCIENCE LAB	L	T	P	C
Version 1.1	Date of Approval: December 2023	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description

This course will give students the basic experimental knowledge of working in undergraduate lab by understanding various methods to develop, identify, characterize and compare fingerprints and other ridge patterns such as lip prints, foot prints etc.

Course Objective:

The students will understand & perform experiments relating to:

- Obtaining and developing fingerprints on various surfaces.
- Development of latent ridge skin patterns using chemical and physical methods.
- Obtaining and characterization of lip-prints.

Course Outcomes

On completion of this course, the students will be able to

CO: Compare fingerprints by characterizing the patterns.
CO2: Learn about dermal ridge patterns in forensic science other than fingerprints.
CO3: Learn about methods to develop latent print patterns

Course Contents:

Modules	Blooms level*	Number of hours
1. Obtaining Plain and Rolled Inked Fingerprints 2. Identifying Fingerprint Patterns	L1, L3	6
3. Ridge Tracing and Ridge Counting 4. Identifying Ridge Characteristics (Minutiae)	L1, L2, L3, L4	6
5. Comparison of Fingerprints 6. Development of latent fingerprints with powders on various surfaces 7. Development of latent fingerprints using iodine fuming method. 8. Development of latent fingerprints using chemical method.	L2, L3	6
9. Obtaining lip-prints and comparison based on classifications. 10. Obtaining footprints and pointing out ridge characteristics	L3	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Suggested Readings:

1. Moenssens, A.A. (1975) Fingerprint Techniques, Chitton Book Co. Philadelphia, NY.
2. Chatterjee S.K. (1981) Speculation in Fingerprint Identification, Jantralekha Printing Works, Kolkata.
3. Cowger, James F (1993) Friction ridge skin- Comparison and Identification of fingerprints, CRC Press, NY.
4. J A Siegel, P.J Saukko (2000) Encyclopedia of Forensic Sciences Vol. I, II and III, Acad. Press.
5. https://www.interpol.int/en/How-we-work/Forensics/Fingerprints
6. https://ncrb.gov.in/en/central-finger-print-bureau

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Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination
Examination Scheme:

A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA–Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva. A-Attendance.

CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**1**	**--**	**-**	**3**	
CO2	**1**	**2**	**--**	**-**	**--**	**--**	**1**	**-**	**-**	**3**	
CO3	**1**	**2**	**--**	**--**	**--**	**--**	**1**	**-**	**-**	**3**	
CO4	**1**	**2**	**--**	**--**	**--**	**--**	**1**	**-**	**-**	**3**	

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DFCH2201	QUESTIONED DOCUMENTS	L	T	P	C
Version 1.1	Date of Approval: December 2023	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description:
This course is designed to provide an insight on the fundamentals of questioned and security documents at the undergraduate level. It will provide the basic experimental knowledge and skills of working in undergraduate laboratory, i.e., examination of questioned and security documents, basic fundamentals of differentiating handwritings and forgery detection. Students will learn the methods to examine Indian passports, bank cheques and currency notes.

Course Objective:
The course focuses on the following objectives-
1. Developing an understanding and appreciation for the scope of handwriting identification and examination.
2. Develop an understanding on types of questioned documents, the types of forgeries and disguise generally encountered.
3. Develop skills to examine questioned and security documents including handwriting and ink analysis.
4. Develop an understanding and skills to use general and scientific equipment's in the examination of questioned documents.

Course Outcomes:
On the completion of this course, the students will be able to:
CO1. Understand the concept and importance of questioned documents in investigation of case and learn the procedure to present the case in the court of law.
CO2. Identify and apply fundamentals of handwriting to examine forged documents.
CO3. Detect alterations in questioned documents and examine paper and ink.
CO4. Classify and examine identify security documents including Indian passports, bank cheques and currency notes.

Course Contents:

Modules	Blooms level*	Number of hours
Module I: Introduction to Questioned Documents Documents, Questioned Documents, Classification of Questioned Documents. Importance, Nature and Problems of Documents. Location, Collection, Handling and Preservation of Documents. Preliminary Examination of Questioned Documents. Adequacy of Exemplars and Standards. Presentation of Report in Questioned Document Examination Cases in Court of Law.	L1, L2, L3	10
Module II: Handwriting Examination Handwriting, Principles of Handwriting, Class and Individual Handwriting Characteristics, Principles of Handwriting Identification, Variations in Handwriting, Handwriting Specimens.	L1, L2, L3, L4	12
Module III: Alteration and Ink Examination Alterations: Erasures, Obliteration, Addition.	L1, L2, L3, L4	10

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Examination of Indented and Charred Documents. Analysis of Writing Inks, Age of Documents. Examination of Paper.		
Module IV: Security Documents Security Documents: Concept, Features, Types, Classification. Examination of Indian Passport, Bank Cheques, Currency Notes (Mahatma Gandhi Series).	L1, L2, L3, L4	10

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Suggested Reading:

- Ellen D, Day S, Davies C. Scientific Examination of Documents: Methods and Techniques, 4th edn. Boca Raton, Florida: CRC Press; 2018.
- Harralson HH, Miller LS. Huber and Headrick's Handwriting Identification: Facts and Fundamentals, 2nd edn. Boca Raton, Florida: CRC Press; 2018.
- Osborn AS. Questioned Documents, 2nd edn. London, UK: Sweet and Maxwell; 1929.

Modes of Evaluation: Assignment/ Seminar/ Quiz/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination.

CO, PO and PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	-	-	-	-	1	2	3	1	2
CO2	1	1	-	-	-	-	1	2	3	1	2
CO3	1	1	-	-	-	-	1	2	3	1	2
CO4	1	1	-	-	-	-	1	2	3	1	2

1: Strongly related; 2: Moderately related; 3: Weakly related

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DFCH2202	QUESTIONED DOCUMENTS LAB	L	T	P	C
Version 1.1	Date of Approval: December 2023	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description
This course will help the students to understand the methods to examine questioned documents. Students will understand the methods to examine currency notes and security documents.

Course Objective: - The students will understand and perform experiments related to:
1. Examination of handwriting
2. Examination of security documents
3. Comparison of bite marks and will visit mortuary

Course Outcomes
The main outcomes of the course are given below:
CO1. Students will learn the methods to identify class and individual characteristics of handwriting.
CO2. Students will learn the methods to examine questioned and security documents using optical methods.
CO3. Students will learn the methods to examine currency notes and security documents.
CO4. Students will learn forgery in bank cheques.

S. No.	List of Experiments	Blooms level*	Number of hours
1.	Handwriting Examination based on Class and Individual Characteristics.	L1, L2, L3, L4, L6	4
2	Handwriting Examination based on Individual Characteristics.	L1, L2, L3, L4, L6	4
3	Examination of Currency Notes.	L1, L2, L3, L4, L6	4
4.	Examination of Alterations in Documents.	L1, L2, L3, L4, L6	4
5.	Examination of Indian Passport.	L1, L2, L3, L4, L6	4
6.	Examination of Bank Cheques.	L1, L2, L3, L4, L6	4

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Suggested Reading:

- Ellen D, Day S, Davies C. Scientific Examination of Documents: Methods and Techniques, 4th edn. Boca Raton, Florida: CRC Press; 2018.
- Harralson HH, Miller LS. Huber and Headrick's Handwriting Identification: Facts and Fundamentals, 2nd edn. Boca Raton, Florida: CRC Press; 2018.
- Osborn AS. Questioned Documents, 2nd edn. London, UK: Sweet and Maxwell; 1929.

Examination Scheme:

		IA			EE	
Components	**A**	**PR**	**LR**	**V**	**PR**	**V**
Weightage (%)	5	10	10	5	35	35

A: Attendance, IA: Internal Assessment, LR: Lab Record, PR: Performance, V: Viva, EE: External Examination.

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CO, PO and PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**2**	**3**	**1**	**2**
CO2	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**2**	**3**	**1**	**2**
CO3	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**2**	**3**	**1**	**2**
CO4	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**2**	**3**	**1**	**2**

1: Strongly related; 2: Moderately related; 3: Weakly related

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SEMESTER-III

DFCH2351	FORENSIC SEROLOGY	L	T	P	C
Version 1.1	Date of Approval: December 2023	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description
This course will help the students to learn the collection, packaging, preservation and transportation of serological evidence from crime scenes. The course will also overview the physio-chemical properties and analysis of these evidence.

Course Objective: This course will cover:
1. Complete and thorough knowledge regarding the various aspects of forensic serology
2. Blood and its detailed study for identification
3. Properties, forensic significance and analysis of various body fluids.

Course Outcomes
On completion of this course, the students will be able to
CO1. Understand and describe the basic properties of serological fluids, and their methods of collection and packaging.
CO2. Perform and identify chemical and microscopic examinations.
CO3. Apply advanced analytical methods of analysis of serological evidence.
CO4. Explain and identify body fluids and their examination.
CO5. Analyse different biological fluids for forensic investigations.

Theory Course Contents:

Modules	Blooms level*	Number of hours
Module 1: Blood and its Properties Physical and chemical properties of blood and blood components, Synthesis of various components of blood, Collection, preservation and packing of blood evidence, procedures and precautions. Blood grouping systems, ABO, Rh and MN system, synthesis of blood grouping antigens, Techniques for determining blood groups.	L1, L2,L3	9
Module 2: Blood Analysis Techniques Presumptive and confirmatory tests for identification of blood/blood stains by microscopic methods, Catalytic tests, and crystal tests.	L1, L2	9
Module 3: Species of Origin & Grouping of Bloodstains Application of Spectrophotometric method, chromatographic and immunological methods (Ring, Precipitin, Ouchterlony, reverse agglutination, normal/mixed agglutination).	L1, L2	9
Module 4: Analysis of semen and saliva	L1, L2, L3	9

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Physical and chemical properties of semen and saliva. Glands associated and composition. Forensic significance of these biological fluids. Forensic analysis of these biological fluids.		
Module V: Analysis of sweat, urine and menstrual blood Physical and chemical properties of sweat, urine and menstrual blood. Forensic significance of these biological fluids. Forensic analysis of these biological fluids.	L1, L2, L3	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Suggested Reading:

1. 1. Eckert, W.G., & James S.H., Interpretation of bloodstain evidence at crime scene, CRC Press, Florida, 1989.
2. James, S.H. and Nordby, J.J. (Eds.), Forensic Science - An introduction to Scientific and investigative Techniques, CRC Press, London, 2003.
3. Saferstein, R. (1998). Criminalistics, An Introduction to Forensic Science, 6th Ed. 6th Ed. Prentice –Hall
4. Kirk, P.L., Introduction in crime investigation (2nd), John Willey and, New York, 1974.

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	2	--	--	--	--	1	--	-	3	-
CO2	1	2	--	-	--	--	1	-	-	3	-
CO3	1	2	--	--	--	--	1	-	-	3	-
CO4	1	2	--	--	--	--	1	-	-	3	-
CO5	1	2	2		-	3	1	1	1	2	-

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DFCH2352	FORENSIC SEROLOGY LAB	L	T	P	C
Version 1.1	Date of Approval: December 2023	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description
This course will help the students to perform various chemical tests on serological evidences such as blood, saliva, urine etc. and presence of toxicological evidences such as poisons and alcohol.

Course Objective: The students will understand & perform experiments relating to:
1. Analysis of blood, biological fluids and alcohol.
2. Thin layer chromatography for poisons.

Course Outcomes
On completion of this course, the students will be able to
CO1. Perform tests on blood
CO2. Perform tests on saliva and urine.
CO3. Perform tests on alcohol and poisons.

Lab Course Contents:

Modules	Blooms level*	Number of hours
1. Analyse different blood groups from the blood found at the crime scene. 2. Perform catalytic test for blood. 3. Perform catalytic test for blood stain. 4. Perform crystal tests for blood. 5. Perform crystal tests for blood stain.	L2, L3, L3, L4	10
6. Analyse biological fluid (saliva)- Amylase test 7. Analyse biological fluid (saliva)- by diffusion. 8. Analyse biological fluid (urine).	L1, L3, L4, L6	10
9. Analyse alcohol, acetone, chloroform 10. Separate metallic poison by thin-layer chromatography (Arsenic, mercury, bismuth, Antimony).	L3, L4	10

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Suggested Reading:

1. Laboratory Protocols CIMMYT Applied Molecular Genetics Laboratory Third Edition
2. Vogel Textbook of Practical organic Chemistry including Qualitative organic analysis By
3. Kathy Mirakovits, Gina Londino, The Basics of Investigating Forensic Science: A Laboratory Manual 2015

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Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO Mapping:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**1**	**--**	**-**	**3**	
CO2	**1**	**2**	**--**	**-**	**--**	**--**	**1**	**-**	**-**	**3**	
CO3	**1**	**2**	**--**	**--**	**--**	**--**	**1**	**-**	**-**	**3**	

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DFCH2301	INSTRUMENTATION BIOLOGICAL	L	T	P	C
Version 1.1	Date of Approval: December 2023	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is intended to provide basic knowledge about the instruments which can be used for the analysis of biological samples. The students will understand the basic principle of the instruments and will be able to apply different techniques as per the requirement of the investigations in medicolegal cases.

Course Objective: The objective of the course is to provide students with practical understanding of the working and applications of various instrumentation techniques used in the forensic science laboratory for the analysis of biological evidence.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain various biological phenomena associated with Forensic Science and the utility of various biological changes in forensic science.

CO2. Describe the principle, types, and applications of centrifugation in forensic science.

CO3. To understand the various types of electrophoresis for the analysis of biological and toxicological samples

CO4. Analyse the biological samples by immuno-electrophoresis.

CO5. Apply various types of microscopes for the forensic investigations.

Course Contents:	Blooms level	Number of hours
Module I: General Principles of Biological/ Bio-chemical Analysis pH and buffers, Physiological solution, and Cell fractionation. Genetic Manipulations, Enzymes used in genetic manipulation, Cloning procedures, Isolation of specific nucleic acid sequences – complementary DNA, Gene libraries, Colony hybridisation, Expression of genes	L1, L2, L3	12
Module II: Centrifugation Techniques Basic principles of sedimentation, Various types of centrifuges, Density gradient centrifugation, Preparative centrifugation, Analysis of sub-cellular fractions, Ultra-centrifuge- Refrigerated Centrifuges.	L1, L2, L3, L4	12
Module III: Electrophoretic Technique General principles, Factors affecting electrophoresis, Types of Electrophoresis- Agarose gel electrophoresis, Polyacrylamide gel electrophoresis, its types, Isoelectric focusing (IEF), Iso-electrophoresis.	L1, L2, L3, L4	12
Module IV: Immuno-chemical Techniques General principles, Production of antibodies, Precipitin reaction, Gel immuno-diffusion, Immuno-electrophoresis, Radio Immuno-assay (RIA), ELISA, Fluorescence Immuno-assay.	L1, L2, L3, L4	12
Module V: Microscopy	L1, L2, L3, L4	12

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Basic principles, Simple and Compound Microscope, Comparison Microscope, Phase Contrast Microscope, Stereoscopic Microscope, Polarizing Microscope, Fluorescent Microscopy, Scanning Electron Microscope (SEM) and Transmission Electron Microscope (TEM).		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

1. H.H Willard et al; Instrumental Methods of Analysis CBS Pub. And Distributors, Delhi (1986)
2. Bryan L. William & Keith Wilson; Principles & Techniques of Practical Biochemistry, Edward Arnold Pub. (1975)
3. Keith Wilson & John Walker; Practical Biochemistry- Principles & Techniques, 5th Ed., Cambridge University Press (2000)
4. David. L. Nelson & Michael M, Cox Lenninges; Principles of Biochemistry, 4th Ed., Freeman Pub. (2005).
5. Watson Gillman, Witkowski, Zolles; Recombinant DNA, 2nd Ed., Scientific American Books, (1998)
6. Gardnes & Snustd; Principles of Genetics 6th Ed., John Wiley & Sons (1981)
7. D.M. Weir; Hand Book of Experimental Immunology, 2nd Ed., Blackwell Pub. (1973)

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	2							3		1		
CO2	1	2							3		1		
CO3	1	2							3		1		
CO4	1	2							3		1		
CO5	1	2							3		1		

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SEMESTER-IV

DFCH2451	DNA FINGERPRINTING	L	T	P	C
Version 1.1	Date of Approval: December 2023	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description

This course is designed to provide insight on the introduction to DNA fingerprinting in forensic science at the undergraduate level. The main objective of this course is to impart essential theoretical knowledge of chromosomes, their structure, functions, DNA and its application in the field of forensic science.

Course Objective: The objectives of the course are to:

1. Provide a basic understanding of genetics in forensic science.
2. Provide students with technical skills and competencies in DNA fingerprinting techniques.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain various biological phenomena associated with Forensic Science and the utility of various biological changes in forensic science.

CO2. Describe the principle, types and applications of centrifugation in forensic science.

CO3. Understand the various types of electrophoresis for the analysis of biological and toxicological samples

CO4. Analyse the biological samples by immunoelectrophoretic.

CO5. Describe the mechanism and perform the DNA extraction and quantification.

Course Contents:

Modules	Blooms level*	Number of hours
Module I: Introduction to DNA Fingerprinting Definition, Importance of DNA Fingerprinting in Forensic Science, Structure of DNA, RNA, Chromosome, Nuclear DNA and Mitochondria DNA.	L1	9
Module II: DNA Isolation Techniques Collection and types of evidence for DNA fingerprinting. Different types of DNA Isolation techniques (Organic, Inorganic and Mechanical), FTA cards for isolation of DNA, and DNA isolation from different evidence (tissue, hair, bone, blood and seminal stains).	L1, L2	9
Module III: Techniques for DNA Fingerprinting Electrophoresis, Northern and Southern blotting. Polymerase Chain Reaction (Denaturation, annealing and extension, Detection of PCR products).	L3, L4	9

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Module IV: Types of DNA Fingerprinting Techniques Mini satellites and Micro-satellites., VNTR and RFLP, AFLP, STRs, SNP and Genotyping.	L3	9
Module V: Practical Application of DNA Fingerprinting Paternity testing and Personal identification. DNA databank, Limitations of DNA Fingerprinting, Chimerism. Legality of DNA Fingerprinting in India. Next-generation sequencing.	L1, L3, L4	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Suggested Readings:

1. Norah Rudin and Keith Inman (2nd Edition) An Introduction to Forensic DNA Analysis, CRC Press, New York, 2002.
2. Sharma, B. R. (3rd Edition) Forensic Science in Criminal Investigation and Trials, Universal Law Publishing Co. Ltd. New Delhi, 2001.
3. John M. Butler (1st Edition) Fundamentals of Forensic DNA Typing, Academic Press, 2005.

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	2	--	--	--	--	1	2	-	3	
CO2	1	2	--	-	--	--	1	2	-	3	
CO3	1	2	--	--	3	--	1	2	-	3	
CO4	1	2	--	--	3	--	1	2	-	3	
CO5	1	1	3	1	3	3	1	3	2	2	

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DFCH2452	DNA FINGERPRINTING LAB	L	T	P	C
Version 1.1	Date of Approval: December 2023	0	0	2	1
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description
This course is intended for students to understand various aspects of toxicological evidence in related field.

Course Objective: - The students will understand & perform experiments relating to:

1. DNA properties, extraction and quantification
2. DNA Isolation techniques

Course outcome: On completion of this course, the students will be able to
CO1. Describe the mechanism of DNA extraction.
CO2. Explain the centrifugation technique.
CO3. Discuss the difference between electrophoresis and spectroscopy.

Lab Course Contents:

Modules	Blooms level*	Number of hours
1. Preparation of different buffers for DNA extraction from plant cells 2. DNA extraction from plant cells 3. Preparation of different buffers for DNA extraction from animal cells 4. DNA extraction from blood. 5. Centrifugation technique for biological fluids 6. Agarose gel electrophoresis. 7. Immunodiffusion- Single immunodiffusion 8. Immunodiffusion- double immunodiffusion 9. Spectrophotometry. 10. PCR Technique	L1, L2, L3, L4	30

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Suggested Readings:

1. A Glencoe Program Physics principles and problems: Forensic Laboratory Manual Student edition.
2. Thomas Kubic, Nicholas Petraco Forensic Science Laboratory Manual and Workbook, Third Edition 2009
3. G.H. Stout & L.H. Jensten, X-ray Structure Determination – A practical Guide; 2nd Edn. Wiley, New York, 1989

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination
Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

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Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**1**	**2**	**-**	**3**	
CO2	**1**	**2**	**--**	**-**	**--**	**--**	**1**	**2**	**-**	**3**	
CO3	**1**	**2**	**--**	**--**	**--**	**--**	**1**	**2**	**-**	**3**	

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DFCH2401	FORENSIC TOXICOLOGY	L	T	P	C
Version 1.1	Date of Approval: December 2023	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description
This course is intended for students to understand various aspects of toxicological evidence in related field.

Course Objective: - The objectives of the course:

1. 1The students understand the various types of drugs and toxic substances encountered in an investigation.
2. The varied toxicological signs and symptoms of different toxins on the body when administered.
3. To ensure that the students understand the nature of the toxicological investigations undertaken in forensic laboratories

Course outcome: On completion of this course, the students will be able to
CO1. Describe the mechanism of drug action and interactions in body.
CO2. Explain the drug movement and distribution in body & their examination.
CO3. Discuss the difference between use and abuse of drugs and their laboratory analytical methods.
CO4. Classify the poison and identify them in forensic science laboratory.

Course Contents:

Modules	Blooms level*	Number of hours
Module I: Introduction to Toxicology Introduction, History of toxicology and poisons, definition, Dose: Fetal Dose, Lethal Dose, LD50, routes of administration of poisons, classification of poisons on mode of action basis, analytical method basis and medicolegal basis, and Role of Toxicologist in a forensic science lab	L1, L2	10
Module II: Drugs of Abuse Introduction, definition, classification of drugs and drug of abuse, drug addiction, sedatives, narcotics, stimulants, hallucinogens, designer drugs, their mode of action, dosage, signs and symptoms, Analysis hierarchy of seized drugs, examination, clandestine laboratories and drugs related Crime. Drugs of abuse in sports and doping, narcotics drugs and psychotropic substances, designer drugs and their forensic examination, Pharmacology and Toxicology of Psychotropic Drugs: Sedatives, Stimulants, Opiates. Extraction, Isolation of drugs from viscera, tissues and body fluids. Drugs and Cosmetic Act, Excise Act, NDPS Act.	L1, L2	13

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Module III: Toxicology and examination of Alcohol Ethyl alcohol and Methyl alcohol: Nature, administration, symptoms, post-mortem findings, medico-legal findings, Country made liquor, Illicit liquor, Methylated spirit isolation, detection. The fate of ethyl alcohol in the body, alcohol in the circulatory system, breath test instruments, field sobriety testing, analysis of blood for alcohol.	L2, L3	12
Module IV: Corrosives and Insecticides Introduction, classifications of acids and bases. Nature, administration, symptoms, post-mortem findings, isolation, detection and estimation, medico-legal findings. Organophosphorus compounds, Organochloro Compounds and Carbamates- Nature, administration, symptoms, post-mortem findings, isolation, detection, estimation, and medico-legal findings.	L2, L3	13
Module V: Instrumentation for Drug analysis -; Introduction to different techniques used in toxicology; Basic principle of chromatography and its forensic applications (Thin Layer Chromatography (TLC), Gas Chromatography (GC) and High pressure liquid chromatography (HPLC)) (in brief).	L2. L3	12

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Suggested Readings:

1. A Burger; Medicinal Chemistry, Vol. II, Wiley Interscience, New York; (1970)
2. A.I Vogel; Textbook of Practical Organic Chemistry including Qualitative Organic Analysis; ELBS, Essex (1971)
3. Boudreau, JE et al – Arson & Arson Investigation, Survey & Assessment National Institute of Law Enforcement, U.S Dept. of Justice, US Govt. Printing Press (1977)
4. Clark, E.G.C., Isolation and identification of Drugs, Vol. I and Vol. II, Academic Press, 1986.
5. Cravey, R.H., Baselt, R.C., Introduction to Forensic Toxicology, Biochemical publications, Davis C A, 1981.
6. Gleason, M.N. et.al, Clinical Toxicology of Commercial products, Williams and Williams, Baltimore
7. Benjamin, D. M., Forensic Pharmacology. In Forensic Science Handbook (vol – 3), Saferstein, R. (Ed.), Prentice-Hall, Englewood Cliffs, New Jersey, 1993.
8. https://www.toxmsdt.com/skills-development.html

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

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CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**1**	**2**	**-**	**3**	
CO2	**1**	**2**	**--**	**-**	**--**	**--**	**1**	**2**	**-**	**3**	
CO3	**1**	**2**	**--**	**--**	**--**	**--**	**1**	**2**	**-**	**3**	
CO4	**1**	**2**	**--**	**--**	**--**	**--**	**1**	**2**	**-**	**3**	

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DFCH2402	FORENSIC TOXICOLOGY LAB	L	T	P	C
Version 1.1	Date of Approval: December 2023	0	0	2	1
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is intended for students to perform various practical in the field of Forensic Chemistry & Toxicology, to isolate different toxic substance, perform thin layer chromatography of several drugs and cations and anions analyses.

Course Objective:

The students will understand & perform experiments related to:-

1. Isolation techniques for different poisons
2. Analysis of different poisons
3. Spot tests for different cations and Anions

Course Outcome

On completion of this course, the students will be able to

CO1. Demonstrate the isolation techniques of different toxic substances.
CO2. Perform the TLC and analysis of various drugs and poisons.
CO3. Perform various tests to analyze cations and anions.

Course Contents: - Lab/Practical	Blooms level	Number of hours
1. Isolation techniques of different toxic substances 2. TLC of insecticides, Barbiturates and other drugs 3. Spot test of mercury, iron, copper, aluminium, cadmium, zinc and other metallic poisons	L1, L2, L3, L4	8 6
4. Analysis of volatile and non-volatile poisons 5. Analysis of vegetable poisons	L1, L2,	6
6. Spot test of nitrates, nitrites, carbonates, sulphates, sulphites, chlorates	L1, L2, L3, L4	10

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

	IA			EE	
A	PR	V	LR	PR	V
5	10	5	10	35	35

Note: IA –Internal Assessment, EE- External Exam, A: Attendance, PR- Performance, LR – Lab Record, V – Viva.

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Suggested Readings:

1. A Glencoe Program Physics principles and problems: Forensic Laboratory Manual Student edition
2. Thomas Kubic, Nicholas Petraco Forensic Science Laboratory Manual and Workbook, Third Edition 2009
3. A. I. Vogel Textbook of Practical organic Chemistry including Qualitative organic analysis
4. Isolation and identification of Drugs by E.G.C. Clark
5. Bryan L. William & Keith Wilson; Principles & Techniques of Practical Biochemistry, Edward Arnold Pub. (1975).
6. K. Nakanishi, Infrared absorption spectroscopy - practical, Holden-Day, Inc., San Francisco and Nankodo Company Ltd., Tokyo, 1962.

CO, PO, PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	1	1		2							1		3
CO2	1	1		2							1		3
CO3	1	1		2							1		3

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SEMESTER-V

DFCH2551	COMPUTER FORENSICS	L	T	P	C
Version 1.1		3	1	0	4
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description

This course introduces undergraduate students to the principles and practices of computer forensics. It covers the techniques for identifying, preserving, analyzing, and reporting digital evidence in computers and digital storage devices, with an emphasis on legal and ethical considerations.

Course Objective:

1. Understand the role of computer forensics in legal contexts.
2. Learn methods for the collection and analysis of digital evidence.
3. Develop skills in various computer forensic tools and software.
4. Gain insight into the legal and ethical dimensions of digital investigations.

Course Outcomes

On completion of this course, the students will be able to

CO1: comprehensively understand the field of computer forensics.

CO2: Become proficient in the legal and ethical considerations of computer forensics.

CO3: Ensuring meticulous evidence collection, analysis, and maintenance of the chain of custody.

CO4: Develop practical skills in acquiring, preserving, and analyzing digital evidence.

Course Contents:

Modules	Blooms level*	Number of hours
Module 1: Introduction to Computer Forensics Overview of computer forensics: Definition, scope, and importance; Types of digital evidence and their significance in investigations; Legal aspects: Laws governing digital evidence, ethical issues, and chain of custody	L1	8
Module 2: Data Acquisition and Storage Formats Understanding Storage Formats for Digital Evidence– Raw Format, Proprietary Formats, Advanced Forensic Formats (E01, AF, AFF4, .mdb, .psd etc.). Tools for data imaging and duplication; Ensuring integrity of evidence - Hashing algorithms; Securing and preserving digital evidence.	L1, L2	8
Module 3: Platform-Specific Forensic Analysis Forensic Analysis of File Systems: Windows file system -FAT12, FAT16, FAT32 and NTFS, UNIX file Systems- EXT and Mac file systems- APFS; Understanding digital storage devices (Hard drives, SSDs, USBs, etc.); Basics of data organization and storage.	L1, L3	10
Module 4: Network Forensics and Advanced Analysis Techniques Basics of network forensics: concepts and tools; Techniques for capturing and analyzing network traffic and intrusions; Advanced forensic analysis: encrypted data, cloud storage, and mobile devices; Dealing with anti-forensic techniques and challenges.	L2, L3	8

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Module 5: Introduction to Digital Forensic Analysis Tools Overview of digital forensic analysis tools, including EnCase, FTK, and Autopsy. Importance of system artifacts in investigations. Exploration of common Windows and UNIX/Linux artifacts. Concepts of file signatures and metadata, and their roles in forensic analysis. Methods for extracting and analyzing artifacts from email clients and web browsers.	L3, L4	12

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Suggested Readings:

1. Casey, E. (2011). "Digital Evidence and Computer Crime: Forensic Science, Computers, and the Internet" (3rd ed.). Academic Press.
2. Carrier, B. (2005). "File System Forensic Analysis". Addison-Wesley Professional.
3. Sammons, J. (2012). "The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics". Syngress.
4. Farmer, D., & Venema, W. (2005). "Forensic Discovery". Addison-Wesley Professional.
5. Boddington, R. (2016). "Practical Digital Forensics". Packt Publishing.
6. SANS Digital Forensics and Incident Response Blog. (n.d.). Retrieved from https://digital-forensics.sans.org/blog
7. Cyber Forensicator. (n.d.). Retrieved from https://www.cyberforensicator.com/
8. DFRWS - Digital Forensic Research Workshop. (n.d.). Retrieved from https://www.dfrws.org/
9. The Sleuth Kit & Autopsy. (n.d.). Retrieved from https://www.sleuthkit.org/

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	2	--	--	--	--	1	2	-	3	
CO2	1	2	--	-	--	--	1	2	-	3	
CO3	1	2	--	--	--	--	1	2	-	3	

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DFCH2501	INSTRUMENTATIONS (PHYSICAL & CHEMICAL)	L	T	P	C
Version 1.1	Date of Approval: December 2023 December, 2021	3	1	0	4
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description
Instrumental Analysis provides a sound knowledge of the various analytical techniques used to examine different kinds of evidence recovered from scene of crime in forensic cases. It develops the ability to analyze different kinds of physical evidence of forensic importance.

Course Objective: The objective of the course is to provide student with practical understanding of the various instrumentation and control systems, instrumentation equipment and troubleshooting skills used in the forensic science laboratory.

Course Outcomes: On completion of this course, the students will be able to
CO1. Communicate the concept, basic principle and instrumentation of various chromatographic techniques.
CO2: Describe the concept, basic principle and instrumentation of spectrophotometry.
CO3: Explain the potential utility of AAS and UV-Visible spectroscopy in instrumentation.
CO4**:** Explain and analyse the chromatographic techniques such as TLC, GC, HPLC, Hyphenated Techniques etc.

Course Contents:

Modules	Blooms level*	Number of hours
Module I: Spectrophotometry-I Electromagnetic spectrum, Sources of Radiation, Types of sources and stability, wavelength selection, filters-cells and sampling devices, detectors, resolution, qualitative and quantitative methods for detection, UV-Visible, FTIR, Raman spectroscopy, Fluorescence spectrophotometry, difference between Atomic spectrum and Molecular spectrum.	L2, L3	12
Module II: Spectrophotometry-II Atomic emission spectroscopy, atomic absorption spectrometry: Principle, Instrumentation techniques quantitative analysis, application of AAS, and ICP in Forensics. X-ray absorption and fluorescence methods, X-ray diffraction, Applications in Forensic Science. Neutron Activation Analysis: Introduction, principle, theory, instrumentation, and forensic applications.	L3, L4	12
Module III: Chromatographic Techniques-I Definition and Concept of Chromatographic methods, Classification of Chromatographic methods: Adsorption and Partition Basic principle, theory, instrumentation of Paper chromatography, Types of Chromatography: Radial, Ascending and Descending Chromatography, and its forensic applications. Basic principle, working and forensic application	L1, L2	12

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of thin layer chromatography and HPTLC, Types of TLC: One-Dimensional TLC and Two-Dimensional TLC.		
Module IV: Chromatography Techniques-II Basic principle, theory, instrumentation, and forensic applications of and HPLC, Gas chromatography, Head Space Chromatography and Pyrolysis Gas Chromatography.	L2, L3, L4	12
Module V: Hyphenated Instrumental Techniques: Working principle, Instrumentation and Forensic Application of LC-MS: HPLC-MS, GC-MS; ICP-MS, CE-MS.	L3, L4	12

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Suggested Readings:

1. Jacobson, B.H.E., Ray, Sidney, Attridge G. G., The Manual of Photography; Focal Press, London, 1988.
2. Baker, D.R., Capillary – Electrophoresis, New York, 1995.
3. Chapmen, J.R., Practical Organic Mass spectrometry, A Guide for Chemical and Biochemical Analysis, Wiley, New York, 1993.
4. Lide, D.R., Handbook of Chemistry & Physics C.R.C. 75th ed. CRC Press Washington D.C., 1994.
5. Dollisth, F.R., Fateley, W. G. & Bentley, F. F., Characteristic Roman frequencies of organic compounds, Wiley, New York, 1974.
6. Friebolin, H. Berik, One & Two Dimensional NMR spectroscopy; Weinheim Germany, VCH 1991.
7. Stout G.H., &Jensten, L.H., X-ray Structure Determination – A practical Guide, 2nd Ed., Wiley, New York, 1989.
8. Gchristian, Gray D and Fredric J. Feldman, Atomic Absorption Spectroscopy; Wiley-Interscience, London, 1970.

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester, A: Attendance

CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	1	--	--	--	--	3	--	-	1	
CO2	3	1	--	-	--	--	3	-	-	1	
CO3	3	1	--	--	--	--	3	-	-	1	
CO4	3	1	--	--	--	--	3	-	-	1	

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DFCH2502	FORENSIC MEDICINE	L	T	P	C
Version 1.1	Date of Approval: December 2023	3	1	0	4
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description
This course will help the students to learn Post-mortem examinations; external examination; internal examination; collection, preservation and packaging of viscera and nature and causes of injuries.

Course Objectives: The student will understand
1. About the scope of different types of injuries, causes and manner of death and their medico legal significance
2. About the utility of the injury assessment in medico legal cases.

Course Outcomes
On completion of this course, the students will be able to
CO1. Describe various physiological and chemical changes after death and will be able to estimate time since death.
CO2. Identify the type of wound and its causes, also they can estimate the age of injury.
CO3. Identify type of dentition and can estimate the age, sex and race of individual by analyzing the given teeth.
CO4. Analyse the types of bitemarks and their significance in identification of culprit and type of crime.
CO5. Explain different types of injuries and their causes and medico-legal significance.

Course Contents:

Modules	Blooms level*	Number of hours
Module I: Autopsy and Postmortem Changes Ante and Post-mortem examinations; external examination; internal examination; collection, preservation and packaging of viscera Post- mortem changes, Assessing and determining the time and cause of death.	L1, L2	9
Module II: Wound Healing Mechanism Introduction to wounds; definition, Mechanism of wound production & healing, Determining the age of the injury, and medico-legal aspects of injuries.	L1, L2	9
Module III: Injuries due to Mechanical Force Blunt force injuries- Abrasions, Bruises, Lacerations; causes, characteristic features, types, differences in antemortem & postmortem injuries and their medico-legal aspects. Sharp force injuries- Incised, Stab, Punctured wounds - causes, dimensions, antemortem & postmortem injuries.	L1, L2	9
Module IV: Burn Injuries Injuries due to heat (dry burn, scald, electrocution, chemicals and radiation) and cold. Feature of injuries and their medicolegal significance.	L1, L2, L3	9
Module V: Asphyxia deaths Asphyxia and its types, Medicolegal aspects of smothering, gagging, choking, traumatic asphyxia, burking, etc., Mechanism of death by	L1, L2, L3	9

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compression of the neck, Types, cause of death, autopsy findings and circumstances of strangulation		
Module VI: Bite Marks Types of dentitions, Basic structure of human teeth, Types of bite marks; collection and preservation of DNA samples, forensic importance of bite marks; identification.	L1, L2	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Suggested Reading:

1. Modi's Medical Jurisprudence and Toxicology,23rd Edition, by K. Mathiharan &Amrit K. Patnaik, Third reprint, 2009, LexisNexis, Butterworth, New Delhi
2. Essentials of forensic medicine, Dr. K. S. Narayan Reddy.
3. Forensic Medicine and toxicology, JB Mukherjee, Vol I & II.
4. Keith Simpson's , Forensic Medicine
5. Gleister's Medical Jurispridence and Toxicology, Churchill Livingstone Dental Anatomy Atlas, Whitaker

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	2	--	--	--	--	1	--	-	3	
CO2	1	2	--	-	--	--	1	-	-	3	
CO3	1	2	--	--	--	--	1	-	-	3	
CO4	1	2	--	--	--	--	1	-	-	3	

1: strongly related, 2: moderately related and 3: weakly related

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DFCH2503	CRIMINOLOGY, CRIMINAL LAW & POLICE ADMINISTRATION	L	T	P	C
Version 1.1	Date of Approval: December 2023	3	1	0	4
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description

This course provides basic knowledge and understanding of Criminology and criminal laws. Knowledge and understanding of basic concepts of crime and criminal behaviour and factor of Crime and Ctheory, Criminal Justice System in India structural and functional process. This course focuses on educating the students about criminal laws of IPC and Cr. P.C. This course serves as a prerequisite for better understanding of Police Administration of India development and history and responsibilities .

Course Objective: The course focuses on following objectives-

1. Developing an understanding and appreciation for the scope of Criminology and criminal laws.
2. Develop an understanding on concepts of crime, types of crime and criminal behavior.
3. Brief description on Juvenile delinquency, types, classification and factors responsible.
4. Develop comprehensive knowledge on Role of Police with regard to criminals, society and custodial crimes
5. 5Understand the punishments and victimology

Course Outcomes: On completion of this course, the students will be able to

CO1. Summarize Criminology and criminal laws and their application in forensic science.
CO2. Describe various concepts of crime and criminal behaviour and factor of crime and criminology theory, criminal Justice system in India structural and functional process.
CO3. Categorize the criminal Laws of IPC and Cr. PC.
CO4. Apply comprehensive knowledge of Police Administration of India development and history and responsibilities and powers, and laws in forensic investigation
CO5 Enhance skill of penology and victimology

Course Contents:

Modules	Blooms level*	Number of hours
Module I: Criminology and Criminal Behavior Definition: Crime, Criminal and Criminology; Criminology as Science, The field and scope of Criminology; Methods and Techniques in Criminology; Concept of a criminal and classification of criminals. Organized crime; White – collar crimes/ Occupational crimes; Murders; Sexual offences; Terrorism; Serial Crimes; Crime against women and children POCSO ACT	L1, L2	7
Module II: Types of offences Bailable, and nonbailable, cognizable, non-cognizable, warrant issue, custodial circumstances, victim offender relationship**.**	L1, L2, L3	8
Module III: Juvenile Delinquency Definition, Types of Juvenile Delinquents ; Classification of Juvenile Delinquents; Factors in Juvenile Delinquency, Custody of juvenile delinquents; Juvenile courts procedure; behavior modification techniques; Preventive Programmes and theories and techniques of rehabilitation	L1, L2, L3	7
Module IV: Penology Concept of punishment, kinds of punishments, Humanitarian approach to concept of punishment, capital punishment in India, Introduction to criminal Laws: IEA, IPC and CrPC.Civil Law	L1, L2	7

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Module V Victimology **An introduction to victimology, Theories of Victimization,The science of serial killers and their victims,**	L1L2	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Suggested Readings

1. Siddique, A. Criminology Problems & perspectives,Lucknow : Eastern Book Co., [1977]
2. Ahuja, R. Social Problems in India.(2014).
3. Ahuja, R. Criminology, Rawat Publication (2000)
4. Lal, B. Law of Evidence, Central Law Agency, 22nd Edition 2018
5. Mishra, S.C. Police Administration in India
6. Government of India, Ministry of Home Affairs: Reports of National Police Commission

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)					

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	--	--	--	--	--	1	--	-	3	
CO2	1	--	--	-	--	--	1	-	-	3	3
CO3	1	--	--	--	--	--	1	-	-	3	3
CO4	1	--	--	--	--	--	1	-	-	3	2
CO5	-	-	-	1	-	-	-	-	2	-	-

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SEMESTER-VI

DFCH2651	BIOMETRIC TECHNOLOGY AND MATLAB	L	T	P	C
Version 1.1		3	0	2	4
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description
This course offers comprehensive insights into both physiological and behavioral biometric systems, highlighting their strengths, weaknesses, and applications.

Course Objective: This course will cover:

1. Introduce the fundamentals of biometrics, exploring its advantages and common applications.
2. Understand the the technologies, components, and the pros and cons of each method.
3. Explore behavioral biometrics, focusing on voice, signature, and gait analysis.
4. Provide in-depth knowledge on gait pattern analysis.

Course Outcomes:

CO1: Understand the foundational principles of biometrics.
CO2: Gain expertise in physiological biometrics.
CO3: Acquire comprehensive knowledge of behavioral biometrics.
CO4: Grasp the fundamentals of MATLAB for forensic investigations.

Course Contents:

Modules	Blooms level*	Number of hours
Module 1: Biometric Fundamentals Biometric fundamentals – Biometric technologies – Biometrics Vs traditional techniques, Characteristics, Benefits of biometrics, Components and steps of a biometric system, Key biometric processes: verification, identification and biometric matching, Types of biometrics and commonly used biometrics and their applications	L1, L2	9
Module 2: Physiological Biometrics Leading technologies: Finger-scan, Facial-scan, Iris-scan – components, working principles, competing technologies, strengths, and weaknesses – Other physiological biometrics: Hand-scan, Retina-scan – components, working principles, competing technologies, Automated fingerprint identification systems (AFIS), Gait Pattern Analysis.	L1, L2	9
Module 3: Leading Behavioral Biometrics technologies Voice scan – Signature scan– Gait scan- components, working principles, strengths and weaknesses, challenges, and scope of behavioral biometrics. Speech-Phonetics-Speech Synthesis-Automatic speech recognition, speech recognition versus voice recognition.	L1, L2	9
Module 4: Introduction to MATLAB Basics and Definitions: Acquisition; Noise filtering; Image Enhancement Region of interest extraction; Feature Extraction; Classification	L1, L2, L3	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Suggested Reading:

1. Daniel Jurafsky and James Martin "Speech and Language Processing", 2nd edition, Prentice- Hall, 2008.
2. Xuedong Huang, Alex Acero and Hsiao-Wuen Hon, "Spoken Language Processing", Prentice- Hall, May 2001.
3. Paul Taylor, "Text-to-Speech Synthesis", Cambridge University Press, February 2009.
4. Samir Nanavati, Michael Thieme, Raj Nanavati "Biometrics – Identity Verification in a Networked World", WILEY- Dream Tech Edition 2009. (UNIT 1, 2, 3, 4,).
5. Paul Reid "Biometrics for Network Security", Pearson Education.2009. (UNIT – V).
6. John D. Woodward, Jr. Wiley Dreamtech Biometrics- The Ul.
7. Perry J. Gait analysis. Normal and Pathological Function. SLACK Incorporated, 1992.

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	2	--	--	--	--	1	--	-	3	
CO2	1	2	--	-	--	--	1	-	-	3	
CO3	1	2	--	--	--	--	1	-	-	3	
CO4	1	2	--	--	--	--	1	-	-	3	

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DFCH2601	FORENSIC PHYSICS	L	T	P	C
Version 1.1	Date of Approval: December 2023	3	0	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is designed to provide insight of basic knowledge about the various types trace evidences and their forensic significance. The students will be able to ascertain the velocity of vehicle in hit-n-run cases with skid marks analysis along with transferred paint and examination of paint flakes. The course will also help the students to differentiate between the different fractures of glass.

Course Objective:

This course will cover:

1. Important physical evidences found at crime scene along with their significance.
2. General characteristics and identification of physical evidences.
3. Analytical examination and evidential value of important physical evidences.

Course Outcomes

On completion of this course, the students will be able to

CO1. Analyze the soil evidence and to define its type and significance with their properties and analytical examination.

CO2. Identify and differentiate between various types of glasses and fractures.

CO3. Explain the importance of paint as evidence and its significance in hit-n-run cases along with application of analytical techniques in its examination.

CO4. Analyse the types of Tool marks and restoration of erased/ obliterated marks and their casting, lifting and comparison.

Course Contents	Blooms level*	Number of hours
Module I: The Metric System Introduction to the metric system, Introduction to prevalent physical evidence (soil, glass, fibre, hair and liquids).	L1	**15**
Module II: Glass Examination Glass: Types of glass and their composition (organic and inorganic elements), Chemical and Analytical examination of glass fragments, Forensic examination and significance of glass fractures.	L1, L2, L3, L4	**15**
Module III: Paint Examination Introduction to paint chemistry, Types of paints, Their composition and Forensic examination of paints, Types, Significance and Forensic examination of fiber evidence.	L1, L2, L3, L4	**15**
Module IV: Soil examination	L1, L2. L3	**15**

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Formation of soil, its Types, Composition and Properties, Mineral and Chemical analysis of Soil, Density gradient analysis. Definition, Types and Composition, Physical and Chemical Analysis of Concrete and Cement.		
Module V: Various marks and their examination Types, significance and examination of tool marks, tyre marks, skid marks, tread marks, shoeprints, foot print, gait pattern and shoeprint casting.	L1, L2, L4	**15**

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings

- B. Caddy, Forensic Examination of glass and paints analysis and interpretation, ISBN 078405749 2001.
- Bengold and Nelson Morgan, Speech and Audio Signal Processing, John Wiley and Sons, USA, 1999.
- C.E. OHara and J.W. Osterburg, An Introduction to Criminalistic, Indiana University Press, Blomington, 1972.
- Denis Shaw, Physics in the Prevention and Detection of Crime, Contem Phys. Vol.17, 1976.
- F.W. Sears, M.W Zemansky, and H.D. Young, University Physics, Sixth Ed., Narosa, 1995.
- Nickolls, L.C., Scientific Investigation of Crime, Bulterwest, London, 1956.
- R. Saferstein, Forensic Science Handbook, Vols. I, II, (Ed), Prentice Hall, Eaglewood Cliffs, NJ; 1988.

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	3							1	2	3		3
CO2	1	3							1		3		
CO3	1	3							1		3		
CO4	1	3							1		3		

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DFCH2602	FORENSIC PHYSICS LAB	L	T	P	C
Version 1.1	Date of Approval: December 2023	0	0	2	1
Pre-requisites/Exposure					
Co-requisites					

Catalog Description:
The course includes the analytical physical techniques to analyse the trace or physical evidences like soil, glass, paints etc. including casting of tyre marks and shoeprints, comparison of bangles and fibres.

Course Objective: The students will be able to understand & perform experiments relate to the examination of physical properties of physical evidences commonly encountered at the crime scene.

Course Outcomes
On completion of this course, the students will be able to
CO1. Examine of soil exhibit by different analytical methods
CO2. Examine Glass sample by different analytical methods
CO3. Perform comparative analysis of paints by TLC
CO4. Casting of different marks and analyse fibres and bangles.

Course Contents: Lab/Practical	Blooms level	Number of hours
1. Examination of various types of glass fractures hit by projectile 2. Comparison of density of glass fragments by density gradient methods. 3. Comparison of broken pieces of glass bangle by physical matching followed by determining the thickness of the glass fragments	L1, L3, L4	6
4. Solubility examination of paints. 5. Comparative analysis of paints by TLC 6. Distribution of components in paint chips.	L1, L3, L4	6
7. Microscopic examination of fibres 8. Burring tests of fibres 9. Solubility examination of fibres 10. Examination and comparison of fabric from the different sources	L1, L3, L4	8
16. Size distribution analysis of soil particles. 17. Microscopic examination of distribution of various particles in soil sample	L1, L3, L4	4
18. Examination of tyre marks 19. Casting of shoeprints 20. Examination of Tool marks	L1, L3, L4	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, A: Attendance, PR- Performance, LR – Lab Record, V – Viva.

Suggested Readings:

- A Glencoe Program Physics principles and problems: Forensic Laboratory Manual Student edition
- Thomas Kubic, Nicholas Petraco Forensic Science Laboratory Manual and Workbook, Third Edition 2009
- Kathy Mirakovits, Gina Londino, The Basics of Investigating Forensic Science: A Laboratory Manual 2015
- Washington state patrol Forensic Laboratory services: Crime Laboratory: Technical & Training Manuals.
- G.H. Stout & L.H. Jensten, X-ray Structure Determination – A practical Guide; 2nd Edn. Wiley, New York, 1989

CO, PO, PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	1	1		3					3	3	1		
CO2	1	1		3					3	3	1		
CO3	1	1		3					3	3	1		
CO4	1	1		3					3	3	1		

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DFCH2603	FORENSIC BALLISTICS	L	T	P	C
Version 1.1	Date of Approval: December 2023	3	0	0	3
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description

The course is designed to provide basic and analytical knowledge of the firearms, types, firing range and the analysis of the GSR components.

Course Objective: - The objectives of the course:

1. To understand the role of ballistics in Forensic Science
2. Classification of firearms, determination of the range of firing, methods of laboratory examination of fired cartridges and firearms.
3. The students will also learn to reconstruct the sequence of events in cases involving firearms.

Course Outcomes: On completion of this course, the students will be able to

CO1. Explain the history and types of Firearms

CO2. Describe various types of ammunition

CO3. Explain about the Internal and External ballistics.

CO4. Restate the concept of linkage of bullets and Cartridge Cases and examination of Gun Shot Residue along with determination of range of firing.

Course Contents	Blooms level*	Number of hours
Module I: Introduction to Firearms and their Characteristics: Definition and scope, Firearms, Indian Arms Act, History and mechanism of Muzzle loaders (Match lock, Wheel lock, Flint lock firearms), Briefs of Pinfire, Rimfire and Centrefire systems of cartridge, Characteristic features of the firearms, various types of modern firearms, Types of evidences associated, classification of firearms on different basis, bore characteristics, Introduction to Shotgun, Revolver, Pistol, Rifle and Country Made/ Improvised Firearms. Proof marks of weapons.	L1, L2	**12**
Module II: Types of Ammunition: Ammunition Components of Shotgun and Rifled firearm cartridges, Headstamp markings on ammunition. Various types of bullets and their compositional aspects, latest trends in their manufacturing and design, smooth bore, and improvised ammunition.	L1, L2, L3, L4	**12**
Module III: Internal and external Ballistics: Internal Ballistics: Definition, shapes and manner of Propellant burning, Muzzle velocity and Factors affecting muzzle velocity, ballistic coefficient, phenomenon of ricochet External Ballistics: Definition- Bullet Trajectory and factors affecting bullet flight. Wound Ballistics: Definition of wound ballistics, Ballistic aspect of	L1, L2, L3, L4	**12**

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firearm injuries, significance of studying cavitations in body, Bullet Entry/Exit Hole Identification, Evaluation of accident, suicide, homicide firearm injuries.		
Module IV: Bullet linkage: Different types of marks produced during firing process on bullet-number/direction of lands and grooves, width of lands and depth of grooves, angle and pitch of rifling, striation marks on lands and grooves, techniques for obtaining test material from various types of weapons and their linkage with fired ammunition, class, and individual characteristics.	L1, L2, L4	**12**
Module V: Range of Firing determination: Introduction and methods of estimation. Gunshot Residue: Introduction and methods of analysis. Bullet and Cartridges matching: Ejecta, burning, scorching, blackening, tattooing and metal fouling, shots dispersion and GSR distribution, time of firing – different methods employed, and their limitations, stereo & comparison microscopy, automatic bullet, and cartridge comparison.	L1, L3, L4	**12**

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

1. Brain J. Heard; Handbook of Firearms and Ballistics; John Willey, England, 1997.
2. D.A. Skoog, D.M. West and F.J. Holler; Analytical Chemistry: An Introduction; Saunders College Publishing, Philadephia, USA, (1994)
3. Dettean, J D; Kirk's Fire Investigation, 5th ed, Prentice Hall, Eaglewood Cliffs, N.J (2002)
4. Working Procedure Manual: Chemistry, Explosives and Narcotics, BPR&D Pub (2000)
5. Hatcher Jury & Weller, 1987: Firearm Investigation Identification and Evidence, The University Book Agency, Allahabad.
6. Gunther & Gunther, 1935 : The Identification of Firearms, Wouldies, New York
7. Jauhri, M. 1980: Monograpnh on Forensic Ballistics, Govt. of India Publication, New Delhi.
8. Burrad, 1951: The Identification of Firearms and Forensic Ballistics.

CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	**1**	--	--	--	--	--	**1**	--	-		
CO2	**1**	--	--	-	--	--	**1**	-	-		
CO3	**1**	**3**	--	--	--	--	**1**	-	-	**3**	
CO4	**1**	**3**	--	--	--	--	**1**	-	-	**3**	

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DFCH2604	FORENSIC BALLISTICS LAB	L	T	P	C
Version 1.1	Date of Approval: December 2023	0	0	2	1
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course introduces students to the experimental analysis to identify the types of firearms and their ammunition and to establish the linkage between the fired ammunition and firearm along with GSR analysis.

Course Objective: - The objectives of the course:

1. To understand the parts of firearms
2. To understand the different types of ammunition
3. To analyse the Gunn shot residues

Course Outcomes

On completion of this course, the students will be able to

CO1. Identify the parts of firearms
CO2. Examine the types of ammunitions
CO3. Analyse the gunshot residues
CO4. Link a bullets, Cartridge Cases and firearms.

Course Contents	Blooms level*		Number of hours
1. To identify the country made firearms 2. To identify the improvised firearms	L1, L2		**4**
3. To identify the type of ammunition recovered 4. To identify the 12 bore shotgun 5. To identify the pellets and wads 6. Ammunition Components of Shotgun 7. Ammunition Components of Rifled firearm cartridges	L3		**10**
8. Identification of parts of firearm • Shotgun • Rifle • Pistol	L3		**6**
9. To identify the Gun shot residues • Nitrate test • sulphate • chlorate test	L3		**6**
10. To examine the individual characteristics on bullet to link a firearm with fired bullet	L4		**4**

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11. To examine the class characteristics on bullet to link a firearm with fired bullet			

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation.*

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination

Examination Scheme:

A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA–Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva. A-Attendance.

Suggested Readings:

- Brain J. Heard; Handbook of Firearms and Ballistics; John Willey, England, 1997.
- D.A. Skoog, D.M. West and F.J. Holler; Analytical Chemistry: An Introduction; Saunders College Publishing, Philadephia, USA, (1994)
- Dettean, J D; Kirk's Fire Investigation, 5th ed, Prentice Hall, Eaglewood Cliffs, N.J (2002)
- Working Procedure Manual: Chemistry, Explosives and Narcotics, BPR&D Pub (2000)
- Hatcher Jury & Weller, 1987: Firearm Investigation Identification and Evidence, The University Book Agency, Allahabad.
- Gunther & Gunther, 1935 : The Identification of Firearms, Wouldies, New York
- Jauhri, M. 1980: Monograpnh on Forensic Ballistics, Govt. of India Publication, New Delhi.
- Burrad, 1951: The Identification of Firearms and Forensic Ballistics.

CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	**1**	**2**	--	--	--	--	**1**	--	-	**3**	
CO2	**1**	**2**	--	-	--	--	**1**	-	-	**3**	
CO3	**1**	**2**	--	--	--	--	**1**	-	-	**3**	
CO4	**1**	**2**	--	--	--	--	**1**	-	-	**3**	

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DFCH2605	FORENSIC ANTHROPOLOGY	L	T	P	C
Version 1.1	Date of Approval: December 2023	3	0	0	3
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description

This course will help the students to understand the basic meaning of forensic anthropology and its utility in the investigation of medico-legal cases. This course will also describe the methods to examine the human skeleton.

Course Objective:

The given course is designed to:

1. Provide knowledge about the basics of physical anthropology
2. Develop a comprehensive understanding of different techniques for determining the identity of unknown remains.
3. Provide an understanding of the process of forensic facial reconstruction and its utilization in personal identification

Course Outcomes

On completion of this course, the students will be able to:

CO1 Describe the basic concepts of anthropology.
CO2 Identify human bones based on their anatomical features.
CO3 Learn the methods to determine height and race from a human skeleton.
CO4 Determine the stature of an individual based on bones and the human skeleton.
CO5 Determine sex by the various bones.

Course Contents:

Modules	Blooms level*	Number of hours
Module I: Introduction to Forensic Anthropology Definition, scope and application of Forensic Anthropology and related sciences. Human skeletal system, and types of bones.	L1	9
Module II: sex determination from Bones Characteristic features of different human bones. Sex determination from skull, mandibular, and pelvic bones.	L1, L2	9
Module III: Age Estimation from Bones Primary and secondary ossifications of bones. Estimation of age from skull, sternum, long bones (humerus, radius, ulna, fibula, tibia, femur), pelvic bone, foot and hand bones.	L1, L2	9
Module IV: Stature and Race Determination Race and height determination from long bones and their medico-legal implication. Establishment of Partial and Complete identity of skeletal material and dead bodies.	L1, L2	9
Module V: Forensic Odontology Types of dentitions, Basic structure of human teeth, types of teeth & their morphology, Determination of age from teeth using various methods, Dental anomalies and their role in personal identification.	L1, L2	9

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Suggested Readings:

- Krogman, W. M. and M. Y.Iscan: Human Skeleton in Forensic Medicine.
- Modi: A Text Book of Medical Jurisprudence and Toxicology.
- Nath, S.: Forensic Anthropology
- Stewart, T. D.: Essentials of Forensic Anthropology.

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	2	--	--	--	--	1	2	-	3	
CO2	1	2	--	-	--	--	1	2	2	3	
CO3	1	1	-	3	--	--	1	2	2	2	
CO4	1	2	--	3	--	--	1	2	2	2	
CO5	1	1	-	3	-	-	1	2	2	2	

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DFCH2606	FORENSIC ANTHROPOLOGY LAB	L	T	P	C
Version 1.1	Date of Approval: December 2023	0	0	2	1
Pre-requisites/Exposure					
Co-requisites					

Lab Course contents*:*

Modules	Blooms level*	Number of hours
1. Identification of the human skeleton system. 2. Identification of various bones (Pelvic and Skull bones). 3. Estimation of height using long bones. 4. Determination of sex from the skull, pelvis and mandibular bone. 5. Determination of age using skull. 6. Dental and bite mark analysis 7. Age estimation by dentition.	L1, L2, L3	30

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Suggested Readings:

- Krogman, W. M. and M. Y.Iscan: Human Skeleton in Forensic Medicine.
- Modi: A Text Book of Medical Jurisprudence and Toxicology.
- Nath, S.: Forensic Anthropology
- Stewart, T. D.: Essentials of Forensic Anthropology.

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination
Examination Scheme:

A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA–Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva. A-Attendance.

CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**1**	**2**	**-**	**3**	
CO2	**1**	**2**	**--**	**-**	**--**	**--**	**1**	**2**	**2**	**3**	
CO3	**1**	**1**	**-**	**3**	**--**	**--**	**1**	**2**	**2**	**2**	
CO4	**1**	**2**	**--**	**3**	**--**	**--**	**1**	**2**	**2**	**2**	
CO5	**1**	**1**	**-**	**3**	**-**	**-**	**1**	**2**	**2**	**2**	

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SEMESTER-VII

DFCH2701	FORENSIC PSYCHOLOGY	L	T	P	C
Version 1.1	Date of Approval: December 2023	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is intended to give insight of providing the basic knowledge about the human behavior, and its impact on social environment. The students will be able to explain cognitive neuroscience and associated disorders. The course will help the students to understand the concept of investigative psychology and criminal profiling.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the concepts of emergent fields of cognitive neuropsychology.

CO2. Describe brain-behaviour relationship in day to day life

CO3. Apply practical implications of cognitive processes in human performance.

CO4. Analyse impact of intelligence and decision making and language on personal behaviour

CO5Apply the concepts of investigative psychology to elicit criminal profiling.

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1					1		3	3			2	1
CO2	1					1		3	3				1
CO3	1					1		3	3			2	1
CO4	1					1		3	3			2	1

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FCH2702	DIGITAL FORENSICS	L	T	P	C
Version 1.1		3	0	2	4
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description

This course provides an in-depth exploration of cyber-criminal behaviors, the dynamics of network communication, tools for investigation and analysis, and the critical aspects of operating systems. Students will learn about the various challenges in cyberspace, methodologies for digital evidence collection, and advanced techniques for system analysis.

Course Objective

1. Understand the threats in networks and security concepts.
2. Apply authentication applications in different networks.
3. Understand security services for email.
4. Awareness of firewall and it applications.

Course Outcomes:

CO1: Understand the complex landscape of cyberspace, recognizing various computer crimes.
CO2: Acquire skills in network forensics.
CO3: Master the tools and techniques related to network security.
CO4: Understanding the core functionalities of operating system.

Course Contents:

Modules	Blooms level*	Number of hours
Module 1: Introduction to Digital Forensics Definitions, Scope, and Fundamentals of digital forensics; Forensic Analysis: Scientific, Data abstraction Layers, Physical and Logical acquisition, Evidence Dynamics, Comparison and Identity; Crime reconstruction	L1, L2	8
Module 2: Forensic Analysis Introduction, Applying scientific methods to digital forensics, Uses of digital forensic analysis, evaluation of source, digital document authentication; Data gathering and observation.	L1, L2, L3	8
Module 3: Electronic Discovery Introduction, Legal Context, Case management, Identification of e-data, Forensic preservation of data, data processing, production of e-data	L1, L2, L3	8
Module 4: Intrusion Investigation Methodologies, preparations, common observations, collection, analysis, combination, feeding analysis, detection phase; Embedded Systems Analysis, Network and mobile network investigation: Introduction, Definition and Operation, Preserving Traces, Data Collection, Information Recovery	L1, L2, L3	10

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Suggested Reading:

1. Casey, E. (2002). Practical approaches to recovering encrypted digital evidence. International Journal of Digital Evidence, Fall 2002, 1(3).
2. Casey, E. (2002). Error, uncertainty, and loss in digital evidence. International Journal of Digital Evidence, 1(2).
3. Casey, E., & Stellatos, G. (2008). The impact of full disk encryption on digital forensics. ACM SIGOPS Operating Systems Review, 42(3).

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	2	--	--	--	--	1	--	-	3	
CO2	1	2	--	-	--	--	1	-	-	3	
CO3	1	2	--	--	--	--	1	-	-	3	
CO4	1	2	--	--	--	--	1	-	-	3	

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DFCH2703	ADVANCED FORENSIC CHEMISTRY & TOXICOLOGY	L	T	P	C
Version 1.1	Date of Approval: December 2023	3	1	0	4
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description

This course is intended for students to understand the adulteration present in petroleum products, the drugs, food product, cosmetics etc. and various related acts and trap case analysis.

This course will also make them understand the investigation and examination of fire, arson and explosives along with the drug of abuse, toxicology and examination of metallic poisons

Course Objective: The objectives of the course are to:

1. Impart the knowledge to students about the adulteration in petroleum products, drugs food product, cosmetics and various related acts along with trap case analysis.
2. Provide scientific knowledge to investigate and examine the scene of fire, arson and explosive.
3. Provide insight about the toxicology, pharmacology of drugs of abuse, NDPS, metallic poisons along with their extraction and examination.

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand the acts related to adulterants in drugs and cosmetic and will also be able to analyze the adulterants in petroleum products, drugs, food product along with tape case analysis.

CO2. Investigate the arson cases and examine the arson evidences.

CO3. Examine the post blast residue

CO4. Extract, isolate and analyze the drug of abuse along with the metallic poison.

Course Contents:

Modules	Blooms level*	Number of hours
Module I: Adulterants and Law related to Drugs, Food product, Cosmetics and Excise Properties of petroleum Product, Analysis of adulteration in Petroleum products: Diesel, Petrol, Kerosene, Adulteration in Food product, Adulteration in construction product. NDPS Act 1985, Drugs and Cosmetic Act 1940, Excise Act, The Drugs Control Act, 1950, Prevention of food adulteration act 1954. Examination of Trap Cases	L1, L2, L3	12
Module II: Investigation and Forensic Examination of Arson Cases Arson scene investigation: Collection and preservation of Arson evidence. Instrumental Analysis and identification of accelerants, flammable liquids, ignitable materials, Extraction of ignitable liquid residue from debris: Solvent extraction methods and Distillation methods, Clean-up procedure: Filtration & Acid stripping, Chemical analysis, Instrumental analysis: GC, GC-MS, and Head Space GC.	L2, L3, L4	12

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Module II: Post blast investigation and Analysis of explosive residue Systematic examination of Post blast explosive residue- Extraction by solvent extraction method based on solubility: Organic solvent extraction for organic explosives, Water extraction for Inorganic anionic explosives, Alkali extraction for metallic explosives, Pyridine extraction for elemental sulphur. Chemical analysis: Solubility test, Flame test and Spot test. Instrumental Analysis: TLC, HPLC, GC-MS, GC, IR, SEM/EDX OR XRF, XRD, CE, ICP, AAS, UV	L3, L4	12
Module III: Drugs of Abuse and Metallic Poisons Introduction, classification of drugs of abuse, drugs of abuse in sports and doping, narcotics drugs and psychotropic substances, designers drugs, Mechanism of action, their Sign and Symptoms, Forensic examination. Introduction to metallic poisons, Mechanism of action, Sign and Symptoms and Medico-legal aspect.	L2, L3, L4	12
Module IV: Toxicology and its Law Definition, Law relating to poison, Classification of poisons: Based on action, Physical State, Toxico-analytical, Medico-legal, Based on purpose (Intention) - Factors affecting the action of poisons, routes of administration of poisons.	L2, L3	12
Module V: Forensic Pharmacology Pharmacology and Toxicology of Psychotropic Drugs: Sedatives, Stimulants, Opiates. Examination of Drugs: Extraction and Isolation of drugs from viscera and body fluids: Extraction of Metallic poisons, Anions, Organic Volatile, Organic Inorganic, Vegetable poisons, Acidic poisons, Basic Poisons, Neutral Poisons.	L3, L4	12

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Suggested Readings:

- James, S. H. and Nordby, J. J. (Eds), Forensic Science - An Introduction to Scientific and Investigation Techniques, CRC Press, London, 2003.
- Saferstein, R., Forensic Science Handbook, Prentice Hall, New Jersey, 1982.
- Saferstein, Richard, Criminalistics - An Introduction to Forensic Science, 6th Ed. Prentice-Hall, New Jersey, 1998.
- Sharma, B. R., Forensic Science in Criminal Investigation and Trials (3rd Ed) Universal Law Publishing Co. Ltd. New Delhi, 2001.

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

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CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**1**	**2**	**-**	**3**	
CO2	**1**	**2**	**--**	**-**	**--**	**--**	**1**	**2**	**-**	**3**	
CO3	**1**	**2**	**--**	**--**	**--**	**--**	**1**	**2**	**-**	**3**	
CO4	**1**	**2**	**--**	**--**	**--**	**--**	**1**	**2**	**-**	**3**	

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DFCH2704	QUALITY MANAGEMENT AND ACCREDITATION IN FORENSIC SCIENCE LABORATORIES	L	T	P	C
Version 1.1	Date of Approval: December 2023	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description
This course is intended for students who have never learned about quality management and technical requirement in forensic laboratories. A knowledge of the process of accreditation and the basic requirements for a testing and calibration laboratory to be accredited is a must for the student of forensic science.

Course Objective: This course aims to introduce the students to the Quality management system and requirements for the competence of testing and calibration, the technical requirements needed in a laboratory.

Course Outcomes
Upon completion of this course, the students will be able to
CO1. Apply quality management in forensic laboratories.
CO2. Summarize the technical requirements for a forensic laboratory to be accredited.
CO3. Perform sampling, handling of test and calibration items, as well as assuring the quality of test and calibration results and reporting the results in forensic cases.
CO4. Set up the forensic laboratory information management system.

Course Contents:	Blooms level	Number of hours
Module I: Quality management and accreditation agencies General requirements for the competence of testing and calibration laboratories – Introduction, scope, management requirements: Organization, Quality system, Document control, Review of requests Organizations involved in setting guidelines and maintaining quality systems: National Accreditation Board for Testing and Calibration Laboratories (NABL), International Laboratory Accreditation Co-operation (ILAC), Asia Pacific Laboratory Accreditation Co-operation (APLAC). International Organization for Standardization (ISO), Bureau of Indian Standards (BIS).	L1, L2	10
Module II: Management Requirements II Internal Audits; Control of records, Corrective and preventive actions, Tenders and contracts, Sub-contracting of tests and calibration, Purchasing services and supplies, Service to the clients, Complaints	L1, L2, L3	10
Module III: Technical Requirements I Technical requirements: General, Personnel, Accommodation and Environmental conditions, Test and Calibration methods.	L1, L2, L3	10

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Equipment, measurement traceability, sampling, handling of test and calibration items, assuring the quality of test and calibration results and reporting the results		
Module IV: Laboratory Management Laboratory information management system, Validation and safety equipments	L1, L2, L3	10
Module V: Assessor Guide: Assessor's role, Assessor assignment procedure, Procedure of assessment of new applicant laboratories, Pre-assessment visit, On-site assessment, Guide of assessors to formulate recommendations for NABL, Procedure for conducting a closing meeting	L1, L2, L3, L4	10
Module VI: Biosafety: Historical Background, Biosafety in Laboratory/Institution. Laboratory-associated infections and other hazards, assessment of Biological Hazards and levels of biosafety, prudent biosafety practices in the laboratory/institution Introduction to Biological safety cabinets, Primary Containment of Biohazards, Biosafety Levels, Recommended Biosafety Levels for Infectious Agents and Infected Animals Biosafety guidelines, Government of India Guidelines Definition of Genetically Modified Organisms (GMOs)	L1, L2, L3, L4	10

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

- International standard on General requirements for the competence of testing and calibration laboratories, Fist Edn., 1999-12-15, ISO/IEC 1702:1999(E)
- Mario Deva RGAS, The Total Quality Management, NCC Blackwell Publication, (1995).
- Willard Merritt, Dean & settle; Instrumental Methods of Analysis, CBS Publishers & Distributors, 7thEdn. New Delhi, (1986)

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2				2		3	3	3			1	3
CO2	2							3	3			1	3
CO3	2				2		3	3	3			1	3
CO4	2				2		3	3	3			1	3

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DFCH2705	FORENSIC GENETICS	L	T	P	C
Version 1.1	Date of Approval: December 2023	3	1	0	4
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description

This course will help the students to understand important fundamental concepts of human anatomy and physiology at the undergraduate level. The main objective is to prepare students for the study of the basic tissues, respiratory system, cardiovascular system, excretory system, nervous system, endocrine system and fluid electrolytes etc.

Course Objective:

1. Understand the foundational concepts of genetics.
2. Comprehend the molecular structure of DNA and its significance in forensic investigations.
3. Analyze chromosomal structures and their implications in forensic genetics.
4. Recognize the impact of genetic mutations and their applications in forensic science.

Course Outcomes

On completion of this course, the students will be able to

CO1: Demonstrate a comprehensive understanding of genetics.

CO2: Analyze and interpret the molecular structure of DNA.

CO3: Evaluate chromosomal structures understanding their implications in forensic genetics.

CO4: Apply knowledge of genetic mutations, the Hardy-Weinberg equilibrium, and other genetic principles to real-world forensic scenarios.

Course Contents:

Modules	Blooms level*	Number of hours
Module I: Foundations of Genetics Introduction to Genetics: Mendelian Genetics: Laws of Inheritance, Exceptions to Mendel's laws, Genes: Structure, Function, and Regulation, Genetic Variation: Sources and Importance in Forensics.	L1, L2 and L3	10
Module II: Nucleic Acids Introduction to Nucleic Acids: DNA and RNA. DNA Structure: Double Helix, Bases, and Backbone (Watson & Crick Model). DNA Replication, Transcription, and Translation: The Central Dogma. DNA Profiling: Techniques and Applications in Forensic Science.	L1, L2, L3	8
Module III: Chromosomes and Genetic Mapping Chromosome Structure and Function: Eukaryotic vs. Prokaryotic. Human Karyotype: Chromosomal Abnormalities and Forensic Implications.	L1, L2, L3	6

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Genetic Mapping: Linkage and Physical Maps. Genomic Imprinting and its Forensic Relevance.		
Module IV: Genetic Mutations and Forensic Applications Introduction to Genetic Mutations: Types and Causes. Detecting Mutations: Techniques and Tools. Genetic Disorders: Inheritance Patterns and Forensic Implications. Forensic Applications. Hardy-Weinberg Equilibrium: Principles and Assumptions.	L1, L2, L3	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Suggested Readings:

- H. Coleman and E. Swenson, DNA in the Courtroom: A Trial Watcher's Guide, GeneLex Corporation, Washington (1994).
- W. Goodwin, A. Linacre, S. Hadi: An Introduction to Forensic Genetics, Wiley, NY (2020)
- W.J. Tilstone, M.L. Hastrup and C. Hald: Fisher's Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).
- H. Machado, R. Granja: Forensic Genetics In The Governance Of Crime, Palgrave Pivot (2020)

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination
Examination Scheme:

A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA–Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva. A-Attendance.

CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	**1**	**2**	--	--	--	--	**1**	--	-	**3**	
CO2	**1**	**2**	--	-	--	--	**1**	-	-	**3**	
CO3	**1**	**2**	--	--	--	--	**1**	-	-	**3**	
CO4	**1**	**2**	--	--	--	--	**1**	-	-	**3**	

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DFCH2706	INTRODUCTION TO LAB SAFETY AND TRAINING	L	T	P	C
Version 1.1	Date of Approval: December 2023	3	1	0	4
Pre-requisites/Exposure	Nil				
Co-requisites					

Course Contents:

Modules	Blooms level*	Number of hours
Module I: Standard Operating Procedures for the Laboratory Chemical Name, Hazard Rating, Hazards, Label Requirements, Exposure Limits, Personal protection equipment and personal Attire required, Precautionary Statement	L1, L2 and L3	10
Module II: Laboratory Safety-I Biological Safety, Chemical Hygiene, Compressed Gas Safety, Electrical Safety, Emergency Response, Fire and Life Safety, Hazard Communication, Hazardous Waste Management	L1, L2, L3	8
Module-III: Laboratory Safety-II Acid Safety, Laboratory Equipment Safety, Laser Safety, Mercury Safety, Needle Stick and Needle Safety, Personal Protection Equipment, Reactive Chemicals and Pyrophoric Safety	L1, L2, L3	6
Module IV: Laboratory Safety III Radiation Safety, Recombinant DNA Materials, Respiratory Protection, Shipping Biological Materials	L1, L2, L3	6

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination
Examination Scheme:

A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA–Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva. A-Attendance.

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DFCH2739	BASICS OF RESEARCH METHODOLOGY, ETHICS, AND RESEARCH COMMUNICATION	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description

This course aims to provide students with a comprehensive understanding of conducting ethical research, utilizing proper research methodologies, and effectively communicating research findings. The course includes a final project where students will write a Literature Review on a topic chosen in consultation with the teacher(s).

This course is designed to equip students with essential skills and knowledge to conduct ethical research, employ proper research methodologies, and effectively communicate scientific information (with focus on writing a literature review). The course will cover topics such as research design, data collection and analysis, research ethics, and science communication strategies. Through a combination of lectures, discussions, case studies, and practical exercises, students will develop a deeper understanding of the research process and its ethical implications.

Course Objectives

The objective of this course is to impart knowledge about various stages of research process, research ethics and different ways of research communication.

The aim of this course is to impart research skills to the beginners and help to improve the quality of research by the existing researchers. It also encompasses the understanding and application of appropriate research design, statistics, and the use of the computer for reference management, report writing, research paper writing and presentation. The course also introduces the key conceptual issues of each research method, as well as giving practical guidance. It covers the series of research methodology contents: from problem formulation, to design, to data collection, analysis, reporting and dissemination. The course has the dual aims of equipping students with conceptual understandings of current academic debates regarding different methods, and the practical skills to put those methods into practice.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define criteria of good research, steps in research process, and data collection.

CO2. Identify different types of sampling and its purpose.

CO3. Conduct hypothesis testing for different types of samples and interpret the results.

CO4: Learn the importance of literature review, write research paper/thesis, use reference management software.

Course Content :

Module	Topic	**Blooms level***	Hours
1	**Research Methodology** Understanding the research process: From research questions to conclusions	L1, L2	10

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	Types of research: Qualitative and quantitative research Exploratory, descriptive, experimental, and correlational studies Scientific Thinking: Subjective Vs. Objective Thinking Logical Reasoning: Inductive Vs. Deductive Reasoning Formulating research hypotheses and objectives Purpose of a good research, Criteria of good research		
2	**Descriptive Statistics** Data, Types of Data, Methods of data collection, Benefits and drawbacks, Graphical representation of data and interpretation. Measures of Central Tendency: Arithmetic Mean, Median, Mode, Measures of Dispersion: Range, Standard Deviation, Variance, Coefficient of Variation.	L1, L2, L3	15
3	**Inferential Statistics** Sampling: Basic concepts, Process of Sampling, Sample Size, Types of Samples, Sampling and non- sampling errors, Statistics and Parameters, Sampling Distribution of Means and Proportion, **Hypothesis Testing**, steps in testing of hypothesis, errors in hypothesis testing, z test and t test.	L1, L2, L3	15
4	**Research Ethics** Plagiarism, Fabrication, Falsification, Ethics with respect to human and Animal Research	L1, L2	5
5	**Communication** Characteristics of a good Research paper, Systematics Literature Review (choosing a topic, preparing outline, gathering authentic & appropriate references, avoiding plagiarism, use of reference management systems), Writing a good literature review, Structure of report (Introduction, Methodology, Analysis, Results, Discussions, Conclusions, Recommendations), Writing Quality Research Paper, Publishing Research Work in Quality Journals, Reference Management Software	L1, L2, L3	15

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional Exam	End Term Examination
Weightage (%)	5	10	15	70

Project based assignment: Student teams (2-3 students per team) will write a literature review on a topic of choice, in consultation with the teacher.

Text books/ Reference books

- Research Methodology for Natural Sciences by Soumitro Banerjee, Publisher: IISc Press (1 January 2022); ISBN-10: 8194835178; ISBN-13: 978-8194835172

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- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt. Ltd., New Delhi-110001
- Geode, Millian J.& Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Kothari, C.R.2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.
- Levin R I., Rubin D S. Statistics for Management. Sixth Edition, PHI
- Kapoor & Gupta. Probability & Statistics. S Chand Publishers, New Delhi.
- Montomery, Douglas C.(2007), 5th Ed. Design and Analysis of Experiments, Wiley India.
- Cooper, Donald R. and Pamels Schindler, Business Research Methods, Tata McGraw Hills, New Delhi
- Krishnaswamy, K.N. Sivakumar. Appa lyer and Mathiranjan M. 2006, Management Research Methodology: Integration of Principles, Methods and Techniques, Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Sachdeva, J.K. 2008. Business Research methodology. Himalaya Publishing House, New Delhi.
- Shekharan, Uma, Business Research Methods, Miley Education, Singapore.
- Zikmund, Millian G., Business Research Methods, Thomson Learning, Bombay**.**

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SEMESTER-VIII

DFCH2801	WILD LIFE FORENSIC AND ENTOMOLOGY	L	T	P	C
Version 1.1	Date of Approval: December 2023	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is intended to provide advanced knowledge of the forensic wildlife and entomology, environmental forensics, and forensic microbiology. The students will understand the advanced analytical techniques to detect poaching. It will be helpful in providing knowledge of the various branches of biology and their direct applications in the criminal investigation.

Course Objective: During the course the students will be able to

1. Understand the scope of wildlife forensics and litigation of environmental forensics.
2. Understand and appreciate the diversity and utility of variety of botanical evidence.
3. Elaborate concepts of entomology, microbiology.
4. Estimate the time since death by life cycle of different insects.

Course Outcomes

On completion of this course, the students will be able to

CO1. Describe entomology, time since death by insects, collection and preservation of the entomological evidences and role of insects in toxicological analysis.

CO2 Elicit the significance of microbial diversity and its applications in forensic investigation.

CO3. Explain significance of botanical evidences such as wood, leaves, pollens etc in forensic investigations

CO4. Analyse diatoms for forensic examination of drowning deaths and role of microbes in these investigations and forensic techniques environmental litigation.

CO5. Explain and analyse wildlife forensics, Wildlife life protection Act and significance of wildlife evidences for criminal investigations and species identification.

Course Contents	Blooms level	Number of hours
Module I: Forensic Entomology & Entomotoxicology History, significance, determination of time since death- Dipterans larval development- life cycle of blowfly, housefly. Importance of Insects in Forensic Investigation Insects as an evidentiary tool in drug abused cases, Effect of drugs & toxins on development of insects and larvae feeding on corpses. Toxin & Drug metabolite Identification and analysis from Insects feeding on Corpses	L1, L2	7
Module II Forensic Microbiology Scope of Microbiology in Forensic Investigation Sterilization Techniques-Physical Agents, Microbial Diversity and its application in forensic investigation Different methods of Isolation of microorganisms from forensic samples like vomitus,stool,stomach wash and residual food.	L1, L2, L3	8

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Module III: Forensic Botany Introduction, types, location, collection ,evaluation and forensic significance. Morphological and anatomical characteristics of Plants yielding drugs,of abuse like Opium, Cannabis,Cocoa Plant, Psilocybe mushrooms, and Tobacco **Wood:** Type of wood and their identification and comparison. **Leaves:** Identification of various types of leaves and their anatomy, methods of comparison. Forensic Palynology Identification and Analysis of Pollen Grains for Criminal Investigation Starch and Toxic Plant Metabolite	L1, L2, L3	6
Module IV: Forensic Diatomology and Environmental Forensics **Diatoms** Nature, location, structure, extraction from various body tissues, including bone marrow, preparation of slides, methods of identification and comparison, forensic significance. Introduction & application of environmental forensics, Principles and method of chemical fingerprinting(Crude oil and refined products, Forensic techniques used in environmental litigation	L1, L2, L3	7
Module V: Wildlife Forensics Importance of Wildlife Species in Ecosystem,Endangered and Rare Species- Wildlife Management, Different methods of killing and Poaching of Wildlife animals, Scientific methods of Identification & Investigation Poaching and Pugmarks Analysis Types of Wild life Crimes Wildlife (Protection) Act,1972 Identification and Analysis of wildlife materials such as skin, fur, bones, nails, horn, teeth, flowers, and plants, by conventional and modern methods,	L1, L2, L3	8

Suggested Readings:

- Jason H. Byrd and James L. Castner; Forensic entomology, CRC Press LLC, 2001.
- Forensic Science Hand book by Richard saferstein Vol (II); Prentice Hall, Publications.
- Richard saferstein; Forensic Science Hand book, Vol (I); Prentice Hall, Publications.
- Curry, A. S. (1965) Methods of Forensic Science, Vol. IV, Interscience, New Youk.
- Chowdhuri, S. (1971) : Forensic Biology, B P R & D Govt. of India.
- Linarce, Adrian; "Forensic Science in Wildlife Investigation", CRC Press, Taylor & Francis, 2009.
- Baalu, T.R.; "The Wildlife Protection Act, 1972", Nataraj Publication, 2001.
- G. Erdtman; "Pollen Morphology & Plant Taxonomy: Angiosperms (an introduction to Palynology), Hafner Publishing Co., 1971.
- Molecular Biotechnology: Gleek and Pasternack.
- Biotechnology: A Text Book of Industrial Microbilogy, T. D.Brock.
- Prescott & Dunn's Industrial Microbiology – G. Reed, CBS Publishers & Distributors, ISBN: 978-8123910017

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

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CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	1		3				3		1			3
CO2	1	1		3				3		1			3
CO3	1	1		3				3		1			3
CO4	1	1		3				3		1			3
CO5	1	1		3				3		1			3

1: strongly related, 2: moderately related and 3: weakly related

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DFCH2802	CYBER SECURITY	L	T	P	C
Version 1.1		3	1	0	4
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description

This course provides an in-depth exploration of cyber-criminal behaviors, the dynamics of network communication, tools for investigation and analysis, and the critical aspects of operating systems. Students will learn about the various challenges in cyberspace, methodologies for digital evidence collection, and advanced techniques for system analysis.

Course Objective

- Understand the threats in networks and security concepts.
- Apply authentication applications in different networks.
- Understand security services for email.
- Awareness of firewall and it applications.

Course Outcomes:

CO1: Understand the complex landscape of cyberspace, recognizing various computer crimes.
CO2: Acquire skills in network forensics.
CO3: Master the tools and techniques related to network security.
CO4: Understanding the core functionalities of operating system.

Course Contents:

Modules	Blooms level*	Number of hours
Module 1: Cyberspace Ethical hacking, Attack Vectors, Cyberspace and Criminal Behaviour, Clarification of Terms, Traditional Problems associated with Computer Crimes, Computer language, Network Language, Realms of Cyber world, brief history of the internet, contaminants and destruction of data, unauthorized access, computer intrusions, white-collar crimes, viruses and malicious code, virus attacks, pornography, software piracy, mail bombs, exploitation, stalking and obscenity in internet.	L1, L2	8
Module 2: Network Forensics Network Forensics: Networking, Overview of OSI Model and TCP/IP Protocol. IP Addressing and NAT. Types of IP addresses, Digital and Analog Signaling Methods, Network Types (LAN, MAN and WAN) and Topologies, Network Hardware devices (hubs, switches, bridges, repeaters, routers etc.) and Client/Server Computing, Routers and Routing Protocols. Monitoring of computer network and activities, Live Packet Capturing and Analysis. Searching and collection of evidences from the network. Network Intrusion Detection and Analysis. SQL Injection, Event Log Aggregation – role of logs in forensic analysis, tools and techniques.	L1, L2, L3	12

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Investigating network attacks. Evidence collection from Routers and CCTV DVRs.		
Module 3: Network Security Investigation Tools, e-discovery, EDRM Models, digital evidence collection and preservation, email investigation, email tracking, IP tracking, email recovery, search and seizure of computer systems, password cracking.	L1, L2, L3	8
Module 4: Operating Systems Operating System: Introduction, Objectives and Functions of Operating System. Types of Operating system- Windows, Linux, Mac, Booting process of computers. Windows artifact analysis, Internet Artifacts, OS Artifacts, File System Artifacts, Registry Artifacts, Application Artifacts, Report Writing.	L1, L2, L3	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Suggested Reading:

- Charles P. Fleeger, "Security in Computing", Prentice Hall, New Delhi,2009.
- Beerhouse A. Frozen, ―Cryptography and Network Security‖, Tata McGraw Hill, India, New Delhi, 2009.
- William Stallings, ―Cryptography and Network Security, Prentice Hall, New Delhi,2006
- Chalice Kaufman, Radii Perlman, Mike Spicier, ―Network Security: Private Communication in a Public Network‖, Pearson Education, New Delhi, 2004.
- Neal Kraetzer ―Introduction to Network Security,Thomson Learning, Boston, 2007.
- Bruce Schneider―Applied Cryptography, John Wiley and Sons, New York, 2004.

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	2	--	--	--	--	1	--	-	3	
CO2	1	2	--	-	--	--	1	-	-	3	
CO3	1	2	--	--	--	--	1	-	-	3	
CO4	1	2	--	--	--	--	1	-	-	3	

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DFCH2803	ARSON AND EXPLOSIVES	L	T	P	C
Version 1.1	Date of Approval: December 2023 December, 2021	3	1	0	4
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description
This course is intended for students to understand the basics of fire, arson and explosives, its classification, composition and analysis in the field of forensic science.

Course Objective: The objectives of the course are to:

- Provide the scientific knowledge and understanding of types of Fire and Explosion.
- Provide illustrations of fire investigation through a wide range of fire and explosion investigation case studies.
- Examine the fire and arosn evidences along with explosive residue.

Course Outcomes
On completion of this course, the students will be able to
CO1. Understand the Chemistry of fire, types of Fire and their forensic significance
CO2. Examine the Arson evidences and their interpitation.
CO3. Classify the explosives and their mechanism of explosion.
CO4. Investigate the scene of Explosion and analyze the explosives.

Course Contents:

Modules	Blooms level*	Number of hours
Module I: Fire and Arson Introduction, Types of Fire: Natural fire, Accidental fire and Malicious Fire; Cause of Fire: Natural fire, Accidental fire and Malicious Fire Laws related to arson, Forensic importance and prerequisites for the cause of Arson cases; Investigation of scene of Natural fire, Accidental fire and Arson cases; Collection and preservation of Arson evidence.	L1, L2	12
Module II: Laboratory Examination of Arson Evidence Identification of flammable liquids, Extraction of ignitable liquid residue from debris, Interferences in debris, Analysis and interpretation.	L2, L3	12
Module III: Explosives Introduction to explosives, definition, Mechanism of Explosion: Deflagration and Detonation, Classification of Explosives and their Types: Low explosives and High explosives; Improvised Explosive Devises: Definition, Classification of IEDs.	L2, L3, L4	12
Module IV: Investigation of Scene of Explosives: Systematic Investigation of scene of explosion: Protection, collection of explosives residue from debris from scene of explosion.	L1. L2	12

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Module V: Laboratory examination of bomb and explosive evidence: Identification of explosives, Examination of Low explosives and High Explosives: Black and smokeless powder, dynamite identification, identifying RDX, PETN, and TATP.	L3, L4	12

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Suggested Readings:

- James, S. H. and Nordby, J. J. (Eds), Forensic Science - An Introduction to Scientific and Investigation Techniques, CRC Press, London, 2003.
- Saferstein, R., Forensic Science Handbook, Prentice Hall, New Jersey, 1982.
- Saferstein, Richard, Criminalistics - An Introduction to Forensic Science, 6th Ed. Prentice-Hall, New Jersey, 1998.
- Sharma, B. R., Forensic Science in Criminal Investigation and Trials (3rd Ed) Universal Law Publishing Co. Ltd. New Delhi, 2001.

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	2	--	--	--	--	1	2	-	3	
CO2	1	2	--	-	--	--	1	2	-	3	
CO3	1	2	--	--	--	--	1	2	-	3	
CO4	1	2	--	--	--	--	1	2	-	3	

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DFCH2804	ADVANCED FORENSIC BIOLOGY AND SEROLOGY	L	T	P	C
Version 1.1	Date of Approval: December 2023	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is intended to provide advanced of the forensic biology and anthropology. The students will understand the advanced analytical techniques. It will be helpful in providing knowledge of the various branches of biology and their direct applications in the criminal investigation.

Course Outcomes

Upon completion of this course, the students will be able to

CO1. Explain wildlife forensics, Wildlife life protection Act and the significance of wildlife pieces of evidence for criminal investigations and species identification.

CO2. Describe various concepts of entomology and its forensic relevance

CO3. Apply various techniques and instruments for individual identification from blood and other biological fluids and presentation of these evidence in court of law.

CO4. Develop comprehensive knowledge of biological fluids.

Course Objectives:

During the course the student will

- Understand and appreciate the scope of forensic biology and Forensic serology
- Understand and appreciate the scope, diversity, and utility of a variety of Human, Animal and plant evidence and their examination
- Learn the primary technique used for the identification of various biological evidence
- Acquire the knowledge on techniques presently being used in the forensic examination of biological evidences and biological fluids

Course Contents	Blooms level	Number of hours
Module I: Introduction to Wildlife Forensics Introduction to wildlife forensics, Examination of pug marks, horns, skin, fur, hair, nail, and teeth. Identification of some endangered species of plants and animals. Wildlife life protection Act.	L1, L2	9
Module II: Forensic Entomology and Forensic Microbiology Collection of insects, Shipment of collected insects, Identification of insects and their stage of growth. Determination of the post-mortem interval in homicide investigations, Forensic Entomo-toxicology. Forensic Microbiology: Definition, Types and identification of Bacteria and Viruses in Forensic Science, Microbial profiles as identification tools, use of microorganisms in bioterrorism, Anthrax, transmission of HIV as a criminal act, role of microbes in food poisoning.	L1, L2, L3	9

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Module III: Forensic Anthropology Somatometry, Osteometry and Craniometry. Identification of individuals from skeletal remains, Collection, Handling, preservation of skeletal remains of forensic science and report writing.	L1, L2	9
Module IV: Blood stain analysis Bloodstain characteristics. Impact bloodstain patterns. Cast-off bloodstain patterns. Projected bloodstain patterns. Contact bloodstain patterns. Blood trails. Bloodstain drying times. Documentation of bloodstain pattern evidence. Crime scene reconstruction with the aid of bloodstain pattern analysis.	L1, L2, L3	9
Module V: Biological markers analysis: Cellular antigens, ABO blood groups, Extracellular proteins and intracellular enzymes, Typing of Biochemical Markers, Forensic Significance of Biochemical markers for identification and individualization	L1, L2, L3, L4	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

- Richard Saferstein; Forensic Science Handbook; Ed.; Prentice – Hall, Englewood Cliff, New jersey; (1982)
- Biology Methods manual, Metropolitan Police Forensic Science Laboratory, London, 1978.
- Byrd, J. H. & Castner, J. L., Forensic Entomology, The Utility of Arthorpods in legal Investigation, CRC Press, USA, 2000.
- Encyclopaedia of Forensic Sciences, Volume, I, II, II & IV, Edited By Jay A. Siegel, Geoffrey
- Advances in Forensic Taphonomy: Method, Theory, and Archaeological Perspectives, William D. Haglund , Marcella H. Sorg, CRC Press; 1 edition, 2001
- Brogdon's Forensic Radiology, Second Edition, Edited by Michael J. Thali, Mark D. Viner, B.G. Brogdon, Published November 22nd 2010 by CRC Press – 654 pages

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1				3			3	3	1			
CO2	1							3	3	1			
CO3	1				3					1		3	
CO4	1							3		1			3

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DFCH2805	ADAVNCED QUESTIONED DOCUMENTS & FINGERPINTS	L	T	P	C
Version 1.1	Date of Approval: December 2023	3	1	0	4
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description
This course will help the students to understand the importance of questioned documents and their examination. Students will also learn examination of questioned documents.

Course Objective: The objective of this course is-
1. To develop an understanding and appreciation for the scope of Questioned Documents.
2. To develop an understanding on different types of questioned documents, the types of forgeries and disguise generally encountered.
3. To provide brief description on general equipment used in examination of Questioned Documents.
4. Developing an understanding and appreciation for the scope of Fingerprints Examination.
5.To Develop an understanding on various methods of development of Fingerprints.

Course Outcomes: On completion of this course, the students will be able to
CO1 Learn the basic concept and classification of questioned documents.
CO2 Learn the methods to detect alterations and examine paper and ink.
CO3 Learn the procedure to present the case in court of law.
CO4 Learn the basic concept and classification of security documents
CO5 Distinguish and categorize characteristics of fingerprints for proper collection and preservation

Course Contents:

Modules	Blooms level*	Number of hours
Module I: Types of Questioned Documents Forgery and its characteristics, erasures, obliteration, alteration and addition.	L1, L2	3
Module II: Detection of Alterations Detection and deciphering of indented writing, charred documents, invisible and secret writings Security Documents and Their Examination Introduction to security documents, Types of security documents, Examination of Passports and fake currency notes, Latest introduced security features for identification of genuine bank notes(new series) 50,100,200,500,2000 rupees	L2	9
Module III: Ink Examination and Paper Comparison Composition of major classes of inks (carbon ink, fountain ink etc.), analysis of writing inks and ink dating, pencil lead examination and age of documents,	L3, L4	9

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Physical characteristics of paper, watermark examination, fibre analysis, chemical and trace elements analysis.		
Module IV: Report Writing and Case Presentation Comparison with standards: admitted and specimen samples, report writing, Presentation of report in questioned document examination cases in Court of Law.	L1, L2	6
Module V: **.Introduction of Fingerprint and its characteristics** Biological significance of skin pattern, Types of fingerprints, Fingerprint characteristics: class and individual, Collection, lifting and preservation of fingerprints, Photography of latent fingerprints and presentation of fingerprint evidence in court. **Classification of Fingerprints** Henry's system of classification, Batley's Single Digit classification, Extension of Henry's system of classification. Primary, secondary, sub-secondary, major, Second sub-secondary, key and final classifications	L2, L3, L4	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Suggested Readings:

- Albert, S. Osborn, Questioned Documents, Second Ed., Universal Law Publishing, Delhi, 1998.
- Charles, C. Thomas, I.S.Q.D. Identification System for Questioned Documents, Billy Prior Bates, Springfield, Illinois, USA, 1971.
- Kelly, J. S. Lindblom, B. S. (2006).*Science, Handwriting Examination and the Courts. Scientific Examinations of Questioned Documents*, 2nd edition, CRC Press, Taylor and Francis group.
- Huber, A. R. Headrick, A. M. (1999). *The Discrimination and Identification of writing. Handwriting Identification Facts and Fundamentals*, CRC Press, Boca Raton London.
- James, S. H. And Nordby, J. J. (Eds), Forensic Science - An Introduction to Scientific and Investigative Techniques, CRC Press, London, 2003. Nath, S., Fingerprint Identification, CRC Press, 2nd edition, 2002.
- Champhod, C., Fingerprint and other ridge skin impressions, CRC Press, 2004.
- Bridges, B. C., Vollmar, A. Monir, M., Criminal Investigation, Practical Fingerprinting, Thumb Impression, Handwriting, Expert Testimony Opinion Evidence, The University Book Agency, Allahbad, 2000.
- James, S. H. and Nordby, J. J. (Eds), Forensic Science - An Introduction to Scientific and Investigation Techniques, CRC Press, London, 2003.
- Nanda, B. B., and Tewari, R. K., Forensic Science in India. Select Publishers, New Delhi, 2001.
- Saferstein, Richard, Criminalistics, An Introduction to Forensic Science, 6th Ed. Prentice-Hall, New Jersey, 1998.
- Sharma, B. R., Forensic Science in Criminal Investigation and Trials (3rdEdn) Universal Law Publishing Co. Ltd. New Delhi, 2001.

Modes of Evaluation: Quiz/Assignment/Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

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CO, PO and PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	**1**	**2**	**--**	**--**	**--**	**--**	**1**	**--**	**-**	**3**	
CO2	**1**	**2**	**--**	**-**	**--**	**--**	**1**	**-**	**-**	**3**	
CO3	**1**	**2**	**--**	**--**	**--**	**--**	**1**	**-**	**-**	**3**	
CO4	**1**	**2**	**--**	**--**	**--**	**--**	**1**	**-**	**-**	**3**	
CO5	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	

1: strongly related, 2: moderately related and 3: weakly related

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DFCH2839	DATA ANALYSIS & VISUALISATION USING SOFTWARE	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	Class X Mathematics				
Co-requisites					

Catalog Description

The implosion of available data has made visualization more critical but also more challenging. Data analysis and Data Visualization are essential tools for business analysis, engineers, policymakers, and decision-makers. Developed originally for "small data", visualization techniques have been met with varied success in the past centuries and decades. There are a few well-known visualizations that are very effective in capturing the essence of the data, and of course, there are many infamous negative examples of poor visuals. An effective visual is critical for decision making it, but it also requires a lot of work, customization, attention to detail, and refinements.

Course Objectives

The course is designed to help students develop skills and knowledge in the following area(s):

- Develop an understanding of what is a good visualization for a given purpose
- Learn visualization theory & techniques
- Build a substantial data analytic project
- Apply data analysis and visualization with Excel, SPSS, R, Python, NVivo and MATLAB

Course Outcomes

On completion of this course, the students will be able to

CO1. Students will be able to articulate meaningful lines of inquiry that might be explored through the collection, organization, visualization, and analysis of data in a context associated with their primary field of study using (as appropriate) numerical, textual, spatial, and/ or visual data.

CO2. Student will understand what data are, how they are collected, and how to assess the quality/ reliability of data.

CO3. Students will demonstrate intermediate proficiency in the visualization of data to communicate information and patterns that exist in the data.

CO4: Students will be able to use at beginning level of proficiency the tools of statistics and machine learning to ask questions of and explore patterns in data.

Course Content :

Module	Topics Covered	Blooms Level	Contact Hours
1	**Module-1: Introduction to Excel** Data Analysis using Excel, Curve fitting, Correlation, Linear Regression, Multiple regression, Principal Component Analysis and Factor Analysis, Hypothesis testing **Introduction to Excel and SPSS** Introduction to SPSS and Types of Data, Importing, exporting and data handling in SPSS; Exploratory data analysis using SPSS and data visualization; Introduction to statistical inference and various univariate tests by using SPSS; Analysis of Variance	L1, L2, L3, L4	20 hours

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	(One Way ANOVA, Two Way ANOVA and ANCOVA); Correlation, Simple and Multiple linear Regression Analysis; Principal Component Analysis and Factor Analysis		
2	**Module-2: VOS Viewer** **Web of Science, Scopus, Dimensions, Lens, and PubMed.** Co-authorship networks, citation-based networks, and co-occurrence networks can be created based on data downloaded from Web of Science, Scopus, Dimensions, and Lens. Co-authorship networks and co-occurrence networks can also be created based on PubMed data. **Crossref, Europe PMC, and OpenAlex**. Networks can also be created based on data retrieved through the APIs of Crossref, Europe PMC, and OpenAlex, These APIs can be queried interactively in VOS viewer. **Semantic Scholar, Open Citations, and Wiki Data.** For a given set of DOIs, networks can also be created based on data retrieved through the APIs of Semantic Scholar, Open Citations and Wiki Data.	L1, L2, L3, L4	10 Hours
3	**Faculty of Management Studies & Behavioural Sciences** **Module 3: Domain Specific Software** **- Structural Equation Modelling** **Smart PLS** Introduction to Structural Equation Modelling (SEM), Introduction to the software's AMOS and SPSS, SMART PLS, Testing of Statistical assumptions, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), common method bias (CMB) test, Measurement Model Assessment, Discussing Fit Indices, Reliability and Validity Testing, Structural Model Assessment identifying multivariate outlier, Construct Validity: Convergent and Discriminant Validity, Measurement Model & Structural Equation Modelling, Mediation and Moderation Effects, Multi-Group Analysis.	L1, L2, L3, L4	30 Hours
	Faculty of Arts **N Vivo** 1. Import text, audio, video, emails, images, spreadsheets, online surveys, web content, and social media from various sources into a simple, intuitive interface. 2. Create and NVivo project, import and organise qualitative and quantitative data 3.Manage a literature review in NVivo		

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	4. Autocode structured data deductively and identify themes inductively 5. Generate and falsify hypotheses 6. Combine data in sets for analysis 7. Seek patterns and identify relationships across codes and cases 8. Present findings using visualisations 9. Export data out of NVivo 10. Coordinate teamwork.		
	Faculty of Science Engineering and Technology **Faculty of Health & Allied Sciences** **R programming / Python/ MATLAB** **R Programming-** Introduction to R, Variables and datatypes in R, Dataframes, Recasting and joining of dataframes, Arithmetic, logical and matrix operations in R, Functions in R, Control structure in R, Data visualization in R. **Python Programming-** Basics of programming, data structure and algorithm using Python, Strings, lists, control, functions, manipulating lists, loops, arrays, selection sort, insertion sort, recursion, sorting, dictionaries, exception handling, file handling, string processing, data analysis using Python **MATLAB Programming-** Introduction, basic features, managing workspace, mathematical functions, basic plotting, Matrices, array operations and linear equations, MATLAB programming- M files script, M-file functions, control flow and operations.		

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional (Theory/ Practical)	End Term Examination
Weightage (%)	5	10	15	70

References:

- David Houcque, 2005. Introduction to MATLAB programming for Engineering students., Northwestern University, E- Book **https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf**
- Mark Lutz, 2009. Learning Python. O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.
- Emmanuel Paradis, 2005. R for Beginners. E book. **https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf**
- A Handbook of Statistical Analysis using SPSS by Dr. Brijesh Awasthi, Redshine Publication.

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Amity School of Applied Sciences

Master of Science (Chemistry)

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Curriculum & Scheme of Examination

2023

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PHYSICAL CHEMISTRY LAB

Course code: CHY4105 **Credit Units 02**

(Minimum 10 Experiments to be performed)

Phase Equilibria:

1. Determination of mutual solubility curve of phenol and water and find consolute point.
2. To determine the distribution coefficient of I_2 between two immiscible solvents(CCl_4 andH_2O).

Chemical Kinetics:

3. To study kinetically the alkaline hydrolysis of ethyl acetate.
4. To study the kinetics of reaction between $K_2S_2O_8$ and KI.:
    a. Determination of the rate constant and order of reaction.
    b. To study the influence of ionic strength on the rate constant.
5. Determination of the effects of change of temperature, concentration of reactant and and ionic strength of the media on the velocity constant of hydrolysis of an ester

Electrochemistry:

6. Determination of the velocity constant, order of the reaction and energy of activation for saponification of ethyl acetate by sodium hydroxide conductomertically.
7. Determine the equivalent conductance of weak electrolyte at infinite dilution by Kohlrausch law.
8. Determination of solubility and solubility product of sparingly soluble salts (e.g., $PbSO_4$, $BaSO_4$) conductometrically.
9. Determination of the strength of strong and weak acids in a given mixture conductomerically.

Potentiometry:

10. Measurement of pH of buffer solution
11. Determination of the strength of strong and weak acids in a given mixture using a potentiometer/pH meter.
12. Acid base titration in a non-aqueous media using a pH meter.

Colligative Properties

13. Determination of depression in Freezing point of solutions.

Adsorption

14. Determine the adsorption isotherms of acetic acid from aqueous solutions by charcoal and verify Freundlich adsorbtion isotherm.

***MSDS -Compilation of MSDS of chemicals used by students in each experiment is compulsory**

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva, A: Attendance.

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Suggested Readings:

- A.Finlay and J.A.Kitchener, “Practical Physical Chemistry, Longman
- F.Daniels and J.H.Mathews, “Experimental Physical Chemistry”, Longman
- H.H.Willard, L.L.Merritt and J.A.Dean, “Instrumental Methods of Analysis”, Affiliated East-West Press
- D.P.Shoemaker and C.W.Garland, “Experimental Physical Chemistry”, McGraw-Hill
- A.I.Vogel, “A Textbook of Quantitative Inorganic Chemistry”, Longman
- J.B.Yadav, “Advanced Practical Chemistry”, Goel Publishing House
- J.J.Lingane, “Electroanalytical Chemistry”, Interscience
- L.Meites, H.C.Thomas and R.P.Bauman, “Advanced Analytical Chemistry McGraw Hill.

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ORGANIC CHEMISTRY LAB

Course Code: CHY4106 **Credit Units: 02**

(Minimum 10 Experiments to be performed)

Qualitative Analysis:

1. Separation, purification and identification of compounds of binary mixture, derivative preparation and confirmatory tests.

Organic Synthesis:

2. Oxidation reaction
3. Reduction: Transfer hydrogenation reaction
4. Aldol condensation: Dibenzal acetone from benzaldehyde.
5. Friedel Craft's reaction
6. Preparation of p-amino azobenzene from aniline via diazoaminobenzene.
7. Preparation ofm-phenylene diamine from Nitrobenzene via m-dinitrobenzene and m- nitroaniline.
8. Preparation of benzidine from benzene involving benzidine rearrangement.

Quantitative Analysis:

9. Determination of the percentage of sulphur in the given organic compounds by Messenger's method.
10. Estimation of Glucose using Fehling's solution.
11. Determination of equivalent weight of the given carboxylic acid using Silver-salt method.
12. Determine percentage purity of the given carbonyl compound using hydroxylamine hydrochloride.
13. Determination of strength of known aniline solution by bromination using KBr-$KBrO_3$ mixture.

Extraction of Natural products:

14 Extration of caffeine from tea leaves.

15 Extraction of Eugenol from Cloves Oil

***MSDS -Compilation of MSDS of chemicals used by students in each experiment is compulsory**

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, A: Attendance, V – Viva.

Suggested Readings:

- Jeffery, G.H.; Bassett, J.; Mendham, J.; Denney, R.C. *Vogel's Textbook of Quantitative Chemical Analysis*, Longman Scientific & Technical, 5th Edition (1989) ISBN 0-582-44693-7.
- Singh, J.; Singh, R. K. P.; Singh, J.; Yadav, L. D. S.; Siddiqui, I. R.; Srivastava, J. *Advanced Practical Chemistry*, Pragati Prakashan, 9th Edition (2019) ISBN: 978-93-88925-70-9.
- Ahluwalia, V. K., Aggarwal, R. *Comprehensive Practical Organic Chemistry*, Universities Press (2001) ISBN 8173712735.
- Pandey, O.P.; Bajpai, D. N.; Giri, S. *Practical Chemistry*, S. Chand & Co. Ltd., (2010) ISBN 9788121908122.
- Mann, F. G.; Saunders, B. C. *Practical Organic Chemistry*, Pearson Education, India, 4th edition (2009) ISBN 978-8131727102.
- Pandey, O.P.; Bajpai, D. N.; Giri, S. *Practical Chemistry*, S. Chand & Co. Ltd., (2010) ISBN 9788121908122.

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CHEMINFORMATICS & BIOINFORMATICS LAB

Course Code: CHY4112 **Credit Units: 01**

Minimum 10 Experiments to be performed

1. Representation of chemical structures through various tools
2. Homology modeling
3. *Abintio* modeling
4. Validation of structures
5. Visualization of PDB file
6. Protein Sequence alignment
7. Genome database retrieval
8. Molecular docking and Simulation

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, A-Attendance, V – Viva.

Suggested Readings:

- M. Karthikeyan and Renu Vyas, *Practical Cheminformatics*, Springer (2014) ISBN: 8132217802

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RESEARCH SEMINAR

Course Code: CHY4108 **Credit Units: 01**

Objectives

A seminar is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning for research based activity. Prereq., graduate standing in chemistry/ biochemistry/ Forensic Sciences on consent of instructor. Seminar to acquaint new graduate students with departmental research (This one will be running through out first semesters on every Monday any Lecture, where normally Ph.D students /internal Faculties /external speakers will give talk on their research or other topic of their specialization).

The trainer has to make sure that the aspect covered is practically practiced by the participants. The evaluation will be done by Board of examiners comprising of the faculties.

Major Themes for Seminar

The seminar may be conducted on any of the following major themes:

- Nuclear Chemistry
- Modern trend in Inorganic Chemistry
- Modern trend in Organic Chemistry
- Modern trend in Physical Chemistry
- Nanotechnology and its application
- Polymer Chemistry
- Pharmaceuticals
- Food Technology
- Agriculture Chemistry
- Computational Chemistry
- Green Chemistry
- Any other relevant topics

These themes are merely indicative and other recent and relevant topics of study may be included.

Evaluation Scheme:

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total
10	30	30	30	100

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ANALYTICAL CHEMISTRY

Course Code: CHY4201 **Credit Units: 03**

Course Contents:

MODULE I: WET CHEMICAL METHODS OF ANALYSIS

Volumetric analysis –neutralization, precipitation, complexometric and redox titrations- theoretical titrations curves - theory of indicators; Gravimetric analysis, volatilization and precipitation methods-homogeneous precipitation; Colorimetric analysis - principles and applications- estimation of iron and nickel.

MODULE II: ELECTROANALYTICAL TECHNIQUES

Conductometry, and high frequency titrations; Potentiometry, pH-metry, Ion selective electrodes; Electrogravimetry and coulometry; Voltammetry –polarography, amperometric titrations and anodic stripping voltammetry; principles, practice and applications.

MODULE III: SEPARATION TECHNIQUES

Solvent extraction and Ion exchange techniques – principles and applications; Chromatographic techniques – adsorption chromatography, thin layer chromatography, gas chromatography, high performance chromatography, size exclusion chromatography; Supercritical fluid chromatography.

MODULE IV: RESEARCH BASED ANALYTICAL TECHNIQUE

Preparations of solutions of different strength and scales (molarity, molality, normality, formality, w/w, v/v ratio calculation exercises) buffers, gel apparatuses, native and SDS -PAGE gels, Isoelectric point

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

- D.A.Skoog, D.M.West, F.J. Holler and S.R.Crouch, " Fundamentals of Analytical Chemistry", 8th Edn., - Thomson Brooks/Cole Pub. (2005).
- J.Mendham, R.C.Denney, J.D. Barnes and M.J.K.Thomas, " Vogel's Text book of quantitative chemical analysis", 6th Edn., Pearson Education (2008).
- F.W. Fifield and D.Kealey, " Principles and Practice of Analytical Chemistry, 1st Indian Reprint, Blackwell Pub. (2004).
- H.H Willard, L.L Merritt, J.A Dean, and F.A Settle, " Instrumental Methods of Analysis", 7th Edn., - CBS Pub (2004).
- G. D.Christian, "Analytical Chemistry", 6th Edn., John Wiley Press (2006).
- K.A. Rubison and J,F. Rubison, " Contemporary Instrumental Analysis, Printice Hall, Inc. (2000).
- A.K.Srivastva& P.C. Jain," Instrument approach to chemical analysis" 4th edition,S.Chand & Company(2012)
- C.L.Wilson and D.W.Wilson, "Comprehensive Analytical Chemistry", Dan van Nostrand 9. J.G.Dick, "Analytical Chemistry, McGraw Hill

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INDUSTRIAL CHEMISTRY

Course Code: CHY4202 **Credit Units: 03**

Course Objective:
This course is intended to give the students the knowledge of various aspects of industrial chemistry with the focus on preparation of different types of glass, cement, soaps and detergent. A student taking up this course should be able to understand the logic and chemistry behind the different types of catalytic process and catalyst.

Course Contents:

MODULE I: GLASS INDUSTRY
Introduction, classification of glass, basic raw materials of glass, manufacturing processes including chemical reactions, some special glasses: optical glass, coloured glass, fibre glass, laminate glass, safety glass, photosensitive glass, photochromatic glass, lead glass, borosilicate glass and glass wool.

MODULE II: CEMENT INDUSTRY
Types of cement, manufacture of Portland cement, composition, setting and hardening of cement, Mortars and concrete, gypsum, plaster of paris, estimation of silica, alumina, calcium oxide and sulphates in Portland cement.

MODULE III: SOAPS AND SYNTHETIC DETERGENTS
Manufacture of detergent, types of detergents, anionic, cationic, nonionic and amphoteric detergents, manufacture of soap, Liquid soap**.**

MODULE IV: HOMOGENEOUS AND HETEROGENEOUS CATALYSIS and CATALYTIC PROCESSES
Conversion, selectivity, contact time, time on stream, Kinetics of heterogeneous catalysis, adsoprtion, phase transfer catalysis, super acid catalysis, intramolecular catalysis, enzyme catalysis, semi-conductor catalysis and photocatalysis. Promoters, stabilizers, catalyst deactivation by poisoning, fouling and sintering, Cracking, reforming, alkylation, isomerization, hydrogenation/dehydrogenation, dehydrocyclisation, dehydrosulphurization, hydrocracking, oxidation, metathesis, carbonylation, polymerization, synthetic fuels, hydrogen generation.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

- Jens Hagen,Industrial catalysis, 2nd Edition, Wiley-VCH Verlay Gambh & Co,.(2006).
- Herman Pines, The chemistry of catalytic hydrocarbon conversions, Academic Press, New York (1981).
- R. Pearce and W.R.Patterson, Catalysis and chemical processes, Leonard Hill, London (1981).
- Charles, N. Satterfield, Heterogeneous catalysis in industrial practice, 2nd Edn. Mc.Graw Hill, International Edition, Singapore (1993).
- Catalytic Chemistry, Bruce-gates, John Wiley & Sons
- Organic Chemistry Vol.2 IL Finar 5th Edn. Longmans 1975

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- Dryden's outlines of Chemical Technlolgy 2nd Edn., edited and revised by M.Gopala Rao, Marshel sitting – EastWest Press, 1973.
- Chemical Process Industries 3 Edn., R Norries Shreve, Mc Graw Hill 1967.
- Chemistry of Engg Materials by CV Agarwal.
- Applied Chemsitry for Engineer's by Diamont
- Industrial Chemistry by BK Sharma, Goel Publishing house Meerut.

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ORGANOMETALLIC CHEMISTRY

Course Code: CHY4211 **Credit Units:04**

Course Objective:
The main idea of this course is to give students a brief idea about Bioinorganic chemistry that examines the role of metals in biology. It includes the study of both natural phenomena such as the behaviour of metalloproteins as well artificially introduced metals, including those that are non-essential, in medicine and toxicology. Many biological processes such as respiration depend upon molecules that fall within the realm of inorganic chemistry. The discipline also includes the study of inorganic models or mimics that imitate the behaviour of metalloproteins. It also covers organometallic chemistry which is the study of chemical compounds containing bonds between carbon and a metal. Since many compounds without such bonds are chemically similar, an alternative may be compounds containing metal-element bonds of a largely covalent character. Organometallic chemistry combines aspects of inorganic chemistry and organic chemistry.

Course Content:
MODULE I: ROLE OF METAL IONS IN BIOLOGICAL SYSTEM
Elements of life: essential major, trace and ultratrace elements. Basic chemical reactions in the biological systems and the role of metal ions (specially Na^+, K^+, Mg^{2+}, Ca^{2+}, Fe^{3+}/2+, Cu2+/+, and Zn2+).Metal ion transport across biological membrane Na^+/K^+ion pump, ionophores. Toxic metal ions and their effects, chelation therapy (examples only), Pt and Au complexes as drugs (examples only), metal dependent diseases.

Module-II: Biological functions of haemoglobin, myoglobin and hemocynin, cytochromes and ferredoxins, carbonate bicarbonate buffering system and carbonicanhydrase. Biological nitrogen fixation, Photosynthesis: (Photosystem-I and Photosystem-II), chlorophyll and related elementary ideas

MODULE III: METALLOCENE
Metallocenes, Structure and synthesis of cyclopentadienyl complexes, Covalent vs Ionic bonding in metallocenes, Arene complexes

MODULE IV: REACTIONS IN ORGANOMETALLIC CHEMISTRY
Substitution reactions in carbonyl complexes, Oxidative addition and reductive elimination, Insertion and elimination, Nucleophilic and electrophillic attack of coordinated ligands, Synthesis of ferrocenes derivatives, carbonylate anion as nucleophile. Introduction to carbenes, types of carbenes (Fischer type and Schrock type carbene complexes, synthesis, structure, bonding and reactions of carbenes.

MODULE V: APPLICATIONS OF ORGANOMETALLICS IN CATALYSIS
(b) In Catalysis: Asymmetric hydrogenation; synthesis of acetic acid (Monsanto) Cativa process; Arylation/vinylation of olefins (Heck reaction); Wacker process (olefin oxidation); Asymmetric epoxidation.

MODULE- VI: METAL π-COMPLEXES
Metal carbonyl, structure and bonding, 18 elctron rule, vibrational spectra of metal carbonyls for bonding and structural elucidation, important reactions of metal carbonyls; preparation, bonding structure and important reaction of transition metal nitrosyl, dinitrogen and dioxgen complexes; tertiary phosphine as ligand.

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Examination Scheme:

Components	CT	HA	S/V/Q	A	EE
Weightage(%)	15	5	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, A: Attendance EE: End Semester Examination

Suggested Readings:

- C. Elschenbroich. Organometallics (3rd edn.), Wiley-VCH Publication (2006).
- C. Elschenbroich & A. Salzer.Organometallics – A Concise Introduction (2nd edn.),VCH Publication (1992).
- F. Mathey & A. Sevin.Molecular Chemistry of the Transition Elements, John Wiley (1996).
- F. A. Cotton & G. Wilkinson.Advanced Inorganic Chemistry (5th edn.), John Wiley (1988).
- R. C. Mehrotra & A. Singh. Organometallic Chemistry: A Unified Approach (2nd edn.), New Age International (2000).
- Yamamoto, Organo Transition Metal Chemistry,

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INTRODUCTION TO LABORATORY SAFETY

Course Code: CHY4212 **Credit Units: 01**

Course Objective :

The basic goal of this course is to make sure students know about potential work hazards, how to recognize them, and how to protect themselves. This course is designed to help reduce possible accidents arising out of negligence. This introductory course in laboratory chemical safety is required for all entering chemistry graduate students. Topics to be covered include laboratory emergencies, chemical hazards, lab inspections and compliance, managing and working with chemicals, waste handling, case studies of university accidents.

Course Contents:

MODULE I: INTRODUCTION TO LABORATORY SAFETY

Risks in a Research Laboratory, Health Effects Due to "Hazardous" Chemical Exposure (How Does One Determine the Hazards Associated with Specific Chemicals, Exposure Routes, Toxicity Risk Assessment), Personal Protective Equipment (PPE) Proper Attire (Eye/Face Protection, Lab Coats, Gloves, Respirators, Disposal/Removal of PPE), Emergency Equipment Safety Showers/Eye Washes, Key Campus and Department Chemical Safety Contacts, Case Study: Dartmouth Chemical Poisoning (Key Lessons learnt).

MODULE II: LABORATORY EMERGENCIES: SPILLS AND FIRES

Handling the Accidental Release of Hazardous Materials, Notifications, Spill Containment and Clean-up, Leaking Gas Cylinders, Fires Classification, Fire Extinguishers (how they work, types), Risk Assessment, Flammable Hazards, Flammability Characteristics, Flammability Classes, Causes of Ignition, Reactive Hazards, Explosives, Case Study: University of Texas Austin Sodium Fire (Key Lessons learnt).

MODULE III: CHEMICAL HAZARDS

Chemical Hygiene Plan, The New Safety Data Sheets (SDS) versus the Old Material Safety Data Sheets (MSDS), Assessment of Chemical Toxicity, Toxic Hazards (Dose, Risk Assessment, Types of Toxins, Working with Highly Toxic Compounds (General Considerations, Planning, Precautions for Minimizing Exposure – Handling, In the Event of a Spill), General Considerations (Chemical Segregation, Transfer and Transport, Chemical Fume Hoods (Safety, Types, Operation), Other Types of Ventilation) Case Study: University of Wisconsin – $LiAlH_4$ Explosion (Key Lessons learnt).

MODULE IV: MANAGING AND WORKING WITH CHEMICALS

Working with Flammable Substances (Standard Operating Procedures), Working with Highly Reactive or Explosive Substances, Working with Compressed Gases (Parts of the Cylinder, Cylinder Pressure Regulator, Storage Guidelines, Transporting Cylinders, Handling Compressed Gas Cylinders) Working with Cryogenics (Health Hazards, Liquid N_2),Waste Handling. Characterization of Waste. Collection and Storage (Lids, Leaks, Labels, Location, Containers), Consequences of Mixing Incompatibles, Solid Wastes (Chemicals, Broken Glass, Sharps, Cylinders). Waste Handling, Characterization of Waste, Collection and Storage (Lids, Leaks, Labels, Location, Containers), Consequences of Mixing Incompatibles

Solid Wastes (Chemicals, Broken Glass, Sharps, Cylinders, Pick-up), Special Cases, Hazardous Waste Minimization, Case Study: the "UCLA Incident".

MODULE V: WORKING ON LABORATORY EQUIPMENTS

Working with Water (liquid)-dependent Equipment (Hazards, Proper Use, Heating Baths), Working with High Pressure Vacuum Pumps, Working with Stirring and Mixing Devices, Working with Heating Devices (Variacs, Oil, Salt, Sand Baths, Microwave Ovens), Ultrasonicators, Centrifuges and HPLCs. Laser classifications, Effects of lasers on skin and eyes, Protective eyewear, Enclosing laser beams, Examples of common mistakes and ways to avoid them, Non-beam

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hazards, Risk Assessment: when is it okay to violate specific safety rules? The importance of understanding, how things work, Case Study: Laboratory Equipment.

MODULE VI: BIOSAFETY, RADIATION, AND ANIMALS

Chemicals such as acrylamide & ethidium bromide, Pathogens, Biological waste handling, Recombinant DNA, Mammalian cell culture, Case Study.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

- CRC Handbook of lab safety, 4th Edition, A. K. Furr
- Laboratory Safety for Chemistry Students, 2nd Edition, David C. Finster and Robert H. Hill, Jr.
- Complete Guide to Laboratory Safety, 4th Edition, Dan Scungio and Terry Jo Gile

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SPECTROSCOPY

Course Code: CHY4213 **Credit Units: 03**

Course Objective:
The course is designed to give students the basis of organic compound charachterization. The student will be able to analyse and interpret spectroscopic data collected by the methods discussed in the course. They will be able to solve problems related to the structure, purity and concentration of chemicals and to study molecular interactions by choosing suitable spectroscopic methods and interpreting corresponding data.

Course Contents:
MODULE I: Ultra-violet and Visible Spectroscopy:
Principles of electronic spectroscopy, Absorption Law's, Type of electronic transitions, Effect of solvent on electronic transitions, Chromophores &Auxochromes, Ultraviolet bands of carbonyl compounds, unsaturated carbonyl compounds, dienes, conjugated polyenes. Fieser-Woodward rules for conjugated dienes and carbonyl compounds. Qualitative applications of UV-Vis spectroscopy.

MODULE II: INFRARED SPECTROSCOPY
Principle of IR spectroscopy, Modes of vibrations, Hook's law and calculation of frequency for different bonds. Fundamental vibrations and selection rule. Characteristic vibrational frequencies of common organic compounds. Effect of hydrogen bonding and solvent effect on vibrational frequencies, overtones, combination bands and Fermi resonance. Fingerprint region. Introduction to Raman spectroscopy. Applications of IR and Raman Spectroscopy in organic chemistry.

MODULE III: Nuclear Magnetic Resonance (NMR) Spectroscopy:
General introduction, chemical shift and factors effecting it, spin-spin coupling, shielding – deshielding mechanism, chemical and magnetic equivalence or non-equivalance chemical shift values and correlation of protons present in different groups in organic compounds. Proton exchange (proton on N, O and S atom), Karplus-relationship of coupling constant with dihedral angle. Simplification of complex spectra-by double resonance, contact shift reagents, D_2O shake. Nuclear Overhauser Effect (NOE). Determination of impurity by NMR, Principle and introduction to C-13 NMR, F-19, P-31, DEPT and 2-D NMR, Strcutrue determination by NMR.

MODULE IV: MASS SPECTROMETRY
Introduction, ion production—Electron ionization (EI), Chemical Ionization (CI), Fast atom bombardment (FAB) and Matrix Assisted Laser Desorption Ionization (MALDI), factors affecting fragmentation, ion analysis, and ion abundance. Mass spectral fragmentation of organic compounds, common functional groups, Molecular ion peak, Base peak, Isotopic peaks, Meta-stable peak, McLafferty rearrangement, ortho effect, Determination of molecular weight and molecular formula: Nitrogen Rule, hydrogen deficiency index. Introduction to GCMS, LCMS and HRMS. Combined structural elucidation problems based on IR, UV, NMR and mass spectral data.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

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Suggested Readings:

- Subramanian, P.S.; Gopalan, R.; Rangarajan, K. *Elements of Analytical Chemistry*, Sultan Chand and Sons, New Delhi (2004) ISBN 978-8180547652.
- Khopkar, S. M. *Basic Concepts of Analytical Chemistry*, New Age International Pvt. Ltd. Publishers (2008) ISBN 978-8122420920.
- Chatwal, G.R.; Anand, S. *Instrumental Methods of Chemical Analysis*, Himalaya Publishing House (2011) ISBN 978-9350248362.
- Usharani, S. *Analytical Chemistry*, Macmillan India Limited (2008) ISBN 9780333933893.
- Willard, H. H.; Merritt, Jr, L. L.; Dean, J A; Settle, Jr, F. A. *Instrumental Methods of Analysis*, Saunders College Publication 7th Edition (1988).
- Janarthanam, P.B. *Physicochemical Techniques of Analysis Vol I & II*, Asia Publishing House (1973) ISBN 978-0210225301.
- Instrumental Methods of Chemical Analysis, Krishna Prakashan Media p Ltd; 1/e Edition (2011) ISBN 978-8182830998.
- Kalsi, P. S. *Spectroscopy of Organic Compounds*, New Age International Publishers, 8th Edition, 2020, ISBN 978-81-943696-8-4.

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ANALYTICAL CHEMISTRY LAB

Course Code: CHY4206 **Credit Units: 02**

Minimum 10 Experiments to be performed

Chromatography

1. Estimation of zinc and magnesium in the given mixture solution against EDTA (Disodium salt) solution
2. Thin-layer chromatography-separation of nickel, manganeses, cobalt and zinc.
3. Separation and identification of the sugars present in the given mixture of glucose, fructose and sucrose by paper chromatography and determination of Rf values.
4. Separation of artificial colorants in confectionary using TLC.
5. Extraction and Determination of caffeine from tea leaves

Colorimetry

6. To verify Beer-Lambert's Law for potassium permanganate solution and hence to determine the molar extinction coefficient and unknown concentration of given sample colorimetrically
7. To verify the Beer-Lamberts Law and determine the concentration of given dye solution colorimetrically.
8. To estimate the amount of D-glucose in given solution colorimetrically.

Quantitative Analysis

9. Estimation of amines/phenols using bromate bromide solution/or acetylation method.
10. Determination of lodine and Saponification values of an oil sample.
11. To determine the acid value of given oil
12. Determination of protein content of wheat flour.

***MSDS -Compilation of MSDS of chemicals used by students in each experiment is compulsory**

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, A: Attendance, V – Viva.

Suggested Readings:

- Wilson L. and Wilson D.W., Comprehensive Analytical Chemistry, New York: Elsevier, 1959 (1990) ISBN: 0444417354.
- Dick J.G., Analytical Chemistry, McGraw Hill (1973) ISBN 13: 9780882755809
- Jeffery, G.H.; Bassett, J.; Mendham, J.; Denney, R.C. Vogel's Textbook of Quantitative Chemical Analysis, Longman Scientific & Technical, 5th Edition (1989) ISBN 0-582-44693-

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INDUSTRIAL CHEMISTRY LAB

Course Code: CHY4207 **Credit Units: 01**

Minimum 10 Experiments to be performed

Analysis of Cement

1. Determination of silica content from given sample

Analysis of polymers

2. Determination of Acid Values of plastic material.
3. Determination of Saponification value of plastic material.
4. Determination Iodine value of a plastic material.
5. Determination of hydroxyl Value of plastic material.
6. Determination of Carbonyl Value of plastic material.
7. Determination of Molecular Weight of a polymer.
8. Determination of Capacity of cation exchange resin.
9. Determination Capacity of an anion exchange resin.
10. Determination of glass transition temperature of plastic.

Preparation of polymers

11. Preparation of Urea Formaldehyde resin and Phenol Formaldehyde resin.
12. To synthesize and hydrolyse Nylon 6:6/polyacrylic acid/polyaminde

Water Analysis

13. Determination ofTotal dissolved solids
14. Determination ofCarbonate and non-carbonate hardness by EDTA
15. Determination ofDissolved oxygen, BOD, COD
16. Determination ofTurbidity

Preparation of Dyes (methyl orange, bismark brown**)**
Preparation of Cosmetics (shampoo, lipstick, detergent**)**
Preparation of Drugs(Paracetamol and Aspirin)

***MSDS -Compilation of MSDS of chemicals used by students in each experiment is compulsory**
Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, A: Attendance,V – Viva.

Suggested Readings:

- A Textbook of quantitative chemical analysis, VIth Edition Vogel, Pearson Education Limited.
- Practical Organic Chemistry, Mann and Saunders, IV Edition, ELBS and Longman Publication
- Comprehensive Experimental Chemistry, V. K. Ahluwalia, New Age Publication, Delhi
- Practical Manual of Organic Chemistry, R. K. Bansal
- A Textbook of quantitative inorganic analysis including elementary instrumental analysis, IVth Edition Vogel, ELBS and Longman Publication
- Advanced Practical Inorganic Chemistry, Gurdeep Raj, Goel Publishing House, Meeru

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TERM PAPER

Course Code: CHY4231 **Credit Units: 01**

Objectives

The objective of this course is to judge the understanding as well as application of the knowledge gained by the students. The aim of the term paper is to provide the students with an opportunity to further enhance their knowledge in a sector of their choice by undertaking a significant practical unit of examining and analyzing various aspects of Chemistry & its application at a level commensurate with the learning outcomes of the various courses taken up them in the ongoing semester.

A term paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned.

Guidelines:

1. The term paper will be related to the contemporary research issue and the topic will be given by the department.

2. The presentation of the term paper is scheduled to be held before the commencement of Semester examinations.

3. The paper will carry 100 marks that will be marked on the basis of understanding and organization of content based on the literature review. The Bibliography shall form an important part of the paper.

4. Examples of a few broad areas for term paper (List is indicative, not exhaustive)

- Inorganic chemistry
- Organic chemistry
- Physical chemistry
- Green chemistry
- Agricultre chemistry

Evaluation Scheme

Organisation and relevance of content	Literature Review	Bibliography	Presentation	Total
30	30	20	20	100

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NATURAL PRODUCTS AND HETEROCYCLIC CHEMISTRY

Course Code: CHY4325 **Credit Units: 03**

Course objective: The course provides an understanding of important natural products. Using selected examples, this course describes the process of identification and isolation of natural products from natural sources, their chemical synthesis and structure elucidation. The course gives a broad introduction to heterocyclic chemistry. Emphasis is given on the most important heterocyclic systems, such as coumarines, indoles, pyrimidines, imidazoles, aziridines and oxiranes etc. For each group, ring synthesis, chemical properties and characteristic reactions will be discussed.

Course Contents:

MODULE I: TERPENOIDS AND CAROTENOIDS

Classification, nomenclature, occurrence, isolation, general methods of structure determination, isoprene rule. Structure determination, stereochemistry and synthesis of the following representative molecules: Citral, α-Terpeneoland β-Carotene

MODULE II: ALKALOIDS

Definition, nomenclature and physiological action, occurrence, isolation, general methods of structure elucidation, degradatin, classification based on nitrogen heterocyclic ring, role of alkaloids in plants. Structure, stereochemistry and synthesis of the following: Coniine, Nicotine, Atropine, and Quinine.

MODULE III: HETEROCYCLIC - I

Introduction, classification, nomenclature of three, four, five and six-membered rings. Methods of synthesis and chemical reactions of aziridines, oxiranes, thiiranes, azetidines, oxetanes. Methods of Synthesis and chemical reactions with emphasis on the mechanism of electrophilic substitutionof pyrrol, thiophene and furan. Synthesis and reactions of pyridine with emphasis on nucleophilic substitution reactions.

MODULE IV: HETEROCYCLIC – II

Introduction to condensed five and six membered heterocycles; preparation and reactions of indole, quinoline and isoquinoline with special reference to Fischer-indole synthesis, Skraup synthesis and BischierNapieralski synthesis. Synthesis and chemical reactions of five membered ring with two heteroatoms; pyrazole, imidazole, oxazole, thiazole, isothiazole, and benzofused analogue like coumarins, thiocoumarins, phenazine, phenothiazines, 1,4 and 1,5-benzodiazepines.

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

- Heterocyclic Chemistry, Vol 1-3, A. A. Gupta. M. Kumar and V. Gupta, 35 Springer Verlag
- The Chemistry of Heterocycles, T. Eicher and S. Hauptmann, Thieme
- Heterocyclic Chemistry, J. A. Joule, K. Mills and G.F. Smith, Chapman and Hall
- Heterocyclic Chemistry,T.LGilchrist,LongmanScietificTechinal
- Contemporary Heterocyclic Chemistry, G. A. Newkome and W. W. Paudler, Wiley-Inter Science
- Organic Chemistry, Vol 2, I. L. Finar, ELBS
- Natural Products- Chemistry and Biological Significance, J. Mann, R.S. Davidson, J. B.
- Hobbs, D.V. Banthrope and J. B. Harborne, Longman, Essex.

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DRUGS AND DYES

Course Code: CHY4304 **Credit Units: 04**

Course Objective: At the end of this course students must acquire a good knowledge about the various drugs their active constituents, their pharmacological actions and therapeutic uses. Beside drugs they will learn about various dyes used in day to day life, their properties and applications.

Course Content:

MODULE I: INTRODUCTION TO DRUGS

Definition of drug (WHO), classification of drugs, nomenclature of drugs, stereochemical aspects of drugs, definitions of terms commonly used in the chemistry of drugs, routes of drug administration and different dosage forms and applications

MODULE II: MECHANISM OF ACTION, STRUCTURE AND SYNTHESIS OF DRUGS

Sulphonamides : Sulphathiazole, Sulphadiazine(any two)
Antiseptics : Iodoform, Dettol
Antileprotic drugs : Dapsone (DDS), Acedapsone (DADDS)
Anticancer agents : Alkylating agents
CardiovascularDrugs : Amyl nitrate, Methyldopa
Antipyretics&Analgesics: Novalgin, Paracetamol
Antimalarials :Chloroquine ,Primaquine,Mepacrine
Anti diabetic : Tolbutamide
Antitubercular : p-amino salicylic acid, Ethambutol

MODULE III: INTRODUCTION TO DYES

Historical development of synthetic Dyes - Introduction, Nomenclature, classification based on structure & mode of applications of fibres.Structural features of a dye (chromophores and auxochromes), bathochromic and hypsochromic effects, diazotisation and coupling, colour and chemical constitution (Witt's theory, Armstrong theory and Modern theory). Dye intermediates- unit, batch & continuous process in the preparation of dye intermediates,

MODULE IV: STRUCTURE AND PREPARATION OF DYES

Nitro Dyes : Picric acid, Martius yellow, Naphthol yellow S
Nitroso Dyes : Fast green O, Naphthol green Y
Azo Dyes : Methyl orange, Methyl red, Congo Red
Phthaleins : Phenolphthalein
Phthalocyanines: Copper phthalocyanine
Xanthenes : Fluorescein, Eosin, Mercurochrome
Rhodamines : Rhodamine B
Thiazine Dyes : Methylene blue
Cyanine Dyes : Quinoline blue
Antraquinone Dyes: Alizarin
Indigoids : Indigo (Indigotin)
Thioindigos : Thioindigo
Azine Dyes : Safranine T

Action of light on dyes and dyed fibres, Factors affecting fastness of dyed fibres General consideration, fluorescence, phototropy, mechanism of fading.

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Examination Scheme:

Components	CT	HA	S/V/Q	A	EE
Weightage(%)	15	5	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, A: Attendance EE: End Semester Examination

Books Suggetsed:

- The Organic Chemistry of Drug Synthesis, Vol. 1,2,3,4 by Lednicer Daniel, 1st edition, John Wiley & Sons INC.
- Exploring QSAR Vol; I Fundamentals and Applications in Chemistry and Biology by CHansh and A Leo Vol. II: hydrophobic, Electronic and Steric Constants by C Hansh, A Leoand D Hockman ACS Book Catalog.
- Foye' s Principles of Medicinal Chemistry by Foye, 6th edition, Lippincott William Wilkins.
- Comprehensive Medicinal Chemistry by Hansh C, Vol IV, Elsevier Pergamon.
- Quantitative Drug Design- A Critical Introduction by Martin YC, Marcel Dekker Inc. NewYork.
- Medicinal Chemistry-A Biochemical Approach by Nogrady T, Oxford University Press NewYork, Oxford.
- Computer Aided Drug Design, by Pops and Perruns, Academic Press, NY
- Burger' s Medicinal Chemistry by Wolff ME, John Wiley & Sons, New York.
- Introduction to Medicinal Chemistry' – How Drugs Act and Why by Alex Gringauz, Willey-VCH Publication 1997.
- Drug Design by Bothara KG &Kulkarni VM, 3rd edition, NiraliPrakashan.
- An Introduction to Drug Design by SN Pandeya& IR Dimmock, 1st edition, New AgeInternational Publishers.
- Structure based Drug Design by Veerapandian, 1st edition, Taylor & Francis New York,London.
- Holtje. Sippl.,Rognan and Folkers, Molecular Modeling.
- P.K. Larsen, Tommy and U.Madsen, textbook of Drug Design and Discovery.

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ADVANCED NATURAL PRODUCTS CHEMISTRY

Course Code: CHY4305 **Credit Units:03**

Course Objective: The main idea of this course is the give the students details of natural product chemistry, which includes the study of Vitamins, alkaloids, terpenes and steroids etc. These plays a key role in our day to day life. The course covers the importance of these naturally occurring materials and their applications in chemistry, biology and medicine. The course will alos includes the invited lectures on recent advances in natural product chemistry and it gives a reasonable good overview of the naturally occurring chemicals and their important reactions, their applications etc.

Course Content:

MODULE I: NATURAL PRODUCTS AND THEIR BIOSYNTHETIC PATHWAYS

General classification of natural products, their isolation and characterisation and biosynthesis of common plant products; Biosynthesis pathways for natural products using co-enzymes and enzymes; Synthesis of selected natural products based on genetic classification – fatty acid derivatives and related compounds, general biogenesis and synthesis of cis jasmone, methyl jasmonate, prostaglandins, exaltone and muscone.

MODULE II: VITAMINS

Vitamins: Classification, occurrence, chemistry of Vitamins A, C and E, structure elucidation and synthesis, deficiency syndromes,

MODULE III: ALKALOIDS

Alkaloids, defination, Isolation, Classification (define different categories of alkaloids with specific examples, their medicinal uses, synthesis).Drugs (cocaine, opiates, quinine, vincristine, curare, mescaline, etc.) and toxins (nicotine, lupinines, strychnine, tetrodotoxin, etc.Introduction, 2. Simple Alkaloids I: Pyrrole Derivatives 3. Simple Alkaloids II: Piperidine Derivatives 4. Aromatic Alkaloids I: Simple Derivatives 5. Aromatic Alkaloids II: More Complex Derivatives 6. The Indole Alkaloids 7.Miscellaneous Alkaloids with Interesting Bioactivities.

MODULE IV: TERPENES AND STEROIDS

Classification and biosynthesis of mono- sesqui-, di- and triterpenoids and steroids.Acetyl CoA, Mevalonic acid, acetoacetyl CoA, squalene to lanosterol, Cholesterol to estradiol, diosgenin and its utility in hormone synthesis.

MODULE V: GENERAL CHEMISTRY OF THE FOLLOWING COMPOUNDS

Cholesterol, Artemisinin, Gibbereline A3, Azadirachtin.

Examination Scheme:

Components	CT	HA	S/V/Q	A	EE
Weightage(%)	15	5	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, A: Attendance EE: End Semester Examination

Suggested Readings:

- K. Nakanashi. Natural Products Chemistry, Vols. I and II, Academic Press, New York andLondon (1974).
- M. Harmata. Strategies and Tactics in Organic Synthesis 4 & 5, Academic Press (2004)
- T. L. Gilchrist. Heterocyclic Chemistry (2nd edn.), Longman Scientific & Technical Publicns.(1992).
- R. K. Bansal. Heterocyclic Chemistry: Synthesis, Reactions and Mechanisms, Wiley

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Eastern (1991).

ADVANCED NANOCHEMISTRY

Course Code: CHY4308 **Credit Units:03**

Course Objective: This course is intended to give the students' knowledge of advances in nanochemistry and introduction to ionic liquids. This course will help the student understand superplasticity and its industrial Applications. A knowledge of introductory level nanochemistry is required.

Course Content:

MODULE-I: SIZE EFFECTS ON STRUCTURE AND MORPHOLOGY OF NANOPARTICLES

Fundamental Properties - Size Effects on Structure and Morphology of Free or Supported Nanoparticles - Size and Confinement Effects - Fraction of Surface Atoms - Specific Surface Energy and Surface Stress - Effect on the Lattice Parameter - Effect on the Phonon Density of States - Nanoparticle Morphology - Equilibrium Shape of a Macroscopic Crystal - Equilibrium Shape of Nanometric Crystals - Morphology of Supported Particles.

MODULE-II: SUPERPLASITICITY AND REACTIVITY OF METAL NANOPARTICLE

Superplasticity – Introduction – Mechanism - Superplastic Nanostructured Materials - Industrial Applications. Reactivity of Metal Nanoparticles - Size Effects-Structural Properties - Electronic Properties - Reactivity in Chemisorption and Catalysis of Monometallic Nanoparticles - Support Effects - Alloying Effects - Effect of Surface Segregation - Geometric Effects -Electronic Effects - Preparation and Implementation in the Laboratory and in Industry.

MODULE-III: SUPERCRITICAL FLUIDS

Supercritical Fluids –Introduction – Physicochemical Properties - Solubility - Viscosity - Diffusion - Thermal Conductivity - Applications - Purification and Extraction - Synthesis.

MODULE-IV: FEATURES OF NANOSCALE GROWTH

Specific Features of Nanoscale Growth – Introduction - Thermodynamics of Phase Transitions -Dynamics of Phase Transitions - Thermodynamics of Spinodal Decomposition - Thermodynamics of Nucleation – Growth - Size Control - Triggering the Phase Transition- Application to Solid Nanoparticles - Controlling Nucleation - Controlling Growth - Controlling Aggregation. Stability of Colloidal Dispersions - Breaking Matter into Pieces.

Examination Scheme:

Components	CT	HA	S/V/Q	A	EE
Weightage(%)	15	5	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, A: Attendance EE: End Semester Examination

Suggested Readings:

- C. Brechignac, P. Houdy, M. Lahmani, ―*Nanomaterials and Nanochemistry*‖, Springer publication (2007).
- Kenneth J. Klabunde, ―*Nanscale materials in chemistry*‖, Wiley Interscience Publications (2001).
- C. N. Rao, A. Muller, A. K. Cheetham ,―*Nanomaterials chemistry*‖, Wiley-VCH (2007).

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MEDICINAL CHEMISTRY

Course Code: CHY4310 **Credit Units: 03**

Course objective: This course is intended to provide students with chemical principles that are required to understand the action and behavior of drug compounds and hence the relationship between the structure and stereochemistry of a compound and its chemical and therapeutic properties, and thus the chemical considerations in drug design: size, physico-chemical properties and ADME (absorption, distribution, metabolism, and excretion).

Course Contents:

MODULE I: DRUG DEVELOPMENT

Drug development: Lead modification. (a) Identification of active part -Pharmacophore (b) Fundamental group modification (c) Structure-activity relationship (d) Structure modification to increase potency and therapeutic index (i) Homologation ii) Chain branching (iii) Ring chain transformations (iv) Bioisosterism. Drug development process: (a) Pre-formulation, product development (b) Preclinical studies; Acute toxicity, sub acute toxicity, chronic toxicity, LD_{50}, ED_{50}, pharmacodynamicsutagenecity and reproductive studies.

MODULE II: PHARMACOKINETICS

Basic principles of pharmacokinetics including absorption, distribution, metabolism and excretion of drugs and metabolites in the human body, important pharmacokinetic parameters in defining drug therapeutics, mathematical approach to pharmacokinetic modeling.

MODULE III: PHARMACODYNAMICS

Introduction, elementary treatment of enzyme stimulation, enzyme inhibition, sulphonamides, membrane active drugs, drug metabolism, biotransformation, significance of drug metabolism in medicinal chemistry. Therapeutic index, explanation of quantal dose, graded dose, dose-effect curves, efficacy, potency, margin of safety

MODULE IV: ANTIBIOTICS

Definition, characteristics, classification, synthesis and therapeutic uses of Penicillin, Ampicillin, Amoxicillin, Chloramphenicol, Cephalosporin, Tetracycline and Streptomycin

Examination Scheme:

Components	CT	HA	S/V/Q	A	EE
Weightage(%)	15	5	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, A: Attendance EE: End Semester Examination

Suggested Readings:

- Principles of Medicinal Chemistry, W. C. Foye, Philadelphia, USA
- An introduction to Medicinal chemistry, G. L. Patrick, Oxford University Press
- Burger's Medicinal Chemistry and Drug Discovery, Vol. 1-5, John Wiley
- The Organic Chemistry of Drug Design and Drug Action, Richard B. Silvermann, Academic Press
- Medicinal Chemistry, Ashutosh kar, New Age International Ltd
- Essentials of Medical Pharmacology, K. D. Tripathi, Jaypee Brothers
- A textbook of medicinal chemistry, P. Primo, CBS Publishers & Distributors
- Text book of pharmaceutical organic chemistry, Md. Ali, CBS Publishers

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ENVIRONMENTAL CHEMISTRY

Course Code: CHY4321 **Credit Units: 03**

Course Objective: This course is intended to provide students with knowledge of key themes, theories and problems and describe important chemical reactions in the atmosphere and in water, including important chemistry in connection with air pollution, water pollution, and case studies of many environmental disasters.

Course Contents:

MODULE I: CHEMISTRY AND THE ENVIRONMENT

Chemistry and the environment - environmental pollution - causes - pollutants – air pollution - effects of air pollution: Environmental fate of pollutants – transformation process - bioconcentration - fate of air, water and soil pollutants

MODULE II: WATER POLLUTION

Water pollution - water quality parameters - turbidity, colour, pH, acidity, alkalinity, solids, hardness, chlorides, residual chlorine, sulphates, fluorides, phosphates, iron and manganese, DO, BOD, COD, nitrogen, grease, volatile acids, gas analysis.

MODULE III: INDUSTRIAL POLLUTION

Cement, sugar, distillery, drug, paper and pulp, thermal power plants, nuclear power plants, metallurgy. Polymers, drugs etc.

Environmental disasters – Cherbonyl, Three Mile Island, Seveso and minamata disasters, Japan tsunami

MODULE IV: BIOLOGICAL ACTIVITY

Biological activity - biodegradation of carbohydrates, proteins, fats and oil, detergents, pesticides; Metabolic fate of pollutants - adsorption – distribution -metabolism - excreation.

MODULE V: ENVIRONMENTAL TOXICOLOGY

Toxic heavy metals**:**Mercury, lead, arsenic and cadmium, Causes of toxicity. Bioaccumulation, sources of heavy metals, Chemical speciation of Hg, Pb, As, and Cd. Biochemical and damaging effects. Toxic Organic Compound**:**Pesticides, classification, properties and uses of organochlorine and ionospheres pesticides detection and damaging effects.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Suggested Readings:

- Environmental Chemistry, S.E. Mahan, Lewis Publishers.
- Environmental Chemistry, Sharma & Kaur, Krishna Publishers.
- Environmental Chemistry, A.K. De, Wiley Eastern
- Environmental Pollution Analysis, S.M. Khopkar, Wiley Eastern
- Standard Method of Chemical Analysis, F.J. Welcher Vol. III, Van Nostrand Reinhold Co.
- Environmental Toxicology, Ed. S. Landsberger and M. Creatchman, Gordon and
- Breach Science Publication.
- Enviromental Chemistry, C. Baird, W.H. Freeman.

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POLYMER TECHNOLOGY

Course Code: CHY4311 **Credit Units:03**

Course objective: This course is designed to familiarize students with the various polymer characterization and manufacturing techniques for converting polymer feed stocks into plastic end products. It involves a study of various plastics processing techniques. Students will become familiar with specialty polymers and their industrial uses, and design factors to create materials with desirable end-use properties

Course Contents:

MODULE I: POLYMER PROCESSING
Plastic Technology: Extrusion, injection molding, blow molding, compression molding, thermoforming, rotational molding, casting.Fiber Technology- Textile and fabric properties, spinning, fiber after-treatments.Elastomer Technology- Vulcanization, reinforcement, elastomer properties and compounding.Recycling of polymers Classification of polymer recycling processes. Waste polymer recovery, sortation, microsortation, polymer reprocessingand Polymer incineration

MODULE II: POLYMER BLENDS AND ALLOYS
Definition, Polymer Blends, compatibilisation, Polymer Blends, Industrial applications of polymer blends.

MODULE III: SPECIALTY POLYMERS
Liquid Crystal Polymers (LCP): Smectic, nematic, cholestric crystals, thermotropic main chain LCP, side chain LCP, chiral nematic LCP, properties of commercial LCP's. Electroactive polymers: Filled polymers, conducting polymers- doping, conducting mechanism, EMI shielding, applications- rechargeable batteries, sensors, photoconductive polymers. Ionic Polymers: Ionic crosslinking, ion exchange, hydrophilicity, ionomers, polyelectrolytes, applications, Synthetic Polymeric membranes- membrane preparation, membrane modules, applications, High temperature and fire resistant polymers, Hydrogels, smart polymers, Dendritic polymers- their applications.Biomedical polymers: Contact Lens, Dental Polymers, Artificial heart, Kidney and skin cells Biobased polymers: PLA, PCL

Examination Scheme:

Components	CT	HA	S/V/Q	A	EE
Weightage(%)	15	5	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, A: Attendance EE: End Semester Examination

Suggested Readings:

- Principles of Polymerization by G. Odian, (Wiley Interscience, New Delhi)
- Polymer Science by Gowarikar
- Thermal Characterization of Polymeric Materials- E. Turi (Academic Press)
- Polymer Characterization- Physical Techniques by D. Campbell and J.R.White (Chapman and Hall)
- Text Book of Polymer Science, F.W.Billmeyer (Willey Eastern)
- Applied Rheology in Polymer Processing by B. R. Gupta, (Asian Books, Pvt. Ltd. New Delhi)
- Polymer Blends and Alloys by R.P. Singh, C.K. Das and S. K. Mustafi, (Asian Books Pvt. Ltd.)
- Principles of Polymer Science by Bahadur and Shastry
- Plastics Technology Handbook by Manas Chanda and S.K.Roy (4th Edition, CRC Press, New York)
- Analysis of polymers- an introduction, by Crompton T.R., pergaman press 1989.
- Thermal characterization of polymeric materials, by Turi E.A., Academic press Inc.

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NON–CONVENTIONAL ENERGY SOURCES

Course Code: CHY4312 **Credit Units:03**

Course Objective: A detailed exposition of the course for the student, opting for Applied Chemistry is so vitally important for a clear understanding of recent intricate theories of non-conventional sources of energy.

Course Contents:

MODULE I: SOLAR ENERGY
Heat Transfer in Renewable Energy Systems - conduction, convection and radiation, Heat transfer and engineering concepts to the renewable energy systems, Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, Spectral distribution, the solar constant, radiation on titled surface/earth, instruments for measuring solar radiation. Application of solar energy and solar photovoltaic system

MODULE II: BIO-GAS
Raw materials, Properties/characteristics of bio gas, Principles of Bio-Conversion; Photosynthesis, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion, Transportation of bio gas, bio gas plant technology & status, Biomass cogeneration Energy recovery from urban waste, Power generation from liquid waste, Bio gas applications.

MODULE III: GEOTHERMAL AND WIND ENERGY
Structure of earth's interior, earthquakes & volcanoes, Geothermal resources, Hot springs, Steam ejection, Principal of working, Types of geothermal station with schematic representation, Applications. Properties of wind, Availability of wind energy in India, wind velocity, Wind machine fundamentals; types of wind machines and their characteristics, Horizontal and Vertical axis wind mills, Elementary design principles, Coefficient of performance of a wind mill rotor, Aerodynamic considerations in wind mill design, Recent development and applications.

MODULE IV: OCEAN AND HYDROGEN ENERGY
Principle of ocean thermal energy conversion (OTEC), setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Fundamentals of tidal power, Potential and conversion techniques, mini-hydel power plants. Use of tidal energy, Limitations of tidal energy conversion systems. Properties of hydrogen in respect of it's use as source of renewable energy, Sources of hydrogen, Production of hydrogen; electrolysis of water, thermal decomposition of water, thermo chemical production bio-chemical production. Applications of hydrogen energy.

Examination Scheme:

Components	CT	HA	S/V/Q	A	EE
Weightage(%)	15	5	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, A: Attendance EE: End Semester Examination

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Suggested Readings:

- Bansal Keemann, Meliss," Renewable energy sources and conversion technology", Tata Mc Graw Hill.
- Kothari D.P., “Renewable energy resources and emerging technologies”, Prentice Hall of India Pvt. Ltd.
- Rai G.D, "Non-Conventional energy Sources", Khanna Publishers.
- Ashok V. Desai, "Nonconventional Energy", New Age International Publishers Ltd.
- Tiwari and Ghosal, “Renewable energy resources” Narosa Publication.
- Twidell & Weir, “Renewable Energy Sources”
- K Mittal “Non-Conventional Energy Systems” , Wheeler Publication
- Ramesh & Kumar, “Renewable Energy Technologies”, Narosa Publications.

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INDUSTRIAL WASTE AND WATER TREATMENT

Course Code: CHY4313 **Credit Units:03**

Course Objectives: This course will give the basic understanding of the chemical principles involved in water and wastewater treatment. It presents the basic chemistry and treatment methodologies used in drinking water and wastewater operations. The students would be able to characteristics and treatment of industrial waste, advanced methods of treatment waste and disposal, reuse and recovery of waster from various industries. A brief introduction to environmental Impact assessment has also been added to create general awareness.

Course Contents:

MODULE I: **AN INTRODUCTION TO SOURCE, CHARACTERISTICS AND TREATMENT OF INDUSTRIAL WASTE**
Undesirable waste characteristics, sources and characteristics of waste water, industrial waste survey, waste characteristics - estimation of organic content, water reuse and in-plant waste control, idea of different technologies for the treatment of industrial waste water and the basis for the selection of treatment technology.

MODULE II: **TREATMENT OF INDUSTRIAL WASTES**
Different steps in the treatment of industrial waste (equalization, neutralization, sedimentation, oil separation, flotation, coagulation), sources and removal of heavy metals e.g. As, Ba, Cd, Cu, F, Fe, Rb, Mn, Hg, Ni, Se, Ag & Zn)

MODULE III: **ADVANCE WATER TREATMENT OF INDUSTRIAL WASTE**
Aeration, air stripping of volatile organics (VOC), biological oxidation - removal of organics (sorption, stripping, biodegradation), nitrification and de-nitrification. Lagoons and stabilization basins, membrane processes, trickling filtration, adsorption, ion exchange, chemical oxidation, sludge dewatering and disposal.

MODULE IV: **WASTE WATER REUSE AND RECOVERY**
Treatment, disposal, reuse and recovery of trade waste from (1) Textile Manufacture (2) Distilleries (3) Sugar (4) Paper and Pulp mills (4) Tanneries (5) Food Processing industries (6) Fertilizer Industry.

MODULE V: **ENVIRONMENTAL IMPACT ASSESSMENT**
Introduction to EIA, impact assessment methodologies, environmental inventory, environmental impact assessment (planning and management), environmental indices and indicators for describing the affected environment, EIA guidelines, introduction to environmental impact statement.

Examination Scheme:

Components	CT	HA	S/V/Q	A	EE
Weightage(%)	15	5	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, A: Attendance EE: End Semester Examination

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Suggested Readings:

- Thomous S. Spiro and William M. Stiglicini, Chemistry of The Environment, Prentice Hall of India Pvt. Ltd. (2002)
- Nicholas P. Cherimisinoff, Biotechnology for Waste and Waste Water Treatment, Prentice Hall of India Pvt. Ltd. (2001).
- Jarry A. Nathanson, Basic Environmental Technology, 4th ed ,Prentice Hall of India Pvt. Ltd. (2003).
- W.Wesley Eckenfelder, Indusrtrial Water Pollution Control, 2nd ed., Tata Mc-Graw Hill Book Company (1989).
- Larry W. Canter. , Environmental Impact Assessment, 2nd ed, Tata Mc Graw Hill (1996).

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NUCLEAR CHEMISTRY

Course Code: CHY4314 **Credit Units: 03**

Course Objective: This course is designed to provide basic information of Radiation and Nuclear chemistry; requirements, methods of preparation, uses of Radioelements. This should improve a student's knowledge of types of radioactive decay, natural decay series, nuclear models, nuclear properties, instrumentation and Introduction to health

Course Contents:

MODULE I: INTRODUCTION TO RADIOACTIVITY
Discovery of radioactivity, α, β and γ radiations, the radioactive series, radioactive decay, modes of decay, the n/p ratio, odd even rule, artificial radioactivity, transmutation of elements, the G.M counter

MODULE II: CHEMISTRY OF RADIOACTIVE ELEMENTS
Positions of radioactive elements in periodic table, trans-uranides and trans-actinides, super heavy elements; nomenclature & predicted chemistry, the Seaborg model, radiation dosimetry, radiolysis of aqueous solutions

MODULE III: USES OF NUCLEAR ISOTOPES
Introduction to nuclear medicine, positron emission tomography (PET) , radiocarbon dating and its uses, nuclear reactors, uses of heavy water in nuclear reactors, Trace analysis of elements and compounds - neutron activation analysis, isotope dilution analysis. Nuclear waste and its environmental effect

MODULE IV: NUCLEAR MODELS
Liquid-drop model, electron shell model, nuclear reactions, fission and fusion, cold fusion, idea about nuclear spin and its application in NMR, nuclear splitting, Zeeman effect and stark effect (only definition and qualitative explanation)

Examination Scheme:

Components	CT	HA	S/V/Q	A	EE
Weightage(%)	15	5	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, A: Attendance EE: End Semester Examination

Suggested Readings:

- Essentials of Nuclear Chemistry, H. J. Arnikar, 4th Edition Wiley Eastern (1987).
- Chemical Applications of Radioisotopes, H. J. M. Bowen. Buttler and Tanner (1969).
- Introduction of Nuclear and Radiochemistry, G Friedlander, T. W. Kennedy, E. S.
- Macias and J. M. Miller, 3rd Edition, John Wiley (1981).

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FOOD TECHNOLOGY

Course Code: CHY4315 **Credit Units:03**

Course objective: The contents have been drawn-up to accommodate the widening horizons of the discipline of Food Technology. They reflect the current changing needs of the students. This will create awareness among the students about the fundamentals of food and nutrition science involved in our everyday life

Course Contents:

MODULE I: INTRODUCTION TO FOOD

Carbohydrates: Structure and functional properties of mono- oligo-polysaccharides including starch, cellulose, pectic substances and dietary fibre; Proteins: Classification and structure of proteins in food; Lipids: Classification and structure of lipids, Rancidity of fats, Polymerization and polymorphism; Pigments: Carotenoids, chlorophylls, anthocyanins, tannins and myoglobin; Food flavours: Terpenes, esters, ketones and quinones; Enzymes: Specificity, Kinetics and inhibition, Coenzymes, Enzymatic and non-enzymatic browning; Nutrition: Balanced diet, Essential amino acids and fatty acids, PER, Water soluble and fat soluble vitamins, Role of minerals in nutrition, Antinutrients, Nutrition deficiency diseases.

MODULE II: FOOD MICROBIOLOGY

Characteristics of microorganisms; Microbial growth in food: Intrinsic and extrinsic factors, Growth and death kinetics, serial dilution method for quantification; Food spoilage: Contributing factors, Microbial spoilage of milk and milk products, meat and meat products; Foodborne disease: Toxins; Fermented food: Buttermilk, yoghurt, cheese, sausage, alcoholic beverage, vinegar, sauerkraut and soya sauce.

MODULE III: FOOD PRODUCTS TECHNOLOGY

Processing principles: Canning, chilling, freezing, dehydration, control of water activity, CA and MA storage, fermentation, hurdle technology, addition of preservatives and food additives, Food packaging, cleaning in place and food laws; Grain products processing: Milling of rice, wheat, and maize, production of bread, biscuits and breakfast cereals, Solvent extraction, refining and hydrogenation of oil; Milk and milk products processing: pasteurized and sterilized milk, cream, butter, ghee, ice-cream, cheese and milk powder; Animal products processing

MODULE IV: FOOD CHEMICAL ENGINEERING

Mass and energy balance; Momentum transfer: Flow rate and pressure drop relationships for Newtonian fluids flowing through pipe, Characteristics of non Newtonian fluids - generalized viscosity coefficient and Reynolds number, Flow of compressible fluid, Flow measurement, Pumps and compressors; Heat transfer: Heat transfer by conduction, convection, radiation, boiling and condensation, heat exchangers; Mass transfer: Molecular diffusion and Fick's Law, Steady state mass transfer, Convective mass transfer;

MODULE V: FOOD MECHANICAL ENGINEERING

Mechanical operations: size reduction of solids, high pressure homogenization, filtration, centrifugation, settling, sieving, flow through porous bed, agitation of liquid, solid-solid mixing, and single screw extrusion; Thermal operations: Energy requirement and rate of operations involved in process time evaluation in batch and continuous sterilization, evaporation of liquid foods, hot air drying of solids, spray and freeze-drying, freezing and crystallization.

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Examination Scheme:

Components	CT	HA	S/V/Q	A	EE
Weightage(%)	15	5	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, A: Attendance EE: End Semester Examination

Suggested Readings:

- Handbook of Food Rheology and Technology by Bernhard Senge (Editor), Joachim Kaldasch (Editor)
- Formulation Engineering of Foods by Ian T. Norton, Peter Fryer, J. Norton
- Guide to Foodborne Pathogens, 2nd Edition by Ronald G. Labbé, Santos García
- The Molecular Biology and Biochemistry of Fruit Ripening by Graham Seymour, Gregory A. Tucker, Mervin Poole, James Giovannoni

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RENEWABLE ENERGY CONVERSION SYSTEMS

Course Code: CHY4322 **Credit Units: 03**

Course Objective:
Course provides an introduction to different renewable energy sources. It analyses the full range of renewable energy supplies needed for modern economies. The course includes power from sun, wind, bio, tidal, ocean, geo and hydro.

Course Contents:
Module I: Introduction to Renewable Energy
Renewable and Non-Renewable Energy, World energy scenario; Fossil fuel resources - estimates and duration; India's energy scenario; Synergy between energy and environment, global environment issues, greenhouse gas emission, global warming, green energy solutions, technical and social implications of renewable energy

Module II: Solar Concepts
Introduction, Sun as the source of radiation, Earth and Solar constant, Extra-terrestrial solar radiation, components of radiation, effects of earth's atmosphere, Introduction to solar PV, Introduction to solar Thermal.

Module III: Biofuels, Wind Energy
Biofuels- Definition, generations and types
Wind-Characteristics, Sources of wind, components of wind turbines, advantages and environmental aspects of wind energy

Module IV: Hydro Energy, Tidal Energy
Hydro- Principles, hydro-turbines, social and environmental aspects
Tidal- The nature of the resource, physics, power generation, technical factors, environmental factors, tidal energy potential, tidal barrage, tidal stream, tidal current turbines.

Module V: Geothermal, OTEC
Geothermal- Principles, suitable sites and criteria, Advantages and disadvantages,
OTEC- Principles, Open and closed systems.

Examination Scheme:

Components	CT	Assignment	V/Q	Attendance	EE
Weightage (%)	15	5	5	5	70

Suggested Readings:
- Renewable energy resources – J. W. Twidell
- Renewable energy engineering and technology-edited by V. V.N. Kishore
- Wind Energy Comes of Age, Paul Gipe, John Wiley & Sons Inc.
- Directory, Indian Windpower 2004, CECL, Bhopal.
- Solar Energy: Fundamentals, design, modeling and applications, Authored by G. N. Tiwari

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INORGANIC CHEMISTRY LAB

Course Code: CHY4324 **Credit Units:02**

(Minimum 10 experiments to be performed)

Quantitative and Qualitative Analysis of following:

1. Ores analysis (oxides and carbonate ores)
2. Nickel/Copper

Estimation of following:

3. Active CaO in lime
4. Chlorine in bleaching powder
5. Lead content in red lead

Preparation and Characterizations/study by spectral methods

6. Trialkoxyboanes.
7. Tin (IV) chloride
8. Sodium tetrathionate
9. Cr (III) complexes.$[Cr(H_2O)_6]NO_3.3H_2O$,$[Cr(H_2O)_4Cl_2]Cl.2H_2O$,$[Cr(en)_3]Cl_3$, $[Cr(acac)_3]$.
10. Fe(II) chloride and its application as catalyst in Friedel-Craft reaction
11. Ferrocene
12. Kinetic study of Cr(III) with a multidentate ligand (EDTA)

Qualitative Inorganic Semi-micro Analysis

13. Detection of atleast four cations and anion in a mixture of salts.

***MSDS -Compilation of MSDS of chemicals used by students in each experiment is compulsory**

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, A-Attendance, V – Viva.

Suggested Readings:

- G.H.Jeffery, J.Bassett, J.Mendham and R.C.Denney Vogel's Text book of quantitatives chemical analysis, ELBS 5th Edn. Longman, Singapoor Publishers,Singapore, 1996.
- R. Mukhopodhyay, P.Chatterjee, " Advanced practical Chemistry"
- Dinesh Sharma, " A hand book of Analytical Inorganic chemistry", First Published(2004)
- I.M.Kolthoff, E.B.Sandell et.al. Quantitative chemical analysis, CHYmillan, Madras 1980.
- A Text book of quantitative Inorganic Analysis – A. I. Vogel
- Standardsmethodsof ChemicalAnalysiF.J.Welcher
- Experimental Inorganic Chemistry – W. G. Palmer.
- Manual on Water and Waste Water Analysis, NEERI- Nagpur D.S. Ramteke and C. A. Moghe
- Inorganic synthesis- King.
- Synthetic Inorganic Chemistry-W .L. Jolly
- EDTA Titrations –F Laschka

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SUMMER INTERNSHIP / STUDY ABROAD PROGRAMME

Course Code: CHY4335 **Credit Units: 6**

Objectives

The objective of this course is to judge the understanding as well as application of the knowledge gained by the students. The aim of the internship is to provide the students with an opportunity to further enhance their knowledge in a sector of their choice by undertaking a significant practical unit of examining and analyzing various aspects of Chemistry & its application at a level commensurate with the learning outcomes of the various courses taken up them in the ongoing semester.

A summer internship is primarily a record of intelligent reading and research on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned.

Guidelines:

1. The internship will be related to the contemporary research issue and the topic will be given by the department.
2. The presentation of the term paper is scheduled to be held before the commencement of Semester examinations.
3. The paper will carry 100 marks that will be marked on the basis of understanding and organization of content based on the literature review. The Bibliography shall form an important part of the paper.
4. Examples of a few broad areas for term paper (List is indicative, not exhaustive)

- Inorganic chemistry
- Organic chemistry
- Physical chemistry
- Green chemistry
- Agricultre chemistry

Marking Scheme:

Committee (50)			Supervisor's Assessment: Regularity and Quality of Work (50)	Total (100)
Presentation: Contents + Delivery (20)	Viva: (Q & A) (20)	Dissertation: Content + Formatting (10)		

Evaluation component of the Supervisor is 50% and the remaining 50% by committee

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MAJOR PROJECT

Course Code: CHY4437 **CreditUnits: 10**

GUIDELINES FOR PROJECT FILE AND PROJECT REPORT

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critically analyzed by the faculty guide and corrected by the student at each stage.

PROJECT FILE

The Project File may be a very useful tool for undertaking an assignment along-with a normal semester, an exploratory study, sponsored projects, a project undertaken during summer period or any other period as per curriculae where the researcher is working with a company/organization. The project/ assignment may also be a part of the bigger research agenda being pursued by a faculty/ institution/ department

The Project File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation. This file may be considered in continuous assessment.

In general, the File should be comprehensive and include:

- A short account of the activities that were undertaken as part of the project;
- A statement about the extent to which the project has achieved its stated objectives;
- A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;
- Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project;
- Any problems that have arisen and may be useful to document for future reference.

PROJECT REPORT

The Project Report is the final research report that the student prepares on the project assigned to him. In case of sponsored project the lay out of the project could be as prescribed by the sponsoring organization. However, in other cases the following components should be included in the project report:

- **Title or Cover Page**
  The title page should contain Project Title; Student's Name; Programme; Year and Semester and Name of the Faculty Guide.
- **Acknowledgement(s)**
  Acknowledgment to any advisory or financial assistance received in the course of work may be given. It is incomplete without student's signature.
- **Abstract**
  A good"Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project. It should not exceed more than 1000 words.
- **Table of Contents**
  Titles and subtitles are to correspond exactly with those in the text.

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- **Introduction**
  Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

- **Materials and Methods**
  This section should aim at experimental designs, materials used (wherever applicable). Methodology should be mentioned in details including modifications undertaken, if any. It includes organization site(s), sample, instruments used with its validation, procedures followed and precautions.
- **Results and Discussion**
  Present results, discuss and compare these with those from other workers, etc. In writing this section, emphasis should be laid on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

  Note that in writing the various secions, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary, do not write in "point" form.

  While presenting the results, write at length about the the various statistical tools used in the data interpretation. The result interpretation should be simple but full of data and statistical analysis. This data interpretation should be in congruence with the written objectives and the inferences should be drawn on data and not on impression. Avoid writing straight forward conclusion rather, it should lead to generalization of data on the chosen sample.

  Results and its discussion should be supporting/contradicting with the previous research work in the given area. Usually one should not use more than two researches in either case of supporing or contradicting the present case of research.

- **Conclusion(s) & Recommendations**
  A conclusion should be the final section in which the outcome of the work is mentioned briefly.
  Check that your work answers the following questions:
  - Did the research project meet its aims (check back to introduction for stated aims)?
  - What are the main findings of the research?
  - Are there any recommendations?
  - Do you have any conclusion on the research process itself?

- **Implications for Future Research**
  This should bring out further prospects for the study either thrown open by the present work or with the purpose of making it more comprehensive.
- **Appendices**
  The Appendices contain material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.
- **Suggested Readings:**
  Suggested Readings: should include papers, books etc. referred to in the body of the report. These should be written in the alphabetical order of the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

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Examples:

For research article:

Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichia coli* O157: H7. *Clin Microbiol Infect* ,**8** (suppl 1): 116–117.

For book:

Kowalski,M.(1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67

The Layout Guidelines for the Project File & Project Report:

- A4 size Paper
- Font: Arial (10 points) or Times New Roman (12 points)
- Line spacing: 1.5
- Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

ASSESSMENT OF THE PROJECT FILE AND THE PROJECT REPORT

Essentially, the assessment will be based on the quality of the report, the technical merit of the project and the project execution. Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project. Project execution is concerned with assessing how much work has been put in.

The Project should fulfill the following ***assessment objectives:***

- Range of Research Methods used to obtain information
- Execution of Research
- Data Analysis (Analyze Quantitative/ Qualitative information)
- Quality Control
- Conclusions

Assessment Scheme:

Continuous Evaluation:

40% (Based on punctuality, regularity of work, adherence to plan and methodology, refinements/mid-course corrections etc. as reflected in the Project File.)

Final Evaluation:

60% (Based on the Documentation in the file, Final report layout, analysis and results, achievement of objectives, presentation/ viva)

It is recommended that the Final evaluation should be carried out by a panel of evaluators.

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GOOD LABORATORY PRACTICES SEMINAR

Course Code: CHY4408 **Credit Units: 01**

Objectives

The aim of the term paper is to provide the students with an opportunity to further enhance their knowledge ofgood laboratory practices. Undertaking this verysignificant practical unit of examining and analyzing various aspects of Chemistry. Good laboratory practice or GLP is a set of principles intended to assure the quality and integrity of non-clinical laboratory studies that are intended to support research or marketing permits for products regulated by government agencies. The term GLP is most commonly associated with the pharmaceutical industry and the required non-clinical animal testing that must be performed prior to approval of new drug products. However, GLP applies to many other non-pharmaceutical agents such as color additives, food additives, food contamination limits, food packaging, and medical devices.

GLP is a quality management system, not a scientific management system. Or, in other words, GLP defines a set of quality standards for study conduct, data collection, and results reporting. GLP does not define scientific standards. If a study follows GLP, then you can be reasonably sure that the reported results were collected as outlined in the study protocol; however, you cannot be sure that the study actually addresses the scientific hypothesis. In the world of cooking, GLP would ensure that someone follows the recipe exactly as written; however, it does not assure you that the recipe was good or that the resulting item will be tasty!

The student is expected to attend the Good Laboratory Practices Seminar's diligently. The student will be tested on the basis of understanding and organization of content based on the seminar.

Evaluation Scheme

Attendance	Active Participation/ Write up	Multiple Choice Questions/ Quiz	Solving the case/ Assignment	Total
10	30	35	25	100

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CHEMISTRY OF NANOMATERIALS

Course Code: CHY4407 **Credit Units: 02**

Course objective: Material science plays a vital role in this modern age of science and technology. The rapid development in the field of nanomaterials and composite science has opened vast opportunities for better understanding and utilization of various materials. The course curriculum is designed to give students an idea of the detailed aspects of important topics of material science like composites, nanomaterials, their synthesis, characterization, and application.

Course Contents:

MODULE I: INTRODUCTION TO CHEMISTRY OF MATERIALS & NANOMATERIALS

Materials & their classification; Classifications of nanostructured materials; Fundamental differences between bulk materials and nanomaterials; Role of chemistry in material design, Nanoscale Science and Technology-Implications for Physics, Chemistry, Biology and Engineering; Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic, and Thermal properties.

MODULE II: SYNTHESIS TECHNIQUES FOR NANOMATERIALS AND THEIR CHARACTERIZATION

Bottom-UP Approach: Self-Assembly, Sol-Gel Synthesis, Hydrothermal growth, Thin Film Growth – Physical Vapour Deposition, Chemical Vapour Deposition

Top-Down Approach: Emulsification-Diffusion Solvent Diffusion/Evaporation Method, Ball Milling, Microfabrication, Lithography

Characterization techniques: X-ray diffraction technique, Scanning Electron Microscopy, Transmission Electron Microscopy, Atomic Force Microscopy, particle size analyzer.

MODULE III: APPLICATION OF MATERIAL CHEMISTRY & NANOCHEMISTRY

Application of organic and inorganic nanoparticles; biomedical applications: design of nanoparticles for oral delivery of peptide drugs, development of nanoscaffolds for tissue engineering and regenerative medicine, bioimaging with quantum dots.

Industrial applications: Nanotechnology in packaging industries, textiles, solar cells, space exploration, computing and information technology; electrical conductive carbon nanotube (CNT) dispersed Si_3N_4 ceramics.

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E**xamination Scheme:**

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance.

Suggested Readings:

- Introduction to Nanoscience by Gabor L. Hornyak, Joydeep Dutta, Harry F. Tibbals, Anil K. Rao.CRC Press, 2008.
- Nanotechnology: Importance and Application by M.H. Fulekar, IK International, 2010.
- Environanotechnology by Mao Hong fan, Chin-pao Huang, Alan E Bland, Z Honglin Wang, RachidSliman, Ian Wright. Elsevier, 2010.
- Nanotechnologies, Hazards and Resource efficiency by M. Steinfeldt, Avon Gleich, U. Petschow, R. Haum. Springer, 2007.
- Nanotechnlogy: Health and Environmental risk by Jo Anne Shatkin. CRC press, 2008.
- Nanotechnology in Biology and Medicine: Methods, Devices and Application by Tuan Vo-Dinh .CRC press, 2007.
- Nanomaterials for Biosensors by Challa Kumar. Wiley-VCH, 2007.
- Nanosystem characterization tools in the life sciences by Challa Kumar. Wiley-VCH, 2006.

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INTRODUCTION TO POLYMERIC MATERIALS

Course Code: CHY4405 **Credit Units:03**

Course Objective: The curriculum is developed to help the students to understand the importance of polymeric materials and their usefulness in day to day life. The Polymeric materials course aims to provide students with an understanding of the different kinds of polymers, their preparation, polymerization and chemical bonding between them. It also covers the applications of these polymeric materials in plastics, elastomers

Course Content:

MODULE I: INTRODUCTION TO POLYMER

History and Concept of macromolecules, monomers with specific example viz. acrylonitrile, vinyl, chloride, methyl methacrylate, isobutylene, isoprene, styrene, hexamethylene diamine and adipic acid, caprolactum, ethylene oxide and sebacic acid, ethylene glycol and terephthalic acid, functionality, Degree of polymerization, Classification of polymers depending on – (a) The origin (natural, Semisynthetic, synthetic etc. (b) The structure (linear, branched, network, hyperbranched, dendrimer (c) The formation (condensation, addition)(d) Homopolymers, copolymers(e) The behaviour on application of heat and pressure (thermoplastic and Thermosetting)(f) The form and application (plastics, fiber. elastomers and resin(g) Stereisomers: Isotactic, Syndiotactic, Atactic, Organic and Inorganic polymers. Concept of molecular mass, polydispersity, number average and weight average, molecular weight distribution in linear polymers.

MODULE II- CHEMISTRY OF POLYMERIZATION (MECHANISM)

chain polymerization- Free radical, Ionic and coordination mechanism, Common features of two types of Mechanism of cationic polymerization and anionic polymerization, Mechanism of coordination polymerization – Ziegler-Natta catalysts, Ring opening polymerization-mechanism of polymerization of cyclic ethers, cyclic amides and cyclosiloxanes.

MODULE III- METHODS OF POLYMERISATION

Methods of polymerization. Bulk polymerization, Solution polymerization, Emulsion polymerization, Suspension polymerization, Melt polycondensation. Controlled polymerization methods, viz, Nitroxide mediated polymerization (NMP), Atom Transfer Radical Polymerization (ATRP), Reversible Addition Fragmentation Termination (RAFT).

MODULE IV-SPECIAL POLYMERS AND THEIR APPLICATIONS

Polyethylene (LLDP, HDP, LLDPE and HDPE), PVC, polyvinyl accohol, polyvinylacetate, polybutadiene, polychloroperene, polystyrene, polyacrylare, PMMA, and acrylonitrrile copolymers.
polyamides (Nylon 6, Nylon 6,6, Nylon 6,10), polyesters (poly ethylene terephthalate (PET), polybutylene, terphthalate (PBT), aromatic polyesters), polycarbonate, polyurethanes – Flexible and rigid polyurethane, polyurethane elastomers, coatings, adhesives, sulphur, containing polymers, polimdes, polyethersulphones, polyetherketones. Thermosetting resins – phenolic resins, amino resins, epoxy resins, silicone polymers, and cyanate ester resins.

MODULE V- POLYMER DEGRADATION

Introduction, Types of degradation-Thermal, mechanical, Photodegradation, oxidative degradation, Hydrolytic degradation, Degradation by ultrasonic waves and high energy radiation.

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Examination Scheme:

Components	CT	HA	S/V/Q	A	EE
Weightage(%)	15	5	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, A: Attendance EE: End Semester Examination

Suggested Readings:

- F.W. Billmeyer, Jr. Textbook of polymer science, Wiley- Interscience, N.Y.(1971)
- Introduction to polymer chemistry, R. Seymour, Wiley –Interscience (1981)
- Physical chemistry of CHYromolecules, by D.D. Deshpande, Vishal publications, (1985)
- principles of polymerization, G.Odian, Wiley – Interscience (1981)
- Organic polymer chemistry, K. J. Saunders, Chapman and Hall, London (1973).
- Principles of polymer chemistry by P.J. Flory.
- Polymer Science –V R Gowarikar.

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Curriculum & Scheme of Examination

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COMPUTING AND C PROGRAMMING

Course Code: MTH4105 **Credit Units: 03**

Course Objectives:
The objectives of this course are to acquaint the students with the mathematics involved in basics of computers system, its components, data representation inside computer and to get them familiar with various important features of a procedure-oriented programming language i.e. C.

Course Contents:

Module-I: Data representation: number systems, character representation codes, binary, octal, hexadecimal and their inter conversions, binary arithmetic, floating point arithmetic, header files, static variables, register variables, declaration of variable names, data types and sizes, constants, format specifier, storage class, scope.

Module-II: Arithmetic operators, relational and logical operators, type conversions, increment and decrement operators, bit-wise operators, assignment operators and expressions, conditional expressions; precedence and order of evaluation. if else, nested if.

Module-III: Loops- switch, while and for, do-while. break and continue, go to and labels, Character Input Output Arrays, Character Arrays. Multi-Dimensional Arrays, Basics of Structures, Arrays of Structures, Unions.

Module-IV: Basics of functions, functions arguments block structures, recursion, pointers, function arguments, call by value, call by reference pointers and arrays functions, pointer arrays, pointers to pointers, command line arguments, strings operation.

Examination Scheme

Components	A	CT	HA	EE
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, Seminar, or Quiz, EE: End Semester Exam

References

- Rajaraman, V., Computer Programming in C" , Prentice Hall of India,1995.
- Schildt, H., C: The complete reference", Osbourne Mcgraw Hill, 4th Edition,2002.
- Kanetkar, Y., Let us C", BPB Publications, 14th Edition,2016.
- Kernighan & Ritchie, C Programming Language", The (Ansi C Version), Prentice Hall India Learning Private Limited; 2 edition(1990).

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C PROGRAMMING LAB

Course Code: MTH4106 **Credit Units: 01**

Software Required: Turbo C

Course Contents:

1. Some basic programs to understand the working of C language.
2. Programs involving conditional operator like if-end, elseif-end
3. Programs involving nested if-else-end
4. Programs involving multiple selections using switch statement
5. Programs involving loops like while and do while.
6. Programs involving for loops.
7. Programs involving user defined function calls.
8. Programs involving arrays and matrices
9. Programs involving strings
10. Programs involving structures
11. Programs involving Unions
12. Programs involving pointers, and solving various problems with the help of those.
13. Programs involving file handling

Examination Scheme

Internal Assessment

Components	Attnd.	Performance	Lab Record	Viva
Weightage (%)	5	10	10	5

End-Term Exam

Components	Performance	Viva
Weightage (%)	35	35

References

- Rajaraman, V., Computer Programming in C" , Prentice Hall of India,1995.
- Schildt, H., C: The complete reference", Osbourne Mcgraw Hill, 4th Edition,2002.
- Kanetkar, Y., Let us C", BPB Publications, 14th Edition,2016.
- Kernighan & Ritchie, C Programming Language", The (Ansi C Version), Prentice Hall India Learning Private Limited; 2 edition(1990).

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OPERATIONS RESEARCH

Course Code: MTH4217 **Credit Units: 04**

Course Objectives:
The problems in optimization are the most common applications of mathematics. The main aim of this course is to present different methods of solving optimization problems in the areas of linear programming, nonlinear programming, and integer linear programming. In addition to theoretical treatments, there will be some introduction to numerical methods for optimization problems.

Course Contents:
Module-I: **Review** Introduction to Operation Research**,** Linear programming problem and its formulation, convex sets and their properties, graphical method, basic feasible solution, simplex method, big-M and two phase methods; infeasible and unbounded LPPs, alternate optima; Dual problem and duality theorems, dual simplex method and its application in post optimality analysis; Sensitivity Analysis, Balanced and unbalanced transportation problems, Vogel's approximation method for solving transportation problems; Hungarian method for solving assignment problems.

Module-II: Dynamic Programming Bellman's Principle of optimality of Dynamic Programming, Multi- stage decision problem and its solution by Dynamic Programming with finite number of stages, Solution of linear programming problems as a Dynamic Programming problem.

Module-III: Integer Linear Programming Problems: Integer Linear Programming Problems, Mixed Integer Linear Programming Problems, Cutting Plane Method, Branch and Bound method.

Module-IV: PERT and CPM: Basic idea of PERT & CPM, Difference between PERT & CPM, PERT/CPM network components and precedence, Relationship critical path analysis, Project Scheduling, Project Time Cost, Trade Off, Resource allocation.

Examination Scheme:

Components	A	CT	HA	EE
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, Seminar, or Quiz, EE: End Semester Exam

References:

- Taha, H.A., Operations Research: An Introduction", MacMillan Pub Co., NY, 9th Ed. (Reprint), 2013.
- Mohan, C. and Deep, K., Optimization Techniques", New Age India Pvt. Ltd, New Delhi,2009.
- Ravindran, A., Phillips, D.T. and Solberg, J.J., Operations Research: Principles and Practice", John Wiley and Sons, NY, 2nd Ed. (Reprint),2012.
- Hillier, F. S., and G. J. Lieberman, Introduction to Operations Research", 2nd ed., Holden-Day, San Francisco, 1974.
- Kanthi Swarup, P.K.Gupta and Man Mohan, \Operations Research". Sultan Chand and Sons New Delhi, Fourteenth Edition-2008

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TOPOLOGY

Course Code: MTH4205 **Credit Units: 04**

Course Objectives:
Topology is a modern branch of geometry. It serves to lay the strong foundations of concepts for study in analysis and in geometry. It is also a prerequisite for many concepts related to Analysis. The course is designed to develop an understanding of topological ideas & techniques and their role in analysis.

Course Contents:
Module-I: Introduction: Finite, countable, uncountable sets, functions, relations, axiom of choice, Zorn's Lemma. Schroder Bernstein theorem.

Module-II: Topological Spaces and Continuous Functions: Open sets, closed sets, basis for a topology, sub basis, T1 and T2 spaces, order topology, product topology, subspace topology, limit point, continuous function, general product topology, metric space and its topology, quotienttopology.

Module-III: Connectedness and Compactness: Connected spaces, connected subspaces, local connectedness, compact subspace, limit point compactness, local compactness.

Module-IV: Countability and Separation Axioms: Countability axioms, separation axioms, regular and normal spaces, Urysohn's Lemma, Urysohn Metrization Theorem, Tietze Extension Theorem, Tychonoff Theorem.

Examination Scheme:

Components	A	CT	HA	EE
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, Seminar, or Quiz, EE: End Semester Exam

References

- Munkres, J.R., Topology", 2nd Edition, PHI,2010.
- Simmons, G.F., Introduction to Topology and Modern Analysis", Krieger Publishing Company, 2003.
- Mansfield, M.J., Introduction to Topology", East-West Student Edition,1973.
- Min, Y., Introduction to Topology: Theory & Applications", Higher Education Press,2010.
- Gamelin, T.W. and Greene, R.E., "Introduction to Topology", 2nd Ed., Dover Publications,1999.

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STATISTICS BASED LAB-I

Course Code: MTH4206 **Credit Units:01**

MTH4206		L	T	P	C
Version		0	0	2	1
Pre-requisites/Exposure	Basics knowledge of Statistics				
Co-requisites					

Course Objectives:

The objective of this Lab work is to acquaint students to use statistical software in computation and interpretation of various statistical results.

1. To plot the histogram, pi-chart, scatter plot and bar-chart etc.
2. To find the measure of arithmetic mean, geometric mean, and harmonic mean of the given data.
3. To find the measure of median and mode of the given data.
4. To find the measure of Range, Quartile deviation, Mean deviation.
5. To find the measure of standard deviation and variance of the given data.
6. To measurement of moments.
7. To measurement Skewness & Kurtosis.
8. To check the linear relationship between two variables using correlation coefficient.
9. To check the non-linear relationship between two variables using correlation coefficient.
10. To find the lines of best fit used for predictions by using the regression analysis.

Examination Scheme:

Internal Assessment

Components	Attnd.	Performance	Lab Record	Viva
Weightage (%)	5	10	10	5

End-Term Exam

Components	Performance	Viva
Weightage (%)	35	35

References

- V. K. Rohatgi and A. K. Md. E. Saleh, An Introduction to Probability and Statistics, 2nd Edn., Wiley, 2001.
- W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Edn., Wiley, 1968.
- Miller, I. and Miller, M:Freunds Mathematical Statistics with Applications, 7th edition, Prentice Hall.
- Hogg, R., Mckean, J. and Craig, A.:Introduction to Mathematical Statistics, 7th edition, Pearson Education

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INTRODUCTION TO MATLAB

Course Code: MTH4215 **Credit Units: 03**

Course Objectives:
The objectives of the course are to familiarize the students with the main features of the MATLAB integrated design environment. Students will learn concepts related to programming in MATLAB and they will also get to the exposure to use few built-in functions to solve many practical problems.

Course Contents:

Module-I: Introduction to MATLAB and Plotting: vector and matrix generation, subscripting and the colon notation, matrix and array operations and their manipulations, introduction to some inbuilt functions. Two & three-dimensional graphics: basic plots, change in axes and annotation in a figure, multiple plots in a figure, saving and printing figures, mesh plots, surface plots and their variants.

Module-II: **m-Files**: scripts and user defined functions, calling functions into a script file, sub-functions, and nested functions, concept of local and global variable, few examples of in-built functions, editing, saving m-files.

Module-III: Loops and Conditional statements: Flow control using various statements and loops including For-End and While-End loops with Break commands. Conditional Statements: If-End statement, If-Else-End statement, nested If-Else-End statements.

Module-IV: Applications of MATLAB: Solving a linear system of equations including over determined and system with infinitely many solutions. Calculus of polynomials using inbuilt functions, Solving equations in one variable, Solving IVPs using inbuilt functions.

Examination Scheme:

Components	A	CT	HA	EE
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, Seminar, or Quiz, EE: End Semester Exam

Reference Books:

- Applied Numerical Methods with Matlab for Engineers and Scientists by Steven Chapra, McGraw Hill,2008.
- MATLAB: An introduction with applications: Amos Gilat, 5th Edition, Wiley India,2014.
- Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers by Rudra Pratap, Oxford University Press,2016.

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MATLAB PROGRAMMING LAB

Course Code: MTH4216 **Credit Units: 01**

Course Objectives:
MATLAB is a scientific computing tool which covers almost all area of science and engineering. Students will be using MATLAB environment to solve various types of mathematical problems.

Course Contents:
Fundamentals of Linear Algebra, Numerical Analysis, Differential Equations and their application using MATLAB :

1. Generating arrays and matrices and their manipulations
2. Eigenvalues & Eigenvectors of various type of matrices
3. Using built-in functions to solve system of equations
4. Functions related to plotting 2D and 3Dplots
5. Introducing built-in functions for numerical approximations
6. Annotation of Plots
7. Writing m files including script and function files
8. Introducing notion of sub-functions and nested functions
9. Solving IVPs using ode45 and other solvers
10. Solving system of equations of IVPs

Examination Scheme

Internal Assessment

Components	Attnd.	Performance	Lab Record	Viva
Weightage (%)	5	10	10	5

End-Term Exam

Components	Performance	Viva
Weightage (%)	35	35

Reference Books:

- Applied Numerical Methods with Matlab for Engineers and Scientists by Steven Chapra, McGraw Hill,2008.
- MATLAB: An introduction with applications: Amos Gilat, 5th Edition, Wiley India,2014.
- Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers by Rudra Pratap, Oxford University Press,2016.

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NUMERICAL ANALYSIS

Course Code: MTH4325 **Credit Units: 03**

Course Objectives:
The objectives of this course are to introduce some advanced numerical methods, commonly used in research to the post graduate students. Student will be introduced to numerical techniques for solving algebraic and transcendental equation, Interpolation of polynomial, Differentiation, Integration and ordinary differential equations.

Course Contents:
Module-I: Solution of Algebraic and Transcendental Equations: Bisection method, Regula-Falsi method, Iteration method, Newton Raphson method, Newton Raphson method for multiple roots, Secant method as an improvement on Newton Raphson method, and Muller's method, Graeffe's Root Square Method. Convergence and error analysis of these methods.

Module-II: Finite differences, interpolation and approximation: Finite difference operators, their properties and their interrelations, problems based on finite difference tables, Newton's forward and Newton's backward interpolation formula, various central difference formulae including Stirling's formula, Bessel's formula and Cubic -Spline interpolation. Divided differences: Operators and difference table, Newton's divided difference formula, Lagrange's interpolation formula.

Module-III: Solution of system of linear equations:
Direct methods: Cramer's rule, Matrix inverse method, Gauss elimination and Gauss-Jordan method, LU decomposition method. Iterative methods: Jacobi's method, Gauss-Seidel method and their convergence criterion. Concept of ill-conditioning, and condition number for system of equations.

Module-IV: Numerical Differentiation and Integration: Numerical differentiation using Newton's for- ward and backward formula, order of leading error terms. Newton-Cotes quadrature formula - derivations & comparison of Trapezoidal rule, Simpsons 1/3 and 3/8 rules. Error analysis of these methods. Numerical solution of first order differential equations: Euler's method, modified Euler's method, Predictor-Corrector Method, Runge-Kutta second order and fourth order methods, their derivations and their extension to solve system of IVPs.

Examination Scheme:

Components	A	CT	HA	EE
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, Seminar, or Quiz, EE: End Semester Exam

References:

- Gerald, C. F. & Wheatly P. O., Applied Numerical Analysis", 6th Ed., Addison-Wesley Publishing, 2002.
- Fausett, L. V., Applied Numerical Analysis", Prentice Hall, 2nd Ed.2007
- Froberg, C. E., "Introduction to Numerical Analysis", 2nd Ed., Addison Wesley.,2004
- E. Scheid, Numerical Analysis", Mc Graw Hill1988.
- Jain, M.K., S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computations", New Age International, New Delhi,2003.

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NUMERICAL ANALYSIS LAB

Course Code: MTH4327 **Credit Units: 01**

Softwares required: Turbo C and MATLAB

Course Objective:

The objective of the course is to explain the most common numerical methods used in engineering analysis, when to use each method, and how to implement basic methods in a structured manner using MATLAB's programming language.

Course Contents:

Module-I: Roots of Transcendental Equations: Programs for Initial approximation for roots, Bisection method, Regula-Falsi method, Iterative method, Newton Raphson method, Secant method. Comparison of these methods. How to use built-in functions to find the roots of Transcendental Equations.

Module-II: System of Linear Equations: Programs for Jacobi method, Gauss-Seidal method, their comparative study using various stopping criterion. Programs for forward and back substitution, LU decomposition method, and using built in functions for system of equations.

Module-III: Programs for Numerical Differentiation, Programs for trapezoidal rule, Simpson's 1/3 and 3/8 rule and their comparison. Using built-in functions for both numerical differentiation and numerical integration.

Module-IV: Programs for solving IVPs for Euler's method and its variants. How to use built in functions for solving IVPs and how to extend the code for solving system of IVPs.

Examination Scheme

Internal Assessment

Components	Attnd.	Performance	Lab Record	Viva
Weightage (%)	5	10	10	5

End-Term Exam

Components	Performance	Viva
Weightage (%)	35	35

Reference Books:

- Applied Numerical Methods with Matlab for Engineers and Scientists by Steven Chapra, McGraw Hill.
- MATLAB: An introduction with applications: Amos Gilat, 5th Edition, WileyIndia.
- Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers by Rudra Pratap, Oxford UniversityPress.

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Summer Workshop

Course Code: MTH4335 **Credit Units: 03**

Workshop will be conducted for one-week (six hours per day). The content of the course will be intended to give an exposure to

- Technical softwares /tools related to scientific computing and statistics.
- Report writing, Presentation etc.

The students will have to appear for class-test(s) during the workshop.

- During summer break, students have to work on the assignment(s) given to them.
- The assignment(s) will have to be submitted within two weeks of commencement of new semester followed by viva-voce.
- The evaluation will be done by the committee comprising of faculty members who served as resource persons in the workshop.

Evaluation scheme:

Components	**Attendance**	**Assignment(s)**	**Class test(s)**	**Viva-voce**
Weightage (%)	5	35	30	30

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NUMBER THEORY & CRYPTOGRAPHY

Course Code: MTH4329 **Credit Units: 04**

Course Objectives:
The course provides an introduction to basic number theory, where the focus is on computational aspects with applications in cryptography. Moreover, the course provides an introduction to some basic cryptographic techniques to understand fundamental mathematical concepts underlying digital signatures, public key encryption, and key establishment protocols.

Course Contents:
Module-I: Euclid's division lemma, Divisibility, The Linear Diophantine Equation, the fundamental theorem of Arithmetic, Fermat's Little theorem, Wilson's Theorem, Generating functions. Congruences, Residue Systems, The Theorems of Fermat and Wilson Revisited, The Chinese Remainder Theorem.

Module-II: Combinatorial Study of $\phi(n)$, Formulae for $d(n)$ and $\sigma(n)$, Multiplicative Arithmetic Functions, The Mobius Inversion Formula, Primitive Roots Modulo p, Tchebychev's Theorem. Euler's Criterion, the Legendre Symbol, The Quadratic Reciprocity Law, Consecutive Residues and Non-residues.

Module-III: Cryptographic Hash Functions Hash functions and data integrity, security of Hash functions, The random oracle model, algorithms in random oracle model, comparison of security criteria, Compression functions from encryption functions, Hash functions from compression functions.

Module-IV: Public Key Cryptography and Discrete Logarithms Finite fields, construction, The Elgamal crypto system, RSA public key crypto system, algorithms for discrete logarithm problems, Shanks Baby step Giant step algorithms, The pollard algorithm, factoring algorithms, attacks on RSA, security of Elgamal system, The Deffe Hellman key exchange problems, Digital signature algorithms using RSA, secrete key sharing principles, The Shamir Secret sharing protocol.

Examination Scheme:

Components	A	CT	HA	EE
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, Seminar, or Quiz, EE: End Semester Exam

References

- Niven, I., Zuckerman, S.H., Montgomery, L.H., An Introduction to the Theory of Numbers, John Wiley and Sons. New York,1991
- Dan Flath, Introduction to Number Theory, Wiley,1988)
- K. Ireland, M. Rosen. A Classical Introduction to Modern Number Theory, Springer Verlage,1990.
- Douglas R. S. Cryptography Theory and Practice, Third edition, Chaman & Hall/CRC,2005
- Johannes Buchmann. Introduction to Cryptography, Second edition, Springer,2004.
- N. Koblitz. Course in Number Theory and Cryptography, Springer,1994.
- A. J. Menezes, P.C. Van Oorschot and S.A. Vanstone. Handbook of Applied Cryptography, CRC Press, Boca Raton,1997.

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FLUID DYNAMICS

Course Code: MTH4409 **Credit Units: 04**

Course Objectives:
Almost everything on this planet is either in a state of fluid or moves within or near a fluid. Fluids have the ability to transport matter and its properties as well as transmit force. The main objectives of the course are to develop fundamental knowledge and understanding of the mechanics of fluid both at rest and in motion.

Course Contents:

Module 1: Introduction
Definition: Fluid, Fluid Dynamics, Stress (shear stress and normal stress), strain, viscosity (dynamic and kinematic). Variation of viscosity with temperature for liquids and gases. Continuum hypothesis, No-slip boundary condition, application areas of fluid dynamics.
Kinematics: Different types of forces: Viscous and inertial forces
Some common non-dimensional parameters and their physical significance: Reynolds number, Froude number and Mach number. (12 lectures)

Module 2: Newton's law of viscosity, Classification of fluids: Newtonian and Non-Newtonian fluid, compressible and incompressible fluid. Inviscid, ideal and real fluid. Different types of flow: Uniform and non-uniform, steady and unsteady, rotational and irrotational flow, Laminar, Turbulent and Transient flow. Flow description: Eulerian and Lagrangian description of fluid motion. Fluid element trajectories: Streamline, pathline, streakline, timeline. (12 lectures)

Module 3: Introduction to Tensors: Definition, rank of tensor, Einstein notation or indical notation, free and dummy indices. Vector operations and calculus operations using index notation (Einstein notation).
Cauchy stress tensor, deviatoric stress tensor, volumetric stress tensor.
Deformation of fluid-elements: derivation of rate of translation vector, rate of rotation, vorticity vector, linear strain rate, strain rate tensor, deformation tensor. (12 lectures)

Module 4: Bernoulli's equation - assumptions and applications.
Differential Analysis: Differential equations of mass and momentum for incompressible flows: inviscid - Euler equation and viscous flows - Navier-Stokes equations, concept of fluid rotation, vorticity, stream function, Exact solutions of Navier-Stokes equation for Couette Flow and Poiseuille flow. (12 lectures)

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

A-Attendance; **CT**-Class Test; **S/V/Q**-Seminar/Quiz/Viva; **HA**-Home Assignment; **EE**-End Semester Examination

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Text Books:

- R. K. Rathy, An Introduction of Fluid Dynamics, Oxford and IBH Publishing company, New Delhi, 1976.
- Y. A. Cengel, J.M. Cimbala , Fluid Mechanics: Fundamentals and Applications, McGraw-Hill, 2006.

Reference Books:

- G. K. Betchelor, An Introduction of Fluid Mechanics, Oxford University Books, New Delhi, 1994.
- F. Charlton, Text Book of Fluid Dynamics, C.B.S. Publishers, Delhi. 1985

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PROJECT

Course Code: MTH4437 **Credit Units: 06**

GUIDELINES FOR PROJECT REPORT: The Project Report is the final research report that the student prepares on the project assigned to him/her. The following components should be included in the project report:

1) Title or Cover Page: The title page should contain Project Title; Student's Name; Programme; Year and Semester and Name of the Faculty Guide.

2) Acknowledgement(s): Acknowledgment to any advisory or financial assistance received in the course of work may be given. It is incomplete without student's signature**.**

3) Abstract: A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project.

4) Table of Contents: Titles and subtitles are to correspond exactly with those in the text.

5) Introduction: Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided**.**

6) **Results and Discussion:** Present results, discuss and compare these with those from other workers, etc. In writing this section, emphasis should be laid on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books.

7) Conclusion(s) & Recommendations: A conclusion should be the final section in which the outcome of the work is mentioned briefly. Check that your work answers the following questions: Did the research project meet its aims (check back to introduction for stated aims)? What are the main findings of the research? Are there any recommendations?

8) **References:** References should include papers, books etc. referred to in the body of the report. These should be written in the alphabetical order of the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system

The Layout Guidelines for Project Report:

1)A4 size Paper

2) Font: Arial (10 points) or Times New Roman (12 points)

3) Line spacing: 1.5

4)Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3cm

Assessment Scheme: Continuous Evaluation: 40% (Based on punctuality, regularity of work, adherence to plan and methodology, refinements/ mid-course corrections etc. as reflected in the Project File.)

Final Evaluation: 60% (Based on the Documentation in the file, Final report layout, analysis and results, achievement of objectives, presentation/ viva)

It is recommended that the Final evaluation should be carried out by a panel of evaluators.

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CLASSICAL MECHANICS

Course Code: MTH4410 **Credit Units: 04**

Course Objectives:
A detailed exposition of classical mechanics for the student, opting for physics is so vitally important for a clear understanding of recent intricate theories of quantum mechanics, modern physics and research for they are built an well developed and conceptualized foundation.

Course Contents:
Module-I: Lagrangian Formulation Mechanics of a system of particles, constraints, D'Alembert's principle, Variational calculus and its applications, Lagrangian equations, conservation theorems and symmetry properties, applications of Lagrangian formulation.

Module-II: Central Force Problem Reduction to one body problem, equation of motion and first integral, one dimensional problem and classification of orbits, Differential equation for the orbit, Kepler problem and planetary motion, Rutherford formula, scattering in central force field, transformation to laboratory frames.

Module-III: Rigid Body and Vibrating System Euler angles, tensor of inertia, kinetic energy of a rotat- ing body, symmetric top and applications. Vibrating string, solution wave equation, normal vibrations, dispersion, coupled vibrating system. Non linear Dynamics, phase trajectories.

Module-IV: Hamiltonian Formulation Hamiltonian equation of motion, Hamilton's equation in different co-ordinate systems example in Hamiltonian dynamics, two dimensional harmonic oscillator the equations of canonical transformations, cyclic coordinates, phase space and Liouville's theorem, Poisson bracket. Lagrange brackets, general Poisson bracket under canonical transformation.

Examination Scheme

Components	A	CT	HA	EE
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, Seminar, or Quiz, EE: End Semester Exam

References:

- H. Goldstein, Classical Mechanics, 2nd edition, Narosa Publishing House(1994).
- W. Greiner, Classical Mechanics, Springer-Verlag(2003).
- Introduction to classical mechanics R.G.Takwall and P.S.Puranik, Tata McGraw Hill, 1980, New Delhi.
- Classical mechanics N.C.Rana and P.S.Joag, Tata McGraw Hill, 1991, New Delhi.

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BIOMECHANICS

Course Code: MTH4412 **Credit Units: 04**

Course Objectives:
The objectives of this course are to study the mechanics of flow of blood in human beings and movement of insects, spread of viruses etc by using mathematical tools like ordinary differential equation, partial differential equation, Calculus of variation, Laplace Transforms etc.

Course Contents:
Module-I: Mathematical Aspects of population biology; Some fundamental aspects, Models and their mathematical formulations, Single species models, Stability and classification of equilibrium points, Relationship between eigen values and critical points.

Module-II: Introduction to Biological Fluid Mechanics: Basic concepts of Fluid Dynamics, Fluid Parameters, Viscosity, Navier- Stokes Equations of viscous fluid motion, Poiseuille's flow, Model for blood flow, Properties of blood, Pulsatile Flow of blood sedimentation.

Module-III: Modeling through partial differential equations: simple models, mass balance equations, Variational principles, probability generating function, traffic flow problems, initial & boundary conditions.

Module-IV: Study of alcohol in the blood stream; Volume of blood in human body; Stochastic epidemic model; Genetic graphs; Food webs: Linear programming in forest management; Mathematics in fisheries; Case studies on anchovy wipe out.

Examination Scheme

Components	A	CT	HA	EE
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, Seminar, or Quiz, EE: End Semester Exam

References

- Brauer, F., Driessche, P. V. D. and Wu, J., Mathematical Epidemiology", Springer,2008.
- Murray, J. D., Mathematical Biology", Springer,1993.
- Kapur, J.N., Mathematical modeling", New Age International Publishers, New Delhi,2015.
- Fung, Y. C., Biomechanics", Springer-Verlag,1990.
- Keshet, L. E., Mathematical Models in Biology", SIAM,1988.

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STOCHASTIC PROCESSES

Course Code: MTH4414 **Credit Units: 04**

Course Objectives:
To introduce the basic concepts of stochastic processes.

Course Contents:
Module-I: Poisson Process: Inter-arrival and waiting time distributions, conditional distributions of the arrival times, non-homogeneous Poisson process, compound Poisson random variables and Poisson processes, conditional Poisson processes.

Module-II: Markov Chains: Introduction and examples, Chapman-Kolmogorov equations and classification of states, limit theorems, transitions among classes, the Gamblers ruin problem, mean time in transient states, branching processes, applications of Markov chain, time reversible Markov chains, semi Markov processes.

Module-III: Continuous-Time Markov Chains: Introduction, continuous time Markov chains, birth and death processes, The Kolmogorov differential equations, limiting probabilities, time reversibility, applications of reversed chain to queueing theory.

Module-IV: Brownian Motion and other Markov Processes: Introduction, hitting time, maximum variable, Arc sine laws, variations on Brownian motion, Brownian motion with drift, backward and forward diffusion equations.

Examination Scheme

Components	A	CT	HA	EE
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, Seminar, or Quiz, EE: End Semester Exam

References

- Ross, S. M., Stochastic Processes" Wiley India Pvt. Ltd., 2nd Ed.2008.
- Brzezniak, Z. and Zastawniak, T., Basic Stochastic Processes: A Course through Exercises", Springer,1992.
- Medhi, J., Stochastic Processes", New Age Science,2009.
- Resnick, S.I., Adventures in Stochastic Processes", Birkhauser,1999.
- Hoel, P.G. and Stone, C.J., \Introduction to Stochastic Processes", Waveland Press,1986

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STATISTICAL INFERENCE

Course Code: MTH4415 **Credit Units: 04**

Course Objectives:
To introduce the concepts of statistical inference.

Course Contents:
Module-I: Point estimation. Characteristics of a good estimator: Unbiasedness, consistency, sufficiency and efficiency. Method of maximum likelihood and properties of maximum likelihood estimators (without proof). Method of minimum Chi-square. Method of Least squares and method of moments for estimation of parameters. Problems and examples.

Module-II: Sufficient Statistics, Cramer-Rao inequality and its use in finding MVU estimators. Statistical Hypothesis (simple and composite). Testing of hypothesis. Type I and Type II errors, significance level,
p-values, power of a test. Definitions of Most Powerful (MP), Uniformly Most Powerful (UMP)and Uniformly Most Powerful Unbiased (UMPU)tests.

Module-III: Neyman-Pearsons lemma and its applications for finding most powerful tests for simple hypothesis against simple alternative. Tests based on t, F and X^2distributions.

Module-IV: Likelihood ratio tests and their reduction to standard tests. Large sample tests. Interval estimation, Pivotal quantity and its use in finding confidence intervals, concept of best confidence intervals.

Examination Scheme:

Components	A	CT	HA	EE
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, Seminar, or Quiz, EE: End Semester Exam

References

- Hogg & Craig, Introduction to Mathematical Statistics", Pearson Education,2005.
- Miller, I. and Miller, M., Freunds Mathematical Statistics with Applications", Prentice Hall PTR, 7th edition,2006.
- Lehman, E.L., Testing of Statistical Hypothesis", Wiley Eastern Ltd,1959
- G. Casella, R. L. Berger, \Statistical Inference", Duxbury Press,2002.
- Rohatgi, V.K., Statistical Inference", Dover Publications,2011.

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NUMERICAL SOLUTIONS TO ODE AND PDES

Course Code: MTH4416 **Credit Units: 04**

Course Objectives:
The course covers few classical and contemporary methods for solving initial and boundary value problems. Finite difference operators and their application to solve various types of PDEs shall be introduced in the course.

Course Contents:
Module-I: Iterative solvers for nonlinear equations and system of linear equations: Iterative method and Newton's method for system of nonlinear equations; Iterative methods to solve system of linear equations including Gauss-Seidel and Jacobi's method with pivoting; Concept of norms and condition number; Application of these methods for test problems using MATLAB codes.

Module-II: Initial value Problems Single-step methods: General definitions and Lipschitz condition, Derivations and stability analysis for Taylor series method, Euler's method and its variants, Runge-Kutta second order and fourth order methods; Implementation of these methods for various test problems using MATLAB.

Module-III: Initial value Problems Multi-step methods: General definitions and derivations of Adams Bashforth, Adams Moulton methods, Predictor-corrector method; stability analysis of these methods and application of these methods for some test problems using MATLAB.

Module-IV: Introduction to Finite difference methods General concepts of truncation error and stability for a finite difference scheme; Numerical solution of one-dimensional heat equation, including Explicit Euler, Backward Euler, Crank-Nicolson schemes with various type of boundary and initial conditions; Laplace Equations and Poisson's equations with different type of boundary and initial conditions.

Examination Scheme

Components	A	CT	HA	EE
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, Seminar, or Quiz, EE: End Semester Exam

Recommended Books:
- Numerical Methods in Engineering and Science by B. S. Grewal, Khanna Publishers,2014
- Numerical Methods for Scientific and Engineering Computation by Jain, Iyengar, Jain, New Age International Publishers, 1996
- Elements of Numerical Analysis by Radhey S Gupta, Macmillan India Ltd,2008.

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Curriculum & Scheme of Examination

2023

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CLASSICAL MECHANICS

Course Code: PHY4102 **Credit Units: 04**

Course Objective:
A detailed exposition of classical mechanics for the students, opting for physics is vitally important for a clear understanding of recent intricate theories of quantum mechanics, Modern Physics and research to build a well developed and conceptualized foundation.

Course Contents:

Module I: Symmetries and Conservation Laws
Mechanics of a system of particles, constraints, D'Alembert's principle, Variational calculus and its applications, Hamiltons variational Principle, Lagrangian equations, applications of Lagrangian formulation, conservation theorems and symmetry properties.

Module II: Hamiltonian Formulation
Hamiltonian equation of motion, applications of hamiltonian formulation, Principle of least action, the equations of canonical transformations, cyclic coordinates, phase space and Liouville's theorem, Poisson bracket, Jacobi's Indentity .

Module III: Central Force Problem
Reduction to one body problem, equation of motion and first integral, one dimensional problem and classification of orbits, Differential equation for the orbit, Kepler problem and planetary motion, Rutherford formula, scattering in central force field, transformation to laboratory frames.

Module IV: Rigid Body and Vibrating System
Euler angles, tensor of inertia, kinetic energy of a rotating body, symmetric top and applications.
Vibrating string, solution wave equation, normal vibrations, dispersion, coupled vibrating system.

Examination Scheme:

Components	CT	HA	S/V/Q	Attendance	EE
Weightage (%)	10	8	7	5	70

CT – Class Test, S/V/Q – Seminar/Viva/Quiz, HA – Home Assignment, EE – End Semester Examination

Text & References:

- H. Goldstein, Classical Mechanics, 2nd edition, Narosa Publishing House (1994).
- W. Greiner, Classical Mechanics, Springer-Verlag (2003).
  Classical mechanics – S.L.Gupta, Meenakshi Prakashan, 1970, New Delhi.
- Introduction to classical mechanics – R.G.Takwall and P.S.Puranik, Tata – McGraw Hill, 1980, New Delhi.
- Classical mechanics – N.C.Rana and P.S.Joag, Tata McGraw Hill, 1991, New Delhi.

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ELECTRONICS

Course Code: PHY4103 **Credit Units: 04**

Course Objectives

The objective of this course is to

- To provide an overview of basic combinational circuits-logic gates, flip-flops, registers, operational amplifier, modulation techniques and integrated circuit fabrication.
- To serve as the foundation for practical lab experiments.

Course Outcomes

On completion of this course, the students will be able to

CO1 Clearly understand the basics of digital electronics.
CO2 Understand the Integrated Circuit Fabrication and Technology.
CO3 Clearly define the characteristics of an operational amplifier.
CO4 Clearly understand the concept of modulation and demodulation

Catalog Description

This course gives a comprehensive view of the digital electronics, integrated circuit fabrication and technology, operational amplifiers, modulation and demodulation techniques. It covers the basic operation and some common applications.

Course Content

Module I: Combinational Circuits **12 Lectures**

Truth tables Logic gates: OR, AND, Inverter gates, The Universal NOR and NAND gates, XOR and XNOR gates, De-Morgan's Theorem, Reduction Technique Karnaugh map simplification. Parity check. The half adder, the Full adder, half and full subtractor.
Sequential Logic: Latches, R.S. Flip/Flop, The D.Flip/Flop, T.Flip/Flop, J.K. Flip/flop, Master/ slave flip/flop, Race Problem. Universal Shift Register, shift counter, Ring Counter.

Module II: Operational Amplifiers **16 Lectures**

The ideal Op-Amp-inverting, non-inverting and differential amplifiers-CMRR; Op-Amp IC building blocks-emitter coupled differential amplifier, active load, level shifting and output stage; Op-Amp characteristics-open-loop input output characteristics, frequency response and slew rate; Op-Amp applications-adder, subtractor, integrator, differentiator, comparator, voltage-to-current converter, current-to-voltage converter and logarithmic amplifier.

Module III: Modulation Techniques **12 Lectures**

Definition, Amplitude modulation, Methods of Amplitude Modulation, Frequency Modulation, Phase Modulation, Pulse Modulation Systems- PAM, PWM, PPM, PCM, Delta Modulation, Principle of AM Detection. Digital modulation schemes: amplitude, phase and frequency shift keying schemes (ASK, PSK, FSK). Multiplexing - time division and frequency division. Applications of Modulation.

Module IV: Integrated Circuit Fabrication **8 Lectures**

Integrated-Circuit Technology, Advantages and limitations of Integrated Circuits, Basic Monolithic Integrated Circuits, Epitaxial Growth, Masking and Etching, Diffusion of Impurities, Integrated Capacitors and Inductors, Large-Scale and Medium-Scale Integration, Metal-Semiconductor Contact

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	CT	HA	S/V/Q	A	EE
Weightage (%)	15	5	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, A: Attendance; EE: End Semester Examination;

Text & References:

- Hand Book of Electronics, Gupta & Kumar, Pragati Prakashan.
- Integrated Electronics: Analog and Digital Circuits and Systems, Jacob Millman and Christos C. Halkias, Tata McGraw-Hill.
- Digital Principles and Applications by A.P. Malvino and D.P. Leach, Tata McGraw-Hill, Publishing Co., New Delhi.
- Text Book of Electronics by S. Chattopadhyay, New Central Book Agency P.Ltd., Kolkata, 2006.
- Electronics Principles by Malvino, 6th Edition, Tata McGraw-Hill Publishing Co., New Delhi, 2001.
- Electronics Principles and Applications by A.B. Bhattacharya, New Central Book Agency P.Ltd., Kolkata, 2007.

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QUANTUM MECHANICS-I

Course Code: PHY4109 **Credit Units: 04**

Course Objective:

Course Contents:

Module I: Introductory concepts
A quick review of failure of classical Physics, Wave particle duality, Wave-packet, Uncertainty principle and its applications
Schrodinger's time dependent equation; Statistical interpretation of wave function, normalization, probability current density, expectation values, Ehrenfest's theorem, Time independent Schrodinger equation, stationary states, orthogonality, Energy, linear momentum and angular momentum operators.

Module II: General Formalism
Linear vector space, linear operators, eigenfunction and eigenvalues, Herimtian operator, Postulates of Quantum Mechanics, Simultaneous measurability of observables, General Uncertainty relation, Dirac's notation (bra & ket), Schrodinger and Heisenberg representation.

Module III: Applications
Quick review of particle in 1D and its extension to 3D box, degeneracy of energy states. Square potential barrier, quantum tunneling and alpha emission. Harmonic Oscillator using operator method, creation and annihilation operators.

Module IV: Hydrogen atom and angular momentum
Schrodinger equation in three dimension (spherical coordinates), separation of variables, radial equation, angular equation, spherical harmonics, angular momentum and their commutation relation, L^2 and L_z operators, Ladder operator.

Examination Scheme:

Components	TA	CT	Attendance	EE
Weightage (%)	10	15	5	70

TA: Teacher Assessment, CT: Class Test EE: External Examination

Text:

- Introduction to Quantum Mechanics by David J Griffiths
- Feynmann Lectures in Physics, vol. 3

References

- Modern Quantum Mechanics by J.J. Sakurai and San Fu Tuan (Addison Wesley)
- Quantum Mechanics by L.I. Schiff (Mc Graw Hill)
- Quantum Physics by S. Gasiorowics (John Wiley)
- Advanced Quantum Mechanics by Paul Roman (Addison Wesley)
- Quantum Mechanics by J. L. Powell, B. Crasemann

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COMPUTATIONAL PHYSICS

Course Code: PHY4110 **Credit Units: 04**

Course Objective:
This course aims at exposing the students to basic Computational Physics which will be useful for them to solve the problems of Physics.

Course Contents:

Module I Introduction to MATLAB and Plotting: vector and matrix generation, subscripting and the colon notation, matrix and array operations and their manipulations, introduction to some inbuilt functions. Two & three-dimensional graphics: basic plots, change in axes and annotation in a gure, multiple plots in a gure, saving and printing gures, mesh plots, surface plots and their variants.

Module II m-files: scripts and user de ned functions, calling functions into a script le, subfunctions, and nested functions, concept of local and global variable, few examples of in-built functions, editing, saving m- les.

Module III Loops and Conditional statements: Flow control using various statements and loops in-cluding For-End and While-End loops with Break commands. Conditional Statements: If-End statement, If-Else-End statement, nested If-Else-End statements.

Module IV Applications of MATLAB: Introduction to builtin functions: related to matrix inversion, eigenvalues, eigenvectors, condition number; for data representation: bar charts, histograms, pie chart, stem plots etc; for solving various type of di erential equations; for specialized plotting e.g., contour plots, sphere, and animations.

Examination Scheme:

Components	A	CT	HA	EE
Weightage (%)	5	15	10	70

CT: Class Test, HA: Home Assignment, EE:End Semester Exam, A: Attendance

Reference Books:

- Applied Numerical Methods with Matlab for Engineers and Scientists by Steven Chapra, McGraw Hill, 2008.
- MATLAB: An introduction with applications: Amos Gilat, 5th Edition, Wiley India, 2014.
- Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers by Rudra Pratap, Oxford University Press, 2016

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INTEGRATED PHYSICS LAB-I

Course Code: PHY4111 **Credit Units: 03**

List of Experiment (Any Eight)

1. Data and error analysis.
2. Plotting and curve fitting software
3. Use of the instruments CRO, multimeter.
4. To design and study various aspects of frequency modulation and demodulation. PAM, PWM and PPM Modulation and demodulation.
5. To study the frequency response of an operational amplifier & to use operational amplifierfor different mathematical operations.
6. To design and study the characteristics of a regulated power supply and voltage multiplier circuits.
7. To design a rectangular/triangular waveform generator using Comparators and IC8038.
8. To design (i) Low pass filter (ii) High pass filter; (iii) All-pass filter; (iv) Band pass filter (v)Band-reject passive filter.
9. To design and study logic gates and flip flop circuits.
10. Use of timer IC 555 in astable and monostable modes and applications involving relays, LDR.
11. The Torsional Pendulum and Moment of Inertia
12. Study of the Coriolis effect.
13. Determination of Lande's factor using ESR spectrometer.
14. To plot the polar curve of a filament lamp and to determine its mean spherical intensity.
15. Raman effect in liquids.
16. Rydberg's constant using constant deviation prism.

Examination Scheme:

Components	TA	V	LR	Attendance	EE
Weightage (%)	7	10	8	5	70

TA : Teacher Assessment, V: Viva, LR: Lab Record EE: External Examination

Text & References:

- J. Milman and C.C. Halkias, Electronic Devices and Circuits, McGraw-Hill (1981).
- A.P. Malvino, Electronics: Principles and Applications, Tata McGraw-Hill (1991).
- G.B. Calyton, Operation Amplifiers, ELBS (1980).
- J. Millman and C.C. Halkias, Integrated Electronics, Tata McGraw Hill (2001).
  R. A. Gayakwad, op-Amps and Linear IC'S, Pearson Education (2003)
- R. P. Singh and S. D. Sapre, Communication Systems: Analog and Digital, Tata McGraw Hill (2007)

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STATISTICAL MECHANICS

Course Code: PHY4202 **Credit Units: 04**

Course Objective: The aim of the course is to introduce the concept of statistical mechanics and applications to various problems in applied Physics.

Course Contents:

Module-I:

Kinetic theory of gas, Probability concepts in statistical mechanics, Random walk problem, General Aspects of Probability Distributions

The Statistical Basis of Thermodynamics, The macroscopic and the microscopic states, Contact between statistics and thermodynamics, Entropy on microscopic scale, physical significance of the number Ω(N,V,E), Thermodynamic equilibrium, Mechanical equilibrium, Chemical equilibrium, Review of phase space, Liouville's theorem, basic postulates of statistical mechanics, The classical ideal gas, The entropy of mixing and Gibb's paradox, Sackur tetrode equation of entropy, Correct Boltzmann counting

Module II Elements of ensemble theory, microcanonical, canonical, grand canonical ensemble, quantum states and the phase space, equilibrium between system and a heat reservoir, partition function, physical significance of the various statistical quantities in the canonical ensemble, The classical systems, energy fluctuations in the canonical ensemble, statistics of paramagnetism, Boltzmann's equation, Maxwell & Boltzmann statistics, Equipartition theorem and its Simple applications, Virial theorem,. Maxwell velocity distribution, related distributions and mean values.

Module III Equilibrium between a system and a particle- energy reservoir, density and energy fluctuations in Grand canonical ensemble, formulation of quantum statistics, Fermi-Dirac and Bose-Einstein statistics. Applications of the formalism to: (a) Ideal Bose gas, The field of sound waves, Einstein and Debye theory of specific heat, properties of black-body radiation, Bose- Einstein condensation, experiments on atomic BEC,(b) Ideal Fermi gas, properties of simple metals, Pauli paramagnetism, electronic specific heat, Compressibility of Fermi gas, A relativistic degenerate electron gas.

Module IV Phase transition, non-equilibrium statistical mechanics, Ising model, fluctuation-dissipation

Examination Scheme:

Components	CT	HA	S/V/Q	Attendance	EE
Weightage (%)	10	8	7	5	70

CT – Class Test, S/V/Q – Seminar/Viva/Quiz, HA – Home Assignment, EE – End Semester Examination

Reference books:

- Huang, Kerson. *Statistical Mechanics*. 2nd ed. Wiley, 1987. ISBN: 9780471815181.
- Pathria, R. K. *Statistical Mechanics*. Pergamon Press, 1972. ISBN: 9780080189949.
- Pippard, A. B. *The Elements of Classical Thermodynamics for Advanced Students of Physics*. University Press, 1966.
- Ma, Shang-keng. *Statistical Mechanics*. Translated by M. K. Fung. World Scientific Publishing Company, 1985. ISBN: 9789971966065.
- Landau, L. D., and E. M. Lifshitz. *Statistical Physics, Part 1*. 3rd ed. Pergamon Press, 1980. ISBN: 9780080230382.
- Reif, Frederick, ed. *Fundamentals of Statistical and Thermal Physics*. McGraw-Hill,

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1988.
- Feynman, Richard Phillips. *Statistical Mechanics: A Set of Lectures*. Westview Press, 1998. ISBN: 9780201360769.]
- Kardar, Mehran. *Statistical Physics of Particles*. Cambridge University Press, 2007. ISBN 9780521873420.

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QUANTUM MECHANICS-II

Course Code: PHY4208 **Credit Units: 04**

Course Objective:
The course is intended to introduce the concept of quantum mechanics to students at the advanced level so that they can solve problem of various branches of Physical Sciences.

Course Contents:

Module I: Spin & Identical Particles
Spin, Stern-Gerlach experiment, Pauli spin matrices, eigenvalues of J^2 and J_z, addition of angular momenta, Clebsh-Gordan coefficients.
Identical particles, particle exchange operator, symmetric and anti-symmetric wave functions, Pauli principle and Slater determinant, spin functions for system with more than one electron.

Module II: Perturbation theory
Time-independent perturbation theory: Basic concepts, Non-degenerate energy levels, degenerate perturbation theory, fine structure of Hydrogen, Spin-orbit coupling, Zeeman effect.
Time-dependent perturbation theory: 1st order perturbation, Fermi's Golden rule, absorption and emission of radiation, Einstein A and B coefficient.

Module III: Variational principle and WKB approximation
Theory of Variational principle; Ground state energy for 1D harmonic oscillator, Delta function potential, and He.
WKB approximation, classical region, tunneling, Gamow's theory of alpha decay, connection formula.

Module IV: Scattering theory and relativistic wave equation:
Scattering cross section, scattering amplitude, Centre of Mass frame, Laboratory frame, partial wave, scattering by a central potential (partial wave analysis), phase shift, Born approximation, Validity of Born Approx.
Klien-Gordon equation and its interpretation, Dirac equation for a free particle.

Examination Scheme:

Components	CT	HA	S/V/Q	ATTD	EE
Weightage(%)	10	7	8	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance
EE: End Semester Examination

Text & References:
- Quantum Mechanics: L.I. Schiff.
- Modern Quantum Mechanics: J.J. Sakurai.
- Introduction to Quantum Mechanics : C.J. Joachain and B.H. Bransden.
- Introduction of Quantum Mechanics: D.J. Griffiths
- Principles of Quantum Mechanics: P.A.M.Dirac.
- A text book of quantum mechanics – P.M Mathews and K.Venkatesan, Mc Graw Hill,
- Principles of Quantum Mechanic: R. Shankar.
- Quantum mechanics – J.P.Dicke and R.H.Wittke, Addison Wiley
- Quantum mechanics A. K. Ghatak and Lokanathan, Mc Millan

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ELECTRODYNAMICS

Course Code: PHY4215 **Credit Units: 04**

Course objective:
The course is suitable as core course for Master of Science Applied Physics students. The course is designed to familiarize and train the student with the tools and techniques used to assess the various problems of electrodynamics. The course provides the in-depth knowledge of electrostatics, magnetostatics, the cases of non-static current and charge densities and related changes. The course also aims at developing an ability to analyse the situation and to apply appropriate techniques to reach to solutions of a particular problem of electrodynamics.

Course Contents:
Module I-Electromagnetic (EM) Fields and Potentials
Dirac-delta function. Green's Theorem, Electrostatics: Laplace and Poisson equations; Dirichlet and Neumann boundary conditions; Method of images (point charge near a conducting plane and a sphere); Separation of variables in Cartesian and spherical coordinates. Magnetostatics: Curl and divergence of magnetic field; vector potential; Divergence of vector potential, Magnetic Scaler potential. Correction in the Ampere's law and Maxwell's equation.

Module II: Electromagnetic Waves and Propagation
EM waves in vacuum: Wave equation of E & B; Energy density of Fields and Poynting's theorem; conservation of momentum and Maxwell's stress tensor. Boundary conditions on field vectors D, E, B and H; Gauge transformations: Lorentz and Coulomb gauges. energy & momentum of EM waves; Propagation of EM waves in matter: propagation in linear media, reflection and transmission, Fresnel equation; Polarisation of Electromagnetic waves, Brewster's angle, EM waves in conducting media, skin depth, reflection and transmission in conducting media.

Module III: Guided Waves and Radiation Guided Waves: Electromagnetic waves in ionosphere, Wave guides; TE, TM and TEM modes; Rectangular wave guide; Dispersion of EM waves and Cauchy's formula, resonant cavity Radiation: Retarded Potentials, Lienard-Wiechert potentials; fields of a moving point charge; electric dipole radiation magnetic dipole radiation.

Module IV: Relativistic Electrodynamics Four vector formalism: Four vectors; Covariant and contravariant vectors; Transformation of Four vectors; Velocity, Current, Momentum and Potentials as four vectors. Lorentz transformation in four vector notation Covariance of Electrodynamics.
Examination Scheme:

Components	A	CT	S/V/Q	HA	E
Weightage (%)	5	10	10	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:
- Classical Electrodynamics by Jackson JD
- Introduction to electrodynamics, D. J. Griffith, Benjamin-Cummins(1999)
- Feynman Lectures in Physics,Vol.2
- Fields and Waves in Communication Electronics by S. Ramo, J.R. Whinnery and T.V.Duzer
- Electromagnetics – Kraus & Carver, TMH,1973

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ATOMIC AND MOLECULAR PHYSICS

Course Code: PHY4216 **Credit Units: 04**

Course Objective: The aim of this course is to give the basic ideas about the structure of atoms and molecules, electronic structure, interaction of radiation and external fields with atoms and molecules.

Course Contents:

Module I

Quantum states of one electron atoms, Hydrogen spectrum, Larmor's theorem, Magnetic moment and Bohr magnetron, Spin orbit interaction, hydrogen fine structure, Vector atom model, two electron systems, LS and jj Coupling schemes, spectroscopic terms, equivalent and non equivalent atoms, Helium atom spectrum, spectra of alkali atoms, Nuclear spin, magnetic moment, isotopic effect and Hyperfine structure, Normal and anomalous Zeeman effect, Paschen Back effect, Stark effect.

Module II

Rotational spectra of diatomic molecules as a rigid rotor and non rigid rotor, intensity of rotational lines, Diatomic molecule as a simple harmonic oscillator, vibrational energy of diatomic molecule, Anharmonicity, Vibrational-rotational spectra, Raman effect, quantum theory of Raman effect, rotational Raman spectra, vibrational Raman spectra .

Module III

Electronic band spectra, electronic energy and total energy, vibrational structure of electronic transitions, rotational structure of electronic bands, The branches(P,Q,R) of band, Band head formation. Intensities in electronic bands, Frank-Condon principle, Fortrat diagram.

Module IV

Interaction of atoms in the formation of molecules, covalent, ionic bonding and vander Waal's interactions, concept of molecular potential, Born-oppenheimer approximation, Electronic states of diatomic molecules, Electronic angular momenta, The LCAO approach, states for hydrogen molecular ion, Coulomb, exchange, overlap integral, symmetries of electronic wave functions. Term symbols for simple molecules.

Examination Scheme:

Components	A	CT	S/V/Q	HA	E
Weightage (%)	5	10	10	5	7

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & Reference Books:

- Arthur Beiser, Concepts of Modern Physics, 6th edition, Tata McGraw-Hill, New Delhi (2003).
- G. Aruldhas, Molecular Structure and Spectroscopy, Prientice Hall of India, NewDelhi (2002).
- I, Chapmen B.P. Straughan & S. Walker, Spectroscopy: Vol. and Hall (1976).
- G.M Barrow, Introduction to Molecular Spectroscopy, McGraw Hill Ltd., Singapore (1986).
- Introduction to Atomic Spectra, H. E. White, McGraw-Hill

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INTEGRATED PHYSICS LAB-II

Course Code: PHY4212 **Credit Units: 03**

List of Experiment (Any Eight)

1. Measurement of vacuum using the Pirani/thermocouple gauge.
2. Measurement of lattice parameters and indexing of powder patterns.
3. Determination grain size of the alloy by optical microscope.
4. Calculation of the optical band gap of the semiconductor by absorption spectroscopy.
5. Calculation of the grain size and strain in the samples from the XRD pattern data.
6. Production and measurement of high pressure.
7. To study temperature-dependence of conductivity of a given semiconductor crystal using four probe method.
8. To determine the Hall coefficient for a given semi-conductor.
9. To determine dipole moment of an organic molecule.
10. To study the lattice dynamics using LC analog kit.
11. To study the characteristic of J-H curve using ferromagnetic standards.
12. To determine the velocity of ultrasonic waves using interferometer as a function of temperature.
13. Temperature dependence of a ceramic capacitor - Verification of Curie-Weiss law for the electrical susceptibility of a ferroelectric material.
14. Tracking of the Ferromagnetic-paramagnetic transition in Nickel through electrical resistivity.
15. To study the characteristics of a PN junction with varying temperature & the capacitance of the junction.
16. (i) Study of the characteristics of klystron tube and to determine its electronic tuning range;(ii) To determine the standing wave ratio and reflection coefficient; (iii) To determine the frequency & wavelength in a rectangular waveguide working on TE10 mode; (iv) To study the square law behavior of a microwave crystal detector.
17. To determine the specific charge (e/m) of an electron.
18. To determine the charge of an electron using Millikan oil drop experiment.
19. To determine the emission spectra of hydrogen atom.
20. To study the Kerr effect using Nitrobenzene

Examination Scheme:

Components	TA	V	LR	Attendance	EE
Weightage (%)	7	10	8	5	70

TA: Teacher Assessment V: Viva LR: Lab Record EE: External Examination

Text & References:

- Charles Kittel, Introduction to Solid State Physics, Wiley Eastern, 5th edition.
- A.J. Dekker, Solid State Physics, Prentice Hall of India (1971).
- N.W. Ashcroft and N.D. Mermin, Solid State Physics, Saunders College Publishing (1976).
- Ali Omar, Elementary Solid State Physics, Narosa Publishing House.
- J.S. Blakemore, Solid State Physics, 2nd edition, Cambridge University Press (1974).

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NUCLEAR AND PARTICLE PHYSICS

Course Code: PHY4321 **Credit Units: 04**

Course Objective: The aim of the course is to introduce the concept of nuclear structure, nuclear forces and nuclear reactions for a clear understanding of recent intricate theories of nuclear physics. Course Contents:

Course Contents:

Module-I:

Nuclear Properties and Radioactivity Nuclear radii and measurements, nuclear binding energy (review), Radioactive decays : Review of barrier penetration of alpha decay & Geiger-Nuttal law. Beta decays, Fermi theory, Kurie plots and comparative half-lives, Allowed and forbidden transitions, Experimental evidence for Parity-violation in beta decay, Electron capture probabilities, Double beta decay, Neutrino, detection of neutrinos, measurement of the neutrino helicity. Multipolarity of gamma transitions, internal conversion process, transition rates, Production of nuclear orientation, angular distribution of gamma rays from oriented nuclei.

Module-II:

Two-Body Problems and Nuclear Forces Properties of deuteron, Schrödinger equation for the deuteron and the ground state; rms radius, spin dependence of nuclear forces, electromagnetic moment of deuteron and the necessity of tensor forces. Nucleon-nucleon scattering, experimental n-p scattering data, partial wave analysis of n-p scattering, phase shifts, singlet and triplet potentials, effective range theory, low energy p-p scattering, meson theory of nuclear forces, Charge independence and charge symmetry; spin dependence, S-wave effective range theory; central and tensor forces, dipole and quadruple moments of deuteron.

Module-III:

Nuclear Reactions Compound nucleus and Direct reactions (elastic, inelastic, transfer, break-up), Nuclear fusion, Laser induced fusion, Quantum mechanical theory, Resonance scattering and reactions, Dispersion relation, Nuclear fission: experimental features, spontaneous fission, barrier penetration, statistical model.

Module-IV: Nuclear Structure and Elementary Particle Physics 15 Liquid drop model, Shell model (extreme single particle), magnetic moment, quadruple moment; Collective models; concept of unified model Elementary particles, Various quantum numbers and their conservation, Gellmann Nishijima formula, C, P and T invariance, applications of symmetry arguments to particle reactions.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	10	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & Reference Books:

- J. M Blatt and V.E. Weisskipf: Theoretical Nuclear Physics
- B.K. Agrawal : Nuclear Physics, Lokbharti Pub, Allahabad. 1989
- RR Roy and B.P.Nigam, Nuclear Physics, Willey-Easter, 1979
- RD. Evans-The Atomic Nucleus(McGraw-Hills, 1955)
- B.L. Cohen - Concept of Nuclear Physics Tata Mc-Graw Hills, 1988
- Kenneth S. Krane, Introductory Nuclear Physics, Willey-Easter

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LASER PHYSICS

Course Code: PHY4322 **Credit Units: 03**

Catalog Description
This course is intended to give knowledge of basic principle of working of lasers, types of lasers and applications.

Course Objective:
1. To develop understanding of construction and operation of different Laser systems.
2. To understand advances in laser physics and its applications

Course outcome
Through this course students will learn following:
1) Fundamental principles of stimulated emission and how to convert it into coherent light emission, types of lasers
2) The manipulation of light e.g. mode selection, non linear optics.
3) Applications of various lasers in various fields including scientific research.

Course Contents:
Module I: Basics of Lasers
Stimulated Absorption, Stimulated Emission and spontaneous Emission, Einstein Coefficients, Light Amplification and Threshold condition, Widths and Profiles of Spectral Lines: Homogeneous and Inhomogeneous Broadening. Natural Linewidth. Doppler Width. Collision Broadening of Spectral Lines.

Module II
Basic principles of LASERS Laser Amplification. Laser Oscillation. Optical and Electrical Pumping. Optical Resonators. Losses in Resonators. Resonance Frequencies of Optical Resonators. Laser Modes. Rate Equations for Three-Level and Four- Level Lasers, Single-Mode Operation: Q-Switching, Mode Locking, Basic ideas of chirped pulse amplification

Module III
Types of Lasers. Solis State lasers (Ruby laser, Semiconductor laser, Nd: YAG laser), Gas lasers (He-Ne laser, Excimer laser), Liquid (organic dye) lasers.

Module IV
Nonlinear Optics, Harmonic Generation, Phase matching, Third Harmonic generation, Parametric oscillator, Applications of lasers: Holography, Basic idea of Mach-Zehnder Interferometer and Laser induced Fluorescence

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	10	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & Reference Books:
- Ajoy Ghatak, Optics 5th Ed., McGraw Hill
- K. Shimoda : Introduction to Laser Physics;(Springer-Verlag)

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INTEGRATED PHYSICS LAB-III

Course Code: PHY4316 **Credit Units: 03**

Course Contents:

1. Fabrication of thermocouple and calibration of the same for the temperature measurement.
2. Production and characterization of plasma.
3. Determination of the transition temperature of the materials undergoing phase transition and calculation of the transition enthalpy.
4. Determination of Young's modulus of steel by flexural vibrations of a bar.
5. To measure numerical aperture and propagation loss and bending losses for optical fibre as function of bending angle and at various wavelengths.
6. To determine wavelength of a given laser source.
7. To determine the Diameter, Divergence and Focus Spot Size of a Laser Beam.
8. To measure the degree of polarization using laser.
9. To study Propagation loss & bending loss using Optical Fiber
10. To study the characteristics of LED & Detector using Fiber Optic.
11. To determine the numerical aperture of a given optical fiber.
12. To study the frequency modulation & demodulation by using Fiber Optic Link.
13. To determine the Planck's constant using photocell
14. To determine the mean wavelength of sodium light and to measure the wavelength difference (Äë) using Michelson interferometer
15. To study the spectral characteristics of the incident beam using Fabry Perot Interferometer
16. To find the intensity distribution of single, double and multiple slit by using Fraunhofer diffraction pattern
17. To measure the grating element of grating by Fraunhofer diffraction pattern.
18. To determine the thickness of a thin transparent sheet using Michelson Interferometer.
19. To verify the Fresnel's formula for reflection and refraction by using a plane refracting surface using Spectrometer.
20. To determine the effect of magnetic field on the polarization state in dispersive medium (Faraday Experiment).

Examination Scheme:

Components	TA	V	LR	Attendance	EE
Weightage (%)	7	10	8	5	70

TA : Teacher Assessment, V: Viva, LR: Lab Record EE: External Examination

Text & References:

- J. Milman and C.C. Halkias, Electronic Devices and Circuits, McGraw-Hill (1981).
- A.P. Malvino, Electronics: Principles and Applications, Tata McGraw-Hill (1991).
- G.B. Calyton, Operation Amplifiers, ELBS (1980).
- J. Millman and C.C. Halkias, Integrated Electronics, Tata McGraw Hill (2001).
- R. A. Gayakwad, op-Amps and Linear IC'S, Pearson Education (2003).
- R. P. Singh and S. D. Sapre, Communication Systems: Analog and Digital, Tata McGraw Hill

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SUMMER INTERNSHIP EVALUATION

Course Code: PHY4335 **Credit Units: 03**

Methodology:

Practical training is based on the theoretical subjects studied by students. It can be arranged within the college or any in any related industrial unit or in any research lab. The students are to learn various industrial, technical and administrative processes followed in the industry/research. In case of on campus training the students will be given specific tasks of synthesizing /testing/analysis/characterization. On completion of the practical training the students are to present a report covering various aspects learnt by them and give a presentation of the same.

Examination Scheme

Feedback from Industry:	20
Training Report:	40
Viva:	15
Presentation:	25
Total	**100**

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DIGITAL ELECTRONICS AND MICROPROCESSORS

Course Code: PHY4306 **Credit Units: 03**

Course Objectives

The objective of this course is to

- To provide a detailed description of registers and counters, A/D and D/A converters, microprocessors and antenna action.
- To serve as the foundation for practical lab experiments.

Course Outcomes

On completion of this course, the students will be able to

CO1 Develop an understanding of the basic concepts of digital electronics- Boolean algebra and applications of logic gates.

CO2 Clearly define and explain different types of the flip-flops, registers and counters

CO3 Enumerate and explain the Analog-to-digital and Digital-to Analog Converters.

CO4 Explain the basics of the Microprocessor 8085 and 8086

Catalog Description

This course gives a comprehensive view of the digital electronics and its applications. It covers the basic idea of a microprocessor. The working principle and operation of the different types of logic gates, flip-flops, registers and counters, A/D and D/A converters will be studied in detail.

Course Contents:

Module I: Shift Registers and Counters **10 Lectures**

Universal Shift Register, shift counter, Ring Counter, D/A converter and A/D converter. Simultaneous and Counter method of A/D converter, Successive Approximation method, Seven segment LED display, BCD to seven segment decoder.

Logic Families: Transistor as a Switch, TTL integrated circuits, CMOS integrated circuit. Logic families and their characteristics, comparing Logic families, Interfacing. Introduction to VHDL and Programming techniques.

Module II: Introduction to Microprocessor **6 Lectures**

Microprocessor 8085: PIN Out and Signals, Internal architecture, Flags, Program counter. Introduction to 8085 Instruction Set: Data Transfer, Arithmetic & Logical Instruction, Branch and machine Code, OP-Code Format, Addressing Mode Timing Diagram. Machine Cycle.

Module III: Microprocessor: - Programming and Interfacing **10 Lectures**

Subroutine and Sub programming, CALL and RETURN, STACK, PUSH & POP, 8085 Interrupts, RST Code; SID, SOD, RIM and SIM; Delay Program Calculation, Memory Organization. (RAM, EPROM, ROM, PROM, DRAM.) Introduction to 8086 and registers. Addressing and Interfacing, Basic Interfacing Concept, Introduction to I/O and Memory Mapped Techniques, Handshaking, Interfacing I/O devices, Display, Keyboard, Generating Control Signals, De Multiplexing of address Bus, Programming Technique, Interfacing 8155, Programmable I/O Ports and Timer IC, Programmable Peripheral Interface 8255 with 8085. Interfacing of A/D and D/A converters, Study of 8279, 8253.

Module IV: Antennas **10 Lectures**

Antenna Action, Short Electric Doublet, Radiation from a Current Element, Thin Linear Antenna, Effect of Ground: Image Antenna, Short Vertical Grounded Antenna, Total Effective resistance and Efficiency of an Antenna, Yagi Antenna, Loop Antenna, Parabolic Reflectors, Antenna measurements, Broadband antenna principles, Practical Transmitting Antennas, Receiving Antennas,

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Difference in Receiving and Transmitting Antennas.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	CT	HA	S/V/Q	A	EE
Weightage (%)	15	5	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, A: Attendance; EE: End Semester Examination;

Text & References:

- Hand Book of Electronics, Gupta & Kumar, Pragati Prakashan.
- Integrated Electronics: Analog and Digital Circuits and Systems, Jacob Millman and Christos C. Halkias, Tata McGraw-Hill.
- Digital Principles and Applications by A.P. Malvino and D.P. Leach, Tata McGraw-Hill, Publishing Co., New Delhi.
- D. V. Hall, Microprocessors and Interfacing- Programming and Hardware, Tata McGraw Hill (1999)
- Microprocessor Architecture Programming and applications by R.S Gaonkar
- The Intel Microprocessors- Architecture, Programming and Interfacing, Pearson Education (2003)

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RENEWABLE ENERGY RESOURCES

Course Code: PHY4317 **Credit Units: 03**

Course Objective:
This is an introductory course to renewable energy technologies and potentials to the Science students aiming to explain basic concepts of Renewable Energy resources.

Course Contents:

Module I: Energy & Thermodynamics & Environmental impact
Heat Transfer in Renewable Energy Systems - conduction, convection and radiation, thermal aspects of energy generation Work, heat, and the first law of thermodynamics. Heat engines and the second law of thermodynamics. The Carnot cycle. Applications of the second law to various energy transformation processes: heat pumps and refrigerators; different engine cycles. Use of fossil fuel, Energy crisis, Global Warming, Carbon emission and climate change. Need for sustainable development and Renewable Energy

Module II: Solar Energy (Thermal and Photovoltaic)
Solar energy option, Environmental impact of solar power, physics of the sun, Thermonuclear reactions , Black body radiation, Spectral distribution, the solar constant, radiation on titled surface / earth, Solar thermal Energy, Application of solar energy in Solar thermal and solar photovoltaic system, Brief introduction to 3 generation of Solar cells,

Module III: Ocean, tidal , wave energy
Principle of ocean thermal energy conversion (OTEC), setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Fundamentals of tidal power, Potential and conversion techniques, mini-hydel power plants. Use of tidal energy, Limitations of tidal energy conversion systems.

Module IV: Geothermal and Wind Energy
Structure of earth's interior, earthquakes & volcanoes, Geothermal resources, Hot springs, Steam ejection, Principal of working, Types of geothermal station with schematic representation, Applications.
Properties of wind, Availability of wind energy in India, wind velocity, Wind machine fundamentals; types of wind machines and their characteristics, Horizontal and Vertical axis wind mills, Elementary design principles, Coefficient of performance of a wind mill rotor, Aerodynamic considerations in wind mill design, Recent development and applications

Module V: Hydrogen Energy and Bio-Gas
Properties of hydrogen in respect of it's use as source of renewable energy, Sources of hydrogen, Production of hydrogen; electrolysis of water, thermal decomposition of water, thermo chemical production bio-chemical production. Storage Issues of Hydrogen, Applications of hydrogen energy.
Biomass: Raw materials, Properties/ characteristics of bio gas, Principles of Bio-Conversion; Photosynthesis, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion, Transportation of bio gas, bio gas plant technology & status, Biomass cogeneration Energy recovery from urban waste, Power generation from liquid waste, Bio gas applications.

Examination Scheme:

Components	CT	HA	S/V/Q	Attendance	EE
Weightage (%)	15	5	5	5	70

CT – Class Test, S/V/Q – Seminar/Viva/Quiz, HA – Home Assignment, EE – End Semester Examination

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Text &References:

- Aldo V. da Rosa, ―Fundamentals of Renewable Energy Processes‖, 2005, Academic Press
- Bansal Keemann, Meliss," Renewable energy sources and conversion technology", Tata Mc Graw Hill.
- Kothari D.P., ―Renewable energy resources and emerging technologies‖, Prentice Hall of India Pvt. Ltd.
- Rai G.D, "Non-Conventional energy Sources", Khanna Publishers.
- Ashok V. Desai, "Nonconventional Energy", New Age International Publishers Ltd.
- Tiwari and Ghosal, ―Renewable energy resources‖ Narosa Publication.
- K Mittal ―Non-Conventional Energy Systems‖ , Wheeler Publication
- Twidell& Weir, ―Renewable Energy Sources‖
- Ramesh & Kumar, ―Renewable Energy Technologies‖, Narosa Publications.

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INTRODUCTION TO ASTROPHYSICS

Course Code: PHY4318 **Credit Units: 03**

Course Objective: To develop an understanding and appreciation of the laws of the Universe. A survey of modern astronomy covering topics about the solar system, galaxies, evolution of stars and methods used to explore the Universe.

Course Contents:

Module-I: Spectrum of EM radiation, and observation in different wavelength bands, atmospheric window. Different types of telescope, Limit of Resolution and resolving power.
Overview of major contents of universe, Black body radiation, specific intensity, flux density, luminosity, Apparent and absolute magnitudes, Bolometric magnitude, Basics of radiative transfer (Emission/absorption coefficients, source functions).

Module-II: Sun as a star: Basic parameters e.g. Solar constant, luminosity, effective temperature, mass, density etc.; Hydrostatic equilibrium, central temperature and pressure at centre of the Sun. Source of energy in the stars: Kelvin-Helmholtz timescale; possibility of thermonuclear reactions.

Module-III: Solar System: Various components of the solar system, Planets, their satellites, atmosphere at different planets, formation of the solar system.
The Galaxy: Size and shape of the Milky Way; interstellar extinction and reddening (qualitative); different types of Nebulae; orbits of stars and epicycle theory; stellar populations.

Module-IV: Morphological classification of galaxies; rotation curve and idea of dark matter; Active galaxies (basic understanding); clusters of galaxies and large scale distribution
Expansion of the universe; Hubble law and Hubble constant; Big-bang picture and Cosmic microwave background radiation (qualitative discussion).

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- The Physical Universe: An introduction to Astronomy by Frank H. Shu
- Astrophysical concepts by Harwit Martin
  Astrophysics for Physicists by Arnab Rai Choudhuri
- An Introduction to modern Astrophysics by Bradley W. Carroll and Dale Ostile, Pearson Addison-Wesley
- http://www.iucaa.ernet.in/~dipankar/ph217/
- http://nptel.iitm.ac.in/courses/115105046

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EXPERIMENTAL TECHNIQUES

Course Code: PHY4410 **Credit Units: 04**

Course Objective: The objective of the present course is to introduce some advanced measurement, characterization and analytical methods commonly used in experimental physics research to the post graduate students.

Course Contents:

Module I: Vacuum Techniques: Basics: Introduction to vacuum technique, units, ranges, review of Kinetic theory of gases, Physical parameters at low pressures, Throughput, different vacuum pumps for production of low, medium, high and ultra- high vacuum. Vacuum gauges (Mc Leod, Knudsen, Pirani, Penning and Ionization gauges), Leak detection, Industrial & Scientific applications.

Module II: Diffraction and Microscopic Techniques: X-Ray diffraction, Electron diffraction, neutron diffraction, Transmission electron microscope (TEM), Scanning electron microscope (SEM), Energy dispersive X-ray analysis techniques (EDX). Atomic Force microscope (AFM), Surface Tunnelling microscopy (STM).

Module III: Spectroscopy & Thermal Techniques UV-VIS spectroscopy, photoluminescence, Infra-red spectroscopy, Raman spectroscopy, Photoelectron spectroscopy (XPS, UPS, AES). Thermal Techniques: TG, DTA, DSC. Scanning Thermal Microscopy (SThM)

Module IV: Accelerators & Detectors Van deGraff Accelerator, Tandem Accelerator, Linear Accelerator (LINAC), Cyclotron, Betatron, Synchrocyclotron, Synchrotron. Detailed study of Ionization chamber; Proportional counter, GM counter, Scintillation detector, photomultiplier tubes, photodiode, semiconductor diode detector.

Examination Scheme:

Components	CT	HA	S/V/Q	Attendance	EE
Weightage(%)	10	8	7	5	70

CT – Class Test, S/V/Q – Seminar/Viva/Quiz, HA – Home Assignment, EE – End Semester Examination

Text & Reference:

- Basic Vacuum Technology, A. Chambers, R.K. Fitch and B.S. Halliday. Taylor & Francis 1998.
- A Users Guide to Vacuum Technology, O'Hanlon. John Wiley & Sons.
- Measurement & Detection of Radiation, Nicholas Tsoulfanids, S Landsberger, CRC Press.
- Radiation Detection and Measurement, G F Knoll, John Wiley & Sons.
- Students solutions manual to Radiation Detection and Measurement, David K Wehe
- Measurement & Detection of Radiation, Nicholas Tsoulfanids, S Landsberger, CRC Press.
- Radiation Detection and Measurement, G F Knoll, John Wiley & Sons.
- Atomic Radiation Detection and Measurement, Harold S Renne, Lloyd J Austin, Literary Licensing.
- Nuclear Radiation Detectors, S. S. Kapoor, V S Ramamurthy, New Age International Publishers.

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NANO-SCIENCE AND TECHNOLOGY

Course Code: PHY4404 **Credit Units: 03**

Course Objective:
The objective of the present course is to introduce Nanoscience and nanotechnology. The course also provides the fundamentals of Nanoscience & nanotechnology and some of its applications. The course further provides the introduction of some of the Synthesis and characterization techniques.

Course Contents:

Module-I: Physics of Low-dimensional Materials -
Nano-materials and their types, Top down and bottom up approach. 1D, 2D and 0D confinement and Concept of quantum dots, quantum wires and quantum wells; Density of states for bulk materials, quantum wells, wires and dots; Importance of size distribution control, size measurement and size selection .

Module-II: Synthesis of Nanomaterials
Chemical methods: Sol-gel/Combustion method, Solvothermal, Chemical bath deposition Chemical vapour deposition, Homo- and hetero-nucleation growth methods, Co-precipitation method, Citrate precursor method. Sputtering and types:RF sputtering,DC sputtering and Magnetron sputtering. Thermal Evaporation, e-beam evaporation, Pulse Laser Ablation (PLD)

Module-III: Properties and Applications of Nanomaterials Physical and Mechanical properties of nanomaterials, Optical Properties, Electronic properties, Magnetic Properties, Electro-magnetic properties

Module-IV: Applications of Nanomaterials
Applications of carbon based nanostructured materials: CNT, Graphene and Fullerenes, Defense application, Medical Application, Mechanical Applications. Applications in communication, Water purification and Agriculture applications.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

A-Attendance; **CT**-Class Test; **S/V/Q**-Seminar/Quiz/Viva; **HA**-Home Assignment; **EE**-End Semester Examination

Suggested Books:

- Edelstein A. A. and Cammarata R.C., ¯Nanomaterials-Synthesis Properties and Applications‖, Institute of Physics Publishing, London, 1998.
- Poole, Jr. CP and Owens, FJ, ¯Introduction to Nanotechnology‖, Wiley India, 2006.
- Shik, A, ¯Quantum Wells: Physics and Electronics of two-dimensional systems‖, World Scientific, 1999.
- Benedek et al G., ¯Nanostructured Carbon for advanced Applications‖, Kluwer Academic Publishers, 2001.
- Harrison, P, ¯Quantum Wells, Wires, and Dots: Theoretical and Computational Physics‖, John Wiley, 2000.

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ATMOSPHERIC PHYSICS

Course Code: PHY4405 **Credit Units: 03**

Course Objectives:
Several fundamental aspects related to Physics, Thermodynamics and Chemistry of the Atmosphere and Oceans will be introduced to the students in order to make them understand, and apply the knowledge to the physico-chemical processes that influence the weather and climate.

Course Contents:

Module-I: Thermodynamics
Thermodynamics of dry and moist air, atmospheric stability and dry adiabatic lapse rate, moist processes in the atmosphere, saturated and unsaturated ascent, moist adiabatic and saturated adiabatic processes in the atmosphere, saturated adiabatic lapse rate, pseudo adiabatic processes and equivalent potential temperature, conditional instability second kind, moist convection, aerosols, condensation processes, formation of cloud droplets, precipitation.

Module-II: Ocean Morphology
Ocean physics, thermodynamics of sea water, observed temperature, salinity, and density in the ocean, density stratification, water mass distribution, coastal currents and upwelling, thermohaline circulation. Oceans currents, coupling of surface and deep ocean waters, basic foundation of turbulence, turbulent flows, turbulent vorticity, turbulence pressure, eddy diffusivity, coherent structures, surface fluxes, air-sea interaction, mixing processes in the ocean.

Module-III: Earth-Atmosphere Radiation Balance
Radiative transfer in atmosphere and ocean: Sun and climate, Planck function, black-body radiation, local thermodynamic equilibrium, radiometric quantities, absorption and emission, Schwarzchild's equation, radiative equilibrium in a grey atmosphere, balance between incoming solar and outgoing
thermal radiation, role of aerosols, absorption by atmospheric gases, heating rates, net radiative heating, Radiative transfer in atmosphere-ocean system.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

A-Attendance; **CT**-Class Test; **S/V/Q**-Seminar/Quiz/Viva; **HA**-Home Assignment; **EE**-End Semester Examination

References

- The Solid Earth: An Introduction to Global Geophysics [Paperback] C. M. R. Fowler, Cambridge University Press, 1990.
- Climate and the Oceans, Ed. Geoffray K. Vallies, Princeton University Press, 2012.
- Ocean Circulation: Wind-Driven and Thermohaline Processes, Ed. RuiZin Huang, Cambridge University Press, 2009.

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GENERAL RELATIVITY & COSMOLOGY

Course Code: PHY4406 **Credit Units: 03**

Course Objective:
This subject aims to provide an introduction to cosmology, including the physics of the early Universe, dark matter and dark energy, and the evolution of the observed large-scale structure.

Course Contents:

Module-I
Newtonian Cosmology, Einstein's universe, Cosmological Principle, Olbers' paradox, Hubble's observations and Expansion of the Universe, Cosmological redshift, Einstein equation for cosmology, Friedman models.

Module-II
Angular diameter distance and luminosity distance as cosmological tools, cosmological models with Ë term, Radiation dominated and matter dominated solutions. Thermal history of the Universe, radiation dominated universe, Big-bang nucleosynthesis, recombination, decoupling of matter and radiation, Horizon problem, flatness problem, introduction to inflation.

Module-III
Formation of large scale structures: Density fluctuations, Jeans mass in expanding universe, evidence of dark matter, growth of fluctuations, Dark matter candidates. Alternative to Friedman cosmology,
Mach's principle, introduction to Brans-Dicke theory

Module-IV
Measurement of Hubble constant, various methods (e.g. Cepheid stars, Tully-Fisher relation, SNIa, Surface brightness fluctuations, Fundamental Plane relation) and recent results. Cosmic microwave background, spectrum and anisotropy, power spectrum of fluctuations, Sunyaev-Zel'dovich effect in galaxy clusters. Latest observations of SNe Ia and evidence of dark energy, Matter-energy of the Universe.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Books Recommended:

- S. Weinberg- Gravitation and Cosmology: Principles and Applications of the General Theory of Relativity (Wiley, 1972).
- Peebles- Principles of Physical Cosmology
- Peacock- Cosmological Physics
- S. Banerji and A. Banerjee – General Relativity and Cosmology (Elsevier, 2007)
- J. V. Narlikar- Introduction to Cosmology (Cambridge Universe Press)

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OPTICAL FIBERS AND COMMUNICATION

Course Code: PHY4407 **Credit Units: 03**

Course Objective:
The objective of the present course is to introduce fundamentals of optical fibers, detectors and amplifiers and their applications in Physics.

Course Contents:

Module-I: Optical Fiber Fundamentals
Light propagation in optical fiber, Acceptance angle and numerical aperture, Losses in optical fiber: absorption loss scattering loss, bending loss, and splice loss. Pulse propagation in dispersive medium, pulse broadening, Intermodal and intramodal dispersion, group velocity dispersion (material and waveguide).

Module-II: Modal Analysis of step index multimode and graded index fiber
Characteristics equation of step index multimode fiber, Transverse Electric (TE), Transverse magnetic (TH) and Hybrid modes, linearly polarized modes, V parameter, mode cutoff, Mode field diameter, Modal analysis of graded index fiber.

Module-III: Optical Sources, Detectors and Amplifiers
Types of Optical Sources, Light emitting diodes (LED), Edge emitting LEDs, Coupling of LEDs with fibers, Semiconductor Lasers; Detectors: Photoconductors, Photodiodes, Avalanche Photodiodes and Phototransistors, Amplifiers: Semiconductor Laser Amplifiers, characteristics, advantages and drawback, Erbium Doped Fiber Amplifier (EDFA), gain and noise in EDFA and noise figure.

Module-IV: Fiber Optical Communication Components and System
Coupling Components- couplers, connectors and splices, Modulators and Modulation methods, Transmitters, Receivers, Repeaters and switches; Transmitter, Receiver and link design, Line codes for optical fiber links, wavelength division multiplexing (WDM) and Optical Division Multiplexing.

Examination Scheme:

Components	CT	HA	S/V/Q	Attendance	EE
Weightage (%)	10	8	7	5	70

CT – Class Test, S/V/Q – Seminar/Viva/Quiz, HA – Home Assignment, EE – End Semester Examination

Text & References:

- John. M. Senior, Optical fiber communications: principles and practice, Prentice Hall of India.
- Gerd Keiser, Optical fiber communications, McGraw Hill, 3rd edition.
- D. K. Mynbaev, L. L. Scheiner, Fiber optic communication technology, Pearson Technology.
- Introduction to fiber optics, Ajoy Ghatak and K. Tyagrajan.
- R. P. Khare, Fiber optic and optoelectronics, Oxford University press.
- Light wave Communication Systems: A practical prospective: R Papannareddy, Penrum International Publishing
- Fundamental of photonics, Saleh and Teich, Wiley Interscience, 2nd Edition, 2007.

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PHYSICS OF SOLAR PHOTOVOLTAICS

Course Code: PHY4408 **Credit Units: 03**

Course Objective:
In this course, one would learn about the fundamentals of photoelectric conversion: charge excitation, conduction, separation, and collection. You will become familiar with commercial and emerging photovoltaic (PV) technologies and various cross-cutting themes in PV: conversion efficiencies, loss mechanisms, characterization, manufacturing, systems, reliability, life-cycle analysis, and risk analysis

Course Contents:

Module I: Solar Cells and Sunlight
Outline of solar cell development, physical source of sunlight, review of solar intensity at the Earth's surface, solar insolation data

Module II: Review of Semiconductor Properties
Crystal structures and orientations, forbidden energy gaps, dynamics of electrons and holes, carrier density, carrier transport, generation and recombination of carriers due to light, direct and in-direct band gap semiconductors, basic device physics, p-n junction diode,

Module III: Standard Silicon Solar Cell Technology (1 st generation solar cells)
Photovoltaic effect , solar cell output parameters, characteristic lifetime, diffusion length, diffusion coefficient, absorption coefficient, efficiency limits, losses, and measurements. Review of fabrication technology, polysilicone and single crystal silicon cell technologies. Design of Solar Cells , Solar cells to solar module

Module IV: Thin Film Solar cells (2nd – Generation)
Polysilicone silicon, amorphous silicone, gallium arsenide solar cells, copper sulfide and cadmium sulfide solar cells, potential & drawbacks of currently manufactured technologies (single- and multicrystalline silicon, CdTe, CIGS, CPV)

Module V: Emerging Solar Cells technologies and concepts (3rd –Generation)
Organic solar cells, Dye-sensitized solar cells, Perovskite solar cells, GaAs solar cells, Thermo-photovoltaic approaches to overcome single junction efficiency limits, spectrum modification approaches, hot carrier solar cells, Quantum Dot solar cells

Examination Scheme:

Components	CT	Assignment	Attendance	EE(1)
Weightage (%)	15	10	05	70

Text & References:
- Solar Photovoltaics (Fundamentals, Technologies and Application) by Chetan Singh Solanki
- Martin A. Green, Solar Cells-Operating Principles, Technology, and System Applications
- M. S. Tyagi, Introduction to Semiconductor Materials and Devices
- Third Generation Photovoltaics (Advanced Solar Energy Conversion) By Martin A. Green; Lecture Notes

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BIOPHYSICS

Course Code: PHY4409 **Credit Units: 03**

Course Objective:
This course aims at exposing the students to basic Biophysics concepts which will be useful for them to solve the integrated problems of Biology and Physics.

Course Contents:

Module I: General Biophysics and Techniques in Biophysics
Fundamentals of Biophysics, Surface tension, Adsorption, Osmosis, Osmotic pressure, Dialysis, Colloids, Colloidal systems of life, Buffer, Buffer capacity, Buffers in life system, pH, its importance, Basics of spectroscopy, X-ray crystallography, NMR, UV etc

Module II: Molecular Biophysics
Different levels of protein structure, Primary, secondary, tertiary and quaternary structure. Main chain and side chain torsion angles, Alpha helix, beta sheet, turns. Ramachandran plot , Allowed conformations for a pair of linked peptide units, Motifs and domains.

Module III: Thermodynamics
Laws of thermodynamics, concept of free energy, unavailable energy and entropy, heat content of food, bomb calorimetry, chemical kinetics – rate, order, molecularity of reactions and energy of activation

Module IV: Simulations, Data Analysis and Visualization
Advantages and challenges in simulations of Biophysics, Basics of simulation software such as NAMD and/or GROMACS, Data Analysis of simulation generated data, Visualization software such as PyMol and VMD

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Biophysics by W Hoope Edtr., Springer – Verlag New York .
- Molecular Biophysics by R B Setlaw & EC Pollard, Addison Wesley Reading MA
- Essentials of Biophysics by P Narayanan, New Age International Publishers.

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RADIATION PHYSICS

Course Code: PHY4411 **Credit Units: 03**

Course Objective:
The objective of the course on Radiation Physics is to expose the students to the concepts of different kinds of radiations, their interaction with matter, radiation detection and radiation dosimetry. The course will enable students to understand that interaction of matter with different kinds of radiations such as charged particles, electrons, neutrons, EM waves etc. and further their technological applications primarily as radiological applications.

Course Contents:

Module I: Radiation Sources
Basic units and definitions, Fast electron sources: beta decay, internal conversion & Auger electrons; Heavy charged particle sources: Alpha decay & spontaneous fission; Sources of electromagnetic radiation: Gamma rays following beta decay, Annihilation radiation, Bremsstrahlung, Characteristic X-rays & Synchrotron radiations; Neutron sources: Radioisotope sources & photoneutron sources

Module II: Radiation Interaction
Interaction of heavy charged particles: Nature of interaction, stopping power, energy loss characteristics, The Bragg curve, Energy straggling, Range & Range straggling, Energy loss in thin absorbers; Interaction of fast electrons: Specific energy loss, Electron range and transmission curves, Interaction of gamma rays: Photoelectric absorption, Compton scattering, Pair production; Interaction of neutrons: Slow neutron & fast neutron interaction; Radiation exposure and dose: Gamma ray exposures, Absorbed Dose, Dose equivalent,

Module III: Radiation Detectors and Spectroscopy:
General characteristics of detectors: Detector model, Modes of detector operation, Energy resolution, Detector efficiency; Gas filled detectors, Organic and inorganic scintillation detectors, Semi-conductor detectors [Si(Li), Ge(Li) HPGe]. Photomultiplier tubes, Gamma ray spectrometers, Gamma ray spectrometry with NaI(Tl) scintillation and semiconductor detectors; Background and detector shielding.

Module IV: Radiation Dosimetry
Radiation dosimetry, its types and applications: Environmental, space, personal and medical dosimetry; General properties of dosimeter; Thermoluminescence (TL) and its mechanism; TL dosimetry: TL glow curve and TL spectra; Concept of trapping parameters: activation energy, order of kinetics & frequency factor; TLD protocols, optically stimulated luminescence (OSL) based dosimetry

Examination Scheme:

Components	A	CT	S/V/Q	H	E
Weightage (%)	5	10	10	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text Books

- Nuclear Radiation Detectors: S. S. Kapoor and V. S. Ramamurthy, New Age, International, New Delhi.
- Introduction to Radiological Physics and Radiation Dosimetry: Frank Herbert Attix, Wiley-VCH

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- The Atomic Nucleus: R.D. Evans, Tata Mc Graw Hill, New Delhi
- Thermoluminescence of Solids, S. W. S. Mckeever, Cambridge University Press

Reference Books

- Radiation Detection and Measurements: G. F. Knoll, Wiley & Sons, New Delhi.
- Introductory Nuclear Physics: K. S. Krane, Wiley & Sons, New Delhi.
- An Introduction to X-ray Spectrometry: Ron Jenkin, Wiley.
- Techniques for Nuclear and Particle Physics Experiments: W. R. Leo, Narosa Publishing House, New Delhi.
- Thermally and Optically Stimulated Luminescence: R Chen, V. Pagonis, John Wiley & Sons.

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HIGH ENERGY PHYSICS

Course Code: PHY4413 **Credit Units: 03**

Course Objective:
The aim of the course is to introduce the basic concepts of elementary particle physics and quantum field theory for a clear understanding of the universe at very fundamental level. Further, the students will be able to gain knowledge of the important concepts which are used in modern day particle physics experiments.

Course Contents:
Module I: Basic Concepts
Natural units, Cosmological origin of universe, Fundamental building blocks and interactions, Historical introduction to particle zoo, Cross section, Decay rate, Pseudo-rapidity, Discrete and Continous Symmetries, Isospin, Strangeness, Hypercharge, Parity, Meson and Baryon Octet, Baryon Decuplet, Eight-fold way, Charge Conjugation, Time Reversal, CP symmetry, CPT theorem, Feynman diagrams, Collider physics, Integrated Luminosity, Hybrid detectors.

Module II: Standard Model of Particle Physics
Gauge theory, Local and global symmetry, Spontaneous breaking of symmetry, Abelian and Non-Abelian gauge fields, Goldstone theorem, Higgs mechanism, Higgs field and coupling to three generations of matter, Gauge boson and fermion mass generation via spontaneous symmetry breaking, Elementary idea of CKM matrix, Basic introduction of Glashow-Weinberg-Salam theory.

Module III: QCD and Quark Model
Deep inelastic scattering, Quark model, Asymptotic freedom, Color confinement, Hadron formation, Flavor symmetry.

Module IV: Basic Idea of Beyond Standard Model Physics
Neutrino – types, oscillation and mass, Elementary idea of Supersymmetry & String theory, Dark matter & Dark Energy, New Physics.

Examination Scheme:

Components	CT	HA	S/V/Q	Attendance	EE
Weightage (%)	10	8	7	5	70

CT – Class Test, S/V/Q – Seminar/Viva/Quiz, HA – Home Assignment, EE – End Semester Examination

Text & References:
- Introduction to Elementary Particles, D. Griffiths (2nd Ed., Wiley-VCH, 2008)
- Quarks & Leptons, F. Halzen and A. D. Martin (John Wiley, 1984)
- An Introductory Course of Particle Physics, Palash B. Pal (CRC Press, 2015)
- Gauge Theory of Elementary Particle Physics: Problems and Solutions, T. P.
- Cheng and Ling-Fong Li (Oxford, 2000)
- Elementary Particles and the Laws of Physics, R. P. Feynman and S. Weinberg
- (Cambridge University Press, 1999)
- Introduction to High Energy Physics, D. H. Perkins (Cambridge University Press, 2000)

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Curriculum & Scheme of Examination

2023

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FCH4103	FORENSIC PHYSICS	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	2	0	0	2
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is intended to give insight of providing the basic knowledge about the physical evidence and its forensic applications. The students will be able to correlate the speed of vehicle in hit-n-run cases with skid marks analysis and paint examination. The course will help the students to differentiate between different fractures of glass.

Course Objective:

This course will cover:

1. Important physical evidences found at crime scene.
2. General characteristics and identification of physical evidences.
3. Examination and evidential value of important physical evidences.

Course Outcomes

On completion of this course, the students will be able to

CO1. Analyse the soil as evidence and to define the significance of its types, particle size and density in crime cases.

CO2. Identify and differentiate between various types of glasses and fractures.

CO3. Explain the importance of paint as evidence and its significance in hit-n-run cases.

CO4. Analyse the types of Tool marks and restoration of erased/ obliterated marks and their lifting and comparison.

CO5. Apply the analysis techniques like chromatography and spectroscopy for physical evidences.

Course Contents	Blooms level*	Number of hours
Module I: Soil Formation and types of soil, composition of soil, particle size distribution, composition and analysis of concrete, cement, and its types.	L1, L2	**7**
Module II: Glass Types of glass and their composition, Forensic examination of glass fractures, determination of direction of impact: cone fracture, rib marks, hackle marks, concentric and radial fractures.	L1, L2, L3, L4	**7**
Module III: Paint Types of paint and their composition, macroscopic and microscopic studies, pigment distribution, micro-chemical analysis. Importance of paint evidence in hit and run cases; Importance of fiber evidence; Forensic gemology	L1, L2, L3, L4	**7**

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Module IV: Tool Marks & Restoration of Erased / Obliterated Marks Types of tool marks: compression marks, striated marks, combination of compression and striated marks, repeated marks, class characteristics and individual characteristics, tracing and lifting of marks.	L1, L2, L4	**7**
Module V: Analysis Techniques **Soil**: microscopic examination, density gradient analysis, interpretation of soil evidence **Glass**: colour and fluorescence, physical matching, refractive index, and interpretation of glass evidence. **Paint**: Pyrolysis Chromatographic techniques, IR spectroscopy and Raman spectroscopy, interpretation of paint evidence, solubility test, Thin layer chromatography **Tool Marks**: Photographic examination of tool marks. Method of making-cast, punch, engrave; methods of obliteration, method of restoration.	L1, L3, L4	**8**

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings

- B. Caddy, Forensic Examination of glass and paints analysis and interpretation, ISBN 078405749 2001.
- Bengold and Nelson Morgan, Speech and Audio Signal Processing, John Wiley and Sons, USA, 1999.
- C.E. OHara and J.W. Osterburg, An Introduction to Criminalistic, Indiana University Press, Blomington, 1972.
- Denis Shaw, Physics in the Prevention and Detection of Crime, Contem Phys. Vol.17, 1976.
- F.W. Sears, M.W Zemansky, and H.D. Young, University Physics, Sixth Ed., Narosa, 1995.
- Nickolls, L.C., Scientific Investigation of Crime, Bulterwest, London, 1956.
- R. Saferstein, Forensic Science Handbook, Vols. I, II, (Ed), Prentice Hall, Eaglewood Cliffs, NJ; 1988.

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	3							1	2	3		3
CO2	1	3							1		3		
CO3	1	3							1		3		
CO4	1	3							1		3		

1: strongly related, 2: moderately related and 3: weakly related

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FCH4106	FORENSIC BALLISTICS	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	2	1	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description
The course is designed to provide basic and analytical knowledge of the firearms, types, firing range and the analysis of the GSR components.

Course Objective: - The objectives of the course:
1. To understand the basics of the projectile motion, ballistics, and role of ballistics in Forensic Science
2. Classification of different types of firearms and explosives.

Course Outcomes
On completion of this course, the students will be able to
CO1. Explain the history and types of Firearms
CO2. Describe various types of ammunition
CO3. Explain about the Internal and External ballistics.
CO4. Restate the concept of linkage of bullets and Cartridge Cases.
CO5. Describe the Gun Shot Residue and determination of range of firing.

Course Contents	Blooms level*	Number of hours
Module I: Introduction to Ballistics: Definition and scope, Firearms, Indian Arms Act, Types of evidences associated, History and mechanism of Muzzleloaders (Match lock, Wheel lock, Flint lock firearms), Briefs of Pinfire, Rimfire and Centrefire systems of cartridge, Characteristic features of the firearms, various types of modern firearms, classification of firearms on different basis, bore characteristics Different parameters of classification of firearms, Introduction to Shotgun, Revolver, Pistol, Rifle and Country Made/ Improvised Firearms. Proof marks of weapons.	L1, L2	7
Module II: Firearm Ammunition: Ammunition Components of Shotgun and Rifled firearm cartridges, Headstamp markings on ammunition. Various types of bullets and their compositional aspects, latest trends in their manufacturing and design, smooth bore, and improvised ammunition.	L1, L2, L3, L4	7

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Module III: Internal and external Ballistics: Internal Ballistics: Definition, shapes and manner of Propellant burning, Muzzle velocity and Factors affecting muzzle velocity, ballistic coefficient, phenomenon of ricochet External Ballistics: Definition- Bullet Trajectory and factors affecting bullet flight. Wound Ballistics: Definition of wound ballistics, Ballistic aspect of firearm injuries, significance of studying cavitations in body, Bullet Entry/Exit Hole Identification, Evaluation of accident, suicide, homicide firearm injuries.	L1, L2, L3, L4	**7**
Module IV: Bullet linkage: Different types of marks produced during firing process on bullet-number/direction of lands and grooves, width of lands and depth of grooves, angle and pitch of rifling, striation marks on lands and grooves, techniques for obtaining test material from various types of weapons and their linkage with fired ammunition, class, and individual characteristics.	L1, L2, L4	**8**
Module V:Range of Firing determination: Introduction and methods of estimation. Gunshot Residue: Introduction and methods of analysis. Bullet and Cartridges matching: Ejecta, burning, scorching, blackening, tattooing and metal fouling, shots dispersion and GSR distribution, time of firing – different methods employed, and their limitations, stereo & comparison microscopy, automatic bullet, and cartridge comparison.	L1, L3, L4	**7**

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

- Brain J. Heard; Handbook of Firearms and Ballistics; John Willey, England, 1997.
- D.A. Skoog, D.M. West and F.J. Holler; Analytical Chemistry: An Introduction; Saunders College Publishing, Philadephia, USA, (1994)
- Dettean, J D; Kirk's Fire Investigation, 5th ed, Prentice Hall, Eaglewood Cliffs, N.J (2002)
- Working Procedure Manual: Chemistry, Explosives and Narcotics, BPR&D Pub (2000)
- Hatcher Jury & Weller, 1987: Firearm Investigation Identification and Evidence, The University Book Agency, Allahabad.
- Gunther & Gunther, 1935 : The Identification of Firearms, Wouldies, New York
- Jauhri, M. 1980: Monograpnh on Forensic Ballistics, Govt. of India Publication, New Delhi.
- Burrad, 1951: The Identification of Firearms and Forensic Ballistics.

CO, PO, PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	1								1				

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CO2	1								1				
CO3	1	3							1		3		
CO4	1	3							1		3		

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FCH4107	FORENSIC PHYSICS – LAB	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	0	0	4	2
Pre-requisites/Exposure					
Co-requisites					

Catalog Description:
The course includes the analytical techniques for physical evidences like soil, glass, paints etc. The course has practical of casting of tyre marks and shoeprints, comparison of bangles and fibres.

Course Objective: The students will understand & perform experiments relating to:
Examination of physical properties of physical evidences commonly encountered at the crime scene.

Course Outcomes
On completion of this course, the students will be able to
CO1. Examine physical evidences (soil) by different analytical methods
CO2. Examine physical evidences (Glass) by different analytical methods
CO3. Perform comparative analysis of paints by TLC
CO4. Cast of different marks and a1nalyse fibres and bangles.

Course Contents: Lab/ Practical	Blooms level	Number of hours
1. Examination of physical properties of Soil by microscopy 2. Solubility test for paints and soil 3. Size distribution analysis of soil particles. 4. Mineral test for soil	L1, L3, L4	12
5. Examination of physical properties of Glass by microscopy 6. Comparative analysis of Glass fragments/ examination of glass fractures	L1, L3, L4	8
7. Comparative analysis of paints by TLC	L1, L3, L4	6
8. Casting of tyre marks 9. Casting of shoeprints	L1, L3, L4	10
10. Comparison of bangles	L1, L3, L4	4
11. Examination of fibres	L1, L3, L4	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Examination Scheme:

	IA			EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, A: Attendance, PR- Performance, LR – Lab Record, V – Viva.

Suggested Readings:

- A Glencoe Program Physics principles and problems: Forensic Laboratory Manual Student edition
- Thomas Kubic, Nicholas Petraco Forensic Science Laboratory Manual and Workbook, Third Edition 2009
- Kathy Mirakovits, Gina Londino, The Basics of Investigating Forensic Science: A Laboratory Manual 2015
- Washington state patrol Forensic Laboratory services: Crime Laboratory: Technical & Training Manuals.
- G.H. Stout & L.H. Jensten, X-ray Structure Determination – A practical Guide; 2nd Edn. Wiley, New York, 1989

CO, PO, PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	1	1		3					3	3	1		
CO2	1	1		3					3	3	1		
CO3	1	1		3					3	3	1		
CO4	1	1		3					3	3	1		

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FCH4108	CRIME SCENE INVESTIGATION (CSI) – LAB	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	0	0	4	2
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is intended to provide basic knowledge of practical aspects of analysis and reconstruction of crime scene to the students. The students will understand the basic requirements for the crime scene investigation. They will understand the significance of crime scene sketching and photography. The course will help the student to understand proper collection and preservation of the evidence and their presentation in court of law.

Course Objective: The course focuses on following objectives-

- Developing an understanding and application of Crime Scene Investigation.
- Develop an understanding on processing of crime scene (searching, sketching and photography of Crime scene (Indoor and Outdoor).
- Brief description on procedure adopted for collection, preservation, and packaging of Physical evidences.

Course Outcomes

On completion of this course, the students will be able to

CO1. Practically do the sketching and searching of all types of crime scenes.
CO2. Perform photography with efficiency in different types of crimes.
CO3. Analyze different types of evidence and their proper collection and preservation techniques.
CO4. Justify by proper Presentation of the evidences in the court of law and significance of chain of custody.

Course Contents: Lab/Practical	Blooms level	Number of hours
1. Camera and its parts	L1, L2	6
2. Sketching of the indoor crime scene 3. Sketching of the outdoor crime scene	L1, L3, L4	12
4. Photography of the indoor crime scene 5. Photography of the outdoor crime scene	L1, L3, L4	12
6. Collection, packaging and forwarding of trace evidences by Druggist fold method. **7.** Collection and preservation of various physical evidences (Fingerprint, blood, saliva, fibre, hair etc.)	L1, L3, L4	12
8. Forwarding of physical evidences	L1, L2, L3	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Examination Scheme:

	IA			EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, A: Attendance, PR- Performance, LR – Lab Record, V – Viva.

Suggested Readings:

- A Glencoe Program Physics principles and problems: Forensic Laboratory Manual Student edition
- Thomas Kubic, Nicholas Petraco Forensic Science Laboratory Manual and Workbook, Third Edition 2009
- Kathy Mirakovits, Gina Londino, The Basics of Investigating Forensic Science: A Laboratory Manual 2015
- Virginia Department of Forensic Science, Practical and Manuals

CO, PO, PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	1								3		1		
CO2	1	2							3	3	1		
CO3	1	2		3					3	3	1		
CO4	1	2						3	3		1		3

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FCH4111	FORENSIC AND CRIMINAL INVESTIGATIONS	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	2	1	0	3
Pre-requisites/Expos					
Co-requisites					

Catalog Description

This course is intended to provide basic knowledge of the crime scene, type of evidence and their significance in forensic investigations. It will be helpful in providing the students a basic connection between crime and the sequence of events that will help them to reconstruct the crime scene. The course will help the student to understand the significance of evidence in expert testimony and presentation of the evidence in court.

Course Objective: The course focuses on following objectives-

- Developing an understanding and appreciation of the scope of Crime Scene Investigation and Management.
- Develop an understanding on handling of different physical evidences found at the crime scene
- Develop comprehensive knowledge on various investigative techniques used in processing the crime scene.

Course Outcomes

On completion of this course, the students will be able to

CO1. Communicate the concept of crime scene, its types and significance in forensic science.

CO2. Investigate crime scene Investigation and do crime scene processing along with knowledge of various techniques used for recording of a crime scene

CO3. Apply his/her comprehensive knowledge on Physical evidence, testimonial and real evidences and the crime scene reconstruction and significance of crime scene reconstruction along with their admissibility in court.

CO4. Apply investigative and interrogative methods in order to obtain information from criminals and to familiarize students with Expert testimony, its role and acceptance of evidence in the court.

Course Contents:	Bloom s level	Number of hours
Module I: Introduction to Forensic Science Introduction and history of Forensic Science, Basic principles and significance, Utilization of Forensic Science, Forensic scientist at the scene of crime, Structure of Forensic labs, ethics in forensic science, Forensic Science in International perspectives, including set up of INTERPOL and FBI	L1,L2	7
Module II: Crime Scene Management Definition and causation of crime, Types of crime scene, Crime scene survey, protection of crime scene, searching of physical evidences, Recording, documentation and presentation in the court, processing, and reconstruction of the crime scene.	L1, L2, L3	8

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Module III: Physical Evidences Physical evidences and its types (fingerprints, glass, fibre, blood, saliva, weapon of crime etc.), Blood spatter analysis, Characteristic blood patterns, testimonial and real evidence, admissibility of scientific evidence and importance of physical evidences, Collection, preservation, packing and forwarding of different types of evidences to the laboratories.	L1,L2	11
Module IV: Investigation and Interrogation techniques Interviewing of the criminals; methods used by the police in getting information from the criminal; the ethical issues related to the same. Criminal profiling, Portrait Parley, Polygraphy, Narcoanalysis, Brain Fingerprinting, Modus operendi, Speech signal processing and pattern recognition – basic factors of sound in speech, acoustic characteristics of speech signal	L1, L2,	10

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

- Nabar, B. S., Forensic Science in Crime Investigation, Asian Law House, 2001.
- Allison, R., Investigation of Crime Scene, Global vision Publishing House, 2008.
- Bodziak, W., Footwear Impression Evidence (2nd Edn.) CRC Press, Boca Raton, Florida, 2000.
- DeForest, P., Gaensslen, R., and Lee, H., Forensic Science - An Introduction to Criminalistics, McGraw Hill, New York, 1983.
- Fisher, B., Techniques of Crime Scene Investigation (6thEdn.) CRC Press, Boca Raton, Florida, 2000.
- James, S.H., and Nordby, J.J., (Eds), Forensic Science; An Introduction to Scientific and Investigative Techniques, CRC Press, London, 2003.

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1								1				
CO2	1	3							1				
CO3	1	3							1				
CO4	1	3	3					3	1				3

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FCH4112	INSTRUMENTATION (CHEMICAL)	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	2	1	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description
Instrumental Analysis provides a sound knowledge of the various analytical techniques used to examine different kinds of evidence recovered from scene of crime in forensic cases. It develops the ability to analyze different kinds of physical evidence of forensic importance.

Course Objective The objective of the course is to provide student with practical understanding of working and applications of various instrumentation techniques used in the forensic science laboratory for the chemical analysis of evidences.

Course Outcomes
On completion of this course, the students will be able to
CO1: Communicate the concept, basic principle, and instrumentation of various chromatographic techniques.
CO2: Describe the concept, basic principle, and instrumentation of mass spectrometry.
CO3: Explain the potential utility of computers in instrumentation.
CO4: Analyse the signal and will be able to do measurement and data analysis.

Course Contents:	Blooms level	Number of hours
Module I: Chromatographic Techniques Basic principle, instrumentation, and forensic applications of Paper chromatography, Column chromatography, TLC, High pressure thin layer chromatography.	L1, L2, L3	9
Module II: Advanced Chromatographic Techniques Gas chromatography, Ion-exchange chromatography, Exclusion (permeation) chromatography, Affinity chromatography, HPLC, High pressure liquid chromatography, Interfacing GC with IR spectrometry	L1, L2, L3, L4	9
Module III: Mass Spectrometry Sample flow, Ionization methods, Mass analyzers, Vacuum systems, Signal processors, Detectors, Data handling, Correlation of mass spectra and molecular structure, Tandem mass spectrometry, GC-MS, LC-MS, Forensic applications of mass spectrometric methods.	L1, L2, L3, L4	9
Module IV: Measurements, Signals and Data Introduction, Noise, Signal-to-noise ratio, Sensitivity and detection limit, Sources of noise, Signal-to-noise enhancement, Evaluation and measurement, precision, Accuracy and instrument calibration, Data representation, The Automated Laboratory, Molarity, Molality, Mole fraction, Normality	L1, L2, L3, L4	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

- Lindsay S; High Performance Liquid Chromatography, Wiley & Sons NY (1992)
- Handbook of TLC, 2nd Ed, Marcel Dekker; NY (1995)
- Jarris, KE, A.L. Gray et al, Handbook of Inductively Coupled Plasma Mass Spectrometry, Glasgow Blockie, (1992)
- Maclaffrty F.W. & F. Turecek; Interpretation of Mass spectra, 4th Ed., Mill Valley, CA Univ Science Books, (1993)
- Chapmen J R; Practical Organic Mass Spectrometry - A Guide for Chemical and Biochemical Analysis, Wiley & Sons, NY (1993)
- H.H Willard et al; Instrumental Methods of Analysis CBS Pub. and Distributors, Delhi (1986).
- Skoog, Holler, Crouch, principles of instrumental analysis, 6th edition, 2007.
- Mendham et al., Vogel's Quantitative Chemical Analysis, Pearson Education Ltd., 2009.
- N. Gray, Instrumental Methods of Analysis, 1st Edition, CBS Publisher, 2011.

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	1							3		1		
CO2	3	1							3		1		
CO3	3	1							3		1		
CO4	3	1							3		1		

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FCH4110	RESEARCH SEMINAR	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	0	0	0	1
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Seminar is a lecture series to acquaint new graduate students with departmental research (This one will be running through out first semesters on every Monday any Lecture, where normally Ph.D. students /internal Faculties /external speakers will give talks on their research or other topic of their specialization). The trainer must make sure that the aspects covered are practically practiced by the participants. The evaluation will be done by Board of examiners comprising of the faculties.

Course Objectives

A seminar is primarily an academic event that is organized to provide the students a one-to-one hands-on experience on any aspect of their learning for research-based activity. Prerequisite, graduate studying in Chemistry/ Biochemistry/ Forensic Sciences on consent of instructor. Seminar to acquaint new graduate students with departmental research (This one will be running through out first semesters on every Monday any Lecture, where normally Ph.D. students /internal Faculties /external speakers will give talk on their research or other topic of their specialization).

The trainer must make sure that the aspects covered are practically practiced by the participants. The evaluation will be done by Board of Examiners comprising of the faculties.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain significance of research and will get an idea of current research trends in Forensic and allied sciences.

CO2: Acquaint with departmental research.

CO3: Perform in the potential seminar-based evaluations.

Major Themes for Seminar

The seminar may be conducted on any of the following major themes:

- Forensic Science & its related laws
- Criminal Investigations & its proceedings
- Forensic Chemistry
- Forensic Physics
- Forensic Ballistics
- Forensic Fraud Investigations
- Forensic Document Examinations
- Investigative Techniques
- Forensic Analytical Techniques
- Forensic Medicine & Odontology
- Forensic Anthropology Examinations
- Cyber & Digital Forensics
- Any other relevant topics

These themes are merely indicative and other recent and relevant topics of study may be included.

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Evaluation Scheme:

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total
10	30	30	30	100

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1											1	
CO2	1											1	
CO3	2			1								1	
CO4	2		1				1	3				1	2

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FCH4201	FORENSIC PHOTOGRAPHY	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	2	0	0	2
Pre-requisites/Exposure					
Co-requisites					

Course Objective: This course is designed to:

- Provide foundation knowledge of photography
- Develop an understanding and application of Photography in Forensic Science and CSI

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand the basic principles of photography.

CO2. Learn about the history and development of photography, developing techniques and methods of photography.

CO3. Learn about the indoor and outdoor crime scene photography and use of photograpy in the reconstruction of crime scene.

CO4 Understand about the I.R and U.V illumination in Photography.

CO5. Learn about the working principles of digital Photography and Videography

Course Contents	Blooms Level	Number of hours
Module I: Introduction Introduction to forensic photography; required equipments for photography – Camera, lens, shutter, depth of field, film; Importance of Forensic photography in a crime scene investigation	L1, L2	**4**
Module II: Types of Photography and Photo Prints History and development of photography. Basic principles and techniques of Black &white and colour photography. Developing techniques and methods of photography, Different kinds of developers and fixers, modern developments in photography, linkage of cameras and film negatives.	L1, L2,	**5**
Module III: Photography of various crime scenes Photography in indoor and outdoor scene of crime. Aerial photography. Surveillance photography – Cameras and accessories for surveillance photography, moving surveillance on foot, 2-person foot surveillance, surveillance with vehicles, fixed surveillance. Use of photography in reconstructing the scene of crime and its presentation in the court of law.	L1, L2, L3	**5**
Module IV: Guidance Documentation Image magnification, U.V. and I.R. illumination in Photography. Photography of Artefactual evidences (Bloodstain, fingerprint, imprints, and micro evidence).	L1, L2, L3	**5**
Module V: High-tech Photography for Crime Scene Digital photography, working principle of digital camera works and basics of digital imaging. videography/ high speed videography, High-speed photography, legal aspects of visual evidence.	L1, L2, L3	5

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

- Redsicker, D. R., The Practical methodology of Forensic Photography, CRC Press, London, 1994.
- Henry Horeustein; Colour Photography -A working Manual, Little Brown Co. Boston (1995)
- B.H.E. Jacobson, Ray GG Attridge; The Manual of Photography, Focal Press, London (1988)
- Jahne B; Digital Image Processing, Heidelberg Springer (1990) Photography- 2nd Ed. CRC Press LLC (2001)
- R.E. Jacobson, S.F. Ray, G.G. Attridge, N.R. Oxford; The Manual of Photography-Photographic and Digital Imaging, 9th Ed., Focal Press (2000)

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	2							1				
CO2	1	2							1				
CO3	1	2							1				
CO4	1	2							1				
CO5	1	2							1				

1: strongly related, 2: moderately related and 3: weakly related

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FCH4202	ELEMENTS OF FORENSIC MEDICINE AND ODONTOLOGY	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	2	1	0	3
Pre-requisites/Exposure					
Co-requisites					

Course Objectives:

During the course the student will

- Understand and appreciate the scope of forensic medicine**.**
- Know about different types of injuries, causes and manner of death and their medico legal significance
- Learn about the utility of the odontological studies in identification and other medico legal purposes like age, sex, and population Determinations.

Course Outcomes

On completion of this course, the students will be able to

CO1. Describe various physiological and chemical changes after death and will be able to estimate time since death

CO2. Identify the type of wound and its causes, also they can estimate the age of injury.

CO3. Identify type of dentition and can estimate the age, sex, and race of individual by analyzing the given teeth.

CO4. Analyse the types of bitemarks and their significance in identification of culprit and type of crime.

CO5. Explain different types of injuries and their causes and medico-legal significance.

Course Contents	Blooms level	Number of hours
Module I: Introduction to Forensic Medicine Definition of forensic medicine, cause, manner and characteristics of death. Autopsy, Post- mortem changes, Importance of canvass form; Handling buried body cases	L1, L2, L3	6
Module I: Wounds and its medico legal significance Basic injury production and healing mechanisms, Mechanical injuries (Abrasions, Bruises, Lacerations, Incised and stab wounds) and their medico legal significance, Importance of hesitation marks.	L1, L2, L3	8
Module III: Causes and manner of death Deaths due to Asphyxia, Fire, Electrocution. Various sexual offences.	L1, L2, L3	8
Module IV: Forensic Odontology - I Introduction to Forensic Odontology, Types of dentitions, Basic structure of human teeth, types of teeth & their morphology, Determination of age from teeth using various methods, Dental anomalies and their role in personal identification.	L1, l2, L3, L4	9

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Module V: Forensic Odontology - II Bite marks: Types & forensic importance, Collection, preservation and examination of Bite marks, Admissibility of bite mark evidences in Court of Law. Role of Forensic odontology in mass disaster victim identification.	L1, l2, L3, L6	5

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

- Modi's Medical Jurisprudence and Toxicology,23rd Edition, by K. Mathiharan & Amrit K. Patnaik, Third reprint, 2009, LexisNexis, Butterworth, New Delhi
- Essentials of forensic medicine, Dr. K. S. Narayan Reddy.
- Forensic Medicine and toxicology, JB Mukherjee, Vol I & II.
- Forensic Dentistry, Paul. G. Stimson & Curtis. A. Mertz, CRC
- Forensic Odontology, Pramod.K. Dayal
- Keith Simpson's, Forensic Medicine
- Glister's Medical Jurisprudence and Toxicology, Churchill Livingstone Dental Anatomy Atlas, Whitaker

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	1							1		3		
CO2	1	1							1		3		
CO3	1	1							1		3		
CO4	1	1							1		3		
CO5	1	1							1		3		

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FCH4205	QUESTIONED DOCUMENTS	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	2	1	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Questioned Documents deals with the examination of different kinds of questioned documents encountered in forensic cases. It provides a sound knowledge of the various aspects of questioned document examination. It develops the ability to analyze and resolve the crime mysteries involving forensic documents.

Course Objective: The course focuses on following objectives-

- Developing an understanding and appreciation for the scope of Questioned Documents.
- Develop an understanding on different types of questioned documents, the types of forgeries and disguise generally encountered.
- Give brief description on various methods of their detection and examination.

Course Outcomes

On completion of this course, the students will be able to

CO1: Understand the concept of questioned documents and its examination.
CO2: Learn various types of forgeries and examination of charred documents, sequence of strokes.
CO3: Learn different methods to determine age of questioned documents and examination of printed and photocopy documents.
CO4: Learn different instruments used to examine questioned documents.
CO5: Understand the concept of forensic report including its format and preparation.

Course Contents:	Blooms level	Number of hours
Module I: Questioned Documents Definition, Importance, Classification and preliminary examination of questioned documents. Handwriting: definition, development, Instruments and Appliances of handwriting expert. Handwriting Characteristics: General Characteristics, Individual Characteristics, Development of Individuality in Handwriting, digital questioned documents and their examination.	L1, L2	9
Module II: Forgeries Forgery and its types and characteristics, identification, and examination of forgeries. Decipherment of secret indented and charred documents, Preservation of documents, Examination of seal and other mechanical impressions, examination of sequence of intersecting of strokes, Standards for Comparison and Disguise etc. Advantages and disadvantages of exemplar and non-exemplar samples	L1,L2, L3	7
Module III: Age of Document & Alterations Determination of Age of Document- Absolute/relative age, Alterations in the document: erasures, additions, overwriting and obliterations. Classification and working of typewriters alterations in typed text, , Comparison of Printed matter- Various printing processes**.**	L1, L2, L3, L4	10

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Module IV : Instrumentation and Photography of Documents Basic principles and techniques Visible and Florescence (UV and IR), Photomicrography & Microphotography, Stereo-zoom microscopy, Video Spectral Comparator (VSC) and Electrostatic Detection Apparatus (ESDA).	L1, L3, L4	6
Module V: Security Documents Brief description of security documents, security and verification features of passports, credit cards, cheques etc. Types of security documents, Salient features for identifications, Instrumentation used for their examination.	L1, L2, L3	4

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

- Osborn, A. S. (1998). Classes of Questioned Documents. Questioned Documents, 2nd edition, First Indian reprint, Universal law publishing co. Pvt. Ltd., New Delhi.
- Huber, A. R. Headrick, A. M. (1999). The Discrimination and Identification of writing. Handwriting Identification Facts and Fundamentals, CRC Press, Boca Raton London.
- Saferstein, Richard, Criminalistics, An Introduction to Forensic Science, 6th Ed. Prentice-Hall, New Jersey, 1998.
- Sharma, B. R., Forensic Science in Criminal Investigation and Trials (3rd Edn) Universal Law Publishing Co. Ltd. New Delhi, 2001.
- Charles, C. Thomas, I.S.Q.D. Identification System for Questioned Documents, Billy Prior Bates, Springfield, Illinois, USA, 1971.
- Charles C. Thomas, Typewriting Identification I.S.Q.D.; Billy Prior Bates; Springfield, Illinois, USA, 1971.
- Hard less, H.R., Disputed Documents, handwriting and thumbs – print identification: profusely illustrated, Low Book Co., Allahabad, 1988.
- Lerinson, Jay, Questioned Documents, Acad Press, London, 2001.
- Ordway Hilton, Scientific Examination of Questioned Documents, Rev. ED., Elsevier, New York, 1982.
- Wilson, R., Harrison, Suspect Documents – Their Scientific Examination; Universal Law Publishing, Delhi, 1997.

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	2							1				
CO2	1	2							1				
CO3	1	2							1		3		
CO4	1	2							1		3		
CO5	1	2							1		3		

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FCH4206	FORENSIC MEDICINE AND ODONTOLOGY -LAB	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	0	0	4	2
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is intended to provide basic knowledge of practical aspects of Forensic medicine to the students. It will be helpful in providing the students a practical knowledge of dentition, bite marks and their investigations and the basic connection between forensic science and law. The course will help the student to understand the physiological and chemical changes in various types of death and will be able in solving the crime.

Course Objective:

- Identification of individual teeth, dental charting.
- To identify individual by using dentition.
- Age estimation by dental evidences.

Course Outcomes

On completion of this course, the students will be able to

CO1. Describe the types of dentitions, characteristics of individual teeth that will help in criminal investigations and species identification.

CO2. Estimate age of person by teeth and x rays.

CO3. Correlate bite marks with species and individuals and type of crime and present in court of law.

CO4. Interpret the results of autopsy and its correlation with type of crime and type of evidences.

Course Contents: - Lab/Practical	Blooms level	Number of hours
1. Types of Dentitions a. Temporary b. Mixed c. Permanent	L1, L3, L4	16
2. Identification of individual teeth based on the morphological features.	L1, L3, L4	12
3. Estimation of age from the teeth. a. Living subject b. Maxilla & mandible c. From X-Rays	L1, L3, L4	10
4. Comparison and Identification of Individuals from bite marks a. Direct comparison b. By casting c. By photography	L1, L3, L4	8
5. Autopsy observation through visits and recording the files		2

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Examination Scheme:

	IA			EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

IA –Internal Assessment, EE- External Exam, A: Attendance, PR- Performance, LR – Lab Record, V – Viva.

Suggested Readings:

- Laboratory Protocols CIMMYT Applied Molecular Genetics Laboratory Third Edition
- Kathy Mirakovits, Gina Londino, The Basics of Investigating Forensic Science: A Laboratory Manual 2015
- Washington state patrol Forensic Laboratory services: Crime Laboratory: Technical & Training Manuals
- G.H. Stout & L.H. Jensten, X-ray Structure Determination – A practical Guide; 2nd Edn. Wiley, New York, 1989
- Redsicker, D. R., The Practical methodology of Forensic Photography, CRC Press, London, 1994.

CO, PO, PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	2	1									1		
CO2	2	1									1		
CO3	2	1									1		
CO4	2	1	3			3					1		3

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FCH4208	QUESTIONED DOCUMENTS AND FINGERPRINTS – LAB	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	0	0	4	2
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is intended to provide the basic knowledge about the instruments which can be used for the analysis of biological samples. The students will understand the basic principle of the instruments and will be able to apply different techniques as per the requirement of the investigations in medicolegal cases.

Course Objective: - The course focuses on following objectives-

- Developing an understanding and application on practical aspects of Questioned Documents and Fingerprints.
- Develop an understanding on procedure adopted for examination of different types of questioned documents, the types of forgeries, disguise and their examination along with giving appropriate conclusion on the basis of findings.
- Brief description on identification, analysis and examinations of various kinds of fingerprints and other impressions that are encountered on crime scenes.

Course Outcomes

On completion of this course, the students will be able to

CO1. Examine and comparison of security documents, fake currency and stamp papers.

CO2. Explain the procedure adopted for examination of different types of questioned documents, the types of forgeries, disguise and their examination along with giving appropriate conclusion on the basis of findings.

CO3. Develop different types of fingerprints and interpret the results.

CO4. Perform fingerprint development by different methods for the forensic investigations.

Course Contents: - Lab/Practical	Blooms level	Number of hours
1. Examination and comparison of security documents, fake currency and stamp papers. 2. Examination and comparison of disputed anonymous letter with specimen of suspect/suspects. 3. Identification of altered/added/obliterated/erased/handwriting on cheques and deeds.	L1, L2, L3, L4	12
4. Comparison of forged (disputed) signature with the specimen signatures. 5. Comparison of disguised (disputed) signature with specimen signatures	L1, L2, L3, L4	10

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6. 7. 8.	Development of latent fingerprints by chemical methods and photography. Development of latent fingerprints by physical methods and photography. Comparison of fingerprints, palm prints based on ridge characteristics and ridge details.	L1, L2, L3, L4	14
9. 10. **11.**	Ridge counting and ridge tracing. Recording of prints on fingerprint chart. Examination of other impressions and photography.	L1, L2, L3, L4	12

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

	IA			EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, A: Attendance, PR- Performance, LR – Lab Record, V – Viva.

Text and references:

- A Glencoe Program Physics principles and problems: Forensic Laboratory Manual Student edition
- Thomas Kubic, Nicholas Petraco Forensic Science Laboratory Manual and Workbook, Third Edition 2009
- Kathy Mirakovits, Gina Londino, The Basics of Investigating Forensic Science: A Laboratory Manual 2015
- Washington state patrol Forensic Laboratory services: Crime Laboratory: Technical & Training Manuals
- Bridges, B. C., Vollmar, A. Monir, M., Criminal Investigation, Practical Fingerprinting, Thumb Impression, Handwriting, Expert Testimony Opinion Evidence, The University Book Agency, Allahbad, 2000.

CO, PO, PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	2	1	3								3		
CO2	2	1	3								3		
CO3	2	1	3								3		
CO4	2	1	3								3		

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FCH4209	INSTRUMENTATION (BIOLOGICAL)	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	2	1	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is intended to provide the basic knowledge about the instruments which can be used for the analysis of biological samples. The students will understand the basic principle of the instruments and will be able to apply different techniques as per the requirement of the investigations in medicolegal cases.

Course Objective: The objective of the course is to provide student with practical understanding of working and applications of various instrumentation techniques used in the forensic science laboratory for the analysis of biological evidences.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain various biological phenomena associated with Forensic Science and the utility of various biological changes in forensic science.

CO2. Describe the principle, types, and applications of the centrifugation in forensic science.

CO3. To understand the various types of electrophoresis for the analysis of biological and toxicological samples

CO4. Analyse the biological samples by immuno-electrophoresis.

CO5. Apply various types of microscopes for the forensic investigations

Course Contents:	Blooms level	Number of hours
Module I:General Principles of Biological/ Bio-chemical Analysis pH and buffers, Physiological solution, Cell fractionation. Genetic Manipulations, Enzymes used in genetic manipulation, Cloning procedures, Isolation of specific nucleic acid sequences – complementary DNA, Gene libraries, Colony hybridisation, Expression of genes	L1, L2, L3	11
Module II: Centrifugation Techniques Basic principles of sedimentation, Various types of centrifuges, Density gradient centrifugation, Preparative centrifugation, Analysis of sub-cellular fractions, Ultra-centrifuge- Refrigerated Centrifuges.	L1, L2, L3, L4	10
Module III: Electrophoretic Technique General principles, Factors affecting electrophoresis, Types of Electrophoresis- Agarose gel electrophoresis, Polyacrylamide gel electrophoresis, its types, Isoelectric focusing (IEF), Iso-electrophoresis.	L1, L2, L3, L4	9

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Module IV: Immuno-chemical Techniques General principles, Production of antibodies, Precipitin reaction, Gel immuno-diffusion, Immuno-electrophoresis, Radio Immuno-assay (RIA), ELISA, Fluorescence Immuno-assay.	L1, L2, L3, L4	8
Module V: Microscopy Basic principles, Simple and Compound Microscope, Comparison Microscope, Phase Contrast Microscope, Stereoscopic Microscope, Polarizing Microscope, Fluorescent Microscopy, Scanning Electron Microscope (SEM) and Transmission Electron Microscope (TEM).	L1, L2, L3, L4	10

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

- H.H Willard et al; Instrumental Methods of Analysis CBS Pub. And Distributors, Delhi (1986)
- Bryan L. William & Keith Wilson; Principles & Techniques of Practical Biochemistry, Edward Arnold Pub. (1975)
- Keith Wilson & John Walker; Practical Biochemistry- Principles & Techniques, 5th Ed., Cambridge University Press (2000)
- David. L. Nelson & Michael M, Cox Lenninges; Principles of Biochemistry, 4th Ed., Freeman Pub. (2005).
- Watson Gillman, Witkowski, Zolles; Recombinant DNA, 2nd Ed., Scientific American Books, (1998)
- Gardnes & Snustd; Principles of Genetics 6th Ed., John Wiley & Sons (1981)
- D.M. Weir; Hand Book of Experimental Immunology, 2nd Ed., Blackwell Pub. (1973)

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	2							3		1		
CO2	1	2							3		1		
CO3	1	2							3		1		
CO4	1	2							3		1		
CO5	1	2							3		1		

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FCH4210	FINGERPRINT SCIENCE	L	T	P	C
Version 1.2	Date of Approval: Dec, 2021	2	1	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description
This course will help the students to understand basic of fingerprint science and their systematic classification.

Course Objective: The course focuses on following objectives-

- Developing an understanding and appreciation for the scope of Fingerprints Examination.
- Develop an understanding on various methods of development of Fingerprints.
- Develop comprehensive knowledge on fingerprint patterns, fingerprint classification, the various methods of fingerprint development- physical and chemical.

Course Outcomes
On completion of this course, the students will be able to

CO1. Identify and outline various types of fingerprints patterns
CO2. Distinguish and categorise characteristics of fingerprints for proper collection and preservation.
CO3. Classify fingerprints for case solving and matching of suspect prints with crime scene evidences.
CO4. Apply advanced knowledge of Automated fingerprints identification for forensic examination in court of law.

Course content:	Blooms level	Number of hours
Module I: Introduction to Fingerprints Dactylography, Dermatoglyphics and Dactyloscopy, Basis concepts of Fingerprint Science, Friction ridge skin, Morphogenesis of friction ridge skin, Primary dermal ridge development, Definition of fingerprint, History of fingerprint identification, Fingerprint as forensic evidence, Visible finger-marks, Latent finger-marks.	L1, L2	7
Module II: Classification of Fingerprints for Comparison purposes Pattern area, Core, Delta, Type lines, ridge characteristics, Fingerprint Pattern types: Essentials and its types: Loop, Arch, Whorl, Composites, Accidental patters etc., Ten Digit and Single Digit fingerprint classification.	L1, L2, L3	8
Module III: Methods of Taking Fingerprints From living and dead persons, preserving and lifting of fingerprints. Comparison protocols: Class and individual characteristics (Galton's details), different ridge characteristics, Standards of proof, Automatic Fingerprint Identification System (AFIS), Poroscopy and Edgeoscopy. Multimetal deposition technique; Physical developer technique; Importance of light sources in fingerprint science	L1, L2, L3, L4	7

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Module IV: Fingerprint Developing Methods Chemistry of latent fingerprint residue, factor contributing to latent fingerprints, Methods of development of latent fingerprints using conventional methods– Powder (Black and grey, fluorescent, and magnetic), Fuming method, Vacuum metal deposition (VMD) method, Chemical method, Reagent chemistry and formulations, Photography of fingerprints**.**	L1, L2, L3, L4	7
Module V: Report Writing and Court Room Testimony Evidence and testimony in court, Information required by the Forensic expert, Components of forensic reports, Preparation of report, Presenting findings in a report, Expert and the rules of evidences, Daubert's challenges to fingerprints.	L1, L2, L3	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

- Nath, S., Fingerprint Identification, CRC Press, 2nd edition, 2002.
- Champhod, C., Fingerprint and other ridge skin impressions, CRC Press, 2004.
- Bridges, B. C., Vollmar, A. Monir, M., Criminal Investigation, Practical Fingerprinting, Thumb Impression, Handwriting, Expert Testimony Opinion Evidence, The University Book Agency, Allahabad, 2000.
- James, S. H. and Nordby, J. J. (Eds), Forensic Science - An Introduction to Scientific and Investigation Techniques, CRC Press, London, 2003.
- Nanda, B. B., and Tiwari, R. K., Forensic Science in India. Select Publishers, New Delhi, 2001.
- Saferstein, Richard, Criminalistics, An Introduction to Forensic Science, 6th Ed. Prentice-Hall, New Jersey, 1998.
- Sharma, B. R., Forensic Science in Criminal Investigation and Trials (3rdEdn) Universal Law Publishing Co. Ltd. New Delhi, 2001.

CO, PO, PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	1								1				
CO2	1	3							1				
CO3	1	3							1		3		
CO4	1			3					1				2

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FCH4231	TERM PAPER	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	0	0	0	1
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Seminar is a lecture series to acquaint new graduate students with departmental research (This one will be running through out first semesters on every Monday any Lecture, where normally Ph.D. students /internal Faculties /external speakers will give talks on their research or other topic of their specialization). The trainer must make sure that the aspects covered are practically practiced by the participants. The evaluation will be done by Board of examiners comprising of the faculties.

Course Objectives

A seminar is primarily an activity based academic event that is organized to provide the students a one-to-one hands-on experience on any aspect of their learning for research-based activity. Prerequisite, graduate studying in Chemistry/ Biochemistry/ Forensic Sciences on consent of instructor. Seminar to acquaint new graduate students with departmental research (This one was for second semester students to attained and fourth semester students had to present on one selected topic of their choice or Ph.D. students/internal faculties /external speaker will give talk).

The trainer must make sure that the aspects covered are practically practiced by the participants. The evaluation will be done by Board of examiners comprising of the faculties. This one will be one time event in one semester.

On completion of this course, the students will be able to

CO1: Explain significance of research and will get an idea of current research trends in Forensic and allied sciences.

CO2: Acquaint with departmental research

CO3: Discuss the potential seminar-based evaluations

Major Themes for Seminar

The seminar may be conducted on any of the following major themes:

- Forensic Science & its related laws
- Criminal Investigations & its proceedings
- Forensic Chemistry
- Forensic Physics
- Forensic Ballistics
- Forensic Fraud Investigations
- Forensic Document Examinations
- Investigative Techniques
- Forensic Analytical Techniques
- Forensic Medicine & Odontology
- Forensic Anthropology Examinations
- Cyber & Digital Forensics

  Any other relevant topics

These themes are merely indicative and other recent and relevant topics of study may be included.

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Evaluation Scheme:

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total
10	30	30	30	100

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1				1								1	
CO2				1								1	
CO3				1								1	3

1: strongly related, 2: moderately related and 3: weakly related

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FCH4301	FORENSIC CHEMISTRY, TOXICOLOGY AND PHARMACOLOGY	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	2	1	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is intended for students to understand about Forensic chemistry and its various aspects in related field. The syllabus contains the various analytical methods to examine alcoholic beverages along with its toxicity. It also contains the drug abuse in sports and doping, classification and routes of administration of poisons and extraction and isolation techniques of various drugs from biological viscera.

Course Objectives:

During the course the student will:

- Understand the scope of forensic chemistry, toxicology, and pharmacology
- Understand and appreciate the scope, diversity, and utility of a variety of chemical analysis
- Learn the principles of primary techniques used for forensic identification of various chemicals, drugs, and poisons

Course outcome

On completion of this course, the students will be able to

CO1. Explain the need and scope of Forensic chemistry & Toxicology.
CO2. Apply the analytical procedure of alcohol & their examination.
CO3. Differentiate between use and abuse of drugs and their laboratory analytical methods.
CO4. Classify the poison and identify them in forensic science laboratory.

Course Contents	Blooms level	Number of hours
Module I: Introduction to Forensic Chemistry Forensic Chemistry: Introduction, types of cases/exhibits, preliminary screening, presumptive test (colour and spot test), inorganic analysis, micro – chemical methods of analysis, Analysis of petroleum products.	L1, L2, L3	6
Module II: Toxicology of alcohol and Examination of Alcoholic Beverages Fate of alcohol in body, alcohol in the circulatory system, Breath test instruments, Field Sobriety testing, Examination of alcoholic beverages; Country made liquor, Illicit liquor. Analysis of blood for alcohol.	L1, L2, L3, L4	6
Module III: Drugs of Abuse Introduction, classification of drugs of abuse, drugs of abuse in sports and doping, narcotics drugs and psychotropic substances, designers drugs and their forensic examination, Drugs and Cosmetic Act, Excise Act, NDPS Act. Dose-response relationship; Importance of Lethal dose 50	L1, L2, L3, L4	6

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Module IV: Introduction to Toxicology Definition, Law relating to poison, Classification of poisons. Action of poisons and factors modifying its action, routes of administration of poisons, Role of Toxicologist	L1, L2, L3, L4	6
Module V: Forensic Pharmacology Pharmacology and Toxicology of Psychotropic Drugs: Sedatives, Stimulants, Opiates. Extraction, Isolation of drugs from viscera, tissues and body fluids.	L1, L2, L3, L4	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

- A Burger; Medicinal Chemistry, Vol. II, Wiley Interscience, New York; (1970)
- A.I Vogel; Textbook of Practical Organic Chemistry including Qualitative Organic Analysis; ELBS, Essex (1971)
- Boudreau, JE et al – Arson & Arson Investigation, Survey & Assessment National Institute of Law Enforcement, U.S Dept. of Justice, US Govt. Printing Press (1977)
- Clark, E.G.C., Isolation and identification of Drugs, Vol. I and Vol. II, Academic Press, 1986.
- Cravey, R.H., Baselt, R.C., Introduction to Forensic Toxicology, Biochemical publications, Davis C A, 1981.
- Gleason, M.N. et.al, Clinical Toxicology of Commercial products, Williams and Williams, Baltimore

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	1								1			
CO2	1	1								1	3		
CO3	1	1			3					1	3		
CO4	1	1			3					1			

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FCH4302	FORENSIC BIOLOGY AND SEROLOGY	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	2	1	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description
This course is intended to give insight of providing the basic knowledge about the anatomy and physiological changes in odontology. The students will be able to correlate the bite marks with type of crime. The course will help the students to differentiate between wound and their medicolegal studies.

Course Objective: This course will cover:
- The important biological evidences commonly found at crime scene
- Significance of forensic anthropology, and forensic botany.
- Importance of serology and DNA analysis in interpretation of crime.

Course Outcomes
On completion of this course, the students will be able to
CO1. Explain the significance of biological evidences in the forensic science.
CO2. Identify and differentiate different types of fibres and racial difference in the fibres.
CO3. Demonstrate features of skeleton system, explain peculiar features of the human skeleton and its significance in age, sex and race determination
CO4. Utilize various biological fluids for the crime investigation and individual identification.
CO5. Summarize significance and applicability of DNA fingerprinting in the forensic investigations

Course Contents	Blooms level	Number of hours
Module I: Hair and Fibre Structure of hair and its biochemical properties, Phases of hair growth, types of hair. Differences between animal and human hair, Forensic examination of different types of hair. Different types of fibres and their identification.	L1, L2, L3	7
Module II: Botanical Evidences and Diatoms Different botanical evidences of forensic significance: seeds, pollens etc. Diatoms: Classification, basic structure and morphology, forensic significance of diatoms, extraction methods, examination of wood	L1, L2, L3,	6
Module III: Forensic Anthropology Definition and scope of forensic anthropology, Human skeletal system, and types of bones. Estimation of age from skull and long bones, site, and side determination. Estimation of stature from skeletal remains. Determination of sex from skull, mandible, and pelvis.	L1, L2, L3, L4	7

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Module IV: Forensic Serology Definition and scope of forensic serology. Nature, composition and functions of blood and other fluids. Collection, preservation and packing of biological fluids. Introduction to ABO, Rh, MN systems, Lectins – their forensic significance, Determination of secretor/ non secretor status.	L1, L2, L3, L4	8
Module V: DNA Profiling DNA Profiling: Introduction, molecular biology of DNA, polymorphism, DNA Extraction methods (Organic and Inorganic extraction, FTA cards), DNA typing systems- RFLP analysis, sequence polymorphism. Evaluation of results, analysis of STR, SNP and Mitochondrial DNA markers, Y-STRs, PCR amplifications, Forensic applications of DNA profiling, limitations of DNA profiling	L1, L2, L3	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:					
Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

- Pandey, B. P., Plant Anatomy; S. Chand, New Delhi, 1998.
- Biology Methods manual, Metropolitan Police Forensic Science Laboratory, London, 1978.
- Byrd, J. H. &Castner, J. L., Forensic Entomology, The Utility of Arthorpods in legal Investigation, CRC Press, USA, 2000.
- Catts, E.P & Haskell N.H., Entomology and death: A procedural guide, Joyce's Print Shop, 1990.
- Mauersberger, Herbert R., & Mathews, Textile Fibres – Their physical, Microscopic and chemical properties, John Wiley, New York, 1954.
- Richard Saferstein; Forensic Science Handbook; Ed.; Prentice – Hall, Englewood Cliff, New jersey; (1982)
- Smith; DGV; A manual of Forensic Entomology Ithaca New York Camstock Univ. Press, USA, (1986)
- Fisher, B., Techniques of Crime Scene Investigation (6thEdn.) CRC Press, Boca Raton, Florida, 2000.
- Butler, John M. (John Marshall), Advanced topics in forensic DNA typing : methodology ISBN 978-0-12-374513-2 (2011)

CO, PO, PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	1	3								1			
CO2	1	3		2						1	3		
CO3	1	3		2						1	3		
CO4	1	3								1			
CO5	1	3		2						1	3		

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FCH4304	FORENSIC BIOLOGY AND SEROLOGY-LAB	L	T	P	C
Version 1.2	Date of Approval: Dec, 2021	0	0	4	2
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is intended to provide basic knowledge of practical aspects of Forensic serology, anthropology, and botany to the students. It will be helpful in providing the students a practical knowledge of various biological and botanical evidence and their analysis and significance in forensic investigations to establish connection between crime and suspect.

Course Objective: This course will cover:

- The practical aspects of forensic biology, anthropology, and serology
- To collect, pack and analyse biological, anthropological, & serological evidences
- To document chain of custody, write laboratory reports pertaining to the examinations conduct presumptive and confirmatory tests for evidence

Course Outcomes

On completion of this course, the students will be able to

CO1. Perform various tests for the species and personal identification that can help criminal investigations.

CO2. Estimate age of person by anthropological examination.

CO3. Correlate the time, site and cause of the crime by the identification of the diatoms and its presentation in court of law.

CO4. Understand the types of fibres, their identification and utility in forensic identification of the person.

Course Contents: Lab/ Practical	Blooms level	Number of hours
1. Determination of species of origin from blood and other biological evidences using precipitin test 2. Presumptive and confirmatory tests for blood 3.Examination and identification body fluids 4. Gel Immuno-diffusion tests for species origin 5. Blood grouping from dried stains by Absorption Inhibition or Absorption Elution	L1,L2,L3,L4	12
6. Microscopic examination of hair for the determination of different types of medulla and scale 7. Microscopic examination of hair for the determination of species	L1, L2, L3, L4	12
8. Extraction /Isolation of Diatoms from water/soil and tissues	L1, L2, L3, L4	6

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9. Identification of bones based on its morphology and anatomical planes 10. Sex determination from skull, mandible, pelvisand long bones 11. Age estimation from skull and long bones	L1, L2, L3, L4	12
12. Sexing from Barr Bodies	L1, L2,L3, L4	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

	IA			EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, A: Attendance, PR- Performance, LR – Lab Record, V – Viva.

Suggested Readings:

- Lab Procedures by V Veeraraghavan, S Lukose
- Laboratory Protocols CIMMYT Applied Molecular Genetics Laboratory, Third Edition
- Kathy Mirakovits, Gina Londino, The Basics of Investigating Forensic Science: A Laboratory Manual 2015
- Washington state patrol Forensic Laboratory services: Crime Laboratory: Technical & Training Manuals
- G.H. Stout & L.H. Jensten, X-ray Structure Determination – A practical Guide; 2nd Edn. Wiley, New York, 1989
- Redsicker, D. R., The Practical methodology of Forensic Photography, CRC Press, London, 1994.

CO, PO, PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1		1		3							1		3
CO2		1		3							1		3
CO3		1		3							1		3
CO4		1		3							1		3

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FCH4305	FORENSIC CHEMISTRY AND TOXICOLOGY - LAB	L	T	P	C
Version 1.1	Date of Approval: July, 2019	2	0	0	2
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is intended for students to perform various practical in the field of Forensic Chemistry & Toxicology, to isolate different toxic substance, perform thin layer chromatography of several drugs and cations and anions analyses.

Course Objective:

The students will understand & perform experiments related to:-

- Isolation techniques for different poisons
- Analysis of different poisons
- Spot tests for different cations and Anions

Course Outcome

On completion of this course, the students will be able to

CO1. Demonstrate the isolation techniques of different toxic substances.
CO2. Perform the TLC and analysis of various drugs and poisons.
CO3. Perform various tests to analyze cations and anions.

Course Contents: - Lab/Practical	Blooms level	Number of hours
1. Isolation techniques of different toxic substances 2. TLC of insecticides, Barbiturates and other drugs 3. Spot test of mercury, iron, copper, aluminium, cadmium, zinc and other metallic poisons	L1, L2, L3, L4	16
4. Analysis of volatile and non-volatile poisons 5. Analysis of vegetable poisons	L1, L2,	16
6. Spot test of nitrates, nitrites, carbonates, sulphates, sulphites, chlorates	L1, L2, L3, L4	16

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

	IA			EE	
A	**PR**	**V**	**LR**	**PR**	**V**
5	10	5	10	35	35

Note: IA –Internal Assessment, EE- External Exam, A: Attendance, PR- Performance, LR – Lab Record, V – Viva.

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Suggested Readings:

- A Glencoe Program Physics principles and problems: Forensic Laboratory Manual Student edition
- Thomas Kubic, Nicholas Petraco Forensic Science Laboratory Manual and Workbook, Third Edition 2009
- A. I. Vogel Textbook of Practical organic Chemistry including Qualitative organic analysis
- Isolation and identification of Drugs by E.G.C. Clark
- Bryan L. William & Keith Wilson; Principles & Techniques of Practical Biochemistry, Edward Arnold Pub. (1975).
- K. Nakanishi, Infrared absorption spectroscopy - practical, Holden-Day, Inc., San Francisco and Nankodo Company Ltd., Tokyo, 1962.

CO, PO, PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	1	1		2							1		3
CO2	1	1		2							1		3
CO3	1	1		2							1		3

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FCH4315	STATISTICS AND RESEARCH METHODOLOGY	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	2	1	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description
Research Methodology and Statistics provide the detailed knowledge about the concept of research methods and its utility in forensic science. It develops the ability to carry research in different fields of forensic science.

Course Objective: This course is designed to:

- Provide foundation knowledge of quantitative and qualitative research methods used in Forensic Sciences.
- Provide understanding of the use of survey, field, and qualitative research techniques to develop practice knowledge.
- Describe distributions in terms of shape, centre, and spread including the ability to construct visual displays of data (charting, graphing).
- Provide an understanding of and ability to use the basic principles of statistical inference.

Course Outcomes
On completion of this course, the students will be able to
CO1: Explain the types of research, methods of sampling used in statistics.
CO2: Apply different methods of data collection and statistical methods useful in forensic science.
CO3: Define the concept and types of parametric and non-parametric tests.

Course Contents:	Blooms level	Number of hours
Module I: Introduction to Research Research: Definition, motives and objectives, Types of Research, Research process, Defining the research problem, Research design.	L1, L2	7
Module II: Sampling Principles, methods: census and sample survey, sample design. Types of sampling, rationale for using a particular sampling procedure.	L1, L2, L3	7
Module III: Tools of Data Collection Observation, interview schedule, questionnaire, survey, case study methods	L1, L2, L3	5
Module IV: Statistics Introduction, Frequency distribution, class intervals, graphical presentation: Line graphs, bar diagram, histogram, pie chart; Measures of Central Tendency: mean, median, mode; Measures of dispersion: Range, Mean deviation, Quartiles, Percentiles, Variance and standard deviation. Skewness and Kurtosis, Pearson and Spearman correlation methods, Regression equations.	L1, L2, L3	10
Module V: Statistics II Tests of Significance, Normal distribution, Confidence level. Level of Significance, Parametric and non-parametric tests, F-test, t-test, Z-test, Chi square test, ANOVA.	L1, L2, L3, L4	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-*

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Synthesis, L6-Evaluation

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

- Broota, K.D., Experimental designs in psychological research, Wiley eastern, New York, 1992.
- Guilford, Statistics in Psychology and Education, McGraw hill, New York, 1986.
- Katz and Kahn, Research in Behavioural Sciences, Methuen, USA, 1979.
- Kerlinger, F., Foundations of Behavioural Research, Surjeet Publications, Delhi, 1983.
- Rajamanickam, M., Statistical Methods in Psychological and Educational Research, Concept Publishing Co. New Delhi, India, 1983.
- Smith, Jonathan, A. (Ed.), Qualitative Psychology: A Practical Guide to Research Methods, Sage Publications, 2003.
- Woodworth and Schlosberg, Experimental Psychology, Methuen and co. ltd, London, 1971.

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	1		2					2		1		
CO2	1	1		2					2		1		
CO3	1	1		2					2		1		

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FCH4316	INSTRUMENTATION (PHYSICAL)	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	2	1	0	3
Pre-requisites/Exposure					
Co-requisites					

Course Objective: The objective of the course is to provide student with practical understanding of working and applications of various instrumentation techniques used in the forensic science laboratory for the analysis of evidences.

Course Outcome

On completion of this course, the students will be able to

CO1: Explain the principle and application of Spectroscopy.

CO2: Describe types of Molecular spectroscopy, their principle and instrumentation and application in forensic science.

CO3: Describe types of Atomic spectroscopy, their principle and instrumentation and application in forensic science

Course Contents:	Blooms level	Number of hours
Module I: Basic Concepts - Atomic & Molecular Spectroscopy Introduction to Atomic orbitals, spectra, Bohr Model. Quantum Theory, molecular orbital, types of molecular energies, vibrational and electronic spectra. Classification of spectroscopic methods.	L1, L2, L3	10
Module II: Molecular Spectroscopy **Ultra-violet and visible spectrophotometry**: Types of sources and stability, wavelength selection, filters, reference cells and sampling devices, detectors, resolution, qualitative and quantitative methods for detection (Single beam and double beam). **Infrared spectrophotometry**: Basic principle, Dispersive and non-dispersive instruments, FTIR, instrumentation, Forensic applications, correlation of infra-red spectra with molecular structure. **Raman spectrophotometry**: Basic principle, theory, instrumentation, forensic applications. **Fluorescence spectrophotometry**: Types of sources, structural factors, instrumentation, comparison of luminescence and UV-visible absorption methods.	L1, L2, L3, L4	13
Module III: Atomic Spectroscopy **Atomic absorption spectrometry**: Instrumentation and techniques, interference in AAS, background correction methods, quantitative analysis, Applications in Forensic Science. **Atomic emission spectrometry**: Instrumentation and techniques, arc/spark emission, comparison of ICP vs AAS methods, quantitative analysis, applications in forensic science. **X-ray spectroscopy**: X-ray absorption and fluorescence methods, X-ray diffraction, Applications in Forensic Science. **Neutron Activation Analysis:** Introduction, principle, theory, instrumentation, and forensic applications.	L1, L2, L3, L4	13

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

- James W. Robinson; Atomic Spectroscopy, 2nd Edn. Revised &Expanded, Marcel Dekkar, Inc, NY. (1996)
- Gurdeep R. Chatwal & Sham K. Anand; Instrumental Methods of Chemical Analysis, Himalaya Pub. House (2004).
- R.S. Khandpur; Handbook of Analytical Instruments, Tata McGraw Hill Pub.Co. New Delhi (2004)
- John C. Lindon, George E. Tranter & John L. Holmes; Encyclopaedia of Spectroscopy & Spectrometry, Academic Press (2000)
- Kamlesh Bansal; Analytical Spectroscopy Campus, Books International (2000)
- D.R. Khanna & H.R. Gulati; Fundamentals of Optics Geometrical Physical & Quantum, 20th Edn., R. Chand & Co. (2002)
- K. Thyagarajan; Lasers Theory & Applications, Macmilan, India Delhi (2004)
- H.D.Bist; Lasers and their applications in the Indian Context, Tata McGraw Hill Pub. Co, New Delhi (1985)
- John D.Cutnell& Kenneth W Johnson; Physics 5th Edn., John Wiley & Sons Inc., NY. (2002)
- E.R.Mengel; Laser Spectroscopy Techniques & applications, Marcel Dekker NY (1995)
- E.R.Mengel; Fluorescence in Forensic Science in Encyclopedia of Analytical Chemistry, Wiley & sons (2000)
- G.R. Chatwal; Analytical Spectroscopy 2nd Edn, Himalaya Pub. House (2002)

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	1		3							1		
CO2	1	1		3							1		
CO3	1	1		3							1		

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FCH4318	INSTRUMENTATION WORKSHOP	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	0	0	0	1
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Instrumentation Workshop is a lecture series along with instrumental demo to acquaint new graduate students with departmental research (This one will be running through out first semesters on every Monday any Lecture, where normally Ph.D. students /internal Faculties /external speakers will give talks on their research or other topic of their specialization). The trainer must make sure that the aspects covered are practically practiced by the participants. The evaluation will be done by Board of examiners comprising of the faculties.

Course Objectives

A workshop/seminar is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop must be necessarily two ways. The trainer must make sure that the aspect covered is practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the principle and application of instruments in forensic research and will get an idea of application of the recent instruments in Forensic and allied sciences.

CO2: Acquaint with departmental research.

CO3: Learn the potential seminar-based evaluations.

Major Themes for Workshop

The workshop may be conducted on any of the following major themes:

- Crime Scene Investigation
- Forensic Toxicology
- Forensic Anthropology
- Handwriting &Typewriting Analysis
- Crime Scene Investigation
- Criminology, Criminal Law &Police Administration
- Fingerprint Science
- Forensic Serology
- DNA Fingerprinting
- Wounds & its Medico-Legal Aspects

These themes are merely indicative and other recent and relevant topics of study may be included.

Guidelines for Workshop

The procedure for earning credits from workshop consists of the following steps:

i. Relevant study material and references will be provided by the trainer in advance.

ii. The participants are expected to explore the topic in advance and take active part in the discussions held

iii. Attending and Participating in all activities of the workshop

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iv. Group Activities must be undertaken by students as guided by the trainer.
v. Evaluation of workshop activities would be done through test and quiz at the end of the workshop.
vi. Submitting a write up of at least 500 words about the learning outcome from the workshop.

Methodology

The methodology followed at the workshop could be based on any one or more of the following methods:

i. Case Study
ii. Simulation
iii. Quiz
iv. Quality analysis & characterization
v. Identification and preparation of materials

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Evaluation Scheme:

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total
10	30	30	30	100

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1			1			3	2	2			1	
CO2	1			1			3	2	2			1	
CO3	1			1			3	2	2			1	

1: strongly related, 2: moderately related and 3: weakly related

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FCH4306	ADVANCED FORENSIC BIOLOGY AND ANTHROPOLOGY	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	2	1	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is intended to provide advanced of the forensic biology and anthropology. The students will understand the advanced analytical techniques. It will be helpful in providing knowledge of the various branches of biology and their direct applications in the criminal investigation.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain wildlife forensics, Wildlife life protection Act and significance of wildlife evidences for criminal investigations and species identification.

CO2. Describe various concepts of entomology and its forensic relevance

CO3. Apply various instruments for individual identification from skeletal remains and presentation of these evidence in court of law.

CO4. Develop comprehensive knowledge of Superimposition techniques, Facial reconstruction for Personal Identification

Course Objectives:

During the course the student will

- Understand and appreciate the scope of forensic biology and Forensic Anthropology
- Understand and appreciate the scope, diversity, and utility of a variety of Human, Animal and plant evidences and their examination
- Learn the primary technique used for identification of various biological evidences
- Acquire the knowledge on techniques presently being used in the forensic examination of biological evidences and skeletal remains

Course Contents	Blooms level	Number of hours
Module I: Introduction to Wildlife Forensics Introduction to wildlife forensics, Examination of pug marks, horn, skin, fur, hair, nail, and teeth. Identification of some endangered species of plants and animals. Wildlife life protection Act.	L1, L2	6
Module II: Forensic Entomology and Forensic Microbiology Collection of insects, Shipment of collected insects, Identification of insect and its stage of growth. Determination of the post-mortem interval or "time since death" in homicide investigations, Forensic Entomo-toxicology. Introduction to Forensic microbiology	L1, L2, L3	8
Module III: Forensic Anthropology Somatometry, Osteometry and Craniometry. Identification of individuals from skeletal remains, Collection, Handling, preservation of skeletal remains of forensic science and report writing.	L1, L2	7

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Module IV: Forensic Taphonomy and Radiology Forensic Taphonomy. Fire modification of bones, Assessment of ante mortem and post-mortem skeletal trauma. Artefacts in the skeletal remains. Application of radiology in forensic anthropology	L1, L2, L3	7
Module V: Superimposition and Facial Reconstruction Superimposition techniques. Facial reconstruction: three dimensional and computer assisted facial reconstruction	L1, L2, L3, L4	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

- Richard Saferstein; Forensic Science Handbook; Ed.; Prentice – Hall, Englewood Cliff, New jersey; (1982)
- Biology Methods manual, Metropolitan Police Forensic Science Laboratory, London, 1978.
- Byrd, J. H. &Castner, J. L., Forensic Entomology, The Utility of Arthorpods in legal Investigation, CRC Press, USA, 2000.
- Encyclopaedia of Forensic Sciences, Volume, I, II, II & IV, Edited By Jay A. Siegel, Geoffrey
- Advances in Forensic Taphonomy: Method, Theory, and Archaeological Perspectives,William D. Haglund , Marcella H. Sorg, CRC Press; 1 edition, 2001
- Brogdon's Forensic Radiology, Second Edition, Edited by Michael J. Thali, Mark D. Viner,B.G. Brogdon, Published November 22nd 2010 by CRC Press – 654 pages

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1				3			3	3	1			
CO2	1							3	3	1			
CO3	1				3					1		3	
CO4	1							3		1			3

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FCH4319	FORENSIC GENETICS	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	2	1	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is intended to give insight of providing the basic knowledge about the DNA, genes, and chromosomes. The students will be able to identify the genic origin of the sample and will be able to match the samples with relatives. The course will help the students to understand the concept of allele transfer and its forensic application.

Course Objective: This course is designed to:

- Provide foundation knowledge of genetics
- Provide understanding of the inheritance laws and gene interactions
- Provide understanding of mutation and genetic diseases

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the significance of biological evidences in the forensic science.
CO2. Describe concept of gene and chromosome and how these are transferred to next generation.
CO3. Describe concept of mutation and genetic variations and their utility in crime investigation.
CO4. Utilize their knowledge of DNA for establishing identity, species differentiation and Forensic genetic research.

Course Contents:	Blooms level	Number of hours
Module I:Introduction to Genetics Mendel's work and Laws of heredity, Test cross, Backcross, Incomplete dominance and simple problems, Structure of DNA and RNA, Structural organization of chromosome, Special types of chromosomes (Salivary gland and Lamp-brush chromosomes)	L1, L2	6
Module II: Cell Division and Linkage Cell cycle, Mitosis and Meiosis, Coupling and repulsion hypothesis, Mechanism of linkage and its importance, Linkage in Maize and Drosophila, Mechanism of crossing over and its importance	L1, L2	8
Module III: Interaction of Genes Supplementary genes, Complementary genes, Pleiotrophy, Lethal genes, Epistasis, Multiple Allelism	L1, L2	7
Module IV: Mutations Mutagens and their types (Physical, chemical, biological), Mutation: Definition and types, Spontaneous and induced mutation, Chromosomal and Gene Mutation, Mutations in plants, animals, and microbes for economic benefit of man	L1, L2, L3	7

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Module V: Inherited Diseases Karyotype, Inherited disorders, Allosomal (Klinefelter syndrome and Turner's syndrome), Autosomal (Down's syndrome and Cri-Du-Chat syndrome)	L1, L2, L3	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	**A**	**CT**		**S/V/Q**	**HA**	**EE**
Weightage (%)	5	15		5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

- Basic Human Genetics by E.J. Manage and A.P. Manage (1997 India Reprint) Rastogi Publications, Meerut.
- Snustad & Simmons, Principles of Genetics, 4th Edition, Wiley, 2005
- M.W. Thompson et al, Genetics in Medicine by, 5th Edition, W.B. Sounders Company, London
- Lewin, Genes IX, 9th Edition, Jones & Bartlett, 2007
- Gustavo Maroni, Molecular and Genetic Analysis of Human Traits, 1st Edition, Wiley-Blackwell, 2001.

CO, PO, PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	1	1								1			
CO2	1	1								1			
CO3	1	1								1	3		
CO4	1	1								1	3		

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FCH4317	CYBER FORENSIC AND COMPUTER APPLICATIONS	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	2	1	0	3
Pre-requisites/Exposure					
Co-requisites					

Course Objective: The objectives of the course are to:

- Provide students with a technical skills and competencies in the field of forensic computing thus producing competent and confident graduates.
- Produce students who will have a hands-on knowledge and able to perform technical role in forensic computing field.
- Equip students with the right skills thus enabling them to adapt real working environment, while contributing positively to the society at large.

Course Outcomes

On completion of this course, the students will be able to

CO1. Describe the basis concept of computer.
CO2. Explain about the fundamentals of programming language and internet concept
CO3. Describe the basics of operating system and data storage devices.
CO4. Illustrate the biometric system and their pattern recognition.
CO5. Explain the cybercrime and their tools for analysis.

Course Contents:	Blooms level	Number of hours
Module I: Computer Fundamentals - I Computer characteristics and classifications, Concept of Computer Hardware, Concept of Computer Software	L1, L2	8
Module II: Computer Fundamentals - II Fundamentals of programming languages, Concept of Algorithm and Flow Chart, Networking, and Internet Concepts	L1, L2	6
Module III: Data Storage Fundamentals Data storage devices, Storage fundamentals (Sector, Cluster, FAT etc.), File System Concepts, Data Storage and recovery, Basics of Operating System Software, Understanding Storage Formats for Digital Evidences – Raw Format, Proprietary Formats, Advanced Forensic Formats. Data Acquisition of live system, Shutdown Systems and Remote systems. Digital Forensics Standard Operating Procedures. Software and Hardware Tools used in Forensic Analysis – Open Source and Proprietary tools.	L1, L2,L3	7
Module IV: Pattern Recognition and Biometrics Pattern Recognition and Biometrics – Face, Iris and retinal imaging, Speech recognition, finger and palm print, gait pattern, signatures, Pattern comparison, Image processing – Proactive Forensic science	L1, L2, L3, L4	7

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Module V: Cyber Crimes, Search and Seizures of Evidence Cyber Crimes – definition, Types, IT laws – introduction, internet, hacking, virus, obscenity, pornography, programme manipulation, software piracy, intellectual property, and computer security etc., Encryption and Decryption methods, Investigation of cyber-crimes and tools for analysis Types of evidence present in mobile phones and SIM cards, Evidence collection from Mobile Phones and SIM Cards, Recovery and preservation of undeleted and deleted Data (call records, phone books, massages, multimedia files i.e. image, video etc.) from Mobile Phones and SIM Cards	L1, L2, L3, L4	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

- James, S.H. and Nordby, J.J. Eds., Forensic Science:An Introduction to Scientific and Investigative Techniques, CRC Press, London, 2003.
- Leshin, C.B., Internet Investigation in Criminalistics, Prentice Hall, New Jersey, 1997.
- Tessarolo, A.A. and Marignani, A., Forensic Science and the Internet. The Canadian Society of Forensic Science Journal, Vol. 29, 1996.
- Bernad Jahne: Digital Image processing, Springer Verlag (1993)

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	1							1				
CO2	1	1							1				
CO3	1	1		3					1				
CO4	1	1		3					1				3
CO5	1	1				3			1				3

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FCH4310	ADVANCED QUESTIONED DOCUMENTS AND FINGERPRINTS EXAMINATION	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	2	1	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Advanced Questioned Document Examination deals with the examination of different kinds of questioned documents encountered in forensic cases. It provides a sound knowledge of the various aspects of questioned document examination. It develops the ability to analyze and resolve the crime mysteries involving forensic documents

Course Objective: The course focuses on following objectives-

- Developing an understanding and appreciation for the scope of Questioned Documents Examination.
- Develop an understanding on different types of cases in questioned documents and different writing conditions.
- Brief description on case presentation and report writing.
- Develop comprehensive knowledge on advanced Instrumentation techniques used for examination.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the concept of poroscopy and edgescopy.

CO2: Explain advanced Methods of Development of Latent Fingerprints

CO3: Perform evaluation and development of handwriting including forensic report including its format and preparation.

CO4: Explain different types of security documents and different instruments used to examine questioned documents.

Course Contents:	Blooms level	Number of hours
Module I: Introduction to Poroscopy and Edgeoscopy Introduction: Poroscopy and edgeoscopy, Fingerprints examination on the basis of poroscopy and its significance, evaluation of fingerprints on the basis of edgeoscopy and its significance in fingerprint field.	L1, L2	8
Module II: Advanced Methods of Development of Latent Fingerprints Automatic fingerprint identification system, application of radiations to examine latent fingerprints on various surfaces including skin, SPR, Phase transfer catalyst, DFO, Indanedione, Oil RedO, Factors affecting fingerprints.	L1, L2, L3	10

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Module III: Personality assessment and Different Writing Condition Evaluation of personality and psychological traits from handwriting, Evolutionary phases in handwriting, effect of age factor in handwriting and variations in handwriting characteristics, effect of alcohol and drugs on handwriting characteristics/ signatures.	L1, L2, L3	8
Module IV: Report Writing and Case Representation Expert's opinion, Examination in chief, Cross examination, Re-examination, Oath taking, Summons for evidences, Report writing and Case representation in Court of Law as Moot court.	L1, L2, L3	10

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

- Kelly, J. S. Lindblom, B. S. (2006). Science, Handwriting Examination and the Courts. Scientific Examinations of Questioned Documents, 2nd edition, CRC Press, Taylor & Francis group.
- Huber, A. R. Headrick, A. M. (1999). The Discrimination and Identification of writing. Handwriting Identification Facts and Fundamentals, CRC Press, Boca Raton London.
- Ordway Hilton, Scientific Examination of Questioned Documents, Rev. ED., Elsevier, New York, 1982.
- Wilson, R., Harrison, Suspect Documents – Their Scientific Examination; Universal Law Publishing, Delhi, 1997.
- Charles C. Thomas, Typewriting Identification I.S.Q.D.; Billy Prior Bates; Springfield, Illinois, USA, 1971.
- Hard less, H.R., Disputed Documents, handwriting and thumbs – print identification: profusely illustrated, Low Book Co., Allahabad, 1988.
- Kurtz, Sheila, Grapholypes a new plant on handwriting analysis, Crown Publishers Inc., USA, 1983.
- Lerinson, Jay, Questioned Documents, Acad Press, London, 2001.
- Morris, Ron, N., Forensic handwriting identification, Acad Press, London, 2001.

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	1	-							1			
CO2	1	1	2							1			
CO3	1	1	3							1	3		
CO4	1	1	-							1			

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FCH4320	ADVANCED FORENSIC CHEMISTRYAND TOXICOLOGY	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	2	1	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is intended for students to understand about Forensic chemistry and its various aspects in related field. The syllabus contains the various analytical methods to examine alcoholic beverages along with its toxicity. It also contains the drug abuse in sports and doping, classification and routes of administration of poisons and extraction and isolation techniques of various drugs from biological viscera.

Course Objective: - The objectives of the course:

- The student understands the basic pharmacodynamics, pharmacokinetic and toxicological principles underlying the actions of the various poisons encountered in forensic toxicology.
- To ensure that the student understand nature of the toxicological investigations undertaken in forensic laboratories.

Course outcome

On completion of this course, the students will be able to

CO1. Describe the mechanism of drug action and interactions in body.
CO2. Explain the drug movement and distribution in body & their examination.
CO3. Discuss the difference between use and abuse of drugs and their laboratory analytical methods.
CO4. Classify the poison and identify them in forensic science laboratory.

Course Contents:	Blooms level	Number of hours
Module I: Pharmacology-I Sites and mechanisms of action of drugs, Dose-effect relationships; agonists, partial agonists, and antagonists. Factor modifying drug actions; side effects, overdose, idiosyncratic and allergic reactions; teratogenesis and foetal toxicity. Drug interactions.	L1, L2	6
Module II: Pharmacology-II Movement of drug molecules across cell membranes, Blood-brain barrier and Placental filter. Routes of administration and drug adsorption. Binding to plasma proteins. Drug distribution, metabolism and elimination. Drug bioavailability and half-life.	L1, L2, L3	**7**
Module III: Toxicology and Isolation techniques of toxins Definition of Toxicology, Principle of toxicology, Isolation of toxic substances from viscera and other relevant materials. Role of drug recognition expert.	L1, L2, L3	**8**

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Module IV: Different Toxins-I Nature, administration, sign and symptoms, Fatal dose, post-mortem findings, Detection, and medicolegal aspects of- **a) Metallic poisons** Arsenic, Mercury **b) Vegetable poisons** AbrusPrecatorius, Calotropis Gigantia,Castor,Oleander, Aconite.	L1, L2, L3	**7**
Module V: Different Toxins-II **a) Insecticides** Organo-phosphorous compounds, Organo-chloro Compounds and Carbamates **b) Volatile Poisons** Methyl alcohol, Chloroform, c) **Asphyxiants** Cyanide, Carbon monoxide **d) Animal Poisons** Snake venom, Cantharide, Insect bite.	L1, L2, L3	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

Suggested Readings:

- Textbook of pharmacology, Lawrence
- A. Stolemen, Progress in Chemical Toxicology: Acad. Press, New York, 1963.
- Clark, E.G.C., Isolation and identification of Drugs, Vol. I and Vol. II, Academic Press, 1986.
- Cravey, R.H., Baselt, R.C., Introduction to Forensic Toxicology, Biochemical publications, Davis C A, 1981.
- Gleason, M.N. et.al, Clinical Toxicology of Commercial products, Williams and Williams, Baltimore, USA, 1969.
- Modi, Jaishing P, Textbook of Medical Jurisprudence & Toxicology, M.M. Tripathi Pub.2001.
- Working Procedure Manual – Toxicology, BPR&D Publication, 2000.

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	1		3						1	3		
CO2	1	1		3						1	3		
CO3	1	1			3					1	3	3	
CO4	1	1			3					1	3	3	

1: strongly related, 2: moderately related and 3: weakly related

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FCH4321	FORENSIC WILDLIFE AND ENTOMOLOGY	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	2	1	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is intended to provide advanced knowledge of the forensic wildlife and entomology. The students will understand the advanced analytical techniques to detect poaching. It will be helpful in providing knowledge of the various branches of biology and their direct applications in the criminal investigation.

Course Objective: During the course the students will be able to

- Understand the scope of wildlife forensics
- Understand and appreciate the diversity and utility of variety of animal evidences
- Elaborate concepts of entomology
- Estimate the time since death by life cycle of different insects

Course Outcomes

On completion of this course, the students will be able to

CO1. Describe entomology, time since death by insects, collection and preservation of the evidences
CO2. Explain role of insects in toxicological analysis
CO3. Explain significance of botanical evidences such as wood, leaves, pollens etc in forensic investigations
CO4. Analyse diatoms for forensic examination of drowning deaths and role of microbes in these investigations
CO5. Explain and analyse wildlife forensics, Wildlife life protection Act and significance of wildlife evidences for criminal investigations and species identification.

Course Contents	Blooms level	Number of hours
Module I: Forensic Entomology History, significance, determination of time since death- Dipterans larval development- life cycle of blowfly, housefly. Succession colonization of body, determining whether the body has been moved, body disturbance, presence and position wounds, linking suspect to the scene, collection and preservation of entomological evidence.	L1, L2	7
Module II: Entomo-toxicology Insects as toxicological indicators, Impact of drugs & toxins on insect development and Identification of drugs and toxins from the insects and larvae feeding on the body, entomology as an evidentiary tool in abuse cases.	L1, L2, L3	8

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Module III: Botanical evidences Introduction, types, location, collection evaluation and forensic significance. **Wood:** Type of wood and their identification and comparison. **Leaves:** Identification of various types of leaves and their anatomy, methods of comparison. **Pollens:** Structure, function, methods of identification and comparison.	L1, L2, L3	6
Module IV: Diatoms and Microbes **Diatoms:** Nature, location, structure, extraction from various body tissues, including bone marrow, preparation of slides, methods of identification and comparison, forensic significance. **Microbes:** Types and identification of microbial organisms of forensic significance.	L1, L2, L3	7
Module V: Wildlife Forensics Introduction, importance, protected and endangered species of Animals and Plants. Identification of wildlife materials such as skin, fur, bones, nails, horn, teeth, flowers, and plants, by conventional and modern methods, Identification of Pug marks of various animals. Different methods of poaching of wildlife animals. Types of wildlife crimes. Wildlife (Protection) Act, 1972.	L1, L2, L3	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

- Jason H. Byrd and James L. Castner; Forensic entomology, CRC Press LLC, 2001.
- Forensic Science Hand book by Richard saferstein Vol (II); Prentice Hall, Publications.
- Richard saferstein; Forensic Science Hand book, Vol (I); Prentice Hall, Publications.
- Curry, A. S. (1965) Methods of Forensic Science, Vol. IV, Interscience, New Youk.
- Chowdhuri, S. (1971) : Forensic Biology, B P R & D Govt. of India.
- Linarce, Adrian; "Forensic Science in Wildlife Investigation", CRC Press, Taylor & Francis, 2009.
- Baalu, T.R.; "The Wildlife Protection Act, 1972", Nataraj Publication, 2001.
- G. Erdtman; "Pollen Morphology & Plant Taxonomy: Angiosperms (an introduction to Palynology), Hafner Publishing Co., 1971.
- Esau Katherine; "Plant Anatomy", Wiley Eastern Ltd., 1965.

CO, PO, PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	1	1		3				3		1			3
CO2	1	1		3				3		1			3
CO3	1	1		3				3		1			3
CO4	1	1		3				3		1			3
CO5	1	1		3				3		1			3

1: strongly related, 2: moderately related and 3: weakly related

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FCH4409	GOOD LABORATORY PRACTICES SEMINAR	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	0	0	0	1
Pre-requisites/Exposure					
Co-requisites					

Course Objective:
Students will be introducing to learning the written and oral communication of technical information. Assignments include writing and presenting proposals, reports, and documentation. Emphasis on use of rhetorical analysis, computer applications, collaborative writing, and usability testing to complete technical communication tasks in the workplace.

Course outcome:
The students will able to
CO1. Explain the technical requirements for lab setup
CO2. Summarize the protocols for the lab setups and procedures.
CO3. Describe the significance of GLP in accreditations of laboratories

Course Contents:	Blooms level	Number of hours
Module I: Technical Writing Process Technical Writing: Scientific and technical subjects; formal and informal writings; formal writings/reports, handbooks, manuals, letters, memorandum, notices, agenda, minutes; common errors to be avoided.	L1, L2	
Module II: Journal Paper Writing Journal paper writing: Abstract for paper and poster, different kind of journal for forensic Sciences, impact factors of journals, ISBN number, Citation, H-index.	L1, L3	
Module III: Documentation Process Writing Skills, Selection of topic, thesis statement, developing the thesis; introductory, developmental, transitional and concluding paragraphs, linguistic unity, coherence and cohesion, descriptive, narrative, expository and argumentative writing. Analytical report, Project management in technical communication, Project writing, project proposal writing.	L1, L3	

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggestive readings:

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- M. Frank. Writing as thinking: *A guided process approach, Englewood Cliffs,* Prentice Hall Reagents.
- L. Hamp-Lyons and B. Heasely: Study Writing; *A course in written English.* For academic and professional purposes, Cambridge Univ. Press.
- R. Quirk, S. Greenbaum, G. Leech and J. Svartik: *A comprehensive grammar of the English language*, Longman, London.
- Daniel G. Riordan & Steven A. Panley: *"Technical Report Writing Today"* - Biztaantra.
- Daniel G. Riordan, Steven E. Pauley, Biztantra: *Technical Report Writing Today*, 8th Edition (2004).
- Contemporary Business Communication, Scot Ober, Biztantra, 5th Edition (2004).

CO, PO, PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	1								3			1	2
CO2	1								3			1	2
CO3	1								3			1	2
CO4	1								3			1	2

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FCH4405	QUALITY MANAGEMENT AND ACCREDITATION IN FORENSIC SCIENCE LABORATORIES	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	2	0	0	2
Pre-requisites/Exposure					
Co-requisites					

Catalog Description
This course is intended for the students who have never learned about the quality management and technical requirement in forensic laboratories. A knowledge of the process of accreditation and basic requirements for a testing and calibration laboratory to be accredited is must for the student of forensic science.

Course Objective: The objective of this course is to introduce the students with the Quality management system and requirements for the competence of testing and calibration, the technical requirements needed in a laboratory.

Course Outcomes
On completion of this course, the students will be able to
CO1. Apply the quality management in forensic laboratories.
CO2. Summarize the technical requirements for a forensic laboratory to be accredited.
CO3. Perform sampling, handling of test and calibration items, as well as assuring the quality of test and calibration results and reporting the results in forensic cases.
CO4. Setup the forensic laboratory information management system.

Course Contents:	Blooms level	Number of hours
Module I: Management requirements I General requirements for the competence of testing and calibration laboratories – Introduction, scope, management requirements: Organization, Quality system, Document control, Review of requests	L1, L2	5
Module II: Management requirements II Internal Audits; Control of records, Corrective and preventive actions, Tenders and contracts, Sub-contracting of tests and calibration, Purchasing services and supplies, Service to the clients, Complaints	L1, L2, L3	5
Module III: Technical requirements I Technical requirements: General, Personnel, Accommodation and Environmental conditions, Test and Calibration methods	L1, L2, L3	5
Module IV: Technical requirements II Equipment, measurement traceability, sampling, handling of test and calibration items, assuring the quality of test and calibration results and reporting the results	L1, L2, L3	4
Module V: Laboratory Management Laboratory information management system, Validation and safety equipments	L1, L2, L3, L4	5

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Readings:

- International standard on General requirements for the competence of testing and calibration laboratories, Fist Edn., 1999-12-15, ISO/IEC 1702:1999(E)
- Mario Deva RGAS, The Total Quality Management, NCC Blackwell Publication, (1995).
- Willard Merritt, Dean & settle; Instrumental Methods of Analysis, CBS Publishers & Distributors, 7thEdn. New Delhi, (1986)

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2				2		3	3	3			1	3
CO2	2							3	3			1	3
CO3	2				2		3	3	3			1	3
CO4	2				2		3	3	3			1	3

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FCH4408	FORENSIC PSYCHOLOGY	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	2	1	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course is intended to give insight of providing the basic knowledge about the human behavior, and its impact on social environment. The students will be able to explain cognitive neuroscience and associated disorders. The course will help the students to understand the concept of intelligence and forensic psychological impact.

Course Objectives:

1. To facilitate the learning of traditional and emergent fields of cognitive neuropsychology.
2. To understand-brain-behaviour relationship in day-to-day life
3. To explore the practical implications of cognitive processes in human performance.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the concepts of emergent fields of cognitive neuropsychology.
CO2. Describe brain-behaviour relationship in day to day life
CO3. Apply practical implications of cognitive processes in human performance.
CO4. Analyse impact of intelligence and decision making and language on personal behaviour

Course Contents:	Blooms level	Number of hours
Module-I: Cognitive Neuroscience Introduction, Philosophical antecedents, Emergence of Cognitive psychology, Approaches and key issues, Organization of Nervous system: Cognition in the Brain, Sensation to representation, Theoretical approaches to perception, Deficits in perception. Attention and consciousness	L1, L2	8
Module-II: Memory Models, Processes, Practical Applications of Cognitive Psychology in improving memory processes, Representations and manipulation of knowledge in: Images and Propositions, Spatial cognition and Cognitive map	L1, L2, L3	7
Module-III: Language Nature and Acquisition: Bilingualism and Multilingualism Reading, Bottom-up and Top-down processes, Comprehension, Neuropsychology of Language. Problem-solving and Creativity, Practical applications of cognitive psychology. Decision-making and reasoning: Deductive reasoning and inductive reasoning	L1, L2, L3, L4	9
Module-IV: Intelligence Information possessing and intelligence, alternative approaches to intelligence. Computer simulation, improving intelligence	L1, L2, L3	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1					1		3	3			2	1
CO2	1					1		3	3				1
CO3	1					1		3	3			2	1
CO4	1					1		3	3			2	1

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FCH4437	MAJOR PROJECT	L	T	P	C
Version 1.1	Date of Approval: Dec, 2021	0	0	0	10
Pre-requisites/Exposure					
Co-requisites					

Course outcome

On completion of this course, the students will be able to

CO1. Explain the recent techniques in the forensic field

CO2. Analyse the samples and compile the data for the research publications

CO3. Apply practical and theoretical knowledge of the Research methodology and the relevant subjects for new findings

CO4. Explain the result in the seminar/ research presentations.

GUIDELINES FOR PROJECT FILE AND PROJECT REPORT

Research experience is as close to a professional problem-solving activity as anything inthe curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, considering that initial drafts should be critically analyzed by the faculty guide and corrected by the student at each stage.

PROJECT FILE

The Project File may be a very useful tool for undertaking an assignment along-with a normal semester, an exploratory study, sponsored projects, a project undertaken during summer period or any other period as per curricula where the researcher is working with a company/organization. The project/ assignment may also be a part of the bigger research agenda being pursued by a faculty/ institution/ department

The Project File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation. This file may be considered in continuous assessment.

In general, the File should be comprehensive and include:

- A short account of the activities that were undertaken as part of the project.
- A statement about the extent to which the project has achieved its stated objectives.
- A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project.
- Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project.
- Any problems that have arisen and may be useful to document for future reference.

PROJECT REPORT

The Project Report is the final research report that the student prepares on the project assigned to him. In case of sponsored project, the lay out of the project could be as prescribed by the sponsoring organization. However, in other cases the following components should be included in the project report:

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Title or Cover Page

The title page should contain Project Title; Student's Name; Programme; Year and Semester and Name of the Faculty Guide.

Acknowledgement(s)

Acknowledgment to any advisory or financial assistance received in the course of work may be given. It is incomplete without student's signature.

Abstract

A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project. It should not exceed more than 1000 words.

Table of Contents

Titles and subtitles are to correspond exactly with those in the text.

Introduction

Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

Materials and Methods

This section should aim at experimental designs, materials used (wherever applicable). Methodology should be mentioned in details including modifications undertaken, if any. It includes organization site(s), sample, instruments used with its validation, procedures followed and precautions.

Results and Discussion

Present results, discuss and compare these with those from other workers, etc. In writing this section, emphasis should be laid on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in textbooks. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

Note that in writing the various sections, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is necessary, do not write in "point" form.

While presenting the results, write at length about the various statistical tools used in the data interpretation. The result interpretation should be simple but full of data and statistical analysis. This data interpretation should be in congruence with the written objectives and the inferences should be drawn on data and not on impression. Avoid writing straight forward conclusion rather; it should lead to generalization of data on the chosen sample.

Results and its discussion should be supporting/contradicting with the previous research work in the given area. Usually, one should not use more than two researches in either case of supporting or contradicting the present case of research.

Conclusion(s) & Recommendations

A conclusion should be the final section in which the outcome of the work is mentioned briefly.

Check that your work answers the following questions:

1. Did the research project meet its aims (check back to introduction for stated aims)?
2. What are the main findings of the research?
3. Are there any recommendations?
4. Do you have any conclusion on the research process itself?

Implications for Future Research

This should bring out further prospects for the study either thrown open by the present work or with the purpose of making it more comprehensive.

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Appendices

The Appendices contain material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

References

References should include papers, books etc. referred to in the body of the report. These should be written in the alphabetical order of the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Examples:

For research article:

Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichiacoli*O157: H7. *Clin Microbiol Infect* ,**8**(suppl 1): 116–117.

For book:

Kowalski, M. (1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67

The Layout Guidelines for the Project File & Project Report:

1. A4 size Paper
2. Font: Arial (10 points) or Times New Roman (12 points)
3. Line spacing: 1.5
4. Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

ASSESSMENT OF THE PROJECT FILE AND THE PROJECT REPORT

Essentially, the assessment will be based on the quality of the report, the technical merit of the project and the project execution. Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project. Project execution is concerned with assessing how much work has been put in.

The Project should fulfill the following ***assessment objectives:***

1. Range of Research Methods used to obtain information
2. Execution of Research
3. Data Analysis (Analyze Quantitative/ Qualitative information)
4. Quality Control
5. Conclusions

Assessment Scheme:

Continuous Evaluation:

40% (Based on punctuality, regularity of work, adherence to plan and methodology, refinements/ mid-course corrections etc. as reflected in the Project File.)

Final Evaluation:

60% (Based on the Documentation in the file, Final report layout, analysis and results, achievement of objectives, presentation/ viva)

It is recommended that the Final evaluation should be carried out by a panel of evaluators.

CO, PO, PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2		1				3	3		3	1	
CO2	3	2		1		3		3	3		3	1	3
CO3	3	2		1		3		3	3		3	1	3
CO4	3	2		1		3		3	3		3	1	3

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COMPUTER FORENSICS & CYBER SECURITY

Programme Structure-2022

Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
FCH2151	Computer Forensics	2	-	2	3
FCH2251	Ethics, Policies and the IT Act	2	1	-	3
FCH2352	Biometric Technology	2	1	-	3
FCH2451	Implementation Practical on MATLAB	-	-	6	3
FCH2551	Cyber Security	2	-	2	3
FCH2651	Incident Response Management	2	1	-	3
	TOTAL				**18**

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Syllabus - Semester First

COMPUTER FORENSICS

Course Code: FCH2151 **Credit Units: 3**

Course Objectives:

- To correctly define and cite appropriate instances for the application of computer forensics Correctly collect and analyze computer forensic evidence
- Identify the essential and up-to-date concepts, algorithms, protocols, tools, and methodology of Computer Forensics

Course Contents:

Module 1: Cyber Crime

Introduction to Digital Forensics, Definition and types of cybercrimes, electronic evidence and handling, electronic media, collection, searching and storage of electronic media, introduction to internet crimes, hacking and cracking, credit card and ATM frauds, web technology, cryptography, emerging digital crimes and modules.

Module 2: Digital Forensics

Forensics Investigation Process: Pre-search consideration, Collection of Evidences from crime scene, Acquisition, Duplication and Preservation of evidences, Examination and Analysis of evidences, Storing of Evidences, Documentation and Reporting, Maintaining the Chain of Custody. Hashing and its importance. Understanding Storage Formats for Digital Evidences – Raw Format, Proprietary Formats, Advanced Forensic Formats. Data Acquisition of live system, Shutdown Systems and Remote systems. Digital Forensics Standard Operating Procedures. Software and Hardware Tools used in Forensic Analysis – Open Source and Proprietary tools. Challenges and issues in Cyber-crime investigations and Digital forensics, Legal and privacy issues.

Module 3: Computer Forensics

Definition and Cardinal Rules, Data Acquisition and Authentication Process, Windows Forensic Analysis of File Systems-FAT12, FAT16, FAT32 and NTFS, UNIX file Systems, Mac file systems, Embedded System Analysis, Network Forensic Analysis Overview, Cloud Computing-an introduction.

Module 4: Forensic Tools and Processing of Electronic Evidence

Introduction to Forensic Tools, Usage of Slack space, tools for Disk Imaging, Data Recovery, Vulnerability Assessment Tools, Encase and FTK tools, Anti Forensics and probable counters, retrieving information, process of computer forensics and digital investigations, processing of digital evidence, digital images, damaged SIM and data recovery, multimedia evidence, retrieving deleted data: desktops, laptops and mobiles, retrieving data from slack space, renamed file, ghosting, compressed files.

Examination Scheme:

Components	CT	HA	S/V/Q	A	EE
Weightage (%)	10	7	8	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance EE: End Semester Examination

References:

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- C. Altheide and H. Carvey Digital Forensics with Open Source Tools, Syngress, 2011.ISBN: 9781597495868.
- Selected readings from various sources as assigned
- Online Course management System:https://esu.desire2learn.com/

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COMPUTER FORENSIC PRACTICAL

List of Exercises

- Live Case Studies
- Open Source Forensic Tools
- Disk Forensics and Data Recovery
- Cryptography: Algorithm Implementation
- Anti-forensic techniques
- Steganography
- Keyloggers
- Networkmonitors
- Flowchart management
- Algorithm designs
- UML diagrams
- e-Commerce on websites

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Syllabus - Semester Second

ETHICS, POLICIES AND THE IT ACT

Course Code: FCH2251 **Credit Units: 3**

Course Objectives:
To understand the ethics and laws by which cyberspace is governed in our country and worldwide.

Course Contents:

Module 1: Introduction
Basics of Law and Technology, Introduction to Indian Laws, Scope and Jurisprudence, Digital Signatures, E Commerce: Introduction, possible crime scenarios, law coverage, data interchange, mobile communication development, smart card and expert systems.

Module 2: Indian and International Laws
Indian Laws, Information Technology Act 2000, Indian Evidence Act, India Technology Amendment Act 2008, Introduction to Indian Penal Code, Computer Security Act 1987, National Information Infrastructure Protection Act 1996, Fraud Act 1997, Children Online Protection Act 1998, Computer Fraud and Abuse Act 2001. Introduction to International Laws, International Cyber Laws, Policy and Compliance, Corporate IT Policy Formulations.

Module 3: Intellectual Property Rights
Intellectual Property, IP Theft, Copyright, Trademark, Privacy and Censorship, Introduction to Cyber Ethics, rights over intellectual property, Compliance Auditing, Ethical hacking.

.

Examination Scheme:

Components	CT	HA	S/V/Q	A	EE
Weightage (%)	10	7	8	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance EE: End Semester Examination

References:

- CYBER LAW-The Indian Perspective, Pawan Duggal(2009).
- 7 Years of Indian Cyber Laws, Rohas Nagpal(2008).
- Doctrine of IT Act of India, Government of India Publication(2000).

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Syllabus - Semester Third

BIOMETRIC TECHNOLOGY

Course Code: FCH2352 **Credit Units: 3**

Course Objectives:

- To understand fundamentals of biometric system and its performance metrics
- To understand the components, issues and approaches for physiological biometrics.
- To learn the technology behind behavioral biometric systems like voice scan, signature scan and gait analysis along with their challenges.
- Know the applicability and privacy concerns in biometrics.

Course Contents:

Module 1: Biometric Fundamentals

Introduction: Biometric fundamentals – Biometric technologies – Biometrics Vs traditional techniques – Characteristics of a good biometric system – Benefits of biometrics, Components and steps of a biometric system, Key biometric processes: verification, identification and biometric matching – Performance measures in biometric systems, FAR,FRR, FTE rate, EER and ATV rate, Layered biometric solutions, Types of biometrics and commonly used biometrics.

Applications of a Biometric System

Applications of Biometric Systems: industry, Government, offices, banks, defense and forensics, Security and Privacy Issues.

Module 2: Physiological Biometrics: Leading technologies : Finger-scan – Facial-scan – Iris-scan – components, working principles, competing technologies, strengths and weaknesses – Other physiological biometrics : Hand-scan, Retina-scan – components, working principles, competing technologies, strengths and weaknesses – Automated fingerprint identification systems.

Module 3: Leading Behavioral Biometrics technologies: Voice scan – Signature scan– Gait scan-components, working principles, strengths and weaknesses, challenges and scope of behavioral biometrics.

Voice Recognition: Voice scan, speaker features, short term spectral feature extraction, speaker matching, Gaussian mixture model, NIST speaker Recognition Evaluation Program.

Speech recognition: Introduction-Regular Expressions and automata-Words and transducers-N-grams Part of speech tagging-Hidden Markov and Entropy models, Speech-Phonetics-Speech synthesis-Automatic speech recognition, speech recognition versus voice recognition.

Module 4: Gait Pattern Analysis

Fundamentals of Gait Analysis, Gait Analysis: Considerations and Terminology, Motion Analysis Systems, Ground Reaction Forces, Introduction to EMG, Motion Analysis, Gait Cycle, Abnormalities in Gait, Challenges in gait recognition

Examination Scheme:

Components	CT	HA	S/V/Q	ATTD	EE
Weightage (%)	10	7	8	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance
EE: End Semester Examination

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References:

- Daniel Jurafsky and James Martin "Speech and Language Processing", 2nd edition, Prentice- Hall, 2008.
- Xuedong Huang, Alex Acero and Hsiao-Wuen Hon, "Spoken Language Processing", Prentice- Hall, May 2001.
- Paul Taylor, "Text-to-Speech Synthesis", Cambridge University Press, February 2009.
- Samir Nanavati, Michael Thieme, Raj Nanavati "Biometrics – Identity Verification in a Networked World", WILEY- Dream Tech Edition 2009. (UNIT 1, 2, 3, 4,).
- Paul Reid "Biometrics for Network Security", Pearson Education.2009. (UNIT – V).
- John D. Woodward, Jr. Wiley Dreamtech Biometrics- The Ul.
- Perry J. Gait analysis. Normal and Pathological Function. SLACK Incorporated, 1992.

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Syllabus - Semester Fourth

IMPLEMENTATION PRACTICAL ON MATLAB

Course Code: FCH2451 **Credit Units: 3**

Experiments based on following concepts:

- Introduction to MATLAB
- Basic MATLAB programming (matrices, plots, multiple plots)
- Acquisition
- Noise filtering
- Image Enhancement
- Region of interest extraction
- Feature Extraction
- Classification

Examination Scheme:

Components	TA	LR	V	A	EE
Weightage (%)	10	7	8	5	70

Note: TA-Teacher's Assessment, LR-Lab Record, V-Viva

References:

- Samir Nanavati, Michael Thieme, Raj Nanavati "Biometrics – Identity Verification in a Networked World", WILEY- Dream Tech Edition 2009.(UNIT1,2,3,4,)
- Paul Reid "Biometrics for Network Security", Pearson Education.2009. (UNIT –V)
- Daniel Jurafsky and James Martin "Speech and Language Processing", 2nd edition, Prentice- Hall, 2008.
- Xuedong Huang, Alex Acero and Hsiao-Wuen Hon, "Spoken Language Processing", Prentice- Hall, May2001.
- Paul Taylor,"Text-to-Speech Synthesis", Cambridge University Press, February2009.

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Syllabus - Semester Fifth

CYBER SECURITY

Course Code: FCH2551 **Credit Units: 3**

Course Objectives:

- Understand the threats in networks and security concepts.
- Apply authentication applications in different networks.
- Understand security services for email.
- Awareness of firewall and it applications.

Course Contents:

Module 1: Cyberspace

Ethical hacking, Attack Vectors, Cyberspace and Criminal Behaviour, Clarification of Terms, Traditional Problems associated with Computer Crimes, Computer language, Network Language, Realms of Cyber world, brief history of the internet, contaminants and destruction of data, unauthorized access, computer intrusions, white-collar crimes, viruses and malicious code, virus attacks, pornography, software piracy, mail bombs, exploitation, stalking and obscenity in internet.

Module 2: Network Forensics

Network Forensics: Networking, Overview of OSI Model and TCP/IP Protocol. IP Addressing and NAT. Types of IP addresses, Digital and Analog Signaling Methods, Network Types (LAN, MAN and WAN) and Topologies, Network Hardware devices (hubs, switches, bridges, repeaters, routers etc.) and Client/Server Computing, Routers and Routing Protocols.

Monitoring of computer network and activities, Live Packet Capturing and Analysis. Searching and collection of evidences from the network. Network Intrusion Detection and Analysis. SQL Injection, Event Log Aggregation – role of logs in forensic analysis, tools and techniques. Investigating network attacks. Evidence collection from Routers and CCTV DVRs.

Module 3: Network Security

Investigation Tools, e-discovery, EDRM Models, digital evidence collection and preservation, email investigation, email tracking, IP tracking, email recovery, search and seizure of computer systems, password cracking.

Module 4: Operating Systems

Operating System: Introduction, Objectives and Functions of Operating System. Types of Operating system- Windows, Linux, Mac, Booting process of computers.

Windows artifact analysis, Internet Artifacts, OS Artifacts, File System Artifacts, Registry Artifacts, Application Artifacts, Report Writing.

Examination Scheme:

Components	CT	HA	S/V/Q	A	EE
Weightage (%)	10	7	8	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance
EE: End Semester Examination

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References:

- Charles P. Fleeger, "Security in Computing", Prentice Hall, New Delhi,2009.
- Beerhouse A. Frozen, ―Cryptography and Network Security‖, Tata McGraw Hill, India, New Delhi, 2009.
- William Stallings, ―Cryptography and Network Security, Prentice Hall, New Delhi,2006
- Chalice Kaufman, Radii Perlman, Mike Spicier, ―Network Security: Private Communication in a Public Network‖, Pearson Education, New Delhi, 2004.
- NealKraetzer,―IntroductiontoNetworkSecurity‖,ThomsonLearning,Boston,2007.
- BruceSchneider,―AppliedCryptography‖,JohnWileyandSons,NewYork,2004.

CYBER SECURITY PRACTICAL

List of Exercises

- File System Analysis
- Log Analysis
- Network Devices: Modem, Router, Switch, Hub, Repeater
- SQL Injection
- Cross Site Scripting
- Click Jacking
- TCP/ IP Attacks
- Bitnet analysis
- Malware Analysis
- IR Objectives and Team Building
- Email Tracking
- IP Tracking
- Cyber psychology and Social Engineering Test Profiling

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Syllabus - Semester Sixth

INCIDENT RESPONSE MANAGEMENT

Course Code: FCH2651 **Credit Units: 3**

Course Objectives:

- Defining an incident relating to cyber security.
- Recognizing an Incident
- Protocols for first on crime scene investigations.
- Government approved handling of computer crime scenarios.

Course Contents:

Module 1: Introduction

Cyber Incident Statistics, Computer Security Incident, Information as Business Asset, Data Classification, Information Warfare, Key Concepts of Information Security, Vulnerability, Threat and Attacks, Types of Computer Security Incidents, Examples of Incidents, Incidents Categorization, Low Level Incident, Mid Level Incident, High Level Incident.

Module 2: Incident Response Management

Introduction to Incident Response Process, Preparing for Incident Response, detection of an Incident, IRM life cycle-preparation, Identification, Detection, Containment, Eradication, Recovery, lessons learnt, Investigations of Cyber Crime cases as per IRM cycles, opinion formatting for cyber crime cases, court testimonies, case studies.

Module 3: Investigation of Incidents

Incident Prioritization, Incident Response and Handling process, Disaster Recovery, Technologies and Impacts, Virtualization and Impacts, Estimated Cost of an Incident, Incident Reporting Organizations, Vulnerability Reports, Incident Identification, Need and Goals of Incident Response.

Module 4: Incident Response Team

Incident Response Team development, Security Awareness and Training Checklist, Incident Management, Purpose of Incident management, Incident management process, Incident management team, Incident Response Team and Members, Member Goals and Responsibilities, Developing Skills in Incident Response Personnel, Incident Response Team Structure, Team Dependencies and Services.

Examination Scheme:

Components	CT	HA	S/V/Q	A	EE
Weightage (%)	10	7	8	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance EE: End Semester Examination

References:

- CERT-In Guidelines.

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DATA ANALYTICS

Programme Structure

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits
MTH2151	Optimization Techniques	3	-	-	3
MTH2251	Statistics	3	-	-	3
MTH2351	Data Mining	3	-	-	3
MTH2451	Database Management System	3	-	-	3
MTH2551	Introduction to Financial Modelling	3	-	-	3
MTH2651	Statistical Quality Control	3	-	-	3
	TOTAL				**18**

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DATA ANALYTICS

Syllabus - Semester First

OPTIMIZATION TECHNIQUES

Course Code: MTH2151 **Credit Units: 03**

Course Objective:
The problems in optimization are the most common applications of mathematics. The main aim of this course is to present different methods of solving optimization problems in the areas of linear programming.

Course Contents:
Module I: Introduction to OR
Historical Development of OR, OR models and Advantages, Methodology of OR, Advantages of OR, Features of OR solution, Applications and Scope of OR

Module II: Linear Programming Problems (LPP)
Definition of LPP, General Structure of Linear Programming, Formulation of LPP, Advantages and Limitations of Linear Programming, Graphical Solutions of Linear Programming Problems. Simplex Method, Degeneracy, Duality.

Module III: Transportation Problems
Introduction to Transportation Model, Degeneracy in TP, Solution Techniques of TP, Different Methods for Obtaining Initial Basic Feasible Solutions viz. Matrix Minima Method, Row Minima Method, Column Minima Methods, Vogel's Approximation Method, Techniques for Obtaining Optimal Basic Feasible Solution – Stepping Stone and MODI Method. **Assignment Problems:** Definition, Types of Assignment Problems, Hungarian Method for AP.

Module IV: Game Theory
Concept of Game problem. Rectangular games. Pure strategy and Mixed strategy. Saddle point and its existence. Optimal strategy and value of the game. Algebraic method, Graphical method and Dominance method of solving Rectangular games. Inter-relation between the theory of Games and L.P.P

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

References:

- Operations Research, S D Sharma, KNRN Publication
- Operations Research, P.K. Gupta and D. S. Hira, Sultan Chand Ltd.
- Introduction to Operations Research, Hamdy A Taha, PHI Limited, New Delhi.
- Operations Research, J K Sharma, Macmillan Publication

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Syllabus - Semester Second

STATISTICS

Course Code: MTH2251 **Credit Units: 03**

Course Objective:
Statistics plays an important role in data analytics. The main aim of this course is to help the students to read, classify and then interpret the data given to them and draw conclusions.

Module I: Data and Representation
Introduction to Statistics, Collection of data, classification and tabulation of data, Types of data: Primary data, Secondary data, Presentation of data Diagrammatic and Graphical Representation: Histogram, frequency curve, frequency polygon, Ogive curves, stem and leaf chart.

Module II: Measures of Central Tendency and Dispersion
Arithmetic Mean (A.M.) Definition, Mode, Median, Partition Values : Quartiles, Deciles and Percentiles, Box Plot, Percentile ranks. Means of transformed data, Geometric Mean (G.M.) Definition, Harmonic Mean (H.M.), Weighted Mean : Weighted A.M., G.M. and H.M.
Range, Mean deviation Mean square deviation, Variance and Standard Deviation, Combined variance (derivation for 2 groups), Combined standard deviation.

Module III: Correlation and Regression
Bivariate normal distribution, types, importance, methods of measuring correlation-scatter diagram, Karl Pearson's Coefficient of Correlation and Spearman's rank Correlation. Regression lines, Difference between regression and correlation, uses of Regression.

Module IV : Sampling theory and tests of significance
Methods of sampling (Description only): Simple random sampling with and without replacement (SRSWR and SRWOR) stratified random sampling, systematic sampling.
Tests of significance – z, t, chi-square and F.

Examination Scheme:

Components	CD	CT1	SA	A	EE
Weightage	5	10	10	5	70

CD= Class Discussion, CT 1= Class Test, SA= Short Assignments, A= Attendance. EE= External Examination

References:

- Mood, A. M., Graybill, F. A. And Boes, D.C. : Introduction to the Theory of Statistics, McGraw Hill.
- Biswas and Srivastava – A textbook, mathematical Statistics, Ist Edition, Narosa Publishing House, New Delhi.
- Gupta, S.C. and V. K. Kapoor – Mathemathical Statistics, Sultan Chand and sons.
- Hogg,R.V. and Craig, A.T: Introduction to Mathematical Statistics, McMillan.
- S. C. Gupta – Fundamentals of Statistics, Himalaya Publishing House.

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Syllabus - Semester Third

DATA MINING

Course Code: MTH2351 **Credit Units: 03**

Module 1: DATA WAREHOUSING
Data warehousing Components –Building a Data warehouse –- Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata.

Module 2: BUSINESS ANALYSIS
Reporting and Query tools and Applications – Tool Categories – The Need for Applications – Cognos Impromptu – Online Analytical Processing (OLAP) – Need – Multidimensional Data Model – OLAP Guidelines – Multidimensional versus Multirelational OLAP – Categories of Tools – OLAP Tools and the Internet.

Module 3 : DATA MINING , CLUSTERING AND APPLICATIONS AND TRENDS IN DATA MINING
Introduction – Data – Types of Data – Data Mining Functionalities – Interestingness of Patterns – Classification of Data Mining Systems – Data Mining Task Primitives – Integration of a Data Mining System with a Data Warehouse – Issues –Data Preprocessing, Cluster Analysis - Types of Data – Categorization of Major Clustering Methods – Kmeans – Partitioning Methods – Hierarchical Methods - Density-Based Methods –Grid Based Methods – Model-Based Clustering Methods – Clustering High Dimensional Data - Constraint – Based Cluster Analysis – Outlier Analysis – Data Mining Applications.

Module 4 : ASSOCIATION RULE MINING AND CLASSIFICATION
Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining Various Kinds of Association Rules – Correlation Analysis – Constraint Based Association Mining – Classification and Prediction - Basic Concepts - Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Backpropagation – Support Vector Machines – Associative Classification – Lazy
Learners – Other Classification Methods – Prediction

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

TEXT BOOKS:
1. Alex Berson and Stephen J. Smith, " Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Tenth Reprint 2007.
2. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Second Edition, Elsevier, 2007.

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REFERENCES:

1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, " Introduction To Data Mining", Person Education, 2007.
2. K.P. Soman, Shyam Diwakar and V. Ajay ", Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2006.
3. G. K. Gupta, " Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.
4. Daniel T.Larose, "Data Mining Methods and Models", Wile-Interscience, 2006.

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Syllabus - Semester Fourth

DATABASE MANAGEMENT SYSTEM

Course Code: MTH2451 **Credit Units: 03**

Module-I

INTRODUCTION: Introduction; An example; Characteristics of Database approach; Actors on the screen; Workers behind the scene; Advantages of using DBMS approach; A brief history of database applications; when not to use a DBMS. Data models, schemas and instances; Three-schema architecture and data independence; Database languages and interfaces; The database system environment; Centralized and client-server architectures; Classification of Database Management systems.

Module-II

ENTITY-RELATIONSHIP MODEL: Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; Refining the ER Design; ER Diagrams, Naming Conventions and Design Issues; Relationship types of degree higher than two.

Module-III

RELATIONAL MODEL AND RELATIONAL ALGEBRA: Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations : JOIN and DIVISION; Additional Relational Operations; Examples of Queries in Relational Algebra; Relational Database Design Using ER- to-Relational Mapping.

Module-IV

TRANSACTION MANAGEMENT: The ACID Properties; Transactions and Schedules; Concurrent Execution of Transactions; Lock - Based Concurrency Control; Performance of locking; Transaction support in SQL; Introduction to crash recovery; 2PL, Serializability and Recoverability; Lock Management; Introduction to ARIES; The log; Other recovery-related structures; The write-ahead log protocol; Checkpointing; Recovering from a System Crash; Media Recovery; Other approaches and interaction with concurrency control.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

TEXT BOOKS:

1. **Fundamentals of Database Systems –** Elmasri and Navathe, 5th Edition, Addison-Wesley, 2007
2. **Database Management Systems** – Raghu Ramakrishnan and Johannes Gehrke – 3rd Edition, McGraw-Hill, 2003.

REFERENCE BOOKS:

1. **Data Base System Concepts** – Silberschatz, Korth and Sudharshan, 5th Edition, Mc-GrawHill, 2006.
2. **An Introduction to Database Systems** – C.J. Date, A. Kannan, S. Swamynatham, 8th Edition, Pearson Education, 2006.

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Syllabus - Semester Fifth

INTRODUCTION TO FINANCIAL MODELLING

Course Code: MTH2551 **Credit Units: 03**

Prerequisites: Introduction to Probability Theory

Basic notions %G–%@ Cash flow, present value of a cash flow, securities, fixed income securities, types of markets.

Forward and futures contracts, options, properties of stock option prices, trading strategies involving options, option pricing using Binomial trees, Black %G–%@ Scholes model, Black %G–%@ Scholes formula, Risk-Neutral measure, Delta %G–%@ hedging, options on stock indices, currency options.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Texts / References

- D.G. Luenberger, Investment Science, Oxford University Press, Oxford, 1998.
- J.C. Hull, Options, Futures and Other Derivatives, 4th ed., Prentice-Hall, New York, 2000.
- J.C. Cox and M. Rubinstein, Options Market, Englewood Cliffs, N.J.: Prentice Hall, 1985.
- C.P Jones, Investments, Analysis and Measurement, 5th ed., John Wiley and Sons, New York, 1996.

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Syllabus - Semester Sixth

STATISTICAL QUALITY CONTROL

Course Code: MTH2651 **Credit Units: 03**

Total quality control in an industry. Quality planning, quality conformance, quality ad-herence. Quality assurance and quality management functions.

Control charts and allied techniques. Concept of quality and meaning of control. Concept of inevitability of variation-chance and assign-able causes. Pattern of variation. Principles of rational sub-grouping.

Different types of control charts. Concept of process capability and its comparison with design specifications, CUSUM charts.

Acceptance sampling. Sampling inspection versus 100 percent inspection. Basic concepts of attributes and variables inspection. OC curve, Single, double, multiple and sequential sampling plans, Management and organisation of quality control.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Texts / References :

- A.J. Duncan, Quality Control and Industrial Statistics, 5th ed., Richard D. Irwin, 1986.
- E.L. Grant and R. Levenworth, Statistical Quality Control, 6th ed., McGraw-Hill, 1988.
- J.M. Juran and F. M. Grayna, Quality Planning and Analysis, Tata McGraw-Hill, 1970.
- D.C. Montgomery, Introduction to Statistical Quality Control, Wiley, 1985.
- T.P. Ryan, Statistical Methods for Quality Improvement, Wiley, New York, 2000.

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MATERIALS SCIENCE & TECHNOLOGY

Programme Structure-2019

Course Code	Course Title	Lecture (L) Hours /Week	Tutorial (T) Hours /Week	Practical (P) Hours/Week	Total Credits
PHY2151	Fundamentals of Materials Science	3	-	-	3
PHY2251	Classification & Selection of Materials	3	-	-	3
PHY2351	Properties of Materials	3	-	-	3
PHY2451	Manufacturing Processes for Materials	3	-	-	3
PHY2551	Materials Testing & Characterization	3	-	-	3
PHY2651	Materials at Nanoscale	3	-	-	3
	TOTAL				**18**

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MATERIALS SCIENCE & TECHNOLOGY

Syllabus - Semester First

FUNDAMENTALS OF MATERIALS SCIENCE

Course Code: PHY2151 **Credit Units: 03**

Course Objective:
The objective of this course is to introduce the students with the basics of the materials science and physical phenomenon.

Course Contents:

Module-I: Basics of Crystal Structure
Space lattice and unit cells, Crystal system, Symmetry operation, Structures of common metallic and ceramic materials, Packing fraction, coordination number, Crystallographic points, directions and planes, Linear and planar densities, Structure determination using X-ray diffraction and Braggs law, single crystal and polycrystalline materials, non-crystalline materials and glass transition temperature,

Module-II: Bonding in Solids and Imperfections
Forces between Atoms: Mechanism of Bond Formation and Bond Energy, Primary bonding in solids viz. ionic, covalent and metallic bonds, Secondary bonding, Perfect and imperfect crystal, Point defects in metals and ceramics, Frenkel and Schottky defects, Color centres, Dislocations: edge and screw dislocation, Interfacial defects, Volume defects,

Module-III: Diffusion and Alloy Systems
Diffusion and its types, Diffusion mechanisms, Diffusion Coefficient: Fick's Laws of Diffusion, Factors affecting diffusion, Applications of diffusion, Alloy systems, Solid solutions: Substitutional and Interstitial, The families of engineering alloys, Hume-Rothery's Rules, Intermediate solid solutions.

Module-IV: Phase diagrams and phase transformation
Phase, Phase equilibrium, Phase rule, Unary and binary phase diagrams, Interpretation of phase diagrams, Phase diagrams of some important metals and ceramics, microstructure changes during cooling, lever rule, invariant reactions, iron-iron carbide phase diagram. Phase transformation, Nucleation and growth of phases, Introduction to TTT curves, heat treatment processes

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Exam; A: Attendance

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Text and references:

- Fundamentals of Materials Science and Engineering by W Callister, John Willey and Sons
- Materials Science by S. L. Kakani, New Age International
- Materials Science and Engineering by Raghvan, PHI
- Ceramic Materials by C Barry Carter, Springer.
- Materials Science and Engineering by W F Smith, McGraw Hill

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Syllabus - Semester Second

CLASSIFICATION & SELECTION OF MATERIALS

Course Code: PHY2251 **Credit Units: 03**

Course Objective:
The objective of the course is to introduce and familiarize the students with the different classes of engineering and advanced materials to the students.

Course Contents:

Module-I: Metals and Alloys
Metals, Alloys (ferrous and non-ferrous), types of steel, cast iron, High temperature steels, properties and applications.
Aluminum and its alloys- physical, chemical and mechanical properties, magnesium, titanium alloys - microstructural features, properties and applications.
Copper and its alloys: classification, physical, chemical and mechanical properties; lead, tin, zinc, silver, gold alloys - microstructural features - properties and applications.

Module-II: Ceramics and glasses
Ceramics: bonding, crystal structure and defects; structure of silicates; polymorphic transformations.
Non crystalline materials - structure, requirement for glass formation, Zachariasen rules, viscosity based transition points, devitrification; glass forming methods; Unary; binary and ternary systems.

Module-III: Composites and Polymers
Composites: Introduction, classification, bonding and failure criteria. Reinforcing materials, different processing methods, novel applications.
Polymers: Introduction, comparison with metals and ceramics - classification, Polymerization, molecular weight determination, Properties, processing and applications.

Module-IV: Advanced materials
Biomaterials: Introduction, need for biomaterials; Property requirements; Metallic, ceramic and polymeric implants, composites as biomaterials; applications.
Superalloys, Iron, nickel and cobalt based superalloys, Shape memory alloys, low temperature materials.
Nano materials – Concept, scale /dimensional aspects, materials and coatings for wear resistance.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Exam; A: Attendance

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Text and references

- Avner, S. H., “Introduction to Physical Metallurgy”, second edition, McGraw Hill, 1985.
- Raghavan, V., “Physical Metallurgy”, Prentice Hall of India, 1985.
- Kingery W. D., Bowen, H. K., Uhlhmen D. R., ‘Introduction to Ceramics’, 2nd Edition, John Wiley, 1976.
- Chiang Y.M., Birnie D. P., Kingery W.D., Physical Ceramics: Principles for Ceramic Science and Engineering, John Wiley, 1997.
- Billmeyer F, ‘Textbook of Polymer Science’, Wiley Interscience, 1994
- Hench L. Larry, and Jones J., (Editors), Biomaterials, Artificial organs and Tissue Engineering, Woodhead Publishing Limited, 2005.

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Syllabus - Semester Third

PROPERTIES OF MATERIALS

Course Code: PHY2351 **Credit Units: 03**

Course Objective:
The objective of the course is to study the properties of the materials to be used in the different applications and to introduce the students to the basics of the structure property correlation in the materials

Course Contents:

Module-I: Mechanical behavior
Concept of stress and strain, tensile strength, compressive strength, yield point phenomenon, Elastic behavior of materials,elastic modulus, Anelastic and Viscoelastic behaviour, strengthening mechanism, work hardening, solid solution hardening, precipitation hardening,hardness, Failure mechanisms: fracture, creep and fatigue.

Module-II: Electrical and dielectric properties
Electricity conductivity, density of states, Fermi energy, Band theory of solids, metals, Semiconductors, Insulators, Semiconductors: Intrinsic and Extrinsic semiconductors, Factors affecting carrier mobility, hall-effect, carrier concentration of semiconductors
Dielectric Behavior: Capacitance, Types of Polarization, Frequency Dependence of the Dielectric Constant, Dielectric Strength, Ferroelectricity, Piezoelectricity, pyro-electricity Applications

Module-III: Magnetic and Optical properties
Introduction, Dia, Para Ferro, Antiferro and Ferrimagnetic materials. Effect of temperature on magnetic behavior, Domains and hysteresis, Soft and Hard magnetic materials. Application.
Optical properties: Light Interactions with Solids, Atomic and Electronic, Interactions, Optical properties of nonmetals, Opacity and translucency in insulators, Luminescence, LEDs, lasers, Light propagation in optical fibers

Module-IV: Thermal Properties and corrosion resistance
Introduction, Heat capacity, thermal expansion, Materials of Importance: Invarand Other Low-Expansion Alloys, Thermal Conductivity, Thermal Stresses
Introduction, Corrosion rates, Passivity, Environmental effects, Cause and Types of corrosion, Corrosion of ceramics and polymers, Corrosion Prevention.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Exam; A: attendance

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Text and references:

- V. Raghavan, Introduction to Materials Science and Engineering; PHI, Delhi, 2005.
- L. H. Van Vlack, Elements of Material Science and Engineering; Thomas Press, India, 1998.
- W.F. Smith, Principles of Materials Science and Engineering: An Introduction; Tata Mc-Graw Hill, 2008.
- W. D. Callister, Materials science and engineering, An introduction, John Wiley and sons 2014.

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Syllabus - Semester Fourth

MANUFACTURING PROCESSES FOR MATERIALS

Course Code: PHY2451 **Credit Units: 03**

Course Objective:
The different industrial processes used for the fabrication and preparation of the materials is introduced in this course.

Course Contents:

Module-I: Introduction to manufacturing processes
different approaches – technical and economic considerations – significance of material properties with respect to selection of manufacturing process

Module-II: Processing techniques
Conventional casting processes – advantages and limitations – melting practices – design of castings – special casting processes
Powder processing: pre-consolidation-shape forming processes; Fundamental Sintering mechanisms, various advanced sintering techniques.

Module-III: Fabrication of materials
Fabrication of materials by Rolling; forging; extrusion; drawing - sheet metal forming. Classification of rolling, extrusion, drawing, advantages and limitations of different fabrication processes.

Module-IV: Conventional material joining processes
Conventional material joining processes – concept of weldability – need for dissimilar joints- machining processes – concept of machinability – material examples – developments in machining processes

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Exam; A: Attendance

Text and references

- Rao, P.N, 'Manufacturing Technology', Tata McGraw Hill, 1996.
- Kalpakjian, S, 'Manufacturing Engineering and Technology', 3rd Edition, Addison-Wesly,1995.
- Crawford R.J., "Plastics Engineering", Pergamon Press, 2nd Edition, 1987.
- M.N. Rahaman, Ceramic Processing and Sintering, 2nd ed.,, CRC press
- F.C. Campbell, Elements of Metallurgy and Engineering Alloys, ASM International, 2008
- J. Beddoes, M.J. Bibby, Principles of Metal Manufacturing Processes, Elsevier, 2003.

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Syllabus - Semester Fifth

MATERIALS TESTING & CHARACTERIZATION

Course Code: PHY2551 **Credit Units: 03**

Course Objective:
The objective of the course is to introduce different materials testing and characterization techniques to the students.

Course Contents:

Module-I: Introduction and Spectroscopic methods
Introduction: Comparison of major techniques, Advantages and disadvantages; Spectroscopic methods: Atomic absorption spectrometry, Atomic fluorescence spectrometry, UV-Visible spectroscopy; Raman spectroscopy, Fourier transform infrared spectroscopy, XPS, UPS, Auger electron spectroscopy.

Module-II: X-ray techniques and Optical Microscopy
X-ray techniques: XRD, X-ray fluorescence spectroscopy, Wavelength dispersive spectroscopy (WDS);Energy dispersive spectroscopy (EDS),
Optical Microscopy: Image formation, Resolution, Aberrations, Imaging modes, Specimen preparation, Confocal microscopy

Module-III: Electron microscopy and Thermal analysis
Electron microscopy: Scanning electron microscopy; Transmission electron microscopy, Electron diffraction, Scanning tunneling microscope, Atomic force microscope
Thermal analysis: Thermo gravimetric analysis, Differential thermal analysis, Differential scanning calorimetry, Dynamic mechanical analysis, Thermo-mechanical analysis

Module-IV: Electrical, magnetic and non-destructive testing
Electrical and magnetic properties: Two probe and four probe methods for electrical characterization, Vibratingsample magnetometer (VSM),
Non-destructive testing:Radiography, Ultrasonic, Acoustic emission, Thermography, Holography, Basic principles, Applications in airframe and rock.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Exam; A: Attendance.

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Text and references:

- S. Zhang, Lin Li, A. Kumar, Materials Characterization Techniques, CRC press, 2008.
- Y. Leng, Materials Characterization: Introduction to Microscopic and Spectroscopic Methods, John Wiley & Sons (Asia), 2008.
- D.A. Skoog, F.J. Holler, S. R. Crouch, Instrumental Analysis, Cengage Learning, 2007.
- W. Kemp, Organic Spectroscopy, 3rd ed., Pagrave, 2007.
- W. W. Wendlandt, Thermal Methods of Analysis, John Wiley, 1974.
- B. Raj, T. Jayakumar, M. Thavasimuthu, Practical Non-Destructive Testing, 2nd ed., Narosa Publishing House, 2002.

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Syllabus - Semester Sixth

MATERIALS AT NANOSCALE

Course Code: PHY2651 **Credit Units: 03**

Course Objective:
The main objective of the course is familiarize the students to the exciting area of the nanotechnology and preparation, characterization of change in the materials properties at the nanoscale.

Course Contents:
Module-I: Introduction to Nano world:
Introduction to Nanostructures: Carbon Nanotubes (CNT), Graphenes, Fullerenes, Nano Peapods, Quantum Dots and Semiconductor Nanoparticles Metal-based Nanostructures (Iron Oxide Nanoparticles) Nanowires, Polymer based nanostructures including dendrimers, Introduction to metal based nanostructures, Protein-based Nanostructures: Nanomotors etc.

Module-II: Structure, properties and Bonding in Nanomaterials:
Chemical Bonds (types and strength)Intermolecular Forces Molecular and Crystalline Structures, Hierarchical Structures, Bulk to Surface transition, surface reconstruction, Mechanical, Electronic, Optical, Magnetic and Thermal properties.

Module-III: Synthesis & Methods of preparation of nanomaterials:
Bottom -up Synthesis, Top-down Approach: Precipitation, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD Sputtering, Evaporation, Bio-inspired synthesis, Nanocomposite fabrication, Nanolithography, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE etc.

Module-IV: Applications
Nano-electronics, Nano optics, Nanoscale chemical-and bio-sensing Biological/biomedical applications, Photovoltaic, fuel cells, batteries and energy-related applications, High strength nanocomposites, Nanoenergetic materials

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Exam; A: Attendance

Text and references:

- B.S. Murty, P. Shankar, Baldev Raj, B.B. Rath, James Murday, textbook of Nanoscience& Nanotechnology (Orient Blackswan Pvt. Ltd.)
- Chris Binns, Introduction to Nanoscience& Nanotechnology (Wiley).
- B.K. Parthasarathy, Nanoscience& Nanotechnology (Isha Books).
- Nanotechnology: Importance and Applications by M.H. Fulekar, IK International 2010.

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PHARMACEUTICALS

Programme Structure-2022

Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits (18)
CHY2152	Cosmetic Formulation	2	1	-	3
CHY2252	Industrial Management & Safety Process	2	1	-	3
CHY2352	Drug Design	2	1	-	3
CHY2452	Application of Nanotechnology in Medicine	2	1	-	3
CHY2552	Intellectual Property Rights & Quality Assurance (THEORY)	2	1	-	3
CHY2652	Pharmaceutical & Cosmetic Sciences Lab	-	-	6	3
	TOTAL				**18**

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PHARMACEUTICALS

Syllabus - Semester First

COSMETIC FORMULATION

Course Code: CHY2152 **Credit Units: 03**

Course Objective:
This course is intended to provide a comprehensive survey of ingredients fundamental to the cosmetic industry. The course will emphasize current trends in the selection of cosmetic ingredients. The chemistry and technology of cosmetic raw materials will be related to their behavioral properties as utilized in the construction of stable functional systems. In this way, it is intended to generate a better understanding of the contributions of ingredients to the performance of finished product formulations. Emphasis will be placed on recognizing and dealing with problem areas associated with the use of various ingredients. Safety considerations and other pertinent matters which can influence ingredient selection will be included in these discussions.

Course Content:
Module I:
Classification of raw materials and raw materials used in the cosmetic industry for the manufacture of finished products. Method of sampling, Indian Standard specification laid down for sampling and testing of various cosmetics in finished form by the bureau of Indian standards. Factors affecting stability of a formulation, ICH guidelines, Methods of stabilizations and Methods of stability testing.Concept of development of stability indicating analytical methods.

Module II:
Determination of Physical and chemical constants such as extractive values, moisture content, alcohol content, volatile oil content, ash values, bitterness values, foreign matters, and physical constants applicable to the lipid containing drugs. Microbial counts, bioburden and Pharmacopoeial microbial assays.

Module III:
Brief introduction of the following cosmetic preparation and a detailed study on their quality control: Shampoo, Tooth paste, skin powder, skin creams, hair creams, nail polish, after shave lotion, bath and toiletries, lipstick and hair dyes, perfumes, depilatories.

Module IV:
Packaging of cosmetics –Filling of solids, semisolids & liquids. Materials used for cosmetic packaging Rules & regulations and legal provisions for packaging & labeling.

Examination Scheme:

Components	CT	HA	S/V/Q	ATTD	EE
Weightage(%)	10	7	8	5	70

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CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance EE: End Semester Examination

Text & References:

- Comprehensive Pharmacy Review 5th Edition by Leon Shargel, Alan H. Mutnick, Paul F. Souney, Larry N. Sawnson – 2004.
- Applied Biopharmaceutics and Pharmacokinetics, 4th Edition by Leon Shargel / Andrew B.C., Yu – 1999.
- A. H. Beckett and J. B. Stenlake Practical Pharmaceutical Chemistry, Part I and Part II, 4th Edition.
- G. H. Jeffery, J. Basset, J. Mendham, R. C. Denny (Rev. by) Vogels Text Book of Quantitative Chemical Analysis, 5th Edition 1989, ELBS.
- The Controller of Publications; New Delhi, Govt. of India, Indian Pharmacopoeia, Vol. I and Vol. II - 1996.
- J. B. Wilkinson and R. J. Moore :Herry'sCosmeticology; Longman Scientific and Technical Publishers, Singapore.
- P.D. Sethi; Quantitative Analysis of Drugs in Pharmaceutical Formulations, 3rd Edition - 1997,
- ICH guideline for impurity determination and stability studies.
- Practical HPLC method development by Lloyd R. Snyder, Joseph J. Kirkland, Joseph I. Glajch, John Wiley and Sons 2nd Edition – 1997.

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Syllabus - Semester Second

INDUSTRIAL MANAGEMENT AND SAFETY PROCESSES

Course Code: CHY2252 **Credit Units: 03**

Course Objective:
The curriculum is developed to help the students understand the basic functions & responsibilities of a manager, provide him tools and techniques of managing different activities of the business concerned and to understand & interpret the provisions of some of the important provisions related to patent, trademark etc. It also aims at minimizing the chances of risks, injuries and accidents by implementing risk management techniques and safety management operations, monitoring the operating systems and bolstering the safety measures of an industry in general. With the rise of natural disasters in and around our world, the importance of the safety of human capital, protection of the environment and conservation of existing assets of an industry is increasing, leading to growing relevance of these skills.

Course Contents:
Module I:
Basic Concepts of Management Function of Management
Planning, Organizing, Directing, Control, Decision-making, Budgeting, Inventory Management (IM) & Quality Control (QC), Meaning & Importance of Inventory management, Inventory models, Cost consideration, Economic order quantity model.
Quality Management
Meaning & definition of Quality-Quality control systems-quality assurance-planning for quality- total quality management (TQM) philosophy-implementation of TQM in service and manufacturing industries-national & international standards.

Module II:
Manufacturing Management
Production planning & control, dynamics of material flow-inventory-bottlenecks and process variability, planning levels and time scales, forecasting-aggregate planning, synchronized manufacturing and theory of constraints-just in time production-shop floor performance monitoring.

Module III:
Safety in Chemical Process Industries
Safety in industries; need for development; importance safety consciousness in Indian chemical industry; safety programmes, elements of safety programme; effective realization, economic and social benefits.Industrial safety- Chemical process industries; potential hazard; chemical and physical job safety analysis; high presssure; high temperature operation; dangerous and toxic chemicals; highly radioactive materials; safe handling and operation of materials and machineries; planning and layout.

Examination Scheme:

Components	CT	HA	S/V/Q	ATTD	EE
Weightage(%)	10	7	8	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance

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EE: End Semester Examination

Text & References:

- William Handley, “Industrial Safety ", Hand Book McGraw-Hill Book Company 2nd Edition, 1969.
- Fawatt, H.H. and Wood, W.S., “Safety and Accident Prevention in Chemical Operation", Interscience, 1965.
- Heinrich, H.W. Dan Peterson, P.E. and Nester Rood, “Industrial Accident Prevention ", McGraw-Hill Book Co., 1980.
- Blake, R.P., “Industrial Safety ", Prentice Hall Inc., New Jersy - III Edition, 1963.
- Subbaram N.R. “Handbook of Indian Patent Law and Practice", S. Viswanathan (Printers and Publishers) Pvt. Ltd., 1998.
- Eli Whitney, United States Patent Number: 72X, Cotton Gin, March 14, 1794.
- Intellectual Property Today: Volume 8, No. 5, May 2001, [www.iptoday.com].

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Syllabus - Semester Third

DRUG DESIGN

Course Code: CHY2352 **Credit Units: 03**

Course Objective

The Principles of Drug Design course aims to provide students with an understanding of the process of drug discovery and development from the identification of novel drug targets to the introduction of new drugs into clinical practice. It covers the basic principles of how new drugs are discovered with emphasis on lead identification, lead optimization, classification and kinetics of molecules targeting enzymes and receptors, prodrug design and applications, as well as structure-based drug design methods. Recent advances in the use of computational and combinatorial chemistry in drug design will also be presented. The course is further enhanced with invited lectures on recent developments and applications of drug design principles in the pharmaceutical industry.

Course Content:

Module I:

Introduction- Definition of drug (WHO), classification of drugs, nomenclature of drugs, stereochemical aspects of drugs, definitions of terms commonly used in the chemistry of drugs, routes of drug administration and different dosage forms and applications. Introduction to phase trials in drug development.

Module II:

Structure Activity Relationships in drug design-Structure based drug design, ligand based drug design. Some case studies e.g. development of ciprofloxacin, antidiabetics and recent cephalosporins. Target selection and lead identification, Natural product sources, Fermentation / Microbial sources, Synthetic, Introduction to Pharmacogenomics. Methods of conformational search used in pharmacophore mapping; catalyst/, etc. with practical examples, ADME databases.

Module III:

Molecular Modeling- Energy minimization, geometry optimization, conformational analysis, Approaches and problems; Bioactive vs. global minimum conformations; Mechanism based Drug Design including Quantum Mechanics Automated methods of conformational search; Molecular graphics.

Module IV:

QSAR-Electronic effects; Hammett equation, Lipophilicity effects; Hansch equation, Steric Effects; Taft Equation; Experimental and theoretical approaches for the determination of physico-chemical parameters, parameter inter-dependence; Case studies; Regression analysis, extrapolation versus interpolation, linearity versus non-linearity; Free Wilson Analysis; The importance of biological data in the correct form; 2D – QSAR; 3D-QSAR-examples CoMFA and CoMSIA.

Module V:

Molecular docking and dynamics-Rigid docking, flexible docking, manual docking; Advantages and disadvantages of flex-X, flex-S, autodock and dock softwares with successful examples; Monte Carlo simulations and molecular dynamics in performing conformational search, docking etc.De novo drug design techniques.

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Examination Scheme:

Components	CT	HA	S/V/Q	ATTD	EE
Weightage(%)	10	7	8	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance EE: End Semester Examination

Suggested Reading:

- Lednicer, D., &Mitscher, L. A. (1980). The Organic Chemistry of Drug Synthesis, Volume 2 (Vol. 1). John Wiley & Sons.
- Foye, W. O. (2008). Foye's principles of medicinal chemistry. Lippincott williams&wilkins.
- Nogrady, T. (1988). Medicinal chemistry: a biochemical approach. Oxford University Press, USA.
- Christoffersen, R. E., Marr, J. J., & Wolff, M. E. (1989). In Burger's Medicinal Chemistry and Drug Discovery, Vol. 1, Principles and Practice.
- Gringauz, A. (1997). Introduction to medicinal chemistry: how drugs act and why. Wiley-VCH.
- Pandeya, S. N., & Dimmock, J. R. (1997). An introduction to drug design. New Age International.
- Veerapandian, P. (Ed.). (2018). Structure-based drug design. Routledge.
- Foye, W. O. (2008). Foye's principles of medicinal chemistry. Lippincott Williams & Wilkins.
- Kubinyi, H. (1993). QSAR: Hansch analysis and related approaches (Vol. 1, pp. p-240). Weinheim: VcH.
- Holtje, H. D., Sippl, W., Rognan, D., &Folkers, G. (2003). *Molecular modeling* (Vol. 5). Weinheim, Germany: Wiley-VCH.

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Syllabus - Semester Fourth

APPLICATION OF NANOTECHNOLOGY IN MEDICINE

Course Code: CHY2452 **Credit Units: 03**

Course Objective:
This course will focus on developing students' understanding of the fundamental properties, as well as synthesis and characterization of nanomaterials, coupled with their applications in nanomedicine. This course also provides a realistic approach and covers the basic concepts of chemistry, physics and biology in the behavior of molecules and molecular interaction. It also includes various experimental techniques used to characterize bio-nano systems, the nano scientific principle involved in the processing, fabrication and manipulation of nanostructures and nanoparticles.

Course Content:
Module I:
Introduction to nanomedicine-Overview of nanotechnology from medical perceptive, different types of nanobiomaterials and their biomedical applications, and cell nanostructure interactions, Synthesis, characterization, and properties of smart nanomaterials, Surface modification/bio functionalization of nanomaterials

Module II:
Nanocarriers (e.g. liposomes, polymer capsules, polymer nanoparticles, porous materials, nanogels, dendrimers, microemulsions, inorganic nanoparticles, carbon nanotubes, lipoproteins, solid lipid nanoparticles) for drug delivery applications, Stimuli-responsive smart nanomaterials, Nanomaterials in different imaging (e.g.fluorescence and MRI) applications

Module III:
BioMEMS, Lab-on-a-Chip, nano/microfluidics, biosensors, Regenerative medicine, including tissue engineering, cell and gene therapy, DNA-based nanostructures, Cellular nanomachines, Toxicology of nanomaterials

Examination Scheme:

Components	CT	HA	S/V/Q	ATTD	EE
Weightage(%)	10	7	8	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance EE: End Semester Examination

Text & References:

- Nano Medicines Edited by Dr.ParagDiwan and AshishBharadwaj, Pentagon press(2006) ISBN 81-8274-139-4.
- Christof M. Niemeyer, Chad A. Mirkin, Nanobiotechnology:Concepts, applications and perpectives, Wiley-Interscience 2004).
- Geoffery A. Ozin, Andre C. Arsenault, Nanochemistry: A chemical approach to nanomaterials, RSC publishing (2005)
- Challa Kumar, Biofunctionalization of nanomaterials, Wiley-Interscience (2006).

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Syllabus - Semester Fifth

INTELLECTUAL PROPERTY RIGHTS AND QUALITY ASSURANCE

Course Code: CHY2552 **Credit Units: 03**

Course Objective:
This course will focus on intellectual property rights and patenting & Indian patent law for pharmaceutical industry.

Course Content:
Module I:
Requirements of GMP, cGMP, GLP, USFDA, WHO Guidelines and ISO 9000 Series, Drugs and Cosmetics Acts and rules, Drug Regulatory Affairs, Documentation- Protocols, Forms and Maintenance of records in Pharmaceutical industry, Preparation of documents for New Drug Approval and Export Registration, Processing and its application, Intellectual Property Rights (Patent, Copyright and Trademarks), Standard Operating Procedure (SOP) for different dosage forms.

Module II:
Concepts in Validation, Validation of manufacturing, Analytical and Process Validation and its Application, Basic concepts of Quality Control and Quality Assurance Systems, Source and Control of Quality Variation of Raw Materials: Containers, Closures, Personnel, Environmental, Etc., In-process quality tests, IPQC problems in Pharmaceutical industries. ICH Guidelines, Sampling Plans, Sampling and Characteristic Curves, Master Formula generation and Maintenance.

Module III:
Patenting, Indian patent law and pharmaceutical industry
Introduction of (IPR) Intellectual Property Rights, Patents, Design, Trademarks, Copyrights, Geographical Indications etc
Patent System: Definition of Patent, Criteria for obtaining patent (Novel, Non-obvious Applications) Filing and Processing of Patents: General procedure for securing patents in India. Case studies Opposition to Grant of Patent, Patent infringement: Silent features of Indian Patents Act 1970 with latest amendments with special reference to- Product & Process Patents, Provision of compulsory license, Exclusive Marketing Right, The Term of Patent, Patent offices in India; International convention relating to Intellectual Property - Establishment of WIPO - Mission and Activities -History - General Agreement on Trade and Tariff (GATT).
Case Studies on - Patents (Basmati rice, turmeric, neem, etc.) - Copyright and related rights - Trade Marks.

Examination Scheme:

Components	CT	HA	S/V/Q	ATTD	EE
Weightage(%)	10	7	8	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance EE: End Semester Examination

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Text & References:

- Willing, S.H., "Good Manufacturing Practices for Pharmaceuticals" Marcel Dekker, Inc., New York
- Drugs and Cosmetics Acts and rules
- Patel, A.H., "Industrial Microbiology" Macmillon India Ltd., Delhi.
- Nash, R.A. and Wachter A.H., "Pharmaceutical Process Validation" Marcel Dekker, Inc., New York
- Bolton, S.H. "Pharmaceutical Statistics"
- Banker, G.S. and Rhodes, C.T. "Modern Phaarmaceutics" Marcel Dekker, Inc., New York.
- Careleton, F.J. and Agallow, J.P. "Validation of Aseptic Pharmaceutical Processes" Marcel Dekker, Inc., New York.
- Garfeild "Quality Assurance Principles of Analytical Laboratories"
- Latest Editions of I.P., U.S.P and B.P.
- Bubharam N. R. - Whatever one should know about patents, 2nd Edition, Pharma book Syndicate.
- P. Narayan – Intellectual Property Law, Edition 3rd; Eastern Law House; 2001.

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Syllabus - Semester Sixth

PHARMACEUTICAL & COSMETICS SCIENCES LAB

Course Code: CHY2652 **Credit Units: 03**

List of Experiments (Any 15 Experiments are to be performed)

Polymers

- Caprolactum from cyclcohexanone
- Synthesis of Nylon-6,10
- Preparation of Polystyrene.
- Study the morphology of polymers through optical microscopy.
- Preparation of Epoxy resin using Bisphenol-A and Epichlorohydrin.
- Determination of molecular weight of high polymer using viscosity method.
- Determination of melt flow index of polymers and Compare their Melt Flow Characteristics

Dyes

- Preparation of Methyl Orange- An azodye.
- Preparation of Indigo

Food Industry

- Separation of artificial colorants in confectionary using TLC.
- Determination of protein content of wheat flour.

Cosmetic Products

- Shampoo
- Detergent
- Talc
- Lipstick
- Perfumes

Drugs Analysis

- Preparation of Paracetamol and Aspirin
- Analysis of Drugs:
    - Novalgin
    - Sulfa-drugs
    - Paracetamol

Examination Scheme:

Components	TA	LR	V	ATTD	EE
Weightage(%)	8	7	10	5	70

Note: TA-Teacher's Assessment, LR-Lab Record, V-Viva

Text & References:

- A Textbook of quantitative chemical analysis, VIth Edition Vogel, Pearson Education Limited.
- Practical Organic Chemistry, Mann and Saunders, IV Edition, ELBS and Longman Publication
- Comprehensive Experimental Chemistry, V. K. Ahluwalia, New Age Publication, Delhi
- Practical Manual of Organic Chemistry, R. K. Bansal
- A Textbook of quantitative inorganic analysis including elementary instrumental analysis, IVth Edition Vogel, ELBS and Longman Publication
- Advanced Practical Inorganic Chemistry, Gurdeep Raj, Goel Publishing House, Meerut

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POLYMER TECHNOLOGY

Programme Structure-2019

Course Code	Course Title	Lecture (L) Hours /Week	Tutorial (T) Hours /Week	Practical (P) Hours/Week	Total Credits
PTE2151	Polymerization	2	-	2	3
PTE2251	Waste Plastic Recycling	3	-	-	3
PTE2351	Polymer Technology	3	-	-	3
PTE2451	Rubber & Tyre Technology	3	-	-	3
PTE2551	Polymeric Nano Composites	2	-	2	3
PTE2651	Bio-Medical Plastics	3	-	-	3
	TOTAL				**18**

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POLYMER TECHNOLOGY

OBJECTIVES OF PROGRAM

The term polymer refers to two different classes of materials – Plastic and Rubber. Polymer engineering uses the theory and knowledge of chemistry in order to handle production and use of polymers. The primary aim of this program is to train students to fulfill the constantly growing requirements of the polymer- based industry. The course provides an in-depth understanding of traditional commodities, such as plastics and specialty polymers, which have wide applications in the biomedical research and pharmaceutical fields. In India, the demand for polymer engineers has increased. After successful completion of the course, one can take up a career in sectors such as automotive, aerospace, packaging, power transmission, and other related manufacturing sectors. Industries based on manufacturing, processing and design of generic polymer (plastics, rubber, composites) also employ such students.

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POLYMER TECHNOLOGY

Syllabus - Semester First

POLYMERIZATION

Course Code: PTE2151 **Credit Units: 03**

Course Objective:
This course provide principles, mechanism and techniques of polymerization. They will also learn about kinetic of polymerization and copolymerization.

Course Contents:

Module-I: General Characteristics of Chain Growth Polymerization, Alkene Polymerization by Free radical, anionic and cationic initiators. Kinetics of Vinyl radical polymerization

Module-II: General Characteristics of Step Growth Polymerization. Chemistry of Step Growth. Polymerization, Kinetics and Statistics of Linear Stepwise Polymerization, Absolute reaction rates.

Module-III: Chemistry of Non-radical chain Polymerization, Anionic and Cationic Polymerization Co-ordination Polymerization, Ring Opening Polymerization

Module-IV: Copolymers, Types of copolymers,copolymerization, Kinetics of Copolymerization, Block and Graft Copolymerization, Cyclopolymerization.

Module-V: Polymerizations in homogenous &heterogenous systems, Diene and divinyl Polymerization Bulk, suspension, solution and emulsion polymerization

Examination Scheme:

	IA				EE	
Components	**CT**	**Assignment**	**LR**	**Attendance**	**Theory**	**Practical**
Weightage (%)	10	5	10	5	40	30

Note: IA –Internal Assessment, EE- External Exam, CT- Class Test, LR – Lab Record.

Suggested Readings:

- Textbook of Polymer Science, F. W. Billmeyer, John Wiley & Sons
- Polymer Science & Technology, J. R. Fried, Prentice Hall
- Polymer Science, V. R. Gowariker, New Age International
- Polymer Science & Technology, P. Ghosh, Tata McGrawHill
- Principles of Polymerization, Odian, Wiley India

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Syllabus - Semester Second

WASTE PLASTIC RECYCLING

Course Code: PTE2251 **Credit Units: 03**

Course Objective:
This course is beneficial to deal with different types of plastics waste, identification of plastics, segregation of plastic wastes, different types of recycling techniques, recycling of commingled plastic waste as well as various rules and regulation regarding plastic manufacturing, disposal and recycling.

Course Contents:

Module I: Introduction, Thermoplastics & thermo sets, Terminology used in recycling, coding & labeling of plastic products for sorting and identification.

Module-II: Organizations involved in plastic recycling. Types of recycling- Primary recycling, secondary recycling, tertiary recycling and quaternary recycling, recycling of mixed waste, recycling of nonwoven sacks

Module-III: Residential recycling: collection containers, education and production, recovery of resins, collection vehicles, role of material recovery facilities (MRF), role of MRF.

Module-IV: Plastic separation, working MRF,case studies, collection and separation systems.

Module-V: Recycling of PET, polyelelfines, polystyrene, Polyvinyl chloride, Engineering Thermoplastics, Acrylics, Thermo sets.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Suggested Readings:

- Plastics Recycling; Ehrig, Hanser.
- Rubber Recycling: De, IsayevKhait, CRC Press.
- Feedstock Recycling & Pyrolysis of waste plastics, Scheirs&Kaminskey,, Wiley Interscience,
- Handbook of Plastic Technology, Vol, 2, Allen &Beker, CBS Publishers.
- Plastic Fabrication & Recycling, Chanda& Roy, CRC Press,

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Syllabus - Semester Third

POLYMER TECHNOLOGY

Course Code: PTE2351 **Credit Units: 03**

Course Objective:
In this course students will learn about preparation, properties and applications of different types of plastics, especially thermoplastics and thermosetting plastics.

Course Contents:

Module-I: Preparation, properties and applications ofPolyolefins- Polyethylene, Polypropylene, Polyisobutylene, Vinyl Polymers: Polystyrene, Polyvinylchloride, Polyvinylacetate, Poly(methylmethacrylate), Polyacrylonitrile, Poly(acrylic acid)

Module-II: Preparation, properties and applications ofDiene Polymers- Polybutadiene, Styrene-Butadiene Rubber, Nitrile Rubber, Polyisoprene, Polychloroprene.

Module-III: Preparation, properties and applications ofPolyesters -Poly(ethylene terephthalate), Polycarbonates, Polyester resins.

Module-IV: Preparation, properties and applications ofPolyamides- Nylons, Polyimides, Polyurethanes, Raw Materials, PU elastomers, PU Foams, PU coatings, adhesives and sealants.

Module-V: Preparation, properties and applications ofEpoxy Polymers - Types of epoxies, Taffy Process, Hardness,Phenolics - Novolacs& Resoles.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Readings:

- Polymer Synthesis: Theory & Practice, Braun, Springer International
- An Introduction to Plastics, Elias, Wiley Interscience
- Principles of Polymerization, G. Odion, Wiley Interscience
- Synthetic Polymers, Feldman &Barbalate, Chapman & Hall
- Synthesis of Polymers, D. Schluter, Wiley VCH

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Syllabus - Semester Fourth

RUBBER & TYRE TECHNOLOGY

Course Code: PTE2451 **Credit Units: 03**

Course Objective:
At the end of the course students should be able to understand different types of rubbers, different additives used in rubber industries, compounding of rubber, manufacturing of tyres and design of tyres

Course Contents:

Module-I: Rubber Technology: Introduction, natural and synthetic rubbers, filler systems, stabilizer systems, vulcanization system, compounding ingredients, environmental requirements in 4 compounding.

Module-II: Manufacture of nitrilerubber ,chleroprene rubber, diene rubber, SBR rubbers.

Module-III: Tyre Technology- Introduction, development of tyres, classification and types of tyres, tyre components, pneumatic tyres**.**

Module-IV: Tyre& tread design, tread pattern, carcass design, bead design, Unit V: Tyre testing techniques, tubeless tyres, colouredtyres.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Suggested Readings:

- Handbook of Plastics Testing & Failure Analysis, Vishu Shah, Wiley Interscience
- Polymer Testing & Evaluation of Plastics, Mathur&Bhardwaj, Allied Publishers
- Encyclopedia of Polymer Science & Technology, Herman F. Mark, Wiley Interscience
- Fatigue, Testing & Analysis, Lee, Elsevier
- Introduction to Plastics & Composites, E. Miller, Marcel Dekker

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Syllabus - Semester Fifth

POLYMERIC NANO COMPOSITES

Course Code: PTE2551 **Credit Units: 03**

Course Objective:
This module deals with introduction, classification, preparation, properties, characterization and applications of polymer nanocomposites.

Course Contents:

Module-I: PREPARATION OF SYNTHESIS: Polymer Nanocomposites, Nanocomposites Preparation and Synthesis, Polymer Matrices: Thermoplastics, Thermosets, Elastomers, Natural and Biodegradable Polymers

Module-II: RHEOLOGY OF NANOCOMPOSITES : Rheology of Multiphase Systems, Rheology of Polymer / clay nanocomposite, Recent studies on Rheology, Measure Techniques, Steady shear Rheology, Dynamic Rheology, Non Linear Viscoelastic properties, Extensional Rheology, Rheological modeling of Nanocomposites.

Module-III: PROCESSING OF NANOCOMPOSITES : Extrusion, Injection Moulding, Blow Moulding, Foaming, Rotational Moulding

Module-IV: STRUCTURE AND PROPERTIES CHARACTERIZATION: Scattering Techniques, Microscopic Techniques, Spectroscopic Techniques, Spectroscopic Techniques, Chromatography, Solid-state characterization: Mechanical Testing, Thermal Characterization

Module-V: APPLICATION OF POLYMER NANOCOMPOSITES: Different applications of Thermoplastics, Thermosets, Biodegradable Polymersnanocomposites.

Examination Scheme:

	IA				EE	
Components	**CT**	**Assignment**	**LR**	**Attendance**	**Theory**	**Practical**
Weightage (%)	10	5	10	5	40	30

Note: IA –Internal Assessment, EE- External Exam, CT- Class Test, LR – Lab Record.

Suggested Readings:

- Luigi Nicolis& Gianfranco Carotenuto "Metal -Polymers Nanocompsites" A John Wiley & Sons, Inc Publication 2005
- Y.C. Ke& P. Stroeve" Polymer-Layered Silicate and Silica Nanocomposites- Elsevier, 2005 3. L.A. Utracki" Clay-Containing Polymeric Nanocomposites" Rapra Technology Limited, 2004

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Syllabus - Semester Sixth

BIO-MEDICAL PLASTICS

Course Code: PTE2651 **Credit Units: 03**

Course Objective:
In this module student will learn about introduction, properties, processing and applications of different polymeric materials used in biomedical and tissue engineering.

Course Contents:

Module-I:
Synthetic and Natural biomaterials used in Biomedical applications
i) Polyolefin's, Polyamides, Acrylic Polymers, Fluorocarbons, Polyesters, Engg. Plastics.
ii) Collagen, Polysaccharides, Proteins etc.

Module-II:
Human applications of Plastics : Cardiovascular iMTPLants, Dental IMTPLants, Role ofplastics in Ophthalmology, Hydro gels, Drug Delivery Systems, Sutures, Burn Dressings andArtificial Skin. Hernia Mesh, adhesives and Sealants, Artificial organs and devices, Blood bags,Condoms etc.

Module-III:
Blood – polymer interactions and blood compatibility, Chemical and biochemical degradation of polymers, Tissue engineering and polymers.

Module-IV:
Testing and evaluation: in-vitro-/vivo; Standards in product development and regulations; Ethical and sociological issues.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Suggested Readings:

- Buddy D. Ratner, Allan S. Hoffman, Fredrick J.Schoen and Jack E. Lemons (eds),"Biomaterials Science – An Introduction to Materials in Medicine", Academic Press, SanDiego (1996).
- Joon B. Park and Roderic S. Lakes, "Biomaterials : An Introduction". 2 edition, Plenum Press, New York (1992).
- Sujata V. Bhat, "Biomaterials", Narosa Publishing House, New Delhi, (2002).

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Amity School of Earth & Environment Sciences

Bachelor of Science (Honors/ Honors with Research) in Earth Sciences

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Curriculum & Scheme of Examination

2023

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Bachelor of Science (Honors/ Honors with Research) in Earth Sciences

Overview

A Bachelor of Science (B.Sc.) in Earth Science is an undergraduate degree program focused on the study of the Earth, including its structure, composition, processes, and history. It encompasses various scientific disciplines such as Geology, Physics, Chemistry, Biology, Petrology, Mineralogy, Soil Science, Geology, Atmospheric Science, meteorology, oceanography, and environmental & Society etc. The program typically takes three to four years to complete and combines theoretical knowledge with practical skills.

PROGRAMME OUTCOMES

The under-graduates will be able to

PO 1. **Fundamental Knowledge**: Demonstrate comprehensive knowledge of the disciplines that form a part of a graduate programme. Execute strong theoretical and practical understanding generated from the specific graduate programme in the area of work.

PO 2. **Effective Communication:** Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.

PO 3. **Social Competence:** Display the understanding, behavioural skills needed for successful social adaptation, work in groups, exhibits thoughts and ideas effectively in writing and orally.

PO 4. **Practical and Research Skills**: Develop the working knowledge and applications of instrumentation and laboratory techniques. Able to apply skills to design and conduct independent experiments, interpret, establish hypothesis and inquisitiveness towards research.

PO 5. **Ethics:** Recognize different value systems including your own, understand the moral dimensions of your decisions and accept responsibility for them.

PO 6. **Environment and Sustainability:** Understand the issues of environmental contexts and sustainable development.

PO 7. **Self-directed and Life-long Learning:** Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes.

PROGRAMME SPECIFIC OUTCOMES

PSO1. Identify, define, interpret and analyze the processes linked with geology and earth sciences and the consequent products by applying knowledge of biology and mathematics. Demonstrate the knowledge of geologic time and earth's history; dynamics of crustal materials with respect to Plate Tectonics theory, outline of regional geology of India

PSO2. Conceptualize and understand the fundamentals of crystals and minerals and apply them in understanding, analyzing the principles and process involved in the origin of different type of rocks, especially those which are economically important.

PSO3. Analyze, comprehend and apply the concepts of earth sciences through field and independent project-based study. Apply the fundamentals concepts of all branches of earth sciences in solving problems related to different fields such as engineering and exploration geology, remote sensing & GIS, hazard assessment and atmospheric and marine sciences.

PSO4. Implement the theoretical concepts to the laboratory experiments. Identify and apply relevant methodologies and tools relating to earth sciences and their applications. Interpret and write effective technical literature and to function efficiently, professionally and ethically in multidisciplinary teams with an ability to engage in life-long learning**.**

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Bachelor of Science (Honors/ Honors with Research) in Earth Sciences
SEMESTER-I

DESC2151	EARTH SYSTEM SCIENCES	L	T	P	C
Version 1.1	Date of Approval:	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue
The purpose of the course is to develop a holistic understanding of the earth as a system. It attempts to illustrate the reasons for why things happen in nature the way they happen and how much humans have adapted and influenced the natural processes. It will give holistic understanding of linkages in system with a perspective of space and time in earth system.

Course Objectives
The objective of this course is to

- Grasp the fundamentals of Earth's four main systems (atmosphere, hydrosphere, biosphere, and geosphere) and their interdependencies.
- To gain Ability to explain how these systems interact to influence Earth's environment and processes.
- Examine the causes and effects of climate change and miscellaneous.
- Ability to critically evaluate human-environment interactions and propose strategies for mitigating negative impacts. Assess the impact of human activities on natural systems and explore sustainable solutions.

Course Outcomes
On completion of this course, the students will be able to
CO1. Understand the concept and origin of Earth System Sciences.
CO2. Understand the fundamentals in applying scientific techniques to explore and understand Earth's dynamic processes.
CO3. Develop a deep understanding of various geological processes, such as plate tectonics, weathering, and erosion, formation, alteration, and recycling of rocks within the Earth's crust.
CO4. Understand the Causes and Impacts of Natural Disasters to analyze the geological and atmospheric processes and develop the knowledge to evaluate their impacts and explore strategies for risk mitigation and disaster preparedness.

Course Content

Modules	Bloom's level*	Number of hours
Module I: The Universe: Concepts and origin; The Solar System and origin of planets; Terrestrial and Jovian planets; Meteorites and Asteroids; Earth in the Solar system: Origin, Size, Shape, Mass, Density, Rotational and Revolution Parameters; Age and history of the earth's surface and Geological time scale; Origin of atmosphere and composition.	**L1, L2, L3**	**20**
Module II:	**L1, L5, L6**	**22**

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Earth Sciences – Aim and scope, Introduction to various branches of Earth Sciences, Distribution of elements in the solar system and in the Earth; Chemical differentiation and composition of the Earth; Definition of rocks and minerals, Types of rock; Igneous, Sedimentary, and Metamorphic rocks; Structure and Composition of Earth's interior and surface; General concepts about geochemical cycles; Soil profile and Processes of soil formation, Types of soils.		
Module III: Concept of Plate Tectonics; Plate boundaries; Sea-floor spreading and Continental Drift; Geodynamic elements of Earth: Mid Oceanic Ridges, trenches, transform faults and island arcs; Origin of oceans, continents, mountains, and rift valleys; Plate tectonics & seismicity; Volcanoes: types, products, and distribution. Earthquake and earthquake belts.	**L1, L4, L3**	**18**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

- Mason, B (1986). Principles of Geochemistry. 3rd Edition, Wiley New York.
- Walther John, v., 2009 Essentials of geochemistry, student edition. Jones and Bartlett Publishers.
- Albarede, F, 2003. An introduction to geochemistry. Cambri

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**HA**	**EE**
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**					**1**	**1**	**1**	**1**	**2**	**2**
CO2	**1**					**2**	**2**	**1**		**2**	**2**
CO3	**1**					**2**	**2**	**1**	**1**	**2**	**2**
CO4	**1**					**2**	**2**	**1**			

1: strongly related, 2: moderately related and 3: weakly related

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DESC2101	EARTH SURFACE FEATURES & PROCESSES	L	T	P	C
Version 1.1	Date of Approval:	2	0	0	2
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

The objective of the course is to make the students acquainted with the various processes operating on the earth and how the interactions leads to the evolution of different geomorphological features and landscape. This course gives an idea of natural process in line with human approach of growth and development and how a mutual balance caters the human need in best possible ways.

Course Objectives

The objective of this course is to

1. **Understanding Earth Processes**: Acquaint students with the various processes operating on Earth.
2. **Geomorphological Evolution**: Explore how interactions between these processes lead to the evolution of different geomorphological features and landscapes.
3. **Natural Processes and Human Development**: Provide insights into natural processes in line with human approaches to growth and development.
4. **Balancing Needs**: Emphasize how maintaining a mutual balance between natural processes and human development can best cater to human needs.

Course Outcomes

CO1. Describe the different components of Earth's systems (Geosphere, Lithosphere, Hydrosphere, Cryosphere, Biosphere) and explain the concepts of isostasy and mountain-building processes.
CO2. Distinguish between endogenic and exogenic processes and their respective roles in shaping Earth's surface.
CO3. Analyze and classify the various types of weathering (physical, chemical, biological) and the agents responsible for these processes
CO4. evaluate and interpret the erosional, trans
portation, and depositional features formed by fluvial (rivers), aeolian (wind), and glacial processes.
CO5. ynthesize information on the interactions between different Earth surface processes and predict the potential impacts of these processes on various landforms and human activities.

Course Content

Modules	Bloom's level*	Number of hours
Module I: Introduction to earth surface processes: Geosphere, Lithosphere, Hydrosphere, Cryosphere, Biosphere, Concept of Isostasy and Mountain building processes, Endogenic and Exogenic processes.	**L1, L2, L3**	**10**
Module II: Weathering, agents and types of weathering: Physical, Chemical and Biological weathering, Erosional, transportation and depositional processes, Fluvial processes: erosional, transportation and depositional features by river,	**L1, L5, L6**	**12**

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Aeolian Processes: erosional, transportation and depositional features by wind		
Module III: Glacial processes: erosional, transportation and depositional features by glaciers, Karst topography: erosional, transportation and depositional features by groundwater, Coastal Processes and Landforms	**L1, L4, L3**	**8**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Readings

1. Bloom, A.L. 1998. Geomorphology: A systematic Analysis of Late Cenozoic Landforms (3rd Edition), Pearson Education, Inc.
2. Singh, S. 1998. Geomorphology. Prayag Pustak Bhavan, Allahabad.
3. Kale, VS. and Gupta, A. 2001. Introduction to Geomorphology. Orient Longman Ltd.
4. Easterbrook, D.J. 1992. Surface processes and landforms. McMillan Publ.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**HA**	**EE**
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**					**1**	**1**	**1**	**1**	**2**	**2**
CO2	**1**	**1**				**2**	**2**	**1**		**2**	**2**
CO3	**1**	**1**				**2**	**1**	**1**	**1**	**2**	**2**
CO4	**1**	**1**				**1**	**2**	**1**			
CO5	**1**					**1**	**2**	**1**			

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DESC2102	MATHEMATICS	L	T	P	C
Version 1.1	Date of Approval:	2	0	0	2
Pre-requisites/Exposure					
Co-requisites					

Course Objective: The objective of the course is to introduce the basic concept of Algebra, Matrices, Trigonometry and Differential calculus

Course Outcomes:
On completion of this course, the students will be able to:
CO1: Learn the concept of algebra where they will be different series like Exponential and logarithmic Series.
CO2: Learn different methods to find the roots of the equations.
CO3: Learn fundamental concepts of matrices like rank, eigen roots, eigen values, Cayley-Hamilton theorem
CO4: Learn different Trigonometric identities
CO5: Learn the concept of derivatives and its applications

Course Content

Modules	Bloom's level*	Number of hours
Module I: Algebra:Partial Fractions; Binomial, Exponential and logarithmic Series (without Proof); Summation; Simple problems. Theory of equations: Polynomial Equations with real Coefficients; Irrational roots and Complex roots; Transformation of equation by increasing or decreasing roots by a constant; Reciprocal equations; Newton's method to find a root approximately; Simple problems.	**L1, L2, L3**	**12**
Module II: Matrices:Symmetric; Skew-Symmetric; Orthogonal and Moduleary matrices; Rank of a matrix; Consistency of equations; Eigen roots and eigen vectors; Cayley-Hamilton theorem (without proof); Verification and computation of inverse matrix. Trigonometry:Expansions of sinn θ, cosn θ, sinnθ, cosnθ, tannθ; Expansions of sinθ, cosθ, tanθ in terms of θ; Hyperbolic and inverse hyperbolic functions; Logarithms of complex numbers.	**L1, L5, L6**	**10**
Module III: Differential calculus:n-th derivatives; Leibnitz theorem (without proof) and applications; Jacobians; Concepts of polar co-ordinates; Curvature and radius of curvature in Cartesian co-ordinates.	**L1, L4, L6**	**8**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Readings:

1. P. Duraipandian and S. Udayabaskaran, (1997) Allied Mathematics, Vol. I &II.Muhil Publishers, Chennai.

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2. P. Balasubramanian and K. G. Subramanian, (1997) Ancillary Mathematics. Vol.I& II. Tata McGraw Hill,
3. S. P. Rajagopalan and R. Sattanathan, (2005) Allied Mathematics.Vol. I & II.Vikas Publications, New Delhi.
4. P. R. Vittal (2003) Allied Mathematics. Marghan Publications, Chennai
5. P. Kandasamy, K. Thilagavathy (2003) Allied Mathematics Vol-I, II S.Chand& company Ltd., New Delhi-55.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**HA**	**EE**
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**							**1**			**2**
CO2	**1**							**1**			**2**
CO3	**1**							**1**			**2**
CO4	**1**							**1**			**2**
CO5	**1**							**1**			**2**

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DESC2103	BIOLOGY	L	T	P	C
Version 1.1	Date of Approval:	2	0	0	2
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

This course is the basic framework for the students of Earth Sciences. It will give an introduction to the evolution of living microorganisms, plants, animals and how the earth is evolved, evolution of life on earth started and how the living organisms came in to existence. The course is foundation for the basics of biology start from microbes to evolution of all direction of living biota, plants vertebrate and invertebrate animals taxonomy and their nomenclature.

Course Objectives

The objective of this course is to

1. Biology is essential to understand geological processes as it provides several vital clues about tracking process in past.
2. This course is meant to provide basic understanding of different forms of life and their organization which is pre-requisite for paleontology. The major thrust will be on the taxonomical classification of the plant and animal kingdom

Course Outcomes

On completion of this course, the students will be able to

CO1. Identify the process of origin of earth and evolution of living organisms.

CO2. Described Taxonomic Hierarchy: Taxonomic category and groups; Concepts of species, genus and family; Nomenclature: Principles and rules.

CO3. Demonstrate classification of plant and animal species based on their characteristics.

Course Content

Modules	Bloom's level*	Number of hours
Module I: Introduction: Origin of life and their adaptation to various kinds of environments; Theories of evolution: Darwinism, Neo-Darwinism, Lamarckism and Neo-Lamarckism; Mode of speciation; Fossils and their significance; Zoogeographical and Phyto-geographical outline only.	**L1**	**10**
Module II: Taxonomic Hierarchy: Taxonomic category and groups; Concepts of species, genus and family; Nomenclature: Principles and rules, Ranks and names; Type method; Principle of priority and its limitations; Biological classification: Five Kingdom system; Basics of Plant & Animal Kingdom	**L1,L2**	**8**

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Module III: Structural Organization in Plants and Animals: Structuralorganization in animals; Salient features and classification of Non-chordates, Classification of Mammal outline; Salient features and classification of plants.	**L3, L4**	**12**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Readings

- Ganguly,H.CandKar,A.K.:*College Botany,* Vol.II, (New Central Book Agency)
- Mayr and Ashlok: *Principles of Systematic Zoology*
- Minkoff: *Evolutionary Biology*
- Ayala: *Population and Evolutionary Genetics*
- Jones,S.B.&Luchsinger, A.B: *Plant Systematics*, (McGrawHill)
- Datta,S.C.: *Systematic Botany*,(Wiley Eastern)

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**HA**	**EE**
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**				**2**		**2**		**2**			**2**
CO2	**1**				**2**		**2**		**2**			**2**
CO3	**1**				**2**		**2**		**2**			**2**

1: strongly related, 2: moderately related and 3: weakly relate

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VAES2101	ENVIRONMENTAL STUDIES (VAC-1)	L	T	P	C
Version 1.1	Date of Approval: Date, Month 2017	4	0	0	4
Pre-requisites/Exposure	Compulsory Value Added Course				
Co-requisites					

Course Catalog

This course gives an idea to find ways of living and working sustainably, so that the reasonable needs and wants of people from all walks of life can be satisfied without so over-exploiting the natural resources that the ability of future generations to meet their need and wants is threatened. Finding approaches to development that balance economic and social progress, address cultural differences, and respect ecological values and limits is the key to sustainable development.

Course Objectives

The objective of this course is to

- Describe the scope, importance and segments of environment and role of natural resources in expanding science and technologies.
- Understand the significance of biodiversity and its conservation, ecosystem processes and attain knowledge about sustainability.
- Reveals knowledge about environmental pollution and population explosion, their effects, control measures and related social issues. To also analyze the environmental issues in India and environmental management and legislation for the sustainable usage of environment.
- Description about value education, human rights, women and child welfare programmes and role of latest technologies in environmental management.
- Field work also forms the integral part of environmental issues so as to understand the theoretical concepts close to the ground realities.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define the scope, importance and relation between environment and other segments of the society.

CO2: List and explain the significance of natural resources. Give in depth interpretation of the knowledge of various aspects of biodiversity and ecosystem processes.

CO3. Analyze and Examine environmental pollution, its effects and control measures and, assessing environmental impacts and livelihoods.

CO4: To illustrate the climate change and sustainable development. Analyze various social issues like consumerism, resettlement, rehabilitation, wasteland reclamation and environmental legislations.

CO5. To create awareness among the public towards sustainability through the use of different tools like environmental journalism and activism. Apply human rights, women and child welfare, population explosion and its control measures.

Course Content

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MODULES	Blooms level*	Number of hours
MODULE I: The multidisciplinary nature of environmental studies. Definition, scope and importance, Need for public awareness.	**L1, L2**	**8**
MODULE II: Natural Resources Renewable and non-renewable resources Natural resources and associated problems Forest resources: Use and over-exploitation, deforestation, case studies, timber extraction, mining, dams and their effects on forests and tribal people. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. - Role of an individual in conservation of natural resources. - Equitable use of resources for sustainable lifestyles.	**L1, L2,L3, L5**	**12**
MODULE III: Ecosystems Concept of an ecosystem: Structure and function of an ecosystem, producers, consumers and decomposers, energy flow in the ecosystem, ecological succession, food chains, food webs and ecological pyramids, introduction, types, characteristic features, structure and function of the following ecosystems: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries).	**L2, L3**	**8**
MODULE IV: Biodiversity and its conservation Introduction, Definition: genetic, species and ecosystem diversity, biogeographical classification of India, value of biodiversity: consumptive use, productive use, social, ethical aesthetic and option values, biodiversity at global, national and local levels, India as a megadiversity nation, hot-spots of biodiversity, threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts, endangered and endemic species of India, conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.	**L2, L3**	**12**
MODULE V: Environmental Pollution Definition, causes, effects, and control measures of: air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution, and nuclear pollution. Solid waste management: causes, effects and control measures of urban and industrial wastes, role of an individual in prevention of pollution, pollution case studies, disaster management: floods, earthquake, cyclone, and landslides.	**L1, L2, L3**	**5**
MODULE VI: Social Issues and the Environment From unsustainable to sustainable development, Urban problems related to energy Water conservation, rain water harvesting, and watershed management Resettlement and rehabilitation of people, its problems and concerns, case studies Environmental ethics: issues and possible solutions Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies Wasteland reclamation Consumerism and waste products Environmental Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention	**L2, L3**	**5**

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and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness.		
MODULE VII: Human Population and the Environment Population growth, variation among nations Population explosion Family Welfare programmes, Environment and human health Human Rights, Value education, HIV/ AIDS, Women and child welfare Role of information technology in environment and human health, Case studies.	**L1,L2**	**7**
MODULE VIII: Field Work Visit to a local area to document environmental assets-river/ forest/ grassland/ hill/ mountain Visit to a local polluted site urban / rural / industrial / agricultural Study of common plants, insects, and birds Study of simple ecosystems - pond, river, hill slopes, etc.	**L2, L3, L6**	**3**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme:

Components	**A**	**CT**	**HA**	**EE**
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, EE: End Semester Examination;

Suggested Readings

- Ecology and Environment by E P Odum
- A Text Book of Environmental Studies by Dr. ShradhaSinha, Dr. ManishaShukla, Dr.RanjanaShukla.
- Environmental Studies & Ecology by Dr. Jaya Pandey, Dr.ManasiMishra.
- Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut.
- Wanger K.D., 1998 Environnemental Management. W.B. Saunders Co. Philadelphia, USA 499p.
- Mckinney, M.L. & School, R.M. 1996. Environmental Science Systems & Solutions, Web enhanced edition. 639p

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**					**1**	**1**	**1**	**1**	**1**	**1**
CO2	**1**	**1**	**2**	**2**		**1**	**2**	**1**		**1**	**1**
CO3	**1**	**1**	**2**	**2**		**1**	**2**	**1**	**1**	**1**	**1**
CO4	**1**	**1**	**2**	**2**		**1**	**2**	**1**			
CO5	**1**	**1**	**2**	**2**		**1**	**2**	**1**			

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SEMESTER-II

DESC2251	PETROLOGY PLUS FIELD	L	T	P	C
Version 1.1	Date of Approval:	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

This course is the basic framework for the students of Earth Sciences A basic course in earth sciences which deals with the origin, composition, distribution and structure of the rocks that have an origin from magma. The study of igneous rocks is important because they make up the bulk of the earth's crust in the geological time period.

Course Objectives

The objective of this course is to

1. Basic understanding of the three major types of rocks (Igneous, sedimentary and Metamorphic rocks).
2. To understand the different process involved in the formation of three types of rocks.

Course Outcomes

On completion of this course, the students will be able to

CO1. Describe, identify and differentiate among Igneous, sedimentary and metamorphic rocks

CO2. Describe the various process and environment in which Igneous, sedimentary and metamorphic rocks are formed.

CO3. Understand the mode of occurrence (temperature/ pressure conditions) of varios types of rocks based on texture and structure.

Course Content

Modules	Bloom's level*	Number of hours
Module I: Introduction to Igneous petrology; its significance, distinguishing features of three types of rocks; concept of intrusion and extrusion; Magma: Definition, generation and crystallization and diversification of magma, Tectonic setting and igneous activities; Bowen's reaction principle and its petrological significance. Structure, textures and classification of igneous rocks.	**L1**	**15**
Module II: Basic concepts of Sedimentary, Description, and classification of Sedimentary rocks, Sedimentary texture and structures, Sedimentary Environments and facies, Weathering, and sedimentary flux; Fluid flow and its types, Sediment transport, and deposition; Submarine weathering, soils, and paleosols; Application of Sedimentary Petrology.	**L1, L2**	**15**
Module III: Introduction to Metamorphic Petrology; Factors controlling metamorphism; Types of metamorphism: contact, regional, fault zone metamorphism, impact metamorphism; Limitations of metamorphism; Diagenesis, Anataxis, Palingenesis. Concept of Zones, Facies, Grades and Isograds;	**L2, L4**	**20**

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Metamorphic differentiation, prograde, retrograde, and poly-metamorphism; Metamorphic fluids and Metasomatism.		
Module IV: A field project based on petrology or Fields of specialization in petrology correspond to the aforementioned three major rock **types—igneous, sedimentary, and metamorphic**. Igneous petrology. Field project includes field observation followed by analysis, writing of short reports, presentation and review by peer.	**L3, L6**	**10**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

- John D. Winter 2001. An Introduction to Igneous and Metamorphic Petrology. Prentice Hall Inc
- Loren A. Raymond 2002. Petrology: The study of Igneous, Sedimentary and Metamorphic rocks. McGraw Hill .New York
- Bose M.K. 1997. Igneous Petrology. World Press
- Cox, K.G. Bel, J.D. and Pankthrust, R.J. 2002. The interpretation of Igneous rocks. Allen and Unwin, London
- Pankthrust, 2000. Igneous and Metamorphic rocks. Prentice Hall.
- Phillpots, A.R., and Ague, S.J., 2009. Principles of igneous and metamorphic petrology (2nd Edn.) Cambridge.
- Prothoreo and Schwab, 2004, Sedimentary Geology, Freeman and Co. New York, 557p
- Sam Boggs, 1995, Principles of Sedimentology and Statigraphy, Printice Hall, New Jersey, 765p .
- Maurice E. Tucker, 2006, Sedimenary Petrology, Blackwell Publishing, 262p.
- Collinson, J.D. and Thompson, D.B. 1988, Sedimentary structures, Unwin-Hyman, London, 207p.
- Best, M.G. 2002. Igneous and metamorphic petrology. Wiley publication.
- Spears F. 1993. Metamorphic Phase Equilibria and Pressure-Temperature-Time Paths. AGU publication

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**HA/PR**	**FW**	**EE**
Weightage (%)	5	15	5	5	70

A: Attendance, CT: Class Test, HA: Home Assignment, PR: Presentation, FW: Field work, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**			**2**					**1**	**1**	**2**	**2**
CO2	**1**			**2**					**1**	**1**	**2**	**2**
CO3	**1**			**2**					**1**	**1**	**2**	**2**

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DESC2201	GEOCHEMISTRY	L	T	P	C
Version 1.1	Date of Approval:	2	0	0	2
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

This course would provide various aspects of chemistry, with major thrust on the relative abundance, distribution and cycling of earth's chemical elements and their isotopes. This will also lay a foundation for analytical and conceptual concepts which would further be helpful for research in specialized areas much significant of earth sciences.

Course Objectives

The objective of this course is to

- To learn about fundamental geochemical methods and practices used in disciplines like aqueous biogeochemistry, trace element geochemistry, and isotope geochemistry.
- To give an integrated understanding of linkages in system with a perspective of space and time in earth system.
- To learn why and how geochemical reactions occur, and how they give rise to global biogeochemical cycling between reservoirs.

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand the thermodynamic principals underlying modern geochemistry.

CO2. Understand the theoretical background, and practical application of commonly used techniques in geoscience research.

CO3. Study the composition, structure, processes, and other physical aspects of the Earth.

CO4. Examine the distribution of chemical elements in rocks and minerals, and the movement of these elements into soil and water systems.

Course Content

Modules	Bloom's level*	Number of hours
Module I: Introduction: Earth in relation to the universe. The nature and age of the universe, nature and origin of solar system, composition of the universe, sun, planets and meteorites, cosmic abundance of elements. Geochemical cycle. Energy changes in the geochemical cycle. Methods for Geochemical analysis (Atomic Absorption spectrometry, electron microprobe Analysis, Mass spectrometry, ICP-MS, TEM)	**L1, L3**	**10**
Module II: Composition of the earth: the internal structure and composition of earth, composition of crust, composition of earth as a whole. Primary distribution of elements, geochemical classification of elements, distribution of elements in igneous, metamorphic and sedimentary rocks, partition coefficients.	**L1, L2**	**8**
Module III: Internal structure of atoms, nuclear systematics, atomic weights, and isotopes, nuclear stability and abundance. Decaying	**L1, L2, L3**	**12**

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mechanism-Beta decay, positron decay, electron capture decay, alpha decay, nuclear fission. Decay laws and half-life. Geochronology-K-Ar, Rb-Sr, Sm-Nd, and U-Pb dating. The hydrological cycle, inter relationship of surface and ground water, physico-chemical properties of water and its structure and bonding. Solution and solubility, composition of natural waters, some characteristics of river waters and ground water.		

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

- Mason, B (1986). Principles of Geochemistry. 3rd Edition, Wiley New York.
- Walther John, v., 2009 Essentials of geochemistry, student edition. Jones and Bartlett Publishers.
- Albarede, F, 2003. An introduction to geochemistry. Cambri

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**HA**	**EE**
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**					**2**	**2**	**1**		**2**	**2**
CO2	**1**					**2**	**2**	**1**		**2**	**2**
CO3	**1**					**2**	**2**	**1**		**2**	**2**
CO4	**1**					**2**	**2**				

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DESC2202	PHYSICS	L	T	P	C
Version 1.1	Date of Approval:	2	0	0	2
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

The course is designed to develop an understanding of basics of physics which is intricately related to various sub-branches of earth sciences. This course will provide theoretical foundations of different geological processes including structural geology, stratigraphy, geo-tectonics, mass wasting, petrology, crystallography and mineralogy.

Course Objectives

The objective of this course is to

1. **Develop Fundamental Physics Knowledge**; Gain a thorough understanding of the basic principles of physics relevant to earth sciences.
2. **Explore Geological Processes**; Learn the theoretical foundations of various geological processes, including structural geology, stratigraphy, and geo-tectonics.
3. **Understand Geological Phenomena;** Study key concepts related to mass wasting, petrology, crystallography, and mineralogy.
4. **Integrate Physics and Earth Sciences**; Apply physics principles to analyze and interpret geological phenomena and processes.

Course Outcomes

On completion of this course, the students will be able to

CO1. Demonstrate a solid understanding of fundamental physics concepts as they apply to earth sciences.
CO2. Effectively analyze and interpret geological structures and processes, such as stratigraphy and geo-tectonics, using theoretical foundations.
CO3. Utilize physics-based methodologies to solve problems and conduct research in various sub-disciplines of earth sciences, such as mass wasting and petrology.

Course Content

Modules	Bloom's level*	Number of hours
Module I: Elasticity: Hooke's Law, elastic constants, bending of beam, bending moment, Cantilever depression at the loaded end of a cantilever, determination of Young's modulus by non-uniform bending; Viscosity: viscosity of a liquid, viscous force, co-efficient of viscosity of a liquid, Poiseuille's formula, comparison of viscosities of two liquids by graduated burette method; Surface Tension: surface tension, excess of pressure inside a curved surface, Synclatic system, Surface Tension and interfacial surface tension by the method of drops. Heat:Specific heat, Newton's law of cooling, determination of specific heat of a liquid using Newton's law of cooling; Emissivity and Emissive Power; J.K. Effect, Positive &Negative Effect, Temperature of Inversion; Super conductors, Type I and II, Meisner Effect, Helium I & II.	**L1**	**10**

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Module II: Electricity and magnetism: Potentiometer, Principle, Calibration of low range voltmeter, Measurement of internal resistance of cell, measurement of an unknown resistance. Magnetism: Moment and pole strength of a magnet, Deflection magnetometer, Tan C position, Vibration magnetometer, Theory, Period of Oscillation, Determination of M and BH using the deflection magnetometer in Tan C position and the vibration magnetometer.	**L1,L2, L3**	**8**
Module III: Physical optics: Interference; Air Wedge, Description Test for optical flatness of glass plate, determination of diameter of a thin wire by air wedge; Diffraction; Theory of transmission grating, Normal Incidence, Determination of Wavelength of monochromatic source and Wavelength of mercury line using a grating by normal Incidence; Polarisation; Optical activity, Specific rotatory power; Polarimeter.	**L3, L4**	**12**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Readings

- Allied Physics – R. Murugesan S. Chand & Co. First Edition (2005).
- Allied Physics – Dr. K. Thangaraj, Dr. D. Jayaraman Popular Book Department, Chennai.
- Allied Physics – Prof. Dhanalakshmi and others.
- Elements of Properties of Matter – D.S. Mathur, S. Chand & Co. (1999).
- Heat and Thermodynamics – N. Brijlal and Subramaniam S. Chand & Co.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**HA**	**EE**
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**				**2**		**2**		**2**			**2**
CO2	**1**				**2**		**2**		**2**			**2**
CO3	**1**				**2**		**2**		**2**			**2**

1: strongly related, 2: moderately related and 3: weakly related

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SEMESTER-III

DESC2351	STRUCTURAL GEOLOGY PLUS FIELD	L	T	P	C
Version 1.1	Date of Approval:	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

This course deals with the study of the three-dimensional distribution of rock modules with respect to their deformational history. The study will make the students understand the structural evolution of a particular region and the important events which occurred in the regional geological past.

The field component of the course is a practical, field-based program which introduces the fundamentals of geologic mapping techniques in undeformed to simply folded and faulted and relatively unmetamorphosed sedimentary and igneous terrains.

Course Objectives

The objective of this course is to

1. The course provides a basic understanding of the forces driving deformation, and the displacements and strains associated with simple crustal deformations.
2. Introduce the basic concepts deformation processes, both brittle and ductile, and how they control the strength, mechanical behaviour and development of structures in the Earth's continental crust.
3. Illustrate how deformation processes change under the influence of changing pressures and temperatures with increasing depth in the lithosphere.

Course Outcomes

On completion of this course, the students will be able to

CO1. Recognize, interpret and discuss structures produced by simple crustal deformation.

CO2. Analyze the geometry of folds, faults, fractures, conformities, and evaluating the stress regimes that produced them.

CO3. Construct accurate geological maps and cross-sections and predict structures at depth and in areas of poor outcrop in simply folded and faulted regions.

Course Content

Modules	Bloom's level*	Number of hours
Module I: Introduction, Attitude of beds; V's rule; dip and strike, Deformation, concept of stress and strain; Strain ellipses of different types and their geological significances.	**L1**	**15**
Module II: Folds morphology; Geometric and genetic classification of folds; Introduction to the mechanics of folding: Buckling, Bending, Flexural slip and flow folding; recognition in field and map, causes of folding. Top and bottom criteria of deformed strata. Fault: Concept and basics of Fault and Joint, classification, mechanism, significance, recognition in the field and map, general effects of faulting on outcrops. Joints - geometry, classification and significance, Outlier, Inlier, Nappe, Klippe and Window.	**L1, L2**	**15**

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Module III: Unconformities, Foliation and lineation Unconformity - types, significance, recognition in the field and map, difference between fault and unconformity. Foliation - types and relation with major structures, Lineation - types and relation with major structures; Salt domes and diapirs. Stereographic projection; shear zones, thrusts and superposed folding; basement-cover relationship. Interpretation of geological maps	**L2, L3, L4**	**15**
Module IV: Field Project To identify the mineral assemblage on an outcrop through hand lens and physical properties; To identify and relate the various structural features in the field and prepare a geological map; Clinometers compass & its uses	**L3, L4, L5**	**15**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

- Davis, GR. 1984. Structural Geology of Rocks and Region. John Wiley
- Weijermars, R. 1997. Structural Geology and Map Interpretation, Alboran Science Publishing.
- Billings, M.P. 1987. Structural Geology, 4th edition, Prentice-Hall.
- Hatcher, Jr., R.D. 1995. Structural Geology - Principles, Concepts and Problems, Merrill Publishing Company.
- Ghosh, SK. 1993. Structural geology: fundamentals and modern developments, Pergamon Press, London

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**HA**	**EE**
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**					**2**	**2**	**1**		**2**	**2**
CO2	**1**			**2**			**2**	**1**		**1**	**2**
CO3	**1**			**2**			**2**	**1**		**1**	**2**

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DESC2301	GEOPHYSICS & ENGINEERING GEOLOGY PLUS LAB	L	T	P	C
Version 1.1	Date of Approval:	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

The course is developed to give an insight about the physics of earth and the study of earth using quantitative physical methods. The course deals with the study of geological structures and their role in engineering structures and projects. Students are expected to develop an insight about the role of a geologist in such engineering projects.

Course Objectives

The objective of this course is to

1. Gain a comprehensive understanding of the physical principles governing the Earth and its geological processes.
2. Learn to use quantitative physical methods to study and analyze geological structures.
3. Understand the significance of geological structures in engineering projects and how they influence the design and stability of these structures.
4. Develop an appreciation for the crucial role of geologists in engineering projects, including their contributions to site assessment, risk analysis, and project planning.

Course Outcomes

On completion of this course, the students will be able to

CO1. Demonstrate a solid understanding of the physical principles related to Earth's geology.
CO2. Apply quantitative physical methods effectively to analyze and interpret geological structures.
CO3. Assess the impact of geological structures on engineering projects, ensuring design and structural integrity.
CO4. Appreciate and articulate the vital role of geologists in engineering projects, including site assessment and risk management.

Course Content

Modules	Bloom's level*	Number of hours
Module I: Interrelationship between geology and geophysics; General and Exploration geophysics; Basic principles of geophysical exploration; Different types of geophysical methods. Role of geological and geophysical data in explaining geodynamical features of the earth. Geophysical Methods: Gravity, magnetic, Electrical, Seismic- their principles and applications.	**L1, L3**	**15**
Module II: Role of engineering geology in planning, design and construction of engineering structures. Geomechanical classification of rock mass (RMR, RQD, SMR). Engineering classification of Soils. Geotechnical components and classification of dams, reservoirs, spillways, tunnels, underground caverns, bridges, highways and shorelines.	**L1, L2**	**15**
Module III:	**L2, L3, L4, L5**	**15**

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Geological structures and discontinuities, engineering properties of rocks, engineering properties of jointed rocks. Classification of construction materials and aggregates. Geological hazards (landslides and earthquakes) their significance, causes and preventive/remedial measures. Seismic zones of India, soil liquefaction.		
Module IV: Field related study includes computation of reservoir area, catchment area, reservoir capacity and reservoir life; Merits, demerits & remedial measures based upon geological cross sections of project sites; Computation of Index properties of rocks. 4. Computation of RQD, RSR, RMR and 'Q'	**L3, L4, L5**	**15**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

- The Solid Earth: An Introduction to Global Geophysics (2nd ed. 2005) by CMR Fowler, Cambridge University Press.
- Applied Geophysics by Telford W.M., Geldart L.P. and Sheriff R.E., Cambridge University Press.
- Milton B. Dobrin (1988): Introduction to Geophysical Prospecting 3rd Ed. McGraw Hill, 630p. ISBN: 0070171955.
- William Lowrie (1997): Fundamentals of Geophysics. Cambridge University Press, 354p. ISBN-0 521 63454 7.
- Edwin S. Robinson (1988): Basic Exploration Geophysics. John Wiley & Sons, 562p. ISBN- 0-471-87941-x.
- Krynin, D.P. and Judd W.R. 1957. Principles of Engineering Geology and Geotechnique, McGrawHill (CBS Publ).
- Johnson, R.B. and DeGraf, J.V. 1988. Principles of Engineering Geology, John Wiley & Sons, N.Y.
- Goodman, R.E., 1993. Engineering Geology: Rock in Engineering constructions. Jonh Wiley & Sons, N.Y.
- Waltham, T., 2009. Foundations of Engineering Geology (3rdEdn.) Taylor & Francis.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**HA**	**EE**
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**		**2**			**2**	**2**	**1**		**2**	**2**
CO2	**1**		**2**	**2**			**2**	**1**		**1**	**2**
CO3	**1**		**2**	**2**			**2**	**1**		**1**	**2**
CO4	**1**		**2**	**2**			**2**	**1**		**1**	**2**

1: strongly related, 2: moderately related and 3: weakly related

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SESC2301	REMOTE SENSING AND GIS	L	T	P	C
Version 1.1	Date of Approval:	2	0	2	3
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

This course will develop the skills of students in the field of GIS and remote sensing. It will also give the basic concepts of remote sensing and principles associated with image acquisition and image processing. The role of GIS as a tool in environmental management and knowledge of GPS will be facilitated.

Course Objectives

1. The course aims to equip students with fundamental theoretical knowledge and practical skills in utilizing remote sensing technologies and Geographic Information Systems (GIS) for spatial data analysis and interpretation.
2. Through lectures and hands-on lab sessions, students will learn to acquire, process, analyze, and visualize spatial data obtained from satellite imagery and other remote sensing platforms.
3. They will also gain proficiency in GIS software for spatial data management, spatial analysis, and cartographic representation.
4. The course emphasizes the application of these tools in environmental monitoring, urban planning, natural resource management, and other fields, preparing students for careers where spatial data analysis and GIS skills are essential.

Course Outcomes

1. **CO1: Understanding Remote Sensing Principles:** Students will demonstrate knowledge of remote sensing principles, including electromagnetic radiation, sensor types, and image acquisition techniques.
2. **CO2: Proficiency in GIS Software:** Students will develop proficiency in using GIS software to manipulate spatial data, perform spatial analysis, and create thematic maps.
3. **CO3: Image Processing and Interpretation:** Students will acquire skills in digital image processing techniques to enhance, classify, and interpret remotely sensed imagery for various applications.
4. **CO4: Spatial Data Analysis**: Students will apply spatial analysis techniques such as buffering, overlay analysis, and suitability modeling to solve spatial problems and make informed decisions.
5. **CO5: Project Work and Reporting**: Students will undertake a comprehensive GIS project that integrates remote sensing data, applying acquired skills to solve real-world spatial problems. They will effectively communicate their findings through reports, maps, and presentations.

Course Content

Modules	Bloom's level*	Number of hours
Module I: Remote sensing: Introduction, scope and components; Electromagnetic spectrum, its characteristics and interaction with environment; Absorption, Transmission, Scattering: Mie-sattering & Rayleigh Scattering; Platforms: Types of Platform (Ground, Air, Space) & Sensors (Active & Passive) Resolution: (Spatial, Temporal, Radiometric); Ground & Satellite Remote Sensing; Albedo, Atmospheric Windows; Aerial photography, Elements of Visual Image Interpretation (Tone, Texture, Size, Shape, Shadow, Pattern), Spectral Signature	**L1, L2, L3, L4**	**15**

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Module II: Techniques and applications of remote sensing in water resource management, Land Use land cover mapping, forest cover/ type mapping, habitat analysis, biodiversity characterization; Use of GIS and remote sensing in environmental monitoringand early warning system; Raster Data; Vector Data; Indian Remote Sensing Satellite	**L1,L2, L3, L4, L5**	**12**
Module III: Image classification and accuracy assessment: Supervised and Unsupervised classification; GPS and its applications; Digital image processing; Optical remote sensing, microwave remote sensing; Photogrammetry: Introduction, stereoscopic vision; Concept of Digital Elevation Model.	**L1, L2,L3**	**12**
Module IV: Lab based project: Basics of Arc-GIS software, Data Downloading, observation, interpretation, Geo-referencing, mosaic. Classification of images: Supervised and Unsupervised; DEM analysis: generating slope map, aspect map and drainage network map and its applications.	**L3, L4, L6**	**6**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

- Lillisand, Thomas, Ralph W. Kiefer and Jonathan Chipman. 2007. Remote Sensingand Image
- Interpretation. Wiley India.
- Jensen, John R. 2004. Introductory Digital Image Processing: A Remote SensingPerspective.Prentice Hall.
- Burrough, P.A. and McDonnell, R.A. (1998) Principles of geographical information systems. Oxford University Press, Oxford, 327 pp.
- Jensen J.R. (2000) Remote Sensing of the Environment: An Earth Resource Perspective, Prentice Hall, ISBN 0-13-489733-1.

Examination Scheme:

Components	**A**	**FP**	**HA**	**EE**
Weightage (%)	**5**	**20**	**5**	**70**

A: Attendance, FP: Field Project, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**	**1**				**2**			**1**	**1**	**2**	**2**
CO2	**1**	**1**				**2**			**1**	**1**	**2**	**2**
CO3	**1**	**1**	**2**	**1**		**2**			**1**	**1**	**2**	**2**
CO4	**1**	**1**	**2**	**1**		**2**			**1**	**1**	**2**	**2**
CO5	**1**	**1**				**2**			**1**	**1**	**2**	**2**

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SEMESTER-IV

DESC2451	MINERALOGY PLUS LAB	L	T	P	C
Version 1.1	Date of Approval:	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

This course is the basic framework for the students of Earth Sciences. The course will develop an understanding of the science behind the fundamental chemical, geometrical and physical relationship of matter. This course highlights the chemical and optical fundamentals to decipher structural symmetry of minerals and their optical properties.

Course Objectives

The objective of this course is to

1. Provide basic understanding of minerals, crystals and the process of their formation on or in the earth.
2. Provide knowledge of Physical, chemical and optical properties of various minerals.
3. Give insight about the major crystal system in which all the minerals crystallize.

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand the processes and conditions involved in the formation of different minerals.
CO2. Describe and identify various minerals existed in a rock.
CO3. Understand the formation of rock types on the basis of optical properties of minerals.

Course Content

Modules	Bloom's level*	Number of hours
Module I: Crystallography: Brief idea of space lattice; Definition and morphology of crystal and crystal notation; Symmetry elements; Parameter, indices and symbols, Laws of Crystallography; Stereographic Projection; Derivation of 32 classes of crystal; Study of following crystal systems: Isometric System, Tetragonal System, Hexagonal System, Orthogonal System, Monoclinic System, Triclinic System.	**L1**	**20**
Module II: Mineralogy: Definition and physical properties of Minerals; ions, bonds and their types, coordination number, Isomorphism, Polymorphism and Pseudomorphism; Structure of silicates; A detailed study of important rock forming mineral groups with reference to their composition, structure, physical and optical properties	**L1, L2**	**10**
Module III: Optical Mineralogy: Elementary concepts of light; Propagation of light through minerals, Principles of optical mineralogy;Introduction to Nicol Prism, Petrological Microscope and its functions; Crystal habits and twinning, laws of twinning, polarization, double refraction; Isotropism and Anisotropism;	**L2, L4**	**15**

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Important optical properties: Relief, Pleochroism, Pleochroic, Haloes, Extinction and Extinction angle, Birefringence, Interference colours; Behaviour of convergent polarized light in Uniaxial and Biaxial Minerals.		
Module IV: Study of physical properties of minerals; Introduction to optical microscopy; Study of optical properties of minerals; Study of physical properties of rocks; Study of optical properties of rock under thin sections; Understanding crystal symmetry via wodden models; Stereographic projection of mineral faces 8. Mineral formula calculation; Crystal chemical calculation 10. Introduction to analytical techniques for rock and mineral study	**L3, L6**	**15**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

- W. D. Nesse, (2000), Introduction to Mineralogy, Oxford University Press, ISBN 0-19- 510691-1
- Cornelis Klein and Barbara Dutrow, The manual of Mineral Science, Wiley Publication 2007.
- P. F. Kerr Optical Mineralogy,1959
- Gribble, 1988. Rutley' elements of Mineralogy
- Nesse W.D. , Introduction to Optical mineralogy, 2008
- Deer, W. A. , Howie, R. A. and Zussman, J., An introduction to the rock forming minerals, ELBS publication,1962-1963.
- Dana, E.S. 1922. A textbook of Mineralogy.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**HA/PR**	**LW**	**EE**
Weightage (%)	5	15	5	5	70

A: Attendance, CT: Class Test, HA: Home Assignment, PR: Presentation, LW: Laboratory work, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**			**2**					**1**	**1**	**2**	**2**
CO2	**1**			**2**					**1**	**1**	**2**	**2**
CO3	**1**			**2**					**1**	**1**	**2**	**2**

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DESC2401	EXPLORATION & ECONOMIC GEOLOGY PLUS FIELD	L	T	P	C
Version 1.1	Date of Approval:	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

Basic knowledge of the occurrence of the resources along with the techniques and statistical analysis associated with mineral exploration. This course will emphasize on the earth materials primarily used for economic and/or industrial purposes. This branch of earth sciences is extremely significant as it is used in geochemistry, mineralogy, geophysics, petrology, structural geology etc. Economic geology is of utmost concern for environmentalists, engineers and conservationists

Course Objectives

The objective of this course is to

- Develop a strong foundation in geological principles, including rock types, mineralogy, and geological structures. Understand the processes that form and alter mineral deposits.
- Learn to identify and classify different rock types and minerals in the field. Use field techniques to recognize and describe geological structures and formations.
- Understand the use of geological maps, cross-sections, and other surveying tools. Understand and apply geophysical survey techniques such as seismic, magnetic, and gravity methods in exploration.
- Assess the economic viability of mineral deposits through cost-benefit analysis and resource estimation.

Course Outcomes

On completion of this course, the students will be able to

CO1. Students will develop practical skills in recognizing and interpreting geological features directly in the field, which are critical for professional work in exploration geology.

CO2. Understand and determine the economic potential of mineral deposits and making informed decisions regarding their development and exploitation.

CO3. Students will be adept at employing advanced technologies to enhance the accuracy and efficiency of geological investigations.

CO4. Develop to conduct their work with a strong awareness of safety, environmental stewardship, and professional ethics, ensuring responsible exploration and mining practices.

Course Content

Modules	Bloom's level*	Number of hours
Module I: **and gangues Ores**, gangue minerals, tenor, grade and lodes Resources and reserves- Economic and Academic definitions; Mineral deposits and Classical concepts of Ore formation Mineral occurrence, Mineral deposit and Ore deposit, Historical concepts of ore genesis: Man's earliest vocation- Mining Plutonist and Neptunist concepts of ore genesis.	**L1, L2, L3**	**20**
Module II:	**L1, L5, L6**	**15**

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Mineral exploration: Exploration and exploitation techniques Remote Sensing, Geophysical and Geochemical Explorations; Geological mapping at different scales, drilling, borehole logs and transverse sections; Structure and texture of ore deposits Concordant and discordant ore bodies Endogenous processes: Magmatic concentration, skarns, greisens, and hydrothermal deposits Exogenous processes: weathering products and residual deposits, oxidation and supergene enrichment, placer deposits		
Module III: Ore grade and Reserve, assessment of grade, reserve estimation; Metallic and Nonmetallic ores Metallogenic provinces and epochs Important deposits of India including atomic minerals, Non-metallic and industrial rocks and minerals.	**L1, L4, L3**	**20**
Module IV: Field related study includes geological exploration follows a sequence of multidisciplinary activities: reconnaissance, discovery, prospecting, and economic mining.	**L3, L4, L6**	**5**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

- McKinstry, H.E. 1962. Mining Geology (2nd Ed.) Asia Publishing House.
- Clark, G.B. 1967. Elements of Mining. 3rd Ed. John Wiley & Sons.
- Arogyaswami, R.P.N. 1996 Courses in Mining Geology. 4th Ed. Oxford-IBH.
- Jensen and Bateman: Economic Mineral Deposits.
- Sen and Guha: A Handbook of Economic Geology.

Modes of Evalation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**HA**	**EE**
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**					**1**	**1**	**1**	**1**	**2**	**2**
CO2	**1**					**2**	**2**	**1**		**2**	**2**
CO3	**1**					**2**	**2**	**1**	**1**	**2**	**2**
CO4	**1**					**2**	**2**	**1**			

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SESC2401	SURVEYING AND MAPPING	L	T	P	C
Version 1.1	Date of Approval:	2	0	2	3
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

This course will develop the skills of students in the field of surveying and mapping. It will also give the basic concepts of surveying and mapping and to promote planned, economic and artistic development of town, cities and rural areas.

Course Objectives

The objective of this course is to

1. Learn cadastral surveying which combines technical and legal knowledge to establish boundaries.
2. Analyze, manage, and disseminate geospatial data utilizing industry standard land surveying techniques.

Course Outcomes

On completion of this course, the students will be able to

CO1. Acquire knowledge and understanding of spatial data collection, analysis, management and presentation.
CO2. Design and acquire field survey measurements, process survey measurements to produce plans of appropriate accuracy and visual representation, incorporate data into geographical information systems
CO3. Recognize the requirements for designing plans of survey according to the needs of a project, understand the processes involved in representing the contiguous real world in a metric abstracted form.

Course Content

Modules	Bloom's level*	Number of hours
Module I: Significance and Principles of Surveying, Survey methods- Compass, Tape, Chain, Plain Table, Theodolite, Electronic Distance Meter, Total Station; Contouring and Plotting, Measurement of slope heights, aspects and gradients; Use of abney level, Global Position System; Geodetic survey, Datum, survey of India topographical maps.	**L1**	**12**
Module II: Different type of maps: base maps, thematic maps. Main categories of thematic maps used in earth sciences; Techniques for legend and symbols in the maps; Scale of maps, classification of maps according to the scale, effect of the scale on the level of details of the information; Geographic projections and deformation of the real world in the maps; Coordinate systems;	**L1, L2**	**12**
Module III: Exercise of localization of points in the map using their coordinates; Representation of the 3rd dimension in the maps: isolines, elevation points; Exercises of estimation of slope and real distance in the maps; Landform identification from maps (identification of valleys, hills). Delineation of drainage basins. Construction of elevation profiles from maps.	**L2, L3, L4**	**12**

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Module IV: Lab Project Exercises of estimation of slope and real distance in the maps, Remote sensing and map based basic skilling, theoretical study and lab work followed by evaluation by Peer group.	**L3, L5, L6**	**9**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

- GPS Satellite Surveying: By Alfred Leic, Published by Wiley.
- Remote Sensing and Geographical Information System: By AM Chandra and SK Ghosh, Published by Narosa Publishing House.
- Surveying: Principles and Applications: By Barry F. Kavanagh, eight edition.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**HA**	**EE**
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**			**1**					**2**	**1**	**2**
CO2	**1**		**1**	**1**		**2**			**2**	**1**	**2**
CO3	**1**		**1**	**1**		**2**			**2**	**1**	**2**

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SEMESTER-V

DESC2551	STRATIGRAPHY & PALEONTOLOGY PLUS FIELD	L	T	P	C
Version 1.1	Date of Approval:	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

The students would explore study of strata (rock layers) and stratification (layering) in sedimentary and layered igneous rocks. It would also elaborate regional geology and tectonic evolution of India. The students would develop an understanding of the origin and evolution of the past life which is vital.

Course Objectives

The objective of this course is to

1. Explore and understand the formation, characteristics, and significance of rock layers and stratification in sedimentary and layered igneous rocks.
2. Gain detailed knowledge of the regional geology and tectonic evolution of India.
3. Analyze the processes and events that have shaped the tectonic structure of the Indian subcontinent.
4. Develop an understanding of paleontology, focusing on the origin and evolution of past life forms and their significance in Earth's history.

Course Outcomes

On completion of this course, the students will be able to

CO1. Demonstrate an understanding of the formation, characteristics, and importance of strata and stratification in sedimentary and igneous rocks.

CO2. Exhibit detailed knowledge of India's regional geology and its tectonic evolution.

CO3. Analyze and interpret the tectonic processes and events that have shaped the geological structure of the Indian subcontinent.

CO4. Demonstrate an understanding of the origin and evolution of past life forms, and appreciate their importance in the context of Earth's history.

Course Content

Modules	Bloom's level*	Number of hours
Module I: Basic Concepts and Historical developments in Stratigraphy; Stratigraphic principles and correlation; Stratigraphic nomenclature; Facies concept and Walther's Law; Principles and methods of lithostratigraphy, Biostratigraphy and Chronostratigraphy; Magnetostratigraphy and Chemostratigraphy; Sequence Stratigraphy. Physiographic and tectonic subdivisions of India; regional geology and tectonic evolution of cratons; Geological Time Scale	**L1**	**17**
Module II: Precambrian of peninsula and extra-peninsula region, Stratigraphy and structure of Gondwana basins; Himalayan region; Marinemesozoic formations with reference to the Triassic deposits; Jurassic rocks of Kutch and Jaisalmer basins;	**L1, L2**	**17**

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Distribution and age of mesozoic volcanic provinces of India; Deccan Traps, Panjal Traps, Rajmahal Traps, Sylhet Traps; Stratigraphic boundary problems with special reference to P / T and K / T boundaries in India.		
Module III: Introduction to Fossils and Index Fossils, Fossilization Processes (Taphonomy); Concept of Species, Fossil nomenclature; Theory of organic evolution and the fossil record; Palaeoecology: Principles and methods; Palaeobiogeography and palaeoclimate. Invertebrate Palaeontology: Morphology, classification and geological history of the following groups: Gastropoda, Lamellibranchia, Brachiopoda, Cephalopoda, Trilobita and Echinoidea; Vertebrate Palaeontology: Origin of vertebrates; Vertebrate fossil record from Gondwana formations, Deccan volcanic province, Palaeogene and Neogene sequences of India and their evolutionary.	**L2, L3, L4**	**16**
Module IV: A field project based on study of geological map of India and identification of major stratigraphic units and diagnostic morphological characters, systematic position, stratigraphic position and age of various invertebrate, vertebrate and plant fossils. Field project includes field observation followed by analysis, writing of short reports, presentation and review.	**L3, L5, L6**	**12**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

- Doyle, P. & Bennett, M.R. 1996. Unlocking the Stratigraphic Record. John Wiley
- Ramakrishnan, M. &Vaidyanadhan, R. 2008. Geology of India Volumes 1 & 2, Geological society of India, Bangalore.
- Valdiya, K.S. 2010. The making of India, Macmillan India Pvt. Ltd.
- Clarkson, E.N.K.1998. Invertebrate Palaeontology and Evolution, George Allen &Unwin.
- Raup, D.M. and Stanley, S. M. 1971. Principles of Palaeontology, W.H. Freeman and Company.
- Benton, M. 1997. Basic Palaeontology: An introductory text, D.Harker, Addision Wisely Longman.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**HA**	**EE**
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**			**1**				**1**	**2**	**1**	**2**
CO2	**1**		**1**	**1**		**2**		**1**	**2**	**1**	**2**
CO3	**1**		**1**	**1**		**2**			**2**	**1**	**2**
CO4	**1**		**1**	**1**		**2**			**2**	**1**	**2**

1: strongly related, 2: moderately related and 3: weakly related

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DESC2501	HYDROLOGY PLUS LAB	L	T	P	C
Version 1.1	Date of Approval:	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

This course introduces students to the fundamental principles and applications of hydrology, focusing on the distribution, movement, and properties of water within the Earth's atmosphere, surface, and subsurface. Students will gain practical experience in analyzing hydrological processes, data collection methods, and interpretation techniques. Emphasis is placed on understanding the interactions between hydrological processes and environmental systems, as well as the implications for water resource management and sustainability.

Course Objectives

1. To provide fundamental understanding of hydrological principles and processes, including the distribution, movement and quality of water within natural systems.
2. Through theoretical knowledge, practical laboratory work and field exercises, students will develop skills in hydrological analysis and water resource management.

Course Outcomes

CO1. Understand Hydrological Principles: Demonstrate a comprehensive understanding of the fundamental principles governing the movement, distribution, and quality of water within terrestrial and aquatic environments.

CO2. Apply Quantitative Analysis: Apply quantitative techniques to analyze hydrological data, including precipitation, runoff, infiltration, and groundwater flow, using appropriate statistical and computational methods.

CO3. Interpret Hydrological Data: Interpret hydrological data to assess water availability, quality, and the impact of human activities on water resources, integrating knowledge of geological and environmental factors.

CO4. Hands-on Experience: Gain practical experience through laboratory experiments and fieldwork, using hydrological instruments to measure and analyze various parameters related to surface and groundwater systems.

CO5. Problem Solving in Water Resource Management: Apply hydrological principles to solve real-world problems related to water resource management, environmental sustainability, and the mitigation of hydrological hazards.

CO6. Communication Skills: Effectively communicate hydrological concepts, methodologies, and findings through written reports, oral presentations, and graphical representations suitable for both scientific and public audiences.

CO7. Ethical and Environmental Awareness: Recognize and evaluate ethical considerations in hydrology, including issues of water rights, conservation practices, and the environmental impacts of water use and management.

Course Content

Modules	Bloom's level*	Number of hours
Module I : Importance of water, Physical and chemical properties of water, Hydrological Cycle, Hydrosphere and its components, Formation of surface water resources; streams, rivers, lakes,	**L1, L2, L3, L4**	**15**

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swamps, caves, seas and oceans. Definition of river, river basin and water divide, formation of river valleys, flood plains, fluvial deposits, alluvial fans, meandering of rivers, formation of ox- bow or horse shoe lakes, deltas, solution valleys and karst topography Evaporation, Condensation and precipitation, Precipitation processes, Forms and types of Precipitation, Measurement of precipitation, Rain gauge network. Distribution and measurement of snow, Spatial and temporal variations of precipitation, Methods for point to aerial estimation of precipitation, Interpretation of precipitation data.		
Module II: Runoff and runoff mechanism, subsurface flow, Definition of discharge, units of discharge measurement, Types of measurements, Determination of stage, stage indicators, gauge site, essential requirements of gauge sites, selection of discharge sites, Stage discharge relationship and extension of rating curves, Flood and Drought, Water quality, Sediment discharge, sediment transportation, sediment yield of watersheds, suspended load and bed load measurements.	**L1,L2, L3, L4, L5**	**15**
Module III: Occurrence of Groundwater: Aquifer, Aquiclude, Aquifuge and Aquitard, Porosity, Effective porosity, Vertical distribution of Groundwater, Groundwater, Artificial Recharge of Groundwater: Concept, Recharge methods, Waste water recharge, Waste water treatment, Recharge mounds and Induced recharge, Surface, Atmosphere and Groundwater interaction, Climate change and water resources, Water resources and management.	**L1, L2,L3**	**17**
Module IV: Lab work Graphical representation of chemical quality data and water classification (C-S and Trilinear diagrams) Simple numerical problems related to: determination of permeability in field and laboratory, Groundwater flow, Well hydraulics etc	**L3, L4, L6**	**13**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

1. Fundamentals of Hydrology by Tim Davie, second edition
2. Hand Book of Applied Hydrology , Ven Te Chow (ed.)
3. Applied Hydrology , R.K.Linsley, M. A. Kohler & Paulhus

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**HA**	**EE**
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**	**1**				**2**			**1**	**1**	**2**	**2**
CO2	**1**	**1**		**1**		**2**			**1**	**1**	**2**	**2**
CO3	**1**	**1**				**2**			**1**	**1**	**2**	**2**
CO4	**1**	**1**		**1**		**2**			**1**	**1**	**2**	**2**
CO5	**1**	**1**		**1**		**2**			**1**	**1**	**2**	**2**
CO6	**1**	**1**			**2**		**2**		**1**	**1**	**2**	**2**
CO7	**1**	**1**		**1**	**2**		**2**		**1**	**1**	**2**	**2**

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DESC2502	PLANETORY SCIENCE PLUS LAB	L	T	P	C
Version 1.1	Date of Approval:	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

To introduce the student to basic concepts in planetary science and the methods that are used to determine what we know about the dynamic processes of planetary formation and evolution. This will lay the foundation for understanding how our Solar System and the Earth was formed. We will study how we believe our planet has changed and evolved in the billions of years since its formation. One important part of this is the understanding of how different parts of our planet interact with each other dynamically.

Course Objectives

1. Introduce students to fundamental concepts in planetary science, including planetary formation and evolution.
2. Familiarize students with the methods and techniques used to determine the dynamic processes involved in planetary science.
3. Lay the foundation for understanding the formation and evolution of our Solar System and Earth over billions of years.
4. Investigate how different parts of the Earth interact dynamically, contributing to its ongoing changes and evolution.

Course Outcomes

1. **CO1: Understanding Planetary Formation and Evolution:** Students will demonstrate a comprehensive understanding of the processes involved in the formation of planetary systems, including the formation of planets, moons, asteroids, and comets, and how these bodies evolve over time.
2. **CO2: Interpretation of Planetary Surface Features:** Students will be able to analyze and interpret geological features observed on planetary surfaces, using data from spacecraft missions and telescopic observations.
3. **CO3: Proficiency in Planetary Data Analysis:** Students will develop skills in analyzing planetary data, including spectroscopic data, remote sensing imagery, and geological maps, to draw conclusions about planetary compositions, atmospheres, and geological processes.
4. **CO4: Hands-on Experience with Planetary Laboratory Techniques:** Students will gain practical experience in laboratory techniques such as spectroscopy, image analysis, and simulation of planetary processes, enhancing their ability to conduct scientific investigations in planetary science.
5. **CO5: Research and Presentation Skills:** Students will demonstrate the ability to conduct independent research projects in planetary science, culminating in the preparation of scientific reports, presentations, and/or posters that effectively communicate their findings and conclusions.

Course Content

Modules	Bloom's level*	Number of hours
Module I: Milky Way and the solar system. Modern theories on the origin of the Earth and other planetary bodies. Earth's orbital parameters, Kepler's laws of planetary motion, Space and time scales of processes in the solid Earth, atmosphere and oceans, Radioactive isotopes and their applications. Meteorites Chemical composition and the Primary	**L1, L2, L3, L4**	**17**

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differentiation of the earth. Earth's gravity and magnetic fields and its thermal structure: Concept of Geoid and, spheroid		
Module II: A Brief History of the Planetary Sciences, Inventory of the Solar System, Giant Planets, Terrestrial Planets, Minor Planets and Comets, Exo planet, Dwarf planet, Satellite and Ring Systems, Planetary Properties: Orbit, Mass, Size, Rotation, Shape, Temperature, Magnetic Field, Surface Composition, Surface Structure and atmosphere	**L1,L2, L3, L4, L5**	**17**
Module III: Sun the primary driver of solar system and life on earth, Basic solar properties, historical understanding, Source of Sun's energy, nuclear reactions in the sun, Earth-Sun-Moon relationship, Black Body Radiation and the solar spectrum, Electromagnetic spectrum, Planetary Atmospheres: Thermal Structure: Sources and Transport of Energy Observed, Thermal Profiles Atmospheric Composition Clouds, Space missions.	**L1, L2,L3**	**15**
Module IV: Laboratory practical exercises: Mineral and rock identification; Locating an epicenter; Constructing and analyzing an asteroids elliptical orbit	**L3, L4, L6**	**10**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

- Armitage, P. J. (2007) Lecture Notes on the Formation and Early Evolution of Planetary Systems, arXiv:astro-ph/0701485
- Catling, D. C. and Kasting, J. F. (2017) Atmospheric Evolution on Inhabited and Lifeless Worlds, Cambridge Univ. Press
- Chamberlain, J. W. and Hunten, D. M. (1989) Theory of Planetary Atmospheres (2ndEd.), Academic Press
- de Pater, I. and Lissauer, J. J. (2010) Planetary Sciences (2nd Ed.), Cambridge Univ. Press
- Petty, G. W. (2006) A First Course in Atmospheric Radiation (2nd Ed.), Sundog Publishing
- Pierrehumbert, R.T. (2011) Principles of Planetary Climate, Cambridge Univ. Press
- Scharf, C. A. (2008) Extrasolar Planets and Astrobiology, University Science Books

Examination Scheme:

Components	**A**	**FP**	**HA**	**EE**
Weightage (%)	**5**	**20**	**5**	**70**

A: Attendance, FP: Field Project, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**	**1**				**2**			**1**	**1**	**2**	**2**
CO2	**1**	**1**				**2**			**1**	**1**	**2**	**2**
CO3	**1**	**1**				**2**			**1**	**1**	**2**	**2**
CO4	**1**	**1**					**2**		**1**	**1**	**2**	**2**
CO5	**1**	**1**					**2**		**1**	**1**	**2**	**2**

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SEMESTER-VI

DESC2651	GEOLOGY AND SOCIETY PLUS FIELD	L	T	P	C
Version 1.1	Date of Approval:	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

Geology and Society is an interdisciplinary course that explores the interaction between geology and human society. The course examines the ways in which geology influences society and how human activities impact the Earth's geology. Students will gain an understanding of the geological processes that shape the Earth, the resources provided by the Earth, and the potential environmental and societal implications of geologic events. The course also covers the ethical considerations and challenges associated with geologic resource extraction, land use planning, and natural hazard mitigation.

Course Objectives

The objective of this course is to

1. Study the geological processes that shape the Earth and their influence on human society. Examine how human activities affect geological systems and the environment.
2. Evaluate the Earth's resources and the environmental and societal implications of geologic events.
3. Discuss ethical challenges in resource extraction, land use planning, and natural hazard mitigation.

Course Outcomes

On completion of this course, the students will be able to

CO1. Demonstrate a clear understanding of the geological processes that shape the Earth and their effects on human society.

CO2. Critically analyze the impact of human activities on geological systems and the resulting environmental consequences.

CO3. Assess the significance of Earth's resources and understand the environmental and societal implications of geologic events and resource extraction.

CO4. Apply ethical considerations and best practices to issues related to resource extraction, land use planning, and natural hazard mitigation.

Course Content

Modules	Bloom's level*	Number of hours
Module I: Introduction to Geology and Society: Overview of the course, Importance of geology in understanding societal issues, Geological time and Earth's history, Earth's Structure and Plate Tectonics, Geological resources and their significance to society.	**L1**	**15**
Module II: Geologic Time and Fossils, Evolution and its relation to geology, Fossil fuels and alternative energy sources, Sustainable resource management, Groundwater resources and contamination, Geology's role in water management, Hydrological cycle and water availability, Climate Change and Geology, Geological evidence for climate change, Impacts of climate change on society, The role of geology in understanding past climates, Urban planning and infrastructure considerations.	**L1, L2**	**15**

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Module III: Geoethics, Environmental ethics and resource extraction, Indigenous perspectives on geology and land rights, Environmental justice and geologic hazards, Heritage Geology, Environmental ethics and resource extraction, Natural resource policies and regulations, Analysis of real-world geologic events and their societal impacts; Introduction to medical geology.	**L2, L3, L4**	**20**
Module IV: A field project based 1. Map Reading 2. Geological resources and Ground water flow direction estimation 3. Case studies of Urban flood; Flood hydrographs 4. Case studies of urban planning. Field project includes field observation followed by analysis, writing of short reports, presentation and review by peer.	**L3, L5, L6**	**10**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

1. Huggenberger, P. and Eptin, J. 2011 Urban Geology: Process-Oriented Concepts for Adaptive and Integrated Resource Management. Springer.
2. Lollino, G. et al. (Ed.), Engineering Geology for Society and Territory. Springer

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**HA**	**EE**
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**			**1**					**2**	**1**	**2**
CO2	**1**		**1**	**1**		**1**			**1**	**1**	**2**
CO3	**1**		**1**	**1**		**2**			**2**	**1**	**2**
CO4	**1**		**1**	**1**		**2**			**2**	**1**	**2**

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DESC2601	OCEANOGRAPHY & ATMOSPHERIC SCIENCE PLUS LAB	L	T	P	C
Version 1.1	Date of Approval:	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

The aim of this course is to make the students aware of the various factors that play an important role in determining the physical and chemical characteristics of the marine water and the associated marine biota. The purpose of the course is to give a holistic understanding of the various processes and effects of the atmosphere on the other systems and vice versa. This will make the students aware with the fundamental concepts of the climate system and the changes taking place therein.

Course Objectives

The objective of this course is to

1. Study the physical and chemical properties of seawater and their spatial and temporal variations.
2. To give a holistic understanding of the various processes and effects of the atmosphere on the other systems and vice versa
3. Discuss the geological features of the ocean floor and the processes of seafloor spreading and plate tectonics.

Course Outcomes

On completion of this course, the students will be able to

CO1: Describe the physical and chemical properties of seawater and their spatial and temporal variations.
CO2: Explain the processes driving ocean circulation, including thermohaline and wind-driven currents.
CO3: Identify major marine ecosystems and understand the ecological interactions within them.
CO4: Discuss the geological features of the ocean floor and the processes of seafloor spreading and plate tectonics.
CO5: Utilize basic oceanographic instruments and techniques to collect and analyze data.

Course Content

Modules	Bloom's level*	Number of hours
Module I: Introduction to Hydrological cycle; Origin and chemical composition of sea water; geomorphology and Relief of ocean floor; Vertical and horizontal distribution of temperature and salinity. Concepts of Eustasy; Ekman rule; Land-Air-Sea interactions; Oceanic current system and effect of Coriolis forces; waves and tides; Ocean currents, Global distribution of major ocean currents; Climate change and ocean; Sea level changes and its impact on coastal areas.	**L1**	**15**
Module II: Atmosphere: Structure and composition, vertical profile of temperature and pressure, microphysical processes in the atmosphere; Atmospheric physics: Earth's heat budget and radiative forcing; Fundamental forces: Pressure gradient force, centrifugal force, gravity force, Coriolis force; Buy Ballot law; Aurora Boreolis and Aurora Australis.	**L1, L2**	**15**
Module III: Introduction to components of climate science**;** Feedback mechanisms; Atmospheric thermodynamics, greenhouse gases and climate forcing; Heat transfer in ocean.	**L2, L3, L4**	**15**

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Indian monsoon and its variability, western disturbances, Indian Ocean Dipole; El Niño-Southern Oscillation.		
Module IV: Practical exercises will include the analysis of ocean basin features, properties of seawater, the physical properties driving ocean currents, identification of marine organisms, and other related items. Atmospheric science experiments will include Sun photometry, Aerosols (aerosol particle measurments), Atmospheric dynamics - rotating tank experiments. Secondary database relevant exercises based on syllabus.	**L3, L5, L6**	**15**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

1. Huggenberger, P. and Eptin, J. 2011 Urban Geology: Process-Oriented Concepts for Adaptive and Integrated Resource Management. Springer.
2. Lollino, G. et al. (Ed.), Engineering Geology for Society and Territory. Springer

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**HA**	**EE**
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**			**1**					**2**	**1**	**2**
CO2	**1**		**1**	**1**			**1**		**1**	**1**	**2**
CO3	**1**		**1**	**1**			**2**		**2**	**1**	**2**
CO4	**1**		**1**	**1**			**1**		**1**	**1**	**2**
CO5	**1**		**1**	**1**			**2**		**2**	**1**	**2**

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DESC2602	ENVIRONMENTAL GEOLOGY & NATURAL HAZARDS PLUS FIELD	L	T	P	C
Version 1.1	Date of Approval:	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

This paper introduces the students to various environmental hazards, their causes, nature, preparedness and assessment of loss. It teaches them to model hazards and familiarizes them with methods of management of disasters and consequently risk zonation.

Course Objectives

The objective of this course is to

1. Develop a holistic understanding of the geology, biosphere,water resources and its management
2. To give an integrated understanding of natural hazard and its mitigation measures and management.

Course Outcomes

On completion of this course, the students will be able to

CO1. Identify the concepts of geology,ecology and biosphere.Understanding of climate change and its outcomes.

CO2. Identify the types of different natural hazard and its mitigation measures and management.

CO3. Description and assessment of Hazard assessment; Disaster preparedness: Preventive measures, Early warning system; Mitigation: Disaster Risk Reduction (DRR), Emergency Operation plan.

Course Content

Modules	Bloom's level*	Number of hours
Module I: Human, Geology and the Environment, The Dynamic Earth systems, Foundational concepts; Solid Earth, Materials, and Processes Current environmental case study; Soils and Environment; Biosphere, Ecology, and Geology; Freshwater resources/water resources/water pollution/Hydrologic hazards at earth's surface.	**L1**	**15**
Module II: Water resources, water pollution, Hydrologic hazards at earth's surface; Energy resources and the Environment; Mineral resources, Environment and Society; Human and the earth systems, Understanding climatic and environmental change; Geology, Society, and the Future, Waste management and geology.	**L1,L2**	**15**
Module III: Natural hazards- prevention and precautions (earthquakes, floods, landslides, river and coastal erosion), impact assessment of urbanization, open cast mining and quarrying, river valley projects, disposal of industrial and radioactive waste, excess withdrawal of ground-water, use of fertilizers,	**L2, L4**	**18**

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dumping of ore, mine waste and fly ash, organic and inorganic contamination of groundwater and their remedial measures, soil degradation and remedial measures. Hazard assessment; Disaster preparedness: Preventive measures, Early warning system; Mitigation: Disaster Risk Reduction (DRR), Emergency Operation plan (EOP).		
Module IV A field project based on environmental geology and study of natural resources. Field project includes field observation followed by analysis, writing of short reports, presentation and review by peer.	**L6, L4**	**12**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

- Bell, F.G., 1999. Geological Hazards, Routledge, London.
- Bryant, E., 1985. Natural Hazards, Cambridge University Press.
- Patwardhan, A.M., 1999. The Dynamic Earth System.Prentice Hall.
- Smith, K., 1992. Environmental Hazards.Routledge, London.
- Subramaniam, v., 2001. Textbook in Environmental Science, Narosa International.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**HA**	**EE**
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**		**2**			**2**			**1**		**2**	**2**
CO2	**1**	**1**	**2**			**2**			**1**		**2**	**2**
CO3	**1**	**1**	**2**			**2**			**1**		**2**	**2**

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DESC2603	COAL AND PETROLEUM GEOLOGY PLUS FIELD	L	T	P	C
Version 1.1	Date of Approval:	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

This course will deal with the geological aspects related to coal and petroleum. This is of utmost significance keeping in view the high employability opportunities associated with this branch of earth science.

Course Objectives

The objective of this course is to

1. Develop an in-depth understanding of the geological formations, processes, and characteristics associated with coal and petroleum deposit
2. Gain practical skills in the latest exploration and extraction techniques used in the coal and petroleum industry. This encompasses geological mapping, geophysical surveys, drilling, and sample analysis, enabling students to locate, evaluate, and exploit coal and hydrocarbon reserves effectively.

Course Outcomes

On completion of this course, the students will be able to:

CO1. Identification and analysis of coal and petroleum geological formations.
CO2. Gain proficiency in using exploration and extraction methods.
CO3. Be well-prepared for employment in the coal and petroleum industry.

Course Content

Modules	Bloom's level*	Number of hours
Module I: Coal; Origin, types, ranks and uses; Coalification process; Coal Petrology: Lithotypes, Microlithotypes and macerals: Physical, chemical and optical properties; Maceral analysis: Mineral and organic matter in coal; Coal exploration and estimation of coal reserves; Applications of coal geology in hydrocarbon exploration; coal petrography of different coalfields of India. Coalbed methane: Elementary idea about generation of methane in coal beds and exploration	**L1, L3**	**15**
Module II: Natural occurrence, Chemical composition and physical properties of crudes in nature; Origin of petroleum, maturation of kerogen; Biogenic and thermal effect; Reservoir rocks: General attributes and petrophysical properties; Migration of oil and gas: Geologic framework and factors controlling hydrocarbon migration; migration routes and barriers.	**L1,L2**	**15**
Module III: Hydrocarbon traps: Definition, theory and classification of hydrocarbon traps - structural, stratigraphic and combination; Time of trap formation and hydrocarbon accumulation; Cap rocks: Definition and general properties; Formation water characteristics as oil exploration leads; Plate tectonics and global	**L2, L4, L5**	**16**

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distribution of hydrocarbon reserves; Classification of Indian basins and petroleum geology of oilfields of India: Assam, Bengal, Cauvery, Krishna-Godavari, Cambay and Bombay offshore basins.		
Module IV: A field project based on coal and petroleum site observations and analysis and Section correlation and identification of hydrocarbon prospect. Field project includes field observation followed by analysis, writing of short reports, presentation and review by peer.	**L6, L4**	**14**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

1. Coal Geology: Larry Thomas, 2002, Wiley and Sons.
2. Coal: it's composition, analysis, utilisation and valuation.: E.E.Somermier 2008, McGrawHill
3. Petroleum Geology: F.K.North, 1986, Allen and Unwin
4. Petroleum Formation and Occurrence: B.P.Tissot and D.H.Welte 1978, Publisher: Springer-Verlag
5. Elements of petroleum Geology: R.C.Shelley 1998, Academic press.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**HA**	**EE**
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**			**2**			**2**		**1**	**2**		**2**
CO2	**1**	**1**		**2**			**2**		**1**	**2**		**2**
CO3	**1**	**1**		**2**		**2**			**1**	**2**		**2**

1: strongly related, 2: moderately related and 3: weakly related

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SEMESTER-VII

DESC2701	ADVANCE PETROLOGY PLUS LAB	L	T	P	C
Version 1.1	Date of Approval:	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

A basic course in earth sciences which deals with the origin, composition, distribution, and structure of the rocks that have an origin from magma. The study of igneous rocks is important because they make up the bulk of the earth's crust in the geological time.

Course Objectives

The objective of this course is to

1. Develop a comprehensive understanding of the processes involved in the formation of igneous rocks, including magma generation, crystallization, and emplacement.
2. Learn to identify, describe, and classify igneous rocks based on their mineral composition, texture, and chemical properties.
3. Explore the distribution and structure of igneous rocks in the earth's crust and their significance in understanding geological history and processes.

Course Outcomes

On completion of this course, the students will be able to

CO1. Students will be able to accurately identify and classify various igneous rocks and understand their formation processes.

CO2. Students will gain hands-on experience with field and laboratory techniques for studying igneous rocks, including petrographic microscopy and geochemical analysis.

CO3. Students will be equipped to analyze the distribution and structure of igneous rocks within the earth's crust and use this knowledge to interpret geological histories and processes.

Course Content

Modules	Bloom's level*	Number of hours
Module I: Structure, textures and classification of igneous rocks; Concept of mode and norm; Phase rule and phase diagrams – binary and ternary systems. Petrogenesis of granite, alkaline rocks; Basalt, Anorthosite and Ultramafic rocks; Petrographic description of the following rock types: Granite, Rhyolite, Syenite, Nepheline-syenite, Monzonite, Granodiorite, Diorite, Pegmatite, Anorthosite, Gabbro, Dolerite, Basalt, Peridotite, Pyroxenite, Norite, Dunite, Trachyte and Andesite.	**L1**	**15**
Module II: Textures of clastic and non-clastic sedimentary rocks; Structures of sedimentary rocks; Lithification and Diagenesis; Provenance; Texture, composition, classification, origin and occurrence of Siliciclastic rocks: Conglomerates, Sandstones, Murdock's; Introduction to coal and petroleum.	**L1,L2**	**15**

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Non-siliciclastic rocks: Carbonate rocks, controls of carbonate deposition, limestone, dolomite and Dolomitization; Chert and siliceous sediments; Phosphorites, carbonaceous sediments, iron rich sediments and evaporates; Petrographic description of the major rock types: Conglomerate, Breccia, Sandstones, Arkose, Greywacke, Limestone, Dolomite, Shale.		
Module III: Paired metamorphic belts, Index minerals, Thermal and Regional metamorphism of argillaceous, calcareous and basic igneous rocks. Origin of Migmatites; Petrographic notes on the following metamorphic rocks: Slate, Phyllite, Schists, Gneisses, Amphibolites, Marble, Quartzites, Hornfels, Charnockite, Khondalite, Eclogite, Kodurite and Skarns.	**L2, L4**	**18**
Module IV: Lab work: Study of petrology in hand specimens and thin sections.	**L6**	**12**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

- John D. Winter 2001. An Introduction to Igneous and Metamorphic Petrology. Prentice Hall Inc
- Loren A. Raymond 2002. Petrology: The study of Igneous, Sedimentary and Metamorphic rocks. McGraw Hill .New York
- Bose M.K. 1997. Igneous Petrology. World Press
- Cox, K.G. Bel, J.D. and Pankthrust, R.J. 2002. The interpretation of Igneous rocks. Allen and Unwin, London
- Pankthrust, 2000. Igneous and Metamorphic rocks. Prentice Hall.
- Phillpots, A.R., and Ague, S.J., 2009. Principles of igneous and metamorphic petrology (2nd Edn.) Cambridge.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**HA**	**EE**
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**		**2**			**2**			**1**		**2**	**2**
CO2	**1**	**1**	**2**			**2**			**1**		**2**	**2**
CO3	**1**	**1**	**2**			**2**			**1**		**2**	**2**

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DESC2702	GEOINFORMATICS PLUS LAB	L	T	P	C
Version 1.1	Date of Approval:	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

Preparing students to identify, analyze, and solve geospatial problems; raining students to develop practical and executable solutions to the challenges of the growing field of Remote Sensing and GIS; Introducing Geoinformatics as an advanced tool that consists of various advanced science and technologies used for mapping and managing earth resources.

Course Objectives

The objective of this course is to

1. Preparing Students to Identify, Analyze, and Solve Geospatial Problems.
2. Training Students to Develop Practical and Executable Solutions to Remote Sensing and GIS Challenges
3. Introducing Geoinformatics as an Advanced Tool for Mapping and Managing Earth Resources

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the fundamental concepts and components of geoinformatics, including GIS, remote sensing, and GPS.

CO2: Describe the principles of cartography and map design, including scale, projection, and symbolization.

CO3: Utilize geoinformatics software to create, manage, and analyze spatial data. Interpret and analyze satellite imagery and aerial photographs for various applications.

CO4: Understand the ethical considerations and best practices in the collection and use of geospatial data.

Course Content

Modules	Bloom's level*	Number of hours
Module I: Electromagnetic Radiation – Characteristics and Remote Sensing Regions and bands; Spectra of common natural objects – soil, rock, water and vegetation; General Orbital characteristics of satellites; Concepts of radiometric, spectral, spatial and temporal resolutions of satellite sensors; Sensor characteristics of remote sensing satellites: Landsat, IRS, ASTER, Quickbird	**L1**	**15**
Module II: Aerial photography: Planning and Execution, types of aerial photography; Aerial photos: classification, scale, resolution, stereoscopic parallax, image displacement; Properties of vertical and inclined aerial photographs; Elements of image and photo interpretations, Interpretations keys Earth Model: Geoid, Authalic sphere and ellipsoid and their uses in GIS; Concept of datum: geocentric and local geodetic, horizontal and vertical; Co-ordinate systems: Geographic and planar; Concept of Map projections: Principal scale and scale factor, Concept of cylindrical, conical and planar map projections; Brief idea about	**L1,L2**	**15**

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commonly used map projections: Mercator, Transverse Mercator, Universal Transverse Mercator (UTM), Lambert Conformal, Conic and Polyconic; Digital Image Processing: Geometric and radiometric		
Module III: Corrections of satellite images; Image enhancement and classification Concept of GIS: Definition and components of GIS; Object based and field based GIS data model; Raster, vector, Spatial and non spatial data structures; Data Based Management Systems and Model; Spatial Analysis: Spatial elements and analysis, local, focal, zonal and global operations; GIS query and output, Digital Elevation Model (DEM) and its derivatives; Utility of GIS in Geological projects	**L2, L4**	**16**
Module IV: Lab Work: Study of Topographic sheets, map sheets, thematic sheets; Study of aerial photographs; processing of satellite data and delineation of rock types and mapping of soil, vegetation, water and geologic structure; GIS software ; map study of water potential zones of India.	**L6**	**14**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

1. Demers, M.N., 1997. Fundamentals of Geographic Information System, John Wiley & sons. Inc.
2. Hoffmann-Wellenhof, B., Lichtenegger, H. and Collins, J., 2001. GPS: Theory & **Practice, Springer Wien New York.**
3. Jensen, J.R., 1996. Introductory Digital Image Processing: A Remote Sensing Perspective, Springer- Verlag.
4. Lillesand, T. M. & Kiefer, R.W., 2007. Remote Sensing and Image Interpretation, Wiley.
5. Richards, J.A. and Jia, X., 1999. Remote Sensing Digital Image Analysis, Springer-Verlag.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**HA**	**EE**
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**		**2**			**2**			**1**		**2**	**2**
CO2	**1**	**1**	**2**			**2**			**1**		**2**	**2**
CO3	**1**	**1**	**2**			**2**			**1**		**2**	**2**
CO4	**1**	**1**	**2**			**2**			**1**		**2**	**2**

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DESC2703	QUATERNARY GEOLOGY AND PALEOCLIMATE PLUS FIELD	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

This course focuses on global change during the recent geologic past and addresses changes in climatic, geomorphic, sedimentologic and biologic systems through the last 2.5 million years, and discusses the causes and implications of those changes. The course will focus on both theory and field understanding. The broad learning goals for this course are to understand the geologic history of the Quaternary on land and sea locally, regionally and globally.

Course Objectives

The objective of this course is to

1. Understand the patterns and causes of climatic changes and their implications for the Earth's future climate.
2. Investigate the evolution of geomorphic and sedimentologic systems, including the processes shaping landscapes and sediment deposits.
3. Explore changes in biological systems, including flora and fauna, and their interactions with environmental shifts during the Quaternary period.
4. Integrate theoretical knowledge with fieldwork to gain a comprehensive understanding of the Quaternary geologic history on local, regional, and global scales.

Course Outcomes

On completion of this course, the students will be able to

CO1. Demonstrate a comprehensive understanding of the climatic, geomorphic, sedimentologic, and biological changes that occurred during the Quaternary period.

CO2. Develop the ability to analyze and interpret geologic data related to the Quaternary period, both in theory and through fieldwork.

CO3. Apply critical thinking to assess the causes and implications of geologic changes over the past 2.5 million years on a local, regional, and global scale.

CO4. Exhibit proficiency in conducting geologic research, including data collection, analysis, and presentation of findings related to Quaternary geology.

Course Content

Modules	Bloom's level*	Number of hours
Module I: Geological Time scale, Recent Geological past: Ceonozoic era, and Quaternary period. Quaternary Stratigraphy, Climate-governing processes, Important events of the Quaternary period, climatic, geomorphic and biological changes. Quaternary climates – glacial- interglacial cycles, eustatic changes, proxy indicators of paleoenvironmental/ paleoclimatic changes, - land, ocean and cryosphere (ice core studies).	**L1**	**11**
Module II: Approaches to understand and study Quaternary Geology. Responses of geomorphic systems to climate, sea level and tectonics on variable time scales in the Quaternary. Correlating events and changes: Dating methods. Reconstruction	**L1, L2**	**12**

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of climate changes based natural environmental archives and climate proxies. Neotectonics; Climate and glaciation history of Earth; Sea-level change during Quaternary.		
Module III: Quaternary stratigraphy of India– continental and marine records; continental- marine correlation of Quaternary record. Humans evolution in relation to the climatic and environmental development before and during the Quaternary. Plant and animal life in relation to glacial and interglacial cycles during Quaternary.	**L2, L3, L4**	**12**
Module IV: A field project on relevant quaternary areas to develop skills of geomorphic and sedimentologic observation. Field project includes field observation of lacustrine/fluvia/aeolian/glacial stratigraphy followed by analysis, writing of short reports, presentation and review by peer.	**L3, L5, L6**	**13**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

1. Lowe, J. J., & Walker, M. (2014). Reconstructing quaternary environments. Routledge
2. M. R. Bennett and P. Doyle, Environmental Geology: Geology And The Human Environment, Wiley India
3. Quaternary Geology: Indian Perspective - U. B. Mathur, Quaternary Geology: Indian Perspective, Geological Society of India

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**HA**	**EE**
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**			**1**					**2**	**1**	**2**
CO2	**1**		**1**	**1**		**1**			**1**	**1**	**2**
CO3	**1**		**1**	**1**		**2**			**2**	**1**	**2**
CO4	**1**		**1**	**1**		**2**			**2**	**1**	**2**

1: strongly related, 2: moderately related and 3: weakly related

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DESC2704	HYDROGEOLOGY	L	T	P	C
Version 1.1	Date of Approval:	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

The course is designed to make the students aware about the peculiarities of the availability and movement of sub-surface and surface water. The various geological characteristics of ground water and surface water will be dealt with. To provide students with a comprehensive knowledge base and practical skills necessary to address complex challenges related to groundwater resources and environmental sustainability.

Course Objectives

To provide students with a comprehensive understanding of groundwater systems and their management. Understand the basic principles of hydrogeology, including the movement of water in the subsurface, groundwater flow, aquifer properties, and the interactions between surface water and groundwater. To equip students with theoretical knowledge, practical skills, and critical thinking abilities necessary for careers in groundwater management, environmental consulting, water resource engineering, and research.

Course Outcomes

CO1. Understanding Hydrogeological Principles: Gain a thorough understanding of the fundamental principles governing groundwater flow, aquifer properties, and the interactions between surface water and groundwater.

CO2. Analyzing Groundwater Systems: Develop skills to analyze and interpret geological and hydrological data to characterize groundwater systems, including aquifer types, groundwater recharge mechanisms, and flow dynamics.

CO3. Assessing Groundwater Quality and Contamination: Learn methods to assess groundwater quality, identify sources of contamination, and evaluate the potential risks to human health and the environment.

CO4. Applying Hydrogeological Techniques: Acquire practical experience in applying hydrogeological techniques such as groundwater sampling, aquifer testing, and data interpretation to solve real-world problems and make informed decisions.

CO5 Integrating Hydrogeology with Environmental Management: Understand the role of hydrogeology in environmental management, including groundwater resource assessment, sustainable development practices, and remediation strategies for contaminated sites.

Course Content

Modules	Bloom's level*	Number of hours
Module I: Scope and significance of hydrogeology Hydrological cycle (Precipitation, Evapo-transpiration, Runoff, and infiltration), Groundwater, Sub-surface movement of water, flow in saturated and unsaturated zones; Vertical distribution of sub-surface water, Origin and age of groundwater, Sub surface hydrogeology: Types, characteristics, classification of aquifers, Porous and Fractured aquifers	**L1, L2, L3, L4**	**15**
Module II:	**L1,L2, L3, L4, L5**	**15**

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Groundwater occurrence in igneous, metamorphic and sedimentary rocks; Darcy's law and its application; Theory and dynamics of groundwater flow, Phreatic and Piezometric level, Analysis of Piezometric surface, Groundwater level fluctuations; Groundwater provinces of India, Groundwater pollution: Municipal /industrial /agricultural /miscellaneous sources & causes of pollution, physical /chemical /biological analysis of ground water quality, criteria & measures of ground water quality, ground water salinity & samples, graphical representations of ground water quality.		
Module III: Elementary well hydraulics, surface and sub-surface exploration of groundwater, drilling and construction of wells, pumping tests and analysis of test data for evaluation of aquifer parameters; Physical and chemical properties of water and water quality; Water balance studies: basic concept, development and management of groundwater resources; Surface and subsurface water interaction; Sea water intrusion in coastal aquifers.	**L1, L2,L3**	**15**
Module IV: Lab Work: Preparation and interpretation of water level contour maps and depth to water level maps Study, preparation and analysis of hydrographs for differing groundwater conditions Water potential zones of India (map study). Graphical representation of chemical quality data and water classification (C-S and Trilinear diagrams) Simple numerical problems related to: determination of permeability in field and laboratory, Groundwater flow, Well hydraulics etc.	**L3, L4, L6**	**15**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

1. Todd, D.K. 2006. Groundwater hydrology, 2nd Ed., John Wiley & Sons, N.Y.
2. Davis, S.N. and De Weist, R.J.M. 1966. Hydrogeology, John Wiley & Sons Inc., N.Y.
3. KaranthK.R., 1987, Groundwater: Assessment, Development and management, Tata McGraw Hill Pub. Co. Ltd.
4. Fetter, C.W. 2001. Applied Hydrogeology, Prentice Hall Inc., N.J

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**HA**	**EE**
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**	**1**				**2**			**1**	**1**	**2**	**2**
CO2	**1**	**1**				**2**			**1**	**1**	**2**	**2**
CO3	**1**	**1**				**2**			**1**	**1**	**2**	**2**
CO4	**1**	**1**				**2**			**1**	**1**	**2**	**2**
CO5	**1**	**1**				**2**			**1**	**1**	**2**	**2**

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DESC2739	BASICS OF RESEARCH METHODOLOGY, ETHICS, AND RESEARCH COMMUNICATION	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description

This course aims to provide students with a comprehensive understanding of conducting ethical research, utilizing proper research methodologies, and effectively communicating research findings. The course includes a final project where students will write a Literature Review on a topic chosen in consultation with the teacher(s).

This course is designed to equip students with essential skills and knowledge to conduct ethical research, employ proper research methodologies, and effectively communicate scientific information (with focus on writing a literature review). The course will cover topics such as research design, data collection and analysis, research ethics, and science communication strategies. Through a combination of lectures, discussions, case studies, and practical exercises, students will develop a deeper understanding of the research process and its ethical implications.

Course Objectives

The objective of this course is to impart knowledge about various stages of research process, research ethics and different ways of research communication.

The aim of this course is to impart research skills to the beginners and help to improve the quality of research by the existing researchers. It also encompasses the understanding and application of appropriate research design, statistics, and the use of the computer for reference management, report writing, research paper writing and presentation. The course also introduces the key conceptual issues of each research method, as well as giving practical guidance. It covers the series of research methodology contents: from problem formulation, to design, to data collection, analysis, reporting and dissemination. The course has the dual aims of equipping students with conceptual understandings of current academic debates regarding different methods, and the practical skills to put those methods into practice.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define criteria of good research, steps in research process, and data collection.

CO2. Identify different types of sampling and its purpose.

CO3. Conduct hypothesis testing for different types of samples and interpret the results.

CO4: Learn the importance of literature review, write research paper/thesis, use reference management software.

Course Content :

Module	Topic	**Blooms level***	Hours
1	**Research Methodology** Understanding the research process: From research questions to conclusions	L1, L2	10

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	Types of research: Qualitative and quantitative research Exploratory, descriptive, experimental, and correlational studies Scientific Thinking: Subjective Vs. Objective Thinking Logical Reasoning: Inductive Vs. Deductive Reasoning Formulating research hypotheses and objectives Purpose of a good research, Criteria of good research		
2	**Descriptive Statistics** Data, Types of Data, Methods of data collection, Benefits and drawbacks, Graphical representation of data and interpretation. Measures of Central Tendency: Arithmetic Mean, Median, Mode, Measures of Dispersion: Range, Standard Deviation, Variance, Coefficient of Variation.	L1, L2, L3	15
3	**Inferential Statistics** Sampling: Basic concepts, Process of Sampling, Sample Size, Types of Samples, Sampling and non- sampling errors, Statistics and Parameters, Sampling Distribution of Means and Proportion, **Hypothesis Testing**, steps in testing of hypothesis, errors in hypothesis testing, z test and t test.	L1, L2, L3	15
4	**Research Ethics** Plagiarism, Fabrication, Falsification, Ethics with respect to human and Animal Research	L1, L2	5
5	**Communication** Characteristics of a good Research paper, Systematics Literature Review (choosing a topic, preparing outline, gathering authentic & appropriate references, avoiding plagiarism, use of reference management systems), Writing a good literature review, Structure of report (Introduction, Methodology, Analysis, Results, Discussions, Conclusions, Recommendations), Writing Quality Research Paper, Publishing Research Work in Quality Journals, Reference Management Software	L1, L2, L3	15

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional Exam	End Term Examination
Weightage (%)	5	10	15	70

Project based assignment: Student teams (2-3 students per team) will write a literature review on a topic of choice, in consultation with the teacher.

Text books/ Reference books

- Research Methodology for Natural Sciences by Soumitro Banerjee, Publisher: IISc Press (1 January 2022); ISBN-10: 8194835178; ISBN-13: 978-8194835172

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- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt. Ltd., New Delhi-110001
- Geode, Millian J.& Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Kothari, C.R.2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.
- Levin R I., Rubin D S. Statistics for Management. Sixth Edition, PHI
- Kapoor & Gupta. Probability & Statistics. S Chand Publishers, New Delhi.
- Montomery, Douglas C.(2007), 5th Ed. Design and Analysis of Experiments, Wiley India.
- Cooper, Donald R. and Pamels Schindler, Business Research Methods, Tata McGraw Hills, New Delhi
- Krishnaswamy, K.N. Sivakumar. Appa lyer and Mathiranjan M. 2006, Management Research Methodology: Integration of Principles, Methods and Techniques, Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Sachdeva, J.K. 2008. Business Research methodology. Himalaya Publishing House, New Delhi.
- Shekharan, Uma, Business Research Methods, Miley Education, Singapore.
- Zikmund, Millian G., Business Research Methods, Thomson Learning, Bombay.

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SEMESTER-VIII

DESC2801	GEOMORPHOLOGY PLUS FIELD	L	T	P	C
Version 1.1	Date of Approval:	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

The objectives of this course are to introduce the concepts in Geomorphology in adequate manner, many facets of surface relief features and to understand various aspects of their growth and evolution on the Earth.

Course Objectives

1. Understand the processes and mechanisms that drive the growth and evolution of surface relief features on Earth.
2. Analyze various geomorphic processes such as weathering, erosion, deposition, and tectonic activities.
3. Evaluate the impact of these processes on landscape formation and transformation over time.

Course Outcomes

CO1. Explain the basic concepts and historical development of geomorphology and define terrestrial relief and scales in geomorphology,

CO2. Describe the normal cycle of erosion and the concept of peneplain and evaluate the factors affecting hill slope stability and the processes of mass movements, and also classify different types of soil based on their characteristics and formation processes

CO3. Explain the concept of watershed and the organization of drainage systems and patterns, and able to apply remote sensing and GIS technologies in geomorphic studies and applications,

CO4. Explain the concept of basin morphometry and its linear aspects, including stream ordering, bifurcation ratio, and the laws of stream numbers and lengths, and assess relief aspects such as relative relief, dissection index, and channel slope laws.

Course Content

Modules	Bloom's level*	Number of hours
Module I : Basic concepts of geomorphology and its historical development, Terrestrial relief and scales in geomorphology; nature and scope; Normal cycle of erosion, Peneplain, Hill Slope Stability and Mass movements; Types of mass movement, Classification, causes, and prevention, Soil: formation of soil, soil profile, classification of soil.	**L1, L2, L3, L4**	**15**
Module II: Valley Development: Valley Deepening, Valley Widening and Lengthening; Concept of watershed, Drainage system and pattern, Major Drainage basins in India, Sand dunes classifications, Lake types and associated features, Wetland, Major wetland regions of India, Remote sensing and GIS as tools in geomorphic applications.	**L1,L2, L3, L4, L5**	**15**
Module III: Drainage basin, Morphometry of drainage basin: basin morphometry, linear aspects: stream ordering, bifurcation ratio, the law of stream numbers, length ratio, law of stream length: geometry of basin shape, the law of basin perimeter, basin length, and basin	**L1, L2,L3**	**15**

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area, stream frequency, drainage density, drainage texture; relief aspects: relative reliefs, dissection index, law of channel slope, profile analysis.		
Module IV: Field Work: Reading topographic maps ,Concept of scale Preparation of a topographic profile , Preparation of longitudinal profile of a river; Preparing Hack Profile; Calculating Stream length gradient index, Morphometry of a drainage basin, Calculating different morphometric parameters , Preparation of geomorphic map , Interpretation of geomorphic processes from the geomorphology of the area	**L3, L4, L6**	**15**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Readings:

1. Small, R.J. 1978: Study of Landforms: A Textbook of geomorphology (2nd Edition), Cambridge University Press. • Halis, J.R. 1983: Applied Geomorphology.
2. Sharma, H.S. 1990: Indian Geomorphology. Concept Publishing Co. New Delhi.
3. Holmes, A. 1992: Holmes Principles of Physical Geology Edited by P. McL. D. Duff. Chapman and Hall, London.
4. Thornbury, W.D. 2004: Principles of Geomorphology. 2nd edition CBS Publication.
5. Kale V S and Avijit Gupta 2010: Introduction to geomorphology. University Press
6. Bloom, A. L. 2011: Geomorphology: A systematic analysis of Late Cenozoic Landforms 3rd Edition. Rawat Publications.
7. Summerfield M.A 2011: Geomorphology and Global Tectonics, Wiley India Pvt Ltd.
8. Gautam, A. 2015 : Geomorphology 5th Edition. Sharda Pustak Bhavan Allahabad.
9. Siddhardha, K. 2016 : The Earth's Dynamic Surface- A book of Geomorphology, Kitab Mahal.
10. Singh Savindra 2016 : Geomorphology. Pravalika Publication Allahabad.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**HA**	**EE**
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**	**1**				**2**			**1**	**1**	**2**	**2**
CO2	**1**	**1**				**2**			**1**	**1**	**2**	**2**
CO3	**1**	**1**				**2**			**1**	**1**	**2**	**2**
CO4	**1**	**1**				**2**			**1**	**1**	**2**	**2**

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DESC2802	CLIMATE SCIENCE PLUS FIELD	L	T	P	C
Version 1.1	Date of Approval:	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue
This course will deal with the diverse aspects related to Climate science. This course is of utmost importance keeping in view the high employability opportunities associated with this branch of earth science.

Course Objectives
1. Comprehend the fundamental principles and concepts of climate science.
2. Analyze the various factors influencing climate patterns and changes.
3.Evaluate the impact of climate science on employability and career opportunities in earth science.

Course Outcomes
CO1: Describe the fundamental components of the Earth's climate system and their interactions.
CO2: Explain the physical processes governing the atmosphere, oceans, and cryosphere. Plan and conduct field experiments to measure atmospheric and oceanic parameters.
CO3: Analyze historical climate data to identify trends and patterns in climate variability and change. Use field instruments and techniques to collect data on temperature, precipitation, wind speed, and other climate variables.
CO4: Discuss the natural and anthropogenic factors driving climate change.
CO5: Utilize climate models to simulate past, present, and future climate scenarios. Present field study findings and analyses in written reports and oral presentations.

Course Content

Modules	Bloom's level*	Number of hours
Module I: **Climate and Weather:** Definition of weather and climate, meteorology and climatology, elements, types of classification systems- empirical, applied and genetic systems, Koeppen classification system: three basic climate groups: low latitude, mid-latitude, high latitude; Aridity index, drought, Holdridge life zones system: global bioclimatic scheme for the classification of land areas; Weather and climate change, Polar ice, Isotopes, Ice melting and Ice core analysis; Sea level changes and Shore line changes (Strand lines) and Temperature changes; Introduction to Paleoclimatology : Major events: Oceanic Anoxic Events ,Holocene climatic optimum , Paleocene–Eocene Thermal Maximum.	**L1, L2, L3, L4**	**15**
Module II: Climate indices and extreme events: Measurement of various climate indices, aridity index, Seismic activity, Remote sensing data for temperature and precipitation; Formation, structure, types and impacts of Cyclone , Thunderstorms, winter storms, summer storms, Tornadoes and Hurricanes; Formation, structure,	**L1,L2, L3, L4, L5**	**15**

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types and impacts of Floods , droughts, precipitation, El nino and arctic circulation, Heat waves, Wild fires, Health effects, Heinrich events and Daansgard-Oeschger (D-O) events		
Module III: Atmospheric chemistry: Measures of atmospheric composition: Mixing ration, number density and partial pressure; Atmospheric transport: Geostrophic flow, General circulation, Vertical transport, turbulence; Atmospheric lifetime and time-scales: Definition, Box models, Source and Sinks mechanism, Atmospheric lifetime of Kyoto gases and sink mechanisms.	**L1, L2,L3**	**15**
Module IV: Field Work: 1. Study of distribution of major climatic regimes of India on map 2. Distribution of major wind patterns on World map 3. Preparation of paleogeographic maps (distribution of land and sea) of India during specific geological time intervals 4. Numerical exercises on interpretation of proxy records for paleoclimate.	**L3, L4, L6**	**15**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Readings:

1. Climate and Global Environmental Change by L.D. Danny Harvey, Prentice Hall publication
2. Climate Change- An Indian Perspective by S.K.Das , Foundation books
3. Global Warming- A very short introduction by Mark Maslin, Oxford publication
4. Climatology-An Atmospheric Science (second edition) by John Oliver & John Hidore– Indian edition
5. Climate and Global Environmental Change by L.D. Danny Harvey, Prentice Hall publication
Climate change: Biological and Human aspects by Jonathan Cowie

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**HA**	**EE**
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**	**1**				**2**			**1**	**1**	**2**	**2**
CO2	**1**	**1**				**2**			**1**	**1**	**2**	**2**
CO3	**1**	**1**	**2**			**2**			**1**	**1**	**2**	**2**
CO4	**1**	**1**		**2**		**2**			**1**	**1**	**2**	**2**
CO5			**1**	**1**		**2**			**1**	**1**	**2**	**2**

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DESC2803	CO-EVOLUTION OF EARTH AND LIFE PLUS FIELD	L	T	P	C
Version 1.1	Date of Approval:	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

The objective of this course is to explore the intricate co-evolution of Earth and life, emphasizing the interconnected development of geological and biological systems over time. Through a combination of theoretical learning and practical fieldwork, students will investigate how life has influenced and been influenced by Earth's dynamic processes. The course aims to provide a comprehensive understanding of the reciprocal relationships between Earth's environment and the evolution of life, preparing students for advanced studies and careers in earth and life sciences.

Course Objectives

1. Explore the reciprocal relationships between Earth's geological processes and the evolution of life.
2. Investigate how life has influenced Earth's environment through biogeochemical cycles and ecosystem interactions.
3. Conduct fieldwork to observe and analyze the co-evolution of geological and biological systems in natural settings.

Course Outcomes

CO1: Demonstrate a comprehensive understanding of the reciprocal relationships between Earth's geological processes and the evolution of life.
CO2: Analyze the impact of biogeochemical cycles and ecosystem interactions on Earth's environment and life forms.
CO3: Apply theoretical knowledge through fieldwork to observe and interpret the co-evolution of geological and biological systems.
CO4: Develop skills in conducting scientific research and data analysis related to Earth and life sciences.

Course Content

Modules	Bloom's level*	Number of hours
Module I : Life through ages: Fossils and chemical remains of ancient life. Geological Time Scale with emphasis on major bio-events. Fossilization processes and modes of fossil preservation. Exceptional preservation sites- age and fauna; Geobiology: Biosphere as a system, processes and products Biogeochemical cycles Abundance and diversity of microbes	**L1, L2, L3, L4**	**15**
Module II: Origin of life: Possible life sustaining sites in the solar system, life sustaining elements and isotope records Archean life: Earth's oldest life, Transition from Archean to Proterozoic, the oxygen revolution and radiation of life Precambrian macrofossils; Biomineralization and skeletalization	**L1,L2, L3, L4, L5**	**15**
Module III: Paleozoic Life: The Cambrian Explosion. Biomineralization and skeletalization Origin of vertebrates and radiation of fishes Origin of tetrapods – Life out of water Early land plants and impact of land vegetation Mesozoic Life: Life after the	**L1, L2,L3**	**15**

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largest (P/T) mass extinction, life in the Jurassic seas Origin of mammals Rise and fall of dinosaurs Origin of birds; and spread of flowering plants **Cenozoic Life:** Aftermath of end Cretaceous mass extinction – radiation of placental mammals; The age of humans Hominid dispersals and climate setting Climate Change during the Phanerozoic – continental break-ups and collisions; Effects of life on climate and geology.		
Module IV: Field work includes Study of modes of fossil preservation and Study of fossils from different stratigraphic levels; xercises related to major evolutionary trends in important groups of animals and plants.	**L3, L4, L6**	**15**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Readings:

1. Stanley, S.M., 2008 Earth System History
2. Jonathan I. Lumine W.H.Freeman Earth-Evolution of a Habitable World, Cambridge University Press.
3. Canfield, D.E. & Konhauser, K.O., 2012 Fundamentals of Geobiology Blackwell
Cowen, R., 2000 History of Life, Blackwell

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**HA**	**EE**
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**	**1**				**2**			**1**	**1**	**2**	**2**
CO2	**1**	**1**				**2**			**1**	**1**	**2**	**2**
CO3	**1**	**1**	**2**			**2**			**1**	**1**	**2**	**2**
CO4	**1**	**1**			**2**	**2**			**1**	**1**	**2**	**2**

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DESC2804	BASICS OF CRYOSPHERE	L	T	P	C
Version 1.1	Date of Approval:	2	1	2	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

This course focuses on components of the cryosphere and processes linking them to other parts of the Earth system and contemporary challenges including climate change. It illustrate the processes and factors affecting ice dynamics and glacier mass balance and explains how cold climate indicators are preserved in the geomorphological and sedimentological records. This course work outline how each component of the Cryosphere has changed in recent decades, and explain the wider impacts these changes are having.

Course Objectives

The objective of this course is to

1. Gain a comprehensive understanding of the components of the cryosphere and their connections to other parts of the Earth system.
2. Illustrate and analyze the processes and factors affecting ice dynamics and glacier mass balance.
3. Explain how cold climate indicators are preserved in geomorphological and sedimentological records.
4. Outline recent changes in cryosphere components and evaluate the wider impacts of these changes, including those related to climate change.

Course Outcomes

CO1. Demonstrate a thorough understanding of the components of the cryosphere and their interactions with other Earth system components.

CO2. Develop the ability to analyze ice dynamics and glacier mass balance, including understanding the processes and factors influencing these systems.

CO3. Exhibit proficiency in interpreting cold climate indicators from geomorphological and sedimentological records.

CO4. Evaluate and articulate the recent changes in cryosphere components and their broader impacts, particularly in the context of climate change.

Course Content

Modules	Bloom's level*	Number of hours
Module I: Cryosphere: Global and regional distribution of glaciers, Glacial types and features, Mineralogy of ice/Metamorphism of ice, terminology of glacial study. Annual/seasonal glacial cycle, accumulation and ice changes. Ice mechanical processes and glacial dynamics, Concept of mass balance and its significance.	**L1**	**12**
Module II: Glacial geomorphology: glacial landscape, glacial profile, evolution of landscape, erosional and depositional features. Glaciers and India, Himalayan glaciers and their significance, third pole. Glacial hydrology in context of Indian sub-continent.	**L1, L2**	**12**

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Module III: Glaciers and Climate change: Global climate and Cryosphere, Earth glacial and climate history and interrelationship. Present climate crisis and cause and impact on glaciers. Glaciers and climate proxies.	**L2, L3, L4**	**10**
Module IV: A field project based on glacial or lower areas or past glaciated areas to develop skills of geomorphic and sedimentologic observation of glacial landscapes, originating river system and past glacial signatures. Field project includes field observation followed by analysis, writing of short reports, presentation and review by peer.	**L3, L5, L6**	**14**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

- Benn, D.I. and Evans D.J.A. Glaciers and Glaciation. London: Hodder Education; 2010.
- Cuffey, K. and Paterson, W.S.B. The Physics of Glaciers: Elsevier; 2010 – chapters 2, 4, and 6
- Bennett, M.R., (2003). Ice streams as the arteries of an ice sheet: their mechanics, stability and significance. Earth-Science Reviews, 61(3-4): 309–339.
- ELE page: https://vle.exeter.ac.uk/course/view.php?id=9305
- Paterson, W.S.B., 1994. Physics of Glaciers. 3rd Edition, Elsevier Science Ltd. 480 pp. (Note, a new edition is currently under preparation)
- Hooke, R.LeB., 2005. Principles of Glacier Mechanics. Cambridge University Press, Cambridge, 429 pp.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	**A**	**CT**	**HA**	**EE**
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**			**1**					**2**	**1**	**2**
CO2	**1**		**1**	**1**		**1**			**1**	**1**	**2**
CO3	**1**		**1**	**1**		**2**			**2**	**1**	**2**
CO4	**1**		**1**	**1**		**2**			**2**	**1**	**2**

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DESC2839	DATA ANALYSIS & VISUALISATION USING SOFTWARE	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	Class X Mathematics				
Co-requisites					

Catalog Description

The implosion of available data has made visualization more critical but also more challenging. Data analysis and Data Visualization are essential tools for business analysis, engineers, policymakers, and decision-makers. Developed originally for "small data", visualization techniques have been met with varied success in the past centuries and decades. There are a few well-known visualizations that are very effective in capturing the essence of the data, and of course, there are many infamous negative examples of poor visuals. An effective visual is critical for decision making it, but it also requires a lot of work, customization, attention to detail, and refinements.

Course Objectives

The course is designed to help students develop skills and knowledge in the following area(s):

- Develop an understanding of what is a good visualization for a given purpose
- Learn visualization theory & techniques
- Build a substantial data analytic project
- Apply data analysis and visualization with Excel, SPSS, R, Python, NVivo and MATLAB

Course Outcomes

On completion of this course, the students will be able to

CO1. Students will be able to articulate meaningful lines of inquiry that might be explored through the collection, organization, visualization, and analysis of data in a context associated with their primary field of study using (as appropriate) numerical, textual, spatial, and/ or visual data.

CO2. Student will understand what data are, how they are collected, and how to assess the quality/ reliability of data.

CO3. Students will demonstrate intermediate proficiency in the visualization of data to communicate information and patterns that exist in the data.

CO4: Students will be able to use at beginning level of proficiency the tools of statistics and machine learning to ask questions of and explore patterns in data.

Course Content :

Module	Topics Covered	Blooms Level	Contact Hours
1	**Module-1: Introduction to Excel** Data Analysis using Excel, Curve fitting, Correlation, Linear Regression, Multiple regression, Principal Component Analysis and Factor Analysis, Hypothesis testing	L1, L2, L3, L4	20 hours

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	Introduction to Excel and SPSS Introduction to SPSS and Types of Data, Importing, exporting and data handling in SPSS; Exploratory data analysis using SPSS and data visualization; Introduction to statistical inference and various univariate tests by using SPSS; Analysis of Variance (One Way ANOVA, Two Way ANOVA and ANCOVA); Correlation, Simple and Multiple linear Regression Analysis; Principal Component Analysis and Factor Analysis		
2	**Module-2: VOS Viewer** **Web of Science, Scopus, Dimensions, Lens, and PubMed.** Co-authorship networks, citation-based networks, and co-occurrence networks can be created based on data downloaded from Web of Science, Scopus, Dimensions, and Lens. Co-authorship networks and co-occurrence networks can also be created based on PubMed data. **Crossref, Europe PMC, and OpenAlex**. Networks can also be created based on data retrieved through the APIs of Crossref, Europe PMC, and OpenAlex, These APIs can be queried interactively in VOS viewer. **Semantic Scholar, Open Citations, and Wiki Data.** For a given set of DOIs, networks can also be created based on data retrieved through the APIs of Semantic Scholar, Open Citations and Wiki Data.	L1, L2, L3, L4	10 Hours
3	**Faculty of Management Studies & Behavioural Sciences** **Module 3: Domain Specific Software** **- Structural Equation Modelling** **Smart PLS** Introduction to Structural Equation Modelling (SEM), Introduction to the software's AMOS and SPSS, SMART PLS, Testing of Statistical assumptions, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), common method bias (CMB) test, Measurement Model Assessment, Discussing Fit Indices, Reliability and Validity Testing, Structural Model Assessment identifying multivariate outlier, Construct Validity: Convergent and Discriminant Validity, Measurement Model & Structural Equation Modelling, Mediation and Moderation Effects, Multi-Group Analysis.	L1, L2, L3, L4	30 Hours
	Faculty of Arts **N Vivo**		

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	1. Import text, audio, video, emails, images, spreadsheets, online surveys, web content, and social media from various sources into a simple, intuitive interface. 2. Create and NVivo project, import and organise qualitative and quantitative data 3.Manage a literature review in NVivo 4. Autocode structured data deductively and identify themes inductively 5. Generate and falsify hypotheses 6. Combine data in sets for analysis 7. Seek patterns and identify relationships across codes and cases 8. Present findings using visualisations 9. Export data out of NVivo 10. Coordinate teamwork.		
	Faculty of Science Engineering and Technology **Faculty of Health & Allied Sciences** **R programming / Python/ MATLAB** **R Programming-** Introduction to R, Variables and datatypes in R, Dataframes, Recasting and joining of dataframes, Arithmetic, logical and matrix operations in R, Functions in R, Control structure in R, Data visualization in R. **Python Programming-** Basics of programming, data structure and algorithm using Python, Strings, lists, control, functions, manipulating lists, loops, arrays, selection sort, insertion sort, recursion, sorting, dictionaries, exception handling, file handling, string processing, data analysis using Python **MATLAB Programming-** Introduction, basic features, managing workspace, mathematical functions, basic plotting, Matrices, array operations and linear equations, MATLAB programming- M files script, M-file functions, control flow and operations.		

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional (Theory/ Practical)	End Term Examination
Weightage (%)	5	10	15	70

References:

- David Houcque, 2005. Introduction to MATLAB programming for Engineering students., Northwestern University, E- Book **https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf**

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- Mark Lutz, 2009. Learning Python. O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.
- Emmanuel Paradis, 2005. R for Beginners. E book. **https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf**
- A Handbook of Statistical Analysis using SPSS by Dr. Brijesh Awasthi, Redshine Publication.

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ENVIRONMENTAL STUDIES

VAES2101/ ENV2152/ ENV2252	**ENVIRONMENTAL STUDIES**	L	T	P	C
Version 1.1	Date of Approval: Date, Month 2017	4	0	0	4
Pre-requisites/Exposure	Compulsory Value Added Course				
Co-requisites					

Course Catalog

This course gives an idea to find ways of living and working sustainably, so that the reasonable needs and wants of people from all walks of life can be satisfied without so over-exploiting the natural resources that the ability of future generations to meet their need and wants is threatened. Finding approaches to development that balance economic and social progress, address cultural differences, and respect ecological values and limits is the key to sustainable development.

Course Objectives

The objective of this course is to

- Describe the scope, importance and segments of environment and role of natural resources in expanding science and technologies.
- Understand the significance of biodiversity and its conservation, ecosystem processes and attain knowledge about sustainability.
- Reveals knowledge about environmental pollution and population explosion, their effects, control measures and related social issues. To also analyze the environmental issues in India and environmental management and legislation for the sustainable usage of environment.
- Description about value education, human rights, women and child welfare programmes and role of latest technologies in environmental management.
- Field work also forms the integral part of environmental issues so as to understand the theoretical concepts close to the ground realities.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define the scope, importance and relation between environment and other segments of the society.

CO2: List and explain the significance of natural resources. Give in depth interpretation of the knowledge of various aspects of biodiversity and ecosystem processes.

CO3. Analyze and Examine environmental pollution, its effects and control measures and, assessing environmental impacts and livelihoods.

CO4: To illustrate the climate change and sustainable development. Analyze various social issues like consumerism, resettlement, rehabilitation, wasteland reclamation and environmental legislations.

CO5. To create awareness among the public towards sustainability through the use of different tools like environmental journalism and activism. Apply human rights, women and child welfare, population explosion and its control measures.

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Course Content

MODULES	Blooms level*	Number of hours
MODULE I: The multidisciplinary nature of environmental studies. Definition, scope and importance, Need for public awareness.	**L1, L2**	**8**
MODULE II: Natural Resources Renewable and non-renewable resources Natural resources and associated problems Forest resources: Use and over-exploitation, deforestation, case studies, timber extraction, mining, dams and their effects on forests and tribal people. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. - Role of an individual in conservation of natural resources. - Equitable use of resources for sustainable lifestyles.	**L1, L2,L3, L5**	**12**
MODULE III: Ecosystems Concept of an ecosystem: Structure and function of an ecosystem, producers, consumers and decomposers, energy flow in the ecosystem, ecological succession, food chains, food webs and ecological pyramids, introduction, types, characteristic features, structure and function of the following ecosystems: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries).	**L2, L3**	**8**
MODULE IV: Biodiversity and its conservation Introduction, Definition: genetic, species and ecosystem diversity, biogeographical classification of India, value of biodiversity: consumptive use, productive use, social, ethical aesthetic and option values, biodiversity at global, national and local levels, India as a megadiversity nation, hot-spots of biodiversity, threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts, endangered and endemic species of India, conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.	**L2, L3**	**12**
MODULE V: Environmental Pollution Definition, causes, effects, and control measures of: air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution, and nuclear pollution. Solid waste management: causes, effects and control measures of urban and industrial wastes, role of an individual in prevention of pollution, pollution case studies, disaster management: floods, earthquake, cyclone, and landslides.	**L1, L2, L3**	**5**

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MODULE VI: Social Issues and the Environment From unsustainable to sustainable development, Urban problems related to energy Water conservation, rain water harvesting, and watershed management Resettlement and rehabilitation of people, its problems and concerns, case studies Environmental ethics: issues and possible solutions Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies Wasteland reclamation Consumerism and waste products Environmental Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness.	**L2, L3**	**5**
MODULE VII: Human Population and the Environment Population growth, variation among nations Population explosion Family Welfare programmes, Environment and human health Human Rights, Value education, HIV/ AIDS, Women and child welfare Role of information technology in environment and human health, Case studies.	**L1,L2**	**7**
MODULE VIII: Field Work Visit to a local area to document environmental assets-river/ forest/ grassland/ hill/ mountain Visit to a local polluted site urban / rural / industrial / agricultural Study of common plants, insects, and birds Study of simple ecosystems - pond, river, hill slopes, etc.	**L2, L3, L6**	**3**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Examination Scheme:

Components	**A**	**CT**	**HA**	**EE**
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, EE: End Semester Examination;

Suggested Readings

- Ecology and Environment by E P Odum
- A Text Book of Environmental Studies by Dr. ShradhaSinha, Dr. ManishaShukla, Dr.RanjanaShukla.
- Environmental Studies & Ecology by Dr. Jaya Pandey, Dr.ManasiMishra.
- Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut.
- Wanger K.D., 1998 Environnemental Management. W.B. Saunders Co. Philadelphia, USA 499p.
- Mckinney, M.L. & School, R.M. 1996. Environmental Science Systems & Solutions, Web enhanced edition. 639p

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	**1**					**1**	**1**	**1**	**1**	**1**	**1**
CO2	**1**	**1**	**2**	**2**		**1**	**2**	**1**		**1**	**1**
CO3	**1**	**1**	**2**	**2**		**1**	**2**	**1**	**1**	**1**	**1**
CO4	**1**	**1**	**2**	**2**		**1**	**2**	**1**			
CO5	**1**	**1**	**2**	**2**		**1**	**2**	**1**			

1: strongly related, 2: moderately related and 3: weakly related

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ENVIRONMENTAL MANAGEMENT

Programme Structure

Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits (12)
ENV2351	Environmental Pollution and Waste Management	3	0	0	3
ENV2451	Environmental Management and Industrial Safety	3	0	0	3
ENV2551	Environmental Economics and Globalization	3	0	0	3
ENV2651	Sustainable Development Practices	3	0	0	3

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ENVIRONMENTAL MANAGEMENT

Syllabus - Semester Third

ENVIRONMENTAL POLLUTION AND WASTE MANAGEMENT

Course Code: ENV2351 **Credit Units: 3**

Course Objective:
The growing pressure on natural resources and the progressive increase in the production of waste poses serious challenges for our society. Waste production and management play a central role in environmental policy. The production of industrial and urban waste has exploded during the last ten years. From a modern viewpoint, waste is to be considered a lost resource and, hence, it is a manufacturing cost variable that must be optimized with both direct costs and the cost to society in mind. Since it is not possible to avoid the production of waste, the main objective in order of importance is to try to reduce it to a minimum.

Course Contents:
Module I: Water pollution – sources, types, and effect of water pollutants, water quality standards, algal bloom, eutrophication, biomagnification/ bioaccumulation, water pollution control - primary, secondary and tertiary wastewater treatment; **Soil Pollution** – soil pollutants – types, sources, effects, and control.

Module II: Air pollution – structure and composition of atmosphere, classification, sources and effects of air pollutants, air pollution control - particulate and gaseous emission control methods; acid rain, green house effect, global warming, ozone depletion, smog, climate change, **Noise Pollution** – sources, effects, and control.

Module III: Waste management: Methods of waste collection, storage, and transportation, treatment and disposal techniques for solid waste: landfill operation and maintenance, composting: advantages and limitations, vermin-composting, autoclaving, incineration, biogas plant, techniques for hazardous waste treatment and safe disposal, nuclear and e-waste management, Government agencies and programs: NCEPC, MoEFCC, CPCB and SPCB's.

Examination Scheme:

Components	CT	HA	S/V/Q	A	EE
Weightage (%)	5	10	10	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, A: Attendance EE: End Semester Examination.

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Syllabus - Semester Fourth

ENVIRONMENTAL MANAGEMENT AND INDUSTRIAL SAFETY

Course Code: ENV2451 **Credit Units: 03**

Course Objective:
The course will give an overview of the safety and environmental issues in the industry. It will provide detailed understanding of the methods and techniques to resolve these key issues for making production and processing cleaner and safer. This course would educate students to identify and assess hazards in any stage of operation, to quantify and manage them as well. This course will also highlight lessons learnt from the past accidents. The aims of this course are: to create awareness for quality of life protection, health and environmental safety, occupational hazards.

Course Contents:
Module I: Public health: definition, need for good health, factors affecting health, communicable diseases, mode of transmission (epidemic and endemic diseases), management of hygiene in public places, occupational health hazards and safety (physical, chemical and biological), health protection measures for workers- health education, first aid, management of medical emergencies.

Module II: Industrial safety and management techniques: industrial safety standards and regulations, accidents – definition, prevention and control, risk analysis and assessment, safety cost and expenses.

Module III: Safety management system - environmental management systems (EMS) ISO 14000 and 14001, OSHA and NIOSH, compensation act, public liability insurance act, mining act, good manufacturing practices (GMP) and good laboratory management practices (GLP).

Examination Scheme:

Components	CT	HA	S/V/Q	A	EE
Weightage (%)	5	10	10	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, A: Attendance EE: End Semester Examination

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Syllabus - Semester Fifth

ENVIRONMENTAL ECONOMICS AND GLOBALIZATION

Course Code: ENV2551 **Credit Units: 03**

Course Objective:
Environmental issues such as pollution, climate change and the conservation of biodiversity are currently in the headlines of economic debate. Economic analysis of the environment is challenging precisely because environmental value is not always conveniently revealed in a market, and thus is subject to inappropriate use. The major topics addressed in this field of study are: the causes of environmental degradation, the need to re-establish the disciplinary ties between ecology and economics, the difficulties associated with assigning ownership right to environmental resources, the trade-off between environmental degradation and economic goods and services, assessing the monetary value of environmental damage etc.

Course Content:

Module I: Introduction: definition and scope of environmental economics, economics and environment, environment inter-linkages, market failure and externality, accounting for the environment.

Module II: Resource economics: natural resources: types and classification, economics of natural resources exploitation, market structure and the exploitation of non-renewable resources, methods of valuation of environmental costs and benefits.

Module III: Economics & Environmental Management: WTO and international trade, environmental trade barriers, natural resource accounting, environmental communication, GRI reports, green marketing, eco-labeling, pollution control: basic approach to environmental policy and management, pollution tax: effluent charges and subsidies.

Examination Scheme:

Components	CT	HA	S/V/Q	A	EE
Weightage (%)	5	10	10	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, A: Attendance EE: End Semester Examination

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Syllabus - Semester Sixth

SUSTAINABLE DEVELOPMENT PRACTICES

Course Code: ENV2651 **Credit Units: 03**

Course Objective

Finding approaches to development that balance economic and social progress, address cultural differences, and respect ecological values and limits is the key to sustainable development. Moving towards this goal requires fundamental changes in human attitudes and behavior in our personal lives, in our community activities, and in our places of work. The success in this regard is critically dependent on education and training. This course will imbue students with respect for the conservation and sustainable use of resources, social equity, and appropriate development along with competencies to practice sustainable tasks at the workplace of today and tomorrow.

Course Content:

Module I: Introduction: Environment, sustainable development and globalization, millennium development goals, regional perspectives, challenges and environmental issues in India, sustainable development and Indian development policies, local environmental management and legislation.

Module II: Climate change and sustainable development: Climate change and sustainable development, climate change and forest management, sustainable consumption, strategies and issues, international environmental agreements and climate change, international environmental agreements and climate change.

Module III: Writing on environment: Environmentalism, environmental journalism and activism, media for environment, conventions and science article styles, fact-checking with sources, research and publication, green peace movement, UNEP, UNCED, WBCSD, WWF, WRI, GRI, and World Bank.

Examination Scheme:

Components	D	P	A	EE
Weightage(%)	15	10	5	70

D: Dissertation, P: Publication, A: Attendance EE: End Semester Examination

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ENVIRONMENTAL HEALTH & CLIMATE

Programme Structure-2021

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits
AST2152	Linkages between Environment & Health	3	-	-	3
AST2252	Climate Change and Implications on Public Health	3	-	-	3
AST2352	Diseases in Contemporary Society	3	-	-	3
AST2452	Air, Water and Soil Pollution, Environmental Health Professions	3	-	-	3
AST2552	Ground-based and Satellite Remote Sensing	3	-	-	3
AST2652	Instrumentation Lab	-	-	6	3
	TOTAL				**18**

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Background

The program describes health issues, originated by air/water/soil pollution, scientific understanding of causes and possible approaches to mitigate and control the major environmental health problems in automobile/industry sectors of developing countries. Finally, the course addresses the pathways that connect pollution, human health and climate change at local/regional/global scale. Topics illustrate how the human body reacts with environmental pollutants; physicochemical, dynamical and biological agents of environmental contamination; vectors for dissemination (air, water, soil); solid and hazardous waste; susceptible populations; biomarkers, risk analysis and climate change; the scientific basis for policy decisions; and emerging global environmental health problems. This course also emphasizes the feedback mechanisms and pathways that interplay between air pollution, human health and climate parameters over different environments in a cohort hybrid seamless model, emphasizing integrated approach.

Objectives

Advancing Environmental Health and Climate (EHC) encompasses the study of all levels of biological organization, biochemical pathways, population at all stages across the lifespan, and climate change. EHC uses a rich, diverse, and constantly evolving set of outdoor/indoor observational, experimental, computational, and clinical approaches to explore the impacts of varying levels of exposure and susceptibility to such exposure. The support of novel, cutting-edge research approaches, high risk for high reward, and mitigation methods is an important element of the advancing EHC theme in this program.

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ENVIRONMENTAL HEALTH & CLIMATE

Syllabus - Semester First

LINKAGES BETWEEN ENVIRONMENT & HEALTH

Course Code: AST2152 **Credit Units: 03**

Course Objectives: To teach students the essential concepts on environment-related health problems, such as asthma and neurological damage from lead exposure, affect children disproportionately. A number of efforts are under way around the nation to educate children about the concepts and principles of environmental health with the goal of expanding science education, empowering children to avoid some adverse environmental exposures, and helping them to grow in to informed citizens who can assess and affect important public health issues.

Course Contents

Module-I: Environment and Public Health
The environment at risk: Converging paradigms for environmental health theory and practice; Understanding linkages between Environment and Public Health: Effect of quality of air, water and soil on health. The Bhopal disaster and its aftermath: are views.

Module II: Human Health Exposure Effects
Ecosystems and Human well-being: Synthesis; Human exposure assessment; Introduction to Bio-monitoring and bio-markers; Exposure assessment; Perspective on Individual health: Nutritional, socio-cultural and developmental aspects, Dietary diversity for good health; Human developmental indices for public health.

Module III: Human Health Risks Assessment
Introduction to environmental hazards and their effects on human health and ecosystems; Health effects of chemical exposure. Known's and unknowns on burden of disease due to chemicals: A systematic review; Cancer-Causing Substances in the Environment. Quantifying selected major risks to health: Selected Occupational risks.

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage(%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance, EE: End Semester Examination

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Suggested Text books/ References

- Adhikari, S.K., 2019: *A Textbook of Environmental Health*, 1st Edition, ISBN: 9789937710305, Samiksha Publication, 420p.
- Bradford, B. and Gwynne, M.A., 2012: *Down to Earth: Community Perspectives on Health, Development and the Environment*, Kumarian Press Library of Management forDevelopment,ISBN-13:978-1565490505.
- World Health Organization and *United Nations, 2017: Environment Programme Health Environment: Managing the Linkages for Sustainable Development* (Synthesis Report(WHO))1st Edition, ISBN-13: 978-9241563727.
- Kaufmann, R.K. and Cleveland, C.J., 2018: *Earth and Environmental Sciences*, ISBN:978-1-63097-030-7.

Syllabus - Semester Second

CLIMATE CHANGE AND IMPLICATIONS ON PUBLIC HEALTH

Course Code: AST2252 **Credit Units: 03**

Course Objectives: This course intends to educate students about basic principles behind the climate change and public health. Emphasis will be given to how the changes in weather and climate parameters, especially the episodic events influence human health and vice versa.

Course Contents

Module-I: Human Influence on Climate
Global warming- Agricultural practices (chemical agriculture) and Industrial technologies (use of non-biodegradable materials like plastics, aerosols, refrigerants, pesticides); Manifestations of climate change on Public Health-Burning of fossil fuels, automobile emissions and acid rain.

Module-II: Local/ Regional Climate Feedbacks on Human Health
Changes in the greenhouse gas concentrations and other drivers that alter the global climate and bring about myriad human health consequences. Environmental consequences of climate change, such as extreme heat waves, rising sea-levels, changes in precipitation, resulting in flooding and droughts, intense hurricanes, and degraded air quality, affect directly and indirectly the physical, social, and psychological health of humans.

Module-III: Cohort Studies of Weather/ Climate and Health Relationship
Changes in precipitation: availability and quantity of water, underlying extreme weather events such as intense hurricanes and flooding. Climate change: a driver of disease migration, as well as exacerbate health effects resulting from their lease of toxic air pollutants invulnerable populations such as children, the elderly, and those with asthma or cardiovascular disease, Cohort Studies.

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage(%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance, EE: End Semester Examination

Suggested Textbooks/ References

- Levy, B.S.and Patz,J.,2015:*ClimateChangeandPublicHealth*,OxfordUniversityPress,405p.
- J. McMichael, D.H. Campbell-Lendrum, C.F.Corvalan, K.L.Ebi, A.Githeko, J.D.Scheraga, A.Woodwar,2015: *Climate Change and Human Health: Risks and Reponses*.
- Patz,J.andLevy,B.S.,2017:*ClimateChangeandAirPollution:TheImpactonHumanHealthin Developed and Developing Countries*, 428p.
- Ebi,K.L.andMenne,B.2006:*ClimateChangeandAdaptationStrategiesforHumanHealth*,
- Ebi,K.L.andMenne,B.,2011:*ModelingtheHealthRisksofClimateChange:WorkshopSummary*
- Ebi,K.L.andMenne,B.2013:*ClimateChangeandHumanWell-Being:GlobalChallengesand Opportunities*

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Syllabus - Semester Third

DISEASES IN CONTEMPORARY SOCIETY

Course Code: AST2352 **Credit Units: 03**

Course Objectives: This course deals with different types of diseases including communicable ones that are primarily caused by particulate and gaseous pollutants. Several pollutants and corresponding health problems will be delineated. Necessary precautions required to be taken for reducing the health problems will be explained.

Course Contents

Module-I: Health-Susceptibility Relationship
Need for good health-factors affecting health; Types of diseases-deficiency, infection, pollution diseases-allergies, epidemiological, cardiovascular, COPD including non-smokers and cancer; Personal hygiene-food - balanced diet; Food habits and cleanliness; food adulterants, avoiding smoking, drugs and alcohol, Physiology.

Module-II: Biomarkers and Different Diseases
Stem cells and Immune cells, DNA/RNA, Biological Processes, Spirometry, Communicable diseases: Mode of transmission epidemic and endemic diseases; Management of hygiene in public places - Railway stations, Bus stands and other public places; Infectious diseases: Role of sanitation and poverty case studies on TB, diarrhea, malaria, viral diseases. Non-communicable diseases: Role of Life style and built environment; Diabetes and Hypertension.

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage(%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance, EE: End Semester Examination

Suggested Textbooks/ References

- Broer,T.,2014: Putting an ameto it: diagnosis in contemporary society, *Disease Control Prioritiesin Developing Countries.*2nd edition,352p.
- Weather all, D., Greenwood, B., Chee, H.L. and Wasi, P., 2015: *Science and Technology for Disease Control: Past, Present, and Future.*
- Barkan,S.E., 2017: *Health, Illness, and Society: An Introduction to Medical Sociology*, Rowman & Little field Publishers, ISBN: 9781442234994.

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Syllabus - Semester Fourth

AIR, WATER AND SOIL POLLUTION, ENVIRONMENTAL HEALTH PROFESSIONS

Course Code: AST2452 **Credit Units: 03**

Course Objectives: This course will provide students with an understanding and appreciation of the complex interactions between microbial air, water and soil quality and human health. The broad objectives of this course cover (i) impact of both primary and secondary (gas-to-particle conversion) particles on morbidity and mortality of human health and pre-mature deaths, (ii) howthequalityofwaterisaffectedbynatural,seasonal,accidental,intentionalandman-madeactivities, (ii) how the contaminated water increases the burden of human diseases with particular emphasis on infectious diseases, (iii) Industrial processes including mining and manufacturing that lead to cause of soil pollution.

Course Contents

Module-I: Interface Between Indoor and Outdoor Pollution
Indoor and outdoor air pollutants; sources and effects of pollutants in the atmospheric environment; Particulate matter and atmospheric visibility; Atmospheric diffusion theories and types of dispersion models; Lapse rates and various types of stability classification; Wind profile; Wind roses; Mixing depth.

Module-II: Air Pollution and Emission Inventory
General characteristics of the stack plumes; Dispersion of pollutants in the atmosphere and solution of advection diffusion equation with Gaussian distribution for point, line and area sources; plume rise; dispersion parameters and various methods of their evaluation; Atmospheric Removal processes and residence time; Effect of buildings and topography on dispersion; Similarity theory and profiles in the surface layer; Air Quality and Emission standards, their measurements and statistics; Air quality and environmental health.

Module-III: Water Pollution and Purification
Understanding of the significance of the environment for human health; Human population pressures and pollution dynamics; Common terms and definitions in water quality; Aquatic resources of the world & Sources of drinking water -Common contaminants of drinking water and linkages to disease; Non-point source pollution.

Module-IV: Soil Pollution-Causes and Mitigation
Soil contamination from abandoned industrial sites; Ants in to the environment, Improper disposal of house hold waste; Garbage and personal waste that leaks from sewer systems; pollution due to aged waste decompose; pollution due to plastic products like water bottles, bags and diapers. Risings use of chemicals in agriculture; toxic soil issues from industries and agricultural activities; contributions from pesticides and fertilizers, Increase in toxicity and reduction in fertility.

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage(%)	7	10	8	5	70

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CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance, EE: End Semester Examination

Suggested Textbooks/ References

- Maynard,R.,Stephen,H.,Koren,Samel,J.(Editors)1999:*AirPollutionandHealth*,ISBN:978012352358, AcademicPress, 1065p.
- Daniel,V.,2 014: *Fundamentals of Air Pollution*,5thEdition,ISBN:9780124017337, Academic Press, 996p.
- Robert, F.P. Phalen, Phalen,R.N.Robert N.Phalen, 2013:*Introduction to Air Pollution Science: A Public health Perspective*, 331p
- Blumenthal, D. S., and Ruttenber, A. J. (1995). Introduction to environmental health. Second Edition. New York: Springer.
- Friis, Robert H. 2007:Essentials of Environmental Health. Jones and Bartlett, MA,390 p.
- Frumkin, Howard 2005 Environmental Health: From Global to Local, Jossey-Bass, San Francisco, CA, 1108 p.
- Gasana J., 2003, Essentials of Environmental Health Management. Aglob Publishing, Hallandale Beach, FL.749p.
- Yassi, A.,Kjellstrom, T., deKok,T., Guidotti,T.L.(2001).Basic environmental health. New York: Oxford University Press.

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Syllabus - Semester Fifth

GROUND-BASED AND SATELLITE REMOTE SENSING

Course Code: AST2552 **Credit Units: 03**

Course Objectives: The course will make the students aware about various passive and active remote sensing sensors and techniques used now-a-days for observing the weather and climate system. The lectures will focus on the fundamentals of retrievals of various geophysical parameters and interpretation of remote sensing data.

Course Contents

Module-I: Aerial Mapping
Introduction & history to Aerial Photography; vantage points, vertical & oblique aerial photography; Planning; Elements of visual image interpretation; Geometry of aerial photography, photogrammetry; Relief displacement; Stereos copy; Parallax.

Module-II: Multi-Platform Remote Sensing
Definition, history; Electromagnetic radiation, atmospheric windows, atmospheric bands; Orbits sun-synchronous, geo-synchronous; Resolution spectral, spatial, radiometric, temporal; Multispectral & Hyper spectral remote sensing; Satellite remote sensing missions; Active &Passive remote sensing, RADAR, LIDAR; Applications – soil, water, vegetation, air, urban landscape.

Module-III: Geographical Information System (GIS)
Introduction to GIS, Management of data, GIS as DBMS, Data types – vector & raster, Data manipulation and analysis; Components of GIS; Structure of GIS; Digital Elevation Models; Triangulated Irregular Network; GIS applications; Global Positioning System.

Examination Scheme

Components	CT	CT/H/P/V/Q	CT	A	EE
Weightage(%)	7	10	8	5	70

CT: Class Test, H: Home Assignment, P/V/Q: Presentation/Viva/Quiz, A: Attendance, EE: End Semester Examination

Suggested Textbooks/ References:

- Kenneth Bowman(Editor), *Satellite Meteorology and Atmospheric Remote Sensing: An Introduction 1st Edition*, Ping Yang (Author), 2015, Wiley-VCH Publishers
- B C Panda, *Remote Sensing: Principles and Applications*, 2008.

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Syllabus - Semester Sixth

INSTRUMENTATION LAB

Course Code: AST2652 **Credit Units: 03**

Course Objectives: This course essentially deals with different experimental methods, data acquisition and retrieval algorithms being used in environmental pollution, Health risks and Climate Change studies. Special emphasis will be given to the students to get familiarized with latest advancements in ground-based and satellite remote sensing techniques.

Course Content

High Volume Sampler; AAS (Atomic Absorption Spectroscopy); ICPMS (Inductively Coupled Plasma Mass Spectrometry); HPLC (High-Performance Liquid Chromatography); GC/IC (Gas and Ion Chromatography),Sun-Sky Radiometers; Real-Time EC-OC Analyzers; RADAR, LIDAR, SODAR and SONAR; Satellite Remote Sensing Techniques.

Examination Scheme

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA–Internal Assessment, EE-External Exam, PR-Performance, LR-Lab Record, V– Viva.

Suggested Textbooks/ References

- Bernstein, D.M. et al., 1976: A High-Volume Sampler for the Determination of Particle Size Distributions in Ambient Air, *Journal of the Air Pollution Control Association*, 26(11),DOI:10.1080/00022470.1976.10470362.
- Tsao, R. and Yang, R., 2003: Optimization of a new mobile phase to know the complex and real poly phenolic composition: towards a total phenolic index using high- performance liquid chromatography, *Journal of Chromatography*, 1018,29-40.
- Kumar, S., Devara, P.C.S., Dani, K.K., Sonbawne, S.M. and Saha, S.K., 2011:Sun- sky radiometer derived column -integrated aerosoloptical and physical properties over atropical urban station during 2004–2009,*Journal of Geophysical Research (Atmospheres)*,doi.org/ 10.1029/ 2010 JD014944
- Brown, S. et al., 2019: Review of Sunset OC/EC instrument measurements during the EPA's Sunset evaluation Project, *Atmosphere*, 10,287.
- Armando, D., Anabela, C. and Teresa, R-S., 2017: *Soil Pollution*, 1st Edition, ISBN: 9780128498729, AcademicPress, 327p.

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CLIMATE SCIENCE

Programme Structure

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits
AST2151	Basics of Climate Science	3	-	-	3
AST2251	Introduction to Earth System Science Editing	3	-	-	3
AST2351	Cloud Microphysics and Chemistry	3	-	-	3
AST2451	Climate Change: Impact, Vulnerability and Adaption Foundations	3	-	-	3
AST2551	Primer of Oceanography Psychology	3	-	-	3
AST2651	Fundamentals of Climate Variability and Modeling	3	-	-	3
	TOTAL				**18**

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CLIMATE SCIENCE

Syllabus - Semester First

BASICS OF CLIMATE SCIENCE

Course Code: AST2151 **Credit Units: 03**

Course Objectives:

The aim of this course is to provide the students a basic understanding about the climate system: its attributes, underlying processes, and the drivers of climate change. Knowledge of various components of climatic system, and their interactions with atmosphere/hydrosphere/lithosphere would further create interest amongst the students about the climate system modelling and climatic vulnerability. This course emphasizes the scientific basis for anthropogenic climate change. Students will learn the physics behind the climate system, how climate has changed in the past and reasons why contemporary climate change is different, the scientific basis for anthropogenic climate change theory and how scientists use models to predict future climate. The course will also provide an overview of the physical, ecological, biological, social and economic impacts of climate change. Finally, students will examine various mitigation and adaptation strategies which society can employ in a warmer world.

Course Contents:

Module I: Introduction to Climate Science and its Components

Fundamentals of meteorology; Vertical profiles of temperature, wind, pressure, water vapor, and microphysical processes in the atmosphere; Climate system and interaction among components (atmosphere, oceans, sea, ice and land surface) of climate system and feedback mechanisms; Atmospheric thermodynamics, radiation in the atmosphere, Greenhouse gases and climate forcing; Overview of weather systems: Extreme weather events and Western disturbance.

Module II: Remote Sensing Techniques

Types of remote sensing; Different remote sensing platforms; Principles of Remote Sensing; Radiometer, Lidar, Radar, Sodar, Sonar, Land-atmosphere-ocean satellites; Calibration and validation methods.

Module III: Climatology and Meteorology

Radiation budget and balance; Solar constant; Lapse rate and stability; Water cycle and role in weather; Mechanism of wind development; Fundamental forces (pressure gradient, centrifugal, gravity, Coriolis); Surface winds and upper air circulations; Jet streams; Planetary circulations.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

A-Attendance; CT-Class Test; S/V/Q-Seminar/Quiz/Viva; HA-Home Assignment; EE-End Semester Examination

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References:

- Marshall J. and plumb R.A.(2001) Atmosphere, Ocean and Climate, Elsevier, Amsterdam
- Climate Change Science: An analysis of some ket questions- National Academy Press, Washington, DC,2001.
- Oliver J.E. and Hidore J.J.(2008) Climatology:An Atmospheric Science, Prentice - Hall
- Atmospheric Thermodynamics by Bohren and Albrecht.
- IPCC(2001 and 2007) Working group I report" The physical basis of climate change"
- Remote Sensing : Principles and Interpretation, by Floyd F. Sabins, 3rd edition (August 1996).
- W H Freeman & Co.; ISBN: 0716724421.
- Remote Sensing and Image Interpretation, by Thomas M. Lillesand, Ralph W. Kiefer, 4th
- edition (October 1999) , John Wiley & Sons; ISBN: 0471255157.
- Remote Sensing : Models and Methods for Image Processing, by Robert A. Schowengerdt, 2nd edition (July 1997), Academic Pr; ISBN: 0126289816.
- Principles of Paleoclimtology, Ed. Thomas M. Cronin, Columbia University, USA.

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Syllabus - Semester Second

INTRODUCTION TO EARTH SYSTEM SCIENCE

Course Code: AST2251 **Credit Units: 03**

Course Objectives:

This course embraces chemistry, biology, mathematics and applied sciences in transcending disciplinary boundaries to treat the Earth as an integrated system. Thus, it imparts knowledge to the students with basic understanding of the physico-chemical, biological and human interactions that determine the past, current and future states of the Earth. Earth system science seeks to integrate various fields of academic study to understand the Earth as a system. It considers interaction between the atmosphere, hydrosphere, lithosphere, biosphere and heliosphere.

Further, the Earth System Science program provides students with a fundamental understanding of the oceanographic, atmospheric, and terrestrial sciences. This program of study prepares students for careers in science, research, or technical fields. Students learn to apply basic sciences (physics, chemistry, mathematics, and biology) to understand the major processes and systems governing the Earth's climate, biogeochemical cycles, and global change. Central to the B.S. program is an understanding of relevant scientific literature, methods to collect/analyze data, and interpret results in the context of scientific theory. Students will learn to work collaboratively to understand and address complex problems and communicate scientific knowledge. Through the core course work, students will learn to explain the current and projected future state of the Earth system in the context of past climate change and current human activities.

Course Contents:

Module I: Fundamental Processes in Earth and Environmental Studies

An introduction to the physical environment, biological systems, and human-environmental interactions, Physical principles such as fluid transport and reaction rates using environmental examples as well as principles of populations, ecosystems, carrying capacity, and sustainable use of resources.

Module II: Hurricanes, Tsunamis and other Catastrophes

Introduction to the basic science and state of predictability of various natural catastrophic events such as hurricanes, tsunamis and volcanoes, future climate catastrophes including severe droughts, abrupt climate change, thermohaline circulation collapse and sea level rise.

Module III: Remote Sensing and Geographic Information System (GIS) for Earth System Science

Principles behind remote sensing, and the types of satellite data available for study of the oceans, land, and atmosphere, GIS Brief History, Techniques and Technology, Uncertainties, Spatial Analysis.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

A-Attendance; CT-Class Test; S/V/Q-Seminar/Quiz/Viva; HA-Home Assignment; EE-End Semester Examination

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References:

- The Blue Planet: An Introduction to Earth System Science, 3rd Edition, Brian J. inner, Barbara W. Murck, December 2010, ©201
- Maliene V, Grigonis V, Palevičius V, Griffiths S (2011). "Geographic information system: Old principles with new capabilities". *Urban Design International* 16 (1). pp. 1–6. doi:10.1057/udi.2010.25.
- Goodchild, Michael F (2010). "Twenty years of progress: GIScience in 2010". *Journal of Spatial Information Science*. doi:10.5311/JOSIS.2010.1.2
- Fu, P., and J. Sun. 2010. *Web GIS: Principles and Applications*.ESRI Press.Redlands, CA. ISBN 1-58948-245-X.
- Tim Foresman 1997 The History of GIS (Geographic Information Systems): Perspectives from the Pioneers. (Prentice Hall Series in Geographic Information Science) Prentice Hall PTR; 1st edition (November 10, 1997), 416 p.
- Coppock, J. T., and D. W. Rhind, (1991).The history of GIS. Geographical Information Systems: principles and applications. Ed. David J. Maguire, Michael F. Goodchild and David W. Rhind. Essex: Longman Scientific & Technical, 1991. 1: 21–43."The history of GIS.".Retrieved 2013-12-20.

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Syllabus - Semester Third

CLOUD MICROPHYSICS AND CHEMISTRY

Course Code: AST2351 **Credit Units: 03**

Course Objectives:
This course focuses on understanding how transformation of aerosol particles to droplets or ice crystals, heterogeneous chemistry and acid rain, physics of aerosol and cloud element motion, the interaction of particles with water vapor, chemical composition of particles and the effect on cloud formation processes, and the effect of cloud processing on aerosol chemistry, geo-engineering, weather modification and volcanic effects. Thus, it provides the students an insight into one of the important complex drivers of the local/regional/continental/hemispheric/global climate system.

Course Contents

Module I: Basic Cloud Physics
Water vapour and its thermodynamic effects, mixing and convection, formation of cloud droplets, formation and growth of ice crystals, aerosol sources and sizes, condensation and growth of cloud droplets: curvature, Kelvin, solute effects, cloud growth and precipitation, rain, snow and hail processes.

Module II: Microphysical Processes in warm and cold clouds
Cloud condensation nuclei, microstructures of warm clouds, growth of cloud droplets in warm clouds, growth by condensation and collision-coalescence, microphysics of cold clouds, growth by collection, modification of warm and cold clouds, lightning and thunder.

Module III: Cloud and Precipitation Chemistry
Transport of particles and gases, nucleation scavenging, dissolution of gases in clouds droplets, precipitation scavenging, chemical composition of rain, production of aerosols by clouds.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

A-Attendance; CT-Class Test; S/V/Q-Seminar/Quiz/Viva; HA-Home Assignment; EE-End Semester Examination

References

- Atmospheric Science-An Introductory Survey, 2nd Edition, Eds. John M. Wallace and Peter V. Hobbs, University of Washington, 2006, Elsevier Inc.
- The Physics of Clouds, Ed. B.J. Mason, Oxford University Press, Oxford, 1971.
- A Short Course in Physics, Eds. R.R. Rogers and M.K. Yau, 3rd Edition, 1989, Pergamon Press, Oxford.

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Syllabus - Semester Fourth

CLIMATE CHANGE: IMPACT, VULNERABILITY AND ADAPTATION

Course Code: AST2451 **Credit Units: 03**

Course Objectives:
This course provides the students with an introduction to the vulnerability of climate change and potential adaptation options of natural as well as social systems. A critical view will be laid on the 'attribution problem', the prioritization of adaptation means, mal-adaptations, the implementation problem, ethical views and conflicts with development goals. Win-win-situations and trade-offs between the latter and climate change adaptation is part of this course too.

Course Contents

Module I: Introduction to the Impacts of Climate Change
Fundamentals of climate system and climate change, brief summary of Inter-Governmental Panel of Climate and Climate Change (IPCC) reports, future directions for mitigation processes.

Module II: Vulnerability
Introduction to the concept, ecological and social systems, coastal vulnerability, methods of evaluation of vulnerability and impacts.

Module III: Adaptation
Introduction to the concept, indicators of adaptation, options and limits of adaptation, food and energy security, autonomous versus planned adaptation, adaptation capacity.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

A-Attendance; CT-Class Test; S/V/Q-Seminar/Quiz/Viva; HA-Home Assignment; EE-End Semester Examination

References

- McMichael, A.J., Cambell-Lendrum, D.H., Corvalan, C.F., Ebi, K.L., Githeko, A.K., Scheraga, J.D., Woodward, A. (Eds.) 2003, Climate change and human helth –Risks and Responses, Geneva, World Health Organization.
- Reckien, D., Hofmann, S., Kit, O., 2009: Qualitative Climate Change Impact Networks for Hyderabad/India. Report from the Project: Hyderabad as a megacity of tomorrow: Climate and energy in a complex transition towards sustainable Hyderabad- Mitigation and adaptation strategies by changing institutions, Governance structures, life styles and consumption patterns. Institute for Climate Research, 2009.
- Roy, J., 2006: The economics of Climate change. A review of studies in the context of South Asia with a special focus on India.
- Jerneck, A., Olsson, L., 2008: Adaptation and the poor, development, resilience and transition, Climate Polity, 8, 170-182.

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Syllabus - Semester Fifth

PRIMER OF OCEANOGRAPHY

Course Code: AST2551 **Credit Units: 03**

Course Objectives:
Ocean-related science is relevant to many contemporary environmental issues and problems and central to understanding earth-system evolution, dynamics, climate and sustainability. This course offers a very flexible curriculum that serves students with a broad range of educational and career interests including environmental management and regulation, environmental law. The topics selected for this course, are expected to provide the students with a broad conception of the world's oceans; evaluation of its potential contributions to solution of problems presently confronting mankind.

Course Contents
Module I: Ocean Properties
Introduction to Oceans, physical and chemical properties of ocean water, composition of sea water, salinity and density.
Module II: Physical Oceanography
Thermal expansion of sea water, viscosity, surface tension, heat conduction, adiabatic temperature changes, optical properties, temperature-salinity relationship,
Module III: Bathymetry, Eco Systems and Pollution
Basic definition, oceanic life and ecosystems, measurement techniques, bathymetric chart, fish-zone detection, marine pollution.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

A-Attendance; CT-Class Test; S/V/Q-Seminar/Quiz/Viva; HA-Home Assignment; EE-End Semester Examination

References

- Baker D.J. 1981. Ocean instruments and experiment design. In Evolution of PhysicalOceanography: Scientific Surveys in Honor of Henry Stommel. Edited by B. A.Warrenand C. Wunsch. 396–433. Cambridge: Massachusetts Institute of Technology Press.
- Bennett A.F. 1992. Inverse Methods in Physical Oceanography. Cambridge: UniversityPress.
- Philander S.G. 1990. El Ni˜no, La Ni˜na, and the Southern Oscillation. Academic Press.
- Ahn, YH; Hong, GH; Neelamani, S; Philip, L and Shanmugam, P (2006) Assessment of Levels of coastal marine pollution of Chennai city, southern India. Water Resource Management, 21(7), 1187-1206.
- Daoji, L and Dag, D (2004) Ocean pollution from land-based sources: East China sea. AMBIO – A Journal of the Human Environment, 33(1/2), 107-113.
- Laws, Edward A (2000) Aquatic Pollution John Wiley and Sons. ISBN 978-0-471-34875-7
- Slater, D (2007) Affluence and effluents. Sierra 92(6), 27
- UNEP/GPA (2006) The State of the Marine Environment: Trends and processes United Nations Environment Programme, Global Programme of Action, The Hague. 2006ISBN 92-807-2708-7.
- UNEP (2007) Land-based Pollution in the South China Sea. UNEP/GEF/SCS Technical Publication No 10.

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Syllabus - Semester Sixth

FUNDAMENTALS OF CLIMATE VARIABILITY AND MODELLING

Course Code: AST2651 **Credit Units: 03**

Course Objectives:
This course essentially deals with fundamentals of climate variability and its modelling. This knowledge to the students makes them familiar with different types of climate models available not only for prediction purposes but also to undertake sensitivity tests and to simulate the future climate scenarios both regionally and globally.

Course Details

Module I: Climate Variability
Natural variability versus anthropogenic forcing to climate system, climate sensitivity, Greenhouse gases and global warming,

Module II: Climate Drivers
Climate Global distributions of temperature, precipitation, precipitation, climate classification, Natural and external forcings to climate variability,

Module III: Basics of Climate Modelling
Simple energy balance climate models, introduction to coupled ocean-atmosphere models, simple models for predicting climate change and impact assessment.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

A-Attendance; CT-Class Test; S/V/Q-Seminar/Quiz/Viva; HA-Home Assignment; EE-End Semester Examination

References

- Climate Change and Climate Modelling, Ed. J. David Neelin, 2011.
- An Introduction to Three-dimensional Climate Modelling, Eds. Warren M. Washington and Clarie L. Parkinson, 2005.

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SUSTAINABILITY SCIENCE

Discipline	Course Code	Name of Course	Type (Major/ Minor)	Semester	Total Credits
Sustainability Science	DESC2153	Fundamentals of Sustainability	Major/ Minor	1	4
Sustainability Science	DESC2253	Ecosystem & Natural Capital	Major/ Minor	2	4
Sustainability Science	DESC2353	Ecological Economics	Major/ Minor	3	4
Sustainability Science	DESC2453	Sustainability: Institutions & Governance	Major/ Minor	4	4
Sustainability Science	DESC2553	Environment & Social Governance (ESG)	Major/ Minor	5	4
Sustainability Science	DESC2503	Approaches to Sustainability	Major	5	4
Sustainability Science	DESC2653	Sustainability: Case Study	Major/ Minor	6	4
Sustainability Science	DESC2604	Sustainability Reporting	Major	6	4
Sustainability Science	DESC2605	Climate Change: Adaptation & Resilience	Major	6	4

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SUSTAINABILITY SCIENCE

PROGRAMME OUTCOMES

The under-graduates will be able to

PO 1. Grasp the foundational principles of sustainability, including ecological, economic, and social dimensions. Understand global and local sustainability challenges and how they intersect with environmental, economic, and social systems.

PO 2. Develop the ability to critically analyze sustainability problems using multidisciplinary approaches. Apply systems thinking to assess the long-term impacts of various environmental and societal actions.

PO 3. Recognize and evaluate the ethical implications of sustainability practices and policies. Demonstrate a commitment to promoting sustainable practices in professional and personal contexts.

PO 4. Communicate effectively with diverse audiences about sustainability issues, using appropriate tools and techniques. Lead and collaborate on projects aimed at promoting sustainable solutions in communities and organizations.

PO 5. Conduct sustainability research using appropriate methods and techniques. Develop innovative solutions to sustainability challenges through creative thinking and technological application.

PROGRAMME SPECIFIC OUTCOMES

PSO1. Apply principles of environmental science to manage natural resources sustainably. Develop and implement strategies for minimizing human impact on ecosystems and biodiversity.

PSO2. Design and evaluate development projects that balance economic growth with environmental stewardship and social equity. Analyze and promote policies that support sustainable urban and rural development.

PSO3. Understand the science and impacts of climate change and develop strategies to mitigate and adapt to its effects. Implement and assess climate action plans and policies at local, regional, and global levels.

PSO4. Integrate sustainability into business models and operations, emphasizing corporate social responsibility and ethical decision-making. Evaluate and improve the sustainability performance of businesses using various metrics and frameworks.

PSO5. Optimize the use of energy and resources to reduce environmental impact and enhance economic viability. Promote the adoption of renewable energy sources and energy-efficient technologies.

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FIRST SEMESTER (Major and Minor)

DESC2153	FUNDAMENTALS OF SUSTAINABILITY	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

The "Fundamentals of Sustainability Science" course is to introduce students to the core principles and concepts of sustainability, emphasizing the interconnectedness of environmental, social, and economic systems. Students will explore the historical context of sustainability, key theories, and the scientific basis for sustainable practices. The course aims to foster an understanding of the challenges and opportunities associated with sustainability, encouraging critical thinking about resource management, ecosystem health, and human well-being.

Course Objectives

Objectives include analyzing case studies that illustrate successful sustainability initiatives, as well as understanding the role of policy and governance in promoting sustainable development. Additionally, the course seeks to equip students with practical skills in sustainability assessment and evaluation techniques. Ultimately, the course aims to inspire a commitment to sustainable practices and empower students to contribute to positive change in their communities and professions.

Course Outcomes

1. **CO1. Conceptual Understanding:** Students will demonstrate a comprehensive understanding of key principles, concepts, and historical contexts of sustainability science.
2. **CO2. Critical Analysis:** Students will critically analyze the interconnections between environmental, social, and economic systems and their implications for sustainable development.
3. **CO3 Sustainability Assessment:** Students will apply sustainability assessment tools and metrics to evaluate the effectiveness of sustainability initiatives and practices.
4. **CO4. Case Study Evaluation:** Students will assess real-world case studies, identifying best practices and lessons learned in sustainability implementation.
5. **CO5. Policy and Governance Insight:** Students will understand the role of policy and governance in promoting sustainability, enabling them to engage in informed discussions and decision-making processes.

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Course Content

Modules	Bloom's level*	Number of hours
Module I: Introduction to Sustainable Development: Glimpse into History and Current practices - Broad introduction to SD - its importance, need, impact and implications; definition coined; evolution of SD perspectives (MDGs AND SDGs) over the years; recent debates; 1987 Brundtland Commission and outcome; later UN summits (Rio summit, etc.) and outcome	**L1, L2, L3, L4**	**20**
Module II: **Dimensions to Sustainable Development** - society, environment, culture and economy; current challenges - natural, political, socio-economic imbalance; sustainable development initiatives, Resource management and implications on sustainable development, CSD-objectives.	**L1, L2, L3, L4, L5**	**20**
Module III: **Gauging Sustainable Development** - Sustainability and development indicators and SDGs, UN's outlookof sustainable development and efforts,UNSDGs -structure, governance and partnerships; communities / society: ensuring resilience and primary needs in society; biosphere: development within planetary boundaries; strengthening institutions for sustainability; shaping a sustainable economy.	**L1, L2, L3**	**15**
Module IV: Project Work/ Case Studies/Field Visit: Visit to sewage treatment plants/ Visit to waste water treatment plants/ Solid waste management site with field report preparation.	**L3, L4, L6**	**5**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

- Franco, I.B. and Tracey, J. (2019), "Community capacity-building for sustainable development: Effectively striving towards achieving local community sustainability targets", International Journal of Sustainability in Higher Education, Vol. 20 No. 4, pp. 691-725
- Our Common Journey: A Transition Toward Sustainability. National Academy Press,Washington D.C. Soubbotina, T. P. 2004.
- Elliott,Jennifer.2012.AnIntroductiontoSustainableDevelopment.4thEd.Routledge,London.
- Rogers, Peter P., Kazi F. Jalal, and John A. Boyd. "An introduction to sustainable development." (2012).
- Sachs,J.D.2015.TheAgeofSustainableDevelopment.ColumbiaUniversityPress,NewYork.
- Soubbotina, Tatyana P. 2004. Beyond Economic Growth: An Introduction to Sustainable Development. WBI learning resources series. Washington DC ; World Bank.
- Kerr, Julie. Introduction to energy and climate: Developing a sustainable environment. CRC Press, 2017.
- Saito, Osamu. Sharing Ecosystem Services. Springer Singapore, 2020. ○ Nhamo, Godwell, and VuyoMjimba. Sustainable Development Goals and institutions of higher education. Springer, 2020.

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Examination Scheme:

Components	A	FP	HA	EE
Weightage(%)	5	20/30	5	70/60

A: Attendance, FP: Field Project, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4
CO1	1	1				1	1	2	2
CO2	1	1				1	1	2	2
CO3	1	1				1	1	2	2
CO4	1	1			1				
CO5			1	1					

1: strongly related, 2: moderately related and 3: weakly related

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SECOND SEMESTER (Major and Minor)

DESC2253	**ECOSYSTEM & NATURAL CAPITAL**	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

The course on Ecosystem and Natural Capital aims to provide students with a comprehensive understanding of the relationships between ecosystems and economic systems. It explores the value of natural resources and ecosystem services, emphasizing their role in sustaining human well-being and economic development. Through a combination of theoretical concepts and practical case studies, students will learn to assess the impacts of human activities on ecosystems, develop strategies for sustainable management, and advocate for policies that integrate ecological health with economic growth, ultimately fostering a deeper appreciation for the intrinsic value of nature in decision-making processes.

Course Objectives

The course on Ecosystem and Natural Capital aims to equip students with an understanding of the interplay between ecosystems and economic systems. It focuses on recognizing the value of natural resources and ecosystem services, highlighting their importance for human well-being and sustainability. Students will learn to assess ecological impacts, explore sustainable management practices, and develop policies that integrate environmental health with economic development, fostering a holistic approach to natural capital preservation and responsible resource use.

Course Outcomes

1. CO1. Understanding Ecosystem Services: Students will be able to identify and categorize various ecosystem services and articulate their significance for human well-being and economic development.
2. CO2. Impact Assessment: Students will develop skills to assess the environmental and economic impacts of human activities on ecosystems, using relevant tools and methodologies.
3. CO3. Sustainable Management Strategies: Students will be able to propose and evaluate sustainable management strategies that balance ecological integrity with economic needs.
4. CO4 Policy Development: Students will learn to design and advocate for policies that promote the integration of ecosystem health into economic decision-making processes.
5. CO5. Critical Analysis: Students will be equipped to critically analyze case studies related to natural capital, enabling them to understand complex interactions between ecosystems and socio-economic factors.

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Course Content

Modules	Bloom's level*	Number of hours
Module I: Natural resources and conservation Resource and reserves; classification of natural resources, resource degradation; resource conservation; resource availability; ecological, social and economic dimension of resource management. Forest resources, sustainable forestry; water resources; fresh water shortages, strategies of water conservation; soil resources importance of soil, soil conservation strategies; food resources: green revolution.	**L1, L2, L3, L4**	**20**
Module II: Mineral resources; types of mining: surface, subsurface, open-pit, dredging, strip; environmental effects of extracting and using mineral resources. Non-renewable energy resources, extraction and processing, oil shale, tar sands; natural gas: exploration, liquefied petroleum gas, liquefied natural gas; coal: reserves, classification; environmental impacts of non-renewable energy consumption; impact of energy consumption on global economy.	**L1,L2, L3, L4, L5**	**20**
Module III: Renewable energy resources and resource management Energy efficiency; solar energy: technology, advantages, passive and active solar heating system, solar cells, hydropower: technology; nuclear power: nuclear fission, fusion, reactors, pros and cons of nuclear power, tidal energy; wave energy; ocean thermal energy conversion (OTEC); geothermal energy; energy from biomass; bio-diesel.	**L1, L2,L3**	**15**
Module IV: Project Work/ Assignment/ Field visit: Application of green technology; future energy options and challenges, Green planning: role of governmental bodies, land-use planning, concept of green cities, waste reduction and recycling in cities.	**L3, L4, L6**	**5**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

- Craig, J.R., Vaughan. D.J. & Skinner. B.J. 1996. Resources of the Earth: Origin, Use, and Environmental Impacts (2nd edition). Prentice Hall, New Jersey.
- Freeman, A.M. 2001. Measures of value and Resources: Resources for the Future Washington DC.Freeman, A.M. 2003. Millennium Ecosystem Assessment: Conceptual Framework. IslandPress.Ginley, D.S. &Cahen, D. 2011. Fundamentals of Materials for Energy and Environmental Sustainability. Cambridge University Press.
- Klee,G.A.1991.ConservationofNaturalResources.PrenticeHallPublication.
- Miller,T.G.2012.EnvironmentalScience.WadsworthPublishingCo.

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- Ramade,F.1984.EcologyofNaturalResources.JohnWiley&SonsLtd.
- Tiwari,G.N.&Ghosal.M.K.2005.RenewableEnergyResources:BasicPrinciplesand Application. Narosa Publishing House.

Examination Scheme:

Components	A	FP	HA	EE
Weightage(%)	5	20/30	5	70/60

A: Attendance, FP: Field Project, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	1				2			1	1	2	2
CO2	1	1				2			1	1	2	2
CO3	1	1				2			1	1	2	2
CO4												
CO5												

1: strongly related, 2: moderately related and 3: weakly related

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THIRD SEMESTER (Major and Minor)

DESC2353	ECOLOGICAL ECONOMICS	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

This subject introduces students to the fundamentals of environmental economics. It covers some basic concepts of economics to familiarize students with absence of market, demand and supply in nature. Each unit covers a range of topics, which will help students develop modern concepts of environmental economics and its importance in conservation of biodiversity and ecosystems through understanding of economic costs associated with these.

Course Objectives

The course objectives of Ecological Economics include understanding the interconnections between ecological systems and economic activities, evaluating the sustainability of resource use, and analyzing the impacts of human behavior on the environment. Students will explore concepts such as ecosystem services, the value of biodiversity, and the principles of sustainable development. The course aims to equip learners with the tools to assess environmental policies, promote equitable resource distribution, and develop innovative solutions that balance economic growth with ecological integrity.

Course Outcomes

1. CO1. Critical Analysis: Students will be able to critically analyze the relationships between economic systems and ecological processes, identifying key sustainability challenges.
2. CO2. Valuation of Ecosystem Services: Learners will demonstrate the ability to assess and articulate the value of ecosystem services and their role in economic decision-making.
3. CO3. Policy Development: Students will be equipped to design and evaluate policies that promote sustainable resource management and address environmental justice.
4. CO4. Interdisciplinary Integration: Participants will integrate knowledge from economics, ecology, and social sciences to propose holistic solutions for environmental issues.
5. CO5. Systems Thinking: Students will apply systems thinking to understand complex ecological-economic interactions and develop strategies for long-term sustainability.

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Course Content

Modules	Bloom's level*	Number of hours
Module I: **Environmental economics**: Marginal analysis; social benefit, costs and welfare functions; meaning and types of environmental values; measures of economic values; Pareto principle or criterion; Hardin's Thesis of 'The Tragedy of Commons'; social cost benefit analysis; cost-effectiveness analysis., Valuation of environment impacts: types of economic values, approach, valuation techniques, Environmental Costs and benefits analysis, cost benefit analysis of technology or process for pollution control.	**L1, L2, L3, L4**	**20**
Module II: **Economic Solutions to environmental problems**: Social costs and benefits of environmental programmes, pollution control: policies for controlling air and water pollution, disposal of toxic and hazardous waste- standards vs. emissions charges; polluter pay principles; pollution permit trading system, Environmental audit and accounting, Kuznets curve, environmental risk analysis, assessing benefits and cost for environmental decision making	**L1,L2, L3, L4, L5**	**20**
Module III: **Natural Resource Economics**: Economics of non-renewable resources; Hotelling's rule and extensions, Environmental audit, Types of environmental audits and their objectives. General audit methodology and audit process, basic steps for environmental audit. Element of audit process, audit protocols. Waste audits and pollution prevention assessments, Waste minimization audit.	**L1, L2,L3**	**15**
Module IV: Project/ Field visit/ Industrial Visit: Energy Audit analysis report, Pollution based Audit, Biofuel and Green Energy	**L3, L4, L6**	**5**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

- Arrow, K., Bolin, B., Costanza, R., Dasgupta, P., Folke, C., Holling, C.S., Jansson, B.O.,Levin, S., Maler, K.G., Perrings, C., Pimentel, D. 1995. Economic growth, carrying capacity, and the environment. Ecological Economics 15: 91-95.
- Perman,R.2003.NaturalResourceandEnvironmentalEconomics.PearsonEducation.
- Singh, K. &Shishodia, A. 2007. Environmental Economics: Theory and Applications. Sage Publications.
- Thomas,J.M.&Callan,S.J.2007.EnvironmentalEconomics.ThomsonLearningInc.
- Tietenberg, T. 2004. Environmental and Natural Resource Economics (6th Edition). Pearson Education Pvt. Ltd.Tietenberg, T. H.& Lewis, L. 2010. Environmental Economics and Policy. AddisonWesley.

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- Turner, R. K., Pearce, D., & Bateman, I. 1994. Environmental Economics: An Elementary Introduction. Harvester Wheatsheaf.

Examination Scheme:

Components	A	FP	HA	EE
Weightage (%)	5	20/30	5	70/60

A: Attendance, FP: Field Project, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	1				2			1	1	2	2
CO2	1	1				2			1	1	2	2
CO3	1	1				2			1	1	2	2
CO4	1	1										
CO5				1								

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FOURTH SEMESTER (Major and Minor)

DESC2453	SUSTAINABILITY: INSTITUTIONS & GOVERNANCE	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

The course aims to equip students with the skills to critically evaluate existing governance frameworks and develop innovative solutions for sustainability issues. Through case studies and collaborative projects, participants will engage in hands-on learning, fostering the ability to navigate complex social-ecological systems and contribute effectively to sustainable governance initiatives.

Course Objectives

The objective of the Sustainability: Institutions & Governance course is to explore the role of various institutions in shaping sustainable practices and policies. Students will analyze how governance structures, both formal and informal, influence decision-making processes and resource management at local, national, and global levels. By understanding these dynamics, learners will gain insights into the challenges and opportunities for promoting sustainability within different contexts.

Course Outcomes

1. **CO1. Critical Analysis Skills**: Students will be able to critically assess various governance frameworks and their effectiveness in promoting sustainability across different contexts.
2. **CO2. Interdisciplinary Understanding**: Learners will develop a comprehensive understanding of the interplay between social, economic, and environmental systems in sustainability governance.
3. **CO3. Policy Development**: Students will acquire the skills to design and propose effective policies that address sustainability challenges, considering institutional and stakeholder dynamics.
4. **CO4. Collaborative Engagement**: Participants will be able to engage collaboratively with diverse stakeholders, fostering partnerships that support sustainable development initiatives.
5. **CO5. Practical Application**: Learners will apply theoretical concepts to real-world scenarios through case studies, enhancing their ability to address complex sustainability issues in various governance settings.

Course Content

Modules	Bloom's level*	Number of hours
Module I: Introduction to Sustainability Governance at Higher Education Institutions: Constitution of sustainable development, Challenges and Potential of a Sustainable Higher Education System, Progress with Implementation.	**L1, L2, L3, L4**	**20**

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Module II: **Governance for sustainability:** Understanding Governance pathways to sustainability, Governing technology, environment and development, addressing the politics of ecology, incertitude and knowledge, dealing with ecology and political ecology, towards an approach to governance of/for pathways to sustainability, elements of a STEPS approach to governance	**L1,L2, L3, L4, L5**	**20**
Module III: **Institutional Quality, Governance and Progress towards the SDGs:** Prerequisites for successful higher education institution sustainability, International accords, national policies and legislation, local decision-making structures, transnational institutions, and environmental NGOs.	**L1, L2,L3**	**15**
Module IV: Project/ Case studies/ field Work: Design an energy saving campaign for Institutions, Institutional sustainable report analysis and case studies.	**L3, L4, L6**	**5**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

- Abraham, C.M. 1999. Environmental Jurisprudence in India. Kluwer Law International.
- Agarwal, V.K. 2005. Environmental Laws in India: Challenges for Enforcement. Bulletin of the National Institute of Ecology 15: 227-238.
- Divan, S. &Rosencranz, A. 2002. Environmental Law and Policy in India: Cases, Materials and Statues (2nd edition). Oxford University Press.
- Gupta, K.R. 2006. Environmental Legislation in India. Atlantic Publishers and Distributors. Leelakrishnan, P. 2008. Environmental Law in India (3rd edition). LexisNexis India. Naseem, M. 2011. Environmental Law in India Mohammad. Kluwer Law International

Examination Scheme:

Components	A	FP	HA	EE
Weightage(%)	5	20/30	5	70/60

A: Attendance, FP: Field Project, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	1				2			1	1	2	2
CO2	1	1				2			1	1	2	2
CO3	1	1				2			1	1	2	2
CO4	1	1										
CO5				1								

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FIFTH SEMESTER (Major & Minor Course)

DESC2553	**ENVIRONMENT & SOCIAL GOVERNANCE (ESG)**	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

The ESG course is designed to help learners understand and evaluate the sustainability and ethical impact of businesses and organizations. Through this comprehensive short course, you'll gain fundamental knowledge of ESG, learn how to embed ESG into business operations and strategy, and understand how to communicate the importance of ESG effectively to different stakeholders.

Course Objectives

The course on Environment & Social Governance (ESG) aims to equip students with a comprehensive understanding of ESG principles and their significance in sustainable business practices. Objectives include analyzing the impact of environmental, social, and governance factors on corporate performance; assessing ESG risks and opportunities; exploring regulatory frameworks and reporting standards; and developing strategies for effective ESG integration.

Course Outcomes

1. **CO1.Understanding ESG Frameworks**: Students will be able to articulate key ESG principles and frameworks, including their relevance to corporate governance and sustainability.
2. **CO2. Risk Assessment Skills**: Participants will develop the ability to assess and analyze ESG-related risks and opportunities, informing strategic decision-making.
3. **CO3. Regulatory Knowledge**: Students will gain insights into global ESG regulations and reporting standards, enabling them to navigate compliance effectively.
4. **CO4. Stakeholder Engagement**: Participants will learn techniques for engaging with stakeholders on ESG issues, fostering transparency and collaboration.
5. **CO5. Implementation Strategies**: Students will design actionable strategies for integrating ESG considerations into organizational practices, enhancing overall sustainability and ethical impact.

Course Content

Modules	**Bloom's level***	**Number of hours**
Module I: **Introduction to ESG:** Define ESG, Approaches to SG, Sustainable investment, green investment, benefits and challenges of incorporating ESG in decision making, Environmental, social, governance factors for ESG, Institutional demand for ESG	**L1, L2, L3, L4**	**20**

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Module II: **Environmental and social risks:** Climate change mitigation, climate change adaptation, and resilience measures, climate-related physical and transition risks; environmental and climate policies; international climate and environmental agreements and conventions; the circular economy, clean and technological innovation, green and ESG-related products.	**L1,L2, L3, L4, L5**	**20**
Module III: **ESG Analysis, Valuation and Integration:** Aims and objectives of integrating ESG into the investment process, approaches of integrating ESG analysis into the investment process, tangible and intangible material ESG-related factors through both qualitative and quantitative approaches, The ESG Integration Framework, what is integration framework, ESG in Fixed Income Analysis, Equity Case Studies	**L1, L2,L3**	**15**
Module IV: Project/ Case studies/ field Work: Development of Broader ESG strategy for Godrej Group,how ESG factors may affect industry and company performance, challenges of undertaking ESG analysis across different geographic regions and cultures.	**L3, L4, L6**	**5**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

- Abraham,C.M.1999.EnvironmentalJurisprudenceinIndia.KluwerLawInternational.
- Agarwal, V.K. 2005. Environmental Laws in India: Challenges for Enforcement. Bulletin of the National Institute of Ecology 15: 227-238.
- Divan, S. &Rosencranz, A. 2002. Environmental Law and Policy in India: Cases, Materials and Statues (2nd edition). Oxford University Press.
- Gupta, K.R. 2006. Environmental Legislation in India. Atlantic Publishers and Distributors. Leelakrishnan, P. 2008. Environmental Lawin India (3rd edition). LexisNexisIndia. Naseem, M. 2011. Environmental Law in India Mohammad. Kluwer Law International.

Examination Scheme:

Components	A	FP	HA	EE
Weightage(%)	5	20/30	5	70/60

A: Attendance, FP: Field Project, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4
CO1	1	1				1	1	2	2
CO2	1	1				1	1	2	2
CO3	1	1				1	1	2	2
CO4	1	1			1				
CO5				1					

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FIFTH SEMESTER (Major)

DESC2503	**APPROACHES TO SUSTAINABILITY**	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

The course emphasizes the importance of interdisciplinary collaboration in sustainability efforts. Through practical case studies and group projects, students will develop the skills needed to apply theoretical concepts to real-world situations, fostering innovative solutions that promote long-term sustainability across various sectors and communities.

Course Objectives

The objective of the Approaches to Sustainability course is to introduce students to various frameworks and methodologies for achieving sustainable development. By exploring ecological, economic, and social dimensions, learners will understand how different approaches can be integrated to address pressing sustainability challenges. This foundational knowledge will empower students to critically evaluate existing strategies and identify best practices.

Course Outcomes

1. **CO1. Comprehensive Understanding**: Students will demonstrate a thorough understanding of various sustainability frameworks and approaches, evaluating their applicability in different contexts.
2. **CO2. Critical Thinking**: Learners will develop critical thinking skills to analyze and assess the effectiveness of existing sustainability strategies and policies.
3. **CO3. Interdisciplinary Application**: Participants will be able to integrate knowledge from multiple disciplines to design comprehensive sustainability solutions for complex problems.
4. **CO4. Practical Problem-Solving**: Students will apply theoretical concepts to real-world scenarios, developing innovative strategies that address sustainability challenges.
5. **CO5. Collaborative Skills**: Learners will cultivate teamwork and communication skills necessary for engaging with diverse stakeholders in sustainability initiatives.

Course Content

Modules	**Bloom's level***	**Number of hours**
Module I: Environment in an urban setting Introduction to urbanization; commodification of nature; metros, cities and towns as sources and sinks of resources; resource consumption and its social, cultural, economic and ecological perspectives; increasing challenges posed by modernity for the environment; urban pollution (air, water, soil).	**L1, L2, L3, L4**	**20**

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Module II: Urban dwelling Housing scenario across a range of large-medium-small cities; Town planning Acts and their environmental aspects; energy consumption and waste disposal as well as accumulation; environmental costs of urban infrastructure; challenges associated with sustainability and urban future. Organization and planning of green spaces such as parks, gardens and public spaces;concept of green belts; urban natural forest ecosystem as green lungs.	**L1,L2, L3, L4, L5**	**20**
Module III: Organization and planning of green spaces such as parks, gardens and public spaces; concept of green belts; urban natural forest ecosystem as green lungs, introduction to green buildings; urban governance; political complexity of applying ecological science to urban policy and planning, smart cities, management of urban environment; alternative resources; policy and management decisions.	**L1, L2,L3**	**15**
Module IV: Case Study on Green buildings; history of green buildings, need and relevance of green buildings over conventional buildings, outlined examples of green buildings; LEED certified building	**L3, L4, L6**	**5**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

1. D'Monte, Darryl. 1985. Industry versus Environment Temples or Tombs. Three Controversies, Delhi, CSE.

2. Ernstson, H. 2011. Re-translating nature in post-apartheid Cape Town: The material semiotics of people and plants at Bottom Road. In: Heeks, R., (Ed.) Conference on "Understanding Development through Actor-Network Theory", London School of Economics, 30 June, London.

3. Grimm, N. B., Faeth, S. H., et al. 2008. Global Change and the Ecology of Cities. Science 319: 756-760.

4.Hinchliffe, S. &Whatmore, S. 2006. Living cities: Towards a politics of conviviality. Science as Culture 15: 123–138.

Examination Scheme:

Components	A	FP	HA	EE
Weightage (%)	5	20/30	5	70/60

A: Attendance, FP: Field Project, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4
CO1	1	1				1	1	2	2
CO2	1	1				1	1	2	2
CO3	1	1				1	1	2	2
CO4	1	1			1				
CO5			1	1					

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Sixth Semester (Major and Minor)

DESC2653	SUSTAINABILITY: A CASE STUDY	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

It aims to provide an idea of effective management strategies and a critical insight of the major sustainability issues. Students will identify and propose innovative solutions to real-world issues, while also examining the role of policies and strategies in shaping sustainable outcomes. Ultimately, the course seeks to equip participants with practical insights that can inform future sustainability initiatives.

Course Objectives

The course "Sustainability: A Case Study" aims to provide students with a deep understanding of sustainability practices through the analysis of specific case studies. Objectives include conducting in-depth evaluations of successful sustainability initiatives across various sectors, fostering critical thinking skills to assess their effectiveness, and exploring multi-disciplinary perspectives on sustainability challenges.

Course Outcomes

1. **CO1.Case Analysis**: Analyze specific case studies to identify key sustainability practices and their outcomes across different sectors.
2. **CO2. Critical Evaluation**: Develop critical evaluation skills to assess the effectiveness and impact of sustainability initiatives in real-world contexts.
3. **CO3. Interdisciplinary Insights**: Explore sustainability issues through interdisciplinary lenses, integrating concepts from environmental science, economics, and social equity.
4. **CO4. Innovative Solutions**: Identify and propose innovative, practical solutions to sustainability challenges presented in case studies.
5. **CO5. Policy Assessment**: Evaluate the influence of policies and strategies on sustainability outcomes, learning from successful case study implementations to inform future practices.

Course Content

Modules	Bloom's level*	Number of hours
Module I: **Various Approaches to Sustainability Science**: Status Quo Approach, Community Capacity Building Approach, Industrial Sector Approach, Integrated Systems Approach, Human Development Approach, Green Accounts Approach	**L1, L2, L3, L4**	**20**

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Module II: **Frameworks of Sustainability** - Analytical frameworks in sustainability studies, sustainability metrics: criteria and indicators; significance of quantitative and qualitative assessments of sustainability; metrics for mapping and measuring sustainable development; application of the metrics in real scenarios	**L1,L2, L3, L4, L5**	**20**
Module III: **Resource management Approaches in resource management**: ecological approach; economic approach; implications of the approaches; integrated resource management strategies; different approach towards sustainable development and its different constituents; sustainability of society, resources and framework; principles of energy conservation; Indian renewable energy programme	**L1, L2,L3**	**15**
Module IV: Project work/ field work: Indian renewable energy programme, Urban farming case study.	**L3, L4, L6**	**5**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

- Craig, J.R., Vaughan. D.J & Skinner. B.J. 1996. Resources of the Earth: Origin, Use, and Environmental Impacts (2nd edition). Prentice Hall, New Jersey.
- Freeman, A.M. 2001. Measures of value and Resources: Resources for the Future. Washington DC.Freeman, A.M. 2003. Millennium Ecosystem Assessment: Conceptual Framework. Island Press.
- Ginley, D.S. &Cahen, D. 2011. Fundamentals of Materials for Energy and Environmental Sustainability. Cambridge University Press.
- Klee,G.A.1991.Conservation of NaturalResources.PrenticeHallPublication.
- Tiwari, G.N &Ghosal. M. K. 2005. Renewable Energy Resources: Basic Principles and Application. Narosa Publishing House.

Examination Scheme:

Components	A	FP	HA	EE
Weightage(%)	5	20/30	5	70/60

A: Attendance, FP: Field Project, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4
CO1	1	1				1	1	2	2
CO2	1	1				1	1	2	2
CO3	1	1				1	1	2	2
CO4	1	1			1				
CO5			1	1					

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SIXTH SEMESTER (Major)

DESC2605	CLIMATE CHANGE: ADAPTATION & RESILIENCE	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

The course on "Climate Change: Adaptation & Resilience" aims to equip students with a comprehensive understanding of the challenges posed by climate change and the strategies for adaptation and resilience. The course emphasizes the importance of interdisciplinary approaches, integrating insights from environmental science, social sciences, and policy studies to develop holistic solutions.

Course Objectives

Objectives include analyzing the impacts of climate change on various ecosystems, communities, and economies, fostering a deep awareness of vulnerability and risk. Students will explore different adaptation strategies that can be implemented at local, national, and global levels, examining case studies that highlight successful resilience initiatives.

Course Outcomes

1. **CO1. Impact Assessment:** Students will be able to analyze the impacts of climate change on ecosystems, communities, and economies, identifying key vulnerabilities**.**
2. **CO2. Adaptation Strategies:** Participants will develop and propose effective adaptation strategies that enhance resilience at local, national, and global levels.
3. **CO3. Interdisciplinary Approach:** Students will demonstrate the ability to integrate knowledge from environmental science, social sciences, and policy studies to create holistic solutions.
4. **CO4. Stakeholder Engagement:** Participants will effectively engage with stakeholders to assess needs and priorities for adaptation measures, ensuring inclusive decision-making.
5. **CO5. Innovative Solutions:** Students will apply critical thinking and problem-solving skills to design innovative resilience initiatives that address current and future climate challenge.

Course Content

Modules	Bloom's level*	Number of hours
Module I: **Introduction; Key Terms and Concepts**: The Meaning of Adaptation , The Ethics of Adaptation, Climate Change Impacts and Risks, Climate Change Vulnerability, Vulnerability Analysis, Dimensions of Resilience, Ecological Resilience, Adaptive Capacity, Adaptation Pathways, Transitions and Transformation	**L1, L2, L3, L4**	**20**

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Module II: **Responses to climate change**: Municipal responses to climate change, challenges, Response to sea level rise, flooding, storm surge and other climate related events, Vulnerability assessments/Resilience Plans /Natural Hazard Mitigation Plans, Impact of climate change on atmosphere, weather patterns, sea level rise, agricultural productivity, Chapman cycle; process of spring time ozone depletion over Antarctica; ozone depleting substances (ODS); effects of ozone depletion; mitigation measures and international protocols.	**L1, L2, L3, L4, L5**	**20**
Module III: Global warming and climate change Evolution and development of Earth's atmosphere; atmospheric structure and composition; Milankovitch cycles, atmospheric windows, Global Warming Potential (GWP) & climate change; Environmental policy debate; International agreements; Montreal protocol 1987; Kyoto protocol 1997; Convention on Climate Change; carbon credit and carbon trading; clean development mechanism	**L1, L2,L3**	**15**
Module IV: Project Work/Field Work: Community-Based Climate Resilience Assessment	**L3, L4, L6**	**5**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

1. Barry,R.G.2003.Atmosphere,WeatherandClimate.RoutledgePress,UK.
2. Gillespie,A.2006.ClimateChange,OzoneDepletionandAirPollution:LegalCommentaries with Policy and Science Considerations. MartinusNijhoff Publishers.
3. Manahan,S.E.2010.EnvironmentalChemistry.CRCPress, Taylor and Francis Group.
4. Maslin,M.2014.ClimateChange:Avery Short Introduction. Oxford Publications.
5. Mathez,E.A.2009.ClimateChange:TheScienceofGlobalWarmingandourEnergyFuture. Columbia University Press.

Examination Scheme:

Components	A	FP	HA	EE
Weightage(%)	5	20/30	5	70/60

A: Attendance, FP: Field Project, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4
CO1	1	1				1	1	2	2
CO2	1	1				1	1	2	2
CO3	1	1				1	1	2	2
CO4	1	1			1				
CO5			1	1					

1: strongly related, 2: moderately related and 3: weakly related

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SIXTH SEMESTER (Major)

DSC2604	SUSTAINABILITY REPORTING	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Catalogue

Sustainability reporting course is designed to equip students with the knowledge and skills necessary to understand, develop, and analyze sustainability reports. Students will learn to assess the environmental, social, and governance (ESG) performance of organizations and effectively communicate these findings to stakeholders.

Course Objectives

The course emphasizes the importance of transparency and accountability in sustainability practices, encouraging critical thinking about how these principles can drive ethical decision-making and enhance stakeholder trust. By exploring real-world examples, students will be prepared to contribute effectively to responsible business operations and advocate for sustainable development within organizations.

Course Outcomes

1. **CO1. Report Creation:** Students will be able to develop comprehensive sustainability reports that adhere to recognized frameworks and standards.
2. **CO2. Performance Assessment:** Participants will evaluate organizational performance in terms of environmental, social, and governance (ESG) metrics.
3. **CO3. Critical Analysis:** Students will critically analyze existing sustainability reports, identifying strengths, weaknesses, and areas for improvement.
4. **CO3. Stakeholder Communication:** Participants will effectively communicate sustainability information to various stakeholders, enhancing transparency and engagement.
5. **CO4. Ethical Decision-Making:** Students will understand the role of ethics in sustainability reporting, applying principles of accountability and transparency to promote responsible business practices**.**

Course Content

Modules	Bloom's level*	Number of hours
Module I: Environmental economics, characteristics of environmental goods; marginal analysis; markets and market failure; social benefit, costs and welfare functions; meaning and types of environmental values; measures of economic values; tangible and intangible benefits; Pareto principle or criterion; Hardin's Thesis of 'The Tragedy of Commons'; prisoner's dilemma game; methods of abatement of externalities; social cost benefit analysis; cost-effectiveness analysis.	**L1, L2, L3, L4**	**20**

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Module II: Economic solutions to environmental problems Social costs and benefits of environmental programmes: marginal social benefit of abatement, marginal social cost of abatement; pollution control: policies for controlling air and water pollution, disposal of toxic and hazardous waste- standards vs. emissions charges.	**L1, L2, L3, L4, L5**	**20**
Module III: Environmental audit and accounting, Kuznets curve, environmental risk analysis, assessing benefits and cost for environmental decision making; cost benefit analysis and valuation: principles of Cost-Benefit Analysis, estimation of costs and benefits, techniques of valuation, adjusting and comparing environmental benefits and costs.	**L1, L2,L3**	**20**
Module IV: Project Work/Field Work: Energy audit of a domestic unit /Institute.	**L3, L4, L6**	**5**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Suggested Books:

- Arrow, K., Bolin, B., Costanza, R., Dasgupta, P., Folke, C., Holling, C.S., Jansson, B.O., Levin, S., Maler, K.G., Perrings, C., Pimentel, D. 1995. Economic growth, carrying capacity, and the environment. Ecological Economics 15: 91-95.
- Perman,R.2003.NaturalResourceandEnvironmentalEconomics.PearsonEducation.
- Singh, K. &Shishodia, A. 2007. Environmental Economics: Theory and Applications. Sage Publications.
- Thomas,J.M.&Callan,S.J.2007.EnvironmentalEconomics.ThomsonLearningInc.
- Tietenberg, T. 2004. Environmental and Natural Resource Economics (6th Edition). Pearson Education Pvt. Ltd.
- Tietenberg,T.H&Lewis,L.2010.EnvironmentalEconomicsandPolicy.AddisonWesley.

Examination Scheme:

Components	A	FP	HA	EE
Weightage(%)	5	20/30	5	70/60

A: Attendance, FP: Field Project, HA: Home Assignment, EE: End Semester Examination;

CO, PO and PSO mapping

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CO1	1	1				1	1	2	2
CO2	1	1				1	1	2	2
CO3	1	1				1	1	2	2
CO4	1	1			1				
CO5			1	1					

1: strongly related, 2: moderately related and 3: weakly related

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Amity Institute of Biotechnology

Bachelor of Science (Honors/ Honors with Research) in Biotechnology

FLEXILEARN
-Freedom to design your degree



Curriculum & Scheme of Examination

2023

AMITY UNIVERSITY HARYANA

GURUGRAM

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Bachelor of Science (Honors/ Honors with Research) in Biotechnology

About the Program

The BSc Biotechnology program aims to provide students with a comprehensive understanding of the principles and applications of biotechnology. It integrates knowledge from biology, chemistry, and technology to explore and manipulate living organisms for the benefit of society. The program's goals include equipping students with practical laboratory skills, a deep understanding of molecular biology, genetic engineering, bioprocess technology, and bioinformatics. Graduates will be prepared for careers in healthcare, agriculture, environmental conservation, and industrial biotechnology, as well as for advanced studies and research.

Aligned with India's National Education Policy (NEP), the program emphasizes multidisciplinary and holistic education, fostering critical thinking, creativity, and problem-solving skills. It includes experiential learning through internships and industry collaborations, promotes research and innovation, and supports the development of ethical and responsible biotechnological practices. The curriculum is designed to be flexible, enabling students to choose electives and pursue interests across various domains, thereby creating a well-rounded educational experience. This alignment ensures that the program remains relevant, dynamic, and responsive to

The table below states Amity University Haryana's key objectives, Amity Institute of Biotechnology's Objectives for the UG program (Program Objectives, PO) and the Program Specific Objectives, PSO, for the BSc Biotechnology program, all in line with the NEP. The POs and PSOs form the foundation principles based on which the program structure and the curriculum for each course is designed. The course content for each course is duly mapped to the POs and PSOs.

	AUH Key Objectives (based on NEP)	AIB Objectives (PO)	BSc BT objectives (PSO)
1	Multidisciplinary Learning and Holistic Education	To impart a comprehensive understanding of core subjects in Life Sciences along with a strong foundation in allied disciplines such as chemistry, physics, and computational and mathematical tools.	To impart a comprehensive understanding of core subjects in Biotechnology along with a strong foundation in allied disciplines such as chemistry, physics, and computational and mathematical tools.
2	Experiential and Hands-on Learning	To empower the students with the technical knowledge and skills for executing experiments in Life Sciences, with focus on experimental design, use of modern experimental equipment, qualitative and quantitative data collection, critical thinking and analysis, in order to make them skilled for career opportunities.	To empower the students with the technical knowledge and skills for executing experiments in Biotechnology, with focus on Experimental Design, use of modern experimental equipment, qualitative and quantitative data collection, Critical Thinking and analysis, in order to make them skilled for career opportunities.
3	Research and Innovation	To inculcate a spirit of scholarly research, innovation and entrepreneurship in Life Sciences	To inculcate a spirit of scholarly research, innovation and entrepreneurship in Life Sciences
4	Ethics and Sustainability	To instil ethical practices and an understanding of sustainable development in the context of issues related to Life Sciences	To instil ethical practices and an understanding of sustainable development in the context of issues related to Life Sciences

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5	Communication and Collaboration	To improve scientific communication skills through various medias, and the ability to work collaboratively in multidisciplinary teams	To improve scientific communication skills through various medias, and the ability to work collaboratively in multidisciplinary teams
6	Lifelong Learning and Adaptability	To nurture a mindset of continuous education and professional development, by encouraging a quest for knowledge and personal growth.	To nurture a mindset of continuous education and professional development, by encouraging a quest for knowledge and personal growth.

A salient feature of the NEP is the emphasis on providing the students opportunities for multidisciplinary learning, practical real-life experience, and a all-rounded personal development. This is implemented through offering various baskets of courses as follows. Students will learn the subjects in their chosen major through the basket of courses offered under Discipline Specific Courses (DSC I). In addition, two more baskets of courses DSC-II and DSC-III (often referred to as D2 and D3 courses respectively). The D2 basket includes courses that are offered by a program different from the one the student has registered as the Major program but within the same Faculty. The D3 basket includes courses that are offered by a program different from the one the student has registered as the Major program and outside the Faculty. (Amity University Haryana has the following 6 Faculties: 1. Faculty of Science Engineering and Technology, 2. Faculty of Health and Allied Sciences, 3. Faculty of Arts, 4. Faculty of Management Studies & Behavioural Sciences, 5. Faculty of Architecture and Planning, and 6. Faculty of Law. Amity Institute of Biotechnology comes under the Faculty of Science Engineering and Technology).

In addition, the Skill Enhancement courses, Ability Enhancement courses and Value Added courses further diversify the scope of student's learning in order to empower them for a wholistic development.

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Bachelor of Science (Honors/ Honors with Research) in Biotechnology
SEMESTER-I

Course Code: DBTH2101	PLANT AND ANIMAL DIVERSITY	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	**Plant and Animal Diversity Lab**				

Catalog Description

This course explores the vast diversity of plant and animal life through Whittaker's five-kingdom system, highlighting the importance of biodiversity and its conservation with case studies. Students will learn about plant and animal classification, evolutionary relationships, and the use of model organisms in research. Key topics include cryptograms and phanerogams, invertebrates, and vertebrates, focusing on their characteristics, reproductive structures, and economic importance. The course also addresses threats to biodiversity and conservation strategies.

Course Objectives

This course aims to provide a comprehensive understanding of Whittaker's five-kingdom classification system, the significance of biodiversity and its conservation, and the diverse classifications and evolutionary relationships among plants and animals. Students will explore cryptograms and phanerogams, invertebrates, and vertebrates, focusing on their characteristics, reproductive structures, and economic importance. The course also addresses the threats to biodiversity and various conservation strategies to mitigate these impacts.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Discuss the magnitude of Biodiversity, current challenges to Biodiversity, and advocate the importance of conservation of Biodiversity
- Explain the basis of Whittaker's five-kingdom system of classification, species concept and scientific nomenclature
- Discuss the significance of model organisms representing diverse taxa in biological research
- Expound the vegetative (/somatic) & reproductive characteristics and classification of Plant (cryptogams & phanerogams) and Animal kingdoms (invertebrates & vertebrates) using specific families as examples. Also, explain their economic importance.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction: • Introduction to Whittaker's five-kingdom system of classification • Why study of Biodiversity and Biodiversity conservation is important? (with case study examples)	**L1, L2, L3**	4
Module II: • Overview of plant & animal diversity & classification • Concept of species, binomial nomenclature • Evolutionary relationship among the different domains of life • Model plants and animals as research tool.	**L1, L2, L3**	4

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Module III: Plant Kingdom - Cryptograms: • Classification (Based on classical and molecular concepts) • Occurrence, types of cell structure, thallus organization • Mode of reproduction in Algae, Fungi, Bryophytes & Pteridophytes; alternation of generation, life cycles • Transient role of heterospory • Economic importance	**L1, L2, L3**	8
Module IV: Plant Kingdom - Phanerogams: • General classification, characteristics, affinities • Development of reproductive structures of Gymnosperm and Angiosperm with salient features of family: *Cucurbitaceae Apiaceae, Apocynaceae, Asclepiadaceae, Lamiaceae, Euphorbiaceae, and Poaceae* • Economic importance	**L1, L2, L3**	8
Module V: Animal Kingdom - Invertebrates: • General characteristics of Protozoa, Porifera, Coelenterates, Helminths, Annelida, Arthropoda, Mollusca, Echinodermata, classification up to classes. (with the following examples: Amoeba, Sycon, Sponges, Hydra, Tapeworm, Earth worm, Cockroach, & Starfish.)	**L1, L2, L3**	8
Module VI: Vertebrates: • General characters and classification of Chordata, taxonomic position of Protochordates, Urochordates, Cephalochordates & Cyclostomes • Fishes, Amphibians, Reptiles, Birds, Mammals; Parental care in Amphibian, Reptiles, Aves and Mammals. • Homeostasis and Thermoregulation in invertebrates and vertebrates.	**L1, L2, L3**	8
Module VII: Brief overview of Threats to Biodiversity and conservation strategies • Impact of Habitat loss and fragmentation, Invasive species, Pollution and climate change, Monoculture, Role of Biotechnology in promoting monoculture • Conservation strategies	**L1, L2, L3**	4

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- The Algae, V. J. Chapman and D. J. Chapman.: Macmillan, London
- Introductory Mycology, Alexopaulos, Mims and Blackwell: John Wiley and Sons Inc.
- College Botany Vol. I and II, Ganguli and Kar: New Central Book Agency.
- A Textbook of Botany, V. Singh, P.C. Pande& D.K. Jain: Rastogi Publication.
- Introductory Phycology, H. D. Kumar: East West Press Pvt. Ltd.
- A Textbook of Algae, H. D. Kumar and H.N. Singh.: McMillan International
- Cryptogamic Botany, G. M. Smith. McGraw Hil
- A Textbook of Algae, B. R. Vashishtha S. Chand and Co. Pvt. Ltd
- Bryophytes, N. S. Parihar Central Book Depot.
- Pteridophytes, N. S. Parihar Central Book Depot
- A Textbook of Botany Angiosperms - Taxonomy by S. N. Pandey, Etc., S Chand & Co Ltd
- Morphology Of Angiosperm - **John Merle Coulter & Charles Joseph Chamberlain**
- Jordan, E.K. and Verma, P.S., Invertebrate Zoology. S. Chand & Co. New Delhi.
- Kotpal, R.L., Refer to the series on Protozoa, Porifera, Coelenterates, Annelida, Arthropoda, Mollusca, Echinodermata. Rastogi Publication, Meerut

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- Parker, T.J. and Haswell, W.A., Textbook of Zoology Vol 1. AZT BS Publisher, New Delhi.
- Borradile, L.A. and Potts, F.A., Invertebrate Zoology, Cambridge Press, UK.
- Dhami, P.S. and Dhami, J.K., Invertebrate Zoology, S Chand & Co. New Delhi.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	CA	A	A/P	EE
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	2	2	1			1	2	2	1		
CO2	1	2	2	3			1	2	2	3		
CO3	1	2	1	3			1	2	1	3		
CO4	1	2	2	3			1	2	2	3		

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2102	PLANT AND ANIMAL DIVERSITY LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**Plant and Animal Diversity Lab**				

Catalog Description

The "Plant and Animal Diversity Lab" course provides hands-on experience with a variety of biological specimens. Modules cover microscopic studies of cryptogams, preparation and identification of gymnosperms and angiosperms, and spot identifications of key animal structures. Students will observe the branchial system, air sacs, and reproductive systems in animals through demonstrations. The course also includes field studies exploring plant and animal diversity on the AUH campus, integrating practical skills with theoretical knowledge.

Course Objectives

The "Plant and Animal Diversity Lab" course aims to provide students with practical skills in microscopic study and preparation of cryptogams, identification and classification of phanerogams, and spot identifications of key animal structures. Through hands-on demonstrations and field studies on the AUH campus, students will explore plant and animal diversity, enhancing their understanding of biological systems and the economic importance of various plant families.

Course Outcomes (COs):

The following skills should be retained by the end of the course:

- Prepare and analyze temporary and permanent microscopic slides of algae, fungi, bryophytes, mosses, lichens, mycorrhiza, and pteridophytes to understand their structure and reproductive features.
- Be proficient in preparing sections of gymnosperms like Cycas and Pinus, as well as in identifying, describing, and characterizing the floral structures and economic importance of locally available angiosperms.
- Identify and describe the anatomical features of various specimens including the earthworm gizzard and intestine, *Amphioxus, Balanoglossus, fish scales, Scoliodon, Trygon*, and *Exocoetus*.
- Identify and explain the functional anatomy of the branchial system of Scoliodon, the air sacs of Columba, and the reproductive systems of male and female Rattus through detailed demonstrations.
- Apply their theoretical knowledge in practical settings by exploring and documenting the diversity of plants and animals on the AUH campus, enhancing their observational and identification skills in a natural environment.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Cryptogams: • Microscopic study Algae of Chlamydomonas, *Volvox, Spirogyra*, (Fresh preparations and permanent slides). • Temporary microscopic slide preparation of Fungi, Bryophytes, Mosses, Lichens, Mycorrhiza, Pteridophytes	L1, L2, L3, L4	6

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Module II: Phanerogams: • Study of the Gymnosperms like *Cycas, Pinus* with the help of permanent slides and by cutting sections and making suitable temporary preparations. • Angiosperm detailed description and identification and floral characterization and economic importance of locally available plants of the families as prescribed in theory course.	L1, L2, L3, L4	6
Module III: Spot Identifications: • Earthworm gizzard and intestine, • *Amphioxus, Balanoglossus,* Fish scales, *Scoliodon, Trygon, Exocoetus*	L3, L4	6
Module IV: Demonstrations: • Branchial system of *Scoliodon*, • Air sacs of *Columba*, • Reproductive system of male and female *Rattus*	L1, L2, L3	6
Module V: Field Study • Exploring Plant Diversity on AUH campus • Exploring Animal Diversity on AUH campus	L3, L5, L6	2

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- The Algae, V. J. Chapman and D. J. Chapman.: Macmillan, London
- Introductory Mycology, Alexopaulos, Mims and Blackwell: John Wiley and Sons Inc.
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- A Manual of Practical Zoology Chordates, P. S. Verma, S. Chand & Co. Ltd.Biology of Animals Vol II, A. K. Sinha, S. Adhikari, B. B. Ganguly, New Central Book Agency,Calcutta
- Parker, T.J. and Haswell, W.A., Text Book of Zoology Vol 1. AZT BS Publisher, New Delhi.
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Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

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CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	1	3	3	2		1	1	3	3	2	
CO2	1	1	3	3	2		1	1	3	3	2	
CO3	1	1	3	3	2		1	1	3	3	2	
CO4	1	1	3	3	2		1	1	3	3	2	
CO5	1	1	1	3	2		1	1	1	3	2	

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2103	PLANT AND ANIMAL PHYSIOLOGY	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	**PLANT AND ANIMAL PHYSIOLOGY LAB**				

Catalog Description

Studying plant and animal physiology as part of a bachelor's degree can be both fascinating and foundational for understanding how living organisms function. The students will learn how plants convert light energy into chemical energy (glucose) and oxygen and will also learn about the fundamentals of plant-water relationship. In the animal physiology domain students will learn how animals acquire nutrients from food. They will also learn about the basics of cardiovascular system, the physiology of muscle contraction and how animals coordinate responses to stimuli through nervous impulses.

Course Objectives

The main objective of this course is to provide the knowledge about plant & animal physiology. This course will provide a robust foundation in biological sciences and the knowledge can be utilized for understanding real-world applications and current research in plant and animal physiology.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Recall fundamental plant and animal physiology processes.
- Identify the cellular mechanisms involved in the growth, development, and function of plants and animals.
- Illustrate the biochemical processes underlying the physiological functions in both plants and animals.
- Describe the process of energy acquisition, storage, and utilization processes in plants and animals, including photosynthesis, circulation, and digestion
- Correlate the structure of cells, tissues, organs, and systems with their physiological functions in both plants and animals.
- Analyse physiological processes and solve problems related to plant and animal physiology.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Plant water relationship, growth, and development Water Potential and its components, water absorption by roots, aquaporins, pathway of water movement, symplast, apoplast, transmembrane pathways, root pressure, guttation. Ascent of sap–cohesion-tension theory. Transpiration and factors affecting transpiration, antitranspirants, mechanism of stomatal movement. Phloem as the site of sugar translocation. Ion and solute transport. Mineral nutrition and deficiency. Plant growth regulators. Photoperiodism, flowering stimulus, florigen concept, vernalization, seed dormancy, phytochrome.	L1, L2, L3	8
Module II: Photosynthesis Discovery, photochemical reaction, LHCs, Photosystem, structure of chloroplast, pigments system, photophosphorylation, and carbon fixation pathways: C3, C4	L1, L2, L3, L4	7

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and CAM pathways. Photorespiration. Principle of limiting factors, factors affecting photosynthesis.		
Module III: Physiology of Digestive and Cardiovascular System Composition and function of saliva; Mechanical and chemical digestion; Functions of pancreatic juices and biles. Blood, Blood Groups and Blood Transfusion; Blood Clotting; Hemodynamics; Cardiac Cycle and its regulation	L1, L3, L4	8
Module IV: Physiology of Neuromuscular System Contraction and relaxation of muscle; Sarcomere; Cori's cycle. Organization of Nervous System; Neuron, nerve impulse; Synaptic Transmission; Neurotransmitters.	L1, L2, L3	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Guyton, A.C. and Hall, J.E. Textbook of Medical Physiology. XI Edition. Hercourt Asia PTE Ltd. / W.B. Saunders Company
- Tortora, G.J. and Grabowski, S. Principles of Anatomy & Physiology. XI Edition John Wiley & sons, Inc.
- Ganong, H, Review of Medial Physiology 14th edition, Appleton &Lange Publisher, New York
- Salisburry & Ross. Plant Physiology (2006)
- Taiz and Zeiger 3rd edition (2002) Plant physiology
- Robert M. Devlin, F.H. Witham (2004) Plant Physiology
- VK Jain Fundamentals of Plant Physiology, 20th Edition (2022) S Chand
- N. Arumugam, Annie Ragland, V. Kumaresan, College Botany: Plant Physiology Vol.-7, (2016) Saras Publication.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	CA	A	A/P	EE
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	--	--	--	--	--	1	--	--	--	--	--
CO2	1	1	--	--	--	--	1	1	--	--	--	--
CO3	1	1	--	--	--	--	1	1	--	--	--	--
CO4	1	2	--	1	2	--	1	2	--	1	2	--
CO5	1	3	1	--	2	1	1	3	1	--	2	1
CO6	1	3	1	--	2	1	1	3	1	--	2	1

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2104	PLANT AND ANIMAL PHYSIOLOGY LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**PLANT AND ANIMAL PHYSIOLOGY**				

Catalog Description

The course shall provide an understanding of the different physiological processes of plant and animal system in relation to its environment. Students will learn systematic planning and execution of different experiments to remember different concepts of plant water relation, growth and photosynthesis and animal systems.

Course Objectives

The main objective of this laboratory work is to introduce different tools to execute basic experiments of animal & plant physiology formulate and test hypotheses. Process and analyze observation data to present appropriate results. This will also provide students with the opportunity to prepare a research report**.**

Course Outcomes (COs):

On completion of this course, students should be able to:

- Independently carry out experiments in plant physiology to study transpiration, water transport and effect of hormones on plant development, analyse and interpret the experimental outcome.
- Apply thin-layer chromatography to separate natural products (e.g. photosynthetic pigments) from plants.
- Identify different types of blood cells, and enumerate the different cell types using appropriate techniques.
- Practically examine the effect of pH on enzyme activity (e.g. amylase)
- Conduct biochemical analyses of carbohydrates, proteins, and fats to explore the nutritional content and metabolic pathways in organisms.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Plant Physiology Structure of Stomata, Stomatal index and Palisade Ratio	L1, L2, L3	3
Module II: Plant Physiology To study plasmolysis, Ascent of sap, Osmosis & Imbibition pressure	L1, L2, L3	5
Module III: Plant Physiology Effects of plant growth hormones on rooting and shooting	L3, L4, L5	3
Module IV: Plant Physiology Separation of photosynthetic pigments through thin layer chromatography and estimation of different pigments in plants available locally	L1, L2, L3	4
Module V: Animal Physiology Enumeration of red blood cells using hemocytometer	L1, L2, L3	2
Module VI: Animal Physiology Enumeration of total and differential count of white blood cells	L1, L2, L3	4
Module VII: Animal Physiology Effect of pH on amylase activity from saliva	L1, L2, L3	4
Module VIII: Animal Physiology Biochemical analysis: carbohydrate, proteins and fats	L1, L2, L3	5

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**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Fundamentals Of Plant Physiology by VK Jain S Chand Publishing-Science
- Modern Practical Botany Volume–III Pandey B.P. S. Chand Publishing – Science Reprint-2021
- Practical manual of Comparative animal Physiology By Ravindra Kshirsagar 2017
- Biochemistry and physiology of animal with practical (paperback, B.D. Singh, Tripurari Mishra, R.K. Pandey) 2020 Ram Prasad Publication.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	1	2	3	2		1	1	2	3	2	
CO2	1	1	2	3	2		1	1	2	3	2	
CO3	1	1	2	3	2		1	1	2	3	2	
CO4	1	1	2	3	2		1	1	2	3	2	
CO5	1	1	2	3	2		1	1	2	3	2	

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SEMESTER-II

Course Code: DBTH2201	MICROBIOLOGY	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Biology				
Co-requisites	**DBTH2202 MICROBIOLOGY LAB**				

Catalog Description

Microbiology is aimed at introducing the world of microorganisms, including bacteria, viruses, fungi, and protozoa. This course covers the fundamental principles of microbiology, emphasizing microbial structure, function, metabolism, genetics, growth, control of microorganisms and ecology. Beginners of the course are rightly exposed to the foundation of microbiology, which would lead them towards progressive advancement of the subject as well as their applications in biotechnology and industry.

Course Objectives

To acquaint the students about the basics of microbiology, various techniques for their cultivation and control, and role of various microorganisms in different biotechnological applications.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Recall the landmark discoveries in Microbiology, and explain the different classifications of microorganisms
- Explain the evolutionary relationship between different microorganisms, and its significance in microbial taxonomy.
- Describe the key metabolic pathways in microorganisms; illustrate their significance in determining the nutrient requirement and growth of microorganisms.
- Explain the principles of microbial genetics and central dogma in microorganisms; illustrate the principles of positive and negative regulation of gene expression.
- Recognise the impact of microorganisms in ecological balance.
- Enlist and explain the ever-increasing list of applications of microorganisms in biotechnology agriculture, food production, and bioremediation.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to Microbiology Historical developments of microbiology scope of microbiology, Brief account of organization and classification of microorganisms. Differences between prokaryotic and eukaryotic cell. Overview of bacterial cell structure, (size, shape, arrangement membrane, cell wall, cytoplasmic inclusions, mesosomes, flagella and motility, slime, capsule, pili, chemotaxis, endospore) The brief account of fungi, structure, physiology and classification,brief account of virus (bacteriophages) structure, life cycle (lytic and lysogenic)	L1, L2	6
Module II: Evolutionary microbiology and microbial diversity Microbial evolution and systematics, prokaryotic diversity: bacteria and archea, eukaryotic microorganisms (structure of algae and fungi), microbial community analysis (overview), classical and molecular taxonomy. Virology: Viruses and	L1, L2	6

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virions, growth and quantification, viral replication, viroids and prions, Bacterial, plant and animal viruses		
Module III: Reproduction and Growth Life cycles of representative microorganisms including bacteria, fungi and viruses, population growth and its measurement, effect of environmental condition on growth pH, temp. aeration etc, continuous culture, diauxic, synchronous growth cultures and anaerobic cultures	L1, L2, L3	5
Module IV: Nutrition and Metabolism Modern concepts of bacterial nutrition, nutritional categories. Transport of nutrients (diffusion, active transport, group translocation) Introduction to oxidative and substrate level phosphorylations, brief account of metabolism of carbohydrates, EMP, ED, TCA and glyoxylate cycle and nucleic acids as building block in biosynthesis of cell constituents' synthesis of peptidogylcan polymer of cell wall	L1, L2	6
Module V: Microbial Genetics A general account of prokaryotic and eukaryotic genome, recombination, brief account of transformation, conjugation, transduction. concept of operon, induction, repression, catabolite repression. Control of Microorganisms: Control of microbes by physical and chemical agents. Antibiotics, properties and mode of action; Drug resistance and its significance. Antibiotic sensitivity test. Industrial uses of bacteria yeast & molds	L1, L2, L3	8
Module VI: Microbial Ecology Methods in microbial ecology (culture dependent and culture independent techniques), microbial habitats and nutrient cycling (Carbon, sulphur and nitrogen cycles), plant-microbes, animal-microbes' interactions. Soil microorganisms associated with vascular plants, bioremediation and biodegradation	L1, L2, L4	7
Module VII: Applied Microbiology Biocatalysts, microbial metabolites, wine production, single cell proteins, microbial transformation of steroids, role of microbes in food industry, production of dairy products (fermented milks and cheese), Role of microbes in Agriculture (biofertilizers, biopesticides), Wastewater treatment	L1, L2, L3	**7**

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Textbooks and References

- Tortora GJ, Funke BR and Case CL. (2008). Microbiology: An Introduction. 9th edition. Pearson Education
- Mara D. and Horan N. (2013). The Handbook of Water and Waste-Water Microbiology. (3rd edition) Academic CRC Press.
- Pelczar MJ, Chan ECS and Krieg NR. 2004 Microbiology. 7th edition. McGraw-Hill Book Company.
- McMillan. Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. (2005) General Microbiology. 6th edition
- Madigan MT Martinko. JM and Parker J Brock TD (2017). Biology of Microorganisms. (15th edition). Pearson.
- Holt, J.S., Kreig, N.R., Sneath, P.H.A and Williams, S.T. Bergey's Manual of Determinative Bacteriology (9th Edition), Williams and Wilkins, Baltimore.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	CA	A	A/P	EE
Weightage (%)	15	5	10	70

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CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1						1					
CO2	1	2	2				1	2	2			
CO3	1	1			2		1	1			2	
CO4	1	1			2		1	1			2	
CO5	1	2		1	2	3	1	2		1	2	3
CO6	1	2		1	2	3	1	2		1	2	3

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2202	MICROBIOLOGY LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**DBTH2201 MICROBIOLOGY**				

Catalog Description

This lab course complements the theory course Microbiology (DBLS 2401). This course will introduce the students to basic microbiology lab techniques including media preparation, sterile culture techniques and standard practices and procedures. The approaches are relevant in both basic (biomedical) research and industrial applications of microorganisms.

Course Objectives

This course aims to prepare the students to carry out standard microbiology lab experiments including culture-media preparation, sterilization and sterile lab techniques, isolation and culture of microorganisms from natural sources, microscopic characterization of microorganisms by standard staining procedures.

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

CO1: prepare culture media following sterile handling techniques, and sterilisation procedures.

CO2: Characterise bacterial and fungal strains using simple staining techniques, and by biochemical tests.

CO3: Estimate the rate of growth of microorganisms by preparing the Growth Curve using turbidometry technique

CO4: Isolate bacterial strains from natural sources (such as soil and water) and culture them

CO5: Recognise and explain the implications of biofilms in industry, environmental and health contexts.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Standard lab practices, sterilisation techniques, sterile handling techniques.	L1, L2, L3	4
Module II: Preprataion different types of culture media for bacterial culture	L1, L2, L3	4
Module III: Staining techniques: Simple staining, differential staining	L1, L2, L3	4
Module IV: Growth curve measurement of bacterial population by turbidometry.	L1, L2, L3, L4	4
Module V: Biochemical tests to identifies the microorganisms	L1, L2, L3	4
Module VI: Isolation and enrichment culture of microorganisms from natural sources (soil, water)	L1, L2, L3	4
Module VII: Biofilm formation of *Candida auris*: culture and characterization	L1, L2, L3	4

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Text Books

- Microbiology: A laboratory Manual, Seventh Edition, by: Cappuccino and Sherman
- Microbes in Action, Fourth Edition:by Harry W. Seeley, Cornell University; Paul J. Vandemark, late of Cornell University; John J. Lee

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	CA	A	A/P	EE
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	1	2				1	1	2			
CO2	1	1	2				1	1	2			
CO3	1	1	2				1	1	2			
CO4	1	1	2	3			1	1	2	3		
CO5	1	1	2	2	2	3	1	1	2	2	2	3

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2203	CELL BIOLOGY AND GENETICS	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	**DBTH2204 CELL BIOLOGY AND GENETICS LAB**				

Catalog Description

This course offers a comprehensive study of cell biology and genetics, providing students with a thorough understanding of cellular structure, function, and genetic principles. The curriculum covers the molecular and biochemical foundations of cell biology, including cell division, signaling, and the regulation of the cell cycle. Additionally, students will explore fundamentals of molecular genetics, principles of Mendelian inheritance, pedigree analysis in humans, and cancer genetics. The course emphasizes the integration of cell biology and genetics to understand cellular processes and genetic mechanisms

Course Objectives

This course aims to provide a foundational understanding of Cell Biology and Genetics. Students will explore the intricacies of cellular structures, delve into the principles of genetic inheritance, and unravel the molecular mechanisms governing life. By the end of the course, students will possess a comprehensive grasp of fundamental biological processes, from cell division to genetic expression, and be equipped with the knowledge to critically analyze and apply these concepts in diverse biological contexts. Students will also draw and analyse human pedigree charts. In addition, they will learn the basic of principles of cancer genetics, and familiarize with the different model organisms used in this field.

Course Outcomes (COs):

On successful completion of this course, students should be able to:

- Comprehend cellular structures and functions; describe the differences between prokaryotes and eukaryotes.
- Explain the function of the 4 classes of macromolecules (proteins, lipids, carbohydrates and nucleic acids) in the cell, with special emphasis on the structure and diverse functions of nucleic acids
- Explain the stages of cell division in mitosis and meiosis, and their significance. Comprehend the role of Cell cycle regulation mechanisms in regulating cell division.
- Understand the concepts of Mendelian genetics; comprehend the Mendelian principles in light of molecular genetics.
- Apply principles of inheritance in human genetics, draw pedigree charts, analyse the mode of inheritance, and make simple calculations to calculate the probability of inheritance of traits.
- Explain the different kinds of mutations that could predispose to or cause cancer.
- Explain the relevance of different model organisms used in genetics and cell biology research.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Cell is the fundamental unit of life Prokaryotic and eukaryotic cell structure; Overview of Cellular organelles and their functions; Plant cells vs. Animal cells; Haploid vs. Diploid cells, History of significant milestone discoveries in Cell Biology.	L1, L2, L3	5
Module II: Macromolecules as building blocks of cells	L1, L2, L3	5

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DNA is the genetic material, RNAs have diverse roles, Proteins are the work-horses of the cell, Lipid membranes maintain the integrity of cell and organellar structures, Carbohydrates have structural and energy storage functions.		
Module III: DNA as the genetic material Bacterial chromosome; Eukaryotic Chromosomes, Packaging of DNA into chromosomes	L1, L2	5
Module IV: Cell division Mitosis and Meiosis	L1, L2	4
Module V: Cell cycle and Regulation of Cell cycle Cell cycle check-points, eg. Regulation of M check point	L1, L2	5
Module VI: Cell-Cell communication Autocrine, Paracrine, Juxtacrine and Endocrine signalling, GPCRs and TRK signalling, Insulin signalling, Adrenaline signalling, Importance of signalling in different contexts of development and metabolism Intracellular Compartment and Protein Transport	L1, L2, L3	6
Module VII: Mendelian inheritance Monohybrid cross, Law of segregation, Dihybrid cross, Law of independent assortment, Test cross; Historical perspective: Chromosomal theory of inheritance, Dilemma on nature of genetic material: Protein or DNA; key experiments that lead to establishment of DNA as genetic material Extensions of Mendelian inheritance: (4 lectures) Linkage, Crossing over frequency and gene mapping, Gene interaction (Epistasis), Expressivity, Penetrance, Polygenic traits, Pleiotropic inheritance	L1, L2, L3, L4, , L5	6
Module VIII: Model organisms in Genetics Research Plant, Animal and Single Cell model organisms in Genetics research	L1, L2, L3	4
Module IX: Human genetics Pedigree and Pedigree analysis, Molecular basis of genetic diseases; Cancer genetics	L1, L2, L3, L4	5

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

1. Molecular Biology of the Cell
Authors: Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts, Peter Walter; 6th Edition; Publisher: Garland Science; Year: 2014; ISBN-13: 978-0815344322
2. Principles of Genetics
Authors**:** D. Peter Snustad, Michael J. Simmons; 6th Edition; Publisher: Wiley; 2015; ISBN-13: 978-1118125889

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

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CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	3					1	3				
CO2	1	3					1	3				
CO3	1	1	3				1	1	3			
CO4	1	1					1	1				
CO5	1	1					1	1				
CO6	1	3					1	3				
CO7	1	1	2	2			1	1	2	2		

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2204	CELL BIOLOGY AND GENETICS LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**DBTH2203 CELL BIOLOGY AND GENETICS**				

Catalog Description

This lab course complements the lectures, allowing students to gain hands-on experience with modern techniques in cell biology and genetics. This course is fundamental for students pursuing careers in biological sciences and biotechnology.

Course Objectives

This course aims to give the students hands on experience on various aspects of practical research in the fields of cell biology and genetics.

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

- Apply standardised experimental procedures to isolate cell organelles
- Observe and distinguish between different stages of cell division (both mitosis and meiosis)
- Draw pedigree chart based on available data, infer the mode of inheritance, and make probability based predictions on the inheritance
- Analyse published (FACS) results (on cell cycle arrest) and infer scientifically valid conclusions
- Extract useful pertinent information from OMIM
- Debate on the ethical considerations surrounding personal genome sequencing

Course Content:

Modules	Blooms level*	Number of hours
Module I: Chloroplast extraction from spinach leaf	**L1, L2, L3**	2
Module II: Mitosis & meiosis (observe prepared slides)	**L1, L2, L3**	2
Module III: Mitosis – onion root tip	**L1, L2, L3**	2
Module IV: Non-disjunction as cause of aneuploidy (case study based activity)	**L1, L2, L3, L4**	2
Module V: Pedigree analysis	**L1, L2, L3, L4**	4
Module VI: Analysis of FACS results in case of mutants in cell cycle regulation. (analysis of experimental data from publications).	**L1, L2, L3, L4**	2
Module VII: Case Study on cancer	**L1, L2, L3, L4**	4
Module VIII: OMIM (Online Mendelian Inheritance in Man) based inquiry into protein structure and genetic disease	**L1, L2, L3**	4
Module IX: Case study on ethical considerations in personal genome sequencing	**L1, L2, L3, L4**	4
Module X: Worm as a model organism	**L1, L2, L3, L4**	2

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**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References
Case Studies resource: **https://my.nsta.org/search?q=BIOLOGY&pt=Case+Studies**

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	1	1				1	1	1			
CO2	1	1					1	1				
CO3	1	1	1				1	1	1			
CO4	1	1	1				1	1	1			
CO5	1	1	1				1	1	1			
CO6	1	1	1	1			1	1	1	1		

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-III

Course Code: DBTH2351	BIOCHEMISTRY	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	**DBTH2352 BIOCHEMISTRY LAB**				

Catalog Description

This course aims to provide a comprehensive understanding of the biochemical principles that govern cellular processes. The course covers the chemical basis of life, focusing on the structure, function, and metabolism of biological molecules such as amino acids and proteins, nucleic acids, lipids, and carbohydrates.

Course Objectives

This course will cover the general properties of all biomolecules, their metabolism and practical approaches to study the same. This will provide a basic understanding of all the essential biochemical species necessary for life.

Course Outcomes (COs):

On completion of the course, the students will be able to:

- Explain the basic principles of biochemistry, and physical and chemical properties of all biomolecules.
- Describe how the biomolecules are metabolized.
- Relate how the structure of biomolecules influences their function and overall cellular homeostasis.
- Propose experiments for quantitative and qualitative analysis of biomolecules.
- Sketch the chemical structures of various biomolecules.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Basic principles • Mole concept, Properties of water; acids, bases and buffers; covalent and non-covalent interactions in biological systems; • Bioenergetics; General understanding of metabolic pathways and principles • Overview of Macromolecules: Proteins, Carbohydrates, Lipids & Nucleic acids – their building blocks, structure, diverse functions in biological system.	L2, L3, L4	4
Module II: Amino acids • Classification, chemical and physical properties • Transamination reaction • Biosynthesis and breakdown of amino acids using few representative examples. • Role of essential proteases and their target sites. • Urea cycle	L1, L2, L3	6
Module III: Proteins • Structural levels of proteins • Nature of peptide bond, phi and psi angles • Types of secondary structural elements - alpha helix, beta conformation, beta turns, Ramachandran plot and its importance • Enzymes: Introduction to kinetic and catalytic mechanisms; • Regulation of enzyme activity; types of enzyme inhibition.	L1, L2, L3, L6	10

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Module IV: Carbohydrates • Sugars and Polysaccharides • Carbohydrate metabolism: glycolysis and its regulation • Citric acid cycle and its regulation • Amphibolic nature of Citric acid cycle • Electron transport System • Oxidative phosphorylation and ATP production • Gluconeogenesis • Pentose phosphate pathway	L1, L4, L5	11
Module V: Lipids • Classification, structure and function • Lipids and biological membranes • Lipoproteins • Phospholipids • Sphingolipids • Glycolipids • Fatty acid metabolism: β-oxidation, biosynthesis and regulation; ketone bodies	L1, L2, L4	8
Module VI: Nucleic Acids • Nitrogenous bases • Nucleotides • Structure and properties of nucleic acids • Nucleotide Metabolism: metabolism of purines and pyrimidines	L1, L2	**6**

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Stryer, L. (2015). Biochemistry. (8th ed.) New York: Freeman.
- Lehninger, A. L. (2012). Principles of Biochemistry (6th ed.). New York, NY: Worth
- Voet, D., & Voet, J. G. (2016). Biochemistry (5th ed.). Hoboken, NJ: J. Wiley & Sons

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	2	--	--	--	1	1	2	--	--	--	1
CO2	1	2	--	--	--	--	1	2	--	--	--	--
CO3	1	2	3	--	2	2	1	2	3	--	2	2
CO4	1	1	1	2	2	1	1	1	1	2	2	1
CO5	1	1	3	--	--	--	1	1	3	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2352	BIOCHEMISTRY LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**DBTH2351 BIOCHEMISTRY**				

Catalog Description

This is a laboratory course focusing on the development of intermediate laboratory skills in modern biochemistry using the context of experiments examining biologically relevant molecules. This course is designed to foster skills in proper laboratory practice and record keeping, the use of biochemical instrumentation, the proper interpretation of experimental results, and the effective communication of the results through written reports. This course will provide both a theoretical and practical understanding of basic biochemical methods including the isolation, purification and characterization of proteins, lipids and DNA. Database applications for biotechnological applications will also be discussed.

Course Objectives

The laboratory experiments in Biochemistry would allow the students to get a practical exposure to the properties of biomolecules studied in the course.

Course Outcomes (COs):

CO1: At the end of the course, student will be able to detect, quantitate and analyse various biomolecules.
CO2: They will also learn the associated analytical tools required in the process.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Preparation of buffers useful for biological experiments	L1, L2, L3	4
Module II: Construction of standard plots using graph sheet and MS- Excel	L1, L2, L3	4
Module III: Detection of the presence of amino acids using Ninhydrin Test	L1, L2, L3	2
Module IV: Detection and quantitation of proteins using Bradford test	L1, L2, L3	4
Module V: Colorimetric detection of sugars (Molisch test, Fehling's test, Seliwanoff test)	L1, L2, L3	4
Module VI: Ethanol emulsion test to detect the presence of lipids	L1, L2, L3	4
Module VII: Biochemical estimation of DNA and RNA, Quantitative determination of DNA and RNA by UV spectrophotometer, Determination of purity of nucleic acids, Determination of melting temperature of DNA from thermal denaturation characteristics	L1, L2, L3	4

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

1. Practical book of Biochemistry by Plummer
2. Practical book of Biochemistry by S.K. Sawhney and Randhir Singh

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

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Examination Scheme:

Components	CA	A	A/P	EE
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	1	2				1	1	2			
CO2	1	1	2				1	1	2			

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2301	MOLECULAR BIOLOGY	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	**DBTH2302 MOLECULAR BIOLOGY LAB**				

Catalog Description

Molecular biology is the branch of Biology that deals with structure and function of macromolecules essential to life. A course in Molecular Biology should enable the students to understand how 1) the genetic material is passed on from one generation to the next and 2) how the genetic material is expressed and regulates the functioning of the cell.

Course Objectives

The objective of the course is to provide a clear understanding of the basic molecules inside the cell that govern the fundamental processes of life i.e. DNA, RNA and proteins. The structure of these molecules provides important clues to their functions. In addition, DNA being the genetic material in most organisms, studies regarding basic tools and techniques to manipulate it are covered in the syllabus. Strong foundation in molecular biology enables the students to familiarize themselves with basic mechanisms of genes, DNA replication and Gene expression in health and disease.

Course Outcomes (COs):

On completion of this course, students should be able to:

1. Understand and conceptualise the landmark discoveries in Molecular Biology, and their role in furthering our knowledge about the subject.
2. Explain the basic structure of biomolecules and the structure-function relationship within the cell and their role in bringing about the daily physiological functions.
3. Describe the key metabolic processes about their replication, gene expression and protein synthesis and illustrate the similarities and differences between the structure and function of DNA and RNA and their role in origin of life.
4. Explain the principle of central dogma in Molecular Biology; illustrate the principles of positive and negative regulation of gene expression.
5. Recognise the impact of gene mutations or changes in gene sequence and ways to repair them and their role in disease and evolution.
6. Enlist and explain the role of molecular biology in health, diagnostics, recombinant DNA technology, food production, and precision medicine.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Historical developments in genetics leading to evolution of molecular biology. Historical experiments that led to identification of DNA as the genetic material, structure of DNA and RNA, complimentarity, phosphodiester bond, different types of DNA, denaturation and reassociation.	**L1, L2, L3**	7
Module II: DNA replication, replication origin, theta structure, DNA polymerases, modes of replication, mechanism of replication in *E.coli*, synthesis of leading and lagging strands, DNA replication in eukaryotes. DNA repair, mutations, DNA damage, Photoreactivation, Base excision repair, mismatch repair, Nucleotide excision repair.	**L1, L2, L3**	8

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Module III: Genome organization in prokaryotes and eukaryotes, genes and pseudogenes, repeated sequences. Transposable elements – transposons, Chromosome structure: heterochromatin, euchromatin, histone proteins, histone code. Chromosomal rearrangements, aneuploidy, chromosomal human diosorders.	**L3, L4, L5**	6
Module IV: Transcription: Gene structure: promoter and coding sequences, regulatory and transcription units, RNA polymerases, basic mechanism of transcription (initiation, elongation and termination) in prokaryotes and eukaryotes, tRNAs, rRNA, microRNA and long noncoding RNA	**L3, L4, L5**	7
Module V: Deciphering the genetic code, Salient fatures of genetic code, Translation – initiation, elongation and termination, Regulation of gene expression, Prokaryotes negative and positive regulation, attenuation, Eukaryotes: Transcription factors, activators and enhancers.	**L3, L4, L5, L6**	7
Module VI: Molecular Biology Techniques: DNA footprinting, Radioactivity, Polymerase Chain reaction, Hybridization, siRNA, EMSA, CRISPR-CAS technique	**L1, L2, L3**	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Griffiths A.J.F, Wessler S.R, Carroll S.B and Doebley J. 2012. Introduction to Genetic Analysis. W.H. Freeman and Co., NewYork
- Snustad D.R and Simmons M.J. 2010. Principles of Genetics. John Wiley and Sons.
- Jocelyn E.K, Elliott S.G and Stephen T.K. 2011. Lewins Genes X. Jones and Barlett Pub., USA
- Watson J.D, Tania A.B, Stephen P.B, Alexander G, Michael L and Richard L. 2007. Molecular Biology of the Gene. Benjamin Cummings

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1						1					
CO2	1	2	2				1	2	2			
CO3	1	1			2		1	1			2	
CO4	1	1			2		1	1			2	
CO5	1	2		1	2	3	1	2		1	2	3
CO6	1	2		1	2	3	1	2		1	2	3

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2302	MOLECULAR BIOLOGY LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**DBTH2301 MOLECULAR BIOLOGY**				

Catalog Description

The laboratory course consists of Molecular Biology experiments organized in different learning modules and lectures relevant to the experiments. These provide hands on training and in-depth knowledge about methods like isolation, purification, and detection of recombinant DNA and proteins; polymerase chain reaction, its use in diagnosis, cloning and recombinant DNA technology, quantification of denatured DNA and gene expression analysis. The students will learn the basics of experimental design, data analysis, and presenting the report in the lab record book.

Course Objectives

The goal of this course is to familiarize students with Molecular Biology techniques so that they can get absorbed easily in research jobs.

Course Outcomes (COs):

- Acquire a working knowledge of methods in Molecular Biology.
- The student should be able to use standard laboratory equipment and methods frequently used in Molecular Biology research.
- Understand and be able to perform simple data analysis (including statistics) and interpret the results generated.
- To communicate their results in written and oral form.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Isolation of Genomic DNA from E. Coli.	**L1, L2, L3**	3
Module II: Qualitative analysis of Genomic DNA by Agarose Gel Electrophoresis	**L1, L2, L3**	2
Module III: Quantitative analysis of DNA by spectrophotometer	**L3, L4, L5**	2
Module IV: Isolation of Plasmid DNA	**L3, L4, L5**	3
Module V: Restriction enzyme digestion	**L3, L4, L5, L6**	3
Module VI: Competent cell preparation	**L1, L2, L3**	4
Module VII: PCR	**L1, L2, L3, L4**	4
Module VIII: Gel extraction of fragments	**L1, L2, L3**	3
Module IX: Ligation and cloning of insert	**L1, L2, L3, L4, L5**	3

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Module X: Transformation of E. coli cells	**L1, L2, L3, L4, L6**	3

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

1. Principles of Gene Manipulation and Genomics; Sandy B. Primrose, Richard Twyman; Blackwell Science Ltd. SBN:9781118653883, 1118653882
2. Molecular cloning: A laboratory manual, Joseph Sambrook, E. F. Fritsch, Tom Maniatis; Cold Spring Harbor Laboratory, Volumes 1-3.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	1	1				1	1	1			
CO2	1	1	1				1	1	1			
CO3	1	1	1		2	2	1	1	1		2	2
CO4	1	1			1	2	1	1			1	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-IV

Course Code: DBTH2401	RECOMBINANT DNA TECHNOLOGY	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	**RECOMBINANT DNA TECHNOLOGY LAB**				

Catalog Description

This course covers the fundamental principles and techniques of recombinant DNA technology. Topics include the functions and uses of various enzymes such as restriction endonucleases and reverse transcriptase (Module I); the use of different cloning and expression vectors, basic cloning strategies, and gene libraries (Module II); blotting techniques and hybridization methods (Module III); and the principles and applications of various PCR techniques (Module IV).

Course Objectives

A basic understanding of molecular techniques can be obtained through the course. The successful application of biotechnology largely depends on these advanced molecular techniques.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Understand and explain the functions and applications of key enzymes in recombinant DNA technology, including restriction endonucleases, methyltransferases, ligases, and reverse transcriptase.
- Describe various cloning and expression vectors, develop basic cloning strategies, and understand the construction and screening of gene libraries.
- Gain proficiency in blotting techniques and hybridization methods, including Southern, Northern, and Western blotting, using both radioactive and non-radioactive probes.
- Comprehend the principles of PCR, explore various types of PCR techniques, and understand their wide range of applications.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Restriction endonuclease, methyltransferase, ligase, polymerase, kinase, phosphatase, nuclease, transferase, reverse transcriptase.	L1, L2	10
Module II: Cloning vectors: Plasmids, bacteriophages (Lambda and M13), phagemids, cosmids, artificial chromosomes (YAC, BAC). Expression vectors (Bacteria and yeast); Basic cloning strategy and screening clones; Gene libraries	L1, L2	14
Module III: Blotting techniques and hybridization: Southern, Northern and Western blotting techniques. Radioactive and non-radioactive probes.	L1, L2	9
Module IV: Principles of PCR, types of PCRs and its applications	L1, L2, L3	12

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Principles of Gene Manipulation: An Introduction to Genetic Engineering, R.W. Old and S. B Primrose, Blackwell Science Inc.
- Recombinant DNA, J.D. Watson et al, W.H. Freeman and Company
- Molecular Biotechnology: Principles and Applications of Recombinant DNA, B.R. Grick and J.J. Pasternak, ASM Press

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- Molecular and Cellular Cells Methods in Biology and Medicine, P.B Kaufman, W. Wu, D. Kim and C.J. Cseke, CRC Press.
- Milestones in Biotechnology: Classic Papers on Genetic Engineering, J.A. Bavies and W.S. Reznikoff, Butterworth Heinemann
- Gene Expression Technology, D.V. Goeddel in Methods in Methods in Enzymology, Academic Press Inc.
- DNA Cloning: A Practical Approach, D.M. Glover and B.D. Hames, IRL Press.
- Molecular Cloning: A Laboratory Manual, J. Sambrook, E.F. Fritsch and T. Maniatis, Cold Spring HarborLaboratory Press.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	1	3				1	1	3			
CO2	1	1	3				1	1	3			
CO3	1	1	3				1	1	3			
CO4	1	1	3				1	1	3			

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2402	RECOMBINANT DNA TECHNOLOGY LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**RECOMBINANT DNA TECHNOLOGY**				

Catalog Description
This course aims to equip students with apply the theoretical knowledge gained in other courses to be translated into practical skills required to excel in the field of recombinant DNA technology and prepare them for advanced studies or careers in biotechnology and related disciplines.

Course Objectives
A basic hands-on training of simple molecular techniques can be obtained through the course. Many advanced application of biotechnology largely depends on these advanced molecular techniques.

Course Outcomes (COs):
On completion of this course, students should be able to:
- Learn the process of making competent *E. coli* cells using $CaCl_2$ to facilitate transformation.
- Transform competent cells with plasmids and understand the principles behind bacterial transformation.
- Master the technique of isolating plasmids from bacterial cells using the alkaline lysis method.
- Estimate DNA concentration and perform gel electrophoresis to analyze DNA samples.
- Gain hands-on experience in digesting DNA with restriction enzymes and interpreting the results.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Making of competent E coli cells using $CaCl_2$	L1, L2, L3	12
Module II: Transformation of competent cells with plasmids	L1, L2, L3, L4	12
Module III: Isolation of plasmids by alkaline lysis method.	L1, L2	12
Module IV: Estimation of DNA concentration and gel electrophoresis.	L2, L3, L4	12
Module V: Digestion of DNA using restriction enzymes.	**L2, L3**	12

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References
Molecular Cloning: A Laboratory Manual (Fourth Edition): Tom Maniatis and others, Cold Spring Harbour Press.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	CA	A	A/P	EE
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

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CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	1	1		2		1	1	1		2	
CO2	1	1	1		2		1	1	1		2	
CO3	1	1	1		2		1	1	1		2	
CO4	1	1	1		2		1	1	1		2	
CO5	1	1	1		2		1	1	1		2	

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2403	GENOMICS AND PROTEOMICS	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	**DBTH2404 GENOMICS AND PROTEOMICS LAB**				

Catalog Description

This comprehensive course offers an in-depth exploration of genomics and proteomics. It begins with an introduction to DNA structure and function, cells, chromosomes, and genetic inheritance. It covers the human genome, gene roles in health and disease, genetic mutations, DNA microarrays, and the Human Genome Project. The societal impact and ethical considerations of genomics, genetic testing, and personalized medicine are discussed. The course also delves into the world of proteins, their functions, and the techniques used to study them, such as 2D gel electrophoresis and mass spectrometry. Additionally, it explores proteomics' role in disease diagnosis, drug development, and personalized medicine.

Course Objectives

The course helps in developing a detailed understanding of eukaryotic genome complexity and organization. Current research on the molecular basis of the control of gene expression in eukaryotic system has developed a detailed understanding of techniques of gene diagnostics and DNA profile to acquire the fundamentals of genomics and Proteomics.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Understand the basics of DNA structure and genetic inheritance.
- Analyze the human genome and its role in health and disease.
- Explore ethical considerations and societal impacts of genomics.
- Learn knowledge of protein functions and metabolic processes.
- Understand techniques such as PCR, DNA microarrays, and mass spectrometry.
- Apply proteomics in disease diagnosis and personalized medicine.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to Genomics: Understand the basics of genomics and the structure of DNA. What is DNA? – Structure and Function, Cells and Chromosomes – Building Blocks of Life, Introduction to Genetic Inheritance – How Traits Are Passed On, Real-Time PCR and Its Application in Genomics.	**L1, L2, L3**	7
Module II: Exploring the Human Genome: Origin of genomes, Human genome and the role genes play in health and disease. Mapping the Human Genome – An Overview, Genes and Their Role in Disease, Genetic Mutations and Variation, DNA Microarrays: An Introduction to Genomic Expression Analysis, Introduction to molecular markers-RFLP, RAPD, AFLP, SSRs, DNA fingerprinting, Human Genome Project.	**L1, L2, L3**	8
Module III: Genomics in Society: Discuss the impact of genomics on society and the ethical considerations. Genetic Testing and Personalized Medicine, Ethics of Genetic Modification and CRISPR, siRNA and miRNA: Small RNAs with Big Roles in Gene Regulation,	**L1, L2**	8

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Chromatin Immunoprecipitation (ChIP): Connecting DNA and Protein Interactions.		
Module IV: Introduction to Proteomics: Introduce the world of proteins and their functions in the body. Proteins and Their Functions, From DNA to Protein – Transcription and Translation, Enzymes and Metabolism, Protein Separation Techniques: Diving into 2D Gel Electrophoresis	**L1, L2**	8
Module V: Techniques in Proteomics: Explore how scientists study proteins and their structures. Protein Structure and Function, Introduction to Mass Spectrometry and Protein Sequencing, Protein Interactions and Pathways, Mass Spectrometry in Proteomics: The Mass Spec Revolution, Post-Translational Modifications: Beyond the Genetic Code.	**L1, L2, L3**	8
Module VI: Proteomics in Health and Disease: Understand the role of proteomics in diagnosing and treating diseases. Biomarkers and Disease Diagnosis, Drug Design and Development, Personalized Medicine and Proteomics, Protein-Protein Interactions: Networking in the Cell, Protein Microarrays and Their Applications in Proteome Analysis.	**L1, L2**	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Bioinformatics: A practical guide to the analysis of genes and proteins, A.D. Baxevanis and B.F.F. Ouellette, John Wiley and Sons Inc.
- Bioinformatics: From Genomes to Drugs, T. Lengauer, John Wiley and Sons Inc
- Bioinformatics: Sequence and Genome Analysis, D.W. Mount, Cold Spring Harbor Laboratory Press
- Genomes II, T.A. Brown
- A Primer of Genome Science, Greg Gibson and Spencer V. Muse
- Database Annotation in Molecular Biology : Principles and Practice, Arthur M. Lesk
- DNA: Structure and Function, Richard R. Sinden
- Recombinant DNA (Second Edition), James D. Watson and Mark Zoller
- Gene Cloning and DNA Analysis – An introduction (Fourth Edition), T.A. Brown
- Genes & Genomes, Maxine Singer and Paul Berg
- Essential of Genomics and Bioinformatics, C.W. Sensen, John Wiley and Sons Inc.
- Proteomics, T. Palzkill, Kluwer Academic Publishers

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1						1					
CO2	1			1			1			1		
CO3	1						1					
CO4	1						1					
CO5	1	2	2				1	2	2			
CO6	1						1					

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2404	GENOMICS AND PROTEOMICS LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**DBTH2403 GENOMICS AND PROTEOMICS**				

Catalog Description

This course equips students with practical skills in computational genomics and structural proteomics. It covers the use of bioinformatics tools for DNA sequence analysis, genetic variation identification, and mutation impact prediction. Students will learn to navigate genomic sequences using BLAST, search SNP databases, and utilize genome browsers. The course also delves into protein structure analysis through the Protein Data Bank, visualization with UCSF Chimera, and examination of protein domains and active sites. By understanding the structural effects of mutations, students will gain insights into the functional implications for proteins, enhancing their ability to apply these techniques in research and clinical settings.

Course Objectives

The course helps in developing a detailed understanding of practical skills in laboratory techniques commonly used in genomics and proteomics research.

Course Outcomes (COs):

On completion of this course, students should be able to:

1. Master bioinformatics tools for DNA sequence analysis and genetic variation identification.
2. Predict the impact of genetic mutations on protein function using computational tools.
3. Analyze and visualize protein structures, understanding their functional implications.
4. Explore the structural effects of mutations on proteins and their consequences for disease and therapy.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Computational Genomics Fundamentals **Objective:** Gain hands-on experience with bioinformatics tools to analyze DNA sequences and identify genetic variations. • **BLAST:** Navigating Genomic Sequences - Learn to use BLAST for sequence alignment and identifying gene families, • **Genetic Variation and Disease -** Use databases to search for SNPs and understand their clinical significance, • **Mutation Impact Prediction -** Apply tools like SIFT or PolyPhen to analyze the effects of mutations on protein function, • **Genome Browsers: Windows into Genomic Data** - Get acquainted with tools such as UCSC Genome Browser for in-depth genomic data analysis.	**L1, L2, L3, L4**	15
Module II: Structural Proteomics Analysis **Objective:** Explore protein structure and function through computational analysis and visualization techniques. • **Protein Data Bank (PDB):** The Repository of Protein Structures - Learn to retrieve and analyze protein structures from PDB, • **UCSF Chimera: Visualizing Protein Complexes** - Use UCSF Chimera for protein visualization to study structure-function relationships, • **Protein Domains and Active Sites -** Investigate how proteins perform their functions by examining their active sites and domains,	**L1, L2, L3, L4**	15

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• **Structural Effects of Mutations -** Explore how mutations can alter protein structure and the consequences for protein function		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

1. Bioinformatics: Sequence and Genome Analysis, D.W. Mount, Cold Spring Harbor Laboratory Press

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	1	2				1	1	2			
CO2	1	1	2				1	1	2			
CO3	1	1	2				1	1	2			
CO4	1	1	2				1	1	2			

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-V

Course Code: DBTH2501	PLANT AND ANIMAL BIOTECHNOLOGY	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	**PLANT AND ANIMAL BIOTECHNOLOGY LAB**				

Catalog Description

This course provides an in-depth exploration of the principles and applications of biotechnology in plants and animals. The course covers genetic engineering techniques, tissue culture, molecular markers, and the role of biotechnology in agriculture, medicine, and industry.

Course Objectives

A basic understanding of molecular techniques in plant and animal biotechnology can be obtained through the course. This course will also familiarize students with recent developments in the field of biotechnology.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Understand and explain the principles and applications of totipotency, plant tissue culture, and in vitro germplasm conservation techniques.
- Analyze the production of secondary metabolites, the development of transgenic plants, and the industrial importance of plant products.
- Evaluate different methods of gene transfer in plants and examine recent advancements in agricultural genetic engineering.
- Cultivate animal cell cultures, understanding media composition, growth kinetics, and techniques for cryopreservation and product development.
- Apply techniques of in vitro fertilization, embryo transfer, and somatic cell hybridization, including hybridoma technology.
- Utilize advanced animal genetic engineering techniques, including gene transfer methods, cloning, and the creation of transgenic and knock-out/knock-in animals.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Totipotency; Regeneration of plants; Plant growth regulators and elicitors; Tissue culture and Cell suspension culture system: methodology, kinetics of growth and, nutrient optimization. Tissue culture and its application, Micropropagation. Meristem culture and production of virus-free plants. Anther and microspore culture. Embryo and ovary culture. Protoplast isolation. Protoplast fusion-somatic hybrids, cybrid. Somaclones, Synthetic seeds. In vitro germplasm conservation.	**L1, L2**	8
Module II: Production of secondary metabolites by plant suspension cultures; Hairy root culture; transgenic plants; Plant products of industrial importance	**L1, L2**	7
Module III: Methods of gene transfer in plants. Achievements and recent developments of genetic engineering in agriculture.	**L3, L4**	7
Module IV: Animal cell culture; Culture media composition and growth conditions; Anchorage and non-anchorage dependent cell culture; Micro & macro-carrier culture; Kinetics of cell growth; Cryopreservation techniques; Cell culture products.	**L1, L2**	8

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Module V: In vitro fertilization and embryo transfer; Somatic cell hybridization, hybridoma technology	**L1, L2**	7
Module VI: Animal genetic engineering – vectors; Gene transfer methods - microinjection, virus mediated and other methods of gene transfer; Animal cloning; Transgenic animals with new traits; Knock-out and knock-in animals.	**L1, L2, L3**	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Plant Biotechnology: The Genetic Manipulation of Plants. A. Slater, N. W. Scott and M. R. Fower.2008. Oxford University Press
- Recent Advances in Plant Biotechnology: AraKirakosyan and Peter B. Kaufan. 2009. Springer
- An Introduction to Plant Tissue Culture. M.K. Razdan. Oxford and IBH Publishing**.**
- Culture of animal cells: A manual of basic technique and specialized applications. R. Ian Freshney. – 6th Edition. John Wiley & Sons, Inc., Hoboken, New Jersey.
- Comprehensive Biotechnology, Moo-Young, Alan T. Bullm Howard Dalton, Oxford: Pergamon Press.
- Gene Cloning & DNA Analysis: An Introduction. T. A. Brown. 8th Edition. Wiley Blackwell
- Principles of Gene Manipulation and Genomics. S. B. Primrose & R. M. Twyman. Blackwell Publication.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	2	3				1	2	3			
CO2	1	2	3				1	2	3			
CO3	1	2	3				1	2	3			
CO4	1	2	3				1	2	3			
CO5	1	2	3	3	3		1	2	3	3	3	
CO6	1	2	3	3	3		1	2	3	3	3	

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2502	PLANT AND ANIMAL BIOTECHNOLOGY LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**PLANT AND ANIMAL BIOTECHNOLOGY**				

Catalog Description

This course is designed to gain practical experience in the laboratory, emphasizing the development and application of biotechnological tools for improving plant and animal species. This course aims to equip students with the knowledge and practical skills necessary for careers or further studies in plant and animal biotechnology, with a strong emphasis on both scientific and ethical aspects of the field.

Course Objectives

A basic understanding of molecular techniques in plant and animal biotechnology can be obtained through the course. This course will also familiarize students with recent developments in the field of biotechnology.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Demonstrate proficiency in sterilization techniques, preparation of culture media, and inoculation of plant explants.
- Develop skills in culturing plant embryos and seeds, callus culture, and testing seed viability.
- Prepare animal cell culture media, monitor cell doubling time, and assess cell viability using the Trypan blue assay.
- Quantify peroxidase from animal tissue and isolate DNA from animal tissue, applying essential biochemical techniques.
- Understand and logically debate on the ethical issues involved in genetic manipulation of plants and animals.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Sterilization techniques of glass wares & equipments. Preparation of cotton plugs & culture media . Preparation and sterilization of different explants. Inoculation of explants on culture media.	**L1, L2, L3**	8
Module II: Culture of plant embryos/seeds. Callus culture. Testing of seed viability.	**L1, L2, L3**	7
Module III: Preparation of animal cell culture media and monitoring doubling time of cells. Trypsinization of anchorage dependent cells. Trypan blue assay for checking cell viability.	**L1, L2**	8
Module IV: Quantification of peroxidase from animal tissue. Isolation of DNA from animal tissue.	**L1, L2**	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Text Books and References

- Molecular Cloning: A Laboratory Manual (Fourth Edition): Tom Maniatis and others, Cold Spring Harbour Press.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	CA	A	A/P	EE
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	1	3				1	1	3			
CO2	1	1	3				1	1	3			
CO3	1	1	3				1	1	3			
CO4	1	1	3				1	1	3			
CO5	1	1	3	3	1	2	1	1	3	3	1	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2503	INTRODUCTION TO IMMUNOLOGY	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	**DBTH2504 INTRODUCTION TO IMMUNOLOGY LAB**				

Catalog Description

This course explores the role of the basics of physiological defense mechanism, it teaches the learner to identify and investigate different immunological barriers and components of physiology that work at different level of exposure to infections. Introductory immunology course in the biotechnology landscape, leads students in building knowledge to understand the biology of disease and defense mechanism to counter different physiological adversities. The course is theoretically driven and delivers the concepts related to immune components, mechanism of immune action, disease detection and immunological therapies all under one umbrella. Students then use that knowledge to analyze and present their study in detection, sensing, and designing cures for disease management and medical biotechnology in the future.

Course Objectives

The course aims to provide students with a foundational knowledge of immunology, its importance in human health, and its relevance in various aspects of biology and medicine. Role of antibody engineering in biomedical applications and the importance of immune detection in disease processes, tissue transplantation and immune therapies. regulations are some of the areas of attributes of this course which can help the students to understand the biotechnology related to human kind.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Recall the history of immunology. Explain the cells and organs of immune system evolutionarily contributing in developing defence mechanism.
- Describe the structure, classification and physico-chemical features of antigen and antibody.
- Explain the key mechanistic pathways to establish antigen-antibody reactions, antigen processing and presentation and regulation of immune response.
- Explain the processes involving immune disorders. Illustrate the mechanism of action in developing autoimmune, hypersensitive and immune compromised physiological situations.
- Recognise varied immune responses like active, passive, cell mediated and humoral immune-actions. Recognise the mechanism and significance of complement activation, amplification and attack mechanism.
- Enlist and explain ever increasing advancement in the field of immunotherapy. Elaborate the technology of Monoclonal antibody production, organ and tissue Transplantation, Cancer immunology, Vaccine biology and graft vs host rejection.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Historical perspective of immune system and immunity, innate and specific immunity, humoral immunity, cell-mediated immunity	L1, L2	7
Module II: Antibody structure in relation to function and antigen-binding, types of antibodies and their structures: isotypes, allotypes, idiotypes, genetic basis of antibody diversity, synthesis of antibody and secretion	L1, L2	7
Module III: The organs and cells of the immune system, histocompatibility: structure of MHC class I, II & III antigens & their mode of antigen presentation, MHC restriction, antigens & antigenicity	L1, L2, L3	7

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Module IV: Antigen-antibody reaction, measurement of antigen – antibody interaction: agglutination, immunodiffusion, immuno-electrophoresis, ELISA, RIE, production of monoclonal antibodies	L1, L2, L3, L4	8
Module V: Regulation of immune response, immune tolerance, complement system, autoimmunity, hypersensitivity, graft versus host reaction	L1, L2, L3, L4	8
Module V1: Hybridoma technology, introduction to transplantation immunology, introduction to cancer immunology, vaccines (attenuated and recombinant)	L1, L2, L3	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books & References

- Kuby Immunology, R.A. Goldsby, T.J. Kindt, and B.A. Osborne, Freeman
- Immunology, Roitt, Mosby – Yearbook Inc.
- Basic Immunology, A.K. Abbas and A.H. Lichtman, Saunders W.B. Company
- Fundamentals of Immunology, W. Paul, Lippincott Williams and Wilkins
- Immunology, W.L. Anderson, Fence Creek Publishing (Blackwell).
- Immunology: A Short Course, E. Benjamin, R. Coico and G. Sunshine, Wiley-Leiss Inc.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	2					1	2				
CO2	1	2					1	2				
CO3	1	2					1	2				
CO4	1	2					1	2				
CO5	1	2		2			1	2		2		
CO6	1	2		2	3	3	1	2		2	3	3

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2504	INTRODUCTION TO IMMUNOLOGY LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**DBTH2503 INTRODUCTION TO IMMUNOLOGY**				

Catalog Description

This course explores the role of theoretical knowledge from the Introductory immunology course to corelate with lab-based observation, ideation and application. This course teaches the learner to observe and investigate different immune-components and immune assays in hand. The course is driven wet lab-based, as it delivers the concepts related to the morphology of different cells and components of immune system and explores immune assays to detect abnormal physiological situations. Students then use that knowledge to detect basic differences between blood parameter oriented normal and diseased situations and develop technologies that improvise the therapeutic aspect analytically.

Course Objectives

The course aims to provide students with hands-on experience in laboratory techniques and procedures commonly used in immunology research. It will help students gain a deeper understanding of fundamental immunological concepts and principles and design experiments, plan protocols, and troubleshoot issues that may arise during laboratory work.

Course Outcomes (COs):

After the completion of this course students will be able to:

- Determine the various ways to make buffers and stain compositions of biological interest and their significance.
- Isolate blood cells, prepare blood film, identify the RBCs and WBCs morphology.
- Detect and confirm antigen-antibody reaction for microbial infection.
- Draw standard calibration curve of known concentration Vs Absorbance and from that they can determine the product released from the graph.
- Explain the relationship between different antigen concentration and epitope pattern in relation to antibody reaction on semisolid matrices.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Blood film preparation and identification of blood cells.	L1, L2, L3	2
Module II: Determination of the blood group and Rh factor of an individual.	L1, L2, L3	2
Module III: Separation of lymphocytes from human blood using density gradient media	L1, L2, L3	3
Module IV: WIDAL Test	L1, L2, L3	3
Module V: Radial immuno diffusion test, Ouchterlony double diffusion test	L1, L2, L3 L4, L5	3

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Module VI: Dot ELISA, Sandwich ELISA	L3, L4, L5	3

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Practical Immunology by Frank C. Hay, and Olwyn MR. Westwood.
- Immunology Lab, Biology 477, Lab Manual by J Jameson.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO4**	**PSO5**
CO1	1	1	2	3			1	1	2	2		
CO2	1	1	2	3			1	1	2	2		
CO3	1	1	2	3			1	1	2	2		
CO4	1	1					1	1				
CO5	1	1	2	3			1	1	2	3		

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2505	COMPUTATIONAL BIOLOGY AND MOLECULAR MODELLING	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	**COMPUTATIONAL BIOLOGY AND MOLECULAR MODELING LAB**				

Catalog Description

"Computational Biology and Molecular Modeling" introduces the fundamentals of bioinformatics and its applications in biology and medicine. The course covers biological databases, sequence data extraction, and analysis, phylogenetic analysis methods, protein structure prediction, and protein modeling techniques. Students will gain hands-on experience with tools and software for sequence alignment, gene prediction, and tree creation, equipping them with essential skills for computational biology research and applications.

Course Objectives

The objectives of this course are to build upon undergraduate level knowledge of bioinformatics principles with specific emphasis on biological data and its analysis. The course shall make the students aware of various biological databases and biological software within the context of each topic.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Understand the basics of bioinformatics, the relationship to the Human Genome Project, and utilize various biological databases such as NCBI, EBI, DDBJ, and PDB.
- Extract nucleotide and protein sequence data, understand sequence formats, submit biological data to databases, and perform sequence analysis using alignment tools and gene prediction techniques.
- Create and interpret different types of phylogenetic trees using character and distance-based methods, validate trees, and understand the processes involved in phylogenetic analysis.
- Predict protein secondary and tertiary structures, analyze these structures, and utilize protein structure visualization tools, including the creation and interpretation of Ramachandran plots.
- Understand the principles of protein modeling, including energy minimization, force field methods, and use software tools to model protein structures, focusing on aspects such as buried residues, side chains, and hydrogen bonds.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to Bioinformatic/computational biology: Bioinformatics basics; relation to Human Genome project, Computers in biology and medicine; Biological Databases- Protein and nucleic acid databases; Structural databases; Literature database; resources at NCBI; resources at EBI; resources at DDBJ, resources at PDB.	**L1, L2, L3**	8
Module II: Nucleotide and Protein sequence data extraction; Genbank format; sequence data format; submission of biological data to respective databases. Sequence analysis: sequence alignment; pairwise and multiple sequence alignment; ORFs, BLAST tools and types, motif discovery and gene prediction; Tools to perform sequence analysis.	**L1, L2, L3**	8
Module III: Phylogenetic analysis: Introduction; type of trees-cladogram, phylogram, dendrogram, additive and non-additive trees; methods of	**L3, L4, L5**	9

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phylogenetic analysis- character and distance-based methods; Simple method for tree creation UPGMA, Clustalw/x, tree validation process; bootstrap.		
Module IV: Protein structure prediction: protein secondary structure prediction: secondary structure prediction; analyzing secondary structures; Protein tertiary structure prediction; homology modeling; Protein structure visualization tools. Ramachandran Plot	**L1, L2, L3**	9
Module V: Protein modelling: introduction; energy, buried and exposed residues; side chains; fixed regions; hydrogen bonds; conformational states; energy minimization; force field methods; software's used for protein modeling.	**L1, L2, L3**	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Computer Science, J.G. Brookshear, Pearson, Addison Wesley
- Introduction to Bioinformation – T.Attawood
- John Essentials of Genomics and Bioinformatics, C.W. Sensen Wiley and Sons
- Bioinformatics: Sequence and Genome Analysis, D.W. Mount, Cold Spring Harbor Laboratory Press
- Algorithms on Strings, Trees, and Sequences: Computer Science and Computational Biology, D. Gusfield, Cambridge University Press
- Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins, A.D. Baxevanis and B.F.F Quellette, Wiley – interscience
- Bioinforamtics: Sequence and Genome Analysis, D.W. Mount, Cold Spring Harbor Laboratory Press.
- Sequence Analysis in Molecular Biology: Treasure Trove or Trivial Pursuit, G. Von Heijne and G. Von Heijne, Academic Press.
- Structural Bioinformatics, Philip E. Bourne, Helge Weissig 2003.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1						1					
CO2	1	1					1	1				
CO3	1	1					1	1				
CO4	1	1					1	1				
CO5	1	--					1					

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2506	COMPUTATIONAL BIOLOGY AND MOLECULAR MODELING LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**COMPUTATIONAL BIOLOGY AND MOLECULAR MODELING**				

Catalog Description

This lab course provides hands-on experience with essential bioinformatics tools and techniques. Students will learn to navigate biological databases (NCBI, Uniprot, EMBL), extract data (Genbank, UniProt, PDB), and perform sequence alignments (BLAST, ClustalW). The course also covers phylogenetic analyses, gene prediction methods (GRAIL, Genscan, Glimmer), protein family databases (SCOP, CATH, Pfam), and tools for protein structure visualization, prediction, and validation using Ramachandran plots.

Course Objectives

The objectives of this course are to build upon undergraduate level knowledge of bioinformatics principles with specific emphasis on biological data and its analysis. The course shall make the students aware of various biological databases and biological software within the context of each topic.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Proficiently navigate and utilize various biological databases such as NCBI, Uniprot, and EMBL to extract relevant biological data.
- Perform pairwise sequence alignment using BLAST and multiple sequence alignment using clustalw, enabling them to compare protein and nucleotide sequences effectively.
- Conduct phylogenetic analyses of protein and nucleotide sequences to understand evolutionary relationships.
- Apply gene prediction methods such as GRAIL, Genscan, and Glimmer to identify genes within a given DNA sequence.
- Utilize different protein family databases (SCOP, CATH, Pfam) and visualization tools to analyze and visualize 2D and 3D protein structures.
- Predict secondary and tertiary protein structures using specialized tools and validate these structures using Ramachandran plots, ensuring accurate structural modeling.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to use of Biological database - Using NCBI and Uniprot web resources.	**L1, L2, L3**	4
Module II: Introduction and use of various databases- NCBI, EMBL	**L1, L2, L3**	2
Module III: Extraction of biological data using resources: Genbank, UniProt, PDB	**L3, L4, L5**	2
Module IV: Pairwise sequence alignment-BLAST	**L1, L2, L3**	2
Module V:. Multiple sequence alignment-ClustalW.	**L1, L2, L3**	2
Module VI: Phylogenetic analyses of protein and nucleotide sequences	**L1, L2, L3**	2

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Module VII: Use of gene prediction methods (GRAIL, Genscan, Glimmer).	**L1, L2, L3**	2
Module VIII: Use of different protein family databases (SCOP, CATH, Pfam).	**L1, L2, L3**	2
Module IX: Use of visualization tools – 2D and 3D protein structure	**L1, L2, L3**	2
Module X: Use of tools for secondary structure prediction	**L1, L2, L3**	2
Module XI: Use of tools for tertiary structure prediction	**L1, L2, L3**	2
Module XII: Structure validation using Ramachandran plot	**L1, L2, L3**	2

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Introduction to Bioinformation – T.Attawood
- John Essentials of Genomics and Bioinformatics, C.W. Sensen Wiley and Sons
- Bioinformatics: Sequence and Genome Analysis, D.W. Mount, Cold Spring Harbor Laboratory Press
- Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins, A.D. Baxevanis and B.F.F Quellette, Wiley – interscience
- Bioinforamtics: Sequence and Genome Analysis, D.W. Mount, Cold Spring Harbor Laboratory Press.
- Structural Bioinformatics, Philip E. Bourne, Helge Weissig 2003.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	1					1	1				
CO2	1	1					1	1				
CO3	1	1					1	1				
CO4	1	1					1	1				
CO5	1	1					1	1				
CO6	1	1					1	1				

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2507	BIOETHICS, BIOSAFETY AND IPR	L	T	P	C
Version	2023	4	0	0	4
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description

The focus of the course is to recognize, learn and understand the role intellectual property rights (IPR) and its implications in biotechnology sector. The students are intended to learn about the concept of biosafety and bioethics role in domain. This course will make the student gain the knowledge about the ethical implication of biological process and products with recombinant DNA guidelines. The students will practice the GLP and follow guidelines for research involving Transgenic, cloning and new BT technologies.

Course Objectives

This course aims to equip students with a comprehensive understanding of bioethical principles, biosafety practices, and intellectual property rights (IPR) in biotechnology. Students will explore ethical issues in biotechnology and biomedical research, learn to implement biosafety measures, understand IPR and regulatory frameworks (laid down by WIPO), and develop critical thinking skills through case studies. This course prepares students to navigate ethical, safety, and legal challenges in scientific research and innovation.

Course Outcomes (COs):

- Enunciate the fundamental principles of bioethics, including ethical theories and frameworks, and apply them to various biological and biomedical scenarios.
- Acquire knowledge of biosafety levels, guidelines, and practices, and learn to implement appropriate safety measures in biological research and laboratory settings.
- Analyze and discuss ethical issues related to biotechnology and biomedical research, such as genetic engineering, cloning, stem cell research, and human experimentation.
- Discuss the basics of intellectual property rights (IPR) in the context of biotechnology, including patents, trademarks, copyrights, and trade secrets.
- Recognize the national and international regulatory frameworks (WIPO) governing biosafety, bioethics, and IPR, and understand the importance of compliance in research and commercialization.
- Develop critical thinking and decision-making skills by analyzing real-world case studies related to bioethics, biosafety, and IPR, and learn to navigate complex ethical dilemmas in the field of biotechnology.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to Bioethics • Overview of bioethics principles; • Historical perspectives on ethical issues in biotechnology; • Emerging ethical issues in genetic research, gene editing, cloning, and stem cell research, Human and animal experimentation, animal rights/welfare, • Informed consent and human subjects research; • Agricultural biotechnology: genetically engineered food, environmental risks, labelling, and public opinion	**L1, L2, L3**	7

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Module II: Biosafety and Laboratory Practices • Concept of biosafety: Role of WHO • Risk groups (RG 1, 2, 3, 4) Biosafety levels (BSL-1, BSL-2, BSL-3, BSL-4) and biological safety cabinets classes, lab design and rules • Primary and Secondary containment for biohazards; GRAS organisms; Biohazard sign, Lab safety, Role of Biosafety Officer. • Recommended biosafety levels for infectious agents and infected animals • Definition of GMOs & LMOs; Indian recombinant DNA guidelines. • Environmental risk assessment and food/feed safety assessment of transgenic crops; Principles of safety assessment of transgenic plants: risk assessment steps, concepts of familiarity and substantial equivalence	**L1, L2, L3, L4**	7
Module III Regulatory Frameworks and Policy: • Overview of regulatory bodies in biotechnology at international, national, regional, and institutional levels. • Biosecurity considerations and international agreements (Cartagena protocol, OECD consensus documents, Codex Alimentarius) • Indian regulations (EPA act and rules, RCGM, GEAC, IBSC, Biotechnology Regulatory Authority of India draft bill) • GM labelling and Food Safety and Standards Authority of India (FSSAI) • OECD- GLP and its international status and MAD agreement. • Biosafety Management: The key to the environmental responsible use of biotechnology	**L2, L3, L4, L5**	7
Module IV: Intellectual Property Rights (IPR) and WIPO • Introduction to intellectual property (IP): patents, trademarks, copyrights, industrial design, traditional knowledge, geographical indications, design, plant breeders right (PBR) and layout of IC design, Trade secrets. • Historical context of GATT, WTO, WIPO, and TRIPS • Protection of new GMOs; IP's role in R&D • Plant variety protection and farmers' rights act • Patent databases and country-wise patent searches (USPTO, EPO, India) • Case studies	**L1, L3, L4, L5**	7
Module V: Patenting: • Basics of patents: types of patents; Indian Basics of patents: types, Indian Patent Act 1970, recent amendments • WIPO Treaties, Budapest Treaty, Patent Cooperation Treaty (PCT) • Patent application procedures and filing system • Precautions before patenting, patent application forms and guidelines, fee structures, time frames • Types of patent applications: provisional and complete specifications, PCT and conventional patent applications • International patenting requirements and procedures; financial assistance for patenting, Publication of patents and patent infringement.	**L1, L3, L4, L5, L6**	7
Module VI: Commercialisation of IP: • Licensing and royalty management • Patenting by research students and scientists: university/organizational rules • Collaborative research: IP management, benefit/credit sharing, commercial and non-commercial incentives; • Case studies on national and international BT products and processes.	**L4, L5, L6**	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Textbooks and References

- Biotechnology – Progress and Prospects. by SM Paul Khurana & Machiavelli Singh, Studium Press.
- Brahmi P, Saxena S, Dhillon BS. The Protection of Plant Varieties and Farmers Rights Act of India. Current Science, 2004: 86(3): 392-398.
- CBD Secretariat. Cartagena Protocol in biosafety to the Convention on Biological Diversity: text and annexes. 2000: Montreal www.biodiv.org/doc/legal/ cartagena-protocol-en.pdf.
- DBT. Recombinant DNA Safety Guidelines, Department of Biotechnology, Ministry of Science and Technology, Government of India. 1990
- DBT. Regulations and Guidelines on Biosafety of Recombinant, DNA Research and Biocontainment, Department of Biotechnology, Ministry of Science and Technology, Government of India. 2017
- Emerging Technologies Towards Agriculture, Food and Environment by RK Behl, Machiavelli Singh and Achim Ibenthal, Wolfgang Merbach. Agrobios International Press.
- Guidelines and Handbook for Institutional Biosafety Committees (IBSCs) by DBT-GOI. Biotech Consortium India Ltd (BCIL), India.
- Journals and Current magazines on IPR, WIPO, CDC, NIH and DBT online portals.
- Macer D. Bioethics is Love of Life, Christchurch N.Z.: Eubios Ethics Institute. 1998
- Persley Gabrielle J, Doyle JJ. Biotechnology for Developing Country Agriculture: Problems and Opportunities Overview, Focus 2. Brief 1 of 10. IFPRI. Washington, DC USA. 1999
- Prabhu LS, Suriyaprakash TNK, Kumar DK. Intellectual property rights and its development in India. Pharma Times 2012: 44(7): 19-22.
- Singh Machiavelli, Khosla Babita. Intellectual Property Rights (IPR), Biosafety and Bioethics In: Handbook of Biotechnology, Daya Publishing House, 2022: 513-549.
- The Copyright Act 1957 as amended up to 1999 along with Copyright Rules 1958 and International Copyright Order 1999: 2005
- The Design Act 2000 along with Design Rules 2001; Universal Law Publishing Co. Ltd., New Delhi: 2004
- The Geographical Indications of Goods (Registration and Protection) Act, 1999 along with Geographical Indications of Goods (Registration and Protection) Rules 2002; Universal Law Publishing Co. Ltd., New Delhi: 2004
- The Patents Act, 1970 as amended by Patents (Amendment) Act 2005, Commercial Law Publisher (India) Private Ltd. 2005
- The Protection of Plant Varieties and Farmers' Rights Act, 2001 along with Protection of Plant Varieties and Farmers' Rights Rules 2003; Akalank Publications, New Delhi. 2008
- The Trademarks Act 1999 along with Trademarks Rules 2002; Commercial Law Publisher (India) Private Ltd. 2004
- WHO. Handbook: Good Laboratory Practice (GLP): quality practices for regulated non-clinical research and development. 2009: 2
- WHO. Laboratory Biosafety Manual. Geneva: World Health Organization 2004: 3: 5-105
- WIPO. WIPO Intellectual Property Handbook, WIPO Pub. No. 2004: 489 (E)

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	CA	A	A/P	EE
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

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CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	2		1			1	2		1		
CO2	1	1		1			1	1		1		
CO3	1	1		1			1	1		1		
CO4	1	2		1			1	2		1		
CO5	1	2		1		2	1	2		1		2
CO6	1	1		1	2	1	1	1		1	2	1

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-VI

Course Code: DBTH2601	BIOPROCESS, & INDUSTRIAL BIOTECHNOLOGY	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	**BIOPROCESS, & INDUSTRIAL BIOTECHNOLOGY LAB**				

Catalogue Description

Industrial biotechnology is an interdisciplinary science that applies principles associated with biology and engineering. This subject provides the knowledge of basic principle of fermentation process, which help students to design, develop and operate industrial level. This fundamental knowledge is essential for students to make their career in industry based on bioprocess. This course also provide the study of industrially relevant microbial strains and processes for production of enzyme, biopolymer and food products.

Course Objectives

The objective of the course is to apply the principles of bioprocess technology in large scale production of primary and secondary metabolites and to understand the basics of traditional and modern industrial fermentation process. After completion of the course, a student will be able to develop the understanding of industrial aspects of biotechnology.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Understand the basic principles and concepts of bioprocess technology.
- Understand the basic aspects of metabolites production at industrial scale.
- Describe the production of primary and secondary metabolites
- Discuss the production of microbial enzymes, biofertilizers, biopesticides and modern biotechnological products
- Describe the production of Mushroom.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Basic principle in bioprocess technology • Advantage of bioprocess over chemical process. • Cell culture techniques • Media formulation • Inoculum development and aseptic transfers.	L1, L2, L3	6
Module II: Process technology for the production of primary metabolites • Baker yeast, • Ethanol, acetone-butanol, • citric acid, amino acids, • Polysaccharides and plastics. • Mushroom production from agro based raw materials and uses. • Biofertilizers and biopesticides.	L1, L2, L3, L4	18
Module III: Production of secondary metabolites • Cephalosporin, penicillin, Streptomycin, Tetracycline etc.	L1, L2, L3, L4	12

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• Penicillin: Classification, various penicillin as precursor and 'R' – side chain, • penicillinase, 6-APA, penicillin production, harvest and recovery, uses of various forms etc. • Streptomycin: chemical structure, production, harvest and recovery, use by-product of streptomycin fermentation etc. • Tetracycline: chemical structure, production, harvest and recovery, use by-product of tetracycline fermentation etc.		
Module IV: Fermentation technology for production of industrial enzymes • Protease, Cellulase, amylase, lipase, • Glucose isomerase, penicillin acylase,	L1, L3, L4, L5	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text books and Reference

- Biotechnology. A Textbook of Industrial Microbiology, W. Crueger and a. Crueger, Sinauer Associates.
- Principles of Fermentation Technology, P.F. Stanbury and A. Whitaker, Pergamon Press.
- Bioprocess Engineering Principles, P Doran, Academic Press
- Biochemical Engineering, S Aiba, A E Humphery and N F Millis, University of Tokyo Press
- Bioprocess Engineering Basic Concepts, M.L. Shuler and F. Kargi, Prentice Hall
- Process Engineering in Biotechnolgy, A T Jackson, Prentice Hall

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1		2				1		2			
CO2	1	2	2				1	2	2			
CO3	1	2					1	2				
CO4	1						1					
CO5	1	1					1	1				

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2602	BIOPROCESS, & INDUSTRIAL BIOTECHNOLOGY LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**BIOPROCESS, & INDUSTRIAL BIOTECHNOLOGY**				

Catalog Description

This course provides an in-depth knowledge of the techniques and methodologies utilized in bioprocessing and industrial biotechnology. Students will gain practical experience in the design and optimization of bioprocesses for the production of bio-based products and will be equipped with the knowledge and skills necessary to contribute to the development and optimization of bioprocesses in academic, industrial, and research settings.

Course Objectives

The objectives of this laboratory course are to provide hands-on training to students in upstream and downstream unit operations. The lab is designed to train students in using microbial cells and cultures for the fermentative production of valuable products at both laboratory and industrial scales.

Course Outcomes (COs):

Students should be able to:

- Isolate and identify industrially important microorganisms for various microbial processes.
- Determine the growth curve and substrate degradation of a given microorganism.
- Establish the Thermal Death Point and Thermal Death Time of microorganisms to inform sterilizer design.
- Compare ethanol production efficiency using various substrates.
- Produce and estimate alkaline protease from microbial cultures.
- Generate single-cell protein and evaluate its production process.
- Apply alginate for effective cell immobilization in bioprocess applications.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Isolation of industrially important microorganisms for microbial processes.	L1, L3 L4, L6	4
Module II Determination of growth curve of a supplied microorganism and determine substrate degradation.	L1, L2, L3 L4	4
Module III: Determination of Thermal Death Point and Thermal death time of microorganisms for design of a sterilizer	L1, L3 L4, L5	4
Module IV: Comparative studies of ethanol production using different substrates.	L1, L2 L3, L4	4
Module V: Production and estimation of alkaline protease	L1, L3 L	4
Module VI: Production of single cell protein	L1,L2 L3, L4,	6
Module VII: Use of alginate for cell immobilization	L1, L3 L4, L6	4

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Text books and Reference

- Industrial Microbiology by L.E.Casida, JR.New Age International (P) LTD.
- Biotechnology, A Text book of Industrial Microbiology, W. Crueger and A. Crueger, Sinauer Association.
- Principles of Fermentation Technology by P.F. Stanbury, A. Whitaker, and S.J. Hall, Aditya Books (P) LTD.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	1	2		2		1	1	2		2	
CO2	1	1					1	1				
CO3	1	1					1	1				
CO4	1	1					1	1				
CO5	1	1					1	1				
CO6	1	1					1	1				
CO7	1	1					1	1				

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2603	ENZYMOLOGY	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	**ENZYMOLOGY LAB**				

Catalog Description

This course explores the role of enzymes and their function in metabolism, teaches the learner to observe and investigate acts of enzymes in biochemical pathways in the biotechnological landscape, and leads the student towards understanding metabolism and signaling of different biomolecules undergoing biochemical processes. The course is theoretically driven, as it delivers the concepts related to fundamental concepts of enzymes and catalysis, kinetics, large-scale production-purification of biomolecules, and their application in allied fields. Students then use that knowledge to analyze and evaluate current trends and future aspects of Enzymology and Enzyme technology.

Course Objectives

The course aims to provide an understanding of the principles and application of proteins, secondary metabolites and enzyme biochemistry in therapeutic applications and clinical diagnosis. The theoretical understanding of biochemical systems would certainly help to interpret the results of laboratory experiments

Course Outcomes (COs):

On completion of this course, students should be able to:

- Recall history of enzymology. Describe fundamental and molecular principles of Enzymes, enzyme classification, mechanisms of rate enhancement of different biochemical reactions contributing evolutionarily in metabolic pathways.
- Understanding the qualitative and quantitative analysis of biochemical (Metabolic) pathways in relationship to enzymes. Explain single substrate and multi-substrate enzyme kinetics.
- Describe the basics of enzyme inhibition, feedback mechanism and microenvironmental factors associated to biocatalysis.
- Explain the process involved with large scale enzyme production, purification and role of recombinant DNA technology in advancement of such processes.
- Enlist and explain ever increasing advancement in the field of enzyme technology. Elaborate current trend of enzyme technology like enzyme immobilization, concepts of hybrid enzymes and benefit their application in agriculture, medical and industrial landscapes.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Enzymes Introduction and scope, Nomenclature, Mechanism of Catalysis. Specificity of enzyme action, monomeric and oligomeric enzymes, Enzyme inhibition.	**L1, L2, L3**	10
Module II: Enzyme Kinetics Single substrate steady state kinetics; Michaelis Menten equation, Linear plots, Inhibitors and activators; Multisubstrate systems; Allosteric enzymes	**L1, L2, L3**	9
Module III:. Enzyme Immobilization Immobilization of Enzymes; Advantages, Carriers, adsorption, covalent coupling, cross-linking and entrapment methods, Micro-environmental effects.	**L3, L4, L5**	10

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Module IV: Enzyme Reactors Reactors for batch/continuous enzymatic processing, choice of reactor type; idealized enzyme reactor systems, Mass transfer in enzyme reactors: Steady state analysis of mass transfer and biochemical reaction in enzyme reaction	**L1, L2, L3**	8
Module V:. Current trend and future prospect of Enzymology and Enzyme Technology Large scale production and purification of enzymes, enzyme utilization in industry, enzymes and recombinant DNA technology	**L3, L4, L5**	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Biotechnological Innovations in Chemical Synthesis, R.C.B. Currell, V.D. Mieras, Biotol Partners Staff, Butterworth Heinemann.
- Enzyme Technology, M.F. Chaplin and C. Bucke, Cambridge University Press.
- Enzymes: A Practical Introduction to Structure, Mechanism and Data Analysis, R.A. Copeland, John Wiley and Sons Inc.
- Enzymes Biochemistry, Biotechnology, Clinical Chemistry, Trevor Palner
- Enzyme Kinetics: Behavior and Analysis of Rapid Equilibrium and Steady State Enzyme Systems, I.H. Segel, Wiley-Interscience
- Industrial Enzymes & their applications, H. Uhlig, John Wiley and Sons Inc.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1						1					
CO2	1	1	1		2		1	1	1		2	
CO3	1	1	1		2		1	1	1		2	
CO4	1	2	1	3	2	3	1	2	1	3	2	3
CO5	1	2	1	2	2	1	1	2	1	2	2	1

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2604	ENZYMOLOGY LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**ENZYMOLOGY**				

Catalog Description

This course explores the in-hand experience of understanding biochemical reactions driven by Enzymes, teaches the learner to observe, perform and investigate enzyme-driven metabolic pathways in the biotechnology landscape, and leads the student through the process of building experimental design, hypothesis development, and process standardizations. The course is driven on wet lab experiments, as it delivers the concepts related to the design of laboratory experiments, analysis, and quality assurance of different enzyme-driven bioassays. Students then utilize the combination of theoretical and practical knowledge of enzyme and enzyme technology in applied aspects.

Course Objectives

The course aims to provide students with hands-on experience in laboratory techniques and procedures commonly used in Enzymology research. It will help students gain a deeper understanding of fundamental enzymological concepts and principles and design experiments, plan protocols, and troubleshoot issues that may arise during laboratory work.

Course Outcomes (COs):

After the completion of this course students will be able to:

- Determine the various ways of calculating enzyme activity of enzymes like alpha and beta amylase etc.
- Draw standard calibration curve of known concentration Vs Absorbance and from that they can determine the product released from the graph.
- Find the optimum temperature and pH at which the enzyme activity is maximum.
- Able to draw and interpret the Michaelis Menton hyperbolic curve and know the importance of Lineweaver Burk Plot.
- Explain the effect of different concentration of substrates on the enzyme activity of various enzymes.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Isolation of enzymes from plant and microbial sources.	**L1, L2, L3**	6
Module II: Enzyme assay; activity and specific activity – Amylase	**L1, L2, L3**	4
Module III: Standard Curve Preparation: Maltose	**L3, L4, L6**	4
Module IV: Effect of varying substrate concentration on enzyme activity, determination of Michaelis-Menten constant (K_m) and Maximum Velocity ($V_{max.}$) using Lineweaver-Burk plot. Catalytic efficiency and catalytic constant.	**L1, L2, L3, L4**	6
Module V: Effect of Temperature and pH on enzyme activity.	**L4, L5, L6**	4

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Text Books and References

- Introduction to Practical Biochemistry by György Hegyi, József Kardos, Mihály Kovács, András Málnási-Csizmadia, László Nyitray, Gábor Pál, László Radnai, Attila Reményi, and István Venekei.
- Practical Manual of Biochemistry by Dr. G. Sattanathan, Dr. S.S. Padmapriya, and Dr. B. Balamuralikrishnan.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	CA	A	A/P	EE
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	1	2				1	1	2			
CO2	1	1	2				1	1	2			
CO3	1	1	2				1	1	2			
CO4	1	1	2				1	1	2			
CO5	1	1	2				1	1	2			

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2605	PHARMACEUTICAL BIOTECHNOLOGY AND DRUG DESIGN	L	T	P	C
Version	2023	4	0	0	4
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description

This course explores the role of biotechnology in drug development, teaches the learner to observe and investigate components and techniques of biology in identifying, understanding and designing cures to diseases in a biotechnological landscape. This course leads the student through the process of understanding pharmacology in the light of life science. The course is theoretically driven, as it delivers the concepts related to drugs, composition, stability, manufacturing, packaging and marketing aspects of pharmaceutical biotechnology through lectures and literatures. Students then use that knowledge to analyze and develop bioanalytical techniques relevant to drug discovery and disease management.

Course Objectives

The course aims to provide an understanding of the principles and application of molecules, Ligands, receptors and disease pathways in therapeutic applications and clinical diagnosis. The theoretical understanding of biotechnological systems would certainly help to interpret the results of laboratory experiments of managing physiological complications and their therapeutic management.

Course Outcomes (COs):

On successful completion of this course, student will be able:

- Recall the history of pharmaceutical biotechnology and illustrate conventional drug design methodology.
- Explain different dosage forms and physicochemical properties of drug.
- Illustrate pharmacokinetics and pharmacodynamics.
- Explain and recognise regulatory attributes and guidelines of biotechnology based pharmaceutical production and marketing ethics.
- Enlist and explain ever increasing advancement in the field of pharmaceutical biotechnology. Elaborate the technology of computational biology in current edge drug design and development.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to Pharmaceutical Biotechnology Introduction to Pharmaceutical Biotechnology and History, Drug Discovery Process and Development	**L1, L2, L3**	5
Module II: Physicochemical Factors Governing Drug Formulation Hydrogen bond and Intermolecular forces, Solubility and Partition coefficient, Viscosity and Rheology, pH, Ionization state, Molecular weight and size, Particle technology, Phase separation.	**L1, L2, L3**	10
Module III: Drug Kinetics Effects of route of administration, Drug Targets, Pharmacokinetics and pharmacodynamics of drugs, Drug Delivery System – rate, time and release, Drug stability, Drug Toxicity.	**L3, L4, L5**	10
Module IV: Regulations and Guidelines	**L1, L2, L3,L6**	10

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Role of FDA, ICH Guidelines, cGMP, The Regulation of Pharmaceutical Biotechnological Products and Ethical Issues.		
Module V: Structure-based Drug-Design Limitations of conventional drug discovery and development. 'de novo' drug design methodologies: indirect drug design, pharmacophore development and receptor mapping, combinatorial libraries**,** DNA vaccines, Vaccines & Monoclonal antibody-based pharmaceuticals, Antibiotics Characterization, Examples of some Biotechnological products in clinical development	**L1, L2, L5, L6**	10

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Pharmaceutical Biotechnology: Fundamentals and Applications by Daan J. A. Crommelin, Robert D. Sindelar, and Bernd Meibohm.
- Textbook of Pharmaceutical Biotechnology by Kolkate, Jalalpure and Hurakadle.
- Pharmaceutical Biotechnology: A Focus on Industrial Application edited by Adalberto Pessoa, Michele Vitolo, Paul Frederick Long.
- Introduction to Pharmaceutical Biotechnology b Saurabh Bhatia and Divakar Goli.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1						1					
CO2	1	1	1		2		1	1	1	2	2	
CO3	1	2	1		2		1	2	1	2	2	
CO4	1	2	1	1	2	3	1	2	1	1	2	3
CO5	1	1	1	2	2	1	1	1	1	2	2	1

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2606	INTRODUCTION TO NEUROSCIENCE AND INFORMATION FLOW	L	T	P	C
Version	2023	4	0	0	4
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description

This course provides an overview of the neuroscience topics starting from structure and function to disease development that help the learners to acquire a basic knowledge of neuroscience. This course also explores fundamental knowledge behind Behavioral neuroscience, ethics and emerging topics.

Course Objectives

The objective of this course is to introduce undergraduate students to the basic knowledge in Neuroscience in topics ranging from structure of neuron, information transmission through nervous system, function of sensory systems, basics of Behavioral neuroscience, and diseases of the nervous system. This course will also introduce students to the ethics of research in neuroscience and provide a glimpse of recent research in this field

Course Outcomes (COs):

- Describe the basic principles and structure of the nervous system, including neural cell types, neuroanatomy, and neural development.
- Comprehend the mechanisms of neural signalling, including action potentials, synaptic transmission, and neurotransmitter function.
- Analyse the organization and function of sensory and motor systems, including the pathways and processes involved in sensory perception and motor control.
- Explain the relationship between brain function and behaviour, examining how neural circuits influence cognitive processes, emotions, and actions, using specific examples.
- Identify and describe specific examples of neurological and psychiatric disorders, understanding their underlying neural mechanisms and potential treatments.
- Discuss the current advancements and future directions in neuroscience research, and the ethical considerations in this field of research.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Foundations of Neuroscience: • Introduction to neuroscience • Historical perspectives • Overview of the nervous system • Neuron structure and function	L1, L2, L3	6
Module II: Neural Communication: • Action potentials and membrane potential • Synaptic transmission • Neurotransmitters and receptors • Neural circuits and signalling pathways	L1, L2, L3	8
Module III: Sensory Systems and Motor Systems: • Introduction to Vision, Auditory, Olfactory, Gustatory and Somatosensory System • Motor neurons and muscle contraction	L3, L4, L5	10

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• Motor coordination, learning and plasticity		
Module IV: Brain and Behaviour: • Brain regions and their functions • Emotion and motivation • Reward system and Addiction • Sleep and circadian rhythms • Cognitive functions (memory, attention, decision-making)	L3, L4, L5	8
Module V: Disorders of the Nervous System: • Neurological disorders (e.g., Alzheimer's, Parkinson's) • Neuropsychiatric disorders (e.g., depression, schizophrenia) • Brain injury and recovery	L3, L4, L5, L6	10
Module VI: Emerging Topics in Neuroscience: • Ethical considerations in neuroscience research • Current trends and Future directions in neuroscience	L1, L2, L3	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- https://bio.libretexts.org/Courses/Lumen_Learning/Anatomy_and_Physiology_I_(Lumen)/16%3A_Module_14-_The_Nervous_System_and_Nervous_Tissue
- https://brain.mcmaster.ca/BrainBee/Neuroscience.Science.of.the.Brain.pdf

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	3	3				1	3	3			
CO2	1	3	3				1	3	3			
CO3	1	3	3				1	3	3			
CO4	1	3	3				1	3	3			
CO5	1	3	3				1	3	3			
CO6	1	3	3	1			1	3	3	1		

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-VII

Course Code: DBTH2701	ADVANCED BIOCHEMISTRY	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description
This graduate-level course offers an in-depth exploration of advanced topics in biochemistry, focusing on the molecular mechanisms that govern cellular processes. It covers the structure and function of biomolecules, metabolic pathways, enzyme kinetics, molecular signaling, and the latest research techniques in biochemistry.

Course Objectives
The primary focus of this course is advanced understanding of protein structure and enzymology. It is also aimed to expose the students to the technological applications in understanding the process of photosynthesis, and production of secondary metabolites through metabolic engineering.

Course Outcomes (COs):
By the end of this course, students will be able to:

- Explain the structure, function, and dynamics of proteins, including protein folding, interactions, and techniques for protein analysis.
- Analyze the principles of enzyme kinetics, mechanisms of enzyme action, roles of co-enzymes & co-factors, and methods for studying enzyme activity and regulation.
- Comprehend the coordination and regulation of cellular metabolic pathways by hormones and their impact on overall metabolic homeostasis.
- Explore the regulatory mechanisms involved in photosynthesis, including the light-dependent and light-independent reactions and their integration within the plant cell.
- Investigate the biosynthesis, functions, and ecological roles of secondary metabolites in plants, as well as their applications in biotechnology and medicine.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Proteins Types of proteins and their classification, Forces stabilizing protein structure and shape. Different Level of structural organization of proteins, Protein Purification. Denaturation and renaturation of proteins. Fibrous and globular protein.	L1, L2, L3	8
Module II: Enzymes Enzyme, prosthetic groups, metalloenzymes, monomeric & oligomeric enzymes, activation energy and transition state, enzyme activity, specific activity, common features of active sites, enzyme specificity: types & theories, Biocatalysts from extreme thermophilic and hyperthermophilic archaea and bacteria. Role of: NAD+, NADP+, FMN/FAD, coenzymes A, Thiamine pyrophosphate, Pyridoxal phosphate,lipoic-acid, Biotin vitamin B12, Tetrahydrofolate and metallic ions	L1, L2, L3	10
Module III: Integration of cellular metabolism and hormonal regulation Action of major hormones (insulin, glucagons, epinephrine) responses to metabolic stress; starvation, metabolic disorders (phenylketonuria, arthritis) and role of antifolates in chemotherapy.	L1, L2, L3, L4	9

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Module IV: Regulatory aspects of photosynthesis Mechanism of light interacting with photo pigments, energy transfer and transduction process during photosynthesis, artificial light harvesting system and application in carbon sequestration, Engineering of Rubisco enzyme for photosynthetic process optimization.	L1, L2, L3	9
Module V: Secondary plant metabolism Importance of secondary metabolites, classification, terpenes, Mevalonic acid pathway, phenolic compounds and alkaloids. Application of metabolic engineering in production of any two class of secondary metabolites. Contribution of metabolic engineering principles in promoting Green Chemistry.	L1, L2, L3	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Principles of Biochemistry, Latest Edition, A.L. Lehninger, D.L. Nelson, M.M. Cox. , Worth Publishing
- Biochemistry By Mathews, Van Holde ,
- Text book of Biochemistry by Devlin.
- Textbook of Biochemistry by Metzler

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	2	3				1	2	3			
CO2	1	2	3				1	2	3			
CO3	1	2	3				1	2	3			
CO4	1	2	3				1	2	3			
CO5	1	2	3				1	2	3			

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2702	ADVANCED BIOCHEMISTRY AND ANALYTICAL TECHNIQUES LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description

The course incorporates practical laboratory experience into students, preparing students for research and professional careers in biochemistry and related fields. This course aims to equip students with advanced knowledge and skills in biochemistry, fostering their ability to conduct independent research and contribute to the scientific community.

Course Objectives

The course aims to provide an advanced understanding of the core principles and topics of Biochemistry and their experimental basis.

Course Outcomes (COs):

- Develop the ability to use colorimetric techniques to quantify biomolecules by measuring their absorbance properties.
- Gain proficiency in various chromatographic methods to separate, identify, and analyze complex biological mixtures.
- Master the techniques of PAGE and SDS-PAGE for the separation, visualization, and analysis of protein samples.
- Acquire skills in extracting total lipids and separating them using thin layer chromatography, including calculating Rf values for lipid identification.
- Learn to characterize isolated nucleic acids by performing and interpreting agarose gel electrophoresis results.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Colorimetry Colorimetry and Spectrometry: Beer Lambert's law, Transmittance, Absorbance, Optical density; Types of Spectroscopies: UV & Visible - Principle, instrumentation & application.	L2, L3	6
Module II: Chromatographic Techniques Partition- Adsorption-Ion Exchange- Molecular sieve and Affinity chromatography; Principles of Gas Liquid chromatography and High-Performance Liquid Chromatography.	L3, L4	6
Module III: Proteins Electrophoretic (PAGE and SDS-PAGE) separation of isolated proteins.	L3, L4	6
Module IV: Lipids Extraction of total lipids by Folch's method; thin layer chromatographic separation of lipids, R_f value	L2, L3	6
Module V: Nucleic Acid Characterization of isolated nucleic acid by agarose gel electrophoresis.	L3, L4	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Text Books and References

1. Practical book of Biochemistry by Plummer
2. Practical book of Biochemistry by S.K. Sawhney and Randhir Singh

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	1	3				1	1	3			
CO2	1	1	3				1	1	3			
CO3	1	1	3				1	1	3			
CO4	1	1	3				1	1	3			
CO5	1	1	3				1	1	3			

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2703	ADVANCED MICROBIOLOGY	L	T	P	C
Version	2023	2	0	0	2
Pre-requisites	Nil				
Co-requisites	**DBTH2704 ADVANCED MICROBIOLOGY LAB**				

Catalog Description

This course will build upon ideas introduced in general microbiology classes by using microbiological techniques to study and identify unknown organisms. In addition to studying microbial diversity, students will learn the similarities and differences between microorganisms in their genetic, biochemical and metabolic profile. The different mechanisms of checking the growth and spread of microorganisms, and the interaction of microorganisms with their hosts and environment will also be discussed.

Course Objectives

The objectives of this course are to introduce field of microbiology with special emphasis on microbial diversity, morphology, physiology and nutrition; methods for control of microbes and host- microbe interactions.

Course Outcomes (COs):

Students should be able to:

- Identify major categories of microorganisms and analyze their classification, diversity, and ubiquity;
- Identify and demonstrate structural, physiological, genetic similarities and differences of major categories of microorganisms;
- Identify and demonstrate how to control microbial growth;
- Demonstrate and evaluate interactions between microbes, hosts and environment

Course Content:

Modules	Blooms level*	Number of hours
Module 1 Microbial characteristics Introduction to microbiology and microbes, history & scope of microbiology, morphology, structure, growth and nutrition of bacteria, bacterial growth curve, bacterial culture methods; bacterial genetics: mutation and recombination in bacteria, plasmids, transformation, transduction and conjugation; antimicrobial resistance	L1, L2, L3	6
Module 2 Microbial diversity Microbial taxonomy and evolution of diversity, classification of microorganisms, criteria for classification; classification of bacteria; Cyanobacteria, acetic acid bacteria, Pseudomonads, lactic and propionic acid bacteria, endospore forming bacteria Mycobacteria and Mycoplasma. Archaea: Halophiles, Methanogens, *Hyperthermophilic archae*, Thermoplasm; eukarya: algae, fungi, slime molds and protozoa; extremophiles and unculturable microbes.	L1, L2, L3	6
Module 3 Control of microorganisms Sterilization, disinfection and antisepsis: physical and chemical methods for control of microorganisms, antibiotics, antiviral and antifungal drugs, biological control of microorganisms.	L1, L2, L3	6

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Module 4 Virology Virus and bacteriophages, general properties of viruses, viral structure, taxonomy of virus, viral replication, cultivation and identification of viruses; sub-viral particles – viroids and prions.	L1, L2, L3	6
Module 5 Host-microbes interaction Host-pathogen interaction, ecological impact of microbes; symbiosis (Nitrogen fixation and ruminant symbiosis); microbes and nutrient cycles; microbial communication system; bacterial quorum sensing; microbial fuel cells; prebiotics and probiotics.	L1, L2, L3	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Pelczar, M. J., Reid, R. D., & Chan, E. C. (2001). Microbiology (5th ed.). New York: McGraw-Hill.
- Willey, J. M., Sherwood, L., Woolverton, C. J., Prescott, L. M., & Willey, J. M. (2011).Prescott's Microbiology. New York: McGraw-Hill.
- Matthai, W., Berg, C. Y., & Black, J. G. (2005). Microbiology, Principles and Explorations. Boston, MA: John Wiley & Sons

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	2	3				1	2	3			
CO2	1	2	3				1	2	3			
CO3	1	2	3				1	2	3			
CO4	1	2	3				1	2	3			

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2704	ADVANCED MICROBIOLOGY LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**DBTH2703 ADVANCED MICROBIOLOGY**				

Catalog Description

The Advanced Microbiology Lab course offers hands-on experience with sophisticated techniques in microbiological research. Students will engage in practical applications of microbial culturing, genetic manipulation, and biochemical analysis. Key areas include microbial physiology, biofilm formation, and pathogen identification. This course is designed to complement Advanced Microbiology (DBLS2703) lectures, imparting essential skills for research and industry applications.

Course Objectives

This course aims to impart hands-on experience in basic microbiology tools and techniques, training to work on research projects as a team, along with essential skills in designing & conducting experiments, data collection & analysis, and record keeping & scientific communication.

Course Outcomes (COs):

Upon completion of this course, students will:

- Gain hands-on experience in culturing, isolating, and identifying various microorganisms using advanced microbiological techniques.
- Conduct experiments to understand microbial growth, metabolic pathways, and physiological responses under different environmental conditions.
- Investigate the mechanisms of biofilm development and the pathogenicity of microorganisms through practical experimentation.
- Develop skills in data collection, statistical analysis, and interpretation of experimental results in microbiology.
- Work collaboratively in a team setting to conduct experiments, analyze results, and present findings clearly and professionally.
- Adhere to strict laboratory safety protocols and maintain accurate, detailed laboratory records.

Course Content:

Modules	Blooms level*	Number of hours
Module 1: Sterilization, disinfection and safety in microbiological laboratory.	**L1, L2, L3**	2
Module 2: Preparation of media for cultivation of bacteria.	**L1, L2, L3**	2
Module 3: Isolation of bacteria in pure culture by streak plate method.	**L1, L2, L3**	2
Module 4: Study of colony and growth characteristics of some common bacteria: Bacillus, E. coli, Staphylococcus, Streptococcus, etc.	**L1, L2, L3**	2
Module 5: Preparation of bacterial smear and Gram's staining.	**L1, L2, L3**	2

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Module 6: Enumeration of bacteria: standard plate count.	**L1, L2, L3,L4**	2
Module 7: Antimicrobial sensitivity test and demonstration of drug resistance.	**L1, L2, L3, L5**	4
Module 8: Maintenance of stock cultures: slants, stabs and glycerol stock cultures	**L1, L2, L3**	2
Module 9: Determination of phenol co-efficient of antimicrobial agents.	**L1, L2, L3**	2
Module 10: Determination of Minimum Inhibitory Concentration (MIC)	**L1, L2, L3**	4
Module 11: Biofilm formation of Candida auris: culture and characterisation	**L1, L2, L3, L4**	4

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

1. Microbiology: A laboratory Manual, Seventh Edition, by: Cappuccino and Sherman
2. Microbes in Action, Fourth Edition:by Harry W. Seeley, Cornell University; Paul J. Vandemark, late of Cornell University; John J. Lee

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	1	2				1	1	2			
CO2	1	1	2				1	1	2			
CO3	1	1	2				1	1	2			
CO4	1	1	2				1	1	2			
CO5	1	1	2		1		1	1	2		1	
CO6	1	1	2				1	1	2			

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2705	ADVANCED CELL BIOLOGY	L	T	P	C
Version	2023	2	0	0	2
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description

This course explores cellular dynamics, chromatin structure, signal transduction, cellular processes, and advanced techniques for studying cells. It covers organelle interactions, gene regulation, cell cycle, differentiation, stress responses, microscopy, DNA/RNA/protein analysis, genome instability, cell transformation, and stem cells and their applications.

Course Objectives

This Advanced Cell Biology course explores the intricacies of cellular processes and covers topics ranging from subcellular organelles, signal transduction, and stem cell applications. This course also delves into complex cell cycle regulation and apoptosis pathways. By course end, the student is expected to possess a deepened understanding of advanced cell biology, ready for research and application in contemporary scientific endeavours.

Course Outcomes (COs):

Upon successful completion of the course, students will be able to:

- Understand the dynamic organization of subcellular organelles and membrane dynamics.
- Learn chromatin structure, remodelling, and epigenetic modifications affecting gene expression.
- Learn about signal transduction pathways, intracellular transport mechanisms, and vesicular trafficking.
- Gain insights into cell cycle regulation, cellular differentiation, stress responses, and cell death mechanisms.
- Understand genome instability, cell transformation, and their implications for disease and therapeutic interventions.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Dynamic Organization of Cell • Subcellular organelles and their dynamic interactions • Membrane dynamics and vesicle trafficking • Cellular compartmentalization and its functional significance	**L1, L2**	6
Module II: Chromatin Structure and Dynamics • DNA packaging in the nucleus • Chromatin remodeling and epigenetic modifications • Regulation of gene expression through chromatin modifications	**L1, L2**	6
Module III: Cellular Signaling, Transport, and Trafficking • Signal transduction pathways and molecular cascades • Intracellular transport mechanisms • Vesicular trafficking and its role in cellular processes	**L1, L2**	6
Module IV: Cellular Processes • Cell cycle regulation and checkpoints	**L1, L2**	6

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• Cellular differentiation and development • Cellular responses to stress and environmental cues • Cell death mechanisms and regulation		
Module V: Manipulating and Studying Cells • Isolation of cells and basics of cell culture • Observing cells under a microscope • Different types of microscopy techniques and their applications	**L1, L2, L3**	6
Module VI: Analyzing and Manipulating DNA, RNA, and Proteins • DNA and RNA extraction techniques • Polymerase chain reaction (PCR) and gene expression analysis • Protein isolation, purification, and analysis method	**L1, L2, L3**	6
Module VII: Genome Instability and Cell Transformation • Mechanisms of genome instability • Cell transformation and carcinogenesis • Implications for disease and therapeutic interventions	**L1, L2**	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Molecular Biology of the Cell:
- Authors: Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts, Peter Walter
- Title: Molecular Biology of the Cell Edition: 6th Edition Publisher: Garland Science Year: 2014 ISBN-13: 978-0815344322

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	3	3				1	3	3			
CO2	1	3	3				1	3	3			
CO3	1	3	3				1	3	3			
CO4	1	3	3				1	3	3			
CO5	1	3	3				1	3	3			

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2706	ECOLOGY AND EVOLUTION	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description

The term environment is used to describe, in aggregate, all the external forces, influences and conditions which affect life, nature, behavior and the growth, development and maturity of living organisms. In present condition huge increase in environmental issues, have grown to complexity day by day with threat of human existence on earth. A study of environmental changes is quite essential in all types of environmental conditions to have control over urban & industrial development. It can also enlighten the masses about the importance of the protection and conservation of our environment and control of human activities which has an adverse effect on the environment. This course also emphasizes the coevolution of organisms and surroundings together with harmony for the coexistence of life on earth.

Course Objectives

This course aims to provide a comprehensive understanding of the principles of ecology and evolution and their interconnectedness. Students will explore the fundamentals of ecology, including population dynamics and community interactions, to understand the complex relationships within ecosystems. They will delve into the mechanisms of evolution, such as natural selection and genetic drift, to comprehend how biodiversity arises and changes over time. The course will also cover applied aspects of ecology and evolution, enabling students to apply theoretical knowledge to real-world issues like conservation, resource management, and the impacts of climate change on ecosystems and biodiversity. Students will also gain real world experience through field work.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Understand and explain the basic principles of ecology, including population dynamics, species interactions, and community structure.
- Analyse the components and functioning of ecosystems, including energy flow, nutrient cycling, and the impact of human activities on ecosystem health.
- Comprehend the mechanisms
- driving evolution, such as natural selection, genetic drift, and gene flow, and explain how these processes contribute to the diversity of life.
- Apply ecological and evolutionary theories to practical challenges in conservation, resource management, and assessing the ecological impacts of environmental changes.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Fundamentals of Ecology Definition, scope, and importance; Abiotic and biotic components; scales (population, species, community, ecosystems, biomes); niches and habitats. Population ecology: Population growth rate, metapopulation ecology Interactions: Ecophysiology (physiological adaptations to abiotic environment. Community ecology.	L1, L2, L3	4

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Module II: Ecosystems Concept of an ecosystem, structure, and function of ecosystems: trophic levels and their interactions; nutrient cycles; primary and secondary productivity, Producers, consumers, and decomposers Energy flow in the ecosystem; Ecological succession; Food chains, food webs and ecological pyramids, introduction, types, characteristic features, structure, and function	L1, L2, L3	8
Module III: Evolution Theory & History of Evolutionary thought: Lamarckism; Darwinism; Modern Synthesis Fundamentals: Variation; heritability; natural selection; fitness and adaptation; types of selection (stabilizing, directional, disruptive) Diverse lifeforms: Origin and history of life on earth; diversity and classification of life; systems of classification (cladistics and phenetics) Interactions: Co-evolution, prey-predator interactions. Population and Quantitative genetics, molecular evolution, phylogenetics and molecular systematics Macroevolution: Species concepts and speciation; adaptive radiation; convergence; biogeography	L3, L4, L5	12
Module IV: Applied Ecology & Evolution Natural resources and associated problems Biodiversity and conservation: Importance of conserving biodiversity Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity Conservation genetics (genetic diversity, inbreeding depression); DNA fingerprinting and DNA barcoding Disease ecology and evolution: Epidemiology; antibiotic resistance; vector Control Plant and animal breeding: marker assisted breeding; genetic basis of economically important traits, global climate change: causes; consequences; mitigation Environment protection law	L3, L4, L5	12
Module V: Field Work Visit to a local area to document environmental assets-river / forest/ grassland/ hill/ mountain. Visit to a local polluted site – Urban / Rural / Industrial / Agricultural Study of common plants, insects, birds Study of simple ecosystems-pond, river, hill slopes, etc.	L3, L4, L5, L6	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
- Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad 380 013, India.
- Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
- Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
- Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
- **De A.K., Environmental Chemistry, Wiley Eastern Ltd**
- Down to Earth, Centre for Science and Environment (R)
- Gleick, H.P. 1993. Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
- Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
- Heywood, V.H & Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
- Mckinney, M.L. & School, R.M. 1996. Environmental Science Systems & Solutions, Web enhanced edition. 639p.

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- Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)
- Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
- Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
- Rao M N. & Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ. Co. Pvt. Ltd. 345p.
- Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut
- Survey of the Environment, The Hindu (M)
- Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science
- Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication (TB)
- Wanger K.D., 1998 Environnemental Management. W.B. Saunders Co. Philadelphia, USA 499p

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	2	3	1			1	2	3	1		
CO2	1	1	3	1			1	1	3	1		
CO3	1	1	3	1	2		1	1	3	1	2	
CO4	1	1	3	1	2		1	1	3	1	2	

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2707	GENETICS	L	T	P	C
Version	2023	2	0	0	2
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description

Genetics is the study of principles and mechanisms of inheritance. In this course students will understand the fundamental principles of inheritance unraveled by Gregor Mendel, who is considered the father of Genetics. Students will explore the mechanisms of inheritance in a range of organisms from bacteriophages to bacteria to yeast and higher organisms including fruit-fly, plants and humans. Students will also get introduced to concepts in population genetics and quantitative inheritance.

Course Objectives

This course aims to provide the students with a strong foundation in the knowledge and applications of principles and mechanisms of inheritance in a range of organisms including bacteriophages, bacteria, yeast, Drosophila, plants and humans. Furthermore, the basics of the principles of inheritance of quantitative traits, and the principles of inheritance at the population level will also be imparted.

Course Outcomes (COs):

On successful completion of this course, student will be able:

- Explain and analyse the genetic mechanisms of bacteria and bacteriophages, including gene transfer, mutation, and recombination.
- Interpret the role of yeast as a model organism for studying eukaryotic gene function and regulation.
- Explain the utility of *Drosophila melanogaster* as a model system to investigate genetic principles applicable to higher eukaryotes.
- Apply the principles of Mendelian inheritance in evaluating genetics crosses and determining genetic map distances in *Drosophila*.
- Apply the principles of population genetics to study the genetic structure of populations and the forces driving changes in the genetic composition of the population.
- Examine the genetic basis of complex traits and the methodologies used to identify quantitative trait loci (QTLs).
- Examine the genetic techniques underlying plant breeding.
- Conduct pedigree analysis and interpret complex pedigrees to identify modes of inheritance and calculate genetic risks for individuals.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Genetics of bacteria and bacteriophages Concept of a gene in pre-DNA era; mapping of genes in bacterial and phage chromosomes by classical genetic crosses; fine structure analysis of a gene; genetic complementation and other genetic crosses using phenotypic markers; phenotype to genotype connectivity prior to DNA-based understanding of gene	L1, L2, L3	4
Module II: Yeast genetics Meiotic crosses, tetrad analyses, non-Mendelian and Mendelian ratios, gene conversion, models of genetic recombination, yeast mating type switch; dominant and recessive genes/mutations, suppressor or modifier screens,	L1, L2, L3	4

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complementation groups, transposon mutagenesis, synthetic lethality, genetic epistasis. Tetrad analysis in Neurospora		
Module III: Drosophila genetics as a model of higher eukaryotes Monohybrid & dihybrid crosses, back-crosses, test-crosses, analyses of autosomal and sex linkages, screening of mutations based on phenotypes and mapping the same (three-point-crossover mapping), hypomorphy, genetic mosaics, genetic epistasis in context of developmental mechanism;	L1, L2, L3, L4	8
Module IV: Population genetics and genetics of evolution Introduction to the elements of population genetics: genetic variation, genetic drift, neutral evolution; mutation selection, balancing selection, Fishers theorem, Hardy- Weinberg equilibrium, linkage disequilibrium; in-breeding depression & mating systems; population bottlenecks, migrations,	L1, L2, L3	5
Module V: Quantitative genetics of complex traits (QTLs) Complex traits, mapping QTLs, yeast genomics to understand biology of QTLs.	L1, L2, L3, L4	3
Module VI: Plant genetics Laws of segregation in plant crosses, inbreeding, selfing, heterosis, maintenance of genetic purity, gene pyramiding.	L1, L2, L3	2
Module VII: Human Pedigree analysis Modes of Inheritance, prediction of probability of progeny genotype based on pedigree analysis	L1, L2, L3, L4, L5	4

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Hartl, D. L., & Jones, E. W. (1998). Genetics: Principles and Analysis. Sudbury, MA:
  - Jones and Bartlett
- Pierce, B. A. (2005). Genetics: a Conceptual Approach. New York: W.H. Freeman
- Tamarin, R. H., & Leavitt, R. W. (1991). Principles of Genetics. Dubuque, IA: Wm. C. Brown.
- Smith, J. M. (1998). Evolutionary Genetics. Oxford: Oxford University Press.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1		2			3	1		2			3
CO2	1		2			3	1		2			3
CO3	1		2			3	1		2			3
CO4	1	1	2			3	1	1	2			3
CO5	1	1	2			3	1	1	2			3
CO6	1	3	2		2	3	1	3	2		2	3
CO7	1	1	2		2	3	1	1	2		2	3
CO8	1	1	2			3	1	1	2			3

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2708	BASICS OF CHEMISTRY AND PHYSICS	L	T	P	C
Version	2023	2	0	0	2
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description

This course will explore the essential principles of physics and chemistry through the lens of biology. Tailored for non-majors, this class aims to provide a solid foundation in the physical and chemical concepts crucial to understanding biological processes.

Course Objectives

In this course, students will delve into the key principles that underpin biological phenomena including topics on Classical Mechanics, Wave & Optics, Electricity & Magnetism, and Thermodynamics. Topics include classical mechanics, chemical reactions in biological systems, and the application of thermodynamics to biological processes.

Through interactive lectures, and real-world examples, students will gain practical insights into how physics and chemistry shape the living world.

Course Outcomes (COs):

This course will enable the students to attain the following:

- Explore fundamental concepts such as motion, forces, and energy to develop a foundational understanding of the physical principles governing biological systems.
- Explain the fundamental principles in waves & optics, and electricity and magnetism, along with the relevance of these principles in the various tools used in biological research.
- Examine Chemical Processes in Biological Systems including enzyme catalysis and cellular metabolism, to comprehend how chemical interactions drive biological functions at the molecular level.
- Gain proficiency in applying thermodynamic principles to analyze energy transfer and transformations within living organisms, emphasizing their relevance to cellular processes and homeostasis.
- Develop problem-solving skills by applying both physics and chemistry concepts to address real-world biological challenges.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Importance of Physics in Biology • Importance of Physics in understanding biological processes	L1, L2	1
Module II: Mechanics: Motion and Forces • Kinematics (1D and 2D motions) • Dynamics: Newton's laws of motion; • Application of Newton's 2nd law in Linear, Circular motions (briefly, mention other kinds of motion – rotational and oscillatory (e.g. SHM)) • Principle of Conservation of Energy • Principle of Conservation of Momentum	L1, L2, L3	5
Module III: Waves and Optics in Biological Systems • Basics of wave motion • Light as a wave • Ability of light to cause atomic excitation and its Biological significance (eg. Biofluorescence, Photosynthesis)	L1, L2, L3	4

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• Applications of optics in biology (e.g., Compound microscopy, Confocal microscopy, Fluorescence microscopy)		
Module IV: Electricity and Magnetism in Biological Systems • Basics of electricity and magnetism • Membrane potentials and electrical signaling in cells • Magnetic resonance imaging (MRI) in biological research	L1, L2	3
Module V: Introduction to Chemistry in Biology • Overview of the course content • Importance of chemistry in biological processes • Basic chemical terminology and concepts	L1, L2	1
Module VI: Section: Organic Chemistry **Structure, Bonding and Nomenclature in Organic Molecules** • Structure & nomenclature of organic molecules • Bonding in organic compounds • Isomerism in organic chemistry	L1, L2	2
Module VII: Functional Groups and Reactions • Common functional groups in biomolecules (aldehyde, ketone, alcohol, acid, amine, amide, ester) • Chemical reactions in organic chemistry • Stereochemistry in biomolecules	L1, L2	2
Module VIII: Section: Physical Chemistry **Thermodynamics in Biological Systems** • First and Second Laws of Thermodynamics • Enthalpy, entropy, and Gibbs free energy • Thermodynamics of biological processes	L1, L2	3
Module IX: Chemical kinetics • Zero, First and Second order reactions	L1, L2	3
Module X: Instrumental analysis • GC/MS, LC/MS, NMR	L1, L2, L3	1

Module XI: Colligative Properties
• Definition of colligative properties
• Different ways of expressing concentration of a solution
• Importance of colligative properties in biological systems
  • Osmosis; Osmotic pressure and its significance in cells
  • Freezing Point Depression and Cryopreservation
	L1, L2, L3	3

Module XII: Section : Inorganic Chemistry **Metals in Biological Systems** • Role of metal ions in biological processes • Metalloenzymes and metalloproteins • Oxidation state of atoms and its importance in bioavailability of micronutrients	L1, L2	2

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Applications of Atomic Excitations and De-Excitations | Physics (lumenlearning.com)
- Bookshelves - Physics LibreTexts
- **Introductory Chemistry; Libre Texts: https://commons.libretexts.org/book/chem-45050**

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Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	CA	A	A/P	EE
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	1					1	1				
CO2	1	1					1	1				
CO3	1	1	2				1	1	2			
CO4	1	1					1	1				
CO5	1	1	2			1	1	1	2			1

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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DBTH2739	BASICS OF RESEARCH METHODOLOGY, ETHICS, AND RESEARCH COMMUNICATION	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description

This course aims to provide students with a comprehensive understanding of conducting ethical research, utilizing proper research methodologies, and effectively communicating research findings. The course includes a final project where students will write a Literature Review on a topic chosen in consultation with the teacher(s).

This course is designed to equip students with essential skills and knowledge to conduct ethical research, employ proper research methodologies, and effectively communicate scientific information (with focus on writing a literature review). The course will cover topics such as research design, data collection and analysis, research ethics, and science communication strategies. Through a combination of lectures, discussions, case studies, and practical exercises, students will develop a deeper understanding of the research process and its ethical implications.

Course Objectives

The objective of this course is to impart knowledge about various stages of research process, research ethics and different ways of research communication.

The aim of this course is to impart research skills to the beginners and help to improve the quality of research by the existing researchers. It also encompasses the understanding and application of appropriate research design, statistics, and the use of the computer for reference management, report writing, research paper writing and presentation. The course also introduces the key conceptual issues of each research method, as well as giving practical guidance. It covers the series of research methodology contents: from problem formulation, to design, to data collection, analysis, reporting and dissemination. The course has the dual aims of equipping students with conceptual understandings of current academic debates regarding different methods, and the practical skills to put those methods into practice.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define criteria of good research, steps in research process, and data collection.

CO2. Identify different types of sampling and its purpose.

CO3. Conduct hypothesis testing for different types of samples and interpret the results.

CO4: Learn the importance of literature review, write research paper/thesis, use reference management software.

Course Content :

Module	Topic	**Blooms level***	Hours
1	**Research Methodology** Understanding the research process: From research questions to conclusions	L1, L2	10

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	Types of research: Qualitative and quantitative research Exploratory, descriptive, experimental, and correlational studies Scientific Thinking: Subjective Vs. Objective Thinking Logical Reasoning: Inductive Vs. Deductive Reasoning Formulating research hypotheses and objectives Purpose of a good research, Criteria of good research		
2	**Descriptive Statistics** Data, Types of Data, Methods of data collection, Benefits and drawbacks, Graphical representation of data and interpretation. Measures of Central Tendency: Arithmetic Mean, Median, Mode, Measures of Dispersion: Range, Standard Deviation, Variance, Coefficient of Variation.	L1, L2, L3	15
3	**Inferential Statistics** Sampling: Basic concepts, Process of Sampling, Sample Size, Types of Samples, Sampling and non- sampling errors, Statistics and Parameters, Sampling Distribution of Means and Proportion, **Hypothesis Testing**, steps in testing of hypothesis, errors in hypothesis testing, z test and t test.	L1, L2, L3	15
4	**Research Ethics** Plagiarism, Fabrication, Falsification, Ethics with respect to human and Animal Research	L1, L2	5
5	**Communication** Characteristics of a good Research paper, Systematics Literature Review (choosing a topic, preparing outline, gathering authentic & appropriate references, avoiding plagiarism, use of reference management systems), Writing a good literature review, Structure of report (Introduction, Methodology, Analysis, Results, Discussions, Conclusions, Recommendations), Writing Quality Research Paper, Publishing Research Work in Quality Journals, Reference Management Software	L1, L2, L3	15

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional Exam	End Term Examination
Weightage (%)	5	10	15	70

Project based assignment: Student teams (2-3 students per team) will write a literature review on a topic of choice, in consultation with the teacher.

Text books/ Reference books

- Research Methodology for Natural Sciences by Soumitro Banerjee, Publisher: IISc Press (1 January 2022); ISBN-10: 8194835178; ISBN-13: 978-8194835172

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- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt. Ltd., New Delhi-110001
- Geode, Millian J.& Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Kothari, C.R.2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.
- Levin R I., Rubin D S. Statistics for Management. Sixth Edition, PHI
- Kapoor & Gupta. Probability & Statistics. S Chand Publishers, New Delhi.
- Montomery, Douglas C.(2007), 5th Ed. Design and Analysis of Experiments, Wiley India.
- Cooper, Donald R. and Pamels Schindler, Business Research Methods, Tata McGraw Hills, New Delhi
- Krishnaswamy, K.N. Sivakumar. Appa lyer and Mathiranjan M. 2006, Management Research Methodology: Integration of Principles, Methods and Techniques, Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Sachdeva, J.K. 2008. Business Research methodology. Himalaya Publishing House, New Delhi.
- Shekharan, Uma, Business Research Methods, Miley Education, Singapore.
- Zikmund, Millian G., Business Research Methods, Thomson Learning, Bombay**.**

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SEMESTER-VIII

Course Code: DBTH2801	DOWN STREAM PROCESSING & FERMENTATION TECHNOLOGY	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description

This course explains the processes and techniques used for production and purification of a product from culture medium. Also, bioprocess consideration in using animal and plant cell cultures will discuss using different techniques. This will also provide students with an up-to-date knowledge of upstream and downstream processing technology.

Course Objectives

The syllabus will help the students to characterize the Bioproducts of biotechnological importance and to get expertise in their downstream processing. The course shall make the students aware of various fermentation processes within the context of each topic.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Produce bio-products and secondary metabolites on commercial level using fermenters.
- Describe the production of primary and secondary metabolites.
- Recognize the fundamental understanding of physical and chemical properties of biological materials and their separation and purification.
- Explain the various principles that underlie major unit operations used in bio separations such as settling, evaporation, centrifugation, and membrane filtration.
- Explain the principles of protein precipitation, aqueous two phase extraction, adsorption and chromatography.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Fermentation Technology-An Overview • Basic principle in fermentation technology, • Media formulation and optimization, • Cell culture techniques • Inoculum development and aseptic transfers.	**L1, L3, L4, L5**	3
Module II: Bioproduct Production • Production of Ethanol, • Production of secondary metabolites – penicillin, cephalosporins, streptomycin, tetracycline, • Fermentation technology for production of acetone-butanol, citric acid, amino acids, • Polysaccharides and plastics.	**L1, L2, L3**	9
Module III: Downstream Processing-An Overview • Importance of downstream processing in biotechnology; • Characteristics of bio-products and fermentation broth	**L1, L3, L4,**	2

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Module IV: Bioproduct Isolation • Separation of insoluble products - filtration, centrifugation, sedimentation, Cell disruption • Separation of soluble products: liquid-liquid extraction, precipitation	**L2, L4, L5**	14
Module V: Purification • Chromatographic techniques • Separation based on size, charge and biological affinity • Membrane Based Separation- reverse osmosis, ultra and micro filtration • Gel electrophoresis	**L3, L4, L5**	11
Module VI: Polishing • Drying; • Crystallization • Storage and packaging.	**L1, L3, L6**	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text books and Reference

- Industrial Microbiology by L.E.Casida, JR.New Age International (P) LTD.
- Biotechnology, A Text book of Industrial Microbiology, W. Crueger and A. Crueger, Sinauer Association.
- Bioseparations: Downstream Processing for Biotechnology, P.A. Belter et al, John Wiley & Sons Inc.
- Practical Biochemistry, Principles & Techniques, Keith Wilson and John Walker
- Biochemical Engineering Fundamentals, J.E. Bailey and D.F. Ollis, McGraw-Hill
- Biotreatment, Downstream Processing and Modelling (Advances in Biochemical Engineering/ Biotechnology, Vol 56), T. Schepler et al, Springer Verlag
- Protein Purification, MR Ladisch, RC Wilson, CC Painton, SE Builder, American Chemical Society
- Principles of Fermentation Technology by P.F. Stanbury, A. Whitaker, and S.J. Hall, Aditya Books (P) LTD.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	2	2				1	2	2			
CO2	1	2	2				1	2	2			
CO3	1						1					
CO4	1	2					1	2				
CO5	1	1	1				1	1	1			

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2802	INTRODUCTION TO DEVELOPMENTAL BIOLOGY	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description

Developmental Biology is a branch of biological sciences that focuses on understanding the processes by which organisms grow and develop from a single cell (zygote) into a fully formed organism. This field integrates principles from molecular biology, genetics, and cell biology to elucidate the mechanisms that control the growth, differentiation, and morphogenesis of cells, tissues, and organs. This course introduces the students to molecular, cellular, and physiological processes that govern development in multicellular organisms. Students will examine key concepts from gamete formation, fertilization, embryonic development, repair and regeneration. Students will also explore current research topics in Stem cell engineering and Stem cell therapy.

Course Objectives

This course aims to enable the students to develop an integrated understanding of the molecular, cellular, genetic and physiological processes that govern development in multicellular organisms. Significant emphasis will be on the scientific process and key experiments that helped scientists unravel the secrets of the development processes in various model organisms.

Course Outcomes (COs):

Upon successful completion of this course students will be able to:

- Describe the different stages of development in multicellular organisms (from formation of gametes to development of a fully developed organism).
- Explain the different molecular and cellular processes involved in regulation of development in higher organisms, with suitable example
- Develop an integrated understanding of knowledge gained in fundamental courses such as genetics, cell biology and molecular biology, in the context of the various cellular, molecular and physiological processes that regulate the development of a multicellular organism.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to Developmental Biology in higher organisms Life cycle and stages of development Introduction to key themes in Developmental Biology: Differential gene expression, Cell fate determination, Signalling in development, Pattern formation, Morphogenesis, Developmental plasticity: Regeneration, Apoptosis (programmed cell death)	L1, L2	7
Module II: Germ Cells and Fertilization The Benefits of Sex Reproduction in higher organisms, Primordial Germ Cells and Sex Determination in Mammals, Eggs, Sperm, Fertilization, Blastulation, Gastrulation.	L1, L2	8
Module III: Universal Mechanisms of Animal & Plant Development • Differential gene expression • Cell-Cell signalling • Cell fate determination • Patterning: axis formation and segmentation • Morphogens and morphogenesis	L1, L2, L4, L5	30

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• Apoptosis and its role in Development • Senescence (in plants) (each of these mechanisms will be discussed with appropriate examples from the following model organisms; Caenorhabditis elegans, Drosophila, Mouse, Arabidopsis		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

Molecular Biology of The Cell, Bruce Alberts et al. Chapters 20, 21 and 22.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	2	2				1	2	2			
CO2	1	2	2		3	3	1	2	2		3	3
CO3	1	2	1		3	3	1	2	1		3	3

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2803	METHODS IN BIOLOGY	L	T	P	C
Version	2023	2	0	0	2
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description

This course introduces the learners to the various techniques and methods used in biology and helps them to strengthen their theoretical knowledge before practical training. This course gives an overview about the different methods used in laboratory and prepare the students for the laboratory experiments. The knowledge about the statistical methods teaches the students to interpret the data.

Course Objectives

The objective of this course is to acquaint the students with various techniques in biology. A student will build upon undergraduate level knowledge of biological principles to understand different biological techniques. The course shall also make the students aware of various statistical techniques used in biology

Course Outcomes (COs):

On completion of this course, students should be able to:

- Explain the principles of buffer preparation and function, and evaluate buffer capacities and pH adjustment for various biological experiments.
- Develop proficiency in a range of analytical techniques, such as spectrophotometry, chromatography, and electrophoresis, for the quantitative and qualitative analysis of biological molecules.
- Explain and apply microbiological methods, including culturing, isolating, and identifying microorganisms, as well as maintaining sterile techniques.
- Apply statistical methods to analyze and interpret biological data, understanding concepts such as hypothesis testing, data visualization, and the use of statistical software.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Buffers: Principle, constitution and preparation of Buffers (acidic, neutral and basic), Biological buffer systems.	**L1, L2, L3**	2
Module II: Analytical Techniques: Principle, instrumentation, applications, analysis and interpretation of the data in UV-Visible Spectrophotometry, Fluorimetry, Chromatography (Paper, TLC, Gel filtration, Ion-exchange chromatography), Electrophoresis (Gel electrophoresis, SDS-PAGE, Agarose Gel Electrophoresis, Immunoelectrophoretic techniques).	**L1, L2, L3, L4**	8
Module III: Microbiological Techniques: Culture of microorganisms; types of culture media; methods for isolating pure cultures; maintenance and preservation of pure cultures. Control of microorganisms; physical and chemical methods. Bacterial growth: definition, growth parameters, measurement of growth, synchronous growth. Batch and continuous cultures	**L1, L2, L3, L4**	7
Module IV: Biostatistics	**L1, L2, L3, L4**	7

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Importance of the use of statistical methods in biological research, sampling theory, samples and populations. Measures of central tendency; mean, median, mode, standard deviations and standard error. Tests of significance, Q Test, F Test and T Test.		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Advanced Instrumentation, Data Interpretation, and Control of Biotechnological Processes, J.F. Van Impe, Kluwer Academic
- Modern Spectroscopy, J.M. Hollas, John Wiley and Son Ltd.
- MLA. Skoog, Douglas A. Principles of Instrumental Analysis. Fort Worth: Saunders College Pub.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	1	2				1	1	2			
CO2	1	1	2				1	1	2			
CO3	1	1	3				1	1	3			
CO4	1	1	2		2		1	1	2		2	

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2804	GENETIC ENGINEERING	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	**DBTH2805 GENETIC ENGINEERING LAB**				

Catalog Description

The objectives of this course are to teach students various approaches to conducting genetic engineering and their applications in biological research as well as in biotechnology industries. Genetic engineering is a technology that has been developed based on our fundamental understanding of the principles of molecular biology and this is reflected in the contents of this course.

Course Objectives

Given the impact of genetic engineering in modern society, the students should be endowed with strong theoretical knowledge of this technology. In conjunction with the practicals in molecular biology & genetic engineering, the students should be able to take up biological research as well as placement in the relevant biotech industry

Course Outcomes (COs):

On completion of this course, students should be able to:

- Understand the fundamental principles of genetic engineering and become proficient in the tools and techniques used in genetic manipulation, such as restriction enzymes and cloning strategies.
- Explain the utility of various types of vectors, including plasmids, viral vectors, and artificial chromosomes, and their applications in gene cloning and expression.
- Discuss in detail the relevant applications of a range of PCR techniques, such as quantitative PCR, reverse transcription PCR, and digital PCR, for amplifying and analyzing DNA sequences.
- Articulate the application of gene manipulation methods and techniques for studying protein-DNA interactions, such as electrophoretic mobility shift assays (EMSAs) and chromatin immunoprecipitation (ChIP).
- Explain the principles and applications of gene silencing methods, including RNA interference, and master genome editing technologies such as CRISPR-Cas9, TALENs, and zinc finger nucleases.
- Explain the principles and applications of stem cell technology and gene therapy, focusing on their potential for treating genetic disorders and regenerative medicine.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction and tools for genetic engineering Impact of genetic engineering in modern society; general requirements for performing a genetic engineering experiment; restriction endonucleases and methylases; DNA ligase, Klenow enzyme, T4 DNA polymerase, polynucleotide kinase, alkaline phosphatase; cohesive and blunt end ligation; linkers; adaptors; homopolymeric tailing; labelling of DNA: nick translation, random priming, radioactive and non-radioactive probes, hybridization techniques: northern, southern, south-western and far-western and colony hybridization, fluorescence in situ hybridization.	**L1, L2**	7
Module II: Different types of vectors	**L1, L2, L3**	10

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Plasmids; Bacteriophages; M13 mp vectors; PUC19 and Bluescript vectors, hagemids; Lambda vectors; Insertion and Replacement vectors; Cosmids; Artificial chromosome vectors (YACs; BACs); Principles for maximizing gene expression expression vectors; pMal; GST; pET-based vectors; Protein purification; His-tag; GST-tag; MBP-tag etc.; Intein-based vectors; Inclusion bodies; methodologies to reduce formation of inclusion bodies; mammalian expression and replicating vectors; Baculovirus and Pichia vectors system, plant based vectors, Ti and Ri as vectors, yeast vectors, shuttle vectors		
Module III: Different types of PCR techniques Principles of PCR: primer design; fidelity of thermostable enzymes; DNA polymerases; types of PCR – multiplex, nested; reverse-transcription PCR, real time PCR, touchdown PCR, hot start PCR, colony PCR, asymmetric PCR, cloning of PCR products; T-vectors; proof reading enzymes; PCR based site specific mutagenesis; PCR in molecular diagnostics; viral and bacterial detection; sequencing methods; enzymatic DNA sequencing; chemical sequencing of DNA; automated DNA sequencing; RNA sequencing; chemical synthesis of oligonucleotides; mutation detection: SSCP, DGGE, RFLP.	**L1, L2, L3**	10
Module IV: Gene manipulation and protein-DNA interaction Insertion of foreign DNA into host cells; transformation, electroporation, transfection; construction of libraries; isolation of mRNA and total RNA; reverse transcriptase and cDNA synthesis; cDNA and genomic libraries; construction of microarrays – genomic arrays, cDNA arrays and oligo arrays; study of protein-DNA interactions: electrophoretic mobility shift assay; DNase footprinting; methyl interference assay, chromatin immunoprecipitation; protein-protein interactions using yeast two-hybrid system; phage display.	**L1, L2, L3, L4**	6
Module V: Gene silencing and genome editing technologies Gene silencing techniques; introduction to siRNA; siRNA technology; Micro RNA; construction of siRNA vectors; principle and application of gene silencing; gene knockouts and gene therapy; creation of transgenic plants; debate over GM crops; introduction to methods of genetic manipulation in different model systems e.g. fruit flies (*Drosophila*), worms (*C. elegans*), frogs (Xenopus), fish (zebra fish) and chick; Transgenics - gene replacement; gene targeting; creation of transgenic and knock-out mice; disease model; introduction to genome editing by CRISPR-CAS with specific emphasis on Chinese and American clinical trials	**L3, L4, L5, L6**	7
Module VI: Stem cell and gene therapy, Types of stem cell, their use, gene therapy	**L1, L2, L3**	5

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Gene cloning and analysis: An Introduction by T. A Brown, Blackwell Publishing
- Principles of gene manipulation: An introduction to genetic engineering by R.W Old and S.B Primrose, Blackwell Publishing
- Principles Of Gene Manipulation And Genomics, 7Th Edition by Primrose S B, John Wiley
- Lewins Genes XII by Jocelyn E. Krebs and Elliott S. Goldstein, JONES & BARTLETT
- 2Green, M. R., & Sambrook, J. (2012). Molecular Cloning: a Laboratory Manual. Cold Spring Harbor, NY: Cold Spring Harbor Laboratory Press.
- Brown, T. A. (2006). Genomes (3rd ed.). New York: Garland Science Pub.
- 4Selected papers from scientific journals, particularly Nature & Science.
- 5Technical Literature from Stratagene, Promega, Novagen, New England Biolab etc.

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Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	CA	A	A/P	EE
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	1	3				1	1	3			
CO2	1	2	3				1	2	3			
CO3	1	1	3				1	1	3			
CO4	1	2	3				1	2	3			
CO5	1	2	3				1	2	3			
CO6	1	2	3				1	2	3			

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2805	GENETIC ENGINEERING LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**DBTH2804 GENETIC ENGINEERING**				

Catalog Description

This course will help the students to better understand what has been taught in the theory class. Designing primers, doing PCR, cloning PCR products will make the theoretical concepts about PCR and cloning crystal clear. Further purification of recombinant proteins, running of SDS-PAGE, western blotting will be helpful for understanding the regulation of expression and understanding molecular biology techniques.

Course Objectives

The objective of this course is to give students hands on experience of the latest techniques in genetic engineering. It will also help them to understand the theoretical concepts better.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Develop the skills to design effective primers and perform PCR amplification to successfully target and amplify a gene for expression purposes.
- Acquire the ability to clone a PCR-amplified gene into an *E. coli* expression vector, including the preparation of competent cells and transformation techniques.
- Apply the principle of gene expression induction using inducers and optimize gene expression in *E. coli*.
- Gain proficiency in preparing and running SDS-PAGE gels to separate and analyze proteins, assessing the expression of the target recombinant protein.
- Master the technique of Western blotting, including transfer, blocking, antibody probing, and detection to identify and quantify the recombinant protein.
- Develop the capability to purify the recombinant protein using chromatography techniques and evaluate the purity and concentration of the final product.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Designing of primers and PCR amplification of a gene for expression	L1, L2, L3	2
Module II: Cloning of the gene in E. coli expression vector	L1, L2, L3	4
Module III: Induction of gene expression	L2, L3	2
Module IV: Running of SDS-PAGE to check expression	L1, L2, L3	2
Module V: Western blotting of the recombinant protein	L2, L3, L4	2
Module VI: Purification of the recombinant protein	L1, L2, L3, L4	3

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and references

- Molecular Cloning A LABORATORY MANUAL by Michael Green and J. Sambrook

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Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	CA	A	A/P	EE
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	1	2				1	1	2			
CO2	1	1	2			2	1	1	2			2
CO3	1	1	2				1	1	2			
CO4	1	1	2				1	1	2			
CO5	1	1	2				1	1	2			
CO6	1	1	2				1	1	2			

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2806	MOLECULAR DIAGNOSTICS	L	T	P	C
Version	2023	2	0	0	2
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description

Molecular Diagnostics familiarizes students about recent advances in molecular biology and molecular medicine with a potential to profoundly alter many aspects of modern medicine including pre- or post-natal analysis of genetic diseases and identification of individuals predisposed to disease ranging from common cold to cancer. Students should be able to understand various facets of molecular procedures and basics of genomics, proteomics and metabolomics that could be employed in early diagnosis and prognosis of human diseases.

Course Objectives

Molecular Diagnosis is the process of identifying a disease by studying molecules, such as proteins, DNA, and RNA, in a tissue or fluid. It is a new discipline that captures genomic and proteomic expression patterns and uses the information to distinguish between two or more conditions at the molecular level. The conditions under investigation can be human genetic disease or infectious diseases. Molecular diagnostics is not confined to human diseases but can be used in animals or plants

Course Outcomes (COs):

On completion of this course, students should be able to:

- Understand the significance of the classical discoveries in Molecular Diagnostics, and explain the uses of the same in modern context
- Compare the modern-day Molecular Diagnostic technologies with the technologies used earlier, and explain their significance in the modern advancements.
- Describe the key uses of Molecular Diagnostics tests in microbial diseases, metabolic pathway impairments and paediatric diseases.
- Explain the role of DNA mutations, polymorphisms and chromosomal abnormalities in diseases and how Molecular Diagnostic tests can identify these.
- Recognise the impact of Molecular Diagnostic tests in rapid, easy, high throughput disease diagnostics
- Enlist and explain the ever-increasing list of Molecular Diagnostics applications in biotechnology, precision medicine and prenatal diagnostics.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to Molecular Diagnostics. Genome biology in health and disease DNA, RNA, Protein: chromosomal structure & mutations; DNA polymorphism: human identity; clinical variability and genetically determined adverse reactions to drugs.	**L1, L2, L3**	5
Module II: Techniques used: Hybridization based techniques, Southern, Western, FISH, PCR, PCR based techniques, RT-PCR, Multiplex, DNA fingerprinting, sequencing, new generation sequencing, RNA sequencing, Microarray, Bioinformatics data acquisition & analysis.	**L1, L2, L3**	5
Module III: Diagnostic metabolomics Metabolite profile for biomarker detection the body fluids/tissues in various metabolic disorders by making using LC MS & NMR technological platforms.	**L3, L4, L5**	5

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Module IV: Detection and identity of microbial diseases Direct detection and identification of pathogenic-organisms that are slow growing or currently lacking a system of invitro cultivation as well as genotypic markers of microbial resistance to specific antibiotics.	**L3, L4, L5**	5
Module V: Detection of inherited diseases: Amniocentesis, inherited diseases for which molecular diagnosis has provided a dramatic improvement of quality of medical care: Down's syndrome, Fragile X Syndrome:	**L3, L4, L5, L6**	5
Module VI: Molecular oncology: Detection of recognized genetic aberrations in clinical samples from cancer patients; predictive biomarkers for personalized onco-therapy of human diseases such as chronic myeloid leukemia, colon, breast, lung cancer and melanoma.	**L1, L2, L3, L5**	5

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

1. Watson J.D, Tania A.B, Stephen P.B, Alexander G, Michael L and Richard L. 2007. Molecular Biology of the Gene. Benjamin Cummings
2. Molecular Diagnostics: George P. Patrinos, Science Direct

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1		--	--	--		1					
CO2	1	2	2	--	--		1	2	2			
CO3	1	1	--	--	2		1	1			2	
CO4	1	1	--	--	2		1	1			2	
CO5	1	2	--	1	2	3	1	2		1	2	3
CO6	1	2		1	2	3	1	2		1	2	3

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBTH2807	ENVIRONMENTAL BIOTECHNOLOGY	L	T	P	C
Version	2023	2	0	0	2
Pre-requisites	Ecology and Environment				
Co-requisites	Nil				

Catalog Description

Environmental Biotechnology" offers an in-depth exploration of how biotechnological methods can address pressing environmental challenges. This course equips students with the knowledge and skills to develop innovative biotechnological solutions for a sustainable future

Course Objectives

The course "Environmental Biotechnology" aims to provide students with a comprehensive understanding of the intersection between biotechnology and environmental science. Through six detailed modules, students will explore critical environmental issues, the development and use of bioenergy resources, and the methods for pollution control and waste treatment. They will gain expertise in bioremediation and biodegradation techniques, which utilize biological systems to address environmental contaminants. The course will also emphasize green practices for sustainable development, encouraging the adoption of eco-friendly technologies and strategies. Additionally, students will examine environmental protection policies, understanding their role in promoting sustainability and conserving natural resources.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Understand and articulate the major environmental issues, including pollution, climate change, and biodiversity loss, and their impact on ecosystems and human health.
- Analyse various bioenergy resources, such as biofuels and biomass, and evaluate their potential and challenges in replacing fossil fuels.
- Develop an understanding of different types of pollution and waste, and explain the principles and techniques for effective waste treatment and pollution control.
- Discuss bioremediation and biodegradation processes, and apply microbial and plant-based strategies to detoxify and restore contaminated environments.
- Explore and assess green practices and technologies aimed at promoting sustainable development, reducing environmental impact, and conserving natural resources.
- Understand the key environmental protection policies and regulations, and evaluate their effectiveness in safeguarding the environment and promoting sustainable practices.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Environmental issues Greenhouse effect, Global Warming, Global Ozone Problem, Acid Rain, Eutrophication and Biomagnification	L1, L2, L3	3
Module II: Bioenergy Resources Renewable and Non-Renewable energy resources Clean fuel technology and generations of Biofuels- Bioethanol, Biogas, Biodiesel, Algal fuels.	L1, L2, L3	6
Module III: Pollutions & Waste treatment Pollutions:- Air, Water & Soil, Classification and characterization of waste, Principles & Mechanisms of Waste Water Engineering: Treatment of municipal	L3, L4, L5	7

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waste water and industrial effluents with special focus on biological and advanced water treatments. Solid Waste Management, Techniques of air & soil waste treatment		
Module IV: Bioremediation and Biodegradation Bioremediation and Biodegradation of major environmental pollutants- release of genetically engineered microbes in environment. Biomineralisation- Use of microbial technology for mining of metals from ores	L3, L4, L5	5
Module V: Green practices for sustainable development Biofertilizers, Biopesticides and IPM, Vermicomposting Bioassessment of environmental quality- Bioindicators and Biosensors	L3, L4, L5, L6	5
Module VI: Environment protection policies EIA and Environmental Audit Related case studies at national and global level	L1, L2, L3	4

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Textbook of Biotechnology, RC Dubey/ PK Gupta
- Environmental Biotechnology, Pradipta Kumar Mohapatra
- Biotechnology- Expanding Horizons, BD Singh
- Introduction to Environmental Biotechnology, Milton Wainwright
- Waste Water Engineering, Metcalf and Eddy
- Environmental Microbiology- Methods and Protocol, Alicia L, Ragout De Spencer, John FT Spencer
- Principles of Environmental Engineering, Gilbert Masters
- Environmental Science- Working with the Earth, G Tyler Miller Jr

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (eg. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	3					1	3				
CO2	1	2	3				1	2	3			
CO3	1	2	3		2		1	2	3		2	
CO4	1	2	3		2		1	2	3		2	
CO5	1	1	3				1	1	3			

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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DBTH2839	DATA ANALYSIS & VISUALISATION USING SOFTWARE	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	Class X Mathematics				
Co-requisites					

Catalog Description

The implosion of available data has made visualization more critical but also more challenging. Data analysis and Data Visualization are essential tools for business analysis, engineers, policymakers, and decision-makers. Developed originally for "small data", visualization techniques have been met with varied success in the past centuries and decades. There are a few well-known visualizations that are very effective in capturing the essence of the data, and of course, there are many infamous negative examples of poor visuals. An effective visual is critical for decision making it, but it also requires a lot of work, customization, attention to detail, and refinements.

Course Objectives

The course is designed to help students develop skills and knowledge in the following area(s):

- Develop an understanding of what is a good visualization for a given purpose
- Learn visualization theory & techniques
- Build a substantial data analytic project
- Apply data analysis and visualization with Excel, SPSS, R, Python, NVivo and MATLAB

Course Outcomes

On completion of this course, the students will be able to

CO1. Students will be able to articulate meaningful lines of inquiry that might be explored through the collection, organization, visualization, and analysis of data in a context associated with their primary field of study using (as appropriate) numerical, textual, spatial, and/ or visual data.

CO2. Student will understand what data are, how they are collected, and how to assess the quality/ reliability of data.

CO3. Students will demonstrate intermediate proficiency in the visualization of data to communicate information and patterns that exist in the data.

CO4: Students will be able to use at beginning level of proficiency the tools of statistics and machine learning to ask questions of and explore patterns in data.

Course Content :

Module	Topics Covered	Blooms Level	Contact Hours
1	**Module-1: Introduction to Excel** Data Analysis using Excel, Curve fitting, Correlation, Linear Regression, Multiple regression, Principal Component Analysis and Factor Analysis, Hypothesis testing **Introduction to Excel and SPSS**	L1, L2, L3, L4	20 hours

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	Introduction to SPSS and Types of Data, Importing, exporting and data handling in SPSS; Exploratory data analysis using SPSS and data visualization; Introduction to statistical inference and various univariate tests by using SPSS; Analysis of Variance (One Way ANOVA, Two Way ANOVA and ANCOVA); Correlation, Simple and Multiple linear Regression Analysis; Principal Component Analysis and Factor Analysis		
2	**Module-2: VOS Viewer** **Web of Science, Scopus, Dimensions, Lens, and PubMed.** Co-authorship networks, citation-based networks, and co-occurrence networks can be created based on data downloaded from Web of Science, Scopus, Dimensions, and Lens. Co-authorship networks and co-occurrence networks can also be created based on PubMed data. **Crossref, Europe PMC, and OpenAlex**. Networks can also be created based on data retrieved through the APIs of Crossref, Europe PMC, and OpenAlex, These APIs can be queried interactively in VOS viewer. **Semantic Scholar, Open Citations, and Wiki Data.** For a given set of DOIs, networks can also be created based on data retrieved through the APIs of Semantic Scholar, Open Citations and Wiki Data.	L1, L2, L3, L4	10 Hours
3	**Faculty of Management Studies & Behavioural Sciences** **Module 3: Domain Specific Software** **- Structural Equation Modelling** **Smart PLS** Introduction to Structural Equation Modelling (SEM), Introduction to the software's AMOS and SPSS, SMART PLS, Testing of Statistical assumptions, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), common method bias (CMB) test, Measurement Model Assessment, Discussing Fit Indices, Reliability and Validity Testing, Structural Model Assessment identifying multivariate outlier, Construct Validity: Convergent and Discriminant Validity, Measurement Model & Structural Equation Modelling, Mediation and Moderation Effects, Multi-Group Analysis.	L1, L2, L3, L4	30 Hours
	Faculty of Arts **N Vivo** 1. Import text, audio, video, emails, images, spreadsheets, online surveys, web content, and social		

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	media from various sources into a simple, intuitive interface. 2. Create and NVivo project, import and organise qualitative and quantitative data 3.Manage a literature review in NVivo 4. Autocode structured data deductively and identify themes inductively 5. Generate and falsify hypotheses 6. Combine data in sets for analysis 7. Seek patterns and identify relationships across codes and cases 8. Present findings using visualisations 9. Export data out of NVivo 10. Coordinate teamwork.		
	Faculty of Science Engineering and Technology **Faculty of Health & Allied Sciences** **R programming / Python/ MATLAB** **R Programming-** Introduction to R, Variables and datatypes in R, Dataframes, Recasting and joining of dataframes, Arithmetic, logical and matrix operations in R, Functions in R, Control structure in R, Data visualization in R. **Python Programming-** Basics of programming, data structure and algorithm using Python, Strings, lists, control, functions, manipulating lists, loops, arrays, selection sort, insertion sort, recursion, sorting, dictionaries, exception handling, file handling, string processing, data analysis using Python **MATLAB Programming-** Introduction, basic features, managing workspace, mathematical functions, basic plotting, Matrices, array operations and linear equations, MATLAB programming- M files script, M-file functions, control flow and operations.		

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional (Theory/ Practical)	End Term Examination
Weightage (%)	5	10	15	70

References:

- David Houcque, 2005. Introduction to MATLAB programming for Engineering students., Northwestern University, E- Book **https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf**
- Mark Lutz, 2009. Learning Python. O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.

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- Emmanuel Paradis, 2005. R for Beginners. E book. **https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf**
- A Handbook of Statistical Analysis using SPSS by Dr. Brijesh Awasthi, Redshine Publication.

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Amity Institute of Biotechnology

Bachelor of Science (Honors/ Honors with Research) in Biological Science

FLEXILEARN
-Freedom to design your degree



Curriculum & Scheme of Examination

2023

AMITY UNIVERSITY HARYANA

GURUGRAM

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Bachelor of Science (Honors/ Honors with Research) in Biological Science

About the Program

The BSc Biological Sciences undergraduate program is designed to provide a comprehensive understanding of the biological sciences, fostering a solid foundation in various disciplines such as botany, zoology, microbiology, genetics, and biotechnology. The program's goals are to equip students with critical thinking skills, practical laboratory experience, and an in-depth knowledge of biological systems and processes. Graduates will be prepared for diverse career opportunities in research, healthcare, environmental conservation, and biotechnology industries, as well as for higher education and specialized professional courses.

Aligned with the National Education Policy (NEP) 2020 of India, the program emphasizes multidisciplinary and holistic education, integrating flexible curricula, and innovative pedagogies to promote lifelong learning and critical inquiry. The curriculum is designed to encourage experiential learning through internships, fieldwork, and project-based assignments. It also promotes the development of ethical values and a scientific temper, preparing students to contribute effectively to societal and global challenges. This alignment ensures that the program remains relevant, dynamic, and responsive to the evolving needs of society and the job market. The table below states Amity University Haryana's key objectives, Amity Institute of Biotechnology's Objectives for the UG program (Program Objectives, PO) and the Program Specific Objectives, PSO, for the BSc Biological Sciences program, all in line with the NEP. The POs and PSOs form the foundation principles based on which the program structure and the curriculum for each course is designed. The course content for each course is duly mapped to the POs and PSOs.

	AUH Key Objectives (based on NEP)	AIB Objectives (PO)	BSc BLS objective (PSO)
1	Multidisciplinary Learning and Holistic Education	To impart a comprehensive understanding of core subjects in Life Sciences along with a strong foundation in allied disciplines such as chemistry, physics, and computational and mathematical tools.	To impart a comprehensive understanding of core subjects in Biological Sciences along with a strong foundation in allied disciplines such as chemistry, physics, and computational and mathematical tools.
2	Experiential and Hands-on Learning	To empower the students with the technical knowledge and skills for executing experiments in Life Sciences, with focus on experimental design, use of modern experimental equipment, qualitative and quantitative data collection, critical thinking and analysis, in order to make them skilled for career opportunities.	To empower the students with the technical knowledge and skills for executing experiments in Biological Sciences, with focus on Experimental Design, use of modern experimental equipment, qualitative and quantitative data collection Critical Thinking and analysis, in order to make them skilled for career opportunities.
3	Research and Innovation	To inculcate a spirit of scholarly research, innovation and entrepreneurship in Life Sciences	To inculcate a spirit of scholarly research, innovation and entrepreneurship in Life Sciences
4	Ethics and Sustainability	To instil ethical practices and an understanding of sustainable development in the context of issues related to Life Sciences	To instil ethical practices and an understanding of sustainable development in the context of issues related to Life Sciences

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5	Communication and Collaboration	To improve scientific communication skills through various medias, and the ability to work collaboratively in multidisciplinary teams	To improve scientific communication skills through various medias, and the ability to work collaboratively in multidisciplinary teams
6	Lifelong Learning and Adaptability	To nurture a mindset of continuous education and professional development, by encouraging a quest for knowledge and personal growth.	To nurture a mindset of continuous education and professional development, by encouraging a quest for knowledge and personal growth.

A salient feature of the NEP is the emphasis on providing the students opportunities for multidisciplinary learning, practical real-life experience, and a all-rounded personal development. This is implemented through offering various baskets of courses as follows. Students will learn the subjects in their chosen major through the basket of courses offered under Discipline Specific Courses (DSC I). In addition, two more baskets of courses DSC-II and DSC-III (often referred to as D2 and D3 courses respectively). The D2 basket includes courses that are offered by a program different from the on the student has registered as the Major program but within the same Faculty. The D3 basket includes courses that are offered by a program different from the one the student has registered as the Major program and outside the Faculty. (Amity University Haryana has the following 6 Faculties: 1. Faculty of Science Engineering and Technology, 2. Faculty of Health and Allied Sciences, 3.Faculty of Arts, 4. Faculty of Management Studies & Behavioural Sciences, 5. Faculty of Architecture and Planning, and 6. Faculty of Law. Amity Institute of Biotechnology comes under the Faculty of Science Engineering and Technology).

In addition, the Skill Enhancement courses, Ability Enhancement courses and Value Added courses further diversify the scope of student's learning in order to empower them for a wholistic development.

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Bachelor of Science (Honors/ Honors with Research) in Biological Science
SEMESTER-I

Course Code: DBLS2101	PLANT DIVERSITY	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites					
Co-requisites	**DBLS2102 PLANT DIVERSITY LAB**				

Catalog Description

This undergraduate course on Plant Diversity explores the vast array of plant life, from algae and mosses to ferns, gymnosperms, and angiosperms. Students will study plant classification, evolutionary relationships, ecological roles, and adaptations to different environments. Students will gain a comprehensive understanding of plant morphology, physiology, and taxonomy, preparing them for advanced studies and careers in botany, ecology, environmental science and biotechnology.

Course Objectives

This course aims to provide undergraduate students with a thorough understanding of plant diversity, encompassing the classification, evolution, and ecological significance of various plant groups. Students will learn to identify and characterize different plant species, understand their physiological and morphological adaptations, and appreciate their roles in ecosystems. The course prepares students for advanced studies and careers in botany, ecology, conservation, environmental science, and biotechnology.

Course Outcomes (COs):

- Describe the importance and scope of plant diversity, including the major plant groups
- Identify and classify various algae and bryophytes, explaining their life cycles, ecological roles, and economic importance.
- Distinguish between pteridophytes and gymnosperms, understanding their morphological characteristics, reproductive strategies, and ecological significance.
- Classify and describe the structural features, reproductive mechanisms, and ecological roles of key angiosperm families such as *Cucurbitaceae, Apiaceae, Apocynaceae, Asclepiadaceae, Lamiaceae, Euphorbiaceae,* and *Poaceae*.
- Analyze the significance of biodiversity in providing ecosystem services, supporting agriculture, and promoting sustainable practices in both rural and urban environments.
- Evaluate the various threats to biodiversity, including habitat loss, invasive species, pollution, climate change, and human activities, and propose conservation strategies to mitigate these impacts.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to Plant Diversity • Introduction to Whittaker's five-kingdom system of classification • Overview of plant diversity and its significance • Increasing complexity: From algae to angiosperms • Basic principles of plant taxonomy and classification Major plant groups and their characteristics	L1, L2, L3	6
Module II: Algae and Bryophytes • Characteristics and classification of algae • Ecological roles and economic importance of algae • Characteristics and classification of bryophytes	L1, L2, L3, L5	8

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• Life cycle and reproduction of bryophytes		
Module III: Pteridophytes and Gymnosperms • Characteristics and classification of pteridophytes • Life cycle, reproduction, and ecological roles of pteridophytes • Characteristics and classification of gymnosperms • Life cycle, reproduction, and economic importance of gymnosperms	L1, L2, L3, L4, L5	8
Module IV: Angiosperms • Overview of angiosperms and their significance • Classification of angiosperms: Monocots vs. dicots • Structural features: Roots, stems, leaves, flowers, fruits, and seeds • Pollination, fertilization, and seed dispersal mechanisms • Representative Families of interest: *Cucurbitaceae*, *Apiaceae, Apocynaceae, Asclepiadaceae, Lamiaceae, Euphorbiaceae,* and *Poaceae* • Economic and Ethnobotanical importance of plants	L1, L2, L3, L4, L5, L6	10
Module V: Why is Biodiversity conservation important? • Biodiversity and ecosystem services • Medicinal plants and natural products • Agrobiodiversity and crop diversity • The role of pollinators in agriculture • Sustainable agriculture and biodiversity conservation • Urban Biodiversity: Biodiversity in urban environments • Green spaces and urban biodiversity conservation (pros and cons of Miyawaki forests)	L1, L2, L3, L4, L5, L6	7
Module VI: Threats to Biodiversity • Habitat loss and fragmentation • Invasive species and their impacts • Pollution and climate change effects on biodiversity • Effect of Monoculture on Biodiversity • Role of Biotechnology in Monoculture. • Human impacts on plant diversity and conservation strategies	L1, L2, L3	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Textbooks and References

- College Botany Vol. I and II, Ganguli and Kar: New Central Book Agency.
- A Textbook of Botany, V. Singh, P.C. Pande& D.K. Jain: Rastogi Publication.
- The Algae, V. J. Chapman and D. J. Chapman.: Macmillan, London
- Introductory Phycology, H. D. Kumar: East West Press Pvt. Ltd.
- A Textbook of Algae, H. D. Kumar and H.N. Singh.: McMillan International
- Introductory Mycology, Alexopaulos, Mims and Blackwell: John Wiley and Sons Inc.
- Cryptogamic Botany, G. M. Smith. McGraw Hill
- A Textbook of Algae, B. R. Vashishtha S. Chand and Co. Pvt. Ltd
- Bryophytes, N. S. Parihar Central Book Depot.
- Pteridophytes, N. S. Parihar Central Book Depot

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	CA	A	A/P	EE
Weightage (%)	15	5	10	70

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CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	1	3	2			1	1	3	2		
CO2	1	2	3	2			1	2	3	2		
CO3	1	2	3	2			1	2	3	2		
CO4	1	1	3	2			1	1	3	2		
CO5	1	1	3	1	2	3	1	1	3	1	2	3
CO6	1	1	3	1	2	3	1	1	3	1	2	3

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2102	PLANT DIVERSITY LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**DBLS2101 PLANT DIVERSITY**				

Catalog Description

The Plant Diversity Lab course offers hands-on experience in studying the vast array of plant species, from simple algae to complex angiosperms. Students will engage in laboratory and fieldwork to observe, identify, and classify plants, examining their morphological and anatomical features. Emphasis is placed on understanding plant evolution, ecological roles, and adaptations. This lab course complements theoretical knowledge from lectures, providing practical skills essential for careers in botany, ecology, and environmental science.

Course Objectives

The objective of the Plant Diversity Lab course is to provide students with practical skills and hands-on experience in identifying, classifying, and studying various plant species. Through laboratory exercises and fieldwork, students will explore the morphological and anatomical features of plants and recognize their ecological roles. This course aims to enhance students' observational and analytical abilities, preparing them for advanced studies and careers in botany, ecology, and environmental science.

Course Outcomes (COs):

Upon successful completion of this course, students will be able to:

- Proficiently use microscopy techniques to prepare and observe various plant specimens.
- Microscopically examine and prepare temporary slides of algae, fungi, bryophytes, mosses, lichens, mycorrhiza, and pteridophytes, identifying their vegetative and reproductive structures.
- Gain the skills to study gymnosperms, specifically Cycas and Pinus, through permanent slides and temporary preparations, understanding their structure and reproductive features.
- Describe, identify, and characterize the floral structures and economic importance of representative angiosperm families such as *Cucurbitaceae, Apiaceae, Apocynaceae, Asclepiadaceae, Lamiaceae, Euphorbiaceae,* and *Poaceae.*
- Conduct field studies to understand the role of biodiversity in ecosystem services,
- Identify invasive plant species and evaluate their impact on native flora, as well as analyze the effects of pollution on plant diversity.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to Microscopy and Plant Specimen Handling • Learning basic microscopy techniques • Preparing and observing plant specimens	L1, L2, L3	2
Module II: Cryptogams • Microscopic study Algae of C*hlamydomonas, Volvox, Spirogyra,* (Fresh preparations and permanent slides). • Temporary microscopic slide preparation of Bryophytes, Mosses, Lichens, Mycorrhiza, Pteridophytes; observation of vegetative and reproductive structures.	L1, L2, L3, L4	6

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Module III: Phanerogams (part 1) • Gymnosperms Study of the Gymnosperms like *Cycas, Pinus* with the help of permanent slides and by cutting sections and making suitable temporary preparations.	L1, L2, L3, L4	6
Module IV: Phanerogams (part 2) • **Study of Representative Angiosperm Families:** Detailed description and identification and floral characterization and economic importance of *Cucurbitaceae, Apiaceae, Apocynaceae, Asclepiadaceae, Lamiaceae, Euphorbiaceae,* and *Poaceae* families as prescribed in theory course.	L1, L2, L3, L4	6
Module V: Biodiversity and Ecosystem Services: • Field study at AUH farm and herbal garden • Case study on role of pollinators in Agriculture (or) • Case study on food biodiversity	L1, L2, L3, L4	4
Module VI: Threat to Biodiversity • Identifying invasive plant species and their impact on native flora (e.g. *Prosopis, Parthenium*) • Analyzing the impact of pollution on plant diversity (e.g. algal bloom, *Eichhornia* proliferation)	L1, L2, L3, L4, L5, L6	4

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Textbooks and References

- The Algae, V. J. Chapman and D. J. Chapman.: Macmillan, London
- Introductory Mycology, Alexopaulos, Mims and Blackwell: John Wiley and Sons Inc.
- College Botany Vol. I and II, Ganguli and Kar: New Central Book Agency.
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- Cryptogamic Botany, G. M. Smith. McGraw Hil
- A Textbook of Algae, B. R. Vashishtha S. Chand and Co. Pvt. Ltd

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	1	2	2			1	1	2	2		
CO2		1	2	2			1	1	2	2		
CO3	1	1	2	2			1	1	2	2		
CO4	1	1	2	2	3		1	1	2	2	3	
CO5	1	1	1	2	3	2	1	1	1	2	3	2
CO6	1	1	1	2	3	2	1	1	1	2	3	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS 2103	ANIMAL DIVERSITY	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	**DBLS2104 ANIMAL DIVERSITY LAB**				

Catalog Description

This course explores the fundamental principles of classification with a focus on animal structure and function. Students will begin by learning the basics of animal diversity, which will build a foundation for progressively deeper understanding of the subject. This knowledge will also highlight its applications in biotechnology and industry

Course Objectives

The aim of this course is to familiarize students with the details of animal classification and diversity, providing a solid foundation for future studies and research in biotechnology

Course Outcomes (COs):

On completion of this course, students should be able to:

- Recall the landmark concepts in animal diversity, and explain the different classifications of microorganisms
- Explain the evolutionary relationship between different animals, and its significance in taxonomy
- Describe and understand the identification and classification of organisms using traditional and modern methods
- Explain and gain fundamental knowledge of Animal Diversity
- Recognize the impact of animals in ecological balance
- Enlist and explain the concept of species and binomial nomenclature

Course Content:

Modules	Blooms level*	Number of hours
Module I: General Account Introduction to Whittaker's five-kingdom system of classification; General accounts of animal diversity, theory of evolution and classification of animals, concept of species, binomial nomenclature, evolutionary relationship among three domains of life- Archaea, Bacteria and Eukaryotes. Model animals as research tool.	L1, L2, L3	15
Module II: Invertebrates General characteristics of Protozoa, Porifera, Coelenterates, Helminths, Annelida, Arthropoda, Mollusca, Echinodermata, classification up to classes. Amoeba as a model to study protozoan characters, Sycon as a model to study poriferan characters, Study of canal system and spicule formation among sponges, Hydra as a model to study morphology, anatomy, locomotion and reproduction of Coelenterates, Tapeworm as a model to study life-cycle and parasitism of Helminths, Earth worm as a model to study morphology, anatomy, nervous system, locomotion, reproduction and physiology of Annelida, Arthropoda morphology, appendages, metamorphosis, Starfish as a model to study life cycle, respiration, nervous	L1, L2, L3, L4	15

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system, circulation, excretion and vascular system of Echinodermata.		
Module III: Vertebrates General characters and classification of Chordata, Protochordates, Urochordates, Cephalochordates, Cyclostomes. Fishes, Amphibians, Reptiles, Birds, Mammals. Parental care in amphibian, reptiles, Aves and mammals. Homeostasis and Thermoregulation in invertebrates and vertebrates.	L1, L2, L3, L4, L6	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Textbooks and References

- Jordan, E.K. and Verma, P.S., Invertebrate Zoology. S. Chand & Co. New Delhi.
- Kotpal, R.L., Refer to the series on Protozoa, Porifera, Coelenterates, Annelida, Arthropoda, Mollusca, Echinodermata. Rastogi Publication, Meerut.
- Parker, T.J. and Haswell, W.A., Text Book of Zoology Vol 1. AZT BS Publisher, New Delhi.
- Borradile, L.A. and Potts, F.A., Invertebrate Zoology, Cambridge Press, UK.
- Dhami, P.S. and Dhami, J.K., Invertebrate Zoology, S Chand & Co. New Delhi.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1						1					
CO2	1	2	2				1	2	2			
CO3	1	1			2		1	1			2	
CO4	1	1			2		1	1			2	
CO5	1	2		1	2	3	1	2		1	2	3
CO6	1	2		1	2	3	1	2		1	2	3

1: Strongly Related, 2: Moderately Related and 3: Weakly Relate

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Course Code: DBLS2104	ANIMAL DIVERSITY LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**DBLS2103 ANIMAL DIVERSITY**				

Catalog Description

This laboratory course complements the theory course Animal Diversity. In this course students will explore the diversity of invertebrate & vertebrate animals, and identify specimens & permanent slides. They will also engage in model-based demonstration of the different organ systems including circulatory, digestive, respiratory and reproductive systems of vertebrate animals.

Course Objectives

The goal of this course is to acquaint the students with the diversity of animals and familiarise with their distinct physiological features. Identification of permanent slides & preserved specimens, and model-based demonstration of different organ systems of vertebrate animals will act as an excellent basis for further biological studies and research.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Explain the basis of animal classification and identify a few organisms belonging to different taxa.
- Describe the various organ systems in different vertebrates using models.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Methods of Sterilization Physical and Chemical methods	L1, L2, L3	2
Module II: Temporary mount of human cheek cells	L1, L2, L3	2
Module III: Spot Identification: Permanent slides of Earthworm Gizzard and Intestine	L1, L2, L3	2
Module IV: Spot Identification: *Amphioxus, Balanoglossus*	L1, L2, L3	2
Module V: Spot Identification: Permanent slides of Fish scales	L1, L2, L3	2
Module VI: Spot Identification: *Scoliodon, Trygon, Exocoetus*	L1, L2, L3	2
Module VII: Demonstration: Branchial system of *Scoliodon*	L1, L2, L3	2
Module VIII: Demonstration: Digestive system of *Bufo*	L1, L2, L3	2
Module IX: Demonstration: Air sacs of *Columba*	L1, L2, L3	2
Module X: Demonstration: Reproductive system of male and female *Rattus*	L1, L2, L3	2

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Text Books and References

- A Manual of Practical Zoology Chordates, P. S. Verma, S. Chand & Co. Ltd.
- Biology of Animals Vol II, A. K. Sinha, S. Adhikari, B. B. Ganguly, New Central Book Agency, Calcutta

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	CA	A	A/P	EE
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	1	--	--	--	--	1	1	--	--	--	--
CO2	1	1	--	--	--	--	1	1	--	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-II

Course Code: DBLS2201	PLANT ANATOMY AND PHYSIOLOGY	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	**DBLS2202 PLANT ANATOMY AND PHYSIOLOGY LAB**				

Catalog Description

This fundamental course, "Plant Anatomy and Physiology" introduces the undergraduate students to the structure and function of plants. It covers cellular organization, tissue systems, and organ functions. Students learn about plant structure (anatomy and morphology), plant growth, development, and adaptation mechanisms. Key topics include photosynthesis, respiration, hormonal regulation of growth, development and adaptation to different kinds of stress, water transport, and nutrient uptake. Emphasis will be placed on the relationship between structure and function, as well as the adaptation of plants to their environments.

Course Objectives

This course aims to impart to students fundamental knowledge and understanding about plant form, function, development and metabolism. A strong understanding of this basic knowledge will prepare the students for a diverse range of career options including cultivation of plants and crop improvement by traditional methods and modern biological tools and application. This knowledge will also equip the students to develop solutions to address key global issues such as Climate change.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Identify plant vegetative and reproductive structures
- Correlate the form and function: correlation of different morphological and anatomical adaptations.
- Understand the detailed anatomy of plant cells, tissues, and organs.
- Explain the physiological mechanisms, processes underlying plant growth and development.
- Analyze the processes of photosynthesis, respiration, and water and nutrient transport.
- Evaluate the morphological, physiological and metabolic adaptive strategies of plants in different environments.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to Plant Anatomy and Physiology • Overview of plant structure and function • Importance of studying plant anatomy and physiology in agriculture and ecology	L1, L2, L3	2
Module II: Plant Cells and Tissues • Plant Cell • Primary & Secondary cell wall, Plasmodesmata and pits • Meristems • Cell types and their functions • Tissue systems: dermal, ground, and vascular tissues • Root, Shoot and Leaf anatomy (one typical example each from Monocot and Dicot)	L1, L2, L3, L4	10
Module III: Plant Growth and Development • Plant growth processes	L1, L2, L3	10

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• Hormonal regulation of plant growth • Abscission and healing of wounds (in brief)		
Module IV: Water Transport and Nutrient Uptake • Plant water relations • Mineral nutrient uptake and transport in plants • Nitrogen availability • Adaptations for water conservation and nutrient acquisition	L1, L2, L3	8
Module V: Photosynthesis and Respiration • Mechanisms of photosynthesis (C3, C4 & CAM) • CAM anatomy • Photorespiration (in brief) • Cellular respiration in plants (in brief)	L1, L2	10
Module VI: Plant Reproduction • Pollination and fertilization processes • Seed development and dispersal	L1, L2, L3	5

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Plant Physiology by Lincoln Taiz and Eduardo Zeiger
- Life The Science Of Biology 10th Edition (2012) David Sadava, David M. Hillis, H. Craig Heller, May R. Berenbaum. (opensource versions available)

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	1					1	1				
CO2	1	1					1	1				
CO3	1	1					1	1				
CO4	1	2					1	2				
CO5	1	2			2		1	2			2	
CO6	1	2			2		1	2			2	

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2202	PLANT ANATOMY AND PHYSIOLOGY LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**DBLS2201 PLANT ANATOMY AND PHYSIOLOGY**				

Catalog Description

This course, "Plant Anatomy and Physiology Lab" complements the theory course "Plant Anatomy and Physiology" (DBLS2201). In this course students will gain hands-on experience in investigating anatomy of different parts of plants, familiarize themselves with different experimental tools and techniques. Study and discussions on case studies will empower them to analyse issue or global concern.

Course Objectives

This course will engage the students in practical experiments to understand the intricate structures and physiological processes that govern plant life. From microscopy techniques unveiling cellular details to experiments elucidating growth patterns and responses to environmental stimuli, this lab experience provides a practical foundation in the fundamental principles of plant anatomy and physiology.

Course Outcomes (COs):

- Demonstrate proficiency in staining and microscopic techniques
- Understand the organization of the root meristem
- Compare and contrast anatomical features of root, stem and leaf samples between monocots and dicots. Also examine structure anatomy of floral parts.
- Classify leaf types (simple, compound) and phyllotaxy patterns
- Comprehend water utilization and soil fertilization practices in organic cultivation
- Examine floral parts and the cross-section of the ovary.
- Critically analyze local and international examples, demonstrating an understanding of the impact of climate change on agriculture.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Staining and Microscopic techniques for studying plant cells and tissues	L1, L2, L3	2
Module II: Root meristem • Onion root tip	L1, L2, L3	2
Module III: Root anatomy • CS of dicot root	L1, L2, L3	2
Module IV: Root anatomy • CS of monocot root	L1, L2, L3	2
Module V: Stem anatomy • Monocot stem & Dicot stem	L1, L2, L3	2
Module VI: Leaf anatomy • Monocot leaf and Dicot leaf	L1, L2, L3	2
Module VII: Field observation • Leaf types (simple, compound); Phyllotaxy; Secondary growth in trees and shrubs	L1, L2, L3, L4	4

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Module VIII: Field observation • Amity farm visit; water utilization and soil fertilization in organic cultivation	L1, L2, L3, L4	4
Module IX: Floral parts and LS of ovary	L1, L2, L3, L4	2
Module X: Case study on impact of climate change on agriculture (one local example and one international example)	L1, L2, L3, L4, L5, L6	4

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- P, Sharma-Natu & Paul, Vijay & PS, Deshmukh. (2004). Laboratory Manual: Experimental Plant Physiology – I. (PDF version available at ResearchGate)
- A Text Book of Practical Botany 2; by Bendre and Kumar; Rastogi Publications. ISBN 817133877-1

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	CA	A	A/P	EE
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	1	2				1	1	2			
CO2	1	1	2				1	1	2			
CO3	1	1	2				1	1	2			
CO4	1	1	2				1	1	2			
CO5	1	1	2	2			1	1	2	2		
CO6	1	1	3				1	1	3			
CO7	1	1		2			1	1		2		

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2203	ANIMAL ANATOMY AND PHYSIOLOGY	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	**DBLS2204 ANIMAL ANATOMY AND PHYSIOLOGY LAB**				

Catalog Description

Studying animal physiology as part of a bachelor's degree curriculum can be both fascinating and foundational for understanding of the physiological processes in animals, including how different organ systems function and interact. In this course the students will learn how animals acquire nutrients from food, the basics of circulatory system, the physiology of muscle contraction and how animals coordinate responses to stimuli through nervous impulses.

Course Objectives

The main objective of this course is to provide the knowledge about Animal Anatomy & Physiology. This course will provide a robust foundation in biological sciences and the knowledge can be utilized for understanding real-world applications and current research in Animal Anatomy & Physiology.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Recall fundamental Animal Anatomy & Physiology processes.
- Demonstrate the structure and function of major organ systems in animals, including the digestive, circulatory, nervous and muscular systems.
- Illustrate the biochemical processes underlying the physiological functions in animals.
- Correlate the structure of cells, tissues, organs, and systems with their physiological functions in animals.
- Analyse physiological processes and solve problems related to animal physiology.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Lymphatic system, respiratory system, urinary system, and reproductive system	L1, L2, L3	10
Module II: Nervous and endocrine system and their role in the maintenance of homeostasis	L1, L2, L3	10
Module III: Composition and function of saliva; Mechanical and chemical digestion; Functions of pancreatic juices and biles. Blood, Blood Groups and Blood Transfusion; Blood Clotting; Hemodynamics; Cardiac Cycle and its regulation	L1, L3, L4	15
Module IV: Contraction and relaxation of muscle; Sarcomere; Cori's cycle. Organization of Nervous System; Neuron, nerve impulse; Synaptic Transmission; Neurotransmitters	L1, L3, L4	10

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Guyton, A.C. and Hall, J.E. Textbook of Medical Physiology. XI Edition. Hercourt Asia PTE Ltd. / W.B. Saunders Company.
- Tortora, G.J. and Grabowski, S. Principles of Anatomy & Physiology. XI Edition John Wiley & sons, Inc.
- Ganong, H, Review of Medial Physiology 14th edition, Appleton & Lange Publisher, New York

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Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	CA	A	A/P	EE
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	--	--	--	--	--	1	--	--	--	--	--
CO2	1	1	--	--	1	--	1	1	--	--	1	--
CO3	1	1	--	--	--	--	1	1	--	--	--	--
CO4	1	3	1	3	2	1	1	3	1	3	2	1
CO5	1	3	1	--	2	1	1	3	1	--	2	1

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2204	ANIMAL ANATOMY AND PHYSIOLOGY LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**DBLS2203 ANIMAL ANATOMY AND PHYSIOLOGY**				

Catalog Description

This laboratory course is designed to complement the theoretical knowledge gained in Animal Anatomy and Physiology courses. It provides hands-on experience with various biochemical and microscopic techniques used in the study of Animal Anatomy and Physiological processes.

Course Objectives

The main objective of this course is integration of theoretical knowledge with practical application, enabling students to connect anatomical structures with physiological functions. By conducting experiments and analyzing data collected during lab sessions, students will learn how to interpret physiological data and draw meaningful conclusions.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Recall basic principles of Anatomy and Physiology
- Demonstrate proficiency in laboratory techniques relevant to animal anatomy and physiology, such as microscopy, histology (study of tissues), and physiological experimentation.
- Enhance critical thinking skills by analysing anatomical variations and relating anatomical structures to physiological functions.
- Identify the ethical considerations related to animal research and experimentation, including proper care and handling of specimens and respect for animal life.
- Apply knowledge gained in the lab to real-world scenarios, such as understanding the impact of diseases or injuries on anatomical structures and physiological functions.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Study of permanent slides (mammalian tissues) • T. S. of Liver • T.S. of Kidney • T. S. of Testis • T.S. of Heart • T.S. of Spleen	L1, L2, L3	10
Module II: • Enumeration of red blood cells using hemocytometer. • Enumeration of total and differential count of white blood cells.	L2, L3. L4	8
Module III: • Effect of pH on amylase activity from saliva. • Biochemical analysis: carbohydrate, proteins and fats**.**	L1, L3,	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Guyton, A.C. & Hall, J.E. (2006). Textbook of Medical Physiology. XI Edition. Hercourt Asia PTE Ltd. / W.B. Saunders Company.

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- Tortora, G.J. & Grabowski, S. (2006). Principles of Anatomy & Physiology. XI Edition John Wiley & sons, Inc.
- Victor P. Eroschenko . (2008). diFiore's Atlas of Histology with Functional Correlations. XII Edition. Lippincott W. & Wilkins.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	1	--	--	--	--	1	1	--	--	--	--
CO2	1	1	2	--	--	--	1	1	2	--	--	--
CO3	1	1	2	--	--	--	1	1	2	--	--	--
CO4	1	1	--	1	--	--	1	1	--	1	--	--
CO5	1	1	2	--	--	2	1	1	2	--	--	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-III

Course Code: DBLS2301	BIOCHEMISTRY	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	**DBLS2302 BIOCHEMISTRY LAB**				

Catalog Description
This course aims to provide a comprehensive understanding of the biochemical principles that govern cellular processes. The course covers the chemical basis of life, focusing on the structure, function, and metabolism of biological molecules such as amino acids and proteins, nucleic acids, lipids, and carbohydrates.

Course Objectives
This course will cover the general properties of all biomolecules, their metabolism and practical approaches to study the same. This will provide a basic understanding of all the essential biochemical species necessary for life.

Course Outcomes (COs):
On completion of the course, the students will be able to:

- Explain the basic principles of biochemistry, and physical and chemical properties of all biomolecules.
- Describe how the biomolecules are metabolized.
- Relate how the structure of biomolecules influences their function and overall cellular homeostasis.
- Propose experiments for quantitative and qualitative analysis of biomolecules.
- Sketch the chemical structures of various biomolecules.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Basic principles • Mole concept, Properties of water; acids, bases and buffers; covalent and non-covalent interactions in biological systems; • Bioenergetics; General understanding of metabolic pathways and principles • Overview of Macromolecules: Proteins, Carbohydrates, Lipids & Nucleic acids – their building blocks, structure, diverse functions in biological system.	L2, L3, L4	4
Module II: Amino acids • Classification, chemical and physical properties • Transamination reaction • Biosynthesis and breakdown of amino acids using few representative examples. • Role of essential proteases and their target sites. • Urea cycle	L1, L2, L3	6
Module III: Proteins • Structural levels of proteins • Nature of peptide bond, phi and psi angles • Types of secondary structural elements - alpha helix, beta conformation, beta turns, Ramachandran plot and its importance • Enzymes: Introduction to kinetic and catalytic mechanisms;	L1, L2, L3, L6	10

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• Regulation of enzyme activity; types of enzyme inhibition.		
Module IV: Carbohydrates • Sugars and Polysaccharides • Carbohydrate metabolism: glycolysis and its regulation • Citric acid cycle and its regulation • Amphibolic nature of Citric acid cycle • Electron transport System • Oxidative phosphorylation and ATP production • Gluconeogenesis • Pentose phosphate pathway	L1, L4, L5	11
Module V: Lipids • Classification, structure and function • Lipids and biological membranes • Lipoproteins • Phospholipids • Sphingolipids • Glycolipids • Fatty acid metabolism: β-oxidation, biosynthesis and regulation; ketone bodies	L1, L2, L4	8
Module VI: Nucleic Acids • Nitrogenous bases • Nucleotides • Structure and properties of nucleic acids • Nucleotide Metabolism: metabolism of purines and pyrimidines	L1, L2	**6**

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Stryer, L. (2015). Biochemistry. (8th ed.) New York: Freeman.
- Lehninger, A. L. (2012). Principles of Biochemistry (6th ed.). New York, NY: Worth
- Voet, D., & Voet, J. G. (2016). Biochemistry (5th ed.). Hoboken, NJ: J. Wiley & Sons

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	CA	A	A/P	EE
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	2	--	--	--	1	1	2	--	--	--	1
CO2	1	2	--	--	--	--	1	2	--	--	--	--
CO3	1	2	3	--	2	2	1	2	3	--	2	2
CO4	1	1	1	2	2	1	1	1	1	2	2	1
CO5	1	1	3	--	--	--	1	1	3	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2302	BIOCHEMISTRY LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**DBLS2301 BIOCHEMISTRY**				

Catalog Description

This is a laboratory course focusing on the development of intermediate laboratory skills in modern biochemistry using the context of experiments examining biologically relevant molecules. This course is designed to foster skills in proper laboratory practice and record keeping, the use of biochemical instrumentation, the proper interpretation of experimental results, and the effective communication of the results through written reports. This course will provide both a theoretical and practical understanding of basic biochemical methods including the isolation, purification and characterization of proteins, lipids and DNA. Database applications for biotechnological applications will also be discussed.

Course Objectives

The laboratory experiments in Biochemistry would allow the students to get a practical exposure to the properties of biomolecules studied in the course.

Course Outcomes (COs):

CO1: At the end of the course, student will be able to detect, quantitate and analyse various biomolecules.
CO2: They will also learn the associated analytical tools required in the process.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Preparation of buffers useful for biological experiments	L1, L2, L3	4
Module II: Construction of standard plots using graph sheet and MS- Excel	L1, L2, L3	4
Module III: Detection of the presence of amino acids using Ninhydrin Test	L1, L2, L3	2
Module IV: Detection and quantitation of proteins using Bradford test	L1, L2, L3	4
Module V: Colorimetric detection of sugars (Molisch test, Fehling's test, Seliwanoff test)	L1, L2, L3	4
Module VI: Ethanol emulsion test to detect the presence of lipids	L1, L2, L3	4
Module VII: Biochemical estimation of DNA and RNA, Quantitative determination of DNA and RNA by UV spectrophotometer, Determination of purity of nucleic acids, Determination of melting temperature of DNA from thermal denaturation characteristics	L1, L2, L3	4

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Practical book of Biochemistry by Plummer
- Practical book of Biochemistry by S.K. Sawhney and Randhir Singh

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Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	CA	A	A/P	EE
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	1	2				1	1	2			
CO2	1	1	2				1	1	2			

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2303	MOLECULAR BIOLOGY	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	**DBLS2304 MOLECULAR BIOLOGY LAB**				

Catalog Description

Molecular biology is the branch of Biology that deals with structure and function of macromolecules essential to life. A course in Molecular Biology should enable the students to understand how 1) the genetic material is passed on from one generation to the next and 2) how the genetic material is expressed and regulates the functioning of the cell.

Course Objectives

The objective of the course is to provide a clear understanding of the basic molecules inside the cell that govern the fundamental processes of life i.e. DNA, RNA and proteins. The structure of these molecules provides important clues to their functions. In addition, DNA being the genetic material in most organisms, studies regarding basic tools and techniques to manipulate it are covered in the syllabus. Strong foundation in molecular biology enables the students to familiarize themselves with basic mechanisms of genes, DNA replication and Gene expression in health and disease.

Course Outcomes (COs):

On completion of this course, students should be able to:

1. Understand and conceptualize the landmark discoveries in Molecular Biology, and their role in furthering our knowledge about the subject.
2. Explain the basic structure of biomolecules and the structure-function relationship within the cell and their role in bringing about the daily physiological functions.
3. Describe the key metabolic processes about their replication, gene expression and protein synthesis and illustrate the similarities and differences between the structure and function of DNA and RNA and their role in origin of life.
4. Explain the principle of central dogma in Molecular Biology; illustrate the principles of positive and negative regulation of gene expression.
5. Recognize the impact of gene mutations or changes in gene sequence and ways to repair them and their role in disease and evolution.
6. Enlist and explain the role of molecular biology in health, diagnostics, recombinant DNA technology, food production, and precision medicine.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Historical developments in genetics leading to evolution of molecular biology. Historical experiments that led to identification of DNA as the genetic material, structure of DNA and RNA, complementarity, phosphodiester bond, different types of DNA, denaturation and reassociation.	**L1, L2, L3**	7
Module II: DNA replication, replication origin, theta structure, DNA polymerases, modes of replication, mechanism of replication in *E.coli*, synthesis of leading and lagging strands, DNA replication in eukaryotes. DNA repair, mutations, DNA damage, Photoreactivation, Base excision repair, mismatch repair, Nucleotide excision repair.	**L1, L2, L3**	8

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Module III: Genome organization in prokaryotes and eukaryotes, genes and pseudogenes, repeated sequences. Transposable elements – transposons, Chromosome structure: heterochromatin, euchromatin, histone proteins, histone code. Chromosomal rearrangements, aneuploidy, chromosomal human disorders.	**L3, L4, L5**	6
Module IV: Transcription: Gene structure: promoter and coding sequences, regulatory and transcription units, RNA polymerases, basic mechanism of transcription (initiation, elongation and termination) in prokaryotes and eukaryotes, tRNAs, rRNA, microRNA and long noncoding RNA	**L3, L4, L5**	7
Module V: Deciphering the genetic code, Salient features of genetic code, Translation – initiation, elongation and termination, Regulation of gene expression, Prokaryotes negative and positive regulation, attenuation, Eukaryotes: Transcription factors, activators and enhancers.	**L3, L4, L5, L6**	7
Module VI: Molecular Biology Techniques: DNA foot printing, Radioactivity, Polymerase Chain reaction, Hybridization, siRNA, EMSA, CRISPR-CAS technique	**L1, L2, L3**	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Griffiths A.J.F, Wessler S.R, Carroll S.B and Doebley J. 2012. Introduction to Genetic Analysis. W.H. Freeman and Co., NewYork
- Snustad D.R and Simmons M.J. 2010. Principles of Genetics. John Wiley and Sons.
- Jocelyn E.K, Elliott S.G and Stephen T.K. 2011. Lewins Genes X. Jones and Barlett Pub., USA
- Watson J.D, Tania A.B, Stephen P.B, Alexander G, Michael L and Richard L. 2007. Molecular Biology of the Gene. Benjamin Cummings

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1						1					
CO2	1	2	2				1	2	2			
CO3	1	1			2		1	1			2	
CO4	1	1			2		1	1			2	
CO5	1	2		1	2	3	1	2		1	2	3
CO6	1	2		1	2	3	1	2		1	2	3

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2304	MOLECULAR BIOLOGY LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**DBLS2303 MOLECULAR BIOLOGY**				

Catalog Description

The laboratory course consists of Molecular Biology experiments organized in different learning modules and lectures relevant to the experiments. These provide hands on training and in-depth knowledge about methods like isolation, purification, and detection of recombinant DNA and proteins; polymerase chain reaction, its use in diagnosis, cloning and recombinant DNA technology, quantification of denatured DNA and gene expression analysis. The students will learn the basics of experimental design, data analysis, and presenting the report in the lab record book.

Course Objectives

The goal of this course is to familiarize students with Molecular Biology techniques so that they can get absorbed easily in research jobs.

Course Outcomes (COs):

- Acquire a working knowledge of methods in Molecular Biology.
- The student should be able to use standard laboratory equipment and methods frequently used in Molecular Biology research.
- Understand and be able to perform simple data analysis (including statistics) and interpret the results generated.
- To communicate their results in written and oral form.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Isolation of Genomic DNA from E. Coli.	**L1, L2, L3**	3
Module II: Qualitative analysis of Genomic DNA by Agarose Gel Electrophoresis	**L1, L2, L3**	2
Module III: Quantitative analysis of DNA by spectrophotometer	**L3, L4, L5**	2
Module IV: Isolation of Plasmid DNA	**L3, L4, L5**	3
Module V: Restriction enzyme digestion	**L3, L4, L5, L6**	3
Module VI: Competent cell preparation	**L1, L2, L3**	4
Module VII: PCR	**L1, L2, L3, L4**	4
Module VIII: Gel extraction of fragments	**L1, L2, L3**	3
Module IX: Ligation and cloning of insert	**L1, L2, L3, L4, L5**	3

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Module X: Transformation of E. coli cells	**L1, L2, L3, L4, L6**	3

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Principles of Gene Manipulation and Genomics; Sandy B. Primrose, Richard Twyman; Blackwell Science Ltd. SBN:9781118653883, 1118653882
- Molecular cloning: A laboratory manual, Joseph Sambrook, E. F. Fritsch, Tom Maniatis; Cold Spring Harbor Laboratory, Volumes 1-3.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	1	1				1	1	1			
CO2	1	1	1				1	1	1			
CO3	1	1	1		2	2	1	1	1		2	2
CO4	1	1			1	2	1	1			1	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-IV

Course Code: DBLS2401	MICROBIOLOGY	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Biology				
Co-requisites	**DBLS2402 MICROBIOLOGY LAB**				

Catalog Description
Microbiology is aimed at introducing the world of microorganisms, including bacteria, viruses, fungi, and protozoa. This course covers the fundamental principles of microbiology, emphasizing microbial structure, function, metabolism, genetics, growth, control of microorganisms and ecology. Beginners of the course are rightly exposed to the foundation of microbiology, which would lead them towards progressive advancement of the subject as well as their applications in biotechnology and industry.

Course Objectives
To acquaint the students about the basics of microbiology, various techniques for their cultivation and control, and role of various microorganisms in different biotechnological applications.

Course Outcomes (COs):
On completion of this course, students should be able to:

- Recall the landmark discoveries in Microbiology, and explain the different classifications of microorganisms
- Explain the evolutionary relationship between different microorganisms, and its significance in microbial taxonomy.
- Describe the key metabolic pathways in microorganisms; illustrate their significance in determining the nutrient requirement and growth of microorganisms.
- Explain the principles of microbial genetics and central dogma in microorganisms; illustrate the principles of positive and negative regulation of gene expression.
- Recognise the impact of microorganisms in ecological balance.
- Enlist and explain the ever-increasing list of applications of microorganisms in biotechnology agriculture, food production, and bioremediation.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to Microbiology Historical developments of microbiology scope of microbiology, Brief account of organization and classification of microorganisms. Differences between prokaryotic and eukaryotic cell. Overview of bacterial cell structure, (size, shape, arrangement membrane, cell wall, cytoplasmic inclusions, mesosomes, flagella and motility, slime, capsule, pili, chemotaxis, endospore) The brief account of fungi, structure, physiology and classification,brief account of virus (bacteriophages) structure, life cycle (lytic and lysogenic)	L1, L2	6
Module II: Evolutionary microbiology and microbial diversity Microbial evolution and systematics, prokaryotic diversity: bacteria and archea, eukaryotic microorganisms (structure of algae and fungi), microbial community analysis (overview), classical and molecular taxonomy. Virology: Viruses and virions, growth and quantification, viral replication, viroids and prions, Bacterial, plant and animal viruses	L1, L2	6

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Module III: Reproduction and Growth Life cycles of representative microorganisms including bacteria, fungi and viruses, population growth and its measurement, effect of environmental condition on growth pH, temp. aeration etc, continuous culture, diauxic, synchronous growth cultures and anaerobic cultures	L1, L2, L3	5
Module IV: Nutrition and Metabolism Modern concepts of bacterial nutrition, nutritional categories. Transport of nutrients (diffusion, active transport, group translocation) Introduction to oxidative and substrate level phosphorylations, brief account of metabolism of carbohydrates, EMP, ED, TCA and glyoxylate cycle and nucleic acids as building block in biosynthesis of cell constituents' synthesis of peptidogylcan polymer of cell wall	L1, L2	6
Module V: Microbial Genetics A general account of prokaryotic and eukaryotic genome, recombination, brief account of transformation, conjugation, transduction. concept of operon, induction, repression, catabolite repression. Control of Microorganisms: Control of microbes by physical and chemical agents. Antibiotics, properties and mode of action; Drug resistance and its significance. Antibiotic sensitivity test. Industrial uses of bacteria yeast & molds	L1, L2, L3	8
Module VI: Microbial Ecology Methods in microbial ecology (culture dependent and culture independent techniques), microbial habitats and nutrient cycling (Carbon, sulphur and nitrogen cycles), plant-microbes, animal-microbes' interactions. Soil microorganisms associated with vascular plants, bioremediation and biodegradation	L1, L2, L4	7
Module VII: Applied Microbiology Biocatalysts, microbial metabolites, wine production, single cell proteins, microbial transformation of steroids, role of microbes in food industry, production of dairy products (fermented milks and cheese), Role of microbes in Agriculture (biofertilizers, biopesticides), Wastewater treatment	L1, L2, L3	**7**

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Textbooks and References

- Tortora GJ, Funke BR and Case CL. (2008). Microbiology: An Introduction. 9th edition. Pearson Education
- Mara D. and Horan N. (2013). The Handbook of Water and Waste-Water Microbiology. (3rd edition) Academic CRC Press.
- Pelczar MJ, Chan ECS and Krieg NR. 2004 Microbiology. 7th edition. McGraw-Hill Book Company.
- McMillan. Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. (2005) General Microbiology. 6th edition
- Madigan MT Martinko. JM and Parker J Brock TD (2017). Biology of Microorganisms. (15th edition). Pearson.
- Holt, J.S., Kreig, N.R., Sneath, P.H.A and Williams, S.T. Bergey's Manual of Determinative Bacteriology (9th Edition), Williams and Wilkins, Baltimore.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

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CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1						1					
CO2	1	2	2				1	2	2			
CO3	1	1			2		1	1			2	
CO4	1	1			2		1	1			2	
CO5	1	2		1	2	3	1	2		1	2	3
CO6	1	2		1	2	3	1	2		1	2	3

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2402	MICROBIOLOGY LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**DBLS2401 MICROBIOLOGY**				

Catalog Description

This lab course complements the theory course Microbiology (DBLS 2401). This course will introduce the students to basic microbiology lab techniques including media preparation, sterile culture techniques and standard practices and procedures. The approaches are relevant in both basic (biomedical) research and industrial applications of microorganisms.

Course Objectives

This course aims to prepare the students to carry out standard microbiology lab experiments including culture-media preparation, sterilization and sterile lab techniques, isolation and culture of microorganisms from natural sources, microscopic characterization of microorganisms by standard staining procedures.

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

- Prepare culture media following sterile handling techniques, and sterilisation procedures.
- Characterise bacterial and fungal strains using simple staining techniques, and by biochemical tests.
- Estimate the rate of growth of microorganisms by preparing the Growth Curve using turbidometry technique
- Isolate bacterial strains from natural sources (such as soil and water) and culture them
- Recognise and explain the implications of biofilms in industry, environmental and health contexts.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Standard lab practices, sterilisation techniques, sterile handling techniques.	L1, L2, L3	4
Module II: Prepratiion different types of culture media for bacterial culture	L1, L2, L3	4
Module III: Staining techniques: Simple staining, differential staining	L1, L2, L3	4
Module IV: Growth curve measurement of bacterial population by turbidometry.	L1, L2, L3, L4	4
Module V: Biochemical tests to identifies the microorganisms	L1, L2, L3	4
Module VI: Isolation and enrichment culture of microorganisms from natural sources (soil, water)	L1, L2, L3	4
Module VII: Biofilm formation of *Candida auris*: culture and characterisation	L1, L2, L3	4

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Text Books

- Microbiology: A laboratory Manual, Seventh Edition, by: Cappuccino and Sherman
- Microbes in Action, Fourth Edition:by Harry W. Seeley, Cornell University; Paul J. Vandemark, late of Cornell University; John J. Lee

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	CA	A	A/P	EE
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	1	2				1	1	2			
CO2	1	1	2				1	1	2			
CO3	1	1	2				1	1	2			
CO4	1	1	2	3			1	1	2	3		
CO5	1	1	2	2	2	3	1	1	2	2	2	3

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2403	CELL BIOLOGY AND GENETICS	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	**DBLS2404 CELL BIOLOGY AND GENETICS LAB**				

Catalog Description

This course offers a comprehensive study of cell biology and genetics, providing students with a thorough understanding of cellular structure, function, and genetic principles. The curriculum covers the molecular and biochemical foundations of cell biology, including cell division, signaling, and the regulation of the cell cycle. Additionally, students will explore fundamentals of molecular genetics, principles of Mendelian inheritance, pedigree analysis in humans, and cancer genetics. The course emphasizes the integration of cell biology and genetics to understand cellular processes and genetic mechanisms

Course Objectives

This course aims to provide a foundational understanding of Cell Biology and Genetics. Students will explore the intricacies of cellular structures, delve into the principles of genetic inheritance, and unravel the molecular mechanisms governing life. By the end of the course, students will possess a comprehensive grasp of fundamental biological processes, from cell division to genetic expression, and be equipped with the knowledge to critically analyze and apply these concepts in diverse biological contexts. Students will also draw and analyse human pedigree charts. In addition, they will learn the basic of principles of cancer genetics, and familiarize with the different model organisms used in this field.

Course Outcomes (COs):

On successful completion of this course, students should be able to:

- Comprehend cellular structures and functions; describe the differences between prokaryotes and eukaryotes.
- Explain the function of the 4 classes of macromolecules (proteins, lipids, carbohydrates and nucleic acids) in the cell, with special emphasis on the structure and diverse functions of nucleic acids
- Explain the stages of cell division in mitosis and meiosis, and their significance. Comprehend the role of Cell cycle regulation mechanisms in regulating cell division.
- Understand the concepts of Mendelian genetics; comprehend the Mendelian principles in light of molecular genetics.
- Apply principles of inheritance in human genetics, draw pedigree charts, analyse the mode of inheritance, and make simple calculations to calculate the probability of inheritance of traits.
- Explain the different kinds of mutations that could predispose to or cause cancer.
- Explain the relevance of different model organisms used in genetics and cell biology research.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Cell is the fundamental unit of life Prokaryotic and eukaryotic cell structure; Overview of Cellular organelles and their functions; Plant cells vs. Animal cells; Haploid vs. Diploid cells, History of significant milestone discoveries in Cell Biology.	L1, L2, L3	5
Module II: Macromolecules as building blocks of cells DNA is the genetic material, RNAs have diverse roles, Proteins are the work-horses of the cell, Lipid membranes maintain the integrity of cell and organellar structures, Carbohydrates have structural and energy storage functions.	L1, L2, L3	5
Module III: DNA as the genetic material	L1, L2	5

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Bacterial chromosome; Eukaryotic Chromosomes, Packaging of DNA into chromosomes		
Module IV: Cell division Mitosis and Meiosis	L1, L2	4
Module V: Cell cycle and Regulation of Cell cycle Cell cycle check-points, eg. Regulation of M check point	L1, L2	5
Module VI: Cell-Cell communication Autocrine, Paracrine, Juxtacrine and Endocrine signalling, GPCRs and TRK signalling, Insulin signalling, Adrenaline signalling, Importance of signalling in different contexts of development and metabolism Intracellular Compartment and Protein Transport	L1, L2, L3	6
Module VII: Mendelian inheritance Monohybrid cross, Law of segregation, Dihybrid cross, Law of independent assortment, Test cross; Historical perspective: Chromosomal theory of inheritance, Dilemma on nature of genetic material: Protein or DNA; key experiments that lead to establishment of DNA as genetic material Extensions of Mendelian inheritance: (4 lectures) Linkage, Crossing over frequency and gene mapping, Gene interaction (Epistasis), Expressivity, Penetrance, Polygenic traits, Pleiotropic inheritance	L1, L2, L3, L4, , L5	6
Module VIII: Model organisms in Genetics Research Plant, Animal and Single Cell model organisms in Genetics research	L1, L2, L3	4
Module IX: Human genetics Pedigree and Pedigree analysis, Molecular basis of genetic diseases; Cancer genetics	L1, L2, L3, L4	5

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Molecular Biology of the Cell
- Authors: Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts, Peter Walter; 6th Edition; Publisher: Garland Science; Year: 2014; ISBN-13: 978-0815344322
- Principles of Genetics
- Authors**:** D. Peter Snustad, Michael J. Simmons; 6th Edition; Publisher: Wiley; 2015; ISBN-13: 978-1118125889

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

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CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	3					1	3				
CO2	1	3					1	3				
CO3	1	1	3				1	1	3			
CO4	1	1					1	1				
CO5	1	1					1	1				
CO6	1	3					1	3				
CO7	1	1	2	2			1	1	2	2		

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2404	CELL BIOLOGY AND GENETICS LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**DBLS2403 CELL BIOLOGY AND GENETICS**				

Catalog Description

This lab course complements the lectures, allowing students to gain hands-on experience with modern techniques in cell biology and genetics. This course is fundamental for students pursuing careers in biological sciences and biotechnology.

Course Objectives

This course aims to give the students hands on experience on various aspects of practical research in the fields of cell biology and genetics.

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

- Apply standardised experimental procedures to isolate cell organelles
- Observe and distinguish between different stages of cell division (both mitosis and meiosis)
- Draw pedigree chart based on available data, infer the mode of inheritance, and make probability based predictions on the inheritance
- Analyse published (FACS) results (on cell cycle arrest) and infer scientifically valid conclusions
- Extract useful pertinent information from OMIM
- Debate on the ethical considerations surrounding personal genome sequencing

Course Content:

Modules	Blooms level*	Number of hours
Module I: Chloroplast extraction from spinach leaf	**L1, L2, L3**	2
Module II: Mitosis & meiosis (observe prepared slides)	**L1, L2, L3**	2
Module III: Mitosis – onion root tip	**L1, L2, L3**	2
Module IV: Non-disjunction as cause of aneuploidy (case study based activity)	**L1, L2, L3, L4**	2
Module V: Pedigree analysis	**L1, L2, L3, L4**	4
Module VI: Analysis of FACS results in case of mutants in cell cycle regulation. (analysis of experimental data from publications).	**L1, L2, L3, L4**	2
Module VII: Case Study on cancer	**L1, L2, L3, L4**	4
Module VIII: OMIM (Online Mendelian Inheritance in Man) based inquiry into protein structure and genetic disease	**L1, L2, L3**	4
Module IX: Case study on ethical considerations in personal genome sequencing	**L1, L2, L3, L4**	4
Module X: Worm as a model organism	**L1, L2, L3, L4**	2

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**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References
Case Studies resource: **https://my.nsta.org/search?q=BIOLOGY&pt=Case+Studies**

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	1	1				1	1	1			
CO2	1	1					1	1				
CO3	1	1	1				1	1	1			
CO4	1	1	1				1	1	1			
CO5	1	1	1				1	1	1			
CO6	1	1	1	1			1	1	1	1		

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-V

Course Code: DBLS2501	BIOANALYTICAL & BIOPHYSICAL INSTRUMENTATION	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	**DBLS2502 BIOANALYTICAL & BIOPHYSICAL INSTRUMENTATION LAB**				

Catalog Description

The course will acquaint the students with the various instruments, their configuration and principle of working, operating procedures, data generation and its analysis. This course also provides the fundamental principles of different bio-analytical techniques, able to apply the math, science, and engineering knowledge gained in the course to the analysis of biomolecules.

Course Objective:

This course begins with a review of basic bio analytical technique and an introduction to general terminologies. This course contains bio analytical techniques along with their theory, working principal, common instrumentation and possible applications. The student will be exposed to principles, instrumentation & application of various instruments & techniques used in biological field.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Explain the principles of centrifugation for the separation and analysis of biomolecules and cellular components.
- Develop the ability to determine the appropriate electrophoretic methods for the separation and characterization of proteins, nucleic acids, and other biomolecules.
- Explain the principle of chromatographic techniques for the efficient separation, identification, and quantification of complex biological mixtures.
- Acquire basic theoretical knowledge about spectroscopic and diffraction techniques to determine the structural and functional properties of biomolecules.
- Able to explain the principles of optics relevant to different types of microscopy, and the appropriate choice of microscopic technique for different kinds of samples and analysis.
- Elucidate the utility of radioisotope techniques for tracing, quantifying, and analyzing biological processes at the molecular level.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Hydrodynamic Techniques: Centrifugation • Viscosity and diffusion, Sedimentation equilibrium, • Analytical and Preparative centrifuges, • Application of density gradient and differential centrifugation.	**L1, L3**	7
Module II: Electrophoretic Techniques • Paper and gel electrophoresis, • Immuno electrophoresis, • Isoelectric focussing, two - dimensional electrophoresis, • Capillary electrophoresis	**L1, L2, L3**	8
Module III: Chromatographic Methods • Paper, TLC • gas chromatography,	**L3, L4, L6**	7

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• gel filtration, ion-exchange chromatography, • affinity chromatography and • HPLC, FPLC, adsorption and desorption.		
Module IV: Spectroscopic and Diffraction Techniques • UV and visible, spectrofluorimetry, • Atomic absorption spectrophotometry, • Mass Spectrometry, Infrared and Raman Spectroscopy, • Mossbauer, MALDITOF, ORD and Circular Dichorism, • Nuclear Magnetic Resonance and Electron Spin Resonance spectroscopy, • X - Ray diffraction, Electron diffraction, Neutron Diffraction.	**L1, L2, L4**	8
Module V: Optical Techniques: Microscopy • Optical and Electron Microscopy, • Transmission and Scanning Electron Microscopy, • Tunneling Electron Microscopy, • Atomic Force Microscopy, • Polarization and Fluorescence microscopy.	**L1, L3, L4, L6**	8
Module VI: Radioisotope Techniques • Radio tracers, • GM Counter, • Proportional and Scintillation Counters, • Autoradiography, radio - immunoassay.	**L1, L3, L4**	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text books and Reference

- Principles and Techniques of Practical Biochemistry by Keith Wilson and John Walker, Fifth edition, Cambridge University Press (2000)
- Biophysical Chemistry: The conformation of Biological Macromolecules by C.R.Cantor and P.R. Schimmel. Publisher: W.H. Freeman (1980).
- Essentials of Biophysics by P. Narayanan. Publishers: New Age International Publishers (2007).
- Introduction to Spectroscopy by D.L. Pavia, G.M. Lampman and G. S. Kriz.and Vyvyan Publisher: Brooks Cole (2009).
- Physical Chemistry of Macromolecules by C. Tanford. Publisher: John Wiley and Sons Inc.(1961)
- Principles of Physical Biochemistry by Kensal E. Van Holde, Curtis Johnson, K.E. Van Holde., W.Curtis Johnson and Pui Shing Ho. Publisher: Prentice Hall. (2005)

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	2	3		2		1	2	3		2	
CO2	1	2	3				1	2	3			
CO3	1	2	3				1	2	3			
CO4	1	2	3				1	2	3			
CO5	1	2	3		2		1	2	3		2	
CO6	1	3	3		3		1	3	3		3	

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2502	BIOANALYTICAL & BIOPHYSICAL INSTRUMENTATION LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**DBLS2501 BIOANALYTICAL & BIOPHYSICAL INSTRUMENTATION**				

Catalog Description

Bioanalytical & Biophysical Instrumentation Labs are vital for advancing research, enhancing diagnostic and therapeutic methods, ensuring quality and safety, and promoting education and innovation in biomedical and biotechnological fields. Emphasis will be placed on understanding the theoretical foundations of each technique, as well as developing practical skills in data acquisition and analysis. The course will also cover the latest advancements in the field and explore their implications for biomedical research and biotechnology.

Course Objectives

The objectives of this course are to provide the Students with the understanding of various analytical techniques used in biotechnology based research and industry. An ability to demonstrate the basic science as well biotechnology knowledge of biotech industry and develop the skills to understand the theory and practice of bioanalytical techniques.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Master various cell disruption techniques to efficiently break open cells and extract their contents for analysis, with a sound understanding of the underlying scientific principles.
- Understand and apply both low-speed and high-speed centrifugation methods to separate cellular components and biomolecules.
- Develop proficiency in using spectrophotometer techniques to measure the concentration and absorption properties of biomolecules.
- Gain practical skills in performing paper chromatography and thin layer chromatography to separate and identify components in biological mixtures.
- Conduct agarose gel electrophoresis to separate, identify, and analyze nucleic acids.
- Explain the scientific principles underlying the functioning and use of polarization and fluorescence microscopy to visualize and study the structural and functional properties of biological specimens.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Cell disruption techniques.	L1, L3 L4, L6	2
Module II: Centrifugation – low speed and high speed.	L1, L2, L3 L4	4
Module III: Spectrophotometer techniques	L1, L3 L4, L5	6
Module IV: : Chromatography –Paper Chromatography and Thin Layer Chromatography	L1, L2 L3, L4	6
Module V: Electrophoresis –SDS Page and Agarose gel electrophoresis.	L1, L3 L4, L6	8
Module VI: Polarization and fluorescence microscopy	L1, L2 L3, L4,	4

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**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text books and Reference

- Skoog, D.A., Crouch, S.R., and Holler, F.J. "Principles of Instrumental Analysis", 6th edition, Brooks/Cole, USA, 2006.
- Williams, D. and Fleming, I. "Spectroscopic Methods in Organic Chemistry", 6th edition, McGraw-Hill Higher Education, Maidenhead,UK, 2008.
- Freifelder D., Willard and Merrit, Instrumental Methods and Analysis 5. Ewing GW, Instrumental Methods of Chemical analysis.

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	1	3				1	1	3			
CO2	1	1	3				1	1	3			
CO3	1	1	3				1	1	3			
CO4	1	1	3				1	1	3			
CO5	1	1	3				1	1	3			
CO6	1	1	3				1	1	3			

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2503	INTRODUCTION TO IMMUNOLOGY	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	**DBLS2504 INTRODUCTION TO IMMUNOLOGY LAB**				

Catalog Description

This course explores the role of the basics of physiological defense mechanisms, it teaches the learner to identify and investigate different immunological barriers and components of physiology that work at different level of exposure to infections. Introductory immunology course in the biotechnology landscape, leads students in building knowledge to understand the biology of disease and defense mechanism to counter different physiological adversities. The course is theoretically driven and delivers the concepts related to immune components, mechanism of immune action, disease detection and immunological therapies all under one umbrella. Students then use that knowledge to analyze and present their study in detection, sensing, and designing cures for disease management and medical biotechnology in the future.

Course Objectives

The course aims to provide students with a foundational knowledge of immunology, its importance in human health, and its relevance in various aspects of biology and medicine. Role of antibody engineering in biomedical applications and the importance of immune detection in disease processes, tissue transplantation and immune therapies. regulations are some of the areas of attributes of this course which can help the students to understand the biotechnology related to humankind.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Recall the history of immunology. Explain the cells and organs of immune system evolutionarily contributing in developing defence mechanism.
- Describe the structure, classification and physico-chemical features of antigen and antibody.
- Explain the key mechanistic pathways to establish antigen-antibody reactions, antigen processing and presentation and regulation of immune response.
- Explain the processes involving immune disorders. Illustrate the mechanism of action in developing autoimmune, hypersensitive and immune compromised physiological situations.
- Recognise varied immune responses like active, passive, cell mediated and humoral immune actions. Recognise the mechanism and significance of complement activation, amplification and attack mechanism.
- Enlist and explain ever increasing advancement in the field of immunotherapy. Elaborate the technology of Monoclonal antibody production, organ and tissue Transplantation, Cancer immunology, Vaccine biology and graft vs host rejection.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Historical perspective of immune system and immunity, innate and specific immunity, humoral immunity, cell-mediated immunity	L1, L2	7
Module II: Antibody structure in relation to function and antigen-binding, types of antibodies and their structures: isotypes, allotypes, idiotypes, genetic basis of antibody diversity, synthesis of antibody and secretion	L1, L2	7
Module III: The organs and cells of the immune system, histocompatibility: structure of MHC class I, II & III antigens & their mode of antigen presentation, MHC restriction, antigens & antigenicity	L1, L2, L3	7

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Module IV: Antigen-antibody reaction, measurement of antigen – antibody interaction: agglutination, immunodiffusion, immuno-electrophoresis, ELISA, RIE, production of monoclonal antibodies	L1, L2, L3, L4	8
Module V: Regulation of immune response, immune tolerance, complement system, autoimmunity, hypersensitivity, graft versus host reaction	L1, L2, L3, L4	8
Module V1: Hybridoma technology, introduction to transplantation immunology, introduction to cancer immunology, vaccines (attenuated and recombinant)	L1, L2, L3	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books & References

- Kuby Immunology, R.A. Goldsby, T.J. Kindt, and B.A. Osborne, Freeman
- Immunology, Roitt, Mosby – Yearbook Inc.
- Basic Immunology, A.K. Abbas and A.H. Lichtman, Saunders W.B. Company
- Fundamentals of Immunology, W. Paul, Lippincott Williams and Wilkins
- Immunology, W.L. Anderson, Fence Creek Publishing (Blackwell).
- Immunology: A Short Course, E. Benjamin, R. Coico and G. Sunshine, Wiley-Leiss Inc.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	2					1	2				
CO2	1	2					1	2				
CO3	1	2					1	2				
CO4	1	2					1	2				
CO5	1	2		2			1	2		2		
CO6	1	2		2	3	3	1	2		2	3	3

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2504	INTRODUCTION TO IMMUNOLOGY LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**DBLS2503 INTRODUCTION TO IMMUNOLOGY**				

Catalog Description

This course explores the role of theoretical knowledge from the Introductory immunology course to corelate with lab-based observation, ideation and application. This course teaches the learner to observe and investigate different immune-components and immune assays in hand. The course is driven wet lab-based, as it delivers the concepts related to the morphology of different cells and components of immune system and explores immune assays to detect abnormal physiological situations. Students then use that knowledge to detect basic differences between blood parameter oriented normal and diseased situations and develop technologies that improvise the therapeutic aspect analytically.

Course Objectives

The course aims to provide students with hands-on experience in laboratory techniques and procedures commonly used in immunology research. It will help students gain a deeper understanding of fundamental immunological concepts and principles and design experiments, plan protocols, and troubleshoot issues that may arise during laboratory work.

Course Outcomes (COs):

After the completion of this course students will be able to:

- Determine the various ways to make buffers and stain compositions of biological interest and their significance.
- Isolate blood cells, prepare blood film, identify the RBCs and WBCs morphology.
- Detect and confirm antigen-antibody reaction for microbial infection.
- Draw standard calibration curve of known concentration Vs Absorbance and from that they can determine the product released from the graph.
- Explain the relationship between different antigen concentration and epitope pattern in relation to antibody reaction on semisolid matrices.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Blood film preparation and identification of blood cells.	L1, L2, L3	2
Module II: Determination of the blood group and Rh factor of an individual.	L1, L2, L3	2
Module III: Separation of lymphocytes from human blood using density gradient media	L1, L2, L3	3
Module IV: WIDAL Test	L1, L2, L3	3
Module V: Radial immuno diffusion test, Ouchterlony double diffusion test	L1, L2, L3 L4, L5	3

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Module VI: Dot ELISA, Sandwich ELISA	L3, L4, L5	3

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Practical Immunology by Frank C. Hay, and Olwyn MR. Westwood.
- Immunology Lab, Biology 477, Lab Manual by J Jameson.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO4**	**PSO5**
CO1	1	1	2	3			1	1	2	2		
CO2	1	1	2	3			1	1	2	2		
CO3	1	1	2	3			1	1	2	2		
CO4	1	1					1	1				
CO5	1	1	2	3			1	1	2	3		

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2505	BIOSTATISTICS AND BIOINFORMATICS	L	T	P	C
Version	2023	4	0	0	4
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description

This undergrad course introduces students to the interdisciplinary fields of bioinformatics and biostatistics. Students will learn how to apply computational tools and statistical methods to analyze biological data. The course covers the basics of bioinformatics, including sequence analysis, data mining, and genomics, as well as fundamental concepts in biostatistics such as probability, hypothesis testing, and data interpretation.

Course Objectives

This course is aimed to equip the students with the essential tools to analyze and interpret biological data. From mastering statistical methods for experimental design to harnessing the power of bioinformatics tools for genomic analysis, this course empowers the student to navigate the complex landscape of biological information. Students will be able to gain the skills to extract meaningful insights, make informed decisions, and contribute to advancements in the life sciences through the lens of statistical analysis and bioinformatics.

Course Outcomes (COs):

CO1: Understand the basic concepts and applications of bioinformatics and biostatistics.
CO2: Use computational tools to analyze biological data.
CO3: Apply statistical methods to interpret biological research findings.
CO4: Conduct basic bioinformatics and biostatistical analyses

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to Data Introduction Samples vs. Populations Collecting Data and Sampling Techniques Experimental Design: Randomization: Ensures unbiased allocation in experiments. Control Groups: Critical for drawing valid conclusions from experiments	**L1, L2**	6
Module II: Organizing Data Tabular Displays Graphical Displays	**L1, L2, L3**	4
Module III: Descriptive Statistics Measures of Centre (central tendency) Measures of Spread Measures of Placement	**L3, L3,**	4
Module IV: Probability Introduction Three Types of Probability Complement Rule Union and Intersection Independent Events	**L1, L2,L3**	6

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Venn diagrams to solve problems in Probability Conditional Probability		
Module V: Basics of Probability Distributions Introduction to Discrete Probability Distributions: Binomial Distribution Introduction to Continuous Probability Distributions: Normal Distribution	**L1, L2**	4
Module VI: Hypothesis Tests Type I and I l Errors Hypothesis Test for One Mean Hypothesis Test for One Proportion Two Sample Mean T-Test for Dependent Groups Chi-Square Tests: Goodness of Fit Test; Test for Independence	**L2, L3**	6
Module VII: Correlation and Regression Correlation Scatterplots Simple Linear Regression	**L2, L3**	4
Module VIII: Introduction and overview Bioinformatics- definition, application of bioinformatics in different areas of life sciences, Basics of biological databases and biological software's	**L1, L2**	4
Module IX: Biological Databases Biological Databases- types of biological databases, Nucleotide database – NCBI, EMBL, DDBJ, Protein Databases- PDB, UniProt, Specialised databases- KEGG, organism specific databases, Sequence file formats	**L2, L3**	6
Module X: Sequence analysis Sequence alignment- Global and local alignments, Pairwise and Multiple sequence alignment, Dot plot, scoring matrices and gap penalties, programs used for sequence alignment	**L2, L3**	6
Module XI: Phylogenetic analysis Phylogenetic analysis- definitions, basic terminologies, Phylogenetic tree- cladogram, dendrogram, ultra metric trees and additive trees etc, rooted and unrooted trees, tree building methods- character and distance-based methods	**L1, L2, L3**	5
Module XII: Structure Prediction Structure file formats, Secondary and tertiary structure prediction methods in proteins, software to visualize secondary and tertiary structural information in protein.	**L2, L3**	5

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Mostly Harmless Statistics, by Rachel L. Webb; LibreTexts
- Introduction to Bioinformation – T.Attawood
- John Essentials of Genomics and Bioinformatics, C.W. Sensen Wiley and Sons
- Bioinformatics: Sequence and Genome Analysis, D.W. Mount, Cold Spring Harbor Laboratory Press

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

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CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	1	--	--	--	--	1	1	--	--	--	--
CO2	1	1	--	--	--	--	1	1	--	--	--	--
CO3	1	1	--	--	--	--	1	1	--	--	--	--
CO4	1	1	2	--	--	2	1	1	2	--	--	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2506	BIOETHICS, BIOSAFETY AND IPR	L	T	P	C
Version	2023	4	0	0	4
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description

The focus of the course is to recognize, learn and understand the role intellectual property rights (IPR) and its implications in biotechnology sector. The students are intended to learn about the concept of biosafety and bioethics role in domain. This course will make the student gain the knowledge about the ethical implication of biological process and products with recombinant DNA guidelines. The students will practice the GLP and follow guidelines for research involving Transgenic, cloning and new BT technologies.

Course Objectives

This course aims to equip students with a comprehensive understanding of bioethical principles, biosafety practices, and intellectual property rights (IPR) in biotechnology. Students will explore ethical issues in biotechnology and biomedical research, learn to implement biosafety measures, understand IPR and regulatory frameworks (laid down by WIPO), and develop critical thinking skills through case studies. This course prepares students to navigate ethical, safety, and legal challenges in scientific research and innovation.

Course Outcomes (COs):

- Enunciate the fundamental principles of bioethics, including ethical theories and frameworks, and apply them to various biological and biomedical scenarios.
- Acquire knowledge of biosafety levels, guidelines, and practices, and learn to implement appropriate safety measures in biological research and laboratory settings.
- Analyze and discuss ethical issues related to biotechnology and biomedical research, such as genetic engineering, cloning, stem cell research, and human experimentation.
- Discuss the basics of intellectual property rights (IPR) in the context of biotechnology, including patents, trademarks, copyrights, and trade secrets.
- Recognize the national and international regulatory frameworks (WIPO) governing biosafety, bioethics, and IPR, and understand the importance of compliance in research and commercialization.
- Develop critical thinking and decision-making skills by analyzing real-world case studies related to bioethics, biosafety, and IPR, and learn to navigate complex ethical dilemmas in the field of biotechnology.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to Bioethics • Overview of bioethics principles; • Historical perspectives on ethical issues in biotechnology; • Emerging ethical issues in genetic research, gene editing, cloning, and stem cell research, Human and animal experimentation, animal rights/welfare, • Informed consent and human subjects research; • Agricultural biotechnology: genetically engineered food, environmental risks, labelling, and public opinion	**L1, L2, L3**	7

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Module II: Biosafety and Laboratory Practices • Concept of biosafety: Role of WHO • Risk groups (RG 1, 2, 3, 4) Biosafety levels (BSL-1, BSL-2, BSL-3, BSL-4) and biological safety cabinets classes, lab design and rules • Primary and Secondary containment for biohazards; GRAS organisms; Biohazard sign, Lab safety, Role of Biosafety Officer. • Recommended biosafety levels for infectious agents and infected animals • Definition of GMOs & LMOs; Indian recombinant DNA guidelines. • Environmental risk assessment and food/feed safety assessment of transgenic crops; Principles of safety assessment of transgenic plants: risk assessment steps, concepts of familiarity and substantial equivalence	**L1, L2, L3, L4**	7
Module III Regulatory Frameworks and Policy: • Overview of regulatory bodies in biotechnology at international, national, regional, and institutional levels. • Biosecurity considerations and international agreements (Cartagena protocol, OECD consensus documents, Codex Alimentarius) • Indian regulations (EPA act and rules, RCGM, GEAC, IBSC, Biotechnology Regulatory Authority of India draft bill) • GM labelling and Food Safety and Standards Authority of India (FSSAI) • OECD- GLP and its international status and MAD agreement. • Biosafety Management: The key to the environmental responsible use of biotechnology	**L2, L3, L4, L5**	7
Module IV: Intellectual Property Rights (IPR) and WIPO • Introduction to intellectual property (IP): patents, trademarks, copyrights, industrial design, traditional knowledge, geographical indications, design, plant breeders right (PBR) and layout of IC design, Trade secrets. • Historical context of GATT, WTO, WIPO, and TRIPS • Protection of new GMOs; IP's role in R&D • Plant variety protection and farmers' rights act • Patent databases and country-wise patent searches (USPTO, EPO, India) • Case studies	**L1, L3, L4, L5**	7
Module V: Patenting: • Basics of patents: types of patents; Indian Basics of patents: types, Indian Patent Act 1970, recent amendments • WIPO Treaties, Budapest Treaty, Patent Cooperation Treaty (PCT) • Patent application procedures and filing system • Precautions before patenting, patent application forms and guidelines, fee structures, time frames • Types of patent applications: provisional and complete specifications, PCT and conventional patent applications • International patenting requirements and procedures; financial assistance for patenting, Publication of patents and patent infringement.	**L1, L3, L4, L5, L6**	7
Module VI: Commercialisation of IP: • Licensing and royalty management • Patenting by research students and scientists: university/organizational rules • Collaborative research: IP management, benefit/credit sharing, commercial and non-commercial incentives; • Case studies on national and international BT products and processes.	**L4, L5, L6**	7

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Textbooks and References

- Biotechnology – Progress and Prospects. by SM Paul Khurana & Machiavelli Singh, Studium Press.
- Brahmi P, Saxena S, Dhillon BS. The Protection of Plant Varieties and Farmers Rights Act of India. Current Science, 2004: 86(3): 392-398.
- CBD Secretariat. Cartagena Protocol in biosafety to the Convention on Biological Diversity: text and annexes. 2000: Montreal www.biodiv.org/doc/legal/ cartagena-protocol-en.pdf.
- DBT. Recombinant DNA Safety Guidelines, Department of Biotechnology, Ministry of Science and Technology, Government of India. 1990
- DBT. Regulations and Guidelines on Biosafety of Recombinant, DNA Research and Biocontainment, Department of Biotechnology, Ministry of Science and Technology, Government of India. 2017
- Emerging Technologies Towards Agriculture, Food and Environment by RK Behl, Machiavelli Singh and Achim Ibenthal, Wolfgang Merbach. Agrobios International Press.
- Guidelines and Handbook for Institutional Biosafety Committees (IBSCs) by DBT-GOI. Biotech Consortium India Ltd (BCIL), India.
- Journals and Current magazines on IPR, WIPO, CDC, NIH and DBT online portals.
- Macer D. Bioethics is Love of Life, Christchurch N.Z.: Eubios Ethics Institute. 1998
- Persley Gabrielle J, Doyle JJ. Biotechnology for Developing Country Agriculture: Problems and Opportunities Overview, Focus 2. Brief 1 of 10. IFPRI. Washington, DC USA. 1999
- Prabhu LS, Suriyaprakash TNK, Kumar DK. Intellectual property rights and its development in India. Pharma Times 2012: 44(7): 19-22.
- Singh Machiavelli, Khosla Babita. Intellectual Property Rights (IPR), Biosafety and Bioethics In: Handbook of Biotechnology, Daya Publishing House, 2022: 513-549.
- The Copyright Act 1957 as amended up to 1999 along with Copyright Rules 1958 and International Copyright Order 1999: 2005
- The Design Act 2000 along with Design Rules 2001; Universal Law Publishing Co. Ltd., New Delhi: 2004
- The Geographical Indications of Goods (Registration and Protection) Act, 1999 along with Geographical Indications of Goods (Registration and Protection) Rules 2002; Universal Law Publishing Co. Ltd., New Delhi: 2004
- The Patents Act, 1970 as amended by Patents (Amendment) Act 2005, Commercial Law Publisher (India) Private Ltd. 2005
- The Protection of Plant Varieties and Farmers' Rights Act, 2001 along with Protection of Plant Varieties and Farmers' Rights Rules 2003; Akalank Publications, New Delhi. 2008
- The Trademarks Act 1999 along with Trademarks Rules 2002; Commercial Law Publisher (India) Private Ltd. 2004
- WHO. Handbook: Good Laboratory Practice (GLP): quality practices for regulated non-clinical research and development. 2009: 2
- WHO. Laboratory Biosafety Manual. Geneva: World Health Organization 2004: 3: 5-105
- WIPO. WIPO Intellectual Property Handbook, WIPO Pub. No. 2004: 489 (E)

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	CA	A	A/P	EE
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

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CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	2		1			1	2		1		
CO2	1	1		1			1	1		1		
CO3	1	1		1			1	1		1		
CO4	1	2		1			1	2		1		
CO5	1	2		1		2	1	2		1		2
CO6	1	1		1	2	1	1	1		1	2	1

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-VI

Course Code: DBLS2601	APPLIED BIOLOGY	L	T	P	C
Version	2023	4	0	0	4
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description

Applied biology is an interdisciplinary science that applies principles associated with biology and engineering. This subject provides the knowledge of basic principle of fermentation process, which help students to design, develop and operate industrial level. This fundamental knowledge is essential for students to make their career in industry based on bioprocess. This course also provide the study of industrially relevant microbial strains and processes for production of enzyme, biopolymer and food products.

Course Objectives

To make the students to explore of India`s rich microbial diversity for novel bioactive molecules and biocatalysts with application in agriculture and industry. Our aim is R&D leading to the production of industrially important enzymes, antibiotics, biocatalysts, biotransformation of steroids and agriculture crop yield improvement through microbial fertilizers. Main activities include production, process optimization, scale up, downstream processing, purification & characterization of immobilized enzymes for industrial applications.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Understand the basic principles and that applies principles associated with microbiology.
- Understand the commercial exploitation of microorganisms on a large scale.
- Discuss the basic principle of fermentation process, which help students to design, develop and operate industrial level production of metabolites.
- Discuss the production of microbial enzymes, biofertilizers, biopesticides and modern biotechnological products
- Prepare the students to make their career in industry based on fermentation process.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to fermentation, the fermentation industry, Production process batch and Continuous system of cultivation, Solid-state fermentation	L1, L2, L3	5
Module II: Selection of industrial microorganisms, media for fermentation, aeration, pH, temperature and other requirements during fermentation, downstream processing and product recovery, food industry waste as fermentation substrate.	L1, L2, L3	6
Module III: Production of compounds like antibiotics, enzymes, organic acids, solvents, beverages, SCP.	L1, L2, L3	7
Module IV: Production of fermented dairy products like yakult, kaffir, cheese, buttermilk etc.	L1, L2, L3	6
Module V: Immobilized enzymes systems, production and applications.	L1, L2, L3	6
Module VI: Applied Biology Applications	L1, L2, L3	6

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Biotechnology and genetic engineering, Agricultural biology and crop improvement, Medical applications of biology		

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books and References

- Industrial Microbiology by Samuel Cate Prescott and Cecil Gordon Dunn
- A textbook of Industrial Microbiology by Wulf Crueger and Anneliese Cruege
- Okafor N. (2007). Modern Industrial Microbiology and Biotechnology. 1st edition. Bios Scientific Publishers Limited. USA
- Biochemical Engineering Fundamentals by Bailey and Ollis Bioprocess Engineering Principles by Doran
- Bioprocess Engineering Basic Concepts by Shular and Karg

Modes of Evaluation: Class Test/Assignment/End Term Eamination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	2					1	2				
CO2	1	2		3			1	2		3		
CO3	1	2				2	1	2				2
CO4	1	2				2	1	2				2
CO5	1	--				3	1	1				3

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2602	GENOMICS AND PROTEOMICS	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	**DBLS2601 GENOMICS AND PROTEOMICS LAB**				

Catalog Description

This comprehensive course offers an in-depth exploration of genomics and proteomics. It begins with an introduction to DNA structure and function, cells, chromosomes, and genetic inheritance. It covers the human genome, gene roles in health and disease, genetic mutations, DNA microarrays, and the Human Genome Project. The societal impact and ethical considerations of genomics, genetic testing, and personalized medicine are discussed. The course also delves into the world of proteins, their functions, and the techniques used to study them, such as 2D gel electrophoresis and mass spectrometry. Additionally, it explores proteomics' role in disease diagnosis, drug development, and personalized medicine.

Course Objectives

The course helps in developing a detailed understanding of eukaryotic genome complexity and organization. Current research on the molecular basis of the control of gene expression in eukaryotic system has developed a detailed understanding of techniques of gene diagnostics and DNA profile to acquire the fundamentals of genomics and Proteomics.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Understand the basics of DNA structure and genetic inheritance.
- Analyze the human genome and its role in health and disease.
- Explore ethical considerations and societal impacts of genomics.
- Learn knowledge of protein functions and metabolic processes.
- Understand techniques such as PCR, DNA microarrays, and mass spectrometry.
- Apply proteomics in disease diagnosis and personalized medicine.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to Genomics: Understand the basics of genomics and the structure of DNA. What is DNA? – Structure and Function, Cells and Chromosomes – Building Blocks of Life, Introduction to Genetic Inheritance – How Traits Are Passed On, Real-Time PCR and Its Application in Genomics.	**L1, L2, L3**	7
Module II: Exploring the Human Genome: Origin of genomes, Human genome and the role genes play in health and disease. Mapping the Human Genome – An Overview, Genes and Their Role in Disease, Genetic Mutations and Variation, DNA Microarrays: An Introduction to Genomic Expression Analysis, Introduction to molecular markers-RFLP, RAPD, AFLP, SSRs, DNA fingerprinting, Human Genome Project.	**L1, L2, L3**	8
Module III: Genomics in Society: Discuss the impact of genomics on society and the ethical considerations. Genetic Testing and Personalized Medicine, Ethics of Genetic Modification and CRISPR, siRNA and miRNA: Small RNAs with Big Roles in Gene Regulation,	**L1, L2**	8

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Chromatin Immunoprecipitation (ChIP): Connecting DNA and Protein Interactions.		
Module IV: Introduction to Proteomics: Introduce the world of proteins and their functions in the body. Proteins and Their Functions, From DNA to Protein – Transcription and Translation, Enzymes and Metabolism, Protein Separation Techniques: Diving into 2D Gel Electrophoresis	**L1, L2**	8
Module V: Techniques in Proteomics: Explore how scientists study proteins and their structures. Protein Structure and Function, Introduction to Mass Spectrometry and Protein Sequencing, Protein Interactions and Pathways, Mass Spectrometry in Proteomics: The Mass Spec Revolution, Post-Translational Modifications: Beyond the Genetic Code.	**L1, L2, L3**	8
Module VI: Proteomics in Health and Disease: Understand the role of proteomics in diagnosing and treating diseases. Biomarkers and Disease Diagnosis, Drug Design and Development, Personalized Medicine and Proteomics, Protein-Protein Interactions: Networking in the Cell, Protein Microarrays and Their Applications in Proteome Analysis.	**L1, L2**	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Bioinformatics: A practical guide to the analysis of genes and proteins, A.D. Baxevanis and B.F.F. Ouellette, John Wiley and Sons Inc.
- Bioinformatics: From Genomes to Drugs, T. Lengauer, John Wiley and Sons Inc
- Bioinformatics: Sequence and Genome Analysis, D.W. Mount, Cold Spring Harbor Laboratory Press
- Genomes II, T.A. Brown
- A Primer of Genome Science, Greg Gibson and Spencer V. Muse
- Database Annotation in Molecular Biology : Principles and Practice, Arthur M. Lesk
- DNA: Structure and Function, Richard R. Sinden
- Recombinant DNA (Second Edition), James D. Watson and Mark Zoller
- Gene Cloning and DNA Analysis – An introduction (Fourth Edition), T.A. Brown
- Genes & Genomes, Maxine Singer and Paul Berg
- Essential of Genomics and Bioinformatics, C.W. Sensen, John Wiley and Sons Inc.
- Proteomics, T. Palzkill, Kluwer Academic Publishers

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1						1					
CO2	1			1			1			1		
CO3	1						1					
CO4	1						1					
CO5	1	2	2				1	2	2			
CO6	1						1					

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2603	GENOMICS AND PROTEOMICS LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**DBLS2602 GENOMICS AND PROTEOMICS**				

Catalog Description

This course equips students with practical skills in computational genomics and structural proteomics. It covers the use of bioinformatics tools for DNA sequence analysis, genetic variation identification, and mutation impact prediction. Students will learn to navigate genomic sequences using BLAST, search SNP databases, and utilize genome browsers. The course also delves into protein structure analysis through the Protein Data Bank, visualization with UCSF Chimera, and examination of protein domains and active sites. By understanding the structural effects of mutations, students will gain insights into the functional implications for proteins, enhancing their ability to apply these techniques in research and clinical settings.

Course Objectives

The course helps in developing a detailed understanding of practical skills in laboratory techniques commonly used in genomics and proteomics research.

Course Outcomes (COs):

On completion of this course, students should be able to:

1. Master bioinformatics tools for DNA sequence analysis and genetic variation identification.
2. Predict the impact of genetic mutations on protein function using computational tools.
3. Analyze and visualize protein structures, understanding their functional implications.
4. Explore the structural effects of mutations on proteins and their consequences for disease and therapy.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Computational Genomics Fundamentals **Objective:** Gain hands-on experience with bioinformatics tools to analyze DNA sequences and identify genetic variations. • **BLAST:** Navigating Genomic Sequences - Learn to use BLAST for sequence alignment and identifying gene families, • **Genetic Variation and Disease -** Use databases to search for SNPs and understand their clinical significance, • **Mutation Impact Prediction -** Apply tools like SIFT or PolyPhen to analyze the effects of mutations on protein function, • **Genome Browsers: Windows into Genomic Data** - Get acquainted with tools such as UCSC Genome Browser for in-depth genomic data analysis.	**L1, L2, L3, L4**	15
Module II: Structural Proteomics Analysis **Objective:** Explore protein structure and function through computational analysis and visualization techniques. • **Protein Data Bank (PDB):** The Repository of Protein Structures - Learn to retrieve and analyze protein structures from PDB, • **UCSF Chimera: Visualizing Protein Complexes** - Use UCSF Chimera for protein visualization to study structure-function relationships,	**L1, L2, L3, L4**	15

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• **Protein Domains and Active Sites -** Investigate how proteins perform their functions by examining their active sites and domains, • **Structural Effects of Mutations -** Explore how mutations can alter protein structure and the consequences for protein function		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

1. Bioinformatics: Sequence and Genome Analysis, D.W. Mount, Cold Spring Harbor Laboratory Press

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	1	2				1	1	2			
CO2	1	1	2				1	1	2			
CO3	1	1	2				1	1	2			
CO4	1	1	2				1	1	2			

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2604	EMERGING FIELDS - NANOBIOTECHNOLOGY AND STEM CELLS BIOLOGY	L	T	P	C
Version	2023	3	1	0	4
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description

This course provides the learners to gain basic knowledge about the two emerging areas of science, one is stem cell biology and the second is nanobiotechnology. The course explores the topics starting from the introduction to application and allows the students to gain insights about these two emergent scientific areas. It also prepares them for advanced studies which further help the learners to explore and contribute to the field through research and development. The course also teaches the learners about good practices and ethics.

Course Objectives

The course is structured to offer a insight into two cutting-edge areas of scientific exploration: Nanobiotechnology and Stem-cell Biology. On the nanobiotechnology front, students will be exposed to the fundamentals of nanoscale materials, their design, fabrication, and potential applications in various fields including medicine, energy, and environment. Parallelly, the segment on stem-cell biology will provide a broad overview of mammalian stem cells, elucidating on their sources, types, cultivation techniques, and their transformative potential in disease therapeutics and regenerative medicine. This course aims to arm students with foundational knowledge in both domains, empowering them to stay at the forefront of these rapidly evolving scientific landscapes.

Course Outcomes (COs):

Upon successful completion of the course the students will be able to:

- Discuss the fundamental principles of stem cell biology, including the types, sources, and differentiation pathways of stem cells.
- Evaluate the current and potential clinical applications of stem cells in regenerative medicine and therapy, along with the associated medical and logistical considerations.
- Comprehend the basic concepts and techniques of nanobiotechnology and how nanomaterials interact with biological systems.
- Assess the applications of nanobiotechnology in various fields and analyze the potential toxicity and safety concerns related to nanomaterials.
- Analyze the ethical issues and societal impacts related to the use of stem cells and nanobiotechnology, fostering informed and responsible scientific practices.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Foundations of Stem Cell Biology The module covers the introduction to stem cell biology and its therapeutic potential, types of stem cells including embryonic stem cells and their characteristics and culturing techniques, adult stem cells with their sources and differentiation pathways, advanced techniques in stem cell culture, and the benefits and challenges associated with stem cell technology.	L1, L2, L3	8
Module II: Clinical Applications and Considerations Topics in this module include the promises of stem cell-based therapies, targeted therapeutic applications such as the use of stem cells in diabetes treatment and cardiac repair, the regulatory framework highlighting the ethical and legal aspects	L1, L2, L3	12

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of stem cell, safety protocols for evaluating human stem cell applications, and the exploration of genetically modified stem cells in experimental gene therapies.		
Module III: Introduction to Nanobiotechnology Nano regime and nanobiotechnology, properties of nanomaterials, different types of nanomaterials – nanomaterials of different shapes and sizes, graphene, quantum dots, nanocomposite, physicochemical characterization of nanomaterials – UV-Visible spectroscopy, X-Ray Diffraction, X-Ray Photoelectron Spectroscopy, electron microscopy.	L3, L4, L5	12
Module IV: Application of Nanobiotechnology and toxicity Nanomaterials in medical imaging, targeted drug delivery, nanomedicine, nano sensors, nano-theranostics, nanodevices, nanotoxicity.	L3, L4, L5	8
Module V: Ethical Considerations in Stem Cells and Nanobiotechnology This module will delve into the ethical landscape surrounding both stem cell research and nanobiotechnology. Topics will include the ethical debates surrounding embryonic stem cell research, the use and potential misuse of nanotechnologies, considerations regarding patient rights and informed consent, and the broader societal implications of these rapidly advancing fields. Additionally, the module will touch upon the global perspectives on these ethical concerns, providing students with a well-rounded understanding of the challenges and responsibilities faced by researchers and professionals in these areas, risks of using nanomaterials and various rules governing the health and safety standards related to nanomaterials.	L3, L4, L5, L6	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Stem Cell Biology and Gene Therapy. Quesenberry PJ, Stein GS, eds. (£65.00.) Wiley, 1998.
- Progress in gene therapy, Volume 2,Pioneering stem cell/gene therapy trials, Roger Bertolotti, Keiya Ozawa and H. Kirk Hammond, VSP international science publishers
- Stem Cells Handbook: Stewart Sell, Humana Press; Totowa NJ, USA; Oct. 2003,
- Understanding Biotechnology by AluízioBorém, Fabrício R. Santos, David E. Bowen, Prentice Hall
- Cell Therapy: Stem Cell Transplantation, Gene Therapy, and Cellular Immunotherapy (Cancer: Clinical Science in Practice) George Morstyn, William Sheridan, Cambridge University Press,
- Nanobiotech- Concepts, Applications and Perspectives, Christot, Chad Mirkin.
- Nanoscale Science and technology, Robert W Kelsall, Mark Geoghegan, Ian W Hamley.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	3	3				1	3	3			
CO2	1	2	3				1	2	3			
CO3	1	3	3				1	3	3			
CO4	1	2	3				1	2	3			
CO5	1	1	3	1	2	2	1	1	3	1	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2605	INTRODUCTION TO NEUROSCIENCE AND INFORMATION FLOW	L	T	P	C
Version	2023	3	1	0	4
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description

This course provides an overview of the neuroscience topics starting from structure and function to disease development that help the learners to acquire a basic knowledge of neuroscience. This course also explores fundamental knowledge behind Behavioral neuroscience, ethics and emerging topics.

Course Objectives

The objective of this course is to introduce undergraduate students to the basic knowledge in Neuroscience in topics ranging from structure of neuron, information transmission through nervous system, function of sensory systems, basics of Behavioral neuroscience, and diseases of the nervous system. This course will also introduce students to the ethics of research in neuroscience and provide a glimpse of recent research in this field

Course Outcomes (COs):

- Describe the basic principles and structure of the nervous system, including neural cell types, neuroanatomy, and neural development.
- Comprehend the mechanisms of neural signalling, including action potentials, synaptic transmission, and neurotransmitter function.
- Analyse the organization and function of sensory and motor systems, including the pathways and processes involved in sensory perception and motor control.
- Explain the relationship between brain function and behaviour, examining how neural circuits influence cognitive processes, emotions, and actions, using specific examples.
- Identify and describe specific examples of neurological and psychiatric disorders, understanding their underlying neural mechanisms and potential treatments.
- Discuss the current advancements and future directions in neuroscience research, and the ethical considerations in this field of research.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Foundations of Neuroscience: • Introduction to neuroscience • Historical perspectives • Overview of the nervous system • Neuron structure and function	L1, L2, L3	6
Module II: Neural Communication: • Action potentials and membrane potential • Synaptic transmission • Neurotransmitters and receptors • Neural circuits and signalling pathways	L1, L2, L3	8
Module III: Sensory Systems and Motor Systems: • Introduction to Vision, Auditory, Olfactory, Gustatory and Somatosensory System • Motor neurons and muscle contraction • Motor coordination, learning and plasticity	L3, L4, L5	10

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Module IV: Brain and Behaviour: • Brain regions and their functions • Emotion and motivation • Reward system and Addiction • Sleep and circadian rhythms • Cognitive functions (memory, attention, decision-making)	L3, L4, L5	8
Module V: Disorders of the Nervous System: • Neurological disorders (e.g., Alzheimer's, Parkinson's) • Neuropsychiatric disorders (e.g., depression, schizophrenia) • Brain injury and recovery	L3, L4, L5, L6	10
Module VI: Emerging Topics in Neuroscience: • Ethical considerations in neuroscience research • Current trends and Future directions in neuroscience	L1, L2, L3	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

1. **https://bio.libretexts.org/Courses/Lumen_Learning/Anatomy_and_Physiology_I_(Lumen)/16%3A_Module_14-_The_Nervous_System_and_Nervous_Tissue**
2. **https://brain.mcmaster.ca/BrainBee/Neuroscience.Science.of.the.Brain.pdf**

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	3	3				1	3	3			
CO2	1	3	3				1	3	3			
CO3	1	3	3				1	3	3			
CO4	1	3	3				1	3	3			
CO5	1	3	3				1	3	3			
CO6	1	3	3	1			1	3	3	1		

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-VII

Course Code: DBLS2701	ADVANCED BIOCHEMISTRY	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description

This graduate-level course offers an in-depth exploration of advanced topics in biochemistry, focusing on the molecular mechanisms that govern cellular processes. It covers the structure and function of biomolecules, metabolic pathways, enzyme kinetics, molecular signaling, and the latest research techniques in biochemistry.

Course Objectives

The primary focus of this course is advanced understanding of protein structure and enzymology. It is also aimed to expose the students to the technological applications in understanding the process of photosynthesis, and production of secondary metabolites through metabolic engineering.

Course Outcomes (COs):

By the end of this course, students will be able to:

- Explain the structure, function, and dynamics of proteins, including protein folding, interactions, and techniques for protein analysis.
- Analyse the principles of enzyme kinetics, mechanisms of enzyme action, roles of co-enzymes & co-factors, and methods for studying enzyme activity and regulation.
- Comprehend the coordination and regulation of cellular metabolic pathways by hormones and their impact on overall metabolic homeostasis.
- Explore the regulatory mechanisms involved in photosynthesis, including the light-dependent and light-independent reactions and their integration within the plant cell.
- Investigate the biosynthesis, functions, and ecological roles of secondary metabolites in plants, as well as their applications in biotechnology and medicine.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Proteins Types of proteins and their classification, Forces stabilizing protein structure and shape. Different Level of structural organization of proteins, Protein Purification. Denaturation and renaturation of proteins. Fibrous and globular protein.	L1, L2, L3	8
Module II: Enzymes Enzyme, prosthetic groups, metalloenzymes, monomeric & oligomeric enzymes, activation energy and transition state, enzyme activity, specific activity, common features of active sites, enzyme specificity: types & theories, Biocatalysts from extreme thermophilic and hyper-thermophilic archaea and bacteria. Role of: NAD+, NADP+, FMN/FAD, coenzymes A, Thiamine pyrophosphate, Pyridoxal phosphate,lipoic-acid, Biotin vitamin B12, Tetrahydrofolate and metallic ions	L1, L2, L3	10
Module III: Integration of cellular metabolism and hormonal regulation Action of major hormones (insulin, glucagons, epinephrine) responses to metabolic stress; starvation, metabolic disorders (phenylketonuria, arthritis) and role of antifolates in chemotherapy.	L1, L2, L3, L4	9
Module IV: Regulatory aspects of photosynthesis	L1, L2, L3	9

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Mechanism of light interacting with photo pigments, energy transfer and transduction process during photosynthesis, artificial light harvesting system and application in carbon sequestration, Engineering of Rubisco enzyme for photosynthetic process optimization.		
Module V: Secondary plant metabolism Importance of secondary metabolites, classification, terpenes, Mevalonic acid pathway, phenolic compounds and alkaloids. Application of metabolic engineering in production of any two class of secondary metabolites. Contribution of metabolic engineering principles in promoting Green Chemistry.	L1, L2, L3	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Principles of Biochemistry, Latest Edition, A.L. Lehninger, D.L. Nelson, M.M. Cox. , Worth Publishing
- Biochemistry By Mathews, Van Holde ,
- Text book of Biochemistry by Devlin.
- Textbook of Biochemistry by Metzler

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	2	3				1	2	3			
CO2	1	2	3				1	2	3			
CO3	1	2	3				1	2	3			
CO4	1	2	3				1	2	3			
CO5	1	2	3				1	2	3			

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2702	ADVANCED BIOCHEMISTRY AND ANALYTICAL TECHNIQUES LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description

The course incorporates practical laboratory experience into students, preparing students for research and professional careers in biochemistry and related fields. This course aims to equip students with advanced knowledge and skills in biochemistry, fostering their ability to conduct independent research and contribute to the scientific community.

Course Objectives

The course aims to provide an advanced understanding of the core principles and topics of Biochemistry and their experimental basis.

Course Outcomes (COs):

- Develop the ability to use colorimetric techniques to quantify biomolecules by measuring their absorbance properties.
- Gain proficiency in various chromatographic methods to separate, identify, and analyze complex biological mixtures.
- Master the techniques of PAGE and SDS-PAGE for the separation, visualization, and analysis of protein samples.
- Acquire skills in extracting total lipids and separating them using thin layer chromatography, including calculating Rf values for lipid identification.
- Learn to characterize isolated nucleic acids by performing and interpreting agarose gel electrophoresis results.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Colorimetry Colorimetry and Spectrometry: Beer Lambert's law, Transmittance, Absorbance, Optical density; Types of Spectroscopies: UV & Visible - Principle, instrumentation & application.	L2, L3	6
Module II: Chromatographic Techniques Partition- Adsorption-Ion Exchange- Molecular sieve and Affinity chromatography; Principles of Gas Liquid chromatography and High-Performance Liquid Chromatography.	L3, L4	6
Module III: Proteins Electrophoretic (PAGE and SDS-PAGE) separation of isolated proteins.	L3, L4	6
Module IV: Lipids Extraction of total lipids by Folch's method; thin layer chromatographic separation of lipids, R_f value	L2, L3	6
Module V: Nucleic Acid Characterization of isolated nucleic acid by agarose gel electrophoresis.	L3, L4	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Text Books and References

- Practical book of Biochemistry by Plummer
- Practical book of Biochemistry by S.K. Sawhney and Randhir Singh

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	1	3				1	1	3			
CO2	1	1	3				1	1	3			
CO3	1	1	3				1	1	3			
CO4	1	1	3				1	1	3			
CO5	1	1	3				1	1	3			

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2703	ADVANCED MICROBIOLOGY	L	T	P	C
Version	2023	2	0	0	2
Pre-requisites	Nil				
Co-requisites	**DBLS2704 ADVANCED MICROBIOLOGY LAB**				

Catalog Description

This course will build upon ideas introduced in general microbiology classes by using microbiological techniques to study and identify unknown organisms. In addition to studying microbial diversity, students will learn the similarities and differences between microorganisms in their genetic, biochemical and metabolic profile. The different mechanisms of checking the growth and spread of microorganisms, and the interaction of microorganisms with their hosts and environment will also be discussed.

Course Objectives

The objectives of this course are to introduce field of microbiology with special emphasis on microbial diversity, morphology, physiology and nutrition; methods for control of microbes and host- microbe interactions.

Course Outcomes (COs):

Students should be able to:

- Identify major categories of microorganisms and analyze their classification, diversity, and ubiquity;
- Identify and demonstrate structural, physiological, genetic similarities and differences of major categories of microorganisms;
- Identify and demonstrate how to control microbial growth;
- Demonstrate and evaluate interactions between microbes, hosts and environment

Course Content:

Modules	Blooms level*	Number of hours
Module 1 Microbial characteristics Introduction to microbiology and microbes, history & scope of microbiology, morphology, structure, growth and nutrition of bacteria, bacterial growth curve, bacterial culture methods; bacterial genetics: mutation and recombination in bacteria, plasmids, transformation, transduction and conjugation; antimicrobial resistance	L1, L2, L3	6
Module 2 Microbial diversity Microbial taxonomy and evolution of diversity, classification of microorganisms, criteria for classification; classification of bacteria; Cyanobacteria, acetic acid bacteria, Pseudomonads, lactic and propionic acid bacteria, endospore forming bacteria Mycobacteria and Mycoplasma. Archaea: Halophiles, Methanogens, *Hyperthermophilic archae*, Thermoplasm; eukarya: algae, fungi, slime molds and protozoa; extremophiles and unculturable microbes.	L1, L2, L3	6
Module 3 Control of microorganisms Sterilization, disinfection and antisepsis: physical and chemical methods for control of microorganisms, antibiotics, antiviral and antifungal drugs, biological control of microorganisms.	L1, L2, L3	6
Module 4 Virology	L1, L2, L3	6

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Virus and bacteriophages, general properties of viruses, viral structure, taxonomy of virus, viral replication, cultivation and identification of viruses; sub-viral particles – viroids and prions.		
Module 5 Host-microbes interaction Host-pathogen interaction, ecological impact of microbes; symbiosis (Nitrogen fixation and ruminant symbiosis); microbes and nutrient cycles; microbial communication system; bacterial quorum sensing; microbial fuel cells; prebiotics and probiotics.	L1, L2, L3	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Pelczar, M. J., Reid, R. D., & Chan, E. C. (2001). Microbiology (5th ed.). New York: McGraw-Hill.
- Willey, J. M., Sherwood, L., Woolverton, C. J., Prescott, L. M., & Willey, J. M. (2011).Prescott's Microbiology. New York: McGraw-Hill.
- Matthai, W., Berg, C. Y., & Black, J. G. (2005). Microbiology, Principles and Explorations. Boston, MA: John Wiley & Sons

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	2	3				1	2	3			
CO2	1	2	3				1	2	3			
CO3	1	2	3				1	2	3			
CO4	1	2	3				1	2	3			

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2704	ADVANCED MICROBIOLOGY LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**DBLS2703 ADVANCED MICROBIOLOGY**				

Catalog Description

The Advanced Microbiology Lab course offers hands-on experience with sophisticated techniques in microbiological research. Students will engage in practical applications of microbial culturing, genetic manipulation, and biochemical analysis. Key areas include microbial physiology, biofilm formation, and pathogen identification. This course is designed to complement Advanced Microbiology (DBLS2703) lectures, imparting essential skills for research and industry applications.

Course Objectives

This course aims to impart hands-on experience in basic microbiology tools and techniques, training to work on research projects as a team, along with essential skills in designing & conducting experiments, data collection & analysis, and record keeping & scientific communication.

Course Outcomes (COs):

Upon completion of this course, students will:

- Gain hands-on experience in culturing, isolating, and identifying various microorganisms using advanced microbiological techniques.
- Conduct experiments to understand microbial growth, metabolic pathways, and physiological responses under different environmental conditions.
- Investigate the mechanisms of biofilm development and the pathogenicity of microorganisms through practical experimentation.
- Develop skills in data collection, statistical analysis, and interpretation of experimental results in microbiology.
- Work collaboratively in a team setting to conduct experiments, analyze results, and present findings clearly and professionally.
- Adhere to strict laboratory safety protocols and maintain accurate, detailed laboratory records.

Course Content:

Modules	Blooms level*	Number of hours
Module 1: Sterilization, disinfection and safety in microbiological laboratory.	**L1, L2, L3**	2
Module 2: Preparation of media for cultivation of bacteria.	**L1, L2, L3**	2
Module 3: Isolation of bacteria in pure culture by streak plate method.	**L1, L2, L3**	2
Module 4: Study of colony and growth characteristics of some common bacteria: Bacillus, E. coli, Staphylococcus, Streptococcus, etc.	**L1, L2, L3**	2
Module 5: Preparation of bacterial smear and Gram's staining.	**L1, L2, L3**	2

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Module 6: Enumeration of bacteria: standard plate count.	**L1, L2, L3,L4**	2
Module 7: Antimicrobial sensitivity test and demonstration of drug resistance.	**L1, L2, L3, L5**	4
Module 8: Maintenance of stock cultures: slants, stabs and glycerol stock cultures	**L1, L2, L3**	2
Module 9: Determination of phenol co-efficient of antimicrobial agents.	**L1, L2, L3**	2
Module 10: Determination of Minimum Inhibitory Concentration (MIC)	**L1, L2, L3**	4
Module 11: Biofilm formation of Candida auris: culture and characterisation	**L1, L2, L3, L4**	4

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Microbiology: A laboratory Manual, Seventh Edition, by: Cappuccino and Sherman
- Microbes in Action, Fourth Edition:by Harry W. Seeley, Cornell University; Paul J. Vandemark, late of Cornell University; John J. Lee

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	1	2				1	1	2			
CO2	1	1	2				1	1	2			
CO3	1	1	2				1	1	2			
CO4	1	1	2				1	1	2			
CO5	1	1	2		1		1	1	2		1	
CO6	1	1	2				1	1	2			

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2705	ADVANCED CELL BIOLOGY	L	T	P	C
Version	2023	2	0	0	2
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description

This course explores cellular dynamics, chromatin structure, signal transduction, cellular processes, and advanced techniques for studying cells. It covers organelle interactions, gene regulation, cell cycle, differentiation, stress responses, microscopy, DNA/RNA/protein analysis, genome instability, cell transformation, and stem cells and their applications.

Course Objectives

This Advanced Cell Biology course explores the intricacies of cellular processes and covers topics ranging from subcellular organelles, signal transduction, and stem cell applications. This course also delves into complex cell cycle regulation and apoptosis pathways. By course end, the student is expected to possess a deepened understanding of advanced cell biology, ready for research and application in contemporary scientific endeavors.

Course Outcomes (COs):

Upon successful completion of the course, students will be able to:

- Understand the dynamic organization of subcellular organelles and membrane dynamics.
- Learn chromatin structure, remodelling, and epigenetic modifications affecting gene expression.
- Learn about signal transduction pathways, intracellular transport mechanisms, and vesicular trafficking.
- Gain insights into cell cycle regulation, cellular differentiation, stress responses, and cell death mechanisms.
- Understand genome instability, cell transformation, and their implications for disease and therapeutic interventions.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Dynamic Organization of Cell • Subcellular organelles and their dynamic interactions • Membrane dynamics and vesicle trafficking • Cellular compartmentalization and its functional significance	**L1, L2**	6
Module II: Chromatin Structure and Dynamics • DNA packaging in the nucleus • Chromatin remodelling and epigenetic modifications • Regulation of gene expression through chromatin modifications	**L1, L2**	6
Module III: Cellular Signaling, Transport, and Trafficking • Signal transduction pathways and molecular cascades • Intracellular transport mechanisms • Vesicular trafficking and its role in cellular processes	**L1, L2**	6
Module IV: Cellular Processes	**L1, L2**	6

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• Cell cycle regulation and checkpoints • Cellular differentiation and development • Cellular responses to stress and environmental cues • Cell death mechanisms and regulation		
Module V: Manipulating and Studying Cells • Isolation of cells and basics of cell culture • Observing cells under a microscope • Different types of microscopy techniques and their applications	**L1, L2, L3**	6
Module VI: Analyzing and Manipulating DNA, RNA, and Proteins • DNA and RNA extraction techniques • Polymerase chain reaction (PCR) and gene expression analysis • Protein isolation, purification, and analysis method	**L1, L2, L3**	6
Module VII: Genome Instability and Cell Transformation • Mechanisms of genome instability • Cell transformation and carcinogenesis • Implications for disease and therapeutic interventions	**L1, L2**	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Molecular Biology of the Cell:
- Authors: Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts, Peter Walter Edition: 6th Edition
- Publisher: Garland Science Year: 2014

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	3	3				1	3	3			
CO2	1	3	3				1	3	3			
CO3	1	3	3				1	3	3			
CO4	1	3	3				1	3	3			
CO5	1	3	3				1	3	3			

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2706	ECOLOGY AND EVOLUTION	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description

The term environment is used to describe, in aggregate, all the external forces, influences and conditions which affect life, nature, behavior and the growth, development and maturity of living organisms. In present condition huge increase in environmental issues, have grown to complexity day by day with threat of human existence on earth. A study of environmental changes is quite essential in all types of environmental conditions to have control over urban & industrial development. It can also enlighten the masses about the importance of the protection and conservation of our environment and control of human activities which has an adverse effect on the environment. This course also emphasizes the coevolution of organisms and surroundings together with harmony for the coexistence of life on earth.

Course Objectives

This course aims to provide a comprehensive understanding of the principles of ecology and evolution and their interconnectedness. Students will explore the fundamentals of ecology, including population dynamics and community interactions, to understand the complex relationships within ecosystems. They will delve into the mechanisms of evolution, such as natural selection and genetic drift, to comprehend how biodiversity arises and changes over time. The course will also cover applied aspects of ecology and evolution, enabling students to apply theoretical knowledge to real-world issues like conservation, resource management, and the impacts of climate change on ecosystems and biodiversity. Students will also gain real world experience through field work.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Understand and explain the basic principles of ecology, including population dynamics, species interactions, and community structure.
- Analyse the components and functioning of ecosystems, including energy flow, nutrient cycling, and the impact of human activities on ecosystem health.
- Comprehend the mechanisms driving evolution, such as natural selection, genetic drift, and gene flow, and explain how these processes contribute to the diversity of life.
- Apply ecological and evolutionary theories to practical challenges in conservation, resource management, and assessing the ecological impacts of environmental changes.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Fundamentals of Ecology Definition, scope, and importance; Abiotic and biotic components; scales (population, species, community, ecosystems, biomes); niches and habitats. Population ecology: Population growth rate, metapopulation ecology Interactions: Ecophysiology (physiological adaptations to abiotic environment. Community ecology.	L1, L2, L3	4

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Module II: Ecosystems Concept of an ecosystem, structure, and function of ecosystems: trophic levels and their interactions; nutrient cycles; primary and secondary productivity, Producers, consumers, and decomposers Energy flow in the ecosystem; Ecological succession; Food chains, food webs and ecological pyramids, introduction, types, characteristic features, structure, and function	L1, L2, L3	8
Module III: Evolution Theory & History of Evolutionary thought: Lamarckism; Darwinism; Modern Synthesis Fundamentals: Variation; heritability; natural selection; fitness and adaptation; types of selection (stabilizing, directional, disruptive) Diverse lifeforms: Origin and history of life on earth; diversity and classification of life; systems of classification (cladistics and phenetics) Interactions: Co-evolution, prey-predator interactions. Population and Quantitative genetics, molecular evolution, phylogenetics and molecular systematics Macroevolution: Species concepts and speciation; adaptive radiation; convergence; biogeography	L3, L4, L5	12
Module IV: Applied Ecology & Evolution Natural resources and associated problems Biodiversity and conservation: Importance of conserving biodiversity Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity Conservation genetics (genetic diversity, inbreeding depression); DNA fingerprinting and DNA barcoding Disease ecology and evolution: Epidemiology; antibiotic resistance; vector Control Plant and animal breeding: marker assisted breeding; genetic basis of economically important traits, global climate change: causes; consequences; mitigation Environment protection law	L3, L4, L5	12
Module V: Field Work Visit to a local area to document environmental assets-river / forest/ grassland/ hill/ mountain. Visit to a local polluted site – Urban / Rural / Industrial / Agricultural Study of common plants, insects, birds Study of simple ecosystems-pond, river, hill slopes, etc.	L3, L4, L5, L6	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
- Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad 380 013, India.
- Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
- Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
- Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
- De A.K., Environmental Chemistry, Wiley Eastern Ltd
- Down to Earth, Centre for Science and Environment (R)
- Gleick, H.P. 1993. Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
- Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
- Heywood, V.H & Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
- Mckinney, M.L. & School, R.M. 1996. Environmental Science Systems & Solutions, Web enhanced edition. 639p.

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- Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)
- Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
- Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
- Rao M N. & Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ. Co. Pvt. Ltd. 345p.
- Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut
- Survey of the Environment, The Hindu (M)
- Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science
- Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication (TB)
- Wanger K.D., 1998 Environnemental Management. W.B. Saunders Co. Philadelphia, USA 499p

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	2	3	1			1	2	3	1		
CO2	1	1	3	1			1	1	3	1		
CO3	1	1	3	1	2		1	1	3	1	2	
CO4	1	1	3	1	2		1	1	3	1	2	

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2707	GENETICS	L	T	P	C
Version	2023	2	0	0	2
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description

Genetics is the study of principles and mechanisms of inheritance. In this course students will understand the fundamental principles of inheritance unraveled by Gregor Mendel, who is considered the father of Genetics. Students will explore the mechanisms of inheritance in a range of organisms from bacteriophages to bacteria to yeast and higher organisms including fruit-fly, plants and humans. Students will also get introduced to concepts in population genetics and quantitative inheritance.

Course Objectives

This course aims to provide the students with a strong foundation in the knowledge and applications of principles and mechanisms of inheritance in a range of organisms including bacteriophages, bacteria, yeast, Drosophila, plants and humans. Furthermore, the basics of the principles of inheritance of quantitative traits, and the principles of inheritance at the population level will also be imparted.

Course Outcomes (COs):

On successful completion of this course, student will be able:

- Explain and analyse the genetic mechanisms of bacteria and bacteriophages, including gene transfer, mutation, and recombination.
- Interpret the role of yeast as a model organism for studying eukaryotic gene function and regulation.
- Explain the utility of *Drosophila melanogaster* as a model system to investigate genetic principles applicable to higher eukaryotes.
- Apply the principles of Mendelian inheritance in evaluating genetics crosses and determining genetic map distances in *Drosophila*.
- Apply the principles of population genetics to study the genetic structure of populations and the forces driving changes in the genetic composition of the population.
- Examine the genetic basis of complex traits and the methodologies used to identify quantitative trait loci (QTLs).
- Examine the genetic techniques underlying plant breeding.
- Conduct pedigree analysis and interpret complex pedigrees to identify modes of inheritance and calculate genetic risks for individuals.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Genetics of bacteria and bacteriophages Concept of a gene in pre-DNA era; mapping of genes in bacterial and phage chromosomes by classical genetic crosses; fine structure analysis of a gene; genetic complementation and other genetic crosses using phenotypic markers; phenotype to genotype connectivity prior to DNA-based understanding of gene	L1, L2, L3	4
Module II: Yeast genetics Meiotic crosses, tetrad analyses, non-Mendelian and Mendelian ratios, gene conversion, models of genetic recombination, yeast mating type switch; dominant and recessive genes/mutations, suppressor or modifier screens, complementation groups, transposon mutagenesis, synthetic lethality, genetic epistasis.	L1, L2, L3	4

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Tetrad analysis in Neurospora		
Module III: Drosophila genetics as a model of higher eukaryotes Monohybrid & dihybrid crosses, back-crosses, test-crosses, analyses of autosomal and sex linkages, screening of mutations based on phenotypes and mapping the same (three-point-crossover mapping), hypomorphy, genetic mosaics, genetic epistasis in context of developmental mechanism;	L1, L2, L3, L4	8
Module IV: Population genetics and genetics of evolution Introduction to the elements of population genetics: genetic variation, genetic drift, neutral evolution; mutation selection, balancing selection, Fishers theorem, Hardy- Weinberg equilibrium, linkage disequilibrium; in-breeding depression & mating systems; population bottlenecks, migrations,	L1, L2, L3	5
Module V: Quantitative genetics of complex traits (QTLs) Complex traits, mapping QTLs, yeast genomics to understand biology of QTLs.	L1, L2, L3, L4	3
Module VI: Plant genetics Laws of segregation in plant crosses, inbreeding, selfing, heterosis, maintenance of genetic purity, gene pyramiding.	L1, L2, L3	2
Module VII: Human Pedigree analysis Modes of Inheritance, prediction of probability of progeny genotype based on pedigree analysis	L1, L2, L3, L4, L5	4

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Hartl, D. L., & Jones, E. W. (1998). Genetics: Principles and Analysis. Sudbury, MA:
- Jones and Bartlett
- Pierce, B. A. (2005). Genetics: a Conceptual Approach. New York: W.H. Freeman
- Tamarin, R. H., & Leavitt, R. W. (1991). Principles of Genetics. Dubuque, IA: Wm. C. Brown.
- Smith, J. M. (1998). Evolutionary Genetics. Oxford: Oxford University Press.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1		2			3	1		2			3
CO2	1		2			3	1		2			3
CO3	1		2			3	1		2			3
CO4	1	1	2			3	1	1	2			3
CO5	1	1	2			3	1	1	2			3
CO6	1	3	2		2	3	1	3	2		2	3
CO7	1	1	2		2	3	1	1	2		2	3
CO8	1	1	2			3	1	1	2			3

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2708	BASICS OF CHEMISTRY AND PHYSICS	L	T	P	C
Version	2023	2	0	0	2
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description

This course will explore the essential principles of physics and chemistry through the lens of biology. Tailored for non-majors, this class aims to provide a solid foundation in the physical and chemical concepts crucial to understanding biological processes.

Course Objectives

In this course, students will delve into the key principles that underpin biological phenomena including topics on Classical Mechanics, Wave & Optics, Electricity & Magnetism, and Thermodynamics. Topics include classical mechanics, chemical reactions in biological systems, and the application of thermodynamics to biological processes.

Through interactive lectures, and real-world examples, students will gain practical insights into how physics and chemistry shape the living world.

Course Outcomes (COs):

This course will enable the students to attain the following:

- Explore fundamental concepts such as motion, forces, and energy to develop a foundational understanding of the physical principles governing biological systems.
- Explain the fundamental principles in waves & optics, and electricity and magnetism, along with the relevance of these principles in the various tools used in biological research.
- Examine Chemical Processes in Biological Systems including enzyme catalysis and cellular metabolism, to comprehend how chemical interactions drive biological functions at the molecular level.
- Gain proficiency in applying thermodynamic principles to analyze energy transfer and transformations within living organisms, emphasizing their relevance to cellular processes and homeostasis.
- Develop problem-solving skills by applying both physics and chemistry concepts to address real-world biological challenges.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Importance of Physics in Biology • Importance of Physics in understanding biological processes	L1, L2	1
Module II: Mechanics: Motion and Forces • Kinematics (1D and 2D motions) • Dynamics: Newton's laws of motion; • Application of Newton's 2nd law in Linear, Circular motions (briefly, mention other kinds of motion – rotational and oscillatory (e.g. SHM)) • Principle of Conservation of Energy • Principle of Conservation of Momentum	L1, L2, L3	5
Module III: Waves and Optics in Biological Systems • Basics of wave motion • Light as a wave	L1, L2, L3	4

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• Ability of light to cause atomic excitation and its Biological significance (e.g. • Biofluorescence, Photosynthesis) • Applications of optics in biology (e.g., Compound microscopy, Confocal microscopy, Fluorescence microscopy)		
Module IV: Electricity and Magnetism in Biological Systems • Basics of electricity and magnetism • Membrane potentials and electrical signaling in cells • Magnetic resonance imaging (MRI) in biological research	L1, L2	3
Module V: Introduction to Chemistry in Biology • Overview of the course content • Importance of chemistry in biological processes • Basic chemical terminology and concepts	L1, L2	1
Module VI: Section: Organic Chemistry **Structure, Bonding and Nomenclature in Organic Molecules** • Structure & nomenclature of organic molecules • Bonding in organic compounds • Isomerism in organic chemistry	L1, L2	2
Module VII: Functional Groups and Reactions • Common functional groups in biomolecules (aldehyde, ketone, alcohol, acid, amine, amide, ester) • Chemical reactions in organic chemistry • Stereochemistry in biomolecules	L1, L2	2
Module VIII: Section: Physical Chemistry **Thermodynamics in Biological Systems** • First and Second Laws of Thermodynamics • Enthalpy, entropy, and Gibbs free energy • Thermodynamics of biological processes	L1, L2	3
Module IX: Chemical kinetics • Zero, First and Second order reactions	L1, L2	3
Module X: Instrumental analysis • GC/MS, LC/MS, NMR	L1, L2, L3	1

Module XI: Colligative Properties
• Definition of colligative properties
• Different ways of expressing concentration of a solution
• Importance of colligative properties in biological systems
  • Osmosis; Osmotic pressure and its significance in cells
  • Freezing Point Depression and Cryopreservation
	L1, L2, L3	3

Module XII: Section : Inorganic Chemistry **Metals in Biological Systems** • Role of metal ions in biological processes • Metalloenzymes and metalloproteins • Oxidation state of atoms and its importance in bioavailability of micronutrients	L1, L2	2

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Applications of Atomic Excitations and De-Excitations | Physics (lumenlearning.com)
- Bookshelves - Physics LibreTexts
- Introductory Chemistry; Libre Texts: https://commons.libretexts.org/book/chem-45050

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Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	CA	A	A/P	EE
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	1					1	1				
CO2	1	1					1	1				
CO3	1	1	2				1	1	2			
CO4	1	1					1	1				
CO5	1	1	2			1	1	1	2			1

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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DBLS2739	BASICS OF RESEARCH METHODOLOGY, ETHICS, AND RESEARCH COMMUNICATION	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description

This course aims to provide students with a comprehensive understanding of conducting ethical research, utilizing proper research methodologies, and effectively communicating research findings. The course includes a final project where students will write a Literature Review on a topic chosen in consultation with the teacher(s).

This course is designed to equip students with essential skills and knowledge to conduct ethical research, employ proper research methodologies, and effectively communicate scientific information (with focus on writing a literature review). The course will cover topics such as research design, data collection and analysis, research ethics, and science communication strategies. Through a combination of lectures, discussions, case studies, and practical exercises, students will develop a deeper understanding of the research process and its ethical implications.

Course Objectives

The objective of this course is to impart knowledge about various stages of research process, research ethics and different ways of research communication.

The aim of this course is to impart research skills to the beginners and help to improve the quality of research by the existing researchers. It also encompasses the understanding and application of appropriate research design, statistics, and the use of the computer for reference management, report writing, research paper writing and presentation. The course also introduces the key conceptual issues of each research method, as well as giving practical guidance. It covers the series of research methodology contents: from problem formulation, to design, to data collection, analysis, reporting and dissemination. The course has the dual aims of equipping students with conceptual understandings of current academic debates regarding different methods, and the practical skills to put those methods into practice.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define criteria of good research, steps in research process, and data collection.

CO2. Identify different types of sampling and its purpose.

CO3. Conduct hypothesis testing for different types of samples and interpret the results.

CO4: Learn the importance of literature review, write research paper/thesis, use reference management software.

Course Content :

Module	Topic	**Blooms level***	Hours
1	**Research Methodology** Understanding the research process: From research questions to conclusions	L1, L2	10

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	Types of research: Qualitative and quantitative research Exploratory, descriptive, experimental, and correlational studies Scientific Thinking: Subjective Vs. Objective Thinking Logical Reasoning: Inductive Vs. Deductive Reasoning Formulating research hypotheses and objectives Purpose of a good research, Criteria of good research		
2	**Descriptive Statistics** Data, Types of Data, Methods of data collection, Benefits and drawbacks, Graphical representation of data and interpretation. Measures of Central Tendency: Arithmetic Mean, Median, Mode, Measures of Dispersion: Range, Standard Deviation, Variance, Coefficient of Variation.	L1, L2, L3	15
3	**Inferential Statistics** Sampling: Basic concepts, Process of Sampling, Sample Size, Types of Samples, Sampling and non- sampling errors, Statistics and Parameters, Sampling Distribution of Means and Proportion, **Hypothesis Testing**, steps in testing of hypothesis, errors in hypothesis testing, z test and t test.	L1, L2, L3	15
4	**Research Ethics** Plagiarism, Fabrication, Falsification, Ethics with respect to human and Animal Research	L1, L2	5
5	**Communication** Characteristics of a good Research paper, Systematics Literature Review (choosing a topic, preparing outline, gathering authentic & appropriate references, avoiding plagiarism, use of reference management systems), Writing a good literature review, Structure of report (Introduction, Methodology, Analysis, Results, Discussions, Conclusions, Recommendations), Writing Quality Research Paper, Publishing Research Work in Quality Journals, Reference Management Software	L1, L2, L3	15

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional Exam	End Term Examination
Weightage (%)	5	10	15	70

Project based assignment: Student teams (2-3 students per team) will write a literature review on a topic of choice, in consultation with the teacher.

Text books/ Reference books

- Research Methodology for Natural Sciences by Soumitro Banerjee, Publisher: IISc Press (1 January 2022); ISBN-10: 8194835178; ISBN-13: 978-8194835172

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- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt. Ltd., New Delhi-110001
- Geode, Millian J.& Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Kothari, C.R.2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.
- Levin R I., Rubin D S. Statistics for Management. Sixth Edition, PHI
- Kapoor & Gupta. Probability & Statistics. S Chand Publishers, New Delhi.
- Montomery, Douglas C.(2007), 5th Ed. Design and Analysis of Experiments, Wiley India.
- Cooper, Donald R. and Pamels Schindler, Business Research Methods, Tata McGraw Hills, New Delhi
- Krishnaswamy, K.N. Sivakumar. Appa lyer and Mathiranjan M. 2006, Management Research Methodology: Integration of Principles, Methods and Techniques, Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Sachdeva, J.K. 2008. Business Research methodology. Himalaya Publishing House, New Delhi.
- Shekharan, Uma, Business Research Methods, Miley Education, Singapore.
- Zikmund, Millian G., Business Research Methods, Thomson Learning, Bombay**.**

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SEMESTER-VIII

Course Code: DBLS2801	DOWN STREAM PROCESSING & FERMENTATION TECHNOLOGY	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description

This course explains the processes and techniques used for production and purification of a product from culture medium. Also, bioprocess consideration in using animal and plant cell cultures will discuss using different techniques. This will also provide students with an up-to-date knowledge of upstream and downstream processing technology.

Course Objectives

The syllabus will help the students to characterize the Bioproducts of biotechnological importance and to get expertise in their downstream processing. The course shall make the students aware of various fermentation processes within the context of each topic.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Produce bio-products and secondary metabolites on commercial level using fermenters.
- Describe the production of primary and secondary metabolites.
- Recognize the fundamental understanding of physical and chemical properties of biological materials and their separation and purification.
- Explain the various principles that underlie major unit operations used in bio separations such as settling, evaporation, centrifugation, and membrane filtration.
- Explain the principles of protein precipitation, aqueous two phase extraction, adsorption and chromatography.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Fermentation Technology-An Overview • Basic principle in fermentation technology, • Media formulation and optimization, • Cell culture techniques • Inoculum development and aseptic transfers.	**L1, L3, L4, L5**	3
Module II: Bioproduct Production • Production of Ethanol, • Production of secondary metabolites – penicillin, cephalosporins, streptomycin, tetracycline, • Fermentation technology for production of acetone-butanol, citric acid, amino acids, • Polysaccharides and plastics.	**L1, L2, L3**	9
Module III: Downstream Processing-An Overview • Importance of downstream processing in biotechnology; • Characteristics of bio-products and fermentation broth	**L1, L3, L4,**	2

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Module IV: Bioproduct Isolation • Separation of insoluble products - filtration, centrifugation, sedimentation, Cell disruption • Separation of soluble products: liquid-liquid extraction, precipitation	**L2, L4, L5**	14
Module V: Purification • Chromatographic techniques • Separation based on size, charge and biological affinity • Membrane Based Separation- reverse osmosis, ultra and micro filtration • Gel electrophoresis	**L3, L4, L5**	11
Module VI: Polishing • Drying; • Crystallization • Storage and packaging.	**L1, L3, L6**	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text books and Reference

- Industrial Microbiology by L.E.Casida, JR.New Age International (P) LTD.
- Biotechnology, A Text book of Industrial Microbiology, W. Crueger and A. Crueger, Sinauer Association.
- Bioseparations: Downstream Processing for Biotechnology, P.A. Belter et al, John Wiley & Sons Inc.
- Practical Biochemistry, Principles & Techniques, Keith Wilson and John Walker
- Biochemical Engineering Fundamentals, J.E. Bailey and D.F. Ollis, McGraw-Hill
- Biotreatment, Downstream Processing and Modelling (Advances in Biochemical Engineering/ Biotechnology, Vol 56), T. Schepler et al, Springer Verlag
- Protein Purification, MR Ladisch, RC Wilson, CC Painton, SE Builder, American Chemical Society
- Principles of Fermentation Technology by P.F. Stanbury, A. Whitaker, and S.J. Hall, Aditya Books (P) LTD.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	2	2				1	2	2			
CO2	1	2	2				1	2	2			
CO3	1						1					
CO4	1	2					1	2				
CO5	1	1	1				1	1	1			

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2802	INTRODUCTION TO DEVELOPMENTAL BIOLOGY	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description

Developmental Biology is a branch of biological sciences that focuses on understanding the processes by which organisms grow and develop from a single cell (zygote) into a fully formed organism. This field integrates principles from molecular biology, genetics, and cell biology to elucidate the mechanisms that control the growth, differentiation, and morphogenesis of cells, tissues, and organs. This course introduces the students to molecular, cellular, and physiological processes that govern development in multicellular organisms. Students will examine key concepts from gamete formation, fertilization, embryonic development, repair and regeneration. Students will also explore current research topics in Stem cell engineering and Stem cell therapy.

Course Objectives

This course aims to enable the students to develop an integrated understanding of the molecular, cellular, genetic and physiological processes that govern development in multicellular organisms. Significant emphasis will be on the scientific process and key experiments that helped scientists unravel the secrets of the development processes in various model organisms.

Course Outcomes (COs):

Upon successful completion of this course students will be able to:

- Describe the different stages of development in multicellular organisms (from formation of gametes to development of a fully developed organism).
- Explain the different molecular and cellular processes involved in regulation of development in higher organisms, with suitable example
- Develop an integrated understanding of knowledge gained in fundamental courses such as genetics, cell biology and molecular biology, in the context of the various cellular, molecular and physiological processes that regulate the development of a multicellular organism.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to Developmental Biology in higher organisms Life cycle and stages of development Introduction to key themes in Developmental Biology: Differential gene expression, Cell fate determination, Signalling in development, Pattern formation, Morphogenesis, Developmental plasticity: Regeneration, Apoptosis (programmed cell death)	L1, L2	7
Module II: Germ Cells and Fertilization The Benefits of Sex Reproduction in higher organisms, Primordial Germ Cells and Sex Determination in Mammals, Eggs, Sperm, Fertilization, Blastulation, Gastrulation.	L1, L2	8
Module III: Universal Mechanisms of Animal & Plant Development • Differential gene expression • Cell-Cell signalling • Cell fate determination • Patterning: axis formation and segmentation	L1, L2, L4, L5	30

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• Morphogens and morphogenesis • Apoptosis and its role in Development • Senescence (in plants) (each of these mechanisms will be discussed with appropriate examples from the following model organisms; Caenorhabditis elegans, Drosophila, Mouse, Arabidopsis		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Molecular Biology of The Cell, Bruce Alberts et al. Chapters 20, 21 and 22.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	CA	A	A/P	EE
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	2	2				1	2	2			
CO2	1	2	2		3	3	1	2	2		3	3
CO3	1	2	1		3	3	1	2	1		3	3

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2803	METHODS IN BIOLOGY	L	T	P	C
Version	2023	2	0	0	2
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description

This course introduces the learners to the various techniques and methods used in biology and helps them to strengthen their theoretical knowledge before practical training. This course gives an overview about the different methods used in laboratory and prepare the students for the laboratory experiments. The knowledge about the statistical methods teaches the students to interpret the data.

Course Objectives

The objective of this course is to acquaint the students with various techniques in biology. A student will build upon undergraduate level knowledge of biological principles to understand different biological techniques. The course shall also make the students aware of various statistical techniques used in biology

Course Outcomes (COs):

On completion of this course, students should be able to:

- Explain the principles of buffer preparation and function, and evaluate buffer capacities and pH adjustment for various biological experiments.
- Develop proficiency in a range of analytical techniques, such as spectrophotometry, chromatography, and electrophoresis, for the quantitative and qualitative analysis of biological molecules.
- Explain and apply microbiological methods, including culturing, isolating, and identifying microorganisms, as well as maintaining sterile techniques.
- Apply statistical methods to analyze and interpret biological data, understanding concepts such as hypothesis testing, data visualization, and the use of statistical software.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Buffers: Principle, constitution and preparation of Buffers (acidic, neutral and basic), Biological buffer systems.	**L1, L2, L3**	4
Module II: Analytical Techniques: Principle, instrumentation, applications, analysis and interpretation of the data in UV-Visible Spectrophotometry, Fluorimetry, Chromatography (Paper, TLC, Gel filtration, Ion-exchange chromatography), Electrophoresis (Gel electrophoresis, SDS-PAGE, Agarose Gel Electrophoresis, Immunoelectrophoretic techniques).	**L1, L2, L3, L4**	8
Module III: Microbiological Techniques: Culture of microorganisms; types of culture media; methods for isolating pure cultures; maintenance and preservation of pure cultures. Control of microorganisms; physical and chemical methods. Bacterial growth: definition, growth parameters, measurement of growth, synchronous growth. Batch and continuous cultures	**L1, L2, L3, L4**	8
Module IV: Biostatistics Importance of the use of statistical methods in biological research, sampling theory, samples and populations. Measures of central tendency; mean, median,	**L1, L2, L3, L4**	8

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mode, standard deviations and standard error. Tests of significance, Q Test, F Test and T Test.		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Advanced Instrumentation, Data Interpretation, and Control of Biotechnological Processes, J.F. Van Impe, Kluwer Academic
- Modern Spectroscopy, J.M. Hollas, John Wiley and Son Ltd.
- MLA. Skoog, Douglas A. Principles of Instrumental Analysis. Fort Worth: Saunders College Pub.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	1	2				1	1	2			
CO2	1	1	2				1	1	2			
CO3	1	1	3				1	1	3			
CO4	1	1	2		2		1	1	2		2	

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2804	GENETIC ENGINEERING	L	T	P	C
Version	2023	3	0	0	3
Pre-requisites	Nil				
Co-requisites	**DBTH2805 GENETIC ENGINEERING LAB**				

Catalog Description

The objectives of this course are to teach students various approaches to conducting genetic engineering and their applications in biological research as well as in biotechnology industries. Genetic engineering is a technology that has been developed based on our fundamental understanding of the principles of molecular biology and this is reflected in the contents of this course.

Course Objectives

Given the impact of genetic engineering in modern society, the students should be endowed with strong theoretical knowledge of this technology. In conjunction with the practicals in molecular biology & genetic engineering, the students should be able to take up biological research as well as placement in the relevant biotech industry

Course Outcomes (COs):

On completion of this course, students should be able to:

- Understand the fundamental principles of genetic engineering and become proficient in the tools and techniques used in genetic manipulation, such as restriction enzymes and cloning strategies.
- Explain the utility of various types of vectors, including plasmids, viral vectors, and artificial chromosomes, and their applications in gene cloning and expression.
- Discuss in detail the relevant applications of a range of PCR techniques, such as quantitative PCR, reverse transcription PCR, and digital PCR, for amplifying and analyzing DNA sequences.
- Articulate the application of gene manipulation methods and techniques for studying protein-DNA interactions, such as electrophoretic mobility shift assays (EMSAs) and chromatin immunoprecipitation (ChIP).
- Explain the principles and applications of gene silencing methods, including RNA interference, and master genome editing technologies such as CRISPR-Cas9, TALENs, and zinc finger nucleases.
- Explain the principles and applications of stem cell technology and gene therapy, focusing on their potential for treating genetic disorders and regenerative medicine.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction and tools for genetic engineering Impact of genetic engineering in modern society; general requirements for performing a genetic engineering experiment; restriction endonucleases and methylases; DNA ligase, Klenow enzyme, T4 DNA polymerase, polynucleotide kinase, alkaline phosphatase; cohesive and blunt end ligation; linkers; adaptors; homopolymeric tailing; labelling of DNA: nick translation, random priming, radioactive and non-radioactive probes, hybridization techniques: northern, southern, south-western and far-western and colony hybridization, fluorescence in situ hybridization.	**L1, L2**	7
Module II: Different types of vectors	**L1, L2, L3**	10

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Plasmids; Bacteriophages; M13 mp vectors; PUC19 and Bluescript vectors, hagemids; Lambda vectors; Insertion and Replacement vectors; Cosmids; Artificial chromosome vectors (YACs; BACs); Principles for maximizing gene expression expression vectors; pMal; GST; pET-based vectors; Protein purification; His-tag; GST-tag; MBP-tag etc.; Intein-based vectors; Inclusion bodies; methodologies to reduce formation of inclusion bodies; mammalian expression and replicating vectors; Baculovirus and Pichia vectors system, plant based vectors, Ti and Ri as vectors, yeast vectors, shuttle vectors		
Module III: Different types of PCR techniques Principles of PCR: primer design; fidelity of thermostable enzymes; DNA polymerases; types of PCR – multiplex, nested; reverse-transcription PCR, real time PCR, touchdown PCR, hot start PCR, colony PCR, asymmetric PCR, cloning of PCR products; T-vectors; proof reading enzymes; PCR based site specific mutagenesis; PCR in molecular diagnostics; viral and bacterial detection; sequencing methods; enzymatic DNA sequencing; chemical sequencing of DNA; automated DNA sequencing; RNA sequencing; chemical synthesis of oligonucleotides; mutation detection: SSCP, DGGE, RFLP.	**L1, L2, L3**	10
Module IV: Gene manipulation and protein-DNA interaction Insertion of foreign DNA into host cells; transformation, electroporation, transfection; construction of libraries; isolation of mRNA and total RNA; reverse transcriptase and cDNA synthesis; cDNA and genomic libraries; construction of microarrays – genomic arrays, cDNA arrays and oligo arrays; study of protein-DNA interactions: electrophoretic mobility shift assay; DNase footprinting; methyl interference assay, chromatin immunoprecipitation; protein-protein interactions using yeast two-hybrid system; phage display.	**L1, L2, L3, L4**	6
Module V: Gene silencing and genome editing technologies Gene silencing techniques; introduction to siRNA; siRNA technology; Micro RNA; construction of siRNA vectors; principle and application of gene silencing; gene knockouts and gene therapy; creation of transgenic plants; debate over GM crops; introduction to methods of genetic manipulation in different model systems e.g. fruit flies (*Drosophila*), worms (*C. elegans*), frogs (Xenopus), fish (zebra fish) and chick; Transgenics - gene replacement; gene targeting; creation of transgenic and knock-out mice; disease model; introduction to genome editing by CRISPR-CAS with specific emphasis on Chinese and American clinical trials	**L3, L4, L5, L6**	7
Module VI: Stem cell and gene therapy, Types of stem cell, their use, gene therapy	**L1, L2, L3**	5

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Gene cloning and analysis: An Introduction by T. A Brown, Blackwell Publishing
- Principles of gene manipulation: An introduction to genetic engineering by R.W Old and S.B Primrose, Blackwell Publishing
- Principles Of Gene Manipulation And Genomics, 7Th Edition by Primrose S B, John Wiley
- Lewins Genes XII by Jocelyn E. Krebs and Elliott S. Goldstein, JONES & BARTLETT
- Green, M. R., & Sambrook, J. (2012). Molecular Cloning: a Laboratory Manual. Cold Spring Harbor, NY: Cold Spring Harbor Laboratory Press.
- Brown, T. A. (2006). Genomes (3rd ed.). New York: Garland Science Pub.
- Selected papers from scientific journals, particularly Nature & Science.
- Technical Literature from Stratagene, Promega, Novagen, New England Biolab etc**.**

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Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	CA	A	A/P	EE
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	1	3				1	1	3			
CO2	1	2	3				1	2	3			
CO3	1	1	3				1	1	3			
CO4	1	2	3				1	2	3			
CO5	1	2	3				1	2	3			
CO6	1	2	3				1	2	3			

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2805	GENETIC ENGINEERING LAB	L	T	P	C
Version	2023	0	0	2	1
Pre-requisites	Nil				
Co-requisites	**DBLS2804 GENETIC ENGINEERING**				

Catalog Description

This course will help the students to better understand what has been taught in the theory class. Designing primers, doing PCR, cloning PCR products will make the theoretical concepts about PCR and cloning crystal clear. Further purification of recombinant proteins, running of SDS-PAGE, western blotting will be helpful for understanding the regulation of expression and understanding molecular biology techniques.

Course Objectives

The objective of this course is to give students hands on experience of the latest techniques in genetic engineering. It will also help them to understand the theoretical concepts better.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Develop the skills to design effective primers and perform PCR amplification to successfully target and amplify a gene for expression purposes.
- Acquire the ability to clone a PCR-amplified gene into an *E. coli* expression vector, including the preparation of competent cells and transformation techniques.
- Apply the principle of gene expression induction using inducers and optimize gene expression in *E. coli*.
- Gain proficiency in preparing and running SDS-PAGE gels to separate and analyze proteins, assessing the expression of the target recombinant protein.
- Master the technique of Western blotting, including transfer, blocking, antibody probing, and detection to identify and quantify the recombinant protein.
- Develop the capability to purify the recombinant protein using chromatography techniques and evaluate the purity and concentration of the final product.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Designing of primers and PCR amplification of a gene for expression	L1, L2, L3	2
Module II: Cloning of the gene in E. coli expression vector	L1, L2, L3	4
Module III: Induction of gene expression	L2, L3	2
Module IV: Running of SDS-PAGE to check expression	L1, L2, L3	2
Module V: Western blotting of the recombinant protein	L2, L3, L4	2
Module VI: Purification of the recombinant protein	L1, L2, L3, L4	3

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and references

- Molecular Cloning A LABORATORY MANUAL by Michael Green and J. Sambrook

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Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	CA	A	A/P	EE
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	1	2				1	1	2			
CO2	1	1	2			2	1	1	2			2
CO3	1	1	2				1	1	2			
CO4	1	1	2				1	1	2			
CO5	1	1	2				1	1	2			
CO6	1	1	2				1	1	2			

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2806	MOLECULAR DIAGNOSTICS	L	T	P	C
Version	2023	2	0	0	2
Pre-requisites	Nil				
Co-requisites	Nil				

Catalog Description

Molecular Diagnostics familiarizes students about recent advances in molecular biology and molecular medicine with a potential to profoundly alter many aspects of modern medicine including pre- or post-natal analysis of genetic diseases and identification of individuals predisposed to disease ranging from common cold to cancer. Students should be able to understand various facets of molecular procedures and basics of genomics, proteomics and metabolomics that could be employed in early diagnosis and prognosis of human diseases.

Course Objectives

Molecular Diagnosis is the process of identifying a disease by studying molecules, such as proteins, DNA, and RNA, in a tissue or fluid. It is a new discipline that captures genomic and proteomic expression patterns and uses the information to distinguish between two or more conditions at the molecular level. The conditions under investigation can be human genetic disease or infectious diseases. Molecular diagnostics is not confined to human diseases but can be used in animals or plants

Course Outcomes (COs):

On completion of this course, students should be able to:

- Understand the significance of the classical discoveries in Molecular Diagnostics, and explain the uses of the same in modern context
- Compare the modern-day Molecular Diagnostic technologies with the technologies used earlier, and explain their significance in the modern advancements.
- Describe the key uses of Molecular Diagnostics tests in microbial diseases, metabolic pathway impairments and paediatric diseases.
- Explain the role of DNA mutations, polymorphisms and chromosomal abnormalities in diseases and how Molecular Diagnostic tests can identify these.
- Recognise the impact of Molecular Diagnostic tests in rapid, easy, high throughput disease diagnostics
- Enlist and explain the ever-increasing list of Molecular Diagnostics applications in biotechnology, precision medicine and prenatal diagnostics.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Introduction to Molecular Diagnostics. Genome biology in health and disease DNA, RNA, Protein: chromosomal structure & mutations; DNA polymorphism: human identity; clinical variability and genetically determined adverse reactions to drugs.	**L1, L2, L3**	5
Module II: Techniques used: Hybridization based techniques, Southern, Western, FISH, PCR, PCR based techniques, RT-PCR, Multiplex, DNA fingerprinting, sequencing, new generation sequencing, RNA sequencing, Microarray, Bioinformatics data acquisition & analysis.	**L1, L2, L3**	5
Module III: Diagnostic metabolomics Metabolite profile for biomarker detection the body fluids/tissues in various metabolic disorders by making using LC MS & NMR technological platforms.	**L3, L4, L5**	5

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Module IV: Detection and identity of microbial diseases Direct detection and identification of pathogenic-organisms that are slow growing or currently lacking a system of invitro cultivation as well as genotypic markers of microbial resistance to specific antibiotics.	**L3, L4, L5**	5
Module V: Detection of inherited diseases: Amniocentesis, inherited diseases for which molecular diagnosis has provided a dramatic improvement of quality of medical care: Down's syndrome, Fragile X Syndrome:	**L3, L4, L5, L6**	5
Module VI: Molecular oncology: Detection of recognized genetic aberrations in clinical samples from cancer patients; predictive biomarkers for personalized onco-therapy of human diseases such as chronic myeloid leukemia, colon, breast, lung cancer and melanoma.	**L1, L2, L3, L5**	5

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books and References

- Watson J.D, Tania A.B, Stephen P.B, Alexander G, Michael L and Richard L. 2007. Molecular Biology of the Gene. Benjamin Cummings
- Molecular Diagnostics: George P. Patrinos, Science Direct

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1		--	--	--		1					
CO2	1	2	2	--	--		1	2	2			
CO3	1	1	--	--	2		1	1			2	
CO4	1	1	--	--	2		1	1			2	
CO5	1	2	--	1	2	3	1	2		1	2	3
CO6	1	2		1	2	3	1	2		1	2	3

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DBLS2807	ENVIRONMENTAL BIOTECHNOLOGY	L	T	P	C
Version	2023	2	0	0	2
Pre-requisites	Ecology and Environment				
Co-requisites	Nil				

Catalog Description

Environmental Biotechnology" offers an in-depth exploration of how biotechnological methods can address pressing environmental challenges. This course equips students with the knowledge and skills to develop innovative biotechnological solutions for a sustainable future

Course Objectives

The course "Environmental Biotechnology" aims to provide students with a comprehensive understanding of the intersection between biotechnology and environmental science. Through six detailed modules, students will explore critical environmental issues, the development and use of bioenergy resources, and the methods for pollution control and waste treatment. They will gain expertise in bioremediation and biodegradation techniques, which utilize biological systems to address environmental contaminants. The course will also emphasize green practices for sustainable development, encouraging the adoption of eco-friendly technologies and strategies. Additionally, students will examine environmental protection policies, understanding their role in promoting sustainability and conserving natural resources.

Course Outcomes (COs):

On completion of this course, students should be able to:

- Understand and articulate the major environmental issues, including pollution, climate change, and biodiversity loss, and their impact on ecosystems and human health.
- Analyse various bioenergy resources, such as biofuels and biomass, and evaluate their potential and challenges in replacing fossil fuels.
- Develop an understanding of different types of pollution and waste, and explain the principles and techniques for effective waste treatment and pollution control.
- Discuss bioremediation and biodegradation processes, and apply microbial and plant-based strategies to detoxify and restore contaminated environments.
- Explore and assess green practices and technologies aimed at promoting sustainable development, reducing environmental impact, and conserving natural resources.
- Understand the key environmental protection policies and regulations, and evaluate their effectiveness in safeguarding the environment and promoting sustainable practices.

Course Content:

Modules	Blooms level*	Number of hours
Module I: Environmental issues Greenhouse effect, Global Warming, Global Ozone Problem, Acid Rain, Eutrophication and Biomagnification	L1, L2, L3	3
Module II: Bioenergy Resources Renewable and Non-Renewable energy resources Clean fuel technology and generations of Biofuels- Bioethanol, Biogas, Biodiesel, Algal fuels.	L1, L2, L3	6
Module III: Pollutions & Waste treatment	L3, L4, L5	7

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Pollutions:- Air, Water & Soil, Classification and characterization of waste, Principles & Mechanisms of Waste Water Engineering: Treatment of municipal waste water and industrial effluents with special focus on biological and advanced water treatments. Solid Waste Management, Techniques of air & soil waste treatment		
Module IV: Bioremediation and Biodegradation Bioremediation and Biodegradation of major environmental pollutants- release of genetically engineered microbes in environment. Biomineralization- Use of microbial technology for mining of metals from ores	L3, L4, L5	5
Module V: Green practices for sustainable development Biofertilizers, Biopesticides and IPM, Vermicomposting Bioassessment of environmental quality- Bioindicators and Biosensors	L3, L4, L5, L6	5
Module VI: Environment protection policies EIA and Environmental Audit Related case studies at national and global level	L1, L2, L3	4

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Textbooks and References

- Textbook of Biotechnology, RC Dubey/ PK Gupta
- Environmental Biotechnology, Pradipta Kumar Mohapatra
- Biotechnology- Expanding Horizons, BD Singh
- Introduction to Environmental Biotechnology, Milton Wainwright
- Waste Water Engineering, Metcalf and Eddy
- Environmental Microbiology- Methods and Protocol, Alicia L, Ragout De Spencer, John FT Spencer
- Principles of Environmental Engineering, Gilbert Masters
- Environmental Science- Working with the Earth, G Tyler Miller Jr

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**CA**	**A**	**A/P**	**EE**
Weightage (%)	15	5	10	70

CA: Continuous assessment (e.g. Sessional exam), EE: End Semester Examination; A: Attendance; A/P: Assignments/projects

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	1	3					1	3				
CO2	1	2	3				1	2	3			
CO3	1	2	3		2		1	2	3		2	
CO4	1	2	3		2		1	2	3		2	
CO5	1	1	3				1	1	3			

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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DBLS2839	DATA ANALYSIS & VISUALISATION USING SOFTWARE	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	Class X Mathematics				
Co-requisites					

Catalog Description

The implosion of available data has made visualization more critical but also more challenging. Data analysis and Data Visualization are essential tools for business analysis, engineers, policymakers, and decision-makers. Developed originally for "small data", visualization techniques have been met with varied success in the past centuries and decades. There are a few well-known visualizations that are very effective in capturing the essence of the data, and of course, there are many infamous negative examples of poor visuals. An effective visual is critical for decision making it, but it also requires a lot of work, customization, attention to detail, and refinements.

Course Objectives

The course is designed to help students develop skills and knowledge in the following area(s):

- Develop an understanding of what is a good visualization for a given purpose
- Learn visualization theory & techniques
- Build a substantial data analytic project
- Apply data analysis and visualization with Excel, SPSS, R, Python, NVivo and MATLAB

Course Outcomes

On completion of this course, the students will be able to

CO1. Students will be able to articulate meaningful lines of inquiry that might be explored through the collection, organization, visualization, and analysis of data in a context associated with their primary field of study using (as appropriate) numerical, textual, spatial, and/ or visual data.

CO2. Student will understand what data are, how they are collected, and how to assess the quality/ reliability of data.

CO3. Students will demonstrate intermediate proficiency in the visualization of data to communicate information and patterns that exist in the data.

CO4: Students will be able to use at beginning level of proficiency the tools of statistics and machine learning to ask questions of and explore patterns in data.

Course Content :

Module	Topics Covered	Blooms Level	Contact Hours
1	**Module-1: Introduction to Excel** Data Analysis using Excel, Curve fitting, Correlation, Linear Regression, Multiple regression, Principal Component Analysis and Factor Analysis, Hypothesis testing **Introduction to Excel and SPSS** Introduction to SPSS and Types of Data, Importing, exporting and data handling in SPSS; Exploratory data analysis using SPSS and data visualization;	L1, L2, L3, L4	20 hours

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	Introduction to statistical inference and various univariate tests by using SPSS; Analysis of Variance (One Way ANOVA, Two Way ANOVA and ANCOVA); Correlation, Simple and Multiple linear Regression Analysis; Principal Component Analysis and Factor Analysis		
2	**Module-2: VOS Viewer** **Web of Science, Scopus, Dimensions, Lens, and PubMed.** Co-authorship networks, citation-based networks, and co-occurrence networks can be created based on data downloaded from Web of Science, Scopus, Dimensions, and Lens. Co-authorship networks and co-occurrence networks can also be created based on PubMed data. **Crossref, Europe PMC, and OpenAlex**. Networks can also be created based on data retrieved through the APIs of Crossref, Europe PMC, and OpenAlex, These APIs can be queried interactively in VOS viewer. **Semantic Scholar, Open Citations, and Wiki Data.** For a given set of DOIs, networks can also be created based on data retrieved through the APIs of Semantic Scholar, Open Citations and Wiki Data.	L1, L2, L3, L4	10 Hours
3	**Faculty of Management Studies & Behavioural Sciences** **Module 3: Domain Specific Software** **- Structural Equation Modelling** **Smart PLS** Introduction to Structural Equation Modelling (SEM), Introduction to the software's AMOS and SPSS, SMART PLS, Testing of Statistical assumptions, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), common method bias (CMB) test, Measurement Model Assessment, Discussing Fit Indices, Reliability and Validity Testing, Structural Model Assessment identifying multivariate outlier, Construct Validity: Convergent and Discriminant Validity, Measurement Model & Structural Equation Modelling, Mediation and Moderation Effects, Multi-Group Analysis.	L1, L2, L3, L4	30 Hours
	Faculty of Arts **N Vivo** 1. Import text, audio, video, emails, images, spreadsheets, online surveys, web content, and social media from various sources into a simple, intuitive interface.		

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	2. Create and NVivo project, import and organise qualitative and quantitative data 3.Manage a literature review in NVivo 4. Autocode structured data deductively and identify themes inductively 5. Generate and falsify hypotheses 6. Combine data in sets for analysis 7. Seek patterns and identify relationships across codes and cases 8. Present findings using visualisations 9. Export data out of NVivo 10. Coordinate teamwork.		
	Faculty of Science Engineering and Technology **Faculty of Health & Allied Sciences** **R programming / Python/ MATLAB** **R Programming-** Introduction to R, Variables and datatypes in R, Dataframes, Recasting and joining of dataframes, Arithmetic, logical and matrix operations in R, Functions in R, Control structure in R, Data visualization in R. **Python Programming-** Basics of programming, data structure and algorithm using Python, Strings, lists, control, functions, manipulating lists, loops, arrays, selection sort, insertion sort, recursion, sorting, dictionaries, exception handling, file handling, string processing, data analysis using Python **MATLAB Programming-** Introduction, basic features, managing workspace, mathematical functions, basic plotting, Matrices, array operations and linear equations, MATLAB programming- M files script, M-file functions, control flow and operations.		

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional (Theory/ Practical)	End Term Examination
Weightage (%)	5	10	15	70

References:

- David Houcque, 2005. Introduction to MATLAB programming for Engineering students., Northwestern University, E- Book **https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf**
- Mark Lutz, 2009. Learning Python. O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.
- Emmanuel Paradis, 2005. R for Beginners. E book. **https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf**
- A Handbook of Statistical Analysis using SPSS by Dr. Brijesh Awasthi, Redshine Publication.

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Bachelor of Technology - Biotechnology

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Curriculum & Scheme of Examination

2023

AMITY UNIVERSITY HARYANA

GURUGRAM

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INTRODUCTION TO COMPUTERS AND PROGRAMMING IN C

Course Code: BTE2104 **Credit Units: 03**

Course Objective:
The objective of this course module is to acquaint the students with the basics of computers system, its components, data representation inside computer and to get them familiar with various important features of procedure oriented programming language i.e. C.

Course Contents:

Module I: Introduction
Introduction to computer, history, von-Neumann architecture, memory system (hierarchy, characteristics and types), H/W concepts (I/O Devices), S/W concepts (System S/W & Application S/W, utilities). Data Representation: Number systems, character representation codes, Binary, octal, hexadecimal and their interconversions. Binary arithmetic, floating point arithmetic, signed and unsigned numbers, Memory storage unit.

Module II: Programming in C
History of C, Introduction of C, Basic structure of C program, Concept of variables, constants and data types in C, Operators and expressions: Introduction, arithmetic, relational, Logical, Assignment, Increment and decrement operator, Conditional, bitwise operators, Expressions, Operator precedence and associativity. Managing Input and output Operation, formatting I/O.

Module III: Fundamental Features in C
C Statements, conditional executing using if, else, nesting of if, switch and break Concepts of loops, example of loops in C using for, while and do-while, continue and break. Storage types (automatic, register etc.), predefined processor, Command Line Argument.

Module IV: Arrays and Functions
One dimensional arrays and example of iterative programs using arrays, 2-D arrays Use in matrix computations.
Concept of Sub-programming, functions Example of user defined functions. Function prototype, Return values and their types, calling function, function argument, function with variable number of argument, recursion.

Module V: Advanced features in C
Pointers, relationship between arrays and pointers Argument passing using pointers, Array of pointers. Passing arrays as arguments.
Strings and C string library.
Structure and Union. Defining C structures, Giving values to members, Array of structure, Nested structure, passing strings as arguments.
File Handling.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
Text:

- "ANSI C" by E Balagurusamy
- Yashwant Kanetkar, "Let us C", BPB Publications, 2nd Edition, 2001.
- Herbert Schildt, "C: The complete reference", Osbourne Mcgraw Hill, 4th Edition, 2002.

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- V. Raja Raman, “Computer Programming in C”, Prentice Hall of India, 1995.

References:

- *Kernighan & Ritchie, “C Programming Language”, The (Ansi C Version), PHI, 2nd Edition.*
- *J. B Dixit, “Fundamentals of Computers and Programming in ‘C’.*
- P.K. Sinha and Priti Sinha, “Computer Fundamentals”, BPB publication.

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ELECTRICAL SCIENCE

Course Code: BTE2106 **Credit Units: 03**

Course Objective:
The objective of the course is to provide a brief knowledge of Electrical Engineering to students of all disciplines. This Course includes some theorems related to electrical, some law's related to flow of current, voltages, basic knowledge of Transformer, basic knowledge of electromagnetism, basic knowledge of electrical network.

Course Contents:

Module I: Basic Electrical Quantities
Basic Electrical definitions-Energy, Power, Charge, Current, Voltage, Electric Field Strength, Magnetic Flux Density, etc., Resistance, Inductance and Capacitance. Ideal Source, Independent Source and Controlled Source

Module II: Network Analysis Techniques & Theorems
Circuit Principles: Ohm's Law, Kirchoff's Current Law, Kirchoff's Voltage Law Network Reduction: Star–Delta Transformation, Source Transformation, Nodal Analysis, Loop analysis. Superposition theorem, Thevenin's Theorem, Norton's theorem and Reciprocity theorem.

Module III: Alternating Current Circuits
Peak, Average and RMS values for alternating currents, Power calculation:
reactive power, active power, Complex power, power factor, impedance, reactance, conductance, susceptance Resonance: series Resonance, parallel resonance, basic definition of Q factor & Band-width.

Module IV: Transformers
Basic Transformer Operation principle, Construction, Voltage relations, current relations, Linear circuit models, open circuit test, short circuit test, Transformer Efficiency.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:
- R.J. Smith, R.C. Dorf: Circuits, devices and Systems
- B.L. Thareja: Electrical Technology: Part -1 & 2
- V. Deltoro: Electrical Engineering fundamentals
- Schaum's Series: Electrical Circuits

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PROGRAMMING IN C LAB

Course Code: BTE2108 **Credit Units: 01**

Software Required: Turbo C

Course Contents:

- C program involving problems like finding the nth value of cosine series, Fibonacci series. Etc.
- C programs including user defined function calls
- C programs involving pointers, and solving various problems with the help of those.
- File handling

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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ELECTRICAL SCIENCE LAB

Course Code: BTE2110 **Credit Units: 01**

List of Experiments:

- To verify KVL & KCL in the given network.
- To verify Superposition Theorem.
- To verify Maximum Power Transfer Theorem.
- To verify Reciprocity Theorem.
- To determine and verify RTh, VTh, RN, IN in a given network.
- To perform open circuit & short circuit test on a single-phase transformer.
- To study transient response of a given RLC Circuit.
- To perform regulation, ratio & polarity test on a single-phase transformer.
- To measure power & power factor in a three phase circuit by two wattmeter method.
- To measure power & power factor in a three phase load using three ammeter& three voltmeter method.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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ENGINEERING CHEMISTRY LAB

Course Code: BTE2113 **Credit Units: 01**

Course Contents:

List of Experiments:(Any 10 Experiments)

1. To determine the ion exchange capacity of a given cation exchanger.
2. To determine the temporary, permanent and total hardness of a sample of water by complexometric titration method.
3. To determine the type and extent of alkalinity of given water sample.
4. To determine the number of water molecules of crystallization in Mohr's salt (ferrous ammonium sulphate) provided standard potassium dichromate solution (0.1N) using diphenylamine as internal indicator.
5. To determine the ferrous content in the supplied sample of iron ore by titrimetric analysis against standard $K_2Cr_2O_7$ solution using potassium ferricyanide $[K_3Fe(CN)_6]$ as external indicator.
6. (a) To determine the surface tension of a given liquid by drop number method.

(b) To determine the composition of a liquid mixture A and B (acetic acid and water) by surface tension method.

7. To prepare and describe a titration curve for phosphoric acid – sodium hydroxide titration using pH-meter.
8. (a) To find the cell constant of conductivity cell.

(b) Determine the strength of hydrochloric acid solution by titrating it against standard sodium hydroxide solution conductometrically

9. Determination of Dissolved oxygen in the given water sample.
10. To determine the total residual chlorine in water.
11. Determination of amount of oxalic acid and H_2SO_4 in 1 L of solution using N/10 NaOH and N/10 $KMnO_4$ solution.
12. Determination of viscosity of given oil by means of Redwood viscometer I.
13. To determine flash point and fire point of an oil by Pensky Martin's Apparatus
14. To determine the Iodine value of the oil.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

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OBJECT ORIENTED PROGRAMMING IN C++

Course Code: BTE2203 **Credit Units: 03**

Course Objective:
The objective of this module is to introduce object oriented programming. To explore and implement the various features of OOP such as inheritance, polymorphism, Exceptional handling using programming language C++. After completing this course student can easily identify the basic difference between the programming approaches like procedural and object oriented.

Course Contents:

Module I: Introduction
Review of C, Difference between C and C++, Procedure Oriented and Object Oriented Approach. Basic Concepts: Objects, classes, Principals like Abstraction, Encapsulation, Inheritance and Polymorphism. Dynamic Binding, Message Passing. Characteristics of Object-Oriented Languages.Introduction to Object-Oriented Modeling techniques (Object, Functional and Dynamic Modeling).

Module II: Classes and Objects
Abstract data types, Object & classes, attributes, methods, C++ class declaration, Local Class and Global Class, State identity and behaviour of an object, Local Object and Global Object, Scope resolution operator, Friend Functions, Inline functions, Constructors and destructors, instantiation of objects, Types of Constructors, Static Class Data, Array of Objects, Constant member functions and Objects, Memory management Operators.

Module III: Inheritance
Inheritance, Types of Inheritance, access modes – public, private & protected, Abstract Classes, Ambiguity resolution using scope resolution operator and Virtual base class, Aggregation, composition vs classification hiérarchies, Overriding inheritance methods, Constructors in derived classes, Nesting of Classes.

Module IV: Polymorphism
Polymorphism, Type of Polymorphism – Compile time and runtime, Function Overloading, Operator Overloading (Unary and Binary) Polymorphism by parameter, Pointer to objects, this pointer, Virtual Functions, pure virtual functions.

Module V: Strings, Files and Exception Handling
Manipulating strings, Streams and files handling, formatted and Unformatted Input output. Exception handling, Generic Programming – function template, class Template Standard Template Library: Standard Template Library, Overview of Standard Template Library, Containers, Algorithms, Iterators, Other STL Elements, The Container Classes, General Theory of Operation, Vectors.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

Text & References:
Text:

- A.R. Venugopal, Rajkumar, T. Ravishanker "Mastering C++", TMH, 1997
- R. Lafore, "Object Oriented Programming using C++", BPB Publications, 2004.
- "Object Oriented Programming with C++" By E. Balagurusamy.
- Schildt Herbert, "C++: The Complete Reference", Wiley DreamTech, 2005.

References:

- Parasons, "Object Oriented Programming with C++", BPB Publication, 1999.

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- Steven C. Lawlor, "The Art of Programming Computer Science with C++", Vikas Publication, 2002.
- Yashwant Kanethkar, "Object Oriented Programming using C++", BPB, 2004

OBJECT ORIENTED PROGRAMMING IN C++ LAB

Course Code: BTE2205 **Credit Units: 01**

Software Required: Turbo C++

Course Contents:

- Creation of objects in programs and solving problems through them.
- Different use of private, public member variables and functions and friend functions.
- Use of constructors and destructors.
- Operator overloading
- Use of inheritance in and accessing objects of different derived classes.
- Polymorphism and virtual functions (using pointers).
- File handling.

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab

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ENGINEERING GRAPHICS LAB

Course Code: BTE2206 **Credit Units: 01**

Course Objective:
This course will provide students concepts on the drawings of different curves like straight line, parabola, ellipse etc. After completion of this course, students will be able to draw different figures manually and will be capable of using various instruments involved in drawings.

Course Contents:

Module I: General
Importance, Significance and scope of engineering drawing, Lettering, Dimensioning, Scales, Sense of proportioning, Different types of projections, Orthographic Projection, B.I.S. Specifications.

Module II: Projections of Point and Lines
Introduction of planes of projection, Reference and auxiliary planes, projections of points and Lines in different quadrants, traces, inclinations, and true lengths of the lines, projections on Auxiliary planes, shortest distance, intersecting and non-intersecting lines.

Module III: Planes other than the Reference Planes
Introduction of other planes (perpendicular and oblique), their traces, inclinations etc., Projections of points and lines lying in the planes, conversion of oblique plane into auxiliary Plane and solution of related problems.

Module IV: Projections of Plane Figures
Different cases of plane figures (of different shapes) making different angles with one or both reference planes and lines lying in the plane figures making different given angles (with one of both reference planes). Obtaining true shape of the plane figure by projection.

Module V: Projection of Solids
Simple cases when solid is placed in different positions, Axis faces and lines lying in the faces of the solid making given angles.

Module VI:Development of Surface
Development of simple objects with and without sectioning. Isometric Projection

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text & References:
- M.B. Shah & B.C. Rana, Engineering Drawing, Pearson Education, 2007
- PS Gill, Engineering Drawing, Kataria Publication
- ND Bhatt, Engineering Drawing, Charotar publications
- N Sidheshwar, Engineering Drawing, Tata McGraw Hill
- CL Tanta, Mechanical Drawing, "Dhanpat Rai"

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LIFE SCIENCES

Course Code: BTE2210 **Credit Units: 03**

Course Objective:
The objective of the course is to provide students an understanding of the very basic molecules of life-DNA,RNA, proteins and how these molecules, when form further complex molecules like carbohydrates, vitamins and lipids, then functioning of body takes place. Since technology is advancing in every field, emphasis is also given on the understanding of application of some biotechnological concepts used in our daily life like biofuels, biofertilizers. An introduction to the origin of earth, the environment-air, water and land, origin of life on Earth, how life evolved from a single cell, some environmental problems and measures to be taken to combat them.

Course Contents:
Module I: Cell Biology
Organization of cell (Inorganic-Water and Ions; Organic-Proteins, Lipids and Carbohydrates constituents) Physical structure of the cell-Brief introduction to the Cell Membrane, Cytoplasm and its Organelles (Nucleus, Mitochondria, Golgi, Endoplasmic Reticulum, Lysosomes, Peroxisomes, Ribosomes, Chloroplasts)**,** Cell cycle.

Module II: Introduction to Cell Physiology
Transport of substances through the cell membrane- Osmosis, Diffusion and its types, Active transport (Sodium-potassium pump) and Passive transport, Membrane potential, Measuring Membrane Potential, Action Potential

Module III: Environmental Biotechnology
Biosensors, Biochips and Biofilms, GMO's and Biofertilizers
Biofuels
Gene Therapy, Stem cell and Nanobiomolecules
Bio Informatics- Introduction and Applications

Module IV: Ecology & Environment
Ecosystem- Structure and functions, Food chain, Food web, Energy flow, Ecological pyramids
Energy sources- Conventional (Coal, Petrol, Natural gas) and Non-conventional (Solar, Wind, Geothermal, Hydro and Biomass)
Pollution- Air, Water, Land, Thermal and Nuclear
Conferences and Protocols- Stockholm, Montreal, Rio-de-Janerio, Kyoto
Environmental issues- Green House Effect, Global Warming and Warning, El-Nino, Acid Rain,
Sustainable Development, Environmental Disasters (Earthquake, Floods, Drought and Cyclones)

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:
- Fundamentals of Environmental Chemistry, G.S.Sodhi, Narosa Publishers.
- Introduction to Environmental Pollution, B.K Sharma, H.Kaur, Goel Publishers.
- Biochemistry Styrier.
- Cell Biology, C B Pawar.
- Biochemistry, Lehninger.

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CELL BIOLOGY & GENETICS

Course Code: BTE2301 **Credit Units: 03**

Course Objective

Cell biology connects different fields of biotechnology by incorporating elements of biology, maths, physics and chemistry. The objective of the course is to understand the structure and function of ellular and sub cellular components of cells and tissues. It also focuses on the understanding of basic principles of genetics, incorporating the concepts of classical, molecular and population genetics. Compilation is required for recent advances in genetic principles for strong foundation in Biotechnology.

Course Contents

Module I

Cell theory, pre-cellular evolution, prokaryotic and eukaryotic cells. Cell cycle: molecular events, cell division, mitosis and meiosis.

Module II

Cellular organelles - structure and function of cell wall, plasma membrane nucleus, Mitochondria, Chloroplast, Nucleus, lysosomes, peroxisomes, golgi bodies, and transport across membranes. Cell locomotion- cytoskeleton, structure and function of cilia and flagella.

Module III

Cellular signaling –general mechanism of signaling and structures of the various types of receptors. Types of cancer, etiology of cancer, metastasis, cytological role of p53 and p21 genes in cancer development. Apoptosis.

Module IV

Genetics: classical and molecular genetics, Mendelian principles of inheritance, human genetics. Extension of Mendelism: Allelic variations, influence of environment on expression, penetrance and expressivity, epistasis, pleiotropy. Chromosomal basis of inheritance; linkage, crossing over and chromosome mapping.

Module V

Mutation and mutagenic agents, types of mutations. Numerical and structural changes in chromosomes with emphasis on human syndromes/plant breeding and genetic counseling. Economic importance of mutation

Module VI

Classical and modern concept of gene, pseudoallelism, position effect, intragenic crossing over & complementation (cistron, recon & nutron) Benzer's work on rII locus in T_2 bacteriophage. Genetics of Population: Hardy- Weinburg Law and its deviations.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

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Text & References:

Text:

- Cell and Molecular Biology, Gerald Karp, John Wiley and Sons Inc.
- Cell and Molecular Biology, DeRobertis, B.I. Publication Pvt. Ltd.
- Genetics, P.K. Gupta, Rastogi Publication
- Concepts of Genetics (Sixth Edition), William S. Klug and Michael R, Cummings, Pearson Education

References:

- Cell in Development and Inheritance, E.B. Wilson, Macmilian
- Developmental Biology, S.F. Gilbert, Sinauer Associates Inc.
- Essential Cell Biology : An Introduction to the Molecular Biology of the Cell, B. Alberts, D. Bray, A. Johnson, J. Lewis, M. Roff, K. Robert, P. Walter and K. Roberts, Garland Publishing Company
- Molecular Cell Biology, H.Lodish, A.Berk, S.L. Zipursky, P. Matsudaura, D. Baltimore and J. Danell, W.H. Preeman and Company.
- Genetics, M.W. Strickberger, Prentice Hall College Division
- Genetics, P.J.Russell, Benjamin/Cummings
- Principles of Genetics, E J Gardner, John Wiley & Sons Inc.
- Genetics, R. Goodenough, International Thomson Publishing
- Introduction to Genetic Analysis, A.J. F. Griffiths, W.H. Freeman and Company
- Principles of Genetics, D.P. Snustad& M.J. Simmons, John Wiley and Sons Inc.
- Molecular Biology of the Gene (Fifth Edition), J.D. Watson, A.M. Weiner and N.H. Hopkins, Addison – Wiesley Publishing

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BIOSTATISTICS

Course Code: BTE2303 **Credit Units: 03**

Course Objective:
The course aims to develop competency and expertise in the application of statistical methods applied to biological data obtained in experimental techniques, methodology and the safe laboratory practice.

Course Contents:

Module I
Statistics and Biostatistics: Preliminary concepts; Measures of Central Tendency: Mean, Median, Mode Measures of Dispersion: Range, Standard deviation, Variance

Module II: Probability
Random Experiments, Trial and Event, Sample Space, Mutually Exclusive or Disjoint Events, Mutually Exhaustive Events, Equally Probable Events, Complementary Event, Classical definition of Probability, Statistical definition of Probability, Axiomatic definition of Probability, Addition theorem, Multiplication theorem, Conditional Probability, Bayes' Theorem. Expectation.

Module III: Continuous Distribution
Normal Distribution, Properties of Normal distribution

Module IV: Correlation
Bivariate distribution Correlation, Types of Correlation, Simple Correlation Coefficient for ungrouped data, Properties and Interpretation of Correlation Coefficient, Coefficient of determination, Scatter diagram, Standard Error, Probable error of Correlation Coefficient. Rank correlation, Some examples.

Module V: Regression
Definition, Regression lines and Regression Coefficients, Properties of Regression Coefficients, Some examples. Method of least square: Fitting of straight line

Module VI: Introduction to the following Statistical terms
Parameter, Statistic, Null hypothesis, Alternative hypothesis, Critical region, Type1 Error, Type 11 Error, Level of significance, P-value and its applications.
Test of Significance for Small samples: One sample t-test, Paired t-test, Degrees of freedom for t-test, F test for equality of Population variances, Degrees of freedom for F-test.
Test of Significance for Large samples: Normal test for sample mean and population mean, Normal test for two sample means.
Chi-square Test: Test of goodness of fit, Test of Independence of attributes, Degrees of freedom for Chisquare test, Coefficient of contingency, Yates' correction for continuity.
Analysis of Variance: One way and Two way (only Examples)

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

- Introduction to Biostatistics, Ronald N. Forthfer and Eun Sun Lee, Publisher: Elsevier.
- Statistical Methodology, S.P. Gupta, Publisher: S. Chand & Co.
- Fundamentals of Statistics, S.C. Gupta. Publisher: S.Chand & Co.

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References:

- Biostatistics: A manual of Statistical Methodology for use in Health, Nutrition and Anthropology, K. Visweswara Rao. Publisher: Jaypee Brothers Biostatistics: A foundation for analysis in the Health Sciences, W.W. Daniel, Publisher: John Wiley and Sons
- Fundamentals of Mathematical Statistics, S.C. Gupta and V.K. Kapoor, Publisher: S.Chand & Co.
- Statistical Analysis, Kaushal, T.L. Publisher: Kalyani Publishers
- Statistical Methods, Potri, D. Kalyani Publishers.
- Mathematical Statistics, H.C. Saxena, and V.K. Kapoor: S. Chand & Company
- Biostatistics, P.N. Arora and P.K. Malhan, Publisher: Himalaya Publishing House.

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DATABASE MANAGEMENT SYSTEM

Course Code: BTE2304 **Credit Units: 02**

Course Objective:
It enables the students to access biological information networks and databases in order to understand the different techniques of biotechnology to build detection systems especially in the prevention and treatment of human diseases.

Course Contents:

Module I: Overview and historical perspective
File systems vs. DBMS, advantages of DBMS

Module II: Describing and storing data in DBMS
Levels of abstraction and data independence; Data models and their comparison; Entity relationship model -concepts, design, keys and features; Relational model -introduction, structure of the relational databases, integrity constraints, Relational algebra and calculus -selection and projection, set operations, renaming, Joins, Division etc.

Module III: SQL and Perl

Module IV: Database design
Functional dependencies, Normal forms; Concurrency control and database discovery -concept of transaction: atomicity, consistency, isolation and durability, transactions and schedules, concurrent execution of transactions, Lock based concurrency control, Database recovery

Module V: Current trends
Distributed databases and multimedia databases;

Module VI: Data warehousing and Data Mining

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:
- Data Mining: Concept and techniques, J. Han and M. Kamber, Morgan Kaufman.
- Database Management, P.C. Desai.

References:
- Introduction to Database Systems, C.J. Date, Addison Wesley Publishing.
- Data Mining, A.K. Pujari, Sangam Books Ltd.
- Principles of Database and Knowledge Based systems, J.D. Ullman, Computer Science Press.
- The Data Warehouse Lifecycle Toolkit, John Wiley and Sons Inc.
- The Data Warehouse Toolkit, R. Kimball et al, John Wiley and Sons Inc.

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CELL BIOLOGY & GENETICS LAB

Course Code: BTE2307 **Credit Units: 02**

Course Contents

Module I
Microscopy: Light microscopy, Bright field, Phase contrast.

Module II
Study of chromoplasts, chloroplast in plant cell; Mitosis and Meiosis

Module III
Study of permanent slides of types of cancer; Study of apoptosis

Module IV
Study of gene interaction; chromosomal translocation in Rhoeo discolor

Module V
Study of bacterial conjugation and bacterial transduction

Module IV
Study of physical and chemical mutagens on growth of *E. coli*; PTC test

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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DATABASE MANAGEMENT SYSTEMS LAB

Course Code: BTE2308 **Credit Units: 01**

Course Contents:

Module I
Database creation using DDL and DML.

Module II
Defining the primary and secondary keys.

Module III
Implementation of selection, projection and joins (internal and external) with SQL and Perl .

Module IV
Normalization of databases with SQL and Perl

Module V
Implementation of transactions and schedules.

Module VI
Detection of association rules and knowledge recovery.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Note: Minor variation could be there depending on the examiner

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INDUSTRIAL BIOTECHNOLOGY

Course Code: BTE2309 **Credit Units: 02**

Course Objective:
The objective of this course is to use microorganism to produce various compounds of commercial interest. The student will be exposed to various techniques available for large scale cultivation of microorganisms.

Course Contents:

Module I
Introduction to fermentation, the fermentation industry, Production process batch and Continuous system of cultivation, Solid-state fermentation

Module II
Selection of industrial microorganisms, media for fermentation, aeration, pH, temperature and other requirements during fermentation, downstream processing and product recovery, food industry waste as fermentation substrate.

Module III
Production of compounds like, antibiotics, enzymes, organic acids, solvents, beverages, SCP.

Module IV
Production of fermented dairy products

Module V
Immobilized enzymes systems, production and applications.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:
- Industrial Microbiology – Cassida

References:
- Principles of fermentation Technology, Salisbury, Whitaker and Hall
- Industrial microbiology – Prescot & Duhn.

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FERMENTATION TECHNOLOGY

Course Code: BTE2310 **Credit Units: 02**

Objective of the course is for the acquaintance of large scale cultivation of microbes for production of industrially important products.

Course Contents

Module I: Fermentation Technology-An Overview
Development and overview of fermentation processes, strain development, media design and optimization, commercial media for fermentation

Module II: Bioproduct Production
Production of Organic acids: citric acid, acetic acid, lactic acid
Production of ethanol
Production of Antibiotics: penicillins, tetracyclins, chloramphenicol
Production of Recombinant products
Production of Industrial enzymes: cellulase, amylase, protease
Production of vitamins: B_{12}, riboflavin, fermented dairy products.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & references:
Text:

- Principles of Fermentation Technology by P.F. Stanbury, A. Whitaker, and S.J. Hall, Aditya Books (P) LTD.
- ***Industrial Microbiology by L.E.Casida, JR. New Age International (P) LTD.***
- ***Biotechnology, A Text book of Industrial Microbiology, W. Crueger and A. Crueger, Sinauer Association.***

References:

- Practical Biochemistry, Principles & Techniques, Keith Wilson and John Walker
- Biochemical Engineering Fundamentals, J.E. Bailey and D.F. Ollis, McGraw-Hill
- Protein Purification, M.R. Ladisch, R.C. Wilson, C.C. Painton and S.E. Builder, American Chemical Society

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DRUG DESIGN AND DEVELOPMENT

Course Code: BTE2311 **Credit Units: 02**

Course Objective:
The above course will be aimed to identify and design drugs that could be potentially useful in the identification of the candidate drugs, which have efficacy in cell culture or animal models, and thus the most effective compounds could be employed based on the above results for being moved through preclinical studies to clinical trials.

Course Contents:

Module I: Drug targets classification
DNA, RNA, post-translational, processing enzymes, metabolic enzymes involved in nucleic acid synthesis, G-protein coupled receptors (monomeric transmembrane proteins), small molecule receptors, neuropeptide receptors, ion channels (monomeric multi-transmembrane) proteins, ligand-gated ion channels (oligomeric transmembrane proteins), transporters (multi-transmembrane proteins).

Module II: Target discovery and validation strategies
Genomics (new target discovery), biological activity directed and other types of screening, natural products, combinatorial chemistry; General overview of validation techniques.

Module III: Structure-based design
Drug design to discovery and development, drug metabolism, toxicity and pharmacokinetics, toxicology considerations, problems and drawbacks on drug discovery and development.
'de novo' design methodologies : indirect drug design, pharmacophore development and receptor mapping, combinatorial libraries and new strategies and recent technologies in drug design.

Module IV: Basic concepts of Drug Delivery
Introductory lecture (1-2), Concepts of Bio availability, Process of drug absorption, Pharmacokinetic processes, Timing for optimal therapy, Drug delivery considerations for the new biotherapeutics
Basic terminologies in drug delivery and drug targeting, Drug release, Drug targeting, Doses forms, Various routes of administration of drugs (just introduction), Strategies for enhanced therapeutic efficacies (Basic principles)

Module V: Delivery of Genetic material
Basic principles of gene expression, Viral and nonviral vectors in gene delivery, Clinical applications of gene therapy and antisense therapy
New generation technologies in Drug delivery and targeting
Nanotechnology / Nanobiotechnology, Use of biosensors and challenge of chronopharmacology, Microchips and controlled drug delivery, genetically engineered cell implants in drug deliver.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

- Drug Delivery and Targeting, A.M. Hillery, A.W. Lloyd and J. Swarbrick, Harwood Academic Publisher
- Pharmaceutical Dosage Forms and Drug Delivery Systems, H.C. Ansel, L.V. allen and N.G. Popovich, Lippincott Williams and Wilkins Publisher

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***References*:**

- Introduction to Biophysical Methods for Protein and Nucleic Acid Research, J.A. Glasel and M.P. Deutscher, Academic Press.
- Principles of Drug Action, W.B. Pratt and P. Taylor, Churchill Livingston.
- Principles of Medicinal Chemistry, W.O. Foye, T.L. Lemke, and D.A. Williams, Williams and Wilkins
- Side Effects and Drug Design, E.J. Lien, Marcel Dekker.
- The Anticancer Drugs, W.B. Pratt, R.W. Ruddon, W.D. Ensminger, and J. Maybaum, Oxford University Press.

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RECOMBINANT DNA TECHNOLOGY

Course Code: BTE2312 **Credit Units: 02**

Course Objective:
A complete understanding of molecular techniques like DNA sequencing, restriction mapping, PCR for the cloning and expression of genes can be obtained through the course.

Course Contents:

Module I
Purification of DNA from bacterial, plant and animal cells, manipulation of purified DNA.

Module II
Introduction of DNA into living cells

Module III
Introduction to gene cloning and its uses, tools and techniques: plasmids and other vectors, DNA, RNA, cDNA.

Module IV
Production of proteins from cloned genes: gene cloning in medicine (Pharmaceutical agents such as insulin, growth hormones, recombinant vaccines), gene therapy for genetic diseases.

Module V
Analysis of DNA by Southern blotting, Analysis of RNA by Northern blotting, Analysis of proteins by Western blot techniques, Dot blots and slot blots, RFLP, AFLP.
PCR: Basic principles and its modification application and uses.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:
- Gene cloning and DNA analysis by T.A. Brown

References:
- Recombinant DNA, J.D. Watson et al, W.H. Freeman and Company
- Principles of Gene Manipulation: An Introduction to Genetic Engineering, R.W. Old and S. B Primrose, Blackwell Science Inc
- Molecular Biotechnology: Principles and Applications of Recombinant DNA, B.R. Grick and J.J. Pasternak, ASM Press
- Molecular Biology of gene by Watson, Baker, Bell, Gann, Levine, Losick
- DNA Science by Micklos Freyer
- Principles of Gene manipulation and Genomics by Primrose and Twyman

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TERM PAPER

Course Code: BTE2331 **Credit Units: 02**

METHODOLOGY

A term (or research) paper is primarily a record of intelligent reading in several sources on a particular subject.

The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned. The evaluation will be done by Board of examiners comprising of the faculties.

GUIDELINES FOR TERM PAPER

The procedure for writing a term paper may consists of the following steps:

1. Choosing a subject
2. Finding sources of materials
3. Collecting the notes
4. Outlining the paper
5. Writing the first draft
6. Editing & preparing the final paper

1. Choosing a Subject

The subject chosen should not be too general.

2. Finding Sources of materials

a) The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.
b) Begin by making a list of subject-headings under which you might expect the subject to be listed.
c) The sources could be books and magazines articles, news stories, periodicals, scientific journals etc.

3. Collecting the notes

Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.

a) Get facts, not just opinions. Compare the facts with author's conclusion.
b) In research studies, notice the methods and procedures, results & conclusions.
c) Check cross references.

4. Outlining the paper

a) Review notes to find main sub-divisions of the subject.
b) Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

5. Writing the first draft

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is. You may follow the following:

a) statement of purpose
b) main body of the paper
c) statement of summary and conclusion

Avoid short, bumpy sentences and long straggling sentences with more than one main ideas.

6. Editing & Preparing the final Paper

a) Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/ details/ analyses of relevance to the question at hand.

Sometimes, the relevance of a particular section may be clear to you but

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not to your readers. To avoid this, ensure you briefly explain the relevance of every section.

b) Read the paper to ensure that the language is not awkward, and that it "flows" properly.
c) Check for proper spelling, phrasing and sentence construction.
d) Check for proper form on footnotes, quotes, and punctuation.
e) Check to see that quotations serve one of the following purposes:
   (i) Show evidence of what an author has said.
   (ii) Avoid misrepresentation through restatement.
   (iii) Save unnecessary writing when ideas have been well expressed by the original author.
f) Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:

1) Title page
2) Table of contents
3) Introduction
4) Review
5) Discussion & Conclusion
6) References
7) Appendix

Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper.

Discussion

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.

Conclusion

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

a) summary of question posed
b) summary of findings
c) summary of main limitations of the study at hand
d) details of possibilities for related future research

References

From the very beginning of a research project, you should be careful to note all details of articles gathered.

The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.

The key to a good bibliography is consistency. Choose a particular convention and stick to this.

Bibliographical conventions

Monographs

Crystal, D. (2001), Language and the internet. Cambridge: Cambridge University Press.

Edited Volumes

Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges to communication in a second language. Berlin/ NY: Mouton de Gruyter.

[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

Edited Articles

Schmidt, R./Shimura, A./Wang, Z./Jeong, H. (1996), Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea. In: Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges to communication in a second language. Berlin/ NY: Mouton de Gruyter: 285-316.

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Journal Articles
McQuarrie, E.F./Mick, D.G. (1992), On resonance: A critical pluralistic inquiry into advertising rhetoric. Journal of consumer research 19, 180-197.

Electronic Book
Chandler, D. (1994), Semiotics for beginners [HTML document]. Retrieved [5.10.'01] from the World Wide Web, http://www.aber.ac.uk/media/Documents/S4B/.

Electronic Journal Articles
Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document]. German as a Foreign Language Journal [online] 1. Retrieved [12.09.'00] from the World Wide Web, http://www.gfl-journal.com/.

Other Websites
Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document]. Retrieved [13.10.'01] from the World Wide Web, http://olaf.hiof.no/~sverrev/eng.html.

Unpublished Papers
Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu.

Unpublished Theses/ Dissertations
Möhl, S. (1996), Alltagssituationen im interkulturellen Vergleich: Realisierung von Kritik und Ablehnung im Deutschen und Englischen. Unpublished MA thesis, University of Hamburg.
Walsh, R. (1995), Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language. Unpublished PhD dissertation, University College Dublin.

Appendix
The appendix should be used for data collected (e.g. questionnaires, transcripts,...) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

Assessment Scheme:

Continuous Evaluation: (Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)	40%
Final Evaluation: (Based on the organization of the paper, objectives/ problem profile/ issue outlining, comprehensiveness of the research, flow of the idea/ ideas, relevance of material used/ presented, outcomes vs. objectives, presentation/ viva etc.)	60%

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PROJECT

Course Code: BTE2332 **Credit Units: 02**

Objectives:
The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Chapter Scheme and distribution of marks:
Chapter 1: Introduction – 10 marks
Chapter 2: Conceptual Framework/ National/International Scenario – 25 marks
Chapter 3: Presentation, Analysis & Findings -- 25 marks
Chapter 4: Conclusion & Recommendations -- 10 marks
Chapter 5: Bibliography -- 05 marks

Project Report	Power Point Presentation & Viva
75 marks	25 marks

Components of a Project Report
The outcome of Project Work is the Project Report. A project report should have the following components:

1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.

2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.

3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.

4) **Body of the Report:** The body of the report should have these four logical divisions
a) ***Introduction:*** This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.
b) ***Conceptual Framework / National and International Scenario*****:** (relating to the topic of the Project).
c***) Presentation of Data, Analysis and Findings*****:** (using the tools and techniques mentioned in the methodology).
d) ***Conclusion and Recommendations:*** In this section, the concluding observations based on the main findings and suggestions are to be provided.

5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.

6) Annexures: Questionnaires (if any), relevant reports, etc.
(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

The Steps of a Project Report

Step I : Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic.
- Relevance of the topic

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- Time available at the disposal.
- Feasibility of data collection within the given time limit.
- Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

Step II : Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.

Step III : Collection of information and data relating to the topic and analysis of the same.

Step IV: Writing the report dividing it into suitable chapters, viz.,
Chapter 1: Introduction,
Chapter 2: Conceptual Framework / National & International Scenario,
Chapter 3: Analysis & Findings
Chapter 4: Conclusion and Recommendations.

Step V: The following documents are to be attached with the Final Project Report.
1) Approval letter from the supervisor (Annexure-IA)
2) Student's declaration (Annexure-IB)
3) Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for Evaluation:

- Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below.
- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bound.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate.

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WORKSHOP / CERTIFICATION

Course Code: BTE2333 **Credit Units: 02**

Objectives

A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two way. The trainer has to make sure that the aspect covered are practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

Major Themes for Workshop

The workshop may be conducted on any of the following major themes:
Accounting
Finance
Human Resources
Marketing
Economics
Operations
Supply Chain Management
These themes are merely indicative and other recent and relevant topics of study may be included.

Guidelines for Workshop

The procedure for earning credits from workshop consists of the following steps:
Relevant study material and references will be provided by the trainer in advance.
The participants are expected to explore the topic in advance and take active part in the discussions held
Attending and Participating in all activities of the workshop
Group Activities have to be undertaken by students as guided by the trainer.
Evaluation of workshop activities would be done through test and quiz at the end of the workshop.
Submitting a write up of at least 500 words about the learning outcome from the workshop.

Methodology

The methodology followed at the workshop could be based on any one or more of the following methods:
Case Study
Business Game
Simulation
Group Activity
Role Play
Business Planning
Quiz

Evaluation Scheme:

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total
10	30	30	30	100

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MICROBIOLOGY

Course Code: BTE2401 **Credit Units: 03**

Course Objective:
The course imparts the knowledge of different types of microorganisms that are invisible to our naked eyes. Discovery origin and evaluation of different forms of bacteria, fungi, protozoa and viruses constitute the basics of biotechnology.

Course Contents:

Module I
Introduction and historical perspective - Discovery of the microbial world, controversy over spontaneous generation, role of microorganisms in transformation of organic matter and in the causation of diseases, development of pure culture methods. Methods in Microbiology -Principles of microbial nutrition, Culture media, Theory and practice of sterilization, pure culture techniques.

Module II
Prokaryotic structure and function - functional anatomy of bacteria: cell envelope, cell wall, cytoplasmic membrane, capsule, surface appendages, cytoplasm and cytoplasmic inclusions. Growth - The definition of growth, mathematical expression of growth, growth curve, measurement of growth, synchronous growth, continuous culture, culture collection and maintenance of cultures.

Module III
Systematics and taxonomy - new approaches to bacterial taxonomy, classification including ribotyping, ribosomal RNA sequencing, characteristics of primary domains, taxonomy, nomenclature and Bergey's manual.

Module IV
Metabolic Diversity among microorganisms - photosynthesis in microorganisms, role of bacteriochlorophylls, carotenoids and phycobilins, Chemolithotrophy, hydrogrn-iron-nitrite-oxidizing bacteria, nitrate and sulphate reduction, methanogenesis and acetogenesis, Fermentations, nitrogen fixation, plant microbe interactions (mycorrhizae).

Module V: Archaea
Archae as earliest life forms, thermophiles, psychrophiles, halophiles, alkalophiles, acidophiles, hyperthermophiles Viruses: Bacterial, animal; structure of viruses; Reproduction and life cycle of RNA and DNA viruses; Viroids and prions. Algae and Fungi: Classification and Reproduction.

Module VI
Host-parasite relationship - Normal micro flora of skin, oral cavity, gastrointestinal tract, Respiratory infections; entry of pathogens into the host, types of toxins (Exo, endo, entro) and their mode of actions, Microbial pathogenesis -Disease reservoirs; Epidemiological terminologies; Infectious disease transmission; Sexually transmitted disease including AIDS, Food and water- borne diseases; pathogenic fungi.

Module VII
Chemotherapy/antibiotics -Antimicrobial agents, sulfa drugs, antibiotics -penicillin and cephalosporins, broad spectrum antibiotics, antifungal antibiotics; mode of action.

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Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

- General Microbiology, R.Y. Stanier, J.L. Ingraham, M.L.Wheelis and P.R. Painter, Macmillian
- Microbiology VI Edition, M.J. Pelczar, E.C.S. Chan and N.R. Kreig, Tata McGraw Hill Microbiology by Prescott
- The microbes – An Introduction to their Nature and Importance, P.V. Vandenmark and B.L. Batzing, Benjamin Cummings.

References:

- The Microbial World, Roger Y. Stanier, Prentice Hall
- Microbiology, Tortora, Funke and Chase, Benzamin & Cummings
- Principles of Fermentation Technology, Salisbury, Whitaker and Hall, Aditya Books Pvt. Ltd.
- Industrial Microbiology, Casida, New Age International
- Industrial Microbiology, Prescott and Dunn, C.B.S. Publishers Principles of Microbiology, R.M. Atlas, WMC. Brown Publisher.

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ENZYMOLOGY AND ENZYME TECHNOLOGY

Course Code: BTE2403 **Credit Units: 03**

Course Objective:
The course aims to provide an understanding of the principles and application of proteins, secondary metabolites and enzyme biochemistry in therapeutic applications and clinical diagnosis. The theoretical understanding of biochemical systems would certainly help to interpret the results of laboratory experiments.

Course Contents:

Module I: Enzymes
Introduction and scope, Nomenclature, Mechanism of Catalysis.

Module II: Enzyme Kinetics
Single substrate steady state kinetics; Michaelis Menten equation, Linear plots, King-Altman's method; Inhibitors and activators; Multisubstrate systems; ping-pong mechanism, Alberty equation, Sigmoidal kinetics and Allosteric enzymes

Module III
Immobilization of Enzymes; Advantages, Carriers, adsorption, covalent coupling, cross-linking and entrapment methods, Micro-environmental effects.

Module IV: Enzyme reactors
Reactors for batch/continuous enzymatic processing, choice of reactor type; idealized enzyme reactor systems, Mass transfer in enzyme reactors: Steady state analysis of mass transfer and biochemical reaction in enzyme reaction.

Module V: Bioprocess Design
Physical parameters, reactor operational stability, Immobilized cells.

Module VI: Challenges and future trends
Enzyme catalysis in organic media; catalytic antibodies and non protein biomolecules as catalysts, biocatalysts from extreme thermophilic and hyper thermophilic Archae and Bacteria.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:
Text:
- Biotechnological Innovations in Chemical Synthesis, R.C.B. Currell, V.D. Mieras, Biotol Partners Staff, Butterworth Heinemann.
- Enzyme Technology, M.F. Chaplin and C. Bucke, Cambridge University Press.
- Enzymes: A Practical Introduction to Structure, Mechanism and Data Analysis, R.A. Copeland, John Wiley and Sons Inc.

References:
- Enzymes Biochemistry, Biotechnology, Clinical Chemistry, Trevor Palner.
- Enzyme Kinetics: Behaviour and Analysis of Rapid Equilibrium and Steady State Enzyme Systems, I.H. Segel, Wiley-Interscience.
- Industrial Enzymes & their applications, H. Uhlig, John Wiley and Sons Inc.

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CHEMICAL ENGINEERING PRINCIPLES

Course Code: BTE2404 **Credit Units: 02**

Course Objective:
The knowledge gained through chemical reaction engineering and material and energy balances will help the students to understand the tools and techniques of biotechnology.

Course Contents:

Module I: Material and Energy Balances
Units and dimensions, Dimensional analysis; Simple problems on material balance calculations involving unit processes and reactive systems; Available electron balances.
Basic energy concepts -enthalpy changes in chemical/biochemical reactions and in non-reactive processes, Energy balance calculations, Use of Steam tables; Heat of reaction and energy balance for microbial processes.

Module II: Chemical reaction engineering
Kinetics of homogenous reactions: Concepts of reaction rate, order of reaction and molecularity, Analysis of batch reactors for kinetic interpretation of data and isothermal reactor design for single and multiple reactions, Design equations for CSTR and plug flow reactors.

Module III: Instrumentation and process control
Principles of measurement: error, accuracy and sensitivity; Measurement of flow, pressure, temperature, level, pH, viscosity and chemical composition.
Basic concepts of feedback control, control loop and its elements, Dynamic behaviour of first, second and higher order physical systems, controller hardware, choice of controllers and settings. Introduction to advanced control systems: feed forward, cascade and ratio control.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:
- Basic Principles and Calculations in Chemical Engineering, D.M. Himmelblau, Prentice Hall
- Basic Principles of Chemical Engineering, E.I. Shaheen, Houghton Mifflin

References:
- Chemical Process Control, An introduction to Theory and Practice, G. Stephanopoulos, Prentice Hall Inc.
- Chemical Reaction Engineering, O. Levenspiel, John Wiley and Sons Inc.
- Elementary Principles of Chemical Processes, R.M. Felder and R.W. Rousseau, John Wiley and Sons Inc.
- Fundamentals of Chemical Reaction Engineering, C.D. Holland and R.G. Anthony, Prentice Hall Inc.
- Process Modelling, Simulation and Control for Chemical Engineers, W.L. Luyben, McGraw Hill

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METHODS AND INSTRUMENTATION IN BIOTECHNOLOGY

Course Code: BTE2405 **Credit Units: 03**

Course Objective:
The students will be exposed to techniques and instruments that are used in biotech industries.

Course Contents:

Module I: Electrophoresis
Gel electrophoresis, SDS-PAGE, isoelectric focusing, two-dimensional electrophoresis, immuno electrophoresis, capillary electrophoresis

Module II: Chromatography
Paper, TLC, gel filtration, ion-exchange chromatography, affinity chromatography, HPLC and GLC

Module III: Spectroscopy
UV and visible spectroscopy, Infrared and Atomic absorption spectroscopy, fluorescence spectroscopy, Mass Spectrometry, MALDITOF, Nuclear Magnetic Resonance and Electron Spin Resonance spectroscopy,

Module IV
X-ray diffraction and X-ray Crystallography

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:
- Principles of Physical Biochemistry, K.E. Van Holde, Prentice Hall.
- Essentials of Biophysics, P. Narayanan, New Age International Publishers

References:
- Advanced Instrumentation, Data Interprtation, and Control of Biotechnological Processes, J.F. Van Impe, Kluwer Academic
- Crystal Structure Analysis, J.P. Glusker and K.N. Trueblood, Oxford University Press
- Crystallography made Crystal Clear, G. Rhodes, Academic Press
- Modern Spectroscopy, J.M. Hollas, John Wiley and Son Ltd.
- NMR Spectroscopy: Basic Principles, Concepts and Applications in Chemistry, H. Gunther, John Wi

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MICROBIOLOGY LAB

Course Code: BTE2406 **Credit Units: 02**

Course Contents:

1. Preparation of solid and liquid media.
2. Isolation and maintenance of organisms by plating, streaking and serial dilution.
3. Preparation of slant cultures.
4. Growth curve measurement of bacterial population by turbidometry.
5. Measurement of bacterial population by dilution method.
6. Effect of temperature, pH, carbon and nitrogen sources on growth of bacteria.
7. Microscopic examination of bacteria by gram staining.
8. Endospore staining.
9. Capsule staining.
10. Isolation and identification of Rhizobium from root nodules.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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ENZYMOLOGY AND ENZYME TECHNOLOGY LAB

Course Code: BTE2408 **Credit Units: 01**

Course Objective:
The laboratory will help the students to isolate enzymes from different sources, enzyme assays and studying their kinetic parameters which have immense importance in industrial processes.

Course Contents:

Module I
Isolation of enzymes from plant and microbial sources.

Module II
Enzyme assay; activity and specific activity – determination of amylase, nitrate reductase, cellulase, protease.

Module III
Purification of Enzyme by ammonium sulphate fractionation.

Module IV
Enzyme Kinetics: Effect of varying substrate concentration on enzyme activity, determination of Michaelis-Menten constant (K_m) and Maximum Velocity ($V_{max.}$) using Lineweaver-Burk plot.

Module V
Effect of Temperature and pH on enzyme activity.

Module VI
Enzyme immobilization

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

Text:

- ***Practical Biochemistry, Sawhney and Singh***

References:

- Practical Biochemistry, Principles & Techniques, Keith Wilson and John Walker

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METHODS AND INSTRUMENTATION IN BIOTECHNOLOGY LAB

Course Code: BTE2409 **Credit Units: 01**

Course Contents:

Module I
Cell disruption techniques

Module II
Centrifugation – low speed and high speed.

Module III
Spectrophotometer techniques

Module IV
Chromatography –Paper Chromatography and Thin Layer Chromatography

Module V
Electrophoresis –SDS Page and Agarose gel electrophoresis.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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MARINE BIOTECHNOLOGY

Course Code: BTE2410 **Credit Units: 02**

Course Objective
The students will be exposed to basic concepts related to marine life. Also the subject deals with the scope and application of marine biota in biotechnology.

Course Contents

Module I
The marine ecosystem and its functioning: intertidal, estuarine, salt marsh, mangrove, coral reef, coastal & deep sea ecosystems. Marine viruses, Bacteria and their significance; Hydrothermal vents; Marine Biodiversity: defining, measurement and conservation strategies.

Module II
Nutrients cycling: carbon, nitrogen sulphur & phosphorus.
Global climate changes: impact on species diversity & productivity, oceans as a carbon sink, effects on corals bleaching. Biological rhythms.

Module III
Important Marine Products: Bioactive compounds from marine organisms, GFP, RFP characteristics and their applications; Green mussel adhesive protein, Chitosan and its applications

Module IV
Probiotic bacteria and their importance in aquaculture; Vaccines in aquaculture: Fish, shrimps & prawns; Marine food analysis-spoilage, quality control; Techniques for identification of bacterial & viral pathogens in aquaculture and Remedies.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- Biodiversity (2004) Borua, P.K
- Text book of Marine Ecology (1989). Nair N.B. & Thampy, D.M.
- Drugs from sea. (2000). Fusetani, N.
- Microbiology of deep sea hydrothermal vents. (1995). Karl, D.M.
- The search from bioactive compounds from microorganisms. (1992). Omum, S.
- Recent Advances in Marine Biotechnology. Vol.2 (1998) Fingerman, M., Nagabushanam, R., Thompson, M.
- Recent Advances in Marine Biotechnology Volume 3 – Milton fingerman et al., 1999.
- Environmental Biotechnology – Gareth M.Evams et al., 2003
- Biotechnology, Recombinant DNA Technology, Environmental Biotechnology – S.Mahesh et al., 2003.

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VACCINE DEVELOPMENT

Course Code: BTE2411 **Credit Units: 02**

Course Objective
The students will be exposed to basic concepts related with development of vaccines.

Course Contents

Module I
History of Vaccine Development
Definition of Vaccine
Evolution of Vaccines

Module II
Process development for vaccines
Manufacturing of vaccines
Various aspects of vaccines, process development and manufacturing

Module III
Clinical development of vaccines
Clinical end-point: Evolution of vaccines
General specifications and pharmaceuticals release criteria for the existing vaccines
Cold chain management of vaccines
Current vaccine research

Examination Scheme:

Components	H/S	A	CT	EE
Weightage (%)	10	5	15	70

Text & Reference
- Vaccines, 4th Edition by Stanley A. Plotkin, Elsevier publication
- Vaccines and Immunotherapy by Stanley J. Cryz Elsevier science publishing co.
- Journal articles and reviews

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AGRICULTURAL BIOTECHNOLOGY

Course code: BTE2412 **Credit Units: 02**

Course Objective:
This course aims to facilitate the students to meet the following learning objectives.
By the end of this course the student should be able to:

- Describe the history of crop development over the centuries by natural processes, human selection and breeding
- Explain the role of mutagenesis-based plant breeding in green revolution, and the consequences of green revolution including its impacts on global health and environment
- Understand and clearly describe the science underlying molecular breeding and marker assisted selection
- Understand and clearly describe the science underlying genetic engineering and GM crops (with focus on Agrobacterium-mediated and particle-bombardment methods
- Be able to enumerate biological risks (health and environmental) of GM crops, and explain the principles & methodologies of risk assessment
- Examine the causes and effects of the public's concerns about GM technology
- Be aware of the regulatory and legal system to test and monitor release and use of GM crops.

Course Contents:
Module-I: History of crop improvement, and pre-genetic engineering plant biotechnology: Traditional breeding; Mutagenesis-based breeding; Role of tissue culture in crop improvement, Molecular breeding and marker assisted selection.

Module-II: Genetic engineering of plants: *Agrobacterium* mediated transformation; Particle bombardment mediated transformation; Limitations of conventional transgenics and solutions offered by gene targeting and gene editing technologies.

Module-III: GM crops and the society: Biological (Environmental and Health) risks of GM; Risk assessment; Concerns and fears about GM technology; Regulatory and Legal system to test and monitor GM crops

Examination Scheme:

Components	H/S	A	CT	EE
Weightage (%)	10	5	15	70

References

- Plant Biotechnology: The Genetic Manipulation of Plants. A. Slater, N. W. Scott and M. R. Fower.2008. Oxford University Press
- Plant Tissue Culture: Theory and Practice. S.S. Bhojwani and M.K.Razdan. Elsevier Health Science
- https://www.isaaa.org/resources/publications/agricultural_biotechnology/download/Agricultural_Biotechnology.pdf
- https://www.isaaa.org/kc/inforesources/publications/biotechinagriculture/Biotech_in_Agriculture.pdf
- https://www.fao.org/3/i1905e/i1905e.pdf

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NATURAL PRODUCTS AND MEDICINAL CHEMISTRY

Course Code: BTE2413 **Credit Units: 02**

Course Objective: The students will be exposed to basic concepts related with natural products and medicinal chemistry and its biological application.

Course Contents:

Natural Products

Module I
Introductory bio-organic chemistry: enzymatic transformations, co-factors, examples from carbohydrate chemistry.

Module II
Isoprenoids, Terpenes and Flavonoids: biosynthetic origins of the group, survey of classes, electron-deficient rearrangements, chemical synthesis, steroids; Alkaloids: shikimate pathway to aromatic amino acids, pyridoxyl phosphate mediated transformations in alkaloid biosynthesis

Medicinal Chemistry

Module III
Drug processing in mammals
The molecular basis of drug action
The multiphore conceptualization of drugs
Messenger and non-messenger target systems

Examination Scheme:

Components	H/S	A	CT	EE
Weightage (%)	10	5	15	70

Text & References:

- G.A. Poulton and C. Spino, "Natural Products Chemistry", available as a Chemistry 433 Course Pack in the Bookstore.
- J. Mann, "Chemical Aspects of Biosynthesis", Oxford Science, 1994, QP517 B57M36 and P.M. Dewick, "Medicinal Natural Products: a Biosynthetic Approach, 1997
- Introduction to Natural Products, 2004 by Albert T. Sneden
- Medicinal Chemistry by Graham Pat

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STEM CELL TECHNOLOGY

Course Code: BTE2414 **Credit Units: 02**

Course Objective: The objective of this paper is to familiarize the students with stem cell technology and its applications for betterment of the society. The course is designed to give a broad view of mammalian stem cells, reviewing where they are found in the body, the different types and how they are cultured. The topics will cover the basic biology of these stem cells as well as bioengineering and application of these stem cells to potential treatments of human diseases.

Course Contents:

Module I
Definition, properties, proliferation, culture of stem cells, medical applications of stem cells, ethical and legal issues in use of stem cells.

Module II
Stem Cell biology and therapy, types embryonic stem cell, Adult stem cell, Stem Cell Biology and Therapy, Embryonic Stem Cells, culture and the potential benefits of stem cell technology

Module III
Gene Therapy: Introduction, History and evolution of Gene therapy, optimal disease targets, Failures and successes with gene therapy and future prospects,Genetic Perspectives for Gene Therapy, **Gene Delivery** methods: Viral vectors and Non-viral Vectors

Module IV
Regulatory and Ethical Considerations of stem cell and Gene Therapy, Assessing Human Stem Cell Safety, Use of Genetically Modified Stem Cells in Experimental Gene Therapies.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:
***Text*:**
- Stem Cell Biology, Daniel Marshak, Richard L. Gardener and David Gottlieb, Cold Spring Harbour Laboratory Press
- Stem cell biology and gene therapy, Booth C., Cell Biology International, Academic Press
- Stem Cell and Gene-Based Therapy: Frontiers in Regenerative Medicine, *Alexander Battler, Jonathan Leo,* Springer,

***References*:**
- Stem Cell Biology and Gene Therapy. Quesenberry PJ, Stein GS, eds. (£65.00.) Wiley, 1998.
- Progress in gene therapy, Volume 2,Pioneering stem cell/gene therapy trials, Roger Bertolotti, Keiya Ozawa and H. Kirk Hammond, VSP international science publishers
- Stem Cells Handbook: Stewart Sell, Humana Press; Totowa NJ, USA; Oct. 2003,
- Understanding Biotechnology by Aluízio Borém, Fabrício R. Santos, David E. Bowen, Prentice Hall

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TERM PAPER

Course Code: BTE2431 **Credit Units: 02**

METHODOLOGY

A term (or research) paper is primarily a record of intelligent reading in several sources on a particular subject.

The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned. The evaluation will be done by Board of examiners comprising of the faculties.

GUIDELINES FOR TERM PAPER

The procedure for writing a term paper may consists of the following steps:

- Choosing a subject
- Finding sources of materials
- Collecting the notes
- Outlining the paper
- Writing the first draft
- Editing & preparing the final paper

1. Choosing a Subject

The subject chosen should not be too general.

2. Finding Sources of materials

d) The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.
e) Begin by making a list of subject-headings under which you might expect the subject to be listed.
f) The sources could be books and magazines articles, news stories, periodicals, scientific journals etc.

3. Collecting the notes

Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.

d) Get facts, not just opinions. Compare the facts with author's conclusion.
e) In research studies, notice the methods and procedures, results & conclusions.
f) Check cross references.

4. Outlining the paper

c) Review notes to find main sub-divisions of the subject.
d) Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

5. Writing the first draft

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is. You may follow the following:

a) statement of purpose
b) main body of the paper
c) statement of summary and conclusion

Avoid short, bumpy sentences and long straggling sentences with more than one main ideas.

6. Editing & Preparing the final Paper

g) Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept

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in mind throughout the paper. Include only information/ details/ analyses of relevance to the question at hand. Sometimes, the relevance of a particular section may be clear to you but not to your readers. To avoid this, ensure you briefly explain the relevance of every section.

h) Read the paper to ensure that the language is not awkward, and that it "flows" properly.
i) Check for proper spelling, phrasing and sentence construction.
j) Check for proper form on footnotes, quotes, and punctuation.
k) Check to see that quotations serve one of the following purposes:
   (iv) Show evidence of what an author has said.
   (v) Avoid misrepresentation through restatement.
   (vi) Save unnecessary writing when ideas have been well expressed by the original author.
l) Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:

- Title page
- Table of contents
- Introduction
- Review
- Discussion & Conclusion
- References
- Appendix

Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper.

Discussion

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.

Conclusion

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

e) summary of question posed
f) summary of findings
g) summary of main limitations of the study at hand
h) details of possibilities for related future research

References

From the very beginning of a research project, you should be careful to note all details of articles gathered.

The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.

The key to a good bibliography is consistency. Choose a particular convention and stick to this.

Bibliographical conventions

Monographs

Crystal, D. (2001), Language and the internet. Cambridge: Cambridge University Press.

Edited Volumes

Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges to communication in a second language. Berlin/ NY: Mouton de Gruyter.

[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

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Edited Articles
Schmidt, R./Shimura, A./Wang, Z./Jeong, H. (1996), Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea. In: Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges to communication in a second language. Berlin/ NY: Mouton de Gruyter: 285-316.

Journal Articles
McQuarrie, E.F./Mick, D.G. (1992), On resonance: A critical pluralistic inquiry into advertising rhetoric. Journal of consumer research 19, 180-197.

Electronic Book
Chandler, D. (1994), Semiotics for beginners [HTML document]. Retrieved [5.10.'01] from the World Wide Web, http://www.aber.ac.uk/media/Documents/S4B/.

Electronic Journal Articles
Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document]. German as a Foreign Language Journal [online] 1. Retrieved [12.09.'00] from the World Wide Web, http://www.gfl-journal.com/.

Other Websites
Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document]. Retrieved [13.10.'01] from the World Wide Web, http://olaf.hiof.no/~sverrev/eng.html.

Unpublished Papers
Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu.

Unpublished Theses/ Dissertations
Möhl, S. (1996), Alltagssituationen im interkulturellen Vergleich: Realisierung von Kritik und Ablehnung im Deutschen und Englischen. Unpublished MA thesis, University of Hamburg.
Walsh, R. (1995), Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language. Unpublished PhD dissertation, University College Dublin.

Appendix
The appendix should be used for data collected (e.g. questionnaires, transcripts,...) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

Assessment Scheme:

Continuous Evaluation: (Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)	40%
Final Evaluation: (Based on the organization of the paper, objectives/ problem profile/ issue outlining, comprehensiveness of the research, flow of the idea/ ideas, relevance of material used/ presented, outcomes vs. objectives, presentation/ viva etc.)	60%

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PROJECT

Course Code: BTE2432 **Credit Units: 02**

Objectives:
The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Chapter Scheme and distribution of marks:
Chapter 1: Introduction – 10 marks
Chapter 2: Conceptual Framework/ National/International Scenario – 25 marks
Chapter 3: Presentation, Analysis & Findings -- 25 marks
Chapter 4: Conclusion & Recommendations -- 10 marks
Chapter 5: Bibliography -- 05 marks

Project Report	Power Point Presentation & Viva
75 marks	25 marks

Components of a Project Report
The outcome of Project Work is the Project Report. A project report should have the following components:

1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.

2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.

3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.

4) **Body of the Report:** The body of the report should have these four logical divisions
a) ***Introduction:*** This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.
b) ***Conceptual Framework / National and International Scenario*****:** (relating to the topic of the Project).
c***) Presentation of Data, Analysis and Findings*****:** (using the tools and techniques mentioned in the methodology).
d) ***Conclusion and Recommendations:*** In this section, the concluding observations based on the main findings and suggestions are to be provided.

5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.

6) Annexures: Questionnaires (if any), relevant reports, etc.
(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

The Steps of a Project Report

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Step I : Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic.
- Relevance of the topic
- Time available at the disposal.
- Feasibility of data collection within the given time limit.
- Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

Step II : Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.

Step III : Collection of information and data relating to the topic and analysis of the same.

Step IV : Writing the report dividing it into suitable chapters, viz.,
Chapter 1:Introduction,
Chapter 2: Conceptual Framework / National & International Scenario,
Chapter 3: Analysis & Findings
Chapter 4: Conclusion and Recommendations.

Step V : The following documents are to be attached with the Final Project Report.
1) Approval letter from the supervisor (Annexure-IA)
2) Student's declaration (Annexure-IB)
3) Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for Evaluation:

- Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below.
- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bound.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate.

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WORKSHOP / CERTIFICATION

Course Code: BTE2433 **Credit Units: 02**

Objectives

A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two way. The trainer has to make sure that the aspect covered are practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

Major Themes for Workshop

The workshop may be conducted on any of the following major themes:
Accounting
Finance
Human Resources
Marketing
Economics
Operations
Supply Chain Management
These themes are merely indicative and other recent and relevant topics of study may be included.

Guidelines for Workshop

The procedure for earning credits from workshop consists of the following steps:
Relevant study material and references will be provided by the trainer in advance.
The participants are expected to explore the topic in advance and take active part in the discussions held
Attending and Participating in all activities of the workshop
Group Activities have to be undertaken by students as guided by the trainer.
Evaluation of workshop activities would be done through test and quiz at the end of the workshop.
Submitting a write up of at least 500 words about the learning outcome from the workshop.

Methodology

The methodology followed at the workshop could be based on any one or more of the following methods:
Case Study
Business Game
Simulation
Group Activity
Role Play
Business Planning
Quiz

Evaluation Scheme:

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total
10	30	30	30	100

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MOLECULAR BIOLOGY

Course Code: BTE2501 **Credit Units: 03**

Course Objective:
The aim is to extend understanding of the molecular mechanisms via which genetic information is stored, expressed and transmitted among generations.

Course Contents:

Module I: DNA Replication and repair
Mechanism of Prokaryotic and Eukaryotic DNA replication, Enzymes and accessory proteins involved in DNA replication, DNA repair Mechanism.

Module II: Transcription
Prokaryotic transcription, Eukaryotic transcription, RNA polymerase, General and specific transcription factors, Regulatory elements.

Module III: Modifications in RNA
5'-cap formation, transcription termination, 3 '-end processing and polyadenylation, Splicing, Editing, Nuclear export of mRNA and mRNA stability.

Module IV: Translation
Prokaryotic and Eukaryotic translation, the translation Machinery; Mechanisms of initiation, elongation and termination, regulation of translation, co-and post-translational modifications of proteins.

Module V: Regulation of Gene Expression in prokaryotic and eukaryotic systems
Lac operon, Ara operan, regulation in Eukaryotes

Module VI: Antisense and Ribozyme technology
Molecular mechanism of antisense molecules, inhibition of spilicing, polyadenylation and translation, disruption of RNA structure and capping, Biochemistry of Ribozyme; Hammerhead, hairpin and other ribozymes, strategies for designing ribozymes, applications of antisense and ribozyme technologies.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:
- Concepts of Genetics, W.S. Klug, and M.R. Cummings 2004, Pearson Education
- Genome, T.A. Brown, John Willey & Sons Inc.
- Molecular Biology of the Cell. B. Alberts, D. Bray, J. Lewis, M. Raff, K. Roberts and J.D. Watson, Garland Publishing
- Gene VIII, Benjamin Lewin 2005, Oxford University Press

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References:

- Molecular Cell Biology, H. Lodish, A.Berk, S. Zipursky, P Matsundaira, D.Baltimore and J.E. Barnell, W.H. Freeman and Company.
- Molecular Cloning: A Laboratory Manual (3-Vilcume set), J. Sambrook, E.F. Fritsch and T. Maniatis, Cold spring Harbor Laboratory Press.
- Molecular Biology of the Gene, J.D. Watson, A.M. Weiner and N.H. Hopkins, Addison-Wesley Publishing.

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BIOINFORMATICS

Course Code: BTE2504 **Credit Units: 03**

Course Objective:
The course involves a basic understanding of computer and bioinformatics tools and skills in the field of biology.

Course Contents:
Module I: Introduction and overview
The NCBI data model; sequence databases, sequence retrieval, sequence file formats, submitting DNA and protein sequences; classification of biological databases

Module II: Biological Databases
Sequence databases (EMBL, GenBank, DDBJ, -UNIPROT, PIR, TrEMBL), Protein family/domain databases (PROSITE, PRINTS, Pfam, BLOCK, etc), Cluster databases-An Introduction, Specialised databases (KEGG, etc), Database technologies (Flat-file), Structural databases (PDB)

Module III: Sequence alignment
Global and local alignments, statistical significance of alignments, scoring matrices and gap penalties, position specific scoring matrices, programs and methods for Pairwise and multiple alignment, pattern searching programs, family and superfamily representation - Pfam, hidden Markov models

Module IV: Phylogenetic prediction
Phylogenetic analysis, Evolutionary Models, Character and distance based Tree building methods; tree evaluation, phylogenetic analysis, parsimony, maximum likelihood trees; Trees-splits and metrices on trees, tree interpretation, Distance – additive, ultrameric and nonadditive distances.

Module V: Predictive methods using DNA and protein sequences
ESTs: construction, databases, clustering, gene discovery and identification, and functional classification. Protein identification tools, physical properties, motifs and patterns, structure, folding classes, structure classification databases – Scop and Cath;

Module VI: Structure databases
Structural databases - PDB and MMDB, structure file formats, Secondary and tertiary structure prediction methods in proteins, Internal and external co-ordinate system, software to visualize secondary and tertiary structural information in protein.

Module VII: Comparative genome analysis
Reconstruction of metabolic pathways; Genome analysis, genome anatomy, genome rearrangements with inversions, signed inversions, gene identification, gene expression, expression analysis, gene identification and functional classification.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

- Computer Science, J.G. Brookshear, Pearson, Addison Wesley
- Introduction to Bioinformation – T.Attawood
- Essentials of Genomics and Bioinformatics, C.W. Sensen, John Wiley and Sons

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- Bioinformatics: Sequence and Genome Analysis, D.W. Mount, Cold Spring Harbor Laboratory Press

References:

- Algorithms on Strings, Trees, and Sequences: Computer Science and Computational Biology, D. Gusfield, Cambridge University Press
- Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins, A.D. Baxevanis and B.F.F Quellette, Wiley – interscience.
- Bioinforamtics: Sequence and Genome Analysis, D.W. Mount, Cold Spring Harbor Laboratory Press.
- Sequence Analysis in Molecular Biology: Treasure Trove or Trivial Pursuit, G. Von Heijne and G. Von Heijne, Academic Press.
- Structural Bioinformatics, Philip E. Bourne, Helge Weissig 2003
- Statistical Methods in Bioinformatics: An Introduction, G.R. Grant, W.J. Ewens, Springer Verlag

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MOLECULAR BIOLOGY LAB

Course Code: BTE2505 **Credit Units: 01**

Course Contents:

Module I
Preparation of DNA: genomic, Plasmid

Module II
Isolation of RNA

Module III
RFLP analysis

Module IV
Gel filtration

Module V
Preparation of Competent Cells

Module VI
Restriction Digestion and Ligation of DNA

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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ANIMAL BIOTECHNOLOGY LAB

Course Code: BTE2506 **CreditUnits: 02**

Course Contents:

1. Preparation, standardization and sterilization of culture media
2. Inoculation of specific tissues for callusing
3. Inoculation and maintenance of cell lines
4. Study of toxicity on cell lines

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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PLANT BIOTECHNOLOGY LAB

Course Code: BTE2507 **Credit Units: 02**

Course Contents:

Module I
Sterilization of glasswares and equipments.
Preparation of cotton plugs and culture media
Preparation of stocks for culture media
Preparation of culture media

Module II
Preparation and sterilization of different explants
Inoculation of explants on culture media

Module III
Study of viability of seeds
Embryo culture

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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BIOINFORMATICS LAB

Course Code: BTE2508 **Credit Units: 01**

List of Experiments/Exercises

1. Basics of sequence analysis Retrieving a sequence-nucleic acid/Protein
2. Local and Global Alignment- concepts Pair wise sequence alignment
3. Multiple sequence alignment
4. DOT Matrix Analysis
5. Analysis Using Scoring Matrices
6. Dynamic Programming – Smith Watermann Algorithm Needleman Wunsch Algorithm
7. Protein identification, physical properties, motifs and patterns, structure, folding classes, structure classification
8. ESTs – databases, clustering, gene discovery and identification, and functional classification.
9. Molecular Structure drawing tool, Molecular modeling/Docking.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Note: Minor variation could be there depending on the examiner.

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SUMMER INTERNSHIP EVALUATION-I

Course Code: BTE2535 **Credit Units: 03**

GUIDELINES FOR PROJECT FILE

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage.

The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

Methodology

The students will be sent to various industries and institutes where they will undergo short term training. After the completion of the training the students will be required to submit project report which shall then be evaluated by two internal examiners. The students will then have to appear for a Viva Voce examination to be conducted by an external evaluator at the end of the semester.

In general, the File should be comprehensive and include

- A short account of the activities that were undertaken as part of the project;
- A statement about the extent to which the project has achieved its stated goals.
- A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;
- Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project;
- Any problems that have arisen that may be useful to document for future reference.

Report Layout

The report should contain the following components:

- **Title or Cover Page**

The title page should contain the following information: Project Title; Student's Name; Course; Year; Supervisor's Name.

- **Acknowledgements** (optional)

Acknowledgment to any advisory or financial assistance received in the course of work may be given.

- **Abstract**

A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project

- **Table of Contents**

Titles and subtitles are to correspond exactly with those in the text.

- **Introduction**

Here a brief introduction to the problem that is central to the project and an outline of the

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structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

- **Materials and Methods**

This section should aim at experimental designs, materials used. Methodology should be mentioned in details including modifications if any.

- **Results and Discussion**

Present results, discuss and compare these with those from other workers, etc. In writing these section, emphasis should be given on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

Note that in writing the various secions, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary never write in "point" form.

- **Conclusion**

A conclusion should be the final section in which the outcome of the work is mentioned briefly.

- **Future prospects**

- **Appendices**

The Appendix contains material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

- **References / Bibliography**

This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Examples

For research article

Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichia coli* O157: H7. *Clin Microbiol Infec*, **8** (suppl 1): 116–117.

For book

Kowalski, M. (1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67

ASSESSMENT OF THE PROJECT FILE

Essentially, marking will be based on the following criteria: the quality of the report, the technical merit of the project and the project execution.

Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project.

Project execution is concerned with assessing how much work has been put in.

The File should fulfill the following ***assessment objectives:***

Range of Research Methods used to obtain information

Execution of Research

Data Analysis

Analyse Quantitative/ Qualitative information

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Control Quality

Draw Conclusions

Examination Scheme:

Project Report	50
Viva Voce	50
Total	**100**

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BIOFUEL AND GREEN TECHNOLOGY

Course Code: BTE2509 **Credit Units: 02**

Course Objective:
This course will acquaint the students with bioenergy resources, their properties, preparation, processing along with the details of equipments utilized for the purpose.

Course Contents:

Module I: Biomass Sources, Characteristics & Preparation: Biomass Sources and Classification
Chemical composition and properties of different biomass materials and bio-fuels – Sugar cane molasses for fermentation ethanol; Sources and processing of oils and fats for liquid fuels- Energy plantations - Preparation of woody biomass; Drying, Storage and Handling of Biomass.

Module II: Biogas Technology
Feedstock for biogas production, biodegradable organic matter, Operating parameters for biogas production, Dry and wet fermentation

Module III: Bio-Ethanol and Bio-Diesel Technology
Production of Fuel Ethanol by Fermentation of Sugars. Trans-esterification of Oils to Produce Bio-Diesel.

Module IV: Pyrolysis and Gasification of Biomass
Thermo-chemical conversion of ligno-cellulose biomass - Pyrolysis of biomass,Thermo-chemical gasification principles

Module V: Combustion of Biomass and Cogeneration Systems
Combustion of Woody Biomass, Cogeneration in Biomass Processing Industries. Use of biogases for cogeneration.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:
***Text*:**
- Biotechnology and Alternative Technologies for Utilization of Biomass or Agricultural Wastes, A. Chakravarthy, Oxford & IBH publishing Co., New Delhi, 1989.

***References*:**
- Biogas Systems: Principles and Applications, K.M. Mital, New Age International Publishers (p) Ltd., 1996.
- Biomass Energy Systems, P. Venkata Ramana and S.N. Srinivas, Tata Energy Research Institute, New Delhi, 1996.
- Fuels from Biomass and Wastes, D.L. Klass and G.M. Emert, Ann Arbor Science publ. Inc. Michigan, 1985.
- Bio-gas Technology, Khandelwal K.C. and Mahdi, Tata McGraw-Hill pub. Co. Ltd., New Delhi
- Advances in bio-gas Technology, O.P. Chawla, I.C.A.R., New Delhi. 1970.

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STEM CELLS AND TISSUE ENGINEERING

Course Code: BTE2510 **Credit Units: 02**

Course Objective:
The course is designed to give a broad view of mammalian stem cells, reviewing where they are found in the body, different types and how they are cultured. The topics will cover the basic biology of these stem cells as well as bioengineering and application of these stem cells to potential treatments of human diseases.

Course Contents:

Module I
Stem Cell biology; types; embryonic stem cell, Adult stem cell and potential benefits of stem cell technology, Bone marrow transplants, Immunotherapy, Autoimmune Diseases and Promise of Stem Cell-Based Therapies, Stem Cells and Diabetes, Stem Cells and heart Repair

Module II
Gene Therapy: Introduction, History and evolution of Gene therapy, optimal disease targets, Failures and successes of gene therapy and future prospects; Gene Therapy and Immune System: Genetic Immunization, Innate and Acquired Immune Response to Gene Therapy

Module III
Gene Delivery methods; Viral vectors: Adenoviral, Adeno-associated virus (AAV), Retroviral, Lentiviral, Herpes Virus; Non-viral Vectors and Physical Methods & Combinatorial methods. Genetic perspectives for Gene Therapy, Gene Therapy for Cancer and Vascular Disorders, Nervous System.

Module IV
Regulatory and Ethical Considerations of Cell and Gene Therapy, Assessing Human Stem Cell Safety, Use of Genetically Modified Stem Cells in Experimental Gene Therapies.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

***Text*:**
- Stem cell biology and gene therapy, Booth C., Cell Biology International, Academic Press
- Stem Cell and Gene-Based Therapy: Frontiers in Regenerative Medicine, *Alexander Battler, Jonathan Leo,* Springer,

***References*:**
- Stem Cell Biology and Gene Therapy. Quesenberry PJ, Stein GS, eds. (£65.00.) Wiley, 1998.
- Progress in gene therapy, Volume 2,Pioneering stem cell/gene therapy trials, Roger Bertolotti, Keiya Ozawa and H. Kirk Hammond, VSP international science publishers
- Stem Cells Handbook: Stewart Sell, Humana Press; Totowa NJ, USA; Oct. 2003,
- Understanding Biotechnology by Aluízio Borém, Fabrício R. Santos, David E. Bowen, Prentice Hall

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- Cell Therapy: Stem Cell Transplantation, Gene Therapy, and Cellular Immunotherapy (Cancer: Clinical Science in Practice) George Morstyn, William Sheridan, Cambridge University Press,

JAVA-I

Course Code: BTE2511 **Credit Units: 02**

Course Objective:
The objective is to introduce students to a modern programming language and help them gain sufficient fluency to undertake research projects with a programming component; to lay the foundations for more advanced study of object-oriented languages
Emphasis is on to understand the basic concepts of programming; to learn the syntax and semantics of Java; to be able to use a program development environment

Course Contents:

Module I
Introduction to Java - Features, Inheritance, Strings, Packages, Interfaces; Multi- Threading, Applet Programming: AWT- Components, Menus, Layout manager, etc., Event Handling,, Java Packages - java.util, -java.io; exception handling,

Module II
Collection API - Arrays, Collection Interfaces, Concrete Collections, The Collections Framework, Legacy Collections

Module III
Swing

Module IV
- JDBC
- Introduction to Client Server Application
- Java Drivers
- java.sql Package
- Installing and setting up JDBC
- Basic JDBC Programming concepts
- Populating a database
- Executing Queries
- Scrollable and Updateable Result Sets

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- Complete reference by Herbert Schildt TataMcGraw Hill
- Programming with java A Primer by Balagurusamy Publisher: TataMcGraw Hill
- Core Java 2 – Volume I – Fundamentals *by Cay S. Horstmann and Gary Cornell* published by Sun Microsystems Press, A Prentice Hall Title
- Thinking in Java – *by Bruce Eckel* published by Prentice Hall Computer Books

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TERM PAPER

Course Code: BTE2531 **Credit Units: 02**

METHODOLOGY

A term (or research) paper is primarily a record of intelligent reading in several sources on a particular subject.

The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned. The evaluation will be done by Board of examiners comprising of the faculties.

GUIDELINES FOR TERM PAPER

The procedure for writing a term paper may consists of the following steps:

- Choosing a subject
- Finding sources of materials
- Collecting the notes
- Outlining the paper
- Writing the first draft
- Editing & preparing the final paper

1. Choosing a Subject

The subject chosen should not be too general.

2. Finding Sources of materials

g) The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.
h) Begin by making a list of subject-headings under which you might expect the subject to be listed.
i) The sources could be books and magazines articles, news stories, periodicals, scientific journals etc.

3. Collecting the notes

Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.

g) Get facts, not just opinions. Compare the facts with author's conclusion.
h) In research studies, notice the methods and procedures, results & conclusions.
i) Check cross references.

4. Outlining the paper

e) Review notes to find main sub-divisions of the subject.
f) Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

5. Writing the first draft

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is. You may follow the following:

a) statement of purpose
b) main body of the paper
c) statement of summary and conclusion

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Avoid short, bumpy sentences and long straggling sentences with more than one main ideas.

6. Editing & Preparing the final Paper

m) Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/ details/ analyses of relevance to the question at hand. Sometimes, the relevance of a particular section may be clear to you but not to your readers. To avoid this, ensure you briefly explain the relevance of every section.
n) Read the paper to ensure that the language is not awkward, and that it "flows" properly.
o) Check for proper spelling, phrasing and sentence construction.
p) Check for proper form on footnotes, quotes, and punctuation.
q) Check to see that quotations serve one of the following purposes:
   (vii) Show evidence of what an author has said.
   (viii) Avoid misrepresentation through restatement.
   (ix) Save unnecessary writing when ideas have been well expressed by the original author.
r) Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:

- Title page
- Table of contents
- Introduction
- Review
- Discussion & Conclusion
- References
- Appendix

Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper.

Discussion

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.

Conclusion

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

i) summary of question posed
j) summary of findings
k) summary of main limitations of the study at hand
l) details of possibilities for related future research

References

From the very beginning of a research project, you should be careful to note all details of articles gathered.

The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.

The key to a good bibliography is consistency. Choose a particular convention and stick to this.

Bibliographical conventions

Monographs

Crystal, D. (2001), Language and the internet. Cambridge: Cambridge University Press.

Edited Volumes

Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges to communication in a second language. Berlin/ NY: Mouton de Gruyter.

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[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

Edited Articles
Schmidt, R./Shimura, A./Wang, Z./Jeong, H. (1996), Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea. In: Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges to communication in a second language. Berlin/ NY: Mouton de Gruyter: 285-316.

Journal Articles
McQuarrie, E.F./Mick, D.G. (1992), On resonance: A critical pluralistic inquiry into advertising rhetoric. Journal of consumer research 19, 180-197.

Electronic Book
Chandler, D. (1994), Semiotics for beginners [HTML document]. Retrieved [5.10.'01] from the World Wide Web, http://www.aber.ac.uk/media/Documents/S4B/.

Electronic Journal Articles
Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document]. German as a Foreign Language Journal [online] 1. Retrieved [12.09.'00] from the World Wide Web, http://www.gfl-journal.com/.

Other Websites
Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document]. Retrieved [13.10.'01] from the World Wide Web, http://olaf.hiof.no/~sverrev/eng.html.

Unpublished Papers
Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu.

Unpublished Theses/ Dissertations
Möhl, S. (1996), Alltagssituationen im interkulturellen Vergleich: Realisierung von Kritik und Ablehnung im Deutschen und Englischen. Unpublished MA thesis, University of Hamburg.
Walsh, R. (1995), Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language. Unpublished PhD dissertation, University College Dublin.

Appendix
The appendix should be used for data collected (e.g. questionnaires, transcripts,...) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

Assessment Scheme:

Continuous Evaluation: (Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)	40%
Final Evaluation: (Based on the organization of the paper, objectives/ problem profile/ issue outlining, comprehensiveness of the research, flow of the idea/ ideas, relevance of material used/ presented, outcomes vs. objectives, presentation/ viva etc.)	60%

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PROJECT

Course Code: BTE2532 **Credit Units: 02**

Objectives:
The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Chapter Scheme and distribution of marks:
Chapter 1: Introduction – 10 marks
Chapter 2: Conceptual Framework/ National/International Scenario – 25 marks
Chapter 3: Presentation, Analysis & Findings -- 25 marks
Chapter 4: Conclusion & Recommendations -- 10 marks
Chapter 5: Bibliography -- 05 marks

Project Report	Power Point Presentation & Viva
75 marks	25 marks

Components of a Project Report
The outcome of Project Work is the Project Report. A project report should have the following components:

1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.

2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.

3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.

4) **Body of the Report:** The body of the report should have these four logical divisions
a) ***Introduction:*** This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.
b) ***Conceptual Framework / National and International Scenario*****:** (relating to the topic of the Project).
c***) Presentation of Data, Analysis and Findings*****:** (using the tools and techniques mentioned in the methodology).
d) ***Conclusion and Recommendations:*** In this section, the concluding observations based on the main findings and suggestions are to be provided.

5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.

6) Annexures: Questionnaires (if any), relevant reports, etc.

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(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

The Steps of a Project Report

Step I : Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic.
- Relevance of the topic
- Time available at the disposal.
- Feasibility of data collection within the given time limit.
- Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

Step II : Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.

Step III : Collection of information and data relating to the topic and analysis of the same.

Step IV : Writing the report dividing it into suitable chapters, viz.,
Chapter 1:Introduction,
Chapter 2: Conceptual Framework / National & International Scenario,
Chapter 3: Analysis & Findings
Chapter 4: Conclusion and Recommendations.

Step V : The following documents are to be attached with the Final Project Report.
1) Approval letter from the supervisor (Annexure-IA)
2) Student's declaration (Annexure-IB)
3) Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for Evaluation:

- Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below.
- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bound.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate.

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WORKSHOP / CERTIFICATION

Course Code: BTE2533 **Credit Units: 02**

Objectives

A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two way. The trainer has to make sure that the aspect covered are practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

Major Themes for Workshop

The workshop may be conducted on any of the following major themes:
Accounting
Finance
Human Resources
Marketing
Economics
Operations
Supply Chain Management
These themes are merely indicative and other recent and relevant topics of study may be included.

Guidelines for Workshop

The procedure for earning credits from workshop consists of the following steps:
Relevant study material and references will be provided by the trainer in advance.
The participants are expected to explore the topic in advance and take active part in the discussions held
Attending and Participating in all activities of the workshop
Group Activities have to be undertaken by students as guided by the trainer.
Evaluation of workshop activities would be done through test and quiz at the end of the workshop.
Submitting a write up of at least 500 words about the learning outcome from the workshop.

Methodology

The methodology followed at the workshop could be based on any one or more of the following methods:
Case Study
Business Game
Simulation
Group Activity
Role Play
Business Planning
Quiz

Evaluation Scheme:

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total

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10	**30**	**30**	**30**	**100**

RECOMBINANT DNA TECHNOLOGY

Course Code: BTE2601 **Credit Units: 03**

Course Objective:
A complete understanding of molecular techniques can be obtained through the course. The successful application of biotechnology largely depends on these advanced molecular techniques.

Course Contents:
Module I: Enzymes used in RDT
Restriction endonuclease, methyltransferase, ligase, polymerase, kinase, phosphatase, nuclease, transferase, reverse transcriptase.

Module II: Cloning vectors
Plasmids, bacteriophages (Lambda and M13), phagemids, cosmids, artificial chromosomes (YAC, BAC). expression vectors (Bacteria and yeast), vector engineering (fusion tags, antibiotic markers), codon optimization, host engineering

Module III: Blotting techniques and hybridization
Southern, Northern and Western blotting techniques. Radioactive and non-radioactive probes.

Module IV: Nucleic acid amplification and its applications
Principles of PCR, designing of primers

Module V: Cloning Techniques
Basic cloning experiment: Design of cloning strategy and stepwise experimental procedure, Complementation, colony and plaque hybridization, restriction, PCR, plus-minus screening, immunoscreening.

Module VI: DNA Libraries
Purpose of constructing DNA libraries. Construction of cDNA and genomic libraries.

Module VII: Sequencing of DNA
DNA sequencing (Maxam Gilbert, Sanger's and automated), protein engineering.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:
Text:

- Principles of Gene Manipulation: An Introduction to Genetic Engineering, R.W. Old and S. B Primrose, Blackwell Science Inc.

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- Recombinant DNA, J.D. Watson et al, W.H. Freeman and Company.

References:

- Molecular Biotechnology: Principles and Applications of Recombinant DNA, B.R. Grick and J.J. Pasternak, ASM Press.
- Molecular and Cellular Cells Methods in Biology and Medicine, P.B Kaufman, W. Wu, D. Kim and C.J. Cseke, CRC Press.
- Milestones in Biotechnology: Classic Papers on Genetic Engineering, J.A. Bavies and W.S. Reznikoff, Butterworth Heinemann.
- Gene Expression Technology, D.V. Goeddel in Methods in Methods in Enzymology, Academic Press Inc.
- DNA Cloning: A Practical Approach, D.M. Glover and B.D. Hames, IRL Press.
- Molecular Cloning: A Laboratory Manual, J. Sambrook, E.F. Fritsch and T. Maniatis, Cold Spring Harbor Laboratory Press.

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BIOPROCESS TECHNOLOGY

Course Code: BTE2602 **Credit Units: 03**

Course Objective:
The objective of the course is to apply the principles of biochemical engineering in large scale cultivation of microorganism for production of important products.

Course Contents:

Module I
Advantage of bioprocess over chemical process. Basic principle in bioprocess technology. Media formulation, Cell culture techniques; Inoculum development and aseptic transfers. Different types of pumps, valves, and line materials, piping conventions etc. used in Biochemical Process

Module II
Process technology for the production of primary metabolites, eg. biomass, ethanol, acetone-butanol, citric acid, amino acids, polysaccharides and plastics.

Ethanol: production by batch, continuous and cell recycle adopted by various technologies practiced in Indian distilleries using molasses and grains. Computation of fermentation efficiency, distillation efficiency and overall efficiency of ethanol production, recovery, uses, glucose effect etc. Power alcohol – definition, uses, merits and demerits of various technologies for its production.

Amino Acid: Genetic Control of metabolic pathway.
Lysine: Indirect and direct fermentation – mechanism of ph of metabolic block in accumulation of L-lysine by inhibition and repression mechanism.

Biomass: Bakers and distillers yeast production using various raw materials, "bios" factors for growth, Crabtree effect, harvesting, different forms and uses.
What are mushroom, different forms of common mushroom production from agro based raw materials and uses. Biofertilizers, biocompost and biopesticides

Module III
Production of secondary metabolites – penicillin, cephalosporins, streptomycin, tetracycline etc. Metabolites from plant and animal cell culture
Penicillin: Classification, various penicillin as precursor and 'R' – side chain, penicillinase, 6-APA, penicillin production, harvest and recovery, uses of various forms etc.
Streptomycin: chemical structure, production, harvest and recovery, use by-product of streptomycin fermentation etc.
Tetracycline: chemical structure, production, harvest and recovery, use by-product of tetracycline fermentation etc.

Module IV
Microbial production of industrial enzymes – glucose isomerase, penicillin acylase, cellulase, amylase, lipase, protease etc.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE

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Weightage (%)	15	5	10	70

Text & References:

- Biochemical Engineering- Kinetics, Mass Transport, Reactors and Gene Expression, W F Weith, John Wiley and Sons Inc
- Biochemical Engineering, S Aiba, A E Humphery and N F Millis, University of Tokyo Press
- Bioprocess Engineering Basic Concepts, M.L. Shuler and F. Kargi, Prentice Hall
- Bioprocess Engineering, B.K. Lydersen, K.L. Nelson, B.K. Lyderson and N. D'Elia, John Wiley and Sons Inc.
- Bioprocess Engineering Principles, P Doran, Academic Press
- Biotechnology. A Textbook of Industrial Microbiology, W. Crueger and a. Crueger, Sinauer Associates.
- Principles of Fermentation Technology, P.F. Stanbury and A. Whitaker, Pergamon Press
- Process Engineering in Biotechnolgy, A T Jackson, Prentice Hall

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IMMUNOLOGY AND IMMUNOTECHNOLOGY

Course Code: BTE2603 **Credit Units: 03**

Course Objective:
Role of antibody engineering in biomedical applications and the importance of immuno genetics in disease processes, tissue transplantation and immune regulation are some of the areas of attributes of this course which can help the students to understand the biotechnology related to human kind.

Course Contents:

Module I: Introduction
Phylogeny of Immune System, Innate and acquired immunity, clonal nature of Immune Response.
Organization and structure of lymphoid organs Nature and Biology of antigens and super antigens Antibody structure and function; Types of immunity- innate, acquired, active and passive.

Module II: Major Histocompatibilty
MHC, BCR and TCR, generation of antibody diversity, Complement system

Module III: Cells of the immune system
Hematopoiesis and differentiation, lymphocyte trafficking, B-Lymphocytes, T -Lymphocytes, macrophages, dendritic cells, natural killer, lymphokines and lymphokine activated killer cells, eosinophils, neutrophils and mast cells

Module IV: Regulation of immune response
Antigen processing and presentation, activation of B and T lymphocytes, cytokines and their role in immune regulation, T cell regulation and MHC restriction, immunological tolerance

Module V: Cell mediated toxicity
Mechanism of T cell and NK cell mediated lysis and macrophage mediated cytotoxicity.

Module VI: Hypersensitivity

Module VII: Autoimmunity

Module VIII: Tumor immunology, Immunity to infectious agents

Module IX: Transplantation Immunology

Module X: Synthetic vaccines
Vaccines: General consideration, ideotype network hypothesis, Synthetic vaccines

Module XI: Hnmunological Techniques
Immuno diffusion, immuno-electrophoresis, ELISA, RIA, fluorescence activated cell sorter

Module XII: Hybridoma technology and its applications
Fusion of myeloma cells with lymphocytes

Examination Scheme:

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Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

- Basic Immunology, A.K. Abbas and A.H. Lichtman, Saunders W.B. Company
- Basic Immunology, A.K. Abbas and A.H. Lichtman, Saunders W.B. Company

References:

- Fundamentals of Immunology, W. Paul, Lippincott Williams and Wilkins
- Immunology, W.L. Anderson, Fence Creek Publishing (Blackwell).
- Immunology: A Short Course, E. Benjamin, R. Coico and G. Sunshine, Wiley-Leiss Inc.
- Immunology, Roitt, Mosby – Yearbook Inc.
- Kuby Immunology, R.A. Goldsby, T.J. Kindt, and B.A. Osborne, Free

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FUNDAMENTALS OF BIOCHEMICAL ENGINEERING

Course Code: BTE2604 **Credit Units: 02**

Course Objective:
The course material on the kinetics of microbial growth, substrate utilization and product formation etc. may help the students to understand the various principles involved in instrumentation and control of bioprocess.

Course Contents:

Module I
Kinetics of microbial growth, substrate utilization and product formation.

Module II
Sterilization of air and medium.

Module III
Batch, continuous, cell recycle and fed batch reactors; mass and energy balance in microbial processes, Bioreactor design, Different types of bioreactors, their parts and functions. Different types of valves.

Module IV
Mass transfer in Biological reactions; Scale-up principles; Instrumentation and control of bioprocesses.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:
- Biochemical Engineering- Kinetics, Mass Transport, Reactors and Gene Expression, W F Weith, John Wiley and Sons Inc
- Biochemical Engineering, S Aiba, A E Humphery and N F Millis, University of Tokyo Press
- Biochemical Engineering Fundamentals, J E Baily and D F Oillis, McGraw Hill
- Bioprocess Engineering Principles, P Doran, Academic Press

References:
- Chemical Engineering, J M Coulson, and J F Richardson, Butterwirth Heinemann
- Fermentation and Biochemical Engineering Handbook: Principles, Process Design, and Equipment, HC Vogel, CL Todaro, CC Todaro, Noyes Data Corporation/Noyes Publications
- Process Engineering in Biotechnology, A T Jackson, Prentice Hall

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RECOMBINANT DNA TECHNOLOGY LAB

Course Code: BTE2605 **Credit Units: 02**

Course Objective:
The laboratory experiments in Recombinant DNA Technology would certainly help to comprehend the theoretical aspects of the subject.

Course Contents:

Module I
Study of cloning (GFP CLONING)

Module II
Study of PCR

Module III
Study of Southern hybridiosation

Module IV
Study of RAPD

Module V
Site directed mutagenesis

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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BIOPROCESS TECHNOLOGY LAB

Course Code: BTE2606 **Credit Units: 02**

Course Contents:

Module I
Isolation of industrially important micro organisms for microbial processes.

Module II
Determination of Thermal Death Point and Thermal death time of micro organisms for design of a sterilizer

Module III
Determination of growth curve of a supplied micro organism and also determine substrate degradation profile and to compute specific growth rate and growth yield from the data obtained.

Module IV
Comparative studies of ethanol production using different substrates.

Module V
Production of single cell protein

Module VI
Production and estimation of alkaline protease

Module VII
Sauer Krant fermentation

Module VIII
Use of alginate for cell immobilization

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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IMMUNOLOGY AND IMMUNOTECHNOLOGY LAB

Course Code: BTE2607 **Credit Units: 01**

Course Contents:

Module I
Blood film preparation and identification of cells.

Module II
Identification of blood group.

Module III
Isolation of serum.

Module IV
Lymphoid organs and their microscopic organization.

Module V
WIDAL Test

Module VI
Radial Immuno Diffusion Test

Module VII
Ouchterlony Double diffusion Test

Module VIII: Elisa
DOT, SANDWICH

Module IX
Purification of lgG through affinity chromatography

Module X
Immunohistochemistry

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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PHARMACEUTICAL BIOTECHNOLOGY

Course Code: BTE2608 **Credit Units: 02**

Course Objective:
The main objectives are to cover representative pharmaceutical dosage forms, and general issues of formulation, production, quality requirements, validation and uses and to gain an understanding of the challenges associated with quality pharmaceutical manufacturing

Course Contents:

Module I
Introduction to Physical Pharmaceutics - Metrology and Calculations,

Module II
Molecular structure, properties and States of Matter, Solutions, Phase Equilibra, Micromeritic and Powder Rheology, Surface and Interfacial Phenomena, Dispersion Systems, Diffusion & Dissolution, Kinetics and
drug stability, Viscosity & Rheology

Module III
Polymer Science and Applications, Formulations and Development, Packaging

Module IV
Introduction to Industrial Processing, Transport Phenomena (Fluid Flow, Heat Transfer and Mass Transfer)

Module V
Particulate Technology (Particle Size, Size reduction, Size Separation, Powder Flow and Compaction), Unit Operations (Mixing, Evaporation, Filtration, Centrifugation, Extraction, Distillation, and Drying)

Module VI
Materials of Pharmaceutical Plant Construction, Good Manufacturing Practice (GMP's) Guidelines

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:
- Bentley's Pharmaceutics by E A Rawlins
- Pharmaceutical Sciences by Remington

References:
- Physical Pharmacy by Alfred Martin.
- Cooper and Gunn's Tutorial Pharmacy

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JAVA-II

Course Code: BTE2611 **Credit Units: 02**

Course Objective

The objective is to introduce students to a serverside programming language and help them gain sufficient fluency to undertake research projects with a programming component; to lay the foundations for study of web technologies and different tools used for the same.

Emphasis is on to understand the basic concepts of web programming; to learn the syntax and semantics of Servlet and JSP; to be able to use a server side program development environment

Course Contents

Module I

HTML and JavaScript, Creating and processing HTML forms

Module II

Java Servlets
Introduction to Server Side Application Development
Basics of Servlet Programming
Web Container
Session Tracking
Servlet Context

Module III: JSP

Advantage of JSP technology (Comparision with ASP / Servlet)
JSP Architecture, JSP Access Model
JSP Syntax Basic (Directions, Declarations, Expression, Scriplets, Comments)
JSP Implicit Object, Object Scope
Synchronization Issue
Exception Handling
Session Management

Module IV: Java Network Programming

Connecting to a server
Implementing Servers in Java
URL Connections
Reading and Posting data
Security and the Network
Java Beans

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- Complete reference by Herbert Schildt TataMcGraw Hill
- Professional Java XML Programming with Servlets and JSP by Alexander Nakhimovsky and Tom Myers published by Wrox Press Ltd.
- More Servlets and Java Server Pages by Marty Hall published by Sun Microsystems Press, A Prentice Hall Title.
- Special Edition – Using Java Server Pages and Servlets by Mark Wutka published by Que

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TERM PAPER

Course Code: BTE2631 **Credit Units: 02**

METHODOLOGY

A term (or research) paper is primarily a record of intelligent reading in several sources on a particular subject.

The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned. The evaluation will be done by Board of examiners comprising of the faculties.

GUIDELINES FOR TERM PAPER

The procedure for writing a term paper may consists of the following steps:

- Choosing a subject
- Finding sources of materials
- Collecting the notes
- Outlining the paper
- Writing the first draft
- Editing & preparing the final paper

1. Choosing a Subject

The subject chosen should not be too general.

2. Finding Sources of materials

j) The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.

k) Begin by making a list of subject-headings under which you might expect the subject to be listed.

l) The sources could be books and magazines articles, news stories, periodicals, scientific journals etc.

3. Collecting the notes

Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.

j) Get facts, not just opinions. Compare the facts with author's conclusion.

k) In research studies, notice the methods and procedures, results & conclusions.

l) Check cross references.

4. Outlining the paper

g) Review notes to find main sub-divisions of the subject.

h) Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

5. Writing the first draft

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is. You may follow the following:

a) statement of purpose

b) main body of the paper

c) statement of summary and conclusion

Avoid short, bumpy sentences and long straggling sentences with more than one main ideas.

6. Editing & Preparing the final Paper

s) Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/ details/ analyses of relevance to the question at hand.

Sometimes, the relevance of a particular section may be clear to you but

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not to your readers. To avoid this, ensure you briefly explain the relevance of every section.

t) Read the paper to ensure that the language is not awkward, and that it "flows" properly.
u) Check for proper spelling, phrasing and sentence construction.
v) Check for proper form on footnotes, quotes, and punctuation.
w) Check to see that quotations serve one of the following purposes:
   (x) Show evidence of what an author has said.
   (xi) Avoid misrepresentation through restatement.
   (xii) Save unnecessary writing when ideas have been well expressed by the original author.
x) Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:

- Title page
- Table of contents
- Introduction
- Review
- Discussion & Conclusion
- References
- Appendix

Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper.

Discussion

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.

Conclusion

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

m) summary of question posed
n) summary of findings
o) summary of main limitations of the study at hand
p) details of possibilities for related future research

References

From the very beginning of a research project, you should be careful to note all details of articles gathered.

The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.

The key to a good bibliography is consistency. Choose a particular convention and stick to this.

Bibliographical conventions

Monographs

Crystal, D. (2001), Language and the internet. Cambridge: Cambridge University Press.

Edited Volumes

Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges to communication in a second language. Berlin/ NY: Mouton de Gruyter.

[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

Edited Articles

Schmidt, R./Shimura, A./Wang, Z./Jeong, H. (1996), Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea. In: Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges to communication in a second language. Berlin/ NY: Mouton de Gruyter: 285-316.

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Journal Articles
McQuarrie, E.F./Mick, D.G. (1992), On resonance: A critical pluralistic inquiry into advertising rhetoric. Journal of consumer research 19, 180-197.

Electronic Book
Chandler, D. (1994), Semiotics for beginners [HTML document]. Retrieved [5.10.'01] from the World Wide Web, http://www.aber.ac.uk/media/Documents/S4B/.

Electronic Journal Articles
Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document]. German as a Foreign Language Journal [online] 1. Retrieved [12.09.'00] from the World Wide Web, http://www.gfl-journal.com/.

Other Websites
Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document]. Retrieved [13.10.'01] from the World Wide Web, http://olaf.hiof.no/~sverrev/eng.html.

Unpublished Papers
Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu.

Unpublished Theses/ Dissertations
Möhl, S. (1996), Alltagssituationen im interkulturellen Vergleich: Realisierung von Kritik und Ablehnung im Deutschen und Englischen. Unpublished MA thesis, University of Hamburg.
Walsh, R. (1995), Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language. Unpublished PhD dissertation, University College Dublin.

Appendix
The appendix should be used for data collected (e.g. questionnaires, transcripts,...) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

Assessment Scheme:

Continuous Evaluation: (Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)	40%
Final Evaluation: (Based on the organization of the paper, objectives/ problem profile/ issue outlining, comprehensiveness of the research, flow of the idea/ ideas, relevance of material used/ presented, outcomes vs. objectives, presentation/ viva etc.)	60%

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PROJECT

Course Code: BTE2632 **Credit Units: 02**

Objectives:
The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Chapter Scheme and distribution of marks:
Chapter 1: Introduction – 10 marks
Chapter 2: Conceptual Framework/ National/International Scenario – 25 marks
Chapter 3: Presentation, Analysis & Findings -- 25 marks
Chapter 4: Conclusion & Recommendations -- 10 marks
Chapter 5: Bibliography -- 05 marks

Project Report	Power Point Presentation & Viva
75 marks	25 marks

Components of a Project Report
The outcome of Project Work is the Project Report. A project report should have the following components:

1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.

2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.

3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.

4) **Body of the Report:** The body of the report should have these four logical divisions
a) ***Introduction:*** This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.
b) ***Conceptual Framework / National and International Scenario*****:** (relating to the topic of the Project).
c***) Presentation of Data, Analysis and Findings*****:** (using the tools and techniques mentioned in the methodology).
d) ***Conclusion and Recommendations:*** In this section, the concluding observations based on the main findings and suggestions are to be provided.

5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.

6) Annexures: Questionnaires (if any), relevant reports, etc.
(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

The Steps of a Project Report

Step I : Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic.
- Relevance of the topic

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- Time available at the disposal.
- Feasibility of data collection within the given time limit.
- Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

Step II : Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.

Step III : Collection of information and data relating to the topic and analysis of the same.

Step IV : Writing the report dividing it into suitable chapters, viz.,
Chapter 1:Introduction,
Chapter 2: Conceptual Framework / National & International Scenario,
Chapter 3: Analysis & Findings
Chapter 4: Conclusion and Recommendations.

Step V : The following documents are to be attached with the Final Project Report.
1) Approval letter from the supervisor (Annexure-IA)
2) Student's declaration (Annexure-IB)
3) Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for Evaluation:

- Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below.
- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bound.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate.

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WORKSHOP / CERTIFICATION

Course Code: BTE2633 **Credit Units: 02**

Objectives

A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two way. The trainer has to make sure that the aspect covered are practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

Major Themes for Workshop

The workshop may be conducted on any of the following major themes:
Accounting
Finance
Human Resources
Marketing
Economics
Operations
Supply Chain Management
These themes are merely indicative and other recent and relevant topics of study may be included.

Guidelines for Workshop

The procedure for earning credits from workshop consists of the following steps:
Relevant study material and references will be provided by the trainer in advance.
The participants are expected to explore the topic in advance and take active part in the discussions held
Attending and Participating in all activities of the workshop
Group Activities have to be undertaken by students as guided by the trainer.
Evaluation of workshop activities would be done through test and quiz at the end of the workshop.
Submitting a write up of at least 500 words about the learning outcome from the workshop.

Methodology

The methodology followed at the workshop could be based on any one or more of the following methods:
Case Study
Business Game
Simulation
Group Activity
Role Play
Business Planning
Quiz

Evaluation Scheme:

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total
10	30	30	30	100

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GENOMICS AND PROTEOMICS

Course Code: BTE2701 **Credit Units: 03**

Course Objective:
The course helps in developing a detailed understanding of eukaryotic genome complexity and organization. Current research on the molecular basis of the control of gene expression in eukaryotic system has developed a detailed understanding of techniques of gene diagnostics and DNA profile to acquire the fundamentals of genomics and Proteomics.

Course Contents:

Module I: Genome Evolution
Origin of genomes, Acquisition of new genes, Noncoding DNA and Genome Evolution, Human Genome Project., Forward genetics (Phenotype to gene structure) and Reverse genetics (Gene structure to phenotype). DNA sequencing – chemical and enzymatic methods

Module II: Structural Genomics
Structural Genomics: Study of 3D- Structure of Protein
Protein Structure, Basics of High Throughput Determination of Protein Structure, Protein Structure Initiative Project, Computational Protein Structure Modeling, Protein Structure and Function.

Module III: Comparative Genomics
Phylogeny, COGS [Cluster of orthologues genes], Introduction to System Biology, Metabolic Reconstruction, The Basic Principles and Methodology. Gene Identification Methods.

Module IV: Functional Genomics
cDNA Microarrays, Oligonucleotide Microarray Chips, Application of Microarrays with examples, Microarray Data Analysis; Real Time PCR.

Module V: Genotyping Background and Applications of Genomics
Genetic and physical mapping, Introduction to molecular markers, DNA fingerprinting, Single nucleotide polymorphisms, RNA interference, antisense RNA, siRNA, MiRNA.

PROTEOMICS

Module VI: Fundamentals of Proteomics
Introduction to Proteomics, 2D Gel Electrophoresis
Protein Identification and Analysis:

a. Protein preparation and Separation
b. Protein Identification by mass spectrometry and its applications.
c. Identification of post translation modification
d. Current concepts of peptide sequencing with MS-MS methods, MALDI-TOF mass spectrometry and nanospray MS

Protein Expression Mapping, Unstructured Proteins.
High-throughput cloning of ORFs, Chromatography
Protein- Protein Interaction Mapping. Its application in health and disease.
Protein Chip/Array. Experimental design and its application. Application of Microarray in proteome analysis.

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Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

- Bioinformatics: A practical guide to the analysis of genes and proteins, A.D. Baxevanis and B.F.F. Ouellette, John Wiley and Sons Inc.
- Bioinformatics: From Genomes to Drugs, T. Lengauer, John Wiley and Sons Inc.
- Bioinformatics: Sequence and Genome Analysis, D.W. Mount, Cold Spring Harbor Laboratory Press
- DNA Microarrays: A Practical Approach, M. Schlena, Oxford University Press.
- Genomes II, T.A. Brown
- Biotechnology and Genomics by P.K.Gupta

References:

- A Primer of Genome Science, Greg Gibson and Spencer V. Muse
- Database Annotation in Molecular Biology : Principles and Practice, Arthur M. Lesk
- DNA : Structure and Function, Richard R. Sinden
- Recombinant DNA (Second Edition), James D. Watson and Mark Zoller
- Gene Cloning and DNA Analysis – An introduction (Fourth Edition), T.A. Brown
- Genes & Genomes, Maxine Singer and Paul Berg
- Essential of Genomics and Bioinformatics, C.W. Sensen, John Wiley and Sons Inc.
- Functional Genomics – A Practical Approach, S.P. Hunt and R. Livesey, Oxford University Press
- Proteomics, T. Palzkill, Kluwer Academic Publishers
- Statistical Genomics: Linkage, Mapping and QTL Analysis, B. Liu, CRC Press.
- Genome II by T.A.Brown

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IPR, BIOSAFETY & BIOETHICS

Course Code: BTE2702 **Credit Units: 02**

Course Objective

The aim of this course is to develop the understanding of relevance, business Impact and protection of Intellectual Property along with the types of Intellectual Property Rights: Patents, Trademarks, Copyrights, Industrial Designs, Geographical Indications and International Conventions, Biosafety and Bioethics

Course Contents

Module I: Basic Principles and Acquisition of Intellectual Property Rights

Basic Principles of Patent Law, Patent Application procedure, Drafting of a Patent Specification, Understanding Copyright Law, Basic Principles of Trade Mark and Design Rights, International Background of Intellectual Property

Module II: Ownership and Enforcement of Intellectual Property Rights

Patents-Objectives, Rights, Assignments, Defences in case of Infringement. Copyright-Objectives, Rights, Transfer of Copyright, work of employment Infringement, Defences for infringement. Trademarks-Objectives, Rights, Protection of goodwill, Infringement, Passing off, Defences. Designs-Objectives, Rights, Assignments, Infringements, Defences of Design Infringement, Enforcement of Intellectual Property Rights - Civil Remedies, Criminal Remedies, Border Security measures, Practical Aspects of Licensing - Benefits, Determinative factors, important clauses, licensing clauses.

Module III: Information Technology Related Intellectual Property Rights

Computer Software and Intellectual Property-Objective, Copyright Protection, Reproducing, Defences, Patent Protection, Database and Data Protection-Objective, Need for Protection, UK Data Protection Act, 1998, US Safe Harbor Principle, Enforcement. Protection of Semi-conductor Chips-Objectives Justification of protection, Criteria, Subject-matter of Protection, WIPO Treaty, Trips, SCPA. Domain Name Protection-Objectives, domain name and Intellectual Property, Registration of domain names, disputes under Intellectual Property Rights, Jurisdictional Issues, International Perspective.

Module IV: Biotechnology and Intellectual Property Rights

Biotechnology and the Law- Objective, Evolution, Basic Structure of Gene Techniques, Applications, Commercial Potential of Biotech Inventions, Rationale for Intellectual Property Protection. Patenting Biotechnology Inventions-Objective, Concept of Novelty, Concept of inventive step, Microorganisms, Moral Issues in Patenting Biotechnological inventions. Plant Varieties Protection-Objectives, Justification, International Position, Plant Varieties Protection in India Protection of Geographical Indications Objectives, Justification, International Position, Multilateral Treaties, National Level, Indian Position.

Module V

Protection of Traditional Knowledge- Objective, Concept of Traditional Knowledge, Holders, Issues concerning, Bio-Prospecting and Bio-Piracy, Alternative ways, Protectability, need for a Sui-Generis regime, Traditional Knowledge on the International Arena, at WTO, at National level, Traditional Knowledge Digital Library.

Module VI

Biosafety and Bioethics Management-Key to environmentally responsible use of biotechnology. Cartagena Protocol on Biosafety, Ethical implications of Biotechnological products and techniques.

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Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text

- Intellectual Property Rights by Birgitte Anderson, Edward Elgar Publishing
- Intellectual Property Rights and the Life Science Industries by Graham Dutfield, Ashgate Publishing

References

- WIPO Intellectual Property Handbook
- Intellectual Property by William Rodelph Cornish, David Clewelyn
- Globalising Intellectual Property Rights by Duncan Matthews
- Journals and Current magazines

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RESEARCH METHODOLOGY AND REPORT WRITING

Course Code: BTE2703 **Credit Units: 02**

Course Objective

To develop understanding of information and library science research issues in the domain of bioinformatics through review of journal articles, invited talks, and critical group discussions of methods. The main objectives for this course are to develop: familiarity with information and library science-oriented problems in the biomedical sciences, an understanding of research methods in the biomedical domain, critical thinking and evaluation skills and presentation and summarization skills.

Course Contents

Module I

Introduction: Science, Scientific Field and Biological research. Role of a researcher in different stages of a project, Routes to research funding (academic and commercial)

Module II

Research – Definition – Importance and Meaning of research – Characteristics of research – Types of Research – Steps in research – Identification, Selection and formulation of research problem – Research questions – Research design – Formulation of Hypothesis – Review of Literature.

Module III: Sampling techniques

Sampling theory – types of sampling – Steps in sampling – Sampling and Non-sampling error – Sample size – Advantages and limitations of sampling. Collection of Data: Primary Data – Meaning – Data Collection methods – Secondary data – Meaning - Relevance's, Limitations and cautions. Statistics in Research.

Module IV

Type of Articles (review, letters etc). Scientific paper format (Abstract, Introduction, Materials and Methods, Results, Discussion). Writing, evaluating, presenting and publishing the results of scientific research in the academic press (journals, conferences etc). Choosing the appropriate journal (Sources, Information, Instructions to authors, peer review system, journal evaluation)

Module V

Case studies of areas of current research. Formulating a research plan and its presentation

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

***Text*:**

- Statistical Methods By S.P. Gupta

***References*:**

- Research Methodology Methods and Techniques by C.R. Kothari
- Statistics(Theory and Practice) by B.N. Gupta
- Research Methodology Methods and statistical Techniques by Santosh Gupta
- Scientific journals and magazines

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GENOMICS AND PROTEOMICS LAB

Course Code: BTE2704 **Credit Units: 02**

Course Contents:

Module I
Three dimensional Structures – In silico study – large molecular complexes RNA polymerase II, ribosome, unstructured proteins

Module II
DNA sequencing methods

Module III
Gene finding tools and Genome annotation

Module IV
Comparison of two given genomes

Module V
Analysis of 2D – IEF data

Module VI
Microarray and Microarray data analysis

Module VII
Inference of protein function from structure

Module VIII
Inference of protein function and structure

Module IX
Two-hybrid methods

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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SUMMER INTERNSHIP EVALUATION-II

Course Code: BTE2735 **Credit Units: 03**

GUIDELINES FOR PROJECT FILE

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage.

The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

Methodology

The students will be sent to various industries and institutes where they will undergo short term training. After the completion of the training the students will be required to submit project report which shall then be evaluated by two internal examiners. The students will then have to appear for a Viva Voce examination to be conducted by an external evaluator at the end of the semester.

In general, the File should be comprehensive and include

- A short account of the activities that were undertaken as part of the project;
- A statement about the extent to which the project has achieved its stated goals.
- A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;
- Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project;
- Any problems that have arisen that may be useful to document for future reference.

Report Layout

The report should contain the following components:

- **Title or Cover Page**

The title page should contain the following information: Project Title; Student's Name; Course; Year; Supervisor's Name.

- **Acknowledgements** (optional)

Acknowledgment to any advisory or financial assistance received in the course of work may be given.

- **Abstract**

A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project

- **Table of Contents**

Titles and subtitles are to correspond exactly with those in the text.

- **Introduction**

Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

- **Materials and Methods**

This section should aim at experimental designs, materials used. Methodology should be mentioned in details including modifications if any.

- **Results and Discussion**

Present results, discuss and compare these with those from other workers, etc. In writing these section, emphasis should be given on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

Note that in writing the various secions, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary never write in "point" form.

- **Conclusion**

A conclusion should be the final section in which the outcome of the work is mentioned briefly.

- **Future prospects**

- **Appendices**

The Appendix contains material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

- **References / Bibliography**

This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Examples

For research article

Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichia coli* O157: H7. *Clin Microbiol Infec*, **8** (suppl 1): 116–117.

For book

Kowalski, M. (1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67

ASSESSMENT OF THE PROJECT FILE

Essentially, marking will be based on the following criteria: the quality of the report, the technical merit of the project and the project execution.

Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project.

Project execution is concerned with assessing how much work has been put in.

The File should fulfill the following ***assessment objectives:***

Range of Research Methods used to obtain information

Execution of Research

Data Analysis
Analyse Quantitative/ Qualitative information
Control Quality

Draw Conclusions

Examination Scheme:

Project Report	50
Viva Voce	50
Total	**100**

MOLECULAR MEDICINE AND DIAGNOSIS

Course Code: BTE2706 **Credit Units: 02**

Course Contents:

Module I
Human Health and Diseases

Module II
Human Diseases – morbidity, mortality, impact on social development

Module III
Mechanism of disease development, Genetic susceptibility, Identification of targets for diagnosis and therapy: Acquired diseases, cardiovascular diseases, Neurological diseases, Hematology, Cancer

Module IV
Epidemiology of disorders

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- Diagnostic and Therapeutic Antibodies (Methods in Molecular Medicine by Andrew J.T. George (Editor), Catherine E. Urch (Editor) Publisher: Humana Press; edition (August 15, 2000) ISBN-10: 0896037983
- Molecular Diagnosis of Infectious Diseases (Methods in Molecular Medicine) by Jochen Decker, U. Reischl Amazon Sales Rank: #287831 in Books
- Human Molecular Genetics by T. Strachan, Andrew Read Amazon Sales Rank
- Principles of Biostatistics by Marcello Pagano , Kimberlee Gauvreau
- Essentials of Epidemiology in Public Health, Second Edition by Ann Aschengrau, George R., III Seage
- Designing Clinical Research: An Epidemiologic Approach, by Stephen B. Hulley, Steven R. Cummings
- Journal articles and reviews

.

APPLICATIONS OF PLANT BIOTECHNOLOGY

Course Code: BTE2707 **Credit Units: 02**

Course Content:

Module I
Homozygous Plant Production through Ovule, Anther & Pollen Culture, Embryo Rescue & Embryo Culture, Endosperm Culture & Production of Seedless Plants, Apomixis & Experimental Polyembryony

Module II
AFLP – Variety Identification & Fingerprinting; Molecular Farming; Marker Assisted Technology; Use of Bioreactors in Plant Production & Scale-up; Basic Aspects of Application-case studies; Metabolic Engineering

Module III
Biotic & Abiotic Stress
Secondary Metabolites
Edible Vaccines and PHBV
Diagnostic Kits & Virus Indexing

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- Experiments in Plant Tissue Culture, J.H. Dodds and L.K. Roberts, Cambridge University Press
- Plant Biotechnology and Transgenic Plants, K.M.O. Caldenty, W.H. Barz and H.L. Wills, Marcel Dekker
- Plant Biotechnology, J. Hammond, P.McGarvy and V. Yusibov, Springer Verlag.
- Plant Cell & Tissue Culture for the Production of Food Ingredients, T-J Fu, G. Singh and W.R. Curtis, Kluwer Adacemic/Plenum Press
- Plant Tissue Culture: Theory & Practice, S.S. Bhojwani and M.K. Razdan, Elsevier Health Sciences
- Biotechnology: Theory and techniques of Plant Biotechnology, Animal cell culture and Immunobiotechnology vols 1 and 2 by Jack K Chirikjian
- Plant Biotechnology and its applications in Plant tissue cultureby Ashwani Kumar and Shikha Roy
- Plant Biotechnology: The Genetic Manipulation of Plants. A. Slater, N. W. Scott and M. R. Fower. 2008. Oxford University Press
- Recent Advances in Plant Biotechnology: Ara Kirakosyan and Peter B. Kaufan. 2009. Springer

BIO-ENERGY ENGINEERING

Course Code: BTE2708 **Credit Units: 02**

Course Objective:
The goal is to introduce students to biotechnology and tools that enable engineers and process scientists to connect innovations in industrial microorganisms and bioprocess unit operations to the engineering fundamentals, fundamentals of systems biology, and biological tools for design, modeling and evaluation of manufacturing facilities for the production of biofuels, bioproducts and biotherapeutics using a case study approach combined with computer modeling.

Course Contents:

Module I: Biomass Sources, Characteristics & Preparation
Biomass Sources and Classification. – Chemical composition and properties of different biomass materials and bio-fuels – Sugar cane molasses and other sources for fermentation ethanol-Sources and processing of oils and fats for liquid fuels- Energy plantations
-Preparation of woody biomass: Size reduction, Briquetting of loose biomass, Drying, Storage and Handling of Biomass.

Module II: Biogas, Technology
Feedstock for biogas production, Aqueous wastes containing biodegradable organic matter, animal residues-. Microbial and biochemical aspects- Operating parameters for biogas production Kinetics and mechanism - Dry and wet fermentation. Digesters for rural application-High rate digesters for industrial waste water treatment.

Module III: Bio-Ethanol and Bio-Diesel Technology
Production of Fuel Ethanol by Fermentation of Sugars. Gasohol as a Substitute for Leaded Petrol. - Trans-Esterification of Oils to Produce Bio-Diesel.

Module IV: Pyrolysis and Gasification of Biomass
Thermo-chemical conversion of ligno-cellulose biomass – Biomass processing for liquid fuel production - Pyrolysis of biomass-Pyrolysis regime, effect of particle size, temperature, and products obtained.
Thermo-chemical gasification principles: Effect of pressure, temperature and of introducing steam and oxygen. Design and operation of Fixed and Fluidized Bed Gasifiers.

Module V: Combustion of Biomass and Cogeneration Systems
Combustion of Woody Biomass: Theory, Calculations and Design of Equipments. Cogeneration in Biomass Processing Industries. Case Studies: Combustion of Rice Husk, Use of Bagasse for Cogeneration.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

- Fuels from Biomass and Wastes by D.L. Klass and G.M. Emert, Ann Arbor Science pub. Inc. Michigan,
- Biotechnology and Alternative Technologies for Utilization of Biomass or Agricultural Wastes by A. Chakraverthy, Oxford & IBH publishing Co., New Delhi,

References:

- Biogas Systems: Principles and Applications by K.M. Mital, New Age International Publishers (p) Ltd.,
- Biomass Energy Systems, by P. Venkata Ramana and S.N. Srinivas, Tata Energy Research Institute, New Delhi, 1996.
- Bio-gas Technology by Khandelwal K.C. and Mahdi, Tata McGraw-Hill pub. Co. Ltd., New Delhi
- Advances in bio-gas Technology by O.P. Chawla, I.C.A.R., New Delhi. 1970.

TERM PAPER

Course Code: BTE2731 **Credit Units: 02**

METHODOLOGY

A term (or research) paper is primarily a record of intelligent reading in several sources on a particular subject.

The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned. The evaluation will be done by Board of examiners comprising of the faculties.

GUIDELINES FOR TERM PAPER

The procedure for writing a term paper may consists of the following steps:

- Choosing a subject
- Finding sources of materials
- Collecting the notes
- Outlining the paper
- Writing the first draft
- Editing & preparing the final paper

1. Choosing a Subject

The subject chosen should not be too general.

2. Finding Sources of materials

m) The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.
n) Begin by making a list of subject-headings under which you might expect the subject to be listed.
o) The sources could be books and magazines articles, news stories, periodicals, scientific journals etc.

3. Collecting the notes

Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.

m) Get facts, not just opinions. Compare the facts with author's conclusion.
n) In research studies, notice the methods and procedures, results & conclusions.
o) Check cross references.

4. Outlining the paper

i) Review notes to find main sub-divisions of the subject.
j) Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

5. Writing the first draft

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is. You may follow the following:

a) statement of purpose
b) main body of the paper
c) statement of summary and conclusion

Avoid short, bumpy sentences and long straggling sentences with more than one main ideas.

6. Editing & Preparing the final Paper

y) Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/ details/ analyses of relevance to the question at hand. Sometimes, the relevance of a particular section may be clear to you but not to your readers. To avoid this, ensure you briefly explain the relevance of every section.
z) Read the paper to ensure that the language is not awkward, and that it "flows" properly.
aa) Check for proper spelling, phrasing and sentence construction.
bb) Check for proper form on footnotes, quotes, and punctuation.
cc) Check to see that quotations serve one of the following purposes:
    (xiii) Show evidence of what an author has said.
    (xiv) Avoid misrepresentation through restatement.
    (xv) Save unnecessary writing when ideas have been well expressed by the original author.
dd) Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:

- Title page
- Table of contents
- Introduction
- Review
- Discussion & Conclusion
- References
- Appendix

Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper.

Discussion

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.

Conclusion

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

q) summary of question posed
r) summary of findings
s) summary of main limitations of the study at hand
t) details of possibilities for related future research

References

From the very beginning of a research project, you should be careful to note all details of articles gathered.
The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.
The key to a good bibliography is consistency. Choose a particular convention and stick to this.

Bibliographical conventions
Monographs
Crystal, D. (2001), Language and the internet. Cambridge: Cambridge University Press.

Edited Volumes
Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges to communication in a second language. Berlin/ NY: Mouton de Gruyter.
[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

Edited Articles
Schmidt, R./Shimura, A./Wang, Z./Jeong, H. (1996), Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea. In: Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges to communication in a second language. Berlin/ NY: Mouton de Gruyter: 285-316.

Journal Articles
McQuarrie, E.F./Mick, D.G. (1992), On resonance: A critical pluralistic inquiry into advertising rhetoric. Journal of consumer research 19, 180-197.

Electronic Book
Chandler, D. (1994), Semiotics for beginners [HTML document]. Retrieved [5.10.'01] from the World Wide Web, http://www.aber.ac.uk/media/Documents/S4B/.

Electronic Journal Articles
Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document]. German as a Foreign Language Journal [online] 1. Retrieved [12.09.'00] from the World Wide Web, http://www.gfl-journal.com/.

Other Websites
Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document]. Retrieved [13.10.'01] from the World Wide Web, http://olaf.hiof.no/~sverrev/eng.html.

Unpublished Papers
Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu.

Unpublished Theses/ Dissertations
Möhl, S. (1996), Alltagssituationen im interkulturellen Vergleich: Realisierung von Kritik und Ablehnung im Deutschen und Englischen. Unpublished MA thesis, University of Hamburg.
Walsh, R. (1995), Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language. Unpublished PhD dissertation, University College Dublin.

Appendix
The appendix should be used for data collected (e.g. questionnaires, transcripts,...) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

Assessment Scheme:

Continuous Evaluation: (Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)	40%
Final Evaluation: (Based on the organization of the paper, objectives/ problem profile/ issue outlining, comprehensiveness of the research, flow of the idea/ ideas, relevance of material used/ presented, outcomes vs. objectives, presentation/ viva etc.)	60%

PROJECT

Course Code: BTE2732 **Credit Units: 02**

Objectives:
The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Chapter Scheme and distribution of marks:
Chapter 1: Introduction – 10 marks
Chapter 2: Conceptual Framework/ National/International Scenario – 25 marks
Chapter 3: Presentation, Analysis & Findings -- 25 marks
Chapter 4: Conclusion & Recommendations -- 10 marks
Chapter 5: Bibliography -- 05 marks

Project Report	Power Point Presentation & Viva
75 marks	25 marks

Components of a Project Report
The outcome of Project Work is the Project Report. A project report should have the following components:

1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.

2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.

3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.

4) **Body of the Report:** The body of the report should have these four logical divisions
a) ***Introduction:*** This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.
b) ***Conceptual Framework / National and International Scenario*****:** (relating to the topic of the Project).
c***) Presentation of Data, Analysis and Findings*****:** (using the tools and techniques mentioned in the methodology).
d) ***Conclusion and Recommendations:*** In this section, the concluding observations based on the main findings and suggestions are to be provided.

5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.

6) Annexures: Questionnaires (if any), relevant reports, etc.
(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

The Steps of a Project Report

Step I : Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic.
- Relevance of the topic
- Time available at the disposal.
- Feasibility of data collection within the given time limit.
- Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

Step II : Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.

Step III : Collection of information and data relating to the topic and analysis of the same.

Step IV: Writing the report dividing it into suitable chapters, viz.,

Chapter 1: Introduction,
Chapter 2: Conceptual Framework / National & International Scenario,
Chapter 3: Analysis & Findings
Chapter 4: Conclusion and Recommendations.

Step V: The following documents are to be attached with the Final Project Report.

1) Approval letter from the supervisor (Annexure-IA)
2) Student's declaration (Annexure-IB)
3) Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for Evaluation:

- Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below.
- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bound.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate.

WORKSHOP / CERTIFICATION

Course Code: BTE2733 **Credit Units: 02**

Objectives

A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two way. The trainer has to make sure that the aspect covered are practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

Major Themes for Workshop

The workshop may be conducted on any of the following major themes:
Accounting
Finance
Human Resources
Marketing
Economics
Operations
Supply Chain Management
These themes are merely indicative and other recent and relevant topics of study may be included.

Guidelines for Workshop

The procedure for earning credits from workshop consists of the following steps:
Relevant study material and references will be provided by the trainer in advance.
The participants are expected to explore the topic in advance and take active part in the discussions held
Attending and Participating in all activities of the workshop
Group Activities have to be undertaken by students as guided by the trainer.
Evaluation of workshop activities would be done through test and quiz at the end of the workshop.
Submitting a write up of at least 500 words about the learning outcome from the workshop.

Methodology

The methodology followed at the workshop could be based on any one or more of the following methods:
Case Study
Business Game
Simulation
Group Activity
Role Play
Business Planning
Quiz

Evaluation Scheme:

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total
10	30	30	30	100

PROJECT/ DISSERTATION

Course Code: BTE2837 **Credit Units: 17**

Course Objective:
The students are expected to utilize their scheduled periods by undertaking the project that would be completed during the semester

Every student shall undertake a major Project. The major Project shall be undertaken in some biotechnology industry or laboratory of repute. Each student shall be assigned to a faculty who shall continuously monitor the progress of the Project in the concerned laboratory or industry. The faculty, in consultation with the concerned scientist of the industry/laboratory, shall decide the topic of the project. At the conclusion of the project the student shall submit a seminar and a dissertation. The dissertation shall be evaluated by the internal faculty/examiner. The student then shall have to appear for the viva voce examination.

GUIDELINES FOR PROJECT FILE
Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage.

The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

In general, the File should be comprehensive and include
- A short account of the activities that were undertaken as part of the project;
- A statement about the extent to which the project has achieved its stated goals.
- A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;
- Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project;
- Any problems that have arisen that may be useful to document for future reference.

Report Layout
The report should contain the following components:

- **Title or Cover Page**

The title page should contain the following information: Project Title; Student's Name; Course; Year; Supervisor's Name.

- **Acknowledgements** (optional)

Acknowledgment to any advisory or financial assistance received in the course of work may be given.

- **Abstract**

A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project

- **Table of Contents**

Titles and subtitles are to correspond exactly with those in the text.

- **Introduction**

Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

- **Materials and Methods**

This section should aim at experimental designs, materials used. Methodology should be mentioned in details including modifications if any.

- **Results and Discussion**

Present results, discuss and compare these with those from other workers, etc. In writing these section, emphasis should be given on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

- Note that in writing the various secions, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary never write in "point" form.

- **Conclusion**

A conclusion should be the final section in which the outcome of the work is mentioned briefly.

- **Future prospects**

- **Appendices**

The Appendix contains material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

- **References / Bibliography**

This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Examples

For research article

Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichia coli* O157: H7. *Clin Microbiol Infect*, 8 (suppl 1): 116–117.

For book

Kowalski, M.(1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67

ASSESSMENT OF THE PROJECT FILE

Essentially, marking will be based on the following criteria: the quality of the report, the technical merit of the project and the project execution.

Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project.

Project execution is concerned with assessing how much work has been put in.

The File should fulfill the following ***assessment objectives:***

Range of Research Methods used to obtain information

Execution of Research

Data Analysis

Analyse Quantitative/ Qualitative information

Control Quality

Draw Conclusions

Examination Scheme:

Dissertation:	100
Viva Voce:	100
Total:	**200**

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Curriculum & Scheme of Examination

2023

AMITY UNIVERSITY HARYANA

GURUGRAM

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MICROBIOLOGY LAB

Course Code: BTH4109 **Credit Units: 02**

Course Objectives
The objective of this laboratory course is to provide practical skills on basic microbiological techniques

Learning Outcomes
- Students should be able to:
- Isolate, characterize and identify common bacterial organisms;
- Determine bacterial load of differentsamples;
- Perform antimicrobial sensitivity tests;
- Preserve bacterial cultures

Course Contents:

Sterilization, disinfection and safety in microbiologicallaboratory.
Preparation of media for cultivation of bacteria.
Isolation of bacteria in pure culture by streak plate method.
Study of colony and growth characteristics of some common bacteria:
Bacillus, E. coli, Staphylococcus, Streptococcus, etc.
Preparation of bacterial smear and Gram's staining.
Enumeration of bacteria: standard plate count.
Antimicrobial sensitivity test and demonstration of drug resistance.
Maintenance of stock cultures: slants, stabs and glycerol stock cultures
Determination of phenol co-efficient of antimicrobial agents.
Determination of Minimum Inhibitory Concentration (MIC)

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

Text & References:

1. Cappuccino, J. G., & Welsh, C. (2016). Microbiology: a Laboratory Manual. Benjamin-Cummings Publishing Company.
2. Collins, C. H., Lyne, P. M., Grange, J. M., & Falkinham III, J. (2004). Collins and Lyne's Microbiological Methods (8th ed.). Arnolds.
3. Tille, P. M., & Forbes, B. A. Bailey & Scott's Diagnostic Microbiology.

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BIOCHEMISTRY & ANALYTICAL TECHNIQUES LAB

Course Code: BTH4115 **Credit Units: 04**

Course Objectives

The objective of this laboratory course is to introduce students to experiments in biochemistry. The course is designed to teach students the utility of set of experimental methods in biochemistry in a problem oriented manner.

Learning Outcomes

On completion of this course, students should be able to:
To elaborate concepts of biochemistry with easy to run experiments;
To familiarize with basic laboratory instruments and understand the
principle of measurements using those instruments with experiments in biochemistry.

Course Contents:

Preparingvariousstocksolutionsandworkingsolutionsthatwillbeneeded for the course.
To prepare an Acetic-Na Acetate Buffer and validate the Henderson-Hassel bach equation.
To determine an unknown protein concentration by plotting a standard graph of BSA using UV-Vis Spectrophotometer and validating the Beer- Lambert's Law.
Titration of Amino Acids and separation of aliphatic, aromatic and polar amino acids by thin layer chromatography.
Purification and characterization of an enzyme from a recombinant source (such as Alkaline Phosphatase or Lactate Dehydrogenase or any enzyme of the institution's choice).
Preparation of cell-free lysates
Ammonium Sulfate precipitation
Ion-exchange Chromatography
Gel Filtration
Affinity Chromatography
Dialysis of the purified protein solution against 60% glycerol as ademonstration of storage method
Generating a Purification Table (protein concentration, amount of total protein; Computing specific activity of the enzyme preparation at each stage of purification)
Assessing purity of samples from each step of purification by SDS-PAGE Gel Electrophoresis
Enzyme Kinetic Parameters: Km, Vmax and Kcat
Experimental verification that absorption at OD260 is more for denatured DNAas compared to native double stranded DNA. reversal of the same following DNA renaturation. Kinetics of DNA renaturation as a function of DNA size.
Identification of an unknown sample as DNA, RNA or protein using available laboratory tools. (Optional Experiments)
Biophysical methods (Circular Dichroism Spectroscopy, Fluorescence Spectroscopy).
Determination of mass of small molecules and fragmentation patterns by Mass Spectrometry.

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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PLANT AND ANIMAL BIOTECHNOLOGY LAB

Course Code: BTH4116 **Credit Units: 04**

Course Objectives

The objectives of this course are to provide hands-on training in basic experiments of plant and animal biotechnology.

Learning Outcomes

On completion of course, students should be able to gain basic skills in plant and animal biotechnology.

Course Contents:

Plant Biotechnology

Prepare culture media with various supplements for plant tissue culture.
Prepare explants of Valleriana wallichii for inoculation under aseptic conditions.
Attempt in vitro andro and gynogenesis in plants (Datura stramonium).
Isolate plant protoplast by enzymatic and mechanical methods and attempt fusion by PEG (available material).
Culture Agrobacterium tumefaciens and attempt transformation of any dicot species.
Generate an RAPD and ISSR profile of Eremurus persicus and Valleriana wallichii.
Prepare karyotypes and study the morphology of somatic chromosomes of Allium cepa, A. sativum, A. tuberosum and compare them on the basis of karyotypes.
Pollen mother cell meiosis and recombination index of select species
(one achiasmate, and the other chiasmate) and correlate with generation of variation.
Undertake plant genomic DNA isolation by CTAB method and its quantitation by visual as well as spectrophotometeric methods.
Perform PCR amplification of 'n' number of genotypes of a species for studying the genetic variation among the individuals of a species using random primers.
Study genetic fingerprinting profiles of plants and calculate polymorphic information content.
Syllabus

Animal Biotechnology

Count cells of an animal tissue and check their viability.
Prepare culture media with various supplements for plant and animal tissue culture.
Prepare single cell suspension from spleen and thymus.
Monitor and measure doubling time of animal cells.
Chromosome preparations from cultured animal cells.
Isolate DNA from animal tissue by SDS method.
Attempt animal cell fusion using PEG

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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RESEARCH METHODOLOGY AND SCIENTIFIC COMMUNICATION SKILLS

Course Code: BTH4214 **Credit Units: 02**

Course Objectives
The objectives of this course are to give background on history of science, emphasizing methodologies used to do research, use framework of these

Learning Outcomes
Students should be able to: Understand history and methodologies of scientific research, applying theset o recent published papers; Understand and practice scientific reading, writing and presentations;
Appreciate scientific ethics through case studies

Course Contents:

Module 1 History of science and science methodologies
Empirical science; scientific method; manipulative experiments and controls; deductive and inductive reasoning; descriptive science; reductionist vs holistic biology.

Module 2 Preparation for research
Choosing a mentor, lab and research question; maintaining a lab notebook

Module 3 Process of communication
Concept of effective communication- setting clear goals for communication; determining outcomes and results; initiating communication; avoiding breakdowns while communicating; creating value in conversation; barriers to effective communication; non-verbal communication-interpreting non-verbal cues; importance of body language, power of effective listening; recognizing cultural differences;Presentationskills-formal presentation skills; preparing and presenting using over-head projector, PowerPoint; defending interrogation; scientific poster preparation & presentation; participating in group discussions; Computing skills for scientific research - web browsing for information search; search engines and their mechanism of searching; hidden Web and its importance in scientific research; internet as a medium of interaction between scientists; effective email strategy using the right tone and conciseness.

Module 4 Scientific communication
Technical writing skills - types of reports; layout of a formal report; scientific writing skills - importance of communicating science; problems while writing a scientific document; plagiarism, software for plagiarism; scientific publication writing: elements of a scientific paper including abstract, introduction, materials & methods, results, discussion, references; drafting titles and framing abstracts; publishing scientific papers- peer review process and problems, recent developments such as open access and non-blindreview;plagiarism;characteristicsofeffectivetechnicalcommunication;scientific presentations; ethical issues; scientific misconduct

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

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Text & References:

- Valiela,I.(2001).DoingScience:Design,Analysis,andCommunicationofScientific Research. Oxford: Oxford UniversityPress.
- OnBeingaScientist:aGuidetoResponsibleConductinResearch.(2009). Washington, D.C.: National AcademiesPress.
- Gopen,G.D.,&Smith,J.A.TheScienceofScientificWriting.AmericanScientist, 78 (Nov-Dec 1990),550-558.
- Mohan,K.,&Singh,N.P.(2010).SpeakingEnglishEffectively.Delhi:Macmillan India.
- Movie:NaturallyObsessed,TheMakingofaScientist.

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BIO-ENTREPRENEURSHIP, INTELLECTUAL PROPERTY RIGHTS, BIOSAFETY AND BIOETHICS

Course Code: BTH4306 **Credit Units: 03**

Course Objectives

Bio-entrepreneurship, an interdisciplinary course, revolves around the central theme of how to manage and develop life science companies and projects. The objectives of this course are to teach students about concepts of entrepreneurship including identifying a winning business opportunity, gathering funding and launching a business, growing and Nurturing the organization and harvesting the rewards.

The other objectives are To understand basic knowledge, policies, requirements, and laws of IPR, Biosafety, and Bio-ethics.

Learning Outcomes

Students should be able to gain entrepreneurial skills, understand the various operations involved in venture creation, identify scope for entrepreneurship in biosciences and utilize the schemes promoted through knowledge centres and various agencies. Understand the rationale for and against IPR and especially patients; Understand why India has adopted an IPR Policy and be familiar with broad outline of patent regulations; Understand different types of IPR.

Course Contents:

Module1 Innovation and entrepreneurship in bio-business

Introduction and scope in Bio-entrepreneurship, Types of bio-industries and competitive dynamicsbetweenthesub-industriesofthebiosector(e.g.pharmaceuticalsvs.Industrial biotech),Strategyandoperationsofbio-sectorfirms:Factorsshapingopportunitiesfor innovation and entrepreneurship in bio-sectors, and the business implications of those opportunities, Alternatives faced by emerging bio-firms and the relevant toolsforstrategicdecision,Entrepreneurshipdevelopmentprogramsofpublicandprivateagencies(MSME, DBT,BIRAC,MakeInIndia),strategicdimensionsofpatenting&commercialization strategies.

Module2 Bio markets - business strategy and marketing

Negotiating the road from lab to the market (strategies and processes of negotiation with financiers, government and regulatory authorities), Pricing strategy, Challenges in marketing in bio business (market conditions & segments; developing distribution channels, the nature, analysis and management of customer needs), Basic contract principles, different types of agreement and contract terms typically found in joint venture and development agreements, Dispute resolution skills.

Module3 Finance and accounting

Business plan preparation including statutory and legal requirements, Business feasibility study, financial management issues of procurement of capital and management of costs, Collaborations & partnership, Information technology.

Module4 Technology management

Technology–assessment,development&upgradation,Managingtechnologytransfer, Qualitycontrol&transferofforeigntechnologies,KnowledgecentersandTechnology transfer agencies, Understanding of regulatory compliances and procedures (CDSCO, NBA, GCP, GLA,GMP

Module5

Introduction to IPR

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Introduction to intellectual property; types of IP: patents, trademarks, copyright & related rights, industrial design, traditional knowledge, geographical indications, protection of new GMOs; International framework for the protection of IP; IP as a factor inR&D;IPsofrelevancetobiotechnologyandfewcasestudies;introductiontohistoryof GATT, WTO, WIPO and TRIPS; plant variety protection and farmers rights act; concept of 'prior art': invention in context of "prior art"; patent databases - country-wise patent searches(USPTO,EPO,India);analysis andreport formation.

Module6 Patenting

Basics of patents: types of patents; Indian Patent Act 1970; recent amendments; WIPO Treaties; Budapest Treaty; Patent Cooperation Treaty (PCT) and implications; procedure forfilingaPCTapplication;roleofaCountryPatentOffice;filingofapatentapplication; precautions before patenting-disclosure/non-disclosure - patent application-forms
and guidelines including those of National Bio-diversity Authority (NBA) and other regulatory bodies, fee structure, time frames; types of patent applications: provisional and complete specifications; PCT and conventional patent applications; international patenting-requirement, procedures and costs; financial assistance for patenting- introductiontoexistingschemes;publicationofpatents-gazetteofIndia,statusinEurope and US; patent infringement- meaning, scope, litigation, case studies and examples; commercialization of patented innovations; licensing – outright sale, licensing, royalty; patenting by research students and scientists-university/organizational rules in India and abroad, collaborative research - backward and forward IP; benefit/credit sharing among parties/community, commercial (financial) and non-commercial incentives.

Module 7 Biosafety

Biosafety and Biosecurity - introduction; historical background; introduction to biologicalsafetycabinets;primarycontainmentforbiohazards;biosafetylevels;GRAS
organisms,biosafetylevelsofspecificmicroorganisms;recommendedbiosafetylevels
forinfectiousagentsandinfectedanimals;definitionofGMOs&LMOs;principlesof safety assessment of transgenic plants – sequential steps in risk assessment; concepts offamiliarityandsubstantialequivalence;risk–environmentalriskassessmentand
food and feed safety assessment; problem formulation – protection goals,compilation ofrelevantinformation,riskcharacterizationanddevelopmentofanalysisplan;risk
assessment of transgenic crops *vs* cisgenic plants or products derived from RNAi, genome editing tools.

Module 8 Nationaland international regulations

International regulations – Cartagena protocol, OECD consensus documents and Codex Alimentarius; Indian regulations – EPA act and rules, guidance documents, regulatoryframework–RCGM,GEAC,IBSCandotherregulatorybodies;Draftbill ofBiotechnologyRegulatoryauthorityofIndia-containments–biosafetylevelsand
category of rDNA experiments; field trails – biosafety research trials – standard operating procedures - guidelines of state governments; GM labeling – Food Safety and Standards Authority of India (FSSAI).

Module 9 Bioethics

Introduction, ethical conflicts in biological sciences - interference with nature, bioethics in health care - patient confidentiality, informed consent, euthanasia, artificialreproductivetechnologies,prenataldiagnosis,geneticscreening,genetherapy, transplantation. Bioethics in research – cloning and stem cell research, Humanand
animal experimentation, animal rights/welfare, Agricultural biotechnology - Genetically engineered food, environmental risk, labeling and public opinion. Sharing benefits and protecting future generations - Protection of environment and biodiversity – biopiracy.

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Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

1. Ganguli,P.(2001).IntellectualPropertyRights:UnleashingtheKnowledgeEconomy. New Delhi: Tata McGraw-Hill Pub.
2. NationalIPRPolicy,DepartmentofIndustrialPolicy&Promotion,Ministryof Commerce,GoI
3. CompleteReferencetoIntellectualPropertyRightsLaws.(2007). Snow White PublicationOct.
4. Kuhse,H.(2010).Bioethics:anAnthology.Malden,MA:Blackwell.
5. OfficeoftheControllerGeneralofPatents,Design&Trademarks;Departmentof Industrial Policy & Promotion; Ministry of Commerce & Industry; Government of India.http://www.ipindia.nic.in/
6. KarenF. GreifandJon F.Merz,CurrentControversiesintheBiologicalSciences -Case Studies of Policy Challenges from New Technologies, MIT Press
7. World Trade Organisation.http://www.wto.org
8. World Intellectual Property Organisation.http://www.wipo.int
9. International Union for the Protection of New Varieties of Plants.http://www.upov.int
10. National Portal of India.http://www.archive.india.gov.in
11. National Biodiversity Authority.http://www.nbaindia.org
12. RecombinantDNASafetyGuidelines,1990DepartmentofBiotechnology,Ministry ofScienceandTechnology,Govt.ofIndia.Retrievedfromhttp://www.envfor.nic.in/ divisions/csurv/geac/annex-5.pdf
13. Wolt,J.D.,Keese,P.,Raybould,A.,Fitzpatrick,J. W.,Burachik,M.,Gray,A.,Wu, F.(2009).ProblemFormulationintheEnvironmentalRiskAssessmentforGenetically ModifiedPlants.TransgenicResearch,19(3),425-436.doi:10.1007/s11248-009-9321-9
14. Craig,W.,Tepfer,M.,Degrassi,G.,&Ripandelli,D.(2008).AnOverviewofGeneral FeaturesofRiskAssessmentsofGeneticallyModifiedCrops.Euphytica, 164(3), 853-880. doi:10.1007/s10681-007-9643-8

BIOPROCESS ENGINEERING & TECHNOLOGY LAB

Course Code: BTH4323 **Credit Units: 03**

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Course Objectives

The objectives of this laboratory course are to provide hands-on training to students in upstream and downstream unit operations

Learning Outcomes

Students should be able to:

- Investigate, design and conduct experiments, analyze and interpret data, and apply the laboratory skills to solve complex bioprocess engineering problems; Apply skills and knowledge gained will be useful in solving problems typical of bio industries and research

Course Contents:

1. Basic Microbiologytechniques
   a) Scaleupfromfrozenvialtoagarplatetoshakeflaskculture.
   b) Instrumentation: Microplate reader, spectrophotometer,microscopy.
   c) Isolation of microorganisms from soil samples.
2. Experimental set-up
   a) Assembly of bioreactor and sterilization.
   b) Growth kinetics.
   c) Substrate and product inhibition.
   d) Measurement of residual substrates.
3. Data Analysis
   a) Introduction to Metabolic Flux Analysis(MFA).
4. Fermentation
   a) Batch.
   b) Fed-batch.
   c) Continuous.
5. Unit operations
   a) Micro filtration: Separation of cells from broth.
   b) Bio separations: Various chromatographic techniques and extractions.
6. Bioanalytic
   a) AnalyticaltechniqueslikeHPLC,FPLC,GC,GC-MSetc.formeasurement of amounts of products/substrates.

Text & References:

1. Shuler,M.L.,&Kargi,F.(2002).BioprocessEngineering:BasicConcepts.Upper Saddle River, NJ: Prentice Hall.
2. Stanbury,P.F.,&Whitaker,A.(2010).PrinciplesofFermentationTechnology. Oxford: PergamonPress.
3. Blanch,H. W., &Clark,D.S.(1997).BiochemicalEngineering.NewYork: M. Dekker.
4. Bailey,J.E.,&Ollis,D.F.(1986).BiochemicalEngineeringFundamentals.NewYork: McGraw-Hill.
5. ElMansi,M.,&Bryce,C.F.(2007).FermentationMicrobiologyandBiotechnology. Boca Raton: CRC/Taylor &Francis.

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BIOINFORMATICS LAB

Course Code: BTH4324 **Credit Units: 03**

Course Objectives

The aim of this course is to provide practical training in bioinformatic methods including accessing major public sequence databases, use of different computational tools to find sequences, analysis of protein and nucleic acid sequences by various software packages

Learning Outcomes

On completion of this course, students should be able to: Describe contents and properties of most important bioinformatics databases;

- Perform text- and sequence-based searches and analyze and discuss results in light of molecular biological knowledge;
- Explain major steps in pairwise and multiple sequence alignment, explain principle and execute pairwise sequence alignment by dynamic programming;P redict secondary and tertiary structures of protein sequences

Course Contents:

Using NCBI and Uniprot webresources.
Introduction and use of various genomedatabases.
Sequenceinformationresource:UsingNCBI,EMBL,Genbank,Entrez,Swissprot/ TrEMBL,UniProt.
SimilaritysearchesusingtoolslikeBLASTandinterpretationofresults.
Multiple sequence alignment usingClustalW.
Phylogenetic analysis of protein and nucleotidesequences.
Use of gene prediction methods (GRAIL, Genscan,Glimmer).
Using RNA structure predictiontools.
Use of various primer designing and restriction site predictiontools.
Use of different protein structure prediction databases (PDB,SCOP, CATH).
Construction and study of protein structures usingDeepview/PyMol.
Homology modelling ofproteins.
Useoftoolsformutationandanalysisoftheenergyminimizationof proteinstructures.
Use of miRNA prediction, designing and target predictiontools.

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ENVIRONMENTAL BIOTECHNOLOGY

Course Code: BTH4204 **Credit Units: 02**

Course Objectives

This course aims to introduce fundamentals of Environmental Biotechnology. The course will introduce major groups of micro organisms tools in biotechnology and their most important environmental applications. The environmental applications of biotechnology will be presented in detail and will be supported by examples from the national and international literature.

Student Learning Outcomes

On completion of course, students will be able to understand use of basic microbiological, molecular and analytical methods, which are extensively used in environmental biotechnology.

Course Contents:

Module I: Introduction to environment.

Introduction to environment; pollution and its control; pollution indicators; waste management: domestic, industrial, solid and hazardous wastes; strain improvement; Biodiversity and its conservation; Role of microorganisms in geochemical cycles; microbial energy metabolism, microbial growth kinetics and elementary chemostat theory, relevant microbiological processes, microbial ecology.

Module II: Bioremediation

Bioremediation: Fundamentals, methods and strategies of application (biostimulation, bioaugmentation)–examples,bioremediationofmetals(Cr,As,Se,Hg),radionuclides (U,Te),organicpollutants(PAHs,PCBs,Pesticides,TNT*etc.*),technologicalaspectsof bioremediation (*in situ, exsitu*).

Module III: Role of microorgan- isms in bioremediation

Application of bacteria and fungi in bioremediation: White rot fungi *vs* specialized degradingbacteria:examples,usesandadvantages*vs*disadvantages;Phytoremediation: Fundamentals and description of major methods of application (phytoaccumulation, phytovolatilization, rhizo-filtrationphyto-stabilization).

Module IV: Biotechnology and agriculture

Bioinsecticides: Bacillus thuringiensis, Baculoviruses, uses, genetic modifications and aspects of safety in their use; Biofungicides: Description of mode of actions and mechanisms (e.g. Trichoderma, Pseudomonas fluorescens); Biofertilizers: Symbiotic systems between plants – microorganisms (nitrogen fixing symbiosis, mycorrhiza fungi symbiosis), Plant growth promoting rhizobacteria (PGPR) – uses, practical aspects and problems in application.

Module V: Biofuels

EnvironmentalBiotechnologyandbiofuels:biogas;bioethanol;biodiesel;biohydrogen; Description of the industrial processes involved, microorganisms and biotechnological interventions for optimization of production; Microbiologically enhanced oil recovery (MEOR); Bioleachingofmetals; Production of bioplastics; Production of biosurfactants: bioemulsifiers; Paperproduction: use of xylanases and whiterotfungi.

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Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

1. G. M. Evans and J. C. Furlong (2003), Environmental Biotechnology: Theory and Applications, Wiley Publishers.
2. B. Ritmann and P. L. McCarty, (2000), Environmental Biotechnology: Principle & Applications, 2nd Ed., McGraw Hill Science.
3. Scragg A., (2005) Environmental Biotechnology. Pearson Education Limited.
4. J. S. Devinny, M. A. Deshusses and T. S. Webster, (1998), Biofiltration for Air Pollution Control, CRC Press.
5. H. J. Rehm and G. Reed, (2001), Biotechnology – A Multi-volume Comprehensive Treatise, Vol. 11, 2nd Ed., VCH Publishers Inc.
6. H. S. Peavy, D. R. Rowe and G. Tchobanoglous, (2013), Environmental Engineering, McGraw-Hill Inc.

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VACCINES

Course Code: BTH4327 **Credit Units: 02**

Course Objectives

This course will provide students with an overview of current developments in different areas of vaccines.

Learning Outcomes

By the end of this course, students should be able to:

- Understand fundamental concepts of human immune system and basic immunology;
- Differentiate and understand immune responses in relation to infection and vaccination;
- Understand requirement and designing of different types of vaccines;
- Understand importance of conventional and new emerging vaccine technologies.

Course Contents:

Module 1 Fundamentals of immune system

Overview of Immune system; Human Immune system: Effectors of immune system; Innate & Adaptive Immunity; Activation of the Innate Immunity; Adaptive Immunity; T and B cells in adaptive immunity; Immune response in infection; Correlates of protection.

Module 2 Immune response to infection

Protective immune response in bacterial; viral and parasitic infections; Primary and Secondary immune responses during infection; Antigen presentation and Role of Antigen presenting cells: Dendriticcells in immune response; Innate immune response Humoral (antibody mediated) responses; Cell mediated responses: role of CD4+ and CD8+ T cells; Memory responses: Memory and effector T and B cells, Generation and Maintenance of memory T and Bcells

Module 3 Immune response to vaccination

Vaccination and immune response; Adjuvants in Vaccination; Modulation of immune responses: Induction of Th1 and Th2 responses by using appropriate adjuvants and antigendeliverysystems-Microbialadjuvants, LiposomalandMicroparticlesas delivery systems; Chemokines and cytokines; Role of soluble mediators in vaccination; Oral immunization and Mucosal Immunity**.**

Module 4 Vaccine types& Design

Historyofvaccines,Conventionalvaccines;Bacterialvaccines;ViralVaccines;Vaccines based on routes of administration: parenteral, oral, mucosal; Live attenuated and inactivated vaccine; Subunit Vaccines and Toxoids; Peptide Vaccine.

Module 5 Vaccine technologies

New Vaccine Technologies; Rationally designed Vaccines;DNAVaccination;Mucosal vaccination; New approaches for vaccine delivery; Engineering virus vectors for vaccination;Vaccinesfortargeteddelivery(VaccineDeliverysystems);Diseasespecific vaccine design: Tuberculosis Vaccine; Malaria Vaccine; HIV/AIDS vaccine; New emerging diseases and vaccine needs (Ebola,Zika).

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

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Textbooks and References:

1. Janeway,C.A.,Travers,P.,Walport,M.,&Shlomchik,M.J.(2005). ImmunoBiology:theImmuneSysteminHealthandDisease.USA:GarlandSciencePub.
2. Kindt,T.J.,Osborne,B.A.,Goldsby,R.A.,&Kuby,J.(2013).KubyImmunology. New York: W.H.Freeman.
3. Kaufmann,S.H.(2004).NovelVaccinationStrategies.Weinheim:Wiley-VCH.
4. JournalArticles(relevantissues)from:AnnualReviewofImmunology,AnnualReviewofMicrobiology,CurrentOpinioninImmunology,NatureImmunology

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RNA BIOLOGY

Course Code: BTH4219 **Credit Units: 02**

Course Objectives

A) Learn basic tenets of RNA Biology

B) Explore emerging topics in RNA Biology including CRISPR/Cas9, differential RNA processing and stability, RNA Epi-transcriptomics, and functions of diverse classes of non-coding RNAs

Learning Outcomes

On successful completion of this course, students should be able to This course will focus on recent research in RNA biology: differential RNA processing and stability (splicing, polyadenylation, and turnover), the functional significance of various classes of non-coding RNAs (microRNAs, lncRNAs, cRNAs, ceRNAs, eRNAs, etc…), the CRISPR/Cas9 system, and RNA epi-transcriptomics (RNA methylation and terminal uridylation). Class lectures and discussions will be predominantly.

Course Contents:

Module1 Introduction to RNA biology

Introduction to RNA Biology and the Course Objectives, RNA Processing and Turnover, RNA and Translation, RNA Editing, Modifications and the Epi-transcriptome. The functions of Noncoding RNAs; the Long and the Short of it.

Module2 RNA therapeutics

RNA-based approaches to target identification and validation: Microarray, miRNAs; RNAi and CRISPR functional screens

2. RNA Therapeutic approaches: Gene therapy issues, Antisense, Ribozymes
3. RNA Therapeutic approaches: Aptamers, Riboswitches
4. RNA Therapeutic approaches: RNAi
5. RNA Therapeutic approaches: CRISPR, Combination therapies, Nano-formulations
6. RNA Therapeutic Efficacy considerations: Chemical modifications, Delivery challenges

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Textbooks and References:

1. Molecular Biology of RNA by David Elliot & Michael Ladomery, Oxford Press, second edition, ISBN 978-0-19-967139-7.

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CANCER BIOLOGY

Course Code: BTH4328 **Credit Units: 02**

Course Objectives

The Cancer Biology elective course will provide knowledge of critical aspects in human cancer biology for better understanding of its development, diagnostics methods as well as clinical/experimental therapeutics available for cancer therapy.

This course provides students with a broad overview of diverse fields of oncology, covering historical perspectives to cutting-edge approaches. The course will span several aspects of cancer research including its genetics, molecular and cellular biology, cancer micro-environment and its physiology, as well as classical vs experimental therapies available for tumor treatment. This course should specially be appealing to students who are interested in studying cancer research for their future career paths.

Learning outcomes:

On completion of this course, students should be able to:

- Describe tumor progression and important 'hallmarks' of cancer
- Understanding of the molecular and cellular origins of cancer
- Key signaling pathways in cancer development and progression
- knowledge of current perspectives about cancer research and current therapies.

Course Contents:

Module1 Introduction

Cancer hallmarks, Carcinogenesis, Oncogenes and tumor viruses, Tumor suppressor genes.

Module2 Cancer signaling

Signal transduction programs in cancer, De-regulation of the cell cycle/cell growth in cancer, Genomic instability and DNA repair in cancer, Apoptosis (p53), autophagy and cancer metabolism

Module3 Cell biology of cancer

The cancer microenvironment – hypoxia, inflammation, angiogenesis and stromal-cancer interactions, Invasion and Metastasis.

Module4 Diagnostics of cancer

Tumor immunology and immunotherapy, Cancer diagnostics – biomarkers, Cancer therapies, Translational research

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

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Curriculum & Scheme of Examination

2023

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Syllabus – First Semester

BIOCHEMISTRY AND METABOLIC REGULATION

Course Code: BTE4101 **Credit Units: 02**

Course Objective:
The primary focus of this course is metabolic regulation of carbohydrates, lipids and nitrogenous compounds. It is also aimed to expose the students to the technological applications in understanding the process of photosynthesis, and production of secondary metabolites through metabolic engineering. It is expected that the knowledge consolidated would help them to explore further into these areas by undertaking advanced research and studies.

Course Contents:

Module I
Carbohydrate and lipid metabolism: Glycolysis, Kreb's cycle, Electron Transport chain (ETS), energetics and regulation of these pathways, HMP pathway and its importance, gluconeogenesis, mechanism of oxidative phosphorylation (Chemiosmotic theory), fatty acid oxidation and their metabolic routes to carbon, biosynthesis of lipids (fatty acids and sterols), glycogen metabolism.

Module II
Protein and nucleotide metabolism: oxidative deamination, decarboxylation and transamination reactions, Urea cycle, overview of biosynthetic families of amino acids, denovo synthesis, breakdown and regulation of purine and pyrimidine nucleotides, salvage pathways of nucleotide synthesis; biosynthesis of nucleotide co-enzymes NAD, NADP, FAD and FMN .

Module III
Integration of cellular metabolism and hormonal regulation: Action of major hormones (insulin, glucagons, epinephrine) responses to metabolic stress; starvation, metabolic disorders (phenylketonuria, arthritis) and role of antifolates in chemotherapy.

Module IV:
Regulatory aspects of photosynthesis: Mechanism of light interacting with photo pigments, energy transfer and transduction process during photosynthesis, artificial light harvesting system and application in carbon sequestration , Engineering of Rubisco enzyme for photosynthetic process optimization.

Module V Secondary plant metabolism
Importance of secondary metabolites, classification, terpenes, mevalonic acid pathway, phenolic compounds and alkaloids. Application of metabolic engineering in production of any two class of secondary metabolites. Contribution of metabolic engineering principles in promoting Green Chemistry.

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Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

- Principles of Biochemistry by A. Lehninger revised by Nelson and Cox.
- Biochemistry by Mathews, Van Holde and Ahern. IIIrd Edition.

References:

- "Biochemistry" by White, Handler and R.B. Smith 7th Ed. 1983
- Biochemistry" by L.Stryer Third Edition.
- Biochemistry by Voet and Voet.
- Fundamentals of Biochemistry by Conn and Stumph.
- Biochemistry and Molecular Biology of Plants by Bob. B. Buchnan, ASPB Publication

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GENETICS AND MOLECULAR BIOLOGY

Course Code: BTE4102 **Credit Units: 03**

Course objective

Knowledge of genetics is fundamental to any field of biotechnology. Molecular biology has brought new dimension to the discipline of genetics in every sense of the word. The course is structured to achieve a balance somewhere between genetics and molecular biology for the student to get a "feel" for what are these overlapping disciplines all about

Course Contents:

Module I

Historical developments in genetics leading to evolution of molecular biology.DNA as genetic material, structure of DNA and RNA, complimentarity, phosphodiester bond, denaturation and reassociation. Basic methods used in studying nucleic acids.

DNA replication, DNA polymerases, modes of replication ,mechanism of replication in *E.coli*, synthesis of leading and lagging strands, DNA replication in eukaryotes.

Module II

Mendels laws of inheritance, alleles and multiple alleles, pedigree analysis in humans, gene interaction, epistasis , mitosis and meiosis, chromosomal basis of inheritance, cell cycle, sex determination in *Drosophila* and humans, sex chromosomes and sex linked inheritance. Dosage compensation.

Module III

Concept of linkage and gene mapping in eukaryotes. Molecular markers and their utility in genetic mapping , , molecular basis of recombination .

Evolution of gene concept.Fine structure mapping, Benzers T4, rII system, complementation and recombination.Bacterial genetics – conjugation and transduction.

Module IV

Genome organization in prokaryotes and eukaryotes (nuclear, chloroplast and mitochondria), genes and pseudogenes, repeated sequences. Transposable elements – transposons, retotransposons C value paradox.

Chromosome structure: heterochromatin ,euchromatin, histone proteins, histone code.

Chromosomal rearrangements, aneuploidy, chromosomal human diosorders.

Module V

Transcription: Gene structure: promoter and coding sequences, regulatory and transcription units, RNA polymerases, basic mechanism of transcription (initiation, elongation and termination) in prokaryotes and eukaryotes, tRNAs, rRNA.

Salient fatures of genetic code.

Translation – initiation, elongation and termination.

Module VI

Regulation of gene expression, Prokaryotes negative and positive regulation, attenuation.

Eukaryotes: Transcription factors, activators and enhancers.

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Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- Griffiths A.J.F, Wessler S.R, Carroll S.B and Doebley J. 2012. Introduction to Genetic Analysis. W.H. Freeman and Co., NewYork
- Snustad D.R and Simmons M.J. 2010. Principles of Genetics. John Wiley and Sons.
- Jocelyn E.K, Elliott S.G and Stephen T.K. 2011. Lewins Genes X. Jones and Barlett Pub., USA
- Watson J.D, Tania A.B, Stephen P.B, Alexander G, Michael L and Richard L. 2007. Molecular Biology of the Gene. Benjamin Cummings

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INSTRUMENTATION AND RESEARCH METHODOLOGY

Course Code: BTE4103 **Credit Units: 02**

Course Objective:
To provide knowledge on key features and applications of the equipment particularly used in molecular biology, protein engineering and analysis of the structure of bio-molecules. An introductory session will be conducted on the basic instruments used in biotechnology, keeping in mind the requirements of the students who have not done B.Tech Biotechnology. Research methodology is aimed to expose and inculcate the research spirit among the students. The course is expected to impart in depth understanding of various steps of research such as formulation of research problem, construction of research design, data collection and generation of a research report. It will also develop the skill of scientific writing.

Course Contents:

Module I: Instruments used in Molecular biology
PCR system; Quantitative and real time PCR, Nucleotide sequencing of DNA (DNA sequencer), Flow cytometer, Microarrays and DNA chips, Gel-Documentation and Image analysis systems, Radioimmunoassay, ELISA

Module II: Cell Disruption Techniques
Chemical and Physical cell disruption techniques: homogenizers, sonicators, permeabilization techniques

Module III: Characterization of Molecules
Mass spectrometry, MALDI, ESI-MS; Nuclear Magnetic Resonance spectroscopy, ^{1}H NMR, ^{13}C NMR, MRI; X-ray Crystallography and analysis of data to predict a protein structure

Module IV
Research – Definition – Importance and Meaning of research – Characteristics of research – Types of Research – Steps in research – Identification, Selection and formulation of research problem – Research questions – Research design – Formulation of Hypothesis – Review of Literature

Module V
Formulation of research plan, report, Type of Articles (review, letters etc). Scientific paper format (Abstract, Introduction, Materials and Methods, Results, Discussion). Writing, evaluating, presenting and publishing the results of scientific research in the academic press (journals, conferences etc). Choosing the appropriate journal (Sources, Information, Instructions to authors, peer review system, journal evaluation)

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

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Text & References:

Text:

- Statistical Methods By S.P. Gupta

References:

Instrumentation

- Principles and Techniques of Biochemistry and molecular Biology, Edited by Keith Wilson & John Walker, Cambridge Publication, 6th Edition
- Biophysical Chemistry By David Friefelder
- Introduction to protein structure, Carl Branden and Tooze, 2nd Edition, Garland Science Publishing, 1998
- Spectrophotometric identification of organic compounds, Robert M. Silverstein and Francis X. Webstar, John Willey and sons, Canada Ltd 1997
- Research Methodology
- Research Methodology Methods and Techniques by C.R. Kothari
- Statistics(Theory and Practice) by B.N. Gupta
- Research Methodology Methods and statistical Techniques by Santosh Gupta

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MICROBIAL TECHNOLOGY

Course Code: BTE4104 **Credit Units: 02**

Course Objective:
An introduction to microorganisms, their morphology, reproduction, cultivation, metabolism, genetics, ecology of microorganisms and their relationships to health and environment

Course Contents:

Module I
General concept of Microbial biotechnology, Concept of pure culture, Theory and practice of sterilization; isolation of industrially important microorganisms

Module II
Microbial Physiology and Metabolic diversity Nutritional requirements of major groups of microbes, nutritional uptake; transport across the membranes and cell wall; Growth curve and growth parameters, measurement of growth (biomass, turbidity, dry weight, protein content); environmental factors affecting microbial growth, Phototrophy, chemolithotrophy, anaerobic way of life, Microbial fermentation.

Module III
Industrial Microbiology : Principles of exploitation of microorganisms, primary and secondary metabolism, microbes in the production of: Antibiotics: Penicillin, streptomycin; Enzymes: proteases, amylases, Organic acids: Citric acid, acetic acid; Vitamins: Vit B12, B2; Amino acids: Glutamic acid, Lysine; Alkaloids; Alcohol, beer, wine, sake; Polysaccharides; microbial transformation of steroids.

Module IV
Food Microbiology: Food and dairy products (fermented milks, cheese, bread and yogurt), Mushroom cultivation, SCP, their uses and contamination; preservation and spoilage of fruits vegetables, meat and poultry products.

Module V
Bioremediation and Biodegradation: Microbial degradation of natural substances (cellulose, xylan, lignin, chitin and keratin), Microbial degradation of xenobiotics; Biodeterioration: microbial deterioration of paper, textile, wood, paint; Bioremediation of heavy metals; Microbes in sugar, leather, paper and pulp industry; Biomagnification.
Agricultural microbiology: Role of microbes in biogeochemical cycling, role of microorgamisms in crop improvement, Biofertilizers and biopesticides, Biopolymers and bioplastics.

Module V
Microbiology of waste disposal: Microbes in solid waste and solid waste management; Sewage treatment systems (primary, secondary, tertiary and disinfection); Disinfection of potable water supplies; Indicators organism for water safety; Microbial assessment of water quality.

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Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- Biotechnology: Rehm and Reid.
- Industrial Microbioplogy – A.H.Patel
- Industrial Microbiology – Casida
- Brock Biology of Microorganisms by Madigan, Martinko, jackparker, Publisher : Prentice Hall

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BIOSTATISTICS

Course Code: BTE4105 **Credit Units: 02**

Course Objective:
The course aims to develop competency and expertise in the application of statistical methods applied to biological data obtained in experimental techniques.

Course Contents:
Module I: Descriptive statistics
Measures of Central Tendency (Mean, Median, Mode), Measures of dispersion (Range, Mean Deviation, Standard Deviation, Quartile Deviation), combined mean and variance, covariance, Graphs (Bar Chart, Pie Chart, Box Plot, Histogram, Ogive, scatter plot)

Module II
Concepts of Probability (Addition and Multiplication Theorem) Bayes theorem, Binomial, Poisson and Normal distribution. Correlation and linear regression, method of least squares. Sampling theory (Probablity and non probability)

Module III: Inferential statistics
Formulation of Hypothesis (One-tailed & Two-tailed), Type I and Type II errors, power of a test, Significance of a test, P-value testing, Hypothesis testing (students T-test, F-test, Chi-square test). Analysis of variance (ANOVA)

Module IV
Applications of statistical methods using statistical software SPSS or Excel

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:
Text:
- Biostatistics: A foundation for analysis in the Health Sciences, W.W Daniel. Publisher: John Wiley and Sons.
- Biostatistics, P.N Arora and P.K Malhan. Publisher: Himalaya Publishing House.

References:
- Introduction to Biostatistics, Ronald N. Forthfer and Eun Sun Lee .Publisher: Elsevier.
- Biostatistics: A foundation for analysis in the Health Sciences, W.W Daniel. Publisher: John Wiley and Sons.
- Statistical Methodology, S.P Gupta. Publisher: S.Chand& Co.
- Biostatistics: A manual of Statistical Methodology for use in Health, Nutrition and Anthropology, K. VisweswaraRao. Publisher: Jaypee Brothers.
- Fundamentals of Mathematical Statistics, S.C Gupta and V.K Kapoor. Publisher: S. Chand & Co.
- Statistical Analysis, Kaushal, T.L. Publisher: Kalyani Publishers.
- Statistical Methods, Potri, D. Kalyani Publishers.
- Mathematical Statistics by H.C. Saxena and V.K. Kapoor. Publisher: S. Chand & Co

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BIOCHEMISTRY AND METABOLIC REGULATION LAB

Course Code: BTE4106 **Credit Units: 01**

Course Contents:

Module I: Solutions and buffers
Preparation of molar, normal and % (w/v) solutions. Calibration of pH meter and preparation of buffers of different pH and molar strength.

Module II: Carbohydrates
Extraction and estimation of carbohydrates from given plant/animal materials: determination of total sugars by Anthrone method
Separation of sugars by thin layer chromatography

Module III: Proteins
Extraction of total proteins by TCA precipitation; Estimation of proteins by Lowery and Bradford Methods; Elctrophoretic (PAGE and SDS-PAGE) separation of isolated proteins

Module IV: Lipids
Extraction of total lipids by Folch's method; estimation of phospholipids and glycolipids; thin layer chromatographic separation of lipids

Module V: Nucleic Acid
Extraction of DNA from germinating seeds or other plant tissues; quantitative estimation of nucleic acid by diphenylamine (DPA) method; quantitative estimation of RNA by Orcinol method; characterization of isolated nucleic acid by agarose gel electrophoresis.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:
- Practical book of Biochemistry by Plummer
- Practical book of Biochemistry by S.K. Sawhney and Randhir Singh

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GENETICS AND MOLECULAR BIOLOGY LAB

Course Code: BTE4107 **Credit Units: 02**

Course Contents:

- To make squash preparations of pre-treated metaphase chromosomes, and PMCs to view diplotene, diakinesis, metaphase I and anaphase I
- To study through photographs normal and deviant cytogenetic mechanisms
- Study of Mendel's laws, and deviations from Mendelian ratios using seed samples in the ratios of 9:7, 9:4:3, 13:3, 15:1, 12:3:1. Use Chi-Square Test for Testing the ratios
- Isolation of chloroplasts by sucrose gradient. Photographs of Restriction site variation of chloroplast DNA
- Isolation and purification of total plant and animal genomic DNA
- Determine quality and quantity of the isolated DNA
- Isolation of bacterial and plasmid DNA
- Restriction digestion profile through agarose gel electrophoresis.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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MICROBIAL TECHNOLOGY LAB

Course Code: BTE4108 **Credit Units: 01**

Course Contents:

Module I
Isolation and enumeration of microorganisms from rhizosphere, Staining techniques: Simple staining, differential Gram staining, endospore staining, lactophenol cotton blue staining for fungi

Module II
Growth curve measurement of bacterial population by turbidometry

Module III
Water microbiology- presumptive, confirmed and complete test for water potability.

Module IV
Antibiotic drug sensivity by Kirby-Baurer method and Broth-Dilution method,
Isolation of antibiotic producing microorganisms and determination of antimicrobial activity of isolates.

Module V
Preparation of sauerkraut, methylene blue reductase test, microbial analysis of food products.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

- Microbiology: A laboratory Manual, Seventh Edition, by: Cappuccino and Sherman
- Microbes in Action, Fourth Edition:by Harry W. Seeley, Cornell University; Paul J. Vandemark, late of CornellUniversity; John J. Lee, City College of New York

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ANIMAL BIOTECHNOLOGY

Course Code: BTE4111 **Credit Units: 02**

Course Objective:
To introduce significance of animal tissue culture and transgenesis.

Course Contents:

Module I: Animal Cell and Tissue Culture: Principles and Applications
Types of Media, Types of Cell Culture-Primary and Secondary, Cell Transformation, Cryopreservation, Contamination.

Module II: Transgenesis
Principles and Applications of Gene Transfer Technology Methods of Gene Transfer, Vectors: SV-40, Retroviral Vector, Adenoviral Vector, Adeno-associated viral vector, Vaccinia Virus vector, Methods for Gene Delivery: Chemical Method, Physical Method. Screening and selection of Transfected cells.

Module III: Mouse as A Model for Transgenesis
Transgenic Mouse as a model to study Human Diseases.Strategies for production of Genetically Altered Mice, Transgenic Animals, Animals as Bioreactors.

Module IV: Animal Cloning and *in vitro* Fertilization
Cloning of Animal, *in vitro* fertilization and ethical issues.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- Freshney RI. Culture of Animal Cells. John Willey & Sons Inc, USA
- Brown TA. Genome. John Willey & Sons Inc, USA.
- Lewin B. Gene VIII, Oxford University Press, USA.
- 4) Sambrook, J., Fritsch E.F., and Maniatis, T. Molecular Cloning: A Laboratory Manual. Cold Spring Harbor Laboratory Press, USA

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PLANT CELL, TISSUE & ORGAN CULTURE

Course Code: BTE4112 **Credit Units: 02**

Course Objective:
The objective of this course is to acquaint the students with technological aspects of plant tissue culture which have direct applications in agriculture, crop improvement and industrial processes.

Course Contents:

Module I
Introduction and potential application of plant cell, tissue and organ culture techniques. Common pathways of plant regeneration and organogenesis.Organ culture, anther and pollen culture. Ovary, ovule and embryo culture (direct and indirect embryogenesis).Callus suspension culture. Protoplast, isolation, culture and fusion.Suspension cultures.Production of hybrids and cybrids.

Module II
Plant genetic transformation (Direct and indirect methods).Regeneration methodologies and recovery of transgenics.

Module III
Somaclonal and Gametoclonal Variations. Induction & Utilization of Somatic Variants; somaclonal variation, its genetic basis and application in crop improvement

Module IV
Types of plant cell reactors. Comparison of reactor performances.Novel design concepts.Elicitation and immobilization techniques.Reactors for production of secondary metabolites, peptide hormones, antigens and therapeutic molecules. Cell lines (BY2) and their development and uses. Artificial seeds and their automated production

Module V
Germplasm Preservation (Short and long term).Ex situ conservation.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:
- An Introduction to Plant Tissue Culture, M.K. Razdan, Oxford and IBH Publishing
- Experiments in Plant Tissue Culture, J.H. Dodds and L.K. Roberts, CambridgeUniversity Press
- Plant Biotechnology and Transgenic Plants, K.M.O. Caldenty, W.H. Barz and H.L. Wills, Marcel Dekker
- Plant Biotechnology, J. Hammond, P. McGarvy and V. Yusibov, Springer Verlag.
- Plant Cell & Tissue Culture for the production of Food Ingredients bt T-J Fu, G. Singh and W.R. Curtis. Kluwer Adacemic/Plenum Press
- Plant Tissue Culture: Theory & Practice, S.S. Bhojwani and M.K. Razdan, Elsevier Health Sciences

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ANIMAL BIOTECHNOLOGY LAB

Course Code: BTE4113 **Credit Units: 01**

Course Contents:

1) Media Preparation and sterilization.

2) Cryopreservation of animal cells.

3) Thawing of frozen cell to initiate new culture.

4) Prepration of growth curve for
   i) Suspension cells
   ii) Adherent Cells

5) Drug toxicity testing and therapeutic index in
   i) Primary cells
   ii) Tumor cells.

6) Transient over-expression of a gene in
   i) Adherent cells
   ii) Suspension cells

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

- Freshney RI. Culture of Animal Cells. John Willey & Sons Inc, USA
- Brown TA. Genome. John Willey & Sons Inc, USA.
- Lewin B. Gene VIII, Oxford University Press, USA.
- Sambrook, J., Fritsch E.F., and Maniatis, T. Molecular Cloning: A Laboratory Manual. Cold Spring Harbor Laboratory Press, USA

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PLANT CELL, TISSUE & ORGAN CULTURE LAB

Course Code: BTE4114 **Credit Units: 01**

Course Contents:

Module I
To Study the effects of various plant growth regulators on different explants.

Module II
Anther and Embryo culture

Module III
Protoplast isolation and culture

Module IV
Test of seed viability

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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Syllabus – Second Semester

RECOMBINANT DNA TECHNOLOGY

Course Code: BTE4201 **Credit Units: 02**

Course Objective:
A complete understanding of molecular techniques like DNA sequencing, restriction mapping, PCR, cloning and expression of genes can be obtained through this course.

Course Contents:
Module I: Concept of gene
Concept of gene, prokaryotic and eukaryotic control elements and their analysis, random, Restriction enzymes, DNA polymerase, DNA modifying enzymes and their use.

Module II: Plasmids, M13 Single stranded DNA Phage, bacteriophage lambda, lysogeny and lytic cycle and their genetic switches. DNA cloning and expression vectors – plasmids, lambda, insertional and replacement vectors, cosmids, YAC, BAC, PAC.

Module III: Construction of genomic and cDNA library .Genomic DNA, mRNA isolation, cDNA synthesis. Methods for identification of recombinant clones.

Module IV:DNA sequencing, genome mapping and sequencing, next generation sequencing, polymerase chain reaction (PCR) and its application, bioinformatics and database analysis.

Module V: Analysis of gene expression: Northern blotting, RT – PCR, Real time (Q) PCR and microarray analysis. Isolation of recombinant DNA clones, gene transfection / transformation in cells and tissues, knock out / in mice, animal cloning and their applications. Genome – wide high through – put analysis and its application.

Module VI : Transposon mediated and site – directed mutagenesis and its applications, Expression of recombinant proteins in *E.coli* and its applications, RNA interference, applications in disease diagnosis, gene therapy, vaccine production, transgenic plants and animals.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text and references:

- Gene cloning and analysis: An Introduction by T. A Brown, Blackwell Publishing
- Principles of gene manipulation: An introduction to genetic engineering by R.W Old and S.B Primrose, Blackwell Publishing.

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BIOINFORMATICS & COMPUTATIONAL BIOLOGY

Course code: BTE4202 **Credit Units: 02**

Course Objective:
This course will enable the students to achieve skills in Bioinformatics & Computational Biology that are essential for application in Biotechnology.

Course Contents:
Module I: Introduction to Bioinformatics
Overview of Bioinformatics and computational biology. Importance of databases - EMBL – NCBI nucleic acid sequence databases - protein sequence databases (SwissProt) - structure databases (PDB) - bibliographic databases

Module II: Sequence Alignment Methods
Sequence analysis of biological data - methods of alignment - methods for optimal alignments; using gap penalties and scoring matrices- multiple sequence alignment – introduction - tools for MSA (MUSCLE, T-coffee) - application of multiple sequence alignment. Similarity Searching Tools: BLAST and FASTA, Theory and Algorithms, variants of BLAST and FASTA, PSI-BLAST and PHI BLAST, Statistical Significance.

Module III: Molecular Phylogenetics and Methods
The concept of evolutionary tree, terminology of phylogenetics, introduction to evolutionary models, Types of phylogenetic trees (rooted vs. unrooted trees).Phylogenetic analysis algorithms: UPGMA, Neighbors-Relation, Neighbor-Joining, maximum Parsimony, maximum likelihood. Tree evaluation methods: Bootstrapping,Randomized and jack-knifing methods, Phylogenetic analysis software: PHYLIP, MEGA, and PhyML.

Module IV: Predictive methods using DNA and protein sequences
Concepts of motif, pattern and profile, Gene Identification methods, Gene predictions strategies – Prokarytotic and Eukaryotic, Identification and characterization of proteins, Protein structure prediction methods: Secondary and tertiary approaches.

Module V: Introduction to Chemoinformatics, Molecular modelling& Drug designing
Chemical similarity search methods, Designing focused chemical libraries, Comparative protein modelling, Molecular docking and virtual high-throughput screening, Search algorithms, Scoring methods, Challenges in Molecular docking, Introduction of receptor flexibility through multiple receptor conformations (MRC docking), Hit-to-lead optimization, Introductory concept of Activity Cliffs.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:
Text:
- Essentials of Genomics and Bioinformaticsby C.W. Sensen, John Wiley and Sons
- Bioinformatics: Sequence and Genome Analysis by D.W. Mount, Cold Spring Harbor Laboratory Press.

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- Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins by A.D. Baxevanis and B.F.F Ouellette, Wiley – interscience.
- Introduction to Bioinformatics By Arthur Lesk
- Bioinformatics for Biologists By PavelPevzner and Ron Shamir
- An Introduction to Chemoinformatics By Andrew R. Leach
- Molecular Modelling: Principles and Applications (2nd Edition) By Andrew Leach
- Chemoinformatics Concepts, Methods, and Tools for Drug Discovery By Jürgen Bajorath
- Systems Biology: Principles, Methods, and Concepts By A.K. Konopka

References:

- Algorithms on Strings, Trees, and Sequences: Computer Science and Computational Biology by D. Gusfield, Cambridge University Press
- Sequence Analysis in Molecular Biology: Treasure Trove or Trivial Pursuit by G. Von Heijne and G. Von Heijne, Academic Press.
- Computational Molecular Biology: An Algorithmic Approach by P.A. Pevzner, MIT Press
- Computer Methods for Macromolecular Sequence Analysis by R.F. Doolittle, J.N, Abelson, M.I. Simon, Academic press
- Essentials of Genomics and Bioinformatics C.W. Sensen, John Wiley and Sons Inc.
- Introduction to Computational Biology: Maps, Sequences and Genomes by M. Waterman, Chapman and Hall
- Sequence Analysis in Molecular Biology: Treasure Trove or Trivial Pursuit by G. V. Heijne and G.V. Heijne, Academic Press
- Inferring Phylogenies by Joseph Felsenstein
- Molecular Evolution and Phylogenetics Masatoshi Nei and Sudhir Kumar

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BIOCHEMICAL ENGINEERING

Course Code:BTE4203 **Credit Units: 02**

Course Objective:
The course material on the types of bioreactor, mass and energy balance, aeration and agitation, scale-up principles etc. may help the students to understand the various principles involved in instrumentation and control and scale-up of bioprocess.

Course Contents:

Module I
Concepts of Mass Balance and Energy Balance, Kinetics of microbial growth and Batch Fermentation processes and Maintenance coefficient. Fed batch fermentation.

Module II
Design considerations for maintaining sterility of the fermentation medium for various temperature-time profiles for Batch and Continuous Processes, Residence Time Concept, Design Calculation.

Module III
Aeration and Agitation in Bioreactors: Mass Transfer Theories, Bubble aeration and Mechanical agitation, Correlation between Mass transfer coefficients and Operating variables.

Module IV
Comparison ofbatch and continuous fermentation, Cell recycle, Two stage continuous Culture . Principles of scale up, Criteria of scale up

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References

- ***Text:***
- Biochemical Engineering, S Aiba, A E Humphery and N F Millis, University of Tokyo Press
- Biochemical Engineering Fundamentals, J E Baily and D F Oillis, McGraw Hill
- Bioprocess Engineering Principles, P Doran, Academic Press
- Bioprocess Engineering Basic concept, Michel L Shuler , PHI Publication

References:

- Chemical Engineering, J M Coulson, and J F Richardson, Butterwirth Heinemann
- Fermentation and Biochemical Engineering Handbook: Principles, Process Design, and Equipment, HC Vogel, CL Todaro, CC Todaro, Noyes Data Corporation/Noyes Publications
- Process Engineering in Biotechnology, A T Jackson, Prentice Hall

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ENVIRONMENTAL BIOTECHNOLOGY

Course Code:BTE4204 **Credit Units: 02**

COURSE OBJECTIVE

To introduce the students to regenerate clean environment using biotechnology as the key tool and also provide them the insight for various eco-friendly approaches and technologies along with the concept of sustainable development

COURSE CONTENTS

Module-I:

Greenhouse effect, Global Warming, Global Ozone Problem, Acid Rain, Eutrophication and Biomagnification

Module-II:

Renewable and Non-Renewable energy resources
Clean fuel technology and Biofuels- Bioethanol, Biogas, Biodiesel, Algal fuels.

Module-III:

Waste Water Engineering: Treatment of municipal waste water and industrial effluents with special focus on biological and advanced water treatments
Solid Waste Management

Module-IV:

Bioremediation and Biodegradation ofmajor environmental pollutants- release of genetically engineered microbes in environment.
Biomineralisation- Use of microbial technology for mining of metals from ores

Module-V:

Biofertilizers, Biopesticides and IPM, Vermicomposting
Bioassessment of environmental quality- Bioindicators and Biosensors

Module-VI

EIA and Environmental Audit
Related case studies at national and global level

Examination Scheme

Components	CT	Attendance	Assignment/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References

Text

- Textbook of Biotechnology, RC Dubey/ PK Gupta
- Environmental Biotechnology, Pradipta Kumar Mohapatra
- Biotechnology- Expanding Horizons, BD Singh
- Introduction to Environmental Biotechnology, Milton Wainwright

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References

- Waste Water Engineering, Metcalf and Eddy
- Environmental Biotechnology- Concepts and Applications, Hans-Joachim Jordening and Jesef Winter
- Environmental Microbiology- Methods and Protocol, Alicia L, Ragout De Spencer, John FT Spencer
- Principles of Environmental Engineering, Gilbert Masters
- Agricultural biotechnology, SS Purohit
- Environmental Science- Working with the Earth, G Tyler Miller Jr

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IPR AND BIOETHICS

Course Code:BTE4205 **Credit Units: 02**

Course Objective:
The objectives of the course are to explain the fundamental principles of IPR and issues related to IP and examine information policy issues from different perspectives. Students will study and assess policy groups, intellectual property rights, access to information and research policy issues that usually include plant, animal and microbial genetic engineering products.

Course Contents:

Module I: Introduction
Introduction – Invention and Creativity – Intellectual Property (IP) – Importance – Protection of IPR – Basic types of property and Objectives of Intellectual Property Rights, origin and evolution of IPR, tangible and intangible property; concept and classification of intellectual property: Copyrights and related rights, Patent, Industrial Design, Trademarks and Geographical indications, Rights of traditional Knowledge and Protection of Plant varieties

Module II: IPR
International convention relating to Intellectual Property – Establishment of WIPO – Mission and Activities – History – General Agreement on Trade and Tariff (GATT) – TRIPS Agreement. Indian Position Vs WTO and Strategies – Indian IPR legislations – commitments to WTO-Patent Ordinance and the Bill – Draft of a national Intellectual Property Policy – Present against unfair competition.

Module III: Patent
Basic criterion for patentability, patentable subjects, patentable inventions, patent acquisition, infringement of patent, discovery Vs invention, product patenting Vs process patenting, special issue in biotechnology patent, Patent laws in Indian and international perspective, Patent Application procedure, patent Claim and specifications, Case study: Basmati case, Neem controversy, Turmeric Case

Module IV: Biosafety
Definition and requirement; biosafety in relation to human health, environment, transgenic research and applications, biosafety laws, guidelines and conventions, biosafety regulation: principles and practices in microbial and biomedical labs, guidelines for research involving DNA molecule ; Regulation bodies at National and International level

Module V Bioethics
Legal and socioeco'nomic impact of the products and techniques in Biotechnology, Bioethics in plant, animal and microbial genetic engineering, Ethical issues in healthcare, Biopiracy and ethical conflicts

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

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Text & References:

Text:

- Intellectual Property Rights by PaulGoldstein
- Intellectual Property Rights by K. R. G. Nair, Ashok Kumar, K. R. G. Nair
- Kilner, John, et.al, eds., *Cutting-Edge Bioethics*. Eerdmans 2002.

References:

• Refer to Periodicals, Industry directories, Articles and report in journals on the regulatory issues,
• "Biotechnology" series by Rehm& Reed.

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MOLECULAR CELL BIOLOGY

Course Code:BTE4206 **Credit Units: 03**

Course Objective:
The object of the present course is to develop basic knowledge and skills in cell and molecular biology and to understand the structure and function of the cellular and sub cellular components of cells and tissues with the help of recent techniques. This course will help students to get an understanding of cell function at the molecular level including the fundamentals of DNA They will become aware of the complexity and harmony of the cell. Applications of cellular and molecular biology in Biotechnology will also be presented.

Course Contents:
Module-I: Membrane structure : Chemical and physical properties of cell membranes and their major components, significance of these properties to membrane structure, integral and peripheral membrane proteins, biosynthesis of membrane and secreted proteins.
Structure of nuclear envelope, nuclear pore, complex. transport across nuclear envelope; regulation of nuclear import

Module-II: Cell Trafficking : Targeting proteins to endoplasmic reticulum, signal recognition parcticle, signal recognition particle receptor, protein folding and processing in ER protein export from ER; Protein sorting and export from Golgi Apparatus; SNARE hypothesis; Protein import into Mitochondria, mitochondrial genome; Import and sorting of chloroplast protein.
Targeting of proteins to membranes, mechanisms for transport of small molecules across the membrane, including simple diffusion, facilitative diffusion, primary and secondary active transport, action of ionophores ; transport across nuclear envelope; regulation of nuclear import

Module-III: Cell division and regulation of cell cycle : control of the cell cycle and the proteins involved; know the role of the cyclins and cyclin-dependent kinases, cell cycle checkpoints, methods for synchronizing the cell cycle in cell populations.

Module-IV: Intracellular Signaling - Modes of cell signaling, steroid hormone receptors, peptide hormones and growth factor, plant hormones, G-protein coupled receptors; receptor –protein tyrosine kinase , c- AMP pathway of signal transduction ; c GMP, phospholipids and calcium ions , Ras, Raf , MAP kinase pathway , JAK –STAT pathway , Apoptosis –role of caspases.

Module-V: Cancer Biology
Types of cancer; development of cancer**,** cells; Oncogenes, protooncogenes , function of oncogene products , tumor suppressor genes , function of tumor suppression gene products, role of oncogene and tumor suppressor gene in development, molecular diagnosis of cancer.

Examination Scheme

Components	CT	Attendance	Assignment/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text and references:
- Molecular Cell Biology by Bruce Albert
- Molecular Biology by Lodish Darnell and Baltimore
- Molecular Biology of the gene by Watson et al 4th ed.
- Genes VIII by Benjamin Lewis

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RECOMBINANT DNA TECHNOLOGY LAB

Course Code:BTE4207 **Credit Units: 02**

- Preparation and transformation of competent cells
- Study of restriction digestion.
- Study of ligation.
- Study of southern blotting.
- Study of Western blotting
- Study of RFLP
- Study of PCR.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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BIOINFORMATICS & COMPUTATIONAL BIOLOGY LAB

Course Code: BTE4208 **Credit Units: 02**

Course Contents:

Module I: Databases and file formats

Biological databases: NCBI, EMBL, DDBJ, PIR, PDB, SwissProt, KEGG, UNIgene, Ensembl, STRING, GEO. Sequence file formats: GenBank, FASTA, EMBL, PDB format

Module II: Sequence Analysis

DotPlot Analysis: DOTPLOT, DOTTER.DOTMATCHER.
Pairwise Sequence Alignment programs: LALIGN, EMBOSS NEEDLE, EMBOSS Water.
Multiple Sequence Alignment programs: Clustalw, Cobalt, Muscle, T-Coffee.
Similarity Searching: BLAST, Variants of Blast.

Module III: Phylogenetic Analysis

Phylogenetic analysis softwares: Phylip, Mega.

Module IV: Predictive softwares

Primer Designing: PRIMER3
Gene Identification Programs: Genscan, ORF finder. Fgenesh, Glimmer
Protein Identification and characterization: Protparam , Peptide cutter.
Motif and Patterns program: Prosite, InterProScan, Pfam.

Module V: Proteins and Comparative Modeling

Modellingsoftwares: Swiss Model workspace, Modeller,
Model Evaluation: PRocheck.
Docking Software: Hex

Module VI: Network Analysis

Network Anaysis Software: Cytoscape, Complex pathway Simulator.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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ENVIRONMENTAL BIOTECHNOLOGY LAB

Course Code: BTE4209 **Credit Units: 01**

Course Objective:
The present course aims to develop the practical understanding of use of various processes and microbes in environmental monitoring and clean up. Hence will provide an insight to envisage the different environmental problems and their solutions

Course Contents:

Module I
Foliar symptomological study of air pollution- chlorosis and necrosis

Module II
Physical and Chemical analysis of water and soil.
BOD, COD, DO determination in water samples

Module III
Isolation and characterization of microbes in contaminated soil and water
And to determine their bioremediation efficiency.

Module IV
Vermicomposting

Module V
Estimation and comparison of pigment content and sugar content in leaves due to air pollution with control.

Examination Scheme:

IA (30)			EE (70)			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Note: Minor variation could be there depending on the examiner.

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MOLECULAR CELL BIOLOGY LAB

Course Code: BTE4210 **Credit Units: 01**

Course objective:

- Isolation of cell organelles by centrifugation.
- Study of membrane potential in isolated mitochondria.
- Study of cell viability / death assay by use of trypanblue, MTT assay and wright staining.
- Study of apoptosis through analysis of DNA fragmentation patterns in mitochondria

Examination Scheme:

IA (30)			EE (70)			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Note: Minor variation could be there depending on the examiner.

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IMMUNOLOGY

Course Code: BTE4211 **Credit Units: 02**

Course Objectives:
Aim of this course is to provide in-depth information of immune-system and its implication for health and diseases. Knowledge about the principles and applications of immune-assay to evaluate the immune-status.

Course Contents:
Module I
Introduction:
Overview of immune system: Types of immunity clonal nature of immune response; Organization and structure of lymphoid organs; Hematopoiesis and differentiation; Cells of the Immune System

Module II
Antigen and Antibody:
Antigens: Types, Responses and Characteristics, Immunoglobulin: structure, function, antibody diversity and its mechanism, Therapeutic applications of antibodies.

Module III
Mechanism of Immune-response:
Complement system, Major histocompatibility complex, Lymphocyte Biology: Development, differentiation and activation of lymphocytes, Cytokines and Cell Signaling, Homeostatic Regulation of Immune Responses.

Module IV
Immune-system in Health and Disease:
Transplantation Immunology, Tumor Immunology, Infection and Infectious Disease, Hypersensitivity,Immune System Disorders; Immunotherapy, Vaccines

Module V
Immunoassays:
Methods of antibody production and their use in Immunoassays; Immunodiffusion, Immunoelectrophoresis and Immunohistochemistry; ELISA,-principle, types and applications; Flow cytometry

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- Kuby Immunology 6th Edition, by Thomas J. Kindt, Barbara A. Osborne, Richard A. Goldsby, WH Freeman Publishers (2006).
- Basic Immunology 4th Edition, by A.K. Abbas and A.H. Lichtman, Elsevier Publishers (2012)
- Fundamental Immunology, Edited by W. Paul, Lippincot Williams and Wilkins Publishers (2008)

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IMMUNOLOGY LAB

Course Code: BTE4212 **Credit Units: 02**

Course Contents

- Agglutination – Blood typing/ Blood group study
- Blood Smear Preparation; Serum isolation; identification of different immune cells in the blood
- WIDAL
- Antigen/antibody purification by affinity chromatography
- Immunodiffusion: SRID and DRID
- Immunoelectrophoresis
- Immunohistochemisty
- ELISA: DOT ELISA, Straight ELISA; Sandwich ELISA

Examination Scheme:

Components	H/S	Q	CT2	EE
Weightage (%)	15	5	20	60

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TERM PAPER

Course Code: BTE4231 **Credit Units: 01**

A term (or research) paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned. The evaluation will be done by Board of examiners comprising of the faculties.

GUIDELINES FOR TERM PAPER

The procedure for writing a term paper may consist of the following steps:

1. Choosing a subject
2. Finding sources of materials
3. Collecting the notes
4. Outlining the paper
5. Writing the first draft
6. Editing & preparing the final paper

1. Choosing a Subject

The subject chosen should not be too general.

2. Finding Sources of materials

a) The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.
b) Begin by making a list of subject-headings under which you might expect the subject to be listed.
c) The sources could be books and magazine articles, news stories, periodicals, scientific journals etc.

3. Collecting the notes

Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.

a) Get facts, not just opinions. Compare the facts with author's conclusion.
b) In research studies, notice the methods and procedures, results & conclusions.
c) Check cross references.

4. Outlining the paper

a) Review notes to find main sub-divisions of the subject.
b) Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

5. Writing the first draft

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is. You may follow the following:

a) statement of purpose
b) main body of the paper
c) statement of summary and conclusion

Avoid short, bumpy sentences and long straggling sentences with more than one main idea.

6. Editing & preparing the final Paper

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a) Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/ details/ analyses of relevance to the question at hand. Sometimes, the relevance of a particular section may be clear to you but not to your readers. To avoid this, ensure you briefly explain the relevance of every section.
b) Read the paper to ensure that the language is not awkward, and that it "flows" properly.
c) Check for proper spelling, phrasing and sentence construction.
d) Check for proper form on footnotes, quotes, and punctuation.
e) Check to see that quotations serve one of the following purposes:
   (i) Show evidence of what an author has said.
   (ii) Avoid misrepresentation through restatement.
   (iii) Save unnecessary writing when ideas have been well expressed by the original author.
f) Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:
1. Title page
2. Table of contents
3. Introduction
4. Review
5. Discussion & Conclusion
6. References
7. Appendix

Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper.

Discussion

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.

Conclusion

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

a) summary of question posed
b) summary of findings
c) summary of main limitations of the study at hand
d) details of possibilities for related future research

References

From the very beginning of a research project, you should be careful to note all details of articles gathered.

The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.

The key to a good bibliography is consistency. Choose a particular convention and stick to this.

Conventions

Monographs

Crystal, D. (2001), Language and the internet. Cambridge: Cambridge University Press.

Edited volumes

Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges

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to communication in a second language. Berlin/ NY: Mouton de Gruyter.
[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

Edited articles
Schmidt, R./Shimura, A./Wang, Z./Jeong, H. (1996), Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea. In: Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges to communication in a second language. Berlin/ NY: Mouton de Gruyter: 285-316.

Journal articles
McQuarrie, E.F./Mick, D.G. (1992), On resonance: A critical pluralistic inquiry into advertising rhetoric. Journal of consumer research 19, 180-197.

Electronic book
Chandler, D. (1994), Semiotics for beginners [HTML document].Retrieved [5.10.'01] from the World Wide Web, http://www.aber.ac.uk/media/Documents/S4B/.

Electronic journal articles
Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document].German as a Foreign Language Journal [online] 1.Retrieved [12.09.'00] from the World Wide Web, http://www.gfl-journal.com/.

Other websites
Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document].Retrieved [13.10.'01] from the World Wide Web, http://olaf.hiof.no/~sverrev/eng.html.

Unpublished papers
Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu.

Unpublished theses/ dissertations
Möhl, S. (1996), AlltagssituationeniminterkulturellenVergleich: Realisierung von Kritik und AblehnungimDeutschen und Englischen. Unpublished MA thesis, University of Hamburg.
Walsh, R. (1995), Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language. Unpublished PhD dissertation, University College Dublin.

Appendix
The appendix should be used for data collected (e.g. questionnaires, transcripts, ...) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

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Assessment Scheme:

Continuous Evaluation: (Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)	40%
Final Evaluation: (Based on the organization of the paper, objectives/ problem profile/ issue outlining, comprehensiveness of the research, flow of the idea/ ideas, relevance of material used/ presented, outcomes vs. objectives, presentation/ viva etc.)	60%

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Syllabus – Third Semester

ENZYME TECHNOLOGY

Course Code: BTE4301 **Credit Unit: 02**

Course Objective

The course objective covers an understanding of the principles and application of protein, secondary metabolites and enzyme biochemistry applicable to industrial bioprocesses, process design, and operation strategies of various enzyme reactors.

Course Contents:

Module I: Introduction to Enzymes

Structure and general properties of enzymes; Mechanism of Enzyme Action; Concept of active site and Energetics of enzyme-substrate complex formation, Activation energy; Specificity of enzyme action; Cofactors; Monomeric and Oligomeric enzymes.

Module II: Kinetics of single-substrate enzyme catalysed reactions

Derivation and significance of Michaelis-Menten rate expression; Linear plots, King-Altman's method; Turnover number; Effect of temperature and pH on enzyme activity and stability; Inhibition kinetics.

Module III: Kinetics of Multisubstrate enzyme catalysed reactions

Multisubstrate enzyme kinetics: Ping-pong and Ordered (Sequential and Random) mechanisms; Alberty equation; Co-operativity; Sigmoidal kinetics; Allosteric enzymes; Isozyme and Multienzyme complex.

Module IV: Enzyme Immobilization and Bioreactors

Techniques for enzyme Immobilization-adsorption, matrix entrapment, encapsulation, cross-linking, covalent binding; Characteristics of Immobilized systems; Design of Enzyme Reactors-Packed-bed, Fluidized-bed, Membrane reactors; CSTRs.

Module V: Applications of enzymes and future trends

Enzymes applications-Industrial, Analytical, Medicaland Environmental; Enzyme based biosensors; Enzyme Inhibitors as therapeutic agents; Extremozymes, Abzymes, Ribozymes, Hybrid enzymes, Inteins.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

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Text & References:

- Enzyme Technology by M.F. Chaplin and C. Bucke, CambridgeUniversity Press
- Enzyme Biochemistry, Biotechnology, Clinical Chemistry by Trevor Palmer
- Fundamentals of enzymology by Nicolas C. price and Lewis stevens, Oxford University Press
- Enzymes: A Practical Introduction to Structure, Mechanism and Data Analysis by R.A. Copeland, John Wiley and Sons Inc.
- Enzyme Kinetics: Behaviour and Analysis of Rapid Equilibrium and Steady State Enzyme Systems, by I.H. Segel, Wiley-Interscience
- Biotechnological Innovations in Chemical Synthesis, R.C.B. Currell, V.D. Mieras, Biotol Partners Staff, Butterworth Heinemann.
- Biochemical engineering fundamentals, second edition. James E Bailey, David F., Ollis, McGraw Hill Intl. Edition
- Industrial Enzymes and their applications by H. Uhlig, John Wiley and Sons Inc

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GENOMICS AND PROTEOMICS

Course code: BTE4302 **Credit Units: 02**

Course Objectives:
The course covers the basic principles that underlying the structure, function, expression and evolution of diverse genomes and proteomes, by assessing contents of genomic /proteomic characterization and bioinformatics analysis. This course introduces a comprehensive overview of analytical platforms, computational tools; experimental design, analysis methods and databases intended to study DNA/protein sequences, characterization, gene expression and genome evolution, remodeling as well as the implications of this research.

Course Contents:
Module I - Introduction & Structural Genomics
Concepts of Genes and Genomes, Genome size, Sequence complexity, genome organization in diverse organisms (eukaryotes, prokaryotes, virus), and organelle genomes, genome evolution.
Structural features of the genome - Organization of single-copy sequences, Repetitive sequences (Tandem repeats, Copy Number variations, duplications, Transposable elements)

Module II – Resources of Genome Study
Structuring genomic resources – Subdividing genomes, DNA markers, Genetic and Physical mapping, Mapping populations. Genome Sequencing (eukaryotic and prokaryotic) – methods (chemical, chain termination) and strategies (WGS, H-WGS, de novo), Human genome project (findings and impact).Next Generation Sequencing technologies (Pyrosequencing, Virtual terminator sequencing, Ion torrent, nanopore). Genome finishing – Annotation of genome (structural and functional- de novo, homology based).

Module III – Comparative and Functional Genomics
Overview of sequence analysis – methods, databases, genome browsers (NCBI, UCSC, ENSEMBL).Homologs, paralogs, orthologs, synteny, colinearity and gene displacement.Implications of comparative genomics – molecular evolution and multigene family evolution. Forward and reverse genetics (Tools and Methods – mutagenesis, knock outs/ knock ins, RNAi, morpholino), genome wide expression analysis. Concept of Epigenomics, Concepts of genome evolution (finding signatures of function, remodeling and applications).

Module IV – Transcriptomics and Gene Expression
mRNA/ protein expression profiles, Transcriptomes (tools and resources), Gene expression profiling / gene regulation (traditional to high throughput techniques- Northern, Subtractive hybridization, SAGE, Microarray).

Module V – Proteomics: Fundamentals and Interactomics
Proteomics Techniques (sequence based and hybridization based techniques - 2D Gel Electrophoresis, HPLC, Mass Spectrometry, Protein/ peptide arrays), Quantitative and Qualitative proteomics, Mining Proteomes, Computational approaches for studying proteomes.
Protein Mapping (expression and interaction mapping) techniques (Two hybrid methods and variations, Phage display, Co-IP, Mass Spectrometry, labeled and unlabeled tagging), Data Analysis using bioinformatics tools, Protein – (Protein/ligand) interaction networks.

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Module VI – Proteomics: Structure-omics and Cellular Proteomics

High throughput proteome analysis (2D GE & MS, Microarray & MS; SAGE & Microarray), 3 D structure determination (X-ray and NMR, PDB, Pfam, Modeller, SMART), structure to functional analysis (Fold comparison, Threadding, Functional sites, homology and ab initio modeling)

High throughput cloning, Activity and functional characterization, Post-translational modifications, Concepts of protein engineering, Proteomic workflows.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

- Bioinformatics: A practical guide to the analysis of genes and proteins, A.D. Baxevanis and B.F.F. Ouellette, John Wiley and Sons Inc.
- Bioinformatics: From Genomes to Drugs, T. Lengauer, John Wiley and Sons Inc.
- Bioinformatics: Sequence and Genome Analysis, D.W. Mount, ColdSpringHarbor Laboratory Press
- DNA Microarrays: A Practical Approach, M. Schlena, OxfordUniversity Press.
- Genomes II, T.A. Brown
- Introduction to Proteomics : Tools for the new biology, Daniel C. Liebler, Humana Press

References:

- A Primer of Genome Science, Greg Gibson and Spencer V. Muse
- Database Annotation in Molecular Biology : Principles and Practice, Arthur M. Lesk
- Recombinant DNA (Second Edition), James D. Watson and Mark Zoller
- Genes & Genomes, Maxine Singer and Paul Berg
- Essential of Genomics and Bioinformatics, C.W. Sensen, John Wiley and Sons Inc.
- Functional Genomics – A Practical Approach, S.P. Hunt and R. Livesey, OxfordUniversity Press
- Statistical Genomics: Linkage, Mapping and QTL Analysis, B. Liu, CRC Press.
- Introduction to Proteomics: Principles and applications, Nawin C. Mishra, Wiley Press 2010.
- Protein and Proteomics: A laboratory manual, Richard J Simpson, CSHL, 2003.

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STRUCTURAL BIOLOGY

Course Code: BTE4303 **Credit Units: 02**

Course Objective:
The course aims to provide an understanding of the canonical and non-canonical structure of the nucleic acids and the detail structure of proteins, enzymes etc. Detailed structural analysis will also give an idea about the mode of recognition of different biomolecules, nature of interaction and their role in therapy and nanotechnology.

Course Contents:
Module I: Canonical and Non-canonical Structure of Nucleic acids:
Canonical Structure: Structure of Nucleic acids, Detail structure of Double-Stranded DNA, Major and Minor groove, Chemical differences in DNA and RNA, Wobble base-pairing, DNA-drug interaction.
Non-canonical Structures: DNA polymorphism (A-DNA, B-DNA, Z-DNA), Parallel DNA, base flipping. Repeat elements (inverted repeat, mirror repeat and direct repeat) and cruciform structures, Intramolecular and Intermolecular Triplex DNA and its role in therapeutics, Intramolecular and intermolecular four-stranded DNA (G-quadruplex and i-motif), Telomeric DNAs of different eukaryotic species, role of telomere in cancer and aging, G-quadruplex as a therapeutic target, G-wire, role of G-quadruplex and i-motif in nanotechnology.

Module II: Protein structure and function: Primary structure of protein, Ramachandran plot, secondary structure of protein (alpha helix, 3_{10} helix, π-helix,β-sheet, loops, turns), sequence and structural motifs (helix-turn-helix, helix-loop-helix, leucine zipper, Greek key motif etc.), tertiary and quaternary structure of proteins.

Module III: Effect of physical and chemical parameters on structure and stability of Nucleic acids and proteins: Effect of cations, pH, temperature and chemical agents on the structure and stability of nucleic acids and protein, concept of thermodynamic parameters (free energy, enthalpy and entropy).

Module IV: BiomolecularInteractions:DNA-protein interaction, DNA-drug interactions, protein-protein interactions (hemoglobin, myoglobin, G-protein coupled receptors).

Module V: Characterization of Nucleic Acid Structure and Protein by biophysical and biochemical approach: Structural analysis by UV-VIS spectroscopy, Circular Dichroism, NMR and X-ray crystallography, thermal stability of Nucleic acid structure and protein by thermal denaturation curves, Principles of Isothermal Calorimetry (ITC), Differential Scanning calorimetry (DSC), Fluorescence Spectroscopy.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- DNA Structure and Function by Richard R. Sinden, (Copyright 1994 edition by Academic Press)
- Protein Structure and function by Carl Braden and John Tooze (Copyright 1991, 1999 by Garland Publishing).
- Exploring Proteins: a student's guide to experimental skills and methods by Nicholas C. Price and Jacqueline Nairn (latest edition by Oxford University Press)

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DOWNSTREAM PROCESSING & FERMENTATON TECHNOLOGY

Course Code: BTE4304 **Credit Unit: 02**

Course Objective:
The syllabus will help the students to characterize the Bioproducts of biotechnological importance and to get expertise in their downstream processing.

Course Contents:
Module I: Fermentation Technology-An Overview
Development and overview of fermentation processes, strain development, media design and optimization, commercial media for fermentation

Module II: Bioproduct Production
Production of Ethanol, Antibiotics, Recombinant products,Citric acid, Industrial enzymes

Module III: Downstream Processing-An Overview
Importance of downstream processing in biotechnology; characteristics of bio-products and fermentation broth

Module IV: **BioproductIsolation**
Cell disruption; Filtration; Centrifugation; Precipitation

Module V: Purification
Membrane Based Separation; Chromatographic methods of separation based on size, charge and biological affinity, 1D, 2D gel electrophoresis

Module VI: Polishing
Crystallization; Drying and Formulations; Case studies

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text:
- Industrial Microbiology by L.E.Casida, JR.New Age International (P) LTD.
- Biotechnology, A Text book of Industrial Microbiology, W. Crueger and A. Crueger, Sinauer Association.
- Bioseparations: Downstream Processing for Biotechnology, P.A. Belter et al, John Wiley & Sons Inc.
- Downstream Processing, J.P. Hamel, J.B. Hunter and S.K. Sikdar, American Chemical Society

References:
- Practical Biochemistry, Principles & Techniques, Keith Wilson and John Walker
- Biochemical Engineering Fundamentals, J.E. Bailey and D.F. Ollis, McGraw-Hill
- Biotreatment, Downstream Processing and Modelling (Advances in Biochemical Engineering/ Biotechnology, Vol 56), T. Schepler et al, Springer Verlag
- Protein Purification, MR Ladisch, RC Wilson, CC Painton, SE Builder, American Chemical Society
- Principles of Fermentation Technology by P.F. Stanbury, A. Whitaker, and S.J. Hall, Aditya Books (P) LTD.

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ENZYME TECHNOLOGY LAB

Course Code: BTE4305 **Credit Units: 02**

Course Contents:

Module I:
Isolation of enzymes from various sources

Module II:
Determination of specific activity of lipase, phosphatase, cellulase, protease and amylase

Module III:
Determination of Temperature and pH optima of an enzyme catalyzed reaction

Module IV:
Determination of Michaelis-Menten constant (K_m) and Maximum Velocity (V_{max}) of an enzyme catalyzed reaction using Linear plot method; Turnover number; catalytic efficiency

Module V:
Effect of various additives on enzyme activity

Module VI:
Enzyme immobilization and its effect on activity

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:
Text:

- Practical Biochemistry by Sawhney and Singh

References:

- Practical Biochemistry, Principles & Techniques by Keith Wilson and John Walker

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GENOMICS AND PROTEOMICS LAB

Course Code: BTE4306 **Credit Units: 02**

Course Objectives:
The course will familiarize students with the tools and principles of contemporary genomics and proteomics. Bioinformatics resources relevant to genome / proteome investigations will be provided for a sound working knowledge of current genomics and proteomics technology and approaches.

Course Contents:
Module I – **An Introduction to Genome Browsers –**
NCBI and UCSC – General features; Important Sequence formats – Raw, Fasta and EMBL; Sequence retrieval methods – Whole Genomes (command line and browser), Gene or position search (browser)

Module II - Sequence annotation
Restriction site annotation; Repeat Annotation of sequence Repeat Masker; ORF annotation – using ORF finder; Gene Prediction – using Gene Scan and Glimmer; Primer designing using Primer 3

Module III – Homology Search, Sequence conservation and Phylogeny
Homology Search – BLAST and its variants, BLAT; Multiple Sequence Alignment – Clustal W and ClustalX; Phylogeny and molecular evolution – MEGA

Module IV: Integration of bioinformatics workflow
NCBI Genome biology workbench

Module V: Proteome analysis
EXPASY Server, RCSB Protein data banks, BLASTp
Primary structure analysis tools (Translate and reverse translate, Codon Usage, FindPept, FindMOD, pI/Mw computing, Multident, ProtParam, Peptide cutter, Mascot)
Secondary structure analysis tools (hydropathy plots, motif searches, conserved domains, PROSITE, InterPro Scan, PfamHMM, SMART, threading); Tertiary structure analysis tools (JMOL/ Pymol / Rasmol), MODELLER; Phylogenetic profiling

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & Web References:
- Bioinformatics: A practical guide to the analysis of genes and proteins, A.D. Baxevanis and B.F.F. Ouellette, John Wiley and Sons Inc.
- NCBI tools
- EMBLtools
- Ensembl tools

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STRUCTURAL BIOLOGY LAB

Course Code: BTE4307 **Credit Units: 01**

Course Contents:

- Calculation of extinction coefficient of olgonucleotides either manually or using the software.
- Quantification of genomic DNA, oligonucleotides and proteins by UV-VIS Spectroscopy.
- Effect of cations (monovalent or divalent) and pH on genomic DNA, oligonucleotides and proteins by UV-VIS Spectroscopy.
- Study of DNA-ligand (spermine, ethidium bromide, proflavin etc.) interactions using UV-VIS spectroscopy and PAGE.
- Electrophoretic shift assays to check molecularity of the structures with short designed synthetic nucleotide sequences.
- Protein Folding using SDS-PAGE.
- Effect of physical and chemical factors on protein structure.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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FERMENTATION BIOTECHNOLOGY & DOWNSTREAM PROCESSING LAB

Course Code: BTE4308 **Credit Unit: 02**

Fermentation Biotechnology

Module I:
Isolation of industrially important microorganisms for microbial processes

Module II:
Determination of growth curve of supplied microorganisms and determination of substrate degradation profile and computation of specific growth rate and growth yield form the data obtained

Module III:
Comparative studies of ethanol production using different substrates; Production of enzyme

Downstream Processing

Module I:
Product Isolation

Module II:
Protein precipitation and recovery

Module III:
Membrane-based separation

Module IV:
Ion exchange chromatography

Module V:
Gel Permeation chromatography

Module VI:
Poly-acrylamide Gel Electrophoresis (PAGE)

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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INDUSTRIAL MANAGEMENT

Course Code: BTE4309 **Credit Unit: 03**

Course Objective:
The course is designed to provide students the ability to understand Industrial Business, it's markets and relevant industrial management strategies. The course will equip students the knowledge to cope up changing environment due the advent of technology & other influences. It will also cover the Safety laws & Acts required in managing industrial business. Also it will make students to understand the nature and role of Industrial business, characteristics of business markets, implementation of relevant industrial strategies and developing comprehensive insight for Entrepreneurship Development.

Course Contents:

Module I: Introduction to Industrial Management
Introduction to the Concept of industrial Management, Planning and decision making in industrial management process, Application and scope of Industrial Management, Understanding Industrial Market need, Want & demand management, Industrial Relations, Role & Responsibility of Industrial Manager.

Module II: Understanding Safety &Legal Framework in Industrial management
Factory Act, ESI Act, Environmental Act, Workmentcomperation Act, Need for industrial safety. Role of Government in industrial safety, Safety organization - safety committee - safety education and training, Advantages of adopting safety laws.

Module III: Understanding Industrial Markets, Goods & Customers and Industrial Buying Behavior: Introduction to the industrial goods, Types of industrial goods, Identifying sources for resource suppliers, Industrial customers, Industrial demand, purchasing practices of Industrial customers, Concept of business buying behavior.

Module IV: Introduction to Entrepreneurial Development
Introduction to the concept of Entrepreneurship & characteristics of entrepreneurship, Entrepreneurial process Stages in Entrepreneurial process, Entrepreneurial competencies, Entrepreneurship in India, Barriers in Entrepreneurship, Types of ownership suitable for business. Woman Entrepreneur, Challenges faced by women entrepreneurs.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text:

- Essentials of Management, H. Koontz, H. Weihrich and C. O'Donnell, McGraw-Hill/Irwin
- Guide for safety in the chemical laboratory second edition. Manufacturing Chemists Allocation. Van vostandard Reinhold Company, New York.
- Safety and Accident Prevention in Chemical Operation 2nd edition, H.H. Fawcett & W.S. Wood Wiley Interscience

References:

- T.R. Banga : Industrial Engineering and Management
- Industrial Management by C.L. Mahajan; SalujaParkashan, New Delhi.
- Industrial Marketing management by M Govindarajan, , Vikas publications
- Entrepreneurship by Rajeev Roy, Oxford

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IMMUNOTECHNOLOGY

Course Code: BTE4310 **Credit Units: 03**

Course Objective:
Aim of this course is to provide in-depth information of immune-system and its implication for health and diseases. Knowledge about the principles and applications of immune-assay to evaluate the immune-status

Course Contents:
Module-I
Introduction to Immunotechnology
Antigen and Antibody: Tools for immunodiagnostics, Kinetics of immune response, Principles of Immunization

Module II
Immunization and Antigen and Antibody
Immuno-chemistry of Antigens - immunogenicity, Antigenicity; Haptens, Toxins-Toxiods, Hapten-carrier system; Production of Polyclonal and Monoclonal Antibodies- Hybridoma Technology, Antibody interaction, affinity, cross reactivity, specificity; Immunoassays- RIA, ELISA, Western blotting, ELISPOT assay, immunofluorescence, Other applications; Antibody engineering, phase display library.

Module III
CMI and Imaging Techniques
Principle of Immunofluorescence Microscopy, Flurochromes, Staining techniques for live cell imaging and fixed cells, Flow cytometry, Lymphoproliferation, Cell Cytotoxicity, mixed lymphocyte reaction, Apoptosis, Cytokine expression, In vivo cell tracking techniques.

Module IV
Vaccine Technology
Active and Passive Immunization, Rationale for vaccine design, Kinds of vaccines live, killed, attenuated, Sub unit vaccines, Recombinant DNA vaccine, Peptide vaccines, conjugate vaccines; Role and properties of adjuvants.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Texts/References
1. F.C. Hay, O.M.R. Westwood, Practical Immunology, 4th Edition-, Blackwell Publishing, 2002
2. S. Hockfield, S. Carlson, C. Evans, P. Levitt, J. Pintar, L. Silberstein. Selected Methods for Antibody and NucleicAcid probes, Volume1, Cold Spring Harbor Laboratory Press,1993.
3. Ed Harlow, David Lane, Antibodies Laboratory Manual, Cold Spring Harbor, Laboratory Press, 1988.

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AGRI-FOOD BIOTECHNOLOGY

Course code: BTE4311 **Credit Units: 03**

Course Contents:

Module I: Introduction
Scope and importance of food industry; RDT and other technologies involved in development of food products; Concept of 'functional food'; Advances and trends, ethical issues, quality control, legislation, FDA & FPO (India), patenting processes and products, consumer acceptance scenario for GM food products and GM crops.

Module II: Techniques used in Food Industry
Sterilization, isolation, screening and strain improvement, cell harvesting and disruption, recovery and purification, production of organic acids – citric acid, lactic acid and acetic acid; Gene cloning, production of recombinant proteins e.g. chymosin

Module III: Dairy Biotechnology
Starter cultures, prebiotics, probiotics – their use as flavor enhancers and disease/ infection combats, applications in production of cheese, butter, ice-cream, yoghurt; applications in biomedical research, e.g. recombinant LABs as vaccines; Modified milk proteins.

Module IV: Microbial, Plant and Animal Biotechnology
Production of SCP (Single cell protein), production of baker's yeast, brewing industry, applications of transgenic plants in food production, transgenic fist, and transgenic poultry.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

***Text*:**
- Food Biotechnology - 2. 1988. R.D. King and P.S.J. Cheetham (Eds.). Elsevier Applied Science, NY.

***References*:**
- Introduction to Food Biotechnology. Green, Perry Johnson. 2002. CRC Press, Boca Raton, Florida.
- Food Biotechnology-Techniques and Applications. Gauri S. Mittal. 1992. Technomic Publishing Co., Inc., Lancaster, PA.

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BIOFUELS & GREEN TECHNOLOGY

Course code: BTE4312 **Credit Units: 03**

Course Objective:
This course will acquaint the students with bioenergy resources, their properties, preparation, processing along with the details of equipments utilized for the purpose.

Course Contents:

Module I: Biomass Sources, Characteristics & Preparation: Biomass Sources and Classification
Chemical composition and properties of different biomass materials and bio-fuels – Sugar cane molasses for fermentation ethanol; Sources and processing of oils and fats for liquid fuels- Energy plantations - Preparation of woody biomass; Drying, Storage and Handling of Biomass.

Module II: Biogas Technology
Feedstock for biogas production, biodegradable organic matter, Operating parameters for biogas production, Dry and wet fermentation

Module III: Bio-Ethanol and Bio-Diesel Technology
Production of Fuel Ethanol by Fermentation of Sugars.Trans-esterification of Oils to Produce Bio-Diesel.

Module IV: Pyrolysis and Gasification of Biomass
Thermo-chemical conversion of ligno-cellulose biomass - Pyrolysis of biomass,Thermo-chemical gasification principles

Module V: Combustion of Biomass and Cogeneration Systems
Combustion of Woody Biomass, Cogeneration in Biomass Processing Industries.Use of biogases for cogeneration.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:
***Text*:**
- Biotechnology and Alternative Technologies for Utilization of Biomass or Agricultural Wastes, A. Chakravarthy, Oxford & IBH publishing Co., New Delhi, 1989.

***References*:**
- Biogas Systems: Principles and Applications, K.M. Mital, New Age International Publishers (p) Ltd., 1996.
- Biomass Energy Systems, P. VenkataRamana and S.N. Srinivas, Tata Energy Research Institute, New Delhi, 1996.
- Fuels from Biomass and Wastes, D.L. Klass and G.M. Emert, Ann Arbor Science publ. Inc. Michigan, 1985.
- Bio-gas Technology, Khandelwal K.C. and Mahdi, Tata McGraw-Hill pub. Co. Ltd., New Delhi
- Advances in bio-gas Technology, O.P. Chawla, I.C.A.R., New Delhi. 1970.

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STEM CELLS & GENE THERAPY

Course Code: BTE4313 **Credit Units: 03**

Course Objective:
The course is designed to give a broad view of mammalian stem cells, reviewing where they are found in the body, the different types and how they are cultured. The topics will cover the basic biology of these stem cells as well as bioengineering and application of these stem cells to potential treatments of human diseases.

Course Contents:

Module I
Introduction to Gene Therapy, History and evolution of Gene therapy, optimal disease targets, Failures and successes with gene therapy and future prospects

Module II: Gene Delivery
Adenoviral Vectors, Adeno-associated virus (AAV) Vectors, Non-viral Vectors and Physical Methods, Retroviral and Lentiviral Vectors, Herpes Virus Vectors & Combinatorial methods, Gene transfer methods

Module III
Innate and Acquired Immune Response to Cell and Gene Therapy, Gene Therapy and the Immune System: Genetic Immunization

Module IV
Stem Cell biology and therapy, types embryonic stem cell, Adult stem cell, Stem Cell Biology and Therapy, Embryonic Stem Cells, culture and the potential benefits of stem cell technology

Module V
Cell, Disease, and Genetic Perspectives for Gene Therapy, Cell and Gene Therapy of the Nervous System, Cancer Gene Therapy, Cell and Gene Therapy for Vascular Disorders, Bone marrow transplants, Cancer Gene Therapy, Immunotherapy, Autoimmune Diseases and the Promise of Stem Cell-Based Therapies, Stem Cells and Diabetes, Stem Cells and heart Repair

Module VI
Regulatory and Ethical Considerations of Cell and Gene Therapy, Assessing Human Stem Cell Safety, Use of Genetically Modified Stem Cells in Experimental Gene Therapies.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

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Text & References:

***Text*:**

- Stem cell biology and gene therapy, Booth C., Cell Biology International, Academic Press
- Stem Cell and Gene-Based Therapy: Frontiers in Regenerative Medicine, *Alexander Battler, Jonathan Leo,* Springer,

***References*:**

- Stem Cell Biology and Gene Therapy. Quesenberry PJ, Stein GS, eds. (£65.00.) Wiley, 1998.
- Progress in gene therapy, Volume 2,Pioneering stem cell/gene therapy trials, Roger Bertolotti, Keiya Ozawa and H. Kirk Hammond, VSP international science publishers
- Stem Cells Handbook: Stewart Sell, Humana Press; Totowa NJ, USA; Oct. 2003,
- Understanding Biotechnology by AluízioBorém, Fabrício R. Santos, David E. Bowen, Prentice Hall
- Cell Therapy: Stem Cell Transplantation, Gene Therapy, and Cellular Immunotherapy (Cancer: Clinical Science in Practice) George Morstyn, William Sheridan, Cambridge University Press,

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DRUG DESIGN & PHARMACEUTICAL BIOTECHNOLOGY

Course code: BTE4314 **Credit Units: 03**

Course Objective:
The above course will be aimed to identify targets and design drugs that could be potentially useful in the identification of the candidate drugs, which have efficacy in cell culture or animal models. The student will gain basic concepts in the specific field of Pharmaceutical Biotechnology Industry and insight into the working of a pharma industry, various classes of biotech products and the regulations governing production and marketing of pharmaceutical products.

Course Contents:

Module I: Drug targets classification, discovery & validation strategies
Introduction to drug discovery & development; Target classification: DNA, RNA, post-translational, processing enzymes, metabolic enzymes involved in nucleic acid synthesis, G-protein coupled receptors, small molecule receptors, neuropeptide receptors, ion channels proteins, ligand-gated ion channels, transporters; Genomics (new target discovery), biological activity directed and other types of screening, natural products, combinatorial chemistry; General overview of validation techniques.

Module II: Structure-based design
Physicochemical properties of drugs, metabolism, toxicity and pharmacokinetics, toxicology considerations, problems and drawbacks on drug discovery and development.
'de novo' design methodologies: indirect drug design, pharmacophore development and receptor mapping, combinatorial libraries**.** DNA vaccines, Vaccines & Monoclonal antibody based pharmaceuticals, Antibiotics, Characterization.

Module III: Basic concepts of Drug Delivery
Concepts of Bio availability, drug absorption, pharmacodynamic&Pharmacokinetic processes, Timing for optimal therapy, Drug delivery considerations for the new biotherapeutics. Basic terminologies in drug delivery and drug targeting, Drug release, Drug targeting, Doses forms, Routes of drug administration, Basic strategies for enhanced therapeutic efficacies

Module IV: Delivery of Genetic material
Basic principles of gene expression, Viral and nonviral vectors in gene delivery, Clinical applications of gene therapy and antisense therapy; Bioanalytical aspects of Recombinant proteins as pharmaceutical drugs**:** Formulation of Biotechnological Products and their role in clinical development
Nanotechnology, Use of biosensors and challenge of chronopharmacology, Microchips and controlled drug delivery, Genetically engineered cell implants in drug deliver.

Module V: Regulations
Role of FDA, ICH Guidelines, cGMP, The Regulation of Pharmaceutical Biotechnological Products and Ethical Issues.
Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

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Text & References:

Text:

- Drug Delivery and Targeting, A.M. Hillery, A.W. Lloyd and J. Swarbrick, Harwood Academic Publisher
- Pharmaceutical Dosage Forms and Drug Delivery Systems, H.C. Ansel, L.V. allen and N.G. Popovich, Lippincott Williams and Wilkins Publisher
- Pharmaceutical Biotechnology- by Oliver. Kayser, Rainer Helmut Müller Series: Pharmaceutical Biotechnology, Vol. 9 Pearlman, Rodney; Wang, Y. John (Eds.) 1996,

***References*:**

- Introduction to Biophysical Methods for Protein and Nucleic Acid Research, J.A. Glasel and M.P. Deutscher, Academic Press.
- Principles of Drug Action, W.B. Pratt and P. Taylor, Churchill Livingston.
- Principles of Medicinal Chemistry, W.O. Foye, T.L. Lemke, and D.A. Williams, Williams and Wilkins
- Side Effects and Drug Design, E.J. Lien, Marcel Dekker.
- The Anticancer Drugs, W.B. Pratt, R.W. Ruddon, W.D. Ensminger, and J. Maybaum, Oxford University Press.
- Drug Delivery: Engineering Principles for Drug Therapy (Topics in Chemical Engineering), W.M. Saltzman, Oxford University Press.
- Handbook of Biodegradable Polymers (Drug Targeting and Delivery), A.J. Domb, J. Kost and D.M. Wiseman, Dunitz Martin Ltd.
- Development and Manufacture of Protein Pharmaceuticals Series: Pharmaceutical Biotechnology , Vol. 14Nail, Steve L.; Akers, Michael J. (Eds.) 2002
- Pharmaceutical Biotechnology: Fundamentals and Applications, Third Edition, Editor Daan J.A. Crommelin, Robert D Sindelar.
- Pharmaceutical Biotechnology, Vyas, S. P., CBS Publishers & Distributors, 2002, Delhi

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NANOBIOTECHNOLOGY

Course code: BTE4315 **Credit Units: 03**

Course Objective:
To evolve a detail understanding into the application of nanotechnology in the field of biological sciences.

Course Contents:

Module I
Biosensors as Precursors of Bioelectronics, Functionlization of Sensing Substrates, Biochip, Nanosensors-Miniaturization of Biosensors, Nanomaterial Based Biosensors.

Module II
Electron Transfer of Biomolecules, Nanoparticle-Biomaterial Hybrid Systems for Sensing and Electronic Devices

Module III
DNA Templated Electronics, Sequence –specific molecular lithography, Single Biomolecule Manipulation for Bioelectronics, DNA as a semiconductor.

Module IV
Applications of nanobiotechnology in medical diagnostics and other biomedical field.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

***Text*:**
- Smart Biosensor Technology, George K. Knopf, Amarjeet S. Bassi, CRC press, 2006

***References*:**
- Bioelectronics: From Theory to ApplicationsWillner, Itamar / Katz, Eugenii (eds.) Wiley-VCH, 2005
- Electrochemical Methods Fundamentals and Applications, 2nd Edition, by Allen J. Bard and Larry R. Faulkner
- Analytical Electrochemistry, by Joseph Wang

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SUMMER INTERNSHIP EVALUATION

Course Code: BTE4335 **Credit Units: 06**

GUIDELINES FOR SUMMER TRAINING

The main objective of summer training is to familiarize students to laboratory environment and make them learn to handle equipments and softwares, design experiments and analyze the results. The student will be supervised by one or more faculty members and he or she will be required to submit a synopsis. While writing a synopsis emphasis should be given to make it publishable. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student. Initial drafts should be critiqued by the faculty guide and corrected by the student at each stage.

The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

In general, the File should be comprehensive and include

- A short account of the activities that were undertaken as part of the project;
- A statement about the extent to which the project has achieved its stated goals.
- A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;
- Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project;
- Any problems that have arisen that may be useful to document for future reference.

Report Layout

The report should contain the following components:

- TITLE PAGE
- CERTIFICATE
- ACKNOWLEDGEMENT
- ABBREVIATIONS
- CONTENTS WITH PAGE NUMBERS
- CHAPTER –
    a. INTRODUCTION
    b. REVIEW OF LITERATURE
    c. MATERIALS & METHODS
    d. RESULTS & DISCUSSION
    e. SUMMARY AND CONCLUSION
    f. REFERENCES
    g. APPENDIX (OPTIONAL)
- 1 inch Margin on left side & 1”each on other sides.
- Single side of the paper to be used.
- Times New Roman.

Font Size

- 12 (Bold for headings)
- 12 (Normal for Matter)
- 14 (for Chapter Names)
- 1.5 line spacing
- Numbering on the right hand Top of the page
    - Numbers on pages before chapters to be done in Roman at the bottom of the page

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References
This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Examples

For research article
Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic*Escherichia coli* O157: H7. *ClinMicrobiol Infect*, **8** (suppl 1): 116–117.

For Book
Kowalski,M.(1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), 7: 63-67

- Scientific names in Italics
- Cover Page containing - Title, Students Name, Supervisors Name, University, Name (along with logo), Course name & year of Submission in the prescribed format
- 2 copies to be submitted

ASSESSMENT OF THE PROJECT FILE
Essentially, marking will be based on the following criteria: the quality of the report, the technical merit of the project and the project execution.. Evaluation will compose of two components - Project report assessment and Viva - voce. Project report assessment will be done by the two internal faculty members in respective fields. A committee of three faculty members will conduct Viva-voce.
Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project will be assessed as per evaluation format.

Examination Scheme:

Project Report	50
Viva Voce	50
Total	**100**

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Syllabus – Fourth Semester

DISSERTATION/ PROJECT

Course Code: BTE4437 **Credit Units: 20**

GUIDELINES FOR PROJECT FILE

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage.

The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

In general, the File should be comprehensive and include

- A short account of the activities that were undertaken as part of the project;
- A statement about the extent to which the project has achieved its stated goals.
- A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;
- Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project;
- Any problems that have arisen that may be useful to document for future reference.

Report Layout

The report should contain the following components:

- **Title or Cover Page**

The title page should contain the following information: Project Title; Student's Name; Course; Year; Supervisor's Name.

- **Acknowledgements** (optional)

Acknowledgment to any advisory or financial assistance received in the course of work may be given.

- **Abstract**

A good"Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project

- **Table of Contents**

Titles and subtitles are to correspond exactly with those in the text.

- **Introduction**

Here a brief introduction to the problem that is central to the project and an outline of the

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structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

- **Materials and Methods**

This section should aim at experimental designs, materials used. Methodology should be mentioned in details including modifications if any.

- **Results and Discussion**

Present results, discuss and compare these with those from other workers, etc. In writing these section, emphasis should be given on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

Note that in writing the various secions, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary never write in "point" form.

- **Conclusion**

A conclusion should be the final section in which the outcome of the work is mentioned briefly.

- **Future prospects**

- **Appendices**

The Appendix contains material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

- **References / Bibliography**

This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Examples

For research article

Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic*Escherichia coli* O157: H7. *ClinMicrobiol Infect*, **8** (suppl 1): 116–117.

For book

Kowalski, M.(1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67

ASSESSMENT OF THE PROJECT FILE

Essentially, marking will be based on the following criteria: the quality of the report, the technical merit of the project and the project execution.
Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project.
Project execution is concerned with assessing how much work has been put in.
The File should fulfill the following ***assessment objectives:***

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Range of Research Methods used to obtain information

Execution of Research

Data Analysis
Analyse Quantitative/ Qualitative information
Control Quality

Draw Conclusions

Examination Scheme:

Project Report	50
Viva Voce	50
Total	**100**

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Amity Institute of Biotechnology

Master of Science - Data Science

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Curriculum & Scheme of Examination

2023

AMITY UNIVERSITY HARYANA

GURUGRAM

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MACHINE LEARNING-I

Course Code: DSC4102 **Credit Units-03**

Course Contents:

Module 1: An Introduction to Machine Learning:
Introduction to machine learning, What is ML, Types of ML, Applications used for ML, AI vs ML, Essential for ML and AI.

Module 2: Techniques of Machine Learning:
Introduction to Supervised, unsupervised, semi-supervised, and reinforced machine learning techniques

Module 3: Introduction to Supervised Learning:
Training, validation, test data, and Over fitting and complexity

Module 4: Managing and understanding data:
Data description, Data processing, Dimension Reduction.

Module 5: Data Preprocessing:
Comprehend the meaning, process, and importance of data preparation, feature engineering and scaling of datasets.

Module 6: Evaluating model performance:
Measures performance for the classification problem. Discuss different performance measures.

Module 7: Resampling methods:
Discuss different cross validation techniques. Leave-One-Out Cross-Validation, k-Fold Cross Validation

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- Programming Collective Intelligence by Toby Segaran
- Machine Learning for Hackers by Drew Conway and John Myles
- Machine Learning by Tom M. Mitchell
- Pattern Recognition and Machine Learning by Christopher M. Bishop (Author)
- Machine Learning Yearning by Andrew NG
- The Elements of Statistical Learning by Trevor Hastie , Robert Tibshirani , Jerome Friedman

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STATISTICS & EXPLORATORY DATA ANALYSIS

Course Code: DSC4103 **Credit Units-03**

Course Contents:

Module 1: Descriptive Statistics

Statistics: Preliminary concepts; Measures of Central Tendency: Mean, Median, Mode
Measures of Dispersion: Range, Standard deviation, Variance, Covariance, Graphical Representation of Statistics: Histograms, Bar plots, Scatter plots etc.

Module 2: Probability

Random Experiments, Trial and Event, Sample Space, Mutually Exclusive or Disjoint Events, Mutually Exhaustive Events, Equally Probable Events, Complementary Event, Classical definition of Probability, Statistical definition of Probability, Axiomatic definition of Probability, Addition theorem, Multiplication theorem, Conditional Probability, Bayes' Theorem. Expectation.

Module 3: Continuous Distribution

Normal Distribution, Properties of Normal distribution

Module 4: Correlation

Bivariate distribution Correlation, Types of Correlation, Simple Correlation Coefficient for ungrouped data, Properties and Interpretation of Correlation Coefficient, Coefficient of determination, Scatter diagram, Standard Error, Probable error of Correlation Coefficient. Rank correlation, Some examples.

Module 5: Introduction to the Inferential Statistics

Parameter, Statistic, Null hypothesis, Alternative hypothesis, Critical region, Type1 Error, Type 11 Error, Level of significance, P-value and its applications.
Test of Significance for Small samples: One sample t-test, Paired t-test, Degrees of freedom for t-test, F test for equality of Population variances, Degrees of freedom for F-test.
Test of Significance for Large samples: Normal test for sample mean and population mean, Normal test for two sample means.
Chi-square Test: Test of goodness of fit, Test of Independence of attributes, Degrees of freedom for Chisquare test, Coefficient of contingency, Yates' correction for continuity.
Analysis of Variance: One way and Two way (only Examples)

Module 6: Introduction to Model Building:

Basics of Model building, Definition of a Model, Point estimation, Confidence intervals, Testing

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- A first course in Probability, Sheldon Ross
- An introduction to Probability and Statistics, Vijay K. Rohatgi and A. K. Md. Ehsanes Saleh
- Biostatistics: A foundation for analysis in the Health Sciences, W.W Daniel. Publisher: John Wiley and Sons.
- Biostatistics, P.N Arora and P.K Malhan. Publisher: Himalaya Publishing House.

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DATABASE MANAGEMENT SYSTEM-I

Course Code: DSC4104 **Credit Units-02**

Course Contents:

- SQL (Structured Query Language)
- Data Definition Language (DDL): Create, Alter and Drop commands
- Data Manipulation Language (DML): Select, Insert, Update, and Delete commands, Basic SQL queries, Integrity constraints on tables,
- Data Control Language Commands(DCL): Grant and Revoke
- SQL Functions
- SQL querying to do operations such as identifying nulls, special characters, blank rows/columns, and run distributions, run data summaries, merge tables, get unique counts
- SQL Joins, Aggregate functions and GROUP BY, Nested queries and sub queries. GROUP BY CLAUSE along basic aggregations such as SUM, COUNT, AVG RANK(), ROWNUM() & DENSE_RANK. UNION and UNION ALL CASE statement
- Introduction to Advanced SQL concepts: Indexes, Sequence, Clusters, Views, Cursors and Triggers, Embedded SQL
- Introduction to SQLITE
- Introduction to NoSQL and its capabilities
- Contrast MySQL with NOSQL
- Introduction to SQLITE
- Introduction to POSTGRESQL

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

- Database System Concepts, Abraham Silberschatz, Henry F. Korth, and S. Sudarshan
- An Introduction to Database Systems, C J Date
- Fundamentals of Databases – Elmasri and Navathe.
- Database Management Systems – Raghu Ramakrishna, Johannes Gehrke

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PROGRAMMING TOOL BOX I-R

Course Code: DSC4105 **Credit Units-01**

Course Contents:

Module 1: An Introduction to R
Overview of R programming, applications, usage and comparative study with other softwares and introduction to R for Data Science

Module 2: Setting up R environment and packages
Setting up R environment and install packages and supporting libraries in R

Module 3: Basics of R
Manage your data and work-space, Save your work, How to use R, Data structure in R, Data creation and curation and special function using R

Module 4: File Handling
Reading different file format using R, file handling and processing, writing output file.

Module 5: Graphics using R
Graphics device, Basic plot function, scatter plot, 3-D scatter plot, pairplots, Lineplot, Matplot, Matpoints, Bar plot, Histogram plot, Density plot, Dot plot, Pie chart, Venn diagram, Grid graphics, Lattice, ggplot2, Interactive plotting, combine multiple plots in same graphics screen, save graphics to a file.

Module 6: Programming using R
Conditional Executions, Comparison Operators, Logical Operators, Control Structures, If statements, Ifelse statements, Loops, For loop, While loop, Apply loop family, Other loops,

Module 7: Functions
Define and Call functions, Syntax Rules for functions, Control utilities for functions, Writing own function

Module 8: Advance R
Advance R functions and Regular expressions, Object oriented programming, Building R package

Module 9: Case study

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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Text & References:

- A Handbook of Statistical analysis using R, Brain Everitt and Torsten Hothorn
- The art of R programming, Norman Matloff
- Data Analysis and Graphics using R, W. John Braun
- R Graphics, Paul murrell
- R for Data Science, Garrett Grolemund and Hadley Wickham
- Linear Models with R, Julian J. Faraway

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PROGRAMMING TOOL BOX II-PYTHON

Course Code: DSC4106 **Credit Units-01**

Course Contents:

Python Programming

Module 1: Introduction to Python :
Overview of Python, applications, usage and comparative study with other softwares.

Module 2: Basics of Python :
Syntax, Data Types, Variables, Operators, Input/output, Flow of Control (Modules, Branching)

Module 3: Basic Programming with Python :
If, If- else, Nested if-else, Looping, For, While, Nested loops, Control Structure, Break, Continue, Pass,

Module 4: Data Structures of Python :
Strings and Tuples, Accessing Strings, Basic Operations, String slices, Working with Lists, Introduction, Accessing list, Operations, Function and Methods, Files, Modules, Dictionaries, Functions and Functional Programming, Declaring and calling Functions, Declare, assign and retrieve values from Lists, Introducing Tuples, Accessing tuples

Module 5: Advanced Python :
Object Oriented, OOPs concept, Class and object, Attributes, Inheritance, Overloading, Overriding, Data hiding, Operations Exception, Exception Handling, Except clause, Try finally clause, User Defined Exceptions

Module 6: Python Libraries :
Introduction to Machine learning packages like NUMPY, SCIPY, PANDAS etc.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

- Think Python by Allen B. Downey
- Introducing Python by Bill Lubanovic
- Hello World by Warner Sande and Carter Sande
- Learning Python , 5th Edition , Mark Lutz
- Python For Data Analysis by W Mckinney

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BIG DATA TOOLS & TECHNOLOGIES-I

Course Code: DSC4107 **Credit Units-01**

Course Contents:

Module 1: Introduction to Big Data
Big Data and its Importance, V's of Big Data, Drivers for Big Data, Introduction to Big Data Analytics, Big Data Analytics applications.

Module 2: Introduction to Hadoop
Hadoop Introduction, Hadoop key characteristics, Hadoop Core Components, Hadoop Ecosystem, Hadoop Services, Different Hadoop Modes, Hadoop's Parallel World – Data discovery

Module 3: Understanding Hadoop
Hadoop Installation, Hadoop Cluster Setup, Storing Data in Hadoop, HDFS Commands (Basics, Intermediate and Advanced), Processing your data with Map Reduce, Customizing Map Reduce Execution, Building Reliable MapReduce Apps, Run test example using Map reduce, Distributed Cache, Map side join vs Reduce Side Join, Running Hadoop applications

Module 4: Processing Big Data
Integrating disparate data stores, Mapping data to the programming framework, Connecting and extracting data from storage, Transforming data for processing, Subdividing data in preparation for Hadoop Map Reduce.

Module 5: Hadoop Map Reduce
Employing Hadoop Map Reduce,Creating the components of Hadoop Map Reduce jobs, Distributing data processing across server farms, Executing Hadoop Map Reduce jobs, Monitoring the progress of job flows, The Building Blocks of Hadoop Map Reduce, Distinguishing Hadoop daemons, Investigating the Hadoop Distributed File System Selecting appropriate execution modes: local, pseudo-distributed, fully distributed.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

- Big Data and Analytics, Seema Acharya , Subhashini Chellappan
- Professional Hadoop Solution, Boris Lublinsky, Kevin T. Smith, Alexey Yakubovich

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INTRODUCTION TO LINUX

Course Code: DSC4108 **Credit Units-01**

Course Contents:

Module 1: Operating System:
Introduction: Windows and Unix/Linux, Definition; Concepts; Function of Operating System; Batch Processing; Multiprogrammed Batch System; Time Sharing System; Parallel System; Distributed System; Real Time System.

Module 2: Process & Memory Management:
Process; Process State(New, Running, Waiting, Ready, Termination); Process Control Block; Process Scheduling (Round Robin Scheduling, Priority Scheduling, Multiple Queues, Shortest Job Scheduling); Operations on Process; Basic Management of Memory; Swapping Virtual Memory; Paging.

Module 3: Input/Output Management:
I/O Devices; Device Controllers; I/O Software; Device Drivers; Deadlock; Resources; Principles of Dead Lock; Detection and Recovery; Deadlock Prevention; Deadlock Avoidance.

Module 4: UNIX/LINUX Operating Systems:
Introduction; Concepts; Layers of UNIX; Role of System Administrator and Ordinary User; Tree Structure of UNIX; Root File System; /bin Directory; /dev Directory; /bin Directory; /etc Directory; /lib Directory; /proc Directory; /mnt Directory; /root Directory; /sbin Directory; /tmp Directory; /var Directory; Relative Path; Absolute Path; Creation of Directory; Creating file; removing file; Listing Files and Directories copying file; renaming file; Changing File Permission; Changing Director Permission; Changing Group; Changing Owner; Pipe; Filters; pwd command; date command; head command; tail command less command; more command; grep command; VI Editor (Creating a new File; Inserting Text in File; Deleting Text in File; Copy , Cut & Paste Text; Save File).

Module 5: Shell Programming:
Variables(Configuration Variable & Environmental Variable); Operators(Arithmetic Operator, Logical Operator, Relational Operator); Instruction(Sequence Control Instruction, Selection Control Instruction, Repetition or Loop Instruction); echo command; read command; outtput command.

Module 6: System Monitoring:
System monitoring, process information, log files, run level, system recovery, Memory management

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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Text & References:

- Ramesh Bangia. 2015. Learning Unix. BPB Publication.
- Peter Baer Galvin. 2016. Operating System Concepts. BPB Publication
- Stuart E. Madnick. 2001. Operating System. Tata Mac Graw Hill.
- Kenneth H. Roshan. 2007. The complete reference Unix Tata Mac Graw Hill..
- D. M. Dhamethire. , 2011. System Programming and Operating Systems. Tata Mac Graw Hill.
- Kirrgcox. 2001. Red Hat Linux by. Printice Hill India.
- Andrew S. Talenbaum. 2008. Modern Operating system. Printice Hill India.
- Sumetabha Das. 2013. Unix (Concept and Application). Tata Mac Graw Hill.

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MACHINE LEARNING-I LAB

Course Code: DSC4109 **Credit Units-01**

Course Contents:

Module 1: Supervised Learning:
Splitting the data into Training and test data, Understanding Overfitting and complexity with case studies

Module 2: Managing and understanding data:
Understanding Data description, Data processing, Dimension Reduction through case studies

Module 3: Data Preprocessing:
Understanding data preparation, feature engineering and scaling, datasets, dimensionality reduction through case studies

Module 4: Evaluating model performance: Calculation of Measures performance for the classification problem.

Module 5: Cross Validation techniques: Case studies of Leave-One-Out Cross-Validation, k-Fold Cross Validation and other cross validation techniques

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

- Programming Collective Intelligence by Toby Segaran
- Machine Learning for Hackers by Drew Conway and John Myles
- Machine Learning by Tom M. Mitchell
- Pattern Recognition and Machine Learning by Christopher M. Bishop (Author)
- Machine Learning Yearning by Andrew NG
- The Elements of Statistical Learning by Trevor Hastie, Robert Tibshirani , Jerome Friedman

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STATISTICS & EXPLORATORY DATA ANALYSIS LAB

Course Code: DSC4110 **Credit Units-01**

Course Contents:

Module 1: Descriptive Statistics
Calculation and interpretation of Descriptive Statistics

Module 2: Probability
Understanding the preliminary concepts of probability through case studies

Module 3: Continuous Distribution
Generation of statistical distributions

Module 4: Correlation
Calculation of correlation understanding and interpreting correlation through case studies

Module 5: Introduction to the Inferential Statistics
Understanding inferential statics through case studies

Module 6: Introduction to Model Building:
Understanding Basics of Model building, Definition of a Model, Point estimation, Confidence intervals, Testing through case studies

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

- A first course in Probability, Sheldon Ross
- An introduction to Probability and Statistics, Vijay K. Rohatgi and A. K. Md. Ehsanes Saleh
- Biostatistics: A foundation for analysis in the Health Sciences, W.W Daniel. Publisher: John Wiley and Sons.
- Biostatistics, P.N Arora and P.K Malhan. Publisher: Himalaya Publishing House.

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MACHINE LEARNING-II

Course Code: DSC4201 **Credit Units-03**

Course Contents:

Module 1: Basic concepts to calculate distance and similiraties
Discuss different methods to calculate distance and similrities including euclidean distance, squared euclidean distance, Manhattan distance, Cosine distance, Chebyshev distance, Canberra distance, Minikowski distance, correlation distance, partial correlation distance, mutual information and rank correlation coefficients

Module 2: Introduction to unsupervised learning
Discuss theory and concepts behind unsupervised learning

Module 3: Clustering:
Finding grouping of data. Hierarchical clustering,k-means and K-medoid clustering algorithm

Module 4: Application to Machine Learning:
Classification using Nearest Neighbors, Naive Bayes, Support Vector Machine, Market basket analysis using Association Rules

Module 5: Case study
Solve a case study on real world data and apply machine learning concepts.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- Advanced Lectures on Machine Learning. Springer-Verlag. Bousquet, O.; von Luxburg, U.; Raetsch, G., eds.
- "Unsupervised Learning and Clustering". Pattern classification (2nd ed.). Wiley. Duda, Richard O.; Hart, Peter E.; Stork, David G.
- The Elements of Statistical Learning: Data mining, Inference, and Prediction. New York: Springer. Hastie, Trevor; Tibshirani, Robert.
- Unsupervised Learning: Foundations of Neural Computation. MIT Press.Hinton, Geoffrey; Sejnowski, Terrence J., eds.

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REGRESSION THEORY & ANALYSIS

Course Code: DSC4202 **Credit Units-03**

Course Contents:

Module 1: Simple linear regression: Estimation of the Parameters, Hypothesis Testing on the Slope and Intercept, Interval Estimation in Simple Linear Regression, Prediction of New Observations, Coefficient of Determination

Module 2: Multiple regression: Estimation of Parameters, Hypothesis Testing, Confidence Intervals, Prediction

Module 3: Model Adequacy testing: Residual Analysis, PRESS statistic, Lack of Fit

Module 4: Transformations: Variance stabilising transformations, Transformations to linearise the model, Methods to select a transformation, Weighted least squares, Regression and random effect

Module 5: Multicollinearity: Sources, Effects, Diagnostics, Methods of dealing with Multicollinearity

Module 6: Validation of regression models: Techniques for validation

Module 7: Introduction to non linear regression and GLM: Non linear least squares, Transformations, Parameter estimation, Logistic and poisson regression

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- Introduction to Linear Regression Analysis, by Douglas C. Montgomery, Elizabeth A. Peck, G. Geoffrey Vining
- Introduction to Regression Analysis, M. Golberg and H.A Cho
- Applied Regression Analysis, Norman R. Draper and Harry Smith

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DATABASE MANAGEMENT SYSTEM-II

Course Code: DSC4204 **Credit Units-02**

Course Contents:

Module 1: MongoDB
A Database for the internet, MongoDB's key features, MongoDB's core server and tools, Why MongoDB? , History of MongoDB, Diving into the MongoDB shell, Creating and Querying with indexes, Basic Administration, Writing Program using MongoDB

Module 2: Application Development in MongoDB
Document oriented data, Constructing queries, Aggregation, Update ,atomic operations and deletes, E-commerce updates, Atomic document processing

Module 3: MongoDB Mastery
Indexing and query optimization, Text Search, Wired Tiger and pluggable storage, Replication, Scaling your system with Sharding, Deployment and Administration

Module 4: Apache Cassandra
Big Data and Apache Cassandra, Importance of Cassandra, Cassandra as a Distributed Database, Cassandra and High Availability, Cassandra and Replication Mechanism, Cassandra's Elastic Scalability, Tune able consistency (Strict Consistency , Casual Consistency , Weak Consistency , Brewer's CAP Theorem ,Cassandra as a Schema Free Database, Where should we use Cassandra , Who and why using the Cassandra

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

- MongoDB: The definitive guide by Kristina Chodorow, Michael Dirolf
- Cassandra: The Definitive Guide, Eben Hewitt
- MangoDB in Action, Kyle Banker, Peter Bakkum, Shaun Verch, Douglas Garrett, Tim Hawkins

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SPARK

Course Code: DSC4205 **Credit Units-01**

Course Contents:

Module 1: Introduction to Apache Spark
Introduction to Apache Spark, Features of Apache Spark, Apache Spark Stack, Introduction to RDD's, RDD's Transformation, What is good and Bad in Map Reduce , Why to use Apache Spark

Module 2: Spark: A Hadoop Replacement?
Java, Scala, or Python? , Scala, Packages, Data Types, Classes, Calling Functions, Operators, Control Structures

Module 3: A Quick Intro to Spark
Starting the shell, Data Sources, Testing Spark, Spark Monitor, Comparing Hadoop Map Reduce to Spark, Writing Standalone program with Spark

Module 4: Spark SQL
Basic Concepts, Using Spark SQL with RDDs

Module 5: Spark Streaming
Basic Concepts, Creating Your First Stream with Scala, Creating Your First Stream with Java

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

- Spark in Action, Marko Bonaci, Peter Zecevic
- Spark Cookbook, Rishi Yadav
- Machine Learning for Big Data , Jason Bell
- Spark : The Definitive Guide, Matei Zaharia, Bill Chambers

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DATA VISUALIZATION

Course Code: DSC4206 **Credit Units-01**

Course Contents:

Module 1: Introduction to data visualization:
Introduction to data visualization. Explore and manipulate all graphical parameter.Drawing graphs such as scatterplot, stripchart, histogram, boxplot, violoin chart, bar chart, dot plot, line graph, line plot, multiplot, stacked bar chart, pie diagram, venn diagram, pair plot.Explore 3d chart, motion chart, interactive charts.Discuss selecting appropriate chart for strategy presentation.Save graphs in various formats.Discuss different ways to combine multiple figures. Discuss margin and graph size.

Module 2: Introduction to Tableau:
Creating Visual Analytics with Tableau Desktop, Connecting to your data, Building your first visualization, Creating Calculations to enhance your data, using maps to improve insight, developing an Ad Hoc Analysis Environment, Tips Tricks and Time Savers, Bringing it all together with dashboards. Installing Tableau Server, Using Tableau server to facilitate fact based team collaboration, Automating Server with Tableau's command line tools, Use case for rapid fire visual analytics, other Tools. Explore various case studies to visualize the data.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

- Tableau your data, Daniel G Murray
- Introduction to ggplot2, Babraham bioinformatics.

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BIG DATA TOOLS & TECHNOLOGIES-II

Course Code: DSC4207 **Credit Units-01**

Course Contents:

Module 1: Fundamental of Apache Pig
What is Pig?, Introduction to Pig Data Flow Engine, Pig and Map Reduce in Detail, When should Pig Used?, Pig and Hadoop Cluster, Pig Interpreter and Map Reduce, Pig Relations and Data Types, Pig example in Detail, Debugging and Generating Example in Apache Pig

Pig philosophy and architecture, Pig installation, Grunt shell, Loading data, Exploring Pig Latin commands, Pig Transformations functions, Joins in Pig, Hands on Exercises

Module 2: Fundamental of Apache Hive
What is Hive?, Architecture of Hive, Hive Services, Hive Clients, How Hive Differs from Traditional RDBMS, Introduction to HiveQL, Data Types and File Formats in Hive, File Encoding , Common problems while working with Hive

Hive architecture, Hive installation, Hive vs. RDBMS, HiveQL and the Hive shell, Data types and schemas, Creating tables (external vs. managed), Creating Partitions, Creating Views, UDF function in java in Hive, Using hive to create diff types of format

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

- Programming PiG, Wiley Publication, Alan Gates
- Programming Hive, Wiley Publication, Jason Rutherglen, Dean Wamplor & Edward Capriolo

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MACHINE LEARNING-II LAB

Course Code: DSC4208 **Credit Units-01**

Course Contents:

Module 1: Basic concepts to calculate distance and similirities
Discuss different methods to calculate distance and similrities including euclidean distance, squared euclidean distance, Manhattan distance, Cosine distance, Chebyshev distance, Canberra distance, Minikowski distance, correlation distance, partial correlation distance, mutual information and rank correlation coefficients

Module 2: Clustering:
Finding grouping of data. Hierarchical clustering,k-means and K-medoid clustering algorithm

Module 3: Application to Machine Learning:
Solve a case study on real world data and apply machine learning concepts. Classification using Nearest Neighbors, Naive Bayes, Support Vector Machine, Market basket analysis using Association Rules

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

- Advanced Lectures on Machine Learning. Springer-Verlag. Bousquet, O.; von Luxburg, U.; Raetsch, G., eds.
- "Unsupervised Learning and Clustering". Pattern classification (2nd ed.). Wiley. Duda, Richard O.; Hart, Peter E.; Stork, David G.
- The Elements of Statistical Learning: Data mining, Inference, and Prediction. New York: Springer. Hastie, Trevor; Tibshirani, Robert.
- Unsupervised Learning: Foundations of Neural Computation. MIT Press.Hinton, Geoffrey; Sejnowski, Terrence J., eds.

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REGRESSION THEORY & ANALYSIS LAB

Course Code: DSC4209 **Credit Units-01**

Course Contents:

Module 1: Simple linear regression:
Estimation of the Parameters, Hypothesis Testing on the Slope and Intercept, Interval Estimation in Simple Linear Regression, Prediction of New Observations, Coefficient of Determination through case studies

Module 2: Multiple regression:
Estimation of Parameters, Hypothesis Testing, Confidence Intervals, Prediction through case studies

Module 3: Model Adequacy testing:
ResidualAnalysis, PRESS statistic, Lack of Fit through case studies

Module 4: Multicollinearity:
Sources, Effects, Diagnostics, Methods of dealing with Multicollinearity through case studies

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

- Introduction to Linear Regression Analysis, by Douglas C. Montgomery, Elizabeth A. Peck, G. Geoffrey Vining
- Introduction to Regression Analysis, M. Golberg and H.A Cho
- Applied Regression Analysis, Norman R. Draper and Harry Smith

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DATA STRUCTURE & ALGORITHM DESIGN LAB

Course Code: DSC4210 **Credit Units-01**

Course Contents:

Module I
Stack implementation through arrays, link list

Module II
Programs for recursion functions

Module III
Implementation of queues and leap structures

Module IV
Application of binary trees in pre-order, post-order and in-order evaluation

Module V
A VL tree implementation

Module VI
Optimal matrix multiplication

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

Text:
- Data Structures and Algorithms, A.V. Aho, J.E. Hopcroft and J. Ullman, Addison-Wesley Publishing
- Database Design, Development and Deployment with Student CD, P. Rob and E. Semaan, McGraw-Hill/Irwin
- Schaum's Outline of Data Structures with C++, J.R. Hubbard, McGraw Hill Trade.

References:
- Database system concepts, A. Silberschatz, P.B. Galvin and G. Gagne, John Wiley and Sons Inc.
- Introduction to Data Structures and Application, J. Tremblay and P.G. Sorensen, McGraw Hill College Division

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PATTERN RECOGNITION

Course Code: DSC4211 **Credit Units-01**

Course Contents:

Statistical Pattern Recognition

Introduction, Gaussian model, discriminant functions, classifier performance, risk and errors; supervised learning using parametric and nonparametric approaches: ML estimation, Bayesian parameter estimation approach, Parzen Windows, k-nn estimation; Unsupervised learning and clustering: the clustering concept, c-means algorithm, learning vector quantization, clustering strategies, a hierarchical clustering procedure.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

- R.Schalkoff, Pattern Recognition: Statistical, Structural and Neural Approaches, John Wiley & Sons, NY, 1992.
- Duda R O and P E Hart, Patten classification and scene analysis, John Wiley & Sons, NY 1973
- K.S.Fu, Syntactic pattern recognition and applications, Prentice Hall, NJ, 1982
- T.Pavlidis, Structural pattern recognition, Springer-Verlag, NY, 1977
- D.H.Ballad and C.M.Brown, Algorithms for computer vision, Prentice Hall, 1982

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NEXT GENERATION SEQUENCING ANALYSIS

Course Code: DSC4212 **Credit Units-01**

Course Contents:

Module 1: Introduction to NGS and NGS Technologies
Introduction to sequencing technologies from a data analysts view, Concept, Applications of sequencing technologies in Whole genome assembly; Gene expression analysis; Genome annotation; Gene regulation analysis; Variation studies

Module 2: NGS data analysis: Preprocessing
Introduction to NGS data analysis, Raw sequence files (FASTQ format), Preprocessing of raw reads: quality control (FastQC), adapter clipping, quality trimming, Introduction to read mapping (Alignment methods, Mapping heuristics), Read alignment to a reference genome (BWA, Bowtie2, TopHat), Mapping output (SAM/BAM format), Usage of important NGS toolkits (samtools, BEDtools), Mapping statistics, Visualization of mapped reads (IGV, UCSC)

Module 3: NGS data analysis: Variant calling
DNA variant calling and Filtering DNA variants using GATK pipeline

Module 4: NGS data analysis: Gene Expression Analysis
Genomics and transcriptome assembly, Differential Expression analysis, Quantification of expression,

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

- Exploring Personal Genomics, 1st Edition, Joel T. Dudley, Konrad J. Karczewski, ISBN-13: 978-0199644490, Oxford University Press, 2013
- High-Throughput Next Generation Sequencing, Methods and Applications,Editors: Kwon, Young Min, Ricke, Steven C. (Eds.), ISBN 978-1-61779-089-8, Springer, 2011
- Next Generation Sequencing Technologies and Challenges in Sequence Assembly, El-Metwally, M.Sc, Sara, Ouda, Osama M., Helmy, Mohamed, ISBN 978-1-4939-0715-1, Springer 2014

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ASSOCIATION RULE MINING

Course Code: DSC4213 **Credit Units-01**

Course Contents:

Where Is Association Learning Used? , Web Usage Mining, Beer and Diapers, How Association Rules Learning Works, Support, Confidence, Lift, Conviction, Defining the process, Algorithms(Apriori, FP-Growth), Mining the Baskets- Market basket analysis

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

- Machine Learning for Big Data HANDS-ON FOR DEVELOPERS AND TECHNICAL PROFESSIONALS- Jason Bell

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GENERALIZED & LINEAR MODELING

Course Code: DSC4301 **Credit Units-03**

Course Contents:

Module 1: Introduction to Generalized Linear Models:
Linear model, Non linear model, GLM

Module 2: Linear Regression Models:
Multiple regression model, Parameter estimation, Maximum likelihood, Model adequacy checking, Weighted least squares

Module 3: Nonlinear Regression Models:
Linear and Non linear regression models, transforming a linear model, Parameter estimation

Module 4: Logistic and Poisson Regression Models:
Logistic regression, Poison regression, Overdispersion

Module 5: The Generalized Linear Model: Exponential family, Likelihood equations, Quasi likelihood, Gamma family, The power function, Generalized Estimating Equation

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- Generalised Linear Models: With Applications in Engineering and the Sciences by Raymond H. Mysers, Douglas C. Montgomery, G. Geoffrey Vining, Timothy J. Robinson
- Data Analysis Using Regression and Multilevel/ Hierarchical Models, Andew Gelman and Jennifer Hill
- Categorical data analysis, Ala Agresti

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DEEP LEARNING & NEURAL NETWORKS

Course Code: DSC4302 **Credit Units-03**

Course Contents:

Module 1: Introduction to deep learning:
Conceptual overview of neural network, Supervised Learning with Neural Networks, Deep neural network, Why is Deep Learning a Buzz word

Module 2: Neural Networks Basics:
Binary Classification, Logistic Regression Cost Function, Gradient Descent, Derivatives, More Derivative Examples, Computation graph, Derivatives with a Computation Graph, Logistic Regression Gradient Descent, Gradient Descent on m Examples, Vectorization, More Vectorization Examples, Vectorizing Logistic Regression, Vectorizing Logistic Regression's Gradient Output, Explanation of logistic regression cost function

Module 3: Shallow neural networks:
Neural Networks Overview, Neural Network Representation, Computing a Neural Network's Output, Vectorizing across multiple examples, Explanation for Vectorized Implementation, Activation functions, Why do you need non-linear activation functions?, Derivatives of activation functions, Gradient descent for Neural Networks, Backpropagation intuition, Random Initialization

Module 4: Deep Neural Networks:
Deep L-layer neural network, Forward Propagation in a Deep Network, Getting your matrix dimensions right, Why deep representations?, Building blocks of deep neural networks, Forward and Backward Propagation, Parameters vs Hyperparameters, What does this have to do with the brain?

Module 5: Case study using real world data.
Building a neural network model and generating predictions from the model.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- Deep learning: adaptive computation and machine learning, Bengio, Yoshua, Courville, Aaron, Goodfellow, Ian J
- Deep Learning: A Practitioner's Approach, J. Patterson, A. Gibson
- Neural Networks and Deep Learning: A Textbook, Charu C. Aggarwal
- Neural Networks and Deep Learning, Michael Nielsen.

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TIME SERIES

Course Code: DSC4303 **Credit Units-03**

Course Contents:

Module 1: Autoregressive-moving average models ARIMA
Moving average models MA(q). Condition of invertability. Autoregressive models AR(p). Yull-Worker equations. Stationarity conditions. Autoregressive-moving average models ARMA (p,q).

Module 2: Coefficient estimation in ARIMA processes.
Coefficients estimation in autoregressive models. Coefficient estimation in ARMA (p) processes. Quality of adjustment of time series models. AIC information criterion. BIC information criterion. "Portmonto"-statistics.

Module 3: Forecasting in the framework of Box-Jenkins model
Forecasting, trend and seasonality in Box-Jenkins model.

Module 4: Non-stationary time series
Non-stationary time series. Time series with non-stationary variance. Non-stationary mean. ARIMA (p,d,q) models. The use of Box-Jenkins methodology to determination of order of integration.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- Enders W. Applied Econometric Time Series. John Wiley & Sons, Inc., 1995
- Mills, T.C. The Econometric Modelling of Financial Time Series. Cambridge University Press, 1999
- Andrew C. Harvey. Time Series Models. Harvester wheatsheaf, 1993.

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GRAPH & SOCIAL NETWORK ANALYSIS

Course Code: DSC4304 **Credit Units-03**

Course Contents:

Module 1: Introduction to graph theory
Use of graph theory to construct different types of networks : Undirected, directed graphs, Cyclic, Directed acyclic graphs, trees, weighted graphs, bipartite graph, Study data structures of the graphs. Adjacency matrix, adjacency list.

Module 2: Study different network models
Small world phenomena, Scale free network, Erdös-Rényi model for random graphs, Watts and Strogatz model, Barabasi-Albert model

Module 3: Stduy network properties
Degree distribution, power law, graph density, graph isomorphism, path length, diameter, clique, shortest distance, clustering coefficient, network motifs, network centralities and node ranking, degree centrality, closeness centrality, betweenness centrality, eigenvector centrality, ecentricity centracility, subgraph centrality, matching index,

Module 4: Network randomization
Randomization with Erdös-Rényi model, Randomization with node degree conservation, Permutation of node labels

Module 5: Introduction to social network
Introduction to social network data, Different data format, Paths and Connectivity-Graphs to represent social relations. Working with network data- Network Datasets-Strong and weak ties - Closure, Structural Holes, and Social Capital.

Module 6: Data and Text Mining In Social Media
Data mining in nutshell, Social media, Motivations for data mining in social media, Data mining methods for social media. Social networking sites: illustrative examples. Text Mining: Keyword search, query semantics and answer ranking, Classification algorithms, Clustering algorithms.

Module 7: Community Detection in Social Networks
Introduction, Communities in context, core methods and algorithm for community detection, Quality functions, Agglomerative/Divisive algorithms, discuss different approached for clustering.

Module 8: Case study using real world data.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

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Text & References:

- Networks, Crowds and Markets by David Easley and Jon Kleinberg, Cambridge University Press, 2010
- Social and Economic Networks by Matthew O. Jackson, Princeton University Press, 2010.
- Easley and Kleinberg, "Networks, Crowds, and Markets: Reasoning about a highly connected world", Cambridge Univ. Press, 2010.
- Charu C. Aggarwal, "Social Network Data Analytics", Springer, 2011.
- Robert A. Hanneman and Mark Riddle, "Introduction to social network methods", University of California, 2005.
- Jure Leskovec, AnandRajaraman, and Jeffrey D. Ullman, "Mining of Massive Datasets", Cambridge University Press, 2 edition, 2014.
- Wasserman, S., & Faust, K, "Social Network Analysis: Methods and Applications", Cambridge University Press; 1 edition, 1994.

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NATURAL LANGUAGE PROCESSING

Course Code: DSC4305 **Credit Units-02**

Course Contents:

Module 1: Introduction to text mining
Introduction, Challenges of Text Processing, Character-Set Dependence, Language Dependence, Corpus Dependence, Application Dependence

Module 2: Exploring Text Data For Preliminary Ideas
A case study for a brief introduction, Examine multiple document corpus of text, Creation of text corpus, Text pre-processing, Stemming, Word tokenisation, Word vectorisation, Word embedding

Module 3: Natural Language Processing:
Sentiment Analysis, Word Frequency in text data, Wordclouds for visualizing sentiments with a case study, Wordclouds for Visualizing text data, Tidy wordclouds, Topic modelling a document

Module 4: Text Data and Machine Learning
Clustering for text data, Clustering tweets, Regression on text data, Introduction to RTextTools, More on RTextTools, Word2Vec approach, The Doc2Vec approach, Doc2Vec approach for predicting a binary outcome, Doc2Vec approach for multi-class classification

Module 5: Sentiment Analysis
What is sentiment, What is sentiment analysis, Scope of sentiment analysis: Document level, Sentence level, Sub-sentence level, Types of sentiment analysis, Word embeddings, Word associations or Text similarities, Building dictionaries, Summarise text, Polarity calculation, Algorithms for sentiment analysis: Rule based, Automatic Hybrid

Module 6: Case study using real world data.
Identify Spam-ham Emails or sms classification.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

- HANDBOOK OF NATURAL LANGUAGE PROCESSING Ralf Herbrich and Thore Graepel
- Text Mining with R by Julia Silge and David Robinson.
- Natural Language Processing with Python by Steven Bird, Ewan Klein and Edward Loper.
- Taming Text by Grant Ingersoll, Thomas Morton and Drew Farris.
- Foundations of Statistical Natural Language Processing by Christopher Manning and Hinrich Schütze.

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GRAPH & SOCIAL NETWORK ANALYSIS LAB

Course Code: DSC4306 **Credit Units-01**

Course Contents:

Module 1: Study Tools for graphs and network study :
Case studies will be implement by using any programming language such as R or python. Learn other tools like Cytoscape and Gephi, and igraph

Module 2: Introduction to graph theory
Input graph data : Read different network format, load network data, Construct network from matrix, Adjacency matrix. Input different types of networks : Undirected, directed graphs, Cyclic, Directed acyclic graphs, trees, weighted graphs, bipartite graph. Study data structures of the graphs. Adjacency matrix, adjacency list.

Module 3: Study different network models
Small world phenomena, Scale free network, Erdös-Rényi model for random graphs, Watts and Strogatz model, Barabasi-Albert model

Module 4: Stduy network properties
Degree distribution, power law, graph density, graph isomorphism, path length, diameter, clique, shortest distance, clustering coefficient, network motifs, network centralities and node ranking, degree centrality, closeness centrality, betweenness centrality, eigenvector centrality, ecentricity centracility, subgraph centrality, matching index,

Module 5: Network randomization
Randomization with Erdös-Rényi model, Randomization with node degree conservation, Permutation of node labels

Module 6: Introduction to social network
Introduction to social network data, Different data format, Paths and Connectivity-Graphs to represent social relations. Working with network data- Network Datasets-Strong and weak ties - Closure, Structural Holes, and Social Capital.

Module 7: Data and Text Mining In Social Media
Data mining in nutshell, Social media, Motivations for data mining in social media, Data mining methods for social media. Social networking sites: illustrative examples. Text Mining: Keyword search, query semantics and answer ranking, Classification algorithms, Clustering algorithms.

Module 8: Community Detection in Social Networks
Introduction, Communities in context, core methods and algorithm for community detection, Quality functions, Agglomerative/Divisive algorithms, discuss different approached for clustering.

Module 9: Case study using real world data.

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Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

- Networks, Crowds and Markets by David Easley and Jon Kleinberg, Cambridge University Press, 2010
- Social and Economic Networks by Matthew O. Jackson, Princeton University Press, 2010.
- Easley and Kleinberg, "Networks, Crowds, and Markets: Reasoning about a highly connected world", Cambridge Univ. Press, 2010.
- Charu C. Aggarwal, "Social Network Data Analytics", Springer, 2011.
- Robert A. Hanneman and Mark Riddle, "Introduction to social network methods", University of California, 2005.
- Jure Leskovec, AnandRajaraman, and Jeffrey D. Ullman, "Mining of Massive Datasets", Cambridge University Press, 2 edition, 2014.
- Wasserman, S., & Faust, K, "Social Network Analysis: Methods and Applications", Cambridge University Press; 1 edition, 1994.

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BIG DATA TOOLS & TECHNOLOGIES-III

Course Code: DSC4307 **Credit Units-01**

Course Contents:

Module 1: Apache Sqoop (SQL to Hadoop)
Sqoop Tutorial, How does Sqoop Work, Sqoop JDBCDriver and Connectors ,Sqoop Importing Data Various Options to Import Data (Table Import , Binary Data Import ,Speedup the Import ,Filtering Import, Full Database Import ,Introduction to Sqoop

Module 2: Apache Flume
Data Acquisition: Apache Flume Introduction, Apache Flume Components, POSIX and HDFS File Write, Flume Events, Interceptors, Channel Selectors, Sink Processor

Module 3: Advanced Apache Flume
Sample Twitter Feed Configuration, Flume Channel (Memory Channel, File Channel),Sinks and Sink Processors, Sources, Channel Selectors, Interceptors

Module 4: HBase Introduction
Fundamentals of HBase, Usage Scenario of HBase, Use of HBase in Search Engine, HBase Data Model (Table and Row, Column Family and Column Qualifier, Cell and its Versioning, Regions and Region Server), HBase Designing Tables, HBase Data Coordinates, Versions and HBase Operation (Get/Scan, Put, Delete)

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

- Apache Sqoop Cookbook, Kathleen Ting , Jarek Jarcec Cecho
- Using Flume: Flexible, Scalable and Reliable Data Streaming, Hari Shreedharan
- Hbase The Definitive Guide, Lars George
- Apache Hadoop Yarn, Arun Murthy

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GENERALIZED & LINEAR MODELING LAB

Course Code: DSC4308 **Credit Units-01**

Course Contents:

Module 1: Linear Regression Models:
Multiple regression model, Parameter estimation, Maximum likelihood, Model adequacy checking, Weighted least squares with case studies

Module 2: Nonlinear Regression Models:
Linear and Non linear regression models, transforming a linear model, Parameter estimation with case studies

Module 3: Logistic and Poisson Regression Models:
Logistic regression, Poison regression, Overdispersion with case studies

Module 4: The Generalized Linear Model: Exponential family, Likelihood equations, Quasi likelihood, Gamma family, The power function, Generalized Estimating Equation with case studies

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

- Generalised Linear Models: With Applications in Engineering and the Sciences by Raymond H. Mysers, Douglas C. Montgomery, G. Geoffrey Vining, Timothy J. Robinson
- Data Analysis Using Regression and Multilevel/ Hierarchical Models, Andew Gelman and Jennifer Hill
- Categorical data analysis, Ala Agresti

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TIME SERIES LAB

Course Code: DSC4309 **Credit Units-01**

Course Contents:

Module 1: Autoregressive-moving average models ARMA
Moving average models MA(q). Condition of invertability. Autoregressive models AR. Yull-Worker equations. Stationarity conditions. Autoregressive-moving average models ARMA with case studies

Module 2: Coefficient estimation in ARMA processes. Box-Jenkins' approach
Coefficients estimation in autoregressive models. Coefficient estimation in ARMA processes. Quality of adjustment of time series models. AIC information criterion. BIC information criterion. "Portmonto"-statistics. Box-Jenkins methodology to identification of stationary time series models with case studies

Module 3: Forecasting in the framework of Box-Jenkins model
Forecasting, trend and seasonality in Box-Jenkins model with case studies

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

- Enders W. Applied Econometric Time Series. John Wiley & Sons, Inc., 1995
- Mills, T.C. The Econometric Modelling of Financial Time Series. Cambridge University Press, 1999
- Andrew C. Harvey. Time Series Models. Harvester wheatsheaf, 1993.
- Andrew C. Harvey. The Econometric Analysis of Time Series. Philip Allan, 1990.Machine Learning I

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DEEP LEARNING & NEURAL NETWORKS LAB

Course Code: DSC4310 **Credit Units-01**

Course Contents:

Module 1: Neural Networks Basics:
Calculation of Logistic Regression Cost Function, Implementation of Gradient Descent, Derivatives, More Derivative Examples, Computation graph, Derivatives with a Computation Graph, Logistic Regression Gradient Descent, Gradient Descent using case studies

Module 2: Shallow neural networks:
Neural Network Representation, Computing a Neural Network's Output, Vectorizing across multiple examples, Calculation of Activation functions, non-linear activation functions, Derivatives of activation functions, Gradient descent for Neural Networks, Backpropagation intuition, Random Initialization using case studies

Module 3: Deep Neural Networks:
Developing a Deep L-layer neural network, Forward Propagation in a Deep Network, Getting your matrix dimensions right, Understanding Building blocks of deep neural networks, Forward and Backward Propagation, Parameters vs Hyperparameters using case studies

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

- Deep learning: adaptive computation and machine learning by Bengio, Yoshua, Courville, Aaron, Goodfellow, Ian J
- Deep Learning: A Practitioner's Approach by J. Patterson, A. Gibson
- Neural Networks and Deep Learning: A Textbook by Charu C. Aggarwal
- Neural Networks and Deep Learning by Michael Nielsen

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WEATHER PREDICTION

Course Code: DSC4311 **Credit Units-01**

Course Contents:

Weather Analysis, Collect dataset, Make model, Apply Machine Learning algorithm to predict weather, Compare the output form the Weather forecasting model and the data from the observation station, Use data science tools to find out when the prediction model may not accurate, predict the extreme weather, Develop visualization program for easy understanding.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

- Weather Analysis and Forecasting, Patrick Santurette

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DISEASE CLASSIFICATION

Course Code: DSC4312 **Credit Units-01**

Course Contents:

Disease classification, Importance of disease classification, Datasets used for classification problem, Data processing steps, Disease classification using machine learning algorithm, Estimate prediction parameter for the classification schema

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

- James, Gareth, Daniela Witten, Trevor Hastie, and Robert Tibshirani. 2013. An Introduction to
- Statistical Learning: With Applications in R. New York: Springer
- Lantz, B. 2013. Machine learning with R. Packt Publishing, Birmingham
- Maindonald J, Braun J. Data Analysis and Graphics Using R. Cambridge University Press: Cambridge, 2003
- Crawley MJ, (2005) Statistics: an introduction using R. Volume 1. 1st edition. New York: John Wiley & Sons.
- Seefeld, K. & Linder, E. (2007), Statistics Using R with Biological Examples . Department of
- Mathematics & Statistics, University of New Hampshire, Durham, NH, USA.
- Vinod, H.D. (Ed.) (2010). Advances in social science research using R, Springer, ISBN 978-1-4419-1763-8, New York

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CUSTOMER BEHAVIOR ANALYSIS

Course Code: DSC4313 **Credit Units-01**

Course Contents:

Introduction: What is "customer analytics" and why do we do it?, Specific Loyalty Matrix tools & biases.

Getting Started: A Brief review of what needs to be done before serious analysis can start, Sourcing business requirements, Sourcing raw data, Profiling raw data, Data quality control & remediation.

Explorative Data Analysis (EDA) and Basic Statistics

Mining, Modeling, Segmentation & Prediction: Decision Tree method, Clustering method and Association Model

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

- Behavioral Research Data Analysis with R- Yuelin Li, Jonathon Baron

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SUMMER INTERNSHIP EVALUATION

Course Code: DSC4335 **Credit Units: 08**

Guidelines:

There are certain phases of every Intern's professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship program can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal classroom situations. These attributes are intellectual ability, professional judgment and decision-making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc.

In order to achieve these objectives:

- **Each student will be allotted a supervisor** for proper guidance.
- **Student will first submit synopsis in the format given by coordinator/supervisor.**
- Student will maintain a file (**Internship File/Project Report**). **Further, coordinator will provide NTCC project guidelines and sample to help in preparation of file.** The Internship File aims to encourage students to keep a personal record of their learning and achievement throughout the Programme. It can be used as the basis for lifelong learning and for job applications. Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development. The File will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and their own personal contribution to the organization.

The **layout guidelines** for the Project Report

1. File should be in the following specification

- A4 size paper
- **Font**

For normal text Font Type and Size must be- Times New Roman, 12 pt. The minimum font size of materials within a table or a figure can be 10 point.

- **Margins**

A margin of 3.75 cm (1½ inch) is to be given on the binding edge while on the other sides it is to be 2.5 cm (1 inch). The text of the report, including headings, figures, tables, and notes, but excluding page numbers, must be accommodated within the page area.

- **Line Spacing**

The line spacing in the main text must be between one-and-a-half (1.5). Single line spacing should be given for figure captions, table titles, figure legends, and footnotes. Equations, tables, figures, and quotations should be set off from the main text with adequate space (not less than the normal line spacing adopted for the main text). Two consecutive paragraphs should be separated by a spacing which must be larger than the line spacing adopted for the text.

- **Tables and Figures**

Each sketch, drawing, graph and photograph should have a figure number and title below the figure etc. Numbering should be sequential, chapter wise. For instance, if there are 24 figures chapter 3

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spread over all of its sections the figure numbers run from Figure 3.1 through Figure 3.24. In figures experimental data should typically be represented by centered symbols, and theoretical data by continuous curves.
Each table should have a table number and caption above the table. Numbering should be sequential, chapter wise, as in the case of Figure numbers. For instance, if there are 18 tables in chapter 3 the table numbers run from Figure 3.1 through Figure 3.18.
Make sure that figures and tables are complete in other respects such as legends, references (if any) and coordinate labels with units. Each figure and table must be explicitly referred to in the text and located where its first reference occurs, preferably after the reference.

- **Drawings**

All engineering drawings must conform to relevant Standards and should include a title block. If drawings are large they should be included at the back of the report in a separate pocket. In case drawings are made using CAD packages, a CD ROM should be included which contains all the files and details of the packages used.

- **Equations**

The numbering of equations should be sequential, chapter wise. Numbered equations must be explicitly referred to in the text.

2. Report Size: The maximum number of pages of the Report should be preferably between 50-80 pages.

3. Report Layout: The report should contain the following components
Front Page
Table of Content
Acknowledgement
Student Certificate
Company Profile (optional)
Introduction
Main Body
References / Bibliography

The File will include ***five sections*** in the order described below. The content and comprehensiveness of the main body and appendices of the report should include the following:
1. **The Title Page**--Title - An Internship Experience Report For (Your Name), name of internship organization, name of the Supervisor/Guide and his/her designation, date started and completed, and number of credits for which the report is submitted.
2. **Declaration by the Students-**This is page number (i), the beginning of the small case Roman numeral page numbers. The student has to give a declaration to the effect that the data used for the work, the work depicted in the report, and the written material contained in the report are not copied from others and that due permission has been taken from, and due credit has been given to, the sources whenever they are used.
3. Certificate-This is page number (ii). The certificate will be signed by the Faculty Supervisor(s) before the viva-voce after verifying the format and by the Head of the Department after review with the Supervisor(s).
4. Acknowledgements-This is page number (iii). Keep this brief and avoid using informal language. This page must be signed by the candidate.
5. Abstract and **Keywords-**This is page number (iv). The abstract (preferably one page) should contain the context/relevance of the problem at hand, a description of what was done and a gist of the significant observations/results.
The keywords (maximum 6) are a hint that what is contained in the report.

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7. Contents-This is page number (v). The table of Contents should be titled just *Contents* (not Table of Contents). Try to fit it into one or two pages.
8. **Introduction**--short, but should include how and why you obtained the internship experience position and the relationship it has to your professional and career goals.
9. **Main Body**--should include but not be limited to daily tasks performed. Major projects contributed to, dates, hours on task, observations and feelings, meetings attended and their purposes, listing of tools and materials and their suppliers, and photographs if possible of projects, buildings and co-workers.
10. **References / Bibliography** --This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

ASSESSMENT OF THE INTERNSHIP FILE

Continuous Internal Assessment		**Final Assessment**
40 Marks		60 Marks

Continuous Internal Assessment consists of topic relevance, progress report and synopsis marks. Final Assessment includes viva, presentation and report marks.

Examination Scheme:

Components	**V**	**S**	**R**	**PR**	**FP**
Weightage (%)	20	20	20	20	20

V – Viva, S – Synopsis, FP – Final Presentation, R – Report, PR-Progress Report

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DISSERTATION/ PROJECT REPORT/ PRESENTATION/ VIVA VOCE

Course Code: DSC4437 **Credit Units: 20**

GUIDELINES FOR DISSERTATION

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage.

The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

In general, the File should be comprehensive and include

A short account of the activities that were undertaken as part of the project;

A statement about the extent to which the project has achieved its stated goals.

A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;

Any activities planned but not yet completed as part of the DISSERTION, or as a future initiative directly resulting from the project;

Any problems that have arisen that may be useful to document for future reference.

- **Report Layout**

The report should contain the following components:

- **Title or Cover Page**

The title page should contain the following information: Project Title; Student's Name; Course; Year; Supervisor's Name.

- **Acknowledgements** (optional)

Acknowledgment to any advisory or financial assistance received in the course of work may be given.

- **Abstract**

A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project

- **Table of Contents**

Titles and subtitles are to correspond exactly with those in the text.

- **Introduction**

Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

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- **Materials and Methods**

This section should aim at experimental designs, materials used. Methodology should be mentioned in details including modifications if any.

- **Results and Discussion**

Present results, discuss and compare these with those from other workers, etc. In writing these section, emphasis should be given on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

Note that in writing the various secions, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary never write in "point" form.

- **Conclusion**

A conclusion should be the final section in which the outcome of the work is mentioned briefly.

- **Future prospects**

- **Appendices**

The Appendix contains material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

- **References / Bibliography**

This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Examples

For research article

Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichia coli* O157: H7. *Clin Microbiol Infect*, **8** (suppl 1): 116–117.

For book

Kowalski,M.(1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67

ASSESSMENT OF THE DISSERTATION FILE

Essentially, marking will be based on the following criteria: the quality of the report, the technical merit of the project and the project execution.
Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project.
Project execution is concerned with assessing how much work has been put in.
The File should fulfill the following ***assessment objectives:***

Range of Research Methods used to obtain information

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Execution of Research

Data Analysis
Analyse Quantitative/ Qualitative information
Control Quality

Draw Conclusions

Examination Scheme:

Dissertation	50
Viva Voce	50
Total	**100**

Selecting the Dissertation Topic
It is usual to give you some discretion in the choice of topic for the dissertation and the approach to be adopted. You will need to ensure that your dissertation is related to your field of specialization.

Deciding this is often the most difficult part of the dissertation process, and perhaps, you have been thinking of a topic for some time.

It is important to distinguish here between 'dissertation topic' and 'dissertation title'. The topic is the specific area that you wish to investigate. The title may not be decided until the dissertation has been written so as to reflect its content properly.

Few restrictions are placed on the choice of the topic. Normally we would expect it to be:
- relevant to business, defined broadly;
- related to one or more of the subjects or areas of study within the core program and specialisation stream;
- clearly focused so as to facilitate an in-depth approach, subject to the availability of adequate sources of information and to your own knowledge;
- of value and interest to you and your personal and professional development.

Planning the Dissertation
This will entail following:
- Selecting a topic for investigation.
- Establishing the precise focus of your study by deciding on the aims and objectives of the dissertation, or formulating questions to be investigated. Consider very carefully what is worth investigating and its feasibility.
- Drawing up initial dissertation outlines considering the aims and objectives of the dissertation. Workout various stages of dissertation
- Devising a timetable to ensure that all stages of dissertation are completed in time. The timetable should include writing of the dissertation and regular meetings with your dissertation guide.

The Dissertation plan or outline
It is recommended that you should have a dissertation plan to guide you right from the outset. Essentially, the dissertation plan is an outline of what you intend to do, chapter wise and therefore should reflect the aims and objectives of your dissertation.

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There are several reasons for having a dissertation plan

- It provides a focus to your thoughts.
- It provides your faculty-guide with an opportunity, at an early stage of your work, to make constructive comments and help guide the direction of your research.
- The writing of a plan is the first formal stage of the writing process, and therefore helps build up your confidence.
- In many ways, the plan encourages you to come to terms with the reading, thinking and writing in a systematic and integrated way, with plenty of time left for changes.
- Finally, the dissertation plan generally provides a revision point in the development of your dissertation report in order to allow appropriate changes in the scope and even direction of your work as it progresses.

Keeping records

This includes the following:

- Making a note of everything you read; including those discarded.
- Ensuring that when recording sources, author's name and initials, date of publication, title, place of publication and publisher are included. (You may consider starting a card index or database from the outset). Making an accurate note of all quotations at the time you read them.
- Make clear what is a direct a direct quotation and what is your paraphrase.

Dissertation format

All students must follow the following rules in submitting their dissertation.

- Front page should provide title, author, Name of degree/diploma and the date of submission.
- Second page should be the table of contents giving page references for each chapter and section.
- The next page should be the table of appendices, graphs and tables giving titles and page references.
- Next to follow should be a synopsis or abstract of the dissertation (approximately 500 words)
- Next is the 'acknowledgements'.
- Chapter I should be a general introduction, giving the background to the dissertation, the objectives of the dissertation, the rationale for the dissertation, the plan, methodological issues and problems. The limitations of the dissertation should also be hinted in this chapter.
- Other chapters will constitute the body of the dissertation. The number of chapters and their sequence will usually vary depending on, among others, on a critical review of the previous relevant work relating to your major findings, a discussion of their implications, and conclusions, possibly with a suggestion of the direction of future research on the area.
- After this concluding chapter, you should give a list of all the references you have used. These should be cross - references with your text. For articles from journals, the following details are required e.g.

  Draper P and Pandyal K. 1991, The Investment Trust Discount Revisited, Journal of Business Finance and Accounting, Vol18, No6, Nov, pp 791-832.

  For books, the following details are required:
  Levi, M. 1996, International Financial Management, Prentice Hall, New York, 3rd Ed, 1996

- Finally, you should give any appendices. These should only include relevant statistical data or material that cannot be fitted into the above categories.

The Layout Guidelines for the Dissertation

- A4 size Paper

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- Font: Arial (10 points) or Times New Roman (12 points)
- Line spacing: 1.5
- Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

Guidelines for the assessment of the Dissertation
While evaluating the dissertation, faculty guide will consider the following aspects:

1. Has the student made a clear statement of the objective or objective(s).
2. If there is more than one objective, do these constitute parts of a whole?
3. Has the student developed an appropriate analytical framework for addressing the problem at hand.
4. Is this based on up-to-date developments in the topic area?
5. Has the student collected information / data suitable to the frameworks?
6. Are the techniques employed by the student to analyse the data / information appropriate and relevant?
7. Has the student succeeded in drawing conclusion form the analysis?
8. Do the conclusions relate well to the objectives of the project?
9. Has the student been regular in his work?
10. Layout of the written report.

Assessment Scheme:

Continuous Evaluation: (Based on Abstract, Regularity, Adherence to initial plan, Records etc.)	40%
Final Evaluation: Based on,	60%
Contents & Layout of the Report,	20
Conceptual Framework,	05
Objectives & Methodology and	05
Implications & Conclusions	10
Viva & Presentation	20

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Amity School of Communication

Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication

FLEXILEARN
-Freedom to design your degree



Curriculum & Scheme of Examination

2023

AMITY UNIVERSITY HARYANA

GURUGRAM

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Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication
SEMESTER-I

DJRN2151	UNDERSTANDING MASS COMMUNICATION	L	T	P	FW/Proj	C
Version	2023	2	1	2	-	4
Pre-requisites/Exposure	NIL					
Co-requisites	NIL					

Catalog Description

Students will begin with understanding basics of communication, its various forms and then acquire knowledge of various traditional media that provided vital means of communications in group settings. Tracing the evolution, they would then discover various forms of contemporary mass communication and the number of professions these media have given birth to. Lastly, they would understand how digital media is the way forward and the various platforms and technologies, imagining the future of mass communications with digitization at the center of this growth and development.

Course Objectives

The objectives of this course are:

- To explain the basics of communication including its various levels and elements.
- To inform about traditional forms of communication, their significance and current scenario.
- To discuss about the different forms of Print, Electronic and Digital media along with their social, economic and political functions.
- To inform about the various professions under mass communication and the plethora of new job opportunities opening up in the field.
- To discuss about prominent developments in the area of digital communication, important media technologies that are shaping a new world.

Course Outcomes

On completion of this course, the students will be able to:

Expected Outcome	Bloom's Taxonomy Level
CO1. Explain what is communication along with aspects such as possible barriers, various elements and levels of communication.	L1, L2
CO2. Define the different kinds of traditional media along with their evolution and significance.	L1, L2
CO3. Discuss various types of Print, Electronic and Digital media, their evolution and various functions.	L1, L2
CO4. Analyze the inter-relationships among Print, Electronic and Digital media along with the scenario of media convergence.	L4
CO5. Identify the different options available under the banner of professions in mass communications.	L1, L2
CO6. Evaluate the new and emerging trends in digital communication and reflect upon the future of mass communication.	L4, L5

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Modules	Blooms level*	Number of hours
MODULE 1: Basics of Communication What is communication? Why do we need communication? Process and elements of communications, Levels of communication, Barriers to effective communication, Forms and Functions of communication, Major vehicles of communication (Introduction to traditional and mass communication vehicles)	L1, L2	6
MODULE 2: Understanding Traditional Media What is traditional media (street theatre, puppetry, music, dance/ballads, folk and tribal art, local fairs); Historical and contemporary significance of such media (tool for political, social, economic, health awareness and sensitization,) dwindling popularity of such media and possible reasons.	L1, L2	7
MODULE 3: Understanding Mass Communication: Print & Electronic Media What are different forms of Print (newspapers, magazines, periodicals etc.) and Electronic Media (Radio, T.V, films). Inception of Print and Electronic Media and motivating factors; their social, economic and political functions.	L1, L2	8
MODULE 4: Understanding Mass Communication: Digital Media What is digital media? Factors leading to inception of the Internet, Journey of the Internet (from earliest platforms, their tools and functions to contemporary use,) the present scenario of Media convergence.	L1, L2, L4	8
MODULE 5: Overview of Professions in Mass Communication Historical relevance and advent of Journalism, Advertising, Public Relations, Photography, Films, Television and Radio professions. Professions in digital communication, especially in management of communication for different purposes like Branding, Media planning & buying, Events, Social media managers.	L1, L2	8
MODULE 6: Futuristic Communication & Expansions in Digital Media New and Emerging Trends in digital communication Overview of various digital media platforms. Overview of latest and upcoming media technologies (like Artificial Intelligence, its tools, AR and VR etc.) and possible effects on interpersonal and mass communication Pros and Cons of such media use for society (Case studies).	L4, L5	8

*Bloom's Level:
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

1. Madhu K, Priyadarshini K, Umang G. (2022). *Fundamentals of Journalism and Mass Communication.* Manda Publishers
2. Abhay Chawla. (2021). *New Media and Online Journalism.* (1st ed.) Pearson Education

Reference Books.

1. Keval, J. Kumar. (2020). *Mass Communication in India.* (5th edition). Jaico Publishing House.
2. Fakira Mohan Nahak. (2020). *Newspapers to New Media: Myriad Ways of Mass Communication*. Rudra Publishers and Distributors

Modes of Evaluation:

Quiz/Assignment/ Case Presentations/Written Examination

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Examination Scheme:

A: Attendance, CP: Case Presentation, CT: Class Test, H: Home Assignment, EE: End

Components	A	CP	CT	H	EE
Weightage (%)	5	5	10	10	70

CO, PO and PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	2	3	3	3	3	3	3	1	3	3	3
CO2	2	3	3	3	3	3	1	3	3	3	3
CO3	1	3	3	3	3	3	2	1	3	3	3
CO4	1	3	3	3	3	3	3	1	3	3	3
CO5	2	3	3	3	3	3	3	3	3	3	3
CO6	1	3	3	3	3	3	3	1	3	3	3

1:Strongly Related, 2: Moderately Related and 3: Weakly Related

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DJRN2101	STILL PHOTOGRAPHY AND IMAGE EDITING	L	T	P	FW/ Proj	C
Version	**2023**	2	1	2	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course is designed to offer the students a thorough conceptual and practical understanding of uses, techniques, aesthetics and various genres of still photography. Besides, the students shall also learn the need and about popular tools for photo editing.

Course Objectives

This course is designed to enable students to understand the meaning, importance, evolution, types and genres of still photography. The student shall be introduced to the concepts and techniques of working of cameras including operations of digital cameras, exposure control, focus control, composition and visual storytelling. The learner shall also be offered knowledge about photo-editing and various tools available for the same.

Course Outcomes (COs):

On completion of this course, the students will be able to

- Define photography, classify the genres and types, and recognize the importance of photography in daily human life as art and as a medium of communication from its birth till now.
- Classify and explain the working of different types of cameras and associated accessories.
- Handle the camera and other photography equipment professionally, explain and demonstrate the working of various controls on still cameras.
- Analyze and evaluate the photographs on basis of exposure, focus, creative lighting, composition and visual storytelling. Critically appreciate and capture photographs of daily human life as art and as a medium of communication
- Shoot professional looking photographs as per requirements of different photography genres.
- Examine the need for photo-editing and recommend the best software and tools for it. Edit photographs on Smartphones and on PC using various software.
- Create and present a portfolio of their photography work both in soft as well as in hard copy.

Syllabus / Topics to be Covered

Modules	Blooms level*	Number of hours
Module I: Intro to Visual Communication and Photography Definition, Types, Uses, Principles of Light and Genres of Photography World renowned photographers from different genres Evolution and development of Photography Holding cameras properly, identifying the controls on DSLR/Mirrorless cameras, controlling the focus, exposure and apply all technical adjustments on cameras to shoot photographs.	**L1, L2, L3**	15
Module II: Photography as an art and a medium of communication Visual Storytelling, its importance, and elements Rules of Composition including (but not limited to) 1. Shooting with purpose and perspective	**L1, L2, L3**	15

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2. Using Leading Lines / Sweeping Curves / Shapes 3. Photo orientation 4. Viewpoints and camera angles 5. Using frames 6. Negative & Positive Spaces 7. Avoiding distractions and isolating subject 8. Rule of Thirds 9. Golden Ratio 10. Eye Movement and Centre of Attention. 11. Create Depth 12. Proximity, Scale and Proportion 13. Visual Balance 14. Symmetry & Patterns 15. Creative lighting (source, direction, reflections and colours) 16. Simplicity 17. Juxtaposition		
Module III: Techniques of Digital Photography Digital Imaging Construction (Size, Resolution of Digital Images) Photography image sensors (CCD and CMOS) Formats of a Digital Image Types of Digital Cameras, Lenses and Accessories Focus and Exposure Control Depth of Field and White Balance Control Read photographs for creative indoor and outdoor lighting (source, direction, reflections and colours) Identify, differentiate and evaluate the use of different studio lights and light modifiers as per project requirements.	**L2, L3, L4, L5, L6**	15
Module IV: Techniques and aesthetic variations for various genres Portrait and People Photography Fashion Photography Nature, Landscapes & Wildlife photography Product & eCommerce Photography Event Photography Journalism (Photography for newspapers and magazines)	**L2, L3, L4, L5, L6**	15
Module V: Digital Image Editing & Portfolio Presentation Commonly used image editors for Smart Phone Editing images with Adobe Photoshop ● Understanding Photoshop Interface ● Adobe Photoshop Tools & Shortcut Keys ● Creating Selection ● Understanding Layers, Masking & Colour Channels, Blending Options etc. ● Adding and subtracting of digital picture elements (like clouds, hair, makeup, tattoos etc) ● Skin tone correction ● Using Digital Filters and scripts. Printing and sharing Digital Portfolios Exhibiting and displaying of original photography work in an exhibition after careful curation of photography work	**L3, L4, L5, L6**	15

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

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Text Books

1. Langford Michael. (2015), Langford's Basic Photography: The Guide for Serious Photographers; Focal Press
2. Corbett Bill. (2002), *A simple guide to 35mm photography*, Sydney:4C Publishing Pty Ltd

Reference Books

1. Stephen G. Anchell, The Darkroom Cookbook; Burlington: Focal Press
2. Naomi Rosenblum. (2008), *A World History of Photography*, New York, Abbeville Press.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**P**	**A**	**CT**	**EE**
Weightage (%)	15	5	10	70

CT: Class Test, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	--	2	--	--	--	--	--	1	2	2	2
CO2	--	2	--	--	--	--	--	1	2	2	2
CO3	--	2	--	--	--	--	--	1	2	2	2
CO4	--	2	--	--	--	--	--	1	--	2	2
CO5	--	--	--	--	--	--	1	1	2	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-II

DJRN2251	PRINT MEDIA: REPORTING & EDITING	L	T	P	FW/ Proj	C
Version	**2023**	2	1	2	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description
This course describes various aspects of print journalism. The course begins with the history of Indian Press. It introduces basics of journalism and news reporting and editing. The aim of this course is to explore various dimensions of print journalism in concept and practice.

Course Objectives
The objective of this course is to
1. Provide an overview of the fundamentals of Print Jour nalism.
2. Introduce the students to the most important aspects of print journalism – reporting & editing.
3. Describe the growth of Press in India.
4. Introduce beat reporting and discuss the finer points of specialized writing.
5. Provide understanding for different types of journalistic writing.
6. Provide knowledge regarding investigative reporting and its tools.

Course Outcomes (COs):
On completion of this course, the students will be able to
CO1: Outline the history of print journalism in India.
CO2: Describe and apply various concepts of print journalism such as news, news values, style guides, reporting, editing etc.
CO3: Describe the process of news reporting and editing.
CO4: Explain the finer points of beat reporting.
CO5: Apply conceptual knowledge to write different types of features and reviews.
CO6: Argue if sting journalism is a healthy practice in a democracy.

Modules	Blooms level*	Number of hours
MODULE I: History of Press in India Press in pre-independent India, Growth of Press post-independence, Role of English and vernacular press during freedom struggle, Growth of newspapers, magazines and publication houses	L1, L2	12
MODULE II: Reporting What is journalism, What is News, News Values & Sources of News, Basic Elements of News, Qualities and responsibilities of a reporter, Interviewing skills required for reporting, Types of reporting. Structure of news report, Lead and types of leads, Newsroom set up	L1, L2, L3, L4	14
MODULE III: Beat Reporting Covering a news beat, coverage of various beats: crime, education, health, civic affairs and local government, political reporting (covering political	L1, L2, L3	14

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parties/events/rallies/elections), Parliament reporting, covering the government (PIB, ministries), legal reporting, sports reporting, entertainment & lifestyle reporting		
MODULE IV: Specialised Writing How to write a feature, different types of features, book reviews and film reviews	L3	9
MODULE V: Investigative Reporting Definition and elements, tools of investigative reporting, importance of sources, sting operations and latest trends, relevant case studies: Indian and international	L1, L5	11

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

1. Sharma, Seema (2005) *Journalism: Reporting*, New Delhi: Anmol Publications Pvt. Ltd.
2. Fox, Walter (2001)*Writing the News: A Guide for Print Journalists*, New Jersey: Wiley-Blackwell
3. Mencher, Melvin (1989)*Basic News Writing*, U.S.A. : William C. Brown Publication
4. Rajan, Nalini (2007) *21st Century Journalism in India*, New Delhi : Sage India
5. Rick Wilber & Randy Miller (2002*) Modern Media Wring*, Belmont : Wadsworth Publishing Company

Reference Books

1. Hough, George A. (1995) *News Writing*, Boston : Houghton Miller
2. Fink, Conrad C. (2001*) Sports Writing: The Lively Game*, New Jersey : Wiley- Blackwell
3. Keeble, Richard (2001)*The Newspaper Handbook*, Abingdon : Rutledge
4. Kamath,MV (2012*) Journalism Reporting*, Noida : Vikas Publication
5. Rosenauer,Kenneth L (2004)*Storycrafting: A Process Approach to Writing News*, New Jersey: Wiley Blackwell

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	A	CP	CT	H	EE
Weightage (%)	5	5	10	10	70

A: Attendance, CP: Case Presentation, CT: Class Test, H: Home Assignment, EE: End

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	--	--	--	--	--	--	--	--	--	--	--
CO2	--	--	--	--	--	--	--	--	--	--	--
CO3	--	--	--	--	--	--	--	--	--	--	--
CO4	--	--	--	--	--	--	--	--	--	--	--
CO5	--	--	--	--	--	--	--	--	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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DJRN2201	CRITICAL THINKING: UNRAVELLING MEDIA	L	T	P	C
Version	2023	2	1	2	4
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

COURSE DESCRIPTION:

This course will examine, discuss and defamiliarize us from the different media that we can study. Any "technology" that changes the way we identify, understand, and relate to the world of mass media will be focused on. Critical thinking is reflective thinking focused on what to do or believe in when making decisions. Students will focus on honing the ability to understand, evaluate and create arguments that will enable them to become good critical thinkers. Based on selected readings from media studies and related fields, we will conduct creative experiments for a better understanding of the tools and technologies.

Course Objectives

The objective of this course is-

1. To develop a reasoned argument and hone necessary skills to make one. To also recognize fallacious arguments.
2. To evaluate the strength of evidence to support claim of arguments.

Course Outcomes

On completion of this course, the students will be able to

CO1. To identify important issues and concepts in the media studies field.
CO2. To analyze key theoretical and methodological concepts in the media domain.
CO3. To synthesize continued critical analyses of texts, institutions and audiences in the field of media.
CO4. To Demonstrate the ability to conduct research.

Course Content

Modules	Blooms level*	Number of hours
MODULE 1: Introduction What is/are Media? A Brief History of Media Studies McLughan: The Mechanical Bride What works, what doesn't: Examples. Ethical issues related to media: Privacy concerns, sensationalism & responsibility of Journalists	L1, L2	15

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MODULE 2: What are Critical Media Studies? • Kellner, Douglas (2015). "Cultural Studies, Multiculturalism, and Media Culture." In *Gender, Race, and Class in Media. ACritical Reader 4th ed.*, 7-19. Media Texts: Purposes and Target Audiences Key Concepts • Media are carefully wrapped packages. • Media construct versions of reality • Interpretation of media • Media & Money • Media promote agenda. Personal response to media texts Reasoning and Arguments. • Cavender & Kahane(2009). Logic and Contemporary Rhetoric: The Use of Reason in Everyday Life How we think: • Facts & Figures (De Bono, White Hat • Emotions & Feelings (De Bono, Red Hat) • Caution & Speculation (De Bono, Black & Yellow Hat) • Creative thinking (De Bono, Green Hat) • Creative thinking & Designing (De Bono Blue Hat)	L3	18
MODULE 3: What are Media Bias charts Creating media bias case studies/ Current debates : Highlight media bias, manipulation and other techniques used to influence audiences in the form of a created video content. Analyze media content such as news articles, advertisements or documentaries (identify the intended message, target audience, underlying assumptions and potential biases).	L4, L6	15
Module 4 Practice Analyzing, Interpreting, and Evaluating Media Texts Final Project Peer Evaluation for Media Literacy Through Critical Thinking	L3, L6	12

*Bloom's Level:
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Readings:

- The Mechanical Bride; Mc Luhan, 1951; Publisher: Basic Books
- A Rulebook for Arguments; Antony Weston,1992; Hacket Publishing
- Cultural Studies, Multiculturalism, and Media Culture; Douglas Kellner;
- Logic and Contemporary Rhetoric; Nancy M Cavender & Howard Kahane;2009
- Six Thinking Hats by Edward De Bono, 1985
- Current News paper clippings

References books:

- Media Literacy: An essential guide to critical thinking skills for our complex digital world Nick Pernisco; Publisher: Ingram Spark, 2020
- An Introduction to Critical Thinking; Madhucchanda Sen; Pearson, 2010

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

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Components	P	CT	A	EE
Weightage (%)	10	15	5	70

P- Project, C- Case Discussion/Presentation/Analysis, CT- Class Test, A- Attendance, EE- End Semester Examination

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	--	--	--	--	--	--	--	--	--	--	--
CO2	--	--	--	--	--	--	--	--	--	--	--
CO3	--	--	--	--	--	--	--	--	--	--	--
CO4	--	--	--	--	--	--	--	--	--	--	--
CO5	--	--	--	--	--	--	--	--	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-III

DJRN2351	ELECTRONIC MEDIA: RADIO AND TELEVISION	L	T	P	FW/ Proj	C
Version	**2023**	2	1	2	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

The course is designed to offer the students a comprehensive understanding of the evolution, technological transformations and socio-economic and developmental outcomes of two major means of electronic communication-- radio and television. The paper seeks to ground the students in both the theoretical and practical understanding of radio and TV production, the crew and equipment used, the various radio and TV formats and the aesthetics of the two media. For the practical component of the course, students will be required to write scripts for radio and TV shows that they will record and edit in class groups for assessment.

Course Objectives

This course is designed to enable students to appreciate the fine nuances, the art and aesthetics involved in radio and TV content production. A thorough understanding of the concepts and techniques of sound and visuals as means of communication will be achieved as students are exposed to a wide variety of popular radio and TV shows from India and abroad.

Course Outcomes (COs):

On completion of this course, the students will be able to

- The evolution of radio and TV as media of communication from the earliest inventions to contemporary times.
- Classify and explain the working of different types of microphones and sound recording systems and related accessories.
- Handle the TV cameras and other television production equipment, studio lighting and Tv production recording for a wide variety of shows and genres including news bulletins
- Master the art and craft of audio and audio-visual storytelling.
- Critically appreciate radio and television in the everyday life of our communities and society as not only the source of *information* but also of *education* and *entertainment*.
- Storytelling for radio and TV. Creating jingles, advertisements and other genres that are popular on AIR and FM radio. Storyboading and writing for TV production using single and multi-camera set-ups both in the studio and outdoors.

Syllabus / Topics to be Covered

Modules	Blooms level*	Number of hours
Module I: Evolutionary history of Radio 1. History and Development of Radio in the World 2. Characteristics of radio as a medium 3. The coming of the Radio in India 4. BBC and the early radio broadcasting in India 5. Radio for Propaganda, Radio and Nazi wartime propaganda	**L1, L2, L3**	15

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6. All India Radio- purpose, reach and impact- Developmental and Educational Role 7. Music and fiction on radio 8. Shortwave radio, FM radio 9. Community and Campus radio stations 10. Internet radio and social media		
Module II: Sound recording, radio production and genres/ formats **<u>Introduction to Sound</u>** 1. Types of Sound: Natural, Ambient, Recorded, Music and effects, voice modulation 2. Types of Microphones and their uses 3. Radio Studio Setup, Lay-out and radio mixers- Speaker Control, Subject Control and Technical Control 4. Types of recording- Tape Recording, Digital Recording 5. Outdoor Recording of radio programmes **<u>Introduction to Radio Formats</u>** • News bulletins on Radio- radio host and styles • Documentary • Radio Feature • Talk Shows and interviews • Radio Drama • Radio interviews and chat shows • Sports broadcasting • Music shows and Radio Jockeys • Jingles	**L1, L2, L3**	15
Module III: Technological developments in the audio-visual- the advent of the television	**L2, L3, L4, L5, L6**	15
Module IV: TV Production- genres, aesthetics and techniques **<u>Introduction to Visuals</u>** 1. The Power and Influence of Visuals 2. The Video-camera: types of shots, camera positions, shot sequences, shot length 3. Lighting: The importance of lighting, types of lights, 3 point lighting 4. Television setup: The TV studio- elements and placement of equipment, camera set up and the PCR Electronic News Gathering (ENG) – single camera, small crew Electronic Field Production (EFP) - 1. Single camera set up 2. Multi-camera set up 3. Live show production **<u>Major TV Genres</u>** • News formats- bulletins and news features, news talk shows, news anchors and news readers • TV Documentary • Fiction- TV serials and soaps • Docudrama • Sports television • Reality TV • Animation	**L2, L3, L4, L5, L6**	15

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• OTT and the web series • Convergence and multimedia- emerging trends, digital storytelling • Use of facebook and social media handles by radio stations and TV channels		
Module V: Practical work • Pre-Production • Production • PostProduction (Ideation, Scripting, storyboarding) A. Writing a Radio Feature/ Interview/ drama (students can choose any one) B. Writing for TV production – news bulletin/feature story/TV documentary/ TV talk show/ TV Advertisement or PSA ((students can choose any one)	**L3, L4, L5, L6**	15

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Amanda Willett (2013) *Media Production: A Practical Guide to Radio and TV*. 1st Edition, New Delhi: Routledge.
- Andrew Boyd(1994)Broadcast Journalism, Techniques of Radio and Television News . Focal Press London.
- Lucy Brown (2016) The TV Studio Production Handbook. I. B. Tauras

Reference Books

- Writing News for TV and Radio by Mervin Block
- E*ssential Radio Journalism: How to produce and present radio news* (Professional Media Practice) by Peter Stewart, by Paul Chantler
- Keval J Kumar, 'Mass Communication in India', Jaico Publishing House.
- K.M Shrivasta, 'Radio and TV Journalism', Sterling Publishers Pvt. Ltd, New Delhi.
- Usha Raman, ' Writing for the Media', Oxford University Press, New Delhi

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**P**	**A**	**CT**	**EE**
Weightage (%)	15	5	10	70

CT: Class Test, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	--	--	--	--	--	--	--	--	--	--	--
CO2	--	--	--	--	--	--	--	--	--	--	--
CO3	--	--	--	--	--	--	--	--	--	--	--
CO4	--	--	--	--	--	--	--	--	--	--	--

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CO5	--	--	--	--	--	--	--	--	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

DJRN2301	**NEWS AND CONTEMPORARY ISSUES**	**L**	**T**	**P/FW/ Project**	**C**
Version	2023	2	1	2	4
Pre-requisites/Exposure	Nil				
Co-requisites	NIL				

Course Description:

This course aims to cultivate and enhance critical thinking abilities in the realm of news and information analysis. By delving into the intricate nuances of contemporary issues, students will gain a fundamental understanding of the multifaceted dynamics that shape our modern world. With a specific focus on the interplay between journalism and communication, the course equips participants with the necessary tools to navigate the complex intersections of political, economic, social, and cultural landscapes. Through a comprehensive exploration of various perspectives, students will develop the intellectual acumen required to assess the significance and implications of diverse narratives within the context of our ever-evolving global society.

Course Objectives:

The objectives of this course are:

- To develop intellectual skills to evaluate and analyze the meanings of news and information.
- To develop a basic understanding of Contemporary Issues.
- To create a foundation to further understand journalism and communication processes in context of political, economic, social and cultural realities of contemporary world.

Course Outcomes:

On completion of this course, the students will be able to:

Expected Outcome	**Bloom's Taxonomy Level**
CO1: Define contemporary issues (National/International)	**L1, L2**
CO2: Demonstrate a habit of staying informed and knowledgeable about current and contemporary issues	**L3, L4, L6**
CO3: Explain the Indian and world's political, social, and economic systems.	**L1, L5**
CO4: Identify the core concepts of journalism (Objectivity, Fairness, Balance, and Accuracy	**L2, L3, L5**
CO5: Study the debates on (inter) national issues, language, and culture	**L2, L3, L6**

Modules	**Blooms level***	**Number of hours**

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MODULE 1: Current Affairs Important National News Important International News News Makers Prominent National & Global Figures Press Information Bureau	**L1, L2, L3, L6**	15
MODULE 2: Polity & Economy in News Politicization of Media Media as a Political Propaganda Tool The World Bank, Asian Development Bank, World Economic Forum Profile of the Indian economy (industry, agriculture, infrastructure, growth rates, world ranking, role of planning, budgets, and government policies)	**L2, L5**	15
MODULE 3: Society in News Social Issues in News Human Rights Issues Science & Scientific Temper Recent Developments in Social Structures National & International Organizations	**L2, L3, L6**	20
MODULE 4: Contemporary Issues for Discussion Globalization The Environment US dominated world order – politically, culturally, and economically Parliamentary versus Presidential government Constitutional Values Criminalization of politics Restructuring the UN	**L2, L3, L4, L6**	10

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books:

- "The Elements of Journalism: What Newspeople Should Know and the Public Should Expect"
- Authors: Bill Kovach and Tom Rosenstiel, Publisher: Three Rivers Press, Year of Publication: 2007
- "Global Issues: An Introduction", Author: Kristen A. Hite and John L. Seitz, Publisher: Wiley-Blackwell, Year of Publication: 2012
- "News: The Politics of Illusion", Authors: W. Lance Bennett and David L. Paletz, Publisher: Longman, Year of Publication: 2010
- "Media and Society", Author: Michael O'Shaughnessy and Jane Stadler, Publisher: Oxford University Press, Year of Publication: 2012
- "Contemporary World Regional Geography", Authors: Michael Bradshaw, Joseph Dymond, George White, Elizabeth Chacko, Paul Claval, Publisher: McGraw-Hill Education, Year of Publication: 2013

References and Further Reading

- "Manufacturing Consent: The Political Economy of the Mass Media" by Edward S. Herman and Noam Chomsky, Publisher: Pantheon Books, Year of Publication: 1988
- "Media Control: The Spectacular Achievements of Propaganda" by Noam Chomsky, Publisher: Seven Stories Press, Year of Publication: 2002
- "The News: A User's Manual" by Alain de Botton, Publisher: Hamish Hamilton, Year of Publication: 2014
- "The Elements of Journalism: What Newspeople Should Know and the Public Should Expect" by Bill Kovach and Tom Rosenstiel, Publisher: Three Rivers Press, Year of Publication: 2007
- "News: The Politics of Illusion" by W. Lance Bennett, Publisher: Longman, Year of Publication: 2010
- "The Oxford Handbook of Political Communication" edited by Kate Kenski and Kathleen Hall Jamieson, Publisher: Oxford University Press, Year of Publication: 2017

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- "Global Journalism: Topical Issues and Media Systems" by Arnold S. de Beer and John C. Merrill, Publisher: Pearson, Year of Publication: 2014
- "Contemporary Journalism in the US and Germany: Agents of Accountability" by Beate Josephi, Publisher: Routledge, Year of Publication: 2016
- "The Language of News Media" by Monika Bednarek and Helen Caple, Publisher: Routledge, Year of Publication: 2016
- "News and Journalism in the UK" by Brian McNair, Publisher: Routledge, Year of Publication: 2009

Modes of Evaluation:
Quiz/Assignment/ Case Presentations/Written Examination

Examination Scheme:

Components	**A**	**CP**	**CT**	**H**	**EE**
Weightage (%)	5	5	10	10	70

A: Attendance, CP: Case Presentation, CT: Class Test, H: Home Assignment, EE: End Semester Examination

CO, PO and PSO Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-IV

DJRN2451	DIGITAL MEDIA	L	T	P	FW/ Proj	C
Version	**2023**	2	1	2	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

Digital media production is the study of media creation and display through online and interactive experiences. This includes audio and video steaming in online contexts, but it also covers other types of new media that are hybrids of the two. Using various multimedia systems and formats, you will explore the foundations of development, content creation and distribution across multiple platforms. Focusing on multi-platform digital media, this course is designed to offer the students with a thorough conceptual and practical understanding of various digital media production tools, their uses, techniques, and aesthetics. The students shall have the opportunity to write, produce and edit their own digital media content for online distribution.

Course Objectives

The objectives of this course are to:

- Enable students to discuss various digital media production workflows from concept to distribution.
- Allow the students to analyze and differentiate between media formats and choose appropriate actions for initiating and completing media projects.
- Offer the learner with techniques to produce, design, record and edit original content for websites, apps, podcasts, video etc.
- Introduce the students to the software and hardware interface and their functions.
- Develop, organize, and create content optimized for various media distribution formats.

Course Outcomes (COs):

On completion of this course, the students will be able to

- Discuss various digital media production workflows from concept to distribution.
- Differentiate between media formats and choose appropriate actions for initiating and completing media projects.
- Produce, design, record and edit original content for websites, apps, podcasts, and videos.
- Identify various software and hardware interface items and define their function.
- Develop, organize, and create content optimized for various media distribution formats.

Syllabus / Topics to be Covered

Modules	Blooms level*	Number of hours

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Module I: Intro to Digital Media • Understanding Digital Media: Evolution and Development • Digital media and its components • Characteristics of Digital Media • Basic office use media application software: word processing, spreadsheet, presentations. • Digital media revolution and effects: social media, portable media production tools and vehicles, cybercrime, privacy, hate speech, surveillance, digital divide etc.	**L1, L2, L3**	10
Module II: Content Writing for Digital Media • Basics of online story writing • News writing & Press Releases • Blog writing • SEO and SEM friendly content writing for web • Content for Emailers, Notifications and Apps • Copywriting and writing for digital ad campaigns • Writing for different social media - tips, tools, and best practices • Script Writing for Audio and Visual Media • Corporate and crisis communication overview	**L3, L4, L5, L6**	15
Module III: Digital Audio Production & Editing • Sound Basics: Frequency, Pitch, Intensity of Sound, etc. • Analog & Digital Signals, Sampling Rate, Bit depth, Channels. • Digital Audio file formats • Microphones and audio accessories – classification and application. • Recording and mixing of Stereo, Mono, and Multi-track sound.	**L2, L3, L4, L5, L6**	12
Module IV: Concept and production of Basic Graphics & Animation • Graphics and animation: principles, types, differences, applications. • Conventional v/s new form of graphics and animation. • Popular online platforms for creating graphics. • Introduction to Advance Graphics and Animation software	**L3, L4, L5, L6**	15
Module V: Digital Video Production • Concept, process and types of Digital Videos • Video formats and file types. • Cameras - designs, functions and principles, usages and formats • Other tools for Digital Video Production: Lens, Tripods, Microphones etc. • Lighting and use of light modifiers • Visual Grammer and Aesthetics of Video Production: Types of Shots, Framing, Continuity, Camera movements, Angles, and Composition guidelines. • Stages of Production - Pre-Production, Production, Post-Production • Video Editing on Smartphone and on PC.	**L2, L3, L4, L5, L6**	15
Module VI: Future of Digital Media Technologies Artificial Intelligence: • Definition, Scope, goals and applications • AI tools. • AI in Social Media • AI in Automated Journalism Augmented Reality Concepts • Definition and scope • Augmented Reality in Print Media: Technology, Uses, and Problems	**L2, L3, L4**	8

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Virtual Reality: Concepts, Definitions, Types, • VR storytelling versus narrative in films, books or TV; • Story structures - linear, branching, alternative endings;		

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Schmidt, E. & Cohen, J. (2013). The New Digital Age. Published by John Murray

Reference Books

- Daniela, Linda (2020). *New Perspectives on Virtual and Augmented Reality*. Published by Routledge; 1st edition
- Goel, Lavika(2021). *Artificial intelligence: concepts and applications.* Published by Wiley India Pvt Ltd(1 January, 2021)
- Guha, Suman(2022). Win The Digital Age with Data: How To Use Analytics To Build Products That Customers Love. Published by Notion Press; 1st edition
- Millerson, G. (2013). Video production handbook. CRC Press.
- Stephen G. Anchell, The Darkroom Cookbook; Burlington: Focal Press
- Naomi Rosenblum. (2008), *A World History of Photography*, New York, Abbeville Press.

Modes of Evaluation:
Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**H**	**A**	**CT**	**EE**
Weightage (%)	15	5	10	70

CT: Class Test, EE: End Semester Examination; A: Attendance; H: Home Assignments

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	--	--	--	--	--	--	--	--	--	--	--
CO2	--	--	--	--	--	--	--	--	--	--	--
CO3	--	--	--	--	--	--	--	--	--	--	--
CO4	--	--	--	--	--	--	--	--	--	--	--
CO5	--	--	--	--	--	--	--	--	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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DJRN2401	ADVERTISING PRINCIPLES AND PRACTICE	L	T	P	C
Version	2023	2	1	2	4
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description

This course describes various concepts of advertising. The course will emphasize the core concepts like segmentation, targeting and positioning. Students will learn the strategy that goes behind the creation of an ad. The aim of this course is to explore various creative fields like copywriting and the media mix involved in making advertisements.

Course Objectives

The objective of this course is to

1. Equip the students with concepts of creative fields involved in making advertisements.
2. Provide an overview of advertising strategies behind creation of an ad.
3. To introduce the students to the concepts and principles of Advertising.
4. To understand the integration of various promotional tools in the present demand of the market.
5. To familiarize students with the concepts of market, audience, product and brand.
6. To familiarize the students with the structure of Advertising Agency.

Course Outcomes (COs):

On completion of this course, the students will be able to

CO1: Define and identify present trends in advertising and marketing.
CO2: Describe and infer market segmentation and target audience influence on consumers and advertising.
CO3: Write and apply the copywriting ingredients of an ad for different media.
CO4: Develop and generate the best media plan for the client.

Modules	Blooms level*	No. of hours
MODULE 1: Advertising and Present Trends Advertising: definitions and concepts, Advertising Tools, Marketing, Events, Models: AIDA, DAGMAR, Maslow's Hierarchy Model, Classification of Ads, Latest Trends in Advertising	L1	10
MODULE 2: The Advertising Plan and Strategies Market Segmentation and Target Audience, Influence of Marketing and Target Audience on Advertising and Consumers, Advertising Strategies, Types of Media, Segmentation, Positioning and Targeting, Media Selection, Planning and Scheduling, Market Strategy and Branding	L2	15
MODULE 3: Ingredients of an Ad Concept of an Advertising Brief, Copywriting- Meaning, Definition and Objectives, Elements of copy – headline (functions and types), overline, underline, body copy, captions, taglines, slo gans, call to action, logo, company name and signature, Copywriting for Print Media,	L3	13

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Electronic Media, the internet and social media. Guidelines for Creative Copywriting, Meaning of advertising campaign, Important aspects of campaign planning, Objectives of ad campaign.		
MODULE 4: The Media Plan Selecting Communication Channel, Determining the Advertising Budget, Marketing Mix, Media Selection & factor determining selection of Media, Advertising budget – Factors affecting budget / Methods, Evaluation, Structure of an Advertising Agency, Ethical Issues: Advertising and Regulatory Bodies	L5	10

*Bloom's Level:
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Chunawalla, S.A. & Sethia, K.C (2002). *Foundation of Advertising Theory & Practice*, 7th ed., Himalaya Publishing House.
- David Ogilvy (1985). *Ogilvy on Advertising*, 1st ed., New York, Vintage Books: A Division of Random House.
- Rathor, B. S. (2003). *Advertising Management*, 11th ed., New Delhi, Himalaya Publishing House.
- Belch, E. G. (2020). Advertising and promotion: An integrated marketing communications
- perspective, New York: McGraw-Hill Education.
- Goffman, E. (1987). Gender advertisements. New York: Harper & Row.
- Halve, A. (2005). Planning for power advertising: A user's manual for students and
- practitioners, New Delhi: SAGE Publications.
- Jethwaney, J., & Jain, S.(2011). Advertising management, (2nd edition), New Delhi: Oxford University Press.
- Kumar, S. R. & Krishnamurthy, A. (2020). Advertising, brands and consumer behaviour: The Indian context, New Delhi: SAGE Publications.

Reference Books

- Batra Rajeev, John G Myers & Aaker David A. (1995). *Advertising Management*, 4th ed., New Delhi, Prentice Hall of India.
- Frank Jefkins (2003). *Advertising*, Macmillan India Limited.
- J. Thomas Russell (2008). *Advertising Procedure*, 17th ed., Pearson Prentice Hall
- Lewis Herschell Gordon (1994). *The Complete Advertising and Marketing Handbook*, Chennai, East West Books (Madras) Pvt. Ltd.
- Marieke, De M. (2011). Consumer behavior and culture: Consequences for global
- marketing & advertising, New Delhi: SAGE Publications.
- McGuigan, J. (2014). Advertising – the magic system (1960/1969). In Raymond Williams on culture & society: Essential writings (pp. 57-84). SAGE Publications Ltd,https://dx.doi.org/10.4135/9781473914766.n4
- Melissa, D. (2009). The fundamentals of branding, New York: Ava Publications.
- Miles, Y., (2018). Ogilvy on advertising in the digital age, New York: Carlton Books.
- Monley, L., & Johnson, C. (2003). Principles of advertising: A global perspective, New York: Routledge.

Modes of Evaluation:
Class Test/Attendance/End Term Examination/Case Presentation/Project

Examination Scheme:

Components	P	C	CT	A	EE
Weightage (%)	5	10	10	5	70

CT: Class Test, P: Project, EE: End Semester Examination; A: Attendance; C: Case Presentation

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CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	--	--	--	--	--	--	--	--	--	--	--
CO2	--	--	--	--	--	--	--	--	--	--	--
CO3	--	--	--	--	--	--	--	--	--	--	--
CO4	--	--	--	--	--	--	--	--	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-V

DJRN2551	MEDIA LITERACY & FACT CHECKING	L	T	P	C
Version	2023	2	2	0	4
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description

Fake news has captured the attention of politicians, the media, and the general public since 2016. But the concept is hardly new; it has existed in some form for centuries. In this course, we will explore the history of fake news in different media, culminating in an examination of the modern phenomenon of fake news. We will learn information literacy techniques for evaluating news sources and will study a specific contemporary manifestation of "fake news" in depth.

Course Objectives

The objective of this course is to

- Define fake news and discuss its history for the learners.
- Explain the modern phenomenon of fake news and discuss its significance
- Share the sources of false or misleading information on a variety of media platforms
- Evaluate news and other information outlets for bias
- Describe how news items are created and disseminated across different types of media and social networks.

Course Outcomes (COs):

On completion of this course, the students will be able to

CO1: Define fake news and discuss its history for the learners

CO2: Explain the modern phenomenon of fake news and discuss its significance

CO3: Share the sources of false or misleading information on a variety of media platforms

CO4: Evaluate news and other information outlets for bias

CO5: Describe how news items are created and disseminated across different types of media and social networks.

Modules	Blooms level*	No. of hours
Module I : History of Fake News History of fake news, Definition and Characteristics of fake news, Variations of fake news, Information cycle of fake news, Identifying and dealing with fake news, Credible sources and organizations. Distinguish among different kinds of information and media: news, commentary/opinion, advertising, publicity, entertainment, propaganda, persuasion, raw information.	**L1 L2**	15
Module-II Media literacy and Real News Concept of Dis-information, Mis-information& Mal-information, Narratives in disinformation and misinformation, Elements of Information disorder, Phases of	**L3, L5, L6**	20

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Information disorder. Identify key characteristics of Real News: Verification, accountability, independence, multiple perspectives.		
Module III: Basic tools and techniques to combat fake news Identification of fake accounts or bots, Concept of Red Flag, Types of common false or misleading visual content: Wrong time/wrong place content, manipulated content, Staged content. Tools: - Reverse Image Search, YouTube Data Viewer, EXIF Viewer, Geolocation, Weather corroboration, Metadata Analysis, Shadow analysis, Image forensics. Fact- checking organisations around the world	**L4**	25

*Bloom's Level:
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Media management in the age of Giants; Herrick, Dennis.H.
- The Indian Media Business; Kohli, Vanita
- Mass Communication in India; Aggarwal, Veerbala
- Fighting Fake News!: Teaching Critical Thinking and Media Literacy in a Digital Age Paperback – April 1, 2018

Reference Books

- Media Literacy, Ninth Edition (International Student Edition)
- W. James Potter - University of California, Santa Barbara, USA
- Fighting Fake News!: Teaching Critical Thinking and Media Literacy in a Digital Age Paperback – April 1, 2018
- Media, Culture and Society: An Introduction 2nd Edition by Paul Hodkinson
- Social Media: How to Engage, Share, and Connect Third Edition by Regina Luttrell.

Modes of Evaluation:
Class Test/Attendance/End Term Examination/Case Presentation/Project

Examination Scheme:

Components	P	H	CT	A	EE
Weightage (%)	5	5	15	5	70

CT: Class Test, P: Project, EE: End Semester Examination; A: Attendance; H: Home Assignment

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	--	--	--	--	--	--	--	--	--	--	--
CO2	--	--	--	--	--	--	--	--	--	--	--
CO3	--	--	--	--	--	--	--	--	--	--	--
CO4	--	--	--	--	--	--	--	--	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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DJRN2502	CORPORATE COMMUNICATION	L	T	P	C
Version	2023	1	1	4	4
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description

Various components like corporate philosophy, identity, citizenship and philanthropy will be learnt and discussed by the students. Image and its management and enhancement which is the core of corporate communication will also be explained. Direct marketing, issue support and crisis management will be learnt. Public affairs and political PR and lobbying as a weapon in the hand effective communicators will be discussed.

Course Objectives

The objective of this course is to

- To impart knowledge of basic concepts of corporate communication and its application in an organization.
- To impart knowledge of basic concepts of event management and its relevance in corporate communication.
- To apply knowledge and skills as communication practitioner to resolve issues and crisis situations using various specific strategies.

Course Outcomes (COs):

On completion of this course, the students will be able to

CO1. Define and describe corporate communication and its various elements: Corporate Culture, Corporate Philosophy and Corporate Identity, Citizenship and Philanthropy.

CO2. Describe and summarise various concepts in Corporate Communication such as Image Management, Media Management, Direct Marketing and Celebrity Management.

CO3. Describe and summarise Public Affairs, Political PR, Lobbying, Group Communication.

CO4. Define and classify Crisis Communication and strategic planning, the crisis life cycle, Determine the traits of a crisis spokesperson.

CO5. Explain Employee Relations/Internal Communication-importance of localized information to line employees, benefits, and challenges.

Modules	Blooms level*	Number of hours
MODULE 1: Foundations of Corporate Communication Introduction, Importance and Functions, Elements of Corporate Communication: Corporate Philosophy, Culture, Corporate Identity, Citizenship and Philanthropy.	L1, L2	10
MODULE 2: Concepts of Corporate Communication Group Communication, Media Relations, Public Affairs, Political PR, Lobbying, Employee Relations/Internal Communication-importance of localized information	L1, L2	18

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to line employees, benefits, and challenges, value of first line leader communication with key employee publics, elements of an effective employee communication plan.		
MODULE 3: Strategic Planning and Communication Image Management, Direct Marketing, Network Marketing, Media Management, Crisis Communication, and Issues Management- the role of issues management and strategic planning, the crisis life cycle, role of communication in effective union negotiations, Determine the traits of a crisis spokesperson.	L1, L2	10
MODULE 4: Customer Communications Customers as critical corporate external stakeholders, marketing strategy (case study), impact of consumer activism and boycotts, Social Media- Uses, application, benefits, and challenges in using social media as a corporate communication vehicle, social media options when considering target audience, message and cost, how global companies use social media.	L1, L2	10
MODULE 5: Corporate Governance Corporate Social Responsibility- eight areas of focus for Corporate Social Responsibility according to Mallen Baker's 4 quadrants, Difference between Community Relations and Corporate Social Responsibility, Government relations. value of experiential learning to succeed in a team environment, learning styles in group activity, corporate applications of learning styles, communication needs and strategies of public and privately held companies.	L2, L3	10

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Argenti Paul A and Forman Janis (2003). *The Power of Corporate Communication,* Tata Mcgraw Hill
- Menon, Mridula (2004). *Development Communication & Media Debate,* Kanishka Publishing House.
- Denis Mc Quail Mc Quail's Mass Communication Theory, Sage Publications, New Delhi, 2001
- Stanley J Baran & Dennis K Devis Mass Communication Theory – Foundation, Ferment and Future, Thomson Wadsworth, 2000

Reference Books

- Kundra S (2005). *Media Management,* New Delhi, Anmol Publication Pvt. Ltd.
- Martin G. Dennis & Robert D. Coons (2011). *Media Flight Plan,* 5th ed., Deer Creek Publishing.
- Albarran, Alan B (1996). *Media Economics: Understanding markets, Industries and Concepts,* 1st ed., Ames, Lowa State University Press.
- C S Rayadu Communication, Himalaya Publishing House, Mumbai
- P.D Chaturvedi Business Communication, Pearson Education, Delhi
- Bovee Thill Schatzman Business Communication Today, Pearson Education, Delhi
- S.P. Robins Organizational Behavour, Prentice Hall, New Delhi

Modes of Evaluation:

Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**P**	**A**	**CT**	**EE**
Weightage (%)	15	5	10	70

CT: Class Test, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	--	--	--	--	--	--	--	--	--	--	--
CO2	--	--	--	--	--	--	--	--	--	--	--

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CO3	--	--	--	--	--	--	--	--	--	--	--
CO4	--	--	--	--	--	--	--	--	--	--	--
CO5	--	--	--	--	--	--	--	--	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

DJRN2501	**MEDIA PLANNING & BUYING**	L	T	P	C
Version	2023	2	2	0	4
Pre-requisites/Exposure	Nil				
Co-requisites					

Catalog Description

This course comes under an interdisciplinary domain which describes various concepts of media planning and media buying. It includes marketing and negotiation skills and concepts of selection of media mix and substantial marketing and advertising research etc. The aim of the course is to explore various creative fields involved in the placement of advertisements.

Course Objectives

The objective of this course is to

- Equip the students with concepts of creative fields involved in media planning and buying for advertisements.
- Provide an overview of the process of selecting and buying of media mix for the placement of advertisements.

Course Outcomes (COs):

On completion of this course, the students will be able to
CO1: Describe media planning and select the media mix.
CO2: Describe and distinguish various media forms.
CO3: Select and apply research data to develop media strategy process.
CO4: Apply software to create media plans and schedules.

Modules	Blooms level*	Number of hours
MODULE 1: MEDIA PLANNING Introduction to Media Planning (MP), Defining Media Planning, Objectives of MP, Importance of MP in the current scenario, Developing Media Strategy- the Media Mix/ communication mix, Factors influencing media strategy decisions.	L1, L2	15
MODULE 2: MEDIA: AN OVERVIEW Media types, characteristics of major media forms, Internet- the big medium, ATL & BTL Media, Electronic Media, Outdoor Advertising, and Transit Advertising, Evaluating Media Vehicles.	L1, L2	10
MODULE 3: MEDIA PLANNING PROCESS	L2, L3	13

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Matching Media & Market- Geographical Selectivity, Reach & Frequency, Media Briefing, Media Scheduling, Media Plan & Strategy Development Process, Media Budgeting (Traditional & Modern Methods), Media Buying Functions, New Trends in Media Buying, Media and Campaign measurement.		
MODULE 4: MEDIA PLANNING SOFTWARE Online Media Monetization Online Media Targeting Online Analytics AD Formats IRS, TAM, MAP, RAM, AdEx	L3, L5	10

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Croteam, David; Hoynes, William D (2005). The Business of Media. Corporate Media and the Public Interest. SAGE Publications, Inc.
- Albarran, Alan B (2002). Media Economic (Understanding markets, Industries and Concepts). Wiley-Blackwell.
- Kelley Larry D, Jugenheimer Donald W, (2009).Advertising Media Planning: A Brand Management Approach. Phi Learning.
- Jack Z. Sissors, Roger B. Baron, (2010). Advertising Media Planning, Tata Mcgraw Hill Education Private Limited.

Reference Books

- Menon, Arpita; (2010).Media Planning and Buying. Tata Mcgraw Hill Education Private Limited.
- Katz, Helen; (Jun 2010. The Media Handbook: A Complete Guide to Advertising Media Selection, Planning, Research, and Buying. Routledge.
- Sissors, Jack Z., Goodrich, William B. (1996). Media Planning Workbook, McGraw-Hill Humanities/Social Sciences/Langua.

Modes of Evaluation:
Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	P	A	CT	EE
Weightage (%)	15	5	10	70

CT: Class Test, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	--	--	--	--	--	--	--	--	--	--	--
CO2	--	--	--	--	--	--	--	--	--	--	--
CO3	--	--	--	--	--	--	--	--	--	--	--
CO4	--	--	--	--	--	--	--	--	--	--	--
CO5	--	--	--	--	--	--	--	--	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-VI

DJRN2651	COMMUNICATION FOR SOCIAL CHANGE	L	T	P	C
Version	2023	2	2	0	4
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

COURSE DESCRIPTION:
This course explores and examines media and social change. During this course the students will evaluate the various media outlets that are used for communication to catalyze social change. A historical and contemporary perspective on different design and communication techniques related to a variety of social and cultural issues will be put forth.

Course Objective
Communication for social change is a way of thinking and taking action that gives people influence over the channels and content of communication processes. This is a process of discussion through which individuals decide who they are, what they need, and what they want in order to improve their lives. It is based on discourse and communal action. This course will explore alternative conceptions of communication and media that have emerged over time. This includes various community projects and participatory communication initiatives that consider the rural poor in developing nations not a passive information receiver but active content producers. We will get a basic understanding of participatory methods that are useful for engaging in development work and research.

Course Outcomes
On completion of this course, the students will be able to
CO1: Comprehend the development issues plaguing the country.
CO2: Developing a communication design for a developmental issue/or creating a campaign.
CO3: Knowledge of alternative communication concepts.
CO4: Analyze how participatory methods are important for development work.

Modules	Blooms level*	Number of hours
MODULE 1: Definition, meaning and process of development. Theories and paradigms of development – unilinear and non-unilinear theories/paradigms Characteristics of underdeveloped economics & Indicators of Development Communication, Democracy, Human Rights as an indicator, Sustainable development, Social Relations [inequality]	L1, L2	15
Module 2 Mapping the field: Actors and Issues. Institutional & Alternative agendas and development Alternative visions and approaches Role of communication in development and Social Change.	L3	15

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Development message design and communication and Role and performance of Print, Radio, TV, Outdoor publicity in Indian perspective		
MODULE 3: Participatory Paradigm Culture centered paradigm Contemporary approaches to C4SC	L4, L6	15
Module 4 **Case Studies: Community Radio, Khabar Lehariya** Traditional media - music, drama, dance, puppetry, street play, fairs, festivals and their role in Development Communication	L3, L6	15

*Bloom's Level:
L1-**Knowle**dge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text books:

- Melkote and Steeves, *Communication for Development*.
- Mohan J. Dutta, "Theorizing Social Change Communication" (chapter 1) in *Communicating Social Change: Structure, Culture, and Agency*, Routledge, 2011.
- Narula Uma Development Communication – Theory and Practice, Har Anand, 1999
- Srinivas R. Melkote Communication for Development in the Third World, Sage, New Delhi 2001
- Rogers Ereerett M Communication and Development, Criticalperspective, Sage, New Delhi, 2000

Readings

- Shirley White, "Introduction – The Concept of Participation," in White, et al.
- Pradip Thomas, "Participatory Development Communication: Philosophical Premises," in White, et al.
- Case Studies in Communication & Social Change
- *Khabar Lahariya*, a weekly rural newspaper
- http://www.khabarlahariya.org/;http://www.comminit.com/democracy-governance/content/khabar-lahariya
- *Gaon Connection* http://www.gaonconnection.com/
- Community Radio
- *Radio Bundelkhand* http://www.devalt.org/
- *Sangham Radio* http://www.ddsindia.com/www/dds_news/SanghamRadio.htm
- Participatory Video
- *Video Volunteers*/*India Unheard* http://www.videovolunteers.org/

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	P	CT	A	EE	
				Practical	Theory
Weightage (%)	10	15	5	0	70

P- Project, C- Case Discussion/Presentation/Analysis, CT- Class Test, A- Attendance, EE- End Semester Examination

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CO, PO, PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	--	--	--	--	--	--	--	--	--	--	--
CO2	--	--	--	--	--	--	--	--	--	--	--
CO3	--	--	--	--	--	--	--	--	--	--	--
CO4	--	--	--	--	--	--	--	--	--	--	--
CO5	--	--	--	--	--	--	--	--	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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DJRN2601	FICTION AND NON FICTION FILM-MAKING	L	T	P	C
Version	2023	2	1	2	4
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

COURSE DESCRIPTION:

Students will learn to compare and contrast between fiction and non-fiction filmmaking and media formats from the point of production and post-production processes involved in the two. The course will help develop a highly nuanced understanding of the two basic divisions in film production, namely, fiction and non-fiction formats. They will be equipped with a critical understanding of the fundamental differences in which the same technology and crew and the camera is employed when shooting and directing for fiction and for documentaries.

Practical exercises like screenplay writing for fiction and writing and researching for a documentary will be undertaken to develop the necessary skills and appreciation of how the two forms have varied histories, relationship with reality, feel and treatment, audience / viewer profile and segmentation and revenue and budgetary models.

Course Objective

The objectives of this course are:

- Students will learn to contrast fiction with documentaries
- To appreciate the interplay of imagination and art in fiction and that of reality and faithfulness to truth in documentaries and time
- To examine the roles that cinema/ fiction and documentaries play in representing and recording the world or the historical world.
- To appreciate the techniques of narrative structure, filming and post production involved in fiction and in non- fiction as well as long-form television documentary journalism and other genres and sub-genres.
- To develop the skills to write proposals and make show reels in order to pitch for projects in the fiction/non-fiction film categories.

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand the difference between fiction/non-fiction genres in filmmaking

CO2. Identify the use and significance of documentaries and non-fiction in representing the objective world

CO3. Analyze the evolutionary history of documentaries

CO4. Master the elements of filmmaking in fiction through a deep understanding of the three stages of film production right from ideation to the final product

CO5. Pitch for story ideas and projects in fiction and non-fiction formats and learn how to do proposal writing and budgeting in order to get their films funded

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Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Film Making (FICTION) • Introduction to various formats and genres of films • Understanding the art of Film direction and visualization • Film crew- roles and responsibilities • Profile of a Director and his/her role	L1, L2	6
MODULE 2: Three stages of Fiction Film Production • Key stages of film production – From Pre production to post production • Concepts - writing for the screen, script, screen play writing • shot division, writing shots, sequences and story boards	L1, L2	6
MODULE 3: Fiction Film Projects – blueprint, budgeting and pitching • Pre-Production, • Budgeting & Funding • Pitching for Film & TV project ideas, • Scripting, • Proposal writing, • Show reels for promotion.	L1, L2	8
MODULE 4: The Documentary Film (Non-fiction formats) • Documentary vs fiction • Fact/ Fiction divide, truth claims and evidence in documentaries – representation of the objective world • history of documentary films and evolution of the documentary genre • Evolution of documentaries from Griersonian documentary films through the age of camcorder television to convergent forms of digital and online media. • Cinema Verite Types of documentary films- World Documentary: Man with the movie camera, Nanook of the North, Bart Hanstra: Zoo, Glass, Propaganda Documentary, Cinema Verite. Contemporary style of documentary filmmaking: Hoop dreams, Television Documentary Journalism	**L1, L2, L3**	8
MODULE 5: Documentary film Production • The three-stages of documentary filmmaking • Researching ideas for documentaries • Camera, lighting and sound for documentary film productions • Designing a shooting schedule for a documentary • Packaging the film Writing proposals, budgeting and pitching for documentary projects and funding	**L4, L5**	12

*Bloom's Level:
L1-**Knowle**dge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text books:

- Beattie, Keith (2004) Documentary Screens Non-Fiction Film and Television, Palgrave Macmillan.
- Bordwell, David (2008) Poetics of Cinema. New York, London: Routedge
- Wales, Lorene M. (2017) *The Complete Guide to Film and Digital Production*, Taylor and Francis.

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Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	P	CT	A	EE	
				Practical	Theory
Weightage (%)	10	15	5	0	70

P- Project, C- Case Discussion/Presentation/Analysis, CT- Class Test, A- Attendance, EE- End Semester Examination

CO, PO, PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	--	--	--	--	--	--	--	--	--	--	--
CO2	--	--	--	--	--	--	--	--	--	--	--
CO3	--	--	--	--	--	--	--	--	--	--	--
CO4	--	--	--	--	--	--	--	--	--	--	--
CO5	--	--	--	--	--	--	--	--	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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DJRN2602	INTRODUCTION TO COMMUNICATION RESEARCH	L	T	P	C
Version	2023	3	1	0	4
Pre- requisites/Exposure	Student should have a basic knowledge of Statistics to understand better				
Co-requisites					

Catalog Description

Research is an important part of communication. To inculcate the habit of research and to nurture innovation, this subject is being introduced to the learners. Purpose is that the students should be able to not just understand the nuances of social science research but should also be able to eventually generate new knowledge in the field.

Course Objectives

- To introduce the students to the concept of communication research
- To establish relationship between mass communication, journalism & research
- To explain to students the various research designs and approaches to research
- To discuss the media research process and various sampling techniques
- To introduce students to statistical applications in communication research
- To discuss research report writing methods and ethical issues in communication research

Course Outcomes (COs):

On completion of this course, the students will be able to:

- CO1: To introduce the students to the concept of communication research
- CO2: To establish relationship between mass communication, journalism & research.
- CO3: To explain to students the various research designs and approaches to research.
- CO4: To discuss the media research process and various sampling techniques
- CO5: To introduce students to statistical applications in communication research
- CO6: To discuss research report writing methods and ethical issues in communication research

Modules	Blooms level*	Number of hours
Module I – Introduction to Communication Research Definition, Research Methods and Approaches in Social Sciences. Mass Media Research and Scientific Methods. Importance of Communication Research – Indian Scenario. Formulation of Research Problem, Review of Literature, Hypothesis, Research Design.	L1, L2	10

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Module II – Communication Research Process Steps of Research Process: Study the situation, Identification of Problem, Developing of Objectives, Formation of Hypothesis, Reviewing of Relevant Literature, Deciding the Research Design, Collection of Data, Data Analysis, Finding the Results, Policy implications and conclusion. Sampling: Meaning, strategies, methods and types Basic Terms of Sampling: Sample Plan, Sample Design, Sample Unit, Sample Frame and Sample Size, Tools of Data Collection	L3, L4	10
Module III – Statistical application Statistics Applied In Research: Frequencies And Percentages; Measures Of Central Tendency: Mean, Median And Mode; Measures Of Dispersion: Range, Standard Deviation And Mean Deviation; Simple Correlation	L4, L5	30
Module IV – Report Writing and Ethical Issues in Communication Research Research Reports: Research Articles/Paper, Project Report, Dissertation and Thesis, Significance of Abstract, Proposal, Synopsis, Reference and Bibliography in Research, Ethical Issues in Research: Plagiarism, Database and Research matrix	L4, L5	10

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- C.R. Kothari, (2008). Research Methodology: Methods and Techniques, second revised edition. New Delhi: New Age International.
- Wimmer R. D & Dominick J.R, (2005). Mass Media Research: An Introduction, second reprint. Singapore: Wadsworth.
- Pauline V. Young, (2001). Scientific Social Surveys and Research: An introduction to the background, content, methods, principles and analysis of social sciences, fourth edition, fourteenth printing. New Delhi: Prentice – Hall of India.

Reference

- Research Papers
- Research Journals
- YouTube Tutorials.

Modes of Evaluation **Class** Test/Assignment/End Term Examination/Case Presentation
CT: Class Test, H: Home Assignment, EE: End Semester Examination; A: Attendance; C: Case Presentation

Examination Scheme:

Components	P/H	CT	A	EE
Weightage (%)	10	15	5	70

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	--	--	--	--	--	--	--	--	--	--	--
CO2	--	--	--	--	--	--	--	--	--	--	--
CO3	--	--	--	--	--	--	--	--	--	--	--

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CO4	--	--	--	--	--	--	--	--	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly related

DJRN2603	FILM THEORY AND APPRECIATION	L	T	P/ FW/ Proj	C
Version	2023	1	1	0	2
Pre-requisites/Exposure	NIL				
Co-requisites	NIL				

Catalog Description

Major theories of 'reading' and understanding cinema will be introduced. The course will help develop a nuanced and critical understanding of film and film theory as a field of inquiry. The Students will be introduced to the finest of world and Indian cinema where these theoretical positions will be elucidated in the works of the greatest film directors of all times. Various elements of cinema will be identified and discussed in order to unpack the technique behind the great art of filmmaking. An evolutionary history of film will help trace the key developments that have contributed towards making cinema as one of the most powerful and creative mediums. The film appreciation aspect of the course will inculcate a deeper understanding of the art, aesthetics and the grammar of 'good cinema'. Such a theoretical and critical grounding of films will go a long way into nurturing the creative and aesthetic sensibilities of students who aspire to tell their stories successfully and differently as future media professionals.

Course Objectives

The objectives of this course are:

- To appreciate cinema as an art and the interplay of image and time
- To identify and appreciate the various elements of filmmaking and the major technological shifts from the era of the silent films to the contemporary times of digital and high end graphic adaptations of films
- To discuss the form, format and principles of cinema in order to have a deeper understanding of cinema as form of storytelling.
- To critically analyze films from the earliest productions of the silent era until the contemporary times of the digital era.
- To develop a keen understanding of the medium and the timeless world of cinema through an appreciation of the history of the cinema and major cinema movements that transformed it.
- To understand the intersections between film theory and practice and its future

Course Outcomes

On completion of this course, the students will be able to:

CO1. Understand film theory and criticism

CO2. Identify the use and significance of different aspects of film appreciation

CO3. Analyze the evolutionary history of cinema and major cinema movements

CO4. Analyze the elements of cinema and their use by the finest film directors

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CO5. Evaluate the emerging trends in digital cinema and reflect upon the future of films in terms of their production, distribution and consumption

Modules	Blooms level*	Number of hours
MODULE 1: Image and Sound: The evolutionary history of Cinema 100 years of cinema: 1895 to 1995 1. The pioneering years (1895-1910)- World and India 2. The Silent Era (1911-1926) 3. Talkies and the rise of the Hollywood studios (1927-1940) 4. The Golden Era of Cinema (1941-1954) 5. Avant-garde films and their impact (1955 to 1976) 6. Modern film industry and the Blockbusters (1977 to late 1990s)	L1, L2	6
MODULE 2: Film Theories • Auteur Theory • Russian Cinema and the Montage Theory • Marxism- Film Screening: Pudovkin, Mother (1926) • Psychoanalysis - Film screening: Hitchcock's *Rear Window* (1954)	L1, L2	6
MODULE 3: Major Film Movements and their filmmakers • Hollywood Cinema and the Star System • Soviet Montage: Screening and analysis of Battleship Potemkin (1925) Dir by Sergei Eisenstein • German Expressionism • Italian Neo-Realism: Screening and analysis of Vittorio de Sica's - Bicycle Thieves (1948) • French New Wave Cinema: Screening and analysis of Jean Luc Goddard's film Breathless (1960) • Japanese cinema- Work of Akira Kurosawa- Rashomon (1950) • Irani cinema- films of Abbas Kiarostami and Majid Majidi Indian Mainstream and Parallel Cinema and the New wave Art films versus Commercial cinema • Golden era of Indian Cinema –Films of work of Bimal Roy, V. Shantaram Guru Dutt, and Raj Kapoor • Indian New Wave cinema – Mrinal Sen, Satya jit Ray Ritwaik Ghatak • Parallel cinema: Contributions of Shyam Benegal, Govind Nihlani, Gulzar and Saeed Mirza	L1, L2	8
MODULE 4: Cinema as language- Film aesthetics and techniques • Understanding the Language of Cinema- Visuals and sound, Shot sequences and their syntax • Grammar of cinema- shot, scene, sequence, montage Cinema as Narrative- the plot and the story	L1, L2, L3	8
MODULE 5: Studying 'Good cinema' Critical analysis of famous film sequences of the following films: • A Trip to The Moon (Dir. GeorgesMéliès) 1902 • The Great Train Robbery (Dir. Edwin Porter) 1903 • Birth of a Nation (Dir. D.W. Griffith),1915 • Battleship Potemkin (Dir. Sergei Eisenstein), 1925 • Metropolis (Dir. Fritz Lang), 1927 • Citizen Kane (Dir. Orson Welles), 1941	L4, L5	12

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*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Metz, Christian (1991) *Film Language: A Semiotics of the Cinema*. The University of Chicago Press.
- Stam, Robert (2003) *Film Theory. An Introduction*. Malden: Blackwell Publishing.
- Andrew J. D. (1984) *Concepts in Film Theory*. Oxford: Oxford University Press.
- Miller, T. and Stam, R. (2000) *A Companion to Film Theory*. Blackwell Companions in Cultural Studies, Malden. MA: Wiley-Blackwell

Reference Books

- Bordwell, David (2008) *Poetics of Cinema*. New York, London: Routedge

Mode of Evaluation:

Assignments/ Written Examination/ Writing Film Reviews/ Film Analysis

Examination Scheme:

Components	A	CP	CT	H	EE
Weightage (%)	5	5	10	10	70

A: Attendance, CP: Case Presentation, CT: Class Test, H: Home Assignment, EE: End Semester Examination

CO, PO, PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	--	--	--	--	--	--	--	--	--	--	--
CO2	--	--	--	--	--	--	--	--	--	--	--
CO3	--	--	--	--	--	--	--	--	--	--	--
CO4	--	--	--	--	--	--	--	--	--	--	--
CO5	--	--	--	--	--	--	--	--	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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DJRN2604	MEDIA LAWS & ETHICS	L	T	P/ FW/ Proj	C
Version	2023	2	0	0	2
Pre-requisites/Exposure	NIL				
Co-requisites	NIL				

Catalog Description

Today's media is increasingly market driven, and the students in this course will learn about regulations and practices in media houses. The course talks in details about legal implications of news and other issues and laws which rule the everyday lives of newsmen. The course discusses in details various ethical issues.

Course Objectives

The objective of this course is to

1. Describe in detail various regulations like Contempt of Court, Right to Information, IPR to the future journalists.
2. Explain the importance and relevance of media ethics.
3. Provide knowledge about the relevant constitutional framework such as freedom of speech and expression.

Course Outcomes (COs):

On completion of this course, the students will be able to

CO1: Explain the differences and importance of media laws and ethics.
CO2: Explain in detail relevant laws for reporting.
CO3: Describe codes of conduct for reporting, as given by different regulatory bodies.
CO4: Distinguish between different types of sources.
CO5: Recognize if the news report is legally safe.
CO6: Relate the media laws and ethical concepts to the daily working of a journalist.

Modules	Blooms level*	Number of hours
MODULE I: Constitutional Framework Constitutional Provisions on Freedom of Speech and Expression, Constitutional Restrictions on Freedom of Speech and Expression, Law on Morality, Obscenity and Censorship	L1, L2	6
MODULE II: Media Laws Contempt of Court, Defamation, Right to Privacy, Intellectual Property Rights, Right to Information (Official Secrets Act, 1923, Evidence Act, 1872), Indecent Representation of Women Prohibition Act, Cyber Laws	L2, L3	10
MODULE III: Media Ethics Defining ethics, truth, fairness & objectivity, Editorial Content & Integrity, Editorial & Advertorial, Meeting Advertisers' Needs, Press Council Guidelines, Broadcast Regulation, Sting Journalism, Trial by the Media, Yellow Journalism, accountability and independence of media	L1, L3	14

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Hakemulder, R. Jan (2010). *Media Ethics & Laws,* Gaziabad: Anmol Publications Pvt Ltd
- Neelamalar, M. (2009). *Media Law and Ethics,* New Delhi: Prentice Hall India Learning Private limited
- Divan, Madhavi G., (2018), *Facets of Media Law,* Delhi: Eastern Book Company
- Thakurta, Paranjoy Guha (2015). Media Ethics: Truth, Fairness and

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Objectivity, Delhi: Generic

Reference Books

1. **Cristians, Clifford G (2016),** ***Media Ethics: Cases and Moral,*** **New York: Taylor and Francis**
2. **Ravindran, R K (1999),** ***Media & Society,*** **Delhi: Commonweath Publishers**
3. **Nanda, Vartika (2018), Media Laws & Ethics: An Introduction to Legal and Ethical Issues in Journalism , New Delhi: Kanishka Publishers Distributers**

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**P**	**A**	**CT**	**EE**
Weightage (%)	10	5	15	70

CT: Class Test, H: Home Assignment, EE: End Semester Examination; A: Attendance; C: Case Presentation

CO, PO, PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	--	--	--	--	--	--	--	--	--	--	--
CO2	--	--	--	--	--	--	--	--	--	--	--
CO3	--	--	--	--	--	--	--	--	--	--	--
CO4	--	--	--	--	--	--	--	--	--	--	--
CO5	--	--	--	--	--	--	--	--	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-VII

DJRN2701	EVENT MANAGEMENT: CONCEPTS & PRACTICE	L	T	P	C
Version	2023	2	1	2	4
Pre- requisites/Exposure	Corporate Communication				
Co-requisites					

Catalog Description

This course gives important insights to the students on an extremely important element of marketing communications- Event Management. With the traditional forms of communication becoming saturated, event management has emerged as an effective alternate for brand awareness. The students will essentially be taken through fundamentals of event management, concept and design, logistics, marketing and promotion and finally evaluation processes. The students will also practice event proposal making, decision-making, conceptualizing as well as planning for events.

Course Objectives

The objective of this course is to

- To equip the students with concepts and activities in event management.
- To teach students about different event planning essentials.
- To teach students about the various marketing techniques involved in promotion of events.
- To explain importance of post event evaluation and different ways of doing it.

Course Outcomes (COs):

On completion of this course, the students will be able to:

Expected Outcome	Bloom's Taxonomy Level
CO1: Define and explain different kinds of events; various pre, during and post event activities in event management.	**L1, L2**
CO2: Describe and illustrate various themes for different events.	**L1, L2, L3**
CO3: Describe and apply various processes for organizing an event.	**L2, L3, L5**
CO4: Describe and assess basic two way evaluation process for any event.	**L2**

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Event Management Historical perspectives, Size and Types of Events, Event Team: roles and responsibilities, leadership traits and characteristics, Team management skills, who are the different stakeholders, Event laws and licenses (relevant regulations, liquor licenses, obtaining necessary permits and licenses, registrations etc.), code of ethics.	L1, L2	9

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MODULE 2: Event Planning Essentials Setting aims and objectives, Event Proposal Making and Planning Tools, Budgeting and basic event accounting, 5 C's of Event Designing, Scheduling, Pre, During and Post Event Activities, Logistics, Suppliers and handling vendors, Technical Requirements (Lighting, Audio/Video, Photography/ Videography), Catering, Staffing, Guest List, Dress Codes, Protocols, Event Security management, crowd management, Risk and Emergency Planning related to Health, Safety etc.	L2, L3, L5	15
MODULE 3: Event Theme and Setting Venue, Target Audience, audience sampling methods- counts and estimates, Layout, Theme, Backdrop, Banner, Décor, Staging, New Trends- Economical, Environment Friendly, Sustainable Practices	L1, L2, L3	6
MODULE 4: Event Marketing and Promotions Different kinds of Event Promotion, Various Media for Event Promotion, Understanding the Relevance of each Media for Event Promotion, Comparisons among them with understanding the Strengths and Weaknesses of each, media invitations, Press Release, Process of Marketing, Marketing Mix, Branding, Sponsorships, Merchandising, Give-aways, Event Reminders SMS's, e-mailers etc.	L2, L4	15
MODULE 5: Event Evaluation Basic Evaluation Processes, Internal (management's collective responsibility to ensure that all programs and activities are meeting goals) and External Evaluation (organization's links with other agencies and stakeholders and the impacts of its actions), Evaluation from Event Organizer's Point of View, Evaluation from Client's Point of View, SWOT analysis, Return on Investment, Audits and checking key financial statements, measures of financial performance, Attendance, Media Coverage, Feedback, Impact assessments and preparing final reports	L2	15

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Wagen Lynn Van Der (2010). Event Management, Australia, Pearson Higher Education.
- Wakhlu, Savita Bhan (2000). Managing Presentations: Communicating with Impact, 1st ed., Sage Publications Pvt. Ltd.
- Palmer Scott (2000). Essential Guide to Stage Management, Lighting and Sound, Hodder & Stoughton
- Walters Graham (1997). Stage Lighting: Step-by-Step (Stage & Costume), A & C Black Publication.

Reference Books

- Parker, W. Oren & Wolf, R. Craig (2008). *Scene Design and Stage Lighting*, 9th ed., Wadsworth Publishing.
- Gaur, Sanjaya Singh & Saggere, Sanjay. V (2003). *Event Marketing & Management*, Delhi, Vikas Publishing Pvt. Ltd
- Hoyle, Leonard H (2002). Event Marketing: How to Successfully Promote Events, Festivals, Conventions and Expositions, New York, John Wiley & Sons Ltd.
- Angus, Robert B and Gundersen, Norman, A (2002). *Planning, Performing and Controlling Projects: Principles and Applications*, 3rd ed., Pearson Prentice Hall.

Modes of Evaluation Class:
Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:
CT: Class Test, H: Home Assignment, EE: End Semester Examination; A: Attendance; C: Case Presentation

Components	H	C	CT	A	EE
Weightage (%)	10	5	10	5	70

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CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	--	--	--	--	--	--	--	--	--	--	--
CO2	--	--	--	--	--	--	--	--	--	--	--
CO3	--	--	--	--	--	--	--	--	--	--	--
CO4	--	--	--	--	--	--	--	--	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly related

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DJRN2702	CONTENT ANALYSIS IN MEDIA	L	T	P	C
Version	2023	2	2	0	4
Pre- requisites/Exposure	Critical Thinking: Unraveling Media				
Co-requisites	NIL				

Catalog Description

Through this course, students will discover content analysis as an important tool for understanding media messages. In different domains of media, through engaging with case studies, they shall formulate a rich understanding of its significance in varied media scenarios whether its news industry, advertising and marketing or Public relations. They shall also be made aware of popular analytical tools and Content analysis approaches, helping them develop a critical bent of mind and improving the media messages that they create in future, in their respective professional domains.

Course Objectives

The objective of this course is to

- To introduce Content analysis as a viable and significant tool for meaning making of media messages and developing critical thinking.
- To explain different purposes of content analysis, its understanding and application by experts of this approach within media studies.
- To introduce different real world, industry oriented applications of content analysis and understanding its significance in improving media messages and media campaigns.
- To introduce the main content analysis approaches and popular tools used by industry experts along with the range of aspects possible to decode.

Course Outcomes (COs):

On completion of this course, the students will be able to:

Expected Outcome	Bloom's Taxonomy Level
CO1 Explain the concept of content analysis and its significance for media professionals.	**L1, L2**
CO2. Understand and describe the different roles of content analysis, its advantages and limitations for experts.	**L1, L2**
CO3. Understand and analyze case studies using content analysis in different media contexts.	**L2, L4**
CO4. Understand the different tools of content analysis, Qualitative and Quantitative along with aspects possible to study through these approaches.	**L2, L4, L5**

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Modules	Blooms level*	Number of hours
MODULE 1: Overview of Media Content Analysis (CA) Meaning and purposes of content analysis. Range of media texts possible to study Descriptive, Inferential, Psychometric, Predictive roles of content analysis. Understanding of content analysis by important scholars, practitioners, political scientists of the time- Harold Lasswell, David Lerner, Ithiel de Sola Pool, Max Weber, Neuendorf, Riffe and Freitag etc. Advent of content analysis for meaning making processes (early 1920's for propaganda research, through audio-visual media and subsequent evolution, use cases).	**L1, L2**	20
MODULE 2: Understanding CA through Case Studies Advantages and Disadvantages/ Limitations of Content Analysis, Discussing applications of CA techniques for news meaning making, Advertising, Branding and marketing initiatives Public relations Case studies (determining message accuracy of media coverage that includes inclusion of basic facts, inclusion of any misstatements about the facts covered, any deceptive or misleading coverage, omissions; Analyzing match between the message communicated with the communication objectives of the brand or program which further depends on the brand/program's stage in the communications lifecycle.	**L2, L4**	20
MODULE 3: Tools for Content Analysis Use and importance of various approaches to CA- Qualitative and Quantitative. Qualitative (Humanist approach identifying what media content says about society and the culture producing it. Display usage and significance of tools like NVIVO and QDA Miner to code descriptive data and decode themes, unravelling deeper meaning and context. Quantitative (volume of mentions, 'messages' determined by key words in context (KWIC), circulation of the media (audience reach) and frequency. Behaviorist approach to CA concerned with the effects that content produces, also determining future effects. Brands using tools like Google Analytics to conduct competitor research, keyword research and comparisons, page and domain authority of brands, understanding new keyword opportunities, gaps to be filled in topics addressed by the brand.	**L2, L4, L5**	20

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Riffe, Daniel, Lacy, Stephen, and Fico, Frederick G. (2005). Analyzing Media Messages (Second Edition). Mahweh, NJ: Erlbaum.
- Kimberly A. Neuendorf. (2002). The Content Analysis Guidebook. Thousand Oaks. Sage Publications
- Krippendorff, K. (2018). Content analysis: An introduction to its methodology. Sage publications.

Reference Books

- Macnamara, J. R. (2005). Media content analysis: Its uses, benefits and best practice methodology. Asia Pacific public relations journal, 6(1), 1-34.
- Michaelson, D. & Griffin, T.L. (2005). A New Model for Media Content Analysis. Institute for Public Relations. https://instituteforpr.org/wp-content/uploads/MediaContentAnalysis.pdf
- Swann, P. (2020). The Illustrated Guide to the Content Analysis Research Project. Routledge

Modes of Evaluation **Class:**Quiz/Assignment/ Case Presentations/Written Examination

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Examination Scheme:

Components	**A**	**CP**	**CT**	**H**	**EE**
Weightage (%)	5	5	10	10	70

A: Attendance, CP: Case Presentation, CT: Class Test, H: Home Assignment, EE: End Semester Examination

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	--	--	--	--	--	--	--	--	--	--	--
CO2	--	--	--	--	--	--	--	--	--	--	--
CO3	--	--	--	--	--	--	--	--	--	--	--
CO4	--	--	--	--	--	--	--	--	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly related

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DJRN2703	ADVANCE COMMUNICATION THEORIES & MODELS	L	T	P/ FW/P roj	C
Version	2023	2	2	0	4
Pre-requisites/Exposure	Basics of Communication				
Co-requisites	NIL				

Catalog Description

Students will begin with understanding the meaning of theory and model building as important steps in Communication Studies. Subsequently, they will learn about global Communication models and theories, including Indian philosophies to Communication and Mass Communication. Emphasis will be laid on the different time periods of their emergence and growth, the prevailing conditions of the times and evaluation of their strengths and weaknesses. Their application in research contexts will also be discussed in the process.

Course Objectives

The objectives of this course are:

- To explain the concept of 'theory' and model building and its relevance in Communication Studies.
- To introduce and explain the various Communication models and theories that have emerged from different schools of thought and varied time periods.
- To assist in the evaluation of their strengths and weaknesses, their evolution and present day relevance and research applications.

Course Outcomes

On completion of this course, the students will be able to:

Expected Outcome	Bloom's Taxonomy Level
CO1. Explain the concept of 'theory' and model building, its relevance in Communication Studies.	L2
CO2. Explain the different kinds of communication models, apply them in real world contexts and evaluate their strengths and weaknesses.	L2, L3, L6
CO3. Understand and compare scholarly perspectives emerging from different eras in the history of Mass Communication.	**L2**
CO4. Interpret the meaning of different Mass Communication Theories and consider real world applications.	L2, L3
CO5. Interpret the meaning and genesis of different cultural theories and constructs, and consider present day relevance and applications.	L2, L3

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Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Communication Models The concept of communication models, purpose of understanding these models, Major models: Aristotle's, SMCR/David Berlo's, Harold Lasswell's, Shannon & Weaver, Wilbur Schramm's (Model I, II, III), Osgood-Schramm Model, Frank Dance Model/Helical Spiral Model, Newcomb's Model, Westley and Mac Lean's/ Gatekeeping Model, George Gerbner's Model, Wimal Dissanayake's Indian Model of Communication based on classical Indian texts.	L2, L3, L6	15
MODULE 2: Different Eras of Mass Communication Theories Understanding the need for theory building, Two schools of thought: Semiotics and Process School, The different Eras of Mass Communication (Era of Mass Society & Mass culture, Era of Scientific Perspective on Mass Communication, Era of Limited Effects Paradigm, Era of Cultural Criticism, Era of Moderate Effects Perspective)	L2	12
MODULE 3: Understanding Mass Communication Theories Magic Bullet Theory, Propaganda Theory, Two-Step Flow Theory, Limited-Effects Theory, Individual Differences Theory (Selective Exposure, Selective Perception, Selective Retention), Cognitive Dissonance Theory, Cultivation Theory, Social Learning Theory, Agenda Setting Theory, Play Theory, Uses and Gratification Theory, Dependency Theory, Diffusion of Innovations Theory, Spiral of Silence Theory, Normative Theories of Mass Media/ Six Theories of Press, Internet Communication Theoretical Concepts (Interactivity, Social Presence and Media Richness Theory, Network approaches, Cyber-pragmatics and Sperber & Wilson's Relevance Theory.)	L2, L3	20
MODULE 4: Emergence of Critical and Cultural Theories of Mass Communication Critical Theory, Marxist Theory, Neo Marxism, The Frankfurt School, Political Economy Theory, Important Asian Communication Theories (sadharanikaran, the Islamic 'Communitarian view,' Buddhist theory of communication called *pattica-samupadda*, Vedantic philosophies such as *Advaita*, Gunaratne's Humanocentric Theory, Comparison of Western Communication Philosophy with Indian Philosophy.	L2, L3	13

*Bloom's Level:
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Anvesha Sharma, Ankit Kashyap. (2017). *Understanding Mass Communication*. Galgotia Publishing Company
- Keval J. Kumar. (2021). *Mass Communication in India*. Jaico Publishing House.

References and Further Reading

- Dennis McQuail, Mark Deuze. (2020). *McQuail's Media & Mass Communication Theory.* Sage Publishing
- Adhikari (2014). *Theory and Practice of communication-Bharata Muni*, Makhanlal Chaturvedi Rashtriya Patrakarita Avam Sanchar Vishwavidyalaya
- Baran & Davis (2012). Introduction to Mass Communication Theory: Foundations, Ferment and Future, 5th Indian Edition, Cengage Learning

Modes of Evaluation:

Quiz/Assignment/ Case Presentations/Written Examination

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Examination Scheme:

Components	A	CP	CT	H	EE
Weightage (%)	5	5	10	10	70

A: Attendance, CP: Case Presentation, CT: Class Test, H: Home Assignment, EE: End Semester Examination

CO, PO and PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-

1:Strongly Related, 2: Moderately Related and 3: Weakly Related

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SPECIALIZATION-I (CHOOSE ANY ONE)

- Print Media
- Advertising
- Still Photography
- Electronic Media (TV/Radio)
- Digital Media
- Media Literacy and Fact Checking

Course Objective:

This subject is an attempt to inculcate professional writing skills and knowledge in flowering buds of the media department. The subject will give hands on experience on different aspects of media writing to the students. The students may choose the option of this subject from their concentration electives.

To give an in-depth exposure to the area of specialization, in order to make the students "industry ready" immediately after the programme

Course Contents:

Project Outlines

The students can opt for any of the following specialized area:

- Print Media
- Advertising
- Still Photography
- Electronic Media (TV/Radio)
- Digital Media
- Media Literacy and Fact Checking

Project details and Topics can be chosen in consultation with the concerned faculty

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DJRN2739	BASICS OF RESEARCH METHODOLOGY, ETHICS, AND RESEARCH COMMUNICATION	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description

This course aims to provide students with a comprehensive understanding of conducting ethical research, utilizing proper research methodologies, and effectively communicating research findings. The course includes a final project where students will write a Literature Review on a topic chosen in consultation with the teacher(s).

This course is designed to equip students with essential skills and knowledge to conduct ethical research, employ proper research methodologies, and effectively communicate scientific information (with focus on writing a literature review). The course will cover topics such as research design, data collection and analysis, research ethics, and science communication strategies. Through a combination of lectures, discussions, case studies, and practical exercises, students will develop a deeper understanding of the research process and its ethical implications.

Course Objectives

The objective of this course is to impart knowledge about various stages of research process, research ethics and different ways of research communication.

The aim of this course is to impart research skills to the beginners and help to improve the quality of research by the existing researchers. It also encompasses the understanding and application of appropriate research design, statistics, and the use of the computer for reference management, report writing, research paper writing and presentation. The course also introduces the key conceptual issues of each research method, as well as giving practical guidance. It covers the series of research methodology contents: from problem formulation, to design, to data collection, analysis, reporting and dissemination. The course has the dual aims of equipping students with conceptual understandings of current academic debates regarding different methods, and the practical skills to put those methods into practice.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define criteria of good research, steps in research process, and data collection.

CO2. Identify different types of sampling and its purpose.

CO3. Conduct hypothesis testing for different types of samples and interpret the results.

CO4: Learn the importance of literature review, write research paper/thesis, use reference management software.

Course Content :

Module	Topic	**Blooms level***	Hours
1	**Research Methodology** Understanding the research process: From research questions to conclusions	L1, L2	10

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	Types of research: Qualitative and quantitative research Exploratory, descriptive, experimental, and correlational studies Scientific Thinking: Subjective Vs. Objective Thinking Logical Reasoning: Inductive Vs. Deductive Reasoning Formulating research hypotheses and objectives Purpose of a good research, Criteria of good research		
2	**Descriptive Statistics** Data, Types of Data, Methods of data collection, Benefits and drawbacks, Graphical representation of data and interpretation. Measures of Central Tendency: Arithmetic Mean, Median, Mode, Measures of Dispersion: Range, Standard Deviation, Variance, Coefficient of Variation.	L1, L2, L3	15
3	**Inferential Statistics** Sampling: Basic concepts, Process of Sampling, Sample Size, Types of Samples, Sampling and non- sampling errors, Statistics and Parameters, Sampling Distribution of Means and Proportion, **Hypothesis Testing**, steps in testing of hypothesis, errors in hypothesis testing, z test and t test.	L1, L2, L3	15
4	**Research Ethics** Plagiarism, Fabrication, Falsification, Ethics with respect to human and Animal Research	L1, L2	5
5	**Communication** Characteristics of a good Research paper, Systematics Literature Review (choosing a topic, preparing outline, gathering authentic & appropriate references, avoiding plagiarism, use of reference management systems), Writing a good literature review, Structure of report (Introduction, Methodology, Analysis, Results, Discussions, Conclusions, Recommendations), Writing Quality Research Paper, Publishing Research Work in Quality Journals, Reference Management Software	L1, L2, L3	15

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional Exam	End Term Examination
Weightage (%)	5	10	15	70

Project based assignment: Student teams (2-3 students per team) will write a literature review on a topic of choice, in consultation with the teacher.

Text books/ Reference books

- Research Methodology for Natural Sciences by Soumitro Banerjee, Publisher: IISc Press (1 January 2022); ISBN-10: 8194835178; ISBN-13: 978-8194835172

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- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt. Ltd., New Delhi-110001
- Geode, Millian J.& Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Kothari, C.R.2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.
- Levin R I., Rubin D S. Statistics for Management. Sixth Edition, PHI
- Kapoor & Gupta. Probability & Statistics. S Chand Publishers, New Delhi.
- Montomery, Douglas C.(2007), 5th Ed. Design and Analysis of Experiments, Wiley India.
- Cooper, Donald R. and Pamels Schindler, Business Research Methods, Tata McGraw Hills, New Delhi
- Krishnaswamy, K.N. Sivakumar. Appa lyer and Mathiranjan M. 2006, Management Research Methodology: Integration of Principles, Methods and Techniques, Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Sachdeva, J.K. 2008. Business Research methodology. Himalaya Publishing House, New Delhi.
- Shekharan, Uma, Business Research Methods, Miley Education, Singapore.
- Zikmund, Millian G., Business Research Methods, Thomson Learning, Bombay**.**

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SEMESTER-VIII

DJRN2801	PUBLIC RELATIONS: CONCEPTS AND PRACTICE	L	T	P	FW/ Proj	C
Version	**2023**	2	1	2	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

Public Relations courses strive to educate the media, potential clients, investors, sponsors, staff, and other stakeholders and eventually encourage them to retain a positive or friendly impression of the company, its management, goods, or policy decisions. Public Relations focuses on independent media promotion through press releases, online content, and marketing. As part of Public Relations courses, students develop and conduct marketing campaigns. The public relations course deals with the free distribution of media information, with the support of press releases, editorial material, and advertising of the very same.

Course Objectives

To take the students through the role and scope of PR in management, its various tools, and its emerging importance of discipline in varying areas. Students enrolled in the Public Relations Program will be immersed in critical thinking, analysis, and writing opportunities to refine their understanding of major concepts and theories associated with Public Relations trends and initiatives.

Course Outcomes (COs):

On completion of this course, the students will be able to

- Describe the communication discipline and its central questions.
- Employ communication perspectives, principles, and concepts.
- Engage in communication inquiry and influence public discourse.
- Create messages appropriate to the audience, purpose, and context.
- Demonstrate the ability to accomplish communicative goals.
- Apply ethical communication principles and practices.
- Utilize communication to embrace difference.

Modules	Blooms level*	Number of hours
Module I: Understanding Public Relations Brief History of Public Relations, Concepts, Definitions, Role, Scope, Functions, New Emerging Trends. Difference between In-house PR and a PR Consultancy, Types of PR	**L1, L2, L3**	15
Module II: Public Relations and Media The Role and Importance of Media Relations in Public Relations, Public Relations as a Source of News, Tools of Media Relations, Tools & Techniques of Public Relations, Present and future of Public Relations in India,	**L1, L2, L3**	15
Module III: Public Relations Theory and Practice Growth of PR in the world and India, Propaganda, Public Opinion and publicity, Public Relations: catalyst, persuasion and motivation, Communication theories	**L2, L3, L4, L5, L6**	15

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and models in Public Relations, Reputation, perception and relationship management, The PR process, Research and Planning and Evaluation, PR ethics. Ethics of Public Relations and Social Responsibility		
Module IV: DIGITAL PUBLIC RELATIONS Conventional PR Vs Digital PR – Digital PR Architecture – Digital Tools for PR – Digital Assets, Video-Audio, Images, Social Web, Digital Influence, Awareness, Brand Loyalty 10, Advocacy, Conversations in Digital PR, Non-Journalistic Audiences, Customers, Industry and Financial Analysts, Prospective Employees	**L2, L3, L4, L5, L6**	15
Module V: – PUBLIC RELATIONS PHOTOGRAPHY Photographic Communication, Photojournalism – PR photography, Characteristics – Advantages, Limitations, Relative Appeal, Types of Photos, News Photos, Photo features, PR photos, Photographs as an aid to PR practice – Use of Photographs –In House Journals and News releases, Photo Cropping, Photo Captions – Digital Photography, PR manager and Photographer – Photo library, Directorate of Photo Divisions.	**L3, L4, L5, L6**	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Textbooks

1. Excellence in Public Relations and Communication Management Book by James E. Grunig, David M. Dozier, William P. Ehling.
2. Public Relations Theory Book by Carl H. Botan, Vincent Hazleton Jr.;

Reference Books

1. Effective Writing Skills for Public Relations by John Foster; John Foster
2. Public Relations and the Social Web by Robert Andrew Brown

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	P	A	CT	EE
Weightage (%)	15	5	10	70

CT: Class Test, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	--	2	--	--	--	--	--	1	2	2	2
CO2	--	2	--	--	--	--	--	1	2	2	2
CO3	--	2	--	--	--	--	--	1	2	2	2
CO4	--	2	--	--	--	--	--	1	--	2	2
CO5	--	--	--	--	--	--	1	1	2	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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DJRN2802	NEW JOURNALISM : CONCEPTS AND PRACTICE	L	T	P	FW/ Proj	C
Version	**2023**	2	1	2	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course focuses on different aspects of New Journalism such as digital reporting, content editing, and the study of digital technology for modern media. Theoretical and practical training of page layout and designing for different online platforms. The course concentrates on New Journalism Practices along with online media contents to enhance the knowledge of students.

Course Objectives

This course is designed to enable students to have a conception of digital media and enable them to understand potential and limitations of Digital Media. The student shall recognise and participate on Digital Media. Students shall be encouraged to produce media messages using variety of digital tools. This course shall introduce students to various career opportunities in New Media.

Course Outcomes (COs):

On completion of this course, the students will be able to

- Explain the uses of online media for journalistic purpose and the trends in online reporting and ethics.
- Examine the applications of online tools for communication.
- Create and design web stories, blogs, podcasts etc.
- Understand changing media scenario.
- Evaluate new media technologies to raise ethical concerns.

Syllabus / Topics to be Covered

Modules	Blooms level*	Number of hours
Module I- Basics of New Journalism Media Convergence and Digital Divide, Information Communication Technology (ICT): An Overview, New Media: Definition, Characteristics, Scope and Revenue Models, New Media Platforms: Networking, ISP, Browsers, WWW, Types of Websites (according to content), Characteristics of Digital Media, Understanding Credibility of Digital Media, Credibility Building Process, Net Neutrality, Mobile Revolution, Digital Literacy, Emerging Trends and Technologies.	**L1, L2**	10
Module II: Online Communication Management Introduction to CMS, Components and Features, How Does CMS Work, Types of CMS - Open source & Commercial CMS, Characteristics and Advantages of Open-Source CMS, How to Build a Website with a CMS software Introduction of Mobile Journalism- Workflow & Skills Required, Tools & Apps for Mobile Journalism, Challenges of Mobile Journalism, social media and Social Networking Sites & Mobile Journalism, E-governance, Citizen Journalism etc.	**L1, L2, L3**	10

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Module III: Media Convergence and Audience Artificial Intelligence and Convergence, Social Media Platforms on Web and Mobile, Understanding Audiences, Characteristics of Audiences, Types of Audiences, Passive, Active and Participatory Audience, Audience Autonomy-free or controlled content creators, Basics of Digital Audiences, Search Engine Strategies for Digital Audience Acquisition, Social Media Campaigns and Engagement, Digital Audience Research and Behaviour, Digital Audience Analytics, Digital Audience Management, Webcasting, Podcasting, Blogs etc., Website Audience Measurement (WAM)	**L2, L3, L5, L6**	8
Module IV: Designing Online Content: Planning and Execution The Importance of Website Planning, Beginner's Guide to Build, produce and publish a website, design a Website: planning and execution using open sources, Rewriting & Reconstruction of News, Photo & Video Editing, Timeline creation for digital news, Editing and uploading content on Web, Tools and Techniques for Online Journalism (Mapping, Timeline, Infographics, Podcasts, Explainer Videos, etc.), Audio Basics, Audio Streaming Server & its use, saving sound files & podcast on Web, Tips for writing for Audio, Tools and Techniques for Voice Over, Podcasting: Formats, Planning, Scripting, Recording a Show, Podcast Production, Terms and Tools. Application for Journalists: Blogs, Portals, Websites, Social media platforms, Wikis, etc., Journalistic use of social media, Social Media Collaboration, Citizen Journalism, Streaming Servers: News Aggregators & SEO, SMO Elements of Digital Multimedia applied for news stories, Content Generation, Dos & Don'ts during traditional journalism vis a vis the multimedia journalism, tips, tools, and best practices of online storytelling.	**L2, L3, L4, L5, L6**	15
Module V: Ethical Concerns in Digital Age Digital Media Laws; Issues in Cyber Security: Piracy, Copyright, Open Sources, Digital Archives, Digital Content and Intellectual Property: Paid & Unpaid Digital Contents (News, Advertisements, etc.), Ethical concerns of writing for digital media, Cyber Piracy, Digital Media Effects: Cybercrime, Privacy, Hate Speech, Surveillance, Case studies.	**L1, L2, L3,**	5

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

1. McQuail, D. (2012). Mass communication theory. Los Angeles: Sage.
- Mishra, R.C. (2008). Cyber crime: Impacts in the new millennium. New Delhi:Author Press.
- Rajgopalan, S., (2006). The digital divide. Hyderabad: ICFAI University Press.
- Robbins, J. N. (2018). Learning web design: A beginner's guide to HTML, CSS, Javascript,
- and web graphics. California: O'Reilly.

Reference Books

- Barker, M. S. et al. (2013). Social media marketing: A strategic approach. Ohio:
- South-Western Cengage Learning.
- D. Satish., & Kaila, R. (2006). Blogs: Emerging communication media. Hyderabad:
- The ICFAI University Press.
- Martin, P., & Erickson, T. (2011). Social media marketing. New Delhi: Global Vision
- Publishing House.
- Schiller, J. (2005). Mobile Communication. Amsterdam: Pearson Education.

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Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	P	A	CT	EE
Weightage (%)	15	5	10	70

CT: Class Test, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	--	--	--	--	--	--	--	--	--	--	--
CO2	--	--	--	--	--	--	--	--	--	--	--
CO3	--	--	--	--	--	--	--	--	--	--	--
CO4	--	--	--	--	--	--	--	--	--	--	--
CO5	--	--	--	--	--	--	--	--	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SPECIALIZATION-II (CHOOSE ANY ONE)

- Print Media
- Advertising
- Still Photography
- Electronic Media (TV/Radio)
- Event Management
- Digital Media
- Media Literacy and Fact Checking

Course Objective:

This subject is an attempt to inculcate professional writing skillsand knowledge in flowering buds of the media department. The subject will give hands on experience on different aspects of media writing to the students. The students may choose the option of this subject from their concentration electives.

To give an in-depth exposure to the area of specialization, in order to make the students "industry ready" immediately after the programme

Course Contents:

Project Outlines

The students can opt for any of the following specialized area:

- Print Media
- Advertising
- Still Photography
- Electronic Media (TV/Radio)
- Event Management
- Digital Media
- Media Literacy and Fact Checking

Project details and Topics can be chosen in consultation with the concerned faculty

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DJRN2839	DATA ANALYSIS & VISUALISATION USING SOFTWARE	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	Class X Mathematics				
Co-requisites					

Catalog Description

The implosion of available data has made visualization more critical but also more challenging. Data analysis and Data Visualization are essential tools for business analysis, engineers, policymakers, and decision-makers. Developed originally for "small data", visualization techniques have been met with varied success in the past centuries and decades. There are a few well-known visualizations that are very effective in capturing the essence of the data, and of course, there are many infamous negative examples of poor visuals. An effective visual is critical for decision making it, but it also requires a lot of work, customization, attention to detail, and refinements.

Course Objectives

The course is designed to help students develop skills and knowledge in the following area(s):

- Develop an understanding of what is a good visualization for a given purpose
- Learn visualization theory & techniques
- Build a substantial data analytic project
- Apply data analysis and visualization with Excel, SPSS, R, Python, NVivo and MATLAB

Course Outcomes

On completion of this course, the students will be able to

CO1. Students will be able to articulate meaningful lines of inquiry that might be explored through the collection, organization, visualization, and analysis of data in a context associated with their primary field of study using (as appropriate) numerical, textual, spatial, and/ or visual data.

CO2. Student will understand what data are, how they are collected, and how to assess the quality/ reliability of data.

CO3. Students will demonstrate intermediate proficiency in the visualization of data to communicate information and patterns that exist in the data.

CO4: Students will be able to use at beginning level of proficiency the tools of statistics and machine learning to ask questions of and explore patterns in data.

Course Content :

Module	Topics Covered	Blooms Level	Contact Hours
1	**Module-1: Introduction to Excel** Data Analysis using Excel, Curve fitting, Correlation, Linear Regression, Multiple regression, Principal Component Analysis and Factor Analysis, Hypothesis testing	L1, L2, L3, L4	20 hours

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	Introduction to Excel and SPSS Introduction to SPSS and Types of Data, Importing, exporting and data handling in SPSS; Exploratory data analysis using SPSS and data visualization; Introduction to statistical inference and various univariate tests by using SPSS; Analysis of Variance (One Way ANOVA, Two Way ANOVA and ANCOVA); Correlation, Simple and Multiple linear Regression Analysis; Principal Component Analysis and Factor Analysis		
2	**Module-2: VOS Viewer** **Web of Science, Scopus, Dimensions, Lens, and PubMed.** Co-authorship networks, citation-based networks, and co-occurrence networks can be created based on data downloaded from Web of Science, Scopus, Dimensions, and Lens. Co-authorship networks and co-occurrence networks can also be created based on PubMed data. **Crossref, Europe PMC, and OpenAlex**. Networks can also be created based on data retrieved through the APIs of Crossref, Europe PMC, and OpenAlex, These APIs can be queried interactively in VOS viewer. **Semantic Scholar, Open Citations, and Wiki Data.** For a given set of DOIs, networks can also be created based on data retrieved through the APIs of Semantic Scholar, Open Citations and Wiki Data.	L1, L2, L3, L4	10 Hours
3	**Faculty of Management Studies & Behavioural Sciences** **Module 3: Domain Specific Software** **- Structural Equation Modelling** **Smart PLS** Introduction to Structural Equation Modelling (SEM), Introduction to the software's AMOS and SPSS, SMART PLS, Testing of Statistical assumptions, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), common method bias (CMB) test, Measurement Model Assessment, Discussing Fit Indices, Reliability and Validity Testing, Structural Model Assessment identifying multivariate outlier, Construct Validity: Convergent and Discriminant Validity, Measurement Model & Structural Equation Modelling, Mediation and Moderation Effects, Multi-Group Analysis.	L1, L2, L3, L4	30 Hours

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	Faculty of Arts **N Vivo** 1. Import text, audio, video, emails, images, spreadsheets, online surveys, web content, and social media from various sources into a simple, intuitive interface. 2. Create and NVivo project, import and organise qualitative and quantitative data 3.Manage a literature review in NVivo 4. Autocode structured data deductively and identify themes inductively 5. Generate and falsify hypotheses 6. Combine data in sets for analysis 7. Seek patterns and identify relationships across codes and cases 8. Present findings using visualisations 9. Export data out of NVivo 10. Coordinate teamwork.		
	Faculty of Science Engineering and Technology **Faculty of Health & Allied Sciences** **R programming / Python/ MATLAB** **R Programming-** Introduction to R, Variables and datatypes in R, Dataframes, Recasting and joining of dataframes, Arithmetic, logical and matrix operations in R, Functions in R, Control structure in R, Data visualization in R. **Python Programming-** Basics of programming, data structure and algorithm using Python, Strings, lists, control, functions, manipulating lists, loops, arrays, selection sort, insertion sort, recursion, sorting, dictionaries, exception handling, file handling, string processing, data analysis using Python **MATLAB Programming-** Introduction, basic features, managing workspace, mathematical functions, basic plotting, Matrices, array operations and linear equations, MATLAB programming- M files script, M-file functions, control flow and operations.		

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional (Theory/ Practical)	End Term Examination
Weightage (%)	5	10	15	70

References:

- David Houcque, 2005. Introduction to MATLAB programming for Engineering students., Northwestern University, E- Book

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https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf

- Mark Lutz, 2009. Learning Python. O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.
- Emmanuel Paradis, 2005. R for Beginners. E book. **https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf**
- A Handbook of Statistical Analysis using SPSS by Dr. Brijesh Awasthi, Redshine Publication.

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Amity School of Communication

Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics

FLEXILEARN
-Freedom to design your degree



Curriculum & Scheme of Examination

2023

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Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics
SEMESTER-I

DANI2151	INTRODUCTION TO DESIGN AND GRAPHICS	L	T	P	FW/ Proj	C
Version	**2023**	2	0	2	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This unit is designed to initiate the student into the rudiments of design and application of design in life that we see around us. After briefly introducing basic principles of design to the student, it will focus more narrowly on design principles that are peculiar or unique to the field of gaming, animation, 3D modeling (both interior and exterior) and character animation.

The student will learn as well as imbibe important typographic principles, use of fonts and fontography, use of color, color harmonies, color mixing, color palettes and tonal balance.
The important role that symmetry, balance, images –both vector as well as bitmaps, play in synchronously creating a harmonious and aesthetically appealing composition will all be explained with real world examples of practical design being implemented in myriad media fields such as advertising, mass communication, gaming, and animation. The second part of the unit will be software intensive, with both popular bitmap as well as vector software taught from beginner to intermediate level.

Course Objectives:

The objective of this course is to:

- Enable the students to comprehend principles of design and graphics using a blended learning approach.
- To familiarize students with all aspects of software, both at the beginner as well as at an intermediate level
- To integrate seamlessly both theoretical as well as practical aspects of design such that the learner is able to instantly identify as well as appreciate design principles incorporated in the physical realm, be it print, net, web, film, or television.
- To attain more than a level of familiarity with popular commercial as well as open-source software so that s/he can instantly start designing the moment a project is assigned.

Course Outcomes:

On completion of this course, the students will be able to:

S.No	Expected Outcome	Bloom's Taxonomy level
1	Be able to visualize and conceptualize layouts for print, web, video and Multimedia	**L1, L2**
2	Completely proficient with all aspects of three to four design software, notably Adobe Photoshop, Illustrator, Affinity Photo and Affinity Designer. They will also be taught fundamentals of Corel Draw or InDesign, at a beginner level	**L1, L2,L3**

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3	Be proficient at delivery of design projects, both at a conceptual level and at the execution stage.	**L3, L4, L5**
4	Be able to work in a team delegating different aspects of production to team members and also work at a peer-to-peer level, so that professional quality work can be produced and exported.	**L3, L4, L5, L6**

Syllabus / Topics to be covered

Modules	Blooms level*	Number of hours
MODULE1: Design Concepts – traditional and digital Differences between traditional design, primarily for print as compared to designing for the web, the internet, and for television and film will be compared and contrasted, and how these inherent differences can be optimized for a specific media will be explained and elaborated upon. A broad overview imparted to each software with its distinguishing features and also reasons will be emphasized why a particular software is more suitable for a design project over others. The importance of maintaining inter-software compatibility as well as with market employed software will also be highlighted	L1,L2	4
MODULE2: What is Design? This module focuses exclusively on Design Elements, Design Principles and Aesthetics. How elements and principles help Indesign. Where, how and in which situation, these elements and principles are applicable. How do different design elements combine and mesh together to create an overall 'look' and feel for the published output – be it a web page, a mobile app or graphics for a social media video.	L2,L3	6
MODULE3: Typography and Introduction to Illustrator & Designer History of fonts, Sizes of fonts, Classification of fonts, True Type and OpenType. Breakdown of a word into typographical elements and ligatures, designing a custom font from scratch, all form part of this particular module. Each concept that is explained is generously illustrated with practical examples drawn from mixed media.	L2,L3	6
MODULE4: Hardware and Software From more theoretical concepts like Typography and design principles we move to the more practical aspects of implementing design on the ground through use of immersive technologies. Important aspects of hardware, notably the computer and accessories like printers, scanners and other input/output devices are explained. The student is also taken through the gamut of design software that exist that take full advantage of the computers' multitasking and multi-threading capabilities. In this module, an overview of Digital Publishing software is given. In the next two modules, the most popular design software are explained at length.	L2, L3, L4	6
MODULE5: Fundamentals of Design Software Editing of images, making selections and cropping, integration of text with graphics, as well as the importance of resolution, image size, pixel depth, and the different sizes and formats for print, web, broadcast and internet mediums such as Youtube are all covered in this module. Also the different image file formats such as jpg, png, tiff etc along with transparency and scaling are also	L3,L4, L5, L6	8

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explained. From technical definitions we move on to the software itself, covering all basic aspects of industry standard software like Photoshop, Illustrator, Corel Draw and Adobe InDesign. An overview of the Affinity range of products like Designer and Photo is also covered so that the student can compare and contrast the differences and know which software to use in a given workplace situation.		
MODULE6: Design Software–Intermediate level This module covers the above software in more detail and depth with overlying emphasis being given to integration of practical projects that employ all the theoretical knowledge imparted. Once a set of topics is taught, application of the same is demonstrated through several practical exercises that are not only structured but also graded in terms of complexity and applicability. Latest developments in the software being taught are covered and also new plugs in that radically extend the functionality of the software (like AI plugins for example) are also enumerated.	L3,L4, L5, L6	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Textbooks

- Sarkar,N.M. Art& Print Production. 2013Ed.
- Krug, Steve. Don't Make Me Think: A Common Sense Approach to Web Usability. NewRiders Publishing, California. 2nd Edition
- Bauer,Peter. Adobe Photoshop CC ForDummies.Wileys.2nd Edition
- Wood, Brian. Adobe Illustrator CC Classroom in a Book (2023 Release), Adobe Press.First Edition.December 2022

Reference Books:

- Morrison, Robert. ADOBE INDESIGN 2023 FOR STARTERS: Beginners Guide to Mastering and Getting Basic knowledge About Adobe Indesign, Adobe Press. February 2023
- Norman, Don. *The Design of Everyday Things: Revised and Expanded Edition*. November2013.

Modes of Evaluation: Practical/Home Assignment/Class Test/Written Examination

Examination Scheme:

Components	**P**	**CT**	**A**	**EE**
Weightage(%)	10	15	5	70

P: Project, CT: Class Test, EE: End Semester Examination; A: Attendance; H: Home Assignments

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CO, PO and PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PS O1**	**PS O2**	**PS O3**	**PS O4**
CO 1	1	2	1	3	..	..	..	1	1	1	3
CO 2	1	2	3	3	..	..	..	1	1	1	3
CO 3	1	2	1	3	..	..	..	1	3	1	3
CO 4	1	1	3	1	..	..	..	2	3	1	1
CO 5	..	..	..	..	..	..	..	..	..	..	..

1: Strongly Related, 2:Moderately Related and 3:Weakly Related

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DANI2102	BASICS OF ART HISTORY AND SKETCHING AND DRAWING	L	T	P	FW/ Proj	C
Version	**2023**	1	0	2	0	2
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course will cover the fundamentals of drawing and will address line, tone, volume, space, scale, proportion and artistic expression. An emphasis on "process" will direct the momentum of this course. The course considerably emphasizes on the concept of Illustration techniques and visualization power.

Course Objectives

The objective is to teach students about different forms of Art. Art is a form of communication, it is an interaction between the elements and principles of art help artists to organize sensorially pleasing works of art while also giving viewers a framework within which to analyze and discuss aesthetic ideas. This course will help students in building basic drawing and sketching skills which is essential part of animation process.

Course Outcomes (COs):

On completion of this course, the students will be able to

Expected Outcome	Bloom's Taxonomy level
1. Know the basic concepts of art with Shapes, Lines and Forms to sketch from Memory and live action.	L1, L2, L3
2. Learn about Lights, Shades, Tone and Colors and to increase thought on Shading in different angles of pencil strokes, simple shapes of geometrical shapes.	L2, L3, L4, L5
3. Understand the Basic concepts on Rhythm, Consistency and Balance.	L3, L4, L5
4. Gain the Knowledge on basic drawing of Organic, Living and Non-Living objects and skills for Human Anatomy.	L3, L4, L5
5. Apply the aesthetic value and observation techniques on further complete Composition.	L2, L3
6. To develop the concept and impart knowledge of Pose to Pose drawing and Rapid Sketching Techniques.	L3, L4, L5

Syllabus / Topics to be Covered

Modules	Blooms level*	Number of hours
Module I: Art History & Drawing Basics • Basic Timeline of Art Movement & Contemporary Art • Understanding the Significance of Art in Human Culture • Simple Geometrical shapes • Elements of Art- Line, Shape, Form, Color, Texture, and Space • Important Principles of Art and Drawing - Balance, Proportion, Rhythm, Harmony, and Contrast • Perspective in Drawing • Perspective in lines in landscapes	**L1, L2, L3**	14

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• Concept of Human Anatomy • Understanding Character Design Anatomy & Proportions • Idea of Different Head Shapes and Characters		
Module II: Understanding Light, Shadow and Color • What is Light & Shadow? • Basics of Color Theory • How to prepare a composition • Shading in different angles of pencil strokes Attitude • Formatting in different textures with pencil • Concept of Lighting and Shading technique	**L2, L3, L4, L5**	12
Module III: Sketching for Animation • Basic Introduction to Acting, Modelling and Sketching • Concept of Sketching from live models • Rapid sketching from live models • Rapid Sketching techniques • Action Analysis • Frame by Frame Sketching Technique • Pose to Pose sketching technique • Background Art and Environments	**L2, L3, L4, L5**	14

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

1. Thomas C. Wang (1977). Pencil Sketching, UK: John Wiley & Sons.
2. Catharine Slade (1997). The Encyclopedia of Illustration Techniques, New York: Martin Salisbury
3. Catharine Slade (2011). The Manual of Illustration Techniques, UK: A & C, Black Publishers Ltd.

Reference Books

1. Darrel Rees (2008). How to be an Illustrator, USA: Dell Publishing Company

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**H**	**A**	**CT**	**EE**
Weightage (%)	10	5	15	70

CT: Class Test, EE: End Semester Examination; A: Attendance; H: Home Assignments

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	2	1	2	--	--	--	1	2	1	3
CO2	1	3	3	3	--	--	--	1	1	1	2
CO3	1	1	1	3	--	--	--	1	3	2	3
CO4	1	1	2	1	--	--	--	2	1	1	1
CO5	--	--	--	--	--	--	--	--	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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DANI2101	FUNDAMENTALS OF CLASSICAL ANIMATION	L	T	P	FW/ Proj	C
Version	**2023**	1	0	2	0	2
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course is designed to provide the students with an understanding of fundamentals of animation, treatment, terminology, principles and various concepts required for Animation. Students will have hand-on practice on several concepts of classical animation.

Course Objectives

The objective is to teach students about different concepts involved in Animation, which will help them to apply these entire concepts practically.

This course provides students the fundamental skills to produce traditional style animation as well as introduce them to modern animation as well. Students will also be exposed to different principles of animation on which subsequent courses could be built upon. Students can also apply skills learned in this class in other areas including motion graphics, stop motion and basic traditional animation.

Course Outcomes (COs):

On completion of this course, the students will be able to

Expected Outcome	Bloom's Taxonomy level
Understand the traditional and computer-generated animation.	L1, L2, L3
Define and explain the 12 Principles of Animation, different concepts and styles, its importance and uses in animation process.	L2, L3, L4, L5
Analyze and Work with both inanimate objects as well as animated objects (human beings, animals) to create simple animation.	L3, L4, L5
Define, make & build assets for Background, Acting, Modeling, Voice over and dialogues from non-live models, etc.	L3, L4, L5
Able to relate to software designed to create 2D animation more easily.	L2, L3

Syllabus / Topics to be Covered

Modules	Blooms level*	Number of hours
Module I: History of Animation • Definition of Animation • Early History of Animation • Genres in Animation • Evolution of Walt Disney • Success of Fleischer Brothers • Traditional forms & Non-Traditional forms • Anime in Japan • Animation in different parts of world • Contemporary developments • Famous studios around the world	**L1, L2**	8

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Module II: Principles of Animation • The 12 Principles of Animation • Importance & Uses of Principles of Animation • Fundamentals of Animation Styles • Exaggeration • Attitude • Silhouettes • Boundary breaking exercises • Acting in Animation	**L1, L2, L3**	10
Module III: Concepts & Styles of Animation • Concept of Illusion • The phi phenomenon • Persistence of Vision • Unity of Motion • Classical forms of Animation • Types of Traditional animation styles • Cel Animation • Different techniques like, Flip Book, Pixilation, Hyperlapse, Sand Animation, Puppetry, Shadow Puppetry, etc • Experimental Animation • Rotoscope Animation • Concept of wide range of commercial, movies, projects and experimental works produced throughout the world	**L2, L3, L4, L5**	10
Module IV: Basic Animation Terminology • What are Layers, Frame and Composition? • Aspect Ratio • Frame Rate • Voice Over • Storyboard • Camera Movement- Panning & Tilting • Blocking • Frame by Frame Animation Technique • Pose to Pose Animation Technique • Onion Skinning • Transitions • Model Sheet • Rigging • Jump Cut • Walk Cycle & Lip sync	**L1, L2, L3, L4**	8
Module V: Stop Motion Animation • What is Stop Motion? • Stop-motion basic technique • Shooting and Editing Stop Motion • Using Stop Motion Softwares like DragonFrame, etc • Elements of Stop Motion • Claymation & Papercut Animation • Sets, models, characters, backgrounds in Stop Motion • Slow Motion, Fast Motion, and Reverse Shot • Lighting and Cinematic techniques	**L2, L3, L4, L5**	14

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

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Text Books

- Schenk, Sonja; Long, Ben. *The Digital Filmmaking Handbook*
- Priebe, Ken A. *The Art of Stop Motion Animation*. 1st Edition
- The Animator's Survival Kit (Revised Edition): A Manual of Methods, Principles and Formulas
- for Classical, Computer... by Richard Williams
- Acting for Animators: by Ed Hooks;
- Animation from Pencils to Pixels: Classical Techniques for the Digital Animator: by Tony White
- How to Make Animated Films: Tony White's Complete Master class on the Traditional Principles of Animation: by Tony White.

Reference Books

- Hollywood cartoons: by Michael Barrier
- Art in Motion: Animation Aesthetics: by Maureen Furniss
- The Animation Book: A Complete Guide to Animated Filmmaking from Flip: by Kit Laybourne.
- Weynand, Diana. Apple Pro Training Series: Final Cut Pro X
- Jago, Maxim. Adobe Premiere Pro CC Classroom in a Book. 2018 edition

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**H**	**A**	**CT**	**EE**
Weightage (%)	10	5	15	70

CT: Class Test, EE: End Semester Examination; A: Attendance; H: Home Assignments

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	2	2	1	1	--	--	--	2	2	1	2
CO2	1	2	3	2	--	--	--	1	1	1	2
CO3	2	1	1	1	--	--	--	1	3	2	3
CO4	1	1	1	1	--	--	--	2	1	2	1
CO5	--	--	--	--	--	--	--	--	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-II

DANI2201	2D ANIMATION	L	T	P	FW/ Proj	C
Version	**2023**	1	0	2	0	2
Pre-requisites/Exposure	Basic Computer Skills					
Co-requisites	Improving the Sketching Skills					

Catalog Description
This course introduces students to the art and concept of two dimensional or 2D computer animation. 'D' stands for dimension and refers to animation, which is conducted on a two-dimensional plane, unlike the real world where everything is seen and experienced on a three-dimensional plane. This course primarily focusses on the theoretical aspects of two-dimensional animation and is reinforced though many hours of hands-on lab training designed to right from the start, train the students to be industry ready.

Course Objectives
The objective of this course is to:

- Enable the students to comprehend principles of animation using a field-based approach.
- To familiarize students with all aspects of software, both at the beginner as well as advanced level.
- To instill in the students such a level of confidence that they can tackle projects at a near professional level by having a holistic knowledge of all software related to 2D animation.

Course Outcomes (COs):
On completion of this course, the students will be able to

Expected Outcome	Bloom's Taxonomy level
Completely proficient with all aspects of at least two 2D animation software, notably Adobe Animate CC (now Animate) and Adobe After Effects	L1, L2, L3
Be able to visualise, script, storyboard and create smart and relevant 2D animations	L2, L3,
Be able to produce quality motion graphics for the Television Industry using a variety of 2D animation tools and third-party plug-ins.	L3, L4
Be able to work in a team delegating different aspects of production to team members and exchange notes and monitor each other's work, so that professional	L3, L4, L5

Syllabus / Topics to be Covered

Modules	Blooms level*	Number of hours
Module I: Fundamentals of Animation What is animation? How is 2D animation different from other forms of animation. How are Animate CC and After Effects different from drawing and 3D packages? • The Animate CC Interface • Animate CC tools and menu commands • Animate CC and Photoshop – an integrated workflow • Frame-by-frame animation in Animate CC • Onion skinning – why it is needed. • Exploring the Timeline	**L1, L2**	15

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• Animating through action script • Motion tweening in Animate CC		
Module II: Introduction to After Effects This Unit moves out from the Animate CC interface tools, and dialogues into the domain of After effects. Since this package is used heavily by the Television Industry, many examples from this medium will be used to illustrate hard-to-grasp concepts. Various components of After Effects that will be taught in this module are: • The After Effects interface: Moving about and navigation in After Effects • AE tools and panels; how to customize and optimize them. • Keyboard shortcuts - how to use and customize. • Creating your first composition • The Timeline - navigation, panels, and scope of the timeline • Project windows and assets • Moving assets from project to timeline • Use of keyframes to create simple animations. • Principles of animation • Frame rates, speeding up and slowing down of animation. • Rendering and compression concepts. • Different kinds of movie formats • Exporting your first animation. • Settings and how they can be tweaked.	**L1, L2, L3**	15
Module III: 2D Animation Post-Production In this module very little theory is imparted. Students are expected to prepare a comprehensive AnimateCC and After Effects project each, which is closely monitored and supervised by the faculty in charge. The goal is to get the students as industry ready as possible and to ensure that at least one professional-looking project in both software packages is designed and executed.	**L2, L3, L4**	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

1. Williams, Richard. The Animation Survival Kit. Expanded Ed. 2009.
2. Whitaker, Harold. Timing for Animation. Focal Press, 2002

Reference Books

1. Schenk, Sonja. Long, Ben. The Digital Filmmaking Handbook. Fourth Edition.
2. Gyncild, Brie. Adobe After Effects CC: Classroom in a Book: the Official Training Workbook from Adobe Systems. 2014 Ed.

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Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	H	A	CT	EE
Weightage (%)	10	5	15	70

CT: Class Test, EE: End Semester Examination; A: Attendance; H: Home Assignments

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1	2	1	2	--	--	--	1	2	1	3
CO2	1	3	3	3	--	--	--	1	1	1	2
CO3	1	1	1	3	--	--	--	1	3	2	3
CO4	1	1	2	1	--	--	--	2	1	1	1
CO5	--	--	--	--	--	--	--	--	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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DANI2251	POST-PRODUCTION	L	T	P	FW/Proj	C
Version	**2023**	2	1	2	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

Post-Production for Animation using DaVinci Resolve is a comprehensive course that covers the essential aspects of post-production in animation projects. Students will learn how to use DaVinci Resolve, a powerful and widely used post-production software, to enhance their animated creations. This course includes audio editing, applying transitions and effects, color grading of RAW videos, and various aspects of video exporting. Through practical exercises and projects, students will gain hands-on experience in applying these techniques to produce videos.

Course Objectives

- Understand the post-production workflow and its significance in post-production.
- Utilize DaVinci Resolve effectively for video editing, audio editing, and applying transitions and effects.
- Enhance the visual appeal and storytelling through color grading techniques for RAW videos.
- Comprehend various RAW video formats and the process of exporting videos for different platforms.

Course Outcomes (COs):

On completion of this course, the students will be able to

Expected Outcome	Bloom's Taxonomy level
Proficiency in DaVinci Resolve: Students will gain a thorough understanding of DaVinci Resolve and its various tools and features. They will be proficient in using the software for video editing, audio editing, applying transitions and effects, color grading of RAW videos, and exporting.	L1, L2, L3
Enhanced Animation Projects: With the knowledge and skills acquired in post-production, students will be able to significantly enhance the quality of their animation projects. They will be able to edit animated sequences effectively, add transitions and effects to improve visual flow, and apply color grading techniques to create visually appealing and compelling animations	L2, L3, L4, L5
Immersive Audio Experience: Students will be capable of editing and manipulating audio tracks in DaVinci Resolve, incorporating sound design principles to create an immersive audio experience that complements the animation's narrative and enhances audience engagement.	L3, L4, L5
Professional-Grade Color Grading: Understanding color theory and utilizing DaVinci Resolve's advanced color grading tools, students will be able to perform professional-grade color grading on RAW videos. This skill will allow them to set the mood, tone, and atmosphere of their animations effectively	L3, L4, L5
Portfolio of Post-Production Work: Through practical exercises and projects, students will build a portfolio showcasing their post-production skills and the final animations they have enhanced using DaVinci Resolve. This portfolio will be an asset for future job opportunities in the animation industry.	L2, L3

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Syllabus / Topics to be Covered

Modules	Blooms level*	Number of hours
Module I: Introduction to Post-Production in Animation and DaVinci Resolve • Understanding the role of post-production in animation projects. • Overview of the DaVinci Resolve interface and workspace. • Importing and organizing animated sequences for editing.	**L1, L2**	8
Module II: Video Editing and Audio Editing in DaVinci Resolve • Techniques for precise video editing, timing, and transitions. • Applying transitions and effects to enhance animation sequences. • Working with audio tracks and applying sound design principles to create immersive audio experiences.	**L1, L2, L3**	10
Module III: Color Grading of RAW Videos in DaVinci Resolve • Introduction to RAW videos and their advantages for animation. • Understanding color theory and its impact on animation storytelling. • Utilizing DaVinci Resolve's advanced color grading tools for RAW videos.	**L2, L3, L4, L5**	10
Module IV: Exporting Videos for Various Platforms • Understanding different video formats and codecs for exporting. • Optimizing settings for web, broadcast, and cinema delivery. • Exploring options for exporting videos with multiple audio channels.	**L1, L2, L3, L4**	8
Module V: Workflow Optimization and Best Practices • Tips for streamlining the post-production process for efficiency. • Collaboration with animation teams and other post-production professionals. • Case studies of successful projects with notable post-production techniques.	**L2, L3, L4, L5**	14

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

1. Chris Roberts. *The Editors Guide to DaVinci Resolve 17.*
2. Lance Phillips (Author), Stefania Marangoni (Foreword) .*Video Editing Made Easy with DaVinci Resolve 18: Create quick video content for your business, the web, or social media.*
3. Henry J. Jame. .*Getting Started with DaVinci Resolve 18*

Reference Books

1. Goodman, Robert M. McGrath, Patrick.*Editing Digital Video (Digital Video and Audio Series). McGraw Hill, 2002.*
2. Dancyger, Ken. *The Technique of Film and Video Editing: History, Theory, and Practice. Focal Press. 5th Ed.*

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Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	H	A	CT	EE
Weightage (%)	10	5	15	70

CT: Class Test, EE: End Semester Examination; A: Attendance; H: Home Assignments

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	1	--	--	--	2	2	1	2
CO2	1	2	3	2	--	--	--	1	1	1	2
CO3	2	1	1	1	--	--	--	1	3	2	3
CO4	1	1	1	1	--	--	--	2	1	2	1
CO5	--	--	--	--	--	--	--	--	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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DANI2202	SCRIPTING AND STORYBOARDING	L	T	P	FW/ Proj	C
Version	**2023**	1	0	2	0	2
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

In this course, students learn the rudiments of scripting and storyboarding as well explore the differences between the different script formats. They are introduced to conceptualizing a treatment and style for a film, scripting for feature films, documentaries and Animation. Students will also acquire knowledge about screenplays, storyboards and Animatics.

Course Objectives

This course equips the learner with skills in three distinct areas. Firstly, to polish their writing styles, structures and grammar so that the student can write in a lexically and grammatically correct manner. Secondly, to build a sound theoretical foundational of filmic elements so that the learner can translate prose elements into visual narratives. Thirdly, to enable the learner to conceptualize, visualize and translate these abstract ideas into a concrete text in the form of storyboards and scripts. The entire course takes the advantage of a huge repository of good audio-visual material so that every theoretical construct can be supplemented and illustrated with examples drawn from filmic and broadcast domains.

Course Outcomes (COs):

On completion of this course, the students will

Expected Outcome	Bloom's Taxonomy level
Have improved writing styles and will be able to write quickly effectively and well in a variety of styles.	L1, L2, L3
Have a sound foundational structure of film grammar so that they can translate filmic elements into narrative structures and visualize scenic elements with ease.	L1, L2
Be able to write creative and cohesive scripts in a variety of programme formats such as fiction, animation and documentaries.	L2, L3, L4
Be proficient at every aspect of writing for fiction and non-fiction. They will be able to translate abstract ideas into shootable scenes.	L4, L5
Be able to make storyboards and animatics for different production.	L3, L4, L5

Syllabus / Topics to be Covered

Modules	Blooms level*	Number of hours
Module I: Pre- Production, Concept and Treatment This unit focuses essentially of all aspects of pre-production. Methods of research, scouring for sources of material, collating and compiling material. And understanding requirements before production. 1. What is Pre-Production? 2. Why is Research needed? 3. Types of Productions	**L1, L2, L3**	8

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4. Concept of Recce 5. Importance and role of Budgeting, Permissions and Auditions. 6. Characterization and its significance. 7. Concept of Shot Division and Continuity 8. Format of Floor Plan and Continuity sheet 9. Different Transitions and its meaning. 10. Concept of Kuleshov Effect and its phenomenon.		
Module II: Fundamentals of Film Grammar This is very important module which introduces the fundamentals of constructing and deconstructing a film as well as techniques developed by the great masters of documentary and cinematic narrative. 1. What is Visual Grammar? 2. Concepts and use of semiotics. 3. Subliminal messaging 4. Auteur 5. Suspension of disbelief 6. Ambiguity in storytelling. 7. Creating different types of Narratives 8. Ellipsis 9. Diegetic and Non-Diegetic 10. Film Genres 11. What are Compositions, Line of Action and Magnification? 12. Uses of Montages 13. Concept of Rashomon Effect	**L1, L2**	10
Module III: Writing a Script This module explains and teaches the actual writing process. How all the different ingredients of pre-production research, visualization, film grammar and principles come together to form a compelling narrative. 1. What is an idea? 2. Synopsis 3. Writing different kinds of Story 4. Slug line 5. Script Formats 6. Writing Dialogues and its importance 7. Soliloquy 8. Mise-en-scène 9. Format of a typical script 10. Writing a sample script 11. Writing a Script for PSA's 12. Writing a Script for Documentaries	**L2, L3, L4, L5**	12
Module IV: Screenplays and Storyboarding This is almost a completely practical unit, where students are taken through the entire process of writing a script and have to prepare on an individual basis scripts and storyboards in a variety of formats. And later make proper animatics with sound design. 1. What is a Screenplay? 2. Screenplay Formats	**L2, L3, L4, L5**	15

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3. Difference between Screenplay and Script 4. Writing a complete Screenplay for Animation 5. Writing a complete Screenplay for Live Action 6. Storyboarding 7. Need of Storyboarding 8. Storyboarding Format 9. Introduction to Narramatics 10. Introduction to Animatics 11. Designing and making Animatics 12. Sound design for Animatics		

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

1. King, Stephen. On Writing: A Memoir of the Craft. Simon and Schuster, 2012
2. Douglas, Pamela. Writing the TV Drama Series: How to Succeed as a Professional Writer in TV. Paperback-Illustrated, 2018
3. Screenplay: The Foundations of Screenwriting, A step-by-step guide from concept to finished script by Syd Field, 2005

Reference Books

1. Truby, John. The Anatomy of Story: 22 Steps to Becoming a Master Storyteller. Faber and Faber, Inc. 2008
2. Strunk Jr., William. White, E. Elements of Style. Fourth edition. 1999

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**H**	**A**	**CT**	**EE**
Weightage (%)	10	5	15	70

CT: Class Test, EE: End Semester Examination; A: Attendance; H: Home Assignments

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	2	1	--	--	--	--	1	2	2	2
CO2	1	2	1	--	--	--	--	1	2	2	2
CO3	1	2	1	--	--	--	--	1	2	2	2
CO4	1	2	1	--	--	--	--	1	--	2	2
CO5	--	--	--	--	--	--	1	1	2	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-III

DANI2301	UI AND UX DESIGN	L	T	P	FW/Proj	C
Version	**2023**	2	0	2	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

The UI/UX Design brings a design-centric approach to user interface and user experience design, and offers practical, skill-based instruction centered around a visual communications perspective, rather than on one focused on marketing or programming alone. Students will learn to summarize and demonstrate all stages of the UI/UX development process, from user research to defining a project's strategy, scope, and information architecture, to developing sitemaps and wireframes. You'll learn current best practices and conventions in UX design and apply them to create effective and compelling screen-based experiences for websites or apps.

User interface and user experience design is a high-demand field, but the skills and knowledge you will learn in this Specialization are applicable to a wide variety of careers, from marketing to web design to human-computer interaction.

Course Objectives

1. To teach about the UX design & Frameworks
2. To train the basic elements of User-centric design
3. Learn the visual elements of User Interface Design
4. To teach the tools of prototyping and user-testing.

Course Outcomes (COs):

On completion of this course, the students will be able to

Expected Outcome	Bloom's Taxonomy level
To teach about the UX design & Frameworks: Students will gain a comprehensive understanding of the key principles and frameworks in UX design, including popular methodologies like Design Thinking and the Double Diamond model.	L1, L2, L3
To train the basic elements of User-centric design: Students will be able to apply user-centric design principles to real-world problems, ensuring that products and services are developed with the end-users' needs and preferences in mind.	L2, L3, L4, L5
Learn the visual elements of User Interface Design: Students will learn the visual elements of user interface design, including color theory, typography, layout, and iconography, and apply these principles to create visually appealing and user-friendly interfaces.	L3, L4, L5
To teach the tools of prototyping and user-testing: Students will learn to create interactive prototypes that simulate user interactions, providing a realistic representation of the final product and allowing for usability testing.	L3, L4, L5
Portfolio of UI/UX Designs: Through practical exercises and projects, students will build a portfolio showcasing their Interface design skills and the final protypes they have made using Figma. This portfolio will be an asset for future job opportunities in the Design industry.	L2, L3

Syllabus / Topics to be Covered

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Modules	Blooms level*	Number of hours
Module 1: Introduction to UI/UX Design • Introduction to UI and UX design concepts • Historical overview of UI and UX design • Importance of user-centered design • Role of UI/UX designers in product development • Overview of the design process	**L1, L2**	8
Module 2: User Research and Information Architecture • Conducting user research (interviews, surveys, observations) • Creating user personas and user stories • Information architecture principles • Card sorting and user flow diagrams. • Wireframing and prototyping tools and techniques	**L1, L2, L3**	10
Module 3: Visual Design and Interaction Design • Principles of visual design (color theory, typography, layout) • Visual hierarchy and composition • Creating mood boards and style guides • Interactive design principles • Designing for multiple devices (responsive design)	**L2, L3, L4, L5**	10
Module 4: Usability Testing and Evaluation • Introduction to usability testing • Planning and conducting usability tests. • Analyzing user feedback and data • Iterative design based on user testing results. • A/B testing and its role in design optimization	**L1, L2, L3, L4, L6**	8
Module 5: Design Tools and Industry Best Practices • Overview of design tools (Figma) • Collaborative design and prototyping • Design handoff to developers • Ethical considerations in UI/UX design • Industry best practices and emerging trends in UI/UX	**L2, L3, L4, L5, L6**	14

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- UX Design: A Field Guide To Process And Methodology For Timeless User Experience (2021), Steven Miller..
- Adobe XD Classroom in a Book (2020 release) , Brian Wood : Adobe Press.

Reference Books

- Sprint: How To Solve Big Problems and Test New Ideas in Just Five Days : transworldBooks

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	H	A	CT	EE
Weightage (%)	10	5	15	70

CT: Class Test, EE: End Semester Examination; A: Attendance; H: Home Assignments

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CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	1	--	--	--	2	2	1	2
CO2	1	2	3	2	--	--	--	1	1	1	2
CO3	2	1	1	1	--	--	--	1	3	2	3
CO4	1	1	1	1	--	--	--	2	1	2	1
CO5	--	--	--	--	--	--	--	--	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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DANI2351	3D FUNDAMENTALS	L	T	P	C
Version	**2023**	2	1	2	4
Pre-requisites/Exposure	Basic understanding of computer and software interface				
Co-requisites	None				

Catalog Description

This course is the introduction to the 3d computer graphics. In this course students will get to know about the possibilities of the 3d art and design. Student will start from the very basics of creating sphere, box, circle, line… etc and then creating 3d interiors and 3d models with textures and shaders. Student will get an introductory look at the processes of 3d lighting. Student will use a project-based approach as we cover the virtual 3D lighting system, look at commonly used attributes and properties of various light, and talk about some time-saving tips and techniques gleaned from production experience.

Course Objectives

The objective of this course is to

- To give a basic understanding of 3D visualization and to understanding how to start with 3D interface.
- To give hands on experience of 3D modeling, texturing, shading, and create a foundation for the advance 3d visualization.
- To provide a detailed understanding of 3d modeling.
- To train the 3D lighting uses various lights available in 3Ds Max lighting and mental ray including shaders.
- To teach the realistic rendering process of scene which used for film or any other Advertisement.
- To visualize the lighting mood for given story and their scenes and shots and then getting output in terms of video or stills using rendering techniques.

Course Outcomes

On completion of this course, the students will be able to

Expected Outcome	**Bloom's Taxonomy level**
CO1. Understand how 3d software interface work.	L1, L2, L3
CO2. Learn various ways of modelling the objects.CO3. Understand how character mesh flow help while animating and designing a character. CO3. Put light for exterior, interior or any kind of scene using fill light, main light and back light.	L1, L2
CO4. Get realistic output in the form of video or still using mental ray, software, and hardware rendering.	L2, L3
CO5. Develop the proper realistic shader effect, given them glow effect, high quality render in HD format	L4, L5

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Course Content

Modules	Blooms level*	Number of hours
Module 1 Introduction to Blender 3d, Interface of Blender 3d, Basics of Blender 3d Modeling, Texturing, Shading, Lighting, Using the menus. Floating and docking, Using drag and drop feature, Introduction to different workspaces. Geometry, sub objects, Extruding, welding, bridging etc. Recognizing the workspaces.	L1, L3	24
Module 2 Introduction to modifiers and modifier gizmos. Familiarity with common modifier like Subdivision Surface, Solidify, Array, Boolean, lathe Mirror etc.	L1, L3	12
Module 3 This module focuses on the development of 3D interiors and environment. Use of different modelling techniques like sculpting and polygon modelling are explained with many real-world references. Also, how to use background images as references objects for creating the 3D model and will be demonstrated in this module. This module also covers coloring, texturing and shading of 3d objects.	L1, L3	12
MODULE 4: Lighting tools in 3D software; 3D lighting tutorial, different types of 3D lights (Point, Sun, Spot and Area light) found in 3D application, and methods for easily aiming and controlling lights, specialized attributes found in certain light types, different types of shadows available in 3D software, how depth can be added for mood to our scenes through the use of volumetric light rays, as well as many other lighting tools and concepts that will help you establish a solid foundation in 3D lighting.	L1, L2	16
MODULE 5: The core rendering tools and features of 3D lighting that every rendering artist needs to be familiar with. Foundational knowledge of rendering in 3D software lighting by talking about many of the key tools, features and concepts. Demonstrate how to resolve some rendering-related issues that student may encounter, strong workflow practices that will be extremely beneficial to them as an emerging render artist.	L4,L6	22

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- *Oscar Baechler, Xury Greer, (2020). Blender by Example, UK: Packt Publishing Ltd.*

Reference Books

- John M. Blain (2019). The Complete Guide to Blender Graphics: Computer Modeling & Animation, Fifth Edition, Cloudtail India
- Kelly L. Murdock (2014). *Autodesk 3ds Max Bible,* India: Wiley

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	P	C	CT	A	EE	
					Practical	Theory
Weightage (%)	5	10	10	5	20	50

P- Project, C- Case Discussion/Presentation/Analysis, CT- Class Test, A- Attendance, EE- End Semester Examination

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	2	-	1	3	--	--	--	1	1	--	2
CO2	2	-	1	3	--	--	--	1	1	--	2
CO3	2	-	1	3	--	--	--	1	1	--	2
CO4	-	1	-	1	-	-	-	1	-	1	1
CO5	1	1	-	-	-	-	-	-	1	-	1

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

DANI2302	SOUND DESIGN	L	T	P	FW/Proj	C
Version	**2023**	0	0	2	0	1
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course provides students with a comprehensive understanding of sound editing principles and techniques used in various media production contexts, including film, television, video games, and multimedia projects. Students will explore the tools and software used for sound editing, as well as the creative and technical aspects of the craft. Through hands-on exercises and real-world projects, students will gain practical experience in recording, editing, and mixing sound to enhance storytelling, create immersive experiences, and produce high-quality audio content.

Course Objectives

The objective of this course is-

- Understand the fundamental principles of sound editing and its role in media production.
- Utilize industry-standard software tools for sound editing and post-production.
- Acquire skills in recording, editing, and manipulating audio for various media formats.
- Develop proficiency in sound design, including creating and manipulating sound effects.
- Apply sound editing techniques to enhance storytelling and convey mood and emotion.
- Collaborate with visual media creators to integrate sound seamlessly into projects.

Course Outcomes (COs):

On completion of this course, the students will be able to

Expected Outcome	Bloom's Taxonomy level
Introduction to Sound : Sound, Digital sound files, different sound formats, midi & digital audio, creating digital audio files, sound producing, sound extracting, Advantages and disadvantages of midi &digital, choosing between midi and digital audio.Sound for the World Wide Web, adding the sound to your multimedia project, production tips, audio recording, keeping track of your sound, testing and evaluation.	L2, L3
Using Audition: Sound recording, editing digital recording, trimming, splicing and assembly, volume adjustments, format conversion, re sampling or downloading, fade-ins and fade outs, equalization, time stretching, digital signal processing, reverting sound, making midi audio, audio file formats	L1, L2, L4
Adding SFX and recording Foley sounds: Adding effect automation enveloping, adding a volume envelop, adding a panning envelop, previewing effect automation, applying effect automation, adjusting envelope, adding envelop points, flipping a envelop points, setting fade properties, cutting, copying, pasting, envelope points, adding mirror and wave hammer, pan to left , pan to right, dry out, wet out, convert mono to stereo, looping, making the remix sound track with using all the special FX from the software. Exporting the files in diff formats, save in wav, mp3 etc.	

Syllabus / Topics to be Covered.

Modules	Blooms level*	Number of hours
Module 1: Fundamentals of Sound Editing with Adobe Audition • Introduction to sound editing and its role in media production. • Overview of Adobe Audition interface and essential tools • Importing, organizing, and managing audio files • Basic audio editing techniques, including cutting, copying, and pasting • Working with multitrack sessions for audio projects • Applying fundamental effects and filters to enhance audio quality • Hands-on exercises: Basic audio editing and project setup in Adobe Audition	**L2, L3**	8
Module 2: Advanced Sound Editing Techniques and Sound Design • In-depth exploration of audio formats and quality considerations • Advanced editing techniques, such as time-stretching and pitch-shifting • Noise reduction and audio restoration methods • Equalization (EQ) and frequency spectrum analysis for precise adjustments • Creation and manipulation of sound effects for sound design • Foley recording and synchronization with visual media • Practical exercises: Applying advanced editing techniques and sound design with Adobe Audition	**L1, L2, L4**	10
Module 3: Fluid Simulations with PhoenixFD • Understanding the art of audio mixing and mastering • Balancing sound elements and creating audio depth in multitrack projects • Mastering audio for various media platforms and distribution channels • Utilizing compression, limiting, and normalization for audio enhancement • Exporting audio files for professional and distribution purposes • Analyzing and critiquing sound editing in real-world media examples • Collaborative work with visual media creators and integrating sound into projects • Preparing a final sound editing project, including mixing and mastering • Presentation and critique of student projects • Industry insights and potential career opportunities in sound editing	**L2, L3, L4, L5**	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- "Adobe Audition Classroom in a Book" by Adobe Creative Team"Bulletproof Web Design" by Dan Cederholm
- "The Sound Effects Bible: How to Create and Record Hollywood Style Sound Effects" by Ric Viers

Reference Books

- "Audio Postproduction for Film and Video" by Jay Rose

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**H**	**A**	**CT**	**EE**
Weightage (%)	10	5	15	70

CT: Class Test, EE: End Semester Examination; A: Attendance; H: Home Assignments

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	2	2	1	1	--	--	--	2	2	1	2
CO2	1	2	3	2	--	--	--	1	1	1	2
CO3	2	1	1	1	--	--	--	1	3	2	3
CO4	1	1	1	1	--	--	--	2	1	2	1
CO5	--	--	--	--	--	--	--	--	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

SEMESTER-IV

DANI2401	RIGGING AND ANIMATION	L	T	P	C
Version	**2023**	1	0	2	2
Pre- requisites/Exposure	Basic understanding of computer interface.				
Co-requisites	None				

Catalog Description

In this course we will take an introductory look into rigging and animation tools and techniques in 3d software.

Course Objectives

The objective of this course is to

1. To impart working knowledge of Rigging in Blender 3d and automate the basic rigging system.
2. To impart knowledge of Animation in Blender for Humanoid and non-organic objects.
3. To Impart Knowledge of Animation techniques in Blender 3d.

Course Outcomes (COs):

On completion of this course, the students will be able to

Expected Outcome	**Bloom's Taxonomy level**
CO1. Create detailed Rigging system of Humanoid and non-organic objects for animation	L1, L2
CO2. Create Animation using Keyframes and Rigging system for smooth and effective lopping animations i.e. Walk cycle, Run Cycle and more.	L2, L3
CO3. To use animation timeline and create Ease-in & Ease-Out using graph editor.	L4, L5

Modules	**Blooms level***	**Number of hours**
MODULE 1 Introduction to rigging systems and methods. Vertex weighting and skinning techniques. Understanding the basics, which include everything from how to establish solid naming conventions to how to utilize 3d bone and IK handle tools. Cover more complicated topics like setting up a enhanced IK rig, using tools to create a counter twist rig that preserves volume. Also learn how 3d software interface can be customized to work faster.	L1, L3	24

MODULE 2 Animation in 3d application. Fundamental key frame animation, repeating animation over time, Hierarchical linking, Key frame, Parameters, Setting Animation Keys, Animating the rotation of the dummy object, Creating a continuously looping animation.	L1, L3	12
MODULE 3 Advanced animation: The Fundamentals of Hierarchical Linking, Animation controllers, Ease curves, Controllers, Constraints, Graph editors.	L1, L3	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6- Evaluation

Text Books

- *Oscar Baechler, Xury Greer, (2020). Blender by Example, UK: Packt Publishing Ltd.*

Reference Books

- John M. Blain (2019). The Complete Guide to Blender Graphics: Computer Modeling & Animation, Fifth Edition, Cloudtail India
- Mastering Autodesk 3ds Max 2013 by Jeffrey Harper

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**H**	C	**CT**	**A**	**EE**
Weightage (%)	10	-	15	5	70

CT: Class Test, H: Home Assignment, EE: End Semester Examination; A: Attendance; C: Case Presentation

CO, PO and PSO Mapping
1: Strongly Related, 2: Moderately Related and 3: Weakly Related

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	2	1	--	2	--	--	2	2	1	1	3
CO2	2	1	--	2	--	--	3	2	1	1	--
CO3	2	1	--	2	--	--	3	2	2	1	--

DANI2451	BASICS OF DIGITAL COMPOSITING & VFX	L	T	P	FW/ Proj	C
Version	**2023**	2	1	2	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

In this course, students will learn the different concepts involved in digital compositing and VFX which will help them to apply this entire knowledge practically. They will explore the world of Node-Based Compositing which Industry standard both in Bollywood and Hollywood.

Course Objectives

The objective of this course is to

1. To impart working knowledge of basics Image & video Compositing & Color correction
2. To impart knowledge into Image tracking and stabilization for seamless composting.
3. To Impart knowledge of basics of Node Based Compositing techniques.
4. To impart knowledge of Rotoscoping, matting & chroma keying.

Course Outcomes (COs):

On completion of this course, the students will

Expected Outcome	Bloom's Taxonomy level
Do Node based digital compositing of Images & video.	L1, L2, L3
Create match move composites for seamless chrome key effects and 3d camera tracking.	L1, L3, L4
Do basic rotoscoping and create clean plate for different composites.	L1, L2, L3, L4
Be proficient at creating alpha mattes and extracting mattes.	L1, L4, L5
Identify and describe various video Formats, Aspect Ratio, color depth bits, & film formats.	L1, L2

Syllabus / Topics to be Covered

Modules	Blooms level*	Number of hours
Module I: Evolution Digital Compositing This unit focuses essentially on all aspects of core compositing techniques. Creative use of Jump cuts, multiple exposure, background projection, dissolve, split screen, aspect ratio is often utilized to make basic composites. Also, the evolution and concepts given by the father of compositing George Méliès will be key knowledge here to understand the general techniques.	**L1, L2, L3**	8
Module II: Introduction to Nuke Interface This is a very important module which introduces the interface of Nuke. It is a Node based industry standard software for compositing. How to import files, save files, make projects and settings, Noise removal, connect different nodes, viewer and its uses, channels, etc. in node-based software like nuke will be focused.	**L1, L2, L3**	10

Module III: Tracking, Stabilization and Rotoscoping This module will focus upon Rotoscoping techniques along with some other topics like tracking an Element into a Plate, Choosing the Feature to Track, Using Tracking Curves Manually, Tracking Multiple Points, Stabilizing a Plate, Camera tracking, Timelines, Curve Editors.	**L2, L3, L4, L5**	15
Module IV: Matting & Multiple Exposure This module explains the need of mattes where students are taken through the entire process of creating alpha mattes for different videos and images. And later they will explore the most commonly used compositing technique that is multiple explore in the practical form.	**L3, L4, L5**	15
Module V: Chroma Keying This is the most important unit for compositing (layering) two or more video streams together. Students will learn the technique to remove a background and green screen from the subject of a photo or video. And then seamlessly replace the different background and composite shot with proper lighting, color, hues, luminance, and edge blending.	**L3, L4, L5, L6**	15

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Steve Wright (2010). Digital Compositing for Film and Video, United Kingdom: Routledge
- Lee Lanier (2012). Digital Compositing with Nuke: Memoirs of a Lifetime in Pursuit of a Reunited Tibet Paperback – 9 July 2012
- Ganbar (2011). Nuke 101: Professional Compositing and Visual Effects

Reference Books

- Ron Ganbar (2014). Nuke 101: Professional Compositing and Visual Effects, United
- Foundry Learn. Nuke Reference Guide (2022)

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**H**	**A**	**CT**	**EE**
Weightage (%)	10	5	15	70

CT: Class Test, EE: End Semester Examination; A: Attendance; H: Home Assignments

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	--	2	--	--	2	2	1	2	3
CO2	1	1	--	2	--	--	3	--	1	2	--
CO3	1	1	--	2	--	--	3	--	1	2	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

DANI2402	DESIGN THINKING	L	T	P	FW/ Proj	C
Version	**2023**	1	0	2	0	2
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

The course will teach students an overview of design thinking and work with a model containing four key questions and several tools to help you understand design thinking as a problem-solving approach. We also look at several stories from different organizations that used design thinking to uncover compelling solutions.

Course Objectives

The objective of this course is to

1. To impart working knowledge of what design thinking is and when to use it.
2. To impart knowledge to use design thinking for generating innovative ideas.
3. To Impart Knowledge of to prepare to see and take action when opportunity arises

Course Outcomes (COs):

On completion of this course, the students will

Expected Outcome	Bloom's Taxonomy level
Create the process of using design thinking to generate and test ideas	L1, L2, L3
Understand how to use design thinking to generate innovative ideas	L1, L3, L4
Identify and describe various design thinking process and methods.	L1, L2, L3, L4
Build prototype of some innovative designs that solves problem	L2, L3, L6

Syllabus / Topics to be Covered

Modules	Blooms level*	Number of hours
Module I: What is Design Thinking? Students will begin by unpacking what we mean by design thinking and why it is more effective than traditional methods when the goal is innovation. We'll also examine what kinds of challenges are best suited for design thinking and learn about the Visualization tool, which helps bring ideas to life. By the end of this module, you'll have a better understanding of what we mean by design thinking, when to use it, and how to use the Visualization tool.	**L1, L2, L3**	5
Module II: Design Thinking Phases and Ethics This is a very important module which introduces the five phases of design thinking. That is Empathize, Define, Ideate, Prototype, Test. And final students will learn about the ethics in design, Copyright, Trademark and Patent in designs.	**L1, L2, L3**	5
Module III: Experimentation In this module students will go through different activities and exercises which will help them to generate innovative ideas. They will experiment and build designs on SDGs and provide something innovative and present	**L3, L4, L5, L6**	20

in form of prototypes of Logo Design, Character Design, Comic Strip Design, Poster Design, Game Prototype, UI/UX.		

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- The Design Thinking Toolbox (2020): A Guide to Mastering the Most Popular and Valuable Innovation Methods, United States: Wiley Press
- Design Your Thinking: The Mindsets, Toolsets and Skill Sets for Creative Problem-solving (2020): Pavan Soni

Reference Books

- Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days: Transworld Books

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**H**	**A**	**CT**	**EE**
Weightage (%)	10	5	15	70

CT: Class Test, EE: End Semester Examination; A: Attendance; H: Home Assignments

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	--	2	--	--	2	2	1	2	3
CO2	1	1	--	2	--	--	3	--	1	2	--
CO3	1	1	--	2	--	--	3	--	1	2	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

SEMESTER-V

DANI2501	INTRODUCTION TO GAME DESIGN & DEVELOPMENT	L	T	P	FW/ Proj	C
Version	**2023**	2	1	2	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

Students will learn to build the skills necessary to design and develop games. The Introduction to Game Development focuses on both the theory and practice of game making. From a technical standpoint, students create game projects in the stable Unity Game Engine, including a 2D Shooter, 2D Platformer, First-Person Shooter, and 3D Platformer. Students will learn to import 3D models with texture & Materials from 3D software. Also practice and learn the basics of programming with C# or C++ for interactive games.

Course Objectives

The objective of this course is to

1. To impart working knowledge of Importing 3D assets into the game engine.
2. To impart knowledge into unity 3D scripting using C#.
3. To impart Knowledge of publishing from Unity 3D for multiple devices.
4. To impart Knowledge of Game Logic and Game Design.

Course Outcomes (COs):

On completion of this course, the students will

Expected Outcome	Bloom's Taxonomy level
Create & assemble 2D & 3D assets into Unity 3D game engine.	L1, L2, L3
Create word-based games with Classical C# in Visual Studio	L1, L3, L4
Create C# scripts for the 2D & 3D interactions in Game Engine	L1, L2, L3, L4
Be able to Build and publish games for different platforms	L2, L3, L6

Syllabus / Topics to be Covered

Modules	Blooms level*	Number of hours
Module I: Introduction to C# Programming Students will begin by unpacking the basics of classical C# scripting in Visual Studio. They will get to know about the programming basics, naming conventions, code readability, working with variables, converting variables, operators, console input, random numbers, If/else case, loops functions and arrays. By the end of this module, students will have a better understanding about programming and will be equipped with proper mindset for game development.	**L1, L2, L3**	5
Module II: Basics of Unity 3D In this module students will be introduced to the Interface of Unity 3D. They will get to know the Unity Editor, Project Dialog and Unity 3D Interface. They will explore the Built-In 3D Objects and see the process of Importing Models and building Textures, Shaders, and Materials. Some	**L1, L2, L3**	5

other topics that could be covered in this module will be Lights and Cameras, Rigidbodies, Collision & Colliders, Prefab Basics, Animation in Unity, Different Animation poses like Idle & jumping, States and Blend Trees, Build Settings & Game Settings.		
Module III: Essentials of Unity Scripting In this module students will be introduced to C# Scripting inside Unity. Focus will be on Creating & Attaching a Script, Anatomy of a Basic C# Script in Unity, The Using Section, The Class Declaration Section, The Class Contents, Variables, Creating Variables, Variable Scope, if / else Statement, the if / else if Statement, Methods, Anatomy of a Method, Writing Methods, Using Methods, Input Basics & Scripting.	**L1, L3, L4, L5**	20
Module IV: Introduction to Visual Scripting In this module students will get know the Visual scripting in Unity as helps to create scripting logic with visual, drag-and-drop graphs instead of writing code from scratch. They will get to know about the script graphs, state graphs, flow machine, Scripting Events, Macros, etc.	**L3, L4, L5, L6**	20

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Unity 2018 Game Development In 24 Hours, Sams Teach Yourself Third Edition, United Kingdom: Pearson
- Hammad Fozi (2020), Game Development Projects with Unreal Engine: Learn to build your first games and bring your ideas to life using UE4 and C++

Reference Books

- Mastering Unity Scripting: Learn advanced C# tips and techniques to make professional-grade games with Unity (2015): Packt Press

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**H**	**A**	**CT**	**EE**
Weightage (%)	10	5	15	70

CT: Class Test, EE: End Semester Examination; A: Attendance; H: Home Assignments

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	--	2	--	--	2	2	1	2	3
CO2	1	1	--	2	--	--	3	--	1	2	--
CO3	1	1	--	2	--	--	3	--	1	2	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

DANI2502	ANIMATION PRODUCTION	L	T	P	FW/ Proj	C
Version	**2023**	2	1	2	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course is designed for students to work in a team just like in Animation Studios and build skills necessary to design and develop one animated movie. Animation Production focuses on the practice of Animation Making. From a technical standpoint, students will produce one 2D or 3D animated movie in this course. Plus, they will also go through the entire process of making animated movies from ideation to post-production and finally complete an entire movie project.

Course Objectives

The objective of this course is to

1. To impart working knowledge of Animation Studios.
2. To impart knowledge and importance of time management for a project.
3. To impart knowledge of Animation Production.
4. To impart knowledge of working in a team and delivering a project.

Course Outcomes (COs):

On completion of this course, the students will

Expected Outcome	Bloom's Taxonomy level
Encouraged and create new ideas for Animated films.	L1, L2
Be able to visualize their ideas in form of stories.	L1, L2, L4
Be able to understand the entire animation production process.	L1, L2, L3
Create one animated movie in a team.	L2, L3, L6

Syllabus / Topics to be Covered

Modules	Blooms level*	Number of hours
Module I: Ideation & Storyboard Students will begin by brainstorming interesting ideas and sequence of thoughts in a team, from the original concept to implementation using scripting and storyboard creation. They will learn the importance of concept development and scriptwriting, character designs and world-building for Animated Movies. Some important topics covered are: • Ideation & Concept Development • Scanning and digitizing your art • Anatomy and proportions for character art • Character turnaround sheets and model sheets • Designing objects and props that fit the animation's world. • Creating consistent design language • Storyboarding the concept and idea	**L1, L2, L3**	10

Module II: Pre-Visualization for Animation This module introduces students to the art and techniques of previsualization, an essential aspect of the animation production process. Students will learn how to plan and visualize animation sequences, which is crucial for creating compelling and well-structured animated content. Some important topics covered are: • Creating clear shot compositions • Blocking out characters, scenes, and camera angles • Communicating storytelling through visuals • Transforming storyboards into animatics • Incorporating sound and dialogue • Planning character movements and actions • Emotion and expression in previsualization • Incorporating visual effects and CGI elements • Exporting previsualizations	**L1, L2, L3**	10
Module III: Production Process This module focuses on the creation of visual assets as per the storyboard and pre-viz for animation, including digitized character designs, background art, environment, and props. Final frames and shots as storyboards will be prepared and made ready. Students will learn essential art principles and develop their artistic skills to effectively contribute to the animation production process. Some important topics covered are: • Background Art and Environment Design • Creating immersive and visually appealing backgrounds • Environmental storytelling through art • Digital painting techniques for backgrounds • Color psychology and symbolism in animation • Color theory and harmony • Making shot wise final frames & assets for post-production.	**L1, L3, L4, L5**	20
Module IV: Post-Production Process This module is most important as it explores the critical post-production stages of animation filmmaking, including animating artwork, characters and background elements and frames. Besides that editing, sound design, visual effects, and final rendering will also be focused. Students will gain the skills and knowledge necessary to bring their animated projects to life through the power of post-production. Some important topics covered are: • Animating assets, shots, and frames. • Preparing final animation sequences for rendering • Understanding render settings and quality optimization • Post-production compositing and color correction • Exporting final animation sequences • The art of editing in animation	**L2, L3, L4**	25

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Shamus Culhane (1990), Animation: From Script to Screen
- Francis Glebas (2008), Directing the Story: Professional Storytelling and Storyboarding Techniques for Live Action and Animation
- Tony White (2022), Animation Masterclasses: From Pencils to Pixels: A Complete Course in Animation & Production

Reference Books

- Tony White (2009), How to Make Animated Films: Tony White's Complete Masterclass on the Traditional Principals of Animation
- Richard E. Williams (2009) Animator's Survival Kit

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**H**	**A**	**CT**	**EE**
Weightage (%)	10	5	15	70

CT: Class Test, EE: End Semester Examination; A: Attendance; H: Home Assignments

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	--	2	--	--	2	2	1	2	3
CO2	1	1	--	2	--	--	3	--	1	2	--
CO3	1	1	--	2	--	--	3	--	1	2	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

DANI2551	MAYA FUNDAMENTALS	L	T	P	FW/Proj	C
Version	**2023**	2	1	2	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

The course introduces students to the foundations of character/object modeling & texturing which is the process of adding mesh and controls to a character that allows a creative model to animate it in a proper manner. The course is prepared to candidates for an advanced work in 3-D modeling & Texturing. In this section, students will get an introductory look at the processes in Maya. Students will use a Project-based approach as we cover the fundamentals of Maya looks at commonly used tools, and talk about some time-saving tips and techniques gleaned from production experience.

Course Objectives

The objective of this course is-

- To train the proper knowledge of surfaces which are used for modeling in TV serials, films and other commercials.
- To train the basic mesh flow system in modeling.
- To teach the tools of modeling, merit and demerit of modeling and designing.
- To guide the visualize the story and their character, assets and other part of design and then impart it in modeling through various tools of Maya software.

Course Outcomes (COs):

On completion of this course, the students will be able to

Expected Outcome	Bloom's Taxonomy level
Introduction to Maya: Hotkeys. Using the spacebar. Manipulating a view. Creating objects. Simple primitives. Lights, cameras, selecting objects, types of selection, single selection, adding and subtracting selection, edit menu selection options. Marquee selection, Lasso selection, selection mask	L2, L3
Create and design the required models for a Project: Students will be able to create and design 3D models and apply appropriate color schemes for use in advertisement projects and various commercial applications.	L1, L2, L4
Develop and represent the 3D models and environment on their own visualized story: Students will gain the ability to independently create and represent 3D models and environments that align with their own visualized narratives and stories.	L2, L3, L4, L5
Introduction to Materials and Textures: Using hyper shade, relationship editor, hyper graph and outliner. The channel box. Duplicating objects, pivot points, introduction to snapping-2D snapping and 3D snapping. Using layers. Introduction to textures and materials..	L3, L4, L5
Make any final Scene or a self-thought Character: Students will learn to create a proper Environment or a Scene. They will also create a final self-designed character which will include ideas from a character Sheet .	L3, L4, L5

Syllabus / Topics to be Covered.

Modules	Blooms level*	Number of hours
Module 1: Introduction to Maya Interface and Basic Operations • Overview of Maya's interface • Introduction to essential hotkeys • Using the spacebar for navigation • Manipulating views and viewports • Creating 3D objects, including simple primitives • Introduction to lights and cameras • Selecting objects in Maya • Types of selection (single selection, adding, subtracting) • Edit menu selection options • Marquee selection and Lasso selection • Selection mask	**L2, L3**	8
Module 2: Create and design the required models for a Project • Creating 3D models for advertisement and commercial projects • Applying appropriate color schemes • Texturing and shading for models • Rendering considerations for advertisements • Real-world applications and case studies	**L1, L2, L4**	10
Module 3: Develop and represent the 3D models and environment on their own visualized story • Developing 3D models and environments • Aligning 3D creations with personal narratives and stories • Creating a visual storytelling project • Incorporating storytelling elements in 3D design • Presenting and sharing 3D visual stories	**L2, L3, L4, L5**	10
Module 4: Introduction to Materials and Textures • Exploring the HyperShade editor • Using the Relationship Editor, HyperGraph, and Outliner • Understanding the Channel Box for object manipulation • Duplicating objects and managing pivot points • Introduction to 2D and 3D snapping • Working with layers for organization • Introduction to textures and materials for 3D objects	**L3, L4, L5**	8
Module 5: Final Scene and Character Creation • Creating a complete 3D environment or scene • Designing a self-thought character • Utilizing character sheets and concept art for character design • Bringing the character into the final scene • Presentation and critique of final projects • Preparing a portfolio of work for showcasing to potential employers or clients	**L3, L4, L5**	14

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- "Maya 2018 Basics Guide" by Kelly Murdock.
- "The Art of 3D Computer Animation and Effects" by Isaac Kerlow
- "Maya Secrets of the Pros" by John Kundert-Gibbs and Dariush Derakhshani

Reference Books

- "The Animator's Survival Kit" by Richard Williams

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	H	A	CT	EE
Weightage (%)	10	5	15	70

CT: Class Test, EE: End Semester Examination; A: Attendance; H: Home Assignments

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	1	--	--	--	2	2	1	2
CO2	1	2	3	2	--	--	--	1	1	1	2
CO3	2	1	1	1	--	--	--	1	3	2	3
CO4	1	1	1	1	--	--	--	2	1	2	1
CO5	--	--	--	--	--	--	--	--	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

DANI2651	BASICS OF AR/VR	L	T	P	FW/ Proj	C
Version	**2023**	2	1	2	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

Students will learn how to design, develop, troubleshoot, and publish their own mobile AR and VR applications through Unity for iOS and Android devices. Using the very latest techniques recommended by Unity's VR engineers and Augmented Reality, or AR, will transform how we see and interact with the world. And the hardware that makes AR possible is the smartphone that you may already have in your pocket. You'll learn about the features offered by Unity's AR Foundation, and about additional features in ARKit and ARCore. Plus, they will be introduced to Vuforia Engine SDK for AR App Development.

Course Objectives

The objective of this course is to

1. To impart working knowledge of basics of AR, VR and Metaverse.
2. To impart knowledge into Image tracking and ground plane tracking using AR Foundation.
3. To Impart knowledge of basics of gaze control, Recasting, & lean touch controls.
4. To impart knowledge of app development using Vuforia Engine.

Course Outcomes (COs):

On completion of this course, the students will

Expected Outcome	Bloom's Taxonomy level
Create sample AR Applications for iOS & Android	L1, L2, L3
Create VR environment with Interactions for Google Cardboard.	L1, L3, L4
Identify and describe Mixed Reality & its applications.	L1, L2, L3, L4
Build and Run the app for AR Supported mobile devices	L2, L3, L6

Syllabus / Topics to be Covered

Modules	Blooms level*	Number of hours
Module I: Introduction to XR In this module Students will be introduced to the concept of Virtual Reality, Augmented Reality, Mixed Reality and Metaverse. Get will get to know about the different types of modern VR/AR experiences and its uses, API SDK, its history, hardware requirement like AR supported mobile devices and & software like Unity, Lens kit, Meta studio, AR Foundation and Vuforia Engine. They will also unpack the Interaction fundamentals which will boost the knowledge about the concept further.	**L1, L2**	5
Module II: Introduction to Unity AR Foundation In this module students will learn process of installing and using AR Foundation package into Unity 3D. Some important topics includes importing models for AR App, Setup the Unity 3D for AR App, Creating UI and Application Functions, Implementation of ARKIT for IOS,	**L1, L2, L3**	5

Implementation of ARCORE for IOS, Publish App from Unity3D for IOS & Android and working on Marker based AR app.		
Module III: Introduction to Vuforia Engine This module is about Vuforia Engine that offers tracking a variety of objects and spaces that can be categorized as Images, Objects, and Environments. Image Targets, Barcode Scanner, Object tracking, Multi target feature, VuMark and building Markerless AR, etc.	**L1, L3, L4, L5**	20
Module IV: VR for Google Cardboard In this module students will unpack the process of making environment and making basic VR App in Unity, enabling VR Support, hardware and software recommendations for VR development in Unity, Camera setup for VR, Head track input and head mounted input, scene controllers, controlling objects, Interaction using Gaze and VR inputs, Animations in VR, Advanced texturing and modelling in Unity 3D through Probuilder and Shader Graph.	**L3, L4, L6**	20

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Complete Virtual Reality and Augmented Reality Development with Unity: Leverage the power of Unity and become a pro at creating mixed reality applications (2019), United Kingdom: Packt Publication
- Jonathan Linowes (2021), Augmented Reality with Unity AR Foundation: A practical guide to cross-platform AR development with Unity 2020 and later versions

Reference Books

- UX for XR: User Experience Design and Strategies for Immersive Technologies (Design Thinking) : APress

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**H**	**A**	**CT**	**EE**
Weightage (%)	10	5	15	70

CT: Class Test, EE: End Semester Examination; A: Attendance; H: Home Assignments

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	--	2	--	--	2	2	1	2	3
CO2	1	1	--	2	--	--	3	--	1	2	--
CO3	1	1	--	2	--	--	3	--	1	2	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

DANI2602	MAYA RIGGING AND ANIMATION	L	T	P	C
Version	**2023**	2	1	2	4
Pre- requisites/Exposure	Basic understanding of computer interface				
Co-requisites	None				

Catalog Description

Student will also learn how Maya's interface can be customized to work faster. By the end of the section, student will be comfortable enough to utilize Maya's rigging features to rig their own objects and characters. Students will have a good understanding of animating objects and characters in Maya.

Course Objectives

The objective of this course is to

- To impart working knowledge of Rigging in Autodesk Maya and automate the basic rigging system.
- To impart knowledge of Animation in Autodesk Maya for Humanoid and non-organic objects.
- To understand and able work with Dope Sheet & Graph Editor in Maya.

Course Outcomes (COs):

On completion of this course, the students will be able to

Expected Outcome	**Bloom's Taxonomy level**
CO1. Create detailed Rigging system of Humanoid and non-organic objects for Cinematic animations	L1, L2
CO2. Create Animation using Keyframes and Rigging system for smooth and effective lopping animations i.e. Walk cycle, Run Cycle and more. And effectively use of graph editor & Dope sheets for ease-in & ease-out animations.	L1, L3

Modules	Blooms level*	Number of hours
MODULE 1 Student will also learn how Maya's interface can be customized to work faster. By the end of the section, student will be comfortable enough to utilize Maya's rigging features to rig their own objects and characters.	L1, L3	24
MODULE 2 The intuitive and fun animation tools of Maya. How to set up animation preferences and create key frames, to learning how animation can be modified from Maya's Timeline and Graph Editor. Learn how to animate objects along a path, how to work non-linearly and non-destructively with the help of the Trax Editor andanimation layers. Animate with constraints and even cover helpful tips on how to improve your productivity.	L1, L3	24

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- The Art of Maya: An Introduction to 3D Computer Graphics by Autodesk Maya Press

Reference Books

- Maya Professional Tip and Techniques; Lee Lanier; John Wiley and Sons

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**H**	C	**CT**	**A**	**EE**
Weightage (%)	10	-	15	5	70

CT: Class Test, H: Home Assignment, EE: End Semester Examination;
A: Attendance; C: Case Presentation

CO, PO and PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	2	1	--	2	--	--	2	2	1	1	3
CO2	2	1	--	2	--	--	3	2	1	1	--
CO3	2	1	--	2	--	--	3	2	1	1	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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DANI2601	ADVANCED COMPOSITING & VFX	L	T	P	FW/ Proj	C
Version	**2023**	2	1	2	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description
This course will take you through the advanced concepts of VFX & Compositing in Nuke. The course is focused both on the 2D & 3D aspects of compositing. It introduces CGI Compositing, Deep Compositing and Particle System in Nuke. Students will also learn how to Render CGI in passes, footage, and all the elements necessary to composite a CG shot.

Course Objectives
The objective of this course is to
1. To impart working knowledge of Advance VFX, Rotoscoping & CGI Compositing
2. To impart knowledge into Compositing of 3D Passes and 3D motion tracking
4. To impart Knowledge of Particle System in Nuke
5. To impart Knowledge of Deep Compositing

Course Outcomes (COs):
On completion of this course, the students will

Expected Outcome	Bloom's Taxonomy level
Be able to create 2D compositing using Advanced Rotoscoping	L3, L4, L5
Be able to create different Multi-pass CG compositing	L1, L3, L4
Use particle system in nuke for different effects and simulations.	L1, L2, L3, L4
Be proficient at Nuke 3D interface	L1, L2
Understand and use basic deep compositing system in Nuke	L1, L2, L3

Syllabus / Topics to be Covered.

Modules	Blooms level*	Number of hours
Module I: Advanced 2D Compositing & Rotoscoping This unit focuses essentially on all aspects of 2D compositing techniques. Students will understand and revise the Additive color theory, 2D Tracking, Rotopaint and Rotoscoping, Keyframe animation, Chroma Keying / Greenscreen removal, Camera traits (Lens distortion, grain, sensor noise), Process of Cleanplate.	**L1, L2, L3, L6**	15
Module II: Lighting & CGI Compositing This module will introduce CG Compositing that happens after 3D rendering, as seen in a typical CG pipeline flow, which is the most expensive phase of CG filmmaking. Essential topics that are covered here will be Matching color tones, darks, highlights of an image, Compositing elements / FX into a shot, integrating	**L1, L2, L3**	15

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a CGI (Computer Generated Image) render into a real scene, how to use the normal AOV to fine tune CG, Use ID passes to correct different geometries.		
Module III: Introduction to Particle system in Nuke This module will focus upon the Particles nodes (NukeX and Nuke Studio only). These nodes deal with Nuke's built-in particle system, often used for creating effects like fog, smoke, rain, snow, and explosions. Some nodes that students will learn include ParticleEmitter, ParticleBounce, ParticleCurve, ParticleSettings, ParticleDirectionalForce, ParticleWind, ParticleMerge, etc.	**L2, L3, L4, L5**	15
Module IV: Basics of Deep Compositing This module introduces the basics of Deep Compositing and Deep Data. Students will learn the basic process to read in your deep image with the DeepRead node, Merge deep data with the DeepMerge, generate holdout mattes from a pair of deep images using the DeepHoldout node, Flatten deep images to regular 2D or create point clouds out of them, Crop, reformat, and transform deep images, learn to use the DeepCrop, DeepReformat and DeepTransform nodes.	**L1, L2 L3**	15

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Digital Compositing with Nuke (2012): United Kingdom: Focal Press

Reference Books

- Nuke 101: Professional Compositing and Visual Effects (Digital Video & Audio Editing Courses): Pearson
- Foundry Learn. Nuke Reference Guide (2022)

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**H**	**A**	**CT**	**EE**
Weightage (%)	10	5	15	70

CT: Class Test, EE: End Semester Examination; A: Attendance; H: Home Assignments

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	--	2	--	--	2	2	1	2	3
CO2	1	1	--	2	--	--	3	--	1	2	--
CO3	1	1	--	2	--	--	3	--	1	2	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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DANI2603	WEB DESIGN AND DEVELOPMENT	L	T	P	C
Version	**2023**	2	1	2	4
Pre-requisites/Exposure	Basic understanding of computer interface.				
Co-requisites	None				

Catalog Description

This course will help students understand the importance of the web as a medium of communication and understand the principles of creating an effective web page, including an in-depth consideration of information architecture. Also, to become more familiar with graphic design principles that relate to web design and learn how to implement these theories into practice.

Course Objectives

The module is structured for the students to learn the basic layout making process of Webpage. They will be able to understand the process of making a layout, Principle of Web page design elements. Understanding the proper Fonts for the contemporary web pages, knowledge about the design edition tools like WordPress. Understanding the basics of HTML and CSS.

Course Outcomes (COs):

On completion of this course, the students will be able to

Expected Outcome	Bloom's Taxonomy level
CO1: Understand Web designing process for a professional website.	L1, L2, & L3
CO2: Understand the aesthetic sense of WordPress and web development technique.	L1, L2
CO3: Develop the process of content writing as well as the proper Font style setup.	L2, L3
CO4: Use the HTML and CSS to create the beautiful layouts.	L4,
CO5: Create a website with professional design.	L3,

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Web Design and Development Workflow that Works Whether or not you are new to website design and development, Comprehend the overall picture. Understand the workflow process and best practices for design. learn the software and technology; and maintain a site that competes and communicates effectively on the Web.	L2, L3	8

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MODULE 2: WordPress Creating a dynamic website students will be able to learn how to set-up a WordPress website and develop the site to include a menu system with navigation bars, widgets for posts and comments, theme, calendar, and interactive forms. Use of templates for faster workflows. Creating a full website using WordPress templates.	L2, L3	8
MODULE 3: HTML and CSS (Basics) Hypertext Markup Language (HTML) and Cascading Style Sheets (CSS) are inseparable languages that together describe the structure and display of pages on the World Wide Web! This course introduces you to the syntax and explores techniques using both languages to create and format headings, body text, hyperlinks, images, tables, forms and more. You'll also learn to control the format and layout of elements on web pages using CSS stylesheets. Toward the end of the class you'll do several multi-column page layouts with an embedded video element.	L2, L3	8
MODULE 4: Creating Website Students will learn to create website using WordPress or Using HTML coding for simple website. Understanding the layout of a website. Managing the content based on the goal of website.	L3, L4	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Jon Duckett, (2011). HTML and CSS: Design and Build Webs, 1st edition. Wiley
- Rachel McCollin(2015).WordPress 4.0 Site Blueprints - Second Edition. Packt Publishing

Reference

- Kelly Goto and Emily Cotler (2004). Web ReDesign 2.0: Workflow that Works (2nd Edition). New Riders.
- Lisa Sabin-Wilson and Matt Mullenweg (2011).WordPress For Dummies, 4th Edition. John Wiley & Sons.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

P: Project, CT: Class Test, EE: End Semester Examination; A: Attendance

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CO, PO and PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	1	3	..	..	..	1	1	1	3
CO2	1	2	3	3	..	..	..	1	1	1	3
CO3	1	2	1	3	..	..	..	1	3	1	3
CO4	1	1	3	1	..	..	..	2	3	1	1
CO5	..	..	..	..	..	..	..	..	..	..	..

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-VII

DANI2701	FILM MAKING PROCESS	L	T	P	FW/ Proj	C
Version	2023	2	1	2	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

In media today, unlike earlier, there are a plethora of options to choose from. Filmmaking has scaled down and video is a strong contender to film. This module encapsulates the entire film making process and students are introduced not only to the theoretical and practical aspects of film production, but to subtle nuances as well of editing and camerawork. The course is a balanced mix of aesthetics of cinema as well as the actual pre, production and post-production process that filmmaking entails

Course Objectives

The objective of the course is to impart a well rounded education of all aspects of film making – theoretical as well as practical and even delves briefly in the psychological aspects of filmmaking and how each shot can impact the viewer at a subconscious level. At the end of this course, students will be able to visualize, ideate and produce films in a variety of formats, image sizes and treatments

Course Outcomes (COs):

The objective of this course is to:

- Enable the students to understand the historical context of the film making process
- Inculcate team spirit by training students to work in small and large teams
- Understand the real meaning of film appreciation and why it is vital to critically understand and deconstruct quality films
- Grasp production techniques so thoroughly that they can produce both short and long films independently or in small teams

Syllabus / Topics to be covered

Modules	Blooms level*	Number of hours
Module I: Evolution of Cinema as a Medium of Communication. The Lumiere brothers and the birth of modern cinema. The invention of cinema; Cinema as a medium of communication. Rise of the feature film and the "Star System"; birth of the "Nickelodeon" theatre; Vaudeville and its influence on theatre and film; Growth of cinema in Europe and Italy; The French "Avant Garde" movement; Italy's gravitation towards Neo-realism; Realistic cinema in India and the films of Satyajit Ray	**L1, L2**	15
Module II: The Syntax and Grammar of Film Genre of cinemas; Shot breakdowns – the syntax of Cinema; Image and Fame sizes; Static images versus moving images; Movement within the frame and without; Camera angles and compositions; The importance of perspective; Vital importance of continuity in cinema; Role of lighting in creating moods and atmosphere; moving from scripts to treatments and screenplays; Editing in	**L1, L2, L3**	15

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cinema as an art form; Time-space concepts; Parallel editing; Continuity and Montage editing		
Module III: Non-fiction film making: Reordering of form and content. The rise of the documentary film. The films of Griffith and John Grierson; The filmmaking process: Pre-production, production and post-production; The importance of research in documentary film making. Recording bites, narration and sound tracks and editing them altogether. Other non-fiction formats: The news bulletin; the educational film; Promotional and Ad films. Pros and Cons of different audio-visual formats	**L1, L2, L4**	15
Module IV: Practical techniques of video and film making In this Module, students learn and practice the entire process of filmmaking moving from ideation to scriptwriting and treatment of the film. Then they practice Camera shots and Camera movements; Breakdown of the film into shots, sequences and segments. In the final stage, the film is put together in the editing table using different editing software like Adobe Premiere Pro or Final Cut Pro	**L3, L4, L5**	15
Module V: The future of the audio-visual medium This is a short module showcasing the future potential and market for film. Moving from cinema theares to OTT Platforms; New age distribution and viewing of created content. The increasing use of fantasy, visual effects and animation in film and video. Creation of video avatars; increasing use of AI in video and film making and possible new immersive experiences in cinema	**L4, L5, L6**	15

***Bloom's Level**:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Thompson, K., Bordwell, D., & Smith, J. (2003). *Film history: An introduction* (Vol. 205). Boston: McGraw-Hill.
- Millerson, Gerald. *The Technique of Television Production*. Focal Press. UK
- Monaco, J. (2000). *How to read a film: the world of movies, media, and multimedia: language, history, theory*. Oxford University Press, USA.

Reference Books

- Millerson, G., & Owens, J. (2012). *Television production*. Routledge.
- Arnheim, R. (1957). *Film as Art: 50th anniversary printing* (Vol. 4). Univ of California Press.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**P**	**A**	**CT**	**EE**
Weightage (%)	10	5	15	70

CT: Class Test, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	--	2	--	1	--	--	--	1	2	2	2
CO2	--	2	--	1	--	--	--	1	2	2	2
CO3	--	2	--	2	--	--	--	1	2	2	2

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CO4	--	2	--	2	--	--	--	1	--	2	2
CO5	--	--	--	--	--	--	1	1	2	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

DANI2702	**MAYA PARTICLES AND DYNAMICS**	**L**	**T**	**P**	**FW/Proj**	**C**
Version	**2023**	2	2	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course delves into the powerful world of Maya particles and dynamics, providing students with the knowledge and skills to create stunning visual effects, simulations, and animations. Through a hands-on approach, students will explore various techniques and tools in Autodesk Maya to understand and control the behavior of particles, simulate realistic physics-based motion, and craft dynamic animations for a wide range of applications. From fluid simulations and particle systems to rigid body dynamics and cloth simulations, this course equips students with the expertise to produce engaging and dynamic visual content.

Course Objectives

The objective of this course is-

- Understand the fundamental concepts of particles and dynamics in Maya.
- Create and manipulate particle systems for visual effects and animation.
- Simulate realistic physics-based motion for objects and characters.
- Implement fluid dynamics, such as smoke, fire, and liquid simulations.
- Master rigid body dynamics for object interactions.
- Develop cloth simulations for realistic fabric behavior.

Course Outcomes (COs):

On completion of this course, the students will be able to

Expected Outcome	**Bloom's Taxonomy level**
Upon completion of this course, students will have a comprehensive understanding of the fundamental concepts related to Maya particles and dynamics, allowing them to create visually engaging and dynamic animations.	L2, L3
Students will be able to create and manipulate particle systems effectively, demonstrating the ability to craft a wide range of visual effects, including rain, snow, explosions, and more	L1, L2, L4
By the end of the course, students will possess the knowledge and skills to simulate realistic physics-based motion, enabling them to create dynamic animations for objects, characters, and environmental elements in a 3D scene.	L2, L3, L4, L5
Students will demonstrate proficiency in implementing fluid dynamics, including smoke, fire, and liquid simulations, giving them the capability to produce realistic and visually appealing effects in their projects.	L3, L4, L5
Upon completion of the course, students will master rigid body dynamics, allowing them to accurately simulate object interactions, collisions, and physical responses within their 3D scenes.	L3, L4, L5

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Students will be able to create cloth simulations to depict realistic fabric behavior and interactions, enhancing the level of detail and realism in their 3D animations and visual effects.	L4, L5

Syllabus / Topics to be Covered.

Modules	Blooms level*	Number of hours
Module 1: Introduction to Maya Dynamics and Bifrost • Overview of Maya Dynamics • Introduction to the Bifrost Graph Editor • Creating particle systems and emitters with Bifrost • Controlling particle behavior and attributes • Forces and fields: Gravity, wind, turbulence • Particle collision with objects and surfaces • Dynamic instancing with Bifrost • Practical exercises: Creating simple particle-based animations using Bifrost	**L2, L3**	8
Module 2: Advanced Particle Systems and Bifrost Simulations • Particle expressions and scripting • Fluid simulations with Bifrost • Introduction to Bullet physics for rigid body dynamics • Creating dynamic environments with Bifrost • Combining particle systems with rigid bodies • Realistic smoke and fire simulations • Practical exercises: Building complex dynamic scenes with Bifrost and Bullet	**L1, L2, L4**	10
Module 3: Fluid Simulations with PhoenixFD • Overview of fluid dynamics and simulation • Introduction to PhoenixFD in Maya • Creating realistic water, fire, and smoke simulations • Customizing fluid properties and settings • Interactions with rigid bodies and particle systems • Practical exercises: Simulating complex fluid dynamics using PhoenixFD	**L2, L3, L4, L5**	10
Module 4: Cloth and Soft Body Simulations with nCloth • Understanding nCloth and soft body dynamics • Creating and simulating cloth objects • Adjusting cloth properties and constraints • Interactive cloth design and collision handling • Using nCloth for character clothing and other fabrics • Combining nCloth with other dynamic systems • Practical exercises: Designing and animating cloth and soft body simulations	**L3, L4, L5**	8
Module 5: Real-world Applications and Project Integration • Exploring real-world applications of Maya dynamics and simulations • Case studies in film, gaming, and advertising • Integrating Maya dynamics with production pipelines	**L3, L4, L5**	14

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• Preparing a final dynamic project • Presenting and critiquing student projects • Industry best practices and career opportunities in dynamic simulations		

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- "Maya Visual Effects: The Innovator's Guide" by Eric Keller
- "Bulletproof Web Design" by Dan Cederholm
- "Phoenix FD for Maya: Essential Training" by Brian Bradley
  A resource dedicated to understanding and using Phoenix FD for fluid simulations.

Reference Books

- "The Visual Effects Producer: Understanding the Art and Business of VFX" by Charles Finance and Susan Zwerman

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	H	A	CT	EE
Weightage (%)	10	5	15	70

CT: Class Test, EE: End Semester Examination; A: Attendance; H: Home Assignments

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	1	--	--	--	2	2	1	2
CO2	1	2	3	2	--	--	--	1	1	1	2
CO3	2	1	1	1	--	--	--	1	3	2	3
CO4	1	1	1	1	--	--	--	2	1	2	1
CO5	--	--	--	--	--	--	--	--	--	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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DANI2739	BASICS OF RESEARCH METHODOLOGY, ETHICS, AND RESEARCH COMMUNICATION	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description

This course aims to provide students with a comprehensive understanding of conducting ethical research, utilizing proper research methodologies, and effectively communicating research findings. The course includes a final project where students will write a Literature Review on a topic chosen in consultation with the teacher(s).

This course is designed to equip students with essential skills and knowledge to conduct ethical research, employ proper research methodologies, and effectively communicate scientific information (with focus on writing a literature review). The course will cover topics such as research design, data collection and analysis, research ethics, and science communication strategies. Through a combination of lectures, discussions, case studies, and practical exercises, students will develop a deeper understanding of the research process and its ethical implications.

Course Objectives

The objective of this course is to impart knowledge about various stages of research process, research ethics and different ways of research communication.

The aim of this course is to impart research skills to the beginners and help to improve the quality of research by the existing researchers. It also encompasses the understanding and application of appropriate research design, statistics, and the use of the computer for reference management, report writing, research paper writing and presentation. The course also introduces the key conceptual issues of each research method, as well as giving practical guidance. It covers the series of research methodology contents: from problem formulation, to design, to data collection, analysis, reporting and dissemination. The course has the dual aims of equipping students with conceptual understandings of current academic debates regarding different methods, and the practical skills to put those methods into practice.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define criteria of good research, steps in research process, and data collection.

CO2. Identify different types of sampling and its purpose.

CO3. Conduct hypothesis testing for different types of samples and interpret the results.

CO4: Learn the importance of literature review, write research paper/thesis, use reference management software.

Course Content :

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Module	Topic	**Blooms level***	Hours
1	**Research Methodology** Understanding the research process: From research questions to conclusions Types of research: Qualitative and quantitative research Exploratory, descriptive, experimental, and correlational studies Scientific Thinking: Subjective Vs. Objective Thinking Logical Reasoning: Inductive Vs. Deductive Reasoning Formulating research hypotheses and objectives Purpose of a good research, Criteria of good research	L1, L2	10
2	**Descriptive Statistics** Data, Types of Data, Methods of data collection, Benefits and drawbacks, Graphical representation of data and interpretation. Measures of Central Tendency: Arithmetic Mean, Median, Mode, Measures of Dispersion: Range, Standard Deviation, Variance, Coefficient of Variation.	L1, L2, L3	15
3	**Inferential Statistics** Sampling: Basic concepts, Process of Sampling, Sample Size, Types of Samples, Sampling and non- sampling errors, Statistics and Parameters, Sampling Distribution of Means and Proportion, **Hypothesis Testing**, steps in testing of hypothesis, errors in hypothesis testing, z test and t test.	L1, L2, L3	15
4	**Research Ethics** Plagiarism, Fabrication, Falsification, Ethics with respect to human and Animal Research	L1, L2	5
5	**Communication** Characteristics of a good Research paper, Systematics Literature Review (choosing a topic, preparing outline, gathering authentic & appropriate references, avoiding plagiarism, use of reference management systems), Writing a good literature review, Structure of report (Introduction, Methodology, Analysis, Results, Discussions, Conclusions, Recommendations), Writing Quality Research Paper, Publishing Research Work in Quality Journals, Reference Management Software	L1, L2, L3	15

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	**A**	**CT**	**Sessional Exam**	**End Term Examination**
Weightage (%)	5	10	15	70

Project based assignment: Student teams (2-3 students per team) will write a literature review on a topic of choice, in consultation with the teacher.

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Text books/ Reference books

- Research Methodology for Natural Sciences by Soumitro Banerjee, Publisher: IISc Press (1 January 2022); ISBN-10: 8194835178; ISBN-13: 978-8194835172
- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt. Ltd., New Delhi-110001
- Geode, Millian J.& Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Kothari, C.R.2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.
- Levin R I., Rubin D S. Statistics for Management. Sixth Edition, PHI
- Kapoor & Gupta. Probability & Statistics. S Chand Publishers, New Delhi.
- Montomery, Douglas C.(2007), 5th Ed. Design and Analysis of Experiments, Wiley India.
- Cooper, Donald R. and Pamels Schindler, Business Research Methods, Tata McGraw Hills, New Delhi
- Krishnaswamy, K.N. Sivakumar. Appa lyer and Mathiranjan M. 2006, Management Research Methodology: Integration of Principles, Methods and Techniques, Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Sachdeva, J.K. 2008. Business Research methodology. Himalaya Publishing House, New Delhi.
- Shekharan, Uma, Business Research Methods, Miley Education, Singapore.
- Zikmund, Millian G., Business Research Methods, Thomson Learning, Bombay.

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SEMESTER-VIII

DANI2801	MOTION GRAPHICS	L	T	P	FW/ Proj	C
Version	2023	2	1	2	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

In media today, there is perhaps not a single course which is untouched by motion graphics. Keeping this widely used tool in mind, this course covers the latest in concepts and techniques in the creation and production of motion design animation using software designed specifically for this purpose such as Animate CC and Adobe After Effects. The course will cover different kinds of motion designs, concepts and storyboard and computer generation of motion design sequences. The course will be profusely illustrated from scenesand sequences employing heavy use of motion graphics, both from the Hollywood as well as Bollywood Motion Picture Industry.

Course Objectives

The objective of this course is to:

- Enable the students to comprehend principles of animation using a field-based approach.
- To familiarize students with all aspects of software in motion graphics.
- To instill in the students such a level of confidence that they can tackle projects at a near professional level by having a holistic knowledge of all software related to motion graphics.

Course Outcomes (COs):

The objective of this course is to:

- Enable the students to comprehend principles of motion design using a judicious mix oftheory and practical work
- To familiarize students with every aspect of motion design software, both at thebeginner as well as advanced level
- To instill in the students such a level of confidence that they can tackle projects at a professional level by having a basic knowledge of all software related to Motion Designsoftware, and intensive knowledge of some selected software such as After Effects.

Syllabus / Topics to be Covered

Modules	Blooms level*	Number of hours
Module I: Fundamentals of Graphics, Animation and Motion Graphics What is Motion Graphics? How is it different from other forms of animation. 2D and 3D animation software. Importance of animation in present day	**L1, L2**	15

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industry. Packages currently being used in the industry and advantages and disadvantages of each. Deconstruction of scenes from movies (Hollywood, Bollywood and International), explanation of how certain effects were created and demonstrating in the computer lab a scaled down version of certain selected effects.		
Module II: After Effects: General Motion Graphics tool This Unit moves out from creative and conceptual dialogues into the domain of After effects. Since this package is used heavily by the Television Industry, many examples from this medium will be used to illustrate hard-to-grasp concepts. Various components of After Effects that will be taught in this module are: • The After Effects interface: Moving about and navigation in AfterEffects • AE tools and panels; how to customise and optimise them • Keyboard shortcuts - how to use and customize • Creating your first composition • The Timeline - navigation, panels and scope of the timeline • Project windows and assets; moving assets from project to timeline • Use of keyframes to create simple animations • Illustration of first principles of animation - ease in/out & easy ease • Frame rates, speeding up and slowing down of animation - using theGraph editor. • Rendering and compression concepts; Different kinds of movieformats • Outputting your first movie; Settings and how they can be tweaked	**L1, L2, L3**	15
Module III: Compositing and Match moving in After Effects This unit is a continuation of the earlier unit. Here we go into greater depth of the various tools, filters effects and presets that can be used. Round tripping between After Effects and Editing software such as Premiere and/or Final Cut Pro, this unit talks about green screen, chroma keying, masks and mattes for compositing stills and videos. Common problems encountered such as fast moving footage or color fringing are discussed and creative solutions offered. Also compositing is demonstrated in softwaresuch as After Effects, Nuke and/or Fusion, and the reason why a particular software is chosen for a particular task is explained. In this unit, also match moving, locking still image or animation on a target, using 2D and 3D cameras, as well as planar tracking software like Mocca are covered in detail.Again to make the students industry, common problems encountered when using these highly specialized software are discussed, examined andstudents are encouraged to come up with creative solutions to fix these problems. A case study approach rather than classroom rote learning will be adopted both in this as well as the next unit.	**L2, L3, L4, L5**	15
Module IV: Rotoscoping, Particle Animation. Liquid and Pyrotechnics In this Module, very specific effects used in films like particle effects, rotoscoping, liquid effects, dynamic simulations using soft and rigid bodies, as well as pyrotechnics – fire and smoke effects as well as explosion effects are dealt with at length. This unit is almost completely practical and theory is only used to augment and strengthen student's knowledge, rather than it being a substitute for imparting practical skills. Figuring out how to deal with	**L3, L4, L5, L6**	15

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hardware and exporting issues when rendering heavy and complex scenes is also discussed and explained.		
Module V: Assembling effects This module, although slightly different is the sense that it is more focused on editing, brings all the skills learnt in the previous modules onto the editing platform. Students learn how to combine and compile sequences, the different editing codecs, how to export both high quality videos as well as compressed videos and how to addmusic and sound effects to their sequences to maximize impact of the visual effects that they have created using a single or combination of different software.	**L3, L4, L5, L6**	15

***Bloom's Level**:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Ron, Brinkmann. *The Art and Science of Digital Compositing: Techniques for Visual Effects, Animation and Motion Graphics: The Morgan Kaufmann Series in Computer Graphics*. 2008
- Byrne, Bill. The Visual Effects Arsenal: VFX Solutions for the Independent Filmmaker. Focal Press 1st Edition. 2009

Reference Books

- Dodds, David. Hands-On Motion Graphics with Adobe After Effects CC: Develop your skills as a visual effects and motion graphics artist. Pakt Publishing. 2019.
- Lanier, Lee. Digital Compositing with Nuke. Focal Press. 2012

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**P**	**A**	**CT**	**EE**
Weightage (%)	10	5	15	70

CT: Class Test, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	--	2	--	1	--	--	--	1	2	2	2
CO2	--	2	--	1	--	--	--	1	2	2	2
CO3	--	2	--	2	--	--	--	1	2	2	2
CO4	--	2	--	2	--	--	--	1	--	2	2
CO5	--	--	--	--	--	--	1	1	2	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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DANI2802	FX AND SIMULATION	L	T	P/ FW	C
Version	**2023**	2	1	2	4
Pre-requisites/Exposure	Nil				
Co-requisites	Nil				

Catalog Description

The birth of new tools in Artificial Intelligence, the increased use of Augmented Reality (AR) and Virtual Reality (VR) as well as the spurt in Gaming and associated technologies; all have led to inclusion of visual effects and simulation in every area of animation. This module deals with exciting field of visual effects, its usage in the industry; the tools and techniques that need to be mastered in order for them to be utilized in video and film industries. This course is highly practical driven, with practical effect and simulation exercises in equal proportion to imparting of theoretical input.

Course Objectives

This course is designed in such a way that students are trained to be industry ready and can begin delivering professional quality work from the very first day. Hence there are a lot of lab exercises, careful supervision and monitoring of projects and submissions and lectures incorporate the latest developments in technology. The intention is to update the student in intermediate as well as advanced animation and simulation techniques, where they learn not only to deliver quality work, but also to meet deadlines.

Course Outcomes (COs):

The objective of this course is to:

Enable the students to comprehend principles of VFX and simulation through a carefully designed mix of theory and practical classes.

- To familiarize students with all aspects of animation, visual effects and dynamic simulation so they can implement these with ease.
- To inculcate in the students a keenness to be updated with all the latest developments in the field as well as learn quickly what client requirements are and produce work that is relevant.

Syllabus / Topics to be Covered

Modules	Blooms level*	Number of hours
Module I: Fundamentals of Animation and VFX This module essentially provides an overview of the multiple components that make up a animation and VFX course. It also introduces the students to new concepts in the field of VFX and simulation such as gaming and gaming engines such as Unreal. Virtual Reality and Augmented reality and other elements are	**L1, L2**	10

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briefly covered in this introductory module.		
Module II: Compositing, Match Moving and Rotoscoping This module covers basics of green screen keying and compositing and the software used in the industry to achieve these effects. Initially motion graphics and VFX software such as After effects and using keylight and external plugin. Later, more complex softwar such as Nuke and Fusion and other node-based software are introduced. Basics of Match Moving, Motion Capture and Motion tracking are introduced. Software used will be mostly After Effects but planar tracking in packages like Mocca are also taught. As well as linked modules in Da Vinci Resolve. • 2D and 3D camera tracking • Rotoscoping: 2D and 3D. Manually and using software • Tracing live action footage frame-by-frame	**L1, L2, L3**	15
Module III: Digital Image Processing; Matte Painting; Paint FX and Dynamics using Maya and Blender Students are introduced to: • Basics of Digital Image Processing. Modifying and Altering still as well as video material. • Texturing for creation of Matte Paints as well as for creating surface maps for 3D objects • Plugs in software such as Keyshot and Substance Painter are covered here	**L2, L3, L4, L5**	10
Module IV: Fire (Pyrotechnics), Liquid and Particle Animation This module is completely focused on the creation of special effects particularly organic VFX like fire, smoke, liquid and particle animation. Software used for this module will be Maya, After Effects; Real Flow; Cinema 4D and Some modules of SideFX Houdini Students are taught to create realistic and organic simulations using core animation software as well as plugins like for example Red Giant's particle generator system	**L4, L5, L6**	15
Module V: Dynamic Simulation (Rigid and Soft body and Collidor Objects) This module is completely focused on creation of realistic dynamic simulation in Maya, Cinema 4D and 3DS Max. Real life Physics and interaction of objects with each other for collisions, fracturing and transformation are used to create realistic simulation of different objects interacting with each other. Blending of simulation into existing 3D animations is also an essential part of this last and completely practically focused module	**L3, L4, L5, L6**	15

***Bloom's Level**:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Ron, Brinkmann. The Art and Science of Digital Compositing: Techniques for Visual Effects, Animation and Motion Graphics: The Morgan Kaufmann Series in Computer Graphics. 2008

Reference Books

- Dodds, David. *Hands-On Motion Graphics with Adobe After Effects CC: Develop your skills as a visual effects and motion graphics artist*. Pakt Publishing. 2019.
- Lanier, Lee. *Digital Compositing with Nuke*. Focal Press. 2012
- Failes,Ian. *Masters of FX: Behind the Scenes with Geniuses of Visual and Special Effects*. CRC Press, 2016

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

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Examination Scheme:

Components	P	A	CT	EE
Weightage (%)	10	5	15	70

CT: Class Test, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	--	2	--	1	--	--	--	1	2	2	2
CO2	--	2	--	1	--	--	--	1	2	2	2
CO3	--	2	--	2	--	--	--	1	2	2	2
CO4	--	2	--	2	--	--	--	1	--	2	2
CO5	--	--	--	--	--	--	1	1	2	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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DANI2839	DATA ANALYSIS & VISUALISATION USING SOFTWARE	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	Class X Mathematics				
Co-requisites					

Catalog Description

The implosion of available data has made visualization more critical but also more challenging. Data analysis and Data Visualization are essential tools for business analysis, engineers, policymakers, and decision-makers. Developed originally for "small data", visualization techniques have been met with varied success in the past centuries and decades. There are a few well-known visualizations that are very effective in capturing the essence of the data, and of course, there are many infamous negative examples of poor visuals. An effective visual is critical for decision making it, but it also requires a lot of work, customization, attention to detail, and refinements.

Course Objectives

The course is designed to help students develop skills and knowledge in the following area(s):

- Develop an understanding of what is a good visualization for a given purpose
- Learn visualization theory & techniques
- Build a substantial data analytic project
- Apply data analysis and visualization with Excel, SPSS, R, Python, NVivo and MATLAB

Course Outcomes

On completion of this course, the students will be able to

CO1. Students will be able to articulate meaningful lines of inquiry that might be explored through the collection, organization, visualization, and analysis of data in a context associated with their primary field of study using (as appropriate) numerical, textual, spatial, and/ or visual data.

CO2. Student will understand what data are, how they are collected, and how to assess the quality/ reliability of data.

CO3. Students will demonstrate intermediate proficiency in the visualization of data to communicate information and patterns that exist in the data.

CO4: Students will be able to use at beginning level of proficiency the tools of statistics and machine learning to ask questions of and explore patterns in data.

Course Content :

Module	Topics Covered	Blooms Level	Contact Hours
1	**Module-1: Introduction to Excel**	L1, L2, L3, L4	20 hours

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	Data Analysis using Excel, Curve fitting, Correlation, Linear Regression, Multiple regression, Principal Component Analysis and Factor Analysis, Hypothesis testing **Introduction to Excel and SPSS** Introduction to SPSS and Types of Data, Importing, exporting and data handling in SPSS; Exploratory data analysis using SPSS and data visualization; Introduction to statistical inference and various univariate tests by using SPSS; Analysis of Variance (One Way ANOVA, Two Way ANOVA and ANCOVA); Correlation, Simple and Multiple linear Regression Analysis; Principal Component Analysis and Factor Analysis		
2	**Module-2: VOS Viewer** **Web of Science, Scopus, Dimensions, Lens, and PubMed.** Co-authorship networks, citation-based networks, and co-occurrence networks can be created based on data downloaded from Web of Science, Scopus, Dimensions, and Lens. Co-authorship networks and co-occurrence networks can also be created based on PubMed data. **Crossref, Europe PMC, and OpenAlex**. Networks can also be created based on data retrieved through the APIs of Crossref, Europe PMC, and OpenAlex, These APIs can be queried interactively in VOS viewer. **Semantic Scholar, Open Citations, and Wiki Data.** For a given set of DOIs, networks can also be created based on data retrieved through the APIs of Semantic Scholar, Open Citations and Wiki Data.	L1, L2, L3, L4	10 Hours
3	**Faculty of Management Studies & Behavioural Sciences** **Module 3: Domain Specific Software** **- Structural Equation Modelling** **Smart PLS** Introduction to Structural Equation Modelling (SEM), Introduction to the software's AMOS and SPSS, SMART PLS, Testing of Statistical assumptions, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), common method bias (CMB) test, Measurement Model Assessment, Discussing Fit Indices, Reliability and Validity Testing, Structural Model Assessment identifying multivariate outlier, Construct Validity: Convergent and Discriminant Validity, Measurement Model & Structural Equation Modelling, Mediation and Moderation Effects, Multi-Group Analysis.	L1, L2, L3, L4	30 Hours

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	Faculty of Arts **N Vivo** 1. Import text, audio, video, emails, images, spreadsheets, online surveys, web content, and social media from various sources into a simple, intuitive interface. 2. Create and NVivo project, import and organise qualitative and quantitative data 3.Manage a literature review in NVivo 4. Autocode structured data deductively and identify themes inductively 5. Generate and falsify hypotheses 6. Combine data in sets for analysis 7. Seek patterns and identify relationships across codes and cases 8. Present findings using visualisations 9. Export data out of NVivo 10. Coordinate teamwork.		
	Faculty of Science Engineering and Technology **Faculty of Health & Allied Sciences** **R programming / Python/ MATLAB** **R Programming-** Introduction to R, Variables and datatypes in R, Dataframes, Recasting and joining of dataframes, Arithmetic, logical and matrix operations in R, Functions in R, Control structure in R, Data visualization in R. **Python Programming-** Basics of programming, data structure and algorithm using Python, Strings, lists, control, functions, manipulating lists, loops, arrays, selection sort, insertion sort, recursion, sorting, dictionaries, exception handling, file handling, string processing, data analysis using Python **MATLAB Programming-** Introduction, basic features, managing workspace, mathematical functions, basic plotting, Matrices, array operations and linear equations, MATLAB programming- M files script, M-file functions, control flow and operations.		

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional (Theory/ Practical)	End Term Examination
Weightage (%)	5	10	15	70

References:

- David Houcque, 2005. Introduction to MATLAB programming for Engineering students., Northwestern University, E- Book **https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf**
- Mark Lutz, 2009. Learning Python. O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.
- Emmanuel Paradis, 2005. R for Beginners. E book. **https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf**
- A Handbook of Statistical Analysis using SPSS by Dr. Brijesh Awasthi, Redshine Publication.

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Amity School of Communication

Master of Arts Journalism & Mass Communication

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Programme Structure

Curriculum & Scheme of Examination

2023

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JRN4103	MEDIA ARTS-I: RADIO & TV	L	T	P	C
Version	2021	2	0	2	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Today broadcasting media is one of the most ruling media in day to day life. TV and Radio plays a very vital role in dissemination of the information and to communicate with the masses not only to cover the national issues but also to go for parachute coverage. This course outline helps students to develop the basic concepts and fundamentals for the broadcasting media not only textual but also hands on practice for the Television as well as Radio.

Course Objectives

The objective of this course is to

- Impart knowledge of basic working of Radio and TV as a medium of mass communication, also to apply knowledge of basic anatomy and working of the Radio and TV in India as well as in global domain.
- Apply knowledge and skills required to know about the different broadcasting instruments in Television and Radio broadcasting Industry.
- Engage in life-long learning and hands on technical expertise in handling the Basics of Camera, Light, Sounds and other equipment's .

Course Outcomes

On completion of this course, the students will be able to

CO1. Describe the different characteristics of Sounds – in film productions for both fiction and Non-fictions.

CO2. Identify and describe various concepts and instruments used for the capturing of Sound in broadcasting media.

CO3. Equipping the students with skills to be able to work on the lighting part- to understand the aesthetical approaches of lighting and different kinds and functions of lighting in the varied environment.

CO4. Analyze the different dimensions and applications of editing for making the raw footage to the finished one.

CO5. Demonstrate hands-on experience on anatomy of Video Camera, different kinds of video productions equipments and to learn the rules of the compositions.

CO6. Analyze the different approaches and aesthetical approaches in Film making and TV Productions.

Course Contents:

Modules	Blooms level*	Number of hours
MODULE 1: Audio and Sound: The Characteristics The basic attributes: Loudness, Frequency, Intensity, Pitch, Amplitude, and Timbre, Sound Aesthetics- Spatial Hearing, Sound Isolation, Sound perspective (mono and stereo), Importance of speech in broadcast media, Sound and its functions, Functions of sound in relation to picture, Acoustics and psychoacoustics.	L1, L2	6
MODULE 2: Sound and Technical Approaches	L1, L4	6

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Types of microphones, Directionality and pick-up patterns, Cardioid, Omni directional, super-cardiod and hyper-cardiod, Quadraphonic and surround sound, Construction of mikes- dynamic mics and condenser mics, Positioning of mics- floor stand, hidden mics, camera mics, wireless mics.		
MODULE 3: Lighting: The Fundamentals Nature, quality, lighting for TV, Colour temperature, Lighting instruments, Three point lighting, Creative additions to lighting for different genres.	L1, L2,	6
MODULE 4: Editing techniques Editing; principles and techniques, Continuity and non-continuity editing, Linear and non-linear editing	L1, L2, L3,	6
MODULE 5: Anatomy of Video Camera The basic structure of a Video Camera, Working mechanism and basic parts of camera, Types of camera, Camera Mounts.	L1, L3	6
MODULE 6: Broadcast: Rules and Approaches Camera movements & angles, shots, Composition principles, TV as a Medium of close ups, Role of sound / voice over in TV programs, TV as a medium of glamour, immediacy, democratizing, Infotainment.	L1, L2, L5	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books:

- Boyd, A. (1997). Broadcast Journalism: Techniques of Radio and TV news. Boston: Focal Press.
- Belavadi, V. (2013). Video production. New Delhi: Oxford University Press.
- Hakemulder, J. R., Jonge, F. A., & Singh, P. P. (2005). Broadcast Journalism. New Delhi. India: Anmol Publications.
- Millerson, G., & Millerson, G. (1999). Television Production. Oxford: Focal Press. 13 edition.

Reference Books:

- Trewin, J. (2003). Presenting on TV and Radio: An Insider's Guide. Amsterdam: Elsevier.
- Utz, P. (2006). Today's Video. Jefferson, NC: McFarland.
- Zettl, H. (2005). Television Production Handbook, Cengage Learning.

Other Books:

- Chantler, P., & Stewart, P. (2003). Basic Radio Journalism. Amsterdam: Focal Press.
- Chatterji, P. C. (1987). Broadcasting in India. New Delhi: Sage Publications.
- Luthra, H. R. (1986). Indian Broadcasting. New Delhi: Publications Division, Ministry of Information and Broadcasting, Govt. of India.
- McLeish, R. (1999). Radio Production: A manual for broadcasters. Oxford: Focal Press.
- Shrivastava, K. M. (1990). Radio & TV Journalism. Sterling.
- Sharma, R. (2012). Breakout nations: In pursuit of the next economic miracles. New York: W.W. Norton &.
- Pavarala, V., & Malik, K. K. (2007). Other voices: The Struggle for Community Radio in India. Thousand Oaks, CA: Sage Publications.

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Examination Scheme:

Components	**P**	**CT**	**A**	**EE**
Weightage (%)	10	15	5	70

P- Project, C- Case Discussion/Presentation/Analysis, CT- Class Test, A- Attendance, EE- End Semester Examination

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	-	1	-	-	1	2	3	3
CO2	2	1	1	2	1	-	-	1	2	3	3
CO3	2	2	2	-	1	-	-	1	2	3	2
CO4	2	2	2	2	1	-	-	1	2	3	2
CO5	2	2	2	-	1	-	-	1	2	3	2
CO6	2	1	2	1	1	-	-	1	2	3	3

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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JRN4104	ADVERTISING: CONCEPTS AND PRINCIPLES	L	T	P	C
Version	2021	2	1	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

The course will focus on basics concepts of advertising, its role & functions. The purpose of this course is to offer cutting-edge thinking on Advertising and explain how advertising works in the real world. The elaborative content will provide strong knowledge base to the students about Advertising and will enhance their critical and creative skills.

Course Objectives

The objective of this course is to:

- Equip the students with advertising environment by understanding, identifying and analyzing important concepts.

Course Outcomes (COs):

On completion of this course, the students will be able to
CO1: Comprehend role and functions of advertising.
CO2: Identify various types of advertising and structure with in advertising agency.
CO3: Analyze role of various department of agency and making of a campaign.
CO4: Comprehend the role of Segmentation, Targeting and position in campaign planning

Course Contents:

Modules	Blooms level*	Number of hours
MODULE 1: Introduction Definition and key concepts of advertising, Advertising Types, Role and Functions	L1, L2	10
MODULE 2: Advertising as a tool of marketing The Marketing Planning ,Relationship of Marketing with Advertising ,Situation Analysis to the Marketing Mix, Market Share, Target Segment, Positioning, Developing Advertising from Marketing Objectives	L1, L3	7
MODULE 3: Understanding advertising agencies Advertising Agencies, Types of Advertising Agencies, Advertising agency structure, Functions of various departments, Workflow in An Agency, Pitching , Account Planning, Media Planning, Copy Writing	L1,L2,L4	7
MODULE 4: Segmenting, Targeting and Positioning (STP) strategy Market Segmentation, Markets, market segments and niches, Meeting editorial needs, Basis for segmenting consumer markets, Targeting strategies, Undifferentiated targeting, Differentiating targeting, Niche targeting, Various positioning strategies, Benefit	L1,L2,L3	11

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approach, Price –Quality approach, User approach, Product category approach, Competitor approach		

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Jethwaney, J. & Jain, S (2006). *Advertising* (6th Ed). Oxford University Press.
- Chunawalla, Sethia, S. (2015). *Foundation of Advertising* (8th ed., Vol. 1). Himalaya Publications.

Reference Books

- Mohan, M. (2008). *Advertising Management* (2008 ed., Vol. 8th, p. 429). McGraw Hill Education (India) Private Limited.
- Thomas, C., & Guinn, O. (1999). *Advertising* (1st ed., p. 694). South-Western College Pub.
- Wells, Moriaty, Burnett. (2006).*Advertising Principles & Practice* (7 Ed) Pearson Prentice Hal.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**H**	**C**	**CT**	**A**	**EE**
Weightage (%)	5	10	10	5	70

CT: Class Test, H: Home Assignment, EE: End Semester Examination; A: Attendance; C: Case Presentation

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	--	--	--	--	--	1	2	--	--
CO2	1	1	--	--	--	--	--	1	2	--	--
CO3	1	1	--	--	--	--	--	1	2	--	--
CO4	1	1	--	--	--	--	--	1	2	--	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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JRN4106	DESIGN SOFTWARE	L	T	P	C
	2021	2	0	2	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This unit is designed to initiate the student into the rudiments of design and application of design in all walks of life that we see all around us. The student will learn and imbibe important typographic principles, use of fonts and fontography, use of color, color harmonies and tonal balance. The vitally important role that symmetry, balance, images – both vector as well as bitmaps, play in creating a harmonious and aesthetically appealing composition will all be explained with real world examples of practical design being implemented in advertising and mass communication.

Course Objectives:

The objective of this course is to:

- Enable the students to comprehend principles of design using a blended learning approach
- To familiarize students with all aspects of software, both at the beginner as well as at an intermediate level
- To integrate seamlessly both theoretical as well as practical aspects of design such that the learner is able to instantly identify design principles incorporated in the physical realm, be it print, net, web, film or television.

Course Description

This course covers all aspects of designs from the traditional orthodox straightforward design principles to contemporary design principles and application. Not only are the traditional fields such as print and broadcast design covered but also newer areas like UI/UX and game design also are briefly covered in this course. By and large however, it is meant to teach print design and layout basics through a well interwoven thought out course that embeds practical constructional projects at every stage of theoretical information imparted. Students are taught to think critically and question traditional concepts as well as come up with their own models and ideas.

Course Outcomes:

On completion of this course, the students will be

CO1. Completely proficient with all aspects of at least three print design software, notably Adobe Photoshop, Illustrator and In Design. They will also be conversant with Corel Draw, at a basic level.

CO2. Be able to visualise and conceptualise layouts for Print, Web and Multimedia.

CO3. Be proficient at delivery of design projects, both at a conceptual level and at the execution stage.

CO4. Be able to work in a team delegating different aspects of production to team members and also exchange notes and monitor each others work, so that professional quality work can be outputted and exported.

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Modules	Blooms level*	Number of hours
MODULE 1: Manual and Computer Aided Design Differences between traditional design, primarily for print as compared to designing for the web, the internet, and for television and film will be compared and contrasted, and how these inherent differences can be optimized for a specific media will be explained and expounded upon. The importance of computer as a design tool as well as the different software currently prevailing in the industry are also highlighted and a broad overview imparted of each software with its distinguishing features	L1, L2	4
MODULE 2: What is Design? Design Elements, Design Principles. How elements and principles helps in design. Where and how these elements and principles are applicable. How do different design elements combine and collaborate together to create an overall 'look' and feel for the published output – be it a web page, a brochure or a billboard hoarding.	L2, L3	6
MODULE 3: Typography History of fonts, Sizes of fonts, Classification of fonts, True Type and Open type. Breakdown of a word into typographical elements and ligatures, designing a custom font from scratch, all form part of this particular module. Each concept that is explained is generously illustrated with practical examples drawn from mixed media	L2, L3	6
MODULE 4: Hardware and Software From more theoretical concepts like Typography and design principles we move to the more practical aspects of implementing design on the ground through use of immersive technologies. Important aspects of hardware, notably the computer and accessories like printers, scanners and other input/output devices are explained. The student is also taken through the gamut of design software that exist that take full advantage of the computer's multitasking and multi-threading capabilities. In this module, only an overview of Digital Publishing software is given. In the next two modules, the most popular design software are explained at length	L2, L3,	6
MODULE 5: Fundamentals of Design Software The Editing of images, selection and cropping, integration of text with graphics, as well as the importance of resolution, image size, pixel depth, and the different sizes for print, web, broadcast and internet mediums such as Youtube are all covered in this module. Also different image file formats such as jpg, png, tiff etc along with transparency and scaling are also explained. From technical definitions we move on to the software itself, covering all basic aspects of industry standard software like Photoshop, Illustrator, Corel Draw and Adobe InDesign	L3, L4	8
MODULE 6: Design Software – Intermediate level This module covers the above software in more detail and depth with overlying emphasis being given to integration of practical projects that employ all the theoretical knowledge imparted. Once a set of topics is taught, application of the same is demonstrated through several practical exercises that are not only structured but also graded in terms of complexity and applicability.	L3,L4	6

**Bloom's Level:*

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L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Sarkar, N. M. Art & Print Production. 2013 Ed.
- Krug, Steve. *Don't Make Me Think: A Common Sense Approach to Web Usability*. New Riders Publishing, California. 2nd Edition
- Bauer, Peter. Adobe Photoshop CC For Dummies. Wileys. 2nd Edition
- Wood, Brian. *Adobe Illustrator CC Classroom in a Book* (2019 Release), Adobe Press. First Edition. December 2018.

Reference Books:

- Anton, Kelly Kordes. Cruise, John. *Adobe InDesign CC Classroom in a Book* (2017 release). December 2016.
- Norman, Don. *The Design of Everyday Things: Revised and Expanded Edition*. November 2013.

Modes of Evaluation: Practical/Home Assignment/Class Test/Written Examination
Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

P: Project, CT: Class Test, EE: End Semester Examination; A: Attendance

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	3	..	..	..	1	3	3	2
CO2	1	2	2	3	..	..	..	1	3	3	1
CO3	1	2	1	3	..	..	..	1	3	1	3
CO4	1	1	3	1	..	..	..	2	3	1	1

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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JRN4202	PRINT DESIGN AND VISUALISATION	L	T	P	C
Version	2021	2	0	2	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description:
This course prepares the students for a career in the print industry. It comprises of modules that move from theoretical concepts like page sizes, resolutions etc to using software to craft print publications for newspapers and the advertising industry.

Course Objectives:
The primary objectives of this course are to:

- Introduce students to design concepts like layout, use of positive-negative space etc.
- Familiarize them with the juxtaposition of fonts, images and text to create compelling print material for publication
- Teach them how to effectively use software to create advertisements, banners and magazine layouts for printing and publication

Course Description
This course moves seamlessly from the definition and description of layout and design theoretical concepts to the actual realization of these concepts in print. Various concepts and jargon used by the print industry are explained and demonstrated, culminating in the use of software to translate design concepts into visually appealing printed material. Fundamentals of advertising and media campaigns are also an integral part of this course

Course Outcomes:
On completion of this course, the students will be able to:
CO1. Describe various style sheets for print media.
CO2. Comprehend how images, text and fonts interact to create pleasing layouts.
CO3. Use different design software to edit and accomplish print related tasks
CO4. Use design skills and knowledge of software to create one or more professionally designed projects.

Course Contents:

Modules	Blooms level*	Number of hours
MODULE 1: Module I: House Styles What is style sheet? How to create style sheets? Style guide: examples from newspapers, magazines; own guide produced for new publication. Styles: choice of typeface and masthead, choice and use of images and color, positioning of articles and images on the page, use of headlines in an appropriate font, point size, number of lines etc., text manipulation, juxtaposition of text/images/advertising, Typography.	L1, L2	8
MODULE 2: Comparison in newspapers and magazines What is the difference between Newspaper & Magazine layouts? What needs to be taken care when creating layouts for Fashion	L2, L3	6

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feature or Business articles or News pages. Which software is to be used - for making layouts, creating vector graphics and raster images? Proper utilization of design elements and principles in layouts.		
MODULE 3: Advertising concepts Corporate Identity: Usage of Types & Fonts, Color schemes, Punch line, Orientation. Corporate Stationary: Logo, Letterhead design, Business Cards, Envelopes, Catalogues, Brochures, Digital Posters, Calendar Design. Communicating through multiple media: Digital and print	L2, L3	6
MODULE 4: Relevant software to design advertisements Advertising campaigns: Developing advertising campaigns from concept to creation, from creative to presentation. Photoshop, PageMaker, Corel Draw, Illustrator and their relevant usage in creating different forms of design for advertisements and campaigns.	L2, L3	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Sarkar, N.N(2001). *Art and Print Production*. 6th Ed.
- Lupton, Ellen(2015). *Graphic Design: The New Basics*. 2nd Ed.

Reference Books

- Moggridge, Bill(2010). Designing Media. The MIT Press.
- Shaoqiang, Wang(2018). *Page Design: Printed Matter and Editorial Design*.

Modes of Evaluation: Practical/Home Assignment/Class Test/Written Examination
Examination Scheme:

Components	**P**	**CT**	**A**	**EE**
Weightage (%)	10	15	5	70

P: Project, CT: Class Test, EE: End Semester Examination; A: Attendance

CO, PO and PSO Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	2	3	-	-	-	2	1	2	3
CO2	3	2	3	3	-	-	-	2	1	2	3
CO3	1	2	1	3	-	-	-	2	1	2	2
CO4	1	3	2	3	-	-	-	2	1	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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JRN4203	SPECIALIZED REPORTING AND FEATURE WRITING	L	T	P	C
Version	2021	2	-	2	3
Pre-requisites/Exposure	Print Journalism – Reporting & Editing				
Co-requisites					

Catalog Description

After introducing the basics of newspaper reporting and editing in the first semester, this course describes the issues of specialization in news. The course introduces the concepts of beat reporting and also deals with the subtle differences between reporting on politics, business, sports, crime etc. The course also describes the nuances of investigative reporting with discussion on relevant case studies.

Course Objectives

The objective of this course is to

- Introduce beat reporting and discuss the finer points of specialized writing.
- Explain how reporting is different for various beats like crime, health, education, politics etc.
- Provide knowledge regarding investigative reporting and its tools.
- Provide understanding for different types of journalistic writing.

Course Outcomes (COs):

On completion of this course, the students will be able to

CO1: Describe differences and similarities between different journalistic beats.
CO2: Describe and apply various concepts of beat reporting.
CO3: Explain investigative reporting in depth; especially sting operations.
CO4: Apply conceptual knowledge to write different types of features and reviews.
CO5: Argue if sting journalism is a healthy practice in a democracy.

Course Contents:

Modules	Blooms level*	Number of hours
MODULE 1: Beat Reporting Covering a news beat, coverage of various beats: crime, education, health, civic affairs and local government, political reporting(political structure in India, covering political parties/events/rallies/elections), parliament reporting (parliament structure, reporting on legislature), covering the government (PIB, ministries), legal reporting (Structure in jurisdiction of courts, reporting court hearings, precautions)	L1, L2	12
MODULE II: Business and Sports reporting Basic business knowledge and business bodies, corporate reporting, covering economic policy (Ministry of Commerce, Finance, Industry, Company Affairs, and other infrastructure ministries), stock market coverage, how to develop good sports writing skills, covering local, national internal level events, entertainment and lifestyle reporting	L2, L3	8
MODULE III: Investigative Reporting	L1, L5	9

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Definition and elements, tools of investigative reporting, importance of sources, sting operations and latest trends, relevant case studies: Indian and international		
MODULE IV: Feature Writing How to write a feature, different types of features, book reviews and film reviews	L3	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Sharma, Seema (2005) *Journalism:Reporting,* New Delhi: Anmol Publications Pvt. Ltd.
- Fox, Walter (2001)*Writing the News: A Guide for Print Journalists*, New Jersey: Wiley-Blackwell
- Mencher, Melvin (1989)*Basic News Writing*, U.S.A. : William C. Brown Publication
- Rajan, Nalini (2007) *21st Century Journalism in India*, New Delhi : Sage India
- Rick Wilber & Randy Miller (2002*) Modern Media Wring*, Belmont : Wadsworth Publishing Company

Reference Books

- Hough, George A. (1995) *News Writing*, Boston : Houghton Miller
- Fink, Conrad C. (2001*) Sports Writing: The Lively Game*, New Jersey : Wiley-Blackwell
- Keeble,Richard (2001)*The Newspaper Handbook*, Abingdon : Routledge
- Kamath,MV (2012*) Journalism Reporting*, Noida : Vikas Publication
- Rosenauer,Kenneth L (2004)*Storycrafting: A Process Approach to Writing News*, New Jersey: Wiley Blackwell

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**P**	**A**	**CT**	**EE**
Weightage (%)	10	5	15	70

CT: Class Test, H: Home Assignment, EE: End Semester Examination; a: Attendance; C: Case Presentation

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	--	3	2	3	--	2	1	2	2	--
CO2	2	1	2	1	2	--	2	1	2	2	2
CO3	3	2	--	2	2	3	--	1	2	2	2
CO4	--	1	2	2	2	2	2	1	2	2	2
CO5	--	--	1	1	1	2	--	1	3	2	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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JRN4204	MEDIA ARTS-II: RADIO AND TV	L	T	P	C
Version	2021	2	0	2	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

Various components of television production will be taught through praxis. Students will know about how a television organization operates and the finer nuances of reporting. Students will do on camera interviews and learn how to work in a PCR and studio.

Course Objectives

The objective of this course is to

1. Give students the opportunity to study the contemporary conventions and practices in Television and Radio Journalism.
2. Identify and examine key principles involved and required in news broadcasting.
3. Train the student in basics of news and feature reporting, writing and programming

Course Outcomes

On completion of this course, the students will be able to

CO1. Write scripts in different formats different genres; Radio and Television.
CO2. Describe roles & functions of various TV Newsroom
CO3. Demonstrate qualities of TV Journalist

Course Contents:

Module	Blooms Level	Number of Hours
Module I: Writing For Media Writing styles for Broadcast Medium TV - Writing for visuals, Conversational Writing Terminology Script, screen play, story board, script formats Writing for different formats Radio- Writing for ear Style, Radio scripts for different formats, Jargon and terminology	**L1, L3**	**12**
Module II : Introduction to TV Journalism Basic contours and characteristics of TV news journalism. TV news room- hierarchy, role of each element in hierarchy The news process from field reporting to packaging and going on Air Various technical departments Functioning of each department Designations of technical staff Equipments or hardwares for a news channel Utility of each Importance of technical functioning in a news channel Coordinating with the newsroom Professional terminologies	**L1,L3**	**12**

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Functioning while working on a live bulletin and recorded programme TV news bulletin; rundown, stacking, blocking		
Module III: Television Reporting: the human angle Qualities and attributes of a broadcast reporter. Essentials during reporting Live reporting and working on a story Different functioning for different beats Interviewing skills The news Anchor- qualities, role and responsibilities.	**L2, L3**	**11**

Text Books:

- Page, D. & Crawley, W. (2001).*Satellites over South Asia*, (New Delhi) Sage Publications Ltd.
- Sexena, G. (1996) *Television in India: Changes and Challenges*, (New Delhi) Vikas Publishing
- Monroe, E. & Verhulust, S. (2001). Broadcasting *reforms in India: Media Law from a Global Perspective*, (New Delhi), Oxford University Press

References:

https://www.youtube.com/watch?v=Xs0K4ApWl4g
https://www.youtube.com/watch?v=6lKehR9HENE
https://www.youtube.com/watch?v=6PXORQE5-CY
https://www.youtube.com/watch?v=p8636YkEhU4
https://www.youtube.com/watch?v=Yaj2PXRswxI
https://www.youtube.com/watch?v=vtU_N57MZf8
https://www.youtube.com/watch?v=W8PBRBlW50I

Other Readings:

- Handout: Television:

Web Resources: (IF ANY)

- http://www.bbc.co.uk/radio4/factual/indiasroute66.shtml
- http://www.radiomirchi.com/
- **http://www.aljazeera.com/**

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**P**	**C**	**CT**	**A**	**EE**
Weightage (%)	5	10	10	5	70

P- Project, C- Case Discussion/Presentation/Analysis, CT- Class Test, A- Attendance, EE- End Semester Exam

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	-	-	-	-	-	-	1	2	-	-
CO2	-	1	-	-	-	-	-	1	-	2	-
CO3	-	-	-	1	-	-	1	1	2	-	-
CO4	-	-	-	1	-	-	1	1	-	-	-

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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JRN4207	ADVANCED PHOTOGRAPHY	L	T	P	C
Version	2021	2	0	2	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course describes how to develop a unique photographic vision using a combination of aesthetics and technology. Using both practical's and theoretical teaching methods and blending traditional processes with current digital technologies, the photographic curriculum provides aspiring photographers with the breadth of experience and knowledge required to succeed in today's market place

Course Objectives

After Being exposed to the basics of photography in the first semester, the students will be eager to try their hands in the comparatively new area of digital photography and imaging. They will be able to start maintaining their portfolios and will be required to make digital presentations and undertake practical assignments.

Course Outcomes (COs):

On completion of this course, the students will be able to

CO1: Demonstrate Lighting essentials for creating incredible images, their importance and purpose of the main light in Photography.

CO2: Analyse aesthetics for various genres of photography.

CO3: Describe concepts of digital photography and imaging.

CO4: Apply techniques of Photo manipulation.

CO5: Produce portfolio in the genre of their choice.

Course Contents:

Modules	Blooms level*	Number of hours
Module I: Advanced lighting and Composition Lighting and its control (source, Contents & Direction of light) Electronic Flash & Its synchronization One, Two- & Three-Point Lighting Working on the subject (Changing proximity, varying angle, tightly framing subjects)	L1,L2	8
Module II: Aesthetics Variations for various beats Portrait Wildlife, Nature and Landscapes Night Photography	L1,L2,L4	6

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Journalism (Photography for newspapers and magazines)		
Module III: Understanding Digital Photography Digital Imaging Construction (Size, Resolution of Digital Images) Uses, Advantages and Limitations of Digital over conventional Photography image sensors (CCD and CMOS) Formats of a Digital Image Types of Digital Cameras	L1,L2	6
Module IV: Digital Image and Manipulation Problems with Digital Photographs Commonly used image editors Editing images with Adobe Photoshop and Photoshop Elements Printing and sharing Digital Images	L1,L2,L3	6
Module V: Advanced Photography Practical's Practicing outdoor Photography Photography Assignment and Projects Developing personal Digital Portfolio Digital Image Manipulation using various computer software	L1,L3	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Langford Michael. (2013), *Basic Photography*; Burlington: Focal Press
- Corbett Bill. (2002), *A simple guide to 35mm photography*, Sydney:4C Publishing Pty Ltd

Reference Books

- Stephen G. Anchell, The Darkroom Cookbook; Burlington: Focal Press
- Naomi Rosenblum. (2008), *A World History of Photography*, New York, Abbeville Press.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**P**	**A**	**CT**	**EE**
Weightage (%)	10	5	15	70

CT: Class Test, EE: End Semester Examination; A: Attendance; P: Practicals

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	--	2	--	--	--	--	--	1	2	2	2
CO2	--	2	--	--	--	--	--	1	2	2	2
CO3	--	2	--	--	--	--	--	1	2	2	2
CO4	--	2	--	--	--	--	--	1	--	2	2
CO5	--	--	--	--	--	--	1	1	2	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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JRN4209	MEDIA PLANNING AND BRAND MANAGEMENT	L	T	P	C
Version	2021	2	1	0	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course comes under a management domain which describes various concepts of media planning and brand management. It includes marketing and negotiation skills and concepts of selection of media mix and substantial marketing and branding research etc. The aim of the course is to explore various creative fields involved in the placement of advertisements and branding strategies and brand positioning decisions involved in managing a brand in the market.

Course Objectives

The objective of this course is to

- Equip the students with concepts of creative fields involved in media planning and buying for advertisements.
- Provide an overview of the process of selecting and buying of media mix for the placement of advertisements.
- Equip the students with the creative branding strategies involved in launching, building and sustaining brands.
- Provide an overview of brand positioning and marketing of brands.

Course Outcomes (COs):

On completion of this course, the students will be able to

CO1: Describe media planning and select the media mix.
CO2: Describe and distinguish various media forms.
CO3: Select and apply research data to develop media strategy process.
CO4: Identify and explain media buying and complexities in media buying.
CO5: Define and describe various basic concepts related to brands.
CO6: Describe and classify various branding strategies.

Course Contents:

Modules	Blooms level*	Number of hours
PART-I **MODULE 1: Media Planning** Planning is the strategic formulation of activities design to carry out the goals or objectives of the advertising program. The Planner decisions are directed by a series of questions: Whom is the campaign directed to Where will the campaign directed to When will the campaign run	L1, L2	10

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What degree of target coverage and repetition of exposure are necessary Integrating science with creatively in advertising Role of media in the Marketing Framework Media Planning Framework Developing Media Strategy- the media mix, Factors influencing media strategy decision Media availability & economics		
MODULE 2: Overview Media types characteristic of major media forms Electronic Media- The global goose Outdoor Advertising- They do not circulate market circulate around them Transit Advertising Internet- new born medium for the millennium	L1, L2	3
MODULE 3: Matching Media & Market Geographical Selectivity, Reach & Frequency Maximizing Advertising Exposure Media Briefing Media Scheduling What patterns of exposure works best Timing the effective exposure and finding time opportunities to communicate and Media Budget	L1, L3	4
MODULE 4: Selecting and Buying Acceptable Media Media Buying Functions New Media Increasing Complexity in Media Buying	L1, L2	3
PART-II **MODULE 5: Brand Management** Evolution of Brands Brand & Products Brand Perspectives Brand Differentiation Brand Positioning Brand Image Brand Equity Brand Extension	L1, L2	12
MODULE 6: Branding Strategies Closing Branding Strategies Product Branding, Line Branding, Range Branding, Umbrella Branding, Source/Double Branding Endorsement Branding	L1, L2	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Croteam, David; Hoynes, William D (2005). The Business of Media. Corporate Media and the Public Interest. SAGE Publications, Inc.
- Albarran, Alan B (2002). Media Economic (Understanding markets, Industries and Concepts). Wiley-Blackwell.

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- Kelley Larry D, Jugenheimer Donald W, (2009).Advertising Media Planning: A Brand Management Approach. Phi Learning.
- Jack Z. Sissors, Roger B. Baron, (2010). Advertising Media Planning, Tata Mcgraw Hill Education Private Limited.
- Harsh V Verma (2008). *Brand Management: Text and Cases*, Excel Books.
- Keller, Kevin Lane, Parameswaran and Jacob (1998). *Strategic Brand Management*, Pearson Education.
- S. A. Chunawalla (2004). *Compendium of Brand Management*, Mumbai: Himalaya Publishing House.

Reference Books

- Menon, Arpita; (2010).Media Planning and Buying. Tata Mcgraw- Hill Education Private Limited.
- Katz, Helen; (Jun 2010. The Media Handbook: A Complete Guide to Advertising Media Selection, Planning, Research, and Buying. Routledge.
- Sissors, Jack Z., Goodrich, William B. (1996). Media Planning Workbook, McGraw-Hill Humanities/Social Sciences/Langua.
- Philip Kotler. *Marketing Management*, Pearson Education.
- Magazines- Business World, Time & Brand Reporter.
- Brand Equity- a Wednesday Supplement with Economic Times.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**P**	**A**	**CT**	**EE**
Weightage (%)	10	5	15	70

CT: Class Test, EE: End Semester Examination; A: Attendance; P: Project

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	--	--	--	--	--	2	2	1	--
CO2	1	3	--	--	--	--	--	--	2	1	--
CO3	2	1	--	--	--	--	--	--	2	1	--
CO4	2	1	--	--	--	--	--	--	2	1	--
CO5	1	3	--	--	--	--	--	2	3	1	--
CO6	1	1	2	--	--	--	--	2	3	1	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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JRN4301	MEDIA ARTS- III: FILM	L	T	P	C
Version	2021	2	0	2	3
Pre-requisites/Exposure	Media Arts 2: Radio and TV				
Co-requisites					

Catalogue Description: The finer nuances of cinema will be the core of this subject. Praxis is the method of all various production processes taught. Students will learn how to analyze and critiques various classics so as to understand human communication.

Course Objectives

The objective of this course is to

- Give students the opportunity to be able to interpret the language of filmmaking and its techniques.
- Train students in analyzing documentary films against mainstream commercial film genres.

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Course Outcomes:

On completion of this course, the students will be able to

CO1: Analyze cinema as an art form and human communication.
CO2: Interpret Classics and use it as reference to make films in the digital age.
CO3: Identify and critique factors that influence making successful cinema.
CO4: Examine different genres, apply the production methods in making a short film.

Course Contents:

Module	Blooms Level	Number of Hours
Module I: Introduction **Language of cinema** Shots, camera angles, movements Mise-en-scène Dimensions of Sound: sync and non-sync, sound effets, and silence, dialogues, ambiant sound. Narrative Composition: 3 plot structure, Characterization & Dramatic Structure Ideation and Visualization, Screen Play, Storyboarding	L1, L2	10
Module II: **Production Overview** Three stages of Film Production: Pre-production, Production, Post Production Lighting Art Direction Departments and their role Role and importance of the director Division of roles between creative and technical personnel	L2,L3	10

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Module III: **Aesthetics of film** Sound as a metaphor Importance of silence Misc en scene and interpretations Continuity vs discontinuity Film space and screen space Changing dimensions of pace and rhythm	L2,L4	8
Module IV: **Learning Outcome/s :** **Film Genres** Narrative and non narrative Fiction: romance, comedy, family drama, suspense thriller Documentary Film and its sub-genres The bollywood masala	L2,L4	8

***Bloom's Level:**

L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Resources:

a) Main text:

- Monaco, J. (1977). *How to read a film,* (New York) Oxford University Press

Nicholas, B. (1976).*Movies and Methods Volume 1,* (Berkeley) University of California Press

Nicholas, B. (1985).*Movies and Methods Volume 2,* (Berkeley) University of California Press

b) Additional Texts:

- Rabiger, M., (1987). *Directing the Documentary,* (Burlington) Focal Press
- Bordwell, D.; Thomson, K.,(1990). *Film Art: An Introduction* (New York) McGraw Hill
- Denzin, K. N. (1995).*The Cinematic Society*, SAGE Publication.
- Kabir, N.M., (2006). *Guru Dutt: A Life in Cinema,* (New Delhi) OUP

c) Other readings:

- Handout: Sound: Its Nature in Cinema, Arun Khopkar, (FTII)
- Handout: "Genre Cinema", Rick Altman
- Handout: Film History: An outline, Suresh Chabaria (FTII)

Assessment Scheme (more columns may be added for assessment):

Components	**Presentation/Short film**	**Attendance**	**Quiz/CT**	**External Evaluation**
Weightage (%)	**10**	**5**	**15**	**70**

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	-	1	-	-	-	-	-	2	1	-	-
CO2	1	-	-	-	-	-	-	-	1	-	-
CO3	1	-	-	-	-	-	-	2	1	-	-
CO4	-	2	-	-	-	-	1	-	1	-	-

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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JRN4304	MEDIA LAWS & ETHICS	L	T	P	C
Version	2021	2	-	-	2
Pre-requisites/Exposure	Print Journalism – Reporting & Editing Specialized Reporting & Feature Writing				
Co-requisites					

Catalog Description

Today's media is increasingly market driven, and the students in this course will learn about regulations and practices in media houses. The course talks in details about legal implications of news and other issues and laws which rule the everyday lives of newsmen. The course discusses in details various ethical issues.

Course Objectives

The objective of this course is to

- Describe in detail various regulations like Contempt of Court, Right to Information, IPR to the future journalists.
- Explain the importance and relevance of media ethics
- Provide knowledge about the relevant constitutional framework such as freedom of speech and expression

Course Outcomes (COs):

On completion of this course, the students will be able to

CO1: Explain the differences and importance of media laws and ethics.
CO2: Explain in detail relevant laws for reporting.
CO3: Describe codes of conduct for reporting, as given by different regulatory bodies.
CO4: Distinguish between different types of sources.
CO5: Recognize if the news report is legally safe.

Course Contents:

Modules	Blooms level*	Number of hours
MODULE 1: Reporting Defining ethics, truth, fairness & objectivity, sources of information, Case Studies: Aarushi and the Indian Media	L1, L2	5
MODULE II: Constitutional Framework Constitutional Provisions on Freedom of Speech and Expression, Constitutional Restrictions on Freedom of Speech and Expression, Law on Morality, Obscenity and Censorship	L1, L2	6
MODULE III: Media Laws Contempt of Court, Defamation, Right to Privacy, Intellectual Property Rights, Right to Information (Official Secrets Act, 1923, Evidence Act, 1872), Cinematograph Act	L2, L3	11
MODULE IV: Media Ethics Editorial Content & Integrity, Editorial & Advertorial, Meeting Advertisers' Needs, Press Council Guidelines, Broadcast Regulation, Sting Journalism, Case Studies: Uma Khurana Sting Operation, Other Relevant Case Studies	L1, L3	14

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis,

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L6-Evaluation

Text Books

- Hakemulder, R. Jan (2010). *Media Ethics & Laws,* Gaziabad: Anmol Publications Pvt Ltd
- Neelamalar, M. (2009). *Media Law and Ethics,* New Delhi: Prentice Hall India Learning Private limited
- Divan, Madhavi G., (2018), *Facets of Media Law,* Delhi: Eastern Book Company
- Thakurta, Paranjoy Guha (2015). *Media Ethics: Truth, Fairness and Objectivity,* Delhi: Generic

Reference Books

- Cristians, Clifford G (2016), *Media Ethics: Cases and Moral,* New York: Taylor and Francis
- Ravindran, R K (1999), *Media & Society,* Delhi: Commonweath Publishers
- Nanda, Vartika (2018), *Media Laws & Ethics: An Introduction to Legal and Ethical Issues in Journalism* , New Delhi: Kanishka Publishers Distributers

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**P**	**A**	**CT**	**EE**
Weightage (%)	10	5	15	70

CT: Class Test, H: Home Assignment, EE: End Semester Examination; A: Attendance; C: Case Presentation

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	--	2	2	1	1	--	3	2	3	1	--
CO2	1	2	--	1	3	--	3	2	2	1	3
CO3	2	2	--	1	1	3	--	3	2	1	--
CO4	3	--	3	--	2	--	--	3	2	1	--
CO5	1	2	--	--	3	--	2	2	2	1	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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JRN4306	DIGITAL MEDIA PRODUCTION	L	T	P	C
Version	2021	1	0	4	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description:
This course introduces the students to the vast field of digital media production. Not only does it provide an overview of all aspects of production, but it also introduces them to the new formats of digital and mobile media, the apps associated with them and how to produce the best possible videos in the shortest possible time.

Course Objectives:
The primary objectives of this course are to:

1. Introduce students to concepts of pre, production and post-production
2. Cover all aspects of scripting as well as hardware and software related to production
3. Synthesize traditional production methods with new digital formats and optimal use of this new format for seamless audio visual production

Course Outcomes:
On completion of this course, the students will able to:
CO1. Describe all aspects of media production
CO2. Explain various format of animation; stop motion, go-motion, 2D, 3D etc.
CO3. Apply macromedia flash 5 for creating animations
CO4. Use sound editing techniques for producing animations

Course Contents:

Modules	Blooms level*	Number of hours
MODULE 1: Module I: Concept of Graphics and Animation Understanding graphics. Types of Graphics. Understanding animation. Difference between graphics and animation. Conventional aspects of graphics and animation, new forms of animation/recent trends.	L1, L2	8
MODULE 2: Formats Stop Motion and Go animation, different forms of animation, 2D, 3D, Cell, Clay (Making sets), etc. Concept definition and Uses.	L1, L2	6
MODULE 3: Applications of Macromedia Flash Keyframe Onion Skinning Importing BMP and JPG images Multi-layering Importing sound	L2, L3	4
MODULE 4: Fundamentals of Sound editing Types of Sound formats- WAVE, MP3 Mixing of Stereo, Mono and Multi-track sound Mixing the composed sound with the animation	L2, L3	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

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Text Books

- Simmons, Ian. Computer dictionary
- Kindem, Gorham. Musburger, Robert B. *Introduction to Media Production: The Path to Digital Media Production*. 4th Edition
- Rich, Jason R. Ultimate Guide to YouTube for Business, Kindle Edition.

Reference Books:

- *Making Media: Production, Practices, and Professions.* Amsterdam University Press
- Kindem, Gorham Anders. Musburger, Robert B. *Introduction to Media Production: From Analog to Digital.* Focal Press, 2001

Modes of Evaluation: Practical/Home Assignment/Class Test/Written Examination
Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

P: Project, CT: Class Test, EE: End Semester Examination; A: Attendance

CO, PO and PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1	1	1	3	-	-	-	2	1	2	2
CO2	2	1	1	3	-	-	-	2	1	2	2
CO3	1	1	2	3	-	-	-	3	1	2	2
CO4	3	2	1	1	-	-	-	3	1	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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JRN4307	MASS MEDIA & INDUSTRY	L	T	P	C
Version	2021	2	0	0	2
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

A knowledge of mass media as a corporate enterprise is essential for a complete understanding of mass communication. Today's media is increasingly market driven, and the students will learn about the various branches in the mass media industry and various aspects of the industry such as ownership patterns, legal issues and laws, and organizational structure.

Course Objectives

- To impart knowledge and understanding of the mass media industries.
- To build an awareness of mass media industries and their functioning, so that meaningful media content can be made.

Course Outcomes

On completion of this of this course students will be able to :

CO1: Analyze the complex relationship between mass media organisations the diverse set of individual, social, and professional practices.

CO2: Describe mass media as a system of interrelated forces, including historical foundations, technological advances, economic dynamics, and regulatory constraints.

CO3: Examine concerns related with media & globalization.

Course Contents:

Modules	Blooms Level*	Number of hours
Module I: Media as an industry Journalists becoming managers Ownership patterns in Print Media Ownership patterns in Broadcast Media Organizational structure Fieldtrip to media industries	**L1,L2**	**10**
Module II: Contemporary Practices Overview of Indian Media Market Growth of the Indian Print Business: Problems and Prospects Growth of the Television Industry: Problems and Prospects Radio Industry: Growth, Problems and Opportunities Indian Film Industry: Growth and success story, problems and prospects Overview of the Indian Music Industry	**L2,L1**	**12**
Module III: Media and Globalization Foreign equity in Indian media The concept of global media Global Media Giants Critical analysis of media globalization	**L1,L2**	**12**

***Bloom's Level:**

L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

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Resources:

- Herrick, D.H.,(2012). *Media management in the age of Giants*, University of New Mexico Press
- Khandekar, V.K., (2003). *The Indian Media Business*,(New Delhi), SAGE Publication
- Aggarwal, V.(2001). *Handbook of Journalism and Mass Communication*,(New Delhi)Concept Publishing

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**P**	**A**	**CT**	**EE**
Weightage (%)	10	5	15	70

P- Project, C- Case Discussion/Presentation/Analysis, CT- Class Test, A- Attendance, EE- End Semester Exam

CO, PO and PSO Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**	-	-	-	-	-	-	**2**	-	**1**	-
CO2	-	-	-	-	**1**	-	-	-	**2**	**1**	-
CO3	-	-	-	-	**1**	-	-	-	-	**1**	-
CO4	-	-	-	-	-	-	**1**	-	-	**1**	-

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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JRN4308	COMMUNICATION RESEARCH	L	T	P	C
Version	2021	2	0	2	3
Pre-Requisites/ Exposure					
Co-Requisites					

Catalog Description

This course is designed to introduce students to social research methods in the Communication discipline so that they can read, conduct and analyze empirical research. They will be able to understand and apply different principles and techniques of research methods. They will have a better understanding of research process and its importance in various fields. Students will be able to develop hypothesis related to communication studies and statistically analyze data. The course emphasizes on both quantitative and qualitative research methods.

Course Objectives

The objective of this course is to

- Understand the importance and research and application of different types of research methods.
- Describe various techniques of data collection and data analysis.
- Understand and apply the research report writing methods.
- Describe Media Research Ethics.

Course Outcomes

On completion of this course students will be able to

CO1: Understand and critically analyze research studies.
CO2: Understand and create research design and apply different research methods.
CO3: Explain different methods of data collection and analyze dataset.
CO4: Develop research problem and Hypothesis and apply statistical operations to analyze.
CO5: Write a research report in a systematic format and understand research ethics.

Course Contents:

Modules	Bloom's Level*	Number of hours
Module 1: Introduction to Communication Research Concept and definition of Research; Process of Research; Approaches to research Problem, qualitative and quantitative approach to research, quantitative approach-scientific/ hypothetic-Deductive methods, Experimental Design, Exploring a population; qualitative approach, Ethnography, Phenomenology; Mixed Methodology; Areas of Communication Research; Research Design and its types; Formulation of Research problem; Scope of Communication Research	L1,L2	12
Module 2: Research Methods Types of Research Methods: Census, Case study, Content analysis, Focused Group studies, Survey, Observation, interviews, research tools, schedule, questionnaire; field work; Sampling- Probabilistic sampling and non-probabilistic sampling; Sources and methods of data collection: coding, classification, tabulation, Minimizing errors in recording source data	L1, L2	12

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Module 3: Data Analysis Statistical Terms used in Communication Research; Measures of Central Tendency; Importance of averages of statistical analysis; Levels of significance, Content Analysis; Different types of scales used in communication research; Problems in scaling; Readership survey, Television audience measurement and television rating, public opinion poll, pre-election and exit poll	L1,L3	12
Module 4: Research Ethics and Report Writing Code of Ethics; Ethical Principles to be followed by researchers; plagiarism, self-plagiarism, tools to avoid plagiarism and references management; Sequence in report writing; formats of research reports; format of dissertation; Important Media and Communication Research journals	L1,L2	12

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme

Components	**H**	**C**	**CT**	**A**	**EE**
Weightage (%)	5	10	10	5	70

CT: Class Test, H: Home Assignment, EE: End Semester Examination; A: Attendance; C: Case Presentation

Text Book

- C R Kothari : Research Methodolgy: Methods & Techniques Wishwa Prakashan, New Delhi, 1996 2. Judith Bell : Doing Your Research Project, Viva Books Private Limited, 1999
- Wimmer Roger D, Dominick Joseph R : Mass Media Research, Thompson, New York, 2004
- Philip Mayer : Precision Journalism : A reporters' introduction to social science methods, Rowman and Littlefield, Lanham, MD, 2005

Reference Books

- Sharon Lorio : Qualitative Research in Journalism : Taking it to the streets, Lawrence Erlbaum, Mahwah: NJ, 2004
- Uma Joshi : Media Research- Cross Sectional Analysis, Authors Press, 2002
- G K Parthasarthy : Electronic Media and Communication Research Methods, Authors Press, New Delhi, 2006

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	2					3	2			3
CO2	1	2			3		2	2		3	3
CO3	1	1						3	1		
CO4	2	3						3	2	3	
CO5	3	2			1			2	2	3	

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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JRN4335	SUMMER INTERNSHIP EVALUATION	L	T	P	C
Version	2021	-	-	-	6
Pre-requisites/Exposure	All courses studied in the previous semesters				
Co-requisites					

Catalog Description

After the second semester, all students of MAJMC are required to undertake an internship which is evaluated in the third semester. While internship introduces the students to the professional world of media, this course aims at providing an opportunity the students to showcase their learnings during internship in a professional manner.

Course Objectives

The objective of this course is to

- Provide an opportunity to the students to discuss their learnings.
- Evaluate the learning experience of the students during internship.
- Enable the students to share the skills acquired during the course of internship.
- Enable the students to understand nuances of formal report writing.

Provide hands on learning experience to the students.

Course Outcomes (COs):

On completion of this course, the students will be able to
CO1: Recognize the expectations of the media industry.
CO2: Assess his/her suitability in his/her desired areas of specialization.
CO3: Have firsthand experience regarding how the media industry functions.
CO4: Explain and understand the latest technology being used in the media industry.

Course Contents:

Modules	Blooms level*	Number of hours
All students of MA J&MC shall be required to undergo a practical training in a media organization for 4-6 weeks after the second semester. The students are required to undergo training in the various areas of the media organization concerned. The work done by the student during the training period shall be submitted in the form of a report in the third semester. The last date of the receipt of the internship report in the department shall be at least 15 working days before the commencement of the end term exams. **Guidelines for Internship** Duration of Internship: 4-6 Weeks There are certain phases of every intern's professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience	L3, L4, L5, L6	No Contact hours

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working with successful professionals and experts in the field. The internship program can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or an institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal classroom situations. These attributes are intellectual ability, professional judgment and decision making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc. The primary objectives of internship are: • To provide an out-of-the classroom training environment for the students and provide opportunities for them to apply the knowledge and skills that they have learnt in real life working environment. • To enable the students to be exposed to more real life work situations and prepare them for their career. The students will submit their **Internship Reports** at least 15 working days before the commencement of the end term exams (as per the date decided upon by the HoI in consultation with the Programme Co ordinator). The Internship Report aims to encourage students to keep a personal record of their learning and achievement throughout the training. It can be used as the basis for lifelong learning and for job applications. Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development. The Internship report will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and their own personal contribution to the organization. The Internship report submission will be followed by a PowerPoint Presentation on their internship experience as per the date decided by the HoI in consultation with the Porgramme Co ordinator. The **layout guidelines** for the Internship File: • A4 size Paper • Font: Arial (10 points) or Times New Roman (11 points) • Line spacing: 1.5 • Top and Bottom margins: 1 inch/2.5 cm; left and right margins: 1.25 inches/ 3 cm The Internship report should include 1. Title Page 2. Table of Contents 3. Internship Experience Certificate 4. Acknowledgements		

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5. Main Body 6. Appendices The **Main Body** will have **different sections/chapters** and will include the following items which will be evaluated for the final assessment:- An analysis of the company/stream in which the student has interned Student's expectations from internship Student's work profile/assignments handled during the course of internship A research report that the student has prepared on a project assigned to him/her by the organization (if applicable) Skill set (technical skills & soft skills) learnt during the internship Overall internship experience **Guidelines for Evaluation** • All students are required to undertake internship report writing under the supervision of a teacher and to submit the same following the guidelines stated below. • Language of the report and presentation & viva-voce examination should be English. The internship report must be typed and hard bound. • Failure to submit the report or failure to make the presentation followed by viva-voce examination will be treated as absence in the examination. The student shall submit the report and make a PowerPoint Presentation followed by appear viva voce examination in the subsequent years (within the time period as per University Rules). • No marks will be allotted for the report unless the student appears for the presentation and the viva-voce examination. Similarly, no marks will be allotted for presentation & viva voce examination unless the student submits his/her report. • Evaluation will be done jointly by one internal expert and one external expert with equal weightage, i.e. average marks of the internal and external experts will be allotted to the student.		

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

NA

Reference Books

NA

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme (For Dissertation):

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Examination Scheme:

Components	Report	Presentation	Viva Voce	Industry Feedback
Weightage (%)	50	25	20	5

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	--	3	1	2	2	3	1	2	2	1	2
CO2	--	--	2	2	1	2	1	2	2	1	2
CO3	2	3	2	2	1	2	1	2	2	1	2
CO4	--	1	1	2	--	--	2	--	2	1	3
CO5	2	1	--	--	1	--	1	--	3	1	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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JRN4402	MEDIA ARTS – IV: CYBER MEDIA	L	T	P	C
Version	2021	2	0	2	3
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

No aspect of today's world has been able to escape the influence of the World Wide Web. Journalism has also been revolutionized with the inclusion of the Internet for newsgathering and news dissemination. The students are made familiar with online organization, process and strategies as well as Internet tool kits, servers and other aspects of the virtual world. The scope of this subject is too vast to merit a detailed or in depth analysis, so a broad overview of the various issues and aspects related to the subject are discussed. Furthermore, since it is a core subject, we go deep into the subject and provide an empirical knowledge to students about the increasing use of digital and online media in all kinds of media industries today.

Course Objectives

The objective of this course is to

- Impart knowledge of basic concepts of Cyber Media. Difference between media as traditionally understood and the Digital platform.
- Apply knowledge of basic principles related to online media. Some myths that exist about Blogging and Online Reading Platforms to be demystified as well as the difference highlighted.
- Impart knowledge and details about how online media Industry functions and to understand various ways of generating revenue via use of cyber media.

Course Outcomes

On completion of this course, the students will be able to

CO1. Identify and describe various online organization, process and strategies as well as various components of Internet as revenue generation tool kits, servers and other aspects of the virtual world and analyze the difference between traditional and New Media platforms.

CO2. Develop the various formats of writing for cyber media e.g. writing online, blog writing, writing for advertisements and online publishing mediums vis a vis traditional styles of writing also equipping the student with the knowledge of media laws in principles and applications as well.

CO3. Demonstrate hands-on experience as content marketers using journalistic and digital techniques for designing a website with the help of various design patterns, HTML and Dreamweaver.

Course Contents:

Modules	Blooms level*	Number of hours
Module I: (Introduction to Internet) Internet-history and development, WWW, W3C, revenue generation Internet tool kits - server, IP address, URL, ISP, networking, browsers, Search Engine, Domain, Domain name, home page, hyperlinks, etc	L1, L2, L3	10
Module II: (Cyber Journalism)	L1, L2, L4, L5	13

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Comparison of Cyber Media with Print, TV, Radio mediums, Online as a publishing medium (main features), Basic rules of online writing, content writing, blog writing, advertising on net, Print & Electronic Media networks are going on the Net, Impact of Web Journalism and reading habits, Web Journalism as a career, Cyber Laws.		
Module III: (Web Designing) Web Design Guidelines, Planning your Website, Design Patterns, Basic HTML, Dream weaver	L1, L3,L5, L6	13

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books:

- Briggs Mark (2002). *Journalism 2.0: How to Survive and Thrive*.
- Wardrip Noah Fruin & Montfort Nick (2003). *The New Media Reader*.
- Kumar. Suresh (2005). *Internet Patrakarita*, Delhi, Takshila Publication.
- Ward. Mike (2008). *Journalism Online*.

Reference Books:

- Hahn, Harley (2008). *The Internet Complete Reference*.
- Jaiswal A. & Wiley Dreamtech (2002). *Fundamentals of computer Information technology today*.
- Ronal Dewolk (2000). *Introduction to Online Journalism*, Allyn & Bacon.
- Towers, J. Tarin (2001). *Macromedia Dreamweaver Max advanced*.
- Michael M. Mirabito (2015), *New Communication Technologies: Application*, Barbara.

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

P- Project, C- Case Discussion/Presentation/Analysis, CT- Class Test, A- Attendance, EE- End Semester Examination

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1	2	2	1	2	-	-	2	1	2	2
CO2	1	2	1	2	2	-	-	2	1	2	2
CO3	1	2	2	2	1	-	-	2	1	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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JRN4435	INTERNSHIP	L	T	P	C
Version	2021	-	-	-	6
Pre-requisites/Exposure	All courses studied in the previous semesters				
Co-requisites					

Catalog Description

By the final semester, students have learnt about all the aspects of mass communication. This course aims at providing an opportunity to put this knowledge to use in a professional manner. The course introduces the students to the professional world of media.

Course Objectives

The objective of this course is to

- Provide hands on learning experience to the students.
- Provide a platform to the students to hone their skill sets.
- Provide students a learning experience where they get to work in the media industry and learn the 'tricks of the trade.'
- Provide an out-of-classroom training environment to the students.

Course Outcomes (COs):

On completion of this course, the students will be able to

CO1: Recognize the expectations of the media industry.

CO2: Assess his/her suitability in his/her desired areas of specialization.

CO3: Have firsthand experience regarding how the media industry functions.

CO4: Explain and understand the latest technology being used in the media industry.

Course Contents:

Modules	Blooms level*	Number of hours
All students of MA J&MC shall be required to undergo a practical training in a media organization for 4-6 weeks. The candidate shall be required to undergo training in the various areas of the media organization concerned. The work done by the student during the training period shall be submitted in the form of a report. The last date of the receipt of the internship report in the department shall be at least 15 working days before the commencement of the end term exams. **Guidelines for Internship** Duration of Internship: 4-6 Weeks There are certain phases of every intern's professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship program can best be described as an attempt to institutionalize efforts to bridge the gap between the professional	L3, L4, L5, L6	No Contact hours

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world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or an institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal classroom situations. These attributes are intellectual ability, professional judgment and decision making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc. The primary objectives of internship are: To provide an out-of-the classroom training environment for the students and provide opportunities for them to apply the knowledge and skills that they have learnt in real life working environment. To enable the students to be exposed to more real life work situations and prepare them for their career. The students will be at least 15 working days before the commencement of the end term exams (as per the date decided upon by the HoI in consultation with the Programme Co ordinator), the students will submit their **Internship Reports**. The Internship File aims to encourage students to keep a personal record of their learning and achievement throughout the training. It can be used as the basis for lifelong learning and for job applications. Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development. The Internship report will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and their own personal contribution to the organization. The Internship report submission will be followed by a PowerPoint Presentation on their internship experience as per the date decided by the HoI in consultation with the Porgramme Co ordinator. The **layout guidelines** for the Internship File: A4 size Paper Font: Arial (10 points) or Times New Roman (11 points) Line spacing: 1.5 Top and Bottom margins: 1 inch/2.5 cm; left and right margins: 1.25 inches/ 3 cm The Internship report should include Title Page Table of Contents Internship Experience Certificate Acknowledgements Main Body Appendices		

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The **Main Body** will have **different sections/chapters** and will include the following items which will be evaluated for the final assessment:- An analysis of the company/stream in which the student has interned Student's expectations from internship Student's work profile/assignments handled during the course of internship A research report that the student has prepared on a project assigned to him/her by the organization (if applicable) Skill set (technical skills & soft skills) learnt during the internship Overall internship experience **Guidelines for Evaluation** • All students are required to undertake internship report writing under the supervision of a teacher and to submit the same following the guidelines stated below. • Language of the report and presentation & viva-voce examination should be English. The internship report must be typed and hard bound. • Failure to submit the report or failure to make the presentation followed by viva-voce examination will be treated as absence in the examination. The student shall submit the report and make a PowerPoint Presentation followed by appear viva voce examination in the subsequent years (within the time period as per University Rules). • No marks will be allotted for the report unless the student appears for the presentation and the viva-voce examination. Similarly, no marks will be allotted for presentation & viva voce examination unless the student submits his/her report. • Evaluation will be done jointly by one internal expert and one external expert with equal weightage, i.e. average marks of the internal and external experts will be allotted to the student.		

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

NA

Reference Books

NA

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme (For Dissertation):

Examination Scheme:

Components	Report	Presentation	Viva Voce	Industry Feedback
Weightage (%)	50	25	20	5

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CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	--	3	1	2	2	3	1	2	2	1	2
CO2	--	--	2	2	1	2	1	2	2	1	2
CO3	2	3	2	2	1	2	1	2	2	1	2
CO4	--	1	1	2	--	--	2	--	2	1	3
CO5	2	1	--	--	1	--	1	--	3	1	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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JRN4437	DISSERTATION/ PROFESSIONAL PROJECT	L	T	P	C
Version	2021	-	-	-	7
Pre-requisites/Exposure	All courses studied in the previous semesters				
Co-requisites					

Catalog Description

By the final semester, students have learnt about all the aspects of mass communication. This course aims at providing an opportunity to put this knowledge to use in a professional manner. The course introduces the students to the professional world of media and research. The course provides an option to the students to either work on a dissertation or undertake a professional project under the supervision of a senior faculty member.

Course Objectives

The objective of this course is to

- Provide hands on learning experience to the students.
- Provide a platform to the students to hone their skill sets.
- Provide students a learning experience where they get to work on either an industry-oriented professional project or a research project and learn the 'tricks of the trade.'
- Provide an out-of-classroom training environment to the students.

Course Outcomes (COs):

On completion of this course, the students will be able to

CO1: Recognize the expectations of the media industry.
CO2: Assess his/her suitability in his/her desired areas of specialization.
CO3: Have firsthand experience regarding how the media industry functions.
CO4: Explain and understand the latest technology being used in the media industry.
CO5: Describe and apply various steps to be followed for undertaking a professional project.

Course Contents:

Modules	Blooms level*	Number of hours
Every student of MA J&MC shall be required to undertake either a hands on project or a scholarly research under the guidance of an assigned supervisor. **Dissertation:** The student shall be required to undertake a research based scholarly project under the guidance of a supervisor, who shall be assigned by the institution. The last date of the receipt of the report in the department shall be at least ten working days before the commencement of the end term exams. **Guidelines for Dissertation** The primary purpose of dissertation is to introduce the final semester students to the processes of scholarly research and writing under the guidance of an assigned supervisor. Through this research experience involved in the process of dissertation, students gain exposure to research methodology and its various tools & techniques. It usually requires the use of advanced concepts with a sound understanding of theoretical underpinnings.	L3, L4, L5, L6	No Contact hours

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The primary objectives of dissertation are: • To enable the students to apply their theoretical and methodological understanding and skills into devising researchable ideas • To design and execute a meaningful research report (dissertation) that demonstrates spatial thinking and uses the knowledge and skills learned during the programme • To enable the students to understand the research process and be aware of research obligations and pitfalls. The **layout guidelines** for the dissertation are: • A4 size Paper • Font: Arial (10 points) or Times New Roman (11 points) • Line spacing: Preferably 1.5 • Top and Bottom margins: 1 inch/2.5 cm; left and right margins: 1.25 inches/ 3 cm The dissertation should include Cover Page Table of Contents Certificate of originality by the Supervisor Acknowledgements Main Body References Appendices The **Main Body** will have **different sections/chapters** and will include the following items which will be evaluated for the final assessment:- Introduction Scope of the study Conceptual Background Research Objectives & Questions Hypothesis (wherever applicable) Limitations of the study Review of Literature Research Design & Methods Results & Discussion Conclusion References The dissertation should be submitted to the supervisor at least ten working days before the commencement of the end-term exams (as per the date decided upon by the supervisor). The dissertation submission will be followed by a PowerPoint Presentation on their research as per the date decided by the HoI in consultation with the research supervisor. **Examination Scheme:** **Dissertation Submission by Student 50** **Presentation & Viva 45** **Research Paper Publication 05**		

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Total **100** **Professional Project:** The students opting for professional project can choose amongst the broad categories of television, radio, print, advertising, public relation, development communication, digital media and photography. They will devote time and attention to the chosen specific area and attempt to comprehensively understand it through making projects, presentations, reports, and assignments on the topic. The duration of the project will be 8 weeks and the students will be expected to submit their project to the school through the assigned faculty guide. **SPECIALIZATION (ANY ONE)** *RADIO* **Course Objective:** Students can do specialization in the different areas of Radio production Viz. Various Formats, News, Talk shows, Spots and commentaries, Radio documentary, Radio features, various music formats- classical, countdown shows, contemporary hit radio, music on demand, oldies, artist spotlights, request and dedication shows etc. Commercials/Jingles/ PSAs *TELEVISION* **Course Objective:** The students can choose a specific area of TV production in which they want to specialize, viz. TV Journalism, Reporting, Anchoring, Editing, Camera, Documentary Film making, Feature Films, Short Film, Ad Film making, Entertainment Based programming etc. *PRINT* **Course Objective:** Students can jointly bring out a journal with each one attending to a specific function of its production like reporting, editing, sub-editing, design and layout, photography and graphics. *ADVERTISING* **Course Objective:** The students will use their understanding of all advertising concepts learnt in the previous semesters to do a practical exercise. Students will act as brand managers of a new brand being launched. They will be required to study the following elements for the product category assigned to them: Market Research to determine the situation analysis Segmenting the market and selecting a segment for their new brand Identifying target audience Positioning their brand. This will involve a detailed study of the positioning of the competitive brands		

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Developing the media strategy, including the communication mix Developing the creative strategy Creative strategy to follow a complete campaign creative presentation. This will include development of TV Commercials, print ads, radio ads and POP material. *PUBLIC RELATIONS* **Course Objective:** PR specialization can be undertaken in these different areas Crisis case studies PR in Non- Governmental organizations Cross- cultural PR Internal PR department in corporate situation *PHOTOGRAPHY* **Course Objective:** Student can choose any two subjects for Specialization: Photojournalism Travel Photography Portrait Photography Product & Table-top Photography Glamour Photography Wildlife Photography DEVELOPMENT COMMUNICATION The focus of the professional project will be an approach to communication for social change that has people controlling the means and content of the communication process. Any topic that is chosen will be to highlight the utilization of power of communication as a catalyst for social development. 1) Students to plan a Communication Design and Implementation strategy for projects that bring about change in society. You could work on any one of the UN sustainable Development Goals towards 2030. **Or** 2) Volunteering your time with a NGO (governmental or private); Intern with CSR department and prepare a report based on a theoretical perspective studied in class or look at the participatory approach that has been adopted for the programmes being implemented. **Or** 3) Make a documentary on an NGO, Community Radio Station, Skill Development center, ASHA workers. DIGITAL MEDIA Students can work on different aspects of digital media such as Cyber Security & E-governance Fake News Creating blogs & vlogs on different online platforms		

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Multimedia Convergence Journalism Analysis of news aggregators Mobile Journalism **Examination Scheme:** a) Duration of summer Project 8 weeks b) Total marks for summer project 100 marks Break-up of marks I) Timely Submission 5 marks II) Content i) Clarity 25 Marks ii) Comprehensiveness 20 marks iii) Originality 5 marks c) Project Presentation & Viva 45 marks		

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

NA

Reference Books

NA

Examination Scheme (For Dissertation):

Components	Report	Presentation & Viva	Research Paper Publication
Weightage (%)	50	45	05

Examination Scheme (For Professional Project):

Components	**Timely Submission of Report**	**Content Comprehensiveness**	**Content Clarity**	**Content Originality**	**Presentation & Viva**
Weightage (%)	5	20	25	5	45

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	--	3	1	2	2	3	1	2	2	1	2
CO2	--	--	2	2	1	2	1	2	2	1	2
CO3	2	3	2	2	1	2	1	2	2	1	2
CO4	--	1	1	2	--	--	2	--	2	1	3
CO5	2	1	--	--	1	--	1	--	3	1	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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ANIMATION

Programme Structure-2021

Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
ANI2152	Introduction to Multimedia and its Application	2	-	2	3
ANI2252	Creating 2D Animation	2	-	2	3
ANI2352	3D Modeling & Texturing	1	-	4	3
ANI2452	Maya Modeling & Texturing	1	-	4	3
ANI2552	Scripting & Storyboarding	1	1	2	3
ANI2652	VFX	2	-	2	3
	TOTAL				**18**

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ANIMATION

Syllabus - Semester First

ANI2152	INTRODUCTION TO MULTIMEDIA & ITS APPLICATION	L	T	P	C
Version	2021	2	-	2	3
Pre-requisites/ Exposure	Basic computer skills				
Co-requisites	None				

Catalog Description

Students will learn the basic concepts and skills required to develop effective graphics for the Web and various business publications. Students will learn the basic tools used in Adobe Photoshop/Illus-trator to create and edit images. Students will learn how to optimize images and save images in properfile formats. Students will learn color selection and conversion as it relates to both Web and business publications. Techniques of digital image capture and photo retouching will also be explored.

Course Objectives

The objective of this course is-

- To teach the idea about screen resolution, picture assembling and color combination.
- To train the basic element which are used in creating a design/logo/creative work
- To teach the tools of image editing, drawing and special effects.
- To guide the logic behind imagination or visualization of creative ideas and graphics usingAdobe Photoshop & Illustrator.

Course Outcomes

On completion of this course, the students will be able to

CO1. Create poster, leaflets, logo or design the given reference object or self-visualize poster for Visual Communication.

CO2. Create advertisement for digital and print media.

CO3. Develop their graphic designs and desk-top publishing.

CO4. Manipulate professional photographs and images.

Course Content

Modules	Blooms level*	Number of hours
MODULE 1: Graphics using line, Graphics by combining basic shapes. Make a perfect crop-ping of some images using Photoshop. Prepare a cut-out of images using Pho- toshop; use back ground for images. Colour adjustment of images. Convert a B & W image into colour.	L1, L2	12

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MODULE 2: Vector Graphics (Designing, Color Theory, Vector Designing & Editing, TextFormatting): Interface**:** working with menus, toolbars, Dockers. Document Setup: Setting Page Size& Orientation, Document Navigation Rulers & Guide- lines: Status Bar. Text: Formatting, Text Layout, Skewing and rotating, Creating drop shadow, Text to Path, Extruding text. Objects: Grouping & locking objects, Combining & breaking apart, Transforming & Shaping, Cutting objects apart, Trim, weld & Intersection of objects. Lines & Curves: Using freehand & Bezier tool, Line properties, Arrowheads Eraser & artist media tools Nodes & Paths. Color& Fills: Solid Color, Color Palettes, Eyedropper & Paint bucket, Foun- tain, Fills, Patterns, Texture Fills, Interactive Mesh Fill. Special effects: Enve- lopes, Blends, Perspective, Shadow Objects, Power clip Command, Transpar- ency, Distortion, Contour, Lens Docker. Complex Shapes: Polygon & Stars Spirals Printing Menu.	L3	18
MODULE 3: Raster Graphics (Designing, Color Theory, Raster Designing & Editing, text Formatting: Adobe Photoshop, Colour modes, Colour, Using the tools, Select-ing and using a tool from the toolbox, Using the tool options bar and other palettes, Customizing the workspace, Using Photoshop Help, Viewing and ed-iting files in Adobe Bridge, Embedding information for easy identification, Au-tomating routine tasks, Resolution and image size, Straightening and cropping an image, Making automatic adjustments, Manually adjusting the tonal range, Replacing colors in an image, etc.	L4, L6	18

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text books:

- Annesa Hartman (2009), *Exploring Adobe Illustrator CS4*, United States, Cengage Learning, Inc Andrew Faulkner and Conrad Chavez (2018), *Adobe Photoshop CC Classroom*, San Francisco:Adobe Press.

References books:

- Jim Krause (2004), *Design basic Index*, United States *:* HOW Books

Modes of Evaluation: Class Test/ Assignment/ End Term Examination/ Case Presentation
Examination Scheme:

					EE	
Components	**P**	**C**	**CT**	**A**	Practical	Theory
Weightage (%)	5	10	10	5	20	50

P- Project, C- Case Discussion/Presentation/Analysis, CT- Class Test, A- Attendance, EE- End Semester Examination

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CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4
CO1	1	--	1	1	1	1	--	--
CO2	--	1	--	1	1	--	--	1
CO3	--	--	1	1	--	1	--	1
CO4	1	1	1	--	--	1	1	1

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Syllabus - Semester Second

ANI2252	CREATING 2D ANIMATION	L	T	P	C
Version 1	2021	2	-	2	3
Pre- requisites/Exposure					
Co-requisites					

Catalog Description

This course introduces students to the art and concept of two dimensional or 2D computer animation. 'D' stands for dimension and refers to animation which is conducted on a two- dimensional plane, unlike the real world where everything is seen and experienced on a three dimensional plane. This course primarily focusses on the theoretical aspects of two dimensional animation and is reinforced though many hours of hands-on lab training designed to right from the start, train the students to be industry ready. The intention of thiscourse is to provide a gradual introduction to animation concepts which are further refined in semester III, when the students will delve into 3D animation

Course Objectives:
The objective of this course is to:

- Enable the students to comprehend principles of animation using a field basedapproach
- To familiarize students with all aspects of software, both at the beginner as well asadvanced level
- To instill in the students such a level of confidence that they can tackle projects at anear professional level by having a holistic knowledge of all software related to 2D animation.

Course Description
This course covers all aspects of two-dimensional animation, normally known as '2D' animation in industry jargon. Beginning from first principles of animation like scaling, exaggeration, squash and stretch etc., they move on to first becoming familiar with different graphical interfaces as well as learning an eclectic mix of software that equip them with tools needed to create the kind of creative content that they wish to create.

The course is graded in terms of intensity as well as complexity and considerable emphasisis placed on design and typographic basics that form building blocks of good animation.

Course Outcomes:
On completion of this course, the students will be
CO1. Completely proficient with all aspects of at least two 2D animation software, notably Adobe Animate CC (now Animate) and Adobe After Effects
CO2. Be able to visualise, script, storyboard and create smart and relevant 2D animations
CO3. Be able to produce quality motion graphics for the Television Industry using a variety of 2D animation tools and third party plug-ins.
CO4. Be able to work in a team delegating different aspects of production to team members and also exchange notes and monitor each others work, so that professional quality work can be outputted and exported.

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Course Content

Modules	Blooms level*	Number of hours
MODULE 1: Fundamentals of Animation What is animation? How is 2D animation different from other forms of animation. How are Animate CC and After Effects different from drawing and 3D packages? The various components that will be covered in Module Iare: • The Animate CC Interface • Animate CC tools and menu commands • Animate CC and Photoshop – an integrated workflow • Frame-by-frame animation in Animate CC • Onion skinning – why it is needed • Exploring the Timeline • Animating through action script • Motion tweening in Animate CC	L1, L2	8
MODULE 2: After Effects: The Industry package This Unit moves out from the Animate CC interface, tools and dialogues intothe domain of After effects. Since this package is used heavily by the Television Industry, many examples from this medium will be used to illustrate hard-to-grasp concepts. Various components of After Effects that will be taught in this module are: • The After Effects interface: Moving about and navigation in AfterEffects • AE tools and panels; how to customise and optimise them • Keyboard shortcuts - how to use and customize • Creating your first composition • The Timeline - navigation, panels and scope of the timeline • Project windows and assets; moving assets from project totimeline • Use of keyframes to create simple animations • Illustration of first principles of animation - ease in, out and easyease • Frame rates, speeding up and slowing down of animation - usingthe Graph editor • Rendering and compression concepts; Different kinds of movieformats • Outputing your first movie; Settings and how they can be tweaked	L2, L3	5

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MODULE 3: After Effects and Animate – Intermediate This unit is a continuation of the earlier unit. Here we go into greater depthof the various tools, filters effects and presets that can be used. Round tripping between After Effects and Animate as well as importing assets fromvarious different format types (Photoshop as well as Illustrator Files) are discussed and explained. Since After Effects is known as a 2.5 type animation, this concept is explained; how After Effects although it is a straight 2D package, can simulate 3D and the illusion of 'fake depth' by usingcameras, lights and third party effects such as Element 3D. Students are expected at the end of this unit to design their own logos and animate themin this software package	L2, L3	8
MODULE 4: Post-Production In this Module, all the salient features of both Animate and After Effects arerecapped and similarities and differences discussed. In this module very little theory is imparted. Students are expected to prepare a comprehensiveAnimateCC and After Effects project each, which is closely monitored and supervised by the faculty in charge. The goal is to get the students as industry ready as possible and to ensure that at least one professional looking project in both software packages is designed and executed.	L3, L4	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis,L6-Evaluation

Text Books

- Williams, Richard. *The Animation Survival Kit*. Expanded Ed. 2009.
- Whitaker, Harold. *Timing for Animation*. Focal Press, 2002

Reference Books

- Schenk, Sonja. Long, Ben. *The Digital Filmmaking Handbook*. Fourth Edition.
- Gyncild, Brie. *Adobe After Effects CC: Classroom in a Book : the Official TrainingWorkbook from Adobe Systems*. 2014 Ed.

Modes of Evaluation: Practical/ Home Assignment/ Class Test/ Written Examination
Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

P: Project, CT: Class Test, EE: End Semester Examination; A: Attendance

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	2	1	3	..	..	..	1	1	1	3
CO2	1	2	3	3	..	..	..	1	1	1	3
CO3	1	2	1	3	..	..	..	1	3	1	3
CO4	1	1	3	1	..	..	..	2	3	1	1
CO5	..	..	..	..	..	..	..	..	..	..	..

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Syllabus - Semester Third

ANI2352	3D MODELING & TEXTURING	L	T	P	C
Version	JULY 2021	1	-	4	3
Pre-requisites/Exposure	Basic understanding of computer and software interface				
Co-requisites					

Catalog Description

This course is the introduction to the 3d computer graphics world. In this course students will get to know about the possibilities of the 3d art and design. Student will start from the very basics of creating sphere, box, circle, line… etc

Course Objectives

The objective of this course is to

- To give a basic understanding of 3D visualization and to understanding how to start with Blender interface.
- To give hands on experience of Blender and create a foundation for the advance 3d visualization.
- To provide a detailed understanding of 3d character modeling.

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand how 3d software interface work.

CO2. Learn various ways of modeling the objects.

CO3. Understand how character mesh flow help while animating and designing a character.

Course Content

Modules	Blooms level*	Number of hours
Module 1 Introduction to Blender 3d, Interface of Blender 3d, Basics of Blender 3dModeling, Exporting, Using the menus. Floating and docking, Using dragand drop feature, Introduction to different workspaces. Geometry, sub objects, Extruding, welding, bridging etc. Recognizing the workspaces.	L1, L3	24
Module 2 Introduction to modifiers and modifier gizmos. Familiarity with commonmodifier like bend, editpoly, Xform wave, lathe symmetry etc.	L1, L3	12
Module 3 This module focuses on the development of 3D interiors and environment. Use of different modelling techniques like sculpting and polygon modellingare explained with many real world references. Also how to use backgroundimages as references objects for creating the 3D model are explained and demonstrated in this module	L1, L3	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis,L6-Evaluation

Text Books

- *John M. Blain (2019). The Complete Guide to Blender Graphics: Computer Modeling & Animation, Fifth Edition, Cloudtail India*

Reference Books

- Kelly L. Murdock (2014). *Autodesk 3ds Max Bible,* India: Wiley
- Dariush Derakhshani (2007). *Introducing 3Ds Max 9: 3D for Beginners,* India: Wiley

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	HA	CT	A	EE
Weightage (%)	10	15	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A:Attendance

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	-	1	3	--	--	--	1	1	--	2
CO2	2	-	1	3	--	--	--	1	1	--	2
CO3	2	-	1	3	--	--	--	1	1	--	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

Syllabus - Semester Fourth

ANI2452	MAYA MODELING & TEXTURING	L	T	P	C
Version	JULY 2021	1	-	4	3
Pre-requisites/ Exposure	Basic skills of computer				
Co-requisites					

Catalog Description

Course introduces students to the foundations of character/object modeling & texturing which is the process of adding mesh and controls to a character that allows a creative model to animate it in a proper manner. The course prepared to candidate for an advanced work in3-D modeling & Texturing. In this section, student will get an introductory look at the processes in Maya. Student will use a Project-based approach as we cover the fundamentalsof Maya looks at commonly used tools, and talk about some time-saving tips and techniquesgleaned from production experience.

Course Objectives

The objective of this course is-

- To train the proper knowledge of surfaces which used for modeling in TV serials, filmsand other commercials.
- To train the basic mesh flow system in modeling.
- To teach the tools of modeling, merit and demerit of modeling and designing.
- To guide the visualize the story and their character, assets and other part of design andthen impart it in modeling through various tools of Maya software.

Course Outcomes

On completion of this course, the students will be able to

CO1. Model or design the given reference object or character for TV episodes and films.

CO2. Create and design the required models and color for advertisement project or any other commercials.

CO3. Develop their own show reel in 3D including modeling, coloring and texturingappropriate shading network.

CO4. Develop and represent the 3D models and environment on their own visualize story.

CO5. Manage and make any big project management in terms of man power requirementalong with budgeting of big animation film project.

Course Content

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to the interface of Maya. Hotkeys. Using the spacebar. Manipulating a view. Creating objects. Simple primitives. Lights, cameras, selecting objects, types of selection, single selection, adding and subtracting selection, edit menu selection options. Marquee selection, Lasso selection, selection mask	L1, L2	24
MODULE 2: Using hyper shade, relationship editor, hyper graph and outliner. The channel box. Duplicating objects, pivot points, introduction to snapping-2D snapping and 3D snapping. Using	L3, L6	15

layers. Introduction to textures and materials.		
MODULE 3: Modeling a 3D character, understanding edge flow of face and body in order to achieve a smoother bends while animating, unwrapping and texturing the characterand understanding use of Photoshop while creating realistic textures.	L3, L6	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis,L6-Evaluation

Text Books:

- Kelly L. Murdock (2015), *Autodesk Maya 2015*, Buchanan: SDC publishing LLC.

References:

- Lee Lanier (2012), *Maya Professional Tip and Techniques*, United States: John Wiley and Sons Publications**.**

Modes of Evaluation: Class Test/ Assignment/ End Term Examination/ Case Presentation

Examination Scheme:

Components	**P**	**C**	**CT**	**A**	**EE**	
					Practical	Theory
Weightage (%)	5	10	10	5	20	50

P- Project, C- Case Discussion/Presentation/Analysis, CT- Class Test, A- Attendance, EE- End SemesterExamination

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	--	1	1	1	1	1
CO2	1	1	--	1	1	1	1	1
CO3	1	1	--	1	1	--	--	1
CO4	1	1	--	1	--	--	--	1

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

Syllabus - Semester Fifth

ANI2552	SCRIPTING AND STORYBOARDING	L	T	P	C
Version 1	2021	1	1	2	3
Pre- requisites/Exposure					
Co-requisites					

Catalog Description
In this course, students learn the rudiments of scripting and storyboarding as well explore the differences between the different formats. They are introduced to the meaning of conceptualizing a treatment and style for a film, the differences between scripting for Ads and short films as compared to scripting for feature films as well as the different types of scripts like treatment, script, shoot and edit scripts, screenplays and finally meticulously prepared scripts which are better known as storyboards

Course Objectives:
The objective of this course is to:

- Help students improve their writing style, especially with reference to film, video andInternet
- Enable students to write creative and cohesive scripts in a variety of programmeformats such as News bulletins, Ads, PSAs, promos, fiction and documentaries
- To build a sound foundational structure of film grammar so that they can translate filmic elements into narrative structures and visualise scenic elements with ease

Course Description
This course equips the learner with skills in three distinct areas. To polish their writing styles, structures and grammar so that the student can write not only well but also in a lexically and grammatically correct manner. The second objective is to build a sound theoretical foundational of filmic elements by deconstruction of popular scenes from films and expound on the principles behind the success of these scenes, so that the learner can translate prose elements into visual narratives. The third objective is to enable the learner to conceptualise, visualise and translate these abstract ideas into a concrete text in the form of storyboards and scripts – both shooting as well as edit scripts. The entire course takes the advantage of a huge repository of good audio visual material so that every theoretical construct can be supplemented and illustrated with examples drawn from filmic and broadcast domains.

Course Outcomes:
On completion of this course, the students will be
CO1. Able to write quickly effectively and well in a variety of styles
CO2. Be able to translate abstract ideas into shootable scenes
CO3. Be able to understand client briefs and producer requirements
CO4. Proficient at every aspect of writing for fiction and non-fiction

Modules	Blooms level*	Number of hours

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MODULE 1: Pre-Production Research This unit focuses essentially of all aspects of pre-production. Methods of research, scouring for sources of material, collating and compiling material. Research indoors as well as outdoors. Preparing and completing a "rekky", techniques of preliminary interview of people. Understanding the requirements of the documentary or film are also covered in this module	L1, L2	6
MODULE 2: Concept & Treatment In this module, students learn all about conceptualizing an idea, abstract concept, trying new and novel methods of treatment; Soliloquy; integrating one comprehensive document out of several different text material, and writing client specific briefs form the core of this module	L2, L3	4
MODULE 3: Fundamentals of Film Grammar This very important module unravels the mysteries of film shooting and filmic editing. The fundamentals of shot composition, camera angles, cameraaesthetics, constructing and deconstructing a film. Dialogue creation; creative use of sound and optimizing the use of the sound studio, as well as techniques developed by the great masters of documentary and cinematic narrative, all form the backbone of this vitally essential module	L2, L3	8
MODULE 4: Writing the Script This module explains and teaches the actual writing process. How all the different ingredients of pre production research, visualization, film grammarand principles come together to form a compelling narrative. Students learnabout writing prose, writing scene and shot descriptions, development of a character, plot points, digetic and non-digetic sound, meaning of clima, anti-climax and other structural elements that make up a well interwoven script	L2, L3, L5	8
MODULE 5: Screenplays and Storyboarding This is almost a completely practical unit, where students are taken through the entire process of writing a script and have to prepare on an individual basis scripts and storyboards in a variety of formats. Thus they have toprepare a script for a news bulletin; a storyboard for an Ad; A storyboard for a PSA; a script for non-fiction short film and one for a short documentary. Some of the exercises will be test exercises while others will be assessed andgraded	L3, L4, L6	4

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis,L6-Evaluation

Text Books

- King, Stephen. *On Writing: A Memoir of the Craft*. Simon and Schuster, 2012
- Douglas, Pamela. *Writing the TV Drama Series: How to Succeed as a ProfessionalWriter in TV*. 2018

Reference Books:

- Truby, John. *The Anatomy of Story: 22 Steps to Becoming a Master Storyteller*. Faberand Faber, Inc. 2008
- Strunk Jr., William. White, E. *Elements of Style*. Fourth edition. 1999

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Modes of Evaluation: Practical/ Home Assignment/ Class Test/ Written Examination
Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

P: Project, CT: Class Test, EE: End Semester Examination; A: Attendance

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1											
CO2											
CO3											
CO4											

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Syllabus - Semester Sixth

ANI2652	VFX	L	T	P	C
Version	2021	2	-	2	3
Pre- requisites/ Exposure					
Co-requisites					

Catalog Description

This VFX course will take you through the fundamental concepts of VFX Compositing in Nuke, and how to learn nuke the interface. The course is focused primarily on the 2D & 3D aspects of compositing to get you started. It involves replacing a background, color correcting and blending the foreground and background, motion tracking the background to the foreground, and seamlessly bringing it all together. And learn how to Render CGI in passes, footage, and all of the elements necessary to compositea CG shot.

Course Objectives

The objective of this course is to

- To impart working knowledge of Advance VFX & Compositing
- To impart knowledge into Compositing of 3D Passes and 3D motion tracking
- To Impart Knowledge of Rotoscoping & Color grading techniques

Course Outcomes (COs):

On completion of this course, the students will be able to

CO1. Create an Multi-pass CG compositing

CO2. Create 2D compositing using Rotoscoping.

CO3. Identify and describe VFX & Compositing.

Course Contents

Modules	Blooms level*	Number of hours
MODULE 1 – 2D Compositing & Rotoscoping • Additive color theory • Image formats / resolutions / colors • 2d Tracking • Rotopaint and Rotoscoping • Keyframe animation • Introduction to Chroma Keying / Greenscreen removal • Camera traits (Lens distortion, grain, sensor noise) • Cleanplating and removal	L1, L2, L3	20

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MODULE 2 – CGI Compositing • Matching color tones, darks, highlights of an image • Compositing elements / FX into a shot • Integrating a CGI (Computer Generated Image) render into areal scene • How to use the normals AOV to fine tune CG. • Use ID passes to correct different geometries	L1, L3	20
MODULE 3 – Color Grading • Color correction / color grading techniques • Advanced Color Grading Techniques • Day to Night Tips and Techniques • Fundamentals of Light and Physics • Image Frequency Separation and Uses • Advanced Color Remap Techniques	L1, L3	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension;L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Digital Compositing with Nuke (2012) : United Kingdom: Focal Press

Reference Books

- Nuke 101: Professional Compositing and Visual Effects (Digital Video & Audio Editing Courses) : Pearson

Modes of Evaluation: Class Test/ Assignment/ End Term Examination/ Case Presentation

Examination Scheme:

Components	**H**	C	**CT**	**A**	**EE**
Weightage (%)	10	-	15	5	70

CT: Class Test, H: Home Assignment, EE: End Semester Examination; A: Attendance; C:Case Presentation

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	--	2	--	--	2	2	1	2	3
CO2	1	1	--	2	--	--	3	--	1	2	--
CO3	1	1	--	2	--	--	3	--	1	2	--

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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JOURNALISM

Programme Structure

Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
JRN2151	Print Media- Reporting and Editing	2	-	2	3
JRN2251	Basic Photography	2	-	2	3
JRN2351	TV Journalism	2	-	2	3
JRN2451	TV Production and Presentation	2	-	2	3
JRN2551	New Media	2	1	-	3
JRN2651	Media Analysis	3	-	-	3
	TOTAL				**18**

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JOURNALISM

Syllabus - Semester First

PRINT MEDIA – REPORTING AND EDITING

Course Code: JRN2151 **Credit Units : 03**

Course Objective:
This unit is aimed at introducing the students to the world of journalism- news and its handling in context of print media. It deals with basic news elements, news structure as also the newsroom set up. The student is to be taught about agency and magazine journalism. Editing is an integral part of this unit.

Course Contents:

Module I: History of Journalism
Journalism in pre-independence era in India
Role of English and vernacular press during freedom struggle
Growth of journalism post independence

Module II: Growth and development of press
Emergence of newspapers, magazines and publication houses
Emergence and growth of Indian news agencies

Module III: The newsroom Set-up
Various departments in Editorial set-up
Hierarchy in the Newsroom
Qualities and responsibilities of a reporter
Sources and beats

Module III: News Reporting
What is News, News Value and Sources of News
Basic elements of News
Writing a News Report
Types of leads & Body text
Interviewing skills required for reporting
Types of Reporting

Module IV: Editing News
Role and functions of desk
Role of copy editor
Electronic Copyediting
Rewriting
Writing Headlines and captions
Understanding the importance of style guides
Newspaper design & Layout

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Examination Scheme:

Components	P	C	CT	A	EE
Weightage (%)	5	5	15	5	70

Components Codes

Project	P
Case Discussion/Presentation/Analysis	C
Class Test	CT
Attendance	A
End Semester Examination	EE

Text & References:

- History of India Journalism; Natarajan, J.
- History of Indian press: Growth of Newspaper in India; Ahuja, B.N.
- Journalism Reporting; Sharma, Seema
- Communication for Development In the Third world; Melkote, Srinivas R.
- Editing; Ahuja, B.N. &Chhabra, S.S
- News Reporting & Writing, A.L. Lawrenz;
- Handbook of Journalism & Mass Communication
- Vir Bala Aggarwal, V.S. Gupta

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Syllabus - Semester Second

BASIC PHOTOGRAPHY

Course Code: JRN2251 **Credit Units: 03**

Course Objective:
This unit introduces to the basic techniques of photography and it's applications in Mass Media with specialization in specific area. This course gives an opportunity to the student to get accustomed to this universal language of expression and communication and exhibit their skills to explore, understand the significance and utility of photographs as an effective medium of communication.

Course Contents:
Module I: Introduction to photography
Brief History of photography
Uses of Photography
Principles of light
How photography works

a. image capturing
b. film processing
c. print processing

Module II: Camera
Elements of a Camera (Introduction) – view finder, lens, iris, shutter, film chamber, light metre
Camera Designs –

a. pinhole camera,
b. view camera,
c. compact camera,
d. T L R
e. S L R,
f. Instant/Polaroid camera,
g. digital camera

Exposure control in camera

Module III: Films & Camera Accessories
Film formats & their use
Lenses - prime &zoom lens

a. angle of view
b. Aperture & f-no.
c. Depth of field, how depth of field works
d. Depth of focus
e. Lens care

Camera accessories

Module IV: Photography & Darkroom Practicals
Outdoor Photography Assignments
Introduction to Darkroom Equipments and their uses
Developing & Printing B&W Films

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Developing, Printing and Enlarging B&W Prints
Portfolio and Presentation

Examination Scheme:

Components	P	C	CT	A	EE
Weightage (%)	5	5	15	5	70

Components Codes

Project	P
Case Discussion/Presentation/Analysis	C
Class Test	CT
Attendance	A
End Semester Examination	EE

Text & References:

- Basic Photography; Langford, Michael (Focal Press)
- Photography, Handbook, Wright, Terence
- Photography, History; Spira, s f
- A simple guide to 35mm photography; Corbett, Bill
- The Darkroom Cookbook; Anchell, Stephen G.

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Syllabus - Semester Third

TV JOURNALISM

Course Code: JRN2351 **Credit Units: 03**

Course Objective:
Students will move further into broadcast journalism in India. The unit will cover the process of how news develops and is moulded into essentials of any medium (Radio or TV) over a chain of processes. The basic attributes and skill set needed to pursue a journalistic path will also de debated and discussed. The unit will encourage students to identify the similarities and differences between key processes in both the mediums. The organizational set up will also be communicated for a better understanding of the functioning of a broadcast media organization.

Course Contents:

Module I: Basics of TV journalism
Qualities of a journalist
Developing sources of news gathering
Process of a report from the idea till its final implementation
Essentials during reporting
Live reporting and presenting the final story
Different styles of functioning for different beats
Basic Interview Skills: different types of interviews, approach, arrangements, research
Stages of production: pre, shoot and post.

Module II: Functioning of a TV organization
Hierarchy of a TV set up
Television Personnel – director, floor manager, audio technician, controller, cameraman
Role of a producer
Technical Process of news from initial stages to telecast.
Working process involved during live bulletin and recorded programme
Role/ contribution of each department and personnel
Hierarchy of a news organization
Professional terminologies

Module III: Outdoor production
Basic shooting according to shooting script
Team members and their role
*P*recautions and safety features while shooting
Single and multi-camera shoot
Shooting for fiction
Shooting for non-fiction
Building a sequence in the camera and without external editing
Process and elements of EFP (Electronic Field Production) and ENG (Electronic News Gathering)
OB (Outdoor Broadcast) Van
Satellite Phone

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Examination Scheme:

Components	H	C	CT	A	EE
Weight age (%)	5	5	15	5	70

Components Codes

Home Assignment	H
Case Discussion/Presentation/Analysis	C
Class Test	CT
Attendance	A
End Semester Examination	EE

Texts & References:

- Television Production Handbook; Zettl, Herbert
- Video production, BelavadiVasuki
- Writing and Production Television News; Gormly, Eric K.
- Broadcast News Production; Schultz, Brad
- Digital Broadcasting Journalism; Sharma, Jitendra K.
- Broadcast journalism; Boyd, Andrew
- Broadcast journalism; Cohler, David Keith
- Television & Social change in Rural India; Johnson, Kirk
- Producing Public Television, Producing Public Culture; Dornfeld, Barry

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Syllabus - Semester Fourth

TV PRODUCTION AND PRESENTATION

Course Code: JRN2451 **Credit Units: 03**

Course Objective:
The module is structured for the students to move further into TV journalism. It shall explore strategies to *handle* key areas within broadcast journalism.
The skill for anchoring and presentation will be honed after explaining the nuances and essentials of the task. This module will also familiarize them with all that is needed for outdoor production and the role of important departments on location. From this unit onwards, they will be exposed to essentials of specialized coverage in the field of current affairs, sports, business etc.

Course Contents:
Module I: Anchoring and presentation
Qualities of an anchor
Role of styling (makeup techniques)
Anchoring according to program formats
News anchoring, Entertainment, current affairs, magazine shows etc
Anchoring techniques: live shows & recorded programmes
Discussing different news anchors of the industry
Using the teleprompter
Piece to camera

Module II: Editing (Post-production)
Basic FCP (Final Cut Pro) Tools of Editing
Basic Transitions (cut, dissolve, fade, wipe)
Sequencing shots
Concept of montage
Continuity vs. non continuity
Linear vs. non linear editing
Role of the editor
Ingest and digitize
Overlay and underlay of sound
Ethics involved in editing
Importance of File footage and archival footage
From finished product to broadcasting

Module III: Specialized coverage I
Current Affairs
Documentaries and Features
Business and stock market reporting
Sports coverage
Legal reporting and Judiciary
Psephology and election based coverage
Political & parliamentary coverage

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Examination Scheme:

Components	P	H	CT	A	EE
Weight age (%)	5	5	15	5	70

Components Codes

Project	P
Home Assignment	H
Class Test	CT
Attendance	A
End Semester Examination	EE

Texts & References:

- Television Production Handbook; Zettl, Herbert
- Video production, BelavadiVasuki
- Writing and Production Television News; Gormly, Eric K.
- Broadcast News Production; Schultz, Brad
- Digital Broadcasting Journalism; Sharma, Jitendra K.
- Broadcast journalism; Boyd, Andrew
- Broadcast journalism; Cohler, David Keith
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- Producing Public Television, Producing Public Culture; Dornfeld,

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Syllabus - Semester Fifth

NEW MEDIA

Course Code: JRN2551 **Credit Units: 03**

Course Objective:
Apart from discussing specialized coverage, *the concept of* convergence will be explored in this semester. The power of the Internet has penetrated every nook and cranny of life. Journalism has also been revolutionized with the inclusion of the World Wide Web for newsgathering and news dissemination. Aspiring journalists today need to be familiar with cyber journalism and the basics of web designing. The course curriculum has been designed, keeping this end in view

Course Contents:

Module I: Specialized coverage – II
Disaster & crises coverage
Science and technology
Environment, Poverty, and Gender

Module II: Convergence
What is convergence?
Emergence of convergence and its effects on broadcast media
Language, structure and technology of new media
Creative, Business, Technical Skills in Convergence Media Programming

Module III: Cyber Media
Cyber Journalism: History of Internet
Comparison of cyber media with Print, TV, Radio.
Writing for Web Media
Online as a publishing medium
Online as an advertising tool
Why Print & Electronic Media networks are going on the Net?
Impact of Web Journalism on reading habits of people and media industry.
Analysis of important Indian news-based websites
Impact of globalization on Web Journalism
Cyber Laws and debates
Concept of e-governance & e-learning
Finding information on the World Wide Web
Writing for blogs

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Examination Scheme:

Components	P	C	CT	EE
Weightage (%)	5	5	15	70

Components Codes

Project	P
Case Discussion/Presentation/Analysis	C
Class Test	CT
End Semester Examination	EE

Text & References:

- Journalism Online, Mike Ward
- The Internet Complete Reference; Harley Hahn
- The Web Writer's Guide, Koppel
- The Ethics of Cyber space; Hamelink, Cees J.
- E-government; Bhatnagar, Subhash
- Cyber Media Journalism Emerging Technologies; Chakravarthy, Jagadish

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Syllabus - Semester Sixth

MEDIA ANALYSIS

Course Code: JRN2651 **Credit Units: 03**

Course Objective: The objective of this course is to provide a clear understanding of trends, movements and principles of journalism, problems and issues in newsgathering.

Course Contents:

Module-I: Problems and Issues in Newsgathering Objectivity Introduction to defamation Activism in journalism Embedded reporters Credibility of sources Pressures on media – internal, governmental, advertising, PR

Module-II: Commercialization of media, Media trials, Changing Equations in media business – mergers & acquisitions, cross media holdings, new trends Media ethics

Module-III: Alternate media Citizen Journalism Blogs as alternate media Community media

Module-IV: Broadcast Regulations Overview of Broadcast law Evolution of Broadcast Bill Cable TV Regulation Act

Examination Scheme:

Components	P	C	CT	A	EE
Weightage (%)	5	10	10	5	70

P- Project, C- Case Discussion/Presentation/Analysis, CT- Class Test, A- Attendance, EE- End Semester Examination

Texts & References:

Text

- Mass communication In India; Keval J. Kumar
- Communication for Development In the third world; Melkote, Srinivas R.

References

- India's communication Revolution; Singhal, A. & Rogers, E. M.
- Media in a Globalised Society; Stig Hiarvard
- Media Management in India; Prassana K Biswasroy
- Government Media, Autonomy and After; G S

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Amity School of Liberal Arts & FL

Bachelor of Arts (Honors/ Honors with Research) in History

FLEXILEARN
-Freedom to design your degree



Curriculum & Scheme of Examination

2023

AMITY UNIVERSITY HARYANA

GURUGRAM

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Bachelor of Arts (Honors/ Honors with Research) in History

Overview

Shaping the future needs proper knowledge of the past. Bachelor of Arts in History is a four-year undergraduate/ programme that explores history pertaining to human evolution, development, and social interaction. It focuses on developing critical thinking among students about the various phasesof history, both in Indian and world. The students will discover about political processes, socio- economic changes, cultural and intellectual life, war and society, and aspects of gender including theresearch work in fourth year.

This programme helps students to develop many skills like logic and theoretical analysis, written andoral expression, and construction of narratives. The programme structure includes theoretical and practical sessions allowing them to explore and expand their interests in ancient, medieval, early modern, and modern cultures and civilisations. The programme helps to foster and demonstrate competency in vital skills like the historical explanation, discernment, and synthesis.

This programme allows students to explore an incredibly diverse range of historical events and the contexts in which they occurred. The study of history is excellent preparation for careers in many fields including law journalism business and finance education politics and public policy social activism and the arts. The said programme structure caters the needs of students who pursues New Education Policy from the 2023 onwards, it is accordingly in line with the NEP 2020, it focuses on Research and methodology.

Programme Objectives

After completing BA Programme, the students will be able to:

- PO1.Critical Thinking: Take informed actions after identifying the assumptions that frameour thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal)from different perspectives.
- PO2.Effective Communication: Speak, read, write and listen clearly in person and throughelectronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.
- PO3. Social Interaction: Elicit views of others, mediate disagreements and help reachconclusions in group settings.
- PO4. Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
- PO5. Ethics: Recognize different value systems including your own, understand the moraldimensions of your decisions, and accept responsibility for them.
- PO6. Environment and Sustainability: Understand the issues of environmental contextsand sustainable development.
- PO7. Self-directed and Life-long Learning: Acquire the ability to engage in independentand life-long learning in the broadest context socio-technological changes

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Programme Specific Skills (PSO)

PSO 1: The course seeks to provide the students with an analytical overview of the developments ofsociety, economy, and politics in the ancient, medieval, modern, and contemporary periods of Indianhistory.
PSO 2: It aims at developing a contact with students about the critical analysis and observations of the historical facts scattered in the world, for instance in Europe, Japan, China, Africa, and the USA.
PSO 3: It aims at creating a general awareness about the historical past and its correlation with thepresent and future by developing the tendency of self-learning and life-long learning.

PSO1 The course seeks to provide the students with ananalytical overview of the developments in the ancient,medieval, modern, and contemporary periods of Indian history.		PSO2 It aims at developing a nuanced understanding among students about the various historical trends in the world, for instance in Europe, Japan, China, Africa, and the USA.		PSO3 It aims at creating a general awareness about the historical past and itscorrelation with the present and future. Lessons from the past are useful not onlyfor interpreting the past but also as guidelines for future course action.		
1	2	3	4	5	6	7
Basic Courses	Research (Analysis)	Gender based	Theory	Social – Political Formatio ns	Culture Patterns	Contemporary
History of Early India I	History of British Rulein India I	Gender and History	History of Contempor ary India	Social Formatio ns & Cultural Patterns of Ancient World	Indo Islamic Polity and Culture in Medieval India II	History of British Rulein India I
History of Early IndiaII	History of British Rulein India II	History of Early India I			History of Early India II	Rise of Modern West
Indo-Islamic Polity and Culture in Medieval India I	Indo-Islamic Polity and Culture in Medieval India II	History of USA	History of World Wars		History of Medieval IndiaIV	History of USSR

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History of British Rulein India I	Dissertation				History of British rule in India II	History of USA
History of China and Japan	Project with Presentation and Evaluation					History of China and Japan
	Term Paper/ Summer Project					
	Summer Internship					

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Bachelor of Arts (Honors/ Honors with Research) in History
SEMESTER-I

Course Code: DHIS2101	SOCIAL FORMATIONS AND CULTURAL PATTERNS OF THE ANCIENT WORLD	L	T	P	FW/ Proj	C
Version	**1.2 (2023)**	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description
The course is designed to provide in-depth knowledge about the historical processes of the ancient world. Some key components of the course include evolution of humankind, the Neolithic phase, Bronze Age civilizations, and the history of Ancient Greece. The course will give an insight into the socio-cultural and political factors which impacted the historical process in the world during the ancient period.

Course Objectives:
After completion of this course, students will be able to

- Introduce students to the evolution of humankind
- Develop critical thinking in students regarding the early historical phases-Paleolithic and Mesolithic periods
- Equip students with relevant historical information regarding early economic processes such as food production, beginnings of agriculture, and animal husbandry
- Introduce students to the institutions of the Bronze Age Civilization
- Develop critical thinking in students about the Egyptian Civilization
- Develop critical thinking in students about the Mesopotamian Civilization

Course Outcomes
On the completion of the course, the student will be able to:
CO 1: Define and explain the basic knowledge about reconstructing Early Indian notions of History
CO 2: Describe and summaries the Paleolithic cultures and Mesolithic cultures
CO 3: Interpret and identify the socio-cultural and religious patterns of the Harappan Civilization
CO 4: Defined and explained various urban features of the Indus Valley Civilization

Course Content:

Modules	Blooms level*	Number of hours
MODULE-I: Evolution of Humankind Paleolithic culture, Mesolithic Culture	**L1, L2, L3**	14
MODULE-II: Neolithic Phase Food production-beginnings of agriculture and animal husbandry	**L1, L2, L3**	12
MODULE III: Bronze Age Civilizations Case Study I: Egypt, Case Study II: Mesopotamia	**L3, L4, L5**	14
MODULE-IV: Ancient Greece I Slave society in ancient Greece, Agrarian economy, urbanization and trade	**L3, L4, L5**	10

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MODULE-V: Ancient Greece II Polis in ancient Greece: Athens and Sparta, Greek Culture, revision	**L3, L4, L5, L6**	10

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Amar Farooqui, *Early Social Formations*
- Burns and Ralph. *World Civilisations*
- V. Gordon Childe, *What Happened in History*
- G. Clark, *World Prehistory: A New Perspective*
- B. Fagan, *People of the Earth*
- Amar Farooqui, *Early Social Formations*
- M. I. Finley, *The Ancient Economy*
- Jacquetta Hawkes, *First Civilisations*
- G. Roux, *Ancient Iraq*
- Bai Shaoyi, *An Outline History of China*
- H. W. F. Saggs, *The Greatness that was Babylon*
- B. Trigger, *Ancient Egypt: A Social History*
- *UNESCO Series: History of Mankind, Vols. I – III/ or New ed. History of Humanity*
- R. J. Wenke, *Patterns in Prehistory*

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**MT**	**A**	**Assignment**	**EE**
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	**1**	**1**						**1**		
CO2		**1**	**1**					**1**		
CO3	**1**									**1**
CO4	**1**									

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DHIS2151	HISTORY OF EARLY INDIA-I	L	T	P	FW/ Proj	C
Version	**1.2 (2023)**	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

The course is aimed at providing in-depth knowledge about the historical processes of early India. The course also intends to provide a historiographical background to Ancient Indian history by reconstructing history of the period. The course will focus on Stone Age cultures, advent of food production, the Harappan Civilization, and the Vedic Period.

Course Objectives

After completion of this course, students will be able to

1. Understand and assess the history of early India with specific reference to the Paleolithic, Mesolithic, and Neolithic phases; Indus Valley Civilization; the advent of the Aryans, etc.
2. Critically analyze the historiography which has helped in reconstructing the ancient past
3. Discuss and comment on all the major historical processes associated with early India

Course Outcomes

On the completion of the course, the student will be able to:

CO 1: Define and explain the basic knowledge about reconstructing Early Indian notions of History
CO 2: Describe and summarize the Paleolithic cultures and Mesolithic cultures
CO 3: Interpret and identify the socio-cultural and religious patterns of the Harappan Civilization
CO4: Defined and explained various urban features of the Indus Valley Civilization

Course Content:

Modules	Blooms level*	Number of hours
MODULE-I: Reconstructing Ancient Indian History Early Indian notions of History, Sources and tools of historical reconstruction, Historical interpretations (with special reference to gender, environment, technology, and regions)	**L1, L2, L3**	16
MODULE-II: Pre-historic Hunter-Gatherers and the Advent of Food Production Palaeolithic cultures- sequence and distribution; stone industries and other technological developments, Mesolithic cultures: regional and chronological distribution, new developments in technology and economy, rock art, Understanding the regional and chronological distribution of the Neolithic, Chalcolithic cultures: subsistence, and patterns of exchange	**L1, L2, L3**	14
MODULE III: **The Harappan Civilization** Origins, Settlement patterns and town planning, Agrarian base; craft productions and trade, Social and political organization, Religious beliefs and practices, art, The problem of urban decline and the late/post-Harappan traditions	**L3, L4, L5**	16

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MODULE-IV: Cultures in Transition The Aryan Invasion Debate, The Vedic Period, Revision	**L3, L4, L5**	14

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- D. P. Agrawal, The Archaeology of India, 1985
- Bridget & F. Raymond Allchin, The Rise of Civilisation in India and Pakistan, 1983
- A.L. Basham, The Wonder that Was India, 1971
- D. K. Chakrabarti, The Archaeology of Ancient Indian Cities, 1997, Paperback
- D. K. Chakrabarti, The Oxford Companion to Indian Archaeology, New Delhi, 2006
- H. C. Raychaudhuri, PoliticalDHIS India, Rev. ed. with Commentary by B.N. Mukherjee,1996
- K. A. N. Sastri, ed., History of South India, OUP, 1966
- R. S. Sharma, Material Culture and Social Formations in Ancient India, 1983
- Upinder Singh, A History of Ancient and Early Medieval India, 2008
- Romila Thapar, Early India from the Beginnings to 1300, London, 2002

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**MT**	**A**	**Assignment**	**EE**
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	**1**	**-**	**1**	**--**	**2**	**--**	**--**	**1**	**1**	**1**
CO2	**1**	**-**	**1**	**--**	**1**	**--**	**--**	**1**	**1**	**--**
CO3	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**
CO4	**1**									

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-II

Course Code: DHIS2201	SOCIAL FORMATIONS AND CULTURAL PATTERNS OF THE MEDIEVAL WORLD	L	T	P	FW/ Proj	C
Version	**1.2 (2023)**	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description
The course is designed to introduce students to the social patterns and cultural formations of the Medieval world. The key components of this course are an in-depth analysis of the Roman Republic, the religion and culture of ancient Rome, crisis of the Roman Empire, economic developments in Europe, and social formations in Central Islamic lands.

Course Objectives
After completion of this course, students will be able to

- Understand the origins of the Roman Empire
- Understand the institution of slavery as a critical component of the Roman Republic
- Understand the nature of urbanization and trade
- Develop critical thinking about the historical processes in the Central Islamic lands
- Understand the development of institutions such as ummah, shariah, mihna, caliphate, etc
- Understand the religious institutions

Course Outcomes
On completion of this course, the students will be able to
CO 1: Explain and outline the developments in Rome in the Medieval world.
CO 2: Define the rise of Islam in the Medieval world.
CO 3: Explain the causes of the decline of Roman Empire
CO 4: Explain the technological development in Medieval Europe

Course Content:

Modules	Blooms level*	Number of hours
MODULE-I: The Roman Republic Origins of the Roman Empire, Slave society in ancient Rome, Agrarian economy, urbanization and trade	**L1, L2, L3**	16
MODULE-II: Religion and Culture in Ancient Rome and the Decline of the Roman Empire Roman Religion, Cultural Patterns, Causes of Decline of the Roman Empire	**L1, L2, L3**	14
MODULE III: **Economic Developments in Europe from the 7th to the 14th Centuries** Organisation of production, Towns and trade, Technological developments, Crisis of feudalism	**L3, L4, L5**	16
MODULE-IV: Societies in Central Islamic Lands	**L3, L4, L5**	14

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The tribal background, ummah, Caliphal state; rise of Sultanates, Religious developments: the origins of Shariah, Mihna, Sufism, Urbanization and trade		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Amar Farooqui, *Early Social Formations*
- Perry Anderson, *Passages from Antiquity to Feudalism*
- Marc Bloch, *Feudal Society*, 2 Vols
- *Cambridge History of Islam*, 2 Vols
- Georges Duby, *The Early Growth of the European Economy*
- Fontana, *Economic History of Europe*, Vol. I (relevant chapters)
- P. K. Hitti, *History of the Arabs*
- P. Garnsey and Saller, *The Roman Empire*

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**MT**	**A**	**Assignment**	**EE**
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	**1**	**1**						**1**		
CO2		**1**	**1**					**1**		
CO3	**1**									
CO4	**1**									

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DHIS2251	HISTORY OF EARLY INDIA-II	L	T	P	FW/ Proj	C
Version	**1.2 (2023)**	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description
This course will delve into the descriptive details and develop an understanding among students about the socio-political processes of Ancient Indian history. The key components of the course include social stratification, changing political formations, history of the Gupta Empire, religious philosophy and their development in this phase, and the important cultural developments of the period.

Course Objectives
After completion of this course, students will be able to

- Introduce students to the history of class, Varna, jati and Untouchability in early India
- Develop critical thinking about the history of Mauryan Empire
- Develop understanding in students about the nature of polity and socio-cultural developments in the Gupta period
- Introduce students about development of various religious tradition in early India
- Develop critical thinking about the these religions
- Develop critical understanding about ancient literary texts for better knowledge of early Indian history

Course Outcomes
On completion of this course, the students will be able to
CO 1: Discuss the factors responsible for the rise of Gupta empire.
CO 2: Recall and compare the caste system in ancient India
CO3: Discuss and identify the emergence of new religious and social order
CO4: Explain the feudalism debate in ancient India

Course Content:

Modules	Blooms level*	Number of hours
MODULE-I: Social Stratification Class, varna, jati, untouchability, Gender and the institution of marriage	**L1, L2, L3**	14
MODULE-II: Changing political formations The Mauryan Empire, Post-Mauryan Polities with special reference to the Kushanas and the Satavahanas	**L1, L2, L3**	16
MODULE III: **The Gupta Empire and Post-Gupta Period** Nature of Polity, Socio-cultural developments, Post-Gupta Period: Pallavas, Chalukyas, and Vardhanas	**L3, L4, L5**	14

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MODULE-IV: Religion, Philosophy, Society and Cultural Developments A brief survey of Sanskrit, Pali-Prakit and Tamil literature, Scientific and technical treatises, Consolidation of the Brahmanical tradition, Development of Jainism, Development of Buddhism, The beginnings of Tantricism, Art and architecture – forms and patronage; Mauryan, post-Mauryan,Gupta, post-Gupta	**L3, L4, L5**	16

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- B. D. Chattopadhyaya, The Making of Early Medieval India, Oxford University Press, New Delhi, 1994
- D. P. Chattopadhyaya, History of Science and Technology in Ancient India, South Asia Books, New Delhi, 1986
- D. D. Kosambi, An Introduction to the Study of Indian History, Sangam Books Ltd, Delhi, 1975
- S. K. Maity, Economic Life in Northern India in the Gupta Period, Dass Publication, UK, 1970
- B. P. Sahu (ed), Land System and Rural Society in Early India, Manohar Publication, New Delhi, 1997
- R. S. Sharma, Indian Feudalism, Macmillan Publishers India Ltd., 3rd Revised Edition, Delhi, 1980
- Romila Thapar, Asoka and the Decline of the Mauryas, OUP, New Delhi, 1997
- Susan Huntington, The Art of Ancient India: Buddhist, Hindu, Jain, Weather hill, New York, 1985

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**MT**	**A**	**Assignment**	**EE**
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	**1**	**-**	**1**	**--**	**2**	**--**	**--**	**1**	**1**	**1**
CO2	**1**	**-**	**1**	**--**	**1**	**--**	**--**	**1**	**1**	**--**
CO3	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**
CO4	**1**									

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-III

Course Code: DHIS2301	INDO-ISLAMIC POLITY AND CULTURE IN MEDIEVAL INDIA-I	L	T	P	FW/ Proj	C
Version	**1.2 (2023)**	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course provides an elementary outline of the Medieval Indian History with its primary focus on the major political formations like the Delhi Sultanate and the regional dynasties: Bahamanis, Vijayanagar, Gujarat, Malwa, Jaunpur and Bengal. The key components of the course include historiography, political structures, social and economic developments, and cultural and religious processes.

Course Objectives

After completion of this course, students will be able to

- Understand the major developments in the history of India during the period between the thirteenth to the fifteenth century.
- Understand the changes and continuities in the field of culture, especially with regard to art, architecture, bhakti movement and Sufi movement.
- Describe the economic history of the period under study.
- Understand the development and importance of trade and commerce in the period under study.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Describe and explain the various facets of the Tughlaq dynasty in order to create an understanding about the various measures adopted by the Tughlaq Sultans especially that of Sultan Muhammad bin Tughlaq and Firoz Shah Tughlaq

CO 2: Discuss and identify the socio-religious movements in the medieval period

CO 3: Describe and define about Bhakti, Sufism, and other religious trends during the medieval period.

CO 4: Explain the economic structures of the Delhi Sultanate including aspects of revenue, trade, village community, agricultural production, etc.

Course Content:

Modules	Blooms level*	Number of hours
MODULE-I: Interpreting the Delhi Sultanate Survey of primary sources: Persian tarikh tradition, vernacular histories, epigraphy.	**L1, L2, L3**	14
MODULE-II: Sultanate Political Structures Foundation, expansion and consolidation of the sultanate of Delhi, Administration and Justice: Theories of Kingship, Monuments and coinage, Emergence of provincial dynasties: Bahamanis, Vijayanagar, Gujarat, Malwa, Jaunpur and Bengal, Consolidation of regional identities: art, architecture and literature	**L1, L2, L3**	14

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MODULE III: Society and Economy Iqta and the revenue-free grants, Agricultural production; technology, Changes in rural society; revenue systems, Monetization; market regulations; growth of urban centres; trade and commerce; Indian Ocean trade	**L3, L4, L5**	16
MODULE-IV: Religion, Society and Culture Sufi silsilas: Chishtis and Suhrawardis; doctrines and practices; social roles, Bhakti movements and monotheistic traditions in South and North India; Women bhaktas; Nathpanthis; Kabir, Nanak and the Sant tradition, Sufi literature: malfuzat; premakhayans	**L3, L4, L5**	16

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Satish Chandra, History of Medieval India (800-1700), Orient Longman, Delhi, 2007.
- Medieval India: From Sultanate to the Mughals, Part 1 and 2, Haranand Publications, Delhi, 2004.
- Peter Jackson, The Delhi Sultanate: A Political and Military History, Cambridge University Press, Cambridge, 2003.
- Sunil Kumar, The Emergence of the Delhi Sultanate, Permanent Black, Delhi, 2007.
- The Cambridge Economic History of India, Vol.I c. 1200-1750, eds. Irfan Habib and Tapan Ray Chaudhuri, Orient Longman, Delhi, 1982.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**MT**	**A**	**Assignment**	**EE**
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	**1**	**1**						**1**		
CO2		**1**	**1**					**1**		
CO3	**1**									**1**
CO4	**1**									

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DHIS2351	RISE OF MODERN WEST-I	L	T	P	FW/ Proj	C
Version	**1.2 (2023)**	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

The course is designed to learn about the rise of the modern west world and transition the society and economy from feudalism to capitalism. They will learn how to rise of Renaissance in Italy and spread of humanism in Europe and results of the European Reformation in the 16th century and Shift of economic balance from the Mediterranean to the Atlantic, Commercial Revolution, Influx of American silver and the Price Revolution. They gathered knowledge towards the emergence of European state system like Spain, France, and England etc.

Course Objectives

After completion of this course, students will be able to

- Explain the theories and concepts of feudalism in West
- Develop critical thinking about the motives of early colonial expansion
- Develop understanding in students about the social roots of renaissance in city states of Italy
- Develop the understanding of humanism in Europe
- Introduce students about the origin of reformation in West
- Develop critical understanding about the emergence of European state system in Spain, France, England and Russia

Course Outcomes

On completion of this course, the students will be able to

CO 1: Discuss the debate regarding Feudalism.

CO 2: Interpret the main features of Reformation.

CO 3: Explain and list the significance of the spread of Humanism in Europe

CO4: Discuss the roots of Renaissance in Italian States

Course Content:

Modules	Blooms level*	Number of hours
MODULE-I: Transition from feudalism to capitalism Problems and theories	**L1, L2, L3**	14
MODULE-II: Early colonial expansion Motives, Voyages and explorations, the conquests of the Americas: beginning of the era of colonization; mining and plantation; the African slaves	**L1, L2, L3**	14
MODULE III: **Renaissance and Reformation** Its social roots, City states of Italy, Spread of humanism in Europe, Artistic Expressions, Origins, Course and results of the European Reformation in the 16th century	**L3, L4, L5**	16
MODULE-IV: Emergence of European State System Spain, France, England, Russia	**L3, L4, L5**	16

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**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Carlo M. Cipolla, Before the Industrial Revolution, European Society and Economy. 1000– 1700. W.W. Norton & Co.; 3rd edition, Berkeley, 1994.
- D. C. Coleman (ed.), Revisions in Mercantilism, Methuen, London, 1971.
- Ralph Davis, The Rise of the Atlantic Economics, Cornell University Press, New York, 1973
- Maurice Dobb, Studies in the Development of Capitalism, Rutledge & Kegan Paul LTD, London, 1945.
- J. R. Hale, Renaissance Europe, Wiley-Blackwell; 2 edition, New York, 2000
- Christopher Hill, A Century of Revolutions, Rutledge, London, 2001.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**MT**	**A**	**Assignment**	**EE**
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	**1**	**1**						**1**		
CO2		**1**	**1**					**1**		
CO3	**1**									**1**
CO4	**1**									

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: SHIS2301	AN INTRODUCTION TO ARCHAEOLOGY (SEC)	L	T	P	FW/ Proj	C
Version	**1.2 (2023)**	3	0	0	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description:
This course provides an in-depth exploration into the field of archaeology, focusing on its emergence as a distinct discipline and its methodologies. Students will be introduced to the historical development of archaeology and will engage in critical thinking about various types of archaeological evidence. Emphasis will be placed on the critical examination of evidence from explored sites and understanding the importance of excavated sites in India. By the end of the course, students will have developed a nuanced understanding of the chief features and methods used in archaeological studies.

Course Objectives:
After completion of this course, the students will be able to:

- Introduce students about the emergence of branch of archaeology
- Develop critical thinking about the variety of archaeological evidence
- Critically examine the various evidence about the explored sites
- Introduce students about the importance of excavated sites in India
- Develop critical thinking about the chief features of the sites in India
- Develop critical understanding about understanding of methods of archaeology

Course Outcomes (COs):
On completion of this course, the students will be able to
CO 1: Discuss the emergence and development of archaeology as a distinct discipline
CO 2: Interpret a variety of archaeological evidence
CO 3: Explain the significance of major excavated sites in India
CO4: Discuss and understand the chief features and methods used in their study

Course Content:

Modules	Blooms level*	Number of hours
Module I: Defining archaeology; understanding its origins and development Definition of the term and its implications, Description of Archaeology as Science	**L1, L2, L3**	16
Module II: The variety of archaeological evidence Early Study of the site and collection of evidence techniques, Expiations about various archaeological method and techniques, The Science of archaeology in action and its implementation, The unearthing of different sites and its implications on World history, Application of Archaeological evidences in reconstruction of history, Explorations of the sites in India and its impact	**L1, L2, L3**	16
Module III: Survey and excavation of sites and features The idea of field archaeology and its application to actual site Survey, The applied archology and its explanation	**L3, L4, L5**	7

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Module IV: Discovering human experience through archaeology The study and significance of archaeology, The idea about relevance of use of material and resources in Archaeology	**L3, L4, L5**	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- ASI publications
- Bahn, P. Archaeology – A Very Short Introduction. Oxford: Oxford University Paperback, 1996.
- Chakrabarti, D. K. The Oxford Companion to Indian Archaeology. New Delhi: Oxford University Press, 2006.
- Hall, M. & W. Silliman, Historical Archaeology. USA: Wiley-Blackwell, 2006.
- Renfrew, C. and Paul Bahn. Archaeology – Theories Methods and Practice. London: Thames and Hudson Paperback, 1991.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**MT**	**A**	**Assignment**	**EE**
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	**1**	**1**						**1**		
CO2		**1**	**1**					**1**		
CO3	**1**									**1**
CO4	**1**									

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-IV

Course Code: DHIS2451	RISE OF MODERN WEST-II	L	T	P	FW/ Proj	C
Version	**1.2 (2023)**	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

The course is designed to provide a critical insight into the historical processes of the 17th-18th centuries in Europe. The critical components of the course include the 17th century European crisis, the English Revolution, rise of modern science, mercantilism and European economies, political process in the Europe in the 18th century, and the Industrial Revolution. The course is intended to develop the learning skills of students as far as European history is concerned.

Course Objectives

After completion of this course, students will be able to

- Understand the 17th century European crisis
- Develop critical understanding about the English Revolution
- Analyze the rise of modern science in Europe and its far-reaching consequences.
- Critically examine the correlation between mercantilism and European economic development in the 17th-18th centuries
- Understand the origins of the Industrial Revolution

Course Outcomes

On completion of this course, the students will be able to

CO 1: Critically analyse the 17th century as a period of crisis

CO 2: Describe and analyse the major aspects the English Revolution

CO 3: Understanding the rise of scientific revolution,

CO4: Discuss Mercantilism and Industrial Revolution in Europe

Course Content:

Modules	Blooms level*	Number of hours
MODULE-I17th century European crisis Economic factors, social factors, political dimensions	**L1, L2, L3**	16
MODULE-II: The English Revolution Major issues, Political and intellectual currents	**L1, L2, L3**	14
MODULE III: **Rise of Modern Science** Developments in science	**L3, L4, L5**	14
MODULE-IV: Mercantilism and the Industrial Revolution Rise of Mercantilism in the 17th and 18th centuries in Europe, Origins of Industrial Revolution, Case Studies- Britain, France, Germany, Course of the Industrial Revolution and its consequences	**L3, L4, L5**	16

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Text Books

- T.S. Aston and C.H.E. Philpin (eds.), The Brenner Debate
- H. Butterfield, The Origins of Modern Science
- Carlo M. Cipolla, Fontana Economic History of Europe, Vols. II and III
- Carlo M. Cipolla, Before the Industrial Revolution, European Society and Economy, 1000–1700. 3rd ed. (1993)
- D.C. Coleman (ed.), Revisions in Mercantilism
- Ralph Davis, The Rise of the Atlantic Economics
- Maurice Dobb, Studies in the Development of Capitalism
- J.R. Hale, Renaissance Europe
- R. Hall, From Galileo to Newton
- Christopher Hill, A Century of Revolutions
- Rodney Hilton, Transition from Feudalism to Capitalism
- H.G. Koenigsberger and G.L. Mosse, Europe in the Sixteenth Century
- Stephen J. Lee, Aspects of European History, 1494 – 1789
- G. Parker, Europe in Crisis, 1598 – 1648
- G. Parker and L.M. Smith, General Crisis of the Seventeenth Century
- J.H. Parry, The Age of Reconnaissance
- Meenaxi Phukan, Rise of the Modern West: Social and Economic History of Early Modern Europe
- Poliselky, War and Society in Europe. 1618 – 48
- Theodore K. Rabb, The Struggle for Stability in Early Modern Europe
- Scammell, The First Imperial Age: European Overseas Expansion, 1400 – 1715
- Jan de Vries, Economy of Europe in an Age of Crisis 1600 – 1750

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**MT**	**A**	**Assignment**	**EE**
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	**1**								**1**	
CO2	**1**								**1**	
CO3	**1**			**1**					**1**	
CO4	**1**	**1**						**1**		

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DHIS2401	INDO-ISLAMIC POLITY AND CULTURE IN MEDIEVAL INDIA-II	L	T	P	FW/ Proj	C
Version	**1.2 (2023)**	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

The course aims to provide the students with an analytical overview of the developments in medieval India. Thus, it aims at developing a critical understanding of the development of the Indian society in the medieval age. The student community would, hence, be able to contribute towards a better present and future.

Course Objectives

After completion of this course, students will be able to

- Understand the vernacular literary traditions.
- Discuss the revenue system introduced by Sher Shah
- Understand the expansion and integration of Mughal rule under Akbar
- Understand the religious policies of different rulers under Mughal period

Course Outcomes

On completion of this course, the students will be able to

CO 1: Describe and explain the basic knowledge about the Mughal Empire and the rise and fall of it

CO 2: Discuss and interpret different aspects of Akbar's rule

CO3: Define the reasons for the downfall of Mughal empire

CO 4: Discuss the administrative and military changes brought about by the Mughals

Course Content:

Modules	Blooms level*	Number of hours
MODULE-I: Sources and Historiography Persian literary culture; translations; Vernacular literary traditions, Modern Interpretations	**L1, L2, L3**	14
MODULE-II: Establishment of Mughal rule India on the eve of Babur's invasion, Fire arms, military technology and warfare, Humayun's struggle for empire, Sher Shah and his administrative and revenue reforms	**L1, L2, L3**	14
MODULE III: **Consolidation of Mughal Empire** Humayun's struggle for empire, Sher Shah and his administrative and revenue reforms, Relations with the Rajputs, Expansion and integration, Jahangir as a Ruler, Nur Jahan's Junta, Shah Jahan's reign, War of Succession, Aurangzeb's religious policies	**L3, L4, L5**	16
MODULE-IV: Decline of the Mughal Empire Debate, Recent Historiographical Trends	**L3, L4, L5**	16

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

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- S. Nurul Hasan, Religion, State, and Society in Medieval India
- Jadunath Sarkar, History of Aurangzeb
- Muzaffar Alam and Sanjay Subrahmanyam, eds, The Mughal State, 1526 – 1750
- J.F. Richards, The Mughal Empire
- Catherine Asher and Cynthia Talbot, India Before Europe
- Irfan Habib, Agrarian System of Mughal India, 1526 – 1707
- S.A.A. Rizvi, Religious and Intellectual History of the Muslims in Akbar's Reign
- Stephen F. Dale, Garden of the Eight Paradises: Babur and the Culture of Empire
- R P Tripati, The Rise and the Fall of the Mughal Empire
- Athar Ali, Mughal India: Studies in Polity, Ideas, Society, and Culture
- Douglas Streusand, The Formation of the Mughal Empire
- Harbans Mukhia, Historians and Historiography During the Reign of Akbar
- A.J. Qaiser, The Indian Response to European Technology and Culture
- Richard M. Eaton, The Rise of Islam and the Bengal Frontier
- Shireen Moosvi, Economy of the Mughal Empire
- K.N. Chaudhuri, Trade and Civilization in the Indian Ocean
- Iqtidar Alam Khan, Gunpowder and Fire Arms: Warfare in Medieval India
- Jos J.S. Gommans and Dirk H.A. Kolff, eds, Warfare and Weaponry in South Asia
- Irfan Habib, An Atlas of the Mughal Empire

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**MT**	**A**	**Assignment**	**EE**
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	**1**	**-**	**1**	**--**	**2**	**--**	**--**	**1**	**1**	**1**
CO2	**1**	**-**	**1**	**--**	**1**	**--**	**--**	**1**	**1**	**--**
CO3	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**
CO4	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**--**

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: SHIS2401	UNDERSTANDING CULTURE, HERITAGE AND TOURISM (SEC)	L	T	P	FW/ Proj	C
Version	**1.2 (2023)**	3	0	0	0	3
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course provides a comprehensive understanding of India's rich heritage, focusing on art, architecture, and the diverse elements that contribute to the country's historical and cultural landscape. Students will begin by defining heritage and exploring an overview of Indian art and architecture. The course will delve into various aspects of built heritage, including detailed studies of stupa architecture with a focus on Sanchi, temple architecture through case studies of specific temples or temple complexes, Indo-Persian architecture encompassing forts, palaces, and mosques in Delhi, and colonial architecture in Delhi. Additionally, the course will cover the different facets of tourism, emphasizing tourism management and the development of tour packages. An integral part of the course is a field visit to a historical site or museum, allowing students to experience heritage firsthand and apply their theoretical knowledge in a practical context.

Course Objectives

After completion of this course, students will be able to

- Understand and define the concept of heritage, with a comprehensive overview of Indian art and architecture.
- Analyze and appreciate various forms of built heritage in India, including stupa, temple, Indo-Persian, and colonial architectures.
- Develop skills in tourism management and create effective tour packages that highlight India's historical sites and heritage.
- Gain practical experience and insights through visits to historical sites or museums, applying theoretical knowledge to real-world contexts.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Define and discuss the concept of heritage and provide an overview of Indian art and architecture.

CO 2: Analyze and evaluate various forms of built heritage in India, including stupas, temples, Indo-Persian structures, and colonial architecture.

CO 3: Develop and apply skills in tourism management, including the creation of comprehensive tour packages that emphasize India's historical and cultural sites.

CO 4: Demonstrate practical knowledge and appreciation of heritage through firsthand experiences and insights gained from visits to historical sites or museums.

Course Content:

Modules	Blooms level*	Number of hours
MODULE-I: Defining heritage **Art and architecture in India: an overview**	**L1, L2, L3**	15

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MODULE-II: Understanding built Heritage Stupa architecture at Sanchi, Temple architecture: a case study of any temple/temple complex Indo-Persian architecture, forts, palaces, mosques in Delhi, Colonial architecture in Delhi	**L1, L2, L3**	15
MODULE III: **Varieties of Tourism** Tourism management, Tour packages A visit to a historical site/museum is part of this course.	**L3, L4, L5**	15

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Agarwal, V.S. *Indian Art*. Varanasi: PrithviPrakashan, 1972.
- Bhowmik, S. K. *Heritage Management: Care, Understanding & Appreciation of Cultural Heritage*, Jaipur, 2004.
- Harle, J. *The Art and Architecture of the Indian Subcontinent*. Hormonds Worth: Penguin, 1988.
- Howard, P. *Heritage: Management, Interpretation, Identity and London.* London: Continuum International Publishing, 2003.
- Kumar, S. *The Present in Delhi's Past*. Delhi: Gyan Publishing House, 2002.
- Ghosh, B. *Tourism and Travel Management*. New Delhi: Vikas Publishing House,1998.
- Study material of IGNOU, Bachelor of Tourism, TS-1 and 6; Study material of B.A.(Prog.) Application courses, Tourism, Dept. of Commerce, Prepared by Prof. K.V. Bhanumurthy. Univ. of Delhi.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**MT**	**A**	**Assignment**	**EE**
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	**1**	**1**						**1**		
CO2		**1**	**1**					**1**		
CO3	**1**									**1**
CO4	**1**									

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-V

Course Code: DHIS2551	HISTORY OF USA	L	T	P	FW/ Proj	C
Version	**1.2 (2023)**	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course has been introduced to acquaint students with the major trends in the history of United States of America. By focusing on the political, constitutional, economic, and socio-cultural history of the USA, this course will help in developing a spirit of inquiry in students. Events such as the American Revolution and the American Civil War will help the students in understanding the revolutionary trends in American history. A study of the institution of slavery and women's rights will be useful in providing deeper insight into the learning of social trends in America. Students will be able to relate to these institutions and draw a link between the institution of slavery in the Islamic world and the issue of women's rights in other countries.

Course Objectives

After completion of this course, students will be able to

- Understand the historical background of the people of America
- Grasp the ideals behind the American Revolution and interpret its importance in shaping ideas across the world.
- Comprehend and critically analyze the black movements.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Describe the formation of the American Republic.
CO 2: Define and explain the evolution of American democracy.
CO 3: Define and explain the practice of slavery in the USA and the functioning of slave society.
CO 4: Describe the foreign policy which shaped the history of America.

Course Content:

Modules	Blooms level*	Number of hours
MODULE-I: Making of the Republic and Evolution of American Democracy Revolutionary trends- Sources of conflict, Revolutionary groups and ideology, The War of Independence and its historical interpretations, Processes and Features of Constitution making debates and historical interpretations, Federalists: Jeffersonianism and Jacksonians, Rise of political parties (from 1840-1960), Judiciary-role of the Supreme Court, Expansion of the Frontier: Turner's Thesis, Marginalization, displacement and decimation of native Americans- Case histories of Tecumseh and Shawnee Prophet	**L1, L2, L3**	16
MODULE-II: Slave Society Culture and Ante Bellum Foreign Policy Agrarian South: Plantation economy, Slave Society and Culture: Slave resistance, War of 1812, Monroe Doctrine, Manifest Destiny	**L1, L2, L3**	14

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MODULE III: **Civil War** Abolitionism and Sectionalism, Issues and interpretations, Rise of Republicanism, Emancipation and Lincoln	**L3, L4, L5**	16
MODULE-IV: US Imperialism Spanish-American War, Expansion in the Far East and Latin America, World War I and Fourteen Points, America and World War II	**L3, L4, L5**	14

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Textbooks

- Bernard Bailyn, *The Great Republic*
- Bernard Bailyn, *The Ideological Origins of the American Revolution*
- Charles Beard, *An Economic Interpretation of the American Constitution*
- David B. Davis, *The Problem of Slavery in the Age of Revolution*
- U. Faulkner, *American Economic History*
- John Hope Franklin, *From Slavery to Freedom*
- Gerald N. Grobb and George A. Billias, *Interpretations of American History: Patterns and*
- *Perspectives, 2 Vols*
- W. Pratt, *A History of the United States Foreign Policy*
- James Randall, *The Civil War and Reconstruction*

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**MT**	**A**	**Assignment**	**EE**
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	**1**		**2**					**1**	**1**	
CO2	**1**								**1**	
CO3	**1**	**1**						**1**	**1**	

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Course Code: DHIS2501	HISTORY OF USSR	L	T	P	FW/ Proj	C
Version	**1.2 (2023)**	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

The course has been designed in order to acquaint students with the processes which shaped the history of USSR. The course includes key components such as the Russian Revolutions, the Civil War, the New Economic Policy, and the period of Soviet industrialization. The course is aimed at introducing students to the history of the Soviet Union and enhancing their learning abilities.

Course Objectives

After completion of this course, students will be able to

- Understand the Dual power that existed in Russia
- Understand the establishment of Provisional government in Russia.
- Understand how the Civil War had unfolded and how it impacted the Russian history
- War Communism and the economic system that came along with it
- The establishment of the trade unions
- Formation of USSR
- Debates surrounding different aspects of Soviet Industrialization.

Course Outcomes

On completion of this course, the students will be able to

CO1: Describe and explain the events of the Russian Revolutions and forms of governance.
CO2: Describe the impact and role of Civil War and the War of Communism.
CO3: Define and explain new economic policies and debates over trade and politics.
CO4: Describe the process of Soviet Industrialization and its effect.

Course Content:

Modules	Blooms level*	Number of hours
MODULE-I: The Russia Revolutions of February and October 1917 Dual Power, Provisional government, The establishment of soviet Power, Nationalities question	**L1, L2, L3**	14
MODULE-II: Civil War and War Communism 1918-1921 The first eight months, Red and White Economic Policies	**L1, L2, L3**	14
MODULE III: **The New Economic Policy** Political Debates, Trade unions, Gender relations, Foreign Policy, The Comintern, Formation of the USSR	**L3, L4, L5**	16
MODULE-IV: Soviet Industrialization Debates and Historiographical Interpretations	**L3, L4, L5**	16

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

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Textbooks

- E.H. Carr : A History of Soviet Russia, 4 Volumes (1952).
- Stephen F. Cohen : Bukharin and the Bolshevik Revolution : A Political Biography, 1888 –1938
- Isaac Deutscher : Stalin (1949).
- Maurice Dobb : Soviet Economic Development Since 1917 (1972).
- Marc Ferro : The Russian Revolution of February 1917 (1972).
- Sheila Fitzpatrick : Cultural Revolution in Soviet Russia (1978).
- Arch Getty : The Origins of the Great Purges (1985).
- Graeme Gill : Peasants and Government in the Russian Revolution (1979).
- John Keep : The Last of the Empires : A History of the Soviet Union, 1945 – 1991 (1995).
- John Keep : The Russian Revolution : A Study in Mass Mobilisation (1976).
- Kollontai : Selected Writings.
- Moshe Levin : The Making of the Soviet System (1985).
- Roy & Zhores Medvedev : Khrushcdev : The Years in Power (1977).
- Alec Nove : An Economic History of the USSR (1993).
- Richard Pipes : Russia of the Old Regime.
- L.Szamuely : First Models of Socialist Economic Systems.
- L.Trotsky : The History of the Russian Revolution (translated by Max Eastman) (1959).
- A.B. Ulam : Expansion and Coexistence : A History of Soviet Foreign Policy, 1917 – 67 (1968).
- K. Vaidyanathan : The Formation of the Soviet Control Asian Nationalities.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**MT**	**A**	**Assignment**	**EE**
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	**1**								**1**	
CO2	**1**								**1**	
CO3	**1**								**1**	
CO4	**1**								**1**	

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DHIS2502	HISTORY OF CHINA AND JAPAN	L	T	P	FW/ Proj	C
Version	**1.2 (2023)**	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course will delve into the descriptive details of the history of China during the 19th century: feudalism and commercialism by focusing on the features of Imperialism in China. This course will also deal with the Emergence of Nationalism in China and Nationalism and Communism in China (1921-1937). Further, there is glimpse of the Transition from Feudalism to Capitalism and Japanese Imperialism, Militarism and Fascism

Course Objectives

After completion of this course, students will be able to

- Learn the various methods for entering and editing data
- Understand the various ways to write simple formulas.
- Analyze the data using techniques in excel

Course Outcomes

On completion of this course, the students will be able to

CO 1: Discuss and explain to the History of China and Japan.

CO 2: Describe and interpret the patterns of imperialism in China and conflict between colonial powers.

CO 3: Define and explain the role of Sun-Yat-Sen in revolution of 1911 and the emergence of Nationalism in China.

CO 4: Describe the notions of equality and fraternity with respect to Nationalism and Communism in China (1921-1937).

Course Content:

Modules	Blooms level*	Number of hours
MODULE-I: China during the 19th century: feudalism, commercialism and Imperialism. Feudal values- the principles of Confucius, Gentry, bureaucracy, and common people, The Canton commercial system, transformation of China into an 'informal' colony, The Opium Wars and Unequal Treaties, Finance Imperialism, The 'Open Door' policy, Agrarian and popular movements: Taiping and Yi Ho Tuan (Boxer Rebellion), Attempts at 'Self-Strengthening' (Tzu-chiang): Reforms of 1860-95; 1898; and 1901-08	**L1, L2, L3**	16
MODULE-II: The Emergence of Nationalism and Communism in China The Revolution of 1911: Causes, nature and significance, social composition, Contribution of Sun Yat-sen to the Revolution, May Fourth Movement of 1919: nature and significance, The Warlord Era-1916-1928, Formation of the CCP, The Guomintang (Nationalist Party or KMT), The First United Front, The Jiangxi Period and the rise of Mao Tse-tung, The Second United Front	**L1, L2, L3**	16

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MODULE III: **Japan- Transition from Feudalism to Capitalism** Meiji Restoration: Its nature and significance, Political Reorganization, Military Reforms, Social, cultural and educational reforms (bunmeikaika), Financial reforms and Economic development in the 'Meiji' era., Meiji Constitution	**L3, L4, L5**	14
MODULE-IV: Japanese Imperialism, Militarism and Fascism Japanese imperialism in China, Korea and Manchuria, Popular/People's Rights Movement, Nature of political parties, Rise of Militarism- nature and significance, Japan and the Second World War, American occupation of Japan	**L3, L4, L5**	14

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Jean Chesneaux, et al, *China from Opium War to 1911 Revolution*, Pantheon, 1977
- Chalmers A Johnson, *Peasant Nationalism, and Communist Power: The Emergence of Red China*, 1937 – 1945, Stanford University Press, 1962
- E.H. Norman, *Japan's Emergence as a Modern State,* University of Washington Press, 2000
- Mary C. Wright, *China in Revolution: The First Phase*, 1900 – 1913, Yale University Press, 1968
- B. Jansen (ed.), *The Cambridge History of Japan*, Vol. V and VI., Cambridge University Press. 1989

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**MT**	**A**	**Assignment**	**EE**
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	**1**								**1**	
CO2	**1**								**1**	
CO3	**1**								**1**	
CO4	**1**								**1**	

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DHIS2503	ENVIRONMENTAL HISTORY	L	T	P	FW/ Proj	C
Version	**1.2 (2023)**	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Course catalog:
This introductory course acquaints students with key themes in the historical relationship between human societies and the natural environment, particularly concerning the acquisitionof food, energy, and raw materials. It explores the enduring changes in how states have organized and managed nature, encompassing aspects such as energy production, the transfer of plants and animals, the circulation of commodities and people, as well as the processes of urbanization and industrialization. Through this exploration, students will gain insights into the ecological dimensions of social inequalities, including those related to class, gender, ethnicity, caste, and nationality. By emphasizing the global interconnectedness of ecological systems, the course aims to provide students with the tools to analyze the politics of nature, recognizing extremes such as poverty in fertile plains, urban development and its associated environmental degradation, energy scarcity near dams and mines, and inequalities arising from carbon-energy regimes.

Course Outcome
On the completion of the course, the student will be able to:

CO 1: Examine environmental issues through the lens of a social and political (or socialscientific) framework.
CO 2: Analyze the impact of social inequality on understanding the global to local environmental crisis, considering unequal distribution and access to environmental resources.
CO 3: Investigate the intricacies of resource distribution and disparities in resource utilization within specific social contexts, using case studies on water rights and forest rights.
CO 4: Locate solutions to environmental problems within a framework that emphasizes the democratization of resource use.

Course Content:

Modules	Blooms level*	Number of hours
MODULE-I: Competition for finite resources and means of Livelihood The practice of Pastoral Nomadism, Technology, Ecology and Agriculture	**L1, L2, L3**	14
MODULE-II: Energy in Human History Before the era of coal, gas and oil Era of fossil energy.	**L1, L2, L3**	14
MODULE III: **Ecological Imperialism** Flora-fauna transfer, Diseases and Migration	**L3, L4, L5**	16
MODULE-IV: Unequal access and Industrial Production	**L3, L4, L5**	16

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Industrial Agriculture, Gendered access to natural resources, Cities and inequalities.		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-*

Text books:

- Singh, Vipul. (2021). The Human Footprint on Environment: Issues in India, Delhi:Macmillan India Ltd.
- Bhattacharya, Neeladri. (1995). "Pastoralists in a Colonial World", in David Arnold & Ramachandra Guha, eds., Nature, Culture, Imperialism: Essays on the Environmental Historyof South Asia.Delhi: Oxford University Press. pp. 49-85. (Available in Hindi also)
- Swaminathan, M S. (2008), 'Agriculture on Spaceship Earth', in Mahesh Rangarajan, ed.,Environmental Issues in India. Delhi: Pearson. pp.161-183.
- Burke III, Edmund. (2009), "The Big Story: Human History, Energy Regime and the Environment" in Edmund Burke III and Kenneth Pomeranz, eds., The Environment and World History.Berkeley: University of California Press. pp. 33-53.
- Bulliet, Richard. (2005). Hunters, Herders and Hamburgers: The Past and Future ofHumanAnimal Relationships. New York: Colombia University Press. 232
- Urry, John. (2013). 'The Century of Oil', in Societies Beyond Oil: Oil Dregs and SocialFutures.London: Zed Books. pp. 36-52.
- Crosby, Alfred W. (2006). Children of the Sun: A History of Humanity's UnappeasableAppetite for Energy.New York: W. W. Norton. pp. 159-166 & pp. 117-158.
- Crosby, Alfred W. (1988), "Ecological Imperialism: The Overseas Migration of Western Europeans as a Biological Phenomenon" in Donald Worster, ed., The Ends of the Earth.New York: Cambridge University Press. pp. 104-105.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**MT**	**A**	**Assignment**	**EE**
Weightage (%)	15	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	1						1		
CO2		1	1					1		
CO3	1									1
CO4	1									

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DHIS2504	DELHI THROUGH THE AGES	L	T	P	FW/ Proj	C
Version	**1.2 (2023)**	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Course catalog:
This course explores the physical and social evolution of Delhi from the colonial era to the present day. By emphasizing the impact of political changes on urban structure and societal encounters, it seeks to uncover the historical roots of certain contemporary challenges faced bythe capital.

Course Objectives
After completion of this course, students will be able to
1. Understand contemporary inquiries into the city through its colonial history
2. Learn political transformations and the formation of Delhi
3. Understand the local dynamics influencing Delhi's transformation
4. Historical origins of sustainable urbanization challenges in Delhi

Course Outcome
On the completion of the course, the student will be able to:
CO 1: Place contemporary inquiries into the city within the context of its colonial historyand current experiences.
CO 2: Examine the political transformations and their enduring impact on the city'sformation.
CO 3: Recognize the significance of 'local' social, ecological, and cultural dynamics thatinfluence the city's continual transformation.
CO4: Elaborate on the historical origins of challenges related to sustainableurbanization in Delhi.

Modules	Blooms level*	Number of hours
Module 1: Delhi before 1857: Company Raj, Mughal Court and Literary Culture	L1, L2, L3	14
Module 2: Delhi during 1857 Rebel violence and British re-conquest	L1, L2, L3	16
Module 3: Delhi in 1947 Partition and its Aftermath	L3, L4, L5	14
Module 4: Capital Culture Public Spaces and Socialites	L3, L4, L5	16

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-*

Text books:

- Gupta, Narayani. (1999).Delhi between the Empires: 1803-1931. Delhi: OUP, pp. 1-20
- Farooqui,Amar. (2013). Zafar and the Raj: Anglo-Mughal Delhi, 1800-1850, Delhi: PrimusBooks, pp.106-133, (chap. 6: "The Palace and the City")

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- C. M. Naim.(2004).
- "Ghalib's Delhi: A Shamelessly Revisionist Look at Two Popular Metaphors," in Urdu Texts and Contexts: The Selected Essays of C. M. Naim, Delhi: Permanent Black, pp. 250-279.
- Gail Minault.(2003). "Master Ramchandra of Delhi College: Teacher, Journalist, and Cultural Intermediary,"Annual of Urdu Studies,vol. 18, pp. 95-104
- Gupta, Narayani. (1999). Delhi between the Empires: 1803-1931. Delhi: Oxford UniversityPress, pp. 20-31, 50-66

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**MT**	**A**	**Assignment**	**EE**
Weightage (%)	10	5	10	70

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	1						1		
CO2		1	1					1		
CO3	1									1
CO4	1									

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-VI

Course Code: DHIS2651	HISTORY OF ANCIENT INDIA	L	T	P	FW/ Proj	C
Version	**1.2 (2023)**	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description
This course will delve into the descriptive details and develop an understanding among students about the socio-political processes of Ancient Indian history. The key components of the course include social stratification, changing political formations, history of the Gupta Empire, religious philosophy and their development in this phase, and the important cultural developments of the period.

Course Objectives
After completion of this course, students will be able to

- Demonstrate knowledge of a range of pedagogical approaches for teaching of early India.
- Describe the programs, construct assessment tasks, and develop lesson plans based on the basics of early history of India.
- Explain the lessons in sequence, assessment activities, and other requirements to understand the history of early India
- Articulate the curriculum philosophies underpinning their selection of pedagogical practices of ancient history of India

Course Outcomes
On completion of this course, the students will be able to
CO 1: Discuss the factors responsible for the rise of Gupta empire.
CO 2: Recall and compare the caste system in ancient India
CO3: Discuss and identify the emergence of new religious and social order
CO4: Discuss and Explain the Gandhara, Mathura and Amravati Schools of Art

Course Content:

Modules	Blooms level*	Number of hours
MODULE-I: Reconstructing Ancient Indian History, Prehistory and Proto-history Sources of Ancient Indian history, Paleolithic, Mesolithic, Neolithic periods, Pre-Indus Civilizations	**L1, L2, L3**	14
MODULE-II: The Indus Valley Civilization Origin, main excavated sites and their characteristics, system of town planning, socio-religious and economic history, causes of decline	**L1, L2, L3**	16
MODULE III: **Vedic Period, Caste System and the Emergence of New Religious Orders** Four Vedas, literature of Later Vedic period like Upanishads, Brahmanas, Sutras and Dharma shastras, etc, Rise of Buddhism and Jainism, causes, spread and decline	**L3, L4, L5**	14

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MODULE-IV: The Mauryan, Kushana and the Gupta Empire Sources, Sixteen Mahajanapadas, Magadhan to Mauryan period, Hariyanka dynasty, Shishunaga and Nandas, decline of the Mauryan Empire, Shungas, Kanvas and Kushanas, Kanishka and Mahayana Buddhism, Gandhara, Mathura and Amravati Schools of Art, Trade and Silk Route	**L3, L4, L5**	16

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- B. D. Chattopadhyaya, The Making of Early Medieval India, Oxford University Press, New Delhi, 1994
- D. P. Chattopadhyaya, History of Science and Technology in Ancient India, South Asia Books, New Delhi, 1986
- D. D. Kosambi, An Introduction to the Study of Indian History, Sangam Books Ltd, Delhi, 1975
- S. K. Maity, Economic Life in Northern India in the Gupta Period, Dass Publication, UK, 1970
- B. P. Sahu (ed), Land System and Rural Society in Early India, Manohar Publication, New Delhi, 1997
- R. S. Sharma, Indian Feudalism, Macmillan Publishers India Ltd., 3rd Revised Edition, Delhi, 1980
- Romila Thapar, Ashoka and the Decline of the Mauryas, OUP, New Delhi, 1997
- Susan Huntington, The Art of Ancient India: Buddhist, Hindu, Jain, Weather hill, New York, 1985
- Upinder Singh, Ancient India

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**MT**	**A**	**Assignment**	**EE**
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	**1**	**-**	**1**	**--**	**2**	**--**	**--**	**1**	**1**	**1**
CO2	**1**	**-**	**1**	**--**	**1**	**--**	**--**	**1**	**1**	**--**
CO3	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**
CO4	**1**									

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DHIS2601	HISTORY OF MODERN INDIA	L	T	P	FW/ Proj	C
Version	**1.2 (2023)**	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course has been introduced in order to acquaint students with the major trends in the history of Modern India. By focusing on the political, constitutional, economic, and socio-cultural history of Modern India course will help in developing a spirit of inquiry in students. Events such as the Drain of wealth, British revenue policies and the social-cultural reforms movement, and the rise of Gandhian politics will help the students in understanding the nationalists' trends in Modern Indian History. A study of the Revolutionary movement, peasant movements, and women's rights movement will be useful in providing deeper insight into the learning of social trends in Modern India. Students will be able to relate to these institutions and draw a link between the institution of Autocracy in British India and the issue of civil rights in other colonial countries.

Course Objectives

After completion of this course, students will be able to

- Understand the historical background of India's backward economic development in the colonial period
- Understand the ideals behind the Gandhiji role and interpret its importance in shaping ideas against British Imperialism.
- Understand and critically analyze Nationalism in India.
- Define and discuss the freedom struggle During the 20th century in India

Course Outcomes

On completion of this course, the students will be able to

CO 1: Describe and explain the developments in the field of economy under British rule in India.

CO 2: Explain the key components of the cultural changes and religious reform movements during the British period

CO 3: Explain the early trends in nationalism and Gandhian nationalism

CO 4: Discuss the Socio-religious Reform Movements

Course Content:

Modules	Blooms level*	Number of hours
MODULE-I: Economic Development Land Revenue, Trade, Drain of Wealth, Growth of Modern Industry	**L1, L2, L3**	14
MODULE-II: The Revolt of 1857 Causes of the Revolt, Major participants, Debates and historiography	**L1, L2, L3**	16
MODULE III: **Socio-religious Reform Movements and Nationalism** The socio-religious movements of the 19th century: Brahmo Samaj, Prarthana Samaj, Arya Samaj, Ramakrishna Mission, Debates on reform and revival, Gandhi's idea of nationalism and freedom, Satyagraha Ideology, Ahmedabad Mill	**L3, L4, L5**	14

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Strike, Champaran, Rowlett Satyagraha, Non-cooperation and Khilafat movement, Civil Disobedience movement		
MODULE-IV: Partition, Independence and the Emergence of New State Quit India movement, Cripps Mission, Mountbatten Plan, Partition riots, The impact of partition on India, India after partition, new developments, framing of the Constitution, Five-Year Plans	**L3, L4, L5**	16

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Bandyopadhyay, Sekhar, From Plassey to Partition, Orient Blackswan, 2004
- Sarkar, Sumit, Modern India, Pearson India, 2014
- Chandra Bipan, Panikkar K.N., Mukherjee Mridula, Mahajan Sucheta. and Mukherjee Aditya, India's Struggles for Independence.
- Ishita Dube Banerjee: History of Modern India.
- Laxmi Subramanyam: A history of Modern India from 1757 to 1947.
- Chandra Bipin: Nationalism and Communalism in India, Manohar,2009
- Hasan Mushirual: Partition of India in 2 Volumes, ROlli Books,2008
- Hasan Mushirul(ed): India Partitioned, ROlli Books,2009.
- Bipin Chandra,Mridula Mukherjee, Aditya Mukherjee: India Since Independence, Penguin Books,2008.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**MT**	**A**	**Assignment**	**EE**
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	**1**	**-**	**1**	**--**	**2**	**--**	**--**	**1**	**1**	**1**
CO2	**1**	**-**	**1**	**--**	**1**	**--**	**--**	**1**	**1**	**--**
CO3	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DHIS2602	HISTORY OF WEST ASIA	L	T	P	FW/ Proj	C
Version	**1.2 (2023)**	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course has been introduced to acquaint students with the major trends in the history of West Asia. By focusing on the political, constitutional, economic, and socio-cultural history of West Asia, this course will help in developing a spirit of inquiry in students. Events such as the Iranian Revolution and the Ottomans in First World War will help the students in understanding the revolutionary trends in West Asian History. A study of the institution of slavery and women's rights will be useful in providing deeper insight into the learning of social trends in West Asia. Students will be able to relate to these institutions and draw a link between the institution of slavery in the Islamic world and the issue of women's rights in other countries.

Course Objectives

After completion of this course, students will be able to

- Understand the historical background of the Balkan and ottoman problems.
- Understand the ideals behind the Turkey role in First World war and interpret its importance in shaping ideas across the world.
- Understand and critically analyze Nationalism in West Asia.
- Define and discuss the freedom struggle in Palestine: Struggles of Zionist movement

Course Outcomes

On completion of this course, the students will be able to

CO 1: Describe Tanzimat Reforms in Ottoman Empire

CO 2: Briefly understand the rise of Saudi Arabia as a monarchy

CO 3: Discuss Rise of Mustafa Kamal Pasha in Turkey

CO 4: Knowledge about Iranian Revolution of 1979 and the National Movement in Egypt

Course Content:

Modules	Blooms level*	Number of hours
MODULE-I: Rise of Arab Nationalism and the Palestinian Problem Causes and Result, Mandate System in West Asia after First World War, Iraq, Syria and Lebanon, History and Development, Arab and Israel conflicts up to 1967, Formation of Kingdom of Saudi Arabia	**L1, L2, L3**	16
MODULE-II: Iran and Western Powers Iran and Western Powers, Reign of Shah Raza Khan: Reforms and Achievements, Foreign Policy of Iran in First Half of 20th Century	**L1, L2, L3**	14
MODULE III: **Political Formations and Post-War Developments in Turkey** Tanzimat Era, Abdul Hamid's Policy of Reforms, Limitations, Young Turk Movement; Programe and Achievements, Turkey and First World War, Emergence of Kamal Pasha, Reforms and Achievements	**L3, L4, L5**	16

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MODULE-IV: Rise of Nationalism in Egypt Growth of Anglo-French Imperialism in Egypt, Rise of Nationalism: Causes and Results, Anglo-Egyptian Relations: Treaty of 1936 and afterwards till Second World War	**L3, L4, L5**	14

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Bernard Lewis: The Emergence of Modern Turkey
- George Kirk: Short History of the Middle East
- Sydney N Fisher: The Middle East
- Hasan Kayali: Arabs and Young Turk
- William Yale: The Near East
- Erik J Zurrcher: Turkey, A Modern History
- M Rowlatt: Founders of Modern Egypt
- Alberts H Houran: Syria and Lebnan
- Stephen H Longrigg: Iraq (1900-1950)
- William Yale: The Near East
- P Sykes: History of Persia vol. II
- Charles Issawi: Economic History of Middle East
- George Antonius: The Arab Awakening
- Hans Kohn: A History of Nationalism in the East

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**MT**	**A**	**Assignment**	**EE**
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	**1**	**-**	**1**	**--**	**2**	**--**	**--**	**1**	**1**	**1**
CO2	**1**	**-**	**1**	**--**	**1**	**--**	**--**	**1**	**1**	**--**
CO3	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**
CO4	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DHIS2603	HISTORY OF MEDIEVAL INDIA	L	T	P	FW/ Proj	C
Version	**1.2 (2023)**	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

The course aims to provide the students with an analytical overview of the developments in medieval India. Thus, it aims at developing a critical understanding of the development of the Indian society in the medieval age. The enlightened student community would, hence, be able to contribute towards a better present and future.

Course Objectives

After completion of this course, students will be able to

- Learn about the key historical sources from the Medieval period and the circumstances leading to the arrival of the Turks and Babur in India.
- Understand the consolidation of Sultanate and Mughal power through conquests and the evolution of administrative institutions like Zabt, Zamindari, and Mansabdari.
- Analyze the religious policies of the Delhi Sultans and Mughals, and their relations with the Rajputs.
- Investigate the decline of the Delhi Sultanate and Mughal Empire, recent historiographical trends, architectural developments, and economic changes impacting society and the state.

Course Outcomes

On completion of this course, the students will be able to

CO 1: Describe and explain the basic knowledge about the Delhi Sultanate and Mughal Empire, the rise and fall of it.

CO 2: Discuss and interpret different aspects of Alauddin Khilji and Akbar's rule.

CO3: Define the reasons for the downfall of the Delhi Sultanate and Mughal empire.

CO 4: Discuss the administrative and military changes brought about by the Delhi Sultans and the Mughals.

Course Content:

Modules	Blooms level*	Number of hours
MODULE-I: Political and Economic Developments in the Sultanate Period Coming of the Turks to India, Dynastic history—Ilbari Turks, Khaljis, Tughlaqs, Sayyids, and Lodhis, socio-political and economic developments, emergence of new institutions, nobility and new ruling elite, economic developments—urban revolution and rural revolution	**L1, L2, L3**	16
MODULE-II: Socio-religious Movements in the Sultanate Period, Art and Architecture Bhakti—origins, nirguna and saguna bhakti, Sufism-origins, silsilahs and impact on Indian society, Developments in architecture	**L1, L2, L3**	14
MODULE III: **Mughal India** The Early Mughals—Babur and Humayun, period of Akbar and Jahangir, political developments, new institutions, territorial integration, economic development,	**L3, L4, L5**	16

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Period of Shah Jahan, Aurangzeb—political developments, new institutions, territorial integration, economic developments		
MODULE-IV: Cultural Developments and the Decline of the Mughal Empire Paintings, architecture, music, calligraphy, patronage of the arts, Causes for the fall of the Mughal Empire, theories—old and new, Rise of regional polities, Coming of the British	**L3, L4, L5**	14

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Chandra Satish, Medieval India Vol. I and II,Haranand Publications Pvt. Lt, 2001
- Kumar Sunil, Emergence of the Delhi Sultanate, Permanent Black, 2010
- Habib Irfan, Medieval India I: Researches in the History of India, Oxford University Press, 1998
- S. Nurul Hasan, Religion, State, and Society in Medieval India
- Jadunath Sarkar, History of Aurangzeb
- Muzaffar Alam and Sanjay Subrahmanyam, eds, The Mughal State, 1526 – 1750
- J.F. Richards, The Mughal Empire
- Catherine Asher and Cynthia Talbot, India Before Europe
- Irfan Habib, Agrarian System of Mughal India, 1526 – 1707
- S.A.A. Rizvi, Religious and Intellectual History of the Muslims in Akbar's Reign
- Stephen F. Dale, Garden of the Eight Paradises: Babur and the Culture of Empire
- R P Tripati, The Rise and the Fall of the Mughal Empire

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**MT**	**A**	**Assignment**	**EE**
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	**1**	**-**	**1**	**--**	**2**	**--**	**--**	**1**	**1**	**1**
CO2	**1**	**-**	**1**	**--**	**1**	**--**	**--**	**1**	**1**	**--**
CO3	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**
CO4	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**2**	**1**	**--**

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DHIS2604	EXPLORING REALMS: NARRATIVES OF URBAN AND RURAL INDIA THROUGH FICTION, FIELDWORK, FILM & HISTORY	L	T	P	FW/ Proj	C
Version	**1.2 (2023)**	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Course catalog:
This course delves into a myriad of portrayals depicting urban and rural life in India, as presented by novelists, anthropologists, folklorists, filmmakers, and historians. The curated selection comprises two timeless novels offering insights into life in 19th and early 20th century Delhi, three varied perspectives on village life from both North and South India, excerpts (along with their cinematic adaptations) from the works of Rajasthani folklorist KomalKothari and Vijay Dandetha.

Learning Outcomes:
The course is aimed at enhancing the analytical skills of students while understanding how socio-cultural, political and historical changes shape our society and perspectives. The learningoutcomes can be defined as follows:

- Exhibit a comprehensive understanding of the relationship between history and orality,highlighting the ways in which oral traditions contribute to historical narratives.
- Analyse the historical context of Delhi during the 19th and 20th century, identifying key events, societal transformations, and their impact on the cultural fabric of the region.
- Explore the intricate relationship between memory, history, and identity, understandinghow individual and collective memories shape historical narratives.
- Analyse how literary and cinematic works reflect and influence societal perceptions ofmarginalized communities, considering the impact on cultural understanding

Course Outcomes
On the completion of the course, the student will be able to:
CO 1- Analyze and critically assess the various portrayals of urban and rural life in India,as depicted by novelists, anthropologists, folklorists, filmmakers, and historians.
CO 2- Investigate the historical and cultural nuances embedded in two classic novelsfocused on life in 19th and early 20th century Delhi.
CO 3- Evaluate the significance and impact of the works of Rajasthani folklorist KomalKothari and Vijay Dan Detha.
CO 4- Examine the ways in which the subaltern is represented in fiction, fieldwork andfilm.

Modules	Blooms level*	Number of hours
Module1: History and orality Oral tradition as historical narratives, cultural impact of oral historie	L1, L2, L3	14

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Module 2: Socio-cultural changes in 19th and 20th century Delhi Urban Transformation and Cultural Shifts Political Movements and Social Dynamics	L1, L2, L3	16
Module 3: **Memory, History and Identity** Individual and Collective Memory, Historical Narratives and Identity Formation	L3, L4, L5	16
Module 4: **Literary and Cinematic Representations of the Marginalised** Narratives of Marginalized Voices, Social Impact of Representation	L3, L4, L5	14

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-*

Essential Readings:

- Maulvi Nazir Ahmad, The Bride's Mirror: Mirat ul 'Arus: A Tale of Life in Delhi a Hundred Years Ago, Tr. From Urdu by G.E. Ward. First Published in EnglishTranslation, 1903 (Permanent Black, Delhi, 2001).
- Ahmed Ali, Twilight in Delhi: A Novel (First Published, 1940; Rupa and Company, Delhi, Pb. 2007) Urdu tr. by Bilqis Jahan, Dilli ki Shaam (Maktab-i-Idara-i-Jamia, Dehli, 1976)
- Gertrude Emerson Sen, Voiceless India [A Discursive Account of a Village in Balrampur, UP in the 1920s] (John Day and Co., New York, 1944)
- M.N. Srinivas, The Remembered Village (OUP, Delhi, Pb. 1988, and subsequent reprints).
- Arvind N Das, 'Changel: Three Centuries of an Indian Village',in Robin Jeffrey et al eds., India: Rebellion to Republic: Selected Writings, 1857-1990 (Sterling Publishers, Delhi, 1990
- Rustom Bharucha, Rajasthan: An Oral History: Conversations with Komal Kothari(Penguin Books, India, Pb. 2007).
- Vijaydan Detha, The Dilemma, and other Stories, translated by Ruth Vanita (anushiPrakashan, New Delhi, 1997), specially 'The Dilemma'.
- Natalie Zemon Davis, The Return of Martin Guerre (Harvard University Press 1983)
- Two films: 'Le Retour de Martin Guerre'; Mani Kaul's 'Duvidha'
- Ira Pande, Diddi: My Mother's Voice (Penguin India, paperback, 2005)

Examination Scheme:

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**MT**	**A**	**Assignment**	**EE**
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	1						1		
CO2		1	1					1		
CO3	1									1
CO4	1									

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course code: DHIS2605	PERSPECTIVES ON GLOBAL HISTORY	L	T	P	FW/ Proj	C
Version	1.2 (2023)	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

Microsoft Excel is a very popular business productivity application for the management and manipulation of data. With the right training and understanding of Excel, businesses and individual users can unlock the world of opportunities that this powerful business application offers. This course will provide all the tools necessary to create and use basic and advanced spreadsheets.

Course Objectives

On the completion of the course, the student will be able to:

1. Demonstrate a nuanced understanding of the terms 'World' and 'Global' in the context of history, recognizing and articulating the distinctions between these conceptualframeworks
2. Analyse the role of the environment in shaping historical developments on a globalscale, exploring how environmental factors have influenced societies, cultures, and historical events.
3.Critically examine the role of gender in shaping historical narratives on a global scale, identifying how societal norms, power structures, and cultural contexts have influenced the experiences of individuals based on gender.

Course Outcomes

On the completion of the course, the student will be able to:

CO 1- Demonstrate a nuanced understanding of the terms 'World' and 'Global' in the context of history, recognizing and articulating the distinctions between these conceptualframeworks

CO 2- Analyse the role of the environment in shaping historical developments on a globalscale, exploring how environmental factors have influenced societies, cultures, and historical events.

CO 3- Critically examine the role of gender in shaping historical narratives on a global scale, identifying how societal norms, power structures, and cultural contexts have influenced the experiences of individuals based on gender.

CO 4- Explore the historical significance of food as a lens through which to understandglobal historical developments, examining how food production, consumption, and tradehave influenced societies across different time periods

Course Content:

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Modules	Blooms level*	Number of hours
Module-I Concepts of 'World' and 'Global' History Perspectives on World and Global History Global Networks and Connections	**L1, L2, L3**	16
Module-II Environment in Global History Ecological Impact of Historical Events Cultural Perspectives on Nature	**L1, L2, L3**	14
MODULE III: **Gender in world history** Power Dynamics and Gender Roles, Resistance and Agency	**L3, L4, L5**	14
MODULE-IV: Food in Global History, Culinary Exchange and Globalization, Food as a Historical Lens	**L3, L4, L5**	16

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Braudel, Ferdinand (1993) A History of Civilizations, Tr. Richard Mayne, VikingPenguin, New York.
- Bayly, C.A. (2004) The Birth of the Modern World: Global Connections andComparisions 1780-1914, Oxford UK: Blackwell.
- Hopkins, A.G. (2002) Globalization in World History, W. W. Norton & Company.
- Stearns, Peter N. (2009) Globalization in World History, Routledge.
- Osterhammel, Jurgen & Petersson, Niels P. (2005) Globalization: A Short History,Princeton, NJ: Princeton University Press.
- Chaudhuri, K.N. (1990) Asia Before Europe: Economy and Civilization of the IndianOcean from the rise of Islam to 1750, Cambridge UK.
- Fernandez-Armesto, F. (2003) The Americas: A Hemispherical History, New York.
- Stearns, Peter N. (2006) Gender in World History (1st ed. 2000) New York &London.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	MT	A	Assignment	EE
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	--	2	--	--	--	--	--	1	2	2	2
CO2	--	2	--	--	--	--	--	1	2	2	2
CO3	--	2	--	--	--	--	--	1	2	2	2
CO4	--	2	2	--	--	--	--	1	--	2	2
CO5	--	--	2	--	--	--	1	1	2	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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SEMESTER-VII

Course code: DHIS2701	HISTORY OF CONTEMPORARY INDIA	L	T	P	FW/ Proj	C
Version	**1.2 (2023)**	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Course catalog:
The course will seek to provide the students with a basic yet meaningful understanding of an in-depth understanding about contemporary issues in India including most of the major political, economic, social, and cultural events that have shaped India post- independence. The course will help students in developing critical thinking about processes of which they are a part and also enrich the knowledge of the students and make them aware about various issues related to the growth and development of India.

Course Outcomes

- On the completion of the course, the student will be able to:
- CO1: Describe and explain the political scenario of contemporary India.
- CO2: Define and summarize the emerging trends in contemporary politics in India.
- CO3: Recall and explain the style of development under the state structure.
- CO4: Define and explain the facets of contemporary developments.

Course Objectives
On the completion of the course, the student will be able to:
1. Demonstrate a nuanced understanding of the terms 'World' and 'Global' in the context of history, recognizing and articulating the distinctions between these conceptualframeworks
2. Analyse the role of the environment in shaping historical developments on a globalscale, exploring how environmental factors have influenced societies, cultures, and historical events.
3.Critically examine the role of gender in shaping historical narratives on a global scale, identifying how societal norms, power structures, and cultural contexts have influenced the experiences of individuals based on gender.

Course Outcomes
On the completion of the course, the student will be able to:
CO 1- Demonstrate a nuanced understanding of the terms 'World' and 'Global' in the context of history, recognizing and articulating the distinctions between these conceptualframeworks
CO 2- Analyse the role of the environment in shaping historical developments on a globalscale, exploring how environmental factors have influenced societies, cultures, and historical events.
CO 3- Critically examine the role of gender in shaping historical narratives on a global scale, identifying how societal norms, power structures, and cultural contexts have influenced the experiences of individuals based on gender.
CO 4- Explore the historical significance of food as a lens through which to understandglobal historical developments, examining how food production, consumption, and tradehave influenced societies across different time periods

Course Content:

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Modules	Blooms level*	Number of hours
Module I: Political Events in the History of Contemporary India - Emergence of political parties at the national level - Emergence of political parties at the state level - History of electoral politics and its contemporary relevance - Caste and religion as factors in electoral politics in contemporary India - The Kashmir Issue - Uniform Civil Code - Violence and Politics- Sikh Riots, Babri Masjid, Bombay Riots, Gujarat Riots	**L1, L2, L3**	14
Module 2: Perspectives on Development since Independence - State and planning- The Five-Year Plans, impact and assessment - Reforms undertaken by the government since independence - Economy and Liberalization, emergence of middle class, industrial expansion	**L1, L2, L3**	14
Module 3: Development Strategy and its Impact - New economic structures-mixed economy, privatisation, special economic zones (SEZ) - Impact on industry, organised and unorganised labour - Land reforms in India - History of the Green and White Revolutions - IT Revolution - Environmental Issues- Historical perspective on environmental issues	**L3, L4, L5**	16
Module 4: Ideologies and Movements - Emergence of Naxalism-historical perspective - RSS and the emergence of Hindutva politics- secularism vs communalism debate - Muslim right-wing organizations and politics - Terrorism and its impact on India - Linguistic movements and emergence of new states - Human Rights and Women's Rights in India - Right to Information	**L3, L4, L5**	16

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Chandhoke, Neera, and Priyadarshi, Praveen (ed.) (2009) *Contemporary India: Economy,Society, Politics*, Delhi: Pearson
- Pratap, Bhanu Mehta and Jayal, Neeraja (ed), (2003). *Handbook of Indian Politics*, NewDelhi: Oxford University Press
- Chandra, Bipin, Mukherjee, Mridula and Mukherje , Aditya, (2008). *India sinceIndependence*, New Delhi: Penguin

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Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	MT	A	Assignment	EE
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	--	2	--	--	--	--	--	1	2	2	2
CO2	--	2	--	--	--	--	--	1	2	2	2
CO3	--	2	--	--	--	--	--	1	2	2	2
CO4	--	2	2	--	--	--	--	1	--	2	2
CO5	--	--	2	--	--	--	1	1	2	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DHIS2702	HISTORY OF BORDERLANDS	L	T	P	FW/ Proj	C
Version	1.2 (2023)	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Course catalog:
This course will explore societies residing at the peripheries of the colonial empire in India, investigating the evolution of these transitional and liminal spaces throughout the nineteenth and the first half of the twentieth century. Emphasizing distinctive modes of resistance prevalent in these margins, the course will scrutinize the responses to governmental technologies employed to govern these regions. Key themes of resistance, including mobility,insurgency, 'agricultures of escape,' ethnogenesis, orality, and collective memory, will be examined to gain insights into the multifaceted nature of opposition within these marginalizedspaces.

Course Objectives:
1. Explore the dynamics of peripheral practices
2. Examine how marginalized spaces within historical contexts have developed unique and distinctive practices that reflect their position in societal structures

Course Outcomes (COs): Course Outcomes
On the completion of the course, the student will be able to:
CO 1- Explore the dynamics of peripheral practices, examining how marginalized spaceswithin historical contexts have developed unique and distinctive practices that reflect their position in societal structures.
CO 2- Examine the historical implications of power dynamics, governance structures, and the experiences of communities existing on the fringes.
CO 3- Analyze the impact of national policies, border dynamics, and the formation of national identity on communities situated at the frontiers of nations
CO 4- Explore how environmental factors influence cultural practices and identity formation, and analyse the historical implications of these connections on the communities residing at the peripheries.

Course Content:

Modules	Blooms level*	Number of hours
Module I: The Margins of History Counter Narratives and Marginal Perspectives, the state, the non-state and the stateless	**L1, L2, L3**	14
Module II: **Resistance and Rebellion** Societal Dynamics and Resistance	**L1, L2, L3**	16

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Module 3: **Culture, Orality, Ecology and Identity** Nature, Frontiers, and Livelihood, Colonialism and Peripheral Identities.	**L3, L4, L5**	16
Module 4: **The Nation at the Frontiers** State Representation and Rule, Mobility and Frontier Trade, Nomadism and Political Dynamics	**L3, L4, L5**	14

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Essential Reaadings

- Clastres, Pierre, Society Against the State, New York, Zone Books, 1993.
- Skaria, Ajay, Hybrid Histories: Forests, Frontiers and Wildness in Western India, Oxford University Press, 1999.
- Banerjee, Prathama, The Politics of Time, New Delhi, Oxford University Press, 2006
- Indrani Chatterjee, Gender, Slavery, and Law in Colonial India, Oxford University Press, 1999.
- Guha, Sumit, Environment and Ethnicity in India 1200 - 1991, Cambridge University Press,1999.
- Balland, D., 'Nomadism and Politics: The Case of the Afghan

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	**MT**	**A**	**Assignment**	**EE**
Weightage (%)	10	5	10	70

CT: Class Test, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	1	1						1		
CO2		1	1					1		
CO3	1									1
CO4	1									

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course code: DHIS2703	HISTORY OF BRITISH RULE IN INDIA-I	L	T	P	FW/ Proj	C
Version	1.2 (2023)	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description:
This course has been created to acquaint the students with the early history of the British rulein India. The key components of the course include the expansion and consolidation of colonial power, colonial strategy and ideology, rural economy and society under British rule,trade and industry under the British, and popular resistance movements. The course will helpin enhancing the awareness of students about the coming of the British to India.

Course Objectives:
On completion of this course, the students will be able to:
1. Understand colonialism and imperialism
2. Learn about the various ideologies and philosophies such as mercantilism, utilitarianism and liberalism
3. Understand the land revenue policies of East India company
4. Evaluate the impact of British economic policies and its impact on India

Course Outcomes (COs):
On completion of this course, the students will be able to:
CO1: Introduce students to the debate around the 18th century India
CO2: Acquaint students with the various debates such as Traditional and Revisionist
CO3: Analyse the impact of British economic policies on the Indian peasantry
CO4: Acquaint students about the political conquest of India by the East India Company in the 18th – 19th centuries

Course Content:

Modules	Blooms level*	Number of hours
Module I: **India in the mid-18th Century** Society-economy developments, Political developments	**L1, L2, L3**	14
Module II: **Expansion and Consolidation of Colonial Power** • Mercantilism, foreign trade and early forms of exactions from Bengal • Dynamics of expansion, with special reference to Bengal, Mysore, Western India, Awadh, Punjab, and Sindh	**L1, L2, L3**	14

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Module III: **Colonial State and Ideology** • Arms of the colonial state: army, police, law • Ideologies of the Raj and racial attitudes • Education: indigenous and 'modern' .	**L3, L4, L5**	16
Module IV: **Rural Economy, Society, Trade and Industry** • Land revenue systems and forest policy • Commercialisation and indebtedness • Rural society: change and continuity • Famines • Pastoral economy and shifting cultivation • De-industrialization • Trade and fiscal policy • Drain of Wealth	**L3, L4, L5**	16

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text books:

- C. A. Bayly, Indian Society and the Making of the British Empire, New Cambridge
- History of India.
- Bipan Chandra, Rise and Growth of Economic Nationalism in India.
- Subash Chakravarty, The Raj Syndrome: A Study in Imperial Perceptions, 1989.
- J.S. Grewal, The Sikhs of the Punjab, New Cambridge History of India
- Ranajit Guha, ed., A Subaltem Studies Reader.
- Dharma Kumar and Tapan Raychaudhuri, eds., The Cambridge Economic History
- of India, Vol. II.
- P.J. Marshall, Bengal: The British Bridgehead, New Cambridge History of India.
- R.C. Majumdar, ed., History and Culture of Indian People, Vols. IX and X.
- British Paramountcy and Indian Renaissance.
- Rajat K. Ray, ed., Entrepreneurship and Industry in India, 1800-1947, Oxford In
- India Readings.
- Eric Stokes, English Utilitarians and India.
- Ram Lakhan Shukla, ed., Adhunik Bharat ka Itihas.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**MT**	**A**	**Assignment**	**EE**
Weightage (%)	10	5	10	70

CT: Class Test, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	1	1						1		
CO2		1	1					1		
CO3	1									1
CO4	1									

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course code: DHIS2704	HISTORY OF BRITISH RULE IN INDIA-II	L	T	P	FW/ Proj	C
Version	1.2 (2023)	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Course catalog:
This course has been created to acquaint the students with the history of the British rule in India. The key components of the course include the cultural changes and religious reform movements during the British period, early trends in nationalism, Gandhian nationalism, communal politics, and the partition of India. The course will help in enhancing the awarenessof students about the history of the freedom movement in India.

Course Objectives
After completion of this course, students will be able to

- Understand that the freedom movement was much beyond a movement against the British Government. It was accompanied by social and cultural movements. Such movements were responsible in shaping the present day India.
- Recognize the different phases of the freedom struggle and important events like theJallianwala Bagh massacre, Chauri Chaura tragedy etc.
- Understand the terms like communism, communalism and movements associated with them.
- Acknowledge the Moderate and Extremists, their point of contention and the role ofrevolutionaries in the freedom struggle.
- Acknowledge the role of Mahatma Gandhi and the INC in the freedom struggle against theBritish.

Course Outcomes
On the completion of the course, the student will be able to:
CO 1: Describe and explain the developments in the field of economy under British rule in India.
CO 2: Explain the key components of the cultural changes and religious reform movementsduring the British period
CO 3: Explain the early trends in nationalism and Gandhian nationalism
CO4: Discuss the partition of India

Course Content:

Modules	Blooms level*	Number of hours
MODULE-I: Cultural Changes and social and Religious Reform Movements Coming of Printing Press and its Implications, Reformist and Revivalist Movements : Brahmo Samaj, Prarthna Samaj, Arya Samaj ;Wahabi Movement; Deoband, Aligarh and Singh Sabha Movements. Caste, Gender and Freedom Struggle: Debates	**L1, L2, L3**	14
MODULE-II: Nationalism: Trends up to 1919	**L1, L2, L3**	14

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Political ideology and organizations, formation of INC, Moderates and extremists, Swadeshi movement, Revolutionaries		
MODULE III: **Gandhian Nationalism after 1919: Ideas and Movements** Mahatma Gandhi: his Perspectives and Methods, Rowlatt Satyagraha and Jallianwala Bagh Massacre, Non-Cooperation and Civil Disobedience Movement, Provincial Autonomy, Quit India and INA, Left-wing movements	**L3, L4, L5**	16
MODULE-IV: Independence and Partition Negotiations for independence, and partition, Popular movements, Partition riots	**L3, L4, L5**	16

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Judith Brown, *Gandhi's Rise to Power*, 1915-22.
- Paul Brass, *The Politics of India Since Independence*, OUP, 1990.
- Bipan Chandra, *Nationalism and Colonialism in Modern India*, 1979.
- *Rise and Growth of Economic Nationalism in India*.
- Mohandas K. Gandhi, *An Autobiography or The Story of My Experiments with Truth*.
- Ranajit Guha, ed., *A Subaltern Studies Reader*.
- Peter Hardy, *Muslims of British India*.
- Mushirul Hasan, ed., *India's Patition*, Oxford in India Readings.
- D.A. Low, ed., *Congress and the Raj*.
- John R. McLane, *Indian Nationalism and the Early Congress*.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	MT	A	Assignment	EE
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	--	2	--	--	--	--	--	1	2	2	2
CO2	--	2	--	--	--	--	--	1	2	2	2
CO3	--	2	--	--	--	--	--	1	2	2	2
CO4	--	2	2	--	--	--	--	1	--	2	2
CO5	--	--	2	--	--	--	1	1	2	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DHIS2705	MIGRATION AND HISTORY	L	T	P	FW/ Proj	C
Version	2023	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description:
This course provides a comprehensive exploration of the Indian diaspora, tracing its origins from the era of indentured labour to its contemporary manifestations in a globalized world. Through four distinct modules, students will delve into the historical dynamics of migration, displacement, and the interconnectedness of the modern world system. The focus then shifts tothe diasporic experience in the United Kingdom, examining religious life, cultural expressions, and community dynamics. The course further investigates the challenges and achievements ofdiasporic communities in their struggle for rights, addressing the preservation of cultural identity and engagement in political advocacy. Finally, students analyze the intricate interplaybetween the politics of the nation-state and long-distance nationalism, emphasizing the relationship between cultural affiliation and national identity within diasporic contexts.

Course Objectives
1.After completion of this course, students will be able to
2.Critically analyze the role of migration in the context of the modern world system, exploring patterns of displacement and migration.
3.Explore the cultural expressions, traditions, and community dynamics of Indians inthe United Kingdom.
4.Understand the ways in which diasporic communities engage in political mobilization and advocacy for their rights, exploring the impact of these efforts on both local and global political landscapes.
5.Examine how diasporic communities manage and impact national identities while being geographically distant from their homeland.

Course Outcomes
On completion of this course, the students will be able to
CO 1: Gain a thorough understanding of the historical context, motivations, and consequences of indentured labor migration, examining its impact on the formation of the modern Indian diaspora.
CO 2: Explore the religious practices, institutions, and dynamics within the Indian diasporic communities in the United Kingdom.
CO 3: Evaluate strategies employed by diasporic communities to preserve and adapt their cultural identity.
CO 4: Examine the intricate relationship between cultural affiliation and national identity in the context of long-distance nationalism.

Course Content:

Modules	Blooms level*	Number of hours
MODULE-I: **The Origins of Modern Indian Diaspora** • Indentured Labor • Migration, Displacement, and the Modern World System	**L1, L2, L3**	14

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MODULE-II: **Indians in the United Kingdom** • The Religious Life of Diasporic Communities Culture and Community in the Diaspora	**L1, L2, L3**	14
MODULE III: **The Struggle for Rights in the Diaspora** • Preservation and Adaptation of Cultural Identity • Political Mobilization and Advocacy	**L3, L4, L5**	16
MODULE-IV: **Politics of the Nation-State and Long-Distance Nationalism** • Cultural Affiliation and National Identity	**L3, L4, L5**	16

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Judith Brown, Global South Asians: Introducing the Modern Diaspora (CambridgeUniversity Press, 2006).
- Stephane Dufoix, Diasporas, trans. William Rodamor (Berkeley: University ofCalifornia Press, 2008).
- South Asians Overseas: Migration and Ethnicity, ed. Colin Clarke, Ceri Peach andSteven Vertovec (Cambridge: Cambridge UP, 1990).
- Selections from Brij V. Lal, ed., The Encylcopedia of the Indian Diaspora (Singapore:Editions Didier Millet, in association with National University of Singapore, 2006).
- Hugh Tinker, A New System of Slavery: Export of Indian Labour Overseas 1830-1920 (Hansib Caribbean, 1991).
- Marina Carter and Khal Torabully, Coolitude: An Anthology of the Indian LabourDiaspora (South Asian Anthem Studies, 2002).
- Sandhya Shukla, India Abroad: Diasporic Cultures of Postwar America andEngland(Princeton University Press, 2003).
- Vinay Lal, The Other Indians: A Cultural and Political History of South Asians inAmerica (Delhi: HarperCollins; Los Angeles: University of California/Asian American Studies Center Press, 2008).

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**MT**	**A**	**Assignment**	**EE**
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	--	2	--	--	--	--	--	1	2	2	2
CO2	--	2	--	--	--	--	--	1	2	2	2
CO3	--	2	--	--	--	--	--	1	2	2	2
CO4	--	2	2	--	--	--	--	1	--	2	2
CO5	--	--	2	--	--	--	1	1	2	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DHIS2706	READING AMBEDKAR, GANDHI AND SAVARKAR	L	T	P	FW/ Proj	C
Version	**1.2 (2023)**	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course offers a comprehensive exploration of key figures and ideologies that shaped thelandscape of Indian nationalism during the pivotal period leading to independence. Divided into four modules, each segment delves into the distinct contributions and perspectives of influential figures, examining their roles in the quest for independence

Course Objectives

The learning outcomes can be defined as follows:

- Gain insight into Savarkar's perspectives on Indian nationalism and his engagementwith Congress politics, discerning the nuances of his contributions.
- Analyse key events such as the Rowlatt Satyagraha, Jallianwala Bagh massacre, non-cooperation, civil disobedience, provincial autonomy, Quit India, and the INA in the context of mass nationalism.
- Familiarity with Ambedkar's seminal work, "The Annihilation of Caste," and itsimplications for social and political change.
- Cultivate a nuanced comprehension of the varied ideologies and movements that significantly influenced the course of Indian nationalism, shaping its trajectory towards independence.

Course Outcomes

On completion of this course, the students will be able to

CO1- Gain an in-depth comprehension of the evolution of revolutionary ideology and itsinfluence on the nationalist discourse.

CO2- Acquire a comprehensive understanding of Gandhi's pivotal role in the massnationalism movement, examining his principles and strategies.

C03- Delve into Ambedkar's perspectives on the caste question, critically assessing hiscritiques of the prevailing social structure.

C04- Reflect on the enduring legacies of Gandhi, Ambedkar, and Savarkar, discerning theirrespective impacts on the path to Indian independence.

Course Content:

Modules	Blooms level*	Number of hours
MODULE-I: **Savarkar and Nationalism** • The development of revolutionary ideology. • The views on Indian nationalism and Congress politics. • Fermentations of thoughts on colonial rule and Hindutva. • The idea of rislo nationalism.	**L1, L2, L3**	16

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MODULE-II: **Gandhi and Mass Nationalism** • Gandhi and Hind Swaraj • Rowlatt Satyagraha and Jallianwala Bagh • Non – Cooperative and Civil Disobedience • Provincial Autonomy, Quit India and INA	**L1, L2, L3**	16
MODULE III: **Ambedkar and Social Movement** • Ambedkar and the Caste Question • Understanding Ambedkar's, The Annihilation of Caste • Perspectives on Nationalism	**L3, L4, L5**	14
MODULE-IV: **India and Independence** • The Legacy of Gandhi, Ambedkar and Savarkar	**L3, L4, L5**	14

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books Vikarm Sampath, Savarkar, Echoes from forgotten past,1883-1924.

- Harindra Srivasatva, Five stormy years: Savarkar in London.
- Indulal Yagnik, Shyam ji Krishna Verma: life and works of an Indian revolutionary.
- Dhanjay Keer, Veer Savarkar.
- Bose A.C. Indian revolutionaries abroad 1905-27, select documents.
- David Garnet, The golden echo.
- V. N. Datta, Madan Lal Dhingra and revolutionary movement.
- Emily. Brown, Har Dayal Indian revolutionary and rationalist.
- Bulu Roy Chaudhry, Madam Cama a short life sketch.
- V. D, Savarkar, Indian War of Independence.
- M.P.T Acharya, Reminiscences of an Indian revolutionary
- R.C. Majumdar, History of Indian freedom movement.
- V.D. Savarkar, Newsletters from London
- V.D. Savarkar, inside enemy camp.
- Collected Works of Mahatma Gandhi, Ahmedabad, Navjivan Press, (first edition), 1956.
- Hind Swaraj or Indian Home Rule (Gujarati and English Edition). Also consult theeditions by Anthony Parel, S.R. Mehrotra and Suresh Sharma.
- M.K. Gandhi, Autobiography or the Story of my Experiments with Truth, Ahmedabad,Navajivan, 1959.
- Ambedkar, Gandhi and Gandhism, Jullundur, Bheem Patrika Publications, 1970.
- Erik K. Erikson, Gandhi's truth on the origins of militant non-violence, New York,Norton 1969.
- Raghavan Iyer, The Moral and Political Thought of Mahatma Gandhi, Delhi, OxfordUniversity Press, 1973.
- Bhiku C. Parekh, Colonialism, tradition, and reform: an analysis of Gandhi's politicaldiscourse, New Delhi ; Thousand Oaks, California: Sage, 1999.
- Ashis Nandy, Traditions, Tyranny and Utopias: Essays in the Politics of Awareness,Delhi; New York: Oxford University Press, 1987.
- David Hardiman, Gandhi in His Time and Ours: A Global Legacy, New York: ColumbiaUniversity Press, 2003.
- Dennis Dalton, Mahatma Gandhi: Nonviolent Power in Action New York, ColumbiaUniversity Press, 1993
- Sabyasachi Bhattachraya, The Mahatma and the

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Poet, National Book Trust, Delhi.

- Valerian Rodrigues Ed. The essential writings of B.R. Ambedkar Delhi ; Oxford : OxfordUniversity Press, 2004

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	MT	A	Assignment	EE
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	--	2	--	--	--	--	--	1	2	2	2
CO2	--	2	--	--	--	--	--	1	2	2	2
CO3	--	2	--	--	--	--	--	1	2	2	2
CO4	--	2	2	--	--	--	--	1	--	2	2
CO5	--	--	2	--	--	--	1	1	2	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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DHIS2739	BASICS OF RESEARCH METHODOLOGY, ETHICS, AND RESEARCH COMMUNICATION	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description

This course aims to provide students with a comprehensive understanding of conducting ethical research, utilizing proper research methodologies, and effectively communicating research findings. The course includes a final project where students will write a Literature Review on a topic chosen in consultation with the teacher(s).

This course is designed to equip students with essential skills and knowledge to conduct ethical research, employ proper research methodologies, and effectively communicate scientific information (with focus on writing a literature review). The course will cover topics such as research design, data collection and analysis, research ethics, and science communication strategies. Through a combination of lectures, discussions, case studies, and practical exercises, students will develop a deeper understanding of the research process and its ethical implications.

Course Objectives

The objective of this course is to impart knowledge about various stages of research process, research ethics and different ways of research communication.

The aim of this course is to impart research skills to the beginners and help to improve the quality of research by the existing researchers. It also encompasses the understanding and application of appropriate research design, statistics, and the use of the computer for reference management, report writing, research paper writing and presentation. The course also introduces the key conceptual issues of each research method, as well as giving practical guidance. It covers the series of research methodology contents: from problem formulation, to design, to data collection, analysis, reporting and dissemination. The course has the dual aims of equipping students with conceptual understandings of current academic debates regarding different methods, and the practical skills to put those methods into practice.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define criteria of good research, steps in research process, and data collection.

CO2. Identify different types of sampling and its purpose.

CO3. Conduct hypothesis testing for different types of samples and interpret the results.

CO4: Learn the importance of literature review, write research paper/thesis, use reference management software.

Course Content :

Module	Topic	**Blooms level***	Hours
1	**Research Methodology** Understanding the research process: From research questions to conclusions Types of research: Qualitative and quantitative research Exploratory, descriptive, experimental, and correlational studies Scientific Thinking: Subjective Vs. Objective Thinking	L1, L2	10

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	Logical Reasoning: Inductive Vs. Deductive Reasoning Formulating research hypotheses and objectives Purpose of a good research, Criteria of good research		
2	**Descriptive Statistics** Data, Types of Data, Methods of data collection, Benefits and drawbacks, Graphical representation of data and interpretation. Measures of Central Tendency: Arithmetic Mean, Median, Mode, Measures of Dispersion: Range, Standard Deviation, Variance, Coefficient of Variation.	L1, L2, L3	15
3	**Inferential Statistics** Sampling: Basic concepts, Process of Sampling, Sample Size, Types of Samples, Sampling and non- sampling errors, Statistics and Parameters, Sampling Distribution of Means and Proportion, **Hypothesis Testing**, steps in testing of hypothesis, errors in hypothesis testing, z test and t test.	L1, L2, L3	15
4	**Research Ethics** Plagiarism, Fabrication, Falsification, Ethics with respect to human and Animal Research	L1, L2	5
5	**Communication** Characteristics of a good Research paper, Systematics Literature Review (choosing a topic, preparing outline, gathering authentic & appropriate references, avoiding plagiarism, use of reference management systems), Writing a good literature review, Structure of report (Introduction, Methodology, Analysis, Results, Discussions, Conclusions, Recommendations), Writing Quality Research Paper, Publishing Research Work in Quality Journals, Reference Management Software	L1, L2, L3	15

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional Exam	End Term Examination
Weightage (%)	5	10	15	70

Project based assignment: Student teams (2-3 students per team) will write a literature review on a topic of choice, in consultation with the teacher.

Text books/ Reference books

- Research Methodology for Natural Sciences by Soumitro Banerjee, Publisher: IISc Press (1 January 2022); ISBN-10: 8194835178; ISBN-13: 978-8194835172
- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt. Ltd., New Delhi-110001
- Geode, Millian J.& Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Kothari, C.R.2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.
- Levin R I., Rubin D S. Statistics for Management. Sixth Edition, PHI
- Kapoor & Gupta. Probability & Statistics. S Chand Publishers, New Delhi.
- Montomery, Douglas C.(2007), 5th Ed. Design and Analysis of Experiments, Wiley India.

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- Cooper, Donald R. and Pamels Schindler, Business Research Methods, Tata McGraw Hills, New Delhi
- Krishnaswamy, K.N. Sivakumar. Appa lyer and Mathiranjan M. 2006, Management Research Methodology: Integration of Principles, Methods and Techniques, Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Sachdeva, J.K. 2008. Business Research methodology. Himalaya Publishing House, New Delhi.
- Shekharan, Uma, Business Research Methods, Miley Education, Singapore.
- Zikmund, Millian G., Business Research Methods, Thomson Learning, Bombay.

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SEMESTER-VIII

Course Code DHIS2801	THE POPULAR CULTURE	L	T	P	FW/ Proj	C
Version	**1.2 (2023)**	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Course catalog:
This course has been created to acquaint the students with the history of popular culture in India. The key components of the course include folklore, oral tradition, food history and pilgrimage and practices. The course will help in enhancing the awarenessof students about the various cultures in India.

Course Objectives
After completion of this course, students will be able to

- Understand folk culture and various popular dance forms.
- Important pilgrimage and pilgrimage practices.
- Major culinary cultures and food cultures.
- Folk lore and oral traditions.

Course Outcomes
On completion of this course, the students will be able to
CO1: Describe the features of different folk cultures.
CO2: Demonstrate their understanding of food and culinary cultures.
CO3: Illustrate the narratives of oral traditions.
CO4: important pilgrimages and pilgrimage practices.

Course Content:

Modules	Blooms level*	Number of hours
MODULE-I: Define popular culture Theatre-folk, tales, songs and dances	**L1, L2, L3**	14
Modules II: Folklore and oral traditions of kathas, narratives, legends Festivals, fair and rituals.	**L1, L2, L3**	16
Modules III: Pilgrimage and pilgrim practices The religious sanctity of the pilgrims and rituals	**L3, L4, L5**	14
Module IV: Food cultures of India The major culinary practices as prevalent in India, A visit to a cultural event/ exhibition/performance is part of this course.	**L3, L4, L5**	16

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Acharya, K.T. Indian Food: A Historical Campanion. New Delhi: OUP, 1994.
- Bhardwaj, R.M. Vratas and Utsavas in North and Central India (Literary andEpigraphic Sources : c400-1200), New Delhi: Eastern Book Linkers, 2015.
- Buck, C.H. Faiths, Fairs and Festivals of India. New Delhi: Asian

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PublishingServices, 1977.
- Jha, M., ed. Social Anthropology of Pilgrimage. New Delhi: Inter-India Publication,1991.
- Storey, J. Cultural Theory and Popular Culture. Delhi: Pearson Prentice Hall, 2009.

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	MT	A	Assignment	EE
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	--	2	--	--	--	--	--	1	2	2	2
CO2	--	2	--	--	--	--	--	1	2	2	2
CO3	--	2	--	--	--	--	--	1	2	2	2
CO4	--	2	2	--	--	--	--	1	--	2	2
CO5	--	--	2	--	--	--	1	1	2	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DHIS2802	GENDER AND HISTORY	L	T	P	FW/ Proj	C
Version	**1.2 (2023)**	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

The role played by gender dynamics in shaping historical processes has not been paid much attention especially at the under-graduate level. This course is developed keeping in mind the need for students to be sensitized to the issue of gender through the prism of historical movements. This course seeks to provide a deeper understanding to the students about the roleof gender in history, and how has played a significant role over a period.

Course Objectives

After completion of this course, students will be able to:
The course is aimed at enhancing the learning skills of students regarding the gender and history, which altered the course of human social history to a large extent. The learning outcomes canbe defined as follows:
Introducing students to the gender and history by explaining critical concepts.
1. Developing critical understanding among students regarding the gender and history.
2. Developing the learning ability of students about the gender and history.
3. Introducing students to the historiography related to these theme

Course Outcomes

On the completion of the course, the student will be able to:
CO 1-Define and explain the finer nuances of gender and its association with culture andhistory.
CO 2- Describe and define the historicity of gender and feminist history.
CO 3- Define and explain the critical understanding of historical perspectives on women.
CO 4- Describe and explain the role of women in contemporary word

Course Content:

Modules	Blooms level*	Number of hours
MODULE-I: **Gender, Culture and History: Theoretical Perspectives** • Theories of Gender • Historicising Gender • Correlation between History and Gender	**L1, L2, L3**	14

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MODULE-II: **Position of Women in the Indian Historical Context** • Women in the Indus Valley Civilisation • Women in Vedic Age • Construction of women's role by Manusmriti • Women in the Epic Age • Women in ancient Indian dynastic history • Position of women in Medieval India • Role of women in India's independence struggle	**L1, L2, L3**	16
MODULE III: **Role of women in World History** • Women in the French Revolution • Women in the Industrial Revolution	**L3, L4, L5**	14
MODULE-IV **Origins of the Feminist Movement** • Socio-cultural genesis • Political background • Impact of feminism on history writing **:**	**L3, L4, L5**	16

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Scott, Joan Wallach. *Gender and the Politics of History*. New York: Columbia UniversityPress, 1988
- Zemon Davis, Natalie. "Women's History in Transition: The European Case." *FeministStudies* 3, no. 3–4 (1976)
- O' Connor, Karen, Gender and Women's Leadership, Sage Publications, 2010
- Altekar A.S., *The Position of Women in Hindu Civilization: From Pre-Historic Times to the Present Day*, Motilal Banarasi Das, 1959 (second edition), New Delhi
- Lal, Ruby, *Domesticity and Power in the Early Mughal World*, Cambridge University Press,2005
- Agrawal, M.G., *Women Freedom Fighters of India*, Isha Books, New Delhi, 2008

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	MT	A	Assignment	EE
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

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CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	--	2	--	--	--	--	--	1	2	2	2
CO2	--	2	--	--	--	--	--	1	2	2	2
CO3	--	2	--	--	--	--	--	1	2	2	2
CO4	--	2	2	--	--	--	--	1	--	2	2
CO5	--	--	2	--	--	--	1	1	2	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Relate

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Course Code: DHIS2803	HISTORY OF THE WORLD FROM MID 20TH CENTURY TO THE 21ST CENTURY	L	T	P	FW/ Proj	C
Version	**1.2 (2023)**	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description:
This course has been designed to make the students aware of the major political developmentsthat shaped European history and world history in general in the 20th century. Thetwo world wars were a turning point in the history of humanity not only in terms of its political, economic and social consequences but also in terms of the aftermath of the wars which left an indelible mark on the history of human civilization. Many lives were lost, and much was learntfrom these two wars that were fought. The inter-war period and the historical processes that shaped this period are also significant in terms of various political institutions that came up during this time and brought Europe on the brink of the Second World War.

Course Objectives
After completion of this course, students will be able to
The course is aimed at enhancing the learning skills of students with regard to the history of the two World Wars which altered the course of human history to a large extent. The learningoutcomes can be defined as follows:

- Introducing students to the history of the World Wars by explaining critical conceptsrelated to both the wars
- Developing critical understanding among students regarding the various events of thetwo wars
- Developing the learning ability of students about the political institutions whichdeveloped in the inter-war period (Fascism and Nazism)
- Introducing students to the historiography related to these themes

Course Outcomes:
On the completion of the course, the student will be able to
CO 1: Define and explain the causes and consequences of the First World War.
CO 2: Describe the developments that occurred in the inter-war period.
CO 3: Define and explain the rise of totalitarian regimes in Europe – Fascism in Italyand Nazism in Germany – and the impact these regimes had on the rest of the world.

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CO 4: Define and explain the causes of the Second World War and the role played byvarious nations to accelerate this war.

Course Content:

Modules	Bloo ms level*	Numb er of hours
MODULE-I: **World War-I** • Causes • political • Economic • Military • Social developments • End of the war and the Treaty of Versailles	**L1, L2, L3**	14
MODULE-II: **Inter-War Period** • Rise of Nazism in Germany • Rise of Fascism in Italy • Stalinist Russia	**L1, L2, L3**	16
MODULE III: **World War - II** • Causes political, • Economic • Military • Social developments • End of the war and reconstruction of Europe	**L3, L4, L5**	16
MODULE-IV: **Liberation from Colonial Rule and Cold War** • End of colonial rule in Latin America • Arab World • Africa and South-East Asia • Power blocks- USA and USSR • Political and economic developments	**L3, L4, L5**	14

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Handbook of Plastics Testing & Failure Analysis, Vishu Shah, Wiley Interscience.
- Polymer Testing & Evaluation of Plastics, Mathur & Bhardwaj, Allied Publishers.
- Encyclopedia of Polymer Science & Technology, Herman F. Mark, Wiley Interscience
- Fatigue, Testing & Analysis, Lee, Elsevier
- Introduction to Plastics & Composites, E. Miller, Marcel Dekker

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation

Examination Scheme:

Components	MT	A	Assignment	EE
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

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CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	--	2	--	--	--	--	--	1	2	2	2
CO2	--	2	--	--	--	--	--	1	2	2	2
CO3	--	2	--	--	--	--	--	1	2	2	2
CO4	--	2	2	--	--	--	--	1	--	2	2
CO5	--	--	2	--	--	--	1	1	2	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course code: DHIS2804	HISTORY OF CONTEMPORARY WORLD	L	T	P	FW/ Proj	C
Version	1.2 (2023)	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description:

This course aims to acquaint students with the significant trends in politics, society, and cultureduring the latter half of the twentieth century and the early years of the twenty-first century. Itendeavours to familiarize students with the historical processes that facilitated the dismantlingof established powers and the establishment of new political and cultural regimes. Central to the course are the examination of emerging social movements that challenged these regimes and the global shift towards unipolarity by the conclusion of the 20th century. The objective ofthe course is to cultivate a critical understanding of globalization, encouraging students to engage critically with various themes, including environment, social movements, art, digital media, and more, thereby exploring the diverse implications of globalization across continents.

Course Objectives:

After completion of this course, students will be able to

The course focuses on the various social, cultural and environmental issues in the worldafter 1945. On the completion of the course, the student will be able to:

- Exhibit advanced analytical skills in comprehending and evaluating diverse social movements and cultural trends, enabling a thorough understanding of the complex dynamics inherent in the socio-cultural landscape of contemporary global contexts.
- Critically analyse the historical and ecological dimensions of various environmental disasters and protests, fostering an awareness of the environmental challenges, human responses, and the interconnectedness between human activities and the natural world.
- Attain a comprehensive understanding of the history of social movements, delving intothe intricacies of livelihood concerns, students' perceptions, and civil rights movements
- Explore cross-cultural influences in music, offering students an in-depth examination of how musical expressions have transcended cultural boundaries. Furthermore, analyse the intricate relations between food and globalization, enabling students to grasp the cultural dynamics inherent in the global culinary landscape.

Course Outcomes

On completion of this course, the students will be able to

CO 1- Develop the ability to analyze the dynamic evolution of global polities, societies,and cultures, gaining insight into the multifaceted changes that have characterized the latter half of the twentieth century and the early twenty-first century.

CO 2- Acquire the analytical skills necessary to examine and understand diverse social movements and cultural trends, fostering a nuanced comprehension of the complexities inherent in the socio-cultural fabric of contemporary global contexts.

CO 3- Conduct a comprehensive analysis of the processes of decolonization and the political dynamics during the Cold War era, gaining insight into the geopolitical shifts and power transitions that shaped the global landscape during this pivotal period.

CO 4- Develop the ability to draw inferences and articulate the inter-connectedness of various cultural facets, including but not limited to sports, music, cinema, and other formsof cultural expression, thereby elucidating the intricate relationships that contribute to the global cultural tapestry.

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Course Content:

Modules	Blooms level*	Number of hours
MODULE-I: **A New World Order (Focus on Algeria and Indonesia)** • De-colonisation and after • Politics of Cold War: Super Power Rivalries • United Kingdom: The Challenge of the Welfare State • South Africa: From Apartheid to Reconciliation	**L1, L2, L3**	16
MODULE-II: **Environmental disasters and Struggles Movements** • Chipko Movement • Struggles for the Amazon • Bhopal Gas Tragedy • Chernobyl Nuclear Disaster	**L1, L2, L3**	14
MODULE III: **Social Movements** • France: The Protests of May 1968 • China: Tiananmen Square Protests of 1989 • Civil Rights Movement the USA: Martin Luther King Jr. and Malcom X • Movements for Democracy: The Arab Spring • Women's Movements: Issues and Debates (focus on Black feminism • and Feminism in the Islamic World)	**L3, L4, L5**	16
MODULE-IV: **A Global Culture** • Spectator Sports • Cinema and Digital Media • Music: Cross Cultural Influences • Food and Globalisation	**L3, L4, L5**	14

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Le Sueur, J.D. (2003). The Decolonization Reader. London and New York: Routledge.
- Betts, R.F. (1998). Decolonization. London and New York: Routledge.
- Kahin, George McTuman. (2003). Nationalism and Revolution in Indonesia, Cornell: Cornell University Press.
- Horne, Alistair. (1977/2006). A Savage War of Peace: Algeria, 1954-1962, New York:Books.
- Beresford, M. (1989). National Unification and Economic Development in Vietnam. NewYork: St. Martin's.
- Garland, David. (2016). The Welfare state: A very Short Introduction, Oxford: OxfordUniversity Press.
- Guelke, Adrian. (2005). Rethinking the rise and Fall of Apartheid: South Africa and World Politics.Basingstoke and New York:Palgrave Macmillan.

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- Joan Martinez-Alier. (2012). “The Environmentalism of the Poor: Its Origins and Spread”in A Companion to Global Environmental History, Eds. J. R. McNeill and Erin Stewart Mauldin, West Sussex: Wiley-Blackwell, pp. 455-73.
- Nagraj, Vijay K. & Nithya V Raman (2006). “Are we Prepared for Another Bhopal.” in Environmental Issues in India, ed. Mahesh Rangarajan, Delhi: Pearson.
- Rodrigues, Gomercindo. (2007). Walking the Forest with Chico Mendes: Struggle forJustice in the Amazon. Austin: University of Texas Press.
- Dierenfield, Bruce J., (2008). The Civil Rights Movement, Revised ed., London: Routledge

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	MT	A	Assignment	EE
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	--	2	--	--	--	--	--	1	2	2	2
CO2	--	2	--	--	--	--	--	1	2	2	2
CO3	--	2	--	--	--	--	--	1	2	2	2
CO4	--	2	2	--	--	--	--	1	--	2	2
CO5	--	--	2	--	--	--	1	1	2	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DHIS2805	GENDER IN INDIAN HISTORY	L	T	P	FW/ Proj	C
Version	**1.2 (2023)**	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

The course delves into the nuanced understanding of 'Gender,' emphasizing that it transcends mere biological distinctions, instead highlighting its role as a socially and culturally constructed unequal relationship. It provides context to the involvement and influence of women in both courtly culture and domestic settings. The course explores inquiries and discussions surrounding law, education, social distinctions, and partition, challenging the concepts of patriarchy and delving into the intricacies of historical gender dynamics. Additionally, the course seeks to historicize and analyse family institutions and norms of manhood. A critical overview is offered to students, unravelling the complex paradigms that categorize women as both victims and agents, and as objects and subjects.

Course Objectives

After completion of this course, students will be able :

- Acquaint students with the theoretical frameworks surrounding gender and patriarchy,illustrating how these concepts serve as analytical tools for understanding historical phenomena
- Critically analyse the prevailing gender stereotypes associated with women in Early Modern India. Also, foster a more contextual and nuanced comprehension of how historical and gendered frameworks surrounding spaces, institutions, and norms contributed to the formation of sensibilities in Early Modern India.
- Examine law and education within the context of the "women's question" by delving into the interconnectedness of gender with diverse social identities and conducting a thorough examination of gender histories within print and popular culture. Explore and reflect upon the intricate relationship between women and the partition, examining the roles played by the state, community, and family in shaping their experiences.

Course Outcomes

On completion of this course, the students will be able to

CO 1- Critically assess the theories and concepts related to gender studies

CO 2- Analyze the key surrounding gender and power dynamics in the context of bothEarly Modern and Modern Indian history.

CO 3- Examine in-depth the challenges, debates, and transformations related to the'women's question' during the modern period of Indian history.

CO 4- Understand the impact of partition on women and analyze gender-related issuesduring the post-partition period in the construction of the independent state.

Course Content:

Modules	Blooms level*	Number of hours

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MODULE-I: **Theories and concepts** • Gender: a tool of historical analysis • Understanding Origins and Structures of patriarchy	**L1, L2, L3**	16
MODULE-II: **Women in Early Modern India (1500 to 1750)** • Reassessing Courtly and Domestic Realms: Dynamics of Power, Household and Family • Constructing Gender Identities: Behaviour and Practices	**L1, L2, L3**	14
MODULE III: **Women, Colonialism, and Modernity** • The Women's Question: Social Reform, Law and Education • Women, Work and Social Differentiation • Gender and Print Culture	**L3, L4, L5**	16
MODULE-IV: **Partition and Women** • Violence, Trauma, Identity and Memory • Partition in Literature	**L3, L4, L5**	14

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Geetha, V. (2002). Gender. Calcutta: Stree.
- Kent, Susan Kingley. (2012).Gender and History. New York: Palgrave McMillan. pp. 49-75.
- Scott, J. W. (1986). "Gender a useful Category of Historical Analysis".The AmericanHistorical Review vol.91/9, pp.1056-1075.
- Lerner, G. (1979). The Majority Finds its Past: Placing Women in History. New York: OxfordUniversity Press.
- Walby, S.(1990).Theorizing Patriarchy. Oxford: Basil Blackwell. pp.1-24, 109-127.
- Joshi, Varsha, Polygamy and Purdah: Women and Society among Rajputs. Jaipur:Rawat Publications, 1995.
- Lal, Ruby, Domesticity and Power in the Early Mughal World. Cambridge: CambridgeStudies in Islamic Civilization, 2005, pp. 1-49, 212-226.
- O'Hanlon, Rosalind, "Kingdom, Household and Body: History, Gender and ImperialService under Akbar", Modern Asian Studies, 2007, vol. 41/5, pp. 889-923.
- Peirce, Leslie, Women and Sovereignty in the Ottoman Empire. New York: Oxford

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	MT	A	Assignment	EE
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

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CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	--	2	--	--	--	--	--	1	2	2	2
CO2	--	2	--	--	--	--	--	1	2	2	2
CO3	--	2	--	--	--	--	--	1	2	2	2
CO4	--	2	2	--	--	--	--	1	--	2	2
CO5	--	--	2	--	--	--	1	1	2	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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Course Code: DHIS2806	GLOBAL ECOLOGICAL HISTORIES	L	T	P	FW/ Proj	C
Version	**1.2 (2023)**	4	0	0	0	4
Pre-requisites/Exposure	Nil					
Co-requisites	Nil					

Catalog Description

This course will systematically analyse the intricate interplay between society and naturespanning from prehistoric eras to contemporary times. By incorporating perspectives from environmental studies, political ecology, historical geography, and gender studies,the curriculum aims to familiarize students with the fundamental concepts, methodologies, and theories underpinning global ecological histories. Departing from conventional approaches confined to regional and national scopes in the examination of historical phenomena, the ensuing course units will elucidate the worldwide interconnectedness inherent in socio-ecological histories.

Course Objectives

After completion of this course, students will be able to

The course is aimed at developing the critical skills of students to assess the relationship shipbetween environment, history and polity. The learning outcomes can be defined as follows:

- Evaluate the interactions between humans and nature, particularly focusing onactivities influenced by human agency.
- Understand how colonialism gave rise to novel consumption patterns by leveraging global resources and fossil fuels for industrial purposes, contributing to the creation ofan interconnected yet unequal global order.
- Gain a historical outlook on the growing disparities in access to natural resources for women and the economically disadvantaged, both within their local contexts and on aglobal scale.

Course Outcomes

CO 1- Examine environmental concerns within a socio-political context.

CO 2- Investigate the impact of social inequality, specifically the unequal distribution and access to environmental resources, to comprehend the global and local dimensions of the world's environmental crisis.

CO 3- Analyse the intricacies surrounding the distribution of resources and disparities intheir utilization, contextualizing these within specific social frameworks.

CO 4- Critically assess the concept of an idealized historical past characterized by a purported harmonious equilibrium between human societies and nature during pre- modern eras.

Modules	Blooms level*	Number of hours
MODULE-I: **Political Ecologies and Societies** • Global Interconnectedness in Ecological Contexts and Historical Narratives • Critiques of Anthropocentrism in Historical Perspectives	**L1, L2, L3**	14

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MODULE-II: **Ecologies of the Industrial World** • Ecological Imperialism • Colonialism and the Re-articulation of Inequalities	**L1, L2, L3**	14
MODULE III: **The Appropriation of Nature by Industries** • Industrial Agriculture • Gendered Allocation of Natural Resources • Urban Centers and Cityscapes	**L3, L4, L5**	16
MODULE-IV: **Exploring the Anthropocene/Capitalocene Debate** • Climate Change and Writing Ecological histories • Whose Anthropocene?	**L3, L4, L5**	16

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Handbook of Plastics Testing & Failure Analysis, Vishu Shah, Wiley Interscience.
- Polymer Testing & Evaluation of Plastics, Mathur & Bhardwaj, Allied Publishers.
- Encyclopedia of Polymer Science & Technology, Herman F. Mark, Wiley Interscience
- Fatigue, Testing & Analysis, Lee, Elsevier
- Introduction to Plastics & Composites, E. Miller, Marcel Dekker

Modes of Evaluation: Class Test/Assignment/End Term Examination/Case Presentation
Examination Scheme:

Components	**MT**	**A**	**Assignment**	**EE**
Weightage (%)	10	5	10	70

MT: Mid Term, EE: End Semester Examination; A: Attendance; P: Project file

CO, PO and PSO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	--	2	--	--	--	--	--	1	2	2	2
CO2	--	2	--	--	--	--	--	1	2	2	2
CO3	--	2	--	--	--	--	--	1	2	2	2
CO4	--	2	2	--	--	--	--	1	--	2	2
CO5	--	--	2	--	--	--	1	1	2	2	2

1: Strongly Related, 2: Moderately Related and 3: Weakly Related

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DHIS2839	DATA ANALYSIS & VISUALISATION USING SOFTWARE	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	Class X Mathematics				
Co-requisites					

Catalog Description

The implosion of available data has made visualization more critical but also more challenging. Data analysis and Data Visualization are essential tools for business analysis, engineers, policymakers, and decision-makers. Developed originally for "small data", visualization techniques have been met with varied success in the past centuries and decades. There are a few well-known visualizations that are very effective in capturing the essence of the data, and of course, there are many infamous negative examples of poor visuals. An effective visual is critical for decision making it, but it also requires a lot of work, customization, attention to detail, and refinements.

Course Objectives

The course is designed to help students develop skills and knowledge in the following area(s):

- Develop an understanding of what is a good visualization for a given purpose
- Learn visualization theory & techniques
- Build a substantial data analytic project
- Apply data analysis and visualization with Excel, SPSS, R, Python, NVivo and MATLAB

Course Outcomes

On completion of this course, the students will be able to

CO1. Students will be able to articulate meaningful lines of inquiry that might be explored through the collection, organization, visualization, and analysis of data in a context associated with their primary field of study using (as appropriate) numerical, textual, spatial, and/ or visual data.

CO2. Student will understand what data are, how they are collected, and how to assess the quality/ reliability of data.

CO3. Students will demonstrate intermediate proficiency in the visualization of data to communicate information and patterns that exist in the data.

CO4: Students will be able to use at beginning level of proficiency the tools of statistics and machine learning to ask questions of and explore patterns in data.

Course Content :

Module	Topics Covered	Blooms Level	Contact Hours
1	**Module-1: Introduction to Excel** Data Analysis using Excel, Curve fitting, Correlation, Linear Regression, Multiple regression, Principal Component Analysis and Factor Analysis, Hypothesis testing **Introduction to Excel and SPSS** Introduction to SPSS and Types of Data, Importing, exporting and data handling in SPSS; Exploratory data analysis using SPSS and data visualization;	L1, L2, L3, L4	20 hours

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	Introduction to statistical inference and various univariate tests by using SPSS; Analysis of Variance (One Way ANOVA, Two Way ANOVA and ANCOVA); Correlation, Simple and Multiple linear Regression Analysis; Principal Component Analysis and Factor Analysis		
2	**Module-2: VOS Viewer** **Web of Science, Scopus, Dimensions, Lens, and PubMed.** Co-authorship networks, citation-based networks, and co-occurrence networks can be created based on data downloaded from Web of Science, Scopus, Dimensions, and Lens. Co-authorship networks and co-occurrence networks can also be created based on PubMed data. **Crossref, Europe PMC, and OpenAlex**. Networks can also be created based on data retrieved through the APIs of Crossref, Europe PMC, and OpenAlex, These APIs can be queried interactively in VOS viewer. **Semantic Scholar, Open Citations, and Wiki Data.** For a given set of DOIs, networks can also be created based on data retrieved through the APIs of Semantic Scholar, Open Citations and Wiki Data.	L1, L2, L3, L4	10 Hours
3	**Faculty of Management Studies & Behavioural Sciences** **Module 3: Domain Specific Software** **- Structural Equation Modelling** **Smart PLS** Introduction to Structural Equation Modelling (SEM), Introduction to the software's AMOS and SPSS, SMART PLS, Testing of Statistical assumptions, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), common method bias (CMB) test, Measurement Model Assessment, Discussing Fit Indices, Reliability and Validity Testing, Structural Model Assessment identifying multivariate outlier, Construct Validity: Convergent and Discriminant Validity, Measurement Model & Structural Equation Modelling, Mediation and Moderation Effects, Multi-Group Analysis.	L1, L2, L3, L4	30 Hours
	Faculty of Arts **N Vivo** 1. Import text, audio, video, emails, images, spreadsheets, online surveys, web content, and social media from various sources into a simple, intuitive interface.		

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	2. Create and NVivo project, import and organise qualitative and quantitative data 3.Manage a literature review in NVivo 4. Autocode structured data deductively and identify themes inductively 5. Generate and falsify hypotheses 6. Combine data in sets for analysis 7. Seek patterns and identify relationships across codes and cases 8. Present findings using visualisations 9. Export data out of NVivo 10. Coordinate teamwork.		
	Faculty of Science Engineering and Technology **Faculty of Health & Allied Sciences** **R programming / Python/ MATLAB** **R Programming-** Introduction to R, Variables and datatypes in R, Dataframes, Recasting and joining of dataframes, Arithmetic, logical and matrix operations in R, Functions in R, Control structure in R, Data visualization in R. **Python Programming-** Basics of programming, data structure and algorithm using Python, Strings, lists, control, functions, manipulating lists, loops, arrays, selection sort, insertion sort, recursion, sorting, dictionaries, exception handling, file handling, string processing, data analysis using Python **MATLAB Programming-** Introduction, basic features, managing workspace, mathematical functions, basic plotting, Matrices, array operations and linear equations, MATLAB programming- M files script, M-file functions, control flow and operations.		

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional (Theory/ Practical)	End Term Examination
Weightage (%)	5	10	15	70

References:

- David Houcque, 2005. Introduction to MATLAB programming for Engineering students., Northwestern University, E- Book **https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf**
- Mark Lutz, 2009. Learning Python. O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.
- Emmanuel Paradis, 2005. R for Beginners. E book. **https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf**, A Handbook of Statistical Analysis using SPSS by Dr. Brijesh Awasthi, Redshine Publication.

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Amity School of Liberal Arts & FL

Bachelor of Arts (Honors/ Honors with Research) in Political Science

FLEXILEARN
-Freedom to design your degree



Curriculum & Scheme of Examination

2023

AMITY UNIVERSITY HARYANA

GURUGRAM

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Bachelor of Arts (Honors/ Honors with Research) in Political Science
SEMESTER-I

Course code: DPOL2151	INDIAN NATIONALISM	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	-				
Co-requisites	-				

Catalog Description
In this course, the instructor will seek to provide the student with a basic yet meaningful understanding of the political scenario that led to the struggle for India's independence. It would endeavour to cover the entire duration of the growth of nationalism in India till the attainment of independence in 1947.

Course Objectives
The objective of this course is to:
1. Educate the nuances of Indian freedom struggle.
2. Provide the role played by different sections of society in the freedom movement.

Course Outcomes
On completion of this course, the students will be able to
CO1: To explain the evolution of nationalism in 19th century India.
CO2: To describe discourses of nationalism given by Partha Chatterjee, AshisNandy, Tagore, Gandhi, Bayly etc.
CO3: To discover functioning of moderates and extremists.
CO4: To recall the various factions of political orientations that dominated the narrative of nationalist struggle.

Modules	Blooms level*	Number of hours
Module 1: Origin and meaning of nationalism. Origin and development of nationalism in the world, the concept of nation, central elements of nationalism, Different approaches to study Indian nationalism.	L1, L2	10
Module 2 Emergence of nationalism in India Agrarian Society and Peasant Discontent, The New Middle Class and the Emergence of Nationalism, Causes of nationalism in India, Foundation of the Indian National Congress, The moderate Congress: objectives and methods	L1, L2	10
MODULE 3: Early Nationalism: Discontent and Dissension The Moderates and Economic Nationalism**,** Hindu Revivalism and Politics, Muslim Politics and the Foundation of the Muslim League.	L1, L2	5
MODULE 4: Roots of extremism The Swadeshi Movement in Bengal- 1905-1908, War and Indian politics, Bhagat Singh, Surya Sen and the Revolutionary Terrorists	L1	6
MODULE 5: The Age of Gandhian Politics	L1	10

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Limited Self Government, 1909-1919, The Arrival of Mahatma Gandhi, Champaran, Kheda, Ahmedabad, Khilafat and Non-Cooperation Movements, Civil Disobedience Movement, The Rowlatt Satyagraha, The Act of 1935 and the Princely States		
MODULE 6: Independence and Partition Simla Conference, The Cabinet Mission, Quit India Movement, The turbulent forties, The Mountbatten Plan, Freedom and Partition, Post-Partition violence, Integration of States	L1, L2	7

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- Anderson, Benedict. 1983. Imagined Communities: Reflections on the Origin and Spread of Nationalism. USA/UK: Verso, New Left Books.
- Bandyopadhyay, Shekhar. 2004. From Plassey to Partition: A History of Modern India. New Delhi: Cambridge University Press.
- Chandra, Bipan, Mridula Mukherjee, Aditya Mukherjee, K N Panicker and Sucheta Mahajan. 1989. India's Struggle for Independence. New Delhi: Oxford University Press.
- Sarkar, Sumit. 1983. Modern India 1885-1947. New Delhi: Macmillan.

Reference Books

- Chatterjee, Partha. 1993. The Nation and its Fragments: Colonial and Post-colonial histories. New Delhi: Oxford University Press.
- Nandy, Ashish. 1994. The Illegitimacy of Nationalism: Rabindranath Tagore and the Politics of the Self. New Delhi: Oxford University Press.
- Bayly, C A. 1998.Origins of Nationality in South Asia: Patriotism and Ethical Government in the Making of Modern India. New Delhi: Oxford University Press.
- Raychaudhuri, Tapan. 1979. "Indian Nationalism as Animal Politics". The Historical Journal 22(3): 747-63.
- Jalal, Ayesha and Sugata Bose. 1997. "Exploding Communalism: The Politics of Muslim Identity in South Asia". In Nationalism, Democracy, and Development: State and Politics in India. UK: Cambridge University Press.
- Guha, Ranajit. 1982. Subaltern Studies: Writings on South Asian History and Society, Volume I.UK: Oxford University Press.
- Prakash, Gyan. 1992. Another Reason: Science and the Imagination of Modern India. Princeton: Princeton University Press.
- Gandhi, M K. 1997. Hind Swaraj and Other Writings. New Delhi: Oxford University Press.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(A: Attendance, P: Presentation, A/TP Assignment /term paper, CT Class term, EE External Examination)

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	2						2	1	
CO2	1	2						2	1	
CO3	1	2						2	1	
CO4	1	2						2	1	

1: strongly related, 2: moderately related and 3: weakly related

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Course code: DPOL2101	BRITISH COLONIALISM	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description
In this course, the instructor seeks to enable students to study colonialism in India from different perspectives that reveal different facets of colonialism in India: social-economic, political, religious, legal, and educational.

Course Objectives
The objective of this course is to:
1. Educate about India's colonial past.
2. Provide them with political institutions and ideas, social and economic structures that are central to politics in India today.

Course Outcomes
On completion of this course, the students will be able
CO1: To define the imperialist approach and its liberal version and its conservative version.
CO2: To explain the growth of constitution and administration under British rule.
CO3: To describe the working of Indian economy under Colonial Rule
CO4: To explain the civilizing mission role and understand politics of census.
CO5: To recall the history of the growth and development of Education in India.

Modules	Blooms level*	Number of hours
MODULE 1: Imperialism and colonialism Brief History of Global and Indian imperialism; Major Perspectives on Colonialism – Liberalism, Marxism, Post-colonialism	L1, L2	8
MODULE 2: Foundations of Colonial Rule in India Consolidation of British power in India; Police and Civil Administration; Legal Foundations of the Colonial State; Issues related to the sovereignty and relations with British Parliament and major constitutional developments	L1, L2	8
MODULE 3: Economy and Society Impact on Agriculture, land relations and ecology; the 'Deindustrialization' Debate	L1, L2	8
MODULE 4: Religion and Society Colonial Ideology of Indian Improvement 'civilizing mission': Orientalists and the Anglicists (Utilitarians and Missionaries); Shaping Communities: Census and Enumeration; Colonialism and the Gender question	L1, L2	8
MODULE 5: Education Teaching the Colonial Subject: Education; The New Middle Class	L1, L2	8
MODULE 6: Early Indian Responses Peasant and Tribal Uprisings; The 1857 Rebellion	L1, L2	8

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

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Text Books:

- Bandopadhyay, S. 2004. *From Plassey to Partition: A History of Modern India*. New Delhi: Orient Longman.
- Fulcher, J. 2004. *Capitalism: A Very Short Introduction*. Oxford: Oxford University Press.
- Datta, G. Sobhanlal.2007. 'Imperialism and Colonialism: Towards a Postcolonial Understanding', in Dasgupta, Jyoti Bhusan (ed.) *Science, Technology, Imperialism and War*. New Delhi: Centre for Studies in Civilization Publication and DK.
- Metcalf, T.1995. 'Liberalism and Empire' in Metcalf, Thomas.*Ideologies of the Raj*.Cambridge: Cambridge University Press.
- Young, R.2003. *Postcolonialism: AVery short introduction*. Oxford: Oxford University Press.
- Metcalf and Metcalf.2002. *A Concise History of India*. Cambridge: Cambridge University Press.
- Sarkar, S.1983. *Modern India (1885-1847)*. New Delhi: Macmillan. Chandra, B.1999.*Essays on Colonialism*. Hyderabad: Orient Longman Ltd.
- Mann, M.2004. 'Torchbearers Upon the Path of Progress: Britain's Ideology of a Moral and Material Progress in India', in Mann, M. and Fischer-Tine, H. (eds.) *Colonialism as Civilizing Mission: Cultural Ideology in British India*. London: Anthem Press.
- Jones, K.1981. 'Census and Religious Identity', in Barrier, N.G. (ed). *Census in British India: New Perspective*. Delhi: Manohar Publishers.

Reference Books

- Chatterjee, Partha. 1993. The Nation and its Fragments: Colonial and Post-colonial histories. New Delhi: Oxford University Press.
- Nandy, Ashish. 1994. The Illegitimacy of Nationalism: Rabindranath Tagore and the Politics of the Self. New Delhi: Oxford University Press.
- Bayly, C A. 1998.Origins of Nationality in South Asia: Patriotism and Ethical Government in the Making of Modern India. New Delhi: Oxford University Press.
- Raychaudhuri, Tapan. 1979. "Indian Nationalism as Animal Politics". The Historical Journal 22(3): 747-63.
- Jalal, Ayesha and Sugata Bose. 1997. "Exploding Communalism: The Politics of Muslim Identity in South Asia". In Nationalism, Democracy, and Development: State and Politics in India. UK: Cambridge University Press.
- Guha, Ranajit. 1982. Subaltern Studies: Writings on South Asian History and Society, Volume I.UK: Oxford University Press.
- Prakash, Gyan. 1992. Another Reason: Science and the Imagination of Modern India. Princeton: Princeton University Press.
- Gandhi, M K. 1997. Hind Swaraj and Other Writings. New Delhi: Oxford University Press.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(A : Attendance, P : Presentation, A/TP Assignment /term paper, CT Class term, EE External Examination)

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	2						1		2
CO2	1	2							1	2
CO3	1	2						1		2
CO4	1	2								1
CO5	1	2							1	2

1: strongly related, 2: moderately related and 3: weakly related

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SEMESTER-II

Course code: DPOL2251	POLITICAL THEORY	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description
In this course, the instructor seeks to introduce the concepts and concerns that are of key significance to philosophical thought and practice.

Course Objectives
The objective of this course is to:
1. Educate the meaning, need and approaches to political philosophy.
2. Outline the political philosophies of notable philosophers like Plato and Aristotle in reference to early Greek settings.

Course Outcomes
On completion of this course, the students will be able to
CO1: To explain the basic conceptual elements of political theory as a discipline.
CO2: To describe the contribution of political theory to the development and growth of discipline of Political Science.
CO3: To define the early Greek social and political setting.
CO4: To recall the contribution of political philosophers to enrich our understanding of human society.
CO5: To explain the concepts of justice, liberty and democracy.

Modules	Blooms level*	Number of hours
MODULE 1: An Introduction to Political Theory Meaning of 'Political', Key elements of 'Political Theory', Aim and Scope of Political Theory, Classification of Political Theories, Relevance	L1, L2	8
MODULE 2: Democracy: Origin and Development of the concept; Different types of Democracy, Active Citizens and Democracy; The Issue of Minority in Democracies	L1, L2	10
MODULE 3: Liberty Meaning and Significance of Liberty; Positive and Negative Liberty, Freedom and the Limits of Government.	L1, L2	10
MODULE 4: Justice Meaning and Need of Justice; The Significance of Procedure; Procedural and Social Justice theories, John Rawls' Theory of Justice and Critique.	L1, L2	10
MODULE 5: Greek Political Thought and Practicum Greek Political Legacy; Plato; Aristotle; Machiavelli; A Study of Current Trends in Political Thought and Practicum.	L1, L2	10

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

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Text Books

- Bird, Colin. 2006. *An Introduction to Political Philosophy*. New Delhi: Cambridge University Press.
- Boucher, Dand P Kelly (eds).2003. *Political Thinkers: From Socrates to the Present*. New York: Oxford University Press.
- Nelson, B.2008.*Western Political Thought*. New Delhi: Pearson Longman.

Reference Books

- Kukathas, Ch. and G F Gaus(eds.). 2004. *Handbook of Political Theory*. New Delhi: Sage Publications.
- Cranston, Maurice. 1964. *Western Political Philosophers*. London: Foutana.
- Skoble, AJand T R Machan.2007. *Political Philosophy: Essential Selections*. New Delhi: Pearson Education.
- Strauss, Land J Cropsey(eds.). 1987. *History of Political Philosophy*. 2nd Edition. Chicago: Chicago University Press.
- Swift, A.2006.*Political Philosophy: A Beginner's Guide for Students and Politicians*. 2nd edition. Cambridge: Cambridge University Press.
- Wolff, J.2002. *An Introduction to Political Philosophy*. Oxford: Oxford University Press.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(**A : Attendance, P : Presentation, A/TP Assignment /term paper, CT Class term, EE External Examination)**

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1			2				1	1	
CO2	1			2				2	1	
CO3	1			2				2	1	
CO4	1			2				2	1	
CO5	1			2				1	1	

1: strongly related, 2: moderately related and 3: weakly related

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Course Code: DPOL2201	GLOBAL THEMES IN DEVELOPMENT	L	T	P	C
Version 1.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description
In this course, the students will get an insight into key global issues in order for them to understand future development and events.

Course Objectives
The objective of this course is to:
1. Educate them about major issues in ransacking the major powers of the global order.
2. Interpret the main cause of concerns that plague the development journey of developing and underdeveloped countries.

Course Outcomes
On completion of this course, the students will be able to
CO1: To explain the cause of concerns affecting developed and developing nations.
CO2: To define the impact of the forces of refugees and terrorism.
CO3: To examine the interactions between developed north and underdeveloped south.
CO4: To explain the system of global governance and regime of human rights.
CO5: To examine the many international movements like disarmament and food security.

Modules	Blooms level*	Number of hours
MODULE 1: Development History of international development, Theories and concepts of international development, international development in practice.	L1, L2	6
MODULE 2: Disarmament History and definition of disarmament, Nuclear Disarmament, India and disarmament.	L1, L2	6
MODULE 3: Food security Need for food security, Challenges to achieving global food security, Risks to food security.	L1, L2	4
MODULE 4: Fair trade Theories of fair trade, The WTO and fair trade, Basics of the fair-trade system.	L1, L2	6
MODULE 5: Governance Need for global governance, Concepts and themes in global governance, regional views.	L1, L2	4
MODULE 6: Human Rights Philosophy of human rights, international protection of human rights, Violation of human rights, Substantive rights.	L1, L2	6
MODULE 7: Peace and Security Ethnic conflict and international security, international cooperation, Rule of Law.	L1, L2	4
MODULE 8: Population	L1, L2	4

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World human population, predicted growth and decline, control of global population		
MODULE 9: Refugees Reasons for global refugee crisis, historical and contemporary crises	L1, L2	4
MODULE 10: Terrorism Definitions and theories of terrorism, Types of terrorism, Global terrorism crisis.	L1, L2	6

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Crick, Bernard. 2002. *Democracy: A Very Short Introduction*. New Delhi: Oxford University Press
- Przeworski, Adam, M. Alvarez, Jose Antonio Cheibub and Fernando Limongi. 2000. *Democracy and Development: Political Institutions and Well-Being in the World, 1950-1990*. Cambridge: Cambridge University Press.
- Sen, Amartya K. 2001. *Development as Freedom*. New Delhi: Oxford University Press.

Reference Books

- Escobar, Arturo. 1994. *Encountering Development: The Making and Unmaking of the Third World*.Princeton: Princeton University Press.
- Polanyi, Karl. 2010. *The Great Transformation: the political and economic origins of our time*. London: Wiley-Blackwell.
- Stiglitz, Joseph E. 2003. *Globalization and its Discontents*. New Delhi: Penguin Books**.**

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(**A: Attendance, P : Presentation, A/TP Assignment /term paper, CT Class term, EE External Examination)**

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1				2				1	2
CO2	1				2				1	2
CO3	1				2				1	2
CO4	1				2				1	2
CO5	1				2				1	2

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SEMESTER-III

Course code: DPOL2351	INDIAN POLITICAL THOUGHT	L	T	P	C
Version 1.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description
The course aims at helping the students understand the ancient Indian political thought with a contemporary perspective.

Course Objectives
The objective of this course is to:
1. Educate the overview of ancient Indian political thought.
2. Interpret the political philosophies of major thinkers.

Course Outcomes
On completion of this course, the students will be able to
CO1: To explain the various strands and sources of ancient Indian political thought like Bhagwad Gita, Manusmriti, and Arthashstra etc.
CO2: To describe various concepts like kingship, idea of justice and purusharthas etc.
CO3: To describe the ideas of Manu registered in the key text called Manusmriti.
CO4: To explain the ideas on Kautilya on state, law, Justice and governance.
CO5: To explain the principles of government and society as expounded by various thinkers.

Modules	Blooms level*	Number of hours
MODULE 1: Ancient Indian Political Thought: An Overview The Political Philosophy of- the Bhagwad Gita, Manusmriti, Arthashastra; Evolution from the Puranas to the Nitishastras.	L1, L2	12
MODULE 2: Basic Concepts and Concerns Duties of the King; Justice and Punishment; Purusharthas; Varnas.	L1, L2	12
MODULE 3: Manu Contents of Manusmriti, Principles of Government, Legal Tenets of Manu, Manu and Brahminism, Manu and Modern Thinkers.	L1, L2	12
MODULE 4: Kautilya Background and content of Arthshastra, the Saptang Theory of State, the Theory of Rajmandala and Inter-State Relations; Relevance of Arthashastra in the Contemporary Times.	L1, L2	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

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Text Books

- Sharma, Urmila and SK Sharma. 1996. *Indian Political Thought*. New Delhi: Atlantic Publishers and Distributors.
- Ghoshal, U.N.1959. *A History of Indian Political Ideas: The Ancient Period and the Period of Transition to the Middle Ages*. London: Oxford University Press.
- Singh, MP and Himanshu Roy(eds.). 2012. *Indian Political Thought: Themes and Thinkers*. Delhi: Pearson.

Reference Books

- Motwani Kewal and Ernest Wood.1958. *Manu Dharma S'astra: A Sociological and Historical Study*. Madras: Ganesh and Company.
- Rangarajan, LN.2000. *The Arthashastra*. New Delhi: Penguin Books.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(A : Attendance, P : Presentation, A/TP Assignment /term paper, CT Class term, EE External Examination)

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1				2			1	1	
CO2	1				2			1	1	
CO3	1				2			1	1	
CO4	1				2			1	1	
CO5	1				2			1	1	

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Course code: DPOL2301	STATE POLITICS IN INDIA	L	T	P	C
Version 1.1	Date of Approval:	3	1	0	4

Catalog Description
The course will seek to define historical legacies and current themes in the development of politics in the states of India.

Course Objectives
The objective of this course is to:
1. Educate the democratic processes in practice in various states and encourage them to understand the politics of states better.
2. Inform the political processes in states and exigencies of coalition politics at the center.

Course Outcomes
On completion of this course, the students will be able to
CO1: To explain various themes related to regionalism in India and its impact.
CO2: To describe evolution and contribution of national parties like BJP and Congress as well as key state level parties while discussing their role in making Indian democracy vibrant and healthy.
CO3: To explain the contribution of various strands of movements like backward caste, subaltern and ethnic minorities while analyzing the demands that such movements make out of the system.
CO4: To explain the impact of globalization on India and special economic zones as the instrument of integrating the Indian economy to the world.
CO5: To explain the changing nature of centre state relations in light of various developments related to society, politics and economy.

Modules	Blooms level*	Number of hours
MODULE 1: Regionalism and State Reorganization Regional cultures in Indian Civilization , States Reorganization Commission and State Reorganization Act 1956, Integration and ethnic conflict, Movements for state autonomy : Jharkhand, Uttarakhand and Telangana.	L1, L2	12
MODULE 2: Political Parties and Electoral Politics in the States National Political Parties , Bharatiya Janata Party : Growth and Expansion, Congress Party: Growth and Decline, Regionalization of Indian Politics , Telugu Desam Party in Andhra Pradesh, DMK and AIADMK in Tamil Nadu, Asom Gana Parishad in Assam , Left Political Parties in West Bengal.	L1, L2	12
MODULE 3: Social Structure and Political Power Dalit Politics, Backward Caste Politics, Minority Politics, Women and Politics.	L1, L2	12
MODULE 4: Economic Reforms and Indian Politics India's federal economy, Globalization and State Disparities in India, India's special economic zones : Protest Politics and Growth patterns, Reforms and Economic Growth in Indian states.	L1, L2	12

**Bloom's Level:*

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L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6:Evaluation

Text Books:

- Pai, Sudha. 2013. *Handbook of Politics in Indian States : Regions, Parties and Electoral Reforms*. New Delhi : Oxford University Press.
- Narain, Iqbal. 1976. *State Politics in India*. Meerut : Meenakshi Prakashan.
- Weiner, Myron. 1968. *State Politics in India*. Princeton : Princeton University Press.

Reference Books

- Jenkins, Rob. 2004. *Regional Reflections : Comparing Politics across India's States*. New Delhi : Oxford University Press.
- Yadav, Yogendra. 2000. 'Understanding the Second Democratic Upsurge: Trends of Bahujan Participation in Electoral Politics in the 1990s', in Francine R. Frankel, Zoya Hasan, Rajeev Bhargava and Balveer Arora (eds.), *Transforming India*. New Delhi : Oxford University Press.
- Yadav, Yogendra and Suhas Palshikar. 2003. 'From Hegemony to Convergence: Party System and Electoral Politics in the Indian States – 1952-2002'. *Journal of the Indian School of Political Economy*, January-June.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(**A: Attendance, P : Presentation, A/TP Assignment /term paper, CT Class term, EE External Examination)**

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1			2				2	1	
CO2	1			2				2	1	
CO3	1			2				2	1	
CO4	1			2				2	1	
CO5	1			2				2	1	

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Course code: SPOL2301	POLITICAL LEADERSHIP AND COMMUNICATION	L	T	P	C
Version 1.1	Date of Approval:	3	0	0	3

Catalog Description
The course will seek to discuss the various aspects of political leadership and political communication to develop skills and training to the students.

Course Objectives
The objective of this course is to:
1. To enable students to develop an understanding of political communication in its linkages with leadership in democratic politics.
2. To understand the various aspects of election campaign studies, opinion polls and exit polls survey.

Course Outcomes
On completion of this course, the students will be able to
CO1: To understand the basics of political leadership.
CO2: Analyze the various aspects of political communication process and effective communication strategies.
CO3: Explain the changing role of communication in changing media environment particularly use of social media.
CO4: Demonstrate empirical and professional implications of Political Communication and to develop skills and orientations of different related professions.

Modules	Blooms level*	Number of hours
Module 1: Introduction to Political Leadership Themes, theories and typologies, participation and performance	L1, L2	9
Module 2: Basics of Political Communication Meaning, nature and scope, the political communication process: various actors and challenges, effective communication strategies	L1, L2	9
Module 3: Political Communication in a Changing Media Environment Social media and political communication, role of print media and television in shaping political opinion	L1, L2	9
Module 4: Empirical and Professional implications of Political Communication Basics of psephology, career options: political analysts, survey of opinion polls and exit polls	L1, L2	9

Text Book:

- H.A. Semetko and M. Scammell (eds.) (2012). The SAGE Handbook of Political Communication. London: Sage.
- Kiran Prasad (ed.) (2003). Political Communication: The Indian Experience. New Delhi: B.R. Publications.

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References:

- D.A. Graber (2005). 'Political Communication Faces the 21st Century', Journal of Communication, September: 479-507.
- Pole (2009). Blogging the Political: Politics and Participation in a networked Society. New York: Routledge.
- Frank Esser and Barbara Pfetsh (eds.). (2004). Comparing Political Communication Theories, Cases and Challenges. Cambridge: Cambridge University Press.
- G. Gerbner, L. Gross, M. Morgan and N. Singnorielli (1982). 'Charting the Mainstream: Television's Contribution to Political Orientations', Journal of Communication, 32(2): 100-27.
- John C Maxwell (2008). Developing the Leader Within You. New Delhi: Harper Collins.
- **Web Source:** https://www.politicalcommunication.org/history.html

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SEMESTER-IV

Course code: DPOL2451	PUBLIC ADMINISTRATION	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This paper aims to help the students understand the key concepts and concerns in the field of public administration. It begins with an introduction to the discipline and proceeds towards an analysis of the main theories and principles. It concludes with a contemporary study and analysis of the relevance of the discipline.

Course Objectives

The objective of this course is to:

1. Educate students about the nature and scope of Public Administration.
2. Discuss methodological pluralism and synthesizing nature of knowledge in Public Administration.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Describe the theories, approaches, concepts and principles of Public Administration.
CO2: Interpret the administrative theories and concepts to make sense of administrative practices.
CO3: Describe the public administration theory and concepts from multiple perspectives.

Modules	Blooms level*	Number of hours
Module-I: Introduction to Public Administration Meaning, Scope and Significance, Evolution, Public Administration as Discipline and New Public Administration.	L1, L2	16
Module-II: Theories and Principles of Public Administration Classical Theory, Scientific Management Theory, Human Relations Theory, Theory of Bureaucracy, Ecological Approach; Principles of Organization, Decentralization, Denhardt's New Public Service	L1, L2	16
Module-III: An Analysis Public Administration in Asia and Beyond, Contemporary Relevance, Areas of Improvement.	L1, L2	16

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Examination Scheme

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(**A :** Attendance ; **P :** Presentation ; **A/TP :** Assignment/Term Paper ; **CT :** Class Test ; **EE :** External Examination)

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Text Books

- Chakrabarty, Bidyut and Mohit Bhattacharaya.2003. Public Administration: A Reader. New Delhi: Oxford University Press.
- Sapru, R.K.2009.Administrative Theories and Management Thought. New Delhi: Prentice-Hall India.
- Stevenoff, Jand E.W.Russell (ed.). 2000. Defining Public Administration. New York:Longman.

References:

- Simon, Herbert A., Donald W. Smithburg, and Victor A Thompson**.**1950. Public Administration. New York: Alfred AKnopf.
- Fry, Brian R.1989. Mastering Public Administration: From Max Weber to Dwight Waldo. Chatham NJ: Chatham House.
- Cox, Raymond and Susan Buck.2009. Public Administration in Theoryand Practice. Pearson Education.

CO, PO and PSO mapping

	PO1	PO1	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1				1		1		1		
CO2				1		1		1		
CO3				1		1		1		

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Course code: DPOL2401	SOCIAL MOVEMENTS IN INDIA	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

The paper aims to facilitate the understanding of various social movements in India and their impact on India's polity, economy and society.

Course Objectives

The objective of the course is to:

1. Discuss the various social movements in India in the pre- independence and post-independence period.
2. Analyze the nature of leadership and organisation of various types of social movements and its success and failures.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Describe the changing orientation of the social movements. It covers from the conventional forms of social movements to the present new social movements, from class-based peasant movements to the present farmers movements.

CO2: Interpret the processes of the movements and also the ideological frameworks of movements.

CO3: Discuss the current developments in civil society, state, economic spheres.

Modules	Blooms level*	Number of hours
Module 1: Concept of Social Movements Definition and components of social movements, Theories of social movements, classification and objectives of social movements, New Social Movements.	L1, L2	8
Module 2: Peasant Movements Key causes of Peasant movements , classification of Peasant movements, Key Peasant Movements before independance, Telangana Movement in Andhra Pradesh, Peasant struggles in Uttar Pradesh, Recent Movements, leadership and organization.	L1, L2	7
Module 3 : Tribal Movements Key causes of Tribal Movements ; classification of Tribal Movements, types of Tribal movements, Tribal movements in Bihar, Tribal movements in North-East India, issues raised by Tribal Movements, organization and leadership.	L1, L2	7
Module 4: Dalit Movements Types of Dalit movements, Causes of Dalit movements, Dalit movements in Andhra Pradesh, Maharashtra, Tamil Nadu and Uttar Pradesh, organization and leadership of Dalit movements, key participants.	L1, L2	7
Module 5 : Working Class Movements Types and methods of Working Class movements, issues in Working Class movements, Major changes corresponding to Working Class movements,	L3	6

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participation and leadership of working class movements, organization of Working Class movements.		
Module 6 : Women's Movements History of Women's Movement in India, social reforms and women, freedom struggle and women, women issues and legislation, subjectivity of women, leadership and organization.		7
Module 7 : Environmental Movements Types and issues of environmental movements, Chipko Movement, Narmada Bachao Andolan, Jungle Bachao Andolan, leadership and organization.		6

L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Examination Scheme

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(**A :** Attendence ; **P :** Presentation ; **A/TP :** Assignment/Term Paper ; **CT :** Class Test ; **EE :** External Examination)

Texts Books

- Rao, M S A. 2000.Social Movements in India. New Delhi : Manohar Publishers and Distributors.
- Shah, Ghanshyam. 2004. Social Movements in India : A Review of Literature. New Delhi : Sage Publications.

Reference Books

- Omvedt, Gail. 1993. Reinventing Revolution : New Social Movements and the Socialist Tradition in India. M E Sharpe.
- Shah, Ghanshyam. 2002. Social Movements and the State. New Delhi : Sage Publications.
- Ray, Raka and Mary Fainsod Katzenstein. 2005. Social Movements in india : poverty, power and politics. New York : Rowman and Littlefield.

CO, PO and PSO mapping

	PO1	PO1	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1			1						1	
CO2			1						1	
CO3			1						2	

1: strongly related, 2: moderately related and 3: weakly related

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Course Code	Course Name	L	T	P	Credits
SPOL2401	BASICS OF DEBUNKING FAKE NEWS & DISINFORMATION	3	0	0	3

Course Objectives:

- By enhancing their critical thinking abilities, participants will be better equipped to evaluate the accuracy and reliability of news and information they encounter.
- By understanding the tools and techniques, students will be able to recognize patterns and characteristics that can help them identify misleading or deceptive content.
- Participants will learn how to navigate fact-checking resources, employ digital verification techniques, and communicate their findings to others in a clear and persuasive manner.

Course Outcomes:

- Students will be equipped with the necessary tools to critically evaluate news sources, assess credibility, and identify potential red flags, thereby enhancing their ability to make informed decisions based on accurate information.
- Students will be able to employ fact-checking techniques, utilize reliable verification tools, and effectively communicate their findings.
- Students will have the knowledge and skills to protect themselves and others from falling victim to fake news and disinformation, fostering a culture of critical thinking, fact-checking, and responsible sharing of information.

Course Contents	Weightage
Module I: MEDIA LITERACY & ITS IMPORTANCE	**10 %**
Developing critical thinking, understanding bias, difference between fake news, misinformation and disinformation	
Module II: Fact Finding from the Images	**20 %**
Understanding images & metadata, Error Level Analysis (ELA), Digital Forensics	
Module III: Fact Finding from the Videos	**20 %**
Understanding videos & metadata, video verification, YouTube Data viewer	
Module IV: Basics of Social Media	**10 %**
Understanding social media, study of digital media algorithms, knowledge of digital media tools	
Module V: Detection Software & Tools	
Open Source Intelligence Software	

Text Books:

- "The News Literacy Handbook: An Educator's Guide to Teaching Digital and Media Literacy" by Michelle Luhtala and Jacquelyn Whiting
- "Network Propaganda: Manipulation, Disinformation, and Radicalization in American Politics" by Yochai Benkler, Robert Faris, and Hal Roberts
- "Fake News: Understanding Media and Misinformation in the Digital Age" by Melissa Zimdars

References:

- "The Misinformation Age: How False Beliefs Spread" by Cailin O'Connor and James Owen Weatherall

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- "Trust Me, I'm Lying: Confessions of a Media Manipulator" by Ryan Holiday
- "Weaponized Lies: How to Think Critically in the Post-Truth Era" by Daniel J. Levitin
- "The Smear: How Shady Political Operatives and Fake News Control What You See, What You Think, and How You Vote" by Sharyl Attkisson
- "Breaking the News: How the Media Undermine American Democracy" by James Fallows.

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SEMESTER-V

Course code: DPOL2551	PUBLIC ADMINISTRATION IN INDIA	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites /Exposure					
Co-requisites					

Catalog Description
This paper aims to help the students develop a deep and analytical understanding of the Indian public administrative system.

Course Objectives
The objective of the course is to:

- Explain the functioning of the systems of local government, personnel administration, financial administration and the like - as conceived and found in India.
- Outline recent events and debates related to the further development of the system.

Course Outcomes
After this course, students will be able to:
CO1: Explain functioning of departments, public corporations and chief executives.
CO2: Analyse the functioning of the institution of civil services - its whole recruitment, training and process of performance appraisal.
CO3: Explain the process of financial administration with regard to budgeting, audits and accounting.
CO4: Discuss the emergence of local self -government in India.
CO5: Analyse the structure and functioning of local self -government in India.

Modules	Blooms' Level	Credit Hours
Module I: Structure of Government Organizations in India Departments, Public Corporations, Chief Executives.	**L1, L2**	**16**
Module II: Personnel and Financial Administration in India Civil Services, Recruitment, Training and Performance Appraisal, Budget, Audit and Accounts.	**L2**	**16**
Module III: Local Self-Government Historical Overview, The structure of Local Self-Government in India, An analysis.	**L1, L2**	**16**
		48

Bloom's Level L1: Knowledge; L2: Comprehension; L3: Application L4: Analysis; L5: Synthesis, L6: Evaluation

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Examination Scheme

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(**A :** Attendence ; **P :** Presentation ; **A/TP :** Assignment/Term Paper ; **CT :** Class Test ; **EE :** External Examination)

Text Books

- Maheshwari, S.R.2009.*Indian Administration*. New Delhi: Orient Black Swan.
- Bhagwan, Vand1 V Bhushan. 2005. *Indian Administration*. New Delhi: S.Chand.

References Books

- Rockwell, Stephen J.2010. *Indian Affairs and the Administrative State in the Nineteenth Century*. Cambridge University Press.
- Chowdhry, Sachin. 2011. *Planning Development for Metropolitan Region*. New Delhi: Indian Institute of Public Administration.

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1		2					1	1	
CO2	1		2					1	1	
CO3	1		1					1	1	
CO4	1		2					1	2	
CO5	1		2					1	2	

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Course Code: **DPOL2501**	**INTERNATIONAL RELATIONS**	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

The course delves beyond the traditional understanding of international politics and provides the students with a detailed overview of the various systems and processes that have and continue to shape the contemporary world. It would also take into consideration the perspective of the devloping nations in defining political interaction among nations.

Course Objectives

The objective of the course is to:

- Acquaint students with the realm of international politics.
- Make students aware of the crucial aspects of global history.
- Explain the various theories of International Politics and their applications.
- Discuss the major contemporary issues at the global level and enable students to locate themselves.

Course Outcomes

On completion of this course, the students will be able to

CO 1- Explain scope and subject matter of International Relations as an autonomous academic discipline. Approaches and methods to study the discipline through Political realism, Pluralism and Worlds system's Model.

CO 2- Discuss the issues of Underdevelopment, Terrorism, Regionalism and Integration that characterizes the Post second world war order. Studying the role of Diplomacy, Propaganda and Military capabilities in the making of foreign policy.

CO 3- Describe certain basic concepts like Globalization in contemporary world order. Describing the Cold War phases and understanding the post-Cold War era.

CO 4- Discuss the developments in European Ethno-nationalism since the 1990's. Tracing the growth of the European Union.

CO 5- Explain the working of the UN and its organs; Peace keeping Function and Human Rights.

Modules	**Blooms level***	**Number of hours**
MODULE 1: Introduction and Basic Concepts Evolution of the discipline, Peace of Westphalia, The Great Debates, Global History, Basic Concepts: Anarchy, Balance of Power, Imperialism; Sovereignty, Security, Geopolitics, Sustainable Development, Cosmopolitanism.	L1, L2	12
MODULE 2: Theories of IR Realism, Liberalism, Constructivism, Gender and International Relations theories, race and international relations, class and international relations, India's perspective on IR.	L1, L2	12

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MODULE 3: Contemporary Global Issues Globalization, global Economic Development, global culture, global migration, global justice, terrorism, climate action.	L1, L2	12
MODULE 4: International Organizations and Law International Law, Theories of International Organization, United Nations, Human Right, Humanitarianism.	L1, L2	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books :

- Chimni, B S and Siddharth Malavarappu. 2010. *International Relations : Perspectives from the Global South*. New Delhi : Pearson Education.
- Khanna, V N. 2004. *International Relations*. New Delhi : Vikas Publications.
- Johari, J C. 1986. *International Relations and Politics*. New Delhi : Vantage Press.

References Books

- Chandra, P. *International Relations*. New Delhi : Vikas Publishing House.
- Pruthi, R K. 2006. *International Relations*. New Delhi : Neha Publications.
- Hunter, Nick. 2012. *International Relations*. Hienemann Library.
- Codevilla, Angelo M. 2010. *Student's Guide to International Relations*. Intercollegiate Studies Institute.

Examination Scheme

Components	**A**	**P**	**A/TP**	**CT**	**EE**
Weightage (%)	5	10	5	10	70

(**A :** Attendance ; **P :** Presentation ; **A/TP :** Assignment/Term Paper ; **CT :** Class Test ; **EE :** External Examination)

CO, PO and PSO mapping

	PO1	PO1	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1							1		
CO2	1							1		
CO3	1							1		
CO4	1							1		
CO5	1							1		

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Course code: DPOL2502	INDIA'S FOREIGN POLICY	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

To provide an overview of the development and déterminants of India's Foreign Policy and an in-depth knowledge of the various phases and challenges in Foreign Policy.

Course Objectives

The objective of the course is to:

- Outline the major factors shaping and impacting India's foreign policy
- Explain the methods of engaging with South Asia and the world that India has adopted over the years.

Course Outcomes

After this course, students will be able to:

CO1: Explain the evolution of India's foreign policy and the influence of social, economic and political factors on it. Analyze the dynamics that made India adopt non alignment. To examine the evolution of NAM and the relevance of NAM in a post cold war scenario

CO2: Describe India's relations with its immediate neighboring countries.

CO3: Explain the historical overview of India China relations and analyze India's foreign policy in South-East Asia- Iran, Israel, Korea, Japan, Russia and USA.

CO4: To outline the evolution of India's Nuclear Policy and its domestic and international impact and other contemporary issues.

MODULES	BLOOMS' LEVEL	CREDIT HOURS
Module I : Determinants and Various Phases Foreign Policy and National Interest, principles and objectives, déterminants, NAM and founding principles, Post-NAM developments and phases of India's Foreign Policy.	**L1**	**12**
Module II: India's Neighbourhood India-Pakistan Relations, India and the Himalayan Neighbours, India-Myanmar Relations, India's Maritime neighbors- Sri Lanka and Maldives.	**L1**	**12**
Module III : India's Policy Towards the Rest of the world Southeast asia in Indian foreign policy, Indo-Iranian relations, India's policy towards Israel, India's relations with Korea, India-Japan relations, India's relations with Russia, India and the United states, India and China	L1, L2	**12**
Module IV: India's Foreign Policy in the Contemporary World Nuclear Proliferation and India's nuclear policy, Global Terrorism and India's Foreign Policy, Rise of China and India's Foreign Policy, Indo-Pacific and India's Maritime Policy, India and Regional Multilateral Organisations- SCO, QUAD, BRICS.	L1, L2	**12**

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Bloom's LevelL1: Knowledge; L2: Comprehension; L3: Application L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- Ganguly, Sumit. 2011. *India's Foreign Policy*. New Delhi : Oxford University Press.
- Dubey, Muchkund. 2012. *India's Foreign Policy : Coping with the changing world*. New Delhi : Pearspon Education.
- Khanna, V N. 2010. *Foreign Policy of India*. New Delhi : Vikas Publishing House.

References Books

- Dutt, V P. 1999. *India's Foreign Policy in a Changing World*. New Delhi : Vikas Publishing House.
- Shukla, Vatsala. 2005. *India's Foreign Policy in the New Millennium*. New Delhi : Atlantic.
- Balakrishnan, T K. 2010. *India's Foreign Policy : problems and paradoxes*. New Delhi : Mohini Publishers and Distributors.
- Mattoo, Amitabh and Happymon Jacob. 2010. *Shaping India's Foreign Policy*. New Delhi : Har Anand Publications.

Examination Scheme

Components	HA	S/V/Q	Att	CT	EE
Weightage (%)	5	10	5	10	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2							1		1
CO2	1							1		1
CO3	2							2		1
CO4	2							2		1
CO5	2							2		1

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Course code: DPOL2503	REVIEW OF CONTEMPORARY LITERATURE-I	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites / Exposure					
Co-requisites					

Catalog Description

The objective of this concentration elective is to inculcate reading habit along with value addition to the existing understanding of the subject. The book would be a kind of knowledge enhancer that would envision the student about some current thoughts related to the discipline. The book reading and its critical analysis would help broaden the intellectual horizon of the student. A contemporary and relevant book will be selected by the concerned department.

Course Objectives

The objective of this course is to:

- Educate the techniques of qualitative analysis of texts.
- Interpret the key problems and arguments of the author in relation to the contemporary environment.

Course Outcomes

On completion of this course, the students will be able to

CO 1: To define the theoretical background of a socio-political text and relate it to contemporary issues.
CO 2: To describe the key assumptions/ hypothesis of the work and text those assumptions in face of the main arguments presented.
CO 3: To explain the social, political, economic and cultural background within which the work has been based.
CO 4: To describe the personal experiences of the author which impinge upon the credibility of the arguments raised by the author.
CO 5: To reproduce the overall intellectual framework within the study.

MODULES	BLOOMS'LEVEL	CREDIT HOURS
Module I: Content In this module, the methodology and key arguments of the text will be analysed.	L1, L2	8
Module II: Writing style In this module, the student will assess the writing style of the author, whether the text is historical or first-person account etc.	L1, L2	8
Module III: Information/Learning In this module, the students will list of the key arguments posited by the author throughout his/her work	L1, L2	8
Module IV: Content handling In this module, the student will understand how the content has been handled by the author in terms of coherence and interrelatedness of arguments.	L1, L2	8
Module V: Characters In this module, the student will enumerate the key characters who form the basis of the work.	L1, L2	8
Module VI: Thematic clarity	L1, L2	8

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In this module, students will categorize the theme under which the text falls, whether it is a historical text, socio-political commentary or a first person narrative.		

Bloom's Level
L1: Knowledge; L2: Comprehension; L3: Application L4: Analysis; L5: Synthesis, L6: Evaluation

Evaluation Scheme

Components	A	P	A/TP	EE
Weightage (%)	5	10	15	70

A : Attendance, P : Presentation, A/TP Assignment /term paper, CT Class term, EE External Examination

CO, PO and PSO mapping

	PO1	PO1	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1						1	1	1	
CO2	1						1	1	1	
CO3	1						1	1	1	
CO4	1						1	1	1	
CO5	1						1	1	1	

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Course code: DPOL2504	CURRENT THEMES IN INDIAN POLITICS	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites / Exposure					
Co-requisites					

Catalog Description
The course would attempt to appreciate the various political processes active in contemporary India and understand their implications for the social and political future of the country.

Course Objectives
The objective of this course is to:
1. Educate the nature and functioning of Indian democracy.
2. Outline the key themes in Indian politics.

Course Outcomes
On completion of this course, the students will be able to
CO1: To explain and describe the parliamentary system and to evaluate the changing nature of coalition politics and electoral process.
CO2: To describe the composition and functions of the two houses of the parliament.
CO3: To define the themes of secularism and its practise in India legally, socially and constitutionally.
CO4: To explain the dimensions of Indian federalism, democratic decentralization and to look at judicial reforms.
CO5: To identify the changing political and electoral narratives in India.

Modules	Blooms level*	Number of hours
MODULE 1: The Nature and Functioning of Democracy The Parliamentary System: An Evaluation; Democracy: Social and Economic Dimensions; The Changing Nature of the Party System; The Nature of Coalition Politics; Transformative Nature of Electoral Processes in India	L1, L2	16
MODULE 2: Key themes in Indian Politics Why Is Secularism Important for India; Contemporary Debates on Nationalism; Hindu Nationalism and its Impact on the Polity	L1, L2	14
MODULE 3: Current Political Scenarios Dimensions of Indian Federalism; Democratic Decentralization and Panchayati Raj; The Changing Nature of Public Administration; Judicial Reforms in Modern India; The Changing Face of the Civil Society; India in the Global Strategic Environment	L1, L2	18

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Chandhoke, Neera and Praveen Priyadarshi. 1999. *Contemporary India: Economy, Society, Politics*. New Delhi : Pearson Learning.
- Rothermund, Deitmar. 2013. *Contemporary India: Political, Economic and Social Development*. New Delhi : Pearson Learning.

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- Hasan, Zoya, S N Jha, and Rasheeduddin Khan. 1989. *The State, Political Process, and Identity: Reflections on Modern India*. New Delhi : Sage Publications.

Reference Books

- Kothari, R. 1970. *Politics in India*. New Delhi: Orient Blackswan.
- Kohli, A. 2001. *The Success of India's Democracy*. New Delhi: Cambridge University Press.
- Kohli, A. 1988. *India's Democracy*. New Delhi: Orient Longman.
- Bhambri, C P. 1998. *The Indian State: Fifty Years*. New Delhi: Shipra.
- Brass, P. 1994. *Politics in India Since Independence*. New Delhi: Cambridge University Press.
- Kashyap, S C. 1992. *Our Parliament*. New Delhi: National Book Trust.
- Kothari, R. 1967. *Party System and Election Studies*. Bombay: Asia Publishing House.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(**A: Attendance, P : Presentation, A/TP Assignment /term paper, CT Class term, EE External Examination)**

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1			1				1	1	
CO2	1			1				1	1	
CO3	1			1				1	1	
CO4	1			1				1	1	
CO5	1			1				1	1	

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SEMESTER-VI

Course code: DPOL2651	COMPARATIVE GOVERNMENT AND POLITICS	L	T	P	C
Version 1.1	Date of Approval:	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

The core objective of the course is to impart an understanding of comparative forms of government and politics in countries with parliamentary as well as presidential forms of government. At the end of the course the student will be able to distinguish between forms and nature of governments in various countries and draw comparisons between political systems.

Course Objectives

The objective of this course is to:

1. Explain the evolution of Comparative Politics as a discipline and drawing a distinction between Comparative Politics and Comparative Government.
2 Discuss the nature and scope of Comparative Politics.
3 Explain the approaches and models of comparison: systems analysis; structural functionalism; and institutional approach.
4. Discuss the features of a liberal democratic and socialist political system with focus on the UK, USA and the People's Republic of China.

Course Outcomes

On the completion of the course the student will be able to:

CO1: Describe different political systems like democracy, authoritarianism etc. and to explain theoretical approaches like structural functionalism and system analysis.

CO2: Discuss the concept of political culture plays in comparative politics. It outlines the concept's premises, insights and recent progress. Political participation covers a wide range of activities, from turning out to vote, to giving money to a campaign, to outright violence in the streets. It also outlines the logic of the comparative study of political communications.

CO3: Interpret a variety of rules under which elections are held and examine the consequences of this variation.

CO4: Explain institutions comprising a political system. It also focuses on understanding the working of institutions like legislature, executive and bureaucracy.

CO5: Describe policy processes and methods informing the functioning of a successful political systems.

Modules	Blooms' Level	Credit Hours
Module I : Theoretical background Political concepts ; The State ; Democracy and democratic political regimes ; Authoritarian rule ; Theoretical approaches ; Structural-Functional Analysis ; System Analysis ; Constitutionalism	L1, L2	**12**

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Module II : Forms of politics and Elements of Political Systems Political culture; political communication; political participation; Political Parties ; Interest Groups ; Elections ; Voters	L1, L2	**12**
Module III : Institutions Policy and Methods Constitution and law ; Multilevel governance ; Legislatures ; Political Executive ; Bureauracy and Public Administration, Policy Process ; Comparative Methods.	L1, L2	**12**
Module V : Comparative Political Structures and Processes United States ; United Kingdom ; China ; Pakistan	L1, L2	**12**

Bloom's LevelL1: Knowledge; L2: Comprehension; L3: Application L4: Analysis; L5: Synthesis, L6: Evaluation

Texts Books

- Hague, Rod and Martin Harrop. 2013. *Comparative Government and Politics : an introduction.* London : Palgrave Macmillan.
- Samuels, David J. 2013. *Comparative Politics*. Minnesota : Pearson.
- Almond, G et al. 2011. *Comparative Politics Today* (9th Edition). New Delhi : Pearson.

References

- Alex de Tocqueville. 1964. *Democracy in America*, 2 Vols. Bombay : Popular Prakashan.
- Akbar S.Ahmad. 2002.*Discovering Islam.* UK : Routlege.
- Bagehot W. 1963. *The English Constitution*. London : Fontana.
- Blondel, J. 1980.*An Introduction to Comparative Government*. London : Weiden & Nicholson.
- Blondel, J. 1973. *Comparative Legislatures*. Engle WoodChiffs NJ : Prentice Hall.
- Derbyshere, I. 1991. *Politics in China*. London : Chambers.
- Dicey, A. 1969. *Introduction to the Study of the Law of the Constitution*, 10th edn.London : Macmillan.
- Finer, H. 1969. *Theory and Practice of Modern Government*. London : Methuen.
- Flamming J. et.al. 1990.*American Politics in a Changing World*. Pacific Groove, California : Brooks Cole.
- Gittings J. 1989. *China Changes Face: The Road from Revolution 1949-89.* London, Oxford : Oxford
- University Press.
- Griffith E.S. 1983. *The American System of Government*, 6th edn. London : Methuen.
- Harding H. 1987. *China's Second Revolution: Reform after Mao*. Washington D.C : Brookings Institution.
- Holmes I. 1997. *Post Communism: An Introduction*. Cambridge : Polity.
- Hu nor H.C. 1973. *An Introduction to Chinese Politics*. London : David Charles.
- John L. Esposito, John Obert Voll. 1996. *Islam and Democracy*. US : Oxford University.
- Khanna V.N. 2004. *Comparative Study of Government andPolitics*. New Delhi : R. Chand & Co.
- Lijphart A. 1994. *Electoral System and Party System*. New Haven C. T: Yale University Press.
- Mackerra C. and A. Yorke. 1991. *The Cambridge Handbook of Contemporary China*. Cambridge : Cambridge University Press.

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Examination Scheme

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(**A :** Attendance ; **P :** Presentation ; **A/TP :** Assignment/Term Paper ; **CT :** Class Test ; **EE :** External Examination)

CO, PO and PSO mapping

	PO1	PO1	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1							1		
CO2	1							1		
CO3	1							1		
CO4	1							1		
CO5	1							1		

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Course code: DPOL2601	READING GANDHI	L	T	P	C
Version 1.1	Date of Approval:	4		0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

The course aims at introducing the students to the life and philosophy of Mohandas Karamchand Gandhi. It enters into a critical evaluation of Gandhian thought and encourages students to analyze Gandhi's contribution to the Indian Society and suggest workable implications for the latter.

Course Objectives

- Understand the Conception of Modern Civilization and Alternative Modernity
- Comprehend the Gandhian thought and action, theory of Satyagraha, Satyagraha in action, Peasant Satyagrahas, the Idea of Trusteeship, Temple Entry and Critique of caste discrimination and communal harmony.
- To understand the link between his ideas and political actions.

Course Outcomes

On the completion of the course the student will be able to

CO1: To look at the life sketch of Gandhi, influences on him.
CO2: to equip the students with the original writings of M.K. Gandhi.
CO3: To understand Gandhian Philosophy, political thought and implications on Indian Society.
CO4: To critically evaluate Gandhi's contributions.

Modules	Blooms' Level	Credit Hours
Module I: M K Gandhi: An Introduction Life Sketch; Influences; Criticism.	L1, L2	**10**
Module II: Key Texts of Gandhi Hindi Swaraj, The Story of My Experiments with Truth		**10**
Module III: Gandhi's Political Thought Gandhian Philosophy and thought, Satyagraha, Swaraj, Critique of Materialistic Civilization, Communal Harmony, Trusteeship, Gandhi and Harijans, Khadi and Self Reliance.	L1, L2	**18**
Module IV: Critical Evaluation of Gandhi's Contribution Gandhi's Contribution in Pan Indian Freedom Movements, Gandhi's legacy in Contemporary times.	**L4**	**10**

Bloom's LevelL1: Knowledge; L2: Comprehension; L3: Application L4: Analysis; L5: Synthesis, L6: Evaluation

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Text & References:

Text

- Parel, A. 1997. Hind Swaraj and Other Writings, Cambridge United Kingdom, Cambridge University Press.
- Gandhi, M K and Ronald Duncan.1951. *Selected Writings of Mahatma Gandhi*. Boston:Beacon Press.
- Dalton, Dennis. 2000. *Mahatma Gandhi: Non-Violent Power in Action*. New York: Columbia University Press.
- Wolpert, Stanley. 2002. *Gandhi's Passion: The Life and Legacy of Mahatma Gandhi*. New Delhi: Oxford University Press.

References

- Gandhi, M K. 1958. *All Men Are Brothers: Life and Thoughts of Mahatma Gandhi as Told in His Own Words*. Paris:UNESCO.
- Deluca, Anthony R.2000. *Gandhi, Mao, Mandela, and Gorbachev: Studies in Personality, Power, and Politics*. Westport CT:Praeger.

Examination Scheme

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(**A :** Attendance ; **P :** Presentation ; **A/TP :** Assignment/Term Paper ; **CT :** Class Test ; **EE :** External Examination)

CO, PO and PSO mapping

	PO1	PO1	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	1							1	
CO2	1	1							1	
CO3	1	1							1	

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Course code: **DPOL2602**	**READING AMBEDKAR**	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites / Exposure					
Co-requisites					

Catalog Description

To cultivate a nuanced understanding of the Dalit leader and Father of the Indian Constitution – Dr B R Ambedkar.

Course Objectives

The objective of this course is to**:**

1. Outline the life, history and contributions of Dr. B R Ambedkar
2. Explain the ideas of Dr Ambedkar and his contribution in the upliftment of Dalits.

Course Outcomes

After this course, students will be able to:

CO 1: Explain the personal life of Dr. B R Ambedkar and illustrate the struggles faced by Ambedkar by virtue of his social status and how he overcame those hardships to establish his ideas.

CO 2: Discuss an in-depth understanding of 'Annihilation of Caste', one of the most celebrated works of Dr. B R Ambedkar. It will enable students to grasp the key ideas surrounding Ambedkar's criticism of the Caste System in India.

CO 3: Describe different original texts of Ambedkar to allow students to have a deep-seated understanding about untouchability, status of *Shudras* in society, social; economic and political paradigms of caste system etc.

CO 4: Analyse the political ideas of Ambedkar and examine the influence of Ambedkar's ideas on Congress, Difference between Gandhi and Ambedkar's approach in dealing with problems of caste.

Modules	Blooms' Level	Credit Hours
Module I : Early life and writings Early times ; struggle for education ; higher learning ; thoughts on the organization of the downtrodden ; conflict and controversy with Congress	L1, L2	**12**
Module II : *Annihilation of Caste* Background of composition ; Key concepts and arguments ; Defining caste discrimination ; Social reform in Ambedkar's writings	L1, L2	**12**
Module III : Writings on caste Castes in India : Their genesis, mechanism and development ; What Path to Salvation?; Essays on Untouchables and Untouchability : Social, Political, Religious ; Manu and the Shudras ; Who were the Shudras ?	L1, L2	**12**
Module IV : Political Writings Ranade, Gandhi and Jinnah ; Communal Deadlock and a way to solve it ; What Congress and Gandhi have done to the Untouchables ; Pakistan or the Partition of India ; Notes on Parliamentary Procedure ; The Problem of Political Suppression	L1, L2	**12**

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Bloom's Level L1: Knowledge; L2: Comprehension; L3: Application L4: Analysis; L5: Synthesis, L6: Evaluation

Examination Scheme

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(**A :** Attendance ; **P :** Presentation ; **A/TP :** Assignment/Term Paper ; **CT :** Class Test ; **EE :** External Examination)

Text books :

1. Rodrigues, Valerian. 2004. *The Essential Writings of B R Ambedkar*. New Delhi : Oxford University Press.

References :

1. Ambedkar, B R. 1944. Annihilation of Caste.
2. Ambedkar, B R. 1916. Castes in India : Their genesis, mechanism and development

- What Path to Salvation ?
- Essays on Untouchables and Untouchability : Social, Political, Religious
- Manu and the Shudras
- 1946. Who were the Shudras ?

3. Ambedkar, B R. 1943. Ranade, Gandhi and Jinnah

- 1945. Communal Deadlock and a way to solve it
- 1945. What Congress and Gandhi have done to the Untouchables
- 1945. Pakistan or the Partition of India
- Notes on Parliamentary Procedure
- The Problem of Political Suppression

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	1							1	
CO2	1	1							1	
CO3	1	1							1	
CO4	1	1							1	

1: strongly related, 2: moderately related and 3: weakly related

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Course code: **DPOL2603**	**READING VIVEKANANDA**	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites / Exposure					
Co-requisites					

Catalog Description

This paper intends to familiarize the students with the life and political thought of Swami Vivekananda. It begins with a life sketch of the Indian stalwart and proceeds with an intensive analysis of his political thought. It concludes with a critical and contemporary evaluation of the political philosophy of the thinker.

Course Objectives

The objective of this course is to:

1. Explain the life and teachings of Swami Vivekananda
2. Analyse the intellectual enquiry into the socio- political contours of life and times of Vivekananda.

Course Outcomes

Students will be able to:

CO 1: Understand the political philosophy of Swami Vivekananda's thought.
CO 2: Discuss the basic underpinnings of Vivekananda's ideas and philosophy.
CO 3: Analyse the metaphysical background of Vivekananda's ideas.
CO 4: Discuss the philosophy of history in Vivekananda's ideas.
CO 5: Understand Vivekananda's ideas on nationalism.

Modules	Blooms' Level	Credit Hours
Module I : Swami Vivekananda: An Introduction Life Sketch; An Overview of Political Philosophy.	L1, L2	**16**
Module II : Political Thought of Swami Vivekananda Metaphysical Foundations; Freedom; Philosophy of History; Social Philosophy.	L1, L2	**16**
Module III : Analysis Vivekananda and Nationalism; Contemporary relevance.	L1, L2	**16**

Bloom's Level L1: Knowledge; L2: Comprehension; L3: Application L4: Analysis; L5: Synthesis, L6: Evaluation

Examination Scheme

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(**A :** Attendance ; **P :** Presentation ; **A/TP :** Assignment/Term Paper ; **CT :** Class Test ; **EE :** External Examination)

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Text books :

- Sharma, Urmila and S.K.Sharma.1996. *Indian Political Thought*. New Delhi: Atlantic Publishers and Distributors.
- Singh, M.P. and Himanshu Roy.2012. *Indian Political Thought: Themes and Thinkers*. New Delhi: Pearson.
- Ghoshal, U.N.1959. *A History of Indian Political Ideas: The Ancient Period and the Period of Transition to the Middle Ages*. London: Oxford University Press.

References *:*

- Sharma, Jyotirmaya. 2013. *A Restatement of Religion: Swami Vivekananda and the Making of Hindu Nationalism*. Yale: Yale University Press.
- *Complete works of Swami Vivekananda*

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1				2				1	
CO2	1				2				1	
CO3	1				2				1	
CO4	1				2				1	
CO5	1				2				1	

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Course code: DPOL2604	REVIEW OF CONTEMPORARY LITERATURE-II	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites / Exposure					
Co-requisites					

Catalog Description

The objective of this concentration elective is to inculcate reading habit along with value addition to the existing understanding of the subject. The book would be a kind of knowledge enhancer that would envision the student about some current thoughts related to the discipline. The book reading and its critical analysis would help broaden the intellectual horizon of the student. A contemporary and relevant book will be selected by the concerned department.

Course Objectives

The objective of this course is to:

- Educate the techniques of qualitative analysis of texts.
- Interpret the key problems and arguments of the author in relation to the contemporary environment.

Course Outcomes

On completion of this course, the students will be able

CO 1: To explain the theoretical background of a socio-political text and relate it to contemporary issues.
CO 2: To describe the key assumptions/ hypothesis of the work and test those assumptions in face of the main arguments presented.
CO 3: To explain the social, political, economic and cultural background within which the work has been based.
CO 4: To define the personal experiences of the author which impinge upon the credibility of the arguments raised by the author.
CO 5: To explain the overall intellectual framework within the study.

MODULES	BLOOMS 'LEVEL	CREDIT HOURS
Module I: Content In this module, the methodology and key arguments of the text will be analysed.	L1, L2	8
Module II: Writing style In this module, the student will assess the writing style of the author, whether the text is historical or first-person account etc.	L1, L2	8
Module III: Information/Learning In this module, the students will list of the key arguments posited by the author throughout his/her work	L1, L2	8
Module IV: Content handling In this module, the student will understand how the content has been handled by the author in terms of coherence and interrelatedness of arguments.	L1, L2	8
Module V: Characters In this module, the student will enumerate the key characters who form the basis of the work.	L1, L2	8
Module VI: Thematic clarity	L1, L2	8

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In this module, students will categorize the theme under which the text falls, whether it is a historical text, socio-political commentary or a first person narrative.		

Bloom's Level

L1: Knowledge; L2: Comprehension; L3: Application L4: Analysis; L5: Synthesis, L6: Evaluation

Evaluation Scheme

Components	A	P	A/TP	EE
Weightage (%)	5	10	15	70

A : Attendance, P : Presentation, A/TP Assignment /term paper, CT Class term, EE External Examination

CO, PO and PSO mapping

	PO1	PO1	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1						1		2	
CO2	1						1		2	
CO3	1						1		2	
CO4	1						1		2	
CO5	1						1		2	

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Course Code: DPOL2605	RELIGION AND POLITICS IN INDIA	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites / Exposure					
Co-requisites					

Catalog Description

The course would attempt to provide the students with quality understanding of the interstices of religion and politics in modern India, with the roots of the current issues lying firmly in movements, events as well as processes witnessed during the colonial period. It would also inculcate in the student an appreciation of the various ways in which politics interacts with religion in Indian society.

Course Objectives

The objective of this course is to:

- Educate students about the various issues relating to religion and politics In India.
- Enable students to trace the intricate link between politics and religion in India.
- Discuss the major religious philosophies.
- Explain the persisting religious conflicts and polarisation in India.

Course Outcomes

On completion of this course, the students will be able:

CO1: Define the problems in defining and delimiting "religion" and "politics." working knowledge of the world's religious traditions, political ideologies, and political institutions.

CO2: Discuss the major trends and themes in the interrelationship between religion and politics: human rights, violence, peace and reconciliation, globalization, etc.

CO3: Interpret the most important political actors that shape religious policy and conversely, the most important religious actors that influence politics.

CO4: Describe the religious and political diversity of the modern world and the methods adopted to manage these diversities.

Modules	Blooms level*	Number of hours
Module I : Introduction to the Study of Religion and Politics Introduction, what is Religion? What is Politics? Introduction to major religious traditions, Religion violence and the Clash of Civilizations.	L1, L2	12
Module II: Secularism in a Religious Society Definitions and theories of secularism ; Historical Evolution of Secularism in India ; India as a secular state ; Functioning of Indian Secularism.	L1, L2	12
Module III : Hindu Nationalism	L1, L2	12

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Meaning of Hindu Nationalism; Contributors and thinkers of the Hindu national identity, Hindu Nationalism as a social movement; the emergence and rise of the RSS.		
Module IV : Persistence of Hindu-Muslim conflict Congress policy towards Muslims ; Muslim grievances in North India ; Muslim politics and voting behaviour ; Hindu-Muslim polarisation ; Hindu consciousness and Hindu-Muslim conflict.		12

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5:Synthesis, L6:Evaluation

Examination Scheme

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(**A :** Attendance ; **P :** Presentation ; **A/TP :** Assignment/Term Paper ; **CT :** Class Test ; **EE :** External Examination)

Texts Books

- Brass, Paul R. 1990. *The Politics of India Since Independence*. New Delhi : Cambridge University Press.
- Kohli, Atul. 2001. *The Success of India's Democracy*. New Delhi : Cambridge University Press.
- 1Jayal, Neerja Gopal and Pratap Bhanu Mehta. 2010. *The Oxford Companion to Politics in India*. New Delhi : Oxford University Press.

References Books

- Jaffrelot, Christophe. 2010. *Religion, Caste and Politics in India*. New Delhi : Primus and Ratna Sagar.
- Hasan, Zoya. 2011. *Politics of Inclusion : Castes, Minorities and Affirmative Action*. New Delhi : Oxford University Press.

CO, PO and PSO mapping

	PO1	PO1	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	2						1		
CO2	1	2						1		
CO3	1	2						1		
CO4	1	2						1		

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SEMESTER-VII

Course Code: DPOL2701	DEBATES IN POLITICAL THEORY	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites / Exposure					
Co-requisites					

Course Objective:
This course aims to
1. This course proposes to build on a prior understanding of the nature and value of theoretical inquiry in politics.
2. Political theory begins with a few fundamental questions that have a bearing on the good life, and the ways in which we seek to collectively secure it. It does not claim to have any final answers to such questions and instead acknowledges disagreements.
3. Our basic disagreements on how we must constitute our collective life are part of our evaluations that we make on a continual basis of the political and social order we inhabit.

Course Outcome
CO1: Evaluation usually entails an intense engagement with the political context within which we live, the nature of our values and political institutions,
CO2: Clarification and analyses, together with weighing the necessity of just institutions and values.
CO3: The activity of evaluation lays bare a wide range of arguments that are used in political discourse sharpening thereby our political judgment.
CO4: It is imperative to evaluate, argue and judge and then raise for the consideration of justification our existing or appropriate political practices, decisions, policies and institutions.
CO5: This course seeks to explore and understand some of the major debates that contemporary political theory is engaged in, and hopes thereby to enrich our skills of analysis and judgment.

	Bloom's Level	Credit hours
Module I: Introduction		
a. What is Political Theory? b. Disagreements and Debates in Political Theory c. Normative judgments in a Political Context	2	10
Module II: The Political Context d. Understanding Power e. The Faces of Power (Steven Lukes) f. Ideology and Power (Althusser) g. Class Power h. Power and the Subject: Foucault i. On the Colonial State in India (Naoroji, Dutt and Gandhi)	*2*	*20*

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Module III: Debates on freedom j. Ancient vs. Modern Liberty k. Freedom as autonomy (Kant, Mill) l. Negative vs. Positive Liberty (Berlin, MacCallum) m. Freedom and the market (Libertarians) n. Republican Conception (Skinner) o. Freedom as Development (Sen) p. Freedom as Swaraj (Gandhi)	*3*	*10*
Module IV: Debates on Equality q. Value of Equality (Bernard Williams) r. Equality of Opportunity (Rawls) s. Equality of What? (Welfare, Resources, Capability) t. Luck egalitarianism and its critique (Elizabeth Anderson) u. Equality, Priority or Sufficiency (Scheffler, Parfit, Franfurt)	*3*	*10*
Module V: Debates on Justice v. Consequentialist vs. Deontological (Utilitarians, Rawls) w. Justice as Fairness (Rawls) x. Communitarian and Feminist Conceptions (Walzer, Sandel, Okin) z. Global Justice (Thomas Pogge)	*4*	*10*

Bloom's Level

L1: Knowledge; L2: Comprehension; L3: Application L4: analysis ; L5 : synthesis, L6 : Evaluation

Key Texts:

- Hampton, Jean (1989) 'Should Political Philosophy be Done without Metaphysics?' *Ethics: 99*, 791-814.
- Mckinnon, Catriona, 2008, 'Introduction' in Mckinnon, Catriona (ed), *Issues in Political Theory*, New York: Oxford University Press.
- Haugaard, Mark, 2002, *Power: A Reader*, Manchester University Press: 1-66; 181-204.
- Althusser, L, 1977, 'Ideology and Ideological State Apparatuses (Notes Towards an Investigation)' in Althusser '*Lenin and Philosophy' and Other Essays*, London: New Left Books.
- Lukes, Steven. *Power: A Radical View*. London: Macmillan Press, 1974. Constant, Benjamin, 1988, 'The Liberty of the Ancients Compared with that of the
- Moderns',in Benjamin Constant, *Political Writings*, Cambridge University Press: 308-28.
- Berlin, I., 1969, 'Two Concepts of Liberty', in I. Berlin, *Four Essays on Liberty*, London: Oxford University Press: 118-72.
- Nelson, E., 2005, 'Liberty: One Concept Too Many?', *Political Theory*, 33, pp. 58-78.
- MacCallum, G. C. Jr., 1967, 'Negative and Positive Freedom', *Philosophical Review*, 76, pp. 312-34.
- Pettit, P., 2007, 'Republican Freedom: Three Axioms, Four Theorems', in Laborde, C. and Maynor, J. (eds), *Republicanism and Political Theory*, Oxford: Blackwell.
- Taylor, C., 1979, 'What's Wrong with Negative Liberty', in A. Ryan (ed.), *The Idea of Freedom*, Oxford: Oxford University Press.
- Skinner, Q., 2002, 'A Third Concept of Liberty', *Proceedings of the British Academy*, 117, no. 237, pp. 237-68.

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- Sen, Amartya, 2000, *Development as Freedom*, Delhi: OUP: Introduction, Ch. 1:3
- Dworkin, Ronald, 1981, 'What is Equality? Part I: Equality of Welfare'; 'Part II: Equality of Resources', *Philosophy and Public Affairs*, Vol. 10.
- Arneson, R, 1989, 'Equality and Equal Opportunity for Welfare', *Philosophical Studies*, 56 (1): 77-93.
- Cohen, G. A., 1989, 'On the Currency of Egalitarian Justice', *Ethics*, 99 (4): 906-44.
- Parfit, D., 2000, 'Equality or Priority?', in M. Clayton and A. Williams (eds.) *The Ideal of Equality*, London: Macmillan: 81-126.
- Frankfurt, H., 1987, 'Equality as a Moral Ideal', *Ethics*, 98 (1): 21-43. Rawls, John, 1971, *A Theory of Justice*, Harvard: Bellknap.
- Sandel, Michael, 1982, *Liberalism and the Limits of Justice*, Cambridge: Cambridge University Press.
- Walzer, M, 1983, *Spheres of Justice*, New York: Basic Books. Steiner, Hillel, 1994, *An Essay on Rights*, Oxford: Blackwell.
- Raz, Joseph, 1986, *The Morality of Freedom*, Oxford: Clarendon Press. Dworkin, Ronald, 1977, *Taking Rights Seriously*, Harvard University Press.
- Taylor, Charles, et al, 1994, *Multiculturalism: Examining The Politics of Recognition*, Princeton: Princeton University Press.
- Callann, Eamonn, 'Citizenship and Education', *Annual Review of Political Science*, 7 (2004): 71-90.
- Bhikhu Parekh, *Gandhi's Political Philosophy*, London, Macmillan Press, 1989
- Bhikhu Parekh, *Colonialism, Tradition and Reform: An Analysis of Gandhi's Political Discourse,* New Delhi, Sage, 1989
- Thomas Pantham, "Habermas's Practical Discourse and Gandhi's Satyagraha", in Bhikhu Parekh and Thomas Pantham, (ed.), *Political Discourse: Explorations in Indian and Western Political Thought*, New Delhi, Sage, 1987, pg 292-310
- Anthony J. Parel, (ed.), *Gandhi, Freedom and Self-Rule*, New Delhi, Vistaar Publications

Examination Scheme

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(**A :** Attendance ; **P :** Presentation ; **A/TP :** Assignment/Term Paper ; **CT :** Class Test ; **EE :** External Examination)

CO, PO and PSO mapping

	PO1	PO1	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
CO 1	1	1	1	2	2	1	2	3	3	3	1		1	1	2
CO 2		1	1	2	1	1	2	1	2	3		2	1	2	1
CO 3	1	1	2	2	3	2	1	2	2	3	2		1	1	2
CO 4	1	1	1	2	2	3	1	1	2	2	1		1	2	2
CO 5	1	2	2	1	2	3	2	3	2	1		3	1	1	2

1.Strongly Related 2. Moderately related 3. Weakly Related

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Course Code: DPOL2702	COMPARATIVE POLITICAL ANALYSIS	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites / Exposure					
Co-requisites					

Course Objective:

The objectives of the course are:

- To enrich students with analytical skills associated with comparative politics.
- To explain in greater detail the input and output functions of a political system.
- To inform students of the Eurocentric biases concerning academic discourses.
- To discuss the various theories of development and origins of the state.

Course Outcome

CO1: When applied to specific fields of study, comparative politics may be referred to by other names, such as for example comparative government (the comparative study of forms of government) or comparative

CO2; Foreign policy (comparing the foreign policies of different States in order to establish general empirical connections between the characteristics of the State and the characteristics of its foreign policy).

CO3: Sometimes, especially in the United States, the term "comparative politics" is used to refer to "the politics of foreign countries." This usage of the term, however, is often considered incorrect.

CO4:"Comparative political science" as a general term for an area of study, as opposed to a methodology of study, can be seen as redundant.

CO5: A study of a single political entity, whether a society, subculture or period, would show the political as simple brute reality without comparison with another society, subculture, or period.

Modules	Bloom's Level	Credit Hours
Module I: Comparative Methods and Approaches Approaches to Comparative Political Analysis; Formal – Institutional, Political Systems and Structural Functional Approach, Culture-centric, Political Economy, New Institutionalism	L1	12
Module II: Nationalism and Anti-Colonial Struggles Emergence of the idea of nationalism, nationalism and rise of Europe, imperialism in Europe, colonial expansion of Europe, Anti-colonial struggles in Asia and Africa.	*L2, L3*	12
Module III: Theories of Development Modernisation, Underdevelopment, Dependency, World System, Post Development		12
Module IV: Theories of the State and State Forms State, Theories of the State, Development of Modern States in Europe and Non-European Societies, State and Social Classes in:- Capitalist, Socialist, Post-Colonial Societies, Federalisms, Patterns of Democracy, Authoritarian and the Security State.	*L3*	12

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Bloom's LevelL1: Knowledge; L2: Comprehension; L3: Application L4: analysis; L5 : synthesis, L6 : evaluation

Examination Scheme

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(A : Attendance ; P : Presentation ; A/TP : Assignment/Term Paper ; CT : Class Test ; EE : External Examination)

Key Texts:

- Adil Khan, *Politics of Identity: Ethnic Nationalism and the State in Pakistan.* Sage, New Delhi 2005
- Alexander Hamilton, John Jay and James Madison, The Federalist Papers (edited with Introduction and notes by Max Beloff) New York, Basil Blackwell Inc. 1987
- Angelo Panebianco, *Political Parties, Organisation and Power,* Cambridge University Press, New York, 1998.
- Arend Lijphart, *Thinking About Democracy*, Routledge, London, 2008
- Benedict Anderson, *Imagined Communities: Reflections on the Origin and Spread of Nationalism,* London, Verso, 1991
- Craig Calhoun, *Nationalism,* Open University Press, Buckingham, 1997
- Barrie Axford, Gary K. Browning, Richard Huggins and Ben Rosamond eds. *Politics: Na Introduction,* Routledge, London and New York, 1997
- Barrington Moore Jr., *Social Origins of Dictatorship and Democracy: Lord and Peasant in the Making of the Modern World, Penguin* 1967
- Daniel Caramani, *Comparative Politics,*OUP, Oxford, 2008
- David Collier, David ed., *The New Authoritarianism in Latin America,* Princeton University Press, Princeton, 1979
- David Lane, *The Rise and Fall of State Socialism: Industrial Society and the Socialist State,*
- Polity Press, 1996
- Faulks, Keith, *Political Sociology,* Edinburgh University Press, 1999
- Georgio Agamben, *State of Exception, (Translated by Kevin Attel),* University of Chicago Pres, Chicago, 2005
- Gerado L. Munck and Richard Snyder, *Passion, Craft and Method in Comparative Politics,*
- The John Hopkins University Press, 2008
- Gerald F. Gaus and Chandran Kukathas (ed.), *Handbook of Political Theory,* Sage, London, 2004
- Giovanni Sartori, *Parties and Party System: A Framework for Analysis,* Cambridge University Press, Cambridge, 1976.
- Hamza Alavi and Teodor Shanin eds. *Introduction to the Sociology of 'Developing Societies',*
- Macmillan, London and Basingstoke, 1982
- Howard J. Wiarda (ed.), *Comparative Politics,* Vol. I-V, Routledge, 2005
- Iris Marion Young, *Global Challenges, War, Self Determination and Responsibility for Justice,* Polity, Cambridge, 2007
- Jean Blondel, *The Discipline of Politics,* Butterworths, London, 1981
- John Harriss, *Depoliticizing Development: The World Bank and Social Capital,* Leftword, Delhi, 2001

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- John S. Dryzek, Bonnie Honig and Anne Phillips eds. *The Oxford Handbook of Political Theory*, OUP, Oxford, 1994
- Joseph La Palombara and Myron Weiner (eds.), *Political Parties and Political Development*,
- Princeton University Press, Princeton, 1966.
- Mattei Dogan and Ali Kazancigili (eds.), *Comparing Nations, Concepts, Strategies, Substance*, Blackwell, Oxford, 1994
- Manoranjan Mohanty, C*ontemporary Indian Political Theory*, Samskriti, Delhi
- Partha Chatterjee, *Nation and its Fragments*, New Delhi, Oxford, 1994
- Michael Burgess, *Comparative Federalism: Theory and Practice*, Routledge, London, 2006
- Maurice Duverger, *Political Parties: Their Origin and Activities in Modern State*, John Yiley, London, 1954.
- Peter Evans, B.Dietrich Rueschmeyer and Theda Skocpol ed., *Bringing the State Back In*,
- Cambridge, Cambridge University Press, 1985
- Peter Limqueco and Bruce McFarlane, *Neo-Marxist Theories of Development*, London, Croom Helm and St. Martin Press, 1983
- Peter Mair, *Party System Change: Approaches and Interpretations*, Clarendon Press, OUP, 1997.
- Ray Keily, *Sociology and Development: The Impasse and Beyond*, UCL Press, London, 1995
- Goodin and H. Klingemann eds., *The New Handbook of Political Science*, Oxford, Oxford University Press, 1996
- Ramchandra Guha, *Environmentalism: A Global History*, Oxford University Press, New Delhi, 2002.
- Rod Hague and Martin Harrop, *Comparative Government and Politics*, Macmillan, 2007, seventh edition.
- Ronald H. Chilcote, *Theories of Comparative Politics*, Westview Press, Boulder, 1994 Sarah Joseph, *Political Theory and Power*, Foundation Books, New Delhi 2004 (Second edition).
- Ronald L. Watts, *Comparing Federal Systems*, 3rd Edition Institute of Intergovernmental Relations, McGill-Queen's University Press, 2008
- Stanley Aronowitz and Peter Bratsis eds., *Paradigm Lost: State Theory Reconsidered*, 2004. Stuart Hall and Bram Gieben, eds. *Formations of Modernity*, Cambridge, Polity Press, 1982.
- Sven Steinmo and Kathleen Thelen and Frank Longstreth, *Structuring Politics: Historical Institutionalism in Comparative Analysis*, Cambridge University Press, Cambridge, 1992.
- Theda Skocpol, *States and Social Revolutions: A Comparative Analysis of France, Russia and China*, Cambridge, Cambridge University Press, 1979.
- Tom Mertes (ed.), *A Movement of Movements: Is Another World Really Possible?* Verso, London, 2004.
- Wolfgang Sachs (eds), *The Development Dictionary*, Orient Longman, Delhi, 1997.

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CO, PO and PSO mapping

	PO 1	PO 1	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO1	PSO2	PSO3
CO1	1	1	1	2	2	1	2	3	3	3	1		1	1	2
CO2		1	1	2	1	1	2	1	2	3		2	1	2	1
CO3	1	1	2	2	3	2	1	2	2	3	2		1	1	2
CO4	1	1	1	2	2	3	1	1	2	2	1		1	2	2
CO5	1	2	2	1	2	3	2	3	2	1		3	1	1	2

1.Strongly Related 2. Moderately related 3. Weakly Related

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Course Code: DPOL2703	THEORIES OF INTERNATIONAL RELATIONS	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites / Exposure					
Co-requisites					

Course Objective:

The objectives of the course are:

- To enable students to establish the linkages between global history and chronological progression of the discipline of IR.
- To introduce graduate students to diverse traditions of theoretical contributions to the study of International Relations as they have evolved around the world.
- The purpose of the course is to provide a thorough background in all schools of IR theory and the debates between them regarding their perspective on the nature of international politics and how it is to be conceptualized, understood and judged, bearing in mind their geo-cultural specificities.
- To provide greater insights into the Indian and Chinese traditions of thinking in international politics, diplomacy and warfare.

Course outcome

CO1 and **CO2**: The study and practice of international relations in today's world is valuable for many reasons. International relations promote successful trade policies between nations.

CO3: International relations encourage travel related to business, tourism, and immigration, providing people with opportunities to enhance their lives.

CO4: International relations allow nations to cooperate with one another, pool resources, and share information as a way to face global issues that go beyond any particular country or region. Contemporary global issues include pandemics, terrorism, and the environment.

CO5: International relations advance human culture through cultural exchanges, diplomacy and policy development.T he practice of international relations is valuable in a wide array of settings.

Modules	Bloom's Level	Credit Hours
Module I: Introduction Evolution of the Discipline The Great Debates State of the Art	**L1**	**12**

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Module II: Realism: Its Variants and Complements Structural Realism Indian Tradition: Kautilya's Realpolitique Chinese Tradition The English School Neo-Liberalism Institutionalism	*L1, L2*	12
Module III: Alternative Approaches in IR Critical Theory Constructivism Post-Modernism Feminism Neo-Marxism Ethics in IR	*L2*	12
Module IV: Problematic of the 'International' Eurocentrism in IR IR of the Global South Rise of non-state actors.	*L4*	12

Bloom's Level

L1: Knowledge; L2: Comprehension; L3: Application L4: analysis ; L5 : Synthesis, L6 : evaluation

Examination Scheme

Components	**A**	**P**	**A/TP**	**CT**	**EE**
Weightage (%)	5	10	5	10	70

(**A :** Attendance ; **P :** Presentation ; **A/TP :** Assignment/Term Paper ; **CT :** Class Test ; **EE :** External Examination)

Key Texts:

- Scott Burchill et al, *Theories of International Relations* 3rd ed, Basingstoke: Palgrave Macmillan, 2005.
- Steve Smith, Ken Booth and Marysia Zalewski, (eds.), *International Theory: Positivism and Beyond*, Cambridge: Cambridge University Press, 1996.
- Chris Brown with Kirsten Ainley, *Understanding International Relations*, 3rd Ed., Palgrave Macmillan, 2005.
- Tim Dunne, M. Kurki Steve Smith, *International Relations. Discipline and Diversity*, Oxford University Press, 2007.
- Hedley Bull, *The Anarchical Society: A Study of Order in World Politics*, 3rd edn., Basingstoke: Palgrave. 2002.
- Arlene B. Tickner and Ole Wever, (eds.), *International Relations Scholarship Around the World*, London: Routledge, 2009.
- Navnita Chadha Behera, ed., *International Relations in South Asia: Search for an Alternative Paradigm*, New Delhi, Sage, 2008.
- Kautilya, *Arthashastra*, Penguin Classics, 1993.
- Sun Tzu and Lionel Giles (translator), *The Art of War*, Ulysses Press, 2007.
- Raymond Aron, *Peace and War: A Theory of International Relations*, New York, Anchor Books, 1973.
- Simon Bromley, William Brown and Suma Athreya, (eds.), *Ordering the International: History, Change and Transformation*, Pluto Press with The Open University, London, 2004.

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- Robert Cox, with T. Sinclair, *Approaches to World Order*, Cambridge: Cambridge University Press, 1996.
- David A. Baldwin (ed.), *Neo-Realism and Neo-liberalism: The Contemporary Debate* (New York: Columbia University Press, 1993)
- John Baylis and Steve Smith (eds.), *The Globalization of World Politics* (Oxford: Oxford University Press, 2001)
- R. B. J Walker, *Inside/Outside: International Relations as Political Theory*, New York: Cambridge University Press, 1995.
- Alexander Wendt, *Social Theory of International Politics*, Cambridge: Cambridge University Press, 1999.
- Anthony Giddens, *The Consequences of Modernity*, London: Polity Press, 1991.
- Rebecca Grant and Newland, eds., *Gender and International Relations*, Buckingham: Open University Press and Millennium Press, 1991.
- Chris Brown, *International Relations Theory: New Normative Approaches*, Hamel Hamstead: Harvester Wheatsheaf, 1992.
- E.H. Carr, *The Twenty Years Crisis*: *1919-1939* (London: Macmillan, 1981)
- Kenneth Waltz, *Theory of International Politics* (London: Addison-Wesley Publishing, 1979).
- Justin Rosenberg, *The Empire of Civil Society*, Verso, London, 1994.
- Fred Halliday, *Rethinking International Relations*, London: Macmillan Press, 1994.
- Martin Hollis & Steve Smith, *Explaining and Understanding International Relations*, Oxford University Press, 1991.
- W. Carlsnaes, T. Risse & B. Simmons, (eds.), *Handbook of International Relations*. London, Sage, 2006.
- Allen Buchanan, *Justice, Legitimacy and Self-Determination*, OUP, Oxford, 2007 Charles Beitz, *Political Theory and International Relations*, OUP, Oxford, 1979

CO, PO and PSO mapping

	PO 1	PO 1	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO1	PSO2	PSO3
CO1	1	1	1	2	2	1	2	3	3	3	1		1	1	2
CO2		1	1	2	1	1	2	1	2	3		2	1	2	1
CO3	1	1	2	2	3	2	1	2	2	3	2		1	1	2
CO4	1	1	1	2	2	3	1	1	2	2	1		1	2	2
CO5	1	2	2	1	2	3	2	3	2	1		3	1	1	2

1. Strongly Related 2. Moderately related 3. Weakly Related

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Course Code: DPOL2704	POLITICS IN INDIA	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites / Exposure					
Co-requisites					

Course Objective

This course focuses on societal dynamics and their impact on political processes. It identifies specific themes which are significant for the study of politics in India, explores the way in which these themes have acquired salience, and how their changing forms have impacted upon the nature and course of Indian politics. It seeks in particular to understand how state and politics are informed by social processes and political mobilizations, historically and in contemporary contexts.

Course Outcomes

CO1: How has India's politics changed over the last five years? This is as important for setting the agenda of the new government as it is for assessing the performance of the incumbent one.
CO2 : To know the structures of the government and legacies which is being carries forward.
CO3: The political discourse has coarsened is self-evident. There is greater intrusion of the media into public and private life, & a lot of what they serve up is degrading, rather than enlightening or redemptive.
CO4: How religion and Language play an important role in Indian Politics.
CO5: Understanding the development strategies in the era of liberalization and Globalization

Module 1: Approaches to Indian Politics Historical, cultural, legal and political economy perspectives	**Bloom's Level** 1	**Credit hours** 10
Module 2: State in India Democratic, developmental and coercive dimensions		8
Module 3: Class, Caste, Tribe and Gender The changing nature of class dominance in India Politics and social mobilizations Issues of equality and representation	2	10
Module 4: Religion, Region and Language Communalism and secular politics Region and language: issues of recognition, autonomy and secession	2	10

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Module 5: Development Process Concept, strategies, policies, and critiques Poverty alleviation programmes Globalization and impact on the weaker sections	3	10

Bloom's LevelL1: Knowledge; L2: Comprehension; L3:Application L4: analysis ; L5 : synthesis, L6 : evaluation

Examination Scheme

Components	**A**	**P**	**A/TP**	**CT**	**EE**
Weightage (%)	5	10	5	10	70

(A : Attendance ; P : Presentation ; A/TP : Assignment/Term Paper ; CT : Class Test ; EE : External Examination)

Key Texts:

- A.R.Desai (ed.), *Peasant Struggles in India*, OUP, New Delhi, 1974.
- A.R. Desai (ed.), *Agrarian Struggles in India*, OUP, New Delhi, 1986.
- Abhay Kumar Dube (ed.), *Rajniti ki kitab, Rajni Kothari ka krititva*, Vani, Delhi, 2003. Abhay Kumar Dube (ed.), *Bharat ka Bhumandalikaran*, Vani, Delhi, 2005.
- Achin Vanaik, *The Painful Transition: Bourgeois Democracy in India*, Verso, London, 1990.
- Aditya Nigam, *The Insurrection of Little Selves: The Crisis of Secular-Nationalism in India*, OUP, New Delhi, 2006.
- Ashis Nandy, *At the Edge of Psychology*, OUP, New Delhi, 1980, second impression 1993.
- Atul Kohli, *India's Democracy: An Analysis of Changing State-Society Relations*, Orient Longman, New Delhi, 1991.
- Atul Kohli (ed.), *The Success of India's Democracy*, Cambridge University Press, Cambridge, 2001
- Atul Kohli, *Democracy and Development: Essays on State, Society, and Economy*, OUP, New Delhi, 2009.
- Atul Kohli, *State and Development*, CUP, Cambridge, *2007.*
- Baldev Raj Nayar (ed.), *Globalization and Politics in India*, OUP, New Delhi, 2007.
- Bina Agarwal (ed.), *Structures of Patriarchy: State, Community and Household in Modernizing Asia*, Kali for Women, New Delhi, 1988.
- Christophe Jaffrelot, *The Hindu Nationalist Movement and Indian Politics, 1925 to the 1990s*, Penguin, New Delhi, 1996.
- Francine Frankel and M.S.A.Rao (eds.), *Dominance and State Power in India: Decline of a Social Order,Volume I and II*, OUP, New Delhi, 1989.
- Gail Omvedt, *Reinventing Revolution, New Social Movements and the Socialist Tradition in India*, Sharpe, 1993.
- Ghanshyam Shah (ed.), *Dalit Identity and Politics*, Sage, New Delhi, 2001. Ghanshyam Shah (ed.), *Social Movements and the State*, Sage, New Delhi, 2002.
- Ghanshyam Shah (ed.), *Social Movements in India, A Review of Literature*, Sage, New Delhi, 2004.
- Javeed Alam, *Who Wants Democracy?*, Orient Longman, New Delhi, (2004) 2006.
- John Zavos, Thomas Blom Hansen and Christophe Jaffrelot (eds.), *Hindu Nationalism and Indian Politics: An Omnibus*, OUP, New Delhi, 2004.

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- Leela Fernandes, *India's New Middle Class: Democratic Politics in an Era of Economic Reform*, OUP, New Delhi, 2007.
- Lloyd I. Rudolph and Susanne Hoeber Rudolph, *In Pursuit of Lakshmi, The Political Economy of the Indian State*, Orient Longman, New Delhi, 1987
- Lloyd I. Rudolph and Susanne Hoeber Rudolph, *Explaining Indian Democracy: A Fifty Year Perspective 1950-2006*, Vol. I-III, OUP, Delhi, 2008
- M.P. Singh and Rekha Saxena, *India at the Polls: Parliamentary Elections in a Federal Phase*, Orient Longman, Delhi, 2003
- Manoranjan Mohanty, Partha Nath Mukherji with Olle Tornquist (ed.), *People's Rights, Social Movements and the State in the Third World*, Sage, New Delhi, 1998.
- Manoranjan Mohanty ed., *Caste, Class and Gender*, Sage, New Delhi, 2000. Niraja Gopal Jayal (ed.), *Democracy in India*, OUP, New Delhi, 2001.
- Nivedita Menon, (ed.), *Gender and Politics in India*, OUP, New Delhi, 2001.
- Nivedita Menon and Aditya Nigam, *Power and Contestation in India: India since 1989*, Orient Longman, New Delhi, 2007.
- Partha Chatterjee (ed.), *State and Politics in India*, OUP, New Delhi, (1997), 2004.
- Partha Chatterjee, *The Politics of the Governed: Reflections on Popular Politics in Most of the World*, Permanent Black, Delhi, 2004.
- Paul R. Brass, *Language, Religion and Politics in North India*, CUP, London, 1974.
- Paul R. Brass, *The Politics in India since Independence*, CUP, reprinted by Foundation Book, New Delhi, 1999.
- Peter Ronald deSouza, (ed.), *Contemporary India – transitions*, Fundacao Oriente and Sage, New Delhi, 2000.
- Peter Ronald deSouza and E. Sridharan (eds.), *India's Political Parties*, Sage, New Delhi,2006.
- Pralay Kanungo, *RSS's Tryst with Politics: From Hedgewar to Sudarshan*, Manohar, Delhi, 2004.
- Pranab Bardhan, *The Political Economy of Development in India,* OUP, New Delhi, 1998. Rajni Kothari, *Politics in India*, Orient Longman, Delhi, (1970), 1985.
- Rajni Kothari, *Bharat Mein Rajniti: Kal aur Aaj*, Hindi presentation by Abhay Kumar Dube, Vaani, Delhi, 2005.
- Ranajit Guha (ed.), *Subaltern Studies I: Writings on South Asian History and Society*, OUP, New Delhi, 1982.
- Randhir Singh, *Of Marxism and Indian Politics*, Ajanta, Delhi, 1990.
- Rajendra Vora and Suhas Palshikar (ed.), *Indian Democracy, Meanings and Practices*, Sage, New Delhi, 2004.
- Rajeev Bhargava ed., *Secularism and Its Critics*, OUP, New Delhi (1998), 2006.
- Raka Ray and Mary Fainsod Katzenstein (ed.), *Social Movements in India, Poverty, Power, and Politics*, OUP, New Delhi, 2006.
- Sandeep Shastri, Yogendra Yadav and K.C Suri , *Electoral Politics in Indian States*, OUP, New Delhi, 2009.
- Sanjib Baruah, *India Against Itself: Assam and the politics of nationality*, OUP, New Delhi, 2003.
- Sanjib Baruah, *Durable Disorder: Understanding the Politics of Northeast India*, OUP, New Delhi, 2007.
- Sudha Pai, *Dalit Assertion and the Unfinished Democratic Revolution: The Bahujan Samaj Party in Uttar Pradesh*, Sage, New Delhi, 2002.
- Sudipta Kaviraj (ed.), *Politics in India*, OUP, New Delhi, 1997.

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- Sumit Ganguly, Larry Diamond and Marc F. Plattner, *The State of India's Democracy*, OUP, New Delhi, 2008.
- T.V.Sathyamurthy ed., *Region, Religion, Caste, Gender and Culture in India*, OUP, New Delhi, 1998.
- Thomas Hansen and Christophe Jaffrelot eds., *The BJP and the Compulsions of Politics in India*, OUP, New Delhi, 1998.
- Ujjwal Kumar Singh, *Institutions and Democratic Governance: A Study of the Election Commission and Electoral Governance in India*, Nehru Memorial Museum and Library (NMML), New Delhi, 2004.
- Veena Das (ed.), *The Oxford India Companion to Sociology and Social Anthropolgy*, OUP, New Delhi, 2003.
- Zoya Hasan (ed.), *Politics and the State in India*, Sage, New Delhi, 2000.

CO, PO and PSO mapping

	PO1	PO1	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
CO 1	1	1	1	2	2	1	2	3	3	3	1		1	1	2
CO 2		1	1	2	1	1	2	1	2	3		2	1	2	1
CO 3	1	1	2	2	3	2	1	2	2	3	2		1	1	2
CO 4	1	1	1	2	2	3	1	1	2	2	1		1	2	2
CO 5	1	2	2	1	2	3	2	3	2	1		3	1	1	2

1.Strongly Related 2. Moderately related 3. Weakly Related

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DPOL2739	BASICS OF RESEARCH METHODOLOGY, ETHICS, AND RESEARCH COMMUNICATION	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description

This course aims to provide students with a comprehensive understanding of conducting ethical research, utilizing proper research methodologies, and effectively communicating research findings. The course includes a final project where students will write a Literature Review on a topic chosen in consultation with the teacher(s).

This course is designed to equip students with essential skills and knowledge to conduct ethical research, employ proper research methodologies, and effectively communicate scientific information (with focus on writing a literature review). The course will cover topics such as research design, data collection and analysis, research ethics, and science communication strategies. Through a combination of lectures, discussions, case studies, and practical exercises, students will develop a deeper understanding of the research process and its ethical implications.

Course Objectives

The objective of this course is to impart knowledge about various stages of research process, research ethics and different ways of research communication.

The aim of this course is to impart research skills to the beginners and help to improve the quality of research by the existing researchers. It also encompasses the understanding and application of appropriate research design, statistics, and the use of the computer for reference management, report writing, research paper writing and presentation. The course also introduces the key conceptual issues of each research method, as well as giving practical guidance. It covers the series of research methodology contents: from problem formulation, to design, to data collection, analysis, reporting and dissemination. The course has the dual aims of equipping students with conceptual understandings of current academic debates regarding different methods, and the practical skills to put those methods into practice.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define criteria of good research, steps in research process, and data collection.

CO2. Identify different types of sampling and its purpose.

CO3. Conduct hypothesis testing for different types of samples and interpret the results.

CO4: Learn the importance of literature review, write research paper/thesis, use reference management software.

Course Content :

Module	Topic	**Blooms level***	Hours
1	**Research Methodology** Understanding the research process: From research questions to conclusions	L1, L2	10

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	Types of research: Qualitative and quantitative research Exploratory, descriptive, experimental, and correlational studies Scientific Thinking: Subjective Vs. Objective Thinking Logical Reasoning: Inductive Vs. Deductive Reasoning Formulating research hypotheses and objectives Purpose of a good research, Criteria of good research		
2	**Descriptive Statistics** Data, Types of Data, Methods of data collection, Benefits and drawbacks, Graphical representation of data and interpretation. Measures of Central Tendency: Arithmetic Mean, Median, Mode, Measures of Dispersion: Range, Standard Deviation, Variance, Coefficient of Variation.	L1, L2, L3	15
3	**Inferential Statistics** Sampling: Basic concepts, Process of Sampling, Sample Size, Types of Samples, Sampling and non- sampling errors, Statistics and Parameters, Sampling Distribution of Means and Proportion, **Hypothesis Testing**, steps in testing of hypothesis, errors in hypothesis testing, z test and t test.	L1, L2, L3	15
4	**Research Ethics** Plagiarism, Fabrication, Falsification, Ethics with respect to human and Animal Research	L1, L2	5
5	**Communication** Characteristics of a good Research paper, Systematics Literature Review (choosing a topic, preparing outline, gathering authentic & appropriate references, avoiding plagiarism, use of reference management systems), Writing a good literature review, Structure of report (Introduction, Methodology, Analysis, Results, Discussions, Conclusions, Recommendations), Writing Quality Research Paper, Publishing Research Work in Quality Journals, Reference Management Software	L1, L2, L3	15

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional Exam	End Term Examination
Weightage (%)	5	10	15	70

Project based assignment: Student teams (2-3 students per team) will write a literature review on a topic of choice, in consultation with the teacher.

Text books/ Reference books

- Research Methodology for Natural Sciences by Soumitro Banerjee, Publisher: IISc Press (1 January 2022); ISBN-10: 8194835178; ISBN-13: 978-8194835172

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- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt. Ltd., New Delhi-110001
- Geode, Millian J.& Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Kothari, C.R.2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.
- Levin R I., Rubin D S. Statistics for Management. Sixth Edition, PHI
- Kapoor & Gupta. Probability & Statistics. S Chand Publishers, New Delhi.
- Montomery, Douglas C.(2007), 5th Ed. Design and Analysis of Experiments, Wiley India.
- Cooper, Donald R. and Pamels Schindler, Business Research Methods, Tata McGraw Hills, New Delhi
- Krishnaswamy, K.N. Sivakumar. Appa lyer and Mathiranjan M. 2006, Management Research Methodology: Integration of Principles, Methods and Techniques, Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Sachdeva, J.K. 2008. Business Research methodology. Himalaya Publishing House, New Delhi.
- Shekharan, Uma, Business Research Methods, Miley Education, Singapore.
- Zikmund, Millian G., Business Research Methods, Thomson Learning, Bombay**.**

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SEMESTER-VIII

Course Code: DPOL2801	ADMINISTRATIVE THEORY	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objective:
The focus of this course is on the theories that have shaped the emergence of modern systems of governance and their related structures and processes. These include Western and Non-Western traditions. The course has a clear normative thrust inasmuch as it seeks to clarify what can be the prerequisites for promoting effective and just administration at the local and national levels.

Course outcome
CO1 and 2: To explore the theoretical underpinnings those have shaped the practice of public administration.
CO3: To understand the nature of public administration
CO4: To comprehend different theoretical frameworks guiding public administration as a field of study and practice
CO5: Explain opportunities and challenges that the micro and macro environments of public administration unveiled to public administrators

Module 1 :Evolution of the Discipline of Public Administration a Western Traditions b Non-Western Traditions	**Bloom's Level** 2	**Credit Hours** 10
Module 2: Classical Schools a. The Scientific Management School b. The Classical Theory of Management/Administrative Management Theory c. The Ideal organization: Max Weber. d. Human Relations: Elton Mayo. e. Behavioural and Systems approaches i. Argyris, Maslow, McGregor: the behavioural approach ii. System Approaches: open/closed systems	*2*	*10*
Module 3: Contextual Public Administration a. Ecological Approach: Fred Riggs b. Rational Decision-Making Approach: Herbert Simon c. Development Administration Approach i. Political Economy Approach ii. Marxist Approach	*3*	*10*

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Module 4:Contemporary Developments **a) New Public Administration** a. Non-Weberian perspectives b. Value questions c. Clientele perspective **b) New Public Management** a. Good Governance and Development b. Feminist Perspectives on Public Administration	*3*	*10*
Module 5: Grassroots governance: alternative perspectives d. Gandhi e. J.Nyerere f. Mao	*2*	*8*

Bloom's LevelL1: Knowledge; L2: Comprehension; L3:Application L4: analysis ; L5 : Synthesis, L6 : evaluation

Examination Scheme

Components	**A**	**P**	**A/TP**	**CT**	**EE**
Weightage (%)	5	10	5	10	70

(A : Attendence ; P : Presentation ; A/TP : Assignment/Term Paper ; CT : Class Test ; EE : External Examination)

Key Texts:

- Albrow, Martin, *Bureaucracy*, London, Macmillan, 1978.
- Arora, Ramesh K, *Comparative Public Administration: An Ecological Perspective*, New Delhi, Associated Publishing House, 1979.
- Bhattacharya, Mohit, *Restructuring Public Administration Essays in Rehabilitation*, New Delhi, Jawahar, 1999.
- Gant, George F., *Development Administration: Concepts, Goals, Methods*, Madison, University of Wisconsin Press, 1979.
- Henry, Nicholas, *Public Administration and Public Affairs*, Delhi, Prentice-Hall of India, 1999.
- Leftwich, A., 'Governance, in the State and the Politics of Development', Development and Change, Vol. 25r 1994.
- Minogue, Martin, *'The Internationalization of New Public Management'* in *The Internationalization of Public Management: Reinventing the Third World State* edited, McCourt W and M. Minogue. U.K., Edward, Elgar, 2001.
- Self, Peter, *Administrative Theories and Politics: An Inquiry into the Structure and process* of Modern Government. New Delhi, S. Chand and Co, 1984.
- Stivers, Camilla, *'Towards a Feminist Theory of Public Administration in Gender'* in Images in Public Administration: Legitimacy and the Administrative Slate. New Delhi, Sage, 1993
- Trembley, Chaudhary and Prema Kumtakar, *Governance and Representation: A Study of Women and Local Self Government*, in Indian Journal of Public Administration, 44(3), Jul.- September 1995 : pp 54-67.

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CO, PO and PSO mapping

	PO1	PO1	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
CO 1	1	1	1	2	2	1	2	3	3	3	1		1	1	2
CO 2		1	1	2	1	1	2	1	2	3		2	1	2	1
CO 3	1	1	2	2	3	2	1	2	2	3	2		1	1	2
CO 4	1	1	1	2	2	3	1	1	2	2	1		1	2	2
CO 5	1	2	2	1	2	3	2	3	2	1		3	1	1	2

1.Strongly Related 2. Moderately related 3. Weakly Related

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Course Code: DPOL2802	THEMES IN INDIAN POLITICAL THOUGHT	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objective:
The purpose behind this course is to introduce students to the richness and variety of the tradition of Indian Political Thought, a tradition that spans centuries if not millennia culminating in the various present day understandings of Indian society.

Course Outcome
CO 1- Tracing the evolution of Indian political thought from ancient India to modern India.
CO 2- Analyzing the nationalist thought of Mahatma Gandhi
CO 3- Assessing the nationalist thought during post colonial period and Hindutva
CO 4- Discussing the nationalism of Gandhi, Reformist and Socialism
CO 5- Explaining the formation of the Congress in 1885.

	Bloom's Level	Credit Hours
Module 1: Perspectives a. Classical and Shramanic b. Islamic and Syncretic c. Contemporary Theories: Liberal, Marxist, Gandhian, Post colonial, Hindutva	2	10
Module 2: Theories and Practices of Knowledge d. Classical and Shramanic e. Colonial	*2*	*10*
Module 3: State f. Monarchical g. Colonial and Post Colonial	*2*	*10*
Module 4:Conception and Forms of Community h. Community in pre-modern and modern times i. Forms of Community: Janapada, Sangha, Jati, Quam, Samaj	*2*	*8*
Module 5 :Critical Perspectives on Indian Society j. Shramanic k. Syncretist l. Reformist	*1*	*10*

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m. Socialist **n.** Gandhian		

Bloom's LevelL1: Knowledge; L2: Comprehension; L3:Application L4: analysis ; L5 : Synthesis, L6 : evaluation

Examination Scheme

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(A : Attendance ; P : Presentation ; A/TP : Assignment/Term Paper ; CT : Class Test ; EE : External Examination)

Key Texts:

- Drekmeir, Charles, *Kingship and Community in early India,* California Stanford University Press, Stanford, 1962,.
- Pt. Sastri, N.A., *Cultural Heritage of India*, v.1, Ramakrishna Mission
- Roy, Asim (ed.), *History and Politics: Perspective from South Asia,* Oxford University Press, Delhi, 2006.
- Heesterman, J.C, *The Inner Conflict of Tradition: Essays in Indian Ritual, Kingship and Society*, University of Chicago Press, Chicago, 1988.
- Subhramanyam, Sanjay, Muzaffar, Alam (eds.), *Moghul State: 1526-1750,* Oxford University Press, Delhi, 1998.
- Jalal, Ayesha, *Self and Sovereigny: Individual and Community in South Asian Islam since 1850*, Routedge, 2001.
- Anderson and Guha (eds.), *Changing Concepts of Rights and Justice in South Asia,* School of Oriental and African Studies, London, 2001.
- Chatterjee, Partha (ed.), *State and Politics in India,* Oxford University Press, Delhi, 2005. Thapar R. *From Lineage to State: Social Formations of the Mid-First Millennium BC,* Oxford University Press, Delhi, 1984.
- Srinivas M.N., *Social Change in Modern India,* Orient Longman, India, 1967. Jafferlot C (ed.), *The Sangh Parivar: A Reader,* Oxford University Press, Delhi, 2005.
- Chatterjee Partha, *Nationalist thought and the Colonial World: A Derivative Discourse?,* Zed Books for United Nations University, London, 1986.
- Cohn Bernard, *Colonialism and Its Forms of Knowledge,* Princeton University Press, New Jersey, 1996.
- V.R. Mehta and Thomas Pantham,(ed.), *Political Ideas in Modern India: Thematic Explorations,* New Delhi, Sage, 2006, Introduction and other selected chapters.
- Anthony Parel, From Political Thought in India to Indian Political Thought," in *Western Political Thought in Dialogue with Asia,* edited by Takashi Shogimen and C.J. Nederman, Plymouth, UK, Lexington Books, 2009, pg 187-208
- Anthony Parel, *Gandhi's Philosophy and the Quest for Harmony,* Cambridge University Press, 2006

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CO, PO and PSO mapping

	PO1	PO1	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
CO 1	1	1	1	2	2	1	2	3	3	3	1		1	1	2
CO 2		1	1	2	1	1	2	1	2	3		2	1	2	1
CO 3	1	1	2	2	3	2	1	2	2	3	2		1	1	2
CO 4	1	1	1	2	2	3	1	1	2	2	1		1	2	2
CO 5	1	2	2	1	2	3	2	3	2	1		3	1	1	2

1.Strongly Related 2. Moderately related 3. Weakly Related

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Course Code: DPOL2803	THEMES IN WORLD POLITICS AND INTERNATIONAL POLITICAL ECONOMY	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objective:

1.The twin objectives of this course are to familiarize the graduate students with certain key concepts for analyzing world politics and, the core theoretical issues and empirical explanations in the field of International Political Economy (IPE).

2.International political economy addresses issues relating to distribution of power, wealth and resources among nations. The course debates key issues pertaining to the relationship between security and economic affairs, the tensions between the 'national' and 'international' loci for decision making on matters of global economic governance and, politics of international trade, finance and labour. The centrality of North-South conflict in several domains especially that of global environmental governance and the role of global social movements in resisting pressures of globalization are also discussed at length.

Course outcome

CO1:Demonstrate understanding basic facts about the world
CO2: Demonstrate capacity to theorize or explain political outcome
CO3: Demonstrate familiarity with current political debates
CO4: Demonstrate skills in critical thinking
CO5: Demonstrate knowledge of social scientific inquiry norms and standards

	Bloom's Level	Credit Hours
Module 1: Concepts a. State b. Power c. Security d. Culture and Religion	2	16
Module 2: International Political Economy e. Theoretical Debates and Critical Perspectives f. Global Economic Governance (IMF, WB and WTO) g. Politics of International Trade, Finance and Labour h. Knowledge and Technology i. International Alignments (G-8, BRICS , G-77 and BIMSTEC)	*3*	16
Module 3: Environmental Governance	*2*	16
Module 4: Global Challenges and Movements	2	16

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j. Global Social Movements k. Global Justice		

Bloom's LevelL1: Knowledge; L2: Comprehension; L3:Application L4: analysis ; L5 : Synthesis, L6 : evaluation

Examination Scheme

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(A : Attendance ; P : Presentation ; A/TP : Assignment/Term Paper ; CT : Class Test ; EE : External Examination)

Key Texts:

- Simon Bromley, William Brown and Suma Athreya, (eds.), *Ordering the International: History, Change and Transformation*, Pluto Press with The Open University, London, 2004.
- .Anthony Giddens and David Held, eds., *Classes, Power and Conflict*, Los Angeles: University of California Press, 1982.
- Steven Lukes, *Power: A Radical Review* , London: The Macmillan Press, 1982.
- Keith Krause and Michael C. Williams, eds., *Critical Security Studies: Concepts and Cases*
- (London: UCL Press, 1997).
- Stuart Croft and Terry Terriff, (eds.), *Critical Reflections on Security and Change*, London: Frank Cass, 2000.
- Barry, Buzan, Ole Waever and Jaap de Wilde, (eds.), "Security: A New Framework for Analysis," Boulder: Lynne Rienner,1998.
- L.I. Rudolph and S.H. Rudolph, *Explaining Indian Democracy A Fifty Year Perspective, 1956-2006: The Realm of Institutions: State Formation and Institutional Change*, New Delhi, OUP, 2008.
- Klaus Knorr, *Power and Wealth: The Political Economy of International Order*, London: Macmillan, 1973
- Navnita Chadha Behera, (ed.), *State, People and Security: The South Asian Context*, New Delhi: Har-Anand, 2002.
- RBJ Walker, ed., *Culture, Ideology and World Order*, Boulder: Westview Press, 1984.
- Richard Falk et.al., *Reframing the International: Law, Culture and Politics*, New York: Routledge, 2002
- Yosef Lapid and Freiedrich Kratochwil, eds., *The Return of Culture and Identity in IR Theory*, (Boulder: Lynne Rienner, 1997
- David N. Balaam and Michael Veseth, *Introduction to International Political Economy* (New Jersey: Prentice Hall, 2001.
- George Crane and Abla Amawi, *The Theoretical Evolution of International Political Economy* (Oxford: OUP, 1997).
- Robert Gilpin, *The Political Economy of International Relations* (Princeton: Princeton University Press, 1987
- John Ravinhill, Second Edition (2008*), Global Political Economy* (Oxford: Oxford University Press)
- Robert O'Brian and Williams, Marc, Second Edition (2007), *Global Political Economy*
- (Basingstoke: Palgrave Macmillan)
- Richard Stubbs and Underhill, Geoffrey R. D, Third Edition, *Political Economy and the Changing Global Order* (Ontario: Oxford University Press)

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- David McGrew & Anthony Held (eds.) Second Edition (2003), *The Global Transformations Reader* (Cambridge: Polity Press)
- Peter Dicken, Fifth Edition (2007), *Global Shift* (London: Sage)
- Hoekman, M. and Kostecki, M. M., (2008), *The Political Economy of the World Trading System* (Oxford: Oxford University Press)
- P.S., Chasek, Downie, D.L., and Brown, J.W., Fourth Edition (2006), *Global Environmental Politics* (Boulder: West view Press)
- John Baylis, Steve Smith and Patricia Owens, Fourth Edition (2008), *The Globalisation of World Politics* (New York: Oxford University Press)
- Mary Kaldor, (2003), *Global Civil Society* (Cambridge: Polity Press)
- Roe Goddard, Patric Cronin and Kishore C. Dash, eds., *International Political Economy: State-Market Relations in a Changing Global Order* (Boulder: Lynne Rienner, 2003).
- Stephen Krasner, *Structural Conflict: The Third World Against Global Liberalism*
- (University of California press, 1985)
- The Independent Commission on International Development Issues, *North-South: A Programme for Survival* (London: Pan Books, 1980).
- Samir Amin, *Delinking: Towards a Polycentric World* (London: Zed Books, 1990).
- Vinod K Aggarwal, *Debt Games: Strategic Interaction in International Debt Rescheduling*, Cambridge University Press (1996)
- Tyrone Ferguson, *The Third World and Decision Making in the International Monetary Fund: The Quest for Full and Effective Participation*, Pinter (1988)
- Stephan Haggard, *Developing Nations and the Politics of Global Integration*, Brookings (1995);
- Miles Kahler (Ed), *The Politics of International Debt*, Cornell University Press (1986)
- Miles Kahler (Ed), *Capital Flows and Financial Crises*, Cornell University Press (1998).
- D Kapur, J Lewis & R Webb, *The World Bank: Its First Half Century*, Vol 1 and 2, Brookings (1997);
- Robert L Rothstein, *The Weak in the World of the Strong: The Developing Countries in the International System*, Columbia University Press (1977);
- Diana Tussie, *The Less Developed Countries and the World Trading System: A Challenge to the GATT*, St Martin's Press (1987).
- Henrik Secher Marcussen and Jens Erik Torp, *The Internationalization of Capital: The Prospects for the Third World, London*: Zed Books, (1982)

CO, PO and PSO mapping

	PO1	PO1	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
CO 1	1	1	1	2	2	1	2	3	3	3	1		1	1	2
CO 2		1	1	2	1	1	2	1	2	3		2	1	2	1
CO 3	1	1	2	2	3	2	1	2	2	3	2		1	1	2
CO 4	1	1	1	2	2	3	1	1	2	2	1		1	2	2
CO 5	1	2	2	1	2	3	2	3	2	1		3	1	1	2

1.Strongly Related 2. Moderately related 3. Weakly Related

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Course Code: DPOL2804	KEY TEXTS IN POLITICAL PHILOSOPHY	L	T	P	C
Version 1.1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objective:

1.The objective of this course is to introduce students to select classical texts in Western Political Philosophy through two methods (i) an intensive reading of selected parts of the text, and (ii) by making them familiar with different interpretations of the texts.

2.The idea is to instill in students an interest in reading original works, in the desire to closely follow the debates around the work, and become aware of the different ways in which a text can be read.

A detailed study of any **Four** texts from the given list will be offered in an academic session.

Course Outcome

CO1: Students will demonstrate knowledge of key thinkers and concepts
CO2: Students will compare thinkers on similar concept
CO3: Students will use concepts to analyze new situations
CO4: Students will explain the nature and value of normative thinking
CO5: Students can forsee Critical gaps.

	Bloom's Level	Credit Hours
Module 1: Introduction a. Why study the History of Ideas? b. What is Interpretation? c. Problems in Interpreting Data d. Theories of Interpretation e. Meaning and Context f. The Importance of Language	**L1, L2**	**10**
Module 2: Texts *1.* **Plato**: *The Republic* *2.* **Aristotle**: *The Politics* *3.* **Machiavelli**: *The Prince* *4.* **Hobbes**: *Leviathan* *5.* **Locke**: *The Second Treatise of Government* *6.* **Rousseau**: *Social Contract* *7.* **Kant**: *Groundwork of the Metaphysic of Morals* 8. **Hegel**: *Philosophy of Right* (excerpts) 9. **Marx & Engels** *10.* **Mill**: *On Liberty*	**L1, L2**	38

Bloom's Level

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L1: Knowledge; L2: Comprehension; L3:Application L4: analysis ; L5 : Synthesis, L6 : evaluation.

Note: Whichever four text student chooses all have to be given equal importance in terms of credit hours. So credit hours stands equally divided between all four text choosen. In Bloom's level it should be both a combination of Knowledge and Comprehension.

Examination Scheme

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(A : Attendence ; P : Presentation ; A/TP : Assignment/Term Paper ; CT : Class Test ; EE : External Examination)

Key Texts:

Introduction:

- Ball, Terence, 'History and the Interpretation of Texts,' in Gerald F Gaus and Chandran Kukathas (eds.), *Handbook of Political Theory* (Sage, 2004).
- Skinner, Quentin, 'Meaning and understanding in the history of ideas' *History and Theory*, 1969, 8: 3–53.
- Pocock, J. G. A., 'The history of political thought: a methodological enquiry' in Peter Laslett and W. G. Runciman, (eds) *Philosophy, Politics and Society*, 2nd series. (Oxford: Blackwell, 1962)
- Strauss, Leo, *What is Political Philosophy?* (Glencoe, IL: Free Press, 1959)

Texts:

- Plato
- Plato, *The Republic*, trans. P. Shorey, Loeb Classical Library (Cambridge, MA: Harvard University Press, 1930)
- Aristotle
- Aristotle, The Politics, *The Politics and the Constitution of Athens*, trans. B. Jowett, ed. S. Everson. (Cambridge: Cambridge University Press, 1996)
- Machiavelli
- Machiavelli, *The Prince*, ed. and trans. G. Bull (Harmondsworth: Penguin, 1961) Hobbes
- Thomas Hobbes, *Leviathan*, ed. C. B. Macpherson (Baltimore: Penguin Books, 1968). Locke
- John Locke, *Two Treatises of Government*, ed. Peter Laslett (Cambridge: Cambridge University Press, 1960).
- Rousseau
- Jean-Jacques Rousseau, *On the Social Contract, with Geneva Manuscript and Political Economy*, ed. Roger D. Masters, trans. Judith R. Masters (New York: St. Martin's Press, 1978)
- Kant
- Kant, I., Groundwork of the Metaphysics of Morals, trans. H.J. Paton, (New York: Harper & Row, 1964)
- Hegel
- Hegel, G.W.F. (1979) *The Philosophy of Right*, trans. T.M. Knox. (Oxford: Oxford University Press, 1979).
- Marx & Engels
- Tucker, Robert C, ed., *The Marx-Engels Reader*, 2nd Edition, (New York: W W Norton & Co.; 1978)
    - *Preface to A Contribution to the Critique of Political Economy:* pg. 3-6
    - *Economic and Philosophic Manuscripts of 1844:* pg. 73-93

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- *Theses on Feuerbach:* pg. 143-145
- *The German Ideology:* pg. 146-200
- *Manifesto of the Communist Party:* pg. 469-500
- *Critique of the Gotha Programme:* pg. 525-541
- *The Eighteenth Brumaire of Louis Bonaparte:* pg. 594-617

- Mill
- Mill, John Stuart, *On Liberty and other writings*, ed. Stefan Collini (Cambridge, 1989). Wollstonecraft
- Wollstonecraft, Mary, *A Vindication of the Rights of Woman, ed.* by Miriam Brody (London: Penguin Books, 1992)
- Kollontai
- Kollontai, A., [1909] *The Social Basis of the Woman Question.*
- Nietzsche
- Nietzsche, F. *On the Genealogy of Morals*, trans. D. Smith. (Oxford: Oxford University Press, 1996)
- Rawls
- Rawls, John, *A Theory of Justice.* (Cambridge, MA: Harvard University Press, 1971) Mahatma Gandhi
- Anthony J. Parel, (ed.), *Gandhi: Hindi Swaraj and Other Writings Centenary Edition*, CUP, 2009

CO, PO and PSO mapping

	PO1	PO1	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
CO 1	1	1	1	2	2	1	2	3	3	3	1		1	1	2
CO 2		1	1	2	1	1	2	1	2	3		2	1	2	1
CO 3	1	1	2	2	3	2	1	2	2	3	2		1	1	2
CO 4	1	1	1	2	2	3	1	1	2	2	1		1	2	2
CO 5	1	2	2	1	2	3	2	3	2	1		3	1	1	2

1.Strongly Related 2. Moderately related 3. Weakly Related

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DPOL2839	DATA ANALYSIS & VISUALISATION USING SOFTWARE	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	Class X Mathematics				
Co-requisites					

Catalog Description

The implosion of available data has made visualization more critical but also more challenging. Data analysis and Data Visualization are essential tools for business analysis, engineers, policymakers, and decision-makers. Developed originally for "small data", visualization techniques have been met with varied success in the past centuries and decades. There are a few well-known visualizations that are very effective in capturing the essence of the data, and of course, there are many infamous negative examples of poor visuals. An effective visual is critical for decision making it, but it also requires a lot of work, customization, attention to detail, and refinements.

Course Objectives

The course is designed to help students develop skills and knowledge in the following area(s):

- Develop an understanding of what is a good visualization for a given purpose
- Learn visualization theory & techniques
- Build a substantial data analytic project
- Apply data analysis and visualization with Excel, SPSS, R, Python, NVivo and MATLAB

Course Outcomes

On completion of this course, the students will be able to

CO1. Students will be able to articulate meaningful lines of inquiry that might be explored through the collection, organization, visualization, and analysis of data in a context associated with their primary field of study using (as appropriate) numerical, textual, spatial, and/ or visual data.

CO2. Student will understand what data are, how they are collected, and how to assess the quality/ reliability of data.

CO3. Students will demonstrate intermediate proficiency in the visualization of data to communicate information and patterns that exist in the data.

CO4: Students will be able to use at beginning level of proficiency the tools of statistics and machine learning to ask questions of and explore patterns in data.

Course Content :

Module	Topics Covered	Blooms Level	Contact Hours
1	**Module-1: Introduction to Excel** Data Analysis using Excel, Curve fitting, Correlation, Linear Regression, Multiple regression, Principal Component Analysis and Factor Analysis, Hypothesis testing **Introduction to Excel and SPSS** Introduction to SPSS and Types of Data, Importing, exporting and data handling in SPSS; Exploratory data analysis using SPSS and data visualization; Introduction to statistical inference and various	L1, L2, L3, L4	20 hours

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	univariate tests by using SPSS; Analysis of Variance (One Way ANOVA, Two Way ANOVA and ANCOVA); Correlation, Simple and Multiple linear Regression Analysis; Principal Component Analysis and Factor Analysis		
2	**Module-2: VOS Viewer** **Web of Science, Scopus, Dimensions, Lens, and PubMed.** Co-authorship networks, citation-based networks, and co-occurrence networks can be created based on data downloaded from Web of Science, Scopus, Dimensions, and Lens. Co-authorship networks and co-occurrence networks can also be created based on PubMed data. **Crossref, Europe PMC, and OpenAlex**. Networks can also be created based on data retrieved through the APIs of Crossref, Europe PMC, and OpenAlex, These APIs can be queried interactively in VOS viewer. **Semantic Scholar, Open Citations, and Wiki Data.** For a given set of DOIs, networks can also be created based on data retrieved through the APIs of Semantic Scholar, Open Citations and Wiki Data.	L1, L2, L3, L4	10 Hours
3	**Faculty of Management Studies & Behavioural Sciences** **Module 3: Domain Specific Software** **- Structural Equation Modelling** **Smart PLS** Introduction to Structural Equation Modelling (SEM), Introduction to the software's AMOS and SPSS, SMART PLS, Testing of Statistical assumptions, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), common method bias (CMB) test, Measurement Model Assessment, Discussing Fit Indices, Reliability and Validity Testing, Structural Model Assessment identifying multivariate outlier, Construct Validity: Convergent and Discriminant Validity, Measurement Model & Structural Equation Modelling, Mediation and Moderation Effects, Multi-Group Analysis.	L1, L2, L3, L4	30 Hours
	Faculty of Arts **N Vivo** 1. Import text, audio, video, emails, images, spreadsheets, online surveys, web content, and social media from various sources into a simple, intuitive interface. 2. Create and NVivo project, import and organise qualitative and quantitative data		

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	3.Manage a literature review in NVivo 4. Autocode structured data deductively and identify themes inductively 5. Generate and falsify hypotheses 6. Combine data in sets for analysis 7. Seek patterns and identify relationships across codes and cases 8. Present findings using visualisations 9. Export data out of NVivo 10. Coordinate teamwork.		
	Faculty of Science Engineering and Technology **Faculty of Health & Allied Sciences** **R programming / Python/ MATLAB** **R Programming-** Introduction to R, Variables and datatypes in R, Dataframes, Recasting and joining of dataframes, Arithmetic, logical and matrix operations in R, Functions in R, Control structure in R, Data visualization in R. **Python Programming-** Basics of programming, data structure and algorithm using Python, Strings, lists, control, functions, manipulating lists, loops, arrays, selection sort, insertion sort, recursion, sorting, dictionaries, exception handling, file handling, string processing, data analysis using Python **MATLAB Programming-** Introduction, basic features, managing workspace, mathematical functions, basic plotting, Matrices, array operations and linear equations, MATLAB programming- M files script, M-file functions, control flow and operations.		

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional (Theory/ Practical)	End Term Examination
Weightage (%)	5	10	15	70

References:

- David Houcque, 2005. Introduction to MATLAB programming for Engineering students., Northwestern University, E- Book **https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf**
- Mark Lutz, 2009. Learning Python. O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.
- Emmanuel Paradis, 2005. R for Beginners. E book. **https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf**
- A Handbook of Statistical Analysis using SPSS by Dr. Brijesh Awasthi, Redshine Publication.

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Amity School of Liberal Arts & FL

Bachelor of Arts (Honors/ Honors with Research) in English

FLEXILEARN
-Freedom to design your degree



Curriculum & Scheme of Examination

2023

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GURUGRAM

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Bachelor of Arts (Honors/ Honors with Research) in English

OVERVIEW

The BA English program aims to introduce a wide range of literatures in English. The programme intends to discuss wider socio-cultural issues in relation to contemporary English Literature. The programme focuses on the major areas of English literature ranging from 14th Century to the 20th Century poetry, prose, drama and novels. The courses included in the programme delve deep into literary analysis, critical thinking, and written and oral communication skills through a rigorous curriculum.

A BA English degree opens up job opportunities in various fields ranging from government to private sector jobs. BA English students also prefer to join many professional courses like editing, , script writing B.Ed etc. Proficiency in English gives the students a cutting edge in competitive exams and in corporate job markets.
For a majority of students, Masters of Arts (MA) English is a preferred choice.

Program Outcomes (POs)

- PO1.**Critical Thinking**: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
- PO2.**Effective Communication**: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.
- PO3. **Social Interaction**: Elicit views of others, mediate disagreements and help reach conclusions in group settings.
- PO4. **Effective Citizenship**: Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
- PO5. **Ethics**: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.
- PO6. **Environment and Sustainability**: Understand the issues of environmental contexts and sustainable development.
- PO7. **Self-directed and Life-long Learning**: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

Program Specific Outcomes (PSOs)

PSO 1. Develop an understanding of the evolution of English literature from the Age of Chaucer up to the 20th century.
PSO 2. Demonstrate an appreciation and understanding of literary theory and criticism.
PSO 3. Apply critical and theoretical approaches to the reading and analysis of literary and cultural texts in multiple genres.

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Bachelor of Arts (Honors/ Honors with Research) in English
SEMESTER-I

Course Code	Course Title	Credit	Structure			
			L	T	P	Total
DENG2151	**HISTORY OF ENGLISH LITERATURE**	04	4	0	0	04
Pre-requisite / Exposure						
Co- requisite						

Catalog Description

In this course, History of English Literature, the purpose is to get the students acquainted with the wide and deep history of English literature so that they may get the vision of the past and for the future which would help to increase their intellectual ability.

Course Objective

- To provide an insight into the major literary canons, the sequence of interlinked works, with their characteristics, trends and genres with major literary authors and texts.
- To interpret the knowledge of history of writing from the Anglo-Saxon and the early Christian period up to the contemporary time.
- To explain a perception of English poetry, drama and fiction through the prescribed texts..

Course Outcome

After completing this course, the students will be able to:

CO1: demonstrate awareness of major issues in the given historical period of literary genre and learn how to engage critically with other periods of English Literature

CO2: describe historical analysis of ancient texts with proficiency in English language.

CO 3: interpret key features of the origin and growth of English literature through the various ages.

CO 4: To describe a range of texts with an analytical knowledge of some aspects of English literature and culture.

Modules	Blooms level*	Credit Hours
Module 1: The Age of Chaucer : Chaucer, Langland and Malory, Miracle and Mystery Plays	L1, L2	15
Module2: Renaissance: Elizabethan Drama and Poetry; Jacobean – Revenge plays, Metaphysical Poets; Puritan Age)	L1, L2	10
Module 3: Classical Age: Restoration & Augustan Age	L1,L2	15
Module 4: Romanticism Age of Romantic Revival (Wordsworth, Coleridge, Keats, Shelley, Browning)	L1, L2	15
Module 5: Victorian Age Victorian Age: Tennyson, Browning, Matthew Arnold, Charles Dickens, Thomas Hardy	L1, L2	5

***Bloom's Level:** *L1- Knowledge; L2- Comprehension; L3- Application; L4- Analysis; L5- Synthesis, L6- Evaluation*

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Text Books

- Daiches, David. *History of English Literature*. Vol. I, II, III, Allied Publishers,1979
- Sanders, Andrew. *Short Oxford History of English Literature*. Oxford Univ, Claredon Press, London, 1994

Reference Books

- Jesse, Matz. *The Modern Novel: A Short Introduction*. Wiley-Blackwell, 2004
- Mehrotra, Arvind Krishna. *An Illustrated History of Indian Literature in English*. Orient Blackswan, 2003
- Harry Blamires. *A Short History of English Literature*. Second Edition, Rutledge, London, 1984

Web Resources

- A-Short-History-of-English-Literature.pdf
- Ronald_Carter_The_Routledge_History_of_LiteraturBookFi.org_.pdf
- Andrew Sanders- The Short Oxford History- 1994.pdf

Modes of Evaluation: **Quiz/Assignment/ Seminar/Written Examination**

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

Relationship between the Course Outcomes (COs), Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	1	1		2			3	1	1	1
CO2	1	1			2		2	1	1	2
CO3	1	1			2		3	1	2	1
CO4	1	1				2	2	1	2	3
CO5	1	1		2	2		1	1	2	2

1. Strongly Related 2. Moderately related 3. Weakly Related

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Course Code	Course Title	Credit	Structure			
			L	T	P	Total
DENG2101	**ENGLISH POETRY FROM CHAUCER TO BLAKE**	04	04	0	0	04
Pre-requisite / Exposure						
Co- requisite						

Catalog Description

In this course English Poetry from Chaucer to Blake, the purpose is to acquaint the students with a wide range of English poetry which covers the time span from Chaucer to Blake so that they may develop the aesthetic taste for literature and nature as well.

Course Objective

1. To provide knowledge of English poetry from Chaucer of the later Middle Age to the Age of Transition.
2. To interpret a broad and sublime perspective of the important periods of English Poetry and different genres of poetry
3. To analyze social, political and cultural aspects of Literature from Chaucer to Blake

Course Outcome

After completing this course, the students will be able to:

CO1- Explain Chaucer's literary works, to describe the connection between Chaucer's literary works and his life and culture

CO2- Describe the philosophy of John Donne's life and summarize the characteristics of metaphysical poetry.

CO3- Interpret Milton's *Paradise Lost* and compare with literature of later time periods, gaining a broader knowledge of one of the most important periods in English literature.

CO4 Identify imagery used in Blake's Poems and describe William Blake's life and vision, understand Blake's unique pattern of work.

CO5- Define various forms of poetry in different eras.

Course Content

Modules	Blooms Level*	Credit Hours
Module 1: Geoffrey Chaucer - Prologue to the Canterbury Tale A vivid picture of the different classes of the contemporary society of Chaucer through poetry, a masterpiece of Chaucer's genius	L1,L2	15
Module 2: John Donne **The Canonization, The Sunne Rising, The Good Morrow, The Flea** Origin of the Metaphysical Movement, Spirituality in Metaphysical poetry, The Metaphysical traits of the Donne's poetry. The contribution of Dr Johnson and T S Eliot.	L2, L2	15
Module 3: John Milton - Paradise Lost Book I. Chief traits of Puritan Age, A quick acquaintance with the Christian mythology in poetical way, Character of Satan, Biblical theme of the epic, Milton as a Puritan Poet.	L2, L2	15
Module 4: William Blake **The Lamb, The Tiger, A Poison Tree** Mysticism in Blake's poetry, His treatment of Nature, Some other important poems of William Blake, the visionary quality in the poems of William Blake, the study of contrast in William Blake's poetry	L1, L2	15

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*****_Bloom's Level: L1- Knowledge; L2- Comprehension; L3- Application; L4- Analysis; L5- Synthesis, L6- Evaluation_

Text Books

- Geoffrey Chaucer, Prologue to the Canterbury Tale, Fingerprint! Publishing, 2017
- John Donne, The Canonization, The Sunne Rising, Createspace Independent Pub, 2016
- John Milton, Paradise Lost Book I, Fingerprint! Publishing , 2015
- William Blake, The Lamb, The Tiger, Harcourt Childrens' Books, 1993

Reference Books

- Guibbory, The Cambridge Companion to John Donne, Cambridge University Press,:2006
- Danielson, Dennis (Ed): Cambridge Companion to Milton, Cambridge University Press, 1999
- Zunder, William, Paradise Lost, J Milton, Macmillan, London, 1999
- Bottrall, Margaret, William Blake, Songs of Innocence and Experience, 1969

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

Relationship between the Course Outcomes (COs), Programme Outcomes (POs) and Proggramme Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	1	3		2	3	2	1	1	1
CO2	1	1	3		2	2	2	2	1	1
CO3	1	1	3	3	2		2	2	2	1
CO4	1	1	3		2	2	2	1	1	1
CO5	1	2	2	2	2	2	2	1	1	1

1. Strongly Related 2. Moderately related 3. Weakly Related

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SEMESTER-II

DENG2251	ENGLISH POETRY FROM WORDSWORTH TO TENNYSON	L	T	P	C
		4	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

This course will enable the students to get a broad perspective of the important as well as prolific periods of English Poetry and different genres of poetry. The focus of this paper is to explore the society, nature, imagination, Victorian Dilemma, etc.

Course Objectives

1. To define the characteristics of Romanticism
2. To explain impact of the French Revolution and Industrial Revolution
3. To interpret the salient features of Victorian Poetry

Course Outcomes

On the completion of the course students will be able to:
CO-1: Identify various themes implicit in the poems of the Romantic and Victorian Poets.
CO-2: Compare the characteristics of romantic and Victorian poetry.
CO-3: Analyze poetic devices, imageries etc used in poetry.
CO-4: Define the sensuousness, escapism, symbolism, negative capability depicted in the poems of John Keats.
CO-5: Describe French revolution, romanticism and Industrial revolution,

Modules		
Module-I: William Wordsworth: Tintern Abbey, Ode on the Intimations of Immortality, The World is Too Much With Us, The Solitary Reaper Concept of Man and Nature, Imagination, Philosophical Aspects, Mysticism, Personal and spiritual Experiences, Pantheistic view	Bloom's Level L1	Credit Hours 10
Module-II: Samuel Taylor Coleridge : Kubla Khan: Intuition, Depths of dream, Superstition, Primary and Secondary Imagination, Romantic associations , supernaturalism	L2	10
Module-III: P.B. Shelley Ode to the West Wind, To a Skylark Background, Philosophy of Love and Dejection, Concept of Nature John Keats: Ode to Nightingale, Ode on a Grecian Urn. Greek Mythology, Sensuousness, Negative Capability,	L2	10
Module-IV: Robert Browning : My Last Duchess, The Last Ride Together Salient Features of Victorian Poetry , Critical Appreciation of the Poem, Art and Culture, Psychological interpretations.	L2	10

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Module-V: Matthew Arnold *Dover Beach, The Scholar Gypsy* Interpretation, Philosophy of optimism vs Pessimism, Treatment of Nature, Concept of Alienation, Touchstone method, Poetry as Criticism of Life	L2	10
Module-VI: Alfred Tennyson The Lady of Shalott: Nature, Love,Hope, Creation,Ballad	L2	10

Bloom's LevelL1: Knowledge; L2: Comprehension; L3:Application L4: analysis ; L5 : Synthesis, L6 : evaluation

Text Books

- Roe, Nichole: *Romanticism*. Oxford University Press 2005
- Wolfson, Susan J: *Cambridge Companion to Keats*. Cambridge University Press.2006
- Fraser, George Sutherland: John Keats: Odes: A Casebook. Macmillan.1971

Reference Books

- Robinson, Daniel: *A Century of Sonnets: The Romantic Era Revival*. Oxford University Press.2002
- Palmer, David John: *Tennyson*. Ohio University Press.1973.

Examination Scheme

Components	Assignment	Sessional	Attendance	EE
Weightage (%)	15	10	05	70

CO ,PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	1							1	1
CO2	1	1							1	1
CO3	1	1							1	1
CO4	1	1							1	1
CO5	1	1							1	1

1. Strongly Related 2. Moderately related 3. Weakly Related

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DENG2201	INTRODUCTION TO LINGUISTICS	L	T	P	C
		4	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

The paper aims to provide the learner the basic knowledge of Linguistics, various aspects of language study and its applications. The focus of the paper is also to introduce the learners with the basics of correct pronunciation and articulation and thereby to improve their communication skills.

Course Objectives

- To define the characteristics and levels of Language
- To explain Phonetics and Phonology
- To describe word-formation using Semantics

Course Outcomes

On the completion of the course students will be able to:

CO1: Explain the meaning and role of language, history linguistics as a science

CO2: Identify speech organs involved in the production and will be able transcribe phonetics transcriptions for the correct pronunciation of words

CO3: Describe word formation would by adding suffixes, prefixes and infixes to the root words

CO4: Explain the relationship between signifiers (words, phrases, signs and symbols), and what they stand for

Modules		
Module-I: Introduction What is language: Characteristics of Human Language, Linguistics **:** Definition and Explanation, Importance and applications of Linguistics, Levels of language study	**Bloom's Level** **L1**	**Credit Hours** **10**
Module-II: Phonetics and Phonology Difference between Phonetics and Phonology; Classification of Sound System Articulation and Production of sounds, Tone, accent, and stress	L2	10
Module-III: Morphology Suffixes and Prefixes; Meaning of Suffix and Prefix, Role in Word Formation Processes, Usage of Suffixes and Prefixes	L2	15
Module-IV: Semantics Meaning, logical semantics, lexical semantics , Usage of Semantics, Vocabulary building in Communication	L2	15
Module-V: Syntax Theories of sentence structure, Simple, Compound and Complex Sentences, Sentence structure analysis	L2	10

Bloom's LevelL1: Knowledge; L2: Comprehension; L3:Application L4: analysis ; L5 : Synthesis, L6 : evaluation

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Examination Scheme

Components	Assignment	Sessional	Attendance	EE
Weightage (%)	15	10	05	70

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1			1							1
CO2			1							1
CO3			1							1
CO4			1							1

1 Strongly Related 2. Moderately related 3. Weakly Related

Text Books

1. Crystal D. *Encyclopedia of Language* : 2nd Vol., Cambridge University Press 1977.

Reference Books

2. Adams, V. *An Introduction to Modern English Word Formation*. London. Longman.1973.
3. Chomskey, N., and M. Halle. *The Sound Pattern of English*, New York : Harper and Row.1968
4. Lyons, J, *Semantics*. 2 Vols. Cambridge University Press.1977.

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SEMESTER-III

DENG2301	20TH CENTURY INDIAN ENGLISH POETRY	L	T	P	C
		4	0	0	4
Pre-requisite / Exposure					
Co- requisite					

Catalog Description

In this course, the students will be able to understand contemporary Indian English Poetry with its emerging trends. The students will be exposed to the varieties of social and literary provocations in the texts prescribed and also trace the changes in style, theme and ideologies in Modern Indian English Poetry.

Course Objectives

1. To describe culture and identity through understanding of a wide spectrum of perspectives on Indian nationhood and culture.
2. To assess Modern Indian Poetry with an understanding of various facets in the history of Modern India.

Course Outcomes

After completing this course, the students will be able to:
CO1**:** Critically analyze new perspectives of Modern Poetry
CO2: Explain vast panorama of literary devices used to create poetic world and to correlate their own sensibilities with the literary expressions in the text
CO3: Analyze the social, cultural and economic status of modern India
CO4: Interpret the crux of texts through translations from Indian regional languages to English
CO5: Explain past-present interface in the texts prescribed

Modules	Bloom's Level	Credit Hours
Module-I: Jayanta Mahapatra Hunger; Grandfather Thematic Concerns, Socio-Cultural Analysis	L2	15
Module-II: A K Ramanujan The Striders, A River Critical Appreciation, Cultural perspectives	L2	15
Module-III: Kamala Das An Introduction ;My Grandmother's House Mail features, Critical Analysis, Psychological Concerns	L2	15
Module-IV: N. Ezekiel Goodbye Party to Miss Pushpa T S.,Night of the Scorpion, The Enterprise Main features of Indian Poetry in English	L2	15

Bloom's Level L1: Knowledge; L2: Comprehension; L3: Application; L4: analysis; L5: synthesis, L6: evaluation

Text Books

- Singh, R.P. *An Anthology of Indian English Poetry*. Orient BlackSwan, 1989.
- Premchand, Munshi. *Selected Short Stories of Premchand*. Maple Press, 2012.

Reference Books

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- Mehrotra Krishna Arvind. *The Oxford India Anthology of Twelve Modern Indian Poets*. Oxford University Press, 1997
- Singh R.P. *Anthology of Indian English Poetry*. Orient Black Swan, 1998
- Ramanujan A.K. *The Collected Essays of A.K. Ramanujan* Oxford University Press, 2004.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	2						1		2
CO2	1	2						1		2
CO3	2	1	1					1		2
CO4	1	1						1		2
CO5	2	1					1	1		2

1Strongly Related 2. Moderately related 3. Weakly Related

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DENG2351	ENGLISH NOVEL	L	T	P	C
		4	0	0	4
Pre- requisite / Exposure					
Co- requisite					

Modules	Bloom's Level	Credit Hours
Module-I: Jonathan Swift- Gulliver's Travels Reprints and adaptations, summary and analysis, characterization, motifs and symbols	L1, L2	15
Module-II: Jane Austen - Pride and Prejudice Historical and literary context of the novel, study of Victorian Era, plot and summary, explanation, analysis and visualization of themes, symbols	L1, L2	15
Module-III: Charles Dickens - Hard Times Utilitarianism, Plot overview, character analysis, themes, motifs and symbols	L1, L2	15
Module-IV: Emily Bronte - Wuthering Heights Plot and Summary, Dramatic Personae, Macabre & Gothic, Conflict between nature and culture, Class system in Victorian era, Gender roles	L1, L2	15

Bloom's Level L1: Knowledge; L2: Comprehension; L3: Application L4: analysis ; L5 : synthesis, L6 : evaluation

Text Books

- Bronte, Emily. Wuthering Heights. Penguin Classic, 2012.
- Swift, Jonathan. *Gulliver's Travels*. Rupa, 1990.
- Austen, Jane. *Pride and Prejudice*. Createspace Independent Publishing Platform, 2016.

Reference Books

- John Richetti. *Cambridge Companion to the Eighteenth Century Novel*. Cambridge Univ. Press, 1996
- Wilbur L Cross. *Development of The English Novel*. Macmillan, 1919

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

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CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	2						1		2
CO2	1	2						1		2
CO3	1		2				3	1		2
CO4	1	2						1		2
CO5	1		2				3	1		2

Strongly Related 2. Moderately related 3. Weakly Related

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Course Code	Course Name	Credit	Structure			
			L	T	P	Total
SENG2301	**ACADEMIC WRITING & COMPOSITION**	03	02	0	1	03
Pre requisite /Exposure						
Co- requisite						

Catalog Description

In this course Academic Writing and Composition is designed to help the students develop the skills necessary for effective academic writing and help the students understand the ways that language and communication shape experience, construct meaning and foster community.

Course Objective

- To provide strategies and processes that successful writers employ as they work to accomplish specific purposes. knowledge and praxis of Academic writing in detail to the students
- To provide students with rhetorical foundations and prepare them for the demands of the professional writings

Course Outcome

After completing this course, the students will be able to:

CO1- Define the scope of Academic Writing and Composition.
CO2- Describe and explain the various writing processes and skills.
CO3- Demonstrate their academic writing skills by composing various types of academic writings.
CO4- Differentiate between various types of academic writings.
CO5- Develop critical thinking and successfully structure an argument in their writings.

Course Content

Modules	Blooms Level*	Credit Hours
Module 1: **Introduction to the Writing Process** Developing writing skills, writing comprehension **Writing in one's own words** Summarizing, Paraphrasing, condensation	L1, L2	12
Module 2: **a) Critical Thinking:** Syntheses, Analyses, and Evaluation **b) Structuring an Argument:** Introduction, Interjection, and Conclusion	L1, L2	12
Module 3: Citing Resources Editing, Book and Media Review	L1, L2	12

***Bloom's Level:** *L1- Knowledge; L2- Comprehension; L3- Application; L4- Analysis; L5- Synthesis, L6- Evaluation*

Text Books

- Lyons, Liz Hamp Lyons and Ben Heasley. 2006. *Study writing: A Course in Writing Skills for Academic Purposes*. Cambridge University Press.
- Renu Gupta. 2010. *A Course in Academic Writing.* Orient BlackSwan.

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Reference Books

- Ilona Leki. 1998. *Academic Writing: Exploring Processes and Strategies*. 2nd Edition, Cambridge University Press.
- Gerald Graff and Cathy Birkenstein,. 2009. *They Say/I Say: The Moves That Matter in Academic Writing*. Orient BlackSwan.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

Relationship between the Course Outcomes (COs), Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	1	3		2	3	2	1		1
CO2	1	1	3		2	2	2	2		1
CO3	1	1	3	3	2		2	2		1
CO4	1	1	3		2	2	2	1		1
CO5	1	2	2	2	2	2	2	1		1

2. Strongly Related 2. Moderately related 3. Weakly Related

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SEMESTER-IV

DENG2451	LITERARY CRITICISM	L	T	P	C
		4	0	0	4
Pre- requisite / Exposure					
Co- requisite					

Catalog Description
Literary Criticism is a survey of Western and Criticism with an emphasis on the most prominent theorists, texts, schools and ideas. It provides a basic frame of reference from which to understand and assess the contemporary theoretical and critical scene.

Course Objectives

- To illustrate an understanding of key concepts in literary theory
- To describe an insight into certain literary traditions in relation to English Literary Criticism.

Course Outcomes
After completing this course, the students will be able to:
CO1: Identify, describe and define a variety of literary theories from Aristotle to present day
CO2: Analyze critical responses to literature grounded in those theories
CO3: Interpret the various social and cultural movements and eras
CO4: Illustrate a clear understanding of important texts in the history of theory and criticism.
CO5: Examine how theory and criticism has shaped literature

Modules	Blooms Level	Credit Hours
Module-I: Aristotle : Poetics Tragedy, Tragic hero, Catharsis, Plot, Unities	L1	15
Module-II: John Dryden :"Three Unities" form Essay of Dramatic Poesy **Wordsworth : Preface to the Lyrical Ballads** Introduction to poetry, qualities of poet, role of nature	L2	15
Module-III: Matthew Arnold: The Study of Poetry Arnold as a poet, inspiration and imitation, touchstone method, theoretical and practical criticism	L1	15
Module-IV: T.S. Eliot :Tradition and the Individual Talent Definition of tradition, definition of poetry, qualities of a poet, comparison between new work and past work, mind of a poet	L1	15

Bloom's Level L1: Knowledge; L2: Comprehension; L3:Application L4: analysis ; L5 : synthesis, L6 : evaluation

Text Books

- Aristotle. *Poetics.* Penguin India. 1996.
- Murukan Babu C R. *A Textbook of Literary Criticism and Theory*. CR Murukan Babu, 2014.

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Reference Books

- Amlan Das Gupta, *Aristotle Poetics*. Pearson Education, 2007
- John R. Willingham, *A Handbook of Critical Approaches to Literature*. Oxford University Press, 2010
- Lodge, David Modern *Criticism and Theory*: *A Reader*. Pearson Education, 2000.
- Patricia Waugh, *Literary Theory and Criticism*. Oxford University Press, 2006.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	2						1		2
CO2	1							1		2
CO3	1		3					1		2
CO4	1						2	1		2
CO5	1						2	1		2

Strongly Related 2. Moderately related 3. Weakly Related

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Course Code	Course Title	Credit	Structure			
			L	T	P	Total
DENG2401	**DRAMA FROM ELIZABETHAN TO RESTORATION AGE**	04	04	0	0	04
Pre-requisite / Exposure						
Co- requisite						

Catalog Description

In this course Drama from Elizabethan to Restoration Age, the purpose is to get the students acquainted with the classical plays, morality plays as well as comic ironical plays so that they can develop the understanding for literature and human nature as well.

Course Objectives

- To explain the different genres of Drama from the Elizabethan to the restoration age.
- To provide a close reading and analysis of selected representative writers of the periods with their representative texts will be done. This will help to
- To analyze the varied literary styles in relation to political and cultural issues of these pivotal literary periods.

Course Outcomes

After completing this course the students will be able to

CO1- Explain main themes of the plays and their social, cultural circumstances.

CO2- Describe the basic elements of literary analysis, such as dialogue, plot and characters.

CO3- Define the interpretative processes involved in the analysis of a Shakespearean play, and identify the fundamentals of psychoanalysis in Dr Faustus.

CO4- Explain a realistic picture of the contemporary society

CO5- Interpret Congreve's style of work, salient characteristics of English aristocratic ladies and satire on the upper class of society

Course Content

Modules	Blooms Level*	Credit Hours
Module I: Marlowe -Dr. Faustus A psychoanalytical play, Chief traits of Marlowe's dramas, Chief traits of psychoanalytical plays, the theme of damnation and eternal thirst for redemption, the Biblical concept of the play.	L1, L2	20
Module II: Shakespeare -Macbeth, The Twelfth Night Shakespeare as a chief dramatist of Elizabethan age, Chief traits of Shakespearean tragedies, the tragic flaw of the main character, character and role of Lady Macbeth	L1,L2	20
Module III: Congreve -The Way of the World A satirical Play, Licentiousness as a major subject in the dramas of William Congreve, Portrayal of picture of the contemporary society.	L1,L2	20

***Bloom's Level:** *L1- Knowledge; L2- Comprehension; L3- Application; L4- Analysis; L5- Synthesis, L6- Evaluation*

Text Books

- Marlowe, *Dr. Faustus*, Oxford; 2 edition, 1997

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- Shakespeare, *Macbeth*, Barron's Educational Series, 1985
- Congreve, The Way of the World, Peacock Books; First edition, 2020

Reference Books

- Ali, Amir, *Basic Introduction to Shakespeare*, Oxford University Press, 1989
- Bloom, v, *Christopher Marlowe*, New York: Chelsea House, 1986
- Clemens, Wolfgang, *Shakespeare's Dramatic Art: Collected Essays,* New York: Routledge, 2005
- Patrick, Lyons, *Congreve: Comedies*, Macmillan, 1983
- Taylor, D. Crane, *William Congreve*, Oxford University Press, 1931.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

Relationship between the Course Outcomes (COs), Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)

	PO1	PO1	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1		2		1		1	1	2	1
CO2	1				2		2	1	2	1
CO3	1				1	2	1	2	2	1
CO4	1	2		2				1	3	2
CO5	1		2		2		1	1	3	3

1. Strongly Related 2. Moderately related 3. Weakly Related

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Course Code	Course Title	Credit	Structure			
			L	T	P	Total
SENG2401	**MEDIA AND COMMUNICATION**	03	02	0	1	03
Pre-requisite / Exposure						
Co- requisite						

Catalog Description

In this course Academic Writing and Composition is designed to help the students develop the skills necessary for effective academic writing and help the students understand the ways that language and communication shape experience, construct meaning and foster community.

Course Objective

To develop an awareness about the types and significant role of Media & communication in the present world with its areas of communication inquiry, social interaction and mediated communication.

- To enable students to practice the ethics and etiquettes during both face-to-face and Mediated social encounters

Course Outcome

After completing this course, the students will be able to:

CO1- To understand the process of communication, including different forms, levels and barriers.
CO2- To get knowledge about communication models and its application
CO3- To understanding Media Systems and Communication Theories
CO4- To learn about the wide array of communication from folk media to Social media.
CO5-. To understand the role of media in development

Course Content

Modules	Blooms Level*	Credit Hours
Module 1: Introduction to Mass Communication Mass Communication and Globalization**;** Forms of Mass Communication: social media, Face book, Twitter; Marshal McLuhan: *The Medium is the Message* Topics for Student Presentations: a. Case studies on current issues Indian journalism b. Performing Street plays c. Writing pamphlets and posters, etc.	L1, L2	12
Module 2: Media Writing and Advertisement Scriptwriting for TV and Radio**;** Writing News Reports and Editorials**;** Editing for Print and Online Media Topics for Student Presentations: a. Script writing for a TV news/panel discussion/radio programme/hosting radio programmes on community radio b. Writing news reports/book reviews/film reviews/TV program reviews/interviews c. Editing articles d. Writing an editorial on a topical subject	L1, L2	12

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Module 3: Introduction to Cyber Media and social media Types of Social Media**;** The Impact of social media**;** Introduction to Cyber Media	L1, L2	12

***Bloom's Level:** *L1- Knowledge; L2- Comprehension; L3- Application; L4- Analysis; L5- Synthesis, L6- Evaluation*

Text Books

1. Keval J Kumar, Mass Communication in India, 4th Edition, Jaico Publishing House, Delhi, India
2. James G. Stovall, Writing for Mass Media, Pearson, London, UK, 2011

Reference Books

1. Jethawaney J and Jain Shruti, Advertising Management, Oxford University Press, Delhi 2006.
2. Frank Jefkins, Advertising, Tata McGraw- Hill, New Delhi 2007.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment, EE: End Semester Examination

Relationship between the Course Outcomes (Cos), Programme Outcomes (Pos) and Programme Specific Outcomes (PSOs)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	1	1	3		2	3	2	1		1
CO2	1	1	3		2	2	2	2		1
CO3	1	1	3	3	2		2	2		1
CO4	1	1	3		2	2	2	1		1
CO5	1	2	2	2	2	2	2	1		1

3. Strongly Related 2. Moderately related 3. Weakly Related

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SEMESTER-V

Course Code	Course Title	Credit	Structure			
			L	T	P	Total
DENG2501	**DRAMA FROM SHAKESPEARE TO BEN JONSON**	04	04	0	0	04
Pre-requisite / Exposure						
Co- requisite	NIL					

Catalog Description

In this course of MA English Literature, we would like students to comprehend the basic concept of English Drama from Shakespeare to Ben Jonson so that they can understand and describe the major characteristics of Drama in that age from Shakespeare to Ben Jonson with the help of the prescribed text.

Course Objectives

- To define the knowledge of the growth and development of drama in the Elizabethan period with Shakespeare as the representative poet through analysis of generic texts.
- To evaluate the representative texts of Thomas Middleton, Webster and Ben Jonson will be studied with Historical and cultural backgrounds.
- To analyse the critical understanding of the different forms of drama like the tragedy, comedy, history, tragic-comedy, melodrama, farce etc.

Course Outcomes

On completion of this course, the students will be able to

CO1:Assess themselves with the different literary trends of the Elizabethan Period.

CO2:Define the important dramas of William Shakespeare through in- depth analysis of generic texts.

CO3:Explain the characteristics of the representative plays of John Webster and Ben Jonson

CO4:Analyse ththe social, historical and cultural background ofthe Elizabethan Age

CO5:Explain the different forms of drama like tragedy, comedy, tragic-comedy, melodrama, farce etc.

Modules	Blooms' Level*	Credit Hours
Module-I: Renaissance, Elizabethan Drama Meaning, origin and growth of Renaissance Important characteristics of the Elizabethan age, growth of English theatre, salient features of Elizabethan drama, characteristics of Shakespearean comedy and tragedy, Comedy of Humours, Jacobean drama	L1	8
Module-II: William Shakespeare: *Hamlet, The Tempest* A brief discussion of the major tragedies of Shakespeare and their characteristics, meaning and elements of Shakespearean romance, *The Tempest* as a Shakespearean Romance, role of fantasy, music song and supernatural element in a romance	L3	20

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John Webster: *The Duchess of Malfi* Meaning and characteristics of revenge tragedy, Senecan tragedies, The important revenge plays in the Elizabethan age, Webster's *The Duchess of Malfi* as a revenge tragedy.	L2	10
Module-III: Ben Jonson : *The Alchemist* Comedy of Humours, *The Alchemist* as a Jonsonian comedy	L3	10

Bloom's Level L1: Knowledge; L2: Comprehension; L3: Application L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Shakespeare, William. *Hamlet*. Fingerprint Publishing, 2015.
2. Shakespeare, William. *The Tempest*. S Chand Publishing, 2017.
3. Webster, John. *The Duchess of Malfi*. Bloomsbury Paperback, 2015.
4. Jonson, Ben. *The Alchemist*. New Delhi: Rama Brothers India, 2009.

Reference Books

1. Bradley, A.C. *Shakespearean Tragedy*. Penguin Random House,1991.
2. Wilson Knight. *A Wheel of Fire*. Routledge, 1989.
3. **Evans, G.***Elizabethan Jacobean Drama: The Theatre in Its Time*. New Amsterdom Books, 1990.
4. Singer, Ben.***Melodrama and Modernity: Early Sensational Cinema and Its Contexts***. Columbia University Press, 2001.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	1								1
CO2	1	1								1
CO3	1	1								1
CO4	1	1								1
CO5	1	1								1

4. Strongly Related 2. Moderately related 3. Weakly Related

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Course Code	Course Title	L	T	P	C
DENG2502	LITERARY THEORY	4	0	0	4
Pre-requisite / Exposure					
Co- requisite					

Catalog Description

Literary Theory has transformed the field of English studies by helping to understand language, identity and society. This course aims to demystify literary theory honing critical reading skills and enriching our understanding of literature.

Course Objectives

- To provide major twentieth-century theories and its applications
- To outline the knowledge to the works of literature

Course Outcomes

After completing this course, the students will be able to:
CO1: Define literary theory and its applications.
CO 2: Describe the concepts of post –colonialism
CO 3: Define post structuralism with the structuralism.
CO 4: Explain feminism and psychoanalysis as literary theories
CO5-: Describe the concepts or arguments in a close reading of a literary text

Modules	Bloom's Level	Credit Hours
Module-I : Structuralism - Definition and Concept. Claude Levi-Strauss, Ferdinand de Saussure, Michel Foucault, Roland Barthes	**L1,L2**	**10**
Module-II: Post-Structuralism & Deconstruction - Definition and Concept Derrida, the father of Deconstruction, binary opposition, difference, supplement	**L1, L2**	**10**
Module-III: Psychoanalytic - Definition and Concept Description of theory, Understanding of Sigmund Freud, Culture, Language and Society, Oedipus Complex.	**L1, L2**	**10**
Module-IV: Post Colonialism- Definition and Concept Colonial discourse, decolonization struggles, nationhood and nationalism, cultural identity	**L1, L2**	**15**
Module-V: Feminism - Definition and Concept. History, the four waves, post-feminism, feminist theory, movements and ideologies, societal impact	**L1, L2**	**15**

Bloom's Level L1: Knowledge; L2: Comprehension; L3: Application L4: analysis; L5: synthesis, L6: evaluation

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Text Books

1. Barry, Peter. *The Beginning Theory*, Manchester University Press, 2002
2. Eagleton, Terry. *Literary Theory: An Introduction*. University of Minnesota Press; 1996.

References Books

1. Spivak, G. Chakravarty. *'Can the Subaltern speak?' in Colonial Discourse and Post Colonial Theory: A Reader*, eds. Patrick Williams and Laura Chrisman London: Harvester Wheat sheaf, 1994
2. Lodge. *Modern Criticism and Theory*: *A Readers*. Pearson Education, 2000
3. Waugh, *Patric. Literary Theory and Criticism*. Oxford University Press, 2006
4. Seldon. *A Reader's Guide to Contemporary Literary Theory*, 5/E. Pearson Education, 2005
5. Young, Robert J C. *Post colonialism: A Very Short Introduction*. Oxford University Press, 2003

Modes of Evaluation: **Quiz/Assignment/ Seminar/Written Examination**

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1						2	1		2
CO2	1						2	1		2
CO3	1						2	1		2
CO4	1						2	1		2
CO5	1							1		2

1. Strongly Related 2.Moderately related 3.Weakly Related

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Course Code	Course Title	Credit	Structure			
			L	T	P	Total
DENG2503	**INDIAN WOMEN WRITING**	04	4	0	0	04
Pre-requisite / Exposure						
Co- requisite	NIL					

Catalog Description:
The aim of the paper is to develop, promote and disseminate knowledge about women's role in society and economic trends which affects women's and status.

Course Objectives

- To provide introduction to a variety of writings by Indian women writers
- To outline students to analyze and discuss literary texts by familiarizing them with basic approaches and concepts used in literary study.

Course Outcomes
After the completion of this course successfully the students will be able to
CO-1**:** Describe corrosive effects of the city life upon the Indian family
CO-2 Explain the theme of Partition and Socio-cultural set up.
CO3 Explain Bharati Mukherjee within the larger Indian Diaspora and cross-cultural conflict in the context in the novel**.**
CO4 Describe cultural and social construction of gender, explore the history, experiences and contribution of women to the society.

Modules	Blooms' Level	Credit Hours
Module 1: Anita Desai *Voices in the City* Fiction writing in English. Desai's love for freedom of life. Physical and mental journey as portrayed in the novel.	**L1, L2**	**12**
Module 2: Nayantara Sahgal *Storm in Chandigarh* Man-woman relationship and the relation of man to politics. Other important themes	**L1, L2**	**12**
Module 3: Bharati Mukherjee *Jasmine* Themes of dislocation and displacement, as one of the problems faced by Indians residing outside India.	**L1, L2**	**12**
Module 4: Jhumpa Lahiri *The Lowland* Political and Personal Violence, duty and desire, secrets and aspirations	**L1, L2**	**12**

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Bloom's LevelL1: Knowledge; L2: Comprehension; L3: Application L4: analysis; L5 : synthesis, L6: evaluation

Text Books

1. Desai, Anita. Voices in the City. Orient Paperbacks, 2005.
2. Sahgal, Nayantara. Storm in Chandigarh. Penguin India, 2008.
3. Mukherjee, Bharati. Jasmine. Grove Press, 2007.

Reference Books

1. Choubey, Asha, *The Fictional Milieu of Nayantara Sahgal*: *A Feminist Perspective*, Classical Pub. Co., 2002

Examination Scheme:

Components	**Assignment**	**Sessional**	**Presentation**	**EE**
Weightage (%)	15	10	05	70

CO, PO and PSO Mapping

	PO1	PO1	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	1	1					1	1	1
CO2	1	1	1					1	1	1
CO3	1	1	1					1	1	1
CO4	1	1	1					1	1	1
CO5	1	1	1					1	1	1

1. Strongly Related 2. Moderately related 3. Weakly Related

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Course Code	Course Title	L	T	P	C
DENG2504	**MODERN DRAMA**	4	0	0	4
Pre-requisites/Exposure					
Co-requisites					

Catalog Description

In this course the students will comprehend the social, socio-political, cultural, psychological, and philosophical aspects of Modern Drama written in English.

Course Objectives

1. To explain theories and practices related to Modern Drama.
2. To identity the social, cultural, philosophical, and psychological concerns of modern Drama.
3. To interpret the literary devices and critical appreciation of Modern Drama.

Course Outcomes

On the completion of the course students will be able to:

CO1: Interpret the features of Modern drama.

CO2: Define feminism depicted by the modern Dramatists.

CO3: Analyze the concept of contemporary post-war young generation and understand the psychological treatment towards the characters, given by author

CO4: Interpret the Theatre of Absurd and other kinds of Modern Drama.

Modules		
Module-I: T.S. Eliot: *Murder in the Cathedral* Features of Modern Drama, Eliot as a Modern Dramatist, Art of Characterization, Socio-Cultural Interpretations, Worldly Power vs. Spiritual Power, Fate and Sacrifice, Temptation	Bloom's Level **L2**	Credit Hours **15**
Module-II: G.B. Shaw: *Pygmalion* Approaches of G B Shaw as a modern dramatist, social, cultural and psychological concerns in *Pygmalion,* Appearance and Identity, Social Class and Manners, Femininity and Gender Roles	**L2**	**15**
Module-III: John Osborne: *Look Back in Anger* Art of Characterization in *Look Back in Anger*, Summary, Social, Cultural themes, Narrative Techniques, Alienation, Anger, Education And Class,	**L2**	**15**
Module-IV: Arthur Miller: Death of a Salesman Modern Theatre, Art of Characterization, Themes and relevance with modern times, Comparative analysis of characters	**L2**	**15**

Bloom's LevelL1: Knowledge; L2: Comprehension; L3: Application L4: analysis; L5 : Synthesis, L6 : evaluation

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Text Books

- Brown, John R. *Theatre Language: A Study of Arden, Osborne, Pinter and Wesker.* London: Allen Lane, 1972.
- Dillon, Cynthia Bishop. *The Playwriting Self of Bernard Shaw*. Southern Illinois University Press, 1991.

Reference Books

- Malamud, Randy. *T. S. Eliot's drama: A Research and Production Sourcebook.* London: Greenwood Press, 1992.
- Raby, Peter. Ed., *The Cambridge Companion to Harold Pinter*. Homerton College: Cambridge University Press, 2001.

Examination Scheme:

Components	Assignment	Sessional	Attendance	EE
Weightage (%)	15	10	05	70

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1			1				1	1		
CO2			1				1	1		
CO3			1				1	1		
CO4			1				1	1		

1.Strongly Related 2. Moderately related 3. Weakly Related

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Course Code	Course Title	L	T	P	C
DENG2505	**POST-COLONIAL LITERATURE**	4	0	0	4
Pre- requisite / Exposure					
Co- requisite					

Catalog Description

The course will discuss a wide range of issues including colonization, decolonization and the emergence of neocolonialism as well as cultural imperialism. It will explore the different modes of writing that interrogate the histories and the presence of colonial mentalities in a variety of postcolonial locations.

Course Objectives

- To provide prescribed texts in relation to post- colonial theory
- To outline coherent arguments and develop research skills

Course Outcomes

After completing this course, the students will be able to

CO1: Describe colonization, decolonization, the theories of imperialism, post-colonialism

CO 2: Define the stereotypes of Orientals.

CO 3: Explain the inter-connections of post-colonial literature and its contexts.

CO 4: Describe knowledge and critical understanding of post- colonial literature

Modules	Bloom's Level	Credit Hours
Module-I: Edward Said - Orientalism Defining and discussing Orientalism, post-structuralism, distinction between Oriental and Occident, cultural criticism, post-colonial studies	**L1, L2**	**15**
Module-II: Chinua Achebe - Things Fall Apart Pre-colonial life, tragedy of Okonkwo, identity, nationalism and decolonization, cultural ambiguity, archetypal modern African novel	**L1, L2**	**15**
Module-III: Raja Rao's Kanthapura Gandhian Thought, Struggle for Independence , Rural India	**L1, L2**	**15**
Module-IV: Gayatri Spivak: Answering the question "Can the Subaltern Speak?" Culture Wars, Their relationship to gender struggle and the dynamics of class	**L1, L2**	**15**

Bloom's Level L1: Knowledge; L2: Comprehension; L3: Application L4: Analysis ; L5 : Synthesis, L6 : Evaluation

Text Books

1. Edward Said. *Orientalism.* Vintage Books, 1979
2. Chinua Achebe. *Things Fall Apart.* Heinemann, 1958
3. Raja Rao. Kanthapura ; Penguin Modern Classics , 2014
4. Gayatri Spivak *:A Critique of Postcolonial Reason: Toward a History of the Vanishing Present*; Harvard University Press, 1999

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Reference Books

1. Naipaul, V.S, *The Mimic Men*, Vintage; Reprint edition, 2001
2. Morrison, Toni. *Beloved* . RHUK; Film Tie-In, 1999
3. Bill Ashcroft, Gareth Griffiths and Helen Tiffin. *The Empire Writes Back: Theory and Practice in Post-Colonial Literature*. Routledge, 2005

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1							1		2
CO2	1							1		2
CO3	1		1				2	1		2
CO4	1	2						1		2

1. Strongly Related 2. Moderately related 3. Weakly Related

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SEMESTER-VI

Course Code	Course Title	Credit	Structure			
			L	T	P	Total
DENG2651	**MODERN ENGLISH POETRY**	04	3	1	0	04
Prerequisite / Exposure	10+2					
Co- requisite	NIL					

Catalog Description

In this course of Modern English Poetry, important poems written by the 20th century poets will be described and various poetic devices used by poets would be discussed. Poets would be taught to inculcate aesthetic values in readers. The focus of the course is to appreciate poetry through form, purpose, tone and meaning of poems by delving into social, cultural and historical context.

Course Objective

- To explain relationship between the texts and socio-political issues of the times.
- To describe about Ireland in the first quarter of 20th century and degeneration of structures.
- To analyze degradation of moral values brought about by the two world wars.

Course Outcomes

On the completion of the course students will be able to:

CO-1 Describe literary context of modernism and analyze poems of T.S. Eliot
CO -2 Explain Irish Literary Renaissance and the poetic significance of W B Yeats
CO -3 Describe experiences of refugees and glorification of God in the same context
CO-4 Explain poems through lens of Modernistic poetry.
CO-5 Describe and apply humanistic values through the poems.

Modules	Blooms'Level	Credit Hours
Module-I: T.S. Eliot: **The Love Song of J. Alfred Prufrock,** Tortured psyche of modern man, neurotic and emotional problems of present day man. **T.S.Eliot: Hollow Men** Themes of Eliot's famous poem **The Hollow Men. R**ecognize and understand the concerns of post World War 1 scenario.	**L 2**	**15**
Module-II: W.B. Yeats, The Second Coming, Sailing to Byzantium Beauty of words in the poems of W B Yeats. Mystical fascination of Yeats **Sailing to Byzantium** Agony of old age, how old people manage to transcend this peculiar state through imagination and their spiritual faith.	**L 2**	**15**
Module-III: W. H. Auden: In the Memory of W. B. Yeats Glimpses of Poet's life, his reverence for death of Sigmund Freud, his tribute to great master of Poetry, Yeats, different aspects of Poet's life. **W.H. Auden: September 1, 1939.**	**L 2**	**15**

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poem in context to World War 11, a move away from failure in history and step forward towards positive future.		
Module-IV: Philip Larkin: Church Going Appreciate poetry of Philip Larkin. Appreciate the lyrical poem that is steeped in spirituality. Universal issues as discussed by the poet.	**L 2**	**15**

Bloom's LevelL1: Knowledge; L2: Comprehension; L3: Application L4: analysis; L5 : synthesis, L6 : evaluation

Text Books

1. Howes, Marjorie. *The Cambridge Companion to W. B. Yeats*, Cambridge University Press, 2006

References Books

- Tate, Allen, *T. S. Eliot: The Man and His Work*, Penguin, 1971.
- Haffenden, John, *W.H. Auden, the Critical Heritage*, Routledge & Kegan Paul, 1983.
- Fuller, John, W.H. Auden: A Commentary, Princeton University Press, 1998

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CO, PO and PSO Mapping

	PO1	PO1	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	2	1					1	1	1
CO2	1	2	1					1	1	1
CO3	1	2	1					1	1	1
CO4	1	2	1					1	1	1
CO5	1	2	1					1	1	1

1.Strongly Related 2. Moderately related 3. Weakly Related

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DENG2601	LITERATURE AND SOCIETY	L	T	P	C
		3	1	0	4
Prerequisite / Exposure					
Co- requisite					

Catalog Description

The course introduces to the role of literature as a cultural form in society. It lays emphasis on the importance of English both in terms of communication and for access and social participation. The course introduces literature in a variety of contexts to let the learners engage with high order of social and cultural aesthetics.

Course Objectives

- To describe social issues like caste, class, race, gender, violence and war.
- To explain critical understanding of inequities, ethics, racial and gender formations and social justice issues

Course Outcomes

After completing this course, the students will be able to:
CO 1: Explain the way literary text participate in the formation of social and cultural identity
CO2: Define new progressive thoughts about female emancipation
CO 3: Interpret caste-system prevailing in India since pre-Independence
CO 4: Analyze critically the representations of war and violence in literature
CO 5: Explain literary depictions of racial discrimination and resistance towards it.

Modules	Bloom's Level	Credit Hours
Module 1 **Omprakash Valmiki- 'Joothan'** **Premchand- 'Deliverance'** Untouchability, life of Dalits, contradictions, class discrimination, new Progressive thoughts	**L1**	**12**
Module 2 **Ambai- 'Yellow Fish'** **Ismat Chugtai-'The Quilt'** Gender discrimination, Oppression in women, concept of feminist fiction	**L1**	**12**
Module 3 **Wilfred Owen- 'Dulce et Decorum Est'** **Sa'adat Hasan Manto- 'The Dog of Tetwal'** Pity of war, Conflict, Ignorance, tragedy of violence	**L1**	**12**
Module 4 **Maya Angelou- 'Still I Rise"** **Langston Hughes- "Harlem"** Racial discrimination, inter-relationship between issues of race and gender		**12**

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Bloom's Level L1: Knowledge; L2: Comprehension; L3: Application L4: analysis; L5: synthesis, L6: evaluation

Text Book

- Pamela J. *Literature and Society: An Introduction to Fiction, Poetry, Drama, Nonfiction*. Prentice Hall College Div., 1990.

Reference Books

- Valmiki, Omprakash. *Joothan: A Dalit's Life*. Trans. Arun Prabha Mukherjee. Kolkata: Samya, 2003
- Valmiki, Omprakash. "Writing and Responsibility." *Journal of Literature and Aesthetics*, 2008
- Manto, Saadat Hasan. *Kingdom's End: And Other Stories*. Trans. Khalid Hasan. London: Verso, 1987
- Angelous, Maya. *And Still I Rise*. Virago, 1986.
- Rampersad, Arnold. The Collected Poems of Langston Hughes, Vintage Books, 1995.
- Premchand, Munshi, *The Complete Short Stories*, Vol 1-Vol3. Trans. M. Asaduddin. New Delhi: Penguin, 2017.
- Chugtai, Ismat. *Lifting the Veil: Selected Writings*. Trans. M. Asaduddin. New Delhi: Penguin India, 2009.

Modes of Evaluation: **Quiz/Assignment/ Seminar/Written Examination**

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1			3		1		2	1		2
CO2			2		1		3	1		2
CO3			3	1	2			1		2
CO4	1		2					1		2
CO5	1	2						1		2

1.Strongly Related 2. Moderately related 3. Weakly Related

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Course Code	Course Title	L	T	P	C
DENG2602	**20TH CENTURY INDIAN ENGLISH NOVEL**	3	1	0	4
Pre-requisite / Exposure					
Co- requisite					

Catalog Description

The course provides a comprehensive understanding of fiction written in English in India since its emergence in 19th century. It will introduce the learners to the literary ground covered in major literary histories, anthologies and critical discussions.

Course Objectives

- To explain the Indian English Novel since its beginnings till recent day.
- To provide the various perspectives of Indian culture, religion and nationalism.

Course Outcomes

After completing this course, the students will be able to:

CO 1: Explain sensibility of Indian English Novels.
CO 2: Interpret the influence of India's history on the characters.
CO 3: Define images of Indian Culture.
CO 4: Describe changes occurred during India's British Colonization.
CO 5: Interpret the novels with current critical frameworks such as post-colonialism, feminism.

Modules	Blooms Level	Credit Hours
Module-I: R.K. Narayan- The Guide Hypocrisy, Role of karma and Feminism	L1, L2	15
Module-II: Salman Rushdie -Midnight's Children Indian transition from British colonialism to independence, post-colonial, postmodern and magical realist literature	L1, L2	15
Module-III: Amitav Ghosh- The Shadow Lines Youth vs Maturity, freedom and identity, borders, violence ,political unrest and social standing	L1, L2	15
Module-IV: Kamala Markandaya- Nectar in a Sieve Historical context, critical overview, plot, characterization , themes and style	L1, L2	15

Bloom's Level L1: Knowledge; L2: Comprehension; L3: Application L4: Analysis; L5 : synthesis, L6 : evaluation

Text Books

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- Narayan, RK. *The Guide.* Indian Thought Publications, 2010
- Rushdie, Salman. *Midnight's Children*. RHUK Publishers, 2013
- Ghosh, Amitav.*The Shadow Lines.* Penguin India, 2009
- Markandaya, Kamala. *Nectar in a Sieve.* Penguin India, 2009

Reference Books

- Iyengar K.R. Srinivas. *Indian Writing in English*. Advent Books Division, 1984
- Daiches D. *Critical Approaches to English Literature*. Orient Black Swan, 1956.
- V. Padma. *Fiction as Window: Critiquing the Indian Literary Cultural Ethos since the1980*.Orient Black Swan.2009
- Dodiya Jaydesinh. *Indian Women Novelists in English*. Sarup and Sons, 2008.

Modes of Evaluation: **Quiz/Assignment/ Seminar/Written Examination**
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

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Course Code	Course Title	L	T	P	C
DENG2603	**NEW LITERATURE IN ENGLISH**	3	1	0	4
Pre-requisites/Exposure					
Co-requisites					

Course Objective:

- To introduce selected texts to the students for their literary value and cultural importance
- To provide the student with a broad perspective of the development of Australian, New Zealand, Canadian, African and Caribbean literature.
- To familiarize the readers with the impression of post-colonialism on the literary writings
- To examine various ways in which different writers negotiate and represent social conditions -- local and global -- in their work, and the ways in which they incorporate and work with domestic and foreign literary forms and conventions.

Course Outcomes:

The students will be able to:

CO1 Approach texts from across cultural perspective.

CO2 Initiate the process of cross- cultural studies and comparative literary studies.

Modules		
Module-I: AUSTRALIA: **Poetry** Peter Porter– "Your Attention Please" **Short Story** • Henry Lawson – The Loaded Dog	**Bloom's Level** **L2**	**Credit Hours** **15**
Module-II: NEW ZEALAND: **Poetry** • Allen Curnow – "Time", "House and Land"	**L2**	**15**
Module-III: CANADA: **Poetry** • A JM Smith– "Ode on the Death of William Butler Yeats"	**L2**	**15**

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Module-IV: AFRICA: **Poetry** • Gabriel Okara –"The Mystic Drum" **Drama** • Ama Ata Aidoo - Anowa	**L2**	**15**

Bloom's LevelL1: Knowledge; L2: Comprehension; L3: Application L4: analysis; L5 : Synthesis, L6 : evaluation

Text Books

- Brown, John R. *Theatre Language: A Study of Arden, Osborne, Pinter and Wesker.* London: Allen Lane, 1972.
- Dillon, Cynthia Bishop. *The Playwriting Self of Bernard Shaw*. Southern Illinois University Press, 1991.

Reference Books

- Malamud, Randy. *T. S. Eliot's drama: A Research and Production Sourcebook.* London: Greenwood Press, 1992.
- Raby, Peter. Ed., *The Cambridge Companion to Harold Pinter*. Homerton College: Cambridge University Press, 2001.

Examination Scheme:

Components	Assignment	Sessional	Attendance	EE
Weightage (%)	15	10	05	70

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1			1				1	1		
CO2			1				1	1		
CO3			1				1	1		
CO4			1				1	1		

1.Strongly Related 2. Moderately related 3. Weakly Related

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SEMESTER-VII

Course code	Course Title	Credit	Structure			
			L	T	P	Total
DENG2701	**CONTEMPORARY LITERATURE**	04	3	1	0	04
Prerequisite / Exposure						
Co- requisite						

Catalog Description
Contemporary literature aims to bring students closer to thinking prevalent in present times. Students should be able to utilize and articulate in English language of current times. Intellectual flexibility would allow full reign to creative power of students. Students should be able to learn and use knowledge gained from these texts in their practical life.

Course Objective

- To analyze key aspects, including: colonial and post-colonial experience; national, cultural, and racial identity; voice; language; political writing; gender and colonization; exile; and imperialism.
- To explain texts in their historical and cultural contexts,
- To explain and give to students both a broad knowledge of Contemporary literature and in-depth understanding of specific texts and issues.

On the completion of the course students will be able to:
CO-1 Explain the question of identity and racial conflict in Derek Walcott's poetry.
CO-2 Elucidate Garcia Gabriel Marquez's fiction and use of magical realism
CO-3 Describe Ngugi wa Thiongo's writings, techniques and style.
CO-4 Explain the feminist impulse in Margaret Atwood's poetry.

Course Contents:

Modules	Blooms' Level	Credit Hours

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Module-I: Gabriel García Márquez: Chronicle of a Death Foretold Characters and main ideas of the novel, themes, motifs and symbols, use of magical realism	**L 2**	**10**
Module-II: Ngugi wa Thiongo: The Trial of Dedan Kimathi Representation of colonial Kenyan history in Nigerian drama, commentary on justice system, use of Gikuyu in the play, characteristics of Negritude movement, decolonisation of the mind	**L2**	**10**
Module-III: Derek Walcott : "A Far Cry from Africa", "Names", "Goats and Monkeys" Colonial rule and tensions arising from it in relation to the poems, conflicts faced by the poet with respect to use of English language to describe native experiences, issues of race and identity in Walcott's poems.	**L 2**	**14**
Module-IV: Margaret Atwood: "Spelling", "This is a Photograph of Me", "Procedures for Underground" Margaret Atwood as a feminist writer, use of metaphors in Atwood's poetry, features of Canadian poetry in English, use of spatial	**L 2**	**14**

Bloom's LevelL1: Knowledge; L2: Comprehension; L3: Application L4: analysis ; L5 : synthesis, L6 : evaluation

Text Books

- Márquez, Gabriel García- *Chronicle of a Death Foretold*, Publisher: Vintage; Reprint, 2003.
- Thiongo, Ngugi wa. *The Trial of Dedan Kimathi*, edited by Dilip K. Basu and Sanjay Kumar, New Delhi: Worldview Publications, 2015.
- Walcott, Derek - *A Far Cry from Africa, Names; Selected Poems* Paperback – 26 Dec 2007, Publisher: Farrar, Straus and Giroux; First edition (26 December 2007)
- **Atwood, Margaret -*Spelling, This is a Photograph of Me, Procedures for Underground*; Eating Fire: Selected Poetry 1965-1995** by Margaret Atwood **„ Publisher: Virago (28 January 2010)**

References Books

- Mishra, Binod, *Explorations in Australian Literature*. Sarup & Sons, 2006
- Boehmer, Elleke, *Colonial and Postcolonial Literatures Migrant Metaphors*. Oxford, 2014
- Lazarus, *The Cambridge Companion to Postcolonial Studies*. Cambridge University Press, 2006

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CO, PO and PSO Mapping

	PO1	PO1	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	2	2					1	1	1
CO2	1	2	2					1	1	1
CO3	1	2	2					1	1	1
CO4	1	2	2					1	1	1
CO5	1	2	2					1	1	1

1.Strongly Related 2. Moderately related 3. Weakly Related

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Course Code	Course Title	L	T	P	C
DENG2702	**MODERN EUROPEAN DRAMA**	3	1	0	4
Pre- requisite / Exposure					
Co- requisite					

Catalog Description

In this course, the students' knowledge and understanding of modern drama will be extended to a wider European context as they will be able to understand trends and movements in the history of European drama and evaluate plays of European playwrights representing political, religious, national ethnic, class related, gendered and individual concepts of identity.

Course Objectives

1. To outline their understanding of European cultural issues
2. To provide movements that contributed to the growth of European drama

Course Outcomes

After completing this course, the students will be able to:

CO1**:** Define dramatic theory to dramatic texts

CO2: Describe literary devices and literary expressions used in the text and correlate with their own sensibilities

CO3: Define the crux of the text with an understanding of the social, cultural, political and economic status of the times

CO4: Explain awareness and ability to handle critical and theoretical approaches to the study of drama

Modules	Bloom's Level	Credit Hours
Module 1: Henrik Ibsen- A Doll's House Feminism, Men and masculinity, respect and reputation, money, deceit	**L1, L2**	**12**
Module 2: Bretold Brecht- Mother Courage Society and class, anti-war play, wealth, rules and order, power and principles	**L1, L2**	**12**
Module 3: Samuel Beckett - Waiting for Godot Theatre of absurd, existentialism, friendship, freedom and confinement, religion	**L1, L2**	**12**
Module 4: Eugene Ionesco- Rhinoceros Absurdity, logic, intellectualism, fascism, escapism	**L1, L2**	**12**

Bloom's Level L1: Knowledge; L2: Comprehension; L3: Application; L4: analysis; L5: synthesis, L6: evaluation

Text Books

1. Ibsen, Henrik. *A Doll's House.* Maple Press, 2011.
2. Brecht, Bretold. *Mother Courage*. Bloomsbury Publishing India Private Limited, 2014.
3. Beckett, Samuel. *Waiting for Godot.* Pearson Education, 2012.

Reference Books

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1. Styan, J. L. *Modern Drama In theory and Practice: Realism and Naturalism*. Cambridge University Press, UK, 1983.
2. Monaco, Paul. *Modern European Culture and Consciousness*. State University of New York Press, Albany, 1983.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	2						1		2
CO2	1							1		2
CO3	1		3					1		2
CO4	1	2						1		2

1.Strongly Related 2. Moderately related 3. Weakly Related

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DENG2703	LITERARY FORMS AND PRACTICAL CRITICISM		L 3	T 1	P 0	C 4
Prerequisite / Exposure						
Co- requisite						

Catalog Description
This course will discuss the major literary forms and their application to the different literary texts.

Course Objectives

- To define the Analytical skills to the major literary pieces with the various literary forms and genres
- To enable students to learn skills evaluate particular literary texts with the help of literary forms.

Course Outcomes
After the completion of this course, the students will be able to:
CO1: Explain the concept of major literary forms and genres.
CO2: Define literary forms and practical criticism to various literary texts.
CO3. Describe particular literary texts on the basis of the various literary forms and genres.

Modules	Blooms' Level	Credit Hours
Module-I: Poetic Forms Discussion of the following literary forms with appropriate examples: Sonnet, Ballad, Ode, Epic, Mock- Epic, Elegy, Dramatic Monologue, Lyrics, Heroic Couplet, Epistle	**L1, L2**	**12**
Module-II: Forms of Novels Discussions of the different forms of a novel with suitable examples: Picaresque, Gothic, Domestic, Realistic, Regional, Stream of Consciousness	**L1, L2**	**12**
Module-III: Practical Criticism Critical Appreciation of Literary Writings	**L1,L2**	**12**
Module-IV: Practical Criticism Discuss the concept of Practical criticism with the suitable example	**L1, L2**	**12**

Bloom's Level L1: Knowledge; L2: Comprehension; L3:Application L4: analysis; L5: synthesis, L6: evaluation

Text Books

1. Kenneth, Burke. *The Philosophy of Literary Forms*, University of California Press; 3rd edition 1974
2. Abrams, M.H. *A Glossary of Literary Terms*. Wadsworth Publishing Co Inc; 11th Revised Edition, 2014

Reference Books

1. Brooks, C. and Warren, R.P. Modern Rhetoric, Houghton Mifflin Harcourt P; 3rd Revised edition, 1970.
2. Lodge, David. Modes of Modern Writing, Lodge, David. Modes of Modern Writing, Houghton Mifflin Harcourt P; 3rd Revised edition, 1970.

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CO, PO and PSO Mapping

	PO1	PO1	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	1								1
CO2	1	1								1
CO3	1	1								1

1.Strongly Related 2. Moderately related 3. Weakly Related

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Course Code	Course Title	Credit	Structure			
			L	T	P	Total
DENG2704	**POPULAR FICTION**	04	3	1	0	04
Prerequisite / Exposure						
Co- requisite						

Catalog Description

The course will describe writers of fiction do more than entertain or educate ;they help readers learn about themselves. Novels throughout the ages have been fictional, that have shaped not just the outer world but the inner world also.

Course Objectives:

- To provide the introduction about the popular forms of novel in the different domain of novels
- To outline the workout of certain novel genres which in the past were not popularly included in literary studies

Course Outcomes

After the completion of this course successfully the students will be able to

CO: 1: Explain Lewis Carroll and the vision of childhood he created in Alice in Wonderland and to Compare Carroll's Victorian world of childhood.

CO: 2: Describe the relationship between picture and text in children's literature to analyze the tradition, particularly as it developed in Detective Fiction.

CO:3: Explain critically the Bond films and Fleming's writings they will be able to locate the Murder of Roger Ackroyd in the history of detective fiction.

Modules	Blooms Level	Credit Hours
Module-I: Agatha Christie: The Murder Of Roger Ackroyd Mystery novel, Character of Hercules Poirot , Detective Fiction, Role of Spy	**L1, L2**	**15**
Module-II: Chetan Bhagat : Two States Blend of Social Commentary and Cultural Diversity	**L1, L2**	**15**
Module-III: J.K. Rowling : Harry Potter and Philosopher's Stone Magic, Organized mind,	**L1, L2**	**15**
Module-IV: Films and Popular Culture Through selections from – The Godfather, Skyfall , Deewar, Dilwale Dulhaniya Le Jayenge	**L1, L2**	**15**

Bloom's LevelL1: Knowledge; L2: Comprehension; L3: Application L4: analysis; L5 : synthesis, L6: evaluation

Text Books

- Caroll, Lewis. *Through the Looking Glass.* Fingerprint! Publishing, 2019.
- Christie, Agatha. *The Murder of Roger Ackroyd.* Harper Collins, 2010.
- Chetan Bhagat : Two States ; Rupa Publications India, 2014

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- J.K. Rowling : Harry Potter and Philosopher's Stone, Bloomsbury Children's Books, 2014

Reference Books

- Pawling, Christopher, '*Popular Fiction: Ideology or Utopia?,' Popular Fiction and Social Change*, ed. Christopher Pawling (London: Macmillan, 1984).
- Eco, Umberto, '*Narrative Structure in Fleming,' in the Study of Popular Culture: A Sourcebook*, ed. Bob Ashley (London: Pinter, 1989), pp. 124-34.
- Suvin, Darko, *'On Teaching SF Critically,' from Positions and Presupositions in Science Fiction,* (London: Macmillan), pp. 86 – 96.
- Felicity Hughes, *'Children's Literature: Theory and Practice*,' ELH. 45 (1978), pp. 542-62

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CO, PO and PSO Mapping

	PO1	PO1	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	2	2					1	1	1
CO2	1	2	2					1	1	1
CO3	1	2	2					1	1	1

1.Strongly Related 2. Moderately related 3. Weakly Related

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DENG2739	BASICS OF RESEARCH METHODOLOGY, ETHICS, AND RESEARCH COMMUNICATION	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description

This course aims to provide students with a comprehensive understanding of conducting ethical research, utilizing proper research methodologies, and effectively communicating research findings. The course includes a final project where students will write a Literature Review on a topic chosen in consultation with the teacher(s).

This course is designed to equip students with essential skills and knowledge to conduct ethical research, employ proper research methodologies, and effectively communicate scientific information (with focus on writing a literature review). The course will cover topics such as research design, data collection and analysis, research ethics, and science communication strategies. Through a combination of lectures, discussions, case studies, and practical exercises, students will develop a deeper understanding of the research process and its ethical implications.

Course Objectives

The objective of this course is to impart knowledge about various stages of research process, research ethics and different ways of research communication.

The aim of this course is to impart research skills to the beginners and help to improve the quality of research by the existing researchers. It also encompasses the understanding and application of appropriate research design, statistics, and the use of the computer for reference management, report writing, research paper writing and presentation. The course also introduces the key conceptual issues of each research method, as well as giving practical guidance. It covers the series of research methodology contents: from problem formulation, to design, to data collection, analysis, reporting and dissemination. The course has the dual aims of equipping students with conceptual understandings of current academic debates regarding different methods, and the practical skills to put those methods into practice.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define criteria of good research, steps in research process, and data collection.

CO2. Identify different types of sampling and its purpose.

CO3. Conduct hypothesis testing for different types of samples and interpret the results.

CO4: Learn the importance of literature review, write research paper/thesis, use reference management software.

Course Content :

Module	Topic	**Blooms level***	Hours
1	**Research Methodology** Understanding the research process: From research questions to conclusions	L1, L2	10

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	Types of research: Qualitative and quantitative research Exploratory, descriptive, experimental, and correlational studies Scientific Thinking: Subjective Vs. Objective Thinking Logical Reasoning: Inductive Vs. Deductive Reasoning Formulating research hypotheses and objectives Purpose of a good research, Criteria of good research		
2	**Descriptive Statistics** Data, Types of Data, Methods of data collection, Benefits and drawbacks, Graphical representation of data and interpretation. Measures of Central Tendency: Arithmetic Mean, Median, Mode, Measures of Dispersion: Range, Standard Deviation, Variance, Coefficient of Variation.	L1, L2, L3	15
3	**Inferential Statistics** Sampling: Basic concepts, Process of Sampling, Sample Size, Types of Samples, Sampling and non- sampling errors, Statistics and Parameters, Sampling Distribution of Means and Proportion, **Hypothesis Testing**, steps in testing of hypothesis, errors in hypothesis testing, z test and t test.	L1, L2, L3	15
4	**Research Ethics** Plagiarism, Fabrication, Falsification, Ethics with respect to human and Animal Research	L1, L2	5
5	**Communication** Characteristics of a good Research paper, Systematics Literature Review (choosing a topic, preparing outline, gathering authentic & appropriate references, avoiding plagiarism, use of reference management systems), Writing a good literature review, Structure of report (Introduction, Methodology, Analysis, Results, Discussions, Conclusions, Recommendations), Writing Quality Research Paper, Publishing Research Work in Quality Journals, Reference Management Software	L1, L2, L3	15

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional Exam	End Term Examination
Weightage (%)	5	10	15	70

Project based assignment: Student teams (2-3 students per team) will write a literature review on a topic of choice, in consultation with the teacher.

Text books/ Reference books

- Research Methodology for Natural Sciences by Soumitro Banerjee, Publisher: IISc Press (1 January 2022); ISBN-10: 8194835178; ISBN-13: 978-8194835172

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- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt. Ltd., New Delhi-110001
- Geode, Millian J.& Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Kothari, C.R.2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.
- Levin R I., Rubin D S. Statistics for Management. Sixth Edition, PHI
- Kapoor & Gupta. Probability & Statistics. S Chand Publishers, New Delhi.
- Montomery, Douglas C.(2007), 5th Ed. Design and Analysis of Experiments, Wiley India.
- Cooper, Donald R. and Pamels Schindler, Business Research Methods, Tata McGraw Hills, New Delhi
- Krishnaswamy, K.N. Sivakumar. Appa lyer and Mathiranjan M. 2006, Management Research Methodology: Integration of Principles, Methods and Techniques, Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Sachdeva, J.K. 2008. Business Research methodology. Himalaya Publishing House, New Delhi.
- Shekharan, Uma, Business Research Methods, Miley Education, Singapore.
- Zikmund, Millian G., Business Research Methods, Thomson Learning, Bombay**.**

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SEMESTER-VIII

DENG2801	LITERTURE AND GENDER		L 3	T 1	P 0	Total C 4
Prerequisite / Exposure						
Co- requisite						

Catalog Description

The course introduces students to representations of gender and sexuality in literary works. The content includes theory of gender and sexual identity; influence of gender and sexual identities on literary expression, and influence of literature on gender and sexual identities; terminology and methods of literary analysis and evaluation.

Course Objectives

- To provide the evolution and growth of gender and sexuality in literary texts.
- To enable students to learn the various theories of gender and sexual identity.

Course Outcomes

After the completion of this course, the students will be able to:
CO1: Describe the evolution and growth of gender and sexuality in literary texts.
CO2: Define the influences of literature on gender and sexual identities.
CO3: Describe the various theories of gender and sexuality and their applications in literary texts

Modules	Blooms' Level	Credit Hours
Module-I: Oscar Wilde -The Picture of Dorian Gray A brief biography of Oscar Wilde, background of the particular age., mportant works of Oscar Wilde, major themes in the writings of Oscar Wilde, gender and sexual identity portrayed in the picture of Dorian Gray.	L1, L2	12
Module-II: Virginia Woolf - Mrs. Dalloway Virginia Woolf, the most important female writer of the 20th century, technique of stream of consciousness in her writings, important works of Virginia Woolf. Mmajor characteristics of Mrs Dolloway	L1, L2	12
Module-III: Alice Walker **The Color Purple** **Womanism, Black Feminism, Sisterhood, Epistolary Technique**	L1,L2	12
Module-IV: Kate Chopin- The Awakening A brief biography of Kate Chopin, major themes of Chopkin's *The Awakening*, significance of the title.	L1, L2	12

Bloom's LevelL1: Knowledge; L2: Comprehension; L3:Application L4: analysis ; L5 : synthesis, L6 : evaluation

Text Books

- Oscar Wilde.*The Picture of Dorian Gray*, CreateSpace Independent Publishing Platform 2016.
- Virginia Woolf .*Mrs. Dalloway*, Fingerprint Publishing, 2017.
- Kate Chopin. *The Awakening*. Createspace Independent Pub, 2014.

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Reference Books

- Virginia Woolf: A Critical Memoir by Winifred Holtby, Continuum International Publishing Group Ltd, 2007
- Virginia Woolf: A Feminist Slant by Jane Marcus, University of Nebraska Press; 1st edition 1983
- Kate Chopin's *The Awakening*: A Routledge Study Guide and Sourcebook (Routledge Guides to Literature), Routledge; 1 edition, 2004

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

CO, PO and PSO Mapping

	PO1	PO1	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	1							1	1
CO2	1	1							1	1
CO3	1	1							1	1

1. Strongly Related 2. Moderately related 3. Weakly Related

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Course Code	Course Title		Structure			
			L	T	P	C
DENG2802	**AMERICAN LITERATURE**		3	1	0	4
Prerequisite / Exposure						
Co- requisite	NIL					

Catalog Description

This course explores different characteristics of American Literature with the help of a few representative American novels, dramas and poems.

Course Objectives

1. To discuss the evolution and growth of American Literature
2. To analyze 19th and 20th Century major novels, plays and poems

3 To enable students to develop critical thinking to understand the dynamics of American literature.

Course Outcomes

After the completion of this course, the students will be able to:

CO1 : Illustrate the historical and political background of America's post-independence to present day American society which ultimately got reflected in its literature.

CO2 : Explore the long history of writing in America, from the Puritan America, Conglomeration of American societies, rise of Christianity, rise of individualism to the present day

CO3 : Evaluate the importance of literary figures and canons of the American Literature.

CO4. Describe themselves with skills to analyze texts in the context of the rise of racial issues and class hierarchies in America.

CO5 :Analyze the historical, cultural, social and political developments of American Literature.

Modules	Blooms' Level	Credit Hours
Module-I: Nathaniel Hawthorne - Scarlet Letter Background discussion, summary, major themes, major characters, A major puritan novel. The significance of the Character 'A' in the novel, the story of a brave woman.	L1	15
Module-II: Ernest Hemingway Old Man and the Sea Themes, Art of Characterisation	L1	15
Module-III: Robert Frost- Stopping by Woods on a Snowy Evening The Road Not Taken A brief discussion of the major characteristics of the American Poetry. Important American poets. The major works of Robert Frost, and the major themes in his poems.	L2	15
Module-IV: Walt Whitman - Song of Myself The background study. Walt Whitman, the representative American poet. The important theme of Whitman's *Songs of Love*. The important lines for explanation.	L2	15

Bloom's LevelL1: Knowledge; L2: Comprehension; L3:Application L4: analysis ; L5 : synthesis, L6 : evaluation

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Prescribed Text and Web Sources:

- The Norton Anthology of American Literature, Vol. C, Baym, Nina et al. Fifth Avenue, USA, 2012
- Norton Anthology of American Literature, Vol. D, Fifth Avenue, New York-17, U.S.A.
- Norton Anthology of American Literature, Vol. E, Fifth Avenue, New York-17, U.S.A.
- The Oxford Book of American Poetry edited by David Lehman, John Brehm. OUP
- A Pageant of Poems By Sheppard, C. A. (ed.) Orient Longman Press. 1998
- Short Story Masterpieces, Five American Masters, Jaico Pub. House, Mumbai- 23, 2003

Web Resources

- https://rpo.library.utoronto.ca/poems/raggedy-man viii) 1.8
  https://www.poetryfoundation.org/poems/52090/the-anti-suffragists ix) 2.3
  http://digitalemerson.wsulibs.wsu.edu/exhibits/show/text/the-american-scholar x) 4.4
  https://americanliterature.com/author/kate-chopin/short-story/regret xi) 5.1
  http://www.gutenberg.org/files/642/642-h/642-h.htm

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CO, PO and PSO Mapping

	PO1	PO1	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1									1
CO2	1									1
CO3	1									1
CO4	1									1
CO5	1									1

1.Strongly Related 2. Moderately related 3. Weakly Related

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Course Code	Course Title	Credit	Structure			
			L	T	P	Total
DENG2803	**THEORETICAL LINGUISTICS**	04	3	1	0	4
Prerequisite / Exposure						
Co- requisite						

Catalog Description

In this course of MA English Literature, we would like students to understand the basic understanding of theoretical Linguistics so that they can classify and interpret the majorsylistics features and concepts of linguistics with the help of the prescribed text.

Course Objectives

- To analyse students with the major theories in Phonology, Morphology, Syntax, Semantics, discourse and Pragmatics.
- To define a scientific reasoning and methodology of modern linguistics to be applied to different spheres of life.

Course Outcomes

After completing this course successfully the students will be able to

CO1. Analyse the major theories in Phonology, Morphology, Syntax, Semantics, Discourse and Pragmatics.
CO2. Explain familiarity with scientific reasoning and methodology of modern Linguistics.
CO3. Identify the different application of these theories to different spheres of life.
CO4.Stimulate an understanding of the structure of language.
CO5. Acquire corrects pronunciation of the English words.

Modules	Blooms' Level*	Credit Hours
Module-I: Introduction to Sociolinguistics , Language Contact, Policy and Shift Diglossia, Code Switiching and Mixing, Language Death and Revitalization, Language globalization and Localization	L1	15
Module-II: Phonology and Morphology, Airstream Mechanism, Sound Systems of English Language, Phoneme Vs Allophones, Stress and Intonation	L2	15
Module-III: Introduction to Syntactic Theories, Syntactic Categories, Traditional Vs Generative Gramma	L3	15
Module-IV: Introduction to Semantic Theories,Types of Semantic Relations, Major Semantic Theories, Discourse and pragmatics, Speech Act Theories	L3	15

Bloom's Level *L1: Knowledge; L2: Comprehension; L3: Application L4: analysis;L5 : synthesis, L6 : evaluation*

Text Books

- Crystal, David.*Linguistics Baltimore*. Penguin Books, 1971.
- Crystal, David. *A First Dictionary of Linguistics and Phonetics. Boulder*. Co: Westview, 1980.
- Dineen, Francis. *An Introduction to General Linguistics.* New York: Holt, Rinehart and Winston, 1967.

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Reference Books

- Ambrose Grillet, Jeane. *Glossary of Transformational Grammar, Rowley*. MA: Newbury House, 1978.
- Myerhoff, M. *Introducing Scociolinguistics* 6th ed. London: Routledge, 2011.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1	1							1	1
CO2	1	1							1	1
CO3	1	1							1	1
CO4	1	1							1	1
CO5	1	1							1	1

1.Strongly Related 2. Moderately related 3. Weakly Related

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Course Code	Course Title		Structure			
			L	T	P	C
DENG2804	**MODERN ENGLISH NOVEL**		4	0	0	4
Prerequisite / Exposure						
Co- requisite						

Catalog Description

This course discusses different characteristics of the twentieth century English novels with the help of a few representative modern novels.

Course Objectives

- To enable the students understand the evolution and growth of modern English novels
- To provide awareness of the new literary styles and techniques used by the different novelists in their novels.
- To enable students to understand the shift and major themes in the different 20th century novels.

Course Outcomes

After completing this course, the students will be able to:

CO1: Describe the historical, political and socio-cultural aspects of novels based on working class and explore the psychological perspectives of modern novels – Freudian psychoanalysis.

CO2: Define the emergence of the figure of adventurer and traveler and his role in sustaining European supremacy and to compare and contrast Lord Jim and Heart of Darkness.

CO3: Define this novel as a bildungsroman and Kunstler Roman and to summarize Joyce's stream of consciousness technique

Modules	Blooms'Level	Credit Hours
Module-I: D. H. Lawrence- Sons and Lovers Important characteristics of the 20th Century novels, Oedipus Complex, Gertrude as a major character in the novel. Problems and tension in the novel. killing of Mrs Morel by her son Paul Morel. The problems beings faced by Paul and the significance of the murder of Mrs Morel	L1, L2	20
Module-II: Joseph Conrad- Lord Jim Joseph Conrad as an important novelist and Lord Jim as a representative novel of the 2oth Century, characterization, message, symbols and themes	L1, L2	20
Module-III: James Joyce - Portrait of an Artist as a Young Man *Portrait of an Artist as a Young Man*, a major shift from the traditional novels, new experiment, and a new approach in writing a novel ,major themes of the novel, structure of the novel, the unique quality of the novel	L1, L2	20

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Module-IV: E.M.Forster : A Passage to India British Raj in India, Characters, Mysticism, Structure	L1, L2	20

Bloom's LevelL1: Knowledge; L2: Comprehension; L3: Application L4: analysis ; L5 : synthesis, L6 : evaluation

Text Books

- D. H. Lawrence. *Sons and Lovers*, Maple Press; 1ST edition, 2010
- Joseph Conrad. *Lord Jim*. Penguin; Reprint edition. 2007.
- James Joyce. *Portrait of an Artist as a Young Man*. Fingerprint; Latest edition 2015
- E.M.Forster : A Passage to India; Penguin Classics Edition 2005

Reference Books

- Sagar, Keith, *The Art of D. H. Lawrence*. Cambridge University Press, 1975
- Sander, Scott Russell. *D. H. Lawrence: The World of the Five Major Novels*. Viking Press, 1974
- H.Stape, ed., *The Cambridge Companion to Joseph Conrad*. Cambridge University Press, 2006
- Brady, Philip and James F. Carens, eds. *Critical Essays on James Joyce's A Portrait of the Artist as a Young Man*. New York: G. K. Hall, 1998
- Wollaeger, Mark A., ed. *James Joyce's A Portrait of the Artist as a Young Man: A Casebook*. Oxford, New York, 2003
- Connolly, Thomas E., *Joyce's Portrait: Criticisms & Critiques, Appleton-Century-Crofts.* New York. 1962.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CO, PO and PSO Mapping

	PO1	PO1	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1								1	1
CO2	1								1	1
CO3	1								1	1

1.Strongly Related 2. Moderately related 3. Weakly Related

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DENG2839	DATA ANALYSIS & VISUALISATION USING SOFTWARE	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	Class X Mathematics				
Co-requisites					

Catalog Description

The implosion of available data has made visualization more critical but also more challenging. Data analysis and Data Visualization are essential tools for business analysis, engineers, policymakers, and decision-makers. Developed originally for "small data", visualization techniques have been met with varied success in the past centuries and decades. There are a few well-known visualizations that are very effective in capturing the essence of the data, and of course, there are many infamous negative examples of poor visuals. An effective visual is critical for decision making it, but it also requires a lot of work, customization, attention to detail, and refinements.

Course Objectives

The course is designed to help students develop skills and knowledge in the following area(s):

- Develop an understanding of what is a good visualization for a given purpose
- Learn visualization theory & techniques
- Build a substantial data analytic project
- Apply data analysis and visualization with Excel, SPSS, R, Python, NVivo and MATLAB

Course Outcomes

On completion of this course, the students will be able to

CO1. Students will be able to articulate meaningful lines of inquiry that might be explored through the collection, organization, visualization, and analysis of data in a context associated with their primary field of study using (as appropriate) numerical, textual, spatial, and/ or visual data.

CO2. Student will understand what data are, how they are collected, and how to assess the quality/ reliability of data.

CO3. Students will demonstrate intermediate proficiency in the visualization of data to communicate information and patterns that exist in the data.

CO4: Students will be able to use at beginning level of proficiency the tools of statistics and machine learning to ask questions of and explore patterns in data.

Course Content :

Module	Topics Covered	Blooms Level	Contact Hours
1	**Module-1: Introduction to Excel** Data Analysis using Excel, Curve fitting, Correlation, Linear Regression, Multiple regression, Principal Component Analysis and Factor Analysis, Hypothesis testing **Introduction to Excel and SPSS** Introduction to SPSS and Types of Data, Importing, exporting and data handling in SPSS; Exploratory data analysis using SPSS and data visualization; Introduction to statistical inference and various	L1, L2, L3, L4	20 hours

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	univariate tests by using SPSS; Analysis of Variance (One Way ANOVA, Two Way ANOVA and ANCOVA); Correlation, Simple and Multiple linear Regression Analysis; Principal Component Analysis and Factor Analysis		
2	**Module-2: VOS Viewer** **Web of Science, Scopus, Dimensions, Lens, and PubMed.** Co-authorship networks, citation-based networks, and co-occurrence networks can be created based on data downloaded from Web of Science, Scopus, Dimensions, and Lens. Co-authorship networks and co-occurrence networks can also be created based on PubMed data. **Crossref, Europe PMC, and OpenAlex**. Networks can also be created based on data retrieved through the APIs of Crossref, Europe PMC, and OpenAlex, These APIs can be queried interactively in VOS viewer. **Semantic Scholar, Open Citations, and Wiki Data.** For a given set of DOIs, networks can also be created based on data retrieved through the APIs of Semantic Scholar, Open Citations and Wiki Data.	L1, L2, L3, L4	10 Hours
3	**Faculty of Management Studies & Behavioural Sciences** **Module 3: Domain Specific Software** **- Structural Equation Modelling** **Smart PLS** Introduction to Structural Equation Modelling (SEM), Introduction to the software's AMOS and SPSS, SMART PLS, Testing of Statistical assumptions, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), common method bias (CMB) test, Measurement Model Assessment, Discussing Fit Indices, Reliability and Validity Testing, Structural Model Assessment identifying multivariate outlier, Construct Validity: Convergent and Discriminant Validity, Measurement Model & Structural Equation Modelling, Mediation and Moderation Effects, Multi-Group Analysis.	L1, L2, L3, L4	30 Hours
	Faculty of Arts **N Vivo** 1. Import text, audio, video, emails, images, spreadsheets, online surveys, web content, and social media from various sources into a simple, intuitive interface. 2. Create and NVivo project, import and organise qualitative and quantitative data		

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	3.Manage a literature review in NVivo 4. Autocode structured data deductively and identify themes inductively 5. Generate and falsify hypotheses 6. Combine data in sets for analysis 7. Seek patterns and identify relationships across codes and cases 8. Present findings using visualisations 9. Export data out of NVivo 10. Coordinate teamwork.		
	Faculty of Science Engineering and Technology **Faculty of Health & Allied Sciences** **R programming / Python/ MATLAB** **R Programming-** Introduction to R, Variables and datatypes in R, Dataframes, Recasting and joining of dataframes, Arithmetic, logical and matrix operations in R, Functions in R, Control structure in R, Data visualization in R. **Python Programming-** Basics of programming, data structure and algorithm using Python, Strings, lists, control, functions, manipulating lists, loops, arrays, selection sort, insertion sort, recursion, sorting, dictionaries, exception handling, file handling, string processing, data analysis using Python **MATLAB Programming-** Introduction, basic features, managing workspace, mathematical functions, basic plotting, Matrices, array operations and linear equations, MATLAB programming- M files script, M-file functions, control flow and operations.		

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional (Theory/ Practical)	End Term Examination
Weightage (%)	5	10	15	70

References:

- David Houcque, 2005. Introduction to MATLAB programming for Engineering students., Northwestern University, E- Book **https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf**
- Mark Lutz, 2009. Learning Python. O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.
- Emmanuel Paradis, 2005. R for Beginners. E book. **https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf**
- A Handbook of Statistical Analysis using SPSS by Dr. Brijesh Awasthi, Redshine Publication.

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Curriculum & Scheme of Examination

2023

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RESEARCH METHODOLOGY-I

Course Code: ENG4206 **Credit Units: 01**

Course Objective:
This paper proposes to introduce student to the philosophy and mechanics of research, to train them in the use of language, style and discourses suitable for dissertation writing, to help them acquire both a theoretical thrust and hands-on experience in writing research proposals before they embark on the execution of the thesis proper.

Module-I: The Philosophy of Research
The Philosophy, Meaning and Definition of Research
The nature of inquiry in Physical Sciences, Social Sciences and Humanities.
The relationship between Scholarship, Criticism and Research.
Interpretation
Textual Criticism
Literary History

Module-II: Project Proposals: Theory and Practice
The Identification of a Research Problem / Research Gap
The problems faced by a Research Scholar.
Parts of a Project Proposal
Preparing Minor Project Proposals

Examination Scheme:

Components	TP	Sessional	Presentation	EE
Weightage (%)	10	10	05	70

Texts and References

- Bateson, F.W. The Scholar Critic 2. Thorpe, James.
- Gibaldi, Joseph. MLA Handbook
- Brooks, C. and Warren, R.P. Modern Rhetoric
- Lodge, David. Modes of Modern Writing
- Kaplan, R.B. The Conduct of Inquiry: Methodology of Behavioural Sciences, San Francisco, 1964. Form and Style in Thesis Writing

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RESEARCH METHODOLOGY-II

Course Code: ENG4305 **Credit Units: 02**

Course Objective:
This paper proposes to introduce student to the philosophy and mechanics of research, to train them in the use of language, style and discourses suitable for dissertation writing, to help them acquire both a theoretical thrust and hands-on experience in writing dissertation before they embark on the execution of the thesis proper.

Module-I: Language, Style and Types of Discourses
The Style suitable for a Literary Thesis
Narration Argumentation
Exposition Description

Module-II: Research Objectives
Literature Review
Research Plan
Research Hypothesis

Module-III: The Mechanics of Research
The Mechanics of dissertation Writing
Data Collection – Primary and Secondary Sources.
Methods of data collection : Questionnaire, Interview, observation, document analysis
Methods of data analysis : Descriptive Statistics
Procedure in Literary Research e-learning and Research

Examination Scheme:

Components	TP	Sessional	Presentation	EE
Weightage (%)	10	10	05	70

Texts and References

- Bateson, F.W. The Scholar Critic 2. Thorpe, James.
- Gibaldi, Joseph. MLA Handbook
- Brooks, C. and Warren, R.P. Modern Rhetoric
- Lodge, David. Modes of Modern Writing
- Kaplan, R.B. The Conduct of Inquiry: Methodology of Behavioural Sciences, San Francisco, 1964. Form and Style in Thesis Writing

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SUMMER PROJECT EVALUATION

Course Code: ENG4335 **Credit Units: 03**

Summer Project is primarily a research work. It involves academic reading of several sources and writing on a particular topic relating to the core course or courses of the program. It is a scholarly inquiry into academic problems or issues. It should involve a systematic approach to gathering and analysis of information/ideas, leading to production of a structured report. The research topic should hold significant academic value commensurate with level of the Program.

GUIDELINES FOR SUMMER PROJECT REPORT

Topic

The topic of the paper will be of the student's choice with consent of the Supervisor. It must be relevant to the content of the course, but it should be treated in greater depth than it is covered in class. Focus is of the utmost importance. Too broad a topic will either lead to superficial treatment or an unnecessarily long paper; too narrow a topic will lead to a lack of source material and redundancy. Make sure the subject focuses on one question or topic so that the paper has a definite purpose. Composing an introduction and conclusion can be a good test of the cohesiveness of the subject. The domain can include Literature, Linguistics, Applied Linguistics, English Language Teaching and other related areas.

Synopsis of Summer Project Report

A Synopsis of the Summer Project Report should be submitted to the Board of Studies of the Institute. The Board, after deliberation, will suggest changes and modifications and will assign a supervisor from amongst the teaching faculty of the Institute. The synopsis should include the following –

1. Title of Summer Project Report
2. Introduction
3. Problems of Research
4. Objectives of Research
5. Tentative Chapter Division
6. Suggested readings

Source Material and References

Presenting your own ideas in a Summer Project Report is acceptable and even encouraged. However, the paper must be based on facts and opinions from authoritative sources and these sources must be given proper credit. A minimum of three published sources is required, and ten or more is typical. Direct quotes must be placed inside quotation marks or in indented sections and should be used sparingly. Paraphrasing is better in most cases.

There are two popular ways to cite references. One is to place superscripted numbers in the text with corresponding footnotes at the bottom of the page or endnotes at the end of the paper. More typical of scientific papers is to place the author and year in parentheses (Heaton, 1984). In either case you need a bibliography of all cited sources at the end of the paper with author(s), year, title, publication or publisher, volume, and pages. These should be in alphabetical order by name of the primary author. Preference however should be given to MLA Style Sheet.

Be sure to find source materials that are specific to your topic, either books or journal articles. Textbooks are usually too general and should be avoided. The libraries have published and computerized indexes that can be used to find relevant sources. See the Supervisor or a reference librarian if you are unfamiliar with these resources.

Plagiarism is the presenting of someone else's wording or ideas as one's own and is a violation of university policy. If you use someone else's words or ideas, you must give them proper

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credit. You must also obtain permission from the Supervisor before using your Summer Project Report for more than one course.

Length and Format

Length is not important; 40 to 60 pages of 1.5 spaced text is a good target. The title, author, course, and date should be typed onto a cover sheet.. Illustrations are not required but are often useful in explaining graphical concepts and in giving the paper character. The bibliography should be the last section of the paper. The entire report has to be submitted in two spiral bound copies.

Grading

Students are required to make two submissions: a first draft and a final draft prior to final submission. The first draft is *not* to be a "rough" draft; it should be a completed, typed paper like you would ordinarily submit. I will read it carefully, offer suggestions for improvement, give it a grade, and return it to you promptly. The final draft, which is worth a larger share of the points, is your chance to respond to the suggestions and submit an improved paper. This, I hope, will make the writing of a Summer Project Report more of a learning experience. We strongly suggest using a word processor so that the final draft can be created by editing rather than complete retyping.

Grading is based on both research content and presentation. Your paper should demonstrate that you have a gained a level of expertise in the subject by studying the relevant literature. Your presentation should be clean and convincing with proper use of paragraphs, complete sentences, and correct grammar, spelling, and punctuation. Make your Summer Project Report look and sound professional.

Evaluation of Project Work

Sl. No.	Evaluated by	Criteria	Marks
1	Institution	✓ Quality ✓ Depth & Breadth of analysis, ✓ Coverage, ✓ Scope and content ✓ Project fulfillment ✓ Data collection ability in the field (if any) ✓ Scope of Implementation.	50
2	Board of Examiners	Viva-voce Examination	50
3		**Total**	**100**

Project Schedule

1. **Registration**

   First week of the last academic month

   Allotment of Faculty Guide takes place in accordance to the area of interest / stream chosen by the student at the time of registration.

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2. **Approval Of Project Topic**
   Week following the 'week of registration'

3. **Submission Of Synopsis To Faculty Guide**
   Prior to the completion of End -Term Examination. The synopsis could be submitted any time after the allotment of project topic but certainly must be before completion of last examination.

4. **Duration of Project**
   The project stretches for the full duration of the Semester break

5. **Submission of Report**
   First Draft – After 20 Days from the commencement of the project
   Second Draft – 20 days after submission of the first draft.
   The first and second reports could be submitted through e-mail or any other medium as per the consent of faculty guide.
   Final Draft – Within second week of rejoining of institution

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LITERARY THEORY

Course Code: ENG4401 **Credit Units: 05**

Course Objective:
This course will familiarize students with the study of major twentieth-century theories and applications. In this course, Historical, formalist, archetypal, psychoanalytic, Marxist, reader-response, New Historicist, feminist, postcolonial perspectives will be dealt. The course will enable students to comment on various theories and apply them to works of literature and aspects of contemporary culture.

Text:

Immanuel Kant	:	"What Is Enlightenment?"
Simone De Beauvoir	:	'Introduction' of *The Second Sex*
Foucault	:	"What is an Author?" from *The Essential Works of Foucault*
Jacques Lacan	:	Return to Freud: The Real, The Symbolic and The Imaginary
Ferdinand de Saussure	:	Course in General Linguistics (Major Concepts)
Derrida	:	*Structure, Sign, and Play in the Discourse of the Human Sciences*
Bill Ashcroft	:	'*Cutting the Ground: Critical Models of Post Colonial Literatures', from The Empire Writes Back.*
Edward Said	:	*Orientalism:* Introduction.
Homi Bhabha	:	*'How Newness enters the world: Postmodern space, Post Colonial times and the trials of cultural translation', in the Location Of Culture*
Gayatri Chakraborti Spivak	:	*Can the Subaltern Speak?*

Examination Scheme:

Components	TP	S	Presentation	EE
Weightage (%)	10	10	05	70

Recommended Readings:

- Amritjit Singh, Peter Schmidt, Postcolonial Theory and the United States: Race, Ethnicity, and Literature, 2000
- Henry Schwarz, Sangeeta Ray edited, *A Companion to Postcolonial Studies*.
- J A Cuddon, *A Dictionary of Literary Terms and Literary Theory*, 1998
- Jacques Lacan *Return to Freud: The Real, The Symbolic and The Imaginary* New York University Press
- Leroy Searle & Hazard Adams *Critical Theory Since Plato*, 3rd Edition, Cengage, 2005
- Bhabha, Homi, *Location of Culture*, Rutledge; 1 edition 1994
- Beauvoir Simone De Introduction' of *The Second Sex*, Vintage
- Saussure Ferdinand de *Course in General Linguistics*, McGraw-Hill, 1965
- Said Edward, *Orientalism*, Vintage 1969
- Spivak Gayatri Chakraborti Can the Subaltern Speak? Turia & Kant, 2007

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AMERICAN LITERATURE

Course Code: ENG4402 **Credit Units: 05**

Course Objective:
This course will examine American Literature from the late 18th through the 19th century till the 20th century. In particular, it will focus on the relation of aesthetic innovation to the cultural milieu. The course will address these in the context of questions of genre and forms and changing understandings of gender, race, and nationalism.

Text:

Walt Whitman	:	Songs of Myself (Section 1, 2, 3, 5, 6, 7, 11, 24, 25, 32, 44, 49, 51, 52)
Nathaniel Hawthorne	:	The Scarlet Letter
Edgar Allan Poe	:	Philosophy of Composition, The Raven
Dylan Thomas	:	Under Milkwood
Henry Thoreau	:	Walden
Mark Twain	:	Adventures of Huckleberry Finn
Edward Albee	:	Who's Afraid of Virginial Woolf?
Ralph Emerson	:	Complete Essays – Self- Reliance, Pursuit of Happiness
Ernest Hemingway	:	Farewell to Arms

Examination Scheme:

Components	TP	Sessional	Presentation	EE
Weightage (%)	10	10	05	70

Recommended Readings:

- Winthrop, Jordan D., et. al. The Americans: The History of a People and a Nation. Evanston: McDougal, Littell & Co., 1989.
- P. Zweig, Walt Whitman: The Making of a Poet (1984); D. S. Reynolds, Walt Whitman's America (1995).
- Bell, Michael Davitt. The Problem of American Realism. Chicago: U of Chicago P, 1993.
- Becker, George, ed. and introd. Documents of Modern Literary Realism. Princeton: Princeton University Press, 1963.
- Berthoff, Werner. The Ferment of Realism: American Literature, 1884-1919. New York: Free Press, 1965.
- Chase, Richard. The American Novel and Its Tradition. Garden City, N. Y.: Doubleday Anchor, 1957.
- Anderson and K. M. Sanderson, ed., Mark Twain: The Critical Heritage (1972).
- Stuart Levine and Susan Levine ed., The Short Fiction of Edgar Allan Poe, Urbana: University of Illinois, 1976, 1990.
- Linda Wagner-Martin ed., Hemingway: Eight Decades of Criticism. Michigan State University Press, 2009.

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EUROPEAN COMEDY

Course Code: ENG4403 **Credit Units: 05**

Course Objective:
The course will introduce trends and issues related to European drama through study of the prescribed texts; develop critical arguments of local issues in relation to wider structures of individual plays and to generically structured theatre. The students will also be encouraged to make critical understanding of national and cross-national concepts of dramatic practice and identify the relationships between drama and wider philosophical, cultural and political issues.

Text:

Cervantes	:	Don Quixote Vol - I
Rabelais	:	The Histories of Gargantua and Pantagorel
Moliere	:	The Misanthrope
Bakhtin	:	The Grotesque
George Meredith	:	Comedy
Henry Bergson	:	Laughter

Examination Scheme:

Components	TP	Sessional	Presentation	EE
Weightage (%)	10	10	05	70

Recommended Readings:

- Gregory Dobrov, Figures of Play: Greek Drama & Metafictional Poetics, 2000.
- Ian Watt, Myths of Modern Individualism: Faust, Don Quixote, Don Juan, Robinson Crusoe, 1997

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ANCIENT GREEK AND LATIN LITERATURE IN TRANSLATION

Course Code: ENG4407 **Credit Units: 05**

Course Objective:
Identify texts, contexts, and authors—and thematic, genre-based and stylistic hallmarks of those texts and authors within the early literary traditions. Understand, discuss and interpret key texts, ideas, themes, and aesthetic modalities and explain how the texts, ideas, themes and modalities arose within a given cultural or historic context. Recognize and discuss significant genre and stylistic aspects of those texts. Relate their knowledge of ancient texts and belief systems to enduring issues and values in contemporary societies, including their own.

Text:

Homer	:	The Iliad
Sophocles	:	Oedipus Rex
Aristophanes	:	The Frog
Ovid	:	Metamarphoses – Story of Phateon (Book II); The Rape of Proserpine (Book V) Story of Pygmalion the Statue (Book X); The region of Augustus in Which He Flourished (Book XV)
Marcus Aurelius	:	The Meditations – Book I to V

Examination Scheme:

Components	TP	Sessional	Presentation	EE
Weightage (%)	10	10	05	70

Recommended Readings

- A Companion to Greek Tragedy by Justina Gregory, Blackwell Publishing
- The Cambridge Companion to Greek Tragedy (Cambridge Companions to Literature) (Paperback) by P. E. Easterling
- Greek Tragedy in Action, Oliver Taplin, Routledge, 2003
- Gender and Politics in Greek Tragedy, Michael X. Zelenak, Peter Lang Publishing, 1998
- Greek Tragedy: A Literary Study, H. D. F. Kitto, Methuen, 1939
- Greek and Roman Comedy: Translations and Interpretations of Four Representative Plays, Edited by Shawn O'Bryhim, Translated by George Fredric Franko, Timothy Moore, Shawn O'Bryhim, and Douglas Olson

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20TH CENTURY INDIAN ENGLISH LITERATURE

Course Code: ENG4404 **Credit Units: 05**

Course Objective:
This course will attempt to explore issues of contemporary Indian English. The aim is to open the students to the varieties of social and literary provocation at work in the texts prescribed and at the same time trace the changes in style, themes and its ideologies in the contemporary Indian English Writings. Students will be encouraged to - appreciate the sheer linguistic vitality of Indian English Writings; understand how the Indian subcontinent has been imaginatively reworked in recent Indian English writing and assess the cross-cultural impact of such reinvention.

Text:

Raja Rao	:	Kanthapura
Anita Desai	:	In the Lighthouse
Amitav Ghosh	:	The Glass Palace
Salman Rushdie	:	Midnights Children
Girish Karnad	:	Tughlaq
Nissim Ezikiel	:	Background Casually; Poet, Lover, Birdwatcher.
A.K. Ramanujan	:	Obituary; A River.
Kamla Das	:	The Descendants; A Hot Noon in Malabar.

Examination Scheme:

Components	TP	Sessional	Presentation	EE
Weightage (%)	10	10	05	70

Recommended Readings:

- Singh, R. S. Indian Novel in English. Rep. Humanities Press Inc. Atlantic Highlands, New Jersey. 1978
- Iyengar, K. R. Srinivasa. Indian Writing in English. Rep Asia Publishing House. New York, New York. 1973.
- Krishnaswamy, Shantha. The Woman in Indian Fiction in English (1950-80). Ashish Publishing House. New Delhi, India. 1984.
- Sara Suleri, The Rhetoric of English India, University of Chicago Press, 1993.
- M. D. Fletcher ed., Reading Rushdie: Perspectives on the Fiction of Salman Rushdie, ISBN, Netherlands, 1994
- Tabish Kahir, Babu Fictions: Alienation in Contemporary Indian English Novels, Oxford UP, 2001.
- T.S. Anand edited, Modern Indian English Fiction. New Delhi, Creative Books, 2002.
- K.V. Surendran, Indian English Fiction: New Perspectives, New Delhi, Sarup & Sons, 2002.
- Walsh, William. Indian Literture in English. Longman, London. 1990
- N. S. Pradham Ed. Major Indian Novels: An Evaluation. Rep by Humanities Press Inc., Atlantic Highlands, New Jersey. 1986.

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LINGUISTICS AND ENGLISH LANGUAGE TEACHING

Course Code: ENG4406 **Credit Units: 05**

Course Objective:
This paper aims to provide the learner the basic knowledge of Linguistics. This course will introduce the intricacies of language and linguistics to the students focusing on the application of linguistic knowledge in language teaching. The focus of the paper is also to introduce the learners with difference in language learning and language acquisition.

Introduction: What is language? Characteristics of human language; Linguistics: Definition and explanation; Importance and applications of linguistics; Levels of language study.

Phonetics and Phonology: Difference between Phonetics and Phonology; Classification of sound system; Articulation and Production of sounds; Tone, Accent and Stress.

Sociolinguistics: Language; Dialect; Registers; Bilingualism; Multilingualism.

Language Acquisition: Theories of language acquisitions; Stages of language acquisition; Problems of language acquisition.

Methods of Language Teaching and Learning: Grammar Translation; Audio – Visual; Immersion (Total and Partial); Direct Method; Communicative Language Teaching.

Examination Scheme:

Components	TP	Sessional	Presentation	EE
Weightage (%)	10	10	05	70

Text & References:

- Adams ,V.1973. *An Introduction to Modern English Word Formation*. London: Longman
- Chomsky,N.,and M.Halle.1968. *The sound pattern of English*. New York: Harper and Row.
- Lyons J, 1977. *Semantics*. 2 Vols. Cambridge: Cambridge University Press.
- Crystal D.1997. Encyclopedia of Language: 2nd Vol., Cambridge: Cambridge University Press

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DISSERTATION

Course Code: ENG4437 **Credit Units: 03**

GUIDELINES FOR DISSERTATION

The aim of the dissertation is to provide you with an opportunity to further your intellectual and personal development in your chosen field by undertaking a significant practical unit of activity, having an educational value at a level commensurate with the award of your degree

The dissertation can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Selecting the Dissertation Topic

It is usual to give you some discretion in the choice of topic for the dissertation and the approach to be adopted. You will need to ensure that your dissertation is related to your field of specialization.

Deciding this is often the most difficult part of the dissertation process, and perhaps, you have been thinking of a topic for some time.

It is important to distinguish here between 'dissertation topic' and 'dissertation title'. The topic is the specific area that you wish to investigate. The title may not be decided until the dissertation has been written so as to reflect its content properly.

Few restrictions are placed on the choice of the topic. Normally we would expect it to be:

- relevant to business, defined broadly;
- related to one or more of the subjects or areas of study within the core program and specialisation stream;
- clearly focused so as to facilitate an in-depth approach, subject to the availability of adequate sources of information and to your own knowledge;
- of value and interest to you and your personal and professional development.

Planning the Dissertation

This will entail following:

- Selecting a topic for investigation.
- Establishing the precise focus of your study by deciding on the aims and objectives of the dissertation, or formulating questions to be investigated. Consider very carefully what is worth investigating and its feasibility.
- Drawing up initial dissertation outlines considering the aims and objectives of the dissertation. Workout various stages of dissertation
- Devising a timetable to ensure that all stages of dissertation are completed in time. The timetable should include writing of the dissertation and regular meetings with your dissertation guide.

The Dissertation plan or outline

It is recommended that you should have a dissertation plan to guide you right from the outset. Essentially, the dissertation plan is an outline of what you intend to do, chapter wise and therefore should reflect the aims and objectives of your dissertation.

There are several reasons for having a dissertation plan

- It provides a focus to your thoughts.
- It provides your faculty-guide with an opportunity, at an early stage of your work, to make constructive comments and help guide the direction of your research.
- The writing of a plan is the first formal stage of the writing process, and therefore helps build up your confidence.

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- In many ways, the plan encourages you to come to terms with the reading, thinking and writing in a systematic and integrated way, with plenty of time left for changes.
- Finally, the dissertation plan generally provides a revision point in the development of your dissertation report in order to allow appropriate changes in the scope and even direction of your work as it progresses.

Keeping records
This includes the following:

- Making a note of everything you read; including those discarded.
- Ensuring that when recording sources, author's name and initials, date of publication, title, place of publication and publisher are included. (You may consider starting a card index or database from the outset). Making an accurate note of all quotations at the time you read them.
- Make clear what is a direct a direct quotation and what is your paraphrase.

Dissertation format
All students must follow the following rules in submitting their dissertation.
- Front page should provide title, author, Name of degree/diploma and the date of submission.
- Second page should be the table of contents giving page references for each chapter and section.
- The next page should be the table of appendices, graphs and tables giving titles and page references.
- Next to follow should be a synopsis or abstract of the dissertation (approximately 500 words) titled: **Executive Summary.**
- Next is the 'acknowledgements'.
- Chapter I should be a general introduction, giving the background to the dissertation, the objectives of the dissertation, the rationale for the dissertation, the plan, methodological issues and problems. The limitations of the dissertation should also be hinted in this chapter.
- Other chapters will constitute the body of the dissertation. The number of chapters and their sequence will usually vary depending on, among others, on a critical review of the previous relevant work relating to your major findings, a discussion of their implications, and conclusions, possibly with a suggestion of the direction of future research on the area.
- After this concluding chapter, you should give a list of all the references you have used. These should be cross - references with your text. For articles from journals, the following details are required e.g.

  Draper P and Pandyal K. 1991, The Investment Trust Discount Revisited, Journal of Business Finance and Accounting, Vol18, No6, Nov, pp 791-832.

  For books, the following details are required:
  Levi, M. 1996, International Financial Management, Prentice Hall, New York, 3rd Ed, 1996

- Finally, you should give any appendices. These should only include relevant statistical data or material that cannot be fitted into the above categories.

The Layout Guidelines for the Dissertation:
- A4 size Paper
- Font: Arial (10 points) or Times New Roman (12 points)
- Line spacing: 1.5
- Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

Guidelines for the Assessment of the Dissertation
While evaluating the dissertation, faculty guide will consider the following aspects:

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1. Has the student made a clear statement of the objective or objective(s).
2. If there is more than one objective, do these constitute parts of a whole?
3. Has the student developed an appropriate analytical framework for addressing the problem at hand.
4. Is this based on up-to-date developments in the topic area?
5. Has the student collected information / data suitable to the frameworks?
6. Are the techniques employed by the student to analyse the data / information appropriate and relevant?
7. Has the student succeeded in drawing conclusion form the analysis?
8. Do the conclusions relate well to the objectives of the project?
9. Has the student been regular in his work?
10. Layout of the written report.

Assessment Scheme:

Continuous Evaluation:	40%
(Based on Abstract, Regularity, Adherence to initial plan, Records etc.)	
Final Evaluation: Based on,	60%
Contents & Layout of the Report,	25
Conceptual Framework,	10
Objectives & Methodology and	10
Implications & Conclusions	15

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Amity School of Liberal Arts & FL

Master of Arts Political Science

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Curriculum & Scheme of Examination

2023

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Master of Arts Political Science

Learning Outcomes

After completing MA Program, the students will be able to:
PO1. Build on the discipline from undergraduate to masters level
PO2. Equip the learners with in depth knowledge of the subject.
PO3. Make them capable of grabbing the opportunities of higher education, research and other professional development.
PO4. Demonstrate proficiency in empirical research.
PO5. Develop a command on academic and professional writing with an emphasis on the abilities to organize and present materials in a cohesive manner.
PO6. Understanding the nature and developments in national and international politics
PO7. Analyzing the Indian constitutional provisions, major legislations and reforms.
PO8. Critical evaluation of social, economic and political variables for a proper understanding of the plurality of Indian society
PO9. Building overall consciousness regarding national political history, international relations and present Indian and Western political thinkers.
PO10. Encouraging a comprehensive, comparative understanding of specific world constitutions such as UK, USA, China, Russia, Switzerland and France.
PO11. Developing knowledge of administrative studies with special reference to Indian administrative structures and practices.
PO12. Examining India's foreign relations with her neighbours and great powers.

Program Specific Skills (PSO)

PSO1- **Political Science and Society:** understanding the inter relationship between policy decisions and its effects on society. This is achieved through a comprehensive teaching of the practice of public administration in India.

PSO2- **Critical thinking:** the ability to analyze and predict socio political phenomena based on the study of existing socio economic determinants and past experiences. This goal is achieved by training students in the different methods and tools of investigation such as empirical research methods, survey research and data analysis of subject responses.

PSO3 **- Effective citizenship**: the course curriculum inculcates among students a basic understanding of the rights and duties of citizenship and thereby to act as responsible citizens through the observation of important days such as Independence Day, Republic Day and also spreading awareness in society through street plays based on specific socio political issues such as domestic violence, disillusioned youth of the materialistic world etc.

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SEMESTER-I

DEBATES IN POLITICAL THEORY

Course Code: POL4101 **Credit Units: 05**

Course Objective:
This course aims to:
1. This course proposes to build on a prior understanding of the nature and value of theoretical inquiry in politics.
2. Political theory begins with a few fundamental questions that have a bearing on the good life, and the ways in which we seek to collectively secure it. It does not claim to have any final answers to such questions and instead acknowledges disagreements.
3. Our basic disagreements on how we must constitute our collective life are part of our evaluations that we make on a continual basis of the political and social order we inhabit.

Course Outcome
CO1: Evaluation usually entails an intense engagement with the political context within which we live, the nature of our values and political institutions,
CO2: Clarification and analyses, together with weighing the necessity of just institutions and values.
CO3: The activity of evaluation lays bare a wide range of arguments that are used in political discourse sharpening thereby our political judgment.
CO4:It is imperative to evaluate, argue and judge and then raise for the consideration of justification our existing or appropriate political practices, decisions, policies and institutions.
CO5:This course seeks to explore and understand some of the major debates that contemporary political theory is engaged in, and hopes thereby to enrich our skills of analysis and judgment.

Debates will relate to concepts:

	Bloom's Level	Credit hours
Module-I: **Introduction**		
a. What is Political Theory?	2	10
b. Disagreements and Debates in Political Theory		
c. Normative judgments in a Political Context		
Module-II: **The Political Context**	2	20
d. Understanding Power		
e. The Faces of Power (Steven Lukes)		
f. Ideology and Power (Althusser)		
g. Class Power		
h. Power and the Subject: Foucault		
i. On the Colonial State in India (Naoroji, Dutt and Gandhi)		
Module-III: **Debates on freedom**	3	10
j. Ancient vs. Modern Liberty		
k. Freedom as autonomy (Kant, Mill)		
l. Negative vs. Positive Liberty (Berlin, MacCallum)		
m. Freedom and the market (Libertarians)		
n. Republican Conception (Skinner)		
o. Freedom as Development (Sen)		

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p. Freedom as Swaraj (Gandhi)		
Module-IV: **Debates on Equality**	3	10
q. Value of Equality (Bernard Williams)		
r. Equality of Opportunity (Rawls)		
s. Equality of What? (Welfare, Resources, Capability)		
t. Luck egalitarianism and its critique (Elizabeth Anderson)		
u. Equality, Priority or Sufficiency (Scheffler, Parfit, Franfurt)		
Module-V: **Debates on Justice**	4	10
v. Consequentialist vs. Deontological (Utilitarians, Rawls)		
w. Justice as Fairness (Rawls)		
x. Communitarian and Feminist Conceptions (Walzer, Sandel, Okin)		
Global Justice (Thomas Pogge)		

Bloom's LevelL1: Knowledge; L2: Comprehension; L3:Application L4: analysis ; L5 : synthesis, L6 : Evaluation

Examination Scheme

Components	**A**	**P**	**A/TP**	**CT**	**EE**
Weightage (%)	5	10	5	10	70

(**A :** Attendance ; **P :** Presentation ; **A/TP :** Assignment/Term Paper ; **CT :** Class Test ; **EE :** External Examination)

CO, PO and PSO mapping

	PO 1	PO 1	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	1	1	1	2	2	1	2	3	3	3	1		1	1	2
CO 2		1	1	2	1	1	2	1	2	3		2	1	2	1
CO 3	1	1	2	2	3	2	1	2	2	3	2		1	1	2
CO 4	1	1	1	2	2	3	1	1	2	2	1		1	2	2
CO 5	1	2	2	1	2	3	2	3	2	1		3	1	1	2

1. Strongly Related 2. Moderately related 3. Weakly Related

READINGS:

- Hampton, Jean (1989) 'Should Political Philosophy by Done without Metaphysics?' *Ethics: 99*, 791-814.
- Mckinnon, Catriona, 2008, 'Introduction' in Mckinnon, Catriona (ed), *Issues in Political Theory*, New York: Oxford University Press.
- Haugaard, Mark, 2002, *Power: A Reader*, Manchester University Press: 1-66; 181-204.
- Althusser, L, 1977, 'Ideology and Ideological State Apparatuses (Notes Towards an Investigation)' in Althusser '*Lenin and Philosophy' and Other Essays*, London: New Left Books.
- Lukes, Steven. *Power: A Radical View*. London: Macmillan Press, 1974. Constant, Benjamin, 1988, 'The Liberty of the Ancients Compared with that of the
- Moderns',in Benjamin Constant, *Political Writings*, Cambridge University Press: 308-28.

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- Berlin, I., 1969, 'Two Concepts of Liberty', in I. Berlin, *Four Essays on Liberty*, London: Oxford University Press: 118-72.
- Nelson, E., 2005, 'Liberty: One Concept Too Many?', *Political Theory*, 33, pp. 58-78.
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COMPARATIVE POLITICAL ANALYSIS

Course Code: POL4102 **Credit Units: 05**

Course Objective:
Each topic is to be studied with reference to concepts, theories and the historical experiments of developing countries as well as advanced industrialized countries. A central concern of the course is to discern the Eurocentric bias in the field of comparative politics, and to identify the processes of de-centering which have reconfigured the field in significant ways.

Course Outcome
CO1: When applied to specific fields of study, comparative politics may be referred to by other names, such as for example comparative government (the comparative study of forms of government) or comparative
CO2; Foreign policy (comparing the foreign policies of different States in order to establish general empirical connections between the characteristics of the State and the characteristics of its foreign policy).
CO3: Sometimes, especially in the United States, the term "comparative politics" is used to refer to "the politics of foreign countries." This usage of the term, however, is often considered incorrect.
CO4:"Comparative political science" as a general term for an area of study, as opposed to a methodology of study, can be seen as redundant. The political only shows as political when either an overt or tacit comparison is being made.
CO5: A study of a single political entity, whether a society, subculture or period, would show the political as simple brute reality without comparison with another society, subculture, or period.

Module-I: Comparative Methods and Approaches	**Bloom's Level**	**Credit Hours**
Comparative Methods and Approaches	1	10
Approaches to Comparative Political Analysis		
Formal – Institutional		
Political Systems and Structural Functional Approach		
Culture-centric		
Political Economy		
New Institutionalism		
Module-II: Nationalism and Anti-Colonial Struggles Development	2	20
Theories of Modernisation		
Underdevelopment		
Dependency		
World System		
Post Development		
Module-III: Theories of the State	3	15
a. State		
i. Theories of the State		
ii. Development of Modern States in Europe and Non-European Societies		
b. State and Social Classes in		
i. Capitalist		
ii. Socialist		
iii. Post-Colonial Societies		

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Module-IV: State Forms		
c. Federalisms	2	15
d. Patterns of Democracy, Authoritarian and the Security State		

Bloom's LevelL1: Knowledge; L2: Comprehension; L3: Application L4: analysis; L5 : synthesis, L6 : evaluation

Examination Scheme

Components	**A**	**P**	**A/TP**	**CT**	**EE**
Weightage (%)	5	10	5	10	70

(A : Attendence ; P : Presentation ; A/TP : Assignment/Term Paper ; CT : Class Test ; EE : External Examination)

CO, PO and PSO mapping

	PO 1	PO 1	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	1	1	1	2	2	1	2	3	3	3	1		1	1	2
CO 2		1	1	2	1	1	2	1	2	3		2	1	2	1
CO 3	1	1	2	2	3	2	1	2	2	3	2		1	1	2
CO 4	1	1	1	2	2	3	1	1	2	2	1		1	2	2
CO 5	1	2	2	1	2	3	2	3	2	1		3	1	1	2

1. Strongly Related 2. Moderately related 3. Weakly Related

READINGS:

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POLITICS IN INDIA

Course Code: POL4103 **Credit Units: 05**

Course Objective:
This course focuses on societal dynamics and their impact on political processes. It identifies specific themes which are significant for the study of politics in India, explores the way in which these themes have acquired salience, and how their changing forms have impacted upon the nature and course of Indian politics.
It seeks in particular to understand how state and politics are informed by social processes and political mobilizations, historically and in contemporary contexts.

Course Outcome:
CO1: How has India's politics changed over the last five years? This is as important for setting the agenda of the new government as it is for assessing the performance of the incumbent one.
CO2 : To know the structures of the government and legacies which is being carries forward.
CO3:The political discourse has coarsened is self-evident. There is greater intrusion of the media into public and private life, & a lot of what they serve up is degrading, rather than enlightening or redemptive.
CO4: How religion and Language play an important role in Indian Politics.
CO5: Understanding the development strategies in the era of liberalization and Globalization

Module-I: Approaches to Indian Politics	Bloom's Level	Credit hours
Historical, cultural, legal and political economy perspectives	1	15
Module-II: State in India		
Democratic, developmental and coercive dimensions		
Module-III: Class, Caste, Tribe and Gender		
The changing nature of class dominance in India	2	10
Politics and social mobilizations		
Issues of equality and representation		
Module-IV: Religion, Region and Language	2	20
Communalism and secular politics		
Region and language: issues of recognition, autonomy and secession		
Module-V: Development Process	3	15
Concept, strategies, policies, and critiques		
Poverty alleviation programmes		
Globalization and impact on the weaker sections		

Bloom's LevelL1: Knowledge; L2: Comprehension; L3:Application L4: analysis ; L5 : synthesis, L6 : evaluation

Examination Scheme

Components	**A**	**P**	**A/TP**	**CT**	**EE**
Weightage (%)	5	10	5	10	70

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(A : Attendence ; P : Presentation ; A/TP : Assignment/Term Paper ; CT : Class Test ; EE : External Examination)

CO, PO and PSO mapping

	PO 1	PO 1	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	1	1	1	2	2	1	2	3	3	3	1		1	1	2
CO 2		1	1	2	1	1	2	1	2	3		2	1	2	1
CO 3	1	1	2	2	3	2	1	2	2	3	2		1	1	2
CO 4	1	1	1	2	2	3	1	1	2	2	1		1	2	2
CO 5	1	2	2	1	2	3	2	3	2	1		3	1	1	2

1. Strongly Related 2. Moderately related 3. Weakly Related

READINGS:

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THEORIES OF INTERNATIONAL RELATIONS

Course Code: POL4104 **Credit Units: 05**

Course Objective:

1. This course introduces graduate students to diverse traditions of theoretical endeavors in the International Relations as they have evolved around the world. It will cover both explanatory and normative paradigms in international relations theory and give a brief overview of the state of the art of IR to students.

2. The purpose of the course is to provide a thorough background in all schools of IR theory and the debates between them regarding their perspective on the nature of international politics and how it is to be conceptualized, understood and judged, bearing in mind their geo-cultural specificities.

Course outcome

CO1 and 2: The study and practice of international relations in today's world is valuable for many reasons. International relations promotes successful trade policies between nations.

CO3: International relations encourages travel related to business, tourism, and immigration, providing people with opportunities to enhance their lives.

CO4:International relations allows nations to cooperate with one another, pool resources, and share information as a way to face global issues that go beyond any particular country or region. Contemporary global issues include pandemics, terrorism, and the environment.

CO5: International relations advances human culture through cultural exchanges, diplomacy and policy development.

The practice of international relations is valuable in a wide array of settings

	Bloom's Level	**Credit Hours**
Module-I: Introduction	2	10
a. Evolution of the Discipline		
b. The Great Debates		
c. State of the Art		
Module-II: Realism: Its Variants and Complements	3	20
d. Structural Realism		
e. Indian Tradition: Kautilya's Realpolitique		
f. Chinese Tradition		
g. European Schools of Thought		
h. The English School		
i. Neo-Liberalism Institutionalism		
Module-III: Alternative Approaches in IR	2	20
j. Critical Theory		
k. Constructivism		
l. Post-Modernism		
m. Feminism		
n. Neo-Marxism		
o. Ethics in IR		
Module-IV: Problematic of the 'International'	2	20

Bloom's LevelL1: Knowledge; L2: Comprehension; L3:Application L4: analysis ; L5

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: Synthesis, L6 : evaluation

Examination Scheme

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(**A :** Attendence ; **P :** Presentation ; **A/TP :** Assignment/Term Paper ; **CT :** Class Test ; **EE :** External Examination)

CO, PO and PSO mapping

	PO 1	PO 1	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	1	1	1	2	2	1	2	3	3	3	1		1	1	2
CO 2		1	1	2	1	1	2	1	2	3		2	1	2	1
CO 3	1	1	2	2	3	2	1	2	2	3	2		1	1	2
CO 4	1	1	1	2	2	3	1	1	2	2	1		1	2	2
CO 5	1	2	2	1	2	3	2	3	2	1		3	1	1	2

1. Strongly Related 2. Moderately related 3. Weakly Related

READINGS:

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- Steve Smith, Ken Booth and Marysia Zalewski, (eds.), *International Theory: Positivism and Beyond*, Cambridge: Cambridge University Press, 1996.
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SEMESTER-II

ADMINISTRATIVE THEORY

Course Code: POL4201 **Credit Units: 05**

Course Objective:

The focus of this course is on the theories that have shaped the emergence of modern systems of governance and their related structures and processes. These include Western and Non-Western traditions. The course has a clear normative thrust inasmuch as it seeks to clarify what can be the prerequisites for promoting effective and just administration at the local and national levels.

Course outcome

CO1 and 2: To explore the theoretical underpinnings those have shaped the practice of public administration.
CO3: To understand the nature of public administration
CO4: To comprehend different theoretical frameworks guiding public administration as a field of study and practice
CO5: Explain opportunities and challenges that the micro and macro environments of public administration unveil to public administrators

Module-I: Evolution of the Discipline of Public Administration	Bloom's Level	Credit Hours
a Western Traditions	2	10
b Non-Western Traditions		
Module-II: Classical Schools	2	10
a. The Scientific Management School		
b. The Classical Theory of Management/Administrative Management Theory		
c. The Ideal organization: Max Weber.		
d. Human Relations: Elton Mayo.		
e. Behavioural and Systems approaches		
i. Argyris, Maslow, McGregor: the behavioural approach		
ii. System Approaches: open/closed systems		
Module-III: Contextual Public Administration	3	15
a. Ecological Approach: Fred Riggs		
b. Rational Decision-Making Approach: Herbert Simon		
c. Development Administration Approach		
i. Political Economy Approach		
ii. Marxist Approach		
Module-IV: Contemporary Developments	3	15
a) New Public Administration		
a. Non-Weberian perspectives		
b. Value questions		
c. Clientele perspective		

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b) New Public Management		
a. Good Governance and Development		
b. Feminist Perspectives on Public Administration		
Module-V: Grassroots governance: alternative perspectives	2	15
d. Gandhi		
e. J.Nyerere		
f. Mao		

Bloom's LevelL1: Knowledge; L2: Comprehension; L3:Application L4: analysis ; L5 : Synthesis, L6 : evaluation

Examination Scheme

Components	**A**	**P**	**A/TP**	**CT**	**EE**
Weightage (%)	5	10	5	10	70

(A : Attendence ; P : Presentation ; A/TP : Assignment/Term Paper ; CT : Class Test ; EE : External Examination)

CO, PO and PSO mapping

	PO 1	PO 1	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	1	1	1	2	2	1	2	3	3	3	1		1	1	2
CO 2		1	1	2	1	1	2	1	2	3		2	1	2	1
CO 3	1	1	2	2	3	2	1	2	2	3	2		1	1	2
CO 4	1	1	1	2	2	3	1	1	2	2	1		1	2	2
CO 5	1	2	2	1	2	3	2	3	2	1		3	1	1	2

1. Strongly Related 2. Moderately related 3. Weakly Related

READINGS:

- Albrow, Martin, *Bureaucracy,* London, Macmillan, 1978.
- Arora, Ramesh K, *Comparative Public Administration: An Ecological Perspective,* New Delhi, Associated Publishing House, 1979.
- Bhattacharya, Mohit, *Restructuring Public Administration Essays in Rehabilitation,* New Delhi, Jawahar, 1999.
- Gant, George F., *Development Administration: Concepts, Goals, Methods,* Madison, University of Wisconsin Press, 1979.
- Henry, Nicholas, *Public Administration and Public Affairs,* Delhi, Prentice-Hall of India, 1999.
- Leftwich, A., 'Governance, in the State and the Politics of Development', Development and Change, Vol. 25r 1994.
- Minogue, Martin, *'The Internationalization of New Public Management'* in *The Internationalization of Public Management: Reinventing the Third World State* edited, McCourt W and M. Minogue. U.K., Edward, Elgar, 2001.
- Self, Peter, *Administrative Theories and Politics: An Inquiry into the Structure and process*
- of Modern Government. New Delhi, S. Chand and Co, 1984.
- Stivers, Camilla, *'Towards a Feminist Theory of Public Administration in Gender'* in Images in Public Administration: Legitimacy and the Administrative Slate. New Delhi, Sage, 1993
- Trembley, Chaudhary and Prema Kumtakar, *Governance and Representation: A Study of Women and Local Self Government,* in Indian Journal of Public Administration, 44(3), Jul.- September 1995 : pp 54-67.

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THEMES IN INDIAN POLITICAL THOUGHT

Course Code: POL4202 **Credit Units: 05**

Course Objective:

The purpose behind this course is to introduce students to the richness and variety of the tradition of Indian Political Thought, a tradition that spans centuries if not millennia culminating in the various present day understandings of Indian society.

Course Outcome

CO 1- Tracing the evolution of Indian political thought from ancient India to modern India.
CO 2- Analyzing the nationalist thought of Mahatma Gandhi
CO 3- Assessing the nationalist thought during post colonial period and Hindutva
CO 4- Discussing the nationalism of Gandhi, Reformist and Socialism
CO 5- Explaining the formation of the Congress in 1885.

Module-I: Perspectives	Bloom's Level	Credit Hours
a. Classical and Shramanic	2	10
b. Islamic and Syncretic		
c. Contemporary Theories: Liberal, Marxist, Gandhian, Post colonial, Hindutva		
Module-II: Theories and Practices of Knowledge	2	10
d. Classical and Shramanic		
e. Colonial		
Module-III: State	2	15
f. Monarchical		
g. Colonial and Post Colonial		
Module-IV: Conception and Forms of Community	2	15
h. Community in pre-modern and modern times		
i. Forms of Community: Janapada, Sangha, Jati, Quam, Samaj		
Module-V: Critical Perspectives on Indian Society	1	10
j. Shramanic		
k. Syncretist		
l. Reformist		
m. Socialist		
n. Gandhian		

Bloom's LevelL1: Knowledge; L2: Comprehension; L3:Application L4: analysis ; L5 : Synthesis, L6 : evaluation

Examination Scheme

Components	**A**	**P**	**A/TP**	**CT**	**EE**
Weightage (%)	5	10	5	10	70

(A : Attendence ; P : Presentation ; A/TP : Assignment/Term Paper ; CT : Class Test ;

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EE : External Examination)

CO, PO and PSO mapping

	PO 1	PO 1	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	1	1	1	2	2	1	2	3	3	3	1		1	1	2
CO 2		1	1	2	1	1	2	1	2	3		2	1	2	1
CO 3	1	1	2	2	3	2	1	2	2	3	2		1	1	2
CO 4	1	1	1	2	2	3	1	1	2	2	1		1	2	2
CO 5	1	2	2	1	2	3	2	3	2	1		3	1	1	2

1. Strongly Related 2. Moderately related 3. Weakly Related

READINGS:

- Drekmeir, Charles, *Kingship and Community in early India*, California Stanford University Press, Stanford, 1962,.
- Pt. Sastri, N.A., *Cultural Heritage of India*, v.1, Ramakrishna Mission
- Roy, Asim (ed.), *History and Politics: Perspective from South Asia*, Oxford University Press, Delhi, 2006.
- Heesterman, J.C, *The Inner Conflict of Tradition: Essays in Indian Ritual, Kingship and Society*, University of Chicago Press, Chicago, 1988.
- Subhramanyam, Sanjay, Muzaffar, Alam (eds.), *Moghul State: 1526-1750*, Oxford University Press, Delhi, 1998.
- Jalal, Ayesha, *Self and Sovereigny: Individual and Community in South Asian Islam since 1850*, Routedge, 2001.
- Anderson and Guha (eds.), *Changing Concepts of Rights and Justice in South Asia*, School of Oriental and African Studies, London, 2001.
- Chatterjee, Partha (ed.), *State and Politics in India*, Oxford University Press, Delhi, 2005. Thapar R. *From Lineage to State: Social Formations of the Mid-First Millennium BC*,
- Oxford University Press, Delhi, 1984.
- Srinivas M.N., *Social Change in Modern India*, Orient Longman, India, 1967. Jafferlot C (ed.), *The Sangh Parivar: A Reader*, Oxford University Press, Delhi, 2005.
- Chatterjee Partha, *Nationalist thought and the Colonial World: A Derivative Discourse?*, Zed Books for United Nations University, London, 1986.
- Cohn Bernard, *Colonialism and Its Forms of Knowledge*, Princeton University Press, New Jersey, 1996.
- V.R. Mehta and Thomas Pantham,(ed.), *Political Ideas in Modern India: Thematic Explorations*, New Delhi, Sage, 2006, Introduction and other selected chapters.
- Anthony Parel, From Political Thought in India to Indian Political Thought," in *Western Political Thought in Dialogue with Asia*, edited by Takashi Shogimen and C.J. Nederman, Plymouth, UK, Lexington Books, 2009, pg 187-208
- Anthony Parel, *Gandhi's Philosophy and the Quest for Harmony,* Cambridge University Press, 2006

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THEMES IN WORLD POLITICS AND INTERNATIONAL POLITICAL ECONOMY

Course Code: POL4203 **Credit Units: 05**

Course Objective:

1.The twin objectives of this course are to familiarize the graduate students with certain key concepts for analyzing world politics and, the core theoretical issues and empirical explanations in the field of International Political Economy (IPE).

2.International political economy addresses issues relating to distribution of power, wealth and resources among nations. The course debates key issues pertaining to the relationship between security and economic affairs, the tensions between the 'national' and 'international' loci for decision making on matters of global economic governance and, politics of international trade, finance and labour. The centrality of North-South conflict in several domains especially that of global environmental governance and the role of global social movements in resisting pressures of globalization are also discussed at length.

Course outcome

CO1:Demonstrate understanding basic facts about the world
CO2: Demonstrate capacity to theorize or explain political outcome
CO3: Demonstrate familiarity with current political debates
CO4: Demonstrate skills in critical thinking
CO5: Demonstrate knowledge of social scientific inquiry norms and standards

Module-I: Concepts	Bloom's Level	Credit Hours
a. State	2	10
b. Power		
c. Security		
d. Culture and Religion		
Module-II: International Political Economy	3	20
e. Theoretical Debates and Critical Perspectives		
f. Global Economic Governance (IMF, WB and WTO)		
g. Politics of International Trade, Finance and Labour		
h. Knowledge and Technology		
i. International Alignments (G-8, BRICS , G-77 and BIMSTEC)		
Module-III: Environmental Governance	2	20
Module-IV: Global Challenges and Movements	2	20
k. Global Social Movements		
l. Global Justice		

Bloom's LevelL1: Knowledge; L2: Comprehension; L3:Application L4: analysis ; L5 : Synthesis, L6 : evaluation

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Examination Scheme

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(A : Attendence ; P : Presentation ; A/TP : Assignment/Term Paper ; CT : Class Test ; EE : External Examination)

CO, PO and PSO mapping

	PO 1	PO 1	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	1	1	1	2	2	1	2	3	3	3	1		1	1	2
CO 2		1	1	2	1	1	2	1	2	3		2	1	2	1
CO 3	1	1	2	2	3	2	1	2	2	3	2		1	1	2
CO 4	1	1	1	2	2	3	1	1	2	2	1		1	2	2
CO 5	1	2	2	1	2	3	2	3	2	1		3	1	1	2

1. Strongly Related 2. Moderately related 3. Weakly Related

READINGS:

- Simon Bromley, William Brown and Suma Athreya, (eds.), *Ordering the International: History, Change and Transformation*, Pluto Press with The Open University, London, 2004.
- Anthony Giddens and David Held, eds., *Classes, Power and Conflict*, Los Angeles: University of California Press, 1982.
- Steven Lukes, *Power: A Radical Review* , London: The Macmillan Press, 1982.
- Keith Krause and Michael C. Williams, eds., *Critical Security Studies: Concepts and Cases*
- (London: UCL Press, 1997).
- Stuart Croft and Terry Terriff, (eds.), *Critical Reflections on Security and Change*, London: Frank Cass, 2000.
- Barry, Buzan, Ole Waever and Jaap de Wilde, (eds.), "Security: A New Framework for Analysis," Boulder: Lynne Rienner,1998.
- L.I. Rudolph and S.H. Rudolph, *Explaining Indian Democracy A Fifty Year Perspective, 1956-2006: The Realm of Institutions: State Formation and Institutional Change*, New Delhi, OUP, 2008.
- Klaus Knorr, *Power and Wealth: The Political Economy of International Order*, London: Macmillan, 1973
- Navnita Chadha Behera, (ed.), *State, People and Security: The South Asian Context*, New Delhi: Har-Anand, 2002.
- RBJ Walker, ed., *Culture, Ideology and World Order*, Boulder: Westview Press, 1984.
- Richard Falk et.al., *Reframing the International: Law, Culture and Politics*, New York: Routledge, 2002
- Yosef Lapid and Freiedrich Kratochwil, eds., *The Return of Culture and Identity in IR Theory*, (Boulder: Lynne Rienner, 1997
- David N. Balaam and Michael Veseth, *Introduction to International Political Economy* (New Jersey: Prentice Hall, 2001.
- George Crane and Abla Amawi, *The Theoretical Evolution of International Political Economy* (Oxford: OUP, 1997).
- Robert Gilpin, *The Political Economy of International Relations* (Princeton: Princeton University Press, 1987
- John Ravinhill, Second Edition (2008*), Global Political Economy* (Oxford: Oxford University Press)

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- Robert O'Brian and Williams, Marc, Second Edition (2007), *Global Political Economy*
- (Basingstoke: Palgrave Macmillan)
- Richard Stubbs and Underhill, Geoffrey R. D, Third Edition, *Political Economy and the Changing Global Order* (Ontario: Oxford University Press)
- David McGrew & Anthony Held (eds.) Second Edition (2003), *The Global Transformations Reader* (Cambridge: Polity Press)
- Peter Dicken, Fifth Edition (2007), *Global Shift* (London: Sage)
- Hoekman, M. and Kostecki, M. M., (2008), *The Political Economy of the World Trading System* (Oxford: Oxford University Press)
- P.S., Chasek, Downie, D.L., and Brown, J.W., Fourth Edition (2006), *Global Environmental Politics* (Boulder: West view Press)
- John Baylis, Steve Smith and Patricia Owens, Fourth Edition (2008), *The Globalisation of World Politics* (New York: Oxford University Press)
- Mary Kaldor, (2003), *Global Civil Society* (Cambridge: Polity Press)
- Roe Goddard, Patric Cronin and Kishore C. Dash, eds., *International Political Economy: State-Market Relations in a Changing Global Order* (Boulder: Lynne Rienner, 2003).
- Stephen Krasner, *Structural Conflict: The Third World Against Global Liberalism*
- (University of California press, 1985)
- The Independent Commission on International Development Issues, *North-South: A Programme for Survival* (London: Pan Books, 1980).
- Samir Amin, *Delinking: Towards a Polycentric World* (London: Zed Books, 1990).
- Vinod K Aggarwal, *Debt Games: Strategic Interaction in International Debt Rescheduling*, Cambridge University Press (1996)
- Tyrone Ferguson, *The Third World and Decision Making in the International Monetary Fund: The Quest for Full and Effective Participation*, Pinter (1988)
- Stephan Haggard, *Developing Nations and the Politics of Global Integration*, Brookings (1995);
- Miles Kahler (Ed), *The Politics of International Debt*, Cornell University Press (1986)
- Miles Kahler (Ed), *Capital Flows and Financial Crises*, Cornell University Press (1998).
- D Kapur, J Lewis & R Webb, *The World Bank: Its First Half Century*, Vol 1 and 2, Brookings (1997);
- Robert L Rothstein, *The Weak in the World of the Strong: The Developing Countries in the International System*, Columbia University Press (1977);
- Diana Tussie, *The Less Developed Countries and the World Trading System: A Challenge to the GATT*, St Martin's Press (1987).
- Henrik Secher Marcussen and Jens Erik Torp, *The Internationalization of Capital: The Prospects for the Third World, London*: Zed Books, (1982)

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KEY TEXTS IN POLITICAL PHILOSOPHY

Course Code: POL4204 **Credit Units: 05**

Course Objective:

1.The objective of this course is to introduce students to select classical texts in Western Political Philosophy through two methods (i) an intensive reading of selected parts of the text, and (ii) by making them familiar with different interpretations of the texts.

2.The idea is to instill in students an interest in reading original works, in the desire to closely follow the debates around the work, and become aware of the different ways in which a text can be read.

A detailed study of any Four texts from the given list will be offered in an academic session.

Course Outcome

CO1:Students will demonstrate knowledge of key thinkers and concepts
CO2:Students will compare thinkers on similar concept
CO3Students will use concepts to analyze new situations
CO4:Students will explain the nature and value of normative thinking
CO5:Students can forsee Critical gaps.

a. Why study the History of Ideas?
b. What is Interpretation?
c. Problems in Interpreting Data
d. Theories of Interpretation
e. Meaning and Context
f. The Importance of Language

Texts	Bloom's Level	Credit Hours
1. **Plato**: *The Republic*		
2. **Aristotle**: *The Politics*		
3. **Machiavelli**: *The Prince*		
4. **Hobbes**: *Leviathan*		
5. **Locke**: *The Second Treatise of Government*		
6. **Rousseau**: *Social Contract*		
7. **Kant**: *Groundwork of the Metaphysic of Morals*		
8. **Hegel**: *Philosophy of Right* (excerpts)		
9. **Marx & Engels**		
10. **Mill**: *On Liberty*		

Bloom's LevelL1: Knowledge; L2: Comprehension; L3:Application L4: analysis ; L5 : Synthesis, L6 : evaluation.

Note: Whichever four text student chooses all have to be given equal importance in terms of credit hours. So credit hours stands equally divided between all four text choosen. In Bloom's level it should be both a combination of Knowledge and Comprehension.

Examination Scheme

Components	**A**	**P**	**A/TP**	**CT**	**EE**
Weightage (%)	5	10	5	10	70

(A : Attendence ; P : Presentation ; A/TP : Assignment/Term Paper ; CT : Class Test ; EE : External Examination)

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CO, PO and PSO mapping

	PO 1	PO 1	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	1	1	1	2	2	1	2	3	3	3	1		1	1	2
CO 2		1	1	2	1	1	2	1	2	3		2	1	2	1
CO 3	1	1	2	2	3	2	1	2	2	3	2		1	1	2
CO 4	1	1	1	2	2	3	1	1	2	2	1		1	2	2
CO 5	1	2	2	1	2	3	2	3	2	1		3	1	1	2

1. Strongly Related 2. Moderately related 3. Weakly Related

READINGS

Introduction:

Ball, Terence, 'History and the Interpretation of Texts,' in Gerald F Gaus and Chandran Kukathas (eds.), *Handbook of Political Theory* (Sage, 2004).
Skinner, Quentin, 'Meaning and understanding in the history of ideas' *History and Theory*, 1969, 8: 3–53.
Pocock, J. G. A., 'The history of political thought: a methodological enquiry' in Peter Laslett and W. G. Runciman, (eds) *Philosophy, Politics and Society*, 2nd series. (Oxford: Blackwell, 1962)
Strauss, Leo, *What is Political Philosophy?* (Glencoe, IL: Free Press, 1959)

Texts:

Plato

Plato, *The Republic*, trans. P. Shorey, Loeb Classical Library (Cambridge, MA: Harvard University Press, 1930)

Aristotle

Aristotle, The Politics, *The Politics and the Constitution of Athens*, trans. B. Jowett, ed. S. Everson. (Cambridge: Cambridge University Press, 1996)

Machiavelli

Machiavelli, *The Prince*, ed. and trans. G. Bull (Harmondsworth: Penguin, 1961) Hobbes
Thomas Hobbes, *Leviathan*, ed. C. B. Macpherson (Baltimore: Penguin Books, 1968). Locke
John Locke, *Two Treatises of Government*, ed. Peter Laslett (Cambridge: Cambridge University Press, 1960).

Rousseau

Jean-Jacques Rousseau, *On the Social Contract, with Geneva Manuscript and Political Economy*, ed. Roger D. Masters, trans. Judith R. Masters (New York: St. Martin's Press, 1978)

Kant

Kant, I., Groundwork of the Metaphysics of Morals, trans. H.J. Paton, (New York: Harper & Row, 1964)

Hegel

Hegel, G.W.F. (1979) *The Philosophy of Right*, trans. T.M. Knox. (Oxford: Oxford University Press, 1979).

Marx & Engels

Tucker, Robert C, ed., *The Marx-Engels Reader*, 2nd Edition, (New York: W W Norton & Co.; 1978)

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Preface to A Contribution to the Critique of Political Economy: pg. 3-6
Economic and Philosophic Manuscripts of 1844: pg. 73-93
Theses on Feuerbach: pg. 143-145
The German Ideology: pg. 146-200
Manifesto of the Communist Party: pg. 469-500
Critique of the Gotha Programme: pg. 525-541
The Eighteenth Brumaire of Louis Bonaparte: pg. 594-617

Mill
Mill, John Stuart, *On Liberty and other writings,* ed. Stefan Collini (Cambridge, 1989).
Wollstonecraft
Wollstonecraft, Mary, *A Vindication of the Rights of Woman, ed.* by Miriam Brody (London: Penguin Books, 1992)

Kollontai
Kollontai, A., [1909] *The Social Basis of the Woman Question.*

Nietzsche
Nietzsche, F. *On the Genealogy of Morals,* trans. D. Smith. (Oxford: Oxford University Press, 1996)

Rawls
Rawls, John, *A Theory of Justice*. (Cambridge, MA: Harvard University Press, 1971) Mahatma Gandhi
Anthony J. Parel, (ed.), *Gandhi: Hindi Swaraj and Other Writings Centenary Edition*, CUP, 2009

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SEMESTER-III

INTERPRETING MODERN INDIA

Course Code: POL4301 **Credit Units: 05**

Course Objective:

1. This course is about introducing students to the conflicting ideas of what India is today and where it might be heading.
2. Therefore, the focus is on the various related discourses of the cultural, social, political, economic that is the sites of intense debate today.

Course outcome

CO1:Major ways in which the story of India as a singular nation has been narrated in history writing, literature and visual arts
CO2:Major theories of nationalism
CO3Debates within the field of the historiography of European and Non-western nationalism
CO4: Having successfully completed this module you will be able to:
CO5Think critically about narratives of nationhood in history writing, literature and visual culture

	Bloom's Level	Credit Hours
Module-I: Conceptions of the "Modern"	**2**	**20**
a. Indological		
b. Gandhian		
c. Nehruvian		
d. Tradition-Modernity Debate		
e. Post Colonial		
Module-II: Perspectives on Justice and Social Transformation	**2**	**20**
f. Gender		
g. Caste		
h. Class		
Module-III: Conceptions of Nationalism	**2**	**10**
i. Subaltern Nationalism		
j. Communal Nationalism		
k. Secular Nationalism, Toleration		
l. Internationalism, Cosmopolitanism		
Module-IV: Development and its critiques	**1**	**15**
m. Debates in Environmental Studies		
n. Debates in Industrialisation and dispossession		
Module-V: Community, Civil Society, Public Sphere	**2**	**10**
o. The Community vs. civil Society debate		
p. The Public Sphere		
Module-VI: Debates on Globalisation	**1**	**5**

Bloom's LevelL1: Knowledge; L2: Comprehension; L3:Application L4: analysis ; L5 : Synthesis, L6 : evaluation

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Examination Scheme

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(**A :** Attendence ; **P :** Presentation ; **A/TP :** Assignment/Term Paper ; **CT :** Class Test ; **EE :** External Examination)

CO, PO and PSO mapping

	PO 1	PO 1	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	1	1	1	2	2	1	2	3	3	3	1		1	1	2
CO 2		1	1	2	1	1	2	1	2	3		2	1	2	1
CO 3	1	1	2	2	3	2	1	2	2	3	2		1	1	2
CO 4	1	1	1	2	2	3	1	1	2	2	1		1	2	2
CO 5	1	2	2	1	2	3	2	3	2	1		3	1	1	2

1. Strongly Related 2. Moderately related 3. Weakly Related

READINGS:

- Thapar, Romila, The *Aryan: Recasting Concepts,* Gurgaon: Three Essays Collective,2008
- Inden, Ronald, *Orientalist constructions of India*, Modern Asian Studies, xxx3, pgs.401-446, 1986
- Thapar, Romila, *Early Indian History and the legacy of D D Kosambi*, EPW, XLIII:30, July 26, 2008
- Parekh, Bhikhu, *Gandhi*, Oxford University Press, USA, 1997
- Hardiman, David, *Gandhi in his time and our: Indian Legacy*, Permanent Black, New Delhi, 2003.
- Chakrabarty, Dipesh, *Provincialising Europe: Postcolonial Thought and Historical Differnece,* Oxford University Press, Delhi, 2000.
- Nandy, Ashis, *The Intimate enemy: Loss and Recovery of the Self Under Colonialism,* Oxford University Press, Delhi, 1983.
- Rudolph and Rudolph, *The Modernity of Tradition: Political Development in India,*
- University of Chicago Press, Chicago, 1984.
- Guha, Ranajit, *Dominance without Hegemony: History and Power in Colonial India,* Harvard University Press, Cambridge Mass, 1998.
- Sarkar, Sumit, *A Critique of Colonial India*, Papyrus, Calcutta, 1985. Khilnani, Sunil, *The Idea of India,* Hamish Hamilton, London, 1997.
- Sarkar, Tanika, *Hindu wife Hindu Nation: Community Religion and Cultural Nationalism,*
- Permanent Black, Delhi, 2001.
- Nair, Janaki, *Women and Law in Colonial India,* Zubaan/Kali for Women, New Delhi, 1996. Chatterjee, Partha (ed.), *State and Politics in India,* Oxford University Press, Delhi, 1998.
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PUBLIC POLICY

Course Code: POL4302 **Credit Units: 05**

Course Objective:

1. This course aims to familiarize students with the broader theoretical financial and practical context in which public policies are discussed, justified, designed and sought to be implemented.

Course Outcome

CO1: Students should demonstrate understanding of various activities of governmental administrators that fall under the rubric of public administration to include rule-making, , and other regulatory activities, policy making and the delivery of services and programs

CO2::Students will understand the 20th century emergence of the modern administrative state as a result of the technological, social, economic and political pressures that have emerged in as the US industrialized and developed complex, interdependent systems.

CO3: Students will have a summary understanding of public administration as a career field in government.

CO4: Making students understand the qualitative and Quantitative methods in research

CO5: Students will be able to understand the various factors affecting public policy at all levels.

	Bloom's Level	Credit Hours
Module-I: Public Policy: Concept and Dimensions	2	10
a. Characteristics and Norms		
b. Politics- Administration Relationship		
c. Political Science and Public Administration as -Policy Science		
Module-II: Approaches to Public Policy Studies	**2**	**20**
d. Political Economy: Western, Marxist and non-Western traditions		
e. Development Policy and Administration		
f. Public Policy Approach: Post-Behavioural Approach		
g. Public Choice Theory		
h. Public Management Theory		
Module-III: Public Policy Process	2	10
i. Policy Context: Political, constitutional, legal, administrative, socio- cultural, economic, environmental, and scientific.		
j. Interfaces of the Policy process: institutions, actors and role of public policy planning and analysis, resource mobilization, policy formulation, policy implementation, policy monitoring and evaluation.		
k. Role of the government, bureaucracy, parliament, courts, political parties, corporate sector, interest groups, citizens, and NGOs in the policy processes.		
Module-IV: Public Policy analysis: Quantitative and Qualitative	1	10

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Models		
Module-V: Public Policy Research and Development B. Practical Issues	**2**	**10**

Bloom's LevelL1: Knowledge; L2: Comprehension; L3:Application L4: analysis ; L5 : Synthesis, L6 : evaluation

Examination Scheme

Components	**A**	**P**	**A/TP**	**CT**	**EE**
Weightage (%)	5	10	5	10	70

(**A :** Attendence ; **P :** Presentation ; **A/TP :** Assignment/Term Paper ; **CT :** Class Test ; **EE :** External Examination)

READINGS:

- Birkland, Thomas A., *An Introduction to the Policy Process*, London, M. E. Sharpe, 2001. Dror, Yehezket, *Public Policy Making Reexamined*, Oxford, Transaction Publication, 1989.
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- House, Peter W., *The Art of Public Policy Analysis*, Delhi, Sage, 1982.
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- Pandya, Hiren J. and Venkatranam, A. 'Policy Approach to Public Administration'. *Indian Journal of Administrative Science*, Jan-Jun., 1990.
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CO, PO and PSO mapping

	PO 1	PO 1	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	1	1	1	2	2	1	2	3	3	3	1		1	1	2
CO 2		1	1	2	1	1	2	1	2	3		2	1	2	1
CO 3	1	1	2	2	3	2	1	2	2	3	2		1	1	2
CO 4	1	1	1	2	2	3	1	1	2	2	1		1	2	2
CO 5	1	2	2	1	2	3	2	3	2	1		3	1	1	2

1. Strongly Related 2. Moderately related 3. Weakly Related

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INDIA AND WORLD

Course Code: POL4303 **Credit Units: 05**

Course Objective: This paper is about the internal and external determinants of Indian foreign policy and its evolution since independence as well as the new pressures brought about by economic globalization and how India has sought to respond to them by involving itself and interrogating various regional and global groupings. Particular attention is paid to Indian post-cold War relations with various countries and regions.

Course Outcome:

CO 1- Examining diverse political systems and analyzing the India's foreign policy and its determinants

CO 2- Evolution of India foreign policy over period of years and matching it with the needs of Contemporary Scenario.

CO 3- Making a comparative analysis of Traditional Foreign Economic Policy and the concept of liberalization and Globalization

CO 4- Understanding India's defense mechanism over years

CO 5 : To provide them with the holistic understanding the of world relations and changing scenario.

	Bloom's Level	Credit Hours
Module-I: The Nature of India's Foreign Policy: Domestic Determinants	**2**	**15**
a. History and Geopolitical context		
b. Political and Ideological factors		
c. Economic compulsions		
d. Social dimensions		
e. Emergence of Non-Alignment		
Module-II: Evolution of India's Foreign Policy	**1**	**10**
f. Cold War and non-alignment		
g. End of Cold War and Bipolarity		
h. Regionalism		
i. Nuclearization (Current Issues)		
Module-III: India and the International Economy	**2**	**10**
j. Traditional Foreign Economic Policy		
k. Liberalization and Globalization: Imperatives and Critical Evaluation		
m. India and the W.T.O with special reference to TRIPS, TRIMS and Social Clauses		
p. Relations with IMF; World Bank		
Module-IV: India's Security: Policy, Perspectives, Problems.	**2**	**10**
a. Changing Security Perspectives: form Traditional to non Traditional		
c. Internal and External linkages		
d. Defence Policy- Parameters, Evolution, Problems		
e. India and the Disarmament Regimes- N.P.T, C.T.B.T, Missile Technology Regime, Chemical and Biological Weapons Regimes.		
h. Nuclear Policy; the debate on nuclearization.		

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Module-V: India's security: Transnational Dimensions.	**2**	**10**
i. Ethno-cultural		
j. Demographic		
k. Terrorism		
l. Narcotics		
m. Ecological.		
Module-VI: India and Her Neighbours: Contemporary Issues	**1**	**5**
a. Characteristics of the region		
b. India and Pakistan		
c. India and China		
d. India and Sri Lanka, Bangladesh, Nepal, Bhutan.		
e. India and Central Asia and Afghanistan.		

Bloom's LevelL1: Knowledge; L2: Comprehension; L3:Application L4: analysis ; L5 : Synthesis, L6 : evaluation

Examination Scheme

Components	**A**	**P**	**A/TP**	**CT**	**EE**
Weightage (%)	5	10	5	10	70

(A : Attendence ; P : Presentation ; A/TP : Assignment/Term Paper ; CT : Class Test ; EE : External Examination)

CO, PO and PSO mapping

	PO 1	PO 1	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	1	1	1	2	2	1	2	3	3	3	1		1	1	2
CO 2		1	1	2	1	1	2	1	2	3		2	1	2	1
CO 3	1	1	2	2	3	2	1	2	2	3	2		1	1	2
CO 4	1	1	1	2	2	3	1	1	2	2	1		1	2	2
CO 5	1	2	2	1	2	3	2	3	2	1		3	1	1	2

1. Strongly Related 2. Moderately related 3. Weakly Related

READINGS:

- Ahmed, Imtiaz., *State and Foreign Policy: India's Role in South Asia*, Delhi, Vikas Publishing House Ltd, 1993.
- Bandyopadhyaya, Jayanta, *The Making of India's Foreign Policy.* New Delhi, Allied, 1970.
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- Punjabi, Riyaz and A.K., Pasha (eds.) *India and the Islamic World.* Delhi Radiant Publishers, 1998.
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FOREIGN POLICY OF MAJOR POWERS

Course Code: POL4304 **Credit Units: 05**

Course Objective: This is the only paper that as its title states, takes up the task of exploring the foreign policies of the major continental and world powers namely, US, Russia, China, Germany and Japan. The value of this course is self-evident.

Course Outcome:

Upon successful completion, students will have the knowledge and skills to:

CO1: Understand how the Foreign Policy Analysis (FPA) subfield relates to the broader discipline of International Relations;

CO2: Demonstrate a strong grasp of the history, key texts, and research priorities of FPA;

CO3: Show an awareness of the pressures, constraints and incentives that affect foreign policy decision-makers;

CO4:Display and ability to critically assess the concepts, debates, and key issues of FPA and effectively communicate their thinking on these issues.

Module-I: Concept and Bases of Power.	**Blooms level**	**Course credit**
a. Framework of Analysis	1	10
b. Determinants of the Foreign Policies of U.S., Russia, China, Germany and Japan		
Module-II: U.S. Foreign Policy	**2**	**20**
e. Main Features		
f. Policy of continuity and change		
g. U.S. threat perceptions and security interests		
h. Foreign Economic Policy		
Module-III: Foreign Policy of Russia	**2**	**10**
i. Main Features		
j. Continuity and change; Russia's threat perceptions and security interests		
l. Foreign Economic Policy		
Module-IV: Foreign Policy of UK	**2**	**10**
m. Main Features		
n. Relations with Regional and Major Powers		
o. Foreign Economic Policy of Germany		
Module-V: Foreign Policy of China	**1**	**10**
p. Main Features		
q. Relations with Regional and Major Powers		
r. Foreign Economic Policy.		

Bloom's LevelL1: Knowledge; L2: Comprehension; L3:Application L4: analysis ; L5 : Synthesis, L6 : evaluation

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Examination Scheme

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(A : Attendence ; P : Presentation ; A/TP : Assignment/Term Paper ; CT : Class Test ; EE : External Examination)

CO, PO and PSO mapping

	PO 1	PO 1	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	1	1	1	2	2	1	2	3	3	3	1		1	1	2
CO 2		1	1	2	1	1	2	1	2	3		2	1	2	1
CO 3	1	1	2	2	3	2	1	2	2	3	2		1	1	2
CO 4	1	1	1	2	2	3	1	1	2	2	1		1	2	2

1. Strongly Related 2. Moderately related 3. Weakly Related

READINGS:

- Chan Gerald, *Chinese Perspective on International Relations,* New Zealand, Houndsmill,Macmillan University Press, 1999.
- Cronin Patrick M. *From Globalism to Regionalism: Sew Perspectives on US Foreign and Defence Policies*, Washington, National Defence University Press, 1993.
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- Gutjahr Lothar. *German Foreign and Defence Policy after Unification,* Pinter Publishers, 1994.
- Haas Richard N, *Intervention: The Use of American Military Forces in the Post Cold War World*, New York, Carnegie Endowment of International Peace, 1998.
- Dumbrell, John, *American Foreign Policy: Carter to Clinton,* Houndsmill, Macmillan, 1997. Kanet, Roger E and Kozhemiakin, Alexander V., *The Foreign Policy of Russian Federation*,
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- McNamara, Robert. *Out of the Cold,* Bloomsbury, 1990.
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- John Pilger, *The New Rulers of the World,* Verso, 2003.
- Robert Kagan, *Of Paradise and Power: America and Europe in the New World Order*,
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SUMMER PROJECT EVALUATION

Course Code: POL4335 **Credit Units: 03**

Objective:
The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Chapter Scheme and distribution of marks:
Chapter 1: Introduction – 10 marks
Chapter 2: Brief Review of Literature – 25 marks
Chapter 3: Research Findings and Analysis – 25marks
Chapter 4: Conclusions– 10marks
Chapter 5: Bibliography – 05marks

Components of a Project Report

The outcome of Project Work is the Project Report. A project report should have the following components:
1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.
2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.
3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.
4)Body of the Report: The body of the report should have these four logical divisions

a)*Introduction:* This will cover the background, rationale/ need / justification, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.

b)*Brief Review of Literature*: (relating to the topic of the Project).

c) *Research Findings and Analysis* ☹ using the tools and techniques mentioned in the methodology).

d)*Conclusions:* In this section, the concluding observations based on the main findings and suggestions are to be provided.

5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.
6) Annexures: Questionnaires (if any), relevant reports, etc.
(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

The Steps of a Project Report

STEP I : Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic
- Relevance of the topic
- Time available for completion
- Feasibility of data collection within the given time limit
- Challenges involved indata collection (time & cost involved in the data collection, possibility of getting responses, etc.)

STEP II: Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor

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STEP III: Collection of information and data relating to the topic and analysis of the same
STEP IV: Writing the report dividing it into suitable chapters, viz.,

Chapter 1: Introduction,
Chapter 2: Brief Review of Literature
Chapter 3: Research Findings and Analysis
Chapter 4: Conclusions
Chapter 5: Bibliography

STEP V: The following documents are to be attached with the Final Project Report.

- Approval letter from the supervisor (Annexure-IA)
- Student's declaration (Annexure-IB)
- Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for evaluation:

- Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below.
- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bound.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate. The evaluation scheme shall be as follows:

Project Report	**Power Point Presentation & Viva**
75 marks	25 marks

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SEMESTER-IV

SOCIAL EXCLUSION: THEORY AND PRACTICE

Course Code: POL4401 **Credit Units: 05**

Course Objective: Social exclusion is a process that deprives individuals as well as groups from their due share in an unequal social order. Social categories of exclusion have become heterogeneous over the years. No longer are class and caste the only social cleavages. Issues like religion, gender, alternative sexuality have occupied an important space in the debates on exclusion.

Course Outcome:
CO1: In these circumstances it becomes imperative to study, understand and explain social exclusion in its various dimensions.
CO2: No linear understanding will do justice to the process of explaining exclusion. What is required is an understanding of the intersection of various social categories and their interdependence on each other.
CO3: The purpose of introducing this paper to students is to familiarize them with the concept of social exclusion having dimensions ranging from the social to the political, economic and cultural. This paper would also look critically at the exclusion located of time and space.

	Bloom's level	**Credit hours**
Module-I: Social Exclusion: Theoretical Premises	**1**	**10**
a. Origin, Concept, Dimensions		
b. Theories, Debates		
c. Issues and Challenges		
Module-II: Dimensions of Social Exclusion in India	**2**	**20**
d. Socio- Cultural		
e. Political		
f. Economic		
g. Sexual		
h. Religious		
Module-III: Social Categories and Social Exclusion	**2**	**10**
i. Caste, Class		
j. Gender		
k. Religion		
Module-IV: Social Exclusion: Emerging Trends	**2**	**20**
l. Alternative Sexuality		
m. Migrants		
n. Disability		
o. Time and Space		
p. Body and Language		

Bloom's LevelL1: Knowledge; L2: Comprehension; L3:Application L4: analysis ; L5 : Synthesis, L6 : evaluation

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CO 3	1	1	2	2	3	2	1	2	2	3	2		1	1	2

1. Strongly Related 2. Moderately related 3. Weakly Related

READINGS:

- Silver, Hilary, "*Social Exclusion: Comparative Analysis of Europe and Middle East Youth*," Middle East Youth Initiative Working Paper (September 2007)
- Sen, Amartya, *"Social Exclusion-concept application scrutiny", Critical Quest, New Delhi.*
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- Burman, J.J. Roy *, 'Beyond Social Exclusion*' Mainstream, Vol. XLVII, No 41, September 26, 2009
- Gurumurthy, S., '*Is Caste the Eeconomic Development Vehicle'* –The Hindu 19 January 2009
- Thorat, Sukhadeo and S Newman, Katherine '*Caste and Economic Discrimination: causes, consequences and remedies'* –; Economic and Political Weekly, 13 October *2007*
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DISSERTATION

Course Code: POL4437 **Credit Units: 03**

Course Objective:
The aim of the dissertation is to provide you with an opportunity to further your intellectual and personal development in your chosen field by undertaking a significant practical unit of activity, having an educational value at a level commensurate with the award of your degree. The dissertation can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Chapter Scheme and distribution of marks:

Chapter 1: Introduction – 10 marks
Chapter 2: Conceptual or Theoretical Framework – 25 marks
Chapter 3: Presentation, Analysis & Findings -- 25 marks
Chapter 4: Conclusions -- 10 marks
Chapter 5: Bibliography-- 5marks

The Components of a Dissertation
A Dissertation should have the following components:

1) Cover Page: This should contain the title of the dissertation, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the work and name of the University.

2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.

3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.

4) Body of the Report: The body of the report should have these four logical divisions

a)*Introduction:* This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.

b)*Conceptual Framework*: (relating to the topic of the Dissertation).

c) *Presentation of Data,Analysis and Findings*:(using the tools and techniques mentioned in the methodology).

d)*Conclusion and Recommendations:* In this section, the concluding observations based on the main findings and suggestions are to be provided.

5) Bibliography or References: This section will include the list of books and articles which have been used in the work, and in writing the report.

6) Annexures: Questionnaires (if any), relevant reports, etc.

(The main text of the Dissertation should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

Steps of the Dissertation Work

Step I: Selection of the topic should be made keeping the following points into consideration:

- Suitability of the topic.
- Relevance of the topic
- Time available at the disposal.
- Feasibility of data collection within the given time limit.
- Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

Step II: Finalisation of the Topic and preparation of Dissertation Proposal in consultation with the Supervisor.

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Step III: Collection of information and data relating to the topic and analysis of the same.
Step IV: Writing the dissertation dividing it into suitable chapters, viz.,

Chapter 1: Introduction,
Chapter 2: Conceptual and Theoretical Framework
Chapter 3: Analysis & Findings
Chapter 4: Conclusions

Step V: The following documents are to be attached with the Dissertation:

1) Approval letter from the supervisor (Annexure-IA)
2) Student's declaration (Annexure-IB)
3) Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Dissertation Work in any Organisation / Institution.
Annexures,
References / Bibliography

Guidelines for evaluation:

- Each of the students has to undertake a topic individually under the supervision of a teacher and to submit the same following the guidelines stated below.
- Language of Dissertation and Viva-Voce Examination has to be English. The Dissertation must be typed and hard bound.
- Failure to submit the Dissertation or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Dissertation and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
- No marks will be allotted on the Dissertation unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Dissertation.
- Evaluation of the Dissertation to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate.
- A candidate has to qualify in the Dissertation separately, obtaining a minimum marks of 40 (Dissertation and Viva-Voce taken together) in paper 3.5.
- Marking Scheme for Dissertation and Viva-Voce Examination:

Dissertation	Power Point Presentation & Viva
75 marks	25 marks

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RESEARCH METHODOLOGY

Course Code: POL4402 **Credit Units: 03**

Course Objective: Research methodology is a way to systematically solve the research problem. It may be understood as a science of studying how research is done scientifically. In it we study the various steps that are generally adopted by a researcher in studying his research problem along with the logic behind them. It is necessary for the researcher to know not only the research methods/techniques but also the methodology.

Course Outcome:
CO1:Understand some basic concepts of research and its methodologies
CO2: Identify appropriate research topics
CO3:Select and define appropriate research problem and parameters
CO4:Prepare a project proposal (to undertake a project)
CO5: Organize and conduct research (advanced project) in a more appropriate manner

Module-I: Introduction to Research:	**Bloom's level**	**Credit hours**
a) What is Research b) Research Concepts c) Research Ethics and Integrity d) Types of Research-Observational, Correlational and Experimental e) Debate around Methods in Social Science	2	10
Module-II: The Scientific Method and Political Science	**3**	**10**
a) How Scientific is Political Science? b) Philosophy of Social Sciences c) Thomas Kuhn &ImreLakatos d) Theory and Hypothesis		
Module-III: Quantitative/Empirical Methods	**2**	**20**
a) Designing Quantitative Research b) Introduction to Statistics c) Descriptive & Inferential Statistics d) Scales of Measurement e) Sampling Methods f) Game theory g) Social Choice		
Module-IV: Qualitative/Interpretive Methods	3	15
a) Designing Qualitative Research b) Interviews c) Participant/Direct Observation d) Ethnography e) Case Studies f) Focus Groups g) Historiography h) Archival Research i) Content Analysis j) Discourse Analysis and Reading Texts k) Hermeneutics l) Phenomenology		
Module-V: Mixed Methods	**1**	**5**

Bloom's LevelL1: Knowledge; L2: Comprehension; L3:Application L4: analysis ; L5 : Synthesis, L6 : evaluation

Examination Scheme

Components	**A**	**P**	**A/TP**	**CT**	**EE**
Weightage (%)	5	10	5	10	70

(A : Attendence ; P : Presentation ; A/TP : Assignment/Term Paper ; CT : Class Test ; EE : External Examination.

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CO, PO and PSO mapping

	PO 1	PO 1	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	1	1	1	2	2	1	2	3	3	3	1		1	1	2
CO 2		1	1	2	1	1	2	1	2	3		2	1	2	1
CO 3	1	1	2	2	3	2	1	2	2	3	2		1	1	2
CO 4	1	1	1	2	2	3	1	1	2	2	1		1	2	2
CO 5	1	2	2	1	2	3	2	3	2	1		3	1	1	2

1. Strongly Related 2. Moderately related 3. Weakly Related

Readings

- Biggam, J. (2008) Succeeding with Your Master's Dissertation: A Step-by-Step Handbook. Basingstoke: Palgrave.
- Blaxter, L., Hughes, C. and Tight, M. (2006) How to Research (third edition). Buckingham: Open University Press. Bonnett, A. (2001) How to Argue. Harlow: Pearson Education.
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- Burdess, N. (2010) Starting Statistics: A Short, Clear Guide. London: Sage. Byrne, D. (2002) Interpreting Quantitative Data. London: Sage.
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STATE AND SOCIETY IN US

Course Code: POL4403 **Credit Units: 05**

Course Objective: The US is the world's oldest democracy and has provided to a greater or lesser extent a model of emulation and learning for later democracies including India. Given that the US is and will remain for some time the world's single most dominant power, it is important to study its state and the social institutions that have shaped its political trajectory which is what this course seeks to do.

Course Outcome:
To understand the basic concepts in US and their fundamental theoretical interrelations, such that students will be able to define, give examples, show interrelationships, and demonstrate the relevance of the following:

CO1:Culture and social change in US
CO2: Socialization and Startification in US
CO3: Social Structure in US
CO4: Political Institutions in US
CO5: Social differentiation by race/ethnicity, gender, sexuality, age, and class.

	Bloom's Level	**Credit Hours**
Module-I: American Political tradition	**2**	**10**
a. Nature		
b. Stages of Evolution.		
Module-II: Ideological and socio-economic Foundations of the US policy	**1**	**10**
c. Ideas		
d. Socio-economic determinants.		
Module-III: Institutional framework	**1**	**10**
e. Structure and Dynamics		
f. Trends in Institutional Functioning		
Module-IV: Nature of the federal polity	**2**	**10**
g. Issues		
h. Debates		
Module-V: Character of the party system	**2**	**20**
i. Ideological and Regional dimensions		
j. Relationship with Interest Groups		
k. Role in Presidential and Congressional elections		

Bloom's LevelL1: Knowledge; L2: Comprehension; L3:Application L4: analysis ; L5 : Synthesis, L6 : evaluation

Examination Scheme

Components	**A**	**P**	**A/TP**	**CT**	**EE**
Weightage (%)	5	10	5	10	70

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CO, PO and PSO mapping

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CO 1	1	1	1	2	2	1	2	3	3	3	1		1	1	2
CO 2		1	1	2	1	1	2	1	2	3		2	1	2	1
CO 3	1	1	2	2	3	2	1	2	2	3	2		1	1	2
CO 4	1	1	1	2	2	3	1	1	2	2	1		1	2	2
CO 5	1	2	2	1	2	3	2	3	2	1		3	1	1	2

1. Strongly Related 2. Moderately related 3. Weakly Related

READINGS

- Babu. Ramesh (ed), *Contemporary American Politics and Society*, New Delhi, Sterling, 1972
- Barker, Lucius & Twiloy, Barker, *Civil Liberties and the Constitution: Cases and Commentaries*, Prentice-Hall, 1978.
- Dennis Welland, edited, *The United States: A Companion to American Studies*, Mathuen and Co Ltd, London, 1974
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- Vile, M.J.C., *Politics in the United States*, Penguin, 1977.
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RELIGION, REFORM AND RELIGIOUS NATIONALISM

Course Code: POL4404 **Credit Units: 05**

Course Objective: The paper will examine the ways in which religion has been imbricated in movements of reform and nationalism. It will study new areas and modes of religious thought. Individual thinkers will be seen as points of anchorage to explore more general issues. The list of suggested readings is designed to generate critical thought about the large issues and not to limit the paper to the study of discrete thinkers alone.

Course outcome

CO1: Identify some common characteristics of religious and social reform movement;

CO2: Explain the role played by Raja Rammohan Roy and his Brahmo Samaj in bringing about religious reforms;

CO3: Recognise the Prarthana Samaj as an institution that worked for religious as well as social reform;

CO4:Explain the ideology of Bankim Chatterjee, Vivekananda and Savarkar. the and its contributors to social and religious reforms;

	Blooms level	**Credit hours**
Module-I: The Gender Question; Vedanta: Rammohon Roy.	**2**	**5**
Module-II: Debates on Secularism.	**2**	**5**
Module-III: Critique of Orthodoxy Dayanand Saraswati.	**1**	**5**
Module-IV: Modernising Islam: Sir Sayyid Ahmed Khan.	**1**	**5**
Module-V: Hinduism and Hindu Nationalism: Bankim Chatterjee, Vivekananda and Savarkar.	**1**	**20**
Module-VI: Nationalism and the Pan Islamic Ummah: Muhammad Iqbal, A.K Azad, Maududi.	**1**	**10**
Module-VII: Dalit Theology: Ambedkar.	**1**	**10**

Bloom's LevelL1: Knowledge; L2: Comprehension; L3:Application L4: analysis ; L5 : Synthesis, L6 : evaluation

Examination Scheme

Components	**A**	**P**	**A/TP**	**CT**	**EE**
Weightage (%)	5	10	5	10	70

(**A :** Attendence ; **P :** Presentation ; **A/TP :** Assignment/Term Paper ; **CT :** Class Test ; **EE :** External Examination)

CO, PO and PSO mapping

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CO 3	1	1	2	2	3	2	1	2	2	3	2		1	1	2
CO 4	1	1	1	2	2	3	1	1	2	2	1		1	2	2

Strongly Related 2. Moderately related 3. Weakly Related

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Readings:

- Jalal, *Self and Sovereignty: Individual and Community in South Asian Islam since 1950*, New Delhi: Oxford, 2001.
- Raghuramraju ed., *Debating Vivekananda: A Reader*, New Delhi: Oxford University Press, 2014.
- Amiya Sen, *Rammohon Roy: A Critical Biography*, New Delhi; Penguin Books, 2012.
- Dermot Killingley, *Rammohon Roy in Hindu and Christian Tradition: The Teape Lectures*
- 1990, Newcastle upon Tyne: Grevatt and Grevatt, 1993.
- Iqbal Singh Sevea, *The Political Philosophy of Muhammad Iqbal*, Cambridge: Cambridge University Press, 2012.
- Johannes Beltz, and S Jondhale, eds., *Reconstructing the World: B.R. Ambedkar and Buddhism in India*, New Delhi: Oxford University Press, 2004.
- M.Hasan ed., *Islam and Indian Nationalism: Reflections of Abul Kalam Azad*, New Delhi: 1992.
- Peter Hardy, *The Muslims of British India*, Cambridge; Cambridge University Press, 1972.
- Roy Jackson, *Maulana Mawdudi and Political Islam: Authority and the Islamic State*, Routledge, 2010.
- S. Clarke, D. Manchal, P.V. Peacock, eds., *Dalit Theology in the Twenty-Century: Discordant Voices, Dissenting Pathways*, New Delhi: Oxford University Press, 2010.
- Shruti Kapila, Feisal Devji eds., *Political Thought in Action: The Bhagavad Gita and Modern India* (Ch.8), Cambridge: Cambridge University Press, 2013.
- Tanika Sarkar, *Rebels, Wives, Saints: Designing Selves and Nations in Colonial times*, Ranikhet Cantt: Permanent Black, 2011.
- Vinay Lal ed., *Political Hinduism: The Religious Imagination in Public Spheres* (New Delhi: Oxford University Press, 2009.
- William Radice ed., *Swami Vivekananda and the modernization of Hinduism*, New Delhi: Oxford University Press, 1998.

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STATE AND POLITICS IN INDIA

Course Code: POL4405 **Credit Units: 05**

Course Objective: Politics in each state has its own internal dynamics, and it is different from others, multifacetdly. It has undergone significant transformation over the decades since the formation of states in terms of social structure, their power relations, electoral participation on the one hand and political governance and economic development on the other. This course attempts to examine the commonalities, diversities and perspectives to study state politics in India. It also seeks to examine the changing role of caste, class and community and their impact on state politics, particularly in the context of global market economy.

Course outcome

CO1: The study of the Indian political system is a window to understanding politics in society. The course will present you about the way Indian political system has been working and the way it shapes institutions in India.

CO2: This course is not about legal provisions and technical details of in Indian constitution. It is about how institutions are shaped through interaction with actual politics. CO3: The course will introduce you to the idea of political system and the account of the making and working of constitutional institutions.

CO4: This course responds to the curiosity about why a particular arrangement in the constitution was adopted and why not some other, how the institutions grow in the company of actual politics**.**

	Bloom's level	**Credit hours**
Module-I: State Politics: Perspectives and Approaches	**2**	**10**
a. Institutional		
b. Political Economy		
c. Cultural – diversities		
Module-II: Patterns of State Formation	**1**	**10**
d. Administrative Units		
e. Linguistic and Identity Formation		
f. Developmental		
Module-III: Power and Participation	**2**	**15**
g. Changing Centre-State Relations		
h. Party Politics and Coalition Governments		
i. Mobilizations and Movements		
Module-IV: Development and Governance	**2**	**15**
j. Empowering the 'Local'		
k. Public Policies and their Implementation		
l. Varying Developmental Patterns: Some Case Studies (Jammu and Kashmir, Mizoram, Kerala, Gujarat, and Madhya Pradesh)		
Module-V: Globalization and States	**1**	**10**
n. State and Investment		
o. Uneven Development		

Bloom's LevelL1: Knowledge; L2: Comprehension; L3:Application L4: analysis ; L5 : Synthesis, L6 : evaluation

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Examination Scheme

Components	A	P	A/TP	CT	EE
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CO, PO and PSO mapping

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CO 1	1	1	1	2	2	1	2	3	3	3	1		1	1	2
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CO 3	1	1	2	2	3	2	1	2	2	3	2		1	1	2
CO 4	1	1	1	2	2	3	1	1	2	2	1		1	2	2

Strongly Related 2. Moderately related 3. Weakly Related

Readings:

- Achin Vanaik, Is There a Nationality Question in India, *Economic and Political Weekly*, 23 (44), 1988.
- Amaresh Bagchi and John Kurian, Regional Inequalities in India: Pre- and Post-Reform Trends and Challenges for Policy, in Jos Mooij ed., *The Politics of Economic Reforms in India*, New Delhi: Sage Publications, 2005.
- Aseema Sinha, *The Regional Roots of Developmental Politics in India: A Divided Leviathan,*
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COLLABORATIVE GOVERNANCE

Course Code: POL4406 **Credit Units: 05**

Course Objective: In the context of the growing popularity of governance as a new paradigm of public administration, collaborative governance has gained salience in contemporary discourse. The objective of this course is to acquaint the students with the basic idea of what constitutes collaborative governance and its complex manifestation in various parts of the globe. Conceptually, this is not a new design because public administration is itself a collaborative endeavour; what is apparently new is the package in which it has been presented as part of the wider governance of both public and private institutions. India is a unique case study since despite being appreciative of collaborative governance, Indian administration continues remain committed to some of the fundamental precepts of Weberian hierarchical bureaucracy in which collaboration seems to be an anathema. The course will thus be a footstep towards understanding the connect between bureaucracy and other institutions in a context when governance needs collaboration for being effective.

Course outcome:

CO1: Provides students with a foundation in collaborative governance:

CO2: The underlying theories that support it; how it is practiced in various policy arenas; and the recent findings from research to improve its use.

CO3: Students will critique the use of collaborative governance in different case studies; apply principles of practice to simulated contexts,

CO4Develop alternative collaborative approaches to hypothetical or contemporary governance challenges.

	Bloom's Level	**Credit hours**
Module-I: Collaborative government: Meanings, Dimensions, Drivers and Outcomes	2	20
Module-II: The governance debate and the rise of Collaborative governance and Multilevel Governance (Horizontal, vertical, and diagonal governance)	1	10
Module-III: Linkages in Collaborative Governance - Collaborative Processes, Activity and Strategy	2	10
Module-IV: Political Dynamics of Collaboration (Power/ politics and turning conflict into collaboration)	2	10
Module-V: The Future of Collaborative Governance and the Challenge of Collaboration	2	10

Bloom's LevelL1: Knowledge; L2: Comprehension; L3:Application L4: analysis ; L5 : Synthesis, L6 : evaluation

Examination Scheme

Components	**A**	**P**	**A/TP**	**CT**	**EE**
Weightage (%)	5	10	5	10	70

(**A :** Attendence ; **P :** Presentation ; **A/TP :** Assignment/Term Paper ; **CT :** Class Test ; **EE :** External Examination)

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CO, PO and PSO mapping

	PO1	PO1	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	2	2	1	2	3	3	3	1		1	1	2
CO2		1	1	2	1	1	2	1	2	3		2	1	2	1
CO3	1	1	2	2	3	2	1	2	2	3	2		1	1	2
CO4	1	1	1	2	2	3	1	1	2	2	1		1	2	2

1.Strongly Related 2. Moderately related 3. Weakly Related

Readings:

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- Bidyut Chakrabarty, Participatory governance In India - The field experience, *ICSSR Journal of Abstracts and Reviews* 36 (1), 2010.
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    - *Combined Field Report Brazil, Peru, South Africa & India,*

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ENVIRONMENTAL POLICIES & POLITICS

Course Code: POL4407 **Credit Units: 05**

Course Objective: The course will equip the students with theoretical perspectives of understanding of the challenges posed by nature from a developing country and livelihoods perspective. It will also equip them to understand the emerging political and policy issues related to the environment as well as various social and economic dimensions due to environmental degradation.

Course Outcome

Environmental Politics & Policy" explores the workings of environmental policymaking in the India

CO1: Students will be able to know what are the big issues facing environmental policy

CO2: How did we end up with the policies we have today?

CO3: Why does it take a crisis to move environmental policy forward?

CO4: Why do political factors - economic interests, social and political values, bureaucratic styles, ideologies, elections, etc. - always seem to overwhelm sound scientific and engineering judgment in determining policy outcomes?

CO5: Case studies ranging from cleaning up toxic waste pollution to endangered species protection probe the clashes between science and politics at local, state, and central levels.

	Bloom's Level	**Credit Hours**
Module-I: Environmental Philosophies, Politics and Ethics	1	10
Module-II: Environment, Institutions and Governance: State, Market, Community & Local Governments:	2	20
a. State: Hardin and the Tragedy of the Commons		
b. Market: Pricing for Sustainability		
c. Community & Local Government Management: A Developing Country Perspective		
Module-III: Resources, Protest & Poverty:	1	10
d. Forests: State, Trade & Community		
e. Biodiversity, Protected Areas & People		
f. Irrigation - Dams & Canals: State, Science & Inequities		
g. Agriculture, Soil Management & Cash Crops: h. Environment & Women's Lives		
i. Land, Displacement & Resettlement: Power, Culture & Resistance		
j. Industrialization, Urbanization & Pollution: Institutional Challenges		
Module-IV: Gender and Environment	1	10
Module-V: Climate Change: Global Commons and Local Initiatives	1	10

Bloom's LevelL1: Knowledge; L2: Comprehension; L3: Application L4: Analysis ; L5 : Synthesis, L6 : evaluation

Examination Scheme

Components	**A**	**P**	**A/TP**	**CT**	**EE**
Weightage (%)	5	10	5	10	70

(**A :** Attendence ; **P :** Presentation ; **A/TP :** Assignment/Term Paper ; **CT :** Class Test ; **EE :** External Examination)

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CO, PO and PSO mapping

	PO 1	PO 1	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	1	1	1	2	2	1	2	3	3	3	1		1	1	2
CO 2		1	1	2	1	1	2	1	2	3		2	1	2	1
CO 3	1	1	2	2	3	2	1	2	2	3	2		1	1	2
CO 4	1	1	1	2	2	3	1	1	2	2	1		1	2	2
CO 5	1	2	2	1	2	3	2	3	2	1		3	1	1	2

1.Strongly Related 2. Moderately related 3. Weakly Related

Readings:

- Amita Baviskar, *In the Belly of the River*, Delhi: Oxford University Press, 1996.
- Arun Agrawal, *Greener Pastures: Politics, Markets, and Community among a Migrant Pastoral People*, Durham NC: Duke University Press, 1999.
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- John S. Dryzek, *The Politics of the Earth: Environmental Discourses*, Oxford: Oxford University Press, 1997.
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- Patrick McCully, *Silenced Rivers: The Ecology and Politics of Large Dams*, N.J: Zed Books, 1996.
- J. Johnston, *Nature, State and Economy: A Political Economy of the Environment*,
- Chichester: John Wiley & Sons, 1996.
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- Ramachandra Guha, *The Unquiet Woods*, Delhi: Oxford University Press, 1992. Ramachandra Guha, *Environmentalism*, Delhi: Oxford University Press, 2000.
- Richard Grove, The Origins of Western Environmentalism, *Scientific American*, 267, 1992.
- Richard Peet & Michael Watts, *Liberation Ecologies: Environment, Development and Social Movements*, London: Routledge, 1996.
- S Buckingham-Hatfield, *Gender and Environment*, Routledge, 1999.
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- Delhi: Oxford University Press, 1997.
- Sumit Sarkar, *Modern Times: India 1880s to 1950s*, Ranikhet: Permanent Black, 2014. Ted Benton (ed), *The Greening of Marxism*, London: The Guilford Press, 1996.
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Curriculum & Scheme of Examination

2023

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Bachelor of Arts (Honors/ Honors with Research) in French
SEMESTER-I

EXPRESSION ÉCRITE - I – WRITTEN EXPRESSION-1

Course Code: DFRE2151 **Credit Units: 04**

Course Objectives:
To enable the learner :

- to present oneself and others, to ask and give personal information
- to give directions, to describe one's surrounding
- to talk about likes and dislikes, hobbies
- to tell time and date, to talk about daily routine
- to describe weather
- to take about events in past, to talk about one's experiences

Course Contents:

Module 1

Unité 1 : Parlez-vous français ?
Saluer, se présenter, communiquer en classe, épeler, différencier le tutoiement du vouvoiement, consulter le dictionnaire, appliquer des stratégies de lecture.
Unité 2 : Elle s'appelle Laura
Se présenter ou présenter quelqu'un, demander et donner des renseignements personnels, exprimer des objectifs, compter, se renseigner sur la nationalité.

Module 2 :

Unité 3 : Mon quartier est un monde
Localiser, décrire et qualifier une ville ou un quartier, exprimer la quantité.

Unité 4 : Tes amis sont mes amis
Parler de ses gouts, de ses intérêts et de ses loisirs, parler de la première impression produite par quelqu'un et de son caractère, parler de son entourage.

Module 3 :

Unité 5 : Jour après jour
Parler de nos habitudes, exprimer l'heure, informer sur l'heure, le moment, la fréquence ; parler de séquences d'actions.

Unité 6 : On fait les boutiques
S'informer sur un produit, acheter et vendre un produit, donner son avis sur la façon de s'habiller, parler du temps qu'il fait.

Grammaire :

1. L'alphabet
2. Le genre des noms
3. Les articles indéfinis, définis, partitifs
4. Les verbes – être, avoir, aller, faire, vivre, sortir, prendre, en –er au présent, les verbespronominaux
5. Les adjectifs possessifs, qualificatifs, interrogatifs, démonstratifs

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6. L'interrogation, Les quantificatifs
7. Les prépositions de lieu, La négation
8. Les adjectifs de nationalité et de couleur – le nombre et le genre

Examination Scheme :

Components	CT	Home Assign	Att.	EE
Weightage (%)	20	5	5	70

Text & References:

Text:

Le livre à suivre:

- M. Denyer, A. Garmendia, C. Royer, Marie–Laure Lions–Olivieri, Version Originale 1 (A1) Livre de l'élève. Paris: Maison des Langues, 2009.

Références :

- Girardeau, Bruno et Nelly Mous. Réussir le DELF A1. Paris: Didier, 2010.

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EXPRESSION ORALE I - ORAL EXPRESSION-1

Course Code: DFRE2101 **Credit Units: 02**

Course Objectives: To enable the learners :

- to understand the French phonetic system
- to develop strategies of listening comprehension
- to pass from written to oral, from oral to written easily
- to be sensitized to nuances of speech, dialectical variations, and "registre delangage."
- to overcome the fear of speaking a foreign language and take position as a foreigner speaking French.

Course Content:

Listening and speaking exercises (imagining dialogues, role plays, telephone conversations) of:

- M. Denyer, A. Garmendia, C. Royer, Marie–Laure Lions–Olivieri, Version Originale1 (A1) Livre de l'élève. Paris: Maison des Langues, 2009.
- Corbeau, Sophie., et al.hôtellerie-restauration.com. Paris: CLE International, 2006.Print.

Examination Scheme:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Texts& References:

- M. Denyer, A. Garmendia, C. Royer, Marie–Laure Lions–Olivieri, Version Originale 1(A1) Livre de l'élève. Paris: Maison des Langues, 2009.Print.
- Corbeau, Sophie., et al.hôtellerie-restauration.com. Paris: CLE International, 2006.Print.

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LIFE IN FRANCE AND FRANCOPHONE COUNTRIES-1

Course Code: DFRE2102 **Credit Units: 02**

Course Objectives:

- To familiarise the students with the culture and civilisation of France.
- To introduce them to the history, political system, education system and social structure of France.
- To acquaint the students with the French gastronomy, monuments, sports, cinema andmusic.

Course Contents:

Module 1

Part 1: History and Geography of France
Part 2: Political and Education System of France
Part 3: Social Life of France
Part 4: Dimensions of India – France relations

Module 2

Part 1: The Gastronomy of France
Part 2: The major monuments of France & Symbols of France
Part 3: The sports in France
Part 4: Cinema, Television, Radio and Music in France

Examination Scheme:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text and References:

Les livres à consulter:

- Mathiex Jean, *Histoire de France*, Gallimard, Paris, 1996.
- Labrune Gérard, *La géographie de la France*, Nathan, Paris, 1997.
- Mény Yves, *Le système politique français*, Montchrestien, Paris, 2008 (6th ed.)
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- Nignon Edouard, *Éloges de la cuisine française*, Menu Fretin, Paris, 2014.
- *Le grand livre de la gastronomie française: Encylopédie par regions*, Christine Bonneton.
- Commission des monuments historiques, *Les Monuments historiques de la France: Bulletin des diverses sections de la Commission des monuments historiques et de la Commission supérieure des monuments naturels et des sites*, 1936.
- Pastoureau Michel, *Les emblèmes de la France*, Christine Bonneton, Paris, 1997. Rocquin Baudry, *Le sport en France: Histoire, économie, sociologie*, Breal, Paris, 2017. Douin Jean-Luc et Thierry Fremaux, *Le cinéma français*, La Martinière, Paris, 2014.

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SEMESTER-II

EXPRESSION ÉCRITE - II – WRITTEN EXPRESSION-2

Course Code: DFRE2251 **Credit Units: 04**

Course Objectives: To enable the learner to:

- to express one's point of view, difficulties, emotions, motivation, preferences etc.
- to describe lodgings, objects
- to talk about or narrate events in past and future,
- to talk about health, express pain and symptoms
- to ask and to give advices, to give instructions
- to compare objects and people, to describe daily activities

Course Contents:

Module 1 :

Unité 7 : Et comme dessert ?

Donner et demander des informations sur des plats et des aliments, commander et prendre lacommande dans un restaurent, exprimer la quantité, situer une action dans le futur.

Unité 8 : Je sais bricoler

Parler de faits passés, parler de nos expériences et de ce que nous savons faire.

Module 2 :

Unité 1 : J'adore le français !

Parler de sa relation avec les langues, exprimer son point de vue (1), exprimer des difficultéset des émotions, parler de faits passés, exprimer une motivation

Unité 2 : Faites comme chez vous !

Décrire un logement et des objets, localiser, faire des comparaisons, exprimer despréférences, nommez ses activités quotidiennes

Module 3 :

Unité 3 : Bien dans sa peau

Parler de sa santé, décrire des douleurs et des symptômes, demander et donner des conseils,donner des instructions, exprimer son point de vue (2)

Unité 4 : En ce temps–là…

Situer dans le passé, décrire des situations du passé et du présent

Grammaire :

1. le passé composé et l'imparfait
2. les prépositions de lieu
3. Les pronoms COD, y, relatifs (qui, que, ou), le pronom personnel on
4. la comparaison de l'adjectif et de l'adverbe (plus, moins, aussi, autant que…)
5. L'impératif, la forme et la place des pronoms réfléchis à l'impératif
6. Le futur proche et les marqueurs temporels du futur

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7. Les adjectifs et les pronoms indéfinis
8. Les adjectifs qualificatifs et leur place
9. La subordonnée temporelle avec quand
10. Devoir (au conditionnel), Etre en train de + infinitif

Examination Scheme:

Components	CT	Home Assign	Att.	EE
Weightage (%)	20	5	5	70

Text & References:

Text:
Le livre à suivre:

- M. Denyer, A. Garmendia, C. Royer, Marie–Laure Lions–Olivieri,Version Originale2 (A2) Livre de l'élève. Paris: Maison des Langues, 2009.
- M. Denyer, A. Garmendia, C. Royer, Marie–Laure Lions–Olivieri,Version Originale2 (A2) Cahier d'exercices. Paris: Maison des Langues, 2009.

Références :

- Girardeau, Bruno et Nelly Mous. Réussir le DELF A2. Paris: Didier, 2010.

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EXPRESSION ORALE II - ORAL EXPRESSION-2

Course Code: DFRE2201 **Credit Units: 02**

Course Objectives: To enable the learners to:

- to understand the French phonetic system
- to develop strategies of listening comprehension
- to pass from written to oral, from oral to written easily
- to be sensitized to nuances of speech, dialectical variations, and "registre delangage"
- to overcome the fear of speaking a foreign language without hesitation

Course Content:

Listening and speaking exercises (imagining dialogues, role plays, telephoneconversations) of:

- M. Denyer, A. Garmendia, C. Royer, Marie–Laure Lions–Olivieri, Version Originale2 (A2) Livre de l'élève.Paris: Maison des Langues, 2009.
- Corbeau, Sophie., et al.tourisme.com. Paris: CLE International, 2004. Print

Examination Scheme:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text & References:

- M. Denyer, A. Garmendia, C. Royer, Marie–Laure Lions–Olivieri, Version Originale2 (A2) Livre de l'élève.Paris: Maison des Langues, 2009.Print.
- Corbeau, Sophie., et al.tourisme.com. Paris: CLE International, 2004. Print

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LIFE IN FRANCE AND FRANCOPHONE COUNTRIES-2

Course Code: FRE2202 **Credit Units: 02**

Course Objectives:

- To familiarise the students with the essentials of life, culture and civilisation of France.
- To introduce them to the history, political system, education system and social structure of France.
- To acquaint the students with the gastronomy, monuments, sports, cinema and musicof France.

Course Contents:

Module 1

Part 1: Introduction to *Colonisation* and *Enlightenment*.

Part 2: History of the Francophone World

- Colonial expansion of France: Phase I
- Colonial expansion of France: Phase II
- Movements against French Colonisation
- Disintegration of the Colonial Empire
- Impact of the French Colonisation

Part 3: Introduction to the 'International Organisation of Francophonie' (OIF).

Part 4: The Languages in the Francophone world.

Module 2

Part 1: Francophone authors and Literatures

- Major Francophone authors

Suggested authors: Albert Camus, Mongo Beti, Tahar Ben Jelloun, Gabrielle Roy

- Major characteristics of the Francophone Literature
- Orality in Francophone literature
- Study of the abstracts from some Francophone novels

Part 2: Ethnic communities of the Francophone World

- What is Ethnicity?
- Ethnicity in Africa and major ethnic groups of Africa.
- Inter-ethnic relations and its impact on the social and political life of the continent.

Part 3: Current issues of the Francophone world (**to be updated from time to time**)

- Boko Haram
- Mali Conflict
- Algeria
- Libya conflict
  - Central African Republic issue
  - South sudan crisis

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- DRC conflict
- Somalia civil war

Part 4: Francophone cinema

Examination Scheme:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text and References:

Les ressources à consulter:

- Alexandre P, Francophonie: the French and Africa. J. Contemporary History, 1969, 4(1):117-25
- Beauclair Michelle, *The Francophone World: Cultural Issues and Perspectives*, Peter Lang, Bern, 2007.
- Bujra Abdalla, *African Conflicts: Their causes and their political and social environment*, Development Policy Management Forum, Addis Ababa, 2002.
- Crettien Charles, *France's relations with her former colonies*, Proceedings of the Meeting ofthe French Colonial Historical Society, Vol. 8 (1985), pp.1-8
- Deniau X, *La Francophonie*, Presses Universitaires de France, Paris, 1983.
- Holm John, *An introduction to pidgins and creoles*, Cambridge University Press, Cambridge,2004.
- Kirk-Greene, Anthony & Daniel Bach. (eds.), *State and society in Francophone Africa since independence*, Palgrave macmillan, 1995, UK.
- Yacono, Xavier, *Histoire de la colonisation française*, Presses Universitaires de France, Paris, 1988 (4th ed.).

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SEMESTER-III

EXPRESSION ÉCRITE - III – WRITTEN EXPRESSION-3

Course Code: DFRE2351 **Credit Units: 04**

Course Objectives: To enable students to:

- to ask for a service, authorization.
- to ask questions in a given situation
- to talk about or narrate events in past
- to talk about one's relation with a language
- to describe someone, a journey, sentiments
- to accept or to refuse a proposal
- to give one's opinion, to carry out a debate or an interaction

Course Contents:

Module 1 :

Unité 5 : L'histoire, les histoires

Poser des questions sur un parcours de vie, décrire et rapporter des faits et des situations du passé, raconter des anecdotes, situer des événements dans le passé, demander des informations

Unité 6 : Qui vivra verra

Faire des prévisions, parler de l'avenir, parler de condition et de conséquences, exprimer différent degrés de certitude, parler du temps.

Module 2 :

Unité 7 : Je vous en prie !

Demander un service, demander l'autorisation, refuser et accepter, se justifier

Unité 8 : Apprendre en jouant !

Poser des questions en fonction de la situation de communication, situer des actions dans le temps, décrire et raconter dans le passe, situer géographiquement, exprimer différents degrés de certitude

Module 3 :

Unité 1 : Dis-moi ce que tu as fait, je te dirai qui tu es

Raconter des expériences passes, Exprimer la cause, parler de sa relation avec les langues,faire une description détaillée, parler de ses motivations, justifier un choix

Unité 2 : Les voyages formes la jeunesse

Préciser les détails d'un voyage, faire des propositions, donner son opinion, faire deshypothèses, situer dans l'espace

Grammaire :

1. L'opposition – passé composé et imparfait, plus-que-parfait

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2. L'accord du participe passé avec avoir
3. Les pronoms COD
4. Le système de l'hypothétique, le conditionnel
5. Les prépositions et articles pour localiser (régions)
6. Les articulateurs temporels et logiques
7. Le subjonctif et les verbes d'opinion

Examination Scheme:

Components	CT	Home Assign	Att.	EE
Weightage (%)	20	5	5	70

Text & References:
Text:
Le livre à suivre:

- M. Denyer, A. Garmendia, C. Royer, Marie–Laure Lions–Olivieri,Version Originale2 (A2) Livre de l'élève. Paris: Maison des Langues, 2009.
- M. Denyer, A. Garmendia, C. Royer, Marie–Laure Lions–Olivieri,Version Originale3 (B 1) Livre de l'élève. Paris: Maison des Langues, 2009.
- M. Denyer, A. Garmendia, C. Royer, Marie–Laure Lions–Olivieri,Version Originale2 (A2) Cahier d'exercices. Paris: Maison des Langues, 2009.
- M. Denyer, A. Garmendia, C. Royer, Marie–Laure Lions–Olivieri,Version Originale3 (B1) Cahier d'exercices. Paris: Maison des Langues, 2009.

Références :

- Girardeau, Bruno et Nelly Mous. Réussir le DELF A2. Paris: Didier, 2010.
- Girardeau, Bruno et Nelly Mous. Réussir le DELF B1. Paris: Didier, 2010

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EXPRESSION ORALE III - ORAL EXPRESSION-3

Course Code: DFRE2301 **Credit Units: 02**

Course Objectives: To enable the learner :

- to understand the French phonetic system
- to develop strategies of listening comprehension
- to pass from written to oral, from oral to written easily
- to be sensitized to nuances of speech, dialectical variations, and "registre delangage"
- to master the current social communication skills in oral
- to enrich the formulations, the linguistic tools and vary the sentence structure.

Course Content:

Listening and speaking exercises (imagining dialogues, role plays, telephoneconversations, participating in debates, and discussions) of:

- M. Denyer, A. Garmendia, C. Royer, Marie–Laure Lions–Olivieri, Version Originale2 (A2) Livre de l'élève. Paris: Maison des Langues, 2009.
- M. Denyer, A. Garmendia, C. Royer, Marie–Laure Lions–Olivieri, Version Originale3 (B1) Livre de l'élève. Paris: Maison des Langues, 2009.

Examination Scheme:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text & References:

- M. Denyer, A. Garmendia, C. Royer, Marie–Laure Lions–Olivieri,Version Originale2 (A2) Livre de l'élève. Paris: Maison des Langues, 2009.Print.
- 2. M. Denyer, A. Garmendia, C. Royer, Marie–Laure Lions–Olivieri,Version Originale 3 (B1) Livre de l'élève. Paris: Maison des Langues, 2009.Print.

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INTRODUCTION TO FRENCH AND FRANCOPHONE CIVILIZATION & CULTURE-1

Course Code: DFRE2302 **Course Credits: 02**

Course Objectives :

- To familiarise the students with the culture and civilisation of France and francophone countries.
- To introduce them to the history, political system, historical movements and social structure of France.
- To acquaint the students with the gastronomy, monuments, sports, cinema and musicof France and francophone countries.

Course Contents :

Module 1: De la préhistoire au Moyen Age

Part 1: La préhistoire de la France: Les grottes de Lascaux
Part 2: La période barbare et l'empire romain
Part 3: La société dans le Moyen Age, la guerre de Cent Ans
Part 4: Le Moyen Age: la croisade et la guerre de religion
Part 5: Les personnes clés: Vercingétorix, Charlemagne, Jeanne d'Arc, Henri IV

Module 2: La Renaissance

Part 1: Les causes de la renaissance
Part 2:Développement dans la science et la littérature
Part 3: Les changements dans la société
Part 4: Le règne de Louis XIV

Examination Scheme:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text and References:

Les livres à consulter:

- Mathiex Jean, *Histoire de France*, Gallimard, Paris, 1996.
- Mény Yves, *Le système politique français*, Montchrestien, Paris, 2008 (6th ed.)
- Pasqua Charles et al., *Demain La France, tome 1: La priorité sociale*, Demain la France,Paris, 1992.
- Commission des monuments historiques, *Les Monuments historiques de la France: Bulletindes diverses sections de la Commission des monuments historiques et de la Commission supérieure des monuments naturels et des sites*, 1936.

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SEMESTER-IV

EXPRESSION ÉCRIT - IV – WRITTEN EXPRESSION-4

Course Code: DFRE2451 **Credit Units: 04**

Course Objectives: To develop the writing skills of the learner in a given situation:

- to express sentiments, obligation, possibility
- to introduce a person, to narrate a story
- to give or to justify one's opinion,

Course Contents:

Module 1 :

Unité 3 : La voix est le miroir de l'âme

Décrire le caractère d'un personnage, décrire ses sentiments, parler de ses espoirs et de sesprojets, évoquer ses regrets, donner et suivre des indications scéniques

Unité 4 : On n'arrête pas le progrès ?

Exprimer des opinions, défendre des idées, réaliser un débat d'idées, débattre et décider de laseconde vie d'un objet, gérer des interactions

Module 2 :

Unité 5 : Les paroles volent, les écrits restent

Exprimer ses sentiments, exprimer l'obligation, la possibilité, l'interdiction, exprimer lamanière

Unité 6 : A chacun son cinéma

Présenter les personnages d'un film, raconter l synopsis d'un film, exprimer son avis, justifierson opinion

Module 3 :

Unité 7 : Y a-t-il une vie après l'école ?

Synthétiser des informations et les transmettre, présenter et publier un compte rendud'enquête, rapporter un événement, une information, une interview

Unité 8 : Pas de nouvelles, bonnes nouvelles !

Rapporter les paroles d'autrui, rendre compte d'événements, présenter des faits et desévénements

Module 4 :

Unité 9 : Tout finit par des slams

Exprimer ses sentiments, exprimer ses idées, expliquer la définition d'un mot, comprendre laformation des mots, jouer avec les mots

Grammaire :

1. Constructions et mode des verbes de sentiments, des verbes impersonnels
2. Le gérondif, le participe présent
3. Les pronoms COD, COI, la double pronominalisation
4. Le pronom relatif- ce que, ce qui, ce dont

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5. La place de l'adjectif
6. Le discours rapporte, la concordance des temps dans le discours rapporte au passe
7. L'interrogation directe et indirecte
8. Le pronom en
9. Les registres de langues, les figures de style

Examination Scheme:

Components	CT	Home Assign	Att.	EE
Weightage (%)	20	5	5	70

Text & References:

***Text*:**
Le livre à suivre:

- M. Denyer, A. Garmendia, C. Royer, Marie–Laure Lions–Olivieri,Version Originale3 (B 1) Livre de l'élève. Paris: Maison des Langues, 2009.
- M. Denyer, A. Garmendia, C. Royer, Marie–Laure Lions–Olivieri,Version Originale3 (B1) Cahier d'exercices. Paris: Maison des Langues, 2009.

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EXPRESSION ORALE IV - ORAL EXPRESSION-4

Course Code: DFRE2401 **Credit Units: 02**

Course Objectives: To enable the learners:

- to understand the French phonetic system
- to develop strategies of listening comprehension
- to pass from written to oral, from oral to written easily
- to be sensitized to nuances of speech, dialectical variations, and "registre de langage"
- to master the current social communication skills in oral
- to enrich the formulations, the linguistic tools and vary the sentence structure.

Course Content:

Listening and speaking exercises (imagining dialogues, role plays, telephoneconversations, participating in debates, and discussions) of:

- M. Denyer, A. Garmendia, C. Royer, Marie–Laure Lions–Olivieri, Version Originale3 (B1) Livre de l'élève. Paris: Maison des Langues, 2009.

Examination Scheme:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text & References:

- M. Denyer, A. Garmendia, C. Royer, Marie–Laure Lions–Olivieri, Version Originale3 (B1) Livre de l'élève. Paris: Maison des Langues, 2009.Print.

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INTRODUCTION TO FRENCH AND FRANCOPHONE CIVILIZATION & CULTURE-2

Course Code: DFRE2402 **Credit Units: 02**

Course Objectives:

- To familiarise the students with the culture and civilisation of France and francophone countries.
- To introduce them to the history, political system, historical movements, and social structure of France.
- To acquaint the students with the gastronomy, monuments, sports, cinema and musicof France and francophone countries.

Course Contents:

Module 1 : La Révolution française

Part 1: Les circonstances politiques et sociales vers 1789
Part 2: La Révolution Française: les évènements et la fondation de la constitution**Part 3:** Les causes de la Révolution: climat, société, politique et âge des Lumières**Part 4:** Le règne de Napoléon
Part 5: Les personnes clés: Napoléon, Victor Hugo, Voltaire, Montesquieu, Rousseau,Diderot

Module 2: De la monarchie à la République

Part 1: La monarchie constitutionnelle et La IIe République
Part 2: La IIIe République 1870-1940
Part 3: L'expansion coloniale
Part 4: Les guerres mondiales
Part 5: Les personnes clés: Jules Verne, Jules Ferry, Dreyfus, Philippe Pétain, GeneralCharles de Gaulle

Examination Scheme:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text and References:
Les ressources à consulter:

- Alexandre P, Francophonie: the French and Africa. J. Contemporary History, 1969, 4(1):117-25
- Beauclair Michelle, *The Francophone World: Cultural Issues and Perspectives*, Peter Lang,Bern, 2007.
- Bujra Abdalla, *African Conflicts: Their causes and their political and social environment*, Development Policy Management Forum, Addis Ababa, 2002.
- Crettien Charles, *France's relations with her former colonies*, Proceedings of the Meeting ofthe French Colonial Historical Society, Vol. 8 (1985), pp.1-8
- Deniau X, *La Francophonie*, Presses Universitaires de France, Paris, 1983.
- Holm John, *An introduction to pidgins and creoles*, Cambridge University Press, Cambridge,2004.
- Kirk-Greene, Anthony & Daniel Bach. (eds.), *State and society in Francophone Africa since independence*, Palgrave macmillan, 1995, UK.
- Yacono, Xavier, *Histoire de la colonisation française*, Presses Universitaires de France,Paris, 1988 (4th ed.).

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SEMESTER-V

INTRODUCTION À LA LITTÉRATURE FRANÇAISE: I
(INTRODUCTION TO FRENCH LITERATURE-1)

Course Code: DFRE2551 **Credit Units: 04**

Course Objective:
To introduce the students to French literature through extracts of texts selected fromdifferent literary genres of various famous authors across the centuries.

Course Content: Material compiled by the Department from Itinéraires Littéraires, andDix Siècles de Littérature Française

Module-1 : Poésie
Mignonne allons voir si la rose : Pierre de Ronsard
Ballade des pendus : François Villon
Module 2: Poésie-II
Le bateau ivre : Rimbaud
L'homme et la mer : Charles Baudelaire
Module 3: Théâtre-II
Le mariage de Figaro : Beaumarchais
Hernani : Victor Hugo
Module-4 : Roman
Les misérables : Victor Hugo
Le père Goriot : Honore de Balzac
Madame Bovary : Gustave Flaubert

Examination Scheme

Components	CT	Att.	H	EE
Weightage	20	5	5	70

Text & References:

- Castex, P.G., P. Surer et G. Becker. Histoire de la Littérature Française. Paris :Hachette, 1974.Print.
- Itinéraires Littéraires. (Moyen Age XVIe, XVIIe, XVIIIe) Paris: Collection Hatier. Print.Dix Siècles de Littérature Française. Paris :Collection Bordas, 1991. Print.
- Masson, Nicole. La littérature française. Editions Eyrolles, 2007.
- Ploquin, Françoise, Laurent Hermeline, and Dominique Rolland. Littérature française: les textes essentiels. Hachette, 2000.

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ETUDE DÉTAILLÉE D'UN ROMAN FRANÇAIS-DETAILED STUDY OF A FRENCH NOVEL

Course Code: DFRE2501 **Credit Units: 04**

Course Objectives:

- To enable students to do a detailed study of a literary work.
- To understand a work in relation to the author and in relation to the other works of theauthor
- To provide a broad perspective of the thoughts and philosophy of the period, of the contemporary works

Course Contents:

Module 1
Lecture d'un roman choisi.
Module 2
L'auteur, sa biographie et ses œuvres littéraires.
Module 3
L'époque, les écrivains contemporains et leurs œuvres.
Module 4
Etude et discussion sur les idées principales de ce roman choisi.

Examination Scheme:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Suggested readings :

- *L'Étranger* by Albert Camus
- *Le Petit Prince* by Antoine de Saint-Exupéry *Les trois mousquetaires* by Alexandre Dumas*Candide* by Voltaire

Text & References:

- Bayard, Pierre. *Comment parler des livres que l'on n'a pas lus?*. Minuit, 2012.Bessière, Jean. *Questionner le roman*. Presses universitaires de France, 2015.

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INTRODUCTION TO LINGUISTICS

Course Code: DFRE2502 **Credit Units: 04**

Course Objectives:
This paper aims to provide the students the basic knowledge of Linguistics and its various branches of study. The focus of the paper is to enable the learners to have an understanding ofthe science of language and to be able to analyze linguistically any given language including the foreign language that they pursue.

Course Contents:

Module 1: Introduction
What is language and linguistics? Design features of human language.
Various branches of Linguistics and their application.

Module 2: Phonetics and Phonology Anatomy and physiology of speech productionClassification of sounds through IPA symbols Difference between Phonetics and Phonology.

Module 3: Morphology
Basic concepts of morphologyWord Formation processes

Module 4: Syntax
Theories and concepts of Syntactic structure.Analysis of sentence structure

Module 5: Semantics
Basic concepts of Semantics Meaning and types of Meaning

Examination Scheme:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text & References:

- **Text:** Fromkin, V., and R. Rodman. 1974 (9th Edition).. *An Introduction to Language*. New York: Holt, Rinehart and Winston.

References:

- Akmajian, A., R.A. Demers, A.K. Farmer, & R.M. Harnish 2001. *Linguistics: An Introduction to Language and Communication*. Cambridge, Massachusetts: The MITPress
- Carnie, Andrew. 2013 (3rd Edition). *Syntax: A Generative Introduction*. West Sussex: Wiley-Blackwell Publication
- Crystal D.1997. *Encyclopedia of Language: 2nd Vol*., Cambridge: CambridgeUniversity Press
- Haegeman, L. 1991. (rev. Ed.). *Introduction to Government and Binding Theory*.
- Hockett. C.F. 1958. *A Course in Modern Linguistics*. New York: Macmillian. IndianEdition, New Delhi: Oxford and IBH Publishing Co.
- Katamba, F. and John Stonham 2006. *Morphology* 2nd ed. London: Palgrave.
- Ladefoged, Peter. 2001 (4th edn.). *A course in phonetics*. New York: Harcourt Brace.
- Lyons J, 1977. *Semantics*. 2 Vols. Cambridge: Cambridge University Press.
- Odden, David. 2005. *Introducing phonology*. Cambridge: Cambridge University Oxford: Blackwell.Press
- Roach, P. 2001. *Phonetics*. Oxford: Oxford University Press.

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SEMESTER-VI

FRANÇAIS À TRAVERS DES ACTIVITÉS - FRENCH THROUGH ACTIVITIES

Course Code: DFRE2651 **Course Credits: 04**

Course Objectives:

- To introduce, poems, songs, role-plays, debates and theatrical text and French films with the purpose of helping students to read, listen, write, speak and think inFrench spontaneously; learn the content and be able to find new meanings through analysis, evaluation, synthesis and application
- To launch students on their personal course of learning through training in activities like reciting poems, listening and singing French songs, appreciating cinematography and writing film reviews
- To empower them to develop skills independently and to develop critical/ creativethinking

Course Content: Material compiled by the Department.

Module 1 : Le français à travers la poésie.
Les poèmes français de divers mouvement littéraires de la littérature française. Apprendrela récitation des poèmes et les apprécier.

Module 2 : Le français à travers des chansons
Exercices de grammaire, de vocabulaire, de dictée, de phonétique tout en écoutant/ enapprenant à chanter des chansons françaises d'hier et d'aujourd'hui

Module 3 : Le français à travers des pièces de théâtre
Apprendre les jeux de rôles, les scènes de la vie quotidiennes, des monologues et extraits detextes littéraires et les comprendre d'une manière holistique.

Module 4 : Le français à travers des films
Comprendre le langage cinématographique et la petite grammaire du cinéma incluant lescourts métrages.
Critique/ appréciation des films

Examination Scheme:

Components	CT	Att.	C	P
Weightage (%)	40	5	30	25

*****There is no end-term examination. There is continuous assessment.

Text & References

- Material compiled by the Department

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INTRODUCTION À LA LITTÉRATURE FRANÇAISE- II
(INTRODUCTION TO FRENCHLITERATURE-2)

Course Code: DFRE2601 **Credit Units: 04**

Course Objectives:
To introduce the students to French literature through extracts of texts selected fromdifferent literary genres of various famous authors across the centuries.

Course Content: Material compiled by the Department from Itinéraires Littéraires,andDix Siècles deLittérature Française.

Module 1: Poésie-I
Liberté : Paul Eluard
Déjeuner du Matin : Jacques Prévert

Module 2: Poésie-II
Le Cimetière marin :Paul Valéry
Le Pont Mirabeau :Guillaume Apollinaire

Module 3: Théâtre-I
Rhinocéros : Eugène Ionesco
Huis clos : Jean-Paul Sartre
En attendant Godot : Samuel Beckett

Module 4: Roman-I
La Peste : Albert Camus
La Jalousie : Alain Robbe-Grillet
Le petit prince : Saint-Exupéry
La Place de l'étoile : Patrick Modiano

Examination Scheme

Components	CT	Att.	H	EE
Weightage	20	5	5	70

Text & References:

- Castex, P.G., P. Surer et G. Becker. Histoire de la Littérature Française. Paris : Hachette, 1974.Print.
- Itinéraires Littéraires. (Moyen Age XVIe, XVIIe, XVIIIe) Paris: Collection Hatier.Print.
- Dix Siècles de Littérature Française. Paris :Collection Bordas, 1991. Print.
- Masson, Nicole. La littérature française. Editions Eyrolles, 2007.
- Ploquin, Françoise, Laurent Hermeline, and Dominique Rolland. Littérature française:les textes essentiels. Hachette, 2000.

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READING FRENCH TEXTS

Course Code: DFRE2602 **Credit Units: 4**

Course Objectives:

- To enhance students' linguistic skills through the study of written discourse on selectthemes.
- To understand the structure and content of texts written in French, such as magazineand newspaper articles, reports, press releases and literary texts.
- To express ideas and opinions in French in relation to the individual, family and dailylife, society, environment and current affairs.

Course Contents:

Module 1 :

La Famille : L'individu, la famille et la vie journalière
Structure and function of the family: relationships; patterns of daily life and living conditions;young people and their values; health and fitness, healthy living choices, aspects of cultural life, for example, music and dance: importance and influence on individuals and society.

Module 2 :

La société et les affaires sociales
Gender roles in society; employment and unemployment: causes and consequences; role of the media; Religion in multicultural societies; education: education system and the role of education in the development of society; crime and violence, for example, crime against individuals and existing laws for the related issues.

Module 3:

L'environnement
Destruction of the environment and its challenges: pollution; deforestation; climate change. Conservation of the environment and its benefits: recycling; reforestation; nature reserves including protection of endangered species.

Module 4:

L'actualité
Current issues: social and political unrest: causes and consequences; political alliances:objective and composition of the alliances, government policies.

Examination Scheme:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text and References:
Les livres à consulter:

Lhote, G. et al. Parlez-moi: Le français au quotidien,Paris: Nathan, 1998.

Lien, B. and Raud, M. Thèmes et Textes. Topics and text studies for advanced French, London: John Murray, 1998.

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Maun, I. and Rodrigues, I.	Bien lire, bien écrire, Sandy, Beds. :Advance Materials, 2001.
Maruani, M	Travail et emploi des femmes, Paris: Editions La Découverte (Coll Repère) 2006.
McLachlan, A.	Zénith, Oxford: Heinemann Educational, 2000.
Monnerie-Goarin, A. et al	Champion (nouvelle édition), Paris:CLE International, 2001.
Murillo, J. et al.	Forum, Paris, Hachette FLE, 2000 –2003.
Neather, T. et al.	Prévisions/Réalisations, Cheltenham: Nelson Thornes, 1998.
Noël, M. F. and Davies, V.	Communiquez, London: Hodder andStoughton, 1999.
Open University	Francothèque: A Resource for French Studies, London: Hodder and Stoughton, 1997.
Paris, D and Foltete-Paris B	Environnement.com, Paris: Clé International 2009.

Les sites web à consulter:

www.advmaterials.demon.co.uk
www.champs-elysees.com
www.cilt.org.uk
www.cndp.fr www.esb.co.uk
www.fdlm.org www.fle.fr
www.french.about.com
www.frenchteachers.org
www.grantandcutler.com
www.quia.com/pages/babelspeak/html
www.rf.fr
www.sitesforteachers.com
http://www.tv5.org/TV5Site/enseigner-apprendre-francais/accueil_enseigner.php
www.voila.fr
www.yahoo.fr

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INTRODUCTION À LA TRADUCTION – INTRODUCTION TO TRANSLATION

Course Code: DFRE2603 **Credit Units: 04**

Course Objectives:

- To sensitize the students to literary and pragmatic translations
- To introduce to the learners the basic concepts and theory of translation
- Processes of translation
- Methods and 'procédé' of translation

Course Contents:

Module 1
Translation – Definition and basic concepts (equivalence of text in translation – word to wordtranslation and meaning based translation), Interpretation
Translation and Traductologie (Translation Studies)

Module 2
Technical translation and Literary translation
Types of Translation according to Roman Jakobson (illustrating the subject matter oftranslation studies)

Module 3
Text (source text, target text, texts in print/audio/video, texts through words and images), analysis of text (identifying difficulties in text-unknown words, technical terms, expression specific to the context, deciphering meaning, finding equivalent terms/expressions in Targetlanguage etc), practice translating texts, phenomenon of untranslatability and skewed translation

Module 4
Linguistic approach to translation, 'sept procédés de traduction' by Vinay & Darbelnet

Examination Scheme:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text & References:

- Vinay, Jean-Paul and Jean Darbelnet. *Comparative Stylistics of French and English : A methodology for translation*. Trans. Sagar, Juan C., and M.-J. Hamel. Amsterdam/ Philadelphia: Jean Benjamins Publishing Company, 1995. Print.
- Newmark, Peter. *A textbook of translation*. New York: Prentice-Hall International,1988. Print

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SEMESTER-VII

CONTEMPORARY FRENCH WRITINGS

Course Code: DFRE2701 **Credit Units : 04**

Course Objectives:

- This course will glance through literary trends in France since early 2000.
- Major themes that will be covered in the course are memory writing, the quest for personal identity, and immigration narratives.
- Introduce students to socio-political debates in multicultural French Society.

Course Contents :

Module 1 & 2 – Memory writing
We will investigate the significance of memory, which is essential in exploring andconstructing characters' identities, seeking meaning and understanding the Self.

Module 3 – Immigrant Narrative
We will encompass the experiences, challenges, and contributions of immigrants to Frenchsociety who are perceived as the Other.

Module 4 – Contemporary debates on multiculturalism
We will look into the contemporary political discourses relating to multi-cultural issues inFrane post 2000.

Examination Scheme :

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Suggested readings:

- Patrick Modiano, Annie Ernaux, Jean-Marie Gustave Le Clézio, Brigitte Giraud, Mohamed Mbougar Sarr.

Text & References :

- Kundera, Milan. *L'Ignorance*. Gallimard, 2000
- Ernaux, Annie. Mémoire de fille. Gallimard, 2016
- Diome, Fatou. Le ventre de l'Atlantique. Le livre du poche, 2003.
- Sinha, Shumona. *Assommons les pauvres!* L'Edition de l'Olivier, 2011.
- Houellebecq, Michel. *Soumission. Editions Flammarion, 2015*
- Scott, Joan Wallach. The Politics of the Veil. Princeton, N.J.: Princeton UniversityPress, 2007

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FRENCH AND FRANCOPHONE CINEMA

Course Code: DFRE2702 **Credit Units: 04**

Course Objectives:

- To introduce students to history of cinema in France and Francophone countriesfrom its origin to the contemporary period.
- To acquaint students with various tools of film criticism and film appreciation toenable them to understand and analyze cinema in a holistic perspective.
- To empower them to develop skills independently and to develop criticalappreciation of a film and its related areas.

Course Content: Material compiled by the Department.

Module 1 : L'introduction au cinéma français.
L'origine du cinéma en France et son évolution au cours du temps. Apprendre l'histoire ducinéma.

Module 2 : Les mouvements du cinéma français
Apprendre et discuter les mouvements du cinéma français à l'aide des différents films aucours du temps.

Module 3 : Le cinéma francophone
L'origine du cinéma dans les pays francophones et son évolution au cours du temps.Apprendre l'histoire du cinéma dans les pays francophones.

Module 4 : Le français à travers des films
Comprendre le langage cinématographique, la petite grammaire du cinéma incluant lescourts métrages et la critique du cinéma.
Critique/ appréciation des films

Examination Scheme:

Components	CT	Att.	C	P
Weightage (%)	40	5	30	25

*****There is no end-term examination. There is continuous assessment.

Text & References

- Material compiled by the Department.

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TRANSLATION: THEORY & PRACTICE-1

Course Code: DFRE2703 **Credit Units: 04**

Course Objectives:

- To introduce students the basic concepts and theory of translation
- The processes of translation
- The methods and 'procédés' of translation

Course Contents:

Module 1

Translation – Definition and basic concepts, study of the principles of translation, the text, translation units, contrastive syntactical structures (French/English) , Translation and Translation Studies-Basic difference, Translation & Interpretation- Basic difference

Module 2

Methodology of translation, methods, procedures, segmentation, 'sept procédés de traduction' by Vinay & Darbelnet

Module 3

Text (source text, target text, texts in print/audio/video, texts through words and images), analysis of text (identifying difficulties in text-unknown words, technical terms, expression specific to the context, deciphering meaning, finding equivalent terms/expressions in Target language etc), practice translating texts, phenomenon of untranslatability and skewed translation.

Examination Scheme:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text & References:

- Vinay, Jean-Paul and Jean Darbelnet. *Comparative Stylistics of French and English : A methodology for translation*. Trans. Sagar, Juan C., and M.-J. Hamel. Amsterdam/ Philadelphia: Jean Benjamins Publishing Company, 1995. Print.
- Newmark, Peter. *A textbook of translation*. New York: Prentice-Hall International,1988. Print.
- M Launay, Qu'est-ce que traduire ?, coll. « Chemins philosophiques », Paris :Vrin, 2006.
- Mona Baker, In Other Words. A Course Book in Translation, Routledge, New York, 2011.
- Peter Newmartz: A Textbook of Translation, New York/London/Toronto, 1988Susan Bassnett-Meguire, Translation Studies, Methuen and Co. 2002.
- S. Leys, L'Ange et le cachalot, Points Essais, Paris : Seuil, 1998 ; spéc. p. 135-206 : «Traduction (théorie et pratique) ».

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CULTURAL HISTORY OF FRANCE

Course Code: DFRE2704 **Credits Units: 04**

Course Objective:

- Study of the major social and cultural movements and their reflection in literature and the arts
- Orients students towards the study of particular themes along with the narrative,cultural & ideological strategies involved.
- Develop an understanding of the critical issues involved in analyzing the theme.
- Enable students to analyze a variety of narrative and generic techniques to representthe theme.

Course Contents :

Module 1: Les mouvements culturels et sociales.
Here the students will be introduced to the socio-cultural movements of France in a succinctmanner. A basic understanding of these movements will prepare them for the next module.

Module 2: Les stratégies culturelles, idéologiques et la narration.
The students will be familiarized with different strategies used to propagate and sustain thecultural and ideological narrative.

Module 3: Les thèmes et l'analyse.
Here the focus will be on developing the understanding of various themes encountered by thestudents and impart the analyzing skills in the course of class.

Module 4: Les techniques de narration.
Various techniques applied to create a cultural narrative and its analysis will be the focus ofstudy in this module.

Examination Scheme:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text &References:

- Antoine de Baecque, Françoise Melonio, Lumières et liberté. Les dix-huitième et dix-neuvième
- siècles, PTS Histoire, Paris, 2005.
- Alain Croix, Jean Queniart, De la Renaissance à l'aube des Lumières, PTS Histoire, Paris,2005
- Albert Soboul, La Révolution Française, 2 volumes, Edition sociales, 1981
- Bernard Droz and Evelyne Lever, Histoire de la guerre d'Algérie (1954-1962), Seuil, coll.Points,1983.
- Georges Duby and Armand Wallon (ed), Histoire de la France rurale, Seuil, 1985.
- Jacques Sole, La révolution en questions, Seuil, coll. Ponts, 1988.
- Georges Duby, L'Europe au Moyen Age, Arts et métiers graphiques, 1979.
- Jean Delumeau, La Civilisation de la Renaissance, Arthaud, 1994.
- J. Tulard et al. Histoire et Dictionnaire de la Révolution française, Robert Laffont, 1987
- Pascale Goetschel, Emmanuelle Loyer, Histoire culturelle de la France de la BelleEpoque à nos jours, Armand Colin, Paris 2005.
- Pascal Ory, «L'histoire culturelle de la France contemporaine. Question et
- questionnement»,Vingtième siècle. Revue d'histoire, octobre-décembre 1987, pp. 67-82
- L'Histoire culturelle, Paris, PUF, coll. « Que sais-je ? », 2004.
- Philippe Poirrier, Les Enjeux de l'histoire culturelle, Paris, Points Seuil, 2004.

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DFRE2739	BASICS OF RESEARCH METHODOLOGY, ETHICS, AND RESEARCH COMMUNICATION	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description
This course aims to provide students with a comprehensive understanding of conducting ethical research, utilizing proper research methodologies, and effectively communicating research findings. The course includes a final project where students will write a Literature Review on a topic chosen in consultation with the teacher(s).

This course is designed to equip students with essential skills and knowledge to conduct ethical research, employ proper research methodologies, and effectively communicate scientific information (with focus on writing a literature review). The course will cover topics such as research design, data collection and analysis, research ethics, and science communication strategies. Through a combination of lectures, discussions, case studies, and practical exercises, students will develop a deeper understanding of the research process and its ethical implications.

Course Objectives
The objective of this course is to impart knowledge about various stages of research process, research ethics and different ways of research communication.

The aim of this course is to impart research skills to the beginners and help to improve the quality of research by the existing researchers. It also encompasses the understanding and application of appropriate research design, statistics, and the use of the computer for reference management, report writing, research paper writing and presentation. The course also introduces the key conceptual issues of each research method, as well as giving practical guidance. It covers the series of research methodology contents: from problem formulation, to design, to data collection, analysis, reporting and dissemination. The course has the dual aims of equipping students with conceptual understandings of current academic debates regarding different methods, and the practical skills to put those methods into practice.

Course Outcomes
On completion of this course, the students will be able to
CO1. Define criteria of good research, steps in research process, and data collection.
CO2. Identify different types of sampling and its purpose.
CO3. Conduct hypothesis testing for different types of samples and interpret the results.
CO4: Learn the importance of literature review, write research paper/thesis, use reference management software.

Course Content :

Module	Topic	**Blooms level***	Hours
1	**Research Methodology** Understanding the research process: From research questions to conclusions	L1, L2	10

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	Types of research: Qualitative and quantitative research Exploratory, descriptive, experimental, and correlational studies Scientific Thinking: Subjective Vs. Objective Thinking Logical Reasoning: Inductive Vs. Deductive Reasoning Formulating research hypotheses and objectives Purpose of a good research, Criteria of good research		
2	**Descriptive Statistics** Data, Types of Data, Methods of data collection, Benefits and drawbacks, Graphical representation of data and interpretation. Measures of Central Tendency: Arithmetic Mean, Median, Mode, Measures of Dispersion: Range, Standard Deviation, Variance, Coefficient of Variation.	L1, L2, L3	15
3	**Inferential Statistics** Sampling: Basic concepts, Process of Sampling, Sample Size, Types of Samples, Sampling and non- sampling errors, Statistics and Parameters, Sampling Distribution of Means and Proportion, **Hypothesis Testing**, steps in testing of hypothesis, errors in hypothesis testing, z test and t test.	L1, L2, L3	15
4	**Research Ethics** Plagiarism, Fabrication, Falsification, Ethics with respect to human and Animal Research	L1, L2	5
5	**Communication** Characteristics of a good Research paper, Systematics Literature Review (choosing a topic, preparing outline, gathering authentic & appropriate references, avoiding plagiarism, use of reference management systems), Writing a good literature review, Structure of report (Introduction, Methodology, Analysis, Results, Discussions, Conclusions, Recommendations), Writing Quality Research Paper, Publishing Research Work in Quality Journals, Reference Management Software	L1, L2, L3	15

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional Exam	End Term Examination
Weightage (%)	5	10	15	70

Project based assignment: Student teams (2-3 students per team) will write a literature review on a topic of choice, in consultation with the teacher.

Text books/ Reference books

- Research Methodology for Natural Sciences by Soumitro Banerjee, Publisher: IISc Press (1 January 2022); ISBN-10: 8194835178; ISBN-13: 978-8194835172
- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt. Ltd., New Delhi-110001

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- Geode, Millian J.& Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Kothari, C.R.2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.
- Levin R I., Rubin D S. Statistics for Management. Sixth Edition, PHI
- Kapoor & Gupta. Probability & Statistics. S Chand Publishers, New Delhi.
- Montomery, Douglas C.(2007), 5th Ed. Design and Analysis of Experiments, Wiley India.
- Cooper, Donald R. and Pamels Schindler, Business Research Methods, Tata McGraw Hills, New Delhi
- Krishnaswamy, K.N. Sivakumar. Appa lyer and Mathiranjan M. 2006, Management Research Methodology: Integration of Principles, Methods and Techniques, Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Sachdeva, J.K. 2008. Business Research methodology. Himalaya Publishing House, New Delhi.
- Shekharan, Uma, Business Research Methods, Miley Education, Singapore.
- Zikmund, Millian G., Business Research Methods, Thomson Learning, Bombay.

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SEMESTER-VIII

INTRODUCTION TO MEDIA STUDIES

Course Code: DFRE2801 **Credit Units: 04**

Course Objectives:

- To introduce students to different types of media in France viz. print media,audio-visual media, and social media.
- To acquaint students with basic theory and tools of media analysis to enable themto understand and analyze different forms of media in a holistic perspective.
- To empower them to analyze different facets of media and incorporate them in theirunderstanding of role of media in daily life.

Course Content:

Module 1 : L'introduction aux médias en France.
Apprendre à propos de différents types de médias qui existent en France aujourd'hui.

Module 2 : La presse écrite en France
Apprendre et discuter les différents types de presse écrite en France, par exemple, lesjournaux quotidiens, les magazines, les hebdomadaires etc.

Module 3 : Les médias audiovisuels
La typologie des médias audio-visuels comme la télé et la radio. Apprendre à distinguer lamodalité de leur fonctionnement et analyser leur enjeu dans la vie quotidienne.

Module 4 : Les nouveaux-médias et les réseaux sociaux
Comprendre les différents types de nouveaux-médias et de réseaux sociaux. Apprendre à appréhender et analyser leur fonctionnement et impact dans la vie quotidienne de nos jours.
Critique/ appréciation des films

Examination Scheme:

Components	CT	Att.	C	P
Weightage (%)	40	5	30	25

*****There is no end-term examination. There is continuous assessment.

Text & References

- Material compiled by the Department.

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THEORY & CRITICISM

Course code: DFRE2802 **Credit Units: 04**

Course Objectives:
Study of the major theoretical and critical approaches to literature and culture. The student will become familiar with the different literary and cultural theoretical approaches. The student will be trained in the theoretical tools of analysis. By the end of this course, the students will be able to

- Remember critical thinkers or philosophers.
- Understand the significance of major critical theories.
- Analyze the themes and structure of major critical works.
- Evaluate a literary work using a theoretical framework.

Course Content:

Module 1: Structuralism

1. The Scope of Structuralists,
2. What Structuralist Critics do
3. Post-structuralism and Deconstruction

Module 2: Feminist and Marxist Criticism

1. Feminist Criticism
2. Marxist Criticism

Module 3: Post-Modernism and Psychoanalytic Criticism

1. Post Modernism
2. Psychoanalytic Criticism

Module 4: Post-Colonial Criticism

1. New Historicism and Cultural Materialism
2. Post Colonial Criticism
3. Ecocriticism

Examination Scheme :

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text & Reference:

1. Aristotle, Poetics. Trans. and ed. by Anthony Kenny. Oxford: Oxford University Press,2013.
2. Barthes, Roland. 'The Death of the Author', in Image-Music-Text. Trans. Stephen Heath.New York: Noonday Press, 1977.
3. Bennett, Andrew, and Nicholas Royle. An Introduction to Literature, Criticism and TheoryHarlow: Pearson Education Limited. 2009.
4. Culler, Jonathan. Literary Theory: A Very Short Introduction. Oxford: OUP, 2011.
5. Eagleton, Terry. Literary Theory: An Introduction. Oxford: Blackwell, 2008.
6. Preminger, Alex, Leon Golden et al, eds. Classical Literary Criticism: Translations and Interpretations. New York: Frederick Ungar Publishing, 1974.
7. Waugh, Patricia. Literary Theory and Criticism: An Oxford Guide. Oxford: OUP, 2006

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Web resources:

1. https://www.classcentral.com/course/swayam-literary-theory-and-literary-criticism7982
2. http://www.openculture.com/2017/02/yale-presents-a-free-online-course-on-literary-theory.html
3. https://www.ted.com/talks/dolores_huerta_what_we_can_learn_from_the_history_of_feminism
4. https://youtu.be/hg3umXU_qWc

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CULTURAL HISTORY OF FRANCOPHONE COUNTRIES

Course Code: DFRE2803 **Credit Units : 04**

Course Objectives:

- To understand colonial history of France and its overseas expansion from its foundations to the present day and to understand the links as to why French languageis spoken across the world.
- To understand the impacts of French language and culture on native populations andvice-versa.
- To understand post-colonialism.

Course Contents:

Module 1 – Understanding how the French language spread out in the world
This module explores the historical context and factors that contributed to the global dissemination of the French language. It covers the spread of French through colonization, diplomacy, trade, and cultural exchanges, examining how the language extended its influencein various regions.

Module 2 – Knowing the situation of the French language in Africa
Focusing on Africa, this module delves into the impact of colonial history and the role of French in the diverse linguistic landscape of African countries.

Module 3 – The presence of the French language in Asia & North America
This module broadens the scope to explore the presence and evolution of the French languagein both Asia and North America.

Module 4 – Decolonization
Focusing on the aftermath of the World Wars, this module studies the decolonization processes, the liberation movements, and the after-effects of colonial legacy.

Examination Scheme:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text & References:

- Casali, Dimitri. *L'Empire colonial français. Quand la France rayonnait dans lemonde 1608-1931*, Grund, 2015.
- Montagnon, Pierre. *La France coloniale, la gloire de l'Empire : Du temps des croisades à la Seconde Guerre mondiale*, Édition Pygmalion, 1997, 508 pages.
- Tony Chafer. *The End of Empire in French West Africa: France's Successful Decolonization?*, 2002
- Frantz Fanon. *Peau noire, masques blancs*. Éditions du Seuil, Paris, 1952
- BETTS, RAYMOND F. "Decolonization: A Brief History of the Word." Beyond Empire and Nation: The Decolonization of African and Asian Societies, 1930s-1970s,edited by ELS BOGAERTS and REMCO RABEN, Brill, 2012, pp. 23–38. JSTOR, http://www.jstor.org/stable/10.1163/j.ctt1w8h2zm.5. Accessed 29 Oct. 2023.

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TRANSLATION: THEORY & PRACTICE-2

Course Code: DFRE2804 **Credit Units: 04**

Course Objectives:

- To familiarize students with the different theoretical approaches to Translation Studies
- To train students in the practical aspects of translation of different types of texts.

Course Contents:

Module 1
Technical translation and Literary translation
Types of Translation according to Roman Jakobson (illustrating the subject matter translationstudies)

Module 2
Translation of specific text types (French/English, English/French) and some theoreticalapproaches.

Module 3
Text (source text, target text, texts in print/audio/video, texts through words and images), analysis of text (identifying difficulties in text-unknown words, technical terms, expression specific to the context, deciphering meaning, finding equivalent terms/expressions in Target language etc), practice translating texts, phenomenon of untranslatability and skewed translation

Examination Scheme:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text & References:

- Andre Lefevere: Translation: Rewriting and the Manipulation of literaryFrame. Routledge: London, 1981.
- Daniel Gile , Basic Concepts and Models for Interpreter and Translator Training,John Benjamins Publishing, 2009.
- G. Kelly L., The True Interpreter. A History of Translation Theory andPractice in the West, Oxford: Blackwell, 1979.
- G. Mounin, Les problèmes théoriques de la traduction, coll. « Bibliothèquedes idées », Paris : Gallimard, 1963 ; rééd. coll. « Tel » 1976.
- —, Les Belles infidèles. Essai sur la traduction, Paris : Cahiers du Sud, 1955 ; rééd. Presses Universitaires de Lille, 1994.
- H. Meschonnic., Poétique du traduire, Verdier, 1999 ; Poche 2012.
- Jeremy Munday, Introducing Translation Studies, Theories and Applications, Routledge, New York, 2012
- Jacqueline Guilleni-Flescher: Syntaxe compare du francais et de I'anglais,Editions Ophrys, 1981.
- John Bignenet/Rainer Schulte (eds.): The Craft of Translation. The Universityof Chicago Press: Chicago & London, 1989.
- J. Ortega Y Gasset, Misère et splendeur de la traduction, éd. Bilingue, trad.Fr. GEAL, coll.« Traductologiques », Paris : Les Belles Lettres, 2014.
- J.-R. Ladmiral, Traduire. Théorèmes pour la traduction, Paris : Gallimard, 1994.
- —, Sourcier ou cibliste, coll. « Traductologiques », Paris : Les Belles Lettres,2014. M.Oustinoff, La traduction, coll. « Que sais-je ? », Paris : PUF, 2012.
- Kirsten Malmaker, Kevin Windle, The Oxford Handbook of TranslationStudies, OUP, Oxford, 2011

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DFRE2839	DATA ANALYSIS & VISUALISATION USING SOFTWARE	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	Class X Mathematics				
Co-requisites					

Catalog Description

The implosion of available data has made visualization more critical but also more challenging. Data analysis and Data Visualization are essential tools for business analysis, engineers, policymakers, and decision-makers. Developed originally for "small data", visualization techniques have been met with varied success in the past centuries and decades. There are a few well-known visualizations that are very effective in capturing the essence of the data, and of course, there are many infamous negative examples of poor visuals. An effective visual is critical for decision making it, but it also requires a lot of work, customization, attention to detail, and refinements.

Course Objectives

The course is designed to help students develop skills and knowledge in the following area(s):

- Develop an understanding of what is a good visualization for a given purpose
- Learn visualization theory & techniques
- Build a substantial data analytic project
- Apply data analysis and visualization with Excel, SPSS, R, Python, NVivo and MATLAB

Course Outcomes

On completion of this course, the students will be able to

CO1. Students will be able to articulate meaningful lines of inquiry that might be explored through the collection, organization, visualization, and analysis of data in a context associated with their primary field of study using (as appropriate) numerical, textual, spatial, and/ or visual data.

CO2. Student will understand what data are, how they are collected, and how to assess the quality/ reliability of data.

CO3. Students will demonstrate intermediate proficiency in the visualization of data to communicate information and patterns that exist in the data.

CO4: Students will be able to use at beginning level of proficiency the tools of statistics and machine learning to ask questions of and explore patterns in data.

Course Content :

Module	Topics Covered	Blooms Level	Contact Hours
1	**Module-1: Introduction to Excel** Data Analysis using Excel, Curve fitting, Correlation, Linear Regression, Multiple regression, Principal Component Analysis and Factor Analysis, Hypothesis testing **Introduction to Excel and SPSS** Introduction to SPSS and Types of Data, Importing, exporting and data handling in SPSS; Exploratory data analysis using SPSS and data visualization; Introduction to statistical inference and various univariate tests by using SPSS; Analysis of Variance (One Way ANOVA, Two Way	L1, L2, L3, L4	20 hours

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	ANOVA and ANCOVA); Correlation, Simple and Multiple linear Regression Analysis; Principal Component Analysis and Factor Analysis		
2	**Module-2: VOS Viewer** **Web of Science, Scopus, Dimensions, Lens, and PubMed.** Co-authorship networks, citation-based networks, and co-occurrence networks can be created based on data downloaded from Web of Science, Scopus, Dimensions, and Lens. Co-authorship networks and co-occurrence networks can also be created based on PubMed data. **Crossref, Europe PMC, and OpenAlex**. Networks can also be created based on data retrieved through the APIs of Crossref, Europe PMC, and OpenAlex, These APIs can be queried interactively in VOS viewer. **Semantic Scholar, Open Citations, and Wiki Data.** For a given set of DOIs, networks can also be created based on data retrieved through the APIs of Semantic Scholar, Open Citations and Wiki Data.	L1, L2, L3, L4	10 Hours
3	**Faculty of Management Studies & Behavioural Sciences** **Module 3: Domain Specific Software** **- Structural Equation Modelling** **Smart PLS** Introduction to Structural Equation Modelling (SEM), Introduction to the software's AMOS and SPSS, SMART PLS, Testing of Statistical assumptions, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), common method bias (CMB) test, Measurement Model Assessment, Discussing Fit Indices, Reliability and Validity Testing, Structural Model Assessment identifying multivariate outlier, Construct Validity: Convergent and Discriminant Validity, Measurement Model & Structural Equation Modelling, Mediation and Moderation Effects, Multi-Group Analysis.	L1, L2, L3, L4	30 Hours
	Faculty of Arts **N Vivo** 1. Import text, audio, video, emails, images, spreadsheets, online surveys, web content, and social media from various sources into a simple, intuitive interface. 2. Create and NVivo project, import and organise qualitative and quantitative data 3.Manage a literature review in NVivo 4. Autocode structured data deductively and identify themes inductively 5. Generate and falsify hypotheses 6. Combine data in sets for analysis 7. Seek patterns and identify relationships across codes and cases 8. Present findings using visualisations 9. Export data out of NVivo 10. Coordinate teamwork.		

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	Faculty of Science Engineering and Technology **Faculty of Health & Allied Sciences** **R programming / Python/ MATLAB** **R Programming-** Introduction to R, Variables and datatypes in R, Dataframes, Recasting and joining of dataframes, Arithmetic, logical and matrix operations in R, Functions in R, Control structure in R, Data visualization in R. **Python Programming-** Basics of programming, data structure and algorithm using Python, Strings, lists, control, functions, manipulating lists, loops, arrays, selection sort, insertion sort, recursion, sorting, dictionaries, exception handling, file handling, string processing, data analysis using Python **MATLAB Programming-** Introduction, basic features, managing workspace, mathematical functions, basic plotting, Matrices, array operations and linear equations, MATLAB programming- M files script, M-file functions, control flow and operations.		

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional (Theory/ Practical)	End Term Examination
Weightage (%)	5	10	15	70

References:

- David Houcque, 2005. Introduction to MATLAB programming for Engineering students., Northwestern University, E- Book **https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf**
- Mark Lutz, 2009. Learning Python. O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.
- Emmanuel Paradis, 2005. R for Beginners. E book. **https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf**
- A Handbook of Statistical Analysis using SPSS by Dr. Brijesh Awasthi, Redshine Publication.

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Bachelor of Arts (Honors/ Honors with Research) in German

FLEXILEARN
-Freedom to design your degree



Curriculum & Scheme of Examination

2023

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GURUGRAM

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Bachelor of Arts (Honors/ Honors with Research) in German
SEMESTER-I

WRITTEN EXPRESSION-1

Course Code: DGER2151 **Credit Units: 04**

Course Objectives:
To furnish the linguistic tools

- to introduce oneself and others, to ask and give personal information.
- to describe ones family and surroundings
- to name and count things and to talk about likes and dislikes.
- to describe ones house and give opinions
- to tell time and date and to talk about daily routine and activities.
- to talk about leisure time and hobbies
- to talk about events in the past
- to describe professions
- to talk about weather
- to ask directions and advices, to ask for help

Course Contents:
Lektion 1 : Guten Tag. Mein Name ist…
Themen
Jemanden begrüßen, sich verabschieden, nach dem namen fragen, sich und andere vorstellen, Heimatland erfragen und nennen, über Sprachkenntnisse sprechen, Alphabet, Telefongespräch : nach jemandem fragen, Visitenkarten lesen, Formular ausfüllen.

Lektion 2 : Meine Familie
Themen
Nach dem Befinden fragen, Befinden ausdrücken, Familienmitglieder vorstellen, den wohnort nennen, zählen, Fragen zur eigenen person, einfache informationen verstehen

Lektion 3 : Essen und Trinken
Themen
Nach einem Wort fragen, Vermutungen äußern, Mengen benennen, Einkaufszettel schreiben, Preise und mengenangaben nennen und verstehen, einen Prospekt verstehen, Gespräche beim Essen verstehen, über das Lieblingsessen berichten, ein einfaches Rezept lesen

Lektion 4 : Meine Wohnung
Themen
Zimmer benennen, Häser uand Wohnungen beschreiben, Möbelstücke, elektrogeräte und Farben benennen, Gefallen und Missfallen ausdrücken, bis eine Million zählen, Wohnungsanzeigen relevante Informationen entnehmen, einen Text über Möbel lesen, Möbel beschreiben

Lektion 5 : Mein Tag
Themen
Über Aktivitäten und Vorlieben sprechen, nach der Uhrzeit fragen und die Uhrzeit angeben, Wochentage benennen, über die eigene Woche sprechen, Angaben zur tageszeit verstehn und machen, über den Tagesablauf berichten, Schilder/Telefonansagen : öffnungszeiten verstehen, eine Internetseite verstehen

Lektion 6 : Freizeit
Themen

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Den Wetterbericht verstehen, nach dem Wetter fragen und darüber sprechen, einfache Gespräche am Imbiss führen, zustimmen, verneinen, über Freizeit aktivitäten sprechen, einen Personenporträt verstehen, eine Reisebrochüre vertsehen, Interviews über Hobbys verstehen

Lektion 7 : Lernen- ein Leben lang
Themen
Möglichkeiten und Fähigkeiten ausdrücken, Absichten ausdrücken, seinen willen äußern, von Ereignissen und Tagesabläufen in der Vergagenheit berichten, über Aktivitäten in der Vergangenheit erzählen, Häufigkeit ausdrücken, Tipps fürs Sprachenlernen, Wichtigkeit ausdrücken

Grammatik :

- W-Frage
- Personalpronomen
- Verbkonjugation
- Posessivartikel
- Indefiniter Artikel
- Plural
- Ja-/nein Fragen
- Nullartikel
- Definiterartikel
- Lokale adverbien : hier, dort
- Prädikatives Adjektiv
- Negation
- Trennbare Verben
- Präposition
- Akkusativ
- Modalverb
- Perfekt mit haben und sein

Evaluation Pattern:

Components	CT	Home Assign	Att.	EE
Weightage (%)	20	5	5	70

Text and References

- Niebisch, Daniele, Specht, Franz et al. (2016): Schritte international Neu 1, Niveau A1/1, Deutsch als Fremdsprache, Kursbuch und Arbeitsbuch, 1. Auflage, München: Hueber Verlag

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ORAL EXPRESSION-1

Course Code: DGER2101 **Credit Units: 02**

Course Objectives:
To provide the students with the know-how

- to understand the German phonetic system
- to develop strategies of listening comprehension
- to pass from written to oral, from oral to written easily
- to be sensitized to nuances of speech, dialectical variations.
- to overcome the fear of speaking a foreign language and take position as a foreigner speaking German.

Course Content:
Listening exercises and speaking tasks (imagining dialogues, role plays, telephone conversations) of:

- Niebisch, Daniele, Specht, Franz et al. (2016): Schritte international Neu 1, Niveau A1/1, Deutsch als Fremdsprache, Kursbuch und Arbeitsbuch, 1. Auflage, München: Hueber Verlag
- Deutche Welle : Deutsch interaktiv

Evaluation Pattern :

Components	CT	Home Assign	Att.	EE
Weightage (%)	20	5	5	70

Texts & References

- Niebisch, Daniele, Specht, Franz et al. (2016): Schritte international Neu 1, Niveau A1/1, Deutsch als Fremdsprache, Kursbuch und Arbeitsbuch, 1. Auflage, München: Hueber Verlag

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INTRODUCTION TO GERMAN HISTORY AND CULTURE

Course Code: DGER2102 **Credit Units: 02**

Course objectives:

- This course is designed to give students an overview of the history of Germany. It gives an insight into the various historical and political developments of Germany.
- The course will highlight how the current Germany came into existence.

Course Content: Material compiled by the department.

Module I

Introduction (1500-1648): The German Reformation, Peasant's Movement, Thirty Years War

Module II

The age of Absolutism and Industrialization (1648-1918): Rise of Prussia, Religion, Culture and Enlightenment, The impact of the French Revolution, The revolution of 1848, Unification of Germany, Germany under Bismarck, First World War

Module III

Democracy and Dictatorship (1918-1945): Weimar Republic, Collapse of Weimar democracy, Second world war, The consolidation of Hitler's Power, Holocaust, resistance and defeat

Module IV

The two Germanies (1945-1990): The creation of two Germanies, Politics, economy and society in West Germany, Politics, economy and society in East Germany, The revolution of 1989 and the Unification of Germany

Evaluation Pattern :

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text and References

- Fulbrook, Mary. *A concise history of Germany*. Cambridge University Press, 2004.
- Tipton, Frank B. *A history of modern Germany since 1815*. A&C Black, 2003.
- Williamson, David. *Germany since 1815*. Palgrave Macmillan. 2005

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SEMESTER-II

WRITTEN EXPRESSION-2

Course Code: DGER2251 **Credit Units: 04**

Course Objectives:

- to name body parts and describe appearances
- to give advices and instructions
- to describe modes of transports
- to ask directions and understand itinerary
- to convey information in written and verbally
- to describe clothes and express
- to express preferences and choice
- to narrate events and to congratulate in written and verbally
- to accept and refuse invitations

Course Contents:

Lektion 8: Beruf und Arbeit

Themen

Berufe bennenen und erfragen, üer die berufliche Situation sprechen, private und berufliche Informationen über Vergangenheit und gegenwart austauschen, von Ereignissen und Aktivitäten in der Vergangenheit berichten, Anziegen verstehen, Telefongespräch: Informationen zu einer Praktikumstelle erfragen.

Lektion 9: Unterwegs

Themen

Abläufe im Alltag erklären, Aufforderungen verstehen und Anweisungen geben, üer Erlaubtes und verbotenes sprechen, eine Informationsbroschüre verstehen, Angebote verstehen, ein Buchungsformular ausfüllen, Gespräche an der Hotelrezeption verstehen

Lektion 10: Gesundheit and Krankheit

Themen

Körperteile bennenen, über das Befinden sprechen, Anweisungen und Ratschläge verstehen und geben, Anzeigen verstehen, eine Anfrage schreiben, Telefongespräche zu Terminvereinbarungen verstehen, eine Termin vereinbaren, ändern oder absagen.

Lektion 11: In der Stadt unterwegs

Themen

Nach dem Weg fragen und den Weg beschreiben, Verkehrsmittel benennen, Ortsangaben machen, Orte und Richtungen angeben, Durschsagen verstehen, am Schalter: um Auskunft bitten, Fahrplänen Informationen entnemen

Lektion 12: Kundenservice

Themen

Zeitangaben verstehen und machen, Tagesabläufe beschreiben, zeitliche Bezüge nennen, um Serviceleistungen bitten, höfliche Bitten und Aufförderungen ausdrücken, Mailboxnachrichten verstehen und formulieren, Service-Anzeigen verstehen, Telefongespräch: Reparaturservice

Lektion 13 : Neue Kleider

Themen

Kleidungsstücke benennen, Gefallen/Missfallen ausdrücken, Vorlieben und Bewertungen ausdrücken, vorlieben erfragen, eine Auswahl treffen, um Hilfe/Rat bitten

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Lektion 14 : Feste

Themen

Das Datum erfragen und nennen, über feste und Feiertage sprechen, über Personen und Dinge sprechen,um Hilfe bitten, Gründe angeben, einen Termin absagen und zusagen, Einladungen verstehen und schreiben, Feste nennen, Texte über Feste verstehen, Glückwünsche formulieren

Grammatik:

- Wortbildung
- Lokale, modale and temporale Präposition
- Präteritum von sein und haben
- Modalverben
- Pronomen *man*
- Imperativ
- Verbkonjugation
- Possessivartikel
- Konjunktiv II
- Verben mit Präfixen
- Demonstrativpronomen
- Personalpronomen im Dativ
- Frageartikel *welch-*
- Verben mit Dativ
- Komparation *gut, gern, viel*
- Ordinalzahlen
- Personalpronomen im Akkusativ
- Konjunktion *denn*

Evaluation Pattern:

Components	**CT**	**Home Assign**	**Att.**	**EE**
Weightage (%)	20	5	5	70

Text and References

- Niebisch, Daniele, Specht, Franz et al. (2016): Schritte international Neu 1, Niveau A1/2, Deutsch als Fremdsprache, Kursbuch und Arbeitsbuch, 1. Auflage, München: Hueber Verlag

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ORAL EXPRESSION-2

Course Code: DGER2201 **Credit Units: 02**

Course Objectives:
To provide the students with the know-how

- to understand the German phonetic system
- to develop strategies of listening comprehension
- to pass from written to oral, from oral to written easily
- to be sensitized to nuances of speech, dialectical variations.
- to overcome the fear of speaking a foreign language and take position as a foreigner speaking German.

Course Content:
Listening exercises and speaking tasks (imagining dialogues, role plays, telephone conversations) of:

- Niebisch, Daniele, Specht, Franz et al. (2016): Schritte international Neu 1, Niveau A1/2, Deutsch als Fremdsprache, Kursbuch und Arbeitsbuch, 1. Auflage, München: Hueber Verlag
- Deutche Welle : Deutsch Interaktiv

Evaluation Pattern :

Components	CT	Home Assign	Att.	EE
Weightage (%)	20	5	5	70

Texts & References

- Niebisch, Daniele, Specht, Franz et al. (2016): Schritte international Neu 1, Niveau A1/2, Deutsch als Fremdsprache, Kursbuch und Arbeitsbuch, 1. Auflage, München: Hueber Verlag

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GERMAN THROUGH ACTIVITIES

Course Code: DGER2202 **Credit Units: 02**

Course Objectives:

- To introduce plays, songs, poems and films with the purpose of helping students to read, listen, write, speak and think in German spontaneously; learn the content and be able to find new meanings through analysis, evaluation, synthesis and application
- To launch students on their personal course of learning through training in activities like acting, reciting poems, appreciating cinematography and writing film reviews
- To empower them to develop skills independently and to develop critical/ creative thinking

Course Content: Material compiled by the Department

Module I: Deutsch mit Spielen und Rätseln

Übungen, Spiele und illustierte Vokabeln, Phonetik und Wortschatzaufgaben.

Module II: Deutsch mit Gedichte und Lieder

Grammatische und phonetische und Vokabeln Übungen mit Kindergedichte und Lieder

Module III: Deutsch mit Rollenspiele

Rollenspiele von alltäglichen Themen, einen Dialog führen

Module IV : Deutsch mit Filme

Grammatik durch Filme, Die Themen verstehen und zusammenfassen,

Module V: Deutsch mit Märchen und Fabeln

Bekannte deutsche Märchen und Fabeln lesen und verstehen

Evaluation Pattern:

Components	CT	Att.	C	P
Weightage (%)	40	5	30	25

*****There is no end-term examination. There is continuous assessment.

Text & References

Material compiled by the Department.

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SEMESTER-III

WRITTEN EXPRESSION-3

Course Code: DGER2351 **Credit Units: 04**

Course Objectives:
To furnish the linguistic tools

- To describe past experiences and events like journey
- To talk about family, living conditions
- To ask and tell directions
- To talk about eating habits, order food in a restaurant
- To talk about different professions, making phone calls at workplace
- To give health tips and understand expert's opinion
- To discuss and give opinions on Germany's education and school system
  Give ideas/ suggestions/ requests, talk about gifts and gift- coupons, marriage customs

Course Contents:
Lektion 1 : Ankommen
Themen
Gründe nennen, von Alltagserlebnissen berichten, von Pannen im Alltag erzählen, über die Familie berichten, von Wohn-und Lebensformen erzählen

Lektion 2 : Zu Hause
Themen
Ortsangaben machen, Richtungen angeben, Gespräche mit Nachbarn führen, um Hilfe bitten, ein Radiointerviewverstehen, über ein Experiment sprechen, Zusammenleben im Mirtshaus, Müll,

Lektion 3 : Essen und Trinken
Themen
Häufigskeitsangaben machen, Dinge im Haushalt bennen, Gespräche bei einer Einladung führen, eine Radiosending zum thema 'Einladung' verstehen, ein Interview verstehen, Gespräche im Restaurant führen

Lektion 4: Arbeitswelt
Themen
Bedingungen ausdrücken, Ratschläge geben, Telefongespräche am Arbeitsplatz führen, ein Zeitungsinterview verstehen, einen Sachtext verstehen, über Arbeit und Freizeit sprechen

Lektion 5 : Sport und Fitness
Themen
Gesundheitstipps verstehen, Interesse ausdrücken, nach Interessen fragen, sich beim Betriebssport anmelden und nach informationen fragen, eine Informationsbroschüchre verstehen, die Meinung sagen

Lektion 6 : Ausbildung und Karriere
Themen
Über Wünsche und Pläne aur der Kindheit/Jugend sprechen, die Meinung sagen, üer das Schulsystem und die Schulzeit sprechen, Aus-und Wieterbildungsangebote verstehen, Forumstexte zu Traumberufen verstehen, über Berufswünsche sprechen

Lektion 7 : Feste und Geschenke
Themen

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Über Geschenkideen sprechen, Bitten und Empfehlungen ausdrücken, Kurznachrichten über eine Hochzeit verstehen, über ein Fest berichten, Meinungen und Vorlieben ausdrüken, von Festen erzählen, Feste planen

Grammatik :

- Konjunktion : *weil, wenn, dass*
- Perfekt der trennbaren Verben und nicht trennbaren Verben
- Genetiv
- Präposition
- Direktionaladverbien : *hierhin, dahin, dorthin,rein, raus, runter*
- Indefinitepronomen
- Konjunktiv II
- Reflexive Verben
- Verben mit Präpositionen
- Fragewörter und Präpositionaladverbien : *Worauf ? Darauf ?*
- Präteritum der Modalverben
- Dativ als Objekt

Evaluation Pattern:

Components	**CT**	**Home Assign**	**Att.**	**EE**
Weightage (%)	20	5	5	70

Text & References:

- Silke, Hilpert, Niebisch, Daniele, Specht, Franz et al. (2017): Schritte international Neu 1, Niveau A2/1, Deutsch als Fremdsprache, Kursbuch und Arbeitsbuch, 1. Auflage, München: Hueber Verlag

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ORAL EXPRESSION-3

Course Code: DGER2301 **Credit Units: 02**

Course Objectives:

To provide the students with the know-how

- to understand the German phonetic system
- to develop strategies of listening comprehension
- to pass from written to oral, from oral to written easily
- to be sensitized to nuances of speech, dialectical variations, and ,,Sprache bemerken und festhalten"
- to master the current social communication skills in oral
- to enrich the formulations, the linguistic tools and vary the sentence structure

Course Content:

Listening exercises and speaking tasks (imagining dialogues, role plays, telephone conversations, participating in debates, and discussions) of:

- Silke, Hilpert, Niebisch, Daniele, Specht, Franz et al. (2017): Schritte international Neu 1, Niveau A2/1, Deutsch als Fremdsprache, Kursbuch und Arbeitsbuch, 1. Auflage, München: Hueber Verlag
- Deutche Welle : Deutsch interaktiv

Evaluation Pattern:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text & References:

- Niebisch, Daniela et al. Schritte International 3. Ismaning : Heuber Verlag, 2006
- Niebisch, Daniela et al. Schritte International 4. Ismaning : Heuber Verlag, 2006
- Deutche Welle : Deutsch interaktiv

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GERMAN THROUGH LITERARY TEXTS

Course Code: DGER2302 **Credit Units: 02**

Course Objective:

- to make the students understand the differences between various kinds of literary texts like novel, poem, short story, parable etc.
- to introduce them to German literature through a study of selected literary works
- to enable them to read and understand literary texts and find new meanings through analysis, evaluation and synthesis
- to empower them to develop critical/ creative thinking

Course Content: Material compiled by the Department
Module I: Bedeutung und Merkmale der unterschiedlichen literarischen Textsorte :

Romane, Kurzgeschichten, Gedichte, Ballade, Fabeln, Märchen, Novelle usw.

Module 2: deutsche Kurzgeschichten :

- Das Brot- Wolfgang Borchert
- Ein Tisch ist ein Tisch- Peter Bichsel
- Popp und Mingel- Marie Luise Kaschnitz
- Anekdote zur Senkung Arbeitsmoral- Heinrich Boell
- Die Küchenuhr – Wolfgang Borchert

Module 3: deutsche Gedichte :

- Todesfuge- Paul Celan
- An den Mond- Goethe
- Wandrers Nachtlied- Goethe
- Der Knabe im Moor- Annette von Droste-Hülshoff
- Die Stadt- Theodor Storm

Module 4: deutsche Novelle:

- Das Erdbeben in Chili - Heinrich von Kleist
- Katz und Maus - Eine Novelle Günter Grass
- Der Tod in Venedig - Thomas Mann
- Peter Schlemihls wundersame Geschichte - A.v.Chamisso

Module 5 : deutsche Ballade, Fabeln, Märchen :

- Erlkönigs Tochter - Johann Gottfried von Herder
- Kinder- und Hausmärchen der Brüder Grimm - Brüder Grimm
- The Tortoise and the Hare

Evaluation Pattern:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text & References:

- Wolfgang Borchet : An diesem Dienstag neunzehn Geschichten. Rowohlt, Hamburg/Stuttgart 1947
- Johann Wolfgang von Goethe : An den Mond Goethes Schriften, Achter Band. Seite 153-154. G.J.Göschen, Leipzig 1789
- http://www.dirkvanwingerden.nl/Duits_GHL-web/Literatuur/B02.pdf

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- http://www.deutschunddeutlich.de/contentLD/GD/GT67cTischistTisch.pdf
- Annette von Droste-Hülshoff: Der Knabe im Moor, in: Deutsche Balladen, hrsg. v. Hartmut Laufhütte, Stuttgart 2000
- http://www.celan-projekt.de
- http://lyrik.antikoerperchen.de/theodor-storm-die-stadt,textbearbeitung,213.html
- http://www.literaturwelt.com/werke/herder/erlkoenigstochter.html

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SEMESTER-IV

WRITTEN EXPRESSION-4

Course Code: DGER2451 **Credit Units: 04**

Course Objective:
To develop the writing skills

- to express wishes, sentiments, possibilities
- to discuss weekend and free time activities
- to present, describe and compare objects
- to understand radio interviews
- telephonic conversations, automatic answering machine
- to understand transport news and directions
- to talk about and plan a trip to your dream destination
- to make conversations in a bank, exchange money

Course Contents:
Lektion 8: Am Wochenende
Themen:
Über Wünsche sprechen, Gegensätze ausdrücken, Vorschläge machen, auf Vorschläge reagieren, einen Veranstaltungskalender verstehen, Veranstaltungstipps in Anzeigen und im Radio verstehen

Lektion 9: Meine Sachen
Themen:
die eigene Meinung ausdrücken, Gegenstände beschreiben, eine Auktion machen, etwas vergleichen, eine Statistik ergänzen, Gespräche über das Kaufen verstehen, über das eigene Kaufen sprechen, einen Text über persönliche Gegenstände verstehen,

Lektion 10: Kommunikation
Themen:
Interviews zum Thema „Sammeln“ verstehen, Gegenstände beschreiben, unpersönliche Sachverhalte verstehen, Sprachnachrichten verstehen, Telefongespräche führen, Ein Quiz zu Gewohnheiten in Deutschland, eine Kursstatistik zum Thema Kommunikation erstellen, Informationen über einen Beruf verstehen

Lektion 11: Unterwegs
Themen:
Ortsangaben machen: Woher? Wo? Wohin?, Wegbeschreibungen verstehen, eine Wegbeschreibung geben, Gründe nennen, Verkehrsnachrichten im Radio verstehen, Verkehrsnachrichten und Berichte über das Wetter verstehen, einen Text über Verkehrsmittel verstehen, über Verkehr in der Heimat berichten

Lektion 12: Reisen
Themen:
Texte zum Thema Reiseziele verstehen, Vorschläge machen, Anzeigen von Unterkünften verstehen, über Vorlieben sprechen, Telefongespräche im Reisebüro verstehen und spielen, eine Reise buchen, Einladungen per Kurznachricht verstehen, jemanden per Kurznachricht zu sich einladen, ein Gespräch über eine Reise verstehen, eine Reise planen

Lektion 13: Geld
Themen:
am Bankschlater um Informationen bitten, über Banken sprechen, sich über Konditionen und Zahlungswege informieren, Informationen zu Dienstleistungen verstehen, über

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Dienstleistungen sprechen, eine Reportage verstehen, etwas beurteilen, Gespräche zum Thema „Geld verstehen“, ein Gespräch zum Thema „Geld“ schreiben

Lektion 14: Lebenssituationen
Themen:
persönliche Texte über wichtige Personen verstehen, über sich selber und andere sprechen, Streitgespräche verstehen, Interviews zu Lieblingsorten verstehen, Vorschläge für Urlaubsaktivitäten machen, auf Vorschläge reagieren, einen Text über Kosenamen verstehen, über Wünsche und Träume sprechen

Grammatik:

- Konjunktiv II: wäre, hätte, würde, könnte
- Konjunktion trotzdem
- Adjektivdeklination indefiniter Artikel
- Komparation
- Vergleichspartikel groß, wie
- Wortbildung Adjektive
- Adjektivdeklination definiter Artikel
- Passiv
- Fragepartikel Was für ein
- Wortbildung (un-, -ung, -bar)
- lokale Präposition aus, von, an-vorbei, auf, in etc.
- Konjunktion deshalb
- Adjektivdeklination ohne Artikel
- modale Präposition ohne
- temporale Präposition von-an, über
- indirekte Fragen mit Fragenpronomen, bei Ja-Nein Fragen
- Verb lassen
- Diminutiv -chen

Evaluation Pattern:

Components	**CT**	**Home Assign**	**Att.**	**EE**
Weightage (%)	20	5	5	70

Reference:

- Hilpert, Silke; Niebisch, Daniela; Pude, Angela et al. (2017): Schritte international Neu 4, Niveau A2/2, Deutsch als Fremdsprache, Kursbuch und Arbeitsbuch, 1. Auflage, München: Hueber Verlag

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ORAL EXPRESSION-4

Course Code: DGER2401 **Credit Units: 02**

Course Objective:

To provide the students with the know-how

- to understand the German phonetic system
- to develop strategies of listening comprehension
- to pass from written to oral, from oral to written easily
- to be sensitized to nuances of speech, dialectical variations, and ,,Sprache bemerken und festhalten"
- to master the current social communication skills in oral
- to enrich the formulations, the linguistic tools and vary the sentence structure

Course Content:

Listening exercises and speaking tasks (imagining dialogues, role plays, telephone conversations participating in debates, and discussions) of:

- Hilpert, Silke; Niebisch, Daniela; Pude, Angela et al. (2017): Schritte international Neu 4, Niveau A2/2, Deutsch als Fremdsprache, Kursbuch und Arbeitsbuch, 1. Auflage, München: Hueber Verlag
- Deutsche Welle : Deutsch Interaktiv

Evaluation Pattern:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text & References:

- Hilpert, Silke; Niebisch, Daniela; Pude, Angela et al. (2017): Schritte international Neu 4, Niveau A2/2, Deutsch als Fremdsprache, Kursbuch und Arbeitsbuch, 1. Auflage, München: Hueber Verlag

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ENHANCING LANGUAGE PROFICIENCY

Course Code: DGER2402 **Credit Units: 02**

Course Objective:
To enable students to enhance their language proficiency

- by analyzing texts and authentic documents of different genres
- through a study of newspaper and magazine articles and other texts

Course Contents:
Module 1
Verscheidene Texttypen und Textsorten
Analyse von Texte unterschiedlicher Genre.
Textexterne und textinterne Faktoren

Module 2
Informative Texte : Zeitungen, Zeitschriften, Sachtexte usw

Module 3
Kochrezepte, Gebrauchsanleitungen, Anzeige, Werbung, usw.

Evaluation Pattern:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text & References:
Material compiled by the Department

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SEMESTER-V

WRITTEN EXPRESSION-5

Course Code: DGER2551 **Credit Units: 04**

Course Objective:
To furnish the linguistic tools

- To report past experiences, to write a newspaper article, to talk about a happy or sad moments
- To express differences and contrasts, to describe people and things
- To talk about television programs, to find a consensus, to read a thriller novel
- To do & describe relaxing exercises for one's health, to give suggestions and advices, examination by a doctor, to talk about statistics, to understand an instruction leaflet
- To ascertain opinions and views, to talk about language learning, to understand a radio transmission.
- To talk about professional wishes and interests, about business ideas, to apply for a job and to introduce oneself over telephone
- To talk about holiday wishes and dialogues while shopping, to understand travel brochures
- To talk & exaggerate about a dream house, unreal wishes, to live neighbors and resolve conflicts

Course Contents:
Lektion 1: Glück im Alltag
Themen:
über Vergangenes berichten, Zeitungsmeldungen verstehen/ schreiben, über Erinnerungen aus der Kindheit sprechen, über Glücksmomente sprechen, ein Radiointerview verstehen, über Erlebnisse in der Vergangenheit sprechen, über Glücksbringer sprechen

Lektion 2: Unterhaltung
Themen:
über Serien sprechen, Mmeinungen und Vorlieben ausdrücken, Gegensätze ausdrücken, Eigenschaften von Dingen und Personen beschreiben, in einer Diskussion einen Konsens finden, eine Statistik zum Thema verstehen

Lektion 3: Gesund bleiben
Themen:
über Gesundheitstipps sprechen, Untersuchung beim Arzt, Vorgänge beschreiben, Fitnessübungen beschrieben und machen, einen Rat suchen, einen Ratschlag/ eine Empfehlung geben, eine Kursstatistik erstellen und darüber sprechen, einen Forumbeitrag verstehen und Tipps geben, Vermutungen austauschen, über Thesen diskutieren

Lektion 4: Sprachen
Themen:
über Irreales sprechen, höflich absagen, eine Radiosendung zum Thema „Fremdsprachen lernen" verstehen, höflich nachfragen, Tipps verstehen und zuordnen, Lerntipps geben, einen Text zum Thema „Mehrsprachigkeit" verstehen, über die eigenen Sprachen sprechen

Lektion 5: Eine Arbeit finden
Themen:
Stellenanzeigen verstehen, eine Bewerbung schreiben, eine Bewerbungsgespräch führen, über Berufswünsche und -interessen sprechen, Techniken verstehen und selbst anwenden

Lektion 6: Dienstleistung
Themen:

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Texte über Geschäftideen verstehen, über Geschäftideen sprechen, über Kenntnisse und Kompetenzen im Beruf sprechen, Ratschläge für Probleme im Arbeitsalltag geben, ein Kundengespräch im Geschäft führen, eine Beschwerde schreiben

Lektion 7: Rund ums Wohnen
Themen:
Probleme beim Zusammenleben, eine Hausordnung verstehen und schreiben, Konflikte mit Nachbarn lösen, Kritik höflich formulieren und höflich auf Kritik reagieren, über die eigene Wohnsituation schreiben, einen Text und ein Interview zum Thema „Fernbeziehungen" verstehen, über Beziehungen sprechen

Grammatik:

- Verbkonjugation im Präteritum
- Konjuktion (als, obwohl, statt, ohne, um-zu)
- Plusquamperfekt
- Gradpartikeln
- Relativpronomen
- Passiv Präsens mit Modalverben
- Genitiv mit definitem und indefinitem Artikel
- Konjuntiv II
- Präposition wegen, trotz
- Infinitiv mit zu
- Temporale Pröposition während, außerhalb, innerhalb
- Verben und Ausdrücke mit es

Evaluation Pattern:

Components	**CT**	**Home Assign**	**Att.**	**EE**
Weightage (%)	20	5	5	70

Reference:

- Hilpert, Silke; Kerner, Marion; Orth-Chambah, Jutta et al. (2018): Schritte international Neu 5, Niveau B1/1, Deutsch als Fremdsprache, Kursbuch und Arbeitsbuch, 1. Auflage, München: Hueber Verlag

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ORAL EXPRESSION-5

Course Code: DER2501 **Credit Units : 04**

Course Objective: To provide the students with the know-how

- to understand the German phonetic system
- to develop strategies of listening comprehension
- to pass from written to oral, from oral to written easily
- to be sensitized to nuances of speech, dialectical variations, and „Sprache bemerken und festhalten"
- to master the current social communication skills in oral
- to enrich the formulations, the linguistic tools and vary the sentence structure

Course Content:

Listening exercises and speaking tasks (imagining dialogues, role plays, telephone conversations participating in debates, and discussions) of:

- Hilpert, Silke; Kerner, Marion; Orth-Chambah, Jutta et al. (2018): Schritte international Neu 5, Niveau B1/1, Deutsch als Fremdsprache, Kursbuch und Arbeitsbuch, 1. Auflage, München: Hueber Verlag

Evaluation Pattern:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text & References:

- Hilpert, Silke; Kerner, Marion; Orth-Chambah, Jutta et al. (2018): Schritte international Neu 5, Niveau B1/1, Deutsch als Fremdsprache, Kursbuch und Arbeitsbuch, 1. Auflage, München: Hueber Verlag

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INTRODUCTION TO LITERATURE

Course Code: DGER2502 **Credit Units: 04**

Course Objective:
To introduce students to different literary epochs starting from enlightenment till modernism through extracts of selected texts from different genres by famous authors.

Course Content:

Module 1:
Aufklärung **:** Emilia Galotti (1772) – Lessing
Nathan der Weise (1779) - Lessing
Sturm und Drang : Teil des Briefromans : Leiden des jungen Werther(1774) –
Goethe Der Erlkönig - Goethe (1778)
Klassik : Maria Stuart – Schiller (1800)

Module 2 :
Romantik : Teil des romans Der blonde Eckbert (1797) – Tieck
Kinder- und Hausmärchen (1812) - Gebrüder Grimm

Junges Deutschland
und Vormärz : Der Hessische Landbote (1834) - Büchner
Woyzeck (1836) - Büchner
Das Lied der Deutschen (1841) – Fallersleben
Deutschland. Ein Wintermärchen (1844) - Heine

Realismus : Maria Magdalene (1844) - Hebbel
Immensee (1850) – Storm
Kleider machen Leute – Gottfried Keller

Module 3 :
Naturalismus **:** Bahnwärter Thiel (1888) - Hauptmann
Vor Sonnenaufgang (1889) – Hauptmann

Moderne : Buddenbrooks (1901) – Thomas Mann

Evaluation Pattern :

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text & References :

- Wulf , Segebrecht: *Gedichte und Interpretationen:* Band 3. Klassik und Romantik Taschenbuch – 1986
- Thomas , Mann:*Buddenbrooks* Paperback – Apr 2015
- Friedrich Hebbel : *Maria Magdalena* (German Texts) Paperback – Import, Dec 1944, Blackwell Publishers 1944
- Gottfried Keller : *Kleider Machen Leute*. Paperback, Nabu Press
- Ludwig Tieck: *Der Blonde Eckbert* / Der Runenberg , CreateSpace Independent Publishing Platform 2015
- Friedrich Schiller : *Maria Stuart: Ein Trauerspiel*. CreateSpace Independent Publishing Platform 2013

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- Gotthold Ephraim Lessing *: Emilia Galotti: Ein Trauerspiel* in fünf Aufzügen Taschenbuch 2014
- Nathan der Weise Taschenbuch – 3. Februar 2015
- Gotthold Ephraim Lessing , CreateSpace Independent Publishing Platform 2015
- Woyzeck Reclam XL – Text und Kontext Taschenbuch 2013
- Georg Büchner , Rüdiger Bernhardt C. Bange Verlag; Auflage: 3. Aufl. 2013
- Gotthold Ephraim Lessing : *Königs Erläuterungen: Textanalyse und Interpretation zu Lessing. Emilia Galotti*, Bange; Auflage: 2., Aufl. (10. August 2012)
- Theodor Storm: *Immensee*,CreateSpace Independent Publishing Platform 2012
- Heinrich Von Kleist : *Das Erdbeben in Chili / Die Verlobungin St. Domingo.* CreateSpace Independent Publishing Platform 2015
- Thomas Mann : *Der Tod in Venedig*2014

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INTRODUCTION TO LINGUISTICS

Course Code: DGER2503 **Credit Units: 04**

Course Objective:
This paper aims to provide the students the basic knowledge of Linguistics and its various branches of study. The focus of the paper is to enable the learners to have an understanding of the science of language and to be able to analyze linguistically any given language including the foreign language that they pursue.

Course Contents:
Module I: Introduction
What is language and linguistics?
Design features of human language.
Various branches of Linguistics and their application.

Module II: Phonetics and Phonology
Anatomy and physiology of speech production
Classification of sounds through IPA symbols
Difference between Phonetics and Phonology.

Module III: Morphology
Basic concepts of morphology
Word Formation processes

Module IV: Syntax
Theories and concepts of Syntactic structure.
Analysis of sentence structure

Module V: Semantics
Basic concepts of Semantics
Meaning and types of Meaning

Evaluation Pattern:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text & References:
Text: Fromkin, V., and R. Rodman. 1974 (9th Edition) *An Introduction to Language*. New York: Holt, Rinehart and Winston.

References:

- Akmajian, A., R.A. Demers, A.K. Farmer, & R.M. Harnish 2001. *Linguistics: An Introduction to Language and Communication*. Cambridge, Massachusetts: The MIT Press
- Carnie, Andrew. 2013 (3rd Edition). *Syntax: A Generative Introduction*. West Sussex: Wiley-Blackwell Publication
- Crystal D.1997. *Encyclopedia of Language: 2nd Vol*., Cambridge: Cambridge University Press
- Haegeman, L. 1991. (rev. Ed.). *Introduction to Government and Binding Theory*.
- Hockett. C.F. 1958. *A Course in Modern Linguistics*. New York: Macmillian. Indian Edition, New Delhi: Oxford and IBH Publishing Co.
- Katamba, F. and John Stonham 2006. *Morphology* 2nd ed. London: Palgrave.
- Ladefoged, Peter. 2001 (4th edn.). *A course in phonetics*. New York: Harcourt Brace.

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- Lyons J, 1977. *Semantics*. 2 Vols. Cambridge: Cambridge University Press.
- Odden, David. 2005. *Introducing phonology*. Cambridge: Cambridge University Oxford: Blackwell.Press
- Roach, P. 2001. *Phonetics*. Oxford: Oxford University Press.

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WRITTEN EXPRESSION-6

Course Code: DGER2651 **Credit Units: 04**

Course Objective:
To furnish the linguistic tools

- To give, accept and decline an invitation
- To talk about wishes and expectations
- To read biographies and make notes
- To compare pictures
- To read advertisements
- To talk about rights and duties
- To predict things and advice
- To talk about media and its role
- To talk about eating habits and food
- To summarize a text
- To express ideas about nature
- To describe tourist places
- To talk about professions and job applications
- To write a bio data and to ask questions regarding it
- To talk about relationships
- To discuss a hypothesis, to take a position and to criticize
- To talk about books and reading habits
- To talk about a theme for and against the motion, to interrupt and continue a discussion.

Course Contents:
Lektion 8: Unter Kollegen
Themen:
Arbeitsaufträge höflich ablehnen, ein Interview verstehen, über den Umgang mit Kollegen diskutieren, eine Person näher beschreiben, das Du anbieten, duzen oder sitzen?

Lektion 9: Virtuelle Welt
Themen:
über Arbeitsabläufe sprechen, etwas planen, über Schein und Wirklichkeit sprechen, über die Funktion von Geräten sprechen, Bedienungsanleitungen verstehen und erklären, wie etwas funktioniert, in einem Forum antworten, eine Radiodiskussion zum Thema „digitale Welt“ verstehen, über digitale Medien diskutieren

Lektion 10: Werbung und Konsum
Themen:
sich beschweren, etwas reklamieren, über Pannen und Missgeschicke im Alltag sprechen, Produkte beschreiben, eine Radioreportage zum Thema Crowdsourcing verstehen, Crowdsourcing ausprobieren, einen Lesetext zum Thema verstehen

Lektion 11: Miteinander
Themen:
Vermutungen, Pläne, Versprechen ausdrücken, über gutes Benehmen und Umgangsformen sprechen, Regeln im Straßenverkehr, falsches Verhalten im Straßenverkehr, Aussagen zum Thema Fremdheit verstehen, über Erfahrungen von Fremdheit sprechen, Aussagen zu unterschiedlichen Arbeitsalltagen verstehen, den eigenen Arbeitsalltag beschreiben

Lektion 12: Soziales Engagement
Themen:

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Angebote eines Bahnunternehmens verstehen, ein Problem beschreiben und sich beraten lassen, Informationen zu Vereinen in deutschsprachigen Ländern verstehen, über persönliches Engagement sprechen, über Vorbilder sprechen, über Gewissensfragen sprechen und einen Standpunkt vertreten

Lektion 13: Auf Politik und Geschichte
Themen:
Über Biografien sprechen, etwas bewerten und vergleichen, seine Meinung sagen, Verbesserungsvorschläge machen, Zeitungsmeldungen verstehen und Zusammenfassen, deutsche Geschichte nach 1945 verstehen, die Geschichte eines Landes präsentieren

Lektion 14: Alte und neue Heimat
Themen:
über regionale Spezialitäten sprechen, ein Fest planen, eine Reportage zum Thema verstehen, über Heimat sprechen, über Europa und die Europäische Union sprechen, über den eigenen Deutschlernweg sprechen, über Pläne und die Zukunft sprechen

Grammatik:

- Konjunktion (falls, während, nachdem, bevor, als-ob, je-desto, sowohl-als auch, weder-noch, da, seit, seitdem, bis, indem, ohne dass, ohne zu)
- Relativsatz mit Präpositionen
- Adjektiv als Nomen
- Relativsatz mit wo und was
- Partizip Präsens als Adjektiv
- Futur I
- Präposition außer + Dativ
- Passiv Perfekt
- Passiv Präteritum
- Adjektivdeklination mit Komparativ und Superlativ

Evaluation Pattern:

Components	CT	Home Assign	Att.	EE
Weightage (%)	20	5	5	70

Reference:

- Hilpert, Silke; Kerner, Marion; Pude, Angela et al. (2018): Schritte international Neu 6, Niveau B1/2, Deutsch als Fremdsprache, Kursbuch und Arbeitsbuch, 1. Auflage, München: Hueber Verlag

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BUSINESS GERMAN

Course Code: DGER2601 **Credit Units: 4**

Course Objective:
The Program's objective is to familiarize students with the current terminology used in German business contexts and building an extensive active and passive Business German vocabulary.

Course Content: Unternehmen Deutsch (Course Book) and the material compiled by the Department.

Module I
Herzlich Willkommen:
Gäste, Besucher begrűßen, sich vom Gastgeber verabschieden, Wűnsche , Bitten im Hotel vortragen, Besuchs und Besichtigungprogramme planen, sich nach Veranstaltung erkűndigen Speisen und Getränke empfehlen und bestellen.

Rund um die Firma
Űber Branchen und Produkte sprechen, Wirtschaftbereiche benennen, Schaubilder und Diagramme beschreiben, Unternehmenstrukturen erläutern, die Geschichte einer Firma darstellen, ein Unternehmen vorstellen.

Am Arbeitsplatz
Abteilung im Betrieb und ihre Aufgaben darstellen, Betieblicher Arbeit, neue Mitarbeiter vorstellen,űber Krankenheiten,Schmerzen und Beschwerden sprechen,Fragen beim Arzt beantworten, Krankversicherungssysteme vergleichen.

Von Haus zu Haus mit…
Planen und organisieren, auf Aufträge erteilen und reagieren, passende Mittel in der Geschäftkommunikation wählen.

Das perfekte Mietsystem
Abläufe beschreiben: Was wird von wem gemacht? űber Vereinbarung und Verpflichtung informieren, Ursachen fűr Störungen im geschäftlichen Ablauf ermitteln, Verschiedene Zahlungsweisen unterscheiden und benutzen.

Grammatik
- Reflexivpronomen und Verben
- Genitiv-Atribut
- Possessivartikel
- Verben mit Präposition
- Satzbau: Dativ-und Akkusativ
- Adjektivendung
- Relativsatz und pronomen
- KII-Gegenwart und Vergangenheit: wűrde+Infinitiv, hätte/ware+Partizip
- Passiv
- Indirekte Fragen mit Ob und dass Sätze

Evaluation Pattern:

Components	CT	Att.	H	EE
Weightage %	20	5	5	70

Text & References:
- Jörg Braunert, Wolfram Schlenker : Unternehmen Deutsch B1/B2. Ernst Klett Sprachen GmbH, Stuttgart 2006

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SPECIALISED STUDY OF AN AUTHOR- GEORG BÜCHNER

Course Code: DGER2602 **Credit Units: 04**

Course Objective:

- To enable students to do a detailed study of a literary work- *„Woyzeck''* **von Georg Büchner**
- To understand a work in relation to the author and in relation to the other works of the author
- To provide a broad perspective of the thoughts and philosophy of the period, of the contemporary works

Course Contents:

Module 1

Studie des Drama**„Woyzeck'' von Karl Georg Büchner**

Module 2

Der Autor, Biographie, literarische Werke

Module 3

Die Zeitwende, zeitgenössische Autoren und Ihre Werke

Module 4

Schreibstil des Autors (dramatische Technik der szenischen Darstellung und Episierung)

Evaluation Pattern:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text & References:

- Wirthwein Heike(Hg.)Büchner Georg,*Woyzeck Reclam XL Text und Kontext Taschenbuch*. Philipp,jun. GmbH, 2013.
- Büchner, Georg, Friedrich Ludwig Weidig, and Hans Magnus Enzensberger. *Der hessische Landbote*. Insel Verlag, 1965.
- Büchner, Georg: Leonce und Lena Ein Lustspiel, Joseph Kiermeier-Debre (Hg.), Deutscher Taschenbuch Verlag.(1. März 1998)
- Büchner, Georg: *Lenz*, Archipelago; Bilingual edition (November 1, 2004)
- Büchner, Georg**:** *Dantons Tod* (German Edition), Klett Lerntraining; Auflage: 4. Auflage (11. März 2013)

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INTRODUCTION TO TRANSLATION

Course Code: DGER2603 **Credit Units: 04**

Course Objective:
To introduce to students

- basic concepts and theory of translation
- methods and procedures

Course Contents:

Module I
What is translation, the concept of source text and target text, the concept of original audience and target audience, text internal and text external factors, types of dictionaries and references, using parallel text and background text.

Module II
Introduction to methodology and theories of translation, equivalence and adequacy in translation, skopus theory, about various pioneers of translation and their theories.

Module III
Grammatical and lexical aspects of translation, stylistic variations in language, various text types.

Evaluation Pattern:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text & References:

- Venuti, Lawrence. *The Translation Studies reader*. Routledge, 2012.
- Schleiermacher, Friedrich. "On the different methods of translating." *The translation studies reader* (1813): 43-63.Benjamin, Walter. *The task of the translator*. Vol. 69. Illuminations, 1968.

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SEMESTER-VII

WOMEN'S WRITING IN GERMAN SPEAKING COUNTRIES

Course Code: DGER2701 **Credit Units: 04**

Course Objectives:

The course will focus on a selection of texts by women writers, locating and analyzing major trends, issues, themes and debates in the light of various critical perspectives formulated by the gender studies.

Course Learning Outcomes

- The student will develop an understanding of women writers and major trends
- The student will become familiar with the works of major women writers
- The student will be able to analyze the literary texts in the light of various perspectives of gender theory.

***Suggested Readings*:**

- Butler,Judith:DasUnbehagenderGeschlechter.Frankfurta.M.:Suhrkamp1991[Gender Trouble. NewYork [u.a.]1990].
- Gnüg,Hiltrud;Möhrmann,Renate(Hg.):Frauen-Literatur-Geschichte.Schreiben-deFrauenvomMittelalterbiszurGegenwart.Stuttgart,Weimar:Metzler1999.
- Hof, Renate: Die Grammatik der Geschlechter. ›Gender‹ als Analysekategorie derLiteraturwissenschaft.Frankfurta.M.,NewYork:CampusVerlag1995.
- Vinken, Barbara (Hg.): Dekonstruktiver Feminismus. Literaturwissenschaft in Amerika.Frankfurt/M.:Suhrkamp 1992.
- Weigel,Sigrid:TopographienderGeschlechter.KulturgeschichtlicheStudienzurLiteratur.Reinbek beiHamburg:Rowohlt1990.

Evaluation Pattern:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

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INTRODUCTION TO FILM & MEDIA STUDIES

Course Code: DGER2702 **Credit Units: 04**

Course Objectives:
The course will introduce the representational and communicative practices developed in different forms of the media, i.e.cinema/electronic and print media.

Course Learning Outcomes

- The student will develop an understanding of the evolution of the various forms of the media
- The student will become familiar with the print media practices.
- The student will become familiar with the electronic media and cinema.

***Suggested Readings*:**

- Kolker,Robert: MediaStudies:An Introduction. Malden,MA:Wiley-Blackwell,2009
- Nelmes,Jill (ed.): An IntroductiontoFilm Studies.4thedition, London,New York: Routledge,2007
- Stam, Robert; Miller, Toby (eds.): Film and Theory: An Anthology, Oxford: Blackwell Publishers,2000
- Badley,Linda; Palmer,R.Barton;Schneider,StevenJay: (eds.): Traditionsin WorldCinema.Edinburgh:Edinburgh UniversityPress, 2006
- Long,Paul;Wall,Tim:MediaStudies:Texts,ProductionandContext.Harlow,Essex,NewYork:PearsonLongman, 2009

Evaluation Pattern:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

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TRANSLATION: THEORY AND PRACTICE-1

Course Code: DGER2703 **Credit Units: 04**

Course Objectives:

Study of the principles of translation, contrastive syntactical structures (German/English), translation of specific text types (German/English, English/German) and some theoretical approaches.

Course Learning Outcomes

- The student will be familiar with the different theoretical approaches to Translation Studies
- The student will be trained in the practical aspects of translation of different types of texts.

***Suggested Readings*:**

- JeremyMunday:IntroducingTranslationStudies,TheoriesandApplications.NewYork:Routledge,2012
- KirstenMalmkjær,KevinWindle:TheOxfordHandbookofTranslationStudiesOxford:OUP,2011
- SusanBassnett-Meguire:TranslationStudies.London:Routledge,2014
- Mona Baker, Gabriela Saldanha, eds: Routledge Encyclopedia of Translation Studies.Abingdon/ NewYork:Routledge, 2011
- MarySnell-Hornby:HandbuchTranslation.Tübingen:StauffenburgVerlag,2006
- JörnAlbrecht:LiterarischeÜbersetzung:Geschichte-Theorie-KulturelleWirkung.Darmstadt:WBG(WissenschaftlicheBuchgesellschaft),2009
- ChristianeNord:EinführungindasfunktionaleÜbersetzen:amBeispielvonTitelnundÜberschriften.Tübingen:Francke, 1993.

Evaluation Pattern:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

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STUDY OF A GENRE (SHORTER NARRATIVE FORMS)

Course Code: DGER2704 **Credit Units: 04**

Course Objectives:

Study of various shorter narrative forms such as Novelle, Erzählung, Kurzgeschichte, Märchen, Fabel, Sage, etc

Course Learning Outcomes

1. Provides knowledge about the various shorter narrative forms.
2. Develops knowledge about the leading writers of these forms and their specificity.

Gives an overview of the evolution of these genres across various centuries up to the contemporary period

Suggested authors:

Goethe, the Grimm Brothers, HeinrichvonKleist, GottfriedKeller, TheodorStorm, FranzKafka, post war and contemporary writers.

***Suggested Readings*:**

- LeonieMarx:DieDeutscheKurzgeschichte.Stuttgart:Metzler,2005
- HugoAust:Novelle.Stuttgart/Weimar:Metzler,2012
- HansChristophGrafvonNayhauss(Hg.):TheoriederKurzgeschichte.Stuttgart:Reclam,2004.
- SonjaHilzinger(Hg.):KleineliterarischeFormen:InEinzeldarstellungen.Stuttgart:Reclam,2002
- MaxLüthi:Märchen.Stuttgart:Metzler,2004.
- Manfred Durzak: Die deutsche Kurzgeschichte der Gegenwart. Autorenportraits,Werkstattgespräche,Interpretationen.Würzburg:VerlagKönighausen &Neumann2002.
- WernerBellmann(Hg.):KlassischedeutscheKurzgeschichten.Stuttgart:Reclam,2005.
- RolfFüllmann:EinführungindieNovelle.Darmstadt:WBG(Wissenschaftliche Buchgesellschaft),2010
- TilmannKöppe,TomKindt:Erzähltheorie.EineEinführung.Stuttgart:Reclam,2014

Evaluation Pattern:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

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DGER2739	BASICS OF RESEARCH METHODOLOGY, ETHICS, AND RESEARCH COMMUNICATION	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description

This course aims to provide students with a comprehensive understanding of conducting ethical research, utilizing proper research methodologies, and effectively communicating research findings. The course includes a final project where students will write a Literature Review on a topic chosen in consultation with the teacher(s).

This course is designed to equip students with essential skills and knowledge to conduct ethical research, employ proper research methodologies, and effectively communicate scientific information (with focus on writing a literature review). The course will cover topics such as research design, data collection and analysis, research ethics, and science communication strategies. Through a combination of lectures, discussions, case studies, and practical exercises, students will develop a deeper understanding of the research process and its ethical implications.

Course Objectives

The objective of this course is to impart knowledge about various stages of research process, research ethics and different ways of research communication.

The aim of this course is to impart research skills to the beginners and help to improve the quality of research by the existing researchers. It also encompasses the understanding and application of appropriate research design, statistics, and the use of the computer for reference management, report writing, research paper writing and presentation. The course also introduces the key conceptual issues of each research method, as well as giving practical guidance. It covers the series of research methodology contents: from problem formulation, to design, to data collection, analysis, reporting and dissemination. The course has the dual aims of equipping students with conceptual understandings of current academic debates regarding different methods, and the practical skills to put those methods into practice.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define criteria of good research, steps in research process, and data collection.

CO2. Identify different types of sampling and its purpose.

CO3. Conduct hypothesis testing for different types of samples and interpret the results.

CO4: Learn the importance of literature review, write research paper/thesis, use reference management software.

Course Content :

Module	Topic	**Blooms level***	Hours
1	**Research Methodology** Understanding the research process: From research questions to conclusions	L1, L2	10

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	Types of research: Qualitative and quantitative research Exploratory, descriptive, experimental, and correlational studies Scientific Thinking: Subjective Vs. Objective Thinking Logical Reasoning: Inductive Vs. Deductive Reasoning Formulating research hypotheses and objectives Purpose of a good research, Criteria of good research		
2	**Descriptive Statistics** Data, Types of Data, Methods of data collection, Benefits and drawbacks, Graphical representation of data and interpretation. Measures of Central Tendency: Arithmetic Mean, Median, Mode, Measures of Dispersion: Range, Standard Deviation, Variance, Coefficient of Variation.	L1, L2, L3	15
3	**Inferential Statistics** Sampling: Basic concepts, Process of Sampling, Sample Size, Types of Samples, Sampling and non- sampling errors, Statistics and Parameters, Sampling Distribution of Means and Proportion, **Hypothesis Testing**, steps in testing of hypothesis, errors in hypothesis testing, z test and t test.	L1, L2, L3	15
4	**Research Ethics** Plagiarism, Fabrication, Falsification, Ethics with respect to human and Animal Research	L1, L2	5
5	**Communication** Characteristics of a good Research paper, Systematics Literature Review (choosing a topic, preparing outline, gathering authentic & appropriate references, avoiding plagiarism, use of reference management systems), Writing a good literature review, Structure of report (Introduction, Methodology, Analysis, Results, Discussions, Conclusions, Recommendations), Writing Quality Research Paper, Publishing Research Work in Quality Journals, Reference Management Software	L1, L2, L3	15

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional Exam	End Term Examination
Weightage (%)	5	10	15	70

Project based assignment: Student teams (2-3 students per team) will write a literature review on a topic of choice, in consultation with the teacher.

Text books/ Reference books

- Research Methodology for Natural Sciences by Soumitro Banerjee, Publisher: IISc Press (1 January 2022); ISBN-10: 8194835178; ISBN-13: 978-8194835172

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- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt. Ltd., New Delhi-110001
- Geode, Millian J.& Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Kothari, C.R.2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.
- Levin R I., Rubin D S. Statistics for Management. Sixth Edition, PHI
- Kapoor & Gupta. Probability & Statistics. S Chand Publishers, New Delhi.
- Montomery, Douglas C.(2007), 5th Ed. Design and Analysis of Experiments, Wiley India.
- Cooper, Donald R. and Pamels Schindler, Business Research Methods, Tata McGraw Hills, New Delhi
- Krishnaswamy, K.N. Sivakumar. Appa lyer and Mathiranjan M. 2006, Management Research Methodology: Integration of Principles, Methods and Techniques, Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Sachdeva, J.K. 2008. Business Research methodology. Himalaya Publishing House, New Delhi.
- Shekharan, Uma, Business Research Methods, Miley Education, Singapore.
- Zikmund, Millian G., Business Research Methods, Thomson Learning, Bombay.

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SEMESTER-VIII

CULTURAL HISTORY OF GERMAN SPEAKING COUNTRIES

Course Code: DGER2801 **Credit Units: 04**

Course Objectives:
Study of the major social and cultural movements and their reflection in literature and the arts.

Course Learning Outcomes

- The student will develop an understanding of German cultural history.
- The student will acquire knowledge about the major literary and cultural movements.

***Suggested Readings*:**

- WolfgangBeutin:DeutscheLiteraturgeschichte.VondenAnfängenbiszurGegenwart.Stuttgart/Weimar:Metzler, 2013
- HeinzSchlaffer:DiekurzeGeschichtederdeutschenLiteratur.München:HanserVerlag,2002
- WolfWucherpfennig:DeutscheLiteraturgeschichte.VondenAnfängenbiszurGegenwart.Stuttgart:KlettVerlag,2010
- BenediktJeßing:NeueredeutscheLiteraturgeschichte:EineEinführung.Tübingen:NarrVerlag,2015
- UlrichHerbert:GeschichteDeutschlandsim20.JahrhundertMünchen:C.H.BeckVerlag,2014
- DieterHein:DeutscheGeschichteim19.Jahrhundert.München:C.H.BeckVerlag,2016
- Axel Schildt und Detlef Siegfried: „Deutsche Kulturgeschichte“. Die Bundesrepublik von 1945 biszurGegenwart.München:HanserVerlag,2009
- SilviaSerenaTschopp,WolfgangE.Weber:GrundfragenderKulturgeschichte.Darmstadt:WBG(WissenschaftlicheBuchgesellschaft), 2007

Evaluation Pattern:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

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TRANSLATION: THEORY AND PRACTICE-2

Course Code: DGER2802 **Credit Units: 04**

Course Objectives:
Study of the principles of translation, contrastive syntactical structures (German/English), translation of specific text types (German/English, English/German) and some theoretical approaches in continuation with Course 104.

Course Learning Outcomes

- The student will become familiar with the different theoretical approaches to Translation Studies
- The student will be trained in the practical aspects of translation of different types of texts.

***Suggested Readings*:**

- Jeremy Munday: Introducing Translation Studies, Theories and Applications,Routledge,NewYork,2012
- WalterBenjamin:„DieAufgabedesÜbersetzers“(1921/23)
- RadegundisStolze:Übersetzungstheorien:EineEinführung.Tübingen:Narr,2011
- MarySnell-Hornbyu.a.:HandbuchTranslation.Tübingen:Stauffenburg,2006
- JörnAlbrecht:LiterarischeÜbersetzung:Geschichte-Theorie-KulturelleWirkung.Darmstadt:WBG(WissenschaftlicheBuchgesellschaft),2009
- MonaBaker,GabrielaSaldanha,eds:RoutledgeEncyclopediaofTranslationStudies.London&NewYork:Routledge, 2009.

Evaluation Pattern:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

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STUDY OF A GENRE (THEATRE)

Course Code: DGER2803 **Credit Units: 04**

Course Objectives:
Study of theatre as a genre and its development through a selection of representative authors from the Enlightenment till the present day.

Course Learning Outcomes

- The student will develop an understanding of the specificities of the genre.
- The student will become familiar with the historical evolution of the genre.
- The student will read the major authors of German literature.

Suggested authors: Lessing, Goethe, Schiller, Georg Büchner. Friedrich Hebbel, Arthur Schnitzler,Gerhart Hauptmann, Georg Kaiser, Bertolt Brecht, Max Frisch, Friedrich Dürrenmatt, Peter Weiss,Heiner Müller, postdramatischesTheater

***Suggested Readings*:**

- Bernhard Asmuth:EinführungindieDramenanalyse.8.,aktualisierteunderweiterte Auflage.Stuttgart:Metzler, 2016
- ErikaFischer-Lichte,DorisKolesch,MatthiasWarstat:MetzlerLexikonTheatertheorie.2.,aktualisierteund erweiterteAuflage.Stuttgart:Metzler, 2014
- PeterW.Marx(Hg.)HandbuchDrama.Theorie,Geschichte,Analyse.Stuttgart/Weimar:Metzler,2012
- PeterLangemeyer(Hg.):Dramentheorie:TextevomBarockbiszurGegenwart.Stuttgart:Reclam,2011
- Hans-Thies Lehmann: PostdramatischesTheater.Frankfurt/M:VerlagderAutoren,2005

Evaluation Pattern:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

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STUDY OF A GENRE (POETRY)

Course Code: DGER2804 **Credit Units: 04**

Course Objectives:

Study of poetry as a genre and its development through a selection of representative authors from the Middle Ages till the present day.

Course Learning Outcomes

- The student will develop an understanding of the specificities of the genre.
- The student will become familiar with the historical evolution of the genre.
- The student will read the major authors of German literature.

Suggested authors: Walther von der Vogelweide, Andreas Gryphius, Goethe, Friedrich Hölderlin,Novalis, Joseph von Eichendorff, Heinrich Heine, Rainer Maria Rilke, Gottfired Benn, Bertolt Brecht,postwar and contemporary poets.

***Suggested Readings*:**

- Dieter Lamping (Hg): Handbuch Lyrik: Theorie - Analyse - Geschichte. 2., erweiterte Auflage.Stuttgart:Metzler, 2016.
- DieterBurdorf:GeschichtederdeutschenLyrik.EinführungundInterpretationen,Stuttgart:Metzler,2015
- Hans-DieterGelfert:WieinterpretiertmaneinGedicht?Reclam:Stuttgart1990.
- HeinrichDetering(Hg.):ReclamsgroßesBuchderdeutschenGedichte.VomMittelalterbisins21.Jahrhundert.Reclam, Stuttgart 2007
- WulfSegebrecht,ChristianRößner(Hg.):DasDeutscheGedicht.VomMittelalterbiszurGegenwart.S.Fischer, FrankfurtamMain2005
- Hans-JoachimWillberg:DeutscheGegenwartslyrik.EinepoetologischeEinführung.Reclam,Stuttgart2012

Evaluation Pattern:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

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DGER2839	DATA ANALYSIS & VISUALISATION USING SOFTWARE	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	Class X Mathematics				
Co-requisites					

Catalog Description

The implosion of available data has made visualization more critical but also more challenging. Data analysis and Data Visualization are essential tools for business analysis, engineers, policymakers, and decision-makers. Developed originally for "small data", visualization techniques have been met with varied success in the past centuries and decades. There are a few well-known visualizations that are very effective in capturing the essence of the data, and of course, there are many infamous negative examples of poor visuals. An effective visual is critical for decision making it, but it also requires a lot of work, customization, attention to detail, and refinements.

Course Objectives

The course is designed to help students develop skills and knowledge in the following area(s):

- Develop an understanding of what is a good visualization for a given purpose
- Learn visualization theory & techniques
- Build a substantial data analytic project
- Apply data analysis and visualization with Excel, SPSS, R, Python, NVivo and MATLAB

Course Outcomes

On completion of this course, the students will be able to

CO1. Students will be able to articulate meaningful lines of inquiry that might be explored through the collection, organization, visualization, and analysis of data in a context associated with their primary field of study using (as appropriate) numerical, textual, spatial, and/ or visual data.

CO2. Student will understand what data are, how they are collected, and how to assess the quality/ reliability of data.

CO3. Students will demonstrate intermediate proficiency in the visualization of data to communicate information and patterns that exist in the data.

CO4: Students will be able to use at beginning level of proficiency the tools of statistics and machine learning to ask questions of and explore patterns in data.

Course Content :

Module	Topics Covered	Blooms Level	Contact Hours
1	**Module-1: Introduction to Excel** Data Analysis using Excel, Curve fitting, Correlation, Linear Regression, Multiple regression, Principal Component Analysis and Factor Analysis, Hypothesis testing **Introduction to Excel and SPSS** Introduction to SPSS and Types of Data, Importing, exporting and data handling in SPSS; Exploratory data analysis using SPSS and data visualization;	L1, L2, L3, L4	20 hours

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	Introduction to statistical inference and various univariate tests by using SPSS; Analysis of Variance (One Way ANOVA, Two Way ANOVA and ANCOVA); Correlation, Simple and Multiple linear Regression Analysis; Principal Component Analysis and Factor Analysis		
2	**Module-2: VOS Viewer** **Web of Science, Scopus, Dimensions, Lens, and PubMed.** Co-authorship networks, citation-based networks, and co-occurrence networks can be created based on data downloaded from Web of Science, Scopus, Dimensions, and Lens. Co-authorship networks and co-occurrence networks can also be created based on PubMed data. **Crossref, Europe PMC, and OpenAlex**. Networks can also be created based on data retrieved through the APIs of Crossref, Europe PMC, and OpenAlex, These APIs can be queried interactively in VOS viewer. **Semantic Scholar, Open Citations, and Wiki Data.** For a given set of DOIs, networks can also be created based on data retrieved through the APIs of Semantic Scholar, Open Citations and Wiki Data.	L1, L2, L3, L4	10 Hours
3	**Faculty of Management Studies & Behavioural Sciences** **Module 3: Domain Specific Software** **- Structural Equation Modelling** **Smart PLS** Introduction to Structural Equation Modelling (SEM), Introduction to the software's AMOS and SPSS, SMART PLS, Testing of Statistical assumptions, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), common method bias (CMB) test, Measurement Model Assessment, Discussing Fit Indices, Reliability and Validity Testing, Structural Model Assessment identifying multivariate outlier, Construct Validity: Convergent and Discriminant Validity, Measurement Model & Structural Equation Modelling, Mediation and Moderation Effects, Multi-Group Analysis.	L1, L2, L3, L4	30 Hours
	Faculty of Arts **N Vivo** 1. Import text, audio, video, emails, images, spreadsheets, online surveys, web content, and social media from various sources into a simple, intuitive interface.		

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	2. Create and NVivo project, import and organise qualitative and quantitative data 3.Manage a literature review in NVivo 4. Autocode structured data deductively and identify themes inductively 5. Generate and falsify hypotheses 6. Combine data in sets for analysis 7. Seek patterns and identify relationships across codes and cases 8. Present findings using visualisations 9. Export data out of NVivo 10. Coordinate teamwork.		
	Faculty of Science Engineering and Technology **Faculty of Health & Allied Sciences** **R programming / Python/ MATLAB** **R Programming-** Introduction to R, Variables and datatypes in R, Dataframes, Recasting and joining of dataframes, Arithmetic, logical and matrix operations in R, Functions in R, Control structure in R, Data visualization in R. **Python Programming-** Basics of programming, data structure and algorithm using Python, Strings, lists, control, functions, manipulating lists, loops, arrays, selection sort, insertion sort, recursion, sorting, dictionaries, exception handling, file handling, string processing, data analysis using Python **MATLAB Programming-** Introduction, basic features, managing workspace, mathematical functions, basic plotting, Matrices, array operations and linear equations, MATLAB programming- M files script, M-file functions, control flow and operations.		

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional (Theory/ Practical)	End Term Examination
Weightage (%)	5	10	15	70

References:

- David Houcque, 2005. Introduction to MATLAB programming for Engineering students., Northwestern University, E- Book **https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf**
- Mark Lutz, 2009. Learning Python. O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.
- Emmanuel Paradis, 2005. R for Beginners. E book. **https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf**
- A Handbook of Statistical Analysis using SPSS by Dr. Brijesh Awasthi, Redshine Publication

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Amity School of Liberal Arts & FL

Bachelor of Arts (Honors/ Honors with Research) in Spanish

FLEXILEARN
-Freedom to design your degree



Curriculum & Scheme of Examination

2023

AMITY UNIVERSITY HARYANA

GURUGRAM

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Bachelor of Arts (Honors/ Honors with Research) in Spanish
SEMESTER-I

WRITTEN EXPRESSION-1
(Expresión Escrita-I)

Course Code: DSPA2151 **Credit Units: 04**

Course Objective: To introduce the students to several linguistic tools. To enable them

- to present oneself and others, to ask and give personal information
- to give directions, to describe one's surrounding
- to talk about likes and dislikes hobbies
- to tell time and date, to talk about daily routine
- to describe weather
- to take about events in past, to talk about one's experiences

Course Contents:
Unidad 1:
Nosotros
Objetivos Comunicativos:

A dar y a pedir los datos personales: el nombre, la edad etcétera. , a saludar y a despedirnos.

Unidad 2: Quiero aprender español
Objetivos Comunicativos:
A expresar intenciones, a expresar intereses, a explicar motivos de lo que hacemos.

Unidad 3: ¿Dónde está Santiago?
Objetivos Comunicativos:
Describir lugares y países, expresar existencia, hablar de ubicación, hablar del clima.

Unidad 4: ¿Cuál prefieres?
Objetivos Comunicativos:
Identificar objetos, expresar necesidad, hablar de preferencias, comprar en tiendas, preguntar pro productos, pedir precios etc.

Unidad 5: Tus amigos son mis amigos
Objetivos Comunicativos:
Hablar del aspecto y del carácter, expresar gustos e intereses, preguntar sobre gustos, contrastar gustos, hablar de relaciones personales.

Unidad 6: Día a día
Objetivos Comunicativos:
Hablar de hábitos, expresar frecuencia, describir rutina diaria y el uso de los verbos reflexivos.

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Unidad 7: ¡A comer!
Objetivos
Comunicativos:
Pedir y dar información sobre comida, las comidas del día, hábitos gastronómicos de los españoles, platos típicos del mundo latino.

Contenido Gramatical:

- Ortología o pronunciación correcta: vocales, consonantes, sílabas. El acento tónico o deintensidad. Grupos fónicos y figuras entonacionales. La puntuación.
- Las tres conjugaciones: -ar, -er, -ir y los verbos ser, tener y llamarse
- El artículo determinado e indeterminado. Algunos usos de a, con, de, por y para
- Los pronombres personales sujeto. El presente de Indicativo (verbos terminados en –ar/-er/-ir)
- Algunos usos de hay, El verbo estar. El Superlativo, Un/una/unos/unas, Mucho/ mucha/muchos/muchas
- Qué/cuál/cuál**es/**cuántos/ cuántas/ Dónde/Cómo
- Los demostrativos: este/esta/estos/estas/esto
- El/la/los/las adjetivo, Qué+ sustantivo/ cuál/cuáles
- Tener que + Infinitivo, El verbo Ir El verbo gustar, Los posesivos
- El presente de Indicativo de algunos verbos irregulares. Los verbos reflexivos
- Yo también/ Yo tampoco/ Yo sí/ Yo no. Primero/ Después/ Luego

Examination Scheme

Component	CT	Home Assign	Att.	EE
Weightage (%)	20	5	5	70

Text & References:
Text
Libros para seguir

- Corpas, Jaime et al.*Aula Internacional 1*. Barcelona: Difusión, 2005.
- Corpas, Jaime et al. *Cuadernos de gramática española A1*. Barcelona:Difusión,2010.

Fuentes

- Concha Moreno Garc. *Nuevo Español Sin Fronteras.*SGEL.2005.

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ORAL EXPRESSION-1
(Expresión Oral)

Course Code: DSPA2101 **Credit Units: 2**

Course Objective: To provide the students with the know-how

- to understand the Spanish phonetic system
- to develop strategies of listening comprehension
- to pass from written to oral, from oral to written easily
- to be sensitized to nuances of speech, dialectical variations.
- to overcome the fear of speaking a foreign language and take position as a foreignerspeaking Spanish.

Course Content:

Listening exercises and speaking tasks (imagining dialogues, role plays, telephone conversations) of:

- Corpas, Jaime et al. *Aula Internacional 1*. Barcelona: Difusión, 2005.
- Jesús Sánchez Lobato et al. *Español sin fronteras. España: SGE, 2005*

Examination Scheme:

Components	CT	Attd.	EE
Weightage (%)	25	5	70

Texts & References:

- Corpas, Jaime et al. *Aula Internacional 1*. Barcelona: Difusión, 2005.
- Jesús Sánchez Lobato et al. *Español sin fronteras. España: SGE, 2005.*

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GRAMMAR AND COMMUNICATIVE SPANISH-1
(Gramática y español comunicativo)

Course Code: DSPA2102 **Credit Units: 2**

Course Objective: To introduce the students to several linguistic tools. To enable them

- to present oneself and others, to ask and give personal information
- to give directions, to describe one's surrounding
- to talk about likes and dislikes, hobbies
- to tell time and date, to talk about daily routine

Course Content:
Actos de comunicación

Unidad 1: Conociendo gente

Saludos y despedidas formales e informales, Presentarte y presentar a otros, Preguntar y contestar sobre nombre, nacionalidad y profesión.

Unidad 2: ¿Dónde está?

Situar lugares y objetos en el espacio, Preguntar y contestar sobre direcciones y teléfonos, Preguntar ycontestar sobre la existencia de lugares y objetos.

Unidad 3: ¿Tienes tiempo?

Hablar de horas y de fechas, hablar de algunas costumbres y situar en el tiempo, preguntar y expresar costumbres y frecuencia

Gramática:

- El género y el número
- El articulo determinado e indeterminado
- Las tres conjugaciones –ar, -er& -ir y los verbos ser, llamarse, tener, vivir etc.
- Construcciones con hay, el verbo estar
- Los artículos
- Interrogativos: ¿Cuál?, ¿Dónde?
- Presente de hacer, ir(se) y venir
- Contracciones al, del

Examination Scheme:

Components	CT	Home Assign	Attd.	EE
Weightage (%)	20	5	5	70

Text & References:
Text: *Nueva Español sin Fronteras1*, SGEL, Madrid, 1998

Referencia
Aula Internacional 1, Editorial difusión, Barcelona, 2006 (Indian Edition Available)

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SEMESTER-II

WRITTEN EXPRESSION-2
(Expresión Escrita-II)

Course Code: DSPA2251 **Credit Units: 04**

Course Objective: To introduce the students to several linguistic tools. To enable them

- to express one's point of view, difficulties, emotions, motivation, preferences etc.
- to describe lodgings, objects
- to talk about or narrate events in past and future,
- to talk about health, express pain and symptoms
- to ask and to give advices, to give instructions
- to compare objects and people, to describe daily activities

Course Contents:

Unidad 8: El barrio ideal
Objetivos Comunicativos:
Describir pueblo, barrios y ciudades, hablar de lo que más uno gusta de un lugar, pedir y dar informaciónpara llegar a un sitio.

Unidad 9: ¿Sabes cocinar?
Objetivos Comunicativos:
Hablar de platos típicos del mundo hispánico, hablar de experiencias pasadas, hablar de habilidades yaptitudes, hablar de cualidades y defectos de las personas.

Unidad 10: Una vida de película
Objetivos Comunicativos:
Escribir y describir una biografía imaginaria, hablar de cineastas del mundo hispánico.

Unidad 1:¿El español y tú
Objetivos Comunicativos:
Hablar de hábitos, expresar duración, preguntar y responder sobre motivaciones, hablar de dificultades,hacer recomendaciones**.**

Unidad 2: Hogar dulce hogar
Objetivos Comunicativos:
Expresar gustos y preferencias, describir una casa, ubicar objetos en el espacio, describir objetos: losmuebles y las partes de la casa.

Unidad 3: Esta soy yo
Objetivos Comunicativos:
Identificar y describir físicamente a las personas, hablar de las relaciones y de los parecidos entre personas.
Unidad 4: ¿Cómo va todo?
Objetivos Comunicativos:
Desenvolverse en situaciones muy codificadas: invitaciones, presentaciones, saludos y despedidas, pedircosas, acciones y favores.

Contenido Gramatical:

- Los verbos poner y traer
- La forma impersonal con **se**
    - Los cuantificadores
    - A resaltar un aspecto

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- El Pretérito Perfecto
- Saber + Infinitivo
- Adjetivos de carácter
- La forma y algunos usos del Pretérito Indefinido
- Marcadores temporales para el pasado
- Empezar a + Infinitivo
- Ir / Irse

Examination Scheme

Component	CT	Home Assign	Attd.	EE
Weightage (%)	20	5	5	70

Text & References:

Text

Libros para seguir

Corpas, Jaime et al. *Aula Internacional 1*. Barcelona: Difusión, 2005.
Corpas, Jaime et al. *Cuadernos de gramática española A1*. Barcelona: Difusión,2010.
Corpas, Jaime et al. *Cuadernos de gramática española A2*. Barcelona: Difusión,2010.
Corpas, Jaime et al. *Aula Internacional 2*. Barcelona: Difusión, 2005.

Fuentes

Concha Moreno Garc. *Nuevo Español Sin Fronteras 1.*SGEL.2005.Concha Moreno Garc. *Nuevo Español Sin Fronteras 2.*SGEL.2005.

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ORAL EXPRESSION-2
(Expresión Oral)

Course Code: DSPA2201 **Credit Units: 02**

Course Objective: To provide the students with the know-how

- to understand the Spanish phonetic system
- to develop strategies of listening comprehension
- to produce sentence-level oral discourse in Spanish and begin to connect strings
- of coherent sentences to approximate paragraph-level oral discourse
- to apply appropriate listening strategies to aid their understanding of extended
- discourse in spoken Spanish
- to be sensitized to nuances of speech, dialectical variations.
- to overcome the fear of speaking a foreign language and take position as a foreigner speaking Spanish

Course Content:

Listening exercises and speaking tasks (imagining dialogues, role plays, telephone conversations) of:

- Corpas, Jaime et al. *Aula Internacional 1*. Barcelona: Difusión, 2005.
- Jesús Sánchez Lobato et al. *Español sin fronteras. España: SGE, 2005*

Examination Scheme:

Components	CT	Attd.	EE
Weightage (%)	25	5	70

Text & References

- Corpas, Jaime et al. *Aula Internacional 2.* Barcelona: Difusión, 2005.
- Jesús Sánchez Lobato et al. *Español sin fronteras. España: SGE, 2005.*

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GRAMMAR AND COMMUNICATIVE SPANISH-2

Course Code: DSPA2202 **Credit Units: 2**

Course Objective: To introduce the students to several linguistic tools. To enable them

- to express opinions, to express likes, preferences.
- to talk about prices, to negotiate.
- to talk about relations, physical aspects.
- to present family members.
- to ask and to give advices, to give instructions

Course Content:

Unidad 4: ¡Que cara esta la vida!

Hablar de cantidades: precios, salarios, monedas etcétera, Preguntar e informar sobre el precio de cosasusuales, comprar el precio entre países, Expresar sorpresa, acuerdo y desacuerdo con exclamaciones.

Unidad 5: ¿Y cómo es él?

Descripciones físicas, hablar de relaciones con otras personas, preguntar por la edad, llamar la atención, confirmar una afirmación

Unidad 6: Para gustos están los colores
Expresar y pedir opinión, expresar, preguntar y contrastar gustos y preferencias

Gramática:

- Los verbos tener, gustar, ser, preferir
- Marcadores de frecuencia
- Algunas exclamaciones
- Los demostrativos
- Adjetivos posesivos
- La doble negación.
- Los adjetivos

Examination Scheme:

Components	CT	Home Assign	Attd.	EE
Weightage (%)	20	5	5	70

Text & References

Text: *Nueva Español sin Fronteras1*, SGEL, Madrid, 1998

Referencia:
Aula Internacional 1, Editorial difusión, Barcelona, 2006 (Indian Edition Available)

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SEMESTER-III

WRITTEN EXPRESSION-3
(Expresión Escrita-III)

Course Code: DSPA2351 **Credit Units: 04**

Course Objective: To introduce the students to several linguistic tools. To enable them

- to ask for a service, authorization.
- to ask questions in a given situation
- to talk about or narrate events in past
- to talk about one's relation with a language
- to describe someone, a journey, sentiments
- to accept or to refuse a proposal
- to give one's opinion, to carry out a debate or an interaction

Course Contents:

Unidad 5: Guía del ocio Objetivos Comunicativos:
Hablar de actividades de ocio, hablar de horarios, relatar experiencias pasadas, describir lugares, hablar de intenciones y de proyectos.

Unidad 6: No como carneObjetivos Comunicativos:
Hablar de gustos y de hábitos alimentarios, preparar el bufé para una fiesta con toda la clase.

Unidad 7: Nos gustó muchoObjetivos Comunicativos:
Hablar de experiencias y a valorarlas, expresar el deseo de hacer algo, hacer una lista de las cosas más interesantes del lugar.

Unidad 8: Estamos muy bienObjetivos Comunicativos:
Dar consejos, hablar de estados de ánimo, describir dolores, molestias y síntomas.

Unidad 9: Antes y ahora Objetivos Comunicativos:
Hablar de hábitos, costumbres y circunstancias en el pasado, situar acciones en el pasado y en el presente, argumentar y debatir.

Unidad 10: Momentos EspecialesObjetivos Comunicativos:
Relatar en pasado, secuenciar acciones, el contraste entre el pretérito indefinido y el pretérito imperfecto.

Unidad 11:Busque y compraré Objetivos Comunicativos:
Dar instrucciones, describir una escena en pasado y en presente, imperativos y sus usos.

Unidad 12: Mañana ObjetivosComunicativos:
Hablar de acciones y situaciones futuras, expresar condiciones**.**

Contenido Gramatical:

- El pretérito perfecto. Ir a+ infinitivo
- ya/ todavía no, las formas impersonales con se
- Algunos usos de ser y de estar y/pero/además
- Usos del pretérito perfecto y del pretérito indefinido
- parecer, caer bien/mal
    - me/te/le/nos/os/les gustaría + infinitivo
    - usos de los verbos ser y estar

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- Algunos usos del pretérito imperfecto
- ya no / todavía, futuro imperfecto.
- El contraste entre pretérito indefinido y el pretérito imperfecto
- Las formas del pasado de estar + gerundio.
- Imperativos

Examination Scheme

Component	CT	Home Assign	Attd.	EE.
Weightage (%)	20	5	5	70

Text & References:

Text

Libros para seguir

- Corpas, Jaime et al. *Aula Internacional 1*. Barcelona: Difusión, 2005.Corpas, Jaime et al. *Aula Internacional 2*. Barcelona: Difusión, 2005.
- Corpas, Jaime et al. *Cuadernos de gramática española A1*. Barcelona: Difusión,2010.
- Corpas, Jaime et al. *Cuadernos de gramática española A2*. Barcelona: Difusión,2010.

Fuentes

- Concha Moreno Garc. *Nuevo Español Sin Fronteras1.*SGEL.2005.Concha Moreno Garc. *Nuevo Español Sin Fronteras 2.*SGEL.2005.

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ORAL EXPRESSION-3
(Expresión Oral)

Course Code: DSPA2301 **Credit Units: 02**

Course Objective: To provide the students with the know-how

- which includes all aspects of the Spanish language: grammar, vocabulary and phonetics,
- colloquial expressions etc., and benefit from continuous personalized evaluation.
- to express in Spanish in a variety of situations, through active learning.
- to develop strategies of listening comprehension
- conversation practice, listening comprehension and reproduction of the text. Use of
- audio and video materials
- to be sensitized to nuances of speech, dialectical variations.
- to master the current social communication skills in oral
- to enrich the formulations, the linguistic tools and vary the sentence structure

Course Content:

Listening exercises and speaking tasks (imagining dialogues, role plays, telephoneconversations, participating in debates, and discussions) of:

- Corpas, Jaime et al. *Aula Internacional 2*. Barcelona: Difusión, 2006.
- Jesús Sánchez Lobato et al. *Español sin fronteras. España: SGE, 2006*

Examination Scheme:

Components	CT	Attd.	EE
Weightage (%)	25	5	70

Text & References:

- Corpas, Jaime et al. *Aula Internacional 2*. Barcelona: Difusión, 2006.
- Corpas, Jaime et al. *Aula Internacional 3*. Barcelona: Difusión, 2006.

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INTRODUCTION TO SPANISH CULTURE AND CIVILIZATION
(Introducción a la cultura y la civilización española)

Course Code: DSPA2302 **Credit Units: 02**

Course Objective:
This course will provide students with a panoramic view and brief analysis of the civilization and culture of Spain and the Spanish people from earliest times to the present. Although history will occupy a large part of this study, other perspectives from geography, political science, economics, music, art, folklore and the dance will be covered. Also, from the Middle Ages up to 1492; and the reign of Ferdinand and Isabella through the Golden Age (1469 to 1700).

Course Contents:

Module I
Geografía: La geografía de España, las costas del Mediterráneo, las montañas, los ríos u el clima.

Module II
Historia: Edad Media, Renacimiento, Siglo de Oro

Module III
Políticas: Desde la transición hasta hoy.

Module IV
Sociedad: El carácter psicológico y la vida de los españoles

Module V
Cultura: Arte, música, cine, gastronomía.

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- Ugarte, Francisco. España y su civilización (sexta edición). McGraw-Hill, 2009.
- *The Hispanic Way*.Noble/La Casa. Lincolnwood, Illinois: Passport Books, 1990.

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SEMESTER-IV

WRITTEN EXPRESSION-4
(Expresión Escrita-IV)

Course Code: DSPA2451 **Credit Units: 04**

Course Objective:
To develop the writing skills

- to express sentiments, obligation, possibility
- to present a person, to narrate a story
- to give or to justify one's opinion.

Course Contents:

Unidad 1: Volver a empezarObjetivos Comunicativos:
Hablar de hábitos en el presente, relatar experiencias pasadas, el uso de los tiempos del pasado.

Unidad 2: Prohibido ProhibirObjetivos Comunicativos:
Expresar prohibición, expresar obligatoriedad, expresar impersonalidad, hablar de hábitos.

Unidad 3: Mensajes ObjetivosComunicativos:
Desenvolverse por teléfono, tomar y dejar recados por teléfono, algunas estrategias de comunicación**.**

Unidad 4: Va y le dice Objetivos Comunicativos:
Relatar en presente, resumir un argumento, contar chiste, los usos de los pronombres de OD y de OI

Unidad 5: ¡Basta Ya!
Objetivos Comunicativos:
Expresar deseos, reclamaciones y necesidades, valorar situaciones y hechos.

Unidad 6: El turista accidentalObjetivos Comunicativos:
Recursos para contar anécdotas, recursos para mostrar interés al escuchar un relato, hablar de cosas y de consecuencias.

Unidad 7: Tenemos que hablarObjetivos Comunicativos:
Expresar interés y sentimientos, hablar de las relaciones entre las personas, contra argumentar, suavizaruna expresión de desacuerdo.

Unidad 8: De Diseño Objetivos Comunicativos:
Describir las características y el funcionamiento de algo, opinar sobre objetos, usar las frases exclamativas.

Contenido Gramatical:

- Pretérito perfecto y Indefinido.
- Los pronombres de OD y de OI
- Presente de subjuntivo
- Pretérito pluscuamperfecto.
- Los verbos irregulares
- Expresiones exclamativas.





Examination Scheme

Component	CT	Home Assign	Attd.	EE
Weightage (%)	20	5	5	70

Text & References:

Text

- **Libros para seguir**
- Corpas, Jaime et al. *Aula Internacional 1*. Barcelona: Difusión, 2005.Corpas, Jaime et al. *Aula Internacional 2*. Barcelona: Difusión, 2005.
- Corpas, Jaime et al. *Cuadernos de gramática española A1*. Barcelona: Difusión, 2010.Corpas, Jaime et al. *Cuadernos de gramática española A2*. Barcelona: Difusión, 2010.Corpas, Jaime et al. *Aula Internacional 3*. Barcelona: Difusión, 2006.

Fuentes

- Concha Moreno Garc. *Nuevo Español Sin Fronteras 1*.SGEL.2005.Concha Moreno Garc. *Nuevo Español Sin Fronteras 2*.SGEL.2005.

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ORAL EXPRESSION-4
(Expresión Oral)

Course Code: DSPA2401 **Credit Units: 02**

Course Objective: To provide the students with the know-how

- to understand the Spanish phonetic system
- to develop strategies of listening comprehension
- to pass from written to oral, from oral to written easily
- to be sensitized to nuances of speech, dialectical variations.
- to master the current social communication skills in oral
- to enrich the formulations, the linguistic tools and vary the sentence structure

Course Content:

Listening exercises and speaking tasks (imagining dialogues, role plays, telephone conversations, participating in debates, and discussions) of:

- Corpas, Jaime et al. *Aula Internacional 2.* Barcelona: Difusión, 2006.
- Jesús Sánchez Lobato et al. *Español sin fronteras. España: SGE, 2006.*

Examination Scheme:

Components	CT	Attd.	EE
Weightage (%)	25	5	70

Text & References:

- Corpas, Jaime et al. *Aula Internacional 2.* Barcelona: Difusión, 2006.
- Jesús Sánchez Lobato et al. *Español sin fronteras. España: SGE, 2006.*

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INTRODUCTION TO CULTURE AND CIVILIZATION OF LATIN AMERICAN COUNTRIES
(INTRODUCCIÓN A LA CULTURA Y CIVILIZACIÓN DE LOS PAÍSES LATINOAMERICANOS)

Course Code: DSPA2402 **Credit Units: 02**

Course Objective:

- The course is designed to give a broad geographical, historical, cultural and social background of Latin America. It will give the students an insight into the major events- historical, political and cultural- of Latin American society.
- This course enables students to be able to understand more about the histories and cultures of Latin America.
- The course will highlight the various other cultural aspects like Latin American festivals, cuisine, cinema, music and theatre.

Course Contents:

- Latino América Retos y problemas
- La cultura contemporánea
- "Descubrimiento" y conquista del "Nuevo Mundo"

Examination Scheme:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text & References:

- Quesada, Sebastián. *Imágenes de América Latina*. EDELSA, 2001.

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SEMESTER-V

SPANISH THROUGH ACTIVITIES
(español a través de las actividades)

Course Code: DSPA2551 **Credit Units: 04**

Course Objective:
To introduce plays, songs, poems and films with the purpose of helping students to read, listen, write, speak and think in Spanish spontaneously; learn the content and be able to find new meanings through analysis, evaluation, synthesis and application.

To launch students on their personal course of learning through training in activities like acting, reciting poems, appreciating cinematography and writing film reviews.
To empower them to develop skills independently and to develop critical/ creative thinking.

Course Contents:

Español a través del teatro
Escenas de juego de roles de la vida cotidiana, monólogos.Reproduce clásico y moderno - Extractos

Español a través de las canciones
Ejercicios de gramática, vocabulario, dictados, fonética mientras escuchar / aprender a cantar canciones españolas de ayer y de hoy.

Español a través de las películas
Lenguaje cinematográfico y poca gramática del cine críticos /películas

Español a través de la comida
Platos populares y tradicionales españoles. Recetas de platos y vocabulario de comida**.**

Examination Scheme

Component Codes	CT	Attd.	C	P
Weightage (%)	40	5	30	25

*There is no end-term examination. There is continuous assessment.Text & References: Material compiled by the Department.

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SPANISH LITERARY TEXTS
(Textos literarios españoles)

Course Code: DSPA2501 **Credit Units: 04**

Course Objective:

- To introduce students to Spanish literature through a study of extracts of select literary works.
- To enable them to read and understand literary texts and find new meanings throughanalysis, evaluation, synthesis and introducing them to different literary movements.
- To understand the nuances of the langue, figures of speech, stylistics
- To empower them to develop critical/ creative thinking.

Course Content: Material compiled by the Department.

Poesía

Pablo Neruda
Antonio Machado
Miguel Hernández
Federico García Lorca

Narrativa

Extractos de las obras de
Julio Cortázar-El fin del mundo
Mariano José de Larra -Vuelva usted mañanaLeopoldo Alas - Adiós cordera
Vicente Huidobro - La mujer con abrigo largoDiego Muñoz Valenzuela- El paseo matinal Miguel Delibes- El príncipe destronado

Ensayos

Extractos de las obras deBenito Jerónimo Feijoo José Ortega y Gasset Miguel de Unamuno

Examination Scheme:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text &References: ***Shorter Narrative Texts:***

- *Breve Biblioteca Hispánica*, **EUNSA, Pamplona, 1998.**

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ORAL EXPRESSION-5
(Expresión Oral)

Course Code: DSPA2502 **Credit Units: 04**

Course Objective: To provide the students with the know-how

- to understand the Spanish phonetic system
- to develop strategies of listening comprehension
- to pass from written to oral, from oral to written easily
- to be sensitized to nuances of speech, dialectical variations.
- to master the current social communication skills in oral
- to enrich the formulations, the linguistic tools and vary the sentence structure
- to present facts, projects, plans with precision
- to develop logical thinking, to speak, argue and debate in a coherent and cohesivemanner employing appropriate words of liaison, and transition

Course Content:

Preparing presentations, talk about any topic, developing the techniques of debates, discussions; mastering the art of convincing through logical arguments

- Corpas, Jaime et al. *Aula Internacional 4.* Barcelona: Difusión, 2006.
- Jesús Sánchez Lobato et al. *Español sin fronteras. España: SGE, 2005.*

Examination Scheme:

Components	CT	Att.	EE
Weightage (%)	25	5	70

Text & References:

- Corpas, Jaime et al. *Aula Internacional 4.* Barcelona: Difusión, 2006.
- Jesús Sánchez Lobato et al. *Español sin fronteras. España: SGE, 2005.*

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SEMESTER-VI

INTRODUCTION TO SPANISH LITERATURE

(Introducción a la literatura española)

Course Code: DSPA2651 **Credit Units: 04**

Course Objective:
To introduce the students to Spanish literature through extracts of texts selected from different literarygenres of various authors across the centuries

Course Content:
Novelas
Miguel de Cervantes
Benito Pérez Galdós
Camilo José Cela

Teatro
Pedro Calderón de la Barca
Fernando de RojasLope de Vega José Zorrilla
Antonio Buero Vallejo

Poesía
Luis de Góngora Francisco de Quevedo
Gustavo Adolfo Bécquer
Rosalía Castro

Examination Scheme:

Components	CT	Att.	H	EE
Weightage (%)	20	5	5	70

Text & References:

- *Literaturahispanoamericana1 y 2*, Ed. de Enrique Anderson Imbert y EugenioFlorit, Holt,Rinehart and Winston, 1970.
- Alborg, Juan Luis. *Historia de la literatura española. Tomo II: Barroco.* Madrid, Gredos,1972.
- Wilson, Edward M. y Moir, Duncan. *Historia y crítica de la literatura española 3. Siglode Oro:Teatro (1492-1700).* México, Ariel, 1

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INTRODUCTION TO TRANSLATION
(Introducción a la Traducción)

Course Code: DSPA2601 **Credit Units: 04**

Course Objective:
To introduce the students to

- Basic concepts and theory of translation
- Methods and procedures
- Translation of commercial correspondence, such as brochures, handouts, agreements,contracts. from Spanish to English and vice versa.

Course Contents:

Module I

What is translation, the concept of source text and target text, the concept of original audience, text internal and text external factors, types of dictionaries and references, using parallel text and background text.

Module II

Introduction to methodology and theories of translation, equivalence and adequacy in translation, Skopos theory, about various pioneers of translation and their theories.

Module III

Grammatical and lexical aspects of translation, stylistic variations in language, various text types.

Module IV

Theory and problems of Translation: Commercial, Economic, Journalistic and Technical Texts.

Examination Scheme

Component	CT	Attd.	H	EE
Weightage (%)	20	5	5	70

Text & References:

- Jack Child *Introduction to Spanish Translation;* University Press of America, 2012
- José H. Valdivieso, L. Teresa Valdivieso, D.C. Heath / Co, *Negocio y comunicación*, Lexington,Massachussets, 1988.
- Blanca Aguirre, Consuelo Hernández, *Curso de español comercial*, SEGEL, Madrid, 1987.
- Josefa Gómez de Enterría, *Correspondencia comercial en español*, SEGEL, Madrid, 1990.

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BUSINESS SPANISH
(español para los negocios)

Course Code: DSPA2602 **Credit Units: 04**

Course Objective:
To familiarize the students with the essentials of professional Spanish.To enable the students;

- to take an appointment
- to enquire and give information about different cities of Spain
- to talk about work habits and preferences (verbs like to want/ prefer)
- to present Spanish companies, prepare their CVs, and to face interviews

Course Contents:
Intermedio Unidad 6-9 pp. 56-95

Contenidoléxico: Unidad: 6: Lugares para trabajar, lugares para vivir

- Características de un piso
- Objetos de oficina
- Instalaciones y servicios de un hotel

Unidad 7: Agenda de trabajo

- Actividades cotidianas
- Las partes del día
- Los días de la semana
- Proponer y concertarunacita
- Rechazar una propuesta, justificarse, plantear una alternativa, expresar consejo
- Curriculum vitae

Unidad 8: Citas y reuniones

- Hábitosalimentarios
- Platostípicos
- Los ingredientes de un plato.

Unidad 9: Productos y proyectos

- Colores, materiales, tamaño de los productos.
- Estaciones del año.

Tarea Comunicativa:

- Hablar de acciones habituales y del horario.
- Expresar gustos y preferencias de trabajo
- Proponer y rechazar una cita a compañeros del trabajo o invitar a unos clientes.
- Conversación entre un camarero y dos clientes.
- Expresarobligación y consejo
- Enfrentar la entrevista de trabajo: presentar a si mismo, estudios, practicas, experiencia profesional, preparación para entrevista, simulación de entrevista.
- Describir los productos: material, color, función, precio.

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Contenido Gramatical:

- La concordancia del adjetivo, el presente de indicativo de preferir y querer.
- Contraste entre ser y estar, los cuantificadores del adjetivo.
- La comparación: más /menos+adjetivo+que, más /menos+sustantivo+que.
- El superlative:el/la/los/las, más /menos+adjetivo+que
- El presente de indicativo de empezar, querer, preferir, poder, dormir, salir etc
- Con+ pronombrespersonales:conmigo,contigo
- Marcadores de frecuencia y secuencia; siempre, casi siempre, a veces, nunca yprimero, después, luego
- La construcción es que, tener que + Infinitivo
- Por la mañana/tarde/noche, a/al mediodía
- El verbo gustar, los pronombres de Objeto Indirecto, las fechas
- A mí también /tampoco, a mí, sí/no
- Expresiones para invitar y proponer algo

Examination Scheme

Component Codes	CT	Attd.	H	EE.
Weightage (%)	20	5	5	70

Text &References:

El Libroparaseguir

- González, Marisa et al. *Socios 1Libro del alumno*. Barcelona: Difusión, 2007.
- González, Marisa et al. *Socios 1Workbook*. Barcelona: Difusión, 2007

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INTRODUCTION TO LINGUISTICS

Course Code: DSPA2603 **Credit Units: 04**

Course Objective:
This paper aims to provide the students the basic knowledge of Linguistics and its various branches of study. The focus of the paper is to enable the learners to have an understanding of thescience of language and to be able to analyze linguistically any given language including the foreign language that they pursue.

Course Contents:Introduction
What is language and linguistics? Design features of human language.Various branches of Linguistics and their application.
Phonetics and Phonology Anatomy and physiology of speech production. Classification of sounds through IPA symbols. Difference between Phonetics and Phonology.

Morphology
Basic concepts of morphology word formation processes Syntax.
Theories and concepts of Syntactic structure. Analysis of sentence structure.

Semantics
Basic concepts of Semantics meaning and types of meaning.

Examination Scheme:

Components	CT	ATT	H	EE
Weightage %	20	5	5	70

Text & References:

Text:

- Fromkin, V., and R. Rodman. 1974 (9th Edition). *An Introduction to Language*. New York: Holt, Rinehartand Winston.

References:

- Akmajian, A., R.A. Demers, A.K. Farmer, & R.M. Harnish 2001. Linguistics: An Introduction to Language and Communication. Cambridge, Massachusetts: The MIT Press
- Carnie, Andrew. 2013 (3rd Edition). Syntax: A Generative Introduction. West Sussex: Wiley-BlackwellPublication
- Crystal D.1997. Encyclopedia of Language: 2nd Vol., Cambridge: Cambridge University Press
- Haegeman, L. 1991. (rev. Ed.). Introduction to Government and Binding Theory.
- Hockett. C.F. 1958.A Course in Modern Linguistics. New York: Macmillian. Indian Edition, New Delhi: Oxford and IBH Publishing Co.
- Katamba, F. and John Stonham 2006. Morphology 2nd ed. London: Palgrave.
- Ladefoged, Peter. 2001 (4th edn.).A course in phonetics. New York: Harcourt Brace.
- Lyons J, 1977. Semantics. 2 Vols. Cambridge: Cambridge University Press.
- Odden, David. 2005. Introducing phonology. Cambridge: Cambridge University Oxford:Blackwell.Press
- Roach, P. 2001. Phonetics. Oxford: Oxford University Press

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SEMESTER-VII

INTRODUCTION TO SPANISH CINEMA

Course Code: DSPA2701 **Credit Units: 4**

Course Objective:

- This course will explore Spanish history and culture through different genres of film.
- To explore the main historical and cultural issues of contemporary Spain.
- To familiarize students with the main film directors of Spain (Pedro Almodovar, Guillermo,Carlos Saura, Alejandro González Iñárritu, Fernando Trueba etc.
- To have a better command of all linguistic skills, especially listening comprehension, fluencyand accuracy in their speech.
- To communicate and participate in regular discussions on diverse topics.
- To have the capacity for close analysis of visual material and comparative analysis.

Course Content:

Module 1: Historical films

- El Cid,1961
- *El Laberinto del Fauno*
- *Mujeres al borde de un ataque de nervios*
- *Todosobre mi Madre*
- ¡Ay, Carmela!
- Amores Perros
- La lengua de las mariposas
- La niña de tus ojos
- La mala educación
- El calentito

Module 2: Science fiction

- Abre los ojos
- Autómata
- Tres Días
- La piel que habito
- Eva

Module 3: Comedy

- Campeones
- Perfectos desconocidos
- Ochoapellidosvascos
- Tenemos que hablar

Module 4: Thrillers

- Los ojos de Julia
- Mirage
- El cuerpo
- Que Dios nosperdone
- Palmerasen la nieve
- Perdida

Examination Scheme:

Components	CT	Att	**H**	**EE**
Weightage (%)	20	5	5	70

Text & References:
All mandatory readings, films, and course material compiled by the department

ADVANCED HISPANIC MEDIA STUDIES

Course Code: DSPA2702 **Credit Units: 4**

Course Objective:

- To facilitate students to scrutinize media and value the application of modern communication techniques.
- To equip students to comprehend essential media theory and cultural history.
- To qualify students in mastering the basic skills of reading, writing, and analyzing articles for various types of media and introduce them to the aspects of journalism that are practiced in the Hispanic world.
- To enable students to understand and become sensitive to the visuals and sounds used across media.
- To introduce students to the New Media.

Course Content:

Module 1: Introduction to Media Theories with Culture and Communication
This module will give an insight into the introduction of mass media and theories. And its relation to society, the influence of various social movements on media, and the future of media. It also focuses on the evolution and power of mass media and the importance of media in the 21st century.

Module 2: Hispanic Print Media
The module will begin with an introduction to what print media is and what are the different phases ofHispanic Journalism. It will also cover the general ethics of newspapers and familiarize learners with the different kinds of Hispanic newspapers and magazines (El País, El mundo, El Dia, La Nueva España, La Vanguardia, Clarín, El Diario, El espectador, El Mercurio, El Universal, La Nación El comercio) etc. It also acquaints students with the Spanish language of newspaper reporting.

Module 3: Audio-Visual Media
It serves as an introduction to varieties of audiovisual media and their functions in mass media. It focuses on the basic theoretical as well as practical nuances of the following themes: visual communication theory, images and understanding, creation of images and sound, society and visuals, ways of hearing and seeing, and the building in of narrative principles. Its principal aim is to introducelearners to Hispanic radio, television programs, news channels, films, etc.

Module 4: New Media
This module will enable students to learn about the New Media, its role, and the evolution of internet.

Examination Scheme:

Components	CT	Att	**H**	**EE**
Weightage (%)	**20**	**5**	**5**	**70**

Text & References:
Compiled by the department.

TRANSLATION: THEORY & PRACTICE-I

Course Code: DSPA2703 **Credit Units: 4**

Course Objective:

- To familiarize students with the process of translation.
- To familiarize students with different theories of translation.
- To enable students to differentiate between the process of literary and non-literary translation.
- To provide students with an understanding of translation in the field of cinema and media.

Course Content:

Module 1: Translation: Meaning and Significance
Exploration of fundamental aspects of translation as a process and its purpose and importance.

Module 2: Translation: Historical Overview
Overview of the history and development of translation as a discipline.

Module 3: Theories of Translation
Exploration of key theories of translation (e.g., functionalism and equivalence).

Module 4: Literary and Non-Literary translation
Discussion on the following and related topics with reference to the assigned texts and handouts: Challenges and techniques associated with the translation of different types of texts.
The impact of form and style in the translation of literary texts. The role of cultural context in the translation of literary texts. The concept of cultural adaptation in translation.
Accuracy and precision required in technical translations. Terminology management and specialized knowledge.

Module 5: Exploring Translation in Cinema and Media
Discussion on the following and related topics with reference to the assigned texts and handouts: Importance of translation for the audience across the globe.
Subtitling and dubbing.
Translation in media content: advertisement, online content, etc. Adaptation for different media platforms.

Examination Scheme:

Components	CT	Att	H	EE
Weightage (%)	20	5	5	70

Text & References:

- Bassnett, Susan. (2002). Translation Studies. Routledge, London.
- Bassnett, S. and A. Lefevre, editors. (1992). Translation, History and Culture. Princeton UP, Princeton.
- Landers, C. E. (2001). Literary Translation. Multilingual Matters.
- Michela Canepari. (2022). A New Paradigm for Translators of Literary and Non-LiteraryTexts. BRILL.
- Cronin, M. (2008). Translation Goes to the Movies. Routledge.
- Abend-David, D. (2016). Media and translation: An interdisciplinary approach. Bloomsbury.

SPANISH SHORT NARRATIVE TRADITIONS: FROM CLASSICS TO CONTEMPORARY WORKS

Course Code: DSPA2704 **Credit Units: 4**

Course Objective:

- This course aims to introduce the students to the origin and significance of shorter narrativeforms in literature such as fable, legend, short story etc.
- To provide students insights of Hispanic literature through the short narrative texts/poems ofselect authors.
- To enable students to gain a profound cultural and historical understanding of Hispanic worldthrough select literary texts.
- To develop students critical and analytical skills in the interpretation and evaluation of literarytexts.

Course Content:

Module 1: History and evolution of narrative genres
This module will familiarize the students with the brief history and the origin of short narrativegenres.

Module 2: Medieval Narrative
Students will have an overview of medieval literary narratives: The Jarchas texts, Mester de Clerecia,Mester de Juglaria, Cantar de mio Cid, El conde Lucanoretc

Module 3: Narratives of the Golden age
This module aims to abreast learners about the select narratives of Spanish Golden Age.

Module 4: Short stories of 18th to 20th Century
This module highlights short stories to 18th-20th Century.

Examination Scheme:

Components	CT	Att	H	EE
Weightage (%)	20	5	5	70

Text and References:

- Aarne, Antti, and Stith Thompson. *Los tipos del cuento folklórico: una clasificación*. No. 258. Suomalainentiedeakatemia, 1995.
- Alemán, Mateo, and Benito Brancaforte. *Guzmán de Alfarache*. Vol. 6. Ediciones AKAL, 1996.
- Alvar, Carlos. "Formas narrativas breves: lecturas e interpretaciones." *Formas narrativas breves* (2014): 1-282.
- Baquero Escudero, Ana Luisa. "El cuento en la historia literaria: la difícil autonomía de ungénero." *Vigo: Academia del Hispanismo (Biblioteca de escriturasprofanas, 29)* (2011).
- Cadalso, José. *Cartas marruecas*. Vol. 3. M. Repullés, 1803Calatrava, José R. Valles. *Teoría de la narrativa: una perspectiva sistemática*. Vol. 3.Iberoamericana Editorial, 2008.
- de Cervantes Saavedra, Miguel. *Don Quijote de la mancha*. Editorial Verbum, 2015.
- Galdós, Benito Pérez. *Miau*. Vol. 279. Edaf, 2003.
- Jurado Morales, José. "MªAngeles Encinar y Anthony Percival (eds.): Cuento españolcontemporáneo." (1994).
- Manuel, Don Juan. *El conde lucanor*. Vol. 286. Edaf, 2004.
- Unamuno, Miguel. *San Manuel Bueno, mártir*. Anaya., 2003.

DSPA2739	BASICS OF RESEARCH METHODOLOGY, ETHICS, AND RESEARCH COMMUNICATION	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description

This course aims to provide students with a comprehensive understanding of conducting ethical research, utilizing proper research methodologies, and effectively communicating research findings. The course includes a final project where students will write a Literature Review on a topic chosen in consultation with the teacher(s).

This course is designed to equip students with essential skills and knowledge to conduct ethical research, employ proper research methodologies, and effectively communicate scientific information (with focus on writing a literature review). The course will cover topics such as research design, data collection and analysis, research ethics, and science communication strategies. Through a combination of lectures, discussions, case studies, and practical exercises, students will develop a deeper understanding of the research process and its ethical implications.

Course Objectives

The objective of this course is to impart knowledge about various stages of research process, research ethics and different ways of research communication.

The aim of this course is to impart research skills to the beginners and help to improve the quality of research by the existing researchers. It also encompasses the understanding and application of appropriate research design, statistics, and the use of the computer for reference management, report writing, research paper writing and presentation. The course also introduces the key conceptual issues of each research method, as well as giving practical guidance. It covers the series of research methodology contents: from problem formulation, to design, to data collection, analysis, reporting and dissemination. The course has the dual aims of equipping students with conceptual understandings of current academic debates regarding different methods, and the practical skills to put those methods into practice.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define criteria of good research, steps in research process, and data collection.

CO2. Identify different types of sampling and its purpose.

CO3. Conduct hypothesis testing for different types of samples and interpret the results.

CO4: Learn the importance of literature review, write research paper/thesis, use reference management software.

Course Content :

Module	Topic	**Blooms level***	Hours
1	**Research Methodology** Understanding the research process: From research questions to conclusions Types of research: Qualitative and quantitative research Exploratory, descriptive, experimental, and correlational studies Scientific Thinking: Subjective Vs. Objective Thinking Logical Reasoning: Inductive Vs. Deductive Reasoning Formulating research hypotheses and objectives Purpose of a good research, Criteria of good research	L1, L2	10

2	**Descriptive Statistics** Data, Types of Data, Methods of data collection, Benefits and drawbacks, Graphical representation of data and interpretation. Measures of Central Tendency: Arithmetic Mean, Median, Mode, Measures of Dispersion: Range, Standard Deviation, Variance, Coefficient of Variation.	L1, L2, L3	15
3	**Inferential Statistics** Sampling: Basic concepts, Process of Sampling, Sample Size, Types of Samples, Sampling and non- sampling errors, Statistics and Parameters, Sampling Distribution of Means and Proportion, **Hypothesis Testing**, steps in testing of hypothesis, errors in hypothesis testing, z test and t test.	L1, L2, L3	15
4	**Research Ethics** Plagiarism, Fabrication, Falsification, Ethics with respect to human and Animal Research	L1, L2	5
5	**Communication** Characteristics of a good Research paper, Systematics Literature Review (choosing a topic, preparing outline, gathering authentic & appropriate references, avoiding plagiarism, use of reference management systems), Writing a good literature review, Structure of report (Introduction, Methodology, Analysis, Results, Discussions, Conclusions, Recommendations), Writing Quality Research Paper, Publishing Research Work in Quality Journals, Reference Management Software	L1, L2, L3	15

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional Exam	End Term Examination
Weightage (%)	5	10	15	70

Project based assignment: Student teams (2-3 students per team) will write a literature review on a topic of choice, in consultation with the teacher.

Text books/ Reference books

- Research Methodology for Natural Sciences by Soumitro Banerjee, Publisher: IISc Press (1 January 2022); ISBN-10: 8194835178; ISBN-13: 978-8194835172
- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt. Ltd., New Delhi-110001
- Geode, Millian J.& Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Kothari, C.R.2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.
- Levin R I., Rubin D S. Statistics for Management. Sixth Edition, PHI
- Kapoor & Gupta. Probability & Statistics. S Chand Publishers, New Delhi.
- Montomery, Douglas C.(2007), 5th Ed. Design and Analysis of Experiments, Wiley India.
- Cooper, Donald R. and Pamels Schindler, Business Research Methods, Tata McGraw Hills, New Delhi
- Krishnaswamy, K.N. Sivakumar. Appa lyer and Mathiranjan M. 2006, Management Research Methodology: Integration of Principles, Methods and Techniques, Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092

- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Sachdeva, J.K. 2008. Business Research methodology. Himalaya Publishing House, New Delhi.
- Shekharan, Uma, Business Research Methods, Miley Education, Singapore.
- Zikmund, Millian G., Business Research Methods, Thomson Learning, Bombay.

SEMESTER-VIII

HISPANIC CULTURAL HISTORY

Course Code: DSPA2801 **Credit Units: 4**

Course Objective:

- This course aims to provide students with an overview of the cultural history of the Hispanicworld.
- It equips students with general knowledge about the history, civilization, and culture ofHispanic world.
- To enable students to demonstrate analytic and critical skills when reading and writing aboutHispanic cultures and civilization.

Course Content:

Module 1: Conquest and Colonization: Pre-Colonial and Colonial Society, Slavery System and The Encomienda System, emergence of Latin American Identity,

Module 2: Nineteenth Century: Wars of independence 1898; Spanish American War New LatinAmerican nations.

Module 3: Twentieth Century: Civil wars and revolutions, Industrialization and international presence, society, music, art andcinema, Nobel prizes(literature)

Module 4: Twenty First Century –The Bolivarian Revolution, NewMovements: the decolonization process of Puerto Rico. Contemporary Hispanic cinema.

Examination Scheme:

Components	CT	Att	H	EE
Weightage (%)	20	5	5	70

Text and References

- Bakewell, Peter. "Colonial Latin America." *Latin America, its problems and its promise*.Routledge, 2019. 57-66.
- Bethell, Leslie, ed. *The Cambridge History of Latin America*. Vol. 10. Cambridge UniversityPress, 1984.
- Child, Jack. *Latin American History through its Art and Literature*. University Press ofAmerica, 2010.
- Quesada Marco, Sebastian. *Imágenes de Espańa / Panorama de la formación de España y delas culturas hispánicas: Libro*. Edelsa Grupo Didascalia, 2001.
- Quesada, Sebastian. *Imágenes de América Latina. 1: Manual de historia y culturalatinoamericanas*. 1. ed., 1. reimp, Edelsa, 2005.
- Williamson, Edwin. *The Penguin History of Latin America: New Edition*. Penguin UK, 2003.

TRANSLATION: THEORY & PRACTICE-2

Course Code: DSPA2802 **Credit Units: 4**

Course Objective:

- To enable students to demonstrate the application of theories and protocols of translation.
- To enable students to demonstrate the role of culture in translation.
- To enable students to understand the ethical aspects of the process of translation.

Course Content:

Module 1: Analysis of Translation Theories in Practice

Discussion on the following and related topics with reference to the assigned texts and handouts.Real-world examples of the application of different translation theories
The impact of theory on translation choices.

Module 2: Practical Application of Protocols

Discussion on the following and related topics with reference to the assigned texts and handouts. Common protocols in translation (terminology management, quality assurance, revision processes).The importance of following industry standards.

Module 3: Cultural Dimensions in Translation

Discussion on the following and related topics with reference to the assigned texts and handouts.The impact of culture on translation.
Cultural sensitivity and the challenges of preserving cultural nuances.

Module 4: Ethical Considerations

Discussion on the following and related topics with reference to the assigned texts and handouts.Ethical considerations related to the application of theories and protocols.
Ethical dilemmas in translation (case study).

Examination Scheme:

Components	CT	Att	H	EE
Weightage (%)	20	5	5	70

Text & References:

- Venuti, Lawrence. (2004). The Translation Studies Reader. Routledge, London and
- New York.
- Sā vanta, S. (2013). Translation studies: Theories and applications. Atlantic Publishers & Distributors.
- Bassnett, S. and A. Lefevre, editors. (1992). Translation, History and Culture. Princeton UP, Princeton.
- Lambert, J. (2023). Translation ethics. Routledge.

READING SPANISH THEATRE

Course Code: DSPA2803 **Credit Units: 4**

Course Objective:

- To equip students with a comprehensive understanding of the historical evolution, the diverseand dynamic landscape of Spanish theatre across different periods and regions.
- To enable students to explore various genres within Spanish theatre, including classicaldrama, modern works, and experimental forms.
- To develop the ability to analyze works by prominent Spanish playwrights, identifyingthematic elements and stylistic nuances.

Course Content:

Module 1: Introduction to Spanish Theatre

Overview of the historical development of Spanish theatre, recognizing key periods, themes andinfluential figures.

Module 2: Classical Spanish Theatre

In-depth study of renowned playwrights such as Lope de Vega, Calderón de la Barca, and Tirso deMolina. Analysis of the structure, themes, and theatrical conventions of the Siglo de Oro.

Module 3: Modern and Contemporary Spanish Theatre

Study of 20th-century playwrights like Federico García Lorca, Antonio Buero Vallejo, andcontemporary voices. Discussion of shifts in style, themes, and dramatic techniques.

Module 4: Contextualizing Cultural Influences

Recognize and analyze the influence of cultural, social, and political factors on Spanish theatre. Contextualize plays within the broader cultural landscape of Spain and Spanish-speaking regions.

Examination Scheme:

Components	CT	Att	**H**	**EE**
Weightage (%)	**20**	**5**	**5**	**70**

Text & References:

- Kanellos, Nicolás, editor. A History of Theatre in Spain. Cambridge University Press, 1996.
- Wilson, Margaret Greer. Theatre and Crisis 1632-1642. Cambridge University Press, 1985.
- Gies, David T. Theatre and Politics in Nineteenth-Century Spain: Juan De Grimaldi asImpresario and Government Agent. Cambridge University Press, 1988.
- Ruiz Ramón, Francisco. Teatro y poder en la España del siglo XVII. Editorial Gredos, 1970.
- Lope de Vega. Fuenteovejuna. Cátedra, 1991.

READING POETRY

Course Code: DSPA2804 **Course Credits: 4**

Course Objective:

- To provide students with a profound understanding of the historical evolution and diversefacets of Hispanic poetry across various periods and regions.
- To enable students to explore different genres within Hispanic poetry, including classicalforms, modern works, and experimental expressions.
- To develop the ability to analyse works by prominent Hispanic poets, identifying thematicelements and stylistic nuances.

Course Content:

Module 1: Unveiling Hispanic Poetry
Explore the historical development of Hispanic poetry, recognizing key periods, themes, andinfluential poets.

Module 2: Classical Treasures in Hispanic Poetry
Comprehensive study of poets like Sor Juana Inés de la Cruz, Garcilaso de la Vega, andGustavo Adolfo Bécquer. Analyze classical forms, themes, and poetic conventions.

Module 3: Modern and Contemporary Hispanic Poetry
Study of 20th-century poets like Pablo Neruda, Federico García Lorca, and contemporary voices.Discuss shifts in style, themes, and poetic techniques.

Module 4: Innovation in Hispanic Poetry
Explore experimental and avant-garde poetry in the Hispanic context. Analyse unconventional styles,themes, and poetic expressions.

Examination Scheme:

Components	CT	Att	H	EE
Weightage (%)	20	5	5	70

Text & References:

- Paz, Octavio. *The Collected Poems of Octavio Paz*, 1957-1987. New Directions, 1991.
- Neruda, Pablo. *Selected Poems.* Vintage, 1975.
- Cruz, Sor Juana Inés de la. *TheAnswer/La Respuesta.*Feminist Press, 2009.
- Bécquer, Gustavo Adolfo. *Rimas*. Alianza Editorial, 2016.
- García Lorca, Federico. *SelectedPoems*. Penguin Classics, 2007.

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DSPA2839	DATA ANALYSIS & VISUALISATION USING SOFTWARE	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	Class X Mathematics				
Co-requisites					

Catalog Description

The implosion of available data has made visualization more critical but also more challenging. Data analysis and Data Visualization are essential tools for business analysis, engineers, policymakers, and decision-makers. Developed originally for "small data", visualization techniques have been met with varied success in the past centuries and decades. There are a few well-known visualizations that are very effective in capturing the essence of the data, and of course, there are many infamous negative examples of poor visuals. An effective visual is critical for decision making it, but it also requires a lot of work, customization, attention to detail, and refinements.

Course Objectives

The course is designed to help students develop skills and knowledge in the following area(s):

- Develop an understanding of what is a good visualization for a given purpose
- Learn visualization theory & techniques
- Build a substantial data analytic project
- Apply data analysis and visualization with Excel, SPSS, R, Python, NVivo and MATLAB

Course Outcomes

On completion of this course, the students will be able to

CO1. Students will be able to articulate meaningful lines of inquiry that might be explored through the collection, organization, visualization, and analysis of data in a context associated with their primary field of study using (as appropriate) numerical, textual, spatial, and/ or visual data.

CO2. Student will understand what data are, how they are collected, and how to assess the quality/ reliability of data.

CO3. Students will demonstrate intermediate proficiency in the visualization of data to communicate information and patterns that exist in the data.

CO4: Students will be able to use at beginning level of proficiency the tools of statistics and machine learning to ask questions of and explore patterns in data.

Course Content :

Module	Topics Covered	Blooms Level	Contact Hours
1	**Module-1: Introduction to Excel** Data Analysis using Excel, Curve fitting, Correlation, Linear Regression, Multiple regression, Principal Component Analysis and Factor Analysis, Hypothesis testing **Introduction to Excel and SPSS** Introduction to SPSS and Types of Data, Importing, exporting and data handling in SPSS; Exploratory data analysis using SPSS and data visualization; Introduction to statistical inference and various univariate tests by using SPSS; Analysis of Variance	L1, L2, L3, L4	20 hours

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	(One Way ANOVA, Two Way ANOVA and ANCOVA); Correlation, Simple and Multiple linear Regression Analysis; Principal Component Analysis and Factor Analysis		
2	**Module-2: VOS Viewer** **Web of Science, Scopus, Dimensions, Lens, and PubMed.** Co-authorship networks, citation-based networks, and co-occurrence networks can be created based on data downloaded from Web of Science, Scopus, Dimensions, and Lens. Co-authorship networks and co-occurrence networks can also be created based on PubMed data. **Crossref, Europe PMC, and OpenAlex**. Networks can also be created based on data retrieved through the APIs of Crossref, Europe PMC, and OpenAlex, These APIs can be queried interactively in VOS viewer. **Semantic Scholar, Open Citations, and Wiki Data.** For a given set of DOIs, networks can also be created based on data retrieved through the APIs of Semantic Scholar, Open Citations and Wiki Data.	L1, L2, L3, L4	10 Hours
3	**Faculty of Management Studies & Behavioural Sciences** **Module 3: Domain Specific Software** **- Structural Equation Modelling** **Smart PLS** Introduction to Structural Equation Modelling (SEM), Introduction to the software's AMOS and SPSS, SMART PLS, Testing of Statistical assumptions, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), common method bias (CMB) test, Measurement Model Assessment, Discussing Fit Indices, Reliability and Validity Testing, Structural Model Assessment identifying multivariate outlier, Construct Validity: Convergent and Discriminant Validity, Measurement Model & Structural Equation Modelling, Mediation and Moderation Effects, Multi-Group Analysis.	L1, L2, L3, L4	30 Hours
	Faculty of Arts **N Vivo** 1. Import text, audio, video, emails, images, spreadsheets, online surveys, web content, and social media from various sources into a simple, intuitive interface. 2. Create and NVivo project, import and organise qualitative and quantitative data 3.Manage a literature review in NVivo 4. Autocode structured data deductively and identify themes inductively 5. Generate and falsify hypotheses 6. Combine data in sets for analysis		

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	7. Seek patterns and identify relationships across codes and cases 8. Present findings using visualisations 9. Export data out of NVivo 10. Coordinate teamwork.		
	Faculty of Science Engineering and Technology **Faculty of Health & Allied Sciences** **R programming / Python/ MATLAB** **R Programming-** Introduction to R, Variables and datatypes in R, Dataframes, Recasting and joining of dataframes, Arithmetic, logical and matrix operations in R, Functions in R, Control structure in R, Data visualization in R. **Python Programming-** Basics of programming, data structure and algorithm using Python, Strings, lists, control, functions, manipulating lists, loops, arrays, selection sort, insertion sort, recursion, sorting, dictionaries, exception handling, file handling, string processing, data analysis using Python **MATLAB Programming-** Introduction, basic features, managing workspace, mathematical functions, basic plotting, Matrices, array operations and linear equations, MATLAB programming- M files script, M-file functions, control flow and operations.		

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional (Theory/ Practical)	End Term Examination
Weightage (%)	5	10	15	70

References:

- David Houcque, 2005. Introduction to MATLAB programming for Engineering students., Northwestern University, E- Book **https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf**
- Mark Lutz, 2009. Learning Python. O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.
- Emmanuel Paradis, 2005. R for Beginners. E book. **https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf**
- A Handbook of Statistical Analysis using SPSS by Dr. Brijesh Awasthi, Redshine Publication.

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COMMUNICATION SKILLS - COURSES BEING OFFERED IN VARIOUS PROGRAMMES



Achieving Academic Excellence

Programme Structure
Curriculum & Scheme of Examination

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PROGRAMME STRUCTURE - COMMUNICATION SKILLS COURSES BEING OFFERED IN VARIOUS PROGRAMMES

UNDERGRADUATE -4 YEAR PROGRAMMES

Semester	Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
1	CSS2152	English-I	1	-	-	1
2	CSS2252	English-II	1	-	-	1
3	CSS2151	Effective Listening	1	-	-	1
4	CSS2251	Presentation Skills	1	-	-	1
5	CSS2351	Reading and Comprehension	1	-	-	1
6	CSS2451	Corporate Communication	1	-	-	1
7	CSS2551	Employability Skills	1	-	-	1
8	CSS2651	Workplace Communication	1	-	-	1

UNDERGRADUATE - 4 YEAR NEP PROGRAMMES

Semester	Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
1	AECS2101	General Business Communication- Foundation	1	-	-	1
2	AECS2201	General Business Communication- Intermediate	1	-	-	1
2	AECS2202	General Business Communication- Advanced	1	-	-	1
3	AECS2301	Workplace Communication	1	-	-	1
4	AECS2401	Public Speaking	1	-	-	1
5	AECS2501	Employability Skills	1	-	-	1

POSTGRADUATE PROGRAMMES

Semester	Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
1	CSS4151	Basics of Communication	1	-	-	1

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2	CSS4251	Corporate Communication	1	-	-	1
3	CSS4351	Interpersonal Communication	1	-	-	1
4	CSS4451	Cross Cultural Communication	1	-	-	1

POSTGRADUATE PROGRAMME –MBA (EXECUTIVE)

Semester	Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
1	CSS4152	Managerial Communication	3	-	-	3

UNDERGRADUATE –INTEGRATED LAW PROGRAMMES (BA LLB, B.COM LLB, BBA LLB)

Semester	Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
3	CSS2151	Effective Listening	1	-	-	1
4	CSS2251	Presentation Skills	1	-	-	1
5	CSS2351	Reading and Comprehension	1	-	-	1
6	CSS2451	Corporate Communication	1	-	-	1
7	CSS2551	Employability Skills	1	-	-	1
8	CSS2651	Workplace Communication	1	-	-	1

INTEGRATED PROGRAMMES (UNDERGRADUATE-POSTGRADUATE)

Semester	Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
1	CSS2152	English-I	1	-	-	1
2	CSS2252	English-II	1	-	-	1
3	CSS2151	Effective Listening	1	-	-	1
4	CSS2251	Presentation Skills	1	-	-	1
5	CSS2351	Reading and Comprehension	1	-	-	1
6	CSS2451	Corporate Communication	1	-	-	1
7	CSS2551	Employability Skills	1	-	-	1
8	CSS2651	Workplace Communication	1	-	-	1
9	CSS4351	Interpersonal Communication	1	-	-	1
10	CSS4451	Cross Cultural Communication	1	-	-	1

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SYLLABUS - COMMUNICATION SKILLS- COURSES BEING OFFERED IN VARIOUS PROGRAMMES

SYLLABUS-UNDERGRADUATE-4 YEAR PROGRAMMES

Syllabus - First Semester

ENGLISH-I

Course Code: CSS2152 **Credit Units: 1**

Course Objective:
The course is intended to give a foundation of English Language. The literary texts are indented to help students to inculcate creative & aesthetic sensitivity and critical faculty through comprehension, appreciation and analysis of the prescribed literary texts. It will also help them to respond form different perspectives.

Course Contents:
Module I: Vocabulary
Use of Dictionary
Use of Words: Diminutives, Homonyms & Homophones

Module II: Essentials of Grammar - I
Articles
Parts of Speech
Tenses

Module III: Communication
The process and importance
Principles & benefits of Effective Communication

Module IV: Spoken English Communication
Speech Drills
Pronunciation and accent
Stress and Intonation

Module V: Short Stories
Of Studies, by Francis Bacon
Dream Children, by Charles Lamb
The Necklace, by Guy de Maupassant
A Shadow, by R.K.Narayan
Glory at Twilight, Bhabani Bhattacharya

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Examination Scheme:

Components	Written	CAF	V/P	GD/Extempore	A
Weightage	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

Text & References:

- MadhulikaJha, Echoes, Orient Long Man
- Ramon & Prakash, Business Communication, Oxford.
- Sydney Greenbaum Oxford English Grammar, Oxford.
- M. Ashraf Rizvi ,Effective Technical Communication, Tata McGraw Hill
- AnjaneeSethi&BhavanaAdhikari, Business Communication, Tata McGraw Hill

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Syllabus – Second Semester

ENGLISH-II

Course Code: CSS2252 **Credit Units: 1**

Course Objective:
The course is intended to give a foundation of English Language. The literary texts are indented to help students to inculcate creative & aesthetic sensitivity and critical faculty through comprehension, appreciation and analysis of the prescribed literary texts. It will also help them to respond form different perspectives.

Course Contents:

Module I: Essentials of Grammar - II
Sentence Structure
Subject -Verb agreement
Punctuation

Module II: Communication Skills-I
Developing listening skills
Developing speaking skills

Module III: Communication Skills-II
Developing Reading Skills
Developing writing Skills

Module IV: Written English communication
Progression of Thought/ideas
Structure of Paragraph
Structure of Essays

Module V: Poems

All the Worlds a Stage	Shakespeare
To Autumn	Keats
O! Captain, My Captain.	Walt Whitman
Where the Mind is Without Fear	Rabindranath Tagore
Psalm of Life	H.W. Longfellow

Examination Scheme:

Components	Written	CAF	V/P	GD/Extempore	A
Weightage	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

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Text & References:

- MadhulikaJha, Echoes, Orient Long Man
- Ramon & Prakash, Business Communication, Oxford.
- Sydney Greenbaum Oxford English Grammar, Oxford.
- M. Ashraf Rizvi ,Effective Technical Communication, Tata McGraw Hill
- Anjanee Sethi & Bhavana Adhikari, Business Communication, Tata McGraw Hill

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Syllabus – Third Semester

EFFECTIVE LISTENING

Course Code: CSS2151 **Credit Units: 1**

Course Objective:
To develop a deep understanding of the fundamentals of communication, and to improve communication skills by appreciating the importance of listening and learning essential techniques to improve the same.

Course Contents:

Module I: Fundamentals of Communication
Role and purpose of communication: *7 C's of communication*
Barriers to effective communication
Forms of Communication: one-to-one, informal and formal

Module II: Listening Skills
The process, importance and types of listening
Effective Listening: Principles and Barriers

Module III: Enhancing Listening Skills
Paraphrasing
Summarizing
Guidelines to increase listening
Activities to enhance listening

Examination Scheme:

Components	Written Test	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

Text & References:

- Ramon & Prakash, Business Communication, Oxford.
- Sydney Greenbaum Oxford English Grammar, Oxford.
- Successful Communications, MalraTreece (Allyn and Bacon)
- Effective Technical Communication, M. Ashraf Rizvi.
- Anjanee Sethi & Bhavana Adhikari, Business Communication, Tata McGraw Hill

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Syllabus – Fourth Semester

PRESENTATION SKILLS

Course Code: CSS2251 **Credit Units: 1**

Course Objective:
To develop good presentation skills by learning the essential steps for its planning and preparation, and effective use of verbal & non-verbal communication for delivering a business presentation.

Course Contents:

Module I: Social Communication Skills
Conversational English
Appropriateness
Building rapport

Module II: Context Based Speaking
In general situations
In specific professional situations
Discussion and associated vocabulary
Simulations/Role Play

Module III: Non Verbal Communication
Relevance and effective usage
Para language
Chronemics
Haptics
Proxemics
Body language
Object language

Module IV: Business Presentation
Audience Analysis
Preparing effective PowerPoint presentation
Delivering of presentation
Handling questions

Examination Scheme:

Components	Written Test	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

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Text & References:

- Working in English, Jones, Cambridge
- Business Communication, Raman –Prakash, Oxford
- Speaking Personally, Porter-Ladousse, Cambridge
- Speaking Effectively, Jermy Comfort, et.al, Cambridge
- Anjanee Sethi & Bhavana Adhikari, Business Communication, Tata McGraw Hill

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Syllabus - Fifth Semester

READING AND COMPREHENSION

Course Code: CSS2351 **Credit Units: 01**

Course Objective:
To facilitate development of good reading & comprehension skills by deepening vocabulary, and refining academic language proficiency

Course Contents:

Module I: Effective Reading
Process, types and reading rate adjustment
Tips for improving reading skills
Reading Comprehension

Module II: Business/Technical Language Development
Advanced Grammar: Syntax, Tenses, Voices
Advanced Vocabulary skills: Jargons, Terminology, Colloquialism

Module III: Business Communication
Reading Business/ Technical press
Researching for Business /Technology

Module IV: Activities
News reading
Picture reading
Review of a book/journal

Examination Scheme:

Components	Written Test	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

Text & References:

- Business Communication, Raman –Prakash, Oxford
- Creative English for Communication, Krishnaswamy N, Macmillan
- Business Vocabulary in Use: Advanced Mascull, Cambridge
- Effective Technical Communication, M. Ashraf Rizvi.
- Anjanee Sethi & Bhavana Adhikari, Business Communication, Tata McGraw Hill

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Syllabus – Sixth Semester

CORPORATE COMMUNICATION

Course Code: CSS2451 **Credit Units: 01**

Course Objective:
To develop competencies to form written communication strategies necessary in the workplace, and to execute them for effective communication

Course Contents:
Module I: Introduction to Writing Skills
Effective Writing Skills
Avoiding Common Errors
Paragraph Writing
Note Taking
Writing Assignments

Module II: Letter Writing
Types
Formats
Module III: Official Correspondence
Memo, Notice and Circulars
Agenda and Minutes
Module IV: Report Writing
Purpose and Scope of a Report
Fundamental Principles of Report Writing
Project Report Writing
Summer Internship Reports

Module V: Social Networking
Advantages
Opportunities
Making Contacts

Examination Scheme:

Components	Written Test	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

Text & References:

- Business Communication, Raman –Prakash, Oxford
- Creative English for Communication, Krishnaswamy N, Macmillan
- Textbook of Business Communication, Ramaswami S, Macmillan
- Working in English, Jones, Cambridge
- A Writer's Workbook Fourth edition, Smoke, Cambridge
- Effective Writing, Withrow, Cambridge
- Writing Skills, Coe/Rycroft/Ernest, Cambridge
- Anjanee Sethi & BhavanaAdhikari, Business Communication, Tata

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Syllabus – Seventh Semester

EMPLOYABILITY SKILLS

Course Code: CSS2551 **Credit Units: 01**

Course Objective:
To enhance employability skills of the learners by enabling them to write effective resume and face the interview with confidence.

Course Contents:
Module I
Introduction to Public Speaking
Business Conversation
Effective Public Speaking
Art of Persuasion

Module II: Interviews
Types of Interview
Styles of Interview
Facing Interviews-Fundamentals and Practice Session
Conducting Interviews- Fundamentals and Practice Session
Mock interview sessions

Module III
Resume Writing
Covering Letters
Interview Follow Up Letters

Module IV
Assessment through employability score card

Module V: Business Etiquette
Introduction
Dressing up
Exchanging Business card
Shaking hands
Dining etiquette

Examination Scheme:

Components	Written Test	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

Text & References:

- Jermy Comfort, Speaking Effectively, et.al, Cambridge
- Krishnaswamy, N, Creative English for Communication, Macmillan
- Raman Prakash, Business Communication, Oxford.
- Taylor, Conversation in Practice

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Syllabus – Eighth Semester

WORKPLACE COMMUNICATION

Course Code: CSS2651 **Credit Units: 01**

Course Objective:
The course is designed to empower students to carry out day to day communication at work place by adequate understanding of various types of communication and use of technology to facilitate efficient interpersonal communication.

Course Contents:
Module I:Dynamics of Group Discussion
Introduction,
Methodology
Role Functions
Mannerism
Guidelines

Module II: Communication through Electronic Channels
Introduction
Technology based Communication Tools
Video Conferencing
Web Conferencing
Selection of the Effective Tool
E-mails, Fax etc.

Module III: Professional Skills
Negotiations
Meetings
Email writing
Telephonic Skills

Examination Scheme:

Components	Written Test	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

Text & References:
- Jermy Comfort, Speaking Effectively, et.al, Cambridge
- Krishnaswamy, N, Creative English for Communication, Macmillan
- Raman Prakash, Business Communication, Oxford.
- Taylor, Conversation in Practice,
- Anjanee Sethi & Bhavana Adhikari, Business Communication, Tata McGraw Hill

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SYLLABUS – UNDERGRADUATE- 4 YEAR NEP PROGRAMMES

Syllabus – First Semester

GENERAL BUSINESS COMMUNICATION- FOUNDATION

Course Code : AECS2101 **Credit Unit: 01**

Course Objective:
The objective of this course is to enhance LSRW (Listening, Speaking, Reading and Writing) skills of the learners.

Course Contents:

Module I: Introduction to Verbal and Non-Verbal Communication
- Understanding Importance and Usage of English and Effective Communication
- Understanding Body Language for Effective Communication

Module II: Effective LSRW Skills
- Techniques and activities to develop Listening skills
- Techniques and activities to develop Speaking skills
- Techniques and activities to develop Reading Skills
- Techniques and activities to develop Writing Skills

Module III: Sentence Formation and Common Errors in English
- Sentence Types and Functions
- Subject Verb agreement, Parallelism, run on sentence, fragment sentence
- Semantic relations: synonymy, antonymy, hyponymy, meronymy, homophones, homonyms, homographs

Module IV: Spoken English Communication
- Pronunciation of English speech sounds
- Word stress and sentence Intonation
- 25 Sentence structures (Tense, Conditionals)
- Collocations - I
- Situational dialogues

Examination Scheme:

Components	LT	ST	RT	WT	A
Weightage (%)	10	50	10	25	5

Listening Test- 30 minutes, Speaking Test-60 minutes, Reading and writing Test- 90 minutes
A- Attendance

Note: Module I, II and III will be delivered in Lecture and tutorial forms. Module IV will

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be delivered in Practicum form.

Text & References:

- Ramon & Prakash, Business Communication, Oxford.
- Sydney Greenbaum Oxford English Grammar, Oxford.
- Successful Communications, Malra Treece (Allyn and Bacon)
- Effective Technical Communication, M. Ashraf Rizvi.
- Comfort-Jeremy et.al. (2002), Speaking Effectively. CUP: Cambridge.

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Syllabus – Second Semester

GENERAL BUSINESS COMMUNICATION- INTERMEDIATE

Course Code: AECS2201 **Credit Unit: 01**

Course Objective:
The objective of this course is to enhance LSRW (Listening, Speaking, Reading and Writing) skills of the learners.

Course Contents:

Module I: Introduction to Verbal and Non-Verbal Communication
- Understanding Importance and Usage of English and Effective Communication
- Understanding Body Language for Effective Communication
- Techniques and Activities to develop LSRW Skills

Module II: Sentence Formation and Common Errors in English
- Sentence Types and Functions
- Subject Verb agreement, Parallelism, run on sentence, fragment sentence
- Semantic relations: synonymy, antonymy, hyponymy, meronymy, homophones, homonyms, homographs

Module III: Spoken English Communication
- Pronunciation of English speech sounds
- Word stress and sentence Intonation
- 25 Sentence structures (Tenses, Conditionals)
- Collocations - I
- 12 Situational dialogues

Examination Scheme:

Components	LT	ST	RT	WT	A
Weightage (%)	10	50	10	25	5

Listening Test- 30 minutes, Speaking Test-60 minutes, Reading and writing Test- 90 minutes
A- Attendance

Text & References:
- Ramon & Prakash, Business Communication, Oxford.
- Sydney Greenbaum Oxford English Grammar, Oxford.
- Successful Communications, Malra Treece (Allyn and Bacon)
- Effective Technical Communication, M. Ashraf Rizvi.
- Comfort-Jeremy et.al. (2002), Speaking Effectively. CUP: Cambridge.

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Syllabus – Second Semester

GENERAL BUSINESS COMMUNICATION- ADVANCED

Course Code: AECS2202 **Credit Unit: 01**

Course Objective:
The objective of this course is to master professional communication for different walks of life.

Course Contents:

Module I: Personality Development
- Soft Skills
- Human Values

Module II: Mastering Speaking and Writing Skills
- Techniques and activities to develop Speaking skills
- Techniques and activities to develop Writing Skills
- Mechanics of Academic Writing
- Creative writing and Stylistics

Module III: English for Specific Purposes
- Sentence Structures (21-60)
- Situational Dialogues (10)
- Collocations - II
- Public Speaking

Examination Scheme:

Components	LT	ST	RT	WT	A
Weightage (%)	10	50	10	25	5

Listening Test- 30 minutes, Speaking Test-60 minutes, Reading and writing Test- 90 minutes
A- Attendance

Text & References:
- Ramon & Prakash, Business Communication, Oxford.
- Sydney Greenbaum Oxford English Grammar, Oxford.
- Successful Communications, Malra Treece (Allyn and Bacon)
- Effective Technical Communication, M. Ashraf Rizvi.
- Comfort-Jeremy et.al. (2002), Speaking Effectively. CUP: Cambridge.

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Syllabus – Third Semester

WORKPLACE COMMUNICATION

Course Code : AECS2301 **Credit Unit: 01**

Course Objective:
To equip students with the skills and knowledge required to formulate written communication strategies essential in the workplace and also to empower them to proficiently implement these strategies to achieve impactful and effective communication outcomes.

Course Contents:

Module I: Essential Writing Skills
- Effective Writing Techniques
- Avoiding Common Errors
- Paragraph Writing
- Note-Taking Strategies
- Writing Assignments and Reports

Module II: Business Correspondence
- Letter Writing Types
- Letter Writing Formats

Module III: Office Communication
- Memo, Notice, and Circulars
- Agenda and Minutes

Module IV: Report Writing
- Purpose and Scope of Reports
- Fundamental Principles of Report Writing
- Technical Report Writing
- Project and Internship Reports

Module V: Professional Communication
- Social Networking in the Workplace
- Advantages and Opportunities
- Building and Maintaining Professional Contacts

Module VI: Advanced Communication Skills
- Negotiation Techniques
- Effective Meetings
- Email Writing Etiquette
- Telephonic Communication Skills

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Examination Scheme:

Components	Written Test	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

Text & References:

- Business Communication, Raman –Prakash, Oxford
- Textbook of Business Communication, Ramaswami S, Macmillan
- Effective Writing, Withrow, Cambridge
- Writing Skills, Coe/Rycroft/Ernest, Cambridge
- Anjanee Sethi & Bhawna Adhikari, Business Communication, Tata Mc Graw Hill
- Guffey, M. E., & Loewy, D. (2018). Business Communication: Process and Product. Cengage Learning.
- Anderson, P. V. (2018). Technical Communication: A Reader-Centered Approach. Cengage Learning.
- Lannon, J. M., & Gurak, L. J. (2016). Technical Communication. Pearson.
- Bovee, C. L., & Thill, J. V. (2017). Business Communication Essentials. Pearson.
- Locker, K. O., & Kaczmarek, S. K. (2014). Business Communication: Building Critical Skills. McGraw-Hill Education.

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Syllabus – Fourth Semester

PUBLIC SPEAKING

Course Code : AECS2401 **Credit Units: 01**

Course Objective:
To provide a comprehensive exploration of the art and science of effective communication. From mastering foundational public speaking principles to adapting to diverse audiences, integrating multimedia, and employing advanced presentation techniques, participants will develop the skills needed to captivate and connect with any audience.

Course Contents:

Module I: Establish Foundational Public Speaking Competencies:
- Define and understand the importance of public speaking.
- Explore historical perspectives on public speaking.
- Develop introductory icebreaker speeches for self-introduction.

Module II: **Master Public Speaking Fundamentals**
- Understand rhetoric and its four elements.
- Identify the three purposes of public speaking.
- Explore the four contexts of public speaking.
- Introduce and apply artistic proofs: ethos, logos, pathos, and Kairos.

Module III: **Audience Analysis and Adaptation**
- Identify and analyze target audiences for effective communication.
- Adapt communication style to diverse audience needs.
- Engage in group exercises to practice audience analysis.

Module IV: **Utilize Visual Aids and Technology**
- Design effective slides and visual aids.
- Utilize presentation software (PowerPoint, Prezi).
- Integrate multimedia elements seamlessly.
- Deliver presentations with visual aids for maximum impact.

Module V: E**nhance Delivery Skills**
- Master non-verbal communication techniques (gestures, posture, eye contact).
- Improve articulation and pronunciation.
- Address and overcome speech anxiety.

Module VI: Advanced Presentation Techniques
- Adapt presentations to diverse audiences and professional contexts.
- Incorporate storytelling, analogies, and rhetorical devices.
- Integrate multimedia effectively into presentations.
- Facilitate interactive and constructive Q&A sessions.

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Examination Scheme:

Components	Written Test	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

Text & References:

- Reynolds, G. (2014). The Presentation Secrets of Steve Jobs: How to Be Insanely Great in Front of Any Audience. McGraw-Hill Education.
- Duarte, N. (2010). Resonate: Present Visual Stories that Transform Audiences. John Wiley & Sons.
- Harvard Business Review. (2019). HBR Guide to Persuasive Presentations. Harvard Business Review Press.
- Lucas, S. E. (2020). The Art of Public Speaking. McGraw-Hill Education.
- Aristotle. (2007). On Rhetoric: A Theory of Civic Discourse. Oxford University Press.
- Beebe, S. A., Beebe, S. J., & Redmond, M. V. (2016). Public Speaking Handbook. Pearson.
- References:
- Guffey, M. E., & Loewy, D. (2018). Essentials of Business Communication. Cengage Learning.
- Carnegie, D. (2010). The Quick and Easy Way to Effective Speaking. Gallery Books.

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Syllabus – Fifth Semester

EMPLOYABILITY SKILLS

Course Code : AECS2501 **Credit Unit: 01**

Course Objective:
To empower learners with comprehensive employability skills, enabling them to craft compelling resumes, confidently face interviews, deliver impactful business presentations, participate effectively in group discussions, and navigate professional etiquette with poise

Course Contents:

Module I: Business Presentation
- Understand Audience Analysis for targeted communication.
- Develop effective PowerPoint presentations.
- Master the art of delivering presentations with confidence.
- Acquire skills in handling questions and engaging with the audience.

Module II: Interviews
- Types of Interviews
- Styles of Interview
- Facing Interviews-Fundamentals and Practice Session
- Conducting Interviews- Fundamentals and Practice Session
- Mock interview sessions

Module III: Dynamics of Group Discussion
- Methodology and guidelines for effective participation.
- Role functions and appropriate mannerisms during group discussions.

Module IV: Professional Communication
- Resume Writing: Crafting impactful resumes.
- Covering Letters: Writing compelling cover letters.
- Interview Follow-Up Letters

Module V: Introduction to Business Etiquette
- Exchanging Business card
- Shaking hands
- Dining etiquette

Module VI: Non-Verbal Communication
- Explore the relevance and effective usage of non-verbal communication.
- Understand Para language, Chronemics, Haptics, and Proxemics.
- Master body language and object language for effective communication.

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Examination Scheme:

Components	Written Test	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

Text & References:

- Jermy Comfort, Speaking Effectively, et.al, Cambridge
- Krishnaswamy, N, Creative English for Communication, Macmillan
- Raman Prakash, Business Communication, Oxford.
- Taylor, Conversation in Practice
- Bolles, R. N. (2019). What Color Is Your Parachute? A Practical Manual for Job-Hunters and Career-Changers. Ten Speed Press.
- Reardon, K. K. (2008). It's All Politics: Winning in a World Where Hard Work and Talent Aren't Enough. Currency.
- Schuman, N. (2011). The Complete Guide to Business Etiquette. AMACOM.

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SYLLABUS – POSTGRADUATE PROGRAMMES

Syllabus - First Semester

BASICS OF COMMUNICATION

Course Code: CSS4151 **Credit Units: 01**

Course Objective:
It is rightly said, one cannot 'not communicate''. This course is designed to facilitate our young Amitians to communicate effectively by emphasizing on practical communication through refurbishing their existing language skills and also to bring one and all to a common take-off level.

Course Contents:

Module I: Fundamentals of communication
Relevance of communication
Effective communication
Models of communication
Effective use of language

Module II: Tools of communication
Proficiency in English – The international
Language of business
Building vocabulary
(Denotative & connotative)
Extensive vocabulary drills
(Synonyms / Antonyms / Homonyms)
One Word substitution
Idioms & phrases
Mechanics and Semantics of sentences
Writing sentences that really communicate
(Brevity, Clarity, and Simplicity)
Improving the tone and style of sentences

Module III: Barriers to Effective use of language
Avoiding clichés
Removing redundancies
Getting rid of ambiguity
Euphemism
Jargons
Code switching

Examination Scheme:

Components	Written Test	CAF	V/P	GD/Extempore	A

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Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

Text & References:

- Working in English, Jones, Cambridge
- Business Communication, Raman – Prakash, Oxford
- Echoes: JhaMadhulika: Orient Longman
- Practical English Usage, Swan M, Cambridge
- Business Communication- Sethi, BhavanaAdhikari, Tata McGraw Hill

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Syllabus - Second Semester

CORPORATE COMMUNICATION

Course Code: CSS4251 **Credit Units: 01**

Course Objective:
This course is designed to hone the Corporate Communication skills of the budding managers and enable them to be an integral part of the corporate communication network. The Verbal Communication (oral and written) will be the lingua franca of this endeavor.

Course Contents:

Module I: Communication in Practice
Verbal Communication
Communication Networks
Developing writing skills
Inter- office communication
The business letters
E mail – Netiquette (étiquette on the mail)
Intra- office communication
Memos
Notices
Circulars
Agenda and Minutes
Business Report writing
Resume writing

Module II: Cross Functional Communication
Marketing/ integrated marketing communication
Project management communication
Human Resource communication
Financial Communication

Module III: Communication for Public Relations
Functions and activities of PR
Reputation Management
Building Corporate Image and Identity
Negotiation Techniques

Examination Scheme:

Components	Written Test	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

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Text & References:

- Business Communication, Raman – Prakash, Oxford
- The Oxford Handbook of Commercial Corrospondence, Ashley A, Oxford Business Communication for Managers: An Advanced Approach, Penrose, Thomson
- Business Communication, Krizan, Thomson
- Understanding Human Communication, 9/e, Adler R Oxford
- Business Communication- Sethi, BhavanaAdhikari, Tata McGraw Hill

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Syllabus - Third Semester

INTERPERSONAL COMMUNICATION

Course Code: CSS4351 **Credit Units: 01**

Course Objective:
'Actions speak louder than words.' Every business communicator needs to understand the nuances of 'body language and voice.' This course is designed to enable the young Amitian to decipher the relevance of Kinesics, Proxemics and Para Language that cater to the fundamental requirements of effective business presentations and speeches.

Course Contents:

Module I: Non - Verbal Communication
Principles of non- verbal communication
Kinesics
Proxemics
Paralanguage and visible code

Module II: Speaking Skills
Pronunciation drills (Neutralizing regional pulls)
Conversational English
Guidelines to an effective presentation

Module III: Interviews and GDs

Note:
1 written test of 20 marks of one hour duration will be conducted. Also, each student will be required to make a presentation for 20 marks over and above the teaching hours. They will have to be programmed accordingly.

Examination Scheme:

Components	Written Test	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

Text & References:
- Business Communication, Raman – Prakash, Oxford
- Business Communication for Managers: An Advanced Approach, Penrose, Thomson
- Business Communication, Krizan, Thomson
- Understanding Human Communication,9/e, Adler R Oxford
- Business Communication- Sethi, Adhikari, Tata McGraw Hill

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Syllabus - Fourth Semester

CROSS CULTURAL COMMUNICATION

Course Code: CSS4451 **Credit Units: 01**

Course Objective:
The influx of multinationals, FDIs and Retail Management makes global communication a harsh reality and offers cultural communication challenges. This course is designed to inculcate trans-cultural communication skills among the young Amitians.

Course Contents:

Module I: Importance of Culture in Communication
Principles of effective cross cultural communication
Developing Communication Competence

Module II: Barriers to effective communication
Sender, Receiver and Situation related barriers
Measures to overcome the barriers
Listening skills

Module III: Cross cultural communication
Characteristics of culture
Social differences
Contextual differences
Nonverbal differences
Ethnocentrism

Examination Scheme:

Components	Written Test	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

Text & References:

- Business Communication, Raman – Prakash, Oxford
- Business Communication for Managers: An Advanced Approach, Penrose, Thomson
- Understanding Human Communication,9/e, Adler R Oxford
- Business Communication- Sethi, Adhikari, Tata McGraw Hill

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SYLLABUS – POSTGRADUATE PROGRAMME (MBA-EXECUTIVE)

Syllabus - First Semester

MANAGERIAL COMMUNICATION

Course Code CSS4152 **Credit Units: 03**

Course Objective:
This course is designed to provide the business professionals an overview of the broad categories of Business communication and to impart managerial knowledge in oral and written communication to help them develop their managerial communication competence.

Course Content:

Module I: Introduction
Relevance of Communication
Principles of effective communication
Forms of Communication
Effective use of language

Module II: Managerial Writing Strategies
The managerial communication process
Levels of managerial communication
Critical errors in communication
Channels of Communication

Inter Office communication
Business Letters
Emails
Netiquette

Intra Office Communication
Memos
Notices
Circulars
Minutes
Report Writing

Module III: Preparing For Interview
Resume Writing
Group Discussion(s)
Making formal presentations
Interviews:
Types of Interviews
Styles of Interview

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Conducting Interviews
Mock Interviews

Module IV: Strategies for Understanding Messages
Non Verbal Communication

Intercultural Managerial Communication
- Ethnocentrism
- Ethno relativism

Conflict Management

Examination Scheme

Components	Viva	Presentations	CT/Quiz	MCAF	Attendance
Weightage	20	20	20	35	5

MCAF - Management Communication Assessment File

Text & References:

- Business Communication, Raman – Prakash, Oxford
- Business Communication for Managers: An Advanced Approach, Penrose, Thomson
- Business Communication, Krizan, Thomson
- Understanding Human Communication, 9/e, Adler R Oxford
- Business Communication- Sethi, Adhikari, Tata McGraw Hill

Web Sources

- www.shkaminski.com/Classes/Handouts/Communication
- www.communicationskills.co.in
- www.hodu.com
- writingforresults.net

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SYLLABUS – UNDERGRADUATE INTEGRATED LAW PROGRAMMES (BA LLB, B.COM LLB & BBA LLB)

Syllabus - Third Semester

EFFECTIVE LISTENING

Course Code: CSS2151 **Credit Units: 1**

Course Objective:
To develop a deep understanding of the fundamentals of communication, and to improve communication skills by appreciating the importance of listening and learning essential techniques to improve the same.

Course Contents:

Module I: Fundamentals of Communication
Role and purpose of communication: *7 C's of communication*
Barriers to effective communication
Forms of Communication: one-to-one, informal and formal

Module II: Listening Skills
The process, importance and types of listening
Effective Listening: Principles and Barriers

Module III: Enhancing Listening Skills
Paraphrasing
Summarizing
Guidelines to increase listening
Activities to enhance listening

Examination Scheme:

Components	Written Test	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

Text & References:
- Ramon & Prakash, Business Communication, Oxford.
- Sydney Greenbaum Oxford English Grammar, Oxford.
- Successful Communications, MalraTreece (Allyn and Bacon)
- Effective Technical Communication, M. Ashraf Rizvi.
- Anjanee Sethi & Bhavana Adhikari, Business Communication, Tata McGraw Hill

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Syllabus - Fourth Semester

PRESENTATION SKILLS

Course Code: CSS2251 **Credit Units: 1**

Course Objective:
To develop good presentation skills by learning the essential steps for its planning and preparation, and effective use of verbal & non-verbal communication for delivering a business presentation.

Course Contents:
Module I: Social Communication Skills
Conversational English
Appropriateness
Building rapport

Module II: Context Based Speaking
In general situations
In specific professional situations
Discussion and associated vocabulary
Simulations/Role Play

Module III: Non Verbal Communication
Relevance and effective usage
Para language
Chronemics
Haptics
Proxemics
Body language
Object language
Module IV: Business Presentation
Audience Analysis
Preparing effective PowerPoint presentation
Delivering of presentation
Handling questions
Examination Scheme:

Components	Written Test	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

Text & References:
- Working in English, Jones, Cambridge
- Business Communication, Raman –Prakash, Oxford
- Speaking Personally, Porter-Ladousse, Cambridge
- Speaking Effectively, Jermy Comfort, et.al, Cambridge
- AnjaneeSethi&BhavanaAdhikari, Business Communication, Tata McGraw Hill

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Syllabus – Fifth Semester

READING AND COMPREHENSION

Course Code: CSS2351 **Credit Units: 01**

Course Objective:
To facilitate development of good reading & comprehension skills by deepening vocabulary, and refining academic language proficiency.

Course Contents:

Module I: Effective Reading
Process, types and reading rate adjustment
Tips for improving reading skills
Reading Comprehension

Module II: Business/Technical Language Development
Advanced Grammar: Syntax, Tenses, Voices
Advanced Vocabulary skills: Jargons, Terminology, Colloquialism

Module III: Business Communication
Reading Business/ Technical press
Researching for Business /Technology

Module IV: Activities
News reading
Picture reading
Review of a book/journal

Examination Scheme:

Components	Written Test	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

Text & References:

- Business Communication, Raman –Prakash, Oxford
- Creative English for Communication, Krishnaswamy N, Macmillan
- Business Vocabulary in Use: Advanced Mascull, Cambridge
- Effective Technical Communication, M. Ashraf Rizvi.
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Syllabus - Sixth Semester

CORPORATE COMMUNICATION

Course Code: CSS2451 **Credit Units: 01**

Course Objective:
To develop competencies to form written communication strategies necessary in the workplace, and to execute them for effective communication.

Course Contents:
Module I: Introduction to Writing Skills
Effective Writing Skills
Avoiding Common Errors
Paragraph Writing
Note Taking
Writing Assignments

Module II: Letter Writing
Types
Formats

Module III: Official Correspondence
Memo, Notice and Circulars
Agenda and Minutes

Module IV: Report Writing
Purpose and Scope of a Report
Fundamental Principles of Report Writing
Project Report Writing
Summer Internship Reports

Module V: Social Networking
Advantages
Opportunities
Making Contacts

Examination Scheme:

Components	Written Test	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

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Text & References:

- Business Communication, Raman –Prakash, Oxford
- Creative English for Communication, Krishnaswamy N, Macmillan
- Textbook of Business Communication, Ramaswami S, Macmillan
- Working in English, Jones, Cambridge
- A Writer's Workbook Fourth edition, Smoke, Cambridge
- Effective Writing, Withrow, Cambridge
- Writing Skills, Coe/Rycroft/Ernest, Cambridge
- Anjanee Sethi & Bhavana Adhikari, Business Communication, Tata McGraw Hill

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Syllabus - Seventh Semester

EMPLOYABILITY SKILLS

Course Code: CSS2551 **Credit Units: 01**

Course Objective:
To enhance employability skills of the learners by enabling them to write effective resume and face the interview with confidence.

Course Contents:
Module I
Introduction to Public Speaking
Business Conversation
Effective Public Speaking
Art of Persuasion

Module II: Interviews
Types of Interview
Styles of Interview
Facing Interviews-Fundamentals and Practice Session
Conducting Interviews- Fundamentals and Practice Session
Mock interview sessions

Module III
Resume Writing
Covering Letters
Interview Follow Up Letters

Module IV
Assessment through employability score card
Module V: Business Etiquette
Introduction
Dressing up
Exchanging Business card
Shaking hands
Dining etiquette
Examination Scheme:

Components	Written Test	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance
Text & References:

- Jermy Comfort, Speaking Effectively, et.al, Cambridge
- Krishnaswamy, N, Creative English for Communication, Macmillan
- Raman Prakash, Business Communication, Oxford.
- Taylor, Conversation in Practice
- Anjanee Sethi & Bhavana Adhikari, Business Communication, Tata McGraw Hill

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Syllabus - Eighth Semester

WORKPLACE COMMUNICATION

Course Code: CSS2651 **Credit Units: 01**

Course Objective:
The course is designed to empower students to carry out day to day communication at work place by adequate understanding of various types of communication and use of technology to facilitate efficient interpersonal communication.

Course Contents:
Module I: Dynamics of Group Discussion
Introduction,
Methodology
Role Functions
Mannerism
Guidelines

Module II: Communication through Electronic Channels
Introduction
Technology based Communication Tools
Video Conferencing
Web Conferencing
Selection of the Effective Tool
E-mails, Fax etc.

Module III: Professional Skills
Negotiations
Meetings
Email writing
Telephonic Skills

Examination Scheme:

Components	Written Test	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

Text & References:
- Jermy Comfort, Speaking Effectively, et.al, Cambridge
- Krishnaswamy, N, Creative English for Communication, Macmillan
- Raman Prakash, Business Communication, Oxford.
- Taylor, Conversation in Practice,
- Anjanee Sethi & Bhavana Adhikari, Business Communication, Tata McGraw Hill

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SYLLABUS – INTEGRATED PROGRAMMES (UNDERGRADUATE-POSTGRADUATE)

Syllabus - First Semester

ENGLISH-I

Course Code: CSS2152 **Credit Units: 1**

Course Objective:
The course is intended to give a foundation of English Language. The literary texts are indented to help students to inculcate creative & aesthetic sensitivity and critical faculty through comprehension, appreciation and analysis of the prescribed literary texts. It will also help them to respond form different perspectives.

Course Contents:
Module I: Vocabulary
Use of Dictionary
Use of Words: Diminutives, Homonyms & Homophones

Module II: Essentials of Grammar - I
Articles
Parts of Speech
Tenses

Module III: Communication
The process and importance
Principles & benefits of Effective Communication

Module IV: Spoken English Communication
Speech Drills
Pronunciation and accent
Stress and Intonation

Module V: Short Stories
Of Studies, by Francis Bacon
Dream Children, by Charles Lamb
The Necklace, by Guy de Maupassant
A Shadow, by R.K.Narayan
Glory at Twilight, Bhabani Bhattacharya

Examination Scheme:

Components	Written	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

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Text & References:

- Madhulika Jha, Echoes, Orient Long Man
- Ramon & Prakash, Business Communication, Oxford.
- Sydney Greenbaum Oxford English Grammar, Oxford.
- M. Ashraf Rizvi ,Effective Technical Communication, Tata McGraw Hill
- Anjanee Sethi & Bhavana Adhikari, Business Communication, Tata McGraw Hill

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Syllabus - Second Semester

ENGLISH-II

Course Code: CSS2252 **Credit Units: 1**

Course Objective:
The course is intended to give a foundation of English Language. The literary texts are indented to help students to inculcate creative & aesthetic sensitivity and critical faculty through comprehension, appreciation and analysis of the prescribed literary texts. It will also help them to respond form different perspectives.

Course Contents:
Module I: Essentials of Grammar - II
Sentence Structure
Subject -Verb agreement
Punctuation

Module II: Communication Skills-I
Developing listening skills
Developing speaking skills

Module III: Communication Skills-II
Developing Reading Skills
Developing writing Skills

Module IV: Written English communication
Progression of Thought/ideas
Structure of Paragraph
Structure of Essays

Module V: Poems

All the Worlds a Stage	Shakespeare
To Autumn	Keats
O! Captain, My Captain.	Walt Whitman
Where the Mind is Without Fear	Rabindranath Tagore
Psalm of Life	H.W. Longfellow

Examination Scheme:

Components	Written	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

Text & References:
- MadhulikaJha, Echoes, Orient Long Man
- Ramon & Prakash, Business Communication, Oxford.
- Sydney Greenbaum Oxford English Grammar, Oxford.
- M. Ashraf Rizvi ,Effective Technical Communication, Tata McGraw Hill
- Anjanee Sethi & Bhavana Adhikari, Business Communication, Tata McGraw Hill

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Syllabus - Third Semester

EFFECTIVE LISTENING

Course Code: CSS2151 **Credit Units: 1**

Course Objective:
To develop a deep understanding of the fundamentals of communication, and to improve communication skills by appreciating the importance of listening and learning essential techniques to improve the same.

Course Contents:
Module I: Fundamentals of Communication
Role and purpose of communication: *7 C's of communication*
Barriers to effective communication
Forms of Communication: one-to-one, informal and formal

Module II: Listening Skills
The process, importance and types of listening
Effective Listening: Principles and Barriers

Module III: Enhancing Listening Skills
Paraphrasing
Summarizing
Guidelines to increase listening
Activities to enhance listening

Examination Scheme:

Components	Written Test	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

Text & References:
- Ramon & Prakash, Business Communication, Oxford.
- Sydney Greenbaum Oxford English Grammar, Oxford.
- Successful Communications, MalraTreece (Allyn and Bacon)
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Syllabus - Fourth Semester

PRESENTATION SKILLS

Course Code: CSS2251 **Credit Units: 1**

Course Objective:
To develop good presentation skills by learning the essential steps for its planning and preparation, and effective use of verbal & non-verbal communication for delivering a business presentation.

Course Contents:
Module I: Social Communication Skills
Conversational English
Appropriateness
Building rapport

Module II: Context Based Speaking
In general situations
In specific professional situations
Discussion and associated vocabulary
Simulations/Role Play

Module III: Non Verbal Communication
Relevance and effective usage
Para language
Chronemics
Haptics
Proxemics
Body language
Object language

Module IV: Business Presentation
Audience Analysis
Preparing effective PowerPoint presentation
Delivering of presentation
Handling questions

Examination Scheme:

Components	Written Test	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance
Text & References:

- Working in English, Jones, Cambridge
- Business Communication, Raman –Prakash, Oxford
- Speaking Personally, Porter-Ladousse, Cambridge
- Speaking Effectively, Jermy Comfort, et.al, Cambridge
- AnjaneeSethi&BhavanaAdhikari, Business Communication, Tata McGraw Hill

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Syllabus - Fifth Semester

READING AND COMPREHENSION

Course Code: CSS2351 **Credit Units: 01**

Course Objective:
To facilitate development of good reading & comprehension skills by deepening vocabulary, and refining academic language proficiency.

Course Contents:
Module I: Effective Reading
Process, types and reading rate adjustment
Tips for improving reading skills
Reading Comprehension

Module II: Business/Technical Language Development
Advanced Grammar: Syntax, Tenses, Voices
Advanced Vocabulary skills: Jargons, Terminology, Colloquialism

Module III: Business Communication
Reading Business/ Technical press
Researching for Business /Technology

Module IV: Activities
News reading
Picture reading
Review of a book/journal

Examination Scheme:

Components	Written Test	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

Text & References:
- Business Communication, Raman –Prakash, Oxford
- Creative English for Communication, Krishnaswamy N, Macmillan
- Business Vocabulary in Use: Advanced Mascull, Cambridge
- Effective Technical Communication, M. Ashraf Rizvi.
- Anjanee Sethi & Bhavana Adhikari, Business Communication, Tata McGraw Hill

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Syllabus - Sixth Semester

CORPORATE COMMUNICATION

Course Code: CSS2451 **Credit Units: 01**

Course Objective:
To develop competencies to form written communication strategies necessary in the workplace, and to execute them for effective communication.

Course Contents:

Module I: Introduction to Writing Skills
Effective Writing Skills
Avoiding Common Errors
Paragraph Writing
Note Taking
Writing Assignments

Module II: Letter Writing
Types
Formats

Module III: Official Correspondence
Memo, Notice and Circulars
Agenda and Minutes

Module IV: Report Writing
Purpose and Scope of a Report
Fundamental Principles of Report Writing
Project Report Writing
Summer Internship Reports

Module V: Social Networking
Advantages
Opportunities
Making Contacts

Examination Scheme:

Components	Written Test	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

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Text & References:

- Business Communication, Raman –Prakash, Oxford
- Creative English for Communication, Krishnaswamy N, Macmillan
- Textbook of Business Communication, Ramaswami S, Macmillan
- Working in English, Jones, Cambridge
- A Writer's Workbook Fourth edition, Smoke, Cambridge
- Effective Writing, Withrow, Cambridge
- Writing Skills, Coe/Rycroft/Ernest, Cambridge
- Anjanee Sethi & Bhavana Adhikari, Business Communication, Tata McGraw Hill

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Syllabus - Seventh Semester

EMPLOYABILITY SKILLS

Course Code: CSS2551 **Credit Units: 01**

Course Objective:
To enhance employability skills of the learners by enabling them to write effective resume and face the interview with confidence.

Course Contents:
Module I
Introduction to Public Speaking
Business Conversation
Effective Public Speaking
Art of Persuasion

Module II: Interviews
Types of Interview
Styles of Interview
Facing Interviews-Fundamentals and Practice Session
Conducting Interviews- Fundamentals and Practice Session
Mock interview sessions

Module III
Resume Writing
Covering Letters
Interview Follow Up Letters

Module IV
Assessment through employability score card

Module V: Business Etiquette
Introduction
Dressing up
Exchanging Business card
Shaking hands
Dining etiquette

Examination Scheme:

Components	Written Test	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

Text & References:

- Jermy Comfort, Speaking Effectively, et.al, Cambridge
- Krishnaswamy, N, Creative English for Communication, Macmillan
- Raman Prakash, Business Communication, Oxford.
- Taylor, Conversation in Practice
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Syllabus – Eighth Semester

WORKPLACE COMMUNICATION

Course Code: CSS2651 **Credit Units: 01**

Course Objective:
The course is designed to empower students to carry out day to day communication at work place by adequate understanding of various types of communication and use of technology to facilitate efficient interpersonal communication.

Course Contents:
Module I: Dynamics of Group Discussion
Introduction,
Methodology
Role Functions
Mannerism
Guidelines

Module II: Communication through Electronic Channels
Introduction
Technology based Communication Tools
Video Conferencing
Web Conferencing
Selection of the Effective Tool
E-mails, Fax etc.

Module III: Professional Skills
Negotiations
Meetings
Email writing
Telephonic Skills

Examination Scheme:

Components	Written Test	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

Text & References:

- Jermy Comfort, Speaking Effectively, et.al, Cambridge
- Krishnaswamy, N, Creative English for Communication, Macmillan
- Raman Prakash, Business Communication, Oxford.
- Taylor, Conversation in Practice,
- AnjaneeSethi&BhavanaAdhikari, Business Communication, Tata McGraw Hill

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Syllabus – Ninth Semester

INTERPERSONAL COMMUNICATION

Course Code: CSS4351 **Credit Units: 01**

Course Objective:

'Actions speak louder than words.' Every business communicator needs to understand the nuances of 'body language and voice.' This course is designed to enable the young Amitian to decipher the relevance of Kinesics, Proxemics and Para Language that cater to the fundamental requirements of effective business presentations and speeches.

Course Contents:

Module I: Non - Verbal Communication
Principles of non- verbal communication
Kinesics
Proxemics
Paralanguage and visible code

Module II: Speaking Skills
Pronunciation drills (Neutralizing regional pulls)
Conversational English
Guidelines to an effective presentation

Module III: Interviews and GDs
Note:
1 written test of 20 marks of one hour duration will be conducted. Also, each student will be required to make a presentation for 20 marks over and above the teaching hours. They will have to be programmed accordingly.

Examination Scheme:

Components	Written Test	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

Text & References:

- Business Communication, Raman – Prakash, Oxford
- Business Communication for Managers: An Advanced Approach, Penrose, Thomson
- Business Communication, Krizan, Thomson
- Understanding Human Communication,9/e, Adler R Oxford
- Business Communication- Sethi, Adhikari, Tata McGraw Hill

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Syllabus - Tenth Semester

CROSS CULTURAL COMMUNICATION

Course Code: CSS4451 **Credit Units: 01**

Course Objective:
The influx of multinationals, FDIs and Retail Management makes global communication a harsh reality and offers cultural communication challenges. This course is designed to inculcate trans-cultural communication skills among the young Amitians.

Course Contents:
Module I: Importance of Culture in Communication
Principles of effective cross cultural communication
Developing Communication Competence

Module II: Barriers to effective communication
Sender, Receiver and Situation related barriers
Measures to overcome the barriers
Listening skills

Module III: Cross cultural communication
Characteristics of culture
Social differences
Contextual differences
Nonverbal differences
Ethnocentrism

Examination Scheme:

Components	Written Test	CAF	V/P	GD/Extempore	A
Weightage (%)	40	25	20	10	5

CAF- Communication Assessment File, **V/P**- Viva/Presentation, **GD**- Group Discussion, **A**- Attendance

Text & References:
- Business Communication, Raman – Prakash, Oxford
- Business Communication for Managers: An Advanced Approach, Penrose, Thomson
- Understanding Human Communication,9/e, Adler R Oxford
- Business Communication- Sethi, Adhikari, Tata McGraw Hill

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ENGLISH LITERATURE

Programme Structure

Course Code	Course Title	Lecture (L) Hours /Week	Tutorial (T) Hours /Week	Total Credits
ENG2151	Shakespearean Comedy	2	1	3
ENG2251	Romantic Poetry	2	1	3
ENG2351	The Novels of England	2	1	3
ENG2451	The English Novels of India	2	1	3
ENG2551	Genre Fiction	2	1	3
ENG2651	Contemporary Literature	2	1	3
	TOTAL			**18**

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ENGLISH LITERATURE

Syllabus - Semester First

SHAKESPEAREAN COMEDY

Course Code: ENG2151 **Credit Units: 03**

Text:

1. Shakespeare - A Midsummer Night's Dream
2. Shakespeare - The Tempest
3. Shakespeare - Twelfth Night

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- Ali, Amir. Basic Introduction to Shakespeare. Oxford University Press.
- *Clemen, Wolfgang. Shakespeare's Dramatic Art: Collected Essays. New York: Routledge, 2005.*
- *Smith, Emma. Shakespeare's Comedies: A Guide to Criticism. Blackwell Publishers, 2004.*
- Eagleton, Terry. Shakespeare and Society: Critical Studies in Shakespearean Drama. 1967.
- Bryant, J.A., Jr. Shakespeare and the Uses of Comedy. 1986.
- Mangan, Michael. A Preface to Shakespeare's Comedies, 1594-1603. 1996.

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Syllabus – Semester Second

ROMANTIC POETRY

Course Code: ENG2251 **Credit Units: 03**

Text:

1.	William Wordsworth	-	Tintern Abbey, Ode on the Intimations of Immortality.
2.	Samuel Taylor Coleridge	-	Ode to Dejection, Kubla Khan.
3.	Shelley	-	Ode to the West Wind.

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- Roe, Nichole: Romanticism. Oxford University Press.
- Wolfson, Susan J: Cambridge Companion to Keats. Cambridge University Press.
- Fraser, George Sutherland: John Keats: Odes: A Casebook. Macmillan.
- Robinson, Daniel: A Century of Sonnets: The Romantic Era Revival. Oxford University Press.

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Syllabus – Semester Third

THE NOVELS OF ENGLAND

Course Code: ENG2351 **Credit Units: 03**

Text:

1. Jonathan Swift - Gulliver's Travels
2. Jane Austen - Pride and Prejudice
3. Charles Dickens - Hard Times

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- John Richetti. Cambridge Companion to the Eighteenth Century Novel. Cambridge Univ. Press
- Wilbur L Cross. Development Of The English Novel

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Syllabus - Semester Fourth

THE ENGLISH NOVELS OF INDIA

Course Code: ENG2451 **Credit Units: 03**

Text:

1. R.K. Narayan - The Guide
2. Salman Rushdie - Midnight's Children
3. Amitav Ghosh - The Shadow Lines

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- Iyengar K.R. Srinivas. Indian Writing in English. Advent Books Division
- Daiches D. Critical Approaches to English Literature. Orient Black Swan.
- V. Padma. Fiction as Window: Critiquing the Indian Literary Cultural Ethos since the1980.Orient Blackswan.
- Dodiya Jaydesinh. Indian Women Novelists in English. Sarup and sons.

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Syllabus - Semester Fifth

GENRE FICTION

Course Code: ENG2551 **Credit Units: 03**

Text:

1.	Science Fiction	Issaac Asinov	Foundation
2.	Children's Fiction	Lewis Caroll	Through the Looking Glass
3.	Detective Fiction	Agatha Christie	The Murder of Roger Ackroyd

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- Christopher Pawling, 'Popular Fiction: Ideology or Utopia?,' Popular Fiction and Social Change, ed. Christopher Pawling (London: Macmillan, 1984).
- Umberto Eco, 'Narrative Structure in Fleming,' in the Study of Popular Culture: A Sourcebook, ed. Bob Ashley (London: Pinter, 1989), pp. 124-34.
- Darko Suvin, 'On Teaching SF Critically,' from Positions and Presupositions in Science Fiction, (London: Macmillan), pp. 86 – 96.
- Felicity Hughes, 'Children's Literature: Theory and Practice,' ELH. 45 (1978), pp. 542-62.

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Syllabus - Semester Sixth

CONTEMPORARY LITERATURE

Course Code: ENG2651 **Credit Units: 03**

Text:

1. D. H. Lawrence - Sons and Lovers
2. Joseph Conrad - Lord Jim
3. James Joyce - Portrait of an Artist as a Young Man

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- Sagar, Keith, The Art of D. H. Lawrence, Cambridge University Press, 1975
- Sander, Scott Russell, D. H. Lawrence: The World of the Five Major Novels, Viking Press, 1974
- H. Stape, ed., The Cambridge Companion to Joseph Conrad, Cambridge University Press, 2006
- Brady, Philip and James F. Carens, eds. Critical Essays on James Joyce's A Portrait of the Artist as a Young Man, New York: G. K. Hall, 1998.
- Wollaeger, Mark A., ed. James Joyce's A Portrait of the Artist as a Young Man: A Casebook, Oxford, New York, 2003.

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HISTORY

Programme Structure

Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
HIS2151	History of Ancient India	3	-	-	3
HIS2251	History of Medieval India	3	-	-	3
HIS2351	History of Modern India	3	-	-	3
HIS2451	The Ancient World	3	-	-	3
HIS2551	Rise of the Modern West	3	-	-	3
HIS2651	History of the World from Mid 20th Century to the 21st Century	3	-	-	3
	TOTAL				**18**

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HISTORY

Syllabus - Semester First

HISTORY OF ANCIENT INDIA

Course Code: HIS2151 **Credit Units: 03**

Course Objective
This course is aimed at acquainting students with the basics of Indian history beginning from the pre-historic period to the early phase of medieval India.

Course Contents
Module-I: Reconstructing Ancient Indian History, Prehistory and Proto-history
Sources of Ancient Indian history, Paleolithic, Mesolithic, Neolithic periods, Pre-Indus Civilizations

Module-II: The Indus Valley Civilization
Origin, main excavated sites and their characteristics, system of town planning, socio-religious and economic history, causes of decline

Module-III: Vedic Period, Caste System and the Emergence of New Religious Orders
Four Vedas and literature of Later Vedic period like Unpanishadas, Brahmanas, Sutras and Dharamshastras, etc, rise of Buddhism and Jainism, causes, spread and decline

Module-IV: The Mauryan Empire
Sources, Sixteen Mahajanapadas, Magadhan to Mauryan period, Hariyanka dynasty, Shishunaga and Nandas, political administration, socio-religious and economic conditions, art and architecture, decline of the Mauryan Empire

Module-V: Kushana Empire and Gupta Empire
Shungas, Kanvas and Kushanas, Kanishka and Mahayana Buddhism, Gandhara, Mathura and Amravati Schools of Art, Trade and Silk Route

Module-VI: India under Harsha, Post- Harsha period
Vardhans and Satvahanas, early-medieval period and feudalism

Examination Scheme

Components	A	A/TP	CT	EE
Weightage (%)	5	15	10	70

(**A :** Attendance ; **A/TP :** Assignment/ Term Paper ; **CT :** Class Test ; **EE :** Endterm Examination)

Texts and References

- Thapar, Romila, Early India, Penguin, 2002
- Sharma, R.S., India's Ancient Past, Oxford University Press, 2011
- Jha, D.N., Ancient India in Historical Outline, Manohar Publishers, 2008
- Upinder Singh, History of Ancient and Early Medieval India, Pearson, 2008

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Syllabus - Semester Second

HISTORY MEDIEVAL INDIA

Course Code: HIS2251 **Credit Units: 03**

Course Objective

This course is aimed at acquainting students with the basics of medieval Indian history beginning from the Sultanate period to the decline of the Mughal Empire in the 18th century.

Course Contents

Module-I: Political and Economic Developments in the Sultanate Period

Coming of the Turks to India, Dynastic history—Ilbari Turks, Khaljis, Tughlaqs, Sayyids, and Lodhis, socio-political and economic developments, emergence of new institutions, nobility and new ruling elite, economic developments—urban revolution and rural revolution

Module-II: Socio-religious Movements in the Sultanate Period, Art and Architecture

Bhakti—origins, nirguna and saguna bhakti, Sufism-origins, silsilahs and impact on Indian society, developments in architecture

Module-III: Mughal India Part-I

The Early Mughals—Babur and Humayun, period of Akbar and Jahangir, political developments, new institutions, territorial integration, economic developments

Module-IV: Mughal India Part-II

Period of Shah Jahan and Aurangzeb—political developments, new institutions, territorial integration, economic developments

Module-V: Cultural Developments during the Mughal Period

Paintings, architecture, music, calligraphy, patronage of the arts

Module-VI: Fall of the Mughal Empire

Causes for the fall of the Mughal Empire, theories—old and new, rise of regional polities, coming of the British

Examination Scheme

Components	A	A/TP	CT	EE
Weightage (%)	5	15	10	70

(**A :** Attendance ; **A/TP :** Assignment/ Term Paper ; **CT :** Class Test ; **EE :** Endterm Examination)

Texts and References

- Chandra Satish, Medieval India Vol. I and II, Haranand Publications Pvt. Lt, 2001
- Kumar Sunil, Emergence of the Delhi Sultanate, Permanent Black, 2010
- Habib Irfan, Medieval India I: Researches in the History of India, Oxford University Press, 1998

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Syllabus - Semester Third

HISTORY OF MODERN INDIA

Course Code: HIS2351 **Credit Units: 03**

Course Objective
This course is aimed at acquainting students with the basics of modern Indian history beginning from the period of British imperialism to the partition of India, and the emergence of the new Indian state.

Course Contents

Module-I : Economic Developments
Land Revenue, Trade, Drain of Wealth, Growth of Modern Industry

Module-II: Popular Resistance- The Revolt of 1857
Causes of the Revolt, major participants, debates and historiography

Module-III: Socio-religious Reform Movements
The socio-religious movements of the 19th century- Brahmo Samaj, Prarthana Samaj, Arya Samaj, Ramakrishna Mission, debates on reform and revival

Module-IV: Nationalism, Mahatma Gandhi and the National Movement, India's Walk to Freedom
Gandhi's idea of nationalism and freedom, satyagrahas, Ahmedabad Mill Strike, Non-cooperation and Khilafat movement, Civil Disobedience movement

Module-V: Partition and Independence
Quit India movement, Cripps Mission, Mountbatten Plan, Partition riots, impact of partition on India

Module-VI: Emergence of a New State
India after partition, new developments, framing of the Constitution, Five-Year Plans

Examination Scheme

Components	A	A/TP	CT	EE
Weightage (%)	5	15	10	70

(**A :** Attendance ; **A/TP :** Assignment/ Term Paper ; **CT :** Class Test ; **EE :** Endterm Examination)

Texts and References

- Bandopadhyay, Sekhar, From Plassey to Partition, Orient Blackswan, 2004
- Sarkar, Sumit, Modern India, Pearson India, 2014
- Chandra Bipan, Panikkar K.N., Mukherjee Mridula, Mahajan Sucheta, and Mukherjee Aditya, India's Struggles for Independence

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Syllabus - Semester Fourth

THE ANCIENT WORLD

Course Code: HIS2451 **Credit Units: 03**

Course Objective

This course is aimed at acquainting students with the basics of world history beginning from pre-history to the Greco-Roman civilizations. The political, social, economic, and cultural aspects of all the phases will be covered as part of this course.

Course Contents

Module-I: Pre-History- Paleolithic and Mesolithic phases

Human evolution, Paleolithic- sites, tools, main characteristic features, Mesolithic- sites, tools, main characteristic features

Module-II: Neolithic Revolution

The beginning of agriculture, revolutionary change, sites, tools, main characteristic features

Module-III: Bronze Age Civilizations-Mesopotamia

Geographical setting, phases in the development of the civilization, polity, economy, society, culture

Module-IV: Bronze Age Civilizations- Egypt

Geographical setting, phases in the development of the civilization, polity, economy, society, culture

Module-V: Greek Civilization

Geographical setting, phases in the development of the civilization, polity, economy, society, culture

Module-VI: Roman Civilization

Geographical setting, phases in the development of the civilization, polity, economy, society, culture

Examination Scheme

Components	A	A/TP	CT	EE
Weightage (%)	5	15	10	70

(**A :** Attendance ; **A/TP :** Assignment/ Term Paper ; **CT :** Class Test ; **EE :** Endterm Examination)

Texts and References

- Amar Farooqui, *Early Social Formations*
- Glyn Daniel, *First Civilizations*

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Syllabus - Semester Fifth

RISE OF THE MODERN WEST

Course Code: HIS2551 **Credit Units: 03**

Course Objective

This course is aimed at acquainting students with the basics of World history, beginning from the Renaissance to the Industrial Revolution. All the important themes and landmark events in world history will be covered as part of this course.

Course Contents

Module-I: The Age of Renaissance

Period of the Renaissance in Europe, spread, major characteristic features, major artistic developments- paintings and sculptures, debates and recent historiography

Module-II: The Age of Reformation

Period of Reformation- background and origins, Martin Luther and the Reformation in Germany, Reformation outside Germany, nature of Reformation, legacy of the Reformation, debates and recent historiography

Module-III: Origins of Modern Politics- The French Revolution

Historiographical trends, causes, phases of the revolution, Age of the Republic, economic and political policies, role of women, impact of the revolution

Module-IV: The American Revolution

Historiographical trends, causes, important events, ideology of the revolution, impact of the revolution

Module-V: British Industrial Revolution

Historiographical trends, factors for the emergence of industrialization, major technological developments, economic impact, socio-political impact

Examination Scheme

Components	A	A/TP	CT	EE
Weightage (%)	5	15	10	70

(**A :** Attendance ; **A/TP :** Assignment/ Term Paper ; **CT :** Class Test ; **EE :** Endterm Examination)

Texts and References

- Meenaxi Phukan, *Rise of the Modern West: Social and Economic History of Early Modern Europe*
- J. R. Hale, *Renaissance Europe*
- Christopher Hill, *A Century of Revolutions*

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Syllabus - Semester Sixth

HISTORY OF THE WORLD FROM MID-20TH CENTURY TO THE 21ST CENTURY

Course Code: HIS2651 **Credit Units: 03**

Course Objective

This course is aimed at acquainting students with the history of the two world wars and the post-war events. All the important themes and landmark events will be covered as part of this course.

Course Contents

Module-I: World War I

Causes; political, economic, military, social developments; end of the war and the Treaty of Versailles

Module-II: Inter-War Period

Rise of Nazism in Germany, rise of Fascism in Italy, Stalinist Russia

Module-III: World War II

Causes; political, economic, military, social developments; end of the war and reconstruction of Europe

Module-IV: Liberation from Colonial Rule

End of colonial rule in Latin America, Arab World, Africa and South-East Asia

Module-V: Cold War

Power blocks- USA and USSR, political and economic developments

Module-VI: Rise of USA as a World Power

Reasons for the emergence of US as a world power, historiograhical trends, political developments in the post-Cold War period, economic supremacy

Examination Scheme

Components	A	A/TP	CT	EE
Weightage (%)	5	15	10	70

(**A :** Attendance ; **A/TP :** Assignment/ Term Paper ; **CT :** Class Test ; **EE :** Endterm Examination)

Texts and References

- David Stevenson, 1914-1918: The History of the First World War, Penguin Books, UK, 2004
- Ross F. Collins, World War One
- Samuel L.A. Marshall, World War I
- Bernard Bailyn, The Ideological Origins of the American Revolution
- R.P. Kaushik, Significant Themes in American History

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SANSKRIT

Programme Structure-2019

Course Code	Course Title	Lecture (L) Hours /Week	Tutorial (T) Hours /Week	Practical (P) Hours/Week	Total Credits
SKT2151	Introduction to Sanskrit Language	3	-	-	3
SKT2251	General Introduction to Vedic Literature & Conversational Sanskrit	3	-	-	3
SKT2351	General Introduction to Sanskrit Literature & Sanskrit Conversation	3	-	-	3
SKT2451	Sanskrit Language & Indian Culture	3	-	-	3
SKT2551	Introduction to Sanskrit Linguistics	3	-	-	3
SKT2651	General Introduction to Indian Philosophy & Sanskrit Grammar	3	-	-	3
	TOTAL				**18**

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SANSKRIT

OBJECTIVES OF THE PROGRAM

AMITY CENTRE FOR SANSKRIT AND INDIC STUDIES under the aegis of Amity School of Liberal Arts (ASLA) offers **SANSKRIT** as of the **Open Elective Courses**. This course intends to make the learners aware of the fact that Sanskrit is the gateway of the ancient Indian wisdom and is a perennial source of inspiration for national integrity and universal brotherhood.

This course aims to improve the Reading, Writing, Speaking and Listening skills in Sanskrit learners. It also aims to enable them to appreciate different forms and genres of Sanskrit literature and to become aware of the rich intellectual tradition of India.

Note: The medium of instruction and examination for the course would be Hindi, Sanskrit and English.

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SANSKRIT

Syllabus - Semester First

INTRODUCTION TO SANSKRIT LANGUAGE

Course Code: SKT2151 **Credit Units: 03**

Course Objectives:

To enable the students to understand the importance and relevance of Sanskrit language and to provide the students with an insight about the mechanism of the Sanskrit language.

Course Contents:

Module-I: Introduction to Sanskrit and its importance

- An introduction to Sanskrit language
- Importance and relevance of Sanskrit language.
- Special features of Sanskrit language.

Module-II: Sanskrit Orthography

- Alphabets of Sanskrit language
- Phonetics of the Sanskrit language
- Articulation of Sanskrit Sounds : Vowels, Consonants and Semi-vowels .
- Identifying the word-endings.
- Maheshwar Sutra
  Concept of Māheśvara-sūtra and Pratyāhāra, Sanskrit alphabets: places of articulation and articulatory efforts. On the basis of Laghusiddhāntakaumudī.

शब्द रूप तथा धातु रूप

शब्द रूप - देव , फल , लता , मुनि , नदी ,मति ,वरि ,साधू ,धेनु , मधु , वधू , मातृ , पितृ , कर्तृ ,आत्मन् ,
विद्वस् , जगत्।

धातु रूप - परस्मैपदी धातु - पठ् , गम् , अस् , लिख्
आत्मनेपदी धातु - सेव् , रुच् , वृत्

Module-III: Sanskrit Texts

- Reading and discussion upon the stories and about Sanskrit text Panchtantra.
- Text Reading (Grammar, Translation, Explanation), Message, Purpose of this text.

Module-IV: Verbal Form (लकार बोध)

- Tense – Present tense, Future tense ,Past tense .
- Learning, memorizing and understanding the conjugation of verbs & words and speculations of Sanskrit grammar.
- Studying purush ,vachan, karak and vibhakti and general use of them.

Module-V: Language Formation

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- Reading understanding and practicing simple sentences of the Sanskrit language from Saral Sanskrit Shikshan.
- Listing and using name of objects in Sanskrit.
- Listing of Tatsam (Sanskrit) words from Hindi.
- Enlisting sentences for general conversation.

Student Learning Outcomes:
Students who complete this course will be able to know and explain features of Sanskrit language . They will illustrate the importance of this language . They will read simple Sanskrit sentences and make similar sentences in verbal and written forms .They will also start reading and understanding the simple text from Sanskrit.

Examination Scheme :

Continuous Assessment /Internal Assessment					End Term Examination
Components	**Class Test**	**Home Assignment**	**Class Performance**	**Attendance**	**EE**
Weightage(%)	10	10	5	5	70

Recommended Books

Text Book

रचनानुवादकौमुदी कपिलदेवद्विवेदी , विश्वविद्यालयप्रकाशन वाराणसी।
संस्कृत शिक्षणसरणी आचार्यरामशास्त्री,परिमलपब्लिकेशन्स दिल्ली।
अनुवादकला अथवा वाग्व्यवहारदर्श चारुदेवशास्त्री – मोतीलालबनारसीदास दिल्ली।
व्याकरणचंद्रोदय (खंड१ - ५) चारुदेवशास्त्री ,मोतीलालबनारसीदास दिल्ली।
सरलसंस्कृतशिक्षण भारतीय विद्याभवन नईदिल्ली
पंचतंत्र विष्णु शर्मा
लघुसिद्धान्तकौमुदी धरानन्द शास्त्री दिल्ली

Reference Book

संस्कृत सहचर राधामोहन पाण्डेय स्टूडेंट्सफ्रेंड्स पटना।
सम्भाषण सन्देश संस्कृतभारतीबेंगलुरु।
संस्कृत-हिन्दीकोश वामन शिवरामआप्टे
प्रारंभिक संस्कृतव्याकरण शिप्रापब्लिकेशन।।
पाणिनिशिक्षा मोतीलालबनारसीदास।
Composition and Essay RanjiUpadyay ,Cowkhambavidyabhava.
Higher Sanskrit Grammar M.R.Kale,MotiLalBanarsidas,Delhi.2007

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Syllabus - Semester Second

GENERAL INTRODUCTION TO VEDIC LITERATURE & CONVERSATIONAL SANSKRIT

Course Code: SKT2251 **Credit Units: 03**

Course Objectives :
This course aims to get students acquainted with the history of Sanskrit literature from Vedic literature to Purāṇa. It also intends to give an outline of use of Sanskrit language and to make students aware of morals and ethics in Indian culture through Vedic texts.

Course Contents:

Module-I: Vedic Literature
- A general introduction of Vedic Samhita (Rigveda , Yajurveda , Samaveda , Atharvaveda - time subject - matter , philosophy and social life).
- A general introduction of Brahman ,Aaranyak , Upanishad , Vedanga and Purana.

Module-II: Introduction to Indian cultural Traditions
- Ancient Indian Education System
- Status of women in ancient Indian society.
- Dharm –dharmshastra

Module-III: Communicative words in Sanskrit
- Listing and using names of objects, fruits, flower and animals in Sanskrit.
- Preparing a dictionary of Sanskrit words, verbs
- Memorizing Sankhyavacaka Shabd.

Module-IV: Introductory Grammar
- Learning memorizing and understanding the Verb , Phonetics of the Sanskrit Language and speculation of Sanskrit grammar.
- An introduction to all types of सन्धि.
- Making new sentences for general conversation.
- Translation practice on various topics of daily life

Module-V: Prefixes and Suffixes
- **प्रत्यय का सामान्य परिचय**

कृत प्रत्यय - तव्यत्, तव्य, अनीयर्, यत्, ण्यत्, क्यप्, ण्वुल्, तृच्, अण्, क्त, क्तवतु, शतृ, शानच्, तुमुन्, घञ्, अच्, क्तिन्, क्त्वा (ल्यप्), ल्युट् .

तद्धित प्रत्यय - मत्वर्थीय- मतुप्, इनि, ठन्। अपत्यार्थक- अण्, इञ्, ढक् . भावकर्मार्थक- त्व, तल्, इमनिच्, ष्यञ्। Others तरप्, तमप्, ईयसुन्, इष्ठन्, तसिल्,

Student Learning Outcomes:

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Students who complete this course will be able to understand simple Sanskrit. They will Come to know about specific texts of contemporary importance will enable them to understand the salient features of Indian culture and make their firsthand viewpoint about these scriptures.

Examination Scheme :

Continuous Assessment /Internal Assessment					End Term Examination
Components	**Class Test**	**Home Assignment**	**Class Performance**	**Attendance**	**EE**
Weightage(%)	10	10	5	5	70

Recommended Books

Text Book

रचनानुवादकौमुदी कपिलदेवद्विवेदी , विश्वविद्यालयप्रकाशन वाराणसी।
वृहद अनुवाद चन्द्रिका कपिलदेव द्विवेदी , विश्वविद्यालय प्रकाशन वाराणसी
संस्कृत शिक्षणसरणी आचार्यरामशास्त्री,परिमलपब्लिकेशन्स दिल्ली।
अनुवादकला अथवा वाग्व्यवहारदर्श चारुदेवशास्त्री – मोतीलालबनारसीदास दिल्ली।
व्याकरणचंद्रोदय (खंड१ - ५) चारुदेवशास्त्री ,मोतीलालबनारसीदास दिल्ली।
सरलसंस्कृतशिक्षण भारतीय विद्याभवन नईदिल्ली
पंचतंत्र - भीमसेन शास्त्री
लघु सिद्धांत कौमुदी- धरानन्द शास्त्री दिल्ली

Reference Book

संस्कृत सहचर राधामोहन पाण्डेय स्टूडेंट्सफ्रेंड्स पटना।
सम्भाषण सन्देश संस्कृतभारतीबेंगलुरु।
संस्कृत-हिन्दीकोश वामन शिवरामआप्टे
प्रारंभिक संस्कृतव्याकरण शिप्रापब्लिकेशन।।
पाणिनिशिक्षा मोतीलालबनारसीदास।
Composition and Essay Ranji Upadyay, Cowkhambavidyabhava.
Higher Sanskrit Grammar, M.R. Kale, MotiLal Banarsidas, Delhi.2007

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Syllabus - Semester Third

GENERAL INTRODUCTION TO SANSKRIT LITERATURE AND SANSKRIT CONVERSATION

Course Code: SKT2351 **Credit Units: 03**

Course Objective:
This course aims to get the students acquainted with the outline of Sanskrit literature. It has two sections:
(i) Literature (poetry, prose and play) and
(ii) Survey of literature. In literature segment two most famous plays of Sanskrit have been introduced, which not only reflect the poetic excellence, but also depict contemporary society.

Course Contents:

Module-I: Bhagvad Gita
- Bhagavadgītā – IInd Chapter, verses, 11, 13, 16, 18, 20, 22, 23, 24, 25 and 27.
- Gītā; Ch. 12- Text Reading (Grammar, Translation, Explanation),
- Philosophy of devotion.

Module-II: Classical Sanskrit literature : An introduction / overview
- Rāmāyaṇa Mahābhārata,
- **Bhāsa**,-**Svapnavassavadattam** Introduction, Author, Story, Unique features / Style of Bhāsa
- **Kālidāsa**,- **Abhijnanashakuntalam** Introduction, Author,story, Personification of nature, Language, and other problems related to texts.

Module-III: Oral and Written Practice in Sanskrit
- Reading prose content from the syllabus loudly with sense in dialogue mode
- Reading poetry from the syllabus loudly with proper tone and intonation
- Writing prose and poetry from the course content for practice

Module-IV: Translation in and from Sanskrit
- Translation of Hindi / English text in Sanskrit and vice versa.
- Writing short passages in Sanskrit.

Module-V: Media and Art in Sanskrit
- Magazines and Newspapers, Media – Radio, TV, Internet, blogs, important sites, Sanskrit Wikipedia (general awareness only).
- Script writing, News editing/ writing.(Sanskrit only)
- Music and Dancing in the context of नाट्यशास्त्र
  Concept of Music - *Saṅgīta*,
  Concept of Instrument – *Vādya*
  Concept of Dance - *Nṛtya*,
  Concept of Rhythm – *Tāla*,
  Inter-relation among Painting, Dancing and Music
  Importance of music in drama,

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Note: It is expected to understand the concepts in the light of Viṣṇudharmottara Purāṇa; Part-III, Chapter 36-43, Citrasūtra; and Classical Indian Dance in Literature & The Arts, KapilaVatsyayan, SangeetNatak Academy, New Delhi (Chapter I, pp. 5-22, Chapter V pp.333-344) only selected portions.

Students Learning Outcome:
After completing the course the students will be able to understand the outline of Sanskrit Literature. They will be able to read, write and speak sentences in Sanskrit .They will be able to know Sanskrit Media and Indian classical- Arts.

Examination Scheme :

Continuous Assessment /Internal Assessment					End Term Examination
Components	**Class Test**	**Home Assignment**	**Class Performance**	**Attendance**	**EE**
Weightage(%)	10	10	5	5	70

Suggested Readings:

Text Books

अभिज्ञानशाकुन्तलम् (कालिदास) : – सुबोधचन्द्र पंत, मोतीलाल बनारसीदास, दिल्ली.
– सुरेन्द्रदेव शास्त्री, रामायणलाल बेनीप्रसाद, इलाहाबाद.

श्रीमद्भगवद्गीता, - व्याख्याकार - मदनमोहनअग्रवाल,चौखम्बासंस्कृत प्रतिष्ठान दिल्ली।
श्रीमद्भगवद्गीता - एस राधाकृष्णन कृत हिंदीअनुवाद ,राजपालएण्डसन्स दिल्ली।
स्वप्नवासदत्तम् - एम आर काले , मोतीलाल बनारसीदास नई दिल्ली।
भारतकालीनकलाएँ - भारतेन्दुमिश्र ,प्रतिभाप्रकाशनदिल्ली२००४
भारतीयनाट्य ;स्वरुपऔरपरंपरा - - राधावल्लभत्रिपाठी , हरिसिंहगौरविश्वविद्यालय , सागर -१९८८

Reference Books

उपाध्याय, बलदेव – *संस्कृत साहित्य का इतिहास*, शारदा निकेतन, वाराणसी.
– *वैदिक साहित्य और संस्कृति*, वाराणसी.
तिवारी, रमाशंकर *महाकवि कालिदास*, चौखम्बा विद्याभवन, वाराणसी.
द्विवेदी, हजारी प्रसाद *कालिदास की लालित्य योजना*, राजकमल प्रकाशन, दिल्ली.
शर्मा, उमाशङ्कर (ऋषि) *संस्कृत साहित्य का इतिहास*, चौखम्बा भारती अकादमी, वाराणसी, 1999.
तिलक बालगंगाधर श्रीमद्भगवद्गीतारहस्य और कर्मयोगशास्त्र ,अपोलोप्रकाशन।
Dikshit,Ratnamayi *Women in Sanskrit Dramas*, Meherchand Lacchman Das, Delhi-6.
Keith,A.B. *History of Sanskrit Literature*, MLBD,Delhi.
Keith,A.B. *Sanskrit Drama*, Oxford University Press, London,1970.

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Syllabus - Semester Four

SANSKRIT LANGUAGE & INDIAN CULTURE

Course Code: SKT2451 **Credit Units: 03**

Course Objectives:
The aim of this course is to develop the inner urge of knowing of Indian culture with various aspects of the ancient Sanskrit texts , and to make students to converse in Sanskrit language.

Course Contents:

Module-I: Introduction to Sanskrit Culture
- What is Culture?
- Characteristic / Salient features of Indian Culture**.**
- Read and discuss Hymns of Sangathan sukta of Rigveda.
- Read and discuss Hymns of Shiv Sanklap Sukta of Yajurveda.
- Collecting remembering sentences of wisdom in Sanskrit with Hindi meaning.

Module-II: Basic Tenets of Sanskrit Culture
- Collecting 15 Sanskrit Mottos of various Institution and Government Departments, translating them into Hindi.
- Reading and discussion upon Varn system and Ashram system.
- Reading and discussion upon four purusharthas.
- Introduction to the eight types of Marriage.

Module-III: Sanskrit Text
- Niti Shatakam of Bhrtrihari (10 verses of **murkh paddhti** and 10 verses of **vidwat paddhti**)

Module-IV: Introductory Grammar
- Memorizing complex conjugations and speculations of Sanskrit.
- Making and practicing sentences of Sanskrit
- Writing short notes on general topics of daily life.

Module-V: Conversing in Sanskrit
- Preparing a dictionary of Sanskrit words, verbs
- Writing and presenting interviews and description in Sanskrit.
- Translation of Unseen passage from Sanskrit into Hindi.

Student Learning Outcome:
Students who complete this course will be able to enlist the Sanskrit Mottos of various institutions. They will be able to explain the basic tenets of Sanskrit culture. They will be able to read, write and speak sentences in Sanskrit. Chanting of verses from Niti Shatak and telling their verbal meaning as well as detailed description will be ensured.

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Examination Scheme :

Continuous Assessment /Internal Assessment					End Term Examination
Components	**Class Test**	**Home Assignment**	**Class Performance**	**Attendance**	**EE**
Weightage(%)	10	10	5	5	70

Suggested Readings:

Text Books

रचनानुवादकौमुदी कपिलदेव द्विवेदी , विश्वविद्यालयप्रकाशन वाराणसी।
संस्कृतशिक्षणसरणी आचार्य रामशास्त्री,परिमलपब्लिकेशन्स दिल्ली।
वैदिकसाहित्यऔरसंस्कृति बलदेवउपाध्याय- शारदामंदिर वाराणसी
भारतीयसंस्कृतिकाउत्थान रामजीउपाध्याय, चौखम्बाविद्याभवन वाराणसी।
वेदोंमेंभारतीयसंस्कृति आद्यादत्त-ठाकुर ,हिंदीसमिति लखनऊ।
मनुस्मृति पंडित रामेश्वर भट्ट , राष्ट्रीय संस्कृत संस्थान ,नई दिल्ली
नीतिशतकम् डॉ विष्णु दत्त शर्मा शास्त्री , ज्ञान प्रकाशन मेरठ

Reference Books

संस्कृति के चार अध्याय , दिनकररामधारीसिंह –लोकभारतीप्रकाशन इलाहाबाद।
भारतीय संस्कृति सर्वपल्ली राधाकृष्णन
धर्म समाजऔरसंस्कृति , श्रीमालीकृष्णमोहन ग्रंथशिल्पीप्राइवेट।
भारत की राष्ट्रियसंस्कृति , हुसैनएसआबिद नेशनलबुकट्रस्ट नईदिल्ली
Ancient Indian Education R.K. Mukherjee -MLBD,Delhi .
History of Sanskrit Literature- A.B.KITH (हिंदीअनुवाद- मंगलदेवशास्त्री ,मोतीलालबनारसीदासदिल्ली।

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Syllabus - Semester Fifth

INTRODUCTION TO SANSKRIT LINGUISTICS

Course Code: SKT2551 **Credit Units: 03**

Course Objectives:
The aim of this course is to teach students the basics of Sanskrit linguistics. This will also describe the families of languages prevalent in the world and place of Sanskrit therein, and to get acquainted with the basic rules of translation and translate the texts of Hindi and English into Sanskrit.

Course Contents:

Module-I: Introduction to linguistics.
- Introduction to linguistics and Classification of languages.

Module-II: Linguistics and Sanskrit language
- Place of Sanskrit language in the classification of languages.
- Read Special features of Sanskrit language, and reading about language family -Sanskrit and Indo – European family.

Module-III: Translation
Rules for Translation into Sanskrit from Hindi and English
- Cases and Case-endings
- Sanskrit Voices : Concept, types and rules
- Application of compounds and numeral words
- Application of suffixes

Concept of Voice, nature of active voice (*kartṛ-vācya*), passive voice (*karma-vācya*) and impersonal passive voice (*bhāva-vācya*), Rules of voice change and Changing voice of simple sentences specially with reference to verbal terms, *kṛtya*-suffixes &*niṣṭhā*-suffixes.
Translation from Hindi/English into Sanskrit (Translation of passages and independent sentences) .

Module-IV: Essay
- Art of Essay writing : Structure-formation like introduction, main body, conclusion etc. by the points and sub-points and uses of appropriate references.
- Traditional Essays based on the issues and topics related to the subjects like Sanskrit Language, Culture, Veda, Rāmāyaṇa, Mahābhārata, Upaniṣad, Gītā, Renowned Sanskrit Poets and their poetic excellence.
- Contemporary Essays based on the issues and topics related to the subjects like entertainment, sports, national and international affairs and problems.

Module-V: Language Formation
- Preparing a dictionary of Sanskrit words, verbs
- Collect paragraphs from texts like *Pañcatantra*, *Hitopadeśa*etc. and translate them into Hindi/English.
- Collect paragraphs from daily national newspapers and translate them into Sanskrit.

Student Learning Outcome:

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After completing the course the students will be able to enlist the school of language and place of Sanskrit there in .They explain the basic rules of translation. They will be able to translate the texts of Hindi and English into Sanskrit .

Examination Scheme :

Continuous Assessment /Internal Assessment					End Term Examination
Components	**Class Test**	**Home Assignment**	**Class Performance**	**Attendance**	**EE**
Weightage(%)	10	10	5	5	70

Suggested Readings:

Text Books

बृहदअनुवादचन्द्रिका चक्रधरनौटियाल**,** मोतीलालबनारसीदास दिल्ली।
तुलनात्मकभाषाविज्ञान भोलानाथतिवारी , मोतीलालबनारसीदास दिल्ली।
भाषाविज्ञान भोलानाथतिवारी-, किताबमहल इलाहाबाद।
भाषाविज्ञानकीभूमिका देवेन्द्रनाथशर्मा,राधाकृष्णनप्रकाशन दिल्ली।

Reference Books

संस्कृतकाभाषाशास्त्रीयअध्यय भोलानाथव्यास , चौखम्बाविद्याभवन दिल्ली।
संस्कृत निबंधशतकम्कपिलदेवद्विवेदी -**,**विश्वविद्यालयप्रकाशन वाराणसी।
संस्कृतका ऐतिहासिक एवं डी .डी .शर्मा, हरियाणासाहित्यअकादमीचंडीगढ़।
व्याकरणचंद्रोदय चारुदेवशास्त्री - **(भाग -1,2,3)**मोतीलालबनारसीदास।

Linguistic introduction to Sanskrit B.K Ghosh–, Sanskrit pustakbhandar , Kolkata.
Modern Linguistic-S.K Varma**.,** Oxford university press Delhi .

Higher Sanskrit Grammar .Kale , MLBD, Delhi (Hindi Translation)

The Students' Guide to Sanskrit Composition, V.S Apte, Chowkhamba Sanskrit Series, Varanasi (Hindi Translation also available)

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Syllabus - Semester Sixth

GENERAL INTRODUCTION TO INDIAN PHILOSOPHY & SANSKRIT GRAMMAR

Course Code: SKT2651 **Credit Units: 03**

Course Objectives:
This course aims to get the students acquainted with the basic approach to study philosophy. To enable students to form and use sentences of the Sanskrit languages and to make students aware about morals and ethics of Indian culture through Sanskrit texts.

Course Contents:

Module-I: Schools of Indian Philosophy
Salient features of Indian Philosophy, Vedic and Non-vedic Schools of Indian Philosophy and their basic doctrines as given below:-

- Sāṁkhya - prakṛti, guṇatraya&puruṣa
- Yoga - Concept of yoga and its eight stepts, samādhi, Īśvara&kaivalya
- Mīmāṁsā – Dharma &adharma, bhāvanā, apūrva, vidhi and niṣedha
- Vedānta – Brahma, Īśvara, māyā, jīvaand jagat
- Nyāya-Vaiśeṣika – seven padārthas, four pramāṇas and paramāṇukāraṇvāda
- Bauddha – Four-fold āryasatya, anātmavādaand kṣaṇikatvavāda
- Jaina – Anekāntavāda, syādvāda
- Cārvāka – materialism and basic ethics

Module-II: Yogasutra - Concentration

- Concept of Yoga : (Yogasūtra, 1.2)
- Restriction of fluctuations by practice (abhyāsa) and passionlessness (vairāgya) :(Yogasūtra, 1.12-16)
- Eight aids to Yoga (aṣṭāṅgayoga) : (Yogasūtra, 2.29, 30,32, 46, 49, 50; 3.1-4).
- Yoga of action (kriyāyoga) : (Yogasūtra, 2.1)
- Introduction to the system of Asanas and Pranayama.

Module-III: Sanskrit Grammar

- Memorizing complex conjugations and speculations of Sanskrit .
- Practicing and Memorizing Sandhi, Samas,Pratyay,and Karak.
- Making and practicing sentences of Sanskrit
  Writing short notes on general topics of daily life

Module-IV: Language Formation

- Preparing a dictionary of Sanskrit words, verbs
- An introduction to computational Sanskrit
- Framing sentences of general conversation
- Writing of sentences on various topics

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Module-V: Conversational Sanskrit

- Listing sentences of general conversation.
- Interaction within and out of class using Sanskrit sentences.
- Conversational practice of the various topics.

Students Learning Outcome:

Students who complete this program will be able to understand Sanskrit language. Students will be able to discussion on various aspects of Art of living and Indian philosophy. The students will be able to speak Sanskrit in their class.

Examination Scheme :

Continuous Assessment /Internal Assessment					End Term Examination
Components	**Class Test**	**Home Assignment**	**Class Performance**	**Attendance**	**EE**
Weightage(%)	10	10	5	5	70

Recommended Books

Text Books

भारतीय दर्शन चंद्रधर शर्मा
वैदिकसाहित्य और संस्कृति बलदेवउपाध्याय शारदामंदिर वाराणसी
भारतीयदर्शन बलदेवउपाध्याय चौखम्भाओरिएण्टल दिल्ली।
भारतीय दर्शन राधाकृष्णन
पातञ्जलयोगदर्शन हरिहरानंद राजकमलप्रकाशन दिल्ली।

Reference Books

भारतीयदर्शन की रुपरेखा हरेंद्रप्रसादसिन्हा मोतीलालबनारसीदास दिल्ली।
भारतीयदर्शन की प्रमुखसमस्या ,महेशभारती
Higher Sanskrit Grammar M.R .Kale MLBD, Delhi (Hindi Translation)
Introduction to Indian Philosophy Chatterjee S.C & D.M. Dutta , Calcutta University .
Outline of Indian Philosophy M Hiriyanna London (Hindi , English)
History of Indian philosophy S.N Dasgupta MLBD, Delhi

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PERFORMING ARTS

Programme Structure-2019

Course Code	Course Title	Lecture (L) Hours /Week	Tutorial (T) Hours /Week	Practical (P) Hours/Week	Total Credits
PAR2151	Introduction to Performing Arts	2	-	2	3
PAR2251	Dynamics of Dance, Music & Theatre	2	-	2	3
PAR2351	Social relevance of Dance, Music & Drama in Contemporary Indian Scene	2	-	2	3
PAR2451	Indian Folk Arts	2	-	2	3
PAR2551	Modern Indian Performing Arts	2	-	2	3
PAR2651	Arts, Aesthetic & Society	2	-	2	3
	TOTAL				**18**

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PERFORMING ARTS

OBJECTIVES OF PROGRAM

AMITY CENTRE FOR PERFORMING ARTS Amity School of Liberal Arts offers **Open Elective Course in PERRFORMING ARTS** . This open elective course in Performing Arts is envisioned for students who have a flair for dance/music/theatre and are looking for structured intervention at the UG level. The course hopes to give a strong platform for our students to develop a passion for the Arts, sharpen their artistic skills and broaden their theoretical base.

The course attempts to transcend the definition of art across content and context while reaching out to individuals and communities. While the focus will be predominantly within the parameters of dance, music and theatre.

The primary aim of the course is not to make students experts in one art form or the other, but introduce them to the possibilities with art and to help them get an integrated sense of art. It is desirable that every student continues to work under an artist/group in one art form or the other outside the curriculum, toward long term development.
Note : The medium of instruction and examination for the course would be Hindi and English.

Objectives:-

- To address a spectrum of art concerns
- To give a base in dance, music and theatre
- To stimulate a composite sense of art
- To foster a blend of practical and theoretical understanding and practice in the arts
- To enable identification and growth opportunities in chosen field of dance/music/theatre

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PERFORMING ARTS

Syllabus - Semester First

INTRODUCTION TO PERFORMING ARTS

Course Code: PAR2151 **Credit Units: 03**

Course Objectives:
To give a strong base in the respective areas of dance, music and theatre.
To expose them to the terms and practice in the field.

Course Contents:

Module-I: Introduction to Performing Arts
- What is Performance?
- Performing Art and art of Performance.
- Nature and Structure of Performance.
- Dance- Theory/ practical.
- Music - Theory/ practical.
- Theatre - Theory/ practical.

Module-II: Introduction to Indian Classical dance Forms

Theory-
- Bharathanatyam
- Kathak
- Kathakali
- Kuchipudi
- Manipuri
- Mohiniatam
- Odissi
- Sathriya

Practical-
Teen Tal(Kathak)
- Simple Tatkar with Ekgun, Dugan and Chougan layakaries.
- Guru-Vandna , Thaat , Tehai , Tora/Tukra Chakardhar Tukda , Kavit.
- 2 Small semi classical dance in Dadra and Kahrawa Tal.

Module-III: Tradition of Indian Music

Theory-
- Definition of Sangeet.
    - Hindustani (Vocal/ Instrumental)

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- Carnatic (Vocal/ Instrumental)
- Classification of musical instruments – Structure and playing techniques of Harmoniyam , Naad ,Tanpura , shruti and Tabla.
- Definitions and Explanation of Musical terms such as: Dhwani, Sangeet, Swar, Laya, Raag, Taal, Shuddh- Vikrit, Chal-Achal, Mandra-Madhya-Taar, Sthayee – Antara, Aroha- Avaroha, Raag Jati, Tal Jati, Alap-Tan, Varn, Alankar, Pakad, Bandish, Vilambit-Madhya-Drut, Matra, Theka, Vibhag, Tali, Khali, Sam ,Dhrupad, Dhamar , Khyal ,Khyal , Thumri. Tappa , Saragam , Geet , Tarana.

Practical-

- Sargam Exerises
- Sargam Patterns to study rhytms
- Scale exercises
- Bhajan , Geet , Ghazal
- Alankars (atleast ten alankaras in all Ragas of varying nature)
- Sight singing or playing of written notations and writing notations on listening
- Tala – Keherwa , Dadra
- Tabla lesson-1
- Guitar lesson-1

Module-IV: Theatre

Theory-

- Overview of Theatre.
- What is Theatre?
- Thorough knowledge of Bharata's Natyashastra, and its relevance to an influence on Indian Classical Theatre. Origin, aim and nature of Sanskrit natya according to Bharata and later commentators.
- The types of theatres and their construction according to Natyashastra.

Practical-

- Basic Understanding of Voice and Speech.
- Breathing Exercises.
- Exercises in Volume and Pitch.
- Pronunciation.
- Diction.
- Intonation.
- Emotional Expression.
- Types of Stage.
- Reading : Prose Passages, Story Telling, Tongue-Twister.
- Play-reading and working on a scene for performance.

Module-V: Workshop and Presentation

- Dance-workshop /guest- lecture .
- Music- workshop / guest-lecture.
- Theatre –workshop / guest – lecture.

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Examination Scheme:

Continuous Assessment /Internal Assessment					End Term Examination	
Components	**Class Test**	**Home Assignment**	**Class Performance**	**Attendance**	**Theory**	**Practical**
Weightage(%)	10	5	10	5	30	40

Recommended Books

Reference Books– Dance

- **Dance dialects of India** -Ragini Devi
- **Indian Classical dance Tradition in transition** – LeelaVenkatarama
- **Nritanjali** – an introduction to hindu Dancing - Sri .Ragini

Reference Books– Music

- **Raga Vigyan (All the parts)** Pt. V.N. Patwardhan
- **Raag Parichay –** Harish Chandra Srivastava – Part 1,2&3
- **Sangeet Vishaal –** Vasant(for theory only)
- **Sangeet Bodh –** Dr Sharacchandra Shridhar Paranjpe, Madhya Pradesh Hindi Granth Academy .
- **Raag Parichay –** Sangeet Sadan Prakashan Allahabad
- **Sangeet Visharad –** Sangeet Karyalaya Hatharas

Reference books – Theatre

- **Natyashastra** – Prof Brojmohan chaturvedi .
- **Performance Tradition in India** – SurseshAwasthi, Ed, Year 2009, ISBN 978-81-237-3618-1
- **From the Wings**(Notes on Indian Theatre) – Nemichandra Jain
- **What we do – Working in the Theatre** – Bo Metzler – Publishers – Infinity Publishing. Com

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Syllabus - Semester Second

DYNAMICS OF DANCE, MUSIC & THEATRE

Course Code: PAR2251 **Credit Units: 03**

Course Objectives:
To understand the dynamic nature of the three forms - dance, music and theatre.
To provide deeper understanding of the subject.

Course Contents:

Module-I: History of Dance

Theory-

- History and technique of Indian dance from the ancient times till modern times to be gathered from different sources like Literature , Epigraphy , Sculpture , Iconography, Painting and religious thought. This entails a thorough study of the Natyashastra and relevant texts.
- History of Kathak Dance.
- Gharanas of Kathak Dance.

Practical-
Teental (Kathak)

- Tatkar in Teental in Ekgun, Dugun and Chaugun Layakari.
- Ganesh Vandna.
- Thaat, Simple Amad ,Tihai , Tora/ Tukra , Chakardar Tukra , Paran , Chakardhar Paran , Kavit , Gat. Bhava – Ched Chad & Shingar, Paltas.
- Brief Introduction to Tintala, Dadra , Kaharwa and Jhaptal.

Module-II: Understanding the dynamics of Music

Theory-

- Raga- Introduction ,Definition , Lakshan and classification in Indian Music,
- Thaat- Introduction , Names and Swar of ten Thaats.
- Comparative study of Raga – Thaat.
- Non-detail terms: Aashrraya Raga ,Sangeet; two main systems of Indian Music; Naad, Saptak; Thaat; Alankar; Raga, Janak-Janya Ragas and Ashraya raga; Vadi, Samvadi, Anuvadi, Vivadi; Aroha, Avaroha, Pakad; Chal and Achal Swara.
- Asthayi, Antara; Taan, Alaap; Matra, Vibhag,Taal, Avartan, Sam, Tali, Khali,

Practical-

- Saragam practice
- Detailed and intensive study of the following ragas - Yaman , Bilaval , Khamaj. with Alap, Swaravistar, Sargam,one lakshan geet , one Saragam geet , One Chhota Khyal or Razakhani Gat.
- Taal- Teen tal ,Ektal.

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Module-III: Instrumental Music

Theory-

- Description of the five taals – Teental, Ektal, chowtal, Dadra and Keharwa, writing them in Thah and Dugun in Taal notation.
- Knowledge of musical notation system of Pt.V.N. Bhatkhande and Vishnu Digambar (swara and Taal-lipi).
- Introducing Guitar

Practical-

- Handling of the instrument; correct posture and finger movement. Playing of 10 alankars in Thah, Dugun and Chaugun.
- Table lesson -2
- Guitar lesion -2

Module-IV: Ancient Practice of Natya

Theory-

- Origin & Development of Classical Indian Theatre.
- Introduction to Natyashastra.,Dasharupaka.
- Rasa & Bhava Theory.
- Kinds of Acting.-Nayak and Naika Bheda.,Natyadharmi & Lokadharmi.
- Sanskrit Plays – Kalidas.

Practical-

- Working on Body, Mind, Voice.
- Theatre design - Direction, Stage Mgt, Sets and Props, Costumes, Light and Sound, Backstage.
- Natyashastra : Angika Abhinaya, Vachika Abhinaya, Aaharya Abhinaya and Satvika Abhinaya.
- Tools and Training of an Actor: Physical : Body and Voice, Psychological – Intellect and Emotional.
- Reading one Shakespeare Play.
- Yoga and pranayam .

Module-V: Workshop and Presentation

- Dance-workshop /guest- lecture .
- Music- workshop / guest-lecture.
- Theatre –workshop / guest – lecture .
- Rehearsals towards class room performance of Dance , Music and Theatre.

Examination Scheme:

Continuous Assessment /Internal Assessment					**End Term Examination**	
Components	**Class Test**	**Home Assignment**	**Class Performance**	**Attendance**	**Theory**	**Practical**
Weightage(%)	10	5	10	5	30	40

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Recommended Books

Reference Books – Dance

- **AbhinayaDarpana**– Nandi Keshwaran.
- **Naatyasaastra** – Unni.

Reference Books – Music

- **Raga Vigyan (All the parts)** Pt. V.N. Patwardhan
- **Raag Parichay –** Harish Chandra Srivastava – Part 1,2&3
- **Sangeet Vishaal –** Vasant(for theory only)
- **Sangeet Bodh –** Dr Sharacchandra Shridhar Paranjpe, Madhya Pradesh Hindi Granth Academy .
- **Raag Parichay –** Sangeet Sadan Prakashan Allahabad
- **Sangeet Visharad –** Sangeet Karyalaya Hatharas

Reference books – Theatre

- **Minding the Body and Mending the Mind**- Joan Borysenko, Ph.D, publishers- The bantam Books.
- **All about Theatre** - Off Stage– by Chris Hogget.
- **A Phaidon Theatre Manual (Series)** – Phaidon Press Ltd, London.
- **An Actor Prepares** – Stanislavsky.

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Syllabus - Semester Third

SOCIAL RELEVANCE OF DANCE, MUSIC & DRAMA IN CONTEMPORARY INDIAN SCENE

Course Code: PAR2351 **Credit Units: 03**

Course Objectives:
The paper is a deeper exploration of identified Art form. The overall aim is to arrive at a platform to integrate and understand the inter-relation of Performing arts - to create an aesthetic experience for the artist and audience

Course Contents:

Module-I: Kathak

Theory-
- Study of following terms. Kavit, Vandana, Gat, Gat Nikas, Premalu , Nagma, Nritta, Nritiya and Natya.
- Simple knowledge of Kathak Dance.
- Brief study of Abhinay and its four parts.
- Laya and its types with special reference to Indian Dances.
- Knowledge of Six Eyebrow movements and Nine Head Gestures.

Practical-

Teental & Jhaptal –
- Thaat , Aamad ,Tehai , Tora/Tukar , Chakardhar Tukra .
- Practised of prescribed material of Teen taal and Jhaptaal with Tali and Khali.
- Practical knowledge of Aasanyukt Mudras.
- Detail Practical knowledge of Sanyukt Mudras based on Abhinay Darpan.

Module-II: Fundamentals of Vocal Music

Theory-
Raga Samaya (Time), Parmel praveshak Raga, Margi – Deshi Sangeet .
Shruti, Swar – Vibhajan.
Varna : Sthayi, Arohi, Avarhi, Sanchari, Alnkar (Palta), Kana Swara, Meend Vilom, anulom Ghaseet, Soot, Khatka, Murki, Gamak.

Practical-
- One chhota Khyal or Razakhani Gat, with Alap and Tana in
  - Bhupali ,Bihag ,Alhaiya – Bilaval ,Bhairav
- Light music
- Tala- Jhaptal , Chaartala

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Module-III: Instrumental & Tabla

Theory-

- Detailed knowledge of the following Talas with Dugan and Chaugun
- **Study of Talas: -** Dadra, Kaharwa, Trital, Ektal, Jhaptal, Chautal, Roopak
- Introduction to western instruments.

Practical-

- Table lesson - 3
- Start playing some western instruments.
- Guitar lesson-3

Module-IV: Play

Theory-

- Reading Different Type Of Plays And Analysis (Either Sanskrit/ Greek/ Modern/ Absurd Play)
- Analysing The Play By Looking Separately Its Structure, Plot, Characters, Themes And style.

Practical-

20-25 Minutes One Act Play By The Students.

Module-V: Workshop and presentation

- Dance-workshop /guest- lecture .
- Music- workshop / guest-lecture.
- Theatre –workshop / guest – lecture .
- Rehearsals towards class room performance of Dance , Music and Theatre.

Examination Scheme:

Continuous Assessment /Internal Assessment					**End Term Examination**	
Components	**Class Test**	**Home Assignment**	**Class Performance**	**Attendance**	**Theory**	**Practical**
Weightage(%)	10	5	10	5	30	40

Recommended Books

Reference books Dance-

- **Kathak Shingar** - T.R. Azad
- **Bhatiya Sanskrit Mei Kathak Parampara** - Mandvi Singh Kathak
- **Nritya Shiksha** (part- 2) - Puru Dadhicha
- **Kathak saunderyatmak Shastriya Nritya** – Shikha Khare

Reference books Music-

- **Raga Vigyan (All the parts)** Pt. V.N. Patwardhan
- **Raag Parichay –** Harish Chandra Srivastava – Part 1,2&3
- **Sangeet Vishaal –** Vasant(for theory only)
- **Sangeet Bodh –** Dr Sharacchandra Shridhar Paranjpe, Madhya Pradesh Hindi

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- **Raag Parichay –** Sangeet Sadan Prakashan Allahabad
- **Sangeet Visharad –** Sangeet Karyalaya Hatharas

Reference books Theatre-

- **The Theatre: An Introduction** , By Oscar G. Brockett.
- **Play Production** , By Henning Nelms,
- **Natyashastrada Adhyaaya Sangraha,** By Adya Rangacharya.
- **Samskrutha Nataka**, by A.R.Krishna Shastri

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Syllabus - Semester Fourth

INDIAN FOLK ARTS

Course Code: PAR2451 **Credit Units: 03**

Course Objective:
The paper aims at a practical and formal introduction for the Folk Culture of India. To the identified performance stage after basic training in Folk dance, Folk music and, Folk theatre.

Course Contents:

Module-I: Folk Dance of India
Theory -

- What is folk Dance ?
- Origin and Development of Folk Dance in India.
- Different Folk Dance forms of India.
- Popular Folk Dances of India

Practical-
Practical work involving learning and research about Folk Dance related to the students' own region.

Module-II: Folk Music of India
Theory-

- What is folk music?
- Origin and Development of Folk Music in India.
- Different Folk musical forms of India.

Practical-
Practical work involving learning and research about Folk Music related to the students' own region.

Module-III: Folk Instrument of India
Theory-
Folk Instruments of India.
Folk Music and Popular Culture.
Folk artists of India

Practical-
Practical work with students regional forms (learning from each other)
Table lesson -4
Guitar lesson-4

Module-IV: Folk Theatre of India
Theory-

- What is folk Theatre?
- Origin and Development of Folk Theatre in India.
- Different Folk Art Forms in India.

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- Folk Art :- Chhau/ Paika/ Hunta/ Barao/ Mundari/ Domkach Etc.

Practical-
Folk Theatre of India, Theatre in awareness building, Publicity, Street Theatre, theatre in Human Recourse Development, Education & Therapy.

Module-V: Workshop and presentation
- Dance-workshop /guest- lecture .
- Music- workshop / guest-lecture.
- Theatre –workshop / guest – lecture .
- Rehearsals towards class room performance of Dance , Music and Theatre.

Examination Scheme:

Continuous Assessment /Internal Assessment					**End Term Examination**	
Components	**Class Test**	**Home Assignment**	**Class Performance + Project**	**Attendance**	**Theory**	**Practical**
Weightage(%)	10	5	10	5	35	35

Recommended Books

Reference books Kathak-
- **Kathak Nritya** – L.N Garg
- **Kathak Nritya Shiksha part 1 & 2** - Puru Dadhicha
- **Kathak Darpan** - T.R. Azad
- **Bhartiya Sanskriti me Kathak Parampra**- Mandvi Singh
- **Himachal ke Lok Naritya**- Hari Ram Justa

Reference books Music-
- **Bharatiya Sangitmala Part – I, II, III** Pt. Y.S. Pandit Mirashibuva
- **Abhinava Sangita Shiksha** Pt. S.N. Ratanjhankar
- **Abhinava Geetamanjri** Pt. S.N. Ratanjhankar Part – I, II, I
- **History of Indian Music** Swami Prajnanananda
- **Historical Study of Indian** Music Swami Prajnanananda
- **Musical Instrumental of India** B.C. Deva
- **Svara Aur Ragon Ke Vekas men Vadyon KaYogadan** Indrani Chakravarti

Reference books Theatre-
- **The Theatre: An Introduction** , By Oscar G. Brockett.
- **Play Production** , By Henning Nelms,
- **Rangabhoomi Kaipidi.** By N.S. Venkataram
- **Costume in Theatre.** By James Laver.

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Syllabus - Semester Fifth

MODERN INDIAN PERFORMING ARTS

Course Code: PAR2551 **Credit Units: 03**

Course Objective:
The course is a deeper exploration of identified Art form. The overall aim is to arrive at a platform to integrate and understand the inter-relation of Performing arts - to create an aesthetic experience for the artist and audience.

Course Contents:

Module-I: Dance

Theory-

- Development of Kathak Dance during Mugal and Hindu period
- Study of Dashavtaras.
- Elementary knowledge of Rasa and their application in Dance.
- A study of Tandav and Lasya.
- Importance of Make-Up, Costumes and Instruments in Kathak Dance.
- Relationship between Dance and Religion
- Dance Theory on basics of Kathak and Contemporary Dance
- Introduction to Contemporary Dance
- Short Biography and Contribution to Dance

Practical-

- Kathak – fusion Dance
- Indian Contemporary Dance
- Shuddh – Kathak

Module-II: Music

Theory-

- History of western music.
- Brief introduction to western notation system
- Contribution of Pt. V.D. Paluskar and Pt. V.N Bhatkhande
- Rabindra Sangeet - Different Forms of Rabindra sangeet
- Life Sketch of Rabindra Nath Tagore with Special reference to his Musical Quality

Practical-

- Forms of compositions – Dhamar, (Hori) Tarana, thumri , Bhajan.
- Laxangeet and Sargam geet in Raga Yaman and Bhaiav
- Rag – bhimpalasi , bageshri.
- Tala- Ada Chutaal , Tilwada.
- Contribution & life sketch – Vidushi Annapurna Devi, Vidushi Kishori Amonkar.

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Module-III: Instrumental Music

Theory-

- Names of different parts (components) of the Tanpura with the help of a simple sketch. Tuning and handling of the instrument.

Practical-

- Play western Instruments
- Playing of Thekas of the following six Taals with development: two kaayadas and its four paltas with tihai in Teentaal, One tukda in each ,Jhaptaal and Ektaal, one paran in chaartaal, two kismen each in Dadra and KeharwaTaal.
- Simple developments of Taals - Taali, Khali etc. on hands.
- Guitar lesson – 5
- Table lesson -5

Module-V: Introduction to Modern Theatre (Indian & World)

Theory

- Origin and Development of Modern after Romanticism.
- Trends and Concepts of Modern Indian Theatre
- Modern Indian Theatre- Practice
- Realistic and Non-Realistic Theatre

Practical-

- Practice: Dialogue delivery
- Nav rasa
- Yoga & pranayam
- Movement
- Rhythm and Tempo

Module-V: Workshop and presentation

- Dance-workshop /guest- lecture .
- Music- workshop / guest-lecture.
- Theatre –workshop / guest – lecture .
- Rehearsals towards class room performance of Dance , Music and Theatre.

Examination Scheme:

Continuous Assessment /Internal Assessment					**End Term Examination**	
Components	**Class Test**	**Home Assignment**	**Class Performance + Project**	**Attendance**	**Theory**	**Practical**
Weightage(%)	10	5	10	5	30	40

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Recommended Books:

- Reference books Kathak-
- **Kathak Nritya** Shiksha part - 2 – Dr. Vidya Nidhi
- **Kathak Darpan** -. T.R. Azad
- **Kathak Shingar** - . T.R. Azad
- **Kathak Nritya (Part 1&2)** – Dr. Vidhi Naggar

Reference books Music-

- **Bharatiya Sangita men Tala Aur Rupa** Vidhana . Subhadra Chaudhary
- **Rasa Siddhanta-** Prem Lata Sharma
- **Musical Instrumental of India** -B.C. Deva
- **Svara Aur Ragon Ke Vekas men Vadyon KaYogadan -** Indrani Chakravarti
- **Musical Instruments** Carl Geiringer
- **Msical Instruments in Indian Scupture -**G.H. Tarlekar & J. NaliniTarlekar

Reference books Theatre-

- **The Theatre: An Introduction** , By Oscar G. Brockett.
- **Play Production** , By Henning Nelms,
- **Rangabhoomi Kaipidi**. By N.S. Venkataram
- **Scenic Design and Stage Lighting**. by Seldon and Sellman.
- **Costume in Theatre**. By James Laver.
- **Stage Make-up**. By Richard Carson.

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Syllabus - Semester Sixth

ARTS, AESTHETIC & SOCIETY

Course Code: PAR2651 **Credit Units: 03**

Course Objectives:
To advance the knowledge and skill level of the Performing Arts.
To provide a platform to practically experiment and exhibit the learning of the Performing Arts.
To provide a deeper knowledge and skill of the Dance , Music and Theatre.
To provide a learning framework.

Course Contents:

Module-I: Dance

Theory-

- Detailed study of Nritta, Natya and Nritya.
- Rasa and Bhava and their importance in Kathak Dance
- Detailed study of kathak Dance by following the sequence of Dance.
- Detailed study of Folk and Classical Dance and their comparision.
- Brief study of Thumari and Bhajan in Dance.
- Essay on:- Importance of Dance in Human life , Dance and Nature

Practical-

- One advance Tatkar variety with atleast ten variations. Ekgun, Dugun, Chaugun of Tatkar in Ektaal, Four Tukras, three Parans, Two Chakkardhar, Amad, Thehai and Kavit in any of Teental. Ability to play Harmonium and Theka of Teen Tal. Ability to write notation and Padhant on hands of the above mentioned Taals.
- Practical demonstration of any Taal of your choice.
- Practical demonstration of Teen Taal.

Module-II: Science of Music

Theory-

- Vibration And Frequency, Pitch And Its Relation With vibrator, Vocal And Instrumental Range Of Sound, Amplitude,Timbre, Qualities Of Musical And Unmusical Overtones (Swayambhu Swara), Echo, Reverberation And Resonance Of Sound.
- Concept of Aesthetics in Music(By Indian and Western scholars)
- Contribution of Scholars In Indian Music.

Prominent Gharanas of Dhrupad and Khyal –

Origin And Development of Gharanas In Hindustani Vocal Music. Four Banis of Dhrupad. Study of Popular Gharanas of Dhrupad. Study of Popular Gharanas of Khyaal. Merits And Demerits of Gharanas System.

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Practical-

Preparing for performance - Individual and group

- Classical music
- Created music – Based on emotions, topics and themes
- Practical Knowledge of Critical and Comparative analysis of Ragas and Talas of the Prescribed Course.
- Ragas :Desh, Aasavari , Malkauns .
- Talas :Jhaptal, Rupak, Addha with Thah, Dugun, Tigun and Chaugun
- Layakari, Vilambit Khyal in any one of the Prescribe Ragas.Drut Khyal in all the Ragas with Aalap and Taan.
- Light Music

Module-III: Instrumental Music

Theory-

- Brief description of four eminent instrumentalists (present or recent past).
- Non-detail terms: Names of 10 Pranas, AadiLaya (Only in Dadra and Keharwa),
- Lehra (Nagma), Paran, Uthan, Chakkardar Tukda, Dumdar and Bedum Tihai, Gat,Padhant,
- Detailed topics: Origin and development of Tabla, Basic 10 Varnas (Syllables) of Tabla,
- Writing in Taal notation, Thekas, in Thah, Dugun,
- Tigun and Chaugun, of all Taals .
- Names of different parts (components) of the Tabla with the help of a simple sketch. Tuning of the instrument.

Practical-

- Technique of producing bols on Tabla like Tirkit, Kran, etc.
- Development of following Taals: Teental , uthan, , new kaydas and its paltas with tihai, Rela, Chakardaar Tukda, Damdar and Bedam Tihai, Roopak , Tihai, Sooltaal ,Tihai, Teevra Taal , Paran, Deepchandi Taal, Tilwada Taal (only Theka).
- Guitar lesson -6
- Table lesson -6

Module-IV: Theatre

Theory-

- The Art and Craft of Acting –The Physical Actor and the Emotional Actor.
- Natyashastra : Angika Abhinaya, Vachika Abhinaya, Aaharya Abhinaya and Satvika Abhinaya.
- Tools and Training of an Actor: Physical : Body and Voice, Psychological – Intellect and Emotional.
- Learning Various Subjects Through Theatre.
- Significance Of Fairy Tales, Moral Stories, Allegories
- And Inspirational Stories

Practical-

- A Full Length Play Performed By The Students And Directed By The Faculty Or Guest Faculty.
- Theatre As A Community Event.
    - Theatre For Development.

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- A Project Report Based On Working With any Community

Module-V: Workshop / Project

- Dance – Workshop / Project
- Music- Workshop / Project
- Theatre- Workshop / Project
- Rehearsals towards class room performance of Dance , Music and Theatre

Examination Scheme:

Continuous Assessment /Internal Assessment					**End Term Examination**	
Components	**Class Test**	**Home Assignment**	**Class Performance + Project**	**Attendance**	**Theory**	**Practical**
Weightage(%)	10	5	10	5	35	35

Recommended Books

Reference books Kathak-

- **Kathak Nritya** Shiksha part - 2 – Dr. Vidya Nidhi
- **Kathak Darpan** -. T.R. Azad
- **Kathak Shingar** - . T.R. Azad
- **Kathak Nritya (Part 1&2)** – Dr. Vidhi Naggar

Reference books Music-

- **Bharatiya Sangita men Tala Aur Rupa** Vidhana . Subhadra Chaudhary
- **Rasa Siddhanta-** Prem Lata Sharma
- **Musical Instrumental of India** -B.C. Deva
- **Svara Aur Ragon Ke Vekas men Vadyon KaYogadan -** Indrani Chakravarti
- **Musical Instruments in Indian Scupture** -G.H. Tarlekar & J. NaliniTarlekar

Reference books Theatre-

- **The Theatre: An Introduction** , By Oscar G. Brockett.
- **Play Production** , By Henning Nelms,
- **Rangabhoomi Kaipidi**. By N.S. Venkataram
- **Scenic Design and Stage Lighting**. by Seldon and Sellman.

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POLITICAL STUDIES

Programme Structure

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits
POL2151	Indian National Movement	3	-	-	3
POL2251	Indian State and Politics after Independence	3	-	-	3
POL2351	State Politics in India	3	-	-	3
POL2451	Politics and Media	3	-	-	3
POL2551	South Asia: Political Perspectives	3	-	-	3
POL2651	Post-Cold War World Politics	3	-	-	3
	TOTAL				**18**

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POLITICAL STUDIES

Syllabus - Semester First

INDIAN NATIONAL MOVEMENT

Course Code: POL2151 **Credit Units: 03**

Course Objectives:
The course will seek to provide the student with a basic yet meaningful understanding of the political scenario that led to the struggle for India's independence. It would endeavour to cover the entire duration of the growth of nationalism in India till the attainment of independence in 1947.

Course Contents

Module-I: Emergence of nationalism in India
Agrarian Society and Peasant Discontent, The New Middle Class and the Emergence of Nationalism, Foundation of the Indian National Congress, The moderate Congress: objectives and methods

Module-II: Early Nationalism: Discontent and Dissension
The Moderates and Economic Nationalism**,** Hindu Revivalism and Politics, Muslim Politics and the Foundation of the Muslim League

Module-III: Roots of extremism
The Swadeshi Movement in Bengal- 1905-1908, Extremism in other provinces, Repression, conciliation, and divide and rule, War and Indian politics, Bhagat Singh, Surya Sen and the Revolutionary Terrorists

Module-IV: The Age of Gandhian Politics
Limited Self Government, 1909-1919, The Arrival of Mahatma Gandhi, Champaran, Kheda, Ahmedabad, Khilafat and Non-Cooperation Movements, Civil Disobedience Movement, The Rowlatt Satyagraha, The Act of 1935 and the Princely States

Module-V: Independence and Partition
Simla Conference, The Cabinet Mission, Quit India Movement, The turbulent forties, The Mountbatten Plan, Freedom and Partition, Communal holocaust and peasant rebellion, Post-Partition violence, Impact of violence on polities of India and Pakistan, Integration of States

Examination Scheme

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(**A :** Attendence ; **P :** Presentation ; **A/TP :** Assignment/Term Paper ; **CT :** Class Test ; **EE :** External Examination)

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Text and References

Text:

Benedict Anderson, *Imagined Communities: Reflections on the Origin and Spread of Nationalism*, 1983
Shekhar Bandyopadhyay, *From Plassey to Partition: A History of Modern India*, 2004
Bipan Chandra, Mridula Mukherjee, Aditya Mukherjee, K N Panicker and Sucheta Mahajan, *India's Struggle for Independence*, 1989
Sumit Sarkar, *Modern India 1885-1947*, 1983

References:

Partha Chatterjee, *The Nation and its Fragments: Colonial and Post-colonial histories*, 1993
Ashish Nandy, *The Illegitimacy of Nationalism: Rabindranath Tagore and the Politics of the Self*, 1994
C A Bayly, *Origins of Nationality in South Asia: Patriotism and Ethical Government in the Making of Modern India*, 1998
Tapan Raychaudhuri, "Indian Nationalism as Animal Politics", *The Historical Journal* 22(3): 747-63, 1979
Ayesha Jalal and Sugata Bose, "Exploding Communalism: The Politics of Muslim Identity in South Asia", in *Nationalism, Democracy, and Development: State and Politics in India*, 1997
Ranajit Guha, *Subaltern Studies: Writings on South Asian History and Society*, Volume I, 1982
Gyan Prakash, *Another Reason: Science and the Imagination of Modern India*, 1992
M K Gandhi, *Hind Swaraj and Other Writings*, 1997

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Syllabus - Semester Second

INDIAN STATE AND POLITICS AFTER INDEPENDENCE

Course Code: POL2251 **Credit Units: 03**

Course Objectives:
To provide the student with a comprehensive background of the political scenario as it developed after independence in 1947. To understand processes that shaped independent India such as the Constitution of India, the Executive and the Legislature, electoral politics and political parties, federalism and the federal structure, communalism and communal politics, linguistic movements etc.

Course Contents:
Module-I: The Indian Constitution
Making of India's Constitution: Perspectives from the Constituent Assembly, Indian Constitution: Features, Socio-economic basis and philosophy and the Preamble, Major Amendments: Trends and rationale

Module-II: Fundamental Rights and Directive Principles
Fundamental Rights, Directive Principles of State Policy

Module-III: Organs of the Government
The Union Executive: the President, Prime Minister, Cabinet, Governor, Parliamentary form of government: The Lok Sabha and the Rajya Sabha, Supreme Court: Judicial Review and Judicial Activism

Module-IV: Federalism in India
Nature of Indian Federalism, Centre-State relations, Issues of state autonomy, Panchayati Raj and Urban Local Bodies

Module-V: Political Parties and Electoral Processes
Political Parties and Pressure Groups, Election Commission, Electoral Reforms

Module-VI: Major Issues in Indian Politics
Caste, religion, language, region, Problems of illiteracy, regional imbalance, environmental degradation, and poverty alleviation, Development strategy and liberalization

Examination Scheme

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(**A :** Attendence ; **P :** Presentation ; **A/TP :** Assignment/Term Paper ; **CT :** Class Test ; **EE :** External Examination)

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Text and References

Text:

Jayal, Neerja Gopal and Pratap Bhanu Mehta. 2011. *The Oxford Companion to Politics in India* (Student Edition). New Delhi: Oxford University Press.
Basu, D. 2013. *Introduction to the Constitution of India*. New Delhi: Lexis Nexis.
Kohli, A. 2001. *The Success of India's Democracy*. New Delhi: Cambridge University Press.
Brass, P. 1994. *Politics in India Since Independence*. New Delhi: Cambridge University Press.

References:

Kothari, R. 1970. *Politics in India*. New Delhi: Orient Blackswan.
Kohli, A. 1988. *India's Democracy*. New Delhi: Orient Longman.
Bhambri, C P. 1998. *The Indian State: Fifty Years*. New Delhi: Shipra.
Kashyap, S C. 1992. *Our Parliament*. New Delhi: National Book Trust.
Kothari, R. 1967. *Party System and Election Studies*. Bombay: Asia Publishing House.
Chanda, A. 1965. *Federalism in India: A Study of Union-State Relations*. London: George Allen and Unwin.
Austin, G. 1979. 'The Constituent Assembly: Microcosm in Action', in *The Indian Constitution: Cornerstone of a Nation*. New Delhi: Oxford University Press.
Chaube, S.K. 1973. *Constituent Assembly of India*. Delhi: People's Publishing House.
Austin, G. 2000. 'The Social Revolution and the First Amendment', in *Working a Democratic Constitution*. New Delhi: Oxford University Press.

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Syllabus - Semester Third

STATE POLITICS IN INDIA

Course Code: POL2351 **Credit Units: 03**

Course Objectives:
The course will seek to define historical legacies and current themes in the development of politics in the states of India. It would provide the student within-depth understanding of the democratic processes in practice in various states and encourage them to understand the politics of states better. A study of politics and political processes in states also pertains to the exigencies of coalition politics at the centre.

Course Contents :

Module-I : Regions and Regionalism
Regional cultures in Indian Civilization ; States Reorganization Commission ; Integration and ethnic conflict ; Movements for state autonomy : Jharkhand and Uttarakhand

Module-II : Political Parties and Electoral Politics in the States
Congress Party in Uttar Pradesh ; BJP's expansion and coalition strategies ; Regionalization of Indian Politics ; Telugu Desam Party in Andhra Pradesh ; Changing Nature of Tamil Nadu ; Asom Gana Parishad in Assam ; Politics of the left in West Bengal

Module-III : Social Movements and Politics in the States
Decline of Backward Caste Politics in North India ; Bahujan Samaj Party and Subaltern Mobilization in Uttar Pradesh ; Ethnic Minorities in Majoritarian Indian Polity

Module-IV: Economic Reforms and Indian Politics
India's federal economy ; Globalization and State Disparities in India ; India's special economic zones : protest politics and growth patterns ; Reforms and economic growth in Indian states

Examination Scheme

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(**A :** Attendence ; **P :** Presentation ; **A/TP :** Assignment/Term Paper ; **CT :** Class Test ; **EE :** External Examination)

Texts and References

Texts :
Pai, Sudha. 2013. *Handbook of Politics in Indian States : Regions, Parties and Electoral Reforms*. New Delhi : Oxford University Press.
Narain, Iqbal. 1976. *State Politics in India*. Meerut : Meenakshi Prakashan.
Weiner, Myron. 1968. *State Politics in India*. Princeton : Princeton University Press.

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References :

Jenkins, Rob. 2004. *Regional Reflections : Comparing Politics across India's States*. New Delhi : Oxford University Press.

Yadav, Yogendra. 2000. 'Understanding the Second Democratic Upsurge: Trends of Bahujan Participation in Electoral Politics in the 1990s', in Francine R. Frankel, Zoya Hasan, Rajeev Bhargava and Balveer Arora (eds.), *Transforming India*. New Delhi : Oxford University Press.

Yadav, Yogendra and Suhas Palshikar. 2003. 'From Hegemony to Convergence: Party System and Electoral Politics in the Indian States – 1952-2002'. *Journal of the Indian School of Political Economy*, January-June.

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Syllabus - Semester Fourth

POLITICS AND MEDIA

Course Code: POL2451 **Credit Units: 03**

Course Objectives:

To provide students with an overarching perspective on the various processes at play in the manner in which the media – print and visual – transform into vehicles of politics. The course will, through exploration of several case studies pertaining to various types of media, encourage the students to critically analyse media messages, both print and visual.

Course Contents :

Module-I : Theories of the mass media
Ageda Setting Theory ; Cultivation Theory ; Dependency Theory ; Hypodermic Needle Theory ; Knowledge Gap ; Media Richness Theory ; Medium Theory ; Spiral of Silence ; Two Step Flow Theory ; Uses and Gratifications Approach ; Priming ; Framing

Module-II : Print media and politics
Brief history of newspapers in India ; Growth of print media in India ; print media and Indian political parties ; democratic processes and print media

Module-III : Television news media and politics
Brief history of television media in India ; Growth of Television news media in india ; democratic politics and television media : perspectives and trends

Examination Scheme

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(**A :** Attendence ; **P :** Presentation ; **A/TP :** Assignment/Term Paper ; **CT :** Class Test ; **EE :** External Examination)

Texts and References

Texts :
McQuail, Dennis. 2010. *McQuail's Mass Communication Theory*. New Delhi : Sage Publications.
Jeffrey, Robin. 2000. *India's Newspaper Revolution : Capitalism, Politics and the Indian Language Press, 1977-99*. New Delhi : Oxford University Press.
Mehta, Nalin. 2008. *Television in India: Satellites, Politics and Cultural Change*. New Delhi : Routledge.

References :
Sahay, Uday. 2006. *Handbook of the Media in Contemporary India*. New Delhi : Oxford University Press.
Batabyal, Somnath, Angad Chowdhry, Meenu Gaur, Matti Pohjonen. 2011. *Indian Mass Media and Politics of Change*. New Delhi : Routledge.

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Syllabus - Semester Fifth

SOUTH ASIA: POLITICAL PERSPECTIVES

Course Code: POL2551 **Credit Units: 03**

Course Objectives:

The course would attempt to inculcate understanding of the various political processes at work in South Asia, particularly states like Pakistan, Bangladesh, Sri Lanka and Nepal. It will supplement the South Asia unit from the core paper on post-colonial states and their development after independence. This course will focus primarily on two countries in South Asia – Pakistan and Sri Lanka.

Course Contents :

Module-I : Institutions and Political Processes in South Asia
Development of post-colonial institutions ; historical development and current debates in democracy in South Asia ; role of military in post-colonial societies in South Asia

Module-II : State and Polity in Pakistan
Democracy and electoral process ; Islamization and cultural change ; the army and its role in political process ; Pakistan's foreign policy ; issues of internal security and terrorism

Module-III : State and Polity in Sri Lanka
Democratic institutions and their functioning ; role of the military ; the Tamil issue ; internal security and terrorism ; Sri Lanka's foreign policy

Examination Scheme

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(**A :** Attendence ; **P :** Presentation ; **A/TP :** Assignment/Term Paper ; **CT :** Class Test ; **EE :** External Examination)

Texts and References

Texts :
Brass, Paul R. 2010. *Routledge Handbook Of South Asian Politics: India, Pakistan, Bangladesh, Sri Lanka, And Nepal*. USA : Routledge.

Reference :
Newman, Edward, Itty Abraham, and Meredith L. Weiss. 2010. *Political Violence in South and Southeast Asia: Critical Perspectives*. UNU Press.

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Syllabus - Semester Sixth

POST-COLD WAR WORLD POLITICS

Course Code: POL2651 **Credit Units: 03**

Course Objectives:
To provide a theoretical understanding of politics as it developed in the post-Cold War scenario particularly with regard to the politics of the United States of America vis-a-vis the rest of the world, the shifting of the power blocks, and the growth of anti-American sentiment in certain parts of the world. The course would also encourage students to read contemporary literature on emerging international political scenarios.

Course Contents :

Module-I : Overview of the post-Cold War decade
Historical background of US foreign policy ; US relations with EU ; brief history of US interventions in West Asia, South East Asia and the Middle East

Module-II : Post-Cold War American Politics
Key institutional players ; lobbies and their importance in American politics ; media and public opinion in US ; America's position in a globalized economy

Module-III : America and the Arab/Muslim World
Historical development of politics of the Arab/Muslim world ; why the Arabs/Muslims hate America? US intervention and international war against terrorism

Examination Scheme

Components	A	P	A/TP	CT	EE
Weightage (%)	5	10	5	10	70

(**A :** Attendence ; **P :** Presentation ; **A/TP :** Assignment/Term Paper ; **CT :** Class Test ; **EE :** External Examination)

Texts and References

Texts :

Cameron,Fraser. 2002. *US Foreign Policy after the Cold War: Global Hegemon or Reluctant Sheriff?* London: Routledge.
Jentleson, Bruce W. 2000. *American Foreign Policy: The Dynamics of Choice in the 21st Century*. W.W. Norton & Company.

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References :

Antizzo, Glenn J. 2010. *U.S. Military Intervention in the Post-Cold War Era : How to Win America's Wars in the Twenty-first Century*. LSU Press.

Lewis, Bernard. 1990. "The Roots of Muslim Rage". *The Atlantic Online*, September. Details available at http://www.theatlantic.com/past/issues/90sep/rage.htm.

Mamdani, Mahmood. 2004. "Introduction: Modernity and Violence". *Good Muslim, Bad Muslim: Islam, the USA, and the Global War against Terror*. New Delhi: Permanent Black.

Huntington, Samuel P. 1993. "The Clash of Civilizations?" *Foreign Affairs* 72 (3) Summer: 22. Details available at http://www.foreignaffairs.com/articles/48950/samuel-p-huntington/the-clash-of-civilizations.

Said, Edward W. 2000. "The Clash of Definitions". In *Reflections on Exile and Other Essays*. Cambridge, Massachusetts: Harvard University Press.

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TAGORE STUDIES

PREAMBLE

Tagore Studies will be a mainly Activity, Presentation and Seminar-based **Learner-Centric** Course that will offer the option of taking it up as a Minor Discipline (all six courses for 18 Credits) or One-at-a-time Course (3 Credits) under Open Elective Choice where the participants would be able to engage themselves in

- *Making a Choice, as to which Course/Courses to opt for* (for instance, someone from Fine Arts and Aesthetics background may like to opt for 'Tagore as a Culture Icon with special reference to his Painting' or 'Tagore and Mass Media,' whereas a Literature candidate may like to go for 'Tagore as a Poet' and 'Tagore as a Fiction Writer.' Students enrolled in Mass Media and Communication may love to get connected to 'Tagore and Mass Media' as well as 'Tagore as a Fiction Writer.' Those from the History orientation may like to opt for the 'Cultural History' area under 'Tagore as a Cultural Icon' module).

- *Collaboration* within or across disciplines to create a joint appraisal/critique/text which could then be presented before the class for internal evaluation – by the faculty and remaining students together – in a peer review mode together.)

- *Communication* would be tested on the oral or ppt presentations that a participant may like to make on any aspect of Tagore in a Colloquium model where one person communicates and the others on the panel comment, agree, differ or substantiate etc where their performance is evaluated.

- *Critical thinking* with respect to the issues raised by Tagore in the areas on Religion, Societal Practices, Nation Building, or Politics (especially in ENG2652) on which a participant may like to write an end-semester Term Paper.

- *Creativity* in performing a text, or putting up a play for the larger University community, or writing a sequel to or a new text/story/poem/essay creatively – or translating Tagore into one's own language based on his English versions.

COURSE OVERVIEW

It is expected that students cutting across disciplines should be interested in ENG2152 as an Open Elective course, just as students in History would like to opt for ENG2252 as well as ENG2352. Students under Mass Media and Communication may like opting for ENG2652 module whereas the students in Literature programme may find all or at least ENG2352, ENG2452 and ENG2552 to be attractive.

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TAGORE STUDIES

Programme Structure

Course Code	Course Title	Lecture (L) Hours /Week	Tutorial (T) Hours /Week	Total Credits
ENG2152	Rabindranath Tagore in the 21st Century	3	-	3
ENG2252	Tagore- Autobiographies and Biographical Sketches	3	-	3
ENG2352	Tagore as a Cultural Icon - Tagore as a Painter & Performer	3	-	3
ENG2452	Tagore as a Poet	3	-	3
ENG2552	Tagore as a Fiction Writer	3	-	3
ENG2652	Tagore and Mass Media	3	-	3
	TOTAL			**18**

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TAGORE STUDIES

Syllabus - Semester First

RABINDRANATH TAGORE IN THE 21ST CENTURY

Course Code: ENG2152 **Credit Units: 03**

Theme:

The face of the world is changing, and as time passes, the changes are visible with a lot of disturbing images. But each time one feels an element of doom and despair, one's faith is rekindled to see that there are thinkers and doers like Tagore who firmly believed that ultimately the truth and beauty would prevail. It is not surprising to see Einstein sharing the same beliefs as the doyen of Indian literature, Rabindranath Tagore (1861-1941). Einstein had said: 'The ideals which have lighted my way, and time after time have given me new courage to face life cheerfully have been kindness, beauty, and truth." The progress of mankind is crucially dependent on this realization. In exchanges with Einstein, Tagore had commented: "The progress of our soul is like a perfect poem. It has an infinite idea which once realized makes all movements full of meaning and joy. But if we detach its movements from that ultimate idea, if we do not see the infinite rest and only see the infinite motion, then existence appears to us a monstrous evil, impetuously rushing towards an unending aimlessness." No amount of personal loss could make Tagore deviate from his own trajectory of working for his own country, his own times and for his own mother tongue – Bangla, or Bengali that holds together two nations, India and Bangladesh. He knew that after the dark comes light, as he said: "Clouds come floating into my life, no longer to carry rain or usher storm, but to add color to my sunset sky." Tagore's relevance today will be focused under this course.

Course Coverage:

Module-1: Contributions of Tagore and Relevance of Tagore Today

- The current economic recession and financial crises in the world, and the continuing problems of religious polarization, militarism and hostilities – Tagore's warning and predictions
- Compassionate humanism and Composite Culture in India
- Nationalism and Internationalism.
- Tagore and Education at all levels

Module-2: Tagore's works – An Introduction to the range and variety

- Number of works: A Chronological Account
- The genre of publications and the range
- Variations of the same works and the *Bichitra Variorum*

Module-3: Translation and Dissemination of Tagore's works

- Tagore's own Translations
- Authentic Translation of Tagore by others
    - Multiple Translations of Tagore

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- Other Indian Languages & Foreign Languages Translation – A brief account

Module-4: Tagore and International Personalities

- Tagore, Yeats and Rothenstein
- Tagore and Einstein
- Tagore and Romain Rolland
- Tagore and Leonard Elmhirst
- Tagore and Victoria Ocampo

Examination Scheme:

Components	CT/OP	AS/LC	A	EE
Weightage (%)	20	05	05	70

CT/OP: Class Test/Oral Presentation, AS/LC: Assignments/Library Consultation, A: Attendance, EE: End-Term Examination

Learning Outcomes: (of the Course)
Through this course, we are made aware as to why Tagore was critical of the de-humanizing economic systems, which, supported by educational methods based principally on competitions and rote-learning, fail miserably in generating creative and sensible individuals ready to think beyond the texts. Tagore's own practical project was to show the way for a modernized and less restrictive form of society that does not shun or abandon traditional values, but one that comprise networks of self sustaining groups, villages, or communities, where children and young people are encouraged to develop their natural curiosity and creativity, and to express themselves freely with body and mind. Tagore's approach to education and rural reconstruction, if implemented widely as he intended, could lead to a radical redesign of society, a turning of the world upside down. For both planners and thinkers, it is important to see the relevance of Tagore's arguments beyond his own time.

At the end of the course students will be able to: (Definitive Outcomes)
(i) Understand the text used,
(ii) Talk about the text,
(iii) Think about issues raised by Tagore through his writings,
(iv) Work with his ideas, and
(v) Raise new issues in the changing contexts to see the relevance of Tagore's messages.

Resources:
Main Text:

- Bhattacharya, Krishnachandra. (1931). 'Swaraj in Ideas,' Ashutosh Memorial Lecture. *Visva-Bharati Quarterly* 20, 103-114.
- Crolick, Sandy. (2010). 'Crisis in civilization and Cultural criticism'. March issue, *Ezinearticles*. Url: (http://ezinearticles.com/?The-Crisis-of-Civilization-And-Cultural-Criticism&id=3876540
- Das Gupta, Uma, ed. (2006). Rabindranath Tagore: My Life in My Words. New Delhi: Penguin/Viking.
- Das Gupta,Uma & Anandatup Ray (2009) Rabindranath Tagore & His Contemporary Relevance. Parabaas at https://www.parabaas.com/rabindranath/articles/pContemporaryTagore.html
- Singh, Udaya Narayana. (2011a). Man at The Centre Of Universe - Tagore's Ideas On Complete Education. *India Perspectives*, 24.1. MEA, New Delhi.
- Singh, Udaya Narayana. (2012a). 'U-Topos & Tagore: Inaugural Talk' in Konrad Meisig, ed. *Utopias from Asia*: An International and Inter-

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disciplinary Symposium in Santiniketan on the occasion of the 150th Birthdy Anniversary of Rabindranath Tagore (An Asian Impact Activity In Memorium of Momoyo Okura). Weisbaden: Harrassowitz Verlag. Xvii-xxvi.

- Singh, Udaya Narayana & Navdeep Suri, eds. (2011). *Rabindranath Tagore: A Commemorative Volume*. 1861-1941. New Delhi: Public Diplomacy Division, Ministry of External Affairs, Government of India.
- Tagore, Rabindranath. (1928). *Letters to a Friend*, edited with two introductory essays by C.F.Andrews. London: George Allen & Unwin; 1929. New York: The Macmillan Company. Also in Sisir Kumar Das, ed. 1994. *The English Writings of Rabindranath Tagore: Vol III: A Miscellany*. New Delhi: Sahitya Akademi.
- Tagore, Rabindranath. (1929) 'Ideals of Education', *Viśva-Bhāratī Quarterly*, April-July 73-74
- Tagore, Rabindranath. (1931) *The Religion of Man.* Kolkata: Granthan Vibhaga, Visva-Bharati. Reprinted (1970). London: Unwine Books
- Thompson, Edward. (1921). Rabindranath Tagore: His Life and Works. Kolkata: YMCA, 1921; rpt. 1961.

Additional Texts:

- Dev Sen, Nabaneeta. 2006. 'Crisis in Civilization and a Poet's Alternatives: Education as one alternative weapon' (www.parabas.com Special Rabindranath Tagore section) Paper presented at an International Seminar on Tagore's Philosophy of Education, organized by Chicago University Law School, at Ramkrishna Mission Institute of Culture in Kolkata on 29 March 2006
- Dutta, Krishna & Robinson, Andrew. (1995). *Rabindranath Tagore: The Myriad-Minded Man*, New York: Saint Martin's Press.
- Singh, Udaya Narayana. (2013a). Tagore redrawing the *Boundaries*: In other words, Crossing the limits of language. In Sanjukta Dasgupta & Chinmoy Guha, eds. *Tagore: At Home in the World*, New Delhi: Sage. 3-12. An earlier version: (2010) Retrieved from http://www.museindia.com/viewarticle.asp?myr=2010&issid=33&id=2130 in *Muse India* portal [ISSN: 0975-1815];

Other Readings:

- Singh, Udaya Narayana. 2006. *India Writes: A Story of Multilingual and Pluricultural Society.* New Delhi: National Book Trust. 154 pp. Frankfurt Book Fair, Guest of Honor Publication.
- Tagore, Rabindranath. (2008). *Sadhana* (1935), In *The English Writings of Rabindranath Tagore* (Vol 2, pp. 19-26). Ed. by Sisir Kumar Das. New Delhi: Sahitya Akademi. Originally, (1916/1922). *Sādhanā: The Realisation of Life*. New York: The Macmillan Company.
- Chatterjee, Ramananda et al, eds. (1931). *The Golden Book of Tagore.* Calcutta: The Golden Book Committee.

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Syllabus - Semester Second

TAGORE- AUTOBIOGRAPHIES AND BIOGRAPHICAL SKETCHES

Course Code: ENG2252 **Credit Units: 03**

Theme:
In this section, we shall first look into Tagore's 1912-work *Jibansmriti*, the English translation of which, *My Reminiscences*, was published by Macmillan in 1917 under Surendranath Tagore's translation. Here Tagore describes the early years of his life; his experiences of loneliness, love, and loss. Tagore's emergence as a poet could also be read about here. In this work, he introduces his family circle and describes his experience with the formal education against which he rebelled. In a published lecture, titled "My School" (*The Modern Review*, 1931), Tagore speaks of his mission to revolutionize education by rearing young minds in harmony with nature. His autobiographical texts capture a child's-eye view of a mysterious, fascinating world in which fantasy blends seamlessly with reality. In a portion, he also describes his first encounters with death, the poignancy.

Tagore's book - *Talks in China* (1925) which was largely autobiographical, contextualizing his life in relation to the broad historical trends of the time, came up after he was invited by Liang Chi-Chao, president of the University Lecture Association of Beijing in April–May 1924. This will also be touched upon.

Tagore's *Chhelebela* (*Boyhood Days*) was published in 1940, in response to a request to write something for young readers, where Tagore embarked on this delightful account of his childhood and adolescence.

When Rabindranath Tagore passed away in 1941 he left behind thousands of pages of poetry, prose, plays, essays, letters, humorous pieces, autobiographical writings, and travel literature. An astonishing number of these works remain of interest to us even today. In a letter in *Chhinnapatra* (*Torn Leaves*, 92), Tagore confesses that though poetry has been for him "a kind of secret and forbidden delight," he has also found pleasure in writing short fiction, writing "in the form of a diary or some such genre," as well as producing polemical pieces. He affirms that it is "very important to cross swords with our people on social issues," although this offers him a pleasurable dilemma: "I don't want to disappoint any of my Muses." His growing awareness of and talent for theater and performing arts, including music and dance were all discussed here.

Finally, in *Atmaparichay* (*Self-Recognition*, 1943), a collection of six introspective essays published posthumously, Tagore reveals some other aspects of himself – when he says: "It is not easy to know oneself. It is difficult to organize life's various experiences into a unified whole."

Course Coverage:
Module-1: The Childhood days – Growing up and De-schooling (1861-78)

- Prince Dwarkanath Tagore, Raja Rammohun Ray & Bankimchandra
- Debendranath Tagore and the Jorasanko Family
- Early Childhood, Loss of Mother and the influence of elder brothers
- Giving up Schooling and Self-education

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Module-2: Tagore and his says of the Youth – Creative Urge (1878-1889)

- Tagore's "education" in England
- Begins to write and publish poetry
- Marriage, Children and Death in the family
- In Eastern Part of Bengal and Contacts

Module-3: Tagore as an Administrator and Institution Builder (1890-1913)

- Tagore's Management of Estate and Rural reconstruction
- Moves to Santiniketan to set up a School
- Tagore as an essayist and participation in nation building
- Spurt in poetic creativity and Short Stories
- The Nobel Prize

Module-4: Tagore's Discovery of the Self (1914-1941)

- Establishment of 'Sriniketan' and the experiments
- Tagore and Gandhi relationship
- Numerous travels abroad and Belles letters
- Tagore's influence over the contemporaries
- Tagore's philosophy

Examination Scheme:

Components	CT/OP	AS/LC	A	EE
Weightage (%)	20	05	05	70

CT/OP: Class Test/Oral Presentation, AS/LC: Assignments/Library Consultation, A: Attendance, EE: End-Term Examination

Learning Outcomes: (of the Course)

There could be several reasons as to why one benefits immensely from reading biographies and autobiographies. These texts help us see where we are going and where we need to go to because they allow us to *stand on the shoulders of giant scholars and performers.* Sir Isaac Newton wrote in a letter (in 1670) to his friend Robert Hooke, "If I have seen further, it is by standing on the shoulders of giants" That is exactly what reading biographies can do for you – allow you to see further. Then, George Santayana had warned us in 1905, "Those who cannot remember the past are condemned to repeat it." Therefore, the best way of taking advantage from others is by reading about their lives. There may not be a direct lesson as you will have to discover for yourself as to what lessons are there to learn. It is therefore a way of promoting 'self-help' based on the stories and experiences of others. It is, as if, Tagore would mentor you from a distance in finding answers to your own questions in life. It is difficult to generalize but all smart people, and all great leaders read biographies. Their personal libraries are likely to have a few biography and memoir and autobiography.

At the end of the course students will be able to: (Definitive Outcomes)

(i) Learn how to write a daily journals of their own activities and make it a habit which could be of great use in future.

(ii) Learn how to jot down great ideas for use at an appropriate time.

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(iii) Come out of agony and depression to see that finally truth does prevail and perseverance pays.
(iv) Will come to know of many unanswered questions about history of the era mentioned in the books.
(v) Find a lot of materials and quotable quotes for use in later days.

Resources:

Main Text:

- Alam, F. & Radha Rani Chakravarty, eds. (2011), *The Essential Tagore*, Harvard University Press & Visva-Bharati.
- Das Gupta, Uma. (2004). Rabindranath Tagore: A Biography. New Delhi: Oxford University Press.
- Kripalani, Krishna. (1962). Rabindranath Tagore: A Biography. New York: Grove Press.
- Tagore, Rabindranath (1916), *Sādhanā: The Realisation of Life,* Macmillan
- Tagore, Rabindranath (1917) *My Reminiscnces*. New York: McMillan.
- Tagore, Rabindranath (1930), *The Religion of Man*, Macmillan
- Tagore, Rabindranath (2005), *My Boyhood Days* [Tr from *Chelebela*, 1940]. Kolkata: Rupa & Co.

Additional Texts:

- Ayyub, A. S. (1980), *Tagore's Quest*, Kolkata: Papyrus.
- Henn, Katherine. (1985). Rabindranath Tagore: A Bibliography. ATLA Bibliography Series, 13; London: The American Theological Library Association.
- Kripalani, K. (2005), *Tagore—A Life*, National Book Trust of India
- Sigi, R. (2006), *Gurudev Rabindranath Tagore—A Biography*, Diamond Books.
- Som, R. *(2010), Rabindranath Tagore: The Singer and His Song*,
- Thompson, E. (1926), *Rabindranath Tagore: Poet and Dramatist*, Pierides Press.
- Stewart, T. K. & Twichell, C. (translator) (2003), Rabindranath Tagore: Lover of God, Lannan Literary Selections, Copper Canyon Press.

Other Readings:

- Das, Sisir Kumar. (2007). Atmajibani: Jibani O Rabindranath (Autobiography: Biography and Tagore, in Bengali). Kolkata,
- Radice, W. (translator) (1995), *Rabindranath Tagore: Selected Poems* (1st ed.), London: Penguin (published 1 June 1995).
- Radice, W (translator) (2004), *Particles, Jottings, Sparks: The Collected Brief Poems*, Angel Books (published 28 December 2004).
- Mukhopadhyay, Prabhatkumar and Kshitis Roy, eds. (1961). Rabindranath Tagore: A Centenary Volume, 1861–1961, Forword by S. Radhakrishnan. New Delhi: Sahitya Akademi.

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Syllabus - Semester Third

TAGORE AS A CULTURAL ICON - TAGORE AS A PAINTER & PERFORMER

Course Code: ENG2352 **Credit Units: 03**

Theme:
This unit will take us back to look at our cultural history – particularly at the way it unfolded itself during the last few hundred years. When we were beginning to negotiate with the western world, we lacked either the will or the vision, or perhaps both, in constructing our own cultural landscape. As a civilization in India, we had the required talent, the native intuition and appropriate knowledge to create our own pathways. But while under the British rule, we failed to communicate this wisdom and originality, because we fell into the trap of believing that we must build, promote and practice a medium of expression that should be understood by our western readers or viewers. That forced us to adopt the medium of English and its styles of expression. These we then decided to introduce in our education system that would be open only to the elites and the middle class gentry. It was not at all surprising, therefore, that along with English poetry and drama, the average neo-educated Indians began to adore the life-style and culture of their British masters, including their music, taste, dress, and even sports. We had been at an interesting cross-road of history when Tagore had emerged as an indigenous Cultural Icon that could match with the best in the west. Tagore's advent came as a boon to both civil society in India and to our cultural fields. How Tagore emerged as a Cultural Icon in a subjugated country is discussed here with copious examples from different fields of culture and literature to which he had contributed.

Course Coverage:
Module-1: Indian Cultural History and Emergence of Tagore

- 18th-19th Century Bengal and the British Indian Rule
- Cultural, Social, Intellectual and Artistic Re-awakening

Module-2: Doodling, Designs and the Brand Santiniketan

- Doodling on poetry copy-books with Hand-writing and Erasure aesthetics
- Masks, Faces and Designs
- Bringing in Designers Andre Karpeles and Stella Kramrisch (1896-1993)
- Abanindranath Tagore

Module-3: Tagore's Experiments in Painting & Creating an Arts School

- The range of Tagore's Paintings
- Painting nature and mystic landscapes
- Merger of the Familiar and the Unknown
- Dramatic Figures and Scenes

Module-4: Tagore as a Playwright and his experiments in Music and Dance

- From 'Valmiki Pratibha' (1881) to 'Visarjan' (1890) to 'The Post-Office' (1912)
    - The Sung Poetry and his own Musical experiments with fusion

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- Dance-Drama as a genre

Examination Scheme:

Components	CT/OP	AS/LC	A	EE
Weightage (%)	20	05	05	70

CT/OP: Class Test/Oral Presentation, AS/LC: Assignments/Library Consultation, A: Attendance, EE: End-Term Examination

Learning Outcomes: (of the Course)

The fallacy in the perception that the 'Eastern' or so-called 'Oriental' Culture remains static – visibly recognizable over a long period of history began to change to become more like the 'Western' culture with the advent of the English rule and education will be clear with these lectures. The stereotype of the 'Unchanging East' and the meek acceptance of the meaning of 'Progress' or 'Development' as a move towards 'Material Culture' need to be demystified. A very practical advice that Tagore had given to those who are worried about this area could be seen in his statement: "You have to judge progress according to its aim. A railway train makes its progress towards the terminus station – it is a movement. But a full grown tree has no definite movement of that kind. Its progress is the inward progress of life. It lives, with its aspiration towards light tingling in its leaves and creeping in its silent sap." How Tagore had created a fusion of the best traditions of the west and the east in his plays and music to emerge as a Cultural Icon of our time is explained in this course.

At the end of the course students will be able to: (Definitive Outcomes)
(i) Appreciate Tagore's contribution in national reawakening that happened in the 19th Century India;
(ii) Be exposed to some of the finest musical experiments and scores where words touching one's soul and tunes appealing to one's senses get enmeshed;
(iii) How plays could be used as instruments in social awakening or in protest movements could be clear from this course
(iv) How education could change the face of our Society and Humanity will be appreaciated.

Resources:
Main Text:

- Clothey, Fred (2006). *Religion in India: A historical introduction*. London New York: Routledge.
- Keay, John. (2011), *India: A History*, 2nd Ed – Revised and Updated, Grove Press / Harper Collins,
- Henderson, Carol E. (2002). *Culture and Customs of India*. Greenwood Publishing Group.
- Lal, Ananda. (2001), *Rabindranath Tagore: Three Plays*. Oxford University Press.
- O'Connell, Kathleen M. & Joseph T. O'Connell, eds. (2009), *Rabindranath Tagore: Reclaiming a Cultural Icon.* Kolkata: Visva-Bharati Granthan Vibhaga.
- Parimoo, Ratan. (1973) *The Paintings of Three Tagores: Abanindranath, gaganendranath and Rabindranath – Chronology and Comparative Study.* Vadodara: MS University.
- Sarvabhutananda, Swami et al, eds. *Proceedings of the International Seminar on Cultural Unity of India*; Feb 16-19, 2013; Kolkata: Ramakrishna Mission Institute of Culture.
- Sivakumar, Raman, ed. (2011) *Rabindra Chitravali*, 4 Vols. Pratikshan, Kolkata & Visva-Bharati, Santiniketan
- Sivakumar, R. (2011). *The Last Harvest: Paintings of Rabindranath.* Ahmedabad: Mapin.
- Som, Reba (2009). *Rabindranath Tagore: The Singer and his Song*. New Delhi, India: Penguin Books (Viking).

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Additional Texts:

- Dalmia, Vasudha and Rashmi Sadana (editors), *The Cambridge Companion to Modern Indian Culture*, Cambridge University Press,
- Walia, Shelly. URL: https://qz.com/603884/portraits-of-some-of-indias-oldest-indigenous-tribes/

Other Readings:

- Bhattacharya, Sabyasachi, ed. (1997), *The Mahatma and the Poet: Letters and Debates between Gandhi and Tagore: 1915-1941*. New Delhi: National Book Trust.
- Chaki-Sarkar, Manjusree. (2003) 'Tagore and the Modernization of the Indian Dance.' In Sunil Kothari ed *New Directions in Indian Dance*. Mumbai: Marg Publications.
- Robinson, Andrew. (1989). The Art of Rabindranath Tagore. London: Andre Deutsch.

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Syllabus - Semester Fourth

TAGORE AS A POET

Course Code: ENG2452 **Credit Units: 03**

Theme:

Noted American author, Pearl Buck wrote about Tagore's poetry: "In a very real sense he was a world poet…He spoke out of his own soul and mind and heart. To him beauty is eternal and invincible, the indispensable source of refreshment for the soul, the mind, the heart of mankind." Rabindranath began writing poems at the age of 6 and as a young boy studied the classical poetry of Kalidasa. He also studied the Upanishads, languages and modern sciences. He was sent to England in 1878 to become a barrister, but he returned by 1880 without completing his education. His marriage to Mrinalini Devi, and his later assignment to look after his family's estates in the areas now in Bangladesh, allowed him a productive period of writing poetry, plays and short stories. When he joined Santiniketan (in West Bengal) to found an ashram, which became a world school, the opportunity grew further. Tagore thus emerged as Asia's first Nobel Prize winner for literature in 1913 for his book – 'The Song Offerings: Gitanjali'. As a creative genius and a seer-poet, he also played a crucial role in the cultural renaissance of India and Bengal in the 19th and early 20th Century.

Although he was inspired by notable poet Biharilal Chakrabarty and acknowledged him as his poetry-guru, his own poetry was undeniably unique. This was evident right from his first published volume of poetry entitled "Sandhyasangeet" (or Evening Songs) which came out in 1882. When his greatest source of inspiration - his sister-in-law Kadambari Devi, a wise and brilliant woman of her time, passed away in 1885, it inflicted a deep wound on Rabindranath. This sense of loss finds expression in many of his works, from "Kori O Komal" (1886) to several others. Rabindranath also wrote "Prabhat Sangeet" (or Morning songs) soon. The poems of love in this collection also symbolized the naissance of Rabindranath's personal view of God. The history of the completion that which Rabindranath was talking of, may be found in several other anthologies - "Naivedya", "Utsarga" and "Kheya", as also in "Chitra", "Kalpana" and "Khanika" – and subsequent works of his, until 'Gitanjali' (1910). Poems of yearning for the Divine, an immense craving for the Infinite, form an integral part of the temperament of the lyrical poems of "Gitanjali". In 1913, the English edition of "Gitanjali" was published with an introduction by English poet, W. B.Yeats. The rest is history. This course will also present a glimpse of the post-Gitanjali poetic creations of Tagore which took a completely different turn.

Course Coverage:

Module-1: Early Phase of Tagore's Poetry

- The Prabhat Sangeet (1883) and the Sandhya Sangeet (1882) days
- The 'Kari o Komal' (1886), 'The Manasi' (1890) and the 'Chitra' & 'Chaitali' (1896) phase

Module-2: The 'Gitanjali' Period

- 'Kanika' (1899), 'Kshanika' (1900) and the Bengali Original 'Gitanjali' (1910)
- Making of the English Gitanjali (1912)
- The sequels – 'Gitimalya' (1914) and 'Gitali' (1914)

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Module-3: The Poetic Plays

- The 'Chitrangada' (1892) – based on the epic story of the Maha-Bharata
- The 'Chandalika' (1938) – touching upon the issue of caste prejudices
- The Card Country, or 'Tasher Desh' (1933)

Module 4: Later Phase of Tagore's Poetry

- Punascha' (1932) and 'Parishesh' (1932)
- 'Shesh Saptak' (1935), Patraput (1936) and Shyamali (1936)
- 'Shesh Kotha' (1940) and 'Rogshajyay' (1941)
- Poetry on Paintings – 'Bichitrita' 91933)

Examination Scheme:

Components	CT/OP	AS/LC	A	EE
Weightage (%)	20	05	05	70

CT/OP: Class Test/Oral Presentation, AS/LC: Assignments/Library Consultation, A: Attendance, EE: End-Term Examination

Learning Outcomes: (of the Course)

Going through this course will make the participants appreciate the position of Tagore, namely, that since Man did not have any choice as to his origin and his state, i.e. his environ, and because the human mind is not contented with what is given, man likes to create, construct and set up himself and all that is around him in the way he likes. This works as a driving force for all in literature and art. Because man was not born complete, he wants to get over his incompletion by creativity. Yet another learning outcome will be to realize what Tagore mentions in his essay, 'The Significance of Literature.' Through his poems, Tagore makes an attempt to define the various worlds that he places before him as a thinker-author – some real, and some unreal; some approachable through 'language', and some that employ a "language that is beyond language". This Utopia expressed in his mystic poetry becomes clearer when we see him saying:

"The world becomes another world in our mind. In this world exist not only the color, shape, sound, and other attributes of the other world, but also our likes and dislikes, our fear and wonder, our pleasure and grief. Our mind, through its various processes, suffuses the outside world differently… This act of the mind enables us to individualize external reality… Through the color and shape of their mind, the external world assumes variegated shapes… This world is more precious to the imaginative individual than the outside world or the human world. The mind helps this world to become more suitable for access into people's hearts, rendering it unique for consumption… Thus there is a difference between the outside world and the human world. The human world does not inform us of what is black and white and what is large and small. It tells us of what is dear and vile, what is beautiful and ugly, and what is good and bad in different ways."
It is the nature of the human mind and the human world that get truly reflected in his poetry – which the participants will be able to discover through this course.

In particular, a few of Tagore's poems in English translation would be discussed here from 'The Fountain's Awakening' to 'The dark Night of Sorrows.' Tagore's songs (over 2500 compositions) that belong to another genre of poetry will also be presented and discussed here, since Tagore had himself declared that music being the most abstract of all the

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arts, just as mathematics was in the region of science, musical expression was the purest and most unimpeded form of creative expression. And it is in his songs that the evolution of the poet from what he called a state of being into one of becoming is best captured.

At the end of the course students will be able to: (Definitive Outcomes)
(i) Comprehend the influences on Tagore by the poetic tradition of India
(ii) Read and recite a few major poems in English translation and be exposed to some fine recorded recitations of original poems
(iii) Understand the problems and nuances of poetic translation of Tagore texts – based on translations done by the poet himself and by the others
(iv) Be exposed to a variety of poems – with so much of thematic and stylistic variations

Resources:
Main Text:

- Alam, Fakrul & Radha Chakravarty, eds. (2011) The Essential Tagore. Harvard University Press & Visva-Bharati.
- Hogan, Patrick Colm & Lalita Pandit, eds. () *Rabindranath Tagore: Universality and Tradition*. Madison, Teaneck: Fairleigh Dickinson University Press.
- Jelnikar, Ana. (2008). "W. B. Yeats's (Mis) Reading of Tagore: Interpeting an Alien Culture," University of Toronto Quarterly 77:4 (Fall no, 2008).
- Kabir, Humayun (1959). 'Tagore's Poetry'. *Indian Literature* Vol. 2, No. 1 (Oct. 1958—Mar. 1959), pp. 5-20
- Singh, Udaya Narayana. (2013/2016). *The Original Gitanjali*. Andorra: AnimaViva multilingüe SL, Escaldes – Engordany, Principat d'Andorra. Indian edn., Kolkata, Delhi: E-Lekhan Foundation.

Additional Texts:

- Aronson, Alex. (1943). Rabindranath Through Western Eyes. Kolkata.
- Zahurul Haque, Abu Saeed. (1981) Folklore and Nationalism in Rabindranath Tagore. Dhaka: Bangla Academy.

Other Readings:

- Mukherjee, Sujit. (1964). Passage to America: The Reception of Rabindranath Tagore in the United States, 1912–1941. Kolkata: Bookland.

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Syllabus - Semester Fifth

TAGORE AS A FICTION WRITER

Course Code: ENG2552 **Credit Units: 03**

Theme:

Rabindranath Tagore is a poet dramatist, novelist, actor, composer, educator, painter, and a Philosopher. In a word he is the Leonardo-da–Vinci of our Renaissance True to the Indian Tradition, his own philosophical vision was depicted is his essays, stories as well as in his fiction. Tagore's short stories emerged at a time when this genre was not so well-cultivated in India, and they have given rise to many films later. The stories often deal with apparently simple subject matter: commoners, whereas his non-fiction writings dealt with history, linguistics, and spirituality. Well-known also as travelogue writer, his *Europe Jatrir Patro* ('Letters from Europe') are a treat to read. His career as a story-teller through dramatic mode began with *Balmiki Pratibha* in 1881 but soon he came up with *Bisarjan* (1890). His later dramas such as *Dak-ghar* ('The Post Office, 1912) or *Raktakarabi* ('Red Oleanders' 1926) were more philosophical and allegorical. The dance dramas such as *Chandalika* (1938), *Shyama* (1939), and *Chitrangada* (1905) are still extremely popular. This unit will also give an introduction to Tagore's well-known novels – Chokher bali (1903), Noukadubi (1906), Gora (1910), Chaturanga (1916), Ghare Baire (1916), Jogajog (1929), Char Adhyay (1933), and Shesher Kabita (1929) etc.

Course Coverage:

Module-1: Tagore's Initial Texts leading to his 'Galpaguccha'

- 'Bou-Thakuranir Hat' (1883) and 'Rajarshi' (1887)
- The beginning of his short stories from 1891 – 'Byabadhan', 'Khokababur Pratyabartan', 'Postmaster' (1891);
- 'Dena-paona', 'Ekti Asharhe Galpo' and Kabuliwalla' (all 1891-92);
- 'Kshudhita Pashan' & 'Icchapuran' (1895)

Module-2: Selected Novella – Initial Phase

- 'Nashtanir' (1901);
- 'Chokher Bali' (1902);
- 'Noukadubi' (1906)

Module-3: Selected Novels – Later Phase

- Gora (1910)

Module-4: Poet as a Story-teller – Experiments in Fusion

- Ghare Baire (1916)
- Shesher Kavita (1929)

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Examination Scheme:

Components	CT/OP	AS/LC	A	EE
Weightage (%)	20	05	05	70

CT/OP: Class Test/Oral Presentation, AS/LC: Assignments/Library Consultation, A: Attendance, EE: End-Term Examination

Learning Outcomes: (of the Course)
This course will provide a thorough and in-depth knowledge of Tagore's profound understanding of human emotions, values and social systems in nineteenth and twentieth century Bengal. More importantly, the man-woman relationships dramatized in Tagore's novels and plays will provide the learners with a glimpse of the turbulences and upheavals that in turn will enable to comprehend the larger politics of gender, sexuality and patriarchy in various guises. One will gradually have a critical acumen to realize the play of hierarchies in the past and the contemporary times. Also, a reading of Tagore's novels will make one aware of his humanist thinking that undermined the parochialism and jingoist nationalism. Tagore's broader humane worldview that repudiated ultra-nationalist excesses is very relevant for today. His plays and novels show that though he argued fiercely against the bonds of colonialism, he warned against the excesses of nationalism. For him "the idea of the nation is one of the most powerful anesthetics that man has invented." So, no wonder, going through this course one will not only revisit the colonial/ national histories, changing roles and status of women but also will grasp the working of social dynamics in different forms in the current era.

At the end of the course students will be able to: (Definitive Outcomes)
i) Appreciate Tagore's take on nationalist and colonial histories.
ii) Understand Tagore's lyrical humanism and how that is pertinent in a world of strife and conflict
iii) Explore the representation of women and how it is related to the feminist studies.
iv) Unravel how fiction can written as a mode of beauty and truth as well as to radically critique the systemic ideologies.

Resources:
Main Text:

- Chaudhuri, Amit. (2008) Clearing a Space: Reflections on India, Literature and Culture. Delhi and Ranikhet: Permanent Black.
- Nussbaum, Martha C. (1996) For Love of Country?, edited by Joshua Cohen for Boston Review. Boston: Beacon Press.
- Sen, Amartya. (2005) "Tagore and His India," reprinted in The Argumentative Indian: Writings on Indian History, Culture and Identity. London: Allen Lane/Penguin, 89–120.
- Tagore, Rabindranath (2009). *Gora*. India: Penguin.
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Syllabus - Semester Sixth

TAGORE AND MASS MEDIA

Course Code: ENG2652 **Credit Units: 03**

Theme:

Very few are aware that Rabindranath Tagore had himself dabbled into screenplay writing in the early days of Indian cinema. The silent era Orient Pictures film '*Balidan*' (1927) directed by Naval Gandhi and based on Tagore-play '*Bisarjan*' (known in English as '*Sacrifice*'), had its screenplay written jointly by Jamshed Ratnagar and Rabindranath Tagore. This commercially successful film was set in the fictional kingdom of Tippera, and involved clashes between a progressive-minded King and a "tradition-bound priest.

'*Natir Puja*' (*The dancing girl's worship*, 1932) - based on a recording of his 1926 dance-drama - is the only film where Rabindranath Tagore is credited as the director. Produced by B.N.Sircar of the New Theatre's Group, it was shot in four days where Tagore had himself enacted a small role. Although it was not a commercial success, the prints of the film were destroyed in a fire at the New Theatres. Though recently, attempts have been made to restore the film.

Tapan Sinha's Bengali version of Tagore-story '*Kabuliwala*' (1957) was remade in Hindi in 1961 – with the lead role being played by Chhabi Biswas in Bengali and Balraj Sahni in Hindi. Both versions were immensely successful aesthetically as well as commercially. The music was scored by Pt Ravi Shankar for the Bengali version and by Salil Choudhury for the Hindi version. It received two National Film Awards in 1956 and the Silver Bear Extraordinary Prize of the Jury in the Berlin Film Festival. The story was translated from Bangla into English by the Irish woman Margaret Elizabeth Noble, more popularly known to the world as Sister Nivedita.

Satyajit Ray's '*Teen kanya*' (literally, 'The Three Daughters') was a tribute to Tagore in his centenary year – 1961 as it was made out of three stories by the Master – 'Postmaster', 'Monihara' ("The Lost Jewels'), and 'Samapti' ('The Conclusion') – awarded as the best film at the National level and also honored at the Berlin Film Festival. The common thread seems to be three extraordinary women and their tale of love and affection.

'*Dak Ghar*', a 1912-play by Tagore, rendered into English by W.B.Yeats, and translated and performed in Spanish, French, German and Polish in Europe, was made into a Hindi film in 1965 – directed by Zul Vellani, produced by the Children's Film Society.

Many other successful films could be named – such as Kumar Shahani's 1997-film '*Char Adhyay*' produced by NFDC – based on Tagore's 1934 novel, and remade recently as a successful Bengali commercial film – '*Elar Char Adhyay*' (2012) directed by Bappaditya Bandopadhyay. In between, the same novel became the subject matter of another film – '*Chaturanga*' (2008) directed by Suman Mukherjee

There was yet another classic Tagore film that was remade – Satyajit Ray's '*Charulata*' (1964), with Soumitra Chatterji, Madhabi Mukherjee and Shailen Banerjee - remade by Agnidev Chatterji in 2012 with Rituparna Sengupta, Arjun Chakraborty and Kaushik Sen. Ray had received the Silver Bear as the Best Director in the 15th Berlin International Festival in 1965 for this film and also Golden

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Lotus Award nationally in the same year.

There were some more movies with double versions – such as Tagore's story '*Naukadubi*' ('The Wreck') being made as '*Ghunghat*' (1960) by Ramanand Sagar under a Gemini Studio production where Bharat Bhushan, Leela Chitnis, Pradeep Kumar, Bina Rai, Asha Parekh etc acted. The film went on to get two Filmfare awards. In 2011, Rituporno Ghosh made it in Bengali under the original title – 'Noukadubi' – produced by Subhash Ghai, and it was premiered as the opening film of the *Indian Panorama* section during the 41st International Film Festival of India (IFFI), Goa on 24 November 2010, in the year that marked Rabindranath Tagore's 150th birth anniversary.

Course Coverage:
In this unit, memorable films and other performances made out of Tagore's works will be introduced, viewed and discussed, and a few documentary films on Tagore will be shown as a part of the course. Evaluation pattern will differ from the other courses under Tagore Studies.

Module-1: Satyajit Ray and Rituparna Ghosh on Tagore's Biopic plus some other Documentaries on Tagore & Discussions
Module-2: Memorable films – Charulata (Satyajit Ray 1964)
Module-3: Chokher Bali (Rituparno Ghosh, 2003)
Module-4: Ghare Baire (Satyajit Ray, 1985)
Module-5: Multiple versions of Tagore films – 'Kabuliwala', 'Char Ahyay', 'Charulata' etc.

Examination Scheme:

Components	CT/OP	AS/LC	A	EE
Weightage (%)	20	05	05	70

CT/OP: Class Test/Oral Presentation, AS/LC: Assignments/Library Consultation, A: Attendance, EE: End-Term Examination

Learning Outcomes: (of the Course)
Tagore has been a source of inspiration to generations of filmmakers and theatre performers. Be it his songs, poems, short stories, novels, or plays, his works attracted many. Even recently, a few film-directors such as Sekhar Das (Jogajog) and Suman Ghosh (Kadambari) came up with elements from tagore stories or from his life. Subhabrata Chatterjee's debut Bengali film, Monihara, based on Tagore's short story was another example. Suman Mukherjee of 'Chaturanga'-fame was working on his next film, Shesher Kabita, based on Tagore's novel of the same name. Tagore's influence on the Bengali television too can't be denied. A television series, Chokher Bali, based on Tagore's work, which was launched recently, too has found many takers.

This being the pervasive influence of Tagore on Mass Media, a student with interest in cinematography, screenplay or direction and production would be incomplete without being exposed to a course such as this. It would also bring out the best in the candidate in appreciating or critiquing film and television classics.

At the end of the course students will be able to: (Definitive Outcomes)
(i) The Social Reformist in Tagore could be understood better through this course. His political ideas would be clearer.
(ii) The stunningly contemporary elements in Tagore's stories would be possible to use in further studies and works by the candidates.
(iii) The issues of gender equality and women's emancipation would be appreciated

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through this course.
(iv) Since Tagore's translation do not match the quality of his originals, the cinematic translations in the inter-semiotic endeavors make it easier for us to appreciate his genius.

Resources:
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PHYSICAL EDUCATION & SPORTS MANAGEMENT

Programme Structure

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits
PED2151	Health Education and Sports Science	2	-	2	3
PED2251	Human Anatomy and Exercise	2	-	2	3
PED2351	Sports Training and Conditioning	2	-	2	3
PED2451	Basics of Sports Management	2	-	2	3
PED2551	Sports Psychology	2	-	2	3
PED2651	Sports Medicine	2	-	2	3
	TOTAL				**18**

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PHYSICAL EDUCATION & SPORTS MANAGEMENT

Syllabus - Semester First

HEALTH EDUCATION AND SPORTS

Course Code: PED2151 **Credit Units: 03**

Course Objective: - The aim of the course is to teach students about the rules for the preservation and development of their physical, mental and emotional health, which will be help to improve the standard of health and fitness status of the individual/community/society.

Part-A

Module I: Health Education

1.1. Introduction of Health Education
1.2. Safety and Security (Hygiene and Precaution)
1.3. Individual and Family Health
1.4. Food and Nutrition

Module-II Physical Fitness and Wellness

2.1. Meaning and Definition of Physical fitness and wellness
2.2. Types of Physical Fitness and Wellness
2.3. Importance of Physical fitness and Wellness
2.4. Healthy diet schedule (Pre-Match-Post)

Module-III Human Posture

4.1 What is a good Posture
4.2. Posture deformities
4.3. Types of Posture deformity
4.4. Remedies of Posture deformities by exercise and Yoga

Part-B

Fitness Assessment (Practical)

Health Related

1. **Cardio-Respiratory fitness**
   -1mile run walk test
   -12 min cooper test
2. **Body Composition**
   -Body Mass Index (BMI)
   -Body Fat Percentage
   (Skin fold measurement/Body composition analyzer)
3. **Flexibility**
   -Sit & reach test (abdominal & hamstring)
   -Back stretch test (shoulder)
4. **Muscular Strength**

Skill/Sports Related

1. Agility
-Shuttle run
-Sumo agility test

2. Speed
-50 yard dash
-8 Sec dash

3. Coordination
-Eye hand coordination
-Fast Foot step test
-Skipping

4. Balance

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-Pull ups or pushups with weight (boys)
-Flex arm hang (girls)
-Grip Strength Test
-Bench press

-Static Balance Test
-Dynamic Balance Test

5. Muscular Endurance

Sit-ups
Pull ups and push ups

5. Power

-Standing Broad Jump

6. Reaction Time

-Nelson Scale test

Fundamental Skills of Game/Sport

Basketball

- History, Rule and Regulation of Sports
- Basic and Specific Skills
- Techniques and Tactics

Examination Scheme:

Components	FA	CA	CP	A	EE
Weightage	10	10	5	5	70

Internal Assessment: 30

{FA=Fitness Assessment (10 Marks), CA=Competition Assignment (10Marks), CP=Class Presentation (5Marks), A=Attendance (5Marks)}
External Assessment: 70

Part-A: Theory = 35

Part-B: Practical Examination = 35

1. **General Fitness Test (5 marks)**
2. **Sports Specific Test (10 Marks)**
3. **Project File (10 Marks)**
4. **Viva (10 Marks)**

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Syllabus - Semester Second

HUMAN ANATOMY AND EXERCISE

Course Code: PED2251 **Credit Units: 03**

Course Objective: - The aim of the course is to provide the knowledge of cell, tissues, organs and systems, microscopic structure of cell, Human body and their internal system and the effect of sports or exercise on their system.

Part –A

Module -I Introduction of Various Human Systems

1.1. Meaning and concept of anatomy, need and importance of anatomy for the athlete/non-athlete
1.2. Brief introduction of various systems cell, tissues, organs and systems, microscopic structure of cell,

Module -II Effect of Exercise on various systems

1.1. Muscular System, Cardio-vascular system, Respiratory system, Nervous system, Reproductive system, Urinary system, Digestive system)

Module-III Fatigue

3.1. Concept, cause and systems of fatigue
3.2. Remedial measure to overcome fatigue
3.3. Importance of Warming-up in sports
3.4. Importance of Limber down in sports

Part-B

Fitness Assessment (Practical)

Health Related

1. **Cardio-Respiratory fitness**
   -1mile run walk test
   -12 min cooper test
2. **Body Composition**
   -Body Mass Index (BMI)
   -Body Fat Percentage
   (Skin fold measurement/Body composition analyzer)
3. **Flexibility**
   -Sit & reach test (abdominal & hamstring)
   -Back stretch test (shoulder)
4. **Muscular Strength**
   -Pull ups or pushups with weight (boys)
   -Flex arm hang (girls)
   -Grip Strength Test
   -Bench press

Skill/Sports Related

1. **Agility**
   -Shuttle run
   -Sumo agility test
2. **Speed**
   -50 yard dash
   -8 Sec dash
3. **Coordination**
   -Eye hand coordination
   -Fast Foot step test
   -Skipping
4. **Balance**
   -Static Balance Test
   -Dynamic Balance Test

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5. **Muscular Endurance**
   Sit-ups
   Pull ups and push ups

5. Power
-Standing Broad Jump

6. Reaction Time
-Nelson Scale test

Fundamental Skills of Game/Sport

Football

- History, Rule and Regulation
- Basic and Specific Skills
- Techniques and Tactics

Examination Scheme:

Components	FA	CA	CP	A	EE
Weightage	10	10	5	5	70

Internal Assessment: 30

{FA=Fitness Assessment (10 Marks), CA=Competition Assignment (10Marks), CP=Class Presentation (5Marks), A=Attendance (5Marks)}
External Assessment: 70

Part-A: Theory = 35

Part-B: Practical Examination = 35

1. **General Fitness Test (5 marks)**
2. **Sports Specific Test (10 Marks)**
3. **Project File (10 Marks)**
4. **Viva (10 Marks)**

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Syllabus - Semester Third

SPORTS TRAINING AND CONDITIONING

Course Code: PED2351 **Credit Units: 03**

Course Objective: - The aim of the course to provide the scientific knowledge of sports training and conditioning which help to the athlete or non athlete for develop their physical efficiency and performance.

Part-A

Module-I Introduction

1.1. Introduction of Sports Training
1.2. Meaning and Definition of Sports Training
1.3. Principle of Sports Training
1.4. Significance of Sports Training

Module-II Motor Components

2.1. Introduction
2.2. Speed
2.3. Strength
2.4. Endurance
2.5. Flexibility and Coordination

Module-III Methods to develop various motor components

3.1. Development of Speed
3.2. Development of Strength
3.3. Development of Endurance.
3.4. Development of Flexibility and Coordination.

Part-B **Fitness Assessment (Practical)**

Health Related

1. Cardio-Respiratory fitness
-1mile run walk test
-12 min cooper test

2. Body Composition
-Body Mass Index (BMI)
-Body Fat Percentage
(Skin fold measurement/Body composition analyzer)

3. Flexibility
-Sit & reach test (abdominal & hamstring)
-Back stretch test (shoulder)

4. Muscular Strength
-Pull ups or pushups with weight (boys)
-Flex arm hang (girls)
-Grip Strength Test
-Bench press

Skill/Sports Related

1. Agility
-Shuttle run
-Sumo agility test

2. Speed
-50 yard dash
-8 Sec dash

3. Coordination
-Eye hand coordination
-fast Foot step test
-Skipping

4. Balance
-Static Balance Test
-Dynamic Balance Test

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5. Muscular Endurance

Sit-ups

Pull ups and push ups

5. Power

-Standing Broad Jump

6. Reaction Time

-Nelson Scale test

b. Fundamental Skills of Game/Sport

Athletics

- ❖ History, Rule and Regulation
- ❖ Basic and Specific Skills
- ❖ Techniques and Tactics

Examination Scheme:

Components	FA	CA	CP	A	EE
Weightage	10	10	5	5	70

Internal Assessment: 30

{FA=Fitness Assessment (10 Marks), CA=Competition Assignment (10Marks), CP=Class Presentation (5Marks), A=Attendance (5Marks)}
External Assessment: 70

Part-A: Theory = 35

Part-B: Practical Examination = 35

1. **General Fitness Test (5 marks)**
2. **Sports Specific Test (10 Marks)**
3. **Project File (10 Marks)**
4. **Viva (10 Marks)**

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Syllabus - Semester Fourth

BASICS OF SPORTS MANAGEMENT

Course Code: PED2451 **Credit Units: 03**

Course Objective: - The aim of this course is to provide the management and organizational skill to the students for organizes any sports/competition or events by giving the practical assignments.

Part -A

Module-I Sports management and planning in sports

1.1 Brief introduction of Sports Management
1.2 Management of Intramural and extramural competition
1.3. Types of Planning
1.4. Principle of planning
1.5. Importance of Effective Planning

Module-II Controlling

2.1. Introduction of Controlling
2.2. Definition and Nature of Controlling
2.3. Steps of Controlling
2.4 Principle of Effective Control
2.5. Importance of Controlling in Physical Education and Sports

Module-III Budgeting and Stocking in Sports

2.1. Introduction
2.2. Definition of Budget and Stocking
2.3. Principles of Effective Budget
2.4. Steps in Constructing/ Preparation of Budget in Physical Education and Sports
2.5. Presentation of Budget Maintenance of Stocks
2.6. Financial Management

Part-B

Fitness Assessment (Practical)

Health Related

1. **Cardio-Respiratory fitness**
   -1mile run walk test
   -12 min cooper test
2. **Body Composition**
   -Body Mass Index (BMI)
   -Body Fat Percentage
   (Skin fold measurement/Body composition analyzer)
3. **Flexibility**
   -Sit & reach test (abdominal & hamstring)
   -Back stretch test (shoulder)
4. **Muscular Strength**
   -Pull ups or pushups with weight (boys)
   -Flex arm hang (girls)

Skill/Sports Related

1. Agility
-Shuttle run
-Sumo agility test

2. Speed
-50 yard dash
-8 Sec dash

3. Coordination
-Eye hand coordination
-fast Foot step test
Skipping

4. Balance
-Static Balance Test
-Dynamic Balance Test

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-Grip Strength Test
-Bench press

5. **Muscular Endurance**
   Sit-ups
   Pull ups and push ups

5. Power
-Standing Broad Jump

6. Reaction Time
-Nelson Scale test

Fundamental Skills of Game/Sport
Volleyball & Throw Ball

- History, Rule and Regulation of
- Basic and Specific Skills
- Techniques and Tactics

Examination Scheme:

Components	FA	CA	CP	A	EE
Weightage	10	10	5	5	70

Internal Assessment: 30

{FA=Fitness Assessment (10 Marks), CA=Competition Assignment (10Marks), CP=Class Presentation (5Marks), A=Attendance (5Marks)}
External Assessment: 70

Part-A: Theory = 35

Part-B: Practical Examination = 35

1. **General Fitness Test (5 marks)**
2. **Sports Specific Test (10 Marks)**
3. **Project File (10 Marks)**
4. **Viva (10 Marks)**

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Syllabus - Semester Fifth

SPORTS PSYCHOLOGY

Course Code: PED2551 **Credit Units: 03**

Course objective: - The objective of this course is to facilitate the understanding of how psychological factors influence involvement and performance in sports setting. The course will explore such topics as Achievement motivation, Goal setting in sports.

Part-A

Module-I Introduction of Sports Psychology

1.1. Meaning, nature and scope of Sports Psychology in Physical Education and Sports
1.2. Importance of Sports Psychology in Physical Education and Sports

Module-II Achievement Motivation

2.1. Meaning and definition of achievement motivation
2.2. Types of Motivation
2.3. Significance of achievement motivation in the field of Physical Education and Sports

Module-III Goal Setting

3.1. Introduction
3.2. Types of Goal Setting
3.3. Significance of Goal Setting in the field of Physical Education and Sports

Part-B

Fitness Assessment (Practical)

Health Related	**Skill/Sports Related**
1. Cardio-Respiratory fitness -1mile run walk test -12 min cooper test	**1. Agility** -Shuttle run -Sumo agility test
2. Body Composition -Body Mass Index (BMI) -Body Fat Percentage (Skin fold measurement/Body composition analyzer)	**2. Speed** -50 yard dash -8 Sec dash
3. Flexibility -Sit & reach test (abdominal & hamstring) -Back stretch test (shoulder)	**3. Coordination** -Eye hand coordination -Fast Foot step test -Skipping
4. Muscular Strength -Pull ups or pushups with weight (boys) -Flex arm hang (girls) -Grip Strength Test -Bench press	**4. Balance** -Static Balance Test -Dynamic Balance Test

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5. **Muscular Endurance**
   Sit-ups
   Pull ups and push ups

5. Power
-Standing Broad Jump

6. Reaction Time
-Nelson Scale test

1. **Fundamental Skills of Game/Sport**

Cricket

- ❖ History, Rule and Regulation of
- ❖ Basic and Specific Skills
- ❖ Techniques and Tactics

Examination Scheme:

Components	FA	CA	CP	A	EE
Weightage	10	10	5	5	70

Internal Assessment: 30

{FA=Fitness Assessment (10 Marks), CA=Competition Assignment (10Marks), CP=Class Presentation (5Marks), A=Attendance (5Marks)}
External Assessment: 70

Part-A: Theory = 35

Part-B: Practical Examination = 35

(1) General Fitness Test (5 marks)
(2) Sports Specific Test (10 Marks)
(3) Project File (10 Marks)
(4) Viva (10 Marks)

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Syllabus - Semester Sixth

SPORTS MEDICINE

Course Code: PED2651 **Credit Units: 03**

Course objective: - The aim of the course is to provide scientific knowledge of sports medicine, care of sports injuries, rehabilitation process and prevention of drugs in sports. This course also enhance the visibility of athletes by provide the comprehensive, diverse and educational experience in the field of sports medicine.

Part-A

Module –I First-Aids

1.1. Basic of First-Aids
1.2. Preparing to respond to a health emergency –location and availability to your sports arena
1.3. Preparing to respond to a health emergency –location and availability to your work place

Module –II Sports Injuries & Rehabilitation

2.1. Introduction
2.2. Types of Sports Injuries
2.3. Cause of Sports Injuries
2.4. Rehabilitation of Sports Injuries
-Prevention and Management of Sports injuries by therapeutic modalities and Massage

Module –III Drug Abuse in Sports

3.1. Introduction
3.2. Meaning and Definition of Doping
3.3. Classification of Doping
3.4. Doping Method
3.5. The prevention of Doping in Sports

Part-B

Fitness Assessment (Practical)

Health Related

1. **Cardio-Respiratory fitness**
   -1mile run walk test
   -12 min cooper test
2. **Body Composition**
   -Body Mass Index (BMI)
   -Body Fat Percentage
   (Skin fold measurement/Body composition analyzer)
3. **Flexibility**
   -Sit & reach test (abdominal & hamstring)
   -Back stretch test (shoulder)
4. **Muscular Strength**
   -Pull ups or pushups with weight (boys)
   -Flex arm hang (girls)

Skill/Sports Related

1. **Agility**
   -Shuttle run
   -Sumo agility test
2. **Speed**
   -50 yard dash
   -8 Sec dash
3. **Coordination**
   -Eye hand coordination
   -fast Foot step test
   -Skipping
4. **Balance**
   -Static Balance Test
   -Dynamic

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Balance Test
-Grip Strength Test
-Bench press

5. **Muscular Endurance**
Sit-ups
Pull ups and push ups

5. Power
-Standing Broad Jump

6. Reaction Time
-Nelson Scale test

Fundamental Skills of Game/Sport

Racquet Sports

- History, Rule and Regulation of
- Basic and Specific Skills
- Techniques and Tactics

Examination Scheme:

Components	FA	CA	CP	A	EE
Weightage	10	10	5	5	70

Internal Assessment: 30

{FA=Fitness Assessment (10 Marks), CA=Competition Assignment (10Marks), CP=Class Presentation (5Marks), A=Attendance (5Marks)}
External Assessment: 70

Part-A: Theory = 35

Part-B: Practical Examination = 35

1. **General Fitness Test (5 marks)**
2. **Sports Specific Test (10 Marks)**
3. **Project File (10 Marks)**
4. **Viva (10 Marks)**

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FRENCH STUDIES

PREAMBLE

Amity University aims to achieve academic excellence by providing multi-faceted education to students. The University has designed a system that would provide rigorous academic programme with necessary skills to enable them to excel in their careers.

This booklet contains the Programme Structure, the Detailed Curriculum and the Scheme of Examination. The Programme Structure includes the courses (Value-added Course: FL- French and Minor track courses), arranged semester wise. The importance of each course is defined in terms of credits attached to it. The credit units attached to each course has been further defined in terms of contact hours i.e. Lecture Hours (L), Tutorial Hours (T), Practical Hours (P). Towards earning credits in terms of contact hours, 1 Lecture and 1 Tutorial per week are rated as 1 credit each and 2 Practical hours per week are rated as 1 credit. Thus, for example, an L-T-P structure of 3-0-0 will have 3 credits, 3-1-0 will have 4 credits, and 3-1-2 will have 5 credits.

The Curriculum and Scheme of Examination of each course includes the course objectives, course contents, scheme of examination and the list of text and references. The scheme of examination defines the various components of evaluation and the weightage attached to each component. The different codes used for the components of evaluation and the weightage attached to them are:

Components	Codes	Weightage (%)
Case Discussion/ Presentation/ Analysis	C	05 - 10
Home Assignment	H	05 - 10
Project	P	05 - 10
Seminar	S	05 - 10
Viva	V	05 - 10
Quiz	Q	05 - 10
Class Test	CT	10 - 15
Attendance	A	05
End Semester Examination	EE	70

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PROGRAMME OBJECTIVE

This programme is designed for the students who opt for French as a Minor **in addition to taking French as Foreign Language (Value-added Course).**

This programme aims at providing an understanding of the basics of French grammar and phonetics.

Students get sensitized towards different "registres de langue" and are able to distinguish formal and informal language right from the beginning and use appropriate language while communicating in the professional and business world.

Through various listening and speaking exercises this course enables the students to quickly take position as a foreigner speaking French and establish contacts and communicate in oral and written language.

This programme also provides an insight into French literature. By furnishing information on select socio-cultural aspects of France, this programme creates a backdrop for a better understanding of the language and the people.

This programme focuses on developing all four language skills of reading, writing, listening and speaking. Through training in various activities it enhances the critical/ creative thinking and encourages the learners to think spontaneously in French.

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FRENCH STUDIES

Programme Structure

Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
LAN2161	Professional French for Business-1	2	1	-	3
LAN2261	Professional French for Business-2	2	1	-	3
LAN2361	Professional French for Business-3	2	1	-	3
LAN2461	Professional French for Business-4	2	1	-	3
LAN2561	Introduction to French Literature & Select Socio-Cultural aspects of France	2	1	-	3
LAN2661	French Through Activities	2	1	-	3
	TOTAL				**18**

Prerequisites:

1. The student should have opted for French as FL

2. In each semester the student should opt for the course offered without skipping any course. They are expected to follow the sequence. These courses cannot be opted for independently as OE in any semester.

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Syllabus - Semester First

PROFESSIONAL FRENCH FOR BUSINESS-1
(FRANÇAIS PROFESSIONNEL ET DES AFFAIRES-1)

Course Code: LAN2161 **Credit Units: 03**

Course Objective:

- This course aims at providing an understanding of the basics of French grammar and phonetics. Students get sensitized towards different "registres de langue" and are able to distinguish formal and informal language right from the beginning and use appropriate language while communicating in the professional and business world.
- Through various listening and speaking exercises this course enables the students to quickly take position as a foreigner speaking French and establish contacts and speak about things.

Course Contents:

Module I: Entrer en contact et faire connaissance

Actes de Communication :

S'adresser poliment à quelqu'un, se présenter, présenter quelqu'un, présenter une entreprise, présenter des renseignements personnels

Module II: Parler des objets

Actes de Communication :

Parler des objets, exprimer ses besoins, expliquer les usages des objets, situer les objets, faire des descriptions, comparer et exprimer ses préférences \

Grammaire :

1. articles indéfinis, masculin et féminin des noms, pluriel des noms
2. pronoms sujets, et toniques, on, c'est/il est + profession, qui est-ce ? qu'est-ce que?
3. masculin et féminin des adjectifs de nationalité
4. verbes parler, habiter, s'appeler, être, avoir, aller faire, connaître, vendre,
5. article défini, complément du nom avec de, quel interrogatif
6. pour + infinitif, il manque...
7. verbe avoir, ne...pas/pas de, question avec est-ce que ?, question négative, réponse "oui/ non/ si"
8. prépositions de lieu, il y a/qu'est-ce qu'il y a
9. adjectifs possessifs (un seul possesseur) accord et place des adjectifs qualificatifs
10. comparatifs et superlatifs

Examination Scheme:

Components	CT	V	Att.	EE
Weightage (%)	15	10	5	70

Text & References:

Text:

Le livre à suivre : Penfornis, Jean-Luc. Français.Com (Débutant). Paris: Clé International, 2007.

References:

Tauzin, Béatrice et Dubois Anne-Lyse. Objectif Express 1. Paris: Hachette, 2009.

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Syllabus - Semester Second

PROFESSIONAL FRENCH FOR BUSINESS-2
(FRANÇAIS PROFESSIONNEL ET DES AFFAIRES-2)

Course Code: LAN2261 **Credit Units: 03**

Course Objective:
To enable the students to

- plan, prepare, talk about time schedules, schedule meetings
- take appointments, confirm, anticipate or postpone appointments
- discuss work habits, frequency of actions, weather
- talk about travel, make reservations at hotel, buy tickets
- understand and give instructions, directions, advice

Course Contents:
Module I: Emploi du Temps
Actes de Communication :
Demander et donner l'heure, des horaires, raconter sa journée, parler de ses habitudes au travail, de ses loisirs, dire la date, parler du temps qu'il fait, fixer rendez-vous (au téléphone par e-mail)

Module II: Voyage
Actes de Communication :
Faire des réservations –un billet de train, une chambre d'hôtel, régler la note, expliquer un itinéraire, parler de ses déplacements, exprimer un conseil, une interdiction, une obligation, acheter un billet de train, consulter un tableau d'horaires

Grammaire:
1. question avec à quelle heure ? adjectifs interrogatifs, démonstratifs
2. verbes pronominaux au présent
3. adverbes de fréquence, pourquoi... ? Parce que .../pour infinitif
4. expressions indiquant la date, le lundi, lundi prochain
5. verbes impersonnels, il faut+ infinitif, il est interdit de + infinitif
6. adjectifs possessifs (plusieurs possesseurs), adjectif tout
7. impératif affirmatif et négatif
8. les prépositions à et de : à et en + moyen de transport, en/au+pays, aller à/venir de
9. verbes pouvoir /devoir+infinitif,
10. verbes : dormir, venir, partir, questions avec d'où, où, par où, à quel, de quel

Examination Scheme:

Components	CT	V	Att.	EE
Weightage (%)	15	10	5	70

Text&References:
Text:
Le livre à suivre : Penfornis, Jean-Luc. Français.Com (Débutant). Paris: Clé International, 2007.

References:
Tauzin, Béatrice et Dubois Anne-Lyse. Objectif Express 1. Paris: Hachette, 2009.

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Syllabus - Semester Third

PROFESSIONAL FRENCH FOR BUSINESS-3
(FRANÇAIS PROFESSIONNEL ET DES AFFAIRES-3)

Course Code: LAN2361 **Credit Units: 03**

Course Objective:
To furnish linguistic tools

- to talk about work and problems related to work
- to perform simple communicative tasks (explaining a setback, asking for a postponement of appointment, give instructions, place orders, reserve)
- to acquaint themselves with the current social communication skills
- Oral (dialogue, telephone conversation)
- Written (e-mails, reply to messages)

Course Contents: Unité 5, 6: pp. 74 to 104
Module I: Déjeuner d'affaires
Actes de Communication :
Manger au restaurant, comprendre un menu, commander , engager une conversation téléphonique, parler de sa formation, de son expérience, de ses compétences, raconter des événements passés, consulter sa boîte e-mails, répondre aux messages

Module II: Problèmes
Actes de Communication :
Identifier un problème, demander des précisions, expliquer un contretemps, déplacer un rendez-vous, demander de l'aide (par téléphone, par e-mail), donner des instructions, expliquer un problème, suggérer une solution

Grammaire:
1. articles partitifs, un peu de, beaucoup de, une bouteille de, un morceau de…
2. futur proche, passé récent, verbes appeler, savoir et connaître (au présent)
3. passé composé avec avoir, affirmatif, négation et interrogatif
4. passé composé avec être, accord du participe passé
5. pronoms COD, COI, impératif et place du pronom et impératif des verbes pronominaux
6. négations (ne…rien, ne…personne, ne…plus, ne…pas encore, trop/pas assez,)
7. passé composé des verbes pronominaux
8. si/quand+présent, être en train de,
9. interrogations qu'est-ce que/ qu'est-ce qui/qui est-ce que/qui est-ce qui
10. verbe devoir au conditionnel présent

Examination Scheme:

Components	CT	V	Att.	EE
Weightage (%)	15	10	5	70

Text & References:
Text:
Le livre à suivre : Penfornis, Jean-Luc. Français.Com (Débutant). Paris: Clé International, 2007.

References:
Tauzin, Béatrice et Dubois Anne-Lyse. Objectif Express 1. Paris: Hachette, 2009.

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Syllabus - Semester Fourth

PROFESSIONAL FRENCH FOR BUSINESS-4
(FRANÇAIS PROFESSIONNEL ET DES AFFAIRES-4)

Course Code: LAN2461 **Credit Units: 03**

Course Objective:

- To strengthen the language of the students in both oral and written
- To provide the students with the linguistic tools
- to use the basic tenses – present, past and future
- to express emotion
- to accomplish simple tasks of day-to-day programmes
- to prepare a résumé and to appear for interviews

Course Contents: Unité 7: pp. 106 -120
Rédiger un résumé : Français.Com, Intermédiaire- p.98
Passer un entretien d'embauche : Français.Com, Intermédiaire – p.100

Module I: Tranches de vie
Actes de Communication :
Evoquer un souvenir, raconter dans le passé, rapporter des événements marquants d'une vie professionnelle, expliquer une situation de stress, donner son avis, faire des projets
Contenu grammatical : 1. formation de l'imparfait, emploi du passé composé et de l'imparfait
2. pronoms : y, chacun (/ chaque)
3. pronoms relatifs «qui, que, où » et mise en relief
4. pronom « en » de quantité
5. futur simple
6. indicateurs de temps : depuis, il y a, pendant, pour, en
7. propositions complétives : je pense que…, je crois que …

Module II: Faire le point
Actes de Communication : Rappel
Grammaire: Révision

Examination Scheme:

Components	CT	V	Att.	EE
Weightage (%)	15	10	5	70

Text & References:

Text:
Le livre à suivre : Penfornis, Jean-Luc. Français.Com (Débutant). Paris: Clé International, 2007.

References:
Tauzin, Béatrice et Dubois Anne-Lyse. Objectif Express 1. Paris: Hachette, 2009.

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Syllabus - Semester Fifth

INTRODUCTION TO FRENCH LITERATURE & SELECT SOCIO-CULTURAL ASPECTS OF FRANCE

(INTRODUCTION À LA LITTERATURE FRANÇAISE ET À CERTAINS ASPECTS SOCIOCULTURELS DE France)

Course Code: LAN2561 **Credit Units: 03**

Course Objective:
The student gets an insight into various literary genres through extracts of novels, plays, and poems of renowned French writers. They also get acquainted with select socio-cultural aspects of France.

Course Contents:

Module I: Théâtre
Le bourgeois gentilhomme – **Molière**
Le Cid – **Corneille**
Phèdre – **Racine**
En attendant Godot **– Samuel Beckett**

Module II: Roman / Récit
Madame Bovary – **Gustave Flaubert**
L'Etranger – **Albert Camus**

Module III: Poésie
Le Lac (Méditations) – **Alphonse Lamartine**
Vieille Chanson du Jeune Temps (Les Contemplations) – **Victor Hugo**
Correspondances – **Baudelaire**
Pour faire le portrait d'un oiseau – **Jacques Prévert**
Liberté **– Paul Elouard**

Module IV: Aspects socioculturels de France
Introduction à l'histoire contemporaine, le système politique, les institutions et la géographie, les pays francophones
Peinture, cinéma, sculpture, architecture, musique et gastronomie

Examination Scheme:

Components	CT	V	Att.	EE
Weightage (%)	15	10	5	70

Text & References:

- P.G. Castex, P. Surer, et G. Becker. Histoire de la Littérature Française. Paris: Hachette, 1974.
- Deshusses, Pierre, Léon Karlson et Paulette Thomander. Dix Siècles de Littérature Française. Paris: Collection Bordas, 1991.

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Syllabus - Semester Sixth

FRENCH THROUGH ACTIVITIES
(FRANÇAIS À TRAVERS DES ACTIVITÉS)

Course Code: LAN2661 **Credit Units: 03**

Course Objective:

- To introduce plays, songs, poems and films with the purpose of helping students to read, listen, write, speak and think in French spontaneously; learn the content and be able to find new meanings through analysis, evaluation, synthesis and application
- To launch students on their personal course of learning through training in activities like acting, reciting poems, appreciating cinematography and writing film reviews
- To empower them to develop skills independently and to develop critical/ creative thinking

Course Contents:

Module I: Le français à travers des chansons
Exercices de grammaire, de vocabulaire, de dictée, de phonétique tout en écoutant/ en apprenant à chanter des chansons françaises d'hier et d'aujourd'hui

Module II: Le français à travers des pièces de théâtre
Jeu de rôles, scènes de la vie quotidiennes
Monologues
Pièces de théâtre classiques ou modernes - extraits

Module III : Le français à travers des films
Langage cinématographique et petite grammaire du cinéma
Critique/ appréciation des films

Module IV: Le français à travers des contes/ des fables
Contes populaires et traditionnels français
Fables de Jean de la Fontaine

Examination Scheme:

Components	Class Test	Attd.	End Term*
Weightage (%)	25	5	70

*All evaluation will be activity based.

Text & References:

Material compiled by ASL

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GERMAN STUDIES

PREAMBLE

Amity University aims to achieve academic excellence by providing multi-faceted education to students. The University has designed a system that would provide rigorous academic programme with necessary skills to enable them to excel in their careers.

This booklet contains the Programme Structure, the Detailed Curriculum and the Scheme of Examination. The Programme Structure includes the courses (Value-added Course: FL- German and Minor track courses), arranged semester wise. The importance of each course is defined in terms of credits attached to it. The credit units attached to each course has been further defined in terms of contact hours i.e. Lecture Hours (L), Tutorial Hours (T), Practical Hours (P). Towards earning credits in terms of contact hours, 1 Lecture and 1 Tutorial per week are rated as 1 credit each and 2 Practical hours per week are rated as 1 credit. Thus, for example, an L-T-P structure of 3-0-0 will have 3 credits, 3-1-0 will have 4 credits, and 3-1-2 will have 5 credits.

The Curriculum and Scheme of Examination of each course includes the course objectives, course contents, scheme of examination and the list of text and references. The scheme of examination defines the various components of evaluation and the weightage attached to each component. The different codes used for the components of evaluation and the weightage attached to them are:

Components	Codes	Weightage (%)
Case Discussion/ Presentation/ Analysis	C	05 - 10
Home Assignment	H	05 - 10
Project	P	05 - 10
Seminar	S	05 - 10
Viva	V	05 - 10
Quiz	Q	05 - 10
Class Test	CT	10 - 15
Attendance	A	05
End Semester Examination	EE	70

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PROGRAMME OBJECTIVE

This programme is designed for the students who opt for German a Minor **in addition to taking German Foreign Language (Value-added Course).**

This programme aims at providing an understanding of the basics of German grammar and phonetics.

Students get sensitized towards different "Sprache Register" and are able to distinguish formal and informal language right from the beginning and use appropriate language while communicating in the professional and business world.

Through various listening and speaking exercises this course enables the students to quickly take position as a foreigner speaking German and establish contacts and communicate in oral and written language.

This programme also provides an insight into German literature. By furnishing information on select socio-cultural aspects of Germany, this programme creates a backdrop for a better understanding of the language and the people.

This programme focuses on developing all four language skills of reading, writing, listening and speaking. Through training in various activities it enhances the critical/ creative thinking and encourages the learners to think spontaneously in German.

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GERMAN STUDIES

Programme Structure

Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
LAN2162	Professional German for Business-1	2	1	-	3
LAN2262	Professional German for Business-2	2	1	-	3
LAN2362	Professional German for Business-3	2	1	-	3
LAN2462	Professional German for Business-4	2	1	-	3
LAN2562	Introduction to German Literature & Select Socio-Cultural aspects of Germany	2	1	-	3
LAN2662	German Through Activities	2	1	-	3
	TOTAL				**18**

Prerequisites:

- The student should have opted for German as FL
- In each semester the student should opt for the course offered without skipping any course. They are expected to follow the sequence. These courses cannot be opted for independently as OE in any semester.

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Syllabus - Semester First

PROFESSIONAL GERMAN FOR BUSINESS-1
(Deutsch-1)

Course Code: LAN2162 **Credit Units: 03**

Course Objective: The complete course provides a comprehensive operational capability in the workplace. The course presents a variety of scenarios from various professional fields and work areas regarding the daily work and give professional language and intercultural skills.

Course objective of this semester is to enable students speak on following topics.

i) How to pronounce names, address and the professions.
ii) To be acquainted with the people.
iii) To ask, how to reach your destination.
iv) To welcome the guests.
v) To ask/confirm/deny an appointment.
vi) To tell the time.

Course Contents: Kapitel 1, 2, 3- pp**. 9-50**
Inhalt: Kapitel 1: Erster Kontakt

i) GutenTag!
ii) Familie und Beruf.
iii) Die Gruppe Allianz.
iv) Karten,Ausweis,Scheine
v) Neue Kollegen

Kapitel 2:Besucher Kommen

i) Wiewar die Reise?
ii) Herzlich willkommen!
iii) Die Leutesind da!
iv) Wer sind die Leute?
v) Kate Carlosbeginntihr Praktikum.

Kapitel 3:Leute

i) MeineFamilie.
ii) Auf einem Seminar
iii) EineVerabredung.
iv) Freizeit und Hobbys.

KommunikationsAufgabe:

i) Eine andere Person und sich vorstellen.
ii) Über den Berufund die Familiesprechen.
iii) Über die Teilnehmer von einem Seminar sprechen.
iv) Visitenkarten und Ausweise lesen und verstehen.
v) Informationen zur Personen fragen.
vi) Über die Reisesprechen.
vii) Ein Programm planen.
viii) Um eineFührung/Informationsmaterial bitten.
ix) ÜberAufgaben und Termine sprechen.
x) EinPraktikumsplan besprechen.

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xi) Einen Praktikumsp an machen.
xii) Verwandtschaft bezeichnung ernennen.
xiii) Personen beschreiben.
xiv)Sich verabreden.
xv) E-Mails lesen.
xvi)Über die Freizeit und seine Hobbys sprechen.

Grammatik Inhalt:

i) Verben in Präsens(ich,er/sie/Sie)
ii) Possesivartikel:mein,sein/ihr
iii) Adverben(und,aber,oder,auch,schon,erst,noch)
iv) Präsens/Präteritum:haben und ein.
v) Zeitangaben:Wann/Wie lange?
vi) Negation:nicht/kein
vii) Verben mit Vokaländerung:e→i(e)

Examination Scheme

Component Codes	CT	V	Att.	EE
Weightage (%)	15	10	5	70

Text & References:

Becker, Braunert et al. *UnternehmenDeutsch*.**Stuttgart: ErnstKlettSprachen, 2011.**

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Syllabus - Semester Second

PROFESSIONAL GERMAN FOR BUSINESS-2
(Deutsch-2)

Course Code: LAN2262 **Credit Units: 03**

Course Objective: To enable students speak on following topics.

i) To advise and to choose.
ii) To book and to reserve.
iii) To describe the route.
iv) To describe any organisation.
v) To organise the work.
vi) To compare things/persons/equipments.

Course Contents: Kapitel 4, 5, 6- pp. 51-92

Kapitel 4:Bedarf,Bestellung,kauf

i) Wir brauchen einen Drucker
ii) Ich möchte einen Wagenmieten.
iii) Das Angebot.
iv) Im Tagunshotel.'
v) Die Dienstreise.

Kapitel 5:ImBüro and Unterwegs.

i) Das Praktikanten büro.
ii) Entschuldigung,wie kommeIch von hier zum….?
iii) Und was machen wir mit….?
iv) Unterwegs zur Firma Rohla.
v) Vor der Messe.

Kapitel 6:Namen,Zahlen,Daten,Fakten

i) Das Mercedes-Benz Kundencenter Bremen.
ii) Chrono.data GmbH& Co. KG
iii) Die Arbeitsorganisation in der Rückware.
iv) Drucker und Regale.
v) Was für einTypbinich?

Kommunikationsaufgabe:

i) Wünsche ausdrücken.
ii) Waren vergleichen.
iii) Beraten,auswählen.
iv) Bestellen,buchen ,reservieren.
v) Kleidungsstücke auswählen.
vi) Fahrpläne verstehen.
vii) Den Wegbeschreiben.

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Grammatik Inhalt:

i) haben,brauchen
ii) unbestimmterArtikel ein-/Negation kein
iii) Ich hätte möchte/würde gern
iv) Imperativ mit Sie und du
v) Personalpronomen:Akkusativ
vi) Wo für/für wen?

Examination Scheme

Component Codes	**CT**	**V**	**Att.**	**EE.**
Weightage (%)	15	10	5	70

Text & References:

Becker, Braunert et al. *UnternehmenDeutsch*.**Stuttgart: Ernst KlettSprachen, 2011.**

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Syllabus - Semester Third

PROFESSIONAL GERMAN FOR BUSINESS-3
(Deutsch-3)

Course Code: LAN2362 **Credit Units: 03**

Course Objective:

To get the students acquainted with the current business communication skills in oral and written.

i) To read job advertisement and then to evaluate it.
ii) To call up someone.
iii) To plan an appointment.
iv) To inform and to justify the change of appointment.
v) To distribute, to accept and to refuse the assignment.
vi) To plan a business trip.

Course Contents: Kapitel 7 & 8- pp. 93-106

Inhalt:Kapitel7 :Aufstellensuchen

i) Versicherungen
ii) Welche Stellepasst?
iii) Das Home-Office von Frau Hörbiger
iv) DreiVersicherungen, drei Länder
v) Zwei Städte

Kapitel8: Tagesplan,Wochenplan

i) Aufgaben über Aufgaben
ii) Herr Sommer,Sie sollen…..
iii) Reise planung
iv) Viel zu tun
v) EinVerrükter Tag-nichts hat geklappt!

Kommunikationsaufgabe:

i) Versicherungen vergleichen
ii) Stellenanzeigen lesen und vergleichen
iii) Stellenanzeigen bewerten
iv) Ein Home-Office einrichten
v) Telefonieren
vi) Über Vesicherungen sprechen und vergleichen

Grammatik Inhalt:

i) Steigerung:Komperativ,Superlativ
ii) Indefinit Pronomen
iii) Adjektivdeklination mit dem bestimmten Artikel.
iv) Komparativ und Superatliv als Attribut.
v) Modalverb:sollen
vi) Nebensatz mit weil

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vii) Präsens und präteritum der Modalverben:
wollen,müssen,können,dürfen,sollen

Examination Scheme

Component Codes	CT	V	Att.	EE.
Weightage (%)	15	10	5	70

Text & References:

Becker, Braunert et al. *UnternehmenDeutsch*.**Stuttgart: Ernst KlettSprachen, 2011.**

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Syllabus - Semester Fourth

PROFESSIONAL GERMAN FOR BUSINESS-4
(Deutsch-4)

Course Code: LAN2462 **Credit Units: 03**

Course Objective:

To strengthen both oral and written language of students **.**To fine tune the grammar in application, to use modalverbs/ genitivecase.

i) To comprehend the instructions.
ii) To use the equipment and to work with program.
iii) To speak about disturbances and their causes.
iv) To complain about errors, defects and damages.
v) To find the solutions of problems.
vi) To explain the colleague his/her task.
vii) To write an invitation.

Course Contents: Kapitel, 9 &10- pp. 121-148
Inhalt Unit 9: Sechs Freunde

i) Einweisung für Frau Carlson
ii) Was ist da passiert?
iii) Hilfe,der Computer spinnt!
iv) Störungen beseitigen,Defekte und Schäden beheben
v) Reparatur oder Neukauf?

Unit 10:

i) Willkommen bei uns!
ii) Kleine Feiern
iii) Ach,das ist interessant
iv) Die Verabschiedung

Kommunikationsaufgabe:

i) Anweisungen verstehen
ii) Geräte bedienen,mit Programmen arbeiten.
iii) Über Störungen,Beschädigungen,Defekte sprechen
iv) Über Störungen und ihreUrsachen sprechen.
v) Störungen,Defekte beheben.
vi) Störungen reklamieren und Problem lösungen finden.
vii) Einen Mitarbeiter und seine Aufgabe vorstellen.

Grammatik Inhalt:

i) (Verbal-) Adjective
ii) Nebensatz mit dass
iii) Ursache und Folge:weil/deshalb
iv) Verb:werden im Präsens
v) Esist…/es wird

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Examination Scheme

Component Codes	CT	V	Att.	EE.
Weightage (%)	15	10	5	70

Text & References:

Becker, Braunert et al. *UnternehmenDeutsch*. Stuttgart: Ernst KlettSprachen, 2011.

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Syllabus - Semester Fifth

INTRODUCTION TO THE GERMAN LITERATURE AND SOCIO CULTURALASPECTS OF GERMANY
(Einführung in die Literatur und der sozio-kulturelle Aspekt Deutschlands Deutsch-5)

Course Code: LAN2562 **Credit Units: 03**

Course Objective:
To introduce the students to various literary genres through extracts of novels, plays, and poems of renowned German writers. They also get acquainted with select socio-cultural aspects of Germany.

Course Contents:

Module I: Einführung des soziokulturellenAspektDeutschlands

Einführung in die Zeitgeschichte das politische System,Institutionen und Geographie,deutschsprachige Ländern . Malerei,Film,Skulptur, Architektur, Musik und Gastronomie .

Module II: Gedichte:

1. Die Teilung der Erde-Friedrich Schiller
2. Willkommen und Abschied- Johann Wolfgang von Goethe
3. Anmeine Mutter – Heinrich Heine

Module III: Kurze Geschichte:

1. Das Brot:Wolfgang Borchert.
2. Die Küchenuhr : Wolfgang Borchert
3. Popp und Mingel : Marie LuiseKaschnitz
4. Aschenputtel: Grimm Bruder
5. Der Froschkönig: Grimm Bruder

Examination Scheme

Component Codes	CT	V	Att.	EE.
Weightage (%)	15	10	5	70

Text & References:

AlloAllkemper, Norbert Otto Eke.*Eine Einführung in die Literaturwissenschaft***. Stuttgart:Wilhelm Fink Gmbh&Co. Verlag-KG ,2004**

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Syllabus - Semester Sixth

GERMAN THROUGH ACTIVITIES
(Deutsch durch Aktivitäten Deutsch-6)

Course Code: LAN2662 **Credit Units: 03**

Course Objective:
To introduce plays, songs, poems and films with the purpose of helping students to read, listen, write, speak and think in Germanspontaneously; learn the content and be able to find new meanings through analysis, evaluation, synthesis and application.
To launch students on their personal course of learning through training in activities like acting, reciting poems, appreciating cinematography and writing film reviews.
To empower them to develop skills independently and to develop critical/ creative thinking.

Course Content:

Module I: DeutschdurchAktivitäten:
Rollenspiel- Szenen des täglichen Lebens ,Monologe .Das klassische und modern Spiele - Auszüge

Module II: Deutschdurch Lieder
Grammatik, Wortschatz, Diktat, Phonetik , Lernen durch Hören, deutsche Lieder von gestern und heute.

Module III: Deutschdurch die Filme.
Kurz FilmSprache und Grammatik des Films
Kritiker / Filme

Module IV:Deutschund das typische deusche Essen.
Beliebte und traditionelle deutsche Gerichte,.Rezepte für Gerichte und Lebensmittel Wortschatz.

Examination Scheme

Component Codes	CT	Att.	EE.*
Weightage (%)	25	5	70

Text & References:
Material compiled by ASL

*All evaluation will be activity based.

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SPANISH STUDIES

PREAMBLE

Amity University aims to achieve academic excellence by providing multi-faceted education to students.The University has designed a system that would provide rigorous academic programme with necessary skills to enable them to excel in their careers.

This booklet contains the Programme Structure, the Detailed Curriculum and the Scheme of Examination. The Programme Structure includes the courses (Value-added Course: FL- Spanish and Minor track courses), arranged semester wise. The importance of each course is defined in terms of credits attached to it. The credit units attached to each course has been further defined in terms of contact hours i.e. Lecture Hours (L), Tutorial Hours (T), Practical Hours (P). Towards earning credits in terms of contact hours, 1 Lecture and 1 Tutorial per week are rated as 1 credit each and 2 Practical hours per week are rated as 1 credit. Thus, for example, an L-T-P structure of 3-0-0 will have 3 credits, 3-1-0 will have 4 credits, and 3-1-2 will have 5 credits.

The Curriculum and Scheme of Examination of each course includes the course objectives, course contents, scheme of examination and the list of text and references. The scheme of examination defines the various components of evaluation and the weightage attached to each component. The different codes used for the components of evaluation and the weightage attached to them are:

Components	Codes	Weightage (%)
Case Discussion/ Presentation/ Analysis	C	05 - 10
Home Assignment	H	05 - 10
Project	P	05 - 10
Seminar	S	05 - 10
Viva	V	05 - 10
Quiz	Q	05 - 10
Class Test	CT	10 - 15
Attendance	A	05
End Semester Examination	EE	70

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PROGRAMME OBJECTIVE

This programme is designed for the students who opt for Spanish as a Minor **in addition to taking Spanish as Foreign Language (Value-added Course).**

This programme aims at providing an understanding of the basics of Spanish grammar and phonetics.

Students get sensitized towards different "registros de lengua" and are able to distinguish formal and informal language right from the beginning and use appropriate language while communicating in the professional and business world.

Through various listening and speaking exercises this course enables the students to quickly take position as a foreigner speaking Spanish and establish contacts and communicate in oral and written language.

This programme also provides an insight into Spanish literature. By furnishing information on select socio-cultural aspects of Spain, this programme creates a backdrop for a better understanding of the language and the people.

This programme focuses on developing all four language skills of reading, writing, listening and speaking. Through training in various activities it enhances the critical/ creative thinking and encourages the learners to think spontaneously in Spanish.

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SPANISH STUDIES

Programme Structure

Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits (18)
LAN2163	*EFE Professional Spanish for Business-I	2	1	-	3
LAN2263	EFE Professional Spanish for Business-II	2	1	-	3
LAN2363	EFE Professional Spanish for Business-III	2	1	-	3
LAN2463	EFE Professional Spanish for Business-IV	2	1	-	3
LAN2563	Introduction to Spanish Literature & Select Socio-Cultural aspects of Spain	2	1	-	3
LAN2663	Spanish Through Activities	2	1	-	3
	TOTAL				**18**

*EFE- Español para Fines Específicos (Spanish for specific purposes)

Prerequisites:

1. The student should have opted for Spanish as FL
2. In each semester the student should opt for the course offered without skipping any course. They are expected to follow the sequence. These courses cannot be opted for independently as OE in any semester.

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Syllabus - Semester First

EFE PROFESSIONAL SPANISH FOR BUSINESS-I

(Español I)

Course Code: LAN2163 **Credit Units: 03**

Course Objective:
To familiarize the students with the Spanish language with its phonetic system, its accents
To enable them

i) To greet and introduce themselves
ii) To furnish basic information/ fill in forms
iii) To identify things and talk about things

This course will help them in building their foundation in four language skills which is reading, writing, listening and speaking.

Course Contents: Unidad 1, 2, 3- pp**. 10-36**, Números del 0 al 1000

Contenido léxico: Unidad 1: En clase de Español

i) Adjetivos de nacionalidad
ii) Nombres de paises

Unidad 2: Datos Personales

i) Nombres propios, profesiones, estudios y lugares de trabajo
ii) Abreviaturas de direcciones

Unidad 3: El mundo de la empresa

i) Tipo de empresa, actividades,etc.

Tarea Comunicativa :

i) Preguntar a si mismo o una persona
ii) Presentar las cosas y compañía
iii) Expresar una opinión(a mi juicio, en mi opinión, me parece que, opino que etc)
iv) Pedir y dar información sobre empresas
v) Expresar cierta inseguridad o duda ante una información.
vi) Expresar acuerdo o desacuerdo ante una propuesta.

Contenido Gramatical:

i) El alfabeto español
ii) El Presente de Indicativo del verbo ser y llamarse
iii) Los demostrativos: este esta,estos,estas,esto
iv) El Presente de los verbos regulares e irregulares.
v) Preguntar con qué, el pronombre relativo que
vi) La preposición en + lugar, el número de los sustantivos
vii) Los posesivos:mi,tu,su,nuestro/a/os/as
viii) El articulo indefinido plural (unos/unas)
ix) Ser + descripción de una empresa, estar en + lugar

Examination Scheme

Component Codes	Class Test	Viva	Attd.	End Term
Weightage (%)	15	10	5	70

Text & References:

El Libro para seguir: González, Marisa et al. *Socios 1Libro del alumno*. Barcelona: Difusión, 2007.

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Syllabus - Semester Second

EFE PROFESSIONAL SPANISH FOR BUSINESS-II

(Español II)

Course Code: LAN2263 **Credit Units: 03**

Course Objective: To enable students

i) To talk about places and location, time schedule, weather
ii) To express preferences, needs
iii) To perform simple communicative tasks like placing orders, making inquiries and giving/ asking for directions.
iv) To familiarize the students with verbs, conjugation of verbs in present tense.

Course Contents: Unidad 4, 5, 6- pp. 36-56

Contenido Lexico: Unidad 4: Le Presento al director general

i) Adjetivos de carácter
ii) Cargos y departamentos
iii) Relaciones de parentesco

Unidad 5: De gestiones

i) Establecimientos y servicio
ii) Objetos de oficina

Unidad: 6: Lugares para trabajar, l**ugares para vivir**

i) Características de un piso
ii) Objetos de oficina
iii) Instalaciones y servicios de un hotel

Tarea Comunicativa :

i) Hablar del cargo de alguien.
ii) Pedir y dar la hora
iii) Hablar del horario de un establecimiento y la dirección.
iv) Preguntar por el precio y cantidades de las cosas en el mercado–adjetivos como bueno, malo, caro, barato etc.

Contenido Gramatical:

i) El Presente de Indicativo del verbo estar, el género y el número de los adjetivos, muy, bastante, un poco +adjetivo
ii) La negación, articulo, definidos (el, la, los, las), preguntas con qué, dónde, de dónde y cómo, preposiciones y locuciones de lugar: en, entre, cerca de.
iii) La forma impersonal hay, la diferencia entre estar y hay
iv) El Presente de Indicativo de los verbos irregulares con cambio vocálico: o>ue(poder) e>ie(cerrar)
v) Tener que+Infinitivo, verbo preferir y querer, contraste entre ser y estar, verbo gustar
vi) La concordancia del adjetivo, el presente de indicativo de preferir y querer.
vii) Contraste entre ser y estar, los cuantificadores del adjetivo.
viii) La comparación: más /menos+adjetivo+que, más /menos+sustantivo+que.
ix) El superlative:el/la/los/las, más /menos+adjetivo+que

Examination Scheme

Component Codes	Class Test	Viva	Attd.	End Term
Weightage (%)	15	10	5	70

El Libro para seguir: González, Marisa et al. *Socios 1Libro del alumno*. Barcelona: Difusión, 2007.

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Syllabus - Semester Third

EFE PROFESSIONAL SPANISH FOR BUSINESS-III

(Español III)

Course Code: LAN2363 **Credit Units: 03**

Course Objective:

To get the students acquainted with the current social communication skills in oral and written

To furnish linguistic tools

i) To take an appointment
ii) To enquire and give information about different cities of Spain
iii) To talk about work habits and preferences (verbs like to want/ prefer)
iv) To present Spanish companies

Course Contents: Unidad 7, 8- pp. 66-76

Contenido léxico:Unidad 7 Agenda de trabajo

i) Actividades cotidianas
ii) Las partes del día
iii) Los días de la semana
iv) Proponer y concertar una cita
v) Rechazar una propuesta , justificarse , plantear una alternativa , expresar consejo
vi) Curriculum vitae

Unidad 8: Citas y reuniones

i) Hábitos alimentarios
ii) Platos típicos
iii) Los ingredientes de un plato.

Tarea Comunicativa: i) Hablar de acciones habituales y del horario.

i) Expresar gustos y preferencias de trabajo
ii) Proponer y rechazar una cita a compañeros del trabajo o invitar a unos clientes.
iii) Conversación entre un camarero y dos clientes.
iv) Expresar obligación y consejo
v) Enfrentar la entrevista de trabajo: presentar a si mismo, estudios, practicas, experiencia profesional, preparación para entrevista, simulación de entrevista.

Contenido Gramatical:

i) El presente de indicativo de empezar, querer, preferir, poder, dormir, salir etc
ii) Con+ pronombres personales:conmigo,contigo
iii) Marcadores de frecuencia y secuencia; siempre, casi siempre, a veces, nunca y primero, después, luego
iv) La construcción es que…
v) Tener que + Infinitivo
vi) Por la mañana/tarde/noche, a/al mediodía
vii) El verbo gustar, los pronombres de Objeto Indirecto, las fechas
viii) A mí también /tampoco, a mí, sí/no
ix) Expresiones para invitar y proponer algo

Examination Scheme

Component Codes	Class Test	Viva	Attd.	End Term
Weightage (%)	15	10	5	70

Text & References: El Libro para seguir: González, Marisa et al. *Socios 1Libro del alumno*. Barcelona: Difusión, 2007.

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Syllabus - Semester Fourth

EFE PROFESSIONAL SPANISH FOR BUSINESS-IV

(Español IV)

Course Code: LAN2463 **Credit Units: 03**

Course Objective:

To strengthen the language of the students in both oral and written**.** To fine tune the grammar in application, to use present, present continuous tenses**.** To provide the students with the know-how

i) To express emotion
ii) To talk about experiences
iii) To talk about the qualities and defects of people

Course Contents: Unidad 9, 10- pp. 86-96

Contenido Léxico Unidad 9: Productos y proyectos

i) Colores, materiales, tamaño de los productos.
ii) Estaciones del año.

Unidad 10: Claves del éxito

i) Las claves para tener éxito en una empresa de nueva creación.
ii) Acuerdo y desacuerdo.
iii) Balances y resultados de una empresa
iv) Calidades en una persona para sacar buen trabajo.

Tarea Comunicativa:

i) Describir los productos: material, color, función, precio.
ii) Expresar planes y experiencias.
iii) Hablar de los proyectos de empresa y como les gusta trabajar.
iv) Expresar una hipótesis: imagina que están haciendo sus compañeros de trabajo.
v) Habla de las prioridades en un trabajo.
vi) Cosas positivas y negativas para una empresa.

Contenido Grammatical:

i) Estar+Gerundio, ir a +Infinitivo
ii) Pronombres de Objeto Directo:lo,la,los,las
iii) Más/menos/igual de/adjetivo + que , tan + adjetivo + como
iv) Verbos+mas/menos/igual/lo mismo + que, mas/menos+sustantivo+como
v) El/la/los/las mismo/a/os/as+sustantivo+que
vi) Marcadores temporales de futuro :el/la próximo/a, dentro de..etc.
vii) La preposición en como marcador temporal
viii) Es de + material, sirve para+ función
ix) Seguro que, me imagino que, a lo mejor, quizá
x) El pretérito perfecto, participios regulares e irregulares, marcadores con pretérito perfecto: hoy, este mes, alguna vez, nunca, etc., ya todavía no.
xi) Formulas para valorar hechos pasados: muy bien, regular, fatal, etc
xii) Conectores: debido a, porque, por eso, pero, sin embargo, etc.
xiii) Lo más/ menos importante es...

Examination Scheme

Component Codes	Class Test	Viva	Attd.	End Term
Weightage (%)	15	10	5	70

Text & References:

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Syllabus - Semester Fifth

INTRODUCTION TO SPANISH LITERATURE & SELECT SOCIO-CULTURAL ASPECTS OF SPAIN

(Introducción a la literatura y el aspecto socio cultural de España, Español V)

Course Code: LAN2563 **Credit Units: 03**

Course Objective:
To introduce the students to various literary genres through extracts of novels, plays, and poems of renowned Spanish writers. They also get acquainted with select socio-cultural aspects of Spain.

Course Contents:
Module I: Introducción al aspecto socio cultural de España

Introducción a la historia contemporánea, el sistema de la política, las instituciones y la geografía, los países de habla hispana. Pintura, cine, escultura, arquitectura, música y gastronomía.

Module II: Teatro

Autos de los Reyes Magos **- Ramón Menéndez Pidal**
Vida es Sueños- **Calderón de la Barca**
El Tragaluz – **Antonio Buero Vallejo**

Module III: Novela e Historia

La Celestina- **Fernando de Rojas**
Lazarillo de Tormes- **Anónimo**
El Conde Lucanor- **Don Juan Manuel**
Vuelve Usted Mañana- **Mariano José de Larra**

Module IV: Poesía

Yo soy un hombre sincero – **José Martí**
La Paloma– **Rafael Alberti**
Nanas de Cebolla– **Miguel Hernández**

Examination Scheme

Component Codes	Class Test	Viva	Attd.	End Term
Weightage (%)	15	10	5	70

Text & References:
El Libro para seguir: Quesada, Sebastián et al. *Imágenes de España.* Madrid : Edelsa, 2001. 2007.

Libros para referencia: Don Juan Manuel, El Conde Lucanor. Letras Hispanicas : Catedra; 22 edition (January 1, 2006) (Book 53)

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Syllabus - Semester Sixth

SPANISH THROUGH ACTIVITIES
(Español a través de las actividades, Español VI)

Course Code: LAN2663 **Credit Units: 03**

Course Objective:
To introduce plays, songs, poems and films with the purpose of helping students to read, listen, write, speak and think in Spanish spontaneously; learn the content and be able to find new meanings through analysis, evaluation, synthesis and application
To launch students on their personal course of learning through training in activities like acting, reciting poems, appreciating cinematography and writing film reviews
To empower them to develop skills independently and to develop critical/ creative thinking

Course Contents:
Module I: Español a través del teatro

Escenas de juego de roles de la vida cotidiana, monólogos.
Reproduce clásico y moderno - Extractos

Module II: Español a través de canciones

Ejercicios de gramática, vocabulario, dictados, fonética mientras escuchar / aprender a cantar canciones españolas de ayer y de hoy.

Module III: Español a través de las películas

Lenguaje cinematográfico y poca gramática del cine
Críticos / películas
Module IV: Español a través de la comida

Platos populares y tradicionales españoles. Recetas de platos y vocabulario de comida.

Examination Scheme

Component Codes	Class Test	Attd.	End Term*
Weightage (%)	25	5	70

*All evaluation will be activity based.

Text & References:

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QUEBEC STUDIES

Programme Structure-2018

Course Code	Course Title	Lecture (L) Hours /Week	Tutorial (T) Hours /Week	Total Credits
LAN2164	Introduction to the French North America- a short history of Quebec	3	-	3
LAN2264	Quebec Society Culture and Language	3	-	3
LAN2364	Quebec in the World Affairs	3	-	3
LAN2464	Political Economy of Quebec	3	-	3
LAN2564	Introduction to Major Literary Movements in Quebec-I	3	-	3
LAN2664	Introduction to Major Literary Movements in Quebec-II	3	-	3
	TOTAL			**18**

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QUEBEC STUDIES

The course will be open to all the undergraduate students of AUG, especially students pursuing B.A (H) French and students learning French as FL.

Description of the Course

The **Introduction to Study of Quebec** attempts to study a society that is overwhelmingly majority francophone in an anglophone American sphere. This course will do a survey of geographical, historical, demographical, cultural, political and social developments in Québec, from the French conquest to the present. The course is intended to provide students with a broad understanding of the narrative of Quebec history and to improve their knowledge of many important issues that have defined and continue to define and redefine Quebec, including the North American Free Trade Agreement, the evolution of the Canadian constitutional debate, the reform of social programs, provincial linguistic policies, native issues, regional differences and relations between the anglophone, allophone and francophone communities (the Ottawa-Paris-Quebec triangle).

Organization of the Course

The weekly lectures (3hrs per week), learning responses, videos, clips, forum, and the weekly mandatory readings are an integral part of this course. It will also include workshop by faculty from Quebec. Movie screening and other cultural exposure will be organized in collaboration with Quebec Bureau Mumbai. The course will be spread up to two semesters.

Who can attend?

Open to all the undergraduate student of AUG. Students learning French (B.A Hons./ FL) will have additional benefit.

Why to attend?

- Quebec government has special provision of fees waiver for Indian students. The knowledge of Quebec society, its institution and education system will help students to better explore higher education opportunity and work possibility in Quebec as the knowledge of this course will add to the extra immigration point (like the knowledge of French)**.**

- Knowing about the business prospects in Quebec will help students who wants to set up their own business or expand their reach to American continent. Quebec can be helpful to penetrate US market also as they do share lot of commonalities in business culture.

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QUEBEC STUDIES

Syllabus - Semester First

INTRODUCTION TO THE FRENCH NORTH AMERICA – A SHORT HISTORY OF QUEBEC

Course Code: LAN2164 **Credit Units: 03**

PERIODS IN THE HISTORY OF QUÉBEC: SOCIAL PHENOMENA

- Origins till colonization : The experience of the Indigenous peoples and the colonization attempts
- French conquest: The evolution of colonial society under French rule
- The change of empire and British North America Act

Syllabus - Semester Second

QUEBEC SOCIETY, CULTURE AND LANGUAGE

Course Code: LAN2264 **Credit Units: 03**

Quebec society, culture and language

- Period of Grande Noirceur/Great Darkness
- Quiet Revolution: The modernization of Québec. Official Language Act
- Contemporary Quebec: culture, arts and cinema

Syllabus - Semester Third

QUEBEC IN THE WORLD AFFAIRS

Course Code: LAN2364 **Credit Units: 03**

Quebec in the world affairs

- *Vive le Québec libre*: Evolution of international relations of Québec.
- The province as global player: Québec and *la Francophonie*
- Quebec-Paris-Ottawa triangle; presence of France in Quebec
- Ottawa-Quebec-Washington: presence of Quebec in United States

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Syllabus - Semester Fourth

POLITICAL ECONOMY OF QUEBEC

Course Code: LAN2464 **Credit Units: 03**

Political economy of Quebec

- Politics of social and economic development in Quebec
- Legal tradition, national identity and Quebec Exceptionalism
- business culture of Quebec
- Quebec vs Canadian business culture

Syllabus - Semester Fifth

INTRODUCTION TO MAJOR LITERARY MOVEMENTS IN QUEBEC-I

Course Code: LAN2564 **Credit Units: 03**

Introduction to major literary movements in Quebec- I

- Evolution of French language
- Early literature, 1830–60
- The literary movement of 1860
- The Montreal School, 1895–1935

Syllabus - Semester Sixth

INTRODUCTION TO MAJOR LITERARY MOVEMENTS IN QUEBEC-II

Course Code: LAN2664 **Credit Units: 03**

Introduction to major literary movements in Quebec-II

- World War II and the postwar period, 1935–60
- The "Quiet Revolution"
- The Quiet Revolution of French Canadian minorities
- Contemporary trends
- The cosmopolitan culture of French Canada and Quebec

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

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References: Material compiled by the department

Text book:

- Rudy, Jarrett, et al. *Quebec questions: Quebec studies for the twenty-first century*. Oxford University Press, 2010.
- Dickinson, John A., and Brian Young. *A short history of Quebec*. McGill-Queen's Press-MQUP, 2008.

Audio-visual:

- Viewing of feature film “Mon Oncle Antoine”
- Viewing of documentary film “Québec My Country Mon Pays”
- Viewing of documentary short “ The Oka Legacy ”

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KOREAN STUDIES

Programme Structure-2018

Course Code	Course Title	Lecture (L) Hours /Week	Tutorial (T) Hours /Week	Total Credits
LAN2165	Introduction to Korean History & Geography	3	-	3
LAN2265	Korean Cultural Perspectives	3	-	3
LAN2365	Modern History of Korea & Introduction to Korean Language	3	-	3
LAN2465	Contemporary Korea	3	-	3
LAN2565	Polity and Economy of Korea	3	-	3
LAN2665	Themes in Korean Literature	3	-	3
	TOTAL			**18**

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KOREAN STUDIES

Course Objective:

The course is designed to give a broad geographical, historical, cultural and social background of Korea. This will give the students an insight into the major events- historical, political and cultural- of Korean society extending from pre-history era till date. This course explores how today's Korea came into existence and what role does it play in world, especially in East Asia. The course will highlight the various cultural aspects also like Korean festival, cuisine, cinema, music and theatre.

Besides this, the course brings out the various phases of contemporary Korea dealing with colonial legacy, anti-colonial movements, social, political and economic agenda; liberation and division; emerging political, economic and administrative structures; Korean war and aftermath; pace, pattern and processes of socio-economic transformation in the peninsula, Government (s) and politics in the peninsula etc. Exercises also involve practical analysis of material and articles dealing with current issues related to Korea. Texts related to economic, social, and political issues of contemporary Korea are read, analysed and discussed. Besides written examination, grading will also be based on active class discussion and participation.

Besides this, the students are also given introductory lectures on Korea's relations with its neighbours like China, Russia and Japan and also with important strategic partners like USA and India.

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KOREAN STUDIES

Syllabus - Semester First

INTRODUCTION TO KOREAN HISTORY AND GEOGRAPHY

Course Code: LAN2165 **Credit Units: 03**

History

- Prehistory and Gojoseon
- Proto–Three Kingdoms
- Three Kingdoms
- North-South States Period
- Goryeo dynasty
- Joseon dynasty
- Korean Empire

Geography

- Location
- Area
- Demography
- Rivers
- Mountains

Syllabus - Semester Second

KOREAN CULTURAL PERSPECTIVES

Course Code: LAN2265 **Credit Units: 03**

Culture

- Attire
- Gastronomy
- Monuments
- Dance/song
- Society
- Loisir

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Syllabus - Semester Third

MODERN HISTORY OF KOREA AND INTRODUCTION TO KOREAN LANGUAGE

Course Code: LAN2365 **Credit Units: 03**

History

- Japanese occupation and Japan-Korea Annexation
- Division
- Korean War

Language

- Introduction to the history of Korean language
- Introduction to the writing system
- Basic Korean expressions and day to day situations

Syllabus - Semester Fourth

CONTEMPORARY KOREA

Course Code: LAN2465 **Credit Units: 03**

Korea in International affairs

- Indo-Korea relations
- R.O.K- US relations
- R.O.K- China relations
- R.O.K- Japan relations
- R.O.K- Russia relations
- R.O.K- D.P.R.K relations

Geography

- Strategic benefits and disadvantages

Syllabus - Semester Fifth

POLITY AND ECONOMY OF KOREA

Course Code: LAN2565 **Credit Units: 03**

Politics

- National government
- Political parties and elections
- Latest elections
- Political pressure groups and leaders
    - Administrative divisions
    - International organization participation

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Business Korean

- The miracle on Han
- Chaebol
- Leading Business Houses
- Business culture

Syllabus - Semester Sixth

THEMES IN KOREAN LITERATURE

Course Code: LAN2665 **Credit Units: 03**

Themes in Korean Literature

- History of Korean literature
- Oral literature
- Modern day Korean literature
- Korean literature abroad

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- Extracts from various Handbooks including 'Facts About Korea', tourism booklets, books on Korean culture and heritage, Korean culture related websites etc.
- History of Korea by Han Woo Keun
- New History of Korea by Lee Ki- Baek
- Shin Young-Ha, Social history of Korea
- Shin, Gyegyun. 1999. Korean Life. Seoul: Korean Textbook Co.
- Korean Culture & Information Service. 1995. Guide to Korean Culture. Seoul: KCIS.
- A Text Book of Korean Culture by Vyjayanti Raghavan, J.M. Kim & Ravikesh, New Delhi: Manak Publishers
- Academy of Korean Studies. 2005. Exploring Korean History through World Heritage. Seoul: AKS.
- Shin, Gyegyun. 1999. Korean Life. Seoul: Korean Textbook Co.
- Korean Culture & Information Service. 1995. Guide to Korean Culture. Seoul: KCIS.
- 30 Years of Diplomatic Relations between India and Korea, Embassy of R.O.K
- Recent News Articles and internet sources
- Articles from Korean Newspapers and Journals
- Facts About Korea
- Excerpts from Political analysts

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Curriculum & Scheme of Examination

2023

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COMPUTER APPLICATIONS

Course Code: FST2103 **Credit Units: 02**

Course Objective:
This course introduces students with computer and its importance in the present world. Fundamentals of computers are learnt through lectures and practical assignments. Different applications of computers are used to make them skilled.

Course Content:

Module I : Overview of the working of a computer

Basic concepts in stored program execution, Input, output, storage devices, RAMS, ROM etc.

Module II : History of computers and it emergence

Module III : Working knowledge of Microsoft Word & Excel

Module III : **Working knowledge of PowerPoint and learn making presentation in PPT**

Examination Scheme:

Components	A	H	CT	EE
Weightage (%)	05	10	15	70

(**A-**Attendance**; H** -Home Assignment**; CT-**Class Test**; EE-**End Semester Examination)

Text & References:
Text:

- Winifred Aldrich, CAD in Clothing and Textiles

References:

- Triedman and Cullan , Colour Graphic
- B.B. Publications Introduction to Computers

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PATTERN MAKING & DRAFTING-II

Course Code: FST2202 **Credit Units: 02**

Course Objective: This part of pattern making course enables to Develop an about the details of construction and understanding the patterns of kids wear and it's variation. This course gives the full knowledge of different type of collars and sleeves.

Course Content:

Module I: Collars
Drafting and adaptation of various collars - Peter Pan Collar – Flat and raised, Cape collar, Sailor's collar, Convertible collar, Mandarin collar

Module II: Sleeves
Drafting of different type of Sleeves –Plain sleeve, puff gathered top and bottom, bell sleeve, bishop sleeve, Cap sleeve. Flared Sleeve, Magyar Sleeve Balloon Sleeve, Petal Sleeve, Leg-o- mutton sleeve**,** Kimono& Raglan

Module III: Petticoat
Drafting of petticoat – A- Line, Straight, 6 panels

Module IV: Project
Kids wear Project- To develop an understanding of the fashion design process along with kids wear segments. Developing a design brief and a range of kids wear for different age groups.

Submission of Practical Work records (Compulsory)

Course Evaluation:

Components	**A**	**H**	**R**	**EE**
Weightage (%)	5	10	15	70

A: Attendance, H: Home Assignment, R: Practical work records, EE: End Semester Examination;

Text Books

- Bina Abling& Kathleen Maggio. UK October 2008/US August 2008. *Integrating Draping, Drafting & Drawing*. Fairchild Books
- Nora. M. MacDonald. UK December 2009/US October 2009. *Principles of Flat PatternDesign 4th edition*. Fairchild Books

Reference Books

- Ernestine Kopp., Lee Gross. Beatrice Zelin & VittorinaRolfo. UK January 1991/US September 1991. *How to draft basic patterns*. Fairchild Books
- Helen Joseph-Armstrong. UK April 2013/US February 2013. *Draping for Apparel Design*. Fairchild Books.
- Bernard Zamkoff& Jeannie Price. UK August 2009/ US June 2009. *Basic PatternSkills for Fashion Design*. Fairchild Books
- BrunellaGiannangeli. December 2010... *Couture unfolded: Innovative pleats, folds& draping in Fashion Design*. Promopress Bilingual Edition

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- Winfred A, Metric Pattern Cutting for children's wear and baby wear, 2011, New Delhi, Wiley.
- Peacock John, Children's costume- The complete historical source book, 2009, London, Thames and Hudson.

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GARMENT CONSTRUCTION-I

Course Code: FST2203 **Credit Units: 02**

Course Objective: The course enables to develop an understanding of the garments of kids wear and its variation. This course gives the full knowledge of different type of collars and sleeves.

Course Contents:
Module I: Collars Peter Pan collar – Flat and raised, Cape collar, Sailor's collar, Convertible collar, Chinese/Mandarin Collar. Construction and adaptation of various collars

Module II: Sleeves
Plain sleeve, puff gathered top and bottom, bell sleeve, bishop sleeve, Cap sleeve, Flared Sleeve, Magyar Sleeve, Balloon Sleeve, Petal Sleeve, and Leg-o- mutton sleeve**.** Construction of different type of Sleeves

Module III: Petticoat
Types of Petticoat-A- Line, Straight, 6 Panels**,** Construction of petticoat

Module IV: Project Kids wear
Submission of Practical Work records (Compulsory)

Course Evaluation:

Components	**A**	**H**	**R**	**EE**
Weightage (%)	5	10	15	70

A: Attendance, H: Home Assignment, R: Practical work records, EE: End Semester Examination;

Text Books

- Bina Abling& Kathleen Maggio. UK October 2008/US August 2008. *Integrating Draping, Drafting & Drawing*. Fairchild Books
- MilvaFiorella Di Lorenzo. UK November 2009/US September 2009. *Tailoring Technique's for Fashion.* Fairchild Books.
- ZoyaNudelman. UK August 2009/US June 2009. *The Art of Couture Sewing*. Fairchild Books.
- Annette Fischer. UK November 2008/US December 2008. *Basic Fashion Design 03-Construction.* Ava Publishing.

Reference Books

- Mary Ruth Sheilds. UK October 2010/US August 2010. *Industry Clothing Construction Methods.* Fairchild Books.
- Pamella Powell. UK September 2010/US July2010. *Tailored Fashion Design*. Fairchild Books.
- Amaden-Crawford, Crawford. UK September 2014. *Fashion Sewing- Introductory Technique's.* Fairchild Books.
- Janace. E. Bubonia. UK December 2014/US October 2014. *Apparel Quality- A Guide to Evaluating Sewn Products*. Fairchild Books.
- Raul Jewel. Publishing year unknown. *Encyclopedia of Dress Making.* Publisher unknown.

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COMPUTER-AIDED DESIGN-I

Course Code: FST2204 **Credit Units: 01**

Course Objective:
This course focuses on the usage of Usage of computers in Fashion & Apparel Industry

Course Content:

Module I	**:**	**Corel Draw - Tool Introduction and usage.**
Module II	**:**	**Functions of tools and its usage.**
Module III	**:**	**Figure Drawing - Block figure and Flesh figure**
Module IV	**:**	**Working with layouts**
Module V	**:**	**Creating Prints and textures**
Module VI	**:**	**Tutorials**

Examination Scheme:

Components	**A**	**H**	**CT**	**EE**
Weightage (%)	**05**	**10**	**15**	**70**

(**A-**Attendance**; H** -Home Assignment**; CT-**Class Test**; EE-**End Semester Examination)

Text & References:

- Winifred Aldrich, CAD in Clothing and Textiles

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FABRIC ARTISTRY & EMBROIDERY

Course Code: FST2205 **Credit Units: 02**

Course Objective
The students will develop a thorough understanding of various techniques used to impart various decorative skills on fabric through practical exercises.

Course Contents:

Module I : Introduction to fabric decoration.
Embroidery - Basic stitches- Running, Back stitch, split stitch, Simple couching, Stem, Satin, Cross, Blanket and Crossed buttonhole Closed buttonhole, Framed, Buttonhole, Chain, Feather, Fly, Herring bone, French knot bullion. **Transferring and Tracing techniques of Designs -** Practical exercise.

Module II : Techniques of thread embroidery
Mirror Work - Mirror work places of India, Types of mirrors, stitches and designs. **Bead Works** – Definition, Bead work places of India, Articles, materials and stitches used for bead work. **Metal thread embroidery -** Definition, Metal thread embroidery places of India, Articles, materials and stitches used for Metal thread embroidery. **Smocking –** Definition, stitches used for smocking – Honey comb smocking.

Module III : Lace Work, Appliqué Work & Quilting
Lace Work – Types of hand and machine made laces, Attaching laces to fabrics; **Appliqué Work** - Definition and Traditional examples- Raw edge appliqué, Satin stitched appliqué, Couched appliqué, Buttonhole appliqué, Chain stitched appliqué, Lined appliqué, Patch Work. **Quilting** – Definition and Traditional examples – Kantha and Sujni – executing various designs using running stitch.

Module IV : Basic Hand Stitches
Hand Stitches - Running stitch, Basting, Gathering, Overcastting, Fagoting, and Hemming.

Module V : Basics of Fabric Embellishment. (Theory)
Constructed Artistry - Yarn design, Weave design, Knitwear design; **Dye & Print Artistry** - Tie & Dye, Batik, Stencil, Screen, Block Printing. **Indian Hand-Painted Artistry** – Pichvai of Rajasthan, Pad of Rajasthan, Kalamkari of Andhra Pradesh, Patachitra of Orissa.
Submission of practical work records - (Compulsory)

Examination Scheme:

Components	A	H	R	V	EE
Weightage (%)	05	05	15	05	70

(**A** - Attendance**; H -**Home Assignment**; R-** Practical work records**; V-** Viva voce**, EE-**End Semester Examination)

References:

- Creative Publishing, Miunezota, Colour and Design on Fabric (Singer Design), 2000.
- The Buttrick Co. NY, USA, Buttrick Dressmaking, 1940.
- Janet Maigh, Crazy Patch Work, Collins and Brown, London, 1998.
- Morrel Anna, Techniques of Indian Embroidery, BT Batsford Ltd; London, 1994
- Jacquie Wilson, Handbook of textile design, Woodhead Publishing Limited England, 2001
- Langerford A Kadolpher S, Textiles Printine Hall, N.J. Ohio, 1998.

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FASHION- BUSINESS LAWS, ETHICS AND COMMUNICATION

Course Code: FDT2208 **Credit Units: 03**

Course Objective:
Whatever may be the nature of a given society, the contractual relations, as are obtained in that society, are governed by certain principles which are more or less of a general and basic nature. In India these general principles are included in the statute of the Indian Contract Act. 1872. This course is designed to acquaint a student with the conceptual and operational parameters of these various general principles of contractual relations. Further to teach methods- to handle Fashion law clients including designers, fashion houses, distributors, manufacturers, modeling agencies, retailers, and photographers and make legal contracts with them and work as professionals in the field of fashion law, intellectual property, fashion business and finance, international fashion trade, government regulations. Lastly to teach business ethics and communication skills among students.

Course Contents:

Module I: Fashion Business Laws
Indian Contract Act, 1872: Definitions (S.2): Agreement, Kinds of Agreements, Contract Kinds of Contracts: Valid, Void, Voidable, Contingent and Quasi Contract and E-Contract, Distinguish between Agreement and Contract; Offer or Proposal- Definition, Essentials of Valid proposal or offer, Counter offer, Standing or Open offer, Distinguish between offer and Invitation to offer, Acceptance- Definition, Essentials of a Valid Acceptance, Promise, Communication of Offer and Acceptance and Revocation, Capacity to contract (Ss. 10-12), Consent and Free Consent (Ss. 13-22), Consideration (S.2 and 25) and Void Agreements (Ss.24-30).

Special Contracts: Law of Indemnity and Guarantee (Ss. 124-125, Ss-126-129,132- 147). Law of Bailment and pledge (Ss.148, 152-154,162,172.178, 178A &179), Law of Agency (S.182-185 & 201-209 only).

Module II: Sale of Goods Act, 1931 and Negotiable Instruments Act, 1881
Introduction, Definitions (Sec-2), Formalities of the Contract of Sale (Ss.4-10), Distinction between 'Sale' and Agreement of Sell, Conditions and Warranties (11-17), Transfer of Property as between the Seller and the Buyer, Rights of an Unpaid Seller (Secs. 45-54).

Meaning and Characteristics of Negotiable Instrument, Operational Rules of Evidence– Presumptions, Classifications of Negotiable Instruments; Meaning of Cheque, Types of Cheque and Penalties in case of Dishonor of certain cheques, Distinguish between Cheque and Bill of Exchange, (Secs: 6, 123-131A, 138-147).

Module III: Business Ethics and Business Communications
Introduction to Business Ethics-The nature and purpose of ethics and morals for organizational interests; Ethics and Conflicts of Interests; Ethical and Social Implications of business policies and decisions; Corporate Social Responsibility; Ethical issues in Corporate Governance.

Communication in Business Environment-Business Meetings – Notice, Agenda, Minutes, Chairperson's speech; Press releases, Corporate announcements by stock exchanges; Reporting of proceedings of a meeting.

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Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(A-Attendance; P-Project/Seminar/Quiz/Viva; HA-Home Assignment; CT-Class Test; EE-End Semester Examination; PT- Portfolio)

Text Books

- PC Tulsiyan- Business Laws
- Avtar Singh - Indian Contract Act
- Bangia - Law of Contract and Specific Relief
- S.K Kapoor, Law of Contract
- Narayan, Intellectual Property Rights

Reference Books

- Anson - Law of Contract
- Pollock and Mulla - Indian Contract Act
- Cheshire and Fifoot - Law of Contract.

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FASHION ART ILLUSTRATION AND MODEL DRAWING-III

Course Code: FST2301 **Credit Units: 02**

Course Objective: The Course enables to further enhance the designing skills of the students and help them in designing more formal and high fashion garments. The students will also be working in their own stylized form with respective themes.

Course Contents:
Module-1: Optical illusions
Module-2: Male block figures (front, side, ¾, back)
Module-3: Male flesh figures (front, side, ¾, back)
Module-4: Rendering of male Croquis with different color mediums (Staedtlers pencils, water colors, poster paints)
Module-5: Designing of casual wear for females with background
Module-6: Designing of executive wear for females with background
Module-7: Designing of sportswear for females with background
Module-8: Designing of resort wear for females
Submission of practical work records - (Compulsory)

Course Evaluation:

Components	A	H	R	EE
Weightage (%)	05	10	15	70

(**A** - Attendance**; H** -Home Assignment**; R-** Practical work records**; EE-**End Semester Examination)

Text &References:
Text Books:
- Kathryn McKelvey, Fashion Source Book

References:
- BinaAbling, Fashion Model Drawing
- Patrick John Ireland, Introduction to Fashion Design
- Patrick John Ireland, Encyclopaedia of Fashion Detail, Batsford, 1987

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ADVANCE PATTERN MAKING-I

Course Code: FST2302 **Credit Units: 02**

Course Objective: The course enables students to learn about details of construction of patterns women's garments like sari blouse and its variation, kurta, salwar etc. The course gives the full knowledge of dart manipulation. The students learn to interpret design and create the patterns for that design.

Course Contents:

Module I: Master Patterns
Adult Bodice block (front & back), Plain sleeve, Skirt (front & back)

Module II: Dart Manipulation
Introduction the slash and spread technique; Suppression positions; Single dart series- common dart position and shaped darts; Two dart series;Form of suppression: dart folds, dart tucks, gathers, pleats, flares etc; Development of styles through dart manipulation –connecting darts to create seam lines; style development.

Module III: Torso, Princess line foundation

Module IV: Sari Blouse
Drafting of four dart, princess-panel, yoke band, katori cut blouses

Module V: Kurta& Salwar
Drafting of Kurtas: Straight, A-Line, Kalidar and Umbrella Kurta; Drafting of Salwar: Plain and Patiala

Module VI Project - Indian Traditional wear project
Research on market, trends, Forecasts, brands for specific Indian wear ensembles, details, trims and finishes client research. Design Realization of one chosen ensemble from a range of five.

Submission of practical work records - (Compulsory)

Course Evaluation:

Components	**A**	**H**	**R**	**EE**
Weightage (%)	5	10	15	70

A: Attendance, H: Home Assignment, R: Practical work records, EE: End Semester Examination;

Text Books

- Bina Abling& Kathleen Maggio. UK October 2008/US August 2008. *Integrating Draping, Drafting & Drawing*. Fairchild Books
- Nora. M. MacDonald. UK December 2009/US October 2009. *Principles of Flat Pattern Design 4th edition*. Fairchild Books
- Aldrich W, Metric Pattern cutting for women's wear, 5th Edition, 2008, Oxford, Blackwell.
- Joseph Armstrong, Pattern making for Fashion Design, IV Edition, 2013, New Delhi, Pearson.

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Reference Books

- Ernestine Kopp., Lee Gross. Beatrice Zelin&VittorinaRolfo. UK January 1991/US September 1991. *How to draft basic patterns*. Fairchild Books
- Helen Joseph-Armstrong. UK April 2013/US February 2013. *Draping for Apparel Design*. Fairchild Books.
- Bernard Zamkoff& Jeannie Price. UK August 2009/ US June 2009. *Basic PatternSkills for Fashion Design*. Fairchild Books
- BrunellaGiannangeli. December 2010... *Couture unfolded: Innovative pleats, folds& draping in Fashion Design*. Promopress Bilingual Edition
- Steven, S. Illustrating Fashion: Concept to Creation, 2010. New York, Fairchild Books.
- Tain, L. Portfolio Presentation for Fashion Designers 1998. New York, Fairchild Books.

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GARMENT CONSTRUCTION-II

Course Code: FST2303 **Credit Units: 02**

Course Objective: The course enables students to learn about details of construction. It's important and most commonly worn women's garments like sari blouse and its variation, kurta, salwar etc. This course gives the full knowledge of dart manipulation. The students learn to interpret design and create the pattern for that design.

Course Content:

Module I: Master Patterns

Adult Bodice block (front & back), Plain sleeve, Skirt (front & back)

Module II: Dart Manipulation

Introduction the slash and spread technique; Suppression positions; Single dart series- common dart position and shaped darts; Two dart series; Form of suppression: dart folds, dart tucks, gathers, pleats, flares etc.; Development of styles through dart manipulation –connecting darts to create seam lines; style development.

Module III: Construction of Torso & Princess line foundation

Module IV: Sari Blouse

Introduction &Construction of Sari Blouses – four dart, princess-panel, yoke band, katori cut

Module V: Kurta & Salwar

Introduction &Construction of Kurta- Straight, A-Line, Kalidhar and Umbrella Kurta; **Salwar-** Plain and Patiala salwar

Module VI: Project - Indian Traditional wear project

Submission of Practical Work records (Compulsory)

Course Evaluation:

Components	**A**	**H**	**R**	**EE**
Weightage (%)	5	10	15	70

A: Attendance, H: Home Assignment, R: Practical work records, EE: End Semester Examination;

Text Books

- Bina Abling& Kathleen Maggio. UK October 2008/US August 2008. *Integrating Draping, Drafting & Drawing*. Fairchild Books
- MilvaFiorella Di Lorenzo. UK November 2009/US September 2009. *Tailoring Technique's for Fashion.* Fairchild Books.
- ZoyaNudelman. UK August 2009/US June 2009. *The Art of Couture Sewing*. Fairchild Books.
- Annette Fischer. UK November 2008/US December 2008. *Basic Fashion Design 03-Construction.* Ava Publishing.

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Reference Books

- Julie Cole & Sharon Czachor. UK July 2014/US June 2014. Professional Sewing Techniques for Designers. Fairchild Books 2nd edition.
- Amaden-Crawford, Crawford. UK September 2014. *Fashion Sewing- Introductory Technique's.* Fairchild Books.
- Janace. E. Bubonia. UK December 2014/US October 2014. *Apparel Quality- A Guide to Evaluating Sewn Products*. Fairchild Books.
- *Classic Tailoring Technique's- A Construction Guide for Women's Wear*. Fairchild Books.

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APPAREL PRODUCTION

Course Code: FST2306 **Credit Units: 02**

FST2306	**Apparel Production**	L	T	P	C
Version 1.1	Date of Approval: July 2021	1	-	2	2
Pre-requisites/Exposure	NIL				
Co-requisites	NIL				

Catalog Description

This course enables and builds people to understand completely about apparel production in terms of machinery and equipment. Production methodology helps to understand the concept of assembly line, garment manufacturing, and quality checkpoints in production line.

Course Objectives

- The objective of this course is to Make students aware of the methods of apparel production. Its provide knowledge regarding machinery, equipment's, production methodology, Garment cost

Course Outcomes

On completion of this course, the students will be able to

- CO1. Understand the methods of apparel production.
- CO2. Learn production planning and control, quality assurance and production methodology.
- CO3. Understand the concept of labeling and packaging in apparels.
- CO4. Write the cost sheet in terms of garment costing.

Modules	**Blooms 5level***	**Number of hours**
Modules I : Introduction to Indian Apparel Industry : Organizational structure and sectors of the garment industry, apparel product types, developments in recent years, opportunities and challenges in Indian apparel sector, over view of global apparel industry, major trends in international apparel technological concepts.	L1,	10
Modules II: Machinery and Equipment This unit includes machinery and equipment related to cutting, sewing, finishing, washing, stain removal and embellishment.	L1,L3	10

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Modules III: Production & **Workroom management :** Pre production process: Tech pack analysis, sampling, pattern and marker preparation, fabric and accessory procurement, sample types, approvals. Garment production: Sequence of production operations for shirts, trousers, jackets, skirts and vests.	L1,L2,L3	10
Module IV– Production Management and Material **Planning & Allocation** Meaning and need for production management; Types of production- Job Batch and mass production. Material planning and allocation; Process planning and process sheet; Job Production control	L2,L3,L6	10
Module V–Garment Costing	L4,L6	5

Bloom's Level

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

1. Giglio and berks fashion production terms Greg hazer fantastic fit for everybody; Helen gover AK fashion buying.

Reference Books

1. AJ Shooter introduction to Ooh clothing production management apparel online apparel views clothesline Moda Vogue simplicity.

Submission of Practical Work records (Compulsory)

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Relationship between the Course Outcomes (COs , Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	2	1	1	1	3	1	1	1	2	2	3	1	3	3	3	3	3
CO2	2	1	1	1	3	1	1	1	1	1	3	1	3	3	3	3	3
CO3	2	1	1	1	3	1	1	1	2	3	3	1	2	2	2	2	2
CO4	2	1	1	1	3	1	1	1	1	1	3	1	1	1	1	1	1

1: strongly related, 2: moderately related and 3: weakly relate

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COMPUTER-AIDED MANUFACTURING (CAM)

Course Code: FST2309 **Credit Units: 03**

Course Objective:
This module makes the student know-how the Computer Applications in the Fashion & Apparel Industry.

Course Content:

Module I	**:**	**Adobe Photoshop - Functions of Tools & Working on layers**
Module II	**:**	**Photo-editing & its usage**
Module III	**:**	**Demo on 'TUKA cad' Module**
Module IV	**:**	**Mode conversation through editing**
Module V	**:**	**Demo on 'Opti Tex'**
Module VI	**:**	**Rendering & filter effects along tutorials**

Examination Scheme:

Components	A	H	CT	EE
Weightage (%)	05	10	15	70

(**A-**Attendance**; H** -Home Assignment**; CT-**Class Test**; EE-**End Semester Examination)

Text & References:
Text:

- Corel DRAW 11 for Windows: Visual Quick start Guide
- Jim X. Chen, Guide to Graphics software
- David Huss, Gary W. Priester ,Corel DRAW Studio Techniques, McGraw-Hill Osborne Media, 1998
- CorelDraw 10 for Windows: Visual Quick Start Guide.
- Linnea Dayton, Cristen Gillespie, The Photoshop Cs/Cs2 Wow!

References:

- Illustrated Encyclopedia of Costume and Fashion,
- Jill B. Treadwell, Edited: Donald Treadwell, Public Relations Writing: Principles in Practice, SAGE, 2004

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PROJECT PRESENTATION

Course Code: FST2332 **Credit Units: 03**

Guidelines for the project

The purpose of this project is to help students to learn the procedure of doing research on a subject of their interest related to fashion field and then analyse & evaluate it in a presentable manner. They will have to submit a report and will have to give presentation for the same. This project will be conducted during their summer break.

In general, the File should be comprehensive and include:

- A short account of the activities that were undertaken as part of the project.
- A statement about the extent to which the project has achieved its stated objectives.
- A statement about the outcomes of the evaluation and dissemination process engaged in as part of the project.
- Any problems that have arisen and may be useful to document for future reference.

Project Report

The project report is the final research report that the student prepares on the project he chose. Following components should be included in the project report:

- **Title or Cover Page:** Title Page should contain Project Title; Student's Name; Programme; Year and Semester and Name of the Faculty Guide
- **Acknowledgement(s):** Acknowledgement to any advisory or financial assistance received in the course of work may be given. It is incomplete without student's signature.
- **Abstract:** A good abstract should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project. It should not exceed more than 1000 words.
- Table of Contents
- Introduction
- Materials and Methods
- Result and Discussions
- Conclusions & Recommendations
- Implications for Future Research
- References

The Layout Guidelines for the Project File & Project Report

- A4 Size Paper
- Font: Arial (10 points) or Times New Roman (12 points)
- Line spacing: 1.5
- Top and bottom margins: 1 inch/2.5 cm; left & right margins: 1.25 inches/ 3 cm

Assessment Scheme:

Continuous Evaluation: 40% (Based on punctuality, regularity of work, adherence to plan and methodology, refinements etc.)

Final Evaluation: 60% (Based on the Documentation in the file, Final report, analysis and results, achievement of objectives, presentation/viva)

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FASHION ART ILLUSTRATION AND MODEL DRAWING-IV

Course Code: FST2401 **Credit Units: 02**

Course Objective: The study of this course develops the student's ability to design for different category of people: casual and formal. This focuses on designing of a garment according to requirement of the industry keeping in mind the forecast of the season. After the students learn the draping of male figure and move to stylized sketching using different color mediums. Students will be able to work on theme boards, mood boards & color boards.

Course Contents:
Module-1: Draping of male figures.
Module-2: Uses of textures in male's apparel (leather, denim, knits etc.)
Module-3: Designing of wedding collection- males & females.
Module-4: Designing of night wear.
Module-5: Designing of uniforms- air lines, hotel staff and industries.
Module-6: Inspirational and innovative designing
Submission of practical work records - (Compulsory)

Course Evaluation:

Components	A	H	R	EE
Weightage (%)	05	10	15	70

(**A** - Attendance**; H** -Home Assignment**; R-** Practical work records**; EE-**End Semester Examination)
Text & References:

Text Books:

- Mc Kenzie, Best in sports wear design
- Lisa Light, Destination Bride, F+W Media, 2005

References:

- Patrick John Ireland, Introduction to fashion design
- Sharon Lee Tate, Inside fashion design, Pearson Education India, 2004
- Fashion design and illustrations
- Patrick John Ireland, Encyclopedia of fashion detail, Batsford, 1987

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ADVANCE PATTERN MAKING-II

Course Code: FST2402 **Credit Units: 01**

Course Objective: The course enables students to learn about details of construction of pattern for important and most commonly worn women's garments like trousers, skirt and its variation, shirt's etc. This course gives the full knowledge of cuffs, plackets and belts. The students learn to interpret design and create the pattern for that design.

Course Content:

Module I: Basic methods and techniques
Basic yokes and cowls, Basic Bodice Contouring: Corset, Strapless Foundation.

Module II: Developing pattern for various Styles
Dresses with seam lines, co-ordinates and dresses without seam lines.

Module III: Skirt Variations
Circular Skirt, Semi Circular Skirt, Four Gore Skirt, Eight Gore Skirt, Princess Line Skirt, Skirt with Flounce, Skirt with Inverted Pleats, Skirt with Box Pleats, Skirts with Knife Pleats and Skirt with Yoke Skirt with Set in Pleats.

Module IV: Executive wear
Drafting of basic trouser block and its variation.
Drafting of shirt (basic and slim fit) with cuffs and collars.

Module V: Drafting of corporate wear and Semi Couture Women's Evening Wear Project - Research on market, trends, Forecasts, brands for specific, details, trims and finishes, client research, fabric sourcing and surface development Design Realization of one chosen ensemble from a range of five.

Submission of Practical Work records (Compulsory)

Course Evaluation:

Components	**A**	**H**	**R**	**EE**
Weightage (%)	5	10	15	70

A: Attendance, H: Home Assignment, R: Practical work records, EE: End Semester Examination;

Text Books

- Bina Abling& Kathleen Maggio. UK October 2008/US August 2008. *Integrating Draping, Drafting & Drawing*. Fairchild Books
- Nora. M. MacDonald. UK December 2009/US October 2009. *Principles of Flat PatternDesign 4th edition*. Fairchild Books
- Aldrich W, Metric Pattern cutting for women's wear, 5th Edition, 2008, Oxford, Blackwell.
- Joseph Armstrong, Pattern making for Fashion Design, IV Edition, 2013, New Delhi, Pearson.

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Reference Books

- Ernestine Kopp., Lee Gross. Beatrice Zelin&VittorinaRolfo. UK January 1991/US September 1991. *How to draft basic patterns*. Fairchild Books
- Helen Joseph-Armstrong. UK April 2013/US February 2013. *Draping for Apparel Design*. Fairchild Books.
- Bernard Zamkoff& Jeannie Price. UK August 2009/ US June 2009. *Basic PatternSkills for Fashion Design*. Fairchild Books
- BrunellaGiannangeli. December 2010... *Couture unfolded: Innovative pleats, folds& draping in Fashion Design*. Promopress Bilingual Edition
- Steven, S. Illustrating Fashion: Concept to Creation, 2010. New York, Fairchild Books.
- Tain, L. Portfolio Presentation for Fashion Designers 1998. New York, Fairchild Books.

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GARMENT CONSTRUCTION-III

Course Code: FST2403 **Credit Units: 01**

Course Objective: The course enables students to learn about details of construction and its important and most commonly worn women's garments like trousers, skirts, shirt's etc. This course gives the full knowledge of cuffs, plackets and belts. The students learn to interpret design and create the pattern for that design.

Course Contents:

Module I: Garment construction methods and techniques

Basic yokes and cowls, Basic Bodice Contouring: Corset, Strapless Foundation.

Module II: Basic Shirt and Slim fit with cuffs and collars.

Module III: Skirt variations

Skirt/Cascades Variation, Gathered Flared, Circular, Handkerchief and Godets etc

Module IV: Basic Trouser and its Variation

Module V: **Project –I**: Evening gown

Project –II: Corporate wear

Submission of Practical Work records (Compulsory)

Course Evaluation

Components	**A**	**H**	**R**	**EE**
Weightage (%)	5	10	15	70

A: Attendance, H: Home Assignment, R: Practical work records, EE: End Semester Examination;

Text Books

- Bina Abling& Kathleen Maggio. UK October 2008/US August 2008. *Integrating Draping, Drafting & Drawing*. Fairchild Books
- MilvaFiorella Di Lorenzo. UK November 2009/US September 2009. *Tailoring Technique's for Fashion.* Fairchild Books.
- ZoyaNudelman. UK August 2009/US June 2009. *The Art of Couture Sewing*. Fairchild Books.
- Annette Fischer. UK November 2008/US December 2008. *Basic Fashion Design 03-Construction.* Ava Publishing.

Reference Books

- Mary Ruth Sheilds. UK October 2010/US August 2010. *Industry Clothing Construction Methods.* Fairchild Books.
- Pamella Powell. UK September 2010/US July2010. *Tailored Fashion Design*. Fairchild Books.
- Julie Cole & Sharon Czachor. UK July 2014/US June 2014. Professional Sewing Techniques for Designers. Fairchild Books 2nd edition.
- Amaden-Crawford, Crawford. UK September 2014. *Fashion Sewing- Introductory Technique's.* Fairchild Books.
- Janace. E. Bubonia. UK December 2014/US October 2014. *Apparel Quality- A Guide to Evaluating Sewn Products*. Fairchild Books.
- *Classic Tailoring Technique's- A Construction Guide for Women's Wear*. Fairchild Books.
- Raul Jewel. Publishing year unknown. *Encyclopedia of Dress Making.* Publisher unknown.

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COMPUTER-AIDED DESIGN (CAD)-III

Course Code: FST2404 **Credit Units: 02**

Course Objective:
This study will introduce the student the usage of computer software in different areas of Fashion Designing &Technology.

Course Content:

Module I	**:**	**Illustrator: Tool Introduction and usage**
Module II	**:**	**Functions of tools & creating objects**
Module III	**:**	**Reach ERP**
Module IV	**:**	**Setting up artwork: Transparency, Gradients and patterns**
Module V	**:**	**Dobby/Jacquard**
Module VI	**:**	**Working on Color separation (2 D)**

Examination Scheme:

Components	**A**	**H**	**CT**	**EE**
Weightage (%)	**05**	**10**	**15**	**70**

(**A-**Attendance**; H** -Home Assignment**; CT-**Class Test**; EE-**End Semester Examination)

Text & References:
Text:

- Corel Draw 11 for Windows: Visual Quick Start Guide
- From Sue Chastain, your guide to Graphics software
- David Huss, Gary W. Priester, Corel Draw Studio Techniques.
- Corel Draw 10 for Windows: Visual Quick Start Guide.
- Linnea Dayton, Cristen Gillespie, The Photoshop Cs/Cs2 Wow!

References:

- Femina - Magazine.
- Elle – Magazine.
- Donald, Illustrated Encyclopedia of Costume and Fashion Public Relations Writing: Principles Practice

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VISUAL MERCHANDISING

Course Code: FST2408 **Credit Units: 03**

Course Objective:
Skill development in the creation of showroom or retail store window/interior displays that sell merchandise. Study of the basic techniques of store planning, mannequin dressing, alternate form design, and display space conceptualization and implementation

Course Contents:

Module I: Introduction to Visual Merchandising (VM): Introduction, Objectives, Concept of Visual Merchandising, Objectives of Visual Merchandising, Growth of Visual Merchandising, Visual Merchandising in India, Scope of visual merchandising in India, Visual Merchandising as a Support for Positioning Strategy, Prospects of Visual Merchandising, Challenges in Visual Merchandising, The common challenges, Ways to overcome the visual merchandising challenges

Module II: The Merchandise Mix: Introduction, Objectives, Concept of Merchandise Mix, Merchandise line, The Assortment of Products, Assortment strategy, Merchandise Mix of Show Off, Role of a merchandiser, Other Atmospherics in Merchandising, Colour scheme, Lighting

Module III: Store Management in Merchandising: Introduction, Objectives, Types of Stores, Location of a Store, Types of retail locations, Planning a Store Layout, Various Types of Store Layouts, Grid layout, Forced-path layout, Free-form layout, Boutique layout, Combined layout, Store Space Allocation, Heads of space allocation in a store, Managing Customer Navigation in a Store, General Rules of Customer Traffic in a Store, The Loop for Guiding the Shoppers through a Store

Module IV: Store Design and Display: Introduction, Objectives, Concept of Store Design and Display, Objectives of store design, Purpose and importance of display, Rules of display planning, Display Settings, Store Design, Exterior of a store, Interior of a store, Window displays, Merchandise Presentation Strategies, Colour blocking, Other techniques of merchandise placement, Physical materials used to support the display, Components of display, Some Useful Display Fixtures, Shelves, Gondolas, Round racks, Four ways, Saccades and fixation, Replenishes, Planogramming

Module V: Store Image & Security: Introduction, Objectives, Concept of Image Mix, Elements of Image Mix, Merchandise, Fixtures, Sound/Music, Odour, Visuals, Employees, Elements that Levy Negative Impact on Shoppers, Change of Image, Security Issues

Module VI: Managing Communication for a Retail Store Offering: Introduction, Objectives, Marketing Communication, Thematic Communication, Methods of Communication, Graphics, Signage

Module VII: The Present and Future of Visual Merchandising: Introduction, Objectives, Visual Merchandising at Different Stores, Apparel store, Furniture store, Gift store, Future Prospects of Visual Merchandising

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Examination Scheme:

Components	A	H	CT	EE
Weightage (%)	05	10	15	70

(**A**-Attendance**; H** -Home Assignment**; CT**-Class Test**; EE**-End Semester Examination)

Text & References:

Text:

- Judith Bell and Kate Ternus , Silent Selling
- Sarah Bailey and Jonathan Baker, Visual Merchandising for Fashion

References:

- Martin M Pegler, Visual Merchandising and Display

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TERM PAPER

Course Code: FST2431 **Credit Units: 02**

Objective:
The objective of this course is to judge the understanding as well as application of the knowledge gained by the students. The aim of the term paper is to provide the students with an opportunity to further enhance their knowledge in a sector of their choice by undertaking a significant practical unit of examining and analyzing various aspects of business management at a level commensurate with the learning outcomes of the various courses taken up them in the ongoing semester.

A term paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. At least one middle level or senior level person of a company from the chosen sector may be interviewed face to face

Guidelines:

1. The term paper will be related to the contemporary business issue and the topic will be given by the department.
2. The presentation of the term paper is scheduled to be held before the commencement of Semester examinations.
3. The paper will carry 100 marks that will be marked on the basis of understanding and organization of content based on the literature review. The Bibliography shall form an important part of the paper.

Examination Scheme:

Organization and relevance of content	Literature Review	Bibliography	Total
40	40	20	100

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WORKSHOP

Course Code: FST2433 **Credit Units: 01**

OBJECTIVES:

A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two ways. The trainer has to make sure that the aspects covered are practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

GUIDELINES FOR WORKSHOP

The procedure for earning credits from workshop consists of the following steps:

1. Relevant study material and references will be provided by the trainer in advance.
2. The participants are expected to explore the topic in advance and take active part in the discussions held
3. Attending and Participating in all activities of the workshop
4. Group Activities have to be undertaken by students as guided by the trainer.
5. Evaluation of workshop activities would be done through test and quiz at the end of the workshop.
6. Submitting a write up of at least 500 words about the learning outcome from the workshop.

METHODOLOGY

The methodology followed at the workshop could be based on any one or more of the following:

- Case Study
- Business Game
- Simulation
- Group Activity
- Role Play
- Business Planning
- Quiz

Examination Scheme:

Attendance	Active Participation	Multiple Choice Questions / Quiz	Solving the Case Assignment / Write up	Total
10	30	30	30	100

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FASHION ART ILLUSTRATION AND MODEL DRAWING-V

Course Code: FST2501 **Credit Units: 02**

Course Objective: The Course helps the students design accessories for different segment of people, along with their display and story board.

Course Contents:
Module-1: Designing of range of ties and stoles.
Module-2: Designing of accessories- head gears, belts, bags etc.
Module-3: Fashion illustration with different mediums- charcoal pencils, glitters, poster colors, staedtlers, 3-d material etc.
Module-4: Fashion illustration with different techniques- tissue paper and blow Ink color.
Submission of practical work records - (Compulsory)

Course Evaluation:

Components	A	H	R	EE
Weightage (%)	05	10	15	70

(**A** - Attendance**; H** -Home Assignment**; R-** Practical work records**; EE-**End Semester Examination)

Text & References:
Text Books:

- Phyllis Tortora, The Fairchild Encyclopedia of Fashion Accessories

References:

- Patrick John Ireland, Encyclopedia of fashion detail, Batsford, 1987
- Kathryn McKelvey, Fashion Design Process
- Hamiyn, Key Moments in Fashion
- Gavin Waddell, How Fashion Work

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GARMENT CONSTRUCTION-IV

Course Code: FST2502 **Credit Units: 01**

Course Objective: The course enables students to learn about details of grading in construction and its important and most commonly worn women's garments like trousers, skirt and its variation, shirt's etc. The students learn to interpret design and create the pattern for that design.

Course Content

Module I: Construction of Different Grades Garments
Basic Bodice Block, Sleeves, Skirts, Trouser, collars, jackets

Module II: Project - Research on market, trends, Forecasts, brands for specific Indian wear ensembles, details, trims and finishes client research. Design Realization of one chosen ensemble from a range of five.
Theme –

- Bridal Wear
- Formal wear
- Maternity Wear
- Beach wear
- Night wear
- Executive Wear
- Street Wear
- Casual Wear

Submission of Practical Work records (Compulsory)

Course Evaluation:

Components	**A**	**H**	**R**	**EE**
Weightage (%)	5	10	15	70

A: Attendance, H: Home Assignment, R: Practical work records, EE: End Semester Examination;

Text Books

- Bina Abling& Kathleen Maggio. UK October 2008/US August 2008. *Integrating Draping, Drafting & Drawing*. Fairchild Books
- MilvaFiorella Di Lorenzo. UK November 2009/US September 2009. *Tailoring Technique's for Fashion.* Fairchild Books.
- ZoyaNudelman. UK August 2009/US June 2009. *The Art of Couture Sewing*. Fairchild Books.
- Annette Fischer. UK November 2008/US December 2008. *Basic Fashion Design 03-Construction.* Ava Publishing.

Reference Books

- Mary Ruth Sheilds. UK October 2010/US August 2010. *Industry Clothing Construction Methods.* Fairchild Books.
- Pamella Powell. UK September 2010/US July2010. *Tailored Fashion Design*. Fairchild Books.
- Julie Cole & Sharon Czachor. UK July 2014/US June 2014. Professional Sewing Techniques for Designers. Fairchild Books 2nd edition.

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- Amaden-Crawford, Crawford. UK September 2014. *Fashion Sewing- Introductory Technique's.* Fairchild Books.
- Janace. E. Bubonia. UK December 2014/US October 2014. *Apparel Quality- A Guide to Evaluating Sewn Products*. Fairchild Books.
- *Classic Tailoring Technique's- A Construction Guide for Women's Wear*. Fairchild Books.
- Raul Jewel. Publishing year unknown. *Encyclopedia of Dress Making.* Publisher unknown.

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COMPUTER AIDED DESIGN (CAD)-IV

Course Code: FST2503 **Credit Units: 02**

Course Objective:
This module will make the student use Fashion studio for compilation of portfolio for Graduation Design Collection undergoing various processes.

Course Contents:

Module I : Tools Introduction and usage

Module II : Cleaning & Selection of fabric

Module III : Color Reduction

Module IV : Texture Mapping.

Module V : Mood board & Color board

Module VI : Draping

Examination Scheme:

Components	A	H	CT	EE
Weightage (%)	05	10	15	70

(**A-**Attendance**; H -**Home Assignment**; CT-**Class Test**; EE-**End Semester Examination)

Text & References:

Text:
- Winifred Aldrich, CAD in Clothing and Textiles
- Alison Beazley and Terry Bond, Computer Aided Pattern Design and Product Development

References:
- Bina Abling, Advanced Fashion Sketchbook
- Pepin Press, Ikat Patterns

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PATTERN DRAPING

Course Code: FST2504 **Credit Units: 01**

Course Objective:
After the students have a thorough knowledge of flat pattern-making and its application they are now introduced to the concept of three dimensional process of pattern making by draping the material on to the mannequin.

Course Contents:

Module I : **Introduction**
Equipments needed, grain, seam allowances, preparation of fabric, dress form.

Module II : **Basic patterns**
Basic bodice (front & back), Basic skirt (front & back), Basic sleeve

Module III : **Variations in necklines, armholes, waistlines, princess bodice and boned bodice**

Module IV : **Creating patterns by dart manipulations**
Multiple darts, Dart tucks, Gathers, Pleats, Flare, Style lines and control seams

Module V : **Style lines and control seams**
Use of style lines, Cowls and twists in bodice, Midriff & yoke styles

Module VI : **Variations in skirts**
Variation of the basic skirt, flared, pegged, paneled, gathered, gored and pleated, Peplums- flared and gathered

Module VII : **Collars**
The Mandarin collar, Convertible Collar, Peter Pan collar, Shawl collar, Notched Collar

Module VIII : **Sleeves - The Dolman sleeve, Raglan and Kimono sleeve**

Module IX : **The Shift**
A Line, Tent, Blouson, Use of Facings, Closures and Pockets

Module X : **Final Presentation**

Submission of practical work records - (Compulsory)

Examination Scheme:

Components	A	P	R	EE
Weightage (%)	05	10	15	70

(**A** - Attendance**; P -** Presentation**; R-** Practical work records**; EE-**End Semester Examination)

Text & References:
Text:

- Jaffe and Rellis, Draping for Fashion Design
- Connie Amaden- Crawford, The Art of Fashion Draping

References:

- Natalie Bray, Dress Fitting

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PATTERN GRADING

Course Code: FST2505 **Credit Units: 01**

Course Objective:
After the knowledge of flat pattern making the students now learn how to increase or decrease any pattern in proportion.

Course Contents:

Module I : **Introduction to Grading**
History, Sizes & Measurement Sizes & Development, Importance of grading, Methods of grading- Stack and Track methods, Different types of grading- horizontal, vertical and diagonal

Module II : **The Master Grades**
Grading of adult bodice block- front and back, Inset and grown on sleeves

Module III : **Grading of collar s and lapels**
Tailored lapel, Tailored Collar, Shawl Collar

Module IV : **Grading of skirts**
Fitted skirt block-front and back, flared skirts, skirt variations, Grading of Sheeth Block

Module V : **Grading of Trouser Block**
Basic Block; Trouser variation

Module VI : **Grading of Jacket**
Paneled, Box and double breasted jackets

Module VII : **Computerized Grading Technology**

Examination Scheme:

Components	A	H	R	EE
Weightage (%)	05	10	15	70

(**A** - Attendance**; H** -Home Assignment**; R-** Practical work records**; EE-**End Semester Examination)

Text & References:
Text:
- Gerry Cooklin, Pattern Grading for Women's Clothes
- Gerry Cooklin, Pattern Grading for Men's Clothes
- Gerry Cooklin, Garment Technology for Fashion Designers

References:
- Natalis Bray, More Dress Pattern Designing

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FASHION MERCHANDIZING-II

Course Code: FST2506 **Credit Units: 3**

Course Objective:
Understand the relevance in functions of merchandising process they are taught the skills related to Sourcing developing and presenting product lines vendor and customer relationship and export documentation.

Module I: Organizational Structures
Structure of export house, buying house and domestic companies, Buyer's classification and buying network in exports

Module II: Marketing and merchandising concepts: - Study of fashion principles and fashion cycle, Fad etc., Fashion movement. Study of domestic and international markets

Module III: Environment and segmentation of fashion: -Market segments and target markets,

Module IV: Developing & presenting product lines: -This includes traditional line planning contemporary line planning

Module V: Merchandising systems - Wholesaling & retailing

Module VI: Customer vendor relationship: - This includes concept of customer service role of personal selling purpose, Online & offline wholesaling & retailing system.

Module VII: Strategies and decisions: - This includes pricing strategies promotional strategies Sourcing of raw material

Module VIII: Financial aspect of merchandising

Submission of Practical work records - (Compulsory)

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A: Attendance, CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination

Text Books and Reference Books:
Text Books

- John Donnellan; Merchandising theory practice and principles
- Merchandise buying and Management; Grace I kunz.

Reference Books

- Mike easy fashion marketing Maria constantino fashion marketing and PR
- Nicholas Alexander International retailing
- VD dudeja professional management of fashion industry
- Lynda gamans; retailing principles

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QUALITY CONTROL & PRODUCTION MANAGEMENT-II

Course Code: FST2507 **Credit Units: 03**

FST2507	**QUALITY CONTROL & PRODUCTION MANAGEMENT-II**	L	T	P	C
Version 1.1	Date of Approval: July 2021	2	1	0	3
Pre-requisites/Exposure	NIL				
Co-requisites	NIL				

Catalog Description

Analyse, synthesis and demonstrate the basic decision-making, production, and creative processes involved in the conversion of materials to finished textile/apparel products and be familiar with the various production systems with respect to quality and able to Identify and discuss concept of apparel machinery Conceptualize the understanding of Production management

Course Objectives

- This subject provides a detailed knowledge to students regarding the quality aspects, production, planning and control, maintenance of equipment, material handling, utilization of resources etc of a garment so that the quality and cost both are in an equilibrium.

Course Outcomes

On completion of this course, the students will be able to:

- Conceptualize the understanding of Production management
- Examine the different standards applicable to industry Learn about the workroom management.
- Identify and discuss concept of apparel machinery
- Analyse the basic decision-making, production, and creative processes involved in the conversion of materials to finished textile/apparel products and be familiar with the various production systems with respect to quality.

Course Content

Modules	**Blooms level***	**Number of hours**
Module I: Quality Control and Standards Introduction to quality control and standards: Evolution of quality, quality planning, qualitycontrol, quality assurance Quality Management System- Organizing, planning and implementation. Quality standards: importance, benefits, levels and sources of standards- ISO, AATCC, ASTM,BS, BIS, DIN.	L1, L2	6

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Module II: Eco Management Eco management of textile and apparel industry: Global scenario, eco textiles, eco standards andcertifications - ISO 14000, Eco-mark, OekoTex 100 standards, GOTS, OHSAS, Green label,Green Seal.Eco specifications and restrictions in apparels and textiles:	L1, L2	6
Module III: Inventory Control and Cost Estimation Need and advantages of inventory control; introduction and functions of cost estimation, estimation procedure, elements of cost and ladder of costs, method of calculating depreciation, overhead expenses and distribution of overhead expenses	L1, L5	7
Module IV: Various Production Systems Study various production systems with respect to quality. Eg. Lean, Sigma, 5S etc.	L1, L2	10
Module V: Care, Labelling and Packaging **Labelling:** Introduction, labelling parameters, fibre content, care labelling and flammability,wash care labels, **Packing:** Function and scope of packing, packing methods, instructions, materials, weight, ratio,and labelling considerations for shipment by air and sea, packing marks, warehousing - assortment and storage methods	L1, L3	7

***Bloom's Level:**

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Textbooks & Reference

1. David H, "ISO 9000 quality system handbook", Butterworth publishing, New Delhi, 2006.
2. Juran J M and Gryna, F M, "Quality Planning and Analysis - From Product Development through Use", Tata McGraw Hill Publishing Limited, New Delhi, 2001.
3. Pradeep V Mehta, "Managing Quality in Apparel Industry", NIFT publication.
4. Sara J Kadolph, "Quality Assurance for Textiles and Apparels", Fairchild publications, 2nd Edition, 2007.
5. Saville, B.P. "Physical testing of textiles", Woodhead Publishing Ltd and CRC Press LLC, 1999

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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Relationship between the Course Outcomes (COs), Programme Outcomes (POs) and Program Specific Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	-	2	3	1	1	3	3	2	1	1	1	1	1	1	3	1	1
CO2	3	2	3	1	2	3	3	1	2	1	2	1	2	1	3	2	1
CO3	3	2	-	1	3	3	3	3	1	1	1	2	3	1	2	3	1
CO4	3	2	-	1	4	3	3	1	2	1	1	2	1	1	2	1	1

1: strongly related, 2: moderately related and 3: weakly relate

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FASHION FORECASTING

Course Code: FST2508 **Credit Units: 03**

Course Objective:
The students are made to start their work with the collection of data regarding fashion forecasting, trend analysis and presentations. They are then made to forecast the fashion trend and dictate fashion in their very own way.

Course Contents:

Module-I : Concept of fashion forecasting (Theory)
Awareness of fashion fairs and fashion centers, Knowledge of creative writing, Reading of fashion forecast magazine, Sources of information, Role of Exhibitions and Fashion shows

Module-II : Fashion Forecasting Process (Theory)
Market Research- Consumer research, Shopping, Sales records; **Evaluating the collections**- Similar Ideas indicate fashion trends, Trends for target market; **Fashion services** – Collection reports, Trend books, consulting, Color services, Television/Video services , News letter services, Web sites, Directories and reference books, Fashion Magazines and news papers, Catalogs. **Design Sources**- Historic inspirations, Folk influences, Vintage clothing shops, Museums, Libraries and bookstores, Arts, Fabrics/Textiles, Travel, Form follows function, The street scene, The turn of the century, innovations and technologies.

Module-III : Applied Learning Assignments. (Practical)

Market Research	-	On site visits to fashion retailers and cloth markets and study the market trends and collect various cloth samples, catalogs etc.
Forecasting Exploration	-	Students will explore a variety of sources like Magazines, News papers, Internet sites and in-site, their market research reports etc. to become familiar with apparel, textile, color, style, and general culture and consumer forecasting resources. Each student will identify and report trends found to class.
Preparation of story boards	-	Students will prepare story boards for specific target.
Presentation of designs	-	Students will prepare fashion forecast for different seasons.
Final Presentation	-	Each student have to submit their Research file in a standard format guided by the faculty for the final evaluation.

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Examination Scheme:

Components	A	CD	A & F	P	Viva	Total
Weightage (%)	10	20	20	25	25	100

(**A -** Attendance, **CD -** Concept Development, **A & F -** Analysis & Findings, **P** – Presentation)

References:

- Gini Stephens Frings (1999): Fashion: From concept to consumer, Prentice-Hill Inc.
- Tracy Diane and Tom Cassidy, Colour Forecasting
- Kathryn Mc Kelvey, Fashion Design Process, Innovation and Practice

List of Magazines

Apparel online, Fiber 2 Fashion, Cosmopolitan. Marie Claire, Elle, Vogue, Harper's Bazaar, In Style, Glamour, Lucky, Allure, W Magazine.

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CRAFT DOCUMENTATION
(ORGANIZATIONAL PROJECTS)

Course Code: **FST2535** **Credit Units: 06**

Objective

The objective of this programme is to bring about the transformational change from a practical application of the learned knowledge in real time corporate world and industry towards laying a focused and insightful planning for a strong foundation towards understanding and contributing towards Indian crafts.

Methodology

- Market Visit
- Field Trip
- Documentation and Presentation
- Scope and Final Presentation

Guidelines

- The Craft Documentation is scheduled between 4th and 5th semester.
- CD is a complete practical training programme with study of each and every aspects of the organization, and the training experience should be submitted as Organizational Project Report.
- There are two guides will be associate with CD. Faculty Guide for overall guidance and Company Guide for monitoring the SIP students in respective departments of the allocated company.
- Every student should attend the company allocated to him/her regularly and complete the project on given time lines. Disciplinary action will be initiated if any student is found to be absenting himself/herself without the permission from company guide / Faculty guide / HOS.
- Student in organizational Project (OP) / CD are the role ambassadors of Amity University Haryana (AUH). They carry the brand image of AUH and should always show high level of dignity at the work place.
- Every student is expected to carry a pen, notepad daily to the company where he/she assigned the project and should always note down the progress of him/her along with daily dosage of work schedule.
- The students in the OP/CD can be meeting the faculty guide in between the programme with prior permission from the company guide. Such cases the company guide should be inform to faculty guide/HOS
- The students by virtue of his/her carelessness fail to do the project, will not be awarded the graduation certificate and also kept out-of-placement services.

FINAL RECORD PREPARATION FORMAT
(Summery of Organizational Project Report content)

1. Cover Page
2. Inner cover page
3. Company Certificate
4. Amity University Haryana Certificate
5. Table of contents / Index
6. Acknowledgement
7. Declaration
8. Executive Summery
9. Introduction

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- Brief on the Industry
- Brief on the Company

10. Project Objective
    - Primary and Secondary
11. Methodology
12. Scope of the study
13. Significance of the study
14. Project Analysis
    - Work Done Analysis
    - Research Methodology analysis
15. Tabulation and Graphical Representation
16. Inference from Study
17. Contributions
18. Learning's
19. Suggestions
20. Conclusions
21. Achievements (In case of any appreciation letter, stipend achievement letter, Photographs on the significant occasions or any others)
22. Reference
23. Annexure.

- Language of Project Report and Viva-Voce Examination may be English. There will be an evaluation by a jury comprising of external experts and internal faculty guide from the department.
- Failure to submit the Project Report in proper manner / without company certificate / AUH certificate or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination.

Examination Scheme:

Evaluation Components	OPR				A	P	V	Total Weightage (%)
	Internal Evaluation		External Evaluation					
Project Analysis	10	20	15	30	10	20	20	**100**
Conclusion & Recommendations	10		15					

(OPR - Organizational Project Report, **A -** Attendance**, P –** Presentation**, V –** Viva voce)

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FASHION PROMOTION

Course Code: FST2512 **Credit Units: 01**

Course objective:
This course describes various types of fashion promotion with procedures and its relation to store needs and target customers.

Course Contents:

Module I : Fashion- Sales Promotion.
Sales promotion – Objectives, Fast sales boost, Encourage Trial, Encourage repeat purchases, Simulate purchase of large stocks, Gain distribution and shelf space. **Promotion Techniques- Consumer Promotion-** Money off, Bonus packs, Premiums, Free samples, Coupons, Competitions, Draws; **Trade Promotions** – Price discounts, Free goods, Competitions, Allowances. **Evaluating sales promotion –** Pretesting research, Post testing research. **Promotional Aids** – Personal appearances, Designer Trunk shows, In-store clinics, Merchandise representatives, Videos, Image books, Display fixtures, Radio scripts and TV commercials, Glossy photographs, Hangtags. Fashions promote associations, Fashion awards.

Module II : Fashion -Advertising.
Define advertising objectives –Position the offering, Create awareness, Stimulate trail, Remind the rain force, Provide support for sales force, correcting misconceptions. **Advertising Strategy –** Identify and understand the target audience, Establish advertising spend, Massage decisions. **Advertising Media** – The term 'Media', Print Media - Types, Methods of advertising, advantages and disadvantages; Electronic Media - Types, Methods of advertising, advantages and disadvantages. **Kinds of advertising-** Image advertising, Item advertising, Promotional advertising. **Advertising Department** – Art, Copy, Production, traffic. **Advertising Agencies.**

Module III : Fashion – Public Relations.
Public relations – Introduction; **Functions of public relations** – Facilitates company's overall operations, Aids promotion, Helps tracking social and environmental issues, Ensure customer's satisfaction, Attracting and retaining talented employees, Give benefits to stake holders , Develop reputation of the organization, Responds effectively to negative publicity. **Publicity** – Task of publicity department, **Characteristics of publicity** – Credible message, No media cost, Loss of control of publication, Loss of control of content, Loss of control of timing. **Publicity Campaigns** – Press package, Individual approaches. **Special events** - Fashion shows – Formal fashion shows, Designer trunk shows, Department fashion shows, Informal fashion shows.

Module IV : Applied Learning Assignments.

1. Visit any department store and observe the various techniques of sales promotion activities and make a report.
2. Search through various news papers and magazines and analyze the coverage of advertising campaigns of different large chain store / fashion brand. Clip the stores advertisements and find the, name, trade mark, manufacturer and store specialties and locations.

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Examination Scheme:

Components	A	L	CT	EE
Weightage (%)	05	10	15	70

(**A**-Attendance**; L**- Learning Assignments**; CT**-Class Test**; EE**-End Semester Examination)

Text & References:

- Jay Diamond, Ellen Diamond, Fashion Advertising and Promotion, Fairchild Books, 1999
- Gini Stephens Frings (1999): Fashion: From concept to consumer, Prentice-Hill Inc.
- Kotler Philip & Armstrong, Gary, Marketing: An Introduction, Pearson Education.
- Stanton, William J. et al, Fundamentals of Marketing, McGraw-Hill Publishing Co. Ltd.
- Phyllis Tortora, The Fairchild's Dictionary of Fashion
- S. A Hussain, Variety- Fashion for Freedom
- Belch, Advertising And Promotion, Tata McGraw-Hill Education, 2003

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THE BUSINESS OF LUXURY FASHION

Course Code: FST2513 **Credit Units: 01**

Course objective:
This course aims to give students a deeper understanding of the luxury sector & reveal the importance of the profession in the contemporary world.

Course Contents:

Module I : Introduction to Luxury Fashion.
Luxury- Concept, Definition in economics, Origins of luxury fashion, Market characteristics **Conspicuous consumption** – Definition and theory, **Socio-economic significance** - Status symbol, Consumerism, Life style and culture. **Luxury and Ethics** -Accessible luxury, Intangible luxury. Sustainable luxury: social luxury guilt-free, luxury, sweatshop-free clothing.

Module II : The Luxury Fashion Consumer & Buying Behavior
Consumer Behavior – Introduction, Models of Consumer Behavior; **Buying Behavior -** Introduction, The consumer purchase-decision process; **Cross-Cultural Behavior -** Economic, demographic and socio-cultural trends and consumer; Globalization of consumer markets and international marketing implications. Luxury consumer market indicators.

Module III : Luxury Retail Design and Atmosphere
Luxury retail - Location, Store concept, Retail extension, Product merchandizing design, New selling techniques, Designer outlet shopping. **Store planning and Design** – Store Image, Target consumers, Seasonal Visual Merchandising, Windows, Interiors, **Shopping as entertainment.**

Module IV : The Art of Creating and Managing Luxury Fashion Brands
Branding – Defining a luxury brand, Branding benefits, **Luxury fashion branding strategy development** - Brand concept, Brand identity, Brand awareness, Brand positioning, Brand loyalty, Brand equity, Brand value; **The luxury fashion marketing strategy** - The product, Pricing, The place of distribution, Promotion, The celebrity connection, People, Positioning. **Building a Brand or Designer Name** –Multi products – Secondary lines, New product divisions, Size ranges, Accessory collections; Licensing, Joint ventures, Exporters, Manufacturers as Retailers – Factory outlet stores, In-store boutiques, Catalogs, Televisions, and Internet sales. Franchising, Leased Departments, Consignment stores Jobbers.

Module V : Global Nature of Fashion Business.
Introduction to international Fashion business – Importance, Nature and scope, Modes of entry into International Business Internationalization process and managerial implications, Multinational Corporations and their involvement, Agreement on Textiles and Clothing (ATC) ; **The luxury fashion business strategy model**- Definition, The business strategy modeling process.

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Examination Scheme:

Components	A	H	CT	EE
Weightage (%)	05	10	15	70

(**A-**Attendance**; H -**Home Assignment**; CT-**Class Test**; EE-**End Semester Examination)

Text & References:

- Uche Okonkwo, Luxury Fashion Branding: Trends, Tactics, Techniques, Palgrave Macmillan, 2007,
- Bennet, Roger, International Business, Financial Times, Pitman Publishing, London, 1999.
- Gini Stephens Frings, Fashion: From concept to consumer, Prentice-Hill Inc. 1999
- Berry, C.J. The idea of luxury –A conceptual and historical investigation, Cambridge University Press.
- Kotler Philip & Armstrong, Gary, Marketing: An Introduction, Pearson Education.
- Stanton, William J. et al, Fundamentals of Marketing, McGraw-Hill Publishing Co. Ltd.
- Phyllis Tortora, The Fairchild's Dictionary of Fashion

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COUTURE DESIGN

Course Code: FST2514 **Credit Units: 01**

Course Objective:
This course offers students the opportunity to enhance their skills to the segment of the fashion industry known as the Couture /High fashion / Designer label market. This is an applied learning course and students need to experience this with concerned faculty experts.

Course Contents:

Module I : Introduction to Couture Design. (Theory)
Couture – Definition, Origin of Couture, Function of couture, Chambre Syndicale de la Haute Couture, **Couture Design Concept -** High-End Luxury, Luxury Sociology and Ceremonies, Concept of 'made-to-measure' clothing**; Designer Clothing** - Definition, Concept, Designer Label, Designer Brands. Key Concept Innovation & Development of couture design. Study of Indian couture designers and International couture designers

Module II : Couture Decorative Techniques & Embellishments. (Practical)
Expands knowledge of the couture by exploring various decorative techniques, Apply glass seed beads, sequins, pearls, and faux gems on different types of fabrics. Create embellishments such as flowers and frog closures from fabric and ribbons, hand embroider original designs, and learn the arts of quilting, cartridge pleating, and quilting

Module III : Couture Apparel Design - Advanced Illustration Techniques. (Practical)
Study the muscular and skeletal functions of the human body and their relationships to the design and creation of haute couture apparel, visualizing how anatomy and aesthetics form the basis of designing a haute couture collection. Become proficient in the translation of ideas via the fashion design sketch and further develop a personal drawing style and various apparel silhouettes.

Module IV : Couture Apparel Design - Advanced pattern Making & Sewing Techniques (Practical)
Skill development in taking body measurements; Developing custom fittings for customized patterns; In depth coverage of the process of transferring a custom body fitted canvas to a couture or designer dress form and padding it for custom sizing; The sewing techniques practiced in the finest haute couture ateliers around the world.; Learn couture techniques in couture fabric selection, proper cutting procedures, hand stitching, seam and hem finishes, pocket construction, inner construction methods pressing, and finishing.

Module V : Haute Couture Portfolio - Applied Learning Assignments.
Write a short description of a person, which include age, build, job, place of residence, interests, and lifestyle. Consider that, this person will be the typical customer. Determine the price range and style range according to the customer life style. Designing a personal collection based on a theme: determine and carry out all the stages of product development from the design to the completed prototype. Apply knowledge of the couture to design, drape, fit, and construct. Develop styles and images through fabric sourcing, market research, and inspirational research for the project.

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Examination Scheme:

Components	A	L	CT	EE
Weightage (%)	05	10	15	70

(**A**-Attendance**; L**- Learning Assignments**; CT**-Class Test**; EE**-End Semester Examination)

References:

- Caroline Rennolds Milbank, Couture, the great designers, Stewart, Tabori & Chang, 1985
- Claire B. Shaeffer, Couture Sewing Techniques, Taunton Press, 2011
- Berry, C.J; The idea of luxury – a conceptual and historical investigation, Cambridge University Press.
- Phyllis Tortora, The Fairchild's Dictionary of Fashion
- Gini Stephens Frings (1999): Fashion: From concept to consumer, Prentice-Hill Inc.

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RETAIL MERCHANDISING AND MANAGEMENT

Course Code: FST2601 **Credit Units: 03**

Course Objective: The objective of the course is providing insights on retail operations. This will enable the students to become good retail planners and decision makers and help focus on change and adaption to change

Module I: Introduction to retail: retail in India; retail models and theories of retail development; understanding the retail consumers; ethical issues in retailing

Module II: Retail marketing strategy; retail franchising; retail store location and site selection; retail store design and visual merchandising; customer relationship management in retailing

Module III: Basics of retail merchandising; the process of retail merchandising; the method of merchandise, Procurement; retail pricing and evaluating merchandise performance; retail communication mix

Module IV: Retail store operations; servicing the retail customers; retail human resource management; financial aspects of retail management; retail information system; supply chain management in retailing

Module V: Evolution of E-commerce industry and role of e-commerce in fashion retail

Examination Scheme:

Components	A	CS	CT	EE
Weightage (%)	05	10	15	70

References:

- Pradhan, Swapna; **Retaling Management**; Tata McGraw Hill; New Delhi
- Bajaj, Chetan, Tuli, Rajnish and Srivastava, Nidhi; **Retail Management**; OUP; New Delhi
- Berman, Barry & Evans, Joel R.; **Retail Management – A strategic approach**; Pearson Education/Prentice Hall of India; New Delhi
- Levy, Michael & Weitz, Barton A.; **Retailing Management**; Tata McGraw Hill; New Delhi
- Newman, Andrew J. & Cullen, Peter; **Retailing – Environment and Operations**; Thomson Asia Pvt. Ltd.; New Delhi
- Dunne, Patrick M., Lusch, Robert F & Griffith, David A.; **Retailing;** Thomson Asia Pvt. Ltd; ND Lamba, A.J.; **The Art of Retailing**; Tata McGraw Hill; New Delhi

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ENTREPRENEURSHIP

Course Code: FST2604 **Credit Units: 03**

Course Objective:
Identify and apply the elements of entrepreneurship and to entrepreneurial processes. Recognize the importance of entrepreneurship and identify the profile of entrepreneurs and their role in economic growth. Use the entrepreneurial mind-set and behave responsibly and ethically in their roles as entrepreneurs. To enable them to identify the opportunities in apparel, textile and Accessories

Course Contents:

Module I : Introduction to Entrepreneurship: What is Entrepreneurship, Why Entrepreneurship, Characteristics of Entrepreneur & Entrepreneurship

Module II : Importance of Entrepreneurship: Importance of Entrepreneurship, Common Myths about Entrepreneurship

Module III : Entrepreneurial Opportunities and Enterprise Creation
Sensing Entrepreneurial Opportunities, Environment Scanning, Market Assessment, Identification of Entrepreneurial Opportunities

Module IV: Enterprise Planning and Resourcing: Business Planning - Preparation of a Project Report, Resource Assessment -Financial and Non – Financial, Fixed and Working Capital Requirement, Funds, Flows, Profit Ratios, Break Even Analysis etc., Mobilising Resources - Sources and Means of Fund,Facilities and Technologies for starting an Enterprise. Organising/Production of goods and services-quality, quantity and flow of inputs.

Module V: Supply Chain and Logistics: What is supply chain? What is the role and importance of Supply chain and logistics in fashion industry? Various challenges faced by fashion industry due to constraints in infrastructure of India

Examination Scheme:

Components	A	CS	CT	EE
Weightage (%)	05	10	15	70

(**A**-Attendance**; CS**-Case Study**; CT**-Class Test**; EE**-End Semester Examination)

References:

- Steve Mariotti, Entrepreneurship
- Peter F Drucker, Innovation and Entrepreneurship
- Bruce R. Barringer & R. Duane, Entrepreneurship: Successfully launching New Ventures Ireland, Pearson publication, 2008

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DESIGNING AND DEVELOPMENT OF FASHION ACCESSORIES

Course Code: FST2606 **Credit Units: 01**

Course Objective: Students will be able to learn about different types of accessories that are relevant to fashion industry

Course Contents:

Module I: Introduction to fashion accessories, Types of accessories

Module II: Functional and decorative importance of accessories

Module III: Designing and developing accessories: Sketching and rendering of headgear, hand wear, foot wear and hand bags (3 each) (Construction of any one)

Module IV: Sketching and rendering of belts, gloves and (construction of any one), Sketching of Indian jewellery- Mughal Jewellery, Thewa, Kundan Jewellery, Temple Jewellery, Sketching of accessories on women and men's croqui (2 each) Jewellery designing based on theme. (with Concept Board)

Examination Scheme:

Components	A	CS	CT	EE
Weightage (%)	05	10	15	70

(**A**-Attendance**; CS**-Case Study**; CT**-Class Test**; EE**-End Semester Examination)

References:

- John Peacock, Fashion Accessories: The Complete 20th Century Sourcebook
- Julia Kuo, 20 Ways to Draw a Dress and 44 Other Fabulous Fashions and Accessories

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PROJECT
(CONCENTRATION ELECTIVES)

Objectives

1. To understand the relationship of forecasting to product development and the need for forecasting knowledge for all aspects of apparel and textile businesses.
2. Integrate consumer, aesthetic and quantitative trend information into the product development process.
3. Engineer new value into an existing product or line while holding costs.

This course is a 'team project' integrated with Concentration Electives -1. The team size should be minimum of two. The team has to be choosing any one of the project from the following:

Course Code:	Concentration Electives -2	Credit Units:
FST2607	Sportswear Design and Development	03
FST2608	Costume Design pertaining to performing arts.	03
FST2609	Functions of Indian Buying Houses/Agents – A study	03

Project Guideline

- Students' team has to complete the project through various research methods.

- **Research Project Idea Generation**: current (or perennial) problems and controversies in the apparel field with relevant chosen topic. This method allows historians the opportunity to explain how the current situation came about and to analyze contributing factors to the problem. To find perennial problems in the apparel industry, search through apparel-related journals. Based on this analysis, formulate the purpose of a potential research study. Think about WHY this topic is important to study (the "so what" question). Summarize the points (research question/purpose; why significant; brief literature review) in a one page outline – Design Brief. Critically think about the purpose of your research study.

- **The Final Research Paper:** This will include the updated sections: introduction, literature review/background, methods, and results with discussion, conclusion and ideas for future research. Students should include images as well as a complete reference list. All citations should comply with requirements for submitting a paper.

- **Professional Presentation:** Students will prepare a PowerPoint presentation for a maximum of 15 minutes (about 15-20 slides) including: introduction, brief literature review, methods, results and discussion, and conclusion. Images should be embedded within the PPT.

Project Evaluation

- There will be an evaluation by a jury comprising of external experts and a committee of internal faculties from the department. Failure to submit the portfolio with final products or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination.

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Evaluation Components	R A				A	P	V	Total Weightage (%)
	Internal Evaluation		External Evaluation					
Portfolio Presentation	10	20	15	30	10	20	20	**100**
Products Presentation	10		15					

(R A– Research & Analysis, A - Attendance, P – Presentation, V – Viva voce)

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FIELD TRIP/VISIT DOCUMENT EVALUATION

Course Code: FST2702 **Credit Units: 04**

Course Objective: Students will get the practical exposure by visiting the field/market and need to submit a report on basis of that.

Course Content: Self study and practical observation by student in the industry.

Teaching Tools:
Self Study, Observation

Learning outcome: Students are exposed to practical aspects of the functional areas of fashion industry and expected to learn the work-flow of fashion business

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COMPUTER-AIDED DESIGN (CAD) - V

Course Code: FST2703 **Credit Units: 03**

Course Objective: Student will learn to present their learning during graduation project via help of coral draw

Module: Application of Coral Draw to enhance the learning in the industry and use of computer systems to assist in the creation, modification, analysis, or optimization of those designs

Examination Scheme:

Components	A	H	CT	EE
Weightage (%)	05	10	15	70

(**A-**Attendance**; H -**Home Assignment**; CT-**Class Test**; EE-**End Semester Examination)

Text & References:

- Winifred Aldrich, CAD in Clothing and Textiles

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GRADUATION DESIGN COLLECTION

Course Code: FST2704 **Credit Units: 10**

Course Objective:

This programme focuses on the design and construction of the fashion garments for the partial fulfillment of the degree of B.Sc. in Fashion Design & Technology.
This course is practical application of creativity, Innovation, discovery, and expression in aesthetic or artistic design through the development of innovative garments that employ unique and sculptural shapes. The course will be assessed through critique and evaluation of design project in each topic area. Project components include inspirational research and development of aesthetic direction, ideation and sketching, garment construction and project presentation of the collection at a fashion show before and invited trade audience.

Course Methodology : Research Project & Product Development

Aim : To developing ideas from paper to object, theory to practice, and fabric to garment.

The projects taken up and have to develop through the following stages:

1. **Fashion Market Study** - Fashion market research information helps the students to understand what, where, and why consumers are buying across all retail channels. It combines point-of-sale (POS) market tracking with consumer panel insights so students can stay on top of fashion industry trends and effectively connect with the fashion consumer.

2. **Field trip / Visit** - The students will have the opportunity to create or styles a collection of designs based on various design inspirations and trends, and learn how to put together presentation boards and portfolio pages.

3. **Portfolio Development -** A portfolio is a collection of work that shows an applicant's skills and knowledge across a number of projects or studies. It is a visual representation of interests, exploration, experimentation, development and final pieces. So fashion portfolio is a critically important tool for successfully applying for additional education opportunities or landing your first internship or entry level job. It reflects your professional skills and best work.

4. **Digital Design Techniques & Presentation** - Include Computer-generated (CAD) mood, color, textile, fashion plate, and flat drawing pages as separate pages or in combinations, these demonstrate the designer's skills with CAD programs. Pages should be all portraits or all landscape orientation, with a few exceptions if needed, to allow for easy viewing by interviewers.

5. **Range Development** – The students will explore what makes a good range, taking into account customers, competitors, price points, fabrics, core items and seasonal specials.

6. **Final presentation** - Fashion show.

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Project Evaluation

- There will be an evaluation by a jury comprising of external experts and a committee of internal faculties from the department. Failure to submit the portfolio with final products or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination.

Evaluation Components	R A				A	P	V	Total Weightage (%)
	Internal Evaluation		External Evaluation					
Portfolio Presentation	10	20	15	30	10	20	20	**100**
Products Presentation	10		15					

(R A– Research & Analysis, A - Attendance, P – Presentation, V – Viva voce)

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GRADUATION PROJECT

Course Code: FST2837 **Credit Units: 16**

Course objective: To provide an opportunity to students to apply and relate the concepts and theoretical inputs from various contextual studies offered in Fashion Design programme. To involve the students in the day to day activities of the functional areas of fashion industry and familiarize the practical aspects of the same.

Course Content:
Week 1 – Week 16: Self study and practical observation by student in the industry.
Week 17: Internal Jury
Week 18: External Jury

Teaching Tools:
Self Study, Observation

Learning outcome: Students are exposed to practical aspects of the functional areas of fashion industry and expected to learn the operational methodology of exploring business opportunities, solving problems and making decisions

Parameters to be considered in External Jury:
• Title of the Project
• Objective
• Research Methodology and Design
• Appropriateness of data
• Scope and coverage of the survey
• Comprehension and analysis
• Findings and recommendations
• Innovative approach to the industrial problems

Parameters to be considered in internal Jury:
• Title page
• Objective
• Report framework and methodology
• Context and analysis
• Comprehension and interpretation
• Findings and recommendations
• Report presentation
• Meeting the time requirements of DP schedule

Examination Scheme:

Evaluation Components	PA		Total Weightage (%)
	Internal Evaluation	External Evaluation	
Project Evaluation	50	50	100

(PA – Project & Analysis)

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Programme Structure

Curriculum & Scheme of Examination

2023

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DRAWING-I

Course Code: FNA2101 **Credit Units: 03**

Course Objective:
Drawing is the basic element of learning art. Drawing exercises are to acquire accurate observation and skills to present representational art.

Course Contents:

Module I
Drawing still life or object drawing to explore basic drawing tool 'Pencil'. Suggestion of solidity by line work as well as light and shade, realization for rhythmic relationship between line, mass, volume and texture, emphasis on various visual experiences.
a) Learning basic elements of drawing.
b) Still life or object drawing, Free hand drawing from nature.

Module II
Pencil work representing still life with familiar objects .like fruits, foliage drapery, books and flowers etc.
Emphasis on creating characteristics and volume (light and shade).
a) Basic knowledge of drawing with pencil.
b) Still life with from arranged objects like fruits, drapery etc.

No. of works to be done - 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Anatomy & Drawing, Victor Perard, Pitman Publishing, New York, 1955

***References*:**
- Figure Drawing, Victor Perard, Grosset and Dunlop, New York, 1956.
- Drawing Hands, Carl Sheek, Grosset and Dunlop, New York, 195
- The Art of Drawing Heads and Hands, Walter Brooks, M. Grumbacher, New York, 1966.

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GEOMETRICAL DRAWING AND PERSPECTIVE - I

Course Code: FNA2102 **Credit Units: 02**

Course Objective:
Introduction to orthographic projections in simple positions, drawing of plan, elevation and section of simple objects to scale, full size, reduced or enlarged.

Course Contents:

Module I
Understanding and use of geometrical instruments. Simple exercise in angles and geometrical figures i.e. triangle, quadrilaterals, parallelograms, squares, rectangles, rhombus, polygons, circles etc.

Module II
Projections of solids in simple positions. Drawing of plan, elevation and section of simple objects. Enlargement and reduction of drawings in different scales. One point, two point and three point perspective etc.

No. of works to be done – 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Geometrical Drawings, C. L. Martin, Macmillan Co, London, 1968.

References:
- Artists Technique, Dr. Kurt Herbert

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DESIGN – I

Course Code: FNA2103 **Credit Units: 02**

Course Objective:
Learning Design is to understand the basic visual language and various methods of form synthesis. It is to develop intellectual and imaginative abilities in creative thinking. It is to provide technical know-how about the principles of design, distribution of space, proportion, behaviour of force and energy contained in lines, form and colour. Organized design exercises in different media offer a wide range of opportunity to develop systematic and intuitive approaches to Creative Design work.

Course Contents:

Module I
Transformation of simple shapes into well balanced design. Understanding the subjective and objective value of applied art. Visualize complex forms into simple, primitive and basic forms from nature also.

Module II
Repetition of a well composed square block, with simple shapes or image into different scale to create rational or systematic design. Concept of positive and negative areas.

No. of works to be done - 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- A history of Graphic Design, Philip B. Meggs, Viking, London, 1986.
- The Designer's Handbook, Stan Smith & H. F. ten Holts.

References:
- The Creative Connection, Winteb/Milton
- Innovation, Industrial Designers Society of America

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PAINTING - I

Course Code: FNA2104 **Credit Units: 02**

Course Objective:
The objective of this course is to acquire experience in basic knowledge to explore painting techniques. Structured exercises on painting include basic colour theory and pictorial composition, which enables students to be confident in the use and manipulation of colour. It also provides a clear idea of different painting techniques. Like water colour, Tempera and opaque colour.

Course Contents:

Module I
Understanding the colour and its possibilities. Practical approach to know primary, secondary and other colours to develop a clear perception about painting work. Painting from objects and nature; study of colours, forms, perspective, tone and texture. Experimenting with vibrant, fluorescent colours and passionate sophistication of opaque and transparent colours. Draw and paint with transparent or opaque colour on a theme (from memory & Nature)

Module II
Handling the tools, application and control of a wide range of painting media. Understanding the detail complex possibilities exploiting different types of colours. Project works on monochromatic experimentations.
Still life with monochromatic.

No. of works to be done – 06

- Colour knowledge and colour wheels
- Memory and landscape painting.
- Monochrome still life

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- The complete painting course, Wendon Blake, Bonanza Books, New York, 1984

References:
- Drawing and Painting the natural environment, Barelay Sheaks, Warcester, Massachusetts, 1974
- Collage by Elizbeth
- Mosaics by Angelice Garnentt

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SCULPTURE - I

Course Code: FNA2105 **Credit Units: 02**

Course Objective:
Clay Modeling to develop visual awareness in three dimensions, through manipulative skills in clay and plaster etc.

Course Contents:

Module I
Simple relief composition in clay, technique of terracotta and direct modeling in plaster.

Module II
Studies to understand three dimensional forms, texture and colour of the material, principle of weight, volume, space and contour.

Module III
Finishing of the final sculpture or relief and installation.

No. of works to be done - 03

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Modelling a likeness in clay, Daisy Grubbs

References:
- The Sculptors Handbook, Stain Smity & H. F. Ten Holt
- Complete Guide to Sculpture, Barry Midgley
- Sculptor's Manual, Bainbridge Copnall

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PRINT MAKING - I

Course Code: FNA2106 **Credit Units: 02**

Course Objective:
This hands-on course is to introduce basic techniques in surface printing in one and more colors. It is to learn and experience simple methods of making printing lino & wood cut technique.

Course Contents:

Module I
Learning basic studio techniques in print making, surface printing relief media and use of printing equipments and tools. Understanding the concept of design construction and composition in black and white. Simple method of making relief blocks for lino print based on final design layout.

Module II
Handling the process of ink application on prepared block; experimenting with different colour-combination and paper surface. Wood cut printing in black and white.

No. of works to be done - 04

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Prints: Art and Techniques, Lambert, Susan, V & A Pub, London, 2001.

References:
- The Woodcut Artist's Handbook, George A. Walker
- The Best of Printmaking: An International Collection, Lynne Allen, Rockport Publishers sept.97
- Printmaking: A Contemporary Perspective, Paul Coldwell, Black Dog Publishing,28th march 10

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VISUAL GRAPHICS - I

Course Code: FNA2108 **Credit Units: 02**

Course Objective:
The objective of the course is to focus on the usage of the digital media. The course lay emphasis on the basics of designing software's to ensure that the students are updated with the technological aspect of the industry.

Course Contents:

Module I
Photoshop: Introduction to any designing software's.
Getting familiar with the tools.

Module II
Photoshop: Making various layouts using the tools

No. of works to be done - 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Adobe Photoshop CS5 for Photographers: A professional image editor's guide to the creative use of Photoshop for the Macintosh and PC by Martin
- Adobe Photoshop CS5 Classroom in a Book by Adobe Creative Team
- Photoshop CS5: The Missing Manual by Lesa Snider

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PHOTOGRAPHY - I

Course Code: FNA2109 **Credit Units: 02**

Course Objective:
The objective of the course is to introduce the fundamental technology, theory, history, techniques and applications of photography.

Course Contents:

Module I
Basic use of camera, its various parts and their functions.

Module II
Observation according to photographic angles, selection of subject, composition exploring indoor and outdoor situations including effects of light.

No. of works to be done – 10

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Photomechanic & Printing by J.S. Mertle & Gordon
- Photo techniques by Lee Frost
- Location Photography Secrets by Andy Snow
- Ways of Seeing by John Berger
- Light and Lens: Photography in the Digital Age by Robert Hirsch

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DRAWING - II

Course Code: FNA2201 **Credit Units: 02**

Course Objective:
Drawing exercises are to learn accurate observation and skills to represent work of art from life or surroundings.

Course Contents:

Module I
Drawing human figures to study proportion. Centre of gravity, inclination of main mass based on anatomical structure. & Animal Study.
a) Sketches / drawing

Module II
Drawing from nature - Outdoor study

No. of works to be done – Drawing 10 + Sketching 100

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Anatomy & Drawing, Victor Perard, Pitman Publishing, New York, 1955

References:
- Figure Drawing, Victor Perard, Grosset and Dunlop, New York, 1956.
- Drawing Hands, Carl Sheek, Grosset and Dunlop, New York, 195
- The Art of Drawing Heads and Hands, Walter Brooks, M. Grumbacher, New York, 1966.

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GEOMETRICAL DRAWING AND PERSPECTIVE - II

Course Code: FNA2202 **Credit Units: 02**

Course Objective:
This is to provide adequate knowledge on visual illusion depending upon the distance and point of view. It makes the learners well-equipped in measurement and scaling system related to visual art.

Course Contents:

Module I
Isometric projection of simple objects like cube, prism, pyramids, cone etc.

Module II
Introduction of perspective - Parallel and angular perspective. Terminology like picture plane, station point, vanishing point. Perspective of simple geometrical objects and their combination.

No. of works to be done - 10

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Geometrical Drawings, C. L. Martin, Macmillan Co, London, 1968.

References:
- Artists Technique by Dr. Kurt Herbert

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DESIGN – II

Course Code: FNA2203 **Credit Units: 02**

Course Objective:
The objective of learning Design and exercises is to develop spontaneity in creative thinking executing a meaningful construction of forms based on principles of design.

Course Contents:

Module I
Creating conceptual design emphasizing the importance of lines and forms. Project on experimental design in creative forms

No. of works to be done - 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- A history of Graphic Design, Philip B. Meggs, Viking, London, 1986.
- The Designer's Handbook, Stan Smith & H. F. ten Holts.

References:
- The Creative Connection, Winteb/Milton
- Innovation, published by Industrial Designers Society of America

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PAINTING - II

Course Code: FNA2204 **Credit Units: 02**

Course Objective:
Learning colour techniques of transparent and opaque representing still life and social themes.
Course Contents:

Module I
Still life with multicolour in transparent water colour technique.

Module II
Developing opaque colour treatment on figurative composition based on social themes and Landscape painting.
Study of Indian Folk painting.

No. of works to be done - 12

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Water Color Painting step by step, Arthur Z Guptill, Waston Goptill, New York, 1967.

References:
- Drawing and Painting the natural environment, Barelay Sheaks, Warcester, Massachusetts, 1974
- Painting Sea and Sky, Jean Khanbegian, Grosset and Dunlop, New York, 1967

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SCULPTURE - II

Course Code: FNA2205 **Credit Units: 02**

Course Objective:
Clay Modeling to develop visual awareness in three dimensions, through manipulative skills in clay and plaster etc.

Course Contents:

Module I
Simple relief composition in clay, technique of terracotta and direct modeling in plaster.

Module II
Studies for understanding the aesthetics of three dimensional forms, textures body, color of the material, principle of weight, volume, space and contour.

Module III
Finishing of the final sculpture or relief landscape and figurative composition and installation.

No. of works to be done- 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Modelling a likeness in clay, Daisy Grubbs

References:
- The Sculptors Handbook, Stain Smity & H. F. Ten Holt
- Complete Guide to Sculpture, Barry Midgley
- Sculptor's Manual, Bainbridge Copnall

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PRINT MAKING - II

Course Code: FNA2206 **Credit Units: 02**

Course Objective:
To introduce more techniques of surface printing in one and more colours, creating blocks with cardboard, plywood or linoleum. Experimental printing with other materials.

Course Contents:

Module I
Experimenting and exploring various texture of different surface using materials like wire, wire mesh, coarse cloth, cork, cardboard and ply wood on print surface. Taking monoprints.

Module II
Experimenting with different color-combination and paper surface.

No. of works to be done- 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:

- Printmaking in the sun, waston guptill, dan Weldon, 1st Jan 2001.
- Prints: Art and Techniques, Lambert, Susan, V & A Pub, London, 2001.

References:

- The Woodcut Artist's Handbook, George A. Walker
- The Best of Printmaking: An International Collection, Lynne Allen, Rockport Publishers sept.97
- Printmaking: A Contemporary Perspective, Paul Coldwell, Black Dog Publishing,28th march 10

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VISUAL GRAPHICS - II

Course Code: FNA2208 **Credit Units: 02**

Course Objective:
The objective of the course is to focus the software's which are the core of every artist. The course lay emphasis on the basics of designing software's to ensure that the students are updated with the technological aspect of the industry.

Course Contents:

Module I
Introduction to Coral Draw.
Getting familiar with the tools.

Module II
Designing using Coral Draw.

No. of works to be done - 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Corel DRAW X5 The Official Guide by Gary David Bouton
- Corel DRAW 8 for Dummies by Deke McClelland
- Adobe Illustrator CS5 Classroom in a Book by Adobe Creative Team

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PHOTOGRAPHY - II

Course Code: FNA2209 **Credit Units: 02**

Course Objective:
The objective of the course is to introduce the fundamental technology, theory, history, techniques and applications of photography.

Course Contents:

Module I
Rules of photography
Learning Camera and its basic components (Digital SLR & Beta Camera)

Module II
Learning the use of Camera Angles, Shots and lighting techniques while doing photography.

No. of works to be done – 10

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Photomechanic & Printing by J.S. Mertle & Gordon
- Photo techniques by Lee Frost
- Location Photography Secrets by Andy Snow
- Ways of Seeing by John Berger
- Light and Lens: Photography in the Digital Age by Robert Hirsch

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SUMMER PROJECT EVALUATION-I

Course Code: FNA2335 **Credit Units: 03**

Course Objective:
The students have to prepare a summer assignment to develop their creative skills. They also have to prepare summer assignment and give a presentation highlighting the following:

- Balance
- Perspective
- Concept
- Value
- Texture
- Composition
- Art and Artist

Examination Scheme:

Assignment	-	60
Viva voce	-	40
Total	**-**	**100**

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COMPOSITION - I

Course Code: FNA2304 **Credit Units: 02**

Course Objective:
The Objective of Composition exercise is the key to study theory of composition in sculptural 3 Dimensional representations of thoughts and concepts. This work provides a meaningful knowledge on creative expression.

Course Contents:

Module I
Sketches in clay of given subjects and the enlargement in round and relief with two of more human figure, birds animals, moulding and casting, direct building processes. Plaster, Cement and terracotta.

Module II
Building of armature for direct work in plaster or cement on the given topic.

Module III
Waste mould and piece mould technique and casting in wax.

No. of works to be done – 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- The Sculptor's Handbook, Prof H. F. Ten Holt

References:
- Encyclopedia of Sculpture by John Mills
- Modeling a Likeness in Clay, Daisy Grubbs
- The Complete Guide to Sculpture. Modeling and Ceramics.
- Techniques and materials by Barry Midgley.

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CARVING - I

Course Code: FNA2305 **Credit Units: 02**

Course Objective:
This course is to learn about working with woods and its various texture to create relief work as well as three-dimensional composition.

Course Contents:

Module I
Introduction to various kinds of wood and carving tools. Practical approach to the introductory phase.

Module II
Simple compositions suitable for curving with appropriate emphasis on techniques.

No. of works to be done – 04

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- The Sculptor's Handbook, Prof H. F. Ten Holt

References:
- Encyclopedia of Sculpture, John Mills
- Modeling a Likeness in Clay, Daisy Grubbs
- Dictionary of tools(wood work), R. A. Salaman

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MURAL - I

Course Code: FNA2306 **Credit Units: 02**

Course Objective:
The objective of this course is to train the learners how to work on wall surface using various mural mediums emphasizing technical aspects in details. Mural is a permanent work on building walls inside or outside. It provides professional experience and good knowledge of handling fundamentals of working on vertical wall surface using specific materials.

Course Contents:

Module I
Making suitable layout designing for mural work as per the basic technical aspects of working on wall surface, which is to be viewed from wide eye level.

Module II
Practical mural work on board using painting mediums.

No. of works to be done – 04

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- The complete guide to Sculpture, Modeling and Ceramics: Techniques and materials by Barry Midgley.

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PHOTOGRAPHY - I

Course Code: FNA2307 **Credit Units: 02**

Course Objective:
This course is designed to provide an adequate training on photography emphasizing on handling the camera, techniques and equipments. Advanced experiments on nature and indoor subjects based on various kinds of light effects.

Course Contents:

Module I
Basic use of camera, observation according to photographic angles, selection of subject, composition exploring indoor and outdoor situations including effects of light.

Module II
Introduction to the process of developing and printing, films and their sensitivity. Basic knowledge of photo printing papers and various chemicals.

No. of works to be done – 10

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Photomechanic & Printing by J.S. Mertle & Gordon
- Photo techniques by Lee Frost
- Location Photography Secrets by Andy Snow

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CERAMICS - I

Course Code: FNA2308 **Credit Units: 02**

Course Objective:
This course is designed to provide basic training on ceramics.

Course Contents:

Module I
Simple slab work and wheel work

No. of works to be done – 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- The complete guide to Sculpture, Modeling and Ceramics: Techniques and materials by Barry Midgley.

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ASSEMBLAGE - I

Course Code: FNA2309 **Credit Units: 02**

Course Objective:
This course is to provide basic concept on assemblage work.

Course Contents:

Module I
Introduction to various kinds of materials and their characteristics.

Module II
Practical method of assemblage.

No. of works to be done – 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- The complete guide to Sculpture, Modeling and Ceramics: Techniques and materials by Barry Midgley.

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SCULPTURE METHODS AND MATERIALS - I

Course Code: FNA2310 **Credit Units: 02**

Course Objective:
The Course is planned for detailed training on methods and materials to work with through the edges. It is to provide technical knowledge of various mediums, techniques and tools used for different kinds of art work practically.

Course Contents:

Module I
Types of clay, Plaster of Paris, Cement & its properties

Module II
Nature and types of wood its growth and process of seasoning use of various tools and equipment.

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- The complete guide to Sculpture, Modeling and Ceramics: Techniques and materials by Barry Midgley.
- Methods and Materials of Sculpture by David Raid.

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DRAWING AND ILLUSTRATION – I

Course Code: FNA2311 **Credit Units: 02**

Course Objective:
Drawing exercises are must to develop creative ability, which is essential for any artist. It is to develop accurate sense of observation and skills of graphic presentation.

Course Contents:

Module I
Life and object study to understand light and shade, half tone and colored. Sketching from nature. Quick sketches in limited time from life and nature - Outdoor as well as indoor.

No. of works to be done – 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- The Art of Human Illustration, Nick Meglin,
- Anatomy & Drawing, Victor Perard, Pitman Publishing, New York, 1955

References:
- The Art of Drawing Heads and Hands, Walter Brooks, M. Grumbacher, New York, 1966.
- Figure Drawing, Victor Perard, Grosset and Dunlop, New York, 1956.
- Drawing Hands, Carl Sheek, Grosset and Dunlop, New York, 1959
- Children Picture Books, Magazines.
- The art of humorous illustrations, Nick Meglin
- Germany in winter time, Mario De Mirando, Tata Press, 1980

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DESIGN-III

Course Code: FNA2312 **Credit Units: 03**

Course Objective:
This will be student's first introduction to design. Students will do small basic level exercises to understand design.

Course Contents:

Module I
Introduction to logo Design and Overlapping of different forms identify proportions with texture black & white and Colour.

No. of works to be done – 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Graphic Arts Manual, Irwing E. Field, Arne Press, New York, 1980.

References:
- Design Graphics, C. L. Martin, Macmillan Co. London.
- Corporate Graphics, Mike Quon
- A History of Graphic Design, Philip B Meggs,

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LETTERING AND TYPOGRAPHY – I

Course Code: FNA2313 **Credit Units: 02**

Course Objective:
Study and history of letter forms of both Roman and Vernacular as design form: spacing, study of basic type faces, study of fundamentals of layout and their practical application, preparation of simple typographical layout for News Papers.

Course Contents:

Module I
Study of basic type faces and exercise based on it

No. of works to be done – 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Letter Assembly in Printing-D. Wooldridge

References:
- INFA Press and Advertising Year Book

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PHOTOGRAPHY - III

Course Code: FNA2314 **Credit Units: 02**

Course Objective:
This course is designed to provide an adequate training on photography emphasizing on handling the camera, techniques and equipments. Advanced experiments on nature and indoor subjects based on various kinds of light effects.

Course Contents:

Module I
Basic use of camera, observation according to photographic angles, selection of subject, composition exploring indoor and outdoor situations including effects of light.

Module II
Introduction to the process of developing and printing, films and their sensitivity. Basic knowledge of photo printing papers and various chemicals.

No. of works to be done – 10

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Photomechanic & Printing by J.S. Mertle & Gordon
- Photo techniques by Lee Frost
- Location Photography Secrets by Andy Snow

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PRINTING TECHNIQUES – I

Course Code: FNA2315 **Credit Units: 02**

Course Objective:
This course in designed for learning basic techniques in print making, surface printing relief media and use of printing equipment and tools. This course provides training on technical method of making relief blocks with linoleum, cardboard, plywood and also serigraphy techniques.

Course Contents:

Module I
Creative experimentation with different colour combinations and paper surface. Printing exercises using relief blocks made from various materials based on different layouts, basically working on serigraphy.

No. of works to be done – 10

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- The art of the print by Fritz Eicherberg
- The bite of print by Frank and Dorothy Gettein
- The art of Print by Earl G. Mueller
- The art of Etching by E.S. Lumdsen
- Manal of woodcut printmaking by J. Hillier
- Screen Process Printing by Schwalbach

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COMPUTER GRAPHICS – I

Course Code: FNA2316 **Credit Units: 02**

Course Objective:
Introduction to Design software related to designs.

Course Contents:

Module I
Application of Coral Draw software.

No. of works to be done – 10

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Computer Graphics, Edward Angel

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DRAWING - III

Course Code: FNA2318 **Credit Units: 02**

Course Objective:
The objective of Drawing Exercise is to learn to approach art in most direct way. It is an introduction to various aspects and techniques of drawing exploring variety of drawing tools and mediums such as pencil, charcoal, crayons, ink and color. This exercise provides accuracy in observation and great opportunity to study and experiment expressive force and spontaneity of line work. Drawing is the most significant basic skill of visual representation of real world.

Course Contents:

Module I: Still Life
Drawing exercises from selected arranged objects and drapery to learn and study using various drawing tools based on eye level, relative proportion, perspective, structure, form, volume, texture, source of light and its effect, balance and also tonal values.

Module II: Portraiture
Portraiture drawing study of human heads, construction of the skull, anatomy, proportion, planes, masses and specific feature; light and shade from different angles and finishing.
Life Drawing-Full Figure: Drawing study from full human figure based on human anatomy, proportion, planes and masses, building blocks, posture and rhythm, unity of body parts, inter-related force of lines, foreshortening and finishing.

Module III: Landscape/ Nature Study (outdoor)
Observation, finding the right view to study, addition and elimination, simplification, eye level and perspective, balance and rhythmic presentation with a unique aesthetic value.

No. of works to be done – 12

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- An Introduction to Drawing by James Horton in association with the Royal Academy of Arts.

References:
- Grassroot of Art by Herbert Read
- How to draw and paint by Hazel Harrison, from Art School
- Human Figure by Walter Foster
- Anatomy by Walter Foster
- Heads by Walter Foster
- Figure Drawing by Patricia Monahan with Albany Wiseman
- Human Anatomy by James Horton
- Big book of Drawing and painting by Francisco Asensio Cerver.

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PAINTING - III

Course Code: FNA2319 **Credit Units: 03**

Course Objective:
This is an intensive training to equip the students with a great skill for original and creative visual expression using different painting mediums and tools. Mastery of technical aspects provides essential foundation for the learners, though it is only means, not the end. Painting is the visual expression of thoughts, dreams and experiences. It is an introductory exposure to different schools, traditions, techniques and media of painting practiced through the ages.

Course Contents:

Module I: Still Life
Painting Study (Monochrome)from selected well arranged objects along with drapery; emphasizing on composition, eye level, structure, relative proportion and perspective, source of light and its effect, tonal and textural values, colour balance and colour perspective.

Module II: Painting from life: portraiture and full figure
Head study and full figure study (monochrome) same as drawing from life models (male & female)

Module III: Landscape
Outdoor study using different painting mediums (water colours/pastel/acrylic etc).

Module IV: Mix Media
Experimentation handling variety of painting mediums including collage and other innovative techniques working on still life, life or nature study to explore beyond traditional and academic method.

No. of works to be done – 12

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Notes on the techniques of Painting by Hilaire Hiler
- Painting Course by Ronald Pearsall

References:
- Big book of drawing and painting by Francisco Asensio Cerver.
- A Concise History of Modern Painting, 1974 Thames & Hudson, London
- The portrait by Norbert Schneider.

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COMPOSITION - I

Course Code: FNA2320 **Credit Units: 02**

Course Objective:
Composition exercise is the most important to learn and study theory of composition, individual approach to the possibilities. Experimenting innovative arrangement of the thing around to create unique visual presentation improves artistic sense and concept of beauty.

Course Contents:

Module I
Composition Exercises working on still life, life and nature study –outdoor and indoor; The 2-D and 3-D objects and the structural possibilities, use of colour and textural values, form and content compositions, use of suitable objects. Exercises based on traditional formats

Module II
Creative composition exercise from traditional paintings and imagination emphasizing on individual creative sense, transformation of simple shapes into well-balanced unique visual presentation.

No. of works to be done – 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Artist's Handbook by Ray Smith

References:
- Art Class ,Copy Right 1999 by Harper Collins Publishers
- Artist's Encyclopedia by John Quick

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PHOTOGRAPHY - III

Course Code: FNA2321 **Credit Units: 02**

Course Objective:
This course is designed to provide an adequate training on photography emphasizing on handling the camera, techniques and equipments. Advanced experiments on nature and indoor subjects based on various kinds of light effects.

Course Contents:

Module I
Basic use of camera, observation according to photographic angles, selection of subject, composition exploring indoor and outdoor situations including effects of light.

Module II
Introduction to the process of developing and printing, films and their sensitivity. Basic knowledge of photo printing papers and various chemicals.

No. of works to be done – 12

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Photomechanic & Printing by J.S. Mertle & Gordon
- Photo techniques by Lee Frost
- Location Photography Secrets by Andy Snow

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PRINT MAKING - III

Course Code: FNA2322 **Credit Units: 02**

Course Objective:
This course in designed for learning basic techniques in print making, surface printing relief media and use of printing equipments and tools. This course provides training on technical method of making relief blocks with linoleum, cardboard, plywood and also making blocks using various metal sheets.

Course Contents:

Module I
Creative experimentation with different colour combinations and paper surface. Printing exercises using relief blocks made from various materials based on different layouts, basically working on silkscreen.

No. of works to be done – 10

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- The art of the print by Fritz Eicherberg
- The bite of print by Frank and Dorothy Gettein
- The art of Print by Earl G. Mueller
- The art of Etching by E.S. Lumdsen
- Manal of woodcut printmaking by J. Hillier
- Screen Process Printing by Schwalbach

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COMPUTER GRAPHICS – I

Course Code: FNA2323 **Credit Units: 02**

Course Objective:
Introduction to Design software related to designs.

Course Contents:

Module I
Application of Coral Draw software.

No. of works to be done – 10

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Computer Graphics, Edward Angel

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PAINTING METHODS AND MATERIALS - I

Course Code: FNA2324 **Credit Units: 02**

Course Objective:
The Course is planned for detailed training on methods and materials to work with through the edges. It is to provide technical knowledge of various mediums, techniques and tools used for different kinds of art work practically.

Course Contents:

Module I
Importance of method & materials.
Permanence and deterioration of paint.

Module II
Nature and characteristic of drawing and painting media such as Pencil, crayon, charcoal, pen and ink, water color, gouache, pastel and oil paint.

Examination Scheme:

Components	CT	P	A	EE
Weightage (%)	15	10	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Method and Materials by Lynton Lamb.
  - A manual of Painting Materials & Techniques by Mark David Goattsegen

References:
- Fundamental of Indian Art by S. N. Dasgupta
- Dance of Shiva by A. K. Coomaraswamy
- Transformation of Nature in Art by A. K. Coomaraswamy
- Color by Edith Anderson Feisner.

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COMPOSITION - II

Course Code: FNA2404 **Credit Units: 03**

Course Objective:
The Objective of Composition exercise is the key to study theory of composition in sculptural 3 Dimensional representations of thoughts and concepts. This work provides a meaningful knowledge on creative expression.

Course Contents:

Module I
Sketches in clay of given subjects and the enlargement in round and relief with two of more human figure, birds animals, moulding and casting, direct building processes. Plaster, Cement and terracotta.

Module II
Building of armature for direct work in plaster or cement on the given topic.

Module III
Waste mould and piece mould technique and casting in wax.

No. of works to be done – 6

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- The Sculptor's Handbook, Prof H. F. Ten Holt

References:
- Encyclopedia of Sculpture by John Mills
- Modeling a Likeness in Clay, Daisy Grubbs
- The Complete Guide to Sculpture. Modeling and Ceramics. Techniques and materials by Barry Midgley.

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CARVING - II

Course Code: FNA2405 **Credit Units: 01**

Course Objective:
The course is designed to improve the skills in working with these two mediums based on textural values and technical differences chiseling out artist's own expressions.

Course Contents:

Module I
To make the small maquettes on creative theme, and the concept of mix-media.

Module II
Uses of various carving tools on the given medium. Emphasis on techniques. Enlargement of the maquettes to create the final work.

Module III
Finishing & installing the final work.

No. of works to be done – 6

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Dictionary of tools by R. A Salaman.
- The Sculptor's Handbook, Prof H. F. Ten Holt

References:
- Contemporary Stone Sculpture, Dona Z. Meliach
- Methods and Materials of Sculpture by David Raid.
- The Complete Guide to Sculpture. Modeling and Ceramics. Techniques and materials by Barry Midgley.

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MURAL - II

Course Code: FNA2406 **Credit Units: 02**

Course Objective:
This course is to train the learners about working on wall surface using various mediums emphasizing technical aspects in details. Mural is a permanent work wall inside or outside. It provides professional experience and good knowledge of handling fundamentals of working on vertical wall surface.

Course Contents:

Module I
Making suitable layout designing for mural work as per the basic technical aspects of working on wall surface, which is to be viewed from wide eye level.

Module II
Practical mural work on board using painting mediums.

No. of works to be done – 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- The complete guide to Sculpture, Modeling and Ceramics: Techniques and materials by Barry Midgley.

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PHOTOGRAPHY - II

Course Code: FNA2407 **Credit Units: 02**

Course Objective:
This course is to provide a training on photography emphasizing on creative techniques using basic equipments. Experiments on nature and indoor subjects using specific Light arrangements.

Course Contents:

Module I
Indoor project on photography experimenting with light effects.

Module II
Outdoor project exploring various possibilities.

No. of works to be done – 12

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Photomechanic & Printing by J.S. Mertle & Gordon
- Photo techniques by Lee Frost
- Location Photography Secrets by Andy Snow

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CERAMICS - II

Course Code: FNA2408 **Credit Units: 02**

Course Objective:
This course is designed to provide basic training on ceramics emphasizing on basic techniques.

Course Contents:

Module I
Slab work, wheel work, coil work and tile making in different textures and designs.

Module II
Ceramic clay body making.

No. of works to be done – 10

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- The complete guide to Sculpture, Modeling and Ceramics: Techniques and materials by Barry Midgley.

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ASSEMBLAGE - II

Course Code: FNA2409 **Credit Units: 02**

Course Objective:
This course is designed to provide basic training on assemblage.

Course Contents:

Module I
Practical assemblage training on working surface according to the layout.

No. of works to be done – 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- The complete guide to Sculpture, Modeling and Ceramics: Techniques and materials by Barry Midgley.

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SCULPTURE METHODS AND MATERIALS - II

Course Code: FNA2410 **Credit Units: 02**

Course Objective:
The Course is planned for detailed training on methods and materials to work with through the edges. It is to provide technical knowledge of various mediums, techniques and tools used for different kinds of art work practically.

Course Contents:

Module I
Types of clay, Plaster of Paris, Cement & its properties

Module II
Nature and types of wood its growth and process of seasoning use of various tools and equipments.

Examination Scheme:

Components	CT	P	A	EE
Weightage (%)	15	10	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Dictionary of tools by R. A Salaman.
- The Sculptor's Handbook, Prof H. F. Ten Holt

References:
- Contemporary Stone Sculpture, Dona Z. Meliach
- Methods and Materials of Sculpture by David Raid.
- The Complete Guide to Sculpture. Modeling and Ceramics. Techniques and materials by Barry Midgley.

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DRAWING AND ILLUSTRATION – II

Course Code: FNA2411 **Credit Units: 02**

Course Objective:
Drawing exercises are must to develop creative ability, which is essential for any artist. It is to develop accurate sense of observation and skills of graphic presentation.

Course Contents:

Module I
Detailed portrait study and human figure, practicing planes, volume, and perspective in figure and foreshortening.

No. of works to be done – 15

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Anatomy & Drawing, Victor Perard, Pitman Publishing, New York, 1955

References:
- The Art of Drawing Heads and Hands, Walter Brooks, M. Grumbacher, New York, 1966.
- Figure Drawing, Victor Perard, Grosset and Dunlop, New York, 1956.
- Drawing Hands, Carl Sheek, Grosset and Dunlop, New York, 1959
- Children Picture Books, Magazines.
- The art of humorous illustrations, Nick Meglin
- Germany in winter time, Mario De Mirando, Tata Press, 1980

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DESIGN – IV

Course Code: FNA2412 **Credit Units: 03**

Course Objective:
This course provides a clear concept of various aspects of designing. It is specially planned for a graphic artist to enable students to develop a commercial skill in design work.

Course Contents:
Module II
Introduction to product poster.

Module I
Show cards and other exercises of creative concept.

No. of works to be done – 10

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Graphic Arts Manual, Irwing E. Field, Arne Press, New York, 1980

References:
- The Art of Human Illustration, Nick Meglin,
- Corporate Graphics, Mike Quon
- A History of Graphic Design, Philip B Meggs,
- Graphic Arts Manual, Irwing E. Field, Arne Press, New York, 1980
- Design Graphics, C. L. Martin, Macmillan Co. London.

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LETTERING AND TYPOGRAPHY – II

Course Code: FNA2413 **Credit Units: 02**

Course Objective:
Study of letter forms as design form: spacing, study of basic type faces, study of fundamentals of layout and their practical application, preparation of simple typographical layout for News Papers.

Course Contents:

Module I
Preparation of typographical layout, logo design, Book jacket and Book Cover.

No. of works to be done – 09

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Letter Assembly in Printing-D. Wooldridge

References:
- INFA Press and Advertising Year Book

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COMPUTER GRAPHICS - II

Course Code: FNA2414 **Credit Units: 02**

Course Objective:
Introduction to Design Softwares

Course Contents:

Module I
Working with Coral Draw software for various design purpose.

Module II
Introduction to Adobe Photoshop CS4 or later version for various design purpose.

No. of works to be done – 10

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Computer Graphics, Edward Angel

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PRINTING TECHIQUES - II

Course Code: FNA2415 **Credit Units: 02**

Course Objective:
This course in designed for learning techniques in print making, surface relief printing using printing equipment and tools. This course provides technical training on method of making experimental serigraphy on various surfaces.

Course Contents:

Module I
Exploring various texture of different surface by using various printing surfaces with serigraphy.

No. of works to be done – 10

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Serigraphy: Silk Screen Techniques for the Artist, Kenneth W. Auvil
- Silk Painting : The Artist's Guide to Gutta and Wax Resist Techniques

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DRAWING - IV

Course Code: FNA2417 **Credit Units: 02**

Course Objective:
The objective of Drawing Exercise is to learn to approach art in most direct way. It is an introduction to various aspects and techniques of drawing exploring variety of drawing tools and mediums such as pencil, charcoal, crayons, ink and colour. This exercise provides accuracy in observation and great opportunity to study and experiment expressive force and spontaneity of line work. Drawing is the most significant basic skill of visual representation of real world.

Course Contents:

Module I: Still Life
Drawing with pen and ink. Still life with pen and ink.

Module II: Landscape/ Nature Study (outdoor)
Nature with pen and ink

Module III: Life drawing with charcoal /pencil.

No. of works to be done – 20

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- An Introduction to Drawing by James Horton in association with the Royal Academy of Arts.

References:
- Grassroot of Art by Herbert Read
- How to draw and paint by Hazel Harrison ,from Art School
- Human Figure by Walter Foster
- Anatomy by Walter Foster
- Heads by Walter Foster
- Figure Drawing by Patricia Monahan with Albany Wiseman
- Human Anatomy by James Horton
- Big book of Drawing and painting by Francisco Asensio Cerver.

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PAINTING - IV

Course Code: FNA2418 **Credit Units: 03**

Course Objective:
This is an intensive and advanced training to equip the students with a great skill for original and creative visual expression using different painting mediums and tools. Mastery of technical aspects provides essential foundation for the learners, though it is only means, not the end. Painting is the visual expression of thoughts, dreams and experiences. It is an introductory exposure to different schools, traditions, techniques and media of painting practiced through the ages.

Course Contents:

Module I: Still Life
Painting Study (Monochrome) from selected well arranged objects along with drapery; emphasizing on composition, eye level, structure, relative proportion and perspective, source of light and its effect, tonal and textural values, colour balance and colour perspective.

- Still life : multi-colour with water colour

Module II: Painting from life
Portraiture and full figure: Head study and full figure study (monochrome) same as drawing from life models (male & female)

- Portrait : multi-colour technique

Module III: Landscape
Copy work from traditional paintings.
Copy work (traditional painting)

Module IV: Mix Media
Copy work (Indian & western) from traditional paintings and opaque colour technique

No. of works to be done – 16

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:

- Notes on the techniques of Painting by Hilaire Hiler
- Painting Courseby Ronald Pearsall

References:

- Big book of drawing and painting by Francisco Asensio Cerver
- by Mark David Goattsegen
- Art Class, Copy Right 1999 by Harper Collins Publishers.
- Images of the human body by Pepin Van Roojen.
- A Concise History of Modern Painting, 1974 Thames & Hudson, London
- The portrait by Norbert Schneider.

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COMPOSITION – II

Course Code: FNA2419 **Credit Units: 02**

Course Objective:
Composition exercise is the most important to learn and study theory of composition, individual approach to the possibilities. Experimenting innovative arrangement of the thing around to create unique visual presentation improves artistic sense and concept of beauty.

Course Contents:

Module I
Composition, arrangement of objects, figures and architectures.

Module II
Creative composition exercise from imagination emphasizing on individual creative sense, transformation of simple shapes into well-balanced unique visual presentation with experimentation.

No. of works to be done – 10

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Artist's Handbook by Ray Smith
- Artist's Encyclopedia by John Quick

References:
- Big book of drawing and painting by Francisco Asensio Cerver
- Art Class, Copy Right 1999 by Harper Collins Publishers.
- A Concise History of Modern Painting, 1974 Thames & Hudson, London
- Painting Courseby Ronald Pearsall
- The portrait by Norbert Schneider.
- Color by Edith Anderson Feisner.

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MURAL - I

Course Code: FNA2420 **Credit Units: 02**

Course Objective:
The objective of this course is to train the learners how to work on wall surface using various mural mediums emphasizing technical aspects in details. Mural is a permanent work on building walls inside or outside. It provides professional experience and good knowledge of handling fundamentals of working on vertical wall surface using specific materials.

Course Contents:

Module I
Making suitable layout designing for mural work as per the basic technical aspects of working on wall surface, which is to be viewed from wide eye level.

Module II
Practical mural work on board using painting mediums.

No. of works to be done – 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

The complete guide to Sculpture, Modeling and Ceramics: Techniques and materials by Barry Midgley.

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PRINT MAKING - II

Course Code: FNA2421 **Credit Units: 02**

Course Objective:
This course in designed for learning techniques in print making, surface relief printing using printing equipment and tools. This course provides technical training on method of making experimental relief blocks on various surfaces.

Course Contents:

Module I
Exploring various texture of different surface by using materials including metal sheets like zinc plate and aluminum sheet.

Module II
Advanced experimentation with monochrome & multi-color lithography etching – intaglio/photo process, advanced print making, use of multicolor relief print and mixed media.

No. of works to be done – 10

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- The art of the print by Fritz Eicherberg
- The bite of print by Frank and Dorothy Gettein
- The art of Print by Earl G. Mueller
- The art of Etching by E.S.Lumdsen
- Manal of woodcut printmaking by J. Hillier
- Screen Process Printing by Schwalbach

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PAINTING METHODS AND MATERIALS - II

Course Code: FNA2422 **Credit Units: 02**

Course Objective:
The Course is planned for detailed training on methods and materials to work with through the edges. It is to provide technical knowledge of various mediums, techniques and tools used for different kinds of artwork practically.

Course Contents:

Module I
Nature and characteristics of Drawing and Painting Media such as Pencils, Crayons, Charcoal, Pen and Ink, Water Colour, Gouache, Pastels and Oils.

Module II
Introduction to murals and Print making media.

Module III
Folk Art of India

Examination Scheme:

Components	CT	P	A	EE
Weightage (%)	15	10	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- A manual of Painting Materials & Techniques
- Method and Materials by Lynton Lamb.

References:
- Artist's Handbook by Ray Smith
- Artist's Encyclopedia by John Quick
- A manual of Painting Materials & Techniques
- Color by Edith Anderson Feisner.

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PRACTICAL TRAINING EVALUATION - I

Course Code: FNA2535 **Credit Units: 03**

Course Objective:

It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage.

BFA (Applied Art)

- Practical work in concerned subject
- Visualization
- Concept of designing

BFA (Painting)

- Concept
- Different technique of painting

BFA (Animation)

- Apply the principle of animation, animation using software
- Short animation clip

Examination Scheme:

Project Report:	60
Viva Voce:	40
Total:	**100**

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STUDY FROM LIFE - III

Course Code: FNA2503 **Credit Units: 03**

Course Objective:
The objective of sculptural study from life is to learn human forms in details. It provides the skill to sculpt human figure in realistic way based on anatomy, planes, body masses, balance, posture and rhythm.

Course Contents:

Module I:
Life Drawing:- Bust & Portrait:- Study of Human Portrait and bust using different drawing tools to study blocks, posture and rhythm, unity of body parts, inter-related force of lines, foreshortening and finishing.

Module II
Head Study Male & Female, Building of Armature study in clay and direct plaster.

Module III
Understanding of structure and proportion and detail modeling of full figure. Waste mould technique & casting in PoP.

No. of works to be done – 12

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Modeling a Likeness in Clay, Daisy Grubbs

References:
- Human Figure, Walter Foster
- Anatomy, Walter Foster
- Figure Drawing, Patricia Monahan with Albany Wiseman
- Human Anatomy, James Horton
- The Sculptor's Handbook, Prof H. F. Ten Holt

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COMPOSITION - III

Course Code: FNA2504 **Credit Units: 02**

Course Objective:
The Objective of Composition exercise is the key to study theory of composition in sculptural 3 Dimensional representations of thoughts and concepts. This work provides a meaningful knowledge on creative expression.

Course Contents:

Module I
Sketches in clay of given subjects and the enlargement in round and relief with two of more human figure, birds animals, moulding and casting, direct building processes. Plaster, Cement and terracotta.

Module II
Building of armature for direct work in plaster or cement on the given topic.

Module III
Waste mould and piece mould technique and casting in wax.

No. of works to be done – 08

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- The Sculptor's Handbook, Prof H. F. Ten Holt

References:
- Encyclopedia of Sculpture by John Mills
- Modeling a Likeness in Clay, Daisy Grubbs
- The Complete Guide to Sculpture. Modeling and Ceramics. Techniques and materials by Barry Midgley.

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METAL CASTING - I

Course Code: FNA2505 **Credit Units: 02**

Course Objective:
This course provides the knowledge on working with metals.

Course Contents:

Module I
Methods of casting – lost wax and sand process.

No. of works to be done – 03

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- The Sculptor's Handbook, Prof H. F. Ten Holt

References:
- Encyclopedia of Sculpture by John Mills
- Modeling a Likeness in Clay, Daisy Grubbs
- The Complete Guide to Sculpture. Modeling and Ceramics. Techniques and materials by Barry Midgley.

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MURAL - III

Course Code: FNA2506 **Credit Units: 02**

Course Objective:
This course is to innovative training to work on wall surface using various mediums emphasizing technical aspects. It provides professional exposure and good knowledge of handling mural materials to work on wall surface.

Course Contents:

Module I
Designing for mural work as per the advanced technique of working on wall surface with tempera, acrylic, encaustic, fiber glass etc.

No. of works to be done – 04

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Painting Murals: Image, Ideas & Techniques by Patrica Seligman
- Paintings Murals Fast & Easy: 21 (Design for walls, canvas you can paint with a sponge) by Terrence Tse, Theodore
- Paintings Murals Step by Step by Charles Grund.

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PHOTOGRAPHY - III

Course Code: FNA2507 **Credit Units: 02**

Course Objective:
The objective of this course is to provide an experimental exposure on photography highlighting on creative aspects. Experiments on nature, depending upon time and mood. It also provides experimental experience on indoor subjects.

Course Contents:

Module I
Basic use of camera, observation according to photographic angles, selection of subject, composition exploring indoor and outdoor situations including effects of light.

No. of works to be done – 12

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Photomechanic & Printing by J.S. Mertle & Gordon
- Photo techniques by Lee Frost
- Location Photography Secrets by Andy Snow

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CERAMICS - III

Course Code: FNA2508 **Credit Units: 02**

Course Objective:
This course is to provide training on creative aspects on ceramics.

Course Contents:

Module I
Slab work, wheel work, coil work and tile making in different textures and designs.

Module II
Ceramic claybody making

No. of works to be done – 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- The complete guide to Sculpture, Modeling and Ceramics: Techniques and Materials by Barry Midgley.

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ASSEMBLAGE - III

Course Code: FNA2509 **Credit Units: 02**

Course Objective:
This course is designed to provide experimental training on assemblage.

Course Contents:

Module I
Methods of various assemblage techniques

No. of works to be done – 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- The complete guide to Sculpture, Modeling and Ceramics: Techniques and materials by Barry Midgley.

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SCULPTURE METHODS AND MATERIALS - III

Course Code: FNA2510 **Credit Units: 02**

Course Objective:
The Course is planned for detailed training on methods and materials to work with through the edges. It is to provide technical knowledge of various mediums, techniques and tools used for different kinds of art work practically.

Course Contents:

Module I
Analysis of fundamentals of sculpture in various media.

Module II
Enlarging and reducing devices. Taking points for copying sculpture.

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- The Sculptor's Handbook, Prof H. F. Ten Holt

References:
- Encyclopedia of Sculpture by John Mills
- Modeling a Likeness in Clay, Daisy Grubbs
- The Complete Guide to Sculpture. Modeling and Ceramics. Techniques and materials by Barry Midgley.

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DRAWING AND ILLUSTRATION – III

Course Code: FNA2511 **Credit Units: 02**

Course Objective:
Drawing exercises are must to develop creative ability which is essential for any artist. It is to develop accurate sense of observation and skills of graphic presentation. Exercises on illustration for various needs of the clients.

Course Contents:
Module I
Study of human figure draped and undraped to study volume, proportion, mass, weight, and anatomy with the aid of light and shade.

Module II
Developing compositions through studies working in colour mediums.

No. of works to be done – 10

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Anatomy & Drawing, Victor Perard, Pitman Publishing, New York, 1955

References:
- The Art of Drawing Heads and Hands, Walter Brooks, M. Grumbacher, New York, 1966.
- Figure Drawing, Victor Perard, Grosset and Dunlop, New York, 1956.
- Drawing Hands, Carl Sheek, Grosset and Dunlop, New York, 1959
- Children Picture Books, Magazines.
- The art of humorous illustrations, Nick Meglin
- Germany in winter time, Mario De Mirando, Tata Press, 1980

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DESIGN – V

Course Code: FNA2512 **Credit Units: 03**

Course Objective:
This course provides a clear concept of various aspects of designing. It is specially planned for a graphic artist to enable students to develop a commercial skill in design work. To understand the needs of visual communications.

Course Contents:

Module I
Comparatively study of different types of Indoor layouts like Designing for press, Brouchers and magazine advertisements etc.

No. of works to be done – 08

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Graphic Arts Manual, Irwing E. Field, Arne Press, New York, 1980

References:
- The Art of Human Illustration, Nick Meglin,
- Corporate Graphics, Mike Quon
- A History of Graphic Design, Philip B Meggs,
- Graphic Arts Manual, Irwing E. Field, Arne Press, New York, 1980
- Design Graphics, C. L. Martin, Macmillan Co. London.

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PACKAGING – I

Course Code: FNA2513 **Credit Units: 02**

Course Objective:
This will be student's first introduction to various packaging design according to the environment, occasions and need. Students will do small basic level layouts exercises to understand design of packaging.

Course Contents:

Module I
Study the basic layouts of Label Design, Box design and shopping Bags and their practical application.

No. of works to be done – 08

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Packaging Art for Export, Nduka Nwosu
- Packaging: The art of the right proposition: An artistic from : Groser (HTML), Nicola Gordon-Seymour

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COMPUTER GRAPHICS – III

Course Code: FNA2514 **Credit Units: 02**

Course Objective:
To understand Computer Software related to Design.

Course Contents:

Module I
Tools interface and applications of Adobe Photoshop CS4 (or above) and Use of Adobe Photoshop CS4 (or above) software to create different types of layouts.

No. of works to be done – 08

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Color Harmony for the Web, Cailin Boyle

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PRINTING TECHNIQUES-III

Course Code: FNA2515 **Credit Units: 02**

Course Objective:
This course in designed for learning basic techniques in print making, surface printing relief media and use of printing equipment and tools. This course provides training on technical method of making relief blocks.

Course Contents:

Module I
Originals for reproduction (monochrome, line originals)
Photographic materials and equipments.
Line negative making.
Line block-making

No. of works to be done – 08

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Color Harmony for the Web, Cailin Boyle

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TEXTILE DESIGN-I

Course Code: FNA2516 **Credit Units: 02**

Course Objective:
To enable creation of various types of textile designs and patterns

Course Contents:

Module I
Fundamental of Textile Design: Motif, Repeat & Design Concept, Setting of Repeat & Change or Repeat into Design.

Module II

Design for Weaving:
a. Weaving Texture
b. Stripe & Check Effect
c. Floral Design

No. of works to be done – 08

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

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DRAWING - V

Course Code: FNA2518 **Credit Units: 02**

Course Objective:
The objective of Drawing Exercise is to practice the basic technique in direct way emphasizing on various aspects and techniques of drawing in advanced concept, exploring and experimenting variety of drawing tools and mediums in traditional way as well as innovative way. This exercise provides accuracy in observation and great opportunity to face the challenge and experiment possibilities in line work.

Course Contents:

Module I: Still Life
Study of selected assorted objects in advanced drawing techniques using various drawing tools based on eye level, relative proportion, perspective, structure, form, volume, texture, source of light and its effect, balance and also tonal values in analytical process.

Module II: Landscape/ Nature Study (outdoor)
Advanced training in landscape drawing depending upon artist's observation, concept of addition and elimination, simplification. Study from nature as a controlled design, difference of handling near and distant objects.

Module III: Life Drawing- Portraiture
Advanced drawing study of human heads based on proportion, masses and specific feature and character using various media with emphasize on manner of finished execution.
Life Drawing-Full Figure: Advanced drawing study from full human figure based on structure of human form and anatomy using life models

Module IV: Sketching
Quick sketches in limited time from life and nature exploring innovative possibilities emphasizing on advanced techniques - Outdoor and indoor.

No. of works to be done – 20

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- An Introduction to Drawing by James Horton in association with the Royal Academy of Arts.

References:
- How to draw and paint by Hazel Harrison ,from Art School
- Human Figure by Walter Foster
- Anatomy by Walter Foster
- Heads by Walter Foster
- Figure Drawing by Patricia Monahan with Albany Wiseman
- Human Anatomy by James Horton
- Big book of Drawing and painting by Francisco Asensio Cerver.

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PAINTING - V

Course Code: FNA2519 **Credit Units: 03**

Course Objective:
Painting is a visual experience with various medium and techniques .learning the fundamental methods of painting will lead to an individual style of painting .developing skill and experimenting different media of painting working in water colour , acrylic and oil colour technique.

Course Contents:

Module I: Still Life
Advanced Painting Study in water colour from selected assorted objects along with drapery; emphasizing on composition, eye level, structure, relative proportion and perspective, source of light and its effect, tonal and textural values with appropriate colour balance and colour perspective.

Module II: Painting from life
Portraiture: Advanced study of human head using colours. The knowledge of advanced techniques of colour application

Module III: Landscape
Figurative composition with opaque colour treatment.

Module IV: Mix Media
Experimentation with various painting mediums exploring innovative techniques to represent thoughts in creative form. Use of various tools like roller, spetuta etc.

No. of works to be done – 16

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Big book of drawing and painting by Francisco Asensio Cerver
- Notes on the techniques of Painting by Hilaire Hiler
- Method and Materials by Lynton Lamb.
- Artist's Handbook by Ray Smith
- Artist's Encyclopedia by John Quick
- A manual of Painting Materials & Techniques by Mark David Goattsegen
- Art Class, Copy Right 1999 by Harper Collins Publishers.
- Images of the human body by Pepin Van Roojen.
- A Concise History of Modern Painting, 1974 Thames & Hudson, London
- Painting Courseby Ronald Pearsall
- The portrait by Norbert Schneider.
- Color by Edith Anderson Feisner.

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COMPOSITION – III

Course Code: FNA2520 **Credit Units: 02**

Course Objective:
Composition exercise is the most important to learn and study theory of composition, individual approach to the possibilities. Experimenting innovative arrangement of the thing around to create unique visual presentation improves artistic sense and concept of beauty.

Course Contents:

Module I
Composition, arrangement of objects, figures and architectures.

Module II
Creative composition exercise from imagination emphasizing on individual creative sense, transformation of simple shapes into well-balanced unique visual presentation with experimentation.

No. of works to be done – 10

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Artist's Handbook by Ray Smith
- Artist's Encyclopedia by John Quick

References:
- Big book of drawing and painting by Francisco Asensio Cerver
- Art Class, Copy Right 1999 by Harper Collins Publishers.
- A Concise History of Modern Painting, 1974 Thames & Hudson, London
- Painting Courseby Ronald Pearsall
- The portrait by Norbert Schneider.
- Color by Edith Anderson Feisner.

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PHOTOGRAPHY- III

Course Code: FNA2521 **Credit Units: 02**

Course Objective:
The objective of this course is to provide an experimental exposure on photography highlighting on creative aspects. Experiments on nature, depending upon time and mood. It also provides experimental experience on indoor subjects.

Course Contents:

Module I
Basic use of camera, observation according to photographic angles, selection of subject, composition exploring indoor and outdoor situations including effects of light.

No. of works to be done – 12

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Photomechanic & Printing by J.S. Mertle & Gordon
- Photo techniques by Lee Frost
- Location Photography Secrets by Andy Snow

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PRINT MAKING- III

Course Code: FNA2522 **Credit Units: 02**

Course Objective:
This course in designed for learning techniques in print making, surface relief printing using printing equipment and tools. This course provides technical training on method of making experimental relief blocks on various surfaces.

Course Contents:

Module I
Exploring various texture of different surface by using materials including metal sheets like zinc plate and aluminum sheet.

Module II
Advanced experimentation with monochrome & multi-color lithography etching – intaglio/photo process, advanced print making, use of multicolor relief print and mixed media and further experimentation.

No. of works to be done – 10

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- The art of the print by Fritz Eicherberg
- The bite of print by Frank and Dorothy Gettein
- The art of Print by Earl G. Mueller
- The art of Etching by E.S.Lumdsen
- Manal of woodcut printmaking by J. Hillier
- Screen Process Printing by Schwalbach

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TRADITIONAL PAINTING-I

Course Code: FNA2523 **Credit Units: 02**

Course Objective:
To introduce Indian traditional art and painting techniques and styles

Course Contents:

Module I
Rajasthani Miniature
Mughal Miniature
Pahari Miniature
Nathdwara and Tanjore Paintings

No. of works to be done – 12

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

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PAINTING METHODS AND MATERIALS - III

Course Code: FNA2524 **Credit Units: 02**

Course Objective:
The Course is planned to provide technical knowledge of various mediums, techniques and tools used for different kinds of artwork practically.

Course Contents:

Module I
Preparation of canvas
Streching and framing of canvas & Traditional and Folk Paintings making Process etc.

Module II
Lithography, silkscreen and etching methods and experimental approach.

Examination Scheme:

Components	CT	P	A	EE
Weightage (%)	15	10	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- The painter's handbook by Stan Smith & Prof. H. F. Tenhalt
- Materials and methods of painting by Lynton Lamb

References:
- Artists Techniques by Dr. Kohei Aida
- A manual of painting Materials and techniques by Mark Daid Gaottsegen
- Notes on the techniques of painting by Hilaire Hiler

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PROJECT-I

Course Code: FNA2532 **Credit Units: 03**

Course Objective:
The objective of this course is to help the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issue, involving a systematic approach to gathering and analysis of information/data, leading to production of a structured Report.

Chapter Scheme and distribution of marks:

Chapter 1: Introduction – 10 marks
Chapter 2: Conceptual Framework/National/International Scenario – 25 marks
Chapter 3: Presentation, Analysis & Finding – 25 marks
Chapter 4: Conclusion & Recommendations – 10 marks
Chapter 5: Bibliography – 05 marks

Selection of the Topic for the project by taking following points into consideration:

- Suitability of the topic
- Relevance of the Topic
- Time available at the disposal

Examination Scheme:

Components	**Project Report**	**PowerPoint Presentation & Viva**
Weightage (%)	75	25

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Note:-
Marking is completely based on submitted project Report

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DISSERTATION-I

Course Code: FNA2637 **Credit Units: 06**

Course Objective:
This course is to continue the research work to put the collected materials together for developing the body of the dissertation on the particular subject.
Putting up the necessary photographs, reproductions with the text materials.

Course Contents:

Module I
Preparing the final paper along with necessary photographs, reproductions with detail information.

Module II
Submission and review of printed dissertation paper.

Examination Scheme:

Components	PR	PS	V
Weightage (%)	70	15	15

(**V**- Viva**; PR**- Project Report**; PS;** Presentation)

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Course Code: FNA2604 **Credit Units: 02**

Course Objective:
The Objective of Composition exercise is the key to study theory of composition in sculptural 3 Dimensional representations of thoughts and concepts. This work provides a meaningful knowledge on creative expression.

Course Contents:

Module I
Sketches in clay of given subjects and the enlargement in round and relief with two of more human figure, birds animals, moulding and casting, direct building processes. Plaster, Cement and terracotta.

Module II
Building of armature for direct work in plaster or cement on the given topic.

Module III
Waste mould and piece mould technique and casting in wax.

No. of works to be done – 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- The Sculptor's Handbook, Prof H. F. Ten Holt

References:
- Encyclopedia of Sculpture by John Mills
- Modeling a Likeness in Clay, Daisy Grubbs
- The Complete Guide to Sculpture. Modeling and Ceramics. Techniques and materials by Barry Midgley.

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METAL CASTING - II

Course Code: FNA2605 **Credit Units: 02**

Course Objective:
The course is designed to improve the skills in working with these two mediums based on textural values and technical differences chiseling out artist's own expressions.

Course Contents:

Module I
Making maquettes in wax or clay alongwith addition, alteration & modification depending upon the layout. Enlargement of the maquette in round or relief

Module II
Student will learn the process of sand casting.

Module III
Finishing, grinding, buffing, and polishing.

No. of works to be done – 03

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Contemporary Stone Sculpture, Dona Z. Meliach
- Dictionary of tools by R. A Salaman.
- Methods and Materials of Sculpture by David Raid.
- The Sculptor's Handbook, Prof H. F. Ten Holt
- The Complete Guide to Sculpture. Modeling and Ceramics. Techniques and materials by Barry Midgley.

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MURAL - IV

Course Code: FNA2606 **Credit Units: 02**

Course Objective:
This course is to provide advanced training to work on wall surface using various mediums emphasizing all possible techniques. It provides professional exposure and professional knowledge of handling mural materials.

Course Contents:

Module I
Practical mural work on slab using mosaic tiles

No. of works to be done – 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- The complete guide to Sculpture, Modeling and Ceramics: Techniques and materials by Barry Midgley.

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PHOTOGRAPHY - IV

Course Code: FNA2607 **Credit Units: 02**

Course Objective:
The objective of this course is to provide advanced exposure on photography highlighting on all possible creative aspects on natural subjects and also indoor subjects.

Course Contents:

Module I
Introduction to the process of developing and printing, films and their sensitivity. Basic knowledge of photo printing papers and various chemicals.

No. of works to be done – 12

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Photomechanic & Printing by J.S. Mertle & Gordon
- Photo techniques by Lee Frost
- Location Photography Secrets by Andy Snow

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CERAMICS - IV

Course Code: FNA2608 **Credit Units: 02**

Course Objective:
This course is to provide training on creative techniques on ceramics.

Course Contents:

Module I
Creating innovative texture and design on claywork.

No. of works to be done – 08

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- The complete guide to Sculpture, Modeling and Ceramics: Techniques and materials by Barry Midgley.

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ASSEMBLAGE - IV

Course Code: FNA2609 **Credit Units: 02**

Course Objective:
This course is designed to provide creative experimental training on assemblage.

Course Contents:

Module I
Methods of technical assemblage aesthetically

No. of works to be done – 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- The complete guide to Sculpture, Modeling and Ceramics: Techniques and materials by Barry Midgley.

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SCULPTURE METHODS AND MATERIALS - IV

Course Code: FNA2610 **Credit Units: 02**

Course Objective:
The Course is planned for detailed training on methods and materials to work with through the edges. It is to provide technical knowledge of various mediums, techniques and tools used for different kinds of art work practically.

Course Contents:

Module I
Types of clay, Plaster of Paris, Cement & its properties

Module II
Nature and types of wood its growth and process of seasoning use of various tools and equipments.

Examination Scheme:

Components	CT	P	A	EE
Weightage (%)	15	10	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Fundamental of Indian Art by S. N. Dasgupta
- Dance of Shiva by A. K. Coomaraswamy
- Transformation of Nature in Art by A. K. Coomaraswamy

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DRAWING AND ILLUSTRATION – IV

Course Code: FNA2611 **Credit Units: 02**

Course Objective:
Drawing exercises are to learn accurate observation and skills of graphic presentation, and various exercises on illustrations.

Course Contents:

Module I
Illustrate children story book.

No. of works to be done – 04

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Anatomy & Drawing, Victor Perard, Pitman Publishing, New York, 1955

References:
- The Art of Drawing Heads and Hands, Walter Brooks, M. Grumbacher, New York, 1966.
- Figure Drawing, Victor Perard, Grosset and Dunlop, New York, 1956.
- Drawing Hands, Carl Sheek, Grosset and Dunlop, New York, 1959
- Children Picture Books, Magazines.
- The art of humorous illustrations, Nick Meglin
- Germany in winter time, Mario De Mirando, Tata Press, 1980

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DESIGN – VI

Course Code: FNA2612 **Credit Units: 03**

Course Objective:
This course provides a clear concept of various aspects of designing. It is specially planned for a graphic artist to enable students to develop a commercial skill in design work.

Course Contents:

Module I
Comparatively study of different types of outdoor layouts like Hording, bus shelter, Poster etc

No. of works to be done – 08

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Graphic Arts Manual, Irwing E. Field, Arne Press, New York, 1980

References:
- The Art of Human Illustration, Nick Meglin,
- Corporate Graphics, Mike Quon
- A History of Graphic Design, Philip B Meggs,
- Graphic Arts Manual, Irwing E. Field, Arne Press, New York, 1980
- Design Graphics, C. L. Martin, Macmillan Co. London.

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PACKAGING - II

Course Code: FNA2613 **Credit Units: 02**

Course Objective:
Making of various packaging according to products environment and needs

Course Contents:

Module I
Advanced exercises on packaging according to various shapes and styles.

No. of works to be done – 08

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Packaging Art for Export by Nduka Nwosu
- Packaging: The art of the right proposition: An artistic from: Groser (HTML) – Nicola Gordon-Seymour

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PRINTING TECHNIQUES-IV

Course Code: FNA2614 **Credit Units: 02**

Course Objective:
This course in designed for learning basic techniques in print making, surface printing relief media and use of printing equipment and tools. This course provides training on technical method of making relief blocks.

Course Contents:

Module I
Originals for reproduction (Monochrome, half tone originals)
Half tone negative –making.
Half tone block making.

No. of works to be done – 08

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Color Harmony for the Web, Cailin Boyle

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COMPUTER GRAPHICS – IV

Course Code: FNA2615 **Credit Units: 01**

Course Objective:
To work on design related software's for various purpose.

Course Contents:

Module I
Tools interface and Applications of Flash software.

No. of works to be done – 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Color Harmony for the Web, Cailin Boyle

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TEXTILE DESIGN-II

Course Code: FNA2616 **Credit Units: 02**

Course Objective:
To enable creation of various types of textile designs and patterns.

Course Contents:

Module I
Fundamental of Textile Design: Motif, Repeat & Design Concept, Setting of Repeat & Change or Repeat into Design.

Module II

Design for Block Printing :

- Design for Block Printing
- Design for Screen Printing

No. of works to be done – 08

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

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DRAWING - VI

Course Code: FNA2618 **Credit Units: 02**

Course Objective:
This course will be found on learning pen & ink drawing technique depicting various objects and nature. It is to devlop skill in handling black and white distribution, tonal various and texture which will lead to expertise in visualization.

Course Contents:

Module I: Still Life in pen & ink
Study of selected assorted objects in advanced drawing techniques using various drawing tools based on eye level, relative proportion, perspective, structure, form, volume, texture, source of light and its effect, balance and also tonal values in analytical process.

Module II: Landscape/ Nature Study (outdoor) in pen & ink
Advanced training in landscape drawing depending upon artist's observation, concept of addition and elimination, simplification. Study from nature as a controlled design, difference of handling near and distant objects.

Module III: Life Drawing- Portraiture in pen & ink
Advanced drawing study of human heads based on proportion, masses and specific feature and character using various media with emphasize on manner of finished execution.
Life Drawing-Full Figure: Advanced drawing study from full human figure based on structure of human form and anatomy using life models.

No. of works to be done – 20

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- An Introduction to Drawing by James Horton in association with the Royal Academy of Arts.

References:
- Grassroot of Art by Herbert Read
- How to draw and paint by Hazel Harrison ,from Art School
- Human Figure by Walter Foster
- Anatomy by Walter Foster
- Heads by Walter Foster
- Figure Drawing by Patricia Monahan with Albany Wiseman
- Human Anatomy by James Horton
- Big book of Drawing and painting by Francisco Asensio Cerver.

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PAINTING - VI

Course Code: FNA2619 **Credit Units: 03**

Course Objective:
This is an intensive and advanced training in painting using variety of painting mediums and tools. Mastery of technical aspects of painting provides advanced knowledge for the learners. It is an exposure to different schools, traditions, techniques and media of painting practiced through the ages in details.

Course Contents:

Module I: Still Life
Creative composition in acrylic or oil colour on canvas.

Module II: Painting from life
Portraiture and full figure: Advanced study of human head and full figure using colours. The knowledge of advanced techniques of colour application in monochrome and full colour.

Module III: Landscape
Exploring outdoor painting to capture the various moods of nature.

Module IV: Mix Media
Experimentation with various painting mediums exploring innovative techniques to represent thoughts and dreams in creative form.

No. of works to be done – 12

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Notes on the techniques of Painting by Hilaire Hiler
- Painting Courseby Ronald Pearsall

References:
- Big book of drawing and painting by Francisco Asensio Cerver by Mark David Goattsegen
- Art Class, Copy Right 1999 by Harper Collins Publishers.
- Images of the human body by Pepin Van Roojen.
- A Concise History of Modern Painting, 1974 Thames & Hudson, London
- The portrait by Norbert Schneider.

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COMPOSITION - IV

Course Code: FNA2620 **Credit Units: 02**

Course Objective:
The objective of composition exercise is to study theory of composition, individual approach to the possibilities. Exploration of creative composition of the real world and imaginary world in unique visual presentation, to improve concept of creative sense.

Course Contents:

Module I
Composition Exercises working on still life, life and nature study – outdoor and indoor. The 2-D and 3-D objects, pictorial space, forms sub division and grouping. Use of colour and textural values

Module II
Creative composition exercise based on individual layouts using various painting mediums giving more stress on oil on canvas also on acrylic.

No. of works to be done – 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Big book of drawing and painting by Francisco Asensio Cerver
- Artist's Handbook by Ray Smith
- Artist's Encyclopedia by John Quick
- Art Class, Copy Right 1999 by Harper Collins Publishers.
- Images of the human body by Pepin Van Roojen.
- A Concise History of Modern Painting, 1974 Thames & Hudson, London
- Painting Courseby Ronald Pearsall
- The portrait by Norbert Schneider.
- Color by Edith Anderson Feisner.

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MURAL - II

Course Code: FNA2621 **Credit Units: 02**

Course Objective:
This course is to innovative training to work on wall surface using various mediums emphasizing technical aspects. It provides professional exposure and good knowledge of handling mural materials to work on wall surface.

Course Contents:

Module I
Designing for mural work as per the advanced techniques of working on wall surface with tiles, Arrangement of tiles and fixing on board for final execution.

No. of works to be done – 04

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Painting Murals: Image, Ideas & Techniques by Patrica Seligman
- Paintings Murals Fast & Easy: 21 (Design for walls, canvas you can paint with a sponge) by Terrence Tse, Theodore
- Paintings Murals Step by Step by Charles Grund.

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PRINT MAKING-II

Course Code: FNA2622 **Credit Units: 01**

Course Objective:
This course in designed for learning techniques in print making, surface relief printing using printing equipment and tools. This course provides technical training on method of making experimental relief blocks on various surfaces.

Course Contents:

Module I
Exploring various texture of different surface by using materials including metal sheets like zinc plate and aluminum sheet.

Module II
Advanced experimentation with monochrome & multi-color lithography etching – intaglio/photo process, advanced print making, use of multicolor relief print and mixed media and further experimentation.

No. of works to be done – 10

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- The art of the print by Fritz Eicherberg
- The bite of print by Frank and Dorothy Gettein
- The art of Print by Earl G. Mueller
- The art of Etching by E.S.Lumdsen
- Manal of woodcut printmaking by J. Hillier
- Screen Process Printing by Schwalbach

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PAINTING METHODS AND MATERIALS - IV

Course Code: FNA2623 **Credit Units: 02**

Course Objective:
The Course is planned to provide technical knowledge of various mediums, techniques and tools used for different kinds of art work practically.

Course Contents:

Module I
Classification and variation of colours.
Chemical factors and cause of changing colours.

Module II
Techniques of fresco painting
Tempara Techniques

Module III
Cataloging, Concept of art galleries and auction houses.

Examination Scheme:

Components	CT	P	A	EE
Weightage (%)	15	10	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- The painter's handbook by Stan Smith & Prof. H. F. Tenhalt
- Materials and methods of painting by Lynton Lamb

References:
- Artists Techniques by Dr. Kohei Aida
- A manual of painting Materials and techniques by Mark Daid Gaottsegen
- Notes on the techniques of painting by Hilaire Hiler

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COMPUTER ANIMATION – II

Course Code: FNA2624 **Credit Units: 03**

Course Objective:
Objective of this course is to undergo Maya deformers, rigging, animation, dynamics, lighting, rendering so the student can have complete knowledge of the software.

Course Contents:

Module I
Deformers, Rigging, Animation

Module II
Dynamics, Lighting & Rendering

No. of works to be done – 12

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Mastering Maya 2009 by Eric Kelly
- Character Animation Fundamentals (Digital) by Chris Kirshbaum.
- Character Rigging (Digital) Carlo Sansonctti
- Mental Ray. Global Illumination (Rendering Techniques) by Matt Hartle

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PRACTICAL TRAINING EVALUATION-II

Course Code: FNA2735 **Credit Units: 02**

Course Objective:
The Practical Training can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal class room situations. The students have to prepare a project and give a presentation highlighting the following:

BFA (Applied Art)
- Organizational structure
- Design Development
- Software's used for designing
- Type of printing machines used
- Industry feedback

BFA (Painting)
- About Senior Artist and his/her history, work style etc.
- Student's independent work style.

BFA (Animation)
- Organizational structure
- Demo reel
- Software's used for 2D / 3D animation
- Personal review of the students management skill
- Animation studio feedback

Assessment Scheme:

Continuous Evaluation: (based on Internship File and the observations of the faculty guide/ supervisor)	15%
Feedback from Company/ Organization:	25%
Final Evaluation: (Based on Internship Report, Viva/ Presentation)	60%

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COMPOSITION - V

Course Code: FNA2703 **Credit Units: 02**

Course Objective:
The Objective of Composition exercise is the key to study theory of composition in sculptural 3 Dimensional representations of thoughts and concepts. This work provides a meaningful knowledge on creative expression.

Course Contents:

Module I
Detailed and advance sketches in clay of given subjects and the enlargement in round and relief exploring various possible techniques of moulding and casting, direct building processes.

Module II
Building of armature for direct work in plaster or cement on the given topic.

Module III
Waste mould and piece mould technique and casting in wax.

No. of works to be done – 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- The Sculptor's Handbook, Prof H. F. Ten Holt

References:
- Encyclopedia of Sculpture by John Mills
- Modeling a Likeness in Clay, Daisy Grubbs
- The Complete Guide to Sculpture. Modeling and Ceramics. Techniques and materials by Barry Midgley.

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METAL CASTING - III

Course Code: FNA2704 **Credit Units: 02**

Course Objective:
The course is designed to improve the skills in working with these two mediums based on textural values and technical differences chiseling out artist's own expressions.

Course Contents:

Module I
Making maquettes in wax or clay alongwith addition, alteration & modification depending upon the layout. Enlargement of the maquette in round or relief.

Module II
Student will learn the process of sand casting

Module III
Finishing, grinding, buffing, polishing

No. of works to be done – 04

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Contemporary Stone Sculpture, Dona Z. Meliach
- Dictionary of tools by R. A Salaman.
- Methods and Materials of Sculpture by David Raid.
- The Sculptor's Handbook, Prof H. F. Ten Holt
- The Complete Guide to Sculpture. Modeling and Ceramics. Techniques and materials by Barry Midgley.

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MURAL - V

Course Code: FNA2705 **Credit Units: 02**

Course Objective:
This course is to provide an advanced training on Mural.

Course Contents:

Module I
Experimentation on mural work in professional way with direct and indirect methods, designs, materials and techniques including Mosaic tiles, Fresco, Encaustic and assemblage along with glaze, distemper, plastering and installing on wall.

No. of works to be done – 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- The complete guide to Sculpture, Modeling and Ceramics: Techniques and materials by Barry Midgley.

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PHOTOGRAPHY - V

Course Code: FNA2706 **Credit Units: 02**

Course Objective:
This course is to provide an advanced training on photography.

Course Contents:

Module I
Advanced training on photography capturing various moods from nature & indoor subjects with special light effects emphasizing on different types of lances to explore experimental photographic techniques.

No. of works to be done – 20

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Photomechanic & Printing by J.S. Mertle & Gordon
- Photo techniques by Lee Frost
- Location Photography Secrets by Andy Snow

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CERAMICS - V

Course Code: FNA2707 **Credit Units: 02**

Course Objective:
This course is to provide training on creative techniques on ceramics.

Course Contents:

Module I
Working on 3D creative form, introduction to glazing.

No. of works to be done – 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- The complete guide to Sculpture, Modeling and Ceramics: Techniques and materials by Barry Midgley.

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ASSEMBLAGE - V

Course Code: FNA2708 **Credit Units: 02**

Course Objective:
This course is designed to provide creative experimental training on assemblage.

Course Contents:

Module I
Advanced creative assemblage.

No. of works to be done – 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- The complete guide to Sculpture, Modeling and Ceramics: Techniques and materials by Barry Midgley.

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SCULPTURE METHODS AND MATERIALS - V

Course Code: FNA2709 **Credit Units: 02**

Course Objective:
The Course is planned for detailed training on methods and materials to work with through the edges. It is to provide technical knowledge of various mediums, techniques and tools used for different kinds of art work practically.

Course Contents:

Module I
System of indigenous casting foundry practice, metals and alloys.

Module II
Coppers and its alloys, metals and alluminium etc. melting points of different metals. Properties of bronze preparation of modeling was and reins, finishing and technical treatments.

Examination Scheme:

Components	CT	P	A	EE
Weightage (%)	15	10	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Fundamental of Indian Art by S. N. Dasgupta
- Dance of Shiva by A. K. Coomaraswamy
- Transformation of Nature in Art by A. K. Coomaraswamy

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DESIGN - VII

Course Code: FNA2710 **Credit Units: 05**

Course Objective: Students will learn the various exercises of Design according to the promotion of products and services.

Course Contents:

Module I
Promotional campaign for any product (indoor as well as outdoor advertisement)
Create a distinct brand identity campaign design for product, services and social awareness while building networking and entrepreneurial skills. With the help of print media, broadcast and social media promotion. Working on a Social Design research-based project leads you to evolve into ethical and purposeful design professionals committed to designing for a better future.

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(A-Attendance; P-Project/Seminar/Quiz/Viva; HA-Home Assignment; CT-Class Test; EE-End Semester Examination; PT- Portfolio)

Text & References:
Text:

- Graphic Arts Manual, Irwing E. Field, Arne Press, New York, 1980

References:

- The Art of Human Illustration, Nick Meglin,
- Corporate Graphics, Mike Quon
- A History of Graphic Design, Philip B Meggs,
- Graphic Arts Manual, Irwing E. Field, Arne Press, New York, 1980
- Design Graphics, C. L. Martin, Macmillan Co. London.

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PACKAGING - III

Course Code: FNA2711 **Credit Units: 03**

Course Objective:
Various Packaging Designs.

Course Contents:

Module I
3D forms in thermo coal & card board etc.

No. of works to be done – 08

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Packaging Art for Export by Nduka Nwosu
- Packaging: The art of the right proposition: An artistic from: Groser (HTML) – Nicola Gordon-Seymour

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DRAWING AND ILLUSTRATION-V

Course Code: FNA2712 **Credit Units: 02**

Course Objective:
Drawing exercises are to learn accurate observation and skills of graphic presentation, and various exercises on illustrations.

Course Contents:

Module I
Illustrate Graphic Novels and Book/Magazine Covers.

No. of works to be done – 04

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Anatomy & Drawing, Victor Perard, Pitman Publishing, New York, 1955

References:
- The Art of Drawing Heads and Hands, Walter Brooks, M. Grumbacher, New York, 1966.
- Figure Drawing, Victor Perard, Grosset and Dunlop, New York, 1956.
- Drawing Hands, Carl Sheek, Grosset and Dunlop, New York, 1959
- Children Picture Books, Magazines.
- The art of humorous illustrations, Nick Meglin
- Germany in winter time, Mario De Mirando, Tata Press, 1980

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COMPUTER GRAPHICS – V

Course Code: FNA2713 **Credit Units: 02**

Course Objective:
To work on design related software's for various purpose.

Course Contents:

Module I
Advance study of Flash software and Applications.

No. of works to be done – 04

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Color Harmony for the Web, Cailin Boyle

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PHOTOGRAPHY-V

Course Code: FNA2714 **Credit Units: 02**

Course Objective:
The objective of this course is to provide an experimental exposure on photography highlighting on creative aspects. Experiments in darkroom on light control, developing and fixing the pictures. It also provides experimental experience on indoor and outdoor subjects.

Course Contents:

Module I
Experiments on indoor and outdoor subjects. Post Production research in dark room.

No. of works to be done – 12

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Photomechanic & Printing by J.S. Mertle & Gordon
- Photo techniques by Lee Frost
- Location Photography Secrets by Andy Snow
- Photomechanic & Printing by J.S. Mertle & Gordon
- Photo techniques by Lee Frost
- Location Photography Secrets by Andy Snow

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DRAWING - VII

Course Code: FNA2716 **Credit Units: 03**

Course Objective:
Advanced drawing exercise is an exposure to various creative aspects and contemporary techniques of drawing exploring all available drawing tools and mediums such as pencil, charcoal, crayons, ink, colour and brush. This exercise provides accuracy in observation and wide opportunity to study and experiment variety of significant possibilities of line work.

Course Contents:

Module I: Portrait study
Portrait study with charcoal from model, life study.

Module II: life study
Life study from a model in different media of drawing**.**

Module III: Full Figure
Advanced drawing study of human head and full body (male & female) exploring complex detailing and finishing from different viewpoints and angles using suitable drapery background and surrounding.

Module IV: creative and indivisual composition using pen and ink

No. of works to be done – 08

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:

- An Introduction to Drawing by James Horton in association with the Royal Academy of Arts.

References:

- Grassroot of Art by Herbert Read
- How to draw and paint by Hazel Harrison ,from Art School
- Human Figure by Walter Foster
- Anatomy by Walter Foster
- Heads by Walter Foster
- Figure Drawing by Patricia Monahan with Albany Wiseman
- Human Anatomy by James Horton
- Big book of Drawing and painting by Francisco Asensio Cerver.

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PAINTING & COMPOSITION - I

Course Code: FNA2717 **Credit Units: 05**

Course Objective:
Painting is an activity which requires a long time involvement to achieve excellence. This stage to explore one's own ideas and style. Studying various schools of art, traditional to modern and contemporary. This stage is to focus in one particular style of his or her own after learning various techniques of paintings. The students would produce/create a number of works of art, paintings and drawings in a fashion of specializing in the subject. It is to specialize in thinking and imagination which create good art.

Advanced exercise on composition work provides thorough knowledge on theory of composition, individual approach to the possibilities and experimental innovative aspects to create unique visual presentation enriched with artistic and aesthetic value. Working with figurative and non-figurative arrangement of objects.

Course Contents:
Module I
Sketching/making layouts based onlife experience, culture and people
Human Figure Study Based on Models from Various Perspective.
Medium: Pastel (dry/oil)/water colour etc.

Module: II
Painting on individual composition based on thelayouts.
Painting Using Digital Media Application and Mixed Media.

Module III
Composition Exercises working on objects from real life and nature. Creative transformation of real world according to the possibilities (2-D & 3-D), use of colour and textural values, forms and individual expression.
Medium: Acrylic/oil/tempara on canvas/paper/board.

Module IV
Creative composition exercise from imagination emphasizing on individual vision and concept, complete pictorial interpretation, theme, expression of moods, symbolism, dramatization, and distortion for emotional effect. Project on independent creative work.

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:
- Big book of drawing and painting by Francisco AsensioCerver
- Notes on the techniques of Painting by HilaireHiler
- Method and Materials by LyntonLamb.
- Artist‟s Handbook by RaySmith
- Artist‟sEncyclopedia by JohnQuick
- A manual of Painting Materials & Techniques by Mark DavidGoattsegen
- Art Class, Copy Right 1999 by Harper CollinsPublishers.
- Images of the human body by Pepin VanRoojen.
- A Concise History of Modern Painting, 1974 Thames &Hudson,London
- Painting CoursebyRonaldPearsall
- The portrait by NorbertSchneider.
- Color by Edith AndersonFeisner.

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MURAL - III

Course Code: FNA2718 **Credit Units: 02**

Course Objective:
This course is for innovative training to work on wall surface using various mediums emphasizing technical aspects. It provides professional exposure and good knowledge of handling mural materials to work on wall surface.

Course Contents:

Module I
Designing for mural work as per the advanced techniques of working on wall surface with tiles .arrangement of tiles and fixing on board.

Module II
Relief mural in P.O.P & mix media.

No. of works to be done – 04

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Painting Murals: Image, Ideas & Techniques by Patrica Seligman
- Paintings Murals Fast & Easy: 21 (Design for walls, canvas you can paint with a sponge) by Terrence Tse, Theodore
- Paintings Murals Step by Step by Charles Grund.

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PRINT MAKING - III

Course Code: FNA2719 **Credit Units: 02**

Course Objective:
This course in designed for learning techniques in print making, surface relief printing using printing equipment and tools. This course provides technical training on method of making experimental relief blocks on various surfaces.

Course Contents:

Module I
Exploring various texture of different surface by using materials including metal sheets like zinc plate and aluminum sheet.

Module II
Advanced experimentation with monochrome & multi-color lithography, etching – intaglio/photo process, aquatint, mezzotint, advanced print making, use of multicolor relief print and mixed media and further experimentation.

No. of works to be done – 10

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- The art of the print by Fritz Eicherberg
- The bite of print by Frank and Dorothy Gettein
- The art of Print by Earl G. Mueller
- The art of Etching by E.S.Lumdsen
- Manal of woodcut printmaking by J. Hillier
- Screen Process Printing by Schwalbach

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PAINTING METHODS AND MATERIALS - V

Course Code: FNA2720 **Credit Units: 02**

Course Objective:
This course is designed to provide a thorough knowledge of methods and technical aspects of drawing and painting work. It helps the students to handle the materials and tools in scientific way.

Course Contents:

Module I
Technique of Jaipur Murals.
Ceramics, glass and terra-cotta tiles.

Module II
Various modern techniques in Painting and Printmaking.
Restoration and Preservation.

Module III
Exhibition Display and Lighting.

Examination Scheme:

Components	CT	P	A	EE
Weightage (%)	15	10	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- The painter's handbook by Stan Smith & Prof. H. F. Tenhalt
- Materials and methods of painting by Lynton Lamb

References:
- Artists Techniques by Dr. Kohei Aida
- A manual of painting Materials and techniques By Mark Daid Gaottsegen

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PROJECT - II

Course Code: FNA2732 **Credit Units: 03**

FOR ANIMATION SPECIALIZATION

Course Objective:
The objective of this course is to help the student in their preparation of their Show Reel and let them understand the pipeline procedure of the industry by working in groups.

Methodology
Students are advised to work in small groups and make a short animation clip.

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Note: - Marking is based on submitted project work (Show reel)

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PORTFOLIO DEVELOPMENT AND PRESENTATION WITH EXHIBITIONS

Course Code: FNA2837 **Credit Units: 5**

Course Objective:
Portfolio Development & Presentation is for the students who are in the final stage of specialization in a particular subject. The students are to prepare a portfolio which contains all type of works relating to the subjects studied by them.

Course Contents:
Submission & Presentation

Module I
As decided by faculty.

Examination Scheme:

Components	C	P	A	EE (Presentation, Report & Viva)
Weightage (%)	15	10	5	70

FOR ANIMATION SPECIALIZATION

Course Objective:
The objective of this course is to help the student in their preparation of their Demo Reel and let them understand the pipeline procedure of the industry by working in groups.

Course Contents:

Methodology
Students are advised to work on individual short animation clip.

Examination Scheme:

Components	P	C	A	FP
Weightage (%)	10	15	5	70

Note: - Marking is based on submitted project work (Demo reel)

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COMPOSITION - VI

Course Code: FNA2803 **Credit Units: 02**

Course Objective:
The Objective of Composition exercise is the key to study theory of composition in sculptural 3 Dimensional representations of thoughts and concepts. This work provides a meaningful knowledge on creative expression.

Course Contents:

Module I
Sketches in clay of given subjects and the enlargement in round and relief with two of more human figure, birds animals, moulding and casting, direct building processes. Plaster, Cement and terracotta.

Module II
Building of armature for direct work in plaster or cement on the given topic.

Module III
Waste mould and piece mould technique and casting in wax.

No. of works to be done – 04

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- The Sculptor's Handbook, Prof H. F. Ten Holt

References:
- Encyclopedia of Sculpture by John Mills
- Modeling a Likeness in Clay, Daisy Grubbs
- The Complete Guide to Sculpture. Modeling and Ceramics. Techniques and materials by Barry Midgley.

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METAL CASTING - IV

Course Code: FNA2804 **Credit Units: 02**

Course Objective:
The course is designed to improve the skills in working with these two mediums based on textural values and technical differences chiseling out artist's own expressions.

Course Contents:

Module I
Taking a waste or piece moulds in PoP. Casting in this mould with wax and fixing runners and risers and preparation of mould for firing.

Module II
Firing of the mould in a kiln. And pouring of molten metal.

Module III
Breaking open the mold and cutting of runners and risers. Grinding buffing and polishing and patina.

No. of works to be done – 04

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Contemporary Stone Sculpture, Dona Z. Meliach
- Dictionary of tools by R. A Salaman.
- Methods and Materials of Sculpture by David Raid.
- The Sculptor's Handbook, Prof H. F. Ten Holt
- The Complete Guide to Sculpture. Modeling and Ceramics. Techniques and materials by Barry Midgley.

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MURAL-IV

Course Code: FNA2805 **Credit Units: 02**

Course Objective:
This course is to provide an advanced training on Mural.

Course Contents:

Module I
Experimentation on mural work in professional way with direct and indirect methods, designs, materials and techniques including Mosaic tiles, Fresco, Encaustic and assemblage along with glaze, distemper, plastering and installing on wall.

No. of works to be done – 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- The complete guide to Sculpture, Modeling and Ceramics: Techniques and materials by Barry Midgley.

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PHOTOGRAPHY-IV

Course Code: FNA2806 **Credit Units: 02**

Course Objective:
This course is to provide an advanced training on photography.

Course Contents:

Module I
Advanced training on photography capturing various moods from nature & indoor subjects with special light effects emphasizing on different types of lances to explore experimental photographic techniques in dark room and out door.

No. of works to be done – 20

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Photomechanic & Printing by J.S. Mertle & Gordon
- Photo techniques by Lee Frost
- Location Photography Secrets by Andy Snow

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CERAMICS-IV

Course Code: FNA2807 **Credit Units: 02**

Course Objective:
This course is to provide training on creative techniques on ceramics.

Course Contents:

Module I
Working on 3D creative form, introduction to glazing.

No. of works to be done – 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- The complete guide to Sculpture, Modeling and Ceramics: Techniques and materials by Barry Midgley.

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ASSEMBLAGE-IV

Course Code: FNA2808 **Credit Units: 02**

Course Objective:
This course is designed to provide creative experimental training on assemblage.

Course Contents:

Module I
Advanced creative assemblage.

No. of works to be done – 06

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- The complete guide to Sculpture, Modeling and Ceramics: Techniques and materials by Barry Midgley.

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SCULPTURE METHODS AND MATERIALS-IV

Course Code: FNA2809 **Credit Units: 02**

Course Objective:
The Course is planned for detailed training on methods and materials to work with through the edges. It is to provide technical knowledge of various mediums, techniques and tools used for different kinds of art work practically.

Course Contents:

Module I
System of indigenous casting foundry practice, metals and alloys.

Module II
Coppers and its alloys, metals and aluminum etc. melting points of different metals. Properties of bronze preparation of modeling was and reins, finishing and technical treatments.

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Fundamental of Indian Art by S. N. Dasgupta
- Dance of Shiva by A. K. Coomaraswamy
- Transformation of Nature in Art by A. K. Coomaraswamy

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DESIGN-VIII

Course Code: FNA2810 **Credit Units: 05**

Course Objective: Students will learn the various exercises of Design according to the promotion of products and services.

Course Contents:

Module I

Promotional campaign for any product (indoor as well as outdoor advertisement)

Portfolio Development according to the industry requirement. Professional portfolio page on behance and academic, designer profile on linked in. Complete self-branding of print media and Digital research portfolio.

No. of works to be done – 04

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(A-Attendance; P-Project/Seminar/Quiz/Viva; HA-Home Assignment; CT-Class Test; EE-End Semester Examination; PT- Portfolio)

Text & References:

Text:

- Graphic Arts Manual, Irwing E. Field, Arne Press, New York, 1980

References:

- The Art of Human Illustration, Nick Meglin,
- Corporate Graphics, Mike Quon
- A History of Graphic Design, Philip B Meggs,
- Graphic Arts Manual, Irwing E. Field, Arne Press, New York, 1980
- Design Graphics, C. L. Martin, Macmillan Co. London.

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PACKAGING-IV

Course Code: FNA2811 **Credit Units: 03**

Course Objective:
Various Packaging Designs

Course Contents:

Module I
3D forms in thermo coal & card board etc.

No. of works to be done – 08

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Packaging Art for Export by Nduka Nwosu
- Packaging: The art of the right proposition: An artistic from: Groser (HTML) – Nicola Gordon-Seymour

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DRAWING AND ILLUSTRATION-VI

Course Code: FNA2812 **Credit Units: 02**

Course Objective:
Drawing exercises are to learn accurate observation and skills of graphic presentation, and various exercises on illustrations.

Course Contents:

Module I
Illustrate Graphic Novels and Book/Magazine Covers.

No. of works to be done – 04

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Anatomy & Drawing, Victor Perard, Pitman Publishing, New York, 1955

References:
- The Art of Drawing Heads and Hands, Walter Brooks, M. Grumbacher, New York, 1966.
- Figure Drawing, Victor Perard, Grosset and Dunlop, New York, 1956.
- Drawing Hands, Carl Sheek, Grosset and Dunlop, New York, 1959
- Children Picture Books, Magazines.
- The art of humorous illustrations, Nick Meglin
- Germany in winter time, Mario De Mirando, Tata Press, 1980

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COMPUTER GRAPHICS-VI

Course Code: FNA2813 **Credit Units: 02**

Course Objective:
To work on design related software's for various purpose.

Course Contents:

Module I
Advance study of Flash software and Applications.

No. of works to be done – 04

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Color Harmony for the Web, Cailin Boyle

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PHOTOGRAPHY-VI

Course Code: FNA2814 **Credit Units: 02**

Course Objective:
The objective of this course is to provide an experimental exposure on photography highlighting on creative aspects. Experiments in darkroom on light control, developing and fixing the pictures. It also provides experimental experience on indoor and outdoor subjects.

Course Contents:

Module I
Experiments on indoor and outdoor subjects. Post Production research in dark room.

No. of works to be done – 12

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Photomechanic & Printing by J.S. Mertle & Gordon
- Photo techniques by Lee Frost
- Location Photography Secrets by Andy Snow
- Photomechanic & Printing by J.S. Mertle & Gordon
- Photo techniques by Lee Frost
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DRAWING-VIII

Course Code: FNA2816 **Credit Units: 03**

Course Objective:
Advanced drawing exercise is an exposure to various creative aspects and contemporary techniques of drawing exploring all available drawing tools and mediums such as pencil, charcoal, crayons, ink, colour and brush. This exercise provides accuracy in observation and wide opportunity to study and experiment variety of significant possibilities of line work.

Course Contents:

Module I: Portrait study
Portrait study with charcoal from model, life study.

Module II: life study
Life study from a model in different media of drawing**.**

Module III: Full Figure
Advanced drawing study of human head and full body (male & female) exploring complex detailing and finishing from different viewpoints and angles using suitable drapery background and surrounding.

Module IV: creative and indivisual composition using pen and ink

No. of works to be done – 08

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- An Introduction to Drawing by James Horton in association with the Royal Academy of Arts.

References:
- Grassroot of Art by Herbert Read
- How to draw and paint by Hazel Harrison ,from Art School
- Human Figure by Walter Foster
- Anatomy by Walter Foster
- Heads by Walter Foster
- Figure Drawing by Patricia Monahan with Albany Wiseman
- Human Anatomy by James Horton
- Big book of Drawing and painting by Francisco Asensio Cerver.

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PAINTING & COMPOSITION-II

Course Code: FNA2817 **Credit Units: 05**

Course Objective:
Painting is an activity which requires a long time involvement to achieve excellence. This stage to explore one's own ideas and style. Studying various schools of art, traditional to modern and contemporary. This stage is to focus in one particular style of his or her own after learning various techniques of paintings. The students would produce/create a number of works of art, paintings and drawings in a fashion of specializing in the subject. It is to specialize in thinking and imagination which create good art.
Advanced exercise on composition work provides thorough knowledge on theory of composition, individual approach to the possibilities and experimental innovative aspects to create unique visual presentation enriched with artistic and aesthetic value. Working with figurative and non-figurative arrangement of objects.

Course Contents:
Module I
Creative Sketching Based on Surround Observation and Life Experiences.
Human Figure Study Based on Models from Various Perspective.
Medium: Pastel (Dry/Oil)/Water Colour and Mixed Media.

Module: II
Creative Painting on Individual Compositions Based on Own Concept.
Creative Painting Using Digital Media Application and Mixed Media.
Medium: Any Mediums

Module III
Composition Exercises working on objects from real life and nature. Creative transformation of real world according to the possibilities (2-D & 3-D), use of colour and textural values, form and individual expression
Medium: Acrylic/oil/tempara on canvas/paper/board.

Module IV
Creative composition exercise from imagination emphasizing on individual vision and concept, complete pictorial interpretation, theme, expression of moods, symbolism, dramatization, and distortion for emotional effect. Project on independent creative work.

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Big book of drawing and painting by Francisco AsensioCerver
- Notes on the techniques of Painting by HilaireHiler
- Method and Materials by LyntonLamb.
- Artist‟s Handbook by RaySmith
- Artist‟sEncyclopedia by JohnQuick
- A manual of Painting Materials & Techniques by Mark DavidGoattsegen
- Art Class, Copy Right 1999 by Harper CollinsPublishers.
- Images of the human body by Pepin VanRoojen.
- A Concise History of Modern Painting, 1974 Thames &Hudson,London
- Painting CoursebyRonaldPearsall
- The portrait by NorbertSchneider.

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MURAL-IV

Course Code: FNA2818 **Credit Units: 02**

Course Objective:
This course is for innovative training to work on wall surface using various mediums emphasizing technical aspects. It provides professional exposure and good knowledge of handling mural materials to work on wall surface.

Course Contents:

Module I
Designing for mural work as per the advanced techniques of working on wall surface with tiles .arrangement of tiles and fixing on board.

Module II
Relief mural in P.O.P & mix media.

No. of works to be done – 04

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- Painting Murals: Image, Ideas & Techniques by Patrica Seligman
- Paintings Murals Fast & Easy: 21 (Design for walls, canvas you can paint with a sponge) by Terrence Tse, Theodore
- Paintings Murals Step by Step by Charles Grund.

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PRINT MAKING-IV

Course Code: FNA2819 **Credit Units: 02**

Course Objective:
This course in designed for learning techniques in print making, surface relief printing using printing equipment and tools. This course provides technical training on method of making experimental relief blocks on various surfaces.

Course Contents:

Module I
Exploring various texture of different surface by using materials including metal sheets like zinc plate and aluminum sheet.

Module II
Advanced experimentation with monochrome & multi-color lithography, etching – intaglio/photo process, aquatint, mezzotint, advanced print making, use of multicolor relief print and mixed media and further experimentation.

No. of works to be done – 10

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

- The art of the print by Fritz Eicherberg
- The bite of print by Frank and Dorothy Gettein
- The art of Print by Earl G. Mueller
- The art of Etching by E.S.Lumdsen
- Manal of woodcut printmaking by J. Hillier
- Screen Process Printing by Schwalbach

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PAINTING METHODS AND MATERIALS-VI

Course Code: FNA2820 **Credit Units: 02**

Course Objective:
This course is designed to provide a thorough knowledge of methods and technical aspects of drawing and painting work. It helps the students to handle the materials and tools in scientific way.

Course Contents:

Module I
Technique of Jaipur Murals.
Ceramics, glass and terra-cotta tiles.

Module II
Various modern techniques in Painting and Printmaking.
Restoration and Preservation.

Module III
Exhibition Display and Lighting.

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- The painter's handbook by Stan Smith & Prof. H. F. Tenhalt
- Materials and methods of painting by Lynton Lamb

References:
- Artists Techniques by Dr. Kohei Aida
- A manual of painting Materials and techniques By Mark Daid Gaottsegen

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Programme Structure

Curriculum & Scheme of Examination

2023

AMITY UNIVERSITY HARYANA

GURUGRAM

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VISUALIZATION - I

Course Code: FNA4101 **Credit Units: 08**

Course Objective:
Additionally for MFA students, to develop further an ability to pursue independent research and articulate ideas in writing through a sound understanding of a range of historical, theoretical and philosophical approaches to art and an understanding of the relevance of these to their work

Course Contents:

Module I
Introduction to Visualization

Module II
Execution of ONE advertising campaigns on consumer's Institutional (Services), related with any of the appropriate medias including Print, Television, Transit etc. and in various techniques available

Module III
Photography module:
a) Product Shoot
b) Models shoot
c) Creative photography
These shoots are to be utilized in the campaign making process by the students.

Module IV
Advanced learning of Corel draw and Photoshop software

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

- The Art of Human Illustration, Nick Meglin.
- Corporate Graphics, Mike Quon
- A History of Graphic Design, Philip B Meggs.
- Graphic Arts Manual, Irwing E. Field, Arne Press, New York, 1980
- Design Graphics, C. L. Martin, Macmillan Co. London

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GRAPHIC DESIGNING - I

Course Code: FNA4102 **Credit Units: 08**

Course Objective:
Graphic designing is a creative field of work which involves imagination in communicating with users It deals with working with object, shape, text, images etc, It is uses to create corporate identity. Brochures, advertisements, print media, product, packaging and icon etc. The objective of this course is to make the students professionals and fully equipped with the software. So that the software's become just a more tool for hem to execute the finished artworks

Software's introduced:
Adobe Illustrator: Adobe Photoshop, Corel Draw

Course Contents:

Module I
To edit photographs, create artistic imagery

Module II
To create illustrations, logos

Module III
Product window display for interactive media

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

Text:
- Graphic design & reproduction techniques, Peter Croy
- Artists and illustration's encyclopedia, John Quick

References:
- The Art of Human Illustration, Nick Meglin.
- Corporate Graphics, Mike Quon
- A History of Graphic Design, Philip B. Meggs,
- Graphic Arts Manual, Irwing E. Field, Arne Press, New York, 1980
- Design Graphics, C. L. Martin, Macmillan Co. London

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TV GRAPHICS - I

Course Code: FNA4103 **Credit Units: 08**

Course Objective:
The design for programmes, station identifies signs, symbols, commercial advertisement, trade-marks and short films etc.

Course Contents:

Module I
Stations identify signs, symbols, commercial advertisement, trade-marks and short films etc.

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

Text:
- Graphic design & reproduction techniques, Peter Croy
- Artists and illustration's encyclopedia, John Quick

References:
- The Art of Human Illustration, Nick Meglin.
- Corporate Graphics, Mike Quon
- A History of Graphic Design, Philip B. Meggs
- Graphic Arts Manual, Irwing E. Field, Arne Press, New York, 1980
- Design Graphics, C. L. Martin, Macmillan Co. London

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ILLUSTRATION - I

Course Code: FNA4104 **Credit Units: 08**

Course Objective:
Advance studies in illustration for graphic expression.

Course Contents:

Module I
Forming of individual style in illustration and cartooning.

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

Text:
- Graphic design & reproduction techniques, Peter Croy
- Artists and illustration's encyclopedia, John Quick

References:
- The Art of Human Illustration, Nick Meglin.
- Corporate Graphics, Mike Quon
- A History of Graphic Design, Philip B. Meggs.
- Graphic Arts Manual, Irwing E. Field, Arne Press, New York, 1980
- Design Graphics, C. L. Martin, Macmillan Co. London

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DRAWING - I

Course Code: FNA4106 **Credit Units: 08**

Course Objective:
The course is to develop professional drawing skill through anatomical study of human figure. This drawing activity is to learn creating big sized drawing on bigger space to capture life size drawing. The drawing exercise to be done from a model in front is called life study.
Secondly this course is also to execute creative drawing based on life experience or to depict socio cultural aspect or conceptualization of new ideas.

Course Contents:

Module I: Life Study
Life study from life model

Module II: Creative Drawing
Creative drawing (figurative/non-figurative)

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

Text:
- Big book of Drawing and painting, Francisco Asensio Cerver

References:
- An Introduction to Drawing, James Horton in association with the Royal Academy of Arts.
- Grassroot of Art, Herbert Read
- How to draw and paint, Hazel Harrison, from Art School
- Human Figure, Walter Foster
- Anatomy, Walter Foster
- Heads, Walter Foster
- Figure Drawing, Patricia Monahan with Albany Wiseman
- Human Anatomy, James Horton

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CREATIVE PAINTING - I

Course Code: FNA4107 **Credit Units: 08**

Course Objective:
Life study in acrylic or oil colour on canvas from life model to exercise figurative painting technique, colour and tonal variation to create three dimensional human figure. An approach to achieve professional level realistic painting skill.
After life study the students are to give the task of innovative and experimental work. This is to execute acrylic or oil colour painting on canvas based on given themes or on themes will be chosen by the students themselves to achieve individual or original style of rendering painting. It is to explore various mediums of painting with new ideas and perception.

Course Contents:

Module I: Life Study
Life Study from life model.

Module II: Creative Painting
Painting based on social or individual experience based themes.

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

Text:
- Notes on the techniques of Painting, Hilaire Hiler
- A Concise History of Modern Painting, 1974 Thames & Hudson, London

References:
- Big book of drawing and painting, Francisco Asensio Cerver
- Method and Materials, Lynton Lamb.
- Artist's Handbook, Ray Smith
- Artist's Encyclopedia, John Quick
- A manual of Painting Materials & Techniques, Mark David Goattsegen
- Art Class, Copy Right 1999, Harper Collins Publishers.
- Images of the human body, Pepin Van Roojen.
- Painting Course, Ronald Pearsall
- The portrait, Norbert Schneider.
- Color, Edith Anderson Feisner.
- History of Painting, Janson.
- History of Western Painting, Eric Ne

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MURAL (PAINTING) - I

Course Code: FNA4108 **Credit Units: 08**

Course Objective:
The objective of this course is to provide working knowledge on wall surface. It gives a detail exposure about all kinds of mural techniques.

Course Contents:

Module I
Preparing suitable layout for mural followed by modification required according to the materials to be used

Module II
Preparing the base and surface

Module III
Final work followed by the installation

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

- Ajanta Murals, Indian Archeology Dept.
- Techniques of Indian paintings and Murals, Indian Archeology Dept.
- Decorative Murals, Donna Dewberry

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PORTRAITURE - I

Course Code: FNA4109 **Credit Units: 08**

Course Objective:
The objective of this course is to provide advanced training on portrait painting exploring all mediums.

Course Contents:

Module I
Portrait study in oil on canvas

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

Text:
- Big book of Drawing and painting, Francisco Asensio Cerver

References:
- An Introduction to Drawing, James Horton in association with the Royal Academy of Arts.
- Grassroot of Art, Herbert Read
- How to draw and paint, Hazel Harrison ,from Art School
- Human Figure, Walter Foster
- Anatomy, Walter Foster
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- Human Anatomy, James Horton

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CREATIVE DRAWING - I

Course Code: FNA4111 **Credit Units: 08**

Course Objective:
The course is to develop professional drawing skill through anatomical study of human figure. This drawing activity is to learn creating big sized drawing on bigger space to capture life size drawing. The drawing exercise to be done from a model in front is called life study.
Secondly this course is also to execute creative drawing based on life experience or to depict socio cultural aspect or conceptualization of new ideas.

Course Contents:

Module I: Life Study
Life study from life model

Module II: Creative Drawing
Creative drawing (figurative/non-figurative)

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

Text:
- Big book of Drawing and painting, Francisco Asensio Cerver

References:
- An Introduction to Drawing, James Horton in association with the Royal Academy of Arts.
- Grassroot of Art, Herbert Read
- How to draw and paint, Hazel Harrison, from Art School
- Human Figure, Walter Foster
- Anatomy, Walter Foster
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PORTRAITURE SCULPTURE-I

Course Code: FNA4113 **Credit Units: 08**

Course Objective:
This is to provide about working on realistic sculpture.

Course Contents:

Module I
Realistic sculpture study supported by preparatory studies and techniques

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

Text:
- Art Now, Herbert Read
- Sculpture Today, Kinston parker

References:
- History of Sculpture, George Henry Chase and Chander Rathforn.
- Four steps towards

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MURAL (SCULPTURE) - I

Course Code: FNA4114 **Credit Units: 08**

Course Objective:
The objective of this course is to provide working knowledge on wall surface. It gives a detail exposure about all kinds of mural techniques.

Course Contents:

Module I
Preparing suitable layout for mural followed by modification required according to the materials to be used

Module II
Preparing the base and surface

Module III
Final work followed by the installation**.**

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

- Ajanta Murals, Indian Archeology Dept.
- Techniques of Indian paintings and Murals, Indian Archeology Dept.
- Decorative Murals, Donna Dewberry

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CREATIVE SCULPTURE - I

Course Code: FNA4115 **Credit Units: 08**

Course Objective:
This is to provide professional experience about working on sculpture using various materials.

Course Contents:

Module I
Abstract Composition supported by preparatory studies and techniques.

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

Text:
- Art Now, Herbert Read
- Sculpture Today, Kinston parker

References:
- History of Sculpture, George Henry Chase and Chander Rathforn.
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REPORT AND VIVA (Specialization Specific)

Course Code: FNA4237 **Credit Units: 01**

Course Objective:
This course has an aim to be as one of the most important aspects in the process of artistic growth and for enrichment of knowledge. This will lead for awareness of contemporary art scene. The students will be given the task to prepare report on various art exhibitions and museum visits near their neighborhood.
This is to provide professional exposure for the researchers.

Course Contents:

Module I
Visiting ad-agencies, museums and exhibitions

Module II
Preparing reports on visits with visual proof.

Examination Scheme:

Components	PR	PS	V
Weightage (%)	70	15	15

(**V**-Viva; **PR**-Project Report; **PS**-Presentation)

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VISUALIZATION - II

Course Code: FNA4201 **Credit Units: 08**

Course Objective:
MFA Program grounded in hands-on making, entrepreneurial strategies, and social and environmental engagement. The realization of work for a specific community or client, and entrepreneurism that connects making a living with making a difference.

Course Contents:

Module I: Social Campaign
Take any burning issue of today's world. It can be regarding exploitation, poverty, human rights, Industrialization, women related issues or any other. Conduct a comprehensive research into its prevalence,
In the society- its origin, its extent, myths related to it, what measures are being taken to eradicate it, what more can be done etc.

Module II
Photography module for the application of social campaign effectively.

Module III
Design the social campaign for either magazine or newspaper according to the subject requirement.

Module IV
Introduction to Illustrator and Flash software.

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

- The Art of Human Illustration, Nick Meglin,
- Corporate Graphics, Mike Quon
- A History of Graphic Design, Philip B Meggs,
- Graphic Arts Manual, Irwing E. Field, Arne Press, New York, 1980
- Design Graphics, C. L. Martin, Macmillan Co. London

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GRAPHIC DESIGNING - II

Course Code: FNA4202 **Credit Units: 08**

Course Objective:
The focus of this course is on refining design work and preparation for the professional world. Projects focus on advanced issues of representation

Software's introduced:
Adobe Flash

Course Contents:

Module I
Use Adobe Photoshop and Adobe Illustrator to create Promotional campaign for print/broadcast media

Module II
Graphic design for web with software flash etc

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)
Text & References:

Text:
- Graphic design & reproduction techniques, Peter Croy
- Artists and illustration's encyclopedia, John Quick

***References*:**
- The Art of Human Illustration, Nick Meglin,
- Corporate Graphics, Mike Quon
- A History of Graphic Design, Philip B Meggs,
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TV GRAPHICS - II

Course Code: FNA4203 **Credit Units: 08**

Course Objective:
The design for programmes, station identifies signs, symbols, commercial advertisement, trade marks and short films etc.

Course Contents:

Module I
Station identify signs, symbols, commercial advertisement, trade marks and short films etc.

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

Text:
- Graphic design & reproduction techniques, Peter Croy
- Artists and illustration's encyclopedia, John Quick

***References*:**
- The Art of Human Illustration, Nick Meglin,
- Corporate Graphics, Mike Quon
- A History of Graphic Design, Philip B Meggs,
- Graphic Arts Manual, Irwing E. Field, Arne Press, New York, 1980
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ILLUSTRATION - II

Course Code: FNA4204 **Credit Units: 08**

Course Objective:
Advance studies in illustration for graphic expression.

Course Contents:

Module I
Emphasis on forming of individual style in illustration and cartooning

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

Text:
- Graphic design & reproduction techniques, Peter Croy
- Artists and illustration's encyclopedia, John Quick

***References*:**
- The Art of Human Illustration, Nick Meglin,
- Corporate Graphics, Mike Quon
- A History of Graphic Design, Philip B Meggs,
- Graphic Arts Manual, Irwing E. Field, Arne Press, New York, 1980
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DRAWING - II

Course Code: FNA4206 **Credit Units: 08**

Course Objective:
Drawing portraiture in this stage will help to enhance professional skill in drawing.
This exercise to make drawing with various mediums from life model is essential. It is to obtain self confidence of making life size portrait and head study.
After the portrait/head study students to be ensured required freedom to create creative drawing based on social themes or abstract compositions of their choice which lead to develop one's own individual creative style and perception in drawing.
The drawing style is necessarily to be related with the style of painting has been developed by the individuals.

Course Contents:

Module I: Portrait Study
Portrait from life model.

Module II: Creative Drawing
Creative drawing to be based on the element like observation, distortion, simplification, symbolic, experimentation, photo-realistic or conceptual.

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

- An Introduction to Drawing, James Horton in association with the Royal Academy of Arts.
- Grassroot of Art, Herbert Read
- How to draw and paint, Hazel Harrison, from Art School
- Human Figure, Walter Foster
- Anatomy, Walter Foster
- Heads, Walter Foster
- Figure Drawing, Patricia Monahan with Albany Wiseman
- Human Anatomy, James Horton
- Big book of Drawing and painting, Francisco Asensio Cerver.

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CREATIVE PAINTING - II

Course Code: FNA4207 **Credit Units: 08**

Course Objective:
This course is for exploring most individualistic style of painting, experimenting with various mediums and ideas. The students will work in figurative/non-figurative compositions. They can work with any medium which provides them a kind of comfort or skill in oil /acrylic colour on canvas/ water colour / tempara on paper / mix-media and so on.
This course also experiments with new media, conceptual art like installation art/video art. Installation/video art introduces to a widely practiced medium in the contemporary art scene. This new medium which is unconventional in nature has modern approach which goes beyond studio practice. It is to develop skill of the craft and has potential to express intense feelings and sensibilities. It deals with new material for displaying social message in particular.

Course Contents:

Module I: Creative Painting
Creative painting (figurative/non-figurative) based on social or individual themes.

Module II: Installation/video art
Creating conceptual art in installation/video art medium

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

- Big book of drawing and painting, Francisco Asensio Cerver
- Notes on the techniques of Painting, Hilaire Hiler
- Method and Materials, Lynton Lamb.
- Artist's Handbook, Ray Smith
- Artist's Encyclopedia, John Quick
- A manual of Painting Materials & Techniques, Mark David Goattsegen
- Art Class, Copy Right 1999, Harper Collins Publishers.
- Images of the human body, Pepin Van Roojen.
- A Concise History of Modern Painting, 1974 Thames & Hudson, London
- Painting Course by Ronald Pearsall
- The portrait, Norbert Schneider.
- Color, Edith Anderson Feisner.

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MURAL (PAINTING) - II

Course Code: FNA4208 **Credit Units: 08**

Course Objective:
The objective of this course is to provide advanced techniques of working knowledge on wall surface. It gives a professional exposure about all kinds of mural work.

Course Contents:

Module I
Preparing suitable layout for mural followed by modification required according to the materials to be used

Module II
Preparing the base and surface

Module III
Final work followed by the installation**.**

Examination Scheme:

Components	**A**	**PT / HA / CT**	**End Term Exam**	
			Project (Display & Viva)	**Exam (Practical)**
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

- Ajanta Murals, Indian Archeology Dept.
- Techniques of Indian paintings and Murals, Indian Archeology Dept.
- Decorative Murals, Donna Dewberry

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PORTRAITURE - II

Course Code: FNA4209 **Credit Units: 08**

Course Objective:
The objective of this course is to provide advanced training on portrait painting exploring all mediums.

Course Contents:

Module I
Portrait study in oil on canvas

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

Text:
- Big book of Drawing and painting, Francisco Asensio Cerver

References:
- An Introduction to Drawing, James Horton in association with the Royal Academy of Arts.
- Grassroot of Art, Herbert Read
- How to draw and paint, Hazel Harrison ,from Art School
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- Figure Drawing, Patricia Monahan with Albany Wiseman
- Human Anatomy, James Horton

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CREATIVE DRAWING - II

Course Code: FNA4211 **Credit Units: 08**

Course Objective:
Drawing portraiture in this stage will help to enhance professional skill in drawing.
This exercise to make drawing with various mediums from life model is essential. It is to obtain self confidence of making life size portrait and head study.
After the portrait/head study students to be ensured required freedom to create creative drawing based on social themes or abstract compositions of their choice which lead to develop one's own individual creative style and perception in drawing.
The drawing style is necessarily to be related with the style of painting has been developed by the individuals.

Course Contents:

Module I: Portrait Study
Portrait from life model

Module II: Creative Drawing
Creative drawing to be based on the element like observation, distortion, simplification, symbolic, experimentation, photo-realistic or conceptual

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

- An Introduction to Drawing, James Horton in association with the Royal Academy of Arts.
- Grassroot of Art, Herbert Read
- How to draw and paint, Hazel Harrison, from Art School
- Human Figure, Walter Foster
- Anatomy, Walter Foster
- Heads, Walter Foster
- Figure Drawing, Patricia Monahan with Albany Wiseman
- Human Anatomy, James Horton
- Big book of Drawing and painting, Francisco Asensio Cerver.

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PORTRAITURE SCULPTURE-II

Course Code: FNA4212 **Credit Units: 08**

Course Objective:
This is to provide about working on realistic sculpture.

Course Contents:

Module I
Realistic study work supported by preparatory studies and techniques.

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

Text:
- Art Now, Herbert Read
- Sculpture Today, Kinston parker

References:
- History of Sculpture, George Henry Chase and Chander Rathforn.

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MURAL (SCULPTURE) - II

Course Code: FNA4213 **Credit Units: 08**

Course Objective:
The objective of this course is to provide advanced techniques of working knowledge on wall surface. It gives a professional exposure about all kinds of mural work.

Course Contents:

Module I
Preparing suitable layout for mural followed by modification required according to the materials to be used

Module II
Preparing the base and surface

Module III
Final work followed by the installation**.**

Examination Scheme:

Components	**A**	**PT / HA / CT**	**End Term Exam**	
			Project (Display & Viva)	**Exam (Practical)**
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

- Ajanta Murals, Indian Archeology Dept.
- Techniques of Indian paintings and Murals, Indian Archeology Dept.
- Decorative Murals, Donna Dewberry

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CREATIVE SCULPTURE - II

Course Code: FNA4214 **Credit Units: 08**

Course Objective:
This is to provide professional experience about working on sculpture using various materials.

Course Contents:

Module I
Abstract Composition supported by preparatory studies and techniques.

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

Text:
- Art Now, Herbert Read
- Sculpture Today, Kinston parker

References:
- History of Sculpture, George Henry Chase and Chander Rathforn.

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DISSERTATION AND VIVA - I

Course Code: FNA4337 **Credit Units: 02**

Course Objective:

PAINTING-
This course is about research work on a particular school of art, artist so on. It is for enrichment of professional knowledge through detail study and research about the field and artist as well. It focuses to put authentic information with analytical approach.
This paper is to be submitted in a form of a report, printed with necessary and authentic reproductions, photographs, or images as illustrations.

Portfolio development is also a part of this course. This project compiles the selected art works have been executed during MFA programme (first and second year both). The portfolio development project has the purpose of preparing students for future prospects in the professional field.

APPLIED ARTS & SCULPTURE-
This is to provide professional exposure for the researchers.

Course Contents:

Module I
a. Research work on the given topic from various sources like art institutes, galleries, libraries so on.
b. Collecting materials like notes, photographs and reproductions.

Module II
Portfolio development project (compiling of selected art works).

Examination Scheme:

Components	PR	PS	V
Weightage (%)	70	15	15

(**V**-Viva; **PR**-Project Report; **PS**-Presentation)

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VISUALIZATION - III

Course Code: FNA4301 **Credit Units: 08**

Course Objective:
There will be students advanced understanding of design in relation to advertising. Students will do intensive exercises to understand design, market trends, target audience, consumer behavior. Each and every media will be explored. Learn new ways of thinking, processing and communicating ideas, emotions, and experiences through your discipline.

Course Contents:

Module I
Execution of ONE advertising Campaigns on consumer's product or Institutional (Services)
Related with any of the appropriate Medias including Print, Television, Transit etc. and in various techniques available.

Module II
Perform the simple exercises on the software's, they will explore flash and illustrator software's in their campaign making process.

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

- The Art of Human Illustration, Nick Meglin,
- Corporate Graphics, Mike Quon
- A History of Graphic Design, Philip B Meggs,
- Graphic Arts Manual, Irwing E. Field, Arne Press, New York, 1980
- Design Graphics, C. L. Martin, Macmillan Co. London

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GRAPHIC DESIGNING - III

Course Code: FNA4302 **Credit Units: 08**

Course Objective:
The focus of this course is to equip students with knowledge of designing campaign for media.

Software's introduced:
Adobe Flash

Course Contents:

Module I
Product and social advertisement for electronic media in the help of i.e adobe flash/Web design software.

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

Text:
- Graphic design & reproduction techniques, Peter Croy
- Artists and illustration's encyclopedia, John Quick

References:
- The Art of Human Illustration, Nick Meglin,
- Corporate Graphics, Mike Quon
- A History of Graphic Design, Philip B Meggs,
- Graphic Arts Manual, Irwing E. Field, Arne Press, New York, 1980
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TV GRAPHICS - III

Course Code: FNA4303 **Credit Units: 08**

Course Objective:
The design for programmes, station identify signs, symbols, commercial advertisements, trade marks and short films etc.

Course Contents:

Module I
The design for programmes, station identify signs, symbols, commercial advertisement, trade marks and short films etc.

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

Text:
- Graphic design & reproduction techniques, Peter Croy
- Artists and illustration's encyclopedia, John Quick

References:
- The Art of Human Illustration, Nick Meglin,
- Corporate Graphics, Mike Quon
- A History of Graphic Design, Philip B Meggs,
- Graphic Arts Manual, Irwing E. Field, Arne Press, New York, 1980
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ILLUSTRATION - III

Course Code: FNA4304 **Credit Units: 08**

Course Objective:
Illustration for books meant for different age groups. Comprehensive illustration for book animation.

Course Contents:

Module I
Advance studies in illustration for graphic expression. Emphasis on forming of individual style in illustration, cartooning.

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

Text:
- Graphic design & reproduction techniques, Peter Croy
- Artists and illustration's encyclopedia, John Quick

References:
- The Art of Human Illustration, Nick Meglin,
- Corporate Graphics, Mike Quon
- A History of Graphic Design, Philip B Meggs,
- Graphic Arts Manual, Irwing E. Field, Arne Press, New York, 1980
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DRAWING - III

Course Code: FNA4306 **Credit Units: 08**

Course Objective:
Drawing is not only one of the most significant aspects for painting students but also is a complete medium in itself. Working in one particular style and media is advisable in this stage.
Drawing is a medium which deals with black and white composition in various drawing mediums like pen and ink, charcoal etc. In this stage a student needs to work on own individual style.
Rendering creative drawing after experimenting with various techniques and possibilities of using different mediums for exploring individual perception in the medium

Course Contents:

Module I: Creative Sketching
Making layouts

Module II: Creative Drawing
Creative drawing (figurative/ non-figurative)

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

- An Introduction to Drawing, James Horton in association with the Royal Academy of Arts.
- Grassroot of Art, Herbert Read
- How to draw and paint, Hazel Harrison, from Art School
- Human Figure, Walter Foster
- Anatomy, Walter Foster
- Heads, Walter Foster
- Figure Drawing, Patricia Monahan with Albany Wiseman
- Human Anatomy, James Horton
- Big book of Drawing and painting, Francisco Asensio Cerver.

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CREATIVE PAINTING - III

Course Code: FNA4307 **Credit Units: 08**

Course Objective:
The course is to maintain a sense of painting as a language that simultaneously upholds tradition and seeks innovation. Painting from observation, formal structure, narrative content. Painting as a means of individual expression are qualities that are valued. Students work both figuratively and abstractly. The course is structured to emphasize individual studio work that is assessed through one on one and group critiques.
This course is to develop an intense ethos towards studio practice that makes for a stimulating work environment.

Course Contents:

Module I
Painting in oil / acrylic colour on canvas (figurative /non-figurative)

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

- Big book of drawing and painting, Francisco Asensio Cerver
- Notes on the techniques of Painting, Hilaire Hiler
- Method and Materials, Lynton Lamb.
- Artist's Handbook, Ray Smith
- Artist's Encyclopedia, John Quick
- A manual of Painting Materials & Techniques, Mark David Goattsegen
- Art Class, Copy Right 1999, Harper Collins Publishers.
- Images of the human body, Pepin Van Roojen.
- A Concise History of Modern Painting, 1974 Thames & Hudson, London
- Painting Course, Ronald Pearsall
- The portrait. Norbert Schneider.
- Color, Edith Anderson Feisner.

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MURAL (PAINTING) - III

Course Code: FNA4308 **Credit Units: 08**

Course Objective:
The objective of this course is to provide advanced techniques of working knowledge on wall surface. It gives a professional exposure about all kinds of mural work including mixed materials.

Course Contents:

Module I
Preparing suitable layout for mural followed by modification required according to the materials to be used

Module II
Preparing the base and surface

Module III
Final work followed by the installation**.**

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

- Ajanta Murals, Indian Archeology Dept.
- Techniques of Indian paintings and Murals, Indian Archeology Dept.
- Decorative Murals, Donna Dewberry

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PORTRAITURE - III

Course Code: FNA4309 **Credit Units: 08**

Course Objective:
The objective of this course is to provide advanced training on portrait painting exploring all mediums.

Course Contents:

Module I
Portrait study in oil on canvas

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

Text:
- Big book of Drawing and painting, Francisco Asensio Cerver

References:
- An Introduction to Drawing, James Horton in association with the Royal Academy of Arts.
- Grassroot of Art, Herbert Read
- How to draw and paint, Hazel Harrison ,from Art School
- Human Figure, Walter Foster
- Anatomy, Walter Foster
- Heads, Walter Foster
- Figure Drawing, Patricia Monahan with Albany Wiseman
- Human Anatomy, James Horton

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ART CRITICISM (PAINTING) - I

Course Code: FNA4310 **Credit Units: 03**

Course Objective:
The objective of this course is to provide Critical Study of Art.

Course Contents:

Module I
Importance and necessary criticism. Evaluation of art works.

Module II
Understanding of Modern and post modern art trends in eastern and western of view.

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

Text:
- Civilization of Mankind, Van Loon
- History of Art, Janson
- Art through the ages, Helen Gardener
- Concise History of Art-Vols. 1 & 2, Gerrmain. Bazin.

References:
- Fundamental of Indian Art, S. N. Dasgupta
- Art of Mankind, Van Loon
- History of Indian and Indonesian Art, A. K. Coomaraswamy
- The Art and Architecture of Indian, Benjamin Rowland.
- The Story of Indian Art, S. K. Bhattacharya.
- 5000 Years of Indian Art, Shivaramaurti
- A History of Fine Arts in India and West, Edith Tomory
- Introduction of Chinese Art, Lawrence Binyon
- History of Indian and Indonesian Art, Bejamin Rowland.
- Concise History of Art Vols. 1&2, Germain Bazin
- Italian Painters of the Renaissance, Bernard Berenson
- Art Now, Herbert Read
- Grassroot of Art, Herbert Read.
- History of Modern Art, H. H. Arnason.

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CREATIVE SCULPTURE - III

Course Code: FNA4311 **Credit Units: 08**

Course Objective:
This is to provide professional experience about working on sculpture using various materials.

Course Contents:

Module I
Abstract Composition supported by preparatory studies and techniques.

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

Text:
- Art Now, Herbertb Read
- Sculpture Today, Kinston parker

References:
- History of Sculpture, George Henry Chase and Chander Rathforn.
- Four steps towards

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PORTRAITURE SCULPTURE-III

Course Code: FNA4312 **Credit Units: 08**

Course Objective:
This is to provide about working on realistic sculpture.

Course Contents:

Module I
Realistic study work supported by preparatory studies and techniques.

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

Text:
- Art Now, Y Herbert Read
- Sculpture Today, Kinston parker

References:
- History of Sculpture. George Henry Chase and Chander Rathforn.
- Four steps towards

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MURAL (SCULPTURE) - III

Course Code: FNA4313 **Credit Units: 08**

Course Objective:
The objective of this course is to provide advanced techniques of working knowledge on wall surface. It gives a professional exposure about all kinds of mural work including mixed materials.

Course Contents:

Module I
Preparing suitable layout for mural followed by modification required according to the materials to be used.

Module II
Preparing the base and surface.

Module III
Final work followed by the installation**.**

Examination Scheme:

Components	**A**	**PT / HA / CT**	**End Term Exam**	
			Project (Display & Viva)	**Exam (Practical)**
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

- Ajanta Murals, Indian Archeology Dept.
- Techniques of Indian paintings and Murals, Indian Archeology Dept.
- Decorative Murals, Donna Dewberry

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ART CRITICISM (SCULPTURE) - I

Course Code: FNA4315 **Credit Units: 03**

Course Objective:
The objective of this course is to provide Critical Study of Art.

Course Contents:

Module I
Importance and necessary criticism. Evaluation of art works.

Module II
Understanding of Modern and post modern art trends in eastern and western of view.

Examination Scheme:

Components	CT	P	A	EE
Weightage (%)	15	10	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Civilization of Mankind, Van Loon
- History of Art, Janson
- Art through the ages, Helen Gardener
- Concise History of Art-Vols. 1 & 2, Gerrmain. Bazin.

References:
- Fundamental of Indian Art, S. N. Dasgupta
- Art of Mankind, Van Loon
- History of Indian and Indonesian Art, A. K. Coomaraswamy
- The Art and Architecture of Indian, Benjamin Rowland.
- The Story of Indian Art, S. K. Bhattacharya.
- 5000 Years of Indian Art, Shivaramaurti
- A History of Fine Arts in India and West, Edith Tomory
- Introduction of Chinese Art, Lawrence Binyon
- History of Indian and Indonesian Art, Bejamin Rowland.
- Concise History of Art Vols. 1&2, Germain Bazin
- Italian Painters of the Renaissance, Bernard Berenson
- Art Now, Herbert Read
- Grassroot of Art, Herbert Read.
- History of Modern Art, H. H. Arnason.

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DISSERTATION AND VIVA - II

Course Code: FNA4437 **Credit Units: 06**

Course Objective:
This course is to continue the research work to put the collected materials together for developing the body of the dissertation on the particular subject.
Putting up the necessary photographs, reproductions with the text materials.

Course Contents:

Module I
Preparing the final paper along with necessary photographs, reproductions with detail information.

Module II
a. Submission of printed dissertation paper.
b. Reviewing dissertation paper.

Examination Scheme:

Components	PR	PS	V
Weightage (%)	70	15	15

(**V**-Viva; **PR**-ProjectReport; **PS**-Presentation)

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VISUALIZATION - IV

Course Code: FNA4401 **Credit Units: 08**

Course Objective:
Encouraging a cross-disciplinary studio environment in which the workshop is a lab to collaboratively explore design and making processes, the Program welcomes students from a wide range of creative backgrounds to make original work with an applied purpose. Applied art transform ideas into symbols to convey specific messages for and in the public.

Course Contents:

Module I: Preparation of a project and presentation
This subject focuses on defining, researching and producing a project work with a formal structure for research and exploration in deciding upon any one topic chosen by the students. These projects are formally presented by all MFA students reflecting on their time and experience within the Program.

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

- The Art of Human Illustration, Nick Meglin,
- Corporate Graphics, Mike Quon
- A History of Graphic Design, Philip B Meggs,
- Graphic Arts Manual, Irwing E. Field, Arne Press, New York, 1980
- Design Graphics, C. L. Martin, Macmillan Co. London

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GRAPHIC DESIGNING - IV

Course Code: FNA4402 **Credit Units: 08**

Course Objective:
Understanding of graphic designing for campaign for media & develop skill for portfolio presentation.

Course Contents:

Module I
Conceptual campaign for any brand/social issue

Module II
Portfolio Development and presentation

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

Text:
- Graphic design & reproduction techniques, Peter Croy
- Artists and illustration's encyclopedia, John Quick

References:
- The Art of Human Illustration, Nick Meglin,
- Corporate Graphics, Mike Quon
- A History of Graphic Design, Philip B Meggs,
- Graphic Arts Manual, Irwing E. Field, Arne Press, New York, 1980
- Design Graphics, C. L. Martin, Macmillan Co. London

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TV GRAPHICS - IV

Course Code: FNA4403 **Credit Units: 08**

Course Objective:
The design for programmes, station identify signs, symbols, commercial advertisements, trade marks and short films etc.

Course Contents:

Module I
The design for programmes, station identify signs, symbols, commercial advertisement, trade marks and short films etc.

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

Text:
- Graphic design & reproduction techniques, Peter Croy
- Artists and illustration's encyclopedia, John Quick

References:
- The Art of Human Illustration, Nick Meglin,
- Corporate Graphics, Mike Quon
- A History of Graphic Design, Philip B Meggs,
- Graphic Arts Manual, Irwing E. Field, Arne Press, New York, 1980
- Design Graphics, C. L. Martin, Macmillan Co. London

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ILLUSTRATION - IV

Course Code: FNA4404 **Credit Units: 08**

Course Objective:
Illustration for books meant for different age groups. Comprehensive illustration for book animation.

Course Contents:

Module I
Advance studies in illustration for graphic expression. Emphasis on forming of individual style in illustration, cartooning.

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

Text:
- Graphic design & reproduction techniques, Peter Croy
- Artists and illustration's encyclopedia, John Quick

References:
- The Art of Human Illustration, Nick Meglin,
- Corporate Graphics, Mike Quon
- A History of Graphic Design, Philip B Meggs,
- Graphic Arts Manual, Irwing E. Field, Arne Press, New York, 1980
- Design Graphics, C. L. Martin, Macmillan Co. London

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ADVERTISING AND BUSINESS ORGANIZATION - II

Course Code: FNA4405 **Credit Units: 03**

Course Objective:
The objective of this course includes instruction in International advertising, visual communication, advertising design and production methods, campaign methods and techniques, Advertising messages, related principles of creative process, and applicable technical and equipment skills

Course Contents:

Module I: The Effective Advertising Messages
The Art and Science of Creative Advertising
Creative thinking
The creative process: How to get an Idea
Creative Strategy: Message Objective, Head and Heart Strategies, Messages that drive perception, Message that touches emotions, Message that persuade.

Module II: Visual Communication
Visual Impact
Layout and Design
Print Production: Print Media Requirement, Art Production
Effective Web Design

Module III: International Advertising
Importance of international Markets
Role of International Advertising
Advantages and disadvantages of global Marketing and Advertising
Decision Areas in International Advertising

Module IV: Evaluating the Social, Ethical and Economic Aspect of Advertising
Social and Ethical Criticism of Advertising
Economic Effects of Advertising

Module V: Brand Management
Brands and their Significance: Attributes, Benefits, Values, Target User, Personality, Culture, Categories of Brands
Brand equity: Managing Brand Equity
Brand Loyalty: Brand Associations
International Branding Considerations

Examination Scheme:

Components	CT	P	A	EE
Weightage (%)	15	10	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:
- Innovation in Marketing, T, Levit.
- Environment of Marketing Behaviour, Halloway and Hawrock.
- Advertising Hand Book, D. V. Gandhi
- Modern Advertising, Hepner
- Economic of Advertising, B. Chiplin
- International Handbook of Advertising
    - Advertising Procedure, Kleppner's.
    - Advertising Management, Donald R. Cooper, PamelaS. Schindler

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DRAWING - IV

Course Code: FNA4406 **Credit Units: 08**

Course Objective:
This course of drawing is in the final stage of learning in an art institute. Students are provided required space and freedom to express themselves. The drawings to be executed in this stage to focus on confined and individual perception. The drawings may be creating in a series, therefore, all the drawings to have a kind of continuation. This stage is after experimenting various techniques and possibilities of using different mediums for exploring individual and innovative ideas. Working in one particular style and media is advisable in this stage.

Course Contents:

Module I: Creative Sketching
Making layouts

Module II: Creative Drawing
Drawing figurative / non-figurative compositions.

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

- An Introduction to Drawing, James Horton in association with the Royal Academy of Arts.
- Grassroot of Art, Y. Herbert Read
- How to draw and paint, Hazel Harrison, from Art School
- Human Figure, Walter Foster
- Anatomy, Walter Foster
- Heads, Walter Foster
- Figure Drawing, Patricia Monahan with Albany Wiseman
- Human Anatomy, James Horton
- Big book of Drawing and painting, Francisco Asensio Cerver.

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CREATIVE PAINTING - IV

Course Code: FNA4407 **Credit Units: 08**

Course Objective:
The course emphasizes the development of a sustained artistic practice through exploration, experimentation, and intensive studio work and study. Opportunities to investigate areas beyond one's concentration are made available.
The course is also to refine the technical aspect like developing individual style of colour application and introduce new treatment of theme and concept as reflection of life experience and social awareness.

This is to render conceptual art to explore new media of creative art like installation art or video art.

Course Contents:

Module I
Painting in oil / acrylic colour on canvas (figurative /non-figurative).

Module II: Installation/video art
Creating conceptual art in installation/video art medium.

Examination Scheme:

Components	**A**	**PT / HA / CT**	**End Term Exam**	
			Project (Display & Viva)	**Exam (Practical)**
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

- Big book of drawing and painting, Francisco Asensio Cerver
- Notes on the techniques of Painting, Hilaire Hiler
- Method and Materials, Lynton Lamb.
- Artist's Handbook, Ray Smith
- Artist's Encyclopedia, John Quick
- A manual of Painting Materials & Techniques, Mark David Goattsegen
- Art Class, Copy Right 1999, Harper Collins Publishers.
- Images of the human body, Pepin Van Roojen.
- A Concise History of Modern Painting, 1974 Thames & Hudson, London
- Painting Course, Ronald Pearsall
- The portrait, Norbert Schneider.
- Color, Edith Anderson Feisner.

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MURAL (PAINTING) - IV

Course Code: FNA4408 **Credit Units: 08**

Course Objective:
The objective of this course is to provide advanced techniques of working knowledge on wall surface. It gives a professional exposure about all kinds of mural work including mixed materials.

Course Contents:

Module I
Preparing suitable layout for mural followed by modification required according to the materials to be used.

Module II
Preparing the base and surface.

Module III
Final work followed by the installation**.**

Examination Scheme:

Components	**A**	**PT / HA / CT**	**End Term Exam**	
			Project (Display & Viva)	**Exam (Practical)**
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

- Ajanta Murals published by Indian Archeology Dept.
- Techniques of Indian paintings and Murals published by Indian Archeology Dept.
- Decorative Murals by Donna Dewberry

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PORTRAITURE - IV

Course Code: FNA4409 **Credit Units: 08**

Course Objective:
The objective of this course is to provide advanced training on portrait painting exploring all mediums.

Course Contents:

Module I
Portrait study in oil on canvas.

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

Text:
- Big book of Drawing and painting, Francisco Asensio Cerver

References:
- An Introduction to Drawing, James Horton in association with the Royal Academy of Arts.
- Grassroot of Art, Herbert Read
- How to draw and paint, Hazel Harrison ,from Art School
- Human Figure, Walter Foster
- Anatomy, Walter Foster
- Heads, Walter Foster
- Figure Drawing, Patricia Monahan with Albany Wiseman
- Human Anatomy, James Horton

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ART CRITICISM (PAINTING) - II

Course Code: FNA4410 **Credit Units: 03**

Course Objective:
The objective of this course is to provide Critical Study of Art.

Course Contents:

Module I
History of criticism, Development of Art History as Human Discipline, Visual Analysis and Psycho-analytic point of View on Art.

Module II
Critical References on Painting and Sculpture (Indian and Western)

Examination Scheme:

Components	CT	P	A	EE
Weightage (%)	15	10	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Civilization of Mankind, Van Loon
- History of Art, Janson
- Art through the ages, Helen Gardener
- Concise History of Art-Vols. 1 & 2, Gerrmain. Bazin.

References:
- Fundamental of Indian Art, S. N. Dasgupta
- Art of Mankind, Van Loon
- History of Indian and Indonesian Art, A. K. Coomaraswamy
- The Art and Architecture of Indian, Benjamin Rowland.
- The Story of Indian Art, S. K. Bhattacharya.
- 5000 Years of Indian Art, Shivaramaurti
- A History of Fine Arts in India and West, Edith Tomory
- Introduction of Chinese Art, Lawrence Binyon
- History of Indian and Indonesian Art, Bejamin Rowland.
- Concise History of Art Vols. 1&2, Germain Bazin
- Italian Painters of the Renaissance, Bernard Berenson
- Art Now, Herbert Read
- Grassroot of Art, Herbert Read.
- History of Modern Art, H. H. Arnason.

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SPECIALIZATION - SCULPTURE

CREATIVE DRAWING - IV

Course Code: FNA4411 **Credit Units: 08**

Course Objective:
This course of drawing is in the final stage of learning in an art institute. Students are provided required space and freedom to express themselves. The drawings to be executed in this stage to focus on confined and individual perception. The drawings may be creating in a series, therefore, all the drawings to have a kind of continuation. This stage is after experimenting various techniques and possibilities of using different mediums for exploring individual and innovative ideas. Working in one particular style and media is advisable in this stage.

Course Contents:

Module I: Creative Sketching
Making layouts

Module II: Creative Drawing
Drawing figurative / non-figurative compositions.

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

- An Introduction to Drawing, James Horton in association with the Royal Academy of Arts.
- Grassroot of Art, Y. Herbert Read
- How to draw and paint, Hazel Harrison, from Art School
- Human Figure, Walter Foster
- Anatomy, Walter Foster
- Heads, Walter Foster
- Figure Drawing, Patricia Monahan with Albany Wiseman
- Human Anatomy, James Horton
- Big book of Drawing and painting, Francisco Asensio Cerver.

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PORTRAITURE SCULPTURE-IV

Course Code: FNA4412 **Credit Units: 08**

Course Objective:
This is to provide about working on realistic sculpture.

Course Contents:

Module I
Realistic study work supported by preparatory studies and techniques.

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

Text:
- Art Now, Herbert Read
- Sculpture Today, Kinston parker

References:
- History of Sculpture, George Henry Chase and Chander Rathforn.
- Four steps towards

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MURAL (SCULPTURE) - IV

Course Code: FNA4413 **Credit Units: 08**

Course Objective:
The objective of this course is to provide advanced techniques of working knowledge on wall surface. It gives a professional exposure about all kinds of mural work including mixed materials.

Course Contents:

Module I
Preparing suitable layout for mural followed by modification required according to the materials to be used.

Module II
Preparing the base and surface.

Module III
Final work followed by the installation**.**

Examination Scheme:

Components	**A**	**PT / HA / CT**	**End Term Exam**	
			Project (Display & Viva)	**Exam (Practical)**
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

- Ajanta Murals published, Indian Archeology Dept.
- Techniques of Indian paintings and Murals, Indian Archeology Dept.
- Decorative Murals, Donna Dewberry

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CREATIVE SCULPTURE - IV

Course Code: FNA4414 **Credit Units: 08**

Course Objective:
This is to provide professional experience about working on sculpture using various materials.

Course Contents:

Module I
Abstract Composition supported by preparatory studies and techniques.

Examination Scheme:

Components	A	PT / HA / CT	End Term Exam	
			Project (Display & Viva)	Exam (Practical)
Weightage (%)	5	25	30	40

(**A**-Attendance; **PT**- Portfolio; **HA**-Home Assignment; **CT**-Class Test)

Text & References:

Text:
- Art Now, Herbertb Read
- Sculpture Today, Kinston parker

References:
- History of Sculpture, George Henry Chase and Chander Rathforn.
- Four steps towards

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ART CRITICISM (SCULPTURE) - II

Course Code: FNA4415 **Credit Units: 03**

Course Objective:
The objective of this course is to provide Critical Study of Art.

Course Contents:

Module I
History of criticism, Development of Art History as Human Discipline, Visual Analysis and Psycho-analytic point of View on Art.

Module II
Critical References on Painting and Sculpture (Indian and Western)

Examination Scheme:

Components	CT	P	A	EE
Weightage (%)	15	10	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

Text & References:

Text:
- Civilization of Mankind, Van Loon
- History of Art, Janson
- Art through the ages, Helen Gardener
- Concise History of Art-Vols. 1 & 2, Gerrmain Bazin.

References:
- Fundamental of Indian Art, S. N. Dasgupta
- Art of Mankind, Van Loon
- History of Indian and Indonesian Art, A. K. Coomaraswamy
- The Art and Architecture of Indian, Benjamin Rowland.
- The Story of Indian Art, S. K. Bhattacharya.
- 5000 Years of Indian Art, Shivaramaurti
- A History of Fine Arts in India and West, Edith Tomory
- Introduction of Chinese Art, Lawrence Binyon
- History of Indian and Indonesian Art, Bejamin Rowland.
- Concise History of Art Vols. 1&2, Germain Bazin
- Italian Painters of the Renaissance, Bernard Berenson
- Art Now, Herbert Read
- Grassroot of Art, Herbert Read.
- History of Modern Art, H. H. Arnason.

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FASHION DESIGN
(Skill Track)

Programme Structure

Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
VFD2152	Design Eco-System	1	-	4	3
VFD2252	Fashion Design Research	1	-	4	3
VFD2352	Design Preparatory Process	1	-	4	3
VFD2452	Prototype Garment Development	1	-	4	3
VFD2552	Design Development	1	1	2	3
VFD2652	Health & Safety Equilibrium	1	-	4	3
	TOTAL				**18**

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FASHION DESIGN

Syllabus - Semester First

DESIGN ECO-SYSTEM

Course Code: VFD2152 **Credit Units: 03**

Course Objectives:
The aim of the course is to provide Performance Criteria, Knowledge & Understanding and skills & abilities required to organize/maintain work areas and activities to ensure tools and machines are maintained as per norms to a Fashion Designer.

Course Contents:
Module-I: Maintain the work area
(1) Handle materials, drawing and pattern drafting tools, equipment and the system for computer designing with care (2.) Use correct handling procedures. (3.) Use materials to minimize waste (4.) Use of measuring devices effectively

Module-II: Maintain the work Tools
(1) Maintain tools and equipment (2) Carryout running maintenance within agreed schedules (3) Carryout maintenance and/or cleaning within one's responsibility (4) Report unsafe equipment and other dangerous occurrences (5) working a comfortable position with the correct posture.

Module-III: Maintain the work equipment.
(1) Use cleaning equipment and methods appropriate for the work to be carried out (2)Dispose of waste safely in the designated location (3) Carryout cleaning according to schedules and limits of responsibility

Module-IV: Maintain the Self and work Computers
(1.) Request for up gradation of system or software's when required for effective working (2.) Always a backup file to be maintained when working on various design software's (3.) All soft copies of design work to be maintained in files as well for future reference (4.) Personal hygiene and duty of care. (5.) Safe working practices and organizational procedures. (6.) Limits of your own responsibility,
(7.) Ways of resolving with problems within the work area. (8.) The production process and the specific work activities that relate to the whole process (9.)The importance of effective communication with colleagues (10) the lines of communication, authority and reporting procedures

Module-V: Case Study (Compulsory)
Industrial visit and case presentation

Examination Scheme:

Components	A	CS	CT	EE
Weight age (%)	05	10	15	70

(**A-**Attendance**; CS-**Case Study**; CT-**Class Test**; EE-**End Semester Examination)

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Text:

- Giolleo and Berks, fashion Production Terms
- Grig Hazer, Fantastic Fit For Everybody

References:

- Tracy Diane and Tom Cassidy, Colour Forecasting
- J Chuter, Introduction to Clothing Production Management.
- Apparel Online, Apparel Views, Clothesline, Moda, Vogue, Simplicity etc
- Rosemar Varley, Retail Product Management: Buying And Merchandising, Routledge, 2006
- Jay Diamond, Ellen Diamond, Contemporary Visual Merchandising, Prentice Hall PTR, 2010

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Syllabus - Semester Second

FASHION DESIGN-RESEARCH

Course Code: VFD2252 **Credit Units: 03**

Course Objectives: The aim of the course is the development of design concepts for commercial production. The Initial process includes conducting market research and trend analysis for the particular season and identifying a theme for the collection; then creating a mood board and color board based on the theme, develop an entire range according to the business plan and as per the theme board.

Course Contents:

Module-I: Designing Fashion Design Research

(1) Review previous 10 years trends and their impact in terms of accuracy. (2) Research on fashion trends and identify the emerging theme (3.) Product range and previous designs developed by the business are reviewed to assess relevance to current design.

Module-II: Conduct fashion design research

(1) Business processes and client goals are identified. (2.) Research is conducted on target market, materials, designs, processes and marketing materials according to the needs of the design. (3.) Quality standards for designs are identified.

Module-III: Design Brief

(1) Design themes and style requirements of design are determined (2) Budget, cost points and timing constraints are identified. (3) Requirements for use of fabrics, materials, suppliers and production processes are determined. (4) Client Requirements are confirmed with the client

Module-IV: Organize fashion design research.

(1) Analyze the market trends and targets for the season (2) Rule-based decision-making processes (3) Complete accurate well written work with attention to detail

Module-V: Case Presentation (Compulsory)

Case presentation with complete mood boards and design presentation for the following season.

Examination Scheme:

Components	A	CS	CT	EE
Weight age (%)	05	10	15	70

(**A-**Attendance**; CS-**Case Study**; CT-**Class Test**; EE-**End Semester Examination)

References:

- Gini Stephens Frings (1999): Fashion: From concept to consumer, Prentice-Hill Inc.
- Gavin Ambrose & Paul Harris, Design Thinking, AVA Publishing, Switzerland.
- Harry B. Watton, "New Product Planning", Prentice Hall Inc., 1992.
- Jacob Solinger, "Apparel Manufacturing Handbook", Reinhold Publications, 1998.
- Introduction to research in education, Ary Hort Reinhart,1982
- Research methodology by C. R Kothari, Published by Wiley Eastern Ltd, New Delhi,2000
- Design Research: Methods and Perspectives, edited by Brenda Laurel
- Lateral Thinking: Creativity Step by Step, Edward De Bono, 1970.
- How Customers Think: Essential Insights into the Mind of the Market – Gerald Zaltman
- Five Minds for the Future – Howard Gardner
- Harry Nystrom, "Creativity and Innovation", John Wiley & Sons, 1979.

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Syllabus - Semester Third

DESIGN PREPARATORY PROCESS

Course Code: VFD2352 **Credit Units: 03**

Course Objectives:
The aim of the course is to designs a clothing range and gets it finalized to make the prototype garments.

Course Contents:
Module-I: Determine key criteria for design brief
(1) Determined Design themes and style. (2) Recognizing and adapting to cultural differences in the workplace, including modes of behavior and interactions (3.) Identify improvements.

Module-II: Technical Aspects
(1.) To do the design by hand sketches or by Computer Aided Design (CAD). (2.) Garment construction techniques and processes. (3.) Detailed knowledge of a range of fabrics and trims

Module-III: Financial Aspects
(1) An understanding on the cost process involved in making an apparel (2) Costing of created designs / product ensembles with knowledge of sale ability of a product designed (3) Knowledge of Intellectual Property Rights with respect to designs.

Module-IV: Pre proto Analyses
(1) Provide opinions on work in a detailed and constructive way (2) communicate with others in the company and to clients in writing (3) Clarification on the design to be developed with the team members

Module-V: Case Presentation (Compulsory)
Case presentation for any two constructed garment with their technical details i.e. Teck-pack and Coasting

Examination Scheme:

Components	A	CS	CT	EE
Weight age (%)	05	10	15	70

(**A**-Attendance**; CS**-Case Study**; CT**-Class Test**; EE**-End Semester Examination)

Text:

- Winifred Aldrich, CAD in Clothing and Textiles
- Corel Draw 11 for Windows: Visual Quick Start Guide
- From Sue Chastain, your guide to Graphics software
- David Huss, Gary W. Priester, Corel Draw Studio Techniques.
- Corel Draw 10 for Windows: Visual Quick Start Guide.
- Linnea Dayton, Cristen Gillespie, The Photoshop Cs/Cs2 Wow!

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Syllabus - Semester Fourth

PROTOTYPE GARMENT DEVELOPMENT

Course Code: VFD2452 **Credit Units: 03**

Course Objectives:
The aim of the course is about how technical package is made after garment range confirmation and process of how prototype garment is made for entire collection

Course Contents:
Module-I: Confirming Design Brief
(1) Create techpack which clearly conveys all guidelines for development of the sample (2) Appropriate personnel are consulted with to confirm feasibility and appropriateness of techpack (3.) Sketches, drawings and samples are used to illustrate design requirements, as appropriate. (4) Given techpacks on the range to be finalised

Module-II: Specify Design Processes
(1.) Required involvement of sampling merchandiser, patternmaker, and tailor are identified, finalized and briefed about the collection (2.) Monitoring procedures and checking points are determined. (3.) Design development personnel selected are briefed and time constraints met (4.)

Module-III: Proto- Type Construction
(1) Construct the prototype and given to concerned dept for better understanding on the product, if required

Module-IV: Implement Design Processes
(1.) Development of sample is monitored to ensure budget and time constraints are met (2) Problems or inconsistencies in sample are identified and addressed. (3) Communicate with others in the company and to clients in writing (4) Evaluate the prototype sample.

Module-V: Case Presentation (Compulsory)
Case presentation for actually constructed garment with their technical details and Coasting

Examination Scheme:

Components	A	CS	CT	EE
Weight age (%)	05	10	15	70

(**A**-Attendance**; CS**-Case Study**; CT**-Class Test**; EE**-End Semester Examination)

Text:
- By Gillian Holman, Pattern cutting made easy
- Dorothy Wood, The Practical Encyclopaedia of Sewing

Reference:
- Leila Aitken, Step by step dress making course
- Amaden-Crawford, A Guide to Fashion Sewing

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Syllabus - Semester Fifth

DESIGN DEVELOPMENT

Course Code: VFD2552 **Credit Units: 03**

Course Objectives:
The aim of the course is about how to review the prototype garment developed for the collection

Course Contents:
Module-I: Evaluate Design Process
(1) Analyze the prototype sample along with the design team (2) coordinate along with design team to check sample against the techpack given to the sampling merchandiser, the look and feel and fit of the sample (3.) Identify the prototype for the feasibility of the garment in terms of sourcing of the fabric and the trims available for the span of production.

Module-II: Evaluate Development Process
(1.) Identify various products testing to proceed with prototype (2.) Incorporate modification of the sample until approved for final production. (3.) Get approval on the prototype/final techpack, agreement finalized with the client

Module-III: Complete Documentation
(1) Document Design brief, development processes and outcomes (2) Complete Documentation processes, including filing and storing, Construct the prototype and given to concerned dept for better understanding on the product, if required

Module-IV: Organization Process
(1) Organization's policies, procedures and priorities for your area of work and your role and responsibilities in carrying out your work. (2) Limits of your responsibilities when coordinating with other department. (3) Your specific work requirements and who these must be agreed with

Module-V: Industrial Case (Compulsory)
Developing Standard Operating Procedure for an Fashion Design Team

Examination Scheme:

Components	A	CS	CT	EE
Weight age (%)	05	10	15	70

(**A**-Attendance**; CS**-Case Study**; CT**-Class Test**; EE**-End Semester Examination)

Text

- Tracy Diane and Tom Cassidy, Colour Forecasting

References:

- Mike Easey, Fashion Marketing
- Maria Constantino, Fashion Marketing and PR
- V. D Dudeja, Professional Management of Fashion Industry
- Julia Kuo, 20 Ways to Draw a Dress and 44 Other Fabulous Fashions and Accessories

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Syllabus - Semester Sixth

HEALTH AND SAFETY EQUILIBRIUM

Course Code: VFD2652 **Credit Units: 03**

Course Objectives:
The aim of the course is to provide Performance Criteria, Knowledge, Understanding, Skills and Abilities required to comply with health, safety and security requirements at the workplace and Covers procedures to prevent, control and minimize risk to self and others.

Course Contents:
Module-I: Comply with Health Requirements at Work
1) Comply with health and safety related instructions applicable to the work place (2) Use and maintain personal protective equipment as per protocol (3) Carry out own activities in line with approved guidelines and procedures. (4) Maintain a healthy lifestyle and guard against dependency on intoxicants (5) Follow environment management system related procedures

Module-II: Comply with Safety Requirements at work
Identify and correct (if possible) malfunctions in machinery and equipment (2.)Report any service malfunctions that cannot be rectified. (3.) Store materials and equipment in line with manufacturer's and organizational requirements (4) safely handle and move waste and debris (5) Minimize health and safety risks to self and others due to own actions (6) Seek clarifications, from supervisors or other authorized personnel in case of perceived risks (7) Monitor the workplace and work processes for potential risks and threats

Module-III: Comply with Security Requirements at work
(1) Carry out periodic walk through to keep work area free from hazards and obstruction (2) Report hazards and potential risks/ threats to supervisors or other authorized personnel (3) Participate in mock drills/ evacuation procedures organized at the workplace (4) Undertake first aid, fire fighting and emergency response training (5) Take action based on instructions in the event of fire, emergencies or accidents. (6) Follow organization procedures for shutdown and evacuation when required

Module-IV: Organization Process
(1) To know and understand: (A) Occupational health and safety risks and methods. (B) Proper disposal system for waste and by-products (c) Signage related to health and safety and their meaning (2) limits of your responsibilities when coordinating with other department. (3) Identification, handling and storage of hazardous substances (4) effects of alcohol, tobacco and drugs

Module-V: Industrial Case (Compulsory)
Ill-effects of alcohol and tobacco (on Employ) – physiology & performance

Examination Scheme:

Components	A	CS	CT	EE
Weight age (%)	05	10	15	70

(**A-**Attendance**; CS-**Case Study**; CT-**Class Test**; EE-**End Semester Examination)

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Text:

- Susan B. Kaiser, The social psychology of clothing and personal adornment, Macmillan, 1985
- Anthony Gonzalez (2007): Cosmetology,Global Media Publications

References:

- Avis. M. Dry, The Psychology of Jung, Methuen & Co., London, 1961.
- Horn, Marilyu J, The Second Skin, Houghton Miffin Co., USA, 1968.
- Claudia Piras & Bernhard Roetzel, Ladies: A guide to fashion and style, Dumonte Monte, 2002.
- Vincent Brome, Jung, Granada Publishing, London, 1978.
- Flugel, J.C. The psycho-analytical study of the family, The Hograth Press &INPA, London, 1950.
- Rona Berg,Beauty: The new basics, Workman Publishing Company Inc., 2000.
- Solomon, Consumer Behavior: In Fashion, Pearson Education India.
- Small Business Safety Management Series OSHA 2209-02R 2005

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FASHION MANAGEMENT

Programme Structure

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits
FDT2151	Fashion Art Illustration and Model Drawing	3	-	-	3
FDT2251	Fashion Theory	3	-	-	3
FDT2351	Computer Aided Manufacturing	3	-	-	3
FDT2451	Fashion Management	3	-	-	3
FDT2551	Fashion Forecasting	3	-	-	3
FDT2651	Fashion Retailing & Visual Merchandising	3	-	-	3
	TOTAL				**18**

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FASHION MANAGEMENT

Syllabus - Semester First

FASHION ART ILLUSTRATION AND MODEL DRAWING

Course Code: FDT2151 **Credit Units: 03**

Course Objective:
The study of this course develops the student's ability to visualize the ideas and putting them in concepts for fashion garments. It gives an understanding to different illustration techniques and explores other media for creating concepts through practical assignments. Whereas Model Drawing is introduced with the concept of drawing normal figures in movement and different postures.

Course Content:

Module I	:	Sketching of Block and Flesh Figures
Module II	:	Photo Analysis
Module III	:	Rendering of Prints into flat illustration
Module IV	:	Detailed drawing of Basic Styles
Module V	:	Draping of Garments
Module VI	:	Introduction to Garment Drawing
Module VII	:	Use of different colour medium

Submission of practical work records - (Compulsory)

Examination Scheme:

Components	A	H	R	EE
Weightage (%)	05	10	15	70

(**A** - Attendance**; H** -Home Assignment**; R-** Practical work records**; EE-**End Semester Examination)

Text & References:
Text:

- By Kathryn McKelvey, Fashion Source book.

References:

- Fashion Design and Illustrations
- By Patrick John Ireland, Introduction to Fashion Design
- By BinaAbling, Model Drawing
- By BinaAbling, Fashion Sketch Book

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Syllabus - Semester Second

FASHION THEORY

Course Code: FDT2251 **Credit Units: 03**

Course Objective:
To provide a broad foundation to acquire the knowledge of fashion theory and its growth which develop the students' potential for professional activities that demand considerable independence or for fashion research work.

Course Contents:
Module-I: Fashion Development
Origin of the Fashion**,** Effect of Industrial Revolution on Fashion; Mass production of clothing; Introduction of Retailing; Changes caused by communications, leisure, and Industry; Effect of world War-i; Effect of depression on Fashion; Effect of world War –ii; Reactionary Postwar Fashion; Fashion at 1960s; Anti fashion at 1970s; Fashion 1980s; Fashion 1990s.

Module-II: Fashion Evaluation & Adoption.
Introduction - Fashion Cycles, Length of Fashion Cycles**; Adoption-** Traditional Fashion adaption (Trickle – Down Theory), Reverse Adaption (Trickle-up or Bottom-up Theories), Mass Dissemination (Trickle-across Theory); James Laver and Laws on the Timeline of Style

Module-III: Study of International Fashion Centers.
France, Italy, England, Germany, Canada, United States.

Module-IV: Applied Learning Assignments.
Visit fashion malls and analyze current fashion styles and find social, economical, technological influence on it. Also refer the fashion magazines and newspapers for trend review. Make a report with views and reasons.

Examination Scheme:

Components	A	L	CT	EE
Weightage (%)	05	10	15	70

(**A-**Attendance**; L-** Learning Assignments**; CT-**Class Test**; EE-**End Semester Examination)

Text & References:
Text:

- By Gini Stephens Frings (1999): Fashion: From concept to consumer, Prentice-Hill Inc.

References:

- By Phyllis Tortora, The Fairchild's Dictionary of Fashion
- By S. A Hussain, Variety- Fashion for Freedom
- By Sandra J.Keiser & Myrna B.Garner, Beyond Design, Fairchild publication.
- By G. J Sumathi, Elements of Fashion & Apparel Design.
- By Solomon, Consumer Behavior: In Fashion, Pearson Education India.

List of Magazines
Apparel online, Fiber 2 Fashion, Cosmopolitan. Marie Claire, Elle, Vogue, Harper's Bazaar, In Style, Glamour, Lucky, Allure, W Magazine.

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Syllabus - Semester Third

COMPUTER-AIDED MANUFACTURING (CAM)

Course Code: FDT2351 **Credit Units: 03**

Course Objective:
This module makes the student know-how the Computer Applications in the Fashion & Apparel Industry.

Course content:

Module I	**:**	**Adobe Photoshop - Functions of Tools & Working on layers**
Module II	**:**	**Photo-editing & its usage**
Module III	**:**	**Demo on 'TUKA cad' Module**
Module IV	**:**	**Mode conversation through editing**
Module V	**:**	**Demo on 'Opti Tex'**
Module VI	**:**	**Rendering & filter effects along tutorials**

Examination Scheme:

Components	**A**	**H**	**CT**	**EE**
Weightage (%)	**05**	**10**	**15**	**70**

(**A-**Attendance**; H** -Home Assignment**; CT-**Class Test**; EE-**End Semester Examination)

Text & References:
Text:

- By Corel DRAW 11 for Windows: Visual Quick start Guide
- By Sue Chastain, your guide to Graphics software
- By David Huss, Gary W. Priester ,Corel DRAW Studio Techniques, McGraw-Hill Osborne Media, 1998
- By CorelDraw 10 for Windows: Visual Quick Start Guide.
- By Linnea Dayton, Cristen Gillespie, The Photoshop Cs/Cs2 Wow!

References:

- Illustrated Encyclopedia of Costume and Fashion,
- By Jill B. Treadwell, Edited: Donald Treadwell, Public Relations Writing: Principles in Practice, SAGE, 2004

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Syllabus - Semester Fourth

FASHION MANAGEMENT

Course Code: FDT2451 **Credit Units: 03**

Course Objective:
The objective of this course is to impart knowledge about fashion global market, fashion brand management, different pricing strategies, and necessary for successful employment in apparel businesses.

Course Contents:
Module-I: Fashion for global market
Social, Cultural, Economic, Demographic factors relating to branded and licensed products, Analyzing potential or global market, identify target consumers and competition, market research and testing, customization
Module-II: Fashion Marketing Concepts
The concept of marketing, Utility, Marketing functions and related activities, The concepts of market segmentation and niche marketing, The marketing mix, The channels of distribution used in the fashion industry, Marketing and merchandising
Module-III: Economics in the Fashion Industry
The concept of economic goods/services, The concept of economic resources, The concept of supply and demand, Cost and retail, Gross profit and net profit.
Module-IV: Fashion Promotional Mix
Types of media used in fashion retail advertising, The importance of special promotional events
Module-V: Consumer Demand for Fashion Marketing
Consumer Groups - Demographic Trends & Psychographic Trends, Consumer spending – Personal Income, Disposable Income, Discretionary Income, Purchasing Power, Factors influencing consumer behaviour.
Module-VI: Pricing strategies & Decisions
Concept and importance of pricing, Factors affecting pricing decisions, Methods of pricing
Module-VII: Fashion Brand Management
Types and relevance of branding, Fashion & brand positioning, launching strategies, distribution, marketing
campaigns for brand introduction
Examination Scheme:

Components	A	H	CT	EE
Weightage (%)	05	10	15	70

(**A**-Attendance**; H** -Home Assignment**; CT**-Class Test**; EE**-End Semester Examination)

Text & References:
Text:
- By V. D Dudeja, Professional Management of Fashion Industry

References:
- By Mike Easey , Fashion marketing
- By Philips Kotler, Marketing management
- By Maria Constantino, Fashion Marketing and PR
- By Nicholas Alexender, international Retailing
- By V. D Dudeja, Professional Management of Fashion Industry
- By Lynda Gamans, Retailing Principles

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Syllabus - Semester Fifth

FASHION FORECASTING

Course Code: FDT2551 **Credit Units: 03**

Course Objective:
The students are made to start their work with the collection of data regarding fashion forecasting, trend analysis
and presentations. They are then made to forecast the fashion trend and dictate fashion in their very own way.

Course Contents:
Module-I: Concept of fashion forecasting (Theory)
Awareness of fashion fairs and fashion centers, Knowledge of creative writing, Reading of fashion forecast magazine, Sources of information, Role of Exhibitions and Fashion shows

Module-II: Fashion Forecasting Process (Theory)
Market Research- Consumer research, Shopping, Sales records; Evaluating the collections- Similar Ideas indicate fashion trends, Trends for target market; Fashion services – Collection reports, Trend books, consulting, Color services, Television/Video services , News letter services, Web sites, Directories and reference books, Fashion Magazines and news papers, Catalogs. Design Sources- Historic inspirations, Folk influences, Vintage clothing shops, Museums, Libraries and bookstores, Arts, Fabrics/Textiles, Travel, Form follows function, The street scene, The turn of the century, innovations and technologies.

Module-III: Applied Learning Assignments. (Practical)

Market Research - On site visits to fashion retailers and cloth markets and study the market trends and collect various cloth samples, catalogs etc.

Forecasting Exploration - Students will explore a variety of sources like Magazines, News papers, Internet sites and in-site, their market research reports etc. to become familiar with apparel, textile, color, style, and general culture and consumer forecasting resources. Each student will identify and report trends found to class.

Preparation of story boards - Students will prepare story boards for specific target.

Presentation of designs - Students will prepare fashion forecast for different seasons.

Final Presentation - Each student have to submit their Research file in a standard format guided by the faculty for the final evaluation.

Course Evaluation:

Components	A	C	A & F	P	Viva	Total
Weightage (%)	10	20	20	25	25	100

(**A -** Attendance, **C -** Concept Development, **A & F -** Analysis & Findings, **P** – Presentation)

References:

- By Gini Stephens Frings (1999): Fashion: From concept to consumer, Prentice-Hill Inc.
- By Tracy Diane and Tom Cassidy, Colour Forecasting
- By Kathryn Mc Kelvey, Fashion Design Process, Innovation and Practice

List of Magazines

Apparel online, Fiber 2 Fashion, Cosmopolitan. Marie Claire, Elle, Vogue, Harper's Bazaar, In Style, Glamour, Lucky, Allure, W Magazine.

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Syllabus - Semester Sixth

FASHION RETAILING AND VISUAL MERCHANDISING

Course Code: FDT2651 **Credit Units: 03**

Course Objectives:
The aim of the course is to provide an integrated curriculum frame work within which students are able to acquire a range of knowledge and transferable skills relevant to employment in retail industry.

Course Contents:

Module-I: Introduction to Fashion Retailing & Strategies
Fashion Retailing-Definition, Concept, Importance, Functions – Indian Retails vs. Global Scenario, **Retail Location**- Factors affecting location decision, Site Selection. **Retail Directions** -Value directed retailing; Service oriented retailing, Unique Merchandising, Shopping as entertainment, Street retailing, Global expansion of retailing; **Types of Retail operations** – (1) Specialty stores- Single brand or Private label retailers, Secondary spin-offs, (2) Department stores, (3) Mass Merchants – Discounters, Off-Price retailers, Outlet stores, Warehouse clubs, (4) Promotional stores, (5) Non store retailing - Mail order merchants, Party plan retailing, Electronic retailing, Television shopping, Online shopping.

Module-II: Fashion Retail Functions & Organizations
Retailing Functions – Merchandising, Store operations, Marketing, Sales Promotion, Finance, Real estate or Store planning, Human resources **Organizations –** (1) Shopping Centers – Traditional Malls, Diversified Malls, Value centers, Outlet Malls, Transportation centers, Recreational Malls, Town center malls; (2) The small stores, (3) The large stores, (4) Store with in a store – In store designer boutiques, Leased departments; (5) Multiple -unit stores – Chain stores, Department store groups, corporate ownerships. **Retail Buying –** Buyer's role, Duties & responsibilities of a retail buyer

Module-III: Introduction to Visual Merchandising
Visual Merchandising - Definition, Concept, Importance; **Store Planning –** Store Image, Target customers, Seasonal Visual merchandising, **Store Design –** (1) Windows – Special event windows, Fashion message windows, Direct-sell windows; (2) Interiors - Apparel fixtures, Folding and stacking, Accessories display **Managing Visual Merchandising Elements -** Mannequins, Standards Manuals, Presentation packages, Tele communications, Designer / Brand in-store shops

Module-IV: General Principles of IPR
Introduction to Intellectual Property 1.1 Concept of Intellectual Property 1.2 Kinds of Intellectual Property 1.3 Economic importance of Intellectual Property 2. **Philosophical Justification of Intellectual Property Western Theories on Private and IP** 2.1 Locke's Labour Theory of Property 2.2 Hegel's Personality Theory of Property 2.3 Marxian Theory on Private Property and IP. 3. **Indian Theory on Private Property** 3.1 Constitutional Aspects of Property 3.2 Constitutional Protection of Property and IP 4**. International Scenario** Introduction to the leading international instruments concerning intellectual property rights: the Berne Convention, Universal Copyright Convention, the Paris Convention, TRIPS, the World Intellectual Property Rights Organization (WIPO) and the UNESCO 5. **Economic Development and IPR Protection**
6.Enforcement of Industrial Property in General 6.1 Civil Court Procedures 6.2 Criminal Actions: 7.**Counterfeiting Intellectual Property Rights and Human Rights** 7.1 Right to Health as

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Basic Human Rights and IPR 7.2 Right to Food as Basic Human Rights and IPR
Need for Protection of Industrial Designs 8.1 Introduction 8.2 Justification for Protecting Design 9. **Subject Matter of Protection and Requirements** 9.1 Copyright on Registered Design 92 Industrial and International Exhibition 10. **The Designs Act, 2000** 10.1 Procedure for obtaining Design Protection 10.2 Revocation, Infringement and Remedies

Module-V: Capstone Project (Compulsory)
Model of Online retailing in Indian Fashion Retail Industry- Establishment and Procedural Working

Examination Scheme:

Components	A	CS	CT	EE
Weight age (%)	05	10	15	70

(**A**-Attendance**; CS**-Case Study**; CT**-Class Test**; EE-**End Semester Examination)

Reference:

- Gini Stephens Frings (1999): Fashion: From concept to consumer, Prentice-Hill Inc.
- Dickerson Kitty G., Inside The Fashion Business, Pearson Education India, 2004
- Swati Bhalla & Anuraag S., Visual Merchandising, Tata McGraw-Hill Education, 2010
- Diamond, Fashion Retailing: A Multi-Channel Approach , Pearson Education India, 2007
- Rosemar Varley, Retail Product Management: Buying And Merchandising, Routledge, 2006
- Jay Diamond, Ellen Diamond, Contemporary Visual Merchandising, Prentice Hall PTR, 2010

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APPAREL MERCHANDISING
(Skill Track)

Programme Structure

Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
VFD2151	Introduction to Apparel Merchandising	1	-	4	3
VFD2251	Apparel Market Research & Product Analysis	1	-	4	3
VFD2351	Vendor Management & Product Evaluation	1	-	4	3
VFD2451	Prototype Preparation & Merchandise Plan	1	-	4	3
VFD2551	Pre-Production Management	1	1	2	3
VFD2651	Shipment & Documentation Management	1	-	4	3
	TOTAL				**18**

- *Eligible for appearing assessment of Qualifications pack-occupational standards for a merchandiser (sub sector-Apparel) according to National Occupational Standards, NSQF level 5, approved by National Skill Development Corporation (NSDC)*

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APPAREL MERCHANDISING

Syllabus - Semester First

INTRODUCTION TO APPAREL MERCHANDISING

Course Code: VFD2151 **Credit Units: 03**

Course Objective:
This course helps the students to get a preview to develop merchandising skills for apparel products. This course covers the basic knowledge of fashion; textile and apparel industry, Safety Management and introduction to merchandizing,

Course Contents:
Module-I: Fashion Terminology
The Language of fashion – Introduction to fashion concept; Definitions and meaning, Classification, Style, Change, Acceptance, Taste, Look, Trends, Season; Color, Texture, Fit, Comfort, Brand or Designer Label, Fashion cycles. **Adoption Theories –** Trickle down, Trickle up, Trickle-across and Laver's law. **Fashion clothing categories, Styling & Size range -** Women's wear, Men's wear Children's wear

Module-II: Introduction to Textiles
Textile fibers & Yarns - Definition & classification. **Woven fabrics -** Classification, fabric properties and identification of fabrics types. **Knit fabrics –** Classification, fabric properties and identification of fabrics types. **Textile processing –** Introduction to Dying, Printing and Finishing. **Care symbols & Labeling.**

Module-III: The Overview of Apparel Industry & Apparel Production
Apparel industry - Major segments; **Organizational structures -** Structure of Export house, Buying house and Domestic companies, Buyer's classification and buying network in exports. Sources of fabric buying and selling of finished fabric. **Apparel construction techniques** - Introduction to Drafting & Patten making. **Machinery & Equipment** - Cutting, sewing, finishing, washing, stain removal, embellishment. **Production methodology -** Assembly line, individual garment manufacturing, job work, quality checkpoints. **Design & Tech-pack -** Introduction & Definition. Labelling & Packing.

Module-IV: Workplace Safety Management Practices
Health and safety instructions – Importance of sound health, hygiene and good habits. Ill-effects of alcohol, tobacco and drugs.. Occupational health and safety risks. Signage related to health and safety. Personal protective equipments & its use. Method of write report on the hazards and risks / threats faced at workplace**.** event of a mock drills, evacuation procedures, accident, emergency or fire **Environmental management system (EMS)** - EMS procedures. Proper disposal system for waste and by-products. Identification, handling and storage of hazardous substances.

Module-V: Basics of Apparel Merchandising
Introduction, Functions and role of Merchandiser, Merchandising Process, Meaning and Need for quality control in Merchandising process.

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Examination Scheme:

Components	A	L	CT	EE
Weightage (%)	05	10	15	70

(**A**-Attendance**; L**- Learning Assignments**; CT**-Class Test**; EE**-End Semester Examination)

Text & References:

- Gini Stephens Frings (1999). Fashion: From concept to consumer, Prentice-Hill Inc.
- Kadolph Sara,J (2009). Textiles, Pearson
- Leila Aitken. Step by step dress making course
- Fuller, C., & Vassie, L. H. (2004). Health and safety management: principles and best practice. Pearson Education.

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Syllabus - Semester Second

APPAREL MARKET RESEARCH AND PRODUCT ANALYSIS

Course Code: VFD2251 **Credit Units: 03**

Course Objective:
This course focuses on the awareness about apparel business plans, market target is and design brief. Scopes of this course include Market trend assessment, Determine design brief, Identification of Design brief and analyze.

Course Contents:

Module-I: Assessment of Market Trends
Research on market trends - Conduct research on target market, materials, trims, better or new sources / suppliers for procurement; **Design review** - Review previous designs & samples developed by the business to assess relevance to current design/samples;

Module-II: Determination of Key Criteria for Design Brief
Identify processes - Identify business processes and client goals; Identify Quality standards for designs, Identify budget, cost points and timing constraints, **Tech-pack review** - Check the Tech-pack received and identify it with the design brief given by the designer and also checked if all specifications are there in the tech-pack, If not clarify and modify if needed.

Module-III: Organizational Context & Technical Knowledge
Organizational processes - Organization's policies, procedures, guidelines and standards for dealing with buyers/clients, Recognizing and adapting to cultural differences in the workplace, including modes of behavior and interactions, Production capacity and processes of business are identified. Systematically work completion with attention to detail without damage to goods and equipment. Awareness of Intellectual Property rights, **Technical processes** - Garment construction techniques and processes, Detailed knowledge of a range of fabrics and trims, An understanding on the cost process involved in making an apparel, Vendors, Compliance Standards.

Examination Scheme:

Components	A	L	CT	EE
Weightage (%)	05	10	15	70

(**A**-Attendance**; L**- Learning Assignments**; CT**-Class Test**; EE**-End Semester Examination)

Text & References:

- A J Chuter, Introduction to clothing production management
- B S Jolly, Law, Ethics & Communication- FOR CA-IPCC, Tata McGraw-Hill Education
- Design Research: Methods and Perspectives, edited by Brenda Laurel
- Gini Stephens Frings (1999): Fashion: From concept to consumer, Prentice-Hill Inc.
- Grace I kunz, Merchandising: Theory, Practice and Principles
- John Donnellan , Merchandise Buying and Management.
- P Narayan, Intellectual Property Rights
- V. D Dudeja, Professional Management of Fashion Industry

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Syllabus - Semester Third

VENDOR MANAGEMENT AND PRODUCT EVALUATION

Course Code: VFD2351 **Credit Units: 03**

Course Objective:
This course is aimed to understand the merchandiser's way to set the objectives to develop the product given following the work flow and the norms required. This course covers preparation of Bill of Materials, Identification of Vendor or Supplier and Evaluation of different parameters.

Course Contents:
Module-I: Vendor Identification.
Vendor database - Method of Identify the vendors for initial development and confirmation on bulk if approved, Method of update the Vendor database, **Swatches collection** - Collect all kind of relevant swatches to meet the design brief from fabrics to trims and get confirmation on the same. **Appropriateness of Tech-pack** - Method of appropriate personnel are consulted with to confirm feasibility.

Module-II: Preparation & Evaluation of the Bill of Material (BOM)
Bill of Material (BOM) – Procedure and Method of preparation a well formed BOM (Bill of Material) for each of the styles in the collection. Method of specify all that is required like the raw material, parts, quantities of each needed to manufacture the end product. **Primary costing** - Method of initial costing of the sampling derived. **Consumption identification** - Appropriate personnel identified for the consumption to be made for making, **Follow up Procedures** - Required involvement of patternmaker and tailor, Determination of monitoring procedures and checking points, follow-ups with IE Department and calculation of the SAM (Standard Allowed Minute) of the sample. **TNA (Time and Action) calendar** – Method of TNA (Time and Action) calendar preparation made with the estimated details got to fix on the delivery date after confirmation on the sample.

Module-III: Organizational Context & Technical Knowledge
Organizational processes – Understand the protocol to obtain more information on work related tasks. Understand the limits of merchandiser's role and responsibilities in relation to IT service requests or incidents and reporting structure. **Technical processes** - Understand how to use equipment, templates and processes for preparing the tech-pack., understand the fabrics and garments that require stitching by hand or machine stitching. Understand Sewing and Pattern making techniques to put across ideology the tailor master to make the same, Understand concepts of product and pricing life cycle, Procedure for Pricing and costing.

Examination Scheme:

Components	A	L	CT	EE
Weightage (%)	05	10	15	70

(**A**-Attendance**; L-** Learning Assignments**; CT**-Class Test**; EE**-End Semester Examination)

Text & References:
- A J Chuter, Introduction to clothing production management.
- Gini Stephens Frings (1999): Fashion: From concept to consumer, Prentice-Hill Inc.
- Grace I kunz, Merchandising: Theory, Practice and Principles..
- V. D Dudeja, Professional Management of Fashion Industry.

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Syllabus - Semester Fourth

PROTOTYPE PREPARATION AND MERCHANDISE PLAN

Course Code: VFD2451 **Credit Units: 03**

Course Objective:
This course helps the students to learn how to develop the samples against the design brief for analyzing and getting it confirmed for bulk production as well as how to plan and process for production. The scope of this course is Prototype Preparation and Merchandise plan.

Course Contents:
Module-I: Prototype Preparation
Specification sheet follow-ups - Procedure of check the specification sheet prepared in accordance with standard format. Preparation, coordination and confirmation of pattern cutting, detailed drawings and mini- markers. Preparation, coordination and confirmation of patterns developed are according to the shrinkage report, tested and received. Procedure and method of checking of assembled garments according to specifications sheet and accepted garment assembly techniques. **Prototype test report** – Procedure and method of Prototype sent for test report either according to company norms or as per the buyers standards requested.

Module-II: Merchandise Plan.
Buyer approval process - Preparation, coordination and confirmation Prototype checked with design team and sent to buyer for approval and accordingly changes done if any and confirmed for production. Size sets approved internally. **P.O (Purchase Order) & P.I (Performa Invoice)** - Procedure and Method of raise and receive P.O (Purchase Order) & P.I (Performa Invoice) after confirmation on the costing to buyer and vendor. **Approval and updating of work sheets** - Procedure and method of approval and updating of all the work sheets, like the trims sheet, fabric sheet, consumption sheet (fabric and thread) this also includes in tech-pack, if any. Procedure and method of actual TNA updating that sent for approval.

Examination Scheme:

Components	A	L	CT	EE
Weightage (%)	05	10	15	70

(**A**-Attendance**; L**- Learning Assignments**; CT**-Class Test**; EE**-End Semester Examination)

Text & References:
- A J Chuter, Introduction to clothing production management
- Design Research: Methods and Perspectives, edited by Brenda Laurel
- Gini Stephens Frings (1999): Fashion: From concept to consumer, Prentice-Hill Inc.
- Grace I kunz, Merchandising: Theory, Practice and Principles
- Harry B. Watton (1992.). New Product Planning, Prentice Hall Inc.
- John Donnellan , Merchandise Buying and Management.
- Lynda Gamans, Retailing Principles
- Maria Constantino, Fashion Marketing and PR
- Nicholas Alexender, international Retailing

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Syllabus - Semester Fifth

PRE-PRODUCTION MANAGEMENT

Course Code: VFD2551 **Credit Units: 03**

Course Objective:
This course focuses on the method of organizes and coordinates the pre-production meeting and a well prepared pre-production file.

Course Contents:
Module-I: Updating Time & Action Calendar (TNA)
Time & Action Calendar (TNA) Follow-ups- Procedure and method of updated on the TNA prepared. Procedure and method of coordination with all departments in the organization. Procedure and method of check on mainly with status on the warehouse to know if the raw materials, trims and all necessary ordered are getting in-house on time.

Module-II: Preparation of pre-production file and pre-production meeting (PPM)
Pre-production file - Procedure and method of create a good and accurate and pre-production file. - Procedure and method of create Trims and accessories card, Procedure and method of create a card that contained all the approved swatches / lab dips and samples with strike offs etc. Procedure and method of maintaining the file with the tech-pack, production order sheet with size break up, cut plan and mini marker, packaging specification, washing instruction (if any), Test report, TNA Chart and important mail conversations etc. **Pre-production meeting** - Procedure and method of clarifies and address any potential issues if any at the pre-production meeting. Procedure and method of identify any other issues, raised if any from the other department personnel attending the meeting. Procedure and method of handling to sort out issue based PPM meeting, if any. Procedure and method of prepare minutes of the PPM meeting.

Module-III: Applied Learning Assignments. (Practical)
The students will have to prepare a pre-production file for the part of their study. Each student has to submit their file in a standard format guided by the faculty for the final evaluation. The students are asked to give a brief oral presentation with 'Power Point' to the class about their understanding. The submission of pre-production file and presentation will be part of student's internal examination scheme.

Examination Scheme:

Components	A	L	Practical	EE
Weightage (%)	05	10	15	70

(**A**-Attendance**; L-** Learning Assignments**; CT**-Class Test**; EE**-End Semester Examination)

Text & References:

- A J Chuter, Introduction to clothing production management
- B. Rao (2009). Business Ethics & Professional Values, Excel Books India.
- B S Jolly, Law, Ethics & Communication- FOR CA-IPCC, Tata McGraw-Hill Education
- Design Research: Methods and Perspectives, edited by Brenda Laurel
- Gini Stephens Frings (1999): Fashion: From concept to consumer, Prentice-Hill Inc.
- Grace I kunz, Merchandising: Theory, Practice and Principles
- Harry B. Watton (1992.). New Product Planning, Prentice Hall Inc.
- Herta A. Murphy (1990), Effective Business Communications, McGraw-Hill Ryerson, Limited.
- John Donnellan , Merchandise Buying and Management.
- V. D Dudeja, Professional Management of Fashion Industry

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Syllabus - Semester Sixth

SHIPMENT & DOCUMENTATION MANAGEMENT

Course Code: VFD2651 **Credit Units: 03**

Course Objective:
This course is aimed to understand how the merchandiser coordinates with the factory to check on the smooth running of it to meet the delivery line. This course discus about hoe the merchandiser handles the program during shipment while the quality check is done and all approved.

Course Contents:
Module-I: Buying House Coordination
Buyer Coordination - Procedure and method of coordinate with buyer or buying house if any clarification is required that is if any issue raised during production is not well identified internally. **QA or 3rd Party QA** - Procedure and method of coordinating with buying house QA or 3rd Party QA for initial/mid and final inspection of shipment. Procedures and methods of inspection

Module-II: Coordination and Management of Shipment
Execution of orders - Procedure and method of check execution of orders whether it is running on time. **Shipping and Documentation** - Procedure of shipping and documentation. Method of coordination with shipping and documentation department for forwarding approved shipment. Procedure and method of closely work with logistics and help shipping department with timely information of packing reports for preparation of shipping documents.

Module-III: Industrial Visits
The students will have to visit various export and buying houses for the part of their study.
The students are asked to give a brief oral presentation with 'Power Point' to the class about their Understanding. They have to explain, what kind of knowledge they want to develop in the field of merchandizing and a debate will follow as well. The submission of industrial visit report and presentation will be part of student's internal examination scheme.

Examination Scheme:

Components	A	L	CT	EE
Weightage (%)	05	10	15	70

(**A**-Attendance**; L**- Learning Assignments**; CT**-Class Test**; EE**-End Semester Examination)

Text & References:
- A J Chuter, Introduction to clothing production management
- Gini Stephens Frings (1999): Fashion: From concept to consumer, Prentice-Hill Inc.
- Grace I kunz, Merchandising: Theory, Practice and Principles
- Harry B. Watton (1992.). New Product Planning, Prentice Hall Inc.
- John Donnellan , Merchandise Buying and Management.
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PAINTING ARTS

Programme Structure-2021

Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
FNA2151	Basics of Drawing and Asian Landscape	1	-	4	3
FNA2251	Basics of Drawing and Monochrome Folk Composition	1	-	4	3
FNA2351	Advanced Drawing and Illustration of Indian Temple Sculpture	1	-	4	3
FNA2451	Advanced Drawing with Ink & Brush Illustration	1	-	4	3
FNA2551	Advanced Drawing & Illustration with Mural Art	1	-	4	3
FNA2651	Advanced Drawing & Illustration with Visual Design	1	-	4	3
	TOTAL				**18**

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PAINTING ARTS

Syllabus - Semester First

BASICS OF DRAWING AND ASIAN LANDSCAPE

Course Code: FNA2151 **Credit Units: 03**

Course Objective:
Drawing is the basic element of learning art. Drawing exercises are to acquire accurate sense of observation and skills to present representational art. Also the objective of this course is to acquire experience in basic knowledge to explore painting techniques too. Structured exercises on painting include basic colour theory and pictorial composition, which enables students to be confident in the use and manipulation of colour. It also provides a clear idea of different painting practices. Like water colours and opaque colours.

Course Contents:

Module I: Basics of Drawing
Object drawing to explore basic drawing tool 'Pencil'. Suggestion of solidity by line work as well as light and shade, realization for rhythmic relationship between lines, mass, volume and texture, emphasis on various visual experiences. Quick Sketching to increase hand eye coordination and improving vision and observation skills.
a) Learning basic elements of drawing.
b) Object drawing.

Module II: Asian Landscape
Landscape drawing and rendering using pencil, charcoal pencil or colour pencils. Understanding the basic fundamentals of Asian style landscapes.
Works to be done:

1. Sketches – 5
2. Landscape-5

Examination Scheme:

Components	PT	CT	A	EE (Practical)
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

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Syllabus - Semester Second

BASICS OF DRAWING AND MONOCHROME FOLK COMPOSITION

Course Code: FNA2251 **Credit Units: 03**

Course Objective:
Drawing is the basic element of learning art. Drawing exercises are to acquire accurate sense of observation and skills to present representational art. Also the objective of this course is to acquire experience in basic knowledge to explore Indian folk painting style & techniques too. Structured exercises on painting include basic colour theory, theme and pictorial composition, which enables students to be confident in the use and manipulation of colour of the folk traditions also provides a clear idea of different folk painting practices.

Course Contents:

Module I: Basics of Drawing
Object drawing to explore basic drawing tool 'Pencil'. Suggestion of solidity by line work as well as light and shade, realization for rhythmic relationship between lines, mass, volume and texture, emphasis on various visual experiences. Quick Sketching to increase hand eye coordination and improving vision and observation skills.
a) Learning basic elements of drawing.
b) Object drawing.

Module II: Monochrome Folk Composition
Indian folk style paintings in monochrome colours using any 2 mediums.

Works to be done:

1. Sketches – 5
2. Folk Paintings-5

Examination Scheme:

Components	PT	CT	A	EE (Practical)
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

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Syllabus - Semester Third

ADVANCED DRAWING AND ILLUSTRATION OF INDIAN TEMPLE SCULPTURE

Course Code: FNA2351 **Credit Units: 03**

Course Objective:

Drawing is the basic element of learning art. Drawing exercises are to acquire accurate sense of observation and skills to present representational art. Also the objective of this course is to acquire experience in basic knowledge to explore temple art & techniques too. It also provides a clear idea of different illustration/painting techniques. Also understanding the structural formation of objects as well as architectural structures is to be taught.

Course Contents:

Module I:
Quick Sketching to increase hand eye coordination and improving vision and observation skills.

a). Indian sculpture drawing like Buddhashirsha, dancing girl of Mohenjo-Daro
b) Ancient architectural composition like Kailas temple, Konark temple

Module II: Illustration of Indian Temple Sculpture

Illustrations and drawings related to the Indian Temple Sculpture of whole India. Understanding the various parts and formation along with architectural structure.

Works to be done:

1. Sculpture drawing – 05
2. Indian Architectures composition -- 05

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

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Syllabus - Semester Fourth

ADVANCED DRAWING WITH INK & BRUSH ILLUSTRATION

Course Code: FNA2451 **Credit Units: 03**

Course Objective:

Illustration and composition is the basic element of learning art. Drawing exercises are to acquire accurate sense of observation and skills to present representational art. Also the objective of this course is to acquire experience in basic knowledge to explore illustrative techniques too. It also provides a clear idea of different Illustration style & techniques with ink and brush. Like transparent colours and opaque colours.

Course Contents:

Module I: Illustration and Composition
Quick Sketching to increase hand eye coordination and improving vision and observation skills.

a) Theme based figure composition in ink
b) Poster making composition for social cause.

Module II: Ink and color Composition
Illustrations and composition using ink and color. Both single & multi-colour techniques.

Works to be done:

1. Illustration and Composition -- 05
2. Ink and color Composition --05

Examination Scheme:

Components	P	CT	A	EE
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

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Syllabus - Semester Fifth

ADVANCED DRAWING & ILLUSTRATION WITH MURAL ART

Course Code: FNA2551 **Credit Units: 03**

Course Objective:

Drawing is the basic element of learning art. Drawing study of human figure based on proportion, masses, specific feature and character using various media with emphasize on manner of finished execution. Structured exercises on mural painting include basic Indian style application and composition, which enables students to be confident in the use and manipulation of Indian mural themes, style & techniques. Mural Art techniques are taught to liberate the students in context of mediums of expression.

Course Contents:

Module I: Life Study
Life study and figurative composition using different mediums of drawing**.**
a) Quick Sketching of Human Figure
b) Figure drawing Composition

Module II: Mural
Illustrations and drawing as murals on wall or board in single/multi-colour.

Works to be done:

1. Sketches – 05
2. Mural - 1

Examination Scheme:

Components	PT	CT	A	EE (Practical)
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

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Syllabus - Semester Sixth

ADVANCED DRAWING & ILLUSTRATION WITH VISUAL DESIGN

Course Code: FNA2651 **Credit Units: 03**

Course Objective:

Drawing is the basic element of learning art. Drawing exercises are to acquire accurate sense of observation and skills to present representational art. Practice figurative drawing through observation. Also the objective of this course is to acquire experience in basic knowledge to explore illustration as well as visual design styles & techniques too. It also provides a clear idea of different design techniques and mediums. Other techniques like visual design are taught to help them develop a visual sense of design in general.

Course Contents:

Module I: Life Study
a) Figure Sketching
b) Life study and figurative composition using different mediums of drawing.

Module II: Illustration with Visual Design

a) Illustrations and drawings using the basic elements of Visual Design along with developing a better sense of color & form coordination to represent the subject.
b) Creative composition exercise based on individual layouts using various painting mediums.

Works to be done:

1. Drawings – 05
2. Illustrations – 1
3. Painting - 1

Examination Scheme:

Components	PT	CT	A	EE (Practical)
Weightage (%)	10	15	5	70

(**A**-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination; **PT**- Portfolio)

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Curriculum & Scheme of Examination

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LEGAL METHOD

Course Code: LAW2104 **Credit Units: 04**

Course Objective:
This paper focuses on orientation of students to legal studies from the point of view of basic concepts of law and legal system.

Course Contents:

Module I: Meaning and Classification of Laws
Meaning, Definition, Functions: Justice, Stability and Peaceful Change; Classification of laws: Public and Private Law, Substantive and Procedural Law, Municipal and International Law.

Module II: Sources of Law
Custom; Precedent, Ratio, Obiter; Legislation

Module III: Basic Concepts of Indian Legal System
Common Law, Essentials of a Valid Law, Constitution as the Basic Law, Rule of Law, Separation of Powers, Judicial system in India, **Principles of Equity**.

Module IV: Legal Writing and Research
Legal materials: Case law, Statutes, Reports, Journals, Manuals, Digests etc.; Importance of legal research ; Techniques of Legal Research : Doctrinal, Empirical Research, Legal writings and citations.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Glanville Willains – Learning the law
- Avtar Singh – Jurisprudence (Legal Theory)
- B.N.M. Tripathi – An Introduction to Jurisprudence and Legal theory
- Benjamin N. Cardozo, The Nature of Judicial Process
- LI Publication – Indian Legal System
- ILI Publication in Legal Research and Methodology

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LAW OF CONTRACT-I

Course Code: LAW2105 **Credit Units: 04**

Course Objective:
Whatever may be the nature of a given society, the contractual relations, as are obtained in that society, are governed by certain principles which are more or less of a general and basic nature. In India these general principles are included in the statute of the Indian Contract Act. 1872. This course is designed to acquaint a student with the conceptual and operational parameters of these various general principles of contractual relations. Specific enforcement of contract is an important aspect of the law of contracts. Analysis of the kinds of contracts that can be specifically enforced and the methods of enforcement forms a significant segment of this study.

Course Contents:

Module I: Formation of Contract
Meaning and nature of contract, Offer / Proposal (Definition, Communication, Revocation, General/Specific offer, Invitation to treat), Acceptance (Definition, Communication, Revocation, Tenders / Auctions). 'E'Contract

Module II: Consideration and Capacity
Consideration (Definition, Essentials, Privity of contract), Capacity to enter into a contract (Minor's position, Nature / effect of minor's agreements).

Module III: Validity of Contract
Unlawful consideration and object, Free Consent, Coercion, undue influence, Misrepresentation, Fraud, Mistake, Contingent contract, Quasi contracts, Effect of void, voidable, valid, illegal, unlawful and uncertain agreements contracts.

Module IV: Discharge and Performance of Contract
Discharge of Contracts, Performance, Time and Place of performance, Impossibility of performance and frustration, Breach – Anticipatory & Present.

Module V: Remedies
Damages, Remoteness etc., Injunction, Specific performance, Quantum Merit.

Module VI: Specific Relief Act, 1963
Recovery of property, Specific performance of contracts, Rescission of Contract, Declaratory Decree, Injunctions: Temporary and Perpetual, Mandatory.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Anson - Law of Contract
- Pollock and Mulla - Indian Contract Act
- Avtar Singh - Indian Contract Act
- Bangia - Law of Contract and Specific Relief
- Cheshire and Fifoot - Law of Contract.

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MICRO ECONOMICS-I

Course Code: LAW2106 **Credit Units: 04**

Course Objective:
This course is designed to expose first –year students, who may be new to economics, the basic principles of microeconomic theory. The emphasis would be on thinking like an economists & the course will illustrate how microeconomic concepts can be applied to analyze real life situations.

Course Contents:

Module I: Exploring the Subject Matter of Economics
Why study economics? The scope and method of economics; scarcity and choice; questions of what, how and for whom to produce and how to distribute output

Module II: Supply and Demand: How Markets Work, Markets and Welfare
Individual demand and supply schedules and the derivation of market demand and supply; shifts in demand and supply curves; the role prices in resource allocation; Elasticity of Demand — price, income and cross; Consumer's surplus

Module III: Consumer's Behavior
Utility-cardinal and ordinal approaches, Indifference curves; budget constraints;. Consumer's equilibrium (Hicks and Slutsky); Giffin goods; Compensated demand; Revealed preference theory; Engel curve.

Module IV: Theory of Production and Costs:
Technology, Isoquants, production with one and more variable inputs, Returns to scale, short run and long run costs, cost curves in the short run and long run, total, average, and marginal product, cost minimization and expansion path, elasticity of substitution.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	10	5	10	70

(A-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination)

Text & References:
Text:

- C. Snyder and W. Nicholson, Fundamentals of Microeconomics, Cengage Learning (India), 2010.
- B. Douglas Bernheim and Michael D. Whinston, Microeconomics, Tata McGraw-Hill (India), 2009
- Ahuja H.L. (2010) Principles of Microeconomics, 18th Edition, S. Chand& Co. Ltd.
- Robert S. Pindyk and D.L. Rubinfeld, (2000), Microeconomics, 3rd edition, Prentice Hall India.
- Ferguson & Gould(1989) Micro Economic Theory, 6th edition, all India Traveller Bookseller.
- Koutsoyiannis, A. (1990), Modern Microeconomics, Macmillan

References:

- N. Gregory Mankiw (2007), Economics: Principles and Applications, 4th edition, India edition by South-Western, a part of Cengage Learning, Cengage Learning India Private
- Karl E. Case and Ray C. Fair (2007), Principles of Economics, 8th edition, Pearson Education Inc., ISBN 81-317-1587-6.(hereafter Case & Fair, 2007, 8e).
- Joseph E. Stiglitz and Carl E. Walsh (2006), Economics, International Student Edition, 4th Edition, W.W. Norton & Company, Inc., New York, ISBN 0-393-92622-2. (hereafter Stiglitz & Walsh, 2006, 4e).Limited, ISBN-13:978-81-315-0577-9 (hereafter Mankiw, 2007, 4e).M.L. Trivedi (2002) Managerial Economics- Theory & Applications, Tata McGraw Hill
- W.J. Baumol, Economic Theory & Operations Analysis, Prentice Hall.
- Jhingan M.L.(2008) Microeconomic Theory,4th edition, Konark, Delhi.

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LAW OF CONTRACT-II

Course Code: LAW2204 **Credit Units: 04**

Course Objective:
This course shall be taught after the students have been familiarized with the general principles of Contract in which the emphasis is on understanding and appreciating the basic essentials of a valid Contract and on the existence of Contractual relationship in various instances. Obviously, Contract Law assumes special significance to suit changes in society. These special Contracts are studied in the light of statutory provisions and decisional Law. With the invent of globalization in various sectors of economy today and are in need of specialized legal Professionals due to huge contractual requirements, joint venture Partnerships and the like, Therefore, this Course of Special Contracts provides an insight into the justification for special statutory provisions for certain kind of Contracts.

Course Contents:

Module I: Indemnity and Guarantee/Bailment and Pledge
Meaning, Distinction between Indemnity and Guarantee, Right / Duties of Indemnifier, Indemnified and Surety, Discharge of Surety, Kinds of Guarantee, Bailment and Pledge: Meaning and Distinction, Rights and Duties of Bailor/Bailee, Pawnor/Pawnee, Lien, Termination of Bailment.

Module II: Agency
Definitions of Agent and Principal, Appointment of an Agent, Authority of an Agent, Creation of agency: by agreement, Ratification and law, Relation of principal / agent, subagent and substituted agent, Ratification of Agents Authority, Revocation of Agency Authority, Effects of Agency on Contracts with third person, Personal Liability of agents, Termination of agency.

Module III: Sale of Goods Act 1930
Contract of Sale: Nature and definition, Conditions and Warranties, Transfer of Property and Title, Performance of the contracts, rights of unpaid seller, suit for breach of contract.

Module IV: The Indian Partnership Act, 1932
Nature of partnership firm, Relations of partners to one another and outsiders, Rights /Duties of partners *inter se*, Partnership Property: Relations of Partners to third parties, Liability for holding out, Minor as a partner; Incoming and outgoing partners, Dissolution of Partnership Firm, Modes of Dissolution, Consequences of dissolution, Registration of firms and effects of non registration.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Texts & References:
- Pollock and Mulla, Indian Contract Act
- Avtar Singh, Indian Contracts Act
- Mulla, D. F., Indian Partnership Act
- Desai, T.R., Law of Contracts and Partnership sale of good Act
- R.K. Bangia, Sales of Goods Act, 1930
- Avtar Singh, Sales of Good Act
- Avtar Singh, Indian Partnership Act.
- K. Sukumaran, Pollock & Mulls - The Indian Partnership Act

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MICRO ECONOMICS-II

Course Code: LAW2205 **Credit Units: 04**

Course Objective:
The main objective of the course is to provide a deeper knowledge on some specific field of Microeconomics such as game theory, factor pricing, oligopoly & welfare Economics.

Course Contents:

Module I: Decision theory under Uncertainty: Utility Functions and Expected Utility
Risk aversion and risk preference, insurance and investor's choice.
Asymmetric information- Adverse selection and moral hazard

Module II: Oligopoly
Analysis of Cournot & Stackelberg, Collusive Oliogopoly and application of Prisoner's Dilemma of Nash equilibrium

Module III: Market Structure
Review of perfect competition and monopoly; Pricing with market power; price discrimination, peak load pricing, two-part tariff; monopolistic competition and oligopoly.

Module IV: Factor Pricing
Derived demand for a single input and multiple inputs in competitive & imperfect competition markets, firm demand and industry demand, collective bargaining and exploitation rent & quasi rent.

Module V: Welfare Economics
Conditions of Pareto optimality in pure exchange and with production, optimality of perfect competition

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	10	5	10	70

A-Attendance; **P**-Project; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination
Text & References:

Text:
- W.J. Baumol, 'Economic Theory and Operations Analysis'4th edition, Prentice hall
- Ahuja H.L (2010) Principles of Microeconomics,18th edition,S.Chand & Co. Ltd.
- Ferguson, 'Microeconomic Theory', Cambridge University Press.

References:
- A K Koutsyanni's, 'Modern Microeonomics', Macmillan.
- L.M.B. Cabral, (2000) Introduction to Industrial Organization, MIT Press.
- P.K. Dutta (1999) Strategies and Games: Theory and Practice, MIT Press.
- Formson & Gould – Microeconomic Theory

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MACRO ECONOMICS-I

Course Code: LAW2302 **Credit Units: 04**

Course Objective:
The objective of this paper is to make the student to understand how the business organizations work by applying economic principles in their business management. The course will attempt to relate theory to practice and try to instill in students the ability to apply basic microeconomic concepts to the understanding of everyday phenomena.

Course Contents:

Module I: Nature and Methodology of Economics
Definition, Nature of economics, Micro and Macro economics; Basic economic problems, Economic problems, Economic laws and Government laws, Dynamic *v.* Static; Methodology: Inductive v. Deductive methods; Economics and Law.

Module II: Consumer Behavior and utility analysis
Utility Analysis: law of diminishing marginal utility. Law of equi-marginal utility; Law of demand and supply, Application of demand and supply: Tax floor and ceiling; Elasticity of demand and supply; Marshallian Scissors, Consumer's surplus.

Module III: Theory of Production and Market structure
Factors of Production, Laws of returns, Returns to scale; Forms of entrepreneurial organization; Cost curves and revenue concepts; Market: Meaning and classifications, equilibrium of the firm and industry; Price and output determination under perfect, monopoly, monopolistic competitions, oligopoly and duopoly.

Module IV: Factor Pricing
The General Theory of factor pricing ; Wage determination, exploitation of labour, role of trade unions, Minimum Wage Act ; Theory of Rent, Quasi rent ; Theory of Interest: Classical, Neo Classical and Loanable Fund Theory, Liquidity Preference Theory; Theory of Profit.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Texts & References:
- I.C. Dhingra, Principles of Microeconomics- Sultan Chand & Sons
- H.L. Ahuja- Microeconomics
- Baumol, W.J. Economic Theory and Operations Analysis, Prentice Hall of India, New Delhi.
- Bach, G.L, Economics, Prentice Hall of India, New Delhi.
- Gould, J.P. and Edward P.L, Microeconomic Theory, Richard, Irwin. Homewood.
- Koutsoyiannis, A, Modern Microeconomics, Macmillan.
- Lipsey, R.G. and K.A. Chrystal, Principles of Economics, Oxford University Press, Oxford.

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CONSTITUTIONAL LAW-I

Course Code: LAW2303 **Credit Units: 04**

Course Objective:
The course aims at analyzing constitutional institutions, its powers, limitations and interrelationships with one another and seeks to mould a frame of mind in the student to appreciate and assess constitutional policy and changes for the future.

Course Contents:

Module I: Fundamental Rights and Directive Principles, and Fundamental Duties
Idea of Fundamental Rights and their importance, against whom the Fundamental rights are available? Definition of 'State'? Law in Art. 13, Directive Principles; Nature and reasons for incorporation, inter-relationship between fundamental rights and directive principles, judicial policy towards Directive principles from Champakam to Minerva Mills and thereafter, Art. 51-A (K) and its correlation with Art. 21-A.

Module II: Freedom and Personal Liberty
Freedom of speech and expression and of press; Is Right to Information inclusive in Freedom of Speech and Expression? Freedom of Assembly, Freedom of Association, Freedom of Movement, Freedom to reside and settle, Freedom of profession/Business, etc. Art. 19: Are these freedoms absolute? Rights of an accused: Double Jeopardy, Self-incrimination and retrospective punishment, Art. 20; Right to life and personal liberty: Meaning of personal liberty, Procedure established by Law, Before Maneka Gandhi, Maneka Gandhi and thereafter, Art. 21; preventive detention and constitutional safeguards: Art. 22; Right to education Art. 21-A.

Module III: Equality and Protective Discrimination
Equality before Law and equal protection of Laws, meaning, constitutional provisions Arts 14, 15, 16, 17, 29 (2), 325: Total conspectus, Classification for differential treatment, prohibited grounds of discrimination: Arts. 15(1), (2), (3), 16 (2), (3), 29 (2); Protective Discrimination in favour of SC / ST and other backward classes and recent trends eg. Schedule IX and Reservation Policy, Women and children Art. 15, 15(3), 15(4), 15(5) Abolition of titles – Arts. 18.

Module IV: Secularism
Concept of Secularism, Indian Constitutional provisions, Indian concept of Secularism, Freedom of religion, Scope: Arts. 25, 26, Limits of Freedom, Religion and State in India, State Control and non-interference with religion; Minority rights: Why? Scope: Meaning and Minority, Minority right to educational institutions and judicial attitude.

Module V: Judicial Process under the constitution
Judicial Review : Nature of Judicial Review, Arts. 32, 136, 141, 226, 227.
Judges: Appointments, conditions of service, etc; Public Interest Litigation.
Supreme Courts Original and Advisory Jurisdiction.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- V.N. Shukla, Constitution of India
- M.P. Jain – Indian Constitutional Law.
- H.M. Seervai – Constitutional Law of India.
- Durga Das Basu – Shorter Constitution.
- P.M. Bakshi – Constitution of India.
- J.N. Pandey – Constitution of India..

LAW OF CRIMES-I (INDIAN PENAL CODE SECTION 1-120B)

Course Code: LAW2304 **Credit Units: 04**

Course Objective:
Course on Law of Crimes aims at introducing students to the basic principles of criminal law. There has been a progressive as well as regressive change in the Indian society since Independence. A proper understanding of crimes and the causal factors for the occurrence of crime is extremely important in the larger context of India's development, if young law students are to use their knowledge and skills to build a just and humane society. The young law students are the would be lawyers and as such they must have an acquaintance with such knowledge to make criminal justice system serve the goals of social defense as well as social justice. Therefore, a study of the basic concepts of specific offences under the Indian Penal Code is imperative.

Course Contents:

Module-I: Introduction to Substantive Criminal Law: Extent and operation of the Indian Penal Code, Definition of Crime, Fundamental elements of crime, Stages in commission of a crime, Intention, Preparation, Attempt.

Module-II: Punishment: Theories: Deterrent, Retributive, Preventive, Expiatory and Reformative Theory. Punishment under the IPC: Fine, Imprisonment, Capital Punishment.

Module-III: General Explanations and Exceptions: Definitions, Constructive joint liability, Mistake, Judicial and Executive acts, Accident, Necessity, Infancy, Insanity, Intoxication, Consent, Good faith, Private defence

Module-IV: Abetment and Criminal Conspiracy

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Ratanlal & Dhirajlal – The Indian Penal Code
- K. D. Gaur – A Text Book on Indian Penal Code
- S.N. Misra, Indian Penal Code
- B.M. Gandhi, Indian Penal Code (1996), Eastern, Nagpur.
- P.S. Achutan Pillai, Criminal Law (1995) Eastern, Lucknow.

FAMILY LAW-I

Course Code: LAW2305 **Credit Units: 04**

Course Objective:
This Course aims at providing adequate Sociological perspective so that the basic concepts relating to family are expounded in their social setting. It is designed to address the various aspects of Hindu Law and strives to give an overview of some of the current problems arising out of the foundational inequalities in the various family concepts.
Course Contents:

Module I: Introduction (Sources, Schools and Joint Hindu Family)
Sources and Schools of Hindu Law; The Concept, Formation and incidents of Joint Hindu Family of Mitaksharaand Dayabhaga; The Coparcenaries : It's formation and various incidents of Joint Hindu Family of Mitakshara and Dayabhaga; Karta of the Joint Family : His position, powers, privileges and obligation.

Module II: Hindu Marriage (Vivah) and Matrimonial Remedies (The Hindu Marriage Act, 1955)
Hindu Marriage: Nature, concept, Essential conditions & Prohibitions; Void & Voidable Marriages; Divorce: Customary and Judicial- Matrimonial fault theory, irretrievable breakdown and of marriage; Option of puberty; Restitution of conjugal rights; Judicial separation.

Module III: Alimony, maintenance, Adoption and Guardianship (The Hindu Adoption and Maintenance Act, 1956 and The Hindu Minority and Guardianship Act, 1956)
Maintenance of neglected wives, divorced wives, minor children, disabled children and parents under sections 125, 127 of Code of Criminal Procedure, 1973; Alimony : Temporary Permanent; Maintenance: Pendente Lite and permanent and maintenance for Divorced Hindu women under The Hindu Adoption and Maintenance Act, 1956; The Hindu Minority and Guardianship Act, 1956,

Module IV: Law of Succession, inheritance and Partition among Hindus (The Hindu Succession Act, 1956)
Property under Mitakshara Law and Dayabhaga: Formation and Incidents; Devolution of interest in MitaksharaCoparcenaries, Coparcenaries with reference to the provisions of Hindu Succession Act, 1956, Succession to property of Hindu female dying intestate under the Hindu Succession Act, 1956, Disqualifications relating to succession; Partition and Re-union**.**

Module V: Dispositions of Property under Hindu Law
Testamentary Disposition (Will): Definition and basis, Capacity of the Legatee, Formalities of a Will; subject matter of Will, Restrictions on testamentary power of disposition, interpretation of the Will, Revocation of the Will; Disposition inter vivos (Gift).

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Mulla, D.F., Principles of Hindu Law
- Paras Diwan, Modern Hindu Law
- Mulla, D.F., Principal of Mohammadan Law
- Fyzee, A.A.A., Outlines of Mohammadan Law
- Mahmood, T., Muslim Law of India
- Paras Diwan, Law of Intestate and Testamentary Succession (1998), Universal.

THE CODE OF CRIMINAL PROCEDURE

Course Code: LAW2311 **Credit Units: 04**

Course Objective:
In the absence of effective enforcement machinery, the substantive Criminal Law which defines offences and provides punishments for them, would be almost worthless. Therefore, the need of the Code of Criminal Procedure. The present course intends at acquainting the students with the various pre judicial and judicial procedures. This course also includes the rights and duties of those proceeded against and the powers, duties and restraints on those administering the criminal judicial process.

Course Contents:

Module I: Introduction
The importance of Fair Trial - constitutional perspectives of fair trial: Articles 14, 20, 21, Section – 2: Definitions; classes of Criminal Courts: Sections 6 to 13 including their powers and jurisdiction. The organization of Police, Prosecutor, Defense Counsel and Prison Authorities alongwith their duties, functions and powers.

Module II: Pre – Trial processes
FIR, Arrest and Bail provisions, bonds, process to compel appearances and production of things, search and seizure – search warrants, search without warrants, police search during investigations, general principles of search, seizure and constitutional aspects of validity of search and seizure proceedings.

Module III: Charge and common features relating to Trials
Form of Charge, joinder of charges, alteration of charge, basic rule regarding charge and its trial, withdrawal of charges, effect of error in the charge. Language of Courts, decision on evidence partly recorded by one judge or magistrate and partly by another, summary procedure to deal with certain cases of perjury and certain kinds of contempt of court, evidence in inquiries and trials, general provisions as to inquiries and trials, provisions as to accused persons of unsound mind.

Module IV: Criminal Trials and Execution Proceedings
Trial before Court of Sessions, Trail of warrant case by magistrate, Trial of Summons Case, Summary Trial, Judgment, submission of death sentence for confirmation, execution, suspension, remission and commutation of sentences.

Module V: Review Procedures
Appeal, Review and Reference

Module VI: Miscellaneous
Maintenance of wives, children and parents, Transfer of criminal cases, Irregular proceedings, Limitations for taking cognizance, Security for keeping peace and for good behavior, Disputes as regarding immovable property, Probation of Offenders Act

Module VII
Juvenile Justice (Care & Protection of Children) Act 2000. Concept of juvenile delinquency, juvenile court system, treatment and rehabilitation of juveniles, law for protection of juvenile offenders. Juvenile Justice (Care &Protection of Children) Act 2014.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Ratan Lal and Dheeraj Lal, Criminal Procedure Code
- D.D. Basu, Criminal Procedure Code
- R.V. Kelkar, Lectures on Criminal Procedure Code
- R.V. Kelkar, Code of Criminal Procedure
- Chandrasekharan Pillai (ed.) Kelkar's Outlines of Criminal Procedure (2001), Eastern, Lucknow.

SUMMER INTERNSHIP EVALUATION-I

Course Code: LAW2335 **Credit Units: 03**

It is a mode of Clinical Legal education Specified period to be spent by the student with a law firm/court/Commissions/NGO's and like institutions working with the realm of law or connected therewith. The reports both by the student and the office together with diary where applicable to be certified will be submitted for evaluation

The Internship during the summer break is a compulsory course. There is a Internship Data form where students fill in the details of where they are interning with complete address and phone numbers Customized Legal Reference /Diary is provided to the students on payment They maintain a day to day record of the work that they do at the place they are interning. They are expected to intern for a minimum 90 days. They submit their completed diary, certificate from the employer and also a report of their experience at work. After submission there is a Viva by concerned faculty. They assess the student on the kind of work they have done during internship, presentation of the work they have done and also on the practical knowledge they have gained

The Paper is marked out of 100 marks. The break up of the marks is as follows:

1.	Diary submission	25 Marks
2.	Report and certificate	25 Marks
3.	Viva (Panel of External Examiners)	40 Marks
4.	Attendance (Regularity in meeting the supervisor)	10 Marks
	Total	**100**

MACRO ECONOMICS-II

Course Code: LAW2402 **Credit Units: 04**

Course Objective:
The objective of this paper to understand the issues related to economic development and planning and International trade and enables them to have a broader perspective while dealing with these issues as a policy maker.

Course Contents:

Module I: Economic development
Concepts of economic development and growth, determinants of economic growth, obstacles to economic growth, Vicious circle of poverty, Strategy of economic development: Balanced and unbalanced growth, Inequalities of income and wealth.

Module II: Economic planning
Economic planning: meaning, forms of planning, objectives & significance and rationale of planning, features of planned economy, Five year plans: Strategy of plans, critical appraisal of plans, Public v. Private Sector.

Module III: International trade
Liberalization & Globalization: Argument for and against, Economic Reforms: Banking, Money market, capital market and International Trade Reforms, Special Economic Zones, Foreign Direct Investment.

Examination Scheme:

Components	**P/S/V**	**CT**	**C**	**A**	**EE**
Weightage (%)	10	10	5	5	70

Text & References:

- Rudra Dult & Sundran, "Indian Economy: S. Chand & Co., Ltd. New Delhi.
- Mishra & Puri," Economic development & Planning, Himalaya Publishing House, Mumbai.
- M.L. Thinghan, "Money, Banking, International Trade & Public Finance.
- Meier & Baldwin, economic Development: Theory, History & Policy." Harper & Row London.
- M. Todaro, 'Economic Development in the Third World, Longman, New York.
- I.C. Dhingra, Indian Economy & Environment & Policy, Sultan Chand & Sons New Delhi.
- M.L. Seth, Money Banking, International Trade & Public Finance, Laxmi Narain Agarwal, Agra

CONSTITUTIONAL LAW-II

Course Code: LAW2403 **Credit Units: 04**

Course Objective:
The course material seeks to introduce the student to the relevance of inalienable fundamental rights and restrictions in the Constitution of India and the principles that ought to guide policy making in India. The student is expected to appreciate the text and the juristic discourse by reference to landmark case laws, juristic opinion and vibrant classroom discussions as the subject raises issues, conflict of interests and dilemmas in a pulsating democracy with changing dynamic priorities in a developing country like India.

Course Contents:
Module I: Distribution of powers between Centre and States – (Arts. 245-281)
Legislative Powers, Administrative Powers, Financial Powers, Relevant Doctrines: Territorial nexus, Harmonious construction, Pith and substance, Repugnancy: Overview of Panchayati Raj Provisions (Art. 243), Freedom of Trade and Commerce.

Module II: Union and State Executive, legislature and Judiciary
Union Executive, President: Appointment, Election, Removal, conditions of service; Powers of president focus on ordinance, pardon, emergency; Assessment of relevance of presidential office on governance; Council of ministers and Prime minister: Appointment, Conditions, functioning, collective responsibility, dismissal of cabinet minister; Office of Attorney General: Significance, Appointment, functions, Conditions; State executive, Governor: Appointment, Removal, Powers, State cabinet dismissal; governors role in the context of centre state relations. (Art 79-122).
Union Legislature: Lok Sabha, Composition, functioning, membership, qualifications and disqualifications, Dissolution of, Effect; Bills : Procedure for the passage; Privileges of legislature; State legislature: functioning, dissolution ; Anti defection law and its impact. (Arts. 168-212).
Union Judiciary: Supreme Court Judges: Appointment, removal, impeachment; jurisdiction of Supreme Court: Original, appellate, advisory, Court of Record; Assessment of independence of judiciary; State judiciary: High Court Judges: Appointment, transfer, removal, promotion; High Court jurisdiction, Art. 226, writs; Subordinate judiciary. (Arts. 124 -147) (Arts. 214 to 237).

Module III: Emergency Provisions
National, State and financial Provisions.

Module IV: Miscellaneous
Official Language, Language of Courts, Trade, Commerce and Intercourse in India, Services Under the Union and State, Elections, Parliamentary, Privileges and Schedules, etc .

Module V: Amendment of the Constitution
Amendment of Constitution, Doctrine of basic Structure.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Texts & References:
- V.N. Shukla, Constitution of India
- M.P. Jain – Indian Constitutional Law.
- H.M. Seervai – Constitutional Law of India.
- Durga Das Basu – Shorter Constitution.
- P.M. Bakshi – Constitution of India.
- J.N. Pandey – Constitution of India.

ADMINISTRATIVE LAW

Course Code: LAW2404 **Credit Units: 04**

Course Objective:

Administrative law is as old as the administration itself. However, the form in which we find it today, Administrative is described a most outstanding legal development of the twentieth century. The reason for this development can only be attributed to a change of philosophy as regards the role and function of the State. The change in the concept of State from 'laissez faire' to a 'welfare state' has led to emergence of state activities in almost all spheres of human life. With the phenomenal increase in the area of state operation, the State was bound to take over a number of functions which were earlier left to private enterprise. In order to ensure that such functions are performed effectively and further due to certain other factors namely contingency, expertise etc. administrative agencies are given extraordinary powers and functions such as to make rules and deciding disputes apart from its wide discretionary powers. Obviously, this necessitated a new set of laws to check the possible abuses of such extraordinary powers on the part of administration. The courts in India and abroad in the course of time have developed various doctrines and methods to deal with such p[problems. However, there is no end to this journey. The field is still open for new changes.

The main thrust of administrative law has been to study the nature of functions and powers exercised by the authorities on whom they have been conferred on and the study of remedies available to common man in case the limits of exercising power are transferred by such an authority. The focus or the centre point of this study, as usual as in cases of the study of other branches of public law, is the rights of individual *wis a wis* the public interest.

Course Contents:

Module I: Evolution, Nature and scope of Administrative law

Definitions, scope, classification and reason for the growth of administrative law; Relationship between constitutional law and administrative law; doctrine of Separation of Powers and its application in administrative law; Doctrine of Rule of law and application in administrative law.

Module II: Legislative function of Administration

Delegated legislation: Necessity for delegated legislation, classification of delegated legislation and its requirement, constitutionality of delegated legislation, All form of control of delegated legislation i.e. Parliamentary, Procedural and Judicial control (doctrine of ultra vires).

Module III: Judicial function of Administration

Reason for Administrative adjudication; Tribunals and classification of Tribunals; Principles of Natural Justice; Ombudsman: Lokpal, Lokayukta; Central Vigilance Commission (CVC).

Module IV: Administrative discretion

Need and legality and abuses; Constitutional objections and discretion, failure to exercise discretion; Doctrine of proportionality; Legitimate expectation.

Module V: Judicial control of administrative action

Courts as the final authority to determine the legality of Administrative actions ; Public Interest Litigation and the principle of *locus standi*, laches, Judicial review ; scope and extent, statutory appeals, writs.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- M.P. Jain and S.N. Jain: Principles of Administrative Law.
- I.P. Massey: Administrative Law.
- C.K. Talewani: Lectures on Administrative Law.
- De Smith: Judicial Review of Administrative Action.
- H.W.R. Wade: Administrative Law
- S.P. Sathe: Administrative Law.

FAMILY LAW-II

Course Code: LAW2405 **Credit Units: 04**

Course Objective:
Family Law II Course is mainly devoted to the study of Muslim Personals Law relating to Marriage, Maintenance, Dower, Adoption & Guardianship, Divorce, Hiba, Pre-emption, Succession, and disposition of Property. The main objective of the course is to provide an indepth knowledge of the Laws governing Muslims.

Course Contents:

Module I: Introduction (Sources, Schools and Muslim Marriage (Nikah)
Sources and Schools of Muslim Law**:** Shia and Sunni; Muslim Marriage: Nature and concepts of Muslim Marriage, Essential conditions of a valid marriage, prohibitions/ disabilities, classification of marriage and effects of valid, irregular, void marriage.

Module II: Dower and Matrimonial Remedies (Dower, Restitution, Separation and Divorce)
Dower : Concept and Nature; Divorce under Muslim personal Law, Nullity of marriage;Option of puberty; Restitution of conjugal rights; Judicial separation; Grounds for divorce under Muslim Law; Bars to matrimonial relief under Muslim Law; Grounds for Divorce under Indian Dissolution of Muslim Marriage Act 1939.

Module III: Alimony, maintenance and Adoption & Guardianship (Hizanat)
Maintenance of neglected wives, divorced wives, minor children, disabled children and parents who are unable to support themselves vide sections 125, 127 of Code of Criminal Procedure, 1973;Alimony and maintenance as an independent remedy, Maintenance (Nafaqa) for Muslim Women under the Muslim Women Protection of Right on Divorce Act, 1986; Guardianship under Muslim Law.

Module IV: Law of Succession and inheritance among Muslims
General rules of succession; inclusion and exclusion of inheritors to the property. Classification of heirs under Hanafi and IthmaAsharia School and their shares and distribution of property.

Module V: Dispositions under Muslim Law, Waqf and Pre- Emption
Wasiyat : Testamentary Disposition and various incidents of wasiyat. Disposition inter vivos (Gift), Gift (Hiba), Musha, Revocation of Gifts; Distinction between Hiba, Ariya, Sadaqa&Wakf, Hiba-bil-Sharatful- ewaz, Gift during death illness (Marz-ul-maut).
Waqf :Meaning, Kinds, Objects,purpose, Requisites and various incidents of waqf.
Pre-emption – Origin, Definition, Classification, Subject matter, formalities, effects, constitutional validity.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Mulla, D.F., Principles of Hindu Law
- Paras Diwan, Modern Hindu Law
- Mulla, D.F., Principal of Mohammadan Law
- Fyzee, A.A.A., Outlines of Mohammadan Law
- Mahmood, T., Muslim Law of India
- Paras Diwan, Law of Intestate and Testamentary Succession (1998), Universal .

LAW OF CRIMES-II (INDIAN PENAL CODE SECTION- 121-511)

Course Code: LAW2406 **Credit Units: 04**

Course Objective:

Course on Law of Crimes aims at introducing students to the basic principles of criminal law. There has been a progressive as well as regressive change in the Indian society since Independence. A proper understanding of crimes and the causal factors for the occurrence of crime is extremely important in the larger context of India's development, if young law students are to use their knowledge and skills to build a just and humane society. The young law students are the would be lawyers and as such they must have an acquaintance with such knowledge to make criminal justice system serve the goals of social defense as well as social justice. Therefore, a study of the basic concepts of specific offences under the Indian Penal Code is imperative.

Course Contents:

Module-I: Offences affecting the Human body: Offences affecting life, causing miscarriage, or injuries to unborn children, Offences of hurt, of wrongful restraint and wrongful confinement, Offences of criminal force and Assault, offences of kidnapping and Abduction

Module-II: Offences against Women: Obscene acts and songs, Outraging the modesty of women, Rape, Cruelty by husband or relatives of husband, Offences relating to marriage

Module-III: Offences against Property: Theft, Extortion, robbery and dacoity, Criminal misappropriation and criminal breach of trust, Cheating, Mischief, Criminal trespass

Module-IV: Defamation and offences relating to documents and property marks: Defamation**,** Forgery**,** Counterfeiting.

Module-V: Offences against State, Public Tranquillity, Public Servants, Religion

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Ratanlal & Dhirajlal – The Indian Penal Code
- K. D. Gaur – A Text Book on Indian Penal Code
- S.N. Misra, Indian Penal Code
- B.M. Gandhi, Indian Penal Code (1996), Eastern, Nagpur.
- P.S. Achutan Pillai, Criminal Law (1995) Eastern, Lucknow.

LAW OF EVIDENCE

Course Code: LAW2502 **Credit Units: 04**

Course Objective:
This paper is to orient students with importance of evidence for establishment of claims and the related rules and principles.

Course Contents:

Module I: Definitions and Relevancy of Facts
Evidence and its relationship with the substantive and procedural laws ;Definitions : Facts, facts in issue, relevant, evidence proved, disproved, not proved, oral and documentary evidence ;Relevancy and admissibility; Doctrine of *res gestae ;*Conspiracy.

Module II: Admissions, confessions and statements by person who cannot be called as witnesses:
Definition of admission, who can make admissions by or on their behalf, proof of admission against the persons making them and admissions in civil cases. (Section 17-23, 31); Definition, relevance and consideration of confessions (section 24-30); Dying declaration (Section 32 and Section 33). **Opinion of Third Persons (Sec. 45 to 51) & Character Evidence (Sec. 52 to 55).**

Module III: Documentary Evidence
Primary and Secondary Evidence, Proof and verification of documents; Public documents and presumption as to documents.

Module IV: Production and Effect of Evidence
Burden of proof (Sections 101-114); Estoppels (Section 115); Competence of witnesses (Sections 118-120).

Module V: Examination of Witnesses (Sections 135-166) and Rejection of evidence (Section 167)
Examination –in-chief : Cross Examination, Re-examination; Leading questions; Hostile witnesses; Refreshing memory; Judge's power to put questions or order production.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Ratanlal and Dheerajlal : Law of Evidence
- Monir Field : Law of Evidence
- Batuklal : Law of Evidence
- Avtar Singh : Evidence Law
- Bare Act : Indian Evidence Act, 1872

CODE OF CIVIL PROCEDURE

Course Code: LAW2503 **Credit Units: 04**

Course Objective:
This paper is to help a law student to acquire a thorough knowledge of procedural aspects of working of civil courts and other machineries.

Course Contents:

Module I: Initial steps in a suit
Jurisdiction and place of suing; Institution of suit, cause of action, joinder, non-joinder and mis-joinder of parties; Summons; Pleadings: Meaning, object, General rules, Amendment of pleadings; Plaint and written statement: Particulars, set off and counter claim; Admission return and rejection; Discovery, Inspection and production of documents; Appearance and non-appearance of parties, ex-parte proceedings; First hearing: Meaning, object, framing of issues, omission to frame issues, disposal of suit in the first hearing; Trial: Summoning and attendance of witnesses, summons to produce documents, adjournment, hearing of suit.

Module II: Significant Terms and Definitions
Definitions: Decree, Judgment, Order, Foreign Court, Foreign Judgment, Mesne, Profits, Affidavit, Suit, Plaint, Written Statement, Suit of civil nature ;Important Concepts: Res Sub-Judice, Resjudicata, Restitution, Caveat, Inherent powers of courts.

Module III: Interim Orders
Commissions, Arrest before judgment, Attachment before judgment, Temporary Injunctions, Interlocutory orders, Receiver, Security of costs.

Module IV: Suits in Particular Cases
Suits by or against Government, Suits by Indigent persons, Interpleader Suit, Summary Procedure, Suits relating to public nuisance. Execution Proceedings

Module V: Law of Limitation
Definitions, period of limitation, plaintiff, defendant; and in foreign countries, limitation of suits, appeals, and application, computation of period of limitation.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Mulla’s Code of Civil Procedure, Universal, Delhi
- C.K. Thakkar’s (Takwani), Code of Civil Procedure
- Majumdar, P.K. and Kataria, R.P., Commentary on the Code of Civil Procedure, 1908, universal, Delhi.

LABOUR LAW-I

Course Code: LAW2504 **Credit Units: 04**

Course Objective:

The course aims at imparting to the students an indepth understanding of Labour Laws in India by recourse to relevant judicial pronouncements in this regard.

Course Contents:

Module I: Regulation of Trade Union & Unfair Labour Practices

History of Trade Union Movement in India and need to form Trade Union, Workers Right to form Union vis-à-vis Indian Constitution; the Membership of Trade Union, Closed shop and Union shop, Registration of Trade Union, Remedies in case of non-registration and cancellation of registration of union, Privileges and Protection of registered Trade Union form certain acts and omissions, Unfair labour practices and victimization.

Module II: Collective Bargaining:

Concept and importance of collective bargaining, Pre-requisites for collective bargaining, Process of administering collective agreement (Negotiation, Mediation, & Voluntary arbitration & Compulsory Arbitration.), Duration and enforcement of bipartite Agreement (Secs. 18, 19, Industrial Disputes Act, 1947), Pressurization: Strike, Go-Slow, wok to rule, Gherao and Lockout.

Module III: Regulation of Industrial Disputes

Define the concept of Industry, Industrial Dispute and workman, Power of Government to refer Industrial Disputes for adjudication: The Adjudicatory Machinery, Award and its binding nature, Judicial review of Awards, The concept of lay-off, retrenchment and procedure and compensation relating to lay-off and retrenchment.

Module IV: Standing Orders

Concept, Nature and scope of standing orders under Industrial Employment (Standing Order) Act, 1946, Formulation of Standing Orders and its Certification process, Modification: Modification and temporary application of Model Standing Order, Interpretation and Legal status of Standing Orders.

Module V: Discipline in Industries

Doctrine of hire and fire in the context of social welfare, Fairness in disciplinary process: Meaning of misconduct, Right to know: The Charge Sheet, Right to defend; Domestic enquiry notice, evidence, cross examination, unbiased enquiry officer and reasoned decision, Punishment of misconduct, Prenatal (permission) and Postnatal (Approach) control during pendency of proceeding (Sec. 33 of industrial and Disputes Act).

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- O.P. Malhotra, Law of Industrial Disputes.
- Indian Law Institute, Labour Law and Labour Relations.
- K.D. Srivastava, Commentary of Industrial Employment (S.C.) Act, 1946.
- S.C. Srivastava, Industrial Relation and Labour Law.
- Report of National Commission on Labour, 1969.
- Industrial Disputes Act, 1947.
- R.B. Sethi & R.N. Dwivedi, Law of Trade Union.

PROPERTY LAW

Course Code: LAW2505 **Credit Units: 04**

Course Objective:
The subject imparts to the student an understanding of the law in India relating to transfer of immovable property and the norms and doctrines that aid in carrying out secure transactions in this regard.

Course Contents:

Module I: Jurisprudential Basis (Sections 5-21)
Concept and meaning of property – New property, Kinds of property – movable and immovable property, tangible and intangible property,

Module II: Sale of Immovable Property
Doctrine of Election Sec. 35, Fraudulent Transfer Sec. 53 ; Sale of immovable property (Secs. 54 – 55). (Sale, Contract of Sale; Contract to sell; Rights and Liabilities of buyer and seller).

Module III: Specific Transfers
Mortgages of immovable Property: Secs. 58 – 77 (Kinds of mortgage, Rights and Liabilities of the mortgagor and mortgagee, Marshalling and Contribution (Secs. 81 – 82), Redemption (Secs. 91 – 96).

Module IV: Leases
Leases (Secs. 105 – 117): Definition, Leases how made, Rights and Liabilites of lesser and lessee, Charges (Section, 100 – 104).

Module V: Easements
Creation of Easements (Secs. 4 – 7), Nature and characteristics of Easements, Extinction, Suspension and Revival of Easements (Secs. 37–51), Riparian Rights, Licenses (Secs. 52 – 64).

Module VI
Indian Stamp and Registration Act.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Mulla, D.F., Transfer of Property Act.
- Shukla, S.N., Transfer of Property Act.
- Shah, S.M., Transfer of Property Act.
- Tripathi, Lectures on Indian Easement Act.
- Jain, J.D., Indian Easement Act.

SUMMER INTERNSHIP EVALUATION-II

Course Code: LAW2535 **Credit Units: 03**

It is a mode of Clinical Legal education Specified period to be spent by the student with a law firm/court/Commissions/NGO's and like institutions working with the realm of law or connected therewith. The reports both by the student and the office together with diary where applicable to be certified will be submitted for evaluation

The Internship during the summer break is a compulsory course. There is a Internship Data form where students fill in the details of where they are interning with complete address and phone numbers Customized Legal Reference /Diary is provided to the students on payment They maintain a day to day record of the work that they do at the place they are interning. They are expected to intern for a minimum 90 days. They submit their completed diary, certificate from the employer and also a report of their experience at work. After submission there is a Viva by concerned faculty. They assess the student on the kind of work they have done during internship, presentation of the work they have done and also on the practical knowledge they have gained

The Paper is marked out of 100 marks. The breakup of the marks is as follows:

1.	Diary submission	25 Marks
2.	Report and certificate	25 Marks
3.	Viva (Panel of External Examiners)	40 Marks
4.	Attendance (Regularity in meeting the supervisor)	10 Marks
	Total	**100**

COMPANY LAW

Course Code: LAW2603 **Credit Units: 04**

Course Objective:
The paper aims to make the student familiar and to provide insight into formation and winding up of companies beside corporate administrations.

Course Contents:

Module I: Company
Definition, Characteristics, Lifting of Corporate Veil; Types of Companies;
Formation of a Company: Promoters, Pre-incorporation Contracts, Provisional Contracts,

Module II: Memorandum of Association, Articles of Association and Prospectus
Memorandum of Association; Articles of Association; Prospectus: Issues, contents, Kinds, liability for misstatements, Shelf Prospectus, Statement in lieu of Prospectus.

Module III: Share Capital
Issue and allotment of shares, SEBI guidelines on allotment, Issue of shares at premium and at discount, Share Certificate, Demat system ; Forfeiture and surrender of Shares, Transfer & Transmission of shares; Provisions relating to payment of dividend, Investor's Education and Protection Fund.

Module IV: Corporate Administration
Directors: kinds, powers and duties; Insider trading; Meetings kinds and procedure; The balance of powers within companies: Majority control and minority protection, Prevention of oppression, and powers of court and Central Government,

Module V: Winding up of Companies
Kinds, consequences and reasons of winding up; Role of the court; Liability of past members; Payment of liabilities; Reconstruction and amalgamation.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Avtar Singh : Indian Company Law
- Shah S. M : Lectures on Company Law
- Saharay H.K.: Company Law, 5th Edn.

LAW OF TORTS (MOTOR VEHICLES ACT AND CONSUMER PROTECTION ACT, 2019)

Course Code: LAW2604 **Credit Units: 04**

Course Objective:
This course aims to introduce the student to the specialized discipline of tort law that is one of the most litigated areas of law in west. In India this realm is on the verge of a lot of litigational activity. The course covers Consumer Protection Act as well as Motor Vehicle Act which are carved out from the general principles of tort.

Course Contents:

MODULE 1: Introduction:
- Nature and Definition of Torts
- Tort distinguished from Contract and Quasi-Contract
- Crime:
  - Conditions of liability including *damnum sine injuria*, *injuria sine damnum*
  - Remoteness of damages
- Maxims: *Ubijus ibi remedium*, *Res ipsa loquitor*, etc.
- Justification in Tort:
  - *Volenti non-fit Injuria*,
  - Necessity,
  - Plaintiff's default**,**
  - Act of God,
  - Inevitable accidents,
  - Private defences,
- Judicial and Quasi
  - Judicial Acts,
  - Parental and quasi-parental authority.

MODULE 2: Actions in Tort
- Assault
- Battery
- False Imprisonment
- Malicious Prosecution
- Defamation
  - Libel
  - Slander including defences in an action for defamation
- Vicarious Liability
- Liability of State
- Doctrine of Sovereign Immunity

MODULE 3: Negligence
- Negligence including contributory negligence and other defenses.
- Absolute liability/Strict liability, Rules in Ryland v. Fletcher.
- Principles for the application of the rule and defenses
- Enterprises engaged in hazardous activities – M.C. Mehta v. Union of India
- Nuisance Trespass

MODULE 4: Consumer Protection: Consumer Protection Act, 2019
- Brief overview of the Consumer Protection Act,2019.
- Major Difference between Consumer Protection Act, 2019 and Consumer Protection Act, 1986.
- Consumer Protection Act, 2019:
  - Consumer Protection Councils Chapter II: Ss. 3-9
  - Central Consumer Protection Authority: Section 2(4) Chapter III: Ss. 10-27

- Consumer Disputes Redressal Commission S. 2(15): District Commission S. 2(44): State Commission S. 2(29): National Commission Chapter IV- with special focus on Ss. 28,34, 35, 37,39, 41, 42, 47,51 53,54,58,59
- Product Liability
- Consumer Protection vis-a vis E-Commerce- Key Aspects

MODULE 5: Motor Vehicles:

- Motor Vehicles Claims and compensation:
  - Relevant provisions of the relating Motor Vehicles Act relating to the liability and assessment of compensation:
  - Liability without fault in certain cases : voidance of contracts restrictive of liability
  - Special provisions and scheme of compensation in case of hit and run motor accidents
- Offences, Penalties and Procedure
- Insurance of Motor Vehicles against Third Party Risks(Sec. 145 – 152)
- Claims Tribunals: Sec. 165-176
- Special provisions as to payment of compensation on structured formula basis: Claims on non-structured basis: Method of calculating compensation evolved by the courts(study with reference to relevant judgments)
- Defences: Changing parameters of negligence and burden of proof

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- Winfield and Jolowicz, Tort
- Law of Torts, Universal law Publishing Company, Dr. S.P. Singh
- The Law of Torts: Ratanlal & Dhirajlal,
- Winfield, Law of Torts,
- Dr. D.N. Saraf, Law of Consumer Protection in India,
- Dr. Avtar Singh, Law of Consumer Protection in India, Dr. Gurjeet Singh, The law of Consumer Protection in India.
- Motor Vehicle Laws, Universal Law Publishing Company.

Reference Books

- William Salmond, "Salmond on the Law of Torts", Sweet & Maxwell, 16th Edition: 1973
- Heuston Salmond, "The Law of Torts", Universal Law Publishing Co Ltd: 2004
- Edward White, "Tort Law in America: An Intellectual History", Oxford University Press: 2003
- Frederick Pollock, "The Law of Torts: A Treatise on the Principles of Obligations Arising from Civil Wrongs in the Common Law: To which is Added the Draft of a Code of Civil Wrongs Prepared for the Government of India", BiblioBazaar: 2008
- Jenny Steele, "Tort Law: Text, Cases & Materials", Oxford University Press: 2007
- Vivienne Harpwood, "Modern Tort Law", Rutledge: 2008
- Carl F. Cranor, "Toxic Torts: Science, Law and the Possibility of Justice", Cambridge University Press: 2006
- N.R. Madhava Menon, "Documents and Court Opinions on Bhopal Gas Leak Disaster Case", National Law School of Indian University: 1991
- Upendra Baxi, Thomas Paul, "Mass Disaster and Multinational Liability: the Bhopal Case", N.M. Tripathi: 1986
- Upendra Baxi, Amita Dhanda and Indian Law Institute, "Valiant Victims and Lethal Litigation: the Bhopal Case", N.M. Tripathi: 1990
- Jenny B. Wahl, "Economic Analysis of Tort and Products Liability Law: A Collection of Essays & Cases (Law and Economics)", Routledge: 1998

LABOUR LAW-II

Course Code: LAW2605 **Credit Units: 04**

Course Objective:
The paper is to focus on wage policies, compensation for learn caused during the course of employment and working conditions of employees.

Course Contents:

Module I: Minimum Wages Act, 1948
Concept of Labour Welfare, Classification and Importance, Labour welfare activities, Concept of minimum wage, fair wage, living wage and need based minimum wage, Constitutional validity of the Minimum wages Act, 1948, Procedure for fixation and revision of minimum wages, Fixation of minimum rates of wage by time rate or by piece rate, Procedure for hearing and deciding claims.

Module II: Payment of Wages Act, 1936
Object, scope and application of the Act, Definition of wage, Responsibility for payment of wages, Fixation of wage period, Time of payment of wage, Deductions which may be made from wages, Maximum amount of deduction.

Module III: Workmen's Compensation Act, 1923
Definition of dependant, workman, partial disablement and total disablement, Employer's liability for compensation: Scope of arising out of and in the course of employment, Doctrine of notional extension, When employer is not liable, Employer's Liability when contract or is engaged, Amount of compensation, Distribution of Compensation, Procedure in proceedings before Commissioner, Appeals.

Module IV: Factories Act, 1948 & Social Security
Concept of "factory", "manufacturing process" "worker" and "occupier" : General duties of occupier, Measures to be taken in factories for health, safety and welfare of workers, Working hours of adults, Employment of young person and children, Annual leave with wages, Additional provisions regulating employment of women in factory, Social Security of Workmen ; Concept and scope of social security : Origin of Social Security in India, Claim and Adjudication of Disputes under Employee's State Insurance Act. 1948.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- S.C. Srivastava, Commentaries on factories Act, 1948, Universal Law Publishing House, Delhi
- H.L. Kumar, Workmen's Compensation Act, 1923.

CYBER LAWS

Course Code: LAW2606 **Credit Units: 04**

Course Objective:
With the advent of information technology law and Right to Information Law, new strides and strategies in legal justice education have come up. There is a need that Law students must also be acquainted with these new developments if a law student has to find a comfortable berth in the competitive legal market as a Law Professional as well as legal manager. Therefore, there seems to be an impending need to generate e-Legal Justice Education that exposes the students to have deep insights into the complexities of information technology and right to information. Objectives of this course, therefore, are understanding the legal recognition and procedure, Digital signatures, legal recognition of cyber authorities and Cyber appellate tribunal, legal implications of new varieties of offences and penalties under the Information Technology Act, 2000. A student of law should also be given the understanding of copy right issues, TRIPS agreements, application of patents to computer technology, etc. Besides, the course also aims at developing insights into the Right to Information Act, 2005 and its grey areas.

Course Contents:

Module I: Introduction (Need, Role and various aspect related to Cyber Law)
Need and role of Cyber; Jurisprudence of Cyber Law in India; Free speech and expression on Internet &Privacy; issues, Right to data protection, Cyber Law &Protection of Domain name.

Module II: Cyber Jurisdiction, Investigation & Cyber Forensics
Cybercrimes: Extradition and Jurisdictional issues; Investigation of Cyber Offences: Cyber equipment's& Cyber Cell; Cyber Forensics: provisions, need and role in cyber investigation.

Module III: Electronic Governance, Cyber space &IPR issues
Legal aspect of Electronic Governance; IPR Issues: An Overview, Patent, Copyright and Trademark& other related Issues in Cyberspace.

Module IV: Cyber Legislations (Laws, National and International treaties & Conventions)
Cyber Legislation: An Indian and International Regime; The Information Technology 2000, The Provisions relating to- Legal recognition of – Digital & Electronic Signature, Secure E- records and Signature, E- signature Certificates, Certifying Authorities, Cyber, Appellate Tribunal and Miscellaneous Provisions.

Module V: Cyber Crimes (Civil & Criminal)
Cyber Crimes and Cyber Victimization; Cyber Offences: Types & the provisions for Penalties mentioned in IT Act, 2000; Cyber Pornography, Cyber Terrorism, Cyber Tort and Cyber defamation etc.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Nandan Kamath, Universal Law Publishing Company and E –commerce: Law relating to computers Internet.
- K.K. Kumar, Dominant Publication: Cyber Law
- B.L. Wadhera : Patent, trademarks, Copyrights
- Ganguly (LMH): Intellectual Property Rights.

ENVIRONMENTAL LAW

Course Code: LAW2702 **Credit Units: 05**

Course Objective:
This paper provides the study of environmental laws covering legislations related to it and protection of forest and wild life.

Course Contents:

Module I: Environmental Law: International and National Perspective
Introduction: Environment and Environment Pollution: Problem and prospects; constitutional Perspective Right to Evolution and Application, Co relation between: Directive Principles of State Policies and Fundamental Degrees, Fundamental Rights and Directive Principles of State Policy; International Norms :Sustainable Development :Precautionary Principle, Polluter Pays Principle, Agenda 21, Inter generational equity, Public Trust Doctrine, Principle of no fault liability : Absolute Liability; Environment Protection through Public Interest Litigation, Remedies under various other laws.

Module II: Prevention and Control of Water and Air Pollution
The Water (Prevention and Control of Pollution) Act, 1974:Water Pollution : Definition, Central and State Pollution Control Boards: Constitution, Powers and Functions, Water Pollution Control Areas, Sample of effluents : Procedure; Restraint order, Consent requirement : Procedure, Grant/Refusal, Withdrawal, Citizen Suit Provision; Air (Prevention and Control of Pollution) Act, 1981: Air Pollution: Definition, Central and State Pollution Control Boards: Constitution, Powers and functions, Air Pollution Control Areas; Consent Requirement : Procedure, Grant/Refusal, Withdrawal, Sample of effluents – Procedure; Restraint order.

Module III: Protection of Forests and Wild Life
Indian Forest Act, 1927: Kinds of forest: Private, Reserved, Protected and Village Forests, The Forest (Conservation) Act, 1980; The Wild Life (Protection) Act, 1972: Authorities to be appointed and constituted under the Act, Hunting of Wild Animals, Protection of Specified Plants, Protected Area, Trade or Commerce in wild animals, animal articles and trophies; Its prohibition.

Module IV: Special Environmental Legislations
Environmental (Protection) Act, 1986, Public Liability Insurance Act, 1991, The National Environment Tribunal Act, 1995, The National Appellate Environmental Authority Act, 1997.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Environmental Law & Policy in India – Shyam Diwan, Armin Rosencranz
- Environmental Law in India – P. Leelakrishnan
- PIL and Environmental Protection-Geetanjali Chandra
- The Water (Prevention and Control of Pollution) Act, 1974
- The Air (Prevention and Control of Pollution) Act, 1981
- The IndianForest Act, 1927
- The Forest (Conservation) Act, 1980
- The Wild Life Protection Act, 1972
- The Environment (Protection) Act, 1986
- The Public Liability Insurance Act, 1991
- The National Environment Tribunal Act, 1995
- The National Environment Appellate Authority Act, 1997

JURISPRUDENCE

Course Code: LAW2703 **Credit Units: 05**

Course Objective:
The objective of the course is to create an understanding of basic legal concepts and provide an insight to the student into philosophical, ideological and theoretical foundations of the discipline of law with special reference to Indian legal system.

Course Contents:
Module I: Introduction
Nature and scope of Jurisprudence**,** State, Sovereignty and Law: Sources of Law: Custom, Precedent, Legislation, Equity.

Module II: Schools of Jurisprudence – I
Natural Law, Analytical positivism, Pure Theory, Historical Jurisprudence, Sociological Jurisprudence, Economic Approach, Legal Realism, Theories of justice: Aristotle, Rawls, Distributive Justice in India.

Module III: Concepts of Rights and Duties
Rights and Duties, Types, Theories, Critique of Rights and Duties, Contemporary issues in Rights.

Module IV: Concepts of Ownership and Possession:
Evolution of concept of possession, ownership, Essentials of ownership, Corpus and Animus, Res Nulius and Res Possessionis

Module V: Indian Perspectives in Jurisprudence
Classical and Medieval Influences, Modern Trends study with reference to judicial pronouncements with state policy.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Bodenheimer, Jurisprudence – The Philosophy and Method of Law (1996), Universal, Delhi.
- Fitzgerald, (ed.) Salmond on Jurisprudence (1999) Tripathi, Bombay
- W. Friedmann, Legal Theory (1999) Universal, Delhi
- V.D. Mahajan, Jurisprudence and Legal theory (1996 re-print), Eastern, Lucknow
- M.D.A. Freeman (ed.) Lloyd's Introduction to Jurisprudence, (1994), Sweet & Maxwell
- Paton G.W. Jurisprudence (1972) Oxford, ELBS
- H.L.A. Hart, The Concepts of Law (1970) Oxford, ELBS
- Roscoe Pond, Introduction to the Philosophy of Law (1998 Re-print) Universal, Delhi
- Dias, Jurisprudence (1994 First Indian re-print), Adithya Books, New Delhi
- Dhyani S.N., Jurisprudence: Jurisprudence and Indian Legal theory
- Dhyani S. N., Fundamentals of Jurisprudence
- Jayakumar N. K., Lectures in Jurisprudence, Butterworths
- Justice Markandey Katju, Law in the Scientific Era, Universal
- Justice J. S. Verma, Dimensions of Justice, Universal
- Justice Rama Jois, Seeds of Modern Public Law in Ancient Indian Jurisprudence
- Justice Rama Jois, Eternal Values in Ancient Law.

PUBLIC INTERNATIONAL LAW

Course Code: LAW2704 **Credit Units: 05**

Course Objective:
The objective of this paper is to provide knowledge to the students regarding the Public International Law to enable them to deal with the transnational legal order.

Course Contents:

Module I: Introduction
Definition and Basis of International Law, Subjects of International Law, Relationship between International Law and Municipal Law.

Module II: Sources of International Law
Custom, Treaties, General Principles of law, Juristic Works, General Assembly Resolutions, Other sources (Conventions).

Module III: State Recognition, State Jurisdiction and Law of the Sea
State Recognition: Recognition of states, Recognition of governments, *De facto* and *De jure* Recognition, Types of Recognition: Implied Recognition, Conditional Recognition, Collective Recognition; Withdrawal of Recognition, The legal effects of recognition; **State Jurisdiction:** Basics of Jurisdiction, Principles of Jurisdiction, Exemption from Jurisdiction: Diplomatic ImmModuleies and Privileges, Armed Forces, Public Ships; **Law of the Sea:** First and Second Law of the Sea Conventions :Third Law of the Sea Convention {UNCLOS III (Moduleed Nations Convention on the Law of The Sea), Maritime Zones; Territorial Waters, Contiguous Zone, Exclusive Economic Zone, Continental Shelf High Seas; Sea Bed Authority, Deep Sea Bed Mining and International Sea – Bed Area.

Module IV: Conflict Resolution, War and Neutrality of States
Modes of Settlement of Disputes: Peaceful means, Coercive means; War: Laws of War, Humanitarian Laws: Rules of neutrality.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Oppenheim, International Law, Vol. – 1.
- J.G. Strake, Introduction to International Law.
- Grieg, International Law.
- R.C. and Hingorani, Modem International Law.
- H.O. Aggarwal, International Law.
- S.K. Kapoor, International Law.
- Bowell, The Law of Internationals Institution.
- Verma, S.K., An Introduction of Public International Law.

ARBITRATION AND ALTERNATE DISPUTE RESOLUTION

Course Code: LAW2705 **Credit Units: 05**

Course Objective:
The course material imparts to the students an understanding of the concept of alternate methods of resolving disputes in addition to the traditional court oriented processes. It focuses on an analytical study of arbitration law and practice in India and the relevant institutions monitoring the same. The paper also focuses on other alternate dispute resolving mechanisms through State mediatory services under the supervision of the courts.

Course Contents:

Module I: Introduction
Alternative Dispute Resolution (ADR): Concept and Need and International and National initiatives in India; IIC, UNCITRAL, KSID.
Arbitration and Conciliation Act, 1996
General Provisions, Definitions, receipt of written communications, waiver of right to object, extent of Judicial Intervention, Administration Assistance; Arbitration agreement, power to refer parties to arbitration where there is an arbitration agreement, Interim measures by court.

Module II: Composition of Arbitral Tribunal
Composition, Jurisdiction, Conduct of Arbitral Proceedings: Settlement, form and contents of arbitral award, termination of proceedings, correction and interpretation of awards, additional award.

Module III: Recourse against Arbitral Award
Application for setting aside Arbitral Award, Finality and enforcement of Arbitral Award, appealable orders, Miscellaneous, Deposits, Lien on Arbitral Award and Deposits as to costs, Arbitration agreement not to be discharged by death of party thereof, Provisions in case of insolvency, Jurisdiction, limitation, Limitations, Enforcement of certain Foreign Awards.

Module IV: Techniques of ADR – I
Negotiation / Consultation, Mediation, Good offices, Conciliation: Nature, Scope and Methods.
Legal Services: Meaning and scope in Legal Aid and Advice, Lok Adalats-nature, scope, procedure and functioning.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Rao, P.C., Arbitration and Conciliation Act, 1996, Universal Law Book Co., Pvt. Ltd., (1997)
- Rao P.C. & Sheffield William, Alternative Dispute Resolution
- Sujan, M.A., Law relating to Arbitration and conciliation.
- Kawatra, G.K., The New Law of Arbitration and conciliation
- Chaudhary, S.K. Roy, Law of Arbitration Conciliation, 4th Ed. Eastern Book
- Saharay H.K., Law of Arbitration (197) (Revised Print)

Statutory Material:
- Arbitration and Conciliation Act, 1996.
- Legal Services Authority Act, 1987.
- UNCITRAL

SUMMER INTERNSHIP EVALUATION-III

Course Code: LAW2735 **Credit Units: 03**

It is a mode of Clinical Legal education Specified period to be spent by the student with a law firm/court/Commissions/NGO's and like institutions working with the realm of law or connected therewith. The reports both by the student and the office together with diary where applicable to be certified will be submitted for evaluation

The Internship during the summer break is a compulsory course. There is a Internship Data form where students fill in the details of where they are interning with complete address and phone numbers Customized Legal Reference /Diary is provided to the students on payment They maintain a day to day record of the work that they do at the place they are interning. They are expected to intern for a minimum 90 days. They submit their completed diary, certificate from the employer and also a report of their experience at work. After submission there is a Viva by concerned faculty. They assess the student on the kind of work they have done during internship, presentation of the work they have done and also on the practical knowledge they have gained

The Paper is marked out of 100 marks. The breakup of the marks is as follows:

1.	Diary submission	25 Marks
2.	Report and certificate	25 Marks
3.	Viva (Panel of External Examiners)	40 Marks
4.	Attendance (Regularity in meeting the supervisor)	10 Marks
	Total	**100**

TAXATION LAW

Course Code: LAW2802 **Credit Units: 05**

Course Objective:
Power to tax has been described as the power to destroy. This idea is being floated often whenever the State introduces a new tax. Is this true? Is it not necessary that in order to raise revenue and place the economy on solid foundation, the taxing power should be conferred on the State? The power to tax shall not go unregulated. In this context of a federal structure the distribution of the taxing powers assumes added significance. Obviously, a study of the Constitutional framework on taxation becomes important. Along with this, an analysis of the different laws enacted in exercise of these powers with their safeguards and remedies sheds light on the mechanics of the taxation by the Union and the States.

Course Contents:

Module I: General Principles of Taxation Laws
History and Development of Tax Laws in India, Fundamental Principles relating to Tax Laws, Taxing power and constitutional limitations, Distinction between: Tax, Fee and Cess; Tax avoidance and Tax evasion .

Module II: Basic concepts of Income Tax
Income, Previous Year, assessment Year, Person, Assesee and Total Income, Income not included in the Total Income. Residential status, Clubbing of Income, Tax planning, Rate of Income Tax, Heads of Income, Salaries, Income from House Property, Income from Business or Profession, Capital Gains, Income from Other sources, Deductions under the Income Tax Act, 1961, Income Tax Authorities: Power and Functions, Filing of returns and procedure for assessment, Offences and Penal Sanctions .

Module III: Value Added Tax
Meaning and importance of VAT, Difference between VAT and Sales Tax, West Bengal Value Added Tax Act, 2003, Criticisms and limitations of Vat system.

Module IV: Service Tax
Taxable Service, Meaning and importance of Service Tax, Valuation of Taxable Service, Offences and Penalities.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Iyengar, Sampath (1998), Law of Income Tax New Delhi, Bharath Law House.
- Jain, Narayan (2004) How to Handel Income Tax Problems, Book Corporation.
- Palkivala, N.A. (1999), The Law & Practice of Income Tax, Nagpur: Wadha Publication.
- Parameswaran, K. (1987), Power of Taxation under the Constitution, Eastern Book Company.
- Sharma, Remesh (1998), Supreme Court on Direct Taxes, New Delhi: Bharath Law House.
- Singh S.D. (1973), Principles of Law of Sales Tax, Eastern Book Company.
- V. Ramachandran & T.A. Ramakrishnan (eds.) (2000), A.N. Aiyar's Indian Tax Laws, Chennai: Company Law Institute of India Pvt. Ltd.

INTERPRETATION OF STATUTES

Course Code: LAW2803 **Credit Units: 05**

Course Objective:
Judicial interpretation involves construction of words, phrases and expressions. In their attempt to make the old and existing statutes contextually relevant, courts used to develop certain rules, doctrines and principles of interpretation. The course material seeks to impart to the students, the necessary skills to interpret the statutes with a judicial mind set.

Course Contents:

Module I: Rules of Interpretation
Commencement, repeal and revival of a statute; Rules of interpretation: Liberal rule, mischief rule and golden rules, Harmonious construction.

Module II: Principles of interpretation
Ejusdem of Generis, Noscitur – A Socius, Reddendo Singula Singlis., Expressio Unius Est exclusion Alteriu, UI Res Magis Valent Quam Pereat, Contemporanea Espositio Est Optima Et Protissima Lege.

Module III: Internal Aids to Interpretation

Module IV: External Aids to Interpretation

Module V
Construction of Penal Statutes, Mens rea in statutory offences, Principles to be applied in interpreting the Constitution, Strict construction of taxing statues and its limitations.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Maxwell, Interpretation of Statutes.
- Sarup, Interpretation Statues.
- G.P. Singh, Principles of Statutory Interpretation.
- V.P. Sarathi, The Interpretation of Statutes.
- Bindra, Interpretation of Statutes.

INTERNATIONAL TRADE LAW

Course Code: LAW2804 **Credit Units: 05**

Course Objective:
To acquaint the Students about the basic aspects of International Trade Law, including the WTO and it's different principles and Agreements.

Course Contents:

Module I: Contract of Sale
Uniform Rules on Contract of Sale, Types of Sale Contract - CIF, FOB, C & F Contract, Special Trade Terms in International Sale Contract, Indian Bill of Lading Act 1856, International Conventions Governing Bill of lading
Addition of Special Trade Terms in International Sale Contract, Indian Bill of Lading Act 1856 and International Conventions Governing Bill of Lading in Module I.
Addition of Background Role and Structure of WTO, and difference between GATT & WTO in Module IV

Module II: Payment for International Sales
Letters of Credit, Bills of Exchange, and function and connected issues.

Module III: Settlement of Disputes
Arbitration, Enforcement of Arbitral Awards.

Module IV: World Trade organization (WTO) and General Agreement on Tariffs and Trade (GATT)
Background of formation of WTO, Role of WTO in International Trade, Difference of GATT and WTO, Structure of WTO.
Basic Principles: MFN, Treatment, National Treatment and Non-Discrimination, Exceptions to MFN : Tariff Bindings, Regional Trade Agreements, Escape Clause, Safeguard Measures, Quantitative Restrictions, Anti-dumping and counter-vailing duties.

Module V: WTO and Multilateral Agreements
Trade Related Investment Measures (TRIMS), General Agreement on Trade in Services (GATS), Trade Related aspects of Intellectual Property Rights (TRIPS).

Module VI: Dispute Settlement Mechanism under WTO

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	05	5	70

Text & References:

- Basic Texts of GATT and WTO.
- Jackson, John, H. (1997) Law of International Trading System, The MIT Press.
- Jackson, John, H. (1997) World Trade and Law of GATT, The MIT Press.
- Dam, K. W. (1970) The GATT Law and International Economic Organisations, Chicago University Press
- Koul, A.K. (2001) World Trade Organisation, Satayam Publication.
- Internet Sources :www.wto.org, www.uncitral.org.
- Text of the Indian Arbitration and Conciliation Act, 1996.

LAND LAWS

Course Code: LAW2805 **Credit Units: 05**

Course Objective:
The legislative power to make laws relating to land and land ceiling is in the state list. Different States have enacted their own laws on this subject. The Constitutional perspectives relating to this subject have to be taught as an essential part of this course. The provisions in the Constitution in Part III, IV and XII as well as those in Schedule VII relating to distribution of legislative powers over land are essentially to be taught with emphasis.

Course Contents:
Module I: Punjab Land Revenue Act1887 (Applicable over Punjab and Haryana), Definition of Key Words, Revenue Officers: Their Power and Functions, Preparation of Revenue Record: Like Documents of Jamabandi, Girdawari, Mutation, Intkaal, SijraNasab (Pedigree Table) Sirjra Axe(Map of the Village), Assessment of Land Revenue, Collection of Land Revenue, Concepts & Procedure of Partitions.

Module II: Punjab Land Revenue Act,1887:
Records-Of-Rights and Annual Records, Collection Of Land Revenue, Recovery of other Demands by Revenue-officers, Partition, **Assessment** and other relevant provisions.

Module III: Haryana Rent Control Act, 1973
Definitions (Sec. 1-4), Rights & Duties of Tenants, Rights and Duties of Landlords, Grounds of Ejectment of Tenants.
Haryana Panchayati Raj Act ,1994 (Sec. 1 to 54) (Chapter 1 to 6) Definition of Key Words, Constitution of Gram Sabha and Gram Panchayat, Gram Panchayat's Duties, Functions and Powers, Finance and Taxation, Control of Gram Panchayat, Sources of Income and Expenditure of Gram Panchayat.

Module IV: Haryana Panchayati Raj Act 1994,
PanchayatiSamiti (Chapter 7 To 11) And Sec. 55 To 116) Definition of Key Words, Conduct of Business of PanchayatSamities, Servant of PanchayatSamities, Duties and Powers of PanachayatSamiti, Finance and Taxation, Sources of Income of PanchayatSamiti, Control of PanchayatSamiti

Module V: Delhi Land Laws
Real Estate Development and Apartment ownership
Delhi Apartment Ownership Act, 2009,

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	05	5	70

Text & References:

- Law, poverty and development, Prof. M.L. Upadhayay.
- Upendra Baxi, Towards a Sociology of Indian Law, pp. 25-65 (1986)
- Atul Kohli, The state and Poverty in India (1987)
- Francine R. Frankel, India's Political Economy, 1947-77 (1988)
- L.H. Rudolph and S.H. Rudolph, The Political Economy of Lakshmi (1987)
- Mohammad Ghouse, "Nehru and Agrarian reform" in Rajeev Dhavan and Thomas Paul (eds.)
- Nehru and the Constitution (1992), Thripathi
- Walter C. Neale, Developing Rural India Policies and Progress (1990) Allied
- Alice, Jacob, Land Reform and Rural Change 6-19 (1992), Land Reforms in India: a Review.
- IASSI quarterly 1992, Vol. X, Numbers 3 and 4.
- B.R. Beotra, Law of Forests (Central and State) 6th Edition 1999, The Law Book Company.
- A. Krishnan, Forest Laws in India, 1998, Asia Law House
- Srivastava, Encyclopedia on forest, 1998, Asia Law House
- Padala Rami Reddy, Forest Laws, 1989, Asia Law House Baden Powel, Manual of Jurisprudence for Forests Officers (1982)

INTELLECTUAL PROPERTY RIGHTS

Course Code: LAW2902 **Credit Units: 05**

Course Objective:

The course is designed to provide comprehensive knowledge to the students regarding Indian position of the Patent Law (1970), Copy Right Law (1957) and Designs Act of 2000 which invariably form the part of Intellectual Property Law and shall comprise of the following.

The importance of this branch of the law is to be sufficiently realized in the Indian legal education. These areas are now internationally conceptualized as representing intellectual property. It is often the case that while the law of patents and trademarks is referred to as industrial property, the law relating to copyright is named intellectual property. While both these terms could be suitably invoked, we here speak of intellectual property as signifying all the three bodies of the law as well as the law on industrial designs.

Unlike other forms of property, intellectual property refers to regimes of legal recognition of, primarily, the products of the mind or imagination. The subject matter of property relations is here preeminently based on mental labour. The law relating to intellectual property protects the right to mental labour.

The law confers rights of proprietary nature on relative intellectual labour primarily on the basis that it is in the interests of society and state to promote creativeness and inventiveness. Limited monopoly provides incentive for greater inventive and innovative efforts in society. An important aspect of the exploration in this course would be ways in which the laws strike a fair balance between the interests and rights of the intellectual labourers on the one hand and organized industrial enterprises on the other. Another dimension is a study of the ways in which this regime of laws militates against, or favours, comm. Moduley property in national cultures. As concerns 'modernization' crucial questions arise in the field of copyright protection in computer software and hardware, internet, electronic music and scientific research. Both copyright, trademarks, design and patent law here relate basically to the law of unfair competition and constitute an aspect of consumer protection and welfare not only in the context of national perspectives but also in view of the waves of globalization already set in. Both from the standpoint of human resources development, modernization and justice it is important that the law students get sufficient insights in Intellectual Property Law.

Course Contents:

Module I: Introduction

Intellectual Property, Concept and Philosophy, Need for Private Rights versus Public Interests, Advantages and Disadvantages of IPR.

Module II: Patent

Development of patent law, Rationale for patent protection**,** Nature and definition, Types of patentable subject matter, Patentability criteria, non-patentable inventions, Rights of patentee, Procedure for granting a patent, Grounds for opposition, Transfer of patent rights, Compulsory Licenses, Acquisition, Surrender, Revocation, restoration, Patent infringement and remedies, Bio patents and software patents, Official Machinery, Controller, Powers and Functions, Patent in pharmaceutical industry, Patent cooperation treaty, Paris convention.

Module III: Copyright

History, Concept of copyright, conditions for grant of copyright, extent of rights exception to copyright protection, fair use provision, assignment and licensing, Compulsory licensing and statutory licensing, Collective administration, Copyright board and office, powers and functions, Moral rights: Neighboring rights; infringement penalties and remedies, Appeals, Berne Convention, Universal Copyright Convention - WIPO Copyright Treaty: WIPO Phonograms and Performances treaty, TRIPS with respect to Copyright and Neighboring rights.

Module IV: Designs, Protection, Historical development, Rationale

Designs Act of 2000: Meaning of Design, Conditions for grant of protection, Ambit of Protection, Exceptions, Registration of Designs, Cancellation, Copyright in Registered Designs, Enforcement, Infringement and remedies, Powers and duties of Controller.

Module V: Trademarks

Evolution, Functions, Objective, Definition, Kinds of Marks, Domain names, Registration, Concurrent registration, Procedure for registration, Relative and absolute grounds of refusal, opposition and its grounds, Assignment, transmission and licensing of Trademarks, Infringement, Penalties and Remedies, Withdrawal of protection, Passing off, Official machinery for regulation administration and Redressal, Registrar, Difference between Trade Mark, **Trade Secret, Traditional Knowledge** and Geographical Indications, TRIPS on Trademarks, Madrid Agreement for The Repression of False or Deceptive Indications of Source on Goods, 1891- Madrid Agreement for the International Registration of Marks, 1891 and protocol relating to that agreement 1989.

Module VI: Plant Varieties Protection Act, 2001

Objectives, Rationale,Registry, Official machinery, registration, Criteria of fulfillment Exclusions, Benefit sharing, Farmers rights, CommModuley Rights, compulsory license Redressal fora, Appellate tribunal, Infringement, offences and penalties; Geographical indications of Goods (Registration and Protection Act, 1999**:** History, Definition, Rationale, Functioning, official Machinery,Registry,Rights conferred, Registration Procedure. Redressal Machinery, Appeal, Passing off, Offences, penalties and Procedure.

Examination Scheme:

Components	**P/S/V**	**CT**	**A**	**C**	**EE**
Weightage (%)	10	10	05	5	70

Text & References:

- D.P. Mittal (Taxman Publication), Indian Patents Law and Procedure
- B.L. Wadera, Patents, trademarks, copyright, Designs and Geographical Judications.
- P. Narayanan (Eastern Law House), Intellectual Property Law
- W. Cornish (Universal Publication), Intellectual Property Law
- R.K. Nagarjan, Intellectual Property Law
- Ganguli (Tata Megraw), Intellectual Property Rights

LAW, POVERTY AND DEVELOPMENT

Course Code: LAW2903 **Credit Units: 05**

Course Objective:
The objective of this paper is to provide an understanding of basic concepts of poverty and development and their relationship with law.

Course Contents:

Module I: Understanding Poverty and Development
Poverty: Meaning and Concept, Relative Dimensions, Measurement and Determinants, Issues related to Poverty in India; Development: Perspectives, Developmental index.

Module II: Constitutional Guarantees for the Poor
Equality and Protective Discrimination, Right to Basic Needs and Welfare, Abolition of Untouchability and Protection of Civil Rights, Right to Development.

Module III: Criminal Justice System and the Poor
Treatment of the poor by Police, Inability to get Bail, Problems of Poor Under trials, Working of free legal aid schemes. .

Module IV: Impoverishment of Women, Children and Disabled Persons
Deprivations of women under family laws, Problems of women workers in organized and unorganized sectors, Child labour, Approaches to disability and rights of the disabled persons, Right to education and dignity.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	05	5	70

Text & References:
- Law, Poverty and Development – Upendra Baxi
- State and Poverty in India – Atul Kohli
- The Poverty Question (Search for Solution) – Yogesh Atal
- Poverty, Rural Development and Public Policy - Amarendra

PROFESSIONAL ETHICS

Course Code: LAW2904 **Credit Units: 05**

Course Objective:
The Course has been designed to acquaint the students of Law about the Professional Ethics and Professional etiquettes that are essentially significant for an advocate to observe while at the Bar. Accountability and transparency are imperative to the profession. Besides, the conducive and cordial Bar- Bench relations can send a good message concerning the richness of the Legal profession. With this background cue, the course aims at developing insights of the students about the professional parameters.

Course Contents:

Module I: Historical Introduction
Historical introduction to legal profession in India – Barristers, Vakils, High Court Pleaders, Advocates, etc. The All India Bar Committee, 1951 and the passing of Indian Advocates Act, 1961. The Advocates Act 1961: Definitions Section 2, Constitution and function of State Bar Councils, Bar Council of India, Terms of Office, various sub-committees including Disciplinary Committee and the qualification for their membership. Power to make rules Sections 3 to 15 – Chapter –II.

Module II: The Advocate's Act, 1961
The Advocate Act, 1961.
Admission and enrolment of Advocate – Senior and other Advocates,
Common role of Advocates, Qualifications and Disqualifications for enrolment and procedure thereof, Chapter – III Section 16 to 28.
Rights to Practice: Monopoly of representation, Exclusion of advocates from certain cases, self representation by litigants. Chapter IV Secs. 29 to 34.
Professional and other misconduct, Principles for determining misconduct,
Disciplinary Committees of State Bar Council and the Bar Council of India,
Punishment of advocates for misconduct, Appeals to the Supreme Court,
Chapter – V – Secs. 35 to 44.

Module III: Legal Profession
Nature of Legal Profession, Need for an Ethical Code of Rights: privileges and duties of Advocates, Preparation of a case and fees of an Advocate, under – cutting, Bar against soliciting work and advertisement, Bar against touting, refusal of briefs, accountability to the client, confidentiality communication between Advocates to compromise, Study of Code of Ethics prepared by the Bar Council of India.

Module IV: Contempt of Courts Act, 1971
Contempt of Courts Act, 1971,
What is Contempt? Civil and criminal contempt, punishment for contempt.
Procedures in contempt cases. High Court Rules and the Supreme Court
Rules to regulate contempt proceedings.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Sanjeev Rao, Indian Advocates Act, 1971.
- M.P. Jain, Indian Legal History (Chap. On Legal Profession).
- Krishna Murthy Iyer's Book on Advocacy.
- The Contempt of Courts Act, 1971.
- Journal of Bar Council of India.

PRIVATE INTERNATIONAL LAW

Course Code: LAW2905 **Credit Units: 05**

Course Objective:
The course equips the student to deal with dispute involving a foreign element in personal, civil and commercial matters *i.e.* increasing in frequency as a result of a globalized economic and social environment.

Course Contents:

Module I: Introduction
Application and subject matter of Private International Law, Distinction with Public International Law, Characterization and theories of characterization, Concept of Renvoi, Application of foreign law, Domicile, Jurisdiction of courts.

Module II: Family Law and Adoptions
Material and formal validity of marriage under Indian and English law, Choice of law and jurisdiction of courts in matrimonial causes: dissolution of marriage, grounds of divorce, restitution of conjugal rights, recognition of foreign judgment, Recognition of foreign adoptions, Adoption by foreign parents, Jurisdiction under Indian and English law.

Module III: Civil and Commercial matters
Tort, Theories of foreign tort, Contract, Theory of Proper Law of Contract, Ascertaining the applicable law, Property.

Module IV: Indian Law relating to foreign judgment
Basis of recognition; Recognition and Enforcement of Foreign Judgments, Finality, Failure, Direct execution of foreign judgments, decrees.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Dr. Paras Diwan :Private International Law
- Cheshire : Private International Law
- Morris : Private International Law

ELECTION LAW

Course Code: LAW2906 **Credit Units: 05**

Course Objective:
The objective of this paper is to acquaint the students with the election laws governing the elections of the Houses of the Parliament and the State Legislatures as well as to the offices of President and Vice President**.**

Course Contents:

Module I: Introduction
Election: Meaning and Process, Constitutional Mandate, Laws governing elections, Election disputes, Election to the Offices of the President and Vice President. .

Module II: Election Commission
Composition, Functions, Powers**;** Delimitation of Constituencies, Preparation and Revision of Electoral Rolls.

Module III: Qualifications and Disqualifications of Candidates
Constitutional and Statutory Provisions**:** Disqualifications of sitting members, Nomination and Candidature, Voters Right to Information; Anti Defection Law (Tenth Schedule to the Constitution of India).

Module IV: Corrupt Practices in the Election Law; Electoral Offences

Examination Scheme:

Components	**P/S/V**	**CT**	**C**	**A**	**EE**
Weightage (%)	10	10	5	5	70

Text & References:
- Manual of Election Law in India – Dev Inder
- Chawla's Elections Law & Practice - P.C. Jain & Kiran Jain
- Election Laws and Practice in India- R.N. Choudhry
- Corrupt Practices in Election Law – K.C. Sunny
- How India Votes – Election Laws, Practice and Procedure – V.S. Rama Devi & S.K. Mendiretta
- V.N. Shukla's The Constitution of India – M.P. Singh.

Statutory Reading:
- Relevant Provisions of the Constitution of India
- The Representation of the People Act, 1951.
- The Representation of the People Act, 1950.
- The Presidential and Vice-Presidential Elections Act, 1952
- The Election Commission (Condition of service of Election Commissioners and Transaction of Business) Act, 1991.
- The Delimitation Act, 2002.

BANKING AND INSURANCE LAWS

Course Code: LAW2907 **Credit Units: 05**

Course Objective:
This course acquaints students with banking system of India and teaches them the various aspects and rights that exists for them in banking and insurance sector.

Course Contents:

Module I: Banking System in India
Kinds of banks and their functions; Banking Regulation Laws: Reserve Bank of India Act, 1934, Banking Regulation Act, 1949; Relationship between banker and customer: Legal Character, Contract between banker & customer, Banks duty to customers; The Banking Ombudsman Scheme, 1995; Liability under Consumer Protection Act, 1986.

Module II: Lending, Securities and Recovery by Banks
Principles of Lending ; Position of Weaker Sections; Nature of Securities and Risks Involved ; Recovery of debts with and without intervention of courts / tribunal: Recovery of Debts due to Banks and Financial Institutions Act, 1993, Securitisation and Reconstruction of Financial Assets and Enforcement of Security Interests Act, 2002.

Module III: Banking Frauds
Nature of Banking Frauds; Legal Regime to Control Banking Frauds; Recent Trends in Banking: Automatic Teller Machine and Internet Banking, Smart Cards, Credit Cards.

Module IV: Insurance Law
Nature of Insurance Contracts; Kinds of Insurance: Life Insurance, Medi claim, Property Insurance, Fire Insurance, Motor Vehicles Insurance (with special reference to third party insurance; Constitution, Functions and Powers of Insurance Regulatory and Development Authority; Application of Consumer Protection Act, 1986.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Banking Law & Negotiable Instruments Act – Sharma and Nainta
- Banking System, Frauds and Legal Control – R.P. Namita
- Law of Insurance – M.N. Mishra
- Handbook of Insurance and Allied Laws – C. Rangarajan
- Banking Law & Practice in India – M.L. Tannan.

INTERNATIONAL HUMANITARIAN AND REFUGEE LAW

Course Code: LAW2908 **Credit Units: 05**

Course Objective:
The objective of this paper is to make students aware of the principles of International Humanitarian and Refugee Laws.

Course Contents:

Module I: Historical Development of International Humanitarian Law
History and evolution, Growth, Character of International Humanitarian Law.

Module II: Geneva Conventions, 1949
Geneva Convention I, Geneva Convention II, Geneva Convention III and Geneva Convention IV, 1949, Additional Protocol I to Geneva Conventions, 1977, Additional Protocol II to Geneva Conventions II 1977.

Module III: Enforcement Machinery
War Crimes, Serious breaches of International Humanitarian Law, International Criminal Court (ICC).

Module IV: Refugees under International Law
Who is a refugee?, Convention Relating to the Status of Refugees, 1933, Convention on Status of Refugees, 1951, The 1967 Protocol, The AALCC Principles 1966, The OAU Convention 1969.

Module V: Implementation and Monitoring of the Rights of Refugees
Status of the UNHCR 1950, Cartegena Declaration 1984.

Module VI: Treatment of Refugees under Indian Laws
Draft SAARC Convention.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Ingrid Detter, The Law of War, (Cambridge, 2000)
- A. Roberts and R. Guelff, eds., Documents on the Laws of War (Oxford, 2000)
- Legality of the Threat or Use of nuclear weapons, Advisory Opinion, ICJ Reports (1996)
- M.K. Balachandran and Rose Verghese (eds.) – International Humanitarian Law ICRC (1997)
- Ravindra Pratap, "India's Attitude towards IHL", in Mani (ed.) International Humanitarian Law in South Asia (Genava: ICRC, 2003)
- Guy S. Goodwin – The Refugee in International Law (Oxford, 2000)
- A. Vibeke Eggli, Mass Refugee Influx and the Limits of Public International Law (The Hague: Nijhoff, 2002).

CORRUPTION LAWS

Course Code: LAW2911 **Credit Units: 05**

Course Objective:
To update the students about corruption laws that have already been formed. The main aim of the course is to make the students aware of the laws prevalent and the legal remedies available

Course Contents:

Module I: Introduction to Corruption Laws
Introduction- definition of corruption,
Genesis of corruption- Historical Background, corruption in ancient time, corruption in Mahabharata need for integrating
Nature of corruption, various types of corruption- in kind, cash or in service Individual Corruption, Institutional Corruption. Why and how of corruption – Nexus between Position of a Public servant and corruption consequences and ill effects

Module II: Offences by Public Servant
Offences under the Prevention of Corruption Act, 1988,
Corruption by Public servant- Prevention of Corruption Act 1988-
Definition of Public Servant sec 2(cc)
Categories of public servant- person in the pay of the Government- a person in the service of the Government a person remunerated by fees or commission for the performance of any public duty by the Government.
Sec 7: public Servant taking gratifications other legal remuneration in respect of an official act.
Gratification: legal remuneration, meaning of holding out as a Public Servant – whether covered under the Act.
Sec 8: Gratification by person other than public servant – to influence pubic servant by corrupt or illegal means.
Sec 9: Gratification by person other than Public Servant- to influence public servant- and not by corruptor illegal means.
Sec10, Sec11, Sec 12: Habitual committing of offence under Sec 8, 9, 12, 14.
Sec 15 Attempt
Sec 16 Fine Criteria
Sec 13 Criminal Misconduct by Public Servant.
Bribe giver Guilty or Abetment?
Investigation and Trial under the Act
Sec 17 Persons authorized to investigate.
Sec 19 Sanction for prosecution
Sec 20 presumptions under the Act.
Sec 3, 4, 5: Special Judges Court- procedure and powers of Special Judge.

Module III: Commission of Enquiry Acts
Section 6 Summary Trial. Commission of Enquiry Act 1952
Composition, function and role of CAG
The Central Vigilance Commission
Central Bureau of Investigation its role, function and Jurisdiction.
Proposed Lok Pal Bill ,its various drafts , legality of sting operations , provision relating to corruption cases of judges , Immunity of legislations and parliamentarians . Law on whistle blowers

Module IV: Money Laundering & National Investigative Agency Act
The Prevention of Money Laundering Act 2002, General Principles, Confiscation of Property earned through crime Sec5
Sec 171-B of IPC Bribery – Offences relating to elections.
Sec 171-C
Sec 171- D Undue influence and Impression at election
Sec 171- E Punishment for Bribery
Sec 171- F Punishment for Influence and Personating at an election.

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National Investigative Agency Act 2009

Module V: International Effort
International Efforts
The United Nations Directions
The Convention on Combating Bribery of Foreign Public Officials
UN Convention against Transnational Organized Crime.
UN Convention against Corruption (UNCAC)

Examination Scheme:

Components	P	A	C	CT	EE
Weightage (%)	5	5	10	10	70

Text & References:
- Prevention of Corruption Act, 1988
- Prevention of Money laundering Act, 2002
- National Investigative Agency act, 2009
- Un Conventions

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SUMMER INTERNSHIP EVALUATION-IV

Course Code: LAW2935 **Credit Units: 03**

It is a mode of Clinical Legal education Specified period to be spent by the student with a law firm/court/Commissions/NGO's and like institutions working with the realm of law or connected therewith. The reports both by the student and the office together with diary where applicable to be certified will be submitted for evaluation

The Internship during the summer break is a compulsory course. There is a Internship Data form where students fill in the details of where they are interning with complete address and phone numbers Customized Legal Reference /Diary is provided to the students on payment They maintain a day to day record of the work that they do at the place they are interning. They are expected to intern for a minimum 90 days. They submit their completed diary, certificate from the employer and also a report of their experience at work. After submission there is a Viva by concerned faculty. They assess the student on the kind of work they have done during internship, presentation of the work they have done and also on the practical knowledge they have gained

The Paper is marked out of 100 marks. The break up of the marks is as follows:

1.	Diary submission	25 Marks
2.	Report and certificate	25 Marks
3.	Viva (Panel of External Examiners)	40 Marks
4.	Attendance (Regularity in meeting the supervisor)	10 Marks
	Total	**100**

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MOOT COURT/ INTERNSHIP

Course Code: LAW2003 **Credit Units: 14**

Course Objective:
This course relates to litigation advocacy and as such this shall be simulation course that shall have two parts. First part shall focus on preparation for trial and trial strategies. It shall also disseminate techniques of examination-in-chief cross examination and re-examination of witnesses, argumentation in courts, bail application, injunction application, etc. The second part shall focus on writing briefs in civil suits and criminal cases, appellate briefs in civil and criminal cases, and writ matters, memorial writings and arguing before the appropriate forums. The students shall be given a case to argue, that shall help to articulate their argumentative zeal as well as capacity.

Course Contents:

Module I: Moot Court
Bench Memorial, Court Craft: Presentation of case, Interaction with Bench, Question Answer Court etiquette and mannerism section.

Module II: Internship
Specified period to be spent by the student with a law firm/court/Commissions/NGO's and like institutions working with the realm of law or connected therewith. The report and diary to be certified and submitted for evaluation.

Module III: Corporate Legal Training
Corporate communication skills and client interaction and etiquette in corporate law work environment.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	05	05	70

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GURUGRAM

FINANCIAL ACCOUNTING-I

Course Code: LAW2107 **Credit Units: 03**

Course Objective:
To develop conceptual understanding of the fundamentals of financial accounting system which processes transactions and other events through a book-keeping mechanism to prepare financial statements, and also to impart skills in accounting for recording various kinds of business transactions.

Course Contents:

Module I
Financial Accounting Concepts, importance and scope, Single entry vs Double entry system of accounting. Journal, Ledger, Trial Balance, Errors and their rectification, Cash Book, Bank reconciliation statement.

Module II
Final accounts, receipts and payments, income and expenditure accounts, balance sheet.

Module III
Depreciation accounting and its methods, Inventory valuation and its methods. Accounting for Hire Purchase Transactions, Journal entries and ledger accounts in the books of Hire Vendors and Hire purchaser

Module IV
Inland Branches: Dependent branches only and ascertainment of profit by debtors method and stock and debtors method.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Text & References:
- Dr. S.N. Maheswari, Financial Accounting
- BS Raman, Financial Accounting
- Grewal and Gupta, Advanced Accounting
- Radhaswamy and R.L. Gupta, Advanced Accounting
- S.Kr. Paul, Advanced Accounting
- P.C. Tulasian, Pearson Editions, Introduction to Accounting
- Jain & Narang, Financial Accounting
- Sehgal, A and Sehgal,D "Advanced Accounting", Part – 1, Taxmann Applied services, New Delhi

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LEGAL METHOD

Course Code: LAW2104 **Credit Units: 04**

Course Objective:
This paper focuses on orientation of students to legal studies from the point of view of basic concepts of law and legal system.

Course Contents:

Module I: Meaning and Classification of Laws
Meaning, Definition, Functions: Justice, Stability and Peaceful Change; Classification of laws: Public and Private Law, Substantive and Procedural Law, Municipal and International Law.

Module II: Sources of Law
Custom; Precedent, Ratio, Obiter; Legislation. ;

Module III: Basic Concepts of Indian Legal System
Common Law, Essentials of a Valid Law, Constitution as the Basic Law, Rule of Law, Separation of Powers, Judicial system in India, **Principles of Equity**.

Module IV: Legal Writing and Research
Legal materials: Case law, Statutes, Reports, Journals, Manuals, Digests etc.; Importance of legal research ; Techniques of Legal Research : Doctrinal, Empirical Research, Legal writings and citations.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Glanville Willains – Learning the law
- Avtar Singh – Jurisprudence (Legal Theory)
- B.N.M. Tripathi – An Introduction to Jurisprudence and Legal theory
- Benjamin N. Cardozo, The Nature of Judicial Process
- LI Publication – Indian Legal System
- ILI Publication in Legal Research and Methodology

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LAW OF CONTRACT-I

Course Code: LAW2105 **Credit Units: 04**

Course Objective:
Whatever may be the nature of a given society, the contractual relations, as are obtained in that society, are governed by certain principles which are more or less of a general and basic nature. In India these general principles are included in the statute of the Indian Contract Act. 1872. This course is designed to acquaint a student with the conceptual and operational parameters of these various general principles of contractual relations. Specific enforcement of contract is an important aspect of the law of contracts. Analysis of the kinds of contracts that can be specifically enforced and the methods of enforcement forms a significant segment of this study.

Course Contents:

Module I: Formation of Contract
Meaning and nature of contract, Offer / Proposal (Definition, Communication, Revocation, General/Specific offer, Invitation to treat), Acceptance (Definition, Communication, Revocation, Tenders / Auctions). 'E'Contract

Module II: Consideration and Capacity
Consideration (Definition, Essentials, Privity of contract), Capacity to enter into a contract (Minor's position, Nature / effect of minor's agreements).

Module III: Validity of Contract
Unlawful consideration and object, Free Consent, Coercion, undue influence, Misrepresentation, Fraud, Mistake, Contingent contract, Quasi contracts, Effect of void, voidable, valid, illegal, unlawful and uncertain agreements contracts.

Module IV: Discharge and Performance of Contract
Discharge of Contracts, Performance, Time and Place of performance, Impossibility of performance and frustration, Breach – Anticipatory & Present.

Module V: Remedies
Damages, Remoteness etc., Injunction, Specific performance, Quantum Merit.

Module VI: Specific Relief Act, 1963
Recovery of property, Specific performance of contracts, Rescission of Contract, Declaratory Decree, Injunctions: Temporary and Perpetual, Mandatory.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Anson - Law of Contract
- Pollock and Mulla - Indian Contract Act
- Avtar Singh - Indian Contract Act
- Bangia - Law of Contract and Specific Relief
- Cheshire and Fifoot - Law of Contract.

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READINGS IN MANAGEMENT

Course Code: MGT2130 **Credit Units: 02**

Objectives

The objective of this concentration elective is to inculcate reading habit alongwith value addition to the existing understanding of the subject. The book would be a kind of knowledge enhancer that would envision the student about some current thoughts related to the discipline. The book reading and its critical analysis would help broaden the intellectual horizon of the student. A contemporary and relevant book will be selected by the concerned department.

Guidelines

The student is expected to thoroughly go through the discipline related prescribed book with the objective of critically reviewing each aspect and character of the book. The student is supposed to have a detailed insight into the following:

1. Content
2. Writing style
3. Information/learning
4. Content handling
5. Characters(if any)
6. Thematic Clarity

The report is to be submitted in about 3000 words on A4 size sheets, Font 12pt., Times New Roman, 1.5 spacing. Headings in Font Size16.

Evaluation Scheme

Report on the Book in 3000 words	Written Test
50 marks	50 marks

TERM PAPER

Course Code: COM2131 **Credit Units: 02**

Objectives

The objective of this course is to judge the understanding as well as application of the knowledge gained by the students. The aim of the term paper is to provide the students with an opportunity to further enhance their knowledge in a sector of their choice by undertaking a significant practical unit of examining and analyzing various aspects of business management at a level commensurate with the learning outcomes of the various courses taken up them in the ongoing semester.

A term paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. At least one middle level or senior level person of a company from the chosen sector may be interviewed face to face

Guidelines:

1. The term paper will be related to the contemporary business issue and the topic will be given by the department.

2. The presentation of the term paper is scheduled to be held before the commencement of Semester examinations.

3. The paper will carry 100 marks that will be marked on the basis of understanding and organization of content based on the literature review. The Bibliography shall form an important part of the paper.

4. Examples of a few broad areas for Term Paper (List is indicative, not exhaustive)

- Credit rating
- Risk management
- Subprime meltdown and its after effect with case study from Indian industry
- Corporate frauds
- Micro finance institutions in India
- Carbon Trading
- IFRS
- Celebrity Endorsement in real estate
- Social media marketing
- Green marketing
- Sustainable branding practices
- Relationship management
- CSR
- Balanced Score Card
- Corporate Governance
- Employee retention
- NGOs.

Evaluation Scheme

Organisation and relevance of content	Literature Review	Bibliography	Total
40	40	20	100

PROJECT

Course code: COM2132 **Credit Units: 03**

Objectives:
The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Chapter Scheme and distribution of marks:
Chapter 1: Introduction – 10 marks
Chapter 2: Conceptual Framework/ National/International Scenario – 25 marks
Chapter 3: Presentation, Analysis & Findings -- 25 marks
Chapter 4: Conclusion & Recommendations -- 10 marks
Chapter 5: Bibliography -- 05 marks

Project Report	Power Point Presentation & Viva
75 marks	25 marks

components of a Project Report
The outcome of Project Work is the Project Report. A project report should have the following components:
1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.
2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.
3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.
4) **Body of the Report:** The body of the report should have these four logical divisions
a) ***Introduction:*** This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.
b) ***Conceptual Framework / National and International Scenario*****:** (relating to the topic of the Project).
c***) Presentation of Data, Analysis and Findings*****:**(using the tools and techniques mentioned in the methodology).
d) ***Conclusion and Recommendations:*** In this section, the concluding observations based on the main findings and suggestions are to be provided.
5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.
6) Annexures: Questionnaires (if any), relevant reports, etc.
(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

The Steps of a Project Report
Step I : Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic.
- Relevance of the topic
- Time available at the disposal.
- Feasibility of data collection within the given time limit.
- Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

Step II : Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.
Step III : Collection of information and data relating to the topic and analysis of the same.
Step IV : Writing the report dividing it into suitable chapters, viz.,
Chapter 1:Introduction,
Chapter 2: Conceptual Framework / National & International Scenario,

Chapter 3: Analysis & Findings
Chapter 4: Conclusion and Recommendations.

Step V : The following documents are to be attached with the Final Project Report.

1) Approval letter from the supervisor (Annexure-IA)
2) Student's declaration (Annexure-IB)
3) Certificate from the competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for Evaluation:

- Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below.
- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bound.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate.

WORKSHOP

Course Code: COM2133 **Credit Units: 01**

Objectives

A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two way. The trainer has to make sure that the aspect covered are practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

Major Themes for Workshop

The workshop may be conducted on any of the following major themes:
Accounting
Finance
Human Resources
Marketing
Economics
Operations
Supply Chain Management
These themes are merely indicative and other recent and relevant topics of study may be included.

Guidelines for Workshop

The procedure for earning credits from workshop consists of the following steps:

1. Relevant study material and references will be provided by the trainer in advance.
2. The participants are expected to explore the topic in advance and take active part in the discussions held
3. Attending and Participating in all activities of the workshop
4. Group Activities have to be undertaken by students as guided by the trainer.
5. Evaluation of workshop activities would be done through test and quiz at the end of the workshop.
6. Submitting a write up of atleast 500 words about the learning outcome from the workshop.

Methodology

The methodology followed at the workshop could be based on any one or more of the following methods:
Case Study
Business Game
Simulation
Group Activity
Role Play
Business Planning
Quiz

Evaluation Scheme:

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total
10	**30**	**30**	**30**	**100**

FINANCIAL ACCOUNTING-II

Course Code: LAW2206 **Credit Units: 03**

Course Objective:
To develop conceptual understanding of the fundamentals of financial accounting system which processes transactions and other events through a book-keeping mechanism to prepare financial statements, and also to impart skills in accounting for recording various kinds of business transactions.

Course Contents:

Module I
Consignment and Joint Venture Accounts:
(i) ***Consignments:*** Features, Accounting treatment in the books of the consignor and consignee.
(ii) ***Joint Ventures:*** Accounting procedures: Joint Bank Account, Records Maintained by Co- venturer of (a) all transactions (b) only his own transactions. (Memorandum joint venture account).

Module II
Accounting for bills of exchange - bills receivable and payable, acceptance, endorsement, discounting, dishonour and renewal of bills, accommodation bills.

Module III
Partnership
Admission of a partner: partenership deed, goodwill valuation and treatment. Sacrificing ratio.
Retirement and death of a partner: gaining ratio, goodwill treatment
Dissolution of partnership: revaluation of assets and liabilities. Legal Position, Accounting for simple dissolution,
Applications of rule in case of Garner Vs. Murray in case of insolvency of partner(s) (excluding piecemeal distribution and sale of a firm to a company).

Examination Scheme:

components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Text & References:

- Dr. S.N. Maheswari, Financial Accounting
- BS Raman, Financial Accounting
- Grewal and Gupta, Advanced Accounting
- Radhaswamy and R.L. Gupta, Advanced Accounting
- S.Kr. Paul, Advanced Accounting
- P.C. Tulasian, Pearson Editions, Introduction to Accounting
- Jain & Narang, Financial Accounting
- Sehgal, A and Sehgal,D "Advanced Accounting", Part – 1, Taxmann Applied services, New Delhi

LAW OF CONTRACT-II

Course Code: LAW2204 **Credit Units: 04**

Course Objective:
This course shall be taught after the students have been familiarized with the general principles of Contract in which the emphasis is on understanding and appreciating the basic essentials of a valid Contract and on the existence of Contractual relationship in various instances. Obviously, Contract Law assumes special significance to suit changes in society. These special Contracts are studied in the light of statutory provisions and decisional Law. With the invent of globalization in various sectors of economy today and are in need of specialized legal Professionals due to huge contractual requirements, joint venture Partnerships and the like, Therefore, this Course of Special Contracts provides an insight into the justification for special statutory provisions for certain kind of Contracts.

Course Contents:

Module I: Indemnity and Guarantee/Bailment and Pledge
Meaning, Distinction between Indemnity and Guarantee, Right / Duties of Indemnifier, Indemnified and Surety, Discharge of Surety, Kinds of Guarantee, Bailment and Pledge: Meaning and Distinction, Rights and Duties of Bailor/Bailee, Pawnor/Pawnee, Lien, Termination of Bailment.

Module II: Agency
Definitions of Agent and Principal, Appointment of an Agent, Authority of an Agent, Creation of agency: by agreement, Ratification and law, Relation of principal / agent, subagent and substituted agent, Ratification of Agents Authority, Revocation of Agency Authority, Effects of Agency on Contracts with third person, Personal Liability of agents, Termination of agency.

Module III: Sale of Goods Act 1930
Contract of Sale: Nature and definition, Conditions and Warranties, Transfer of Property and Title, Performance of the contracts, rights of unpaid seller, suit for breach of contract.

Module IV: The Indian Partnership Act, 1932
Nature of partnership firm, Relations of partners to one another and outsiders, Rights /Duties of partners *inter se*, Partnership Property: Relations of Partners to third parties, Liability for holding out, Minor as a partner; Incoming and outgoing partners, Dissolution of Partnership Firm, Modes of Dissolution, Consequences of dissolution, Registration of firms and effects of non registration.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Texts & References:

- Pollock and Mulla, Indian Contract Act
- Avtar Singh, Indian Contracts Act
- Mulla, D. F., Indian Partnership Act
- Desai, T.R., Law of Contracts and Partnership sale of good Act
- R.K. Bangia, Sales of Goods Act, 1930
- Avtar Singh, Sales of Good Act
- Avtar Singh, Indian Partnership Act.
- K. Sukumaran, Pollock & Mulls - The Indian Partnership Act

COMPUTER APPLICATIONS IN BUSINESS

Course Code: COM2204 **Credit Units: 03**

Course Objective:
To provide computer skills and knowledge for commerce students, and to make them complacent with the use of new tools of IT.

Course Contents:

Module I
General features of a computer. Generation of computers. Personal computer, Workstation, Mainframe computer and super computers. computer applications – data processing, information processing, Application areas of computer.

Module II
Computer organization. Central processing module. Computer memory- primary memory and secondary memory. Secondary storage devices – magnetic and optical media. Input and output modules. OMR, OCR, MICR, scanner, mouse, Modem.

Module III
Computer hardware and software. Machine language and high level language. Application software. Computer program. Operating system. Computer virus, Antivirus and Computer security, Windows OS and its features.
Computer arithmetic. Binary, octal and hexadecimal number systems. Algorithm and flowcharts. Illustrations. Elements of database and its applications.

Module IV
Introduction to MS office Packages- Ms-Word – Editing a Document – Move and Copy text – Formatting text and paragraph – Finding and Replacing text and spelling checking – Using tabs, Tables, and other features, Enhancing document – using mail merge and other features.
Introduction to Worksheet- Getting started with excel – Editing Cells and using commands and functions – Moving And Coping, Inserting and Deleting Rows and Columns – Getting help and formatting a worksheet – Printing the worksheet – Creating Charts – using formulae and functions in excel. Introduction to Power Point Presentation

Module V
Computer Networks & Internet Technology
Introduction to Computer Networks, Networking Components, Classification and types of Networks, Network Topologies – Overview with Advantages and Disadvantages, Communication Channels, Client Server Architecture, LAN concepts.
Introduction to internet intranet and Extranet, Myths about the Internet, Basic concepts of internet, Domain Name Service, Internet Protocols and Addressing, Services of internet, Internet and support Technologies, Censorship and Privacy issues

Examination Scheme:

Components	**A**	**P**	**HA**	**CT**	**EE**
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Text & References:

- Craig Stinson "Running Microsoft Windows-98" – Microsoft press.
- Joshua C. Nossiter. " Using Excel – 5 for Windows"
- "Working with Word" – Aptech Computer Education
- "Power Point Presentation" – Aptech Computer Education.
- Malhotra, Computer Applications in Business
- Rajaraman V, Analysis and Design of Information System, Prentice Hall of India, New Delhi

- Murdick, RG and Ross, JE Information Systems for Modern Management
- Kanter, J, Management Oriented MIS, Prentice Hall of India
- Bhattacharya SK, Management Planning and Information Systems

HUMAN VALUES AND PROFESSIONAL ETHICS

Course Code: MGT2206 **Credit Units: 03**

Course Objective:
The aim of this course is to facilitate the development of a holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of value based living in a natural way. Recognize the need for lifelong learning and have the knowledge and skills that prepare them to identify the Moral issues involved in Management areas and to provide an understanding of the interface between Social, Technological and Natural environments.

Course Contents:
Module I: Human Values
Morals, Values, Types of values, evolution of human values, Ethics – Integrity – Work Ethic – Honesty – Courage –Empathy – Self-Confidence – Character, Challenges at Work place

Module II: Values in Management
Relevance of values in Management, need for values in global change, values for managers, holistic approach for managers in decision making, problems related to stress in corporate management

Module III:
Workplace Rights and Responsibilities: Organizational Complaint procedures. Government agencies. Resolving Employee concerns. Limits on acceptable behavior in large corporation.
Work environment: Ethical and legal considerations, Organizational responses to offensive behavior and harassment. Ethics in a Global Context.

Module IV: Industrial Integrity
The epitome of industrial success, Integrity and organization, Exploring learning process of integrity, Consequences of lack of integrity.

Examination Scheme:

Components	**A**	**P**	**HA**	**CT**	**EE**
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Text &References:
Text
- R R Gaur, R Sangal, G P Bagaria, 2010, *A Foundation Course in Human Values and Professional Ethics*, Excel Books

References:
- Ivan Illich, 1974, *Energy & Equity*, The Trinity Press, Worcester, and HarperCollins, USA
- E.F. Schumacher, 1973, *Small is Beautiful: a study of economics as if people mattered*, Blond & Briggs, Britain.
- A Nagraj, 1998, *Jeevan Vidya ek Parichay*, Divya Path Sansthan, Amarkantak.
- Sussan George, 1976, *How the Other Half Dies*, Penguin Press. Reprinted 1986, 1991
- PL Dhar, RR Gaur, 1990, *Science and Humanism*, Commonwealth Purblishers.
- A.N. Tripathy, 2003, *Human Values*, New Age International Publishers.
- Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, *Limits to Growth – Club of Rome's report*, Universe Books.

READINGS IN MANAGEMENT

Course Code: MGT2230 **Credit Units: 02**

Objectives

The objective of this concentration elective is to inculcate reading habit alongwith value addition to the existing understanding of the subject. The book would be a kind of knowledge enhancer that would envision the student about some current thoughts related to the discipline. The book reading and its critical analysis would help broaden the intellectual horizon of the student. A contemporary and relevant book will be selected by the concerned department.

Guidelines

The student is expected to thoroughly go through the discipline related prescribed book with the objective of critically reviewing each aspect and character of the book. The student is supposed to have a detailed insight into the following:

1. Content
2. Writing style
3. Information/learning
4. Content handling
5. Characters(if any)
6. Thematic Clarity

The report is to be submitted in about 3000 words on A4 size sheets, Font 12pt., Times New Roman, 1.5 spacing. Headings in Font Size16.

Evaluation Scheme

Report on the Book in 3000 words	Written Test
50 marks	50 marks

TERM PAPER

Course Code: COM2231 **Credit Units: 02**

Objectives

The objective of this course is to judge the understanding as well as application of the knowledge gained by the students. The aim of the term paper is to provide the students with an opportunity to further enhance their knowledge in a sector of their choice by undertaking a significant practical unit of examining and analyzing various aspects of business management at a level commensurate with the learning outcomes of the various courses taken up them in the ongoing semester.

A term paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. At least one middle level or senior level person of a company from the chosen sector may be interviewed face to face

Guidelines:

1. The term paper will be related to the contemporary business issue and the topic will be given by the department.

2. The presentation of the term paper is scheduled to be held before the commencement of Semester examinations.

3. The paper will carry 100 marks that will be marked on the basis of understanding and organization of content based on the literature review. The Bibliography shall form an important part of the paper.

4. Examples of a few broad areas for Term Paper (List is indicative, not exhaustive)

- Credit rating
- Risk management
- Subprime meltdown and its after effect with case study from Indian industry
- Corporate frauds
- Micro finance institutions in India
- Carbon Trading
- IFRS
- Celebrity Endorsement in real estate
- Social media marketing
- Green marketing
- Sustainable branding practices
- Relationship management
- CSR
- Balanced Score Card
- Corporate Governance
- Employee retention
- NGOs.

Evaluation Scheme

Organisation and relevance of content	Literature Review	Bibliography	Total
40	40	20	100

PROJECT

Course Code: COM2232 **Credit Units: 03**

Objectives:
The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Chapter Scheme and distribution of marks:
Chapter 1: Introduction – 10 marks
Chapter 2: Conceptual Framework/ National/International Scenario – 25 marks
Chapter 3: Presentation, Analysis & Findings -- 25 marks
Chapter 4: Conclusion & Recommendations -- 10 marks
Chapter 5: Bibliography -- 05 marks

Project Report	Power Point Presentation & Viva
75 marks	25 marks

Components of a Project Report
The outcome of Project Work is the Project Report. A project report should have the following Components:
1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.
2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.
3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.
4) **Body of the Report:** The body of the report should have these four logical divisions
a) ***Introduction:*** This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.
b) ***Conceptual Framework / National and International Scenario*****:** (relating to the topic of the Project).
c***) Presentation of Data, Analysis and Findings*****:**(using the tools and techniques mentioned in the methodology).
d) ***Conclusion and Recommendations:*** In this section, the concluding observations based on the main findings and suggestions are to be provided.
5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.
6) Annexures: Questionnaires (if any), relevant reports, etc.
(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

The Steps of a Project Report
Step I : Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic.
- Relevance of the topic
- Time available at the disposal.
- Feasibility of data collection within the given time limit.
- Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

Step II : Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.
Step III : Collection of information and data relating to the topic and analysis of the same.
Step IV : Writing the report dividing it into suitable chapters, viz.,
Chapter 1:Introduction,
Chapter 2: Conceptual Framework / National & International Scenario,

Chapter 3: Analysis & Findings
Chapter 4: Conclusion and Recommendations.

Step V : The following documents are to be attached with the Final Project Report.

1) Approval letter from the supervisor (Annexure-IA)
2) Student's declaration (Annexure-IB)
3) Certificate from the competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for Evaluation:

- Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below.
- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bound.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate.

WORKSHOP

Course Code: COM2233 **Credit Units: 01**

Objectives

A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two way. The trainer has to make sure that the aspect covered are practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

Major Themes for Workshop

The workshop may be conducted on any of the following major themes:
Accounting
Finance
Human Resources
Marketing
Economics
Operations
Supply Chain Management
These themes are merely indicative and other recent and relevant topics of study may be included.

Guidelines for Workshop \

The procedure for earning credits from workshop consists of the following steps:

1. Relevant study material and references will be provided by the trainer in advance.
2. The participants are expected to explore the topic in advance and take active part in the discussions held
3. Attending and Participating in all activities of the workshop
4. Group Activities have to be undertaken by students as guided by the trainer.
5. Evaluation of workshop activities would be done through test and quiz at the end of the workshop.
6. Submitting a write up of atleast 500 words about the learning outcome from the workshop.

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Methodology

The methodology followed at the workshop could be based on any one or more of the following methods:
Case Study
Business Game
Simulation
Group Activity
Role Play
Business Planning
Quiz

Evaluation Scheme:

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total
10	**30**	**30**	**30**	**100**

CORPORATE ACCOUNTING

Course Code: LAW2307 **Credit Units: 03**

Course Objective:
This course enables the students to develop awareness about Corporate Accounting in conformity with the Provision of companies' Act and latest amendments thereto with adoption of Accounting Standards that are likely to be introduced from time to time.

Course Contents:
Module I- Introduction to Corporate Accounts
Statutory records to be maintained by a company; Accounting for share capital transactions- issue of shares at par, at premium and at discount; forfeiture and re-issue of shares; buy-back of equity shares; redemption of preference shares - statutory requirements, disclosure in balance sheet; rights issue.

Module II
Issue & Redemption of debentures - accounting treatment and procedures; conversion of debentures into shares; Final accounts of Limited liability companies; Preparation of Profit & Loss account, Profit & Loss appropriation & Balance Sheet account in accordance with the provisions of existing companies act(excluding managerial remuneration).

Module III
Holding and subsidiary companies - accounting treatment and disclosures; consolidation of accounts.

Module IV
Valuation of Goodwill and shares
Good will- Meaning, definition, elements, types and methods of valuation of Goodwill, Methods of share valuation (Equity & preference shares).

Module V
Accounting treatment for amalgamation with reference to As-14 (excluding intercompany transactions & holdings), absorption and reconstruction of companies; internal & external reconstruction, Liquidation – Preparation of Liquidator's Statement of affairs, deficiency /surplus statement, calculation of pro rata treatment of uncalled capital.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Text & References:
- S.N. Maheswari, Financial Accounting
- Narayanaswamy, Financial Accounting
- SP Iyengar, Advanced Accountancy
- RL Gupta, Advanced Accountancy
- Jain and Narang, Corporate Accounting
- Tulsian, Advanced Accounting

STATISTICAL METHODS IN RESEARCH-I

Course Code: LAW2308 **Credit Units: 03**

Course Objectives:
To provide basic understanding of quantitative tools and their elementary application to business problems.

Module I- Introduction to Statistics
Basic Concepts, Primary & Secondary data, classification of data, Graphical representation of data, frequency distribution.

Module II- Central Tendency and Dispersion
Measures of central tendency; Mean, Median, Mode, Geometric mean and Harmonic mean; Measures of dispersion; Range, Mean Deviation, Standard Deviation, Coefficient of variation, Quartile Deviation, Skewness and Kurtosis; Difference between these measures and their interpretation.

Module III- Correlation & Regression
Correlation- Concepts and importance, Positive & Negative correlation, Karl-Pearson's coefficient of correlation, Rank correlation coefficient, Spurious correlation, Coefficient of determination.
Regression-Concept, Difference between correlation & regression.

Module IV- Time Series and Index numbers
Time Series- Introduction, Components of a time series, Multiplicative and additive models, Semi Average & Moving Average method;
Index Numbers- Concept, price relative, quantity relative, value relative, Laspeyre's, Passche's and Fisher's index numbers, Family Budget method, problems in construction and limitations of index numbers Tests for adequacy of index numbers.

Examination Scheme:

Components	**A**	**P**	**HA**	**CT**	**EE**
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA-**Home Assignment; **CT**-Class Test; **EE-**End Semester Examination

Text & References:
Text:
- Fundamentals of Applied Statistics, V.K.Kapoor & S.C.Gupta, S. Chand & Sons, New Delhi.
- Theory and Problems of Statistics, M.R. Theory, McGraw-Hill Book, London.

References:
- Essential Mathematics for Economics, J. Black & J.F. Bradley, John Willey and Sons.
- Fundamental Method of Mathematical Economics, Chiang, McGraw-Hill New Delhi.
- Applied General Statistics. F.E. Croxton & D.J. Cowden, Prentice Hall, New Delhi.

CONSTITUTIONAL LAW-I

Course Code: LAW2303 **Credit Units: 04**

Course Objective:
The course aims at analyzing constitutional institutions, its powers, limitations and interrelationships with one another and seeks to mould a frame of mind in the student to appreciate and assess constitutional policy and changes for the future.

Course Contents:

Module I: Fundamental Rights and Directive Principles, and Fundamental Duties
Idea of Fundamental Rights and their importance, against whom the Fundamental rights are available? Definition of 'State'? Law in Art. 13, Directive Principles; Nature and reasons for incorporation, inter-relationship between fundamental rights and directive principles, judicial policy towards Directive principles from Champakam to Minerva Mills and thereafter, Art. 51-A (K) and its correlation with Art. 21-A.

Module II: Freedom and Personal Liberty
Freedom of speech and expression and of press; Is Right to Information inclusive in Freedom of Speech and Expression? Freedom of Assembly, Freedom of Association, Freedom of Movement, Freedom to reside and settle, Freedom of profession/Business, etc. Art. 19: Are these freedoms absolute? Rights of an accused: Double Jeopardy, Self-incrimination and retrospective punishment, Art. 20; Right to life and personal liberty: Meaning of personal liberty, Procedure established by Law, Before Maneka Gandhi, Maneka Gandhi and thereafter, Art. 21; preventive detention and constitutional safeguards: Art. 22; Right to education Art. 21-A.

Module III: Equality and Protective Discrimination
Equality before Law and equal protection of Laws, meaning, constitutional provisions Arts 14, 15, 16, 17, 29 (2), 325: Total conspectus, Classification for differential treatment, prohibited grounds of discrimination: Arts. 15(1), (2), (3), 16 (2), (3), 29 (2); Protective Discrimination in favour of SC / ST and other backward classes and recent trends eg. Schedule IX and Reservation Policy, Women and children Art. 15, 15(3), 15(4), 15(5) Abolition of titles – Arts. 18.

Module IV: Secularism
Concept of Secularism, Indian Constitutional provisions, Indian concept of Secularism, Freedom of religion, Scope: Arts. 25, 26, Limits of Freedom, Religion and State in India, State Control and non-interference with religion; Minority rights: Why? Scope: Meaning and Minority, Minority right to educational institutions and judicial attitude.

Module V: Judicial Process under the constitution
Judicial Review : Nature of Judicial Review, Arts. 32, 136, 141, 226, 227.
Judges: Appointments, conditions of service, etc; Public Interest Litigation.
Supreme Courts Original and Advisory Jurisdiction.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- V.N. Shukla, Constitution of India
- M.P. Jain – Indian Constitutional Law.
- H.M. Seervai – Constitutional Law of India.
- Durga Das Basu – Shorter Constitution.
- P.M. Bakshi – Constitution of India.
- J.N. Pandey – Constitution of India..

LAW OF CRIMES - I (INDIAN PENAL CODE Section 1-120B)

Course Code: LAW2304 **Credit Units: 04**

Course Objective:
Course on Law of Crimes aims at introducing students to the basic principles of criminal law. There has been a progressive as well as regressive change in the Indian society since Independence. A proper understanding of crimes and the causal factors for the occurrence of crime is extremely important in the larger context of India's development, if young law students are to use their knowledge and skills to build a just and humane society. The young law students are the would be lawyers and as such they must have an acquaintance with such knowledge to make criminal justice system serve the goals of social defense as well as social justice. Therefore, a study of the basic concepts of specific offences under the Indian Penal Code is imperative.

Course Contents:

Module-I: Introduction to Substantive Criminal Law: Extent and operation of the Indian Penal Code, Definition of Crime, Fundamental elements of crime, Stages in commission of a crime, Intention, Preparation, Attempt.

Module-II: Punishment: Theories: Deterrent, Retributive, Preventive, Expiatory and Reformative Theory. Punishment under the IPC: Fine, Imprisonment, Capital Punishment.

Module-III: General Explanations and Exceptions: Definitions, Constructive joint liability, Mistake, Judicial and Executive acts, Accident, Necessity, Infancy, Insanity, Intoxication, Consent, Good faith, Private defence

Module-IV: Abetment and Criminal Conspiracy

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Ratanlal & Dhirajlal – The Indian Penal Code
- K. D. Gaur – A Text Book on Indian Penal Code
- S.N. Misra, Indian Penal Code
- B.M. Gandhi, Indian Penal Code (1996), Eastern, Nagpur.
- P.S. Achutan Pillai, Criminal Law (1995) Eastern, Lucknow.

FAMILY LAW-I

Course Code: LAW2305 **Credit Units: 04**

Course Objective:
This Course aims at providing adequate Sociological perspective so that the basic concepts relating to family are expounded in their social setting. It is designed to address the various aspects of Hindu Law and strives to give an overview of some of the current problems arising out of the foundational inequalities in the various family concepts.

Course Contents:

Module I: Introduction (Sources, Schools and Joint Hindu Family)
Sources and Schools of Hindu Law; The Concept, Formation and incidents of Joint Hindu Family of Mitaksharaand Dayabhaga; The Coparcenaries : It's formation and various incidents of Joint Hindu Family of Mitakshara and Dayabhaga; Karta of the Joint Family : His position, powers, privileges and obligation.

Module II: Hindu Marriage (Vivah) and Matrimonial Remedies (The Hindu Marriage Act, 1955)
Hindu Marriage: Nature, concept, Essential conditions & Prohibitions; Void & Voidable Marriages; Divorce: Customary and Judicial- Matrimonial fault theory, irretrievable breakdown and of marriage; Option of puberty; Restitution of conjugal rights; Judicial separation.

Module III: Alimony, maintenance, Adoption and Guardianship (The Hindu Adoption and Maintenance Act, 1956 and The Hindu Minority and Guardianship Act, 1956)
Maintenance of neglected wives, divorced wives, minor children, disabled children and parents under sections 125, 127 of Code of Criminal Procedure, 1973; Alimony : Temporary Permanent; Maintenance: Pendente Lite and permanent and maintenance for Divorced Hindu women under The Hindu Adoption and Maintenance Act, 1956; The Hindu Minority and Guardianship Act, 1956,

Module IV: Law of Succession, inheritance and Partition among Hindus (The Hindu Succession Act, 1956)
Property under Mitakshara Law and Dayabhaga: Formation and Incidents; Devolution of interest in MitaksharaCoparcenaries, Coparcenaries with reference to the provisions of Hindu Succession Act, 1956, Succession to property of Hindu female dying intestate under the Hindu Succession Act, 1956, Disqualifications relating to succession; Partition and Re-union**.**

Module V: Dispositions of Property under Hindu Law
Testamentary Disposition (Will): Definition and basis, Capacity of the Legatee, Formalities of a Will; subject matter of Will, Restrictions on testamentary power of disposition, interpretation of the Will, Revocation of the Will; Disposition inter vivos (Gift).

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Mulla, D.F., Principles of Hindu Law
- Paras Diwan, Modern Hindu Law
- Mulla, D.F., Principal of Mohammadan Law
- Fyzee, A.A.A., Outlines of Mohammadan Law
- Mahmood, T., Muslim Law of India
- Paras Diwan, Law of Intestate and Testamentary Succession (1998), Universal

THE CODE OF CRIMINAL PROCEDURE

Course Code: LAW2311 **Credit Units: 04**

Course Objective:
In the absence of effective enforcement machinery, the substantive Criminal Law which defines offences and provides punishments for them, would be almost worthless. Therefore, the need of the Code of Criminal Procedure. The present course intends at acquainting the students with the various pre judicial and judicial procedures. This course also includes the rights and duties of those proceeded against and the powers, duties and restraints on those administering the criminal judicial process.

Course Contents:

Module I: Introduction
The importance of Fair Trial - constitutional perspectives of fair trial: Articles 14, 20, 21, Section – 2: Definitions; classes of Criminal Courts: Sections 6 to 13 including their powers and jurisdiction. The organization of Police, Prosecutor, Defense Counsel and Prison Authorities alongwith their duties, functions and powers.

Module II: Pre – Trial processes
FIR, Arrest and Bail provisions, bonds, process to compel appearances and production of things, search and seizure – search warrants, search without warrants, police search during investigations, general principles of search, seizure and constitutional aspects of validity of search and seizure proceedings.

Module III: Charge and common features relating to Trials
Form of Charge, joinder of charges, alteration of charge, basic rule regarding charge and its trial, withdrawal of charges, effect of error in the charge. Language of Courts, decision on evidence partly recorded by one judge or magistrate and partly by another, summary procedure to deal with certain cases of perjury and certain kinds of contempt of court, evidence in inquiries and trials, general provisions as to inquiries and trials, provisions as to accused persons of unsound mind.

Module IV: Criminal Trials and Execution Proceedings
Trial before Court of Sessions, Trail of warrant case by magistrate, Trial of Summons Case, Summary Trial, Judgment, submission of death sentence for confirmation, execution, suspension, remission and commutation of sentences.

Module V: Review Procedures
Appeal, Review and Reference

Module VI: Miscellaneous
Maintenance of wives, children and parents, Transfer of criminal cases, Irregular proceedings, Limitations for taking cognizance, Security for keeping peace and for good behavior, Disputes as regarding immovable property, Probation of Offenders Act

Module VII
Juvenile Justice (Care & Protection of Children) Act 2000. Concept of juvenile delinquency, juvenile court system, treatment and rehabilitation of juveniles, law for protection of juvenile offenders. Juvenile Justice (Care &Protection of Children) Act 2014.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Ratan Lal and Dheeraj Lal, Criminal Procedure Code
- D.D. Basu, Criminal Procedure Code
- R.V. Kelkar, Lectures on Criminal Procedure Code
- R.V. Kelkar, Code of Criminal Procedure
- Chandrasekharan Pillai (ed.) Kelkar's Outlines of Criminal Procedure (2001), Eastern, Lucknow.

STATISTICAL METHODS IN RESEARCH-II

Course Code: LAW2408 **Credit Units: 03**

Course Objectives:
To provide basic understanding of quantitative tools and their elementary application to business problems.

Module I- Probability Theory
Independent, Dependent, Mutually Exclusive, Favourable, Exhaustive & Complementary events, Addition theorem, Conditional Probability, multiplication Theorem, Bayer's Theory.

Module II- Statistical Methods
Random Variable- Continuous & discrete; Discrete distribution- Binomial & Poisson, Bernoulli's trials; Continuous Distribution- Normal distribution, Properties of normal curve, importance & application

Module III- Tests of Hypothesis
Significance test: concepts and applications, acceptance and critical regions, null and alternative hypothesis, judgemental errors, level of significance. Power of a test, z test for testing of mean, proportion and equality of means, t- test.

Module IV- Decision Tree
Decision Theory: Decision making, under certainity, uncertainity & risk, Bayersian Analysis, Decision tree.

Examination Scheme:

Components	**A**	**CT**	**C**	**H**	**EE**
Weightage (%)	5	15	5	5	70

Texts and References:
Text:
- Fundamentals of Applied Statistics, V.K.Kapoor & S.C.Gupta, S. Chand & Sons, New Delhi.
- Theory and Problems of Statistics, M.R. Theory, McGraw-Hill Book, London.

References:
- Business Statistics, J.K. Sharma, Pearson Education.
- Statistical Methods, S.P.Gupta, S. Chand and Sons, New Delhi.
- Applied General Statistics. F.E. Croxton & D.J. Cowden, Prentice Hall, New Delhi.

CONSTITUTIONAL LAW-II

Course Code: LAW2403 **Credit Units: 04**

Course Objective:
The course material seeks to introduce the student to the relevance of inalienable fundamental rights and restrictions in the Constitution of India and the principles that ought to guide policy making in India. The student is expected to appreciate the text and the juristic discourse by reference to landmark case laws, juristic opinion and vibrant classroom discussions as the subject raises issues, conflict of interests and dilemmas in a pulsating democracy with changing dynamic priorities in a developing country like India.

Course Contents:
Module I: Distribution of powers between Centre and States – (Arts. 245-281)
Legislative Powers, Administrative Powers, Financial Powers, Relevant Doctrines: Territorial nexus, Harmonious construction, Pith and substance, Repugnancy: Overview of Panchayati Raj Provisions (Art. 243), Freedom of Trade and Commerce.

Module II: Union and State Executive, legislature and Judiciary
Union Executive, President: Appointment, Election, Removal, conditions of service; Powers of president focus on ordinance, pardon, emergency; Assessment of relevance of presidential office on governance; Council of ministers and Prime minister: Appointment, Conditions, functioning, collective responsibility, dismissal of cabinet minister; Office of Attorney General: Significance, Appointment, functions, Conditions; State executive, Governor: Appointment, Removal, Powers, State cabinet dismissal; governors role in the context of centre state relations. (Art 79-122).
Union Legislature: Lok Sabha, Composition, functioning, membership, qualifications and disqualifications, Dissolution of, Effect; Bills : Procedure for the passage; Privileges of legislature; State legislature: functioning, dissolution ; Anti defection law and its impact. (Arts. 168-212).
Union Judiciary: Supreme Court Judges: Appointment, removal, impeachment; jurisdiction of Supreme Court: Original, appellate, advisory, Court of Record; Assessment of independence of judiciary; State judiciary: High Court Judges: Appointment, transfer, removal, promotion; High Court jurisdiction, Art. 226, writs; Subordinate judiciary. (Arts. 124 -147) (Arts. 214 to 237).

Module III: Emergency Provisions
National, State and financial Provisions.

Module IV: Miscellaneous
Official Language, Language of Courts, Trade, Commerce and Intercourse in India, Services Under the Union and State, Elections, Parliamentary, Privileges and Schedules, etc .

Module V: Amendment of the Constitution
Amendment of Constitution, Doctrine of basic Structure.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Texts & References:
- V.N. Shukla, Constitution of India
- M.P. Jain – Indian Constitutional Law.
- H.M. Seervai – Constitutional Law of India.
- Durga Das Basu – Shorter Constitution.
- P.M. Bakshi – Constitution of India.
- J.N. Pandey – Constitution of India.

ADMINISTRATIVE LAW

Course Code: LAW2404 **Credit Units: 04**

Course Objective:

Administrative law is as old as the administration itself. However, the form in which we find it today, Administrative is described a most outstanding legal development of the twentieth century. The reason for this development can only be attributed to a change of philosophy as regards the role and function of the State. The change in the concept of State from 'laissez faire' to a 'welfare state' has led to emergence of state activities in almost all spheres of human life. With the phenomenal increase in the area of state operation, the State was bound to take over a number of functions which were earlier left to private enterprise. In order to ensure that such functions are performed effectively and further due to certain other factors namely contingency, expertise etc. administrative agencies are given extraordinary powers and functions such as to make rules and deciding disputes apart from its wide discretionary powers. Obviously, this necessitated a new set of laws to check the possible abuses of such extraordinary powers on the part of administration. The courts in India and abroad in the course of time have developed various doctrines and methods to deal with such p[problems. However, there is no end to this journey. The field is still open for new changes.

The main thrust of administrative law has been to study the nature of functions and powers exercised by the authorities on whom they have been conferred on and the study of remedies available to common man in case the limits of exercising power are transferred by such an authority. The focus or the centre point of this study, as usual as in cases of the study of other branches of public law, is the rights of individual *wis a wis*the public interest.

Course Contents:

Module I: Evolution, Nature and scope of Administrative law

Definitions, scope, classification and reason for the growth of administrative law; Relationship between constitutional law and administrative law; doctrine of Separation of Powers and its application in administrative law; Doctrine of Rule of law and application in administrative law.

Module II: Legislative function of Administration

Delegated legislation: Necessity for delegated legislation, classification of delegated legislation and its requirement, constitutionality of delegated legislation, All form of control of delegated legislation i.e. Parliamentary, Procedural and Judicial control (doctrine of ultra vires).

Module III: Judicial function of Administration

Reason for Administrative adjudication; Tribunals and classification of Tribunals; Principles of Natural Justice; Ombudsman: Lokpal, Lokayukta; Central Vigilance Commission (CVC).

Module IV: Administrative discretion

Need and legality and abuses; Constitutional objections and discretion, failure to exercise discretion; Doctrine of proportionality; Legitimate expectation.

Module V: Judicial control of administrative action

Courts as the final authority to determine the legality of Administrative actions ; Public Interest Litigation and the principle of *locus standi*, laches, Judicial review ; scope and extent, statutory appeals, writs.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- M.P. Jain and S.N. Jain: Principles of Administrative Law.
- I.P. Massey: Administrative Law.
- C.K. Talewani: Lectures on Administrative Law.
- De Smith: Judicial Review of Administrative Action.
- H.W.R. Wade: Administrative Law
- S.P. Sathe: Administrative Law.

FAMILY LAW-II

Course Code: LAW2405 **Credit Units: 04**

Course Objective:
Family Law II Course is mainly devoted to the study of Muslim Personals Law relating to Marriage, Maintenance, Dower, Adoption & Guardianship, Divorce, Hiba, Pre-emption, Succession, and disposition of Property. The main objective of the course is to provide an indepth knowledge of the Laws governing Muslims.

Course Contents:

Module I: Introduction (Sources, Schools and Muslim Marriage (Nikah)
Sources and Schools of Muslim Law**:** Shia and Sunni; Muslim Marriage: Nature and concepts of Muslim Marriage, Essential conditions of a valid marriage, prohibitions/ disabilities, classification of marriage and effects of valid, irregular, void marriage.

Module II: Dower and Matrimonial Remedies (Dower, Restitution, Separation and Divorce)
Dower : Concept and Nature; Divorce under Muslim personal Law, Nullity of marriage; Option of puberty; Restitution of conjugal rights; Judicial separation; Grounds for divorce under Muslim Law; Bars to matrimonial relief under Muslim Law; Grounds for Divorce under Indian Dissolution of Muslim Marriage Act 1939.

Module III: Alimony, maintenance and Adoption & Guardianship (Hizanat)
Maintenance of neglected wives, divorced wives, minor children, disabled children and parents who are unable to support themselves vide sections 125, 127 of Code of Criminal Procedure, 1973;Alimony and maintenance as an independent remedy,Maintenance (Nafaqa) for Muslim Women under the Muslim Women Protection of Right on Divorce Act, 1986; Guardianship under Muslim Law.

Module IV: Law of Succession and inheritance among Muslims
General rules of succession; inclusion and exclusion of inheritors to the property. Classification of heirs under Hanafi and IthmaAsharia School and their shares and distribution of property.

Module V: Dispositions under Muslim Law, Waqf and Pre- Emption
Wasiyat : Testamentary Disposition and various incidents of wasiyat. Disposition inter vivos (Gift), Gift (Hiba), Musha, Revocation of Gifts; Distinction between Hiba, Ariya, Sadaqa&Wakf, Hiba-bil-Sharatful- ewaz, Gift during death illness (Marz-ul-maut).
Waqf :Meaning, Kinds, Objects,purpose, Requisites and various incidents of waqf.
Pre-emption – Origin, Definition, Classification, Subject matter, formalities, effects, constitutional validity.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Mulla, D.F., Principles of Hindu Law
- Paras Diwan, Modern Hindu Law
- Mulla, D.F., Principal of Mohammadan Law
- Fyzee, A.A.A., Outlines of Mohammadan Law
- Mahmood, T., Muslim Law of India
- Paras Diwan, Law of Intestate and Testamentary Succession (1998), Universal .

LAW OF CRIMES-II (INDIAN PENAL CODE SECTION- 121-511)

Course Code: LAW2406 **Credit Units: 04**

Course Objective:

Course on Law of Crimes aims at introducing students to the basic principles of criminal law. There has been a progressive as well as regressive change in the Indian society since Independence. A proper understanding of crimes and the causal factors for the occurrence of crime is extremely important in the larger context of India's development, if young law students are to use their knowledge and skills to build a just and humane society. The young law students are the would be lawyers and as such they must have an acquaintance with such knowledge to make criminal justice system serve the goals of social defense as well as social justice. Therefore, a study of the basic concepts of specific offences under the Indian Penal Code is imperative.

Course Contents:

Module-I: Offences affecting the Human body: Offences affecting life, causing miscarriage, or injuries to unborn children, Offences of hurt, of wrongful restraint and wrongful confinement, Offences of criminal force and Assault, offences of kidnapping and Abduction

Module-II: Offences against Women: Obscene acts and songs, Outraging the modesty of women, Rape, Cruelty by husband or relatives of husband, Offences relating to marriage

Module-III: Offences against Property: Theft, Extortion, robbery and dacoity, Criminal misappropriation and criminal breach of trust, Cheating, Mischief, Criminal trespass

Module-IV: Defamation and offences relating to documents and property marks: Defamation**,** Forgery**,** Counterfeiting.

Module-V: Offences against State, Public Tranquillity, Public Servants, Religion

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Ratanlal & Dhirajlal – The Indian Penal Code
- K. D. Gaur – A Text Book on Indian Penal Code
- S.N. Misra, Indian Penal Code
- B.M. Gandhi, Indian Penal Code (1996), Eastern, Nagpur.
- P.S. Achutan Pillai, Criminal Law (1995) Eastern, Lucknow.

COST ACCOUNTING

Course Code: LAW2507 **Credit Units: 03**

Course Objective:
To get an expert knowledge in the area of cost management and cost control to enable effective management decisions.

Course Contents:
Module I: Cost Accounting
Introduction – Meaning of Cost, costing and Cost Accounting – Comparison between Financial Accounts and Cost Accounts –Cost concepts and Classification of Costs – Cost Module – Cost Center, cost object –Preparation of cost sheet

Module II: Material Costing
Issue of materials, Methods of pricing of material issues- LIFO, FIFO- Weighed Average Method, Simple Average Method; Inventory Control- Concept & techniques like fixing of stock levels, EOQ, ABC analysis, perpetual & periodic inventory systems, material losses & their treatment.

Module III: Labour Costing
Control of labour cost – Labour Turn Turnover – Causes and effects of labour turnover – Meaning of Time and Motion Study, Merit Rating, Job Analysis, Time keeping and Time booking – Idle time, causes and treatment – Overtime – Methods of Wage Payment, Time rate and Piece Rate – Incentive Schemes – Halsey Premium Plan – Rowan Bonus Plan – Taylor's and Merrick's differential piece rate systems – Problems.

Module IV: Overhead Costing
Definition, Classification, allocation, apportionment & absorption of overhead, treatment of over & under absorption

Module V:
Costing Methods Introduction - Job Costing – Batch Costing – Contract Costing-
Process Costing – principles – distinction between Process and Job – Preparation of process accounts – treatment of normal loss – abnormal loss – abnormal gain – Joint and By-products. Service costing. Marginal costing- introduction, contribution, PVR, BEP Chart and Margin of safety.

Module VI:
Reconciliation of Cost and Financial Accounts - Need for reconciliation – Reasons for difference in profits – Problems on preparation of Reconciliation statements including Memorandum Reconciliation account.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Text & References:

- N.K. Prasad: Cost Accounting
- Nigam & Sharma: Cost Accounting
- Khanna Pandey & Ahuja: Practical Costing
- M.L. Agarwal: Cost Accounting
- Jain & Narang: Cost Accounting
- S.P. Iyengar: Cost Accounting
- S.N. Maheshwari: Cost Accounting
- Horngren: Cost Accounting: A Managerial Emphasis
- M. N. Arora: Cost Accounting
- Dutta: Cost Accounting

MACRO ECONOMICS

Course Code: LAW2508 **Credit Units: 03**

Course Objective:
This course aims at introducing the fundamentals of Macroeconomic theories, policies and models in a historical perspective. It will enable the students to develop a critical insight on Classical and Keynesian macroeconomic models, to understand the relationship between inflation and employment by providing exposure to the constructions of Friedman, Phelps & Phillips.

Course Contents:
Module I: Introduction to Macroeconomics
The roots of macroeconomics, macroeconomic concerns, the role of government in the macro economy, the components of the macro economy, the methodology of macroeconomics

Module II: Introduction to National Income Accounting
Concepts of GDP and national income, approaches to calculating GDP, GDP and personal income, Nominal and real GDP, Limitations of the GDP concept, GDP and the black economy.

Module III: Schools of Macroeconomic Thoughts
Classical, Neo Classical and Keynesian Models.; Say's Law of Markets and Classical Theory of Employment

Module IV: Keynesian Model
Aggregate expenditure and equilibrium output; Consumption function; theory of investment-marginal efficiency of capital; saving and investment; The Investment Multiplier and its application to LDC's

Module V: Money in the Modern Economy
Theories of Demand for Money: Quantity Theory and Keynes approach. Baumol and Tobin Contributions and Friedman's restatement of quantity theory Characteristics of a monetary economy; the supply of money and overall liquidity position; credit creation

Module VI: Inflation
The causes of inflation, level of prices and the value of money, The Fisher effect, the cost of inflation.

Examination Scheme:

Components	**A**	**P**	**HA**	**CT**	**EE**
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Text & References:
Text:
- Mc Connell. C.R & H.C. Gupta, "Introduction to Macro Economics", Tata McGraw Hill, Delhi
- Gardner Ackeley, "Macro Economics".

References:
- J.E. Stiglitz, and C.E. Walsh (2002), *Principles of Economics*, 3rd Edition, W.W. Norton & Company, New York.
- R. Stone and G. Stone (1962), *National Income and Expenditure*, Bowes and Bowes London.
- Lipsey & Chrystal- Principles of Economics
- K.K. Dewett: Modern Economic Theory, New Delhi, Shyamlal Charitable Trust.

LAW OF EVIDENCE

Course Code: LAW2502 **Credit Units: 04**

Course Objective:
This paper is to orient students with importance of evidence for establishment of claims and the related rules and principles.

Course Contents:

Module I: Definitions and Relevancy of Facts
Evidence and its relationship with the substantive and procedural laws ;Definitions : Facts, facts in issue, relevant, evidence proved, disproved, not proved, oral and documentary evidence ;Relevancy and admissibility; Doctrine of *res gestae ;*Conspiracy.

Module II: Admissions, confessions and statements by person who cannot be called as witnesses:
Definition of admission, who can make admissions by or on their behalf, proof of admission against the persons making them and admissions in civil cases. (Section 17-23, 31); Definition, relevance and consideration of confessions (section 24-30); Dying declaration (Section 32 and Section 33). **Opinion of Third Persons (Sec. 45 to 51) & Character Evidence (Sec. 52 to 55).**

Module III: Documentary Evidence
Primary and Secondary Evidence, Proof and verification of documents; Public documents and presumption as to documents.

Module IV: Production and Effect of Evidence
Burden of proof (Sections 101-114); Estoppels (Section 115); Competence of witnesses (Sections 118-120).

Module V: Examination of Witnesses (Sections 135-166) and Rejection of evidence (Section 167)
Examination –in-chief : Cross Examination, Re-examination; Leading questions; Hostile witnesses; Refreshing memory; Judge's power to put questions or order production.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Ratanlal and Dheerajlal : Law of Evidence
- Monir Field : Law of Evidence
- Batuklal : Law of Evidence
- Avtar Singh : Evidence Law
- Bare Act : Indian Evidence Act, 1872

CODE OF CIVIL PROCEDURE

Course Code: LAW2503 **Credit Units: 04**

Course Objective:
This paper is to help a law student to acquire a thorough knowledge of procedural aspects of working of civil courts and other machineries.

Course Contents:

Module I: Initial steps in a suit
Jurisdiction and place of suing; Institution of suit, cause of action, joinder, non-joinder and mis-joinder of parties; Summons; Pleadings: Meaning, object, General rules, Amendment of pleadings; Plaint and written statement: Particulars, set off and counter claim; Admission return and rejection; Discovery, Inspection and production of documents; Appearance and non-appearance of parties, ex-parte proceedings; First hearing: Meaning, object, framing of issues, omission to frame issues, disposal of suit in the first hearing; Trial: Summoning and attendance of witnesses, summons to produce documents, adjournment, hearing of suit.

Module II: Significant Terms and Definitions
Definitions: Decree, Judgment, Order, Foreign Court, Foreign Judgment, Mesne, Profits, Affidavit, Suit, Plaint, Written Statement, Suit of civil nature ;Important Concepts: Res Sub-Judice, Resjudicata, Restitution, Caveat, Inherent powers of courts.

Module III: Interim Orders
Commissions, Arrest before judgment, Attachment before judgment, Temporary Injunctions, Interlocutory orders, Receiver, Security of costs.

Module IV: Suits in Particular Cases
Suits by or against Government, Suits by Indigent persons, Interpleader Suit, Summary Procedure, Suits relating to public nuisance. Execution Proceedings

Module V: Law of Limitation
Definitions, period of limitation, plaintiff, defendant; and in foreign countries, limitation of suits, appeals, and application, computation of period of limitation.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Mulla's Code of Civil Procedure, Universal, Delhi
- C.K. Thakkar's (Takwani), Code of Civil Procedure
- Majumdar, P.K. and Kataria, R.P., Commentary on the Code of Civil Procedure, 1908, universal, Delhi.

LABOUR LAW-I

Course Code: LAW2504 **Credit Units: 04**

Course Objective:
The course aims at imparting to the students an indepth understanding of Labour Laws in India by recourse to relevant judicial pronouncements in this regard.

Course Contents:

Module I: Regulation of Trade Union & Unfair Labour Practices
History of Trade Union Movement in India and need to form Trade Union, Workers Right to form Union vis-à-vis Indian Constitution; the Membership of Trade Union, Closed shop and Union shop, Registration of Trade Union, Remedies in case of non-registration and cancellation of registration of union, Privileges and Protection of registered Trade Union form certain acts and omissions, Unfair labour practices and victimization.

Module II: Collective Bargaining:
Concept and importance of collective bargaining, Pre-requisites for collective bargaining, Process of administering collective agreement (Negotiation, Mediation, & Voluntary arbitration & Compulsory Arbitration.), Duration and enforcement of bipartite Agreement (Secs. 18, 19, Industrial Disputes Act, 1947), Pressurization: Strike, Go-Slow, wok to rule, Gherao and Lockout.

Module III: Regulation of Industrial Disputes
Define the concept of Industry, Industrial Dispute and workman, Power of Government to refer Industrial Disputes for adjudication: The Adjudicatory Machinery, Award and its binding nature, Judicial review of Awards, The concept of lay-off, retrenchment and procedure and compensation relating to lay-off and retrenchment.

Module IV: Standing Orders
Concept, Nature and scope of standing orders under Industrial Employment (Standing Order) Act, 1946, Formulation of Standing Orders and its Certification process, Modification: Modification and temporary application of Model Standing Order, Interpretation and Legal status of Standing Orders.

Module V: Discipline in Industries
Doctrine of hire and fire in the context of social welfare, Fairness in disciplinary process: Meaning of misconduct, Right to know: The Charge Sheet, Right to defend; Domestic enquiry notice, evidence, cross examination, unbiased enquiry officer and reasoned decision, Punishment of misconduct, Prenatal (permission) and Postnatal (Approach) control during pendency of proceeding (Sec. 33 of industrial and Disputes Act).

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- O.P. Malhotra, Law of Industrial Disputes.
- Indian Law Institute, Labour Law and Labour Relations.
- K.D. Srivastava, Commentary of Industrial Employment (S.C.) Act, 1946.
- S.C. Srivastava, Industrial Relation and Labour Law.
- Report of National Commission on Labour, 1969.
- Industrial Disputes Act, 1947.
- R.B. Sethi & R.N. Dwivedi, Law of Trade Union.

PROPERTY LAW

Course Code: LAW2505 **Credit Units: 04**

Course Objective:
The subject imparts to the student an understanding of the law in India relating to transfer of immovable property and the norms and doctrines that aid in carrying out secure transactions in this regard.

Course Contents:

Module I: Jurisprudential Basis (Sections 5-21)
Concept and meaning of property – New property, Kinds of property – movable and immovable property, tangible and intangible property,

Module II: Sale of Immovable Property
Doctrine of Election Sec. 35, Fraudulent Transfer Sec. 53 ; Sale of immovable property (Secs. 54 – 55). (Sale, Contract of Sale; Contract to sell; Rights and Liabilities of buyer and seller).

Module III: Specific Transfers
Mortgages of immovable Property: Secs. 58 – 77 (Kinds of mortgage, Rights and Liabilities of the mortgagor and mortgagee, Marshalling and Contribution (Secs. 81 – 82), Redemption (Secs. 91 – 96).

Module IV: Leases
Leases (Secs. 105 – 117): Definition, Leases how made, Rights and Liabilites of lesser and lessee, Charges (Section, 100 – 104).

Module V: Easements
Creation of Easements (Secs. 4 – 7), Nature and characteristics of Easements, Extinction, Suspension and Revival of Easements (Secs. 37–51), Riparian Rights, Licenses (Secs. 52 – 64).

Module VI
Indian Stamp and Registration Act

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Mulla, D.F., Transfer of Property Act.
- Shukla, S.N., Transfer of Property Act.
- Shah, S.M., Transfer of Property Act.
- Tripathi, Lectures on Indian Easement Act.
- Jain, J.D., Indian Easement Act.

ADVANCED CORPORATE ACCOUNTING

Course Code: COM2503 **Credit Units: 04**

Course Objectives:

Course Contents:

Module I-
Advanced problems on final Accounts of Companies, Disposal of Profit and Capitalization Of Profits Issue of Bonus Shares.

Module II-
Problems of Amalgamation, (AS-14) and Reconstruction, Aspects of Corporate Reconstructuring.

Module III-
Consolidated Accounts of Holding and Group Companies.

Module IV-
Preparation of Final Accounts of Banking Companies and Insurance Companies.

Module V-
Preparation of Final Accounts of electricity Companies and Double Account System.

Examination Scheme:

Components	**A**	**P**	**HA**	**CT**	**EE**
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA-**Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Texts and References:

Texts:

- Advanced Accounts, Batliboi
- Advanced Accounts, R.R. Gupta

References:

- Advanced Accounts, Shukla & Grewal
- Advanced Accounts, S.N. Maheswari
- Accountancy, W. Pickles
- Advanced Accountancy, R.L. Gupta

CORPORATE TAX LAW AND PRACTICE

Course Code: COM2504 **Credit Units: 04**

Course Objectives:

Course Contents:

Module I-

Computation of total income in case of companies including non-residents, Co-operative Society

Module II-

Procedure for assessment: Section 139 to 148 (Return of Income)PAN, Assessments, Methods of Accounting, Accounting standards, Time limit for completion of Assessment, Rectification of mistake etc. Special procedure for assessment of search cases.

Module III-

Liability in Special Cases: Legal representatives, Representative assesses: provisions applicable to firms, AOP & BOI, executors succession, shipping companies. Recovery of tax in respect of non-resident, persons leaving India, person trying to alienate their property, discontinuation of business & profession

Module IV-

Collection and Recovery of tax, TDS, Advance payment of income tax, Interest u/s 234, Refunds and settlement of cases

Module V-

Appeals & Revision, Acquisition of Immovable properties, provisions to counter evasion of tax, Penalties, Offences and Prosecutions, Authorized representation and miscellaneous provisions.

Examination Scheme:

Components	**A**	**P**	**HA**	**CT**	**EE**
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA-**Home Assignment; **CT**-Class Test; **EE-**End Semester Examination

Texts & References:

Texts:

- Income Tax Act, Taxmann, New Delhi
- Income Tax Rules, Taxmann, New Delhi

References:

- Direct taxes, V.K. Singhania, Taxmann, New Delhi

Circulars and Notification issued by CBDT

BUSINESS TAXATION

Course Code: COM2505 **Credit Units: 04**

Course Objectives:

Course Contents:

Module I-

C.S.T.: Constitutional History, Definitions, principle for determining different sales, Registration of Dealer, Rate of Tax.

C.S.T.: Determination of Taxable turn-over, Computation of Tax, Liability, Different forms used under C.S.T.

Module II-

Value Added Tax Act: Definitions, incidence and levy of tax, Computation Registration of Dealer, Exemptions Determination of taxable turn-over, computation of tax liability.

Module III-

C.S.T./V.A.T. : Tax authorities, filling of returns, assessments, payment and recovery of tax, appeal, revision and rectification.

Module IV-

Wealth Tax Act : Definitions, incidence of tax, deemed assets. exempted assets, computation of net wealth, Valuation of assets, assessment, appeals, penalties.

Module V-

Indian Tax System: Central and State Powers of taxation, Distribution of revenue between Centre and State. Finance Commission constitution, functions and recommendations.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Texts & References:

Texts:

- Indirect Taxes, V.K. Singhania, Taxmann , New Delhi
- Central Sales Tax Act 1956

References:

- Bare Act of Value Added tax
- Central Sales tax Rules
- An Introduction to Rajasthan and Central Sales Tax Act, B.L.Gupta

Wealth Tax Rules, Taxmann, New Delhi

SUMMER INTERNSHIP EVALUATION-II

Course code: LAW2535 **Credit Units: 03**

Objective:
The basic objective of a Summer Internship is to refine the practical exposure of the corporate functioning. This summer training will provide an opportunity to the students to apply their theoretical understanding while working on the concerned project in the industry. Thus this summer internship programme is an attempt to bridge the gap between theory and practice. This will also enhance the students' intellectual ability and attributes related to data handling, decision making, report writing, oral presentation and imbibing an interdisciplinary approach.

General Guidelines:
Every student of B.Com (Hons.) shall be required to undergo a practical training in an corporate organization approved by the Institute for eight weeks, normally in the Summer Vacation, after the end of the fourth semester examinations. The candidates shall be required to undergo training in the various areas of the organization concerned. The organization may assign a specific project to the candidate, which will be completed by him/her during the period of training. The work done by the candidate during the training period shall be submitted in form of a training report.
The last date for the receipt of training report in the department shall be one month after the date of completion of training, i.e. at the beginning of the fifth semester.

Chapter Scheme
Chapter I: Introduction 20 marks
Chapter II: Conceptual Framework/National/International Scenario 5 marks
Chapter III: Presentation, Analysis and Findings 35 marks
Chapter IV: Conclusion and Recommendations 15 marks
The report has to be type written in font Times New Roman, 12 points, 1.5 line spacing on both sides of the paper, Spiral Bound. The report should comprise of a maximum of 80 to 100 pages and has to be submitted in two copies.

Examination Scheme:

SIP Report	Power Point Presentation & Viva
75 marks	25 marks

Components of the Report
The outcome of Summer Internship is the Project Report. A project report should have the following Components:
1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.
2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.
3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.
4) **Body of the Report:** The body of the report should have these four logical divisions
a) ***Introduction:*** This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.
b) ***Conceptual Framework / National and International Scenario*****:** (relating to the topic of the Project).
c***) Presentation of Data, Analysis and Findings*****:**(using the tools and techniques mentioned in the methodology).
d) ***Conclusion and Recommendations:*** In this section, the concluding observations based on the main findings and suggestions are to be provided.
5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.
6) Annexures: Questionnaires (if any), relevant reports, etc.

MANAGEMENT ACCOUNTING

Course Code: LAW2607 **Credit Units: 03**

Course Objective:
To provide the students knowledge about the use of costing data for planning, control and decision making.

Course Contents:
Module I: Management Accounting
Nature & Scope: Meaning and Definition - Objectives of Management Accounting - Management Accounting and Financial Accounting - Management Accounting and Cost Accounting - Utility of Management Accounting - Limitations of Management Accounting - Position of Management Accountant in the Organisation.

Module II: Analysis and Interpretation of Financial Statements - I
Concept of Financial Statements and their Nature - Limitations of Financial Statements - Analysis and Interpretation - Tools - comparative Financial Statements -common size Statements - Trend Percentages
Ratio Analysis - Nature and Interpretation - Utility and Limitations of Ratios - Short-term Financial Ratios - Long-term Financial Ratios - Profitability Ratios - Proprietary and Yield Ratios - Turnover Ratios - DUPONT Control Chart

Module III: Cash Flow Analysis
Distinction of cash from funds-utility of cash flow statement construction of cash flow statement

Module IV: Responsibility Accounting and Standard Costing
Concept of Responsibility Accounting - Cost Centers and Profit Centers - Contribution by Segments

Module V: Budgets and Budgetary Control
Concept of Budgets and Budgetary Control - Nature and Objectives of Budgetary Control - Advantages and Limitations of Budgetary Control - Establishing a system of Budgetary Control - Preparation of Sales Budget, Selling and Distribution Cost Budget, Production Budget, Purchase Budget, Cash Budget etc. - Flexible Budgets and Master Budgets

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Text & References:

- Dr. S.N. Maheswari , Management Accounting
- Sexana, Management Accounting
- Made Gowda, Management Accounting
- Dr. S.N. Goyal and Manmohan, Management Accounting
- B.S. Raman, Management Accounting
- R.S.N. Pillai and Bagavathi, Management Accounting
- Sharma and Gupta, Management Accounting
- J. Batty, Management Accounting
- Foster, Financial Statement Analysis, Pearson.
- PN Reddy & Appanaiah, Essentials of Management Accounting

COMPANY LAW

Course Code: LAW2603 **Credit Units: 04**

Course Objective:
The paper aims to make the student familiar and to provide insight into formation and winding up of companies beside corporate administrations.

Course Contents:

Module I: Company
Definition, Characteristics, Lifting of Corporate Veil; Types of Companies;
Formation of a Company: Promoters, Pre-incorporation Contracts, Provisional Contracts,

Module II: Memorandum of Association, Articles of Association and Prospectus
Memorandum of Association; Articles of Association; Prospectus: Issues, contents, Kinds, liability for misstatements, Shelf Prospectus, Statement in lieu of Prospectus.

Module III: Share Capital
Issue and allotment of shares, SEBI guidelines on allotment, Issue of shares at premium and at discount, Share Certificate, Demat system ; Forfeiture and surrender of Shares, Transfer & Transmission of shares; Provisions relating to payment of dividend, Investor's Education and Protection Fund.

Module IV: Corporate Administration
Directors: kinds, powers and duties; Insider trading; Meetings kinds and procedure; The balance of powers within companies: Majority control and minority protection, Prevention of oppression, and powers of court and Central Government,

Module V: Winding up of Companies
Kinds, consequences and reasons of winding up; Role of the court; Liability of past members; Payment of liabilities; Reconstruction and amalgamation.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Avtar Singh : Indian Company Law
- Shah S. M : Lectures on Company Law
- Saharay H.K.: Company Law, 5th Edn.

LAW OF TORTS (MOTOR VEHICLES ACT AND CONSUMER PROTECTION ACT, 2019)

Course Code: LAW2604 **Credit Units: 04**

Course Objective:
This course aims to introduce the student to the specialized discipline of tort law that is one of the most litigated areas of law in west. In India this realm is on the verge of a lot of litigational activity. The course covers Consumer Protection Act as well as Motor Vehicle Act which are carved out from the general principles of tort.

Course Contents:

MODULE 1: Introduction:
- Nature and Definition of Torts
- Tort distinguished from Contract and Quasi-Contract
- Crime:
  - Conditions of liability including *damnum sine injuria*, *injuria sine damnum*
  - Remoteness of damages
- Maxims: *Ubijus ibi remedium*, *Res ipsa loquitor*, etc.
- Justification in Tort:
  - *Volenti non-fit Injuria*,
  - Necessity,
  - Plaintiff's default**,**
  - Act of God,
  - Inevitable accidents,
  - Private defences,
- Judicial and Quasi
  - Judicial Acts,
  - Parental and quasi-parental authority.

MODULE 2: Actions in Tort
- Assault
- Battery
- False Imprisonment
- Malicious Prosecution
- Defamation
  - Libel
  - Slander including defences in an action for defamation
- Vicarious Liability
- Liability of State
- Doctrine of Sovereign Immunity

MODULE 3: Negligence
- Negligence including contributory negligence and other defenses.
- Absolute liability/Strict liability, Rules in Ryland v. Fletcher.
- Principles for the application of the rule and defenses
- Enterprises engaged in hazardous activities – M.C. Mehta v. Union of India
- Nuisance Trespass

MODULE 4: Consumer Protection: Consumer Protection Act, 2019
- Brief overview of the Consumer Protection Act,2019.
- Major Difference between Consumer Protection Act, 2019 and Consumer Protection Act, 1986.
- Consumer Protection Act, 2019:
  - Consumer Protection Councils Chapter II: Ss. 3-9
  - Central Consumer Protection Authority: Section 2(4) Chapter III: Ss. 10-27

- Consumer Disputes Redressal Commission S. 2(15): District Commission S. 2(44): State Commission S. 2(29): National Commission Chapter IV- with special focus on Ss. 28,34, 35, 37,39, 41, 42, 47,51 53,54,58,59
- Product Liability
- Consumer Protection vis-a vis E-Commerce- Key Aspects

MODULE 5: Motor Vehicles:

- Motor Vehicles Claims and compensation:
  - Relevant provisions of the relating Motor Vehicles Act relating to the liability and assessment of compensation:
  - Liability without fault in certain cases : voidance of contracts restrictive of liability
  - Special provisions and scheme of compensation in case of hit and run motor accidents
- Offences, Penalties and Procedure
- Insurance of Motor Vehicles against Third Party Risks(Sec. 145 – 152)
- Claims Tribunals: Sec. 165-176
- Special provisions as to payment of compensation on structured formula basis: Claims on non-structured basis: Method of calculating compensation evolved by the courts(study with reference to relevant judgments)
- Defences: Changing parameters of negligence and burden of proof

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- Winfield and Jolowicz, Tort
- Law of Torts, Universal law Publishing Company, Dr. S.P. Singh
- The Law of Torts: Ratanlal & Dhirajlal,
- Winfield, Law of Torts,
- Dr. D.N. Saraf, Law of Consumer Protection in India,
- Dr. Avtar Singh, Law of Consumer Protection in India, Dr. Gurjeet Singh, The law of Consumer Protection in India.
- Motor Vehicle Laws, Universal Law Publishing Company.

Reference Books

- William Salmond, "Salmond on the Law of Torts", Sweet & Maxwell, 16th Edition: 1973
- Heuston Salmond, "The Law of Torts", Universal Law Publishing Co Ltd: 2004
- Edward White, "Tort Law in America: An Intellectual History", Oxford University Press: 2003
- Frederick Pollock, "The Law of Torts: A Treatise on the Principles of Obligations Arising from Civil Wrongs in the Common Law: To which is Added the Draft of a Code of Civil Wrongs Prepared for the Government of India", BiblioBazaar: 2008
- Jenny Steele, "Tort Law: Text, Cases & Materials", Oxford University Press: 2007
- Vivienne Harpwood, "Modern Tort Law", Rutledge: 2008
- Carl F. Cranor, "Toxic Torts: Science, Law and the Possibility of Justice", Cambridge University Press: 2006
- N.R. Madhava Menon, "Documents and Court Opinions on Bhopal Gas Leak Disaster Case", National Law School of Indian University: 1991
- Upendra Baxi, Thomas Paul, "Mass Disaster and Multinational Liability: the Bhopal Case", N.M. Tripathi: 1986
- Upendra Baxi, Amita Dhanda and Indian Law Institute, "Valiant Victims and Lethal Litigation: the Bhopal Case", N.M. Tripathi: 1990
- Jenny B. Wahl, "Economic Analysis of Tort and Products Liability Law: A Collection of Essays & Cases (Law and Economics)", Routledge: 1998

LABOUR LAW-II

Course Code: LAW2605 **Credit Units: 04**

Course Objective:
The paper is to focus on wage policies, compensation for learn caused during the course of employment and working conditions of employees.

Course Contents:

Module I: Minimum Wages Act, 1948
Concept of Labour Welfare, Classification and Importance, Labour welfare activities, Concept of minimum wage, fair wage, living wage and need based minimum wage, Constitutional validity of the Minimum wages Act, 1948, Procedure for fixation and revision of minimum wages, Fixation of minimum rates of wage by time rate or by piece rate, Procedure for hearing and deciding claims.

Module II: Payment of Wages Act, 1936
Object, scope and application of the Act, Definition of wage, Responsibility for payment of wages, Fixation of wage period, Time of payment of wage, Deductions which may be made from wages, Maximum amount of deduction.

Module III: Workmen's Compensation Act, 1923
Definition of dependant, workman, partial disablement and total disablement, Employer's liability for compensation: Scope of arising out of and in the course of employment, Doctrine of notional extension, When employer is not liable, Employer's Liability when contract or is engaged, Amount of compensation, Distribution of Compensation, Procedure in proceedings before Commissioner, Appeals.

Module IV: Factories Act, 1948 & Social Security
Concept of "factory", "manufacturing process" "worker" and "occupier" : General duties of occupier, Measures to be taken in factories for health, safety and welfare of workers, Working hours of adults, Employment of young person and children, Annual leave with wages, Additional provisions regulating employment of women in factory, Social Security of Workmen ; Concept and scope of social security : Origin of Social Security in India, Claim and Adjudication of Disputes under Employee's State Insurance Act. 1948.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- S.C. Srivastava, Commentaries on factories Act, 1948, Universal Law Publishing House, Delhi
- H.L. Kumar, Workmen's Compensation Act, 1923.

CYBER LAWS

Course Code: LAW2606 **Credit Units: 04**

Course Objective:
With the advent of information technology law and Right to Information Law, new strides and strategies in legal justice education have come up. There is a need that Law students must also be acquainted with these new developments if a law student has to find a comfortable berth in the competitive legal market as a Law Professional as well as legal manager. Therefore, there seems to be an impending need to generate e-Legal Justice Education that exposes the students to have deep insights into the complexities of information technology and right to information. Objectives of this course, therefore, are understanding the legal recognition and procedure, Digital signatures, legal recognition of cyber authorities and Cyber appellate tribunal, legal implications of new varieties of offences and penalties under the Information Technology Act, 2000. A student of law should also be given the understanding of copy right issues, TRIPS agreements, application of patents to computer technology, etc. Besides, the course also aims at developing insights into the Right to Information Act, 2005 and its grey areas.

Course Contents:
Module I: Introduction (Need, Role and various aspect related to Cyber Law)
Need and role of Cyber; Jurisprudence of Cyber Law in India; Free speech and expression on Internet &Privacy; issues, Right to data protection, Cyber Law &Protection of Domain name.

Module II: Cyber Jurisdiction, Investigation & Cyber Forensics
Cybercrimes: Extradition and Jurisdictional issues; Investigation of Cyber Offences: Cyber equipment's& Cyber Cell; Cyber Forensics: provisions, need and role in cyber investigation.

Module III: Electronic Governance, Cyber space &IPR issues
Legal aspect of Electronic Governance; IPR Issues: An Overview, Patent, Copyright and Trademark& other related Issues in Cyberspace.

Module IV: Cyber Legislations (Laws, National and International treaties & Conventions)
Cyber Legislation: An Indian and International Regime; The Information Technology 2000, The Provisions relating to- Legal recognition of – Digital & Electronic Signature, Secure E- records and Signature, E-signature Certificates, Certifying Authorities, Cyber, Appellate Tribunal and Miscellaneous Provisions.

Module V: Cyber Crimes (Civil & Criminal)
Cyber Crimes and Cyber Victimization; Cyber Offences: Types & the provisions for Penalties mentioned in IT Act, 2000; Cyber Pornography, Cyber Terrorism, Cyber Tort and Cyber defamation etc.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Nandan Kamath, Universal Law Publishing Company and E –commerce: Law relating to computers Internet.
- K.K. Kumar, Dominant Publication: Cyber Law
- B.L. Wadhera : Patent, trademarks, Copyrights
- Ganguly (LMH): Intellectual Property Rights.

ADVANCED COST ACCOUNTING

Course Code: COM2603 **Credit Units: 04**

Course Objectives:

Course Contents:

Module I: Cost Book-Keeping
Non-integrated Accounting system, Accounting Ledgers And Control Accounts, Integrated Accounting, Reconciliation of Cost & Financial Accounts.

Module II: Process Costing
Basic Concept, Joint products and By-products, work-in-progress, (Equivalent production), inter-Process profits, Uniform Costing and inter firm comparisons.

Module III: Activity Based Costing
Problems of Traditional Costing, Cost analysis under ABC, Institution of ABC, Benefits and Weaknesses, Life Cycle Costing; Target Costing.

Module IV: Cost Management System
Total Quality Management, Benchmark, Back-flush Costing, Reengineering, Cost Reduction and value Analysis: Concept and Techniques.

Module V:
Service Costing, Marginal Costing, Standard Costing, Decision Making, Make or buy, Add or Drop, Operate/Shutdown, Sell/Process.

Examination Scheme:

Components	A	P	HA	CTT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Text & References:

Text:

- Principles and Practice of Cost Accounting, N. K. Prasad
- Cost Accounting, C.D. Vashisht & V. K. Saxena, Sultan Chand& Sons, New Delhi.

References:

- Principles & Practice of Cost Accounting, Asish K Bhattacharyya ,Wheller Publishing, N. Delhi
- Management Accounting, J. Batty
- Advanced Cost Accounting & Cost System, M. Kishore Ravi
- Accounting For Management, Guru Prasad Murthy
- Decisional Phenomena And Management Accountants, Backer and Jucobson

INDIRECT TAXES INCLUDING GST

Course Code: COM2604 **Credit Units: 04**

Course Objectives: To provide students with adequate theoretical and working knowledge about GST and its practical application in unification of indirect tax system in India. The course intends to make students aware of the latest developments and changes being incorporated in GST at the systemic level and its implications in the process of economic and financial integration.

Course Contents:

Module I-

Origin of GST – Evolution of GST concept, How GST came into existence, GST Laws, Constitutional Perspectives – Cooperative Federalism in economic system, Application of GST in tax sharing – CGST/SGST/IGST, Classification of goods and services in GST assessment, Exemption from Tax, Composition levy.

Module II-

Basic Framework of GST – Unification of indirect tax system, GST Council – composition, objectives, functions and significance, Tax sharing and disbursement mechanism between the Centre and states, Responsibilities of various stakeholders – government, firms, traders, consumers,. Registration, Tax invoice, Returns.

Module III-

Administration of GST – GST Network, Registration, Tax Invoice, Credit & Debit Notes, Electronic way bill for interstate movement of goods, Computation of GST Liability, Input Tax Credit, Concept of times value of supply, Filing of Returns, Payment of Tax, Search, Seizure & arrest, Demand & Recovery, Offences & Penalties.

Module IV-

Safeguard Measures – Anti-profiteering clause, Reverse charge mechanism, Assessment & Audit, Inspection – Concept of HSN and SAC, Advance Ruling, Appeals & Revision, Implications on Tax terrorism, corruption, tax evasion and black money

Module V-

Comparative analysis between GST in India and other countries such as Canada, France, Australia and China, Advantages and Disadvantages.

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Text & References:

Text:

- GST Council, Government of India, Publications.
- Singh, Awdhesh (2018), *GST Made Simple: A Complete Guide to Goods and Services Tax in India*, Centax Publications.

References:

- Bhattacharjee Govind and Debasis Bhattacharya (2018), *GST and Its Aftermath – Is Consumer Really the King?* SAGE Publications.
- Garg, Rakesh (2016), *Handbook of GST in India: Concepts and Procedures*, Bloomsbury.

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PUBLIC FINANCE AND TAX PRACTICES

Course Code: COM2605 **Credit Units: 04**

Course Objective:

Course Contents:
Module I:
Origin and Development of Public Finance
Meaning, public finance and federal finance, public finance and private finance, principle
Principles of Taxation and Government Expenditure
Benefit approach, allocation of public goods, ability to pay approach, excess burden of taxes

Module II:
Raising of Public Funds
Sources and classification of public revenues, incidences and shifting of taxes
Distribution of Public Funds
Effect on production, employment, distribution and stability, public debt and fiscal deficit

Module III:
Public Debt Management and Taxation
Development of Federal Finance in India
The constitutional arrangements, Finance Commissions

Module IV: Central and StateFinances
Sources and uses of funds, effects of Fiscal Policy, relation between planning and central budgeting
State Finances- Sources and uses of funds, issues of federalism

Module V: Financing of Five-year Plans
Changing scenario of Indian tax Structure, new economic policy since 1991
Indian Fiscal Policy and Deficit Financing

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	15	5	5	70

A-Attendance; **P**-Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination

Texts & References:
Texts:
• R. Mursgrave, The Theory of Public Finance, McGraw Hill
• R. Mursgrave and P.B. Mursgrave, Public Finance in Theory and Practice, McGraw Hill
• J. M. Buchanan, Public Finance

References:
• Due and Friedlandar, Public Finance
• S. Ganguli, Public Finance, World Press
• B. M. Bhargava, Public Finance
• B. M. Bhargava, The Theory and Working of Union Public of India
• Vaish and Agarwal, Public Finance, Wiley Eastern

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ENVIRONMENTAL LAW

Course Code: LAW2702 **Credit Units: 05**

Course Objective:
This paper provides the study of environmental laws covering legislations related to it and protection of forest and wild life.

Course Contents:
Module I: Environmental Law: International and National Perspective
Introduction: Environment and Environment Pollution: Problem and prospects; constitutional Perspective :Right to Evolution and Application, Co relation between: Directive Principles of State Policies and Fundamental Degrees, Fundamental Rights and Directive Principles of State Policy; International Norms :Sustainable Development :Precautionary Principle, Polluter Pays Principle, Agenda 21, Inter generational equity, Public Trust Doctrine, Principle of no fault liability : Absolute Liability; Environment Protection through Public Interest Litigation, Remedies under various other laws.

Module II: Prevention and Control of Water and Air Pollution
The Water (Prevention and Control of Pollution) Act, 1974:Water Pollution : Definition, Central and State Pollution Control Boards: Constitution, Powers and Functions, Water Pollution Control Areas, Sample of effluents : Procedure; Restraint order, Consent requirement : Procedure, Grant/Refusal, Withdrawal, Citizen Suit Provision; Air (Prevention and Control of Pollution) Act, 1981: Air Pollution: Definition, Central and State Pollution Control Boards: Constitution, Powers and functions, Air Pollution Control Areas; Consent Requirement : Procedure, Grant/Refusal, Withdrawal, Sample of effluents – Procedure; Restraint order.

Module III: Protection of Forests and Wild Life
Indian Forest Act, 1927: Kinds of forest: Private, Reserved, Protected and Village Forests, The Forest (Conservation) Act, 1980; The Wild Life (Protection) Act, 1972: Authorities to be appointed and constituted under the Act, Hunting of Wild Animals, Protection of Specified Plants, Protected Area, Trade or Commerce in wild animals, animal articles and trophies; Its prohibition.

Module IV: Special Environmental Legislations
Environmental (Protection) Act, 1986, Public Liability Insurance Act, 1991, The National Environment Tribunal Act, 1995, The National Appellate Environmental Authority Act, 1997.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Environmental Law & Policy in India – Shyam Diwan, Armin Rosencranz
- Environmental Law in India – P. Leelakrishnan
- PIL and Environmental Protection-Geetanjali Chandra
- The Water (Prevention and Control of Pollution) Act, 1974
- The Air (Prevention and Control of Pollution) Act, 1981
- The Indian Forest Act, 1927
- The Forest (Conservation) Act, 1980
- The Wild Life Protection Act, 1972
- The Environment (Protection) Act, 1986
- The Public Liability Insurance Act, 1991
- The National Environment Tribunal Act, 1995
- The National Environment Appellate Authority Act, 1997

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JURISPRUDENCE

Course Code: LAW2703 **Credit Units: 05**

Course Objective:
The objective of the course is to create an understanding of basic legal concepts and provide an insight to the student into philosophical, ideological and theoretical foundations of the discipline of law with special reference to Indian legal system.

Course Contents:

Module I: Introduction
Nature and scope of Jurisprudence**,** State, Sovereignty and Law: Sources of Law: Custom, Precedent, Legislation, Equity.

Module II: Schools of Jurisprudence – I
Natural Law, Analytical positivism, Pure Theory, Historical Jurisprudence, Sociological Jurisprudence, Economic Approach, Legal Realism, Theories of justice: Aristotle, Rawls, Distributive Justice in India.

Module III: Concepts of Rights and Duties
Rights and Duties, Types, Theories, Critique of Rights and Duties, Contemporary issues in Rights.

Module IV: Concepts of Ownership and Possession:
Evolution of concept of possession, ownership, Essentials of ownership, Corpus and Animus, Res Nulius and Res Possessionis

Module V: Indian Perspectives in Jurisprudence
Classical and Medieval Influences, Modern Trends study with reference to judicial pronouncements with state policy.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Bodenheimer, Jurisprudence – The Philosophy and Method of Law (1996), Universal, Delhi.
- Fitzgerald, (ed.) Salmond on Jurisprudence (1999) Tripathi, Bombay
- W. Friedmann, Legal Theory (1999) Universal, Delhi
- V.D. Mahajan, Jurisprudence and Legal theory (1996 re-print), Eastern, Lucknow
- M.D.A. Freeman (ed.) Lloyd's Introduction to Jurisprudence, (1994), Sweet & Maxwell
- Paton G.W. Jurisprudence (1972) Oxford, ELBS
- H.L.A. Hart, The Concepts of Law (1970) Oxford, ELBS
- Roscoe Pond, Introduction to the Philosophy of Law (1998 Re-print) Universal, Delhi
- Dias, Jurisprudence (1994 First Indian re-print), Adithya Books, New Delhi
- Dhyani S.N., Jurisprudence: Jurisprudence and Indian Legal theory
- Dhyani S. N., Fundamentals of Jurisprudence
- Jayakumar N. K., Lectures in Jurisprudence, Butterworths
- Justice Markandey Katju, Law in the Scientific Era, Universal
- Justice J. S. Verma, Dimensions of Justice, Universal
- Justice Rama Jois, Seeds of Modern Public Law in Ancient Indian Jurisprudence
- Justice Rama Jois, Eternal Values in Ancient Law.

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PUBLIC INTERNATIONAL LAW

Course Code: LAW2704 **Credit Units: 05**

Course Objective:
The objective of this paper is to provide knowledge to the students regarding the Public International Law to enable them to deal with the transnational legal order.

Course Contents:
Module I: Introduction
Definition and Basis of International Law, Subjects of International Law, Relationship between International Law and Municipal Law.

Module II: Sources of International Law
Custom, Treaties, General Principles of law, Juristic Works, General Assembly Resolutions, Other sources (Conventions).

Module III: State Recognition, State Jurisdiction and Law of the Sea
State Recognition: Recognition of states, Recognition of governments, *De facto* and *De jure* Recognition, Types of Recognition: Implied Recognition, Conditional Recognition, Collective Recognition; Withdrawal of Recognition, The legal effects of recognition; **State Jurisdiction:** Basics of Jurisdiction, Principles of Jurisdiction, Exemption from Jurisdiction: Diplomatic ImmModuleies and Privileges, Armed Forces, Public Ships; **Law of the Sea:** First and Second Law of the Sea Conventions :Third Law of the Sea Convention {UNCLOS III (Moduleed Nations Convention on the Law of The Sea), Maritime Zones; Territorial Waters, Contiguous Zone, Exclusive Economic Zone, Continental Shelf High Seas; Sea Bed Authority, Deep Sea Bed Mining and International Sea – Bed Area.

Module IV: Conflict Resolution, War and Neutrality of States
Modes of Settlement of Disputes: Peaceful means, Coercive means; War: Laws of War, Humanitarian Laws: Rules of neutrality.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Oppenheim, International Law, Vol. – 1.
- J.G. Strake, Introduction to International Law.
- Grieg, International Law.
- R.C. and Hingorani, Modem International Law.
- H.O. Aggarwal, International Law.
- S.K. Kapoor, International Law.
- Bowell, The Law of Internationals Institution.
- Verma, S.K., An Introduction of Public International Law.

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FORENSIC SCIENCE-I

Course Code: LAW2707 **Credit Units: 05**

Course Objective:
Forensic Science is science related to the law. It is the scientific method of gathering and examining information about the past which is then used in a court of law. It is applied science and consists of a range of different disciplines which often require different underpinning science knowledge. It continues to evolve and is now applicable to crime disruption and crime prevention as well as crime detection and the identification of victims in mass disasters.

The course focuses on the following objectives:
1. Developing an understanding and appreciation for the Forensic Sciences.
2. Brief description of crime scene investigation alongwith its various techniques and significance of physical evidences.
3. Develop an understanding on different types of questioned documents, the types of forgeries and disguise generally encountetred.
4. Developing an understanding of handwritting and typewritting alongwith its analysis.

Course Contents:
Module I: Introduction to Forensic Sciences
Brief description of Forensic Sciences, historical development of forensic sciences in India and forensic lab, laws and principles of forensic science, mobile forensic units their distribution in India.
Module II: Crime Scene Investigation
Definition, types- mobile, indoor and outdoor crime scene, various searching techniques used for locating physical evidence at crime scene, recording the scene , reconstruction of crime scene- modus operendii, role of investigating officer.

Module III: Physical Evidences in Forensic Science
Definition, collecting, packaging, prevention and forwading of evidences, fingerprint its characteristics, classification, developmental techniques- chemical developmental techniques.

Module IV: Introduction to Questioned Documents
Questined documents, types, disputed documents, security documents, bank notes, tampered documents, age of the documents and ink analysis, examinations of the fake currencies, instrumentations.

Module V: Handwriting and Typewritting Analysis
Handwritting identification forged and disguises handwritting, typewritting identification, general equipments for examinations

Module VI: Tool marks and other impressions
Definitions, types and decipherment of tool marks and techniques; examination of tool marks; introduction to tyre marks: its nature and types, skid marks tread marks; footprints and shoeprints types significance and examinations.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Sharma. B.R., Forensic Science in Criminal Investigations and trials (3rd Edn) Universal Law Publishing Co. Ltd
- Nath.S, Fingerprint Identification CRC Press 2nd Edn, 2002
- Fisher, B, Techiniques of Crime Scene Investigation 6th Edn CRC Press,
- Albert, S. Osborn, Questioned Documents, 2nd Edn, Universal Law Publishing Delhi, 1998

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OFFENCES AGAINST CHILD AND JUVENILE OFFENCE
HUMAN RIGHT LAW

Course Code: LAW2708 **Credit Units: 05**

Course Objective: To impart knowledge and expertise in legal and social issues relating to juvenile justice system in India, and sensitize about juvenile crimes and justice delivery system.

Course Contents:

Module I: Definition and concepts of term child and Juvenile. Causes of offence against child, International protection to child and convention, Offences against Child, Child abuse, Child labour and forced labour , Kidnapping, abduction , Abetment of suicide of child, Sale of obscene objects to young.

Module II: Concepts of: juvenile in conflict with laws, neglected juvenile, Determining factors of juvenile in conflict with laws: differential association, anomie, economic pressure, peer group influence, gang sub-culture, and class differentials.

Module III: Legislative Approaches , Constitutional provisions, Relevant provisions of the Juvenile Justice (Care and Protection of Children) Act, 2000, Relevant provisions of Protection of Children from Sexual Offences Act, 2012.

Module IV: Child and Criminal Liability, Crimes committed by child, Crimes committed by others in relation to children, Implementation of social policy through criminal sanctions in relation to child, Variation of procedure in case of child offender, Judicial proceedings in criminal cases relating to children, Protection of Children from Sexual Offences.

Module V: Judicial Contribution and Preventive Strategies, Social action litigation concerning juvenile justice, recent judicial decisions, Role of legal profession in juvenile justice system, State welfare programs: health, nutrition, ICWS, grant-in-aid, and compulsory education, Role of community, family, voluntary bodies, and individuals.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Bhattacharya, S.K.; Juvenile Justice: An Indian Scenario; Regency Publications
- Kumar, K. and Rani, Punam; Offences Against Children: Socio Legal Perspective; Regency Publications
- Josine Junger-Tas and Decker, Scott H.; International Handbook of Juvenile Justice; Springer
- Dunkel, Frieder; Juvenile Justice Systems in Europe: Current Situation and Reform Developments; Forum Verlag Godesberg

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LAW AND MEDICINE-I

Course Code: LAW2709 **Credit Units: 05**

Course Objective:

The course aims to provide the students the knowledge about the interrelationship between law and medicine and complex legal and ethical issues involved in the field of medicine and medical profession. The course include the doctor-patient relationship and its legal dimensions, medical negligence, socio-legal issues involved in the new technologies in medical science and biotechnology as well. As medico-legal issues became a consumer issue as well as a fundamental rights violation the course will help the students to have knowledge in laws related to medicine and analyse the issues in a better way.

Course Contents:

Module I: Introduction
Inter-relationship between law and medicine-issues involved and legal control- Doctor-Patient relationship- Constitutional perspective and penal provisions- Indian penal Code- Directive principles- Right to life- Right to health and emergency medical care.

Module II: Regulation of medical and Paramedical profession
Medical profession in India- Para medical profession- Regulatory authorities- Self regulation- medical Ethics- WHO declarations- Declaration of Geneva- Helsinki declaration- Regulatory authorities created by statutes- Regulations under medical Degrees Act, 1916- Pharmacy Act, 1948- Indian medical Councils Act- education regulations- Medical Council of India- Disciplinary Control-Hospital and research centers- Responsibility to patients- Duty to take care- Medical examination-Informed consent- Confidentiality- Access to medical records.

Module III: Liability of Professional Negligence
Medical negligence- Negligence in diagnosis, treatment- Duty to warn- Civil negligence and criminal negligence- Vicarious liability- negligence of students and nurses- Liability of Doctors and Hospitals under the Consumer protection Act, 1986.

Module IV: regulation of Manufacture, Storage and sale of Medicines
Drugs and Cosmetic Act, 1940-Production, storage and sale of drugs- Advertisement drugs and Magic remedies Act, 1954- penalties.-Access to medicine and Public health.

Module V: Medical Science and Technologies
Boitechnology-Bioethics-Genetic Engineering- Cloning-Human genome project- Biomedicine Convention- Invirto fertilization(IVF)- Selective reproduction- Surrogacy- Euthanasia- abortion-Medical termination of pregnancy Act- Indian penal Code-Stem cell therapy and research-Transplantation of Human organs- Organ Transplantation Act, 1994- Human Subjects Research-Helsinki declaration- Schedule Y, Drugs and Cosmetic Act1940- ICMR Code- AMA code of Ethics-WHO Good Clinical Practices.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Vijay Malik – Drug and Cosmetic Act, 1940, Eastern Book Company, 24th Edition, 2014
- Anoop K. Kaushal – Medical Negligence & Legal Remedies, Universal Publishing House, 2nd Edition, 2004

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- Dr. Jagdish Singh – Medical negligence Compensation, Bharat Law House, 3rd Edition, 2007
- P K. Dutta – Drug Control, Eastern Law House, 3rd Edition, 1997.
- Annas, George J. *American Bioethics: Crossing Human Rights and Health Law Boundaries.* New York:
  Oxford University Press, 2005.
- Annas, George J. Michael A. Gordin. *The Nazi Doctors and the Nuremberg Code: Human Rights in*
  Human Experimentation. New York: Oxford University Press, 1995.
- Dworkin, Ronald. *Life's Dominion: An Argument about Abortion, Euthanasia, and Individual Freedom.*
  New York: Alfred A. Knopf, 1993.
- Dr. Lily Srivastava, Law & Medicine (Universal Law Publishing, 2006)
- W. Noel Keyes, Bioethical and Evolutionary Approaches to Medicine and the Law (American Bar Association, 2007)
- Cynthia Ho, Access to Medicine in the Global Economy: International Agreements on Patents and Related Rights (Oxford University Press, 21-Apr-2011)

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TAXATION LAW

Course Code: LAW2802 **Credit Units: 05**

Course Objective:
Power to tax has been described as the power to destroy. This idea is being floated often whenever the State introduces a new tax. Is this true? Is it not necessary that in order to raise revenue and place the economy on solid foundation, the taxing power should be conferred on the State? The power to tax shall not go unregulated. In this context of a federal structure the distribution of the taxing powers assumes added significance. Obviously, a study of the Constitutional framework on taxation becomes important. Along with this, an analysis of the different laws enacted in exercise of these powers with their safeguards and remedies sheds light on the mechanics of the taxation by the Union and the States.

Course Contents:

Module I: General Principles of Taxation Laws
History and Development of Tax Laws in India, Fundamental Principles relating to Tax Laws, Taxing power and constitutional limitations, Distinction between: Tax, Fee and Cess; Tax avoidance and Tax evasion .

Module II: Basic concepts of Income Tax
Income, Previous Year, assessment Year, Person, Assesee and Total Income, Income not included in the Total Income. Residential status, Clubbing of Income, Tax planning, Rate of Income Tax, Heads of Income, Salaries, Income from House Property, Income from Business or Profession, Capital Gains, Income from Other sources, Deductions under the Income Tax Act, 1961, Income Tax Authorities: Power and Functions, Filing of returns and procedure for assessment, Offences and Penal Sanctions .

Module III: Value Added Tax
Meaning and importance of VAT, Difference between VAT and Sales Tax, West Bengal Value Added Tax Act, 2003, Criticisms and limitations of Vat system.

Module IV: Service Tax
Taxable Service, Meaning and importance of Service Tax, Valuation of Taxable Service, Offences and Penalities.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Iyengar, Sampath (1998), Law of Income Tax New Delhi, Bharath Law House.
- Jain, Narayan (2004) How to Handel Income Tax Problems, Book Corporation.
- Palkivala, N.A. (1999), The Law & Practice of Income Tax, Nagpur: Wadha Publication.
- Parameswaran, K. (1987), Power of Taxation under the Constitution, Eastern Book Company.
- Sharma, Remesh (1998), Supreme Court on Direct Taxes, New Delhi: Bharath Law House.
- Singh S.D. (1973), Principles of Law of Sales Tax, Eastern Book Company.
- V. Ramachandran & T.A. Ramakrishnan (eds.) (2000), A.N. Aiyar's Indian Tax Laws, Chennai: Company Law Institute of India Pvt. Ltd.

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LAND LAWS

Course Code: LAW2805 **Credit Units: 05**

Course Objective:
The legislative power to make laws relating to land and land ceiling is in the state list. Different States have enacted their own laws on this subject. The Constitutional perspectives relating to this subject have to be taught as an essential part of this course. The provisions in the Constitution in Part III, IV and XII as well as those in Schedule VII relating to distribution of legislative powers over land are essentially to be taught with emphasis.

Course Contents:
Module I: Punjab Land Revenue Act1887(Applicable over Punjab and Haryana),Definition of Key Words, Revenue Officers: Their Power and Functions, Preparation of Revenue Record: Like Documents of Jamabandi, Girdawari, Mutation, Intkaal, SijraNasab (Pedigree Table) Sirjra Axe(Map of the Village), Assessment of Land Revenue, Collection of Land Revenue, Concepts & Procedure of Partitions.

Module II: Punjab Land Revenue Act,1887:
Records-Of-Rights and Annual Records, Collection Of Land Revenue, Recovery of other Demands by Revenue-officers, Partition, **Assessment** and other relevant provisions.

Module III: Haryana Rent Control Act, 1973
Definitions (Sec. 1-4), Rights & Duties of Tenants, Rights and Duties of Landlords, Grounds of Ejectment of Tenants.
Haryana Panchayati Raj Act ,1994 (Sec. 1 to 54) (Chapter 1 to 6) Definition of Key Words, Constitution of Gram Sabha and Gram Panchayat, Gram Panchayat's Duties, Functions and Powers, Finance and Taxation, Control of Gram Panchayat, Sources of Income and Expenditure of Gram Panchayat.

Module IV: Haryana Panchayati Raj Act 1994,
PanchayatiSamiti (Chapter 7 To 11) And Sec. 55 To 116) Definition of Key Words, Conduct of Business of PanchayatSamities, Servant of PanchayatSamities, Duties and Powers of PanachayatSamiti, Finance and Taxation, Sources of Income of PanchayatSamiti, Control of PanchayatSamiti

Module V: Delhi Land Laws
Real Estate Development and Apartment ownership
Delhi Apartment Ownership Act, 2009,

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	05	5	70

Text & References:
- Law, poverty and development, Prof. M.L. Upadhayay.
- Upendra Baxi, Towards a Sociology of Indian Law, pp. 25-65 (1986)
- Atul Kohli, The state and Poverty in India (1987)
- Francine R. Frankel, India's Political Economy, 1947-77 (1988)
- L.H. Rudolph and S.H. Rudolph, The Political Economy of Lakshmi (1987)
- Mohammad Ghouse, "Nehru and Agrarian reform" in Rajeev Dhavan and Thomas Paul (eds.)
- Nehru and the Constitution (1992), Thripathi
- Walter C. Neale, Developing Rural India Policies and Progress (1990) Allied
- Alice, Jacob, Land Reform and Rural Change 6-19 (1992), Land Reforms in India: a Review.
- IASSI quarterly 1992, Vol. X, Numbers 3 and 4.
- B.R. Beotra, Law of Forests (Central and State) 6th Edition 1999, The Law Book Company.
- A. Krishnan, Forest Laws in India, 1998, Asia Law House
- Srivastava, Encyclopedia on forest, 1998, Asia Law House

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- Padala Rami Reddy, Forest Laws, 1989, Asia Law House Baden Powel, Manual of Jurisprudence for Forests Officers (1982)

WOMEN AND CRIMINAL LAW

Course Code: LAW2806 **Credit Units: 05**

Objectives: Women had suffered in the society since centuries and even after 50 years of Adoption of the Constitution, for women, equality appears to be a distant mirage to be reached. Effective political representation of women in Legislature and other forums too has become a difficult proposition to be acceptable. Breach of her personality, through various forms of violence, too has not subsided. The course intends to educate about the legal provisions enacted to ameliorate these situations with special emphasis on Indian Municipal Law, its scope and to evaluate the existing provisions.

Module-I
Women in Pre-Constitution Period: Social and Legal Inequality; Social Reform Movement in India; Legislative response in India. Women & children in Post-Constitution Period, Provisions of Constitution of India Preamble, Art.14, 15, 23, and Part IV Legal Measures in relating to Child Labour Women and Political Representation

Module-II
Different Personal Laws- Unequal Position of Indian Women-Uniform Civil Code; Sex Inequality in Inheritance Rights: Right of Inheritance by birth for Sons and not for Daughters; Inheritance under Christian Law; Inheritance under Muslim Law; Matrimonial Property Law; Right of Women to be Guardian of her minor sons and daughters.

Module-III
Law of Divorce - Christian Law-Discriminatory Provision; Muslim Law- Inheritance divorce. Women and Social Legislation: Dowry Prohibition Law; Sex Determination Test, Law relating to Prevention of Immoral Trafficking in Women Act.

Module-IV
Women and Criminal Law: Adultery; Rape; Outraging the Modesty of Women; Kidnapping; Sati Prohibition Law; Law relating to Domestic Violence; Law relating Eve Teasing; Indecent Representation of Women Act.

Module-V
Women and Employment: Factories Act- Provisions relating to women; Maternity Benefit Act; Equal Remuneration Act; Law Relating to Sexual Harassment at Working Place; N.C.W-Aims, Functions and Performance.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

PRESCRIBED BOOKS:
- Indu Prakash Singh- Women, Law and Social Change in India.
- Paras Dewan- Dowry and Protection to Married Women.
- S.P.Sathe- Towards Gender Justice.
- Dwarka Nath Mitter- Position of Women in Hindu Law
- Shaukat Nasir- Muslim Women and their Rights.

REFERENCE MATERIAL:
- Relevant Provisions of Constitution of India.
- Relevant Provisions of Indian Penal Code.
- S.125, Criminal Procedure Code.
- National Commission on Women Act, 1990.
- Matrimonial Property- Private Members Bill Introduced in Parliament Towards Equality- Report of Committee on the

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Status of Women (Govt. of India) Chapter IV and Section IV, General Conclusions and Recommendations

PROBATION AND PAROLE

Course Code: LAW2807 **Credit Units: 05**

Course Objective:
This course will introduce the student to the emerging discipline of community corrections. This alternative has become an integral resource to the criminal justice system.

Course Contents:
Module I: Theories of Punishment: (i) Deterrent Theory (ii) Retributive Theory (iii) Preventive Theory (iv) Reformative Theory Efficacy of Punishment: Early stages-Medieval Period, Modern or New Penology, Essentials of an ideal system of Penal Policy.

Module II: Concept of Correction Genesis and evolutions, objectives and theories of correction - various types of correctional methods.
Institutional Correction Origin and development of Indian Prison System, daily routine - prison as an institution, scientific classification of prisons and prisoners.

Module III: Treatment of correction of offenders. The need for reformation and rehabilitation of offenders, Undergoing punishment/imprisonment, Classification of offenders through modern diagnostic techniques, The role of psychiatrists and Socials workers in the prison., Vocational and religions education and apprenticeship programmes for the offenders, Group counseling & Resocialization programmes, Participation of inmates in community service.

Module IV: Non-Institutional Methods Open air jails, Admonition, fine, probation and parole. Half way houses - organization and significance.
Recent trends in corrections Role of voluntary agencies in prevention of crime and treatment of offenders - Discharged prisoners' aid society. After care and rehabilitation, Need, importance and services in India - Pre-release and premature release., Attitude of the community towards released offender, Prisoner Aid Society and other Voluntary Organization governmental Action.

Module V: The place of probation in penal policy – public participation in probation, Legislations on Parole and probation in India, Probation of Offenders Act, 1958, Section 360 of the Criminal Procedure Code, 1973

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Martin Wasik, Emmins On Sentencing (1998) 2.
- Hall J., Law, Social Science and Criminal Theory
- J.M.Sethna, Society and the Criminal, 1980
- Siddique, Criminology-Problems and Perspectives, 1997
- Sutherland,E H,Cressey.D R,Criminology A. Siddique, Criminology (1984) Eastern, Lucknow.
- Law Commission of India, Forty-Second Report Ch. 3 (1971)
- K.S. Shukla, "Sociology of Deviant Behaviour" in 3 ICSSR Surveys of Sociology and Social Anthropology 1969-179 (1986)
- Tapas Kumar Banerjee, Background to Indian Criminal Law (1990)
- Bhattacharya S.K. (1986) Probation system in India,
- Mans Publications, New Delhi. 2. Bhattacharya,
- S.K. (1985) Social defence: An Indian perspective, Manas publications.

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FORENSIC SCIENCE-II

Course Code: LAW2808 **Credit Units: 05**

Course Objective:
Forensic science is science related to the law. It is the scientific method of gathering and examining information about the past which is then used in a court of law. It is applied science and consists of a range of different disciplines which often require different underpinning science knowledge. It continues to evolve and is now applicable to crime disruption and crime prevention as well as crime detection and the identification of victims in mass disasters.
The course focuses on the following objectives:
1. Developing and understanding the concept of forensic anthropology
2. Breif description on the ballistic its analysis and reconstruction
3. Developing an understanding to wounds and its medco-legal aspect.
4. Developing an understanding on explosives and its crime scene investigations.

Course Contents:

Module I: Forensic Anthropology
Definition, scope, and application; time since death: assessing and determing the time and cause of death, study of burned bones and bones fragments; identification.

Module II: Ballistics
Definition, Indian Arms Act, forensic importance, classification of firearms; ammunition; range of fire; firearms injuries, analysis and reconstuction.

Module III: Wounds and its medico-legal aspects
Introduction to wounds; determining the age of the injury and its medico-legal aspect, injuries due to blunt forces, injuries due to sharp forces, miscellaneous injuries.

Module IV: Explosives and Explosion Scene Investigation
Explosive Act: nature and classification, composition and characterstics of explosives, pyrotechnics, IEDs, specific approach to scene of explosion, post-blast residue collection, reconstruction of sequences of events; evaluation and assessment of scence of explosion and its examination.

Module V: Advanced fingerprint and other impression
Fingerprint in personal identification, examination on the basis of poroscopy and its significances; evaluation of fingerprints on the basis of edgescopy and its significance in fingerprint field, Palmer, Planter and other impression its evaluation**.**

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Sharma. B.R., Forensic Science in Criminal Investigations and trials (3rd Edn) Universal Law Publishing Co. Ltd
- Nath.S, Fingerprint Identification CRC Press 2nd Edn, 2002
- Fisher, B, Techiniques of Crime Scene Investigation 6th Edn CRC Press,
- Albert, S. Osborn, Questioned Documents, 2nd Edn, Universal Law Publishing Delhi, 1998
- James, S. H. and Nordby, J.J (Eds), Fornsic Science- An Introduction to Scientific and Investigation Techniques CRC Press, London, 2003.

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LAW AND MEDICINE-II

Course Code: LAW2809 **Credit Units: 05**

Course Objective:

The course aims to provide the students the knowledge about the interrelationship between law and medicine and complex legal and ethical issues involved in the field of medicine and medical profession. The course include the ethical and legal issues in population control, surrogate motherhood, HIV/AIDS, the rights of the unborn, AID and Law, mental health and medical experimentation on human beings.

Course Contents:

Module I: Population control and community health
Law, Practice and Society- Causes for Population Explosion- National Population Policy, 2000- Terminal methods female sterilization and male sterilization- State Imposed sterilization and its legal validity- Population control and Right to family and Right to privacy.

Module II: Surrogate Motherhood and the Rights of the Unborn
Surrogacy in foreign countries- Motherhood Debated-Legality of contract- problems-Refusal to accept the child-health Tourism and sanctity of woman's life- ICMR Code- The Unborn-Introduction- Right of an Unborn Chile-Prenatal Diagnosis (and Amniocentesis)-Miscarriage

Module III: AIDS
Rights, Freedom and duties of HIV/AIDS Patients- Privacy and Public health- Liberty and Security-Movement- Marriage and Finding a family- Right to work- Education for an infected person-Protection of children infected or born to infected parents- Right against degrading Treatment-Equality before law- access to medicine

Module-IV
International Norms- general Provision-Consent-Human Genome-Scientific Research-Donors for Transplantation Purposes-Prohibition of Financial gain and Disposal of a part of the Human Body

Module-V
Mental Health- Historical Background-types of Causes of Mental Illness- Development of the Human being and mental health-Prevention of Mental Illness and Treatment-Alcoholism and Drug Addiction- Mental health Act- Admission and discharge to mental hospital legal issues

Module-VI
Experiments of Human Beings- The concept-Kinds of Experiments-Subject of Experimentation-controls-Clinical Trials-Studies in special Populations-Informed consent-Special Studies of Bioavailability and Bioequivalence-Ethics committee- Stem cell research- International documents and Indian laws-Ethical norms on experimentation

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Vijay Malik – Drug and Cosmetic Act, 1940, Eastern Book Company, 24th Edition, 2014

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- Dr. Jagdish Singh – Medical negligence Compensation, Bharat Law House, 3rd Edition, 2007
- P K. Dutta – Drug Control, Eastern Law House, 3rd Edition, 1997.
- Annas, George J. *American Bioethics: Crossing Human Rights and Health Law Boundaries.* New York:Oxford University Press, 2005.
- Annas, George J. Michael A. Gordin. *The Nazi Doctors and the Nuremberg Code: Human Rights in Human Experimentation.* New York: Oxford University Press, 1995.
- Dworkin, Ronald. *Life's Dominion: An Argument about Abortion, Euthanasia, and Individual Freedom.* New York: Alfred A. Knopf, 1993.
- Dr. Lily Srivastava, Law & Medicine (Universal Law Publishing, 2006)
- W. Noel Keyes, Bioethical and Evolutionary Approaches to Medicine and the Law (American Bar Association, 2007)
- Cynthia Ho, Access to Medicine in the Global Economy: International Agreements on Patents and Related Rights (Oxford University Press, 21-Apr-2011)

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INTELLECTUAL PROPERTY RIGHTS

Course Code: LAW2902 **Credit Units: 05**

Course Objective:

The course is designed to provide comprehensive knowledge to the students regarding Indian position of the Patent Law (1970), Copy Right Law (1957) and Designs Act of 2000 which invariably form the part of Intellectual Property Law and shall comprise of the following.

The importance of this branch of the law is to be sufficiently realized in the Indian legal education. These areas are now internationally conceptualized as representing intellectual property. It is often the case that while the law of patents and trademarks is referred to as industrial property, the law relating to copyright is named intellectual property. While both these terms could be suitably invoked, we here speak of intellectual property as signifying all the three bodies of the law as well as the law on industrial designs.

Unlike other forms of property, intellectual property refers to regimes of legal recognition of, primarily, the products of the mind or imagination. The subject matter of property relations is here preeminently based on mental labour. The law relating to intellectual property protects the right to mental labour.

The law confers rights of proprietary nature on relative intellectual labour primarily on the basis that it is in the interests of society and state to promote creativeness and inventiveness. Limited monopoly provides incentive for greater inventive and innovative efforts in society. An important aspect of the exploration in this course would be ways in which the laws strike a fair balance between the interests and rights of the intellectual labourers on the one hand and organized industrial enterprises on the other. Another dimension is a study of the ways in which this regime of laws militates against, or favours, commModuley property in national cultures. As concerns 'modernization' crucial questions arise in the field of copyright protection in computer software and hardware, internet, electronic music and scientific research. Both copyright, trademarks, design and patent law here relate basically to the law of unfair competition and constitute an aspect of consumer protection and welfare not only in the context of national perspectives but also in view of the waves of globalization already set in. Both from the standpoint of human resources development, modernization and justice it is important that the law students get sufficient insights in Intellectual Property Law.

Course Contents:

Module I: Introduction

Intellectual Property, Concept and Philosophy, Need for Private Rights versus Public Interests, Advantages and Disadvantages of IPR.

Module II: Patent

Development of patent law, Rationale for patent protection**,** Nature and definition, Types of patentable subject matter, Patentability criteria, non-patentable inventions, Rights of patentee, Procedure for granting a patent, Grounds for opposition, Transfer of patent rights, Compulsory Licenses, Acquisition, Surrender, Revocation, restoration, Patent infringement and remedies, Bio patents and software patents, Official Machinery, Controller, Powers and Functions, Patent in pharmaceutical industry, Patent cooperation treaty, Paris convention.

Module III: Copyright

History, Concept of copyright, conditions for grant of copyright, extent of rights exception to copyright protection, fair use provision, assignment and licensing, Compulsory licensing and statutory licensing, Collective administration, Copyright board and office, powers and functions, Moral rights: Neighboring rights; infringement penalties and remedies, Appeals, Berne Convention, Universal Copyright Convention - WIPO Copyright Treaty: WIPO Phonograms and Performances treaty, TRIPS with respect to Copyright and Neighboring rights.

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Module IV: Designs, Protection, Historical development, Rationale
Designs Act of 2000: Meaning of Design, Conditions for grant of protection, Ambit of Protection, Exceptions, Registration of Designs, Cancellation, Copyright in Registered Designs, Enforcement, Infringement and remedies, Powers and duties of Controller.

Module V: Trademarks
Evolution, Functions, Objective, Definition, Kinds of Marks, Domain names, Registration, Concurrent registration, Procedure for registration, Relative and absolute grounds of refusal, opposition and its grounds, Assignment, transmission and licensing of Trademarks, Infringement, Penalties and Remedies, Withdrawal of protection, Passing off, Official machinery for regulation administration and Redressal, Registrar, Difference between Trade Mark, **Trade Secret, Traditional Knowledge** and Geographical Indications, TRIPS on Trademarks, Madrid Agreement for The Repression of False or Deceptive Indications of Source on Goods, 1891- Madrid Agreement for the International Registration of Marks, 1891 and protocol relating to that agreement 1989.

Module VI: Plant Varieties Protection Act, 2001
Objectives, Rationale, Registry, Official machinery, registration, Criteria of fulfillment Exclusions, Benefit sharing, Farmers rights, CommModuley Rights, compulsory license Redressal fora, Appellate tribunal, Infringement, offences and penalties; Geographical indications of Goods (Registration and Protection Act, 1999**:** History, Definition, Rationale, Functioning, official Machinery, Registry, Rights conferred, Registration Procedure. Redressal Machinery, Appeal, Passing off, Offences, penalties and Procedure.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	05	5	70

Text & References:
- D.P. Mittal (Taxman Publication), Indian Patents Law and Procedure
- B.L. Wadera, Patents, trademarks, copyright, Designs and Geographical Judications.
- P. Narayanan (Eastern Law House), Intellectual Property Law
- W. Cornish (Universal Publication), Intellectual Property Law
- R.K. Nagarjan, Intellectual Property Law
- Ganguli (Tata Megraw), Intellectual Property Rights

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LAW, POVERTY AND DEVELOPMENT

Course Code: LAW2903 **Credit Units: 05**

Course Objective:
The objective of this paper is to provide an understanding of basic concepts of poverty and development and their relationship with law.

Course Contents:

Module I: Understanding Poverty and Development
Poverty: Meaning and Concept, Relative Dimensions, Measurement and Determinants, Issues related to Poverty in India; Development: Perspectives, Developmental index.

Module II: Constitutional Guarantees for the Poor
Equality and Protective Discrimination, Right to Basic Needs and Welfare, Abolition of Untouchability and Protection of Civil Rights, Right to Development.

Module III: Criminal Justice System and the Poor
Treatment of the poor by Police, Inability to get Bail, Problems of Poor Under trials, Working of free legal aid schemes. .

Module IV: Impoverishment of Women, Children and Disabled Persons
Deprivations of women under family laws, Problems of women workers in organized and unorganized sectors, Child labour, Approaches to disability and rights of the disabled persons, Right to education and dignity.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	05	5	70

Text & References:
- Law, Poverty and Development – Upendra Baxi
- State and Poverty in India – Atul Kohli
- The Poverty Question (Search for Solution) – Yogesh Atal
- Poverty, Rural Development and Public Policy - Amarendra

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PROFESSIONAL ETHICS

Course Code: LAW2904 **Credit Units: 05**

Course Objective:
The Course has been designed to acquaint the students of Law about the Professional Ethics and Professional etiquettes that are essentially significant for an advocate to observe while at the Bar. Accountability and transparency are imperative to the profession. Besides, the conducive and cordial Bar- Bench relations can send a good message concerning the richness of the Legal profession. With this background cue, the course aims at developing insights of the students about the professional parameters.

Course Contents:

Module I: Historical Introduction
Historical introduction to legal profession in India – Barristers, Vakils, High Court Pleaders, Advocates, etc. The All India Bar Committee, 1951 and the passing of Indian Advocates Act, 1961. The Advocates Act 1961: Definitions Section 2, Constitution and function of State Bar Councils, Bar Council of India, Terms of Office, various sub-committees including Disciplinary Committee and the qualification for their membership. Power to make rules Sections 3 to 15 – Chapter –II.

Module II: The Advocate's Act, 1961
The Advocate Act, 1961.
Admission and enrolment of Advocate – Senior and other Advocates,
Common role of Advocates, Qualifications and Disqualifications for enrolment and procedure thereof, Chapter – III Section 16 to 28.
Rights to Practice: Monopoly of representation, Exclusion of advocates from certain cases, self representation by litigants. Chapter IV Secs. 29 to 34.
Professional and other misconduct, Principles for determining misconduct,
Disciplinary Committees of State Bar Council and the Bar Council of India,
Punishment of advocates for misconduct, Appeals to the Supreme Court,
Chapter – V – Secs. 35 to 44.

Module III: Legal Profession
Nature of Legal Profession, Need for an Ethical Code of Rights: privileges and duties of Advocates, Preparation of a case and fees of an Advocate, under – cutting, Bar against soliciting work and advertisement, Bar against touting, refusal of briefs, accountability to the client, confidentiality communication between Advocates to compromise, Study of Code of Ethics prepared by the Bar Council of India.

Module IV: Contempt of Courts Act, 1971
Contempt of Courts Act, 1971,
What is Contempt? Civil and criminal contempt, punishment for contempt.
Procedures in contempt cases. High Court Rules and the Supreme Court
Rules to regulate contempt proceedings.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Sanjeev Rao, Indian Advocates Act, 1971.
- M.P. Jain, Indian Legal History (Chap. On Legal Profession).
- Krishna Murthy Iyer's Book on Advocacy.
- The Contempt of Courts Act, 1971.
- Journal of Bar Council of India.

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PRIVATE INTERNATIONAL LAW

Course Code: LAW2905 **Credit Units: 05**

Course Objective:
The course equips the student to deal with dispute involving a foreign element in personal, civil and commercial matters *i.e.* increasing in frequency as a result of a globalized economic and social environment.

Course Contents:

Module I: Introduction
Application and subject matter of Private International Law, Distinction with Public International Law, Characterization and theories of characterization, Concept of Renvoi, Application of foreign law, Domicile, Jurisdiction of courts.

Module II: Family Law and Adoptions
Material and formal validity of marriage under Indian and English law, Choice of law and jurisdiction of courts in matrimonial causes: dissolution of marriage, grounds of divorce, restitution of conjugal rights, recognition of foreign judgment, Recognition of foreign adoptions, Adoption by foreign parents, Jurisdiction under Indian and English law.

Module III: Civil and Commercial matters
Tort, Theories of foreign tort, Contract, Theory of Proper Law of Contract, Ascertaining the applicable law, Property.

Module IV: Indian Law relating to foreign judgment
Basis of recognition; Recognition and Enforcement of Foreign Judgments, Finality, Failure, Direct execution of foreign judgments, decrees.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Dr. Paras Diwan :Private International Law
- Cheshire : Private International Law
- Morris : Private International Law

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ELECTION LAW

Course Code: LAW2906 **Credit Units: 05**

Course Objective:
The objective of this paper is to acquaint the students with the lection laws governing the elections of the Houses of the Parliament and the State Legislatures as well as to the offices of President and Vice President**.**

Course Contents:

Module I: Introduction
Election: Meaning and Process, Constitutional Mandate, Laws governing elections, Election disputes, Election to the Offices of the President and Vice President. .

Module II: Election Commission
Composition, Functions, Powers**;** Delimitation of Constituencies, Preparation and Revision of Electoral Rolls.

Module III: Qualifications and Disqualifications of Candidates
Constitutional and Statutory Provisions**:** Disqualifications of sitting members, Nomination and Candidature, Voters Right to Information; Anti Defection Law (Tenth Schedule to the Constitution of India).

Module IV: Corrupt Practices in the Election Law; Electoral Offences

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Manual of Election Law in India – Dev Inder
- Chawla's Elections Law & Practice - P.C. Jain & Kiran Jain
- Election Laws and Practice in India- R.N. Choudhry
- Corrupt Practices in Election Law – K.C. Sunny
- How India Votes – Election Laws, Practice and Procedure – V.S. Rama Devi & S.K. Mendiretta
- V.N. Shukla's The Constitution of India – M.P. Singh.

Statutory Reading:
- Relevant Provisions of the Constitution of India
- The Representation of the People Act, 1951.
- The Representation of the People Act, 1950.
- The Presidential and Vice-Presidential Elections Act, 1952
- The Election Commission (Condition of service of Election Commissioners and Transaction of Business) Act, 1991.
- The Delimitation Act, 2002.

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BANKING AND INSURANCE LAWS

Course Code: LAW2907 **Credit Units: 05**

Course Objective:
This course acquaints students with banking system of India and teaches them the various aspects and rights that exists for them in banking and insurance sector.

Course Contents:

Module I: Banking System in India
Kinds of banks and their functions; Banking Regulation Laws: Reserve Bank of India Act, 1934, Banking Regulation Act, 1949; Relationship between banker and customer: Legal Character, Contract between banker & customer, Banks duty to customers; The Banking Ombudsman Scheme, 1995; Liability under Consumer Protection Act, 1986.

Module II: Lending, Securities and Recovery by Banks
Principles of Lending ; Position of Weaker Sections; Nature of Securities and Risks Involved ; Recovery of debts with and without intervention of courts / tribunal: Recovery of Debts due to Banks and Financial Institutions Act, 1993, Securitisation and Reconstruction of Financial Assets and Enforcement of Security Interests Act, 2002.

Module III: Banking Frauds
Nature of Banking Frauds; Legal Regime to Control Banking Frauds; Recent Trends in Banking: Automatic Teller Machine and Internet Banking, Smart Cards, Credit Cards.

Module IV: Insurance Law
Nature of Insurance Contracts; Kinds of Insurance: Life Insurance, Medi claim, Property Insurance, Fire Insurance, Motor Vehicles Insurance (with special reference to third party insurance; Constitution, Functions and Powers of Insurance Regulatory and Development Authority; Application of Consumer Protection Act, 1986.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Banking Law & Negotiable Instruments Act – Sharma and Nainta
- Banking System, Frauds and Legal Control – R.P. Namita
- Law of Insurance – M.N. Mishra
- Handbook of Insurance and Allied Laws – C. Rangarajan
- Banking Law & Practice in India – M.L. Tannan.

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INTERNATIONAL HUMANITARIAN AND REFUGEE LAW

Course Code: LAW2908 **Credit Units: 05**

Course Objective:
The objective of this paper is to make students aware of the principles of International Humanitarian and Refugee Laws.

Course Contents:

Module I: Historical Development of International Humanitarian Law
History and evolution, Growth, Character of International Humanitarian Law.

Module II: Geneva Conventions, 1949
Geneva Convention I, Geneva Convention II, Geneva Convention III and Geneva Convention IV, 1949, Additional Protocol I to Geneva Conventions, 1977, Additional Protocol II to Geneva Conventions II 1977.

Module III: Enforcement Machinery
War Crimes, Serious breaches of International Humanitarian Law, International Criminal Court (ICC).

Module IV: Refugees under International Law
Who is a refugee?, Convention Relating to the Status of Refugees, 1933, Convention on Status of Refugees, 1951, The 1967 Protocol, The AALCC Principles 1966, The OAU Convention 1969.

Module V: Implementation and Monitoring of the Rights of Refugees
Status of the UNHCR 1950, Cartegena Declaration 1984.

Module VI: Treatment of Refugees under Indian Laws
Draft SAARC Convention.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Ingrid Detter, The Law of War, (Cambridge, 2000)
- A. Roberts and R. Guelff, eds., Documents on the Laws of War (Oxford, 2000)
- Legality of the Threat or Use of nuclear weapons, Advisory Opinion, ICJ Reports (1996)
- M.K. Balachandran and Rose Verghese (eds.) – International Humanitarian Law ICRC (1997)
- Ravindra Pratap, "India's Attitude towards IHL", in Mani (ed.) International Humanitarian Law in South Asia (Genava: ICRC, 2003)
- Guy S. Goodwin – The Refugee in International Law (Oxford, 2000)
- A. Vibeke Eggli, Mass Refugee Influx and the Limits of Public International Law (The Hague: Nijhoff, 2002).

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CRIMINOLOGY

Course Code: LAW2909 **Credit Units: 05**

Course Objective:
The course is intended to introduce students to the broad study of criminology. It is to give a broad overview to the scope of criminology, to the ideas which have influenced the area of the subject and to the practical uses and impact to which these have been, or might be put.

Course Contents:

Module I: Introduction to Crime & Criminology
Definition and Scope, Criminology & other Social-Science; Legal, Social and Psychological aspects of crime, Traditional crimes; Organized Crimes, Socio Economic Crimes, Modern Crimes; Corruption, Cyber Crimes Environmental Crimes Terrorism and insurgency ; Specific theories: Classical School and Neoclassical School; Positive School; Cartographic School; Sociological theories : Social Structural Theories and Social Process Theories; Economic Theories of Crime .

Module II: Juvenile Delinquency
Concept & Causes, Pre delinquency stages: Truancy and Vagrancy, Main features of juvenile Justice Act, (New & Old), Institutional Services like Observation homes, Juvenile Homes, Special Homes & Juvenile Aftercare Services.

Module III: Punishment
History & Theories of Punishment, Capital Punishment, Historical Development from Punishment to Correction and Reformation, Prison System In India; Correctional Programmes in jail; Alter care services, Probation & Parole.

Module IV: Impact on Society
Social Disorganization and Social Problems, Victimless Crimes: Alcoholism, Drug Addiction, Beggary, Commercial Sex, Suicide; Crimes related to Family: Dowry death, Domestic Violence, Child Abuse.

Module V: Victimology
Concept, origin & Development, Need to study victims, U.N. Declaration on the basic principles of justice for victims of crimes and abuse of power, Victim's rights in India: Fair Access to Justice, Restitution, Compensation and assistance to victims, Human Rights Protection.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Sutherland and Crssey – Criminology
- Ahmed Siddique – Criminology
- Mrs. Vedkumari – Juvenile Justice

CORRUPTION LAWS

Course Code: LAW2911 **Credit Units: 05**

Course Objective:
To update the students about corruption laws that has already been formed. The main aim of the course is to make the students aware of the laws prevalent and the legal remedies available

Course Contents:

Module I: Introduction to Corruption Laws
Introduction- definition of corruption,
Genesis of corruption- Historical Background, corruption in ancient time, corruption in Mahabharata need for integrating
Nature of corruption, various types of corruption- in kind, cash or in service Individual Corruption, Institutional Corruption. Why and how of corruption – Nexus between Position of a Public servant and corruption. consequences and ill effects

Module II: Offences by Public Servant
Offences under the Prevention of Corruption Act, 1988,
Corruption by Public servant- Prevention of Corruption Act 1988-
Definition of Public Servant sec 2(cc)
Categories of public servant- person in the pay of the Government- a person in the service of the Government a person remunerated by fees or commission for the performance of any public duty by the Government.
Sec 7: public Servant taking gratifications other legal remuneration in respect of an official act.
Gratification: legal remuneration, meaning of holding out as a Public Servant – whether covered under the Act.
Sec 8: Gratification by person other than public servant – to influence public servant by corrupt or illegal means.
Sec 9: Gratification by person other than Public Servant- to influence public servant- and not by corruptor illegal means.
Sec10, Sec11, Sec 12: Habitual committing of offence under Sec 8, 9, 12, 14.
Sec 15 Attempt
Sec 16 Fine Criteria
Sec 13 Criminal Misconduct by Public Servant.
Bribe giver Guilty or Abetment?
Investigation and Trial under the Act
Sec 17 Persons authorized to investigate.
Sec 19 Sanction for prosecution
Sec 20 presumptions under the Act.
Sec 3, 4, 5: Special Judges Court- procedure and powers of Special Judge.

Module III: Commission of Enquiry Acts
Section 6 Summary Trial. Commission of Enquiry Act 1952
Composition, function and role of CAG
The Central Vigilance Commission
Central Bureau of Investigation its role, function and Jurisdiction.
Proposed Lok Pal Bill ,its various drafts , legality of sting operations , provision relating to corruption cases of judges , Immunity of legislations and parliamentarians . Law on whistle blowers

Module IV: Money Laundering & National Investigative Agency Act
The Prevention of Money Laundering Act 2002, General Principles, Confiscation of Property earned through crime Sec5
Sec 171-B of IPC Bribery – Offences relating to elections.
Sec 171-C
Sec 171- D Undue influence and Impression at election
Sec 171- E Punishment for Bribery
Sec 171- F Punishment for Influence and Personating at an election.

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National Investigative Agency Act 2009

Module V: International Effort
International Efforts
The United Nations Directions
The Convention on Combating Bribery of Foreign Public Officials
UN Convention against Transnational Organized Crime.
UN Convention against Corruption (UNCAC)

Examination Scheme:

Components	**P**	**A**	**C**	**CT**	**EE**
Weightage (%)	5	5	10	10	70

Text & References:
- Prevention of Corruption Act, 1988
- Prevention of Money laundering Act, 2002
- National Investigative Agency act, 2009
- Un Conventions

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SUMMER INTERNSHIP EVALUATION-IV

Course Code: LAW2935 **Credit Units: 03**

It is a mode of Clinical Legal education Specified period to be spent by the student with a law firm/court/Commissions/NGO's and like institutions working with the realm of law or connected therewith. The reports both by the student and the office together with diary where applicable to be certified will be submitted for evaluation

The Internship during the summer break is a compulsory course. There is a Internship Data from where students fill in the details of where they are interning with complete address and phone numbers Customized Legal Reference /Diary is provided to the students on payment. They maintain a day to day record of the work that they do at the place they are interning. They are expected to intern for a minimum 90 days. They submit their completed diary, certificate from the employer and also a report of their experience at work. After submission there is a Viva by concerned faculty. They assess the student on the kind of work they have done during internship, presentation of the work they have done and also on the practical knowledge they have gained

The Paper is marked out of 100 marks. The breakup of the marks is as follows:

1.	Diary submission	25 Marks
2.	Report and certificate	25 Marks
3.	Viva (Panel of External Examiners)	40 Marks
4.	Attendance (Regularity in meeting the supervisor)	10 Marks
	Total	**100**

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MOOT COURT/ INTERNSHIP

Course Code: LAW2003 **Credit Units: 14**

Course Objective:
This course relates to litigation advocacy and as such this shall be simulation course that shall have two parts. First part shall focus on preparation for trial and trial strategies. It shall also disseminate techniques of examination-in-chief cross examination and re-examination of witnesses, argumentation in courts, bail application, injunction application, etc. The second part shall focus on writing briefs in civil suits and criminal cases, appellate briefs in civil and criminal cases, and writ matters, memorial writings and arguing before the appropriate forums. The students shall be given a case to argue, that shall help to articulate their argumentative zeal as well as capacity.

Course Contents:

Module I: Moot Court
Bench Memorial, Court Craft: Presentation of case, Interaction with Bench, Question Answer Court etiquette and mannerism section.

Module II: Internship
Specified period to be spent by the student with a law firm/court/Commissions/NGO's and like institutions working with the realm of law or connected therewith. The report and diary to be certified and submitted for evaluation.

Module III: Corporate Legal Training
Corporate communication skills and client interaction and etiquette in corporate law work environment.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	05	05	70

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FINANCIAL ACCOUNTING

Course Code: LAW2110 **Credit Units: 03**

Course Objective:
To understand the basics of accounting and concepts of double entry system. The students will be given a detailed grounding on recording of transactions and preparation of final accounting statements for business organizations

Course Contents:
Module I: Introduction to Accounting
Understanding the meaning, nature, functions and usefulness of accounting, branches of accounting, accounting equation, accounting concepts and Generally Accepted Accounting Principles. Difference between Indian GAAP and US GAAP

Module II: Recording of Transactions and Subsidiary Books
Concept of double entry system. Understanding the Accounting cycle. Preparation of voucher, journal, ledger and trial balance and numerical on the same. Preparation of subsidiary books including purchase book, sales book, purchase returns book and sales return books and numerical on the same. Cash book, types of cash book and balancing of cashbook. Numerical on single column cashbook, double column cashbook, triple column cashbook and petty cash book.

Module III: Reconciliation of Bank Accounts
Causes for difference in the balance as per pass book and balance as per cashbook.Procedure for preparation of bank reconciliation statement when there is favorable balance and in case of overdraft and numerical on the same.

Module IV: Financial Statements
Preparation of trading account, manufacturing account, profit and loss account and balance sheet along with adjustments and numerical on the same and non-profit making organizations an overview.AS-1,AS-21**(no numerical)**

Module V: Accounting For Partnership
Introduction to partnership accounts, partnership deed.**Admission of a new partner**-Revaluation account, Computation of new profit sharing ratio and sacrificing ratio, Proportionate capital, Treatment of goodwill in partnership accounts and its valuation.**Retirement and Deathof a partner:** Determining the gaining ratio, Revaluation of assets and liabilities, Reserve, Final payment to retiring partner, Treatment and adjustment of goodwill. Numericals on preparation of various accounts in case of retirement and death of a partner.**Dissolution of the firm:** Circumstances leading to dissolution of partnership, Settlement of the accounts, Capital ratio on insolvency, Insolvency of all partners and Garner Vs Murray decision.

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

Text & References:
Text:
- Maheshwari, S.N., Advanced Accountancy Volume-I, Ninth Edition, Vikas Publishing House Pvt. Ltd.

References:
- Grewal, T. S., Shukla, M .C, Advanced Accountancy, Sixteenth Edition, Sultan Chand and Sons.
- Tulsian, P.C, Financial Accounting 2005, Pearson Education.
- Narayanaswamy, R. Financial Accounting-A Managerial Perspective Second Edition, Prentce Hall India.
- Ramachandran, N., Kakani, R.K., Financial Accounting for Management, 2006, Tata McGraw Hill Publishing Company Limited.

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LEGAL METHOD

Course Code: LAW2104 **Credit Units: 04**

Course Objective:
This paper focuses on orientation of students to legal studies from the point of view of basic concepts of law and legal system.

Course Contents:

Module I: Meaning and Classification of Laws
Meaning, Definition, Functions: Justice, Stability and Peaceful Change; Classification of laws: Public and Private Law, Substantive and Procedural Law, Municipal and International Law.

Module II: Sources of Law
Custom; Precedent, Ratio, Obiter; Legislation. ;

Module III: Basic Concepts of Indian Legal System
Common Law, Essentials of a Valid Law, Constitution as the Basic Law, Rule of Law, Separation of Powers, Judicial system in India, **Principles of Equity**.

Module IV: Legal Writing and Research
Legal materials: Case law, Statutes, Reports, Journals, Manuals, Digests etc.; Importance of legal research ; Techniques of Legal Research : Doctrinal, Empirical Research, Legal writings and citations.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Glanville Willains – Learning the law
- Avtar Singh – Jurisprudence (Legal Theory)
- B.N.M. Tripathi – An Introduction to Jurisprudence and Legal theory
- Benjamin N. Cardozo, The Nature of Judicial Process
- LI Publication – Indian Legal System
- ILI Publication in Legal Research and Methodology

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LAW OF CONTRACT-I

Course Code: LAW2105 **Credit Units: 04**

Course Objective:
Whatever may be the nature of a given society, the contractual relations, as are obtained in that society, are governed by certain principles which are more or less of a general and basic nature. In India these general principles are included in the statute of the Indian Contract Act. 1872. This course is designed to acquaint a student with the conceptual and operational parameters of these various general principles of contractual relations. Specific enforcement of contract is an important aspect of the law of contracts. Analysis of the kinds of contracts that can be specifically enforced and the methods of enforcement forms a significant segment of this study.

Course Contents:

Module I: Formation of Contract
Meaning and nature of contract, Offer / Proposal (Definition, Communication, Revocation, General/Specific offer, Invitation to treat), Acceptance (Definition, Communication, Revocation, Tenders / Auctions). 'E'Contract

Module II: Consideration and Capacity
Consideration (Definition, Essentials, Privity of contract), Capacity to enter into a contract (Minor's position, Nature / effect of minor's agreements).

Module III: Validity of Contract
Unlawful consideration and object, Free Consent, Coercion, undue influence, Misrepresentation, Fraud, Mistake, Contingent contract, Quasi contracts, Effect of void, voidable, valid, illegal, unlawful and uncertain agreements contracts.

Module IV: Discharge and Performance of Contract
Discharge of Contracts, Performance, Time and Place of performance, Impossibility of performance and frustration, Breach – Anticipatory & Present.

Module V: Remedies
Damages, Remoteness etc., Injunction, Specific performance, Quantum Merit.

Module VI: Specific Relief Act, 1963
Recovery of property, Specific performance of contracts, Rescission of Contract, Declaratory Decree, Injunctions: Temporary and Perpetual, Mandatory.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Anson - Law of Contract
- Pollock and Mulla - Indian Contract Act
- Avtar Singh - Indian Contract Act
- Bangia - Law of Contract and Specific Relief
- Cheshire and Fifoot - Law of Contract.

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E-COMMERCE

Course Code: COM2103 **Credit Units: 03**

Course Objective:
In the changed business environment of today, it has become imperative for businesses to understand, appreciate and learn to create their presence in cyber space. This course focuses on exposing the students to the world of e-commerce, the opportunities, and the threats and teaches them the strategies of making businesses viable and successful.

Course Contents:

Module I: E-Commerce Concept
Meaning, definition, concept, features, function of E-Commerce, E-Commerce practices v/s traditional practices, scope and basic models of E-Commerce, limitations of E-Commerce, precaution for secure E-Commerce, proxy services. Concept of EDI, difference between paper based Business and EDI Based business, Advantages of EDI, Application areas for EDI, Action plan for Implementing EDI, Factors influencing the choice of EDI, Software Concept of Electronic Signature, Access Control.

Module II: Types of E-Commerce
Meaning of B2C, B2B, C2C, P2P. Applications in B2C- E-Banking, E-Trading. E-Auction - Introduction and overview of these concepts. Application of B2B- E-distributor, B2B service provider, benefits of B2B on Procurement, Just in time delivery. Consumer to consumer and peer to peer business model Introduction and basic concepts.

Module III: E-Marketing
Traditional Marketing V/S E-Marketing, Impact of Ecommerce on markets, Marketing issue in E-Marketing, Promoting your E-Business. Direct marketing, one to one marketing.

Module IV: E-Finance
Areas of E-Financing, E-Banking, traditional v/s E-Banking, operations in E-Banking. E-Trading-Stock marketing, trading v/s E-Trading, Importance of E-Trading, Advantages of E-trading, operational aspects of E-Trading.

Module V: E-Payment
Transactions through Internet, Requirements of E-Payment system, Post paid payment system- Credit card solutions, cyber cash Internet cheques. Instant Paid payment system- Debit card, direct debit. Prepaid payment system- Electronic cash, digicash, Netcash, cybercash, smart cards.

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

Text & References:
Text:
- Electronic Commerce from Vision to fulfilment, Third Edition, Elias M Awad, Pearson Education

References:
- Electronic Commerce – A manager's Guide, Ravi Kalakota & Andrew B. Shinston, PearsonEducation.
- Electronic Commerce - Technologies & Applications, Bhaskar Bharat, Tata McGraw Hill.
- Global E-Commerce, University Press, J. Christopher & T.H.K. Clerk.

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ECONOMIC SYSTEM AND SOCIETY

Course Code: ECO2104 **Credit Units: 03**

Course Objective:
This course will reflect the socio-economic change in historical perspective, capitalism as an economic system, structure of capitalism and capitalism in global context.

Course Contents:

Module I
Analyzing Socio-Economic Change in Historical Perspective

Module II
Capitalism as an economic system
Origins, nature and structure of capitalism; Accumulation and crisis; Alternative perspectives on capitalism.

Module III
The transition from feudalism to capitalism

Module IV: The evolving structure of capitalism
Monopoly capitalism, The modern corporation: divorce between ownership and control; The institutional diversity of capitalism; Alternative perspectives on the role of state.

Module V: Capitalism in Global Context
Multinational corporations and their impact on the developing economics; imperialism.

Examination Scheme:

Components	ATT	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

ATT-Attendance; **P**-Project; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination
Text & References:

Text:
- J. Schumpeter (1942), Capitalism, Socialism and Democracy, George Allen and Unwin (1976 edition).
- T. Bottomore (1985), Theories of Modern Capitalism, Allen & Unwin. Chapters on Weber & Schumpeter.

References:
- D. Foley (1983), "Commodity", in T. Bottomore et al(ed.), The Dictionary of Marxist Thought., OUP, (Indian edition, Maya Blackwell, 2000)
- R. Blackburn (ed.) (1972), Ideology in Social Science, Chapter 8, Fontana
- Rodney Hilton(ed.) The Transition from Feudalism to Capitalism, Introduction
- P. Hirst and J. Zeitiln (1997), "Flexible Specialization: Theory and Evidence in the Analysis of Industrial Change", in R. Boyer et al (ed.), Contemporary Capitalism, Cambridge University Press.

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READINGS IN MANAGEMENT

Course Code: MGT2130 **Credit Units: 02**

Course Objective:
The objective of this concentration elective is to inculcate reading habit along with value addition to the existing understanding of the subject. The book would be a kind of knowledge enhancer that would envision the student about some current thoughts related to the discipline. The book reading and its critical analysis would help broaden the intellectual horizon of the student. The selection of the book will be department specific so that it can be discipline specific.

Guidelines:
The student is expected to thoroughly go through the discipline related prescribed book with the objective of critically reviewing each aspect and character of the book. The student is supposed to have a detailed insight into the following:

1. Content
2. Writing style
3. Information/learning
4. Content handling
5. Characters(if any)
6. Thematic Clarity

The report is to be submitted in about 3000 words on A4 size sheets, Font 12pt., Times New Roman, 1.5 spacing. Headings in Font Size16

Evaluation:

Report on the Book in 3000 words	Written Test
50 marks	50 marks

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TERM PAPER

Course Code: MGT2131 **Credit Units: 02**

Course Objective:

The objective of this course is to judge the understanding as well as application of the knowledge gained by the students. The aim of the term paper is to provide the students with an opportunity to further enhance their knowledge in a sector of their choice by undertaking a significant practical unit of examining and analyzing various aspects of business management at a level commensurate with the learning outcomes of the various courses taken up them in the ongoing semester.

A term paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. At least one middle level or senior level person of a company from the chosen sector may be interviewed face to face.

Guidelines:

1. The term paper will be related to the contemporary business issue and the topic will be given by the department.
2. The presentation of the term paper is scheduled to be held before the commencement of Semester examinations.
3. The paper will carry 100 marks that will be marked on the basis of understanding and organization of content based on the literature review. The Bibliography shall form an important part of the paper.
4. Examples of a few broad areas for Term Paper (List is indicative, not exhaustive)
    - Credit rating
    - Risk management
    - Subprime meltdown and its after effect with case study from Indian industry
    - Corporate frauds
    - Micro finance institutions in India
    - Carbon Trading
    - IFRS
    - Celebrity Endorsement in real estate
    - Social media marketing
    - Green marketing
    - Sustainable branding practices
    - Relationship management
    - CSR
    - Balanced Score Card
    - Corporate Governance
    - Employee retention
    - NGOs.

Examination Scheme:

Organisation and relevance of content	Literature Review	Bibliography	Total
40	40	20	100

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PROJECT (WITH PRESENTATION & EVALUATION)

Course Code: MGT2132 **Credit Units: 03**

Objectives:
The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Chapter Scheme and distribution of marks:

Chapter 1: Introduction	– 10 marks
Chapter 2: Conceptual Framework/ National/International Scenario	– 25 marks
Chapter 3: Presentation, Analysis & Findings	– 25 marks
Chapter 4: Conclusion & Recommendations	– 10 marks
Chapter 5: Bibliography	– 05 marks

Components of a Project Report
The outcome of Project Work is the Project Report. A project report should have the following components:
1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.
2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.
3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.
4) Body of the Report: The body of the report should have these four logical divisions

- **a)** *Introduction:* This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.
- **b)** *Conceptual Framework / National and International Scenario*: (relating to the topic of the Project).
- **c)** *Presentation of Data, Analysis and Findings*: (using the tools and techniques mentioned in the methodology).
- **d)** *Conclusion and Recommendations:* In this section, the concluding observations based on the main findings and suggestions are to be provided.

5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.
6) Annexures: Questionnaires (if any), relevant reports, etc.
(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

The Steps of a Project Report

Step I: Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic.
- Relevance of the topic
- Time available at the disposal.
- Feasibility of data collection within the given time limit.
- Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

Step II: Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.
Step III: Collection of information and data relating to the topic and analysis of the same.
Step IV: Writing the report dividing it into suitable chapters, viz.,
Chapter 1: Introduction,
Chapter 2: Conceptual Framework / National & International Scenario,

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Chapter 3: Analysis & Findings
Chapter 4: Conclusion and Recommendations.

Step V: The following documents are to be attached with the Final Project Report.

1) Approval letter from the supervisor (Annexure-IA)
2) Student's declaration (Annexure-IB)
3) Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for Evaluation:

Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below:

- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bounded.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate.

Evaluation Scheme:

Project Report	Power Point Presentation & Viva	Total
75 marks	25 marks	100

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WORKSHOP

Course Code: MGT2133 **Credit Units: 01**

Course Objective:
A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two ways. The trainer has to make sure that the aspects covered are practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

Major Themes for Workshop:
The workshop may be conducted on any of the following major themes:
Accounting
Finance
Human Resources
Marketing
Economics
Operations
Supply Chain Management
These themes are merely indicative and the trainer may choose any recent and relevant topic of study.

Guidelines for Workshop:
The procedure for earning credits from workshop consists of the following steps:

1. Relevant study material and references will be provided by the trainer in advance.
2. The participants are expected to explore the topic in advance and take active part in the discussions held
3. Attending and Participating in all activities of the workshop
4. Group Activities have to be undertaken by students as guided by the trainer.
5. Evaluation of workshop activities would be done through test and quiz at the end of the workshop.
6. Submitting a write up of atleast 500 words about the learning outcome from the workshop.

Methodology:
The methodology followed at the workshop could be based on any one or more of the following methods:
Case Study
Business Game
Simulation
Group Activity
Role Play
Business Planning
Quiz

Examination Scheme:

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total
10	30	30	30	100

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LAW OF CONTRACT-II

Course Code: LAW2204 **Credit Units: 04**

Course Objective:
This course shall be taught after the students have been familiarized with the general principles of Contract in which the emphasis is on understanding and appreciating the basic essentials of a valid Contract and on the existence of Contractual relationship in various instances. Obviously, Contract Law assumes special significance to suit changes in society. These special Contracts are studied in the light of statutory provisions and decisional Law. With the invent of globalization in various sectors of economy today and are in need of specialized legal Professionals due to huge contractual requirements, joint venture Partnerships and the like, Therefore, this Course of Special Contracts provides an insight into the justification for special statutory provisions for certain kind of Contracts.

Course Contents:

Module I: Indemnity and Guarantee/Bailment and Pledge
Meaning, Distinction between Indemnity and Guarantee, Right / Duties of Indemnifier, Indemnified and Surety, Discharge of Surety, Kinds of Guarantee, Bailment and Pledge: Meaning and Distinction, Rights and Duties of Bailor/Bailee, Pawnor/Pawnee, Lien, Termination of Bailment.

Module II: Agency
Definitions of Agent and Principal, Appointment of an Agent, Authority of an Agent, Creation of agency: by agreement, Ratification and law, Relation of principal / agent, subagent and substituted agent, Ratification of Agents Authority, Revocation of Agency Authority, Effects of Agency on Contracts with third person, Personal Liability of agents, Termination of agency.

Module III: Sale of Goods Act 1930
Contract of Sale: Nature and definition, Conditions and Warranties, Transfer of Property and Title, Performance of the contracts, rights of unpaid seller, suit for breach of contract.

Module IV: The Indian Partnership Act, 1932
Nature of partnership firm, Relations of partners to one another and outsiders, Rights /Duties of partners *inter se*, Partnership Property: Relations of Partners to third parties, Liability for holding out, Minor as a partner; Incoming and outgoing partners, Dissolution of Partnership Firm, Modes of Dissolution, Consequences of dissolution, Registration of firms and effects of non registration.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Texts & References:
- Pollock and Mulla, Indian Contract Act
- Avtar Singh, Indian Contracts Act
- Mulla, D. F., Indian Partnership Act
- Desai, T.R., Law of Contracts and Partnership sale of good Act
- R.K. Bangia, Sales of Goods Act, 1930
- Avtar Singh, Sales of Good Act
- Avtar Singh, Indian Partnership Act.
- K. Sukumaran, Pollock & Mulls - The Indian Partnership Act

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ANALYSIS AND DESIGN OF BUSINESS SYSTEM

Course Code: MGT2204 **Credit Units: 03**

Course Objective:
The course aims at preparing students conceptualize and define scope and domain of system analysis and design. It also focuses on system development life cycle using conventional and structural look.

Course Contents:

Module I: The systems development Environment. (Information system development life cycle)
System & its parts, Types of Systems, Characteristics of a System, System Analyst in system Development, Developing Systems- SDLC, Approaches to System Development (Prototyping, Joint Application Design (JAD), Participatory Design (PD)), System Development Models (Waterfall model & Spiral Model), System Planning & Selection (Identifying, Selecting, Initiating & Planning System Development Project).

Module II: System Planning and Selection (Graphic technology modeling tool)
Identifying and Selecting Projects (Identifying potential development projects, classifying and ranking projects, and selecting projects for development), Methods for project identification and selection, Evaluation criteria for classifying and ranking projects, Initiating and Planning System Development Projects (Process & performed Activities, Deliverables & Outcomes), Assessing Project Feasibility (Economic, Operational, Technical, Schedule, Legal & Contractual, Political Feasibility)

Module III: System & Data Analysis (Data Analyzing Modeling)
Determining System Requirements (Traditional Methods, Modern & Radical Methods), Structuring System Requirements (Process Modeling – DFD, Logic Modeling – Structured English & Decision Tables, Conceptual Modeling – ER Model), Data Analysis & Techniques (Interpretive, Coding, Recursive Abstraction and Mechanical Technique), Types of Analysis (Descriptive, Exploratory, Confirmatory and Predictive), Modeling Methodologies (Bottom Up method & Top Down Method), Generic and Schematic Data Modeling.

Module IV: System & Database Design
System Design (Design Objectives, Phases in Designing, Purpose of System Design), System Design Goals, Type of Design, Design Strategy, System Decomposition (Modeling, Connection and Coupling of a System), System Design Methodologies, Database Design, Database Management System – an introduction, Overview of Data Models, Relational Database Model – Well structured relations, Keys, Schema & Subschema, Structure, Facilities & Users, Constraints, Anomalies, Functional Dependency, Normalization, Roles & Duties of System Administration.

Module V: System Implementation & Operation (System Management)
Activities in implementing (Coding, Testing & Installation, Documentation, Training, Support, Maintenance), Types of testing, planning installation, approaches to installation, Documenting a system, Training and Supporting users, Types & Frequencies of Training Methods, Reasons of System Implementation Failures, Project Closedown, Conducting System Maintenance – Types of Maintenance (Corrective, Adaptive and Perfective Maintenance), effective maintenance, Evaluation of System's Success, System Enhancement, Quality Assurance in System Cycle.

Module VI: System Security and Auditing
System Security: Data Security, Backup & Recovery during System & Database failure, Ethical Issues in System Development, Threat and Risk Analysis, Audit, System Audit, System Audit Standards (Planning, Implantation and Reporting Standards), System Analysis and Programming (Overview, Role & Duties of System Experts as Analyst and Programmer).

Examination Scheme:

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Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

Text & References:

Text:

- Essentials of System Analysis & Design, Second Edition, Valacich George Hoffer, Prentice-Hall India

References:

- Analysis and Design of information systems, James A. Senn
- Computer Based Information Systems, Kroeber, Donald W. and Watron, Hugh J.
- Systems Analysis & Design, E. M. Awad.
- Systems Analysis and Design – An Applied Approach, Dennis Wixom, Wiley

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INNOVATION & CREATIVITY MANAGEMENT

Course Code: MGT2205 **Credit Units: 03**

Course Objective:
To develop an appreciation for new ideas and out of the box thinking so that students can successfully imbibe the habit of innovative and creative thinking in situations is demanding such an approach.

Course Contents:

Module I:
Innovation Management- Introduction, characteristics, Components, Types, Models of Innovation process, Innovation Environment-Originators of Innovation, Key Drivers of Innovation, Factors influencing innovation, Nurturing innovation in e-business.

Module II:
Organizing for Innovation- Organizational theories and structures, traits of innovative organizations, current trends, factors influencing organizational design and size decisions, Need & Characteristics for creative organization, 7S framework, creativity crushers, fostering innovation climate and culture, The creativity Hit List.

Module III:
Research and Development management- Significance, Prerequisites, Process, Technology development approaches, management of R &D, In source to open source environment, R&D in small industry, Managing Creative employees, significance and challenges of managing creative employees, Traits of a creative person, motivation to creativity, strategies for unblocking creativity, factors influencing group creativity, Promoting group creativity, Left and right thinking, Linear and non-linear thinking process, creative thinking, Tradition vs creative thinking.

Module IV:
Individual creativity techniques- Inner and Directed creativity techniques, Group Creativity Techniques-creativity methods, writing techniques, techniques based on pictures, maps and networks, Product innovation-types of new products, Target markets for Disruptive Innovation, Technology strategies for innovation, new product development, packaging and positioning innovations, beyond product innovation, New product failures.

Module V:
Innovation Diffusion- Concept of diffusion and adaptation, diffusion types, Innovation diffusion theory, Innovation adoption by organizations, Innovation adoption across countries, Marketing strategy and the diffusion process.

Module VI:
Legal aspects of innovation- IPR, Indian Patents Act, trademark, Copyrights, Trade secrets, Towards Innovative Society-Innovation for social development, Spirit of innovation in India, Favourable and Unfavourable factors.

Examination Scheme:

Components	CT 1	HA	V	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

Text:

- Krishnamarcharyulu and Lalitha, *Innovation Management*, Himalaya Publishing House, New Delhi- 2007

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References:

- Plsek**,** *Creativity, Innovation and Quality***,** Prentice Hall of India, New Delhi-2003

SALIENT PEDAGOGICAL FEATURES-

1. Classroom teaching to focus on enhancing out of the box thinking.
2. Assignments: Practical tasks emphasising on honing up creative thinking.
3. Case study analysis: To enable students to appreciate the application of concepts in real life environment.
4. Active student participation in class discussions.
5. Role plays to boost spontaneity.

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HUMAN VALUES AND PROFESSIONAL ETHICS

Course Code: MGT2206 **Credit Units: 03**

Course Objective:
The aim of this course is to facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of value based living in a natural way. Recognize the need for lifelong learning and have the knowledge and skills that prepare them to identify the Moral issues involved in Management areas and to provide an understanding of the interface between Social, Technological and Natural environments.

Course Contents:

Module I: Human Values
Morals, Values, Types of values, evolution of human values, Ethics – Integrity – Work Ethic – Honesty – Courage –Empathy – Self-Confidence – Character, Challenges at Work place

Module II: Values in Management
Relevance of values in Management, need for values in global change, values for managers, holistic approach for managers in decision making, problems related to stress in corporate management

Module III:
Workplace Rights and Responsibilities: Organizational complaint procedures. Government agencies. Resolving Employee concerns. Limits on acceptable behavior in large corporation.
Work environment: Ethical and legal considerations, Organizational responses to offensive behavior and harassment. Ethics in a Global Context.

Module IV: Industrial Integrity
The epitome of industrial success, Integrity and organization, Exploring learning process of integrity, Consequences of lack of integrity.

Examination Scheme:

Components	CPA	Viva	HA	A	ME	EE
Weightage (%)	5	5	5	5	10	70

Text &References:
R R Gaur, R Sangal, G P Bagaria, 2010, *A Foundation Course in Human Values and Professional Ethics,* Excel Books

References:

- Ivan Illich, 1974, *Energy & Equity,* The Trinity Press, Worcester, and HarperCollins, USA
- E.F. Schumacher, 1973, *Small is Beautiful: a study of economics as if people mattered*, Blond & Briggs, Britain.
- A Nagraj, 1998, *Jeevan Vidya ek Parichay,* Divya Path Sansthan, Amarkantak.
- Sussan George, 1976, *How the Other Half Dies,* Penguin Press. Reprinted 1986, 1991
- PL Dhar, RR Gaur, 1990, *Science and Humanism*, Commonwealth Purblishers.
- A.N. Tripathy, 2003, *Human Values*, New Age International Publishers.
- Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, *Limits to Growth – Club of Rome's report*, Universe Books.

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READINGS IN MANAGEMENT

Course Code: MGT2230 **Credit Units: 02**

Course Objective:
The objective of this concentration elective is to inculcate reading habit along with value addition to the existing understanding of the subject. The book would be a kind of knowledge enhancer that would envision the student about some current thoughts related to the discipline. The book reading and its critical analysis would help broaden the intellectual horizon of the student. The selection of the book will be department specific so that it can be discipline specific.

Guidelines:
The student is expected to thoroughly go through the discipline related prescribed book with the objective of critically reviewing each aspect and character of the book. The student is supposed to have a detailed insight into the following:

- Content
- Writing style
- Information/learning
- Content handling
- Characters(if any)
- Thematic Clarity

The report is to be submitted in about 3000 words on A4 size sheets, Font 12pt., Times New Roman, 1.5 spacing. Headings in Font Size16

Evaluation:

Report on the Book in 3000 words	Written Test
50 marks	50 marks

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TERM PAPER

Course Code: MGT2231 **Credit Units: 02**

Course Objective:

The objective of this course is to judge the understanding as well as application of the knowledge gained by the students. The aim of the term paper is to provide the students with an opportunity to further enhance their knowledge in a sector of their choice by undertaking a significant practical unit of examining and analyzing various aspects of business management at a level commensurate with the learning outcomes of the various courses taken up them in the ongoing semester.

A term paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. At least one middle level or senior level person of a company from the chosen sector may be interviewed face to face.

Guidelines:

1. The term paper will be related to the contemporary business issue and the topic will be given by the department.
2. The presentation of the term paper is scheduled to be held before the commencement of Semester examinations.
3. The paper will carry 100 marks that will be marked on the basis of understanding and organization of content based on the literature review. The Bibliography shall form an important part of the paper.
4. Examples of a few broad areas for Term Paper (List is indicative, not exhaustive)
    - Credit rating
    - Risk management
    - Subprime meltdown and its after effect with case study from Indian industry
    - Corporate frauds
    - Micro finance institutions in India
    - Carbon Trading
    - IFRS
    - Celebrity Endorsement in real estate
    - Social media marketing
    - Green marketing
    - Sustainable branding practices
    - Relationship management
    - CSR
    - Balanced Score Card
    - Corporate Governance
    - Employee retention
    - NGOs.

EVALUATION

Organisation and relevance of content	Literature Review	Bibliography	Total
40	40	20	100

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PROJECT (WITH PRESENTATION & EVALUATION)

Course Code: MGT2232 **Credit Units: 03**

Objectives:
The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Chapter Scheme and distribution of marks:

Chapter 1: Introduction	– 10 marks
Chapter 2: Conceptual Framework/ National/International Scenario	– 25 marks
Chapter 3: Presentation, Analysis & Findings	– 25 marks
Chapter 4: Conclusion & Recommendations	– 10 marks
Chapter 5: Bibliography	– 05 marks

Components of a Project Report
The outcome of Project Work is the Project Report. A project report should have the following components:
1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.
2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.
3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.
4) Body of the Report: The body of the report should have these four logical divisions
a) *Introduction:* This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.
b) *Conceptual Framework / National and International Scenario*: (relating to the topic of the Project).
c*) Presentation of Data, Analysis and Findings*: (using the tools and techniques mentioned in the methodology).
d) *Conclusion and Recommendations:* In this section, the concluding observations based on the main findings and suggestions are to be provided.
5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.
6) Annexures: Questionnaires (if any), relevant reports, etc.
(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

The Steps of a Project Report

Step I: Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic.
- Relevance of the topic
- Time available at the disposal.
- Feasibility of data collection within the given time limit.
- Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

Step II: Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.
Step III: Collection of information and data relating to the topic and analysis of the same.
Step IV: Writing the report dividing it into suitable chapters, viz.,
Chapter 1: Introduction,
Chapter 2: Conceptual Framework / National & International Scenario,
Chapter 3: Analysis & Findings
Chapter 4: Conclusion and Recommendations.

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Step V: The following documents are to be attached with the Final Project Report.

1) Approval letter from the supervisor (Annexure-IA)
2) Student's declaration (Annexure-IB)
3) Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for evaluation:

Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below:

- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bounded.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate.

Evaluation Scheme:

Project Report	Power Point Presentation & Viva	Total
75 marks	25 marks	100

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WORKSHOP

Course Code: MGT2233 **Credit Units: 01**

Course Objective:
A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two ways. The trainer has to make sure that the aspects covered are practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

Major Themes for Workshop:
The workshop may be conducted on any of the following major themes:
Accounting
Finance
Human Resources
Marketing
Economics
Operations
Supply Chain Management
These themes are merely indicative and the trainer may choose any recent and relevant topic of study.

Guidelines for Workshop:
The procedure for earning credits from workshop consists of the following steps:

- Relevant study material and references will be provided by the trainer in advance.
- The participants are expected to explore the topic in advance and take active part in the discussions held
- Attending and Participating in all activities of the workshop
- Group Activities have to be undertaken by students as guided by the trainer.
- Evaluation of workshop activities would be done through test and quiz at the end of the workshop.
- Submitting a write up of atleast 500 words about the learning outcome from the workshop.

Methodology:
The methodology followed at the workshop could be based on any one or more of the following methods:
Case Study
Business Game
Simulation
Group Activity
Role Play
Business Planning
Quiz

Evaluation Scheme:

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total
10	30	30	30	100

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CONSTITUTIONAL LAW-I

Course Code: LAW2303 **Credit Units: 04**

Course Objective:
The course aims at analyzing constitutional institutions, its powers, limitations and interrelationships with one another and seeks to mould a frame of mind in the student to appreciate and assess constitutional policy and changes for the future.

Course Contents:
Module I: Fundamental Rights and Directive Principles, and Fundamental Duties
Idea of Fundamental Rights and their importance, against whom the Fundamental rights are available? Definition of 'State'? Law in Art. 13, Directive Principles; Nature and reasons for incorporation, inter-relationship between fundamental rights and directive principles, judicial policy towards Directive principles from Champakam to Minerva Mills and thereafter, Art. 51-A (K) and its correlation with Art. 21-A.

Module II: Freedom and Personal Liberty
Freedom of speech and expression and of press; Is Right to Information inclusive in Freedom of Speech and Expression? Freedom of Assembly, Freedom of Association, Freedom of Movement, Freedom to reside and settle, Freedom of profession/Business, etc. Art. 19: Are these freedoms absolute? Rights of an accused: Double Jeopardy, Self-incrimination and retrospective punishment, Art. 20; Right to life and personal liberty: Meaning of personal liberty, Procedure established by Law, Before Maneka Gandhi, Maneka Gandhi and thereafter, Art. 21; preventive detention and constitutional safeguards: Art. 22; Right to education Art. 21-A.

Module III: Equality and Protective Discrimination
Equality before Law and equal protection of Laws, meaning, constitutional provisions Arts 14, 15, 16, 17, 29 (2), 325: Total conspectus, Classification for differential treatment, prohibited grounds of discrimination: Arts. 15(1), (2), (3), 16 (2), (3), 29 (2); Protective Discrimination in favour of SC / ST and other backward classes and recent trends eg. Schedule IX and Reservation Policy, Women and children Art. 15, 15(3), 15(4), 15(5) Abolition of titles – Arts. 18.

Module IV: Secularism
Concept of Secularism, Indian Constitutional provisions, Indian concept of Secularism, Freedom of religion, Scope: Arts. 25, 26, Limits of Freedom, Religion and State in India, State Control and non-interference with religion; Minority rights: Why? Scope: Meaning and Minority, Minority right to educational institutions and judicial attitude.

Module V: Judicial Process under the constitution
Judicial Review : Nature of Judicial Review, Arts. 32, 136, 141, 226, 227.
Judges: Appointments, conditions of service, etc; Public Interest Litigation.
Supreme Courts Original and Advisory Jurisdiction.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- V.N. Shukla, Constitution of India
- M.P. Jain – Indian Constitutional Law.
- H.M. Seervai – Constitutional Law of India.
- Durga Das Basu – Shorter Constitution.
- P.M. Bakshi – Constitution of India.
- J.N. Pandey – Constitution of India..

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LAW OF CRIMES - I (INDIAN PENAL CODE SECTION 1-120B)

Course Code: LAW2304 **Credit Units: 04**

Course Objective:
Course on Law of Crimes aims at introducing students to the basic principles of criminal law. There has been a progressive as well as regressive change in the Indian society since Independence. A proper understanding of crimes and the causal factors for the occurrence of crime is extremely important in the larger context of India's development, if young law students are to use their knowledge and skills to build a just and humane society. The young law students are the would be lawyers and as such they must have an acquaintance with such knowledge to make criminal justice system serve the goals of social defense as well as social justice. Therefore, a study of the basic concepts of specific offences under the Indian Penal Code is imperative.

Course Contents:

Module-I: Introduction to Substantive Criminal Law: Extent and operation of the Indian Penal Code, Definition of Crime, Fundamental elements of crime, Stages in commission of a crime, Intention, Preparation, Attempt.

Module-II: Punishment: Theories: Deterrent, Retributive, Preventive, Expiatory and Reformative Theory. Punishment under the IPC: Fine, Imprisonment, Capital Punishment.

Module-III: General Explanations and Exceptions: Definitions, Constructive joint liability, Mistake, Judicial and Executive acts, Accident, Necessity, Infancy, Insanity, Intoxication, Consent, Good faith, Private defence

Module-IV: Abetment and Criminal Conspiracy

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Ratanlal & Dhirajlal – The Indian Penal Code
- K. D. Gaur – A Text Book on Indian Penal Code
- S.N. Misra, Indian Penal Code
- B.M. Gandhi, Indian Penal Code (1996), Eastern, Nagpur.
- P.S. Achutan Pillai, Criminal Law (1995) Eastern, Lucknow

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FAMILY LAW-I

Course Code: LAW2305 **Credit Units: 04**

Course Objective:
This Course aims at providing adequate Sociological perspective so that the basic concepts relating to family are expounded in their social setting. It is designed to address the various aspects of Hindu Law and strives to give an overview of some of the current problems arising out of the foundational inequalities in the various family concepts.

Course Contents:

Module I: Introduction (Sources, Schools and Joint Hindu Family)
Sources and Schools of Hindu Law; The Concept, Formation and incidents of Joint Hindu Family of Mitaksharaand Dayabhaga; The Coparcenaries : It's formation and various incidents of Joint Hindu Family of Mitakshara and Dayabhaga; Karta of the Joint Family : His position, powers, privileges and obligation.

Module II: Hindu Marriage (Vivah) and Matrimonial Remedies (The Hindu Marriage Act, 1955)
Hindu Marriage: Nature, concept, Essential conditions & Prohibitions; Void & Voidable Marriages; Divorce: Customary and Judicial- Matrimonial fault theory, irretrievable breakdown and of marriage; Option of puberty; Restitution of conjugal rights; Judicial separation.

Module III: Alimony, maintenance, Adoption and Guardianship (The Hindu Adoption and Maintenance Act, 1956 and The Hindu Minority and Guardianship Act, 1956)
Maintenance of neglected wives, divorced wives, minor children, disabled children and parents under sections 125, 127 of Code of Criminal Procedure, 1973; Alimony : Temporary Permanent; Maintenance: Pendente Lite and permanent and maintenance for Divorced Hindu women under The Hindu Adoption and Maintenance Act, 1956; The Hindu Minority and Guardianship Act, 1956,

Module IV: Law of Succession, inheritance and Partition among Hindus (The Hindu Succession Act, 1956)
Property under Mitakshara Law and Dayabhaga: Formation and Incidents; Devolution of interest in MitaksharaCoparcenaries, Coparcenaries with reference to the provisions of Hindu Succession Act, 1956, Succession to property of Hindu female dying intestate under the Hindu Succession Act, 1956, Disqualifications relating to succession; Partition and Re-union**.**

Module V: Dispositions of Property under Hindu Law
Testamentary Disposition (Will): Definition and basis, Capacity of the Legatee, Formalities of a Will; subject matter of Will, Restrictions on testamentary power of disposition, interpretation of the Will, Revocation of the Will; Disposition inter vivos (Gift).

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Mulla, D.F., Principles of Hindu Law
- Paras Diwan, Modern Hindu Law
- Mulla, D.F., Principal of Mohammadan Law
- Fyzee, A.A.A., Outlines of Mohammadan Law
- Mahmood, T., Muslim Law of India
- Paras Diwan, Law of Intestate and Testamentary Succession (1998), Universal

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THE CODE OF CRIMINAL PROCEDURE

Course Code: LAW2311 **Credit Units: 04**

Course Objective:
In the absence of effective enforcement machinery, the substantive Criminal Law which defines offences and provides punishments for them, would be almost worthless. Therefore, the need of the Code of Criminal Procedure. The present course intends at acquainting the students with the various pre judicial and judicial procedures. This course also includes the rights and duties of those proceeded against and the powers, duties and restraints on those administering the criminal judicial process.

Course Contents:
Module I: Introduction
The importance of Fair Trial - constitutional perspectives of fair trial: Articles 14, 20, 21, Section – 2: Definitions; classes of Criminal Courts: Sections 6 to 13 including their powers and jurisdiction. The organization of Police, Prosecutor, Defense Counsel and Prison Authorities alongwith their duties, functions and powers.

Module II: Pre – Trial processes
FIR, Arrest and Bail provisions, bonds, process to compel appearances and production of things, search and seizure – search warrants, search without warrants, police search during investigations, general principles of search, seizure and constitutional aspects of validity of search and seizure proceedings.

Module III: Charge and common features relating to Trials
Form of Charge, joinder of charges, alteration of charge, basic rule regarding charge and its trial, withdrawal of charges, effect of error in the charge. Language of Courts, decision on evidence partly recorded by one judge or magistrate and partly by another, summary procedure to deal with certain cases of perjury and certain kinds of contempt of court, evidence in inquiries and trials, general provisions as to inquiries and trials, provisions as to accused persons of unsound mind.

Module IV: Criminal Trials and Execution Proceedings
Trial before Court of Sessions, Trail of warrant case by magistrate, Trial of Summons Case, Summary Trial, Judgment, submission of death sentence for confirmation, execution, suspension, remission and commutation of sentences.

Module V: Review Procedures
Appeal, Review and Reference

Module VI: Miscellaneous
Maintenance of wives, children and parents, Transfer of criminal cases, Irregular proceedings, Limitations for taking cognizance, Security for keeping peace and for good behavior, Disputes as regarding immovable property, Probation of Offenders Act

Module VII
Juvenile Justice (Care & Protection of Children) Act 2000. Concept of juvenile delinquency, juvenile court system, treatment and rehabilitation of juveniles, law for protection of juvenile offenders. Juvenile Justice (Care &Protection of Children) Act 2014.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Ratan Lal and Dheeraj Lal, Criminal Procedure Code
- D.D. Basu, Criminal Procedure Code
- R.V. Kelkar, Lectures on Criminal Procedure Code
- R.V. Kelkar, Code of Criminal Procedure

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- Chandrasekharan Pillai (ed.) Kelkar's Outlines of Criminal Procedure (2001), Eastern, Lucknow.

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INDUSTRIAL PSYCHOLOGY

Course Code: MGT2305 **Credit Units: 03**

Course Objective:
This course is designed to provide an overview of I/O Psychology including individual, group, and organizational issues resulting in enhanced understanding of the world of business and related career concerns. The main aim is to create awareness about the role and importance of Psychological factors and processes in the world of work

Course Contents:

Module I: Introduction
Nature and scope of organizational Psychology, History and development of field, Major problems of Industrial Psychology, Current trends in organizational Psychology

Module II: Types of Psychology
Mental psychology, Male & Female psychology, Impact on behavior and efficiency

Module III: Test of Psychology
Types of Tests, Effectiveness of these tests, Measures to control the tests steps to improve the psychology

Module IV: Individual and group behavior
Interaction and psychology involved in individuals, Improving psychology, Group Dynamics, Characteristics of group behavior, Attitude measurement, Methods of measuring attitudes,
Leadership and supervision, Theories of Leadership.

Module V: Performance Management
Performance appraisal- Introduction, types, importance, Training and development- Introduction, significance and categories/types.

Examination Scheme:

Components	C	HA/P	CT	V	A	EE
Weightage (%)	10	5	5	5	5	70

C - Case Discussion/ Presentation; HA - Home Assignment; P - Project; S - Seminar; V - Viva; Q - Quiz; CT - Class Test; A - Attendance; EE - End Semester Examination

Text &References:

- Miner J.B. (1992) Industrial/Organizational Psychology. N Y : McGraw Hill.
- Blum & Naylor (2004) Industrial Psychology. Its Theoretical & Social Foundations CBS Publication.

References:

- Aamodt, M.G. (2012) Industrial/Organizational Psychology : An Applied Approach (7th edition) Wadsworth/Thompson : Belmont, C.A.
- Aswathappa K. (2008). Human Resource Management (fifth edition) New Delhi : Tata McGraw Hill.

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TERM PAPER

Course Code: MGT2331 **Credit Units: 02**

Course Objective:

The objective of this course is to judge the understanding as well as application of the knowledge gained by the students. The aim of the term paper is to provide the students with an opportunity to further enhance their knowledge in a sector of their choice by undertaking a significant practical unit of examining and analyzing various aspects of business management at a level commensurate with the learning outcomes of the various courses taken up them in the ongoing semester.

A term paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. At least one middle level or senior level person of a company from the chosen sector may be interviewed face to face.

Guidelines:

1. The term paper will be related to the contemporary business issue and the topic will be given by the department.
2. The presentation of the term paper is scheduled to be held before the commencement of Semester examinations.
3. The paper will carry 100 marks that will be marked on the basis of understanding and organization of content based on the literature review. The Bibliography shall form an important part of the paper.
4. Examples of a few broad areas for Term Paper (List is indicative, not exhaustive)
    - Management practices
    - Talent management
    - HR cases from Indian any industry
    - Employee motivation
    - Managerial competencies
    - Employability skills
    - Industrial relations
    - Knowledge management
    - Social media
    - Green marketing
    - Six Sigma
    - Sustainable branding practices
    - Training and development
    - Relationship management
    - CSR
    - Performance management system
    - Balanced Score Card
    - Corporate Governance
    - Employee retention
    - NGOs.

Evaluation Scheme:

Organisation and relevance of content	Literature Review	Bibliography	Presentation & Viva	Total
30	30	20	20	100

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PROJECT (WITH PRESENTATION & EVALUATION)

Course Code: MGT2332 **Credit Units: 03**

Objectives:
The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Chapter Scheme and distribution of marks:

Chapter 1: Introduction	– 10 marks
Chapter 2: Conceptual Framework/ National/International Scenario	– 25 marks
Chapter 3: Presentation, Analysis & Findings	-- 25 marks
Chapter 4: Conclusion & Recommendations	-- 10 marks
Chapter 5: Bibliography	-- 05 marks

Components of a Project Report
The outcome of Project Work is the Project Report. A project report should have the following components:
1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.
2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.
3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.
4) Body of the Report: The body of the report should have these four logical divisions

a. *Introduction:* This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.
b. *Conceptual Framework / National and International Scenario*: (relating to the topic of the Project).
c. *Presentation of Data, Analysis and Findings*: (using the tools and techniques mentioned in the methodology).
d. *Conclusion and Recommendations:* In this section, the concluding observations based on the main findings and suggestions are to be provided.

5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.
6) Annexure: Questionnaires (if any), relevant reports, etc.
(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

Steps of a Project Report

Step I: Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic.
- Relevance of the topic
- Time available at the disposal.
- Feasibility of data collection within the given time limit.
- Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

Step II: Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.
Step III: Collection of information and data relating to the topic and analysis of the same.
Step IV: Writing the report dividing it into suitable chapters, viz.,
Chapter 1: Introduction,
Chapter 2: Conceptual Framework / National & International Scenario,

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Chapter 3: Analysis & Findings
Chapter 4: Conclusion and Recommendations.

Step V: The following documents are to be attached with the Final Project Report.

1) Approval letter from the supervisor (Annexure-IA)
2) Student's declaration (Annexure-IB)
3) Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for evaluation:

Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below:

- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bounded.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate.

Evaluation Scheme:

Project Report	Power Point Presentation & Viva	Total
75 marks	25 marks	100

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(Annexure I B)

Declaration

I .....hereby declare that the Project Work with the title (in block letters).....
submitted by me for the partial fulfilment of the degree of BBA is my original work and has not been submitted earlier to any other University /Institution for the fulfilment of the requirement for any course of study.

I also declare that no chapter of this manuscript in whole or in part has been incorporated in this report from any earlier work done by others or by me. However, extracts of any literature which has been used for this report has been duly acknowledged providing details of such literature in the references.

Signature of supervisor:

Signature of the student
Name:
Registration No

Place:
Date:

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WORKSHOP

Course Code: MGT2333 **Credit Units: 01**

Course Objective:
A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two ways. The trainer has to make sure that the aspects covered are practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of faculties.

Major Themes for Workshop:
The workshop may be conducted on any of the following major themes:

- Accounting
- Finance
- Human Resources
- Marketing
- Economics
- Operations
- Supply Chain Management

These themes are merely indicative and the trainer may choose any recent and relevant topic of study.

Guidelines for Workshop:
The procedure for earning credits from workshop consists of the following steps:

1. Relevant study material and references will be provided by the trainer in advance.
2. The participants are expected to explore the topic in advance and take active part in the discussions to be held
3. Attending and Participating in all activities of the workshop
4. Group Activities have to be undertaken by students as guided by the trainer.
5. Evaluation of workshop activities would be done through test and quiz at the end of the workshop.
6. Submitting a write up of atleast 500 words about the learning outcome from the workshop.

Methodology:
The methodology followed at the workshop could be based on any one or more of the following methods:

- Case Study
- Business Game
- Simulation
- Group Activity
- Role Play
- Business Planning
- Quiz

Evaluation Scheme:

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total
10	30	30	30	100

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SUMMER INTERNSHIP EVALUATION-I

Course Code: LAW2335 **Credit Units: 03**

It is a mode of Clinical Legal education Specified period to be spent by the student with a law firm/court/Commissions/NGO's and like institutions working with the realm of law or connected therewith. The reports both by the student and the office together with diary where applicable to be certified will be submitted for evaluation

The Internship during the summer break is a compulsory course. There is a Internship Data form where students fill in the details of where they are interning with complete address and phone numbers Customized Legal Reference /Diary is provided to the students on payment They maintain a day to day record of the work that they do at the place they are interning. They are expected to intern for a minimum 90 days. They submit their completed diary, certificate from the employer and also a report of their experience at work. After submission there is a Viva by concerned faculty. They assess the student on the kind of work they have done during internship, presentation of the work they have done and also on the practical knowledge they have gained

The Paper is marked out of 100 marks. The break up of the marks is as follows:

1.	Diary submission	25 Marks
2.	Report and certificate	25 Marks
3.	Viva (Panel of External Examiners)	40 Marks
4.	Attendance (Regularity in meeting the supervisor)	10 Marks
	Total	**100**

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RESEARCH METHODOLOGY AND REPORT PREPARATION

Course Code: MGT2410 **Credit Units: 03**

Course Objective:
To provide an exposure to the students pertaining to the nature and extent of research orientation, which they are expected to possess when they enter the industry as practitioners. To give them an understanding of the basic techniques and tools of marketing research. To train the students in evaluating and developing the marketing information system.

Course Contents:

Module I: Introduction
Nature and scope of marketing research, Marketing research as input in decision making process, Marketing research and marketing information system. Applications of marketing research, Planning a research project, Problem identification and formulation of Research Design, introduction to Research Design, Market research on the Internet.

Module II: Data collection methods
Attitudes measurement and scaling techniques, Ratio, Interval, Ordinal and nominal scales, Likert's scale, Thurstone scale, Semantic differentiation method. Observation methods and questionnaire method, Questionnaire design, Steps in constructing a questionnaire, Types of questions, introduction to Projective techniques and perceptual mapping.

Module III: Sampling
Sampling decisions, Sampling frame, Sample selection methods - Probability and non probability, Sample size, sampling error and error in sampling. Application of sampling methods to marketing problems.

Module IV: Data Collection Field Force
Data collection field force, Fieldwork procedure, common sources of error in the fieldwork, minimizing fieldwork errors, Tabulation of collected data.

Module V: Data Analysis
Data analysis-1, Test of significance Z, t, F and chi-square, Data analysis-II, Correlation and regression techniques, Data analysis – III – Cluster Analysis, Introduction to Statistical Package

Module VI: Report Writing
Research presentation and research process examination; Report writing - Types of research report. Examination of the research procedure, Selected applications of marketing research, identifying market segments, Product research, Advertising research**.**

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

Text & References:
Text:
- Luck, David J and Rubin, Ronald S., Marketing Research, Seventh edition, Prentice Hall of India

References:
- Aaker, David A; Kumar V and George S., Marketing Research, Sixth edition, John Wiley & Sons
- Boyd, Harper W, Westphall, Ralph & Stasch, Stanely F, Market Research – Text & Cases, Richard D. Irwin Inc. Homewood, Illinois.

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CONSTITUTIONAL LAW-II

Course Code: LAW2403 **Credit Units: 04**

Course Objective:
The course material seeks to introduce the student to the relevance of inalienable fundamental rights and restrictions in the Constitution of India and the principles that ought to guide policy making in India. The student is expected to appreciate the text and the juristic discourse by reference to landmark case laws, juristic opinion and vibrant classroom discussions as the subject raises issues, conflict of interests and dilemmas in a pulsating democracy with changing dynamic priorities in a developing country like India.

Course Contents:
Module I: Distribution of powers between Centre and States – (Arts. 245-281)
Legislative Powers, Administrative Powers, Financial Powers, Relevant Doctrines: Territorial nexus, Harmonious construction, Pith and substance, Repugnancy: Overview of Panchayati Raj Provisions (Art. 243), Freedom of Trade and Commerce.

Module II: Union and State Executive, legislature and Judiciary
Union Executive, President: Appointment, Election, Removal, conditions of service; Powers of president focus on ordinance, pardon, emergency; Assessment of relevance of presidential office on governance; Council of ministers and Prime minister: Appointment, Conditions, functioning, collective responsibility, dismissal of cabinet minister; Office of Attorney General: Significance, Appointment, functions, Conditions; State executive, Governor: Appointment, Removal, Powers, State cabinet dismissal; governors role in the context of centre state relations. (Art 79-122).
Union Legislature: Lok Sabha, Composition, functioning, membership, qualifications and disqualifications, Dissolution of, Effect; Bills : Procedure for the passage; Privileges of legislature; State legislature: functioning, dissolution ; Anti defection law and its impact. (Arts. 168-212).
Union Judiciary: Supreme Court Judges: Appointment, removal, impeachment; jurisdiction of Supreme Court: Original, appellate, advisory, Court of Record; Assessment of independence of judiciary; State judiciary: High Court Judges: Appointment, transfer, removal, promotion; High Court jurisdiction, Art. 226, writs; Subordinate judiciary. (Arts. 124 -147) (Arts. 214 to 237).

Module III: Emergency Provisions
National, State and financial Provisions.

Module IV: Miscellaneous
Official Language, Language of Courts, Trade, Commerce and Intercourse in India, Services Under the Union and State, Elections, Parliamentary, Privileges and Schedules, etc .

Module V: Amendment of the Constitution
Amendment of Constitution, Doctrine of basic Structure.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Texts & References:
- V.N. Shukla, Constitution of India
- M.P. Jain – Indian Constitutional Law.
- H.M. Seervai – Constitutional Law of India.
- Durga Das Basu – Shorter Constitution.
- P.M. Bakshi – Constitution of India.
- J.N. Pandey – Constitution of India.

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ADMINISTRATIVE LAW

Course Code: LAW2404 **Credit Units: 04**

Course Objective:

Administrative law is as old as the administration itself. However, the form in which we find it today, Administrative is described a most outstanding legal development of the twentieth century. The reason for this development can only be attributed to a change of philosophy as regards the role and function of the State. The change in the concept of State from 'laissez faire' to a 'welfare state' has led to emergence of state activities in almost all spheres of human life. With the phenomenal increase in the area of state operation, the State was bound to take over a number of functions which were earlier left to private enterprise. In order to ensure that such functions are performed effectively and further due to certain other factors namely contingency, expertise etc. administrative agencies are given extraordinary powers and functions such as to make rules and deciding disputes apart from its wide discretionary powers. Obviously, this necessitated a new set of laws to check the possible abuses of such extraordinary powers on the part of administration. The courts in India and abroad in the course of time have developed various doctrines and methods to deal with such p[problems. However, there is no end to this journey. The field is still open for new changes.

The main thrust of administrative law has been to study the nature of functions and powers exercised by the authorities on whom they have been conferred on and the study of remedies available to common man in case the limits of exercising power are transferred by such an authority. The focus or the centre point of this study, as usual as in cases of the study of other branches of public law, is the rights of individual *wis a wis* the public interest.

Course Contents:

Module I: Evolution, Nature and scope of Administrative law

Definitions, scope, classification and reason for the growth of administrative law; Relationship between constitutional law and administrative law; doctrine of Separation of Powers and its application in administrative law; Doctrine of Rule of law and application in administrative law.

Module II: Legislative function of Administration

Delegated legislation: Necessity for delegated legislation, classification of delegated legislation and its requirement, constitutionality of delegated legislation, All form of control of delegated legislation i.e. Parliamentary, Procedural and Judicial control (doctrine of ultra vires).

Module III: Judicial function of Administration

Reason for Administrative adjudication; Tribunals and classification of Tribunals; Principles of Natural Justice; Ombudsman: Lokpal, Lokayukta; Central Vigilance Commission (CVC).

Module IV: Administrative discretion

Need and legality and abuses; Constitutional objections and discretion, failure to exercise discretion; Doctrine of proportionality; Legitimate expectation.

Module V: Judicial control of administrative action

Courts as the final authority to determine the legality of Administrative actions ; Public Interest Litigation and the principle of *locus standi*, laches, Judicial review ; scope and extent, statutory appeals, writs.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- M.P. Jain and S.N. Jain: Principles of Administrative Law.
- I.P. Massey: Administrative Law.
- C.K. Talewani: Lectures on Administrative Law.
- De Smith: Judicial Review of Administrative Action.
- H.W.R. Wade: Administrative Law
- S.P. Sathe: Administrative Law.

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FAMILY LAW-II

Course Code: LAW2405 **Credit Units: 04**

Course Objective:
Family Law II Course is mainly devoted to the study of Muslim Personals Law relating to Marriage, Maintenance, Dower, Adoption & Guardianship, Divorce, Hiba, Pre-emption, Succession, and disposition of Property. The main objective of the course is to provide an indepth knowledge of the Laws governing Muslims.

Course Contents:

Module I: Introduction (Sources, Schools and Muslim Marriage (Nikah)
Sources and Schools of Muslim Law**:** Shia and Sunni; Muslim Marriage: Nature and concepts of Muslim Marriage, Essential conditions of a valid marriage, prohibitions/ disabilities, classification of marriage and effects of valid, irregular, void marriage.

Module II: Dower and Matrimonial Remedies (Dower, Restitution, Separation and Divorce)
Dower : Concept and Nature; Divorce under Muslim personal Law, Nullity of marriage;Option of puberty; Restitution of conjugal rights; Judicial separation; Grounds for divorce under Muslim Law; Bars to matrimonial relief under Muslim Law; Grounds for Divorce under Indian Dissolution of Muslim Marriage Act 1939.

Module III: Alimony, maintenance and Adoption&Guardianship (Hizanat)
Maintenance of neglected wives, divorced wives, minor children, disabled children and parents who are unable to support themselves vide sections 125, 127 of Code of Criminal Procedure, 1973;Alimony and maintenance as an independent remedy,Maintenance (Nafaqa) for Muslim Women under the Muslim Women Protection of Right on Divorce Act, 1986; Guardianship under Muslim Law.

Module IV: Law of Succession and inheritance among Muslims
General rules of succession; inclusion and exclusion of inheritors to the property. Classification of heirs under Hanafi and IthmaAsharia School and their shares and distribution of property.

Module V: Dispositions under Muslim Law, Waqf and Pre- Emption
Wasiyat : Testamentary Disposition and various incidents of wasiyat. Disposition inter vivos (Gift), Gift (Hiba), Musha, Revocation of Gifts; Distinction between Hiba, Ariya, Sadaqa&Wakf, Hiba-bil-Sharatful- ewaz, Gift during death illness (Marz-ul-maut).
Waqf :Meaning, Kinds, Objects,purpose, Requisites and various incidents of waqf.
Pre-emption – Origin, Definition, Classification, Subject matter, formalities, effects, constitutional validity.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Mulla, D.F., Principles of Hindu Law
- Paras Diwan, Modern Hindu Law
- Mulla, D.F., Principal of Mohammadan Law
- Fyzee, A.A.A., Outlines of Mohammadan Law
- Mahmood, T., Muslim Law of India
- Paras Diwan, Law of Intestate and Testamentary Succession (1998), Universal .

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LAW OF CRIMES - II (INDIAN PENAL CODE SECTION- 121-511)

Course Code: LAW2406 **Credit Units: 04**

Course Objective:

Course on Law of Crimes aims at introducing students to the basic principles of criminal law. There has been a progressive as well as regressive change in the Indian society since Independence. A proper understanding of crimes and the causal factors for the occurrence of crime is extremely important in the larger context of India's development, if young law students are to use their knowledge and skills to build a just and humane society. The young law students are the would be lawyers and as such they must have an acquaintance with such knowledge to make criminal justice system serve the goals of social defense as well as social justice. Therefore, a study of the basic concepts of specific offences under the Indian Penal Code is imperative.

Course Contents:

Module-I: Offences affecting the Human body: Offences affecting life, causing miscarriage, or injuries to unborn children, Offences of hurt, of wrongful restraint and wrongful confinement, Offences of criminal force and Assault, offences of kidnapping and Abduction

Module-II: Offences against Women: Obscene acts and songs, Outraging the modesty of women, Rape, Cruelty by husband or relatives of husband, Offences relating to marriage

Module-III: Offences against Property: Theft, Extortion, robbery and dacoity, Criminal misappropriation and criminal breach of trust, Cheating, Mischief, Criminal trespass

Module-IV: Defamation and offences relating to documents and property marks: Defamation**,** Forgery**,** Counterfeiting.

Module-V: Offences against State, Public Tranquillity, Public Servants, Religion

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Ratanlal & Dhirajlal – The Indian Penal Code
- K. D. Gaur – A Text Book on Indian Penal Code
- S.N. Misra, Indian Penal Code
- B.M. Gandhi, Indian Penal Code (1996), Eastern, Nagpur.
- P.S. Achutan Pillai, Criminal Law (1995) Eastern, Lucknow.

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BUSINESS INFORMATION AND DATA BASE SYSTEM

Course Code: MGT2404 **Credit Units: 03**

Course Objective:
The aim of this course is to introduce the students to the managerial issues relating to information systems, its role in organization and how information technology can be leveraged to provide business value.

Course Contents:

Module I:
MIS need and concepts, characteristics, Typology of MIS, Structure of MIS. Planning for MIS, System Development Methodologies, Conceptual and detailed designs of MIS, System Implementation strategies and process, System Evaluation and Maintenance.

Module II:
Introduction to data base management system- Data versus information, record, file; data dictionary, database administrator, functions and responsibilities, file-oriented system versus databases system.

Module III:
Advanced Concepts in Information Systems: Enterprise Resource Planning, Supply Chain Management, Customer Relationship Management, Data, Warehousing and Data Mining.

Module IV:
Database system architecture- Introduction, schemas, sub schemas and instances; data base architecture, data independence, mapping, data models, types of database systems.

Module V:
Data base security- Threats and security issues, firewalls and database recovery; techniques of data base security; distributed data base.

Examination Scheme:

Components	C	H	CT	V	A	EE
Weightage (%)	5	5	10	5	5	70

Text & References:

- James, A. O'Brien, *Introduction to Information Systems*, Tata McGraw-Hill Publishing Co. Ltd., New Delhi, 2005.
- Kenneth C. Laudon and Jane P. Laudon, *Management Information Systems*, Prentice-Hall of India, New Delhi, 9th Edition, 2006.

References:
- Navathe, *Data Base System Concepts* 3rd, McGraw Hill.
- Date, C.J., *An Introduction to Data Base System* 7ed, Addision Wesley.
- Singh, C.S., *Data Base System*, New Age Publications, New Delhi.

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PERSONAL FINANCIAL PLANNING

Course Code: MGT2405 **Credit Units: 03**

Course Objective:

Post Liberalization, India has witnessed a phenomenal growth in her GDP. With the advent of MNC's, and growth in private business, individuals income and saving pattern has changed. Therefore the need arises to manage these funds in a manner that it is no more called as savings but addressed as a need for Personal financial planning. This course is essential for every student irrespective of the specialization as every individual needs to plan his finances.

Course Contents:

Module I: Introduction to personal financial planning and personal accounting

Concept of Personal Financial Planning: Need, Significance, Scope; Ethical issues in Personal Financial Planning; Changing per capita investors. Need to maintain Accounts, Methods: Traditional & Using Electronic Media. Applying for PAN & filing of Income Tax returns.

Module II: Investment Avenues

Real Assets: Investment in Real Assets: Real Estate, Precious Metals, Other Fixed assets. Their relative merits & demerits. Change in their returns over the past few years.

Financial Assets: Investments in securities: Through IPO, Secondary Market. Investment in G-sec; Debt instruments, Post Office instruments, Insurance Policies, Mutual Funds, Certificate of Deposits, Foreign Market.

Module III: Introduction to Income tax and Income from salary

Introduction to Income tax act 1961 and Finance Act. Previous year, Assessment year, Income, Total Income, Gross Total Income, Capital and Revenue Receipts / Expenditures, Exempted Incomes, Residential Status and incidence of Tax.

Salary, Exemption:- Leave encashment, Gratuity, Pension, Annuity, Pension fund, Allowance (HRA, Entertainment, Special allowance – dependent of expense ad not dependent on expenae, perquisites – rent free accommodation, Leave travel concession, medical facility), Deductions 80c to 80u.). Sections (2(9), 2(31), 2(7), 2(24), 3, 6, 14, 288A, 288B, 2(17), 4, 9, 45, 9(1)(ii), 9(1)(iv), 9(1)(v), 10, 11, 12, 17(1), 22,

Module IV: Income from house property, capital gains and other sources

Income from House Property(Types of house property, Exempted house property income, Computation of GAV and NAV, Treatment of unrealized, recovered and arrears of rent), Capital Gains and other Sources (Short term & Long term capital gain, Cost of acquisition, Cost of improvement, Index cost, Income that are taxed under other sources, Deduction under other sources, Tax treatment of lotteries, puzzles. Sections 23, 24, 2528, 30, 31, 32.

Module V: Tax planning

Concept, significance and problems of tax planning, Tax evasion and tax avoidance, Individual Taxation Slabs, Wealth Tax, Gift Tax, Capital Gains Tax, Service tax, Recent Tax saving schemes

Module VI: Retirement & Goal Planning

Concept of risk assessment of individual, Introduction to portfolio management, Retirement planning & investment: Income generation after retirement, liability management, anticipation of expenses. Investment for major goals: House, Family, Education, Medical, Wealth Management/ Financial Advisory companies. Their role, significance & growth.

Examination Scheme:

Components	P-1	C-1	CT-1	Attendance	EE1
Weightage (%)	10	5	10	5	70

Text & References:

Text:

- Chandra P, Investment analysis and Portfolio Management, 3rd edition, Tata McGraw Hill
- Lal & Vashisht, Direct Taxes, 29th Edition, Tata McGraw Hill.

References:

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- V.K.Bhalla, Security analysis and Portfolio Management, 16th edition, S.Chand

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TERM PAPER

Course Code: MGT2431 **Credit Units: 02**

Course Objective:

The objective of this course is to judge the understanding as well as application of the knowledge gained by the students. The aim of the term paper is to provide the students with an opportunity to further enhance their knowledge in a sector of their choice by undertaking a significant practical unit of examining and analyzing various aspects of business management at a level commensurate with the learning outcomes of the various courses taken up them in the ongoing semester.

A term paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. At least one middle level or senior level person of a company from the chosen sector may be interviewed face to face.

Guidelines:

1. The term paper will be related to the contemporary business issue and the topic will be given by the department.
2. The presentation of the term paper is scheduled to be held before the commencement of Semester examinations.
3. The paper will carry 100 marks that will be marked on the basis of understanding and organization of content based on the literature review. The Bibliography shall form an important part of the paper.
4. Examples of a few broad areas for Term Paper (List is indicative, not exhaustive)
    - Credit rating
    - Risk management
    - Subprime meltdown and its after effect with case study from Indian industry
    - Corporate frauds
    - Micro finance institutions in India
    - Carbon Trading
    - IFRS
    - Celebrity Endorsement in real estate
    - Social media marketing
    - Green marketing
    - Sustainable branding practices
    - Relationship management
    - CSR
    - Balanced Score Card
    - Corporate Governance
    - Employee retention
    - NGOs.

EVALUATION

Organisation and relevance of content	Literature Review	Bibliography	Total
40	40	20	100

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PROJECT (WITH PRESENTATION & EVALUATION)

Course Code: MGT2432 **Credit Units: 03**

Objectives:
The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Chapter Scheme and distribution of marks:

Chapter 1: Introduction	– 10 marks
Chapter 2: Conceptual Framework/ National/International Scenario	– 25 marks
Chapter 3: Presentation, Analysis & Findings	-- 25 marks
Chapter 4: Conclusion & Recommendations	-- 10 marks
Chapter 5: Bibliography	-- 05 marks

Components of a Project Report
The outcome of Project Work is the Project Report. A project report should have the following components:
1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.
2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.
3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.
4) Body of the Report: The body of the report should have these four logical divisions

a. *Introduction:* This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.
b. *Conceptual Framework / National and International Scenario*: (relating to the topic of the Project).
c. *Presentation of Data, Analysis and Findings*: (using the tools and techniques mentioned in the methodology).
d. *Conclusion and Recommendations:* In this section, the concluding observations based on the main findings and suggestions are to be provided.

5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.
6) Annexures: Questionnaires (if any), relevant reports, etc.
(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

Steps of a Project Report

Step I: Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic.
- Relevance of the topic
- Time available at the disposal.
- Feasibility of data collection within the given time limit.
- Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

Step II: Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.
Step III: Collection of information and data relating to the topic and analysis of the same.
Step IV: Writing the report dividing it into suitable chapters, viz.,

Chapter 1: Introduction,

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Chapter 2: Conceptual Framework / National & International Scenario,
Chapter 3: Analysis & Findings
Chapter 4: Conclusion and Recommendations.

Step V: The following documents are to be attached with the Final Project Report.

1) Approval letter from the supervisor (Annexure-IA)
2) Student's declaration (Annexure-IB)
3) Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for evaluation:
Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below:

- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bounded.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate.

Evaluation Scheme:

Project Report	Power Point Presentation & Viva	Total
75 marks	25 marks	100

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WORKSHOP

Course Code: MGT2433 **Credit Units: 01**

Course Objective:
A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two ways. The trainer has to make sure that the aspects covered are practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

Major Themes for Workshop:
The workshop may be conducted on any of the following major themes:
Accounting
Finance
Human Resources
Marketing
Economics
Operations
Supply Chain Management
These themes are merely indicative and the trainer may choose any recent and relevant topic of study.

Guidelines for Workshop:
The procedure for earning credits from workshop consists of the following steps:

1. Relevant study material and references will be provided by the trainer in advance.
2. The participants are expected to explore the topic in advance and take active part in the discussions held
3. Attending and Participating in all activities of the workshop
4. Group Activities have to be undertaken by students as guided by the trainer.
5. Evaluation of workshop activities would be done through test and quiz at the end of the workshop.
6. Submitting a write up of atleast 500 words about the learning outcome from the workshop.

Methodology:
The methodology followed at the workshop could be based on any one or more of the following methods:
Case Study
Business Game
Simulation
Group Activity
Role Play
Business Planning
Quiz

EVALUATION

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total
10	30	30	30	100

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LAW OF EVIDENCE

Course Code: LAW2502 **Credit Units: 04**

Course Objective:
This paper is to orient students with importance of evidence for establishment of claims and the related rules and principles.

Course Contents:

Module I: Definitions and Relevancy of Facts
Evidence and its relationship with the substantive and procedural laws ;Definitions : Facts, facts in issue, relevant, evidence proved, disproved, not proved, oral and documentary evidence ;Relevancy and admissibility; Doctrine of *res gestae* ;Conspiracy.

Module II: Admissions, confessions and statements by person who cannot be called as witnesses:
Definition of admission, who can make admissions by or on their behalf, proof of admission against the persons making them and admissions in civil cases. (Section 17-23, 31); Definition, relevance and consideration of confessions (section 24-30); Dying declaration (Section 32 and Section 33). **Opinion of Third Persons (Sec. 45 to 51) & Character Evidence (Sec. 52 to 55).**

Module III: Documentary Evidence
Primary and Secondary Evidence, Proof and verification of documents; Public documents and presumption as to documents.

Module IV: Production and Effect of Evidence
Burden of proof (Sections 101-114); Estoppels (Section 115); Competence of witnesses (Sections 118-120).

Module V: Examination of Witnesses (Sections 135-166) and Rejection of evidence (Section 167)
Examination –in-chief : Cross Examination, Re-examination; Leading questions; Hostile witnesses; Refreshing memory; Judge's power to put questions or order production.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Ratanlal and Dheerajlal : Law of Evidence
- Monir Field : Law of Evidence
- Batuklal : Law of Evidence
- Avtar Singh : Evidence Law
- Bare Act : Indian Evidence Act, 1872

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CODE OF CIVIL PROCEDURE

Course Code: LAW2503 **Credit Units: 04**

Course Objective:
This paper is to help a law student to acquire a thorough knowledge of procedural aspects of working of civil courts and other machineries.

Course Contents:

Module I: Initial steps in a suit
Jurisdiction and place of suing; Institution of suit, cause of action, joinder, non-joinder and mis-joinder of parties; Summons; Pleadings: Meaning, object, General rules, Amendment of pleadings; Plaint and written statement: Particulars, set off and counter claim; Admission return and rejection; Discovery, Inspection and production of documents; Appearance and non-appearance of parties, ex-parte proceedings; First hearing: Meaning, object, framing of issues, omission to frame issues, disposal of suit in the first hearing; Trial: Summoning and attendance of witnesses, summons to produce documents, adjournment, hearing of suit.

Module II: Significant Terms and Definitions
Definitions: Decree, Judgment, Order, Foreign Court, Foreign Judgment, Mesne, Profits, Affidavit, Suit, Plaint, Written Statement, Suit of civil nature ;Important Concepts: Res Sub-Judice, Resjudicata, Restitution, Caveat, Inherent powers of courts.

Module III: Interim Orders
Commissions, Arrest before judgment, Attachment before judgment, Temporary Injunctions, Interlocutory orders, Receiver, Security of costs.

Module IV: Suits in Particular Cases
Suits by or against Government, Suits by Indigent persons, Interpleader Suit, Summary Procedure, Suits relating to public nuisance. Execution Proceedings

Module V: Law of Limitation
Definitions, period of limitation, plaintiff, defendant; and in foreign countries, limitation of suits, appeals, and application, computation of period of limitation.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Mulla's Code of Civil Procedure, Universal, Delhi
- C.K. Thakkar's (Takwani), Code of Civil Procedure
- Majumdar, P.K. and Kataria, R.P., Commentary on the Code of Civil Procedure, 1908, universal, Delhi.

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LABOUR LAW-I

Course Code: LAW2504 **Credit Units: 04**

Course Objective:

The course aims at imparting to the students an indepth understanding of Labour Laws in India by recourse to relevant judicial pronouncements in this regard.

Course Contents:

Module I: Regulation of Trade Union & Unfair Labour Practices

History of Trade Union Movement in India and need to form Trade Union, Workers Right to form Union vis-à-vis Indian Constitution; the Membership of Trade Union, Closed shop and Union shop, Registration of Trade Union, Remedies in case of non-registration and cancellation of registration of union, Privileges and Protection of registered Trade Union form certain acts and omissions, Unfair labour practices and victimization.

Module II: Collective Bargaining:

Concept and importance of collective bargaining, Pre-requisites for collective bargaining, Process of administering collective agreement (Negotiation, Mediation, & Voluntary arbitration & Compulsory Arbitration.), Duration and enforcement of bipartite Agreement (Secs. 18, 19, Industrial Disputes Act, 1947), Pressurization: Strike, Go-Slow, wok to rule, Gherao and Lockout.

Module III: Regulation of Industrial Disputes

Define the concept of Industry, Industrial Dispute and workman, Power of Government to refer Industrial Disputes for adjudication: The Adjudicatory Machinery, Award and its binding nature, Judicial review of Awards, The concept of lay-off, retrenchment and procedure and compensation relating to lay-off and retrenchment.

Module IV: Standing Orders

Concept, Nature and scope of standing orders under Industrial Employment (Standing Order) Act, 1946, Formulation of Standing Orders and its Certification process, Modification: Modification and temporary application of Model Standing Order, Interpretation and Legal status of Standing Orders.

Module V: Discipline in Industries

Doctrine of hire and fire in the context of social welfare, Fairness in disciplinary process: Meaning of misconduct, Right to know: The Charge Sheet, Right to defend; Domestic enquiry notice, evidence, cross examination, unbiased enquiry officer and reasoned decision, Punishment of misconduct, Prenatal (permission) and Postnatal (Approach) control during pendency of proceeding (Sec. 33 of industrial and Disputes Act).

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- O.P. Malhotra, Law of Industrial Disputes.
- Indian Law Institute, Labour Law and Labour Relations.
- K.D. Srivastava, Commentary of Industrial Employment (S.C.) Act, 1946.
- S.C. Srivastava, Industrial Relation and Labour Law.
- Report of National Commission on Labour, 1969.
- Industrial Disputes Act, 1947.
- R.B. Sethi & R.N. Dwivedi, Law of Trade Union.

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PROPERTY LAW

Course Code: LAW2505 **Credit Units: 04**

Course Objective:
The subject imparts to the student an understanding of the law in India relating to transfer of immovable property and the norms and doctrines that aid in carrying out secure transactions in this regard.

Course Contents:

Module I: Jurisprudential Basis (Sections 5-21)
Concept and meaning of property – New property, Kinds of property – movable and immovable property, tangible and intangible property,

Module II: Sale of Immovable Property
Doctrine of Election Sec. 35, Fraudulent Transfer Sec. 53 ; Sale of immovable property (Secs. 54 – 55). (Sale, Contract of Sale; Contract to sell; Rights and Liabilities of buyer and seller).

Module III: Specific Transfers
Mortgages of immovable Property: Secs. 58 – 77 (Kinds of mortgage, Rights and Liabilities of the mortgagor and mortgagee, Marshalling and Contribution (Secs. 81 – 82), Redemption (Secs. 91 – 96).

Module IV: Leases
Leases (Secs. 105 – 117): Definition, Leases how made, Rights and Liabilites of lesser and lessee, Charges (Section, 100 – 104).

Module V: Easements
Creation of Easements (Secs. 4 – 7), Nature and characteristics of Easements, Extinction, Suspension and Revival of Easements (Secs. 37–51), Riparian Rights, Licenses (Secs. 52 – 64).

Module VI
Indian Stamp and Registration Act.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Mulla, D.F., Transfer of Property Act.
- Shukla, S.N., Transfer of Property Act.
- Shah, S.M., Transfer of Property Act.
- Tripathi, Lectures on Indian Easement Act.
- Jain, J.D., Indian Easement Act.

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TERM PAPER

Course Code: MGT2531 **Credit Units: 02**

Course Objective:

The objective of this course is to judge the understanding as well as application of the knowledge gained by the students. The aim of the term paper is to provide the students with an opportunity to further enhance their knowledge in a sector of their choice by undertaking a significant practical unit of examining and analyzing various aspects of business management at a level commensurate with the learning outcomes of the various courses taken up them in the ongoing semester.

A term paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. At least one middle level or senior level person of a company from the chosen sector may be interviewed face to face.

Guidelines:

1. The term paper will be related to the contemporary business issue and the topic will be given by the department.
2. The presentation of the term paper is scheduled to be held before the commencement of Semester examinations.
3. The paper will carry 100 marks that will be marked on the basis of understanding and organization of content based on the literature review. The Bibliography shall form an important part of the paper.
4. Examples of a few broad areas for Term Paper (List is indicative, not exhaustive)
    - Credit rating
    - Risk management
    - Subprime meltdown and its after effect with case study from Indian industry
    - Corporate frauds
    - Micro finance institutions in India
    - Carbon Trading
    - IFRS
    - Celebrity Endorsement in real estate
    - Social media marketing
    - Green marketing
    - Sustainable branding practices
    - Relationship management
    - CSR
    - Balanced Score Card
    - Corporate Governance
    - Employee retention
    - NGOs.

EVALUATION

Organisation and relevance of content	Literature Review	Bibliography	Total
40	40	20	100

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PROJECT (WITH PRESENTATION & EVALUATION)

Course Code: MGT2532 **Credit Units: 03**

Objectives:
The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Chapter Scheme and distribution of marks:

Chapter 1: Introduction	– 10 marks
Chapter 2: Conceptual Framework/ National/International Scenario	– 25 marks
Chapter 3: Presentation, Analysis & Findings	-- 25 marks
Chapter 4: Conclusion & Recommendations	-- 10 marks
Chapter 5: Bibliography	-- 05 marks

Components of a Project Report
The outcome of Project Work is the Project Report. A project report should have the following components:
1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.
2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.
3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.
4) Body of the Report: The body of the report should have these four logical divisions

- *Introduction:* This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.
- *Conceptual Framework / National and International Scenario*: (relating to the topic of the Project).
- *Presentation of Data, Analysis and Findings*: (using the tools and techniques mentioned in the methodology).
- *Conclusion and Recommendations:* In this section, the concluding observations based on the main findings and suggestions are to be provided.

5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.
6) Annexures: Questionnaires (if any), relevant reports, etc.
(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

Steps of a Project Report

Step I: Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic.
- Relevance of the topic
- Time available at the disposal.
- Feasibility of data collection within the given time limit.
- Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

Step II: Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.
Step III: Collection of information and data relating to the topic and analysis of the same.
Step IV: Writing the report dividing it into suitable chapters, viz.,

Chapter 1: Introduction,

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Chapter 2: Conceptual Framework / National & International Scenario,
Chapter 3: Analysis & Findings
Chapter 4: Conclusion and Recommendations.

Step V: The following documents are to be attached with the Final Project Report.

1) Approval letter from the supervisor (Annexure-IA)
2) Student's declaration (Annexure-IB)
3) Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for evaluation:

Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below:

- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bounded.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate.

Evaluation Scheme:

Project Report	Power Point Presentation & Viva	Total
75 marks	25 marks	100

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WORKSHOP

Course Code: MGT2533 **Credit Units: 01**

Course Objective:
A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two ways. The trainer has to make sure that the aspects covered are practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

Major Themes for Workshop:
The workshop may be conducted on any of the following major themes:
Accounting
Finance
Human Resources
Marketing
Economics
Operations
Supply Chain Management
These themes are merely indicative and the trainer may choose any recent and relevant topic of study.

Guidelines for Workshop:
The procedure for earning credits from workshop consists of the following steps:

1. Relevant study material and references will be provided by the trainer in advance.
2. The participants are expected to explore the topic in advance and take active part in the discussions held
3. Attending and Participating in all activities of the workshop
4. Group Activities have to be undertaken by students as guided by the trainer.
5. Evaluation of workshop activities would be done through test and quiz at the end of the workshop.
6. Submitting a write up of atleast 500 words about the learning outcome from the workshop.

Methodology:
The methodology followed at the workshop could be based on any one or more of the following methods:
Case Study
Business Game
Simulation
Group Activity
Role Play
Business Planning
Quiz

EVALUATION

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total
10	30	30	30	100

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TRAINING AND DEVELOPMENT

Course Code: MGT2510 **Credit Units: 03**

Course Objective:
The objective of the course is to help students acquire and enhance their knowledge of how to plan, develop, carry out, and evaluate training and executive development programmes in Business Organizations.

Course Contents:

Module I: Introduction
Meaning and definition of training, Training vs education, Culture and Context, Introduction to training Strategy.

Module II: Process of Training
Establishing objectives, training need assessment, designing the programs, training methods, trainers and training styles, Introduction to Management Development program.

Module III: Evaluation of Training & Development
Training Evaluation – Need for evaluation, Measuring Training Effectiveness, Concept of Return on Investment, Cost – Benefit Analysis, Models of Training Evaluation.

Module IV: Training Systems
Action Research for better training, knowledge management, career development, succession planning, diversity training, orientation training.

Module V: Changes in Training Needs for Modern Organizations
Concept and Need for Learning Organizations, Training for Trainers, Leadership, Team Playing and Group Dynamics, Basics of Sensitivity Training, Computer Based Training.

Module VI: Development
Executive Development – significance & nature, identifying development needs and setting objectives. Techniques of development and advantages. Role of HRD in 21st Century.

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

Text & References:

Text:
- Lynton R.P and Pareek U (1990). Training for Development. Vistaar Publications, New Delhi

References:
- Goldstein, Training in Organizations, Thomson Learning
- Pareek Udai, Training and Development, Tata McGraw Hill.
- Srivastava, S., Recruitment, Selection & Retention, ABS Course pack, 1999.
- Wexley, K & Lathan Gary, Developing & Training HR in Organization. P. Hall, 2002.

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SUMMER INTERNSHIP EVALUATION-II

Course Code: LAW2535 **Credit Units: 03**

It is a mode of Clinical Legal education Specified period to be spent by the student with a law firm/court/Commissions/NGO's and like institutions working with the realm of law or connected therewith. The reports both by the student and the office together with diary where applicable to be certified will be submitted for evaluation

The Internship during the summer break is a compulsory course. There is a Internship Data form where students fill in the details of where they are interning with complete address and phone numbers Customized Legal Reference /Diary is provided to the students on payment They maintain a day to day record of the work that they do at the place they are interning. They are expected to intern for a minimum 90 days. They submit their completed diary, certificate from the employer and also a report of their experience at work. After submission there is a Viva by concerned faculty. They assess the student on the kind of work they have done during internship, presentation of the work they have done and also on the practical knowledge they have gained

The Paper is marked out of 100 marks. The breakup of the marks is as follows:

1.	Diary submission	25 Marks
2.	Report and certificate	25 Marks
3.	Viva (Panel of External Examiners)	40 Marks
4.	Attendance (Regularity in meeting the supervisor)	10 Marks
	Total	**100**

COMPANY LAW

Course Code: LAW2603 **Credit Units: 04**

Course Objective:
The paper aims to make the student familiar and to provide insight into formation and winding up of companies beside corporate administrations.

Course Contents:

Module I: Company
Definition, Characteristics, Lifting of Corporate Veil; Types of Companies;
Formation of a Company: Promoters, Pre-incorporation Contracts, Provisional Contracts,

Module II: Memorandum of Association, Articles of Association and Prospectus
Memorandum of Association; Articles of Association; Prospectus: Issues, contents, Kinds, liability for misstatements, Shelf Prospectus, Statement in lieu of Prospectus.

Module III: Share Capital
Issue and allotment of shares, SEBI guidelines on allotment, Issue of shares at premium and at discount, Share Certificate, Demat system ; Forfeiture and surrender of Shares, Transfer & Transmission of shares; Provisions relating to payment of dividend, Investor's Education and Protection Fund.

Module IV: Corporate Administration
Directors: kinds, powers and duties; Insider trading; Meetings kinds and procedure; The balance of powers within companies: Majority control and minority protection, Prevention of oppression, and powers of court and Central Government,

Module V: Winding up of Companies
Kinds, consequences and reasons of winding up; Role of the court; Liability of past members; Payment of liabilities; Reconstruction and amalgamation.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Avtar Singh : Indian Company Law
- Shah S. M : Lectures on Company Law
- Saharay H.K.: Company Law, 5th Edn.

LAW OF TORTS (MOTOR VEHICLES ACT AND CONSUMER PROTECTION ACT, 2019)

Course Code: LAW2604 **Credit Units: 04**

Course Objective:
This course aims to introduce the student to the specialized discipline of tort law that is one of the most litigated areas of law in west. In India this realm is on the verge of a lot of litigational activity. The course covers Consumer Protection Act as well as Motor Vehicle Act which are carved out from the general principles of tort.

Course Contents:

MODULE 1: Introduction:
- Nature and Definition of Torts
- Tort distinguished from Contract and Quasi-Contract
- Crime:
  - Conditions of liability including *damnum sine injuria*, *injuria sine damnum*
  - Remoteness of damages
- Maxims: *Ubijus ibi remedium*, *Res ipsa loquitor*, etc.
- Justification in Tort:
  - *Volenti non-fit Injuria*,
  - Necessity,
  - Plaintiff's default**,**
  - Act of God,
  - Inevitable accidents,
  - Private defences,
- Judicial and Quasi
  - Judicial Acts,
  - Parental and quasi-parental authority.

MODULE 2: Actions in Tort
- Assault
- Battery
- False Imprisonment
- Malicious Prosecution
- Defamation
  - Libel
  - Slander including defences in an action for defamation
- Vicarious Liability
- Liability of State
- Doctrine of Sovereign Immunity

MODULE 3: Negligence
- Negligence including contributory negligence and other defenses.
- Absolute liability/Strict liability, Rules in Ryland v. Fletcher.
- Principles for the application of the rule and defenses
- Enterprises engaged in hazardous activities – M.C. Mehta v. Union of India
- Nuisance Trespass

MODULE 4: Consumer Protection: Consumer Protection Act, 2019
- Brief overview of the Consumer Protection Act,2019.
- Major Difference between Consumer Protection Act, 2019 and Consumer Protection Act, 1986.
- Consumer Protection Act, 2019:
  - Consumer Protection Councils Chapter II: Ss. 3-9
  - Central Consumer Protection Authority: Section 2(4) Chapter III: Ss. 10-27

- Consumer Disputes Redressal Commission S. 2(15): District Commission S. 2(44): State Commission S. 2(29): National Commission Chapter IV- with special focus on Ss. 28,34, 35, 37,39, 41, 42, 47,51 53,54,58,59
- Product Liability
- Consumer Protection vis-a vis E-Commerce- Key Aspects

MODULE 5: Motor Vehicles:

- Motor Vehicles Claims and compensation:
  - Relevant provisions of the relating Motor Vehicles Act relating to the liability and assessment of compensation:
  - Liability without fault in certain cases : voidance of contracts restrictive of liability
  - Special provisions and scheme of compensation in case of hit and run motor accidents
- Offences, Penalties and Procedure
- Insurance of Motor Vehicles against Third Party Risks(Sec. 145 – 152)
- Claims Tribunals: Sec. 165-176
- Special provisions as to payment of compensation on structured formula basis: Claims on non-structured basis: Method of calculating compensation evolved by the courts(study with reference to relevant judgments)
- Defences: Changing parameters of negligence and burden of proof

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Books

- Winfield and Jolowicz, Tort
- Law of Torts, Universal law Publishing Company, Dr. S.P. Singh
- The Law of Torts: Ratanlal & Dhirajlal,
- Winfield, Law of Torts,
- Dr. D.N. Saraf, Law of Consumer Protection in India,
- Dr. Avtar Singh, Law of Consumer Protection in India, Dr. Gurjeet Singh, The law of Consumer Protection in India.
- Motor Vehicle Laws, Universal Law Publishing Company.

Reference Books

- William Salmond, "Salmond on the Law of Torts", Sweet & Maxwell, 16th Edition: 1973
- Heuston Salmond, "The Law of Torts", Universal Law Publishing Co Ltd: 2004
- Edward White, "Tort Law in America: An Intellectual History", Oxford University Press: 2003
- Frederick Pollock, "The Law of Torts: A Treatise on the Principles of Obligations Arising from Civil Wrongs in the Common Law: To which is Added the Draft of a Code of Civil Wrongs Prepared for the Government of India", BiblioBazaar: 2008
- Jenny Steele, "Tort Law: Text, Cases & Materials", Oxford University Press: 2007
- Vivienne Harpwood, "Modern Tort Law", Rutledge: 2008
- Carl F. Cranor, "Toxic Torts: Science, Law and the Possibility of Justice", Cambridge University Press: 2006
- N.R. Madhava Menon, "Documents and Court Opinions on Bhopal Gas Leak Disaster Case", National Law School of Indian University: 1991
- Upendra Baxi, Thomas Paul, "Mass Disaster and Multinational Liability: the Bhopal Case", N.M. Tripathi: 1986
- Upendra Baxi, Amita Dhanda and Indian Law Institute, "Valiant Victims and Lethal Litigation: the Bhopal Case", N.M. Tripathi: 1990
- Jenny B. Wahl, "Economic Analysis of Tort and Products Liability Law: A Collection of Essays & Cases (Law and Economics)", Routledge: 1998

LABOUR LAW-II

Course Code: LAW2605 **Credit Units: 04**

Course Objective:
The paper is to focus on wage policies, compensation for learn caused during the course of employment and working conditions of employees.

Course Contents:

Module I: Minimum Wages Act, 1948
Concept of Labour Welfare, Classification and Importance, Labour welfare activities, Concept of minimum wage, fair wage, living wage and need based minimum wage, Constitutional validity of the Minimum wages Act, 1948, Procedure for fixation and revision of minimum wages, Fixation of minimum rates of wage by time rate or by piece rate, Procedure for hearing and deciding claims.

Module II: Payment of Wages Act, 1936
Object, scope and application of the Act, Definition of wage, Responsibility for payment of wages, Fixation of wage period, Time of payment of wage, Deductions which may be made from wages, Maximum amount of deduction.

Module III: Workmen's Compensation Act, 1923
Definition of dependant, workman, partial disablement and total disablement, Employer's liability for compensation: Scope of arising out of and in the course of employment, Doctrine of notional extension, When employer is not liable, Employer's Liability when contract or is engaged, Amount of compensation, Distribution of Compensation, Procedure in proceedings before Commissioner, Appeals.

Module IV: Factories Act, 1948 & Social Security
Concept of "factory", "manufacturing process" "worker" and "occupier" : General duties of occupier, Measures to be taken in factories for health, safety and welfare of workers, Working hours of adults, Employment of young person and children, Annual leave with wages, Additional provisions regulating employment of women in factory, Social Security of Workmen ; Concept and scope of social security : Origin of Social Security in India, Claim and Adjudication of Disputes under Employee's State Insurance Act. 1948.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- S.C. Srivastava, Commentaries on factories Act, 1948, Universal Law Publishing House, Delhi
- H.L. Kumar, Workmen's Compensation Act, 1923.

CYBER LAWS

Course Code: LAW2606 **Credit Units: 04**

Course Objective:
With the advent of information technology law and Right to Information Law, new strides and strategies in legal justice education have come up. There is a need that Law students must also be acquainted with these new developments if a law student has to find a comfortable berth in the competitive legal market as a Law Professional as well as legal manager. Therefore, there seems to be an impending need to generate e-Legal Justice Education that exposes the students to have deep insights into the complexities of information technology and right to information. Objectives of this course, therefore, are understanding the legal recognition and procedure, Digital signatures, legal recognition of cyber authorities and Cyber appellate tribunal, legal implications of new varieties of offences and penalties under the Information Technology Act, 2000. A student of law should also be given the understanding of copy right issues, TRIPS agreements, application of patents to computer technology, etc. Besides, the course also aims at developing insights into the Right to Information Act, 2005 and its grey areas.

Course Contents:
Module I: Introduction (Need, Role and various aspect related to Cyber Law)
Need and role of Cyber; Jurisprudence of Cyber Law in India; Free speech and expression on Internet &Privacy; issues, Right to data protection, Cyber Law &Protection of Domain name.

Module II: Cyber Jurisdiction, Investigation & Cyber Forensics
Cybercrimes: Extradition and Jurisdictional issues; Investigation of Cyber Offences: Cyber equipment's& Cyber Cell; Cyber Forensics: provisions, need and role in cyber investigation.

Module III: Electronic Governance, Cyber space &IPR issues
Legal aspect of Electronic Governance; IPR Issues: An Overview, Patent, Copyright and Trademark& other related Issues in Cyberspace.

Module IV: Cyber Legislations (Laws, National and International treaties & Conventions)
Cyber Legislation: An Indian and International Regime; The Information Technology 2000, The Provisions relating to- Legal recognition of – Digital & Electronic Signature, Secure E- records and Signature, E- signature Certificates, Certifying Authorities, Cyber, Appellate Tribunal and Miscellaneous Provisions.

Module V: Cyber Crimes (Civil & Criminal)
Cyber Crimes and Cyber Victimization; Cyber Offences: Types & the provisions for Penalties mentioned in IT Act, 2000; Cyber Pornography, Cyber Terrorism, Cyber Tort and Cyber defamation etc.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Nandan Kamath, Universal Law Publishing Company and E –commerce: Law relating to computers Internet.
- K.K. Kumar, Dominant Publication: Cyber Law
- B.L. Wadhera : Patent, trademarks, Copyrights
- Ganguly (LMH): Intellectual Property Rights.

BRAND MANAGEMENT

Course Code: MGT2602 **Credit Units: 03**

Course Objective:
The objective of the course is to help the students understand and appreciate the theoretical concepts of brands. To generate the ability to apply the concepts in real life.

Course Contents:

Module I: Introduction
Meaning and importance of brands. Brands v/s products. Challenges and opportunities of branding. Concept of Brand Equity. Brand management process. Role of CRM in building brands.

Module II: Brand Positioning and value
Sources of brand equity. Brand Building. Implications of brand building. Brand positioning: Brand value. Internal branding.

Module III: Brand Marketing
Criteria for choosing Brand elements. Building brand equity: Product strategy, pricing strategy. Integrated marketing communication. Celebrity endorsements. Concept of co-branding

Module IV: Brand Performance and Branding strategies
Brand value chain, Brand equity management system. Brand hierarchy. Designing branding strategy. Brand extension: Concept, Advantages and disadvantages. Evaluating opportunities of brand extension. Branding strategy over PLC.

Module V: Managing Brands
Reinforcing Brands. Brands revitalization Managing brands internationally, advantages and disadvantages of global marketing. Standardization v/s customization. Global Brand strategy.

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

Text & References:

Text:

- Keller Kevin Lane, Strategic Brand Management: Building, Measuring and Managing Brand Equity, Second Edititon, Printice Hall.

References:

- Jean Noel Kampferer, Kogan Page, Strategic Brand Management, Second Edition
- Understanding Brands, Cowley D.

ADVERTISING AND SALES PROMOTION

Course Code: MGT2603 **Credit Units: 03**

Course Objective:
The objective of the course is to familiarize students with advertising concepts and strategies, the methods and tools used. Enabling them to develop advertising strategies and plans and to develop the judgment parameters required in product management, to evaluate advertising.

Course Contents:
Module I: Introduction
Role of Promotion in Marketing Mix. Components of promotion mix viz Advertising Publicity, Personal selling, Public relations and Sales promotion. Concept of integrated marketing communication.

Module II: Advertising
Need, scope objectives and importance of advertising, Strengths and Weaknesses of Advertising as a Promotion Tool, role of advertising in current market, advertising and society- latest trends in advertisements different types of advertisements.

Module III: Advertising Campaign Planning
Setting advertising goals and objectives- The DAGMAR Approach. Message strategies and tactics- Creative approaches, Copywriting and testing. Advertising copy design. Copy layout, Advertising appeals and themes, Classification of advertisement copies-Essentials of a good copy Ethics in advertising.

Module IV: Advertising Media and Agencies
Types of media, media planning and scheduling. Advertising budgets. Approaches to advertising budgeting. Measuring advertising effectiveness. Advertising business in India. Rural advertising. Legal and ethical aspects of advertising, Advertising and society. Advertising in international perspective.

Module V: Sales Promotion
Need, scope objectives and importance of sales promotion. Management of sales Promotion at the consumer, trade and sales force levels. Strengths and weaknesses of Sales Promotion.

Module VI: Sales Promotion Strategy
Planning and designing sales promotion programme with specific reference to sales contest, trade in discount coupons etc. sales display and merchandising. Latest trends in sales promotion.

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

Text & References:
Text:
- Belch and Belch, Advertising and Promotion, Sixth Edition, Tata McGraw Hill

References:
- Batra Rajeev, Aaker, David A and Myere John G. Advertising Management, Fifth Edition, Pearson Education
- Advertising Management – Chunawalla

TERM PAPER

Course Code: MGT2631 **Credit Units: 02**

Course Objective:

The objective of this course is to judge the understanding as well as application of the knowledge gained by the students. The aim of the term paper is to provide the students with an opportunity to further enhance their knowledge in a sector of their choice by undertaking a significant practical unit of examining and analyzing various aspects of business management at a level commensurate with the learning outcomes of the various courses taken up them in the ongoing semester.

A term paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. At least one middle level or senior level person of a company from the chosen sector may be interviewed face to face.

Guidelines:

1. The term paper will be related to the contemporary business issue and the topic will be given by the department.
2. The presentation of the term paper is scheduled to be held before the commencement of Semester examinations.
3. The paper will carry 100 marks that will be marked on the basis of understanding and organization of content based on the literature review. The Bibliography shall form an important part of the paper.
4. Examples of a few broad areas for Term Paper (List is indicative, not exhaustive)
    - Credit rating
    - Risk management
    - Subprime meltdown and its after effect with case study from Indian industry
    - Corporate frauds
    - Micro finance institutions in India
    - Carbon Trading
    - IFRS
    - Celebrity Endorsement in real estate
    - Social media marketing
    - Green marketing
    - Sustainable branding practices
    - Relationship management
    - CSR
    - Balanced Score Card
    - Corporate Governance
    - Employee retention
    - NGOs.

Evaluation Scheme:

Organisation and relevance of content	Literature Review	Bibliography	Total
40	40	20	100

PROJECT (WITH PRESENTATION & EVALUATION)

Course Code: MGT2632 **Credit Units: 03**

Objectives:
The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Chapter Scheme and distribution of marks:

Chapter 1: Introduction	– 10 marks
Chapter 2: Conceptual Framework/ National/International Scenario	– 25 marks
Chapter 3: Presentation, Analysis & Findings	-- 25 marks
Chapter 4: Conclusion & Recommendations	-- 10 marks
Chapter 5: Bibliography	-- 05 marks

Components of a Project Report
The outcome of Project Work is the Project Report. A project report should have the following components:
1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.
2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.
3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.
4) Body of the Report: The body of the report should have these four logical divisions

a. *Introduction:* This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.
b. *Conceptual Framework / National and International Scenario*: (relating to the topic of the Project).
c. *Presentation of Data, Analysis and Findings*: (using the tools and techniques mentioned in the methodology).
d. *Conclusion and Recommendations:* In this section, the concluding observations based on the main findings and suggestions are to be provided.

5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.
6) Annexures: Questionnaires (if any), relevant reports, etc.
(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

The Steps of a Project Report

Step I: Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic.
- Relevance of the topic
- Time available at the disposal.
- Feasibility of data collection within the given time limit.
- Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

Step II: Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.
Step III: Collection of information and data relating to the topic and analysis of the same.
Step IV: Writing the report dividing it into suitable chapters, viz.,
Chapter 1: Introduction,
Chapter 2: Conceptual Framework / National & International Scenario,
Chapter 3: Analysis & Findings

Chapter 4: Conclusion and Recommendations.

Step V: The following documents are to be attached with the Final Project Report.

1) Approval letter from the supervisor (Annexure-IA)
2) Student's declaration (Annexure-IB)
3) Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for evaluation:

Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below:

- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bounded.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate.

Evaluation Scheme:

Project Report	Power Point Presentation & Viva	Total
75 marks	25 marks	100

WORKSHOP

Course Code: MGT2633 **Credit Units: 01**

Course Objective:
A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two ways. The trainer has to make sure that the aspects covered are practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

Major Themes for Workshop:
The workshop may be conducted on any of the following major themes:
Accounting
Finance
Human Resources
Marketing
Economics
Operations
Supply Chain Management
These themes are merely indicative and the trainer may choose any recent and relevant topic of study.

Guidelines for Workshop:
The procedure for earning credits from workshop consists of the following steps:

1. Relevant study material and references will be provided by the trainer in advance.
2. The participants are expected to explore the topic in advance and take active part in the discussions held
3. Attending and Participating in all activities of the workshop
4. Group Activities have to be undertaken by students as guided by the trainer.
5. Evaluation of workshop activities would be done through test and quiz at the end of the workshop.
6. Submitting a write up of atleast 500 words about the learning outcome from the workshop.

Methodology:
The methodology followed at the workshop could be based on any one or more of the following methods:
Case Study
Business Game
Simulation
Group Activity
Role Play
Business Planning
Quiz

Evaluation Scheme:

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total
10	30	30	30	100

CORPORATE TAX PLANNING

Course Code: MGT2605 **Credit Units: 03**

Course Objective:
To provide understanding of Direct Tax including Rules pertaining there to and application to different business situations. To understand principles underlying the Service Tax and concepts of VAT.

Course Contents:

Module I: Introduction to Tax Management
Concept of tax planning, Tax avoidance and tax evasions, Corporate taxation.

Module II Income from business
Residential Status of companies, Taxable income under Business and Profession, Computation of Profit and Gains from business profession, Deemed business profits, Assessment of Retail Business, Deemed incomes (cash credit, unexplained investments, un explained money and other assets, unexplained expenditures, investments and valuable articles not fully disclosed in books of accounts).

Module III: Deductions allowed under business and profession
Deduction Expressly allowed section 30-35, Depreciation deduction calculation, Setoff and carry forward of unabsorbed depreciation section 32(2). Determining Actual Cost43(1), Set-off and Carry Forward Losses, Bonus or commission to employees section, Interest on borrowed capital, Insurance premium 36(1(i)), Employees contribution to provident fund, Bad debts 36, Revenue expenditure incurred by statutory corporation, Banking transaction tax, Security transaction tax, Commodity transaction tax, provision for adminisibility of general deduction 37(1),

Module IV: International accounting and Taxation
Analysis of foreign financial statement, Accounting standard: US GAAP, Indian GAAP, IAS, IFRS. Transfer Pricing – Meaning, measurement, strategic considerations Norms & Practices, tax havens, Double taxation agreement among countries, Tax implication of activities of foreign enterprise in India: Mode of entry and taxation respectively.

Module V: Indirect tax - concepts and general principles
Service tax - Charge of service tax and taxable services, Valuation of taxable services, Payment of service tax and filing of returns.
VAT – Introduction, Calculation of VAT Liability including input Tax Credits, Small Dealers and Composition Scheme, VAT Procedures, Central Sales Tax.

Module VI: Tax Planning and Financial Management Decisions
Tax planning relating to capital structure decision, Dividend policy, Inter – corporate, dividends and bonus shares, Tax provisions relating to free trade zones, Infrastructure sector and backward areas, Tax incentives for exports. Tax deductions and collection at source, Advance payment of tax.

Examination Scheme:

Components	P-1	C-1	CT-1	Attendance	EE1
Weightage (%)	10	5	10	5	70

Text & Reference:
Text:
- Lal & Vashisht, Direct Taxes, 29th Edition, Pearson

References:
- Singhania & Singhania, Income Tax, 39th Edition, Taxmann

BANKING AND FINANCIAL INSTITUTIONS

Course Code: MGT2606 **Credit Units: 03**

Course Objective:
The aim of the course is to orient the finance students to the change in the banking industry. The financial industry much like the computer industry is changing rapidly. The students will be familiarized with institutions of today and developing an understanding why they are the way they are, and why they are changing is the core aim of the course. An Indian perspective will be added but conceptually the Global frameworks will be used.

Course Contents:
Module I: Introduction
Money, Process of Capital Formation., Banking and Financial Institutions and economic development, Role of Development Banks in Industrial Financing.

Module II: Banking System & Operations.
Banking system and structure in India- Types of banks in operation and their functions, Retail and Wholesale Banking, Near Banks, Rural Banking. Cooperative Banking. Universal Banking, NBFCs- International Banking- financing exporters and importers – Important ECGC Policies and guarantees governing export financing) Banking Operation: An overview Principles of Lending, Study of Borrowers & Project Evaluation Criteria

Module III: Banking Sector Reforms
Provisions of Banking Regulation Act, Prudential Norms - Narsimhan Committee Recommendations, Regulatory Institutions RBI & SEBI, Basle Committee Recommendations, Asset Liability Management in Commercial Banks.

Module IV: Insurance Institutions
Introduction to Insurance – Elements of Insurance Risk, Principles of Insurance, Types of Insurance – Life Insurance and General Insurance Products including unit linked plans, Re-insurance, Bancassurance- concepts, critical issues & functional aspects. Role of Insurance companies in Industrial Financing.

Module V: Financial Inclusion
Concept, Financial Inclusion in India: Challenges, Scope of Financial Inclusion in banking activities & financial services.
Micro Finance as a tool of Financial inclusion: Evolution: Grameen Model, Self Help groups.
Progress in India, Principles of microfinance- institutional structures and delivery mechanisms. Enforcement and savings

Module VI: Trends in Banking
Banking Innovations. Marketing of banking services; Banking Technology - Internet banking, ATMs, mobile banking; Banking Technology - ECS, debit, credit and smart cards
Securitization (SARFAECI Act, SPV, ARC)

Examination Scheme:

Components	P-1	C-1	CT-1	Attendance	EE1
Weightage (%)	10	5	10	5	70

Text & References:
Text:
- Khan,M. 3rd Reprint, 1998, Financial Institutions and Markets, Tata McGraw Hill Publishing Company Limited.

References:
- Cornett and Sauunders, 1999, Fundamentals of Financial Institutions Management, 1999 McGraw Hill Publishing Company Limited.
- Bhole L.M., Third Edition, Financial Institutions and Markets; Structure, Growth and Innovations, Third Edition. Tata McGraw Hill Publishing Company Limited.
- Patahak.V Bharati Second Edition, The Indian Financial System Pearson Education

ADVANCED CORPORATE FINANCE

Course Code: MGT2607 **Credit Units: 03**

Course Objective:
The basic objective of this course is to acquaint the students with the latest developments in the field of corporate finance. This course will be a step above Financial Management II where they will learn advanced topics related to behavioural finance, corporate restructuring & corporate governance

Course Contents:

Module I: Introduction
Objectives of Corporate finance. Shareholder wealth maximization. Agency Problems, Management Compensation & measurement of Performance

Module II: Valuation Concepts
Valuation Models, Application of Valuation Model, EVA/MVA, Balanced scorecard and other methods/measures of financial performance.

Module III: Corporate restructuring
Differential Efficiency & Financial Synergy: Theory of Mergers**,** Operating Synergy & Pure Diversification: Theory of mergers**,** Costs and Benefits of Merger**,** Evaluation of Merger as a Capital Budgeting Decision**,** Poison Pills,Turnaround Strategies, Tax Planning relating to mergers and Amalgamation

Module IV: Corporate Governance& Business Ethics
Implementation of Corporate Governance**,** Ethics and finance, Ethical practices in market place, corporate responsibility, social audit and ethical investing.

Module V: Behavioural Finance
Introduction and Expected Utility, Non-Expected Utility Preferences, A review of classical probability theory, Beliefs, Biases and Heuristics, Preferences and Anomalies in the Financial markets

Module VI: Strategic Cost management
Financial aspects of supply chain management, Operations management perspective on Costs, Strategic cost analysis (using activity based costing, target costing and life cycle costing) and product pricing at Different stages of product's life cycle

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

Text & References:
Text:

- Brealey and Myers, Priciples of Corporate Finance, Eighth Edition, Tata McGraw Hill Publishing Company Limited.

References:

- Ross, Westerfield and Jaffe, Seventeenth Edition, Tata McGraw Hill.
- Quiry, P., Dallocohio, M., YannLE Fur,.Antonio Salvi, Seventh Edition, John Wiley and Sons

INDUSTRIAL RELATIONS AND LABOUR LAW

Course Code: MGT2608 **Credit Units: 03**

Course Objective:
The objective of the course is to acquaint students with the origin and importance of Labour laws governing general functioning of employees in an organisation and also to educate student with the important provisions under these laws .This will enable them to develop the right perspective of this delicate responsibility to deal with union constructively and to maintain industrial democracy.

Course Contents:

Module I: Basic Concepts
Industrial Relations, Industrial Peace, Industrial unrest and Industrial Discipline

Module II: Laws Relating to Industry
The factories Act, 1948 - Definition - Approval licencing and registration of factories - Notice by occupier, Health, and welfare measures - weekly holidays. Leave with wages, Employment of women and young person - Penalties and returns. The Industrial Disputes Act, 1947 - Definition – conciliation, court of enquiry and voluntary process for the settlement of industrial disputes - power of the Govt. under ID Act - Instrument of economic coercion - Strike & lock out, Lay off Retrenchment, Transfer and closures - Discharge and Dismissal - Managements prerogative during pendency of proceeding – Work Committee, arbitration and adjudication.

Module III: Laws Relating to Remuneration
The Payment of Wages Act, 1936 - Definition - Rules for payment of wages and deductions from wage. The Minimum Wages Act 1948 - Fixing of minimum wages, Procedure for raising minimum wage - Concept of living wages, Fair wage and minimum wage. The Employees State Insurance Act 1948 - Definition - Applicability of the Act - Insurable workmen - Contribution Benefit - Penalties. The Employees Provident Fund and Miscellaneous Provisions Act, 1952 and Employees family pension scheme - definition - Coverage of the organization and employees under the Act - Employees Provident Fund and pension fund scheme - Calculation of contribution withdrawal of Provident Fund amount - Penalties for offence. The Payment of Gratuity Act, 1972 - Definition - Scope and Coverage of the Act - Eligibility criteria - Calculation of Gratuity Nomination. The Payment of Bonus Act 1965 - Applicability of Act - Coverage of employee - Calculation of bonus Rate of Payable bonus - available surplus - allocable surplus.

Module IV: Laws Relating to Trade Union
The Trade Union Act 1926. Statutory Definition - Registration of TU Immoduley granted to Registered Trade Union - Recognition of TU.

Module V: Compensation and Insurance
The workmen's compensation Act 1923 - Definition - Rules regarding workmen's compensation - Defense available to employer and employees, The Maternity Benefit Act 1961.

Module VI: Misc Acts
The Industrial Employment (standing order) Act 1946 - Scope and coverage of the Act - Concept of standing order - its certification process - Modification - interpretation and enforcement of standing orders.

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

Text & References:

Text:

- P L Malik, Handbook of Labour and Industrial Law Eastern Book Publication 9th Edition 2005

References:

- R. C. Chawla and K.C. Garg, "Industrial Law", Ludhiana, Kalyani Publishers, 1993.
- P.L. Malik, "Industrial Law", Lucknow, Eastern Book Co., 1995.19th edition reprinted 2006
- J.K. Bareja, "Industrial Law", New Delhi, Galgotia Publishing Co., 2001.
- M.Y. Pylee and George Simon, "Industrial Relations and Personnel Management", New Delhi, Vikas Publishing House, 1996.
- P. Subba Rao, "Essentials of Human Resource Management and Industrial Relations: Text, Cases and Games", Mumbai, Himalaya, 2000.
- S.C. Shrivastava, "Industrial Relations and Labour Laws", New Delhi, Vikas Publishing House, 2000 Fourth revised Edition. Reprinted 2006

PERFORMANCE MANAGEMENT SYSTEM

Course Code: MGT2609 **Credit Units: 03**

Course Objective:
This course will help students understand the significance of appraisal for an organization and individuals. It will develop an understanding of various Performance Appraisal tools and their applications and potential appraisal. Further it will develop a right perspective in them towards managing and improving performance.

Course Contents:

Module I: Overview of Performance Management
Employee Motivation & Needs (Vroom's & Adam's Theory of Motivation), Performance Appraisal: The past & the future, Human Resource Development & Performance Appraisal, Planning Performance & Role Clarity, Accountability and Effectiveness.

Module II: Process of Performance Appraisal
Measuring Performance Appraisal – Objectives & Indicators, Methods of Appraisal – Contemporary & Modern methods, Performance feedback & counseling, PMS.

Module III: 360 degree Feedback
Definition, methodology, advantages/disadvantages of Feedback, RSDQ Model, and Criteria for success, Experiences in 360 appraisals.

Module IV: Potential Appraisal
Concept, difference between performance appraisal and potential appraisal, Competency mapping & potential appraisal –case studies

Module V: Performance Management in application
Performance Management and development, Performance Management and Pay, Creating High Performance organization.

Module VI: Emerging Concerns & Performance Management
Appraisal for future – going beyond tangible performance, HR Scorecard.

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

Text & References:

Text:

- T.V. Rao; Performance Management and Appraisal; Jaico Publication
- Dinesh K. Srivastava, "Strategies for Performance Management", New Delhi, 2005, Excel Books,

References:

- K Aswathappa; Human Resource and Personnel Management; McGraw- Hill Companies
- Desimone; Human Resource Development Thomson Learning

COMPENSATION AND REWARD MANAGEMENT

Course Code: MGT2610 **Credit Units: 03**

Course Objective:
The objective of this course is to familiarize students with the dynamics of wage and salary administration and current trends in India.

Course Contents:
Module I: Introduction
Overview of Compensation Management, Wage and Salary Administration – Nature, Importance, Philosophy, Objectives, Definition, Goals Role of various parties – Employees, Employers, Unions & Government and Legislations for compensation.

Module II: Developing Compensation Programs
Job Evaluation, Basic systems Time wage, Piece wage, Incentives, Wage payments and Total Salary Structure, Compensation Surveys, Hay Plan, Developing Competitive Compensation Programs, Developing Salary Structures

Module III: Derivatives of Compensation
Pay for Performance, Merit pay and Performance Appraisal, Performance based rewards, Performance Criteria Choices, and Competency Mapping & Developing Performance Matrix, Performance based Compensation Schemes.

Module IV: Incentive Plans
Incentive Plans: individual and group incentive plans, Productivity Gain sharing plans, Profit Sharing Plans, Non - Financial and Financial incentives, Measuring Cost- to – Company (CTC).

Module V: Employee Benefits
Employee Benefits: Supplemented Pay benefits (pay for time not worked) insurance benefits, Retirement benefits, Employees' service benefits, Introduction to ESOPs, Flexible benefits and Benefit Surveys.

Module VI: Current Trends
Current Trends in Compensation and Reward Management

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

Text & References:
Text:
- Garry Dressler, "Personnel / Human Resource Management", London, Prentice Hall, 1994.
- William B. Werther Jr. and Keith Davis "Human Resource Management". New Jersey: McGraw Hill. (1993)
- Milkovich & Newman, Compensation, Irwin/McGraw-Hill 8th Ed.

References:
- Frans Poets, The Art of HRD – Job Evaluation & Remuneration, Crest Publishing, Volume7 1st Edition
- Michael Armstrong, Helen Murlis, The Art of HRD – Reward Management, Crest Publishing
- Michael Armstrong, Employee Reward, (University Press)
- P. Zingheim, The New Pay, Linking Employee & Organization Performance, Schuster, (Jossey-Bass)
- Sara Rynes, Compensation in Organization, Gerhart (Jossey BASS)
- Wendell L French, "Human Resource Management", USA, Houghton Mifflin Company, 1994.
- David D. Decenzo and Stephen P. Robbins, "Human Resource Management", New Delhi, Prentice Hall, 3rd Edn., 1988.

HUMAN RIGHTS LAW

Course Code: LAW2701 **Credit Units: 05**

Course Objective:

Learning about human rights is largely cognitive, including human rights history, documents, and implementation mechanisms. All segments of society need to understand the provisions of the UDHR and how these international standards affect governments and individuals. They also need to understand the interdependence of rights, both civil and political and social, economic, and cultural. The course analyses International instruments on human rights, provisions of the Indian Constitution and protection of Human Rights Act emphasizing the role of NHRC and HRC. The Course include the study on the role of media, NGO and Human rights education at the grass root level to protect the basic rights of the people.

Course Contents:

Module I: The concept of Human Rights
Theoretical foundations of Human Rights- meaning, basic concept and origin of Human Rights,- Sources and significance of Human Rights-Different definitions of Human Rights-Classification of Human Rights.-Theories of Human Rights- Historical development of the concept of Human Rights- Concept of natural law and the concept of natural Rights- Human Rights in legal tradition- International law and National law.

Module II: UN and Human Rights
International documents related to Human Rights- Universal declaration of Human rights- Individual Rights and Group Rights- Significance and limitations- International Covenant on Civil and Political Rights,1966-International Covenant on Economic, Social and Cultural Rights,1966- Specific Conventions dealing with Human Rights-Importance and binding effect of above documents on the member countries of UN-Impact and implementation of Human Rights norms in India-Human Rights norms reflected in the Fundamental Rights under the Constitution of India- Directive principles legislative and administrative implementation of Human Rights norms-Implementation of Human Rights norms through judicial process. Regional arrangements –EU- Inter American System.

Module III: Human Rights under the Constitution and Different legislation in India
Provisions to ensure Human Rights to woman and children in India-Human Rights granted to Scheduled Castes and Scheduled Tribes and other socially and economically backward communities-Human Rights of prisoners

Module IV: Enforcement of Human Rights
Organs under the UN- International commissions of Human Rights- Amnesty International- American system and European system-Role of the Judiciary in India- Statutory Commissions- Woman's Commission- Minority Commission- SC/ST Commission.

Module V: Human Rights Commissions and Human Rights
Protection of Human Rights Act,1993- National Human Rights Commission- State Human Rights Commisions- Role of Media- Role of NGO's- Human Rights Education

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Jack Donnelly, Universal Human Rights in Theory and Practice (Cornell University Press, 2013)
- David P. Forsythe, Encyclopedia of Human Rights: Vol. 1 (Oxford University Press, 2009)
- Beth A. Simmons, Mobilizing for Human Rights: International Law in Domestic Politics (Cambridge University Press, 2009)
- D.D. Basu, Human Rights in Constitutional Law, Lexis Nexis, 2008 (3rd Edn)
- Upendra Baxi, The Future of Human Rights, Oxford University Press, 2012 (3rd
- Edn)
- Thomas Buergenthal, International Human Rights in a Nutshell, West Publisher
- Company, 2009 (4th Edn)
- Henry Steiner & Philip Alston, International Human Rights in Context: Law,
- Politics, Morals: Text and Materials, Oxford University Press, 2008
- S. K. Kapoor, International Law and Human Rights, Central Law Agency, 2014
- M. K. Sinha, Implementation of Basic Human Rights, Lexis Nexis, 2013

ENVIRONMENTAL LAW

Course Code: LAW2702 **Credit Units: 05**

Course Objective:
This paper provides the study of environmental laws covering legislations related to it and protection of forest and wild life.

Course Contents:

Module I: Environmental Law: International and National Perspective
Introduction: Environment and Environment Pollution: Problem and prospects; constitutional Perspective :Right to Evolution and Application, Co relation between: Directive Principles of State Policies and Fundamental Degrees, Fundamental Rights and Directive Principles of State Policy; International Norms :Sustainable Development :Precautionary Principle, Polluter Pays Principle, Agenda 21, Inter generational equity, Public Trust Doctrine, Principle of no fault liability : Absolute Liability; Environment Protection through Public Interest Litigation, Remedies under various other laws.

Module II: Prevention and Control of Water and Air Pollution
The Water (Prevention and Control of Pollution) Act, 1974:Water Pollution : Definition, Central and State Pollution Control Boards: Constitution, Powers and Functions, Water Pollution Control Areas, Sample of effluents : Procedure; Restraint order, Consent requirement : Procedure, Grant/Refusal, Withdrawal, Citizen Suit Provision; Air (Prevention and Control of Pollution) Act, 1981: Air Pollution: Definition, Central and State Pollution Control Boards: Constitution, Powers and functions, Air Pollution Control Areas; Consent Requirement : Procedure, Grant/Refusal, Withdrawal, Sample of effluents – Procedure; Restraint order.

Module III: Protection of Forests and Wild Life
Indian Forest Act, 1927: Kinds of forest: Private, Reserved, Protected and Village Forests, The Forest (Conservation) Act, 1980; The Wild Life (Protection) Act, 1972: Authorities to be appointed and constituted under the Act, Hunting of Wild Animals, Protection of Specified Plants, Protected Area, Trade or Commerce in wild animals, animal articles and trophies; Its prohibition.

Module IV: Special Environmental Legislations
Environmental (Protection) Act, 1986, Public Liability Insurance Act, 1991, The National Environment Tribunal Act, 1995, The National Appellate Environmental Authority Act, 1997.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Environmental Law & Policy in India – Shyam Diwan, Armin Rosencranz
- Environmental Law in India – P. Leelakrishnan
- PIL and Environmental Protection-Geetanjali Chandra
- The Water (Prevention and Control of Pollution) Act, 1974
- The Air (Prevention and Control of Pollution) Act, 1981
- The IndianForest Act, 1927
- The Forest (Conservation) Act, 1980
- The Wild Life Protection Act, 1972
- The Environment (Protection) Act, 1986
- The Public Liability Insurance Act, 1991
- The National Environment Tribunal Act, 1995
- The National Environment Appellate Authority Act, 1997

JURISPRUDENCE

Course Code: LAW2703 **Credit Units: 05**

Course Objective:
The objective of the course is to create an understanding of basic legal concepts and provide an insight to the student into philosophical, ideological and theoretical foundations of the discipline of law with special reference to Indian legal system.

Course Contents:

Module I: Introduction
Nature and scope of Jurisprudence**,** State, Sovereignty and Law: Sources of Law: Custom, Precedent, Legislation, Equity.

Module II: Schools of Jurisprudence – I
Natural Law, Analytical positivism, Pure Theory, Historical Jurisprudence, Sociological Jurisprudence, Economic Approach, Legal Realism, Theories of justice: Aristotle, Rawls, Distributive Justice in India.

Module III: Concepts of Rights and Duties
Rights and Duties, Types, Theories, Critique of Rights and Duties, Contemporary issues in Rights.

Module IV: Concepts of Ownership and Possession:
Evolution of concept of possession, ownership, Essentials of ownership, Corpus and Animus, Res Nulius and Res Possessionis

Module V: Indian Perspectives in Jurisprudence
Classical and Medieval Influences, Modern Trends study with reference to judicial pronouncements with state policy.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Bodenheimer, Jurisprudence – The Philosophy and Method of Law (1996), Universal, Delhi.
- Fitzgerald, (ed.) Salmond on Jurisprudence (1999) Tripathi, Bombay
- W. Friedmann, Legal Theory (1999) Universal, Delhi
- V.D. Mahajan, Jurisprudence and Legal theory (1996 re-print), Eastern, Lucknow
- M.D.A. Freeman (ed.) Lloyd's Introduction to Jurisprudence, (1994), Sweet & Maxwell
- Paton G.W. Jurisprudence (1972) Oxford, ELBS
- H.L.A. Hart, The Concepts of Law (1970) Oxford, ELBS
- Roscoe Pond, Introduction to the Philosophy of Law (1998 Re-print) Universal, Delhi
- Dias, Jurisprudence (1994 First Indian re-print), Adithya Books, New Delhi
- Dhyani S.N., Jurisprudence: Jurisprudence and Indian Legal theory
- Dhyani S. N., Fundamentals of Jurisprudence
- Jayakumar N. K., Lectures in Jurisprudence, Butterworths
- Justice Markandey Katju, Law in the Scientific Era, Universal
- Justice J. S. Verma, Dimensions of Justice, Universal
- Justice Rama Jois, Seeds of Modern Public Law in Ancient Indian Jurisprudence
- Justice Rama Jois, Eternal Values in Ancient Law.

PUBLIC INTERNATIONAL LAW

Course Code: LAW2704 **Credit Units: 05**

Course Objective:
The objective of this paper is to provide knowledge to the students regarding the Public International Law to enable them to deal with the transnational legal order.

Course Contents:

Module I: Introduction
Definition and Basis of International Law, Subjects of International Law, Relationship between International Law and Municipal Law.

Module II: Sources of International Law
Custom, Treaties, General Principles of law, Juristic Works, General Assembly Resolutions, Other sources (Conventions).

Module III: State Recognition, State Jurisdiction and Law of the Sea
State Recognition: Recognition of states, Recognition of governments, *De facto* and *De jure* Recognition, Types of Recognition: Implied Recognition, Conditional Recognition, Collective Recognition; Withdrawal of Recognition, The legal effects of recognition; **State Jurisdiction:** Basics of Jurisdiction, Principles of Jurisdiction, Exemption from Jurisdiction: Diplomatic ImmModuleies and Privileges, Armed Forces, Public Ships; **Law of the Sea:** First and Second Law of the Sea Conventions :Third Law of the Sea Convention {UNCLOS III (Moduleed Nations Convention on the Law of The Sea), Maritime Zones; Territorial Waters, Contiguous Zone, Exclusive Economic Zone, Continental Shelf High Seas; Sea Bed Authority, Deep Sea Bed Mining and International Sea – Bed Area.

Module IV: Conflict Resolution, War and Neutrality of States
Modes of Settlement of Disputes: Peaceful means, Coercive means; War: Laws of War, Humanitarian Laws: Rules of neutrality.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Oppenheim, International Law, Vol. – 1.
- J.G. Strake, Introduction to International Law.
- Grieg, International Law.
- R.C. and Hingorani, Modem International Law.
- H.O. Aggarwal, International Law.
- S.K. Kapoor, International Law.
- Bowell, The Law of Internationals Institution.
- Verma, S.K., An Introduction of Public International Law.

FORENSIC SCIENCE-I

Course Code: LAW2707 **Credit Units: 05**

Course Objective:
Forensic Science is science related to the law. It is the scientific method of gathering and examining information about the past which is then used in a court of law. It is applied science and consists of a range of different disciplines which often require different underpinning science knowledge. It continues to evolve and is now applicable to crime disruption and crime prevention as well as crime detection and the identification of victims in mass disasters.

The course focuses on the following objectives:
1. Developing an understanding and appreciation for the Forensic Sciences.
2. Brief description of crime scene investigation alongwith its various techniques and significance of physical evidences.
3. Develop an understanding on different types of questioned documents, the types of forgeries and disguise generally encountetred.
4. Developing an understanding of handwritting and typewritting alongwith its analysis.

Course Contents:
Module I: Introduction to Forensic Sciences
Brief description of Forensic Sciences, historical development of forensic sciences in India and forensic lab, laws and principles of forensic science, mobile forensic units their distribution in India.

Module II: Crime Scene Investigation
Definition, types- mobile, indoor and outdoor crime scene, various searching techniques used for locating physical evidence at crime scene, recording the scene , reconstruction of crime scene- modus operendii, role of investigating officer.

Module III: Physical Evidences in Forensic Science
Definition, collecting, packaging, prevention and forwading of evidences, fingerprint its characterstics, classsification, developmental techniques- chemical developmental techniques.

Module IV: Introduction to Questioned Documents
Questined documents, types, disputed documents, security documents, bank notes, tampered documents, age of the documents and ink analysis, examinations of the fake currencies, instrumentations.

Module V: Handwriting and Typewritting Analysis
Handwritting identification forged and disguises handwritting, typewritting identification, general equipments for examinations

Module VI: Tool marks and other impressions
Definitions, types and decipherment of tool marks and techniques; examination of tool marks; introduction to tyre marks: its nature and types, skid marks tread marks; footprints and shoeprints types significance and examinations.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Sharma. B.R., Forensic Science in Criminal Investigations and trials (3rd Edn) Universal Law Publishing Co. Ltd
- Nath.S, Fingerprint Identification CRC Press 2nd Edn, 2002
- Fisher, B, Techiniques of Crime Scene Investigation 6th Edn CRC Press,
- Albert, S. Osborn, Questioned Documents, 2nd Edn, Universal Law Publishing Delhi, 1998

OFFENCES AGAINST CHILD AND JUVENILE OFFENCE HUMAN RIGHT LAW

Course Code: LAW2708 **Credit Units: 05**

Course Objective: To impart knowledge and expertise in legal and social issues relating to juvenile justice system in India, and sensitize about juvenile crimes and justice delivery system.

Course Contents:

Module I: Definition and concepts of term child and Juvenile. Causes of offence against child, International protection to child and convention, Offences against Child, Child abuse, Child labour and forced labour , Kidnapping, abduction , Abetment of suicide of child, Sale of obscene objects to young.

Module II: Concepts of: juvenile in conflict with laws, neglected juvenile, Determining factors of juvenile in conflict with laws: differential association, anomie, economic pressure, peer group influence, gang sub-culture, and class differentials.

Module III: Legislative Approaches , Constitutional provisions, Relevant provisions of the Juvenile Justice (Care and Protection of Children) Act, 2000, Relevant provisions of Protection of Children from Sexual Offences Act, 2012.

Module IV: Child and Criminal Liability, Crimes committed by child, Crimes committed by others in relation to children, Implementation of social policy through criminal sanctions in relation to child, Variation of procedure in case of child offender, Judicial proceedings in criminal cases relating to children, Protection of Children from Sexual Offences.

Module V: Judicial Contribution and Preventive Strategies, Social action litigation concerning juvenile justice, recent judicial decisions, Role of legal profession in juvenile justice system, State welfare programs: health, nutrition, ICWS, grant-in-aid, and compulsory education, Role of community, family, voluntary bodies, and individuals.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Bhattacharya, S.K.; Juvenile Justice: An Indian Scenario; Regency Publications
- Kumar, K. and Rani, Punam; Offences Against Children: Socio Legal Perspective; Regency Publications
- Josine Junger-Tas and Decker, Scott H.; International Handbook of Juvenile Justice; Springer
- Dunkel, Frieder; Juvenile Justice Systems in Europe: Current Situation and Reform Developments; Forum Verlag Godesberg

LAW AND MEDICINE-I

Course Code: LAW2709 **Credit Units: 05**

Course Objective:

The course aims to provide the students the knowledge about the interrelationship between law and medicine and complex legal and ethical issues involved in the field of medicine and medical profession. The course include the doctor-patient relationship and its legal dimensions, medical negligence, socio-legal issues involved in the new technologies in medical science and biotechnology as well. As medico-legal issues became a consumer issue as well as a fundamental rights violation the course will help the students to have knowledge in laws related to medicine and analyse the issues in a better way.

Course Contents:

Module I: Introduction
Inter-relationship between law and medicine-issues involved and legal control- Doctor-Patient relationship- Constitutional perspective and penal provisions- Indian penal Code- Directive principles- Right to life- Right to health and emergency medical care.

Module II: Regulation of medical and Paramedical profession
Medical profession in India- Para medical profession- Regulatory authorities- Self regulation- medical Ethics- WHO declarations- Declaration of Geneva- Helsinki declaration- Regulatory authorities created by statutes- Regulations under medical Degrees Act, 1916- Pharmacy Act, 1948- Indian medical Councils Act- education regulations- Medical Council of India- Disciplinary Control- Hospital and research centers- Responsibility to patients- Duty to take care- Medical examination- Informed consent- Confidentiality- Access to medical records.

Module III: Liability of Professional Negligence
Medical negligence- Negligence in diagnosis, treatment- Duty to warn- Civil negligence and criminal negligence- Vicarious liability- negligence of students and nurses- Liability of Doctors and Hospitals under the Consumer protection Act, 1986.

Module IV: regulation of Manufacture, Storage and sale of Medicines
Drugs and Cosmetic Act, 1940-Production, storage and sale of drugs- Advertisement drugs and Magic remedies Act, 1954- penalties.-Access to medicine and Public health.

Module V: Medical Science and Technologies
Boitechnology-Bioethics-Genetic Engineering- Cloning-Human genome project- Biomedicine Convention- Invirto fertilization(IVF)- Selective reproduction- Surrogacy- Euthanasia- abortion- Medical termination of pregnancy Act- Indian penal Code-Stem cell therapy and research- Transplantation of Human organs- Organ Transplantation Act, 1994- Human Subjects Research- Helsinki declaration- Schedule Y, Drugs and Cosmetic Act1940- ICMR Code- AMA code of Ethics- WHO Good Clinical Practices.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Vijay Malik – Drug and Cosmetic Act, 1940, Eastern Book Company, 24th Edition, 2014
- Anoop K. Kaushal – Medical Negligence & Legal Remedies, Universal Publishing House, 2nd Edition, 2004
- Dr. Jagdish Singh – Medical negligence Compensation, Bharat Law House, 3rd Edition, 2007

- P K. Dutta – Drug Control, Eastern Law House, 3rd Edition, 1997.
- Annas, George J. *American Bioethics: Crossing Human Rights and Health Law Boundaries.* New York:
  Oxford University Press, 2005.
- Annas, George J. Michael A. Gordin. *The Nazi Doctors and the Nuremberg Code: Human Rights in*
  Human Experimentation. New York: Oxford University Press, 1995.
- Dworkin, Ronald. *Life's Dominion: An Argument about Abortion, Euthanasia, and Individual Freedom.*
  New York: Alfred A. Knopf, 1993.
- Dr. Lily Srivastava, Law & Medicine (Universal Law Publishing, 2006)
- W. Noel Keyes, Bioethical and Evolutionary Approaches to Medicine and the Law (American Bar Association, 2007)
- Cynthia Ho, Access to Medicine in the Global Economy: International Agreements on Patents and Related Rights (Oxford University Press, 21-Apr-2011)

SUMMER INTERNSHIP EVALUATION-III

Course Code: LAW2735 **Credit Units: 03**

It is a mode of Clinical Legal education Specified period to be spent by the student with a law firm/court/Commissions/NGO's and like institutions working with the realm of law or connected therewith. The reports both by the student and the office together with diary where applicable to be certified will be submitted for evaluation

The Internship during the summer break is a compulsory course. There is a Internship Data form where students fill in the details of where they are interning with complete address and phone numbers Customized Legal Reference /Diary is provided to the students on payment They maintain a day to day record of the work that they do at the place they are interning. They are expected to intern for a minimum 90 days. They submit their completed diary, certificate from the employer and also a report of their experience at work. After submission there is a Viva by concerned faculty. They assess the student on the kind of work they have done during internship, presentation of the work they have done and also on the practical knowledge they have gained

The Paper is marked out of 100 marks. The breakup of the marks is as follows:

1.	Diary submission	25 Marks
2.	Report and certificate	25 Marks
3.	Viva (Panel of External Examiners)	40 Marks
4.	Attendance (Regularity in meeting the supervisor)	10 Marks
	Total	**100**

INVESTMENT AND COMPETITION LAWS

Course Code: LAW2801 **Credit Units: 05**

Course Objective:
This paper focuses on the investment and competition laws of India inn the contest of new economic order.

Course Contents:

Module I: Competition Law
Background, Prohibitions, Competition Commission of India.

Module II: Corporate Finance and regulatory framework
Security Contract (Regulation) Act 1956, SEBI Act 1992, Depositories Act 1996, The Securitisation and Reconstruction of Financial Assets and enforcement of security Interest Act, 2002.

Module III: Regulatory framework for foreign trade, multinational companies
Foreign Trade (Development & Regulation) Act 1992, UNCTAD Draft Model on Trans – national Corporations, Control and regulation of foreign companies in India, Foreign collaborations and joint ventures.

Module IV: Foreign Exchange Management
Background, Policies, Authorities.

Module V
Role of Information Technology in the investment market, functioning of demat A/c portal. Investment through internet and virtual banking.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Competition Act 2002
- Security Contract (Regulation) Act 1956
- SEBI Act 1992
- Depositories Act 1996
- Foreign Trade (Development & Regulation) Act 1992,
- Foreign Exchange Management Act, 1999
- Taxman's Student's Guide to Economic Laws

TAXATION LAW

Course Code: LAW2802 **Credit Units: 05**

Course Objective:
Power to tax has been described as the power to destroy. This idea is being floated often whenever the State introduces a new tax. Is this true? Is it not necessary that in order to raise revenue and place the economy on solid foundation, the taxing power should be conferred on the State? The power to tax shall not go unregulated. In this context of a federal structure the distribution of the taxing powers assumes added significance. Obviously, a study of the Constitutional framework on taxation becomes important. Along with this, an analysis of the different laws enacted in exercise of these powers with their safeguards and remedies sheds light on the mechanics of the taxation by the Union and the States.

Course Contents:

Module I: General Principles of Taxation Laws
History and Development of Tax Laws in India, Fundamental Principles relating to Tax Laws, Taxing power and constitutional limitations, Distinction between: Tax, Fee and Cess; Tax avoidance and Tax evasion .

Module II: Basic concepts of Income Tax
Income, Previous Year, assessment Year, Person, Assesee and Total Income, Income not included in the Total Income. Residential status, Clubbing of Income, Tax planning, Rate of Income Tax, Heads of Income, Salaries, Income from House Property, Income from Business or Profession, Capital Gains, Income from Other sources, Deductions under the Income Tax Act, 1961, Income Tax Authorities: Power and Functions, Filing of returns and procedure for assessment, Offences and Penal Sanctions .

Module III: Value Added Tax
Meaning and importance of VAT, Difference between VAT and Sales Tax, West Bengal Value Added Tax Act, 2003, Criticisms and limitations of Vat system.

Module IV: Service Tax
Taxable Service, Meaning and importance of Service Tax, Valuation of Taxable Service, Offences and Penalities.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Iyengar, Sampath (1998), Law of Income Tax New Delhi, Bharath Law House.
- Jain, Narayan (2004) How to Handel Income Tax Problems, Book Corporation.
- Palkivala, N.A. (1999), The Law & Practice of Income Tax, Nagpur: Wadha Publication.
- Parameswaran, K. (1987), Power of Taxation under the Constitution, Eastern Book Company.
- Sharma, Remesh (1998), Supreme Court on Direct Taxes, New Delhi: Bharath Law House.
- Singh S.D. (1973), Principles of Law of Sales Tax, Eastern Book Company.
- V. Ramachandran & T.A. Ramakrishnan (eds.) (2000), A.N. Aiyar's Indian Tax Laws, Chennai: Company Law Institute of India Pvt. Ltd.

INTERPRETATION OF STATUTES

Course Code: LAW2803 **Credit Units: 05**

Course Objective:
Judicial interpretation involves construction of words, phrases and expressions. In their attempt to make the old and existing statutes contextually relevant, courts used to develop certain rules, doctrines and principles of interpretation. The course material seeks to impart to the students, the necessary skills to interpret the statutes with a judicial mind set.

Course Contents:

Module I: Rules of Interpretation
Commencement, repeal and revival of a statute; Rules of interpretation: Liberal rule, mischief rule and golden rules, Harmonious construction.

Module II: Principles of interpretation
Ejusdem of Generis, Noscitur – A Socius, Reddendo Singula Singlis., Expressio Unius Est exclusion Alteriu, UI Res Magis Valent Quam Pereat, Contemporanea Espositio Est Optima Et Protissima Lege.

Module III: Internal Aids to Interpretation

Module IV: External Aids to Interpretation

Module V
Construction of Penal Statutes, Mens rea in statutory offences, Principles to be applied in interpreting the Constitution, Strict construction of taxing statues and its limitations.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Maxwell, Interpretation of Statutes.
- Sarup, Interpretation Statues.
- G.P. Singh, Principles of Statutory Interpretation.
- V.P. Sarathi, The Interpretation of Statutes.
- Bindra, Interpretation of Statutes.

INTERNATIONAL TRADE LAW

Course Code: LAW2804 **Credit Units: 05**

Course Objective:
To acquaint the Students about the basic aspects of International Trade Law, including the WTO and it's different principles and Agreements.

Course Contents:

Module I: Contract of Sale
Uniform Rules on Contract of Sale, Types of Sale Contract - CIF, FOB, C & F Contract, Special Trade Terms in International Sale Contract, Indian Bill of Lading Act 1856, International Conventions Governing Bill of lading
Addition of Special Trade Terms in International Sale Contract, Indian Bill of Lading Act 1856 and International Conventions Governing Bill of Lading in Module I.
Addition of Background Role and Structure of WTO, and difference between GATT & WTO in Module IV

Module II: Payment for International Sales
Letters of Credit, Bills of Exchange, and function and connected issues.

Module III: Settlement of Disputes
Arbitration, Enforcement of Arbitral Awards.

Module IV: World Trade organization (WTO) and General Agreement on Tariffs and Trade (GATT)
Background of formation of WTO, Role of WTO in International Trade, Difference of GATT and WTO, Structure of WTO.
Basic Principles: MFN, Treatment, National Treatment and Non-Discrimination, Exceptions to MFN : Tariff Bindings, Regional Trade Agreements, Escape Clause, Safeguard Measures, Quantitative Restrictions, Anti-dumping and counter-vailing duties.

Module V: WTO and Multilateral Agreements
Trade Related Investment Measures (TRIMS), General Agreement on Trade in Services (GATS), Trade Related aspects of Intellectual Property Rights (TRIPS).

Module VI: Dispute Settlement Mechanism under WTO

Evaluation Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	05	5	70

Text & References:

- Basic Texts of GATT and WTO.
- Jackson, John, H. (1997) Law of International Trading System, The MIT Press.
- Jackson, John, H. (1997) World Trade and Law of GATT, The MIT Press.
- Dam, K. W. (1970) The GATT Law and International Economic Organisations, Chicago University Press
- Koul, A.K. (2001) World Trade Organisation, Satayam Publication.
- Internet Sources :www.wto.org, www.uncitral.org.
- Text of the Indian Arbitration and Conciliation Act, 1996.

LAND LAWS

Course Code: LAW2805 **Credit Units: 05**

Course Objective:
The legislative power to make laws relating to land and land ceiling is in the state list. Different States have enacted their own laws on this subject. The Constitutional perspectives relating to this subject have to be taught as an essential part of this course. The provisions in the Constitution in Part III, IV and XII as well as those in Schedule VII relating to distribution of legislative powers over land are essentially to be taught with emphasis.

Course Contents:
Module I: Punjab Land Revenue Act1887(Applicable over Punjab and Haryana),Definition of Key Words, Revenue Officers: Their Power and Functions, Preparation of Revenue Record: Like Documents of Jamabandi, Girdawari, Mutation, Intkaal, SijraNasab (Pedigree Table) Sirjra Axe(Map of the Village), Assessment of Land Revenue, Collection of Land Revenue, Concepts & Procedure of Partitions.

Module II: Punjab Land Revenue Act,1887:
Records-Of-Rights and Annual Records, Collection Of Land Revenue, Recovery of other Demands by Revenue-officers, Partition, **Assessment** and other relevant provisions.

Module III: Haryana Rent Control Act, 1973
Definitions (Sec. 1-4), Rights & Duties of Tenants, Rights and Duties of Landlords, Grounds of Ejectment of Tenants.
Haryana Panchayati Raj Act ,1994 (Sec. 1 to 54) (Chapter 1 to 6) Definition of Key Words, Constitution of Gram Sabha and Gram Panchayat, Gram Panchayat's Duties, Functions and Powers, Finance and Taxation, Control of Gram Panchayat, Sources of Income and Expenditure of Gram Panchayat.

Module IV: Haryana Panchayati Raj Act 1994,
PanchayatiSamiti (Chapter 7 To 11) And Sec. 55 To 116) Definition of Key Words, Conduct of Business of PanchayatSamities, Servant of PanchayatSamities, Duties and Powers of PanachayatSamiti, Finance and Taxation, Sources of Income of PanchayatSamiti, Control of PanchayatSamiti

Module V: Delhi Land Laws
Real Estate Development and Apartment ownership
Delhi Apartment Ownership Act, 2009,

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	05	5	70

Text & References:

- Law, poverty and development, Prof. M.L. Upadhayay.
- Upendra Baxi, Towards a Sociology of Indian Law, pp. 25-65 (1986)
- Atul Kohli, The state and Poverty in India (1987)
- Francine R. Frankel, India's Political Economy, 1947-77 (1988)
- L.H. Rudolph and S.H. Rudolph, The Political Economy of Lakshmi (1987)
- Mohammad Ghouse, "Nehru and Agrarian reform" in Rajeev Dhavan and Thomas Paul (eds.)
- Nehru and the Constitution (1992), Thripathi
- Walter C. Neale, Developing Rural India Policies and Progress (1990) Allied
- Alice, Jacob, Land Reform and Rural Change 6-19 (1992), Land Reforms in India: a Review.
- IASSI quarterly 1992, Vol. X, Numbers 3 and 4.
- B.R. Beotra, Law of Forests (Central and State) 6th Edition 1999, The Law Book Company.
- A. Krishnan, Forest Laws in India, 1998, Asia Law House
- Srivastava, Encyclopedia on forest, 1998, Asia Law House
- Padala Rami Reddy, Forest Laws, 1989, Asia Law House Baden Powel, Manual of Jurisprudence for Forests Officers (1982)

WOMEN AND CRIMINAL LAW

Course Code: LAW2806 **Credit Units: 05**

Objectives: Women had suffered in the society since centuries and even after 50 years of Adoption of the Constitution, for women, equality appears to be a distant mirage to be reached. Effective political representation of women in Legislature and other forums too has become a difficult proposition to be acceptable. Breach of her personality, through various forms of violence, too has not subsided. The course intends to educate about the legal provisions enacted to ameliorate these situations with special emphasis on Indian Municipal Law, its scope and to evaluate the existing provisions.

Module-I
Women in Pre-Constitution Period: Social and Legal Inequality; Social Reform Movement in India; Legislative response in India. Women & children in Post-Constitution Period, Provisions of Constitution of India Preamble, Art.14, 15, 23, and Part IV Legal Measures in relating to Child Labour Women and Political Representation

Module-II
Different Personal Laws- Unequal Position of Indian Women-Uniform Civil Code; Sex Inequality in Inheritance Rights: Right of Inheritance by birth for Sons and not for Daughters; Inheritance under Christian Law; Inheritance under Muslim Law; Matrimonial Property Law; Right of Women to be Guardian of her minor sons and daughters.

Module-III
Law of Divorce - Christian Law-Discriminatory Provision; Muslim Law- Inheritance divorce. Women and Social Legislation: Dowry Prohibition Law; Sex Determination Test, Law relating to Prevention of Immoral Trafficking in Women Act.

Module-IV
Women and Criminal Law: Adultery; Rape; Outraging the Modesty of Women; Kidnapping; Sati Prohibition Law; Law relating to Domestic Violence; Law relating Eve Teasing; Indecent Representation of Women Act.

Module-V
Women and Employment: Factories Act- Provisions relating to women; Maternity Benefit Act; Equal Remuneration Act; Law Relating to Sexual Harassment at Working Place; N.C.W-Aims, Functions and Performance.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

PRESCRIBED BOOKS:

- Indu Prakash Singh- Women, Law and Social Change in India.
- Paras Dewan- Dowry and Protection to Married Women.
- S.P.Sathe- Towards Gender Justice.
- Dwarka Nath Mitter- Position of Women in Hindu Law
- Shaukat Nasir- Muslim Women and their Rights.

REFERENCE MATERIAL:

- Relevant Provisions of Constitution of India.
- Relevant Provisions of Indian Penal Code.
- S.125, Criminal Procedure Code.
- National Commission on Women Act, 1990.
- Matrimonial Property- Private Members Bill Introduced in Parliament Towards Equality- Report of Committee on the Status of Women (Govt. of India) Chapter IV and Section IV, General Conclusions and Recommendations

PROBATION AND PAROLE

Course Code: LAW2807 **Credit Units: 05**

Course Objective:
This course will introduce the student to the emerging discipline of community corrections. This alternative has become an integral resource to the criminal justice system.

Course Contents:
Module I: Theories of Punishment: (i) Deterrent Theory (ii) Retributive Theory (iii) Preventive Theory (iv) Reformative Theory Efficacy of Punishment: Early stages-Medieval Period, Modern or New Penology, Essentials of an ideal system of Penal Policy.

Module II: Concept of Correction Genesis and evolutions, objectives and theories of correction - various types of correctional methods.
Institutional Correction Origin and development of Indian Prison System, daily routine - prison as an institution, scientific classification of prisons and prisoners.

Module III: Treatment of correction of offenders. The need for reformation and rehabilitation of offenders, Undergoing punishment/imprisonment, Classification of offenders through modern diagnostic techniques, The role of psychiatrists and Socials workers in the prison., Vocational and religions education and apprenticeship programmes for the offenders, Group counseling & Resocialization programmes, Participation of inmates in community service.

Module IV: Non-Institutional Methods Open air jails, Admonition, fine, probation and parole. Half way houses - organization and significance.
Recent trends in corrections Role of voluntary agencies in prevention of crime and treatment of offenders - Discharged prisoners' aid society. After care and rehabilitation, Need, importance and services in India - Pre-release and premature release., Attitude of the community towards released offender, Prisoner Aid Society and other Voluntary Organization governmental Action.

Module V: The place of probation in penal policy – public participation in probation, Legislations on Parole and probation in India, Probation of Offenders Act, 1958, Section 360 of the Criminal Procedure Code, 1973

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Martin Wasik, Emmins On Sentencing (1998) 2.
- Hall J., Law, Social Science and Criminal Theory
- J.M.Sethna, Society and the Criminal, 1980
- Siddique, Criminology-Problems and Perspectives, 1997
- Sutherland,E H,Cressey.D R,Criminology A. Siddique, Criminology (1984) Eastern, Lucknow.
- Law Commission of India, Forty-Second Report Ch. 3 (1971)
- K.S. Shukla, "Sociology of Deviant Behaviour" in 3 ICSSR Surveys of Sociology and Social Anthropology 1969-179 (1986)
- Tapas Kumar Banerjee, Background to Indian Criminal Law (1990)
- Bhattacharya S.K. (1986) Probation system in India,
- Mans Publications, New Delhi. 2. Bhattacharya,
- S.K. (1985) Social defence: An Indian perspective, Manas publications.

FORENSIC SCIENCE-II

Course Code: LAW2808 **Credit Units: 05**

Course Objective:
Forensic science is science related to the law. It is the scientific method of gathering and examining information about the past which is then used in a court of law. It is applied science and consists of a range of different disciplines which often require different underpinning science knowledge. It continues to evolve and is now applicable to crime disruption and crime prevention as well as crime detection and the identification of victims in mass disasters.
The course focuses on the following objectives:
1. Developing and understanding the concept of forensic anthropology
2. Breif description on the ballistic its analysis and reconstruction
3. Developing an understanding to wounds and its medco-legal aspect.
4. Developing an understanding on explosives and its crime scene investigations.

Course Contents:

Module I: Forensic Anthropology
Definition, scope, and application; time since death: assessing and determing the time and cause of death, study of burned bones and bones fragments; identification.

Module II: Ballistics
Definition, Indian Arms Act, forensic importance, classification of firearms; ammunition; range of fire; firearms injuries, analysis and reconstuction.

Module III: Wounds and its medico-legal aspects
Introduction to wounds; determining the age of the injury and its medico-legal aspect, injuries due to blunt forces, injuries due to sharp forces, miscellaneous injuries.

Module IV: Explosives and Explosion Scene Investigation
Explosive Act: nature and classification, composition and characterstics of explosives, pyrotechnics, IEDs, specific approach to scene of explosion, post-blast residue collection, reconstruction of sequences of events; evaluation and assessment of scence of explosion and its examination.

Module V: Advanced fingerprint and other impression
Fingerprint in personal identification, examination on the basis of poroscopy and its significances; evaluation of fingerprints on the basis of edgescopy and its significance in fingerprint field, Palmer, Planter and other impression its evaluation**.**

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Sharma. B.R., Forensic Science in Criminal Investigations and trials (3rd Edn) Universal Law Publishing Co. Ltd
- Nath.S, Fingerprint Identification CRC Press 2nd Edn, 2002
- Fisher, B, Techiniques of Crime Scene Investigation 6th Edn CRC Press,
- Albert, S. Osborn, Questioned Documents, 2nd Edn, Universal Law Publishing Delhi, 1998
- James, S. H. and Nordby, J.J (Eds), Fornsic Science- An Introduction to Scientific and Investigation Techniques CRC Press, London, 2003.

LAW AND MEDICINE-II

Course Code: LAW2809 **Credit Units: 05**

Course Objective:

The course aims to provide the students the knowledge about the interrelationship between law and medicine and complex legal and ethical issues involved in the field of medicine and medical profession. The course include the ethical and legal issues in population control, surrogate motherhood, HIV/AIDS, the rights of the unborn, AID and Law, mental health and medical experimentation on human beings.

Course Contents:

Module I: Population control and community health
Law, Practice and Society- Causes for Population Explosion- National Population Policy, 2000- Terminal methods female sterilization and male sterilization- State Imposed sterilization and its legal validity- Population control and Right to family and Right to privacy.

Module II: Surrogate Motherhood and the Rights of the Unborn
Surrogacy in foreign countries- Motherhood Debated-Legality of contract- problems-Refusal to accept the child-health Tourism and sanctity of woman's life- ICMR Code- The Unborn-Introduction- Right of an Unborn Chile-Prenatal Diagnosis (and Amniocentesis)-Miscarriage

Module III: AIDS
Rights, Freedom and duties of HIV/AIDS Patients- Privacy and Public health- Liberty and Security-Movement- Marriage and Finding a family- Right to work- Education for an infected person-Protection of children infected or born to infected parents- Right against degrading Treatment-Equality before law- access to medicine

Module-IV
International Norms- general Provision-Consent-Human Genome-Scientific Research-Donors for Transplantation Purposes-Prohibition of Financial gain and Disposal of a part of the Human Body

Module-V
Mental Health- Historical Background-types of Causes of Mental Illness- Development of the Human being and mental health-Prevention of Mental Illness and Treatment-Alcoholism and Drug Addiction- Mental health Act- Admission and discharge to mental hospital legal issues

Module-VI
Experiments of Human Beings- The concept-Kinds of Experiments-Subject of Experimentation-controls-Clinical Trials-Studies in special Populations-Informed consent-Special Studies of Bioavailability and Bioequivalence-Ethics committee- Stem cell research- International documents and Indian laws-Ethical norms on experimentation

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Vijay Malik – Drug and Cosmetic Act, 1940, Eastern Book Company, 24th Edition, 2014
- Anoop K. Kaushal – Medical Negligence & Legal Remedies, Universal Publishing House, 2nd Edition, 2004
- Dr. Jagdish Singh – Medical negligence Compensation, Bharat Law House, 3rd Edition, 2007
- P K. Dutta – Drug Control, Eastern Law House, 3rd Edition, 1997.
- Annas, George J. *American Bioethics: Crossing Human Rights and Health Law Boundaries.* New York:Oxford University Press, 2005.

- Annas, George J. Michael A. Gordin. *The Nazi Doctors and the Nuremberg Code: Human Rights in Human Experimentation.* New York: Oxford University Press, 1995.
- Dworkin, Ronald. *Life's Dominion: An Argument about Abortion, Euthanasia, and Individual Freedom.* New York: Alfred A. Knopf, 1993.
- Dr. Lily Srivastava, Law & Medicine (Universal Law Publishing, 2006)
- W. Noel Keyes, Bioethical and Evolutionary Approaches to Medicine and the Law (American Bar Association, 2007)
- Cynthia Ho, Access to Medicine in the Global Economy: International Agreements on Patents and Related Rights (Oxford University Press, 21-Apr-2011)

INTELLECTUAL PROPERTY RIGHTS

Course Code: LAW2902 **Credit Units: 05**

Course Objective:

The course is designed to provide comprehensive knowledge to the students regarding Indian position of the Patent Law (1970), Copy Right Law (1957) and Designs Act of 2000 which invariably form the part of Intellectual Property Law and shall comprise of the following.

The importance of this branch of the law is to be sufficiently realized in the Indian legal education. These areas are now internationally conceptualized as representing intellectual property. It is often the case that while the law of patents and trademarks is referred to as industrial property, the law relating to copyright is named intellectual property. While both these terms could be suitably invoked, we here speak of intellectual property as signifying all the three bodies of the law as well as the law on industrial designs.

Unlike other forms of property, intellectual property refers to regimes of legal recognition of, primarily, the products of the mind or imagination. The subject matter of property relations is here preeminently based on mental labour. The law relating to intellectual property protects the right to mental labour.

The law confers rights of proprietary nature on relative intellectual labour primarily on the basis that it is in the interests of society and state to promote creativeness and inventiveness. Limited monopoly provides incentive for greater inventive and innovative efforts in society. An important aspect of the exploration in this course would be ways in which the laws strike a fair balance between the interests and rights of the intellectual labourers on the one hand and organized industrial enterprises on the other. Another dimension is a study of the ways in which this regime of laws militates against, or favours, commModuley property in national cultures. As concerns 'modernization' crucial questions arise in the field of copyright protection in computer software and hardware, internet, electronic music and scientific research. Both copyright, trademarks, design and patent law here relate basically to the law of unfair competition and constitute an aspect of consumer protection and welfare not only in the context of national perspectives but also in view of the waves of globalization already set in. Both from the standpoint of human resources development, modernization and justice it is important that the law students get sufficient insights in Intellectual Property Law.

Course Contents:

Module I: Introduction

Intellectual Property, Concept and Philosophy, Need for Private Rights versus Public Interests, Advantages and Disadvantages of IPR.

Module II: Patent

Development of patent law, Rationale for patent protection**,** Nature and definition, Types of patentable subject matter, Patentability criteria, non-patentable inventions, Rights of patentee, Procedure for granting a patent, Grounds for opposition, Transfer of patent rights, Compulsory Licenses, Acquisition, Surrender, Revocation, restoration, Patent infringement and remedies, Bio patents and software patents, Official Machinery, Controller, Powers and Functions, Patent in pharmaceutical industry, Patent cooperation treaty, Paris convention.

Module III: Copyright

History, Concept of copyright, conditions for grant of copyright, extent of rights exception to copyright protection, fair use provision, assignment and licensing, Compulsory licensing and statutory licensing, Collective administration, Copyright board and office, powers and functions, Moral rights: Neighboring rights; infringement penalties and remedies, Appeals, Berne Convention, Universal Copyright Convention - WIPO Copyright Treaty: WIPO Phonograms and Performances treaty, TRIPS with respect to Copyright and Neighboring rights.

Module IV: Designs, Protection, Historical development, Rationale

Designs Act of 2000: Meaning of Design, Conditions for grant of protection, Ambit of Protection, Exceptions, Registration of Designs, Cancellation, Copyright in Registered Designs, Enforcement, Infringement and remedies, Powers and duties of Controller.

Module V: Trademarks

Evolution, Functions, Objective, Definition, Kinds of Marks, Domain names, Registration, Concurrent registration, Procedure for registration, Relative and absolute grounds of refusal, opposition and its grounds, Assignment, transmission and licensing of Trademarks, Infringement, Penalties and Remedies, Withdrawal of protection, Passing off, Official machinery for regulation administration and Redressal, Registrar, Difference between Trade Mark, **Trade Secret, Traditional Knowledge** and Geographical Indications, TRIPS on Trademarks, Madrid Agreement for The Repression of False or Deceptive Indications of Source on Goods, 1891- Madrid Agreement for the International Registration of Marks, 1891 and protocol relating to that agreement 1989.

Module VI: Plant Varieties Protection Act, 2001

Objectives, Rationale,Registry, Official machinery, registration, Criteria of fulfillment Exclusions, Benefit sharing, Farmers rights,CommModuley Rights, compulsory license Redressal fora, Appellate tribunal, Infringement, offences and penalties; Geographical indications of Goods (Registration and Protection Act, 1999**:** History, Definition, Rationale, Functioning, official Machinery,Registry,Rights conferred, Registration Procedure. Redressal Machinery, Appeal, Passing off, Offences, penalties and Procedure.

Examination Scheme:

Components	**P/S/V**	**CT**	**A**	**C**	**EE**
Weightage (%)	10	10	05	5	70

Text & References:

- D.P. Mittal (Taxman Publication), Indian Patents Law and Procedure
- B.L. Wadera, Patents, trademarks, copyright, Designs and Geographical Judications.
- P. Narayanan (Eastern Law House), Intellectual Property Law
- W. Cornish (Universal Publication), Intellectual Property Law
- R.K. Nagarjan, Intellectual Property Law
- Ganguli (Tata Megraw), Intellectual Property Rights

LAW, POVERTY AND DEVELOPMENT

Course Code: LAW2903 **Credit Units: 05**

Course Objective:
The objective of this paper is to provide an understanding of basic concepts of poverty and development and their relationship with law.

Course Contents:

Module I: Understanding Poverty and Development
Poverty: Meaning and Concept, Relative Dimensions, Measurement and Determinants, Issues related to Poverty in India; Development: Perspectives, Developmental index.

Module II: Constitutional Guarantees for the Poor
Equality and Protective Discrimination, Right to Basic Needs and Welfare, Abolition of Untouchability and Protection of Civil Rights, Right to Development.

Module III: Criminal Justice System and the Poor
Treatment of the poor by Police, Inability to get Bail, Problems of Poor Under trials, Working of free legal aid schemes. .

Module IV: Impoverishment of Women, Children and Disabled Persons
Deprivations of women under family laws, Problems of women workers in organized and unorganized sectors, Child labour, Approaches to disability and rights of the disabled persons, Right to education and dignity.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	05	5	70

Text & References:

- Law, Poverty and Development – Upendra Baxi
- State and Poverty in India – Atul Kohli
- The Poverty Question (Search for Solution) – Yogesh Atal
- Poverty, Rural Development and Public Policy - Amarendra

PROFESSIONAL ETHICS

Course Code: LAW2904 **Credit Units: 05**

Course Objective:
The Course has been designed to acquaint the students of Law about the Professional Ethics and Professional etiquettes that are essentially significant for an advocate to observe while at the Bar. Accountability and transparency are imperative to the profession. Besides, the conducive and cordial Bar- Bench relations can send a good message concerning the richness of the Legal profession. With this background cue, the course aims at developing insights of the students about the professional parameters.

Course Contents:

Module I: Historical Introduction
Historical introduction to legal profession in India – Barristers, Vakils, High Court Pleaders, Advocates, etc. The All India Bar Committee, 1951 and the passing of Indian Advocates Act, 1961. The Advocates Act 1961: Definitions Section 2, Constitution and function of State Bar Councils, Bar Council of India, Terms of Office, various sub-committees including Disciplinary Committee and the qualification for their membership. Power to make rules Sections 3 to 15 – Chapter –II.

Module II: The Advocate's Act, 1961
The Advocate Act, 1961.
Admission and enrolment of Advocate – Senior and other Advocates,
Common role of Advocates, Qualifications and Disqualifications for enrolment and procedure thereof, Chapter – III Section 16 to 28.
Rights to Practice: Monopoly of representation, Exclusion of advocates from certain cases, self representation by litigants. Chapter IV Secs. 29 to 34.
Professional and other misconduct, Principles for determining misconduct,
Disciplinary Committees of State Bar Council and the Bar Council of India,
Punishment of advocates for misconduct, Appeals to the Supreme Court,
Chapter – V – Secs. 35 to 44.

Module III: Legal Profession
Nature of Legal Profession, Need for an Ethical Code of Rights: privileges and duties of Advocates, Preparation of a case and fees of an Advocate, under – cutting, Bar against soliciting work and advertisement, Bar against touting, refusal of briefs, accountability to the client, confidentiality communication between Advocates to compromise, Study of Code of Ethics prepared by the Bar Council of India.

Module IV: Contempt of Courts Act, 1971
Contempt of Courts Act, 1971,
What is Contempt? Civil and criminal contempt, punishment for contempt.
Procedures in contempt cases. High Court Rules and the Supreme Court
Rules to regulate contempt proceedings.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Sanjeev Rao, Indian Advocates Act, 1971.
- M.P. Jain, Indian Legal History (Chap. On Legal Profession).
- Krishna Murthy Iyer's Book on Advocacy.
- The Contempt of Courts Act, 1971.
- Journal of Bar Council of India.

PRIVATE INTERNATIONAL LAW

Course Code: LAW2905 **Credit Units: 05**

Course Objective:
The course equips the student to deal with dispute involving a foreign element in personal, civil and commercial matters *i.e.* increasing in frequency as a result of a globalized economic and social environment.

Course Contents:

Module I: Introduction
Application and subject matter of Private International Law, Distinction with Public International Law, Characterization and theories of characterization, Concept of Renvoi, Application of foreign law, Domicile, Jurisdiction of courts.

Module II: Family Law and Adoptions
Material and formal validity of marriage under Indian and English law, Choice of law and jurisdiction of courts in matrimonial causes: dissolution of marriage, grounds of divorce, restitution of conjugal rights, recognition of foreign judgment, Recognition of foreign adoptions, Adoption by foreign parents, Jurisdiction under Indian and English law.

Module III: Civil and Commercial matters
Tort, Theories of foreign tort, Contract, Theory of Proper Law of Contract, Ascertaining the applicable law, Property.

Module IV: Indian Law relating to foreign judgment
Basis of recognition; Recognition and Enforcement of Foreign Judgments, Finality, Failure, Direct execution of foreign judgments, decrees.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Dr. Paras Diwan :Private International Law
- Cheshire : Private International Law
- Morris : Private International Law

ELECTION LAW

Course Code: LAW2906 **Credit Units: 05**

Course Objective:
The objective of this paper is to acquaint the students with the election laws governing the elections of the Houses of the Parliament and the State Legislatures as well as to the offices of President and Vice President**.**

Course Contents:

Module I: Introduction
Election: Meaning and Process, Constitutional Mandate, Laws governing elections, Election disputes, Election to the Offices of the President and Vice President. .

Module II: Election Commission
Composition, Functions, Powers**;** Delimitation of Constituencies, Preparation and Revision of Electoral Rolls.

Module III: Qualifications and Disqualifications of Candidates
Constitutional and Statutory Provisions**:** Disqualifications of sitting members, Nomination and Candidature, Voters Right to Information; Anti Defection Law (Tenth Schedule to the Constitution of India).

Module IV: Corrupt Practices in the Election Law; Electoral Offences

Examination Scheme:

Components	**P/S/V**	**CT**	**C**	**A**	**EE**
Weightage (%)	10	10	5	5	70

Text & References:
- Manual of Election Law in India – Dev Inder
- Chawla's Elections Law & Practice - P.C. Jain & Kiran Jain
- Election Laws and Practice in India- R.N. Choudhry
- Corrupt Practices in Election Law – K.C. Sunny
- How India Votes – Election Laws, Practice and Procedure – V.S. Rama Devi & S.K. Mendiretta
- V.N. Shukla's The Constitution of India – M.P. Singh.

Statutory Reading:
- Relevant Provisions of the Constitution of India
- The Representation of the People Act, 1951.
- The Representation of the People Act, 1950.
- The Presidential and Vice-Presidential Elections Act, 1952
- The Election Commission (Condition of service of Election Commissioners and Transaction of Business) Act, 1991.
- The Delimitation Act, 2002.

BANKING AND INSURANCE LAWS

Course Code: LAW2907 **Credit Units: 05**

Course Objective:
This course acquaints students with banking system of India and teaches them the various aspects and rights that exists for them in banking and insurance sector.

Course Contents:

Module I: Banking System in India
Kinds of banks and their functions; Banking Regulation Laws: Reserve Bank of India Act, 1934, Banking Regulation Act, 1949; Relationship between banker and customer: Legal Character, Contract between banker & customer, Banks duty to customers; The Banking Ombudsman Scheme, 1995; Liability under Consumer Protection Act, 1986.

Module II: Lending, Securities and Recovery by Banks
Principles of Lending ; Position of Weaker Sections; Nature of Securities and Risks Involved ; Recovery of debts with and without intervention of courts / tribunal: Recovery of Debts due to Banks and Financial Institutions Act, 1993, Securitisation and Reconstruction of Financial Assets and Enforcement of Security Interests Act, 2002.

Module III: Banking Frauds
Nature of Banking Frauds; Legal Regime to Control Banking Frauds; Recent Trends in Banking: Automatic Teller Machine and Internet Banking, Smart Cards, Credit Cards.

Module IV: Insurance Law
Nature of Insurance Contracts; Kinds of Insurance: Life Insurance, Medi claim, Property Insurance, Fire Insurance, Motor Vehicles Insurance (with special reference to third party insurance; Constitution, Functions and Powers of Insurance Regulatory and Development Authority; Application of Consumer Protection Act, 1986.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Banking Law & Negotiable Instruments Act – Sharma and Nainta
- Banking System, Frauds and Legal Control – R.P. Namita
- Law of Insurance – M.N. Mishra
- Handbook of Insurance and Allied Laws – C. Rangarajan
- Banking Law & Practice in India – M.L. Tannan.

INTERNATIONAL HUMANITARIAN AND REFUGEE LAW

Course Code: LAW2908 **Credit Units: 05**

Course Objective:
The objective of this paper is to make students aware of the principles of International Humanitarian and Refugee Laws.

Course Contents:

Module I: Historical Development of International Humanitarian Law
History and evolution, Growth, Character of International Humanitarian Law.

Module II: Geneva Conventions, 1949
Geneva Convention I, Geneva Convention II, Geneva Convention III and Geneva Convention IV, 1949, Additional Protocol I to Geneva Conventions, 1977, Additional Protocol II to Geneva Conventions II 1977

Module III: Enforcement Machinery
War Crimes, Serious breaches of International Humanitarian Law, International Criminal Court (ICC).

Module IV: Refugees under International Law
Who is a refugee?, Convention Relating to the Status of Refugees, 1933, Convention on Status of Refugees, 1951, The 1967 Protocol, The AALCC Principles 1966, The OAU Convention 1969.

Module V: Implementation and Monitoring of the Rights of Refugees
Status of the UNHCR 1950, Cartegena Declaration 1984.

Module VI: Treatment of Refugees under Indian Laws
Draft SAARC Convention.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Ingrid Detter, The Law of War, (Cambridge, 2000)
- A. Roberts and R. Guelff, eds., Documents on the Laws of War (Oxford, 2000)
- Legality of the Threat or Use of nuclear weapons, Advisory Opinion, ICJ Reports (1996)
- M.K. Balachandran and Rose Verghese (eds.) – International Humanitarian Law ICRC (1997)
- Ravindra Pratap, "India's Attitude towards IHL", in Mani (ed.) International Humanitarian Law in South Asia (Genava: ICRC, 2003)
- Guy S. Goodwin – The Refugee in International Law (Oxford, 2000)
- A. Vibeke Eggli, Mass Refugee Influx and the Limits of Public International Law (The Hague: Nijhoff, 2002).

CRIMINOLOGY

Course Code: LAW2909 **Credit Units: 05**

Course Objective:
The course is intended to introduce students to the broad study of criminology. It is to give a broad overview to the scope of criminology, to the ideas which have influenced the area of the subject and to the practical uses and impact to which these have been, or might be put.

Course Contents:

Module I: Introduction to Crime & Criminology
Definition and Scope, Criminology & other Social-Science; Legal, Social and Psychological aspects of crime, Traditional crimes; Organized Crimes, Socio Economic Crimes, Modern Crimes; Corruption, Cyber Crimes Environmental Crimes Terrorism and insurgency ; Specific theories: Classical School and Neoclassical School; Positive School; Cartographic School; Sociological theories : Social Structural Theories and Social Process Theories; Economic Theories of Crime .

Module II: Juvenile Delinquency
Concept & Causes, Pre delinquency stages: Truancy and Vagrancy, Main features of juvenile Justice Act, (New & Old), Institutional Services like Observation homes, Juvenile Homes, Special Homes & Juvenile Aftercare Services.

Module III: Punishment
History & Theories of Punishment, Capital Punishment, Historical Development from Punishment to Correction and Reformation, Prison System In India; Correctional Programmes in jail; Alter care services, Probation & Parole.

Module IV: Impact on Society
Social Disorganization and Social Problems, Victimless Crimes: Alcoholism, Drug Addiction, Beggary, Commercial Sex, Suicide; Crimes related to Family: Dowry death, Domestic Violence, Child Abuse.

Module V: Victimology
Concept, origin & Development, Need to study victims, U.N. Declaration on the basic principles of justice for victims of crimes and abuse of power, Victim's rights in India: Fair Access to Justice, Restitution, Compensation and assistance to victims, Human Rights Protection.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Sutherland and Crssey – Criminology
- Ahmed Siddique – Criminology
- Mrs. Vedkumari – Juvenile Justice

CORRUPTION LAWS

Course Code: LAW2911 **Credit Units: 05**

Course Objective:
To update the students about corruption laws that has already been formed. The main aim of the course is to make the students aware of the laws prevalent and the legal remedies available

Course Contents:

Module I: Introduction to Corruption Laws
Introduction- definition of corruption,
Genesis of corruption- Historical Background, corruption in ancient time, corruption in Mahabharata need for integrating
Nature of corruption, various types of corruption- in kind, cash or in service Individual Corruption, Institutional Corruption. Why and how of corruption – Nexus between Position of a Public servant and corruption. consequences and ill effects

Module II: Offences by Public Servant
Offences under the Prevention of Corruption Act, 1988,
Corruption by Public servant- Prevention of Corruption Act 1988-
Definition of Public Servant sec 2(cc)
Categories of public servant- person in the pay of the Government- a person in the service of the Government a person remunerated by fees or commission for the performance of any public duty by the Government.
Sec 7: public Servant taking gratifications other legal remuneration in respect of an official act.
Gratification: legal remuneration, meaning of holding out as a Public Servant – whether covered under the Act.
Sec 8: Gratification by person other than public servant – to influence pubic servant by corrupt or illegal means.
Sec 9: Gratification by person other than Public Servant- to influence public servant- and not by corruptor illegal means.
Sec10, Sec11, Sec 12: Habitual committing of offence under Sec 8, 9, 12, 14.
Sec 15 Attempt
Sec 16 Fine Criteria
Sec 13 Criminal Misconduct by Public Servant.
Bribe giver Guilty or Abetment?
Investigation and Trial under the Act
Sec 17 Persons authorized to investigate.
Sec 19 Sanction for prosecution
Sec 20 presumptions under the Act.
Sec 3, 4, 5: Special Judges Court- procedure and powers of Special Judge.

Module III: Commission of Enquiry Acts
Section 6 Summary Trial. Commission of Enquiry Act 1952
Composition, function and role of CAG
The Central Vigilance Commission
Central Bureau of Investigation its role, function and Jurisdiction.
Proposed Lok Pal Bill ,its various drafts , legality of sting operations , provision relating to corruption cases of judges , Immunity of legislations and parliamentarians . Law on whistle blowers

Module IV: Money Laundering & National Investigative Agency Act
The Prevention of Money Laundering Act 2002, General Principles, Confiscation of Property earned through crime Sec5
Sec 171-B of IPC Bribery – Offences relating to elections.
Sec 171-C
Sec 171- D Undue influence and Impression at election
Sec 171- E Punishment for Bribery
Sec 171- F Punishment for Influence and Personating at an election.
National Investigative Agency Act 2009

Module V: International Effort

International Efforts
The United Nations Directions
The Convention on Combating Bribery of Foreign Public Officials
UN Convention against Transnational Organized Crime
UN Convention against Corruption (UNCAC)

Examination Scheme:

Components	**P**	**A**	**C**	**CT**	**EE**
Weightage (%)	5	5	10	10	70

Text & References:

- Prevention of Corruption Act, 1988
- Prevention of Money laundering Act, 2002
- National Investigative Agency act, 2009
- Un Conventions

SUMMER INTERNSHIP EVALUATION-IV

Course Code: LAW2935 **Credit Units: 03**

It is a mode of Clinical Legal education Specified period to be spent by the student with a law firm/court/Commissions/NGO's and like institutions working with the realm of law or connected therewith. The reports both by the student and the office together with diary where applicable to be certified will be submitted for evaluation

The Internship during the summer break is a compulsory course. There is a Internship Data form where students fill in the details of where they are interning with complete address and phone numbers Customized Legal Reference /Diary is provided to the students on payment They maintain a day to day record of the work that they do at the place they are interning. They are expected to intern for a minimum 90 days. They submit their completed diary, certificate from the employer and also a report of their experience at work. After submission there is a Viva by concerned faculty. They assess the student on the kind of work they have done during internship, presentation of the work they have done and also on the practical knowledge they have gained

The Paper is marked out of 100 marks. The breakup of the marks is as follows:

1.	Diary submission	25 Marks
2.	Report and certificate	25 Marks
3.	Viva (Panel of External Examiners)	40 Marks
4.	Attendance (Regularity in meeting the supervisor)	10 Marks
	Total	**100**

MOOT COURT/ INTERNSHIP

Course Code: LAW2003 **Credit Units: 14**

Course Objective:
This course relates to litigation advocacy and as such this shall be simulation course that shall have two parts. First part shall focus on preparation for trial and trial strategies. It shall also disseminate techniques of examination-in-chief cross examination and re-examination of witnesses, argumentation in courts, bail application, injunction application, etc. The second part shall focus on writing briefs in civil suits and criminal cases, appellate briefs in civil and criminal cases, and writ matters, memorial writings and arguing before the appropriate forums. The students shall be given a case to argue, that shall help to articulate their argumentative zeal as well as capacity.

Course Contents:

Module I: Moot Court
Bench Memorial, Court Craft: Presentation of case, Interaction with Bench, Question Answer Court etiquette and mannerism section.

Module II: Internship
Specified period to be spent by the student with a law firm/court/Commissions/NGO's and like institutions working with the realm of law or connected therewith. The report and diary to be certified and submitted for evaluation.

Module III: Corporate Legal Training
Corporate communication skills and client interaction and etiquette in corporate law work environment.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	05	05	70

Amity Law School

Master of Law (LLM)

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Programme Structure

Curriculum & Scheme of Examination

2023

AMITY UNIVERSITY HARYANA

GURUGRAM

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RESEARCH METHOD AND LEGAL WRITING

Course Code: LAW4101 **Credit Units: 03**

Course Objective:
The main objective of this course is to acquaint the students of Law with the method of social science research. This course is expected to provide the knowledge of technique of selection, collection and interpretation of primary and secondary data in socio –legal research.

Course Contents:

Module-I: Nature and Scope
1. Meaning and Objective of Legal Research.
2. Kinds of Research.
3. Doctrinal and Non-Doctrinal Methods of Research.
4. Stages of Research Process.

Module-II: Research Problem, Hypothesis and Research Design
1. Research Problem- Definition, Determination, Sources of Data.
2. Hypothesis- Meaning and Definition, Characteristics.
3. Research Design- Meaning and Essentials of Research Design; Forms of Research Design.
4. Testing of Hypothesis.
5. Sampling Design- Basic Assumption, Classification.

Module-III: Research Methods and Tools
1. Social and Legal Survey.
2. Case Analysis.
3. Questionnaire Schedule.
4. Observation and Interview.

Module-IV: Tabulation, Analysis, Interpretation, Reporting and Legal Writing
1. Classification and Tabulation of Data.
2. Analysis and Interpretation of Data.
3. Use of Statistical Methods and Computers in Legal Research.
4. Reporting and Method of Citations.
5. Ethics in Research.
6. Foundation of Writing.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

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Text & References:

- Garg,B.L, Karadia, R. Agarwal, F and Agarwal, U.K 2002. An Introduction to Research Methodology, RBSA Publishers.
- Kothari, C.R, 1990. Research Methodology: Methods and Techniques. New Age International
- Sinha, S.C and Dhiman, A.K, 2002. Research Methodology, Ess Publications (2 Volumes)
- Trochim, W.M.K., 2005, Research Methods: The Concise Knowledge base, Atomic Dog Publishing,

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COMPARATIVE PUBLIC LAW OR SYSTEM OF GOVERNANCE

Course Code: LAW4102 **Credit Units: 03**

Course Objective:

This course focuses on orientation of the students to understand the Constitutional Laws, their concept, constitutionalism and comparative Constitutional Law.

Course Contents:

Module-I: Public Law-Constitution and Administrative Law

1. **Concept of Constitution**
   - Meaning and Idea of Constitution, Nature and Goals.
   - Living Constitution.
   - Constitution as Supreme Law.
2. **Study of Comparative Constitutional Law**
   - Relevance
   - Problems and Concerns in Using Comparison.
3. **Constitutionalism**
   - Concept, Distinction between Constitution and Constitutionalism.
   - Essential features of Constitutionalism -Written Constitution, Separation of Powers, Fundamental Rights, Independence of Judiciary and Judicial Review.

Module-II: Constitutional Foundations of Powers

1. **Supremacy of Legislature in Law making**.
2. **Rule of Law**
   - Dicey‟s concept of Rule of Law.
   - Modern concept of Rule of Law.
   - Social and economic rights as part of Rule of Law.
3. **Separation of powers**
   - Concept of separation of powers.
   - Checks and balances.
   - Separation of powers or separation of functions.
4. **Forms of Governments**
   - Federal and Unitary Forms.
   - Features, Advantages and Disadvantages.
   - Models of Federalism and Concept of Quasi-federalism.
   - Role of Courts in Preserving Federalism.
   - Parliamentary and Presidential Forms of Government.

Module-III: Constitutional Review

1. **Methods of Constitutional Review**
   - Judicial and Political Review
   - Concentrated and Diffused Review
   - Anticipatory and Successive Review
2. Concept and Origin of Judicial Review
3. Limitations on Judicial Review

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Module-IV: Amendment of Constitution

1. Various Methods of Amendment
2. Limitations on Amending Power: Comparative Perspective
3. Theory of Basic Structure: Origin and Development

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Barendt, An Introduction to Constitutional Law (1998)
- Cane, Administrative Law (4th ed 2004)
- Finer, Comparative Government (1970)
- Loughlin, The Idea of Public Law (2003)
- Marks, The Riddle of All Constitutions: International Law, Democracy, and Critique of Ideology (2000)
- Where, Modern Constitutions (2nd ed 1966) Zines, Constitutional Change in the Commonwealth (1991)
- Seervai, Constitution of India (4th Edition)
- Above is a non-exhaustive list of books, which students may find helpful to refer:

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INTELLECTUAL PROPERTY LAW

Course Code: LAW4105 **Credit Units: 02**

Course Objective

This Course is designed with the objective of acquainting students with the conceptual and operational parameters of Intellectual Property Law, the judicial interpretation and the new and emerging dimensions of the subjects. It also teaches them various aspects and rights that exist for them in emerging Intellectual Property Laws.

Course Contents:

Module-I:

1. Introduction to IPR
   - Introduction to various kinds of Intellectual Property Rights.
   - TRIPS & WTO

Module-II:

1. Patents
   - Meaning of Patents.
   - Subject matter of Patents.
2. Infringement of Patents and Remedies available
   - Patent of Addition, Rights of Patentee.
   - Transfer of Patents, revocation of Patents & leading Case Law.

Module-III:

1. Trademark
   - Introduction meaning and definition of Trademark,
   - Function and essentials of Trademark,
   - Similar and deceptive mark, principles of registration of Trademark,
2. Infringement of Trademark,
3. Passing off, Absolute & Relative Mark of Refusal & Leading Case Laws.

Module-IV:

1. Copyright
   - Meaning and definition of Copyrights.
   - Concept of Author and Owners of Copyrights.
   - Contract of Service and Contract for Service.
   - Infringement Under Section 51 of Copyrights Act 1957.
2. Fair dealing Under section 52.
3. Features of Copyrights and Remedies available & leading Case Laws.
4.

Module-V:

1. Trade Secret
   - Meaning of Trade Secret.
   - Definition of Trade Secret and Leading Laws.

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Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Chisum on Patents
- Intellectual Property, Dr. B.L. Wadhera

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FUNDAMENTAL RIGHTS AND DIRECTIVE PRINCIPLES

Course Code: LAW4106 **Credit Units: 02**

Course Objective:

This paper is designed with a view to educate the pupil about the Constitutional rights, duties and policies of the government underlining the relevant legislations which are having wider ramification on the interpretation of the provisions of the Constitution.

Course Contents:

Module-I: INTRODUCTION

1. Evolution of Fundamental Rights, impact of Universal Declaration of Human Rights and Constitutions of other countries on Fundamental Rights.
2. Concepts of Fundamental Rights, Bill of Rights, Natural Rights and Human Rights.
3. Preamble of the Constitution and its implication with reference to Fundamental Rights, Directive Principles of State Policy, and Fundamental Duties.
4. Definition of State under Art.12, 13 - Inviolability of Fundamental Rights.
5. Doctrine of Waiver, Doctrine of Severability, Doctrine of Eclipse, scope of definition of law under Art.13.

Module-II: RIGHT TO EQUALITY

1. Relationship between Articles 14, 15, 16, 17, and 18.
2. Doctrine of Classification, Doctrine of Arbitrariness, Doctrine of Legitimate Expectation, Wendsbury Principle.
3. Prohibited grounds for discrimination (Art.15); special provisions relating to women; protective discrimination in favor of Backward Classes, Scheduled Castes and Scheduled Tribes; Development of case law.
4. Equality of Opportunity in the matters of public employment, reservations in public employment, residence as prerequisite for employment.
5. Untouchability, Abolition of Titles.

Module-III: RIGHT TO FREEDOM, RIGHT AGAINST EXPLOITATION

1. Six fundamental freedoms under Art.19 and reasonable restrictions under Art 19 (2) to (6); test to determine thereasonableness of restrictions; whether restriction includes deprivation and prohibition.
2. Rights of accused; Doctrine of ex-post -facto law; Doctrine of Double Jeopardy; privilege against self- incrimination.
3. Protection of life and personal liberty; right to education; safeguards against ordinary arrest and preventive detention; right against exploitation.
4. Ambit of religious freedom, cultural and educational rights.
5. Right to Constitutional remedies; Fundamental Rights vis-à-vis Armed Forces.
6. Martial Law and Armed Forces Special Powers Act.

Module-IV: DIRECTIVE PRINCIPLES OF STATE POLICY AND FUNDEMENTAL DUTIES

1. Relative importance of Directive Principles of State Policy (DPSP) and Fundamental Rights.
2. Nature of Directive Principles of State Policy; Justifiability of Directive Principles of State Policy.
3. Social security and welfare provisions under Directive Principles of State Policy; economic rights.

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4. Directive Principles of State Policy that were read into Fundamental Rights.
5. Fundamental Duties – evolution, relationship between Fundamental Rights and Duties.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- H.M. Seervai, Constitutional Law of India – Vol. I &II
- V.N.Shukla , Constitution of India
- Subhash C Jain, The Constitution of India
- D.D. Basu, Commentaries on Constitutional Law of India, Vol. A to E
- M. Hidayatullah (Ed.), Constitution of India
- M.P.Jain, Indian Constitutional Law
- Subba Rao G C V, Indian Constitutional Law
- Pande G S, Constitutional Law of India
- Saharay H K, Constitution of India
- Pylee M.V, Our Constitution, government & politics
- Tope T K, Constitutional Law of India

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INTERNATIONAL & REGIONAL INSTRUMENTS ON CHILD PROTECTION

Course Code: LAW4113 **Credit Units: 02**

Course Objective: In this Course, students will gain insight relative to the development of this specific Human Rights category, as well as to the evolution of the challenges faced by children over time and society's efforts to respond. They will learn more about global strategies and initiatives that have had success in promoting children's rights and will analyse these strategies throughout the Course. This Course will further provide the necessary tools for understanding the child protection and welfare under International Humanitarian Laws. The goal of the Course is to empower the students for the protection of children through academic training and action.

Course Contents:

Module I: General International Instruments Pertaining to the Rights of the Child

- UN Convention on the Rights of the Child.
- Universal Declaration of Human Rights.
- International Covenant on Civil and Political Rights.
- International Covenant on Economic, Social and Cultural Rights**.**

Module II: Specific International Instruments

- World Declaration on the Survival, Protection and Development of Children and its Plan of Action adopted at the 1990 World Summit for Children.
- United Nations Guidelines for Prevention of Juvenile Delinquency, 1990 (Riyadh Guidelines).
- United Nations Standard Minimum Rules for the Administration of Juvenile Justice, 1985 (Beijing Rules).
- United Nations Rules for Protection of Juveniles Deprived of their Liberty, 1990.
- International Convention for the Suppression of Traffic in Women and Children, 1921.
- SAARC Convention on Preventing and Combating Trafficking in Women and Children for Prostitution, 2002.

Module III: International Labour Organization Conventions pertaining to the Rights of the Child

ILO Convention on-

- Minimum age.
- Night work of young persons.
- Medical examination of young persons.
- Worst forms of Child Labour.

Module IV: Regional Instruments Pertaining to the Rights of the Child

- European Social Charter.European Convention on the Legal Status of Children Born out of Wedlock, 1975. European Convention on the Recognition and Enforcement of Decisions Concerning Custody of Children and on the Restoration of Custody of Children, 1980.
- American Convention on Human Rights. Additional Protocol to the American Convention on Human Rights in the Field of Economic, Social, and Cultural Rights.
- African Charter on the Rights and Welfare of the Child.African Charter on Human and Peoples' Rights.
- Hague Convention on the Protection of Children and Co-operation in Respect of Inter country Adoption, 1993.

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- Convention on the Civil Aspects of Child Abduction, 1980.

Module V: Protection of Children in International Humanitarian Law

- Protection of children in the Geneva Conventions and their Additional Protocols.
- Special Protection of children, as members of the civilian population.
- Special provisions for protection against the effects of hostilities:
  1. Right to care and aid.
  2. The cultural environment of the child: Fourth Geneva Convention (Article 24 & Article 50), Protocol I (Article 78).
  3. The personal rights and education of children: Fourth Geneva Convention (Article 50), (Article 94), Protocol II for non-international armed conflicts (Article 4, 3, a).
  4. Respect of preferential treatment for children (Article 38).
  5. Rights of arrested, detained or interned children: Fourth Geneva Convention (Article 82-89), the release and repatriation (Article 132) Protocol I (Article 75, 5), (Article 77, 4).
  6. Children and death penalty (Article 68 (4) of theFourth Geneva Convention Protocol I (Article 77, 5), Protocol II (Article 6, 4).
  7. Orphaned or separated children (Article 24).

Examination Scheme:

Components*	P/S/V	CT	A	CS/AS	EE
Weightage (%)	10	10	5	5	70

Text and References

- S.K. Awasthi & R.P. Kataria (2006), Law relating to Protection of Human Rights, Orient Publishing
- S.K. Kapur(2001), Human Rights under International Law and Indian Law, Central Law
- Bajpai, A. (2003) Child Rights in India: Law, Policy and Practice, New Delhi: Oxford University Press.
- Ghosh, A. (1998) A Primer of the Convention on The Rights of The Child, Calcutta: IPER.
- Bajpai, A, Burra, Neera and Weiner Myron (2006). Born Unfree: Child Labour, Education and the State in India
- Mehendale, A. (2012) Handbook for Local Authorities: on Commissions for Protection of Child Rights and Grievance Redressal, Bangalore: Centre for Child and the Law National Law School of India University.
- Manoharan, A. & Mehendale, A. (2012) Commissions for Protection of Child Rights: Answers to Common Questions Children May Have, Bangalore: Centre for Child and the Law National Law School of India University.
- Agrawal,Babita (2008)Child Labour: Issues, causes and interventions. Mahamaya Publication House.
- Chandru, K., Geetha, R. & Thanikachalam, C. (1998) Child Law in India, Chennai: Indian Council for Child Welfare.
- Kumar, Rajnish,Toiling Children in India: The gender dimension. Vol. 40 International Journal of Social Economics Bindley Emerald 885-897(2013)
- Verhellen, E. (2006) Convention on the Rights of the Child, London: Garant Publishers.

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NATIONAL AND STATE POLICIES FOR CHILD PROTECTION AND DEVELOPMENT

Course Code: LAW4114 **Credit Units: 02**

Course Objective: To equip students with the skills of using appropriate knowledge of different child protection policies and services with role and responsibility of different stakeholders. It will further help in developing understanding of students about adoption of child friendly approach and practices among stakeholders.

Course Contents:

Module I: Policies and Schemes for Child Protection and Child Health

- National Policy for Children 1974 and 2013.
- National Charter for Children, 2003.
- Programmes / Schemes for restoring Child Health- Integrated Child Development Services ICDS, Integrated Child Protection Scheme ICPS, Substance Abuse and Mental Health Services Administration (SAMHSA), SAMHSA's SOAR program etc.
- Other National Policies on nutrition, population, education, health etc.
- Sustainable Development Goals on nutrition, population, education, health.

Module II: Child Education

- The Right of Children to Free and Compulsory Education Act, 2009.
    - Philosophy, Objectives and Key Provisions.
    - Challenges in Implementation.
- National Education Policy 2020 (NEP).Online Learning and its Challenges: Measures and Legislations to protect children from online offences such as Bullying, Stalking and Child Pornography etc.
- Other National Policies with implications for Child Development such as Skill Development Programme SABLA, National Child Labour Project Scheme, Single State Authority SSA etc. Essential components of Life Skill Education with adolescents and youth.
- Need and importance of coordination and cooperation between various stakeholders, such as Judiciary, Police, Administration, CSOs, NGOs, Media, Parents and Children themselves.

Module III: Environmental Protection for Child Welfare

- Environment and Child Relationship: Laws and Institutional Practices.
- Factors enabling Healthy Child.
- Judicial Approach.

Module IV: Other Measures for Child Protection

- National Commission for Protection of Child Rights: Services and Programmes for Institutional Care (Child line and Other Outreach Service, Open Shelter, Residential Care)
    i. Principles and Process.
    ii. Roles of each stakeholder and child participation.
    iii. Challenges in Implementation and Interface with Juvenile Justice (Care and Protection of Children) Act, 2015.
    iv. Child Participation.
- Allied Welfare Policies: National Institute of Public Cooperation and Child Development; Central Adoption Resource Authority) CARA and State Adoption Resource Agency SARA.

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Examination Scheme:

Components*	P/S/V	CT	A	CS/AS	EE
Weightage (%)	10	10	5	5	70

Text and References:

- Gangrade, K. D. (2001) Working with Community at the Grassroot level: Strategies and Programmes, New Delhi: Radha Publications.
- Dayaram (2011) School Management Committee and the Right to Education Act 2009, New Delhi: American India Foundation.
- Dabir, N.; Kashyap, L.; Bajpai, A. (et al) (2010) Saarathi Manual for Training of Frontline Workers in Child Development Agencies, UK: Kusuma Trust.
- GoI (Undated) School Education, Ministry of Human Resource Development, Government of India (Web)
- Munro, E. (2002) Effective Child Protection London: Sage
- Kabeer, N. et al (Ed.) (2003) Child Labour and the Right to Education in South Asia; Needs Versus Rights? New Delhi: Sage.
- SCF (2005) Child Rights Programming: How to apply rights-based approaches to programming, A Handbook for International Save the Children Alliance Members, II Ed. Lima-Peru: Save the Children.
- GoI (2012) The CPCR Act 2005 and Rules 2006.The Bare Act with Short Notes. Delhi: Universal Law Publishing Co. Pvt. Ltd
- Kumari, V. & Brooks, S.L. (2004) Creative Child Advocacy: Global Perspectives, New Delhi: Sage.

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DISSERTATION

Course Code: LAW4237 **Credit Units: 03**

Research Dissertations:

(a) Dissertations are in the nature of monographs based on students" own research work under their respective Guides.

(b) Length of Dissertations should be between 100-125 pages (typed in 12 points, double-spaced, on A-4 size paper, hard-bound).

(c) Title-page of the Dissertation should mention its title followed by the words dissertation submitted to amity law school in partial fulfillment of the requirement for the degree of Master of Laws and should bear the students name and year of submission.

(d) Contents-page of the Term Paper should give its chapter-plan consisting of proper headings and sub-headings. This will be followed by a Preface.

(e) Each chapter of the Dissertation should begin on a fresh page and references in the prescribed style (given below) for each chapter should be given at the end of that chapter.

(f) Table of Statutes, Table of Cases and Bibliography must be given in the Dissertation after the last chapter.

Assessment Scheme:

Dissertation

Continuous Evaluation: Based on the oral presentations [three], regularity and records etc. – 30%

Final Evaluation: Based on contents and layout of the report, conceptual framework, objectives and methodology and implications and conclusions. – 70%

Term Paper: Continuous Evaluation based on chapter-plan, general approach and two presentations – 30%

Final Evaluation: Based on the organization of the paper, objectives, comprehensiveness of the research, flow of the ideas, relevance of the material used. – 70%

Text & References:

- Books: DW Bowett, *Law of International Institutions*, 4th ed, Delhi 2003, pp 11-13.
- Articles: GC Wadhwa, „Latest Trends in International Law", *Delhi Law Review* 2 (1992) p 223
- Reports: National Human Rights Commission, *Annual Report 1996-97*, p 212
- Codes & Acts: Hindu Marriage Act 1955, Sec. 14
- Cases: Sarla Mudgal v Union of India AIR 1995 SC 337

* To avoid repetition of references learn to use expressions like *ibid* and *id at.... &, supra and infra*, etc. Your Dissertation Guide will explain to you how to use these expressions.

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COMPETITION LAW

Course Code: LAW4202 **Credit Units: 02**

Course Objectives:
Competition Law course provides a conceptual understanding and in-depth knowledge of the Competition Act, 2002 and the regulatory framework concerning anti competitive agreements, abuse of dominant position and cartelization and other related matters that try to curb competition in India.

Course Contents:

Module-I: Introduction
1. Basic economic and legal principles.
2. Restraint of Trade Under Indian Contract Act.
3. Monopolistic Trade Practices, Restrictive Trade Practices.

Module-II: Development of Law from MRTP to Competition Act, 2002
1. Aims, Objective and salient features.
2. Comparison between MRTP Act & Competition Act.
3. Anti-Competitive Agreement, Abuse of Dominant Position, Combination.

Module-III: Competition Commission of India
1. Structure and function of Competition Commission of India.
2. Regulatory role.

Module-IV: Competition Appellate Tribunal
1. Composition, functions, powers & procedure.
2. Award Compensation, Power to punish for contempt, Execution of orders

Module-V: IPRs and Competition Law
1. Concept of IPRs, Transaction Involcing IPRs, Licensing IPRs, Protection offered by IPRs,
2. Territorial restraints

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Competition Act 2002
- Security Contract (Regulation) Act 1956
- SEBI Act 1992
- Depositories Act 1996
- Foreign Trade (Development & Regulation) Act 1992

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INTERNATIONAL TRADE LAW

Course Code: LAW4203 **Credit Units: 02**

Course Objective:
This course aims to introduce the students to the specialized discipline of International Trade Law. It will acquaint the students with the basic aspects of International Trade Law including the WTO and its different principles and agreements.

Course Contents:

Module-I: INTRODUCTION TO INTERNATIONAL TRADE LAW
1. Meaning of International Trade Law.
2. Scope and subject covered under international Trade Law.

Module-II: Payment for International Sales
1. Letters of Credit, Bills of Exchange
2. Their functions and connected issues.

Module-III: World Trade organization (WTO) and General Agreement Tariffs and Trade (GATT) Background of formation of WTO, role of WTO in International Trade, Difference of GATT and WTO, Structure of WTO

1. Basic Principles: MFN Treatment, National Treatment and Non Discrimination and Exception to MFN.
2. Tariff and Bindings, Regional Trade Agreements, Escape clause, safeguard measures, quantitative restrictions, antidumping and counter- veiling duties.

Module-IV: International Trade Financing
1. Trade related investment measures (TRIMS).
2. General agreement on trade in services (GATS).
3. Trade related aspects on intellectual property rights (TRIPS).

Module-V: International Commercial Arbitration
1. Concept of Commercial Arbitration among different Countries.
2. Relation between India and World with regard to International Commercial Arbitration and its Legal effects.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text & References
- Basic texts of GATT and WTO
- Jackson, John, H (1997) Law of International Trading System, The MIT Press
- Jackson, John, H (1997) World trade and Law of GATT, The MIT Press
- Dam, K.W (1970) the GATT Law and International Economic Organisation, Chicago University Press

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- Koul, A.K (2001) World Trade OrganisationSatayam Publication
- Internet Sources www.wto.org, www.uncitral.org
- Text of the Indian Arbitration and Conciliation Act, 1996

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BANKING & INSURANCE LAW

Course Code: LAW4205 **Credit Units: 02**

Course Objective*:*
This course is designed with the objective of acquainting students with the conceptual and operational parameters of Banking law and Insurance Law, the judicial interpretation and the new and emerging dimensions of both Insurance as well as Banking sector. It also teaches the students the various aspects and rights that exist in the Banking and Insurance sector.

Course Contents:
Module-I: Banking System in India

1. Banking Regulation Laws: Reserve Bank of India Act, 1934, Banking Regulation Act, 1949.
2. Kinds of Banks and their functions; Relationship between banker and customer: Legal Character, Contract between banker & customer, Banks duty to customers.
3. The Banking Ombudsman Scheme, 1995 and the Liability under Consumer Protection Act, 1986.

Module-II: Lending, Securities and Recovery by Banks

1. Principles of Lending; Position of Weaker Sections.
2. Nature of Securities and Risks Involved.
3. Recovery of debts with and without intervention of courts / tribunal: Recovery of Debts due to Banks and Financial Institutions Act, 1993. Set up of Bank Debt Recovery Tribunals.

Module-III: Banking Frauds

1. Nature of Banking Frauds; Legal Regime to Control Banking Frauds;
2. Recent Trends in Banking: Automatic Teller Machine and Internet Banking, Smart Cards, Credit Cards.

Module-IV: Insurance Law

1. Nature of Insurance Contracts.
2. Kinds of Insurance:
   - Life Insurance, Medi claim, Property Insurance, Fire Insurance, Motor Vehicles Insurance (with special reference to third party insurance.
3. Insurance Regulatory And Development Authority Act, 2000;
   - Constitution, Functions and Powers of Insurance Regulatory and Development Authority;
4. Foreign Direct Investment (FDI) in Insurance sector and the Application of Consumer Protection Act, 1986.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Banking Law & Negotiable Instruments Act – Sharma and Nainta
- Banking System, Frauds and Legal Control – R.P. Namita
- Law of Insurance – M.N. Mishra
- Handbook of Insurance and Allied Laws – C. Rangarajan
- Banking Law & Practice in India – M.L. Tannan.

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ADMINISTRATIVE LAW

Course Code: LAW4206 **Credit Units: 02**

Course Objective:
This course introduces students to various aspects of Administrative Law by examining the interaction between Public Administration and the Law. The main objectives of this course are to enable the students to:

- Understand the basic nature of Public Administration, the Courts, and Administrative Law.
- Be able to distinguish between Rulemaking, Adjudication, and Judicial Review.
- Be familiar with how Legislative and Judicial values have been infused in the Administrative State.
- Understand the implications and importance of Administrative discretion.

Course Contents:

Module-I:

1. Evolution and significance of Administrative Law in various systems of governance-from ancient to modern.
2. Doctrine of Separation of Powers: Comparative survey-Common Law and Continental System: England, USA, France and India from Rigidity to Flexibility.
3. Rule of Law: Changing dimensions, Regulation of administrative process.

Module-II:

1. Delegated Legislation: Problems, Process and Control.
2. Judicial Review of Delegated Legislation.

Module-III:

1. Processual Fairness: Evolution and Significance of Natural Justice:
   a) England: Judicial Process, Doctrine of fairness and doctrine of legitimate expectation.
   b) U.S.: Due process and judicial decision.
   c) India : Through judicial decision-Doctrine of Fairness (Art.14, 19, 21).
2. Doctrine of Legitimate Expectation, Privilege against disclosure, official secrecy, Access to information and Right to Information Act.

Module-IV:

1. Global Administrative Law: Meaning, Scope and Relevance.
2. Global Administrative Law Challenges: Constitutional Issues/ Judicial Review.
3. Increased role of Global Institutions like UN, IMF, WB, WTO etc (Transparency, Accountability & Democracy).

Module-V:

1. Control on Maladministration: Ombudsman, Commissions of Inquiry, Vigilance Commissions.
2. Investigative Agencies: The CBI, Inquiries by Legislative Committee, Legislative control, Judicial Inquiries.

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Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & Reference Books

- Pater H. Schunk, Foundation of Administrative Law, 1994
- Friedman, The State and Rule of law in a mixed Economy.
- Ivor Jennings, Law & the Constitution
- Schwartz and Wade, Legal Control of Government
- De Smith, Judicial Review of Administrative Action, 1998
- D.D.Basu, Comparative Administrative Law, 1998
- K.S.Shukla and S.S.Singh, LokAyukta: A Socio-Legal Study, 1988
- Jain & Jain, Principles of Administrative Law

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RELIGION DIVERSITY & LAW

Course Code: LAW4207 **Credit Units: 02**

Course Objective:
The course aims at imparting knowledge as well as an understanding about the multifarious nature of culture and religion in the Indian society in relation to the legal and Constitutional system of India. Basically, this course seeks to sensitize students about the existing nexus between law, religion and culture.

Course Contents:

Module-I: Introduction
1. Law: concept and significance.
2. Religion: role and significance.
3. Culture: forms and contribution.
4. Effect of culture and tradition on law: Law as an instrument of social change.

Module-II: Relationship between Law, Religion and Culture
1. Relationship between religion, culture and law.
2. Religion as a tool of unity and diversity.
3. Right to Freedom of Religion and legal reforms on secular lines; Status of languages in India: recognized and official languages; Status of marginalized communities in India; Constitutional guarantees to linguistic minorities.

Module-III: Law, Diversities and Contemporary Social Problems
1. Fundamentalism, Communalism and Terrorism.
2. Secularism, Formation of Linguistic states, Constitutional policies on language.
3. Marginalized communities and protective discrimination and affirmative action policies.
4. Role of the Constitution in preserving unity; Judicial trends.

Module-IV: Alternative Approaches
1. Jurisprudence of Sarvodaya and the role of Mahatma Gandhi.
2. Role of Vinobha Bhave and Jayaprakash Narayan.
3. Socialist thought on Law and Justice; Indian Marxist critiques on Law and Justice
4. Alternate social movements.
5. Alternative Dispute Resolution; Lok Adalats and contemporary movements.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & Reference Books:
- Galanter, Marc; Law and Society in Modern India; Oxford University Press
- Lingat, Robert; The Classical Law of India; Oxford University Press
- Baxi, Upendra; The Crisis of the Indian Legal System; Vikas Publishing House
- Basu, Durga Das; Introduction to the Constitution of India; LexisNexis

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- Bhandari, M.K.; Basic Structure of Indian Constitution: A Critical Reconsideration; Deep and Deep Publication
- Robinson, Rowena; Sociology of Religion in India; Sage Publications
- Bhat, Ishwara; Law and Social Transformation; Eastern Book Company
- Tripathi; Law and Social Change: Indo-American Reflections; Indian Law Institute

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MEDIA LAW

Course Code: LAW4208 **Credit Units: 02**

Course Objective:
This course discusses the principles of media law as they apply to the work of media and communications professionals in a variety of fields. Understanding the current and evolving state of media law is a challenging task, therefore this course will introduce students to the study of legal and ethical issues in the media. Students will develop an understanding and appreciation of these issues and the ability to analyze the important legal and ethical issues involved with the mass media industry.

Course Contents:

Module-I: Media & Public Policy

I. Disseminating the facets of Media

1. Understanding the concept of Media
2. History of Media Theories of Media
3. Evolution of Media

1. Media Legislation - British experience
2. Media Legislation in U.S.
3. Media Legislation in Indian Context

1. Freedom of Expression in Indian Constitution
2. Interpretation of Media freedom
3. Issues of Privacy
4. Right to Information
5. Case studies on Media and Free expression

Module-II: Media - Regulatory Framework

1. Legal Dimensions of Media
2. Self Regulation& Other Issues

Module-III: Convergence & New Media

1. Understanding Broadcast Sector
2. Legislative efforts on Broadcast sector
3. Opening of Airwaves
4. The New Media of Internet

Module-IV: Media – Advertisement & Law

1. Concept of Advertisement
2. Advertisement & Ethics
3. Advertisement Act of 1954

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

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Text & Reference Books:

- N. Grover: Press and the Law.
- Basu: Laws of Press in India.
- K. S. Padhy: Battle for Freedom of Press in India.
- S. K. Aggarwal: Media and Ethics.
- M.P.Jai, Constitutional Law of India (1994) Wadhwa
- H.M.Seervai, Constitutional Law of India Vol.I (1991) Tripathi, Bombay
- Rajeev Dhavan "On the Law of the Press in India" 26 J.I.L.I. 288 (1984)
- Rajeev Dhavan, "Legitimating Government Rhetoric : Reflections on Some Aspects of the Second Press Commission" 26 J.I.L.I. 391 (1984)
- Soli Sorabjee, Law of Press Censorship in India (1976)
- Justice E.S. Venkatramaiah, Freedom of Press : Some Recent Trends (1984)
- D.D. Basu, The Law of Press of India (1980)

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INTERNATIONAL CRIMINAL LAW

Course Code: LAW4209 **Credit Units: 02**

Course Contents:

Module I: Notion and General Features of the International Criminal Law

1.1. History of International Criminal Law.
1.2. Sources of the International Criminal Law
a. Treaty of Versailles,
b. Nuremberg & Tokyo Trials
c. Genocide Convention, 1948,
d. Geneva Convention, 1949, ILC Draft Code of Crimes against the Peace and Security
e. of Mankind
1.3. International Criminal Law and National Legal Systems.

Module II: Criminal Jurisdiction of States. Immunities

2.1. Mutual Legal Assistance in Criminal Matters and Extradition.
2.2. International Criminal Justice. International Criminal Courts and Tribunals
2.3 Individual Criminal Responsibility in International Criminal Law

Module III: International Crimes

3.1 War Crimes
3.2 Crimes against Humanity
3.3 Genocide
3.4 Crime of Aggression

Module IV: International criminal procedure

4.1 Penalties and Sentencing
4.2 Alternatives to International Criminal Justice
4.3 Future of International Criminal Justice

MODULE V: Some Practical Cases

Libyan Crisis

Essential Readings:

- Koenig, N., 2014. Between conflict management and role conflict: the EU in the Libyan crisis. European security, 23(3), pp.250-269.
- Koenig, N., 2011. The EU and the Libyan crisis–in quest of coherence?. The international spectator, 46(4), pp.11-30.
- Omorogbe, E.Y., 2012. The African Union, responsibility to protect and the Libyan crisis. Netherlands International Law Review, 59(2), pp.141-163.

Addl. Suggested Readings:

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• Pedde, N., 2017. The Libyan conflict and its controversial roots. European view, 16(1), pp.93- 102.
• Morana, W., 2020. The OSCE and the Libyan Crisis: Challenges and Opportunities for Comprehensive Security in the Mediterranean. Security and Human Rights, 30(1-4), pp.23- 38.
• Lounnas, D., 2018. The Libyan Security Continuum: The Impact of the Libyan Crisis on the North African/Sahelian Regional System. Middle East and North Africa Regional Architecture (MENARA) Working Papers, (15)

Syrian Crisis

Essential Readings:

• Yazgan, P., Utku, D.E. and Sirkeci, I., 2015. Syrian crisis and migration. Migration Letters, 12(3), pp.181-192.
• Cousins, S., 2015. Syrian crisis: health experts say more can be done. The Lancet, 385(9972), pp.931-934.
• Khashanah, K., 2014. The Syrian Crisis: a systemic framework. Contemporary Arab Affairs, 7(1), pp.1-21.

Addl. Suggested Readings:

• Li, X. and Li, D., 2014. Can night-time light images play a role in evaluating the Syrian Crisis?. International Journal of Remote Sensing, 35(18), pp.6648-6661.
• Hinnebusch, R. and Zartman, I.W., 2016. UN mediation in the Syrian crisis: from Kofi Annan to Lakhdar Brahimi. Raymond Hinnebusch, I. William Zartman, et al.,"UN Mediation in the Syrian Crisis: From Kofi Annan to Lakhdar Brahimi," New York: International Peace Institute.
• Berti, B., 2015. The Syrian refugee crisis: Regional and human security implications. Strategic Assessment, 17(4), pp.41-53.

Russia Ukraine War

Essential Readings:

• Liadze, I., Macchiarelli, C., Mortimer-Lee, P. and Juanino, P.S., 2022. The economic costs of the Russia-Ukraine conflict. NIESR Policy Paper, 32.
• Tosun, O.K. and Eshraghi, A., 2022. Corporate decisions in times of war: Evidence from the RussiaUkraine conflict. Finance Research Letters, 48, p.102920.
• Ibendahl, G., 2022. The Russia-Ukraine Conflict and the Effect on Fertilizer.

Addl. Suggested Readings:

• Berninger, M., Kiesel, F. and Kolaric, S., 2022. Should I stay or should I go? Stock market reactions to companies' decisions in the wake of the Russia-Ukraine conflict.
• Stock market reactions to companies' decisions in the wake of the Russia-Ukraine conflict (April 20, 2022).
• Yousaf, I., Patel, R. and Yarovaya, L., 2022. The reaction of G20+ stock markets to the Russia Ukraine conflict. Available at SSRN.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

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POLICE LAW AND ADMINISTRATION

Course Code: LAW4210 **Credit Units: 2**

Course Objective:
The objective of this paper is to discuss about the Administration, Function, Duties and Problems of the Police. This paper also discusses the general laws governing police and the various reforms done to strengthen them.

Course Contents:

Module I - Police Administration and Management:
a) Development of Police Force in India
b) Hierarchical Structure of Police Force
c) Code of Conduct for the Police
d) Police Commissions

Module II – Introduction and Overview of Police Law:
a) The Police Act, 1861
b) The Police Act, 1949
c) Other Specific Legislations

Module III – Functions, Duties and Problems of Police:
a) Prevention of Offences
b) Arrest and Release of Accused
c) Investigation and Enquiry into Offences
d) Frisking and Interrogation of Offenders or Suspects
e) Search and Seizure
f) Identification of Criminals and Crime Prone Area
g) Police – Public Relations
h) Forensic Science and Evidence

Module IV – Judicial Trends and Police Reforms:
a) Constitution of the State Security Commission
b) Separation of Investigation Staff from Law and Order Staff
c) Constitution of a Police Establishment Board
d) Constitution of Police Complaints Authority
e) Establishment of a National Security Commission

Learning Outcome:
Students will able to
- Understand the basic knowledge about the police administration.
- Analyze the functions and duties of police authorities.
- Know about the measures taken by the state and National Security Commission.
- Determine the relationship of Police and Society.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

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Text and References:

- Dr. Vijay Pal Singh: Law of Confession in India and Poison Tree Principle Published by Bright Law House.
- Dr. Vijay Pal Singh: Law Relating to Dying Declaration in India Published by Bright Law House.
- Dr. N. Maheshwara Swamy: Criminology and Criminal Justice System, Asia Law House.
- Arvind Verma & K.S. Subramanian: Understanding the Police in India, Lexis Nexis.
- B.L. Babel: Rajasthan Police Act & Rule.
- Swanson, C., Territo, L., & Taylor, R. (2016). Police Administration: Structures, Processed and Behaviour (9th ed.). Upper Saddle River, NJ: Pearson Publishing.
- Diaz, S.M., (1976), *New Dimensions to the Police Role and Functions in India*, Published by the National Police Academy, Hyderabad.
- Nehad Ashraf, (1992), *Police and Policing in India*, Common Wealth Publishers, New Delhi.
- Parmar M.S., (1992), *Problems of Police Administration*, Reliance Publishing House, New Delhi.

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CORPORATE CRIMES OR WHITE-COLLAR CRIMES
(Fundamentaliples fundamental rights & directive principle)

Course Code: LAW4211 **Credit Units: 02**

Course Brief:
The increase in white-collar crime has presented unique issues for the criminal justice system. This course exposes students to nontraditional violent and nonviolent crimes that have significant physical, fiscal, and social costs. The study of white-collar crime has challenged commonly accepted explanations of crime and has introduced new complexities at all levels of the criminal justice system; including, widespread victimization, difficulties in crime discovery, ambiguous legal definitions, corporate and individual deterrence, and perceived disparities in sanctioning.

Learning Objectives:
This course provides Student with an understanding of the
(1) issues and varieties of white-collar crime;
(2) applicable theories and research;
(3) intricacies in detecting, prosecuting and sentencing white-collar offenders; and
(4) an overview of corporate crime and professional deviance

Learning Outcome:
Students will gain knowledge on: ─

- Concept of White-Collar Crime.
- White Collar crimes prevalent in India and Legislative remedies

Course Contents:

Module – I Introduction

1.1 Nature, Concept & Scope of White-Collar Crime.
1.2 Classification of White-Collar Crime.
1.3 Sutherland's view on White Collar Crime.
1.4 Criticism of Sutherland's view on White Collar Crime.
1.5 White Collar Crime in India:-
- 1.5.1 Hoarding, Black-marketing & Adulteration.
- 1.5.2 Tax evasion.
- 1.5.3 White collar crime in different professions – Medical, Engineering, Legal, Educational Institutions.
- 1.5.4 Cyber Laws & Cyber Crimes

Module – II Corporate Crime

2.1 White collar crime in Business.
2.2 Fraud as defined under Company's Act, 2013.
2.3 Prosecution and Penalties.

Module – III Remedies to combat White Collar crime

3.1 White collar crime vs. Traditional crime.
3.2 Judicial response to White collar crime.
3.3 Remedial measures to curb White Collar Crimes.

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Module – IV Bribery and Anti Corruption Laws

4.1 **The Prevention of Corruption Act, 2018**

- 4.1.1 Salient features of the Act.
- 4.1.2 Offences committed by Public Servant & bribe giver.
- 4.1.3 Sanction for Prosecution.
- 4.1.4 Presumption where public servant accepts gratification.
- 4.1.5 Prosecution and Penalties.

4.2 Comparative Analysis of the Prevention of Corruption Act, 2018 with Foreign Corrupt Practices Act, 1977, USA and Bribery Act, 2010, UK.

4.3 Extra-territorial Reach of these Acts'

Module – V The Prevention of Money Laundering Act, 2002

5.1 Salient features of the Act.

5.2 Definition & Scope of Money Laundering.

5.3 Survey, Search & Seizure, Attachment.

5.4 Powers to arrest under the Act.

5.5 Adjudication by the Adjudicating authorities & Special Courts.

5.6 Obligation of banking companies, financial institutions and Intermediaries.

5.7 Comparative analysis of Laws dealing with Prevention of Money Laundering across USA, UK, Singapore with Laws in India.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- S.P. Singh, Socio- Economic Offences (1st Ed., 2005, Reprint 2015)
- Ahmed Siddiqui, Criminology: Problems and Perspectives (4th Ed., 1997)
- Seth and Capoor, Prevention of Corruption Act with a treatise on Anti- Corruption Laws (3rd Ed., 2000)
- C. Mehanathan, Law on Prevention of Money Laundering in India (2014)
- N.V Paranjape, Criminology, Penology with Victimology, 16th Ed., 2014, Central Law Publications

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CIVIL LAWS FOR CHILD RIGHTS

Course Code: LAW4212 **Credit Units: 02**

Course Objective: The upbringing of children is the responsibility of a nation as they behold the future of the nation. Irrespective of a child's circumstances, abandoned, neglected, or surrendered, every single child should get proper facility of living. To uphold every child's rights and to promote their best interests many Legislations have been enacted (Adoption Laws, Maintenance Laws, Labour Laws etc) which provide all the rights, privileges and responsibilities and a better standard of living for them. The nucleus of this Course is to elucidate upon all such Laws.

Course Contents:

Module I: Adoption& Maintenance

- Meaning of Adoption. Adoption in India. Procedure for Adoption.
- Adoption in Hindus (Pre & Post Hindu Adoption and Maintenance Act, 1956).Adoption under Juvenile Justice Act, 2015.
- Central Adoption Resource Authority and Inter-Country Adoption.
- Concept of Maintenance. Maintenance under Criminal Procedure Code, 1973.
- Maintenance under Hindu Personal Law (Hindu Adoption and Maintenance Act, 1956 & Hindu Marriage Act, 1955) and Muslim Personal Law.

Module II: Guardianship

- Meaning of Guardianship
- Guardianship under Hindu Law (Pre-1956 Act, Hindu Minority and Guardianship Act, 1956).
- Guardianship under Muslim Personal Law.
- Guardianship under other Religions- Guardians and Wards Act, 1890.

Module III: Marriage

- Marriage of a Minor under different Personal Laws.
- Option of Puberty.
- Child Marriage Restraint Act, 1929.
- Prohibition of Child Marriage Act, 2006.

Module IV: Property Rights

- Need for Property Rights of a child.
- Property Rights of a Child under Hindu Law.
- Property Rights of a Child under Muslim Law.

Module V: Labour Laws

- Child Labour (Prohibition & Regulation) Act, 1986.
- Factories Act, 1948 (Sections 22, 23, 27), **Domestic Workers (Registration Social Security and Welfare) Act, 2008 (**Section 14).
- The Beedi and Cigar Workers (Conditions of Employment) Act, 1966 (Section 24), **Plantation Labour Act, 1951 (**Section 25).

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Examination Scheme:

Components	P/S/V	CT	A	CS/AS	EE
Weightage (%)	10	10	5	5	70

Text & Reference Books:

- Agarwala, R.K. (2016). *Hindu Law*, Allahabad: Central Law Agency.
- Diwan, Dr. P. (2016). *Muslim Law in Modern India*, Allahabad: Allahabad Law Agency.
- Sinha, Dr. R.K. (2016). *Muslim Law*, Allahabad: Central Law Agency, 6th Ed.
- Myneni, Dr. S. R. (2018). *Hindu Law (Family Law-I)*, Hyderabad: Asia Law House.
- Mulla, D.F. (2018). *Hindu Law*, New Delhi: Lexis Nexis, 23rd Ed.
- Sagade, J. (2012). *Child Marriage in India: Socio-Legal and Human Rights Dimensions*, New Delhi: Oxford University Press India.

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CRIMES AGAINST CHILDREN

Course Code: LAW4213 **Credit Units: 02**

Course Objective: The study of Criminal Law is incomplete without discussing the crimes related to vulnerable sections of society like women and children. It is important to address this social concern in order to have a holistic approach towards Criminal Law. Children are considered an important asset of a nation as the future depends on how they mature and develop. In the present times, protection of children from all kinds of exploitation and abuses (sexual molestation, child marriage, child prostitution, child pornography and child labour etc.) has become the main objective of our society. This Course will focus on articulating different Laws which help in protecting the childhood so as to have a better understanding of the provisions helping in providing the basic necessities and protecting them. To achieve this aim, this Course has been introduced wherein a 360-degree approach has been taken to study the crimes and offences against children.

Course Contents:

Module I: Nature & Concept

- Definition of a Child (as per various Acts).
- Incidence of Crime against children in India.
- Classification of Offences against a Child.

Module II: Crimes against Children under Indian Penal Code, 1860

- Offences affecting Life (Sections 302, 304, 305, 307, 315, 316, 317).
- Kidnapping & Abduction (Sections 363, 363A, 364, 364A, 365, 366, 366A, 366B, 367, 368, 369, 372, 373).
- Sexual Offences (Sections 354, 354A-D, 376, 376A, 376AB, 376C, 376D, 376DA, 376DB, 377, 509).

Module III: Protection of Children from Sexual Offences Act, 2012 (POCSO)

- Objectives of the Act.
- Penetrative Sexual Assault, Aggravated Penetrative Sexual Assault, Sexual Assault, Aggravated Sexual Assault, Sexual Harassment.Using Child for Pornographic Purposes.
- Abetment of an Attempt to Commit an Offence.
- Procedure for Reporting of Cases and Recording Statement of the Child.
- Special Courts.

Module IV: Other Legislations w.r.t. to Offences against Children

- Prohibition of Child Marriage Act, 2006 (Section 9, 10, 11, 15).
- Juvenile Justice (Care and Protection of Children) Act, 2015 (Sections 74-89).
- Immoral Traffic (Prevention) Act, 1956 &Transplantation of Human Organs Act, 1994.
- Child Labour (Prohibition & Regulation) Act, 1986 (Sections 14, 15).
- Information Technology Act, 2000 (Sections 66A, 67, 67A, 67).

Examination Scheme:

Components*	P/S/V	CT	A	CS/AS	EE
Weightage (%)	10	10	5	5	70

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Text & Reference Books:

- Chatterjee. Dr. S.K. (2018). *Offences against Children and Juvenile Offence,* Allahabad: Central Law Publications.
- Joshi, N. (2021). *Protection of Children from Sexual Offences Act, 2012,* New Delhi: Kamal Publishers.
- Narayana, Justice P.S. (2018). *Commentary on The Protection of Children from Sexual Offences Act, 2012,* Delhi: Universal Law Publishing.
- Manjula, Dr. S.R. & Deepa, T.N. (2018). *The Children and Laws in India with Reference to POCSO Act, 2012,* Chennai: Notion Press.

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HUMAN RIGHTS

Programme Structure

Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
LAW2152	Concept and Theoretical Understanding of Human Rights	3	-	-	3
LAW2252	Systems, Organizations and Instruments of Human Rights	3	-	-	3
LAW2352	Contemporary Human Rights Situations and Issues	3	-	-	3
LAW2452	Specific Themes in Human Rights	3	-	-	3
LAW2552	Legislation Themes in Human Rights	3	-	-	3
LAW2652	Report Writing and Thesis Preparation (Human Rights)	3	-	-	3
	TOTAL				**18**

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HUMAN RIGHTS

Syllabus - Semester First

CONCEPT AND THEORETICAL UNDERSTANDING OF HUMAN RIGHTS

Course Code: LAW2152 **Credit Units: 03**

Module-I: Introduction
History of Human Rights-17th-18th century-19th century-20th century- pre world wars- Post world wars- Philosophy of Human rights

Module-II: Principle and Theories of Human Rights
Classification of human rights- Three generations-Nature of Human rights- Legal Theories related to Human Rights- Legal documents related to Human Rights before the Second World War

Module-III: International Protection of Human Rights
Failure of League of Nations- United Nations Organisation- UN Charter- UN system and organs of the UN-Universal Declaration of Human Rights- International Covenant on Civil and Political Rights (**ICCPR**) - the International Covenant on Economic, Social and Cultural Rights (**ICESCR**)

Module-IV: Implementation of Human Rights at the International Level
Human Rights Council of the UN- Committees and organs protecting Human Rights- Role of UN General Assembly and Security Council – Individual Communication system

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

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Syllabus - Semester Second

SYSTEM, ORGANIZATIONAL AND INSTRUMENTS OF HUMAN RIGHTS

Course Code: LAW2252 **Credit Units: 03**

Module-I: UN and other Regional Organisation for the Protection of Human Rights
UN system of protection of Human Rights- EU and Human Rights- Protection under the Inter American System- African Charter – Arab Charter- Cultural Relativism and Universalism

Module-II: International Documents Related to Human Rights
Genocide Convention-Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) - Convention on the Elimination of All Forms of Racial Discrimination (CERD)- Convention on the Rights of Persons with Disabilities (CRPD)- Convention on the Rights of the Child (CRC)-United Nations Convention Against Torture (CAT)- International Convention on the Protection of the Rights of All Migrant Workers and Members of their Families

Module-III: Basic Human Rights under the International Documents
Three generations of Rights- First generation Rights- Right to Equality- Right to life- Right to Speech- Freedom of Religion- Freedom from Torture

Module-IV: Second and Third generations of Rights
Rights related to dignity of individuals- Right to education- Right to food- Right to work-Right to livelihood- Right to Self Determination- Right to development- Rights of Indigenous people

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

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Syllabus - Semester Third

CONTEMPORARY HUMAN RIGHTS SITUATIONS AND ISSUES

Course Code: LAW2352 **Credit Units: 03**

Module-I: Indian Constitution and Human Rights
Concept of State- Concept of Law- Just fair and reasonableness- Fundamental Rights and Human Rights

Module-II: Fundamental Rights and International Covenant on Civil and Political Rights (ICCPR)
Right to Equality- Right to Freedom- - Right to Life- Freedom of Religion- Rights of Minorities- Right to Constitutional Remedies- Judicial pronouncement of the Courts in India

Module-III: Directive principles of State Policy and the International Covenant on Economic, Social and Cultural Rights (ICESCR)
Resources of a country and Implementation of Second Generation Rights- Positive Rights and negative rights- Enumerated Rights and Non Enumerated Rights-Directive principles of State Policy- International Covenant on Economic, Social and Cultural Rights (ICESCR)

Module-IV: Protection of Human Rights in India
Protection of Human Rights Act, 1993- National Human Rights Commission and State Commissions- Woman's Commission- Minority Commission- SC/ST Commission- Police atrocities- Violations against woman and other weaker sections- Role of NGOs- Human Rights education

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

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Syllabus - Semester Fourth

SPECIFIC THEMES IN HUMAN RIGHTS

Course Code: LAW2452 **Credit Units: 03**

Module-I: Morality, Ethics, Religion and Human Rights
Module-II: Terrorism and Human Rights
Module-III: Science and Technology and Human Rights
Module-IV: Human Rights of the Marginalized People

Rights of the Refugees- Prisoners of war- Under trials- Rights of the Differently abled- Sexual Minorities and Human Rights- HIV/AIDS- Access to Medicine- Protection of persons from enforced disappearance- Right against corruption- Right to development-Right to clean Environment

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

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Syllabus - Semester Fifth

LEGISLATION THEMES IN HUMAN RIGHTS

Course Code: LAW2552 **Credit Units: 03**

Module-I: Regional Human Rights Legislations
Module-II: National Human Rights Legislations
Module-III: Role of Judiciary-judicial Activism and P.I.L
Module-IV: Specific Human Rights issues in India and Role of legislation and Judiciary

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

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Syllabus - Semester Sixth

REPORT WRITING AND THESIS PREPARATION

Course Code: LAW2652 **Credit Units: 03**

1- **Field Report**
2- **Term Paper/ Study Report**
3- **Viva**

Examination Scheme:

Components	Field Report	Term Paper/ Study Report	Viva	Total
Weightage (%)	20	50	30	100

References:-

Agosín, Marjorie, ed. *Women, Gender, and Human Rights: A Global Perspective.* New Brunswick, NJ: Rutgers University Press, 2001.

Allen, Robin and Rachel Crasnow. *Employment Law and Human Rights.* New York: Oxford University Press, 2002.

Alston, Philip. *The United Nations and Human Rights: A Critical Appraisal*. Oxford, UK: Clarendon Press, 1992.

Alston, Philip. *Promoting Human Rights through Bills of Rights: Comparative Perspectives.* New York: Oxford University Press, 2000.

Alston, Philip, ed. *Labour Rights as Human Rights.* New York: Oxford University Press, 2005.

Alston, Philip and James Heenan. *Economic, Social and Cultural Rights: A Bibliography.* The Hague: Martinus Nijhoff, 2006.

Alston, Philip and James Crawford, eds. *The Future of UN Human Rights Treaty Monitoring.* Cambridge, UK: Cambridge University Press, 2000.

Alston, Philip, Stephen Parker and John Seymour, eds. *Children, Rights and the Law.* New York: Oxford University Press, 1993 (with corrections).

Alston, Philip and Mary Robinson, eds. *Human Rights and Development: Towards Mutual Reinforcement*. New York: Oxford University Press, 2005.

Anaya, S. James. *Indigenous Peoples in International Law*. New York: Oxford University Press, 1996.

Andreassen, Bård A. and Stephen P. Marks, eds. *Development as a Human Right: Legal, Political and Economic Dimensions.* Cambridge, MA: Harvard School of Public Health, François-Xavier Bagnoud Center for Health and Human Rights/Harvard University Press, 2006.

An-Na'im, Abdullahi A., ed. *Human Rights in Cross-Cultural Perspectives: A Quest for Consensus.* Philadelphia, PA: University of Pennsylvania Press, 1992.

Annas, George J. *American Bioethics: Crossing Human Rights and Health Law Boundaries.* New York: Oxford University Press, 2005.

Askin, Kelly D. and Dorean M. Koenig, eds. *Women and International Human Rights Law*, 3 Vols., Ardsley, NY: Transnational Publ., 2000.

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Bernhardt, Rudolf and John Anthony Jolowicz, eds. *International Enforcement of Human Rights.* Berlin: Springer-Verlag, 1987.
Broomhall, Bruce. *International Justice & The International Criminal Court: Between Sovereignty and the Rule of Law.* New York: Oxford University Press, 2003.
Brownlie, Ian and Guy S. Goodwin-Gill, eds. *Basic Documents on Human Rights*. New York: Oxford University Press, 5th ed., 2006.
Brysk, Alison, ed. *Globalization and Human Rights.* Berkeley, CA: University of California Press, 2002.
Cassese, Antonio. *Human Rights in a Changing World*. Cambridge, UK: Polity Press, 1990.
Chandler, David. *From Kosovo to Kabul and Beyond: Human Rights and International Intervention*. London: Pluto Press, 2006 ed.
Chesterman, Simon. *Just War or Just Peace? Humanitarian Intervention and International Law.* New York: Oxford University Press, 2001.
Clapham, Andrew. *Human Rights in the Private Sphere.* New York: Oxford University Press, 1994.
Clapham, Andrew. *Human Rights Obligations of Non-State Actors.* New York: Oxford University Press, 2006.
Claude, Richard Pierre and Burns H. Weston, eds. *Human Rights in the World Community: Issues and Action.* Philadelphia, PA: University of Pennsylvania Press, 2nd ed., 1992.

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INTELLECTUAL PROPERTY RIGHTS

Programme Structure

Course Code	Course Title	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
LAW2151	Principles of IPR	1	-	4	3
LAW2251	Patent Law and Practices	1	-	4	3
LAW2351	Copyright Law and Practices	1	-	4	3
LAW2451	Trademark Law and Practices	1	-	4	3
LAW2551	Emerging Issues and Challenges	1	-	4	3
LAW2651	Future Aspects of Intellectual Property Rights	1	-	4	3
	TOTAL				**18**

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INTELLECTUAL PROPERTY RIGHTS

Syllabus - Semester First

PRINCIPLES OF IPR

Course Code: LAW2151 **Credit Units: 03**

Course Contents

The course is designed to provide comprehensive knowledge to the students regarding the general principles of IPR, Concept and Theories, Criticisms of Intellectual Property Rights, International Regime Relating to IPR

Module I

Introduction to Intellectual Property Rights
Concept and Theories
Kinds of Intellectual Property Rights
Economic analysis of Intellectual Property Rights
Need for Private Rights versus Public Interests
Advantages and Disadvantages of IPR.

Module II

Criticisms of Intellectual Property Rights
Politics of Intellectual Property Rights
Third World Criticisms
Marxist Criticisms

Module III

International Regime Relating to IPR
TRIPS and other Treaties (WIPO,WTO, GATTS)

Examination Scheme

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	05	5	70

Text & References:

- D.P. Mittal (Taxman Publication), Indian Patents Law and Procedure
- B.L. Wadera, Patents, trademarks, copyright, Designs and Geographical Judications.
- P. Narayanan (Eastern Law House), Intellectual Property Law
- N.S. Gopalakrishnan & T.G. Agitha, Principles of Intellectual Property (2009), Eastern Book Company, Lucknow

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Syllabus - Semester Second

PATENT LAW AND PRACTICES

Course Code: LAW2251 **Credit Units: 03**

Course Objective

The course is designed to provide comprehensive knowledge to the students regarding Indian position of the Patent Law (1970), Historical development, Procedure for granting a patent, Infringement.

Module I

Research exemption Introduction to Patents
Overview
Historical development
Concepts, Novelty, Utility
Inventiveness/Non-obviousness

Module II

Patent Act 1970 – amendments of 1999, 2000, 2002 and 2005
Patentable subject matter, Patentability criteria, non-patentable inventions
Pharmaceutical products and process and patent protection
Software Patents
Patenting of Micro-organism

Module III

Rights of patentee
Procedure for granting a patent and obtaining patents
Grounds for opposition
Working of Patents, Compulsory License
Acquisition, Surrender, Revocation, restoration
Transfer of patent rights,

Module IV

Infringement
What Is Infringement? Direct, Contributory, and Induced
How Is Infringement Determined? Who Is an Infringer?
Official Machinery, Controller, Powers and Functions
Defences to Infringement

Examination Scheme

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	05	5	70

Text & References:

- Sookman, Computer Law, 1996
- N.S. Gopalakrishnan & T.G. Agitha, Principles of Intellectual Property (2009), Eastern Book Company, Lucknow
- Dr. B.L. Wadhera, Law Relating to Patent, Trademarks, Copyright & Designs
- P. Narayanan (Eastern Law House), Intellectual Property Law

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Syllabus - Semester Third

COPYRIGHT LAW AND PRACTICES

Course Code: LAW2351 **Credit Units: 03**

Course Objective

The course is designed to provide comprehensive knowledge to the students regarding Indian position of the Copyright Law, 1957, Historical background and Development of Copyright Law, Infringement.

Module I

Copyright and Neighbouring Rights
Concept and Principles
Historical background and Development of Copyright Law
Leading International Instruments, Berne Convention, Universal Copyright Convention,
International Copyright under Copyright Act
WIPO Phonograms and Performances treaty

Module II

Copyright Act, 1957
Terms of Copyright
conditions for grant of copyright,
extent of rights exception to copyright protection,
fair use provision, assignment and licensing,
Copyright in Literary, Dramatic and Musical ,Works, Sound Recording, Cinematograph Films,
Copyright in Computer Programme, Author Special Rights, Right of Broadcasting and performers,

Module III

Copyright Registrar and Copyright Board-Power and Procedure
Copyright Societies,
Ownership, Assignment, Licence, Translation of Copyright,
Compulsory Licences,
Infringement-Criteria of Infringement, Infringement of Copyright-Films,
Literary and Dramatic works, Importation and Infringement.

Examination Scheme

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	05	5	70

Text & References:

- P. Narayanan (Eastern Law House), Intellectual Property Law
- W. Cornish (Universal Publication), Intellectual Property Law
- R.K. Nagarjan, Intellectual Property Law
- Ganguli (Tata Megraw), Intellectual Property Rights

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Syllabus - Semester Fourth

TRADEMARK LAW AND PRACTICES

Course Code: LAW2451 **Credit Units: 03**

Course Objective

The course is designed to provide comprehensive knowledge to the students regarding Indian position of the Trademark Act, 1999, Historical development of the concept of trademark and trademark law, Registration of trademark, Infringement of trademark.

Module I

Historical development of the concept of trademark and trademark law-National and International
Introduction to Trademarks
Need for Protection.
Kinds of trademarks
Concept of Well known trademark

Module II

Registration of trademark
Grounds of refusal of registration
- Absolute ground
- Relative ground

Procedure of registration of trademark
opposition and its grounds

Module III

Infringement of trademark
Passing off
Deceptive similarity
Defences
Remedies for infringement and passing off
- Civil remedies
- Criminal remedies

Examination Scheme

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	05	5	70

Text & References:

- P. Narayanan (Eastern Law House), Intellectual Property Law
- W. Cornish (Universal Publication), Intellectual Property Law
- R.K. Nagarjan, Intellectual Property Law
- Ganguli (Tata Megraw), Intellectual Property Rights

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Syllabus - Semester Fifth

EMERGING ISSUES AND CHALLENGES

Course Code: LAW2551 **Credit Units: 03**

Course Objective

The course is designed to provide comprehensive knowledge to the students regarding the effect of IPR especially of patents on emerging issues like public health, climate, Domain Name Disputes and Cyber squatting, Bio piracy etc. and the ways to tackle this problem,

Module I

Public health and Intellectual Property Rights
Case study—Novartis Pharmaceuticals
Bayer Pharmaceuticals

Module II

TRIPS Flexibities and access to medicine
IPR and Climate change
Patents and Biotechnology

Module III

Traditional knowledge and IPR
Bio piracy
Domain Name Disputes and Cyber squatting

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	05	5	70

Text & References:

- Merges, Patent Law and Policy: Cases and Materials, 1996
- Brian C. Reid, A Practical Guide to Patent Law, 2nd Edition, 1993
- Brinkhof (Edited), Patent Cases, Wolters Kluwer
- Prof. Willem Hoyng & Frank Eijsvogels, Global Patent Litigation, Strategy
- Hilarry Pearson and Clifford Miller, Commercial Exploitation of INtellectual Property

Status Prescribed :

- The Patent Act, 1970
- The Copyright Act, 1957
- The Trade Marks Act. 1999

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Syllabus - Semester Sixth

FUTURE ASPECTS OF INTELLECTUAL PROPERTY RIGHTS

Course Code: LAW2651 **Credit Units: 03**

Course Objective
The course is designed to provide comprehensive knowledge to the students regarding the effect of IPR especially of patents on emerging issues like public health, climate, Domain Name Disputes and Cyber squatting, Bio piracy etc. and the ways to tackle this problem,

Module I
Concept of property in Cyberspace
Implications on intellectual property Rights: International & National legal preparedness
Application of copyright Act 1957,
Scope of protection of computer program
Applications of patents to computer technology

Module II
Competition Law and Intellectual Property Rights: Confronting Paradigms
Introduction
What is Competition Policy and Law?
IPRs and IPRs Policy.
Framing the Competition-IPRs Relationship.

Module III
Case study related to both modules.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	05	5	70

Text & References:
- W.R. Cornish, Intellectual Property, Sweet & Maxwell, London (2000)
- Avtar Singh, Competition Law, Eastern Book Company
- Dr. H. K. Saharay, Textbook on Competition Law, Universal Publications
- Brinkhof (Edited), Patent Cases, Wolters Kluwer
- Hilarry Pearson and Clifford Miller, Commercial Exploitation of Intellectual Property

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BUSINESS AND LABOUR LEGISLATIONS

Discipline	Course Code	Name of Course	Type (Major/ Minor)	Semester	Total Credits
Business and Labour Legislations	DLAW2151	Law of Contract-I	Major/ Minor	1	4
Business and Labour Legislations	DLAW2251	Law of Contract-II	Major/ Minor	2	4
Business and Labour Legislations	DLAW2351	Arbitration & Alternate Dispute Resolution	Major/ Minor	3	4
Business and Labour Legislations	DLAW2451	Consumer Protection Act, 2019	Major/ Minor	4	4
Business and Labour Legislations	DLAW2551	Labour Law-I	Major/ Minor	5	4
Business and Labour Legislations	DLAW2501	Intellectual Property Rights	Major	5	4
Business and Labour Legislations	DLAW2651	Labour Law - II	Major/ Minor	6	4
Business and Labour Legislations	DLAW2601	Cyber Laws	Major	6	4
Business and Labour Legislations	DLAW2602	Negotiable Instruments Act, 1881	Major	6	4

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Curriculum & Scheme of Examination

LAW OF CONTRACT - I

Course Code: DLAW2151 **Credit Units: 04**

Course Objective:
Whatever may be the nature of a given society, the contractual relations, as are obtained in that society, are governed by certain principles which are more or less of a general and basic nature. In India these general principles are included in the statute of the Indian Contract Act. 1872. This course is designed to acquaint a student with the conceptual and operational parameters of these various general principles of contractual relations. Specific enforcement of contract is an important aspect of the law of contracts. Analysis of the kinds of contracts that can be specifically enforced and the method of enforcement forms a significant segment of this study.

Course Contents:

Module I: Formation of Contract
Meaning and nature of contract, Offer / Proposal (Definition, Communication, Revocation, General/Specific offer, Invitation to treat), Acceptance (Definition, Communication, Revocation, Tenders / Auctions). 'E' Contract

Module II: Consideration and Capacity
Consideration (Definition, Essentials, Privity of contract), Capacity to enter into a contract (Minor's position, Nature / effect of minor's agreements).

Module III: Validity of Contract
Unlawful consideration and object, Free Consent, Coercion, undue influence, Misrepresentation, Fraud, Mistake, Contingent contract, Quasi contracts, Effect of void, voidable, valid, illegal, unlawful and uncertain agreements contracts.

Module IV: Discharge and Performance of Contract
Discharge of Contracts, Performance, Time and Place of performance, Impossibility of performance and frustration, Breach – Anticipatory & Present.

Module V: Remedies
Damages, Remoteness etc., Injunction, Specific performance, Quantum Merit.

Module VI: Specific Relief Act, 1963
Recovery of property, Specific performance of contracts, Rescission of Contract, Declaratory Decree, Injunctions: Temporary and Perpetual, Mandatory.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Anson - Law of Contract
- Pollock and Mulla - Indian Contract Act
- Avtar Singh - Indian Contract Act
- Bangia - Law of Contract and Specific Relief
- Cheshire and Fifoot - Law of Contract.

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LAW OF CONTRACT - II

Course Code: DLAW2251 **Credit Units: 04**

Course Objective:
This course shall be taught after the students have been familiarized with the general principles of Contract in which the emphasis is on understanding and appreciating the essentials of a valid Contract and on the existence of Contractual relationship in various instances. Obviously, Contract Law assumes special significance to suit changes in society. These special Contracts are studied in the light of statutory provisions and decisional Law. With the invent of globalization in various sectors of economy today and are in need of specialized legal Professionals due to huge contractual requirements, joint venture Partnerships and the like, Therefore, this Course of Special Contracts provides an insight into the justification for special statutory provisions for certain kind of Contracts.

Course Contents:

Module I: Indemnity and Guarantee/Bailment and Pledge
Meaning, Distinction between Indemnity and Guarantee, Right / Duties of Indemnifier, Indemnified and Surety, Discharge of Surety, Kinds of Guarantee, Bailment and Pledge: Meaning and Distinction, Rights and Duties of Bailor/Bailee, Pawnor/Pawnee, Lien, Termination of Bailment.

Module II: Agency
Definitions of Agent and Principal, Appointment of an Agent, Authority of an Agent, Creation of agency: by agreement, Ratification and law, Relation of principal / agent, subagent and substituted agent, Ratification of Agents Authority, Revocation of Agency Authority, Effects of Agency on Contracts with third person, Personal Liability of agents, Termination of agency.

Module III: Sale of Goods Act 1930
Contract of Sale: Nature and definition, Conditions and Warranties, Transfer of Property and Title, Performance of the contracts, rights of unpaid seller, suit for breach of contract.

Module IV: The Indian Partnership Act, 1932
Nature of partnership firm, Relations of partners to one another and outsiders, Rights /Duties of partners *inter se*, Partnership Property: Relations of Partners to third parties, Liability for holding out, Minor as a partner; Incoming and outgoing partners, Dissolution of Partnership Firm, Modes of Dissolution, Consequences of dissolution, Registration of firms and effects of non-registration.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Texts & References:
- Pollock and Mulla, Indian Contract Act
- Avtar Singh, Indian Contracts Act
- Mulla, D. F., Indian Partnership Act
- Desai, T.R., Law of Contracts and Partnership sale of good Act
- R.K. Bangia, Sales of Goods Act, 1930
- Avtar Singh, Sales of Good Act
- Avtar Singh, Indian Partnership Act.
- K. Sukumaran, Pollock & Mulls - The Indian Partnership Act

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ARBITRATION AND ALTERNATE DISPUTE RESOLUTION

Course Code: DLAW2351 **Credit Units: 04**

Course Objective:
The course material imparts to the students an understanding of the concept of alternate methods of resolving disputes in addition to the traditional court-oriented processes. It focuses on an analytical study of arbitration law and practice in India and the relevant institutions monitoring the same. The paper also focuses on other alternate dispute resolving mechanisms through State mediatory services under the supervision of the courts.

Course Contents:

Module I: Introduction
Alternative Dispute Resolution (ADR): Concept and Need and International and National initiatives in India; IIC, UNCITRAL, KSID.
Arbitration and Conciliation Act, 1996
General Provisions, Definitions, receipt of written communications, waiver of right to object, extent of Judicial Intervention, Administration Assistance; Arbitration agreement, power to refer parties to arbitration where there is an arbitration agreement, Interim measures by court.

Module II: Composition of Arbitral Tribunal
Composition, Jurisdiction, Conduct of Arbitral Proceedings: Settlement, form and contents of arbitral award, termination of proceedings, correction and interpretation of awards, additional award.

Module III: Recourse against Arbitral Award
Application for setting aside Arbitral Award, Finality and enforcement of Arbitral Award, appealable orders, Miscellaneous, Deposits, Lien on Arbitral Award and Deposits as to costs, Arbitration agreement not to be discharged by death of party thereof, Provisions in case of insolvency, Jurisdiction, limitation, Limitations, Enforcement of certain Foreign Awards.

Module IV: Techniques of ADR – I
Negotiation / Consultation, Mediation, Good offices, Conciliation: Nature, Scope and Methods.
Legal Services: Meaning and scope in Legal Aid and Advice, Lok Adalats-nature, scope, procedure and functioning.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Rao, P.C., Arbitration and Conciliation Act, 1996, Universal Law Book Co., Pvt. Ltd., (1997)
- Rao P.C. & Sheffield William, Alternative Dispute Resolution
- Sujan, M.A., Law relating to Arbitration and conciliation.
- Kawatra, G.K., The New Law of Arbitration and conciliation
- Chaudhary, S.K. Roy, Law of Arbitration Conciliation, 4th Ed. Eastern Book
- Saharay H.K., Law of Arbitration (197) (Revised Print)

Statutory Material:
- Arbitration and Conciliation Act, 1996.
- Legal Services Authority Act, 1987.
    - UNCITRAL

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CONSUMER PROTECTION ACT, 2019

Course Code: DLAW2451 **Credit Units: 04**

Course Objective:
Globalization of trade, market-dominated economy, information revolution and emergence of e-commerce has led to the development of Laws aimed towards Consumer considerations and their protection. A greater importance has been assigned to Consumer Law at a global basis. The Legislative framework globally has undergone tremendous change to address the Consumer issues and the Indian legal framework has also undergone a substantial change to comply with the international norms. The present Course aims to introduce the existing Law and practice relating to Consumer Protection.

Course Contents:

Module I: Introduction
- Development of market and Consumer relations.
- Consumer movement in the global context.
- Enforcement of Consumer Protection: Law and Policy.

Module II: Legislative Framework On Consumer Protection In India
- **Consumer Protection Act, 2019**
  - Objective of the Legislation.
  - Grievance redressal system and its jurisdiction.
  - Definition of Consumer.
  - Complaints that can be made under the Act.
  - Relief available to Consumer.
  - Appeals, limitations, adjournments and other procedures.
- **Other Legislations For Consumer Protection**

Module III: **Consumer Issues And Consumer Rights**
- Consumer Issues.
- Consumer Rights.
- Consumer Education.
- Consumer Rights and Corporate Social Responsibility.

Module IV: **Emerging Issues In Consumer Protection**
- E-Commerce and Consumer Protection.
- Alternative Dispute Resolution as a means of resolving Consumer Disputes.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Law of Consumer Protection in India, D.N. Saraf, N.M. Tripathi (1990).
- Public Utility Services under the Consumer Protection Act, Mamta Rao, Deep & Deep, (1999).
- Is it Really Safe? Girimaji & Roy, CUTS, (2004).
- State of the Indian Consumer, CUTS, (2001).
- Consumer Protection, Dr. V.K. Agarwal, 6th edition, Bharat, (2008).
- Consumer Protection Law in India: An Eco-Legal Treatise on Consumer Justice, R.K. Nayak, N.M. Tripathi, (1991).

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LABOUR LAW - I

Course Code: DLAW2551 **Credit Units: 04**

Course Objective:
The course aims at imparting to the students an indepth understanding of Labour Laws in India by recourse to relevant judicial pronouncements in this regard.

Course Contents:

Module I: Regulation of Trade Union & Unfair Labour Practices
History of Trade Union Movement in India and need to form Trade Union, Workers Right to form Union vis-à-vis Indian Constitution; the Membership of Trade Union, Closed shop and Union shop, Registration of Trade Union, Remedies in case of non-registration and cancellation of registration of union, Privileges and Protection of registered Trade Union form certain acts and omissions, Unfair labour practices and victimization.

Module II: Collective Bargaining:
Concept and importance of collective bargaining, Pre-requisites for collective bargaining, Process of administering collective agreement (Negotiation, Mediation, & Voluntary arbitration & Compulsory Arbitration.), Duration and enforcement of bipartite Agreement (Secs. 18, 19, Industrial Disputes Act, 1947), Pressurization: Strike, Go-Slow, wok to rule, Gherao and Lockout.

Module III: Regulation of Industrial Disputes
Define the concept of Industry, Industrial Dispute and workman, Power of Government to refer Industrial Disputes for adjudication: The Adjudicatory Machinery, Award and its binding nature, Judicial review of Awards, The concept of lay-off, retrenchment and procedure and compensation relating to lay-off and retrenchment.

Module IV: Standing Orders
Concept, Nature and scope of standing orders under Industrial Employment (Standing Order) Act, 1946, Formulation of Standing Orders and its Certification process, Modification: Modification and temporary application of Model Standing Order, Interpretation and Legal status of Standing Orders.

Module V: Discipline in Industries
Doctrine of hire and fire in the context of social welfare, Fairness in disciplinary process: Meaning of misconduct, Right to know: The Charge Sheet, Right to defend; Domestic enquiry notice, evidence, cross examination, unbiased enquiry officer and reasoned decision, Punishment of misconduct, Prenatal (permission) and Postnatal (Approach) control during pendency of proceeding (Sec. 33 of industrial and Disputes Act).

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- O.P. Malhotra, Law of Industrial Disputes.
- Indian Law Institute, Labour Law and Labour Relations.
- K.D. Srivastava, Commentary of Industrial Employment (S.C.) Act, 1946.
- S.C. Srivastava, Industrial Relation and Labour Law.
- Report of National Commission on Labour, 1969.
- Industrial Disputes Act, 1947.
- R.B. Sethi & R.N. Dwivedi, Law of Trade Union.

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INTELLECTUAL PROPERTY RIGHTS

Course Code: DLAW2501 **Credit Units: 04**

Course Objective:
The course is designed to provide comprehensive knowledge to the students regarding Indian position of the Patent Law (1970), Copy Right Law (1957) and Designs Act of 2000 which invariably form the part of Intellectual Property Law and shall comprise of the following.

The importance of this branch of the law is to be sufficiently realized in the Indian legal education. These areas are now internationally conceptualized as representing intellectual property. It is often the case that while the law of patents and trademarks is referred to as industrial property, the law relating to copyright is named intellectual property. While both these terms could be suitably invoked, we here speak of intellectual property as signifying all the three bodies of the law as well as the law on industrial designs.

Unlike other forms of property, intellectual property refers to regimes of legal recognition of, primarily, the products of the mind or imagination. The subject matter of property relations is here preeminently based on mental labour. The law relating to intellectual property protects the right to mental labour. The law confers rights of proprietary nature on relative intellectual labour primarily on the basis that it is in the interests of society and state to promote creativeness and inventiveness. Limited monopoly provides incentive for greater inventive and innovative efforts in society. An important aspect of the exploration in this course would be ways in which the laws strike a fair balance between the interests and rights of the intellectual labourers on the one hand and organized industrial enterprises on the other. Another dimension is a study of the ways in which this regime of laws militates against, or favours, commModuley property in national cultures. As concerns 'modernization' crucial questions arise in the field of copyright protection in computer software and hardware, internet, electronic music and scientific research. Both copyright, trademarks, design and patent law here relate basically to the law of unfair competition and constitute an aspect of consumer protection and welfare not only in the context of national perspectives but also in view of the waves of globalization already set in. Both from the standpoint of human resources development, modernization and justice it is important that the law students get sufficient insights in Intellectual Property Law.

Course Contents:

Module I: Introduction
Intellectual Property, Concept and Philosophy, Need for Private Rights versus Public Interests, Advantages and Disadvantages of IPR.

Module II: Patent
Development of patent law, Rationale for patent protection**,** Nature and definition, Types of patentable subject matter, Patentability criteria, non-patentable inventions, Rights of patentee, Procedure for granting a patent, Grounds for opposition, Transfer of patent rights, Compulsory Licenses, Acquisition, Surrender, Revocation, restoration, Patent infringement and remedies, Bio patents and software patents, Official Machinery, Controller, Powers and Functions, Patent in pharmaceutical industry, Patent cooperation treaty, Paris convention.

Module III: Copyright
History, Concept of copyright, conditions for grant of copyright, extent of rights exception to copyright protection, fair use provision, assignment and licensing, Compulsory licensing and statutory licensing, Collective administration, Copyright board and office, powers and functions, Moral rights: Neighboring rights; infringement penalties and remedies, Appeals, Berne Convention, Universal Copyright Convention - WIPO Copyright Treaty: WIPO Phonograms and Performances treaty, TRIPS with respect to Copyright and Neighboring rights.

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Module IV: Designs, Protection, Historical development, Rationale
Designs Act of 2000: Meaning of Design, Conditions for grant of protection, Ambit of Protection, Exceptions, Registration of Designs, Cancellation, Copyright in Registered Designs, Enforcement, Infringement and remedies, Powers and duties of Controller.

Module V: Trademarks
Evolution, Functions, Objective, Definition, Kinds of Marks, Domain names, Registration, Concurrent registration, Procedure for registration, Relative and absolute grounds of refusal, opposition and its grounds, Assignment, transmission and licensing of Trademarks, Infringement, Penalties and Remedies, Withdrawal of protection, Passing off, Official machinery for regulation administration and Redressal, Registrar, Difference between Trade Mark, **Trade Secret, Traditional Knowledge** and Geographical Indications, TRIPS on Trademarks, Madrid Agreement for The Repression of False or Deceptive Indications of Source on Goods, 1891- Madrid Agreement for the International Registration of Marks, 1891 and protocol relating to that agreement 1989.

Module VI: Plant Varieties Protection Act, 2001
Objectives, Rationale,Registry, Official machinery, registration, Criteria of fulfillment Exclusions, Benefit sharing, Farmers rights,CommModuley Rights, compulsory license Redressal fora, Appellate tribunal, Infringement, offences and penalties; Geographical indications of Goods (Registration and Protection Act, 1999**:** History, Definition, Rationale, Functioning, official Machinery,Registry,Rights conferred, Registration Procedure. Redressal Machinery, Appeal, Passing off, Offences, penalties and Procedure.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	05	5	70

Text & References:

- D.P. Mittal (Taxman Publication), Indian Patents Law and Procedure
- B.L. Wadera, Patents, trademarks, copyright, Designs and Geographical Judications.
- P. Narayanan (Eastern Law House), Intellectual Property Law
- W. Cornish (Universal Publication), Intellectual Property Law
- R.K. Nagarjan, Intellectual Property Law
- Ganguli (Tata Megraw), Intellectual Property Rights

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LABOUR LAW - II

Course Code: DLAW2651 **Credit Units: 04**

Course Objective:
The paper is to focus on wage policies, compensation for learn caused during the course of employment and working conditions of employees.

Course Contents:

Module I: Minimum Wages Act, 1948
Concept of Labour Welfare, Classification and Importance, Labour welfare activities, Concept of minimum wage, fair wage, living wage and need based minimum wage, Constitutional validity of the Minimum wages Act, 1948, Procedure for fixation and revision of minimum wages, Fixation of minimum rates of wage by time rate or by piece rate, Procedure for hearing and deciding claims.

Module II: Payment of Wages Act, 1936
Object, scope and application of the Act, Definition of wage, Responsibility for payment of wages, Fixation of wage period, Time of payment of wage, Deductions which may be made from wages, Maximum amount of deduction.

Module III: Workmen's Compensation Act, 1923
Definition of dependant, workman, partial disablement and total disablement, Employer's liability for compensation: Scope of arising out of and in the course of employment, Doctrine of notional extension, When employer is not liable, Employer's Liability when contract or is engaged, Amount of compensation, Distribution of Compensation, Procedure in proceedings before Commissioner, Appeals.

Module IV: Factories Act, 1948 & Social Security
Concept of "factory", "manufacturing process" "worker" and "occupier" : General duties of occupier, Measures to be taken in factories for health, safety and welfare of workers, Working hours of adults, Employment of young person and children, Annual leave with wages, Additional provisions regulating employment of women in factory, Social Security of Workmen ; Concept and scope of social security : Origin of Social Security in India, Claim and Adjudication of Disputes under Employee's State Insurance Act. 1948.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- S.C. Srivastava, Commentaries on factories Act, 1948, Universal Law Publishing House, Delhi
- H.L. Kumar, Workmen's Compensation Act, 1923.

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CYBER LAWS

Course Code: DLAW2601 **Credit Units: 04**

Course Objective:
With the advent of Information Technology Law and Right to Information Law, new strides and strategies in legal justice education have come up. There is a need that Law students must also be acquainted with these new developments if a law student has to find a comfortable berth in the competitive legal market as a Law Professional as well as legal manager. Therefore, there seems to be an impending need to generate e-Legal Justice Education that exposes the students to have deep insights into the complexities of information technology and right to information. Objectives of this course, therefore, are understanding the legal recognition and procedure, Digital signatures, legal recognition of cyber authorities and Cyber appellate tribunal, legal implications of new varieties of offences and penalties under the Information Technology Act, 2000. A student of law should also be given the understanding of copy right issues, TRIPS agreements, application of patents to computer technology, etc. Besides, the course also aims at developing insights into the Right to Information Act, 2005 and its grey areas.

Course Contents:

Module I: Introduction (Need, Role and various aspect related to Cyber Law)
Need and role of Cyber; Jurisprudence of Cyber Law in India; Free speech and expression on Internet &Privacy; issues, Right to data protection, Cyber Law &Protection of Domain name.

Module II: Cyber Jurisdiction, Investigation & Cyber Forensics
Cybercrimes: Extradition and Jurisdictional issues; Investigation of Cyber Offences: Cyber equipment's& Cyber Cell; Cyber Forensics: provisions, need and role in cyber investigation.

Module III: Electronic Governance, Cyber space &IPR issues
Legal aspect of Electronic Governance; IPR Issues: An Overview, Patent, Copyright and Trademark& other related Issues in Cyberspace.

Module IV: Cyber Legislations (Laws, National and International treaties & Conventions)
Cyber Legislation: An Indian and International Regime; The Information Technology 2000, The Provisions relating to- Legal recognition of – Digital & Electronic Signature, Secure E- records and Signature, E- signature Certificates, Certifying Authorities, Cyber, Appellate Tribunal and Miscellaneous Provisions.

Module V: Cyber Crimes (Civil & Criminal)
Cyber Crimes and Cyber Victimization; Cyber Offences: Types & the provisions for Penalties mentioned in IT Act, 2000; Cyber Pornography, Cyber Terrorism, Cyber Tort and Cyber defamation etc.

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:
- Nandan Kamath, Universal Law Publishing Company and E –commerce: Law relating to computers Internet.
- K.K. Kumar, Dominant Publication: Cyber Law
- B.L. Wadhera : Patent, trademarks, Copyrights
- Ganguly (LMH): Intellectual Property Rights.

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NEGOTIABLE INSTRUMENTS ACT, 1881

Course Code: DLAW2602 **Credit Units: 04**

Course Objective:

This course is designed to provide students with an overview of negotiable instruments i.e., promissory notes, bills of exchange, and cheques. The course plan includes a discussion of the requirements defined by the Laws applicable to negotiable instruments. In this course the students will learn the requirements associated with the transfer of negotiable instruments including but not limited to the parties involved and their rights.

Course Contents:

Module I: Introduction

- Definition and Nature of Negotiable Instruments
- Kinds of Negotiable Instruments: Promissory Note, Bill of Exchange, Cheque.
- 'Holder' and 'Holder in Due Course' (N.I. Act, section 8 read with 78; 9, 19-25, 53, 58, 59 and 118)

Module II: Transfer of Negotiable Instruments

- Negotiation (N.I. Act, sections 14, 46, 47, 48, 57)
- Assignment (The Transfer of Property Act, 1882, sections 130-132)
- Meaning of Indorsement – Who can indorse (N.I. Act, sections 15 and 51)
- Kinds of Indorsement – Indorsement in Blank and Full (N.I. Act, sections 16 and 54), Conditional Indorsement (N.I. Act, section 52), Restrictive Indorsement (N.I. Act, section 50), Sans Recourse Indorsement (N.I. Act, section 52); Partial Indorsement (N.I. Act, section 56)

Module III: Liability and Discharge of Parties

- Liability of Maker, Drawer, Drawee and Indorser (N.I. Act, sections 30, 31, 32, 35 and 36)
- Modes of Discharge – Cancellation [N.I. Act, section 82 (a)]; Release [N.I. Act, section 82 (b)]; Payment [N.I. Act, section 82(c)]; Material Alteration (N.I. Act, sections 87-89); Crossing of Cheques (sections 123-131-A)
- Liabilities for Dishonour of Cheques (sections 138-147) (The Negotiable Instruments (Amendment) Act 2018)

Module IV: Emerging Payment Systems

- **The Payment and Settlement Systems Act, 2007**

Examination Scheme:

Components	P/S/V	CT	C	A	EE
Weightage (%)	10	10	5	5	70

Text & References:

- Bimal N. Patel, Dolly Jabbal, Prachi V. Motiyan**i, *Banking Law and Negotiable Instruments Act,*** (2015)
- 2. O.P. 'Faizi' & Ashish Aggarw**al, Khergamvala on *The Negotiable Instruments Act*** (20h ed., 2008)
- **Ranganath Misra, Bhashyam & Adiga's *The Negotiable Instruments Act*** (18th ed., 2008)
- Dr. Rajesh Gupta & Dr. Gunjan Gupta (revised), S.*P. Tyagi**'s Commentary on The Negotiable Instruments Act, 1881 (*2019)**

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- Dr. Rajesh Gupta & Dr. Gunjan Gup**ta,** ***Law of Dishonour of Cheques*** (5th ed.,2019)
- **Avtar** Singh, ***Negotiable Instruments (*****4t**h ed., 2005) *7.* S. Krishnamurti Aiy**ar,** ***Law Relating to the Negotiable Instruments Act*** (10th ed., 2009)
- Dr. H.K**. Saharay,** ***Negotiable instruments Act 1881 (With Special Emphasis on Dishonour of cheques), (*****3rd ed., 2011)**
- **D.K. Sharma***, Dishonour of Cheque**s, (*2012)

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Amity Medical School

Bachelor of Science (Honors / Honors with Research) in Dietetics & Applied Nutrition

FLEXILEARN
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Programme Structure

Curriculum & Scheme of Examination

2023

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Bachelor of Science (Honors / Honors with Research) in Dietetics & Applied Nutrition

SEMESTER-I

PRINCIPLES OF NUTRITION

Course Code: DDAN2151 **Credit Units: 04**

Course Contents:

Module I

Nutrition - General introduction, Classification of nutrients, Functions of food, social function of food, psychological functions of food.

Energy - Definition of Kilocalories, Joule, energy value of foods, determination, physiological fuel values, SDA of foods, determination of energy requirements of body, basal metabolic rate determination, factors influencing BMR, Recommended Dietary Allowances for energy.

Carbohydrates - functions, source, digestion, absorption and utilization, dietary fiber and health.

Module II

Protein - Classification, functions, sources and requirements, digestion, absorption and Utilization, Deficiency due to shortage of protein and energy – PCM, kwashiorkor

Fats and Lipids - Classification, functions, sources, requirement, digestion, absorption and utilization

Module III

Vitamins – Fat soluble vitamins –A, D, E and K- functions, source, requirements, deficiency disorders. Water soluble vitamins –The B-complex vitamins – Thiamine, Riboflavin, Niacin, Folic acid, Biotin, Pantothenic acid and Vitamin C - functions, source, requirements and deficiency disorders.

Module IV

Minerals - General functions in the body, classification- macro and micro minerals. Micro minerals – Iron, Fluorine, Zinc, copper, Iodine -functions, absorption, utilization, requirements, deficiency and toxicity. Macro minerals – Calcium & phosphorus - functions, absorption, utilization, requirements, deficiency and toxicity.

Module V

Water Balance – Functions of water, water distribution, maintenance of water and electrolyte balance, regulation of acid-base balance in the body.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

REFERENCE:

1. Essential of food & Nutrition –Vol. 1 M. Swaminathan, Bappco, Bangalore.
2. Human Nutrition and Dietetics –Davidson S. Passmore
3. Normal and Therapeutic Nutrition- Corinne .H.Robinson & Marilyn Lawler
4. Contemporary Nutrition - Gordon M. Wardlaw, Paul Insel et, al., (2000) Mosby, Chicago.
5. Nutrition- concepts and controversies- Eleanor Whitney –Eighth Edition (2000)
6. Basic principles of Nutrition- Seema Yadav, First edition (1997)
7. Essentials of Nutrition and Diet therapy -Sue Rodwell Williams, fifth edition, Times Mirror Mosby College Publishing, 1990.
8. Understanding Nutrition -Whitney P.N. and Roes S.R., West Publication Co, 1996.

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FOOD SCIENCE

Course Code: DDAN2101 **Credit Units: 04**

Course Contents:

Module I
Food group: Basic 4, 5 & 7 food groups; functional food groups-energy yielding, bodybuilding and protective foods (only sources and not properties and functions)food pyramid
Study of various cooking methods - Boiling, steaming, stewing, frying, baking, roasting, broiling, cooking under pressure. Stages of sugar cookery, crystallization and factors affecting crystallization.

Module II
Cereals - Structure, composition of rice, wheat, effects of cooking on parboiled and raw rice, principles of starch cookery, gelatinization, flours-types, formation of dough and batter, hydration, rheological properties and development of gluten.
Pulses and Legumes – Varieties of pulses & legumes, composition, nutritive value, cooking quality of pulses, germination and its effect.

Module III
Vegetables - Classification, composition, nutritive value, selection and preparation for cooking, methods and principles involved in cooking, and medicinal value of vegetables.
Fruits - Classification, composition, nutritive value, changes during ripening, methods and effects of cooking, enzymatic browning and medicinal value of fruits.

Module IV
Milk - Composition, nutritive value, kinds of milk, pasteurization and homogenization of milk, changes in milk during heat processing, preparation of cheese and milk powder.

Module V
Egg - Structure, composition, selection, nutritive value, uses of egg in cookery, methods of cooking, foam formation and factors affecting foam formation.
Fleshy foods - Types of fleshy foods, meat structure, composition, nutritive value, selection of meat, post-mortem changes in meat, aging, tenderness, methods of cooking meat and their effects.
Poultry – types, composition, nutritive value, selection, methods of cooking.
Fish - Structure, composition, nutritive value selection of fish, methods of cooking.

Module VI
Fats and Oils - Types of oils, the function of fats and oils, shortening effects of oil, smoking point of oil, the effect of heat on oil absorption and factors affecting absorption of oil. Composition and nutritive value and health benefits of nuts and seeds.
Beverages - Classification, nutritive value, milk-based beverages, fruit-based beverages and preparation of carbonated beverages. Spices and Condiments - Uses and abuses.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

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REFERENCE:

1.Food Science, Chemistry and Experimental Foods by M. Swaminathan.
2.Food Science by Norman.N.Potter.
3.Experimental Study of Foods by Griswold R.M.
4.Food Science by Helen Charley.
5.Foundation of Food Preparation by A.G. Peckam.
6.Modern Cookery for teaching and trade, volume I&II ,Thangam Philip. Orient Longmans Ltd.
7.Food Fundamentals by MacWiliams, John Willy and son's, New York.
8.Food Facts & Principles by Shakunthala manay & Shadakhraswamy.
9.Food Science by Srilakshmi , second edition,2002.

FOOD SCIENCE LAB

Course Contents:

1. Cereals:
a) Microscopic study of different starches.
b) Methods of combining starch and boiling water.
C) Study of effects of moist heat on starch.
d) Preparation of white sauces and soups.
e) Gluten formation.

2. Pulses -
Effect of hard water, soft water, alkali, papaya on texture and cooking time of grams and dhals.

3. Vegetables -
Effect of shredding, dicing, acids, alkali, covering, steaming arid pressure cooking on the different pigments and acceptability of vegetables.

4. Fruits -
Study of different methods of preventing enzymatic browning of fruits. Pectin content of fruits.

5. **Eggs** -
Coagulation of egg protein - factors, Egg white foam, effects of beating, sugar, acid and temperature

6. **Milk** cookery
Coagulation of milk protein, panneer, cooking of vegetables in milk.

7. **Fats and Oils** -
Comparison of smoking temperature of some fats and oils.

8. S**ugar** and Jaggery -
Different stages of crystallisation of sugar.

1. Experience in Baking (Group work) Cakes and biscuits.
2. Experience in preservation of foods (Group work) salting, pickling, preservation with sugar, jams, jellies, marmalades, squash, sauces and ketchup.

9. Food adulteration - Identification of common adulterants - Demonstration.

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SEMESTER-II

FAMILY MEAL MANAGEMENT

Course Code: DDAN2251 **Credit Units: 04**

Course Contents:

Module I

Protein quality - Definition of biological value, NPU, digestibility coefficient, PER definition and measurement. Reference protein, essential amino acids and mutual supplementation of dietary protein.
Fats : the importance of essential fatty acids, their requirements and deficiency.
Basic Principles of Meal Planning - Basic meal pattern and its need to suit different income levels age and physiological stages.

Module II

Nutritional Needs during Pregnancy - Normal growth and weight change. Nutritional requirements, complications during various stages of pregnancy –
Nutrition during Lactation - Function of breast, physiology of lactation, hormonal control and relaxation, Milk output and factors affecting it, frequency of nursing- supply and demand, nutritional components of colostrum and mature milk. Nutritional requirements of lactating women.

Module III

Nutrition during Infancy - Growth and development, factors influencing growth, Advantages of breastfeeding, the difference between breastfeeding and bottle feeding, factors to be considered in bottle feeding. Different types of milk formulae.
Weaning Foods - Weaning foods and commercially prepared baby foods. Uses of growth chart to monitor growth & development. Nutritional requirements of infants upto one year. Weaning foods developed by different organizations. Problems of feeding in normal and premature infants.

Module IV

Nutritional needs of preschool children (1-5 years) - Nutritional and food requirements of preschool children. Factors to be considered while planning meals for preschool children. Eating problems of children and their management, preparation of supplementary foods using available low-cost foods.
Nutrition for School children - Nutritional requirement, meal planning for school children, dental caries and packed lunch.

Module V

Nutrition during Adolescence - Physical Growth- changes and factors affecting height and weight, Nutritional requirement. Nutritional problems in adolescence- Iron deficiency anemia, anorexia nervosa and bulimia nervosa.
Nutritional needs of adults (men and women) – Nutrition and work efficiency. Menopausal and post-menopausal women, hormonal changes, nutritional requirement of the adult in relation to occupation.
Nutrition During Old Age - Physiological changes in ageing- psycho-social and economic factors affecting eating behaviour. Nutritional problems of the aged and their management.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

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REFERENCE:

1. Nutrition Trends in India -Vinodhini Reddy, Prahlad Rao, Govmth Sastry and Kashinath, NIN, Hyderabad, 1993.
2. Modern Nutrition in Health and Diseases- Shills, E.M. Olson, A.J. and Shike, Lea and Febiger
3. Dietetics -B. Srilakshmi, New Age International Pvt. Ltd, 2003.
4.NutritionScience-B.Srilakshmi,NewAgeInternationalPvt.Ltd., 2003.
5.Food,nutrition and diet therapy -Krause, Eleventh edition
6. Human Nutrition and Dietetics- Davidson S Passmore R, Brock JP, ELBS and Churchill, Livingstone.
7.Fundamentals of foods and Nutrition - Mudambi SR and Rajagopal M Y, Wiley Eastern Ltd.
8.ICMR- Nutritive value of Indian Foods, 1989.
9.Nutrition throughout the life cycle, Bonnie S.Worthinton, Roberts, Sue Rod well Williams., TheMcGraw- Hill company,1996.
10.Nutrition in the life span- Virginia Beal, John Wiley & sons New York.

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FOOD MICROBIOLOGY

Course Code: DDAN2201 **Credit Units: 04**

Course Contents:

Module I

Introduction and History of Microbiology - The theory of spontaneous generation, gene theory of disease, Louis pasteur's experiment. Different terminology of Heterotrophic nutrition, autotrophic nutrition, saprophytic, holozoic, host, culture, parasite.

Bacteria - Morphology, reproduction, growth curve, nomenclature, genera of bacteria important in food microbiology. Observation of motility of bacteria in bottle milk.

Mold - Morphology, reproduction, physiology and nutrition, genera of mold important in foods. Demonstration of mold growth in bread.

Module II

Yeast - Morphology, reproduction, classification, physiology and nutrition, process of hybridization, importance of yeast in food. Observation of yeast cells

Virus - Occurrence, morphology, reproduction, human viral disease caused by virus.

Algae - Occurrence, morphology, reproduction, importance of algae.

General principles underlying spoilage- fitness and unfitness of food for consumption, causes for spoilage, factors affecting kinds and number of micro organism in food, factors affecting the growth of micro-organism in food.

Module III

Contamination and kinds of micro-organisms causing spoilage of

Cereal products- grains, flour, baked products and cake.

Fruits and vegetables and their products- fruit juice, pickles.

Fleshy foods- meats, poultry and fish. Observation of milk spoilage.

Module IV

Contamination and kinds of micro-organisms causing spoilage of

Eggs and milk and milk products- cream, milk frozen desserts and butter.

Fats and oils, bottled beverages, spices and condiments.

Food poisoning, food infection and food borne diseases.

Micro-organism in air, air borne diseases.

Module V

Micro-organisms in Water - sources, bacteriological examinations, total count, test of E.Coli, purification of water, water borne diseases.

Micro-organisms in sewage and sewage disposal.

Destruction of bacteria- sterilization, physical agents, light, desiccators, electricity, heat and chemical agents. Visit to micro lab to learn most probable number.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

REFERENCE:

1. Frazier WC, Food Microbiology Mc Green Hill Book, 1985
2. Sullia SB and S Shantharam- " General Microbiology" Oxford and IBH Publishing Ltd., 1998.
3. Michael J. Pelczar, E.C.S.Cahn & Noel. R.Kruef- Microbiology.Tata McGraw- Hill Edition-1993.

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4. Nicklin J. Graeme- Cook K, Page& Killington R- " Notes in Microbiology Bros Scientific Publishers- Preprinted 2001, 2002.
5. Eugene Rosenlarg & Irun R. Cohea- Microbial Biology- Holt- Saunders International Editions 1983.
6. James M.Jay ' Modern Food Microbiology International Thomson Publishing- Fifth Edn-1996.
7. Paul A.Ketchem- "Microbiology Concepts and applications Wiley International Edition-1942.
8. West BB wood-L Harger VT- Food Service in Institutions, John Wiley, 2003
9. Karls L Qauntity ,Food Sanitation, John Wiley, 1973

FOOD MICROBIOLOGY LAB

Course Contents:

- Demonstration of the different parts of the Microscope,the use and care of Microorgainism
- Preparation of Bacterial smear,Simple staining
- Preparation of Common Laboratory media for cultivation of Bacteria,Yeast & Mold
- Microbiological Identification of Important Mould & Yeast - Rhizopus,Mucour,Aspergillus,Penicilliam,Sacromyces,Alternaria
- Demonstration Of Micro biological analysis of water and Milk

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SEMESTER-III

NUTRITION FOR SPECIAL NEEDS

Course Code: DDAN2301 **Credit Units: 04**

Course Contents:

Module 1
Definition of the population with developmental disabilities and special health care needs. Main characteristics of people with special health care needs: Diagnostic, placement, education and welfare, housing frames except home. System support and continuity of care from infancy to adulthood

Module 2
Health risk factors: Poor health habits, limited access to services, long term use of multiple medications

Module 3
Growth alterations: failure to thrive, obesity and growth retardation. Metabolic disorders, Poor feeding skills
Medication-nutrient interaction, partial or total dependence on enteral or parenteral nutrition

Module 4
Nutritional assessment: Anthropometric measures and special equipment, Biochemical measures, Dietary intake and feeding problems, Oral-motor problems, Behavioural issues

Module 5
Medical Nutrition Therapy in selected conditions: Down syndrome, Autism spectrum disorders, Cerebral palsy, Mental health. Multidisciplinary treatment

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

REFERENCES:

- Cloud H. Medical nutrition therapy for intellectual and developmental disabilities. In: Mahan KL, Escott -Stump S, Raymond J. Krause's foods and the nutrition care process. 13th edition Elsevier Saunders Inc. 2012.
- Cohen SA, Navathe A. Nutrition and feeding for Children with Developmental Disabilities. In: Wyllie R, Hayam JS. Pediatric Gastrointestinal and Liver disease, 4th edition Saunders, an imprint of Elsevier Inc 2011.
- Van Riper CL, Wallace LS; American Dietetic Association. Position of the American Dietetic Association. Providing nutrition services for people with developmental disabilities and special health care needs. Journal of American Diabetic Association. 2010; 110: 296-307

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CLINICAL NUTRITION

Course Code: DDAN2302 **Credit Units: 04**

Course Contents:

Module I
clinical nutrition - medical conditions food allergy - food intolerance & mal absorption syndrome - the role of personnel management in an organization - functioning of the hospital dietary department

Module II
role of nutrition & medicine in sports science - technical - counseling - other skills required by a dietician - dietician`s ability to interpret pathological / clinical parameters in health & disease - pediatric and geriatric dietetics

Module III
Nutritional problems of cancer therapy - role of antioxidants in the prevention of disintegrative diseases - the dietitian - responsibilities in Indian context - diet counselling - registered dietitian and the Indian dietetic association. Changes in biochemical parameters during the disease condition.

Module IV
Nutritional Management in the following conditions:
a. AIDS: Introduction, sign and symptoms, Transmittal routes, Biochemical tests for diagnosis, Nutritional Management
b. Arthritis: Osteoarthritis and Rheumatoid Arthritis, Changes in biochemical parameters during the disease condition, Nutritional Management
c. Polycystic ovarian disease (PCOD)- Signs and symptoms, Biochemical and imaging technology for diagnosis, hormone therapy and nutritional management

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

CLINICAL NUTRITION LAB

1. Planning and Preparing the diet plans for the following diseases
   - **Gastrointestinal tract**-Diarrhoea, Constipation, Gastritis and Ulcers, Colitis, Malabsorption syndromes.
   - **Liver Gallbladder & Pancreas**: Hepatitis, Cirrhosis, Hepatic Coma, Pancreatic, Cholecystitits, Cholelithiasis.
   - **Renal System**: Nephritis, Nephrotic Syndrome, Renal Failure, Renal Calculi
   - **Cardiovascular system**: Hypertension and Atherosclerosis
   - **Metabolic Disorders:** Diabetes Mellitus, Inborn Errors of Metabolism, Gout

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HEALTHY AND SUSTAINABLE FOOD CHOICES

Course Code: SDAN2301 **Credit Units: 03**

Course Contents:

Module I: Healthy food choices

Identification of healthy and unhealthy foods and understanding the immediate food environment

• Food labels and basics of nutrient profiling models to classify foods as HFSS

• Nutrient profiling of commonly consumed food items

• Exploring the food environment by mapping the food outlets and food available near home and college

Module II: Food portion sizes and related factors

Understanding food portion sizes and its relation to nutrient density

• The concept of portion/serving sizes and portion control

• Estimation of energy and nutrient density of selected food products using nutrient composition database

Module III: Basics of food preparation

Planning and preparation of healthy and nutritious dishes

Planning and preparation of the following:

- Snacks
- Soups and Salads
- Desserts
- Meal combinations

Module IV: Sustainability and healthy food

Linking the concept of healthy eating with sustainability

• Identification of nutritious food sources which have minimal impact on the environment

• Case study on understanding the food supply chain and carbon footprints of any commonly consumed foods.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

REFERENCE:

- Chadha R and Mathur P (2015). Nutrition - A Lifecycle Approach. New Delhi: Orient Blackswan Pvt Ltd.
- Longvah T, Ananthan R, Bhaskarachary K and Venkaiah K (2017). Indian Food Composition Tables. National Institute of Nutrition, Indian Council of Medical Research, Department of Health Research, Ministry of Health and Family Welfare, Government of India, Hyderabad.
- Khanna K, Gupta S, Seth R, Mahna R, Rekhi T (2004). The Art and Science of Cooking: A Practical Manual, Revised Edition. New Delhi: Elite Publishing House Pvt Ltd.
- Raina U, Kashyap S, Narula V, Thomas S, Suvira, Vir S, Chopra S (2010). Basic Food Preparation: A Complete Manual, Fourth Edition. Hyderabad: Orient Black Swan.

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SEMESTER-IV

FOOD SERVICE MANAGEMENT

Course Code: DDAN2451 **Credit Units: 04**

Course Contents:

Module I

Different types of catering institutions and services, classifications of food service institutions according to

a. Function: Profit oriented, service oriented and public health facility oriented.

b. Method of processing: Conventional systems, Commissary system, fast food service system.

c. Service of food: Self-service, tray service, waiter-waitress services

Module II

Organisation - Types and principles, organizational structure for catering institutions.

Management - Definition, principles and techniques of effective management, leadership and managerial abilities. Tools of management-organisational chart, work study and work improvement.

Module III

Personnel Management - Methods of selection, orientation, training, supervision and motivation of employees, importance of good human relations, legal aspects of catering.

Module IV

Cost control - Principles and methods of food cost control.

Financial management –Factors affecting food, labour, operating and overhead cost, budget, inventories.

Sanitation and safety-significance of hygienic management in food preparation and service, sterilization, pest control, garbage disposal.

Health care of food service personnel, safety measures to be adopted in foodservice.

Module V

Art in food service - Design selection-structural and decorative. Elements of design, principles of design, their application in food service institutions.

Color - Qualities of color, color schemes, flower arrangement-application of art principles in arranging flowers, styles and types.

Table service - Application of art in table service.

Home furnishing - With special reference to furniture and accessories, selection, factors to be considered and current trends.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

REFERENCE:

- West ,BB, Wood "Food service in Institutions" ,Johnwiley & Sons,New York
- Khan MA "Food service operations", AVI publishing Company Inc.1987.
- Sethi and Mahan S.-Catering Management and integrated approach, Johnwiley & Sons,New York .
- Kotas R and Davis B "food cost control" Billing & Sons Ltd, Great Britian ,1976

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- Dr. B.K. Chakravati, " A Technical guide to Hotel operation" , Metropolitan, New Delhi India.
- Earl R. Palan and Judity A. Stadler (1986) Preparing for the food service Industry, AVI
- Publishing& co
- Mickey Warner (1989) Recreational food service Management Van Nostrand Reinhold, New-york.
- J.M. Diwan (1997) Catering and food service Management, Common Wealth publishers.
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FOOD SERVICE MANAGEMENT LAB

Practical experience is correlated with theory course and will be provided at Amity School of Medical, Gurgaon.

Contents:

- Standardisation of recipes
- Napkin folds
- Fruit and vegetable carving
- Table setting
- Quantity preparation and sale
- Visit to hospital food service
- Visit to Hotel food service
- Visit to Industrial canteen

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COMMUNITY NUTRITION

Course Code- DDAN2401 **Credit Units- 04**

Course Contents:

Module I

Definition - Community, family, village and block

Meaning of Optimum Nutrition, Malnutrition- Undernutrition and overnutrition..

Characteristics of community- Demography, Vital statistics, IMR, MMR, morbidity. Causes of **malnutrition**-Factors contributing to malnutrition in the community - food habits, customs and practices, availability of food, Socio-economic factors, Housing and hygienic conditions, population explosion.

Module II

Assessment of the nutritional status of the community -direct and indirect methods - Anthropometry, Clinical and Biochemical, Diet Surveys.

Nutritional problems of women and men- Anemia, Vitamin A deficiency, B-complex deficiency.

Nutritional problems of infants and children- PEM-Marasmus and Kwashiorkor, Vitamin A deficiency, B-complex deficiency diseases, anemia-incidence, prevalence, epidemiology and prevention, other problems- Goitre, fluorosis and Lathyrism- prevalence, causes and symptoms and programmes to control.

Module III

Nutrition Intervention programmes - ICDS: Objectives and services, Noon meal programme, TINP, SNP, Vitamin A prophylaxis.

National Organization- Role of ICMR, NIN, NNMB & ICAR

International organization- WHO, FAO, UNICEF, DANIDA & World Bank.

Module IV

Home Science- Meaning and Objectives. Role of Home-Scientists in rural development-with reference to ongoing programmers like Family Welfare Programme, Adult Education for community-different methods, advantages and disadvantages. Nutrition education- merits and demerits of different methods, Concept of nutrition garden.

Module V

Communication- Principles, methods and classification. Advantages and limitations of different methods.

Audio-visual aids- Types, advantages and limitations.

Health care- delivery, challenges & strategies. Set up of PHC, school health services and employees state insurance.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

REFERENCE:

1. Jellife DN, Assessment of Nutritional Status of the community.
2. Ritchie JA, Teaching Nutrition FAO, 1979.
3. Rajalakshmi R, Applied Nutrition, Oxford and JBH Publishers, 1981.
4. Devadas RF, Nutrition in Tamil Nadu, Sanfam Publishers, Madras, 1972.
5. Mc.Laren S, Nutrition and the community, John Wiley & Sons, 1982.
6. Reddy AA, Extension Education, Srilakshmi Press, Baptla, 1971.

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7. Dahama OP and Bhatnagar OP Eucation and Communication for development.Oxford IBH Publishing Co.,1980.
8. Savile AH, Extension in rural communities, Oxford University Press,1965.
9. Nutrition Science, Srilakshmi (2001).
10. Nutritional problem in India-PK Shukla,Prentice Hall, India.
11. Foundations of community Health Education, Mc Graw Hill,London.

COMMUNITY NUTRITION LAB

Practical

1. Diet and nutrition surveys
   a. To study of various anthropometric methods of nutritional status assessment.
   b. To study of various Biochemical methods of nutritional status assessment.
   c. To study about various clinical sign and symptoms used in nutritional assessment.
   d. To study of various dietary approaches used in nutritional assessment.
   e. To study existing national food security system and report writing
2. Preparation of visual aids for community awareness.
3. Study about various software and applications used in nutritional assessment.
4. Field visit to observe the working of nutrition and health-oriented programs (survey-based result).

References:

- D Bansal and C B Mamoria offered by Aggarwal Agricultural Problems of India.
- Dietary Surveys- Their Techniques and Interpretation, F AO Nutritional Studies No.4
- Note on the Management and Techniques of Diet Surveys in India. ICMR Special Report Series No. 21
- M. Swaminathan,1993, Bappeo 88, Mysore Road, Bangalore. Principles of Nutrition and Dietetics,
- Assessment of Nutritional Status of the Community,D B Jelliffe, WHO Monograph Series No. 53
- Learning Better Nutrition, F AO Nutritional Studies No. 20
- Nutrition Atlas of India, C Gopalan & K Raghavan, ICMR Publication.
- Diet Atlas of India, C Gopalan, S C Balasubramaniam, B V Ramasastri & K Viswara Rao, ICMR Publications
- Nutrition in the community, Arvind Wadhwa and Sushma Sharma (2003), Elite Publishing House Pvt. Ltd. New Delhi

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UTILIZATION OF FOOD WASTE MANAGEMENT

Course Code- SDAN2401 **Credit Units- 03**

1. Identification of waste from agriculture and food processing (Dairy/ Meat/ Fruits Vegetables / Alcoholic beverages/ cereals)
2. Study and layout of wastewater treatment system (ETP)
3. Identification of co-products from the F&V industry, estimation and utilization to develop value-added products (pectin, banana fibre, lycopene from tomato waste, watermelon/ pumpkin rind).
4. Identification of waste from the animal industry and utilisation to develop value-added products (gelatin, eggshell).
5. Identification of various co-products from the dairy industry, estimation and utilization to develop value-added products (utilisation of ghee residue, buttermilk beverage, whey).
6. Identification of co-products from cereal industry, estimation and utilization to develop value-added products (cereal husk, wheat fibre).
7. Determination of physicochemical properties of wastewater.
8. Production of alcohol/ acetic acid from waste material.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

REFERENCES

- Marriott, N. G., Gravani, R. B., & Schilling, M. W. (2006). Principles of food sanitation(Vol. 22). New York: Springer.
- Sadasivam, A, & Manickam, A. (2021). Biochemical Methods. New Age InternationalPublishers.
- Green, J. H., & Kramer, A. (1979). Food Processing. Waste Management. Avi PublishingCompany, 629.
- Herzka, A. and Booth, R.G. Food Industry and Trade: Recycling Waste. Applied SciencePublishers, 1981.
- Tegge, G., Green, J. H., and A. Kramer. Food Processing Waste Management; AVIPublishing, 1979

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SEMESTER-V

HUMAN NUTRITION FOR LIFE SPAN

Course Code- DDAN2551 **Credit Units- 04**

Course Contents:

Module I: Principles of meal planning

Balanced diet, Food groups, Food exchange list, Factors affecting meal planning and food-related behaviour, Dietary guidelines for Indians and food pyramid

Module II: Nutrient requirements

Concept of Dietary Reference Intakes, Overview of methods for assessment of nutrient needs

Module III: Nutrition for adulthood and old age

Adult: Nutrient requirements for adult man and woman, RDA, nutritional guidelines, nutritional concerns, diet and lifestyle related diseases and their prevention Elderly – Physiological changes in elderly, RDA, nutritional guidelines, nutritional and health concerns in old age and their management, factors contributing to longevity

Module IV: Nutrition during pregnancy and lactation

Pregnancy – Physiological changes in pregnancy, RDA, nutritional guidelines, nutritional needs, effect of nutritional status on pregnancy outcome, optimal weight gain and its components, nutrition related problems in pregnancy and ways to control them.

Lactation – Physiology of lactation, RDA and nutritional needs of a nursing mother, nutritional guidelines

Module V: Nutrition during childhood

Growth and development, growth reference/ standards, RDA, nutritional guidelines, nutritional concerns and healthy food choices – Infants – Preschool children – School children – Adolescents

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

REFERENCES

- Khanna K, Gupta S, Seth R, Passi SJ, Mahna R, Puri S (2013). Textbook of Nutrition and Dietetics. Phoenix Publishing House Pvt. Ltd.
- Wardlaw GM, Hampi JS, DiSilvestro RA (2004). Perspectives in Nutrition, 6th edition. McGraw Hill.
- ICMR (2011) Dietary Guidelines for Indians. Published by National Institute of Nutrition, Hyderabad.
- ICMR (2010) Recommended Dietary Allowances for Indians. Published by National Institute of Nutrition, Hyderabad.
- Chadha R and Mathur P eds.(2015) Nutrition: A Lifecycle Approach. Orient Blackswan. New Delhi.
- Seth V and Singh K (2006). Diet Planning through the Life Cycle: Part 1 Normal Nutrition. A Practical Manual. Elite Publishing House Pvt. Ltd. New Delhi.
- Gopalan C, Rama Sastri BV, Balasubramanian SC (1989) Nutritive Value of Indian Foods. National Institute of Nutrition, ICMR, Hyderabad.

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FOOD PRESERVATION

Course Code- DDAN2501 **Credit Units- 04**

Course Contents:

MODULE I

Food preservation – Definition, General Principles and Methods of Food Preservation- Classification of foods for processing. Preservation by addition of sugar- General principles and methods of preparation of jams, jellies and Marmalades, theory of gel formation. Preparation of preserves, squashes & syrups. Preservation by addition of salt- Pickling. Preparation of Indian Pickles, Sauerkraut. Status & scope of food processing industry in India in developing Entrepreneur.

MODULE II

Preservation by Use of High Temperature – Pasteurization, Sterilization and their types. Thermal death curve, calculation of process time, methods of heat transfer.
Canning – steps, types of cans, advantages, disadvantages.
Bottling – steps, advantages, disadvantages.
Food dehydration – concept of dehydration and sun drying. Types of driers- advantages, disadvantages. Principle of dehydration-heat and mass transfer.

MODULE III

Preservation by use of Low Temperature, Types – Common types of cold storage, refrigeration requirement of refrigerated storage, characteristic of refrigerant, refrigeration during transport, defects in cold storage.
Freezing – Principles and methods of freezing, Freeze drying. Advantages and disadvantages.

MODULE IV

Preservation with chemicals

a. Mechanism of microbial inhibition, mechanism and action of preservatives in processed food
b. Inorganic & Organic preservatives.
c. Antibiotics
d. Mold inhibitors.
e. Antioxidants and its role.

MODULE V

Preservation with radiations

a. Sources of radiation, units of radiation
b. Mode of action of irradiation, radiation effect on proteins enzyme system
c. Microwave heating, properties of microwaves, applications in food processing and preservation.

Preservation of Semi moist foods:

a. Principles
b. Intermediate moist foods

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

Reference Books:

- The technology of food preservation- NV Desroisier
- Food Science- Norman Potter
- Food Technology- Prescott and Procter

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- Technology of food preservation -ICAR
- Food Microbiology- W C Frazier
- Preservation of Fruits and Vegetables- Siddappa S G, ICAR New Delhi
- Shirley J. Vangarde and Margy Wood Burn, (1999) Food Preservation and Safety, Surabhi Publications, Jaipur.
- D.K.Salunkhe,S.S.kadam-Handbook of vegetable science and technology,Marcel Dekker Inc,New York,2005.

FOOD PRESERVATION LAB

- Methods of Food Preservation using salt and sugar.
- Drying and Dehydration
- Food Adulteration tests for some common foods.
- Preservation and bottling of fruit and vegetable products.
- Preservation by using chemicals
- Sensory analysis of preserved and processed foods.

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ADVANCED DIETETICS-I

Course Code- DDAN2502 **Credit Units- 04**

Course Contents:

Module – I
Role of Dietician-hospital and community, Nutrition & Diet Clinics – Patients check-up and dietary counselling, education of the patient and follow up.
Basic concepts in Diet Therapy, Therapeutic Adaptation of the normal diet .

Module – II
Routine Hospital Diets- Regular diet, light diet, soft diet, full liquid diet and tube feeding.
Modifications of Diet -Febrile conditions, infections & surgical conditions.

Module – III
Diets of gastro intestinal disorders, renal diseases, liver diseases, obesity, cardio vascular disorders and diabetes mellitus.
Geriatrics – Role of diet.

Module – IV
Feeding infants & children – problems in feeding children in the hospital.
Feeding the patient – psychology of feeding the patient, assessment of patients needs.

Module V
Diet in Allergy – Definition, classification, common food allergy, test of allergy, diet therapy. Pre operative and post operative diets.
Diet in febrile conditions – Short duration e.g. Typhoid, Long duration e.g. Tuberculosis. Dietetic management of gout and phenyl ketonuria.
Diet in relation to deficiency diseases-Protein calorie deficiency, vitamin A deficiency and anemia.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

REFERENCE:

- Krause and Mahan – Food, Nutrition and Diet therapy, 6th Edition W.B. Saunders company, London
- Normal and therapeutic nutrition –17th Edition, Robinson et. Al., Mac Millan Pub.Co., New York
- ICMR(1989) Nutrient Requirements and recommended dietary allowances for Indians.
- Antia FP (1987) Clinical Dietetics and Nutriton, Oxford University Press, New Delhi
- Srilakshmi (2002) Dietetics, Ivth Edition. New Age International (P) Limited, Publishers, New Delhi
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- B. Srilakshmi (2002) Nutrition science, New age international (P) limited, New Delhi
- Carolynn E.Town send and Ruth A. Roth (2002) Nutrition and Diet Therapy, Delmar publisher

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- Sue rod Williams, Nutrition and diet Therapy, Times Mirror Mosby College publishing,Boston, 1989.
- The Indian journal of nutrition and dietetics, Avinashilingam Deemed University, Coimbatore

ADVANCED DIETETICS I LAB

Planning and Preparing the diet plans for the following Physiological conditions:

- Normal Regular diet, bland diet, soft diet, semi-liquid diet and full fluid diet
- High Protein Diet
- High Fiber Diet
- Low Calorie Diet
- Weaning food
- Gluten free diet
- Specific deficiency diet (High iron, calcium, vitamin A, Folic acid etc.)

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HUMAN PHYSIOLOGY

Course Code- DDAN2503 **Credit Units- 04**

Course Contents:

Module – I
Cell - Structure and functions
Tissues - Structure and functions
Digestive system - Anatomical consideration – structure & functions, Brief study of the organization of the digestion, absorption and assimilation of food.

Module – II
Blood, RBC,WBC, Platelets and Lymph. Blood coagulation, blood grouping and Rh factor.
Circulatory system - Heart structure and functions - cardiac cycle, pulse rate and measurement of blood pressure –definition and normal value (only).

Module – III
Respiratory system - Basic anatomy of the respiratory system, process of respiration, transport and exchange of oxygen and carbon di oxide in the body.
Endocrine glands - Structure and function of pituitary, thyroid, islets of langerhans and adrenal gland.

Module – IV
Reproductive system - Anatomy of the male and female reproductive organs. Menstrual cycle
Sense organs - Structure and function of eye, ear, nose, tongue and skin.

Module – V
Excretory system - Excretory organs - structure of kidney and functions, formation of urine, composition of urine.
Muscles - physiology of muscular action.
Central nervous system - Physiology of the nerve cell, parts of the central nervous system and function.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

REFERENCE:
1. Chaterjee, C.C., Human Physiology, Vol-I&II Medical allied agency, Calcutta 1981.
2. Beat and Taylor, Living body. Mc.Graw hill company, Newyork.
3. Sathya Narayana, Essentials of Biochemistry(2000)
4. Saratha Subramanian,Text of Human Physiology(2000).
5. Stuart Ira Fox ,Human Physiology(2003)

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NUTRACEUTICALS AND FUNCTIONAL FOODS

Course Code- DDAN2504 **Credit Units- 04**

Course Contents:

Module 1: Nutraceuticals: Definition, Classification, food and non-food sources, mechanism of action. Role of omega-3, fatty acids, carotenoids, dietary fiber, phytoestrogens; gluconates, organo-Sulphur compounds as nutraceuticals. Use of nutraceuticals in traditional health sciences. Their role in preventing /controlling diseases.

Module 2: Prebiotics and Probiotics: Usefulness of probiotics and prebiotics in gastrointestinal health and other benefits. Beneficiary microbes; prebiotic ingredients in foods; types of prebiotics and their effects on gut microbes.

Module 3: Functional foods: Definition, development of functional foods, health benefits and sources of functional foods.

Module 4: Development of nutraceutical and functional foods: Standards for health claims, Process of developing - preclinical & clinical studies, Marketing and Regulatory issues, Regulatory bodies in India.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

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SEMESTER-VI
EXERCISE, PHYSIOLOGY AND METABOLISM

Course Code- DDAN2651 **Credit Units- 04**

Course Contents:

Module I: Definition and domains of fitness-Physical, Mental, Social & Spiritual domains of fitness Components of physical fitness Health oriented components -cardiovascular endurance, muscular strength, muscular endurance, flexibility, and body composition. Skill oriented components-agility, balance, coordination, power, reaction time, and speed -Factors influencing Physical fitness – Role of exercise and nutrition in Physical fitness, Psychological Fitness- stress- Causes, consequences & strategies of management.

Module II: Role of exercise and nutrition in fitness

A-Types of exercise-Endurance & resistance exercise o Role of exercise in the prevention and management of chronic degenerative diseases-Obesity, Diabetes, CVD, Cancer, Bone health etc. • --Guidelines for physical activity- National and international

B-Effect of malnutrition on body composition and exercise performance -Effect of macro (carbohydrates, amino acids, EFA) and micronutrients (Vitamins & Minerals) on physical & mental fitness.

Module III: Nutrition and Physical Fitness in sports persons

- -Classification of sports activities,
- -Body Composition of Sports Persons
- -Energy metabolism during Exercise (aerobic and anaerobic)
- -Utilisation of Carbohydrates, Protein and fat during Exercise
- -Micronutrients and sports performance
- -Fluid and Electrolyte needs of sports persons
- -Nutritional problems of athletes
- -Ergogenic Aids

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

REFERENCES:

- Powers, S. and Dodd, Stephen (1996) Total fitness, Allyss and Bacon, Univ. of Florida
- Hoeger, W., Turner, Low and W. Hafen Brent (2002), Wellness Guidelines for a healthy life style Wadsworth/Thomas Learning USA.
- Brannon, L. and Feist, Jess (2000), Health Psychology IV edition, An Introduction to behaviour and health, Wadsworth USA.
- Schafer Walt (1998) Stress Management for IV ed. Wellness Wadsworth USA. Mind, body and soul (1998) The body shop, Bullyinch press book, little Brown and co.
- Bhat and Savur, S. (1998) Fitness for life, Jaico publishing House, Mumbai
- Hamlyn, Encylopedia for Complimentary Health (1996)
- Wolinsky, Ira (1998) Nutrition in Exercise & Sport (3rded.)
- Fred and Brouns (2002) Essentials of Sports Nutrition (2nd ed.), John Wiley & Sons pub.
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- Williams, C. &Delvin, J.T. (1992) Foods, Nutrition & Sports Performance (1sted.)E. & F.N. Sons' Pub.

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QUANTITY FOOD PRODUCTION

Course Code- DDAN2601 **Credit Units- 04**

Course Contents:

Module I
Aims and objectives of different food service outlets.
(a) Industrial (b) Institutional (c) Hospital.

Module II
Different food and beverage outlets. 5 types of services of food and beverage outlets.
Staff organization of different outlets
Manager, Hostess, Supervisor, Steward, waiter.

Module III
Menu planning - sequence of course - Indian (Regional i.e., North Indian, South Indian, West Indian and Gujarathis, Western and others)
Techniques of writing menus.

Module IV
Types of meals and styles of service, breakfast, lunch, dinner, afternoon tea, snacks (table 'd' hote and a la carte menu).

Module V
Plant and equipment management, maintenance, sanitation of plant, safety, security, garbage disposal pest control.

Module VI
Beverages - alcoholic and non-alcoholic-Hot and cold - classification of beverages, use and importance in meals and snacks, suitable glassware for beverage service.

Module VII
Use of bills and checks in control system outlets.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

REFERENCES:

1. Food service system and Lewis J. Minor, Ronald F. Cichy, Avi Publishing Co.
2. Food service operations; Mahmood A. Khan, Avi Publishing Co. 1987.
3. Professional Dining Room Management, Conol A. King VNR, NY 1988.
4. Modern Restaurant Service, John Fuller, Hutchinson, 1983.
5. Table Layout and Decoration, Dorothy Tompkins. Ward Lock & Co. Ltd.,1969
6. Food and Bevarage Service, D.R. Lillicarp 2nd edn. BLBS, Reprinted 1989.
7. Food service in Institution, 6th edition, Besie B. West, Le Velle Wood Revised by Harger V. Shugant M.S. June Payne Palacio, Macmillan. Publishing Co. 1986.
8. Mass Catering WHO publication.
9. Avery - A.A. Modern Guide to food Service Equipment C.B.l. Publishing Inc. 1980.
10. Anderson F. Home Appliance Servicing Taraporewala Sons & Co. 1976.
11. Johnston J.B. Equipment for Modern Linings. The Macmillan Co. 1965.

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12. Kotschevir, L. and TerrlI, M.E. Food Service Planning Layout and Equipment. John Wiley & Sons 1971.
13. Mohini Sethi and Surjet Malhan Catering Management, "An Integrated approach. Wiley Eastern Ltd. 1987.

QUANTITY FOOD PRODUCTION LAB

Practical

1. Standardization and costing of recipes.
    a. Cereal and cereal products,
    b. Vegetables,
    c. Fruits,
    d. Meat, chicken and other fleshy foods,
    e. Sugar and jaggery,
    f. Milk and its products,
    g. Pulses,
    h. Nuts and Oil seeds.
2. Survey of hostels and cafeteria to assess various aspects of food service management.

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PRINCIPLES OF THERAPEUTIC NUTRTION

Course Code: DDAN2602 **Credit Units: 3**

Course Contents:

Module 1: Introduction: Difference between registered dietician & Nutritionist**,** Role of dietician in hospital and community. Nutrient & diet clinics- Introduction, Nutritional Assessment, patient checkup.

Module 2: Therapeutic Process: Phases of Care process**,** Diet Therapy, Objectives of Diet therapy**,** Concepts of Diet therapy. Therapeutic nutrition for changing needs**,** Role of Antioxidants in the prevention of degenerative disease.

Module 3: Therapeutic Adaptation of Normal Diet: Consistency, energy intake, nutrient, fiber, frequency of feeding, mode of feeding, elimination of food, Introduction of therapeutic diets, Modification of diet**,** Routine hospital diets, clear liquid diet, liquid diet, semi-solid diet, soft diet, normal diet, tube feed, PEG feed, JJ feed, bland diet, high & low-calorie diet, high & low protein diet, high & low fiber diet, low cholesterol diet

Module 4: Modification of Diet: Infection- nutrient & immune response, metabolic changes during infection, nutritional management. Surgical conditions- general surgery, emergency surgery, gastrointestinal surgery, bariatric surgery, nutritional management.

Module 5: Feeding the Patient, Infant and Children: Introduction objectives, feeding technique, psychology of patient, assessment of patient. Introduction, normal infant, pre-term infant, nutritional management, feeding problems, management of feeding problem.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

REFERENCES:

- Normal and Therapeutic Nutrition - Robinson & Lawler, 17th edition, Mac Millan Publishers.
- Dietetics – B Srilakshmi, 7thedition, New Age International Publishers
- Textbook of Nutrition and Dietetics- Kumud Khanna, Sharda Gupta, Santosh Jain Passi, Rama Seth, Ranjana Mahna & Seema Puri, 2nd edition, latest reprint, Phoenix Publishing House (P) Ltd.
- Principles of Nutrition and Dietetics, M. Swaminathan,1993, Bappeo 88, Mysore Road, Bangalore

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PRINCIPLES OF THERAPEUTIC NUTRTION LAB

Course Code: DDAN2603 **Credit Units: 1**

Practical

- Formation of different types of diets: Full fluid diet, Clear fluid diet, Semi fluid diet
- Formulation of soft diet and Bland diet
- Formulation of Normal diet
- Formulation of nutritious weaning food
- Formulation of High Fiber, Low sodium and High protein diet.
- Formation of Low calorie diet.
- Hospital Visit

Examination Scheme:

IA				EE		
A	**PR**	**LR**	**V**	**PR**	**WT**	**V**
5	10	10	5	15	15	20

A-Assignment, PR-Practical Record, LR-Lab Record, V-viva, WT-Written Test

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PRODUCT DEVELOPMENT AND SENSORY ANALYSIS

Course Code- DDAN2604 **Credit Units- 04**

Course Contents:

Module 1: Sensory evaluation of foods: Importance and application for product formulation. Basic tastes, threshold tests for basic tastes. Requirements for sensory analysis. Sensory panel, type, selection, and training. Subjective and objective sensory evaluation. Different types of sensory tests. Instrumental tests for sensory attributes – color, texture, and odor.

Module 2: Product Development: Designing new product – types and drawing forces. Need for product development. Stages of product development. Success in product development. Consumer research. Role of sensory evaluation in consumer product acceptance.

Module 3: Consumer Behavior: In purchasing foods, Factors influencing product acceptance and purchasing trends. Market place changes in processed foods.

Module 4: Special food processing technologies and novel food ingredients: Membrane technology (reverse osmosis and ultra-filtration), agglomeration, agitation, air classification, extrusion, automation in food industries.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

References:

- Fuller, G. W. (1994): New Food Product Development: From Concept to Market Place, CRC Press, New York.
- Man, C.M.D. and Jomes, A.A (1994): Shelf-life Evaluation of Foods. Blackie Academic and Professional, London.
- Shapton, D.A. and Shapton, N.F. (1991): Principles and Practices for the safe processing of Foods. Butterworth Heinemann Ltd., Oxford.
- Oickle, J.G. (1990): New Product Development and Value Added. Food Development Division Agriculture, Canada.

PRODUCT DEVELOPMENT AND SENSORY ANALYSIS LAB

- Market survey and Questionnaire method for consumer acceptance.
- Tests for analysis of taste thresholds.
- Sensory Analysis of food product using Nine-point Hedonic Scale.
- Sensory Analysis of Food Product using Score Card method.

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BASICS OF NUTRITION EPIDEMIOLOGY

Course Code- DDAN2606 **Credit Units- 04**

Course Contents:

Module 1.
Definition of Health, Dimension of Health: Positive health versus Absence of disease, Determinants of Health, Indicators of health – Mortality, Morbidity, Disability, Nutritional Status, Health care Delivery, Environmental, Socioeconomics, Health care Policy

Module 2.
Epidemiology: Definition, Aims, Tools of Measurement – Rates, Ratios and Proportions. Study designs in epidemiology, Descriptive epidemiology, Analytical epidemiology, Data collection and sources of data.

Module 3.
Secondary Sources of Community Health data: Sources of relevant vital statistics of infant, child & maternal mortality rates, Under- 5 mortality, Birth Rate, Crude death rate.

Module 4.
Immunization: Importance and Immunization schedule for children, adults and for foreign travellers.

Module 5.
Water and Waste Management: Importance of water to the community, etiology and effects of toxic agents, water borne infectious agents, sources of water, safe drinking water, potable water, waste and waste disposal, sewage disposal and treatment, solid waste and disposal, liquid waste disposal.

Module 6.
Communicable and infective disease control: Nature of communicable and infectious diseases, infection, contamination, disinfections, decontamination, transmission-direct & indirect, vector borne disease infecting organisms and positive agents, environmental agents and epidemiological principles of disease control.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

REFERENCES

1.Smith, G.W.: Preventive Medicine and public health. 2nd edition. McMillan Co. New York. 2.Park: Park's Textbook of preventive and Social Medicine. 23rd edition.M/s. BanarasidasBhanot. Jabalpur.
3.SeshubabuVVR(2011): Review in Community Medicine, 2nd Ed, Paras Medical Books Pvt Ltd.
4.Mahajan BK, Roy RN , Saha I, Gupta, MC (2013):Text book of Preventive and Social Medicine, 4th Ed. Japee Brothers.
5.Vir SC(2011): Public Health Nutrition in Developing Countries, Woodhead Publishing India.
6.Willett W(2012): Nutritional Epidemiology, 3rd Ed. Oxford University Press,USA

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DIETARY SUPPLEMENTS AND ERGOGENIC AIDS

Course Code- DDAN2607 **Credit Units- 04**

Course Contents:

Module I:
Anti-doping regulations and harmful effects of use of steroids & other banned substances Dietary Supplements: Regulations and Classification − Definition and regulations OF Dietary Supplements (country-specific) −Classification of Dietary/Nutritional Supplements Composition, Benefits and Applications of Nutritional Supplements Macronutrient Supplements: − Pure proteins (e.g. Whey, Casein, Egg albumen, Soy protein, Pea protein & other vegan proteins/protein blends), Protein bars, Weight gainers; Amino acid supplements- , Glutamine, Arginine −Carbohydrate supplements & EFAs, Glycerol − Meal replacement powders, Ready To Drink protein shakes (RTDs) − Sports drinks & Sports gels

Module II:
Micronutrient Supplements: −Benefits/Mechanism of action and Applications − Vitamins: Ergogenic role of B-complex vitamins, Vitamin B12 & folic acid, Vitamin D supplements', Multi-vitamin supplements − Mineral supplements: Calcium-Magnesium-, Iron supplements, supplements, Electrolyte replacement drinks − Antioxidant vitamins & mineral supplements

Module III:
Benefits/Mechanism of action and Applications of Herbal Supplements - Ergogenic Herbal supplements-:Ashwagandha, Rhodiola, Shilajit, Ginseng, Grape seed extract, - Herbal Testosterone-boosters (e.g. Tribulus terristris, Nettle root, Long jack root etc) Functional foods/phytochemicals - Green tea extract, Tart cherries, Caffeine, Curcumin, Phytosterols, Flavonoids, Betaalanine, L-Carnitine

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

References
1. Goldberg, I 1994. Functional Foods: Designer Foods, Pharma foods, Nutraceuticals Chapman & Hall
2. Gibson, GR and William, CM. 2000. Functional foods - Concept to Product. Woodhead publishing.
3. Aluko, R.E. (2012). Functional Foods and Nutraceuticals. Springer

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SEMESTER-VII

HUMAN NUTRITION

Course Code: DDAN2701 **Credit Units: 4**

Course Contents:

Module 1:
Nutrients & Nourishment, Complementary and Alternative Nutrition, Digestion & Absorption of nutrients

Module 2:
Carbohydrates and their metabolism: Introduction, definition, classification, biomedical importance Brief outline of metabolism. Regulation of blood glucose

Module 3:
Lipids and their metabolism: Introduction, definition, classification, biomedical importance, essential fatty acids, identification of fats & oils (saponification no, acid no, iodine no, acetyl no, reichert- miesel no. etc.)

Module 4:
Proteins and their metabolism: Introduction, definition, and classification, biomedical importance, essential & non-essential amino acids.

Module 5:
Vitamins: Fat soluble and water soluble vitamins, Sources, requirement, deficiency disorders & biochemical functions.

Module 6:
Minerals: Macro, micro and ultra trace minerals, Sources, requirement, deficiency disorders & biochemical functions.

Module 7:
Importance of water in human health. Water and electrolyte balance in body.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

References:

- Bamji M.S., Rao N.P. and Reddy V. (1996): Textbook of Human Nutrition. 11th Ed. Oxford and IBH.
- Publishing Co. Pvt. Ltd., New Delhi.
- Swami Nathan M (1974) Essentials of Foods and Nutrition. 1st Ed. Ganesh and co.

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PUBLIC HEALTH NUTRITION

Course Code: DDAN2702 **Credit Units: 4**

Course Contents:

Module 1:
Introduction to course and Public Health Nutrition. The nutrition professional and their role.

Module 2:
Nutrition Policy and Programs, Nutrition program development, Education in Nutrition programs, Dietary Guidelines, Community Needs Assessment- Dietary Assessment and Clinical Assessment

Module 3:
Nutrition in Primary Health Care- Government initiatives in health care provision. Infant and maternal health care

Module 4:
Food availability, Food safety and accessibility. Hidden hunger. Malnutrition. Public distribution system.

Module 5:
Nutrition and Diseases- cardiovascular diseases and public health, Diabetes and public health, Cancer and public health, communicable diseases and public health.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

REFERENCES:

1. PUBLIC HEALTH NUTRITION 2 nd ed. BUTTRISS, WELCH, KEARNEY ISBN: 978118660973
https://books.google.com/books?id=lb6nDgAAQBAJ&dq=public+health+nutrition+welch
2. NUTRITION IN PUBLIC HEALTH 4 th ed EDELSTEIN ISBN: 9781284104691

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ADVANCED DIETETICS-II

Course Code- DDAN2703 **Credit Units- 04**

Course Contents:

Module I
Diet therapy - Principles of diet preparation and patient counselling. Types of diets and feeding practices in Hospitals

Module II
Therapeutic diets for the following disorders:
a. Under weight - definition, etiology, treatment
b. Obesity - definition, etiology, treatment.
c. Diseases of the gastro intestinal tract-Peptic ulcer and duodenal ulcer, Dumping syndrome, constipation
d. Acute and chronic diarrhea -rehydration therapy.

Module III
Diseases of the liver and gall bladder (risk factors and diet therapy)
a) jaundice b) hepatitis c) cirrhosis d) fatty liver and diet therapy
Diseases of the cardio vascular system (risk factors and diet therapy)
a) atherosclerosis b) arteriosclerosis c) hypertension d) congestive heart failure

Module IV
Diabetes mellitus – causes, symptoms, bio-chemical changes, insulin, hypo- glycemic drugs, changes in the metabolism of carbohydrate, fat and protein, food exchange list, dietary management
Diseases of the kidney and urinary tract
a.Acute and chronic nephritis
b.Nephrotic syndrome
c.Renal failure
d.Urinary calculi
e.Uremia
Causes and dietary treatment of kidney diseases and dialysis.
Nutrition and cancer - Dietary guidelines for management.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

REFERENCE:
1.Krause and Mahan – Food ,Nutrition and Diet therapy, 6th Edition W.B. Saunders company, London
2. Normal and therapeutic nutrition –17th Edition, Robinson et. al ., Mac Millan Pub.Co., New York
3.ICMR(1989) Nutrient Requirements and recommended dietary allowances for Indians.
4. Antia FP (1987) Clinical Dietetics and Nutrition, Oxford University Press, New Delhi
5. Srilakshmi (2002) Dietetics, IVth Edition. New Age International (P) Limited, Publishers, New Delhi
6. Shubhangini. A. Joshi (2002) Nutrition and dietetics, Tata Mc Graw- Hill publishing company limited, New Delhi.
7. B. Srilakshmi (2002) Nutrition science, New age international (P) Limited, New Delhi

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ADVANCED DIETETICS-II LAB

Planning and Preparing the diet plans for the following diseases

- **Gastrointestinal tract**-Diarrhoea, Constipation, Gastritis and Ulcers, Colitis, Malabsorption syndromes.
- **Liver Gallbladder & Pancreas**: Hepatitis, Cirrhosis, Hepatic Coma, Pancreatic, Cholecystitits, Cholelithiasis.
- **Renal System**: Nephritis, Nephrotic Syndrome, Renal Failure, Renal Calculi
- **Cardiovascular system**: Hypertension and Atherosclerosis
- **Metabolic Disorders:** Diabetes Mellitus, Inborn Errors of Metabolism, Gout

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FOOD LAWS AND SAFETY

Course code: DDAN2704 **Credit Units: 4**

Course Contents:

Module 1: Introduction: Concept and meaning of Food quality and food Safety, food adulteration, food hazards, Natural toxins.

Module 2: Food Laws and Regulations: National and international food laws, Governing bodies. Exposure, estimation, toxicological requirements, and risk assessment.

Module 3: Safety Assessment: Safety assessment of food contaminants and pesticide residues. Safety aspects of water and beverages such as soft drinks, tea, coffee, cocoa. Safety evaluation of heat treatments and related processing techniques.

Module 4: Quality Assurance: Total Quality Management; GMP/GHP; GLP, GAP; Sanitary and hygienic practices; Quality manuals, documentation, and audits; Indian & International quality systems and standards like ISO and Food Codex; Export import policy, export documentation; Laboratory quality procedures and assessment of laboratory performance; Applications in different food industries.

Module 5: Quality Control: In food service institutions.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

REFERENCES:

- Early. R. (1995) Guide to Quality Management Systems for the Food Industry 1st Ed. Blackie, Academic and professional, London.
- Gould, W.A and Gould, R.W. (1998) Total Quality Assurance for the Food Industries. 1st Ed. CTI Publications Inc. Baltimore.
- Pomeraz, Y. and MeLoari, C.E. (1996): Food Analysis: Theory and Practice. 2nd Ed. CBS publishers and Distributor, New Delhi.
- Bryan, F.L. (1992): Hazard Analysis Critical Control Point Evaluations A Guide to Identifying Hazards and Assessing Risks Associated with Food Preparation and Storage. 9th Ed. World Health Organization, Geneva.
- Kirk, R.S and Sawyer, R. (1991): Pearson s Composition and Analysis of Foods, Longman Scientific and Technical. England.
- Rekha S. Singhal, Pushpa R. Kulkarni, Dananesh V. Rege, (1997) Handbook of Indices of food Quality and Authenticity, wood head Publishing Ltd.
- Hubbard, Merton R. (2003). Statistical Quality Control for the Food Industry, 3rd Ed, Springer.

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DDAN2739	BASICS OF RESEARCH METHODOLOGY, ETHICS, AND RESEARCH COMMUNICATION	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	NIL				
Co-requisites					

Catalog Description

This course aims to provide students with a comprehensive understanding of conducting ethical research, utilizing proper research methodologies, and effectively communicating research findings. The course includes a final project where students will write a Literature Review on a topic chosen in consultation with the teacher(s).

This course is designed to equip students with essential skills and knowledge to conduct ethical research, employ proper research methodologies, and effectively communicate scientific information (with focus on writing a literature review). The course will cover topics such as research design, data collection and analysis, research ethics, and science communication strategies. Through a combination of lectures, discussions, case studies, and practical exercises, students will develop a deeper understanding of the research process and its ethical implications.

Course Objectives

The objective of this course is to impart knowledge about various stages of research process, research ethics and different ways of research communication.

The aim of this course is to impart research skills to the beginners and help to improve the quality of research by the existing researchers. It also encompasses the understanding and application of appropriate research design, statistics, and the use of the computer for reference management, report writing, research paper writing and presentation. The course also introduces the key conceptual issues of each research method, as well as giving practical guidance. It covers the series of research methodology contents: from problem formulation, to design, to data collection, analysis, reporting and dissemination. The course has the dual aims of equipping students with conceptual understandings of current academic debates regarding different methods, and the practical skills to put those methods into practice.

Course Outcomes

On completion of this course, the students will be able to

CO1. Define criteria of good research, steps in research process, and data collection.

CO2. Identify different types of sampling and its purpose.

CO3. Conduct hypothesis testing for different types of samples and interpret the results.

CO4: Learn the importance of literature review, write research paper/thesis, use reference management software.

Course Content :

Module	Topic	**Blooms level***	Hours
1	**Research Methodology** Understanding the research process: From research questions to conclusions	L1, L2	10

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	Types of research: Qualitative and quantitative research Exploratory, descriptive, experimental, and correlational studies Scientific Thinking: Subjective Vs. Objective Thinking Logical Reasoning: Inductive Vs. Deductive Reasoning Formulating research hypotheses and objectives Purpose of a good research, Criteria of good research		
2	**Descriptive Statistics** Data, Types of Data, Methods of data collection, Benefits and drawbacks, Graphical representation of data and interpretation. Measures of Central Tendency: Arithmetic Mean, Median, Mode, Measures of Dispersion: Range, Standard Deviation, Variance, Coefficient of Variation.	L1, L2, L3	15
3	**Inferential Statistics** **Sampling:** Basic concepts, Process of Sampling, Sample Size, Types of Samples, Sampling and non- sampling errors, Statistics and Parameters, Sampling Distribution of Means and Proportion, **Hypothesis Testing**, steps in testing of hypothesis, errors in hypothesis testing, z test and t test.	L1, L2, L3	15
4	**Research Ethics** Plagiarism, Fabrication, Falsification, Ethics with respect to human and Animal Research	L1, L2	5
5	**Communication** Characteristics of a good Research paper, Systematics Literature Review (choosing a topic, preparing outline, gathering authentic & appropriate references, avoiding plagiarism, use of reference management systems), Writing a good literature review, Structure of report (Introduction, Methodology, Analysis, Results, Discussions, Conclusions, Recommendations), Writing Quality Research Paper, Publishing Research Work in Quality Journals, Reference Management Software	L1, L2, L3	15

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional Exam	End Term Examination
Weightage (%)	5	10	15	70

Project based assignment: Student teams (2-3 students per team) will write a literature review on a topic of choice, in consultation with the teacher.

Text books/ Reference books

- Research Methodology for Natural Sciences by Soumitro Banerjee, Publisher: IISc Press (1 January 2022); ISBN-10: 8194835178; ISBN-13: 978-8194835172

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- Panneerselvam, R.2009. Research Methodology, PHI Learning Pvt. Ltd., New Delhi-110001
- Geode, Millian J.& Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Kothari, C.R.2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.
- Levin R I., Rubin D S. Statistics for Management. Sixth Edition, PHI
- Kapoor & Gupta. Probability & Statistics. S Chand Publishers, New Delhi.
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- Cooper, Donald R. and Pamels Schindler, Business Research Methods, Tata McGraw Hills, New Delhi
- Krishnaswamy, K.N. Sivakumar. Appa lyer and Mathiranjan M. 2006, Management Research Methodology: Integration of Principles, Methods and Techniques, Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Ranjit Kumar 2009. Research Methodology- A step –by- step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patparganj, Delhi- 110092
- Sachdeva, J.K. 2008. Business Research methodology. Himalaya Publishing House, New Delhi.
- Shekharan, Uma, Business Research Methods, Miley Education, Singapore.
- Zikmund, Millian G., Business Research Methods, Thomson Learning, Bombay.

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SEMESTER-VIII

CRITICAL CARE NUTRITION

Course Code: DDAN2801 **Credit Units: 4**

Course Contents:

Module 1:
The physiologic metabolic response to stress, hyper catabolism and anabolism.

Module 2:
Energy balance, clinical effects of overfeeding vs. underfeeding.

Module 3:
Assessment of energy requirements, clinical applications of indirect calorimetry.

Module 4:
Protein metabolism and requirements in stress conditions, skeletal muscle adaptation to critical illness

Module 5:
Choosing the route for nutritional support and introduction to leading international guidelines.

Module 6:
Enteral nutrition - indications, monitoring, administration and solutions, complications. Parenteral nutrition - indications, monitoring, administration and solutions, complications.

Module 7:
Pharmaconutrition - an evaluation of the specific issues surrounding selection and supplementation of macronutrients and micronutrients such as fish oil, glutamine and antioxidants. The effects of pharmaconutrition elements on trauma, sepsis and acute lung injury patients.

Module 8:
Glucose control, controversy around Tight glucose control, goals of glycemic control during critical illness. Nutrition support for wound healing in the intensive care unit patient.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

REFERENCES:

1.McClave SA, Taylor BE, Martindale GR et al. Guidelines for the provision and assessment of nutrition support therapy in the adult critically ill patient: Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.). JPEN 2016;40:159-211
2. Singer P, Blaser AR, Berger MM et al. ESPEN guideline on clinical nutrition in the intensive care unit. Clin Nutr 2019;38:48-79.

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FOOD PSYCHOLOGY AND NUTRTIONAL COUNSELLING

Course Code: DDAN2803 **Credit Units: 4**

Course Contents:

Module 1:

The psychology of food choices, food Purchase and eating behavior - Models of food choice, Biological & Genetic influences on energy and nutrient intake, Neurobiology of food intake, Social and psychological models of food choice, Role of family and peers, Food and Culture, Mood ,emotions and food choice, Food cravings and addiction, Food Rewards, Influences of Media on food choice, Psychological stress among sports persons & its impact on food choices, consumption and performance, Food choices across the life span. Factors affecting purchase of food/supplements/ergogenic aids, Ethnic, religious and economic influences on food choices, Factors affecting the consumers healthy food choice.

Module 2:

Applications of food psychology for health maintenance and fitness − Strategies to change dietary behavior, Optimisim and intention, Strategic automisation, using stages of change model to change dietary behavior, Behavior modification strategies to influence food and nutrition choices, Theory of planned behavior and healthy eating.

Module 3:

Nutritional Care Process and Counseling Strategies − Nutritional Care Process; Role and skills of a sport dietician. Detailed study of Nutrition Counseling theories and strategies, Cognitive behavior therapy, Rational Emotive Behavioural Therapy. Stress management & Counselling; Tools of psychological testing, Counseling of individual sports persons and teams

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

REFERENCES:

1. Robert S. Weinberg and Daniel Gould (2006) Foundations of Sport and Exercise Psychology
2. Arnold LeUnes (2011) Introducing Sport Psychology: A Practical Guide.
3. Mike Kane (2015) Sports Psychology: The Ultimate Guide For Mastering The Mental Aspects Of Sports Performance
4. Ellis Cashmore (2002) Sport and Exercise Psychology: The Key Concepts (Routledge Key Guides

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FOOD QUALITY ANALYSIS

Course Code: DDAN2802 **Credit Units: 4**

Course Contents:

Module 1:
Food Analysis: Introduction, Functions of Food Analysts, Sampling and Sample Preparation, Quality Control of Raw Materials, in –Process Food Control& Quality Control Of Finished Products,

Module 2:
Compositional/Analytical Evaluation of Foods-Proximate composition – Moisture, Total and Acid Insoluble Ash, Crude Fat, Crude Protein, Crude Fiber, Carbohydrate [by difference].

Module 3:
Introduction to Advanced laboratory techniques for Detection of Pesticide Residues, Toxicants, Heavy Metals, Processing Contaminants (Direct and Indirect). Simple Tests for Detection of Food Adulteration.

Module 4:
Food Quality Indices: Cereals and Pulses and their Products, Meat and Meat Products, Fish and Fish Products, Milk and Dairy Products, Fruits and Vegetables and their Products, Coffee, Tea and Spices. Microbiological Analysis of Foods: Bacteria, Fungi, yeast, and other common pathogens associated with Food Spoilage.

Module 5:
Food Laboratories: Accreditation of Food Laboratory, Referral Laboratories, Hierarchy of Food Safety Authorities.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

REFERENCES:

1. Food Analysis: Theory and Practice 3rd Edition Pomeraz, Y. and MeLoari, C.E. 2008 CBS publishers and Distributor, New Delhi.
2. Modern Food Microbiology 4th Edition James, M.J.2005 CBS Publisher, New Delhi
3. Food Microbiology 5th Ed Frazier, W.C. 2014 McGraw Hill Inc., New York
4. Hand Book of Analysis and Quality Control Fir Fruit and Vegetable Product 2nd Edition S Ranganna1997 McGraw Hill Education Pvt.Ltd
5. Food Microbiology M.R.Adams& M.O.Moss 2015
6. Hand Book of Media Stains and Reagents in Microbiology 1st Edition A.M. Deshmush 2007 Oxford University Press.

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ENTREPRENEURSHIP

Course Code: DDAN2804 **Credit Units: 4**

Course Contents:

Module I:
Introduction to Food Service, Origin of Food Service units, Kinds of food service units

Module II:
Menu Planning, Importance of menu, Factors affecting menu planning, Types of menu

Module III:
Organization & Management, Principles of management, Functions of management/ manager

Module IV:
Food Production Process, Food purchase and receiving, Storage, Quantity food production: Standardization of recipes, Recipe adjustments and portion control, Quantity food production techniques, Food service, Food hygiene and sanitation

Module V:
Space and Equipment, Types of kitchen areas, Flow of work and work area relationship, Equipment: a) Factors affecting selection of equipment b) Equipment needs for different situations

Module VI:
Financial Management, Importance of Financial Management, Budgets and Budgeting process, Cost concepts.

Module VII:
Personnel Management, Functions of a personnel manager, Factors to consider while planning the kind and number of personnel: Menu, type of operations, Type of service, Job description and job specification

Module VIII:
Planning of A Small Food Service, Preliminary Planning Survey of types of units, identifying clientele, menu, operations and delivery, Planning the set up: a) Identifying resources b) Developing Project plan c) Determining investments. Development of a business plan.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A-Assignment, CT-Class Test, S/V/Q-Seminar/Viva/Quiz, HA-Home Assignment, EE-End Semester Examination

REFERENCES:

1. West B Bessie & Wood Levelle (1988) Food Service in Institutions 6th Edition Revised By Hargar FV, Shuggart SG, & Palgne Palacio June, Macmillian Publishing Company New York. 2. Sethi Mohini (2005) Institution Food Management New Age International Publishers
3. Knight J B & Kotschevar LH (2000) Quantity Food Production Planning & 19 Management 3rd edition John Wiley & Sons
4. Dessler Gary (1987) Personnel Management, Modern Concepts & Techniques Prentice Hall New Jersey
5.Tripathi P C (2000) Personnel management 15th ed Sultan Chand, New Delhi

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6.Kotas Richard & Jayawardardene. C (1994) Profitable Food and Beverage Management Hodder & Stoughton Publications
7. Longree K, Langree K, Longrie K (1996) Quantity Food sanitation, John Wiley & sons
8. Roday .S (2003) Food Hygiene & Sanitation , Tata Mc Graw Hill publication Ltd
9. Taneja S and Gupta SL (2001) Enterpreneurship development, Galgotia Publishing

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DDAN2839	DATA ANALYSIS & VISUALISATION USING SOFTWARE	L	T	P	C
Version 1	Date of Approval:	4	0	0	4
Pre-requisites/Exposure	Class X Mathematics				
Co-requisites					

Catalog Description

The implosion of available data has made visualization more critical but also more challenging. Data analysis and Data Visualization are essential tools for business analysis, engineers, policymakers, and decision-makers. Developed originally for "small data", visualization techniques have been met with varied success in the past centuries and decades. There are a few well-known visualizations that are very effective in capturing the essence of the data, and of course, there are many infamous negative examples of poor visuals. An effective visual is critical for decision making it, but it also requires a lot of work, customization, attention to detail, and refinements.

Course Objectives

The course is designed to help students develop skills and knowledge in the following area(s):

- Develop an understanding of what is a good visualization for a given purpose
- Learn visualization theory & techniques
- Build a substantial data analytic project
- Apply data analysis and visualization with Excel, SPSS, R, Python, NVivo and MATLAB

Course Outcomes

On completion of this course, the students will be able to

CO1. Students will be able to articulate meaningful lines of inquiry that might be explored through the collection, organization, visualization, and analysis of data in a context associated with their primary field of study using (as appropriate) numerical, textual, spatial, and/ or visual data.

CO2. Student will understand what data are, how they are collected, and how to assess the quality/ reliability of data.

CO3. Students will demonstrate intermediate proficiency in the visualization of data to communicate information and patterns that exist in the data.

CO4: Students will be able to use at beginning level of proficiency the tools of statistics and machine learning to ask questions of and explore patterns in data.

Course Content :

Module	Topics Covered	Blooms Level	Contact Hours
1	**Module-1: Introduction to Excel** Data Analysis using Excel, Curve fitting, Correlation, Linear Regression, Multiple regression, Principal Component Analysis and Factor Analysis, Hypothesis testing **Introduction to Excel and SPSS** Introduction to SPSS and Types of Data, Importing, exporting and data handling in SPSS; Exploratory data analysis using SPSS and data visualization;	L1, L2, L3, L4	20 hours

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	Introduction to statistical inference and various univariate tests by using SPSS; Analysis of Variance (One Way ANOVA, Two Way ANOVA and ANCOVA); Correlation, Simple and Multiple linear Regression Analysis; Principal Component Analysis and Factor Analysis		
2	**Module-2: VOS Viewer** **Web of Science, Scopus, Dimensions, Lens, and PubMed.** Co-authorship networks, citation-based networks, and co-occurrence networks can be created based on data downloaded from Web of Science, Scopus, Dimensions, and Lens. Co-authorship networks and co-occurrence networks can also be created based on PubMed data. **Crossref, Europe PMC, and OpenAlex**. Networks can also be created based on data retrieved through the APIs of Crossref, Europe PMC, and OpenAlex, These APIs can be queried interactively in VOS viewer. **Semantic Scholar, Open Citations, and Wiki Data.** For a given set of DOIs, networks can also be created based on data retrieved through the APIs of Semantic Scholar, Open Citations and Wiki Data.	L1, L2, L3, L4	10 Hours
3	**Faculty of Management Studies & Behavioural Sciences** **Module 3: Domain Specific Software** **- Structural Equation Modelling** **Smart PLS** Introduction to Structural Equation Modelling (SEM), Introduction to the software's AMOS and SPSS, SMART PLS, Testing of Statistical assumptions, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), common method bias (CMB) test, Measurement Model Assessment, Discussing Fit Indices, Reliability and Validity Testing, Structural Model Assessment identifying multivariate outlier, Construct Validity: Convergent and Discriminant Validity, Measurement Model & Structural Equation Modelling, Mediation and Moderation Effects, Multi-Group Analysis.	L1, L2, L3, L4	30 Hours
	Faculty of Arts **N Vivo** 1. Import text, audio, video, emails, images, spreadsheets, online surveys, web content, and social media from various sources into a simple, intuitive interface.		

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	2. Create and NVivo project, import and organise qualitative and quantitative data 3.Manage a literature review in NVivo 4. Autocode structured data deductively and identify themes inductively 5. Generate and falsify hypotheses 6. Combine data in sets for analysis 7. Seek patterns and identify relationships across codes and cases 8. Present findings using visualisations 9. Export data out of NVivo 10. Coordinate teamwork.		
	Faculty of Science Engineering and Technology **Faculty of Health & Allied Sciences** **R programming / Python/ MATLAB** **R Programming-** Introduction to R, Variables and datatypes in R, Dataframes, Recasting and joining of dataframes, Arithmetic, logical and matrix operations in R, Functions in R, Control structure in R, Data visualization in R. **Python Programming-** Basics of programming, data structure and algorithm using Python, Strings, lists, control, functions, manipulating lists, loops, arrays, selection sort, insertion sort, recursion, sorting, dictionaries, exception handling, file handling, string processing, data analysis using Python **MATLAB Programming-** Introduction, basic features, managing workspace, mathematical functions, basic plotting, Matrices, array operations and linear equations, MATLAB programming- M files script, M-file functions, control flow and operations.		

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional (Theory/ Practical)	End Term Examination
Weightage (%)	5	10	15	70

References:

- David Houcque, 2005. Introduction to MATLAB programming for Engineering students., Northwestern University, E- Book https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf
- Mark Lutz, 2009. Learning Python. O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.
- Emmanuel Paradis, 2005. R for Beginners. E book. https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf

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- A Handbook of Statistical Analysis using SPSS by Dr. Brijesh Awasthi, Redshine Publication.

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Amity Medical School

Bachelor of Science (Honors / Honors with Research) in Medical Lab Technology

FLEXILEARN
-Freedom to design your degree



Programme Structure

Curriculum & Scheme of Examination

2023

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Bachelor of Science (Honors / Honors with Research) in Medical Lab Technology
SEMESTER-I

ANATOMY AND PHYSIOLOGY

Course Code: DMLT2151 **Crédit Units: 4**

Course Objectives:

- To develop the knowledge of anatomical structures.
- To provide the basic understanding of human organ systems.
- To provide the concepts of interrelationship among different organ systems.

Module I

Introduction: Definition and functions of different organ systems, anatomical divisions, axis and planes, anatomical terms, and structural organization of the human body.
Cell: Structure and functions of mammalian cells and organelles.
Tissues: Structure, functions and classification.
Musculoskeletal system: Anatomy and function of musculoskeletal system; Histology of bone; Types of bones and joints; Bone marrow; Cartilage; Composition and function of synovial fluid, classification, and functions of muscles; mechanism of muscle contraction

Module II

Urinary system: Structure and functions of organs involved in urinary system, structure and functions of nephron, measurement, and regulation of GFR, mechanism and composition of urine formation, physiology of excretion of urine.
Digestive System: Structure and function of digestive organs, digestion and absorption of food, compositions, and functions of various gastrointestinal secretions.
Endocrine system: Histology and functions of different endocrine glands, hormones, and their functions.

Module III

Respiratory System: Structure and functions of different organs involved in respiratory system, regulation of respiration, mechanism of respiration, respiratory muscles, composition, and functions of pleural fluid; Various terms involved in respiratory System (Vital capacity, Total volume, Reserve volume, Total lung capacity).
Cardiovascular System: Structure and functions of heart and blood vessels, blood circulation, cardiac cycle, cardiac output, stroke volume and blood pressure; ECG.
Lymphatic System: Structure and functions of lymphoid organs; lymph vessels; compositions, function and circulation of lymph.

Module IV

Nervous system: Central Nervous System – structure and functions of brain and spinal cord; Peripheral Nervous System – structure and functions of cranial nerves and spinal nerves; Autonomic Nervous System – structure and functions of sympathetic system and parasympathetic system; Neurohumoral and neuro-muscle transmission, reflex action, electroencephalogram, and nerve impulse; Secretion, composition, and functions of CSF.
Special senses organs: Structure and functions of eyeball, ear, nose, tongue and skin, mechanism of vision, hearing, smell, taste, and sensation.
Reproductive system: Structure and functions of male and female reproductive organs, spermatogenesis, ovarian cycle, menstruation, fertilization, and pregnancy.

List of experiments:

- Demonstration of human anatomical planes and divisions.

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- Demonstration of different tissues.
- Demonstration of the human digestive and respiratory system.
- Demonstration of structure of skeletal, smooth, and cardiac muscles.
- Demonstration of various parts of the circulatory and lymphatic system.
- Demonstration of human musculoskeletal system.
- Estimation of blood pressure with the help of BP apparatus.
- Demonstration of body temperature, pulse, and heart rate.
- Demonstration of central nervous system and endocrine system.
- Demonstration of reproductive systems.

Examination Scheme

Components	CA	A	ME	EE
Weightage (%)	15	5	10	70

Recommended books:

- B. D. Chaurasia, BD Chaurasia's Human Anatomy Regional and Applied Dissection and Clinical: Lower Limb Abdomen and Pelvis, Vol I, II and III, 7th Edition 2016, CBS Publishers & Distributors.
- K Simbulingam & P Simbulingam, Essential Medical Physiology, 6th Edition 2012, Jaypee Brothers Medical publishers (P) LTD.
- N Murgesh, Basic Anatomy and Physiology, 6th Edition 2011, Satya Publishers.
- Anne Waugh, Kathleen and J W Wilson, Ross and Wilson Anatomy and Physiology, 12th Edition 2014, Churchill Living Stone.
- H. G. Q. Rowett, Basic Anatomy and Physiology, 3rd Edition 1996, Murray Publishers Ltd.
- Gerard J. Tortora, Bryan H. Derrickson, Principle of anatomy and physiology, 14th Edition 2014, Wiley Publication.
- R S Winwood, Sears Anatomy & Physiology, 6th Edition, 1985, CRC Press.
- Elaine N. Marie, Essentials of Human Anatomy and Physiology, 11th Edition 2015, Pearsons Benjamin Cummings.

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GENERAL CLINICAL MICROBIOLOGY

Course Code: DMLT2101 **Credit Units: 4**

Course Objectives:

- To familiarize students with the essential equipment used in medical microbiology: This objective focuses on ensuring that students become proficient in handling and operating the various equipment and instruments commonly used in a medical microbiology laboratory.
- To teach basic laboratory techniques and procedures in medical microbiology: This objective emphasizes the acquisition of practical skills such as microscopy, sterilization, disinfection, and culture methods. Students should be able to perform these techniques accurately and safely.
- To enable students to conduct microbiological tests relevant to clinical microbiology: This objective involves teaching students how to perform a range of microbiological tests and assays essential for diagnosing and treating infectious diseases in a clinical microbiology setting.
- To educate students about biomedical waste management: This objective aims to raise awareness of the proper disposal and management of biomedical waste generated in medical microbiology laboratories. Students should understand the importance of biohazard safety and regulatory compliance in handling such waste.
- These objectives ensure that students not only gain a theoretical understanding of medical microbiology but also develop practical skills and knowledge necessary to work effectively in a medical microbiology laboratory and contribute to healthcare and patient safety.

Module 1: Introduction to Medical Microbiology:

Definition
History
Host - Microbe relationship
Safety measures in Clinical Microbiology
Glassware used in Clinical Microbiology Laboratory:
Introduction
Care and handling of glassware
Cleaning of glassware
Equipment used in clinical Microbiology Laboratory:
Introduction
Care and maintenance including calibration

Module 2: Microscopy

Introduction and history
Types, principle and operation mechanism of following microscopes
Light microscope
DGI
Fluorescent
Phase contrast
Electron microscope: Transmission/ Scanning
Sterilization:
Definition
Types and principles of sterilization methods
Heat (dry heat, moist heat with special Reference to autoclave)
Radiation
Filtration
Efficiency testing to various sterilizers
Antiseptics and disinfectants:
Definition.
Types and properties

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Mode of action - Uses of various disinfectants
Precautions while using the disinfectants - Qualities of a good disinfectant
Testing efficiency of various disinfectants

Module 3: Biomedical waste management in a Medical Microbiology laboratory:

Types of the waste generated – Segregation – Treatment – Disposal
General characteristics & classification of Microbes: (Bacteria &fungi)
Classification of microbes with special reference to prokaryotes & eukaryotes
Morphological classification of bacteria
Bacterial anatomy (Bacterial cell structures)
Growth and Nutrition of Microbes:
General nutritional & other requirements of the bacteria
Classification of bacteria on the basis of their nutritional requirements
Physical conditions required for growth.
Normal growth cycle of bacteria (growth curve)
Types of microbial cultures: Synchronous, Static, continuous culture.
Culture media:

Module 4:

Introduction Classification of culture media (Example & Uses) solid media, liquid media, semisolid, Media, routine/synthetic/defined media, basal media, enriched, enrichment, Selective differential media, sugar fermentation media, transport media, preservation media and anaerobic culture media
Quality control in culture media
Automation in culture media preparation
Aerobic & anaerobic culture methods:
Concepts
Methods Used for aerobic cultures
Methods used for anaerobic cultures
Introductions to Immunology
Immunity
Antigens and Antibodies
Care & handling of laboratory animals:
Introduction
General care & handling
Ethics & legality in use of laboratory animals

List of experiments:

- To demonstrate safe code of practice for a Microbiology laboratory
- To prepare cleaning agents & to study the technique for cleaning & sterilization of glassware.
- To demonstrate the working & handling of Compound microscope.
- To demonstrate the method of sterilization by autoclave including its efficacy testing.
- To demonstrate the method of sterilization by hot air oven including its efficacy testing.
- To demonstrate the method of sterilization of media/solution by filtration.
- Demonstration of Antiseptics, Spirit, Cetrimide& Povidone-Iodine.
- To demonstrate the use of disinfectants.
- Demonstrate the precaution while using disinfectants.
- To prepare working dilution of commonly used disinfectants.
- In-use test
- Rideal-walker phenol co-efficient test.
- Kelsey-Sykes test
- To demonstrate the different morphological types of bacteria
    - Preparation of one culture media from each type

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- To demonstrate aerobic culture
- To demonstrate anaerobic culture
- Visit to animal house & demonstrate about care of laboratory animals

Examination Scheme

Components	CA	A	ME	EE
Weightage (%)	15	5	10	70

Suggested Readings

- Practical Medical Microbiology by Mackie and McCartney
- Text book of Microbiology by Ananthanarayan
- Medical Microbiology by Panikar& Satish Gupte
- Medical laboratory Technology vol. I, II, III by Mukherjee
- District Laboratory Practice in tropical countries Vol II Microbiology by Monica Cheesbrough
- Text book of Microbiology by Prescott

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SEMESTER-II

BASIC CLINICAL BIOCHEMISTRY

Course Code: DMLT2251 **Credit Units: 4**

Course Objectives:

- To provide a foundational understanding of the laboratory apparatus and equipment used in clinical biochemistry:
- To educate students about the fundamental principles and ethical considerations in medical laboratory technology:
- To promote safety awareness and first aid skills
- To teach proper techniques for cleaning and maintaining laboratory glassware and equipment
- To provide a comprehensive understanding of volumetric analysis and pH measurement:

Module 1

Introduction to Medical lab. Technology
Role of Medical lab Technologist
Ethics and responsibility
Safety measures
First aid
Cleaning and care of general laboratory glass ware and equipment
Steps involved in cleaning soda lime glass
Steps involved in cleaning borosil glass
Preparation of chromic acid solution
Storage

Module 2

Distilled water
Method of preparation of distilled water
Type of water distillation plants
Storage of distilled water
Units of Measurement.
S.I unit and CGS units
Conversion
Strength, molecular weight, equivalent weight
Normality, Molarity, Molality
Numerical

Module 3

Calibration of volumetric apparatus
Flask
Pipettes
Burettes
Cylinders
Analytical balance
Principle
Working
Maintenance
Concept of pH
Definition
Henderson Hassel batch equation

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Pka value
pH indicator
Methods of measurement of pH
pH paper
pH meter
Principle, working, maintenance and calibration of pH meter

Module 4

Volumetric analysis
Normal and molar solutions
Standard solutions
Preparation of reagents
Storage of chemicals
Osmosis
Definition
Types of osmosis
Factors affecting osmotic pressure
Vant Hoff's equation
Applications of osmosis
Dialysis

List of experiments:

- Cleaning of the laboratory glass ware (Volumetric and non-volumetric)
- Preparation of distilled water
- Principle, working and maintenance of pH meter.
- To prepare 0.1 N NaOH solution.
- To prepare 0.2N HCl solution.
- To prepare 0.1 molar H_2SO_4
- To prepare 0.2 Molar Sodium carbonate solution.
- Demonstration of osmosis and dialysis.

Examination Scheme

Components	CA	A	ME	EE
Weightage (%)	15	5	10	70

Suggested Readings

- Text book of Medical Laboratory Technology by P. B. Godker
- Medical Laboratory Technology by K.L. Mukherjee volume III
- Practical Clinical Biochemistry by Harold Varley
- Principal of Biochemistry by M. A. Siddiqi
- Instrumental Analysis by Chatwal Anand
- Text book of Medical Biochemistry by Chatterjee, Shinde
- Principal of Biochemistry by Lehninger
- Biochemistry by Voet&Voet
- Biochemistry by Stryer

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BASIC HAEMATOLOGY

Course Code: DMLT2201 **Credit Units: 4**

Course Objectives:

- To provide students with a clear understanding of the fundamental concepts in haematology, including the definition of haematology and its importance in medical diagnosis and patient care.
- To familiarize students with the important equipment used in haematology laboratories and to instill a strong sense of laboratory organization and safety measures for working in such environments.
- To educate students about the composition and functions of blood, including its normal cellular components, as well as the role of anticoagulants in maintaining the integrity of blood samples for various hematological studies.
- To delve into the formation of cellular components of blood (Haemopoiesis), including Erythropoiesis, Leucopoiesis, and Thrombopoiesis, and to explore the structure, synthesis, and degradation of Hemoglobin.
- To emphasize the importance of quality assurance in haematology, both internally and externally, and to introduce students to routine quality assurance protocols.

Module 1

Introduction to Haematology
- Definition
- Importance
- Important equipment used

Laboratory organization and safety measures in Haematology Laboratory
Introduction to blood, its composition, function and normal cellular components
Anticoagulants: types, mode of action and preference of anticoagulants for different hematological studies

Module 2

Collection and preservation of blood sample for various hematological investigations
Formation of cellular components of blood (Haemopoiesis)
- Erythropoiesis
- Leucopoiesis
- Thrombopoiesis

Module 3

Hemoglobin: definition, types, structure, synthesis and degradation
Morphology of normal blood cells
Normal Hemostasis & physiological properties of coagulation factors
Radioactivity: definition, half-life, physical decay and units
Urine analysis

Module 4

Quality assurance in Haematology
- Internal and external quality control including reference preparation
- Routine quality assurance protocol
- Statistical analysis i.e. Standard deviation, Co-efficient of variation, accuracy and precision

List of experiments:

Preparation of various anticoagulants :
- EDTA

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Sodium Citrate,
Oxalate with Fluoride
Collection of blood sample for various Lab Investigations
Familiarization and working of routine Haematology Lab. Instruments
Microscopes
Haemocytometers
Colorimeter
Spectrophotometer
Glass pipettes & Auto pipettes
Glassware
Sahli's Apparatus
Identification of Normal blood cells
Urine Analysis:
Routine biochemistry of Urine for:
pH
Specific Gravity
Glucose
Ketones
Bilirubin
Albumin
Microscopic Examination of Urine

Examination Scheme

Components	CA	A	ME	EE
Weightage (%)	15	5	10	70

Suggested Readings

- Text book of Medical Laboratory Technology by Praful B. Godkar
- Medical laboratory Technology by K.L. Mukherjee Volume-I
- Practical Haematology by J.B. Dacie
- Clinical Diagnosis &Management by Laboratory methods (20th edition) by John Bernard Henry
- Atlas of Haematology (5th edition) by G.A. McDonald De Gruchy's Clinical Haematology in Medical Practice

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SEMESTER-III

APPLIED HAEMATOLOGY

Course Code: DMLT2351 **Credit Units: 4**

Course Objectives:

- Learn methods for hemoglobin measurement and cell counting, understanding their advantages and limitations.
- Understand ESR measurement principles, methods, and their clinical significance.
- Master hematocrit measurement methods and the preparation of various blood film types with staining techniques.
- Acquire the skill to perform differential leukocyte counts and interpret the results.
- Develop expertise in examining body fluids for cytology and preparing reagents for coagulation studies, recognizing their clinical significance.

Module 1

Haemoglobinometry: Different methods to measure Haemoglobin with merits anddemerits
Haemocytometery: Introduction, Principle, Reagent preparation, procedure, errors involved and means to minimize errors.

RBC Count,
Total leucocytes count(TLC)
Platelet Count.
Absolute Eosinophil count

Principle mechanism and different methods with merit and demerits for the measuring Erythrocyte Sedimentation Rate (ESR) and its significance
Different methods with merit and demerits for packedcellvolume/Haematocritvalue
Preparation of blood films

Module 2

Types, Methodsofpreparation (Thick andthinsmear/film) and utility
StainingtechniquesinHaematology(Romanowsky‘sstains):Principle, composition,preparationofstainingreagentsandprocedureofthefollowing

Giemsa‘sstain
Leishman‘sstain
Wright‘sstain
Field‘s stain
JSBstain.

Module 3

Differential leucocytes count(DLC)
Normal and absolute values in Haematology
Physiological variations in Hb, PCV, TLC and Platelets
Macroscopic and microscopic examination of seminal fluid
Examination of CSF and other body fluids for cytology i.e. pleural, peritoneal and synovial fluid etc.

Module 4

Preparation of Reagents for coagulation studies:

M/40 Calcium chloride

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Brain Thromboplastin
Cephalin
Adsorbed Plasma

Screening Tests for coagulation Studies and their significance

List of experiments:

1. HbEstimation
    a. Sahli'smethod
    b. Cyanmethahaemoglobinmethod
    c. Oxyhaemoglobinmethod
2. Totalleukocytecount
3. Plateletscount
4. AbsoluteEosinophil count
5. PreparationofsmearandstainingwithGiemsaandLeishmanstain.
6. ESR(WintrobeandWestergrenmethod)
7. Packedcellvolume(Macro&Micro)
8. CytologicalexaminationofCSF andotherbody fluids
9. Physical andMicroscopic examinationof seminalfluidincludingsperm count
10. Perform normal DLC
11. Preparation of M/40 Calcium chloride
    a. Brain thromboplastin and standardization
    b. Cephaln
    c. Adsorbed plasma
12. Perform BT, CT, Hess test, PT and APTT

Examination Scheme

Components	CA	A	ME	EE
Weightage (%)	15	5	10	70

Suggested Readings:

- Textbook of Medical Laboratory Technologyby PrafulB. Godkar
- Medical laboratory Technology by K.L.Mukherjee Volume-I
- Practical Haematology by J.B. Dacie
- Clinical Diagnosis &Management by Laboratory methods (20thedition)by John BernardHenry
- Atlas of Haematology by G.A.McDonald
- De Gruchy's Clinical Haematology in medical practice

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SYSTEMATIC BACTERIOLOGY

Course Code: DMLT2301 **Credit Units: 4**

Course Objectives:

- Bacterial Culture: Master diverse bacterial culture techniques.
- Staining Proficiency: Learn staining methods for bacterial visualization.
- Morphology and Culture: Identify bacteria based on morphology and cultural characteristics.
- Biochemical Tests: Understand bacterial identification through biochemical tests.
- Laboratory Diagnosis: Acquire skills for diagnosing and identifying bacteria in the lab.

Course Contents

Module 1
Bacterial culture
Instruments used to seed culture media
Culture procedures – seeding a plate
Staining techniques in bacteriology
Significance of staining in bacteriology
Principle, Reagent preparation, procedures and interpretation of the following
Simple staining
Negative staining
Gram stain
Albert‘s stain
Neisser‘s stain
Ziehl –Neelsen staining
Capsule staining
Flagella staining
Spore staining
Fontana stain for spirochetes

Module 2
Principle, procedures and interpretation of the following biochemical tests for identification of different bacteria.
Catalase
Coagulase
Indole
Methyl Red
VogesProskauer
Urease
Citrate
Oxidase
TSIA
Nitrate reduction
Carbohydrate fermentation
Huge and Leifson
Bile solubility
H 2 S production
Demonstration of motility
Decarboxylases
CAMP
Hippurate hydrolysis
Nagler‘s reaction

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Cholera-red reaction

Module 3

Definition, Classification, Various characteristics (morphological, cultural and biochemical), pathogenesis and laboratory diagnosis of the following bacteria

Staphylococcus
Streptococcus
Pneumococcus
Neisseria gonorrhea and Neisseria meningitis
Haemophilis
Corynebacterium
Enterobacteriaceae: Escherichia coli, Klebsiella, Citrobacter, Enterobacter, Proteus, Salmonella, Shigella, Yersinia enterocolitica and Yersinia pestis
Vibrio, Aeromones and Plesiomonas
Clostridia of wound infection
Mycobacterium tuberculosis complex, Atypical Mycobacteria and M. leprae

Module 4

Spirochetes – Treponema, Borrellia and leptospira
Bordetella and brucella
Mycoplasma and Ureaplasma
Rickettsia
Chlamydia
Actinomyces
Pseudomonas and Burkholderia
Brief introduction about non sporing anaerobic cocci and bacilli

List of experiments:

To demonstrate the instruments used to seed culture media
To learn techniques for Inoculation of bacteria on culture media
To isolate specific bacteria from a mixture of organisms.
To demonstrate simple staining (Methylene blue)
To prepare India ink preparation to demonstrate negative staining.
Bacterial identification: To demonstrate reagent preparation, procedure and interpretation for

- Gram stain
- Albert stain
- Neisser‘s staining
- Z-N staining
- Capsule staining
- Demonstration of flagella by staining methods
- Spore staining
- To demonstrate spirochetes by Fontana staining procedure

To prepare the reagent and demonstrate following biochemical tests with positive and negative control bacteria:

- Catalase
- Coagulase
- Indole
- Methyl Red (MR)
- VogesProskauer (VP)
- Urease
- Citrate
- Oxidase
- TSIA

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Nitrate reduction
Carbohydrate fermentation
Huge and Leifson
Bile solubility
H2S production
Demonstration and motility
Decarboxylases
CAMP
Hippurate hydrolysis
Nagler‘s reaction

To demonstrate various characteristics (morphological, cultural and biochemical) of bacteria commonly isolated from clinical samples i.e.

Staphylococcus
Streptococcus
Corynebacterium
Escherichia coli
Klebsiella
Citrobacter
Enterobacter
Proteus
Salmonella
Shigella
Vibrio cholera
Mycobacterium tuberculosis
Pseudomonas

Examination Scheme

Components	CA	A	ME	EE
Weightage (%)	15	5	10	70

Suggested Readings:

- Practical Medical Microbiology by Mackie & McCartney Volume 1 and 2
- Text book of Microbiology by Ananthanarayanan
- Medical Microbiology by Paniker& Satish Gupte
- Medical laboratory Technology Vol. I, II, III by Mukherjee

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LABORATORY MANAGEMENT

Course Code: SMLT2301 **Credit Units: 3**

Course Objectives:

- Cover the basics of management, decision-making, and leadership.
- Emphasize ethical practices, safety, and good laboratory procedures.
- Introduce laboratory information systems, financial management, and quality assurance.
- Promote ethical behavior in laboratory procedures, record-keeping, procurement, and audits.
- Foster leadership skills and teamwork in a clinical laboratory setting.

Course Contents:

Module 1

The course is intended to provide knowledge about the basic principles of Management listed below, in addition to MLS management: Introduction to management, Strategic Management; Foundations of Planning; Planning Tools and Techniques
Decision Making, conflict and stress management
Managing Change and Innovation
Understanding Groups and Teams
Leadership
Time Management
Cost and efficiency
Laboratory Information system (LIS), Hospital Information system (HIS) and financial management.
Ethical Principles and standards for a clinical laboratory professional

Module 2

Good Laboratory Practice (GLP) Regulations and Accreditation
Introduction to Basics of GLP and Accreditation
Aims of GLP and Accreditation
Advantages of Accreditation
Brief knowledge about National and International Agencies for clinical laboratory accreditation
Awareness / Safety in a clinical laboratory
Patient management for clinical samples collection, transportation and preservation
Sample accountability
Purpose of accountability Methods of accountability
Sample analysis

Module 3

Introduction
Factors affecting sample analysis
Reporting results
Basic format of a test report
Reported reference range
Clinical Alerts
Abnormal results
Turnaround time
Results from referral laboratories
Release of examination results
Alteration in reports

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Module 4

Quality Management system
Introduction
Quality assurance
Quality control system
Internal and External quality control
Introduction and importance of calibration and Validation of Clinical Laboratory instruments
Laboratory Information system (LIS), Hospital Information system (HIS) and financial Management
Introduction
Functions of a laboratory management system
Standards for laboratory management system
Introduction and awareness of financial management in a clinical laboratory

Examination Scheme

Components	CA	A	ME	EE
Weightage (%)	15	5	10	70

Suggested readings:

- Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur

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SEMESTER-IV

ANALYTICAL CLINICAL BIOCHEMISTRY

Course Code: DMLT2451 **Credit Units: 4**

Course Objectives:

- The students will learn basic principles/mechanisms, procedures and various types of techniques commonly performed in analytical biochemistry such as:
- To equip students with a fundamental understanding of the principles and mechanisms behind analytical biochemistry techniques, including spectrophotometry, colorimetry, flame photometry, atomic absorption spectroscopy, chromatography, and electrophoresis.
- To ensure that students gain practical proficiency in the techniques and procedures associated with these analytical biochemistry methods, covering areas such as instrumentation, experimental techniques, and operation of each technique.
- To teach students how to apply these techniques in real-world scenarios by exploring their various applications.
- To enable students to differentiate between various types of analytical biochemistry techniques, understand their advantages and limitations, and make informed decisions about which technique is most suitable for a given analytical task.

Course Contents:

Module 1

Spectrophotometry and colorimetry

Introduction
Theory of spectrophotometry and colorimetry
Lambert`s law and Beer`s law
Applications of colorimetry and spectrophotometry

Photometry

Introduction
General principles of flame photometry
Limitations of flame photometry
Instrumentation
Applications of flame photometry
Atomic absorption spectroscopy – Principle & applications

Module 2

Chromatography

Introduction
Types of chromatography
Paper Chromatography: Introduction, principle, types, details for qualitative and quantitative analysis, application
Thin layer chromatography: Introduction, experimental techniques, application of TLC, limitations, High performance thin layer chromatography

Module 3

Column chromatography: Introduction, principle column efficiency, application of column chromatography
Gas chromatography: Introduction principle, instrumentation, application
Ion exchange chromatography: Introduction, Definition and principle, cation and anion exchangers, application
Gel Chromatography: Introduction Principle and method, application and advantages

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Module 4

Electrophoresis: Introduction
Principle
Instrumentation
Applications
Types of electrophoresis
Paper electrophoresis
Gel electrophoresis

List of experiments:

- To demonstrate the principle, working & maintenance of spectrophotometer.
- To demonstrate the principle, working & maintenance of colorimeter.
- To demonstrate the principle, working & maintenance of flame photometer.
- To demonstrate the principle, procedure of paper chromatography.
- To demonstrate the principle & procedure of Gas chromatography.
- To demonstrate the principle & demonstration of TLC.
- To demonstrate the principle & procedure of column chromatography.
- To demonstrate the principle & procedure of Electrophoresis.

Examination Scheme

Components	CA	A	ME	EE
Weightage (%)	15	5	10	70

Suggested readings

- Practical Clinical Biochemistry by Harold Varley
- Text book of Medical Laboratory Technology by P. B. Godker
- Medical Laboratory Technology by Mukherjee
- Principal of Biochemistry by M. A. Siddiqi
- Instrumental Analysis by Chatwal Anand
- Text book of Medical Biochemistry by Chatterjee, Shinde
- Principal of Biochemistry by Lehninger
- Biochemistry by Voet&Voet
- Biochemistry by Stryer

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IMMUNOHEMATOLOGY AND BLOOD TRANSFUSION

Course Code: DMLT2401 **Credit Units: 4**

Course Objectives:

- To educate students about the history and discovery of various blood group systems, with a focus on the ABO and Rh systems, and their significance in transfusion medicine.
- To provide practical knowledge on blood grouping techniques, including forward and reverse grouping, while emphasizing error prevention to ensure safe transfusions.
- To instruct students in compatibility testing for blood transfusion, covering major and minor cross matching, along with the use of enzymes like Papain for optimal results.
- To outline the selection criteria for healthy blood donors and the procedures for collecting and processing various blood components, ensuring the safety and quality of blood products.
- To stress the importance of quality control in the blood bank, including precautions in procurement and storage of grouping antisera, addressing complications and hazards of transfusions, and introducing students to artificial blood and hemapheresis techniques, all aimed at improving patient care and safety.

Module 1

Blood Banking

Introduction to Blood Banking
History and discovery of various blood group systems
ABO blood group system
Rh and other major blood group system
Sources of error in blood grouping and their elimination.

Module 2

ABO grouping: Forward and reverse grouping. Causes of discrimination between forward and reverse grouping
Rh grouping
Compatibility test in blood transfusion
Collection of blood for cross matching from a blood bag
Major cross matching
Minor cross matching
Use of enzymes in blood bank specially Papain

Module 3

Complications and hazards of blood transfusion
Laboratory investigations of transfusion reactions and mismatched blood transfusion.
Precautions while procurement and storage of grouping antisera
Various anticoagulants used to collect blood for transfusion purposes
Selection of donor and procedure for collection of blood from a healthy donor
Preparation of various fractions of blood for transfusion and therapeutic purposes such as:
Packed red cells, washed red cells and FROZEN Red cells
Platelet Rich Plasma (PRP), Platelet concentrate and frozen platelets.
Fresh plasma (FP), Fresh Frozen Plasma (FFP) and cryoprecipitate

Brief introduction of blood substitute/artificial blood
Haemopheresis: pertaining to Leucocytes, platelets and plasma.Quality control in blood bank

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Module 4

Genetics

Continuity of life-heredity, variation;
Mendel's laws of inheritance,
Chromosomal basis of inheritance; other patterns of inheritance- incomplete dominance, multi parallelism, quantitative inheritance.
Chromosomes - bacterial cell and eukaryotic cell; parallelism between genes and chromosomes; genome, linkage and crossing over; gene mapping; recombination;
Molecular genetics: DNA as a genetic material- its structure and replication; structure of RNA and its role in protein synthesis, Vectors, plasmids
Human Genetics
Microbial genetics

List of experiments:

- To prepare Acid Citrate Dextrose (ACD) and Citrate Phosphate Dextrose (CPD) Solutions
- Screening of blood donor: physical examination including medical history of the donor
- Collection and preservation of blood for transfusion purpose
- Screening of blood for Malaria, Microfilaria, HBs Ag, Syphilis and HIV
- To determine the ABO & Rh grouping
- Direct or preliminary grouping
- Indirect or proof grouping
- Rh grouping and determination of Du in case of Rh negative
- To perform Direct and Indirect Coomb‘s test
- To perform cross matching
- Major cross matching
- Minor cross matching
- Preparation of various fractions of blood.

Examination Scheme

Components	CA	A	ME	EE
Weightage (%)	15	5	10	70

Suggested readings

- Practical Haematology by J.B. Dacie
- Transfusion Science by Overfield, Hamer
- Medical Laboratory Technology by K.L. Mukherjee Volume-I
- Mollison's Blood Transfusion in Clinical Medicine, 12th Edition by Harvey G. Klein
- Genes by Benjamin Lewin
- Genetics by B.D. Singh
- Principals of Genetics by Gardner
- Instant Noteson Genetics by PC Winter, GI Hickey and HL Fletcher

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SEMESTER-V

APPLIED HISTOPATHOLOGY

Course Code: DMLT2551 **Credit Units: 4**

Course Objectives:

- Understand microscopy and equipment maintenance for histological examination.
- Learn and apply safe lab practices and proper tissue specimen handling.
- Gain knowledge of the tissue processing, from fixation to sectioning with microtomes.
- Apply staining and mounting techniques for effective slide preparation.
- Ensure proficiency in histological staining procedures.

Module 1

Introduction to Histotechnology
Compound microscope:
Optical system, magnification and maintenance
Microscopy:
Working principle
Applications of various types of microscopes i.e. dark field, polarizing, phase contrast, interference and fluorescent microscope
Care and maintenance of laboratory equipment used in histotechnology
Safety measures in a histopathology laboratory
Basic concepts about routine methods of examination of tissues
Collection and transportation of specimens for histological examination

Module 2

Basic concepts of fixation
Various types of fixatives used in a routine histopathology laboratory
Simple fixatives
Compound fixatives
Special fixatives for demonstration of various tissue elements
Decalcification
Criteria of a good decalcification agent
Technique of decalcification followed with selection of tissue, fixation, anddecalcification, neutralization of acid and thorough washing
Various types of decalcifying fluids: Organic & Inorganic Acid, chelating agents, Use of Ion-exchange resigns and Electrophoretic decalcification and treatment of hard tissueswhich are not calcified

Module 3

Processing of various tissues for histological examination
Procedure followed by Dehydration, Clearing, Infiltration and routine timing schedule for manual or automatic tissue processing.
Components & principles of various types of automatic tissue

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Processors
Embedding:
Definition
Various types of embedding media
Section Cutting
Introduction regarding equipment used for sectioning
Microtome Knives, Sharpening of Microtome Knives, Honing, Stropping, various types of microtome and their applications
Freezing Microtome and various types of Cryostats.
Faults in paraffin section cutting with reason and remedy, spreading the sections and attachment or mounting of sections to glass slides.

Module 4

Staining, Impregnation and Mountants
Theory of Staining, Classifications of Dyes, Principles of Dye Chemistry
Stains and Dyes and their uses
Types of Stains, Chemical Staining Action, Mordants and Accentuators,Metachromasia
Use of Controls in Staining Procedures
Preparation of Stains, solvents, aniline water and buffers etc.
Commonly used mountants in histotechnology lab
General Staining Procedures for Paraffin Infiltrated and Embedded tissue
Nuclear Stains and Cytoplasmic stains
Equipment and Procedure for manual Staining and Automatic Staining Technique
Mounting of Cover Slips, Labeling and Cataloguing the Slides
Routine Staining Procedures
Haematoxylin and Eosin Staining, various types of Haematoxylins 13.2Mallory‘s Phosphotungstic Acid Haematoxylin (PTAH)

List of experiments:

1. Demonstration of instruments used for dissection
2. Use of antiseptics, disinfectants and insecticides in a tissue culture processing laboratory
3. Reception and labeling of histological specimens
4. Preparation of various fixatives
    a. Helly‘s fluid
    b. Zenker‘s fluid
    c. Bouin‘s fluid
    d. Corney‘s fluid
    e. 10% Neutral formalin
    f. Formal saline
    g. Formal acetic acid
    h. Pereyn‘s fluid
5. Testing of melting point of paraffin wax and perform embedding of given tissue in paraffin block
6. To process a bone for decalcification
7. To prepare ascending and descending grades of alcohol from absolute alcohol
8. Processing of tissue by manual and automated processor method
9. To demonstrate various part and types of microtome
10. To learn sharpening of microtome knife (Honing and stropping technique), and types of disposable blades in use (High and Low Profile).
11. To perform section cutting (Rough and Fine)
12. To practice attachment of tissue sections to glass slides
13. To learn using tissue floatation bath and drying of sections in oven (60-65C)
14. To perform & practice the Haematoxylin and Eosin staining technique
15. To perform & practice the Mallory‘s Phospho tungstic Acid Haematoxylin (PTAH)
16. To learn mounting of stained smears

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Examination Scheme

Components	CA	A	ME	EE
Weightage (%)	15	5	10	70

Suggested Readings

- Handbook of Histopathological Techniques by C F A Culling
- Medical Lab technology by Lynch
- An Introduction to Medical Lab Technology by F J Baker and Silverton
- Bancroft's Theory and Practice of Histopathological Techniques by John D Bancroft

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IMMUNOLOGY AND SEROLOGY

Course Code: DMLT2501 **Credit Units: 4**

Course Objectives:

- Understand the fundamentals of immunity, including innate and acquired immunity.
- Explore antigens and immunoglobulins and their roles in the immune system.
- Master practical applications of antigen-antibody reactions.
- Learn diagnostic techniques like ELISA and Western blotting in serology.
- Gain insight into immune responses, hypersensitivity, and autoimmunity concepts.

Module 1

History and introduction to immunology
Immunity
- Innate
- Acquired immunity
- Basic concepts about their mechanisms

Definition, types of antigens and determinants of antigenicity
Definition, types, structure and properties of immunoglobulin

Module 2

Antigen-Antibody reactions
- Definition
- Classification
- General features and mechanisms
- Applications of various antigen antibody reactions

Principle, procedure and applications of under mentioned in Medical Microbiology:
- Complement fixation test
- Immuno- fluorescence
- ELISA
- SDS-PAGE
- Western blotting

Principle, procedure and interpretation of various serological tests:
- Widal
- VDRL
- ASO
- CRP
- Brucella tube agglutination
- Rose-Waaler

Module 3

Complement system:
- Definition
- Basic concepts about its components
- Complement activation pathways

Immune response:
- Introduction
- Basic concepts of Humoral and Cellular immune responses

Hypersensitivity:
- Definition
- Types of hypersensitivity reactions

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Module 4

Basic concepts of autoimmunity and brief knowledge about autoimmune diseases
Automation in diagnostic serology
Vaccines:
- Definition
- Types
- Vaccination schedule
- Brief knowledge about _Extended programme of immunization' (EPI) in India

List of experiments:

- Collection of blood sample by vein puncture, separation and preservation of serum
- Performing Haemolysin titration for Rose-Waaler test
- Preparation of Phosphate buffers, Verinol buffer, ASO buffer, Richardson's buffer, Buffers of different pH and Molarity, Tris buffer, Standardization of cell concentration by Spectrophotometer
- Performance of Serological tests i.e.
- Widal,
- Brucella Tube Agglutination,
- VDRL (including Antigen Preparation),
- ASO (Anti-Streptolysin _O')
- C-Reactive Protein (Latex agglutination)
- Rheumatoid factor (RF) Latex agglutination
- Rose Waaler test,
- Demonstration of antigen/antibody determination by Immuno fluorescence (IF), Immunodiffusion, precipitation in Agarose gel (Ouchterlony), CCIEP, ELISA, SDS - PAGE and Western blotting.

Examination Scheme

Components	CA	A	ME	EE
Weightage (%)	15	5	10	70

Suggested Readings:

- Practical Medical Microbiology by Mackie & McCartney Volume 1 and 2
- Text book of Microbiology by Ananthanarayanan
- Medical Microbiology by Paniker& Satish Gupte
- Medical laboratory Technology Vol. I ,II, III by Mukherjee
- Medical Laboratory manual for tropical countries Vol II Microbiology by Monica Cheesbrough
- Immunology by Riot
- Basic & Clinical Immunology by P. Daniel Fudenberg. H. Hugh and Stites

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APPLIED CLINICAL BIOCHEMISTRY

Course Code: DMLT2502 **Credit Units: 4**

Course Objectives:

- Emphasize laboratory safety and hazard awareness.
- Instill quality control and assurance practices.
- Teach efficient laboratory organization and record-keeping.
- Explain assay procedures and reference values for key biochemical parameters.
- Introduce advanced techniques like radioisotope detection and enzyme-linked immunosorbent assays.

Module 1:
Hazards & safety measures in clinical Biochemistry laboratory
Quality control and quality assurance in a clinical biochemistry laboratory
Laboratory organization, management and maintenance of records

Module 2:
Principles of assay procedures, Normal range in blood, Serum, Plasma and Urine and reference values for:
Glucose
Proteins
Urea
Uric acid
Creatinine
Bilirubin
Lipids

Module 3:
Principles, procedures for estimation & assessment of the following including rrors involved and their corrections
Sodium, Potassium and Chloride, Iodine
Calcium, Phosphorous and Phosphates

Module 4:
Instruments for detection of Radioactivity
Applications of Radioisotopes in clinical biochemistry.
Enzyme linked immune sorbent assay

List of experiments:

- Estimation of Glucose in Urine and in Blood.
- Estimation of Protein in Urine and Blood.
- Estimation of Urea in blood.
- Estimation of uric acid in blood.
- Estimation of serum Bilirubin
- Estimation of Total Cholesterol in blood.
- Estimation of HDL Cholesterol.
- Estimation of LDL Cholesterol.
- Estimation of TG
- Estimation of Creatinine in Blood
- Estimation of serum calcium, Inorganic phosphate
- To measure electrolytes Sodium, Potassium & Chloride.

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Examination Scheme

Components	CA	A	ME	EE
Weightage (%)	15	5	10	70

Suggested Readings

- Text book of Medical Laboratory Technology by P.B. Godkar.
- Medical Laboratory Science, Theory & Practical by A. Kolhatkar.
- Practical Clinical Biochemistry by Harold Varley.
- Biochemistry, U. Satyanarayan& U. Chakrapani.
- Text book of Medical Biochemistry by Chatterjee&Shinde.
- Principal of Biochemistry by Lehninger
- Biochemistry by Voet&Voet
- Biochemistry by Stryer

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CLINICAL PARASITOLOGY AND ENTOMOLOGY

Course Code: DMLT2651 **Credit Units: 4**

Course Objectives:

- Gain proficiency in the basic terminology used in medical parasitology.
- Understand protozoal parasites' characteristics and laboratory diagnostics.
- Grasp the biology and lab diagnosis of blood and tissue flagellates.
- Familiarize with helminth characteristics and diagnostic methods.
- Learn essential parasitology diagnostic techniques.

Module 1

Introduction to Medical Parasitology with respect to terms used in Parasitology.
Protozoology/ Protozoal parasites:
General characteristics of protozoa.
Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of Entamoeba sp.
Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of Intestinal and vaginal flagellates i.e. Giardia, Trichomonas sp.
Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of blood and tissue flagellates i.e. Plasmodium and Toxoplasma sp.

Module 2

Helminthology/ Helminthic parasites:
General characteristics of Cestodes, Trematodes and Nematodes
Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of :
Taeniasolium and saginata
Echinococcusgranulosus
Hymenolepis nana
Schistosoma haematobium and mansoni
Fasciola hepatica and buski
Trichuristrichura
Trichinellaspirales
Strongyloidesstercoralis
Ancylostomaduodenale
Enterobiusvermicularis
Ascarislumbricoides
Wuchereriabancrofti
Dracunculusmedinensis

Module 3

Diagnostic procedures:
Examination of Stool for parasites
For intestinal protozoal infections
General rules for microscopic examination of stool samples
Collection of stool samples
Preparation of material for unstained and stained preparations
Staining methods i.e. Iodine staining and permanent staining
For Helminthic infections
Introduction, direct smear preparation and examination
Concentration techniques i.e. Flotation and sedimentation techniques
Egg counting techniques

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Module 4

Examination of blood for parasites
- Preparation of thin and thick blood film
- Leishman staining
- Examination of thick and thin smear
- Field's stain
- JSB stain

Examination of blood film for Malarial parasite and Microfilariae
Collection, Transport, processing and preservation of samples for routine parasitological investigations
Morphology, life cycle and lab-diagnosis of Giardia and Entamoeba
Morphology, life cycle and lab-diagnosis of Roundworms and Hookworms
Morphology, life cycle and lab-diagnosis of T. solium and T. saginata
Morphology, life cycle and lab-diagnosis of Malarial parasite with special reference to P.vivax and P. falciparum
Laboratory diagnosis of hydated cyst and cysticercosis
Concentration techniques for demonstration of Ova and Cysts (Principles and applications)

List of experiments:

- Routine stool examination for detection of intestinal parasites with concentration methods:
- Saline preparation
- Iodine preparation
- Floatation method
- Centrifugation method
- Formal ether method
- Zinc sulphate method
- Identification of adult worms from models/slides:
- Tapeworm
- Tapeworm segments
- Ascaris (Round worm)
- Hookworms
- Pinworms
- Malarial parasite:
- Preparation of thin and thick smears
- Staining of smears
- Examination of smears for malarial parasites (P. vivax and P. falciparum)

Examination Scheme

Components	CA	A	ME	EE
Weightage (%)	15	5	10	70

Suggested Readings

- Parasitology in relation to Clinical Medicine by K D Chhatterjee
- Medical Entomology by A.K. Hati, Pub. Allied Book Agency
- Medical Parasitology by D.R. Arora
- Clinical Parasitology by Paul Chester Beaver

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CLINICAL CYTOPATHOLOGY

Course Code: DMLT2601 **Credit Units: 4**

Course Objectives:

- Learn cryostat sectioning and its diagnostic applications.
- Understand enzyme cytochemistry and vital staining.
- Comprehend the principles and utility of aspiration cytology.
- Master exfoliative cytology techniques for cervical and fluid samples.

Module 1

Explore automation and advanced techniques in cytology.Cryostat sectioning, its applications in diagnostic cytopathology

Enzyme Cytochemistry:

Diagnostic applications

Demonstration of Phosphatases, Dehydrogenases, Oxidases & Peroxidases

Module 2

Vital staining for Sex Chromatin

Aspiration cytology:

Principle

Indications & utility of the technique with special emphasis on role of cytotechnologist in FNAC clinics

Module 3

Exfoliative cytology (Papanicolaou technique for the staining of cervical smears)

Cervical cytology

Fluid Cytology

Urine

CSF

Body Fluids (Pleural, Pericardial, Ascitic)

Module 4

Automation in cytology

Liquid based cytology: Principles and preparation, Cytocentrifuge, molecular cytology, Cell Block and Immune-cytochemistry

List of experiments:

- To perform Papnicolaou‘s stain on cervical smear
- To perform Guard‘s staining for demonstration sex chromatin (Barr bodies on a buccal smear)
- To perform Shorr‘s staining for Hormonal assessment
- To cut frozen sections of Gynaec tissue
- To perform CSF sample and body fluids by cytospin
- Should know the various stains used in Cytology lab:‖ May Grunwald Giemsa, H&E, PAS, Grocott‘s.

Examination Scheme

Components	CA	A	ME	EE
Weightage (%)	15	5	10	70

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Suggested Readings

- Handbook of Histopathological Techniques by C F A Culling
- Medical Lab technology by Lynch
- An Introduction to Medical Lab Technology by F J Baker and Silverton
- Bancroft's Theory and Practice of Histopathological Techniques by John D Bancroft
- Diagnostic Cytology by Koss Volume -II

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IMMUNOPATHOLOGY AND MOLECULAR BIOLOGY

Course Code: DMLT2602 **Credit Units: 4**

Course Objectives:

- Teach clinical sample analysis for immune disease diagnosis.
- Provide comprehensive knowledge of immunology, including antigen-antibody reactions and molecular techniques.
- Introduce students to the basics of molecular biology and techniques like PCR.
- Foster an understanding of biomolecular interactions within cells.
- Equip students with clinical diagnostics proficiency for immune diseases and molecular challenges.

Module 1

Introduction to Immunology
Cells of the immune system
Types and Mechanisms of immune response
Lymphoid organs of the Immune system

Module 2

MHC I & II
HLA Typing & Cross matching
Transplant Immunology
Hypersensitivity: Definition, Types, Mechanisms
Autoimmunity
Immune tolerance : Basic concepts

Module 3

Introduction to Molecular Biology
Relationship of Mol. Biology with other Science
Molecular Biology Techniques : Principle, Reagents used, procedure and applications in Medical diagnostics
Polymerase Chain Reaction and its advanced versions

Module 4

Gel electrophoresis
Western blotting
Chemical composition of DNA
DNA replication
DNA damage and repair
Regulation of prokaryotic and eukaryotic gene expression
Cell Cycle

List of experiments:

1. Peripheral blood mononuclear cell (PBMC) isolation by gradient centrifugation
2. T and B cell separation
3. Immunofluorescence
    a. Anti- Nuclear Antibody (ANA)
    b. Anti- Neutrophil Cytoplasmic Antibody (ANCA)
4. AIDS Immunology and Pathogenesis (AIP)
5. Thyroid Microsomal antigen (TMA)- Agglutination reactions
6. Electrophoresis
7. Gel diffusion
8. Nephlometery

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9. HLA
    a. Typing Serology & Cross match
    b. Molecular Typing
10. Nitro blue Tetrazolium Chloride Test (NBT)
11. FACS for CD4 and CD8
12. ELISA for lab. diagnosis of AIDS
13. Polymerase Chain Reaction and its advanced versions
14. Gel electrophoresis
15. Western blotting
16. Isolation of DNA and RNA
17. Estimation of DNA and RNA
18. Determination of molecular weight and quantification of DNA using agarose gel electrophoresis

Examination Scheme

Components	**CA**	**A**	**ME**	**EE**
Weightage (%)	15	5	10	70

Suggested Readings

- Immunology by Ivan Roitt, JonathaanBrostoff and David Male
- Immunology by Kuby
- Medical Immunology by Daniel P Stites
- Basic & Clinical Immunology by P. Daniel Fudenberg. H. Hugh and Stites
- Elements of Biotechnology by PK Gupta
- Watson Molecular Biology of Gene
- Advanced Molecular Biology by R Twyman
- Principal of Biochemistry by Lehninger

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CLINICAL MYCOLOGY AND VIROLOGY

Course Code: DMLT2603 **Credit Units: 4**

Course Objectives:

1. Understand the basics of medical mycology and its applications.
2. Learn the taxonomy, characteristics, and diagnostic procedures for medically important fungi.
3. Explore yeast and mold identification techniques and antifungal susceptibility testing.
4. Gain proficiency in routine myco-serological tests and skin tests.
5. Introduce medical virology, significant viruses, viral structure, and diagnostic techniques.

Module 1

Mycology: Introduction to Medical Mycology
Basic concepts about superficial and deep Mycoses
Taxonomy and classification and general characteristics of various medically important fungi
Normal fungal flora
Morphological, cultural characteristics of common fungal laboratory contaminants
Culture media used in mycology

Module 2

Direct microscopy in Medical mycology laboratory
Processing of clinical samples for diagnosis of fungal infections i.e. Skin, nail, hair, pus, sputum, CSF and other body fluids
Techniques used for isolation and identification of medically important fungi
Methods for identification of yeasts and moulds
Dimorphism in fungi
Antifungal susceptibility tests
Preservation of fungal cultures
Routine myco-serological tests and skin tests

Module 3

Virology: Introduction to medical virology
Introduction to medically important viruses
Structure and Classification of viruses.
Multiplication of viruses

Module 4

Collection, transportation and storage of sample for viral diagnosis
Staining techniques used in Virology
Processing of samples for viral culture (Egg inoculation and tissue culture)
Rapid diagnosis of viral infections with special reference to HIV, HBV and HCV
EIA
Immunofluorescence
PCR

List of experiments:

- To prepare culture media used routinely in mycology
- To perform KOH preparation, Gram stain, Potassium Hydroxide - Calcofluor White method, India Ink preparation, Modified Kinyoun Acid Fast Stain for Nocardia, LCB preparation.
- To identify given yeast culture by performing various identification techniques studied in theory.
- To identify given mould culture by performing various identification techniques studied in theory.
- To demonstrate dimorphism in fungi

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- To collect and process clinical samples for laboratory diagnosis of fungal infections i.e.
- Skin
- Nail
- Hair
- Body fluids and secretions
- To demonstrate structure of viruses and their multiplication from charts etc.
- To perform Giemsa stain, Seller‘s stain, immunofluorescent staining procedures for diagnosis of viral infections
- Demonstration of fertilized hen egg
- Demonstration of various inoculation routes in fertilized hen egg

Examination Scheme

Components	**CA**	**A**	**ME**	**EE**
Weightage (%)	15	5	10	70

Suggested Readings

- Practical Medical Microbiology by Mackie &MacCartney Volume 1 and 2
- Text book of Microbiology by Ananthanarayanan
- Medical Microbiology by Panikar& Satish Gupte
- Medical laboratory Technology Vol. I ,II, III by Mukherjee
- Medical Laboratory manual for tropical countries Vol. II Microbiology by Monica Cheesbrough
- Medical Mycology by Dr. JagdishChander

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SEMESTER-VII

FUNDAMENTALS OF MEDICAL LAB TECHNOLOGY

Course Code: DMLT2701 **Credit Units: 4**

Course Objectives:

- Understand the fundamental principles and ethics in Medical Laboratory Technology.
- Familiarize with essential laboratory safety practices and accident prevention measures.
- Gain knowledge of common laboratory hazards and proper first-aid procedures in clinical laboratory settings.
- Acquire introductory knowledge of medical laboratory instruments and equipment, including blood collection techniques.
- Learn about advanced laboratory instruments and specialized equipment used in medical laboratories, their principles, care, and applications.

Module 1

Basic Training of laboratory technicians
Basic ethics of Medical laboratory Technology
Training of clinical laboratory technicians.
Medical laboratory professional - professionalism in laboratory workers,
Code of conduct and communication between physician and lab technician
Common Lab accidents and ways for its prevention
First aid in the clinical laboratory
Storage and handling of dangerous chemicals
Common Laboratory hazards
Color coding of various Waste disposal containers in the labs

Module 2

Introduction to Instrumentation in a Medical Laboratory
Introduction to Basic Equipments in MLT
Different types of syringes used for blood collection.
Basic requirements of blood collection.

Principle, Care, Procedure and Application of the Basic Instruments Part-I
Centrifuge (routine - low and high speed -table top)
Water Bath
Hot Air Oven
Incubator
Colorimeter
Compound Microscope (Monocular and Binocular)

Module 3

Principle, Care & Safe Operating Procedure and Application of the Basic Instruments Part-II
pH Meter
Distillation unit
Balance (Physical and chemical)
Micro tom
Microbe filters (Seitz, Glass Scintered & Membrane)

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Module 4

Principle, Care, Procedure and Application of the AdvancedInstruments

Refrigerated Centrifuge
Ultra Centrifuge
Specialised Incubator
B.O.D. Incubator
Special Microscopes
Dark Field Microscope
Phase Contrast Microscope
Florescence Microscope
Electron Microscope
Tissue Processing Unit
Biochemistry Analyzer
Laminar Air Flow Hood& their Different Types
Haematology Cell Counter

Examination Scheme

Components	**CA**	**A**	**ME**	**EE**
Weightage (%)	15	5	10	70

Suggested readings

- Medical Laboratory Technology Vol. 1 by KL Mukherjee; Tata McGraw Hill Publishers, New Delhi
- An Introduction to Medical Laboratory Technology by FJ Baker; Butterworth Heinmann, Oxford
- Medical Laboratory Manual for Tropical Countries by Monica Cheesbrough; Cambridge University Press, UK
- Textbook of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai

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ADVANCED LABORATORY TECHNIQUES

Course Code: DMLT2702 **Credit Units: 4**

Course Objectives:

- Understand different types of chromatography, including HPLC, for practical applications.
- Learn the fundamentals of electrophoresis, including protein purification and densitometry.
- Master immunological methods, such as ELISA, radioimmunoassay, and immunodiffusion.
- Gain an understanding of molecular techniques like PCR, DNA fingerprinting, and blotting methods.

Module 1

Principles & Application of Chromatography: Definition and types of Chromatography; Paper Chromatography; Thin Layer Chromatography; Adsorption Chromatography; Partition Chromatography; Ion-exchange Chromatography; Gel Filtration; Affinity Chromatography; Column Chromatography; High Performance liquid Chromatography (HPLC).

Module 2

Electrophoresis: Definition, General Methodology; Factors affecting migration of charged particles; Theory and applications of paper, SDS-PAGE and agarose gel electrophoresis; Isoelectric Focusing; Two Dimensional Electrophoresis; Protein purification and Evaluation; Densitometry

Module 3

Immunological Technique: Enzyme Linked immunosorbent assay; Radioimmunoassay; Immunodiffusion, Florescent immunoassay; Immunofluorescence, Immunoarray, Chemiluminosence assay.

Module 4

Molecular Techniques: Recombinant DNA technology; Polymerase chain reaction; RT PCR; RFLP; DNA Probe; DNA finger printing; Sequencing; Eastern blot; Southern blot; Northern blot; Gel documentation, DNA microarray, FISH, RFLP.

Examination Scheme

Components	CA	A	ME	EE
Weightage (%)	15	5	10	70

Suggested readings

- Keith Wilson & John Walker. Principles and techniques of biochemistry and molecular biology. Cambridge University Press, 7th Edition, (2015)
- S.V.S. Rana. Biotechniques theory and Practice Rastogi Publications, 3rd edition, (2012)
- U Satyanarayan and U Chakrapani, Text book of Biochemistry, 4th Edition 2013, Elsevier.
- M N Chatterjea and Rana Shinde, Text book of Medical Biochemistry , 8th Edition 2012, Jaypee Brothers Medical Publishers (P) Ltd.
- Mc Pherson and Pincus. Henry's Clinical Diagnosis and management by Laboratory Method, 23rd Edition, Elsevier.

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BIOMEDICAL WASTE MANAGEMENT

Course Code: DMLT2703 **Credit Units: 4**

Course Objectives:

- Define biomedical waste and its management, emphasizing waste minimization and safety protocols.
- Teach evidence-based infection control principles, including sterilization, disinfection, hand hygiene, and personal protective equipment use.
- Explain the proper handling, collection, transportation, treatment, and disposal of biomedical waste.
- Address the prevention and control of common healthcare-associated infections, promoting health outcomes.
- Familiarize students with standards and guidelines for effective Hospital Infection Control as per NABH and JCI standards.

Module 1

Bio medical waste management and environment safety – The aim of this section will beto help prevent harm to workers, property, the environment and the general public. Topics to be covered under the subject are as follows:

Definition of Biomedical Waste
Waste minimization

Module 2

BMW – Segregation, collection, transportation, treatment and disposal (including color coding)

Liquid BMW, Radioactive waste, Metals / Chemicals / Drug waste
BMW Management & methods of disinfection
Modern Technology for handling BMW
Use of Personal protective equipment (PPE)
Monitoring & controlling of cross infection (Protective devices)

Module 3

Infection prevention and control – The objective of this section will be to provide a broad understanding of the core subject areas of infection prevention and control and to equip AHPs with the fundamental skills required to reduce the incidence of hospital acquired infections and improve health outcomes. Concepts taught should include –

Evidence-based infection control principles and practices [such as Sterilization, Disinfection, Effective hand hygiene and use of Personal Protective Equipment (PPE)],
Prevention & control of common healthcare associated infections,

Module 4

Components of an effective infection control program, and
Guidelines (NABH and JCI) for Hospital Infection Control

Examination Scheme

Components	CA	A	ME	EE
Weightage (%)	15	5	10	70

Suggested readings

- The Essentials of Patient Safety by Charles Vincent
- Laboratory quality control and patient safety by De Gruyter

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MEDICAL TERMINOLOGY

Course Code: DMLT2704 **Credit Units: 2**

Course Objectives:

- Develop proficiency in fundamental medical terminology, emphasizing the ability to understand and spell medical words.
- Orient students to the role and scope of medical laboratory professionals in the healthcare system, including potential career opportunities in Medical Laboratory Science.
- Provide knowledge of medical terminology related to human anatomy specific to students' fields of study.
- Instruct students on reading and interpreting medical orders and reports accurately.
- Introduce the Indian healthcare system and public health, emphasizing students' roles within this context.

Module 1

Medical Terminology, Record keeping

Derivation of medical terms.
Define word roots, prefixes, and suffixes.
Conventions for combined morphemes and the formation of plurals.
Basic medical terms.
Form medical terms utilizing roots, suffixes, prefixes, and combining roots.
Interpret basic medical abbreviations/symbols.

Module 2

Utilize diagnostic, surgical, and procedural terms and abbreviations related to the integumentary system, musculoskeletal system, respiratory system, cardiovascular system, nervous system, and endocrine system.
Interpret medical orders/reports.
Data entry and management on electronic health record system.

Module 3

Orientation to Medical Laboratory Science (MLS)

Medical Lab Science – Introduction
Career opportunities in MLS
Role of a Medical lab. professional in Health care system
Common laboratory associated hazards and biosafety measures including radiation hazards
Subject specific role of a Medical lab. professional:
Microbiology
Role of microbes in human health
Overview of the role of Medical Laboratory Professional in Medical Microbiology
Bio-safety in Microbiology

Module 4

Haematology
Introduction to Haematological diseases
Overview of the role of Medical lab. professional in Haematology
Bio-safety in Haematology
Histopathology
Introduction to Tumor pathology
Overview of the role of Medical lab. professional in Histopathology
Bio-safety in Histopathology
Biochemistry
Introduction to metabolic disorders

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Overview of the role of Medical lab. professional in Clinical Biochemistry
Bio-safety in Clinical Biochemistry

Examination Scheme

Components	CA	A	ME	EE
Weightage (%)	15	5	10	70

Suggested readings:

- An Introduction to Medical Lab Technology by F J Baker and Silverton
- Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur

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MEDICAL LAW & ETHICS

Course Code: DMLT2705 **Credit Units: 2**

Course Objectives:

- Acquire proficiency in fundamental medical terminology, with a focus on word construction and precise spelling.
- Gain insight into the role of medical laboratory professionals and potential career paths in the healthcare system.
- Learn anatomy-related medical terms specific to your field of study.
- Develop the skill to interpret medical orders and reports effectively.
- Acquire an understanding of the Indian healthcare system and its connection to public health.

Module 1

Medical ethics - Definition - Goal - Scope
Introduction to Code of conduct
Basic principles of medical ethics – Confidentiality

Module 2

Malpractice and negligence - Rational and irrational drug therapy
Autonomy and informed consent - Right of patients
Care of the terminally ill- Euthanasia

Module 3

Organ transplantation
Medico legal aspects of medical records – Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects.

Module 4

Professional Indemnity insurance policy
Development of standardized protocol to avoid near miss or sentinel events
Obtaining an informed consent.
Ethics in the profession of Medical Laboratory Science

Examination Scheme

Components	CA	A	ME	EE
Weightage (%)	15	5	10	70

Suggested readings:

- Medical Law and Ethics by Bonnie F Fremgen
- Medical Law and Ethics by Jonathan Herring

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BASICS OF RESEARCH METHODOLOGY, ETHICS AND RESEARCH COMMUNICATION

Course Code: DMLT2739 **Credit Units: 4**

Course Objectives:

- Introduce research methods, problem identification, and ethical considerations.
- Provide foundational knowledge of research design and data collection techniques.
- Explain the need for biostatistics and its practical application.
- Teach data handling, sampling methods, and data summarization.
- Offer a basic understanding of statistical analysis principles for research.

Module 1

Research Methodology:
Introduction to research methods
Identifying research problem
Ethical issues in research
Research design

Module 2

Basic Concepts of Biostatistics
Types of Data
Research tools and Data collection methods
Sampling methods
Developing a research proposal

Module 3

Biostatistics:
Need of biostatistics
What is biostatistics: beyond definition
Understanding of data in biostatistics
How & where to get relevant data
Relation between data & variables

Module 4

Type of variables: defining data set
Collection of relevant data: sampling methods
Construction of study: population, sample, normality and its beyond (not design of study, perhaps)
Summarizing data on the pretext of underlined study
Understanding of statistical analysis (not methods)

Examination Scheme

Components	CA	A	ME	EE
Weightage (%)	15	5	10	70

Suggested readings

- Statistical Methods by S.P. Gupta
- Methods in biostatistics for medical students by B.K.Mahajan
- RPG Biostatistics by HimanshuTyagi

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Curriculum & Scheme of Examination

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PHYSICAL OPTICS

Course Code: OPT2104 **Credit Units: 03**

Course Objectives: The objective of this course is to equip the students with a thorough knowledge of properties of light. At the end of this course, students will be able to predict the distribution of light under various conditions.

Course Contents:

Module-I: Nature of light
Light as electromagnetic oscillation – wave equation, Sources of light; Electromagnetic Spectrum, Polarized light; Intensity of polarized light; Malus' Law; polarizers and analyzers.

Module-II: Birefringence; ordinary and extraordinary rays.
Relationship between amplitude and intensity, Coherence; interference; constructive interference, destructive interference; fringes; fringe width, Double slits, multiple slits, gratings, Diffraction; diffraction by a circular aperture;

Module-III: Resolution of an instrument
Raleigh's criterion, Scattering; Raleigh's scattering; Tyndall effect, Fluorescence and Phosphorescence

Module-IV: Basics of Lasers
Coherence; population inversion; spontaneous emission; Einstein's theory of lasers.

Module-V: Radiometry
radiometric units; photopic and scotopic luminous efficiency and efficacy curves; photometric units, Inverse square law of photometry; Lambert's law, other units of light measurement; retinal illumination; Trolands

Practicals:
Determination of wavelengths of light from Mercury vapour lamp,Measurement of the resolving power of telescopes;; Demonstration of fluorescence and phosphorescence using crystals and paints.

Examination Scheme:

Components	CT	HA	P	A	EE
Weightage (%)	10	5	10	5	70

(CT-Class Test; HA - Home Assignment-,P-Practical; A- Attendance; EE-End Semester Examination)

Text & References:

- Text Book:Subrahmanyan N, Brij Lal, A text book of Optics, S. Chand Co Ltd, New Delhi, India, 2003.

Reference Books:

- Pedrotti L. S, Pedrotti Sr. F. L, Optics and Vision, Prentice Hall, New Jersey, USA, 1998.
- Keating NM. P, Geometric, Physical and Visual Optics, Butterworth- Heinemann, Massachusetts, USA, 2002.

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GEOMETRICAL OPTICS-I

Course Code: OPT2105 **Credit Units: 03**

Course Objectives: The objective of this course is to equip the students with a thorough knowledge of mirrors and lenses. At the end of this course, students will be able to predict the basic properties of the images formed on the retina by the optics of the eye.

Course Contents:

Module-I: Nature of light

Light as electromagnetic oscillation; ideas of sinusoidal oscillations; amplitude and phase; speed of light in vacuum and other media; refractive index; Wavefronts – spherical, elliptical and plane; Curvature and vergence; rays; convergence and divergence in terms of rays and vergence; vergence at a distance; Refractive index; its dependence on wavelength

Module-II: Mirrors

Fermat's and Huygen's Principle – Derivation of laws of reflection and refraction (Snell's law) from these principles; Plane mirrors – height of the mirror; rotation of the mirror; Reflection by a spherical mirror – paraxial approximation; sign convention; derivation of vergence equation; Imaging by concave mirror & convex mirror; Reflectivity; transmittivity; Snell's Law; refraction at a plane surface; Glass slab; displacement without deviation; displacement without dispersion.

Module-III: Refraction

Thick prisms; angle of prism; deviation produced by a prism; refractive index of the prism; angular dispersion; dispersive power; Abbe's number, definition of crown and flint glasses; materials of high refractive index; Thin prism – definition; definition of Prism diopter; deviation produced by a thin prism; it dependence on refractive index; Refraction by a spherical surface; sign convention; introduction to spherical aberration using image formed by a spherical surface of a distance object; sag formula; Paraxial approximation; derivation of vergence equation; Imaging by a positive powered surface; Imaging by a negative powered surface.

Module-IV: Effectivity

Vergence at a distance formula; effectivity of a refracting surface; Definition of a lens as a combination of two surfaces; different types of lens shapes; Image formation by a lens by application of vergence at a distance formula; definitions of front and back vertex powers; equivalent power; first and second principal planes/points; primary and secondary focal planes/points; primary and secondary focal lengths; Newton's formula; linear magnification; angular magnification; Nodal Planes.

Module-V: Lenses

Thin lens as a special case of thick lens; review of sign convention; Imaging by a thin convex lens; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions; Imaging by a thin concave lens; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions; Prentice's Rule; System of two thin lenses; review of front and back vertex powers and equivalent power, review of six cardinal points; System of more than two thin lenses; calculation of equivalent power using magnification formula

Practical:

Thick Prism – determination of prism angle and dispersive power; calculation of the refractive index; Thin Prism – measurement of deviation; calculation of the prism diopter; Image formation by spherical mirrors; Convex lens - power determination using lens gauge, power determination using

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distant object method; power determination using the vergence formula; Concave lens – in combination with a convex lens – power determination; Construction of a tabletop telescope – all three types of telescopes; Construction of a tabletop microscope.

Examination Scheme:

Components	CT	HA	P	A	EE
Weightage (%)	10	5	10	5	70

(CT-Class Test ; HA - Home Assignment-,P-Practical; A- Attendance; EE-End Semester Examination)
Text & References:

Text book:

- Milton Katz,Introduction to Geometrical Optics : World Scientific Publishing Co. Pre. Ltd.
- Subrahmanyam, Brijlal and Avadhanulu ,A Textbook of Optics Pub: S. Chand
- Tunnacliffe A. H, Hirst J. G, Optics, The association of British Dispensing Opticians, London, U.K., 1990.
- Pedrotti L. S, Pedrotti Sr. F. L, Optics and Vision, Prentice Hall, New Jersey, USA, 1998.

Reference Books:

- Loshin D. S. The Geometric Optics Workbook, Butterworth-Heinemann, Boston, USA, 1991.
- Schwartz S. H. Geometrical and Visual Optics: A Clinical Introduction, McGraw-Hill, New York, USA, 2002.

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OPTOMETRIC PROCEDURES-I

Course Code: OPT2106 **Credit Units: 01**

Course Objectives: At the end of the course the students will be equipped with the introduction to certain concepts that would lay the foundation of the program

Course Content:

Module-I: Introduction to Optometry

Introduction to structure of eye.
Torch examination

Module-II: Scope of optometry

Historyof Optometry
Visit to Hospital / clinics
Introduction to various eye examination procedures

Module-III:

Visual Acuity
Refractive errors
Spectacle lenses and types

Module-IV:

History Taking;
Basic Eye Examination

Examination Scheme:

Components	A	P	HA	V	EE
Weightage (%)	5	20	25	20	30

(CT-Class Test ; V-Viva; P-Practical; A- Attendance; EE-End Semester Examination, HA= assignments)

Reference Book:

- Primary Care Optometry: Theodore Grosvenor, Theodore P. Grosvenor; Elsevier Health Sciences
- BHVI: Module I.
- Teachers reference notes

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BASICS IN COMPUTER & PC PACKAGE

Course Code: OPT2107 **Credit Units: 02**

Course objective: This course aims at preparing the students to handle personal computers, Learn Basics of the current hardware and software being used .the student should be able to complete his optometry and other professional assignment like project work ,thesis presentation etc. he should be well versed in using e-mail, and internet .

Course Contents:

Module-I: Computer Basics

History of computers, Definition of computers, Input Devices, storage devices, types of memory, and units of measurement, range of computers, generations of computers. Characteristicsof computers.

Module-II: System

Hardware, Software,, system definition, fundamentals of networking, internet, performing searches and working with search engines ,types of software and its applications

Module-III: Office Application Suite

Word Processor, spread sheet, presentations, other utility tools Fundamentals of Linux /windows operating system, functions, interfaces, basic commands.

Module-IV: Special Applications

Use of database software for clinic records
Use of specialised software for optometric use

Practical:

Various browsers, Search engines, E-mail
Text document with multiple formatting option using specific office package
Spread sheet using a specified office package
Presentation on a specified topic using a specified office package

Examination Scheme:

Components	A	HA	(CT)	VIVA	PRACTICAL
Weightage (%)	20	20	20	20	20

(CT-Class Test; V-Viva; HA - Home Assignment; P-Practical; A- Attendance; EE-End Semester Examination)

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GEOMETRICAL OPTICS-II

Course Code: OPT2204 **Credit Units: 04**

Course Objectives: The objective of this course is to equip the students with a thorough knowledge of mirrors and lenses used in spectacle lenses. At the end of this course, students will be able to predict the basic properties of the images formed on the retina by the optics of the eye.

Course Contents:

Module-I: Cylindrical Lenses

Image formation; relation between cylinder axis and line image orientation; Imaging due to two cylinders in contact with axes parallel; Two cylinders in contact with axes perpendicular; line images and their orientations to the cylinders' powers; interval of Sturm; circle of least confusion (CLC); spherical equivalent; position of CLC; Spherical lens and a cylindrical lens in contact; spherical equivalent; interval of Sturm and CLC; Spherocylindrical lens notations – plus/minus cylinder form, cross cylinder/meridian form; transformations between them; depth of focus; depth of field;

Module-II: Aberrations

Chromatic Aberrations; methods of removing chromatic aberrations; Abbe number; Monochromatic Aberrations – deviation from paraxial approximation; difference between ray aberrations and wavefront aberrations; Third order aberrations – spherical aberrations; coma; astigmatism; distortion and curvature of fields; Ways of minimizing spherical aberrations – pupil size, bending of lens, shape factor; Lens tilt – astigmatism; Higher order aberrations; introduction to Zernike Polynomials

Module-III: Telescopes & Microscopes

Telescopes – Keplerian, Galilean and Newtonian; position of cardinal points, entrance and exit pupils; magnifications; advantages and disadvantages; Microscopes – magnification; tube length.

Module-IV: Gullstrand's Schematic Eye (GSE)

Calculation of the power of the cornea, the lens and the eye; axial length; calculation of the position of the cardinal points; magnification; Purkinje images and their reflectances; Entrance and exit pupils for a 3mm pupil; ocular aberrations – spherical aberrations and coma; chromatic aberrations; Introduction to refractive errors - myopia and hyperopia; corneal curvature; axial length; far point; blur size calculations; corrections; astigmatism; blur size; circle of least confusion; correction; Object closer than at infinity; introduction to accommodation; far point; near point; presbyopia; spectacle and contact Lens corrections - comparison of magnification.

Practical- Demonstration:

Imaging by a cylindrical lens – relationship between cylinder axis and image orientation; Imaging by two cylinders in contact – determination of the position of CLC; verification of CLC using a spherical lens with power equal to the spherical equivalent; orientations and position of the line images and their relation to the cylinders' powers and orientations; Imaging by a spherocylindrical lens – sphere and cylinder in contact – determination of the position of CLC; verification of CLC using a spherical lens with power equal to the spherical equivalent; orientations and position of the line images and their relation to the cylinder's power and orientation

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Examination Scheme:

Components	A	HA	CT	P	EE
Weightage	5	5	10	10	70

(CT-Class Test; HA - Home Assignment; P-Practical; A- Attendance; EE-End Semester Examination)

Text & References:

Text book:

- Tunnacliffe A. H, Hirst J. G, Optics, The association of British Dispensing Opticians, London, U.K., 1990.
- Pedrotti L. S, Pedrotti Sr. F. L, Optics and Vision, Prentice Hall, New Jersey, USA, 1998.
- Recommendation as per faculty

Reference Books:

- Loshin D. S. The Geometric Optics Workbook, Butterworth-Heinemann, Boston, USA, 1991.
- Schwartz S. H. Geometrical and Visual Optics: A Clinical Introduction, McGraw-Hill, New York, USA, 2002.

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OPTOMETRIC PROCEDURES-II

Course Code: OPT2205 **Credit Units: 02**

Course Objectives: At the end of the course the students will be equipped with the basics knowledge about certain concepts, which would lay the foundation for their courses in the next semester

Course Content:

Module-I: Objective refraction

Principles of Retinoscopy, instrumentation brief and purpose; Retinoscopy demonstration and practical on model eyes.

Module-II: Examination of the anterior segment

Pupillary reflex test; Anterior segment examination with torch light – Slit lamp examination – demo, Tonometry.

Module-III: Examination of the posterior segment

Fundus demonstration by ophthalmoscopy, direct & indirect

Module-IV: Adjunct tests

Near point of convergence; cover test; Motilities; Visual field testing; Colour vision; IPD; Stereopsis; Contrast visual acuity

Examination Scheme:

Components	A	CT	PL	V	P	EE
Weightage	5	15	20	20	10	30

(CT-Class Test; A- Attendance; PL- Practical Lab Record; V- Viva; P- Performance; EE-End Semester Examination)

Text & References:

Text book:

- Grosvenor, Primary Care Optometry , Butterworth-Heinemann,

Reference Books:

- Benjamin Borish ,Clinical Refraction ,Butterworth Heinemann

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CLINICS-I

Course Code: OPT2206 **Credit Units: 01**

Course Objective: This course aims to give student the basic knowledge of the theory and practical behind the basic clinical procedures. After completion, of course the student should have standard eye examination. Learn to write formal records and understand the preliminary eye testing

Course Content:
The practical will involve rotation in campus clinics, observation in eye hospitals and screening camps.
Unit of Competency:

Methods of ocular Examination-I
The ability to communicate effectively with a diverse group of patients with arrange of optometric conditions and needs.
The ability to use techniques in ocular examination and to understand the implication of findings in terms of subsequent examination techniques
History taking of an Ophthalmic care
Visual acuity testing – Distance, Near
Basic of eye examination
History Taking
Visual Acuity Estimation
Torch light Examination
Pupil Examination
Near point of accommodation
Near point of convergence
Extra ocular Motility and cover/ uncover test
Tear function test
Slit lamp examination – Demo
Retinoscopy procedure on model eyes
IPD

90 % attendance is compulsory in clinics .In case of any miss out the student will have to complete the clinical hours to be allowed for the end term exam

Examination Scheme:

Components	Attd.	Record File	Multiple Choice Questions/ Quiz	Viva	Practical	Total
Weightage	5	15	15	15	50	100

Text & References
Reference book:

- Grosvenor, Primary Care Optometry , Butterworth-Heinemann,
- A K Khurana: Comprehensive Ophthalmology, 4th edition, New age international (p) Ltd. Publishers, New Delhi, 2007
- D B. Elliott :Clinical Procedures in Primary Eye Care,3rd edition, Butterworth-Heinemann, 2007

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NUTRITION

Course Code: OPT2207 **Credit Units: 03**

Course Objective: At the end of the course student would have gained the knowledge of the following: Balanced diet. Protein, carbohydrates, vitamins, Minerals, carotenoids and eye, Nutrition and Ocular aging and adverse effects of ocular nutritional supplements.

Course Contents:

Module-I:

Introduction to Nutrition and Food Science, Food Groups and Food Pyramid; Balanced diet for different age groups, recommended dietary Allowances

Module-II:

Assessment of Nutritional Status; Energy – Units, Metabolisms, Energy expenditure, and Energy imbalance; Digestion, absorption and transport of Food

Module-III:

Proteins and eye; Lipids and eye; Carbohydrates and eye; Vitamins and eye; Minerals and trace elements and eye; Carotenoids and eye; Oxidative stress and the eye

Module-IV:

Vitamin A, C and E deficiency; Nutrition and ocular aging; Contraindications, Adverse reactions and ocular nutritional supplements

Ocular complications to nutritional deficiencies

Examination Scheme:

Components	A	HA	CT	P	EE
Weightage	5	5	10	10	70

(CT-Class Test; HA - Home Assignment; P-Practical; A- Attendance; EE-End Semester Examination)

Text & References:

Text books:

- M Swaminathan: Hand book of Food and Nutrition, fifth edition, Bangalore printing & publishing Co.Ltd, Bangalore,2004
- C Gopalan, BV Rama Sastri, SC Balasubramanian: Nutritive Value of Indian Foods , National Institute of Nutrition, ICMR, Hyderabad,2004

Reference book:

- Frank Eperjesi & Stephen Beatty: Nutrition and the Eye A practical Approach, Elsevier Butterworth – Heinemann, USA, 2006

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PROJECT

Course code: OPT2232 **Credit Units: 03**

Course Objectives:
The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity.
The basics of Research methodology need to be understood
The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Course Contents:

Module-I:
Introduction to research methods, Variables in research, Reliability and validity in research, Conducting a literature review, Formulation of research problems and writing research questions, Hypothesis, Null and Research Hypothesis, Type I and Type II errors in hypothesis testing

Module-II:
Experimental and non experimental research designs, Sampling methods, Data collection methods-Observation method, Interview method, Questionnaires and schedules Construction

Module-III
Ethical Issues in Research, Principles and Concepts in research ethics – confidentiality and privacy, informed consent

Module-IV:
Writing Research proposals, Development of conceptual framework in research

Module-V:
Basics of statistics in Research
Standard deviation, variance, T test, Regression, correlation

Examination Scheme:

Components	CP	V	A	ME	CT
Weightage	5	10	5	30	50

(CP – Class Performance; V-Viva; A- Attendance; ME- Mid-Term Exam, CT-Class Test)

Text & References:
Text books:
- Research Methodology: A Step By Step Guide For Beginners : Ranjit Kumar
- Research Methodology: Methods and Techniques : By C. R. Kothari

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OCULAR MICROBIOLOGY

Course Code: OPT2301 **Credit Units: 02**

Course Objectives: The objectives of the course are:

- to prepare the students to gain essential knowledge about the characteristics of bacteria, viruses, fungi and parasites;
- to acquire knowledge of the principles of sterilisation and disinfection in hospital and ophthalmic practice;
- to understand the pathogenesis of the diseases caused by the organisms in the human body with particular reference to the eye infections and
- To understand basic principles of diagnostic ocular Microbiology.

Course Contents:

Module-I:
Introduction to Microbiology; Types of Microorganisms; Physiology of Microorganisms – Nutrition, Enzymes, Metabolism and energy, Microbial Growth

Module-II:
Sterilization and disinfection in the laboratory; Control of Microbial Growth; Microbes versus Humans- The development of Infection, the disease process, pathogenicity and virulence

Module-III:
Ocular Bacteriology - Gram positive,(Staphylococcus aureus, Staphylococcus epidermidis, Streptococcus, propionibacterium, actinomyces, Nocardia) Bacteria including acid fast bacilli (Mycobacterium tuberculosis, Mycobacterium leprae); Ocular Bacteriology - Gram negative Bacteria (pseudomonas, haemophiilus, Brucella, Neisseria, Moraxella); Spirochetes (Treponema, Leptospiraceae)

Module-IV:
Virology: Classification of Viruses in Ocular Disease, Rubella, Adenovirus, Oncogenic Viruses (HPV, HBV, EBV, Retroviruses), HIV.; Fungi : Yeasts, Filamentous, Dimorphic; Intracellular parasites - Chlamydia, Protozoa (Toxoplasmosis, Acanthamoeba); Helminths (Toxocariasis, Filariasis, Onchocerciasis, Trematodes)

Practical:
Students will visit the microbiology lab identify various microorganism; Practical demo of various culture media preparations and growth of microorganism on culture medias; Culture sensitivity test

Examination Scheme:

Components	A	HA	CT	P	EE
Weightage	5	5	10	10	70

(CT-Class Test; HA- Home Assignment; P-Practical/ record file ; A- Attendance; EE-End Semester Examination)

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Text & References:

Text books:

- BURTON G.R.W: Microbiology for the Health Sciences, third edition, J.P. Lippincott Co., St. Louis, 1988.
- M J Pelczar (Jr),ECS Chan, NR Krieg : Microbiology ,fifth edition, TATA McGRAW-HILL Publisher, New Delhi,1993

Reference Books:

- KJ Ryan, CG Ray: Sherris Medical Microbiology- An Introduction to infectious Diseases, fourth edition, McGRAWHiLL Publisher, New Delhi, 1994
- MACKIE & McCartney Practical Medical Microbiology
- SYDNEY M. FINEGOLD & ELLEN JO BARON: Diagnostic Microbiology (DM)
- As per faculty recommendation

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APPLIED OPTICS-I (Optometric Optics)

Course Code: OPT2302 **Credit Units: 03**

Course Objectives: Skills/knowledge to be acquired at the end of this course:
Measurement of lens power, lens centration using conventional techniques
Transposition of various types of lenses
Knowledge to identify different forms of lenses (equi- convex, planoconvex, periscopic, etc.)
Knowledge to select the tool power for grinding process.
Measurement of surface powers using lens measure.
Method of laying off the lens for glazing process.
Ophthalmic prism knowledge – effects, units, base-apex notation, compounding and resolving prisms.
Knowledge of prism and decentration in ophthalmic lenses
Knowledge of different types of materials used to make lenses and its characteristics
Knowledge lens designs – single vision, bifocals, progressive lens
Knowledge on tinted and protective lenses
Knowledge on special lenses like iseikonic, spectacle magnifiers.
Knowledge on spectacle frames – manufacture, materials

Course Contents:

Module-I: Revision of Basics
Introduction – Light, Mirror, Reflection, Refraction and Absorption; Prisms – Definition, properties, Refraction through prisms, Thickness difference, Base-apex notation, uses, nomenclature and units, Sign Conventions, Fresnel's prisms, rotary prims

Module-II:
Lenses – Definition, units, terminology used to describe, form of lenses; Vertex distance and vertex power, Effectivity calculations; Lens shape, size and types i.e. spherical, cylindrical and Sphero-cylindrical; Transpositions – Simple, Toric and Spherical equivalent; Prismatic effect, centration, decent ration and Prentice rule, Prismatic effect of Plano-cylinder and Sphero-cylinder lenses

Module-III:
Spherometer& Sag formula, Edge thickness calculations; Magnification in high plus lenses, Minification in high minus lenses; Tilt induced power in spectacles; Aberration in Ophthalmic Lenses

Module-IV:
The characteristics of Ophthalmic lens material properties (Refractive index, Specific gravity, UV Cutoff, Impact resistance-Drop ball test, Abbe value, Center thickness) :Power Specification (Measurement of Lens power) including Lensometry:Types of Ophthalmic Lenses

Module-V:
Spectacle Frame Nomenclature,Lens surfacing:Identification of Optical center of the given Lens:Marking Datum line for spherical and cylindrical lenses:Glazing of spectacle lenses (Fitting)

Practicals: Based on theory lectures
Unit of competency: Lens Identification and Centration.
The ability to interpret different types of lenses, Facial and frame measurements.
The ability to measure the lens power by different methods

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Elements of competence:

A) Lens Identification: Biconvex, biconcave, Meniscus, Plano Convex and plano concave.
B) Geneva lens measure for surface power calculation
C) Lensometry and Hand neutralization
D) Identification of optical centre and datum line marks for spherical lens
E) Prism Power measurement with Lensometer
F) Lens Material Identification
G) Identification of different types of bifocal
H) IPD measurement (Monocular and binocular)

Examination Scheme:

Components	A	HA	CT	P	EE
Weightage	5	5	10	10	70

CT-Class Test; HA-Home Assignment; P-Practical; A- Attendance; EE-End Semester Examination)

Text & References:

- Text Books: Jalie M: The principles of Ophthalmic Lenses, The Association of Dispensing Opticians, London, 1972

Reference Books:

- David Wilson: Practical Optical Dispensing, OTEN- DE, NSW TAFE Commission, 1999
- C V Brooks, IM Borish: System for Ophthalmic Dispensing, Second edition, Butterworth-Heinemann, USA, 1996

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VISUAL OPTICS-I

Course Code: OPT2303 **Credit Units: 04**

Course Objectives:
To understand the fundamentals of optical components of the eye
Upon completion of the course, the student should be able:
1. To understand the fundamentals of optical components of the eye
2. To gain theoretical knowledge and practical skill on visual acuity measurement, colour vision and history taking

Course Contents:
Module-I: Review of Geometric Optics
Vergence and power, Object space and image space, Sign convention, Cardinal points, Magnification, Aberrations

Module-II: Optics of Ocular Structures
Cornea and aqueous, crystalline lens, Vitreous, Schematic and Reduced Eye

Module-III: Measurement of the optical constants of the eye
Curvature of cornea, Curvature of the lens, Measurement of Axial length, Axes of the eye

Module-IV: Basic Optometric Procedures
History taking in various cases, Visual Acuity, Color Vision, Maddox rod, filters,

Module-V: Refractive anomalies and their causes
Etiology of refractive anomalies, populating distributions of anomalies, Optical component measurements, Growth of the eye in relation to refractive errors
Practicals:
History taking
Visual acuity measurement
Measurement of corneal curvature
Study of Purkinje Images
Effects of lenses
Colour Vision Measurement,
Pinhole

Examination Scheme:

Components	A	HA	CT	P	EE
Weightage	5	5	10	10	70

CT-Class Test; HA - Home Assignment; A- Attendance; P-Practicals, EE-End Semester Examination

Text & References:
Text Books:
- A H Tunnacliffe: Visual optics, The Association of British Optician, 1987
- AG Bennett & RB Rabbets: Clinical Visual optics, 3rd edition, Butterworth Heinemann, 1998

Reference Books:
- WJ Benjamin: Borish's clinical refraction,2nd edition, Butterworth Heinemann, Missouri, USA,2006
- Primary Care Optometry- Theodore Grosvenor,4th edition, Butterworth

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CLINICAL OPTOMETRIC PROCEDURES

Course Code: OPT2306 **Credit Units: 03**

Course Objectives: At the end of the course the students will be skilled in knowing the purpose, set-up and devices required for the test, indications and contraindications of the test, step-by-step procedures, documentation of the findings, and interpretation of the findings of the various clinical optometry procedures.

Course Contents: Revision of skills and enhanced knowledge on skills as discussed in previous courses OP 1 and OP 2

Module-I: Case History
Case History Script

Module-II: Entrance Tests
Visual acuity and it's estimation
Colour vision
cover test, Extraocular motility
Hirschberg test,
Near point of accommodation, Near point of convergence
Stereopsis
WFDT
Pupils Examination
Visual field test-Confrontation, Amsler' grid
IPD

Module-III: Ocular Health Assessment
External examination of the eye, Lid Eversion
Tear function test-Schirmer's, TBUT, tear meniscus level, NITBUT (keratometer),
Anterior segment examination with torch light – Slit lamp examination – demo
Photostress test
Corneal Sensitivity

Module-IV: Functional Test
Contrast acuity

Examination Scheme:

Components	A	HA	CT	P	EE
Weightage	5	5	10	10	70

CT-Class Test; HA - Home Assignment, P-Practical; A- Attendance; EE-End Semester Examination)

Text & References:
Text books:

- T Grosvenor: Primary Care Optometry, 5th edition, Butterworth – Heinneman, USA, 2007.

Reference Books:

- A K Khurana: Comprehensive Ophthalmology, 4th edition, New age international (p) Ltd. Publishers, New Delhi, 2007
- D B. Elliott :Clinical Procedures in Primary Eye Care,3rd edition, Butterworth-Heinemann, 2007
- Jack J. Kanski Clinical Ophthalmology: A Systematic Approach,6th edition,

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- J.B Eskridge, J F. Amos, J D. Bartlett: Clinical Procedures in Optometry, Lippincott Williams and Wilkins,1991
- N B. Carlson , Dl Kurtz: Clinical Procedures for Ocular Examination,3rd edition, McGraw-Hill Medical, 2003

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CLINICS-II

Course Code: OPT2307 **Credit Units: 01**

Course Objective: This course aims to give student the basic knowledge of the theory and practical behind the basic clinical procedures. After completion, of course the student should have standard eye examination. Learn to write formal records and understand the preliminary eye testing

Unit of Competency:
Methods of ocular Examination Part 2
The ability to communicate effectively with a diverse group of patients with arrange of optometric conditions and needs.
The ability to use techniques in ocular examination and to understand the implication of findings in terms of subsequent examination techniques

Elements of competence:
Module-I: Basic Eye examination and finding the refractive error.
History taking,
Visual acuity estimation
Retinoscopy on model eye.
Retinoscopy on human eye and neutralization.

Module-II: Anterior segment examination
External examination of the eye, Lid Eversion
Schirmer's, TBUT, tear meniscus level, NITBUT (keratometer)
Pupillary reflex test
Slit lamp techniques.
Anterior segment examination with torch light
Slit lamp examination on live eye – demo
Corneal Sensitivity, HVID, Keratometry

Module-III: Visual field examination.
Visual field testing
Confrontation test, Amsler' grid

Module-IV: Miscellaneous test
Photostress test,
Colour vision
Direct Ophthalmoscopy

Examination Scheme:

Components	Attd.	Record File	Written Test	Viva	Practical	Total
Weightage	5	15	30	30	20	100

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MEDICAL LAWS AND ETHICS

Course Code: OPT2310 **Credit Units: 02**

Course Objective: The course not only aims at training students to gain knowledge in the fields related to Legal and ethical considerations are firmly believed to be an integral part of medical practice in planning patient care. Advances in medical sciences, growing sophistication of the modern society's legal framework, increasing awareness of human rights and changing moral principles of the community at large, now result in frequent occurrences of healthcare professionals being caught in dilemmas over aspects arising from daily practice.

Medical ethics has developed into a well based discipline which acts as a "bridge" between theoretical bioethics and the bedside. The goal is "to improve the quality of patient care by identifying, analyzing, and attempting to resolve the ethical problems that arise in practice". Doctors are bound by, not just moral obligations, but also by laws and official regulations that form the legal framework to regulate medical practice. Hence, it is now a universal consensus that legal and ethical considerations are inherent and inseparable parts of good medical practice across the whole spectrum.

Course Contents:
Few of the important and relevant topics that need to focus on are as follows:
1. Medical ethics - Definition - Goal - Scope b
2. Introduction to Code of conduct
3. Basic principles of medical ethics –Confidentiality
4. Malpractice and negligence - Rational and irrational drug therapy
5. Autonomy and informed consent - Right of patients
6. Care of the terminally ill- Euthanasia
7. Organ transplantation
8. Medico legal aspects of medical records –Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects.
9. Professional Indemnity insurance policy
10. Development of standardized protocol to avoid near miss or sentinel events
11. Obtaining an informed consent.

Examination Scheme:

Components	A	ASG	CT1	CT2	EE
Weightage	5	15	15	15	50

(CT-Class Test; ASG-Assignment; A- Attendance; EE-End Semester Examination)

Text book/ Reference Book
As recommended by the faculty

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TERM PAPER

Course Code: OPT2331 **Credit Units: 02**

Course Objective:
The objective of this course is to judge the understanding as well as application of the knowledge gained by the students. The aim of the term paper is to provide the students with an opportunity to further enhance their knowledge in a sector of their choice by undertaking a significant practical unit of examining and analyzing various aspects of Clinical Optometry at a level commensurate with the learning outcomes of the various courses taken up them in the ongoing semester.

A term paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. At least one middle level or senior level person of a company from the chosen sector may be interviewed face to face.

Guidelines:
1. The term paper will be related to the contemporary Optometry topic and it will be given by the department.
2. The presentation of the term paper is scheduled to be held before the commencement of Semester examinations.
3. The paper will carry 100 marks that will be marked on the basis of understanding and organization of content based on the literature review. The Bibliography shall form an important part of the paper.

Examination Scheme:

Components	Organization & relevance of content	Literature Review	Bibliography	Total
Weightage	40	40	20	100

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PROJECT

Course Code: OPT2332 **Credit Units: 02**

Course Objectives:
The objective of this module is to help the students understand the basic principles of research and methods applied to draw inferences from the research findings.

Course Contents:
Module-I and II: Research Methodology
1. Introduction to research methods
2. Identifying research problem
3. Ethical issues in research
4. Research design
5. Types of Data
6. Research tools and Data collection methods
7. Sampling methods
8. Developing a research proposal

Module-III and IV: Biostatistics
1. Basics of Biostatistics
1.1 Introduction of Biostatistics
1.2 Measures of Morality
1.3 Sampling
1.4 Statistical significance
1.5 Correlation
1.6 Sample size determination.
1.7 Statistics –Collection of Data - presentation including classification and diagrammatic representation –frequency distribution. Measures of central tendency; measures of dispersion.
1.8 Theoretical distributions.
1.8.1 Binomial
1.8.2 Normal
1.8.3 Sampling –necessity of methods and techniques.
1.8.4 Chi. Square test (2 x 2)
2. Hospital Statistics
3. Use of computerized software for statistics

Examination Scheme:

Components	A	ASG	CT1	CT2	EE
Weightage	5	15	15	15	50

(CT-Class Test; ASG-Assignment; A- Attendance; EE-End Semester Examination)

Text book/ Reference Book

- Mausner & Bahn: Epidemiology-An Introductory text, 2nd Ed., W. B. Saunders Co.
- Richard F. Morton & J. Richard Hebd: A study guide to Epidemiology and Biostatistics, 2nd Ed., University Park Press, Baltimore.
- Sylvia W Smoller, J Smoller, Biostatistics & Epidemiology A Primer for health and Biomedical professionals, 4th edition, Springs, 2015

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WORKSHOP

Course Code: OPT2333 **Credit Units: 01**

Course Objective:
A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two ways. The trainer has to make sure that the aspects covered are practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

Major Themes for Workshop:
The workshop may be conducted on any of the major themes
The department may choose any recent and relevant topic of study.

Guidelines for Workshop:
The procedure for earning credits from workshop consists of the following steps:
Relevant study material and references will be provided by the department in advance.
The participants are expected to explore the topic in advance and take active part in the discussions held
Attending and Participating in all activities of the workshop
Group Activities have to be undertaken by students as guided by the department.
Evaluation of workshop activities would be done through test and quiz at the end of the workshop.
Submitting a write up of atleast 500 words about the learning outcome from the workshop.

Methodology:
The methodology followed at the workshop could be based on any one or more of the following methods:
Case Study
Hands on training
Simulation
Group Activity
Role Play
Quiz

Evaluation Scheme:

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total
10	30	30	30	100

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APPLIED OPTICS-II (Dispensing optics)

Course Code: OPT2401 **Credit Units: 04**

Course Objectives: Skills/knowledge to be acquired at the end of this course:
Measurement of lens power , lens centration using conventional techniques
Ophthalmic prism knowledge – effects, units, base-apex notation, compounding and resolving prisms.
Method of laying off the lens for glazing process.
Knowledge of prism and decentration in ophthalmic lenses
Knowledge of different types of materials used to make lenses and its characteristics
Knowledge lens designs – Bifocals and Progressive lens
Knowledge on tinted and protective lenses
Knowledge on special lenses like iseikonic, spectacle magnifiers.
Knowledge on spectacle frames – manufacture, materials

Course Contents:

Module-I
The characteristics of lens material properties (Refractive index, specific gravity, UV cut off, impact resistance – include drop ball test, abbe value, Center thickness); Measurement of lens power; Quality control. Lens enhancements (Scratch resistant coatings – spin/dip, Anti-reflection coating, UV coating, Hydrophobic coating, anti-static coating

Module-II
Lens types single vision; Lens types bifocal / multifocal; Lens notation; Lens power and thick lenses; Effectivity and high power lenses; Aberrations and lens design; Lens thickness.

Module-III
Ophthalmic prism; Absorptive lenses and lens coatings; Frames types and materials; Frame standard alignment and repairs done; Prescribing ophthalmic lenses; Facial Measurements; Frame Adjustment; Spectacle Delivery - on eye verification

Module-IV
Progressive lenses history and development; Prescribing PALs; Customized PAL designs; Dispensing PALs; Delivery of PALs; Troubleshooting PALs

Module-V
Pediatric Dispensing; Low Vision Aids; Lens enhancements (Scratch resistant coatings – spin/dip, Anti-reflection coating, UV coating, Hydrophobic coating, anti-static coating

Practical to be conducted along with theory lectures
Lab visit will be undertaken to demonstrate different lab procedures.
Glazing and edging Hands on; A collection of different lens types and frames types should be done by students; Lens verification; Project report : lens and spectacle frames available in Indian market

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Examination Scheme:

Components	A	HA	CT	P	EE
Weightage	5	5	10	10	70

(CT-Class Test; HA - Home Assignment; P-Practical; A- Attendance; EE-End Semester Examination)

Text & References:

Text Books:

- Jalie M: The principles of Ophthalmic Lenses, The Association of Dispensing Opticians, London, 1972

Reference Books:

- David Wilson: Practical Optical Dispensing, OTEN- DE, NSW TAFE Commission, 1999
- C V Brooks, IM Borish: System for Ophthalmic Dispensing, Second edition, Butterworth-Heinemann, USA, 1996

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VISUAL OPTICS-II

Course Code: OPT2402 **Credit Units: 03**

Course Objectives: To acquire a comprehensive theoretical understanding to the Optometric diagnostic procedures and the refractive conditions of the eye.
Course Outcome: Upon completion of the course, the student should be able:
1. To understand the fundamentals of optical components of the eye
2. To gain theoretical knowledge and practical skill on visual acuity measurement, objective and subjective clinical refraction

Course Contents:
Module-I: Refractive conditions
Myopia
Hyperopia
Astigmatism
Anisometropia and Anisekonia
Presbyopia
Aphakia and Pseudophakia
Correction and Management of Amblyopia

Module-II: Accommodation
Far and near point of accommodation
Range and amplitude of accommodation,
Anomalies of accommodation
Relationship between accommodation and convergence; A/c ratio

Module-III: Objective Refraction
Retinoscopy – principles and methods
Retinoscopy – speed of reflex and optimum condition
Retinoscopy – dynamic/static
Review of objective refractive methods

Module-IV: Subjective Refraction
Subjective refractive methods
Cross cylinder method for astigmatism, Astigmatic Fan test
Duochrome, Transposition of lenses
Spherical equivalent
Prescribing prisms
Binocular balancing & refraction

Module-V: Effective power of spectacles; vertex distance effects
Ocular refraction versus spectacle refraction
Ocular accommodation versus spectacle accommodation
Spectacle magnification and relative spectacle magnification
Retinal image blur; depth of focus and depth of field

Tutorials: Case discussion on difficult situations on Retinoscopy
Practicals
I - History taking

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II - Visual acuity measurement

III - Objective Refraction

Students are to neutralize 10cases (2 low myope, 2 low hyperope, 2 high myope, 2 Aphake, 2 astigmats with or without spherical errors). An initial practice session would be given and the students are to exhibit their competency in neutralizing to the nearest power. In case of gross errors the lab would be repeated. The students are to submit the report of their cases duly signed by their supervisor

IV - Subjective refraction

Students should perform fogging technique, Duochrome, cyclodamia, JCC, Binocular balancing and binocular refraction to determine the end point of refraction.

V - Measurement of accommodation

Students need to measure the far point, near point, range and amplitude of accommodation using various methods for 10 cases. Also needs to measure the negative and positive relative accommodation compare the values between the normals.

VI - Measurement of convergence

Students need to measure the near point of convergence, AC/A ratio for 10 patients

Examination Scheme:

Components	A	HA	CT	P	EE
Weightage	5	5	10	10	70

(CT-Class Test; HA - Home Assignment; A- Attendance; P-Practicals, EE-End Semester Examination)

Text & References:

Text Books:

- Abrams D: Duke elders Practice of Refraction, Edition 9, 1998
- Primary Care Optometry- Theodore Grosvenor,4th edition, Butterworth

Reference Books:

- WJ Benjamin: Borish's clinical refraction,2nd edition, Butterworth Heinemann, Missouri, USA,2006

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OCULAR DISEASES-II

Course Code: OPT2403 **Credit Units: 04**

Course Objective: At the end of the course the students will be knowledgeable in the following aspects of ocular diseases: knowledge
on the etiology,
epidemiology,
symptoms,
signs,
course sequelae of ocular disease,
diagnostic approach, and
Management of the ocular diseases.

Course Contents:

Module-I: Retina and Vitreous:

Applied Anatomy; Congenital and Developmental Disorders (Optic Disc: Coloboma, Drusen, Hypoplasia, Medullated nerve fibers; Persistent Hyaloid Artery) ; Inflammatory disorders (Retinitis: Acute purulent , Bacterial, Virus, mycotic); Retinal Vasculitis (Eales's); Retinal Artery Occlusion (Central retinal Artery occlusion); Retinal Vein occlusion (Ischaemic, Non Ischaemic , Branch retinal vein occlusion); Retinal degenerations : Retinitis Pigmentosa, Lattice degenerations; Macular disorders: Solar retinopathy, central serous retinopathy, cystoid macular oedema, Age related macular degeneration; Retinal Detachment: Rhegmatogenous, Tractional, Exudative); Retinoblastoma; LASERS in Ophthalmology; Fluorescein angiography; OCT

Module-II: Ocular Injuries:

Terminology: Closed globe injury (contusion, lamellar laceration) Open globe injury (rupture, laceration, penetrating injury, peforating injury); Mechanical injuries (Extraocular foreign body, blunt trauma, perforating injury, sympathetic ophthalmitis); Non Mechanical Injuries (Chemical injuries, Thermal, Electrical, Radiational); Clinical approach towards ocular injury patients

Module-III: Uveal Tract & Sclera

Applied Anatomy; Classification of uveitis; Etiology; Pathology ; Anterior Uveitis; Posterior Uveitis; Purulent Uveitis; Endophthalmitis; Panophthalmitis; Pars Planitis; Tumors of uveal tract(Melanoma); Episcleritis and scleritis; Clinical examination of Uveitis and Scleritis

Module-IV: Clinical Neuro-ophthalmology

Anatomy of visual pathway; Lesions of the visual pathway; Pupillary reflexes and abnormalities; Amaurotic light reflex, Efferent pathway defect, Wernicke's hemianopic pupil, Marcus gunn pupil. Argyll Robetson pupil, Adie's tonic pupil); Optic neuritis, Anterior Ischemic optic neuropathy, Pappilloedema, optic atrophy; Cortical blindness; Malingering; Nystagmus; Clinical examination

Module-V: Glaucoma

Applied anatomy and physiology of anterior segment; Clinical Examination; Definitions and classification of glaucoma; Pathogenesis of glaucomatous ocular damage; Congenital glaucomas; Primary open angle glaucoma; Ocular hypertension; Normal Tension Glaucoma; Primary angle closure glaucoma (Primary angle closure suspect, Intermittent glaucoma, acute congestive, chronic angle closure); Secondary Glaucomas; Management : common medications, laser intervention and surgical techniques; Glaucoma investigations and procedures; Confrontation Amsler grid; Tonometry-ApplanationSchiotz; Visual fields-; GTX,HRT; Provocative test; OCT

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Practicals:
Students will visit OPD clinic and record pathologies seen during the posting [under supervision of faculty]; Record file of ocular pathologies to be prepared [Faculty to decide]; Atleast two Case presentations of pathologies seen during clinical posting

Examination Scheme:

Components	A	HA	CT	P	EE
Weightage	5	5	10	10	70

CT-Class Test; HA- Home Assignment; P-Practical; A- Attendance; EE-End Semester Examination)

Text & References:
Text books:

- A K Khurana: Comprehensive Ophthalmology, 4th edition, New age international (p) Ltd. Publishers, New Delhi, 2007

Reference Books:

- Stephen J. Miller : Parsons Diseases of the Eye, 18th edition, Churchill Livingstone, 1990
- Jack J. Kanski Clinical Ophthalmology: A Systematic Approach, 6th edition, Butterworth-Heinemann, 2007

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CLINICS-III

Course Code: OPT2406 **Credit Units: 03**

Course Contents:

Module-I:

Unit of competency: Refraction

An understanding of methods of assessing vision, Refraction in all Patients

The ability to relate facial anatomy to the fitting of optical appliances.

Elements of competence:

1.Recording VA

2.Practice of Streak Retinoscopy and dynamic retinoscopy.

3.Subjective refraction –

4.Initial sphere check.: fogging

5.Cylinder axis and power refinement: clockdial, fan, JCC,

6.Second sphere check , Duocchrome or bichrome test,

7.Binocular balance :prism balance, TIB,

8.cyclodeimia,

9.Slit refraction.

10.Presbyopic add determination

11.Writing prescription

12.Overview of the use of cycloplegic drugs.

Module-II

Unit of competency: Applied Optics:

The ability to dispensing appropriate appliances

The ability to interpret and dispense a prescription using appropriate lenses and facial frame measurements.

Elements of competence:

1.Frame types and nomenclature of frames. Know about special frame features and handling the frames.

2.Relationship between frame ,lenses and face

3.IPD measurement (with Scale and IPD ruler , Pupilometer)

4. Recommends and dispenses special optical appliances where appropriate(e.g. VDU users, Sports, safety, pediatric frames, recumbent, reversible, flips, trigeminal spectacles etc.)

5.Identification of tints & Coating on lens surface and its application ,associated advantage and disadvantages.

6.Taking and recording children's facial and frame measurement

7.Awareness of the dermatological effects of the materials to be able to advise patient accordingly.

8. Identifies possible errors in prescription and follows the appropriate course of action.

9. Identification of incomplete, inaccurate and ambiguous prescription.

10.when to modify and when to refer a new prescription

Module-III

Unit of competency: Progressive addition lens

Brief overview of PAL'S and clinical decision making.

An understanding of refractive prescribing and management decisions

Elements of competence:

1. Know Basic construction of progressive addition lens.

2. Frame selection for Progressive

3. Familiarity of different types of progressive lens design and clinical relevance .advantages

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and disadvantages of different types of lens.
4. Choosing the right type of progressive lens
5. Progressive lens fitting measurement
6. Progressive lens verification.
7. Progressive dispensing
8. Trouble shooting of progressive.
9.Familiarity of different brands of PAL's.

Module-IV:
Unit of competency: Comprehensive eye care:
The ability to identify and manage ocular abnormalities
The ability to identify sight threatening eye diseases
Recognizes common ocular abnormalities referred when appropriate
Recognizes adverse ocular reactions to medication
Assess symptoms and signs of neurological significance

Elements of competences:
1.Understands the risk factors for developing common ocular conditions including: Glaucoma, cataract, diabetic retinopathy and ARMD .
2. Recognizes, using appropriate technique/s, all of the following: Cataract, Glaucoma or glaucoma suspects ,Anterior eye disorders e.g. blepharitis, dry eye, meibomian gland dysfunction, lid lesions
AMD and macular abnormalities and Manages appropriately.
3. Manages patients presenting with cataract.
4. Evaluates glaucoma risk factors, to detect glaucoma and refer accordingly.
5. Recognize the patients presenting with macular degeneration .
6. Recognizes, evaluates and manages diabetic eye disease and refers accordingly.
7.Evaluates and manages patients presenting with symptoms of retinal detachment.
8. Recognizes ocular manifestations of systemic disease
9. Assesses symptoms and signs of neurological significance
10. Recognizes adverse ocular reactions to medication.

Module-V
Unit of competency: Ocular diseases 1.
The ability to identify and manage ocular abnormalities
The ability to identify sight threatening eye diseases
Recognizes common ocular abnormalities referred when appropriate
Recognizes adverse ocular reactions to medication

Elements of competences:
1. Interprets and investigates the presenting symptoms and sign of the patient.
2. Identifies external pathology and offers appropriate advice to patients not requiring referral.
- External eye and ocular surfaces : Lids, lashes, lumps/bumps and red eye
- Gives the correct advice /treatment and review period
- Aware of pharmaceutical agents available (legal status, indications, contraindications and side effects and uses appropriate sources of medicines information)
- Explains clearly to the patient and checks their understanding

3. Recognizes common ocular abnormalities
4. Understanding of symptoms associated with internal eye disease.
5. Manage patient presenting with Red eyes.

Examination Scheme:

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Components	Attd.	Record File	Multiple Choice Questions/ Quiz	Viva	Practical	Total
Weightage	5	15	15	15	50	100

Text book/ Reference Book

- Grosvenor, Primary Care Optometry, Butterworth-Heinemann,
- A K Khurana: Comprehensive Ophthalmology, 4th edition, New age international (p) Ltd. Publishers, New Delhi, 2007
- D B. Elliott :Clinical Procedures in Primary Eye Care,3rd edition, Butterworth-Heinemann, 2007
- BHVI modules

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OPHTHALMIC ELECTRODIAGNOSTIC PROCEDURES

Course Code: OPT2408 **Credit Units: 03**

Course Objective: The objective of the course is to familiarize the student with the Electrophysiology Laboratory which performs several clinical tests, including the electroretinogram (ERG), electro-oculogram (EOG), visual evoked response (VER), color vision testing (CVT) and dark adaptometry (DA)

Course Contents:

Module-I: Electrophysiological investigations

Electro-oculogram (EOG) Measurement of retinal function with standardised eye movements.
Electroretinogram (ERG)
Macular or Focal Electroretinogram
Pattern Electroretinogram (PERG)
Flash Visually Evoked Cortical Potential (Flash VEP)
Pattern Appearance Visually Evoked Cortical Potential
Other non-standard procedures for recording VEP and ERG e. g., measurement of interocular beat frequencies, flicker and sweep VEPs, multi-focal ERG, fast oscillation.
Electromyogram (EMG)
Electro-nystagmography. For measurement of nystagmus and eye movements.

Module-II: Indications for Patient Referral

Tests Available
Patterns of Referral
Indications for Specific Tests
Standardised Electroretinogram, Electro-Oculogram and Visually, Evoked Potential

Evaluation Scheme:

Attendance	Record file	Multiple Choice Questions/ Quiz	Viva	Practical skills /performance	Total
5	15	15	15	50	100

Textbook:

- Ophthalmic Electrodiagnosis (Major Problems in Ophthalmology) N.R. Galloway

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PERIMETRY

Course Code: OPT2409 **Credit Units: 03**

Course Objective: The aim of this course is to acquire skills in the visual filed examination of the eye. This course deals almost exclusively with manual and automated perimetry. Emphasis is on technical aspects of administering the automated test with skill; as well as on skillful interpretation of the result based on an understanding of the text.

Course Contents:

Module-I:

The field of vision
Normal field of vision
Retinal nerve fiber paths and the field of vision
Characteristics of visual field loss in glaucoma

Module-II:

Perimetric Parameters
Manual vs. Automated Perimetry
Advantages of Automated Perimetry
Static vs. Dynamic Perimetry
Target size and luminance
Testing Algorithms

Module-III:

Monitoring Fixation
Monocular vs. Binocular testing
Alternative perimetric targets
Interpretation of SAP
Patient and Test details
Displays of sensitivities across the visual field

Module-IV:

Summary measures of visual field performance
Establishing reliability of results
Identifying Glaucomatous VF Loss on SAP
Common perimetric errors

Evaluation Scheme:

Attendance	Record file	Multiple Choice Questions/ Quiz	Viva	Practical skills /performance	Total
5	15	15	15	50	100

Reference Book

- Automated static perimetry : Douglas R. Anderson

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TERM PAPER

Course Code: OPT2431 **Credit Units: 02**

Course Objective:
The objective of this course is to judge the understanding as well as application of the knowledge gained by the students. The aim of the term paper is to provide the students with an opportunity to further enhance their knowledge in a sector of their choice by undertaking a significant practical unit of examining and analyzing various aspects of Clinical Optometry at a level commensurate with the learning outcomes of the various courses taken up them in the ongoing semester.

A term paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. At least one middle level or senior level person of a company from the chosen sector may be interviewed face to face.

Guidelines:
1. The term paper will be related to the contemporary Optometry topic and it will be given by the department.
2. The presentation of the term paper is scheduled to be held before the commencement of Semester examinations.
3. The paper will carry 100 marks that will be marked on the basis of understanding and organization of content based on the literature review. The Bibliography shall form an important part of the paper.

Evaluation Scheme:

Organisation and relevance of content	Literature Review	Bibliography	Total
40	40	20	100

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PROJECT

Course code: OPT2432 **Credit Units: 03**

Course Objectives:
The objective of this module is to help the students understand the basic principles of research and methods applied to draw inferences from the research findings.

Course Contents:

Module-I and II: Research Methodology
1. Introduction to research methods
2. Identifying research problem
3. Ethical issues in research
4. Research design
5. Types of Data
6. Research tools and Data collection methods
7. Sampling methods
8. Developing a research proposal

Module-III and IV: Biostatistics
1. Basics of Biostatistics
1.1 Introduction of Biostatistics
1.2 Measures of Morality
1.3 Sampling
1.4 Statistical significance
1.5 Correlation
1.6 Sample size determination.
1.7 Statistics –Collection of Data - presentation including classification and diagrammatic representation –frequency distribution. Measures of central tendency; measures of dispersion.
1.8 Theoretical distributions.
1.8.1 Binomial
1.8.2 Normal
1.8.3 Sampling –necessity of methods and techniques.
1.8.4 Chi. Square test (2 x 2)
2. Hospital Statistics
3. Use of computerized software for statistics

Evaluation Scheme:

Attendance	Assignment	CT1	CT 2	End-Term Evaluation	Total
5	15	15	15	50	100

Text book/ Reference Book

- Mausner & Bahn: Epidemiology-An Introductory text, 2nd Ed., W. B. Saunders Co.
- Richard F. Morton & J. Richard Hebd: A study guide to Epidemiology and Biostatistics, 2nd Ed., University Park Press, Baltimore.
- Sylvia W Smoller, J Smoller, Biostatistics & Epidemiology A Primer for health and Biomedical professionals, 4th edition, Springs, 2015

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WORKSHOP

Course Code: OPT2433 **Credit Units: 01**

Course Objective:
A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two ways. The department has to make sure that the aspects covered are practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

Major Themes for Workshop:
The workshop may be conducted on any of the various major themes: These themes are merely indicative and the department may choose any recent and relevant topic of study.

Guidelines for Workshop:
The procedure for earning credits from workshop consists of the following steps:
Relevant study material and references will be provided by the department in advance.
The participants are expected to explore the topic in advance and take active part in the discussions held
Attending and Participating in all activities of the workshop
Group Activities have to be undertaken by students as guided by the department .
Evaluation of workshop activities would be done through test and quiz at the end of the workshop.
Submitting a write up of atleast 500 words about the learning outcome from the workshop.

Methodology:
The methodology followed at the workshop could be based on any one or more of the following methods:
Case Study
Hands on training
Simulation
Group Activity
Role Play
Quiz

Evaluation Scheme:

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total
10	30	30	30	100

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CONTACT LENS-I

Course Code: OPT2501 **Credit Units -03**

Course Objectives: Upon completion of the course, the student should be able to:

- Understand the basics of contact lenses
- List the important properties of contact lenses
- Finalise the CL design for various kinds patients
- Recognize various types of fitting
- Explain all the procedures to patient
- Identify and manage the adverse effects of contact lens

Course Contents:

Module-I

Anatomy and physiology of anterior segment, History of contact lenses, Optics of contact lenses, comparison spectacles, Contact lens designs, Corneal oxygenation in contact lens wear

Module-II

Contact lens fabrication, Manufacturing of Rigid and soft Contact Lenses –Various methods
Pre fitting examination-steps, significance, recording of results, Instruments used for examination, Special investigation in pre-fitting examinations., Keratometry and corneal topography, Slit lamp examination, Discussion with patient, choice of lens type

Module-III

Examining the Prospective Contact Lens Patient, Selecting Lens Type, Wear Mode and Replacement Rate, Fitting Spherical GP Contact Lenses, Fitting Spherical Soft Contact Lenses, Correcting Astigmatism with Contact Lenses

Module-IV

Calculation and finalizing of contact lens parameters, Ordering contact lenses – writing a prescription to the laboratory, Checking and verifying contact lenses from laboratory,Modifications possible with rigid lenses

Practical:

History Taking role plays, Pre fitting evaluation, RGP CL insertion & Removal, Fitting assessment
Over refraction, Follow up examination, Patient instructions, Contact Lenses Do’s and don’ts, Instructions for care and maintenance

Practical:

History Taking role plays; Pre fitting evaluation; RGP CL insertion & Removal; Fitting assessment; Over refraction; Follow up examination; Patient instructions; Contact Lenses Do’s and don’ts ; Instructions for care and maintenance.

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Examination Scheme:

Components	A	HA	CT	P	EE
Weightage	5	5	10	10	70

(CT-Class Test; HA- Home Assignment; P-Practical; A- Attendance; EE-End Semester Examination)

Text & Reference:

Text books:

- IACLE modules A1 - 6,B2-9,C 1-4
- CLAO Volumes 1, 2, 3
- Text book of Contact Lenses 5th editionby Sinha Rajesh ,jaypee publication 2017
- Contact lens Primer :Jaypee Bros : Monica Chaudhry
- Anthony J. Phillips : Contact Lenses, 5th edition, Butterworth-Heinemann, 2006
- Elisabeth A. W. Millis: Medical Contact Lens Practice, Butterworth-Heinemann, 2004
- E S. Bennett ,V A Henry :Clinical manual of Contact Lenses, 3rd edition, Lippincott Williams and Wilkins, 2008

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LOW VISION CARE

Course Code: OPT2502 **Credit Units: 03**

Course Objectives: At the end of the course, the student will be knowledgeable in the following:

- Definition and epidemiology of Low Vision
- Clinical examination of Low vision subjects
- Optical, Non-Optical, Electronic, and Assistive devices.
- Training for Low Vision subjects with Low vision devices
- Referrals and follow-up

Course Contents:

Module-I

Definitions & classification of Low vision; Epidemiology of low vision [magnitude]

Module-II

Pre-clinical evaluation of low vision patients, functional needs assessment; Types of low vision aids – optical aids, non-optical aids & electronic devices ,Assistive technologies devices; Optics of low vision aids

Module-III

Clinical evaluation – assessment of visual acuity, visual field, selection of low vision aids, instruction & training; Paediatric Low Vision care

Module-IV

Low vision aids – dispensing & prescribing aspects; Visual rehabilitation & counselling prognostic & psychological factors; psycho-social impact of low vision; Legal aspects of Low vision in India; Eye Disorders & Low vision; Case Analysis

Practical:

Attending in low vision care clinic and history taking; Determining the type of telescope and its magnification (Direct comparison method & calculated method); Determining the change in field of view with different magnification and different eye to lens distances with telescopes and magnifiers; Inducing visual impairment and prescribing magnification; Determining reading speed with different types of low vision aids with same magnification; Evaluation of low vision patient; Prescribing optical devices [How to use]; Prescribing of non-optical devices [how to use them]; Visit to blind school and rehabilitation centers; Establishing a low vision in clinic; Report on disability networks in India; Visit to clinics and prepare report on low vision patients

VISUAL REHABILITATION:

Module-I: Rehabilitation

History of Rehabilitation Optometry; Definition and Principles of Rehabilitation; Psychology in Optometric Rehabilitation; Pain and Suffering; Adaptation and Compensatory Adjustment; Human Motivation; Psychological Disturbance and Psychotherapy; Symptomatology of Visual Disorders

Module-II: Introduction to Optometry rehabilitation Practice

A Basis for Practice; Roles in Daily Life and Professional Practice

Module-III: Clinical Presentation and Case

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Examination Scheme:

Components	A	HA	CT	P	EE
Weightage	5	5	10	10	70

(CT-Class Test; HA- Home Assignment; P-Practical; A- Attendance; EE-End Semester Examination)

Text & References:

Text books:

- Christine Dickinson: Low Vision: Principles and Practice Low vision care, 4th edition, Butterworth-Heinemann, 1998
- Low vision : jaypee Bros : Monica Chaudhry
- E Vaithilingam: practice of Low vision – A guide book, Medical Research
- Foundation, 2000

Reference Books:

- Richard L. Brilliant: Essentials of Low Vision Practice, Butterworth-Heinemann, 1999
- Helen Farral: optometric Management of Visual Handicap, Blackwell Scientific publications, 1991
- A J Jackson, J S Wolffsohn: Low Vision Manual, Butterworth Heinnemann, 2007

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BINOCULAR VISION-I

Course Code: OPT2504 **Credit Units: 03**

Course Objectives: On successful completion of this module, a student will be expected to be able to:-

- Demonstrate an in-depth knowledge of the gross anatomy and physiology relating to the extraocular muscles.
- Provide a detailed explanation of, and differentiate between the aetiology, investigation and management of binocular vision anomalies.
- Adapt skills and interpret clinical results following investigation of binocular vision anomalies appropriately and safely.

Course Contents:

Module-I
Binocular Vision and Space perception; Relative subjective visual direction; Retino motor value; Grades of BSV; SMP and Cyclopean Eye; correspondence, Fusion, Diplopia, Retinal rivalry; Horopter; Physiological Diplopia and Suppression; Stereopsis, Panum's area, BSV

Module-II
Revision: Anatomy of Extra Ocular Muscles; Physiology of Ocular movements; Center of rotation, Axes of Fick; Action of individual muscles

Module-III
Laws of ocular motility; Donder's and Listing's law; Sherrington's law; Hering's law; Uniocular& Binocular movements - fixation, saccadic & pursuits; Version &Vergence; Fixation & field of fixation

Module-IV
Near Vision Complex; Accommodation: Definition and mechanism (process), Methods of measurement, Stimulus and innervation, Types of accommodation, Anomalies of accommodation – aetiology and management; Convergence: Definition and mechanism, Methods of measurement, Types and components of convergence - Tonic, accommodative, fusional, proximal, Anomalies of Convergence – aetiology and management.

Module-V
Sensory adaptations: Confusion, Suppression, Investigations, Management, Blind spot syndrome; Abnormal Retinal Correspondence, Investigation and management; Eccentric Fixation, Investigation and management; Amblyopia: Classification and management

Practicals:
Binocular vision assessment, Stereopsis evaluation, Measurement of NPC and NPA, Measurement of AC/A Ratio, Measurement of convergence, Convergence insufficiency and management of cases, ARC-case discussion, Eccentric fixation –Diagnosis and discussion, Amblyopia management –case presentation

Examination Scheme:

Components	A	HA	CT	P	EE
Weightage	5	5	10	10	70

(CT-Class Test; HA- Home Assignment; P-Practical; A- Attendance; EE-End Semester

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Examination)

Texts & References:

Text Books:

- Pradeep Sharma: Strabismus simplified, New Delhi, First edition, 1999, Modern publishers.
- Mitchell Scheiman; Bruce Wick: Clinical Management of Binocular Vision Heterophoric, Accommodative, and Eye Movement Disorders, 2008, Lippincot Williams & Wilkins publishers

References:

- Fiona J. Rowe: Clinical Orthoptics, second edition, 2004, Blackwell Science Ltd
- Gunter K. Von Noorden: BURIAN- VON NOORDEN'S Binocular vision and ocular motility theory and management of strabismus, Missouri, Second edition, 1980, C. V. Mosby Company
- Mitchell Scheiman; Bruce Wick: Clinical Management of Binocular Vision Heterophoric, Accommodative, and Eye Movement Disorders, 2008, Lippincot Williams & Wilkins publishers

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DISEASE OF EYE AND CLINICAL MEDICINE

Course Code: OPT2505 **Credit Units: 02**

Course Objectives: At the end of the course, students should get acquainted with the following:
Common Systemic conditions: Definition, diagnostic approach, complications and management options
Ocular findings of the systemic conditions
First Aid knowledge

Course Contents:

Module-I

Hypertension – Definition, classification, Epidemiology, clinical examination, complications, and management. Hypertensive retinopathy; Diabetes Mellitus – Classification, pathophysiology, clinical presentations, diagnosis, and management, Complications, Diabetic Retinopathy; Thyroid DiseasePhysiology, testing for thyroid disease, Hyperthyroidism, Hypothroidism, Thyroiditis, Thyroid tumors, Grave's Ophthalmopathy; Acquired Heart Disease : Ischemic Heart Disease, Congestive heart failure, Disorders of cardiac rhythm, Ophthalmic considerations

Module-II

Cancer; Connective Tissue Disease; Rheumatic arthritis; Systemic lupus erythematosus; Sjogren syndrome Behcet's syndrome; Tuberculosis – Aetiology, pathology, clinical features, pulmonary tuberculosis, diagnosis, complications, treatment tuberculosis and the eye.

Module-III

Herpes virus (HERPES AND EYE); Hepatitis (Hepatitis A, B, C); Acquired Immunodeficiency Syndrome

Module-IV

Anaemia (Diagnosis, clinical evaluation, consequences, Sickle cell disease, treatment, Ophthalmologic considerations); Common Tropical Medical Ailments; Nutritional and Metabolic disorders: Myasthenia Gravis, Marfan's Syndrome

Practical: Visit to Hospital Medicine O.P.D / Ward, Neurology

Examination Scheme:

Components	A	HA	CT	P	EE
Weightage	5	5	10	10	70

(CT-Class Test; HA- Home Assignment; P-Practical; A- Attendance; EE-End Semester Examination)

Text & References:

- C Haslett, E R Chilvers, N A boon, N R Coledge, J A A Hunter: Davidson's Principles and Practice of Medicine, Ed. John Macleod, 19th Ed., ELBS/Churchill Livingstone. (PPM), 2002
- Basic and clinical Science course: Update on General Medicine, American Academy of Ophthalmology, Section 1, 1999
- As recommended by Faculty

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CLINICS-IV

Course Code: OPT2507 **Credit Units: 03**

Module-I

Unit Of competency: Contact lens -1.

The ability to select and fit the most appropriate lens for the planned use

The ability to Identify and manage after care

Elements of competence:

1.Recognize Contact lens types and material.

2.Pre fitting evaluation

3. Demonstrates an understanding of the range of rigid lens material and designs available

4. Appropriate choice of rigid lens parameter.

5. Fitting philosophies of rigid lens and fitting assessment.

6.Demonstrates an understanding of the type of astigmatism which require correction.

7.RGP lens adaptation

8.RGP lens wear and care including use of RGP lens care product.

9.Demonstrates an understanding of the range of soft lens materials and design available.

10.appropriate choices of soft lens , Fitting philosophies and fitting assessment.

11. Write appropriate order form for RGP and soft lenses

12. Instruct patient the technique of RGP, soft lens insertion, removal and other relevant handling instructions.

Module-II

Unit Of competency: Assessment of Binocular vision

The ability to assess the patient with anomalies of binocular vision

The ability to asses binocular status using objective and subjective means

Elements of competence:

1. Understand the different objective test available to asses deviation. E.g. cover & motility test

2. Different subjective test available to assess subjective deviation. E.g. fixation disparity

3. Identification of phoria and tropia

4. Measurement of fusional vergence range dist and near

5. Measureent of accommodative facility

6. Measurement of stereopsis

7. AC/A ratio (heterophoria and gradient method)

8. Synoptophore:

Measurement of SMP, FUSION And stereopsis

Angle of anomaly

ARC

Module-III:

Unit of competency: Low vision and rehabilitation:

The ability to assess a patient with low vision

The ability to advice, refer and provide after care to low vision patients

The ability to refer low vision Patients to other agencies where appropriate

Elements of competence:

1. Distance and near vision chart used for low vision

2. Assessment of visual function, including the use of Log MAR and other specialist charts, effects of illumination, contrast and glare.

3. Assessment of visual field of patient with reduced vision.

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4. VA criteria for visual impairment, Low vision and visually handicap
5. Indication of binocular low vision aids
6. Knowledge of Optical and non optical devices
7. Identification of patients visual needs
8. Sign and symptoms of ocular and systemic pathologies.
9. Assessment of magnification for distance and near vision
10.Selection of Optical aids for distance and near.
11.Advises on the use of, and dispenses simple low vision aids :
Identifies which patients would benefit from low vision aids and advice ,
Understands the principles of magnification,
Field of view and working distance in relation to different aids Provides advice on the advantages and disadvantages of different types of simple low vision aids ,
Understands the mechanisms of prescribing magnification including acuity reserve ,
Gives correct instruction to a patient in the use of various aids, to include: Which specs to use with aid, Lighting required, Appropriate working distance
12.Training in use of aids
13.Low vision rehabilitation

Module-IV:
Unit of competency: Community Visit.
The ability to screen refractive error and knowledge of eye health disordered in community
The ability to impart information in a manner which is appropriate to the recipients.
Elements of competence:
1.School screening
2.Industrial Eye screening
3.Community eye services.

Evaluation Scheme:

Attendance	Record file	Written test	Viva	Practical	Total
5	15	30	30	20	100

Text book/ Reference Book

- Grosvenor, Primary Care Optometry , Butterworth-Heinemann,
- A K Khurana: Comprehensive Ophthalmology, 4th edition, New age international (p) Ltd. Publishers, New Delhi, 2007
- D B. Elliott :Clinical Procedures in Primary Eye Care,3rd edition, Butterworth-Heinemann, 2007
- BHVI modules

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SUMMER INTERSHIP EVALUATION-I

Course Code: OPT2535 **Credit Units: 02**

Objective:
The basic objective of a Summer Internship is to refine the practical exposure .This summer training will provide an opportunity to the students to apply their theoretical understanding while working on the concerned project in the hospital / coporates. Thus this summer internship programme is an attempt to bridge the gap between theory and practice. This will also enhance the students' intellectual ability and attributes related to data handling, decision making, report writing, oral presentation and imbibing an interdisciplinary approach.

General Guidelines:
Every student of Boptom shall be required to undergo a practical training in a organization approved by the Institute for minimum of four weeks, normally in the Summer Vacation, after the end of the fourth semester examinations. The candidates shall be required to undergo training in the various areas of the organization concerned. The organization may assign a specific tasks to the candidate, which will be completed by him/her during the period of training. The work done by the candidate during the training period shall be submitted in form of a training report.

The last date for the receipt of training report AND CASE SHEETS in the department shall be one month after the date of completion of training, i.e. at the beginning of the fifth semester.

Evaluation Scheme:

Attendance	Overall Performance: grading by centre	Viva	Attendance	LOG book Report	Total
5	30	30	10	30	100

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OCULAR PROSTHESIS

Course Code: OPT2508 **Credit Units: 03**

Course Objective:
This course aims at making the students equipped with the basics of Prosthesis and the various conditions where they are applied.

Course Contents:
- Basics on Prosthesis,
- Types of Prosthesis
- Indications,
- Techniques employed,
- Complications,
- Advancements and Results

Evaluation Scheme:

Attendance	Record file	Multiple Choice Questions/ Quiz	Viva	Practical skills /performance	Total
5	15	15	15	50	100

Reference Book
- J.H. Prince, Ocular Prosthesis, Livingstone, 1946

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REFRACTIVE SURGERY

Course Code: OPT2509 **Credit Units: 03**

Course Objectives:

- Provide patients with unbiased, up-to-date advice concerning refractive surgery techniques
- Recognise the most appropriate tests for investigating suitable candidates pre-operatively and assessing visual performance post-operatively
- Recognise post-operative complications
- Appreciate the most appropriate management strategy for a given refractive surgery patient, communicating effectively with the patient and their surgeon
- Interpret and critically review research pertaining to refractive surgery.

Course Contents:

Module-I: Background – History of Refractive Surgery, Radial Keratotomy, Excimer Laser Photorefractive Keratectomy, Automated Lamellar Keratoplasty, Laser In Situ Keratoplasty , newer advances

Module-II: Refractive surgery Measurement – Peripheral Keratometry, Photokeratoscopy, Videokeratoscopy, Evaluation of Videokeratoscopy, Applications of Videokeratoscopy, Corneal topography reports, Corneal tomography reports.

Module-III: Principles of Microkeratomes- Types of Microkeratomes, Achieving the Optimal Flap, Risks & Complications, Flap Creation Using Femtosecond Laser, Advantages & Disadvantages of Femtosecond Laser Customized Ablation Procedures - Why Use Customized Ablation?, Technology Used for Customised Ablation, Customized Ablation Methods, Guidelines

Module-IV: Complications of Refractive Procedures- Microkeratome related complication, Laser Ablation related complications, Postoperative Complications, Management.

Module-V: Introduction to Phakic IOLs-and Types of Corneal Rings- Preoperative Evaluation & Inclusion Criteria, Surgical Procedures, Overview of Refractive Lens Exchange (RLE), Deciding to perform RLE, Retinal Risks of RLE, Avoiding Retinal Detachment, Informing Patient of Risks, Postoperative Issues, Problems of Phakic IOLs

Evaluation Scheme:

Attendance	Record file	Multiple Choice Questions/ Quiz	Viva	Practical skills /performance	Total
5	15	15	15	50	100

Text & References:

Text books:

- Ioannis G. Pallikaris and Dimitrios S. Siganos (1998), LASIK, SLACK incorporated, NJ
- T Grosvenor: Primary Care Optometry,4th edition, Butterworth – heinneman,USA,2002
- Agarwal: Dr. Agarwal's Step by Step Lasik Surgery; Jaypee Brothers, medical Publishers, India (2005)
- Reference Books:
    - Hanratty, M. (2005) Lasik: a handbook for optometrists. Oxford: Butterworth-Heinemann

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- MacRae, S., Krueger, R., Applegate, R.A. (2004) Wavefront Customized Visual Correction - the quest for super vision-II. London: Slack Inc.
- Naroo, S.(2003) Refractive Surgery: Clinical Decision making in ophthalmic practice. Oxford: Butterworth Heinemann.
- Probst, L.E. (2001) LASIK - a color atlas and surgical synopsis. London: Slack inc.
- Sullivan, L.(2007) Step by step LASIK surgery (2nd Edition). London: Taylor and Francis

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TERM PAPER

Course Code: OPT2531 **Credit Units: 02**

Course Objective:
The objective of this course is to judge the understanding as well as application of the knowledge gained by the students. The aim of the term paper is to provide the students with an opportunity to further enhance their knowledge in a sector of their choice by undertaking a significant practical unit of examining and analyzing various aspects of Clinical Optometry at a level commensurate with the learning outcomes of the various courses taken up them in the ongoing semester.

A term paper is primarily a record of intelligent reading in several sources on a particular subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned. At least one middle level or senior level person of a company from the chosen sector may be interviewed face to face.

Guidelines:
1. The term paper will be related to the contemporary Optometry topic and it will be given by the department.
2. The presentation of the term paper is scheduled to be held before the commencement of Semester examinations.
3. The paper will carry 100 marks that will be marked on the basis of understanding and organization of content based on the literature review. The Bibliography shall form an important part of the paper.

Evaluation Scheme:

Organisation and relevance of content	Literature Review	Bibliography	Total
40	40	20	100

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PROJECT

Course code: OPT2532 **Credit Units: 03**

Objectives:
The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Chapter Scheme and distribution of marks:
Chapter 1: Introduction – 10 marks
Chapter 2: Conceptual Framework/ National/International Scenario – 25 marks
Chapter 3: Presentation, Analysis & Findings -- 25 marks
Chapter 4: Conclusion & Recommendations -- 10 marks
Chapter 5: Bibliography -- 05 marks

Project Report	Power Point Presentation & Viva
75 marks	25 marks

Components of a Project Report
The outcome of Project Work is the Project Report. A project report should have the following components:
1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.
2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.
3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.
4) Abstract: The body of the report should have summary of the project.
a) Introduction: This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, inclusion & exclusion criteria and method of analysis), Limitations of the Study, and Planning.
b) Conceptual Framework / National and International Scenario: (relating to the topic of the Project).
c) Presentation of Data, Analysis and Findings
d) Conclusion and Recommendations: In this section, the concluding observations based on the main findings and suggestions are to be provided.
5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.
6) Annexure: Questionnaires (if any), relevant reports, etc.
(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

The Steps of a Project Report
Step I: Selection of the topic for the project by taking following points into consideration:
Suitability of the topic.
Relevance of the topic
Time available at the disposal.
Feasibility of data collection within the given time limit.

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Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

Step II: Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.
Step III: Collection of information and data relating to the topic and analysis of the same.
Step IV: Writing the report dividing it into suitable chapters, viz.,
Chapter 1: Introduction,
Chapter 2: Methodology,
Chapter 3: Analysis & Findings
Chapter 4: Conclusion and Recommendations.
Step V: The following documents are to be attached with the Final Project Report.
1) Approval letter from the supervisor
2) Student's declaration
3) Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for Evaluation:
Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below.
Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bound.
Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate.

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WORKSHOP

Course Code: OPT2533 **Credit Units: 01**

Course Objective:
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The participants are expected to explore the topic in advance and take active part in the discussions held
Attending and Participating in all activities of the workshop
Group Activities have to be undertaken by students as guided by the department .
Evaluation of workshop activities would be done through test and quiz at the end of the workshop.
Submitting a write up of atleast 500 words about the learning outcome from the workshop.

Methodology:
The methodology followed at the workshop could be based on any one or more of the following methods:
Case Presentation
Hands on training
Simulation
Group Activity
Role Play
Quiz

Evaluation Scheme:

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total
10	30	30	30	100

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CONTACT LENS-II

Course Code: OPT2601 **Credit Units: 04**

Course Objectives: Upon completion of the course, the student should be able to:

- Review the basics of contact lenses
- List the important properties of contact lenses
- Finalise the CL design for various kinds patients
- Recognize various types of fitting
- Explain all the procedures to patient
- Identify and manage the adverse effects of contact lens

Course Contents:

Module-I: Prefitting examination

Review of Basics; Patient Selection; Pre screening for contact lens wear; Slit Lamp examination; Assessment of Cornea; Assessment of Tear film

Module-II: Contact lens fitting

Soft contact lens fitting; Soft Toric Contact Lens fitting; Rigid Contact lens fitting; Managing the Presbyope

Module-III: Extended wear contact lens

Cornea and Oxygen; Extended Wear and Silicone Hydrogel Lenses

Module-IV: Contact lens care

Contact lens After Care; Contact lens Care System

Module-V: Speciality contact lens

Therapeutic and Prosthetic contact lenses; Overview of Special considerations for fitting contact lenses; Business Aspects of Contact lens practice; Setting up a Contact lens clinics

Assignment: The student should consult all the manufacturers of RGP lenses and soft lenses and list down various products (Lenses, care products and accessories) available with them. Detailed parameters along with manufacturer recommendation should be noted. Also students will be encouraged to read books and journals and submit a report to the faculty. The topics of the same can be decided by the faculty.

Practical

Pre fitting evaluation; SCL insertion & Removal; Fitting assessment; Over refraction; Follow-up Examination; Toric contact lens fitting and assessment; Cosmetic contact lens fitting and assessment; Do's and don'ts for contact lenses; Care and maintenance; Special instructions for silicone hydrogels; Demonstration for bifocal ,multifocal lenses, scleral lenses, Orthokeratology; Patient communication workshop / role plays; Visit to contact lens manufacturing unit, Case Presentations (components of Practical exam); Video preparations (components of Practical exam)

Examination Scheme:

Components	A	HA	CT	P	EE
Weightage	5	5	10	10	70

(CT-Class Test; HA- Home Assignment; P-Practical; A- Attendance; EE-End Semester

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Examination)

Text & References:

- IACLE modules 1 – 10
- Essential Contact Lens practice : Jane Veys, John Meyler , Ian Davies
- CLAO Volumes 1, 2, 3
- Anthony J. Phillips : Contact Lenses, 5th edition, Butterworth-Heinemann, 2006
- Elisabeth A. W. Millis: Medical Contact Lens Practice, Butterworth-Heinemann, 2004
- E S. Bennett ,V A Henry :Clinical manual of Contact Lenses, 3rd edition, Lippincott Williams and Wilkins, 2008
- Contact lens Primer : Monica Chaudhry : Jaypee Brothers

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BINOCULAR VISION-II

Course Code: OPT2602 **Credit Units: 04**

Course Objective: The objective of this course is to inculcate the student with the knowledge of different types of strabismus its etiology signs and symptoms, necessary investigations and also management. The student on completion of the course should be able to independently investigate and diagnose case of strabismus with comments in respect to retinal correspondence and binocular single vision. The student should be able to perform all the investigations to check retinal correspondence, state of Binocular Single Vision, angle of deviation and special investigations for paralytic strabismus.

Course Contents:

Module-I:
Strabismus - Definition, Classification and etiology; Development of squint or ocular deviation; Adaptation to development of ocular deviation; Orthoptic instruments and their uses; Methods of examination

Module-II:
Anomalous Retinal Correspondence (ARC); Suppression; Amblyopia and eccentric fixation; Definition & Classification; Investigations; Management

Module-III:
Latent Strabismus (Heterophoria); Esotropia; Accommodative esotropia; Partially accommodative esotropia; Non accommodative esotropia; Microtropia; Recurrent esotropia; Secondary esotropia; Management of esotropia; esotropia associated with vertical deviation; Exotropia; Classification and etiology; Primary exodeviation; Dissociated exodeviation; Secondary exodeviation; Cyclo - Vertical Deviation; Comitant hyper deviation; Dissociated vertical deviation; Dissociated horizontal deviation; Elevation in adduction; Depression in adduction; Cyclodeviation

Module-IV:
A and V pattern; Paralytic Strabismus; Genetics and occurrence of squint and binocular vision problems; Special Forms of Strabismus; Retraction syndrome (Duane syndrome); Brown syndrome; Adherence syndrome; Strabismus fixus; Strabismus in high myopes; Fibrosis of extra ocular muscles; Graves' Endocrine ophthalmopathy; Acute orbital myositis; Cyclic heterotropia; Acquired motor fusion deficiency; Fracture of orbital floor; Fracture of medial orbital floor; Ocular Myasthenia gravis; Chronic progressive external ophthalmoplegia (Ocular myopathy of Von Graefe)

Module-V:
Nystagmus; Principle of non surgical treatment; Optical treatment; Pharmacological treatment; Orthoptics; Chemodenervation of extra ocular muscles – Botulinum Toxin; Principle of surgical treatment; Vision Training Programme (VTP)

Practicals:
History taking –Role play; Cover test; ocular motility demonstration and hands on various orthoptic instruments and procedures; Case discussion different types of strabismus; Visit to clinic and record cases

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Examination Scheme:

Components	A	HA	CT	P	EE
Weightage	5	5	10	10	70

(CT-Class Test; HA- Home Assignment; P-Practical; A- Attendance; EE-End Semester Examination)

Text & References:

- Pradeep Sharma: Strabismus simplified, New Delhi, First edition, 1999, Modern publishers.
- Fiona J. Rowe: Clinical Orthoptics, second edition, 2004, Blackwell Science Ltd
- Gunter K. Von Noorden: BURIAN- VON NOORDEN'S Binocular vision and ocular motility theory and management of strabismus, Missouri, Second edition, 1980, C. V. Mosby Company
- Mitchell Scheiman; Bruce Wick: Clinical Management of Binocular Vision Heterophoric, Accommodative, and Eye Movement Disorders, 2008, Lippincot Williams & Wilkins publishers

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CLINIC-V

Course Code: OPT2605 **Credit Units: 03**

Course Contents:

Module-I
Unit of competency: Contact lens II
The ability to select and fit the most appropriate lens for the planned use
The ability to Identify and manage after care
The ability to understand the techniques used in fitting complex contact lenses and advises patients requiring complex visual corrections.

Module-II
Unit of competency: Pediatric and geriatric optometry:

Pediatric:
Assess ocular health and systemic health conditions.
Identify risk factor of systemic diseases based on ocular findings.
Assess VA, ocular motility, pupil, Objective and subjective refraction.
Pediatric prescribing decision and their purpose. E.g. early onset myopia
investigation and management of children presenting with anomalies of binocular vision.

Geriatric:
Evaluate the functional status of the eye, vision system and account special demands and needs.
Assess ocular health and systemic health conditions.
Detect and diagnose ocular abnormalities and disease
Counsel and educate the patients regarding their visual, ocularand related systemic health care status including recommendations for treatment, management and future care.

Module-III:
Unit of competency: Squint Evaluation:
The ability to assess binocular status using objective and subjective tests
The ability to investigate and manage a patient presenting with heterophoria or heterotropia.
The ability to manage a patient presenting with an incomitant deviations
Demonstration of following Orthoptic instruments/methods and their uses –
Orthoptic Investigative & Therapeutic Procedure.
Cover and uncover test: Differentiate from phoria and tropia.
Measurement of angle of deviation: Subjectively (Synoptophore) and objectively (PBCT/ Modified Krimsky)

Module-IV: Vision Therapy:
The ability to understand different eye exercise procedure
Restoration of vision and maintain ocular alignments by means of different eye exercise

Module-V: Comprehensive eye examination

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Evaluation Scheme:

Attendance	Record file	Written test	Viva	Practical	Total
5	15	30	30	20	100

Text book/ Reference Book

- Grosvenor, Primary Care Optometry , Butterworth-Heinemann,
- A K Khurana: Comprehensive Ophthalmology, 4th edition, New age international (p) Ltd. Publishers, New Delhi, 2007
- D B. Elliott :Clinical Procedures in Primary Eye Care,3rd edition, Butterworth-Heinemann, 2007
- BHVI modules

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VISUAL REHABILITATION

Course Code: OPT2606 **Credit Units: 03**

Course Objective:
Its aim is develop skills for those who want to work in a professional setting assisting adult populations who are blind/visually impaired and integrate compensatory skills and assistive technology that will enable them to live safe, productive, and independent lives.

Competencies acquired

Specific areas of instruction learned by Vision Rehabilitation Therapists will include:
Communication Systems (Braille, handwriting, recording skills, use of electronic reading systems, use of assistive technology and computer access technology, etc.).
Personal Management (grooming, hygiene, clothing organization, medical measurement, socialization skills, etc.)
Home Management (organization and labeling, repair and home maintenance, budgeting and record keeping, etc.)
Activities of Daily Living (cooking, cleaning, shopping, safety, money organization and management, etc.)
Leisure and Recreation (hobbies, woodworking, crafts, sports, etc.)
Psychosocial Aspects of Blindness and Vision Loss
Medical Management (assessment and instruction and training of adaptive medical equipment)
Basic Orientation and Mobility Skills (sighted guide, safety techniques, etc.)

Evaluation Scheme:

Attendance	Record file	Multiple Choice Questions/ Quiz	Viva	Practical skills /performance	Total
5	15	25	15	40	100

Text & References:

As per the clinical supervisor

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VISION THERAPY AND LEARNING DISABILITIES

Course Code: OPT2607 **Credit Units: 03**

Course Objective: Its aim is develop skills for those who want to work as a professional Vision therapist --The course on learning disabilities, vision therapy is specifically directed toward resolving visual problems which interfere with reading, learning and educational instruction.

Competencies acquired

Overview of Normal Child Development
The Relationship between Vision and Learning General Issues
Visual Efficiency Problems
Management of Visual Information Processing Problems
Vision Therapy Procedures for Developmental Visual Information Processing Problems
Interdisciplinary Management of Learning Problems Case Studies
The Role of the Optometrist in the Management of Learning Related Vision Problems
Optometric Assessment Case History
Optometric Assessment Visual Efficiency Problems
Optometric Assessment Visual Information Processing Problems
Various techniques used in management of anomalies

Evaluation Scheme:

Attendance	Record file	Multiple Choice Questions/ Quiz	Viva	Practical skills /performance	Total
5	15	25	15	40	100

Text & References:

- Optometric Management of Learning-related Vision Problems: Mitchell Scheiman, Michael W. Rouse
- Understanding and Managing Vision Deficits: A Guide for Occupational Therapists Mitchell Scheiman

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EYE BANKING

Course Code: OPT2608 **Credit Units: 03**

Course Objective:
To familiarise the students with various methods of eye banking and the various procedures involved in tissue preservation, transport and storage.

Course Contents:

Module-I: Quality Assurance and Control
EB Medical Standards
EB Standardized Procedures
Sterilization
Refrigeration and Temperature Recording
Instrument Inspection, Cleaning, and Handling
Quality Assurance Monitoring
Record Keeping and Documentation
Professional Standards
Adverse Reaction Reports
Consent Informed Consent Procedures and Documentation
Donor History, Screening, and Evaluation
Determination of Suitability
Donation
Transplant
Legislation and Regulatory Requirements

Module-II: Tissue Related Procedures
Preservation of Tissue
Procedures and Methods
Preservation Media
Transport and Storage of Tissue
Packaging and Labeling
Documentation Requirements
Distribution of Tissue
Storage
Examination and Evaluation of Tissue
Slit Lamp Biomicroscopy
Specular Microscopy
Other
Surgical Procedures
Penetrating Keratoplasty
Lamellar Keratoplasty
Epikeratoplasty
Patch Graft

Module-III: Technical Procedures
Whole Eye Enucleations
Preparation
Equipment and Instrumentation

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Procedure
Corneal Excisions
Preparation
Equipment and Instrumentation
Procedure

Evaluation Scheme:

Attendance	Record file	Multiple Choice Questions/ Quiz	Viva	Practical skills /performance	Total
5	15	25	15	40	100

Text & References:

- Essentials of Eye Banking : by A. Panda
- Eye Banking : T. Bredehorn, Gernot Duncker, W. John Armitage
- Postgraduate Ophthalmology, Volume 1Zia Chaudhuri, MurugesanVanathi
- As per the clinical supervisor

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PROJECT

Course code: OPT2632 **Credit Units: 03**

Objectives:
The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Chapter Scheme and distribution of marks:
Chapter 1: Introduction – 10 marks
Chapter 2: Conceptual Framework/ National/International Scenario – 25 marks
Chapter 3: Presentation, Analysis & Findings -- 25 marks
Chapter 4: Conclusion & Recommendations -- 10 marks
Chapter 5: Bibliography -- 05 marks

Project Report	Power Point Presentation & Viva
75 marks	25 marks

Components of a Project Report
The outcome of Project Work is the Project Report. A project report should have the following components:
1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.
2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.
3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.
4) Abstract: The body of the report should have summary of the project.
a) Introduction: This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, inclusion & exclusion criteria and method of analysis), Limitations of the Study, and Planning.
b) Conceptual Framework / National and International Scenario: (relating to the topic of the Project).
c) Presentation of Data, Analysis and Findings
d) Conclusion and Recommendations: In this section, the concluding observations based on the main findings and suggestions are to be provided.
5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.
6) Annexure: Questionnaires (if any), relevant reports, etc.
(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

The Steps of a Project Report
Step I: Selection of the topic for the project by taking following points into consideration:
Suitability of the topic.
Relevance of the topic
Time available at the disposal.
Feasibility of data collection within the given time limit.

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Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)
Step II: Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.
Step III: Collection of information and data relating to the topic and analysis of the same.
Step IV: Writing the report dividing it into suitable chapters, viz.,
Chapter 1: Introduction,
Chapter 2: Methodology,
Chapter 3: Analysis & Findings
Chapter 4: Conclusion and Recommendations.
Step V: The following documents are to be attached with the Final Project Report.
1) Approval letter from the supervisor (Annexure-IA)
2) Student's declaration (Annexure-IB)
3) Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for Evaluation:
Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below.
Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bound.
Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate.

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(CLINIC-VI A – INTERNSHIP)
RETINA, GLAUCOMA, LOW VISION

Course Code: OPT2701 **Credit Units: 03**

Course Objectives:
At the end of the course, the student will be knowledgeable in the following:
Examination diagnose and manage various conditions of retina
Examine, Diagnose and manage various conditions of glaucoma
Examine manage patients with low vision
Prescribe and train patient for use of low vision devices

Course Contents:

Module-I: Retina and Vitreous: student should be learning following
Assess pupil reactions
Interpret and investigate the presenting symptoms of the patient.
Examine fundus using direct and indirect techniques
Identify external pathology and offer appropriate advice to patients not needing referral,
Understand of risk factors for common ocular conditions.
Recognise common ocular abnormalities and to refer when appropriate.
Develop a management plan for the investigation of the patient
Manage a patient presenting with reduced vision.
Manage a patient presenting with macular degeneration
Recognize, evaluate and manage diabetic eye disease and refer accordingly.
Evaluate and manage a patient presenting with symptoms suggestive of retinal detachment.
An understanding of the treatment of a range of common retinal diseases.
Recognise ocular manifestations of systemic disease.
Assess symptoms and signs of neurological significance.
Manage patients presenting with sight- threatening eye disease.
Recognise adverse ocular reactions to medication.
Help ophthalmologist in performing Retinal LASERS
Perform and analyse Fluorescein angiography
Perform and interpret test results of OCT

Module-II: Glaucoma
The ability to perform an examination of the eye and related structures use instruments in ocular examination and to understand the implications of the findings in terms of subsequent examination techniques. Use a contact tonometer to measure intraocular pressure and analyse and interpret the results of Tonometry-ApplanationSchiotz
Amsler grid
Assess visual fields of patients with reduced visual acuity.
Interpret and investigate the presenting symptoms of the patient.
Understanding of risk factors for Glaucoma
Investigate visual fields and to analyse and interpret the results.
Visual fields- confrontations, automated, tangent screen, bernels perimeter
Manage a patient presenting with a red eye.
Manage a patient presenting with reduced vision.
Evaluate glaucoma risk factors, to detect glaucoma and refer accordingly.
Understanding of the role of optometrists in shared care

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Recognise adverse ocular reactions to medication.
Management : common medications, laser intervention and surgical techniques
Glaucoma investigations and procedures
GTX,HRT,
Provocative test
OCT

Module-III: Low Vision
Clinical examination of Low vision subjects
Optical, Non-Optical, Electronic, and Assistive devices.
Training for Low Vision subjects with Low vision devices
Deciding management plan for Referrals and follow-up
Visual rehabilitation

Examination Scheme

Component	Attendance	Performance	Log book	Practical skills	Viva	Total
Max marks	05	25	20	30	20	100

Text books:
- A K Khurana: Comprehensive Ophthalmology, 4th edition, new age international (p) Ltd. Publishers, New Delhi, 2007
- Christine Dickinson: Low Vision: Principles and Practice Low vision care, 4th edition, Butterworth-Heinemann, 1998

Reference Books:
- Stephen J. Miller : Parsons Diseases of the Eye, 18th edition, Churchill Livingstone, 1990
- Jack J. Kanski Clinical Ophthalmology: A Systematic Approach, 6th edition, Butterworth - Heinemann, 2007
- Richard L. Brilliant: Essentials of Low Vision Practice, Butterworth-Heinemann, 1999

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(CLINIC-VI B) PEDIATRIC & BINOCULAR VISION

Course Code: OPT2702 **Credit Units: 03**

Course Objective:
To inculcate in a student the
Ability to take an appropriate binocular vision history
Ability to assess eye alignment and eye movements.
Ability to assess sensory fusion and stereopsis.
Ability to assess oculomotor function.
Ability to assess accommodation.

Also to make the student able
To develop an appropriate timetable for eye and vision examinations for pediatric patients
To select appropriate examination procedures for all pediatric patients
To examine the eye health and visual status of pediatric patients effectively
To minimize or avoid the adverse effects of eye and vision problems in children through early identification, education, treatment, and prevention
To inform and educate patients, parents/caregivers, and other health care providers about the importance and frequency of pediatric eye and vision examinations

Evaluation:
Evaluation will be based on the following competencies:
Assesses binocular status using objective and subjective means.
Understands the management of patients with an anomaly of binocular vision.
Investigates and manages adult patients presenting with heterophoria
Manages adult patients with heterotropia.
Manages children at risk of developing an anomaly of binocular vision.
Manages children presenting with an anomaly of binocular vision.
Manages patients presenting with an in commitant deviation.

Examination Scheme:

Component	Attendance	Performance	Log book	Practical skills	Viva	Total
Max marks	05	25	20	30	20	100

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(CLINIC-VI C) CORNEA & CONTACT LENS

Course Code: OPT2703 **Credit Units: 03**

Course Objectives: At the end of the course the student will be able to:

- Examine the anterior segment of the eye with the help of advanced diagnostic instrument.
- Access the ocular health and clinical decision making of types of contact lens is appropriate
- Instruct a patient in the techniques of soft & RGP lens insertion, removal and other relevant handling instructions and Instruct a patient on the principles of lens wear and care including lens care products.

Course Contents:

Module-I: Examination of anterior segment:
Anatomy & physiology of the anterior segment
Corneal topography: Measurement and significance
Keratometry: interpretation of keratometry result.
Slit lamp bio microscopy procedure
Tear function test
Corneal staining
Corneal sensation test
Specular microscopy: interpretation of test result

Module-II: RGP lens
Pre-fitting evaluation
Nomenclature and lens design
RGP contact lens fitting
Correction of astigmatism with rigid lens
Market availability of different types of RGP contact lens and lens material

Module-III: Soft contact lens
Nomenclature, design, Material properties and manufacturing techniques.
Soft contact lens fitting
Disposable, extended wear and frequent replacement soft contact lens
Correction of astigmatism with soft contact lens
Silicon hydrogel lens
Market availability of different types of soft CL and

Module-IV: Speciality contact lens
Presbyopic lenses
Rose k Lenses
Scleral lenses
Lenses for irregular cornea
Orthokeratology
Myopia control lenses .
Contact lens fitting in high myopia and hyperopia.

Module-V: Care & Maintenance
Preservation and disinfection
Contact lens cleaning and disinfection

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Post fitting care of RGP and soft lenses
Write appropriate order form for RGP and soft lenses
CL practice management

Examination Scheme:

Components	Attd.	Case Presentation	Log book	Viva /CT	EE Practical
Weightage (%)	5	10	15	30	40

Text book:

- IACLE modules
- Essential Contact Lens practice : Jane Veys, John Meyler , Ian Davies
- Contact lens Primer : Monica Chaudhry : Jaypee Brothers
- CLAO Volumes 1, 2, 3
- Anthony J. Phillips : Contact Lenses, 5th edition, Butterworth-Heinemann, 2006
- Elisabeth A. W. Millis: Medical Contact Lens Practice, Butterworth-Heinemann, 2004
- E S. Bennett ,V A Henry :Clinical manual of Contact Lenses, 3rd edition, Lippincott Williams and Wilkins, 2008

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(CLINIC-VI D) PRIMARY EYE CARE

Course Code: OPT2704 **Credit Units: 03**

Objectives:

- It is expected that upon completion the student will be able to carry out the standard clinical procedures safely and efficient
- Upon completion of the course the student must be able to achieve these skills

Module-I: Take down a comprehensive history –
Must be able to take a structured, accurate history of symptoms from patients with a range of ophthalmic problems and needs
Must be able to produce comprehensive, legible and organized record keeping

Module-II: Do a complete and proper refraction
Visual acuity estimation
Must be able to measure and assess visual function of patients of any age with appropriate tests and techniques like
Lensometry
Retinoscopy
Refraction procedures
Must be able to use subjective and objective techniques to identify and quantify ametropia

Module-III: Do a torch light examination.
Hirschberg test

Module-IV: Do a binocular vision assessment
Ocular motility, cover test
Must be able to assess eye alignment and eye movements
Near point of accommodation, Near point of convergence
Do a detailed binocular vision assessment if required in particular cases

Module-V: Use a slit lamp to do a complete anterior segment examination and posterior segment as required
Must be able to examine for abnormalities in eye and adnexa especially eyelid, conjunctiva, cornea, anterior chamber, lens and fundus using appropriate instruments and techniques
Must be able to interpret signs and symptoms of ocular abnormality
Must be able to perform applanation tonometry and non contact tonometry
Must be able to take the decision to dilate the eye as per need
Must be able take the decision to use appropriate ocular drugs diagnostically and to aid refraction and fundus examination in consultation with the ophthalmologist.

Module-VI: Must be able to give a preliminary diagnosis
During management the student must be able to advice on the most suitable form of optical correction

Examination Scheme:

Components	A	Case Discussion	Log book	Viva /CT	EE Practical
Weightage (%)	5	10	10	25	50

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SUMMER INTERNSHIP EVALUATION-II

Course Code: OPT2735 **Credit Units: 06**

Course Objectives:

The basic objective of a Summer Internship is to refine the practical exposure .This summer training will provide an opportunity to the students to apply their theoretical understanding while working on the concerned project in the hospital / corporate. Thus this summer internship programme is an attempt to bridge the gap between theory and practice. This will also enhance the students' intellectual ability and attributes related to data handling, decision making, report writing, oral presentation and imbibing an interdisciplinary approach.

General Guidelines:

Every student of Boptom shall be required to undergo a practical training in a organization approved by the Institute for minimum of four weeks, normally in the Summer Vacation, after the end of the fourth semester examinations. The candidates shall be required to undergo training in the various areas of the organization concerned. The organization may assign a specific tasks to the candidate, which will be completed by him/her during the period of training. The work done by the candidate during the training period shall be submitted in form of a training report.

The last date for the receipt of training report AND CASE SHEETS in the department shall be one month after the date of completion of training, i.e. at the beginning of the next semester.

Evaluation Scheme:

Attendance	Overall Performance: grading by centre	Viva	Attendance	LOG book Report	Total
5	30	30	10	30	100

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RESEARCH PROJECT (MID TERM EVALUATION)

Objectives: Midterm review of the final year project will be done this semester .The student is required to submit the following during this semester end
Chapter Scheme and distribution of marks:
Chapter 1: Introduction
Chapter 2: Literature review
Chapter 3 : methodology
Chapter 4 : data and its analysis
Pre conclusion and results

Project Report	Viva
75 marks	25 marks

Components of a Project Report
The outcome of Project Work is the Project Report. A project report should have the following components:
1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.
2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.
3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.
4) Abstract: The body of the report should have summary of the project.
a) Introduction: This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, inclusion & exclusion criteria and method of analysis), Limitations of the Study, and Planning.
b) Conceptual Framework / National and International Scenario: (relating to the topic of the Project).
c) Presentation of Data, Analysis and Findings
d) Conclusion and Recommendations: In this section, the concluding observations based on the main findings and suggestions are to be provided.
5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.
6) Annexure: Questionnaires (if any), relevant reports, etc.
(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

The Steps of a Project Report
Step I: Selection of the topic for the project by taking following points into consideration:
Suitability of the topic.
Relevance of the topic
Time available at the disposal.
Feasibility of data collection within the given time limit.
Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

Step II: Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.
Step III: Collection of information and data relating to the topic and analysis of the same.
Step IV: Writing the report dividing it into suitable chapters, viz.,

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Chapter 1: Introduction,
Chapter 2: Methodology,
Chapter 3: Analysis & Findings
Chapter 4: Conclusion and Recommendations.
Step V: The following documents are to be attached with the Final Project Report.
1) Approval letter from the supervisor (Annexure-IA)
2) Student's declaration (Annexure-IB)
3) Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for Evaluation:
Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below.
Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bound.

Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.

Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate.

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INTERNSHIP-II
(CLINIC-VII) COMPREHENSIVE EYE CARE & REFRACTION

Course Code: OPT2801 **Credit Units: 05**

Objectives: It is expected that upon completion the student will be able to carry out the standard clinical procedures especially refraction efficiently and safely.

Course Contents:
Upon completion of the course the student must be able to

Module-I: Take down a comprehensive history –
Must be able to communicate effectively with the patient, taking into account his/her physical, emotional, intellectual and cultural background – building a rapport
Must be able to take a structured, efficient, accurate history and symptoms from patients with a range of ophthalmic problems and needs
Must be able to produce comprehensive, legible and organised record keeping with appropriate detail and grading
Must be able to interpret and respond appropriately to patient records and other relevant information

Module-II: Do a complete and proper refraction
Visual acuity estimation.
Must be able to measure visual function of patients of any age with appropriate tests and techniques
Must be able to assess visual function in patients with visual impairment
Lensometry
Retinoscopy
Refraction procedures
Must be able to use subjective and objective techniques to identify and quantify ametropia

Module-III: Do a torch light examination.
Hirschberg test

Module-IV: Do a binocular vision assessment
Ocular motility, cover test
Must be able to assess eye alignment and eye movements
Near point of accommodation, Near point of convergence

Module-V: Do a detailed binocular vision assessment if required in particular cases as per the format given in binocular vision syllabus

Module-VI: Do a pupil evaluation with torch light

Module-VII: Use a slit lamp to do a complete anterior segment examination and posterior segment as required
Must be able to examine for abnormalities in eye and adnexa especially eyelid, conjunctiva, cornea, anterior chamber, lens and fundus using appropriate instruments and techniques
Must be able to interpret signs and symptoms of ocular abnormality
Must be able to perform applanation tonometry and non contact tonometry
8. Must be able to take the decision to dilate the eye as per need
Must be able take the decision to use appropriate ocular drugs diagnostically and to aid

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refraction and fundus examination.
Must be able to give a preliminary diagnosis
During management the student must be able to advice on, order and be able to dispense the most suitable form of optical correction taking into account durability, comfort, cosmetic appearance, age and lifestyle.

Evaluation Scheme:

Attendance	Record file Log book	Case discussion-I	Case discussion-II	EE Practical	Total
10	20	20	20	30	100

The final evaluation is based on the Clinical skill evaluation practical exam the candidate will be asked to examine a patient with all details. This examination will primarily measures skills, it contains an assessment, management and communication skills, as well as some interpretation of clinical findings.
The study centre will form an integral part of the evaluation and will be based on the regular performance and participation in grand rounds .discussions and presentations.

Text book/ Reference Book

- Grosvenor, Primary Care Optometry , Butterworth-Heinemann,
- A K Khurana: Comprehensive Ophthalmology, 4th edition, New age international (p) Ltd. Publishers, New Delhi, 2007
- D B. Elliott :Clinical Procedures in Primary Eye Care,3rd edition, Butterworth-Heinemann, 2007
- BHVI modules

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(CLINIC-VII) OPTOMETRIC PROCEDURES & INSTRUMENTS

Course Code: OPT2802 **Credit Units: 05**

Course Objective:
This course deals with complete theory and practical experience in all basic tests, instrumentation and procedures necessary to evaluate the ocular health status of a patient. The topics include complete optometric procedures and instruments taught in the previous semesters like case history, gross external examination of the eye and adnexa, pupil and muscle functions, anterior and posterior segment examination, tonometry, visual acuity, and visual fields assessment and so on .

The objective of this course is to apply all theoretical knowledge into examination and optometric management of the patient with ocular problems.
The student should learn to operate all instruments and be able to carry out all ophthalmic procedures.

Evaluation Scheme:
The final evaluation is based on the Clinical skill evaluation practical exam the candidate will be asked to examine a patient with all details. This examination will primarily measures skills, it contains an assessment, management and communication skills, as well as some interpretation of clinical findings.
It will be assessing the competence of individual optometrists in the practice of optometry

Evaluation Scheme:

Attendance	Record file Log book	Practical	Written test	Viva	Total
10	20	30	30	20	100

The study centre will form an integral part of the evaluation and will be based on the regular performance and participation in grand rounds .discussions and presentations.

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PROJECT-DISSERTATION

Course Code: OPT2837 **Credit Units: 12**

The project evaluation will include assessment at the end of third year (synopsis submission). Midterm review (at the end of 7th semester)
Weightage will be as follows
Synopsis submission = 20% (end of sixth semester)
Mid-Term review = 30 % (end of seventh semester)
Final submission and presentation = 50%

Chapter Scheme and distribution of marks: (submission at end semester)
Chapter 1: Introduction – 10 marks
Chapter 2: Conceptual Framework and literature review – 25 marks
Chapter 3: Presentation, Analysis & Findings -- 25 marks
Chapter 4: Conclusion & Recommendations -- 10 marks
Chapter 5: Bibliography -- 05 marks

Project Report	Power Point Presentation & Viva
75 marks	25 marks

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INTEGRATIVE SEMINAR DURING THE INTERNSHIP

It serves to teach optometry students how the material in the curriculum relates to their role as optometrist. This will be achieved through a synthesis of lecture, clinical observation, case-based learning and small-group discussion. Once a week, the entire class will attend a one-hour lecture with topics reflective of the ongoing course material being presented in other courses. For two additional hours per week, small seminar group observation and discussion will take place. The seminar meetings will reinforce the lecture concepts through clinical observation and case discussions relating to those observations. Lecture and small-group discussions will include the participation of both basic and clinical science faculty in order to promote integration of the curricular material and to show how the care provided is related to what is currently being learned. This will enable the future clinician to make informed clinical decisions, encourage critical thinking and promote lifelong independent learning.

INTEGRATIVE SEMINAR

Is designed to facilitate the student's transition into clinical internship by using an integrative approach. The course builds upon past Integrative Seminars, providing the student with an environment leading to the development of informed clinical decision making, critical thinking and lifelong independent learning. The student gains a foundation for optometric practice by learning to employ scientific knowledge, utilization of informational resources, doctor-patient interactive skills and clinic participation to form the basis of an individualized patient evaluation, assessment and plan. This will be achieved through a synthesis of group teaching, case-based learning, small-group discussion and clinical experience. Group discussions will include the participation of both basic and clinical science faculty to foster integration of curricular material. As a means of entry into clinical practice, the highest standards of professional conduct and responsibility will be emphasized throughout the course.

The interns are required to complete one quarter of senior seminar.

The seminar meets over four hours each week to provide a small group-learning environment focused on clinical case presentations derived from the participants' clinical experience.

This grand-rounds format will provide a basis for integration and critical analysis of current clinical research with the goal of increasing the participants' understanding, use and communication of evidence-based clinical information.

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Amity Medical School

Bachelor of Audiology & Speech Language Pathology

FLEXILEARN
-Freedom to design your degree



Curriculum & Scheme of Examination

2023

AMITY UNIVERSITY HARYANA

GURUGRAM

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ANATOMY AND PHYSIOLOGY OF SPEECH AND HEARING

Course Code: ASL2107 **Credit Units: 05**

Course Objectives: After completing this course, the student will be able to understand the

- anatomy of the auditory system
- anatomy of the speech mechanism
- physiology of hearing mechanism
- functioning of speech and swallowing mechanism

Course Contents:

Module-I: Introduction

a) General anatomical terms
b) Anatomical positions and planes of reference
c) Cells, tissues and muscles
d) Muscle connection and joints
e) Tissue - vascular and neural

Module-II: Embryology

a) Basic terminologies related to embryology
b) Development of external ear
c) Development of middle ear
d) Development of Inner ear and the auditory system
e) Five examples of embryonic anomalies affecting speech-language & hearing
f) Development of respiratory structures
g) Development of larynx
h) Development of facial region and palate
i) Development of tongue and teeth

Module-III: Anatomy and physiology of speech production systems and swallowing

a) Mechanisms of breathing with emphasis on speech breathing
b) Supportive frame work of larynx
c) Anatomy of larynx
d) Anatomy of oesophagus
e) Brief mechanisms of swallowing
f) Mechanisms of phonation
g) Anatomy of articulators and associated structures
h) Contribution of articulatory structures to speech production
i) Anatomy of resonatory mechanisms
j) Contribution of resonatory mechanisms to speech production

Module-IV: Anatomy and physiology of external and middle ear

a) Anatomy of the external ear
b) Physiology of external ear including localization
c) Head shadow effect, inter-aural intensity and time differences
d) Brief anatomy of temporal bone
e) Anatomy of tympanic membrane and associate structures
f) Anatomy of middle ear and ossicles
g) Anatomy of Eustachian tube and middle ear muscles

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h) Physiology of Eustachian tube
i) Middle ear transformer action
j) Physiology of middle ear muscles

Module-V: Anatomy and physiology of labyrinth

a) Anatomy of bony and membranous labyrinth
b) Macro anatomy of cochlea
c) Micro anatomy of cochlea
d) Innervations and blood supply to cochlea
e) Overview of theories of hearing
f) Physiology of cochlea
g) Electrical potentials of the cochlea
h) Physiology of hearing through bone conduction
i) Overview to physiology of balancing mechanisms
j) Overview to anatomy of central auditory pathway
k) Overview to central auditory mechanism

Examination Scheme:

Components	CRW	PTB	CT	A	EE
Weightage (%)	5	5	15	5	70

CRW- Clinical record writing, PTB- Proficiency in using test batteries, CT- Class test, A- Attendance, EE- End semester examination

Recommended Reading

- Seikel, J. A., King, D. W., & Drumright, D. G. (2010). Anatomy & Physiology for Speech, Language, and Hearing (4th edition). Delmar, Ceenage Learning, Division of Thomson Learning. NY.
- Zemlin, W. R. (2010). Speech and Hearing Science: Anatomy and Physiology: International Edition (4 edition.). Boston: Pearson.
- Chaurasia, B.D (2004). Human Anatomy, vol 3. Head Neck and Brain 4 th Eds, CBS Publishers and Distributors, New Delhi. ISBN 81-239-1157-2.
- Kelley, M., Wu, D., & Fay, R. R. (Eds.). (2005). Development of the Inner Ear (2005 edition.). New York: Springer.

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CLINICAL PSYCHOLOGY

Course Code: ASL2108 **Credit Units: 05**

Course Objectives: After completing this course, the student will be able to understand the

- scope of clinical psychology and its significance for speech and hearing
- concept of normality, abnormality and classification of abnormal behavior
- cognitive, motor, emotional and social development
- theories of learning and therapy techniques based on learning principles
- neuropsychological assessment and rehabilitation
- application of neuropsychology in the field of speech and hearing
- basics of counselling

Course Contents:

Module-I: Introduction to psychology

a) Introduction to psychology: definition, history and schools of psychology
b) Scope of psychology
c) Meaning and definition of clinical psychology
d) Historical development, modern clinical psychology
e) Significance of clinical psychology in health sciences
f) Role of clinical psychology in speech and hearing
g) Concept of normality
h) Concept of abnormality
i) Models of mental disorders: biological, psychological social models

Module-II: Assessment procedures in clinical psychology

a) Methods in clinical psychology: case history, clinical interviewing, clinical observation, definition and types of psychological testing
b) Assessment of cognitive functions
c) Adaptive functions,
d) Personality
e) Behavioural assessment
f) Classification of abnormal behavior
g) History, need & rationale of classification
h) Current classificatory system: DSM, ICD

Module-III: Developmental psychology

a) Child and developmental psychology: meaning, definition and scope
b) Meaning of growth, development & maturation
c) Principles of child development
d) Motor development: general principals of motor development
e) Stages in motor development: early motor development, motor development during later childhood and adolescence, decline with age
f) Cognitive development: growth from early childhood to adolescence
g) Piaget's theory of cognitive development
h) Emotional development
i) Social development

Module-IV: Principles of learning and behaviour modification

a) Learning: meaning, definition and characteristics

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b) Theories of learning: introduction
c) Pavlov's classical conditioning: experiments and principles
d) Skinner's operant conditioning: experiments and principles
e) Therapeutic techniques based on learning principles
f) Skill behavior techniques
g) Problem behavior techniques

Module-V: Neuropsychology and its relevance to study of speech

a) Neuropsychology: introduction and definition
b) Neuropsychological assessment
c) Neuropsychological rehabilitation
d) Application of neuropsychology in the field of speech and hearing
e) Counselling: introduction and definition
f) Types of counselling: directive and non- directive
g) Characteristics of a good counsellor

Examination Scheme:

Components	**CRW**	**PTB**	**CT**	**A**	**EE**
Weightage (%)	5	5	15	5	70

CRW- Clinical record writing, PTB- Proficiency in using test batteries, CT- Class test, A- Attendance, EE- End semester examination

Recommended Reading

- Morgon C.T., King R.A., Robinson N.M. Introduction to Psychology. Tata McGraw Hill Publishing Co.
- Anastasi, A. (1999). Psychological testing, London: Freeman
- Baura, M (2004). Human Development and Psychlogy, Rehabiliation Council of India, New Delhi. ISBN: 81-7391-868-6
- Coleman J.C. Abnormal Psychology and Modern Life, Taraporevala Sons & Co.
- Gregory, R.J. (2000). Neuropsychological and geriatric assessment in Psychological Testing: History, Principles, and Applications (3rd ed.). New York: Allyn & Bacon.
- Hurlock, E.B. (1981). Child development. (VI Ed.). Mc Graw Hill International Book Co.
- Kline, P. (1993). The Handbook of Psychological Testing. Routledge
- Lezak, M., Loring, D.W., and Hannay, H.J. (2004). Neuropsychological Assessment. Fourth Edition. New York: Oxford University Press
- Siegal M.G. (Ed). (1987). Psychological Testing from Early Childhood Through Adolescence. International Universities Press.

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LINGUISTICS AND PHONETICS

Course Code: ASL2109 **Credit Units: 05**

Course Objectives: After completing this course, the student will be able to understand

- different branches and aspects of linguistics
- characteristics and functions of language
- different branches of phonetics, applied linguistics, and phonology
- morphology, syntax, semantics, pragmatics
- acquisition of language and factors affecting it
- bi/multilingualism and related issues

Course Contents:

Module-I: Linguistics

a) Introduction to linguistics and different branches of linguistics: applied linguistics, sociolinguistics, psycholinguistics, metalinguistics, neurolinguistics and clinical linguistics
b) Language characteristics and functions, difference between animal communication systems and human language
c) Morphology – concepts of morph, allomorph, morpheme, bound free and compound forms, roots etc.
d) Processes of word formation, content and function words
e) Endocentric and exocentric constructions, form classes, grammatical categories
f) Inflection and derivation, paradigmatic and syntagmatic relationship
g) Principles and practices of morphemic analysis
h) Langue versus parole
i) Competence vs. performance

Module-II: Phonetics and Phonology

a) Introduction to phonetics
b) Articulatory, acoustic, auditory and experimental phonetics – an introduction
c) Articulatory classification of sounds – segmental and supra-segmental
d) Classification description and recognition of vowels and consonants
e) Pathological aspects of speech sound production
f) Transcription systems with special emphasis on IPA. Transcription of samples of normal and disordered speech
g) Introduction to phonology, classification of speech sounds on the basis of distinctive features and phonotactics
h) Application of distinctive feature theory to speech pathology and speech therapy, phonotactics, phonotactic patterns of English and Indian languages
i) Phonemic analysis – Principles and practices; their practical implications for speech pathologists
j) Common phonological processes - assimilation, dissimilation, metathesis, haplology, epenthesis, spoonerism, vowel harmony, nasalization, neutralization

Module-III: Morphology, syntax, semantics and applied linguistics

a) Morphology – concepts of morph, allomorph, morpheme, roots, compound forms - endocentric and exocentric constructions, free and bound morphemes, inflection and derivation, principles and practices of morphemic analysis
b) Syntax – different methods of syntactic analysis
c) IC analysis, phrase structure, grammar, transformational generative grammar
d) Introduction to the major types of transformations

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e) Sentence types, notions about competence versus performance
f) Deep structure versus surface structure
g) Acceptability versus grammaticality language versus parole etc.
h) A brief introduction to semantics – semantic feature theory, pragmatics
i) Processes of word formation, content and function words, form classes, grammatical categories
j) Syntax – concepts of phrases and clauses, sentence and its types
k) Different methods of syntactic analysis – Immediate constituent analysis, Phrase structure, grammar, transformational generative grammar– deep structure versus surface structure, acceptability versus grammaticality; Introduction to the major types of transformations
l) Usefulness of morphemic and syntactic analysis in planning speech and language therapy
m) A brief introduction to semantics, semantic relations, semantic feature theory
n) A brief introduction to pragmatics and discourse.

Module-IV: Language acquisition

a) Issues in first language acquisition
b) Pre-linguistic stages, linguistic stages
c) Acquisition of phonology, morphology, syntax, semantics, and pragmatics
d) Language and cognition
e) A brief introduction to theories and models of language acquisition
f) Biological maturation theory, linguistic theory, behavioral theory, information processing theory, social interaction theory
g) An integrated approach to theories communicative competence and its development
h) Applied linguistics with special reference to communication disorders
i) Usefulness of morphemic and syntactic analysis in planning speech and language therapy

Module-V: Bi/multilingualism

a) Introduction to the language families of the world and India
b) Issues related to second language acquisition & factors influencing it
c) Inter-language theory, language transfer and linguistic interference
d) Differences between first and second language acquisition/learning
e) Bilingualism/Multilingualism
f) Metaphonology
g) Writing systems – types of writing
h) History of writing systems
i) Indian writing systems

Examination Scheme:

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- Ball & Martin (1995). Phonetics for speech pathology. Delhi: AITBS Publishes, India.
- Ball, Rahilly&Tench (1996). The phonetic transcription of disordered speech. San Diego: Singular Publishing Group Inc.
- Clark and Yallop (1999). An introduction to phonetics and phonology. Oxford: Blackwell Publishes Inc.
- Karanth, P (2003). Cross-Linguistic study of Acquired Reading Disorders. Sage Publications, New Delhi. ISBN : 0-306-48319-X
- Ladefoged, P. (1982). A course in phonetics. New York: Harcourt Brace Jovanorich Inc.
- Shriberg & Kent (1982). Clinical phonetics. New York: John Wiley

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& Sons.

ELECTRONICS AND ACOUSTICS

Course Code: ASL2110 **Credit Units: 05**

Course Objectives: After completing this course, the student will be able to understand the

- concept and types of power supply for biomedical instruments
- basic aspects of digital signal processing
- theoretical basis of acoustics required for audiologists
- functioning of computers and computing systems

Course Contents:

Module-I: Electronic components and power supply

a) Resistors, capacitors, inductors
b) Transformers and potentiometers,
c) Semiconductor diodes and transistors
d) Light emitting devices, seven segment displays, Liquid crystal displays
e) Principles of operations and working of Field Effect Transistors, Uni-junction transistors and thyristors
f) Introduction to linear and digital integrated circuits
g) Block diagram of a DC power supply
h) Linear regulated power supplies, line regulation and load regulation, specifications of a DC power supply unit, Switched Mode Power Supply
i) AC power supply, stabilizers, Uninterrupted Power Supply, and inverters
j) Basic electronic concepts such as Polarity, Grounding

Module-II: Introduction to acoustics

a) Vibrations and their characteristics
b) Sound - generation and propagation
c) Characteristics of sound
d) Amplitude, frequency and phase of pure tones
e) Amplitude, frequency and phase of complex tones (FFT and spectrum, relationship between time waveform, FFT and impulse response)
f) Reflection and absorption, acoustic impedance, reverberation
g) Impedance and admittance
h) Electro-mechano-acoustic transformers

Module-III: Acoustical treatment, transducers and basics of computers

a) Introduction to audiometric rooms
b) Absorption coefficient, Sabine's formula
c) Materials for construction of audiometric rooms
d) Lighting, grounding and other miscellaneous issues related to audiometric rooms
e) Evaluation of efficiency of sound proofing in the audiometric rooms
f) Amplifiers
g) Microphones, loudspeakers - types and function
h) Fundamentals of digital electronics, binary number system, Hex code, bit, byte, logic gates, counters, flip-flops etc.
i) Introduction to computers
j) Operating systems, hard ware, software, memory devices and other peripherals, care and preventive maintenance of computers

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Module-IV: Digital signal processing

a) Digital signal processing –introduction and need
b) Analog to digital converters, sampling and quantization
c) Fundamentals of digital filtering
d) Infinite impulse response and finite impulse response filters
e) Time domain methods of speech processing
f) Frequency domain methods of speech processing
g) Linear predictive analysis of speech signals
h) Digital coding of speech signals
i) Automatic speech recognition
j) Speech synthesis

Module-V: Instrumentation in speech and hearing

a) Introduction to electronic instrumentation in speech and hearing
b) Electrodes, filters and preamplifiers
c) Principle of operations, block diagram, calibration, maintenance and troubleshooting of audiometers, immittance meters, oto-acoustic emissions, hearing aids, evoked potential system, speech and voice analyses systems, artificial larynx, electroglottograph

Examination Scheme:

Components	CRW	PTB	CT	A	EE
Weightage (%)	5	5	15	5	70

CRW- Clinical record writing, PTB- Proficiency in using test batteries, CT- Class test, A- Attendance, EE- End semester examination

Recommended Reading

- Haughton, P., & Haughton, P. M. (2002). Acoustics for Audiologists (1st edition.). San Diego, Calif: Emerald Group Publishing Limited.
- Moser, P. (2015). Electronics and Instrumentation for Audiologists. Psychology Press.
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- Speaks, C. E. (1999). Introduction To Sound: Acoustics for the Hearing and Speech Sciences (3 edition.). San Diego: Cengage Learning.
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RESEARCH METHODS AND STATISTICS

Course Code: ASL2111 **Credit Units: 05**

Course Objectives: After completing this course, the student will be able to understand the

- basic concept of research in the field of audiology and speech-language pathology
- design and execution of research
- ethical guidelines for conducting research

Course Contents:
Part-A: Research Methods

Module-I: Introduction to research methods

a) Meaning and purpose of research: meaning
b) Need for research in audiology and speech-language pathology
c) Funds/grants for research
d) Steps in research: identification, selection
e) Formulation of research questions: aims, objectives, statement of problem, hypothesis
f) Types of variables; types of sampling procedures (random and non-random);
g) Types/ methods of data collection and their advantages and disadvantages
h) Reliability and validity (internal and external validity)

Module-II: Research design in audiology and speech-language pathology

a) Types of research: survey, ex-post facto research, normative research, standard-group comparison
b) Experimental and quasi experimental research: group design & single subject design
c) Internal and external validity of research
d) Between groups vs. repeated measures design
e) Documentation of research: scientific report writing, different formats or styles (APA, AMA and MLA),
f) Ethics of research

Part-B: Statistics

Module-III: Introduction to statistics and data collection

a) Application of statistics in the field of Audiology and speech-language pathology.
b) Scales of measurement: nominal, ordinal, interval, ratio
c) Classification of data: class intervals, continuous and discrete measurement
d) Normal distribution: general properties of normal distribution, theory of probability, area under normal probability curve
e) Variants from the normal distribution: skewness and kurtosis
f) Measure of central tendency: mean, median, mode
g) Measures of variability: range, deviation (average and standard deviation), variance

Module-IV: Statistics and research designs

a) Choosing statistics for different research designs
b) Correlational techniques: Pearson's Product Moment Correlation Coefficient; Spearman's Rank order correlation coefficient
c) Statistical inference: concept of standard error and its use; the significance of statistical measures; testing the significance of difference between two means z-test, t-test; analysis of variance, post hoc tests,

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d) Non-parametric tests: Chi-square test, Wilcoxon test, Mann-Whitney U test,
e) Reliability and validity of test scores: reliability and validity, Item analysis
f) Analysis of qualitative data
g) Software for statistical analysis

Module-V: Epidemiology

a) Basic epidemiologic concepts and principles
b) Epidemiologic data sources and measurements
c) Epidemiologic methods – questionnaire survey, screening, personal survey, testing
d) Media - their advantages and disadvantages
e) Incidence and prevalence of hearing, speech, language disorders as per different census (NSSO, WHO)

Examination Scheme:

Components	CRW	PTB	CT	A	EE
Weightage (%)	5	5	15	5	70

CRW- Clinical record writing, PTB- Proficiency in using test batteries, CT- Class test, A- Attendance, EE- End semester examination

Recommended Reading

- Dane F. C. (2011). Sampling and Measurement. In Evaluating research: Methodology for people who need to read research. New Delhi: SAGE publication.
- Field, A. (n.d.). Discovering Statistics Using IBM SPSS (4th ed.). SAGE Publications.
- Hegde M. N. (2010). A course book on Scientific and professional writing for speech language pathology (4thEdition), Singapore: Delmar publication.
- Hegde, M. N. (2003). Clinical research in communicative disorders: Principles and strategies. (3rd Edition), Austin: Pro-ed
- Hesse-Biber, S. N. &Leavy, P. (2011). The Ethics of social research. In The Practice of qualitative research. (2nd Edition), New Delhi: SAGE publication.
- Jekel, F. J., Katz, L.D., & Elmore, G.J (2001). Basic Epidemiologic Concepts and Principles in epidemiology, Biostatistics, and Preventive Medicine (2nd Edition). Pennsylvian: Saunders
- Meline, T. (2010). A research primer for communication sciences and disorders. Singapore: Pearson publication.

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SPEECH-LANGUAGE PATHOLOGY

Course Code: ASL2208 **Credit Units: 05**

Course Objectives: After completing this course, the student will be able to understand the

- different speech and language disorders
- basic concepts and tools required for diagnosing speech and language disorders
- basics of assessment procedures for speech and language disorders
- basic principles and intervention procedures for speech and language disorders
- clinical requirements to practice,
- different laws, social-cultural and ethical issues
- identification and prevention of speech and language disorders
- basic principles of providing counselling and guidance to clients and caregivers

Course Contents:

Module-I: Basic concepts and methods of diagnostics

a) Introduction to Speech Language Disorders
b) Definition and descriptions of delay, deviancy and disorders; impairment, disability and handicap
c) Incidence and prevalence of speech and language disorders
d) Causes of speech and language disorders
e) Basic principles in assessment, evaluation and appraisal
f) Tools for diagnosis- case history, interview, self-reports, questionnaire & observations
g) Diagnostic models – SLPM, Wepman, Bloom and Lahey
h) Types of diagnoses – Clinical diagnosis, direct diagnosis, differential diagnosis, diagnosis by treatment, diagnosis by exclusion, team diagnosis, instrumental diagnosis, provocative diagnosis, tentative diagnosis advantage/disadvantages
i) Characteristics of a diagnostic clinician
j) Organization and basic requirements for clinical set up and team approach
k) DSM, ICD classification and ICF

Module-II: Basic concepts and methods of therapeutics

a) Basic concepts and terminologies in speech therapeutics
b) General principles of speech and language therapy
c) Speech therapy set-up
d) Individual and group therapy
e) Procedures and types of for speech-language therapy
f) Approaches to speech and language therapy – formal, informal and eclectic approaches
g) Planning for speech and language therapy – goals, steps, procedures and activities
h) Importance of reinforcement principles and strategies in speech and language therapy, types and schedules of rewards and punishment
i) Individual and group therapy
j) AAC and other nonverbal methods of therapy

Module-III: Overview of basic assessment and management of speech disorders

a) Causes of speech disorders
b) Overview of assessment procedures for voice disorders; articulation and phonological disorders; and fluency disorders
c) Overview of management procedures for voice disorders; articulation and phonological disorders; and fluency disorders
d) Early identification and prevention of speech disorders

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e) Basic concepts in assessment and management of swallowing disorders

Module-IV: Overview of basic assessment and management of language disorders

a) Types, characteristics and classification of language disorders
b) Causes of language disorders
c) Overview of assessment procedures for child language disorders; adult language disorders; and neurogenic language disorders
d) Overview of management procedures for child language disorders; adult language disorders; and neurogenic language disorders
e) Early identification and prevention of language disorders
f) Issues related to bi- /multilingualism

Module-V: Other issues in practice as a speech - language pathologist

a) Professional code of conduct – social, cultural and other ethical issues
b) Scope of practice –different set ups and prerequisites
c) Documentation of diagnostic, therapeutic and referral reports
d) Counselling, guidance, facilitation of parent participation and transfer of skills
e) Evaluation of therapy outcome and follow up
f) Evidence based practice
g) Community based rehabilitation
h) Role of itinerant speech therapist, Anganwadis, resource teachers etc.
i) PWD act, National Trust, Consumer protection Act, noise pollution Act and other public laws, RCI, ISHA and other organizations controlling the field
j) Facilities and concessions available for speech and hearing disabled

Examination Scheme:

Components	CRW	PTB	CT	A	EE
Weightage (%)	5	5	15	5	70

CRW- Clinical record writing, PTB- Proficiency in using test batteries, CT- Class test, A- Attendance, EE- End semester examination

Recommended Reading

- Owens. Jr, Kimberly, A. Metz, F.E. (2014). 5th Ed. Introduction to Communication Disorders: A life span based Perspective. Pearson Communication Science and Disorders Series.
- Hegde, M. N., & Davis, D. (2005). Clinical methods and practicum in speech-language pathology (4th ed.). Australia; Clifton Park, NY: Thomson Delmar Learning.
- Shipley, K. G., & Roseberry-McKibbin, C. (2006). Interviewing and counselling in communicative disorders : Principles and procedures (3rd ed.). Austin, Tex: Pro-Ed.
- Brookshire, R. H. (2003). Introduction to neurogenic communication disorders (6th ed.). St. Louis, Mo: Mosby.
- Hulit, L.M., Marle. R., Kathleen, R. H., & Fowey (2010). Born to Talk. Pearson Communication Science and Disorders Series 5th Ed.
- Roth, F. P., & Worthington, C. K. (2005). Treatment resource manual for speech language pathology (3rd ed.). Australia; Clifton Park, NY: Thomson Delmar Learning.
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AUDIOLOGY

Course Code: ASL2209 **Credit Units: 05**

Course Objectives: After completing this course, the student will be able to

- understand and carryout experiments to measure differential sensitivity loudness and pitch
- take case history, administer the tuning fork tests and interpret the results
- administer pure tone audiometry including masking on clinical population and appreciate the theoretical back ground of it
- carryout different tests involved in speech audiometry appreciate the theoretical back ground
- carryout subjective calibration and daily listening checks of the audiometer
- get adequate theoretical information necessary to understand concepts involved in objective calibration

Course Contents:

Module-I: Differential sensitivity

a) Concept of differential sensitivity, just noticeable difference
b) Weber's fraction
c) Intensity discrimination
d) Frequency discrimination
e) Duration discrimination and temporal resolution
f) Applications of jnd's
g) Magnitude estimation and production
h) Loudness – equal loudness level contours and its application
i) Loudness scales - sone, phone, Steven's power law
j) Pitch- scales of pitch

Module-II: Case history and tuning fork tests

a) Need for case history
b) Basics of history taking
c) Essential factors to be included in case history for adults
d) Essential factors to be included in case history for children
e) Interpretation of case history
f) Audiological evaluation – rationale and purpose
g) Principles, procedure, interpretation, advantages and disadvantages of Rinne and Schwabach tuning fork test
h) Principles, procedure, interpretation, advantages and disadvantages of Weber and Bing tuning fork test
i) Audiometric version of Weber and Bing test

Module-III: Pure tone audiometry

a) Classification of audiometers, Parts of an audiometer, characteristics and specifications of transducers used (earphones, bone vibrators, loud speakers)
b) Audiogram- concept and symbols used
c) Clinical method of threshold estimation
d) Factors affecting air conduction threshold
e) Bone conduction thresholds- measurements, factors effecting
f) Permissible noise levels in the audiometric room

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Module-IV: Speech audiometry

a) Importance and purpose
b) Different types of stimuli used in speech audiometry
c) Concept of phonetically and phonemically balanced
d) Speech detection thresholds – procedure and application
e) Speech reception thresholds – procedures and application
f) Word recognition scores –procedure and applications
g) PIPB function – procedure and applications
h) Factors affecting speech audiometry
i) BC speech audiometry – procedure and its application
j) Test materials available in various languages

Module-V: Clinical masking and instrumental calibration

a) Definition and different terminologies
b) Purpose and rationale of clinical masking
c) Different types of stimulus employed in clinical masking
d) Interaural attenuation and factors affecting interaural attenuation
e) When to mask and how much to mask – importance of adequate noise levels
f) Different procedures for masking
g) Masking for speech audiometry
h) Calibration definition and purpose
i) Daily listening checks and subjective calibration
j) Objective calibration of air conduction transducers
k) Objective calibration of bone conduction transducers
l) Frequency calibration

Examination Scheme:

Components	CRW	PTB	CT	A	EE
Weightage (%)	5	5	15	5	70

CRW- Clinical record writing, PTB- Proficiency in using test batteries, CT- Class test, A- Attendance, EE- End semester examination

Recommended Reading

- Durrant, J. D., &Feth, L. L. (2012). Hearing Sciences: A Foundational Approach (1 edition.). Boston: Pearson.
- Emanuel, D. C., &Letowski, T. (2008). Hearing Science (1 edition.). Philadelphia: Lippincott Williams and Wilkins.
- Gelfand, S. A. (2009). Hearing: An Introduction to Psychological and Physiological Acoustics (5 edition.). London: CRC Press.
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- Katz, J. (2014). Handbook of Clinical Audiology (7th International edition edition.). Lippincott Williams and Wilkins.
- Martin, F. N., & Clark, J. G. (2014). Introduction to Audiology. Boston: Pearson.
- Silman, S., & Silverman, C. A. (1997). Auditory Diagnosis: Principles and Applications (Reissue edition.). San Diego: Singular Publishing Group

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PRACTICALS IN SPEECH-LANGUAGE PATHOLOGY

Course Code: ASL2210 **Credit Units: 07**

Practicals

a) Demonstrate normal aspects of speech and analyse perceptually variations in voice, articulation and fluency in different recorded speech samples of typical individuals at different age groups (children, adults and older adults) and sex.
b) Demonstrate normal aspects of language and analyse perceptually variations in language in different recorded samples of typical individuals at different age groups (children, adults and older adults) and sex.
c) Demonstrate stress, rhythm and intonation and variations in rate of speech and analyse perceptually variations in prosody in different recorded samples of typical individuals at different age groups (children, adults and older adults) and sex.
d) Use IPA to transcribe spoken words.
e) Record a standard passage, count number of syllables and words, identify syllable structure, syntactic structures in the passage.
f) Oral mechanism examination on 5 normal children and 5 normal adults.
g) Prepare a chart and show the developmental stages of speech and language behavior.
h) Administer standardized tests for assessment of delayed speech and language development such as REEL, SECS, LAT, 3DLAT, ALD each on any 2 children.
i) Study the available normative data (Indian/Western) of speech such as respiratory, phonatory, resonatory and articulatory parameters.
j) Measure the following in 5 normal subjects: (a) Habitual frequency (b) Frequency range (c) Intensity (d) Intensity range (e) Phonation duration (f) rate of speech (g) Alternate Motion Rates and Sequential Motion Rates (h) s/z ratio.
k) Study the available normative data (Indian/Western) of language such as phonology, semantics, syntax, morphology and pragmatic measures.
l) Perceptual analysis of speech and language parameters in normal (2 children and 2 adults and persons with speech disorders (3 adults + 3 children).
m) Prepare a model diagnostic report of a patient with speech and language disorder.
n) Prepare a diagnostic and therapy kit.
o) Make a list of speech language stimulation techniques and other therapy techniques for various speech disorders.
p) Familiarize with the sources for referral and parent counseling procedures.
q) Prepare a report on the available audiovisual material and printed material/pamphlets relating to speech-language pathology, public education of communication and hearing disorders, etc.
r) Prepare a report on the available clinical facilities and clinical activities of the institute.

Clinical Practicum

a) Observe the evaluation process and counselling of at least 5 different speech and language disorders in children.
b) Observe the evaluation process and counselling of at least 5 different speech and language disorders in adults.
c) Take case history of a minimum of 10 individuals (5 normal & 5 clients with complaints of speech-language problems).
d) Observation of diagnostic procedures.

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e) Observe various therapeutic methods carried out with children and adults with speech and language disorders.

Examination scheme:

Components	CRW	C/P/A	CT	A	Viva
Weightage (%)	15	15	15	5	50

CRW- Clinical record writing, C/P/A- Case discussion/presentation/analysis, CT- Class test, A- Attendance, Viva- Internal/External

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PRACTICALS IN AUDIOLOGY

Course Code: ASL2211 **Credit Units: 07**

Practicals

Calculate/derive the answers for following

a) Calculate the relative intensities with different reference intensities.
b) Calculate decibels when sound intensities are doubled, increased by 4 times
c) Add decibels when two sounds with different intensities are produced simultaneously
d) Collect pictures of audiometers that existed between 1920 and 1990.

Perform the following experiments

a) Calculate reference equivalent sound pressure levels (RETSPL) for head phones and bone vibrator for any two frequencies using 30 participants.
b) Measure most comfortable level on 10 participants with normal hearing sensitivity.
c) Measure uncomfortable levels on 10 participants with normal hearing sensitivity.
d) Calculate the sensation levels of MCL and UCLs in above 10 participants.
e) Measure difference limen of intensity, frequency and duration on 10 normal hearing adults and plot it in graphical form and interpret the results.
f) Measure equal loudness level contours at minimum level, 40 dB SPL, 70 dB SPL (1 kHz) in 5 normal hearing adults.
g) Measure sone and mel in 5 normal hearing adults using scaling techniques.
h) Take case history on 5 adults and 5 children with hearing problem and correlate the information from case history to results of pure tone audiometry.
i) Administer different tuning fork tests on 5 simulated conductive and 5 sensori neural hearing loss individuals.
j) Carry out pure tone and speech audiometry on 10 normal hearing individuals.
k) Carry out clinical masking on 10 normal hearing individuals with simulated conductive hearing loss and carry out clinical masking on 5 individuals with conductive hearing loss and 5 individuals with sensori-neural hearing loss.
l) Carryout daily listening checks and subjective calibrations 20 times and observe objective calibration once
m) Perform otoscopy and draw the tympanic membrane of 10 healthy normal individuals
n) Measure difference limen of intensity, frequency and duration on 10 normal hearing adults and plot it in graphical form and interpret the results
o) Measure equal loudness level contours at minimum level, 40 dB SPL, 70 dB SPL (1 kHz) in 5 normal hearing adults
p) Measure sone and mel in 5 normal hearing adults using scaling techniques
q) Take case history on 5 adults and 5 children with hearing problem and correlate the information from case history to results of pure tone audiometry
r) Administer different tuning fork tests on 5 simulated conductive and 5 sensori neural hearing loss individuals
s) Carry out pure tone and speech audiometry on 10 normal hearing individuals.
t) Carry out clinical masking on 10 normal hearing individuals with simulated conductive hearing loss and carry out clinical masking on 5 individuals with conductive hearing loss and 5 individuals with sensori-neural hearing loss
u) Carryout daily listening checks and subjective calibration 20 times and observe objective calibration once

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Clinical Practicum

a) Observe case history being taken on 5 adults and 5 children with hearing problem and correlate the information from case history to results of pure tone audiometry.
b) Administer different tuning fork tests on 5 conductive and 5 sensori neural hearing loss individuals.
c) Observe the pure tone audiometry being carried out on 30 clients.
d) Plot the audiogram, calculate the pure tone average and write the provisional diagnosis of observed clients.
e) Perform otoscopy (under supervision) on at least 1 client with following conditions: Tympanic membrane perforation, SOM, CSOM

Examination scheme:

Components	CRW	C/P/A	CT	A	Viva
Weightage (%)	15	15	15	5	50

CRW- Clinical record writing, C/P/A- Case discussion/presentation/analysis, CT- Class test, A- Attendance, Viva- Internal/External

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VOICE AND ITS DISORDERS

Course Code: ASL2307 **Credit Units: 05**

Course Objectives: After completing this course, the student will be able to

- describe characteristics of normal voice and identify voice disorders
- explain etiology related to voice problems, and its pathophysiology
- assess voice disorders
- provide counselling and therapy to individuals with voice disorders

Course Contents:

Module-I: Basic concepts in voice and its production

a) Definition and functions of voice – biological and non-biological
b) Parameters of voice
c) Structures and function of respiratory system for the purpose of phonation
d) Laryngeal anatomy – Structural support of larynx, muscles, vocal fold microstructure, blood supply, and innervations
e) Vocal tract resonance and voice quality
f) Development of voice: Birth to senescence; structural and voice related changes
g) Aerodynamic myo-elastic theory of voice production
h) Voice mechanics – Physiologic, acoustic and aerodynamic correlates of voice
i) Pitch and loudness changing mechanism, voice registers and voice quality
j) Description of normal and abnormal voice: Parametric, pathologic/perceptual, social

Module-II: Characteristics and pathophysiology of voice disorders

a) Pathologies of the laryngeal mechanism: classification of voice disorders, incidence, and prevalence
b) Etiology of voice disorders: voice misuse and abuse, medical related etiologies, primary disorder etiologies and personality related etiologies
c) Pathologies of vocal fold cover (infective and trauma related secondary conditions) and muscular dysfunction
d) Non-organic voice disorders: functional disorders, psychosomatic- functional aphonia and physiological- voice abuse, puberphonia)
e) Congenital voice disorders
f) Neurological voice disorders
g) Voice problems in systemic illnesses and endocrine disorders
h) Voice problems in transgenders
i) Voice problems in the elderly
j) Voice problems in professional voice users: teachers and singers

Module-III: Assessment of voice

a) Referral sources, medical examination and team approach
b) Protocol for voice assessment: components and philosophies (ICF, ICD)
c) Clinical voice laboratory: principles of instrumental measurements – electrical error, electrical safety, hygiene safety; recording of data; storage; patented softwares, free wares
d) Perceptual evaluation of voice: GRBAS, CAPE -V
e) Visualization procedures- indirect laryngoscopy, video laryngoscopy & stroboscopy
f) Acoustic analysis of voice: F0 related measures, intensity related measures, quality related measures, phonetogram, DSI
g) Electroglottography and inverse filtering procedures
h) Aerodynamic analysis of voice: static & dynamic measures

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i) Self-evaluation of voice : PROM, VHI, V-DOP
j) Reporting of voice findings, normative comparisons, differential diagnosis

Module-IV: Management of voice

a) Voice therapy orientation: basic principles, goal setting and approaches
b) Vocal hygiene and preventive counselling
c) Symptomatic voice therapy – voice facilitation techniques
d) Psychological approaches to voice therapy – psychoanalysis, rational emotive therapy and cognitive behavior therapy
e) Physiological approach – breathing and postural techniques
f) Holistic voice therapy approaches -1: accent therapy, confidential voice therapy,
g) Holistic voice therapy approaches - 2: vocal function exercises, resonant voice therapy, Lee Silverman voice therapy
h) Medical and surgical procedures in the treatment of benign vocal fold lesions: pharmaceutical effects on voice, phono surgery : re-innervation techniques, laryngeal framework surgeries, micro laryngeal excision
i) Professional voice care

Module-V: Intervention strategies for voice disorders

a) Vocal trauma related disorders
b) Functional voice disorders – inappropriate vocal components
c) Functional aphonia
d) Puberphonia/mutational falsetto
e) Muscle tension dysphonia
f) Sulcus vocalis
g) Vocal fold palsy
h) Spasmodic dysphonia
i) GERD/LPR
j) Benign vocal fold lesions requiring surgical intervention
k) Post-operative care for benign vocal fold lesions disorders
l) Documenting voice therapy outcomes

Practicals

a) Record phonation and speaking samples (counting numbers) from five children, adult men, adult women, geriatric men and geriatric women. Note recording parameters and differences in material.
b) Make inferences on age and sex differences across the samples obtained in the previous experiment using perceptual voice profiling. Make a note of differences in pitch, loudness, quality and voice control. Explain how voice reflects ones personality and other social needs.
c) Perform an acoustic voice analysis on phonation sample and generate a voice report based on acoustic findings. Compare findings between men & women.
d) Perform MPT and s/z ratio. Infer differences across age and sex.
e) Perform spirometry or any other appropriate aerodynamic procedure. Infer differences across age and sex.
f) Perform acoustic analysis on five abnormal voice samples.
g) Observe and document findings from five laryngeal examinations (pre-recorded or live) such as VLS, stroboscopy or any other relevant.
h) Administer a PROM on five individuals.
i) Prepare a vocal hygiene checklist.
j) Demonstrate therapy techniques such as vocal function exercise,

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resonant voice therapy, digital manipulation, push pull, relaxation exercises.

Examination Scheme:

Components	CRW	PTB	CT	A	EE
Weightage (%)	5	5	15	5	70

CRW- Clinical record writing, PTB- Proficiency in using test batteries, CT- Class test, A- Attendance, EE- End semester examination

Recommended Reading

- Stemple, J. C., Glaze, L. E., & Gerdeman, B, K. (2014). Clinical voice pathology: Theory & Management (5th Ed.). San Diego: Plural publishers.
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SPEECH SOUND DISORDERS

Course Code: ASL2308 **Credit Units: 05**

Course Objectives: After completing this course, the student will be able to

- describe normal speech sound development and characterization of individuals with speech sound disorders.
- perform phonological analysis and assessment of speech sound disorders.
- plan intervention for individuals with speech sound disorders.

Course Contents:

Module-I: Speech sound acquisition and development

a) Fundamentals of articulatory phonetics - phonetic description of vowels & consonants.
b) Phonology & phonological theories – generative phonology, natural phonology.
c) Phonology & phonological theories – non-linear phonology, optimality theory.
d) Methods to study speech sound acquisition – diary studies, cross sectional studies and longitudinal studies.
e) Speech sound acquisition
   i. birth to one year (development of infant speech perception, early speech production).
   ii. one to two years (consonant inventories, influence of phonological knowledge on vocabulary acquisition).
   iii. two to five years (growth of phonetic, phonemic, phonotactic inventory – consonants, clusters, phonological patterns).
   iv. above five years (speech sound mastery and development of literacy – phonological awareness).
   v. Factors influencing speech sound acquisition
f) Acoustics of speech sounds
g) Speech intelligibility, factors affecting speech intelligibility, assessment of speech intelligibility
h) Co articulation: types and effects
i) Phonological development in bilingual children.
j) Phonological development in Indian languages.

Module-II: Assessment of speech sound disorders - I

a) Current concepts in terminology and classification of speech sound disorders
   i. Organically-based speech sound disorders, childhood apraxia of speech.
   ii. Speech sound disorders of unknown origin, classification by symptomatology.
b) Factors related to speech sound disorders
   i. structure and function of speech & hearing and oro-sensory mechanisms.
   ii. cognitive – linguistic, psychosocial and social factors.
   iii. metalinguistic factors related to speech sound disorders.
c) Introduction to assessment procedures: aims of assessment, screening and comprehensive assessment.
d) Speech sound sampling procedures - issues related to single word and connected speech samples; imitation and spontaneous speech samples, contextual testing, recording of speech samples.
e) Review of tests in English and other Indian languages - Single word articulation tests, deep articulation of articulation, and computerized tests of phonology.
f) Influence of language and dialectal variations in assessment.

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g) Transcription of speech sample - transcription methods –IPA and extension of IPA; broad and narrow transcription.

Module-III: Assessment of speech sound disorders - II

a) Introduction to independent and relational analysis.
b) Independent analyses – phonetic inventory, phonemic inventory and phonotactic inventory (utility of independent analysis for analysis of speech of young children and children with severe speech sound disorders).
c) Relational analyses – SODA, pattern analysis, (distinctive features, phonological process analysis).
d) Phonological processes analyses - language specific issues, identification and classification of errors.
e) Assessment of oral peripheral mechanism.
f) Speech sound discrimination assessment, phonological contrast testing.
g) Stimulability testing.
h) Determining the need for intervention – speech intelligibility and speech severity assessment.
i) Factors influencing target selection – stimulability, frequency of occurrence, developmental appropriateness, contextual testing, and phonological process analysis.
j) Case study – Documenting the assessment findings and determining the need for intervention.

Module-IV: Management – I

a) Basic considerations in therapy – target selection, basic framework for therapy, goal-attack strategies, organizing therapy sessions, individual vs. group therapy.
b) Treatment continuum – establishment, generalization and maintenance; measuring clinical change.
c) Facilitation of generalization.
d) Maintenance and termination from therapy.
e) Motor-based treatment approaches – Principles of motor learning.
f) Discrimination/ear training and sound contrast training.
g) Establishing production of target sound – imitation, phonetic placement, successive approximation, context utilization.
h) Traditional approach, contextual/sensory-motor approaches.
i) General guidelines for motor-based treatment approaches.
j) Use of technology in articulation correction.

Module-V: Management – II

a) Core vocabulary approach.
b) Introduction to linguistically-based treatment approaches- Distinctive feature therapy.
c) Minimal pair contrasts therapy.
d) Metaphon therapy, Cycles approach.
e) Broad-based language approaches.
f) General guidelines for linguistically-based approaches.
g) Phonological awareness and phonological disorders.
h) Phonological awareness intervention for preschool children.
i) Adapting intervention approaches to individuals from culturally and linguistically diverse backgrounds.
j) Role of family in intervention for speech sound disorders.

Practicals

a) List the vowels and consonants in your primary language and provide phonetic and acoustic descriptions for the speech sounds.
b) Identify the vowels and consonants of your language on the IPA chart and practice the IPA symbols by transcribing 25 words.

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c) Make a list of minimal pairs (pairs of words which differ by only one phoneme) in English.
d) Make a list of minimal pairs in any language other than English.
e) Identify the stages of speech sound acquisition by observations from videos of children from birth to 5 years of age.
f) Record the speech of a two year old typically developing child, transcribe and analyze the speech sample.
g) Record the speech of one typically developing child from 3-5 years of age (include single word and connected speech samples), transcribe the sample, and perform phonological assessment.
h) Analyze transcribed speech samples of typically developing children – practice independent and relational analysis.
i) Practice instructions for phonetic placement of selected sounds.
j) Develop a home plan with activities for any one section of phonological awareness in English and in one Indian language.

Examination Scheme:

Components	CRW	PTB	CT	A	EE
Weightage (%)	5	5	15	5	70

CRW- Clinical record writing, PTB- Proficiency in using test batteries, CT- Class test, A- Attendance, EE- End semester examination

Recommended Reading

- Bernthal, J.E., Bankson, N.W., & Flipsen, P. (2013). Articulation and phonological disorders.(7th Ed.). Boston, MA: Pearson.
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DIAGNOSTIC AUDIOLOGY: BEHAVIOURAL TESTS

Course Code: ASL2309 **Credit Units: 05**

Course Objectives: After completing this course, the student will be able to

- choose individualized test battery for assessing cochlear pathology, retro cochlear pathology, functional hearing loss, CAPD, vestibular dysfunctions, tinnitus and hyperacusis
- independently run the tests and interpret the results to identify the above conditions and also use the information for differential diagnosis
- make adjustments in the test parameters to improve sensitivity and specificity of tests.
- make appropriate diagnosis based on the test results and suggest referrals.

Course Contents:

Module-I: Introduction to diagnostic audiology

a) Characteristics of a diagnostic test, difference between screening and diagnostic test, functions of a diagnostic test in Audiology
b) Need for test battery approach in auditory diagnosis and integration of results of audiological tests, cross-check principle
c) Concept of sensitivity, specificity, true positive, true negative, false positive, false negative, hit rate
d) Definition of behavioural and physiological tests and their characteristics in diagnostic audiology
e) Theories and physiological bases of recruitment
f) Theories and physiological bases of adaptation
g) Clinical indications for cochlear pathology, retro-cochlear pathology, central auditory processing disorders, functional hearing loss, vestibular disorders

Module-II: Tests to identify cochlear and retro cochlear pathology

a) ABLB, MLB and SISI tests
b) Behavioural tests of adaptation
c) Bekesy audiometry
d) Brief tone audiometry
e) PIPB function
f) Glycerol test
g) Test to identify dead regions of cochlea

Module-III: Tests to diagnose functional hearing loss

a) Behavioural and clinical indicators of functional hearing loss
b) Pure tone tests including tone in noise test, Stenger test, BADGE, puretone DAF
c) Speech tests including Lombard test, Stenger test, lip-reading test, Doerfler-Stewert test, Low level PB word test, Yes-No test, DAF test
d) Identification of functional hearing loss in children: Swinging story test, Pulse tone methods

Module-IV: Assessment of central auditory processing

a) Definition, different behavioral processes
b) Behavioral and clinical indicators of central auditory processing disorders
c) Bottle neck and subtlety principles and their implications in
d) Tests to detect central auditory processing disorders
e) Monaural low redundancy tests - filtered speech tests, time compressed speech test, speech-in-noise test, SSI with ICM, other monaural low redundancy tests.
f) Dichotic speech tests – Dichotic digit test, Staggered spondaic word test, Dichotic CV test, SSI with CCM, Competing sentence test, other dichotic speech tests.

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g) Binaural interaction tests – RASP, BFT, MLD, other binaural interaction tests
h) Tests of Temporal processing – pitch pattern test, duration pattern tests, other temporal ordering tests, gap detection test, TMTF
i) Variables influencing the assessment of central auditory processing: Procedural and subject variables
j) Test findings of important tests in subjects with central auditory disorders: brainstem lesion, cortical, CAPD in children.

Module-V: Assessment of persons with vestibular disorder, tinnitus, hyperacusis

a) Introduction to structure and function of vestibular system
b) Vestibular ocular reflex and vestibulo spinal reflex
c) Overview on other systems involved in balance
d) Signs and Symptoms of vestibular disorders
e) Team in the assessment and management of vestibular disorders
f) Behavioral tests to assess vestibular functioning: Fukuda stepping test, tandem gait test, finger nose pointing, Romberg test, Sharpened Romberg test, Dix-Hallpike test, Log-roll test
g) Overview of tinnitus and hyperacusis and tests for assessment
h) Pitch matching, loudness matching, residual inhibition, Feldman masking curves
i) Johnson Hyperacusis Dynamic Range Quotient

Practicals

a) Administer ABLB, MLB and prepare ladder gram (ABLB to be administered by blocking one ear with impression material)
b) Administer classical SISI on 3 individuals and note down the scores
c) Administer tone decay tests (classical and its modifications) and note down the results (at least 3 individuals)
d) Administer Bekesy audiometry
e) Administer Brief tone audiometry
f) Plot PIPB function using standardized lists in any 5 individuals
g) Administer the tests of functional hearing loss (both tone based and speech based) by asking subject to malinger and having a yardstick of loudness.
g) Administer CAPD test battery to assess different processes on 3 individuals and note down the scores
h) Administer Fukuda stepping test, Tandem gait test, Finger nose pointing, Romberg test, Sharpened Romberg test, Dix-Hallpike test, Log-roll test on 5 of the individuals each and note down the observations.
i) Estimate the pitch and loudness of tinnitus in 2 persons with tinnitus (under supervision). Assess the residual inhibition in them.
j) Plot Feldman masking curves for a hypothetical case
k) Administer Johnson Hyperacusis Dynamic Range Quotient on any 2 of the individuals and note down the scores.

Examination Scheme:

Components	CRW	PTB	CT	A	EE
Weightage (%)	5	5	15	5	70

CRW- Clinical record writing, PTB- Proficiency in using test batteries, CT- Class test, A- Attendance, EE- End semester examination

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Recommended Reading

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- Hall, J. W., & Mueller, H. G. (1996). Audiologists' Desk Reference: Diagnostic audiology principles, procedures, and protocols. Cengage Learning.
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AMPLIFICATION DEVICES

Course Code: ASL2310 **Credit Units: 05**

Course Objectives: After completing this course, students will be able to

- assess the candidacy for hearing aids and counsel accordingly
- evaluate the listening needs and select the appropriate hearing aid
- independently program digital hearing aids as per the listening needs of the client
- independently assess the benefit from the hearing aid using subjective and objective methods
- make all types of ear molds
- counsel the parents/care givers at all stages

Course Contents:

Module-I: Types of hearing aids

a) Historical development of hearing aids: development of concept of amplification, development of different types of amplification devices

b) Review of basic elements of hearing aids: Microphone, Amplifier, Receiver/vibrator, Cords, Batteries.

c) Classification and Types of hearing aids
   - Body level, ear level, in the ear, ITC, invisible in the canal, CIC
   - Binaural, pseudo binaural, monaural
   - Programmable, trimmer digital and digital hearing aids
   - Directional hearing aids, modular hearing aids
   - RIC hearing aids
   - Implantable hearing aids
   - Master hearing aids
   - CROS hearing aids

d) Group amplification – hard wired, induction loop, FM, infrared

e) Assistive listening devices – types and selection (Telephones, Television, typing technology)

Module-II: Technological aspects in hearing aids

a) Routing of signals, head shadow/baffle/diffraction effects

b) Output limiting and issues related to them: peak clipping, compression

c) Concept and use of compression in hearing aids: BILL, TILL, PILL, Wide Dynamic Range Compression, Syllabic Compression, Dual Compression

d) Signal processing in hearing aids – BILL, TILL, PILL

e) Signal enhancing technology

f) Noise reduction algorithms

g) Extended low frequency amplification, frequency lowering technology (transposition, compression)

h) Recent advances in hearing aids

Module-III: Electro-acoustic measurements for hearing aids

a) Purpose and Parameters to be considered: OSPL90, SSPL90,HFA SSPL90, Gain, Full on Gain, HFA Full on Gain, Reference test Gain, Basic Frequency Response, Total Harmonic distortion, Intermodulation Distortion, input Output functions, instrumentation, procedure, variables affecting EAM

b) Electro-acoustic measurements, BIS, IEC and ANSI standards

c) Environmental tests.

d) Care, maintenance and troubleshooting of hearing aids

e) Counselling and orienting the hearing aid user (Client and significant others)

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Module-IV: Selection of hearing aids

a) Pre-selection factors; Prescriptive and comparative procedures; Functional gain and insertion gain methods; Use of impedance, OAEs and AEPs audiometry; Hearing aids for conductive hearing loss; Hearing aids for children; Hearing aids for elderly; Selection of non-linear programmable and digital hearing aids
b) Hearing aid programming
c) Methods for assessing hearing aid benefit
d) Real ear insertion measurements for verification of hearing aid benefit: REIG, REUR, REAR, REOR, RESR, REIG, REAG, RECD
e) Acoustic feedback in hearing aids

Module-V: Mechano-acoustic couplers (Ear molds)

a) Different types of molds
b) Procedure for hard molds and soft mold
c) UV curing methods
d) Special modifications in the ear molds: Vents (diagonal and parallel), deep canal molds, short canal, horns, Libby horn, reverse horn, acoustic modifier
e) Effects of mechano-acoustic couplers on the hearing aid output

Practicals

a) Listen to the output of different types and classes of hearing aids (monaural, binaural, analog, digital hearing aids), in different settings
b) Troubleshoot hearing aids: Check the continuity of the receiver cord using multi meter, measure the voltage of different sized batteries using multi meter, Check voltage of batteries different types and sizes
c) Carry out electroacoustic measurements for the body level and ear level hearing aids
d) Program the hearing aid for different configuration and degrees of hearing loss (at least 5 different audiograms) using different prescriptive formulae
e) Program the hearing aid for different listening situations (at least 3 different situations)
f) Vary the compression settings in a digital hearing aid and note down the differences in the output
g) Perform real ear insertion measurements using different hearing aids (body level and ear level, hearing aids of different gains)
h) Compare speech perception through conventional BTE and RIC hearing aids using a rating scale
i) Observe assistive listening devices such as telephone amplifier, vibro-tactile alarms, note down the candidacy and their utility.
j) Administer a questionnaire to assess hearing aid benefit on 2 persons using hearing aids.
k) Carry out a role play activity of counselling a hearing aid user
l) Ear Molds

- Take impression for the ear mold using different techniques, different methods and using different materials
- Make hard mold for any 2 ears
- Make soft mold for any 2 ears
- Make vent in hard molds you made

Examination Scheme:

Components	CRW	PTB	CT	A	EE
Weightage (%)	5	5	15	5	70

CRW- Clinical record writing, PTB- Proficiency in using test batteries, CT- Class test, A- Attendance, EE- End semester examination

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Recommended Reading

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CLINICALS IN SPEECH LANGUAGE PATHOLOGY-I

Course Code: ASL2311 **Credit Units: 07**

General considerations:

- Exposure is primarily aimed to be linked to the theory courses covered in the semester.
- After completion of clinical postings in Speech –language diagnostics, the student will know (concepts), know how (ability to apply), show (demonstrate in a clinical diary/log book based on clinical reports/recordings, etc), and do (perform on patients/ client contacts) the following:

Know:

1. Procedures to obtain a speech language sample for speech & language assessment from children of different age groups such as, pre schoolers, kindergarten, primary school and older age groups.
2. Methods to examine the structures of the oral cavity/organs of speech.
3. The tools to assess language abilities in children (with hearing impairment, specific language impairment & mixed receptive language disorder).
4. Development of speech sounds in vernacular and linguistic nuances of the language.

Know-how:

1. To evaluate speech and language components using informal assessment methods.
2. To administer at least two standard tests for childhood language disorders.
3. To administer at least two standard tests of articulation/ speech sounds.
4. To assess speech intelligibility.

Show:

1. Analysis of language components – Form, content & use – minimum of 2 samples.
2. Analysis of speech sounds at different linguistic levels including phonological processes – minimum of 2 samples.
3. Transcription of speech language samples – minimum of 2 samples.
4. Analyse differences in dialects of the local language.

Do:

1. Case history - minimum of 5 individuals with speech & language disorders.
2. Oral peripheral examination - minimum of 5 individuals.
3. Language evaluation report – minimum of 5.
4. Speech sound evaluation report – minimum of 5.

Evaluation:

- Internal evaluation shall be based on attendance, clinical diary, log book and learning conference.
- External evaluation: Spot test, OSCE, Record, Viva-voce, case work

Examination scheme:

Components	CRW	C/P/A	CT	A	Viva
Weightage (%)	15	15	15	5	50

CRW- Clinical record writing, C/P/A- Case discussion/presentation/analysis, CT- Class test, A-Attendance, Viva- Internal/External

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CLINICALS IN AUDIOLOGY-I

Course Code: ASL2312 **Credit Units: 07**

General considerations:

- Exposure is primarily aimed to be linked to the theory courses covered in the semester, however, not just limited to these areas.
- After completion of clinical postings in auditory diagnostics and auditory rehabilitation, the student will Know (concept), know how (ability to apply), show (demonstrate in a clinical diary/log book), and do (perform on patients/ client contacts) the following:

Know:

1. Methods to calibrate audiometer.
2. Materials commonly employed in speech audiometry.
3. Calculation pure tone average, % of hearing loss, minimum and maximum masking levels.
4. Different types of hearing loss and its common causes

Know-how:

1. To obtain detailed case history from clients or parents/guardians.
2. To carryout commonly used tuning fork tests.
3. To administer pure tone audiometry including appropriate masking techniques on adults using at least techniques
4. To administer tests to find out speech reception threshold, speech identification scores, most comfortable and uncomfortable levels on adults.

Show:

1. Plotting of audiograms with different degree and type with appropriate symbols – 2 audiograms per degree and type
2. Detailed case history taken and its analysis
3. Calculation degree, type and percentage of hearing loss on 5 sample conditions

Do:

1. Case history on at least 5 adults and 3 children with hearing disorders
2. Tuning fork test on at least 2 individuals with conductive and 2 individuals with sensori-neural hearing loss
3. Pure tone audiometry with appropriate masking on 5 individuals with conductive, 5 individuals SN hearing loss and 3 individuals with unilateral/asymmetric hearing loss – 5

Evaluation:

- Internal evaluation shall be based on attendance, clinical diary, log book and learning conference.
- External evaluation: Spot test, OSCE, Record, Viva-voce, case work

Examination scheme:

Components	CRW	C/P/A	CT	A	Viva
Weightage (%)	15	15	15	5	50

CRW- Clinical record writing, C/P/A- Case discussion/presentation/analysis, CT- Class test, A-Attendance, Viva- Internal/External

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MOTOR SPEECH DISORDERS IN CHILDREN

Course Code: ASL2402 **Credit Units: 05**

Course Objectives: After completing this course, the student will be able to

- describe the characteristics of motor speech disorders in children such as cerebral palsy, childhood apraxia of speech and other childhood dysarthrias
- assess the speech and non-speech aspects associated with the above conditions
- plan and execute therapy strategies for children with motor speech disorders

Course Contents:

Module-I: Neuro-developmental processes in speech production and motor speech disorders

a) Review of neuro-anatomy (cerebral cortex, sub-cortical structures, brainstem, cerebellum, spinal cord & cranial nerves, pyramidal and extra-pyramidal systems)
b) Sensory-motor integration (spatial temporal planning, motor planning and feedback)
c) Anatomic development of speech production systems
d) Development of neural pathways of speech motor control (brain maturation, reflexes, sensory and motor)
e) Dysarthria in children – cerebral palsy – disorders of tone (spastic, flaccid): definition, etiology, characteristics and associated problems
f) Dysarthria in children – cerebral palsy – disorders of movement (hyperkinetic, hypokinetic) and disorder of balance (ataxia): definition, etiology, characteristics and associated problems
g) Dysarthria in children – lower motor neuron and other syndromes with motor speech disorders
h) Childhood apraxia of speech and nonverbal oral apraxia: definition, characteristics and classification

Module-II: Assessment of motor speech disorders in children

a) Case history and developmental neurological evaluation – primitive postural and oro-pharyngeal reflexes, cranial nerve examination
b) Assessment of oral sensory and motor capacity – Oral peripheral mechanism examination, neuro-muscular status
c) Assessment of speech sub-systems – quantitative and qualitative
d) Assessment of speech intelligibility and comprehensibility
e) Assessment of associated problem
f) Speech assessment with specific reference to childhood apraxia of speech – Phonetic and phonemic inventory, phonotactics and syllable sequencing, variability of errors, speech intelligibility, fluency and prosody
g) Test materials – checklist for childhood apraxia of speech, screening test for developmental apraxia of speech
h) Protocols for non-verbal and verbal praxis specific to Indian languages
i) Differential diagnosis- dysarthria and other developmental disorders
j) Differential diagnosis - childhood apraxia of speech and other developmental disorders

Module-III: Management of childhood dysarthria

a) Team approach in rehabilitation of motor speech disorders in children
b) Neuro-developmental therapy
c) Non speech oral-motor exercises: its application for children with dysarthria
d) Management of drooling
e) Behavioral management of respiratory, phonatory, resonatory and articulatory subsystems
f) Prosthetic appliances in treatment of childhood dysarthria

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g) AAC in management of motor speech disorders- role of devices, AAC team, candidacy and pre-requisites, symbol selection, techniques, assessment for AAC, effective use of AAC
h) Case studies: Planning intervention for children with dysarthria

Module-IV: Management of childhood apraxia of speech

a) Principles of motor learning
b) Integral stimulation – dynamic temporal cueing
c) Multisensory and tactile cueing techniques (moto kinesthetic speech training, sensory motor approach, PROMPTS, Touch cue method & speech facilitation)
d) Gestural cueing techniques (signed target phoneme therapy, adapted cueing techniques, cued speech, visual phonics,& Jordon's gestures)
e) Miscellaneous techniques (melodic intonation therapy, multiple phonemic approach, & instrumental feedback)
f) Cognitive/conceptual/ linguistic /phonological remedial approaches - phonotactics
g) Other approaches: Vowel and diphthong remediation techniques (Northampton (Yale) vowel chart and Alcorn symbols), Nancy Kauffman's speech praxis treatment kit
h) Use of AAC in childhood apraxia of speech
i) Evidence-based practice in intervention for childhood apraxia of speech
j) Case studies: Planning intervention for childhood apraxia of speech

Module-V: Feeding and swallowing disorders in children

a) Embryology- periods and structures of development
b) Anatomical structures of swallowing- upper aero digestive system, anatomic difference between adults and children
c) Physiology of swallowing- swallow phases, neural control of swallowing, reflexes related to swallowing, suckling and sucking, airway and swallowing
d) Terms involved in dysphagia and development of feeding skills
e) Causes of dysphagia in children
f) Signs and symptoms of dysphagia in children
g) Assessment – inferences from neural developmental assessment, cranial nerve examination, assessment scales, nutritive and non-nutritive assessment, instrumental assessment (VFS, cervical auscultation), gastrointestinal evaluation
h) Management: positioning, oral- motor treatment, team approach, non oral feeding, transitional feeding, modifications in feeding
i) Role of speech-language pathologist in neonatal intensive care with reference to feeding and swallowing

Practicals

a) With the help of models, charts and software, identify the motor control centers in the brain.
b) Perform oro-motor examination in five children and adults and compare
c) Identify oro-motor reflexes (rooting, suckling, & phase bite) in 5 infants.
d) Demonstrate normal posture and breathing patterns required for varied speech tasks. Alter the postures and breathing patterns and notice changes in speech patterns.
e) Assess DDK rate in five typically developing children.
f) Rate intelligibility of speech in five typically developing children. Discuss factors that influenced speech intelligibility and their ratings.
g) Observe and record (a) physical status, (b) oral sensory motor abilities and vegetative skills, (c) respiration, (d) phonation, (e) resonation, (f) articulation and (g) language abilities in five typically developing children. Compare these with observations made from children with motor speech disorders.

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h) Perform oro-motor exercises – isotonic and isometric. Discuss strategies to modify exercises for children.

i) Identify from video the AAC system such as low technology vs high technology systems and different symbol system, that is, Bliss symbols, IICP symbols and different signing systems – Makaton.

j) Observe feeding and swallowing skills in different age groups of children: 2 newborns; 2 infants, 2 toddlers, and 2 older children. Identify the differences in feeding methods, food consistencies, texture, quantity, feeding habits, feeding appliances used by these children.

Examination Scheme:

Components	CRW	PTB	CT	A	EE
Weightage (%)	5	5	15	5	70

CRW- Clinical record writing, PTB- Proficiency in using test batteries, CT- Class test, A- Attendance, EE- End semester examination

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DIAGNOSTIC AUDIOLOGY: PHYSIOLOGICAL TESTS

Course Code: ASL2407 **Credit Units: 05**

Course Objectives: After completing this course, the students will be able to

- justify the need for using the different physiological tests in the audiological assessment
- independently run the tests and interpret the results to detect the middle ear, cochlear and retro cochlear pathologies and also differentially diagnose
- design tailor-made test protocols in immittance, AEPs and OAEs as per the clinical need
- make appropriate diagnosis based on the test results and suggest referrals.

Course Contents:

Module-I: Immittance Evaluation

a) Clinical significance of physiological tests in audiology
b) Immittance evaluation: Principle of immittance evaluation: Concept of impedance and admittance, their components,
c) Tympanometry: definition, measurement procedure, response parameters, their measurement and normative, classification of tympanogram, clinical significance of tympanometry
d) Eustachian tube functioning tests of tympanometry: basics of pressure equalization function of ET, Valsalva, Toynbee, William's pressure swallow, inflation-deflation test.
e) Overview on multicomponent and multi-frequency tympanometry
f) Overview on wide band reflectance and wide band tympanometry
g) Reflexometry: definition, acoustic reflex pathway, measurement procedure, clinical applications of acoustic reflexes, special tests

Module-II: Auditory evoked potentials (AEPs): Auditory brainstem response (ABR)

a) Introduction and classification of AEPs
b) Instrumentation
c) Principles of AEP recording techniques:
d) Auditory brainstem response generators
e) Protocol and procedure of recording auditory brainstem response
f) Factors affecting auditory brainstem responses
g) Clinical applications of ABR
h) ABR in the paediatric population
i) Role of ABR in infant hearing screening

Module-III: Overview of other AEPs

a) ECochG
b) Auditory Middle Latency Responses (AMLR) and their clinical applications
c) Auditory Long Latency Responses (Obligatory responses) and their clinical applications
d) Other long latency potentials such as P300, MMN, P600, N400, T-complex, CNV) and their clinical applications
e) ASSR: Instrumentation, recording and clinical applications
f) Brainstem responses to speech and other complex signals

Module-IV: Otoacoustic emissions

- Introduction to otoacoustic emissions
- Origin and classification of OAEs
- Instrumentation
    - Procedure of OAE measurement: SOAE, TEOAEs, and DPOAEs

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- Interpretation of results: SOAE, TEOAEs, and DPOAEs
- Clinical applications of OAEs: SOAE, TEOAEs, and DPOAEs
- Contralateral suppression of OAEs and its clinical implications

Module-V: Physiological tests for assessment of vestibular system

a) Electronystagmography: procedure, interpretation, clinical applications
b) Videonystagmography, videoocculograph
c) Vestibular Evoked Myogenic Potentials
d) Overview of Rotatory chair test, video Head Impulse Test,
e) Overview of Dynamic Posturography

Practicals

a) Measure admittance in the calibration cavities of various volumes and note down the observations
b) Calculate Equivalent ear canal volume by measuring static admittance in an uncompensated tympanogram (10 ears)
c) Do tympanogram in the manual mode and measure peak pressure, peak admittance and ear canal volume manually using cursor (10 ears).
d) Measure gradient of the tympanogram (10 ears)
e) Administer Valsalva and Toynbee and William's pressure swallow test(5 ears)
f) Record acoustic reflex thresholds in the ipsi and contra modes, (10 ears)
g) Plot Jerger box pattern for various hypothetical conditions that affect acoustic reflexes and interpret the pattern and the corresponding condition.
h) Carry out Acoustic reflex decay test and quatify the decay manually using cursor (5 individuals).
i) Trace threshold of ABR (in 5 dB nHL steps near the threshold) for clicks and tone bursts of different frequencies (2 persons) and draw latency intensity function.
j) Record ABR using single versus dual channels and, note down the differences
k) Record ABR at different repetition rates in 10/sec step beginning with 10.1/11.1 per second. Latency-repetition rate function needs to be drawn.
l) Record with each of three transducers (HP, insert phones and bone vibrator) and polarities and draw a comparative table of the same. Students should also record with different transducers without changing in the protocol in the instrument and calculate the correction factor required.
m) Record ASSR for stimuli of different frequencies and estimate the thresholds
n) Record TEOAEs and note down the amplitude, SNR, noise floor and reproducibility at octave and mid-octave frequencies. Note down the stimulus stability and the overall SNR (10 ears).
o) Record DPOAEs and note down the amplitude, SNR, noise floor and reproducibility at octave and mid-octave frequencies (10 ears)

Examination Scheme:

Components	CRW	PTB	CT	A	EE
Weightage (%)	5	5	15	5	70

CRW- Clinical record writing, PTB- Proficiency in using test batteries, CT- Class test, A- Attendance, EE- End semester examination

Recommended Reading

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IMPLANTABLE HEARING DEVICES

Course Code: ASL2408 **Credit Units: 05**

Course Objectives: After completing this course, the students will be able to

- assess candidacy for bone anchored hearing devices, middle ear implants, cochlear implants, and ABI
- select the appropriate device depending on the audiological and non-audiological findings
- handle post-implantation audiological management
- assess the benefit derived from implantation, and
- counsel the parents/care givers during different stages of implantation

Course Contents:

Module-I: Implantable hearing devices – basics

a) Need for implantable hearing devices
b) History of implantable hearing devices (bone anchored hearing devices, middle ear implants, cochlear implants, auditory brainstem implants and midbrain implants)
c) Candidacy for implantable hearing devices
d) Team involved in implantable hearing devices
e) Pre-implant counseling, Informed consent

Module-II: Bone anchored hearing devices and middle ear implants

a) Types, components
b) Surgical approaches, risks, complications
c) Audiological evaluations for candidacy, contraindications
d) Assessment of benefits

Module-III: Cochlear implant and brain stem implants – basics

a) Terminology, types, components and features
b) Bilateral, bimodal and hybrid cochlear implants
c) Factors related to selection of the device, funding sources
d) Surgical approaches, risks, complications
e) Audiological and non-audiological candidacy criteria, contraindications

Module-IV: Cochlear implants and brainstem implants

a) Signal coding strategies, classification, types
b) Intraoperative monitoring by audiologists
c) Objective measures: ESRT, ECAP, prom stim, EABR, aided cortical potentials
d) Post implant Mapping: schedule, pre-requisites, switch-on, mapping parameters, impedance, compliance, role of objective and subjective measures in mapping,
e) post mapping audiological evaluation
f) Assessment of benefits
g) Optimization of hearing aid on contralateral ear

Module-V: Implantable hearing devices - Counselling and troubleshooting; Rehabilitation

a) Post implant Counselling on care and maintenance and trouble shooting of the device
b) Overview of post implant rehabilitation including AVT
c) Factors affecting outcome of implantable devices in adults and children

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Practicals

a) Watch videos of BAHA, middle ear implant, cochlear implant
b) Create hypothetical cases (at least 5 different cases) who are candidates for cochlear implantation. Make protocol for recording an EABR
c) List down the technological differences across different models of cochlear implants from different companies, their cost
d) Observation of mapping
e) Watching of videos on AVT
f) Watch video on cochlear implant surgery

Examination Scheme:

Components	CRW	PTB	CT	A	EE
Weightage (%)	5	5	15	5	70

CRW- Clinical record writing, PTB- Proficiency in using test batteries, CT- Class test, A- Attendance, EE- End semester examination

Recommended Reading

- Clark, G., Cowan, R. S. C., & Dowell, R. C. (1997). Cochlear Implantation for Infants and Children: Advances. Singular Publishing Group.
- Cooper, H., & Craddock, L. (2006). Cochlear Implants: A Practical Guide. Wiley.
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CLINICALS IN SPEECH-LANGUAGE PATHOLOGY-II

Course Code: ASL2409 **Credit Units: 07**

General considerations:

- Exposure is primarily aimed to be linked to the theory courses covered in the semester.
- After completion of clinical postings in Speech –language diagnostics, the student will know (concepts), know how (ability to apply), show (demonstrate in a clinical diary/log book based on clinical reports/recordings, etc), and do (perform on patients/ client contacts) the following:

Know:

1. Speech & language stimulation techniques.
2. Different samples /procedures required to analyse voice production mechanism. (acoustic/ aerodynamic methods / visual examination of larynx/ self evaluation)
3. Different samples /procedures required to analyse speech production mechanism in children with motor speech disorders.

Know-how:

1. To administer at least two more (in addition to earlier semester) standard tests for childhood language disorders.
2. To administer at least two more (in addition to earlier semester) standard tests of articulation/ speech sounds.
3. To set goals for therapy (including AAC) based on assessment/test results for children with language and speech sound disorders.
4. To record a voice sample for acoustic and perceptual analysis.
5. To assess parameters of voice and breathing for speech.
6. Assessment protocol for children with motor speech disorders including reflex profile and swallow skills.
7. Counselling for children with speech-language disorders.

Show:

1. Acoustic analysis of voice – minimum of 2 individuals with voice disorders.
2. Simple aerodynamic analysis - minimum of 2 individuals with voice disorders.
3. Self evaluation of voice – minimum of 2 individuals with voice disorders.
4. Informal assessment of swallowing – minimum of 2 children.
5. Assessment of reflexes and pre linguistic skills - minimum of 2 children.
6. Pre –therapy assessment and lesson plan for children with language and speech sound disorders - minimum of 2 children each.

Do:

1. Case history - minimum of 2 individuals with voice disorders.
2. Case history - minimum of 2 children with motor speech disorders
3. Oral peripheral examination- minimum of 5 children
4. Apply speech language stimulation/therapy techniques on 5 children with language disorders (with hearing impairment, specific language impairment & mixed receptive language disorder)/speech sound disorders – minimum of 5 sessions of therapy for each child.
5. Exit interview and counselling - minimum of 2 individuals with speech language disorders.

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Evaluation:

- Internal evaluation shall be based on attendance, clinical diary, log book and learning conference.
- External evaluation: Spot test, OSCE, Record, Viva-voce, case work

Examination scheme:

Components	CRW	C/P/A	CT	A	Viva
Weightage (%)	15	15	15	5	**50**

CRW- Clinical record writing, C/P/A- Case discussion/presentation/analysis, CT- Class test, A- Attendance, Viva- Internal/External

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CLINICALS IN AUDIOLOGY-II

Course Code: ASL2410 **Credit Units: 07**

General considerations:

- Exposure is primarily aimed to be linked to the theory courses covered in the semester, however, not just limited to these areas.
- After completion of clinical postings in auditory diagnostics and auditory rehabilitation, the student will Know (concept), know how (ability to apply), show (demonstrate in a clinical diary/log book), and do (perform on patients/ client contacts) the following:

Know:

- Indications to administer special tests
- Procedures to assess the listening needs
- National and international standards regarding electroacoustic characteristics of hearing aids

Know-how:

- To administer at least 1 test for adaptation, recruitment and functional hearing loss.
- Counsel hearing aid user regarding the use and maintenance hearing aids
- To troubleshoot common problems with the hearing aids
- To select test battery for detection of central auditory processing disorders.
- Select different types of ear moulds depending on type of hearing aid, client, degree, type and configuration of hearing loss

Show:

- Electroacoustic measurement as per BIS standard on at least 2 hearing aids
- How to process 2 hard and 2 soft moulds
- How to preselect hearing aid depending on listening needs and audiological findings on at least 5 clinical situations (case files)
- How select test battery depending on case history and basic audiological information – 3 situations

Do:

- Tone decay test – 2 individuals with sensori-neural hearing loss
- Strenger test – 2 individuals with unilateral/asymmetrical hearing loss
- Dichotic CV/digit, Gap detection test – 2 individuals with learning difficulty or problem in hearing in noise
- Hearing aid fitment for at least 5 individuals with mild to moderate and 3 individuals with mod-severe to profound
- Hearing aid selection with real ear measurement system on 3 individuals with hearing impairment

Evaluation:

- Internal evaluation shall be based on attendance, clinical diary, log book and learning conference.
- External evaluation: Spot test, OSCE, Record, Viva-voce, case work

Examination scheme:

Components	CRW	C/P/A	CT	A	Viva
Weightage (%)	15	15	15	5	50

CRW- Clinical record writing, C/P/A- Case discussion/presentation/analysis, CT- Class test, A-Attendance, Viva- Internal/External

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FLUENCY AND ITS DISORDERS

Course Code: ASL2501 **Credit Units: 05**

Course Objectives: After completion of the course, the student will be able to

- understand the characteristics of fluency and its disorders
- evaluate and diagnose fluency disorders
- learn about the techniques for the management of fluency disorders

Course Contents:

Module-I: Fluency

a) Scope and definition of fluency
b) Factors influencing fluency
c) Definition and characteristics of features of suprasegmentals in speech: rate of speech, intonation. rhythm, stress and pause
d) Suprasegmental features in typical speech
e) Suprasegmental features in the speech of persons with fluency disorders
f) Developmental aspects of suprasegmentals of speech
g) Normal non-fluency

Module-II: Stuttering and other fluency disorders

a) Stuttering: Definition and causes for stuttering
b) Characteristics of stuttering: core and peripheral characteristics, primary and secondary stuttering, effect of adaptation and situation
c) Development of stuttering
d) Normal non fluency: characteristics and differential diagnosis
e) Theories of stuttering: organic, functional, neurogenic, diagnosogenic and learning
f) Cluttering: Definition, causes and characteristics
g) Neurogenic stuttering: Definition, causes and characteristics

Module-III: Assessment and differential diagnosis

a) Assessment of fluency disorders: stuttering, cluttering, neurogenic stuttering and normal non fluency:
b) Subjective methods: protocols and tests
c) Objective methods
d) Qualitative and quantitative assessment
e) Differential diagnosis of fluency disorders

Module-IV: Management of stuttering

a) Approaches to management
b) Changing scenario in management of stuttering
c) Different techniques and strategies used in management with their rationale
d) Relapse and recovery from stuttering
e) Issues of speech naturalness in stuttering

Module-V: Management of fluency-related entities

a) Management of cluttering: rationale, techniques and strategies
b) Management of neurogenic stuttering: rationale, techniques and strategies
c) Management of normal non-fluency: rationale, techniques and strategies

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d) Relapse and recovery in cluttering and neurogenic stuttering. Changes in normal non-fluency
e) Prevention and early identification of stuttering, and cluttering

Practicals

a) Assess the rate of speech in 5 normal adults.
b) Record and analyse the supra segmental features in typically developing children between 2 and 5 years.
c) Record audio visual sample of 5 typically developing children and 5 adults for fluency analysis.
d) Listen/see samples of normal non fluency and stuttering in children and document the differences.
e) Identify the types of dysfluencies in the recorded samples of adults with stuttering.
f) Instruct and demonstrate the following techniques: Airflow, prolongation, easy onset shadowing techniques.
g) Record 5 speech samples with various delays in auditory feedback and analyse the differences.
h) Administer SPI on 5 typically developing children.
i) Administer SSI on 5 adults with normal fluency.
j) Administer self-rating scale on 10 adults with normal fluency.

Examination Scheme:

Components	CRW	PTB	CT	A	EE
Weightage (%)	5	5	15	5	70

CRW- Clinical record writing, PTB- Proficiency in using test batteries, CT- Class test, A- Attendance, EE- End semester examination

Recommended Reading

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STRUCTURAL ANOMALIES AND SPEECH DISORDERS

Course Code: ASL2507 **Credit Units: 05**

Course Objectives: After completing the course, the student will be able to

- understand the characteristics of disorders with structural anomalies including speech
- evaluate and diagnose the speech characteristics seen in these disorders
- learn about the techniques for the management of speech disorders in these conditions

Course Contents:

Module-I: Speech characteristics of persons with cleft lip and palate

a) Types, characteristics and classification of cleft lip and palate
b) Causes of cleft lip and palate: genetic, syndrome and others
c) Velopharyngeal inadequacy: types, causes and classification
d) Associated problems in persons with cleft lip and palate: speech, language, feeding, dental and occlusion, hearing, psychological

Module-II: Assessment and management of cleft lip and palate speech

a) Team of professionals in the management of persons with cleft lip and palate: their roles in diagnosis and management.
b) Assessment of persons with cleft lip and palate for speech language functions:
c) Subjective assessment of speech characteristics and speech intelligibility: proforma, tests, scales and others.
d) Objective assessment of phonatory, resonatory and articulatory features
e) Diagnosis and differential diagnosis of speech related functions
f) Subjective assessment of language and communication functions
g) Reporting test results using Universal Parameters
h) Management of persons with cleft lip and palate
i) Surgical and prosthetic management
j) Techniques and strategies to correct speech sound disorders
k) Techniques and strategies to improve feeding
l) Counselling and guidance

Module-III: Structural anomalies of tongue and mandible - Characteristics, assessment and management

a) Types, classification and characteristics of structural anomalies of tongue and mandible
b) Causes for structural anomalies of tongue and mandible
c) Team of professionals in the management of persons with structural anomalies of tongue and mandible and their roles.
d) Associated problems in persons with structural anomalies of tongue and mandible:
    - Speech
    - Feeding
    - Dental and occlusion
    - Psychological and others
e) Management of persons with structural anomalies of tongue and mandible
    - Surgical and prosthetic management
    - Techniques and strategies to improve speech intelligibility
    - Techniques and strategies to improve feeding
        - Counselling and guidance for persons with glossectomy and mandibulectomy

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Module-IV: Characteristics & assessment of laryngectomy

a) Causes, symptoms and classifications of laryngeal cancers
b) Team of professionals in the management of persons with laryngeal cancer
c) Surgery for laryngeal cancers: types and outcome
d) Associated problems in laryngectomee individuals
e) Assessment of speech and communication skills of laryngectomee individuals: Pre and post-operative considerations

Module-V: Management of speech and communication in laryngectomies

a) Esophageal speech: candidacy, types of air intake procedures, speech characteristics and its modification through techniques and strategies, complications and contraindications.
b) Tracheo-esophageal speech: candidacy, types of TEP, fitting of prosthesis, speech characteristics and its modification through techniques and strategies, complications and contraindications.
c) Artificial larynx: types, factors for selection, output characteristics, techniques for efficient use of artificial larynx, complications and contraindications.
d) Other remedial procedures: Pharyngeal speech, buccal speech, ASAI speech, gastric speech.

Practicals

a) Identify the different types of cleft lip and palate by looking at illustrations and images
b) Listen to 10 speech samples of children with cleft lip and palate and rate their nasality/ speech (articulation and cleft type errors) based on universal reporting parameters.
c) Identify the type of closure of velopharyngeal port for 5 normal individuals and 5 individuals with cleft lip and palate using videos of nasoendoscopy/ videofluroscopy.
d) Perform oral peripheral mechanism examination on 10 individuals and document the structure and functions of the articulators.
e) Analyse the different types of occlusion in 10 individuals.
f) Identify the type of glossectomy by looking at pictures/illustrations.
g) Identify the different types of prosthesis in the management of head and neck cancer.

h) Analyse the speech profile of 5 individuals with laryngectomy.
i) Identify parts of an artificial larynx and explore its use.
j) Prepare a checklist / pamphlet illustrating care of the stoma and T- tubes in vernacular.

Examination Scheme:

Components	CRW	PTB	CT	A	EE
Weightage (%)	5	5	15	5	70

CRW- Clinical record writing, PTB- Proficiency in using test batteries, CT- Class test, A- Attendance, EE- End semester examination

Recommended Reading

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PEDIATRIC AUDIOLOGY

Course Code: ASL2508 **Credit Units: 05**

Course Objectives: After completing this course, the student will be able to

- describe auditory development
- list etiologies and relate them to different types of auditory disorders that may arise
- explain different hearing screening/identification procedures and their application
- elaborate on different aspects of paediatric behavioral and physiological / electrophysiological evaluation

Course Contents:

Module-I: Auditory development

a) Review of Embryology of the ear
b) Development of auditory system from periphery to cortex
c) Neuroplasticity
d) Prenatal hearing
e) Normal auditory development from 0-2 years
f) Infant speech perception
g) Incidence and prevalence of auditory disorders in children

Module-II: Auditory disorders

a) Congenital and acquired hearing loss in children
b) Permanent minimal and mild bilateral hearing loss
c) Impact on auditory skills, speech-language, educational and socio-emotional abilities
d) Moderate to profound sensorineural hearing loss
e) Unilateral hearing loss
f) Auditory Neuropathy Spectrum Disorders
g) Central auditory processing disorders
h) Pseudohypacusis
i) Auditory disorders in special population and multiple handicap

Module-III: Early identification of hearing loss

a) Principles of early hearing detection and intervention programs
b) Principles and history of hearing screening
c) Joint Committee on Infant Hearing position statement (2000, 2007,2013)
d) High risk register/ checklists for screening
e) Sensitivity and specificity of screening tests
f) Hearing screening in infants and toddlers: Indian and Global context
g) Hearing screening in preschool children: Indian and Global context
h) Hearing screening in school-age children (including screening for CAPD): Indian and Global context

Module-IV: Paediatric assessment I

a) Behavioral observation audiometry
b) Conditioned orientation reflex audiometry
c) Visual reinforcement audiometry, TROCA, play audiometry
d) Pure tone audiometry in children: Test stimuli, response requirement and reinforcement
e) Speech audiometry (SRT, SDT); Speech recognition and speech perception tests developed in India)

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f) Bone conduction speech audiometry
g) Immittance evaluation in paediatric population
h) Central auditory processing disorders assessment

Module-V: Paediatric assessment II

a) Recording and interpretation of OAE in paediatric population
b) Factors affecting OAE in paediatric population
c) Recording and interpretation of click evoked and tone burst evoked ABR in paediatric population
d) Factors affecting ABR in paediatric population
e) Recording ASSR in paediatric population
f) Recording AMLR, ALLR in paediatric population
g) Assessment of hearing loss in special population
h) Diagnostic test battery for different age groups
i) Diagnosis and differential diagnosis

Practicals

a) Observe a child with normal hearing (0-2 years) in natural settings. Write a report on his/her responses to sound.
b) Observe a child with hearing impairment (0-2 years) in natural settings. Write a report on his/her responses to sound with and without his amplification device
c) Administer HRR on at least 3 newborns and interpret responses
d) Based on the case history, reflect on the possible etiology, type and degree of hearing loss the child may have.
e) Compare ABR wave forms in children of varying ages from birth to 24 months.
f) Observe live or video of BOA/VRA of a child with normal hearing and hearing loss and write a report on the instrumentation, instructions, stimuli used, procedure and interpretation.
g) Observe OAE in a child with normal hearing and a child with hearing loss. Write a report on the instrumentation, protocol used and interpretation
h) Observe ABR in a child with normal hearing and a child with hearing loss. Write down a report on the instrumentation, protocol used and interpretation
i) Observe immittance evaluation in a child with normal hearing and a child with hearing loss. Write a report on the instrumentation, protocol used and interpretation
j) Using role play demonstrate how the results of audiological assessment are explained to caregiver in children with the following conditions
    - Child referred in screening and has high risk factors in his history
    - Child with chronic middle ear disease
    - Child with CAPD
    - Child with severe bilateral hearing impairment

Examination Scheme:

Components	CRW	PTB	CT	A	EE
Weightage (%)	5	5	15	5	70

CRW- Clinical record writing, PTB- Proficiency in using test batteries, CT- Class test, A- Attendance, EE- End semester examination

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- Northern, J.L. and Downs, M.P. (2014). Hearing in Children. 6th Ed. San Diego: Plural Publishing.
- Seewald, R., and Thorpe, A.M. (2011). Comprehensive Handbook of Paediatric Audiology, San Diego: Plural Publishing. (core text book)
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AURAL REHABILITATION IN CHILDREN

Course Code: ASL2509 **Credit Units: 05**

Course Objectives: After completing this course the student will be able to

- describe the different communication options available for young children with hearing impairment
- explain the impact of hearing impairment on auditory development and spoken language communication
- describe factors that effect of acoustic accessibility and strategies to manage them at home and in classroom
- design activities for auditory learning at different levels
- enumerate how the needs of individuals with hearing impairment using sign language and spoken language as form of communication in India are being met

Course Contents:

Module-I: Auditory development, spoken communication and acoustic accessibility

a) Sensitivity period for auditory development
b) Impact of hearing impairment on auditory development, spoken language acquisition, parent child communication
c) Factors affecting auditory development
d) Hearing loss implications for speech perception: acoustics of speech
e) Optimizing hearing potential through hearing aids
f) Optimizing hearing potential through cochlear implants
g) Barriers to acoustic accessibility: distance, signal to noise ratio, reverberation
h) Managing the listening environment for infants, toddlers schools
i) Signal to noise ratio enhancing technologies personal FM, loop systems, desktop group systems, blue tooth connectivity

Module-II: Communication options

a) Detecting and confirming hearing loss
b) Parent support counselling, individual family service plan
c) Choosing communication options
d) Auditory oral approach
e) Auditory verbal therapy
f) Manual/sign language: Indian and Global context
g) Cued speech and total communication
h) Listening devices hearing aid/cochlear implant
i) Early intervention programs

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Module-III: Optimal listening and learning environments infancy and early childhood

a) Involvement of family
b) Factors impacting family involvement, supporting families through information and education
c) Creating optimum listening and learning environment
d) Intervention: Assessment, auditory learning, listening and language facilitation techniques in infancy and early childhood
e) Issues with children with mild hearing loss, unilateral hearing loss,
f) Children with hearing loss, ANSD or APD: Children are intervened late
g) Children with hearing loss and other special needs
h) Listening and spoken language in school age: benefits of inclusion
i) Intervention at school age: Functional hearing assessment, communication assessment and intervention to integrate with academic targets

Module-IV: Auditory - speech reading training and literacy

a) Candidacy for auditory training and speech reading
b) Auditory training/learning four design principles skill, stimuli, activity, and difficulty level
c) Early training Objectives
d) Analytic and Synthetic training Objectives
e) Formal and informal training
f) Auditory training for infants and very young children
g) Outcomes of training
h) Speech and language and literacy characteristics
i) Speech language and literacy evaluation assessment
j) Speech language therapy

Module-V: Indian perspectives

a) Prevalence of hearing impairment in children
b) Education of the deaf in India historical perspectives
c) Available resources for education of the hearing impaired
d) Early intervention programs and centers
e) Schools for the hearing impaired; day schools, residential schools
f) Beyond school: college and vocational training
g) Training manpower resources for service delivery
h) Indian sign language
i) Training sign language interpreters
j) Cued speech in India
k) Assessment and therapy tools developed for individuals with hearing impairment in India.

Practicals

a) Watch documentaries such as “Sound and Fury” (2001). Write a reflection of why parents made communication choices for their children
b) Follow on links to the above film that shows the status of the children with hearing impairment after a few years.
c) Learn at least 50 signs across different categories of Indian sign language. Make a video of you signing 10 sentences. Have a class mate interpret them.
d) Interview a parent of a child with hearing impairment on how they adapted their child to wear the hearing aids and /or implant. What were the first responses to sound they observed and how language and speech develop?
e) Complete a functional auditory evaluation on one child with hearing loss. Do a speech and language evaluation and also write a report on the child strengths and

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weakness.

f) Design and demonstrate auditory learning activities at the four levels awareness, discrimination, identification and comprehension. Ensure that the activities encompass different skill level and difficulty levels.

g) Develop a short audio/film/pamphlet for parents in your local language on one of the following: teaching parent to trouble shooting the hearing aid/cochlear implant, establishing consistent use of listening device, activities to facilitate language across different age groups

h) Visit a school for the deaf. Document your observation about the acoustic environment in the class, strategies used by the teacher to promote listening and spoken language

Examination Scheme:

Components	CRW	PTB	CT	A	EE
Weightage (%)	5	5	15	5	70

CRW- Clinical record writing, PTB- Proficiency in using test batteries, CT- Class test, A- Attendance, EE- End semester examination

Recommended Reading

- Fitzpatrick, E.M., and Doucet S.P. (2013) (Eds). Paediatric Audiologic Rehabilitation. Thieme, New York
- Hosford-Dumm, H., Roser, R., & Valente, M. (2007). Audiology Practice Management (2nd edition edition). New York: Thieme.
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- Rout, N and Rajendran, S. (2015). Hearing aid Counselling and Auditory training Manual, A publication of NIPMED, Chennai. Freely downloadable from http://niepmd.tn.nic.in/publication.php. ISBN 978-81-928032-5-8.
- Schwartz, S., (2007) Choices in Deafness : a Parent's guide to Communication Options , 3rd edition Woodbine house Bethesda
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CLINICALS IN SPEECH LANGUAGE PATHOLOGY-III

Course Code: ASL2510 **Credit Units: 07**

General considerations:

- Exposure is primarily aimed to be linked to the theory courses covered in the semester.
- After completion of clinical postings in Speech –language diagnostics, the student will know (concepts), know how (ability to apply), show (demonstrate in a clinical diary/log book based on clinical reports/recordings, etc.), and do (perform on patients/ client contacts) the following:

Know:

1. Procedures to assess speech fluency and its parameters using standardized tests for children and adults.
2. Differential diagnosis of motor speech disorders in children.
3. Procedures to assess individuals with cleft lip and palate, and other oro-facial structural abnormalities.
4. Procedures to assess laryngectomee and provide management options.

Know-how:

1. To administer at least two more (in addition to earlier semesters) standard tests for childhood language disorders.
2. To record a speech sample for analysis of fluency skills (including blocks & its frequency, rate of speech, prosody, etc.).
3. To assess posture and breathing for speech in children with motor speech disorders.
4. To consult with inter-disciplinary medical/rehabilitation team and counsel the individual/family regarding management options and prognosis.

Show:

1. Rating of cleft, speech intelligibility and nasality – minimum of 2 individuals with cleft lip and palate.
2. Language assessment - minimum of 2 individuals with cleft lip and palate.
3. Transcription of speech sample and assessment of percentage dis/dysfluency– minimum of 2 individuals with stuttering.
4. Assessment of rate of speech on various speech tasks – at least on 2 children & adults.

Do:

1. Voice assessment report - minimum of 2 individuals with voice disorders.
2. Fluency assessment report - minimum of 2 individuals with fluency disorders.
3. Oral peripheral examination on minimum of 2 individuals with cleft lip and palate.
4. Apply speech language stimulation/therapy techniques on 5 children with language disorders/speech sound disorders/ motor speech disorders – minimum 5 sessions of therapy for each child.

Evaluation:

- Internal evaluation shall be based on attendance, clinical diary, log book and learning conference.
- External evaluation: Spot test, OSCE, Record, Viva-voce, case work.

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Examination Scheme:

Components	CRW	PTB	CT	A	EE
Weightage (%)	5	5	15	5	70

CRW- Clinical record writing, PTB- Proficiency in using test batteries, CT- Class test, A- Attendance, EE- End semester examination

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CLINICALS IN AUDIOLOGY-III

Course Code: ASL2511 **Credit Units: 07**

General considerations:

- Exposure is primarily aimed to be linked to the theory courses covered in the semester, however, not just limited to these areas.
- After completion of clinical postings in auditory diagnostics and auditory rehabilitation, the student will Know (concept), know how (ability to apply), show (demonstrate in a clinical diary/log book), and do (perform on patients/ client contacts) the following:

Know:

- Different protocols in tympanometry and reflexometry.
- Different protocols used in auditory brainstem responses
- Protocols for screening and diagnostic otoacoustic emissions
- Tests to assess vestibular system
- Different indications for selecting implantable hearing devices
- Various speech stimulation and auditory training techniques

Know-how:

- To administer auditory brainstem responses for the purpose of threshold estimation and sight of lesion testing
- To administer high frequency tympanometry and calculate resonance frequency
- To administer high risk register
- To modify the given environment to suit the needs of hearing impairment

Show:

- Analysis of ABR waveforms – threshold estimation 5 and site of lesion 5
- Analysis of immittance audiometry and relating to other tests – 5 individuals with conductive and 5 individuals with sensori-neural hearing loss
- How to formulate select appropriate auditory training technique based on audiological evaluation

Do:

- Threshold estimation on 5 infants (< 2 years)
- TEOAE and DPOAE on 5 infants (<2 years)
- BOA on 5 infants (<2 years)
- VRA on 2 infants (6 month – 3 year)
- Conditioned play audiometry – 3 children (3-6 years)
- Hearing aid fitment on 1 infant (< 3 years) 2 children (3-6 years)
- Listening age of 3 children with hearing impairment
- Appropriate auditory training on 5 children with hearing loss

Evaluation:

- Internal evaluation shall be based on attendance, clinical diary, log book and learning conference.
- External evaluation: Spot test, OSCE, Record, Viva-voce, case work

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Examination Scheme:

Components	CRW	PTB	CT	A	EE
Weightage (%)	5	5	15	5	70

CRW- Clinical record writing, PTB- Proficiency in using test batteries, CT- Class test, A- Attendance, EE- End semester examination

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MOTOR SPEECH DISORDERS IN ADULTS

Course Code: ASL2606 **Credit Units: 05**

Course Objectives: After completing the course, the student will be able to

- understand the characteristics of acquired motor speech disorders in adults
- evaluate and diagnose speech characteristics in acquired motor speech disorders
- learn about the techniques for the management of speech and related errors in acquired motor speech disorders

Course Contents:

Module-I: Causes & Characteristics of dysarthria

a) Definition, etiology and classification of acquired dysarthria
b) General, speech and feeding related characteristics of acquired dysarthria with and without genetic underpinnings:
c) Vascular lesions: dysarthria following stroke/CVA, cranial and peripheral nerve palsies
d) Infectious condition of the nervous system: dysarthria following meningitis, encephalitis, polyneuritis, poliomyelitis, neurosyphilis.
e) Traumatic lesions: Dysarthria following TBI.
f) Toxic conditions of the nervous system: Dysarthria following exogenic and endogenic toxic conditions of the nervous system.
g) Anoxia of the nervous system: Dysarthria following anoxic conditions
h) Metabolic disorders affecting nervous system: Dysarthria following metabolic conditions that affect the nervous system, Wilson's disease etc.
i) Idiopathic causes: Dysarthria following idiopathic causes
j) Neoplastic lesions of nervous system: Dysarthria following neoplastic lesions in the nervous system
k) Demyelinating and degenerative conditions: Huntington's Chorea, Parkinson's, Multiple Sclerosis, Motor Neuron Diseases

Module-II: Assessment and diagnosis of dysarthria

a) Subjective assessment of dysarthria:
    - Assessment of respiratory, phonatory, resonatory, articulatory errors
    - Assessment of prosodic features
    - Assessment of speech intelligibility
    - Scales, protocols and tests used for subjective assessment of dysarthria
b) Instrumental analysis of speech in dysarthria: Acoustic, kinematic and physiological
c) Advantages and disadvantages of subjective and instrumental procedures in the assessment of dysarthria in adults
    - Differential diagnosis of acquired motor speech disorders in adults:
    - Dysarthria and verbal apraxia
    - Dysarthria and functional articulation disorders
    - Dysarthria and aphasia
    - Apraxia of speech and aphasia
    - Dysarthria from other allied disorders such as agnosia, alexia, agraphia etc.
    - Apraxia from other allied disorders such as agnosia, alexia, agraphia etc.
    - Assessment of feeding, swallowing and related issues in persons with dysarthria

Module-III: Management of dysarthria

a) Management of acquired dysarthria

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b) General principles in the management of dysarthria
c) Influence of medical, prosthetic and surgical procedures on the speech in persons with acquired dysarthria.
d) Facilitative approach: vegetative, sensorimotor and reflex based.
e) Systems approach: correction of respiratory, phonatory, resonatory, articulatory and prosodic errors.
f) Strategies to improve speech intelligibility and speech enhancement techniques
g) Strategies to improve feeding, swallowing behavior in persons with acquired dysarthria

Module-IV: Assessment and management of apraxia in adults

a) Definition, etiology and classification of acquired apraxia
b) Characteristics of nonverbal apraxia's in adults
c) Characteristics of verbal apraxia's in adults
d) Subjective assessment strategies: standard tests and scales, protocols and behavioral profiles
e) Instrumental analysis of the speech of apraxia in adults: Acoustic, Kinematic and Physiological
f) Management Approaches for verbal & nonverbal apraxia: principles and strategies

Module-V: Management related issues in motor speech disorders

a) Team involved in the management of persons with acquired dysarthria and apraxia
b) Issues related to maintenance and generalization of speech in dysarthria and apraxia
c) Counselling and guidance for persons with acquired dysarthria and apraxia
d) Augmentative and alternative strategies for persons with acquired dysarthria and apraxia

Practicals

a) Identify the cranial nerves and mention its origin and insertion from a picture/ model. Demonstrate methods to assess the cranial nerves.
b) Assess the respiratory system using speech and non-speech tasks in 10 healthy adults.
c) Assess the phonatory system using subjective and acoustic analysis in 10 healthy adults.
d) Looking at a video identify the clinical signs and symptoms of different neurological conditions resulting in Dysarthria.
e) Record the speech sample of 5 normal adults and compare with the audio sample of individuals with Dysarthria.
f) Administer Duffy's intelligibility rating scale on 5 healthy adults.
g) Administer Frenchay's Dysarthria Assessment on 5 healthy adults.
h) Demonstrate activities to improve the functions of speech subsystem.
i) Identify the signs of UMN and LMN based on a video.
j) Prepare a low tech AAC for functional communication for an individual with apraxia.

Examination Scheme:

Components	CRW	PTB	CT	A	EE
Weightage (%)	5	5	15	5	70

CRW- Clinical record writing, PTB- Proficiency in using test batteries, CT- Class test, A- Attendance, EE- End semester examination

Recommended Reading

- Brookshire, R. H. (2007). Introduction to Neurogenic Communication Disorders. University of Virginia, Mosby.

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- Ferrand, C. T., & Bloom, R. L. (1997). Introduction to Organic and Neurogenic Disorders of Communication: Current Scope of Practice. US, Allyn & Bacon.
- Goldenberg, G. (2013). Apraxia: The Cognitive Side of Motor Control. Oxford University Press, UK.
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AUDIOLOGY IN PRACTICE

Course Code: ASL2609 **Credit Units: 05**

Course Objectives: After completing the course, the student will able to

- list and describe the highlights of legislations relating to hearing impairment and other disabilities
- incorporate ethical practices in professional service delivery.
- provide information on welfare measures, policies of government when needed
- describe different strategies to create awareness of hearing impairment and programs to address them
- explain the different clinical practice settings in audiology with reference to their requirement, protocols and role and responsibility of audiologist
- describe methods to measure the impact of noise on humans and strategies to address excessive noise exposure in industries and the community.
- describe terminology, technology and methods used in tele practice, and their application in audiological service delivery

Course Contents:

Module-I: Scope, legislation and ethics in audiology

a) Scope of practice in audiology (National – ISHA & International body - AAA)
b) Professional ethics (ISHA)
c) Legislations and conventions relating to disability: need and historical aspects
d) Classification of hearing impairment and disability certification,
e) Rehabilitation Council of India Act (1992) and its amendments
f) Person with Disability Act (1995)
g) National Trust Act (1999)
h) Right to Education (2012)
i) Biwako Millennium framework (2003) and Salamanca Statement 1994
j) UNCRPD
k) Concept of barrier free access and universal design relating to individuals with hearing impairment

Module-II: Hearing health and strategies for prevention of hearing impairment

a) Epidemiology of hearing disorders
b) ICD and ICF
c) Levels of prevention: Primary, secondary and tertiary
d) National programs and efforts national institutes
e) Welfare measures by Government,
f) Camps (planning, purpose, organizing and providing remedial measures)
g) Public education and information (media, radio broadcasts, street plays)
h) Hearing health and prevention programs (hearing help line, dangerous decibels, online hearing tests etc.)

Module-III: Audiological practice in different settings

a) Audiological Private practice
b) ENT clinics
c) Paediatric / neonatology clinic/departments
d) Neurology departments
e) Factories and Industry
f) Hearing aid dispensing centre/hearing aid industry
g) Rehabilitation centres such as DRC/CRCs

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h) Schools for the hearing impaired
i) Cochlear implant clinics
j) Multiple handicap habilitation centre and others

Module-IV: Noise and hearing conservation in industry and community

a) Introduction to noise, types
b) Sources of noise in the industry and community
c) Effects of noise in the auditory system (outer, middle and inner ear)
d) Temporary threshold shift, permanent threshold shift, factors increasing the risk of NIHL
e) Non auditory effects of noise (physiological, psychological, stress, sleep, job productivity and accidents)
f) Legislations related to noise, permissible noise exposure levels, workers compensation, OSHA standards, Indian legislations related to noise
g) Instrumentation, measurement and procedure for measuring noise in industry
h) Instrumentation, measurement and procedure for measuring noise in community

i) Hearing conservation program (HCP), steps, record keeping,
j) Ear protective devices

Module-V: Scope and practice of tele audiology

a) Introduction to tele-health: definition, history of tele-health
b) Terminologies-tele-health, tele medicine, tele practice
c) Connectivity: internet, satellite, mobile data
d) Methods of tele-practice-store and forward and real time
e) Ethics and Regulations for tele-audiology
f) Requirements/Technology for tele- audiology: Web based platforms, Video conferencing, infrastructure
g) Manpower at remote end and audiologist end, training assistants for tele-audiology
h) Audiological screening using tele-technology : new born hearing screening, school screening, community screening, counselling
i) Diagnostic audiological services using tele-technology : video otoscopy, pure tone audiometry, speech audiometry, oto acoustic emission, tympanometry, auditory brainstem response. Intervention / aural rehabilitation using tele-technology :hearing aid counselling and troubleshooting, tinnitus, counselling, aural rehabilitation services, AVT, and counselling

Practicals

a) Undertake the activities such as ‘Dangerous decibel” program (www.dangerousdecibels.org)
b) Noise measurement and attenuation measurement of ear protection devices.
c) Sound level meter measurement in different areas (generator room, audio rooms)
d) Speech in noise assessment for 10 subjects
e) Visit an audiologist in different practice settings and provide a report
f) Administer ICF protocols for patients with different disorders
g) Explore websites of national institutes, hearing aid companied, NGOs in disability field and describe the accessibility features and information provided
h) Remote control a PC based audiology equipment connected to internet using any authorized desktop sharing software
i) Develop one pamphlet/poster/ in local language that would address some aspect of audiology practice
j) Perform Accessibility ability of your institute/center and prepare a report

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Examination Scheme:

Components	CRW	PTB	CT	A	EE
Weightage (%)	5	5	15	5	70

CRW- Clinical record writing, PTB- Proficiency in using test batteries, CT- Class test, A- Attendance, EE- End semester examination

Recommended Reading

- Audiology Telepractice; Editor in Chief, Catherine V. Palmer, Ph.D.; Guest Editor, Greg D. Givens, Ph.D. Seminars in Hearing, volume 26, number 1, 2005.
- Bergland, B., Lindwall, T., Schwela, D.H., eds (1999). Guidelines on Community noise http://www.who.int/docstore/peh/noise/guidelines2.html WHO 1999
- BIS specifications relating to Noise Measurements.- IS:7194-1973 Specification for assessment of noise exposure during work for hearing conservation purposes.
- Census of India information on disability
- Dobie, R. A (2001). Medical legal evaluation of hearing loss, 2nd Ed.
- Hearing health and strategies for prevention of hearing impairment WHO (2001). International classification of Functioning, Disability and Health. Geneva: WHO
- http://www.asha.org/Practice-Portal/Professional-Issues/Audiology-Assistants/Teleaudiology-Clinical-Assistants/
- http://www.asha.org/uploadedFiles/ModRegTelepractice.pdf
- IS:10399-1982 Methods for measurement of noise emitted by Stationary vehicles
- IS:6229-1980 Method for measurement of real-ear
- IS:9167-1979 Specification for ear protectors. 95
- IS:9876-1981 Guide to the measurement of airborne acoustical noise and evaluation of its effects on man- IS:7970-1981 Specification for sound level meters.
- IS:9989-1981 Assessment of noise with respect to community response.
- John Ribera. Tele-Audiology in the United States. In Clinical Technologies: Concepts, Methodologies, Tools and Applications (pp. 693-702), 2011. Hershey, PA: Medical Information Science Reference. doi:10.4018/978-1-60960-561-2.ch305
- Lipscomb, D. M. (1994). Hearing conservation – In industry, schools and the military.
- Mandke, K and Oza R.K (2014). Private practice in speech pathology and audiology, 2014 ISHA
- Philippe Valentin Giffard. Tele-Audiology. Tort, 2012. ISBN 6139256615, 9786139256617
- Rawool, V. W. (2012). Hearing conservation in occupational, recreational, educational and home setting. Thieme: New York
- RCI, PWD and National Trust, and Right to education act
- Richard Wootton, John Craig, Victor Patterson, editors. Introduction to telemedicine. Second edition. London: The Royal Society of Medicine Press Ltd. 2006. p. 206 ISBN: 1 85315 677 9.
- Salamanca statement and framework for action
- Scope of practice by RCI
- Swanepoel de W, Hall JW 3rd A systematic review of tele health applications in audiology. Telemed J E Health. 2010 Mar;16(2):181-200. doi: 10.1089/tmj.2009.0111.
- UNCRPD

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CLINICALS IN SPEECH-LANGUAGE PATHOLOGY-IV

Course Code: ASL2610 **Credit Units: 07**

General considerations:

- Exposure is primarily aimed to be linked to the theory courses covered in the semester.
- After completion of clinical postings in Speech–language diagnostics, the student will know (concepts), know how (ability to apply), show (demonstrate in a clinical diary/log book based on clinical reports/recordings, etc.), and do (perform on patients/ client contacts) the following:

Know:

1. Procedures to assess motor speech disorders in adults.
2. Differential diagnosis of motor speech disorders in adults.
3. Procedures to assess individuals with adult language disorders, and other related abnormalities.

Know-how:

1. To administer at least two standard tests for adult language disorders.
2. To administer at least two standard tests/protocols for motor speech disorders in adults.
3. To record a sample for analysis of language and speech skills in adults with neuro-communication disorders.
4. To assess posture, breathing, speech and swallowing in adults with motor speech disorders.
5. To consult with inter-disciplinary medical/rehabilitation team and counsel the individual/family regarding management options and prognosis.

Show:

1. Language assessment - minimum of 2 individuals after stroke.
2. Associated problems in individuals after stroke and its evaluation.
3. Dysphagia assessment – minimum of 2 children & adults.
4. Goals and activities for therapy (including AAC) based on assessment/test results for adults with neuro-communication disorders.

Do:

1. Voice therapy - Minimum of 2 individuals with voice disorders.
2. Fluency therapy - Minimum of 2 individuals with fluency disorders.
3. Bed side evaluation of individuals with neuro-communication disorders – Minimum of 2 individuals.
4. Apply speech language stimulation/therapy techniques on 5 children with language disorders/speech sound disorders/ motor speech disorders – minimum 5 sessions of therapy for each child.

Evaluation:

- Internal evaluation shall be based on attendance, clinical diary, log book and learning conference.
- External evaluation: Spot test, OSCE, Record, Viva-voce, case work

Examination scheme:

Components	CRW	C/P/A	CT	A	Viva
Weightage (%)	15	15	15	5	50

CRW- Clinical record writing, C/P/A- Case discussion/presentation/analysis, CT- Class test, A-Attendance, Viva- Internal/External

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CLINICALS IN AUDIOLOGY-IV

Course Code: ASL2611 **Credit Units: 07**

General considerations:

- Exposure is primarily aimed to be linked to the theory courses covered in the semester, however, not just limited to these areas.
- After completion of clinical postings in auditory diagnostics and auditory rehabilitation, the student will Know (concept), know how (ability to apply), show (demonstrate in a clinical diary/log book), and do (perform on patients/ client contacts) the following:

Know:

1. National and international standards related to noise exposure.
2. Recommend appropriate treatment options such as speech reading, AVT, combined approaches etc.

Know-how:

1. To carryout noise survey in Industry and community
2. To carryout mapping of cochlear implant in infants and children using both objective and subjective procedures
3. To trouble shoot cochlear implant

Show:

1. Analysis of objective responses like compound action potential, stapedial reflexes on at least 3 samples
2. Comprehensive hearing conservation program for at least 1 situation

Do:

1. AVT on at least 1 child with hearing impairment
2. Trouble shooting and fine tuning of hearing aids on at least 5 geriatric clients
3. At least one activity for different stages involved in auditory training

Evaluation:

- Internal evaluation shall be based on attendance, clinical diary, log book and learning conference.
- External evaluation: Spot test, OSCE, Record, Viva-voce, case work

Examination scheme:

Components	CRW	C/P/A	CT	A	Viva
Weightage (%)	15	15	15	5	50

CRW- Clinical record writing, C/P/A- Case discussion/presentation/analysis, CT- Class test, A-Attendance, Viva- Internal/External

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CLINICALS IN SPEECH-LANGUAGE PATHOLOGY AND AUDIOLOGY-I

Course Code: ASL2701 **Credit Units: 24**

CLINICALS IN SPEECH LANGUAGE PATHOLOGY

General: Clinical internship aims to provide clinical exposure and experience in different set ups. The students would not only carry out greater quantum of work, but also work varied clinical populations and in different contexts. Internship will provide greater opportunity for the students to liaise with professionals from allied fields. The intern is expected to demonstrate competence and independence in carrying out the following, among others:

1) Diagnosis and management of speech, language, and swallowing disorders across life span.
2) Report evaluation findings, counsel and make appropriate referrals.
3) Plan and execute intervention and rehabilitation programs for persons with speech language, communication, and swallowing disorders
4) Develop and maintain records related to persons with speech-language, communication, and swallowing disorders

CLINICALS IN AUDIOLOGY

General: Clinical internship aims to provide clinical exposure and experience in different set ups. The students would not only carry out greater quantum of work, but also work varied clinical populations and in different contexts. Internship will provide greater opportunity for the students to liaise with professionals from allied fields. The intern is expected to demonstrate competence and independence in carrying out the following, among others:

1) Diagnosis and management of hearing disorders across life span.
2) Report evaluation findings, counsel and make appropriate referrals.
3) Plan and execute intervention and rehabilitation programs for persons with hearing disorders
4) Develop and maintain records related to persons with hearing disorders
5) Engage in community related services such as camps, awareness programs specifically, and community based rehabilitation activities, in general.

Examination Scheme: Based on performance in clinical practicum.

Components	DR	LP/TP	AT	CL
Weightage (%)	30	30	20	20

DR-Daily Report, LP/TP-Lesson Plan/Therapy Plan, AT-Attendance, CL-Case Load

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CLINICALS IN SPEECH-LANGUAGE PATHOLOGY AND AUDIOLOGY-II

Course Code: ASL2801 **Credit Units: 24**

CLINICALS IN SPEECH LANGUAGE PATHOLOGY

General: Clinical internship aims to provide clinical exposure and experience in different set ups. The students would not only carry out greater quantum of work, but also work varied clinical populations and in different contexts. Internship will provide greater opportunity for the students to liaise with professionals from allied fields. The intern is expected to demonstrate competence and independence in carrying out the following, among others:

1) Engage in community related services such as camps, awareness programs specifically, and community based rehabilitation activities, in general.
2) Make appropriate referrals and liaise with professionals from related fields.
3) Gain experience in different set ups and be able to establish speech centres in different set-ups
4) Demonstrate that the objectives of the B.ASLP program have been achieved.
5) Advise on the welfare measures available for their clinical clientele and their families.
6) Advise and fit appropriate aids and devices for their clinical population.

CLINICALS IN AUDIOLOGY

1) Make appropriate referrals and liaise with professionals from related fields.
2) Gain experience in different set ups and be able to establish hearing centres in different set-ups
3) Demonstrate that the objectives of the B.ASLP program have been achieved.
4) Advise on the welfare measures available for their clinical clientele and their families.
5) Advise and fit appropriate aids and devices for their clinical population.

Examination Scheme: Based on performance in clinical practicum.

Components	DR	LP/TP	AT	CL
Weightage (%)	30	30	20	20

DR-Daily Report, LP/TP-Lesson Plan/Therapy Plan, AT-Attendance, CL-Case Load

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NUTRITIONAL BIOCHEMISTRY-I

Course Code: DAN4102 **Credit Units: 04**

Course Objectives

1. This subject makes students understand about the basic concepts of biochemistry like cell and the various processes involved in it like the release of energy.
2. Students are made to know about the various enzymes involved in the various biochemical reactions taking place in the human body.
3. The subject involves understanding of various nutrients and their involvement in the processes occurring in our body.
4. Biochemical structures, various acids, their classification are being learnt by the students.

Module – I :

Principles of Bioenergetics- Concept of free energy, Oxidation and reduction, concept of cell, high energy compounds (ATP, PEP, and Phosphogens),role of ATP/ADP cycle in transfer of high energy phosphates, concept of coupled reactions.

Module – II :

Carbohydrates-

Definition, classification.

Monosaccharides Classification, occurrence, structure, stereoisomerism (DL and RS systems) and Properties, derivatives of Monosaccharides- deoxy sugars and amino sugars. **Disaccharides** of nutritional importance (sucrose, maltose, lactose),

Polysaccharides Homopolysaccharides- starch, glycogen, cellulose,

Heteropolysaccharides - glycoprotein, Proteoglycans, mucopolysaccharides, pectins.

Module – III :

Lipids : Definition, classification. Structure and functions of fatty acids (including essential fatty acids) Trans fatty acids, prostaglandins acylglycerols, phospholipids, sphingolipids, glycolipids, steroids (including role of cholesterol). Characterization of fats- saponification, iodine, acid, acetyl and peroxide value.

Module – IV :

Amino acids and Proteins: Common structural features,classification based on the nature of R group, non-protein amino acids, essential amino acids and titration curves of monoamino-monocarboxilic,monoamino-dicarboxilic and diamino-monocarboxilic acids. peptide bond,biological role of proteins, classification of proteins, levels of protein structure- primary, secondary (super secondary elements in brief), tertiary and quaternary structure, forces stablizing protein structure, denaturation of proteins.

Module – V :

Enzymology: General Characteristics, classification and nomenclature, coenzyme, cofactor, prosthetic group, concept of holoenzyme and apoenzyme, units of enzyme activity, Enzyme kinetics- Michaelis-Menten and Lineweaver-Burk equation for monosubstrate reactions (turnover number), bisubstrate reactions.

Module – VI :

Nucleic acids: Nitrogenous bases, experimental proof of DNA and RNA as genetic material, Chargaff's rules, double helical model of DNA (A, B and Z), DNA packaging, types of RNA and their functions.

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A – Attendance , CT- Class Test , S- Seminar , V- Viva , Q –Quiz , HA – Home Assignment , EE – End Term Exam

Texts and References:

Texts:

1 Harper's Biochemistry- Robert K. Murray
2 Textbook of Biochemistry- West and Todd
3 Bio chemical aspect of Nutrition – S.X.C.- Okoyo
4 Food Chemistry – O.R. Fennema
5 Biochemistry – Voet and Voet
6 Principles of Biochemistry – A.L. Lehniger

References:

7 Outlines of Biochemistry- E. E. Conn
8 Practical Clinical Biochemistry- Harold Varley

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FOOD SCIENCE – I

Course Code: DAN4104 **Credit Units: 04**

Course Objectives:

1. Students learn about the various food groups and their structure and composition
2. Properties of all food groups are included in the subject to make students aware about the various processes
3. Cooking methods involved for making varieties of foods are being known by the students.
4. Various adulterants and their tests of presence are learnt by the students which they can utilize for doing quality check.
5. Evaluating the various foods on different measures is included to make students know about those measures and their use.

Course Contents:

Module – I

Physical & Physiological changes in food.
a) Colloidal Chemistry as related to food emulsions, foams, sols & gels, osmotic pressure. b)Enzymatic browning immobilized enzymes & enzymes in food Processing..
c) Denaturation of Protein.

Module – II :Cereal and cereal Products:

(A) Cereal grains, structure & composition , Cereal products, Breakfast Cereals. Leavening agents and products.

Module – III :Sugar and Sugar Products

Manufacturing Process of Sugar Stages of sugar Cookery. Starch Structure , gelatinization, Modified Food Starches.

Module – IV :Fruits & Vegetables:

Pigments and colour in Food.

Module – V :Milk & Milk Products:

Composition and properties of milk. Dairy Products: Cultured milk , Yoghurt, butter, Whey, cheese etc.

Module – VI :

Meat , Poultry & Egg: Postmortem changes in meat, tenderizing meat, heat induced changes in meat, meat substitutes.
Egg: Structure & composition , changes during storage, functional properties of egg, egg substitutes.

Module – VII :Food Additives

a) Meaning, need of food additives.
b) Antioxidants, chelating agents, coloring agents, curing agents.
c) Nutrient supplements, Non nutritive sweeteners, pH control agents.
d) Preservatives, stabilizers and thickeners, Other Additives.
e) Additives & Food Safety.

Module – VIII :Food Adulteration and Sensory evaluation

Definition, meaning and various tests used in Sensory evaluation & food product development.

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A – Attendance , CT- Class Test , S- Seminar , V- Viva , Q –Quiz , HA – Home Assignment , EE – End Term Exam

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NUTRITIONAL BICHEMISTRY LAB

Course Code: DAN4106 **Credit Units: 01**

Course Objectives:

1. Students learn the process to identify the presence of one or more component present in food.
2. Practical teaches them about the preparation of solutions and buffers.
3. Qualitative and quantitative estimation of nutrients is learnt by the students.
4. The change in activity of certain foods on adding chemicals and observing them.

Course Content:

1. Preparation of standard solutions.
2. Preparation of buffers using buffer tables and verify pH
3. Extraction and quantitative estimation of total sugars and reducing sugar from food stuffs.
4. Isolation and estimation of casein from milk.
5. Quantitative estimation of proteins by kjeldahl's, Biuret and lowary's method (any two methods).
6. Effect of pH, concentration, time and temperature of incubation on enzyme activity.
7. Estimation of activity of alkaline phosphatase in Moong been seeds.

Examination Scheme:

IA				EE		
A	**PR**	**LR**	**V**	**PR**	**WT**	**V**
5	10	10	5	25	25	20

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FOOD SCIENCE – I LAB

Course Code: DAN4107 **Credit Units: 01**

Course Objectives:

1. This practical aims at making students learn about the presence and absence of adulterants in foods.
2. Various experiments to check the purity and quality of foods are included to make students know about them and their use in future.
3. Students learn about the sensory evaluation and the various types and its uses to check the quality of food.
4. Students are made to think about innovative recipes by focussing on new product development and then checking its acceptability.

Assessment of purity and quality of different food

1 Detection of metanil yellow in a given food sample .
2 Check the presence of rhodamine B in the given food sample.
3 Test the presence of sugar in honey.
4 Detection of NaHCo3 in flour.
5 Check for the presence of vanaspati and rancidity in the ghee.
6 Check the milk for presence of protein, urea, sugar and starch.
7.Check the presence of mineral oil in the edible oil sample.

Sensory Evaluation of Foods

1 Design of sensory experiment – selection of panel, types of panel, training of panel, development of score card , data analysis and interpretation of results.
2 Determination of test threshold for the different sensations sweet, salty, sour.
3. Conduct test to know the acceptability of a new product using rating test.

Examination Scheme:

IA				EE		
A	**PR**	**LR**	**V**	**PR**	**WT**	**V**
5	10	10	5	25	25	20

Text and Reference:

Texts:

1. Sharma, S. Practical biochemistry, classic publishing house, Jaipur, 1993.
2. Mody, N.I.Experimental food chemistry, Avi publishing company, INC, Westport, connetional.
3. A manual of laboratory techinques, National Institute of Nutrition. 1983.
4. Sathe, A.V.(1999) A first course in food analysis, New age International (p) limited Publishers, New Delhi.

Reference:

5. Sethi M. and Rao, E.S. (2001) Food Science Experiments and Applications, CBS Publishers & Distributors, New Delhi.

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THERAPEUTICS NUTRITION – I LAB

Course Code: DAN4108 **Credit Units: 01**

Course Objectives:

1. This practical aims to make students learn and make use of the various cooking methods.
2. Students learn to plan about the various diets of various diseases they have learnt in theory.
3. Calculation of nutritive values, the preparation of the planned recipe, its presentation and its evaluation is known by the students.
4. Including the correct choices of foods and the correct method of preparation is being learnt by the students.
5. Students learn the way of presenting a recipe to the person or patient.

Course Content:

Planning, Calculation, Preparation, serving and evaluation of therapeutic diets for diseases covered in theory

Examination Scheme:

IA				EE		
A	**PR**	**LR**	**V**	**PR**	**WT**	**V**
5	10	10	5	25	25	20

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ADVANCED NUTRITION–II

Course Code: DAN4201 **Credit Units: 03**

Course Objectives:

1.To understand about the digestion, absorption and transport of proteins, vitamins and minerals
2. To understand the role of nutrient interaction and drug-nutrient interaction in our body
3. To learn about the practical knowledge of various nutrients.
4. To learn about the physiological, pharmacological and therapeutic effects, toxicity and deficiency of vitamins.

Course Contents:

Module – I

Proteins: Classification, digestion, absorption and transport - review. Protein quality, methods of evaluating protein quality. Protein and amino acid requirements. Therapeutic applications of specific amino acids: Branched chain, glutamine arginine, homocysteine, cysteine, taurine.

Module – II :

Vitamins : Historical background, food sources, absorption and transport, biochemical function. Interactions with other nutrients. Physiological, pharmacological and therapeutic effects, toxicity and deficiency with respect
to the following
a) Fat soluble: Vitamins A, D, E & K.
b) Water soluble:Thiamine, riboflavin, niacin, biotin, pyridoxine, folic acid, pantothenic acid,ascorbic acid, cyanocobalamin, choline, inositol.

Module – III :

Minerals

(Note: For each nutrient sources, bioavailability, function requirements, RDI/ESADDI, deficiency and toxicity, interactions with other nutrients are to be discussed)
Macro minerals: calcium, phosphorus, magnesium sodium, potassium and chloride.
Micro minerals: Iron, copper, zinc, manganese, iodine, fluoride.
Trace minerals: Selenium, cobalt, chromium, vanadium, silicon, boron, nickel.

Module – IV :Nutrient

Nutrient interaction, drug-nutrient interaction.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A – Attendance , CT- Class Test , S- Seminar , V- Viva , Q –Quiz , HA – Home Assignment , EE – End Term Exam

Texts and References:

Texts:

1 Modern Nutrition in Health and Disease – Goodhearth, R. S.
2 Recommended dietary allowance for Indian – I.C.M.R., 1980
3 Nutrition and Development- Winick 1973, Univ. of Calombia.
4 Biology of Nutrition – Eclames 1972, Palaniuma Press
5 Foods & Nutrition – Krause 1972, Saunders.
6 Proteins and Human Foods 1970, Lowrie, Avi. Pub. Co.
7 Nut. & Physical fitness-BoGert L.J.

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8 Principles of Nut. – Wilson, L.D. and Fisher. K.H.
9 Standardised diets for Hospital – National Nut. Advisory Committee
10 Nutrition in Health & Disease – Cooper, L. Barher, L. Mitehell, Hand Rynheraen.

References:

1. Nutrition A comprehensive: Beaton and McHanery, Treatise Vol-1, II, & III.
2. Human Nut. & Dietetics- Davidson S., Passmore, R., Brook, J.E. and Truswell.
3. Foods and Nut.- Rankin, W. Munn. Hildath E.N.
4. Iron deficiency – Holiberth, H.C. Harvorth, vannotti, N.Y.
5. Trace Elements in Human and Animal Nut. – Underwood, N.Y.
6. Essays in Biochemistry – Samul Graff, Tandon Book Dept. Sec. –16
7. Diabetes Mellitus- The Williams and Wilkinas Co., U.S.A.

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NUTRITIONAL BIOCHEMISTRY-II

Course Code: DAN4202 **Credit Units: 04**

Course Objectives:

1. To understand the metabolism of carbohydrate, amino acid, lipid metabolism and nucleotide.
2. To learn the mechanism of enzyme action and role of enzymes in medicine and food industry.
3. To understand the different bio physical techniques with their applications.
4. To learn about the regulation of metabolic pathways in our body.

Course Contents:

Module – I :

Metabolism of Carbohydrates: Review of glycolysis, fate of pyruvate: alcoholic and homolactic fermentation, Cori cycle, Citric acid cycle. Hexose monophosphate shunt, glycogenesis, glycogenolysis, gluconeogenesis, glyoxalate cycle. Regulation of blood glucose level.

Module – II :

Amino Acid Metabolism: Transamination, deamination, urea cycle, amino acids as biosynthetic precursors- biosynthesis of heme, biologically active amines and glutathione.

Module – III

Lipid Metabolism: Beta-oxidation of saturated and unsaturated fatty acids (including brief account of minor pathways of fatty acid oxidation),biosynthesis of fatty acids, triacylglycerols, Phospholipids, ketone body formation and their utilization, prostaglandins. Major alterations in carbohydrates,protein and fat metabolism in chronic nutrition related degenerative diseases.

Module – III :

Nucleotide Metabolism :Biosynthesis of purines and pyrimidines, DNA replication, transcription, translation, regulation of gene expression (Prokaryotes), mutagenesis and DNA repair, recombinant DNA technology and genetically modified foods.

Module – IV :

Enzymology :Mechanism of enzyme action (acid base catalysis, covalent catalysis, metal ion catalysis, electrostatic catalysis, proximity and orientation effect, preferential binding of the transition stae complex, strain and distortion theory) Enzyme inhibition – irreversible(non-competitive,uncompetitive),reversible(competitive), feed back and product inhibition, regulation of enzyme activity by covalent modification, allosteric modification, isoenzymes, applications of enzymes in medicine and food industry

Module – V :

Biophysical Techniques: Chromatography- Column, Thin layer, Paper, Ionexchange, Affinity, Molecular exclusion, GLC and HPLC.

Electrophoresis- cellulose acetate and gel electrophoresis, isoelectric focusing. Spectrophotometry- Bear Lambert's Law, determination and application of extinction coefficient.

Centrifugation- sedimentation velocity and analytical methods, ultracentrifugation.Immunochemical Methods – RIA, ELISA.Use of Isotopes in biochemistry. *Regulation of metabolic pathways should be discussed along with.

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A – Attendance , CT- Class Test , S- Seminar , V- Viva , Q –Quiz , HA – Home Assignment , EE – End Term Exam

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4 Food Chemistry – O.R. Fennema
5 Biochemistry – Voet and Voct

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RESEARCH MEHODOLOGY

Course Code: DAN4203 **Credit Units: 04**

Course Objectives:

1. To understand the scientific approaches to research.
2. To appreciate the importance of scientific writing and develop competence in writing skills.
3. To identify the sources of variability and uncertainty in research.
4. To learn about the different methods of research.

Course Contents:

Module – I :

Nature of research in Home Science, scientific approach. Types of Research: Experimental, Field studies, Case study, and Survey research.

Designing research: Problem, hypothesis, concept and types of variables (dependent, independent, random, discrete, continuous, qualitative and quantitative).

Module – II

Methods of data collection: Interview, observation, questionnaire, rating scales. Research Designs: randomized groups, matched groups, pre and post test and factorial.

Sampling: Meaning, importance and types; random (simple, stratified, cluster), Non random (incidental, purposive, quota)

Module – III :

Statistics: Meaning, primary data, array, frequency, frequency distribution and its types.

Measures of central tendency: Mean, Median, Mode; Measures of dispersion: range, mean deviation, standard deviation, root mean square deviation, variance, moments about origin and moments about mean, Binomial and Normal distribution, Skewness and Kurtosis.Case studies of areas of current research. Formulating a research plan and its presentation

Module – IV :

Type of Articles (review, letters etc). Scientific paper format (Abstract, Introduction, Materials and Methods, Results, Discussion). Writing, evaluating, presenting and publishing the results of scientific research in the academic press (journals, conferences etc). Choosing the appropriate journal (Sources, Information, Instructions to authors, peer review system, journal evaluation)

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A – Attendance , CT- Class Test , S- Seminar , V- Viva , Q –Quiz , HA – Home Assignment , EE – End Term Exam

Texts and References:

Texts:

1. S.C. Gupta & V.K. Kapoor: Fundamentals of Mathematical Statistics
2. S.C. Gupta: Fundamentals of statistics
3 G. Udny Yule, N.M.G. Kendall: An Introduction to the theory of Statistics

References:

4 Croxton, F.C. and Cowden, D. J. Applied General Statistics, Prentics hall Inc. 1955
2 Garrett. H. Statistical in Psychology and Education. Oxford book Co. 1960.
3 R.P. Hooda: Introduction to statistics. The MacMillon Co.
5 Scotharman, W. A. Textbook of Statistics, (Revised edition) 1973.
6 Kerlinge, Foundations of Behavioral Research
7 Sneedecer G. W. Statistical Methods. Applied Pacific Private Ltd., 1961.

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DIETETIC TECHNIQUES AND PATIENT COUNSELING

Course Code: DAN4205 **Credit Units: 03**

Course Objectives:

1. To understand the knowledge about the disease like gastrointestinal disorders, renal disease, liver diseases etc.
2. To familiarize the students with the layout and organization of the hospital.
3. To assess the medical profile of the patient like general details, family history, and associated complications, anthropometry, clinical status, biochemical and biophysical status.
4. To suggest the diet for the particular diseased condition.

Module I

Dietitian as part of the Medical Team and Outreach Services.

Clinical Information - Medical History and Patient Profile Techniques of obtaining relevant information, Retrospective information, Dietary Diagnosis, Assessing food and nutrient intakes, Lifestyles, Physical activity, Stress, Nutritional Status. Correlating Relevant Information and identifying areas of need.

The Care Process - Setting goals and objectives short term and long term, Counselling and Patient Education, Dietary Prescription.

Module II

Motivating Patients. Working with -

B. Hospitalized patients (adults, pediatric, elderly, and handicapped), adjusting and adopting to individual needs.

C. Outpatients (adults, pediatric, elderly, handicapped), patients' education, techniques and modes.

Follow up, Monitoring and Evaluation of outcome, Home visits

Module III

Teaching aids used by dietitians- charts, leaflets, posters etc., preparation of teaching material for patients suffering from Digestive disorders, Hypertension, Diabetes, Atherosclerosis & Hepatitis and cirrhosis.

Module IV

Maintaining records, Reporting findings, Applying findings, Resources and Aids for education and counselling, Terminating counselling, Education for individual patients, Use of regional language, linguistics in communication process, Counselling and education.

Texts and References:

Texts:

1 Modern Nutrition in Health and Disease – Goodhearth, R. S.
2 Recommended dietary allowance for Indian – I.C.M.R., 1980
3Nutrition and Development- Winick 1973, Univ. of Calombia.
4.Biology of Nutrition – Eclames 1972, Palaniuma Press
5Foods & Nutrition – Krause 1972, Saunders.

References:

6 Human Nutrition and dietetics- Davidson, S. Passmore, R. Brock- J.F. and Turswell A.S.
7 Clinical Dietetics and Nutrition - Anita, F.P.
8 Food Science and Technology: Pyke, Maonus.
9 Modern Nutrition in health and disease by Goodhearth R.S. Shills.

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NUTRITIONAL BIOCHEMISTRY-II LAB

Course Code: DAN4206 **Credit Units: 01**

Course Objectives:

1. To understand the use of instruments like chromatography, calorimeter, etc. in biochemical estimation .
2. To detect the purity of sample by using biochemical techniques.

Course Content:

1. Extraction and quantitative estimation of ascorbic acid.
2 Isolation and quantitative estimation of B1, B2 vitamins in various food stuffs.
3 Estimation of Moisture, Crude Fat, crude fiber and ash in the food stuffs.
4 Determination of energy value of foods using bomb calorie meter.
5 Determination of iodine value of given fat sample.
6 Determination of Sodium & Potassium of food /drinks through Flame Ph Meter
7 Separation of amino acids by paper chromatography, TLC.
8. Separation of proteins by gel electrophoresis

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ADVANCED NUTRITION-II LAB

Course Code: DAN4207 **Credit Units: 01**

Course Objectives:

1. To develop the new food product from different food groups.
2. To understand the knowledge about sensory evaluation of the food product

Course content:

1. Market and consumer survey to identify new products
2. Product development from different food groups and their sensory evaluation by different methods.
3. Two Visit to Food Industry

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THERAPEUTICS NUTRITION – II LAB

Course Code: DAN4208 **Credit Units: 02**

Course objectives:

1. Plan and prepare suitable therapeutic diets based on patient needs for various diseased condition.
2. To provide nutritional counseling for the prevention/ treatment of various disease in hospitals.
3. Prepare special therapeutic diets.

Course Contents:

1 Planning, Calculation, Preparation, serving and evaluation of therapeutic diets for diseases covered in theory

2 Study of the management of food services in selected Hospitals.

3 Visits to dietetic clinics in hospitals- case study of patients needing specific therapeutic diets.

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INSTITUTIONAL FOOD ADMINISTRATION

Course Code: DAN4302 **Credit Units: 04**

Course Objectives:

1. To understand management aspects related to food services and its application
2. Develop general knowledge on the origins and development of food service systems in hotels, restaurants, and institutions.
3. To identify variety of managerial, production, and service areas that is typical of the food service industry.
4. To understand managerial responsibilities as they relate to food service functions including menu planning, purchasing, storing, preparation, and recipe development.
5. To understand role of food safety, food budgeting and food standards.

Course Contents:

Module I :

Food service system and management
(i) Introduction to food service system
(ii) Evaluation of the food service industry
(iii) Characteristics of the various types of food service units –
commercial, institutional, hospital, military, any other
(iv) Scope and development of food service institution in India
(v) Effects of environmental changes on different types of establishments

Module II :

Food service management
(a) Definitions, principles and functions of Management
(b) Approaches to management – traditional, system approach, management by objectives
(c) Financial management – (i) Definition, application of management accounting to catering operations
(ii) Budgeting, determining the financial needs sources
(iii) Book- keeping and accounting

Module III : Food service organization

(a) Definition and types of organization in food
(b) Tools of organization Chart, job description, job specification, work schedule and communication
(c) Recruitment, induction, training, motivation and performance appraisal of personnel
(d) Administrative leadership

Module IV: Planning and service of food

(a) Menu planning
(i) Types of menu structure
(ii) Factors affecting menu planning
(iii) Menu evaluation

Module V :Delivery and service of food

(a) Food service system Conventional, commissary, assembly service
(b) Service of food: Self-service, tray service, waiter service, portable meals, banquets
(c) Food service in selected types of organizations Hospitals, schools, colleges, industrial canteens, airlines and space
(d) Customer relationships

Module VI :

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Quality and Quantity control
(a) Construction and selection of recipes by quantity cooking
(b) Standardization of recipe, recipe format and adjustment
(c) Product standard and production control

Module VII:
Food cost accounting / Analysis
(a) Importance of costing and food cost control
(b) Methods of costing
(c) Cost classification into materials, labor and overheads and their percentage analysis
(d) Reports and trend analysis
Food purchasing, selection and storage
(a) Purchasing –
(i) Forecasting, product selection, purchasing , specification
(ii) Methods and procedure of purchasing

(i) Elements of receiving process
(ii) Inventory control
(c) Storage -
(i) Dry
(ii) Refrigerated and cold storage

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

A – Attendance , CT- Class Test , S- Seminar , V- Viva , Q –Quiz , HA – Home Assignment , EE – End Term Exam

Text and References:
Texts:
1. West, B Bessie & Wood, Levelle (1988): Food service in institutions 6th Edition. Revised by F.V., Shuggart S.G. & Palgne-Palacio June Macmillian Publication company New York.
2. Sethi Mohini (1993): Catering Management An integrated approach 2nd Edition, Wiley publication.
3. Kotas Richard & Jayawardardene, C., (1994): Profitable Food and Beverage Management, Hodder Stoughton Publication.

References:
1. Brodner, J., Maschal, H.T., Carlon, H. M.(1982): Profitable Food and Beverage Operation 4th Edition, Hayden Book company New Jersey.
2. Green, E. F., Drake, C.G., Sweeny, J.F. (1972): Profitable Food and Beverage Management, Planning Operatio Hayden Book company New Jersey.
3. Knootz, H.O., Donnel C (1968): Principles of Management , McGraw Hill Book Company.

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COMMUNITY NUTRITION LAB

Course Code: DAN4305 **Credit Units: 01**

Course Objectives:
1. To learn method of socio-economic survey.
2. To perform dietary survey.
3. To study clinical examination to asses nutrient deficiencies.
4. To plan and conduct nutrition education program.

Course Content:
Conduct of socio - economic survey
Conduct of Diet survey
Conduct of Clinical Examination
Planning, conducting and Evaluating Nutrition Education Programme.

Examination Scheme:

IA				EE		
A	**PR**	**LR**	**V**	**PR**	**WT**	**V**
5	10	10	5	25	25	20

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FOOD SCIENCE-II LAB

Course Code: DAN4306 **Credit Units: 02**

Course Objectives:

1. To conduct appropriate experiments of food science and interpret the results.
2. To study effect of various treatments on food.
3. To learn basic culinary skills in various food groups.
3. To plan and perform nutrient rich recipes.

Course content:

Practical related to theory papers i.e : Effect of various treatments on the foods mentioned in syllabi

Examination Scheme:

IA				EE		
A	**PR**	**LR**	**V**	**PR**	**WT**	**V**
5	10	10	5	25	25	20

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FOOD MICROBIOLOGY- II LAB

Course Code: DAN4307 **Credit Units: 02**

1. To learn basic microbiological apparatus and equipments used in the laboratory.
2. To study and perform sterilization techniques used in microbiology.
3. To study and perform staining of bacteria and microscopic examination.
4. To perform isolation and culture techniques used in food microbiology.
5. To demonstrate RIA and ELISA

Course content:

1. Microbiological apparatus and equipments-a basic introduction, instruments needed for isolation, cultivation and maintenance of microbes, tools needed in microbiology laboratory for inoculation and culturing
2. Cleaning and sterilization procedures for glassware.
3. Preparation and sterilization of laboratory media.
4. Staining of bacteria- gram's staining, use of oil immersion lens, micrometry, and microscopic enumeration.
5. Spread plating, pour plating, streaking techniques.
6. Enrichment of isolated cultures, SPC, MPC. Coli count and coli confirmations.
7. Study of biochemical characteristics of isolated cultures-

· Fermentation reaction · Starch cultures
· IMVIC Tests · Catalase test
· Oxidase test · Urease test
· H2S test · Coagulase test

8. Microbiological analysis of milk- raw, boiled and pasteurized - MBRT Test.
9. Demonstration of Techniques of

. Radio immune Assay (RIA)
.Enzyme Linked Immuno Sorbunt Assay (ELISA)

Examination Scheme:

IA				EE		
A	**PR**	**LR**	**V**	**PR**	**WT**	**V**
5	10	10	5	25	25	20

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SUMMER INTERNSHIP

Course Code: DAN4335 **Credit Units: 06**

Objectives:
Summer internships are usually eight weeks long and it is full time. The students are required to do internships during the summer than during any other time of the year. These short term experiences provide a real insight into what it's actually like working in a particular job or career field. There's ample time to get into a regular work routine and gain valuable knowledge and skills. Internship objectives include:

- Developing personally and professionally while gaining confidence and real-world experience
- Meeting and networking with practitioners in one's area of interest
- Mentoring and performance feedback from the site supervisor
- Earning academic credit while getting paid or non paid.

General Guidelines:
Every student of post graduate courses will be required to undergo a practical training in an organization approved by the Institute for eight weeks, normally in the Summer Vacation, after the end of the fourth semester examinations. The candidates shall be required to undergo training in the various areas of the organization concerned. The organization may assign a specific project to the candidate, which will be completed by him/her during the period of training. The work done by the candidate during the training period shall be submitted in the form of a report as per the guidelines provided by the Department.

Chapter Scheme for the SIP Report:

Chapter I: Introduction	- 10 marks
Chapter II: Conceptual Framework/National/International Scenario	- 05 marks
Chapter III: Presentation, Analysis and Findings / Case Studies	- 20 marks
Chapter IV: Conclusion and Recommendations	- 10 marks
Hospital Chief Dietitian Marking	-30 marks

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The Chief Dietitian is asked to evaluate the student based on his/her performance as well as their conduct. The report has to be written in font Times New Roman, 12 points, 1.5 line spacing on both sides of the paper, Spiral Bound. The report should comprise of a maximum of 70 pages and has to be submitted in two copies.

THE COMPONENTS OF A SIP REPORT

The outcome of Summer Internship is the Project Report. A project report should have the following components:

1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.

2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.

3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.

4) Body of the Report: The body of the report should have these four logical divisions

a. *Introduction:* This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.
b. *Conceptual Framework / National and International Scenario*: (relating to the topic of the Project).
c. *Presentation of Data, Analysis and Findings / Case studies* : (using the tools and techniques mentioned in the methodology).
d. *Conclusion and Recommendations:* In this section, the concluding observations based on the main findings and suggestions are to be provided.

5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.

6) Annexure: Questionnaires (if any), relevant reports, etc.

Evaluation Scheme:

SIP Report	Power Point Presentation & Viva
75 marks	25 marks

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FOOD PROCESSING & TECHNOLOGY

Course Code: DAN4402 **Credit Units: 03**

Course objectives:

1. To understand principles of food preservation and its application of the different food.
2.To impart systematic knowledge of basic and applied aspects food processing and technology
3. To gain in depth knowledge about processing and preservation techniques of milk and milk product technology and fruits and vegetable technology.
4. To gain knowledge about industrial processing of legumes and oil seeds.

Module I:

Processing technology of foods & nutritional implications for the following:

• Cereals & Pulses- Wheat grain characteristics and products, Rice processing, Pulses Processing & their elimination of toxic factors. Fermentation & Germination Nuts & Oilseeds- Nuts Oilseeds Processing, solvent extraction purification, hydrogenation and tempering products - butter, margarine etc

• Flesh Foods: Processing & Their Products.

Module II:

Milk and Milk Products:- Classification and standardization, Pasteurization, homogenization, packing of milk. Milk Products- Fortified milk, Skim milk, Concentrated milks, Cream, Butter, Cheese, Ice cream and Indigenous milk products: Khoa, Paneer, Curd, Yoghurt, Ghee.

Module III:

• Fruits & Vegetables: Physiological and biochemical changes during ripening, handling & storage & fruit processing. Processing of vegetables, canning, freezing, dehydration, pickles & chutneys. Beverages & Appetizers : Classification, Coffee, Tea, coco chocolates, Fruit beverages, soups, Vegetable Beverages, Carbonated & Noncarbonated beverages, Alcoholic beverages.

Module IV:

a).Physical principles in Food Processing Operations:
b).Food Deterioration, Methods of Preservation and Processing: Thermal Processing, Refrigeration, Freezing, Dehydration, Ionizing radiations, Fermentation, concentration.
c).Chemical Principles of Food Processing:
d).Preservation/processing by sugar, salt, smoke, acid and chemicals.
e).Chemical & biochemical reactions affecting food quality & safety.
Some Recent concepts in Food Technology -

• Biotechnology in food.
• Algae as food - Spirulina
• Low cost nutrient supplement.
• Packaging of foods.

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Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

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NUTRITION FOR HEALTH & FITNESS

Course Code: DAN4403 **Credit Units: 03**

Course objectives:

1.Students learn about the meaning and importance of general health and fitness.
2. Detailed study of various sports and the diet involved for best outcome is being included.
3.Subject aims to make students understand how nutrition is important pre and post games and how it makes an influence on the performance of the player.
4. Nutrition and diet of injured athletes, specially abled athletes, along with the influence of environmental conditions are being learnt by the students.

Module I:

Physical Fitness and health status: meaning, concept, assessment criteria and management
Healthy life style: Strategies, factors that promote life style changes, self management skills. Body composition in exercise and sport

Module II:

Physical Activity: need, principles of physical activity Energy input and output: Different energy systems for endurance and power activity, Fuels and nutrients to support physical activity.

Module III:

Nutrition in Sports: Sports specific requirement, Diet manipulation, Pre-game, during and post-game meals. Diets for athletes with high energy requirements, stress, fracture and injury
Water and electrolyte balance: Losses and their replenishment during exercise and sports events, effect of dehydration, sports drinks.

Module IV:

Special Nutrition considerations for female, older and disabled athletes. Nutrition of athletes in hot, cold and high altitude environments
Nutrition education of athletes and coaches.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

Books Recommended

- Ira Walinaky, (1998) Nutrition in Exercise and sport
- Charles B. Corbin, Ruth Lindsey and grey walk (2000) Concepts of fitness and wellness
- Robert A. Robergers and Scott O. Roberts (2000) exercise physiology.

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COMMUNITY NUTRITION-II LAB

Course Code: DAN4404 **Credit Units: 02**

Course Objectives:

1. To conduct socio-economic and dietary survey in detail.
2. To conduct of clinical examination with ICMR score card.
3. To design, perform, interpret and evaluate nutrition education program.
4. To critically review various nutritional programs conducted in villages
5. To cook recipes for various socio-economic groups: LIG, MIG, HIG.

Course content:

1. Conduct of socio - economic survey with Nutritional status parameters
2. Conduct of Dietary survey with detail calculations
3. Conduct of Clinical Examination with ICMR score card.
4. Planning, conducting and Evaluating Nutrition Education Programme.
5. Evaluation of various nutritional programmes conducted in villages.
6. Cooking of recipes for Low income group , Middle income group and High Income group.

Examination Scheme:

IA				EE		
A	**PR**	**LR**	**V**	**PR**	**WT**	**V**
5	10	10	5	25	25	20

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FOOD PROCESSING AND TECHNOLOGY LAB

Course Code: DAN4405 **Credit Units: 01**

Course Objectives:

1. To study physical dimensions of grains and other properties.
2. To determine pectin strength in various fruits and vegetables.
3. To study various food adulterants present in common foods.
4. To study tests used in sensory appraisal.
5. To prepare culture media of various microorganisms.

Course content:

1. Determination of physical dimensions of grains (Length, Breadth, Thickness and Bulk density)
2. Determination of wet and dry gluten content of flours.
3. Testing the pectin strength of different fruits and vegetables.
4. Determination of PH and titrable acidity of a food sample.
5. Determination of Total solids as soluble and insoluble in foods
6. Test for adulterants
7. Food Evaluation using different sensory tests
8. Total microbial count
9. Determination of pasteurization effect in milk by MBRT
10. Preparation of culture media for different organisms

Examination Scheme:

IA				EE		
A	**PR**	**LR**	**V**	**PR**	**WT**	**V**
5	10	10	5	25	25	20

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DISSERTATION

Course Code: DAN4437 **Credit Units: 06**

Course Objectives:

1. To understand comprehensive knowledge of the literature in the field of nutrition.
2. To conduct and apply appropriate research methods, collect & interpret data systematically; to conduct research ethically.
3. To learn importance of scientific writing and develop competence in writing skills.
4. To do research work and submit dissertation at the end of semester.

GUIDELINES FOR PROJECT FILE AND PROJECT REPORT

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critically analyzed by the faculty guide and corrected by the student at each stage.

PROJECT FILE

The Project File may be a very useful tool for undertaking an assignment along-with a normal semester, an exploratory study, sponsored projects, a project undertaken during summer period or any other period as per curricula where the researcher is working with a company/organization. The project/ assignment may also be a part of the bigger research agenda being pursued by a faculty/ institution/ department

The Project File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation. This file may be considered in continuous assessment.

In general, the File should be comprehensive and include:

- A short account of the activities that were undertaken as part of the project;
- A statement about the extent to which the project has achieved its stated objectives;
- A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;
- Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project;
- Any problems that have arisen and may be useful to document for future reference.

PROJECT REPORT

The Project Report is the final research report that the student prepares on the project assigned to him. In case of sponsored project the lay out of the project could be as prescribed by the sponsoring organization. However, in other cases the following components should be included in the project report:

- **Title or Cover Page**

The title page should contain Project Title; Student's Name; Programme; Year and Semester and Name of the Faculty Guide.

- **Acknowledgement(s)**

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Acknowledgment to any advisory or financial assistance received in the course of work may be given. It is incomplete without student's signature.

➢ **Abstract**

A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project. It should not exceed more than 1000 words.

➢ **Table of Contents**

Titles and subtitles are to correspond exactly with those in the text.

➢ **Introduction**

Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

➢ **Materials and Methods**

This section should aim at experimental designs, materials used (wherever applicable). Methodology should be mentioned in details including modifications undertaken, if any. It includes organization site(s), sample, instruments used with its validation, procedures followed and precautions.

➢ **Results and Discussion**

Present results, discuss and compare these with those from other workers, etc. In writing this section, emphasis should be laid on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

Note that in writing the various secions, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary, do not write in "point" form.

While presenting the results, write at length about the the various statistical tools used in the data interpretation. The result interpretation should be simple but full of data and statistical analysis. This data interpretation should be in congruence with the written objectives and the inferences should be drawn on data and not on impression. Avoid writing straight forward conclusion rather, it should lead to generalization of data on the chosen sample.

Results and its discussion should be supporting/contradicting with the previous research work in the given area. Usually one should not use more than two researches in either case of supporing or contradicting the present case of research.

➢ **Conclusion(s) & Recommendations**

A conclusion should be the final section in which the outcome of the work is mentioned briefly.
Check that your work answers the following questions:

- Did the research project meet its aims (check back to introduction for stated aims)?
- What are the main findings of the research?
- Are there any recommendations?
- Do you have any conclusion on the research process itself?

➢ **Implications for Future Research**

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This should bring out further prospects for the study either thrown open by the present work or with the purpose of making it more comprehensive.

- **Appendices**

The Appendices contain material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

- **References**

References should include papers, books etc. referred to in the body of the report. These should be written in the alphabetical order of the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Examples:
For research article:
Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichia coli* O157: H7. *Clin Microbiol Infect* , **8** (suppl 1): 116–117.
For book:
Kowalski,M.(1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67

The Layout Guidelines for the Project File & Project Report:

- A4 size Paper
  - Font: Arial (10 points) or Times New Roman (12 points)
  - Line spacing: 1.5
  - Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

ASSESSMENT OF THE PROJECT FILE AND THE PROJECT REPORT

Essentially, the assessment will be based on the quality of the report, the technical merit of the project and the project execution. Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project. Project execution is concerned with assessing how much work has been put in.

The Project should fulfill the following ***assessment objectives:***

- Range of Research Methods used to obtain information
- Execution of Research
- Data Analysis (Analyze Quantitative/ Qualitative information)
- Quality Control
- Conclusions

Assessment Scheme:

Continuous Evaluation:40% (Based on punctuality, regularity of work, adherence to plan and methodology, refinements/ mid-course corrections etc. as reflected in the Project File.)

Final Evaluation: 60% (Based on the Documentation in the file, Final report layout, analysis and results, achievement of objectives, presentation/ viva)

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Examination Scheme:

Research Originality	Dissertation (including all Chapters)	Research Paper	Power Point Presentation & Viva
20	40	10 marks	30 marks

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Curriculum & Scheme of Examination
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LABORATORY MANAGEMENT AND QUALITY CONTROL

Course Code: MLT4108 **Credit Units: 3**

Course Objective: To allow students to understand the laboratory management and quality control.

Course Contents:

Module-I: General Concept of Laboratory Management: Strategic planning; quality system management; human resource management; laboratory design and service model; regulation, accreditation and legislation; safety- biomedical hazard, chemical hazard, ergonomic hazard.

Module-II: Clinical Laboratory Informatics: Information flow (patient's registration/ID), test order, sample collection, labeling, performing test, releasing result & report, feedback. LIS selection, Implementations & management; good laboratory practice

Module-III: Quality Control: Introduction, analytical variability and calibration; calibration issue in quality control; proficiency testing; Westgurd rules; quality control of the product, chemicals, reagent; good, reliable, authentic report; total quality management framework of laboratory; essential elements of quality assurance programme; quality laboratory processes, quality assurance, quality assessment, quality control, quality planning and quality improvement

Module-IV: Internal Quality control: Control of pre-analytical variables, control of analytical variables, laboratory precision, accuracy & sensitivity; validation of methods; reference materials and calibrating definitive methods; sources of variation in laboratory test results. Systemic and random errors; quality control charts: Levy-Jenning chart, Cusum chart and Gaussian curve; Internal and external factors for quality control assurance; reference values

Examination Scheme:

Components	CT	HA	S/V/Q	ATTD	EE
Weightage (%)	15	5	5	5	70

Recommended books:

- Praful B. Godkar, Darshan P. Godkar. Text book of Medical Laboratory Technology, 3rd Edition 2014, Bhalani Publishing House.
- J Ochei and A Kolhatkar. Medical Laboratory Science- Theory and Practice, 1st Edition 2000, Tata Mcgraw Hill Publishing Co. Ltd.
- Mc Pherson and Pincus. Henry's Clinical Diagnosis and management by Laboratory Method, 23rd Edition, Elsevier.

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CLINICAL IMMUNOLOGY

Course Code: MLT4113 **Credit Units: 4**

Course Objective: To familiarize the students about the immune system and its role in infections, allergy and transplantation.

Course Contents:
Module-I: Introduction to Immunology: History of immunology; innate immunity; acquired immunity.
Immunoglobulin: Structure, function and types of immunoglobulin; monoclonal and polyclonal antibody; adjuvant.
Antigen: Types of antigens; antigenicity; haptens

Module-II: Immune Response: Primary and secondary immune response; phagocytosis; antigen processing and presentation; humoral and cell mediated immune response; hemolytic disease of newborn.
Compliment System: Complement portions and functions; classical, alternative pathway and lectin pathway.
Hypersensitivity: Introduction, types and complications of hypersensitive reactions; allergies

Module-III: Clinical Transplantation: Types of transplant; types of donor; HLA typing; transplant rejection; ethical issues; artificial organ; laboratory-grown organ; organ trafficking;
Autoimmunity: Factor affecting autoimmunity; pathogenesis of autoimmunity;autoimmune disease;diagnosis;immunological tolerance.

Module-IV: Vaccines: Effectiveness; adverse effects; types; recombinant vaccines
Antigen and Antibody Reactions: General features; precipitation; agglutination; flocculation; complement fixation test; neutralization; opsonisation.

Examination Scheme:

Components	CT	HA	S/V/Q	ATTD	EE
Weightage (%)	15	5	5	5	70

Recommended books:

- Dale Male, Jonathan Brostoff, David B Roth and Ivan RoittKuby Immunology, 7th Edition 2012, Mosby (Elsevier).
- C P Baveja, Text book of Microbiology, 4th Edition 2010, Arya Publication.
- Arti Kapil, Ananthanarayan and Paniker's Textbook of Microbiology, 9th Edition 2013, Orient BlackSwan.
- D.R.Arora / BrijBala Arora, Textbook of Microbiology, 5th Edition 2016, CBS Publishers & Distributors Pvt. Ltd..
- B S Nagoba and D V Bedpathsk, Immunology, 1st Edition 2008, BI Publications.
- J Ochei and A Kolhatkar, Medical Laboratory Science- Theory and Practice, 1st Edition 2000, Tata Mcgraw Hill Publishing Co Ltd.
- Praful B. Godkar, Darshan P. Godkar, Text book of Medical Laboratory Technology, 3rd Edition 2014, Bhalani Publishing House.
- Peter Lydyard, Alex Whelan, Michael Fanger, Instant Notes in Immunology 3rd Edition 2011, BIOS Scientific Publisher.
- William E. Paul, Fundamental Immunology 7th Edition 2013, WoultersKluwar / Lippincott Williams & Wilkins.
- T Doan, R Mervold, S Visseli, C Waltenbough, Immunology 2nd Edition 2013, WoultersKluwar / Lippincott Williams & Wilkins.

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ADVANCED LABORATORY TECHNIQUE

Course Code: MLT4114 **Credit Units: 4**

Course Objective: To enable the students to understand the working principle of latest laboratory techniques.

Course Contents:

Module-I: Principles & Application of Chromatography: Definition and types of Chromatography; Paper Chromatography; Thin Layer Chromatography; Adsorption Chromatography; Partition Chromatography; Ion-exchange Chromatography; Gel Filtration; Affinity Chromatography; Column Chromatography; High Performance liquid Chromatography (HPLC).

Module-II: Electrophoresis: Definition, General Methodology; Factors affecting migration of charged particles; Theory and applications of paper, SDS-PAGE and agarose gel electrophoresis; Isoelectric Focusing; Two Dimensional Electrophoresis; Protein purification and Evaluation; Densitometry

Module-III: Immunological Technique: Enzyme Linked immunosorbent assay; Radioimmunoassay; Immunodiffusion, Florescent immunoassay; Immunofluorescence, Immunoarray, Chemiluminosence assay.

Module-IV: Molecular Techniques: Recombinant DNA technology; Polymerase chain reaction; RT PCR; RFLP; DNA Probe; DNA finger printing; Sequencing; Eastern blot; Southern blot; Northern blot; Gel documentation, DNA microarray, FISH, RFLP.

Examination Scheme:

Components	CT	HA	S/V/Q	ATTD	EE
Weightage (%)	15	5	5	5	70

Recommended books:

- Keith Wilson & John Walker. Principles and techniques of biochemistry and molecular biology. Cambridge University Press, 7th Edition, (2015)
- S.V.S. Rana. Biotechniques theory and Practice Rastogi Publications, 3rd edition, (2012)
- U Satyanarayan and U Chakrapani, Text book of Biochemistry, 4th Edition 2013, Elsevier.
- M N Chatterjea and Rana Shinde, Text book of Medical Biochemistry , 8th Edition 2012, Jaypee Brothers Medical Publishers (P) Ltd.
- Mc Pherson and Pincus. Henry's Clinical Diagnosis and management by Laboratory Method, 23rd Edition, Elsevier.

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LAB COURSE

Course Code: MLT4105 **Credit Unit: 1**

Course Objective:

- To impart the basic knowledge of principles, procedure and clinical importance of laboratory various test.
- To familiarize with basic knowledge of instruments commonly utilized in the clinical laboratory.

Serology

1. HIV test.
2. HCV test.
3. HBsAg test.
4. widal test.
5. ASO test.
6. CRP test.
7. RA test.
8. VDRL and RPR test.
9. Coomb's test.

Molecular Pathology and Cytogenetics

1. To demonstrate PCR.
2. To demonstrate recombinant DNA technology.
3. To demonstrate DNA finger printing.
4. To demonstrate RT PCR and RFLP.

Examination Scheme:

Components	Internal Assessment	Attendance	Record	EE
Weightage (%)	20	5	5	70

Recommended books:

- DM Vasudevan, Subir Kumar Das, Practical Textbook of Biochemistry for Medical Students, Jaypee & Brothers Medical Publishers Pvt. Ltd.
- P K Godkar, Text Book of Medical Laboratory Technology 13th edition, Bhalani Publication.
- Ranjna Chawla, Practical Clinical Biochemistry: Methods and Interpretations 4th edition, Jaypee & Brothers Medical Publishers Pvt. Ltd.
- Shivaraja Shankara YM, ,ShankaraGanesh MK, Laboratory Manual for Practical Biochemistry, .Jaypee & Brothers Medical Publishers Pvt. Ltd
- Medical Laboratory Science: Theory and practice by J. Ochei, Arundhati kolhatkar, Mcgraw Hill Education, 1stedition (2008).

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CLINICAL TRAINING

Course Code: MLT4112 **Credits Units: 2**

Course objective: The purpose of a Clinical training is to provide hands on practical experience in relevant sections of diagnostic labs as per the need of healthcare system. Students will participate in samples collection, documentation, transportation, receiving, processing and dispatch of reports. Students will help in the performance of clinical protocols, quality maintenance and laboratory research. In some cases, students may be deputed in community services or assist in organizing camps like blood testing or blood donation camp.

Students will be sent to diagnostic laboratory or hospital once a week outside campus or may be within the campus if facility available.

Second Semester:

1. Serology Lab
2. Molecular Lab

Note: Students must submit training report during examination and the same would be evaluated through Viva voice and presentation.

Examination Scheme:

Components	Viva	A	ME	EE
Weightage (%)	10	5	15	70

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MOLECULAR DIAGNOSTICS

Course Code: MLT4208 **Credit Units: 3**

Course Objective: To enable the students to understand genetic diseases and its diagnosis.

Course Contents:

Module-I: Mendelian Disease: Autosomal recessive disordes; autosomal dominant disorders; sex linked inheritance; hemophilia; sickle-cell anaemia; phenylketonuria; cystic fibrosis; tay-sachs disease; xerodermapigmentosa; pedigree analysis;proband
Chromosomal Disorders: Normal chromosomes**;** Numerical disorders; Structural abnormalities; Down syndrome; Turner syndrome; Klinefeltersyndrome.

Module-II: Karyotyping: Human karyogram, banding technique, applications of karyotyping; prenatal diagnosis; DNA profiling.
Nucleic acid extraction: Plasmid DNA; eukaryotic genomic DNA and Mitochondrial DNA extraction.

Module-III: Mutation: Introduction; molecular basis of mutation, mutagens.
Gene Therapy: Introduction; types and current approach and advancement

Module-IV: Molecular Diagnosis: Molecular based diagnosis of bacterial, viral, parasitic and fungal infections; ethical issues related to molecular diagnostics; future of molecular diagnostics.

Examination Scheme:

Components	CT	HA	S/V/Q	ATTD	EE
Weightage (%)	15	5	5	5	70

Recommended books:

- U. Satyanarayana. Biotechnology, 1st Edition 2013. BOOKS & ALLIED Ltd.
- U Satyanarayan and U Chakrapani. Text book of Biochemistry, 4th Edition 2013, Elsevier.
- M N Chatterjea and Rana Shinde. Text book of Medical Biochemistry, 8th Edition 2012, Jaypee Brothers Medical Publishers (P) Ltd.

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RESEARCH METHODOLOGY AND BIOSTATISTICS

Course Code: MLT4211 **Credit Units: 3**

Course Objective: The course aims to promote the students to progress in research aspects in the medical diagnostic, pharmaceutical, biotechnology, and medical treatment field.

Course Contents:

Module-I: Basics of Research: Meaning and purpose; Types, (Educational, Clinical, Experimental, Historical descriptive, Basic applied and Patent oriented Research); Formulation of hypothesis; Characteristic of designing a research work.
Scientific writing: Characteristics - Logical format for writing thesis and papers; essential features of abstract, introduction, review of literature, materials and methods, and discussion; effective illustration - tables and figures; reference styles - harvard and vancouver systems.
Literature Survey- use of library, books, journals-medlines-internet, and reprints of articles as a source for literature survey.

Module-II: Biostatistics: Collection and classification of data - diagrammatic and graphic representation of data, statistical tools, its importance in data analysis; measurement of central tendency; standard deviation; normal distribution; test of significance based on large samples and small samples; student t test; correlation and regression; Chi square test for independence of attributes; ANOVA

Module-III: Patenting and ethical issues in research patenting: definition of patent; the patents system in India and present status; intellectual property rights; what may be patented? ; Who may apply for patents?; preparation of patent- proposal; registration of patents in foreign countries & vice versa; research funding agency.

Module-IV: ETHICS: Ethics in animal experimentation; cpcsea guidelines - animal care, animal husbandry, feed, bedding, water, sanitation and cleanliness, waste disposal, anesthesia and euthanasia; composition of (human) institutional ethical committee (IEC) - general ethical issues; specific principles for chemical evaluation of drugs, herbal remedies and human genetics research, ethics in food and drug safety; environmental release of microorganisms and genetically engineered organisms; ethical issues in human gene therapy and human cloning.

Examination Scheme:

Components	CT	HA	S/V/Q	ATTD	EE
Weightage(%)	15	5	5	5	70

Recommended books:

- R.A. Day. How to write a scientific paper. Cambridge University Press.
- Cooray P.G. Guide to scientific and technical writing.
- Carter V. Good and Douglas E seats Methods of Research.
- Alley, Michael. The craft of scientific writing. Englewood Cliffs. N.N. Prentice 1987.
- Sundar Rao, Jesudian Richard - An Introduction to Biostatistics. S.P. Gupta - Fundamentals of statistics, Sultan Chand.

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CLINICAL NUTRITION

Course Code: MLT4213 **Credit Units: 4**

Course Objective: To prepare the students to understand the structure, function and properties carbohydrates, proteins and lipids.

Course Contents:

Module-I: Carbohydrate: Introduction**;** biomedical importance; physical and chemical properties; structure- classification- monosaccharide, disaccharide, polysaccharide; triose, tetrose, pentose and hexoses sugars; digestion and absorption of carbohydrate; quantitative & qualitative test of carbohydrate; reducing and non-reducing sugars.

Module-II: Amino acid: Introduction**;** importance; physical & chemical properties; essential and non-essential amino acid; glucogenic and ketogenic amino acid.
Protein: Properties; functions; structure- primary, secondary, tertiary and quaternary; albumin, globulin and fibrinogen; clinical importance; digestion and absorption of protein; qualitative and quantitative test of protein and amino acid.

Module-III: Lipid: Introduction**;** importance; physical & chemical properties; structure of fat and fatty acid; essential and non- essential fatty acid; triglyceride and cholesterol structure and function; glycolipids; phospholipids; lipoproteins; digestion and absorption of fat; qualitative and quantitative test of lipids.

Module-IV: Nucleic Acid: Introduction**;** importance; physical & chemical properties; structure; Nucleoside; nucleotide; DNA and RNA- structure, function and biomedical importance.
Vitamins: Introduction; classification; importance; source; RDA; normal range and clinical significance.
Minerals: Introduction; classification; micro and macro minerals; importance; source; RDA; normal range and clinical significance.

Examination Scheme:

Components	CT	HA	S/V/Q	ATTD	EE
Weightage (%)	15	5	5	5	70

Recommended books:

- U Satyanarayan and U Chakrapani, Text book of Biochemistry, 4th Edition 2013, Elsevier.
- M N Chatterjea and Rana Shinde, Text book of Medical Biochemistry , 8th Edition 2012, Jaypee Brothers Medical Publishers (P) Ltd
- D M Vasudevan, Sreekumari S, Kannan Vidhyanathan. Textbook of Biochemistry for Medical students, 8thEdition 2016, Jaypee & Brothers Medical Publishers (P) Ltd.
- S Ramakrishana, Test Book of Medical Biochemistry, 3rd Illustrated Edition 2004, Orient Longman.
- S Chitiprol, Biochemistry: Instant Notes for Medical students, 1st Edition 2006, Jaypee Brothers Medical Publishers (P) Ltd
- DM Vasudevan, Subir Kumar Das, Practical Textbook of Biochemistry for Medical Students, 2nd Edition 2013, Jaypee Brothers Medical Publishers (P) Ltd
- Albert L Lehninger, Michel M Cox, David L Nension, Lehninger Principle of Biochemistry, 6th Edition 2013, W H Freeman & Co.
- Robert Kincaid Murray, David Bender, Kathleen M. Botham, Peter J. Kennelly, Harpers Illustrated Biochemistry, 30th Edition 2015, McGraw Hill Professional.
- Donald Voet, Judith G. Voet, Charlotte W. Pratt. Fundamentals of Biochemistry:

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Life at the Molecular Level: Life at the Molecular Level. Fifth Edition 2016, Wiley

CLINICAL BIOCHEMISTRY LAB COURSE-I

Course Code: MLT4215 **Credit Unit: 1**

Course Objective

- To impart the basic knowledge of principles, procedure and clinical importance of laboratory various test.
- To familiarize with basic knowledge of instruments commonly utilized in the clinical laboratory.

Course Contents:

1) Carbohydrates: estimation of glucose (F, PP & R)
2) Protein: estimation of serum albumin, total protein and A/G ration.
3) Triglycerides : estimation of serum triglycerides
4) Cholesterol : estimation of total cholesterol
5) SGPT : estimation of SGPT
6) SGOT : estimation of SGOT
7) Alkaline phosphatase : estimation of alkaline phosphatase
8) Acid phosphatase : estimation of acid phosphatase
9) Bilirubin : estimation of serum bilirubin
10) Blood urea : estimation of blood urea in blood sample
11) Creatinine : estimation of serum creatinine
12) Calcium : estimation of serum calcium

Examination Scheme:

Components	Internal Assessment	Attendance	File	EE
Weightage(%)	20	5	5	70

Recommended books:

- Medical Laboratory Science: Theory and practice by J. Ochei, Arundhati kolhatkar, Mcgraw Hill Education, 1st edition (2008).
- P K Godkar, Text Book of Medical Laboratory Technology 13th edition, Bhalani Publication.

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CLINICAL BIOCHEMISTRY CLINICAL TRAINING-I

Course Code: MLT4216 **Credit Units: 2**

Course Objective: The purpose of a Clinical training is to provide hands on practical experience in relevant sections of diagnostic labs as per the need of healthcare system. Students will participate in samples collection, documentation, transportation, receiving, processing and dispatch of reports. Students will help in the performance of clinical protocols, quality maintenance and laboratory research. In some cases, students may be deputed in community services or assist in organizing camps like blood testing or blood donation camp.

Students will be sent to diagnostic laboratory or hospital once a week outside campus or may be within the campus if facility available.

Plan for clinical training:

1. Clinical Pathology Lab
2. Instrumentation Lab

Note: Students must submit training report during examination and the same would be evaluated through Viva voice and presentation.

Examination Scheme:

Components	Viva	A	ME	EE
Weightage (%)	10	5	15	70

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GENERAL MICROBIOLOGY

Course Code: MLT4217 **Credit Units: 4**

Course Objective:

- To provide detailed knowledge of anatomy and physiology of microorganisms.
- To become students aware about applications of microorganisms in the industry, health-care, environment and research fields.

Course Contents:

Module-I: General Microbiology: Introduction, history of microbiology; importance and scopes; safety measurements in microbiology laboratory; terminology related to microbiology.
Microorganisms: Introduction and Classification; morphological characteristics of various medically important microorganisms; microbial metabolism and reproduction; importance of normal micro-flora.

Module-II: Microbial Genetics: Introduction, principles of microbial genetics, structure and functions of genetic material, transformation; transduction, conjugation, lysogenic conversion, transposition, gene transfer by artificial methods, mutation, bacteriophages.

Module-III: Microbial Pathogenicity: Mechanism and transmission of microbial Infections, classification of infections, virulence factors affecting microbial pathogenicity, role of microorganisms in hospital acquired infections.

Module-IV: Microscopy: Introduction and types of microscopy**;** working, components, applications and preventive maintenance of different microscopes.
Sterilisation and Disinfection: Introduction, importance and types of sterilization; sterilization indicators; calibration and preventive maintenance of sterilizing equipments and instruments; mode of action, properties and uses of disinfectants and antiseptics, efficiency testing of disinfectants.

Examination Scheme

Components	CA	A	ME	EE
Weightage (%)	15	5	10	70

Recommended books:

- C P Baveja, Text book of Microbiology, Arya Publication.
- R. Ananthanarayan and Arti Kapil, Ananthanarayan and Paniker's Textbook of Microbiology, Orient BlackSwan.
- D.R.Arora / Brij Bala Arora, Textbook of Microbiology 4th, CBS Publishers & Distributors.
- Eds J. G. Collee, J. P. Duguid, A. G. Fraser & B. P. Marmio, Mackie and McCartney: Practical medical microbiology 13th Edition, Churchill Livingston.
- R C Dubay & D.K.Maheshwari, Practical Microbiology revised edition, S Chand & Company LTD.
- Suvarna, Layton & Bancroft, Suvarna Bancroft's Theory & Pract. Of Histological Techniques, Churchill Livingstone.
- Joanne Willey, Linda Sherwood, Christopher J. Woolverton, Presscot's Microbiology 9th edition, McGraw-Hill Education.
- Gary W Procop & Elmer W. Koneman Koneman's Color Atlas and Textbook of Diagnostic Microbiology 7th, Woulter Kluwer.
- F. H. Kayser, K. A. Bienz, J. Eckert, Medical Microbiology, Thieme Stuttgart, New York.
- Michael Ford, Medical Microbiology 2nd Edition, Oxford university press.
- Neal Chamberlain, Medical Microbiology: The Big Picture, Mc Grew Hill Medical.

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CLINICAL BACTERIOLOGY

Course Code: MLT4219 **Credit Units: 4**

Course Objective:

- To impart the knowledge of morphology, culture characteristics, pathogenicity, lab diagnosis and prophylaxis of major bacterial pathogens.
- To provide the understanding of special laboratory techniques.

Course Contents:

Module-I: Bacteriology: Introduction, history and importance in health care sector
Staining: Gram stain, AFB stain, Albert's stain and special stains for spore, capsule and flagella.
Biochemical test: Catalase, coagulase, oxidase, indole, MR, VP, citrate, urease and triple sugar iron agar. Identification of bacteria by conventional method, molecular method and automatic methods.
Special laboratory techniques: Bacteriological examination of water, milk and air.

Module-II: Gram positive bacteria: Morphology, pathogenicity, lab diagnosis and prophylaxis of: Staphylococci, Streptococci, Pneumococcus, Enterococcus, Bacillus, Corynebacterium, Clostridia, Mycobacterium Tuberculosis, Mycobacterium leprae, Actinomycetes and Listeria.

Module-III: Gram negative bacteria: Morphology, pathogenicity, lab diagnosis and prophylaxis of: Neisseria gonorrhoeae, Neisseria meningitides, Escherichia coli, Shigella, Klebsiella, Proteus, Yersinia, Salmonella, Vibrio, Aeromonas.

Module-IV: Gram negative bacteria
Pseudomonas, Campylobacter, Bacteroides, Fusobacterium, Brucella, Haemophilus, Bordetella and Helicobacter pylori
Miscellaneous bacteria: Morphology, Pathogenicity, lab diagnosis and prophylaxis of: Spirochetes, Rickettsiae, Chlamydia and Mycoplasma and Ureaplasma. Bacterial Vaginosis.

Examination Scheme:

Components	CT	HA	S/V/Q	ATTD	EE
Weightage (%)	15	5	5	5	70

Recommended books:

- C P Baveja, Text book of Microbiology, 4th Edition 2010, Arya Publication.
- Arti Kapil, Ananthanarayan and Paniker's Textbook of Microbiology, 9th Edition 2013, Orient BlackSwan.
- D.R.Arora / Brij Bala Arora, Textbook of Microbiology, 5th Edition 2016, CBS Publishers & Distributors.
- Mark Gladwin, Trattler William, C. Scott, Mahan, Clinical Microbiology Made Ridiculously Simple. 6th Edition 2013, Medmaster.
- Eds J. G. Collee, J. P. Duguid, A. G. Fraser & B. P. Marmio, Mackie and McCartney: Practical medical microbiology, 14th Edition 2007, Church New Delhi (India): Elsevierill Livingston.
- R C Dubay & D.K.Maheshwari, Practical Microbiology, Revised edition 2014, S Chand & Company LTD.
- Dr. C.P. Baveja, Dr. V. Baveja, Textbook of Microbiology for MLT, 2nd Edition,

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Arya Publication.
- Joanne Willey, Linda Sherwood, Christopher J. Woolverton, Presscot's Microbiology, 9th Edition 2014, McGraw-Hill Education.
- Gary W Procop & Elmer W. Koneman Koneman's Color Atlas and Textbook of Diagnostic Microbiology, 7th Edition 2016,Wolters Kluwer Health.
- F. H. Kayser, K. A. Bienz, J. Eckert, Medical Microbiology,10th German Edition 2005, Thieme Stuttgart, New York.
- Michael Ford, Medical Microbiology, 2nd Edition 2014, Oxford university press.
- Neal Chamberlain, Medical Microbiology: The Big Picture, 1st Edition 2008, Mc Grew Hill Medical.

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CLINICAL MICROBIOLOGY LAB COURSE-I

Course Code: MLT4220 **Credit Unit: 1**

Course Objective:

- To impart the basic knowledge of principles, procedure and clinical importance of laboratory various test.
- To familiarize with basic knowledge of instruments commonly utilized in the clinical laboratory.

Course Contents:

1) **Preparation of culture media:** Peptone water, Nutrient broth, Selenite F broth, Thiosulfate citrate bile salt sucrose agar, Nutrient agar, Blood agar, chocolate agar, MacConkey's agar, Mueller-Hinton, Salmonella-Shigella agar, Xylose Lysine Deoxycholate agar, L J Medium, TSI agar, citrate agar, urease agar.
2) **Staining method**: Simple stain, Gram stain, ZN Stain, Albert stain, Negative stain,
3) **Culture Method**: Streak culture, Lawn Culture, Stroke Culture, Pour plate culture, Liquid culture.
4) **Biochemical tests:** Catalase test, Coagulase test, CAMP reaction, Bile solubility test,
5) Widal test
6) Hanging drop preparation and Satellitism.

Examination Scheme:

Components	Internal Assessment	Attendance	File	EE
Weightage(%)	20	5	5	70

Recommended books:

- C P Baveja, Text book of Microbiology, 4th Edition 2010, Arya Publication.
- Arti Kapil, Ananthanarayan and Paniker's Textbook of Microbiology, 9th Edition 2013, Orient BlackSwan.
- D.R.Arora / Brij Bala Arora, Textbook of Microbiology, 5th Edition 2016, CBS Publishers & Distributors.
- Eds J. G. Collee, J. P. Duguid, A. G. Fraser & B. P. Marmio, Mackie and McCartney: Practical medical microbiology, 14th Edition 2007, Church New Delhi (India): Elsevierill Livingston.
- R C Dubay & D.K.Maheshwari, Practical Microbiology, Revised edition 2014, S Chand & Company LTD.
- Mark Gladwin, Trattler William, C. Scott, Mahan, Clinical Microbiology Made Ridiculously Simple. 6th Edition 2013, Medmaster.
- Dr. C.P. Baveja, Dr. V. Baveja, Textbook of Microbiology for MLT, 2nd Edition, Arya Publication.
- Joanne Willey, Linda Sherwood, Christopher J. Woolverton, Presscot's Microbiology, 9th Edition 2014, McGraw-Hill Education.
- Gary W Procop & Elmer W. Koneman Koneman's Color Atlas and Textbook of Diagnostic Microbiology, 7th Edition 2016,Wolters Kluwer Health.

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CLINICAL MICROBIOLOGY CLINICAL TRAINING-I

Course Code: MLT4221 **Credit Units: 2**

Course Objective: The purpose of a Clinical training is to provide hands on practical experience in relevant sections of diagnostic labs as per the need of healthcare system. Students will participate in samples collection, documentation, transportation, receiving, processing and dispatch of reports. Students will help in the performance of clinical protocols, quality maintenance and laboratory research. In some cases, students may be deputed in community services or assist in organizing camps like blood testing or blood donation camp.

Students will be sent to diagnostic laboratory or hospital once a week outside campus or may be within the campus if facility available.

Plan for clinical training:

1. Microbiology Lab
2. Bacteriology Lab

Note: Students must submit training report during examination and the same would be evaluated through Viva voice and presentation.

Examination Scheme:

Components	Viva	A	ME	EE
Weightage (%)	10	5	15	70

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SUMMER PROJECT EVALUATION

Course Code: MLT4335 **Credit Units: 6**

Summer Project report:
The Project Report is the final research report that the student prepares on the project assigned to him. In case of sponsored project the layout of the project could be as prescribed by the sponsoring organization. However, in other cases the following components should be included in the project report:

- **Title or Cover Page:** The title page should contain Project Title; Student's Name; Programme; Year and Semester and Name of the Faculty Guide.
- **Acknowledgement(s):** Acknowledgment to any advisory or financial assistance received in the course of work may be given. It is incomplete without student's signature.
- **Abstract:** A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project. It should not exceed more than 1000 words.
- **Table of Contents**: Titles and subtitles are to correspond exactly with those in the text.
- **Introduction:** Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.
- **Materials and Methods:** This section should aim at experimental designs, materials used (wherever applicable). Methodology should be mentioned in details including modifications undertaken, if any. It includes organization site(s), sample, instruments used with its validation, procedures followed and precautions.
- **Results and Discussion:** Present results, discuss and compare these with those from other workers, etc. In writing this section, emphasis should be laid on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow. Note that in writing the various sections, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary, do not write in "point" form.While presenting the results, write at length about the various statistical tools used in the data interpretation. The result interpretation should be simple but full of data and statistical analysis. This data interpretation should be in congruence with the written objectives and the inferences should be drawn on data and not on impression. Avoid writing straight forward conclusion rather; it should lead to generalization of data on the chosen sample. Results and its discussion should be supporting / contradicting with the previous research work in the given area. Usually one should not use more than two researches in either case of supporting or contradicting the present case of research.
- **Conclusion(s) & Recommendations:** A conclusion should be the final section in which the outcome of the work is mentioned briefly.

Check that your work answers the following questions:
• Did the research project meet its aims (check back to introduction for stated aims)?
• What are the main findings of the research?
• Are there any recommendations?

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• Do you have any conclusion on the research process itself?

- **Implications for Future Research:** This should bring out further prospects for the study either thrown open by the present work or with the purpose of making it more comprehensive.
- **Appendices:** The Appendices contain material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.
- **References:** References should include papers, books etc. referred to in the body of the report. These should be written in the alphabetical order of the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Examples:

- For research article:

Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic Escherichia coli O157: H7. Clin Microbiol Infect , 8 (suppl 1): 116–117.

- For book:

Kowalski,M.(1976) Transduction of effectiveness in Rhizobium meliloti. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), 7: 63-67

The Layout Guidelines for the Project File & Project Report:

• A4 size Paper
• Font: Arial (10 points) or Times New Roman (12 points)
• Line spacing: 1.5
• Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

ASSESSMENT OF THE PROJECT FILE AND THE PROJECT REPORT

Essentially, the assessment will be based on the quality of the report, the technical merit of the project and the project execution. Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project. Project execution is concerned with assessing how much work has been put in.

The Project should fulfil the following assessment objectives:

• Range of Research Methods used to obtain information
• Execution of Research
• Data Analysis (Analyze Quantitative/ Qualitative information)
• Quality Control
• Conclusions

Assessment Scheme:

Continuous Evaluation:

40% (Based on punctuality, regularity of work, adherence to plan and methodology, refinements/mid-course corrections etc. as reflected in the Project File.)

Final Evaluation:

60% (Based on the Documentation in the file, Final report layout, analysis and results, achievement of objectives, presentation/ viva)

It is recommended that the final evaluation should be carried out by internal supervisors.

Examination Scheme:

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Components	Continuous assessment (External Supervisor-20 & Internal Supervisor-20)	Final Evaluation (Attendance >75%-5, Viva-10, Presentation- 15 & Final report- 30
Weightage (%)	40	60

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SPECIALIZATION - CLINICAL BIOCHEMISTRY
CLINICAL ENDOCRINOLOGY

Course Code: MLT4307 **Credit Units: 4**

Course Objective: To make the students to understand the basics of hormones function; clinically important hormones; diagnostic procedure and clinical interpretations.

Course Contents:

Module-I: Basics of Endocrinology: Exocrine and endocrine; anatomical aspects of human endocrine system; regulation of endocrine system; chemical nature of human hormones; hormone receptors; mechanism of peptide and non- peptide hormones action; secondary messenger.
Hypothalamus: Introduction; production, secretion regulation and functions of hypothalamic hormones.

Module-II: Pituitary gland: Introduction; production, secretion regulation and functions of pituitary hormones; related disorders.
Pineal gland: Introduction; production, secretion regulation and functions of pineal hormones; related disorders.
Thyroid gland: Introduction; production, secretion regulation and functions of thyroid hormones; related disorders; thyroid function test.

Module-III: Parathyroid glands: Introduction; production, secretion regulation and functions of parathyroid hormones;
Adrenal gland: Introduction; production, secretion regulation and functions of adrenal hormones; related disorders.
Pancreas: Introduction; production, secretion regulation and functions of insulin and glucagon; somatostatin; related disorders.

Module-IV: Testes and Ovary: Introduction; production, secretion regulation and functions of testes and ovarian hormones; related disorders.
Other Biologically Important Hormones: Hormones involving incontraception; calcium metabolism; renin angiotensin; urotensin; erythropoietin; anti-mullerian hormone.

Examination Scheme:

Components	CT	HA	S/V/Q	ATTD	EE
Weightage (%)	15	5	5	5	70

Recommended Books:

- U Satyanarayan and U Chakrapani. Text book of Biochemistry, 4th Edition 2013, Elsevier.
- M N Chatterjea and Rana Shinde. Text book of Medical Biochemistry , 8th Edition 2012, Jaypee Brothers Medical Publishers (P) Ltd
- D M Vasudevan, SreekumariS, Kannan Vidhyanathan. Textbook of Biochemistry for Medical students, 8thEdition 2016, Jaypee& Brothers Medical Publishers (P) Ltd.
- S Ramakrishana, Test Book of Medical Biochemistry. 3rd Illustrated Edition 2004, Orient Longman.
- S Chitiprol. Biochemistry: Instant Notes for Medical students, 1st Edition 2006, Jaypee Brothers Medical Publishers (P) Ltd
- DM Vasudevan, Subir Kumar Das. Practical Textbook of Biochemistry for Medical Students, 2nd Edition 2013, Jaypee Brothers Medical Publishers (P) Ltd

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- Ranjna Chawla. Practical Clinical Biochemistry: Methods and Interpretations, 4th Edition 2014, Jaypee Brothers Medical Publishers (P) Ltd
- David T Punmmer. An introduction to practical biochemistry, 3rd Edition 2004, Tata McGraw-Hill Education Private Limited
- YM ShivarajaShankara, MK Ganesh, AR Shivashankara. Laboratory Manual for Practical Biochemistry. 2nd Edition 2013, Jaypee Brothers Medical Publishers (P) Ltd
- Albert L Lehninger, Michel M Cox, David L Nension.Lehninger Principle of Biochemistry, 6th Edition 2013, W H Freeman & Co.
- Robert Kincaid Murray, David Bender, Kathleen M. Botham, Peter J. Kennelly. Harpers Illustrated Biochemistry, 30th Edition 2015, McGraw Hill Professional.
- Michael Lieberman, Allan D. Marks, Colleen M. Smith, Dawn B. Marks. Essential Medical Biochemistry, 2nd Edition 2007, Lippincott Williams & Wilkins.
- Donald Voet, Judith G. Voet, Charlotte W. Pratt. Fundamentals of Biochemistry: Life at the Molecular Level: Life at the Molecular Level. Fifth Edition 2016, Wiley
- Henry M. Kronenberg, ShlomoMelmed, Kenneth S. Polonsky, P. Reed Larsen. William Textbook of Endocrinology, 11th ed. Saunders Elsevier 2008
- Bolander, F. F. Molecular Endocrinology, III ed. Academic Press, 2004.
- Nelson Cox. Lehninger's Principle of Biochemistry. 3rd ed. MacMillianWorth Publ. 2000.
- Mac E. Hadely. Endocrinology: 5thed. Pearson Education, 2000.

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CLINICAL ENZYMOLOGY

Course Code: MLT4308 **Credit Units: 4**

Course Objective: To make the students to understand the basics of enzymes function; clinically important enzymes; diagnostic procedure and clinical interpretations.

Course Contents:
Module-I: Basic Enzymology: Historical perspective; general characteristics; factor affecting enzyme activity; nomenclature and IUB classification; holoenzyme; apoenzyme; co-factors; co-enzymes; prosthetic group; metallozyme; enzyme assay; units; Michaelis-Menten equation.

Module-II: Enzyme inhibition: Introduction; types; enzyme inhibitors; applications
Co-enzyme: NAD; NADP; FAD; Co-enzyme A TTP; Lipic acid; Vitamin B12; Tetrahydrofolate

Module-III: Enzymes In Clinical Medicine: Introduction; intra-cellular and extra-cellular enzymes; CPK; CK-MB; LDH; SGOT; SGPT; cholinesterase; amylase; lipase; aldolase; alkaline and acid phosphatase; Glucose-6-phosphatase; 5-nuceotidease; GGT.

Module-IV: Enzymes in the Diagnosis of Diseases: Diagnosis, prognosis and assessment of myocardial infarction, hepatitis, jaundice, pancreatitis, cancer, neurodegenerative disorders.

Examination Scheme:

Components	CT	HA	S/V/Q	ATTD	EE
Weightage (%)	15	5	5	5	70

Recommended books:

- U Satyanarayan and U Chakrapani. Text book of Biochemistry, 4th Edition 2013, Elsevier.
- M N Chatterjea and Rana Shinde. Text book of Medical Biochemistry , 8th Edition 2012, Jaypee Brothers Medical Publishers (P) Ltd
- D M Vasudevan, Sreekumari S, Kannan Vidhyanathan,Textbook of Biochemistry for Medical students, 8thEdition 2016, Jaypee & Brothers Medical Publishers (P) Ltd.
- P K Godkar, Text Book of Medical Laboratory Technology, 3rd Edition 2014,Bhalani Publishing House.
- Ranjna Chawla, Practical Clinical Biochemistry: Methods and Interpretations, 4th Edition 2014, Jaypee Brothers Medical Publishers (P) Ltd
- David T Punmmer, An introduction to practical biochemistry, 3rd Edition 2004, Tata McGraw-Hill Education Private Limited
- YM Shivaraja Shankara, MK Ganesh, AR Shivashankara. Laboratory Manual for Practical Biochemistry. 2nd Edition 2013, Jaypee Brothers Medical Publishers (P) Ltd
- Carl A Buttis, David E. Bruns, Teitz fundamental of clinical chemistry and molecular diagnosis,7th Edition 2015, Elsevier.
- Albert L Lehninger, Michel M Cox, David L Nension, Lehninger Principle of Biochemistry, 6th Edition 2013, W H Freeman & Co.
- Robert Kincaid Murray, David Bender, Kathleen M. Botham, Peter J. Kennelly, Harpers Illustrated Biochemistry, 30th Edition 2015, McGraw Hill Professional.
- Michael Lieberman, Allan D. Marks, Colleen M. Smith, Dawn B. Marks, Marks' Essential Medical Biochemistry, 2nd Edition 2007, Lippincott Williams & Wilkins.
- Donald Voet, Judith G. Voet, Charlotte W. Pratt. Fundamentals of Biochemistry:

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Life at the Molecular Level: Life at the Molecular Level. Fifth Edition 2016, Wiley

ADVANCED CHEMICAL PATHOLOGY

Course Code: MLT4313 **Credit Units: 4**

Course Objective:

- To empower the students' knowledge with the procedure to diagnose human disease.
- To develop professional interests in the field of diagnosis.

Course Contents:

Module-I: Urine chemistry: Colour, pH, bile salt and pigment, glucose, protein, ketones, nitrites, urobilinogen, casts and crystals, amylase, sodium, potassium, chloride, occult blood, Diagnostic Strip and its working principle; future aspects of urine chemistry in diagnosis.

Module-II: Cancer: Benign and malignant cancer; Cancer markers and its uses -CA15-3, CA19-9, CA-125 , PSA, CEA, alpha fetoprotein, beta-HCG and other markes; common techniques.

Module-III: Advance diagnostic procedure: Separation of abnormal haemoglobin, isoenzymes, lipoproteins and serum proteins.

Module-IV: Hormone profile: Advance techniques for estimation of T3, T4, TSH, Testosterone, Oestrogen, Progesterone, Prolactin, FSH, ADH, Insulin and Glucagon

Examination Scheme:

Components	CT	HA	S/V/Q	ATTD	EE
Weightage (%)	15	5	5	5	70

Recommended books:

- Praful B. Godkar, Darshan P. Godkar. Text Book of Medical Laboratory Technology, 3rd Edition 2014,Bhalani Publishing House.
- U Satyanarayan and U Chakrapani, Text book of Biochemistry, 4th Edition 2013, Elsevier.
- M N Chatterjea and Rana Shinde, Text book of Medical Biochemistry , 8th Edition 2012, Jaypee Brothers Medical Publishers (P) Ltd.

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CLINICAL BIOCHEMISTRY LAB COURSE-II

Course Code: MLT4314 **Credit Units: 1**

Course Objective

- To impart the basic knowledge of principles, procedure and clinical importance of laboratory various test.
- To familiarize with basic knowledge of instruments commonly utilized in the clinical laboratory.

a. Lipid profile.
b. Liver function test
c. Pancreas function test
d. Cardiac profile
e. Cancer markers
f. Diabetic profile.
g. Kidney function test.
h. Gastric function test
i. To study hormonal assessment to diagnose disorders related to:
    a. Pituitary gland
    b. Hypothalamus
    c. Thyroid gland
    d. Parathyroid gland
    e. Pancreas
    f. Adrenal gland
    g. Testes and ovary.

Examination Scheme:

Components	Internal Assessment	Attendance	Record	EE
Weightage (%)	20	5	5	70

Recommended books:

- DM Vasudevan, Subir Kumar Das, Practical Textbook of Biochemistry for Medical Students, Jaypee & Brothers Medical Publishers Pvt. Ltd.
- P K Godkar, Text Book of Medical Laboratory Technology 13th edition, Bhalani Publication.
- Ranjna Chawla, Practical Clinical Biochemistry: Methods and Interpretations 4th edition, Jaypee & Brothers Medical Publishers Pvt. Ltd.
- Shivaraja Shankara YM, ,ShankaraGanesh MK, Laboratory Manual for Practical Biochemistry, .Jaypee & Brothers Medical Publishers Pvt. Ltd
- Teitz, Fundamental of Clinical Chemistry and Molecular Diagnosis, Carl A Buttis, David E. Bruns Elsevier.
- Medical Laboratory Science: Theory and practice by J. Ochei, Arundhati kolhatkar, Mcgraw Hill Education, 1stedition (2008).

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CLINICAL BIOCHEMISTRY CLINICAL TRAINING-II

Course Code: MLT4315 **Credit Units: 2**

Course objective: The purpose of a Clinical training is to provide hands on practical experience in relevant sections of diagnostic labs as per the need of healthcare system. Students will participate in samples collection, documentation, transportation, receiving, processing and dispatch of reports. Students will help in the performance of clinical protocols, quality maintenance and laboratory research. In some cases, students may be deputed in community services or assist in organizing camps like blood testing or blood donation camp.
Students will be sent to diagnostic laboratory or hospital once a week outside campus or may be within the campus if facility available.

Plan for clinical training:

1. Clinical Biochemistry Lab
2. Collection centre

Note: Students must submit training report during examination and the same would be evaluated through Viva voice and presentation.

Examination Scheme:

Components	Viva	A	ME	EE
Weightage (%)	10	5	15	70

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CLINICAL VIROLOGY

Course Code: MLT4317 **Credit Units: 4**

Course Objectives:

- To impart knowledge about harmful effects of virus in human health.
- To develop understanding of morphology, cultivation, transmission, Pathogenicity, and control strategies of clinically important Virus.
- To familiarize with techniques of sample collection, transport and processing to diagnose viral infection.

Course Contents:

Module-I: Virology: The nature of viruses, Classification of viruses, structure of virus, Cultivation and replication of virus, Bacteriophase, Interferon, Viral vaccines and antiviral drugs, sample collection, transport and storage of sample for viral diagnosis.

Module-II: Clinically important DNA virus: Herpes simplex virus, Varicella Zoster virus, Cytomegalovirus, Epstein-Barr virus, Poxviridae, Adenoviridae, Parvoviridae, Papillomaviridae.

Module-III: Clinically important of RNA virus: Orthomyxoviruses, Paramyxoviruses, Rubella virus, Picornaviruses, Dengue virus, Chikungunya virus, Japanese B encephalitis virus, Kyasanur Forest disease virus, Rhabdoviruses, HIV and other Retroviruses.

Module-IV: Clinically important of miscellaneous virus: Hepatitis viruses, Oncogenic viruses, Hantaviruses, Arenaviruses, Ebola virus, Coronaviruses, Slow viruses, Rotavirus. Emerging viral infections – SARS, Avian influenza, H1N1.

Examination Scheme:

Components	CT	HA	S/V/Q	ATTD	EE
Weightage (%)	15	5	5	5	70

Recommended books:

- C P Baveja, Text book of Microbiology, 4th Edition 2010, Arya Publication.
- Arti Kapil, Ananthanarayan and Paniker's Textbook of Microbiology, 9th Edition 2013, Orient BlackSwan.
- Mark Gladwin, Trattler William, C. Scott, Mahan Clinical Microbiology Made Ridiculously Simple. 6th Edition 2013, Medmaster
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- R C Dubay & D.K.Maheshwari, Practical Microbiology, Revised edition 2014, S Chand & Company LTD.
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- Gary W Procop & Elmer W. Koneman Koneman's Color Atlas and Textbook of Diagnostic Microbiology, 7th Edition 2016, Wolters Kluwer Health.
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CLINICAL MYCOLOGY

Course Code: MLT4318 **Credit Units:4**

Course Objectives:

- The subject includes the study of fungi (yeasts and moulds) which can cause infectious disease in humans.
- It discusses the present classification of fungi, modes of transmission, and infection, disease spectrum.
- Laboratory isolation and identification techniques by cultural and non cultural methods and susceptibility testing to antifungal agents will be emphasized.

Course Contents:

Module-I: Mycology: Introduction of Mycology, Characteristic of Fungi, Taxonomy of Fungi, Immunity to Fungal diseases, Fungal culture media, Fungal reagent and staining, Discuss the procedures used in properly collecting specimens for mycology; Diagnosis of fungal disease; Anti Fungal drugs.

Module-II: Superficial Mycoses: Malassezia Versicolor, Atopic Dermatitis, Malassezia Folliculitis and Systemic Malassezia infection. Tinea Nigra, White Piedra, Black Piedra, Dermatophytes, Tinea Capitis, Dermatophytid or id reaction, wood,s lamp examination.

Module-III: Subcutaneous Mycoses: Mycetoma, Sporotrichosis, Chromoblastomycosis, Phaeohyphomycosis, Rhinosporidiosis and Lobomycosis.

Module-IV: Systemic and Opportunistic Mycoses: Histoplasmosis, Blastomycosis, Coccidioidomycosis and Paracoccidioidomycosis. Candidiasis, Cryptococcosis, Pneumocystosis, Penicilliosis Marneffei, Aspergillosis, Zygomycosis and Oppertunistic Mycoses.

Examination Scheme:

Components	CT	HA	S/V/Q	ATTD	EE
Weightage (%)	15	5	5	5	70

Recommended books:

- C P Baveja, Text book of Microbiology, 4th Edition 2010, Arya Publication.
- Arti Kapil, Ananthanarayan and Paniker's Textbook of Microbiology, 9th Edition 2013, Orient BlackSwan.
- Mark Gladwin, Trattler William, C. Scott, Mahan, Clinical Microbiology Made Ridiculously Simple. 6th Edition 2013, Medmaster.
- D.R.Arora / Brij Bala Arora, Textbook of Microbiology, 5th Edition 2016, CBS Publishers & Distributors.
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- Michael Ford, Medical Microbiology, 2nd Edition 2014, Oxford university press.
- Neal Chamberlain, Medical Microbiology: The Big Picture, 1St Edition 2008, Mc Grew Hill Medical.
- Jagdish Chander, Text book of medical Mycology, 3rd Edition2009, Mehta publishers.

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CLINICAL PARASITOLOGY

Course Code: MLT4319 **Credit Units:4**

Course Objectives:

- To provide advanced knowledge and understanding of medically important parasites.
- To equip students with the fundamental understanding of parasitological techniques.

Course Contents:

Module-I: Parasitology: Introduction to parasites and host, classification of parasites and hosts, relationship between parasites and host, transmission of parasitic infections, preventive measurements for parasitic infections, terminology related to parasitology.

Module-II: Protozoology: Detailed study and laboratory techniques for diagnosis of medically important protozoa such as intestinal protozoa, blood and tissue protozoa.

Module-III: Helminthology: Detailed study and laboratory techniques for diagnosis of medically important parasitic worms; for example- intestinal, blood and tissue parasitic worms.

Module-IV: Laboratory Techniques: Collection and processing of different clinical samples for parasitological investigations; laboratory techniques for intestinal parasites, blood parasites, tissue parasites; advanced diagnostic techniques and molecular laboratory techniques.

Examination Scheme

Components	CA	A	ME	EE
Weightage (%)	15	5	10	70

Recommended books:

- Arora & Arora, Text book of Medical parasitology, CBS Publishers.
- Saugata Ghosh, Paniker's text book of medical parasitology, Jaypee.
- KD Chatterjee, Protozoology and Helminthology 13th edition, CBS Publishers & Distributors pvt.
- Parasitic diseases in man by Richard Knight English Language Book Society (ELBS).
- Subhash Chandra Parija, Textbook of Medical Parasitology : Protozoology & Helminthology, 4th Edition.
- T V Rajan, Textbook of Medical Parasitology, B I Publications.
- World Health Organization, Basic laboratory methods in medical parasitology, World Health Organization.
- Lynne S. Garcia, Diagnostic Medical Parasitology 5th Edition, ASM Press.
- David T. John, William A. Petri Jr., Markell and Voge's Medical Parasitology 9th, Sunders Elseviers.
- World Health Organization, Basic laboratory methods in medical parasitology, World Health Organization.

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PHARMACEUTICAL MICROBIOLOGY

Course Code: MLT4320 **Credit Units: 3**

Course Objective:

- A provide detailed knowledge about antimicrobial action and resistance.
- To become students aware about applications of microorganisms in the industry, health-care, environment and research fields.

Course Contents:

Module-I: Antimicrobial Agents: Introduction and types of antimicrobial agents; terminology related to pharmaceutical microbiology; history of development of antimicrobial drugs or agents, concept of R & D.
Action Mechanism: Mode of action and activity spectrum of major antibiotic classes, antifungal agents, antiviral agents, prophylactic usage and adverse reactions.

Module-II: Antibiotic and antimicrobial Resistance: introduction and importance, Mechanism of resistance- enzymatic destruction and modification, decreased permeability, promotion of antibiotic reflux, alteration and protection of target sites, bind-up antibiotics etc; molecular genetics of antibiotics resistance in bacteria- role off plasmid, transposable genetic elements, DNA integration elements.

Module-III: Multidrug Resistance: Mechanism and significance of multidrug resistance among microbes; detailed study about - multidrug resistant TB, Malaria, MRSA, VRE, MDR GNR, MDR viruses and fungus.

Module-IV: Sterilization and quality control: Microbial contamination and spoilage of microbial agents and their sterilization, FDA and govt. regulatory practices and policies, quality control**.**
Vaccines: Introduction**,** types**,** working mechanism and applications, adverse effects, terminology related to vaccines.

Examination Scheme

Components	CA	A	ME	EE
Weightage (%)	15	5	10	70

Recommended books:

- Hugo, WB and Russell, AD. Pharmaceutical Microbiology, (2003). Blackwell Science, Oxford, UK.
- Krogsgaard L, Lilijefors T. and Madsen, U. Textbook of Drug Design and Discovery, (2004). Taylor and Francis, London.
- Geoffrey Hanlon and Norman Hodges. Essential Microbiology for pharmacy and pharmaceutical science. (2013). Wiley Blackwell.
- S. P. Vyas & V. K. Dixit. Pharmaceutical Biotechnology. (2003) CBS Publishers & Distributors, New Delhi.
- Bhatia R and Ichhpujani RL. Quality Assurance in Microbiology. (1995). CBS Publishers, New Delhi.
- Gregory Gregoriadis. Drug Carriers in biology & Medicine. (2001). Academic Press New York.
- Davis, B. D., Dulbecco, R, Eisen, H. N., Ginsberg, R. S. Microbiology. (1990). Harper and Row Publishers, Singapore. F. H. Kayser, K. A. Bienz, J. Eckert, Medical Microbiology, Thieme Stuttgart, New York.
- Quality Assurance in Microbiology by Rajesh Bhatia, Rattan Lal Ihhpunjani. CBS publishers & distributors, New Delhi.
- Quniolinone antimicrobial agents- Edited by David C. Hooper, John S. Wolfson. ASM Washington DC.

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CLINICAL MICROBIOLOGY LAB COURSE-II

Course Code: MLT4321 **Credit Units: 1**

Course Objective:

- To impart the basic knowledge of principles, procedure and clinical importance of laboratory various test.
- To familiarize with basic knowledge of instruments commonly utilized in the clinical laboratory

LIST OF PRACTICAL EXERCISES:

Virology, Mycology and Parasitology sections:

- Collection, transportation and preservation of specimens Specimen for viral diagnosis.
- Isolation and identification of viruses from specimens.
- Preparation of glassware and media for tissue culture.
- Preparation and maintenance of tissue culture.
- Virus isolation in tissue culture and identification.
- Use of chick embryo – inoculation by various routes.
- Use of laboratory animals for isolation of viruses, preparation of antisera and complement etc.
- Serological tests in virology.
- Antigen detection by various techniques.
- Collection of specimens for fungal examination.. Direct KOH examination.
- LPCB and India ink staining.
- Concentration techniques for stool and blood samples.
- Wet mount preparation of stool.
- Slide culture techniques.

Examination Scheme:

Components	Internal Assessment	Attendance	Record	EE
Weightage (%)	20	5	5	70

Recommended books:

- Arora & Arora, Text book of Medical parasitology, CBS Publishers.
- Saugata Ghosh, Paniker's text book of medical parasitology, Jaypee.
- KD Chatterjee, Protozoology and Helminthology 13th edition, CBS Publishers & Distributors pvt.
- C P Baveja, Text book of Microbiology, 4th Edition 2010, Arya Publication.
- Arti Kapil, Ananthanarayan and Paniker's Textbook of Microbiology, 9th Edition 2013, Orient BlackSwan.
- Michael Ford, Medical Microbiology, 2nd Edition 2014, Oxford university press.
- Neal Chamberlain, Medical Microbiology: The Big Picture, 1St Edition 2008, Mc Grew Hill Medical.

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CLINICAL MICROBIOLOGY CLINICAL TRAINING-II

Course Code: MLT4322 **Credit Units: 2**

Course Objective: The purpose of a Clinical training is to provide hands on practical experience in relevant sections of diagnostic labs as per the need of healthcare system. Students will participate in samples collection, documentation, transportation, receiving, processing and dispatch of reports. Students will help in the performance of clinical protocols, quality maintenance and laboratory research. In some cases, students may be deputed in community services or assist in organizing camps like blood testing or blood donation camp.
Students will be sent to diagnostic laboratory or hospital once a week outside campus or may be within the campus if facility available.

Plan for clinical training:

- Serology Lab
- Microbiology lab

Note: Students must submit training report during examination and the same would be evaluated through Viva voice and presentation.

Examination Scheme:

Components	Viva	A	ME	EE
Weightage (%)	10	5	15	70

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ON JOB TRAINING

Course Code: MLT4401 **Credit Units: 9**

On-the-job training, also known as OJT, is teaching the skills, knowledge, and competencies that are needed to perform a specific job within the workplace and work environment. The main purpose is to correlate laboratory investigations, through case studies and laboratory tests and their correlations. Implementation of Quality controls and guidelines for implementation in accreditation programmes. Students will learn in an environment in which they will need to practice the knowledge and skills which he/she learnt in the class. On-the-job training uses the regular or existing workplace tools, machines, documents, equipment, knowledge, and necessary skills required for an employee to learn to effectively perform his or her job where ever he/she is sent for OJT.

Examination Scheme:

Components	**Continuous assessment (External Supervisor-20 & Internal Supervisor-20)**	**Final Evaluation (Attendance >75%-5, Viva-10, Presentation- 15 & Final report- 30**
Weightage (%)	40	60

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CLINICAL RESEARCH-DISSERTATION

Course Code: MLT4437 **Credit Units: 9**

GUIDELINES FOR PROJECT FILE AND PROJECT REPORT

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critically analyzed by the faculty guide and corrected by the student at each stage.

PROJECT FILE

The Project File may be a very useful tool for undertaking an assignment along-with a normal semester, an exploratory study, sponsored projects, a project undertaken during summer period or any other period as per curricular where the researcher is working with a company/organization. The project/ assignment may also be a part of the bigger research agenda being pursued by a faculty/ institution/ department

The Project File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation. This file may be considered in continuous assessment.

In general, the File should be comprehensive and include:

- A short account of the activities that were undertaken as part of the project;
- A statement about the extent to which the project has achieved its stated objectives;
- A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;
- Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project;
- Any problems that have arisen and may be useful to document for future reference.

PROJECT REPORT

The Project Report is the final research report that the student prepares on the project assigned to him. In case of sponsored project the layout of the project could be as prescribed by the sponsoring organization. However, in other cases the following components should be included in the project report:

- **Title or Cover Page:** The title page should contain Project Title; Student's Name; Programme; Year and Semester and Name of the Faculty Guide.
- **Acknowledgement(s):** Acknowledgment to any advisory or financial assistance received in the course of work may be given. It is incomplete without student's signature.
- **Abstract:** A good"Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project. It should not exceed more than 1000 words.
- **Table of Contents**: Titles and subtitles are to correspond exactly with those in the text.
- **Introduction:** Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

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- **Materials and Methods:** This section should aim at experimental designs, materials used (wherever applicable). Methodology should be mentioned in details including modifications undertaken, if any. It includes organization site(s), sample, instruments used with its validation, procedures followed and precautions.
- **Results and Discussion:** Present results, discuss and compare these with those from other workers, etc. In writing this section, emphasis should be laid on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow. Note that in writing the various sections, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary, do not write in "point" form. While presenting the results, write at length about the various statistical tools used in the data interpretation. The result interpretation should be simple but full of data and statistical analysis. This data interpretation should be in congruence with the written objectives and the inferences should be drawn on data and not on impression. Avoid writing straight forward conclusion rather; it should lead to generalization of data on the chosen sample. Results and its discussion should be supporting/contradicting with the previous research work in the given area. Usually one should not use more than two researches in either case of supporting or contradicting the present case of research.
- **Conclusion(s) & Recommendations:** A conclusion should be the final section in which the outcome of the work is mentioned briefly.

Check that your work answers the following questions:
• Did the research project meet its aims (check back to introduction for stated aims)?
• What are the main findings of the research?
• Are there any recommendations?
• Do you have any conclusion on the research process itself?

- **Implications for Future Research:** This should bring out further prospects for the study either thrown open by the present work or with the purpose of making it more comprehensive.
- **Appendices:** The Appendices contain material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.
- **References:** References should include papers, books etc. referred to in the body of the report. These should be written in the alphabetical order of the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Examples:

- For research article:

Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic Escherichia coli O157: H7. Clin Microbiol Infect , 8 (suppl 1): 116–117.

- For book:

Kowalski,M.(1976) Transduction of effectiveness in Rhizobium meliloti. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), 7: 63-67

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The Layout Guidelines for the Project File & Project Report:
• A4 size Paper
• Font: Arial (10 points) or Times New Roman (12 points)
• Line spacing: 1.5
• Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

ASSESSMENT OF THE PROJECT FILE AND THE PROJECT REPORT
Essentially, the assessment will be based on the quality of the report, the technical merit of the project and the project execution. Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project. Project execution is concerned with assessing how much work has been put in.

The Project should fulfil the following assessment objectives:
• Range of Research Methods used to obtain information
• Execution of Research
• Data Analysis (Analyze Quantitative/ Qualitative information)
• Quality Control
• Conclusions

Assessment Scheme:
Continuous Evaluation:
40% (Based on punctuality, regularity of work, adherence to plan and methodology, refinements/mid-course corrections etc. as reflected in the Project File.)

Final Evaluation:
60% (Based on the Documentation in the file, Final report layout, analysis and results, achievement of objectives, presentation/ viva)

It is recommended that the Final evaluation should be carried out by a panel of evaluators.

Examination Scheme:

Components	**Continuous assessment** (External Supervisor-20 & Internal Supervisor-20)	**Final Evaluation** (Attendance >75%-5, Viva-10, Presentation- 15 & Final report- 30

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Amity Medical School

Master of Optometry

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Curriculum & Scheme of Examination

2023

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EPIDEMIOLOGY, PUBLIC HEALTH & COMMUNITY OPTOMETRY

Course Code: OPT4101 **Credit Units: 03**

Course Objective: To inculcate the knowledge, sensitivity and clinical exposure of community optometry. The outcomes of the course are: thorough understanding of conducting of screening for specific eye conditions, and resultant implications through theoretical and practical exposure. By the end of the course the student will be able to use the knowledge of the skills gained in promotion and preventive measures of community optometry.

Course Contents:

Module-I: Public health concepts
History of public health
History of public health optometry (including epidemology, man power, projections, community reimbursement mechanisms)
Organizations of health services (principles of primary, secondary and tertiary care) Health Care Delivery systems in India and determinants of health.
Detriments of health care delivery system
Planning of health services (including revelent legislation and implication to optometric practice).
Health manpower protection and in the practice of ophthalmology
Multidisciplinary and institutional practice modes
Global medicine and evolution of Public Health in India
Public Health optometry: concepts and implementation

Module-II: Levels of prevention-optometrist's role in community
Optometry's role as a care primary care professional

Module-III: Health systems
Concepts of Health systems
National Health Programs
Effective delivery of eye care services

Module- IV: Global Blindness and visual impairment
Refractive error and low vision as public health issues
Socioeconomic implications of blindness and visual impairment
Vision screening
Organizing eye camps
Eye Donation and Eye Banking
Role of civil societies in blindness prevention
Vision2020 : the Right to Sight
National and International Agencies in eye Care
NPCB
DBCS

Module-V: Epidemiology
Public health and epidemiology

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Prevalence ,incidence and distribution of visual impairment
Basics of Epidemiology study methods
Incidence , prevalence , risk factors , odd ratio
Childhood blindness
Refractive errors and presbyopia
Age related cataract
Low Vision
Diabetic retinopathy
Glaucoma
Age related Macular Degeneration
Trachoma
Corneal blindness

Examination Scheme:

Components	**A**	**CT**	**P**	**HA**	**EE**
Weightage (%)	5	10	10	5	70

A: Attendance, CT: Class Test, HA: Home Assignment, P: Presentation, EE: End Semester Exam

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APPLIED OPTICS

Course Code: OPT4110 **Credit Units: 04**

Course Objective: This course mainly deals with Optical management of refractive errors-new modalities the advanced techniques in subjective and objective refraction and Spectacle Dispensing. This course leads to a rewarding career as an optometrist, a specialist trained to dispense and to recognize basic ocular disorders. This allows students to recommend the right spectacle lens based on the condition of the eye

Course Contents:
Module-I: Ophthalmic Lens types,
Lens materials Properties of lenses (Refractive index, base curve, specific gravity, Abbe Value, UV cut off,etc)
Prism
Tints and coatings

Module-II: Bifocals/Multifocals

Module-III: Progressive addition lenses
Dispensing PAL, PAL trouble shooting, PALs in detail for Essilor, Hoya, Zeiss, Seiko, Rodenstock lenses

Module-IV: Spectacle FRAMES:
Facial fitting principles
Spectacle delivery
Dispensing problem prescriptions
Frame types and parts
Classification of spectacle frames-material, weight, temple position, coloration Frame construction
Frame Measurements and markings
Frame manipulation and repair
Facial measurements and frame choice
Measuring the interpupillary distance and pupillometer
Special purpose frames (sports, kids, reading)

Module-V: Lens Ordering
Lens edge thickness calculation Writing spectacle lens order
Facial measurements - Interpupillary distance measurement and measuring heights (single vision, multifocal, progressives)
Measurement of effective diameter minimum blank size Glazing and edging Hands on

Module-VI: Lens Verification
Lens verification and axis marking and fitting of all lens types
Final checking of finished spectacle with frame adjustments
Delivery and follow-up
Troubleshooting complaints and handling patient‟s questions.
Optical centre marking
Axis marking
Surface power measurement using Geneva leans measure Identify various types of Frames and mountings

Project: Different brands for spectacle frames and sunglasses –Indian & international

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Demonstration- safety eyewear, different filters, recumbent spectacle, Ptosis spectacle,

Workshop

PRACTICE MANAGMENT

Building a Successful Optometry Practice
Basic Operational Costs/Income Spread sheet
Marketing a optometry Practice

Developing an Internal Marketing Plan for optometric Practice
Developing an External Marketing Plan for optometric Practice

Managing a optometry Practice
Developing a Plan to Manage a Contact Lens Practice Standards of Practice

Eight Categories of Professional Obligation
Ethics in optometry
Laws related to optometry practice

Examination Scheme:

Components	**A**	**CT**	**P**	**HA**	**EE**
Weightage (%)	5	10	10	5	70

A: Attendance, CT: Class Test, HA: Home Assignment, P: Presentation, EE: End Semester Exam

Text & Reference Books:

- The fine art of prescribing glasses , Benjmin Milder, Butterworth Heinnemann,
- Spectacle frame dispensing: H Obstfeld: Butterworth Heinnemann
- essentials of ophthalmic lens finishing , C.W.Brooks and Irvin Borish, Butterworth Heinnemann
- Bennett's OPhthalmic prescription work Bennet & K.G wakefield, butterworth heinmann
- Systems of ophthalmic dispensing , Brook & Borish, Butterworth heinmann
- Clinical Optics , Troy Fennin ,Theodore Grosvenor, Butterworth Heinmann

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CLINIC-I (GENERAL)

Course Code: OPT4105 **Credit Units: 3**

Course Contents:

This course includes minimum of 90 hours of supervised clinical training. The clinics involve primary care clinics and community work.

The objective of clinics in this semester is to be able to examine the eye and understand the basic eye procedures with clinical management.

A logbook is maintained and 15 case sheets with complete management and follow up are mandatory for submission. The log book needs to be signed by the supervisor.

Examination Scheme:

Components	Attd.	Log Book	Case Sheets	Viva-EE	EE-Practical
Weightage (%)	5	10	15	20	50

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RESEARCH METHODOLOGY & BIOSTATISTICS-I

Course Code: OPT4106 **Credit Units: 03**

Research Methodology

Course Objective: This course is a brief overview about research design that is intended to cover the basics of designing and implementing a scientific study. It will provide the students the basic knowledge in Bio-statistics. At the completion of the course, the students will have the knowledge of data collection, statistical application and finally ready for research project. This will enable the student to gain understanding of different research methodologies and appropriate research design to be able to conduct research projects.

Course Contents:

Module-I:

Introduction to research methods, Variables in research, Reliability and validity in research, Formulation of research problems and writing research questions, Hypothesis, Null and Research Hypothesis, Type I and Type II errors in hypothesis testing

Module-II:

Introduction of epidemiology, Descriptive epidemiology, Experimental and non experimental research designs, Screening, Sampling methods, Biological variability, normal distribution

Module-III:

Bias and Confounding, Association and causation, Odds ratio and relative risk, sensitivity and specificity Data collection methods- Observation method, Interview method, Questionnaires and schedules Construction,

Module-IV:

Critical analysis of research papers, Conducting a literature review, Writing Research proposals, Development of conceptual framework in research

Module-V: Introduction to Biostatistics

Introduction to Statistics, Classification of data, Source of data, Method of scaling - nominal, ordinal, ratio and interval scale, measuring reliability and validity of scales, Measures of Central tendency, Measures of Dispersion, Skewness and kurtosis, Sampling, Sample size determination

Examination Scheme:

Components	CP	V	A	ME	EE
Weightage (%)	5	5	5	15	70

(CP – Class Performance; V-Viva; A- Attendance; ME- Mid-Term Exam, EE – End semester Exam)

Text & References:

Text books:

- Research Methodology: A Step By Step Guide For Beginners: Ranjit Kumar
- Research Methodology: Methods and Techniques : By C. R. Kothari

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RESEARCH METHODOLOGY & BIOSTATISTICS-II

Course Code: OPT4212 **Credit Units: 03**

Course Objective:
Introduction to Biostatistics and Implementing Statistical Tests and Procedures. This course is intended to provide a better understanding of data analysis and statistical issues in design of experiments, as well as the techniques and terminology commonly used to elicit and communicate evidence concerning scientific hypotheses. Students will learn to properly interpret the strength of statistical arguments made by researchers, and how to weigh statistical and clinical evidence in assessing a scientific hypothesis. Emphasis will be placed on conceptual understanding of issue. This is intended for students interested in learning how to conduct data analysis and how to interpret the output of statistical software. The implementation of these techniques through Excel and JMP will be illustrated by real datasets taken from clinical and public health studies. Students will learn where to find the relevant information from the statistical output tables generated by the software. Emphasis will be placed on application of statistical methods to real datasets.

Course Contents:
Module-I:
Introduction to SPSS

Module-II:
Concept of probability and Probability distributions – Binomial Probability distribution, Poisson Probability distribution and Normal Probability distribution

Module-III:
Data entry. Data coding and cleaning, tests for Normality, chi square test two sample tests (t test, man whitney test and wilcoxon signed rank test)

Module-IV:
Three or more sample testing (One way AND Repeated measures ANOVA, Kruskal Wallis test and Friedman test

Module-V:
Correlation-Karl Person, Spearman's Rank correlation methods, Regression Analysis, Scientific writing (Writing research papers and thesis), Ethical Issues in Research, Principles and Concepts in research ethics – confidentiality and privacy, informed consent

Examination Scheme:

Components	A	HA (log book)	CT-I	CT-II	EE-Practical/ Viva
Weightage (%)	5	10	10	5	70

A: Attendance, CT: Class Test, HA: Home Assignment, EE: End Semester Exam

Text & References:
Text books:

- B.K. Mahajan. Methods in Biostatistics, Jaypee Brothers
- P.S.S. Sundar Rao. An Introduction to Biostatistics: A manual for students in Health Sciences, J.Richard Prentice Hall, 1996.

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Reference Books:

- Daniel, Wayne.W. Bio-Statistics: A foundation for Analysis in the Health Sciences, John Wiley and Sons Pub, 1991.
- K. Vishwas Rao. Bio-Statistics: A Manual of statistical methods for use in the Health, Nutrition and Anthropology, Jaypee Brothers Medical Pub, 1996.
- Verma B.L., Shukla G.D. Bio-Statistics perspective in Health care research and practice, C.B.S. Pub, 1993.
- Krishnaiah, P.K. Rao, C.R. (ed), Handbook of Statistics, Elsevier Science Pub, 1988.

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ADVANCED CONTACT LENS -I

Course Code: OPT4204 **Credit Units: 4**

Course Objective: Contact lenses are an essential part of optometric practice; not only for practice success, but also in the management of certain ocular conditions that require visual or therapeutic rehabilitation. This course introduces all aspects of contacts lens practice to the optometry student. It begins with soft and rigid gas permeable contact lenses, and continues through toric, multifocal and specialty lenses in the next semester. This semester gives overview of contact lens related complications and their management which is discussed in detail in the next semester, A hands-on practical provides experience with the various lens types, and online materials encourage independent learning.

Course Contents:

Module-I: Introduction to Contact Lenses

History of Contact Lenses ,Contact Lens Materials and Manufacturing ,Optics of Contact Lenses, Soft & Rigid Gas Permeable Contact Lens Design ,Contact Lens Fabrication, Contact Lens Verification

Module-II: Contact Lens Fitting

Examining the Prospective Contact Lens Patient, Selecting Lens Type, Wear Mode and Replacement Rate

Fitting Spherical GP Contact Lenses, Fitting Spherical Soft Contact Lenses, Correcting Astigmatism with Contact Lenses

Module-III: Contact Lens Fitting

Fitting SiHyCLs, The Dispensing Visit and After-Care, Contact Lenses for Sports, Presbyopic Contact Lens Options

Module-IV: Care and Maintenance

Contact Lens Contamination ,CL Care and CL Care Products ,Rigid CL Care ,Hydrogel and Silicone Hydrogel CL Care

Module-V: Complications

Defending the Ocular Surface in Contact Lens Wear

Rigid Contact Lens Complications

Soft Contact Lens Complications

Dry Eye and Contact Lenses

Examination Scheme:

Components	A	CT	P	HA	EE
Weightage (%)	5	10	5	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, P: Presentation, EE: End Semester Exam

Recommended Text & Reference books:

- IACLE modules A,B,C,D,E
- Text book Of Contact Lenses 5th edition by Sinha Rajesh ,jaypee publication 2017
- Contact lens Primer
- Essentials of Contact lens practice

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- Silicone hydrogels: the rebirth of continuous wear contact lense, Deborah F. Sweeney, Butterworth Heinemann
- Clinical manual of Contact Lenses, Edward S. Bennett and Vinita Allee Henry, Lippincott Williams and Wilkins, 2008
- Medical Contact Lens Practice, Elisabeth A. W. Millis
- Contact Lenses, Anthony J. Phillips and Lynne Speedwell
- The CLAO Guide to Basic Science and Clinical Practice: Volumes 1, 2, 3, Contact Lens Association of Ophthalmologists

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CLINICS-II (SPECIALITY)

Course Code: OPT4205 **Credit Units: 3**

The objective of clinics in this semester is to be able to examine the eye and understand the classified eye procedures with clinical management with special reference to low vision, binocular vision, pediatric care and contact lens.

An approximate of guided 150 hours needs to be completed in this semester. The students will be by rotation go to community clinics, Campus clinics, associated hospital partners and optical / optometric clinics.

The logbook has to be maintained and 30 case sheets of SELECTED speciality in the semester with complete management and follow up are mandatory for submission at the end of the semester

The log book needs to be signed by the supervisor during every visit. No case record will be considered without the supervisor's signature.

Examination Scheme:

Components	A	Log Book	Case Sheets	Viva-EE	EE-Practical
Weightage (%)	5	10	15	20	50

A: Attendance, EE: End Semester Exam

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PROJECT (Research)

Course Code: OPT4232 **Credit Units: 02**

Research Project Data update

Examination Scheme:

Components	Results & Analysis	Data Collection	Conclusion & Discussion	Total
Weightage (%)	40	40	20	100

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Syllabus - Third Semester

TEACHING METHODOLOGY

Course Code: OPT4307 **Credit Units: 3**

Course Contents:

Module-I:
Introduction, Understanding how adults learn, How to enhance student learning

Module-II:
Teaching strategies to enhance Learning, How to structure your course, leaning activities

Module-III:
Effective learning and Teaching activities in eye Care,
Methods of teaching, presentation, demonstration, case studies, Role plays, group discussion

Module-IV:
Student Assessment and evaluation techniques, formative and summative assessment, marking and providing feedback

Examination Scheme:

Components	A	Assignment-1	Assignment-2	Assignment-3	Project	Total
Weightage (%)	5	20	20	20	35	100

A: Attendance

Text book/ Reference Book
As recommended by the faculty

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ADVANCED CONTACT LENS-II

Course Code: OPT4303 **Credit Units: 4**

Course Objective: This course gives both in-depth theoretical knowledge and clinical exposure in Contact lens at advanced level and in therapeutic conditions. It prepares student to develop competency in handling all types of specialty lenses. This course also deals with all complications related to contact lenses and its management.

Course Contents:
Module-I: Children and Contact Lenses

Module-II: Fitting Scleral and Mini-Scleral Contact Lenses, Fitting an Ocular Prosthesis

Module-III: Myopia Control and Orthokeratology

Module-IV: Special Topics
Contact Lenses for Keratoconus ,Special Applications of Contact Lenses, Advanced Techniques and Instrumentation ,The Working Environment and Contact Lenses

Module-V: Business Aspects of Contact Lens Practice
Contact lenses (CLs) in practice, Financial factors in a CL practice, Managing &marketing techniques for a CL practice, Employee management, Record Keeping
Professionalism & standards of care

Examination Scheme:

Components	A	CT	P	HA	EE
Weightage (%)	5	10	10	5	70

A: Attendance, CT: Class Test, HA: Home Assignment, P: Presentation, EE: End Semester Exam

Recommended Text & Reference books:

- IACLE modules B,C,D,E
- Text book Of Contact Lenses 5th edition by Sinha Rajesh ,jaypee publication 2017
- Contact lens Primer
- Essentials of Contact lens practice
- Silicone hydrogels: the rebirth of continuous wear contact lense, Deborah F. Sweeney, Butterworth Heinemann
- Clinical manual of Contact Lenses, Edward S. Bennett and Vinita AlleeHenry,Lippincott Williams and Wilkins, 2008
- Medical Contact Lens Practice, Elisabeth A. W. Millis
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OCULAR DISEASE AND DIAGNOSTICS-II

Course Code: OPT4308 **Credit Units: 04**

Course Objective: In this course latest articles published in optometry and vision science journals will be discussed. Periodic Journal club presentation would be conducted. This will enable the student to develop skill on critical appraisal of publications and also help to keep abreast of latest developments in the field of optometry and vision science. The course would also provide insight on understanding and/or incorporation of scientific evidence in clinical practice.

This course examines selected areas of recent research in optometry. Current advances in methodology, specifics of research design, and impact of research findings will be emphasized. Selected topics are based on participating faculty expertise will be assigned to the students.

Students will be assigned topics of presentation during the semester and they will have to present base literature review and latest advancements.

Text & Reference books /journals:
Clinical and experimental optometry, Edited By: H. Barry Collin
Optometry & vision science ,journal of American academy of optometry
Optometry journal of American optometric association
Ophthalmic and Physiological Optics Journal of the College of Optometrists, UK
Contact lens & anterior eye : the journal of the British Contact Lens Association
British Contact Lens Association

CLINICAL DECISION MAKING IN OPTOMETRIC CARE-I

Course Objective: Upon completing this course, the student will achieve a moderately-high level of competence with respect to a modest list of patient presentations commonly encountered by primary care optometrists. By the course's end, the student will be able to conduct a comprehensive, primary-care optometric examination, reach a diagnosis, and outline a management plan for the vast majority of patients seen during the year. The course will cover the general areas of ocular disease, refraction, functional vision analysis, and patient communication.

Course Contents: In this course, the student will begin with refreshing their basic knowledge on common eye disease of the anterior segment. The course would further orient towards clinical decision making skills, interpretation and improving their clinical skill set, clinical management of optometry. They will learn and develop skills on evidence/intuitive based management for the commonly seen eye diseases and learn appropriate referral & co management guidelines for secondary or tertiary ophthalmic care

The mode of delivery would be through cases scenarios discussion, problem based learning and seminar/workshops and Presentations. Records need to be maintained in the following pathologies.

The following common conditions will be covered in this semester:

Module-I: Lid and Adnexa:
Eyelid cysts
GPC
Hodeleum
Chemosis

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Xanthelasma
Ectropion VKC Entropion

Module-II: Cornea :corneal dystrophy Corneal edema corneal infiltrates
corneal opacities Fuchs endothelial dystrophy fungal keratitis
Hypopyon
Keratoconus follicular conjunctivitis Irirtis
pterigium PMD Pingecula ptosis
Rhematoid and eye Acne and eye Scleritis Episcleritis
Stevenson johnson syndrome Synechia
Terriens marginal degeneration

Module-III: Dry eye and its interpretation and managementWorkshop

Module-IV: Diseases of sclera and conjunctiva
Abrasion
Allegic eye disease Aniridia
Atopic Keratoconjunctivitis Bacterial Conjunctivitis Blephritis
Chalazion
Epiphora
Scleritis Episcleritis
ophthalmia neonatrum Trachoma
Trichiasis

Module-V: Lens and its abnormalities –
Cataract Ectopia Lentis
IOL, power calculations – post-refractive surgery , analysis of surgically induced astigmatism , complications of cataract surgery

Module-VI: Diseases of Uvea /
Endophthtalmitis
Anterior uveitis

Examination Scheme:

Components	A	Presentation	Presentation-EE	Case Records	EE-Viva	EE-Viva
Weightage (%)	5	20	20	5	30	20

A: Attendance, EE: End Semester Exam

Text books:

- Kanski, Clinical Ophthalmology: A Systematic Approach – May 2011 Edition, Jack J. Kanski MD MS FRCS FRCOphth, Brad Bowling FRCSEd(Ophth),Elsweare heath science division
- Optometric Management Of Visual Handicap, Helen Farral,Blackwell Scientific Publications, 1991
- Ocular Differential Diagnosis, Roy
- Clinical Decision Making In Optometry, Ellen Richter Ettinger OD MS FAAO
- Anterior segment disease and Management by Andrian Bruce

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CLINICS-III (SPECIALITY)

Course Code: OPT4305 **Credit Units: 3**

The objective of clinics in this semester is to be able to examine the eye and understand the eye procedures with clinical management with special reference to complete optometric care.

A minimum of guided 240 hours need to be completed in this semester. The students will be by rotation go to community clinic, Campus clinics, associated hospital partners and optical / optometric clinics.

The logbook has to be maintained and 30 case sheets of complete case management and follow up are mandatory for submission.

The log book needs to be signed by the supervisor every time a case is recorded in it. No case will be considered without the supervisor's signature.

Examination Scheme:

Components	A	Assignment (log book)	Case Sheets	Viva-EE	EE-Practical
Weightage (%)	5	15	10	20	50

A: Attendance, EE: End Semester Exam

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ENVIRONMENTAL OPTOMETRY

Course Code: OPT4306 **Credit Units: 3**

Course Objective: Occupational optometry is the portion of optometric practice that is concerned with the efficient and safe visual functioning of an individual within the work environment. It encompasses more than just the prevention of occupational eye injuries, although that certainly is a major component. It also includes vision assessments of workers/patients, taking into account their specific vision requirements and the demands these requirements place upon them. Optometrists provide occupational vision services at three general areas or levels: primary care, eye safety consultation, vision consultation.

After the completion of the course the student should be able to
Complete an occupational history on each adult patient
Diagnose and manage occupationally induced conditions (making referrals when necessary)
Assess his or her patients‟ occupational vision demands and provide appropriate treatments as necessary
Educate patients on the need to incorporate eye safety principles into their daily activities.
Performing an eye-safety workplace assessment
Overseeing the procurement of eye protection devices (both prescription and nonprescription)

Course Contents:
Module-I: Introduction

Module-II: Work place survey
Oculo visual hazard analysis
Ergonomic Factor
Work place lighting assessment

Module-III: Matching the worker to the task
Visual standards
Clinical evaluation
Personal protective strategies

Module-IV: Pitsfall of industrial consulting

Module-V: Visual Health in selected industries

Module-VI: References and standards

Examination Scheme:

Components	Attd.	Case Studies	Field Visit	Assignment	Class Test
Weightage (%)	5	30	10	5	50

Test Books:

- Eye Essentials: Environmental & Occupational Optometry, G Carson, S Doshi, W Harvey, butterworth heinmann
- BHVI module for environmental optometry
- R V North: Work and the eye, Second edition, Butterworth Heinnemann, 2001
- G W Good: Occupational Vision Manual available in the following website: www.aoa.org
- N.A. Smith: Lighting for Occupational Optometry, HHSC Handbook Series, Safchem Services, 1999
- J Anshel : Visual Ergonomics Handbook, CRC Press, 2005

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INTERNSHIP

Eye care clinic: This sequence of courses gives students direct patient care experience and responsibilities in affiliated health centers, hospitals or in private practices. Clinical preceptors will evaluate and guide the student through the process of providing eye care. Students are graded on key clinical tools: technical skills, knowledge base, analytical skills, diagnostic skills, management and treatment, communication skills, efficiency, attitude, and professionalism. The clinical grade is honors, pass, remedial, or fail based on a midterm and final preceptor evaluation; on meeting documentation requirements, such as maintaining documentation; and on submitting patient logs, and site evaluations.

The AUG department of Optometry monitors the quality and quantity of patient encounters for each student. Through the clinical assignments, students will gain proficiency in full scope primary care optometry and contact lenses. All students must satisfy a minimum number of patient encounters during the course of their assignments. Some students may be assigned to specific sites in order to assure a clinical experience based on their projects. Some students may meet the contact lens requirement through affiliations set up on behalf of the students during the summer vacations with private practitioners who meet the College's program standards.

Four rotations during the final semester complete the clinical requirements, with mandatory assignments in Primary Care, Advanced Care and Specialty Care. Students choose an additional assignment in one of the mandatory categories or from a list of elective sites based on their projects. The College currently has affiliated clinical sites located around the campus and in other states.

Clinical sites that provide comprehensive eye care services for patients of all age brackets are categorized as Primary Care sites. Typically, these sites are eye care hospitals or private optometric practices. Clinical sites that provide professional specialty care are categorized as Specialty Care clinics. These include clinics specializing in visual therapy/binocular vision, contact lenses, pediatrics, geriatrics, patients with disabilities, or low vision. The rotation provides training in all of these specialty areas.

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CLINICAL OPTOMETRY (GENERAL)

Course Code: OPT4401 **Credit Units: 05**

Objective: It is expected that upon completion the student will be able to carry out the standard clinical procedures safely and efficiently
Upon completion of the course the student must be able to
Take down a comprehensive history
Do a complete and proper refraction
Do a torch light examination
Do a binocular vision assessment
Use a slit lamp to do a complete anterior segment examination and posterior segment as required
Must be able to take the decision to dilate the eye as per need
Must be able to give a preliminary diagnosis

Each student must be able to complete 20 such examinations under supervision and maintain verified case records for the same.

Tutorial (Presentations) – Each student must also make 1 presentation on instruments and present it atthe study center.

Case Presentation:
Each student must do two case discussions during the semester and of the patients. Thus each student presents 2 case discussions at a time and presents it at the study centre.

The hard copy of the presentations will have to be submitted for the term end exam.

Examination Scheme:

Components	Attd.	Case Records	Assignments	Clinical Supervisors Evaluation	Case Discussion	Practical + Viva
Weightage (%)	5	10	10	15	10	50

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ADVANCE APPLIED OPTICS AND ADVANCE CORNEA & CONTACT LENS

Course Code: OPT4409 & OPT4410 **Credit Units: 10 & 10**

Course Contents:

MODULE I- Insert and remove contact lenses and instruct patients in these procedures.

MODULE II- Fit soft contact lenses.

MODULE III- Manage the aftercare of patients wearing soft contact lenses

MODULE IV- Advise on contact lens materials and care regimes

MODULE V- Manage the aftercare of patients wearing rigid gas permeable contact lens.

MODULE VI- Fit rigid gas permeable contact lenses.

MODULE VII- Fit contact lenses to patients with astigmatism.

MODULE VIII- Techniques used in fitting contact lenses and to advise patients requiring complex visualcorrection.

MODULE IX- Fit multifocal, contact Lenses

MODULE X- Fit special contact lenses e.g Rose K , Orthokeratology, Scleral

MODULE XI- Dispensing, ordering &verification of spectacle

Examination Scheme:

Components	A	Case Records	Clinical Supervisors Evaluation	EE Practical + Viva
Weightage (%)	5	10	15	70

A: Attendance, EE: End Semester Exam

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CLINICAL INTERNSHIP-DISSERTATION

Course Code: OPT4437 **Credit Units: 10**

Course Contents:

MODULE-I: Thesis Proposal Development is an independent tutorial conducted by the student's advisor, and involves a comprehensive literature survey of the chosen research area. Through regular meetings, the student and advisor discuss this literature in detail, and the student writes a paper, reviewed by the advisor, summarizing the literature. This paper should help in the development of the thesis proposal and thesis.

MODULE-II: Thesis Proposal At the end of the Semester 2. each student must submit to the university with the signed approval of the advisor, a thesis proposal defining the thesis project, the methods and design of the experiments needed for completion, the progress to date, and plans for completion.

MODULE-III: Thesis Preparation

This is involving preparation of the thesis. The thesis must include a cover and title page, abstract, table of contents, Introduction of the thesis topic with a comprehensive review of the literature, appropriately organized methods, results, and discussion sections for the experiments performed, and a final conclusions section summarizing the outcome of the project. The student should submit a draft of the thesis to the advisor by the end of the third semester. Plans should be in place for the thesis examination to be held in the final exam.

MODULE-IV: Thesis submission

Project Work and Practical Training

A Full time student admitted to M.Optom course will have to be involved in teaching under-graduate students for lectures, demonstrations and hands-on practical sessions.

All students will have to choose ONE speciality subject at start of first year M.Optom and inform the University through School of Optometry in writing within 3 months of being admitted for the first Semester M.Optom

As a part of clinical training during the first year M.Optom every student will document minimum number of cases specified in clinically examined by them. These clinical cases will have to be submitted before end of 4thsemester

Every student will have to do a dissertation thesis during the second year M.Optom for this. Every student should submit a protocol which will have to be approved and accepted by post graduate teaching faculty at School of Optometry within second semester of starting first year.

Two copies of the dissertation thesis will have to be submitted before 15thMay in second year.

Some post graduate students may have to work with ophthalmic and optical industry in their projects of practitioner education, research and other related activities which will be given as assignments by the School of Optometry, Amity medical school.

Examination Scheme:

Components	A	Clinical Supervisors Evaluation	EE Practical + Viva
Weightage (%)	5	25	70

A: Attendance, EE: End Semester Exam

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Examination & Rules of passing for first and Second Year M.Optom

Format for term end examination Theory papers
Each theory examination will be of 100 marks and 3 Hours duration, 70% marks will be taken as external marks.
Each theory examination paper will have total three Sections

Examination Pattern:
Each semester examination will consists of both internal assessment and term end examination in the subjects prescribed in syllabus for each semester. The Faculty will conduct the internal assessments as per schedule prepared by school of optometry.

Amity University, Gurgaon will conduct university every term end examination
Eligibility for a student to appear in term for semester-term end Examination

Minimum 50% marks in internal assessment i.e. minimum 15marks in theory internal and minimum 25 marks in practical/Viva/Oral

Minimum 75% attendance for all course , If of these eligibility conditions have not been satisfied, thestudent will not be allowed to appear for semester term end examinations

Duration of examination at end for each semester term for each written/practical/clinical examination will be such as may be notified from time to time on recommendation of the Amity University, Gurgaon authorities.

Results and passing for each semester Examination:
A student will be declared to have passed in particular theory subjects provided he/she has secured not less than 50% marks out of 100(15 marks out of 30 in internal assessment and 35 marks out of 70 in term end examination) in each theory subject for every semester.

A student will be declared to have passed in a particular subject provided he/she has secured not less than 50 marks out of 100 [25 marks out of 50 in internal Assessment and 25 marks out of 50 in terms end examination] in each practical subject for every semester.

A student will be declared to have "PASSED" the complete semester Examination provided he/she has secured 50% marks individually in all theory and practical subjects of that semester.

If a student fails or does not appear for semester examination for semester I& III he/she will still be allowed to attend the theory classes and practical sessions for the semester II & IV Respectively ,which falls in same academic year.

A student who has not appeared or has failed in the semester examination for semester I& III will have to appear for the internal and external exams for only that subject along with semester exam for the current semester i.e. .II and IV respectively.

Only when the student is declared pass all subject of semester I and semester II examinations will be admitted to the second year of the course.

A student who has not appeared or has failed in the semester examination for semester I & II will not be admitted to the second year of the course. He/ She will have to get readmitted in the first year and pay the fees as prescribed by the university.

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Allowed to keep term: If the student secures minimum 50% marks in at least three subjects offirst year M.Optom, he/she will be allowed to keep term for second year. However he/she will have to pass in all the subjects of first year M.Optom in order to become eligible to apply/appear for second year final M.Optom University Examinations.

Repeat term: If the student fails in four or all five subjects of first year, he/she will be asked to pay the tuition fees proportionate to the number of subjects failed and the university examination fees and then appear for the midterm external examinations in those subjects in which he/she failed earlier. But they are not required to appear for internal examinations and neither repeat project.

Second Year M.Optom Passing: The internal examination and external examination marks will be added as the final marks of that subject for each year. Only when the student secures minimum 50% marks [Internal+External=combined] in all subjects of both the years and has completed the M.Optom. Course and will be eligible for post graduate degree of Master of Clinical optometry [M.Optom]

Repeat Dissertation: If the M.Optom student has failed in subject of the second year M.Optom the student will be required to either repeat the same dissertation project OR Choose different dissertation project and appear for the year end examination only.
He/she cannot take midterm examination for this subject in month of February every year.

If any student fails three times successively in the same subject at the university examinations for either first or second year M.Optom, He/She will not be allowed to continue the M.Optom course and his admission stands cancelled.

Award of the Degree:
A student who has secured 50% marks in every subject of final second year M.Optom Examination will be Eligible for conferment of Master of clinical Optometry [M.Optom] Post Graduate Degree by Amity university, Gurgaon

Award of Gold Medal:
Gold Medal will be awarded to the student who secures maximum marks in first and second ,Third& Fourth semester M.Optom added together, The candidate should have cleared each and every subject in every term in the first attempt.

Guidelines for Master research project work:
Basic reading material: Introductory reading material on research methodology, how to do a literature search and statistical methods should be provided at the beginning of the semester.

The students should read the material thoroughly and can mail their queries to their guides. a. Assignment 1: Exercises should be also given based on the reading material

The student should learn to do a through pubmed search in their area of research interest.. Read the recent research articles initially. Find out the research gaps. Based on that set up your research

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aim. Your research aim should not be a repetition of an already done research. Substantiate the necessity (Gap in current research) for the proposed study. (Assignment II: mailed to guide)

Discuss with your peers and clinicians regarding the Originality & objective of the study, feasibility of the study and other ethical issues involved: Very important

Institutional Review Board and Ethics committee approval
Consent form certified
As they begin the research, it would be wise to also meet the statistician

Sample size estimation
Microsoft excel or access proforma design

Prepare a rough draft of the protocol (Assignment III)
Emphasize on the methodology
The final protocol should be ready by end of second semester

Update your research activities at least once in a month to your guide (Data collection proforma as excel sheet).

Data entry should be done in Excel appropriately. Consult with your local statistician for any queries and also discuss with your guide. (Assignment IV)

End of your data collections takes to Analysis: Kindly discuss with your guide and a statistician (Assignment V: on the basics of statistics pertaining to your research interest)*

In the thesis introduction, literature and methodology should be ready before the end of fourth semester.

Submission of the final thesis to the guide should be done before one month of the deadline given. So that your guide will have enough time to review and make corrections

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Amity Medical School

Master of Science - Speech Language Pathology

FLEXILEARN
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Curriculum & Scheme of Examination

2023

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RESEARCH METHODS, EPIDEMIOLOGY AND STATISTICS

Course Code: SLP4101 **Credit Units: 05**

Objectives: After completing this course, the student will be able to understand

a) clinical research designs and statistical methods,
b) epidemiological issues and its relevance in speech-language research,
c) evidence based practice in speech and language pathology, and
d) ethical practices in research

Course Contents:

Module-1: Experimental Designs and Their Applicability in Speech-language Research

a) Types of research- post facto research, normative research, standard group comparison, experimental research, clinical and applied research, sample surveys, evaluation research
b) Methods of observation and measurement, strategies and designs in research
c) Experimental designs, single subject designs and group designs
d) Critical analysis of the research methods employed in Speech-language Pathology.
e) Documentation and research writing
f) Ethical considerations in research – National and international guidelines

Module-2: Epidemiology

a) Epidemiology: Definition, basic concepts – scope and function of epidemiology
b) Study designs in epidemiology: Cohort studies, case-control studies, cross-sectional studies, clinical trials
c) Measures in epidemiology – Ratios, proportions, rates, relative risk, odds ratio
c) Identify biases and their consequences in published literature.
d) Describe criteria for characterizing the causality of associations.
e) Application of epidemiology in evaluation and screening procedures employed in Speech-language Pathology
f) Application and impact of epidemiology on national and local policy; influence of epidemiology on ethical and professional issues

Module-3: Statistical Measures and their Features

a) Review of data description and exploratory data analysis (Numerical summaries and graphical summaries)
b) Probability concepts and models
c) Statistical Inference – Estimation Confidence Intervals
d) Statistical Inference – Basic concepts related to hypothesis testing –null hypothesis, alternative hypothesis, significance level, statistically significant, critical value,

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acceptance / rejection region, p-value, power, types of errors: Type I (□), Type II (□), one-sided (one-tailed) test, Two-sided (two-tailed) test

e) Parametric and non-parametric approaches to hypothesis testing
f) Categorical data analysis - contingency tables, Chi-square test for independence of attributes,
g) Measures of association (Contingency coefficient, Cramer's V), Kappa coefficient

Module-4: Regression, Univariate and Multivariate Analysis

a) Correlation, regression analysis and prediction including multiple regression; logistic regression; path analysis
b) Analysis of Variance (ANOVA)- Basic models, assumptions, one way and two way ANOVA; Consequence of failure of assumptions underlying ANOVA; Tests for additively, homogeneity, transformation; Post – hoc tests; Analysis of Covariance (ANOCOVA); Repeated measure ANOVA
c) Multivariate analysis: Need for multivariate analysis, various methods including MANOVA,MANCOVA
d) Introduction to principal component analysis, factor analysis, discriminate function, multidimensional scaling
e) Evaluation of application of statistics to different research designs used in different publications
f) Critical analysis of research articles in the field: Analysis of research designs in different areas of Speech-language Pathology

Module-5: Evidence Based Practice

a) Introduction to Evidence Based Practice (EBP) and Steps to EBP from formulating foreground question, finding best current evidence, critical appraisal of best current evidence, summarizing evidence, integrating evidence and tracking progress.
b) Concepts related to practical significance (effect size) vs. statistical significance, precision of measurement (confidence intervals)
c) Levels of evidence: For experimental and non-experimental designs; treatment efficacy-randomized control study, quasi experimental study, correlation and case study, single subject designs, expert committee report, consensus conference
d) Measures of diagnostic accuracy – positive and negative likelihood ratios; positive predictive value, negative predictive value, diagnostic odds ratio
e) Concepts related to randomized control trials: Comparative groups- allocation concealment / random allocation; importance of participation and follow up in understanding, evaluating and applying randomized controlled trial results
e) Methods of carrying out therapy trials; execution, indexing and reporting of therapy trials –efficacy studies; Conventions to study outcomes - i) Absolute risk reduction, ii) Absolute benefit increase, iii) Absolute risk increase, and iv) Absolute benefit reduction
f) Systematic review and meta-analysis; importance of research publications in terms of systematic review, meta-analysis, clinical practice guidelines, health technology assessments.
g) Challenges in implementation of EBP in Speech-language Pathology in India and future directions

Examination Scheme:

Components	CD	CA	MSE	A	EE
Weightage (%)	5	5	15	5	70

CD- Class discussion, CA- Class assignment, MSE – Midterm seasonal exam,
A- Attendance, EE- End semester examination

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Recommended Reading

- Russell Carter, Jay Lubinsky (2016). Rehabilitation Research: Principles and Applications. Elsevier
- Robert E. Owens Jr., Dale Evan Metz, Kimberly A. Farinella (2014). Introduction to Communication Disorders: A Lifespan Evidence-Based Perspective. Pearson Education
- Laura M. Justice, Erin Redle (2013). Communication Sciences and Disorders: A Clinical Evidence-Based Approach. Pearson Education.
- Robert F. Orlikoff, Nicholas E. Schiavetti, Dale Evan Metz (2014). Evaluating Research in Communication Disorders. Pearson Education
- David L. Irwin, Mary Pannbacker, Norman J. Lass (2013). Clinical Research Methods in Speech-Language Pathology and Audiology.Second Edition. Plural Publishing
- Timothy Meline (2009). A Research Primer for Communication Sciences and Disorders. PearsonEducation
- David L. Maxwell, EikiSatake. (2006) Research and Statistical Methods in Communication Sciences and Disorders.Thomson/DelmarLearning.
- John C Reinard (2006). Communication Research Statistics. SAGE Publications
- Nicholas Schiavetti, Dale Evan Metz (2006). Evaluating Research in Communicative Disorders. Allyn & Bacon
- Tim Pring (2005). Research Methods in Communication Disorders. Wiley
- Donald G. Doehring (2002). Research Strategies in Human Communication Disorders. Pro-Ed
- Carole E. Johnson, Jeffrey L. Danhauer (2002). Handbook of Outcomes Measurement in Audiology. Singular
- David L. Maxwell, Eiki Satake (1997). Research and Statistical Methods in Communication Disorders. Williams &Wilkins

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SPEECH SCIENCE AND SPEECH PRODUCTION

Course Code: SLP4102 **Credit Units: 05**

Objectives: At the end of the course, the students will be able to

a) describe the physiology of speech production,
b) discuss acoustic theories of speech production,
c) describe the acoustic characteristics of speech sounds, and
d) know the application of acoustic analysis and speech synthesis.

Course Contents:

Module-1: Introduction to the Study of Speech Physiology

a) Physiological aspects of speech production (respiration, laryngeal and articulator subsystem)
b) Aerodynamics of speech: mechanics of airflow – laminar, orifice and turbulent flow: maintenance of airway pressure for speech
c) Speech breathing
d) Lower air way dynamics: anatomy, laryngeal and lung activity in speech: conversational speech and loud speech; glottal activity in the production of speech sounds and whisper
e) Upper airway dynamics: constrictors in upper airway; aerodynamics of speech sounds
f) Measures of respiratory analysis and instrumentation: intraoral and sub glottal pressure; instrumentation

Module-2 : Theories of Speech Production

a) Acoustic theory of speech production: source and filter characteristics; output speech and its characteristics
b) Critical evaluation of acoustic theory of speech production
c) Aspects of speech acoustics
d) Aspects of prosody and their realization
e) Characteristics and production of vocal music: Contrast with speech production

Module-3: Instrumentation for Studying Speech

a) Acoustic analysis of speech - techniques of digital signal processing, Long Term Average Spectrum
b) Software for acquisition and acoustic analysis – freeware and patented software
c) Spectrogram: Identification of sounds and their acoustic features through spectrogram
d) Physiological measurements: Techniques and instrumentation like Electromyography Stroboscope, Electroglottography, Ultrasound, EMMA, evoked potentials, FMRI,PET

Module-4 : Acoustic and Aerodynamic Characteristics of Speech Sounds

a) vowels and diphthongs
b) plosives
c) nasal consonants
d) fricatives
e) other consonants - affricates, glides and liquids
f) effects of context and speaker

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Module-5: Application of Acoustic Analysis and Speech Synthesis

a) Applications of acoustic analysis in speech disorders.
b) Forensic applications: semiautomatic and automatic methods.
c) Infant cry analysis- characteristics of normal and abnormal cries, models, infant cry as a tool for early identification of high-risk babies
d) Speech synthesis and its applications: articulator, parametric synthesis and analysis by synthesis

Examination Scheme:

Components	CD	CA	MSE	A	EE
Weightage (%)	5	5	15	5	70

CD- Class discussion, CA- Class assignment, MSE – Midterm seasonal exam,
A- Attendance, EE- End semester examination

Recommended Reading

- Borden, G. J., & Harris, K. S. (2011). Speech Science Primer, Philadelphia. Lippincott, William &Wilkins.
- Ferrand, C. T. (2007). Speech Science – An Integrated Approach to Theory and Practice.2nd Edition, Boston, Allyn & Bacon.
- Hixon, T. J., Weismer, G., &Hoit, J. D. (2014).Preclinical Speech Sciences; Anatomy Physiology Acoustics Perception. San Diego, Plural Publishing.
- Hollien, H. (2002). Forensic Voice Identification. NY, Academic Press Inc.
- Kent, R. D., & Read, C. (2002).The Acoustic Analysis of Speech. New York, Delmar Learning.
- Lade fogd, P. (2001). An Introduction to the Sounds of Languages; Vowels and Consonants. Oxford, Black Well
- Raphael, L. J. (2007). Speech Science Primer. Philadelphia, Lippincott Williams & Wilkins.
- CIIL Publications on the production of sounds in different languages of India

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CLINICAL (INTERNAL)

Course Code: SLP4106 **Credit Units: 10**

Know how

a) Perform acoustic analysis of speech including FFT, LPC, cestrum and inverse filtering; acoustic analysis of vowels, diphthongs, plosives, nasals, fricatives, Affricates and other speech sounds using spectrograms on PRAAT
b) Vowel synthesis using parametric and analysis by synthesis; demonstration of articulator synthesis
c) Observation of stroboscopic evaluation of persons with voice disorders as part of team assessment
d) Observation of endoscopic examination of persons with cleft lip and palate as part of team assessment
e) Differential diagnosis of conditions relevant to speech and hearing as per DSM-V and ICD 10classifications

Demonstrate

a) Measurement of aerodynamic parameters using pyrometers and instrumentation for aerodynamic analysis
b) Record language samples of 5 typically developing children and 5 children with language disorders, transcribe the samples using International Phonetic Alphabet (IPA) and perform analysis of language in terms of different components of language
c) Carry out and interpret the acoustic measures of voice on two recorded samples and correlate with the perceptual analysis
d) Complete perceptual analysis of speech samples of persons with CLP.
e) Demonstration of therapy techniques for disorders of speech sound, voice, and fluency.
f) Practice and learn to use the strategies of direct selection, scanning, encoding and word prediction in a communication board/book or aided AAC system in simulated situation
g) Practice and learn to use finger spelling and signs for functional vocabulary
h) Learn to operate AAC devices, aids and software

Do

a) Complete evaluation, write detailed evaluation report, counsel persons with communication disorder and their families as required for the following:
    1) Five children with language disorders using appropriate tests/protocols: Autism Spectrum Disorders, Attention Deficit Hyperactivity Disorder (ADHD), cognitive impairment and global developmental delay.
    2) Five persons with stuttering using standardized tests (SSI, SPI etc.), including assessment of rate of speech, type, percent of dysfluencies, and quality of life measures.
    3) Five persons with voice disorders including perceptual assessment using different scales, acoustic analysis of voice and patient reported outcome measurement.
    4) Five children with speech sound disorders – record and transcribe speech samples (word and connected speech), carry out error analysis – pattern analysis, calculate percentage consonant correct, mean length of utterance.
b) Plan and carry out appropriate intervention program for children and adults with voice and fluency disorders, children with language disorders and children with speech sound disorders.
c) Plan and carry out intervention program for a child with language disorder using AAC

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Examination Scheme:

Components	CRW	C/P/A	CT	A	VIVA
Weightage (%)	15	15	15	5	50

CRW- Clinical record writing, CPA- Case discussion/presentation/analysis, CT- Class test A- Attendance, Viva – External

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ADVANCED IN SPEECH SOUND DISORDER

Course Code: SLP4201 **Credit Units: 05**

Objectives: At the end of the course, the students will be able to

a) describe recent theories and concepts related to phonological development and its disorders,
b) diagnose and manage children with speech sound disorders,
c) provide comprehensive care including speech therapy for persons with CLP as a member of the cleft palate team, and
d) guide and counsel families of children with CLP.

Course Contents:

Module-1: Phonological Development and Disorders

a) Recent concepts in theories of phonological development: Generative phonology, natural phonology, non-linear phonology, optimality theory
b) Application of phonological theories in evaluation and management of phonological disorders
c) Co-articulation – Types (anticipatory, carryover); Models of co-articulation - feature based, syllabic, allophonic, target, physiological and degree of articulator constriction models); Physiological / Acoustical / Perceptual studies in co-articulation
d) Current concepts in taxonomy of speech sound disorders in children

Module-2: Assessment and Management of Children with Phonological Disorders

a) Comprehensive phonological assessment procedures – Formal and informal; Independent and relational analyses; dynamic assessment
b) Assessment of phonological awareness and phonological processing in children with speech sound disorders
c) Critical appraisal of test material in Indian context - Specific issues in phonological assessment in multilingual environments
d) Determining need for intervention and intervention decisions

Module-3: Management of Children with Speech Sound Disorders

a) Evidence based approaches to intervention – Motor based approaches, linguistic based approaches; use of non-speech oro-motor activities
b) Motor learning principles – applications to interventions
c) Considerations in intervention: methods to measure clinical change and determining progress in therapy and generalization
d) Specific considerations in intervention within multilingual contexts.
e) Use of software applications (Apps) in intervention; Use of tele-health for intervention of speech sound disorders

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Module-4: Cleft Lip and Palate

a) Phonological development in children with CLP
b) Development of other language attributes (morphology, semantics, syntax, pragmatics)
c) Velopharyngeal Closure- normal physiology, parameters affecting velopharyngeal closure and nature of velopharyngeal dysfunction in persons with CLP
d) Perceptual assessment protocols for speech characteristics in children with repaired CLP
e) Instrumental assessment of velopharyngeal closure- Imaging techniques, acoustic measurements, aerodynamic measurements

Module-5: Management of Persons with CLP

a) Surgical, orthodontic and prosthodontic management in CLP.
b) Early intervention for children with CLP – Methods and studies related to efficacy
c) Speech and language therapy for persons with velopharyngealdys function
d) Current evidence based practices in assessment and management of CLP

Examination Scheme:

Components	CD	CA	MSE	A	EE
Weightage (%)	5	5	15	5	70

CD- Class discussion, CA- Class assignment, MSE – Midterm seasonal exam,
A- Attendance, EE- End semester examination

Recommended Reading

- Bernthal, J.E., Bankson, N.W., &Flipsen, P. (2013).Articulation and phonological disorders (7th Ed.).Boston, MA: Pearson.
- Dodd, B. (2013). Differential diagnosis and treatment of children with speech disorder (2nd Ed). NJ:Wiley.
- Vasanta, D. (2014). Clinical applications of phonetics and phonology. ISHA Monograph.Vol 14, No. 1.Indian Speech & Hearing Association.
- Velleman, S. L (2003). Resource guide for Childhood Apraxia of Speech. Delmar/Thomson Learning.
- Williams, A., McLeod, S., & Mc Cauley ,R. (2010). Interventions for speech sound disorders in children. Baltimore: Brookes.

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VOICE SCIENCE AND DISORDER

Course Code: SLP4202 **Credit Units: 05**

Objectives: At the end of the course, the student will be able to

a) understand the bio-mechanics of voice production in normal individuals and in those with voice disorders,
b) explain and assess the roles of breathing mechanism, vocal fold vibration, vocal tract resonance and enunciation in voice production,
c) delineate the varying roles and responsibilities of a SLP in a trans-disciplinary (medical) team to assess and treat voice disorders in children, adults, geriatrics and specific population including professional voice users, and
d) appraise different service delivery models and procedures to run a voice clinic

Course Contents:

Module-1: Voice Science

a) Vocology – scope and objectives
b) Breathing and voicing: lungs and airways, breathing mechanism as an interactive sound generating system: breathing oscillator & valuing oscillator, combining the breathing and valuing oscillators with voicing
c) Vocal folds and voice: Biology of vocal fold tissue and lamina propria, muscular properties and vocal behaviors, biomechanics and voice control/modulation, voice fatigue, vocal injury and recovery, wound healing
d) Resonance and voice: concepts of acoustic impedance, reactance, inertance, and compliance, acoustic impedance of the vocal tract, the effect of vocal tract reactance on self-sustained vocal fold oscillation, idealized vocal tract shapes and voice quality, modulating phonation with articulation and prosody

Module-2: Voice Assessment and Voice Disorders

a) Vocometry: assessing vocal ability: principles, methods and procedures: General assessment principles, evaluation procedures, tools of measurement, purpose of measurement, measurement scales, auditory perceptual evaluation- speech breathing, voice quality, resonance, and overview of instrumentation for voice assessment: visualization techniques, acoustic analysis, aerodynamic analysis, glottography, nasometry and electromyography
b) Voice disorders: issues in definition, incidence and prevalence, occupational risks and voice disorders
c) Classification of voice pathologies, characteristics and path physiology: Structural, neuropathology, idiopathic, functional/behavioral - pathologies related to mechanical stress, tissue elasticity, fluid transport, airway environment and abnormal muscle activation
d) Voice disorders in specific populations: Laryngectomy, pediatric voice disorders, aging voice, professional voice, vocal cord dysfunction/paradoxical vocal fold motion, transgender and trans-sexual voice

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Module-3: Voice Habilitation

a) Voice management team, roles and functions
b) Pharmacological and surgical effects on voice: Current trend in medical and surgical management: Medications for bacterial and other infections, allergies, edema, pain, asthma, cough, gastric and laryngopharyngeal reflux, stage fright, spasmodic dysphonic, mood conditions, sleep disturbance, hormone imbalances, etc. Voice surgeries – pre- operative and post-operative care and precautions
c) Voice habilitation: Current views and approaches; EBP for voice and its disorders; Voice therapy methods for children and adults.
d) Voice exercise principles and procedures: Physiological voice therapy methods Vs. Behavioral voice therapy methods, role of vocal hygiene and voice rest, basics of exercise physiology, general principles, types of exercises, exercise prescription and progress, vocal exercise techniques – vocal function exercises, resonant voice exercise, confidential voice therapy, and other voice exercises including psychological approaches, relapse and restoration
e) Habilitation of persons with laryngectomy: Speech and medical considerations in laryngectomy, voice restoration in laryngectomees, counseling and quality of life

Module-4: Voice Needs and Problems in Professional Voice Users

a) Vocal professionals and voice disorders: classification, pathologies affecting voice – frequency, personal and social impacts, occupational hazards and issues, nature of voice problems: repetitive strain injuries, acute injuries and chronic problems – presentation, assessment and treatment
b) Laryngeal rest, modified voice rest/conservative voice use, vocal hygiene; laryngeal rest versus exercise: effects on wound healing, general wound healing processes
c) Voice habilitation for singers and other elite vocal users: Demands on voice, nature of vocal training and use, voice fatigue and assessment, basic principles of motor learning, awareness training, and vocal exercises, concept of professional voice care team – role of medical and non-medical team players
d) Voice habilitation for teachers: voice problems in teachers: nature and manifestation, use of voice in classroom and factors influencing, vocal loading and assessment, vocal fatigue, techniques to improve the speaking voice and delivery, voice projection techniques, vocal education and counseling

Module-5: Service Delivery and Other Professional Issues

a) Scope of practice in the area of voice – training in endoscopy, documentation, tele practice – trends across globe and in India (practice guidelines, technical reports, position statements, knowledge and skills document relevant to voice as per RCI, ASHA, European Laryngological Society, and other relevant professional/statutory body).Issues in adopting and implementing the same in India.
b) Patient compliance and concordance to voice management: Relevance of voice problems/voice problems as a public health concern, measuring severity of voice condition, measurement of compliance to management options, treatment variables and effects, patient-clinician interactions, socio cultural and economic considerations
c) Voice clinics: SLP led clinics Vs. SLP in a medical team, space and other infrastructural requirements, specialty clinics considering needs of specific population such as singers, transgender, transsexuals, non-native speakers, broad casters, etc.

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d) Research and ethics in clinical practice: overview of basic and applied research in voice, ethics in clinical research, informed consent, clinical trials, methods to popularize services- roles of associations, conferences, working groups, awareness movements/drives like world voice day, camps, public awareness programs, role of media, prevention of voice problems.

Examination Scheme:

Components	CD	CA	MSE	A	EE
Weightage (%)	5	5	15	5	70

CD- Class discussion, CA- Class assignment, MSE – Midterm seasonal exam,
A- Attendance, EE- End semester examination

Recommended Reading

- American Speech-Language- Hearing Association. (2004a). Vocal tract visualization and imaging: Position statement. Available fromwww.asha.org/policy.
- American Speech-Language- Hearing Association. (2004b). Vocal tract visualization and imaging: Technical report. Available fromwww.asha.org/policy.
- Behrman, A. (2013). Speech & Voice Science (2nd Ed.). San Diego: Plural publishers.
- Hixon, T. J., Weismer, G., &Hoit, J. D. (2014). Preclinical Speech Science: Anatomy, Physiology, Acoustics, Perception (2nd Ed.). San Diego: Plural publishers.
- Sapienza, C.M., & Ruddy, B. H. (2013).Voice Disorders. (2nd Ed.). San Diego: Plural publishers.
- Sataloff, R. T. (2006). Vocal Health & Pedagogy: Advanced Assessment and Treatment. Vol. II. (2nd Ed.). San Diego: Plural publishers.
- Sataloff, R. T. (2006). Vocal Health & Pedagogy: Science and Assessment. Vol. I. (2nd Ed.). San Diego: Plural publishers.
- Sataloff, R. T. (2005). Voice Science. San Diego: Plural publishers.
- Scope of practice document – SLPA (2015) – Rehabilitation Council of India
- Stemple, J. C., Glaze, L. E., &Gerdeman, B. K. (2014). Clinical Voice Pathology: Theory & Management (5th Ed.). San Diego: Plural publishers.
- Titze, I. R., & Verdolini Abbott, K. (2012).Vocology: The Science and Practice of Voice Habilitation. Salt Lake City: National Center for Voice and Speech.

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DISORDER OF FLUENCY

Course Code: SLP4203 **Credit Units: 05**

Objectives: At the end of the course, the students will be able

a) explain the nature, types and bases of fluency and its disorders,
b) discuss the theories and models of stuttering,
c) describe, diagnose and manage persons with different types of fluency disorders,
d) implement a team of professional for evaluation and management of fluency disorders,
e) counsel the clinical clientele, their family members and others to manage the problem, and
f) evaluate research output in the area of fluency and its disorders

Course Contents:

Module-1: Overview of Fluency and its Disorders

a) Dimensions of fluency disorders- recent advances; Suprasegment
b) Development of fluent speech: Factors affecting fluency of speech
c) Theories of stuttering - linguistic, articulator, audiological, laryngeal and genetic predisposition
d) Neuro anatomical, neuro-physiological bases of fluency disorders
e) Cortical activation patterns in stuttering – neuromotor problem
f) Stuttering as a timing disorder
g) Feedback and feed-forward models of stuttering.

Module-2: Types of Non-fluencies and Dysfluencies

a) Normal non-fluency and developmental stuttering
b) Cluttering- causes and characteristics
c) Neurogenic, Psychogenic and other types of fluency disorders
d) Stuttering in persons with multiple disability

Module-3: Assessment of Fluency and Dysfluency

a) Objective tools for assessment of fluency and its disorders
b) Subjective and perceptual assessment
c) Electrophysiology in the evaluation of fluency disorders
d) Functional radiological studies of stuttering
e) Cognitive dimension of stuttering
f) Diagnosis and differential diagnosis

Module-4: Management of Disorders of Fluency

a) Spontaneous recovery and relapse
b) Principles of therapy; skill training
c) Approaches to management of fluency disorders in adults and children
d) Group therapy
e) Input from allied professionals in the management of fluency disorders
f) Behavioral and work-place management

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g) Counseling - including parents and teachers
h) Social help and advocacy groups
i) Apps based and other innovative modes including tele mode.

Module-5: Recovery and Related Issues

a) Relapse and recovery pattern in fluency disorders
b) Efficacy and outcome measures of fluency therapy
c) Evidence based practice
d) Bilingualism / multilingualism relating to stuttering and cultural sensitivity
e) Ethics in research and management of stuttering

Examination Scheme:

Components	CD	CA	MSE	A	EE
Weightage (%)	5	5	15	5	70

CD- Class discussion, CA- Class assignment, MSE – Midterm seasonal exam,
A- Attendance, EE- End semester examination

Recommended Reading

- Bloodstein, O., & Ratner, N. B. (2008). A Handbook on Stuttering (6th Ed.). Clifton Park, NY, Thomson Demer Learning.
- Conture, E., Curlee, R., & Rrichard F., (2007).Stuttering and Related Disorders of Fluency. 3rd Ed. N Y, Thieme Publishers.
- Corder, Akingham, R.J. (1998): Treatment efficacy for stuttering. Singular Publishing
- Group, SanDiego.
- Curlee (1993): Stuttering and related disorders of fluency. Thieme Medical Publisher, New York.
- Ham, R.E. (1990): Therapy of stuttering pre-school through adolescence. Prentice Hall, Englewood-Cliffs.
- Manning, W. H. (2010). Clinical Decision Making in Fluency Disorders. 3rd Ed. NY, Delmer Language Learning
- Myers, (1992): Cluttering.Kibworth, Far Communication.
- Onslow, M., & Packman, A. (1999).The Handbook of Early Stuttering Intervention. USA, Singular Publishing Group.
- Peters, H.F.M. and others (Ed.) :(1991). Speech motor control and stuttering. Excerpta medicals, Amsterdam.
- Riley (1986).Stuttering severity instrument for children and adults. Pro.Ed.Austin.
- Rustin, L. and others (1996).Assessment and therapy for young dysfluent children. Whurr Publishers ,London.
- Starkweather, C.W. and others (1990): Stuttering prevention. Inglewood Cliffs, Prentice Hall.
- Webster, R. L. (2014). From Stuttering to Fluent Speech, 6300 Cases Later: Unlocking Muscle Mischief Create Space. South Carolina, Independent Publishing Platform
- Wells (1987).Stuttering treatment. Prentice-Hall, New Jersey.

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CLINICAL (EXTERNAL)

Course Code: SLP4205 **Credit Units: 10**

Know how

f) Perform acoustic analysis of speech including FFT, LPC, cepstrum and inverse filtering; acoustic analysis of vowels, diphthongs, plosives, nasals, fricatives, Affricates and other speech sounds using spectrograms on PRAAT

g) Vowel synthesis using parametric and analysis by synthesis; demonstration of articulatory synthesis

h) Observation of stroboscopic evaluation of persons with voice disorders as part of team assessment

i) Observation of endoscopic examination of persons with cleft lip and palate as part of team assessment

j) Differential diagnosis of conditions relevant to speech and hearing as per DSM-V and ICD 10classifications

Demonstrate

i) Measurement of aerodynamic parameters using spirometer and instrumentation for aerodynamic analysis

j) Record language samples of 5 typically developing children and 5 children with language disorders, transcribe the samples using International Phonetic Alphabet (IPA) and perform analysis of language in terms of different components of language

k) Carry out and interpret the acoustic measures of voice on two recorded samples and correlate with the perceptual analysis

l) Complete perceptual analysis of speech samples of persons with CLP.

m) Demonstration of therapy techniques for disorders of speech sound, voice, and fluency.

n) Practice and learn to use the strategies of direct selection, scanning, encoding and word prediction in a communication board/book or aided AAC system in simulated situation

o) Practice and learn to use finger spelling and signs for functional vocabulary

p) Learn to operate AAC devices, aids and software

Do

d) Complete evaluation, write detailed evaluation report, counsel persons with communication disorder and their families as required for the following:

   1) Five children with language disorders using appropriate tests/protocols: Autism Spectrum Disorders, Attention Deficit Hyperactivity Disorder (ADHD), cognitive impairment and global developmental delay.
   2) Five persons with stuttering using standardized tests (SSI, SPI etc.), including assessment of rate of speech, type, percent of dysfluencies, and quality of life measures.
   3) Five persons with voice disorders including perceptual assessment using different scales, acoustic analysis of voice and patient reported outcome measurement.
   4) Five children with speech sound disorders – record and transcribe speech samples (word and connected speech), carry out error analysis – pattern analysis, calculate percentage consonant correct, mean length of utterance.

e) Plan and carry out appropriate intervention program for children and adults with voice and fluency disorders, children with language disorders and children with speech sound disorders.

f) Plan and carry out intervention program for a child with language disorder using AAC

Examination Scheme:

Components	**CRW**	**C/P/A**	**CT**	**A**	**VIVA**
Weightage (%)	15	15	15	5	50

CRW- Clinical record writing, CPA- Case discussion/presentation/analysis, CT- Class test A- Attendance, Viva –External

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NEUROGENIC SPEECH DISORDER

Course Code: SLP4301 **Credit Units: 05**

Objectives: At the end of the course, the student will be able to

a) describe the neuroanatomical bases of speech motor control,
b) explain the models relevant to speech motor control, and
c) know the methods for assessment and management of neuromotor speech disorders.

Course Contents:

Module-1: Neuroanatomical and Physiological Substrates of Speech Motor Control

a) Review of neuroanatomical substrates of speech motor control- motor and sensory cortex, sub cortical, cerebella and brain stem structures and their pathways; cranial nerves and peripheral nervous system, types of mechanoreceptors and their topography in speech
b) Early models of speech motor control: Closed Loop, Open Loop, Associative Chain and Serial Order Model, Schema Theory, Task Dynamic Model, Mackay's Model, Gracco's Model,
C) Recent Models of Speech Motor Control: DIVA Model
d) Other speech control models related to development of speech motor control in children
e) Age related changes in speech motor control

Module-2: Assessment and Management of Dysarthria in Adults

a) Perceptual methods: Rating scales and tests for speech parameters, prosody, speech intelligibility, and comprehensibility and naturalness.
b) Recent advances in use of aerodynamic and acoustic analysis of speech among persons with dysarthria
c) Other physiological analyses of speech subsystems in persons with dysarthria
d) Behavioral approaches for treatment of speech subsystems affected in persons with dysarthria
e) Evidence based practice guidelines for management of dysarthria in adults

Module-3: Assessment and Management of Dysarthria in Children

a) Behavioral approaches to correct posture, tone, and strength and sensori-motor treatment techniques
b) Specific behavioral approaches in developmental dysarthria: McDonald's Approach and Hardy's Approach
c) Application of facilitator approaches (neurodevelopment approach and methods for reflex inhibition) in the management of developmental dysarthrias– evidence base for facilitator approaches

Module-4: Assessment and Management of Apraxia of Speech (AOS) in Adults

a) Assessment for suspected apraxia of speech, apraxia of speech and non-speechapraxia: Perceptual assessment protocols; physiological assessment of speech in adults with AOS
b) Intervention methods for non-verbal apraxia

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c) Intervention for AOS in adults: specific, programmed and nonspecific approaches– Evidence based practice
d) Motor learning principles – applications in intervention of AOS

Module-5: Assessment and Management of Childhood Apraxia of Speech (CAS)

a) Current status of nature of CAS as primary disorder and CAS as co-morbid condition in other neurodevelopmental disorders
b) Assessment protocols for CAS and differential diagnosis from other speech sound disorders
c) Intervention approaches for CAS – Evidence based practice
d) Motor learning principles – applications in intervention of CAS

Examination Scheme:

Components	CD	CA	MSE	A	EE
Weightage (%)	5	5	15	5	70

CD- Class discussion, CA- Class assignment, MSE – Midterm seasonal exam,
A- Attendance, EE- End semester examination

Recommended Reading

- Burda, A. N. (2011). Communication and Swallowing Changes in Healthy Aging Adults. Chapter 7 & 8.MA, Jones & Barlett Learning.
- Murdoch, B. E. (2010). Acquired Speech and Language Disorders: A Neuroanatomical and Functional Neurological Approach (2nd Ed.). New Delhi, India: John Wiley
- Guenther F. H., & Perkell, J. S. (2004).A Neural Model of Speech Production and its Application to Studies of the Role of Auditory Feedback in Speech. UK, Oxford University Press.
- Maassen, B., Kent, R., Peters, H., Lieshout, P.V., & Hulstijn, W. (Eds.) (2009).Speech Motor Control in Normal and Disordered Speech. NY, Oxford University Press.
- Maassen, B., &Lieshout, P. V. (Eds.) (2010).Speech Motor Control: New Developments in Basic and Applied Research. NY, Oxford University Press.
- McNeil, M. R. (2008). Clinical Management of Sensorimotor Speech Disorders (2nd Ed.). New York, NY, Thieme.
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- Crary. M. A. (1993). Developmental Motor Speech Disorders. San Diego, Singular Publishing Group.
- Dodd, B. (2005). Differential Diagnosis and Treatment of Children with Speech Disorders. London, Whurr Publishers.
- Duffy, J. R. (2013). Motor Speech Disorders: Substrates, Differential Diagnosis, and Management (3rd Ed.). University of Michigan, Elsevier Mosby.
- Halpern, H., & Goldfarb, R. (2013). Language and Motor Speech Disorders in Adults (3rd Ed.). Chapters 8 and 9.MA, Jones & Barlett Learning.
- Love. R. J. (2000). Childhood Motor Speech Disability (2nd Ed.). USA, Allyn & Bacon.
- Manasco, M. H. (2014). Introduction to Neurogenic Communication Disorders.MA, Jones & Barlett Learning.
- Weismer, G. (2007). Motor Speech Disorders: Essays for Ray Kent. San Diego, Plural Publishing Inc.
- Yorkston, K. M., Beukelman, D. R., Strand, E. A., &Hakel, M. (2010). Management of Motor Speech Disorders in Children and Adults (3rd Ed.). Austin, Texas; Pro-EdInc.

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LANGUAGE AND LITERACY DISORDER

Course Code: SLP4304 **Credit Units: 05**

Objectives: At the end of the course, the student will be able to

a) explain the relationships among language, literacy, and cognition and specifically the role of oral language in acquisition of literacy skills,
b) discuss the development and related disorders pertaining to language and literacy among children,
c) discuss evidence based assessments of language and literacy skills, and
d) plan evidence based intervention for children with a focus on oral language based interventions

Course Contents:

Module-1: Reading: Development and Relationship with Language

a) Concepts related to reading and its acquisition – Decoding, reading accuracy, reading fluency, reading comprehension;
b) Differences among writing systems for languages; Importance of phoneme-grapheme correspondence for reading
c) Foundations for development of reading in languages with different writing systems (Phonological processing, phonological awareness, orthographic skills, visual processing skills, oral language skills);
a) Role of oral language in the acquisition of literacy – Aspects of oral language contributing to decoding (e.g., vocabulary and morphosyntax) and reading comprehension (e.g., syntax, syntactic awareness etc.) and spelling (e.g., morphological awareness)
b) Stages of reading and writing development – emergent literacy to proficient reading comprehension; Models of reading development in English /alphabetic script and other writing systems.

Module-2: Disorders Related Language and Literacy

a) Definition and differences among underachievement in school, learning disability, reading disability, dyslexia, dysgraphia, dyscalculalia, language learning disability, language impairment/ specific language impairment; DSM V and ICD 10 classifications; challenges in use of classifications.
b) Linguistic characteristics of students with reading/language/learning disabilities
c) Issues related to co-morbidity and overlap among phonological disorders, specific language disorders, reading disability and auditory processing disorders with relation to development of reading
d) Genetics of literacy disorders (family risk, molecular genetics etc.).

Module-3: Assessment

a) Screening of children for language disorders in schools; Standardized tests to assess language and (English and other languages) in children 5-18years
b) Other forms of assessments to identify children with language/learning disabilities - Criterion referenced assessments, language sampling, portfolio, dynamic assessment, curriculum-based assessment etc.
c) Specific assessment tools for learning disability in India (e.g., NIMHANS battery, Dyslexia Assessment for Languages in India and other published tests)

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d) informal assessment of different domains – Tasks and stimuli in specific languages for phonological awareness, orthographic skills, phonological processing, oral language skills etc.
e) Brief overview of assessment of associated areas (auditory processing, visual processing, memory etc.)

Module-4: Evidence based Intervention for Literacy Development

a) Intervention approaches to promote emergent literacy
b) Intervention approaches to promote decoding and early reading skills
c) Intervention approaches to promote development of reading comprehension
d) Intervention approaches to promote spelling and written language output
e) Research on cross-linguistics issues in intervention; intervention for children with Bilingual / multilingual background and reading intervention

Module-5: Issues related to Service Delivery and Related Laws/Policies

a) Modes of service delivery for school-aged children (clinical, consultative, collaborative, language-based classroom, peer-mediated)
b) Team members working children with literacy disorders; Response to Intervention– tiers and their role in instruction for poor readers; role of SLP in Response to Intervention
c) Acts, regulations and policies relevant to education and children with special needs in India (e.g., Right to Education Act, Sarva Shiksha Abhiyan, regulations related to language exemption in examination, National Open School system).
d) Dyslexia associations/groups in India

Examination Scheme:

Components	CD	CA	MSE	A	EE
Weightage (%)	5	5	15	5	70

CD- Class discussion, CA- Class assignment, MSE – Midterm seasonal exam,
A- Attendance, EE- End semester examination

Recommended Reading

- C. A. Stone, E. R. Silliman, B. J. Ehren, & G. P. Wallach (Eds.), (2016). *Handbook of language and literacy: Development and disorders* (2nd ed.), pp. 339-357. New York, NY: Guilford Press.
- Clarke, P. J., Truelove, E., Hulme, C., & Snowling, M. J. (2013). *Developing reading comprehension*. John Wiley &Sons.
- Nag, S., & Snowling, M. J. (2012). School underachievement and specific learning difficulties. *IACAPAP e-Textbook of Child and Adolescent Mental Health. Geneva: International Association for Children and Adolescent Psychiatry and Allied Professions*.
- Paul, R. &Norbury, C. (2012).*Language disorders from infancy through adolescence: Listenig, speaking, reading, writing, and communicating* (4th Ed.). St. Louis, MO: Elsevier.
- Carroll, J. M., Bowyer-Crane, C., Duff, F. J., Hulme, C., & Snowling, M. J. (2011). *Developing language and literacy: Effective intervention in the early years*.John Wiley &Sons.
- Turnbull, K. L. P., & Justice, L. M. (2011). *Language development from theory to practice e*.Pearson Higher Ed.
- Hulme, C., & Snowling, M. J. (2009). *Developmental disorders of language learning and cognition*.John Wiley &Sons.
- Cabell, S. Q., Justice, L. M., Kaderavek, J., Pence, K. L., &Breit-Smith, A. (2008). *Emergent literacy: Lessons for success*. Plural Publishing.
- Justice, L. M. (2006). *Clinical approaches to emergent literacy intervention*. Plural Publishing.

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COGNITIVE COMMUNICATION DISORDER

Course Code: SLP4305 **Credit Units: 05**

Objectives: At the end of the course, the student will be able to

a) describe various conditions in adults leading to cognitive communication disorders,
b) acquire skills in issues related to assessment of cognitive communication disorders,
c) acquire skills in management of cognitive communication disorders, and
d) critically evaluate research articles related to cognitive communication disorders.

Course Contents:

Module-1: An Overview of Cognitive Communication Disorders - Aphasia Related, Traumatic Brain Injury (TBI) and Right Hemisphere Damage (RHD)

a) Cognition- description of cognitive processes, mapping, mechanisms, concept, schema and properties
b) Models of memory, cognitive-linguistic processes
c) Cognitive communication disorders associated with TBI, disability following TBI-WHO-ICF classification, assessment and principles of cognitive rehabilitation of TBI
e) Nature, assessment and management of various cognitive communication deficits in RHD

Module-2: Dementia and Related Cognitive Disorders

a) Neuropathology in Alzheimer's Disease (AD, evaluation and intervention of cognitive communication disorders in AD and other dementias
b) Cognitive communicative aspects in primary progressive aphasia (PPA),evaluation and management of PPA
c) Role of speech-language pathologist working with persons with dementia

Module-3: Alcohol Induced Language Disorders and Metabolic Disorders of Language

a) Cognitive communication deficits in alcohol induced and metabolic language disorders
c) Assessment and management of body structure and function: quantifying and qualifying cognitive communication disorders of alcohol induced and metabolic disorders
d) Assessment of swallowing in persons with cognitive communication disorders
e) Differential diagnosis of cognitive communication disorders in adults

Module-4: Physiology, Pathology and Cognitive Communication Changes in young ageing with Aging

a) Theories aging, and age related changes of the organ system, and cognition
b) Psychological- death and bereavement, personality development and quality of life
c) Physical changes and performance- range of motion, strength, endurance praxis, performance work
d) Aging speech- voice, resonance and articulation and swallowing
e) Language and cognitive aging: primary, secondary and tertiary aging factors

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Module-5: Ethno-Cultural Dynamics in Cognitive Communication Disorders and Cognitive Communication Approaches.

a) Language as socio-cultural phenomena in aging
b) Role of supportive relationships in cognitive communication disorders
c) Cognitive communication approaches in rehabilitation
d) Role of AAC in the intervention of cognitive communication disorders
e) Team and partnerships in cognitive communication disorders
f) Rights of persons with cognitive communication disorders

Examination Scheme:

Components	CD	CA	MSE	A	EE
Weightage (%)	5	5	15	5	70

CD- Class discussion, CA- Class assignment, MSE – Midterm seasonal exam,
A- Attendance, EE- End semester examination

Recommended Reading

- Chapey, R. (2008).Language Intervention Strategies in Aphasia and Related Neurogenic Communication Disorders. Philadelphia, Lippincott Williams &Wilkins.
- Chop, C. W &Robnett, H. R (2015.). Gerontology for health care professional.MA: Jones and Bartlett Learning Burlington.
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- Laura, L. M., & Heather, M. C. (2006).Neurogenic Disorders of Language: Theory Driven Clinical Practice. New York, Thomson Delmar Learning.
- Sarno, T.M (1998). Acquired Aphasia. San Diego, Academic Press.
- Papathanasiou, P. Coppens, & C. Potagas (2013), Aphasia and Related Neurogenic Communication Disorders. Burlington, Jones &Bartlett.
- Morris, J. C. (1994). Handbook of Dementic Illnesses. NY, Marcel DekkerInc.
- Murray, L.L. & Clark, M.H (2015).Neuro-genic Disorders of Language and cognition. Austin, Texas, Pro-EdInc.

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CLINICAL (INTERNAL)

Course Code: SLP4306 **Credit Units: 10**

Know how

a) Observation of modified barium swallow and/or flexible endoscopic examination of swallowing as part of team assessment
b) Observe and identify reports of persons with neurogenic communication disorders in tests such as EEG, CT Scan, MRI etc.
c) Reversible and irreversible conditions that cause neurogenic communication disorders.
d) Certificationprocedures
e) Rights and privileges of persons with communication disorder
f) Ethics in clinical practice

Demonstrate

a) Perform assessment of typically developing child using assessment protocols for learning disability
b) Demonstrate process of differential diagnosis for persons with adult language and cognitive communication disorders.
c) Use of AAC for adults with communication disorders (e.g., alphabet supplementation board, software applications)
d) Perform assessment of phonological awareness, visuospatial skills, orthographic skills on typically developing children.

Do

a) Complete evaluation, write detailed evaluation report, counsel persons with communication disorder and their families as required for the following:
    1) Three persons with aphasia using appropriate screening, diagnostic (WAB/ BDAE etc.) and performance tool
    2) Bed side screening for five adults with communication disorders.
    3) Three persons with adult cognition communication disorders using appropriate screening (ACE/MMSE/CLQT etc.), diagnostic (ABCD/CLAP etc.) and performance tool
    4) Three persons with motor speech disorders including perceptual evaluation of speech subsystems, speech intelligibility assessment, instrumental assessments for respiration or phonology and quality of life assessment
    5) Clinical swallow examination for five persons with concerns in swallowing
    6) Three children at risk for language learning disability
b) Plan and carry out intervention program for adults with neurogenic speech disorders, aphasia, cognitive communication disorders and dysphagia

Prepare a report for persons with communication disorders for medico-legal purposes

Examination Scheme:

Components	CRW	C/P/A	CT	A	VIVA
Weightage (%)	15	15	15	5	50

CRW- Clinical record writing, CPA- Case discussion/presentation/analysis, CT- Class test A- Attendance, Viva – External

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PRACTICES IN SPEECH-LANGUAGE PATHOLOGY

Course Code: SLP4401 **Credit Units: 05**

Objectives: At the end of the course, the students should be able

a) know the role of an speech-language pathologist in different set-ups.
b) liaise with other professionals in setting-up an speech-language clinic.
c) audit speech-language practices in existing set-ups.
d) implement acts and legislations relating to persons with speech-language impairment,
e) advise Governments and other agencies on the formulation of policies and legislative acts relating to speech-language disability
f) understand the legal implications of practice in speech-language pathology.

Course Contents:

Module-1: Scope of Practice, Laws, Regulations and Professional Ethics

a) Scope of practice in global and Indian scenario
b) Professional ethics-
c) Existing acts, legislations, policies related to persons with communication impairment
d) Role of speech-language pathologists in the formulation of acts, regulations and policies
e) Implementation of acts, legislations, policies and welfare measures relating to persons with speech-language impairment
f) Advocacy groups, NGOs
g) Rights of citizens
h) National and international standards related to Speech-language pathology

Module-2: Specialized Programs in Speech-language Pathology

a) Need for specialized programs in Speech-language pathology: Geriatric and persons with multiple handicaps
b) Other specializations (medical speech language pathology, forensic speech science)
b) Health, wellness, and health care - Health promotion and disease prevention, quality of life and healthcare finances
c) Disability-friendly environment including public education
e) Culture and religion sensitive practice in speech-language practice
e) Multilingual and multicultural sensitivity in therapeutics and management
f) Prevention and early identification programs including societal participation

Module-3: Service Delivery Models in Speech-language Pathology

a) Services in different medical / rehabilitation/ research /educational setups
b) School based services pertaining to regular and special schools
c) Community based practice in rural and urban areas
d) Family empowerment program
e) Home based delivery of services
f) Autonomous practice in speech-language pathology
g) Services for other groups of professionals (professional voice users)

Module-4: Tele-practice in Speech-language Pathology

a) Information and communication technology in speech-language pathology practice

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b) Infrastructure for video-conferencing and tele-practice in Speech-language Pathology
c) Techniques/principles of remote testing for screening and diagnostic assessment for speech-language, intervention and counseling
d) Challenges and limitations of tele-practice in Speech-language Pathology in screening, assessment and evaluation, selection of aids and appliances, therapeutics and counseling.

Module-5: Issues in Speech-Language Pathology Practice

a) Entrepreneurship and planning to set up private practice/clinic for speech-language pathology practice: Clinical ethics
b) Documentation in speech-language pathology practice: clinical / demographic data, database management and storage
c) ICF framework for documentation /reports
d) Quality control and auditing in speech-language pathology practice
e) Documenting and implementing evidence based practice in speech-language pathology
f) Understanding team approach: Work in cohesion with other professionals
g) Information resources in speech-language pathology including books and journals, both electronic and print - Databases - Evidence based practice: Change scenario

Examination Scheme:

Components	CD	CA	MSE	A	EE
Weightage (%)	5	5	15	5	70

CD- Class discussion, CA- Class assignment, MSE – Midterm seasonal exam,
A- Attendance, EE- End semester examination

Recommended Reading

- Acts relating to disability, particularly hearing, enacted by the Indian Parliament.
- ASHA.2007. Scope of Practice in Speech-Language Pathology [Scope of Practice].Available at:http://www.asha.org/policy.
- ASHA. 2009a. Audiology and Speech-Language Pathology Outside the United States. Available at:http://www.aasha.org/members/international/intl_assoc.
- ASHA.2009b. Tele practices for SLPs and Audiologists. Available at: http://www.asha.org/practice/telepractice
- Cari M. Tellis, Orlando R. Baron (2015). Counseling and Interviewing in Speech- Language Pathology and Audiology
- College of Audiologists and Speech-Language Pathologists of Ontario.(2004). Use of Tele practice Approaches in Providing Services to Patients/Clients.
- David L. Irwin (2007). Ethics for speech-language pathologists and audiologists : an illustrative casebook
- Position paper Speech and language therapy in adult critical care. Royal college of Speech-language therapists. (2014), London
- Rizzo, S.R., & Trudean, M.D. (1994).Clinical administration in audiology and speech language pathology. San Diego: Singular Publishing GroupInc.
- Rosemary Lubinski and Melanie W. Hudson. (2013), Professional Issues in Speech- Language Pathology and Audiology 4thEdition
- Sarah Ginsberg; Jennifer Friberg; CollennF. Visconti(2011). Scholarship of Teaching and Learning in Speech-Language Pathology and Audiology
- Speech-Language Pathology Medical Review Guidelines (2015). American Speech- Language-Hearing Association
- Stephen, R.R., Jr., Trudeau, D.M. (Eds.) (1994). Clinical administration in audiology & speech language pathology. San Diego: Singular Publishing GroupInc.

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- Todd K Houston (2013). Tele practice in Speech-Language Pathology
- Trici Schraeder (2013). A Guide to School Services in Speech-Language Pathology 2nd Edition
- www.disabilityaffairs.gov.in (website of Department of Empowerment with Disabilities
- www.rehabcouncil.nic.in (website of Rehabilitation Council of India)

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DISSERTATION

Course Code: SLP4437 **Credit Units: 10**

Examination Scheme:

Components	**IE**	**EE**
Weightage (%)	30	70

IE-Internal Examination, EE- External Examination

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CLINICAL (EXTERNAL)

Course Code: SLP4403 **Credit Units: 10**

Knowhow

g) Observation of modified barium swallow and/or flexible endoscopic examination of swallowing as part of team assessment
h) Observe and identify reports of persons with neurogenic communication disorders in tests such as EEG, CT Scan, MRI etc.
i) Reversible and irreversible conditions that cause neurogenic communication disorders.
j) Certificationprocedures
k) Rights and privileges of persons with communication disorder
l) Ethics in clinical practice

Demonstrate

a) Perform assessment of typically developing child using assessment protocols for learning disability
b) Demonstrate process of differential diagnosis for persons with adult language and cognitive communication disorders.
c) Use of AAC for adults with communication disorders (e.g., alphabet supplementation board, software applications)
d) Perform assessment of phonological awareness, visuospatial skills, orthographic skills on typically developing children.

Do

c) Complete evaluation, write detailed evaluation report, counsel persons with communication disorder and their families as required for the following:
   1) Three persons with aphasia using appropriate screening, diagnostic (WAB/ BDAE etc.) and performance tool
   2) Bed side screening for five adults with communication disorders.
   3) Three persons with adult cognition communication disorders using appropriate screening (ACE/MMSE/CLQT etc.), diagnostic (ABCD/CLAP etc.) and performance tool
   4) Three persons with motor speech disorders including perceptual evaluation of speech subsystems, speech intelligibility assessment, instrumental assessments for respiration or phonology and quality of life assessment
   5) Clinical swallow examination for five persons with concerns in swallowing
   6) Three children at risk for language learning disability
d) Plan and carry out intervention program for adults with neurogenic speech disorders, aphasia, cognitive communication disorders and dysphagia
e) Prepare a report for persons with communication disorders for medico-legal purposes.

Examination Scheme:

Components	CRW	C/P/A	CT	A	VIVA
Weightage (%)	15	15	15	5	50

CRW- Clinical record writing, PA- Case discussion/presentation/analysis, CT- Class test A- Attendance, Viva – External

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Amity Medical School

Bachelor of Science (Honors / Honors with Research) in Molecular Medicine & Stem Cell Technologies

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Programme Structure

Curriculum & Scheme of Examination

2023

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Bachelor of Science (Honors / Honors with Research) in Molecular Medicine & Stem Cell Technologies

SEMESTER-I

MICROBIOLOGY & VIROLOGY

Course Code: DSCT2101 **Credit Units: 04**

Course Objective:
Students will learn about different types of bacteria, fungi, protozoa and viruses, their role in disease development as well as in useful applications in biotechnology.

Course Contents:

Module I:
Discovery of the microbial world, role of microorganisms in transformation of organic matter and in the causation of diseases, development of pure culture methods. Principles of microbial nutrition, culture media, theory and practice of sterilization, pure culture techniques.

Module II
Functional anatomy of bacteria: cell envelope, cell wall, cytoplasmic membrane, capsule, surface appendages, cytoplasm and cytoplasmic inclusions. Growth: Definition of growth, mathematical expression of growth, growth curve, synchronous growth, continuous culture, culture collection and maintenance of cultures. New approaches to bacterial taxonomy, classification including ribotyping, ribosomal RNA sequencing, characteristics of primary domains, taxonomy, nomenclature and Bergey's manual.

Module III
Metabolic diversity among microorganisms: photosynthesis in microorganisms, role of bacteriochlorophylls, carotenoids and phycobilins, Chemolithotrophy, hydrogen-iron-nitrite-oxidizing bacteria, nitrate and sulphate reduction, methanogenesis and acetogenesis, Fermentation.

Module IV:
Viruses: Bacterial, animal; structure of viruses; Reproduction and life cycle of RNA and DNA viruses; Viroids and prions. Algae and Fungi: Classification and Reproduction. Host-parasite relationship: Normal micro flora of skin, oral cavity, gastrointestinal tract, Respiratory infections; entry of pathogens into the host, types of toxins (Exo, endo, entro) and their mode of actions, Microbial pathogenesis: Disease reservoirs; Epidemiological terminologies; Infectious disease transmission; Sexually transmitted disease including AIDS, Food and water- borne diseases; pathogenic fungi.

Module V
Antimicrobial agents, sulfa drugs, antibiotics, penicillin and cephalosporins, broad spectrum antibiotics, antifungal antibiotics; mode of action.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

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Text & References:

Text:

- General Microbiology, R.Y. Stanier, J.L. Ingraham, M.L.Wheelis and P.R. Painter, Macmillian
- Microbiology VI Edition, M.J. Pelczar, E.C.S. Chan and N.R. Kreig, Tata McGraw Hill Microbiology by Prescott
- The microbes – An Introduction to their Nature and Importance, P.V. Vandenmark and B.L. Batzing, Benjamin Cummings.

References:

- The Microbial World, Roger Y. Stanier, Prentice Hall
- Microbiology, Tortora, Funke and Chase, Benzamin & Cummings
- Principles of Fermentation Technology, Salisbury, Whitaker and Hall, Aditya Books Pvt. Ltd.
- Industrial Microbiology, Casida, New Age International
- Industrial Microbiology, Prescott and Dunn, C.B.S. Publishers Principles of Microbiology, R.M. Atlas, WMC. Brown Publisher

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BIOCHEMISTRY

Course Code: DSCT2151 **Credit Units: 04**

Course Objective

The course offers understanding of the relationships between structure and function of major classes of biopolymers. Students will learn the central metabolic processes and the role of enzymes in modulating different biological pathways. Understanding of the biochemical systems is essential for understanding normal cell functioning and maintenance of homeostasis in biological systems, as well as for the understanding of several disease conditions.

Course Contents

Module I

Water: Properties of water; acids, bases and buffers; covalent and non-covalent interactions in biological systems. Bioenergetics: First and second law, concept of free energy and chemical equilibrium, Henderson Hasselbalch equation. Buffering against pH Changes in Biological Systems: Phosphate buffer, Bicarbonate buffer, Protein buffer, Amino acid Buffer & Hemoglobin Buffer System. Cellular energy transactions: ATP-ADP cycle, role of mitochondria and chloroplast.

Module II

Carbohydrates: classification, structure and functions of monosaccharides, disaccharides and polysaccharides. Ring structure and mutarotation, stereo isomers and structural isomers. Carbohydrate metabolism: glycolysis and its regulation, Glycogen breakdown, synthesis, Regulation; Citric acid cycle and its regulation, amphibolic nature of Citric acid cycle; Electron transport System, oxidative phosphorylation and control of ATP production; Gluconeogenesis, glyoxylate pathway, Pentose phosphate pathway. Disorder/diseases of carbohydrate metabolism.

Module III

Lipids: Classification, structure and function: Simple, Compound & Derived lipids, Essential fatty acids. Fatty acid synthesis, origin of acetyl-Co A for fat synthesis, Elongation & desaturation of Fatty Acids. Lipids and biological membranes, lipoproteins, Phospholipids, Sphingolipids, Glycolipids; Lipid metabolism: digestion, absorption and transport. Activation & transport of fatty acid from cytosol to mitochondria for oxidation. Oxidation of saturated & unsaturated fatty acids. β, α, ω oxidation.; fatty acid metabolism: β, α, ω oxidation, biosynthesis and regulation; Formation and utilization of ketone bodies; Cholesterol and Arachidonic Acid metabolism, disorder/ diseases of lipid metabolism.

Module IV

Amino acids and Proteins: Amino Acids: Classification, chemical and physical properties of amino acids. Amino acid metabolism: deamination, urea cycle, biosynthesis and breakdown non-essential amino acids (asparagine, aspartic acid, cysteine, glutamic acid, glutamine, glycine, proline, serine, Tyrosine). Disorders and diseases of amino acids metabolism. *Proteins:* structure and function. Ramachandran plot, Primary, secondary, tertiary & quaternary structure of proteins. Glycoproteins: structure and function. *Vitamins and Coenzymes*: structure and function of water soluble vitamins. Enzymes: Introduction to kinetic and catalytic mechanisms; Regulation of enzyme activity; Effects of physical parameters on enzyme activity, enzyme inhibitors: types of inhibition.

Module V

Nucleic acids: nitrogenous bases, nucleotides, structure and properties of nucleic acids. Nitrogen fixation; Nucleotide Metabolism: metabolism of purines and pyrimidine, biosynthesis of nucleotide, coenzymes (NAD, NADP, FAD, FMN); Catabolism of heam and clinical significance of bilirubin.

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Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

- Harper's Biochemistry, K. Robert, M.D. Murray, D.K. Granner, P.A. Mayes and V.I. Rodwell, McGraw-Hill/Appleton and Lange.
- Biochemistry, L. Stryer, W.H. Freeman and Company
- Tools of Biochemistry, T.G. Cooper, John Wiley and Sons Inc.

References:

- Cellular Biophysics I & II, Thomas F. Weiss 1995, MIT Press
- Biochemical calculations, I.H. Segal. Publisher, John Wiley and Sons
- Biochemistry, C.K. Mathews, K.E. Van Holde and K. G. Ahern, Benjamin / Cummings.
- Devlin's Textbook of Biochemistry with Clinical correlations, John Wiley and Sons Inc.
- Principles of Biochemistry, A.L. Lehninger, D.L. Nelson, M.M. Cox, Worth Publishing

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SEMESTER-II

CELL BIOLOGY & GENETICS

Course Code: DSCT2251 **Credit Units: 04**

Course Objective
The course offers understanding of the structure and function of cellular and subcellular components of cells and tissues, basic principles of genetics, classical, molecular and population genetics.

Course Contents

Module I: Cell and cellular organelles
Cell theory, prokaryotic and eukaryotic cells. Structure and function of cell wall, plasma membrane, nucleus, mitochondria, chloroplast, Nucleus, lysosomes, peroxisomes, golgi bodies, and transport across membranes. Cell locomotion, cytoskeleton, structure and function of cilia and flagella. Cell cycle: molecular events, cell division, mitosis and meiosis.

Module II: Cell signaling mechanisms and their significance
General mechanism of signaling and structures of the various types of receptors. Cell proliferation and cell death mechanisms, e.g. apoptosis, necrosis, autophagy, immunogenic and non-immunogenic cell death.

Module III: Genetics
Classical and molecular genetics, Mendelian principles of inheritance, human genetics. Extension of Mendelism: Allelic variations, influence of environment on expression, penetrance and expressivity, epistasis, pleiotropy. Chromosomal basis of inheritance, linkage, crossing over and chromosome mapping.

Module IV: Mutations and Development of Cancer
Mutation and mutagenic agents, types of mutations. Numerical and structural changes in chromosomes and human syndromes associated with them. Types of cancer, etiology of cancer, metastasis, tumor suppressor genes. Cytological role of p53 and p21 genes in cancer development. Introduction to cancer therapy approaches: chemotherapy, radiation therapy, immunotherapy.

Module V: Classical and modern concept of gene
Classical and modern concept of gene, pseudoallelism, position effect, intragenic crossing over & complementation (cistron, recon & nutron) Benzer's work on rII locus in T_2 bacteriophage. Genetics of Population: Hardy-Weinburg Law and its deviations.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:
Text:
- Cell and Molecular Biology, Gerald Karp, John Wiley and Sons Inc.
- Cell and Molecular Biology, DeRobertis, B.I. Publication Pvt. Ltd.
- Genetics, P.K. Gupta, Rastogi Publication

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- Concepts of Genetics (Sixth Edition), William S. Klug and Michael R, Cummings, Pearson Education

References:

- Cell in Development and Inheritance, E.B. Wilson, Macmilian
- Developmental Biology, S.F. Gilbert, Sinauer Associates Inc.
- Essential Cell Biology : An Introduction to the Molecular Biology of the Cell, B. Alberts, D. Bray, A. Johnson, J. Lewis, M. Roff, K. Robert, P. Walter and K. Roberts, Garland Publishing Company
- Molecular Cell Biology, H.Lodish, A.Berk, S.L. Zipursky, P. Matsudaura, D. Baltimore and J. Danell, W.H. Preeman and Company.
- Genetics, M.W. Strickberger, Prentice Hall College Division
- Genetics, P.J.Russell, Benjamin/Cummings
- Principles of Genetics, E J Gardner, John Wiley & Sons Inc.
- Genetics, R. Goodenough, International Thomson Publishing
- Introduction to Genetic Analysis, A.J. F. Griffiths, W.H. Freeman and Company
- Principles of Genetics, D.P. Snustad& M.J. Simmons, John Wiley and Sons Inc.
- Molecular Biology of the Gene (Fifth Edition), J.D. Watson, A.M. Weiner and N.H. Hopkins, Addison – Wiesley Publishing.

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MOLECULAR BIOLOGY & RECOMBINANT DNA TECHNOLOGY

Course Code: DSCT2201 **Credit Units: 02**

Course Objectives:

- The objective of this course is to have a deep understanding of the process of replication, central dogma of the molecular biology, mechanisms of gene expression and regulation. Students will gain an understanding of chemical and molecular processes that occur in the cells.
- The theoretical and practical application of recombinant DNA technology includes understanding and analyzing genomics, proteomics, genetic engineering of microbes, animal and plant cells and their protein expression. Ethical, legal and social concerns surrounding the field of biotechnology are also addressed.

Course Contents

Module I: **Replication of DNA and DNA Repair Mechanisms:** Nucleic acids. DNA replication in phages, prokaryotes and eukaryotes, chromosomal structure and organization, origin of replication and replication machinery, DNA damage and repair mechanisms, excision repair systems, recombination and recombination repair systems.

Module II: Gene Expression and Regulation In prokaryotes

Structure of prokaryotic gene (promoter, initiator & terminator regions), Structure and functions of RNA polymerase Transcription mechanism- initiation, elongation & proof reading, termination (rho independent & rho dependent); basic concept of reverse transcription Genetic code- properties, deciphering of genetic code, wobble hypothesis, aminoacylation Translation mechanism- initiation, elongation and termination Gene regulation: Negative & Positive control Operon conceptLac operon, CAP-cAMP system, Arabinose operon

Module III: Gene expression and regulation in eukaryote

Structure of eukaryotic gene (promoter, exons, introns, terminator, enhancer & silencer) Transcriptional machinery in eukaryotes (RNA polymerases), structures and transcriptional factors (basic, upstream &regulatory) Transcription- initiation (formation of transcriptome), elongation and termination Post-transcriptional modifications- capping, polyadenylation, Splicing (self &protein mediated) and alternative splicing Translation- initiation, elongation and termination Regulation of gene expression in eukaryotes- mating types in yeast

Module IV Recombinant DNA Technology

Enzymes useful in molecular cloning: Restriction endonuclease, DNA ligases, polynucleotide kinase, klenow enzyme, DNA Polymerase- I, reverse transcriptase, alkaline phosphatase, terminal nucleotidyltransferase Cloning Vectors: PBR 322, Bacteriophage, Cosmid, Phagemid, Shuttle vectors Gene transfer techniques: Physical, Chemical and Biological methods Labeling nucleic acids and blotting techniques (Southern, Northern, Western, Zooblot) Polymerase Chain Reaction and its applications Applications of recombinant DNA technologies- Agriculture, Medicine

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Note: Minor variation could be there depending on the examiner

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REFERENCE BOOKS

- Molecular Biology of the cell. Alberts, B; Bray, D, Lews, J., Raff, M., Roberts, K and Watson, J.D. Garland publishers, Oxford
- Molecular Biology of the Gene - By Watson, Hopkins, Goberts, Steitz and Weiner (Pearson Education)
- Text Book of Biotechnology - By H.K. Das (Wiley Publications)
- Gene Structure & Expression - By J.D. Howkins, Publ: Cambridge
- Test Book of Molecular Biology - By K.S. Sastry, G. Padmanabhan& C. Subramanyan,
- Publ: Macmillan India
- Principles of Gene Manipulation - By R.W. Old & S.B. Primrose, Publ: Blackwell
- Genes - By B. Lewin - Oxford Univ. Press
- Molecular Biology &Biotechnol. - By H.D. Kumar, Publ: Vikas
- Methods for General & Molecular Bacteriology - By P. Gerhardf et al., Publ: ASM
- Molecular Biotechnology - By G. R. Click and J. J. Pasternak, Publ: Panima
- Genes and Genomes – By Maxine Singer and Paul Berg
- Molecular Biology - By D. Freifelder, Publ: Narosa
- Molecular biology. By;F. Weaver. WCB/McGraw Hill.
- Gene, Genomics and Genetic Engineering - By Irfan Ali Khan and AtiyaKhanum (Ukaaz Publications).

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MOLECULAR BIOLOGY RECOMBINANT DNA TECHNOLOGY LAB

Course Code: DSCT2202 **Credit Units: 01**

Course Objective:
The laboratory experiments in Recombinant DNA Technology would certainly help to comprehend the theoretical aspects of the subject.

Course Contents:

Module I
Isolation of DNA from bacterial cells, Isolation of plasmid DNA

Module II
Agarose gel electrophoresis of DNA, Quantification of DNA by Spectrophotometer

Module III
Separation of proteins by SDS-PAGE, Polymerase Chain Reaction

Module IV
Restriction digestion of DNA, Bacterial Transformation (Selection of transformants with blue white selection)

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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NANO-TECHNOLOGY AND NANO-MEDICINE

Course Code: DSCT2203 **Credit Units: 01**

Course Objective:
Students will learn basic concepts, techniques and technologies involving nanomaterials, and their applications for biotechnology and medical applications.

Course Contents:

Module I: Introduction to Nanotechnology: Historical perspective of development and applications of nanostructured materials, physical environmental regulations governing nanomaterials, and rules governing health and safety regulations for chemicals and nanomaterials.

Module II:
Investigation and manipulation of nano-materials: Principle and applications of electron microscope, scanning probe microscope, optical microscope, Fourier transform Infrared spectroscopy, X-ray photoelectron spectroscopy, and X-ray diffraction for nanoscience and technology

Module III:
Nanostructures for medicinal applications and toxicity: Introduction to nanomedicine and nanobiotechnology materials; their applications, therapeutic and commercial implications. Micro- and nanoscale control of cellular environment for tissue engineering. Nanoparticle contrast agents for molecular magnetic resonance imaging. Nano-material-based cancer therapeutics

Module IV:
Safety and regulatory issues associated with nanomaterials: Nanomaterial cytotoxicity and geno-toxicity analysis, in-vivo-tests and assays. Biological barriers to nanocarrier-mediated delivery of therapeutic and imaging agents

Module V:
Societal implications of nanoscience: From first industrial revolution to nano-revolution. Implications of nanosceicne and nanotechnology for society, nano policies, nano arms race, public perception and public involvement in nano discourse. Harnessing nanotechnology for economical and social development

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References: Texts:

- Nanobiotechnology: Concepts, Applications and Perspectives by Christof M. Niemeyer and Chad A. Mirkin, First Wiely 2006, ISBN: 978-3-527-60591-0.
- Nanobiotechnology II: More Concepts and Applications by Chad A. Mirkin and Christofer M. ZNiemeyer, Wiely 2007, ISBN: 978-3-527-31673-1.
- Nano-The essentials- Understanding the nanoscience and technology by T. Pradeep, Tata McGraw-Hill Publishing Company Limited 2008, ISBN-10:0-07-154829-7/0071548297.

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SEMESTER-III

HUMAN DEVELOPMENTAL BIOLOGY

Course Code: DSCT2351 **Credit Units: 04**

Course Objective: Students will learn about the fundamental process of human embryology and developmental biology and progression of pluripotent stem cells through different phases of development.

Course Contents:

Module-I: Basics principles of human embryogenesis: gametogenesis, fertilization and embryo development.

Module-II:

Ectoderm, mesoderm and endoderm development. Organogenesis during human development

Module-III:

Molecular regulation of embryogenesis and organogenesis processes during human development. Epigenetics mechanisms and their role in human development process

Module-IV:

Different types of stem cells, process and mechanism of stem cell subset development and their spatial organization during human development, role of epigenetic mechanisms in human stem cell homeostasis and differentiation.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

***Text*:**

- Stem Cell Biology, Daniel Marshak, Richard L. Gardener and David Gottlieb, Cold Spring Harbour Laboratory Press
- Stem cell biology and gene therapy, Booth C., Cell Biology International, Academic Press
- Stem Cell and Gene-Based Therapy: Frontiers in Regenerative Medicine, *Alexander Battler, Jonathan Leo*, Springer.

***References*:**

- Stem Cell Biology and Gene Therapy. Quesenberry PJ, Stein GS, eds. (£65.00.) Wiley, 1998.
- Progress in gene therapy, Volume 2,Pioneering stem cell/gene therapy trials, Roger Bertolotti, Keiya Ozawa and H. Kirk Hammond, VSP international science publishers
- Stem Cells Handbook: Stewart Sell, Humana Press; Totowa NJ, USA; Oct. 2003, Human Embryonic Stem Cells: The Practical Handbook by Stephen Sullivan and Chad A Cowan.

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BIOINFORMATICS

Course Code: DSCT2301 **Credit Units: 03**

Course Objective:
It enables the students to access biological information networks and databases in order to understand the different techniques of biotechnology to build detection systems especially in the prevention and treatment of human diseases.

Course Contents:

Module I: History of Bioinformatics.
The notion of Homology. Sequence Information Sources, EMBL, GENBANK, Entrez, Unigene, Understanding the structure of each source and using it on the web.

Module- II: Protein Information Sources
PDB, SWISSPROT, TREMBL, Understanding the structure of each source and using it on the web. Introduction of Data Generating Techniques and Bioinformatics problem posed by them- Restriction Digestion, Chromatograms, Blots, PCR, Microarrays, Mass Spectrometry.

Module-III: Sequence and Phylogeny analysis, Detecting Open Reading Frames, Outline of sequence Assembly, Mutation/Substitution Matrices, Pairwise Alignments, Introduction to BLAST, using it on the web, Interpreting results, Multiple Sequence Alignment, Phylogenetic Analysis

Module-IV
Searching Databases: SRS, Entrez, Sequence Similarity Searches-BLAST, FASTA, Data Submission. Genome Annotation: Pattern and repeat finding, Gene identification tools

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:
Text:

- Data Mining: Concept and techniques, J. Han and M. Kamber, Morgan Kaufman.
- Database Management, P.C. Desai.
- Bioinformatics and Computational Biology Solutions Using R and Bioconductor (Statistics for Biology and Health)" by Vincent Carey and Sandrine Dudoit Statistics and Data Analysis for Microarrays Using R and Bioconductor by Sorin Drăghici.

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BIOINFORMATICS LAB

Course Code: DSCT2302 **Credit Units: 01**

Course Contents:

PRACTICALS

1. Sequence information resource
2. Understanding and use of various web resources: EMBL and Genbank
3. Entrez
4. Unigene
5. Protein information resource (PIR)
6. Understanding and using: PDB, Swissprot, TREMBL
7. Using various BLAST and interpretation of results
8. Retrieval of information from nucleotide databases
9. Sequence alignment using BLAST
10. Multiple sequence alignment using Clustal W

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment / Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Note: Minor variation could be there depending on the examiner

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BIOINSTRUMENTATION IN MOLECULAR MEDICINE & STEM CELL BIOLOGY

Course Code: SSCT2301 **Credit Units: 03**

Course Objective:
Students will learn about safe laboratory practices, bio-analytical instruments, principles of their proper functioning, and analysis methods applied to biological data obtained in experimental techniques.
Course Contents: Module I
Sampling and sample preparation: Sample fixing for various analytical applications and sample processing. Principles of microscopy, Light, dark field, fluorescence microscope, confocal microscope, transmission and Scanning electron microscopy, microtomy and analysis and measurement of image. Fluorescence activated cell sorter (FACS) basic principles and applications.

Module II
Electrophoresis of DNA, RNA and proteins. Capillary electrophoresis, Two-dimensional electrophoresis, Southern blotting, Northern blotting, Immunoprecipitation, Western blotting. Sequencing, Next Generation Sequencing, RNA-Seq. etc.

Module III:
Centrifugation techniques: Introduction, Basic principle of sedimentation, centrifuges and their uses, Density gradient and analytical centrifugation. Spectroscopy techniques: UV and visible spectroscopy, infrared and atomic absorption spectroscopy, fluorescence spectroscopy, mass spectrometry, MALDI-TOF, nuclear magnetic resonance and electron spin resonance spectroscopy.

Module IV:
Chromatography: Theoretical basis of chromatographic separations. Column, Thin layer, Paper, Normal phase and reverse phase chromatography, Ion-exchange, Affinity and Gas Chromatography, High performance liquid chromatography (HPLC) and GLC.

Module V
Principles of X-ray diffraction and X-ray Crystallography. Theory and application of UV-VIS, IR, NMR, Fluorescence, Atomic absorption spectroscopy; X-ray diffraction. Introduction to mass spectroscopy Radioisotopic techniques: Introduction to radioisotopes, detection, measurement and uses of radioisotopes, counting efficiency and autoradiography, biotechnological applications

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:
Text:
- Principles of Physical Biochemistry, K.E. Van Holde, Prentice Hall.
- Essentials of Biophysics, P. Narayanan, New Age International PublishersReferences:
- Advanced Instrumentation, Data Interpretation, and Control of Biotechnological Processes, J.F. Van Impe, Kluwer Academic
- Crystal Structure Analysis, J.P. Glusker and K.N. Trueblood, Oxford University Press
- Crystallography made Crystal Clear, G. Rhodes, Academic Press
- Modern Spectroscopy, J.M. Hollas, John Wiley and Son Ltd.
- NMR Spectroscopy: Basic Principles, Concepts and Applications in Chemistry, H. Gunther, John Wi

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SEMESTER-IV

STEM CELL TECHNOLOGY BASICS

Course Code: DSCT2451 **Credit Units: 04**

Course Objective: The course is designed to give a broad overview of mammalian stem cells, different types of stem cells and their properties. The topics will cover the basic biology as well as bioengineering and application of these stem cells to potential treatments of human diseases.

Course Contents:

Module I:

Introduction to stem cells: Definition, properties, proliferation and, culture of stem cells, edical applications of stem cells, ethical and legal issues in use of stem cells.

Module II:

Stem Cell biology and therapy: types of stem cells, embryonic stem cell, Adult stem cell, Embryonic Stem Cells, culture and the potential benefits of stem cell technology

Module III:

Gene Therapy: Introduction, history and evolution of Gene therapy, optimal disease targets. Genetic perspectives for Gene Therapy, Gene Delivery methods: Viral vectors and Non-viral Vectors. Failures and successes of gene therapy. Future prospects of gene therapy.

Module IV:

Applications of stem cells in cell replacement and gene therapy approaches. Stem cells in drug discovery.

Module V:

Regulatory and ethical considerations of stem cell and gene therapy. Assessing human stem cell safety, use of genetically modified stem cells in experimental gene therapies.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

***Text*:**

- Stem Cell Biology, Daniel Marshak, Richard L. Gardener and David Gottlieb, Cold Spring Harbour Laboratory Press
- Stem cell biology and gene therapy, Booth C., Cell Biology International, Academic Press
- Stem Cell and Gene-Based Therapy: Frontiers in Regenerative Medicine, *Alexander Battler, Jonathan Leo,* Springer.

***References*:**

- Stem Cell Biology and Gene Therapy. Quesenberry PJ, Stein GS, eds. (£65.00.) Wiley, 1998.
- Progress in gene therapy, Volume 2,Pioneering stem cell/gene therapy trials, Roger Bertolotti, Keiya Ozawa and H. Kirk Hammond, VSP international science publishers
- Stem Cells Handbook: Stewart Sell, Humana Press; Totowa NJ, USA; Oct. 2003, Human Embryonic Stem Cells: The Practical Handbook by Stephen Sullivan and Chad A Cowan

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HUMAN PLURIPOTENT STEM CELL BASED THERAPEUTICS

Course Code: DSCT2401 **Credit Units: 04**

Course Objective: The objective of this paper is to provide students greater understanding of methodologies for generation of different cell lineages from pluripotent stem cells, and their phenotypic and functional characterization.

Course Contents:

Module-I:
History of human pluripotent stem cell development: isolation of human embryonic stem cells, generation of human induced pluripotent stem cells (iPSC).

Module-II:
Methodologies for pluripotent stem cell culture, characterization of pluripotency. Methods for differentiation of PSC into different lineages, e.g. RBCs, platelets, lung cells, heart cells, neuronal cells, and their functional characterization.

Module-III:
Methods to engineer pluripotent stem cells for treatment of genetically impaired conditions/diseases: Viral and non-viral vector-mediated gene delivery, homologous gene recombination-mediated genome engineering, CRISPR/TALEN-mediated gene editing.

Module-IV:
Stem cell-based organogenesis, xeno-free culture systems or stem cell-based therapeutics, Immunogenicity of PSC, 3D-culture systems and bioreactors for stem cell culture and differentiation.

Module-V:
Ethical, regulatory and safety issues affective pluripotent stem cell-based cell replacement therapies. Technological challenges towards development of pluripotent stem cell-based cell replacement therapies. Methodologies and recent advances in development of stem cell-based clinical trials

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- Stem Cell Biology, Daniel Marshak, Richard L. Gardener and David Gottlieb, Cold Spring Harbour Laboratory Press
- Stem cell biology and gene therapy, Booth C., Cell Biology International, Academic Press Stem Cell and Gene-Based Therapy: Frontiers in Regenerative Medicine, *Alexander Battler, Jonathan Leo*, Springer.

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GOOD LABORATORY PRACTICES

Course Code: SSCT2401 **Credit Units: 03**

Course Objectives: The objective of the course is to teach the students safety handling and regulation laboratory facility, how to keep the record, analyze laboratory data with accuracy. Also, to educate them about the ways how to minimize the errors related with handling of laboratory accessories and equipment's, and to learn the standard operating procedures (SOPs).

Course Contents:

Module-I: Introduction to GLP
Introduction to GLP, History, Scope, Fundamental points of GLP (Resources Characterization, Rules, Results, Quality assurance)

Module-II: Laboratory rules and Protocols
General Rules/Protocols for Lab Safety measures, Precaution and Safety in handling of chemicals, Laboratory tools, Glassware and instruments. Internal and External Audit,

Module-III: Laboratory hierarchy and SOP Levels of Laboratories
Log Book Maintenance, Basic SOPs for instrument handling and Maintenance, calibration of Instruments: PH meter, colorimeter, spectrophotometer, water bath, Distillation assembly, Burette, and Pipette etc.

Module-IV: Record Keeping and Interpretation
Keeping data records, its analysis by using statistical and mathematical tools. Result analysis and its interpretation. Use of Microsoft word, Excel for data entry, calculation and graphical representation, and use of internet and emails

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text Book and References:
1. Handbook Good Laboratory Practices-World health organization (WHO)
2. Life science protocol manual (2018)-DBT star college scheme
3. Guidelines for good laboratory practices-Indian council of medical research, New Delhi (2008)

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SEMESTER-V

FUNDAMENTALS OF IMMUNOLOGY

Course Code: DSCT2551 **Credit Units: 03**

Course Objective: The objective of this paper is to provide students greater understanding of different approaches for T cell-based and antibody-based cancer immunotherapy approaches.

Module-I: Immune Response: an overview, components of mammalian immune system, molecular structure of Immunoglobulins or Antibodies, Humoral & Cellular immune responses, T-lymphocytes & immune response (cytotoxic T-cell, helper T-cell, suppressor T-cells), T-cell receptors, genome rearrangements during B-lymphocyte differentiation, Antibody affinity maturation class switching, assembly of T-cell receptor genes by somatic recombination.

Module-II: Regulation of immunoglobulin gene expression: clonal selection theory, allotypes & idiotypes, allelic exclusion, immunologic memory, heavy chain gene transcription, genetic basis of antibody diversity, hypotheses (germ line & somatic mutation), antibody diversity, alternate pathways of transcript splicing, variable joining sites & somatic mutation, role of antibody (alone, in complement activation & with effector cells), hybridoma technology and monoclonal antibodies.

Module-III. Major Histocompatibility complexes, and Immunity to infections, and Autoimmune diseases

Class I & class II MHC antigens, antigen processing. – immunity to different organisms, pathogen defense strategies, avoidance of recognition, inactivation of host-immune effector mechanisms. autoimmunity & auto-immune diseases, factors contributing development of auto-immune diseases, mechanism of development, breakdown of self-tolerance, rejection of transplants, molecular mimicry, diagnosis & treatment of auto-immune diseases, replacement therapy, suppression of auto- immune processes, nature of auto-antigens, immunodeficiency, AIDS.

Module-IV. Vaccines & Vaccination, and Immuno-techniques : Adjuvants, cytokines, DNA vaccines, recombinant vaccines, bacterial vaccines, viral vaccines, vaccines to other infectious agents, passive & active immunization. Blood grouping, Antigen-Antibody reactions : agglutination, precipitation, immuno-electrophoresis, Coomb's test, ELISA, RIA.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

***Text*:**

1. Abbas AK, Lichtman AH, Pillai S. (2007). Cellular and Molecular Immunology. 6 th edition Saunders Publication, Philadelphia.
2. Delves P, Martin S, Burton D, Roitt IM. (2006). Roitt's Essential Immunology. 11th edition Wiley-Blackwell Scientific Publication, Oxford.
3. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.
4. Murphy K, Travers P, Walport M. (2008). Janeway's Immunobiology. 7th edition Garland Science Publishers, New York.
5. Peakman M, and Vergani D. (2009). Basic and Clinical Immunology. 2nd edition Churchill Livingstone Publishers, Edinberg.
6. Richard C and Geiffrey S. (2009). Immunology. 6th edition. Wiley Blackwell Publication.

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FUNDAMENTALS OF IMMUNOLOGY LAB

Course Code: DSCT2552 **Credit Units: 01**

Course Objective: The objective of this lab course is to provide students greater understanding of different tools and techniques that are frequently used in diseases diagnosis.

Course Content

Module I

Blood film preparation and identification of cells. Identification of blood groups

Module II

Isolation of serum. Purification of lgG through affinity chromatography

Module III

Immunohistochemistry. Lymphoid organs and their microscopic organization

Module IV

WIDAL Test

Module V

Radial Immuno-diffusion Test. Ouchterlony Double diffusion Test. DOT, Sandwich ELISA.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid-term Viva**	**Attendance**	**Major Experiment**	**Minor Exp/Spotting**	**Practical record**	**Viva**
15	10	05	35	15	10	10

Text & References:

***Text*:**

- Diagnostic and Therapeutic Antibodies (Methods in Molecular Medicine by Andrew J.T. George (Editor), Catherine E. Urch (Editor) Publisher: Humana Press; edition (August 15, 2000) ISBN-10: 0896037983
- Molecular Diagnosis of Infectious Diseases (Methods in Molecular Medicine) by Jochen Decker, U. Reischl Amazon Sales Rank: #287831 in Books
- Human Molecular Genetics by T. Strachan, Andrew Read Amazon Sales Rank
- Principles of Biostatistics by Marcello Pagano , Kimberlee Gauvreau
- Essentials of Epidemiology in Public Health, Second Edition by Ann Aschengrau, George R., III Seage
- Designing Clinical Research: An Epidemiologic Approach, by Stephen B. Hulley, Steven R. Cummings
- Journal articles and reviews

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CANCER BIOLOGY & CANCER THERAPEUTICS

Course Code: DSCT2501 **Credit Units: 04**

Course Objective: Course Objective: The objective of this paper is to provide students greater understanding of different approaches for T cell-based and antibody-based cancer immunotherapy approaches.

Course Content

Module I

Biology and mechanism of cancer development. Cancer seed and soil theory, Chemotherapy, radiation therapy, immunotherapy of cancer. Hallmarks of cancer

Module II History of Vaccine

Development, Definition of Vaccine, Evolution of Vaccines, Process development for vaccines, Manufacturing of vaccines, Various aspects of vaccines, process development and manufacturing.

Module III Clinical development of vaccines

Clinical development of vaccines, Clinical end-point: Evolution of vaccines, General specifications and pharmaceuticals release criteria for the existing vaccines, Cold chain management of vaccines, Current vaccine research: Immune checkpoint strategies in cancer immunotherapy.

Module IV Engineered anti-tumor immunity

T cell receptor (TCR) and chimeric antigen receptor technology development and TCR/CAR-engineered anti-tumor immunity.

Module V Immunotherapy and ADC

Antibody-based cancer immunotherapy. Antibodies as drug carriers

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

***Text*:**

- Diagnostic and Therapeutic Antibodies (Methods in Molecular Medicine by Andrew J.T. George (Editor), Catherine E. Urch (Editor) Publisher: Humana Press; edition (August 15, 2000) ISBN-10: 0896037983
- Molecular Diagnosis of Infectious Diseases (Methods in Molecular Medicine) by Jochen Decker, U. Reischl Amazon Sales Rank: #287831 in Books
- Human Molecular Genetics by T. Strachan, Andrew Read Amazon Sales Rank
- Principles of Biostatistics by Marcello Pagano , Kimberlee Gauvreau
- Essentials of Epidemiology in Public Health, Second Edition by Ann Aschengrau, George R., III Seage
- Designing Clinical Research: An Epidemiologic Approach, by Stephen B. Hulley, Steven R. Cummings
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TRANSLATIONAL MEDICINE

Course Code: DSCT2502 **Credit Units: 04**

Course Objective: This course is for students to gain an insight into clinical research and clinical application, for clinical researchers to gain insight into the basic science required to reach clinical trials, and for all researchers to gain insight into the importance of industry, regulation, marketing, and acceptance into medical practice, which constitutes the endpoint of translational research.

Course content

Module I: An introduction to Translational Medicine

Definition of translational medicine, it's scope and significance in biomedical sciences, Normal versus diseases stag in the context of human being, Processes and mechanism of the normal vs. pathological lifespan trajectory of humans and animal models at the molecular, cellular, organ system, organismal, group and social levels. Analysis of homeostatic processes throughout life's stages and the genetic, environmental, behavioral and social drivers and interactions that lead to pathological outcomes.

Module II Envisioning a path between bench and bedside.

Usage of small molecules, biologics, devices, and diagnostics for treatment of human conditions or diseases, different model systems are used to approximate molecular, cellular, or physiologic aspects of the human environment (In vitro Assays for Drug Discovery and Development: Towards better clinical Predictability including biochemical or cellular models, animal models, etc.) and the advantages/limitations of each approach, benchmark findings need to be obtained before preclinical studies can be moved into human trials (i.e., standards underlying preclinical evaluation, regulatory requirements)

Module III Role of Pharmacokinetics and pharmacodynamics in Translational Research

Principles of drug absorption, drug metabolism and distribution - intestinal absorption, metabolic stability, drug-drug interactions, plasma protein binding assays, metabolite profile studies, Principles of toxicology, Experimental design for preclinical and clinical PK/PD/TK studies, Selection of animal model; Regulatory guidelines for preclinical PK/ PD/TK studies

Module IV Clinical trials Design and Goals

Requirement and goal of Clinical trials, their types, and significance in medical sciences, clinical trial design and implementation, Clinical trial materials (Documentation, Investigational drugs, logistical materials), Adverse event and serious adverse event reporting in clinical trials; emphasis on SUSARs, managing and reporting of events. clinical Research regulations in India – CDSCO guidelines, ICMR guidelines, Clinical trial application requirements in India- IND, ANDA, AADA and NDA. USFDA regulations to conduct drug studies,

Module V Translational Medicine, and Clinical Translational research

What is Clinical and Translational Research? Understanding the Stages of CTR, and role of CTR in precision Medicine, Multi-dimensional data in CTR (bioinformatics), Outcomes and Comparative Effectiveness Research, formulating CTR questions and hypotheses, and pursuing Novelty to Accelerate Innovation in Translational Research

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

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Text & References:

***Text*:**

- Liu R, Wang X, Chen GY, Dalerba P, Gurney A, Hoey T, Sherlock G, Lewicki J, Shedden K, Clarke MF. The prognostic role of a gene signature from tumorigenic breast-cancer cells. N Engl J Med. 2007 Jan 18;356(3):217-26.
- Slamon DJ1, Leyland-Jones B, Shak S, Fuchs H, Paton V, Bajamonde A, Fleming T, Eiermann W, Wolter J, Pegram M, Baselga J, Norton L. Use of chemotherapy plus a monoclonal antibody against HER2 for metastatic breast cancer that overexpresses HER2. N Engl J Med. 2001 Mar 15;344(11):783-92.
  Pritchard KI, Shepherd LE, O'Malley FP, Andrulis IL, Tu D, Bramwell VH, Levine MN; National Cancer Institute of Canada Clinical Trials Group. HER2 and responsiveness of breast cancer to adjuvant chemotherapy. N Engl J Med. 2006 May 18;354(20):2103-11.
- Stark A, Kucera G, Lu M, Claud S, Griggs J. Influence of health insurance status on inclusion of HER-2/neu testing in the diagnostic workup of breast cancer patients. Int J Qual Health Care. 2004 Dec;16(6):517-21.
- Krogsgaard-Larsen et al. Textbook of Drug Design and Discovery. 4th Edition. CRC Press.
- Kuhse, H. (2010). Bioethics: an Anthology. Malden, MA: Blackwell.
- Nally, J. D. (2006) GMP for Pharmaceuticals. 6th edition. CRC Press
- Brody, T. (2016) Clinical Trials: Study Design, Endpoints and Biomarkers, Drug Safety, and FDA and ICH Guidelines. Academic Press.

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HUMAN ANATOMY AND PHYSIOLOGY

Course Code: DSCT2503 **Credit Units: 04**

Course Objective: Students will learn about the basic organization of adult somatic cells, human anatomy and normal physiology, basic principles and mechanisms that dictate maintenance of pluripotency in pluripotent stem cells and their differentiation into adult stem cells, somatic cells, tissues and organs.

Course Contents:

Module-I:

Cell, cell organelles and their organization, cell proliferation and cell death mechanisms in somatic cells and stem cells. Cell division mechanisms in somatic cells and pluripotent stem cells.

Module-II:

Introduction to epigenetics and its role in maintenance of pluripotency and differentiation of pluripotent stem cells into different somatic cell lineages.

Module-III:

Basics of human anatomy & physiology and role of pluripotent stem cells and adult stem cells in maintenance of normal human physiology.

Module-IV:

Effect of breach in normal cellular physiology and hoemostasis on human development. Role of healthy diet in epigenetics and epigenetic reprogramming. Metabolic reprogramming in normal physiology and disease development.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

***Text*:**

- Stem Cell Biology, Daniel Marshak, Richard L. Gardener and David Gottlieb, Cold Spring Harbour

Laboratory Press

- Stem cell biology and gene therapy, Booth C., Cell Biology International, Academic Press
- Stem Cell and Gene-Based Therapy: Frontiers in Regenerative Medicine, *Alexander Battler, Jonathan Leo,* Springer.

***References*:**

- Stem Cell Biology and Gene Therapy. Quesenberry PJ, Stein GS, eds. (£65.00.) Wiley, 1998.
- Progress in gene therapy, Volume 2,Pioneering stem cell/gene therapy trials, Roger Bertolotti, Keiya Ozawa and H. Kirk Hammond, VSP international science publishers
- Stem Cells Handbook: Stewart Sell, Humana Press; Totowa NJ, USA; Oct. 2003,
- Human Embryonic Stem Cells: The Practical Handbook by Stephen Sullivan and Chad A Cowan

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MOLECULAR DIAGNOSTICS IN HEALTH CARE

Course Code: DSCT2504 **Credit Units: 04**

Course Objective: The objective of this paper is to provide in depth knowledge of different told and techniques used for molecular diagnosis of communicable as well as non-communicable diseases.

Course Contents

Module I: Enzyme Immunoassays

Comparison of enzymes available for enzyme immunoassays, conjugation of enzymes. Solid phases used in enzyme immunoassays. Homogeneous and heterogeneous enzyme immunoassays. Enzyme immunoassays after immuno blotting. Enzyme immuno histochemical techniques. Use of polyclonal or monoclonal antibodies in enzymes immuno assays. Applications of enzyme immunoassays in diagnostic microbiology

Module II: Molecular methods in clinical microbiology

Applications of PCR, RFLP, Nuclear hybridization methods, Single nucleotide polymorphism and plasmid finger printing in clinical microbiology Laboratory tests in chemotherapy: Susceptibility tests: Micro-dilution and macro-dilution broth procedures. Susceptibility tests: Diffusion test procedures. Susceptibility tests: Tests for bactericidal activity. Automated procedures for antimicrobial susceptibility tests.

Module III. Automation in microbial diagnosis, rapid diagnostic approach including technical purification and standardization of antigen and specific antibodies. Concepts and methods in idiotypes. Antiidiotypes and molecular mimicry and receptors. Epitope design and applications. Immunodiagnostic tests. Immuno florescence. Radioimmunoassay.

Module IV: ELISA, Western blot, GLC, HPLC, Electron microscopy, flowcytometry and cell sorting, Transgenic animals

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

***Text*:**

Text & References:

- Diagnostic and Therapeutic Antibodies (Methods in Molecular Medicine by Andrew J.T. George (Editor), Catherine E. Urch (Editor) Publisher: Humana Press; edition (August 15, 2000) ISBN-10: 0896037983
- Molecular Diagnosis of Infectious Diseases (Methods in Molecular Medicine) by Jochen Decker, U. Reischl Amazon Sales Rank: #287831 in Books
- Practical Biochemistry, Principles and Techniques, Keith Wilson and John Walker
- Bioinstrumentation, Webster
- Advanced Instrumentation, Data Interpretation, and Control of Biotechnological Processes, J.F. Van Impe,Kluwer Academic
- Ananthanarayan R and Paniker CKJ. (2005). Textbook of Microbiology. 7th edition (edited by Paniker CKJ). University Press Publication.
- Brooks GF, Carroll KC, Butel JS and Morse SA. (2007). Jawetz, Melnick and Adelberg's Medical Microbiology. 24th edition. McGraw Hill Publication.
- Goering R, Dockrell H, Zuckerman M and Wakelin D. (2007). Mims' Medical Microbiology. 4th edition. Elsevier.
- Joklik WK, Willett HP and Amos DB (1995). Zinsser Microbiology. 19th edition. AppletonCentuary-Crofts publication.

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- Willey JM, Sherwood LM, and Woolverton CJ. (2008). Prescott, Harley and Klein's Microbiology. 7th edition. McGraw Hill Higher Education.
- Microscopic Techniques in Biotechnology, Michael Hoppert

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SIP/INTERNSHIP/PROJECT/DISSERTATION/FIELD VISIT

Course Code: NSCT2537 **Credit Units: 05**

GUIDELINES FOR PROJECT FILE

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation. Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student. Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage. The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

Methodology

The students will be sent to various industries and institutes where they will undergo short term training. After the completion of the training the students will be required to submit project report which shall then be evaluated by two internal examiners. The students will then have to appear for a Viva Voce examination to be conducted by an external evaluator at the end of the semester.

In general, the File should be comprehensive and include:
A short account of the activities that were undertaken as part of the project;
A statement about the extent to which the project has achieved its stated goals.
A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project; Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project; Any problems that have arisen that may be useful to document for future reference.

Report Layout

The report should contain the following components:

Title or Cover Page

The title page should contain the following information: Project Title; Student's Name; Course; Year; Supervisor's Name.

Acknowledgements (optional)

Acknowledgment to any advisory or financial assistance received in the course of work may be given.

Abstract

A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project

Table of Contents

Titles and subtitles are to correspond exactly with those in the text. Introduction
Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

Materials and Methods

This section should aim at experimental designs, materials used. Methodology should be mentioned in details including modifications if any.

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Results and Discussion
Present results, discuss and compare these with those from other workers, etc. In writing these section, emphasis should be given on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow. Note that in writing the various sections, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary never write in "point" form.

Conclusion
A conclusion should be the final section in which the outcome of the work is mentioned briefly.

Future prospects

Appendices
The Appendix contains material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

References / Bibliography
This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.
Examples
For research article
Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichia coli* O157: H7. *Clin Microbiol Infec*, **8** (suppl 1): 116–117.

For book
Kowalski, M. (1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67
A
SSESSMENT OF THE PROJECT FILE
Essentially, marking will be based on the following criteria: the quality of the report, the technical merit of the project and the project execution. Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project. Project execution is concerned with assessing how much work has been put in.

The File should fulfill the following *assessment objectives:*
Range of Research Methods used to obtain information Execution of Research
Data Analysis
Analyse Quantitative/ Qualitative information Control Quality
Draw Conclusions

Examination Scheme:
Project Report 50
Viva Voce 50
Total 100

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SEMESTER-VI

STEM CELL AND REGENERATIVE MEDICINE

Course Code: DSCT2651 **Credit Units: 04**

Course Objective: The course will cover topics in the basic biology of embryonic, fetal and adult stem cells, the tools, methods, and experimental protocols needed to study and characterize stem cells as well as the applications of stem cells to treat specific human diseases.

Course Contents

Module I: Basic and Translational research of stem cells

Overview of basic and translational research of stem cells, origin of embryonic stem cells, properties of embryonic stem cells, embryonic stem cell self-renewal pathways, and Application of embryonic stem cells

Module-II: Derivation and modification in Embryonic Stem Cells

Derivation and maintenance of human embryonic stem cells, Human embryonic stem cell self-renewal pathways, Genetic modification of human embryonic stem cells. Different techniques including Crispr/Cas9, TALENs, and ZFN for modification in stem cells.

Module II: Generation and characterization of Pluripotent Stem Cells

Generation of pluripotent stem cells, characterization of pluripotent stem cells Induced pluripotency-the underlying mechanism, Generation of pluripotent stem cells from other species, Origin of primordial germ cells and embryonic germ cells, properties of primordial germ cells and embryonic germ cells

Module III. Primordial and embryonic germ cells:

Origin of primordial germ cells and embryonic germ cells, properties of primordial germ cells and embryonic germ cells, derivation and maintenance of embryonic germ cells, amniotic fluid and amniocentesis, isolation and characterization of amniotic fluid derived pluripotent cells

Module IV: **Stem Cell Based Therapy**

Cord blood transplantation, characteristics of cord blood stem cells, sources and properties of retinal stem cells, The bulge as a residence of hair follicle stem cells, and cell signaling in hair follicle stem cells, Sources of skeletal muscle stem cells, Intrinsic rand extrinsic regulation of skeletal muscle stem cells, Organization of adult liver and pancreas stem cells, location and isolation of mesenchymal stem cells, applications of Mesenchymal stem cells in tissue-engineering, Therapeutic potential of neural stem cells Cell replacement using neural stem cells, Preclinical studies using stem cells to treat heart disease, Use of stem cell to treat diabetes: β-cell replacement therapy

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

***Text*:**

- Essentials of Stem Cell Biology 3rd Edition - August 31, 2013 Editors: Robert Lanza, Anthony Atala Hardback ISBN: 9780124095038 9 7 8 - 0 - 1 2 - 4 0 9 5 0 3 - 8 eBook ISBN: 9780124104273
- Li M, Suzuki K, Kim NY, Liu GH, Izpisua Belmonte JC. A cut above the rest: targeted genome editing technologies in human pluripotent stem cells. J Biol Chem. 2014 Feb 21;289(8):4594-9. doi: 10.1074/jbc.R113.488247. Epub 2013 Dec 20. PMID: 24362028; PMCID: PMC3931021.

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GENOMICS AND PROTEOMICS

Course Code: DSCT2601 **Credit Units: 04**

Course Objective:

- The course involves a basic understanding of computer and bioinformatics tools and skills in the field of biology.
- To acquaint the student with genome organization, gene identification, expression and applications of genomics analysis. Also about proteomics, analysis and its applications.

Course Content:

Module-I

Introduction to Genomics, DNA sequencing methods – manual & automated: Maxam & Gilbert and Sangers method. Pyrosequencing, Genome Sequencing: Shotgun & Hierarchical (clone contig) methods, Computer tools for sequencing projects: Genome sequence assembly software.

Module-II: Managing and Distributing Genome Data

Web based servers and softwares for genome analysis: ENSEMBL, VISTA, UCSC Genome Browser, NCBI genome. Selected Model Organisms' Genomes and Databases.

Module- III - Introduction to protein structure

Chemical properties of proteins. Physical interactions that determine the property of proteins. Short-range interactions, electrostatic forces, van der waal interactions, hydrogen bonds, Hydrophobic interactions. Determination of sizes (Sedimentation analysis, gel filteration, SDS-PAGE); Native PAGE, Determination of covalent structures – Edman degradation.

Module-IV: Introduction to Proteomics

Analysis of proteomes. 2D-PAGE. Sample preparation, solubilization, reduction, resolution. Reproducibility of 2D-PAGE. Mass spectrometry based methods for protein identification. Quantitative proteomics techniques (iTRAQ, TMT, ICAT, and SILAC), De novo sequencing using mass spectrometric data.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text Book and references:

- Genes IX by Benjamin Lewin, Johns and Bartlett Publisher, 2006.
- Modern Biotechnology, 2nd Edition, S.B. Primrose, Blackwell Publishing, 1987.
- Molecular Biotechnology: Principles and Applications of Recombinant DNA, 4th Edition, B.R. Glick, J.J. Pasternak and C.L. Patten, 2010.
- Molecular Cloning: A Laboratory Manual (3rd Edition) Sambrook and Russell Vol. I to III, 1989.
- Principles of Gene Manipulation 6th Edition, S.B.Primrose, R.M.Twyman and R.W. Old. Blackwell Science, 2001.
- Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics. V Edition. John Wiley and Sons Inc.
- Klug, W.S., Cummings, M.R., Spencer, C.A. (2009). Concepts of Genetics. IX Edition. Benjamin Cummings.
- Russell, P. J. (2009). iGenetics- A Molecular Approach. III Edition. Benjamin Cummings.
- Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington. 6. Pevsner, J. (2009). Bioinformatics and Functional Genomics. II Edition. John Wiley & Sons.

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PRECISION AND PERSONALIZED MEDICINE

Course Code: DSCT2602 **Credit Units: 04**

Course Objectives

- Provide overview of a mechanistic understanding of the aetiology and pathogenesis of disease with the ability to detect (diagnose in the clinical laboratory) specific causal factors.
- Provide an overview of the different types of molecular biomarkers (macromolecules and/or metabolites) and how they are collected for diagnostics.
- Provide an overview of the technologies available to measure these markers, *eg* so called next generation sequencing (NGS) technologies as well as techniques used to analyze and interpret large, multidimensional data sets using biomedical informatics and systems biology techniques.
- Highlight how precision molecular diagnostics (also known as companion diagnostics) enables the prediction of efficacies of targeted therapeutics and are mandatory prerequisites for cost-effective and safe use of individual drugs and combination therapies in the clinical care setting.

Course Contents

Module-I

Molecular Diagnostics: central dogma of biology; Gel electrophoresis -sample preparation, DNA probes); key Genomic Technologies (PCR, Microarray, RNAseq); *In situ* hybridization (ISH); DNA sequencing; germline and somatic genomic testing in cancer, Case studies in genomics and assay trouble-shooting; Proteomics: iTRAQ, SILAC, and TMT

Module-II

Mechanistic Understanding of Aetiology: A mechanistic understanding of the aetiology and pathogenesis of disease. Monogenic versus complex disease, and genomic medicine, The ability to detect (diagnose in the clinical laboratory) specific causal factors. The ability to specifically treat the underlying cause(s).

Module-III

Molecular Biomarkers: Different types of molecular biomarkers (macromolecules and/or metabolites) and how they are collected for diagnostics. Technologies available to measure these markers, eg so called next generation sequencing (NGS) technologies as well as techniques used to analyse and interpret large, multidimensional data sets using biomedical informatics and systems biology techniques.

Module-IV. Precision Molecular Diagnostics

Precision molecular diagnostics (also known as companion diagnostics): The prediction of efficacies of targeted therapeutics and are mandatory prerequisites for cost effective and safe use of individual drugs and combination therapies in the clinical care setting. Individual gene-drug interaction case scenario: cardiology - CYP2C19-clopidogrel, CYP2C9/VKORC1-warfarin, SLCO1B1-simvastatin, pain management: CYP2D6-opiates, CYCP2C9-NSAIDs Gastroenterology: TPMT-thiopurines; CYP2C19-PPIs, CYP2D6-ondansetron, transplantation: CYP3A5-tacrolimus, CYP2C19-voriconazole, Psychiatry: CYP2D6/ CYP2C19-TCAs and SSRIs, adverse drug reactions/hypersensitivity: abacavir, allopurinol, carbamazepine, phenytoin

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

- Suggested Reading: Lela Buckingham: 2012, Molecular Diagnostics: Fundamentals, Methods and Clinical Applications, 2, 978-0-8036-26
- Genomic and Precision Medicine, 3rd Edition, Geoffrey Ginsburg and Huntington Willard, 2016

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- The Language of Life: DNA and the Revolution in Personalized Medicine, Francis S. Collins, 2010

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ETHICS AND INTELLECTUAL PROPERTY RIGHTS

Course Code: DSCT2603 **Credit Units: 04**

Course Objective The aim of this course is to develop the understanding of relevance, business Impact and protection of Intellectual Property along with the types of Intellectual Property Rights: Patents, Trademarks, Copyrights, Industrial Designs, Geographical Indications and International Conventions, Biosafety and Bioethics

Course Content:

Module-I: Introduction to Indian Patent Law.

World Trade Organization and its related intellectual property provisions. Intellectual/Industrial property and its legal protection in research, design and development. Patenting in Biotechnology, economic, ethical and depository considerations.

Module-II

Entrepreneurship: Selection of a product, line, design and development processes, economics on material and energy requirement, stock the product and release the same for making etc. The basic regulations of excise: Demand for a given product, feasibility of its production under given constraints of raw material, energy input, financial situations export potential etc.

Module-III

Bioethics – Necessity of Bioethics, different paradigms of Bioethics – National & International. Ethical issues against the molecular technologies.

Module-IV

Biosafety– Introduction to biosafety and health hazards concerning biotechnology. Introduction to the concept of containment level and Good Laboratory Practices (GLP) and Good Manufacturing Practices (GMP).

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text Book and References

1. Entrepreneurship: New Venture Creation : David H. Holt
2. Patterns of Entrepreneurship : Jack M. Kaplan
3. Entrepreneurship and Small Business Management: C.B. Gupta, S.S. Khanka, Sultan Chand & Sons.
4. Sateesh MK (2010) Bioethics and Biosafety, I. K. International Pvt Ltd.
5. Sree Krishna V (2007) Bioethics and Biosafety in Biotechnology, New age international publishers

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Semester-VII

PHARMACOGENOMICS

Course Code: DSCT2701 **Credit Units: 04**

Module-I: Introduction to Pharmacogenomics
Introduction to pharmacogenomics, pharmacodynamics, pharmacokinetics, toxicogenomics and ADME properties. Process of drug development-clinical trials phase I, II, III and IV. Route of drug administration. Nature of cell membrane, physiological factors related to drug absorption and drug distribution.

Module-II: Drug Metabolism and Ayugenomics
Biotransformation (Metabolism) of drugs and related organic compounds – General pathways, sites of drug biotransformation. Oxidative reactions, reductive reactions, hydrolytic reactions, conjugation reactions, factors affecting drug metabolism and variability in drug response. Ayugenomics (integration of Ayurveda & genomics). Microsatellite in studying genetic variation. Microarray in herbal drug research, Pharmacodynamics, Pharmacogenomics and Pharmacognosy.

Module-III. Pharmacogenomics in the Disease
Pharmacogenomics in the treatment of cancer, neurodegenerative diseases, cardiovascular diseases. Pharmacogenomics in pharmaceutical industry, Ethical issues related to Pharmacogenomics, Pharmacogenomics and ethanopharmacology

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text book and References:
Text Book(s)
1 B. Patwaradhan.2007. Drug discovery and development. New India publishing agency, New Delhi.
2 Andrew R. Leach Molecular Modeling: Principles and Applications.
3 L. Shargel and A. B. C. Yu.1999. Applied Biopharmaceutics and Pharmacology. McGrawHill, New York.
4 Jin Xiong. Essential Bioinformatics. Cambridge University Press.

Reference Books
1. J. H. Block and J. M. Beale Jr. 2004. Organic medicinal and Pharmaceutical chemistry. Lippincott Williams and Wilkins, New York.
2 Rothstein, Pharmacogenomics: Social, ethical and clinical dimensions, Wiley Less.
3 D. M. Brown. 2004. Drug delivery systems in Cancer therapy. Humana press, Totowa, New Jersey.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1. https://dth.ac.in/medical/courses/pharmacology/3/13/index.php
2. https://dth.ac.in/medical/courses/pharmacology/3/4/index.php

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APPLICATION OF PLANT BIOTECHNOLOGY IN MOLECULAR MEDICINE

Course Code: DSCT2702 **Credit Units: 04**

Course Objective:

- The application of Plant Biotechnology covers major areas related to commercial applications.
- Regeneration of plants through *in vitro* techniques offers a practical strategy for micro propagation. Importance will also be given to areas like *in vitro* fertilization, animal cell and tissue culture, hormone
- vaccine and important enzyme production through animal biotechnology.

Course Contents:

Module I

Historical perspective of plant tissue culture, tissue culture lab and organization Sterilisation techniques Types of nutrient media and media composition, plant regeneration pathways Role of phytohormones, Cell culture techniques- cell, tissue, organ cultures, callus culture, suspension culture Culture techniques Callus culture, cell culture and protoplast cultures.

Module II

Organogenesis and somatic embryogenesis. Applications of plant tissue and cell culture. Micropropagation, pathogen free plants. production haploids, Somaclonal variation.preservation of germplasm

Module III

Genetic engineering in plants, - transformation vectors, Gene transfer techniques-vector meditated and vector less gene transfer. Transgenic plants transgene integration and expression

Module IV: Molecular Pharming

Transgenic crop with new traits-herbicide tolerance, insect and disease resistance, Therapeutic proteins and compounds, Edible vaccines, production of secondary, metabolites via tissue culture Bioethics of plant genetic engineering, Plantibodies, Edible Vaccines, and edible interferons

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- An Introduction to Plant Tissue Culture, M.K. Razdan, Oxford and IBH Publishing
- Experiments in Plant Tissue Culture, J.H. Dodds and L.K. Roberts, Cambridge University Press
- Plant Biotechnology and Transgenic Plants, K.M.O. Caldenty, W.H. Barz and H.L. Wills, Marcel Dekker
- Plant Biotechnology, J. Hammond, P.McGarvy and V. Yusibov, Springer Verlag.
- Plant Cell & Tissue Culture for the Production of Food Ingredients, T-J Fu, G. Singh and W.R. Curtis, Kluwer Adacemic/Plenum Press
- Plant Tissue Culture: Theory & Practice, S.S. Bhojwani and M.K. Razdan, Elsevier Health Sciences

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MOLECULAR MODELLING & DRUG DEVELOPMENT

Course Code: DSCT2703 **Credit Units: 04**

Course Objective:
The above course will be aimed to identify and design drugs that could be potentially useful in the identification of the candidate drugs, which have efficacy in cell culture or animal models, and thus the most effective compounds could be employed based on the above results for being moved through preclinical studies to clinical trials.

Course Contents:

Module I: Drug targets classification
DNA, RNA, post-translational, processing enzymes, metabolic enzymes involved in nucleic acid synthesis, G-protein coupled receptors (monomeric transmembrane proteins), small molecule receptors, neuropeptide receptors, ion channels (monomeric multi-transmembrane) proteins, ligand-gated ion channels (oligomeric transmembrane proteins), transporters (multi-transmembrane proteins).

Module II: Target discovery and validation strategies
Genomics (new target discovery), biological activity directed and other types of screening, natural products, combinatorial chemistry; General overview of validation techniques.Drug Discovery: Drug design-Ligand based, Structure based, Active site identification, rational drug discovery High throughput screening, Structure Activity Relationship (SAR), Quantitative Structure Activity Relationship (QSAR), Computer assisted drug designing (CADD).

Module III: Structure-based design
Drug design to discovery and development, drug metabolism, toxicity and pharmacokinetics, toxicology considerations, problems and drawbacks on drug discovery and development, 'de novo' design methodologies : indirect drug design, pharmacophore development and receptor mapping, combinatorial libraries and new strategies and recent technologies in drug design

Module IV: Basic concepts of Drug Delivery
Introductory lecture, Concepts of Bio availability, Process of drug absorption, Pharmacokinetic processes, Timing for optimal therapy, Drug delivery considerations for the new biotherapeutics, Basic terminologies in drug delivery and drug targeting, Drug release, Drug targeting, Doses forms, Various routes of administration of drugs, Strategies for enhanced therapeutic efficacies (Basic principles)

Module V: Delivery of Genetic material
New generation technologies in Drug delivery and targeting, Nanotechnology / Nanobiotechnology, Use of biosensors and challenge of chronopharmacology, Microchips and controlled drug delivery, genetically engineered cell implants in drug delivery

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:
Text:

- Drug Delivery and Targeting, A.M. Hillery, A.W. Lloyd and J. Swarbrick, Harwood Academic Publisher
- Pharmaceutical Dosage Forms and Drug Delivery Systems, H.C. Ansel, L.V. allen and N.G. Popovich, Lippincott Williams and Wilkins Publisher

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References:

- Introduction to Biophysical Methods for Protein and Nucleic Acid Research, J.A. Glasel and M.P. Deutscher, Academic Press.
- Principles of Drug Action, W.B. Pratt and P. Taylor, Churchill Livingston.
- Principles of Medicinal Chemistry, W.O. Foye, T.L. Lemke, and D.A. Williams, Williams and Wilkins
- Side Effects and Drug Design, E.J. Lien, Marcel Dekker.
- The Anticancer Drugs, W.B. Pratt, R.W. Ruddon, W.D. Ensminger, and J. Maybaum, Oxford University Press.

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FERMENTATION TECHNOLOGY

Course Code: DSCT2704 **Credit Units: 04**

Course Objective
The course will educate students about use microorganism to produce various compounds of commercial interest. The student will be exposed to various techniques available for large scale cultivation of microorganisms.

Course Contents:
Module I
Introduction to fermentation process, Batch and Continuous production systems of cultivation, Solid-state fermentation process.

Module II
Selection of industrial microorganisms, media for fermentation, aeration, pH, temperature and other requirements during fermentation, downstream processing and product recovery, food industry waste as fermentation substrate.

Module III
Production of compounds like, antibiotics, enzymes, organic acids, solvents, beverages, SCP.

Module IV
Production of fermented dairy products

Module V
Immobilized enzymes systems, production and applications.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:
Text:
- Principles of Fermentation Technology by P.F. Stanbury, A. Whitaker, and S.J. Hall, Aditya Books (P) LTD.
- Industrial Microbiology by L.E.Casida, JR. New Age International (P) LTD.
- Biotechnology, A Text book of Industrial Microbiology, W. Crueger and A. Crueger, Sinauer Association.

References:
- Practical Biochemistry, Principles & Techniques, Keith Wilson and John Walker
- Biochemical Engineering Fundamentals, J.E. Bailey and D.F. Ollis, McGraw-Hill
  Protein Purification, M.R. Ladisch, R.C. Wilson, C.C. Painton and S.E. Builder, American Chemical Society ***Text:*** Industrial Microbiology – Cassida
  Principles of fermentation Technology, Salisbury, Whitaker and Hall
- Industrial microbiology – Prescot & Duhn.

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BASICS OF RESEARCH METHODOLOGY, ETHICS & RESEARCH COMMUNICATION

Course Code: DSCT2739 **Credit Units: 04**

Course Objectives:

The primary objective of this course is to enable the students, irrespective of their disciplines, in developing the most appropriate methodology for their research studies; and to make them familiar with the art of exploiting different research methods and techniques. The participants of the course should obtain a guideline on how to write, publish, present, and review scientific papers. The course aims to guide the students regarding the publication ethics and misconducts. It is expected that the course will assist in the accomplishment of exploratory as well as result-oriented research studies.

Course Content

Module-I: Fundamentals of Research

Basics: Definition, Purpose and Classification of research, Fundamentals of research methods, Writing a research proposal; Problem Identification: Review of literature, Broadening knowledge base in the specific research area, Bringing clarity and focus to the research problem, Writing a research proposal, Writing research reports/papers; Identifying variables: The difference between a concept and a variable, Converting concepts into variables, Types of variable, Types of measurement scale.

Module-II: Research Design

Selecting a study design: Differences between quantitative and qualitative study designs, Study designs in quantitative research, Data collection: Selecting a method of data collection, Differences in the methods of data collection in quantitative and qualitative research, Major approaches to information gathering, Methods of data collection in qualitative research.

Module-III: Research Ethics

Philosophy & Ethics: Introduction to Philosophy, definition, nature and scope, concepts, branches, nature of moral philosophy, nature of moral judgements and reactions, Ethics with respect to science and research, Intellectual honesty and research integrity; Scientific misconducts: Falsification, Fabrication, and Plagiarism (definition and types, Self-plagiarism), Methods to avoid plagiarism (Summary writing, Paraphrase, Quotations, Citations), Software for similarity and plagiarism checks – TURNITIN, and VIPER, redundant publications; duplicate and overlapping publications, Selective reporting and misrepresentation of data, Conflict of interest; Publication misconduct: parallel submission, authorship and contributorship, Ethical issues regarding the sponsoring organisation, Restrictions imposed by the sponsoring organisation, The misuse of information.

Module-IV: Research Communication, Referencing, and Bibliography

Significance of scientific communication in academics and research, Choice of words in academic writing, Conventions in academic writing – tone, style, structure of an academic write-up, Assessing credibility of an information resource – facts versus opinions, Note-taking – methods and tools to aid note-taking in a class. In-text citations, Reference writing in APA style-Textbook/book chapter as source, Research paper/Journal article as source, Websites, citations, Constructing a bibliography using freely available software or program like Mendeley

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

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Text and References

- Day RA, Gastel B, (2012) "How to Write & Publish a Scientific Paper" 7 th Edition, Cambridge University Press.
- Booth V, (2006) "Communicating in Science: Writing a Scientific Paper and Speaking at Scientific Meetings" 2 nd Edition Reprinted, Cambridge University Press.
- Matthews JR., Matthews RW, (2008) "Successful Scientific Writing: A Step-By-step Guide for the Biological and Medical Sciences" 3 rd Edition, Cambridge University Press. 4. Yousuf A, Sidiq M, Acharya S, (2018) "Publish and Cherish – The Art and Craft of Publishing Scientific Research" 1st Edition, Sara Book Publication.

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SIP/INTERNSHIP/PROJECT/DISSERTATION/FIELD VISIT

Course Code: NSCT2737 **Credit Units: 04**

GUIDELINES FOR PROJECT FILE

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation. Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student. Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage. The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

Methodology

The students will be sent to various industries and institutes where they will undergo short term training. After the completion of the training the students will be required to submit project report which shall then be evaluated by two internal examiners. The students will then have to appear for a Viva Voce examination to be conducted by an external evaluator at the end of the semester.

In general, the File should be comprehensive and include:
A short account of the activities that were undertaken as part of the project;
A statement about the extent to which the project has achieved its stated goals.
A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project; Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project; Any problems that have arisen that may be useful to document for future reference.

Report Layout

The report should contain the following components:

Title or Cover Page

The title page should contain the following information: Project Title; Student's Name; Course; Year; Supervisor's Name.

Acknowledgements (optional)

Acknowledgment to any advisory or financial assistance received in the course of work may be given.

Abstract

A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project

Table of Contents

Titles and subtitles are to correspond exactly with those in the text. Introduction
Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

Materials and Methods

This section should aim at experimental designs, materials used. Methodology should be mentioned in details including modifications if any.

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Results and Discussion
Present results, discuss and compare these with those from other workers, etc. In writing these section, emphasis should be given on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow. Note that in writing the various sections, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary never write in "point" form.

Conclusion
A conclusion should be the final section in which the outcome of the work is mentioned briefly.

Future prospects

Appendices
The Appendix contains material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

References / Bibliography
This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.
Examples
For research article
Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichia coli* O157: H7. *Clin Microbiol Infec*, **8** (suppl 1): 116–117.

For book
Kowalski, M. (1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67

ASSESSMENT OF THE PROJECT FILE
Essentially, marking will be based on the following criteria: the quality of the report, the technical merit of the project and the project execution. Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project. Project execution is concerned with assessing how much work has been put in.

The File should fulfill the following *assessment objectives:*
Range of Research Methods used to obtain information Execution of Research
Data Analysis
Analyse Quantitative/ Qualitative information Control Quality
Draw Conclusions

Examination Scheme:
Project Report 50
Viva Voce 50
Total 100

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SEMESTER-VIII

SYSTEMS BIOLOGY

Course Code: DSCT2801 **Credit Units: 04**

Course Objective:
The course offers different tools and technologies for systems biology analysis, interpretation of data and development of hypothesis based on interpretations. Students will get acquainted with the diversity of different organisms and models and mathematical frameworks used in systems biology, and their application to a range of biological systems and processes.

Course Contents:
Module-I:
Concepts and working principles of System Biology.

Module-II:
The multi-scale and multi-disciplinary nature of Systems Biology. Introduction to System Biology platforms. Proprietary system Biology platform. Practical applications of System Biology in Life Sciences.

Module-III:
Microarray data analysis - Microarray analysis platforms - Introduction to Concepts and principles of Microarray technology - Application of Microarrays in Life Sciences.

Module-IV:
Different Markup languages used in systems biology. Introduction to NGS technology. Current research topics within the field

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Texts & References Texts:

- System Biology: Computational Systems Biology (Hardcover) by Andres Kriete (Editor), Roland Eils (Editor)
- Stochastic Modelling for Systems Biology. ISBN-10 1-58488-540-8 and ISBN-13 978-158488-540-5
- Microarray Data Analysis: Gene Expression Data Analysis. A Beginner's Guide By: Helen Causton (Imperial College), J Quackenbush and AlvisBrazma (The European Bioinformatics Institute)
- A Practical Approach to Microarray Data Analysis (Hardcover) by Daniel P. Berrar (Editor), Werner Dubitzky (Editor), Martin Granzow (Editor)

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INTEGRATIVE OMICS

Course Code: DSCT2802 **Credit Units: 04**

Course Objectives

- To provide the basic understanding of integrative omics to the students
- To understanding the molecular basis of three dimensional integration of the OMICS data to understand different diseases
- To provide knowledge to the stundets about the integrated approach of OMIC sciences and computational biology for the development of suitable and strategic therapeutic intervention.

Course Content:

Module-I: Genome & Genomics:

Genome mapping: Physical and Genetic Map, Genome Sequencing, Next generation sequencing methods ,Genome Annotation, Functional Genomics.

Module-II: Transcriptomics:

Search for transcription factor binding sites,RNA-Seq, Microarrays, Regulatory RNAs: small or large, Computational prediction of miRNA target genes, RNA Darkmatter

Module-III: Proteomics:

Basic concepts , Tools of proteomics- SDS PAGE, 2D PAGE , Liquid chromatography , Mass Spectrometry (ESI and MALDI) ,Protein identification by peptide mass fingerprinting ,Applications of proteomics.

Module-IV: Metabolomics, and Lipidomics

Fundamental concept, Tools of metabolomics- Capillary electrophoresis, Gas chromatography, Electrochemical detectors, Case studies. Basic concepts and tools Case studies in lipidomics

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

Text and References:

- Introduction to Proteomics -Tools for the New Biology by Daniel C. Liebler, Humana Press.
- Mass Spectrometry for Biotechnology by Gary Siuzdak, Academic Press.
- Proteomics for Biological Discovery by Timothy Veenstra and John Yates, Wiley.
- Metabolomics- Methods and Protocols by Wolfram Weckwerth, Humana Press.
- Lipidomics- Technologies and Applications by Kim Ekroos, Wiley-VCH.

Web/Journal Resources.

Transcriptomics: Expression Pattern Analysis, Virendra Gomase, Somnath Tagore; VDM Publishing, 2009 – Science

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CLINICAL TRIAL DESIGN

Course Code: DSCT2803 **Credit Units: 04**

Course Objective:
Students will learn about the process a drug reaches to public, especially the development of clinical trials for testing the specificity, efficacy and toxicity of different drug candidates/ therapeutic molecules.

Course Contents:

Module-I: History & Background of Origin of Clinical Research
Thalidomide tragedy, Sulphanilamide disaster, WMA Declaration of Helsinki- Ethical Principles for Medical Research Involving Human Subjects, The Belmont Report. Terminology in clinical research, Preclinical phases, First in human trials, Single ascending dose and multiple ascending dose studies, Exploratory clinical trials, Confirmatory clinical trials, post marketing surveillance

Module-II: Types of trials:
Pharmacoepidemiology, Meta-analysis, Case control study, Prevention Trials, diagnostic trial, Treatment trial, Case cohort study, Observational studies, Quality of life trials. Fundamentals of Trial Design – Randomized clinical trial, uncontrolled trials, protocol development, end points, Patient selection, sources and control of bias, Randomization, sample size and power

Module-III: Clinical Research Organization Structure and Functions
Definition, fundamental operations of CRO, Role and responsibilities of CRO, Organogram of CRO, basic documentation in CRO, Site Management organizations (SMO), Central Lab, Research Management Organizations and differences between Contract Research Organization/Site Management Organization/Research Management Organization, Functions of Quality Assurance and Quality Control Departments, Bioanalytical Departments, Clinical Project Management, Regulatory affairs, Medical Writing and Data Management, Biostatistics

Module-IV: Study Execution Process
Study design, Feasibility, Overview of National regulatory applications, CR professional training and development, preparations and planning for clinical trials, CRF and monitoring, Training and site management**,** Budget Management of Clinical trials on Harmonization of technical requirements for registration of Pharmaceuticals for human use guidelines (ICH-GCP).

Module-V: Regulatory Requirements for Clinical Trials
Indian Council Of Medical Research- Ethical Guidelines for Biomedical Research on Human participants (ICMR), Indian Good Clinical Practices, International Regulatory bodies and **Guidelines:**

- o ***US Food and Drug Administration(USFDA):*** The FDA and Food Drug and Cosmetics Act, New drug development and approval : the principal steps
- o ***India****:* Regulatory laws, Schedule Y, registration of new drugs, requirements for registration, regulatory environment and practices
- o ***Medicines and Healthcare Products Regulatory Agency (MHRA)***: Overview of regulatory environment/ background, regulatory authorities, regulatory requirements and procedures
- o ***European Agency for Evaluation of medicinal Products(EMEA)***: National registration , the decentralized procedures, mutual recognition procedures

o ***Brazil*****:** Overview of regulatory affairs ***Good Laboratory practices(GLP) :*** Organization and Personnel, Quality assurance program, Facilities, Equipments, reagents and Materials, Standard operating procedures, Storage of Records and Reports **Council for International Organizations of Medical Science (CIOMS) guidelines:** CIOMS International Ethical guidelines for biomedical research involving human subjects, Principles Of Medical Ethics Relevant To The Protection Of Prisoners Against Torture (1983).

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Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References: Text

- Intellectual Property Rights by Birgitte Anderson, Edward Elgar Publishing
- Intellectual Property Rights and the Life Science Industries by Graham Dutfield, Ashgate Publishing

References

- WIPO Intellectual Property Handbook
- Intellectual Property by William Rodelph Cornish, David Clewelyn
- Globalising Intellectual Property Rights by Duncan Matthews
- Journals and Current magazines

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PRE-CLINICAL ANIMAL MODELS

Course Code: DSCT2804 **Credit Units: 04**

Course Objective:
The application of Animal Biotechnology covers major areas related to commercial applications. Importance will also be given to areas like *in vitro* fertilization, animal cell and tissue culture, hormone vaccine and important enzyme production through animal biotechnology.

Course Contents:
Module I
Historical perspectives, sterilization methods, organ culture - culture techniques, plasma clot, raft methods, agar gel, grid method, organ engineering. Cell culture substrates, cultural media, natural and artificial media, initiation and maintenance of cell cultures, cell culture products, cryopreservation techniques, immobilized cultures

Module II
In vitro fertilization and embryo transfer

Module III
Somatic cell hybridization, hybridoma technology. Animal genetic engineering, vectors, gene transfer methods: microinjection, virus mediated and other methods of gene transfer

Module IV
Transgenic animals with new traits, transgenic animals as bioreactors for producing pharmaceutically important compounds and therapeutics. Animal models for cancer research.

Module V
Bioethical issues related to utilization of animals in biomedical research

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References
- Cell Culture LabFAx, M. Butler and M. Dawson, Bios scientific Publications Ltd.
- Cell Growth and Division – A Practical approach, R. Basega, IRL Press
- Culture of Animal Cells, R.I Freshney, Wiley-Leiss
- Comprehensive Biotechnology, Moo-Young, Alan T. Bullm Howard Dalton, Panima Publication

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SIP/INTERNSHIP/PROJECT/DISSERTATION/FIELD VISIT

Course Code: NSCT2837 **Credit Units: 05**

GUIDELINES FOR PROJECT FILE

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Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

Materials and Methods

This section should aim at experimental designs, materials used. Methodology should be mentioned in details including modifications if any.

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Results and Discussion
Present results, discuss and compare these with those from other workers, etc. In writing these section, emphasis should be given on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow. Note that in writing the various sections, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary never write in "point" form.

Conclusion
A conclusion should be the final section in which the outcome of the work is mentioned briefly.

Future prospects

Appendices
The Appendix contains material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

References / Bibliography
This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.
Examples
For research article
Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichia coli* O157: H7. *Clin Microbiol Infec*, **8** (suppl 1): 116–117.

For book
Kowalski, M. (1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67

ASSESSMENT OF THE PROJECT FILE
Essentially, marking will be based on the following criteria: the quality of the report, the technical merit of the project and the project execution. Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project. Project execution is concerned with assessing how much work has been put in.

The File should fulfill the following *assessment objectives:*
Range of Research Methods used to obtain information Execution of Research
Data Analysis
Analyse Quantitative/ Qualitative information Control Quality
Draw Conclusions

Examination Scheme:
Project Report 50
Viva Voce 50
Total 100

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DATA ANALYSIS & VISULAIZATION USING SOFTWARES

Course Code: DSCT2839 **Credit Units: 04**

Course Objectives: This course enables the students: • To interpret data plots and understand core data visualization concepts such as correlation, linear relationships, and log scales. • To explore the relationship between two continuous variables using scatter plots and line plots. • To translate and present data and data correlations in a simple way, data analysts use a wide range of techniques — charts, diagrams, maps, etc.

Module-I: Statistics and Probability
Introduction to Statistics – Origin of Statistics, Features of Statistics, Scope of Statistics, Functions of Statics, Uses and importance of Statistics, Limitation of Statistics, Distrust of Statistics

Module-II: Date Collection and Types
Introduction to Collection of Data, Primary and Secondary Data, Methods of Collecting Primary Data, Methods of Secondary Data, Statistical Errors, Rounding off Data (Approximation).

Module- III: Classification of Data Frequency Distribution
Introduction Classification of Data, Objectives of Classification, Methods of Classification, Ways to Classify Numerical Data or Raw Data. Tabular, Diagrammatic and Graphic Presentation of Data: Introduction to Tabular Presentation of Data, Objectives of Tabulation, Components of a Statistical Table, General Rules for the Construction of a Table, Types of Tables, Introduction to Diagrammatic Presentation of Data, Advantage and Disadvantage of Diagrammatic Presentation, Types of Diagrams, Introduction to Graphic Presentation of Data, Advantage and Disadvantage of Graphic Presentation, Types of Graphs

Module-IV: Measures of Central tendency, and Mesaures of Dispersion
Introduction to Central Tendency, Purpose and Functions of Average, Characteristics of a Good Average, Types of Averages (Arithmetic Mean, Median, and Mode), their Calculation, and Merit and Demerits, Meaning of Dispersion, Objectives of Dispersion, Properties of a good Measure of Dispersion, Methods of Measuring Dispersion (Range, Mean deviation, Standard deviation, and Coefficient of Variation), their Merit and Demerits

Module-V: Data Visualization tools in Biomedical sciences:
Introduction and need of data visualization, data visualization using excel, and free online tools, making of different types of plots, Histograms, Box plot, scatter plot, heat map, bubble chart, Bar chart, scatter plot, linked plot, distribution plot, pair plot, line graph, pie chart, Doughnut chart, area chart, and venn diagram using online freely available tool Pangloss (http://www.pangloss.com/seidel/Protocols/venn.cgi)

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Components	A	CT	Sessional (Theory/ Practical)	End Term Examination
Weightage (%)	5	10	15	70

Text Book and References
TEXT BOOKS
1. Statistics and Data Analysis, A.Abebe, J. Daniels, J.W.Mckean, December 2000.
2. Statistics, Tmt. S. EzhilarasiThiru, 2005, Government of Tamilnadu.
3. Introduction to Statistics, David M. Lane.
4. Weiss, N.A., Introductory Statistics. Addison Wesley, 1999.
5. Clarke, G.M. & Cooke, D., A Basic course in Statistics. Arnold, 1998.

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REFERENCE BOOKS

1. Banfield J.(1999), Rweb: Web-based Statistical Analysis, Journal of Statistical Software.
2. Bhattacharya,G.K. and Johnson, R.A.(19977), Statistical Concepts and Methods, New York, John Wiley & Sons.

E-Books/ Online learning material

1. http://onlinestatbook.com/Online_Statistics_Education.pdf
2. https://textbookcorp.tn.gov.in/Books/12/Std12-Stat-EM.pdf
3. https://3lihandam69.files.wordpress.com/2015/10/introductorystatistics.pdf

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Amity Medical School

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Curriculum & Scheme of Examination

2023

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MICROBIOLOGY & VIROLOGY

Course Code: SCT4102 **Credit Units: 03**

Course Objective:
The course will offer thorough understanding of the biology of different forms of bacteria, fungi, protozoa and viruses, their role in disease development as well as in useful applications in biotechnology.

Course Contents:

Module I
Introduction and historical perspective: Discovery of the microbial world, role of microorganisms in transformation of organic matter and in the causation of diseases, development of pure culture methods. Methods in Microbiology: Principles of microbial nutrition, culture media, theory and practice of sterilization, pure culture techniques.

Module II
Prokaryotic structure and function: functional anatomy of bacteria, cell envelope, cell wall, cytoplasmic membrane, capsule, surface appendages, cytoplasm and cytoplasmic inclusions. Growth: Definition of growth, mathematical expression of growth, growth curve, measurement of growth, synchronous growth, continuous culture, culture collection and maintenance of cultures. Systematics and taxonomy: new approaches to bacterial taxonomy, classification including ribotyping, ribosomal RNA sequencing, characteristics of primary domains, taxonomy, nomenclature and Bergey's manual.

Module III
Metabolic diversity among microorganisms: photosynthesis in microorganisms, role of bacteriochlorophylls, carotenoids and phycobilins, Chemolithotrophy, hydrogrn-iron-nitrite-oxidizing bacteria, nitrate and sulphate reduction, methanogenesis and acetogenesis, Fermentations, nitrogen fixation, plant microbe interactions (mycorrhizae).

Module IV:
Archae as earliest life forms, thermophiles, psychrophiles, halophiles, alkalophiles, acidophiles, hyperthermophiles Viruses: Bacterial, animal; structure of viruses; Reproduction and life cycle of RNA and DNA viruses; Viroids and prions. Algae and Fungi: Classification and Reproduction. Host-parasite relationship: Normal micro flora of skin, oral cavity, gastrointestinal tract, Respiratory infections; entry of pathogens into the host, types of toxins (Exo, endo, entro) and their mode of actions, Microbial pathogenesis: Disease reservoirs; Epidemiological terminologies; Infectious disease transmission; Sexually transmitted disease including AIDS, Food and water- borne diseases; pathogenic fungi.

Module V
Chemotherapy/antibiotics: Antimicrobial agents, sulfa drugs, antibiotics, penicillin and cephalosporins, broad spectrum antibiotics, antifungal antibiotics; mode of action.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

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Text & References:

Text:

- General Microbiology, R.Y. Stanier, J.L. Ingraham, M.L.Wheelis and P.R. Painter, Macmillian
- Microbiology VI Edition, M.J. Pelczar, E.C.S. Chan and N.R. Kreig, Tata McGraw Hill Microbiology by Prescott
- The microbes – An Introduction to their Nature and Importance, P.V. Vandenmark and B.L. Batzing, Benjamin Cummings.

References:

- The Microbial World, Roger Y. Stanier, Prentice Hall
- Microbiology, Tortora, Funke and Chase, Benzamin & Cummings
- Principles of Fermentation Technology, Salisbury, Whitaker and Hall, Aditya Books Pvt. Ltd.
- Industrial Microbiology, Casida, New Age International
- Industrial Microbiology, Prescott and Dunn, C.B.S. Publishers Principles of Microbiology, R.M. Atlas, WMC. Brown Publisher.

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MOLECULAR BIOLOGY & rDNA TECHNOLOGY

Course Code: SCT4103 **Credit Units: 02**

Course Objective:
A complete understanding of molecular techniques like DNA sequencing, restriction mapping, PCR for the cloning and expression of genes can be obtained through the course.

Course Contents:

Module I
Purification of DNA from bacterial, plant and animal cells, manipulation of purified DNA. Introduction of DNA into living cells, transformation, transduction, electroporation, micro-injection.

Module II
Introduction to gene cloning and its uses, tools and techniques: plasmids, cosmids, transposons and other vectors, DNA, RNA, cDNA, viral and non-viral vectors.

Module III
Clinical applications of recombinant technology; Erythropoietin; Insulin analogs and its role in diabetes; Recombinant human growth hormone; Streptokinase and urokinase in thrombosis; Recombinant coagulation factors, Monoclonal antibodies and their role in cancer; Role of recombinant interferons; Immunostimulants; Immune-supressors in organ transplants; Role of cytokine therapy in cancers.

Module IV
Analysis of DNA by Southern blotting, Analysis of RNA by Northern blotting, Analysis of proteins by Western blot techniques, Dot blots and slot blots, RFLP, AFLP.
PCR: Basic principles and its modification application and uses.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:
- Gene cloning and DNA analysis by T.A. Brown

References:
- Recombinant DNA, J.D. Watson et al, W.H. Freeman and Company
- Principles of Gene Manipulation: An Introduction to Genetic Engineering, R.W. Old and S. B Primrose, Blackwell Science Inc
- Molecular Biotechnology: Principles and Applications of Recombinant DNA, B.R. Grick and J.J. Pasternak, ASM Press
- Molecular Biology of gene by Watson, Baker, Bell, Gann, Levine, Losick
- DNA Science by Micklos Freyer
- Principles of Gene manipulation and Genomics by Primrose and Twyman

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BIOANALYTICAL TECHNOLOGIES & INSTRUMENTATION

Course Code: SCT4105 **Credit Units: 02**

Course Objective:
The course aims to educate students about bio-analytical instruments, principles of their proper functioning, and analysis methods applied to biological data obtained in experimental techniques, methodology and the safe laboratory practice.

Course Contents:

Module I
BSL I, BSLII, BSLIII laboratory facility development: design and regulatory requirements. Sampling and sample preparation: Sample fixing for various analytical applications and sample processing. Principles of microscopy, Light, dark field, fluorescence microscope, confocal microscope, transmission and Scanning electron microscopy, microtomy and analysis and measurement of image. Fluorescence activated cell sorter (FACS) basic principles and applications.

Module II
Electrophoresis of DNA, RNA and proteins. Capillary electrophoresis, Two-dimensional electrophoresis, Southern blotting, Northern blotting, Immunoprecipitation, Western blotting. Sequencing, Next Generation Sequencing, RNA-Seq. etc.

Module III: Centrifugation and Spectroscopy
Centrifugation techniques: Introduction, Basic principle of sedimentation, centrifuges and their uses, Density gradient and analytical centrifugation.
UV and visible spectroscopy, infrared and atomic absorption spectroscopy, fluorescence spectroscopy, mass spectrometry, MALDITOF, nuclear magnetic resonance and electron spin resonance spectroscopy.

Module IV: Chromatography
Introduction to chromatographic techniques: Theoretical basis of chromatographic separations. Column, Thin layer, Paper, Normal phase and reverse phase chromatography, Ion-exchange, Affinity and Gas Chromatography, High performance liquid chromatography (HPLC) and GLC.

Module V
Principles of X-ray diffraction and X-ray Crystallography. Theory and application of UV-VIS, IR, NMR, Fluorescence, Atomic absorption spectroscopy; X-ray diffraction. Introduction to mass spectroscopy Radioisotopic techniques: Introduction to radioisotopes, detection, measurement and uses of radioisotopes, counting efficiency and autoradiography, biotechnological applications

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:
Text:
- Principles of Physical Biochemistry, K.E. Van Holde, Prentice Hall.
- Essentials of Biophysics, P. Narayanan, New Age International Publishers

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References:

- Advanced Instrumentation, Data Interpretation, and Control of Biotechnological Processes, J.F. Van Impe, Kluwer Academic
- Crystal Structure Analysis, J.P. Glusker and K.N. Trueblood, Oxford University Press
- Crystallography made Crystal Clear, G. Rhodes, Academic Press
- Modern Spectroscopy, J.M. Hollas, John Wiley and Son Ltd.
- NMR Spectroscopy: Basic Principles, Concepts and Applications in Chemistry, H. Gunther, John Wi

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BIOSTATISTICS

Course Code: SCT4106 **Credit Units: 03**

Course Objective:
The course aims to develop competency and expertise in the application of statistical methods applied to biological data obtained in experimental techniques, methodology and the safe laboratory practice.

Course Contents:

Module I
Statistics and Biostatistics: Preliminary concepts; Measures of Central Tendency: Mean, Median, Mode Measures of Dispersion: Range, Standard deviation, Variance

Module II: Probability
Random Experiments, Trial and Event, Sample Space, Mutually Exclusive or Disjoint Events, Mutually Exhaustive Events, Equally Probable Events, Complementary Event, Classical definition of Probability, Statistical definition of Probability, Axiomatic definition of Probability, Addition theorem, Multiplication theorem, Conditional Probability, Bayes' Theorem. Expectation.

Module III: Types of Probability Distributions
Introduction to Normal Distribution, Bernoulli Distribution, Uniform Distribution, Binomial Distribution, Poisson distribution, Exponential Distribution

Module IV: Correlation & Regression
Bivariate distribution Correlation, Types of Correlation, Simple Correlation Coefficient for ungrouped data, Properties and Interpretation of Correlation Coefficient, Coefficient of determination, Scatter diagram, Standard Error, Probable error of Correlation Coefficient. Rank correlation, Some examples. Regression lines and Regression Coefficients, Properties of Regression Coefficients, Some examples. Method of least square: Fitting of straight line

Module V: Hypothesis Testing
Parameter, Statistic, Null hypothesis, Alternative hypothesis, Critical region, Type1 Error, Type 11 Error, Level of significance, P-value and its applications. One sample t-test, Paired t-test, Degrees of freedom for t-test, F test for equality of Population variances, Degrees of freedom for F-test. Normal test for sample mean and population mean, Normal test for two sample means. Chi-square Test: Test of goodness of fit, Test of Independence of attributes, Degrees of freedom for Chi-square test, Coefficient of contingency, Yates' correction for continuity. Analysis of Variance: One way and Two-way (only Examples)

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

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Text & References:

Text:

- Introduction to Biostatistics, Ronald N. Forthfer and Eun Sun Lee, Publisher: Elsevier.
- Statistical Methodology, S.P. Gupta, Publisher: S. Chand & Co.
- Fundamentals of Statistics, S.C. Gupta. Publisher: S.Chand & Co.

References:

- Biostatistics: A manual of Statistical Methodology for use in Health, Nutrition and Anthropology, K. Visweswara Rao. Publisher: Jaypee Brothers Biostatistics: A foundation for analysis in the Health Sciences, W.W. Daniel, Publisher: John Wiley and Sons
- Fundamentals of Mathematical Statistics, S.C. Gupta and V.K. Kapoor, Publisher: S.Chand & Co.
- Statistical Analysis, Kaushal, T.L. Publisher: Kalyani Publishers
- Statistical Methods, Potri, D. Kalyani Publishers.
- Mathematical Statistics, H.C. Saxena, and V.K. Kapoor: S. Chand & Company
- Biostatistics, P.N. Arora and P.K. Malhan, Publisher: Himalaya Publishing House.

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BIOLOGICAL PROGRAMMING (BIOINFORMATICS)-I

Course Code: SCT4107 **Credit Units: 01**

Course Objective:
The course offers a basic understanding of bioinformatics tools and technologies for understanding different biological pathways at systems level as well as for characterizing cross-talks between different pathways.

Course Contents:

Module I: Introduction and overview
The NCBI data model; sequence databases, sequence retrieval, sequence file formats, submitting DNA and protein sequences; classification of biological databases. Sequence databases (EMBL, GenBank, DDBJ, -UNIPROT, PIR, TrEMBL),

Module II: Sequence alignment
Global and local alignments, statistical significance of alignments, scoring matrices and gap penalties, position specific scoring matrices, programs and methods for Pairwise and multiple alignment, pattern searching programs, family and superfamily representation - Pfam, hidden Markov models.

Module III: Predictive methods using DNA and protein sequences
ESTs: construction, databases, clustering, gene discovery and identification, and functional classification. Protein family/domain databases (PROSITE, PRINTS, Pfam, BLOCK, etc), Cluster databases-An Introduction, Specialised databases (KEGG, etc), Database technologies (Flat-file), Protein identification tools, physical properties, motifs and patterns

Module IV: Structure databases
Structural databases - PDB and MMDB, structure file formats, Secondary and tertiary structure prediction methods in proteins, Internal and external coordinate system, software to visualize secondary and tertiary structural information in protein.folding classes, structure classification databases – SCOP and CATH;

Module V: Comparative genome analysis
Phylogenetic analysis, Evolutionary Models, Character and distance based Tree building methods; tree evaluation, phylogenetic analysis, parsimony, maximum likelihood trees; Trees-splits and metrics on trees, tree interpretation, Distance – additive, ultrametric and nonadditive distances.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:
Text:
- Computer Science, J.G. Brookshear, Pearson, Addison Wesley
- Introduction to Bioinformation – T.Attawood
- Essentials of Genomics and Bioinformatics, C.W. Sensen, John Wiley and Sons
- Bioinformatics: Sequence and Genome Analysis, D.W. Mount, Cold Spring Harbor Laboratory Press

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References:

- Algorithms on Strings, Trees, and Sequences: Computer Science and Computational Biology, D. Gusfield, Cambridge University Press
- Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins, A.D. Baxevanis and B.F.F Quellette, Wiley – interscience.
- Bioinforamtics: Sequence and Genome Analysis, D.W. Mount, Cold Spring Harbor Laboratory Press.
- Sequence Analysis in Molecular Biology: Treasure Trove or Trivial Pursuit, G. Von Heijne and G. Von Heijne, Academic Press.
- Structural Bioinformatics, Philip E. Bourne, Helge Weissig 2003
- Statistical Methods in Bioinformatics: An Introduction, G.R. Grant, W.J. Ewens, Springer Verlag

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CELL & MOLECULAR BIOLOGY LAB

Course Code: SCT4108 **Credit Units: 01**

Course Contents

Module I
Microscopy: Light microscopy, Bright field, Phase contrast.

Module II
Cell culture: aseptic suspension and adherent cell culture techniques. Cell number enumeration and cell passage methods, and methods for characterization of cells in culture and cell proliferation.

Module III
Induction and characterization of apoptosis and necrosis. Cell mitosis and meiosis and karyotyping techniques. Cell mounting techniques, and study of permanent slides of different types of cancer.

Module IV
Bacterial culture techniques, single cell clone isolation, bacterial transformation and transduction techniques.

Module V
Study of physical and chemical mutagens on growth of *E. coli*; PTC test.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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MOLECULAR BIOLOGY & rDNA TECHNOLOGY LAB

Course Code: SCT4109 **Credit Units: 01**

Course Objective:
The laboratory experiments in Recombinant DNA Technology would certainly help to comprehend the theoretical aspects of the subject.

Course Contents:

Module I
Study of cloning (GFP cloning)

Module II
Design and execution of PCR, RT-PCR, quantitative RT-PCR

Module III
Study of Southern hybridization

Module IV
Study of RAPD

Module V
Site directed mutagenesis

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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BIOANALYTICAL TECHNOLOGIES & INSTRUMENTATION LAB

Course Code: SCT4110 **Credit Units: 01**

Course Contents:

Module I
Cell disruption techniques

Module II
Centrifugation – low speed and high speed.

Module III
Spectrophotometer techniques

Module IV
Chromatography –Paper Chromatography and Thin Layer Chromatography

Module V
Electrophoresis –SDS Page and Agarose gel electrophoresis.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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RESEARCH PRESENTATION / LIT. REVIEW & PRESENTATION

Course Code: SCT4111 **Credit Units: 01**

Course Objective:

Students will learn how to do literature search on a particular topic, how to construct, organize and deliver a scientific presentation.

Examination Scheme:

Literature Search/Project Report	50
Presentation	50
Total	**100**

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TERM PAPER

Course Code: SCT4131 **Credit Units: 01**

METHODOLOGY

A term (or research) paper is primarily a record of intelligent reading in several sources on a particular subject.

The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned. The evaluation will be done by Board of examiners comprising of the faculties.

GUIDELINES FOR TERM PAPER

The procedure for writing a term paper may consists of the following steps:

1. Choosing a subject
2. Finding sources of materials
3. Collecting the notes
4. Outlining the paper
5. Writing the first draft
6. Editing & preparing the final paper

1. Choosing a Subject

The subject chosen should not be too general.

2. Finding Sources of materials

a) The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.

b) Begin by making a list of subject-headings under which you might expect the subject to be listed.

c) The sources could be books and magazines articles, news stories, periodicals, scientific journals etc.

3. Collecting the notes

Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.

a) Get facts, not just opinions. Compare the facts with author's conclusion.

b) In research studies, notice the methods and procedures, results & conclusions.

c) Check cross references.

4. Outlining the paper

a) Review notes to find main subdivisions of the subject.

b) Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

5. Writing the first draft

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is. You may follow the following:

a) statement of purpose

b) main body of the paper

c) statement of summary and conclusion

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Avoid short, bumpy sentences and long straggling sentences with more than one main ideas.

6. Editing & Preparing the final Paper

a) Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/ details/ analyses of relevance to the question at hand. Sometimes, the relevance of a particular section may be clear to you but not to your readers. To avoid this, ensure you briefly explain the relevance of every section.
b) Read the paper to ensure that the language is not awkward, and that it "flows" properly.
c) Check for proper spelling, phrasing and sentence construction.
d) Check for proper form on footnotes, quotes, and punctuation.
e) Check to see that quotations serve one of the following purposes:
   (i) Show evidence of what an author has said.
   (ii) Avoid misrepresentation through restatement.
   (iii) Save unnecessary writing when ideas have been well expressed by the original author.
f) Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:

1) Title page
2) Table of contents
3) Introduction
4) Review
5) Discussion & Conclusion
6) References
7) Appendix

Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper.

Discussion

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.

Conclusion

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

a) summary of question posed
b) summary of findings
c) summary of main limitations of the study at hand
d) details of possibilities for related future research

References

From the very beginning of a research project, you should be careful to note all details of articles gathered.

The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.

The key to a good bibliography is consistency. Choose a particular convention and stick to this.

Bibliographical conventions

Monographs

Crystal, D. (2001), Language and the internet. Cambridge: Cambridge

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[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

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Schmidt, R./Shimura, A./Wang, Z./Jeong, H. (1996), Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea. In: Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges to communication in a second language. Berlin/ NY: Mouton de Gruyter: 285-316.

Journal Articles
McQuarrie, E.F./Mick, D.G. (1992), On resonance: A critical pluralistic inquiry into advertising rhetoric. Journal of consumer research 19, 180-197.

Electronic Book
Chandler, D. (1994), Semiotics for beginners [HTML document]. Retrieved [5.10.'01] from the World Wide Web, http://www.aber.ac.uk/media/Documents/S4B/.

Electronic Journal Articles
Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document]. German as a Foreign Language Journal [online] 1. Retrieved [12.09.'00] from the World Wide Web, http://www.gfl-journal.com/.

Other Websites
Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document]. Retrieved [13.10.'01] from the World Wide Web, http://olaf.hiof.no/~sverrev/eng.html.

Unpublished Papers
Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu.

Unpublished Theses/ Dissertations
Möhl, S. (1996), Alltagssituationen im interkulturellen Vergleich: Realisierung von Kritik und Ablehnung im Deutschen und Englischen. Unpublished MA thesis, University of Hamburg.
Walsh, R. (1995), Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language. Unpublished PhD dissertation, University College Dublin.

Appendix
The appendix should be used for data collected (e.g. questionnaires, transcripts,...) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

Assessment Scheme:

Continuous Evaluation: 40%
(Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)

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Final Evaluation: (Based on the organization of the paper, objectives/ problem profile/ issue outlining, comprehensiveness of the research, flow of the idea/ ideas, relevance of material used/ presented, outcomes vs. objectives, presentation/ viva etc.)	60%

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STEM CELL TECHNOLOGY

Course Code: SCT4201 **Credit Units: 02**

Course Objective: The objective of this paper is to familiarize the students with stem cell technology and its applications for betterment of the society. The course is designed to give a broad view of mammalian stem cells, reviewing where they are found in the body, the different types and how they are cultured. The topics will cover the basic biology of these stem cells as well as bioengineering and application of these stem cells to potential treatments of human diseases.

Course Contents:

Module I: Introduction to stem cells

Definition, properties, proliferation and, culture of stem cells, medical applications of stem cells, ethical and legal issues in use of stem cells.

Module II: Types of stem cells.

Stem Cell biology and therapy, types embryonic stem cell, Adult stem cell, Stem Cell Biology and Therapy, Embryonic Stem Cells, culture and the potential benefits of stem cell technology

Module III: Gene Therapy

Gene Therapy: Introduction, history and evolution of Gene therapy, optimal disease targets. Genetic perspectives for Gene Therapy, Gene Delivery methods: Viral vectors and Non-viral Vectors. Failures and successes of gene therapy. Future prospects of gene therapy.

Module IV: Therapeutic applications of stem cells

Applications of stem cells in cell replacement and gene therapy approaches. Stem cells in drug discovery.

Module V: Ethical Issues associated with stem cell-based regenerative medicine field

Regulatory and ethical considerations of stem cell and gene therapy. Assessing human stem cell safety, use of genetically godified gtem cells in experimental gene therapies.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

***Text*:**

- Stem Cell Biology, Daniel Marshak, Richard L. Gardener and David Gottlieb, Cold Spring Harbour Laboratory Press
- Stem cell biology and gene therapy, Booth C., Cell Biology International, Academic Press
- Stem Cell and Gene-Based Therapy: Frontiers in Regenerative Medicine, *Alexander Battler, Jonathan Leo,* Springer.

***References*:**

- Stem Cell Biology and Gene Therapy. Quesenberry PJ, Stein GS, eds. (£65.00.) Wiley, 1998.
- Progress in gene therapy, Volume 2,Pioneering stem cell/gene therapy trials, Roger Bertolotti, Keiya Ozawa and H. Kirk Hammond, VSP international science publishers

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- Stem Cells Handbook: Stewart Sell, Humana Press; Totowa NJ, USA; Oct. 2003,
- Human Embryonic Stem Cells: The Practical Handbook by Stephen Sullivan and Chad A Cowan.

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BIOLOGICAL PROGRAMMING (BIOINFORMATICS)-II

Course Code: SCT4204 **Credit Units: 01**

Course Objective:
It enables the students to access biological information networks and databases in order to understand the different techniques of biotechnology to build detection systems especially in the prevention and treatment of human diseases.

Course Contents:
Module I: Data Models and Database Management Systems
File systems vs. DBMS, advantages of DBMS**,** Levels of abstraction and data independence; Data models and their comparison; Entity relationship model -concepts, design, keys and features; Relational model - introduction, structure of the relational databases, integrity constraints, Relational algebra and calculus - selection and projection, set operations, renaming, Joins, Division etc.

Module II: Introduction to Biological scripting languages: BioJava
BioJava modules for sequence alignment, data mining, structure alignment.

Module III: BioPerl & BioPython
BioPerl & BioPython modules for sequence alignment, data mining, structure alignment,

Module IV: Introduction to R Programming
Introduction to R Programming R basics; Data structures in R; R programming fundamentals; Working with data in R; Strings and Dates in R;

Module V: R/Bioconductor for advanced biological data analysis
Overview of the Bioconductor; Pre-processing microarray data; Differential gene expression; Distances, prediction, and cluster analysis; Annotation and metadata Visualization; GO;

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:
Text:
- Data Mining: Concept and techniques, J. Han and M. Kamber, Morgan Kaufman.
- Database Management, P.C. Desai.
- Bioinformatics and Computational Biology Solutions Using R and Bioconductor (Statistics for Biology and Health)" by Vincent Carey and Sandrine Dudoit
- Statistics and Data Analysis for Microarrays Using R and Bioconductor by Sorin Drăghici

References:
- Introduction to Database Systems, C.J. Date, Addison Wesley Publishing.
- BioJava - www.biojava.org;
- BioPerl - www.bioperl.org;
- BioPython - www.biopython.org;
- R Programming Language: http://cran.r-project.org/;
- Bioconductor: http://www.bioconductor.org ;

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MOLECULAR MEDICINE: PRINCIPLES AND APPLICATIONS

Course Code: SCT4205 **Credit Units: 03**

Course Objective
The students will be exposed to basic concepts related with human health development of different types of infectious and non-infectious diseases.

Course Contents

Module I: Medical Biotechnology
History and scope of medical biotechnology, current status and future prospects.

Module II: Classification of genetic diseases
Chromosomal disorders – Numerical disorders e.g. trisomies & monosomies, Structural disorders e.g deletions, duplications, translocations & inversions, Chromosomal instability syndromes. Gene controlled diseases – Autosomal and X-linked disorders, Mitochondrial disorders.

Module III: Molecular basis of human diseases
Mechanism of disease development, Genetic susceptibility, Identification of targets for diagnosis and therapy: Acquired diseases, cardiovascular diseases, Neurological diseases, Hematology, Cancer. Pathogenic mutations: Gain of function mutations: Oncogenes, Huntingtons Disease, Pittsburg variant of alpha 1 antitrypsin. Loss of function: Tumour Suppressor. Dynamic Mutations - Fragile- X syndrome, Myotonic dystrophy. Mitochondrial diseases.

Module IV: Traditional and Modern Tools for Detection of Genomic Abnormalities
Classical gene mapping techniques, next generation sequencing technology.

Module V: Nucleic acid based Therapy
Gene silencing technology, siRNA, Aptamers, antisense oligodeoxynucleotides (AS-ODN), Ribozymes, Peptide Nucleic Acids

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- Diagnostic and Therapeutic Antibodies (Methods in Molecular Medicine by Andrew J.T. George (Editor), Catherine E. Urch (Editor) Publisher: Humana Press; edition (August 15, 2000) ISBN-10: 0896037983
- Molecular Diagnosis of Infectious Diseases (Methods in Molecular Medicine) by Jochen Decker, U. Reischl Amazon Sales Rank: #287831 in Books
- Human Molecular Genetics by T. Strachan, Andrew Read Amazon Sales Rank
- Principles of Biostatistics by Marcello Pagano , Kimberlee Gauvreau
- Essentials of Epidemiology in Public Health, Second Edition by Ann Aschengrau, George R., III Seage
- Designing Clinical Research: An Epidemiologic Approach, by Stephen B. Hulley, Steven R. Cummings
- Journal articles and reviews

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NANO-MEDICINE AND TECHNOLOGIES

Course Code: SCT4206 **Credit Units: 03**

Course Objective:
Nanotechnology is the branch of biotechnology that utilizes nanomaterials for biological applications to develop novel solutions to different scientific and medical problems. Students will learn basic concepts, techniques and technologies and applications of nanomaterials for biotechnology and medical applications.

Course Contents:
Module I: Introduction to Nanotechnology
Historical perspective of the developments in the field of nanotechnology. Classification of nanostructured materials, physical environment regulations governing nanomaterials, and rules governing health and safety regulations for chemicals and nanomaterials.

Module II: Investigation and manipulation of nanomaterials
Principal and applications of electron microscope, scanning probe microscope, optical microscope, Fourier transform Infrared spectroscopy, X-ray photoelectron spectroscopy, and X-ray diffraction for nanoscience and technology.

Module III: Nanostructures for medicinal applications and toxicity
Introduction to nanomedicine and nanobiotechnology materials, their applications and therapeutic and commercial implications. Micro- and nanoscale control of cellular environment for tissue engineering. Nanoparticle contrast agents for molecular magnetic resonance imaging. Nano-material-based cancer therapeutics.

Module IV: Safety and regulatory issues associated with nanomaterials
Nanomaterials and toxicity evaluation: cytotoxicity, genotoxicity, in-vivo-tests and assays. Biological barriers to nanocarrier-mediated delivery of therapeutic and imaging agents.

Module V: Societal implications of nanoscience
From first industrial revolution to nano-revolution. Implications of nanoscience and nanotechnology for society, nano policies, nano arms race, public perception and public involvement in nano discourse. Harnessing nanotechnology for economical and social development

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:
Texts:

- Nanobiotechnology: Concepts, Applications and Perspectives by Christof M. Niemeyer and Chad A. Mirkin, First Wiely 2006, ISBN: 978-3-527-60591-0.
- Nanobiotechnology II: More Concepts and Applications by Chad A. Mirkin and Christofer M. ZNiemeyer, Wiely 2007, ISBN: 978-3-527-31673-1.
- Nano-The essentials- Understanding the nanoscience and technology by T. Pradeep, Tata McGraw-Hill Publishing Company Limited 2008, ISBN-10:0-07-154829-7/0071548297.

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FERMENTATION TECHNOLOGY AND ITS APPLICATIONS IN MOLECULAR MEDICINE

Course Code: SCT4207 **Credit Units: 03**

The course will educate students about use microorganism to produce various compounds of commercial interest. The student will be exposed to various techniques available for large scale cultivation of microorganisms.

Course Contents:

Module I
Introduction to fermentation process, Batch and Continuous production systems of cultivation, Solid-state fermentation process.

Module II
Selection of industrial microorganisms, media for fermentation, aeration, pH, temperature and other requirements during fermentation, downstream processing and product recovery, food industry waste as fermentation substrate.

Module III
Production of compounds like, antibiotics, enzymes, organic acids, solvents, beverages, SCP.

Module IV
Production of fermented dairy products

Module V
Immobilized enzymes systems, production and applications.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

- Principles of Fermentation Technology by P.F. Stanbury, A. Whitaker, and S.J. Hall, Aditya Books (P) LTD.
- Industrial Microbiology by L.E.Casida, JR. New Age International (P) LTD.
- Biotechnology, A Text book of Industrial Microbiology, W. Crueger and A. Crueger, Sinauer Association.

References:

- Practical Biochemistry, Principles & Techniques, Keith Wilson and John Walker
- Biochemical Engineering Fundamentals, J.E. Bailey and D.F. Ollis, McGraw-Hill
- Protein Purification, M.R. Ladisch, R.C. Wilson, C.C. Painton and S.E. Builder, American Chemical Society ***Text:***
- Industrial Microbiology – Cassida
- Principles of fermentation Technology, Salisbury, Whitaker and Hall
- Industrial microbiology – Prescot & Duhn.

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STEM CELL TECHNOLOGY LAB

Course Code: SCT4208 **Credit Units: 01**

Course Contents:

Module-I:
Stem cell isolation and characterization.

Module-II:
Generation of iPSC lines and characterization of their pluripotency profile and genome stability (Stem Cell Keryotype analysis).

Module-III:
Differentiation of iPSC into somatic cell lineages and characterization of stem cell-derived somatic cell populations.

Module-IV:
Functional characterization of stem cell-derived somatic cell populations.

Module-V:
Recent advances in stem cell therapeutics and stem cell-based drug discovery.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Text & References:

***Text*:**

- Stem Cell Biology, Daniel Marshak, Richard L. Gardener and David Gottlieb, Cold Spring Harbour Laboratory Press
- Stem cell biology and gene therapy, Booth C., Cell Biology International, Academic Press
- Stem Cell and Gene-Based Therapy: Frontiers in Regenerative Medicine, *Alexander Battler, Jonathan Leo,* Springer.

***References*:**

- Stem Cell Biology and Gene Therapy. Quesenberry PJ, Stein GS, eds. (£65.00.) Wiley, 1998.
- Progress in gene therapy, Volume 2,Pioneering stem cell/gene therapy trials, Roger Bertolotti, Keiya Ozawa and H. Kirk Hammond, VSP international science publishers
- Stem Cells Handbook: Stewart Sell, Humana Press; Totowa NJ, USA; Oct. 2003,
- Human Embryonic Stem Cells: The Practical Handbook by Stephen Sullivan and Chad A Cowan.

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NANO-MEDICINES AND TECHNOLOGIES LAB

Course Code: SCT4209 **Credit Units: 01**

Course Objective:
This course offers understanding of generation of nano particles, their characterization and applications.

Course Contents:

1. Demonstration about occupational health and safety (OHS) and workplace health and safety (WHS) in nanotechnology.
2. Preparation of aqua regia, its handling and role in washing glass-wares for metal nanoparticles sysnthesis.
3. Optimization of temperature for metal nanoparticle preparations using biological materials.
4. Synthesis of silver nanoparticles and analysis of their surface Plasmon resonance (SPR) properties.
5. Neem extract mediated silver nanoparticle synthesis and analysis of their optical properties.
6. Dye degradation using silver nanoparticles synthesized in experiments 4 and 5.
7. Preparation of metal oxide nanoparticles and their characterization.
8. Interactions of silver nanoparticles with red blood cells.
9. Interaction of silver nanoparticles with bacterium and their antimicrobial properties.
10. Preparation of nanoparticles containing polymeric films.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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FUNDAMENTAL IMMUNOLOGY-I LAB

Course Code: SCT4210 **Credit Units: 01**

Course Contents:

1. Blood film preparation and identification of cells.
2. Immuno-diffusion.
3. Hemagglutination, Agglutination inhibition.
4. Rocket immune-electrophoresis.
5. Western blotting, ELISA.
6. Epitope prediction using Immuno-informatics tool.
7. Isolation of Peripheral blood mononuclear cells.
8. Phenotype analysis.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Note: Minor variation could be there depending on the examiner

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BIOLOGICAL PROGRAMMING (BIOINFORMATICS)-II LAB

Course Code: SCT4211 **Credit Units: 01**

Course Contents:

Module I
Database creation using DDL and DML. Defining the primary and secondary keys.Implementation of selection, projection and joins (internal and external) with MySQL

Module II
Introduction to Linux Shell Programming, Running BioJava Scripts

Module III
Running BioPerl and BioPython Scripts

Module IV
Programming in R basic scripts

Module V
R/Bioconductor programming for DEGs, Visualization and annotation.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

Note: Minor variation could be there depending on the examiner

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CANCER BIOLOGY & CANCER THERAPEUTICS (T CELL AND ANTIBODY-BASED THERAPEUTICS)

Course Code: SCT4301 **Credit Units: 03**

Course Objective: The objective of this paper is to provide students greater understanding of different approaches for T cell-based and antibody-based cancer immunotherapy approaches.

Course Contents:

Module I

Biology and mechanism of cancer development. Chemotherapy, radiation therapy, immunotherapy of cancer.

Module II

History of Vaccine Development, Definition of Vaccine, Evolution of Vaccines, Process development for vaccines, Manufacturing of vaccines, Various aspects of vaccines, process development and manufacturing.

Module III

Clinical development of vaccines, Clinical end-point: Evolution of vaccines, General specifications and pharmaceuticals release criteria for the existing vaccines, Cold chain management of vaccines, Current vaccine research: Immune checkpoint strategies in cancer immunotherapy.

Module IV

Engineered anti-tumor immunity: T cell receptor (TCR) and chimeric antigen receptor technology development and TCR/CAR-engineered anti-tumor immunity.

Module V

Antibody-based cancer immunotherapy. Antibodies as drug carriers.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- Diagnostic and Therapeutic Antibodies (Methods in Molecular Medicine by Andrew J.T. George (Editor), Catherine E. Urch (Editor) Publisher: Humana Press; edition (August 15, 2000) ISBN-10: 0896037983
- Molecular Diagnosis of Infectious Diseases (Methods in Molecular Medicine) by Jochen Decker, U. Reischl Amazon Sales Rank: #287831 in Books
- Human Molecular Genetics by T. Strachan, Andrew Read Amazon Sales Rank
- Principles of Biostatistics by Marcello Pagano , Kimberlee Gauvreau
- Essentials of Epidemiology in Public Health, Second Edition by Ann Aschengrau, George R., III Seage
- Designing Clinical Research: An Epidemiologic Approach, by Stephen B. Hulley, Steven R. Cummings
- Journal articles and reviews

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VACCINES AND PRECLINICAL ANIMAL MODELS

Course Code: SCT4303 **Credit Units: 02**

Course Objective:
The application of Animal Biotechnology covers major areas related to commercial applications. Importance will also be given to areas like *in vitro* fertilization, animal cell and tissue culture, hormone vaccine and important enzyme production through animal biotechnology.

Course Contents:

Module I
Historical perspectives, sterilization methods, organ culture - culture techniques, plasma clot, raft methods, agar gel, grid method, organ engineering. Cell culture substrates, cultural media, natural and artificial media, initiation and maintenance of cell cultures, cell culture products, cryopreservation techniques, immobilized cultures

Module II
In vitro fertilization and embryo transfer

Module III
Somatic cell hybridization, hybridoma technology. Animal genetic engineering, vectors, gene transfer methods: microinjection, virus mediated and other methods of gene transfer

Module IV
Transgenic animals with new traits, transgenic animals as bioreactors for producing pharmaceutically important compounds and therapeutics. Animal models for cancer research.

Module V
Bioethical issues related to utilization of animals in ,

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References
- Cell Culture LabFAx, M. Butler and M. Dawson, Bios scientific Publications Ltd.
- Cell Growth and Division – A Practical approach, R. Basega, IRL Press
- Culture of Animal Cells, R.I Freshney, Wiley-Leiss
- Comprehensive Biotechnology, Moo-Young, Alan T. Bullm Howard Dalton, Panima Publication

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ETHICS OF BIOMEDICAL RESEARCH, INTELLECTUAL PROPERTY (IP), IP RIGHTS (IPR)

Course Code: SCT4306 **Credit Units: 02**

Course Objective

The aim of this course is to develop the understanding of relevance, business Impact and protection of Intellectual Property along with the types of Intellectual Property Rights: Patents, Trademarks, Copyrights, Industrial Designs, Geographical Indications and International Conventions, Biosafety and Bioethics

Course Contents

Module I: Basic Principles and Acquisition of Intellectual Property Rights

Basic Principles of Patent Law, Patent Application procedure, Drafting of a Patent Specification, Understanding Copyright Law, Basic Principles of Trade Mark and Design Rights, International Background of Intellectual Property

Module II: Ownership and Enforcement of Intellectual Property Rights

Patents-Objectives, Rights, Assignments, Defences in case of Infringement. Copyright-Objectives, Rights, Transfer of Copyright, work of employment Infringement, Defences for infringement. Trademarks-Objectives, Rights, Protection of goodwill, Infringement, Passing off, Defences. Designs-Objectives, Rights, Assignments, Infringements, Defences of Design Infringement, Enforcement of Intellectual Property Rights - Civil Remedies, Criminal Remedies, Border Security measures, Practical Aspects of Licensing - Benefits, Determinative factors, important clauses, licensing clauses.

Module III: Biotechnology and Intellectual Property Rights

Objective, Evolution, Basic Structure of Gene Techniques, Applications, Commercial Potential of Biotech Inventions, Rationale for Intellectual Property Protection. Patenting Biotechnology Inventions-Objective, Concept of Novelty, Concept of inventive step, Microorganisms, Moral Issues in Patenting Biotechnological inventions. Plant Varieties Protection-Objectives, Justification, International Position, Plant Varieties Protection in India Protection of Geographical Indications Objectives, Justification, International Position, Multilateral Treaties, National Level, Indian Position.

Module IV

Biosafety and Bioethics Management-Key to environmentally responsible use of biotechnology. Cartagena Protocol on Biosafety, Ethical implications of Biotechnological products and techniques. Biosafety: History, evolution and concept of biosafety; need and application of biosafety in laboratories and industries; biosafety guidelines and regulations, international and national norms of biosafety; Implementation of biosafety guidelines; Classification and Description of Biosafety levels. Good laboratory practice (GLP) and Good manufacturing practice (GMP), Use of GMO's and their release, GM products, issues in use of GMO's, risk for animal/human/agriculture and environment owing to GMOs. Bioethics: Introduction and need of bioethics, its relation with other branches, types of risk associated with genetically modified microorganisms, Ethical Issues involving GMOs; ethics related to human cloning, human genome project, prenatal diagnosis, agriculture and animal rights, data privacy of citizens health; ethical issues in India and abroad through case studies.

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Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text

- Intellectual Property Rights by Birgitte Anderson, Edward Elgar Publishing
- Intellectual Property Rights and the Life Science Industries by Graham Dutfield, Ashgate Publishing

References

- WIPO Intellectual Property Handbook
- Intellectual Property by William Rodelph Cornish, David Clewelyn
- Globalising Intellectual Property Rights by Duncan Matthews
- Journals and Current magazines

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PLANT BIOTECHNOLOGY AND ITS APPLICATIONS IN MOLECULAR MEDICINE

Course Code: SCT4307 **Credit Units: 02**

Course Objective:
The application of Plant Biotechnology covers major areas related to commercial applications. Regeneration of plants through *in vitro* techniques offers a practical strategy for micro propagation. Importance will also be given to areas like *in vitro* fertilization, animal cell and tissue culture, hormone vaccine and important enzyme production through animal biotechnology.

Course Contents:

Module I
Historical perspective of plant tissue culture.
Tissue culture lab and organization
Sterilisation techniques
Types of nutrient media and media composition
Plant regeneration pathways
Role of phytohormones
Cell culture techniques- cell, tissue, organ cultures, callus culture, suspension culture
Culture techniques Callus culture, cell culture and protoplast cultures.

Module II
Organogenesis and somatic embryogenesis.
Applications of plant tissue and cell culture.
Micropropagation, pathogen free plants. production haploids,
Somaclonal variation.preservation of germplasm.

Module III
Genetic engineering in plants, - transformation vectors
Gene transfer techniques-vector meditated and vector less gene transfer.
Transgenic plants transgene integration and expression

Module IV
Transgenic crop with new traits-herbicide tolerance, insect and disease resistance,
Therapeutic proteins and compounds
Oral vaccines
Production of secondary metabolites via tissue culture
Bioethics of plant genetic engineering.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

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Text & References:

- An Introduction to Plant Tissue Culture, M.K. Razdan, Oxford and IBH Publishing
- Experiments in Plant Tissue Culture, J.H. Dodds and L.K. Roberts, Cambridge University Press
- Plant Biotechnology and Transgenic Plants, K.M.O. Caldenty, W.H. Barz and H.L. Wills, Marcel Dekker
- Plant Biotechnology, J. Hammond, P.McGarvy and V. Yusibov, Springer Verlag.
- Plant Cell & Tissue Culture for the Production of Food Ingredients, T-J Fu, G. Singh and W.R. Curtis, Kluwer Adacemic/Plenum Press
- Plant Tissue Culture: Theory & Practice, S.S. Bhojwani and M.K. Razdan, Elsevier Health Sciences

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FUNDAMENTAL IMMUNOLOGY-II LAB

Course Code: SCT4308 **Credit Units: 01**

Course Contents:

Module I
Blood film preparation and identification of cells. Identification of blood groups.

Module II
Isolation of serum. Purification of lgG through affinity chromatography

Module III
Immunohistochemistry. Lymphoid organs and their microscopic organization.

Module IV
WIDAL Test

Module V
Radial Immuno-diffusion Test. Ouchterlony Double diffusion Test. DOT, Sandwich ELISA.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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GENOMICS & PROTEOMICS LAB

Course Code: SCT4309 **Credit Units: 01**

Course Contents:

Module I
Three dimensional Structures – In silico study – large molecular complexes RNA polymerase II, ribosome, unstructured proteins

Module II
Microarray and Microarray data analysis, DNA sequencing methods, next generation sequencing.

Module III
Comparison of two given genomes

Module IV
Inference of protein function from structure

Module V
Gene finding tools and Genome annotation.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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STEM CELL CULTURE LAB

Course Code: SCT4310 **Credit Units: 01**

Course Objective:
Students will learn methods for isolation, culture and maintenance of immune cells, for example T cell lines, human primary T cells and antigen presenting cells. Students will also learn nuances of antigen-specific immune response generation, antigen processing and presentation, cell phenotype analysis, cell proliferation, cell death and cytotoxicity assays.

Course Contents:

1. Culture of immortalized immune cell lines, for example Jurkat, T2-A2 etc.
2. Isolation of CD4 and CD8+ T cells from human peripheral blood.
3. Cell phenotype analysis, calculation of CD4:CD8 ratio in normal healthy individual blood.
4. Isolation and characterization of antigen presenting cells.
5. Activation of T cells by non-specific stimulus as well as by engaging their T cell receptor (TCR).
6. Cell proliferation assay.
8. Generation, and phenotypic and functional characterization of antigen-specific T cell response.
9. B cell culture and hybridoma technology.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	**Mid Term Viva**	**Attendance**	**Major Experiment**	**Minor Experiment/Spotting**	**Practical Record**	**Viva**
15	10	05	35	15	10	10

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SCIENTIFIC COMMUNICATION SKILL DEVELOPMENT (SEMINAR/ WORKSHOP)

Course Code: SCT4311 **Credit Units: 01**

Students will learn how to do literature search on a particular topic, how to construct, organize and deliver a scientific presentation.

Examination Scheme:

Literature Search/Project Report	50
Presentation	50
Total	**100**

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SUMMER INTERNSHIP EVALUATION

Course Code: SCT4335 **Credit Units: 03**

GUIDELINES FOR PROJECT FILE

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage.

The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

Methodology

The students will be sent to various industries and institutes where they will undergo short term training. After the completion of the training the students will be required to submit project report which shall then be evaluated by two internal examiners. The students will then have to appear for a Viva Voce examination to be conducted by an external evaluator at the end of the semester.

In general, the File should be comprehensive and include

- A short account of the activities that were undertaken as part of the project;
- A statement about the extent to which the project has achieved its stated goals.
- A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;
- Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project;
- Any problems that have arisen that may be useful to document for future reference.

Report Layout

The report should contain the following components:

➢ **Title or Cover Page**

The title page should contain the following information: Project Title; Student's Name; Course; Year; Supervisor's Name.

➢ **Acknowledgements** (optional)

Acknowledgment to any advisory or financial assistance received in the course of work may be given.

➢ **Abstract**

A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project

➢ **Table of Contents**

Titles and subtitles are to correspond exactly with those in the text.

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➢ **Introduction**

Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

➢ **Materials and Methods**

This section should aim at experimental designs, materials used. Methodology should be mentioned in details including modifications if any.

➢ **Results and Discussion**

Present results, discuss and compare these with those from other workers, etc. In writing these section, emphasis should be given on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in textbooks. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

Note that in writing the various sections, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations

should also be numbered and unless it is really necessary never write in "point" form.

➢ **Conclusion**

A conclusion should be the final section in which the outcome of the work is mentioned briefly.

➢ **Future prospects**

➢ **Appendices**

The Appendix contains material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

➢ **References / Bibliography**

This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Examples

For research article

Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichia coli* O157: H7. *Clin Microbiol Infec*, **8** (suppl 1): 116–117.

For book

Kowalski, M. (1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67

ASSESSMENT OF THE PROJECT FILE

Essentially, marking will be based on the following criteria: the quality of the report, the technical merit of the project and the project execution.

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Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project. Project execution is concerned with assessing how much work has been put in.
The File should fulfill the following ***assessment objectives:***

Range of Research Methods used to obtain information

Execution of Research
Data Analysis
Analyse Quantitative/ Qualitative information
Control Quality

Draw Conclusions

Examination Scheme:

Project Report	50
Viva Voce	50
Total	**100**

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TERM PAPER

Course Code: SCT4331 **Credit Units: 02**

METHODOLOGY

A term (or research) paper is primarily a record of intelligent reading in several sources on a particular subject.

The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned. The evaluation will be done by Board of examiners comprising of the faculties.

GUIDELINES FOR TERM PAPER

The procedure for writing a term paper may consists of the following steps:

- Choosing a subject
- Finding sources of materials
- Collecting the notes
- Outlining the paper
- Writing the first draft
- Editing & preparing the final paper

1. Choosing a Subject

The subject chosen should not be too general.

2. Finding Sources of materials

d) The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.

e) Begin by making a list of subject-headings under which you might expect the subject to be listed.

f) The sources could be books and magazines articles, news stories, periodicals, scientific journals etc.

3. Collecting the notes

Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.

d) Get facts, not just opinions. Compare the facts with author's conclusion.

e) In research studies, notice the methods and procedures, results & conclusions.

f) Check cross references.

4. Outlining the paper

c) Review notes to find main sub-divisions of the subject.

d) Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

5. Writing the first draft

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is. You may follow the following:

a) statement of purpose

b) main body of the paper

c) statement of summary and conclusion

Avoid short, bumpy sentences and long straggling sentences with more than one main ideas.

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6. Editing & Preparing the final Paper

g) Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/ details/ analyses of relevance to the question at hand. Sometimes, the relevance of a particular section may be clear to you but not to your readers. To avoid this, ensure you briefly explain the relevance of every section.

h) Read the paper to ensure that the language is not awkward, and that it "flows" properly.

i) Check for proper spelling, phrasing and sentence construction.

j) Check for proper form on footnotes, quotes, and punctuation.

k) Check to see that quotations serve one of the following purposes:

(iv) Show evidence of what an author has said.

(v) Avoid misrepresentation through restatement.

(vi) Save unnecessary writing when ideas have been well expressed by the original author.

l) Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:

- Title page
- Table of contents
- Introduction
- Review
- Discussion & Conclusion
- References
- Appendix

Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper.

Discussion

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.

Conclusion

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

- summary of question posed
- summary of findings
- summary of main limitations of the study at hand
- details of possibilities for related future research

References

From the very beginning of a research project, you should be careful to note all details of articles gathered.

The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.

The key to a good bibliography is consistency. Choose a particular convention and stick to this.

Bibliographical conventions

Monographs

Crystal, D. (2001), Language and the internet. Cambridge: Cambridge University Press.

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Edited Volumes
Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges to communication in a second language. Berlin/ NY: Mouton de Gruyter.
[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

Edited Articles
Schmidt, R./Shimura, A./Wang, Z./Jeong, H. (1996), Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea. In: Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges to communication in a second language. Berlin/ NY: Mouton de Gruyter: 285-316.

Journal Articles
McQuarrie, E.F./Mick, D.G. (1992), On resonance: A critical pluralistic inquiry into advertising rhetoric. Journal of consumer research 19, 180-197.

Electronic Book
Chandler, D. (1994), Semiotics for beginners [HTML document]. Retrieved [5.10.'01] from the World Wide Web, http://www.aber.ac.uk/media/Documents/S4B/.

Electronic Journal Articles
Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document]. German as a Foreign Language Journal [online] 1. Retrieved [12.09.'00] from the World Wide Web, http://www.gfl-journal.com/.

Other Websites
Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document]. Retrieved [13.10.'01] from the World Wide Web, http://olaf.hiof.no/~sverrev/eng.html.

Unpublished Papers
Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu.

Unpublished Theses/ Dissertations
Möhl, S. (1996), Alltagssituationen im interkulturellen Vergleich: Realisierung von Kritik und Ablehnung im Deutschen und Englischen. Unpublished MA thesis, University of Hamburg.
Walsh, R. (1995), Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language. Unpublished PhD dissertation, University College Dublin.

Appendix
The appendix should be used for data collected (e.g. questionnaires, transcripts,...) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

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Assessment Scheme:

Continuous Evaluation: (Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)	40%
Final Evaluation: (Based on the organization of the paper, objectives/ problem profile/ issue outlining, comprehensiveness of the research, flow of the idea/ ideas, relevance of material used/ presented, outcomes vs. objectives, presentation/ viva etc.)	60%

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PROJECT/ DISSERTATION

Course Code: SCT4437 **Credit Units: 18**

Course Objective:
The students are expected to utilize their scheduled periods by undertaking the project that would be completed during the semester

Every student shall undertake a major Project. The major Project shall be undertaken in some biotechnology industry or laboratory of repute. Each student shall be assigned to a faculty who shall continuously monitor the progress of the Project in the concerned laboratory or industry. The faculty, in consultation with the concerned scientist of the industry/laboratory, shall decide the topic of the project. At the conclusion of the project the student shall submit a seminar and a dissertation. The dissertation shall be evaluated by the internal faculty/examiner. The student then shall have to appear for the viva voce examination.

GUIDELINES FOR PROJECT FILE
Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage.

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In general, the File should be comprehensive and include
- A short account of the activities that were undertaken as part of the project;
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Report Layout
The report should contain the following components:

➢ **Title or Cover Page**
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➢ **Acknowledgements** (optional)
Acknowledgment to any advisory or financial assistance received in the course of work may

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be given.

➢ **Abstract**

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➢ **Table of Contents**

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Present results, discuss and compare these with those from other workers, etc. In writing these section, emphasis should be given on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

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➢ **Conclusion**

A conclusion should be the final section in which the outcome of the work is mentioned briefly.

➢ **Future prospects**

➢ **Appendices**

The Appendix contains material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

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This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

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For research article

Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita

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T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichia coli* O157: H7. *Clin Microbiol Infect*, 8 (suppl 1): 116–117.
For book
Kowalski, M.(1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67

ASSESSMENT OF THE PROJECT FILE

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Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project.

Project execution is concerned with assessing how much work has been put in.

The File should fulfill the following ***assessment objectives:***

Range of Research Methods used to obtain information

Execution of Research

Data Analysis

Analyse Quantitative/ Qualitative information

Control Quality

Draw Conclusions

Examination Scheme:

Dissertation:	50
Viva Voce:	50
Total:	**100**

ANALYSIS OF BUSINESS OF SCIENCE AND ALTERNATIVE

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CAREERS IN MOLECULAR MEDICINE & REGENERATIVE MEDICINE

Course Code: SCT4401 **Credit Units: 01**

Course Objective:
Students will be provided study material on business aspects of science/biotechnology. Material may include papers, articles, webinars etc.

Examination Scheme:
Assignment/Project/Viva: 100

INDUSTRY TRENDS AND CAMPUS RECRUITMENT EVENTS

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AND CAREER COUNSELING

Course Code: SCT4402 **Credit Units: 01**

Course Objective:
Students will be provided study material on Molecular Medicine and Stem Cell Technology Industry trends. Material may include papers, articles, webinars etc..

Examination Scheme:
Assignment/project: 100

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DIETETICS & NUTRITION

Programme Structure

Course Code	Course Title	Lectures (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits (15)
DAN2151	Principles of Nutrition	3	-	-	3
DAN2251	Family Meal Management	3	-	-	3
DAN2351	Basic Dietetics	2	-	2	3
DAN2451	Advanced Dietetics	2	-	2	3
DAN2551	Community Nutrition	3	-	-	3
DAN2651	Food Chemistry	3	-	-	3
	TOTAL				**18**

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DIETETICS & NUTRITION

Syllabus - Semester First

PRINCIPLES OF NUTRITION

Course Code: DAN2151 **Credit Units: 03**

Course Objective

This Course is designed to enable students

1. Understand the vital link between nutrition and health
2. Gain knowledge on functions, metabolism and effects of deficiency of nutrients

Course Contents:

Module -I

Nutrition - General introduction, Classification of nutrients, Functions of food, social function of food, psychological functions of food.

Energy - Definition of Kilocalories, Joule, energy value of foods, determination, physiological fuel values, SDA of foods, determination of energy requirements of body, basal metabolic rate determination, factors influencing BMR, Recommended Dietary Allowances for energy.

Carbohydrates - Classification, functions, source, digestion, absorption and utilization, dietary fiber and health.

Module -II

Protein - Classification, functions, sources and requirements, digestion, absorption and Utilization, Protein quality - Definition of biological value, NPU, digestibility coefficient, PER definition and measurement. Deficiency due to shortage of protein and energy – PCM, kwashiorkor. Reference protein, essential amino acids and mutual supplementation of dietary protein.

Fats and Lipids - Classification, functions, sources, requirement, digestion, absorption and utilization, importance of essential fatty acids, their requirements and deficiency.

Module -III

Vitamins – Fat soluble vitamins –A, D, E and K- functions, source, requirements, deficiency disorders. Water soluble vitamins –The B-complex vitamins – Thiamine, Riboflavin, Niacin, Folic acid, Biotin, Pantothenic acid and Vitamin C - functions, source, requirements and deficiency disorders.

Module -IV

Minerals - General functions in the body, classification- macro and micro minerals.

Micro minerals – Iron, Fluorine, Zinc, copper, Iodine -functions, absorption, utilization, requirements, deficiency and toxicity. Macro minerals – Calcium & phosphorus - functions, absorption, utilization, requirements, deficiency and toxicity.

Module -V

Water Balance – Functions of water, water distribution, maintenance of water and electrolyte balance, regulation of acid-base balance in the body.

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Examination Scheme:

Components	ATT	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

(ATT-Attendance; P-Project; HA-Home Assignment; CT-Class Test; EE-End Semester Examination)

Text and References:

- Essential of food & Nutrition –Vol. 1 M. Swaminathan, Bappco, Bangalore.
- Human Nutrition and Dietetics –Davidson S. Passmore
- Normal and Therapeutic Nutrition- Corinne .H.Robinson & Marilyn Lawler
- Contemporary Nutrition - Gordon M. Wardlaw, Paul Insel et, al., (2000) Mosby, Chicago.
- Nutrition- concepts and controversies- Eleanor Whitney –Eighth Edition (2000)
- Basic principles of Nutrition- Seema Yadav, First edition (1997)
- Essentials of Nutrition and Diet therapy -Sue Rodwell Williams, fifth edition, Times Mirror Mosby College Publishing, 1990.
- Understanding Nutrition -Whitney P.N. and Roes S.R., West Publication Co, 1996

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Syllabus - Semester Second

FAMILY MEAL MANAGEMENT

Course Code: DAN2251 **Credit Units: 03**

Course Objectives: To enable the students

1. Understand the nutritional demands in various stages of life cycle.
2. Acquire skills in planning adequate meals in different stages of life cycle.

Course Contents:

Module I

Basic Principles of Meal Planning - Basic meal pattern and its need to suit different income levels age and physiological stages. Recommended allowance-RDA for Indians, basis for requirement, energy allowance for different growth pattern of children, energy allowance for various activities.

Module II

Nutritional Needs during Pregnancy - Normal growth and weight change. Nutritional requirements, complications during various stages of pregnancy – hyper emesis gravid arum, preeclampsia and eclampsia and their management at family level.

Nutrition during Lactation - Function of breast, physiology of lactation, hormonal control and relaxation, Milk output and factors affecting it, frequency of nursing- supply and demand, nutritional components of colostrum and mature milk. Nutritional requirements of lactating women.

Module III

Nutrition during Infancy - Growth and development, factors influencing growth, Advantages of breast feeding, difference between breast feeding and bottle feeding, factors to be considered in bottle feeding. Different types of milk formulae.

Weaning Foods - Weaning foods and commercially prepared baby foods. Uses of growth chart to monitor growth & development. Nutritional requirements of infants' upto one year. Weaning foods developed by different organizations. Problems of feeding in normal and premature infants.

Module IV

Nutritional needs of pre-school children (1-5 year) - Nutritional and food requirements of preschool children. Factors to be considered while planning meals for pre-school children. Eating problems of children and their management, preparation of supplementary foods using available low cost foods.

Nutrition for School children - Nutritional requirement, meal planning for school children, dental caries and packed lunch.

Module-V

Nutrition during Adolescence - Physical Growth- changes and factors affecting height and weight, increments during menarche, Nutritional requirement. Nutritional problems in adolescence- Iron deficiency anemia, obesity , anorexia nervosa and bulimia nervosa.

Nutritional needs of adults (men and women) – Nutrition and work efficiency. Menopausal and post menopausal women, hormonal changes, nutritional requirement of the adult in relation to occupation.

Nutrition During Old Age - Physiological changes in ageing- psycho-social and economic factors affecting eating behavior. Nutritional problems of aged and their management.

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Examination Scheme:

Components	ATT	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

(ATT-Attendance; P-Project; HA-Home Assignment; CT-Class Test; EE-End Semester Examination)

Text and References :

- Nutrition Trends in India -Vinodhini Reddy, Prahlad Rao, Govmth Sastry and Kashinath, NIN, Hyderabad, 1993.
- Modern Nutrition in Health and Diseases- Shills, E.M. Olson, A.J. and Shike, Lea and Febiger
- Dietetics -B. Srilakshmi, New Age International Pvt. Ltd, 2003.
- NutritionScience-B.Srilakshmi,NewAgeInternationalPvt.Ltd., 2003.
- Food,nutrition and diet therapy -Krause, Eleventh edition
- Human Nutrition and Dietetics- Davidson S Passmore R, Brock JP, ELBS and Churchill, Livingstone.
- Fundamentals of foods and Nutrition - Mudambi SR and Rajagopal M Y, Wiley Eastern Ltd.
- ICMR- Nutritive value of Indian Foods, 1989.
- Nutrition throughout the life cycle, Bonnie S.Worthinton, Roberts, Sue Rod well Williams., TheMcGraw- Hill company,1996.
- Nutrition in the life span- Virginia Beal, John Wiley & sons New York.

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Syllabus - Semester Third

BASIC DIETETICS

Course Code: DAN2351 **Credit Units: 03**

Course Objectives:

- To understand the modifications in nutrients and dietary requirements for various diseases.
- To acquire the ability to plan and prepare diets for various diseases.

Course Contents:

Module I

1.Role of Dietician-hospital and community
2. Basic concepts in Diet Therapy
3. Therapeutic Adaptation of the normal diet
4. Routine Hospital Diets- Regular diet, light diet, soft diet, full liquid diet and tube feeding.
5. Modifications of Diet -Febrile conditions, infections & surgical conditions.

Module II

6. Diets of gastro intestinal disorders, renal diseases, liver diseases, obesity, cardio vascular disorders and diabetes mellitus.
7. Geriatrics - Role of diet.
8. Feeding infants & children - problems in feeding children in the hospital.
9. Feeding the patient - psychology of feeding the patient, assessment of patients needs.
10. Nutrition & Diet Clinics - Patients check up and dietary counseling, education of the patient and follow up.

Examination Scheme:

Components	ATT	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

(ATT-Attendance; P-Project; HA-Home Assignment; CT-Class Test; EE-End Semester Examination)

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Syllabus - Semester Fourth

ADVANCED DIETETICS

Course Code: DAN2451 **Credit Units: 03**

Course Objectives: To enable students

1. Gain knowledge about principles of diet therapy and different therapeutic diets.
2. Develop aptitude for taking up dietetics as a profession.

Course Contents:

Module-I

Objectives of diet therapy - Role of a dietitian. Principles of diet preparation and counselling.
Normal diet in the hospitals –regular diet, liquid ,semi liquid, light , soft diet, and bland diet.
Different types of Feeding - Basic concepts of oral feeding, tube feeding, IV feeding, gastrostomy feeding.

Module-II

Therapeutic diets for the following disorders:

a. Under weight - definition, etiology, treatment
b. Obesity - definition, etiology, treatment.
c. Diseases of the gastro intestinal tract-Peptic ulcer and duodenal ulcer, Dumping syndrome, constipation
d. Acute and chronic diarrhea -rehydration therapy.

Module-III

Diseases of the liver and gall bladder (risk factors and diet therapy)
a) jaundice b) hepatitis c) cirrhosis d) fatty liver and diet therapy
Diseases of the cardio vascular system (risk factors and diet therapy)
a) atherosclerosis b) arteriosclerosis c) hypertension d) congestive heart failure

Module-IV

Diabetes mellitus – causes, symptoms, bio-chemical changes, insulin, hypo- glycemic drugs, changes in the metabolism of carbohydrate, fat and protein, food exchange list, dietary management
Diseases of the kidney and urinary tract
a. Acute and chronic nephritis
b. Nephrotic syndrome
c. Renal failure
d. Urinary calculi
e. Uremia
Causes and dietary treatment of kidney diseases and dialysis.
Nutrition and cancer - Dietary guidelines for management.

Module-V

Diet in Allergy - Definition, classification, common food allergy, test of allergy, diet therapy. Pre operative and post operative diets.
Diet in febrile conditions - Short duration e.g. Typhoid, Long duration e.g. Tuberculosis. Dietetic management of gout and phenyl ketonuria.
Diet in relation to deficiency diseases-Protein calorie deficiency, vitamin A deficiency and anemia.

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Examination Scheme:

Components	ATT	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

(ATT-Attendance; P-Project; HA-Home Assignment; CT-Class Test; EE-End Semester Examination)

Text and References:

- Krause and Mahan – Food ,Nutrition and Diet therapy, 6th Edition W.B. Saunders company, London
- Normal and therapeutic nutrition –17th Edition, Robinson et. al ., Mac Millan Pub.Co., New York
- ICMR(1989) Nutrient Requirements and recommended dietary allowances for Indians.
- Antia FP (1987) Clinical Dietetics and Nutriton, Oxford University Press, New Delhi
- Srilakshmi (2002) Dietetics, IVth Edition. New Age International (P) Limited, Publishers, New Delhi
- Shubhangini. A. Joshi (2002) Nutrition and dietetics, Tata Mc Graw- Hill publishing company limited, New Delhi.
- B. Srilakshmi (2002) Nutrition science, New age international (P) limited, New Delhi
- Carolynn E.Town send and Ruth A. Roth (2002) Nutrition and Diet Therapy, Delmar
- publisher
- Sue rod Williams, Nutrition and diet Therapy, Times Mirror Mosby College
- publishing, Boston, 1989.
- The Indian journal of nutrition and dietetics, Avinashilingam Deemed University, Coimbatore

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Syllabus - Semester Fifth

COMMUNITY NUTRITION

Course Code: DAN2551 **Credit Units: 03**

Course Objectives: To enable the students

1. Know about the application of basics of nutrition in the community
2. Gain knowledge of community nutrition programmes of national and international organization

Course Contents :

Module-I

Definition - Community, family, village and block

Meaning of Optimum Nutrition, Malnutrition- Under nutrition and over nutrition..

Characteristics of community- Demography, Vital statistics, IMR, MMR, morbidity. Causes of **malnutrition**-Factors contributing to malnutrition in the community - food habits, customs and practices, availability of food, Socio-economic factors, Housing and hygienic conditions, population explosion.

Module-II

Assessment of the nutritional status of the community -direct and indirect methods - Anthropometry, Clinical and Biochemical, Diet Surveys.

Nutritional problems of women and men- Anemia, Vitamin A deficiency, B-complex deficiency.

Nutritional problems of infants and children- PEM-Marasmus and Kwashiorkor, Vitamin A deficiency, B-complex deficiency diseases, anemia-incidence, prevalence, epidemiology and prevention , other problems- Goitre, fluorosis and Lathyrism- prevalence, causes and symptoms and programmes to control.

Module-III

Nutrition intervention programmes - ICDS: Objectives and services, Noon meal programme, TINP, SNP, Vitamin A prophylaxis.

National Organization- Role of ICMR, NIN, NNMB & ICAR

International organization- WHO, FAO , UNICEF, DANIDA & World Bank.

Module-IV

Home Science- Meaning and Objectives. Role of Home-Scientists in rural development-with reference to ongoing programmers like Family Welfare Programme, Adult Education for community-different methods, advantages and disadvantages. Nutrition education- merits and demerits of different methods, Concept of nutrition garden.

Module-V

Communication- Principles, methods and classification. Advantages and limitations of different methods.

Audio-visual aids- Types, advantages and limitations.

Health care- delivery, challenges & strategies. Set up of PHC, school health services and employees state insurance.

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Examination Scheme:

Components	ATT	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

(ATT-Attendance; P-Project; HA-Home Assignment; CT-Class Test; EE-End Semester Examination)

Text and References:

- Jellife DN, Assessment of Nutritional Status of the community.
- Ritchie JA, Teaching Nutrition FAO, 1979.
- Rajalakshmi R, Applied Nutrition, Oxford and JBH Publishers, 1981.
- Devadas RF, Nutrition in Tamil Nadu, Sanfam Publishers, Madras, 1972.
- Mc.Laren S, Nutrition and the community, John Wiley & Sons, 1982.
- Reddy AA, Extension Education, Srilakshmi Press, Baptla, 1971.
- Dahama OP and Bhatnagar OP Eucation and Communication for development.Oxford IBH Publishing Co.,1980.
- Savile AH, Extension in rural communities, Oxford University Press,1965.
- Nutrition Science, Srilakshmi (2001).
- Nutritional problem in India-PK Shukla,Prentice Hall, India.
- Foundations of community Health Education, Mc Graw Hill,London.

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Syllabus - Semester Sixth

FOOD CHEMISTRY

Course Code: DAN2651 **Credit Units: 03**

Course Contents:

Module-I

Study of various cooking methods - Boiling, steaming, stewing, frying, baking, roasting , broiling, cooking under pressure. Stages of sugar cookery, crystallization and factors affecting crystallization.

Module-II

Cereals - Structure, composition of rice, wheat, effects of cooking on parboiled and raw rice, principles of starch cookery, gelatinization, flours-types, formation of dough and batter

Pulses and Legumes – Varieties of pulses & legumes, composition, nutritive value, cooking quality of pulses, germination and its effect.

Module III

Vegetables - Classification, composition, nutritive value, selection and preparation for cooking

Fruits - Classification, composition, nutritive value, changes during ripening, methods and effects of cooking, enzymatic browning

Module IV

Milk - Composition, nutritive value, kinds of milk, pasteurization and homogenization of milk, changes in milk during heat processing, preparation of cheese and milk powder.

Module V

Egg - Structure, composition, selection, nutritive value, uses of egg in cookery

Fleshy foods - meat structure, composition, nutritive value, selection of meat, post mortem changes in meat, aging, methods of cooking meat

a)Poultry – types, composition, nutritive value, selection

b)Fish - Structure, composition, nutritive value selection of fish

Module VI

Fats and Oils - Types of oils, function of fats and oils, shortening effects of oil, smoking point of oil

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

Texts & References:

- Food Science, Chemistry and Experimental Foods by M. Swaminathan.
- Food Science by Norman.N.Potter.
- Experimental Study of Foods by Griswold R.M.
- Food Science by Helen Charley.
- Foundation of Food Preparation by A.G. Peckam.
- Modern Cookery for teaching and trade, volume I&II ,Thangam Philip. OrientLongmans Ltd.
- Food Fundamentals by MacWiliams, John Willy and son's, New York.
- Food Facts & Principles by Shakunthala manay & Shadakhraswamy.
- Food Science by Srilakshmi , second edition,2002.

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STEM CELL TECHNOLOGY

Programme Structure-2018

Course Code	Course Title	Lecture (L) Hours /Week	Tutorial (T) Hours /Week	Total Credits
SCT2151	Introduction to Stem Cell Technology	3	-	3
SCT2251	Fundamental Human Embryology & Developmental Biology	3	-	3
SCT2351	Fundamental Cell Biology and Human Anatomy & Physiology	3	-	3
SCT2451	Human Pluripotent Stem Cell Culture & Differentiation Methods	3	-	3
SCT2551	Therapeutic Applications of Human Pluripotent Stem Cells	3	-	3
SCT2651	Project & Paper Presentation	-	-	3
	TOTAL			**18**

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STEM CELL TECHNOLOGY

Syllabus - Semester First

INTRODUCTION TO STEM CELL TECHNOLOGY

Course Code: SCT2151 **Credit Units: 03**

Course Objective: The objective of this paper is to familiarize the students with stem cell technology and its applications for betterment of the society. The course is designed to give a broad view of mammalian stem cells, reviewing where they are found in the body, the different types and how they are cultured. The topics will cover the basic biology of these stem cells as well as bioengineering and application of these stem cells to potential treatments of human diseases.

Course Contents:

Module I: Introduction to stem cells
Definition, properties, proliferation, culture of stem cells, medical applications of stem cells, ethical and legal issues in use of stem cells.

Module II: Types of stem cells.
Stem Cell biology and therapy, types embryonic stem cell, Adult stem cell, Stem Cell Biology and Therapy, Embryonic Stem Cells, culture and the potential benefits of stem cell technology

Module III: Therapeutic applications of stem cells
Gene Therapy: Introduction, History and evolution of Gene therapy, optimal disease targets, Failures and successes with gene therapy and future prospects,Genetic Perspectives for Gene Therapy, **Gene Delivery** methods: Viral vectors and Non-viral Vectors

Module IV: Ethical Issues associated with stem cell-based regenerative medicine field
Regulatory and Ethical Considerations of stem cell and Gene Therapy, Assessing Human Stem Cell Safety, Use of Genetically Modified Stem Cells in Experimental Gene Therapies.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

***Text*:**

- Stem Cell Biology, Daniel Marshak, Richard L. Gardener and David Gottlieb, Cold Spring Harbour Laboratory Press
- Stem cell biology and gene therapy, Booth C., Cell Biology International, Academic Press
- Stem Cell and Gene-Based Therapy: Frontiers in Regenerative Medicine, *Alexander Battler, Jonathan Leo*, Springer,

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***References*:**

- Stem Cell Biology and Gene Therapy. Quesenberry PJ, Stein GS, eds. (£65.00.) Wiley, 1998.
- Progress in gene therapy, Volume 2,Pioneering stem cell/gene therapy trials, Roger Bertolotti, Keiya Ozawa and H. Kirk Hammond, VSP international science publishers
- Stem Cells Handbook: Stewart Sell, Humana Press; Totowa NJ, USA; Oct. 2003,
- Human Embryonic Stem Cells: The Practical Handbook by Stephen Sullivan and Chad A Cowan.

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Syllabus - Semester Second

FUNDAMENTAL HUMAN EMBRYOLOGY AND DEVELOPMENTAL BIOLOGY

Course Code: SCT2251 **Credit Units: 03**

Course Objective: The objective of this course is to familiarize students with fundamental process of human embryology and developmental biology and progression of pluripotent stem cells through different phases of development.

Course Contents:

Module-I: Basics principles of human embryogenesis--gametogenesis, fertilization and embryo development.

Module-II:

Ectoderm, mesoderm and endoderm development and process of organogenesis during human development.

Module-III:

Molecular regulation of embryogenesis and organogenesis processes during human development.

Module-IV:

Different types of stem cells, process and mechanism of stem cell subset development and their spatial organization during human development.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

***Text*:**

- Human embryology and developmental biology 5th Edition by Bruce M. Carson.
- Larsen's Human Embryology (Schoenwolf,Larsen's Human Embryology) 4th Edition
- Atlas of Human Anatomy (Netter Basic Science) 7th Edition
- Developmental Biology, S.F. Gilbert, Sinauer Associates Inc.
- Gray's Anatomy for Students 3rd Edition by Richard Drake, Wayne Vogl and Adam W. M. Mitchell.

***References*:**

- The Developing Human: Clinically Oriented Embryology 10th Edition by Keith L. Moore, T. V. N. Persaud MD and Mark G. Torchia.
- Developmental Biology, Tenth Edition 11th Edition by Scott F. Gilbert.
- Molecular Developmental Biology 2nd Edition by T. Subramoniam.

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Syllabus - Semester Third

FUNDAMENTAL CELL BIOLOGY, HUMAN ANATOMY AND PHYSIOLOGY

Course Code: SCT2351 **Credit Units: 03**

Course Objective: The objective of this course is to familiarize students with basic organization of adult somatic cells, human anatomoy and normal physiology. Students will learn basic principles and mechanisms that dictate maintenance of pluripotency in pluripotent stem cells and their differentiation into adult stem cells, somatic cells, tissues and organs.

Course Contents:

Module-I:

Cell anatomy, organizational components, cell division mechanisms in normal adult cells and in pluripotent stem cells.

Module-II:

Introduction to epigenetics and its role in maintenance of pluripotency and differentiation of pluripotent stem cells into different somatic cell lineages.

Module-III:

Basics of Human anatomy & physiology and role of pluripotent stem cells and adult stem cells in maintenance of normal

Module-IV:

Effect of breach in normal cellular physiology and hoemostasis on human development.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

***Text*:**

- Molecular Biology of the Cell. B. Alberts, D. Bray, J. Lewis, M. Raff, K. Roberts and J.D. Watson, Garland Publishing
- Cell Biology, Thomas D. Pollard MD
- Atlas of Human Anatomy (Netter Basic Science) 7th Edition
- Gray's Anatomy for Students 3rd Edition by Richard Drake, Wayne Vogl and Adam W. M. Mitchell.

***References*:**

- The Developing Human: Clinically Oriented Embryology 10th Edition by Keith L. Moore, T. V. N. Persaud MD and Mark G. Torchia.
- Gene VIII, Benjamin Lewin 2005, Oxford University Press
- Cell and Molecular Biology, Gerald Karp, John Wiley and Sons Inc.
- Cell and Molecular Biology, DeRobertis, B.I. Publication Pvt. Ltd.

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Syllabus - Semester Fourth

HUMAN PLURIPOTENT STEM CELL CULTURE & DIFFERENTIATION METHODS

Course Code: SCT2451 **Credit Units: 03**

Course Objective: The objective of this paper is to provide students greater understanding of different types of stem cells.

Course Contents:

Module-I:

Isolation of human Embryonic stem cells, generation of human induced pluripotent stem cells. History of human pluripotent stem cell development.

Module-II:

Methodologies for pluripotent stem cell culture, characterization of pluripotency and differentiation into different lineages.

Module-III:

Methods to engineer pluripotent stem cells for treatment of genetically impaired conditions/diseases.

Module-IV:

Ethical and regulatory issues affective pluripotent stem cell-based cell replacement therapies. Technological challenges towards development of pluripotent stem cell-based cell replacement therapies.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- Human Pluripotent Stem Cells: Methods and Protocols (Methods in Molecular Biology) 2011th Edition by Philip H. Schwartz (Editor), Robin L. Wesselschmidt.
- Atlas of Human Pluripotent Stem Cells: Derivation and Culturing (Stem Cell Biology and Regenerative Medicine) 2011 by Michal Amit and Joseph Itskovitz-Eldor.
- Stem Cell and Gene-Based Therapy: Frontiers in Regenerative Medicine, *Alexander Battler, Jonathan Leo,* Springer,

References:

- Stem Cell Biology, Daniel Marshak, Richard L. Gardener and David Gottlieb, Cold Spring Harbour Laboratory Press
- Stem cell biology and gene therapy, Booth C., Cell Biology International, Academic Press

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Syllabus - Semester Fifth

THERAPEUTIC APPLICATIONS OF HUMAN PLURIPOTENT STEM CELLS

Course Code: SCT2551 **Credit Units: 03**

Course Objective: The objective of this paper is to familiarize students with different therapeutic areas that can benefit with pluripotent stem cell-based cell replacement therapies.

Course Contents:

Module-I:

Principles of cell replacement therapy and application of pluripotent stem cells in cell replacement therapy.

Module-II:

Application of pluripotent stem cells in neuronal disease management and treatment.

Module-III:

Application of pluripotent stem cells in ocular and cardiovascular diseases management and treatment.

Module-IV:

Application of pluripotent stem cells in treatment of autoimmune complications and cancer management and treatment.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

***Text*:**

- Frontiers in Pluripotent Stem Cells Research and Therapeutic Potentials Bench-To-Bedside, 2018**,** by Kuldip S. Sidhu.
- Patient-Specific Induced Pluripotent Stem Cell Models: Generation and Characterization (Methods in Molecular Biology) 1st ed. by Andras Nagy (Editor) and Kursad Turksen (Editor)
- Stem Cell and Gene-Based Therapy: Frontiers in Regenerative Medicine, *Alexander Battler, Jonathan Leo,* Springer.

***References*:**

- Stem Cell Biology and Gene Therapy. Quesenberry PJ, Stein GS, eds. (£65.00.) Wiley, 1998.
- Stem Cells Handbook: Stewart Sell, Humana Press; Totowa NJ, USA; Oct. 2003.
- Frontiers in Pluripotent Stem Cells Research and Therapeutic Potentials Bench-To-Bedside, 2018**,** by Kuldip S. Sidhu.

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Syllabus - Semester Sixth

PROJECT & PAPER PRESENTATION

Course Code: SCT2651 **Credit Units: 03**

Course Objective: The objective of this course is to help students acquire scientific skills to formulate research hypothesis and design research projects to test those hypotheses. The course will also help students to acquire/improve research presentation skills.

Course Contents:

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	-	-	100	-

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HOSPITAL ADMINISTRATION

Discipline	Course Code	Name of Course	Type (Major/ Minor)	Semester	Total Credits
Hospital Administration	DMHA2151	Introduction to Hospital Management	Major/ Minor	1	4
Hospital Administration	DMHA2251	Essentials of Healthcare System	Major/ Minor	2	4
Hospital Administration	DMHA2351	Basic Epidemiology	Major/ Minor	3	4
Hospital Administration	DMHA2451	Introduction to Healthcare Economics	Major/ Minor	4	4
Hospital Administration	DMHA2551	Basics of Quality Management	Major/ Minor	5	4
Hospital Administration	DMHA2501	Introduction to Medical & Health Laws	Major	5	4
Hospital Administration	DMHA2651	Basics of Hospital Management Information System	Major/ Minor	6	4
Hospital Administration	DMHA2601	Introduction to Health Insurance and Medical Tourism	Major	6	4
Hospital Administration	DMHA2602	Basics of Disaster Management	Major	6	4

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INTRODUCTION TO HOSPITAL MANAGEMENT

Course Code: DMHA2151 **Credit Units: 04**

Course Objective:
To help the students gain understanding of the functions and responsibilities of the manager and to provide the student understand Human Behaviour in organizations so as to improve his managerial effectiveness.

Course Contents:

Module I: Management Process
Evaluation of Management thought and function of Management, roles and skills of a Manager, Emerging challenges of Management.

Module II: Fundamentals of Organizational Behavior
Nature and Structure of Organization, Types of Organization Line and Staff relationships, Formal and Informal Organizations.

Module III: Individual Behavior
Overview of Organization Behavior and its Importance, Organization Models.

Module IV: Foundations of Group Behavior
Individual Behavior, Perception and Learning, Personality, Values & Attitudes, Motivation: Concept Theory and application

Module V: Conflict Management
Group Dynamics, Communication, Leadership, Power and Politics, Conflicts and Negotiation.

Module VI: Organizational Change and Stress Management & Social responsibilities of management
Organizational Culture, Organizational Change and Development, Work Stress and its Management. Management and Society, Culture and management, management ethics, social objectives and responsibilities of management.

Module VII: Hospital as an Organization
History and development of hospitals, Definition, types, control, role and functions. Roles and functions of Hospital Administration, Profile of Hospital Administrator, Role of HA in education and research.

Examination Scheme:

Components	CP	V	A	ME	EE
Weightage (%)	5	5	5	15	70

Text &References:

- McGibbony, *Hospital Organization &Managemen.*
- *Hospital administration & management Theory* and Practice R Kumar, S.L. Goel
- Luthans, F. (2005), Organizational Behaviour, McGraw – Hill International Edition.
- Robbins, S.P. (2005), Organizational Behaviour, Eleventh Edition, Prentice Hall of India.
- Greenberg, J. & Baron, R.A. (2005), Behaviour in Organizations, Pearson Education.

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- Newstrom John W. and Davis Keith, (1993), Organizational Behaviour: Human Behaviour at Work, Tata McGraw Hill, New Delhi
- P. SubbaRao (2010), Management and Organisation and Behaviour, Himalaya Publishing House, New Delhi
- Pierce Gardner with Dunham (2011)Managing Organizational Behaviour. Cengage Learning India.

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ESSENTIALS OF HEALTHCARE SYSTEM

Course Code: DMHA2251 **Credit Units: 04**

Course Objective: To provide the students a basic insight into the main features of Indian health care delivery system and how it compares with the other systems of the world.

Course Contents:

Module I: Health and Development
Concept of Health, illness, sickness and disease; Public health Indicators, Health and its determinants, Disease Burden in terms of DALY, Social context of Health – Culture, health belief model and social issues affecting health like urbanization etc; Gender and health, Nutrition and Health, Nutritional Transition.

Module II: Healthcare Systems
Evolution of Health Planning in India, Concept and Elements of Primary Health Care, Rural Healthcare system in India – Structure & Current Scenario, Indian Public Health Standards, Organization and Management of Public Healthcare System, Issues in healthcare delivery system,

Module III: Health Policies and Schemes
Millennium development goals, National Health Policy, Integrated Child Development Scheme, Health Sector Reforms, Mid-Day Meal Program.

Module IV: National Health Progrmmes
Management and Implementation of National Health Programmes– Revised National Tuberculosis Control Programme, National AIDS control Programme, National programme for Control of Blindness, Vector Borne Diseases Control Programme, National Leprosy Eradication Programme, National Cancer Control Programme, National Diabetes Control Programme and National Mental Health Programme.

Examination Scheme:

Components	CP	V	A	ME	EE
Weightage (%)	5	5	5	15	70

Text & References:

- K Park, *Preventive and Social Medicine,* BansaridasBhanot Publishing House.
- Brijesh C Purohit. *Health Care System in India***:** *Towards Measuring Efficiency in Delivery of Services*.
- Maxcy-Rosenau-Last, *Public Health & Preventive Medicine,* 14th Edition Ed Robert Wallace.

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BASIC EPIDEMIOLOGY

Course Code: DMHA2351 **Credit Units: 04**

Course Objective
To provide an introduction to the basic concepts and methods of epidemiology and to highlight inter-relationship between epidemiology and medicine to understand evidence based medicine.

Course Contents
Module I: Introduction

Concepts and uses of epidemiology, Components of epidemiological studies – frequency distribution and determinants of diseases, Methods to measure and describe health of population, epidemiological triad.

Module II: Descriptive epidemiology

Natural history of disease, Disease spectrum, Modes of transmission, Levels of prevention. Epidemiological principles of Intervention in prevention and control of disease,

Module III: Measurement Methods

Measurement of morbidity and mortality, incidence, prevalence, age adjustment, standardization and Risk Measurement.

Module IV: Study designs Basics

- Epidemiological study designs and analysis, its application and use in the community.
- Case control and Cohort methods.

Examination Scheme:

Components	CP	V	A	ME	EE
Weightage (%)	5	5	5	15	70

Texts& References:

- Gordis Leon *Epidemiology* (3rd edition) ,W B Saunders and Co.
- Beaglehole. R. Bonita, et. al *Basic Epidemiology* : WHO Publication
- David E., et. al. *Foundations of Epidemiology* : Oxford University Press.
- Katz Mitchell: *Study Design and Statistical Analysis*: A Practical Guide for Clinicians
- Last, J.M., Spasoff, R.A. Harris, S. S. and Thuriaux, M.C. (Eds): *A Dictionary of Epidemiology*, Oxford University Press, 4th Ed., 2001.
- Mayer Dan, *Essential Evidence-Based Medicine Series: Essential Medical Texts for Students and Trainees*
- Silman and McFarland: *Epidemiological Studies- A Practical Guide*, 2nd Edition
- Timmreck Thomas C: *An Introduction to Epidemiology*, Third Edition 2002.

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INTRODUCTION TO HEALTHCARE ECONOMICS

Course Code: DMHA2451 **Credit Units: 04**

Course Objective: To study principles of economics and its application in Hospitals.

Course Contents:

Module I: Nature and scope of Economics
Fundamental Concepts –Scarcity & Choice, Macroeconomics & Microeconomics, Economic Agents – Consumer, Producer & government, Market – Free market mechanism and chained Market Mechanism.

Module II: Demand and Supply Market
Law of Demand, Shift in Demand Curve, Law of Supply, Shift in Supply curve, Market Equilibrium, Concept of elasticity – Price elasticity of Demand & Supply.

Module III: Healthcare Market
- Market Failure: Imperfect competition, Risk & uncertainty, Moral Hazard, Adverse selection, Externalities, Public Good, Asymmetric Information and concern of Equity. Market of unqualified medical care providers.
- Demand for Healthcare: Need, Want & demand, Healthcare as an investment, Determinants of demand – Price factors (opportunity cost), Patient factors & Physician factors – Supplier Induced Demand; Insurance and demand for healthcare.

Module IV: Costs
Classification of costs on the basis of traceability, cost behavior, controllability and selection among alternatives; Total, Average and Marginal costs.

Examination Scheme:

Components	CP	V	A	ME	EE
Weightage (%)	5	5	5	15	70

Text & References:

- Ceri J Phillips. *Health Economics- An introduction for health professionals*, Blackwell publishing.
- Clewer Ann and D Perkins. *Economics for healthcare management*, Prentice Hall.
- Folland S, A.C. Goodman, and M. Stano, *The economics of health & Healthcare*, Prentice Hall

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BASICS OF QUALITY MANAGEMENT

Course Code: DMHA2551 **Credit Units: 04**

Course Objective:
To understand the concept of quality and its relation to healthcare scenario.

Course Contents:

Module I: Basics of Quality Management
Definitions, principles of quality, benefits of quality management, dimensions of quality in primary healthcare and various quality frameworks

Module II: Quality Improvement Approaches
- Quality Assurance cycle and developing standards.
- TQM Quality Gurus: Deming, Juranand Crosby principles.
- Benchmarking: Principles, types and process of benchmarking
- Medical Audit: Clinical Audit, its methodology and related statistics.

Module III: Quality Improvement Tools and techniques:
- Tools: Brainstorming, Cause effect Analysis, Flow chart, Pareto Analysis, etc
- Lean Management: 4P model, Lean principles and its tools - 5 S technique, 3 M technique, Kaizen's theory, Jidoka&Andon, Throughput &Takt Time.
- Six Sigma: Variations in performance, DMAIC & DFSS methodology, Champions, black belts and green belts, Six sigma applications and its benefits.

Module IV: Accreditation
Benefits of Hospital Accreditation, ISO certification, Quality Council of India (QCI), National Accreditation Board for Hospitals & Healthcare Providers (NABH) – accreditation procedure, assessment criteria and its standards; and Joint Commission International (JCI)

Module V: Cost and Quality
Prevention cost, Appraisal Cost, Internal & External failure costs, Net & Total cost of quality.

Examination Scheme:

Components	CP	V	A	ME	EE
Weightage (%)	5	5	5	15	70

Text & References:

- *Quality Management in Hospitals* by S. K. Joshi
- *Total Quality Management* – Aswathappa – Himalaya Books House
- *Quality Management* – P. C. Tripathy
- *Hospital Quality Assurance: Risk Management & Program evaluation*, Jesus J. Pena
- Donald E. Lighter and Douglas C Fair: *Quality Management in Health Care – Principles and Methods*, Jones and Bartlett publishers, second edition.
- Daigh RD. *Financial implications of a quality improvement process.*
- McLaughlin CP and Kalauzny AD. *Total quality management in health*, Healthcare management review.

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INTRODUCTION TO MEDICAL & HEALTH LAWS

Course Code: DMHA2501 **Credit Units: 04**

Course Objectives:
To acquaint the students with various legal aspects concerning type and character of the health care organizations and its duties towards patients and its employees.
To familiarize the students in matters of liability of hospital medical negligence and medical malpractice in diagnosis, administration of drugs, surgery etc.

Course Contents:
Module I: Introduction
Law pertaining to establishment of hospitals andlegal requirements under Medical Council Acts.

Module II: Hospitals as an Industry
Basic concepts of labour laws in India, Hospitals as an 'industry' - application of labour enactments, Discipline in hospitals and Trade union act

Module III: Hospital's duties towards Patients
Essentials of Contractual obligations in hospital services, duties towards patients, Rights of patients and Code of ethics.

Module IV: Acts pertaining to Hospitals
Legal aspects relating to Organ transplantation, MTP Act 1971, Basics of Drugs and Cosmetic Acts, Euthanasia. ESI Act, PNDT Act, Human experimentation, Clinical trials, Industrial dispute Act, Central Births & Death Registration Act.

Module V: Legal liabilities of Hospitals
Legal liability of hospitals - criminal, civil and tortuous; Absolute liability and vicarious liability, Medical negligence, Legal remedies available to patients under contract law, tort, criminal law, Consumer protection Actand Medical Jurisprudence.

Module VI: Medical ethics, CPA & Auditory procedures
- Consumer protection act, Autopsy, Use of investigational drugs, Introduction/need & procedures for medical audit, Audit administration & Regulating committees.
- Confidentiality and professional secrecy, ethics of trust and ethics of rights – autonomy and informed consent,
- Medical ethics – basic issues, importance, process of developing and implementing ethics and values in an institution – codes of conduct: Hippocrates oath and declaration of Geneva – MCI regulation – professional conduct, etiquette and ethics.

Examination Scheme:

Components	CP	V	A	ME	EE
Weightage (%)	5	5	5	15	70

Text & References:
- *Medico-legal Aspects of Patient Care*, 3rd Edition, R. C. Sharma, Peepee Publishers & Distributers-2008

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BASICS OF HOSPITAL MANAGEMENT INFORMATION SYSTEM

Course Code: DMHA2651 **Credit Units: 04**

Course Objective:
To understand the various indicators of health and health information system and health management information system in hospitals.

Course Contents

Module I: Introduction
Concept of information as a resource, understanding the principles of information systems and Classification of information in hospitals.

Module II: Managing Hospital Information Systems
- Data generated for HIS;Functions, Benefits and applications of HIS, HIS components, various performance Indicators, HIS model and data movement.
- HIS modules: Various HIS Modules for Clinicians Access, Nursing Access, In-patient Module, Registration Module, Diagnostic services Module, Dietetics Module, OT Module and Accident & Emergency Module etc.

Module III: Role of Information Technology in Hospitals
Computerization in Hospitals, advantages of computerized system, database interface, IT Components of HIS and various softwares available in the healthcare market.

Module IV: Management Information System
Concept of MIS, functions of MIS, developing MIS, types of MIS, developing indicators, identifying data and developing tools of measurement and applications of MIS.

Module V: Telemedicine
Concept of Telemedicine and its evolution, Telemedicine network in India, and Strengths & Opportunities for Telemedicine in India.

Examination Scheme:

Components	CP	V	A	ME	EE
Weightage (%)	5	5	5	15	70

Text & References
- *Management Information System (MIS) in Hospitals: A computer based approach for quality in hospital services and administration*, by Anil Kumar Saini
- S.C. Joshi & S.N. Mehta. *National Information System: Planning and Management*, Global vision publishing house.
- *Information Technology in health care: Socio technical approaches, 2010.* IOS Press BV

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INTRODUCTION TO HEALTH INSURANCE AND MEDICAL TOURISM

Course Code: DMHA2601 **Credit Units: 04**

Course Objective:
To acquaint students to the concept of HI and various HI products, so that the students are ready for challenges of healthcare insurance which is emerging as a sector holding great promise.

Course Contents

Module I: **Introduction**
History of Health Insurance, Principles of Health Insurance, Public Financing, Private Financing, Current trends in Health Insurance - International and Indian scenario, Economic and financial management of Health Insurance

Module II: Health Insurance systems in India
- Private Health Insurance: Individual Health Plans, Mediclaim, Floaters plans, Third Party Administration, Benefits Management, Claims Management, IRDA
- Social Health Insurance: ESI, CGHS, RSBY
- Social and Community based Insurance: Microfinance

Module III: Medical Tourism
Basic Concepts of Medical Tourism, Scope of Medical Tourism in India.

Examination Scheme:

Components	CP	V	A	ME	EE
Weightage (%)	5	5	5	15	70

Text & References:

- Usha Mehta, A.D. Narde. *Health Insurance in India and Abroad,* Allied Publishers.
- Thomas K. T., Sakthivel R.*Health Insurance In India*: *Overcoming Challenges and Looking Ahead*, Lambert Academic Publishing, 2012.
- Michelle A. Green, JoAnne C. Rowell. *Understanding Health Insurance- A guide to billing and reimbursement.*
- William S Stevens. *Health Insurance- Current Issues and Background,* Nova Science Publishers.

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BASICS OF DISASTER MANAGEMENT

Course Code: DMHA2602 **Credit Units: 04**

Course Objectives:

- To learn, identify and assess disasters in the community.
- To set-forth policies and procedures for disaster preparedness and to prepare hospital disaster plan.

Course Contents

Module I: Basics of Disaster Management

Definitions, Determining risk of disaster, Classification of disaster on the basis of origin, source, onset & anticipated response; Disaster process, Effects of Disasters – Health issues, characteristics and geography of disasters, Impact of Disasters on the Hospitals.

Module II: Disaster Management Process

Phases of disaster management, leadership, organization of medical relief, Triaging, Disaster Response – local, national & International; Disaster Management Act – 2005.

Module III: Disaster preparedness

Hospital Disaster Plan – its pre-requisites, principles and components; Hospital disaster management committee and its role; Hospital disaster manual.

Module IV: Fire Safety

Grades of fire and its causes; elements of fire safety, various fire extinguishers; and fire safety training.

Examination Scheme:

Components	CP	V	A	ME	EE
Weightage (%)	5	5	5	15	70

Text & References:

- *A guide to emergency health management after natural disasters*, American health organization scientific publication.
- *Emergency vector control after Natural disaster*, American health organization scientific publication.
- *District Health facilities*, WHO regional publication western pacific services.
- *Medical supply management after natural disaster*, American health organization scientific publication.

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B.Sc.(Hons.)Nursing

DURATION- FOUR YEARS FULL TIME

PROGRAM STRUCTURE

CURRICULUM

&

SCHEME OF EXAMINATION

2023

AMITY UNIVERSITY HARYANA

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SYLLABUS

COMMUNICATIVE ENGLISH

PLACEMENT:ISEMESTER

THEORY: 2Credits(40hours)

DESCRIPTION: The course is designed to enable students to enhance their ability to speak and write the language (and useEnglish) required for effective communication in their professional work. Students will practice their skills in verbal andwrittenEnglishduring clinicaland classroomexperience.

COMPETENCIES: Oncompletionofthecourse,thestudentswillbeableto

1. IdentifythesignificanceofCommunicativeEnglishforhealthcareprofessionals.

2. Applytheconceptsandprinciplesof EnglishLanguageuseinprofessionaldevelopmentsuchaspronunciation,vocabulary,grammar,paraphrasing,voicemodulation, Spelling,pauseandsilence.
3. Demonstrateattentivelisteningindifferenthypotheticalsituations.
4. Converseeffectively,appropriatelyandtimelywithinthegivencontextandtheindividualorteamtheyarecommunicating with either faceto faceor byothermeans.
5. Read,interpretandcomprehendcontentintext,flowsheet,framework,figures,tables,reports,anecdotesetc.
6. Analysethesituationandapplycriticalthinkingstrategies.
7. Enhanceexpressionsthroughwritingskills.
8. ApplyLSRW(Listening,Speaking,ReadingandWriting)Skillincombinationtolearn,teach,educateandshareinformation,ideasandresults.

COURSEOUTLINE

T–Theory

Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
I	3(T)	Identify thesignificance ofcommunicativeEnglish	**Communication** • Whatiscommunication? • What are communication roles of listeners,speakers, readers and writers as healthcareprofessionals?	• Definitionswith examples,illustrations andexplanations • Identifyingcompetencies/communicativestrategiesinLSRW • Reading excerptson the above andinterpreting themthroughtasks	• Checking forunderstandingthroughtasks
II	5(T)	Describe conceptsand principles ofLanguage(English) use inprofessionaldevelopment suchas pronunciation,vocabulary,grammar, paraphrasing,voice modulation,spelling, pauseandsilence	**IntroductiontoLSRGW** • L–Listening:Differenttypesoflistening • S–Speaking:UnderstandingConsonants,Vowels, Word and Sentence Stress,Intonation • R–Reading:Medicalvocabulary, • Gr – Grammar: Understanding tenses,linkers • W – Writing simple sentences and shortparagraphs–emphasisoncorrectgrammar	• Exercises onlistening to news,announcements,telephoneconversations andinstructions fromothers • Information onfundamentals ofSpeech – Consonant, Vowel,Stress andIntonation withtasks based onthese throughaudio/video andtexts • Reading a medicaldictionary/ glossaryof medical termswith matchingexercises • Information ontenses and basicconcepts of correctgrammar throughfill in the blanks,true/falsequestions	• Through_check yourunderstanding‘exercises

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Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
III	5(T)	Demonstrateattentive listeningin differenthypotheticalsituations	**AttentiveListening** • Focusingonlisteningindifferentsituations – announcements,descriptions,narratives,instructions,discussions,demonstrations • ReproducingVerbatim • Listeningtoacademictalks/lectures • Listeningtopresentation	•Listening toannouncements,news,documentaries withtasks based onlistening •Withmultiple choice,Yes/Noand fill in the blankactivities •Listeningfor overall meaningandinstructions	• Checkingindividuallyagainst correctanswers • Listening forspecificinformation • Listening toattitudes andopinions • Listening toaudio, video andidentify keypoints
IV	9(T)	Converseeffectively,appropriately andtimely within thegiven context andthe individual orteam they arecommunicatingwitheitherfaceto face or othermeans	**Speaking–EffectiveConversation** • Conversation situations – informal, formalandneutral • Factors influencing way of speaking – setting, topic, social relationship, attitudeandlanguage • Greetings,introductions,requesting,askingfor and giving permission, speakingpersonally andcasualconversations • Askingforinformation,givinginstructionsanddirections • Agreeinganddisagreeing,givingopinions • Describingpeople,places,eventsandthings,narrating,reporting&reaching conclusions • Evaluatingandcomparing • Complaintsandsuggestions • Telephoneconversations • Deliveringpresentations	• Different types ofspeaking activitiesrelated to thecontent • Guided withprompts and freediscussions • Presentation techniques • Talking to peersandotheradults. • Talkingtopatientsand Patientattenders • Talking to otherhealthcare professionals • Classroomconversation • Scenariobased learningtasks	• Individual andgroup/peer assessmentthrough livespeakingtests • Presentation ofsituation inemergency androutine • Handoff • Reporting indoctors/nurses‘rounds • Casepresentation • Facetofaceoralcommunication • Speakingindividually(Nurse tonurse/patient/doctor) and toothers in thegroup
V	5(T)	Read, interpretand comprehendcontent in text,flow sheet,framework, figures, tables,reports,anecdotes	• **Reading** • Readingstrategies,readingnotesandmessages • Readingrelevantarticlesandnewsitems • Vocabulary for everyday activities,abbreviationsandmedicalvocabulary • Understandingvisuals,graphs,figuresandnoteson instructions	• Detailedtasksandexercises onreading forinformation,inference andevaluation • Vocabularygames and puzzles formedicallexis	• Telephonic talking • Reading/summarizing/justifying answersorally • Patientdocument • Doctor‘sprescription ofcare • Journal/news

Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
			• Readingreportsandinterpretingthem • Usingidiomsandphrases,spottingerrors,vocabulary for presentations • RemedialGrammar	• Grammaractivities	reading andinterpretation • Notes/Reports
VI	5(T)	Enhanceexpressionsthrough writingskills Apply	**WritingSkills** • Writingpatienthistory • Notetaking • Summarising • Anecdotalrecords • Letterwriting • Diary/Journalwriting • Reportwriting • Paperwritingskills • Abstractwriting	• Writing tasks withfocus on taskfulfilment,coherence andcohesion,appropriatevocabulary andcorrectgrammar • Guided and freetasks • Different kinds ofletterwritingtasks	• Paper basedassessment by theteacher/ traineragainst set banddescriptors • Presentation ofsituation • Documentation • Reportwriting • Paper writingskills • Verbatimre producing • Letterwriting • Resume/CV
VII	8(T)	LSRWSkill incombination tolearn, teach,educate and shareinformation, ideasandresults	**LSRWSkills** • Criticalthinkingstrategiesforlisteningandreading • Oralreports,presentations • Writinginstructions,lettersand reports • ErroranalysisregardingLSRW	• Valuatingdifferent options/multipleanswers andinterpretingdecisions throughsituational activities • Demonstration – individually and ingroups • GroupDiscussion • Presentation • RolePlay • Writingreports	• Consolidatedassessment orallyand throughwrittentasks/exercises

APPLIEDANATOMY

PLACEMENT:ISEMESTER

THEORY:3Credits(60hours)

DESCRIPTION:Thecourseisdesignedtoassiststudenttorecallandfurtheracquiretheknowledgeofthenormalstructureofhumanbody,identifyalterationinanatomicalstructurewithemphasisonclinicalapplicationtopracticenursing.

COMPETENCIES: Oncompletionofthecourse,thestudentswillbeableto

1. Describeanatomicalterms.
2. Explainthegeneralandmicroscopicstructureofeachsystemofthebody.
3. Identifyrelativepositionsofthe majorbodyorgansaswellastheirgeneralanatomiclocations.
4. Exploretheeffectofalterationsinstructure.

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5. Applyknowledgeofanatomicstructurestoanalyzeclinicalsituationsandtherapeuticapplications.

COURSEOUTLINE

T –

Unit	Time (Hrs)	Learning Outcomes	TheoryCo	Teaching/ Learning Activities	Assessment Methods
I	8(T)		**ntent**	• Lecture cumDiscussion	• Quiz • MCQ • Shortanswer
		Define the termsrelative to theanatomicalposition	**Introductiontoanatomicaltermsandorganizationofthehumanbody** • Introduction to anatomical terms relative toposition– anterior,ventral,posteriordorsal,superior, inferior, median, lateral, proximal,distal, superficial, deep, prone, supine,palmarandplantar	• Useofmodels • Videodemonstration	
		Describe theanatomicalplanes	• Anatomical planes (axial/ transverse/horizontal, sagittal/vertical plane andcoronal/frontal/obliqueplane)	• Use ofmicroscopicslides	
		Define and describethe terms used todescribemovements	• Movements (flexion, extension, abduction,adduction, medial rotation, lateral rotation,inversion, eversion, supination, pronation,plantar flexion, dorsal flexion andcircumduction	• Lecture cumDiscussion • Video/Slides	
		Organization ofhuman body andstructure of cell,tissues membranesandglands	• Cellstructure,Celldivision • Tissue– definition,types,characteristics,classification, location • Membrane, glands – classification andstructure • Identifymajorsurfaceandbonylandmarksineach body region, Organization of humanbody	• Anatomical Torso	
		Describethetypesofcartilage	• Hyaline,fibrocartilage,elastic cartilage • Featuresofskeletal,smoothandcardiacmuscle • Applicationandimplicationinnursing		
II	6(T)	Compareandcontrastthe features ofskeletal, smooth andcardiac muscle	**TheRespiratorysystem**	• Lecture cumDiscussion • Models • Video/Slides	• Shortanswer • Objectivetype
		Describethestructureofrespiratorysystem	• Structureoftheorgansofrespiration		
		Identify the musclesof respiration andexamine theircontribution to themechanism ofbreathing	• Musclesofrespiration • Applicationandimplicationinnursing		

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Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/ Learning Activities	Assessment Methods
III	6(T)	Describethestructureofdigestivesystem	**TheDigestivesystem** • Structureofalimentarycanalandaccessoryorgansof digestion • Applicationandimplicationsin nursing	• Lecture cumDiscussion • Video/Slides • Anatomical Torso	• Shortanswer • Objectivetype
IV	6(T)	Describethestructure of circulatory andlymphaticsystem.	**TheCirculatoryandLymphaticsystem** • Structureofbloodcomponents,bloodvessels – ArterialandVenoussystem • Positionofheartrelativetotheassociatedstructures • Chambersofheart,layersofheart • Heartvalves,coronaryarteries • Nerveandbloodsupplytoheart • Lymphatictissue • VeinsusedforIVinjections	• Lecture • Models • Video/Slides	• Shortanswer • MCQ
V	4(T)	Identify the majorendocrine glands anddescribethestructureofendocrineGlands	• Applicationandimplicationinnursing **TheEndocrinesystem** • StructureofHypothalamus,PinealGland,Pituitary gland, Thyroid, Parathyroid,Thymus,PancreasandAdrenal glands	• Lecture • Models/charts	• Shortanswer • Objectivetype
VI	4(T)	Describethestructureof various sensoryorgans	**TheSensoryorgans** • Structureofskin,eye,ear,noseandtongue • Applicationandimplicationsinnursing	• Lecture • Explain withVideo/models/charts	• Shortanswer • MCQ
VII	10 (T)	Describe anatomicalpositionandstructureofbonesand joints Identify major bonesthatmakeupthe axialand appendicularskeleton Classifythejoints Identify theapplication andimplications innursing Describethestructureof muscle	**TheMusculoskeletalsystem:** **TheSkeletalsystem** • Anatomicalpositions • Bones – types, structure, growth andossification • Axialandappendicularskeleton • Joints – classification, major joints andstructure • Applicationandimplicationsinnursing	• Review – discussion • Lecture • Discussions • Explain usingcharts, skeletonandloosebonesandtorso • Identifyingmusclesinvolved innursingprocedures inlab	• Shortanswer • Objectivetype

Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/ Learning Activities	Assessment Methods
		Apply the knowledgein performing nursingprocedures/skills	**TheMuscularsystem** • Typesandstructureofmuscles • Musclegroups– musclesofthehead,neck,thorax, abdomen, pelvis, upper limb andlowerlimbs • Principalmuscles– deltoid,biceps,triceps,respiratory, abdominal, pelvic floor, pelvicfloor muscles, gluteal muscles and vastuslateralis • Majormusclesinvolvedinnursingprocedures		
VIII	5(T)	Describe the structureofrenalsystem	**TheRenalsystem** • Structureofkidney,ureters,bladder,urethra • Applicationandimplicationinnursing	• Lecture • Models/charts	• MCQ • Shortanswer
IX	5(T)	Describethestructureof reproductivesystem	**TheReproductivesystem** • Structureofmalereproductiveorgans • Structureoffemalereproductiveorgans • Structureofbreast	• Lecture • Models/charts	• MCQ • Shortanswer
X	6(T)	Describe the structureof nervous systemincluding thedistribution of thenerves,nerveplexuses Describe theventricularsystem	**TheNervoussystem** • ReviewStructureofneurons • CNS,ANSandPNS(Central,autonomicandperipheral) • Structureofbrain,spinalcord,cranialnerves,spinal nerves, peripheral nerves, functionalareasof cerebral cortex • Ventricularsystem– formation,circulation,anddrainage • Applicationandimplicationinnursing	• Lecture • Explain withmodels • Videoslides	• MCQ • Shortanswer

Note: Fewlabhourscanbeplannedforvisits, observationandhandling(lessthan1 creditlabhoursarenot specifiedseparately)

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APPLIEDPHYSIOLOGY

PLACEMENT:ISEMESTER

THEORY: 3Credits(60hours)

DESCRIPTION: The course is designed to assists student to acquire comprehensive knowledge of the normal functions ofthe organ systems of the human body to facilitate understanding of physiological basis of health, identify alteration infunctionsandprovide thestudent withthenecessaryphysiologicalknowledgetopracticenursing.

COMPETENCIES: Oncompletionofthecourse,thestudentswillbeableto

1. Developunderstandingofthenormalfunctioningofvariousorgansystemsofthebody.
2. Identifytherelativecontributionofeachorgansystemtowardsmaintenanceofhomeostasis.
3. Describetheeffectofalterationsinfunctions.
4. Applyknowledgeofphysiologicalbasistoanalyzeclinicalsituationsandtherapeuticapplications.

COURSEOUTLINE

T–Theory

Unit	Time(Hrs)	Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
I	4(T)	Describethephysiologyofcell, tissues,membranes andglands	**GeneralPhysiology–Basicconcepts** •Cellphysiologyincludingtransportation acrosscellmembrane • Bodyfluidcompartments,Distributionof totalbody fluid,intracellularandextracellular compartments,majorelectrolytesandmaintenanceofhomeostasis • Cellcycle • Tissue–formation,repair • Membranesand glands –functions • Applicationandimplicationinnursing	• Review–discussion • Lecture cumDiscussion •Video demonstrations	• Quiz • MCQ • Shortanswer
II	6(T)	Describe thephysiology andmechanism ofrespiration Identify themuscles ofrespiration andexamineth eir contributiontothe mechanismof breathing	**Respiratorysystem** • Functionsofrespiratoryorgans • Physiologyofrespiration • Pulmonarycirculation–functionalfeatures • Pulmonaryventilation,exchangeofgases • Carriage of oxygen and carbon-dioxide,Exchangeof gasesintissue •Regulation ofrespiration • Hypoxia, cyanosis, dyspnea, periodicbreathing • Respiratorychangesduringexercise • Applicationandimplicationinnursing	• Lecture • Videoslides	• Essay • Shortanswer • MCQ
III	8(T)	Describe thefunctions ofdigestivesystem	**Digestivesystem** • Functionsoftheorgansofdigestivetract • Saliva–composition,regulationofsecretionandfunctionsof saliva • Composition and function of gastric juice,mechanismandregulationofgastricsecretion • Compositionofpancreaticjuice,function,regulationof pancreaticsecretion • Functionsofliver,gallbladderandpancreas • Compositionofbileandfunction • Secretion and function of small and largeintestine • Movementsofalimentarytract • Digestioninmouth,stomach,smallintestine,largeintestine,absorption offood • Applicationandimplicationsinnursing	•Lecture•Essay •Shortanswer •MCQ	•Shortanswer
IV	6(T)	Explain thefunctionsofthe	**CirculatoryandLymphaticsystem** • Functionsofheart,conductionsystem,	•LecturecumDiscussion •Videoslides	

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Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
		heart, andphysiology ofcirculation	cardiac cycle, Stroke volume and cardiacoutput • Bloodpressure andPulse • Circulation– principles,factorsinfluencingbloodpressure, pulse • Coronary circulation, Pulmonary andsystemiccirculation • Heartrate –regulationofheartrate • Normalvalueandvariations • Cardiovascular homeostasis in exercise andposture • Applicationandimplicationinnursing	• Discussion • Video/Slides	• MCQ
V	5(T)	Describe thecomposition andfunctionsofblood	**Blood** • Blood–Functions,Physicalcharacteristics • Formationofbloodcells • Erythropoiesis– FunctionsofRBC,RBClifecycle • WBC–types,functions • Platelets – Function and production ofplatelets • Clottingmechanismofblood,clottingtime,bleedingtime, PTT • Hemostasis– roleofvasoconstriction,plateletplug formation in hemostasis, coagulationfactors, intrinsic and extrinsic pathways ofcoagulation • Bloodgroupsand types • Functionsofreticuloendothelialsystem,immunity • Applicationinnursing	• Lecture • Discussion • Videos	• Essay • Shortanswer • MCQ
VI	5(T)	Identifythemajorendocrine glandsand describe theirfunctions	**TheEndocrinesystem** • FunctionsandhormonesofPinealGland,Pituitary gland, Thyroid, Parathyroid,Thymus,PancreasandAdrenalglands. • Otherhormones • Alterationsindisease	• Lecture • Explain usingcharts	• Shortanswer • MCQ
VII	4(T)	Describe thestructure ofvarious sensoryorgans	• Applicationandimplicationinnursing **TheSensoryOrgans** • Functionsofskin • Vision,hearing,tasteandsmell • Errorsofrefraction, agingchanges	• Lecture • Video	• Shortanswer • MCQ
VIII	6(T)	Describe thefunctions of	• Applicationandimplicationsinnursing **Musculoskeletalsystem**	• Lecture	• Structuredessay

Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
		bones,joints, various types ofmuscles, itsspecial propertiesand nervessupplyingthem	• Bones–Functions,movementsofbonesof axialandappendicularskeleton,Bonehealing • Jointsandjointmovements • Alterationofjointdisease • Properties and Functions of skeletal muscles – mechanismof musclecontraction • Structureandpropertiesofcardiacmusclesand dsmoothmuscles • Applicationandimplicationinnursing	• Discussion • Videopresentation	• Shortanswer • MCQ
IX	4(T)	Describe thephysiology ofrenalsystem	**Renalsystem** • Functionsofkidneyinmaintainingho meostasis • GFR • Functionsofureters,bladderandurethra • Micturition • Regulationofrenalfunction • Applicationandimplicationinnursing	• Lecture • Chartsandmodels	• Shortanswer • MCQ
X	4(T)	Describe thestructure ofreproductivesystem	**TheReproductivesystem** • Femalereproductivesystem– Menstrualcycle, function and hormones of ovary,oogenesis, fertilization, implantation,Functionsof breast • Malereproductivesystem– Spermatogenesis,hormonesand itsfunctions, semen • Applicationandimplicationinprovidingn ursingcare	• Lecture • Explain usingcharts, models,specimens	• Shortanswer • MCQ
XI	8(T)	Describe thefunctions ofbrain,physiology ofnervestimulus, reflexes, cranialandspinal nerves	• **Nervoussystem** • Overviewofnervoussystem • Reviewoftypes,structureandfunctionsof neurons • Nerveimpulse • Review functions of Brain-Medulla, Pons,Cerebrum,Cerebellum • SensoryandMotorNervoussystem • PeripheralNervoussystem • AutonomicNervoussystem • LimbicsystemandhighermentalFunctions-Hippocampus,Thalamus,Hypothalamus • Vestibularapparatus • Functionsofcranialnerves • Autonomicfunctions • Physiology of Pain-somatic, visceral andreferred	• Lecture cumDiscussion • Videoslides	• Brief structuredessays • Shortanswer • MCQ • Criticalreflection

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Unit	Time(Hrs)	Learning Outcomes	Content	Teaching/Learning	Assessment
			• Reflexes • CSFformation,composition,circulationofCSF, blood brain barrier and blood CSFbarrier • Applicationandimplicationinnursing		

Note: Fewlabhourscanbeplannedforvisits,

observationandhandling(lessthan1 creditlabhoursarenot

specifiedseparately)

APPLIEDSOCIOLOGY

PLACEMENT:ISEMESTER

THEORY: 3Credits(60hours)

DESCRIPTION: Thiscourseisdesignedtoenablethestudentstodevelopunderstandingaboutbasicconceptsofsociologyanditsapplication in personaland community life, health, illnessandnursing.

COMPETENCIES: Oncompletionofthecourse,thestudentswillbeableto

1. Identifythescopeandsignificanceofsociologyinnursing.
2. Applytheknowledgeofsocialstructureanddifferentcultureinasocietyinidentifyingsocialneedsofsickclients.
3. Identifytheimpactofcultureonhealthandillness.
4. Developunderstandingabouttypesoffamily,marriageanditslegislation.
5. Identifydifferenttypesofcaste,class,socialchangeanditsinfluenceonhealthandhealthpractices.
6. DevelopunderstandingaboutsocialorganizationanddisorganizationandsocialproblemsinIndia.
7. Integratetheknowledgeofclinicalsociology anditsusesincrisisintervention.

COURSEOUTLINE

T–Theory

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ Learning Activities	Assessment Methods
I	1	(T)Describe the scopeand significance	**Introduction** • Definition,natureandscopeofsociology • Significanceofsociologyinnursing	• Lecture • Discussion	•Essay •Shortanswer
II	15(T)Describethe individualization,Groups,processesof Socialization, socialchange and itsimportance		**Socialstructure** • Basic concept of society, community,associationandinstitution • Individualandsociety • Personaldisorganization • Social group – meaning, characteristics, andclassification. • Socialprocesses–definitionandforms,Co-operation, competition,conflict,accommodation,assimilation,isolation • Socialization – characteristics, process,agenciesof socialization • Socialchange–	• Lecture cumDiscuss	• Essay • Shortanswer • Objectivetype

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ Learning Activities	Assessment Methods
			• Structureandcharacteristicsofurban,ruralandtribalcommunity. • Major health problems in urban, rural and tribalcommunities • Importanceofsocialstructureinnursingprofession		
III	8(T)	Describe culture andits impact on healthanddisease	**Culture** • Nature,characteristicandevolutionof culture • Diversityanduniformityofculture • Differencebetweencultureandcivilization • Cultureandsocialization • Transculturalsociety • Culture,Modernizationanditsimpactonhealthanddisease	• Lecture • Paneldiscussion	• Essay • Shortanswer
IV	8(T)	Explain family,marriage andlegislation related tomarriage	**FamilyandMarriage** • Family– characteristics,basicneed,typesandfunctionsof family • Marriage – forms of marriage, social customrelatingtomarriageandimportanceofmarriage • LegislationonIndian marriageandfamily. • Influenceof marriageandfamilyonhealthandhealthpractices	• Lecture	• Essay • Shortanswer • Case studyreport
V	8(T)	Explain differenttypes of caste andclasses in societyand its influence onhealth	**Socialstratification** • Introduction– Characteristics&formsofstratification • Functionofstratification • Indiancastesystem–originandcharacteristics • Positiveandnegativeimpactofcasteinsociety. • Classsystemandstatus • Socialmobility-meaningandtypes • Race–concept,criteriaofracialclassification • Influenceofclass,casteandracesystemonhealth.	• Lecture • Paneldiscussion	• Essay • Shortanswer • Objectivetype
VI	15(T)	Explainsocial organization,disorganization,socialproblemsandrole of nurse inreducing socialproblems	**Socialorganizationanddisorganization** • Socialorganization– meaning,elementsandtypes • Voluntaryassociations • Social system – definition, types, role andstatusasstructuralelementofsocialsystem. • Interrelationshipofinstitutions • Socialcontrol– meaning,aimsandprocessofsocialcontrol	• Lecture • Groupdiscussion • Observational visit	• Essay • Shortanswer • Objectivetype • Visitreport

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Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ Learning Activities	Assessment Methods
			•Socialnorms,moralandvalues •Socialdisorganization– definition,causes,Controlandplanning •Majorsocialproblems– poverty,housing,foodsupplies, illiteracy, prostitution, dowry, Childlabour, child abuse, delinquency, crime,substanceabuse,HIV/AIDS,COVID-19 •Vulnerablegroup– elderly,handicapped,minority andothermarginalgroup. •Fundamentalrightsofindividual,womenandchildren •Roleofnursein reducingsocial problemandenhancecoping		
VII	5(T)	Explain clinicalsociology and itsapplication in thehospital andcommunity	•SocialwelfareprogramsinIndia **Clinicalsociology** •Introductiontoclinicalsociology •Sociologicalstrategiesfordevelopingservicesfor theabused •Useof clinicalsociology incrisisintervention	•Lecture, •Groupdiscussion •Roleplay	•Essay •Shortanswer

APPLIED PSYCHOLOGY

PLACEMENT:ISEMESTER

THEORY:3Credits(60Hours)

DESCRIPTION: Thiscourseisdesignedtoenablethestudentstodevelopunderstandingaboutbasicconceptsofpsychology and its application in personal and community life, health, illness and nursing. It further provides studentsopportunitytorecognizethe significanceandapplicationofsoftskillsandself-empowermentinthepracticeofnursing.

COMPETENCIES: Oncompletionofthecourse,thestudentswillbeableto

1. Identifytheimportanceofpsychologyinindividualandprofessionallife.
2. Developunderstandingofthebiologicalandpsychologicalbasisofhumanbehaviour.
3. Identifytheroleofnurseinpromoting mentalhealthanddealingwithalteredpersonality.
4. Performtheroleof nursesapplicabletothepsychology ofdifferentagegroups.
5. Identifythecognitiveandaffectiveneedsofclients.
6. Integratetheprinciplesofmotivationandemotioninperformingtheroleofnurseincaringfor emotionallysickclient.
7. Demonstratebasicunderstandingofpsychologicalassessmentandnurse‘srole.
8. Applytheknowledgeofsoftskillsinworkplaceandsociety.
9. Applytheknowledgeofself-empowermentinworkplace,societyandpersonallife.

COURSEOUTLINE

T–Theory

Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
I	2(T)	Describe scope,branches andsignificance ofpsychology innursing	**Introduction** • MeaningofPsychology • Development of psychology – Scope,branchesand methodsofpsychology • Relationshipwithothersubjects • Significanceofpsychologyinnursing • Appliedpsychologytosolveeverydayissues	• Lecture cumDiscussion	• Essay • Shortanswer
II	4(T)	Describebiologyofhumanbehaviour	**Biologicalbasisofbehavior–Introduction** • Bodymindrelationship • Geneticsandbehaviour • Inheritanceofbehaviour • Brainandbehaviour. • Psychologyandsensation–sensoryprocess –normalandabnormal	• Lecture • Discussion	• Essay • Shortanswer
III	5(T)	Describe mentallyhealthypersonanddefensemechanisms	**Mentalhealthandmentalhygiene** • Conceptofmentalhealthandmentalhygiene • Characteristicofmentally healthyperson • Warningsignsofpoormental health • Promotiveandpreventivementalhealthstrategiesandservices • Defensemechanismanditsimplication • Frustration and conflict – types of conflictsand measurementstoovercome • Role of nurse in reducing frustration andconflictandenhancingcoping • Dealingwithego	• Lecture • Casediscussion • Roleplay	• Essay • Shortanswer • Objectivetype
IV	7(T)	Describepsychology ofpeople in differentage groups and roleofnurse	**Developmentalpsychology** • Physical, psychosocial and cognitivedevelopment across life span – Prenatalthrough early childhood, middle to latechildhood through adolescence, early andmid-adulthood, late adulthood, death anddying • Roleofnurseinsupportingnormalgrowthand developmentacrossthelifespan • Psychological needs of various groups inhealth and sickness – Infancy, childhood,adolescence,adulthoodandolderadult • Introductiontochildpsychologyandroleofnurseinmeetingthepsychologicalneedsof	• Lecture • Group • discussion	• Essay • Shortanswer

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Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
			children • Psychology of vulnerable individuals – challenged,women,sick etc. • Roleofnursewith vulnerablegroups		
V	4(T)	Explain personalityand role of nurse inidentification andimprovement inalteredpersonality	**Personality** • Meaning,definitionofpersonality • Classificationofpersonality • Measurementandevaluationofpersonality –Introduction • Alterationinpersonality • Roleofnurseinidentificationofindividualpersonality and improvement in alteredpersonality	• Lecture • Discussion • Demonstration	• Essay and shortanswer • Objectivetype
VI	16(T)	Explaincognitive process and theirapplications	**Cognitiveprocess** • **Attention**– definition,types,determinants,duration, degreeandalterationinattention • **Perception –** Meaning of Perception,principles,factoraffectingperception, • **Intelligence** – Meaning of intelligence – Effect of heredity and environment inintelligence, classification, Introduction tomeasurement of intelligence tests – Mentaldeficiencies • **Learning –** Definition of learning, types oflearning, Factors influencing learning – Learningprocess,Habitformation • **Memory**- meaningandnatureofmemory,factors influencing memory, methods toimprove memory, forgetting • **Thinking** – types, level, reasoning andproblemsolving. • **Aptitude** – concept, types, individualdifferencesandvariability • Psychometricassessmentofcognitiveprocesses– Introduction • Alterationincognitiveprocesses	• Lecture • Discussion	• Essay and shortanswer • Objectivetype
VII	6(T)	Describemotivation,emotion, attitudeandroleofnurseinemotionally sickclient	**Motivationandemotionalprocesses** • **Motivation** – meaning, concept, types,theoriesofmotivation,motivationcycle,biologicalandspecial motives • **Emotions –** Meaning of emotions,development of emotions, alteration ofemotion,emotionsinsickness –handlingemotionsin self andother • Stressandadaptation– stress,stressor,cycle,effect,adaptationandcoping	• Lecture • Groupdiscussion	• Essay and shortanswer • Objectivetype

Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
			• **Attitudes** – Meaning of attitudes, nature,factor affecting attitude, attitudinal change,Roleof attitude in healthand sickness • Psychometricassessmentofemotionsandattitude– Introduction • Roleofnurseincaringforemotionallysickclient		
VIII	4(T)	Explainpsychological assessmentandtests androleofnurse	**Psychological assessment and tests – introduction** •Types,development,characteristics, principles,uses,interpretation • Roleofnurseinpsychological assessment	• Lecture • Discussion • Demonstration	• Shortanswer • Assessmentof practice
IX	10(T)	Explainconceptof soft skill and itsapplicationinworkplaceandsociety	**Applicationofsoftskill** • Conceptofsoftskill • Types of soft skill – visual, aural andcommunication skill • Thewayofcommunication • Buildingrelationshipwithclientandsociety • **Interpersonal Relationships (IPR):**Definition, Types, and Purposes,Interpersonalskills,Barriers,Strategiestoovercomebarriers • Survivalstrategies– managingtime,copingstress,resilience,work–lifebalance • Applyingsoftskilltoworkplaceandsociety – Presentation skills, social etiquette,telephone etiquette, motivational skills,teamworketc.	• Lecture • Groupdiscussion • Roleplay • Refer/CompleteSoftskillsmodule	•Essayandshortanswer
X	2(T)	Explain self-empowerment	• Useofsoftskillinnursing **Self-empowerment** •Dimensionsofself-empowerment •Self-empowermentdevelopment •Importanceofwomen'sempowermentinsociety •Professionaletiquetteandpersonalgrooming •Roleofnurseinempoweringothers	• Lecture • Discussion	• Shortanswer • Objectivetype

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NURSING FOUNDATION - I (including First Aid

module)PLACEMENT: I SEMESTER

THEORY: 6Credits(120hours)

PRACTICUM: SkillLab:2Credits(80hours)andClinical:2Credits(160hours)

DESCRIPTION: Thiscourseisdesignedtohelpnovicenursingstudentsdevelopknowledgeandcompetenciesrequiredtoprovideevidence-based,comprehensivebasicnursing careforadult patients,usingnursingprocessapproach.

COMPETENCIES: Oncompletionofthecourse,thestudentswillbeableto

1. Developunderstandingabouttheconceptofhealth,illnessandscopeofnursingwithinhealthcareservices.
2. Applyvalues,codeofethicsandprofessional conductinprofessional life.
3. Applytheprinciplesandmethodsofeffectivecommunicationinestablishingcommunicationlinkswithpatients,familiesandother healthteammembers.
4. Developskillinrecordingandreporting.
5. Demonstratecompetencyinmonitoringanddocumentingvitalsigns.
6. Describethefundamentalprinciplesandtechniquesofinfectioncontrolandbiomedicalwastemanagement.
7. Identifyandmeetthecomfortneedsofthepatients.
8. Performadmission,transfer, anddischargeofa patientundersupervisionapplyingtheknowledge.
9. Demonstrateunderstandingandapplicationofknowledgeincaringforpatientswithrestricted mobility.
10. Performfirstaidmeasuresduringemergencies.
11. Identifytheeducationalneedsofpatientsanddemonstratebasicskillsofpatienteducation.

***MandatoryModuleusedinTeaching/Learning:**

FirstAid:40Hours(includingBasicCPR)

COURSEOUTLINE

T–Theory, SL – SkillLab

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ Learning Activities	Assessment Methods
I	5(T)	Describe theconcept of healthandillness	**Introductiontohealthandillness** • Concept of Health – Definitions (WHO),Dimensions • Maslow'shierarchyofneeds • Health–Illnesscontinuum • Factorsinfluencinghealth • Causes and risk factors for developingillnesses • Illness–Types,illnessbehavior • Impactof illnessonpatientand family	• Lecture • Discussion	• Essay • Shortanswer • Objective type
II	5(T)	Describe the levelsofillnessprevention andcare,health careservices	**HealthCareDeliverySystems–** ***IntroductionofBasicConcepts&Meanings*** • Levels of Illness Prevention – Primary(Health Promotion), Secondary andTertiary • LevelsofCare– Primary,SecondaryandTertiary • Types of health care agencies/ services – Hospitals, clinics, Hospice, rehabilitationcentres,extended carefacilities • Hospitals–Types,Organizationand	• Lecture • Discussion	• Essay • Shortanswer • Objective type

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Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
			Functions • Healthcareteamsinhospitals– membersandtheirrole		
III	12(T)	Trace the history ofNursing Explain theconcept, nature andscopeof nursing Describe values,codeof ethics andprofessionalco nduct for nursesinIndia	**History of Nursing and Nursing as aprofession** • HistoryofNursing,HistoryofNursinginInd ia • ContributionsofFlorenceNightingale • Nursing – Definition – Nurse, Nursing,Concepts, philosophy, objectives,Characteristics, nature and Scope ofNursing/ Nursing practice, Functions ofnurse,Qualitiesofanurse,Categoriesofn ursingpersonnel • Nursing as a profession – definition andcharacteristics/criteriaofprofession • Values – Introduction – meaning andimportance • Code of ethics and professional conductfor nurses– Introduction	• Lecture • Discussion • Casediscussion • Roleplays	• Essay • Shortanswers • Objective type
IV	8(T) 3(SL)	Describetheprocess, principles,andtypeso fcommunication Explain therapeutic,non-therapeutic andprofessionalcom munication Communicateeffe ctively withpatients, theirfamilies and teammembers	**CommunicationandNursePatient Relationship** • Communication–Levels,Elementsand Process,Types,Modes,Factors influencingcommunication • Methods of effectivecommunication/th erapeuticcommunicationte chniques • Barriers to effective communication/non-therapeuticcommunicationtechniques • Professionalcommunication • HelpingRelationships(NursePatientR elationship)–PurposesandPhases • Communicatingeffectivelywith patient,familiesandteammembers • Maintaining effective human relations andcommunication with vulnerable groups(children,women,physicallyandmen tallychallengedand elderly)	• Lecture • Discussion • Roleplayandvideo filmonTherapeutic Communication	• Essay • Shortanswer • Objective type
V	4(T) 2(SL)	Describe thepurposes,typesa ndtechniques ofrecording andreporting Maintain recordsand reportsaccurat ely	**DocumentationandReporting** • Documentation – Purposes of Reports andRecords • Confidentiality • Types of Client records/Common Record-keepingforms • Methods/Systems ofdocumentation/Recordi ng	• Lecture • Discussion • Demonstration	• Essay • Shortanswer • Objective type

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Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
			• Guidelinesfordocumentation • Do'sandDon'tsofdocumentation/LegalguidelinesforDocumentation/Recording • Reporting – Change of shift reports,Transferreports,Incidentreports		
VI	15(T) 20(SL)	Describe principlesand techniques ofmonitoring andmaintaining vitalsigns Assess and recordvitalsignsaccurately	**Vitalsigns** • Guidelinesfortakingvitalsigns • *Bodytemperature*– ○ Definition,Physiology,Regulation, Factorsaffectingbodytemperature ○ Assessmentofbodytemperature– sites,equipmentand technique ○ Temperature alterations – Hyperthermia, Heat Cramps, HeatExhaustion,Heatstroke,Hypothermia ○ Fever/Pyrexia– Definition,Causes,Stages,Types • NursingManagement ○HotandColdapplications • *Pulse*: ○ Definition,PhysiologyandRegulation, Characteristics,Factorsaffectingpulse ○ Assessment of pulse – sites, equipmentandtechnique ○ Alterationsinpulse • *Respiration:* ○ Definition, Physiology and Regulation,Mechanicsofbreathing,Characteristics, Factorsaffectingrespiration ○ Assessmentofrespirations–technique ○ ArterialOxygensaturation ○ Alterationsinrespiration • *Bloodpressure*: ○ Definition,PhysiologyandRegulation, Characteristics,FactorsaffectingBP ○ Assessment of BP – sites, equipmentand technique, Common Errors in BPAssessment ○ AlterationsinBloodPressure	• Lecture • Discussion • Demonstration &Re-demonstration	• Essay • Shortanswer • Objective type • Document thegiven valuesoftemperature,pulse, andrespiration inthe graphicsheet • OSCE
VII	3(T)	Maintainequipment andlinen	• DocumentingVitalSigns **EquipmentandLinen** • Types–Disposablesandreusable ○Linen,rubbergoods,glassware, metal,plastics,furniture • Introduction– Indent,maintenance,Inventory		

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
VIII	10(T) 3(SL)	Describe the basicprinciples andtechniques ofinfection controland biomedicalwastemanagement	**IntroductiontoInfectionControlinClinicalsetting Infection** • Natureofinfection • Chainofinfection • Typesofinfection • Stagesofinfection • Factors increasing susceptibility toinfection • Body defenses against infection – Inflammatory response & Immuneresponse • Healthcareassociatedinfection(Nosocomialinfection) **IntroductoryconceptofAsepsis– Medical&Surgicalasepsis** ***Precautions*** • HandHygiene • (HandwashinganduseofhandRub) • Use of Personal Protective Equipment(PPE) • Standardprecautions ***BiomedicalWastemanagement*** • Typesofhospitalwaste,wastesegregationandhazards – Introduction	• Lecture • Discussion • Demonstration • Observation ofautoclaving andother sterilizationtechniques • Video presentationon medical &surgicalasepsis	• Essay • Shortanswer • Objective type
IX	15(T) 15(SL)	Identify and meetthecomfortneedsofthepatients	***Comfort,Rest&SleepandPain*** • Comfort ○ FactorsInfluencingComfort ○ Typesofbedsincludinglatestbeds,purposes& bedmaking ○ Therapeuticpositions ○ Comfortdevices • SleepandRest ○ Physiologyofsleep ○ Factorsaffectingsleep ○ PromotingRestandsleep ○ SleepDisorders • Pain(Discomfort) ○ Physiology ○ Commoncauseofpain ○ Types ○ Assessment– painscalesandnarcoticscales	• Lecture • Discussion • Demonstration &Re-demonstration	• Essay • Shortanswer • Objective type • OSCE

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Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
			○ Pharmacological and Non-pharmacological pain relievingmeasures– Useofnarcotics,TENSdevices,PCA ○ Invasivetechniquesofpain management ○ Anyothernewermeasures ○ CAM(Complementary&Alternativehealing Modalities)		
X	5(T) 3(SL)	Describe theconceptofpatientenvironment	**PromotingSafetyinHealthCareEnvironment** • Physicalenvironment–Temperature, Humidity,Noise,Ventilation,Light,Odor, control • Reduction of Physical hazards – fire,accidents • FallRiskAssessment • Roleofnursein providingsafeandcleanenvironment • Safetydevices– ○ Restraints – Types, Purposes,Indications, Legal Implications andConsent,ApplicationofRestraints- SkillandPracticeguidelines ○ OtherSafetyDevices– Siderails,Grabbars, Ambu alarms, non-skid slippersetc.	• Lecture • Discussion • Demonstration Pest	• Essay • Shortanswer • Objective type
XI	6(T) 2(SL)	Explainandperform admission, transfer,and discharge of apatient	**HospitalAdmissionanddischarge** • Admission to the hospital Unit andpreparationof unit ○ Admissionbed ○ Admissionprocedure ○ Medico-legalissues ○ RolesandResponsibilitiesofthenurse • Dischargefromthehospital ○ Types– Planneddischarge,LAMAandAbscond, Referralsandtransfers ○ DischargePlanning ○ Dischargeprocedure ○ Medico-legalissues ○ RolesandResponsibilitiesofthenurse ○ Careoftheunitafterdischarge	• Lecture • Discussion • Demonstration	• Essay • Shortanswer • Objectivetype
XII	8(T) 10(SL)	Demonstrateskillincaring for patientswith restrictedmobility	**MobilityandImmobility** • Elements of Normal Movement,Alignment&Posture,Joint Mobility,Balance,CoordinatedMovement	• Lecture • Discussion • Demonstration&	• Essay • Shortanswer • Objective

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
			•Principlesofbodymechanics •FactorsaffectingBodyAlignmentandactivity •Exercise–Typesandbenefits •EffectsofImmobility •MaintenanceofnormalBodyAlignmentandActivity •AlterationinBodyAlignmentandmobility •NursinginterventionsforimpairedBodyAlignment and Mobility – assessment,types,devicesused, method o Rangeofmotionexercises o Musclestrengtheningexercises o Maintainingbodyalignment–positions o Moving o Lifting o Transferring o Walking •Assistingclientswithambulation •CareofpatientswithImmobility usingNursingprocessapproach •Careofpatientswithcastsandsplints	Re-demonstration	type •OSCE
XIII	4(T) 2(SL)	Describe theprinciples andpractice of patienteducation	**Patienteducation** •PatientTeaching– Importance,Purposes,Process •Integratingnursingprocessinpatienttea ching	•Discussion •Roleplays	•Essay •Shortanswer •Objectivetype
XIV	20(T) 20(SL)	Explain and applyprinciples of FirstAid duringemergencies	**FirstAid*** •Definition,BasicPrinciples,Scope&Rules •FirstAidManagement o Wounds,Hemorrhage&Shock o MusculoskeletalInjuries–Fractures, Dislocation,Muscleinjuries o TransportationofInjuredpersons o RespiratoryEmergencies&Basic CPR o Unconsciousness o ForeignBodies–Skin,Eye,Ear,Nose, Throat&Stomach o Burns&Scalds o Poisoning,Bites&Stings o Frostbite&EffectsofHeat o CommunityEmergencies	•Lecture •Discussion •Demonstration &Re-demonstration •Modulecompletion •National DisasterManagementAuthority(NDMA) / Indian Red CrossSociety (IRCS)FirstAidmodule	•Essay •Shortanswer •Objectivetype •OSCE

*Mandatorymodule

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CLINICALPRACTICUM

ClinicalPracticum: 2Credits(160hours),10weeks×16hoursperweek

PRACTICECOMPETENCIES: Oncompletionoftheclinicalpracticum,thestudentswillbeableto

1. Maintaineffectivehumanrelations(projectingprofessionalimage)
2. Communicateeffectivelywithpatient,familiesandteammembers
3. Demonstrateskillsintechniquesofrecordingandreporting
4. Demonstrateskillinmonitoringvitalsigns
5. Careforpatientswithalteredvitalsigns
6. Demonstrateskillinimplementingstandardprecautionsanduseofppe
7. Demonstrateskillinmeetingthecomfortneedsofthepatients
8. Providesafeandcleanenvironment
9. Demonstrateskillinadmission,transfer,anddischargeofapatient
10. Demonstrateskillincaringforpatientswithrestrictedmobility
11. Planandprovideappropriatehealthteachingfollowingtheprinciples
12. AcquireskillsinassessingandperformingFirstAidduringemergencies.

SKILLLAB

UseofMannequinsandSimulators

S.No.	Competencies	ModeofTeaching
1.	TherapeuticCommunicationandDocumentation	RolePlay
2.	Vitalsigns	Simulator/Standardizedpatient
3.	MedicalandSurgicalAsepsis	Videos/Mannequin
4.	PainAssessment	Standardizedpatient
5.	ComfortDevices	Mannequin
6.	TherapeuticPositions	Mannequin
7.	PhysicalRestraintsandSiderails	Mannequin
8.	ROMExercises	Standardizedpatient
9.	Ambulation	Standardizedpatient
10.	MovingandTurningpatientsinbed	Mannequin
11.	Changingpositionofhelplesspatients	Mannequin/Standardizedpatient
12.	Transferringpatientsbedtostretcher/wheelchair	Mannequin/Standardizedpatient
13.	Admission,Transfer,Discharge&HealthTeaching	RolePlay

CLINICAL POSTINGS – General Medical/Surgical

Wards10weeks×16hours/week =160Hours

Clinical Unit	Duration(inWeeks)	LearningOutcomes	ProceduralCompetencies/Clinical Skills (SupervisedClinicalPractice)	ClinicalRequirements	AssessmentMethods
General Medical/ Surgical wards	2	Maintain effectivehuman relations(projecting professionalimage) Communicateeffectively withpatient, families andteammembers Demonstrateskillsintechniques ofrecording andreporting	**Communication and Nursepatientrelationship** •MaintainingCommunicationwithpatient and family andinterpersonalrelationship •DocumentationandReporting ○ Documentingpatientcareandprocedures ○ Verbalreport ○ Writtenreport		•OSCE
	2	Demonstrateskillin monitoring vitalsigns Careforpatientswithaltered vitalsigns Demonstrate skill inimplementingstandard precautionsanduseofPPE	*Vitalsigns* •Monitor/measureanddocumentvitalsignsinagraphicsheet ○ Temperature(oral,tympanic,axillary) ○ Pulse(Apicalandperipheralpulses) ○ Respiration ○ Bloodpressure ○ Pulseoximetry •Interpretandreport alteration •Cold Applications – ColdCompress, Ice cap, TepidSponging •Careofequipment–thermometer,BP apparatus, Stethoscope, Pulseoximeter *Infection control in Clinicalsettings* •Handhygiene •UseofPPE	•Careofpatients with alterationsinvitalsigns-1	•Assessmentof clinical skillsusingchecklist •OSCE
	3	Demonstrate skill inmeeting the comfortneedsofthepatients	**Comfort, Rest & Sleep, Pain andPromoting Safety in Health CareEnvironment** *Comfort,Rest&Sleep* •Bedmaking- ○ Open ○ Closed ○ Occupied ○ Post-operative		•Assessment ofclinical skillsusingchecklist •OSCE

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Clinical Unit	Duration(inWeeks)	LearningOutcomes	ProceduralCompetencies/Clinical Skills (SupervisedClinicalPractice)	ClinicalRequirements	AssessmentMethods
			○ Cardiacbed ○ Fracturebed •Comfortdevices ○ Pillows ○ Overbedtable/cardiactable ○ Backrest ○ BedCradle •TherapeuticPositions ○ Supine ○ Fowlers(low,semi,high) ○ Lateral ○ Prone ○ Sim's ○ Trendelenburg ○ Dorsalrecumbent ○ Lithotomy ○ Kneechest *Pain* •Painassessmentandprovisionforcomfort *Promoting Safety in Health CareEnvironment*		
		Providesafeandcleanenvironment	•CareofPatient'sUnit •UseofSafetydevices: ○SideRails •Restraints(Physical) •FallriskassessmentandPostFallAssessment	•Fall riskassessment-1	
	2	Demonstrate skill inadmission, transfer,and discharge of apatient	**Hospital Admission anddischarge, Mobility andImmobilityandPatienteducation** *HospitalAdmissionanddischarge* Perform&Document: •Admission •Transfer •PlannedDischarge		•Assessment ofclinical skillsusingchecklist •OSCE
		Demonstrate skill incaring for patientswith restrictedmobility	*MobilityandImmobility* •Rangeof MotionExercises •Assistpatientin: ○Moving	•Individualteaching-1	•Assessment ofclinical skillsusingchecklist •OSCE

Clinical Unit	Duration(inWeeks)	LearningOutcomes	ProceduralCompetencies/Clinical Skills(Supervised ClinicalPractice)	Clinical Requirements	Assessment Methods
		Plan and provideappropriate healthteaching followingtheprinci	○ Turning ○ Logrolling • Changingpositionofhelplesspatient • Transferring (Bed to and fromchair/wheelchair/stretcher)		
	1	Demonstrateskillsin assessingand performingFirstAidduringemergencies	**FirstaidandEmergencies** • BandagingTechniques ○ BasicBandages: ▪ Circular ▪ Spiral ▪ Reverse-Spiral ▪ Recurrent ▪ FigureofEight ○ SpecialBandages: ▪ Caplin ▪ Eye/EarBandage ▪ JawBandage ▪ ShoulderSpica ▪ Thumbspica ▪ TriangularBandage/Sling(Head& limbs) ▪ Binders	• ModulecompletionNationalDisasterManagementAuthority (NDMA) FirstAid module(Tocompleteitin clinicals ifnot completedduringlab)	• Assessment ofclinical skillsusingchecklist • OSCE (first

APPLIEDBIOCHEMISTRY

PLACEMENT:IISEMESTER

THEORY: 2credits(40hours) (includeslabhoursalso)

DESCRIPTION: The course is designed to assist the students to acquire knowledge of the normal biochemical compositionandfunctioning ofhumanbody,itsalterationsindiseaseconditionsandtoapply thisknowledgeinthepracticeofnursing.

COMPETENCIES: Oncompletionofthecourse,thestudentswillbeableto

1. Describethe metabolismofcarbohydratesanditsalterations.
2. Explainthe metabolismoflipidsanditsalterations.
3. Explainthe metabolismofproteinsandaminoacidsanditsalterations.
4. Explainclinicalenzymology invariousdisease conditions.
5. Explainacidbasebalance,imbalanceanditsclinicalsignificance.
6. Describethemetabolismofhemoglobinanditsclinicalsignificance.
7. Explaindifferentfunctiontestsandinterpretthefindings.
8. Illustratetheimmunochemistry.

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COURSEOUTLINE

T–Theory

Unit Time (Hrs)	Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
I 8(T)	Describe themetabolism ofcarbohydrates anditsalterations	**Carbohydrates** •Digestion,absorptionandmetabolismofcarbohydratesand related disorders •Regulationofblood glucose •Diabetes Mellitus – type 1 and type 2,symptoms,complications&management inbrief •InvestigationsofDiabetesMellitus o OGTT–Indications,Procedure, InterpretationandtypesofGTTcurve o MiniGTT,extendedGTT,GCT,IVGTT o HbA1c(Onlydefinition) •Hypoglycemia–Definition&causes	•Lecturecum Discussion •Explain usingchartsandslides •Demonstrationoflaboratory tests	•Essay •Shortanswer •Veryshortanswer
II 8(T)	Explain themetabolism oflipids and itsalterations	**Lipids** •Fattyacids–Definition,classification •Definition & Clinical significance ofMUFA&PUFA,Essentialfattyacids, Transfattyacids •Digestion,absorption&metabolismoflipids& relateddisorders •Compoundsformedfromcholesterol •Ketonebodies(name,types&significanceonly) •Lipoproteins– types&functions(metabolismnot required) •Lipid profile	•Lecturecum Discussion •Explain usingchartsandslides •Demonstrationoflaboratory tests	•Essay •Shortanswer •Veryshortanswer
III 9(T)	Explain themetabolism ofamino acids andproteins Identify alterationsin diseaseconditions	•Atherosclerosis(inbrief) **Proteins** •Classification of amino acids based onnutrition,metabolicratewithexamples •Digestion,absorption&metabolismofprotein& related disorders •Biologically important compoundssynthesizedfromvariousaminoacids(only names) •Inbornerrorsofaminoacid metabolism –onlyaromatic aminoacids(inbrief) •Plasmaprotein – types,function&normalvalues •Causesofproteinuria,hypoproteinemia,hyper-gammaglobinemia •Principleof electrophoresis,normal&abnormalelectrophoreticpatterns(in	•Lecturecum Discussion •Explain usingcharts,modelsandslides	•Essay •Shortanswer •Veryshortanswer

Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
			brief)		
IV	4(T)	Explain clinicalenzymology invarious diseaseconditions	**ClinicalEnzymology** •Isoenzymes–Definition&properties •Enzymesofdiagnosticimportancein o LiverDiseases– ALT,AST,ALP,GGT o Myocardial infarction – CK, cardiactroponins,AST, LDH o Musclediseases–CK,Aldolase o Bonediseases–ALP o Prostatecancer–PSA,ACP	•Lecturecum Discussion •Explain usingchartsandslides	•Essay •Shortanswer •Veryshortanswer
V	3(T)	Explain acid basebalance, imbalanceand its clinicalsignificance	**Acidbasemaintenance** •pH– definition,normalvalue •RegulationofbloodpH– bloodbuffer,respiratory & renal •ABG–normal values •Acidbasedisorders – types,definition&causes	•Lecturecum Discussion •Explain usingchartsandslides	•Shortanswer •Veryshortanswer
VI	2(T)	Describe themetabolism ofhemoglobin and itsclinicalsignificance	**Hemecatabolism** •Hemedegradationpathway •Jaundice– type,causes,urine&bloodinvestigations(vandenbergtest)	•Lecturecum Discussion •Explain usingchartsandslides	•Shortanswer •Veryshortanswer
VII	3(T)	Explain differentfunction tests andinterpretthefindings	**Organ function tests (biochemicalparameters&normal valuesonly)** •Renal •Liver	•Lecturecum Discussion •VisittoLab	•Shortanswer •Veryshortanswer
VIII	3(T)	Illustrate theimmunochemistry	•Thyroid **Immunochemistry** •Structure&functionsofimmunoglobulin •Investigations&interpretation–ELISA	•Explain usingchartsandslides •Lecturecum Discussion •Explain usingchartsandslides •Demonstrationoflaboratory tests	•Shortanswer •Veryshortanswer

Note: Fewlabhourscanbeplannedforobservationandvisits(Lessthan1credit, labhoursarenotspecifiedseparately).

APPLIEDNUTRITIONANDDIETETICS

PLACEMENT:IISEMESTER

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THEORY: 3 credits (60 hours)Theory:45 hours

Lab :15hours

DESCRIPTION: Thecourseisdesignedtoassistthestudentstoacquirebasicknowledgeandunderstandingoftheprinciplesof Nutrition andDieteticsandapplythisknowledgein thepracticeof Nursing.

COMPETENCIES: Oncompletionofthecourse,thestudentswillbeableto

1. Identifytheimportanceofnutritioninhealthandwellness.
2. Applynutrientanddietarymodificationsincaringpatients.
3. ExplaintheprinciplesandpracticesofNutritionandDietetics.
4. Identifynutritional needsofdifferentagegroupsandplanabalanceddietfor them.
5. Identifythedietaryprinciplesfordifferentdiseases.
6. Plantherapeuticdietforpatientssufferingfromvariousdiseaseconditions.
7. Preparemealsusingdifferentmethodsandcookeryrules.

COURSEOUTLINE

T–Theory

Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
I	2(T)	Definenutritionand its relationship toHealth	**IntroductiontoNutrition** ***Concepts*** • DefinitionofNutrition&Health • Malnutrition– UnderNutrition&OverNutrition • RoleofNutritioninmaintaininghealth • Factorsaffectingfoodandnutrition ***Nutrients*** • Classification • Macro&Micronutrients • Organic&Inorganic • EnergyYielding&Non-EnergyYielding ***Food*** • Classification–Foodgroups • Origin	• Lecture cumDiscussion	• Essay • Shortanswer • Very shortansw
II	3(T)	Describethe classification,functions, sourcesand recommendeddaily allowances(RDA) of ExplainBMRandfactors affectingBMR	**Carbohydrates** • Composition– Starches,sugarandcellulose • RecommendedDailyAllowance(RDA) • Dietarysources • Functions **Energy** • Unitofenergy–Kcal • BasalMetabolicRate(BMR) • FactorsaffectingBMR	• Lecture cumDiscussion • Charts/Slides • Models • Displayoffoodi	• Essay • Shortanswer • Very shortansw
III	3(T)	Describe theclassification, Functions,sources	**Proteins** • Composition	• Lecture cumDiscussion	• Essay • Shortanswer • Veryshort

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Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
		and RDA ofproteins.	• Eightessentialaminoacids • Functions • Dietarysources • Proteinrequirements–RDA	•Models •Displayoffoodite ms	answer
IV	2(T)	Describe theclassificati on, Functions, sourcesandRDAof fats	**Fats** • Classification–Saturated&unsaturated • Calorievalue • Functions • Dietarysourcesoffatsandfattyacids • Fatrequirements–RDA	•Lecturecum Discussion •Charts/Slides •Models •Displayoffoodite ms	•Essay •Shortanswer •Veryshorta nswer
V	3(T)	Describe theclassification,f unctions, sourcesand RDA ofvitamins	**Vitamins** • Classification– fatsoluble&watersoluble • Fatsoluble– VitaminsA,D,E,andK • Water soluble – Thiamine(vitamin B1), Riboflavin (vitamin B2),Nicotinic acid, Pyridoxine (vitamin B6),Pantothenicacid,Folicacid,VitaminB12,Ascorbicacid(vitamin C) • Functions, Dietary Sources &Requirements–RDAofeveryvitamin	•Lecturecum Discussion •Charts/Slides •Models •Displayoffoodite ms	•Essay •Shortanswer •Veryshorta nswer
VI	3(T)	Describe theclassification,f unctions, sourcesand RDA ofminerals	**Minerals** • Classification – Majorminerals(Calcium,phosphorus,sodium,potassium andmagnesium)andTraceelements • Functions • DietarySources • Requirements–RDA	•Lecturecum Discussion •Charts/Slides •Models •Displayoffoodite ms	•Shortanswer •Veryshorta nswer
VII	7(T) 8(L)	Describe and planbalanced diet fordifferent agegroups, pregnancy,andlact ation	**Balanceddiet** • Definition,principles,steps • Foodguides–BasicFourFoodGroups • RDA–Definition,limitations,uses • FoodExchangeSystem • Calculationofnutritivevalueoffoods • Dietaryfibre **Nutritionacrosslifecycle** • Meal planning/Menu planning – Definition,principles,steps • InfantandYoungChildFeeding(IYCF)guidelines–breastfeeding,infantfoods • Dietplanfordifferentagegroups –	•Lecturecum Discussion •Mealplanning •Labsessionon ○ Preparation ofbalanced diet fordifferentcategories ○ Low costnutritiousdishes	•Shortanswer •Veryshorta nswer

Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
			Children,adolescentsandelderly •Diet in pregnancy – nutritionalrequirementsandbalanced dietplan •Anemiainpregnancy– diagnosis,dietforanemicpregnantwomen,iron&folicacidsupplementationandcounseling •Nutrition in lactation – nutritionalrequirements,dietforlactating mothers,complementaryfeeding/weaning		
VIII	6(T)	Classify anddescribe thecommon nutritionaldeficiency disordersand identify nurses'role in assessment,management andprevention	**Nutritionaldeficiencydisorders** •Proteinenergymalnutrition –magnitudeof the problem, causes, classification,signs & symptoms, Severe acutemalnutrition (SAM), management &preventionandnurses'role •Childhoodobesity– signs&symptoms,assessment, management & preventionandnurses' role •Vitamindeficiencydisorders–vitaminA,B, C & D deficiency disorders –causes,signs & symptoms, management &preventionandnurses'role •Mineral deficiency diseases – iron, iodineandcalciumdeficiencies– causes,signs&symptoms,management&preventionandnurses' role	•Lecturecum Discussion •Charts/Slides •Models	•Essay •Shortanswer •Veryshortanswer
IX	4(T) 7(L)	Principles of dietsinvariousdiseases	**Therapeuticdiets** •Definition,Objectives,Principles •Modifications–Consistency,Nutrients, •Feedingtechniques. •Diet in Diseases – Obesity, DiabetesMellitus, CVD, Underweight, Renaldiseases,HepaticdisordersConstipation,Diarrhea,PreandPost-operativeperiod	•Lecturecum Discussion •Mealplanning •Lab session onpreparation oftherapeuticdiets	•Essay •Shortanswer •Veryshortanswer
X	3(T)	Describe the rulesand preservation ofnutrients	**Cookery rules and preservation ofnutrients** •Cooking– Methods,AdvantagesandDisadvantages •Preservationofnutrients •Measurestopreventlossofnutrientsduringpreparation •SafefoodhandlingandStorage offoods •Foodpreservation •Foodadditivesandfoodadulteration •PreventionofFoodAdulterationAct(PFA) •Foodstandards	•Lecturecum Discussion •Charts/Slides	•Essay •Shortanswer •Veryshortanswer

Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
XI	4(T)	Explain themethods ofnutritionalassessment andnutritioneducation	**Nutritionassessmentandnutritioneducation** • Objectivesofnutritionalassessment • Methods of assessment – clinicalexamination, anthropometry, laboratory&biochemicalassessment,assesmentofdietary intake including Food frequencyquestionnaire(FFQ)method • Nutritioneducation– purposes,principlesand methods	• Lecture cumDiscussion • Demonstration • Writing nutritionalassessmentreport	• Essay • Shortanswer • Evaluation ofNutritional assessmentreport
XII	3(T)	Describe nutritionalproblems in Indiaand nutritionalprograms	**NationalNutritionalProgramsandroleofnurse** • NutritionalproblemsinIndia • Nationalnutritionalpolicy • *National nutritional programs* – VitaminA Supplementation, Anemia Mukt BharatProgram, Integrated Child Development Services (ICDS), Mid-day Meal Scheme(MDMS), National Iodine DeficiencyDisorders Control Program (NIDDCP),Weekly Iron Folic Acid Supplementation(WIFS)andothersasintroduced • ~~Roleofnurseinevery program~~	• Lecture cumDiscussion	• Essay • Shortanswer • Very shortanswer
XIII	2(T)	Discuss theimportanceoffoodhygiene and foodsafety Explain the Actsrelated to foodsafety	**Foodsafety** • Definition,Foodsafetyconsiderations&measures • FoodsafetyregulatorymeasuresinIndia –RelevantActs • Fivekeystosaferfood • Foodstorage,foodhandlingandcooking • Generalprinciplesoffoodstorageoffoodeitems(ex.milk,meat) • Roleoffoodhandlersinfoodbornediseases • ~~Essentialstepsinsafecookingpractices~~	• Guidedreadingonrelatedacts	• Quiz • Shortanswer

FoodborndiseasesandfoodpoisoningaredealtinCommunityHealthNursingI.

NURSING FOUNDATION - II (including Health Assessment

Module)PLACEMENT: IISEMESTER

THEORY: 6Credits(120hours)

PRACTICUM: SkillLab:3Credits(120hours), Clinical:4Credits(320hours)

DESCRIPTION: Thiscourseisdesignedtohelpnovicenursingstudentsdevelopknowledgeandcompetenciesrequiredtoprovideevidence-based,comprehensivebasicnursing careforadult patients,usingnursingprocessapproach.

COMPETENCIES: Oncompletionofthecourse,thestudentswillbeableto

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1. Developunderstandingaboutfundamentalsofhealthassessmentandperformhealthassessmentinsupervisedclinicalsettings

2. Demonstratefundamentalskillsofassessment,planning,implementationandevaluationofnursingcareusingNursingprocessapproach in supervised clinicalsettings
3. AssesstheNutritionalneedsofpatientsandproviderelevantcareundersupervision
4. Identify andmeetthehygienicneedsofpatients
5. Identifyandmeettheeliminationneedsofpatient
6. Interpretfindingsofspecimentestingapplying theknowledgeofnormalvalues
7. Promoteoxygenationbasedonidentifiedoxygenationneedsofpatientsunder supervision
8. Reviewtheconceptoffluid,electrolytebalanceintegratingtheknowledgeof appliedphysiology
9. Applytheknowledgeoftheprinciples,routes,effectsofadministrationofmedicationsinadministeringmedication
10. Calculate conversions ofdrugsanddosages within and between systemsofmeasurements
11. Demonstrateknowledgeandunderstandingincaringforpatientswithalteredfunctioningofsenseorgansandunconsciousness
12. Explainloss,deathandgrief
13. Describesexualdevelopmentandsexuality
14. Identifystressorsandstressadaptationmodes
15. Integratetheknowledgeofcultureandculturaldifferencesinmeetingthespiritualneeds
16. Explaintheintroductory conceptsrelevantto modelsofhealthandillnessinpatientcare

***MandatoryModuleusedinTeaching/Learning:**

HealthAssessmentModule:40hours

COURSEOUTLINE

T– Theory,SL –SkillLab

	Unit Time (Hrs)	**LearningOutcomes**	**Content**	**Teaching/ LearningActivities**	**Assessment Methods**
I	20(T) 20(SL)	Describethe purposeandprocess ofhealth assessmentand perform assessmentunder supervisedclinicalpractice	**HealthAssessment** • Interviewtechniques • Observationtechniques • Purposesofhealthassessment • ProcessofHealthassessment oHealthhistory o Physicalexamination: ▪ Methods: Inspection, Palpation,Percussion,Auscultation, Olfaction ▪ Preparationforexamination:patientand unit ▪ Generalassessment ▪ Assessmentofeachbodysystem ▪ Documentinghealthassessmentfindings	• ModularLearning ***HealthAssessment Module** • Lecture • Discussion	• Essay • Shortanswer • Objective type • OSCE
II	13(T) 8(SL)	Describeassessment,planning,	**TheNursingProcess** • CriticalThinkingCompetencies, • cumDiscussion • Demonstration		• Essay • Shortanswer

	implementation andevaluationof nursingcareusing Nursingprocess	AttitudesforCriticalThinking,Levelsof criticalthinkinginNursing • NursingProcessOverview • ed ClinicalPractice • of careplan	• Demonstration	• Objectivetype

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Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
		approach	○**Assessment** ces,Methods ▪ OrganizingData ▪ ValidatingData ▪ DocumentingData ○ **NursingDiagnosis** ▪ Identificationofclientproblems, risksandstrengths ▪ Nursingdiagnosisstatement– parts,Types,Formulating, GuidelinesforformulatingNursing Diagnosis ▪ NANDAapproveddiagnoses ▪ Differencebetweenmedicaland nursingdiagnosis ○ **Planning** ▪ Typesofplanning ▪ EstablishingPriorities ▪ EstablishingGoalsandExpectedO utcomes–Purposes,types, guidelines,Componentsofgoals andoutcomestatements ▪ TypesofNursingInterventions, Selectinginterventions:Protocols andStandingOrders ▪ IntroductiontoNursing InterventionClassificationand NursingOutcomeClassification ▪ Guidelinesforwritingcareplan ○ **Implementation** ▪ ProcessofImplementingtheplan ofcare ▪ Typesofcare–Directand Indirect ○ **Evaluation** ▪ EvaluationProcess, DocumentationandReporting **Nutritionalneeds**		
III	5(T) 5(SL)	Identifyandmeetthe Nutritionalneeds ofpatients ▪ ction of Data: Types, Sour	• Importance • Factorsaffectingnutritionalneeds • Assessmentof nutritionalstatus • *Review:*specialdiets– Solid,Liquid,Soft • *Review* ontherapeuticdiets • Care ofpatient withDysphagia,	• Lecture • Discussion • Demonstration • Exercise • SupervisedClinicalpractice	• Essay • Shortanswer • Objectivetype • Evaluationof nutritional assessment& dietplanning

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
			Anorexia,Nausea,Vomiting • MeetingNutritionalneeds:Principles,equipment,procedure,indications o Oral o Enteral:Nasogastric/ Orogastric o Introduction to other enteralfeeds– types, indications, Gastrostomy,Jejunostomy o Parenteral – TPN (TotalParenteralNutrition)		
IV	5(T) 15(SL)	Identify and meetthe hygienic needsofpatients	**Hygiene** • FactorsInfluencingHygienicPractice • Hygienic care: Indications andpurposes,effectsofneglectedcare o Care of the Skin – (Bath, feet and nail,HairCare) o Careofpressurepoints o AssessmentofPressureUlcersusingBradenScaleandNortonScale o Pressure ulcers – causes, stages andmanifestations,careandprevention o Perinealcare/Meatalcare o Oralcare,CareofEyes,EarsandNose including assistive devices (eyeglasses,contactlens,dentures,hearingaid)	• Lecture • Discussion • Demonstration	• Essay • Shortanswer • Objectivetype • OSCE
V	10(T) 10(SL)	Identifyandmeetthe eliminationneeds of patient	**Eliminationneeds** • UrinaryElimination o Review of Physiology of UrineElimination, Composition andcharacteristicsof urine o FactorsInfluencingUrination o AlterationinUrinaryElimination o Facilitating urine elimination:assessment,types, equipment,procedures and specialconsiderations o Providingurinal/bedpan o Careofpatientswith ▪ Condomdrainage ▪ IntermittentCatheterization ▪ Indwelling Urinary catheter andurinarydrainage ▪ Urinarydiversions ▪ Bladderirrigation	• Lecture • Discussion • Demonstration	• Essay • Shortanswer • Objectivetype • OSCE

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Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
			• BowelElimination o ReviewofPhysiologyofBowelElimination, Composition andcharacteristicsof feces o FactorsaffectingBowelelimination o AlterationinBowelElimination o Facilitating bowel elimination:Assessment,equipment, procedures ▪ Enemas ▪ Suppository ▪ Bowelwash ▪ DigitalEvacuationofimpactedfeces ▪ Care of patients with Ostomies(BowelDiversionProcedures)		
VI	3(T) 4 (SL)	Explain varioustypes of specimensandidentifynormalvaluesof tests Develop skill inspecimencollection, handlingandtransport	**Diagnostictesting** • Phases of diagnostic testing (pre-test,intra-test & post-test) in Commoninvestigationsandclinicalimplications o CompleteBloodCount o SerumElectrolytes o LFT o Lipid/Lipoproteinprofile o SerumGlucose–AC,PC, HbA1c o Monitoring Capillary BloodGlucose (Glucometer RandomBloodSugar – GRBS) o StoolRoutineExamination o UrineTesting–Albumin, Acetone,pH,SpecificGravity o UrineCulture,Routine,TimedUrineSpecimen o Sputumculture o OverviewofRadiologic&EndoscopicProcedures	• Lecture • Discussion • Demonstration	• Essay • Shortanswer • Objectivetype
VII	11(T) 10(SL)	Assess patients foroxygenation needs,promoteoxygenation andprovide care duringoxygentherapy	**Oxygenationneeds** • ReviewofCardiovascularandRespiratory Physiology • Factorsaffectingrespiratoryfunctioning • AlterationsinRespiratoryFunctioning • Conditionsaffecting o Airway o Movementofair	• Lecture • Discussion • Demonstration& Re-demonstration	• Essay • Shortanswer • Objectivetype

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
			○ Diffusion ○ Oxygentransport • Alterationsinoxygenation • Nursinginterventionstopromoteoxygenation: assessment, types,equipmentused& procedure ○ Maintenanceofpatentairway ○ Oxygenadministration ○ Suctioning–oral, tracheal ○ Chestphysiotherapy– Percussion,Vibration&Posturaldrainage ○ CareofChestdrainage– principles& purposes ○ PulseOximetry– Factorsaffecting measurement of oxygensaturation using pulse oximeter,Interpretation • Restorative&continuingcare ○ Hydration ○ Humidification ○ Coughingtechniques ○ Breathingexercises ○ Incentivespirometry		
VIII	5(T) 10(SL)	Describe theconcept of fluid,electrolytebalance	**Fluid,Electrolyte,andAcid–BaseBalances** • ReviewofPhysiologicalRegulationofFluid, Electrolyte and Acid-BaseBalances • FactorsAffectingFluid,Electrolyteand Acid-BaseBalances • Disturbancesinfluidvolume: ○ Deficit ▪ Hypovolemia ▪ Dehydration ○ Excess ▪ Fluidoverload ▪ Edema • Electrolyteimbalances(hypoandhyper) ○ Acid-baseimbalances ▪ Metabolic–acidosis&alkalosis ▪ Respiratory–acidosis&alkalosis ○ Intravenoustherapy	• Lecture • Discussion • Demonstration	• Essay • Shortanswer • Objectivetype • Problems olving – calculations

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Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
			▪ Peripheralvenipuncturesites ▪ TypesofIVfluids ▪ CalculationformakingIVfluidplan ▪ ComplicationsofIVfluidtherapy ▪ Measuringfluidintakeandoutput ▪ AdministeringBloodandBloodcomponents ▪ Restrictingfluidintake ▪ EnhancingFluidintake		
IX	20(T) 22(SL)	Explain theprinciples, routes,effectsof administrationof medications Calculateconversions ofdrugsanddosages withinandbetweensystems ofmeasurements Administeroraland topical medicationand documentaccurately undersupervision	**AdministrationofMedications** • Introduction – Definition ofMedication,Administrationof Medication,DrugNomenclature,Effects of Drugs, Forms of Medications,Purposes,PharmacodynamicsandPharmacokinetics • FactorsinfluencingMedicationAction • MedicationordersandPrescriptions • Systemsofmeasurement • Medicationdosecalculation • Principles,10rightsofMedication Administration • ErrorsinMedicationadministration • Routesofadministration • StorageandmaintenanceofdrugsandNursesresponsibility • Terminologiesandabbreviationsusedinprescriptionsandmedicationsorders • Developmentalconsiderations • Oral,SublingualandBuccalroutes:Equipment,procedure • Introduction to ParenteralAdministration of Drugs – Intramuscular, Intravenous,Subcutaneous, Intradermal: Location ofsite, Advantages and disadvantages ofthe specific sites, Indication andcontraindications for the different routesandsites. • Equipment – Syringes & needles,cannulas, Infusion sets – parts, types,sizes • Types of vials and ampoules,Preparing Injectable medicines fromvialsandampoules o Care of equipment: decontaminationanddisposalofsyringes,needles,	• Lecture • Discussion Demonstration& Re-demonstration	• Essay • Shortanswer • Objectivetype • OSCE

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
			infusionsets oPreventionofNeedle-StickInjuries • Topical Administration: Types,purposes,site,equipment,procedure o Applicationtoskin&mucousmembrane o Directapplicationofliquids,Gargleandswabbing thethroat o Insertion of Drug into body cavity:Suppository/ medicated packing inrectum/vagina o Instillations:Ear,Eye,Nasal,Bladder,andRectal o Irrigations:Eye,Ear,Bladder,VaginalandRectal o Spraying:Noseandthroat • Inhalation: Nasal, oral,endotracheal/tracheal (steam, oxygenand medications) – purposes, types,equipment, procedure, recording andreportingofmedicationsadministered • OtherParenteralRoutes:Meaningofepidural, intrathecal,		
X	5(T) 6(SL)	Providecareto patientswithalteredfunctioningofsense organs andunconsciousness insupervised clinicalpractice	intraosseous,intraperitoneal, intra-pleural, intra-arterial **Sensoryneeds** • Introduction • Assessment and nursing management ofpatientwithunconsciousness,complications	• Lecture • Discussion • Demonstration	• Essay • Shortanswer • Objectivetype

- mponentsofsensoryexperience– Reception,Perception&Reaction
- ArousalMechanism
- Factorsaffectingsensoryfunction
- Assessment of Sensory alterations – sensorydeficit,deprivation,overload&sensorypoverty
- Management
  - Promoting meaningful communication (patients with Aphasia, artificial airway &VisualandHearingimpairment)

CareofUnconsciousPatients

- Unconsciousness: Definition, causes & riskfactors, pathophysiology, stages ofUnconsciousness,ClinicalManifestations

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Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
XI	4(T) 6(SL)	Explainloss,death andgrief	**CareofTerminallyill,deathanddying•** • Loss– Types • Grief,Bereavement&Mourning • TypesofGriefresponses • ManifestationsofGrief • FactorsinfluencingLoss&GriefResponses • TheoriesofGrief&Loss– KublerRoss • 5StagesofDying • TheRProcessmodel(Rando's) • Death– Definition,Meaning,Types(Brain&CirculatoryDeaths) • SignsofImpendingDeath • Dyingpatient'sBillofRights • CareofDyingPatient • PhysiologicalchangesoccurringafterDeath • DeathDeclaration,Certification • Autopsy • Embalming • Lastoffice/Death Care • Counseling&supportinggrievingrelatives • PlacingbodyintheMortuary • ReleasingbodyfromMortuary • Overview – Medico-legal Cases,Advancedirectives,DNI/DNR, OrganDonation,Euthanasia	Lecture • Discussion • Casediscussions • Death care/lastoffice	• Essay • Shortanswer • Objectivetype
XII	3(T)	Develop basicunderstanding ofself-concept	**PSYCHOSOCIALNEEDS(A-D)** **A. Self-concept** • Introduction • Components (Personal Identity, BodyImage,RolePerformance,SelfEsteem) • FactorsaffectingSelfConcept • NursingManagement	• Lecture • Discussion • Demonstration • Case Discussion/Roleplay	• Essay • Shortanswer • Objectivetype
XIII	2(T)	Describe sexualdevelopment andsexuality	**B. Sexuality** • Sexualdevelopmentthroughoutlife • Sexualhealth • Sexualorientation • Factorsaffectingsexuality	• Lecture • Discussion	• Essay • Shortanswer • Objective type

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
			• Prevention of STIs, unwantedpregnancy,avoidingsexualharassmentandabuse • Dealingwithinappropriatesexualbehavior		
XIV	2(T) 4(SL)	Describe stress andadaptation	**C. Stress and Adaptation – Introductoryconcepts** • Introduction • Sources,Effects,Indicators&TypesofStress • Typesofstressors • Stress Adaptation – GeneralAdaptationSyndrome(GAS) ,LocalAdaptationSyndrome(LAS) • Manifestation of stress – Physical &psychological • Copingstrategies/Mechanisms • StressManagement o Assistwithcopingandadaptation o Creatingtherapeuticenvironment • Recreationalanddiversiontherapies	• Lecture • Discussion	• Essay • Shortanswer • Objective type
XV	6(T)	Explain culture andculturalnorms Integrate culturaldifferences andspiritual needs inproviding care topatients undersupervision	**D. ConceptsofCulturalDiversityandSpirituality** • Culturaldiversity o CulturalConcepts– Culture,Subculture,Multicultural,Diversity, Race,Acculturation,Assimilation o TransculturalNursing o CulturalCompetence o ProvidingCulturallyResponsiveCare • Spirituality o Concepts–Faith,Hope,Religion, Spirituality,SpiritualWellbeing o FactorsaffectingSpirituality o SpiritualProblemsinAcute,Chronic,Terminal illnesses & Near-DeathExperience o DealingwithSpiritual Distress/Problems	• Lecture • Discussion	• Essay • Shortanswer • Objective type
XVI	6(T)	Explainthe significance ofnursingtheories	**NursingTheories:Introduction** selected nursing theories– Nightingale,Orem,Roy • Useof theories innursingpractice	• Lecture	• Essay • Shortanswer • Objective type

• aning&Definition,Purposes,Types• Discussion of theories with examples,Overviewof

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CLINICALPRACTICUM

Clinical:4Credits(320hours)

PRACT|ICECOMPETENCIES: Oncompletionofthecourse,thestudentwillbeableto

1. Performhealthassessmentofeachbodysystem
2. Developskillsinassessment,planning,implementationandevaluationofnursingcareusingNursingprocessapproach
3. IdentifyandmeettheNutritionalneedsofpatients
4. Implementbasicnursingtechniquesinmeetinghygienicneedsofpatients
5. PlanandImplementcaretomeettheeliminationneedsofpatient
6. Developskillsininstructingandcollectingsamplesforinvestigation.
7. Performsimplelabtestsandanalyze&interpretcommondiagnosticvalues
8. Identifypatientswithimpairedoxygenationanddemonstrateskillincaringforpatientswithimpairedoxygenation
9. Identifyanddemonstrateskillincaringforpatientswithfluid,electrolyteandacid–baseimbalances
10. Assess,plan,implement&evaluatethebasiccareneedsofpatientswithalteredfunctioningofsenseorgansandunconsciousness
11. Carefor terminallyillanddyingpatients

SKILLLAB

UseofMannequinsandSimulators

S.No.	Competencies	ModeofTeaching
1.	HealthAssessmentNutritional	Standardized
2.	Assessment	PatientStandardized
3.	Spongebath,oralhygiene,perinealcareNa	PatientMannequin
4.	sogastrictubefeeding	Trainer/
5.	Providing bed pan &	SimulatorMannequinC
6.	urinalCathetercare	atheterization
7.	Bowelwash,enema,insertionofsuppository	TrainerSimulator/Man
8.	Oxygenadministration– facemask,venturemask,nasal prongs	nequin
9.	AdministrationofmedicationthroughP arenteralroute–IM,SC,ID,IV	IMinjectiontrainer,IDinjectiontrainer, IVarm(Trainer)
10.	LastOffice	Mannequin

CLINICAL POSTINGS – General Medical/Surgical

Wards(16weeks×20hoursper week =320hours)

Clinical Unit	Duration (Weeks)	LearningOutcomes	Procedural Competencies/Clinical Skills (SupervisedClinicalPractice)	ClinicalRequirements	Assessment Methods
General Medical/ Surgical wards	3	Perform healthassessmento feachbody system	**HealthAssessment** • Nursing/Healthhistorytaking • Performphysicalexamination:	• HistoryTaking–2 • Physical examination–2	• Assessmentof clinical skillsusingchec • OSCE

Clinical Unit	Duration (Weeks)	LearningOutcomes	Procedural Competencies/Clinical Skills (SupervisedClinicalPractice)	Diagnostictesting	ClinicalRequirements
			oBodysystems • Use various methods ofphysical examination – Inspection, Palpation,Percussion, Auscultation,Olfaction • Identification of system wisedeviations		• Nursingprocess–1
	1	Develop skills inassessment, planning,implementation andevaluation of nursingcare using Nursingprocessapproach	• Documentationoffindings **TheNursingProcess** • PrepareNursingcareplanforthe patient based on the givencase scenario		• NutritionalAssessment andClinicalPresentation–1
	2	Identify and meet theNutritional needs ofpatients Implement basicnursing techniques inmeeting hygienicneedsof patients	**Nutritional needs, Eliminationneeds&Diagnostic testing** *Nutritionalneeds* • NutritionalAssessment • PreparationofNasogastrictubefeed • Nasogastrictubefeeding *Hygiene* • CareofSkin&Hair: – SpongeBath/Bedbath – Careofpressurepoints&backmassage • Pressuresoreriskassessmentusing Braden/Nortonscale – Hairwash – ~~Pediculosistreatment~~		• Pressure soreassessment–1 • ClinicalPresentation onCare of patientwithConstipation–1
	2	Plan and Implementcare to meet theeliminationneeds ofpatient Develop skills ~~in~~instructing andcollectingsamples forinvestigation.	• OralHygiene • PerinealHygiene • Cathetercare **Eliminationneeds** • Providing – Urinal – Bedpan • InsertionofSuppository • Enema • UrinaryCathetercare • Careofurinarydrainage		• Labvalues–inter-pretation

Assessment Methods

- Evaluation ofNursing processwithcriteria
- Assessment ofclinical skills using check list
- OSCE

- Assessment of clinical skills using checklist
- OSCE

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Clinical Unit	Duration (Weeks)	LearningOutcomes	Procedural Competencies/Clinical Skills (SupervisedClinicalPractice)	ClinicalRequirements	AssessmentMethods
		Perform simple labtests and analyze &interpret commondiagnostic values	• SpecimenCollection oUrineroutineandculture oStoolroutine oSputum Culture • PerformsimpleLabTestsusingreagent strips o Urine – Glucose, Albumin,Acetone,pH,Specificgravity		
	3	Identify patients withimpaired oxygenationand demonstrate skillin caring for patientswith impairedoxygenation	• Blood–GRBSMonitoring **Oxygenation needs, Fluid,Electrolyte, and Acid – BaseBalances** ***Oxygenationneeds*** • Oxygenadministration methods o NasalProngs o FaceMask/VenturiMask • Steaminhalation • ChestPhysiotherapy • DeepBreathing&CoughingExercises • OralSuctioning		• Assessment ofclinical skillsusingchecklist • OSCE
		Identify anddemonstrate skill incaringforpatientswithfluid, electrolyte andacid–baseimbalances	***Fluid, Electrolyte, and Acid – BaseBalances*** • Maintainingintakeoutputchart • Identify&reportcomplicationsofIV therapy • ObserveBlood&BloodComponenttherapy • Identify & ReportComplications of Blood & BloodComponenttherapy		• Assessment ofclinical skillsusingchecklist • OSCE
	3	Explain the principles,routes, effects ofadministration ofmedications Calculate conversionsof drugs and dosageswithin and betweensystems ofMeasurements	**AdministrationofMedications** • CalculateDrugDosages • Preparation of lotions &solutions • AdministerMedications oOraloTopical Inhalationsoparenteral ▪ Intradermal ▪ Subcutaneous		• Assessment ofclinical skillsusingchecklist • OSCE
		Administer drugs bythe following routes-Oral,Intradermal,			

Clinical Outcomes	Duration Unit	Learning (Weeks)	Procedural Competencies/Clinical Skills (SupervisedClinicalPractice)	ClinicalRequirements	Assessment Methods
		Subcutaneous,Intramuscular, IntraVenous Topical,inhalation	▪ Instillations o Eye, Ear, Nose –instillation ofmedicateddrops,nasalsprays,irrigations		
	2	Assess, plan,implement & evaluatethebasiccareneedsofpatients with alteredfunctioning of senseorgans andunconsciousness Care for terminally illanddying patients	**Sensory Needs and Care ofUnconscious patients, Care ofTerminallyill,deathanddying** *SensoryNeedsandCareofUnconsciouspatients* • Assessment of Level ofConsciousnessusingGlasgowComaScale *Terminallyill, deathanddying* • DeathCare	• Nursingroundsoncareof patient withalteredsensorium	• Assessmentof clinical skillsusingchecklist • Assessmentof clinical skillsusingchec

HEALTH/NURSINGINFORMATICSANDTECHNOLOGY

PLACEMENT:IISEMESTER

THEORY:2Credits(40hours)

PRACTICAL/LAB:1Credit(40hours)

DESCRIPTION: Thiscourseisdesignedtoequipnovicenursingstudentswithknowledgeandskillsnecessarytodeliverefficientinformatics-ledhealth careservices.

COMPETENCIES: Oncompletionofthecourse,thestudentswillbeableto

1. Developabasicunderstandingofcomputerapplicationinpatientcareandnursingpractice.
2. Applytheknowledgeofcomputerandinformationtechnologyinpatientcareandnursingeducation,practice,administrationandresearch.
3. Describetheprinciplesof healthinformaticsanditsuseindevelopingefficienthealthcare.
4. Demonstratetheuseof informationsysteminhealthcareforpatientcareandutilizationofnursingdata.
5. DemonstratetheknowledgeofusingElectronicHealthRecords(EHR)systeminclinicalpractice.
6. Applytheknowledgeofinteroperabilitystandardsinclinicalsetting.
7. Apply theknowledgeofinformationandcommunicationtechnology inpublichealthpromotion.
8. UtilizethefunctionalitiesofNursingInformationSystem(NIS)systeminnursing.
9. Demonstratetheskillsofusingdatain managementofhealthcare.
10. Applytheknowledge oftheprinciplesofdigitalethicalandlegalissuesinclinicalpractice.
11. Utilizeevidence-basedpracticesininformaticsandtechnologyforprovidingqualitypatientcare.
12. Updateandutilizeevidence-basedpracticesinnursingeducation,administration,andpractice.

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COURSEOUTLINE

T–Theory,P/L–Lab

	Unit Time (Hrs)		LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
	T	P/L				
I	10	15	Describetheimportance ofcomputerand technologyinpatient care and nursingpractice	**Introduction to computerapplicationsforpatientcaredeliverysystemandnursing practice** • Use of computers in teaching,learning,researchand nursingpractice	• Lecture • Discussion • Practicesession • Supervised clinicalpracticeonEHRuse • Participate in dataanalysis using statisticalpackagewithstatistician • Visittohospitalswithdifferenthospital managementsystems	(T) • Shortanswer • Objectivetype • Visitreports • Assessment ofassignments (P) • Assessmentof skills usingcheck list
II	4	5	Demonstratetheuseofcomputerand technology inpatient care,nursing education,practice, administration andresearch. Describetheprinciples of healthinformatics Explain the waysdata,knowledgeandinformation can beused for effectivehealthcare	• Windows, MS office: Word,Excel, PowerPoint •Internet • Literatureresearch • Statisticalpackages • Hospital managementinformationsystem **PrinciplesofHealthInformatics** • Health informatics – needs,objectivesandlimitations • Use of data, information andknowledgeformoreeffectivehealthcareand betterhealth	• Lecture • Discussion • Practicalsession • Work in groups withhealth informatics teamin a hospital to extractnursingdataandpreparereport	(T) • Essay • Shortanswer • Objective typequestions • Assessment ofreport
III	3	5	Describetheconcepts ofinformation systeminhealth Demonstratetheuse ofhealthinformation systeminhospitalsetting	**InformationSystemsin Healthcare** • Introduction to the role andarchitecture of informationsystemsinmodern healthcareenvironments •ClinicalInformationSystem (CIS)/Hospital informationSystem(HIS)	• Lecture • Discussion • Demonstration • Practicalsession • Workingroupswith nurseleaderstounderstandthehospitalinformationsystem	(T) • Essay • Shortanswer
IV	4	4	Explain the use ofelectronic healthrecordsinnursing practice	**SharedCare&ElectronicHealthRecords** • Challengesofcapturingrich patienthistoriesinacomputable	• Lecture • Discussion •PracticeonSimulated	(T) • Essay • Shortanswer

e s c r i b e the lat est tre nd in ele

ctronichealth recordsstandards andinteroperability	form • Latestglobaldevelopmentsandstandards to enable lifelongelectronic health records to beintegrated from disparatesystems.	EHRsystem • Practicalsession • Visit to healthinformatics departmentof a hospital tounderstand the use ofEHRinnursingpractice	• Objective type(P) • Assessment ofskills usingchecklist

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Unit	Time (Hrs)		LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
	T	P/L				
					• Prepare a report oncurrentEHRstandardsinIndian setting	
V	3		Describethe advantages andlimitations of healthinformatics inmaintaining patientsafety and riskmanagement	**PatientSafety&ClinicalRisk** • Relationshipbetweenpatientsafety andinformatics • Functionandapplicationoftherisk managementprocess	• Lecture • Discussion	(T) •Essay •Shortanswer •Objectivetype
VI	3	6	Explaintheimportance ofknowledge management Describe thestandardizedlanguages used inhealthinformatics	**ClinicalKnowledge&Decision Making** • Roleofknowledgemanagementinimprovingdecision-makingin both the clinical and policycontexts • Systematized Nomenclature ofMedicine, Clinical Terms,SNOMED CT to ICD-10-CMMap, standardized nursingterminologies (NANDA, NOC),Omahasystem.	• Lecture • Discussion • Demonstration • Practicalsession • Work in groups toprepare a report onstandardized languagesused in healthinformatics. • Visithealthinformatics department tounderstand thestandardized languagesusedinhospital setting	(T) •Essay •Shortanswer •Objectivetype
VII	3		Explain the use ofinformation andcommunicationtechnologyinpatientcare Explain theapplication of publichealthinformatics	**eHealth: Patients and theInternet** • Use of information andcommunication technology toimproveorenablepersonaland publichealthcare • Introduction to public healthinformaticsandroleofnurses	• Lecture • Discussion • Demonstration	•Essay •Shortanswer •Objectivetype •Practicalexam
VIII	3	5	Describethe functionsofnursinginformationsystem Explain the use ofhealthcare data inmanagement ofhealth careorganization	**UsingInformationinHealthcare Management** •Components of NursingInformationsystem(NIS) •Evaluation, analysis andpresentationofhealthcaredatato inform decisions in themanagement of health-careorganizations	•Lecture •Discussion •Demonstration onsimulatedNISsoftware •Visit to healthinformatics departmentof the hospital tounderstand use ofhealthcare data indecision making	(T) •Essay •Shortanswer •Objectivetype
IX	4		Describetheethical and legal issues inhealthcareinformatics	**InformationLaw&Governance**	•Lecture	(T)

Explainsth eethicaland legalissues

inClinicalPractice

- Ethical-legalissuespertainingtohealthcare information incontemporaryclinicalpractice
- Ethical-legalissuesrelatedto

- Discussion
- Casediscussion
- Roleplay

- Essay
- Shorta nswer
- Object ivetyp e

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Unit	Time Outcomes(Hrs)		Learning	Content	Teaching/ LearningActiv	Assessment Methods
	T	P/L				
			related to nursinginformati	digitalhealthappliedtonursing		
X	3		Explain therelevance ofevidence-basedpractices inproviding qualityhealthcare	**HealthcareQuality&EvidenceBasedPractice** • Useofscientificevidenceinimproving the quality ofhealthcare and technical andprofessional informaticsstandards	• Lecture • Discussion • Casestudy	(T) • Essay • Shortanswer • Objectivetype

SKILLS

- Utilizecomputerinimprovingvariousaspectsofnursingpractice.
- Usetechnologyinpatientcareandprofessionaladvancement.
- Usedatainprofessionaldevelopmentandefficientpatientcare.
- Useinformationsysteminprovidingqualitypatientcare.
- Usetheinformationsystemtoextractnursingdata.
- Developskillinconductingliteraturereview.

APPLIEDMICROBIOLOGYANDINFECTIONCONTROLINCLUDINGSAFETY

PLACEMENT:IIISEMESTER

THEORY: 2Credits(40hours)

PRACTICAL: 1Credit(40hours)(Lab/Experiential Learning –L/E)

SECTIONA:APPLIEDMICROBIOLOGY

THEORY: 20hours

PRACTICAL:20hours(Lab/ExperientialLearning–L/E)

DESCRIPTION: This course is designed to enable students to acquire understanding of fundamentals of Microbiology,compare and contrast different microbes and comprehend the means of transmission and control of spread by variousmicroorganisms.Italsoprovidesopportunitiesfor practicinginfectioncontrolmeasuresinhospitalandcommunitysettings.

COMPETENCIES: Oncompletionofthecourse,thestudentswillbeableto:

1. Identifytheubiquityanddiversityofmicroorganismsinthehumanbodyandtheenvironment.
2. Classifyandexplainthemorphology andgrowthofmicrobes.
3. Identifyvarioustypesofmicroorganisms.
4. Exploremechanismsbywhichmicroorganismscausedisease.
5. Developunderstandingofhowthehumanimmunesystemcounteractsinfectionbyspecificandnon-specificmechanisms.
6. Applytheprinciplesofpreparationanduseofvaccinesinimmunization.
7. Identifythecontributionofthemicrobiologistandthe microbiology laboratory tothediagnosisofinfection.

COURSEOUTLINE

T–Theory,L/E–Lab/ExperientialLearning

Unit	Time (Hrs) T	P	Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
I	3		Explainconcepts and principles ofmicrobiology andits importance innursing	**Introduction:** • Importanceand relevancetonursing • Historicalperspective • Conceptsandterminology • Principlesofmicrobiology	• Lecturecum Discussion	• Shortanswer • Objective type
II	10	10(L/E)	Describestructure,classification morphologyand growthofbacteria. 4(L/E)	**GeneralcharacteristicsofMicrobes:** • Structureandclassificationof Microbes • Morphological types • Sizeandformofbacteria Identify Microorganisms	• Lecture cumDiscussion • Demonstration • ExperientialLearning throughvisual • Motility • Colonization • Growthandnutritionofmicrobes • Temperature • Moisture • Bloodandbodyfluids • Laboratory methods forIdentificationof Microorganisms • Types of Staining – simple,differential (Gram's, AFB), special –capsular staining (negative), spore,LPCB, KOHmount. • Cultureandmediapreparation –solid and liquid. Types of media – semi synthetic, synthetic, enriched,enrichment, selective and differentialm	• Shortanswer • Objective type edia.Pureculturetechniques– tubedilution, pour, spread, streak plate.Anaerobiccultivationofbacteria **Pathogenicorganisms** • Micro-organisms: Cocci – grampositive and gram negative; Bacilli – grampositiveand gramnegative • Viruses • Fungi:SuperficialandDeepmycoses • Parasites • Rodents&Vectors o Characteristics, Source, portal ofentry, transmission of infection,Identificationofdiseaseproducingmicro-organisms **Immunity**
III	4	6(L/E)		Describe thedifferent diseaseproducingorganisms		
IV	3			Explain theconceptsof		

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• Lecture cumDiscussion • Demonstration • Experientiallearning throughvisual	• Short answer • Objective type	
• Lecture		
	• Short answer • Objective	

Unit	Time(Hrs)		Learning Outcomes	Content	Teaching/Learning	Assessment
	T	P				
			immunity, hypersensitivity andimmunizatio	• Immunity:Types,classification • Antigenandantibodyreaction • Hypersensitivityreactions • Serologicaltests • Immunoglobulins:Structure,types&properties • Vaccines: Types & classification,storage and handling, cold chain,Immunizationforvariousdiseases	• Discussion • Demonstration • Visit to observevaccine storage	type •Visitreport

SECTIONB:INFECTIONCONTROL&SAFETY

THEORY: 20hours

PRACTICAL/LAB:20hours(Lab/ExperientialLearning–L/E)

DESCRIPTION: This course is designed to help students to acquire knowledge and develop competencies required forfundamental patient safety and infection control in delivering patient care. It also focuses on identifying patient safetyindicators,preventing and managinghospitalacquiredinfections, andinfollowing universalprecautions.

COMPETENCIES: Thestudentswillbeableto:

1. DevelopknowledgeandunderstandingofHospitalacquiredInfections(HAI)andeffectivepracticesforprevention.
2. Integratetheknowledgeofisolation(Barrierandreversebarrier)techniquesinimplementing variousprecautions.
3. DemonstrateandpracticestepsinHandwashingandappropriateuseofdifferenttypesofPPE.
4. Illustratevariousdisinfectionandsterilizationmethodsandtechniques.
5. Demonstrateknowledgeandskillinspecimen collection,handlingandtransporttooptimizethediagnosisfortreatment.
6. IncorporatetheprinciplesandguidelinesofBioMedicalwastemanagement.
7. ApplytheprinciplesofAntibioticstewardshipinperformingthenurses'role.
8. Identify patientsafety indicatorsandperformtheroleof nurseinthepatientsafety audit process.
9. ApplytheknowledgeofInternationalPatientSafetyGoals(IPSG)inthepatientcaresettings.
10. Identifyemployeesafetyindicatorsandriskofoccupationalhazards.
11. Developunderstandingofthevarioussafetyprotocolsandadheretothoseprotocols.

COURSEOUTLINE

T–Theory,L/E–Lab/ExperientialLearning

Unit	Time(Hrs)		Learning	Content	Teaching/ LearningActiv	Assessment Methods
	T	P				
I	2	2(E)	Summarize theevidence basedand effectivepatient carepractices for theprevention ofcommonhealthcareassociated infectionsintheh ealthcare	**HAI(HospitalacquiredInfection)** • Hospitalacquiredinfection • Bundleapproach - Prevention of Urinary TractInfection(UTI) - Prevention of Surgical SiteInfection(SSI) - PreventionofVentilator	• Lecture &Discussion • Experiential	• Knowledge assessment • MCQ • Shortanswer

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Unit	Time (Hrs) T	P	Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
			setting	Associatedevents(VAE) -Prevention of Central LineAssociated Blood StreamInfection(CLABSI) • Surveillance of HAI – Infectioncontrol team & Infection controlcommittee		
II	3	4(L)	Demonstrateappropriate useof differenttypes of PPEsand the criticaluse of riskassessment	**Isolation Precautions and use ofPersonal Protective Equipment(PPE)** • Typesofisolationsystem,standardprecaution and transmission-basedprecautions (Direct Contact,Droplet, Indirect) • Epidemiology & Infectionprevention– CDCguidelines • EffectiveuseofPPE	• Lecture • Demonstration &Re-demonstration	• Performance assessment • OSCE
III	1	2(L)	DemonstratetheHandHygiene gement	**Hand Hygiene** • TypesofHandhygiene. • Handwashinganduseofalcoholhandrub • MomentsofHandHygiene • WHOhandhygienepromotion	• Lecture	• Performance sample • Staffprecautionsinhandlingspecimens **BMW(BioMedicalWasteManagement)** *Laundrymanagementprocessandinfectioncontrolandprevention*
IV	1	2(E)	Illustratesdisinfection andsterilization inthe healthcaresetting	**Disinfectionandsterilization** • Definitions • Typesofdisinfectionand sterilization • Environmentcleaning • EquipmentCleaning • Guidesonuseofdisinfectants • Spaulding'sprinciple		
V	1		Illustrate onwhat, when,how, whyspecimens arecollected tooptimize thediagnosis fortreatment andmanagement.	**SpecimenCollection(Review)** • Principleofspecimencollection • Typesofspecimens • Collectiontechniquesandspecialconsiderations • Appropriatecontainers • Transportationofthe		
VI	2	2(E)	Explain on BioMedical wastemanagement &laundrymana			

• Demonstration &Re-demonstration	assessment	sessment • Checklist
• Lecture • Discussion • Experientiallearning throughvisit	• Shortanswer • Objectivetype	• Knowledgeassessment byshort answers, objectivetype
• Discussion	• Knowledgeevaluation • Quiz • Performanceas	• Performance
• Discussion • Demonstration • Experientiallearningthrough		





Unit	Time (Hrs) T	P	Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
				• Wastemanagementprocessandinfectionprevention • Staffprecautions • Laundrymanagement • Country ordinance and BMWNational guidelines 2017:Segregation of wastes, Colourcoded waste containers, wastecollection&storage,Packaging&labeling,Transportation	visit	assessment
VII	2		Explainindetail about Antibioticstewardship,AMR DescribeMRSA/MDRO and itspreventi on	**Antibioticstewardship** • ImportanceofAntibiotic Stewardship • Anti-MicrobialResistance • PreventionofMRSA,MDROinhealthcare setting	• Lecture • Discussion • Writtenassignment –Recent AMR(Antimicrobialresistance)guidelines	• Shortanswer • Objectivetype • Assessment ofassignment
VIII	3	5(L/E)	Enlistthepatient safetyindicators followedina healthcare organizationand theroleofnurse inthepatients afety auditprocess Captures andanalyzesincidents andevents forqualityimprovement	**PatientSafetyIndicators** •CareofVulnerablepatients • PreventionofIatrogenicinjury •Careof lines,drainsandtubing‘s • Restrain policy and care – PhysicalandChemical • Blood&blood transfusionpolicy • PreventionofIVComplication • PreventionofFall • PreventionofDVT • Shiftingandtransportingofpatients • Surgicalsafety • Care coordination event related tomedication reconciliation andadministration • Preventionofcommunicationerrors • PreventionofHAI • Documentation **IncidentsandadverseEvents** • Capturingofincidents • RCA(RootCauseAnalysis) • CAPA(CorrectiveandPreventiveAction) • Reportwriting	• Lecture • Demonstration • Experiential learning •Lecture	• Knowledge assessment • Performance assessment • Checklist/OSCE •Knowledgeassessment •Shortanswer

Unit	Time (Hrs) T	P	Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
					•Roleplay •InquiryBasedLearning	• Objectivetype
IX	1		EnumerateIPSGI and applicationof the goals inthe patient caresettings.	**IPSG(InternationalPatientsafety Goals)** • Identifypatientcorrectly • Improveeffectivecommunication • ImprovesafetyofHighAlertmedication • Ensuresafesurgery • Reducetheriskofhealthcareassociatedinfection • Reduce the risk of patient harmresultingfromfalls • Reducetheharmassociatedwithclinicalalarmsystem	• Lecture • Roleplay	• Objectivetype
X	2	3(L/E)	Enumerate thevarious safetyprotocolsanditsapplications	**Safetyprotocol** • 5S(Sort,Setinorder,Shine,Standardize,Sustain) • Radiationsafety • Lasersafety • Firesafety - Typesandclassificationof fire - Firealarms - Firefightingequipment • HAZMAT(HazardousMaterials)safety - Typesofspill - Spillagemanagement - MSDS (Material Safety DataSheets) • Environmentalsafety - Riskassessment - Aspectimpactanalysis - Maintenance of Temp andHumidity(Departmentwise) - Audits • EmergencyCodes	• Lecture • Demonstration/ Experientiallearning	• Mockdrills • Posttests • Checklist
XI	2		Explainimportance ofemployeesafety	• RoleofNurseintimesofdisaster **EmployeeSafetyIndicators** • Vaccination • Needlestickinjuries(NSI)	• Lecture • Discussion	• Knowledgeassessment

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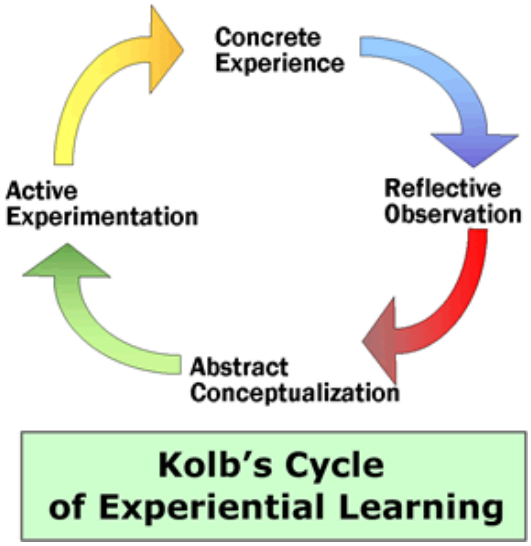
Unit	Time(Hrs)		Learning	Content	Teaching/ LearningActiv	Assessment Methods
	T	P				
			indicators Identifyriskofoccupationalhazards,preventionandpost exposureprophylaxis.	prevention • Fallprevention • Radiationsafety • Annualhealthcheck **HealthcareWorkerImmunization Program and management ofoccupationalexposure** • Occupationalhealthordinance • Vaccinationprogramforhealthcarestaff • Needlestickinjuriesandpreventionandpostexposure prophylaxis	• Lecturemethod • Journalreview	objectivetype • Shortanswer

***ExperientialLearning:**

Experientiallearningistheprocessbywhichknowledgeiscreated throughtheprocessofexperienceintheclinical field.Knowledgeresultsfromthecombinationofgrasping



Kolb's Cycle of Experiential Learning

and transformingexperience.(Kolb,1984).Theexperiential learning cycle begins with an experience that the student hashad, followed by an opportunity to reflect on that experience.Thenstudentsmayconceptualizeanddrawconclusions about what they experienced and observed, leading to futureactionsinwhichthestudentsexperimentwithdifferentbehaviors. This begins the new cycle as the students havenewexperiencesbasedontheirexperimentation.Thesesteps mayoccurinnearlyandorderasthelearningprogresses.As theneedofthelearner,theconcretecomponentsand conceptual componentscanbeindifferentorderastheymayrequirea variety ofcognitiveandaffectivebehaviors. per

PHARMACOLOGY-I

PLACEMENT:IIISEMESTER

THEORY:1Credit(20hours)

DESCRIPTION: ThiscourseisdesignedtoenablestudentstoacquireunderstandingofPharmacodynamics,Pharmacokinetics,principlesoftherapeuticsand nursing implications.

COMPETENCIES: Oncompletionofthecourse,thestudentswillbeableto

1. Describepharmacodynamicsandpharmacokinetics.
2. Reviewtheprinciplesofdrugcalculationandadministration.
3. Explainthecommonlyusedantisepticsanddisinfectants.
4. DescribethepharmacologyofdrugsactingontheGIsystem.
5. Describethepharmacologyofdrugsactingontherespiratorysystem.
6. Describedrugs usedinthetreatmentofcardiovascularandblooddisorders.

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7. Explainthedrugsusedinthetreatmentofendocrinesystemdisorders.
8. Describethedrugsactingonskinanddrugsusedtotreatcommunicablediseases.

COURSEOUTLINE

T–Theory

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/Learning Activities	Assessment Methods
I	3(T)	DescribePharmacodynamics,Pharmacokinetics,Classification,principles ofadministrationofdrugs	**IntroductiontoPharmacology** • Definitions&Branches • Nature&Sourcesofdrugs • DosageFormsandRoutesofdrugadministration • Terminologyused • Classification, Abbreviations,Prescription,DrugCalculation,WeightsandMeasures • *Pharmacodynamics:* Actions, DrugAntagonism, Synergism, Tolerance,Receptors,Therapeutic,adverse,toxiceffects,pharmacovigilance • *Pharmacokinetics:* Absorption,Bioavailability, Distribution,Metabolism,Interaction,Excretion • Review: Principles of drugadministrationandtreatmentindividualization ○Factors affectingdose,routeetc. • IndianPharmacopoeia:LegalIssues,DrugLaws,ScheduleDrugs • RationalUseofDrugs	• Lecture cumDiscussion • Guided reading andwritten assignmentonscheduleKdrugs	• Shortanswer • Objectivetype • Assessment ofassignments
II	1(T)	Describe antiseptics,and disinfectant &nurse‘sresponsibilities	• PrinciplesofTherapeutics **Pharmacology of commonly usedantisepticsanddisinfectants** • AntisepticsandDisinfectants • Composition,action,dosage,route,indications,contraindications,	• Lecture cumDiscussion • Drug study/presentation	• Shortanswer • Objectivetype
III	2(T)	Describe drugs actingon gastro-intestinalsystem &nurse‘sresponsibilities	Druginteractions,sideeffects,adverseeffects,toxicity androleof nurse **DrugsactingonG.I.system** • Pharmacologyofcommonlyuseddrugs ○ EmeticsandAntiemetics ○ LaxativesandPurgatives ○ Antacidsandantipepticulcerdrugs ○ Anti-diarrhoeals – Fluid andelectrolyte therapy, Furazolidone,dicyclomine • Composition,action,dosage,route,indications, contraindications, ~~druginteractions, side effects,~~ adverseeffects,toxicity androleof nurse	• Lecture cumDiscussion • Drug study/presentation	• Shortanswer • Objectivetype

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/Learning Activities	Assessment Methods
IV	2(T)	Describedrugsacting onrespiratorysystem& nurse'sresponsibilities	**Drugsactingonrespiratorysystem** •Pharmacologyofcommonlyused ○ Antiasthmatics– Bronchodilators(Salbutamolinhalers) ○ Decongestants ○ Expectorants,Antitussivesand Mucolytics ○ Broncho-constrictorsandAntihistamines • Composition, action, dosage, route,indications, contraindications, druginteractions, side effects, adverseeffectstoxicityandroleof nurse	• Lecturecum Discussion • Drug study/presentation	• Shortanswer • Objectivetype
V	4(T)	Describedrugsusedoncardio-vascular system&nurse'sresponsibilities	**Drugs used in treatment ofCardiovascularsystemandbloodd isorders** • Haematinics,&treatmentofanemiaandantiadrenergics • Cholinergicand anticholinergic • AdrenergicDrugsforCHF&vasodilators • Antianginals • Antiarrhythmics • Antihypertensives • Coagulants&Anticoagulants • Antiplatelets&thrombolytics • Hypolipidemics • Plasmaexpanders&treatmentofshock • Drugsusedtotreatblooddisorders • Composition,action,dosage,route,indications, contraindications, druginteractions, side effects, adverseeffects,toxicity androleof nurse	• Lecture cumDiscussion • Drug study/presentation	• Shortanswer • Objectivetype
VI	2(T)	Describethedrugsused in treatment ofendocrine systemdisorders	**Drugsusedintreatmentofendocrinesystemdisorders** • Insulin&oralhypoglycemics • Thyroidandanti-thyroiddrugs • Steroids ○Corticosteroids ○Anabolicsteroids • Calcitonin,parathormone,vitaminD3,calciummetabolism ○Calciumsalts	• Lecturecum Discussion • Drug study/presentation	• Shortanswer • Objectivetype

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Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/Learning Activities	Assessment Methods
VII	1(T)	Describe drugs used inskindiseases&nurse‘ sresponsibilities	**Drugsusedintreatmentofin tegumentary system** • Antihistaminicsandantipruritics • Topical applications for skin-Benzylbenzoate, Gamma BHC,Clotrimazole,Miconazole,Silver Sulphadiazine(burns) • Composition,action,dosage,route,indications, contraindications, druginteractions, side effects, adverseeffectstoxicityandroleof nurse	• Lecture cumDiscussion • Drug study/presentation	• Shortanswer • Objectivetype
VIII	5(T)	Explain drug therapy/chemotherapy ofspecific infections &infestations&nurse‘ sresponsibilities	**Drugs used in treatment ofcommunicablediseases(commoninfections,infestations)** • GeneralPrinciplesforuseofAntimicrobials • Pharmacologyofcommonlyusedd rugs: o Penicillin, Cephalosporin‘s, Aminoglycosides,Macrolide&broadspectrum antibiotics, Sulfonamides,quinolones,Misc.antimicrobials • Anaerobicinfections • Antituberculardrugs, • Antileprosydrugs • Antimalarials • Antiretroviraldrugs • Antiviralagents • Antihelminthics,Antiscabiesagents • Antifungalagents • Composition, action, dosage, route,indications,contraindications, ~~Druginteractions, side effects,~~ adverseeffects,toxicity androleof nurse	• Lecture cumDiscussion • Drug study/presentation	• Shortanswer • Objectivetype

PATHOLOGY -I

PLACEMENT:IIISEMESTER

THEORY: 1Credit(20hours)(includeslabhoursalso)

DESCRIPTION: Thiscourseisdesignedtoenablestudentstoacquireknowledgeofpathologyofvariousdiseaseconditions, understanding of genetics, its role in causation and management of defects and diseases and to apply thisknowledgein practiceofnursing.

COMPETENCIES: Oncompletionofthecourse,thestudentswillbeableto

1. Applytheknowledgeofpathology inunderstandingthedeviationsfrom normaltoabnormal pathology.
2. Rationalizethevariouslaboratoryinvestigationsindiagnosingpathologicaldisorders.
3. Demonstratetheunderstandingofthemethodsofcollectionofblood,bodycavityfluids,urineandfecesforvarioustests.

4. Applytheknowledgeofgeneticsinunderstandingthevariouspathologicaldisorders.
5. Appreciatethevariousmanifestationsinpatientswithdiagnosedgeneticabnormalities.
6. Rationalizethespecificdiagnostictestsinthedetectionofgeneticabnormalities.
7. Demonstratetheunderstandingofvariousservicesrelatedtogenetics.

COURSEOUTLINE

T–Theory

Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
I	8(T)	Define thecommon termsused inpathology Identify the deviationsfrom normal toabnormalstructure andfunctions ofbodysystem	**Introduction** • Importanceofthestudyofpathology • Definitionoftermsinpathology • Cellinjury:Etiology,pathogenesisofreversibleandirreversiblecellinjury,Necrosis,Gangrene • Cellularadaptations:Atrophy,Hypertrophy, Hyperplasia,Metaplasia,Dysplasia,Apoptosis • Inflammation: o Acuteinflammation(VascularandCellularevents, systemic effects of acuteinflammation) o Chronic inflammation (Granulomatousinflammation, systemic effects of chronicinflammation) • Woundhealing • Neoplasia**:** Nomenclature, Normal and Cancercell, Benign and malignant tumors, Carcinomain situ, Tumor metastasis: general mechanism,routesof spreadandexamplesofeachroute • Circulatorydisturbances:Thrombosis,embolism, shock • Disturbanceofbodyfluidsandelectrolytes:Edema,TransudatesandExudates	• Lecture • Discussion • Explainusingslides • Explain withclinicalscenarios	• Shortanswer • Objectivetype
II	5(T)	Explainpathologicalchanges indiseaseconditions ofvarioussystems	**SpecialPathology** **Pathological changes in disease conditions ofselected systems:** **1. Respiratorysystem** • Pulmonary infections: Pneumonia, Lungabscess,pulmonarytuberculosis • Chronic Obstructive Pulmonary Disease:Chronic bronchitis, Emphysema, BronchialAsthma,Bronchiectasis • TumorsofLungs **2. Cardio-vascularsystem** • Atherosclerosis • IschemiaandInfarction. • RheumaticHeartDisease	• Lecture • Discussion • Explain usingslides, X-rays andscans • Visit to pathologylab,endoscopyunitandOT	• Shortanswer • Objectivetype

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Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
			• Infectiveendocarditis **3. Gastrointestinaltract** • Pepticulcerdisease(GastricandDuodenalulcer) • Gastritis-HPyloriinfection • Oralmucosa:OralLeukoplakia,Squamouscellcarcinoma • Esophagealcancer • Gastriccancer • Intestinal:Typhoidulcer,InflammatoryBowel Disease (Crohn's disease andUlcerativecolitis),Colorectalcancer **4. Liver,GallBladderandPancreas** • Liver:Hepatitis,AmoebicLiverabscess,Cirrhosisof Liver • Gallbladder:Cholecystitis. • Pancreas:Pancreatitis • Tumorsofliver, GallbladderandPancreas **5. Skeletalsystem** • Bone:Bonehealing,Osteoporosis,Osteomyelitis,Tumors • Joints: Arthritis - Rheumatoid arthritis andOsteoarthritis **6. Endocrinesystem** • DiabetesMellitus • Goitre • Carcinomathyroid		
III	7(T)	Describe various laboratorytests in assessmentand monitoringof diseaseconditions	**Hematologicaltestsforthediagnosisofblooddisorders** •Bloodtests:Hemoglobin,Whitecellandplatelet counts,PCV,ESR • Coagulation tests: Bleeding time (BT),Prothrombintime(PT),ActivatedPartialProthrombinTime(APTT) • Bloodchemistry • Bloodbank: o Bloodgrouping andcrossmatching o Bloodcomponents o Plasmapheresis o Transfusionreactions **Note:**Few lab hours can be planned forobservationandvisits (Lessthan1credit,labhoursarenotspecifiedseparately)	• Lecture • Discussion • Visit to clinical lab,biochemistry labandblood bank	• Shortanswer • Objectivetype

ADULTHEALTHNURSING-

IWITHINTEGRATEDPATHOPHYSIOLOGY(includingBCLSmodule)PLACEMENT: III SEMESTER

THEORY:7Credits(140hours)

PRACTICUM: Lab/SkillLab(SL) –1Credit(40hours)Clinical–6 Credits(480hours)

DESCRIPTION: Thiscourseisdesignedtoequipthestudentstoreviewandapplytheirknowledgeof Anatomy,Physiology, Biochemistry and Behavioral sciences in caring for adult patients with Medical/Surgical disorders using nursingprocess approach and critical thinking. It also intends to develop competencies required for assessment, diagnosis, treatment,nursing management,andsupportive/palliative caretopatients withvariousMedicalSurgicaldisorders.

COMPETENCIES: OncompletionofMedicalSurgicalNursingIcourse,studentswillbeableto

1. Explaintheetiology,pathophysiology,manifestations,diagnosticstudies,treatmentsandcomplicationsofcommon medicaland surgicaldisorders.
2. Performcompletehealthassessmenttoestablishadatabaseforprovidingqualitypatientcareandintegratetheknowledgeofa natomy,physiology anddiagnostictestsintheprocessofdatacollection.
3. Identifynursingdiagnoses,listthemaccordingtopriorityandformulatenursingcareplan.
4. Performnursingproceduresskillfullyandapplyscientificprinciples whilegivingcomprehensivenursingcaretopatients.
5. Integrateknowledgeofpathology,nutritionandpharmacologyincaringforpatientsexperiencingvariousmedicalandsurgi cal disorders.
6. Identifycommondiagnosticmeasuresrelatedtothehealthproblemswithemphasisonnursingassessmentandresponsibiliti es.
7. Demonstrateskillinassisting/performingdiagnosticandtherapeuticprocedures.
8. Demonstratecompetencies/skillstopatientsundergoingtreatmentformedicalsurgicaldisorders.
9. Identifythedrugsusedintreatingpatientswithmedicalsurgicalconditions.
10. Planandgiverelevantindividualandgroupeducationonsignificantmedicalsurgicaltopics.
11. Maintainsafeenvironmentforpatientsandthe healthcarepersonnelinthehospital.
12. Integrateevidence-basedinformationwhilegivingnursingcaretopatients.

COURSECONTENT

T–Theory,L/SL –Lab/SkillLab

Unit	Time Outcomes(Hrs)	Learning	Content	Teaching/Learning Activities	Assessment Methods
I	6(T) 4(L/SL)	NarratetheevolutionofmedicalsurgicalnursingApplynursingprocessin caring for patientswith medical surgicalproblemsExecute the role of anurse in variousmedicalsurgicalDevelop skills inassessmentandcareofwound	**Introduction** • Evolutionandtrendsofmedicalandsurgicalnursing • International classification ofdiseases • Roles and responsibility of a nurseinmedicalandsurgicalsettings ○ Outpatientdepartment ○ In-patientunit ○ Intensivecareunit • Introductiontomedicalandsurgicalasepsis ○ Inflammation,infection ○ Wound healing – stages,influencingfactor	• Lecturecum discussion • Demonstration &Practicesession • Roleplay • Visit to outpatientdepartment, inpatient and	•ShortAnswer •OSCE

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Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
		Developcompetencyinproviding pre andpostoperativecare	○Woundcareanddressingtechnique • Careofsurgicalpatient ○pre-operative ○post-operative • Alternativetherapiesusedincaringfor patients with Medical SurgicalDisorders **Intraoperative Care**		
II	15(T) 4(L/SL)	Explain organizationalset up of the operatingtheatre Differentiate the role ofscrub nurse andcirculatingnurse Describe the differentpositioning for varioussurgeries Apply principles ofasepsis in handling thesterileequipment Demonstrate skill inscrubbingprocedures Demonstrate skill inassessing the patientand documentaccurately the surgicalsafety checklist Develop skill inassisting with selectedsurgeries Explain the types,functions, and nursingconsiderations fordifferent types ofanaesthesia	• Organization and physical set up oftheoperation theatre ○ Classification ○ O.TDesign ○ Staffing ○ MembersoftheOT team ○ Dutiesandresponsibilitiesofthenursein OT • Position and draping for commonsurgicalprocedures • Instruments, sutures and suturematerials, equipment for commonsurgicalprocedures • Disinfection and sterilization ofequipment • Preparationofsetsforcommonsurgicalprocedures • Scrubbing procedures – Gowning,maskingandgloving • Monitoring the patient during theprocedures • Maintenanceofthetherapeuticenvironmentin OT • Assisting in major and minoroperation,handlingspecimen • Preventionofaccidentsandhazardsin OT • Anaesthesia – types, methods ofadministration, effects and stages,equipment& drugs • Legalaspects	• Lecture cumDiscussion • Demonstration,Practicesession,andCase Discussion • Visittoreceivingbay	• Caring forpatient intraoperatively • Submit a list ofdisinfectants used forinstruments with the actionandprecaution
III	6(T) 4(L/SL)	Identify the signs andsymptoms of shock andelectrolyteimbalances Develop skills inmanaging fluid andelectrolyteimbalances	**Nursing care of patients withcommon signs and symptoms andmanagement** • Fluidandelectrolyteimbalance • Shock • Pain	• Lecture, discussion,demonstration • Casediscussion	• Shortanswer • MCQ • Casereport

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
		Perform painassessmentandplansfor the nursingmanagement	decompression,gavage,andstomacare		andphysicalassessment • GIinvestigations • CommonGIdisorders:
IV	18(T) 4(L)	Demonstrate skill inrespiratoryassessment Differentiates differentbreath sounds and liststheindications Explain the etiology,pathophysiology,clinical manifestations,diagnostic tests, andmedical, surgical,nutritional, and nursingmanagement ofcommon respiratoryproblems Describe the healthbehaviourtobeadoptedin preventingrespiratory illnesses		**NursingManagementofpatientswithrespiratoryproblems** • Review of anatomy andphysiologyofrespiratorysystem • Nursing Assessment – historytaking,physicalassessment anddiagnostictests • Commonrespiratory problems: o Upperrespiratorytractinfections o Chronicobstructivepulmonarydiseases o Asthma o Pleuraleffusion,Empyema o Bronchiectasis	o Oralcavity:lips, gumsandteeth o GI: Bleeding, Infections,Inflammation, tumors,Obstruction, Perforation &Peritonitis o Peptic&duodenalulcer, o Mal-absorption,Appendicitis, Hernias o Hemorrhoids,fissures,Fistulas o Pancreas:inflammation,cysts,andtumors
V	16(T) 5(L)	Explain the etiology,pathophysiology,clinical manifestations,diagnostic tests, andmedical, surgical,nutritional, and nursingmanagement ofgastrointestinaldisorders Demonstrate skill ingastrointestinalassessment Prepare patient forupper and lowergastrointestinalinvestigations Demonstrate skill ingastric		o Pneumonia o Lungabscess o Cystandtumors o ChestInjuries o Acute respiratory distresssyndrome o Pulmonaryembolism • Healthbehaviourstoprevent respiratoryillness **Nursing Management of patientswithdisordersofdigestivesystem** • Reviewofanatomyandphysiologyof GI system • Nursing assessment – History	

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• Lecture,discussion, • Demonstration • Practicesession • Casepresentation • VisittoPFTLab	•Essay •Shortanswer •OSCE
• Lecture,Discussion • Demonstration, • Roleplay • Problem BasedLearning • Visittostomaclinic	•Shortanswer •Quiz •OSCE

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
		Demonstrate skill indifferent feedingtechniques	○ Liver: inflammation, cysts,abscess, cirrhosis, portalhypertension,hepaticfailure,tumors ○ Gallbladder:inflammation, Cholelithiasis,tumors • Gastricdecompression,gavageandstoma care, different feedingtechniques • Alternativetherapies,drugsusedintreatment of disorders of digestivesystem		
VI	20(T) 5(L)	Explain the etiology,pathophysiology,clinical manifestations,diagnostic tests, andmedical, surgical,nutritional, and nursingmanagement ofcardiovasculardisorders Demonstrate skill incardiovascularassessment Prepare patient forinvasive and non-invasive cardiacprocedures Demonstrate skill inmonitoring andinterpreting clinicalsigns related to cardiacdisorders Complete BLS/BCLSmodule	**NursingManagementofpatientswithcardiovascularproblems** • Review of anatomy andphysiology of cardio-vascularsystem • NursingAssessment:HistoryandPhysicalassessment • Invasive & non-invasive cardiacprocedures • Disorders of vascular system-Hypertension, arteriosclerosis,Raynaud'sdisease,aneurysmandperipheralvascular disorders • Coronary artery diseases:coronaryatherosclerosis,Anginapectoris,myocardialinfarction • Valvulardisorders:congenitalandacquired • Rheumatic heart disease:pericarditis, myocarditis,endocarditis,cardiomyopathies • Cardiacdysrhythmias,heartblock • Congestive heart failure,corpulmonale,pulmonaryedema,cardiogenic shock, cardiactamponade • Cardiopulmonaryarrest	• Lecture,discussion • Demonstration • Practicesession • CaseDiscussion • Healtheducation • Drug Book/presentation • **Completion ofBCLSModule**	• Careplan • Drugrecord • BLS/ BCLSevaluation
VII	7(T) 3(L)	Explain the etiology,pathophysiology,clinical manifestations,diagnostic tests, andmedical, surgical,nutritional, and nursingmanagement ofhematologicaldisorders Interpretbloodreports	**NursingManagementofpatientswithdisordersof blood** • ReviewofAnatomyandPhysiologyofblood • Nursing assessment: history,physicalassessment&Diagnostictests • Anemia,Polycythemia • Bleeding Disorders: clotting factordefects and platelets defects,thalassemia,leukemia,leukopenia,	• Field visit to bloodbank • Counseling	• Interpretation ofbloodreports • Visitreport

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Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
		Prepare and provideshealth education onblooddonation	agranulocytosis • Lymphomas,myelomas		
VIII	8(T) 2(L)	Explain the etiology,pathophysiology,clinical manifestations,diagnostic tests, andmedical, surgical,nutritional,and nursingmanagement ofendocrinedisorders Demonstrateskillin assessment of endocrine mellitusorgandysfunction Prepare and provideshealth education ondiabeticdiet	**Nursing management of patientswithdisordersofendocrinesystem** • Reviewofanatomyandphysiologyof endocrine system • Nursing Assessment –History andPhysicalassessment • Disorders of thyroid andParathyroid,AdrenalandPituitary(Hyper, Hypo,tumors) •Diabetes	• Lecture, discussion,demonstration • Practicesession • CaseDiscussion • Healtheducation	•Preparehealtheducation onself-administration ofinsulin •Submits adiabetic dietplan
IX	8(T) 2(L)	Demonstrate skill ininsulinadministration Explain the etiology,pathophysiology,clinical manifestations,diagnostic tests, andmedical, surgical,nutritional,and nursingmanagement ofdisorders ofintegumentarysystem Demonstrate skill inintegumentaryassessment Demonstrate skill inmedicatedbath Prepare and providehealtheducation onskincare	**Nursing management of patientswith disorders of Integumentarysystem** • Reviewofanatomyandphysiologyof skin • NursingAssessment:HistoryandPhysicalassessment • Infection and infestations;Dermatitis • Dermatoses;infectiousandNoninfectious • Acne,Allergies,Eczema&Pemphigus • Psoriasis,Malignantmelanoma, Alopecia • Specialtherapies,alternativetherapies • Drugs used in treatment ofdisordersofintegumentarysystem	• Lecture,discussion • Demonstration • Practicesession • CaseDiscussion	• Drugreport • Preparation ofHomecareplan
X	16(T) 4(L)	Explain the etiology,pathophysiology,clinical manifestations,diagnostic tests, andmedical, surgical,nutritional,and nursingmanagement ofmusculoskeletaldisorders	**Nursing management of patientswithmusculoskeletalproblems** • ReviewofAnatomyandphysiologyof the musculoskeletalsystem • NursingAssessment:Historyandphysical assessment, diagnostictests • Musculoskeletal trauma:Dislocation,fracture,sprain, strain,	• Lecture/ • Discussion • Demonstration • CaseDiscussion • Healtheducation	• Nursing careplan • Prepare healthteaching on careof patient withcast

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
		Demonstrate skill inmusculoskeletalassessment Prepare patient forradiological and non-radiologicalinvestigations ofmusculoskeletalsystem Demonstrate skill incrutch walking andsplinting Demonstrate skill incare of patient withreplacementsurgeries	contusion,amputation • Musculoskeletal infections andtumors: Osteomyelitis, benign andmalignanttumour • Orthopedicmodalities:Cast,splint,traction, crutchwalking • Musculoskeletalinflammation: Bursitis,synovitis,arthritis • Specialtherapies,alternativetherapies • Metabolicbonedisorder:Osteoporosis, osteomalacia andPaget'sdisease • Spinal column defects anddeformities – tumor, prolapsedintervertebraldisc,Pott'sspine • Rehabilitation,prosthesis • Replacementsurgeries		
XI	20(T) 3(L)	Prepare and providehealth education onbonehealing Explain the etiology,pathophysiology,clinical manifestations,diagnostic tests, andmedical, surgical,nutritional, and nursingmanagementofpatientswith communicablediseases Demonstrate skill inbarrier and reversebarriertechniques Demonstrate skill inexecution of differentisolationprotocols	**Nursingmanagementofpatientswith Communicablediseases** • Overviewofinfectiousdiseases,theinfectiousprocess • NursingAssessment:HistoryandPhysical assessment, Diagnostictests • Tuberculosis • Diarrhoeal diseases, hepatitis A-E, Typhoid • Herpes,chickenpox,Smallpox, Measles,Mumps,Influenza • Meningitis • Gasgangrene • Leprosy • Dengue, Plague, Malaria,Chikungunya,swineflu,Filariasis • Diphtheria,Pertussis,Tetanus, Poliomyelitis • COVID-19 • Special infection controlmeasures: Notification, Isolation,Quarantine,Immunization	• Lecture, discussion,demonstration • Practicesession • Case Discussion/seminar • Healtheducation • Drug Book/presentation • **ReferTBControl & Managementmodule**	• Prepares andsubmitsprotocol onvarious isolationtechniques

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CLINICALPRACTICUM

CLINICALPRACTICUM:6Credits(480hours)-18weeks×27hours

PRACTICE COMPETENCIES: On completion of the clinical practicum, the students will be able to apply nursingprocess and critical thinking in delivering holistic nursing care including rehabilitation to the adult patients undergoingsurgery,withshockandfluidandelectrolyteimbalanceandwithselectedmedical&surgicalconditionsi.e.,Gastrointestinal,Respiratory,Endocrine,Orthopedic, Dermatology andCardiovascular disorders.

Thestudentswillbecompetentto:

1. Utilizethenursingprocessinprovidingcaretothesickadultsinthehospital:
   a. Performcompletehealthassessmenttoestablishadatabasefor providingquality patientcare.
   b. Integratetheknowledgeofdiagnostictestsintheprocessofdatacollection.
   c. Identifynursingdiagnosesandlistthemaccordingtopriority.
   d. Formulatenursingcareplan,usingproblemsolvingapproach.
   e. Applyscientificprincipleswhilegivingnursingcaretopatients.
   f. Performnursingproceduresskillfullyonpatients.
   g. Establish/developinterpersonalrelationshipwithpatientsandfamilymembers.
   h. Evaluatetheexpectedoutcomesand modify theplanaccordingtothepatientneeds.
2. Providecomfortandsafety toadultpatientsinthehospital.
3. Maintainsafeenvironmentforpatientsduring hospitalization.
4. Explainnursingactionsappropriatelytothepatientsandfamily members.
5. Ensurepatientsafety whileprovidingnursingprocedures.
6. Assesstheeducationalneedsofthepatientandtheirfamilyrelatedtomedicalandsurgicaldisordersandprovideappropriatehealth educationtopatients.
7. Providepre,intraandpost-operativecaretopatientsundergoingsurgery.
8. Integrateknowledgeofpathology,nutritionandpharmacologyforpatientsexperiencingvariousmedicalandsurgicaldisorders.
9. Integrateevidence-basedinformationwhilegivingnursingcaretopatients.
10. Demonstratetheawarenessoflegalandethical issuesinnursingpractice.

I. NURSINGMANAGEMENTOFPATIENTSWITHMEDICALCONDITIONS

A. SkillLab

Useofmanikinsandsimulators

- Intravenoustherapy
- Oxygenthroughmask
- Oxygenthroughnasalprongs
- Venturimask
- Nebulization
- Chestphysiotherapy

B. ClinicalPostings

Clinical	Duration Learningarea/unit (weeks)	Outcomes	Procedural Competencies/ ClinicalSkills	Clinical Requirements	Assessment Methods
General	4	Developskillinmedical intravenous injectionadministr	• Intravenoustherapy ○ IVcannulation ○ IVmaintenanceandmonitoring ○ AdministrationofIVmedication	• CareStudy–1 • Healtheducation presentation/Care	•Clinical evaluation •OSCE •CareStudy

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		Assist withdiagnosticprocedures Developskillin themanagementofpatients withRespiratoryproblems Develop skill inmanaging patientswith metabolicabnormality	• CareofpatientwithCentralline • Preparation and assisting andmonitoring of patients undergoingdiagnostic procedures such asthoracentesis,Abdominalparacentesis *Managementpatientswithrespiratory problems* • Administrationofoxygenthrough mask,nasalprongs,venturimask • Pulseoximetry • Nebulization • Chestphysiotherapy • Posturaldrainage • Oropharyngealsuctioning • Careofpatientwithchestdrainage • DietPlanning ○ HighProteindiet ○ Diabeticdiet • Insulinadministration • MonitoringGRBS	note)–1	evaluation • Care Note/Clinicalpresentation

II. NURSINGMANAGEMENTOFPATIENTSWITHSURGICALCONDITIONS

A. SkillLab

Useofmanikinsandsimulators

- Nasogastricaspiration
- Surgicaldressing
- Sutureremoval
- Colostomycare/ileostomycare
- Enteralfeeding

B. ClinicalPostings

Clinical	Duration (Weeks)	Learningarea/unit Outcomes	Procedural Competencies/ ClinicalSkills	ClinicalRequirements	Assessment Methods
General surgical wards	4	Developskillin caringfor patients during pre-andpost- Assistwith diagnostic procedures Develop skill inmanaging patientwith Gastro-	• Pre-Operativecare • ImmediatePost-operativecare • Post-operativeexercise • Painassessment • PainManagement • Assisting diagnostic procedure andaftercareof patientsundergoing ○ Colonoscopy ○ ERCP ○ Endoscopy ○ LiverBiopsy	• Carestudy–1 • Healthteaching	• Clinicalevaluation,OSCE • Carestudy • Care note/Clinicalpresentatio

		Developskillin woundmanagement	• Nasogastricaspiration • Gastrostomy/Jejunostomyfeeds • Ileostomy/Colostomycare • Surgicaldressing • Sutureremoval • Surgicalsoak • Sitzbath • Careofdrain		

III. NURSINGMANAGEMENTOFPATIENTSWITHCARDIACCONDITIONS

A. SkillLab

Useofmanikinsandsimulators

- Cardiovascularassessment
- InterpretingECG
- BLS/BCLS
- CPR
- ABGanalysis
- Takingbloodsample
- Arterialbloodgasanalysis–interpretation

B. ClinicalPostings

Clinical area/unit	Duration (Weeks)	Learning Outcomes	Procedural Competencies/ ClinicalSkills	ClinicalRequirements	Assessment Methods
Cardiology wards	2	Develop skill inmanagement ofpatients withcardiacproblems Develop skill inmanagement ofpatients withdisordersofBlood	• Cardiacmonitoring • RecordingandinterpretingECG • Arterial blood gas analysis – interpretation • Administercardiacdrugs • Preparationandaftercareofpatientsfor cardiaccatheterization • CPR • Collectionofbloodsamplefor: o Bloodgrouping/crossmatching o Bloodsugar o Serumelectrolytes • Assistingwithbloodtransfusion • Assistingforbonemarrowaspiration • Application of anti-embolismstockings(TED hose) • Application/maintenance ofsequentialCompressiondevice	• Cardiacassessment–1 • Drugpresentation –1	• Clinicalevaluation • Drug presentation

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IV. NURSINGMANAGEMENTOFPATIENTSWITHDISORDERSOFINTEGUMENTARYSYSTEM

A. SkillLab

Use of manikins and simulatorsApplicationoftopicalmedication

B. ClinicalPostings

Clinical area/unit	Duration (Weeks)	Learning Outcomes	Procedural Competencies/Clinical Skills	ClinicalRequirements	Assessment Methods
Dermatology wards	1	Developskillin management ofpatients withdisorders ofintegumentarysystem	• Intradermalinjection-Skinallergytesting • Applicationoftopicalmedication		• Clinicalevaluation

V. NURSINGMANAGEMENTOFPATIENTSWITHCOMMUNICABLEDISEASES

A. SkillLab

- BarrierNursing
- ReverseBarrierNursing
- Standardprecautions

B. ClinicalPostings

ClinicalDurationarea/unit(Weeks)		Learning Outcomes	ProceduralCompetencies/Clinical Skills	Clinical Requirements	Assessment Methods
Isolation ward	1	Develop skill inthe managementof patientsrequiringisolation	• BarrierNursing • Reversebarriernursing • Standard precautions (Universalprecaution), use of PPE, needlestick and sharp injury prevention,Cleaning and disinfection,Respiratory hygiene, wastedisposal and safe injectionpractices)	• CareNote–1	• Clinicalevaluation • Carenote

VI. NURSINGMANAGEMENTOFPATIENTSWITHMUSCULOSKELETALPROBLEMS

A. SkillLab

Useof manikinsandsimulators

- Rangeofmotionexercises
- Musclestrengtheningexercises
- Crutchwalking

B. ClinicalPostings

Clinical area/unit	DurationLearningOutcomes(Weeks)		Procedural Competencies/ClinicalSkills	ClinicalRequirements	Assessment Methods
Orthopedic wards	2	Develop skill inmanagement ofpatients withmusculoskeletalproblems	• Preparationofpatientwith Myelogram/CT/MRI • Assistingwithapplication&removalof POP/Cast • Preparation,assistingandafterc	• CareNote–1	• Clinicalevaluation, • Carenote

			traction/skeletaltraction • Careoforthotics • Musclestrengtheningexercises • Crutchwalking • Rehabilitation		

VII. NURSINGMANAGEMENTOFPATIENTSINTHEOPERATINGROOMS

A. SkillLab

Useofmanikinsandsimulators

- Scrubbing,gowningandgloving
- Orienttoinstrumentsforcommonsurgeries
- Orienttosuturematerials
- Positioning

B. ClinicalPostings

Clinical area/unit	Duration (Weeks)	Learning Outcomes	Procedural Competencies/ ClinicalSkills	Clinical Requirements	Assessment Methods
Operation theatre	4	Developskillinc aring forintraoperativ epatients	• Positionanddraping • Preparationofoperationtable • Setupoftrolleywithinstrument • Assistinginmajorandminorop eration • Disinfectionandsterilizationofe quipment • Scrubbing procedures – Gowning,maskingandgloving • Intraoperativemonitoring	• Assistas •Clinicalcirculatory nurse– 4 • Positioning& draping– 5 • Assist as scrubnurse in majorsurgeries –4	evaluation •OSCE

PHARMACOLOGY-II

includingFundamentalsofPrescribingModule

PLACEMENT:IVSEMESTER

THEORY:3Credits(60hours)

DESCRIPTION: ThiscourseisdesignedtoenablestudentstoacquireunderstandingofPharmacodynamics,Pharmacokinetics, principles of therapeutics & nursing implications. Further it develops understanding of fundamentalprinciplesof prescribing in students.

COMPETENCIES: Oncompletionofthecourse,thestudentswillbeableto

1. Explainthedrugsusedinthetreatmentof ear,nose,throatand eyedisorders.
2. Explainthe drugsusedinthetreatmentof urinarysystemdisorders.
3. Describethedrugsusedinthetreatmentof nervoussystemdisorders.
4. Explain the drugs used for hormonal replacement and for the pregnant women during antenatal, intra natal and postnatalperiod.
5. Explainthedrugsusedtotreatemergency conditionsandimmunedisorders.
6. Discusstheroleandresponsibilitiesofnursestowardssafeadministrationofdrugsusedtotreatdisordersofvarioussystemswith basicunderstanding of pharmacology.
7. Demonstrateunderstandingaboutthedrugsusedinalternativesystemofmedicine.
8. Demonstrateunderstandingaboutthefundamentalprinciplesofprescribing.

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COURSEOUTLINE

T–Theory

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
I	4(T)	Describedrugsusedin disordersofear,nose,throat and eye andnurses'responsibilities	**Drugsusedindisordersofear,nose, throat&Eye** • Antihistamines • Topical applications for eye(Chloramphenicol, Gentamycin eyedrops),ear(Sodaglycerin,boricspirit ear drops), nose and buccal cavity-chlorhexidine mouthwash • Composition,action,dosage,route,indications, contraindications, druginteractions, side effects, adverseeffects,toxicity androleof nurse	• Lecturecum Discussion • Drug study/presentation	• Shortanswer • Objectivetype
II	4(T)	Describe drugs actingon urinary system &nurse'sresponsibilities	**Drugsusedonurinarysystem** • Pharmacologyofcommonlyuseddrugs o Reninangiotensinsystem o Diureticsandantidiuretics o Drugstoxictokidney o Urinaryantiseptics o Treatment of UTI – acidifiers andalkalinizers • Composition, action, dosage, route,indications, contraindications, ~~Druginteractions, side effects,~~ adverseeffectstoxicityandroleof nurse	• Lecture cumDiscussion • Drug study/presentation	• Shortanswer • Objectivetype
III	10 (T)	Describe drugs usedonnervoussystem&nurse'sresponsibilities	**Drugsactingonnervoussystem** • Basis&appliedpharmacologyofcommonly useddrugs • Analgesicsandanaesthetics o Analgesics: Non-steroidal anti-inflammatory(NSAID)drugs o Antipyretics o Opioids&othercentralanalgesics ✓ General(techniquesofGA,preanesthetic medication) & localanesthetics ✓ Gases:oxygen,nitrous,oxide,carbon-dioxide & others • Hypnoticsandsedatives • Skeletalmusclerelaxants • Antipsychotics oMoodstabilizers	• Lecture cumDiscussion • Drug study/presentation	• Shortanswer • Objectivetype

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
			• Antidepressants • AntianxietyDrugs • Anticonvulsants • Drugs for neurodegenerativedisorders&miscellaneousdrugs • Stimulants, ethyl alcohol andtreatmentofmethylalcoholpoisoning • Composition, action, dosage, route,indications, contraindications, druginteractions, side effects, adverseeffectstoxicityandroleofnurse		
IV	5(T)	Describe drugs usedfor hormonal disorder& supplementation,contraception &medicalterminationofpregnancy &nurse'sresponsibilities	**Drugs used for hormonal, disordersand supplementation, contraceptionandmedicaltermination ofpregnancy** • Estrogensandprogesterones ○Oralcontraceptivesandhormonereplacementtherapy • Vaginalcontraceptives • Drugs for infertility and medicalterminationof pregnancy ○Uterinestimulants and relaxants • Composition, actions dosage routeindications contraindications, drugsinteractions, side effects, adverseeffects, toxicity androleof nurse	• Lecture cumDiscussion • Drug study/presentation	• Shortanswer • Objectivetype
V	3(T)	Develop understanding aboutimportantdrugs usedfor women before,during and afterlabour	**Drugsusedforpregnantwomenduring antenatal,labourandpostnatalperiod** •Tetanusprophylaxis •IronandVitK1supplementation •Oxytocin,Misoprostol •Ergometrine •MethylprostaglandinF2-alpha	•Lecturecum Discussion •Drugstudy/presentation	• Shortanswer • Objectivetype
VI	10(T)	Describedrugs usedin deaddiction,emergency, poisoning,vitamins & mineralssupplementation,drugs used forimmunization &immune-suppression&nurse'sresponsibilities	•Magnesiumsulphate •Calciumgluconate **Miscellaneous** • Drugsusedfordeaddiction • Drugs used in CPR and emergency-adrenaline, Chlorphenir amine,hydrocortisone,Dexamethason • IVfluids&electrolytesreplacement • Commonpoisons,drugsusedfortreatmentofpoisoning ○Activatedcharcoal	• Lecturecum e	• Shortanswer

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Discussion

- Drug study/presentation
- Objectivetype

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
			○ Ipecac ○ Antidotes, ○Anti-snake venom(ASV) • Vitaminsandmineralss upplementation • Vaccines & sera (Universalimmunizationprograms chedules) • Anticancerdrugs:Chemotherapeutic drugscommonlyused • Immuno-suppressants andImmunostimulants		
VII	4(T)	Demonstrate awarenessofcommon drugs used inalternativesystemo fmedicine	**Introductiontodrugsusedin alternativesystemsofmedicine** • Ayurveda,Homeopathy,UnaniandS iddhaetc. • Drugsusedforcommonailments	• Lecturecum Discussion • Observationalvisit	• Shortanswer • Objectivetype
VIII	20(T)	Demonstrate understanding aboutfundamentalpr inciples ofprescribing	**Fundamentalprinciplesofprescribing** • Prescriptiveroleofnursepractitioners:In troduction • Legal and ethical issues related toprescribing • Principlesofprescribing • Stepsofprescribing • Prescribingcompetencies	• Completion ofmodule onFundament alprinciples ofprescribing	• Shortanswer • Assignments evaluation

PATHOLOGY-IIANDGENETICS

PLACEMENT:IVSEMESTER

THEORY: 1Credit(20hours) (Includeslabhoursalso)

DESCRIPTION: Thiscourseisdesignedtoenablestudentstoacquireknowledgeofpathologyofvariousdiseaseconditions, understanding of genetics, its role in causation and management of defects and diseases and to apply thisknowledgein practiceof nursing.

COMPETENCIES: Oncompletionofthecourse,thestudentswillbeableto

1. Applytheknowledgeofpathology inunderstandingthedeviationsfromnormaltoabnormal pathology
2. Rationalizethe variouslaboratory investigationsindiagnosingpathologicaldisorders
3. Demonstratetheunderstandingofthemethodsofcollectionofblood,bodycavityfluids,urineandfecesforvarioustests
4. Applytheknowledgeofgeneticsinunderstandingthevariouspathologicaldisorders
5. Appreciatethevariousmanifestationsinpatientswithdiagnosedgeneticabnormalities
6. Rationalizethespecificdiagnostictestsinthedetectionofgeneticabnormalities.
7. Demonstratetheunderstandingofvariousservicesrelatedtogenetics.

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COURSEOUTLINE

T–Theory

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
I	5(T)	Explain pathologicalchanges in diseaseconditionsofvarioussystems	**SpecialPathology:** **Pathological changes in diseaseconditionsofselectedsystems** **1. KidneysandUrinarytract** • Glomerulonephritis • Pyelonephritis • Renalcalculi • Cystitis • RenalCellCarcinoma • RenalFailure(AcuteandChronic) **2. Malegenitalsystems** • Cryptorchidism • Testicularatrophy • Prostatichyperplasia • CarcinomapenisandProstate. **3. Femalegenitalsystem** • Carcinomacervix • Carcinomaofendometrium • Uterinefibroids • Vesicularmoleand Choriocarcinoma • Ovariancystandtumors **4. Breast** • Fibrocysticchanges • Fibroadenoma • Carcinomaof theBreast **5. Centralnervoussystem** • Meningitis. • Encephalitis • Stroke • TumorsofCNS	• Lecture • Discussion • Explain usingslides,X-raysandscans • Visit to pathologylab,endoscopyunitandOT	• Shortanswer • Objectivetype
II	5(T)	Describe thelaboratory tests forexamination of bodycavity fluids, urineandfaeces	**ClinicalPathology** • Examinationofbody cavityfluids: o Methods of collection andexamination of CSF and other bodycavity fluids (sputum, wounddischarge) specimen for variousclinicalpathology,biochemistryandmicrobiology tests	• Lecture • Discussion • Visit to clinical laband biochemistrylab	• Shortanswer • Objectivetype

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/Learning	Assessment
			• Analysisofsemen: o Sperm count, motility andmorphology and their importance ininfertility • Urine: o Physicalcharacteristics,Analysis, CultureandSensitivity • Faeces: o Characteristics o Stool examination: Occult blood,Ova, Parasite and Cyst, Reducingsubstanceetc. o Methods and collection of urine andfaecesfor various tests		

GENETICSCOURS

EOUTLINE

T–Theory

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
I	2(T)	Explain nature,principles andperspectives ofheredity	**Introduction:** • Practicalapplicationofgeneticsinnursing • Impactof geneticconditiononfamilies • Reviewofcellulardivision:mitosisandmeiosis • Characteristicsandstructureofgenes • Chromosomes:sexdetermination • Chromosomalaberrations • Patternsofinheritance • Mendeliantheoryofinheritance • Multipleallotsandbloodgroups • Sexlinkedinheritance • Mechanismofinheritance	• Lecture • Discussion • Explainusingslides	• Shortanswer • Objectivetype
II	2(T)	Explain maternal,prenatalandgeneticinfluences ondevelopment ofdefectsanddiseases	• Errorsintransmission(mutation) **Maternal, prenatal and geneticinfluencesondevelopmentofdefectsanddiseases** • Conditions affecting the mother:geneticand infections • Consanguinityatopy • Prenatalnutritionandfoodallergies • Maternalage	• Lecture • Discussion • Explainusingslides	• Shortanswer • Objectivetype

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Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
			• Maternaldrugtherapy • Prenataltestinganddiagnosis • EffectofRadiation,drugsandchemicals • Infertility • Spontaneousabortion • NeuralTubeDefectsandtheroleoffolicacid in loweringtherisks • Downsyndrome(Trisomy21)		
III	2(T)	Explain the screeningmethodsfor genetic defectsanddiseasesinneonatesandchildren	**Genetic testing in the neonates andchildren** • Screeningfor o Congenitalabnormalities o Developmentaldelay o Dysmorphism	• Lecture • Discussion • Explainusingslides	• Shortanswer • Objectivetype
IV	2(T)	Identify geneticdisorder sin adolescentsand adults	**Geneticconditionsofadolescentsandadults** •Cancergenetics:Familialcancer • Inbornerrorsof metabolism • Bloodgroupallelesandhematologicaldisorder • Genetichaemochromatosis • Huntington'sdisease	• Lecture • Discussion • Explainusingslides	• Shortanswer • Objectivetype
V	2(T)	Describetheroleofnurse in geneticservices andcounselling	• Mentalillness **Servicesrelatedtogenetics** • Genetictesting • Genetherapy • Geneticcounseling • LegalandEthicalissues • Roleofnurse	• Lecture • Discussion	• Shortanswer • Objectivetype

ADULT HEALTH NURSING - II WITH INTEGRATED PATHOPHYSIOLOGY including Geriatric NursingANDPALLIATIVECARE MODULE

PLACEMENT:IVSEMESTER

THEORY:7Credits(140hours)

PRACTICUM: Lab/SkillLab(SL):1Credit(40hours)Clinical:6Credits(480hours)

DESCRIPTION: Thiscourseisdesignedtoequipthestudentstoreviewandapplytheirknowledgeof Anatomy,Physiology, Biochemistry and Behavioral sciences in caring for adult patients with Medical/Surgical disorders using nursingprocessapproach.Italsointendstodevelopcompetenciesrequiredforassessment,diagnosis,treatment,nursingmanagement, andsupportive/palliativeandrehabilitativecaretoadultpatientswithvariousMedicalSurgicaldisorders.

COMPETENCIES: Oncompletionofthecoursethestudentswillapplynursingprocessandcriticalthinkingindeliveringholisticnursing carewith selectedMedicalandSurgicalconditions.

AtthecompletionofAdultHealthNursingIIcourse,studentswill

1. Explaintheetiology,pathophysiology,manifestations,diagnosticstudies,treatmentsandcomplicationsofselectedcommon medicaland surgicaldisorders.
2. Perform completehealthassessmenttoestablishadatabaseforprovidingqualitypatientcareandintegratetheknowledgeofdiagnostictests in theprocessof datacollection.
3. Identifydiagnoses,listthemaccordingtopriorityandformulatenursingcareplan.
4. Perform nursingproceduresskillfullyandapplyscientificprinciples whilegivingcomprehensivenursingcaretopatients.
5. Integrate knowledge ofanatomy,physiology, pathology,nutritionand pharmacologyin caringforpatientsexperiencingvarious medicalandsurgical disorders.
6. Identifycommondiagnosticmeasuresrelatedtothehealthproblemswithemphasisonnursingassessmentandresponsibilities.
7. Demonstrateskillinassisting/performingdiagnosticandtherapeuticprocedures.
8. Demonstratecompetencies/skillstopatientsundergoingtreatmentformedicalsurgicaldisorders.
9. Identifythedrugsusedintreatingpatientswithselectedmedicalsurgicalconditions.
10. Planandproviderelevantindividualandgroupeducationonsignificantmedicalsurgicaltopics.
11. Maintainsafeenvironmentforpatientsandthe healthcarepersonnelinthehospital.

COURSEOUTLINE

T–Theory,L/SL –Lab/SkillLab

	Unit Time	**LearningOutcomes**	**Content**	**Teaching/ LearningActivities**	**Assessment Methods**
I	**(Hrs)** 12(T) 4(SL)	Explaintheetiology, thophysiology, **Throat**clinicalmanifestations, diagnostic measuresand medical, surgical,nutritionaland nursingmanagement ofpatients with ENTdisorders	**Nursingmanagementofpatientwithpa disorders of Ear, Nose and Throat**(Includesetiology,pathophysiology, clinical manifestations, diagnosticmeasures and medical, surgical,nutritionalandnursingmanagement) • Review of anatomy and physiology oftheear, noseand throat • History,physicalassessment,anddiagnostictests • **Ear** o External ear: deformities otalgia,foreignbodiesandtumors o Middle ear: impacted wax,tympanic,membraneperforation,otitis media, andtumors o Inner ear: Meniere's disease,labyrinthitis,ototoxicity tumors • Upper respiratory airway ~~infections:Rhinitis,sinusitis,tonsillitis,l~~aryngitis • Epistaxis,Nasalobstruction,laryngealobstruction • Deafnessanditsmanagement	• Lecture anddiscussion • Demonstrationof hearing aids, nasalpacking, medicationadministration • Visittoaudiologyandspeechclinic	• MCQ • Shortanswer • Essay • OSCE • Assessment ofskill (usingchecklist) • Quiz • Drugbook

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Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
II	12(T) 4(SL)	Explain the etiology,pathophysiology, clinicalmanifestations, diagnostic measuresand management ofpatientswithdisordersofeye Describeeyedonation, bankingand transplantation •Refractiveerrors	**Nursingmanagementofpatientwithdisorderofeye** •Reviewofanatomy andphysiology of theeye • History,physicalassessment, diagnosticassessment **EyeDisorders** • Eyelids:infection,deformities • Conjunctiva:inflammationandinfectionbleeding • Cornea:inflammationandinfection • Lens:cataract • Glaucoma • Retinaldetachment • Blindness • Eyedonation,bankingandtransplantation	• Lecture anddiscussion • Demonstrationof visual aids, lens,medication administration • Visittoeyebank	• MCQ • ShortEssay • OSCE • Drugbook
III	15(T) 4(L/SL)	Explaintheetiology,pathophysiology, clinicalmanifestations, diagnostictests,and medical,surgical, nutritional,andnursing managementofKidneyand urinary systemdisorders Demonstrateskillingenitourinaryassessment Preparepatientforgenitourinaryinvestigations Prepareandprovidehealth education onprevention of renalcalculi	**NursingmanagementofpatientwithKidneyandUrinaryproblems** •ReviewofAnatomyandphysiologyof thegenitourinarysystem •History,physicalassessment, diagnostictests • Urinarytractinfections:acute,chronic,lower,upper • Nephritis,nephroticsyndrome • Renalcalculi • Acuteandchronicrenalfailure • Disorders of ureter, urinary bladderandUrethra • Disorders of prostate: inflammation,infection, stricture, obstruction, andBenignProstate Hypertrophy	• Lecture cumDiscussion •Demonstration • CaseDiscussion • Healtheducation • Drugbook • Field visit – Visitshemodialysisunit	• MCQ • ShortNote • Longessay • Casereport • Submits healthteaching onprevention ofurinarycalculi
IV	6(T)	Explain the etiology,pathophysiology, clinicalmanifestations, diagnostictests,and medical,surgical, nutritional,andnursing management of	**Nursingmanagementofdisordersofmalereproductive system** •ReviewofAnatomyandphysiologyof themalereproductivesystem •History,PhysicalAssessment,	• Lecture,Discussion • CaseDiscussion • Healtheducation	• Shortessay

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malereproductivedisor
dersDiagnostictests

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
			Orchitis • Sexual dysfunction, infertility,contraception • MaleBreastDisorders:gynecomastia,tumor, climacteric changes		
V	10(T) 4(SL)	Explaintheetiology,pathophysiology, clinicalmanifestations,types, diagnosticmeasures andmanagement ofpatientswithdisorders of burns/cosmeticsurgeries and itssignificance	**Nursingmanagementofpatientwithburns,reconstructiveandcosmetic surgery** • Review of anatomy and physiology oftheskin andconnectivetissues • History, physical assessment,assessmentofburnsandfluid&electrolyteloss • Burns • Reconstructive and cosmetic surgeryfor burns, congenital deformities,injuriesandcosmeticpurposes,genderreassignment • Legalandethicalaspects • Specialtherapies:LAD,vacuumeddressing. Laser, liposuction, skinhealth rejuvenation, use of dermafilters	• Lecture anddiscussion • Demonstrationof burn woundassessment, vacuumdressing and fluidcalculations • Visit to burnrehabilitationcenters	• OSCE • Shortnotes
VI	16(T) 4(L/SL)	Explain the etiology,pathophysiology, clinicalmanifestations, diagnosticmeasures andmanagementof patients withneurologicaldisorders	**Nursingmanagementofpatientwithneurologicaldisorders** •Reviewof anatomyandphysiology of theneurologicalsystem • History, physical and neurologicalassessment,diagnostictests • Headache,Headinjuries • Spinal injuries: Paraplegia,Hemiplegia,Quadriplegia • Spinalcordcompression:herniationofinvertebraldisc • Intracranialandcerebralaneurysms • Meningitis,encephalitis,brain,abscess,neuro-cysticercosis • Movementdisorders:Chorea,Seizures &Epilepsies • Cerebrovasculardisorders:CVA • Cranial, spinal neuropathies: Bell'spalsy,trigeminalneuralgia • PeripheralNeuropathies • Degenerativediseases:Alzheimer'sdisease,Parkinson'sdisease • *Guillain-Barré syndrome,*	• Lecture anddiscussion • Demonstrationof physiotherapy,neuro Myastheniagravis &Multiplesclerosis	• OSCE • Shortnotes •Essay assessment,tracheostomycare • Visittorehabilitation center,long term careclinics, EEG, NCVstudyunit,Drugbook

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Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
			•Rehabilitationofpatientwithneurologicaldeficit		
VII	12(T) 4(L/SL)	Explain the etiology,pathophysiology, clinicalmanifestations, diagnostictests,and medical, surgical,nutritional,and nursingmanagement ofimmunologicaldisorders Prepareandprovidesh ealth education onprevention of HIVinfection andrehabilitation Describe the nationalinfection controlprograms	**NursingmanagementofpatientswithImmunological problems** •ReviewofImmunesystem • NursingAssessment:HistoryandPhysicalassessment • HIV & AIDS: Epidemiology,Transmission, Prevention ofTransmissionandmanagementofHIV/AIDS • Role of Nurse; Counseling, Healtheducationandhomecareconsiderationandrehabilitation • National AIDS Control Program – NACO, various national andinternational agencies for infectioncontrol	•Lecture,discussion •CaseDiscussion/ seminar • ReferModuleon HIV/AIDS	
VIII	12(T) 4(L/SL)	Explain the etiology,pathophysiology, types,clinical manifestations,staging, diagnosticmeasures andmanagement ofpatientswithdifferentcancer, treatmentmodalities includingnewertreatments	**Nursing management of patient withOncologicalconditions** • Structureandcharacteristicsofnormal andcancercells • History,physicallyassessment,diagnostictests • Prevention screening early detectionswarningsignof cancer • Epidemiology,etiologyclassification, Pathophysiology, staging clinicalmanifestations, diagnosis, treatmentmodalities and medical and surgicalnursing management of Oncologicalcondition • Common malignancies of variousbody system eye, ear, nose, larynx,breast,cervix,ovary,uterus,sarcoma,renal, bladder, kidney, prostate Brain,Spinalcord. • Oncologicalemergencies • Modalities of treatment:Chemotherapy, Radiotherapy:Radiation safety, AERB regulations,Surgical intervention, Stem cell andbone marrow transplant,Immunotherapy,Genetherapy • Psychological aspects of cancer:anxiety,depression,insomnia, anger • Supportivecare • Hospicecare	• Lecture anddiscussion •Demonstrationof chemotherapypreparation andadministration • Visit to BMT,radiotherapy units(linear accelerator,brachytherapy, etc.),nuclear medicineunit • Completion ofpalliativecare	• OSCE • Essay • Quiz • Drugbook • Counseling, healthteaching

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
				module duringclinical hours(20hours)	
IX	15(T) 4(L/SL)	Explain the types,policies, guidelines,prevention andmanagement ofdisasterandthe etiology,pathophysiology, clinicalmanifestations, diagnostic measuresand management ofpatients with acuteemergencies	**Nursing management of patient inEmergencyandDisastersituations** **DisasterNursing** • Conceptandprinciplesofdisasternursing,RelatedPolicies •Typesofdisaster:Naturaland manmade •Disaster preparedness: Team,guidelines, protocols, equipment,resources •Etiology, classification,Pathophysiology, staging, clinicalmanifestation, diagnosis, treatmentmodalities and medical and surgicalnursingmanagementofpatientwithmedical and surgical emergencies –Poly trauma, Bites, Poisoning andThermalemergencies •Principlesofemergency management •Medicolegalaspects	• Lecture anddiscussion • Demonstration ofdisasterpreparedness (Mockdrill)andtriaging • Filedvisittolocal disaster managementcenters or demo byfireextinguishers •Group presentation(role play, skit,conceptmapping)ondifferent emergencycare •**ReferTraumacaremanagement/ATCN module**	• OSCE • Case presentationsandcasestudy
X	10(T)	Explain the Concept,physiological changes,and psychosocialproblems ofageing Describe the nursingmanagement of theelderly	**Nursingcareoftheelderly** •Historyandphysicalassessment •Agingprocessandage-relatedbodychangesandpsychosocialaspects •Stressandcopinginelderpatient •Psychosocialandsexualabuseofelderly •Roleoffamily andformaland non-formalcaregivers •Useof aidsand prosthesis(hearingaids,dentures) •Legalandethicalissues	•Guided reading onNational DisasterManagementAuthority(NDMA)guidelines •Lectureandd iscussion •Demonstration ofcommunication withvisual and hearingimpaired •Fieldvisittooldagehomes	• OSCE • Case presentations • Assignmenton familysystems ofIndia focusingon geriatricpopulation
XI	15(T) 8(L/SL)	Explain the etiology,pathophysiology, clinicalmanifestations, diagnosticmeasures andmanagementof	•National programs for elderly,privileges,communityprogramsandhealthservices •Homeandinstitutionalcare **Nursingmanagementofpatientsincriticalcareunits** •Principlesofcriticalcarenursing	•Lectureandd iscussion • Demonstration ontheuseof	• Objectivetype • Shortnotes • Case

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patientsincriticalc

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ts	• Organization:physicalset-up,policies, staffingnorms • Protocols,equipmentandsupplies	mechanicalventilators, cardiacmonitorsetc. • Clinicalpracticein	presentations • Assessment ofskill onmonitoring of

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
			• Use and application of critical carebiomedical equipment: ventilators,cardiac monitors, defibrillators,infusion pump, Resuscitationequipmentand anyother • AdvancedCardiacLifesupport • Nursing management of critically illpatient • Transitionalcare • EthicalandLegalAspects • BreakingBadNewstoPatientsand/orthe ir families: Communication withpatientand family • Endoflifecare	differentICUs	patients inICU. • Writtenassign ment onethical andlegal issues incriticalcare
XII	5(T)	Describe the etiology,pathophysiol ogy, clinical manifestations, diagnostic measuresand management ofpatients withoccupational/in dustrial healthdisorders	**Nursing management of patientsoccupationalandindustrialdis orders** • History,physicalexamination, Diagnostictests • Occupationaldiseasesand management	• Lecture anddiscussi on • Industrialvisit	• Assignment onindustrial healthhazards

CLINICALPRACTICUM

CLINICALPRACTICUM:6Credits(480Hours)–**20weeks×24hours**

PRACTICECOMPETENCIES: Oncompletionofthecliniclapracticum,thestudentswilldevelopproficiencyinapplying nursing process and critical thinking in rendering holistic nursing care including rehabilitation to the adult/geriatricpatients admitted in Critical Care Units, undergoing cosmetic and reconstructive surgery and with selected medical &surgicaldisordersofear,nose,throat,eye,Genitourinary,reproductive,immunologic,nervoussystemsandinemergency/disasterc onditions.

Thestudentswillbecompetent to

1. Utilizethenursingprocessinprovidingcaretothesickadultsinthehospital
   a. Performcompletehealthassessmenttoestablishadatabaseforprovidingqualitypatientcare.
   b. Integratetheknowledgeofdiagnostictestsinpatientassignment.
   c. Identifynursingdiagnosesandlistthemaccordingtopriority.
   d. Formulatenursingcareplan,usingproblemsolvingapproach.
   e. Applyscientificprincipleswhilegivingnursingcaretopatients.
   f. Developskillinperformingnursingproceduresapplyingscientificprinciple.
   g. Establish/developinterpersonalrelationshipwithpatientsandfamilymembers.
   h. Evaluatetheexpectedoutcomesandmodify theplanaccordingtothepatientneeds.
2. Providecomfortandsafety toadultpatientsinthehospital.
3. Maintainsafeenvironmentforpatientsduringhospitalization.
4. Explainnursingactionsappropriatelytothepatientsandfamily members.
5. Ensurepatientsafetywhileprovidingnursingprocedures.

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6. Assesstheeducationalneedsofthepatientandtheirfamilyrelatedtomedicalandsurgicaldisordersandprovideappropriatehealth educationtopatients.

7. Providepre,intraandpost-operativecaretopatientsundergoingsurgery.
8. Integrateknowledgeofpathology,nutritionandpharmacologyforpatientsexperiencingselectedmedicalandsurgicaldisorders.
9. Integrateevidence-basedinformationwhilegivingnursingcaretopatients.
10. Demonstratetheawarenessoflegalandethicalissuesinnursingpractice.

I. NursingManagementofPatientswithENTDisorders

A. SkillLab

Useofmanikinsandsimulators

- Tracheostomycare
- InstillingEarandNasalmedications
- Bandageapplication

B. ClinicalPostings

Clinical	Duration (weeks)	Learningarea/unit Outcomes	Procedural Competencies/ClinicalSkills	ClinicalRequirements	Assessment Methods
ENT Ward careandOPD	2	Provide topatients with Educate thepatients andtheirfami	• Examination of ear, nose, throat andHistory taking • ApplyingbandagestoEar,Nose • Tracheostomycare • Preparationofpatient,assistingandmonitoring of patients undergoingdiagnosticprocedures o Auditoryscreeningtests o **Audiometrictests** • Preparing the patient and assisting inspecialprocedureslikeAnterior/posterior nasalpacking,EarPackingandSyringing • Preparation and after care of patientsundergoingENTsurgicalprocedures	• ENTassessment –1 • Case study/Clinicalpresentation–1	• Clinicalevaluation • OSCE • Case reportstudy/ Clinicalpresentation

II. NursingManagementofPatientswithEyeConditions

A. SkillLab

Useofmanikinsandsimulators

- InstillingEyemedications
- Eyeirrigation
- Eyebandage

B. ClinicalPostings

Clinical	Duration (weeks)	Learningarea/unit Outcomes	Procedural Competencies/ClinicalSkills	ClinicalRequirements	Assessment Methods
Ophthalmology skillunit	2	Develop inproviding care topatients Educate thepatientsa	• Historytaking,Examinationofeyesanddinterpretation • Assistingprocedures o Visualacuity o Fundoscopy, retinoscopy,ophthalmoscopy,tonometry,	• Eyeassessment –1 • Healthteaching • Case study/ClinicalPresentation–1	• Clinical evaluation • OSCE • Clinicalpresentation

		theirfamilies	• Preandpost-operative care • Instillationofdrops/ medication • Eyeirrigation • Applicationofeyebandage • Assistingwithforeignbodyremoval		

III. NursingManagementofPatientswithKidneyandUrinarySystemDisorders

A. SkillLab

Useofmanikinsandsimulators

- Assessment:kidney&urinarysystem
- Preparation:dialysis
- Catheterizationandcare

B. ClinicalPostings

Clinical area/unit	Duration (weeks)	Learning Outcomes	Procedural Competencies/ClinicalSkills	ClinicalRequirements	Assessment Methods
Renal ward/nephrologywardincludingDialysisunit	2	DevelopskillinManagementof patientswithurinary,malereproductiveproblems	• Assessmentofkidneyandurinarysystem o Historytaking o Physicalexamination o Testicularself-examination o digitalrectalexam • Preparationandassistingwithdiagnosticandtherapeuticprocedures o Cystoscopy,Cystometrogram, o Contraststudies:IVPetc. o Peritonealdialysis o Hemodialysis, o Lithotripsy o Specific tests: Semen analysis,gonorreoeatest,Renal/Prostate Biopsyetc. • Catheterization:care • Bladderirrigation • I/Orecordingandmonitoring • Ambulationandexercise	• Assessment–1 • Drugpresentation–1 • Care study/Clinicalpresentation–1 • Preparing andassisting inhemodialysis	• Clinicalevaluation • Careplan • OSCE • Quiz • Drug presentation

IV. NursingManagementofPatientswithBurnsandReconstructiveSurgery

A. SkillLab

Useofmanikinsandsimulators

- Assessmentofburnswound
- Wounddressing

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B. ClinicalPostings

Clinical area/unit	Duration (weeks)	LearningOutcomes	Procedural Competencies/ClinicalSkills	ClinicalRequirements	Assessment Methods
Burns unit/reconstructivesurgicalu	2	Developskillinburnsassessment andproviding care topatients with differenttypesof burns Develop skill inproviding care topatients with differenttypes of cosmetic	• Assessmentofburns • Firstaidofburns • Fluid & electrolytereplacement therapy • Skincare • CareofBurnwounds – Bathing – Dressing • Pre-operative and post-operativecareofpatients • Caringofskingraftandpostcosmeticsurgery	• burn woundassessment–1 • care	• Clinicalevaluation, • Care study/case report

V. NursingManagementofPatientswithneurologicaldisorders

A. SkillLab

Useofmanikinsandsimulators

- Rangeofmotionexercises
- Musclestrengtheningexercises
- Crutchwalking

B. ClinicalPostings

Clinical area/unit	Duration	Learning(	Procedural Competencies/ ClinicalSkills	ClinicalRequirements	Assessment Methods
Neurology-medical/ Surgery wards	3	Developskill inManagement of patientswith Neurological problems	• Historytaking;Neurological Examination • Patientmonitoring • Prepare and assist for various invasiveand non-invasive diagnosticprocedures • Rangeofmotionexercises,musclestrengthening • Careofmedical,surgicalandrehabilitativepatients	• euro-assessment–1 • Case study/ casepresentation–1 • Drug	• Clinical evaluation • Neuroassessment • OSCE • Case report/presen

VI. NursingManagementofPatientswithImmunologicalDisorders

A. SkillLab

- BarrierNursing
- ReverseBarrierNursing

B. ClinicalPostings

Clinical area/unit	Duration (weeks)	Learning Outcomes	Procedural Competencies/ ClinicalSkills	ClinicalRequirements	Assessment Methods
Isolation ward/Medicalward	1	Developskillin Management ofpatients withimmunological disorders	• Historytakingthe • Immunologicalstatusassessment(e.g.HIV) and Interpretation of specifictests • Caringofpatientswithlowimmunity • Practicingofstandardsafetymeasures, precautions/barrier nursing/reversebarrier/isolation • Nutritional management	• Assessment ofimmunestatus • Teaching ofisolation to patientand family • CareNote–1	• Carenote • Quiz • HealthTeaching

VII. NursingManagementofPatientswithdisordersofOncologicalconditions

A. SkillLab

Useofmanikinsandsimulators

- Applicationoftopicalmedication
- Administrationofchemotherapy

B. ClinicalPostings

Clinical area/unit	Duration (weeks)	Learning Outcomes	Procedural Competencies/ ClinicalSkills	ClinicalRequirements	Assessment Methods
Oncologywards(includingday careradiotherapyunit)	3	Developskillin providingcare topatients withoncological disorders	• Historytaking&physicalexaminationofcancer patients • Screeningforcommoncancers:TNMclassification • Preparation,assistingandaftercarepatients undergoing diagnosticprocedures – Biopsies/FNAC – Papsmear – Bone-marrowaspiration • Variousmodalitiesoftreatment – Chemotherapy – Radiotherapy – Painmanagement – Stomatherapy – Hormonaltherapy – Immunotherapy – Genetherapy – Alternativetherapy • Stomacareandfeeding • Caringofpatientstreatedwithnuclearmedicine • Rehabilitation	• Assessment–1 • Care study/clinicalpresentation–1 • Pre and post-operativecareofpatient withvariousmodesof cancertreatment • Teaching onBSEtofamilymembers • Visit topalliative careunit	• Clinicalevaluation • Carestudy • Quiz • Drugbook

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VIII. NursingManagementofPatientsinemergencyconditions

A. SkillLab

Useofmanikinsandsimulators

- Assessment:primaryandsecondarysurvey
- Traumacare:bandaging,woundcare,splinting,positions

B. ClinicalPostings

Clinical area/unit	Duration Skills(weeks)	Learning	Procedural Competencies/ Clinical Outcomes	Clinical Requirements	Assessment Methods
Emergency room/Emergencyunit	2	Developskill roviding care topatients withemergencyhealthproblems	•Practicing_triage'inp • Primary and secondary survey inemergency • Examination, investigations & theirinterpretations,inemergency&disastersituations • Emergencycareofmedicalandtraumaticinjury patients • Documentations,assistinginlegalproceduresin emergencyunit • Managingcrowd • Counseling the patient and family indealingwithgrieving&bereavement	• Triage • Immediatecare • Useof •Quiz emergency	•Clinical evaluation

IX. NursingManagementofgeriatricpatients

A. SkillLab

Useofmanikinsandsimulators

- **Useofassistivesafetydevices**

B. ClinicalPostings

ClinicalArea/unit	Duration(weeks)	LearningOutcomesare	ProceduralCompetencies/ClinicalSkills	ClinicalRequirements	Assessment Methods
Geriatric ward	1	Developsskillin takinggeriatricassessment dprovidingcare to Geriatricpatientswith	•History andassessmentan of	• Geriatricassessment–1 • Care of normal and geriatric patientwithillness • Fallriskassessment–1 • Functionalstatusassessment–1	• Clinicalevaluation • Careplan

X. NursingManagementofPatientsincriticalcareunits

A. SkillLab

Useofmanikinsandsimulators

- Assessmentcriticallyill
- ETtubesetup–suction
- TTsuction
- Ventilatorsetup
- Chestdrainage
- Bagmaskventilation

- Central&Peripheralline
- Pacemaker

B. ClinicalPostings

Clinical area/unit	Duration (weeks)	Learning Outcomes	ProceduralCompetencies/ClinicalSkills	ClinicalRequirements	Assessment Methods
CriticalCareUnit	2	Develop skillin assessmentofcriticallyillandprovidingcare topatients withcritical healthconditions	• Assessmentofcriticallyillpatients • Assisting in arterial puncture, ET tubeintubation&extubation • ABG analysis & interpretation - respiratoryacidosis,respiratoryalkalosis, metabolicacidosis,metabolicalkalosis • Setting up of Ventilator modes andsettingsandcareof patientonaventilator • Setupoftrolleywithinstruments • MonitoringandmaintenanceofChestdrainagesystem • Bagandmaskventilation • AssistingandmaintenanceofCentralandperipherallines invasive • Settingupofinfusionpump,defibrillator, • Drug administration-infusion, intracardic,intrathecal,epidural, • Monitoringpacemaker • ICUcarebundle • ManagementofthedyingpatientintheICU	• Hemodynamic monitoring • Different scalesusedin ICU • Communicating withcriticallyill patients	•Clinicalevaluation •OSCE •RASSscaleassessment • Use of VAEbundle VAP,CAUTI,BSI •Case Presentation

PROFESSIONALISM,PROFESSIONALVALUES&ETHICSINCLUDINGBIOETHICSPLACEMENT:

IV SEMESTER

THEORY:1Credit(20hours)

DESCRIPTION: This course is designed to help students to develop an understanding of professionalism and demonstrateprofessional behavior in their workplace with ethics and professional values. Further the students will be able to identifyethicalissuesin nursingpracticeandparticipateeffectively inethicaldecision making alongwithhealthteammembers.

COMPETENCIES: Oncompletionofthiscourse,thestudentswillbeableto

1. Describeprofessionandprofessionalism.
2. Identifythechallengesofprofessionalism.
3. Maintainrespectfulcommunicationand relationshipwithotherhealthteammembers,patientsandsociety.
4. Demonstrateprofessionalconduct.
5. Describevariousregulatory bodiesandprofessionalorganizationsrelatedtonursing.
6. Discusstheimportanceofprofessionalvaluesinpatientcare.
7. Explaintheprofessionalvaluesanddemonstrateappropriateprofessionalvaluesinnursingpractice.
8. Demonstrateandreflectontheroleandresponsibilitiesinprovidingcompassionatecareinthehealthcaresetting.
9. Demonstraterespect,humandignityandprivacyandconfidentialitytoself,patientsandtheircaregiversandotherhealthteam members.
10. Advocateforpatients'wellbeing,professionalgrowthandadvancingtheprofession.
11. Identifyethicalandbioethicalconcerns,issuesanddilemmasinnursingandhealthcare.
12. Applyknowledgeofethicsandbioethicsinethicaldecisionmakingalongwithhealthteammembers.
13. Protectandrespectpatient'srights.

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COURSEOUTLINE

T–Theory

	Unit Time	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
	(Hrs)				
I	5(T)	Discussnursingasaprofession Describetheconceptsand attributes ofprofessionalism Identifythechallengesofprofessionalism Maintain respectfulcommunication andrelationshipwithotherhealth team members,patientsandsociety Demonstrateprofessionalconduct Respectandmaintainprofessionalboundaries betweenpatients, colleaguesandsociety Describetherolesandresponsibilities ofregulatorybodiesand professional organizations	**PROFESSIONALISM** **Profession** • Definitionofprofession • Criteriaofaprofession • Nursingasaprofession **Professionalism** • Definition and characteristics ofprofessionalism • Concepts, attributes and indicators ofprofessionalism • *Challengesofprofessionalism* ○ Personal identity vs professionalidentity ○ Preservationofself-integrity:threatto integrity, Deceiving patient:withholding information andfalsifyingrecords ○ Communication & Relationship withteam members: Respectful and opencommunication and relationshippertaining to relevant interests forethicaldecisionmaking ○ Relationshipwithpatientsandsociety **ProfessionalConduct** • Followingethicalprinciples • Adheringtopolicies,rulesandregulationoftheinstitutions • Professionaletiquettesandbehaviours • Professionalgrooming:Uniform,Dresscode • Professionalboundaries:Professionalrelationship with the patients,caregiversand teammembers **RegulatoryBodies&Professional Organizations:Roles&Responsibilities** • *Regulatory bodies***:** Indian NursingCouncil,StateNursingCouncil • *ProfessionalOrganizations:*Trained Nurses Association of India (TNAI),Student Nurses Association (SNA),Nurses League of Christian MedicalAssociation of India, InternationalCouncil of Nurses (ICN) andInternational Confederation ofMidwives	• Lecture cumDiscussion • Debate • Roleplay • Case baseddiscussion • Lecturecum Discussion • VisittoINC,SNC,TNAI	• Shortanswer • Essay • Objectivetype • Visitreports

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
II	5(T)	Discuss theimportance ofprofessionalvalues Distinguish betweenpersonal values andprofessionalvalues Demonstrateappropriateprofessional values innursingpractice	**PROFESSIONALVALUES** •Values:Definitionandcharacteristicsof values •Valueclarification •Personalandprofessionalvalues •Professionalsocialization:Integrationof professional values with personalvalues **Professionalvaluesinnursing** •Importanceofprofessionalvaluesinnursingandhealth care •Caring:definition,andprocess •Compassion:SympathyVsempathy,Altruism •Conscientiousness •Dedication/devotiontowork •Respectfortheperson-Humandignity •Privacyandconfidentiality:Incidentaldisclosure •Honestyandintegrity:Truthtelling •Trustandcredibility:Fidelity,Loyalty •Advocacy:Advocacyforpatients,workenvironment, nursing education andpractice, and for advancing theprofession	•Lecturecum Discussion •Valueclarificationexercise •Interactivelearning •Story telling •Sharingexperiences •Scenariobasedd iscussion	•Shortanswer •Essay •Assessmentofstudent‘sbehavior withpatients andfamilies
III	10(T)	Define ethics &bioethics Explain ethicalprinciples Identify ethicalconcerns Ethical issues anddilemmas in healthcare	**ETHICS&BIOETHICS** **Definitions:Ethics,BioethicsandEthicalPrinciples** •Beneficence •Non-maleficence: Patient safety,protectingpatientfromharm,Reportingerrors •Justice:Treatingeachpersonasequal •Carewithoutdiscrimination,equitableaccesstocareandsafety ofthepublic •Autonomy: Respects patients‘autonomy,Self-determination,Freedomofchoice **Ethical issues and ethical dilemma**:**Commonethicalproblems** •Conflictof interest •Paternalism •Deception •Privacy andconfidentiality	•Lecturecumd iscussion •Groupdiscussionwithexamples •Flipping/ self-directedlearning •Roleplay •Story telling •Sharingexperiences •CasebasedClinicaldiscussion •Role modeling •Groupexerciseonethical decision-making followingsteps on a givenscenario •Assignment	•Shortanswer •Essay •Quiz •Reflectivediary •Casereport •Attitudetest •Assessmentofassignment

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Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
			• Validconsentandrefusal • Allocationofscarcenursingresources • Conflictsconcerningnewtechnologies • Whistle-blowing • *Beginningoflifeissues* o Abortion o Substanceabuse o Fetaltherapy o Selectivededuction o Intrauterine treatment of fetalconditions o Mandatedcontraception o Fetalinjury o Infertilitytreatment • *Endof lifeissues* o Endoflife o Euthanasia o DoNotResuscitate(DNR) • *Issuesrelatedtopsychiatriccare* o Noncompliance o Restrainandseclusion o Refusetotakefood		
		Explain process ofethical decisionmaking and applyknowledge of ethicsand bioethics inmaking ethicaldecisions			
		Explain code of ethicsstipulated by ICN andINC			

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
		Discuss the rights ofthe patients andfamilies to makedecisionsabouth ealthcare Protect and respectpatients'rig hts	**Processofethicaldecisionmaking** •Assessthesituation(collectinf ormation) •Identify theethical problem •Identify thealternativedecisions •Choosethesolutiontotheethicaldeci sion •Implementthedecision •Evaluatethedecision **Ethicscommittee:Rolesandr esponsibilities** •Clinicaldecision making •Research **CodeofEthics** •InternationalCouncilofNurses(ICN) •IndianNursingCouncil **Patients' Bill of Rights-17 patients'rights(MoH&FW,GoI)** 1. Righttoemergency medicalcare 2. Right to safety and quality careaccordingtostandards 3. Righttopreservedignity 4. Righttonondiscrimination 5. Righttoprivacyandconfidentiality 6. Righttoinformation 7. Righttorecords andreports 8. Righttoinformedconsent 9. Righttosecond opinion 10. Righttopatient education 11. Right to choose alternative treatmentoptionsif available 12. Righttochoosesourceforobtainingme dicinesor tests 13. Righttoproperreferralandtransfer,wh ich is free from perversecommercialinfluences 14. Right to take discharge of patient orreceive body of deceased fromhospital 15. Right toinformationontherates tobe charged by the hospital for eachtypeofserviceprovidedandfaciliti esavailable on a prominent displayboardanda brochure 16. Right to protection for patientsinvolved in clinical trials, biomedicalandhealth research 17. Righttobeheardandseekredressal		

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CHILDHEALTHNURSING-I

PLACEMENT:VSEMESTER

THEORY:3Credits(60hours)

PRACTICUM: Lab/SkillLab:1Credit(40hours) Clinical:2Credits(160hours)

DESCRIPTION: Thiscourseisdesignedfordevelopinganunderstandingofthemodernapproachtochild-care,identification,prevention andnursingmanagementof commonhealthproblemsof neonatesandchildren.

COMPETENCIES: Oncompletionofthecourse,thestudentswillbeableto

1. Developunderstandingofthehistoryandmodernconceptsofchildhealthandchild-care.
2. Explorethenationalchildwelfareservices,nationalprogramsandlegislationinthelightofNationalHealthPolicy2017.
3. Describetheroleofpreventivepediatricsandperformpreventive measurestowardsaccidents.
4. Participateinnationalimmunizationprograms/UniversalImmunizationProgram(UIP).
5. Identifythedevelopmentalneedsofchildrenandprovideparentalguidance.
6. Describetheprinciplesof childhealthnursingandperformchildhealthnursingprocedures.
7. Demonstratecompetenciesinnewbornassessment,planningandimplementationofcare tonormalandhigh-risknewborn including neonatalresuscitation.
8. Applytheprinciplesandstrategiesof Integratedmanagementofneonatalandchildhoodillness(IMNCI).
9. Applytheknowledgeofpathophysiologyandprovidenursingcaretochildrenwithrespiratorysystemdisorders.
10. Identifyandmeetchildhoodemergenciesandperformchild CPR.

COURSEOUTLINE

T–Theory,L/SL –Lab/SkillLab

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
I	10(T) 10(L)	Explainthemodern conceptofchild-care Describe Nationalpolicy, programs andlegislationinrelationto child health &welfare Describe role ofpreventivepediatrics	**Introduction**:**Moderncon ceptsofchild-care** • Historicaldevelopmentofchildhealth • Philosophyandmodernconceptofchild-care • Culturalandreligiousconsiderationsinchild-care • Nationalpolicyandlegislationsinrelationtochildhealthandwelfare • Nationalprogramsandagenciesrelated to welfare services to thechildren • Internationallyacceptedrightsofthechild • Changing trends in hospital care,preventive, promotive and curativeaspectofchild health • *Preventivepediatrics:* o Concept o Immunization o Immunizationprogramsandcold	•LectureDiscussion•Shortanswer •Demonstration ofcommon pediatricprocedures	•Objectivetype •Assessmentofskills withchecklist

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
			chain. o Care of under-five and Under-fiveClinics/Well-baby clinics o Preventive measures towardsaccidents • Childmorbidityandmortalityrates • Difference between an adult andchildwhichaffectresponsetoillness o Physiological o Psychological o Social o Immunological • Hospitalenvironmentforsickchild • Impactofhospitalizationonthechildandfamily • Communicationtechniquesforchildren • Griefandbereavement • Theroleofachildhealthnurseincaringforahospitalizedchild • Principles of pre and postoperativecareofinfantsand children. *ChildHealthNursingprocedures:* •Administrationof medication:oral,I/M,& I/V •Calculationof fluidrequirement •Applicationofrestraints •Assessmentofpaininchildren.		
		List major causes ofdeath during infancy,early&latechildhood Differentiate betweenan adult and child interms of illness andresponse Describe the majorfunctions & role of thepediatric nurse incaringforahospitalizedchild. Describetheprinciplesof child health nursingand perform childhealth nursingprocedures			
II	12(T)	Describethenormal growth anddevelopment ofchildren at differentages Identifytheneedsofchildren at differentages &	o FACESpainratingscale o FLACCscale o Numericalscale **TheHealthyChild** providepar entalguidance Identifythenutritionalneeds of children atdifferentages&ways	•LectureDiscussion•Shortanswer • Definitionand dprinciplesofgrowthanddevelopment • Factors affecting growth anddevelopment • Growtha	nddevelopmentfrombirthtoadolescence • Growth and developmental theories(Freud, Erickson, Jean Piaget,Kohlberg) • Theneedsofnormalchildrenthroughthestagesofdevelopmentalandparentalguidance

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•Demonstration •Developmentalstudy of infant andchildren •Observationstudyof normal & sickchild •Field visit toAnganwadi, childguidanceclinic •Videosonbreastfeeding	• Objectivetype • Assessment offield visits anddevelopmentalstudyreports	

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
		ofmeetingneeds Identifytheroleofplayfor normal & sickchildren	• Nutritional needs of children andinfants - breastfeeding - exclusivebreastfeeding - Supplementary/artificial feedingandweaning •Babyfriendlyhospitalconcept •Typesandvalueofplayandselectionofplay material	•Clinicalpractice/field • Refer/consult MAA Mothers absolute affection program for breast feeding module (National Guideline)	
III	15(T) 20(L)	Providecaretonormal andhigh-riskneonates Perform neonatalresuscitation Recognizeandmanagecommon neonatalproblems	**Nursingcareofneonate:** •AppraisalofNewborn • Nursingcareofanormal newborn/essentialnewborncare • Neonatalresuscitation • Nursingmanagementoflowbirthweightbaby • Kangaroomothercare • Nursingmanagementofcommonneonataldisorder - Hyperbilirubinemia - Hypothermia - Hyperthermia - Metabolicdisorder - Neonatalinfections - Neonatalseizures - Respiratory distresssyndrome - RetinopathyofPrematurity	• Modularbased teaching**: ENBCandFBNCmodule(oraldrills,videos, self-evaluationexercises)** •Workshop onneonatalresuscitation: NRPmodule •Demonstration •PracticeSession •Clinicalpractice •LectureDiscussion	• OSCE •Shortanswer •Objectivetype
IV	10(T) 5(L)	Applyprinciplesand strategiesofIMNCI	•Organizationofneonatalcareunit •Neonatalequipment **Integratedmanagementofneonataland childhoodIllnesses**	*Modularbased teaching:* **IMNCImodule**	• OSCE
V	8(T)	Describetheetiology, pathophysiology,clinical manifestationand nursingmanagement ofchildrenwithdisorders of respiratory,	**Nursingmanagementincommon childhood diseasesRespiratorysystem**: • Identificationand Nursingmanagement of congenitalmalformations	• Clinicalpractice/field • LectureDiscussion	•Shortanswer • Congenital disorders:Tracheoesophageal fistula,Diaphragmaticchernia

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• Demonstration • Practicesession • Clinicalpractice	• Objectivetype • Assessment ofskills withchecklist

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/Learning	Assessment
			• Others:Acutenaso-pharyngitis,Tonsillitis, Croup, Bronchitis,Bronchiolitis,Pneumonia,Asthma **Endocrinesystem**: • JuvenileDiabetesmellitus, Hypo-thyroidism		
	5(L)	child-hood emergencies andperformchildC	• Accidents – causes and prevention,Poisoning,Foreignbodies,Hemorrhage,BurnsandDrowning • PLS(AHAGuidelines)	• Lecture • Discussion • Demonstration • PLSModule/ Workshop	• OSCE

CHILD HEALTH NURSING - I & II CLINICAL (3 Credits – 240

hours)PLACEMENT: V& VI SEMESTER

PRACTICUM: SkillLab:1Credit(40hours)

Clinical:V SEMESTER – 2 Credits (160 hours)VISEMESTER – 1Credit(80hours)

PRACTICECOMPETENCIES: Oncompletionofthecourse,thestudentswillbeableto

1. Performassessmentofchildren:health,developmental&anthropometric.
2. Providenursingcaretochildrenwithvariousmedicaldisorders.
3. Providepre&postoperativecaretochildrenwithcommonpediatricsurgicalconditions/malformation.
4. PerformimmunizationasperNIS.
5. Providenursingcaretocriticallyillchildren.
6. Givehealtheducation/nutritionaleducationtoparents.
7. Counselparentsaccordingtoidentifiedcounselingneeds.

SkillLab

Use of Manikins and SimulatorsPLS,CPAP,Endotracheal Suction**PediatricNursingProcedures:**

- Administrationofmedication–Oral,IM&IV
- Oxygenadministration
- Applicationofrestraints
- Specimencollection
- Urinarycatheterizationanddrainage
- Ostomycare
- Feeding–NG,gastrostomy,Jejunostomy
- Wounddressing
- Sutureremoval

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CLINICALPOSTINGS

8weeks×30hoursperweek(5weeks+3weeks)

Clinical area/unit	Duration (Weeks)	Learning Outcomes	Procedural Competencies/Clinical Skills	ClinicalRequirements	Assessment Methods
Pediatric MedicalWard	**VSem– 2weeks** **VI Sem – 1week**	• Providenursing care to childrenwith variousmedicaldisorders	• Takingpediatrichistory • Physicalexamination&assessmentofchildren • Administrationoforal,I/M,&I/V medicine/fluids • Calculationoffluidreplacement • Preparationofdifferentstrengthsof I/Vfluids • Applicationofrestraints • Administration of O_2inhalationbydifferentmethods • Baby bath/spongebath • FeedingchildrenbyKatorispoon, Paladai cup • Collectionofspecimensforcommoninvestigations • Assistingwithcommondiagnostic procedures • Teaching mothers/parents ○ Malnutrition ○ Oralrehydrationtherapy ○ Feeding&Weaning ○ Immunizationschedule • Play therapy	• Nursingcareplan –1 • Case studypresentation–1 • Healthtalk –1	• Assess performance with ratingscale • Assess eachskill withchecklist OSCE/OSPE • Evaluation ofcase study/presentation &healtheducationsession • Completion of activityrecord
PediatricSurgicalWard	**V Sem – 2weeks** **VI Sem – 1week**	• Recognizedifferent pediatricsurgicalconditions/malformations • Provide pre &post-operativecare to childrenwith commonpaediatricsurgicalconditions/malformation • Counsel &educateparents	• Calculation,preparation&administrationofI/Vfluids • Bowelwash,insertionofsuppositories • Carefor ostomies: ○ ColostomyIrrigation ○ Ureterostomy ○ Gastrostomy ○ Enterostomy • Urinarycatheterization&drainage • Feeding ○ Naso-gastric ○ Gastrostomy	• Nursing careplan– 1 • Case study/presentation–1	• Assessperformancewith ratingscale • Assess eachskill withchecklist OSCE/OSPE • Evaluation ofcase study/presentation • Completion of activityrecord

Clinical area/unit	Duration (Weeks)	Learning Outcomes	Procedural Competencies/Clini	ClinicalRequirements	Assessment Methods
			○Jejunostomy • Careofsurgicalwounds ○ Dressing ○ Sutureremoval		
PediatricOPD/ Immunization room	**VSem– 1week**	• Performassessment ofchildren: health,developmental &anthropometric • Performimmunization • Give healtheducation/nutritional education	• Assessmentofchildren ○ Healthassessment ○ Developmental assessment ○ Anthropometricassessment ○ Nutritionalassessment • Immunization • Health/Nutritionaleducation	• Growth anddevelopmentalstudy: Infant– 1 Toddler– 1 Preschooler–1 Schooler–1 Adolescent–1	• Assessperformancewith ratingscale • Completion of activityrecord
NICU&PICU	**VISem– 1week**	• Providenursing caretocritically illchildren	• Care of a baby inincubator/warme • Careofachildonventilator,CPAP • EndotrachealSuction • ChestPhysiotherapy • Administrationoffluidswithinfusionpumps • TotalParenteralNutrition • PhototherapyMonitori • ng of • babiesRecording&rep • orting	• Newbornassessment–1 • Nursing CarePlan– 1	• Assessperformancewith ratingscale • Evaluation ofobservationreport • Completion of activityrecord

MENTALHEALTHNURSING -I

PLACEMENT:VSEMESTER

THEORY:3Credits(60hours)

PRACTICUM: Clinical:1Credit(80hours)

DESCRIPTION: Thiscourseisdesignedtodevelopbasicunderstandingoftheprinciplesandstandardsofmentalhealthnursingandskill inapplicationof nursingprocessinassessment andcare ofpatientswithmentalhealthdisorders.

COMPETENCIES: Oncompletionofthecourse,thestudentswillbecompetentto

1. Tracethehistoricaldevelopmentofmentalhealthnursinganddiscussitsscope.
2. Identifytheclassificationofthe mentaldisorders.
3. Developbasicunderstandingoftheprinciplesandconceptsofmentalhealthnursing.

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4. ApplytheIndianNursingCouncilpracticestandardsforpsychiatricmentalhealthnursinginsupervisedclinicalsettings.
5. Conductmentalhealthassessment.
6. Identifyandmaintaintherapeuticcommunicationandnursepatientrelationship.
7. Demonstrateknowledgeofthevarioustreatmentmodalitiesandtherapiesusedinmentaldisorders.
8. Applynursingprocessindeliveringcaretopatientswithmentaldisorders.
9. Providenursingcaretopatientswithschizophreniaandotherpsychoticdisordersbasedonassessmentfindingsandtreatment/therapiesused.
10. Providenursingcaretopatientswithmooddisordersbasedonassessmentfindingsandtreatment/therapiesused.
11. Providenursingcaretopatientswithneuroticdisordersbasedonassessmentfindingsandtreatment/therapiesused.

COURSEOUTLINE

T–Theory

	Unit Time	**LearningOutcomes**	**Content**	**Teac**	**Assessment Methods**
	(Hrs)			**hing/Learning Activities**	
I	6(T)	Describe thehistoricaldevelopment &current trends inmentalhealthnursing Discuss the scope ofmentalhealthnursing Describetheconceptof normal &abnormalbehaviour	**Introduction** •PerspectivesofMentalHealthandMentalHealth Nursing, evolution of mentalhealth services, treatments and nursingpractices •Mentalhealthteam •Nature&scope ofmentalhealthnursing •Role&functionsof mentalhealthnursein various settings and factors affectingthelevelof nursing practice •Conceptsofnormalandabnormalbehaviour	•Lecturecum Discussion	• Essay • Shortanswer
II	10(T)	Definethevarious termsusedinmentalhealthNursing Explainthe classificationof mentaldisorders Explain thepsychodynamics ofmaladaptivebehaviour Discuss theetiological factors &psychopathology ofmentaldisorders Explaintheprinciplesand standards ofMentalhealthNursing Describe theconceptual models ofmentalhealthnursing	**PrinciplesandConceptsofMentalHealth Nursing** •Definition:mentalhealthnursingandterminology used • Classificationofmentaldisorders:ICD11,DSM5,Geropsychiatrymanualclassification •Reviewofpersonalitydevelopment,defensemechanisms •Etiology bio-psycho-socialfactors •Psychopathology of mental disorders:reviewofstructureandfunctionofbrain,limbic system and abnormalneurotransmission •PrinciplesofMentalhealthNursing •Ethicsandresponsibilities •PracticeStandardsforPsychiatricMentalHealthNursing(INCpracticestandards) •Conceptual modelsandthe roleof nurse:○Existentialmodel	•Lecturecum Discussion • Explain usingCharts •Reviewof personalityd evelopment	• Essay • Shortanswer

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/Learning Activities	Assessment Methods
			○ Psychoanalyticalmodels ○ Behaviouralmodel ○ Interpersonalmodel •Preventivepsychiatryandrehabilitation		
III	6(T)	Describe nature,purpose and processof assessment ofmentalhealthstatus	**MentalHealthAssessment** •Historytaking •Mentalstatusexamination •Minimentalstatusexamination •Neurologicalexamination •Investigations:RelatedBloodchemistry,EEG,CT & MRI •Psychologicaltests	•Lecturecum Discussion •Demonstration •Practicesession •Clinicalpractice	•Essay •Shortanswer •Assessmentof mental healthstatus
IV	6(T)	Identify therapeuticcommunication &techniques Describe therapeuticrelationship	**Therapeutic Communication and Nurse-PatientRelationship** •Therapeutic communication: Types,techniques,characteristicsandbarriers •Therapeuticnurse-patientrelationship •Interpersonalrelationship- •Elementsofnursepatientcontract, •ReviewoftechniqueofIPR-Johariwindow •Therapeuticimpasseandits management	•Lecturecum Discussion •Demonstration •RolePlay •Processrecording •Simulation(video)	•Essay •Shortanswer •OSCE
V	10(T)	Describe therapeuticimpasses and itsinterventions Explain treatmentmodalities andtherapies used inmental disorders androleof thenurse	**Treatmentmodalitiesandtherapiesusedinmental disorders** •**Physical therapies**:Psychopharmacology, •ElectroConvulsivetherapy •**PsychologicalTherapies**:Psychotherapy,Behaviourtherapy,CBT •**Psychosocial**: Group therapy, Familytherapy, Therapeutic Community,Recreational therapy, Art therapy (Dance,Musicetc),Occupationaltherapy •**Alternative&Complementary**:Yoga,Meditation,Relaxation •**Considerationforspecialpopulations**	•Lecturecum Discussion •Demonstration •Groupwork •Practicesession • Clinicalpractice	•Essay •Shortanswer •Objectivetype
VI	8(T)	Describetheetiology,psycho-dynamics/pathology, clinicalmanifestations,diagnostic criteriaandmanagementofpatients	**Nursingmanagementofpatientwith Schizophrenia,andotherpsychoticdisorders** • Prevalenceandincidence • Classification • Etiology,psychodynamics,clinicalmanifestation, diagnosticcriteria/formulations	• Lectureand Discussion • Casediscussion • Casepresentation • Clinicalpractice	• Essay

withSchizophrenia, andother psychoticdisorders

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- Shortanswer
- Assessment ofpatientmanagementproblems

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/Learning Activities	Assessment Methods
			Nursingprocess • NursingAssessment:History,Physicala nd mentalassessment • Treatment modalities and nursingmanagement of patients withSchizophrenia and other psychoticdisorders • Geriatric considerations andconsiderationsforspecialpopulatio ns • Followupandhomecareandre habilitation		
VII	6(T)	Describetheetiology,psycho-dynamics,clinical manifestations,di agnosticcriteria andmanagementof patientswithmoodd isorders	**Nursingmanagementofpatientwith mooddisorders** • Prevalenceandincidence • Mooddisorders:Bipolaraffective disorder,maniadepressionanddysthymia etc. • Etiology, psycho dynamics, clinicalmanifestation,diagnosis • NursingAssessmentHistory,Physicalandm entalassessment • Treatment modalities and nursingmanagement of patients with mooddisorders • Geriatric considerations/ considerationsfor specialpopulations • Follow-up and home care andrehabilitation	• Lectureand Discussion • Casediscussion • Casepresentation •Clinicalpractice	• Essay • Shortanswer • Assessment ofpatient management problems
VIII	8(T)	Describetheetiology,psycho-dynamics,clinicalm anifestations,diagn ostic criteriaandmanage mentofpatients withneurotic, stressrelated andsomatizationdis orders	**Nursingmanagementofpatientwith neurotic, stress related and somatisationdisorders** • Prevalenceandincidence • classifications • Anxiety disorders – OCD, PTSD,Somatoform disorders, Phobias,DisassociativeandConversiondi sorders • Etiology,psychodynamics,clinical manifestation, diagnostic criteria/formulations • NursingAssessment:History,Physicala nd mentalassessment • Treatment modalities and nursingmanagementofpatientswithneuroti candstressrelateddisorders • Geriatric considerations/ considerationsfor specialpopulations • Follow-up and home care andrehabilitation	• Lectureand Discussion •Casediscussion •Casepresentation •ClinicalpracticeSh ortanswer • A s s e s s m e n t o f p a t i e n t m	• Essay anagementpro blems

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CLINICAL

PRACTICUMMENTALHEALTHNUR

SING -I&II

PLACEMENT:SEMESTERV&VI

MENTALHEALTHNURSING-I–1Credit(80hours)

MENTALHEALTHNURSING -II–2Credits(160hours)

PRACTICECOMPETENCIES: Oncompletionofthecourse,thestudentswillbeableto:

1. Assesspatientswithmentalhealthproblems/disorders
2. Observeandassistinvarioustreatment modalitiesortherapies
3. Counselandeducatepatientsandfamilies
4. Performindividualandgrouppsychoeducation
5. Providenursingcaretopatientswithmentalhealthproblems/disorders
6. Motivatepatientsinthecommunity forearlytreatmentandfollowup
7. Observetheassessmentandcareof patientswithsubstanceabusedisordersindeaddictioncentre.

CLINICALPOSTINGS

(8weeks×30hoursperweek=240hours)

Clinical Area/Unit	**Duration (Weeks)**	**Learning Outcomes**	nursingcare for patientswithvarious	**Skills/ Procedural Competencies**	•Observeandassistinvarioustherapies
Psychiatric OPD	2	•Assess patientswith mentalhealthproblems •Observe andassistintherapies •Counsel andeducate patients,andfamilies		•Historytaking •Performmentalstatusexamination(MSE) •Observe/practicePsychometricassessment •PerformNeurological examination	•Parentalteachingforchildwithmentaldeficiency •Historytaking •Mentalstatusexamination(MSE) •Neurologicalexamination •Assistinginpsychometric
ChildGuidanceclinic	1	•Assesschildrenwith variousmental healthproblems •Counsel andeducate children,families andsignificantothers		•Observingandassistingintherapies •Individualandgroup psycho-education ▪ Mentalhygienepracticeeducation	
Inpatientward	4	•Assess patientswith mentalhealthproblems • Provide		▪ Familypsycho-education •History&mentalstatusexamination •Observe/practicepsychometricassessment	

ClinicalRequirements	Assessments Methods		
•History takingand Mental statusexamination–2 •Healtheducation –1 •ObservationreportofOPD		with checklist •Evaluation of health education	rt •Completionofactivityrecord
•Casework–1 •Observationreportofdifferentttherapies– 1	• Assessperformance withratingscale		•Assessperformance withratingscale •Assesseachskillwithchecklist •Evaluationoftheobservationreport
•Givecareto2-3patients withvarious mentaldisorders •Casestudy –1	• Assessperformance withratingscale		•Assessperformance withratingscale •Assesseachskillwithchecklist
	• Assessea chskill	• Assessment of observatio	

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Clinical Area/Unit	Duration (Weeks)	LearningOutcomes	Skills/Procedural Competencies	ClinicalRequirements	Assessments Methods
		mental healthproblems •Assistinvarioustherapies • Counsel andeducate patients,families andsignificantothers	assessment •Recordingtherapeuticcommunication • Administrationofmedications •AssistElectro-ConvulsiveTherapy (ECT) •Participatinginalltherapies •Preparing patients forActivitiesofDailyLiving(ADL) •Conductingadmissionanddischargecounselling •~~Counselingandteaching~~patientsandfamilies	• Careplan • Clinicalpresentation–1 •Processrecording –2 •Maintaindrugbook	•Evaluationofthecase study, careplan, clinicalpresentation, processrecording • Completion ofactivityrecord
Community psychiatry & Deaddictioncentre	1	•Identify patientswithvariousmentaldisorders • Motivate patientsfor earlytreatment andfollowup • Assist in followupclinic • Counsel andeducate patient,family andcommunity • Observe theassessment andcareofpatients atdeaddictioncentre	•Conducthomevisitandcasework •Identifyingindividualswithmentalhealthproblems •AssistinginorganizationsofMentalHealthcamp •Conducting awarenessmeetingsformental health&mentalillness •Counseling and Teachingfamilymembers,patientsandcommunity •Observingdeaddictioncare	•Casework–1 •Observationreport on fieldvisits •Visit todeaddictioncentre	• Assessperformance withratingscale • Evaluation ofcase work andobservationreport • Completion ofactivityrecord

COMMUNITYHEALTHNURSING-I
includingEnvironmentalScience&Epidemiology

PLACEMENT:VSEMESTER

THEORY: 5Credits(100hours) includesLabhoursalso

PRACTICUM: Clinical:2Credits(160hours)

DESCRIPTION: This course is designed to help students develop broad perspectives of health, its determinants, aboutcommunity health nursing and understanding about the health care delivery services, health care policies and regulations inIndia. It helps the students to develop knowledge and understanding of environmental science. It further helps them to applythe principles and concepts of BCC and health education for health promotion and maintenance of healthwithin thecommunity in wellness and illness continuum. It helps students to practice Community Health Nursing for the individuals,family and groups at rural, urban and tribal settings by applying principles of community health nursing and epidemiologicalapproach.It also helps thestudents todevelop knowledge and competencies required toscreen, assess, diagnose,manageand refer clients appropriately in various health care settings. It prepares the students to provide primary healthcare to clientsof all ages in the community, DH, PHC, CHC, SC/HWC and develop beginning skills in participating in all the NationalHealthPrograms.

COMPETENCIES: Oncompletionofthecourse,thestudentswillbeableto

1. Exploretheevolutionofpublic healthinIndiaandcommunity healthnursing
2. Explaintheconceptsanddeterminantsofhealth
3. Identifythelevelsofpreventionandhealthproblemsof India
4. Develop basic understanding about the health care planning and the present health care delivery system in India atvariouslevels
5. Locate the significance of primary health care and comprehensive primary health care as part of current health caredelivery systemfocus
6. Discusshealth carepoliciesandregulationsin India
7. Demonstrateunderstandingaboutanoverviewofenvironmentalscience,environmentalhealthandsanitation
8. Demonstrateskillinnutritionalassessmentfordifferentagegroupsinthecommunityandprovideappropriatenutritionalcounseling
9. Providehealtheducationtoindividualsandfamiliesapplyingtheprinciplesandtechniquesofbehaviorchangeappropriateto communitysettings
10. Describecommunityhealthnursingapproachesandconcepts
11. Describetheroleandresponsibilitiesofcommunityhealthnursingpersonnel
12. Utilizetheknowledgeandskillsinprovidingcomprehensiveprimaryhealthcareacrossthelifespanatvarioussettings
13. Makeeffectivehomevisitsapplyingprinciplesandmethodsusedfor homevisiting
14. Useepidemiologicalapproachincommunitydiagnosis
15. Utilize the knowledge of epidemiology, epidemiological approaches in caring for people with communicable and non-communicable diseases
16. Investigateanepidemicofcommunicablediseases
17. Assess, diagnose, manage and refer clients for various communicable and non- communicable diseases appropriately attheprimaryhealth carelevel
18. Identify and perform the roles and responsibilities of nurses in implementing various national health programs in thecommunity for the prevention, control and management of communicable and non-communicable diseases particularlyinscreening,identification, primarymanagementandreferraltoahealthfacility/FirstReferralUnit(FRU)

COURSEOUTLINE

T–Theory

Unit	**Time (Hrs)**	**LearningOutcomes**	**Content**	**Teaching/LearningActivities**	**Assessment Methods**
I	4(T)	Define public health,communityhealthandcommunity health nursing Explain the evolutionofpublic healthinIndia and scope ofcommunity healthnursing Explain variousconceptsofhealthanddisease, dimensionsand determinants ofhealth Explain the	**ConceptsofCommunity Health and CommunityHealthNursing** • Definitionofpublichealth, nat ural his tor y of	• Lecture • Discussion •Explainusingchart,graphs diseaseandlevelsof prevention Discussthehealth	• Shortanswer • Essay • Objectivetype

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community health andcommunityhealthnursing

- Public health in India andits evolution and Scope ofcommunityhealthnursing
- *Review:* Concepts ofHealth & Illness/ disease:Definition,dimensionsanddeterminants of health anddisease
- Naturalhistoryofdisease
- Levels of prevention:Primary,Secondary&

- Communityneeds assessment(Field•Surveyreports urvey on identificationof demographic characteristics, health determinants and resources of aruraland anurbancommunity)
- Explainusingexamples

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/Learning Activities	Assessment Methods
		problemsofIndia	tertiary prevention – Review •Healthproblems(Profile)of India		
II	8(T)	Describe healthplanning and its steps,and various healthplans,andcommittees Discuss health caredelivery system inIndiaatvariouslevels Describe SDGs,primaryhealthcareand comprehensiveprimaryhealthcare(CPHC) Explain health carepolicies andregulationsinIndia	**HealthCarePlanningand Organization of HealthCareat variouslevels** •Healthplanningsteps •Health planning in India:various committees andcommissionsonhealthandfamily welfare and FiveYearplans •Participation ofcommunity andstakeholders in healthplanning •Health care deliverysystem in India:Infrastructure and Healthsectors, Delivery of healthservices at sub-centre(SC), PHC, CHC, Districtlevel, state level andnationallevel •Sustainabledevelopmentgoals (SDGs), PrimaryHealth Care andComprehensive PrimaryHealth Care (CPHC):elements,principles •CPHCthroughSC/HealthWellnessCenter(HWC) •RoleofMLHP/CHP •National Health CarePoliciesandRegulations ○ National Health Policy(1983, 2002, 2017) ○ NationalHealthMission(NHM): National RuralHealth Mission(NRHM), NationalUrban Health Mission(NUHM),NHM ○ National HealthProtection Mission(NHPM) ○ AyushmanBharat	•Lecture •Discussion •Field visits to CHC, PHC, SC/HealthWellnessCenters(HWC) •Directedreading	• Shortanswer • Essay • Evaluation ofField visitreports &presentation
			○ Universal HealthCoverage		
III	15(T)	Identifytheroleofanindividualin the	**Environmental Science,EnvironmentalHealth,and**	• Lecture	• Shortanswer

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/Learning Activities	Assessment Methods
		conservationofnaturalresources Describe ecosystem,itsstructure,typesandfunctions Explain theclassification, valueand threats tobiodiversity Enumerate the causes,effects and controlmeasures ofenvironmentalpollution Discuss about climatechange, globalwarming, acid rain,and ozone layerdepletion Enumerate the role ofan individual increating awarenessaboutthesocialissues relatedtoenvironment	**Sanitation** •*Natural resources:*Renewable and non-renewable resources,natural resources andassociated problems:Forest resources, waterresources, mineralresources, food resources,energyresources andlandresources •Role of individuals inconservation of naturalresources,andequitableuse of resources forsustainablelifestyles •*Ecosystem:* Concept,structure and functions ofecosystems, Types &Characteristics – Forestecosystem, Grasslandecosystem, Desertecosystem, Aquaticecosystem,Energy flowinecosystem •*Biodiversity:*Classification, value ofbio-diversity, threats tobiodiversity, conservationofbiodiversity •*Environmental pollution:*Introduction, causes,effects and controlmeasures of Air pollution,Water pollution, Soilpollution, Marinepollution, Noise pollution,Thermalpollution,nuclearhazards & their impact onhealth •*Climate change, globalwarming:* ex. heat wave,acid rain, ozone layerdepletion, waste landreclamation&itsimpactonhealth •*Social issues andenvironment:* sustainabledevelopment, urbanproblems related toenergy, water andenvironmental ethics •Acts related toenvironmental protectionandpreservation **EnvironmentalHealth&**	• Discussion •Debates on environmentalprotectionandpreservation • ExplainusingCharts,graphs, Models,films,slides • Directedreading • Visitstowatersupply&purificationsites • dvisitreports	• Essay

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Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/Learning Activities	Assessment Methods
			Sanitation		
		ListtheActsrelatedto environmental protection andpreservation Describe the conceptof environmentalhealth andsanitation Describe waterconservation, rainwater harvesting andwater shedmanagement Explain wastemanagement	• Conceptofenvironment healthandsanitation • Concept of safe water,sourcesofwater, waterbornediseases,water be	Observerainwaterharvesting purification processes,household purification ofwater • Physical and chemicalstandards of drinkingwaterqualityandtestsforassessing bacteriologicalquality of water • Concepts of waterconservation: rain waterharvestingandwatershedmanagement • Solid waste management,human excreta disposal &management and sewagedisposalandmanagement • Commonly usedinsecticidesandpesticides	plants • Visit to sewage disposal andtreatmentsites,andwastedisposalsites
IV	7(T)	Describe the variousnutrition assessmentmethods at thecommunity level Planandprovidedietplans for all agegroups includingtherapeutic diet Provide nutritioncounseling andeducation to all agegroupsanddescri		**NutritionAssessmentandNutritionEducation** • *ReviewofNutrition* o Concepts,types o Mealplanning:aims,steps & diet plan fordifferentagegroups o Nutrition assessment ofindividuals,familiesandcommunity by usingappropriate methods • Planning suitable diet forindividuals and familiesaccording to localavailability of foods,dietary habits andeconomic status • Generalnutritionaladvice • Nutrition education:purpose, principles &methods andRehabilitation	•Lecture •Discussion •Demonstration •Roleplay •Marketvisit •Nutritionalassessmentfordifferentagegroups •Lecture •Discussion

- Performanceassessment ofnutritionassessment fordifferent agegroups
- Evaluationonnutritionalassessment reports

- Shortanswer
- Essay

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Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/Learning Activities	Assessment Methods
		the national nutritionprogramsand Identifyearlythefoodborne diseases, andperform initialmanagement andreferralappropriately	•*Review:* Nutritionaldeficiencydisorders •Nationalnutritionalpolicy& programsinIndia **FoodBorneDiseasesandFoodSafety** **Foodbornediseases** •Definition, & burden,Causesandclassification •Signs&Symptoms •Transmission of foodbornepathogens&toxins •Earlyidentification,initialmanagementandreferral **Food poisoning & foodintoxication** •Epidemiologicalfeatures/ clinicalcharacteristics, Types offoodpoisoning • Foodintoxication-features, preventive & controlmeasures •~~Publichealthresponsetofo~~odborne diseases	•Fieldvisitstomilkpurificationplants,slaughterhouse •ReferNutritionmodule-BPCCHN Block2-unitI&UNIT5	• Field visitreports
V	6(T)	Describe behaviourchangecommunicationskills Counsel and providehealth education toindividuals, familiesand community forpromotionofhealthylifestylepractices	**Communicationmanagementandhealtheducation** •Behaviour changecommunicationskills ○communication ○ Humanbehaviour ○ Health belief model:concepts&definition,ways to influencebehaviour ○ Stepsofbehaviourchange ○ Techniquesofbehaviourchange: Guidingprinciples in planningBCCactivity ○ StepsofBCC ○ Social and BehaviourChange Communicationstrategies (SBCC):techniques to collectsocial history fromclients ○ Barrierstoeffective	•Lecture •Discussion •Roleplay •Demonstration:BCCskills •Supervisedfieldpractice •Refer:BCC/SBCCmodule(MoHFW&USAID)	• Shortanswer • Essay • Performance evaluation ofhealth

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/Learning Activities	Assessment Methods
		using appropriatemethod sandmedia	communication, andmethodstooverco methem •Health promotion andHealth education:methods/tech niques, andaudio-visualaids		educationse ssions toindividual sandfamilie s
VI	7(T)	Describe communityhealth nursingapproaches andconcepts	**Community healthnursingappro aches,concepts, roles andresponsibilities ofcommunity healthnursingperso nnel** • *Approaches:* o Nursingprocess o Epidemiological approach o Problem solvingapproac h o Evidence basedapproach o Empoweringpeopletoc areforthemselves	• Lecture • Discussion • Demonstration • Roleplays	• Shortanswer • Essays
		Describeandidentifyt he activities ofcommunity health nursetopromoteand maintain familyhealththrough homevisits	•*Review:* Primary healthcareandComprehe nsivePrimary Health Care(CPHC) **HomeVisits**: • Concept, Principles,Process, & Techniques:Bagtechniq ue • QualitiesofCommunity HealthNurse •Rolesandresponsibilitiesof community healthnursing personnel infamily healthservices	• Supervisedfieldpractice adolescents, elderly etc.	• Assessment ofsupervisedfi eldpractice
VII	10(T)	Explain the specificactivities ofcommunity healthnurse in assistingindividuals andgroupsto promoteand maintain theirhealth	•*Review:* Principles &techniquesofcounselin g **Assistingindividualsandf amilies to promote andmaintaintheirhealth** *A. Assessment of individualsand families* (Reviewfrom Child healthnursing,Medicalsu rgicalnursing and OBGNursing) •Assessmentofchildren,w omen,	•Lecture •Discussion •Demonstration •Roleplays	

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field practice area

- Short answer
- Essay
- Assessment of clinical performance in the

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/Learning Activities	Assessment Methods
			•Children: Monitoringgrowth and development,milestones • Anthropometricm easurements,BMI • Socialdevelopment • Temperature and Bloodpressure monitoring •Menstrualcycle • Breast self-examination(BSE) and testicles self-examination(TSE) • Warning Signs of variousdiseases •Tests:Urineforsugarandalbumin, blood sugar,Hemoglobin *B. Provision of healthservices/primary healthcare:* •Routine check-up,Immunization, counseling,anddiagnosis •Managementofcommondiseases at home andhealthcentrelevel o Care based on standingorders/protocol sapprovedbyMoH&FW o Drugs dispensing andinjections at healthcentre *C. Continue medical careand follow up* incommunityforvariousdiseases/disabilities *D. Carry out therapeuticprocedures* asprescribed/required forclientand family *E. Maintenanceofhealthrecordsandreports* •Maintenanceofclientrecords • Maintenance of healthrecordsatthefacilitylevel •Report writing anddocumentationofactivitiescarried out during homevisits, in the clinics/centersandfield visits		• Assessment ofproceduralskills in labprocedures
		Provideprimarycareathome/healthcenters(HWC) using standingorders/protocolsasper public healthstandards/approved byMoH&FW and INCregulation			
		Develop skill inmaintenance ofrecordsandreports		•Documentandmaintain: •Individualrecords	• Evaluation ofrecords andreports

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Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/Learning Activities	Assessment Methods
			F. Sensitize and handlesocial issues affectinghealthanddeve lopmentofthefamily •Womenempowerment •Womenandchild abuse •Abuseofelders •Femalefoeticide •Commercialsexworkers •Substanceabuse *G. Utilize communityresources for client andfamily* •Traumaservices •Oldagehomes •Orphanages •Homes for physicallychallengedi ndividuals •Homesfor destitute •Palliativecarecentres •Hospicecarecentres •Assistedlivingfacility	• Familyrecords • Healthcenterrecords	
		Develop beginningskills in handlingsocialissuesa ffectingthe health anddevelopment of thefamily Identify and assist thefamilies to utilize thecommunity resourcesappropriatel y		• Fieldvisits	• Evaluation offield visitreports
VIII	10(T)	Describetheconcepts,ap proaches andmethods ofepidemiology	**Introduction toEpidemiology– EpidemiologicalApproach esandProcesses** •Epidemiology:Concepta ndDefinition •Distributionandfrequencyof disease •Aims&usesofep idemiology •Epidemiologicalmodelsofca usationof disease •Conceptsofdiseasetr ansmission •Modes of transmission:Direct, Indirect and chainofinfection •Timetrendsorfluctuationsin diseaseoccurrence •Epidemiologicalapproach es: Descriptive,analytical andexperimental •Principlesofcontrolm easures/levelsof	•Lecture •Discussion •Demonstration •Roleplay •Fieldvisits:communicablediseaseho spital& Entomology office •Investigationofanepidemicof	• Shortanswer • Essay • Reportonvisitt ocommunicabl ediseasehospit al • Report on visitto entomologyoff ice

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/Learning Activities	Assessment Methods
			preventionofdisease •Investigation of anepidemicofcommunicabledisease •Use of basicepidemiological tools tomake communitydiagnosis for effectiveplanningandintervention	communicabledisease	• Report andpresentationoninvestigatingan epidemicofcommunicabledisease
		Investigate anepidemic ofcommunicabledisease			
IX	15(T)	Explainthe epidemiologyof specificcommunicablediseases Describe the variousmethodsofprevention,control andmanagement ofcommunicablediseasesandtheroleof nurses in screening,diagnosing, primarymanagement andreferral to a healthfacility	**Communicable DiseasesandNationalHealth Programs** **1.** *CommunicableDiseases–Vectorbornediseases(Every diseasewillbe dealtunder thefollowingheadlines)* •Epidemiology of thefollowing vector borndiseases •Prevention&controlmeasures •Screening,anddiagnosingthe following conditions,primary management,referraland followup o Malaria o Filaria o Kala-azar o Japaneseencephalitis o Dengue o Chickungunya **2.** *Communicablediseases: Infectious diseases (Everydisease will be dealt underthefollowingheadlines)* • Epidemiology of thefollowing infectiousdiseases • Prevention & Controlmeasures •Screening,diagnosingthefollowing conditions,primary management,referraland followup o Leprosy o Tuberculosis o Vaccine preventablediseases – Diphtheria,whooping cough,tetanus,poliom	• Lecture • Discussion, •Demonstration •Roleplay yelitis •Suggestedfieldvisits •Fieldpractice •Assessmentofclientswithcommunicablediseases	• Field visitreports • Assessmentof family casestudy

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- OSCEassessment
- Shortanswer
- Essay

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/Learning Activities	Assessment Methods
			andmeasles o Entericfever o Viralhepatitis o HIV/AIDS/RTI infections o HIV/AIDS, andSexually TransmittedDiseases/ Reproductivetract infections(STIs/RTIs) o Diarrhoea o Respiratory tractinfections o COVID-19 o Helminthic – soil &food transmitted andparasitic infections –Scabiesandpediculosis **3.** *Communicablediseases: Zoonoticdiseases* •EpidemiologyofZoonoticdiseases •Prevention&controlmeasures •Screeninganddiagnosingthe following conditions,primary management,referraland followup o Rabies: Identify,suspect, primarymanagementand referraltoahealth facility •Roleofanursesincontrolofcommunicablediseases **NationalHealthPrograms** 1. UIP: UniversalImmunization Program(Diphtheria, Whoopingcough, Tetanus,Poliomyelitis, MeaslesandHepatitisB) 2. National LeprosyEradication Program(NLEP) 3. Revised NationalTuberculosis ControlProgram(RNTCP) 4. Integrated ~~Disease~~Surveillance Program(IDSP): Enteric fever,Diarrhea,Respiratory		
		Identify the nationalhealth programsrelevant tocommunicablediseasesandexplainthe role of nurses inimplementation oftheseprograms			

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Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/Learning Activities	Assessment Methods
			infectionsandScabies 5. National Aids ControlOrganization(NACO) 6. National Vector BorneDiseaseControlPro gram 7. NationalAirQuality MonitoringProgram 8. Any other newly addedprogram		
X	15(T)D	escribethenational health program for thecontrol of non-communicablediease s and the roleofnursesinscreenin g,identification, primarymanagement andreferral to a healthfacility	**Non-CommunicableDiseases and NationalHealthProgra m(NCD)** •National response toNCDs(Everydiseasewill be dealt under thefollowingheadlines •Epidemiologyofspecificdi seases •Preventionandcontrolm easures •Screening, diagnosing/identificationa ndprimarymanagement, referral andfollowup care **NCD-1** o DiabetesMellitus o Hypertension o Cardiovasculardiseases o Stroke&Obesity o **Blindness:** Categories ofvisual impairment andnational program forcontrolof blindness o **Deafness:** nationalprogramforpre ventionandcontrolofde afness o **Thyroiddiseases** o **Injury and accidents:**Risk factors for Roadtraffic injuries andoperationalguidelines fortrauma care facility onhighways **NCD-2Cancers** o CervicalCancer o BreastCancer o Oralcancer o Epidemiologyofspecificc ancers,Riskfactors/	• Lecture • Discussion • Demonstration • Roleplay • Suggestedfieldvisits • Fieldpractice • Assessmentofclientswithnon-communicable diseases	• Field visitrepor ts • Assessment offamily casestudy • OSCEasse ssment • Shortanswer • Essay

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/LearningActivities	Assessment Methods
			Causes, Prevention,Screening, diagnosis – signs,Signs&symptoms,and early management &referral o Palliativecare o Role of a nurse in non-communicable diseasecontrolprogram **NationalHealthPrograms** • National program forprevention and control ofcancer, Diabetes,Cardiovascular DiseasesandStroke(NPCDCS) • Nationalprogramforcontrolofblindness • National program forprevention and control ofdeafness • Nationaltobaccocontrolprogram • **Standard treatmentprotocols used inNational HealthPrograms**	• Participation innationalhealthprograms	
XI	3(T)	Enumerate the schoolhealth activities andtherolefunctionsofaschoolhealthnurse	**SchoolHealthServices** • Objectives • Healthproblemsofschoolchildren • Componentsofschoolhealthservices • Maintenanceofschoolhealthrecords • Initiationandplanningofschoolhealthservices • Role of a school healthnurse	• Lecture • Discussion • Demonstration • Roleplay • Suggestedfieldvisits • Fieldpractice	• Shortanswer • Essay • Evaluation ofhealthcounseling toschoolchildren • Screen,diagnose,manage andrefer schoolchildren • OSCEassessment

Note: Labhourslessthan1Creditisnotspecifiedseparately.

CLINICALPRACTICUM

CLINICAL:2Credits(160hours)

CLINICALPOSTINGS:(4weeks×40hoursperweek)

Clinical	Duration	LearningOutcomes	ProceduralCompetencies/ ClinicalSkills	ClinicalRequirements	Assessment Methods
Urban	2weeks	Buildandm	• Interviewingskillsusingcommunication and	• Communityneeds •Evaluationofassessment/Survey	

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Clinical Area/Unit	Duration (Weeks)	LearningOutcomes	Procedural Competencies/CliniCalSkills	ClinicalRequirements	Assessment Methods
Rural	2Weeks	Identifythesocio-demographiccharacteristics, healthdeterminants andresourcesofaruralandanurbancommunity Observethefunctioningand documentsignificantobservations Perform nutritionalassessmentandplandietplanforadult Educate individuals/family/community on - Nutrition - Hygiene - Foodhygiene - Healthylifestyle - Healthpromotion Perform healthassessmentforclientsofvariousagegroups	– Rural/urban– interpersonalrelationship • Conductingcommunityneeds assessment/surveytoidentifyhealth determinants of acommunity • Observationskills • Nutritionalassessmentskills • Skill in teachingindividual/familyon: o Nutrition,includingfoodhygieneand safety o Healthylifestyle o Healthpromotion • Healthassessmentincludingnutritionalassessmentfor clientsofdifferentagegroups	1Fieldvisits: • SC/HWC,PHC, CHC • Water resources &purification site –water qualitystandards • Rain waterharvesting • Sewage disposalObservation of • milkdiary • slaughterhouse – meathygiene • Observation ofnutritionprograms • Visittomarket • Nutritionalassessment of anindividual (adult) –1 • Health teaching(Adult) – 1 • Useofaudio-visualaids o Flashcards o Posters o Flannelgraph o Flipcharts • Health assessmentof woman – 1,infant/under five –1, adolescent – 1,adult– 1 • Growthmonitoring of under-fivechildren – 1 **Document andmaintain**: • Individualrecord • Familyrecord Maintain	• Evaluationof field visit andobservationreports • Health talkevaluation • Assessment ofclinicalperformance

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ports	• Documentationskills	• Healthcenterrecord • Community healthsurvey toinvestigate anepidemic– 1	
		• Evaluations ofreports&	

Clinical Area/Unit	Duration (Weeks)	LearningOutcomes	Procedural Competencies/CliniCalSkills	ClinicalRequirements	Assessment Methods
		Investigateepidemicofcommunicabledisease Identify prevalentcommunicable andnon-communicablediseases Screen, diagnose,manage and referclients with commonhealthproblemsinthecommunity and referhigh risk clients usingstandingorders/protocols Participatein implementation ofnational healthprograms	• Investigatinganepidemic– Communityhealthsurvey • Screening, diagnosing,primary management ofcommonhealthproblemsin the community and referral of 2high-riskclients to FRUs • Conducthomevisit • Participation inimplementation of nationalhealthprograms	**Screening,diagnosing andprimarymanagement andreferral**: • Communicable disease– 1 • Non-communicablediseases– 1 •Home visits – • Participationinanytwo national healthprograms • Participationin school healthprogram– 1	records • Clinicalperformanceassessment • OSCE • Final clinicalexamination • Evaluation ofhomevisit
		Participateinschoolhealthprogram	• Participationinschoolhealthprogram		

EDUCATIONAL TECHNOLOGY/NURSING

EDUCATIONPLACEMENT: VSEMESTER

THEORY:2Credits(40hours)

PRACTICUM: Lab/Practical:1Credit(40hours)

DESCRIPTION: This course is designed to help the students to develop knowledge, attitude and beginning competenciesessential for applying basic principles of teaching and learning among individuals and groups both in educational andclinical settings. It also introduces basics of curriculum planning and organization. It further enables students to participateactively in teamandcollaborativelearning.

COMPETENCIES: Oncompletionofthecourse,thestudentswillbecompetentto

1. Developbasicunderstandingoftheoreticalfoundationsandprinciplesofteachingandlearning
2. Identifythelatestapproachesto educationandlearning
3. Initiateself-assessmenttoidentifyone‘sownlearningstyles
4. Demonstrateunderstandingofvariousteachingstylesthatcanbeused,basedonthelearners‘readinessandgenerationalneeds
5. Developunderstandingofbasicsofcurriculumplanning,andorganizing

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6. Analyzeandusedifferentteachingmethodseffectivelythatarerelevanttostudentpopulationandsettings
7. Makeappropriatedecisionsinselectionofteachinglearningactivitiesintegratingbasicprinciples

8. Utilizeactivelearningstrategiesthatenhancecriticalthinking,teamlearningandcollaboration
9. Engageinteamlearningandcollaborationthroughinterprofessionaleducation
10. Integratetheprinciples ofteachingandlearninginselectionanduseofeducational media/technology
11. Applytheprinciplesofassessmentinselectionanduseofassessmentandevaluationstrategies
12. Constructsimpleassessmenttools/testsintegratingcognitive,psychomotorandaffectivedomainsoflearningthatcanmeasureknowledgeand competenceof students
13. Developbasicunderstandingofstudentguidancethroughmentoringandacademicadvising
14. Identifydifficultsituations,crisisanddisciplinary/grievanceissuesexperiencedbystudentsandprovideappropriatecounseling
15. Engageinethicalpracticeineducationalaswellasclinicalsettingsbasedonvalues,principlesandethical standards
16. Developbasicunderstandingofevidence-basedteachingpractices

COURSEOUTLINE

T–Theory,P –Practical(Laboratory)

Unit	Time (Hrs.)		LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
	T	P				
I	6	3	Explainthedefinition,aims, types,approaches and scopeof educationaltechnology Compare and contrastthe variouseducationalphilosophies Explain the teachinglearning process,nature, characteristicsandprinciples	**IntroductionandTheoretical Foundations:** *Educationandeducationaltechnology* • Definition,aims • Approachesandscopeofeducationaltechnology • Latestapproachestoeducation: o Transformationaleducation o Relationshipbasededucation o Competencybasededucation *Educationalphilosophy:* • Definitionofphilosophy,educationdphilosophy • Comparison of educationalphilosophies • Philosophyofnursingeducation *Teachinglearningprocess:* • Definitions • Teachinglearningasaprocess • Nature and characteristics of teachingandlearning • Principlesofteachingandlearning • Barrierstoteachingandlearning • Learningtheories • Latestapproachestolearning oExperientiallearning	•Lecturecumdiscussion	• Quiz

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Unit	Time (Hrs.)		LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
	T	P				
				○ Reflectivelearning ○ Scenariobasedlearning ○ Simulationbasedlearning ○ Blendedlearning	**Groupexercise**: • Create/discuss scenario-basedexercise	**Assessment ofAssignment:** • Learningtheories –analysis of anyone
II	6	6	Identify essentialqualities/attributes of ateacher Describe the teachingstylesof faculty Explain thedeterminants oflearning and initiatesself-assessment toidentify own learningstyle Identify the factorsthat motivate thelearner Define curriculum andclassify types Identify the factorsinfluencing curriculumdevelopment Develop skill inwriting learningoutcomes, and lessonplan	**AssessmentandPlanning** *Assessmentofteacher* • Essentialqualitiesof ateacher • Teaching styles – Formalauthority,demonstrator,facilitator,delegator *Assessmentoflearner* • Typesof learners • Determinants of learning – learningneeds,readinesstolearn,learningstyles • Today'sgenerationoflearnersandtheirskillsand attributes • Emotional intelligence of thelearner •Motivational factors – personalfactors, environmental factors andsupportsystem **CurriculumPlanning** • Curriculum–definition, types • Curriculum design – components,approaches •Curriculum development – factorsinfluencing curriculum development,facilitatorsandbarriers • Writing learning outcomes/behavioralobjectives •Basic principles of writing courseplan,unit planand lesson plan	•Lecture cumdiscussion **Self-assessmentexercise:** • Identify yourlearningstyleusingany learning styleinventory (ex.Kolb's learningstyleinventory) • Lecture cumdiscussion **Individual/group exercise**:	• Shortanswer • Objectivetype **Assessment ofAssignment:** •Individual/ Group
III	8	15	Explain the principlesand strategies ofclassroommanagement	**Implementation** *TeachinginClassroomandSkilllab – TeachingMethods* • Classroom management-principlesandstrategies •Classroomcommunication ○ Facilitators and Barriers toclassroomcommunication	• Writing learningoutcomes •Preparationofalessonplan • Lecture cumDiscussion	• Shortanswer • Objectivetype

Unit	Time (Hrs.)		LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
	T	P				
			Describe differentmethods/strategies ofteaching and developbeginning skill inusing various teachingmethods Explainactivelearning strategies andparticipate actively inteamandcollaborativelearning	○ Information communicationtechnology (ICT) – ICT used ineducation *Teachingmethods– Features,advantagesanddisadvantages* •Lecture,Groupdiscussion,microteaching •Skill lab – simulations,Demonstration&re-demonstration •Symposium,paneldiscussion,seminar, scientific workshop,exhibitions •Roleplay, project •Fieldtrips •Self-directedlearning(SDL) •Computerassistedlearning •One-to-oneinstruction *Activelearningstrategies* •Teambasedlearning •Problembasedlearning •Peersharing •Casestudyanalysis •Journaling •Debate •Gaming	• Practiceteaching/Microteaching •Exercise(Peerteaching) •Patientteachingsession • Constructionof game– puzzle •Teachingingroups –interdisciplinary	•Assessmentofmicroteaching
IV	3	3	Enumerate the factorsinfluencing selectionof clinical learningexperiences Developskillinusingdifferent clinicalteachingstrategies	•Inter-professionaleducation **Teaching in the Clinical Setting – TeachingMethods** •Clinicallearningenvironment •Factorsinfluencingselectionofclinicallearning experiences •Practicemodel •Characteristicsofeffectiveclinicalteacher •Writing clinical learningoutcomes/practice competencies •Clinicalteachingstrategies– patientassignment – clinical conference,clinical presentation/bedside clinic,Case study/care study, nursingrounds, ~~concept mapping, project,debate~~, game, role play, PBL,questioning, written assignment,processrecording	• Lecture cumdiscussion • Writing ~~clinicaloutcomes~~ – assignments inpairs	•Shortanswer • Assessment ofwrittenassignment

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Unit	Time (Hrs.)		LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
	T	P				
V	5	5	Explain the purpose,principlesand stepsintheuseof media Categorize thedifferent types ofmediaanddescribeit sadvantages anddisadvantages Develop skill inpreparing and usingmedia	**Educational/TeachingMedia** •Mediause– Purpose,components,principlesand steps •Typesofmedia *Stillvisuals* o Non projected –drawings &diagrams, charts, graphs, posters,cartoons,boarddevices(chalk /whiteboard, bulletin board, flannel board,flip charts, flash cards, stillpictures/photographs, printedmaterials-handout, leaflet, brochure,flyer o Projected– filmstripes,microscope,power point slides, overheadprojector *Movingvisuals* o Video learning resources – videotapes & DVD, blu-ray, USBflashdrive o Motionpictures/films *Realiaandmodels* o Realobjects&Models *Audioaids/audiomedia* o Audiotapes/Compactdiscs o Radio&Taperecorder o Publicaddresssystem o Digitalaudio *Electronic media/computer learningresources* o Computers o Web-basedvideoconferencing o E-learning,Smartclassroom *Telecommunication (Distanceeducation)* o Cable TV, satellite broadcasting,videoconferencing Telephones – Telehealth/telenursing *Mobiletechnology*	•Lecturecumd iscussion •Preparation ofdifferent teachingaids – (Integratewith practiceteachings essions)	• Shortanswer • Objectivetype • Assessment ofthe teachingmediap repared
VI	5	3	Describe the purpose,scope,princip lesin selectionofevaluation methods and barrierstoevaluation Explaintheguidelinest odevelopassessment	**Assessment/EvaluationMethods/Strategies** •Purposes,scope andprinciplesin selectionofassessmentmethodsandtypes •Barrierstoevaluation •Guidelinestodevelopassessment	• Lecture cumdiscussio n	• Shortanswer • Objectivetype

Unit	Time (Hrs.)		LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
	TP					
			tests Developskillinconstruction ofdifferenttests Identifyvariousclinicalevaluation tools anddemonstrate skill inselectedtests	tests *Assessmentofknowledge*: •Essaytypequestions, •Shortanswerquestions(SAQ) •Multiple choice questions (MCQ – singleresponse&multipleresponse) *Assessmentofskills:* • Clinicalevaluation •Observation(checklist,ratingscales,videotapes) •Writtencommunication– progressnotes, nursing care plans, processrecording,writtenassignments •Verbalcommunication(oralexamination) •Simulation •ObjectiveStructuredClinicalExamination(OSCE) •Self-evaluation •Clinicalportfolio, clinicallogs *AssessmentofAttitude:* •Attitudescales *Assessmenttestsforhigherlearning*: •Interpretive questions, hot spotquestions,draganddropandorderedresponsequestions	•Exercise onconstructingassessmenttool/s	•Assessment oftool/spreparedd
VII	3	3	Explain the scope,purposeandprinciplesofguidance Differentiate betweenguidance andcounseling Describethe principles,types,andcounselingprocess	**Guidance/academic advising,counselinganddiscipline** *Guidance* • Definition,objectives,scope,purposeand principles • Roles of academic advisor/ facultyinguidance *Counseling* • Difference between guidance andcounseling • Definition,objectives,scope, principles,types,processandstepsofcounseling • Counselingskills/techniques– Developbasicskillsoffcounselingandguidance	• Lecture cumdiscussion • Role play onstudent counselingin differentsituations Assignmenton identifying situationsrequiring basics counselingservices • Rolesof counselor • Organizationofcou	• Assessment ofperformance inroleplayscenario • Evaluationof

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counseling assignment

Unit	Time (Hrs.)		LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
	T	P				
			Recognize theimportance ofpreventive counselingand develop skill torespond to disciplinaryproblemsand grievanceamongstudents	• Issues for counseling innursingstudents *Disciplineandgrievanceinstudents* • Managingdisciplinary/grievancepro blems– preventiveguidance&counseling • Roleofstudents'grievancer edressalcell/committee		
VIII	4	2	Recognize theimportance of value-basededucation Developskillinethicald ecision making andmaintain ethicalstandardsfor students Introduce knowledge ofEBT and its applicationinnursing education	**Ethics and Evidence BasedTeaching (EBT) in NursingEducation** *Ethics– Review* •Definitionofterms •Valuebasededucationinnursing •Valuedevelopmentstrategies •Ethicaldecisionmaking •Ethicalstandardsforstudents •Student-facultyrelationship *Evidencebased teaching– Introduction* •Evidencebasededucationprocessan d its application to nursingeducation	• Valueclar ificationexe rcise • Case studyanalysis (studentencount eredscenarios) andsuggest ethicaldecision-makingsteps • Lecture cumdiscussio n	• Shortanswer •Evaluationofc ase studyanalysis •Quiz –MCQ

INTRODUCTION TO FORENSIC NURSING AND INDIAN

LAWSPLACEMENT: VSEMESTER

THEORY: 1Credit(20hours)

DESCRIPTION:Thiscourseisdesignedtohelpstudentstoknowtheimportanceofforensicscienceintotalpatientcareandto recognizeforensicnursing asaspecialtydiscipline inprofessionalnursing practice.

COMPETENCIES: Oncompletionofthecourse,thestudentswillbeableto

1. Identifyforensicnursingasan emergingspecialtyinhealthcareandnursingpractice
2. Explorethehistoryandscopeofforensicnursingpractice
3. Identifyforensicteam,roleandresponsibilitiesofforensicnurseintotalcareofvictimofviolenceandinpreservationofevidence
4. DevelopbasicunderstandingoftheIndianjudicialsystemandlegalprocedures

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COURSEOUTLINE

T–Theory

Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
I	3(T)	Describe thenature offorensicscience anddiscusissues ncerning violence	**ForensicScience** •Definition •Historyco • Importanceinmedicalscience • ForensicScienceLaboratory **Violence** • Definition • Epidemiology • Sourceofdata	• Lecture cumdiscussion • Visit to RegionalForensic ScienceLaboratory	• Quiz–MCQ • Write visitreport
II	2(T)	Explainconcepts of forensicnursingand scopeofpractice forensic nurse	**Sexualabuse–childandwomen** **ForensicNursing** • Definition •Historyanddevelopmentfor •Scope–settingofpractice,areasofpractice andsubspecialties •Ethicalissues	• Lecturecum discussion	• Shortanswer • Objectivetype
III	7(T)	Identifymembers offorensic teamanddescribe role offorensicnurse	•Rolesandresponsibilitiesofnurse •INC&SNCActs **ForensicTeam** •Membersandtheirroles **Comprehensiveforensicnursingcareof victimandfamily** • Physicalaspects • Psychosocialaspects • Culturalandspiritualaspects • Legalaspects • Assistforensicteamincarebeyondscopeofher practice • Admissionanddischarge/referral/deathofv ictimof violence • Responsibilitiesofnurseasawitness **Evidencepreservation–roleofnurses**	• Lecture cumDiscussion • Hypothetical/real casepresentation • Observation of post-mortem	• Objectivetype • Shortanswer • Observa

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ognition

- Visit to departmentforensic medicine

•Writereport

Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/Learning Activities	Assessment Methods
			• Collection • Preservation • Documentation of Biological and otherevidencerelatedtocriminal/traumaticevent • Forwarding biological samples for forensicexamination		
IV	3(T)	Describe fundamental rights andhuman rightscommi	**FundamentalRights** • Rightsofvictim • Rightsofaccused **HumanRightsCommission**	• Lecture cumdiscussi • WrittenAssignment • Visittoprison	• Shortanswer • Assessmentof writtenassignment • Write visitreport
V	5(T)	ExplainIndian judicial systemandlaws Discuss theimportance	**Sourcesoflawsandlaw-makingpowers** **OverviewofIndianJudicialSystem** • JMFC(JudicialMagistrateFirstClass) • District • State • Apex **CivilandCriminalCaseProcedures** • IPC(IndianPenalCode) • ICPC • IEAct(IndianEvidenceAct) **OverviewofPOSCOAct**	• Lecture cumdiscussi • Guidedreading • Lecture cumdiscussi	• Quiz • Shortanswer

CHILDHEALTHNURSING -II

PLACEMENT:VISEMESTER

THEORY: 2Credits(40hours)

PRACTICUM: Clinical:1Credit(80hours)

DESCRIPTION: Thiscourseisdesignedfordevelopinganunderstandingofthemodernapproachtochild-care,identification,prevention andnursingmanagementof commonhealthproblemsofneonatesandchildren.

COMPETENCIES: Oncompletionofthecourse,thestudentswillbeableto

1. Applytheknowledgeofpathophysiologyandprovidenursingcare tochildrenwithCardiovascular,GI,genitourinary,nervoussystemdisorders,orthopedicdisorders, eye,earandskindisordersand communicablediseases
2. Providecaretochildrenwithcommonbehavioural,socialandpsychiatricproblems
3. Managechallengedchildren

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4. Identifythesocialandwelfareservicesforchallengedchildren

COURSEOUTLINE

T–Theory

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
1	20(T)	Describetheetiology, pathophysiology,clinical manifestationand nursingmanagement ofchildrenwithdisordersof cardiovascular,gastrointestinal,genitourinary, andnervoussystem	manifestationandnursing	**Cardiovascularsystem:** •IdentificationandNursingmanagementofcongenitalmalformations •**Congenital heart diseases:** CyanoticandAcyanotic(ASD,VSD,PDA,TOF) •Others:RheumaticfeverandRheumaticheartdisease,Congestivecardiacfailure •**Hematological conditions:** a) Congenital:Hemophilia, Thalassemia b) Others: Anemia, Leukemia,Idiopathic thrombocytopenicpurpura, Hodgkins and non-hodgkinslymphoma **Gastro-intestinalsystem:** •IdentificationandNursingmanagementofcongenitalmalformations. •Congenital: Cleft lip, Cleft palate,Congenital hypertrophic pyloricstenosis, Hirschsprungs disease(Megacolon),Anorectalmalformation,Malabsorption syndrome, Abdominal walldefects, Hernia	•Others: Gastroenteritis, Diarrhea,Vomiting, Protein energy malnutrition,Intestinalobstruction,Hepaticdiseases,intestinalparasites **Genitourinaryurinarysystem:** •IdentificationandNursingmanagementofcongenitalmalformations. •Congenital:Wilmstumor,Extropyofbladder, Hypospadias, Epispadias,Obstructiveuropathy •Others:Nephroticsyndrome,Acuteglomerulonephritis,renal failure **Nervoussystem:** •IdentificationandNursingmanagementofcongenitalmalformations a) Congenital:Spina bifida,Hydrocephalous. b) Others: Meningitis, Encephalitis,Convulsivedisorders(convulsionsand seizures), Cerebral palsy headinjury **Orthopedicdisorders**: •Clubfoot
II	10(T)	Describetheetiology, pathophysiology,clinical			

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•Lecturecumdiscussion •Demonstrationandpracticesession		• Shortanswer • Objectivetype • Assessment ofskills withchecklist
Refer/consult **SAM operational guidelines on facility-based management of children with severe acute malnutrition**		
•Lecturecumdiscussion •Demonstration		• Shortanswer • Objectivetype • Assessmentof

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/ LearningActivities	Assessment Methods
		management ofchildren withOrthopedicdisorders,eye, ear and skindisorders Explainthepreventive measuresandstrategies forchildrenwith communicablediseases	• Hipdislocationand • Fracture **Disorderofeye,earandskin**: • Refractoryerrors • Otitismediaand •Atopicdermatitis **Communicablediseasesinchildren**, theiridentification/diagnosis,nursing managementinhospital,inhome,control&prevention: • Tuberculosis • Diphtheria • Tetanus • Pertussis • Poliomyelitis • Measles • Mumps,and • Chickenpox • HIV/AIDS • Denguefever • COVID-19	• Practicesession • Clinicalpractice	skillswith checklist
III	10(T)	Describethe management ofchildren withbehavioral & socialproblems Identifythesocial&welfare services forchallengedchildren	**Managementofbehaviorandsocialproblemsin children** • ChildGuidanceclinic • Commonbehaviordisordersinchildrenand management o EnuresisandEncopresis o Nervousness o Nailbiting o Thumbsucking o Tempertantrum o Stealing o Aggressiveness o Juveniledelinquency o Schoolphobia o Learningdisability • Psychiatricdisordersinchildrenandmanagement o Childhoodschizophrenia o Childhooddepression o Conversionreaction o Posttraumaticstressdisorder o Autisticspectrumdisorders	•Lecturecumd iscussion •Field visits to childguidance clinics,schoolformentally& physically,socially challenged	•Shortanswer •Objectivetype •Assessmentoffieldreports

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/Learning	Assessment
			• Eatingdisorderinchildrenandmanagement o Obesity o Anorexianervosa o Bulimia • Managementofchallengedchildren. o Mentally o Physically o Socially o Childabuse, o Substanceabuse • Welfare services for challengedchildrenin India		

CHILDHEALTHNURSING -II–CLINICALPRACTICUM(1Credit–80hours)

GivenunderChildHealthNursing-IasI&II

MENTALHEALTHNURSING-II

PLACEMENT:VISEMESTER

THEORY:1Credit(40Hours)

PRACTICUM:Clinical:2Credits(160Hours)

DESCRIPTION: Thiscourseisdesignedtoprovidethestudentswithbasicunderstandingandskillsessentialtomeetpsychiatricemergenciesand performtheroleofcommunitymentalhealth nurse.

COMPETENCIES: Oncompletionofthecourse,thestudentswillbeableto

1. Applynursingprocessinprovidingcaretopatients withsubstanceusedisorders,andpersonalityandsexualdisorders.
2. Applynursingprocessinprovidingcaretopatientswithbehaviouralandemotionaldisordersoccurringduringchildhoodandadolescence.
3. Applynursingprocessinprovidingcaretopatients withorganicbraindisorders.
4. Identifyandrespondtopsychiatricemergencies.
5. Carryoutcrisisinterventionsduringemergenciesundersupervision.
6. PerformadmissionanddischargeproceduresasperMHCA2017.
7. Exploretherolesandresponsibilitiesofcommunitymentalhealthnurseindeliveringcommunitymentalhealthservices.

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COURSEOUTLINE

T–Theory

	Unit Time	Learning Outcomes	Content	Teaching/Le	Assessment Methods
	(Hrs)			**arningActiviti es**	
I	6(T)	Describe theetiology, psycho-dynamics, clinicalmanifestatio ns,diagnostic criteriaandmanage mentofpatients withsubstance usedisorders	**Nursing Management of Patients withSubstanceUseDisorders** •Prevalenceandincidence •Commonlyusedpsychotropicsubstance:cla ssifications, forms, routes, action,intoxicationandwithdrawal •Psychodynamics/etiologyofsubstanceusedis order (Terminologies: Substance Use,Abuse, Tolerance, Dependence,Withdrawal) •Diagnosticcriteria/formulations •Nursing Assessment: History (substancehistory),Physical,mentalassess mentanddruganddrug assay •Treatment(detoxification,antabuseandna rcotic antagonist therapy and harmreduction, Brief interventions, MET,refusal skills, maintenance therapy) andnursing management of patients withsubstanceusedisorders •Specialconsiderationsforvulnerablepo pulation	•Lecturecumd iscussion •Casediscussion •Casepresentation •Clinicalpractice	• Essay • Shortanswer • Assessment ofpatientmana gementproble ms
II	6(T)	Describe theetiology, psycho-dynamics, clinicalmanifestat ions,diagnosticcri teria andmanagementof patients withpersonality, andsexualdisord ers	•Follow-upandhomecareandrehabilitat ion **Nursing Management of Patient withPersonalityandSexualDisorders** •Prevalenceandincidence •Classificationofdisorders •Etiology,psychopathology,characteristics,•Clinicalpracticediag nosis •NursingAssessment:History,Physicalandmentalhe althassessment •Treatment modalities and nursingmanagementofpatientswithperson ality,andsexualdisorders	•Lecturecumd iscussion •Casediscussion •Casepresentation	• Essay • Shortanswer • Assessment ofpatient management problems
III	8(T)	Describe theetiology, psycho-pathology, clinicalmanifestatio ns,diagnostic criteriaand management ofchildhood andadolescent disordersincluding mentaldeficiency	•Geriatricconsiderations •Follow-upandhomecareandrehabilitat ion **NursingManagementofBehavioural&E motional Disorders occurring duringChildhood and Adolescence (**Intellectualdisability, autism, attention deficit,hyperactive disorder, eating disorders,learningdisorder) •Prevalenceandincidence •Classifications •Etiology,psychodynamics,Characteristics,di agnosticcriteria/formulations	•Lecturecumd iscussion •Casediscussion •Casepresentation •Clinicalpractice	• Essay • Shortanswer • Assessment ofpatientmana gementproble ms

Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/Learning Activities	Assessment Methods
			•NursingAssessment:History,Physical,mental status examination and IQassessment •Treatment modalities and nursingmanagementofchildhooddisordersincludingintellectualdisability •Follow-upandhomecareandrehabilitation		
IV	5(T)	Describe theetiology, psycho-pathology, clinicalmanifestations,diagnostic criteriaandmanagementoforganic braindisorders.	**Nursing Management of Organic BrainDisorders** (Delirium, Dementia, amnesticdisorders) •Prevalenceandincidence •Classification • Etiology, psychopathology, clinicalfeatures, diagnosis and Differentialdiagnosis •NursingAssessment:History,Physical,mentalandneurologicalassessment •Treatment modalities and nursingmanagementoforganicbraindisorders •Follow-upandhomecareandrehabilitation	•Lecturecumdiscussion •Casediscussion •Casepresentation •Clinicalpractice	•Essay •Shortanswer •Assessmentofpatientmanagementproblems •Shortanswer
V	6(T)	Identify psychiatricemergencies andcarry out crisisintervention	**PsychiatricEmergenciesandCrisisIntervention** •Types of psychiatric emergencies(attemptedsuicide,violence/aggression,stupor, delirium tremens and otherpsychiatric emergencies) and theirmanagements •Maladaptivebehaviourofindividualandgroups,stress,crisisanddisaster(s) •Typesof crisis •Crisisintervention:Principles,Techniquesand Process - Stressreductioninterventionsaspersst ressadaptation model	•Lecturecumdiscussion •Casediscussion •Casepresentation •Clinicalpractice	•Objectivetype •Shortanswer
VI	4(T)	Explain legalaspects applied inmental healthsettingsandroleofthenurse	- Copingenhancement - Techniquesof counseling **LegalIssuesinMentalHealthNursing** •OverviewofIndianLunacyActandTheMentalHealthAct1987 •(ProtectionofChildrenfromSexualOffence) POSCOAct •MentalHealthCareAct(MHCA)2017 •Rightsof mentally illclients •Forensicpsychiatryandnursing •Actsrelatedtonarcoticandpsychotropicsubstancesand illegaldrugtrafficking	•Lecturecumdiscussion •Casediscussion	•Objectivetype

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Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/Learning Activities	Assessment Methods
			•AdmissionanddischargeproceduresasperMHCA2017 •Roleandresponsibilitiesofnursesinimplementing MHCA2017		
VII	5(T)	Describethemodelof preventivepsychiatry DescribeCommunity Mentalhealth services androleofthenurse	**CommunityMentalHealthNursing** •DevelopmentofCommunityMentalHealthServices: •Nationalmentalhealthpolicyviz.NationalHealthPolicy •NationalMentalHealthProgram •Institutionalizationversus Deinstitutionalization •ModelofPreventivepsychiatry •MentalHealthServicesavailableattheprimary, secondary, tertiary levelsincluding rehabilitation and nurses'responsibilities •MentalHealthAgencies:Governmentandvoluntary,NationalandInternational •Mental health nursing issues for specialpopulations: Children, Adolescence,WomenElderly,Victimsofviolenceandabuse,Handicapped,HIV/AIDSetc.	•Lecturecumdiscussion •Clinical/fieldpractice •Field visits tomental healthserviceagencies	• Shortanswer • Objectivetype • Assessment ofthe field visitreports

CLINICALPRACTICUM–2Credits(80hours)

Clinical Practicum for Mental Health Nursing - I & II are given under Mental Health Nursing - I Clinical PracticumNURSINGMANAGEMENTANDLEADERSHIP

PLACEMENT:VISemester

THEORY:3Credits(60hours)includesLab/SkillLabhoursalso

PRACTICUM: Clinical:1Credits(80hours)

DESCRIPTION: Thiscourseisdesignedtoenablestudentstoacquireknowledgeandcompetenciesinareasofadministration, and management of nursing services and education. Further prepares the students to develop leadershipcompetenciesandperformtheir role aseffectiveleadersin an organization.

COMPETENCIES: Oncompletionofthecourse,thestudentswillbeableto

1. Analyzethehealthcaretrendsinfluencingdevelopmentof nursingservicesand educationinIndia.
2. Describetheprinciples,functionsandprocessof managementappliedtonursing.
3. Developbasicunderstandingandbeginningcompetenciesinplanningandorganizingnursingservicesinahospital.
4. Applytheconceptofhumanresourcemanagementandidentifythejobdescriptionforallcategoriesofnursingpersonnelincluding in serviceeducation.
5. Discusstheprinciplesandmethodsofstaffingandschedulinginanindividualhospital/nursingunit.
6. Developskillinmanagementofmaterialsandsuppliesincludinginventorycontrol.
7. Developteamworkingandinterprofessionalcollaborationcompetencies.
8. Identifyeffectiveleadershipstylesanddevelopleadershipcompetencies.
9. Utilizetheknowledgeofprinciplesandlineofcontrolandparticipateinqualitymanagementandevaluationactivities.
10. Utilizetheknowledgerelatedtofinancialplanninginnursingservicesandeducationduringbudgetaryprocess.

11. Applytheknowledgeofnursinginformaticsinmaintenanceofrecordsandreportsrelevanttopatientinformation,nursingcareand progress.
12. DemonstrateunderstandingoftheINCguidelinesforestablishmentandaccreditationofeducationalinstitutionsintermsof faculty norms, physical infrastructureand clinicalfacilities.
13. Demonstratebeginningcompetenciesinplanning,organizingandstaffingatcollegeincludingimplementationandevaluationof curriculum.
14. Identifythelegalissuesandlawsrelevanttonursingpracticeandeducation.

15Applytheknowledgeandutilizethevariousopportunitiesforprofessionaladvancement.

COURSEOUTLINE

T–Theory

Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/LearningActivities	Assessment Methods
I	1(T)	Explore the healthcare development of nursing services andeducation inIndia andtrends	**HealthCareandDevelopmentof NursingServicesinIndia** • Currenthealthcaredelivery systemof India–review • Planninganddevelopmentofnursingservices and education at global andnationalscenario • Recenttrendsandissuesofnursingservice and management	• Lecturecumdiscussion • Directedreadingandwrittenassignment	• Shortanswer • Assessmentof assignment
II	2(T)	Explainthe principles andfunctions ofmanagementapplied tonursing Describe theintroductoryconcepts of managementasprocess	**Management Basics Applied toNursing** • Definitions,conceptsandtheoriesofmanagement • Importance, features and levels ofmanagement • Managementandadministration • Functionsofmanagement • Principlesofmanagement • Roleofanurseasa manager **IntroductiontoManagementProcess** • Planning • Organizing • Staffingap • Directing/Leading	• Lectureanddiscussion	• MCQ • Shortanswer
			• Controlling		
III	4 (T)	Describetheessentialelements ofplanning	**MANAGEMENT OF NURSINGSERVICES** **PlanningNursingServices** • Vision,Mission,philosophy,objectives • Nursingservicepolicies,proceduresand manuals • Functionalandoperationalplanning	• LectureandDiscussion • Visittospecifichospital/patientcareunits • Demonstrationofdisasterdrillintherespectivesetting	• FormulateMission &VisionStatement forthe nursingdepartment/unit • Assessment

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Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/LearningActivities	Assessment Methods
			• Strategicplanning • Program planning – Gantt chart &milestonechart • Budgeting– concepts,principles,types, • Budgetproposal,costbenefitanalysis • Planninghospitalandpatientcareunit(Ward) • Planningforemergencyanddisaster		of problem-solvingexercises • VisitReport
IV	4(T)	Discussthe concepts oforganizingincludinghospitalorganization	**Organizing** • Organizingasaprocess– assignment,delegationand coordination • Hospital– types,functions&organization • Organizationaldevelopment • Organizationalstructure • Organizationalcharts • Organizationaleffectiveness • Hospitaladministration,Control&lineof authority • Hospitalstatisticsincludinghospitalutilizationindices • Nursingcaredeliverysystemsandtrends • Roleofnurseinmaintenanceofeffectiveorganizationalclimate	• Lecturecumdiscussion • Comparisonoforganizationalstructure of variousorganizations • Nursingcaredeliverysystems– assignment • PreparationofOrganizationalchart of hospital/ Nursingservices	•Shortanswer •Assessmentofassignment
V	6(T)	Identify the significanceof humanresource management(HRM) andmaterialmanagementanddiscussitselements	**Staffing (Human resourcemanagement)** • Definition,objectives,components andfunctions **Staffing&Scheduling** •Staffing–Philosophy,staffingactivities •Recruiting,selecting,deployment •Training,development,credentialing,retaining, promoting, transfer,terminating,superannuation •Staffing units – Projecting staffingrequirements/calculation ofrequirements of staff resources Nursepatient ratio, Nurse Population ratio asperSIUnorms/IPHNorms,andPatient classification system • Categories of nursing personnelincludingjobdescriptionofalllevels •Assignmentandnursingcarerespons ibilities	• Lectureanddiscussion • Roleplay •Games self-assessment, casediscussionandpracticesession •Calculation of staffingrequirementsforaspecifiedward	•FormulateJob descriptionatdifferentlevels of care& comparewithexistingsystem • Preparation ofduty roster

Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/LearningActivities	Assessment Methods
			• Turnoverandabsenteeism • Staffwelfare • Disciplineandgrievances **In-ServiceEducation** • Nature and scope of in-serviceeducationprogram • Principlesofadultlearning –review • Planning and organizing in-serviceeducationalprogram • Methods,techniquesandevaluation • Preparationofreport **MaterialResourceManagement** • Procurement,purchasingprocess,inventory control&roleofnurse • Auditingandmaintenanceinhospitalandpatient careunit	• Visit to inventory store of theinstitution	•Preparationof MMF/records •Preparationoflog book &condemnationdocuments •VisitReport
VI	5 (T)	Describethe importantmethods ofsupervision andguidance Explain theproceduralsteps ofmaterialmanagement Developmanagerialskill ininventorycontrol andactivelyparticipate inprocurementprocess	**DirectingandLeading** • Definition,principles,elementsofdirecting • Supervisionandguidance •Participatorymanagement •Inter-professionalcollaboration •Managementbyobjectives •Teammanagement •Assignments,rotations •Maintenanceof discipline •Leadershipin management	•Lectureanddiscussion •Demonstration of record &reportmaintenanceinspecific wards/departments	•Assignmenton Reports &Recordsmaintained innursingdepartment/ • Preparation ofprotocols andmanuals
VII	4(T)	Discussthe significanceand changingtrends ofnursingleadership Analyze thedifferentleadershipstyles anddeveloleadershipcompetencies	**Leadership** •Definition,concepts,andtheories •Leadershipprinciplesandcompetencies •Leadershipstyles:Situationalleadership, Transformationalleadership • Methodsofleadershipdevelopment • Mentorship/preceptorshipinnursing • Delegation, power & politics,empowerment, mentoring andcoaching •Decisionmakingandproblemsolving	•Lecturecumdiscussion •Self-assessment •Report on types of leadershipadopted at different levels ofhealthcareinthegivensetting •Problemsolving/Conflictmanagementexercise •Observationofmanagerialrolesat different levels (middle levelmangers-wardincharge,ANS)	•Shortanswer •Essay •Assessmentofexercise/report

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Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/LearningActivities	Assessment Methods
			• Conflictmanagementandnegotiation • Implementingplannedchange		
VIII	4(T)Explainthe process ofcontrolling anditsactivities		**Controlling** •Implementing standards, policies,procedures,protocolsandpractices •Nursingperformanceaudit,patientsatisfaction •Nursingrounds,Documentation – recordsandreports •Totalqualitymanagement– Qualityassurance,Quality andsafety •Performanceappraisal •Programevaluationreviewtechnique(PERT) •Benchmarking,Activityplan(Ganttchart) •Criticalpathanalysis	•Lecturecumdiscussion •Preparation of policies/protocolsfornursingunits/department	• Assessment of preparedprotocols
IX	4(T)Explainthe concepts oforganizationalbehavior andgroupdynamics		**OrganizationalBehaviorandHumanRelations** •Conceptsandtheoriesoforganizationalbehavior •Groupdynamics •Review–Interpersonalrelationship •Humanrelations •Publicrelations inthecontextofnursing •Relations with professionalassociationsandemployeeunions •Collectivebargaining •Review– Motivationandmoralebuilding •Communicationintheworkplace– assertivecommunication •Committees– importanceintheorganization,functioning	•Lectureanddiscussion •Role play/ exercise – Groupdynamics&humanrelations	•Shortanswer •OSCE
X	2 (T)Describe thefinancial management related tonursingservices		**FinancialManagement** • Definition,objectives,elements,functions, principles & scope offinancial management • Financialplanning(budgetingfornursingdepartment) • Proposal,projectingrequirementforstaff, equipment and supplies for – Hospital & patient care units &emergency anddisaster units	•Lecturecumdiscussion •Budgetproposalreview •Preparationofbudgetproposalforaspecificdepartment	•Shortanswer •Essay •Assessmentofassignment

Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/LearningActivities	Assessment Methods
			• BudgetandBudgetaryprocess • Financialaudit		
XI	1(T)R	Reviewthe concepts,principles andmethods anduse of nursinginformatics	**Nursing Informatics/ InformationManagement – Review** •Patientrecords •Nursingrecords •Useofcomputersinhospital,collegeand community •Telemedicine& Telenursing •ElectronicMedicalRecords(EMR),EHR	• Review • Practicesession • Visittodepartments	• Shortanswer
XII	1(T)R	Review personalmanagement interms ofmanagement of emotions,stress andresilience	**PersonalManagement–Review** •Emotionalintelligence •Resiliencebuilding •Stressandtimemanagement –de-stressing •Career planning	• Review • Discussion ,labs,	
			MANAGEMENT OF NURSINGEDUCATIONALINSTITUTIONS		
XIII	4(T)D	Describethe process ofestablishingeducationalinstitutions andits accreditationguidelines	**EstablishmentofNursingEducationalInstitutions** •Indian Nursing Council norms andguidelines – Faculty norms, physicalfacilities, clinical facilities, curriculumimplementation, andevaluation/examinationguidelines •Coordinationwithregulatorybodies– INCandState NursingCouncil •Accreditation–Inspections • Affiliation with university/Statecouncil/boardofexaminations		•Lectureanddiscussion •Visittooneof theregulatorybodies
XIV	4(T)E	Explainthe planning andorganizingfunctions of anursingcollege	**PlanningandOrganizing** •Philosophy,objectivesandmissionofthe college •Organizationstructureofschool/college •Review– Curriculumplanning • Planning teaching and learningexperiences,clinicalfacilities–masterplan,timetableandclinicalrotation •Budget planning – faculty, staff,equipment&supplies,AVaids,Labequipment, library books, journals,computersandmaintenance •Infrastructurefacilities– college,classrooms,hostel,library		• Directed reading – INCCurriculum • Preparationoforganizationalstructureofthecollege • Writtenassignment– writingphilosophy of a teachingdepartment • Preparation of master plan,timetableandclinicalrotation

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- Visitreport
- Shortanswer
- Essay
- Assessmentofassignment

Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/LearningActivities	Assessment Methods
			computerlab,transportfacilities •Records&reportsforstudents,staff,faculty andadministrative •Committeesandfunctioning •Clinicalexperiences		
XV	4(T)	Develop understanding of staffing thecollege andselecting thestudents	**StaffingandStudentSelection** • Faculty/staffselection,recruitmentandplacement,jobdescription • Performanceappraisal • Facultydevelopment • Faculty/staffwelfare • Studentrecruitment,admission,clinicalplacement	• Guidedreadingonfacultynorms • Facultywelfareactivitiesreport • Writing job description oftutors	•Shortanswer •Activityreport •Assessmento f jobdescription
XVI	4(T)	Analyzethe leadership andmanagementactivitiesinaneducationalorganization	**DirectingandControlling** • Review–Curriculumimplementationandevaluation • Leadershipandmotivation,supervision–review • Guidanceandcounseling • Quality management – educationalaudit • Programevaluation,evaluationofperformance • Maintainingdiscipline • Institutional records and reports – administrative, faculty, staff andstudents	•Reviewprinciplesofevaluation •**Assignment –** Identifydisciplinary problems amongstudents •Writingstudentrecord	• Short answer •Assessmentof assignmentandrecord
XVII	4(T)	Identify various legalissuesand lawsrelevantto nursing practice	**PROFESSIONAL CONSIDERATIONS** **Review–LegalandEthicalIssues** • Nursing as a profession – Characteristicsofaprofessionalnurse • Nursing practice – philosophy, aimandobjectives • Regulatory bodies – INC and SNCconstitutionandfunctions **Review–Professionalethics** • Code of ethics and professionalconduct– INC& ICN • Practicestandardsfor nursing–INC • InternationalCouncilforNurses(ICN) **Legalaspectsinnursing:** • Consumerprotectionact,patientrights • Legaltermsrelatedtopractice,legal		

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Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/LearningActivities	Assessment Methods
			system – types of law, tort law &liabilities • Laws related to nursing practice – negligence, malpractice, breach,penalties • Invasionofprivacy,defamationofch aracter • Nursing regulatory mechanisms – registration, licensure,renewal,accreditation, nurse practice act,regulation for nursepractitioner/specialistnursingpra ctice		
XVIII	2(T)	Explainvarious for professionaladv	**ProfessionalAdvancement** • ContinuingNursingEducation • Careeropportunities • Membership with professionalorganizations – national andinternational • Participationinresearchactivities • Publications–journals,newspaper	• Preparejournallistavailable •AssessmentinIndia • Writeanarticle–research/ assignments clinical	of

Note: Lessthan1creditlabhoursarenotspecified

CLINICALPRACTICUM

Clinical:2Credits(80hours)2weeks×40hoursperweek=80hours

PracticeCompetencies:

Hospital

1. Prepareorganizationalchartofhospital/Nursingservices/nursingdepartment
2. Calculatestaffingrequirementsforaparticularnursingunit/ward
3. FormulateJobdescriptionatdifferentlevelsofcare
4. Preparedutyrosterforstaff/studentsatdifferentlevels
5. Participateinprocuring/purchaseofequipment&supplies
6. Preparelogbook/MMFforspecificequipment/materials
7. Maintainandstoreinventory andkeepdaily records
8. Prepareandmaintainvariousrecords&reportsofthesettings–incidentreports/adversereports/auditreports
9. Prepareandimplementprotocols&manuals
10. Participateinsupervision,evaluationandconductinginservice educationforthestaff

College&Hostel

1. Prepareorganizationalchartofcollege
2. Formulatejobdescriptionfortutors
3. PrepareMasterplan,timetableandclinicalrotation
4. Preparestudentanecdotes
5. Participateinplanning,conductingandevaluationofclinicalteaching

6. Participateinevaluationofstudents'clinicalexperience
7. ParticipateinplanningandconductingpracticalexaminationOSCE–endofposting

CLINICALPOSTING: Managementexperienceinhospital&college.

MIDWIFERY/OBSTETRICSANDGYNECOLOGY(OBG)NURSING-I includingSBAmodule

PLACEMENT:VISEMESTER

THEORY: 3Credits(60hours)

PRACTICUM: SkillLab**:**1Credit(40hours);Clinical:3Credits(240hours)

DESCRIPTION: This course is designed for students to develop knowledge and competencies on the concepts andprinciples of midwifery. It helps them to acquire knowledge and skills in rendering respectful maternity care to womanduring antenatal, intranatal and postnatal periods in hospitals and community settings. It further helps to develop skills inmanagingnormalneonatesandparticipatein familywelfare programs.

COMPETENCIES: Oncompletionoftheprogram,thestudentswillbeableto

1. Demonstrateprofessionalaccountabilityforthedeliveryofnursingcareasper INCstandards/ICMcompetenciesthatareconsistentwith moral, altruistic,legal,ethical,regulatory andhumanisticprinciplesin midwifery practice.
2. Communicateeffectivelywithindividuals,familiesandprofessionalcolleaguesfosteringmutualrespectandshareddecision making to enhancehealth outcomes.
3. Recognizethetrendsandissuesinmidwiferyandobstetricalnursing.
4. Reviewanddescribetheanatomyandphysiologyofhumanreproductivesystemandconception.
5. Describeandapplyphysiologyinthemanagementofnormalpregnancy,birthandpuerperium.
6. Demonstratecompetencyinprovidingrespectfulandevidencebasedmaternitycareforwomenduringtheantenatal,intranatalan d postnatal period.
7. Upholdthefundamentalhumanrightsofindividualswhenprovidingmidwiferycare.
8. Promotephysiologiclabourandbirth,andconductnormalchildbirth.
9. Provideevidencebasedessentialnewborncare.
10. Applynursingprocessapproachincaringforwomenandtheirfamilies.
11. Describethemethodsofcontraceptionandroleofnurse/midwifeinfamilywelfareservices.
12. Recognizetheimportanceofandactivelyparticipateinfamilywelfareprograms.
13. Provideyouthfriendlyhealthservicesandcarefor womenaffectedbygenderbasedviolence.

COURSEOUTLINE

T–Theory,SL/L–SkillLab/Lab,C–Clinical

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/Learning	Assessment
I	8(T)	Explainthehistory and current scenarioofmidwifery	**Introductiontomidwifery** • HistoryofmidwiferyinIndia • *Currentscenario:* o Trendsof maternity careinIndia o MidwiferyinIndia– Transformativeeducationforrelations transformativemidwiferypracticein India	• Discussion • Demonstration • Roleplay • Directedreading Quizandassignment: ICMcompetencies • Scenariobased learning	• Shortanswer • Objectivetype • Essay •
		Reviewvitalhealth	• Vital health indicators – Maternalmortalityratio,InfantMortali		

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Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/Learning Activities	Assessment Methods
		indicators Describe the variousnational healthprograms related toRMNCH+A Identify the trendsand issues inmidwifery Discuss the legal andethicalissuesrelevanttomidwiferypractice	NeonatalMortalityRate,perinatalmortality rate,fertility rates oMaternaldeath audit • NationalhealthprogramsrelatedtoRMNCH+A (Reproductive MaternalNewborn and Child Health +AdolescentHealth) *CurrenttrendsinmidwiferyandOBGnursing:* o Respectfulmaternityandnewborncare(RMNC) o Midwifery-ledcareunits(MLCU) o Women centered care, physiologicbirthinganddemedicalizationofbirth o Birthingcenters,waterbirth,lotusbirth o Essentialcompetenciesfor midwifery practice(ICM) o Universal rights of child-bearingwomen o Sexualandreproductivehealthandrights o Women'sexpectations&choicesaboutcare *LegalprovisionsinmidwiferypracticeinIndia:* • INC/MOH&FWregulations • ICMcodeofethics • Ethicalissuesinmaternalandneonatalcare •Adoption laws, MTP act, Pre-NatalDiagnosticTest(PNDT)Act,Surrogate mothers • Roles and responsibilities of amidwife/Nurse practitioner midwife indifferentsettings(hospital/community)		
II	6(T) 3(L)	Review theanatomya nd physiology of humanreproductivesystem	•Scopeof practicefor midwives **Anatomy and physiology of humanreproductivesystemandconception(Maternal, Fetal & Newbornphysiology)** *Review:* •Femaleorgansofreproduction •Femalepelvis–bones,joints,ligaments, planes, diameters,landmarks, inclination, pelvicvariations •Foetalskull–bones,sutures,	•Lecture •Discussion •Self-directedlearning •Models •Videos&films	•Quiz •Shortanswer •Essay

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Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/Learning Activities	Assessment Methods
			fontanelles,diameters,moulding •Fetopelvicrelationship •Physiologyofmenstrualcycle,menstrualhygiene •Fertilization,conceptionandimplantation •Embryologicaldevelopment •Placentaldevelopmentandfunction,placentalbarrier •Fetalgrowthanddevelopment •Fetalcirculation&nutrition		
III	12(T) 10(L) 40(C)	Providepreconception caretoeligiblecouples Describethe physiology,assessment and management ofnormalpregnancy Demonstrateknowledge, attitudeandskillsofmidwifery practice throughout1st,2ndand3rd	**Assessmentandmanagementofnormalpregnancy(ante-natal):** **Pre-pregnancyCare** •Reviewof sexualdevelopment*(SelfLearning)* • Socio-cultural aspects of humansexuality*(Self Learning)* • Preconceptioncare • Pre-conceptioncounseling(includingawareness regarding normal birth)Geneticcounseling*(SelfLearning)* • Plannedparenthood **Pregnancyassessmentandantenatal care(I,II&IIITrimesters)** **Normalpregnancy** •Physiologicalchangesduringpregnancy •Assess and confirm pregnancy:Diagnosis of pregnancy – Signs,differentialdiagnosisandconfirmatorytests •Reviewofmaternalnutrition&malnutrition •BuildingpartnershipwithwomenfollowingRMC protocol •Fathers'engagementinmaternitycare **Ante-natalcare:** **1st Trimesters** •Antenatalassessment:Historytaking,physical examination, breastexamination,laboratoryinvestigation •Identificationandmanagementofminordiscomfortsofpregnancy	• Lecture • Discussion • Demonstration • Self-Learning • Healthtalk • Roleplay • Counselingsession • Casediscussion/ presentation • Simulation • Supervisedclinicalpractice •Refer SBA module&Safemotherhood	• Shortanswer • Objectivetype • Assessmentof skillswith checklist •Casestudye valuation •OSCE

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/Learning Activities	Assessment Methods
		trimesters	•Antenatalcare:asperGoIguidelines •Antenatalcounseling(lifestylechanges, nutrition,shareddecision making,risky behavior,sexuallifeduringpregnancy,immunizationetc.) • Dangersignsduringpregnancy • Respectfulcareandcompassionatecommunication • Recordingandreporting:aspertheGoIguidelines • RoleofDoula/ASHAs **II Trimester** • Antenatal assessment: abdominalpalpation, fetal assessment,auscultate fetal heart rate – Dopplerandpinnard'sstethoscope • Assessment of fetal well-being:DFMC, biophysical profile, Nonstress test, cardio-tocography, USG,Vibro acoustic stimulation,biochemicaltests. • Antenatalcare • Womencentered care • Respectful care and compassionatecommunication • Health education on IFA, calciumand vitamin D supplementation,glucosetolerance test, etc. • Educationandmanagementofphysiological changes anddiscomfortsof2nd trimester • Rh negative and prophylacticantiD • Referral and collaboration,empowerment • Ongoingriskassessment • MaternalMentalHealth **III Trimester** • Antenatal assessment: abdominalpalpation, fetal assessment, auscultatefetalheartrate– Dopplerandpinnard'sstethoscope • Education and management ofphysiological changes anddiscomfortsof3rd trimester	booklet •Labtests–	

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	ancy • Childbirthpreparationclasses	performance andinterpretatio n •Demonstration •Roleplay
		•Demonstrationofa ntenatalassessme nt

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/Learning Activities	Assessment Methods
			• Birthpreparednessandcomplicationreadiness including micro birthplanning •Danger signs of pregnancy – recognitionofrupturedmembranes •Education on alternative birthingpositions – women's preferredchoices,birthcompanion • Ongoingriskassessment • Culturalneeds • Womencenteredcare •Respectfulandcompassionatecommunication •Health education on exclusivebreastfeeding • RoleofDoula/ASHA's	•Scenariobasedlearning •Lecture •Simulation •Roleplay •Refer GoIGuidelines •Healthtalk •Counselingsession •Demonstrationofbirthingpositions •Workshop onalternative birthingpositions	
IV	12(T) 12(L) 80(C)	Applythephysiologyof labour inpromoting normalchildbirth Describethe managementandcare duringlabour Discusshowto maintainasafe environmentforlabour Workeffectivelyforpain managementduringlabour	**Physiology,managementandcareduringlabour** •Normallabourandbirth •Onsetof birth/labour •Pervaginalexamination(ifnecessary) •Stagesoflabour • Organizationoflabourroom–Triage,preparationforbirth • Positivebirthenvironment • Respectfulcare andcommunication • DrugsusedinlabourasperGoIguidelines **FistStage** • Physiologyofnormallabour •Monitoringprogressoflabourusing Partograph/labourcareguide • Assessingandmonitoringfetalwellbeing • Evidencebased careduring1ststageoflabour • nmanagementinlabour(non-pharmacological) • Psychologicalsupport–Managing fear • Activityandambulationduringfirst stageoflabour	•Lecture •Discussion •Demonstration •Bedsideclinics •Casediscussion/ presentation •Simulatedpractice •SupervisedClinicalpractice – Pervaginalexamination,Conduction ofnormalchildbirth •ReferSBA module • LaQshya guidelines • guidelines	• Essay type • Shortanswer • Objective type • Casestudy evaluation • Assessment ofskillswithchecklist • OSCE

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Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/Learning Activities	Assessment Methods
		Discuss how themidwife provides careand support for thewomenduringbirthtoenhance physiologicalbirthing and promotenormalbirth Assess and providecare of the newbornimmediatelyfollowingbirth Discusstheimpactoflabour and birth as atransitional event inthewoman'slife	• Nutritionduringlabour • Promotepositivechildbirthexperiencefor women • Birthcompanion • RoleofDoula/ASHA‘s **Secondstage** • Physiology(Mechanismoflabour) • Signsofimminentlabour • Intrapartummonitoring • Birthpositionofchoice • Vaginalexamination • Psychologicalsupport • Non-directivecoaching • Evidence based management ofphysiological birth/Conduction ofnormalchildbirth • Essentialnewborncare(ENBC) • Immediateassessmentandcareofthenewborn • RoleofDoula/ASHA‘s **ThirdStage** • Physiology–placentalseparationandexpulsion, hemostasis • Physiologicalmanagementofthirdstageoflabour • Activemanagementofthirdstageoflabour (recommended) • Examinationofplacenta, membranesandvessels • Assessperineal,vaginaltear/injuriesandsutureifrequired • InsertionofpostpartumIUCD • Immediateperinealcare • Initiationofbreastfeeding • Skintoskincontact • Newbornresuscitation **FourthStage** *Observation, Critical Analysis andManagementofmotherandnewborn* • Maternal assessment, observationfundal height, uterine consistency,urineoutput, blood loss • DocumentationandRecordofbirth	•Refer ENBC,NSSKmodule • Demonstration • Groupwork • Scenario basedlearning •Simulation •Roleplay •Demonstration •Videos	

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/Learning Activities	Assessment Methods
		Ensure initiation ofbreast feeding andadequatelatchin g	•Breastfeedingandlatching •Managinguterinecramp •Alternative/complementarytherapies •RoleofDoula/ASHA's •Variouschildbirthpractices •Safeenvironmentformotherandne wbornto promotebonding • Maintainingrecordsandreports		
V	7(T) 6(L) 40(C)	Describe thephysiolo gy, managementandcare ofnormalpuerperium	**Postpartumcare/Ongoingcareofw omen** •Normalpuerperium–Physiology, duration •Post-natal assessment and care –facility andhome-basedcare •Perinealhygieneandcare •Bladderandbowelfunction •Minordisordersofpuerperiumanditsman agement •Physiology of lactation and lactationmanagement •Postnatal counseling andpsychological support •Normal postnatal baby blues andrecognitionofpost-nataldepression •Transitiontoparenthood •Care for the woman up to 6 weeksafterchildbirth •Cultural competence (Taboos relatedtopostnatal diet andpractices) •Dietduringlactation-review •Post-partumfamilyplanning •Follow-upofpostnatal mothers	• Lecture • Discussion • Demonstration • Healthtalk • Simulated practice • Supervisedcli nicalpractice •ReferSBAmodule	• Essay type • Shortanswer • Objective type • Assessment ofskills withchecklist • OSCE
VI	7(T) 7(L) 40(C)	Discuss the need forand provision ofcompassionate,famil y centered midwiferycareofthen ewborn Describe theasses smentan dcareof normaln eonate	•Drugsusedinthepostnatalperiod •Recordsandreports **Assessmentandongoingcareofn ormalneonates** •Family centeredcare	• Lecture •Discussion •Respectfulne wborncarea ndcommuni cation •NormalNeon ate–Physiologic aladaptation	• Essay type • Shortanswer •Newbornassessment–Screeningforcongenitalanomalies •Careof newbornupto6weeksafter

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- Demonstration
- Simulatedpracticesession
- Supervisedclinicalpractice
- Refersafedeliverapp module –newborn
- Objectivetype
- Assessment ofskills withchecklist
- OSCE

Unit	Time (Hrs)	LearningOutcomes	Content	Teaching/Learning Activities	Assessment Methods
			thechildbirth(Routinecareofnewborn) •Skintoskincontactandthermoregulation •Infectionprevention •Immunization •Minordisordersofnewbornanditsmanagement	management • Partial completionofSBA module	
VII	8(T) 2(L) 40 (C)	Explain variousmethods of familyplanningandroleof nurse/midwife inproviding familyplanningservices Describe youthfriendlyservicesandrole of nurses/midwives Recognize the role ofnurses/midwives ingenderbasedviolence	**Familywelfareservices** • Impactofearly/frequentchildbearing • mprehensive range of family planningmethods o Temporarymethods – Hormonal,non-hormonalandbarrier methods o Permanent methods – Male sterilization andfemalesterilization • Action, effectiveness, advantages,disadvantages, myths, misconception andmedical eligibility criteria (MEC) for use ofvariousfamilyplanningmethods • Emergencycontraceptives • Recent trends and research incontraception • Family planning counseling using BalancedCounselingStrategy(BCS) • LegalandrightsaspectsofFP • Human rights aspects of FPadolescents • Youth friendly services – SRHR services,policies affecting SRHR and attitude of nursesandmidwivesinprovisionofservices(Review) • Importance of follow up andrecommendedtiming **GenderrelatedissuesinSRH** • Gender based violence – Physical, sexual andabuse, Laws affecting GBV and role ofnurse/midwife • Specialcourtsforabusedpeople • Gender sensitive health services includingfamily planning	• Lecture • Supervised practice • Fieldvisits • Scenariobased learning • Discussion • GoI guidelines – injectablecontraceptives, oral contraceptives,IUCD,maleandfemalesterilization • jectivetype • Fieldvisitreports • Vignettes	• Essay type • Shortanswers

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PRACTICUM

PLACEMENT:VI&VIISEMESTER

VI SEMESTER:MIDWIFERY/OBSTETRICSANDGYNECOLOGY(OBG)NURSING-I

SKILLLAB& CLINICAL: SkillLab–1Credit(40hours);Clinical–3Credits(240hours)

PRACTICECOMPETENCIES: Oncompletionofthecourse,thestudentswillbeableto:

1. Counselwomenandtheirfamiliesonpre-conceptioncare
2. Demonstratelabtestsex.urinepregnancytest
3. Performantenatalassessmentofpregnantwomen
4. Assessandcarefornormalantenatalmothers
5. Assistandperformspecificinvestigationsfor antenatalmothers
6. Counselmothersandtheirfamiliesonantenatalcareandpreparationfor parenthood
7. Conductchildbirtheducationclasses
8. Organizelabourroom
9. Prepareandproviderespectfulmaternity carefor mothersinlabour
10. Performper-vaginalexaminationforawoman inlabourifindicated
11. Conductnormalchildbirthwithessentialnewborncare
12. Demonstrateskillsinresuscitatingthenewborn
13. Assistwomeninthetransitiontomotherhood
14. Performpostnatalandnewbornassessment
15. Providecareforpostnatalmothersandtheirnewborn
16. Counselmotherson postnatalandnewborncare
17. PerformPPIUCDinsertionandremoval
18. Counselwomenonfamilyplanningandparticipateinfamilywelfareservices
19. Provideyouthfriendlyhealthservices
20. Identify,assess,careandreferwomenaffectedwithgenderbasedviolence

SKILLLAB: Procedures/Skillsfordemonstrationandreturndemonstration:

1. Urinepregnancytest
2. CalculationofEDD,Obstetricalscore,gestationalweeks
3. Antenatalassessment
4. Counselingantenatalmothers
5. Microbirthplanning
6. PVexamination
7. Monitoringduring firststageoflabour–Plottingandinterpretationofpartograph
8. Preparationfordelivery–settinguplabourroom,articles,equipment
9. Mechanismoflabour –normal
10. Conductionofnormalchildbirthwithessentialnewborncare
11. Activemanagementofthirdstageoflabour
12. Placentalexamination
13. Newbornresuscitation
14. Monitoringduringfourthstageoflabour
15. Postnatalassessment

16. Newbornassessment
17. Kangaroomothercare
18. Familyplanningcounseling
19. PPIUCDinsertionandremoval

CLINICALPOSTINGS(6weeks×40hoursperweek=240hours)

Clinical Area		**Duration(weeks)**	**ClinicalLearningOutcomes**	**Procedural Competencies/ClinicalSkills**
Antenatal OPD andAntenatalward		1week 3weeks	Perform antenatalassessment Performlaboratorytestsforantenatal women and assistin selected antenataldiagnosticprocedures Counselantenatalwomen Monitor labour usingpartograph	• Historycollection • Physicalexamination • Obstetricexamination • Pregnancyconfirmationtest • Urinetesting • BloodtestingforHemoglobin,grouping& typing • Bloodtestformalaria • KICKchart • USG/NST • Antenatalcounseling • Preparationfor childbirth • Birth preparednessandcomplicationreadiness • Assessmentofwomaninlabour • Partograph
Labour room		2weeks	Providecaretowomenduringlabour Conduct normal childbirth,provide care to mother andimmediatecareofnewborn Perform postnatalassessment Providecaretonormalpostnatal mothers andnewborn	
Post-partumclinicandPostnatalWardincludin				

- Pervaginalexaminationwhenindicated
- Careduringfirststageoflabour
- Painmanagementtechniques
- Uprightandalternativepositionsinlabour
- Preparation for labour – articles,physical,psychological
- Conductionofnormalchildbirth
- Essentialnewborncare
- Newbornresuscitation
- Active management of thirdstageoflabour
- Monitoring and care duringfourthstageof labour
- Postnatalassessment
- Care of postnatal mothers –normal
- Careofnormal newborn
- Lactationmanagement

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ClinicalRequirements	Assessment Methods	
•Antenatalpalpation •Healthtalk •Casestudy		•Casestudy •Case presentation
	•OSCE •Case presentation	
•Partographrecording •PVexamination •Assisting/Conduction ofnormalchildbirth •Casestudy •Case presentation •Episiotomyandsuturing ifindicated •Newbornresuscitation		
•Postnatalassessment •Newbornassessment •Casestudy	•Assignment •casestudy •Case presentation •OSCE	
	•Assignment	

Clinical Area	Duration (weeks)	ClinicalLearning Outcomes	Procedural Competencies/ClinicalSkills	Clinical Requirements	Assessment Methods
		Providepostnatalcounseling Providefamilywelfareservices	• Healthteaching onpostnataland newborncare • Familywelfarecounseling	• Case presentation • PPIUCDinsertion &removal	

Note: PartialCompletionofSBAmoduleduringVIsemester

VII SEMESTER

MIDWIFERY/OBSTETRICS AND GYNECOLOGY (OBG) NURSING - IIPRACTICUM

SKILLLAB&CLINICAL: SkillLab –1Credit(40hours);Clinical–4Credits(320hours)

PRACTICECOMPETENCIES: Oncompletionofthecourse,thestudentswillbeableto:

1. Identify,stabilizeandreferantenatalwomenwithcomplications
2. Providecaretoantenatalwomenwithcomplications
3. Providepostabortioncare&counselling
4. Assistintheconductionofabnormalvaginaldeliveriesandcaesareansection.
5. Demonstrateskillsinresuscitatingthenewborn
6. Assistandmanagecomplicationsduringlabour
7. Identifypostnatalandneonatalcomplications,stabilizeandreferthem
8. Providecareforhighriskantenatal,intranatalandpostnatalwomenandtheir familiesusingnursingprocessapproach
9. Providecareforhighrisknewborn
10. Assistinadvancedclinicalproceduresinmidwiferyandobstetricnursing
11. Providecareforwomenduringtheirnonchildbearingperiod.
12. Assessandcareforwomenwithgynecologicaldisorders
13. Demonstrateskillsinperformingandassistinginspecificgynecologicalprocedures
14. Counselandcareforcoupleswithinfertility

SKILLLAB: Procedures/Skillsfordemonstrationandreturndemonstration:

1. Antenatalassessmentandidentificationofcomplications
2. Postabortioncare&counseling
3. Counselingantenatalwomenforcomplicationreadiness
4. Mechanismoflabour–abnormal
5. Assistingintheconductionofabnormalvaginaldeliveriesandcaesareansection.
6. Managementofcomplicationsduringpregnancy/labour/postpartum(casestudies/simulatedscenarios)
7. AdministrationofInj.Magnesiumsulphate
8. Startingandmaintaininganoxytocindripfor PPH
9. ManagementofPPH –Bimanualcompressionofuterus
10. ManagementofPPH–Balloontamponade
11. Instrumentsusedinobstetricsandgynecology
12. Visualinspectionofcervixwithaceticacid
13. Cervicalbiopsy
14. Breastexamination
15. Counselingofinfertilecouples

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CLINICALPOSTINGS(8weeks×40hoursperweek=320hours)

Clinical Areas	Duration (Weeks)	LearningOutcomes	Procedural Competencies/ClinicalSkills	ClinicalRequirements	Assessment Methods
Antenatal OPD/ infertilityclinics/Reproductivemedicine andantenatal ward Labourroom	2weeks	Perform/assist inselected advancedantenatal diagnosticprocedures Provideantenatalcarefor women withcomplications ofpregnancy Counsel antenatalmothers Provide post abortioncare and counselling Providecounsellingandsupport to infertilecouples	•Kickchart,DFMC •AssistinNST/CTG/USG •Assistinginadvanceddiagnosticprocedures •Careofantenatalwomenwithcomplicationsinpregnancy •Antenatalcounselling •Preparationforchildbirth,Birthpreparedness and complicationreadiness •Postabortioncare •Postabortioncounselling •Counselling infertilecouples	•Antenatal palpation •Healthtalk •Casestudy	• Simulation • Case presentation • OSCE
	2weeks	Conductionofnormalchidlbirth Conduct/assist inabnormaldeliveries Monitor labour usingpartograph Identify and managecomplications duringlabour	•Assessmentofwomaninlabour •Partograph •Pervaginalexaminationifindicated •Obstetricexamination •Careduringfirststageoflabour •Painmanagementtechniques •Uprightandalternativepositionsin labour •Preparation for labour – articles,physical,psychological •Conductionofnormalchildbirth •Essentialnewborncare •Newbornresuscitation •Activemanagementofthirdstageoflabour •Monitoringandcareduringfourthstageof labour •Identification, stabilization,referal and assisting inmanagement of prolongedlabour,cervicaldystocia,CPD,contractedpelvis •Assistinthemanagementof	•Partographrecording •Pain management duringlabour •Conductionofnormalchildbirth •Assistinginabnormaldeliveries •Managingcomplicationduringlabour •Casestudy •Case presentation	• Assignment • Casestudy • Case presentation • Simulation • OSCE

Clinical Areas	Duration (Weeks)	LearningOutcomes	Procedural Competencies/ClinicalSkills	ClinicalRequirements	Assessment Methods
			abnormaldeliveries– posteriorposition,breechdeliveries,twin deliveries, vacuumextraction, forceps delivery,shoulderdystocia • Assistincervicalencerclageprocedures,D&C,D&E • Identify, assist and managetrauma to the birth canal,retained placenta, post partumhemorrhage,uterineatony		
Postnatal Ward	1week	Performpostnatal y n e c o l o g y	• Managementofobstetricshock • Postnatalhistorycollectionand assessment and identifypostnatalcomplications Providepostnatalcare Providefamilywelfareservices Perform assessment ofnewborn and identifycomplications/congenitalanomalies Perform neonatalresuscitation Care of high risknewborn Provide care fornewbornsinventilator,incubatoretc	• Healthtalk physicalexamination • Identify postnatal complications • Care of postnatal mothers – abnormal deliveries, caesareansection • Careofnormal newborn • Lactationmanagement • Postnatalcounselling • Healthteachingonpostnatal andnewborn care • Familywelfarecounselling • Neonatal assessment – identification	• Roleplay of complication,congenitalanomalies. • Observationofnewborn • Neonatalresuscitation • Phototherapyandmanagementofjaundicein newborn • AssistinExchangetransfusion • Neonatalfeeding–spoonandkatori, paladai, NGtube • Careofbabyinincubator,ventilator, warmer • Infectioncontrolinthenursery • Neonatalmedications • StartingIVlinefornewborn,drugcalculation • Observe/Assistincaesareansection • Managementofretainedplacenta
NeonatalIntensive CareUnit	1week				
Obstetric/ Gynaeoperationtheatre & G	2weeks		Assist/perform specialneonatalprocedures Assistingynecologicalandobstetric surgeries		

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•Postnatalassessment •Newbornassessment •Casestudies •Case presentation •PPIUCDinsertion andremoval	•Assignment •Case study •Case presentation •Simulation •Vignettes •OSCE	•Assignment •Trayset-upforobstetric andgynecological surgeries
•Casestudy •Case presentation •Assignments •Simulatedpractice		
	•Case presentation •Care study •Care plan •Simulation, Vignettes •OSCE	
•Assisting inobstetric andgynecologicalsurgery •Trayset-upfor		

Clinical Areas	DurationLearningOutcomes(Weeks)		Procedural Competencies/CliniclSkills	ClinicalRequirements	Assessment Methods
ward		Care for women withgynecologicaldisor	• Gynecologicalsurgeries • Hysterectomy • Uterinerupture • Care of women withgynecologicalconditions	caesarean section • Careplan	• Case presentation • Simulation • Vignettes

Note: CompletionofsafedeliveryAppmoduleduringVIISemester

COMMUNITYHEALTHNURSING–II

PLACEMENT:VIISEMESTER

THEORY: 5Credits(100hours)–includeslabhoursalso

PRACTICUM: Clinical:2Credit(160hours)

DESCRIPTION: This course is designed to help students gain broad perspective of specialized roles and responsibilities ofcommunity health nurses and to practice in various specialized health care settings. It helps students to develop knowledgeand competencies required for assessment, diagnosis, treatment, and nursing management of individuals and families withinthecommunityinwellnessandillnesscontinuum.

COMPETENCIES: Oncompletionofthecourse,thestudentswillbeableto

1. Demonstrate beginning practice competencies/skills relevant to provide comprehensive primary health care/community-based care to clients with common diseases and disorders including emergency and first aid care at home/clinics/centresasper predeterminedprotocols/drugstandingordersapprovedbyMOH&FW
2. Provide maternal, newborn and child care, and reproductive health including adolescent care in the urban and ruralhealthcare settings
3. Describethemethodsofcollectionandinterpretationofdemographicdata
4. Explainpopulationcontrolanditsimpactonthesocietyanddescribetheapproachestowardslimitingfamilysize
5. Describeoccupationalhealthhazards,occupationaldiseasesandtheroleofnursesinoccupationalhealthprograms
6. Identifyhealthproblemsofolderadultsandprovideprimarycare,counselingandsupportivehealthservices
7. Participateinscreeningformentalhealthproblemsinthecommunityandprovidingappropriatereferralservices
8. Discussthe methodsofdatacollectionforHMIS,analysisandinterpretationofdata
9. Discussabouteffectivemanagementofhealthinformationincommunitydiagnosisandintervention
10. Describethemanagementsystemofdeliveryofcommunityhealthservicesinruralandurbanareas
11. Describe the leadership role in guiding, supervising, and monitoring the health services and the personnel at the PHCs,SCsandcommunity levelincludingfinancialmanagement and maintenanceof records &reports
12. Describe the roles and responsibilities of Mid-Level Health Care Providers (MHCPs) in Health Wellness Centers(HWCs
13. Identifytherolesandresponsibilitiesofhealthteammembersandexplaintheir jobdescription
14. Demonstrateinitiativeinpreparingthemselvesandthecommunityfordisasterpreparednessandmanagement
15. Demonstrateskillsinproperbio-medicalwastemanagementasperprotocols
16. Explaintherolesandfunctionsofvariousnationaland internationalhealthagencies

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COURSEOUTLINE

T–Theory

	Unit Time (Hrs)	Learning Outcomes	Content	Teaching/LearningActivities	Assessment Methods
I	10(T)	Explainnurses'roleinidentification,primarymanagement andreferral of clientswithcommondisorders/conditions andemergenciesincludingfirstaid	**Managementofcommonconditionsandemergenciesincludingfirstaid** • Standingorders:Definition,uses **Screening,diagnosing/identification, primary care and referral ofGastrointestinalSystem** o Abdominalpain o Nauseaandvomiting o Diarrhea o Constipation o Jaundice o GIbleeding o Abdominaldistension o Dysphagiaanddyspepsia o Aphthousulcers **RespiratorySystem** o Acute upper respiratory infections – Rhinitis,Sinusitis,Pharyngitis,Laryngitis, Tonsillitis o Acute lower respiratory infections – Bronchitis,pneumoniaandbronchialasthma o Hemoptysis,Acutechestpain **Heart&Blood** o Common heart diseases – Heartattack/coronary artery disease, heart failure,arrhythmia o Bloodanemia,bloodcancers,bleedingdisorders **Eye&ENTconditions** • Eye – local infections, redness of eye,conjunctivitis,stye,trachomaandrefractiveerrors • ENT– Epistaxis,ASOM,sorethroat,deafness **UrinarySystem** • Urinary tract infections – cystitis,pyelonephritis,prostatitis,UTIsinchildren **Firstaidincommonemergencyconditions –Review** • Highfever,lowbloodsugar, minorinjuries,fractures, fainting, bleeding, shock, stroke,bites, burns, choking, seizures, RTAs,poisoning,drowningandforeignbodies	• Lecture •Discussion •Demonstration •Roleplay •Suggestedfieldvisits •Fieldpractice •Assessment ofclientswithcommonconditions andprovidereferral	• Shortanswer •Essay •Fieldvisitreports •OSCEassessment

Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/Learning Activities	Assessment Methods
II	20(T)	Providereproductive,maternal, newbornand childcare,includingadolescent care inthe urban and ruralhealthcaresettings	**Reproductive, maternal, newborn, childandadolescentHealth(ReviewfromOBGNursing and application in communitysetting)** •Presentsituationofreproductive,maternaland child healthin India **Antenatalcare** •Objectives, antenatal visits andexamination,nutritionduringpregnancy,counseling •Calciumandironsupplementationinpregnancy •Antenatalcareathealthcentrelevel •Birth preparedness •High risk approach – Screening/earlyidentificationandprimary managementofcomplications – Antepartum hemorrhage,pre-eclampsia, eclampsia, Anemia,Gestational diabetes mellitus,Hypothyroidism,Syphilis •Referral,followupand maintenanceofrecordsandreports **Intranatalcare** •Normallabour– process,onset,stagesoflabour •Monitoringandactivemanagementofdifferentstagesof labour •Careofwomenafterlabour •Earlyidentification,primarymanagement,referral and follow up – preterm labour,fetal distress, prolonged and obstructedlabour, vaginal & perennial tears, ruptureduterus •Careofnewbornimmediatelyafterbirth •Maintenanceof recordsandreports •Useof Safechildbirthchecklist •SBAmodule–Review •Organizationoflabourroom **Postpartumcare** •Objectives,Postnatalvisits,careofmotherand baby, breast feeding, diet duringlactation,andhealthcounseling •Earlyidentification,primarymanagement,referral and follow up of complications,Danger signs-postpartum hemorrhage,shock, puerperal sepsis, breast conditions,post-partumdepression •Postpartumvisitbyhealthcare provider	•Lecture •Discussion •Demonstration •Roleplay •Suggestedfieldvisits and fieldpractice •Assessment ofantenatal, postnatal,newborn, infant,preschool child,school child, andadolescenthealth	•Shortanswer •Essay •OSCEassessment

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Unit	Time (Hrs)	Learning Outcomes	Content	Teaching / LearningActivities	Assessment Methods
		Promote adolescenthealth and youthfriendly services	**Newbornandchildcare** •*Review:*Essentialnewborncare •Managementofcommonneonatalproblems •Management of common child healthproblems:Pneumonia,Diarrhoea,Sepsis,screening for congenital anomalies andreferral •*Review:*IMNCIModule •Underfive clinics **AdolescentHealth** •Commonhealthproblemsandriskfactorsinadolescentgirls andboys •Common Gynecological conditions – dysmenoorhea, Premenstrual Syndrome(PMS),Vaginaldischarge,Mastitis,Breastlump,pelvicpain,pelvicorganprolapse •Teenagepregnancy,awarenessaboutlegalage of marriage, nutritional status ofadolescents National Menstrual Hygienescheme •Youthfriendlyservices: o SRHServiceneeds o Role and attitude of nurses:Privacy,confidentiality,nonjudgementalattitude,client autonomy, respectful care andcommunication •Counselingfor parentsandteenagers(BCS –balancedcounselingstrategy) **NationalPrograms** •RMNCH+A Approach – Aims, Healthsystems strengthening, RMNCH+Astrategies,Interventionsacrosslifestages,program management, monitoring andevaluation systems •UniversalImmunizationProgram(UIP)asper Government of India guidelines –Review •RashtriyaBalSwasthyaKaryakaram(RSBK)-children •RashtriyaKishorSwasthyaKaryakram(RKSK)– adolscents Anyothernewprograms	•Screen,manageandreferadolescents •Counseladolescents	

Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/Learning Activities	Assessment Methods
III	4(T)	Discuss theconcepts and scopeofdemography	**Demography,SurveillanceandInterpretationofData** •*Demography and vital statistics* – demographic cycle, world populationtrends,vital statistics •Sexratioandchildsexratio, trendsof sexratio in India, the causes and socialimplications •*Sourcesofvitalstatistics*– Census,registration of vital events, sampleregistrationsystem •*Morbidityand mortalityindicators*– Definition,calculationandinterpretation •Surveillance,Integrateddiseasesurveillanceproject(IDSP),OrganizationofIDSP, flow of information and mother andchildtrackingsystem(MCTS)inIndia •Collection,analysis,interpretation,useofdata •*Review:*Commonsamplingtechniques– randomand nonrandomtechniques •Disaggregation ofdata	•Lecture •Discussion •Demonstration •Roleplay •Suggestedfieldvisits •Fieldpractice	•Shortanswer •Essay
IV	6(T)	Discuss populationexplosion and itsimpact on socialand economicdevelopment ofIndia Describe thevarious methods ofpopulationcontrol	**PopulationanditsControl** •PopulationExplosionanditsimpactonSocial, Economic development ofindividual,society andcountry. •Population Control – WomenEmpowerment; Social, Economic andEducationalDevelopment •LimitingFamilySize – Promotionofsmallfamily norm, Temporary Spacing Methods(natural, biological, chemical, mechanicalmethods etc.), Terminal Methods(Tubectomy,Vasectomy) •EmergencyContraception •Counselinginreproductive,sexualhealthincludingproblemsof adolescents •MedicalTerminationofpregnancyandMTPAct •NationalPopulationStabilizationFund/JSK(JansankhyaSthirataKosh) •Family planning2020 •NationalFamilyWelfareProgram	•Lecture •Discussion •Demonstration •Roleplay •Suggestedfieldvisits •Fieldpractice	•Shortanswer •Essay •OSCEassesssment •Counselingonfamilyplanning •Essay
V	5(T)	Describeoccupational healthhazards, occupationaldiseases and theroleof nursesin	•RoleofanurseinFamilyWelfareProgram **OccupationalHealth** •Occupationalhealthhazards •Occupationaldiseases •ESIAct	•Lecture •Discussion •Demonstration •Roleplay	•Shortanswer •Clinicalperformance

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Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/Learning Activities	Assessment Methods
		occupational healthprograms	•National/StateOccupationalHealthPrograms •Role of a nurse in occupational healthservices – Screening, diagnosing,managementandreferralofclientswithoccupationalhealth problems	•Suggestedfieldvisits •Fieldpractice	evaluation
VI	6(T)	Identify healthproblems of olderadults and provideprimary care,counseling andsupportive healthservices	**GeriatricHealthCare** •Healthproblemsofolderadults •Managementofcommongeriatricailments:counseling, supportive treatment of olderadults •Organizationofgeriatrichealthservices •National programfor healthcareofelderly(NPHCE) •Statelevelprograms/Schemesforolderadults •Role of a community health nurse ingeriatric health services – Screening,diagnosing,managementandreferralofolderadultswith healthproblems	•Lecture •Discussion •Demonstration	•Visitreportonelderlyhome •Essay •Shortanswer
VII	6(T)	Describe screeningfor mental healthproblems in thecommunity, takepreventivemeasures andprovide appropriatereferralservices	**MentalHealthDisorders** •Screening,management,preventionandreferralformental healthdisorders •*Review:* o Depression,anxiety,acutepsychosis, Schizophrenia o Dementia o Suicide o Alcoholandsubstanceabuse o Drugdeaddictionprogram o NationalMentalHealthProgram o NationalMentalHealthPolicy o NationalMentalHealthAct •Role of a community health nurse inscreening,initiationoftreatmentandfollowupofmentallyill clients	•Lecture •Discussion •Demonstration •Roleplay •Healthcounselingon promotion ofmentalhealth •Suggestedfieldvisits •Fieldpractice	•Essay •Shortanswer •Counselingreport
VIII	4(T)	Discuss abouteffectivemanagement ofhealth informationin communitydiagnosis andintervention	**HealthManagementInformationSystem(HMIS)** •Introductiontohealthmanagementsystem:data elements, recording and reportingformats,dataqualityissues •*Review:* o BasicDemographyandvitalstatistics o Sourcesofvitalstatistics oCommonsamplingtechniques,frequency distribution	•Lecture •Discussion •Demonstration •Roleplay •Suggestedfieldvisits •Fieldpractice •Group project on communitydiagnosis–data	•Groupprojectreport •Essay •Shortanswer

Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/Learning Activities	Assessment Methods
			○Collection,analysis,interpretationofdata • Analysis of data for community needsassessmentandpreparationofhealthactionplan	management	
IX	12(T)	Describethesystem management ofdelivery ofcommunity healthservicesinrural andurbanareas	**Managementofdeliveryofcommunity healthservices:** •Planning, budgeting and materialmanagementofCHC,PHC,SC/HWC •**ManpowerplanningasperIPHSstandards** •**Rural:**Organization,staffingandmaterialmanagement of rural health servicesprovided by Government at village,SC/HWC, PHC, CHC, hospitals – district,stateand central •**Urban:** Organization, staffing, andfunctionsofurbanhealthservicesprovidedby Government at slums, dispensaries,special clinics, municipal and corporatehospitals •Defenseservices •Institutionalservices •Other systems of medicine and health:Indiansystemofmedicine,AYUSHclinics,Alternative health care system referralsystems,Indigenoushealthservices	• Lecture •Discussion •Visits to varioushealthcaredeliverysystems •Supervisedfieldpractice	• Essay •Shortanswer •Filedvisitreports
X	15(T)	Describe theleadership role inguiding,supervising, andmonitoring thehealth services andthe personnel at thePHCs, SCs andcommunity levelincluding financialmanagement Describe the rolesand responsibilitiesof Mid-LevelHealth CareProviders(MHCPs)in Health WellnessCenters(HWCs)	**Leadership,SupervisionandMonitoring** •Understanding work responsibilities/jobdescriptionofDPHN,HealthVisitor,PHN,MPHW (Female), Multipurpose healthWorker(Male),AWWsandASHA •RolesandresponsibilitiesofMid-LevelHealthCareProviders(MLHPs) •Village Health Sanitation and NutritionCommittees (VHSNC): objectives,compositionandroles&responsibilities •Healthteammanagement •*Review*:Leadership&supervision – concepts,principles&methods •Leadershipinhealth:leadershipapproachesin healthcare setting, taking control ofhealth of community and organizing healthcamps,villageclinics •Training, Supportive supervision andmonitoring – concepts, principles andprocesse.g.performanceoffrontlinehealthworkers **FinancialManagementandAccounting&ComputingatHealthCenters(SC)**	•Lecture •Discussion •Demonstration •Roleplay •Suggestedfieldvisits •Fieldpractice	•Report oninteraction with MPHWs,HVs, ASHA,AWWs •Participationin trainingprograms •Essay •Shortanswer
			○ Activitiesforwhichfundsarereceived		

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Unit	Time (Hrs)	Learning Outcomes	Content	Teaching/Learning Activities	Assessment Methods
			○ Accountingandbookkeepingrequirements – accounting principles & policies, book ofaccounts to be maintained, basic accountingentries, accounting process, payments &expenditure, fixed asset, SOE reportingformat,utilizationcertificate(UC)reporting ○ Preparingabudget ○ Audit **Records&Reports:** •*Concepts of records and reports –* importance, legal implications, purposes,useofrecords,principlesofrecordwriting,filingof records •*Typesofrecords–*community relatedrecords, registers, guidelines formaintaining •*Reportwriting–* purposes,documentationofactivities, typesof reports •*MedicalRecordsDepartment –* functions,filingandretentionofmedicalrecords •*Electronic Medical Records (EMR) –* capabilities and components of EMR,electronic health record (EHR), levels ofautomation, attributes, benefits anddisadvantagesof HER		
XI	6(T)	Demonstrateinitiative inpreparingthemselvesandthecommunity fordisasterpreparedness andmanagement	•**Nurses'responsibilityinrecordkeepingandreporting** **DisasterManagement** •Disastertypesandmagnitude •Disasterpreparedness •Emergency preparedness •Commonproblemsduringdisastersandmethodsto overcome •Basicdisastersupplieskit •Disaster response including emergencyreliefmeasuresandLifesavingtechniques Usedisastermanagementmodule	•Lecture •Discussion •Demonstration •Roleplay • Suggested fieldvisits, and fieldpractice •Mockdrills •Refer Disastermodule (NDMA)NationalDisaster/INC – Reaching out inemergencies	
XII	3(T)	Describe theimportance of bio-medical wastemanagement, itsprocess andmanagement	**Bio-MedicalWasteManagement** •Waste collection, segregation,transportation and management in thecommunity •Wastemanagementinhealthcenter/clinics •Bio-medicalwastemanagementguidelines –2016,2018(Review)	•Lecturecum Discussion •Fieldvisittowastemanagementsite	•Fieldvisitreport
XIII	3(T)	Explain the rolesandfunctionsof	**HealthAgencies**	•Lecture	•Essay

Unit	Time	Learning Outcomes	Content	Teaching/Learning Activities	Assessment Methods
		various nationaland internationalheal	• **International:** WHO, UNFPA, UNDP,World Bank, FAO, UNICEF, EuropeanCommission, Red Cross, USAID,UNESCO,ILO,CAR,CIDA,JHPIEGO,any other • **National:**IndianRedCross,IndianCouncilfor Child Welfare, Family PlanningAssociation of India, TuberculosisAssociationofIndia,CentralSocialWelfare Board, All India Women'sConference, Blind Association of India, anyother • **Voluntary Health Association of India(VHA)**	• Discussion	•Shortanswer

COMMUNITYHEALTHNURSINGII

Clinical practicum – 2 credits (160 hours)CLINICALPOSTINGS(4weeks×40hoursperweek)

Clinical Area	Duration (Weeks)	LearningOutcomes	ProceduralCompetencies/ ClinicalSkills	ClinicalRequirements	Assessment Methods
Urban Rural	2weeks 2Weeks	Screen,diagnose, manageandreferclientswith commonconditions/emergencies Assess and provideantenatal, intrapartum,postnatal and new- borncare Promote adolescenthealth	• Screening, diagnosing,management andreferral of clientswith commonconditions/emergencies •Assessment(physical &nutritional) ofantenatal,intrapartum,postnatal andnewborn •Conduction ofnormal delivery athealthcenter •Newborncare •Counseladolescents •Familyplanningcounselling •Distribution oftemporarycontraceptives – condoms, OCP's,emergencycontraceptives	• Screening,diagnosing,Primary managementandcarebasedonstanding orders/protocolsapprovedby MOH&FW •Minorailments–2 •Emergencies–1 •Dentalproblems–1 •Eyeproblems – 1 •Ear,nose,andthroatproblems –1 •Highriskpregnantwoman–1 •High riskneonate –1 •Assessment of antenatal – 1,intrapartum – 1, postnatal – 1andnewborn – 1 •Conductionofnormaldeliveryat health center anddocumentation– 2 •Immediatenewborncareanddocumentation– 1 •Adolescentcounseling –1 •Family planningcounselling–	•Clinical performance assessment •OSCEduringposting •Finalclinicalexamination(University) •Clinicalperformanceassessment •OSCE

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Clinical Area	Duration (Weeks)	LearningOutcomes	ProceduralCompetencies/ ClinicalSkills	ClinicalRequirements	Assessment Methods
		Providefamilywelfareservices Screen, diagnose,manage and refer clientswithoccupational healthproblem Screen, assess andmanageelderlywithhealth problems andreferappropriately Screen, diagnose,manage and refer clientswho are mentallyunhealthy Participate incommunity diagnosis –data management Participateinhealthcentreactivities Organize and conductclinics/health camps inthecommunity Preparefordisasterpreparedness andmanagement Recognize theimportanceandobservethe biomedical wastemanagementprocess	• Screening, diagnosing,management andreferral of clientswith occupationalhealthproblems •Healthassessmentofelderly •Mentalhealthscreening •Participation inCommunitydiagnosis– datamanagement • Writing healthcenter activityreport •Organizingandconductingclinics/camp •Participation indisastermockdrills	1 •Family casestudy– 1(Rural/Urban) •Screening, diagnosing,management and referral ofclients with occupationalhealthproblems– 1 •Healthassessment(Physical&nutritional)of elderly–1 •Mentalhealthscreeningsurvey –1 •**Group project:** Communitydiagnosis– datamanagement •Writereportonhealthcenteractivities– 1 •OrganizingandconductingAntenatal/under-fiveclinic/Healthcamp– 1 •Participationindisastermockdrills •Fieldvisittobio-medicalwastemanagementsite •VisittoAYUSHclinic	•FamilyCasestudyevaluation •Clinicalperformanceevaluation •OSCE •Projectevaluation

NURSINGRESEARCHANDSTATISTICS

PLACEMENT:VIISEMESTER

THEORY:2Credits(40hours)

PRACTICUM: Lab/SkillLab:1Credit(40hours)ClinicalProject:40hours

DESCRIPTION: The Course is designed to enable students to develop an understanding of basic concepts of research,research process and statistics. It is further, structured to conduct/ participate in need-based research studies in varioussettings and utilize the research findings to provide quality nursing care. The hours for practical will be utilized forconductingindividual/group research project.

COMPETENCIES: Oncompletionofthecourse,studentswillbecompetentto

1. Identifyresearchprioryareas
2. Formulateresearchquestions/problemstatement/hypotheses
3. Reviewrelatedliteratureonselectedresearchproblemandprepareannotated bibliography
4. Preparesampledatacollectiontool
5. Analyzeandinterpretthegivendata
6. Practicecomputing,descriptivestatisticsandcorrelation
7. Drawfiguresandtypesofgraphson givenselectdata
8. Developaresearchproposal
9. Planandconductagroup/individualresearchproject

COURSEOUTLINE

T–Theory,P – Practicum

Unit	Time(Hrs.)		Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
	T	P				
I	6		Describe theconcept ofresearch, terms,needandareasofresearch innursing Explain the stepsof researchprocess State the purposesand steps ofEvidence BasedPractice	**ResearchandResearchProcess** •Introduction and need for nursingresearch •Definition of Research & nursingresearch •Stepsofscientificmethod •Characteristicsofgoodresearch •StepsofResearchprocess– overview •Evidence Based Practice – Concept,Meaning, Purposes, Steps of EBPProcessand Barriers	•Lecture cumDiscussion •Narratestepsofresearch processfollowed fromexamples ofpublishedstudies •Identifyresearchprioritiesonagivenarea/specialty •List examples ofEvidence BasedPractice	•Shortanswer •Objectivetype
II	2	8	Identify and statethe researchproblem andobjectives	**ResearchProblem/Question** •Identificationofproblemarea •Problemstatement •Criteriaofagoodresearchproblem •Writingobjectivesandhypotheses	•Lecturecum Discussion •Exercise on writingstatement ofproblem andobjectives	•Shortanswer •Objectivetype •Formulation ofresearchquestions/objectives/hypothesis

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Unit	Time (Hrs.) T	P	Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
III	2	6	Review therelatedliterature	**ReviewofLiterature** •Location •Sources •Onlinesearch;CINHAL,COCHRANEetc. •Purposes •Methodofreview	• Lecture cumDiscussion • Exercise onreviewing oneresearch report/articleforaselectedresearchproblem	•Shortanswer •Objectivetype •Assessmentofreview ofliterature ongiven topicpresented
IV	4	1	Describethe Researchapproaches anddesigns	**ResearchApproachesandDesigns** • Historical,surveyandexperimental • QualitativeandQuantitativedesigns	• Prepare annotatedBibliography •Lecturecum Discussion •Identifytypesofresearch approachesused from examplesof published andunpublishedresearch	• Shortanswer •Objectivetype
V	6	6	Explain theSamplingprocess Describethe methodsofdatacollection	**SamplinganddataCollection** • DefinitionofPopulation,Sample • Samplingcriteria,factors influencing sampling process, typesofsampling techniques • Data– why,what,fromwhom,whenand wheretocollect • Data collection methodsandinstruments o Methodsofdatacollection o Questioning,interviewing o Observations,recordanalysisandmeasurement o Typesofinstruments,Validity&Reliability oftheInstrument • Researchethics	•Studieswithrationale •Lecture cumDiscussion • Readingassignment onexamplesofdatacollectiontools •Preparationofsample datacollection tool •Conductgroupresearchproject	•Shortanswer •Objectivetype •Developing •Practiceon
VI	4	6	Analyze,Interpret andsummarize theresearchdata	• Pilotstudy • Datacollectionprocedure **Analysisofdata** • Compilation, Tabulation,classification, summarization,presentation,interpretationofdata	•Lecturecum Discussion •Preparation ofsampletables	
VII	12	8	Explain the useof statistics,scales ofmeasurement	**IntroductiontoStatistics** • Definition, use of statistics, scalesof measurement.	•Lecturecum Discussion	

questionnaire/Interview Schedule/Checklist

- Shortanswer
- Objectivetype
- Analyzeandinterpret givendata
- Shortanswer
- Objectivetype
- Computationof

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Unit	Time (Hrs.) T	P	Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
			and graphicalpresentation ofdata Describe themeasures ofcentraltendency andvariabilityand efficientofcorrelation Correlation	• Frequency distribution andgraphicalpresentationofdata • Mean,Median,Mode,Standarddeviation • Normal Probability and tests ofsignificance •Co-methodsof •Statisticalpackagesanditsapplication	graphicalpresentations • Practice oncomputation ofmeasures of centraltendency, variability&correlation	descriptive statistics
VIII	4	5 40 Hrs(ClinicalProject)	Communicate andutilize the researchfindings	**CommunicationandutilizationofResearch** •Communication of researchfindings •Verbalreport •Writingresearchreport •Writingscientificarticle/paper •Critical review ofpublishedresearchincluding publicationethics •Utilizationofresearchfindings •Conductinggroupresearchproject	• Lecture cumDiscussion • Read/ Presentationsof a samplepublished/unpublishedresearch report • Plan, conduct andWriteindividual/groupresearch project	• Shortanswer • Objectivetype • Oral Presentation • Development ofresearchproposal • Assessment ofresearchProject

MIDWIFERY/OBSTETRICANDGYNECOLOGYNURSING-II
includingSafeDeliveryAppModule

PLACEMENT:VIISEMESTER

THEORY:3Credits(60hours)

PRACTICUM: SkillLab:1Credit(40Hours)Clinical:4Credits(320Hours)

DESCRIPTION: This course is designed for students to develop knowledge and competencies on the concepts andprinciples of obstetric and gynecology nursing. It helps them to acquire knowledge and skills in rendering respectfulmaternity care to high risk woman during antenatal, natal and postnatal periods in hospitals and community settings and helpto develop skills in initial management and referral of high risk neonates. It would also help students to gain knowledge,attitudeandskillsin caringforwomen with gynecologicaldisorders.

COMPETENCIES: Oncompletionofthecourse,thestudentswillbeableto:

1. Describetheassessment,initialmanagement,referralandrespectfulmaternitycareofwomenwithhighriskpregnancy.
2. Demonstratecompetencyinidentifyingdeviationfromnormalpregnancy.
3. Describetheassessment,initialmanagement,referralandnursingcareofwomenwithhighrisklabour.
4. Assistintheconductionofabnormalvaginaldeliveriesandcaesareansection.
5. Describetheassessment,initialmanagement,referralandnursingcareofwomenwithabnormalpostnatalconditions.
6. Demonstratecompetencyintheinitialmanagementofcomplicationsduringthepostnatalperiod.
7. Demonstratecompetencyinprovidingcareforhighrisknewborn.
8. Applynursingprocessincaringforhighriskwomenandtheirfamilies.
9. Describetheassessmentandmanagementofwomenwithgynecologicaldisorders.

10. Demonstrateskillsinperformingandassistinginspecificgynecologicalprocedures.
11. Describethedrugsusedinobstetricsandgynecology.
12. Counselandcareforcoupleswithinfertility.
13. Describeartificialreproductivetechnology.

COURSEOUTLINE

T–Theory,SL/L–SkillLab,C–Clinical

	Unit Time	**Learning Outcomes**	**Content**	**Teaching/ LearningActivities**	**Assessment Methods**
	(Hrs.)				
I	12(T) 10(L) 80(C)	Describe theassessment, initialmanagement, andreferral of womenwith problemsduringpregnancy Support womenwith complicatedpregnancy andfacilitatesafeandpositive birthingoutcome	**Recognition and Management ofproblemsduringPregnancy** • Assessmentofhigh-riskpregnancy **Problems/ComplicationsofPregnancy** •Hyper-emesisgravidarum, •Bleedinginearlypregnancy – abortion,ectopicpregnancy,vesicular mole •Unintendedormistimedpregnancy •Postabortioncare&counseling •Bleedinginlatepregnancyplacentaprevia,abruptionplacenta,trauma •Medical conditions complicatingpregnancy – Anemia, PIH/Pre-eclampsia,Eclampsia,GDM,cardiacdisease, pulmonary disease,thyrotoxicosis, STDs, HIV, Rhincompatibility •Infectionsinpregnancy – urinarytractinfection, bacterial, viral, protozoal,fungal,malariainpregnancy •Surgicalconditionscomplicatingpregnancy – appendicitis, acuteabdomen •COVID-19&pregnancy andchildren •Hydramnios •Multiplepregnancy •Abnormalitiesofplacentaandcord •Intrauterinegrowthrestriction •Intrauterinefetaldeath •Gynaecologicalconditionscomplicatingpregnancy •Mentalhealthissuesduringpregnancy •Adolescentpregnancy •Elderlyprimi,grandmultiparity •Managementandcareof conditionsaspertheGoIprotocol •Policyforthereferralservices	• Lecture • Discussion • Demonstration • Video&films • Scanreports • Casediscussion • Casepresentation • Drugpresentation • Healthtalk • Simulation • Roleplay • SupervisedClinical practice • WHO midwiferytoolkit • GoI guideline – screening forhypothyroidism,screeningforsyphilis,deworming duringpregnancy, diagnosisand management ofGDM	• Essay • Shortanswer • Objectivetype • Assessment ofskills withchecklist • OSCE

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Unit	Time (Hrs.)	Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
			• Drugsusedinmanagementofhigh-riskpregnancies • Maintenanceof recordsandreports		
II	20(T) 15(L) 80(C)	Identify,provide initialmanagementa and refer womenwith problemsduring labourwithinthesc opeofmidwiferypr actice.	**Recognitionandmanagementof abnormallabour** •Preterm labour – Prevention andmanagement of preterm labour; (Use ofantenatal corticosteroids in pretermlabour) •Prematureruptureofmembranes •Malposition's and abnormalpresentations(posteriorposition ,breech,brow, face, shoulder) •ContractedPelvis,CephaloPelvicDi sproportion(CPD) •Disorders of uterine action – Prolongedlabour,Precipitatelabour,Dysf unctionallabour •Complications of third stage – Retainedplacenta, Injuries to birth canal,Postpartum hemorrhage (bimanualcompression of the uterus, aorticcompression,uterineballoontampon ade) •Obstetric emergencies – Foetal distress,Ruptureduterus,Cordprolapse,Sh oulderdystocia, Uterine inversion, Vasa previa,Obstetrical shock, Amniotic fluidembolism •Episiotomyandsuturing •Obstetricprocedures – Forcepsdelivery,Vacuumdelivery,Versio n •Inductionoflabour–Medical&surgical •Caesareansection– indicationsandpreparation •Nursingmanagementofwomenun dergoing •Obstetricoperationsandprocedures •Drugsusedinmanagementofabnormallab our •Anesthesiaandanalgesiainobstetrics	• Lecture • Discussion •Demonstration •Case discussion/presentati on •Simulation •Roleplay •Drugpresentation •Supervisedclinicalp ractice •WHOmidwiferyt oolkit •GoI guidelines – useof uterotonics duringlabour, antenatalcorticostero ids •GoIguidancenoteonpr evention andmanagementofPP H	• Essay • Shortanswer •Objectivetype •Assessmentofs kills withchecklist •OSCE
III	9(T) 5(L) 40(C)	Describe theassessment, initialmanagement ,referralandnursing care ofwomen withabnormal postnatalcondition s.	**RecognitionandManagementofp ostnatalproblems** •Physicalexamination,identificationofde viationfromnormal •Puerperalcomplicationsanditsma nagement ○ Puerperalpyrexia ○ Puerperalsepsis	•Lecture •Demonstration •Casediscussion/p resentation •Drugpresentation •Supervisedclinicalp ractice	•Quiz •Simulation •Shortanswer •OSCE

Unit	Time (Hrs.)	Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
			○ Urinarycomplications ○ SecondaryPostpartumhemorrhage ○ Vulvalhematoma ○ Breast engorgement includingmastitis/breastabsces s,feedingproblem ○ Thrombophlebitis ○ DVT ○ Uterinesubinvolution ○ Vesicovaginalfistula(VVF),Rectova ginalfistula(RVF) ○ Postpartumdepression/psychosis •Drugsusedinabnormalpuerperium •Policyaboutreferral		
IV	7(T) 5(L) 40(C)	Describehighriskn eonates and theirnursingmana gement	**~~Assessment and management of High-~~ risk newborn(Review)** •ModelsofnewborncareinIndia– NBCC;SNCUs •Screeningofhigh-risknewborn •Protocols,levelsofneonatalcare,inf ectioncontrol •Prematurity,Post-maturity •Lowbirthweight •KangarooMotherCare •Birthasphyxia/Hypoxicencephalopathy •Neonatalsepsis •Hypothermia •Respiratorydistress •Jaundice •Neonatalinfections •Highfever •Convulsions •Neonataltetanus •Congenitalanomalies •Baby ofHIVpositivemothers •Baby ofRhnegative mothers •Birth injuries •SIDS(SuddenInfantDeathSyndrome)pre vention, Compassionatecare •Calculationoffluidrequirements,E BM/formulafeeds/tubefeeding •Homebasednewborncareprogram-	•Lecture •Discussion •Demonstration •Simulation •Case discussion/presentati on •Drugpresentation •SupervisedClinicalp ractice •IntegratedManageme nt ofNeonatalChildho odIllnesses(IMNCI)	•Shortanswer •Objectivetype •Assessmentofs kills withchecklist •OSCE

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Unit	Time (Hrs.)	Learning Outcomes	Content	Teaching/ LearningActivities	Assessment Methods
			community facility integration innewborncare • Decisionmakingaboutmanagementandreferral • Bereavementcounseling • Drugsusedforhighrisknewborns • Maintenanceof recordsandreports		
V	12(T) 5(L) 80(C)	Describethe assessment andmanagement ofwomen withgynecological disorders.	**Assessmentandmanagementofwomen withgynecologicaldisorders** • Gynecologicalassessment– HistoryandPhysicalassessment • BreastSelf-Examination • Congenitalabnormalitiesoffemaler eproductivesystem • Etiology, pathophysiology, clinicalmanifestations, diagnosis, treatmentmodalitiesandmanagementof womenwith o Menstrualabnormalities o Abnormaluterinebleed o Pelvicinflammatorydisease o Infectionsofthereproductivetract o Uterinedisplacement o Endometriosis o Uterine and cervical fibroids andpolyps o Tumors – uterine, cervical, ovarian,vaginal,vulval o Cysts–ovarian,vulval o Cystocele,urethrocele,rectocele o Genitor-urinaryfistulas o Breast disorders – infections,deformities,cysts,tumors o HPVvaccination o DisordersofPubertyandmenopause o Hormonalreplacementtherapy • Assessmentandmanagementofcouplesw ithinfertility o Infertility–definition,causes o Counselingtheinfertilecouple o Investigations– maleandfemale o Artificialreproductivetechnology o Surrogacy,spermandovumdonation,cryopreservation	• Lecture • Discussion • Demonstration • Casediscussion/presentation • Drugpresentation • Videos,films • Simulatedpractice • SupervisedClinicalpractice • Visittoinfertilityclinic and ARTcenters	• Essay • Shortanswer • Objectivetype • Assessment ofskills withchecklist • OSCE

Unit	Time (Hrs.)	Learning Outcomes	Content	Teaching/ LearningActiv	Assessment Methods
			• Adoption–counseling,procedures • InjuriesandTrauma;Sexualviolence • Drugsusedintreatmentofgy naecologicaldisorders		

Note: CompletesafedeliveryappduringVIISemester.

PRACTICUM

SKILLLAB&CLINICALAREGIVENUNDEROBGNURSING–I

LISTOFAPPENDICES

1. InternalAssessment:Distributionofmarks
2. InternalAssessmentguidelines
3. UniversityTheorypaperQuestionpatternandPracticalexamination

APPENDIX 1

INTERNALASSESSMENT:Distributionofmarks

ISEMESTER

S.No.	NameoftheCourse	Continuous Assessment	Sessional Exams – Theory/Practical	TotalInternalMarks
	Theory			
1	CommunicativeEnglish	10	15	25
2	AppliedAnatomy&AppliedPhysiology	10	15	25
3	AppliedSociology&AppliedPsychology	10	15	25
4	NursingFoundationI	10	15	25
	Practical			
5	NursingFoundationI	10	15	25

II SEMESTER

S.No.	Course	Continuous Assessment	Sessional Exams – Theory/Practical	TotalMarks
	Theory			
1	AppliedBiochemistryandAppliedNutrition&Dietetics	10	15	25
2	NursingFoundationIIincludingFirstAid I&II	10	15	25 I&II=25+25=50/2
3	Health/NursingInformatics&Technology	10	15	25
	Practical			
4	NursingFoundationII I&II	10	15	25 I&II=25+25=50

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III SEMESTER

S.No.	Course	Continuous Assessment	Sessional Exams – Theory/Practical	TotalMarks
	Theory			
1	AppliedMicrobiologyandInfectionControlincludingSafety	10	15	25
2	PharmacologyIandPathologyI	10	15	25
3	Adult Health Nursing I with integratedpathophysiologyincludingBCL	10	15	25
	Practical			
4	AdultHealthNursingI	20	30	50

IV SEMESTER

S.No.	Course	Continuous Assessment	SessionalExams/ Practical	TotalMarks
	Theory			
1	PharmacologyII&PathologyII I&II	10	15	25 I&II=25+25=50/2
2	Adult Health Nursing II with integratedpathophysiologyincludingGeriatric	10	15	25
3	Professionalism,Professionalvalues&Ethicsincludingbioethics	10	15	25
	Practical			
4	AdultHealthNursingII	20	30	50

V SEMESTER

S.No.	Course	Continuous Assessment	Sessional Theory/Practical	TotalMarks
	Theory			
1	ChildHealthNursingI	10	15	25
2	MentalHealthNursingI	10	15	25
3	CommunityHealthNursingI	10	15	25
4	EducationalTechnology/Nursingeducation	10	15	25
5	IntroductiontoForensicNursingandIndianLaws	10	15	25
	Practical			
6	ChildHealthNursingI	10	15	25
7	MentalHealthNursingI	10	15	25
8	CommunityHealthNursingI	20	30	50

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VI SEMESTER

S.No.	Course	Continuous Assessment	SessionalExams/ Practical	TotalMarks
	Theory			
1	ChildHealthNursingII I&II	10	15	25 I&II=25+25=50/2
2	MentalHealthNursingII I&II	10	15	25 I&II=25+25=50/2
3	NursingManagementandLeadership	10	15	25
4	Midwifery/ObstetricsandGynecologyI	10	15	25
	Practical			
5	ChildHealthNursingII I&II	10	15	25 I&II=25+25=50
6	MentalHealthNursingII I&II	10	15	25 I&II=25+25=50
7	Midwifery/Obstetrics and Gynecology (OBG)NursingI	10	15	25

VII SEMESTER

S.No.	Course	Continuous assessment	SessionalExams/ Practical	TotalMarks
	Theory			
1	CommunityHealthNursingII	10	15	25
2	NursingResearch&Statistics	10	15	25
3	Midwifery/Obstetrics and Gynecology (OBG)NursingII I&II	10	15	25 I&II =25+25=50/2
	Practical			
4	CommunityHealthNursingII	20	30	50
5	Midwifery/ObstetricsandGynecology(OBG)NursingII I&II	10	15	25 I&II =25+25=50

VIII SEMESTER(Internship)

S.No.	Course	Continuousperformance evaluation	OSCE	TotalMarks
1	Competencyassessment– 5specialties× 20marks	Eachspecialty–10 5×10=50 marks	Eachspecialty–10 5×10=50 marks	100

APPENDIX 2

INTERNALASSESSMENTGUIDELINEST

HEORY

I. CONTINUOUSASSESSMENT:10marks

1. Attendance–**2marks**(95-100%:2marks,90-94:1.5marks,85-89:1mark, 80-84:0.5mark,<80:0)
2. Writtenassignments(Two)–**10marks**
3. Seminar/microteaching/individualpresentation(Two)–**12marks**
4. Group project/work/report – **6**

marksTotal=30/3=10

Ifthereismandatorymodule inthatsemester,marksobtainedbystudentoutof10canbeaddedto30totaling40 marks

Total=40/4=10marks

II. SESSIONALEXAMINATIONS:15marks

Twosessionalexamspercourse

Exampattern:

MCQ–4×1=4

Essay–1×10=10

Short–2×5=10

VeryShort–3×2=6

30marks× 2=60/4 =15

PRACTICAL

I. CONTINUOUSASSESSMENT:10marks

1. Attendance–**2marks**(95-100%:2marks,90-94:1.5marks,85-89:1mark, 80-84:0.5mark,<80:0)
2. Clinicalassignments –**10marks**

   (Clinicalpresentation–3,drugpresentation&report–2,casestudy report–5)
3. Continuousevaluationofclinicalperformance–**10marks**
4. EndofpostingOSCE –**5marks**
5. Completion of procedures and clinical requirements – **3**

marksTotal=30/3 =10

II. SESSIONAL EXAMINATIONS: 15

marksExampattern:

OSCE–10marks(2-3hours)

DOP–20 marks(4-5hours)

{DOP–Directlyobservedpracticalintheclinicalsetting}

Total=30/2=15

Note: For Adult Health Nursing I, Adult Health Nursing II, Community Health Nursing I & Community Health Nursing II,the marks can be calculated as per weightage. Double the weightage as 20 marks for continuous assessment and 30 forsessionalexams.

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COMPETENCYASSESSMENT:(VIIISEMESTER)

Internalassessment

Clinical performance evaluation – 10 × 5 specialty = 50

marksOSCE= 10 ×5specialty=50marks

Total=5specialty×20marks=100

APPENDIX 3

I. UNIVERSITYTHEORYQUESTIONPAPERPATTERN(For75marks)

1. **SectionA–37marksandSectionB–38marks**

   a. **AppliedAnatomy&AppliedPhysiology:**AppliedAnatomy–SectionAandAppliedPhysiology–SectionB,

   b. **AppliedSociology&AppliedPsychology:**AppliedSociology–SectionAandAppliedPsychology–SectionB

   c. **AppliedMicrobiology&InfectionControlincludingSafety:**AppliedMicrobiology–SectionAandInfectionControl including Safety– Section B

   SectionA(37marks)

   MCQ–6 ×1 =6

   Essay – 1×10=10

   Short–3×5=15

   Very Short – 3 × 2 =

   6**Section B (38**

   marks)MCQ– 7 ×1

   =7

   Essay – 1×10=10

   Short–3×5=15

   VeryShort –3×2=6

2. **SectionA–25marksandSectionB–50marks**

   AppliedBiochemistry&Nutrition&Dietetics: AppliedBiochemistry–SectionAandAppliedNutrition&Dietetics–Section B

   SectionA(25marks)

   MCQ–4 ×1 =4

   Short–3×5=15

   Very Short – 3 × 2 =

   6**Section B (50**

   marks)MCQ– 8 ×1

   =8

   Essay/situationtype– 1×10=10

   Short–4×5=20

   VeryShort –6×2=12

3. **SectionA–38marks,SectionB–25marksandSectionC–12marks**

   Pharmacology,PathologyandGenetics: Pharmacology–SectionA,Pathology–SectionBandGenetics–SectionC

   SectionA(38marks)

   MCQ–7 ×1 =7

   Essay – 1×10=10

   Short–3×5=15

Very Short – 3 × 2 = 6**Section B (25 marks)**MCQ– 4 ×1 =4

Short–3×5=15

Very Short – 3 × 2 = 6**Section C (12 marks)**MCQ– 3 ×1 =3

Short–1×5=5

VeryShort –2×2=4

4. **SectionA–55marksandSectionB–20marks**

ResearchandStatistics: Research–SectionAandStatistics–SectionB

SectionA(55marks)

MCQ–9 ×1 =9

Essay/situationtype– 2×15=30

Short–2×5=10

Very Short – 3 × 2 = 6**Section B (20 marks)**MCQ– 4 ×1 =4

Short–2×5=10

VeryShort –3×2=6

5. **Marks75(Forallotheruniversityexamswith75marks)**

MCQ–12 ×1=12

Essay/situationtype– 2×15=30

Short–5×5=25

VeryShort –4×2=8

6. **CollegeExam(EndofSemester)–50marks(50/2=25marks)**

MCQ–8 ×1 =8

Essay/situationtype– 1×10=10

Short–4×5=20

VeryShort –6×2=12

II. **UNIVERSITY PRACTICAL EXAMINATION – 50 marksOSCE– 15 marks**

DOP –35marks

III. **COMPETENCYASSESSMENT–UniversityExam(VIIISEMESTER)**

IntegratedOSCEincludingall5specialties(Stationsbasedonevery specialty)=5specialty 5×20=100marks

Totalof5Examiners: external–2andinternal–3(Onefromeachspecialty)

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Internalexaminersmaybechosenfromcollegefacultywithrequiredqualificationorfromhospitalwithrequiredqualification.

Clinical Logbook for B.Sc. Nursing

Program(ProceduralCompetencies/Skills)

I&IISEMESTER

S.No.	ProceduralCompetencies/Skills	Performsin dependently	Assists/ Observes procedures A/O	DATE		Signature of theTutor/Faculty
				Skill Lab/SimulationLab	Clinical Area	
	ISEMESTER					
I	**CommunicationandDocumentation**					
1	MaintainingCommunicationandinterpersonal relationship withpatientand families					
2	VerbalReport					
3	Recording/Documentationofpatientcare(WrittenReport)					
II	**MonitoringVitalSigns**					
	Temperature					
4	OralAxillary					
5	RectalTymp					
6	anic*Pulse*					
7	RadialApic					
	al*Respirati*					
8	*on*					
9	*BloodPressure*					
10	**Hot&ColdApplication**					
11	Cold					
III	CompressHot					
12	CompressIceC					
13	ap					
14	Tepidsponge					
15						
IV	**HealthAssessment(Basic–Firstyearlevel)**					
16	HealthHistory					
17	Physical Assessment – General &systemwise					
18	Documentationoffindings					

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V InfectionControlinClinicalSettings

S.No.	ProceduralCompetencies/Skills	Performsindependently	Assists/ Observes	DATE		Signature of theTutor/Faculty
		harge			SkillLab/ SimulationLab	
		Transfer(withinhospital)				
19	Handhygiene(Handwashing&Handrub)	**Mobility**				
20	Use of personal and protectiveequipment	Ambulation				
		Transferringpatientfrom&to				
VI	**Comfort**Ope					
21	n					
22	BedOccupied					
23	Bed					
24	Post-operative					
25	BedSupine					
26	PositionFowler‘s					
27	PositionLateral					
28	PositionPronePosit					
29	ion					
30	Semi Prone					
31	PositionTrendelenburg					
	PositionLithotomyPosit					
32	ion					
33	ChangingPositionofhelplessp					
34	atient (Moving/Turning/Logrolling)					
35	Cardiac table/Over-bed					
	tableBackRest					
VII						
36	BedCradle					
37	Pain Assessment (Initial &Reassessment)					
38	**Safety**					
VIII	Siderail					
39	Restraint(Physical)					
40	Fallriskassessment&postfallassessment					
41	**Admission&Discharge**					
IX	Admission					
42	D					
43	i					
	s					
	c					

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Clinical Area

S.No.	ProceduralCompetencies/Skills	Performsindependently	Assists/ Observes	DATE		Signature of theTutor/Faculty
		ke&outputchartIntra Venous Infusion PlanElimination			SkillLab/ SimulationLab	
	bed&wheelchair					
44	Transferringpatientfrom&tobed& stretcher					
45	RangeofMotionExercises(ROM)					
X	**PatientEducation**					
46	IndividualPatientTeaching					
XI	**Hygiene**					
47	Sponge bath/Bed					
48	bathPressureInjuryAssessmen					
49	t					
50	Skincareandcareofpressurepoints					
51	Oral					
52	hygieneHair					
53	wash					
54	Pediculosis					
XII	treatmentPerineal					
55	Care/Meatal careUrinary					
56	Catheter					
57	careNursingProcess-					
58	**Basiclevel** Assessmentandformulatingnursingdiagnosis					
XIII						
59	Planning the nursing					
60	CareImplementation ofCare					
61	EvaluationofCare(Reassessment &Modification)					
62	**Nutrition & Fluid**					
63	**Balance**24 Hours Dietary					
64	RecallPlanningWellbalance					
65	ddietMakingfluid plan					
XIV	Preparationofnasogastrictubefeed Nasogastric tube feedingMaintaininginta					

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Clinical Area

S.No.	ProceduralCompetencies/Skills	Performsindependently	Assists/ Observes procedures A/O	DATE		Signature of theTutor/Faculty
				SkillLab/ Simulation Lab	Clinical Area	
66	Providing					
67	BedpanProviding					
68	UrinalEnema					
69	BowelWash					
XV	**DiagnosticTests-Specimencollection**					
70	UrineSpecimenforRoutineAnalysis					
71	Urine Specimen for					
72	CultureTimed urine specimen					
73	collectionFeces specimen for					
74	routineSputumCulture					
	Urine					
75	***Testing***Ketone					
76	AlbuminReacti					
77	onSpecificGravi					
78	ty					
XVI	**OxygenationNeeds/PromotingRespiration**					
79	DeepBreathing&CoughingExercises					
80	Steaminhalation					
81	Oxygenadministrationusingfacemask					
82	Oxygenadministrationusingnasalprongs					
XVII	**Medication**					
83	**Administration**Oral					
84	MedicationsIntramuscular					
85	SubcutaneousRectal					
86	Suppositories**Death**					
XVIII	**andDying**					
87**XI**	Deathcare/LastOffice					
X	**FirstAidandEmergenciesB**					
	andages &					
	BindersCircular					

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S.No.	ProceduralCompetencies/Skills	Performs independently	Assists/Observesprocedures A/O	DATE		Signature of theTutor/Facul
				Skill Lab/SimulationLab	Clinical Area	
89	Spiral					
90	ReverseSpiral					
91	Recurrent					
92	Spica					
93	Figureofeight					
94	Eye					
95	Ear					
96	Caplin					
97	Jaw					
98	ArmSling					
99	AbdominalBinder					
100	BasicCPR(firstaidmodule)					

III&IVSEMESTER

S.No.	Specific ProceduralCompete	Performs independently	Assists/ Observes Procedures A/O	DATE		Signatureofthe Tutor/ Faculty
				SkillLab/SimulationLab	Clinical Area	
IIISEMESTER						
I	**MEDICAL**					
	Intravenoustherapy					
1	IVcannulation					
2	IVmaintenance&monitoring					
3	AdministrationofIVmedication					
4	CareofpatientwithCentralLine					
	Preparation,assisting,andaftercareofpatientsundergoingdiagnosticprocedures					
5	Thoracentesis					
6	Abdominalparacentesis					
	Respiratorytherapiesandmonitoring					
7	Administrationofoxygenusingventuri mask					
8	Nebulization					

S.No.	Specific ProceduralCompetencies/Skills	Performsindependently	Assists/ObservesProcedures A/O	DATE		Signature of theTutor/ Faculty
				Skill Lab/Simulation Lab	Clinical Area	
9	Chestphysiotherapy					
10	Posturaldrainage					
11	Oropharyngealsuctioning					
12	Careofpatientwithchestdrainage					
	Planningtherapeuticdiet					
13	Highproteindiet					
14	Diabeticdiet					
15	Performingandmonitoring GRBS					
16	Insulinadministration					
II	**SURGICAL**					
17	Pre-Operativecare					
18	ImmediatePost-operativecare					
19	Post-operativeexercise					
20	Painassessmentandmanagement					
	Assistingdiagnosticproceduresandaftercareofpatientsundergoing					
21	Colonoscopy					
22	ERCP					
23	EndoscopyL					
24	iverBiopsy					
25	Nasogastric					
26	aspirationGastrostomy/Jejunost					
27	omy feedsIleostomy/Colostomy					
28	careSurgicaldressing					
29	Sutureremoval					
30	Surgical					
31	soakSitzbath					
32	Careofdrain					
III	**CARDIOLOGY**					
33	Cardiacmonitoring					
34	Recording and					
35	interpreting					

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ECG Arterial blood gas analysis –

S.No.	Specific ProceduralCompetencies/Skills	Performsindependently	Assists/ObservesProcedures	DATE		Signature of theTutor/ Faculty Lab/Simulation Lab
				Skill A/O	Clinical	
	interpretation					
36	Administrationofcardiacdrugs					
37	Preparation and after care ofpatientsundergoingcardiac Catheterization					
38	PerformingBCLS					
	Collectionofbloodsamplefor					
39	Bloodgrouping/crossmatching					
40	Bloodsugar					
41	Serumelectrolytes					
42	Assistingwithbloodtransfusion					
43	Assistingforbonemarrowaspiration					
44	Application of antiembolismstockings(TED hose)					
45	Application/maintenanceof sequentialCompression Device					
IV	**DERMATOLOGY**					
46	Applicationoftopicalmedication					
47	Intradermalinjection-Skinallergytesting					
48	Medicatedbath					
V	**COMMUNICABLE**					
49	Intradermal injection-BCG andTuberculin skin Test or Mantouxtest					
50	Barriernursing&Reversebarriernursing					
51	Standard precautions-Handhygiene,useofPPE,needlestickand sharp injury prevention,Cleaning and disinfection,Respiratory hygiene, wastedisposal and safe injectionpractices					
VI	**MUSCULOSKELETAL**					

Preparation of patient with Myelogram/CT/MRI

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Area

S.No.	Specific ProceduralCompetencies/Skills	Performsindependently	Assists/ObservesProceduresA/O	DATE		Signature of theTutor/ Faculty
				Skill Lab/Simulation Lab	Clinical Area	
53	Assistingwithapplication&removalof POP/Cast					
54	Preparation,assistingandaftercare of patient with Skintraction/skeletal traction					
55	Careoforthotics					
56	Muscle strengthening					
57	exercisesCrutchwalking					
58	Rehabilitation					
VII	**OR**					
59	PositionanddrapingPreparation					
60	of operation					
61	tableSetupoftrolleywithinstrume					
62	nt Assistinginmajorandminorop					
63	eration Disinfection and sterilization					
64	ofequipment Scrubbing procedures –					
65	Gowning,maskingandgloving					
	Intraoperativemonitoring **IVSEMESTER**					
I						
1	**ENT** History taking and					
2	examinationofear, nose& throat ApplicationofbandagestoEar					
3	& Nose					
	Tracheostomycare					
	Preparationofpatient,assistingandmonitoringofpatientsundergoingdiagnosticprocedures					
4	Auditoryscreeningtests					
5	**Audiometrictests**					
6	Preparing and assisting in specialprocedures like Anterior/posteriornasal packing,					
7	Ear Packing andSyringing Preparation and after care					

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	ofpatientsundergoingENTsurgica lprocedures
8	Instillationofear/nasal

S.No.	Specific ProceduralCompetencies/ Skills	Performsindependently	Assists/ObservesProcedures A/O	DATE		Signature of theTutor/ Faculty
				SkillLab/SimulationLab	Clinical Area	
	medication					
II	**EYE**					
9	Historytakingand examination of eyes andinterpretation					
	Assisting					
10	*procedures*Visual					
11	acuityFundoscopy/retinos					
12	copy/ Ophthalmoscopy/tonometry					
13	Refractiontests					
14	Pre and postoperative care ofpatientundergoingeyesurgery					
15	Instillation of					
16	eyedrops/medication					
17	Eyeirrigation					
III	Applicationofeyebandage					
18	Assisting with foreign bodyremoval **NEPHROLOGY&UROLOGY** Assessment of kidney and urinarysystem •Historytakingandphysicalexamination					
	•Assisting with Testicularself-examination					
	•Digitalrectalexam					
	Preparationandassistingwithdiagnosticandtherapeuticprocedures					
19	Cystoscopy,Cystometrogram					
20	Contraststudies–IVP					
21	Peritonealdialysis					
22	Hemodialysis					
23	Lithotripsy					
24	Renal/ProstateBiopsy					

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25 Specific tests –
26 Semen analysis,gonorrheatest

27 Urinary Catheterization&care

28 Bladderirrigation

S.No.	Specific ProceduralCompetencies/Skills	Performsindependently	Assists/ObservesProceduresA/O	DATE		Signature of theTutor/ Faculty
				Skill Lab/Simulation Lab	Clinical Area	
28	Intake and output recording andmonitoring					
29	Ambulationandexercise					
IV	**BURNS&RECONSTRUCTIVESURGERY**					
30	Assessment of burns wound					
31	Firstaidofburns					
32	Fluid&electrolytereplacementtherapy					
33	Skincare					
34	CareofBurnwounds					
35	o Bathing o Dressing Pre-operative and post-operativecareofpatientwith burns					
36	Caringofskingraftandpostcosmeticsurgery					
37	Rehabilitation					
V	**NEUROLOGY**					
38	NeurologicalExamination–ex. UseofGlasgowcomascale					
39	Continuous monitoring					
40	Preparation and assisting forvarious invasive and non-invasivediagnosticprocedures					
41	Careofpatientundergoingneurosurgery includingrehabilitation					
VI	**IMMUNOLOGY**					
42	HistorytakingandPhysicalexamination					
43	Immunological status assessmentand interpretation of specific test(e.g.HIV)					
44	Careofpatientwithlowimmunity					
VII	**ONCOLOGY**					

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S.No.	Specific ProceduralCompetencies/Skills	Performsindependently	Assists/ObservesProcedures A/O	DATE		Signature of theTutor/ Faculty
				Skill Lab/Simulation Lab	Clinical Area	
45	History taking & physicalexaminationofcancerpatients					
46	Screening for common cancers – TNMclassification					
	Preparation,assistingandaftercarepatientsundergoingdiagnosticprocedures					
47	Biopsies/FNAC					
48	Bone-marrowaspiration					
	Preparationofpatientsandassistingwithvariousmodalitiesoftreatment					
49	Chemotherapy					
50	Radiotherapy					
51	Hormonal therapy/Immunotherapy					
52	Genetherapy/anyother					
53	Care of patients treated withnuclear medicine					
54	Rehabilitation					
VIII	**EMERGENCY**					
55	Practicing_triage‘					
56	Primary and secondary survey inemergency					
57	Examination, investigations &their interpretations, inemergency&disastersituations					
58	Emergency care of medical andtraumaticinjury patients					
59	Documentation,andassistinginlegal procedures in emergencyunit					
60	Managingcrowd					
61	Counseling the patient and familyin dealing with grieving &bereavement					
IX	**CRITICALCARE**					
62	Assessment of critically illpatients					
63	Assistingwitharterialpuncture					
64	Assisting with ET tube intubation&extubation					

S.No.	Specific ProceduralCompetencies/Skills	Performsindependently	Assists/ObservesProceduresA/O	DATE		Signature of theTutor/ Faculty
				Skill Lab/Simulation Lab	Clinical Area	
65	ABGanalysisandinterpretation – respiratoryacidosis,respiratoryalkalosis, metabolic acidosis,metabolicalkalosis					
66	Setting up of ventilator modesandsettingsandcareofpatientonventilator					
67	Settingupoftrolleywithinstruments					
68	MonitoringandmaintenanceofChestdrainage system					
69	Bagandmaskventilation					
70	Assisting with starting andmaintenanceofCentralandperipherallinesinvasive					
71	Settingupofinfusionpump,andefibrillator					
72	Administration of drugs viainfusion,intracardiac,intrathecal,epidural					
73	Monitoringandmaintenanceofpacemaker					
74	ICUcarebundle					
75	ManagementofthedyingpatientintheICU					
X	**Geriatric**					
76	HistorytakingandAssessmentofGeriatricpatient					
77	Geriatriccounseling					
78	Comprehensive Healthassessment(adult)aftermodulecompletion					
	V & VI SEMESTER – CHILD HEALTH NURSING I & III PEDIATRICMEDICAL & SURGICAL *Healthassessment–Takinghistory &Physicalexaminationandnutritionalassessmentof*					
1	Neonate					
2	Infant					
3	Toddler					
4	Preschooler					
5	Schooler					

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S.No.	Specific ProceduralCompetencies/Skills	Performsindependently	Assists/ObservesProceduresA/O	DATE		Signature of theTutor/ Faculty
				Skill Lab/Simulation Lab	Clinical Area	
6	Adolescent					
	Administrationofmedication/fluids–Calculation,preparationandadministrationofmedication					
7	Oral					
8	I/M					
9	I/V					
10	Intradermal					
11	Subcutaneous					
12	Calculationoffluidrequirements					
13	Preparation of different strengthsofI/V fluids					
14	AdministrationofIVfluids					
15	Applicationofrestraints					
	Administration of O_2 inhalationbydifferentmethods					
16	NasalCatheter/NasalProng					
17	Mask					
18	Oxygenhood					
19	Babybath/spongebath					
20	Feeding children by Katori&spoon/paladai, cup					
	Collectionofspecimensforcommoninvestigations					
21	Urine					
22	Stool					
23	Blood					
24	Assistingwithcommondiagnosticprocedures					
	(Lumbarpuncture,bonemarrowaspiration)					
	Healtheducationtomothers/parents–Topics					
25	Prevention and management ofMalnutrition					
26	Prevention and management ofdiarrhea (Oral rehydrationtherapy)					
27	Feeding&Complementaryfeeding					

S.No.	Specific ProceduralCompetencies/Skills	Performsindependently	Assists/ObservesProceduresA/O	DATE		Signature of theTutor/ Faculty
				Skill Lab/Simulation Lab	Clinical Area	
28	Immunization					
29	schedulePlay therapy					
30	Conductindividualandgroupplay therapysessions					
31	Preventionofaccidents					
32	Bowelwash					
33	Administrationofsuppositories					
	Careforostomies:					
34	Colostomy					
35	IrrigationUreterosto					
36	myGastrostomyEnte					
37	rostomy					
38	Urinarycatheterization&drainage					
	*Feeding*Nas					
39	o-					
40	gastricGastr					
41	ostomyJejun					
	ostomy					
42	*Careofsurgicalwounds*					
43	DressingSuture					
II	removal					
	PEDIATRICOPD/IMMUNIZATIONROOM					
44	*GrowthandDevelopmentalassessmentofchildren*					
45	InfantToddl					
46	erPreschool					
47	erSchooler					
48	Adolescent					
49	Administrationofvaccination					
50	Health/Nutritional					
III	education**NICCU/PICU**					
51	Assessmentofnewborn					
52	Careofpreterm/LBWnewborn					

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				Skill Lab/Simulation Lab	Clinical Area	
53	Kangaroocare					
54	Neonatalresuscitation					
55	Assistinginneonataldiagnosticprocedures					
56	Feeding of high risk newborn – EBM(spoon/paladai)					
57	Insertion/removal/feeding– Naso/oro-gastrictube					
58	Administrationofmedication– oral/parenteral					
59	Neonataldrugcalculation					
60	Assistinginexchangetransfusion					
61	Organizingdifferentlevelsofneonatalcare					
62	Careofachildonventilator/CPAP					
63	EndotrachealSuction					
64	ChestPhysiotherapy					
65	Administrationoffluidswithinfusionpumps					
66	TotalParenteralNutrition					
67	Recording&reporting					
68	CardiopulmonaryResuscitation– PLS					
	V & VI SEMESTER – MENTAL HEALTH NURSING I & IIPSCHIATRY OPD					
1	Historytaking					
2	Mentalstatusexamination(MSE)					
3	Psychometric assessment(Observe/practice)					
4	Neurologicalexamination					
5	Observing & assisting intherapies					
	Individualandgrouppsychoeducation					
6	Mentalhygienepracticeeducation					
7	Familypsycho-education					

S.No.	Specific ProceduralCompetencies/Skills	Performsindependently	Assists/ObservesProceduresA/O	DATE		Signature of theTutor/ Faculty
				Skill Lab/Simulation Lab	Clinical Are	
	CHILDGUIDANCECLINIC					
8	History Taking & mental statusexamination					
9	Psychometricassessment (Observe/practice)					
10	Observingandassistinginvarioustherapies					
11	Parentalteachingforchildwithmentaldeficiency					
	IN-PATIENTWARD					
12	Historytaking					
13	Mentalstatusexamination(MSE)					
14	Neurologicalexamination					
15	Assistinginpsychometricassessment					
16	Recording therapeuticcommunication					
17	Administrationofmedications					
18	AssistinginElectro-convulsiveTherapy (ECT)					
19	Participationinalltherapies					
20	Preparation of patients forActivitiesofDailyliving(ADL)					
21	Conductingadmissionanddischargecounseling					
22	Counselingandteachingpatientsandfamilies					
	COMMUNITYPSYCHIATRY&DEADDICTIONCENTRE					
23	Conducting home visit and casework					
24	Identification of individuals withmentalhealthproblems					
25	Assistinginorganizationsof MentalHealthcamp					
26	Conducting awareness meetingsfor mental health & mentalillness					
27	CounselingandTeachingfamily members, patients andcommunity					
	28 Observationofdeaddictioncare					

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				SkillLab/SimulationLab	Clinical Area	
	V SEMESTER – COMMUNITY HEALTH NURSING IINCLUDINGENVIRONMENTALSCIENCE&EPIDEMIOLOGY					
1	Interviewing skills (usingcommunication and interpersonalskills)					
2	Conducting community needsassessment/survey					
3	Observationskills					
4	Nutritionalassessmentskills					
5	Teaching individuals and familieson nutrition-food hygiene					
6	andsafety,healthylifestyleandhealthpromotion BCC (Behaviour changecommunication)skills					
7	Health assessment					
8	includingnutritional assessment-differentagegroups • Childrenunder five • Adolescent • Woman Investigating an epidemic –					
9	Communityhealthsurvey Performing lab tests –					
10	Hemoglobin, blood sugar, bloodsmearformalaria,etc. Screening, diagnosis and					
	primarymanagement of common healthproblems in the community andreferral of high-risk clients(Communicable &NCD)					
11	Documentationskills					
12	Homevisit					
13	Participationinnationalhealthprograms					
14	Participationinschoolhealthprograms					
	VSEMESTER–EDUCATIONALTECHNOLOGY/NURSINGEDUCATION					
1	Writinglearningoutcomes					
2	Preparationoflessonplan					
3	PracticeTeaching/Microteaching					

S.No.	Specific ProceduralCompetencies/Skills	Performsindependently	Assists/ObservesProceduresA/O	DATE		Signature of theTutor/ Faculty
				Skill Lab/Simulation Lab	Clinical Area	
4	Preparation of teaching aids/media *Preparationofassessmenttools*					
5	ConstructionofMCQtests					
6	Preparationofobservationchecklist					
VISEMESTER–NURSINGMANAGEMENT&LEADERSHIP						
	HospitalandNursingServiceDepartment					
1	Preparation of organogram(hospital/nursing department)					
2	Calculation of staffingrequirements for a nursingunit/ward					
3	Formulation of Job description ofnursingofficer (staff nurse)					
4	PreparationofPatientassignmentplan					
5	Preparation of duty roster forstaff/studentsatdifferentlevels					
6	Preparation of logbook/MMF forspecificequipment/ materials					
7	ParticipationinInventorycontrolanddailyrecord keeping					
8	Preparation and maintenance ofrecords & reports such asincident reports/adversereports/auditreports					
9	Participation in performanceappraisal/evaluationofnursingstaff					
10	Participate in conducting in-serviceeducationforthestaff					
	College&Hostel					
11	Preparation of organogram ofcollege					
12	Formulationofjobdescriptionfor tutor					
13	Participationinperformanceappraisalof tutor					

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14	PreparationofMasterplan,time-tableand clinicalrotation

S.No.	Specific ProceduralCompetencies/Skills	Performsindependently	Assists/ObservesProceduresA/O	DATE		Signature of theTutor/ Faculty
				Skill Lab/Simulation Lab	Clinical Area	
15	Preparationofstudentanecdotes					
16	Participation in clinicalevaluationofstudents					
17	Participation in planning andconducting practical examinationOSCE– endof posting					
	VI&VIISEMESTER–MIDWIFERY/OBSTETRICSANDGYNECOLOGY(OBG)NURSINGI&III ANTENATALCARE					
	Healthassessmentof antenatalwoman					
1	History Taking includingobstetrical score, Calculation ofEDD, gestationalage					
2	Physicalexamination:headtofoot					
3	Obstetrical examination includingLeopards maneuvers &auscultation of Fetal heart sound(fetoscope/stethoscope/Doppler)					
	Diagnostictests					
4	Urinepregnancytest/cardtest					
5	EstimationofhemoglobinusingSahle'shemoglobinometer					
6	Advice/assistinHIV/HBsAg/ VDRLtesting					
7	Preparationofperipheralsmearfor malaria					
8	Urinetestingforalbuminandsugar					
9	PreparationofmotherforUSG					
10	Kickchart/DFMC(DailyFetalandMaternalChart)					
11	Preparation and recording ofCTG/NST					
12	Antenatal counseling for eachtrimester including birthpreparednessandcomplicationreadiness					
13	Childbirth preparation classes forcouples/family					
14	AdministrationofTd/TT					

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15	Prescription of iron & folic acidandcalciumtablets

S.No.	Specific ProceduralCompetencies/ Skills	Postnatal counseling-diet,exercise &breastfeeding	Performs independently	Assists/Observe sProcedures		DA ClinicalArea E
				A/O	Skill Lab/ Simulation Lab	
II	**INTRANATALCARE**					
16	Identification and assessment ofwomanin labour					
17	AdmissionofwomaninlabourPerforming/assistingCTG					
18						
19	Vaginalexaminationduringlabour including Clinicalpelvimetry					
20	Plotting and interpretation ofpartograph					
21	Preparationforbirthing/delivery – physicalandpsychological					
22	Setting up of the birthingroom/delivery unit					
23	andnewborncorner/carearea					
24	Pain management during labour-non-pharmacological					
25	Supportingnormalbirths/conductnormal childbirth in					
26	uprightpositions/evidencebased					
27	Essential newborn careBasicnewbornresuscitation					
28	Management of third stage oflabour – Physiologicmanagement/active management(AMTSL)					
29						
30	Examinationofplacenta					
31	Careduringfourthstageoflabour					
III	Initiationofbreastfeedingandlactation management					
32						
33	Infectionpreventionduringlabourandnewborncare					
34	**POSTNATALCARE**					
35	Postnatalassessmentandcare Perineal/episiotomy careBreastcare					

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S.No.	Specific ProceduralCompetencies/Skills	Performsindependently	Assists/ObservesProceduresA/O	DATE		Signature of theTutor/ Faculty
				Skill Lab/Simulation Lab	Clinical Area	
36	Preparationfor discharge					
IV	**NEWBORNCARE**					
37	Assessmentofnewborn					
38	Weighingofnewborn					
39	AdministrationofVitaminK					
40	Neonatal immunization – AdministrationofBCG,HepatitisB vaccine					
41	Identification of minor disordersofnewborn andtheirmanagement					
CAREOFWOMENWITHANTENATAL,INTRANATAL&POSTNATALCOMPLICATIONS						
42	High risk assessment – identification of antenatalcomplications such as pre-eclampsia, anemia, GDM,Antepartumhemorrhageetc.					
43	Postabortioncare&counseling					
44	Glucose challenge test/GlucoseTolerancetest					
45	Identification of fetal distress andits management					
46	AdministrationofMgSo4					
47	Administration of antenatalcorticosteroidsforpretermlabour					
48	AssistingwithMedicalinductionoflabour					
49	Assist in Surgical induction – stripping and artificial rupture ofmembranes					
50	Episiotomy(onlyifrequired)andrepair					
51	Preparation for emergency/electivecaesareansection					
52	Assistingincaesareansection					
53	Preparation of mother and assistinvacuumdelivery					
54	Identification and assisting inmanagementofmalpresentatio					

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nandmalpositionduringlabour

55 Preparationandassistinginlow

S.No.	Specific ProceduralCompetencies/Skills	Performsindependently	Assists/ObservesProceduresA/O	DATE		Signature of theTutor/ Faculty
				Skill Lab/Simulation Lab	Clinical Area	
	forcepsoperation					
56	Preparation and assisting inemergencyobstetricsurgeries					
57	Prescription/administration offluids and electrolytes throughintravenousroute					
	Assistinginprocedures					
58	Assisting in Manual removal oftheplacenta					
59	Assisting in Bimanualcompressionofuterus /Balloontamponadeforatonicuterus					
60	AssistinginAorticcompressionfor PPH					
61	Identification and first aidmanagementofPPH&obstetricshock					
62	Assistinginmanagementofobstetricshock					
63	Identification and assisting inmanagement of puerperal sepsisandadministrationofantibiotics					
64	Management of breastengorgementandinfections					
65	Managementofthrombophlebitis					
	HIGHRISKNEWBORN(SomeaspectsofhighrisknewborncareareincludedinChildHealthNursing)					
66	Identification of high-risknewborn					
67	Care of neonate under radiantwarmer					
68	Careofneonateonphototherapy					
69	Referralandtransportationofhighrisknewborn					
70	Parental counselling – sickneonateandneonatalloss					
	FAMILYWELFARE					
71	PostpartumFamilyplanningcounseling					

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72	Postpartum family planning – Insertion and removal ofPPIUCD/PAIUCD

S.No.	Specific ProceduralCompetencies/Skills	Performsindependently	Assists/ObservesProceduresA/O	DATE		Signature of theTutor/ Faculty
				Skill Lab/Simulation Lab	Clinical Area	
73	CounsellingofthewomanforPostpartumsterilization					
74	Preparationandassistingintubectomy					
	OTHERPROCEDURES					
75	PreparationandassistingforD&C/D&Eoperations					
76	Observation/AssistinginManual VacuumAspiration					
77	Assessmentofwomenwithgynaecological disorders					
78	Assisting/performingPapsmear					
79	PerformingVisualinspectionofcervixwith aceticacid					
80	Assisting/observationofcervicalpunch biopsy/Cystoscopy/Cryosurgery					
81	Assistingingynecologicalsurgeries					
82	Postoperativecareofwomanwithgynecologicalsurgeries					
83	CounselonBreastself-examination					
84	Counselingcoupleswithinfertility					
85	Completionofsafedeliveryappwithcertification					
VIISEMESTER–COMMUNITYHEALTHNURSINGII						
1	Screening, diagnosing,management and referral ofclients with commonconditions/emergencies					
2	Antenatalandpostnatalcareatho meand healthcentre					
3	Conductionofnormalchildbirth &newborncare athealth centre					
4	Tracking every pregnancy andfillingup MCPcard					
5	Maintenanceofrecords/registers/reports					
6	Adolescent counseling					

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S.No.	Specific ProceduralCompetencies/Skills	Performsindependently	Assists/ObservesProceduresA/O	DATE		Signature of theTutor/ Faculty
				Skill Lab/Simulation Lab	Clinical Area	
	services					
7	Counselingforsafeabortionservices					
8	Familyplanningcounseling					
9	Distribution of temporarycontraceptives – condoms,OCP‘s, emergencycontraceptives,InjectableMPA					
10	InsertionofintervalIUCD					
11	Removalof IUCD					
12	Participation in conductingvasectomy/tubectomycamp					
13	Screening, diagnosis, primarymanagement and referral ofclientswithoccupationalhealthproblems					
14	Healthassessmentofelderly					
15	MentalHealthscreening					
16	Participation in communitydiagnosis– datamanagement					
17	Writinghealthcentreactivityreport					
18	Participationinorganizingandconductingclinic/healthcamp					
19	Participationindisastermockdrills					
20	Co-ordinating with ASHAs andothercommunityhealthworkers					
	VIISEMESTER–NURSINGRESEARCH&STATISTICS					
	ResearchProcessExercise					
1	Statementof theproblem					
2	FormulationofObjectives&Hypotheses					
3	Literaturereviewofresearchreport/article					
	4 Annotatedbibliography					

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5 Preparationofsampleresearcht
ool

Analysis&Interpretationofdata –Descriptivestatistics

S.No.	Specific ProceduralCompete	Performs independently	Assists/ Observes Procedures A/O	DATE		Signatureofthe Tutor/ Faculty
				SkillLab/SimulationLab	Clinical Area	
6	Organizationofdata					
7	Tabulationofdata					
8	Graphicrepresentationofdata					
9	Tabularpresentationofdata					
10	Research Project(Group/Individual)					
VIIISEMESTER(INTERNSHIP)						

Note: Maximum of 30% of all skills/procedures can be performed by students in skill lab/simulation lab for allclinical nursing Courses except Community Health Nursing and Mental Health Nursing in which the percentageallowedisonly 10%

*–Whenthestudentisfoundcompetenttoperformtheskill,itwillbesignedby thefaculty/tutor.

Students: Students are expected to perform the listed skills/competencies many times until they reach level 3 competency,afterwhichthe preceptor signsagainst eachcompetency.

Preceptors/faculty: Mustensurethatthesignatureisgivenforeachcompetency onlyaftertheyreachlevel3.

- Level3competencydenotesthatthestudentisabletoperformthatcompetencywithoutsupervision
- Level2Competencydenotesthatthestudentisabletoperformeachcompetencywithsupervision
- Level1competencydenotesthatthestudentisnotabletoperformthatcompetency/skillevenwithsupervision

SignatureoftheFacultyCoordinator **SignatureoftheHOD/Principal**

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CLINICALREQUIREMENTS

S.No.	ClinicalRequirement	Date	Signature of theFaculty
	I&IISEMESTER		
	NURSINGFOUNDATIONI&II		
1	History Taking – 21. 2.		
2	Physical Examination – 21. 2.		
3	Fallriskassessment –2		

S.No.	ClinicalRequirement	Date	Signature of theFaculty
	1. 2.		
4	Pressure Sore Assessment – 21. 2.		
5	Nursing Process – 21. 2.		
6	Completionoffirstaidmodule		
7	CompletionofHealthassessmentmodule		
III	**SEMESTER–ADULTHEALTHNURSINGI**		
	Medical		
1	CareStudy –1		
2	Healtheducation–1		
3	Clinicalpresentation/carenote–1		
	Surgical		
4	Carestudy–1		
5	Healtheducation–1		
6	ClinicalPresentation/Carenote –1		
	Cardiac		
7	Cardiacassessment –1		
8	Drugpresentation –1		
	Communicable		
9	Clinicalpresentation/Carenote –1		
	Musculoskeletal		
10	Clinicalpresentation/Carenote –1		
	OR		
11	Assist as circulatory nurse – 5i. ii.i ii.i v. v.		
12	Assist as scrub nurse in minor surgeries – 5i. ii.		

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S.No.	ClinicalRequirement	Date	Signature of theFaculty
	iii. iv. v.		
13	Positioning & draping – 5i. ii.i ii.i v. v.		
14	Assist as scrub nurse in major surgeries – 5i. ii.i ii.i v. v.		
15	CompletionofBCLS module		
IV	**SEMESTER–ADULTHEALTHNURSINGII**		
	ENT		
1	ENT assessment of an adult – 2i. ii.		
2	ObservationandactivityreportofOPD		
3	Clinicalpresentation –1		
4	DrugBook		
	EYE		
5	Eyeassessment i. Adult–1 ii. Geriatric–1		
6	Patient-teaching–1		
7	ClinicalPresentation–1		
	NEPHROLOGY&UROLOGY		
8	Assessment of adult – 1AssessmentofGeriatric–1		
9	Drugpresentation –1		
10	Carestudy/Clinicalpresentation–1		
	BURNSANDRECONSTRUCTIVESURGERY		

S.No.	ClinicalRequirement	Date	Signature of theFaculty
11	Burn wound assessment –		
12	1Clinical presentation –		
13	1ObservationreportofBurnsunit		
14	Observecosmetic/reconstructiveprocedures		
	NEUROLOGY		
15	Neuro-assessment – 2i ii.		
16	Unconsciouspatient–1		
17	Care study/case presentation –		
18	1Drugpresentation–		
	1**IMMUNOLOGY**		
19	Assessmentofimmunestatus		
20	Teachingofisolationtopatient		
21	andfamilycaregiversNutritional management		
22	CareNote –1		
	ONCOLOGY		
23	Observationreportofcancerunit		
24	Assessment of each system cancer patients –		
25	2Carestudy/clinicalpresentation– 1		
26	Pre and post-operative care of patient with various modes of cancertreatmentsuchaschemotherapy,radiationtherapy,surgery,BMT,etc. –3(at least)i. ii. ii.		
27	TeachingonBSEtofamily members		
	EMERGENCY		
28	Primaryassessmentofadult–1		
29	Immediate care (IV access establishment, assisting in intubation,suction,etc.)		
30	Useofemergencytrolley		
	CRITICALCARE		
31	Assessmentofcriticallyill i. Adult ii. Geriatric		

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S.No.	ClinicalRequirement	Date	Signature of theFaculty
32	Carenote/Clinicalpresentation–1		
	GERIATRIC		
33	Geriatricassessment–1		
34	Care note/clinical presentation –		
35	1Fallrisk assessment1		
36	Functionalstatusassessment–1		
37	CompletionofFundamentalsofPrescribingmoduleCo		
38	mpletionofPalliative care module		
V &VISEMESTER –CHILDHEALTHNURSINGI&II			
	Pediatricmedical		
1	Nursingcareplan–1		
2	Casepresentation –1		
3	Healthtalk–1		
	Surgical		
4	Nursingcareplan–1		
5	Casestudy/presentation–1		
	OPD/ImmunizationRoom		
6	GrowthandDevelopmentalstudy: i. Infant– 1 ii. Toddler– 1 iii. Preschooler–1		
	NICCU/PICU		
7	Newbornassessment–1		
8	NursingCarePlan–1		
9	Kangaroomothercare–2		
10	Nursingcareplanof highrisknewborn –1		
11	CompletionofENBCmodule		
12	CompletionofFNBCmodule		
13	CompletionofIMNCImodule		
14	CompletionofPLSmodule		
V&VISEMESTER –MENTALHEALTHNURSINGI&II			
	PsychiatryOPD		
1	History taking and Mental status examination – 2i.		

S.No.	ClinicalRequirement	Date	Signature of theFaculty
	ii.		
2	Healtheducation–1		
3	ObservationreportofOPD		
	Childguidanceclinic		
4	Casework –1		
	InpatientWard		
5	Casestudy –1		
6	Careplan– 2		
7	Clinicalpresentation1		
8	Processrecording2		
9	Maintaindrugbook		
	Communitypsychiatry&Deaddictioncentre		
10	Casework –1		
11	Observationreportonfieldvisits		
12	Visittodeaddictioncentre		
	V SEMESTER – COMMUNITY HEALTH NURSING – IINCLUDINGENVIRONMENTALSCIENCE&EPIDEMIOLOGY		
1	Communityneedsassessment/survey(Rural/Urban) –1		
2	Visitsto – SC/HWC – PHC – CHC		
3	Observation of nutritional programsAnganwadi		
4	**Observationvisits**		
	i. WaterpurificationsiteandWaterqualitytests		
	ii. Milkdiary		
	iii. Slaughter-house		
	iv. Market		
	v. Sewagedisposalsite		
	vi. Rainwaterharvesting		
	vii. Slaughter-house		
5	Nutritionalassessment–Adult1		
	6 Individualhealthteaching –Adult1		

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S.No.	ClinicalRequirement	Date	Signature of theFaculty
7	UseofAVaids–flashcards/posters/flannelgraphs/flipcharts(AnyTwo) i. ii. Healthassessmentof		
8	i. Woman–1 ii. Infant/underfivechild– 1 iii. Adolescent–1 iv. Adult–1 Growth monitoring of children under five –		
9	1Documentation		
10	i. Individualrecords–1 ii. Family records– 1Investigationofanepidemic–1		
11	Screeningandprimarymanagementof		
12	i. Communicablediseases–1 ii. NCD – 1Homevisits–2		
13	Participation in national health programs –		
14	2Participationinschoolhealthprogram–1		
15	**VSEMESTER–EDUCATIONALTECHNOLOGY/NURSINGEDUCATION**		
1	Microteaching –2		
	i. Theory – 1 ii. Practical/lab– 1		
2	Field Visit to nursing educational institution – regional/nationalorganization		
	VISEMESTER–NURSINGMANAGEMENT&LEADERSHIP		
1	FieldvisittoHospital–regional/nationalorganization		
VI	**&VIISEMESTER–MIDWIFERY/OBSTETRICSANDGYNECOLOGY (OBG)NURSINGI&II**		
1	Antenatalassessmentandcare–20		
2	Postnatalassessmentandcare–15		
3	Assessmentoflabourusingpartograph–10		
4	Pervaginalexamination –10		
5	Observingnormalchildbirths/deliveries–10		
6	Assistinginconductionofnormalchildbirth –10		
7	Conductionofnormaldeliveries –10		

S.No.	ClinicalRequirement	Date	Signature of theFaculty
8	Assisting in abnormal/instrumental deliveries –		
9	5Performing placental examination –		
10	5Episiotomy and suturing (only if indicated)–		
11	3Assist/observe Insertionof PPIUCD–2		
12	Newborn assessment –		
13	10Newborn resuscitation		
14	– 5Kangaroomothercare–		
	2		
15	**NursingCarePlan/ClinicalpresentationwithDrugStudy** *Antenatalcare* Normal(careplan) –1		
16	Highrisk(casestudy/Clinicalpresentation)–1		
	Intrapartumcare		
17	Highrisk(Clinicalpresentation) –1 *Postnatalcare*		
	Normal(careplan) –1		
18	Highrisk(Clinicalpresentation) –1		
	Newborncare		
19	Normal(careplan) –1		
	Gynecological		
20	conditionCareplan – 1		
21	Health talk – individual/group –		
22	2Counselingmothersandfamilymembers Visitto •Peripheralhealthfacility/Laqshyacertifiedlabourroom		
23	•Infertilitycentre(Virtual/videos)C		
24	ompletion of SBA		
	moduleCompletionofsafedelivery app		
	VII SEMESTER–COMMUNITYHEALTHNURSINGII		
1	Screeningandprimarymanagementofof i. Minorailments–2 ii. Emergencies–1 iii. Dentalproblems–1		
	iv. Eye–1 v. ENT –1		

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2	Primarymanagementandcarebasedonprotocolsapproved byMO H&FW (Home/healthcentre)

S.No.	ClinicalRequirement	Date	Signature of theFaculty
3	Screeningandprimarymanagementof i. Highriskpregnancy ii. Highriskneonate		
4	Assessmentof i. Antenatal–1 ii. Intrapartum– 1 iii. Postnatal–1 iv. Newborn–1		
5	Conductionofnormalchildbirthanddocumentation–2		
6	Immediatenewborncareanddocumentation –1		
7	Familyplanningcounseling–1		
8	Grouphealtheducation(Rural/urban)–1		
9	Adolescentcounseling–1		
10	Familycasestudy(Rural/urban)–1		
11	Screening,diagnosis,primarymanagementandreferralofclientswithoccupationalhealth problems–2 i. ii.		
12	Healthassessment(physical&nutritional)ofelderly–1		
13	Mentalhealthscreeningsurvey–1		
14	**Groupproject–**Communitydiagnosis(datamanagement)		
15	Writingreportonhealthcentre activity–1		
16	Participation in organizing and conducting under five/antenatalclinic/healthcamp– 2 i. ii.		
17	Participationindisastermockdrills		
18	Fieldvisits - Biomedicalwastemanagementsite - AYUSHcentre - Industry - Geriatrichome		
19	Report on interaction with MPHW/HV/ASHA/AWWs (Any 2)1. 2.		
VIISEMESTER–NURSINGRESEARCH			
1	Research Project – Group/IndividualTitle:		

SignatureoftheFacultycoordinator **SignatureoftheHOD/Principal**

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CLINICALEXPERIENCEDETAILS

NameofICU	ClinicalCondition	Numberofdayscare given	Signatureof Faculty/Preceptor

SignatureoftheFacultyCoordinator **SignatureoftheHOD/Principal**

Amity College of Nursing

Post Basic Bachelor of Science Nursing

FLEXILEARN

-Freedom to design your degree



Curriculum & Scheme of Examination

2023

AMITY UNIVERSITY HARYANA

GURUGRAM

NUTRITON AND DIETETICS

Course Code: NUR2106 **Credit Unit-04**

Course Description: This course is designed to provide the students with a wide knowledge of dietetics in Indian setting, that the practices of teaching optimum and realistic dietary planning can become an integral part of Nursing Practices.

OBJECTIVES

At the end of the course, the student will:

1. Explain the principles and practices of nutrition and dietetics.
2. Plan therapeutic diets in different settings.
3. Identify nutritional needs of different age groups and plan diet accordingly.
4. Prepare meals using different methods utilizing cookery rules.
5. Prepare recommended meals according to the disease conditions of the patients.

Course Contents

Module I

- Introduction to nutrition and dietetics.
- Balanced diet, factors on which it depends.
- Factors to be considered in planning.
- Guides available for planning.
- Food hygiene, preparation and preservation.
- Review of nutrients – micro & macro.

Module II

- Introduction to diet therapy.
- Routine hospital diets.
- Therapeutic diet under each Module i.e. Cardiovascular diseases, gastrointestinal diseases, renal disorders, endocrine and metabolic disorders, allergy, infections and fevers, pre and post operative stages, deficiency diseases and malnutrition, overweight and underweight.

Module III

- Infant and child nutrition.
- Feeding of normal infants: factors to be considered in planning nutritional requirements.
- Feeding of premature infants: factors to be considered in panning nutritional requirements.
- Supplementary feeding of infants: Advantage and method of introduction.
- Weaning, effects on mother and child.
- Psychology of infant and child feeding.
- Feeding the sick child. Diet in diseases of infancy and childhood.
- Deficiency status – Malnutrition and under nutrition.
- Feeding pre-school child: Nutritional needs, factors to be considered in planning diets. Problems in feeding.
- School lunch programme: Advantage, need in India.

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Module IV

- Community nutrition: need for Community nutrition programme.
- Nutritional needs for special groups: Infant, child, adolescent, pregnant woman, lactating mother and old people.
- Substitutes for non-vegetarian foods.
- Selection of cheap and nutritious foods. Nutrition education needs and methods.
- Methods of assessing nutritional status of individual / group / Community.
- Current nutritional problems and national programmes.

PRACTICUM

I. ***Methods of cooking and cookery rules***.

1. Simple preparation of beverages, soups, cereals and pulses, eggs, vegetables, meat.
2. Menu plans.

II. ***Preparation of supplementary food for infants.***

1. Foods for toddlers.
2. Low cost nutritious dishes for vulnerable groups.
3. Dietary case study of patient on special diet planning of low cost dietary instructions for home adaptations.
4. Planning of therapeutic diets.

Examination Scheme:

Components	ATT	HA	CT	SE	EA	EE
Weightage(%)	5	5	5	5	5	75

ATT-Attendance; HA-Home Assignment; CT-Class Test; SE-Sessional Examination; EA- Extracurricular activity; EE- End Semester Examination

Text & References:

Text

1. Swaminathan M., *Hand Book of Food and Nutrition*, Bangalore printing and publishing Co., 1970, Bangalore.
2. Anderson, *Nutrition in Nursing*, Lippincott Co., 1972, Philadelphia.
3. Joshi V.D., *Hand Book of Nutrition and Dietetics*, Vora Medical Publications, Bombay

References

1. Antia, E. P., *Clinical Dietetics and Nutrition*, Oxford University Press, 1995, New Delhi.
2. Corrine H Robinson, *Normal and Therapeutic Nutrition*, Oxford and IBH Publications.
3. Sue Rodwell Williams, *Nutrition and Diet Therapy*, C.V Mosby and Co., 1977.
4. Patwardhan V. N., *Nutrition in India*, 1961.
5. Hervietta Flick, *Introduction to Nutrition*, Mac Millon Publishing Co., 1970.
6. Lenna F. Copper, *Nutrition in Heath and Disease*, J.B Lippincott Co., Philadelphia.

* Latest editions of all the suggested books are recommended.

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MEDICAL SURGICAL NURSING

Course Code: NUR2108 **Credit Unit-08**

Course Description: The purpose of this course is to widen the students' knowledge and develop proficiency in caring for patients with medical surgical problems. This course includes review of relevant Anatomy and Physiology, Pathophysiology in Medical-Surgical disorders and Nursing management of these conditions.

OBJECTIVES

At the end of the course, the student will:

1. Explain relevant Anatomy and Physiology of various systems of the body.
2. Explain Pathophysiology of various disorders.
3. Explain the actions, side effects and Nursing implications in administering drugs for various disorders.
4. Discuss the recent advancement in the treatment and care of patients with medical surgical conditions.
5. Develop skill in giving comprehensive Nursing care to patients following the steps of Nursing process.
6. Assist the patients and their families in identifying and meeting their own health needs.
7. Appreciate the role of the nurse in the medical surgical health term.

Course Contents

Module I

- Introduction to Medical Surgical Nursing.
- Review of concepts of comprehensive Nursing care in medical surgical conditions.
- Nurse, patient and his/ her family.
- Functions of Nurse in the Outpatient Department.
- Intensive care Module.

Module II

- Nursing management of patient with specific problems:
  - Fluid and electrolyte imbalance.
  - Dyspnea and cough, Respiratory obstruction
  - Fever
  - Shock
  - Unconsciousness
  - Pain
  - Acute illness
  - Chronic illness
  - Terminal illness
  - Age related illness
  - Patient undergoing surgery
  - Incontinence.

Module III

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- Nursing management of patient with Neurological and Neurosurgical conditions.
- Review of Anatomy and Physiology of the Nervous System.
- Pathophysiology, diagnostic procedures and management of-
    - Cerebra-vascular accident.
    - Cranial spinal and peripheral Neuropathies.
    - Headache and intractable pain.
    - Epilepsy.
    - Infectious and inflammatory diseases and trauma of the Nervous System.
    - Common disorders of the system.
    - Recent advances in diagnostic and treatment modalities.
    - Drugs used in these disorders.
    - Tumors of brain & Spinal card, congenital malformations, degenerative diseases.

Module IV

- Nursing management of patient with Cardiovascular problems.
- Review of relevant Anatomy and Physiology of Cardiovascular system.
- Pathophysiology, diagnostic procedures and management of:
    - Ischemic Heart diseases
    - Cardiac arrhythmias
    - Congestive heart failure
    - Rheumatic and other valvular heart diseases
    - Endocarditis, cardiomyopathies, congenital heart diseases, hypertension, heart block
    - Cardiac emergencies: Cardiac Arrest, acute pulmonary oedema, cardiac tamponade, cardiogenic shock, aneurysms and peripherovascular disorders, recent advancement in cardiology.

Module V

- Nursing management of patient with respiratory problems.
- Review of Anatomy and Physiology of respiratory system Pathophysiology, diagnostic procedures and management of upper respiratory tract infections:
    - Bronchitis
    - Asthma
    - Emphysema, Empyema, Atelectasis, COPD
    - Bronchiectasis
    - Pneumonia
    - Pulmonary tuberculosis
    - Lung abscess
    - Pleural effusion
    - Tumours and cysts
    - Chest injuries
    - Respiratory arrest and insufficiency
    - Pulmonary embolism
    - Drugs used in the management of these patients
        - Special respiratory therapies.

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Module VI

- Nursing management of patient with Genito-urinary problems.
- Review of Anatomy and Physiology of the Genito-urinary System
  - Nephritis
  - Renal calculus
  - Acute renal failure
  - Chronic renal failure
  - End stage renal disease.
- Special procedures, dialysis, renal transplant.
- Drugs used in management of these patients.
- Congenital disorders, urinary infections.
- Benign prostate hypertrophy.

Module VII

- Nursing management of patients with problems of the digestive systems.
- Review of Anatomy and Physiology of gastrointestinal system and accessory organs.
- Pathophysiology, diagnostic procedures and management of :
  - G.I. Bleeding
  - Peptic ulcer
  - Infections
  - Acute abdomen
  - Colitis, diarrhea, dysentery & mal-absorption syndrome.
  - Cholecystitis
  - Hepatitis, hepatic coma and cirrhosis of liver
  - Portal hypertension
  - Pancreatitits
  - Tumors, Hernias, Fistulas, Fissures, Hemorrhoids.

- Drug used in the management of these patients.

Module VIII

- Nursing management of patients with endocrine problems.
- Review of Anatomy, Physiology and Pathophysiology of patient with:
  - Thyroid disorders
  - Diabetes mellitus
  - Diabetes insipidus
  - Adrenal tumour
  - Pituitary disorders
  - Diagnostic procedures.

- Nursing management of patient with above problems.
- Drug used in Endocrine problems.

Module IX

- Nursing management of patient with musculoskeletal problems.
- Review of anatomy, Physiology and Pathophysiology:
  - Arthritis Osteomyelitis, Bursitis

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- Fractures, dislocation and trauma
- Prolapsed disc
- Osteomalacia and osteoporosis
- Tumor
- Amputation.

- Diagnostic procedures
- Nursing management of patient with above problems.
- Prosthesis and Rehabilitation.
- Transplant & replacement surgeries.

Module X

- Nursing management of patient with disorders of female reproductive tract.
- Disorder of menstruation.
- Infections of the genital tract.
- Benign and malignant tumors of the genital tract.
- R.V.F., V.V.F.
- Climacteric changes and associated problems.

Module XI

- Nursing management of patient with Oncological disorders.
- Types of Neoplasms and related Pathophysiology.
- Diagnostic procedures.
- Modalities of treatment and nurse's role.
- Special therapies – Chemotherapy and Radiotherapy
- Preventive measures, other therapies.

Module XII

- Nursing management of patient with burns.
- Nursing management of patient with reconstructive surgeries.

Module XIII

- Nursing management of patient with common communicable diseases & STD'S.
- Nursing management of patient with immunological disorders including HIV/AIDS.

Module XIV

- Nursing management of patient with diseases of eye, ear, nose, throat & skin.

Module XV

- Nursing management of patient with blood disorders
- Review of Anatomy & Physiology of Blood & Blood products.
- Pathophysiology, diagnostic procedures and management of blood disorders:
  - Anemia
  - Leukemia
  - Bleeding disorders
    - Hemophilia
    - Purpura etc.

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- Blood transfusion, safety checks, procedure and requirements. Management of adverse transfusion reaction, records for blood transfusion.
- Management and counseling of blood donors, phlebotomy procedure, and post donation management.
- Blood bank functioning and hospital transfusion committee
- Bio-safety and waste management in relation to blood transfusion.

Module XVI

- Nursing in emergencies.
- Cardiac emergencies.
- Trauma.
- Poisoning.
- Crisis management: Thyroid crisis, Hypertensive crisis and Adrenal crisis.

Examination Scheme:

Components	ATT	HA	CT	SE	P/S	EE
Weightage (%)	5	5	5	5	5	75

ATT-Attendance; HA-Home Assignment; CT-Class Test; SE-Sessional Examination; P/S-Presentation/Seminar; EE- End Semester Examination

Text & References:

Text

1. Chintamani, Lewis's Medical Surgical Nursing, Assessment and Management of Clinical Problems, Adapted for South Asian Curriculum; 2011, New Delhi, Elsevier,
2. Joyce M. Black & Jane Hokanson Hawks, Medical Surgical Nursing, 7th Edition, Year 2004, Saunders (imprint of device)

References

1. Phippe, Manohar, Saids et al. Medical Surgical Nursing – Health and Illness perspectives, 7th Edition, Year 2003 Mosby (Elsevier).
2. Beare-Myers-Adults Health Nursing 3rd Edition, Year 1998 Mosby.
3. Saundra M Nettina- The Lippincott Manuel of Nursing Practice, 6th Edition, Year- 1991, Lippincott.
4. Brunner & Doris Smith Suddarth, Text Book of Medical Surgical Nursing, J.B. Lippincott Company.
5. Ansari, Javed. A textbook of Medical Surgical Nursing II, Year 2013, S.Vikas and Company India (Pee Vee)
6. Jean Luckman-Saunders, Manual of Nursing Care Year 1997, W.B. Saunders Company.
7. Donna D. Jgmataromis & M Linda workman Medical Surgical Nursing, Year- 2002. L.B. Saunders Company.

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MEDICAL SURGICAL NURSING (PRACTICAL)

Course Code: NUR2110 **Credit Unit-11**

This Course is based on Course Code NUR2108
Guidelines

1. Students should be rotated in the selected medical & surgical areas, like Cardio Thoracic, Neurology, Urology, Orthopedics, Gynecology, Oncology, and Burns and Reconstructive surgical Modules.
2. The students should be given patient assignment. They have practices patient centered comprehensive Nursing.
3. Each student is requested to give planned health teachings, conduct clinical teaching, case presentation and drug study.

Examination Scheme:

Components	P/S	NCS	NCP	HE	CE	SPE	EPE
Weightage (%)	20	15	30	5	20	10	100

P/S-Presentation/Seminar; NCS-Nursing Case Study; NCP- Nursing Care plan; HE- Health Education; CE-Clinical Evaluation; SPE-Sessional Practical Examination; EE- External Practical Examination

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MATERNAL NURSING

Course Code: NUR2208 **Credit Unit-05**

Course Description: This course is designed to widen the student's knowledge of obstetrics during pregnancy, labour and puerperium. It also helps to acquire knowledge and develop skill in rendering optimum Nursing care to a child bearing mother in a hospital or Community and help in the management of common gynecological problems.

OBJECTIVES

At end of the course, the student will:

1. Describe the Physiology of pregnancy, labour and puerperium.
2. Manage normal pregnancy, labour and puerperium.
3. Explain the Physiology of lactation and advice on management of breast feeding.
4. Be skilled in providing pre and post operative Nursing care in obstetric conditions.
5. Identify and manage high risk pregnancy including appropriate referrals.
6. Propagate the concept and motivate acceptance of family planning methods.
7. Teach, guide and supervise auxiliary midwifery personnel.

Course Contents

Module I

- Introduction and historical review.
- Planned Parenthood.
- Maternal morbidity and mortality rates.
- Legislations related to maternity benefits, MTP acts, incentives for family planning etc.

Module II

- Review of the Anatomy and Physiology of female reproductive system.
- Female pelvis (normal and contracted).
- Review of Foetal development.

Module III

- Physiology and management of pregnancy, labour and puerperium.
- Signs and symptoms and diagnosis of pregnancy.
- Antenatal care.
- Pregnant woman with HIV/ AIDS.
- Management of common Gynecological problems.

Module IV

- The new born baby.
- Care of the baby at birth including resuscitation.
- Essential newborn care:
  - Feeding
  - Jaundice and infection
  - Small & large for date babies.
  - Intensive care of the new born
  - Trauma and hemorrhage.

Module V

- Management of abnormal pregnancy, labour and puerperium.
- Abortion, ectopic pregnancy and vesicular mole.

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- Pregnancy induced hypertension, gestational diabetes, anaemia, heart disease.
- Urinary infection, Antepartum haemorrhage.
- Abnormal labour (malposition & malpresentation):
  - Uterine inertia
  - Disorders of puerperium
  - Management of engorged breast, cracked nipples, breast abscess and mastitis
  - Pueperal sepsis
  - Post partum haemorrhage
  - Inversion and prolapsed of uterus, obstetrical emergencies
  - Obstetrical operation i.e. forceps, vacuum, episiotomy, caesarean section.

Module VI

- Drugs in obstetrics.
- Effects of drugs during pregnancy, labour and puerperium on mother & body.

Module VII

- National Welfare Programmes for Women.
- National Family Welfare Programme.
- Infertile Family.
- Problems associated with unwanted pregnancy.
- Unwed mothers.

Examination Scheme:

Components	ATT	HA	CT	SE	P/S	EE
Weightage (%)	5	5	5	5	5	75

ATT-Attendance; HA-Home Assignment; CT-Class Test; SE-Sessional Examination; P/S-Presentation/Seminar; EE- End Semester Examination

Text & References:

Text

1. Dawn C.S, *Text Book of Gynaecology & Contraception*, Dawn books, 1994, CIT Road, Calcutta.
2. Dutta D. C., *Text Book of Gynaecology*, New central book agency Ltd., Calcutta.
3. Myles Margaret, *Text Book of Midwifes*, Educational low priced books scheme, British Government

Reference Books

1. Dawn C.S, *Text Book of Obstetrics*, New central book agency Ltd., Calcutta.
2. Hawkins & Borune, Shaw's, *Text Book of Gynaecology*, B.I. Chrchill Livingstone Pvt. Ltd.

*Latest editions of all the suggested books are recommended.

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PAEDIATRIC NURSING

Course Code: NUR2209 **Credit Unit-05**

Course Description: This course is aimed at developing an understanding of the modern approach to child care, the common health problems of children and neonates in health and sickness.

OBJECTIVES

At the end of the course, the student will:

1. Explain the modern concept of child care and the principles of Paediatric Nursing.
2. Describe the normal growth and development of children at different ages.
3. Manage sick as well as healthy neonates and children.
4. Identity various aspects of preventive Paediatric Nursing and apply them in providing Nursing care to children in hospital and Community.

Course Contents

Module I

- Introduction.
- Modern concept of child care.
- Internationally accepted rights of the child.
- National policy and legislations in relation to child health and welfare.
- National programmes related to child health and welfare.
- Changing trends in hospital care, preventive, promotive and curative aspects of child health.
- Child morbidity and mortality rates.
- Differences between an adult and child.
- Hospital environment for a sick child.
- The role of a Paediatric Nurse in caring for a hospitalized child.
- Principles of Pre and Post operative care of infants and children.
- Paediatric Nursing procedures.

Module II

- The healthy child.
- Growth and development from birth to adolescence.
- The needs of normal children through the stages of development and parental guidance.
- Nutritional needs of children & infants breast- feeding, supplementary/ artificial feeding and weaning.
- Accidents, causes and prevention.
- Value of play selection of play material.
- Preventive immunization.

Module III

- Nursing care of a neonate.
- Nursing care of a normal newborn.
- Neonatal resuscitation.
- Nursing management of a low birth weight body.
- Nursing management of common neonatal disorders.
- Organization of neonatal Module. Preventive of infections in the nursery.

Module IV

- Nursing management in common childhood diseases.
- Nutritional deficiency disorders.
- Reparatory disorders and infections.

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- Gastrointestinal infections, infections and congenital disorders.
- Cardio vascular problem-congenital defects and rheumatic fever.
- Genito-urinary disorder – Nephritic syndrome, Wilms' tumor, infection and congenital disorders.
- Neurological infections and disorders- convulsions, epilepsy, meningitis, hydrocephalus, spinabifida.
- Hematological disorders – Anemias, Thalassemia, ITP, Leukemia, hemophilia.
- Endocrine disorders – Juvenile Diabetes Mellitus.
- Orthopedic disorders – club feet, hip dislocation and fracture.
- Disorders of skin eye and ears.
- Common Communicable Diseases in children, their identification, Nursing management in hospital and home and prevention.
- Paediatric emergencies – poisoning, foreign bodies, haemorrage, burns and drowning.

Module V

- Management of behavioral disorders in children.
- Management of challenged children:
  - Mentally challenged
  - Physically challenged
  - Socially challenged.

Examination Scheme:

Components	ATT	HA	CT	SE	P/S	EE
Weightage (%)	5	5	5	5	5	75

ATT-Attendance; HA-Home Assignment; CT-Class Test; SE-Sessional Examination; P/S-Presentation/Seminar; EE- End Semester Examination

Text & References:

Text

1. Marlow R., *Child Health for Nurses*, 6th edition, W.B. Saunders Company, New Delhi, 2002
2. Parthasarathy A., *Text Book of Paediatrics*, 3rd edition, Jaypee Brothers, New Delhi, 2006.
3. Lippincott, *Lippincott manual of nursing practice*, 6th edition, , Lippincott publishers, Philadelphia. 1996

References

1. Behrman, Richard K & Vaughan, Nelson,s, *TextBook of Paediatrics*, WB Saunders Co.,
2. Barbara EW, *Guidelines in the Care of the Low Birth Weight*, Orient Longman
3. Aravind. R., *Applied Neonatology*, 1st edition, Jaypee brothers medical publication, New Delhi, 2006.
4. Guha.K, *Neonatology-Principles and practice*, 3rd edition, Jaypee publication, New Delhi, 2005.
5. Singh Meharban, *Care of the Newborn*, 6th edition, Sagar publications, New Delhi, 2004.
6. Ghai .O.P, *Essential Pediatric*, 6th edition, CBS Publishers, Bangalore, 2006
7. Gupta .S, *Essential Text Book of Paediatrics*, Jaypee Brothers Publishers Pvt. Ltd., 7th edition, 1995.
8. J.M. Chellapa, *Paediatric Nursing*, Gajanana Book Publishers and Distributors, Delhi, 1995.

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* Latest editions of all the suggested books are recommended.

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MATERNAL NURSING (PRACTICAL)

Course Code: NUR2211 **Credit Unit-10**

This Course is based on Course Code NUR2208
Guidelines

1. The student will:
   a. Be posted in antenatal Clinic, MCH clinic, antenatal ward, labour room, postnatal ward, maternity OT, MTP room.
   b. Visit welfare agencies for woman and write observation report.
   c. Follow Nursing process in providing care to 3-6 patients.
   d. Write at least two Nursing care studies and do a presentation.
   e. Give at least one planned health teaching to a group of mothers.
2. Practices following Nursing procedures -
   a. Antenatal & Post natal examination, per vaginal exam.
   b. Conduct normal delivery, stitching of episiotomy, (for male candidate minimum conduct of 5 deliveries)
   c. Motivation of family for adopting family planning methods.
   d. Motivate family for Planned Parenthood.
   e. Assist in various diagnostic and therapeutic procedures including IUD insertion and removal.

Examination Scheme:

Components	ANC	NCP (PNC)	P/S	HE	NCS	CE	SPE	EPE
Weightage (%)	10	10	10	10	10	40	10	100

ANC-Antenatal case; NCP- Nursing Care plan; PNC-Post natal case; P/S-Presentation//Seminar; HE-Health Education; NCS- Nursing Case Study; CE- Clinical Evaluation; SPE- Sessional Practical Examination; EPE-External Practical Exam

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PAEDIATRIC NURSING (PRACTICAL)

Course Code: NUR2212 **Credit Unit-10**

This Course is based on Course CodeNUR2209

Guidelines
The student will:

1. Be posted in Pediatric Medical and Surgical wards, OPD in hospital, health centre and neonatal unit.
2. Visit a centre for handicapped children and child welfare centre and write observation report.
3. Write an observational study of normal children of various age groups in home/ nursery school/ crèche.
4. Follow Nursing process in providing care to 3-6 children.
5. Write at least two Nursing care studies and do a presentation.
6. Give two planned health teachings, one in hospital and one in OPD / health centre.
7. Practice the following Nursing procedures:
    - Taking pediatric history
    - Physical assessment of children
    - Baby bath
    - Feeding
    - Restraining.
8. Calculation of dosage of drugs and administration of medications and injections.
9. Collection of specimens.
10. Enema, bowel wash, colostomy irrigation.
11. Steam and oxygen inhalation.
12. Preparation to assist with diagnostic tests and operations.
13. Examination / Assessment of a newborn.
14. Neonatal resuscitation.
15. Care of a baby in incubator and on ventilator.
16. Photo Therapy.
17. Assist in exchange transfusion and other therapeutic procedures.

Examination Scheme:

Components	NCP	HE	NCS/P	GDA	CE	SPE	EPE
Weightage (%)	10	10	20	10	30	20	100

NCP-Nursing Care Plan; HE- Health Education; NCS/P-Nursing Case Study/Presentation; GDA-Growth & Development Assessment; SPE-Sessional Practical Examination; CE- Clinical Evaluation; EPE- End Semester Practical Examination

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COMMUNITY HEALTH NURSING (PRACTICAL)

Course Code: NUR2308 **Credit Unit-10**

This Course is based on Course Code NUR2306
Guidelines

1. Each student will prepare a Community profile.
2. The student will be allotted families for gaining experience in identifying family health needs, health counseling and guidance and family budgeting for optimum health.
3. The student will participate in the activities of primary health centre.
4. Sub-centre, MCH centre.
5. Visits will be made to selected health and welfare agencies, water purification plant and sewage disposal plant, infectious disease hospital, child welfare centre, old aged homes, orphanages and handicapped hospitals.
6. Conduct health educational programmes for individual/ groups/ Community.

Examination Scheme:

Components	CHP	CP	FCS	OR	HE	EPE
Weightage (%)	20	10	30	10	30	100

CHP- Community Health project; CP-Community Profile; FCS-Family Case Study; OR-Observation Report; HE-Health Education; EPE-External Practical Exam

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INTRODUCTION TO NURSING RESEARCH AND STATISTICS

Course Code: NUR2407 **Credit Unit-04**

Course Description: The course is designed to assist the students to develop an understanding of basic concepts of Research and Statistics, use the findings of Nursing Research in nursing practices, apply the knowledge in conducting project(S) and solve problems related to nursing using scientific method.

OBJECTIVES

At the end of the course, the students will:

1. Define the terms and concepts of Nursing Research.
2. Identify needs and scope of Nursing Research
3. Identify and define a Research problem
4. Locate and list sources of literature for a specific study
5. Describe different Research approaches, methods of data collection and sampling techniques with a special reference to survey method.
6. Develop tool for data collection.
7. Enumerate steps of data analysis and present data summary in tabular form.
8. Use descriptive and co-relational statistics in data analysis.
9. Conduct a group Research project.

Course Contents

A. INTRODUCTION TO RESEARCH METHODOLOGY

Module I

- Steps of scientific methods.
- Definition of Research.
- Need for Nursing Research.
- Characteristics of good research. Research process.

Module II

- Statement of Research problem.
- Statement of purpose and objectives.
- Definition of Research terms.
- Review of literature.

Module III

- Research approaches: historical, survey and experimental.

Module IV

- Sampling techniques and methods of data collection.
- Sampling.
- Instrument-questionnaire, Interview.
- Observation schedule, records, measurements.
- Reliability and validity of instruments.

Module V

- Analysis of Data, Tabulation:
    - Classification and summarization

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- Presentation
- Interpretation of data.

Module VI

- Communication of research findings.
- Writing report:
  - Organizing materials for writing
  - Format of the report
  - Use of computers.

B. INTRODUCTION TO STATISTICS

Module VII

- Descriptive Statistics.
- Frequency Distribution – Types of measure - frequencies, class interval, graphic methods of describing frequency.
- Measures of Central Tendency – Mode, Median, Mean.
- Measures of variability: Range, Standard deviation
- Introduction to normal probability.

Module VIII

- Correlation.
- Computation by rank difference methods.
- Uses of correlation co-efficient.

Module IX

- Biostatistics: Crude rates and standardized rates, ratio and estimation of the trends.

Module X

- Introduction to computers in Nursing.
- Introduction to Computer and disk – operating system
- Introduction to word processing
- Introduction to data base
- Window application: Word, Excel, Power point, Multimedia.
- Use of statistical packages.
- Introduction to internet & use of electronic mail.
- Computer aided teaching & testing.

Examination Scheme:

Components	ATT	HA	CT	SE	EE
Weightage (%)	5	10	5	5	75

ATT-Attendance; HA-Home Assignment; CT-Class Test; SE-Sessional Examination; EE- End Semester Examination

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Text & References:

Text

1. Polit. D. F. and Hungler, B. P, *Essentials of Nursing Research*, J. B. Lippincott Co., Philadelphia.
2. Basavanthappa B.T, *Nursing Research*, Jaypee Brothers, 2003, New Delhi

References

1. Treece, E. W. and Treece J. W, *Elements of Research in Nursing*, C.V. Mosby Co., St. Louis.
2. Garrrett H.E, *Statistic in Psychology & Education*, Vakils, Feffer and Samons, Bombay.
3. Mahajan B.K, *Methods in Biostatistics*, Jaypee medical publication, 1999, New Delhi.

* Latest editions of all the suggested books are recommended.

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PSYCHIATRIC NURSING (PRACTICAL)

Course Code: NUR2408 **Credit Unit-10**

This Course is based on Course Code NUR2405

Guidelines

The student will be provided opportunity to:

1. Observe, Record and Report the behavior of their selected patients.
2. Record the process of interaction.
3. Assess the Nursing needs of their selected patients, plan and implement the Nursing intervention.
4. Counsel the attendant and family members of patient.
5. Participate in the activities of Psychiatric team.
6. Write observation report after a field visit to the following places:
   - Child guidance clinic.
   - School / Special Schools (For mentally subnormal)
   - Mental Hospital,
   - Community Mental Health Centers.
   - De-addiction and Rehabilitation Centers.

Examination Scheme:

Components	PR	NCP	NCS	MSE	HE	CE	EPE
Weightage (%)	20	20	20	10	10	20	100

PR-Process Recording; NCP-Nursing Care Plan; NCS-Nursing Case Study; MSE- Mental status Examination; HE- Health Education; CE-Clinical Evaluation; EPE-End Term Practical Examination.

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DISSERTATION (NURSING RESEARCH)

Course Code: NUR2437 **Credit Unit-10**

Objectives: During the training the students are expected to learn about research problem, research methodology, research plan, implementation and statistical methods. The knowledge will be utilized for improving the quality of nursing practice and education.

Research Project

Students will conduct research project in selected areas of nursing and submit a report. The studies may include exploring existing health practices, improved practices of nursing procedures, health records, patient records and survey of nursing literature.

Guidelines:

- During the clinical training a student will write a research project work related to the profession of nursing, based on his/her interest.
- Project work would be under the supervision of internal faculty (assigned for guiding the project) appointed by the Principal/Director of college of nursing.
- The research project would be completed and submitted before the completion of fourth semester of the course.
- Before the submission of project the student will be required to make a presentation before the research committee through power point presentation.
- The assessment of performance of student will be totally internal and the research committee will assess the student on the basis of his/her performance.
- There would be mid-term review of the progress of the project before three members of the research committee appointed by the Principal/Director of college of nursing.
- The research project work should cover the following area.
    - Review of literature on the selected topic and reporting
    - Formulation of problem statement, objectives.
    - Research methodology
    - Analysis and interpretation
    - Summary & Conclusion.

Examination Scheme

Components	PP	TP	DAP	GE	Pr R/V (EE)
Weightage (%)	10	10	15	15	50

PP -Proposal Presentation; TP- Tool Presentation; DAP- Data Analysis Presentation; GE- Guides' Evaluation; Pr R/V (EE)-Project Report/Viva (External Examination)

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Curriculum & Scheme of Examination

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NUR4102	Nursing Education (Practical)	L	T	P	C
Pre-requisites/Exposure				**15**	**8**
Co-requisite					

Course Description:

This course is designed to assist students in developing expertise and in - depth knowledge in the field of neurology and neurosurgical Nursing. It will help students to develop advanced skills for nursing intervention in caring for patients with neurological and neurosurgical disorders. It will enable the student to function as neuroscience nurse practitioner/ specialist. It will further enable the student to function as educator, manager and researcher in the field of neurology and neuro-surgical Nursing.

Course Outcomes:

At the end of the course the students will be able to perform the following activities (Practical):

CO1- Framing philosophy, aims and objectives.

CO2-Lesson Planning.

CO3-Micro teaching-2.

CO4-Conduct practice teachings using different teaching strategies -10 (like lecture cum discussion, demonstration- lab method, field trips, seminars, project, role play, panel discussion, clinical methods etc)

CO5-Preparation and utilization of instructional Aids using different media.

CO6-Develop course plans, unit plans, rotation plans.

CO7-Conduct a continuing education workshop.

CO8-Annotated bibliography.

CO9-Critical evaluation of any nursing education program offered by a selected institution.

CO10-Planning and Organizing field visits.

CO11-Educational visits.

CO12-Field visits (INC/SNRC) to get familiar with recognition/registration process.

CO13-Construct, administer and evaluate tools (objective & essay type test, observation checklist, rating scale etc)

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CO14-Observe and practice application of various non-standardized tests (intelligence, Aptitude, personality, Sociometry, physical & mental disabilities tests.)

Course Content

Modules	Blooms level*	Number of hours
Module I: • Framing philosophy, aims and objectives. • Annotated bibliography.	L1, L2 and L3	5
Module II Lesson Planning.	L1,L2, L3	5
Module III Micro teaching-2.	L1, L2 and L3	10
Module IV Conduct practice teachings using different teaching strategies -10 (like lecture cum discussion, demonstration- lab method, field trips, seminars, project, role play, panel discussion, clinical methods etc)	L1,L2, L3, L4 and L5	15
Module V Preparation and utilization of instructional Aids using different media.	L1,L2, L3 and L4	5
Module VI Develop course plans, unit plans, rotation plans.	L1,L2, L3, and L5	5

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Module VII Conduct a continuing education workshop.	L1,L2, L3, L4 and L5	10
Module VIII Critical evaluation of any nursing education program offered by a selected institution.	L3, L4 and L5	10
Module IX Field visits (INC/SNRC) to get familiar with recognition/registration process. Educational visits. Planning and Organizing field visits.	L1,L2, and L3	10
Module X Construct, administer and evaluate tools (objective & essay type test, observation checklist, rating scale etc)	L1,L2, L3,	10
Module XI Observe and practice application of various non-standardized tests (intelligence, Aptitude, personality, Sociometry, physical & mental disabilities tests.)	L1,L2, L3,	10

Text & References:

1. Conley, Virginia C. Curriculum and Instruction in Nursing; Little Brown and Co, London.
2. Heidgerkein LE. Teaching and Learning in Schools of Nursing Delhi; Konark Publishers 1992.
3. Aggarwal J.C, *Principles, Methods & Techniques of Teaching,* Vikas Publishing House
4. Neeraja K.P, Text *Book of Nursing Education*, Jaypee Brothers, New Delhi.
5. Bevis, Em Olivia, *Curriculum Building in Nursing a Process*, C.V Mosby Co., St. Louis. George Kurian Aleyamma,
6. *Principles of Curriculum Development and Evaluation*, Vivekananda Press, 2002.
7. Basavanthappa B.T, *Nursing Education,* Jaypee Brothers, 2005, New Delhi.
8. Bhatia B.D, *Principles and Methods of Teaching*, Doabra House, New Delhi.
9. Billing, Diane M & Halstead, Judith A, *Teaching in Nursing: A Guide for Faculty*, W.B. Saunders.
10. Bloom, Benjamin S Ed, *Taxonomy of Educational Objectives: Cognitive*

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Domain, David Mckay CO., Inc, 1956, New York.

11. Modley Doris M, *Advancing Nursing Education World Wide*, Springer Publishing Co., 1995, New York.

* Latest editions of all the suggested books are recommended.

Additional Texts:

1. Fuszard, Barbara, *Innovating Teaching Strategies in Nursing*, Aspen Publishers Inc, 1989, Maryland.
2. Gay L.R., *Educational Evaluation and Measurement Competencies for Analysis and Application*, Ion, Charles E. Merill Publishers Co., 1985, Columbus.
3. Guilbert. J J., *Educational Handbook for Health Personnel*, World Health Organization, 1982, Geneva.
4. Guinee. Kathleen k, *Teaching and Learning in Nursing*, Macmillan, 1978, New York.
5. Joyce.B, *Models of Teaching*, Prentice Hall Inc, Englewood Cliffs, 1986, New Jersey.
6. Keay F.E., *A History of Education in India and Pakistan*, Oxford University Press, 1964, London.

Other readings:

- ✓ Journal of Nursing Education
- ✓ Journal of Continuing Education in Nursing
- ✓ Journal of Nursing Education and Practice

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Scheme of Examination

Practical:

	Internal- 100				**EE = 100**		
Components	**ATT**	**RM**	**W/ISE**	**PT**	**RM**	**PT**	**RP**

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Weightage (%)	**5**	**25**	**50**	**20**	**25**	**50**	**25**

ATT-Attendance; RM-Resource material; ; PT- Practice teaching; RP- Rotation Plan/construction of test; W/ISE-Workshop/In-service education programme; EE- End Semester Examination

Mapping between COs, PLOs

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	-	1	-	1	1	1	1	-	1
CO2	2	1	2	-	1	1	2	2	1	2	-
CO3	1	1	1	2	-	-		1	1	1	2
CO4	2	2	1	-	1	2	2	2	2	1	-
CO5	2	-	-	2	2	1	2	2	-	-	2
CO6	1	1	-	1	1	1	1	1	1	-	1
CO7	1	1	-	1	-	1	1	1	1	-	1
CO8	2	1	2	-	1	1	2	2	1	2	-
CO9	1	1	1	2	-	-		1	1	1	2
CO10	1	-	1	1	1	1	1	-	1	-	1
CO11	-	1	1	2	2	1	1	2	-	1	1
CO12	2	-	-		1	1	1	1	2	-	-
CO13	-	1	2	2	2	2	2	1	-	1	2
CO14	2	2	1	2	2	-	-	-	2	2	1

1-strongly related; 2-moderately related; 3-weakly related

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NUR4201	Advance Nursing Practice	L	T	P	C
Version 1.1	Date of Approval: November 2011	**15**	**12****		**21**
Pre-requisites/Exposure	NIL				
Co-requisites	NIL				

Course Catalogue: This course is aimed at developing a holistic approach in rendering nursing care to the patients/clients in the hospital as well as in the community respectively by implementing modern trends & methods in nursing profession for the specific protection, promotion, prevention and rehabilitation of the patients/clients.

Course Objectives:

The course is designed to develop an understanding of concepts and constructs of theoretical basis of advance nursing practice and critically analyze different theories of nursing and other disciplines.

Course Outcomes:

On completion of this course students will be able to:

CO1: Describe the History of development of nursing profession, characteristics, criteria of the profession, perspective of nursing profession-national, global

CO2: Explain the Health care delivery system- national, state, district as well as at local level.

CO3: Discuss the Approaches to common genetic disorders

CO4: Describe the Application of epidemiology in health care delivery, Health surveillance and health informatics

CO5: Explain the Bio-Psycho social pathology

CO6: Describe the Philosophy as well as Theories of Nursing along with its implication in health care delivery system.

CO7: Explain Nursing process approach for the individual, family as well as

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community

CO8: Discuss Psychological aspects and Human relations

CO9: Describe the Extended and expanded role of the Nurse in promotive, preventive, curative as well as restorative health care delivery system in community and institutions

CO10: Explain the Computer applications for patient care delivery system as well as in Nursing Practice

Modules	**Blooms level***	**Number of hours**
MODULE 1: **Nursing as a Profession** • History of development of nursing profession, characteristics, criteria of the profession, perspective of nursing profession-national, global • Code of ethics(INC), code of professional conduct(INC), autonomy and accountability, assertiveness, visibility of nurses, legal considerations • Role of regulatory bodies • Professional organizations and unions-self defense, individual and collective bargaining • Educational preparations, continuing education, career opportunities, professional advancement & role and scope of nursing education. • Role of research, leadership and management. • Quality assurance in nursing (INC). • Futuristic nursing.	L1, and L2	10

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MODULE 2: **Health care delivery** • Health care environment, economics, constraints, planning process, policies, political process vis a vis nursing profession. • Health care delivery system- national, state, district and local level. • Major stakeholders in the health care system-Government, non-govt, Industry and other professionals. • Patterns of nursing care delivery in India. • Health care delivery concerns, national health and family welfare programs, inter-sectoral coordination, role of nongovernmental agencies. • Information, education and communication (IEC). • Tele-medicine.	L1,L2, and L3	10
MODULE 3: **Genetics** • Review of cellular division, mutation and law of inheritance, human genome project ,The Genomic era. • Basic concepts of Genes, Chromosomes & DNA. • Approaches to common genetic disorders. • Genetic testing – basis of genetic diagnosis, Pre symptomatic and predisposition testing, Prenatal diagnosis & screening, Ethical, legal & psychosocial issues in genetic testing. • Genetic counselling. • Practical application of genetics in nursing.	L1,L2, L3 and L4	15

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MODULE 4: **Epidemiology** • Scope, epidemiological approach and methods, • Morbidity, mortality, • Concepts of causation of diseases and their screening, • Application of epidemiology in health care delivery, Health surveillance and health informatics • Role of nurse	L1,L2, and L3	15
MODULE 5: **Bio-Psycho social pathology** • Pathophysiology and Psychodynamics of disease causation. • Life processes, homeostatic mechanism, biological and psycho-social dynamics in causation of disease, life style. • Common problems: Oxygen insufficiency, fluid and electrolyte imbalance, nutritional problems, hemorrhage and shock, altered body temperature, unconsciousness, sleep pattern and its disturbances, pain, sensory deprivation. • Treatment aspects: pharmacological and pre- post operative care aspects, • Cardio pulmonary resuscitation. • End of life Care • Infection prevention (including HIV) and standard safety measures, bio-medical waste management. • Role of Nurse- Evidence based Nursing practice; Best practices • Innovations in Nursing.	L1,L2 and L3	15

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MODULE 6: **Philosophy and Theories of Nursing** • Values, Conceptual Models, Approaches. • Nursing theories: Nightingale's, Hendersons's, Roger's, Peplau's, Abdella's, Lewine's, Orem's, Johnson's, King's, Neuman's, Roy's, Watson Parsce, etc and their applications, • Health belief models, communication and management, etc • Concept of Self health. • Evidence based practice model.	L1, L2,L3 and L5	15
MODULE 7: **Nursing process approach** • Health Assessment- illness status of patients/clients (Individuals, family, community), Identification of health illness problems, health behaviors, signs and symptoms of clients. • Methods of collection, analysis and utilization of data relevant to Nursing Process. Formulation of nursing care plans, health goals, implementation, modification and evaluation of care.	L1,L2, and L3	10

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MODULE 8: **Psychological aspects and Human relations** • Human behavior, Life processes & growth and development, personality development, defense mechanisms, • Communication, interpersonal relationships, individual and group, group dynamics, and organizational behavior, • Basic human needs, Growth and development, (Conception through preschool, School age through adolescence, Young & middle adult, and Older adult) • Sexuality and sexual health. • Stress and adaptation, crisis and its intervention, Coping with loss, death and grieving, • Principles and techniques of Counseling.	L1,L2, and L5	15

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MODULE 9: **Nursing practice** • Framework, scope and trends. • Alternative modalities of care, alternative systems of health and complimentary therapies. • Extended and expanded role of the Nurse, in promotive, preventive, curative and restorative health care delivery system in community and institutions. • Health promotion and primary health care. • Independent practice issues: - Independent Nurse-midwifery practitioner. • Collaboration issues and models-within and outside Nursing. • Models of Prevention, • Family Nursing, Home Nursing, • Gender sensitive issues and women empowerment. • Disaster Nursing. • Geriatric considerations in Nursing. • Evidence based Nursing practice- best practices • Trans-cultural Nursing.	L1,L2, and L3	15
MODULE 10: **Computer applications for patient care delivery system and Nursing Practice** • Use of computers in teaching, learning, research and Nursing practice. • Windows, MS office: Word, Excel, Power Point, • Internet, literature search, • Statistical packages, • Hospital management information system: software.	L1,L2, L3 and L4	10

**Bloom's Level:*

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L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Main text

1. Potter A. P. & Perry A. G, *Fundamental of Nursing*, C. V. Mosby Co., 2005, St. Louis.
2. Kozier B. et al, *Fundamentals of Nursing Concepts, Process and Practice, Pearson Education*, Inc, 2004.
3. Brunner and Suddarth, *Text Book of Medical Surgical Nursing*, 2002.
4. Zwemer A, *Professional Adjustments and Ethics for Nurse in India*, BI publications, 1995, Bangalore.
5. Rosdhal, *Fundamentals of Nursing*, Lippincott Co., 2003.
6. Taylor Carol, et al, *Fundamentals of Nursing*, Lippincott Co., 2005.
7. Park J.E., *Text Book of Preventive and Social Medicine,* Banarsidas Bhanot, Jabalpur

* Latest editions of all the suggested books are recommended.

Additional Texts:

1. Basavanthappa B. T, *Nursing Theories*, Jaypee Brothers, 2007, New Delhi.
2. Alligood M. R. & Tomey A. M, *Nursing Theory Utilization and Application,* Mosby, St. Louis.

Other readings:

- ✓ International Journal of Nursing Practice
- ✓ Journal of Advance Nursing
- ✓ International Journal of Research and Analytical Reviews

Web Resources:

- Pub med
- CINAHL(cumulative index to Nursing and allied health literature)
- MEDLINE (Medical Literature Analysis and Retrieval System Online)

Examination Scheme:

Components	ATT	HA	CT	SE	EA	EE
Weightage (%)	5	5	5	5	5	75

ATT-Attendance; HA-Home Assignment; CT-Class Test; SE-Sessional Examination; EA-Extracurricular activity; EE- End Semester Examination

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Concept Mapping between COs, PLOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	1	-	1	-	1	1	1	1	-	1
CO2	2	1	2	-	1	1	2	2	1	2	-
CO3	1	1	1	2	-	-		1	1	1	2
CO4	2	2	1	-	1	2	2	2	2	1	-
CO5	2	-	-	2	2	1	2	2	-	-	2
CO6	1	1	-	1	1	1	1	1	1	-	1
CO7	1	1	-	1	-	1	1	1	1	-	1
CO8	2	1	2	-	1	1	2	2	1	2	-
CO9	1	1	1	2	-	-		1	1	1	2
CO10	1	-	1	1	1	1	1	-	1	-	1
CO11	-	1	1	2	2	1	1	2	-	1	1
CO12	2	-	-		1	1	1	1	2	-	-
CO13	-	1	2	2	2	2	2	1	-	1	2
CO14	2	2	1	2	2	-	-	-	2	2	1
CO15	1	1	1	1	1	1	1	-	1	1	1
CO16	1	-	1	1	1	1	1	-	1	-	1
CO17	-	1	1	2	2	1	1	2	-	1	1

1: strongly related, 2: moderately related and 3: weakly related

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NUR4202	Nursing Research and Statistics	L	T	P	C
Version 1.1	Date of Approval: November 2011	15	6		18
Pre-requisites/Exposure	NIL				
Co-requisites	NIL				

Catalog Description

The course is designed to assist the students to acquire an understanding of the research methodology and statistical methods as a basis for identifying research problem, planning and implementing a research plan. It also enables the students to evaluate research studies and utilize research findings to improve quality of Nursing practice, education and management. It will further enable the students to develop an understanding of the statistical methods and apply them in conducting research studies in Nursing.

Course Objectives

The objective of this course is to

1. to acquire an understanding of the research methodology and statistical methods as a basis for identifying research problem, planning and implementing a research plan.
2. enable the students to evaluate research studies and utilize research findings to improve quality of Nursing practice, education and management.
3. enable the students to develop an understanding of the statistical methods and apply them in conducting research studies in Nursing.

Course Outcomes:

At the end of the course the students will be able to:

CO1. Define the terms used in research

CO 2. Describe concepts of scientific inquiry

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CO 3. Describe research methodology

CO 4. Critically analyze research studies

CO 5. Develop acceptable research proposal

CO 6. Demonstrate initial competency to conduct health related research

CO 7. Write, present, interpret and utilize health related research

CO 8. Write scientific paper for publication

CO 9. Explain basic concepts related to statistics

CO 10. Identify scope of statistics

CO 11. Organize and tabulate the data and present it

CO 12. Use descriptive and inferential statistics to predict the results

CO 13. Apply & interpret measures of central tendency & measures of variance

CO 14. Identify concepts related to probability

CO 15. Use parametric and non- parametric statistical methods.

CO 16. Draw conclusions of the study and to predict statistical significance of the results

CO 17. Describe vital and health statistics and their use

Course Content

Modules	**Blooms level***	**Number of hours**

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Unit I: Introduction Methods of acquiring knowledge – problem solving and scientific method. Research – Definition, characteristics, purposes, kinds of research, Historical Evolution of research in Nursing, Basic research terms, Scope of Nursing research: areas, problems in Nursing, health and social research, Concept of evidence based practice, Ethics in research, Overview of Research process.	L1, L2,L3 and L4	10
Unit II **Review of Literature** Importance, purposes, sources, criteria for selection of resources and steps in reviewing literature.	L1,L2, L3 and L5	5
Unit III **Research Approaches and designs** Type: Quantitative and Qualitative, Historical, survey and experimental –Characteristics, types advantages and disadvantages, Qualitative: Phenomenology, grounded theory, ethnography	L2, L3 and L4	12

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Unit IV: **Research problem:** Identification of research problem, Formulation of problem statement and research Objectives:, Definition of terms, Assumptions and delimitations, Identification of variables, Hypothesis – definition, formulation and types.	L1,L2, L3, L4 and L5	10
Unit V: **Developing theoretical/conceptual framework** • Theories: Nature, characteristics, Purpose and uses • Using, testing and developing conceptual framework, models and theories.	L1,L2 and L4	5
Unit VI –Sampling • Population and sample • Factors influencing sampling • Sampling techniques • Sample size • Probability and sampling error • Problems of sampling	L1,L2, L3, L4 and L5	6

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Unit VII **Tools and methods of Data collection:** • Concepts of data collection • Data sources, methods/techniques quantitative and qualitative. • Tools for data collection – types, characteristics and their development • Validity and reliability of tools Procedure for data collection	L1,L2, L3, L4 and L5	20
Unit VIII **Implementing research plan** • Pilot Study, review research plan (design), planning for data collection, Administration of tool /interventions, collection of data	L1,L2, L3, L4 and L5	5
Unit IX **Analysis and interpretation of data** • Plan for data analysis: quantitative and qualitative • Preparing data for computer analysis and presentation. • Statistical analysis • Interpretation of data • Conclusion and generalizations • Summary and discussion	L1,L2, L3, L4 and L5	10

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Unit X **Reporting and utilizing research findings:** • Communication of research results; oral and written • Writing research report purposes, methods and style Vancouver, American Psychological Association (APA), Campbell etc. • Writing scientific articles for publication: purposes & style	L1,L2, L3, L4 and L5	10
Unit XI Critical analysis of research reports and articles	L1,L2, L3, L4 and L5	3
Unit XII • Developing and presenting a research proposal	L1,L2, L3, L4 and L5	4
STATISTICS		
Unit I – **Introduction:** Concepts, types, significance and scope of statistics, meaning of data, • Sample, parameter • Type and levels of data and their measurement • Organization and presentation of data – Tabulation of data; • Frequency distribution • Graphical and tabular presentations.	L1,L2, L3, L4 and L5	7

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Unit II - **Measures of central tendency:** • Mean, Median, Mode	L1,L2, L3, L4 and L5	4
Unit III **Measures of variability;** • Range, Percentiles, average deviation, quartile deviation, standard deviation	L1,L2, L3, L4 and L5	4
Unit V **Measures of relationship:** • Correlation – need and meaning • Rank order correlation • Scatter diagram method • Product moment correlation • Simple linear regression analysis and prediction.	L1,L2, L3, L4 and L5	6
Unit VI **Designs and meaning:** • Experimental designs • Comparison in pairs, randomized block design, Latin squares.	L1,L2, L3, L4 and L5	5

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Unit VII **Significance of Statistic and Significance of difference between two Statistics (Testing hypothesis)** • Non parametric test – Chi-square test, Sign, median test, Mann Whitney test. • Parametric test –'t' test, ANOVA, MANOVA, ANCOVA	L1,L2, L3, L4 and L5	8
Unit VIII **Use of statistical methods in psychology and education:** • Scaling – Z score, Z Scaling • Standard Score and T Score • Reliability of test Scores: test-retest method, parallel forms, split half method.	L1,L2, L3, L4 and L5	5
Unit IX **Application of statistics in health:** • Ratios, Rates, Trends • Vital health statistics – Birth and death rates. • Measures related to fertility, morbidity and mortality	L1,L2, L3, L4 and L5	4
Unit X **Use of Computers for data analysis** • Use of statistical package.	L1,L2, L3, L4 and L5	4

Text books:

1. Polit, D.F. & Bleck C.T, *Nursing Research Principles & Methods*, Lippincott

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Williams Wilkins, 2004, New York.

2. Polit, Bleck & P. Hungler, Nursing *Research Methods, Appraisal & Utilization*, 2001, Lippincott.
3. Mahajan, B.K, *Methods in Biostatistics*, Jaypee Brothers, 1999, New Delhi.
4. Rose Hott & Budin. Notter's, *Essentials of Nursing Research*, spinger publisher, 1999, New York.

Reference Books:

5. Patricial Nunhall. *Nursing Research*, James & Bar, 2001, Canada.
6. Caroly M.H, *Research Methods for Clinical Therapists Applied Project Design and Analysis*, 1999, Churchill Livingstone.
7. P.K. Indrani, T.K, *Research Methods for Nurses*. Jaypee brothers, 2005.
8. Clifford et al, *Getting Research into Practice*, Churchill Livingstone, 2004, New York.
9. Freshwater D. & Bishop V, *Nursing Research in Context*, Palgrave Macmillan, 2004, New York.
10. Macnee C. L, *Understanding Nursing Research: Reading & Using Research in Practice*, Lippincott Williams, Wilinks, 2004, London.
11. Specials & Carpenter, *Qualitative Research in Nursing Advancing the Humanistic Imperative*, Lippincott Williams. 2007
12. Basavanthappa, B.T, *Nursing Research*, Jaypee Brothers, 2003, New Delhi.

* Latest editions of all the suggested books are recommended

Journals:

1. *Journal of nursing practice and research.*
2. *Indian journal of medical ethics*
3. *International Journal of Nursing Education*
4. *Nursing Journal of India*

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	5	8	7	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Course Outcomes Assessment

This course contributes towards the learning outcomes**, 'nursing research and statistics**. The outcome will be measured by the performance of students in various class tests/assignments in addition to the End Semester Examination (ESE) that contains significant number of questions on problems related to the **nursing research and statistics**.

Relationship between the course outcomes (COs), programme Outcomes (PO) and learning outcomes (Los)

Mapping between COs, PLOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1	1	-	1	-	1	1	1	1	-	1
CO2	2	1	2	-	1	1	2	2	1	2	-
CO3	1	1	1	2	-	-		1	1	1	2
CO4	2	2	1	-	1	2	2	2	2	1	-
CO5	2	-	-	2	2	1	2	2	-	-	2
CO6	1	1	-	1	1	1	1	1	1	-	1

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CO7	1	1	-	1	-	1	1	1	1	-	1
CO8	2	1	2	-	1	1	2	2	1	2	-
CO9	1	1	1	2	-	-		1	1	1	2
CO10	1	-	1	1	1	1	1	-	1	-	1
CO11	-	1	1	2	2	1	1	2	-	1	1
CO12	2	-	-		1	1	1	1	2	-	-
CO13	-	1	2	2	2	2	2	1	-	1	2
CO14	2	2	1	2	2	-	-	-	2	2	1
CO15	1	1	1	1	1	1	1	-	1	1	1
CO16	1	-	1	1	1	1	1	-	1	-	1
CO17	-	1	1	2	2	1	1	2	-	1	1

1-strongly related; 2-moderately related; 3-weakly related

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MSN4203	Medical Surgical Nursing CS I & II Practical	L	T	P	C
Version 1.1	Date of Approval:				22
Pre-requisites/Exposure	NIL				
Co-requisites	NIL				

Course Catalogue: The course is designed to enable students to develop expertise in the field of medical surgical nursing procedures.

Course Description: It will help students to appreciate the adults as a holistic individual and develop skill to function as a Medical Surgical Nurse specialist.

Course Outcomes:

On completion of this course students will be able to:

CO1: Apply concepts & theories related to health promotion.

CO2: Appreciate the client as a holistic individual.

CO3: Perform physical, psychosocial assessment of Medical – Surgical patients.

CO4: Apply Nursing process in providing care to patients.

CO5: Integrate the concept of family centered nursing care with associated disorder such as genetic, congenital and long-term illness.

CO6: Recognize and manage emergencies with Medical- Surgical patients.

CO7: Describe various recent technologies & treatment modalities in the management of critically ill patients.

CO8: : Recognize the role of Nurse practitioner as a member of the Medical – Surgical health team

CO9: Prepare a design for layout and management of Medical – Surgical Units.

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PROGRAMME SPECIFIC OUTCOMES:-

On completion of M.Sc. Nursing programme the post graduates will be able to:

PSO1 : Assess the health status, identify nursing needs, plan, implement and evaluate nursing care for patients/client that contribute to health of individuals, families and communities.

PSO2: Demonstrate competency in techniques of nursing skills based on concepts and principles from specialized areas of nursing, physical, biological and behavioral sciences. And Participate as member of health care team in the promotive, preventive, curative and restorative health care delivery system of the country.

PSO3: Demonstrate leadership, managerial skills, qualities and decision-making abilities, teaching and communication skills in clinical/ community health settings.

PSO4: Participation in research activities towards continued learning for personal and professional development, practice ethical values and utilize the research findings to improve the quality of care.

Course Content

Modules	**Blooms level**

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Module I Students will be posted in General Medical Ward 120 Hours General Surgical Ward 120 Hours ICUs 120 Hours Oncology 60 Hours Ortho 60 Hours Cardio 60 Hours Emergency Department 60 Hours Neuro 60 Hours **Total 660 Hours (22 Weeks)**	**L1,2, 3**
Module II **Student Activities:** • Clinical presentations • History taking • Health Assessment • Nutritional Assessment • Health Education related to disease conditions • Case studies • Project work • Field visits	**L2,3, 4**

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

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7. Examination Scheme Practical: Internal 100, External 100

Components	NCP	CS/CP	Project	OR	HE	CE	EPE
Weightage (%)	10	30	10	05	05	40	100

NCP- Nursing Care Plan, CS- Case Study, CP - Case Presentation, OR- Observation Report, HE- Health Education, CE-Clinical Evaluation, EPE- External Practical Examination

Reference Books:

1. Black M.J., Hawks H.J, *Medical Surgical Nursing, Clinical Management for Positive Outcome,* 7th edition, Sauders, Elsevier Publication.
2. Morton, Patricia, et. al. *Critical Care Nursing: A Holistic Approach,* Lippincott Williams and Wilkkins; Eighth edition.
3. Urban, A.N., Greenlac K.K,"*Guidelines for Critical Care Nursing,* Mosby.
4. Wood L.S., Freelicher S.E, *Fetal Cardiac Nursing,* Lippincott Williams & Wilkings.
5. Gulanic, Klopp, Galnes, *Fetal Nursing Care Plans Nursing Diagnosis and intervention.*
6. Lewis, Collier & Heitkemper, *Medical Surgical Nursing Assessment and Management of Clinical Problems.*
7. Baughman Diane C, *Hand Book for Surgical Nursing,* 2nd edition, published by Lipincott, NewYork.
8. Philip &Wilma J, *Medical- Surgical Nursing,* 3rd edition, published by B.T Pubn Bangalore.

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Course Outcome Measurement:

The outcome will be measured by the performance of the students in various class tests, assignments in addition to the End Semester Exam (ESE) that contains significant number of questions on problems related to meeting needs of the patients.

Relationship between the course outcomes (COs), Programme Outcomes (PO) and Programme Specific Outcomes (PSOs)

Mapping between COs, POs and PSOs

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	2	2	2	2	2	1	2	3	1
CO2	2	1	2	2	2	2	2	1	2	3	1
CO3	2	1	2	3	2	2	2	1	2	3	1

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CO4	**3**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**3**	**1**
CO5	**2**	**1**	**3**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**1**
CO6	**2**	**1**	**3**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**1**
CO7	**2**	**1**	**3**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**1**
CO8	**3**	**2**	**3**	**2**	**2**	**2**	**2**	**1**	**2**	**3**	**1**
CO9	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**1**

1: strongly related, 2: moderately related and 3: weakly related

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PDN4203	Pediatric Nursing CS I & II Practical	**L**	**T**	**P**	**C**
Version 1.1	Date of Approval:				**22**
Pre-requisites/Exposure	NIL				
Co-requisites	NIL				

Course Catalogue: The course is designed to enable students to develop expertise in the field of child health nursing procedures.

Course Description: It will help students to appreciate the child as a holistic individual and develop skill to function as a Pediatric Nurse specialist.

Course Outcomes:

On completion of this course students will be able to:

CO1. Elicit the history and perform physical examination of children
CO2. Apply the concepts of growth and development in providing care to the pediatric clients and their families.
CO3. Perform developmental, family and nutritional assessment of pediatric clients
CO4. Apply nursing process in providing nursing care to neonates & children
CO5. Integrate the concept of family centered pediatric nursing care with related areas such as genetic disorders, congenital malformations and long term illness.
CO6. Recognize and manage emergencies in neonates
CO7. Implement care using recent technologies and treatment modalities in the management of high risk neonates
CO8. Prepare a design for layout and management of neonatal units
CO9. Incorporate evidence based nursing practice and identify the areas of research in the field of pediatric/neonatal nursing

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PROGRAMME SPECIFIC OUTCOMES:-

On completion of M.Sc. Nursing programme the post graduates will be able to:

PSO1 : Assess the health status, identify nursing needs, plan, implement and evaluate nursing care for patients/client that contribute to health of individuals, families and communities.

PSO2: Demonstrate competency in techniques of nursing skills based on concepts and principles from specialized areas of nursing, physical, biological and behavioral sciences. And Participate as member of health care team in the promotive, preventive, curative and restorative health care delivery system of the country.

PSO3: Demonstrate leadership, managerial skills, qualities and decision-making abilities, teaching and communication skills in clinical/ community health settings.

PSO4: Participation in research activities towards continued learning for personal and professional development, practice ethical values and utilize the research findings to improve the quality of care.

Course Content

Modules	**Blooms level**
Module I Growth & developmental assessment	**L1,2, 3**
Module II History taking, Physical examination Family assessment	**L2,3, 4**
Module III Developmental assessment	**L1,2,3**

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Module IV Nutritional assessment	**L1,2, 3**
Module V Assess and manage neonatal conditions	**L3,4, 5**

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

7. Examination Scheme Practical: Internal 100, External 100

Components	**NCP**	**CS/CP**	**Project**	**OR**	**HE**	**CE**	**EPE**
Weightage (%)	**10**	**30**	**10**	**05**	**05**	**40**	**100**

NCP- Nursing Care Plan, CS- Case Study, CP - Case Presentation, OR- Observation Report, HE- Health Education, CE-Clinical Evaluation, EPE- External Practical Examination

Reference Books:

1. Whaley and Wong, Essentials of Pediatrics Nursing
2. Learners Guide, WHO, AIIMS
3. IMNCI Students' Handbook, WHO
4. Ball and Bindler, *Paediatric Nursing Caring for Children*, Prenticehall.
5. Behrman, Richard K & Vaughan, Nelson,s, *TextBook of Paediatrics*, WB Saunders Co.,
6. Ghai O P, *Essential Paediatrics*
7. Asuma Beevi, Textbook of Pediatric Nursing
8. Parul Datta, Textbook of Pediatric Nursing
9. Panchali Pal, Textbook of Pediatric Nursing

Course Outcome Measurement:

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The outcome will be measured by the performance of the students in various class tests, assignments in addition to the End Semester Exam (ESE) that contains significant number of questions on problems related to meeting needs of the patients.

Relationship between the course outcomes (COs), Programme Outcomes (PO) and Programme Specific Outcomes (PSOs)

Mapping between COs, POs and PSOs

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**2**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**3**	**1**
CO2	**2**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**3**	**1**
CO3	**2**	**1**	**2**	**3**	**2**	**2**	**2**	**1**	**2**	**3**	**1**
CO4	**3**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**3**	**1**
CO5	**2**	**1**	**3**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**1**
CO6	**2**	**1**	**3**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**1**
CO7	**2**	**1**	**3**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**1**
CO8	**3**	**2**	**3**	**2**	**2**	**2**	**2**	**1**	**2**	**3**	**1**
CO9	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**1**

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CHN4203	Community Health Nursing CS I & II Practical	**L**	**T**	**P**	**C**
Version 1.1	Date of Approval:				**22**
Pre-requisites/Exposure	NIL				
Co-requisites	NIL				

Course Catalogue: The course is designed to enable students to develop expertise in the field of Community health nursing health nursing procedures.

Course Description: The course is designed to enable students to develop expertise in the field of clinical specialization. It will help students to appreciate the patient, individual as a holistic individual and develop skill to function as a Nurse specialist in their field of clinical specialization

Course Outcomes:

On completion of this course students will be able to:

CO1. Elicit the importance of health services in subcentre, primary health centres and community health centres
CO2. Apply the Government health scheme in providing community health services
CO3. Perform developmental, family and nutritional assessment of Geriatrics
CO4. Apply nursing process in providing nursing care to Antenatal and Post natal Mothers
CO5. Apply the Family planning services among eligible couples
CO6. Recognize the importance of Health Programmes in community
CO7. Apply the nursing Procedures in post natal mothers
CO8. Prepare the vital statistics of community people
CO9. Incorporate evidence based nursing practice and identify the areas of re-

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search in the field of nursing.

PROGRAMME SPECIFIC OUTCOMES:-

On completion of M.Sc. Nursing programme the post graduates will be able to:

PSO1 : Assess the health status, identify nursing needs, plan, implement and evaluate nursing care for patients/client that contribute to health of individuals, families and communities.

PSO2: Demonstrate competency in techniques of nursing skills based on concepts and principles from specialized areas of nursing, physical, biological and behavioral sciences. And Participate as member of health care team in the promotive, preventive, curative and restorative health care delivery system of the country.

PSO3: Demonstrate leadership, managerial skills, qualities and decision-making abilities, teaching and communication skills in clinical/ community health settings.

PSO4: Participation in research activities towards continued learning for personal and professional development, practice ethical values and utilize the research findings to improve the quality of care.

Course Content

Modules	**Blooms level**

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Module I • Identification of community leaders and resource persons (community mapping) • Community health survey • Community health nursing process- individual, family and special groups and community Counseling • Identification of community leaders and resource persons (community mapping.	**L1,2, 3**
Module II • Health education – campaign, exhibition, folk media, preparation of IECmaterials • Organising and participating in special clinics/camps and national health and welfare programmes-Organise atleast one health and family welfare mela/fair (all stalls of national health and family welfare activities should be included)	**L2,3, 4**
Module III • Estimation of Vital health statistics –Exercise Drill for disaster preparedness • Organise atleast one in-service education to ANM's/LHV/PHN/HW • Nutrition – Exercise on nutritional assessment on dietary planning, demonstration and education for various age groups	**L1,2,3**

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Module IV • Filling up of Records, reports and registers maintained at SC/PHC/CHC • Assist women in self breast examination • Conduct antenatal examination • Conduct vaginal examination • Conduct deliveries	**L1,2, 3**
Module V • Post natal visits • Perform Episiotomy and suturing • Prepare Pap smear • Conduct Insertion/Removal of IUD • Blood Slide preparation	**L3,4, 5**

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

7. Examination Scheme Practical: Internal 100, External 100

Components	**NCP**	**CS/CP**	**Project**	**OR**	**HE**	**CE**	**EPE**
Weightage (%)	**10**	**30**	**10**	**05**	**05**	**40**	**100**

NCP- Nursing Care Plan, CS- Case Study, CP - Case Presentation, OR- Observation Report, HE- Health Education, CE-Clinical Evaluation, EPE- External Practical Examination

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Text & References:

Reference Books:

1. Clark, June & Jill Handerson, *Community Health*, Churchill Livingstone, 1993, New York.
2. Freeman B. Ruth, *Public Health Practices*, W. W. Saunders CO., 1990, Philadelphia.
3. Fromer Joan Margot, *Community Health Care and the Nursing Process*, C.VMosby CO., Toronto.
4. Park J. E, *Text Book of Preventive and Social Medicine*, Ms Banarsidas Bhanot CO., 1996, Jabalpur.
5. Rao S. Kasthi, *An Introduction to Community Health Nursing*, B. I. Publishers, Madras.
6. Gulani,K,K. Community Health Nursing(2007). Kumar Publishing House.pp 339-420.
7. Basavanthappa,B,T. Community Health Nursing(2nd edition), Jaypee Brothers Medical Publishers.
8. Park ,K .Preventive and Social Medicine.(19th edition), Kumar Book Depot.
9. Kamalam, S. Essentials in Community Health Nursing Practice.(2nd edition), Jaypee Brothers.
10. Alternative approaches to health care. ICMR. Paper presented at the National Symposium on Alternative Approaches to health care.
11. Archer,S,E. Community Health Nursing:Patterns and Practice.(2nd edition).Duxbusy Press.
12. Prabhakara,G,N. Textbook of Community Health for Nurses.(2nd edition). Peepee Publishers and distributers.
13. Stanhope,M &Lanchaster,J.Community Health Nursing:Practice and Process for Promoting Health.(3rd edition).mosby.
14. Pinger,R,P.An Introduction to Community health.(4th edition).Jones and Bartlett Publishers.
15. Patney Sunita , (2005), Text Book Of Community Health Nursing, First Edition, Cbs.
16. Mckenzie James F. Pinger Robert R, Kotecki Jerome E, (2002), An Introduction To Community Health Nursing, Fourth Edition, Jones And Bartlett.
17. Lundy Saucier Karen, Janes Sharyn, (2002) Community Health Nursing, First Edition, Jones And Bartlettt.

*Latest editions of all the suggested books are recommended

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Course Outcome Measurement:

The outcome will be measured by the performance of the students in various class tests, assignments in addition to the End Semester Exam (ESE) that contains significant number of questions on problems related to meeting needs of the patients.

Relationship between the course outcomes (COs), Programme Outcomes (PO) and Programme Specific Outcomes (PSOs)

Mapping between COs, POs and PSOs

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**2**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**3**	**1**
CO2	**2**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**3**	**1**
CO3	**2**	**1**	**2**	**3**	**2**	**2**	**2**	**1**	**2**	**3**	**1**
CO4	**3**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**3**	**1**
CO5	**2**	**1**	**3**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**1**
CO6	**2**	**1**	**3**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**1**
CO7	**2**	**1**	**3**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**1**
CO8	**3**	**2**	**3**	**2**	**2**	**2**	**2**	**1**	**2**	**3**	**1**
CO9	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**1**

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PSN4203	Psychiatric Nursing CS-I & II Practical	**L**	**T**	**P**	**C**
Version 1.1	Date of Approval: November 2011		**24**		**22**
Pre-requisites/Exposure	NIL				
Co-requisites	NIL				

Course Catalog: This course is designed to assist students in developing expertise and in depth understanding in the field of Psychiatric Nursing. It will help students to develop advanced skills for nursing intervention in various Psychiatric conditions. It will enable the student to function as Psychiatric Nurse practitioner/specialist. It will further enable the student to function as educator, manager, and researcher in the field of Psychiatric Nursing.

Course Objectives:

The objective of this course is to Provide an overview of psychiatric disorders and management of psychiatric patients.

- Demonstrate the role of nurse in psychiatric settings/hospitals.

Course Outcomes:

On completion of this course, the students will be able to:

1. Appreciate the trends and issues in the field of psychiatry and psychiatric nursing.
2. Explain the dynamics of personality development and human behaviour.
3. Describe the concepts of psychobiology in mental disorders and its implications for psychiatric nursing
4. Demonstrate therapeutic communications skills in all interactions
5. Demonstrate the role of psychiatric nurse practitioner in various therapeutic modalities
6. Establish and maintain therapeutic relationship with individual and groups
7. Uses assertive techniques in personal and professional actions
8. Promotes self-esteem of clients, others and self
9. Apply the nursing process approach in caring for patients with mental disorders

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10. Describe the psychopharmacological agents, their effects and nurse's role

11. Recognize the role of psychiatric nurse practitioner and as a member of the psychiatric and mental health team

12. Describe various types of alternative system of medicines used in psychiatric settings

13. Incorporate evidence-based nursing practice and identify the areas of research in the field of psychiatric nursing.

Course Content

Modules	**Blooms level**
Module 1: History collection and Assessment of mental status examination	L1,2, 3
Module 2 : Management of Psychiatric Patient	L2,3, 4
Module 3: Psychometric and Personality Assessment	L1,2,3
Module 4: Observing various therapies	L1,2, 3
Module 5: Process Recording	L3,4
Module 6: Socio and Psycho drama	L2, 3

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text Books

- Kaplan H. Sadock B, Synopsis of Psychiatry, William and Wilkins, 1991, Bathmov.
- Stuart W.G. Sundeen J.S, Principles and Practice of Psychiatry Nursing, Mosby Year book, 1991, London.
- Taylor C.M., Essentials of Psychiatric Nursing, CV Mosby Co., 1982, London.
- Bimla Kapoor CV, A Text book of Psychiatric Nursing, Mosby Co.,1982, Delhi

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- Shivas, “Basic Concept of Psychiatric Mental Health Nursing, B.I Publications, 1994
- Brown R.T. Feldman G.R., Epilepsy- Diagnosis and Management, Little Brown and Co.,1983, Toronto.
- Beck M.C. Rawtins P.R. and et al, Mental Health-Psychiatric Nursing. The C.V. Mosby Co., Ltd.1984, Toronto.
- Coleman C.J, Abnormal Psychology and Modern Life. P.B. Tara and Sons Co. Pvt Ltd. 1982.

Reference Books

- Gelder M.G., Andreasen N.C., New Oxford Text book of Psychiatry, Oxford University Press, 2012.
- Elizabeth M. Varcarolis: Foundations of Psychiatric Mental Health Nursing; 4th Edition, W.B. Saunders, Company, 2002.
- Kaplan & Sadock’s: Concise Text book of Clinical psychiatry; 2nd Edition, J.P. Brothers (Indian) Lippincott, Williams & Wilkins, 2002.
- Stuart M. psychiatric mental health nursing
- Sheila. L. Videbeck: Psychiatric mental health nursing; Lippincott, 2001.
- Many Ann Boyd & Mary Ann Nihart: Psychiatric Nursing Contemporary Practice; Lippincott, 1998

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme Practical: Internal 100, External 100

Components	NCP	CS/CP	Project	OR	HE	CE	EPE
Weightage (%)	10	30	10	05	05	40	100

NCP- Nursing Care Plan, CS- Case Study, CP - Case Presentation, OR- Observation Report, HE- Health Education, CE-Clinical Evaluation, EPE- External Practical Examination

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	3	3	3	2	3	2	-	1	-	-
CO2	1	1	2	3	2	3	1	-	1	-	-
CO3	1	1	2	3	2	3	1	-	1	-	-
CO4	1	1	2	3	1	2	1	-	1	-	-
CO5	1	2	3	3	1	2	1	-	1	-	-
CO6	2	2	2	3	1	2	2	-	1	-	-
CO7	2	1	1	1	2	1	3	-	1	-	-
CO8	1	1	1	3	2	3	2	-	1	-	-
CO9	2	1	2	3	2	3	1	-	1	-	-
CO10	2	3	3	3	1	3	1	-	1	-	-
CO11	1	2	3	3	1	3	1	-	1	-	-
CO12	2	1	1	2	1	2	1	-	1	-	-
CO13	1	1	2	3	1	3	1		1		

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OGN4203	Obstetrical and Gynaecological CS I & II Practical	L	T	P	C
Pre-requisites/Exposure					**32**
Co-requisite					

Course Description:

This course is designed to assist students in developing expertise and in depth understanding in the field of Obstetrics & Gynecological Nursing. It will help students o appreciate the client as a holistic individual and develop skill to function as an independent midwifery practitioner. It will further enable the student to function as an educator, manager and researcher in the field of Obstetrics & Gynecological Nursing.

Course Outcomes:

CO1- Be in a position to describe the physiology and management of the various stages of labour and puerperium.

CO2-Be is a position to manage the mothers during the normal vaginal delivery

CO3-Be in a position to conduct normal vaginal delivery and also be able to resuscitate the newborn babies immediately after birth.

CO4-Be in a position to identify the at risk mothers and manage them accordingly.

CO5-Be in a position to identify the various alternative and complimentary therapies in obstetrics & gynaecological nursing

CO6-Be in a position to incorporate evidence based nursing practice and identify the areas of nursing research.

Course Content

Modules	Blooms level*	Number of hours

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Module I : Students will be posted in following areas: Anetenatal Wards & OPDs 120 Hours Labour Room 150 Hours Postnatal Ward 60 Hours Family Planning Clinics 60 Hours PHC/Rural maternity settings 120 Hours Gynae 60 Hours Maternity OT 60 Hours NICU 30 Hours **Total 660Hours - 22 Weeks**	L1, L2 and L3	5
Module II : Procedures Observed • Diagnostic investigations : amniotcentecis, chordocentecis, chorionic villi sampling • Infertility management: artificial reproduction : artificial insemination, invitro fertilization, and related procedures		
Module II : Procedures Assisted • Medical termination of pregnancy		8

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Module III : Procedures Performed Antenatal assessment-20 • Postnatal assessment-20 • Assessment during labour : use of partograph - 20 • Per vaginal examination-20 • Conduct of normal delivery-20 • Episiotomy and suturing-10 • Setting up of delivery areas • Insertion of intra uterine devices(copper T) **Others** • Identification of high risk women and referral • Health education: to women and their families • Motivation of couples for planned parenthood		10

Text & References:

Reference Books:

1. Buckley Kathleen and Kulb Nancy W, *High Risk Maternity Nursing Manual*, Williams & Wilkin, 1993, Philadelphia.
2. Bennet V Ruth & Brown K Linda, *Myles Text Book for Midwives*, ELBS, Churchill Living-stone.
3. Calander, R & Miller A, *Obstetrics Illustrated*, 4th edition, Churchill & Livingstone, 1993, New York.
4. Dawn C.S, *Text Book of Obstetrics and Neonatology*, Dawn Books, Calcutta.
5. Dawn C.S, *Text Book of Gynecology and Contraception*, Dawn Books, Calcutta.
6. Dutta D.C, *Text Book of Obstetrics*, 4th edition, New Central Agency (p), 2001, Calcutta.
7. Dutta D.C, *Text Book of Gynaecology*, 4th edition, New Central Agency (p), 2001, Calcutta.
8. Daftary Shrish, *Holland and Brews Manual of Obstetrics*,16th edition, B Churchill Living-stone (P) Ltd, New Delhi.
9. Dickason Elizabeth jean et al, *Maternal Infant Nursing Care*, 2nd edition, Mosby, 1998, St. Louis.

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10. GoodnerBrenda, *Concepts of Obsterics Nursing*, 1st edition, Skidmore, Roth Publishing, INC, 1994, Texas.
11. Gorie Trula Myers et al, *Foundations of Maternal Newborn Nursing*, 2nd edition, WB Saunders Co., 1998, Philadelphia.
12. Ladewing Patricia Wieland et al, *Essentials of Maternal Newborn Nursing*, 2nd edition, Addisol Wesley Nursing, 1990, New York.
13. Rashmi Patil, *Instruments, Operatuions, Drugs in Obstetrics and Gynaecology*, Vors Medical Publications, Mumbai.
14. Philips Celeste R, *Family Centered Maternity Newborn Care*, 3rd edition, Mosby New year Book, 1996, St Louis.

Examination Scheme Practical:

Components	NCP	CS/CP	Pr	OR	HE	CE	EPE
Weightage (%)	10	30	10	05	05	40	100

NCP- Nursing Care Plan, CS- Case Study, CP - Case Presentation, Pr- Project, OR- Observation Report, HE- Health Education, CE-Clinical Evaluation, EPE- External Practical Examination

Relationship between the course outcomes (COs), programme Outcomes (PO) and learning outcomes (Los)

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Mapping between COs, POs

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	-	1	-	1	1	1	1	-	1
CO2	2	1	2	-	1	1	2	2	1	2	-
CO3	1	1	1	2	-	-		1	1	1	2
CO4	1	1	-	1	-	1	1	1	1	-	1
CO5	2	1	2	-	1	1	2	2	1	2	-
CO6	1	1	1	2	-	-		1	1	1	2

1-strongly related; 2-moderately related; 3-weakly related

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PSN4203	Psychiatric Nursing	L	T	P	C
Version 1.1	Date of Approval: November 2011	**16**	**36**		**16**
Pre-requisites/Exposure	NIL				
Co-requisites	NIL				

Catalog Catalogue:

This course is designed to assist students in developing expertise and in depth understanding in the field of Psychiatric Nursing. It will help students to develop advanced skills for nursing intervention in various Psychiatric conditions. It will enable the student to function as Psychiatric Nurse practitioner/specialist. It will further enable the student to function as educator, manager, and researcher in the field of Psychiatric Nursing

Course Objectives: On completion of the two year M.Sc. Nursing (Psychiatry) programme, the Post Graduate Nurse will be able to provide comprehensive nursing care to patients with psychiatric problems in preventive, curative and rehabilitation aspects.

Course Outcomes

On completion of this course, the students will be able to

CO1: Utilize/apply the concepts, theories and principles of psychiatric nursing science

CO2.Demonstrate advance competence in practice of psychiatric nursing &Practice as a psychiatric nurse specialist.

CO3.Demonstrate leadership qualities and function effectively as psychiatric nurse educator and manager.

CO4.Demonstrate skill in conducting nursing research, interpreting and utilizing the findings from health related research.

CO5.Demonstrate the ability to plan and effect change in psychiatric nursing practice and in the health care delivery system.

CO6.Establish collaborative relationship with members of other disciplines and

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Demonstrate interest in continued learning for personal and professional advancement

CO7 Elaborate the Substance-Related Disorders

CO8 Explain the Schizophrenia and Other Psychotic Disorders (Check ICD10)

CO9 Describe the mood disorder

CO10 Describe the Anxiety disorder

CO11 Discuss Somatoform and Sleep Disorders

CO12 Discuss the Dissociative Disorders and Management

CO13 Elaborate the Sexual and Gender Identity Disorders

CO14 Enumerate the Eating Disorders

CO15 Describe the Adjustment and Impulse Control Disorders

CO16 Explain the Medical Conditions due to Psychological Factors

CO17 Explain the Personality Disorders

CO18 Discuss the The Aging Individual

CO19 Describe the person living with HIV Disease

CO20 Explain the Problems Related to Abuse or Neglect

CO21 Elaborate the Community Mental Health Nursing

CO22 Discuss the Ethical and Legal Issues in Psychiatric/Mental Health Nursing

CO23 Describe the Psychosocial rehabilitation

CO24 Discuss the Counseling

CO25 Explain the Administration and management of Psychiatric units including emergency unit

Modules	**Blooms level***	**Number of hours**
MODULE 1: **Principles and practice of Psychiatric Nursing** Review	L1, L2 and L3	6

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MODULE 2: **Crisis Intervention** • Crisis, Definition • Phases in the Development of a Crisis • Types of Crisis Dispositional, Anticipated Life Transitions Traumatic Stress, • Maturational / Development , Reflecting • Psychopathology • Psychiatric Emergencies and their management • Grief and grief reaction • Crisis Intervention; Phases • Post traumatic stress disorder (PTSD) • Role of the Nurse	L2, L3 and L4	16
MODULE 3: **Anger / Aggression Management** • Anger and Aggression, Types, Predisposing Factors • Management • Role of the Nurse	L2, L3 and L4	20
MODULE 4: **The Suicidal Client** • Epidemiological Factors • Risk Factors **Predisposing Factors** • Theories of Suicide-Psychological, Sociological, Biological Nursing Management	L1, L2, and L4	10

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MODULE 5: **Disorders of Infancy, Childhood, and Adolescence** • Mentally Challenged • Autistic Disorders • Attention-Deficit/Hyperactivity Disorder • Conduct Disorders, behavioural disorders • Oppositional Defiant Disorder • Tourette's Disorders • Separation Anxiety Disorder Psychopharmacological Intervention and Nursing Management	L1,L2, and L4	10

MODULE 6: **Delirium, Dementia, and Amnestic Disorders** • Delirium • Dementia • Amnesia Psychopharmacological Intervention and Nursing Management	L1,L2, L4	12
MODULE 7: **Substance-Related Disorders** • Substance-Use Disorders • Substance-Induced Disorders • Classes Of Psychoactive Substances • Predisposing Factors • The Dynamics of Substance-Related Disorders • The Impaired Nurse • Codependency Treatment Modalities For Substance-Related Disorders and Nursing Management	L1,L2, L3 and L4	10

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MODULE 8: **Schizophrenia and Other Psychotic Disorders (Check ICD10)**
• Nature of the Disorder
• Predisposing Factors
• Schizophrenia -Types
  • Disorganized Schizophrenia
  • Catatonic Schizophrenia
  • Paranoid Schizophrenia
  • Undifferentiated Schizophrenia
  • Residual Schizophrenia
• Other Psychotic disorders
  • Schizoaffective Disorder
  • Brief Psychotic Disorder
  • Schizophrenic form Disorder
  • Psychotic Disorder Due to a General Medical Condition
  • Substance-Induced Psychotic Disorder
Treatment and Nursing Management
	L1,L2, L3 and L4	06

MODULE 9: **Mood Disorders** • Historical Perspective • Epidemiology • The Grief Response • Maladaptive Responses to Loss • Types Of Mood Disorders • Depressive disorders • Bipolar disorders Treatment and Nursing Management	L1,L2, L3 and L4	06

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MODULE 10: **Anxiety Disorders**
• Historical Aspects
• Epidemiological Statistics
• How much is too much?
• Types
  • Panic Disorder
  • Generalized Anxiety Disorder
  • Phobias
  • Obsessive-Compulsive Disorder
  • Posttraumatic Stress Disorder
  • Anxiety Disorder Due to a General Medical Condition
  • Substance-Induced Anxiety Disorder
• Treatment Modalities
Psychopharmacology & Nursing Management
	L1,L2, L3 and L4	08

MODULE 11: **Somatoform and Sleep Disorders** • Somatoform Disorders • Historical Aspects •Epidemiological Statistics •Pain Disorder •Hypochondriasis •Conversion Disorder •Body Dysmorphic Disorder • Sleep Disorder Treatment Modalities and Nursing Management	L1,L2, L3 and L4	06

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MODULE 12: **Dissociative Disorders and Management** • Historical Aspects • Epidemiological Statistics • Application of the Nursing Management Treatment Modalities and Nursing Management	L1,L2, L3 and L4	06
MODULE 13: **Sexual and Gender Identity Disorders** • Development of Human Sexuality • Sexual Disorders • Variation in Sexual Orientation Nursing Management	L1,L2, L3 and L4	06
MODULE 14: **Eating Disorders** • Epidemiological Factors • Predisposing Factors: Anorexia Nervosa and Bulimia Nervosa obesity • Psychopharmacology Treatment & Nursing Management	L1,L2, L3 and L4	06
MODULE 15: **Adjustment and Impulse Control Disorders** • Historical and Epidemiological Factors • Adjustment Disorders • Impulse Control Disorders Treatment & Nursing Management	L1,L2, L3 and L4	06

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MODULE 16: **Medical Conditions due to Psychological Factors** • Asthma • Cancer • Coronary Heart Disease • Peptic Ulcer • Essential Hypertension • Migraine Headache • Rheumatoid Arthritis • Ulcerative Colitis Treatment & Nursing Management	L1,L2, L3 and L4	06

MODULE 17: **Personality Disorders**
• Historical perspectives
• Types Of Personality Disorders
  • Paranoid Personality Disorder
  • Schizoid Personality Disorder
  • Antisocial Personality Disorder
  • Borderline Personality Disorder
  • Histrionic Personality Disorder
  • arcissistic Personality Disorder
  • Avoidance Personality Disorder
  • Dependent Personality Disorder
  • Obsessive-Compulsive Personality Disorder
  • Passive-Aggressive Personality Disorders
• Identification, diagnostic, symptoms
• Psychopharmacology
Treatment & Nursing Management
	L1,L2, L3 and L4	06

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MODULE 18: **The Aging Individual** • Epidemiological Statistics • Biological Theories • Biological Aspects of Aging • Psychological Aspects of Aging • Memory Functioning • Socio-cultural aspects of aging • Sexual aspects of aging • Special Concerns of the Elderly Population • Psychiatric problems among elderly population Treatment & Nursing Management	L1,L2, L3 and L4	06
MODULE 19: **The person living with HIV Disease** • Psychological problems of individual HIV/AIDS • Counseling Treatment & Nursing Management	L1,L2, L3 and L4	06
MODULE 20: **Problems Related to Abuse or Neglect** • Vulnerable groups, Women, Children, elderly, Psychiatric patients, under privileged, challenged • Predisposing Factors Treatment & Nursing management- Counseling	L1,L2, L3 and L4	06

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MODULE 21: **Community Mental Health Nursing**
• National Mental Health Program- Community mental health program
• The Changing Focus of care
• The Public Health Model
• The Role of the Nurse
• Case Management
• The community as Client
  • Primary Prevention
  • Populations at Risk
  • Secondary prevention
  • Tertiary Prevention
Community based rehabilitation
	L1,L2, L3 and L4	06

MODULE 22: **Ethical and Legal Issues in Psychiatric/Mental Health Nursing** • Ethical Considerations • Legal Consideration • Nurse Practice Acts • Types of Law • Classification within Statutory and Common Law • Legal Issues in Psychiatric/Mental Health Nursing Nursing Liability	L1,L2, L3 and L4	06

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Module 23 : Psychosocial rehabilitation • Principles of rehabilitation • Disability assessment • Day care centers • Half way homes • Reintegration into the community • Training and support to care givers • Sheltered workshops Correctional homes	L1,L2, L3 and L4	05
MODULE 24: **Counselling** • Liaison Psychiatric Nursing • Terminal illnesses-Counseling • Post partum psychosis-treatment, care and counseling • Death dying- Counseling • Treatment, care and counseling – • Unwed mothers HIV and AIDS	L1,L2, L3 and L4	05
MODULE 25: **Administration and management of Psychiatric units including emergency unit** • Design & layout • Staffing, • Equipment, supplies, • Norms, policies and protocols • Quality assurance • Practice standards for Psychiatric Nursing Documentation	L1,L2, L3 and L4	05

**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis,

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L6: Evaluation

1. **Text Books a) Main text:** Kaplan H. Saddock B, Synopsis of Psychiatry, William sand Wilkins, 1991, Bathmov.
2. Bimlakapoor CV, A Text book of Psychiatric Nursing, Mosby Co., 1982, Delhi.
3. Shivas, "Basic Concept of Psychiatric Mental Health Nursing, B.I Publications, 1994.
4. Brown R. T. Feldman G. R., Epilepsy -Diagnosis and Management, Little Brown And Co., 1983, Toronto.
5. Beck M. C. Rawtins P. R. and et al, Mental Health – Psychiatric Nursing. The C.V. Mosby Co., Ltd. 1984, Toronto.
6. Coleman C. J, Abnormal Psychology and Modern Life. P. B. Tara and Sons Co. Pvt Ltd. 1982.

– **b) Additional Texts:** Gelder M.G., Andreasen N.C. New Oxford Textbook of Psychiatry, Oxford University Press, 2012.

c) Other readings: Journals of Psychiatry
Journals of Psychiatric Nursing
Journals of Psychiatric Social Work
Journals of Clinical Psychology

7. **Reference Books** :

1.Stuart W. G. Sundeen J. S, Principles and Practice of Psychiatric Nursing, Mosby Year book, 1991, London.

2. Taylor C.M., Essentials of Psychiatric Nursing, CV Mosby Co., 1982, London

1. Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

1. Assessment Scheme(more columns may be added for assessment):

Components	ATT	HA	CT	SE	EA	EE

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Weightage (%)	**5**	**5**	**5**	**5**	**5**	**75**

ATT-Attendance; HA-Home Assignment; CT-Class Test; SE-Sessional Examination;

EA- Extracurricular activity; EE- End Semester Examination

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**	**3**	**1**	**2**	**1**	**-**	**3**	**1**	1	--	--	1
CO2	**1**	**3**	**1**	**1**	**1**	**-**	**3**	**1**	1	--	--	1
CO3	**1**	**3**	**1**	**3**	**1**	**-**	**3**	**1**	1	--	--	1
CO4	**1**	**1**	**1**	**2**	**2**	**2**	**3**	**1**	1	-	1	-
CO5	**1**	**2**	**3**	**3**	**1**	**2**	**3**	**1**	1	-	2	1
CO6	**1**	**2**	**3**	**3**	**1**	**2**	**3**	**1**	1	-	2	1
CO7	**1**	**3**	**1**	**2**	**1**	**-**	**3**	**1**	1	--	--	1
CO8	**1**	**3**	**1**	**1**	**1**	**-**	**3**	**1**	1	--	--	1
CO9	**1**	**3**	**1**	**3**	**1**	**-**	**3**	**1**	1	--	--	1
CO10	**1**	**1**	**1**	**2**	**2**	**2**	**3**	**1**	1	-	1	-
CO11	**1**	**2**	**3**	**3**	**1**	**2**	**3**	**1**	1	-	2	1
CO12	**1**	**2**	**3**	**3**	**1**	**2**	**3**	**1**	1	-	2	1
CO13	**1**	**3**	**1**	**2**	**1**	**-**	**3**	**1**	1	--	--	1
CO14	**1**	**3**	**1**	**1**	**1**	**-**	**3**	**1**	1	--	--	1
CO15	**1**	**3**	**1**	**3**	**1**	**-**	**3**	**1**	1	--	--	1
CO16	**1**	**1**	**1**	**2**	**2**	**2**	**3**	**1**	1	-	1	-
CO17	**1**	**2**	**3**	**3**	**1**	**2**	**3**	**1**	1	-	2	1
CO18	**1**	**2**	**3**	**3**	**1**	**2**	**3**	**1**	1	-	2	1
CO19	**1**	**3**	**1**	**2**	**1**	**-**	**3**	**1**	1	--	--	1
CO20	**1**	**3**	**1**	**1**	**1**	**-**	**3**	**1**	1	--	--	1

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CO21	**1**	**3**	**1**	**3**	**1**	**-**	**3**	**1**	1	--	--	1
CO22	**1**	**1**	**1**	**2**	**2**	**2**	**3**	**1**	1	-	1	-
CO23	**1**	**2**	**3**	**3**	**1**	**2**	**3**	**1**	1	-	2	1
CO24	**1**	**2**	**3**	**3**	**1**	**2**	**3**	**1**	1	-	2	1
CO25	**1**	**3**	**1**	**2**	**1**	**-**	**3**	**1**	1	--	--	1

1: strongly related, 2: moderately related and 3: weakly related

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CHN4402	Community Health Nursing Practical	L	T	P	C
Version 1.1	Date of Approval:		28**		32
Pre-requisites/Exposure	NIL				
Co-requisites	NIL				

Course Catalogue: The course is designed to enable students to develop expertise in the field of Community health nursing procedures.

Course Outcomes: The course is designed to assist students in developing expertise and in depth understanding in the field of Community Health Nursing. It would help students to appreciate holistic life style of individuals, families & groups and develop skills to function as Community Health Nurse specialist/practitioner. It would further enable student to function as an educator, manager, care giver and researcher in the field of Community Health Nursing. Each student is required to participate in following activities during the community posting in urban as well as rural area

On completion of this course students will be able to:

CO1. Apply the nursing process in the care of geriatric patients in old age home and community
CO2. Demonstrate advanced skills/competence in nursing management of children with Communicable problems
CO3. Recognize and manage emergencies in deaddiction centres and mental health centres
CO4. Utilize the recent technology and various treatment modalities in the management of high risk children

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CO5. Prepare a design for layout and describe standards for National health services

CO6. Identify areas of research in the field of community health nursing

Course Content

Modules	**Blooms level**
Module 1 • MCH office and DPHNO • CHC/ First Referral unit (FRU) • Child guidance clinic • Institute/ unit for mentally challenged • District TB centre • AIDS control society	**L1,2,**
Module 2 • Filariasis clinic • RCH clinic • STD clinic • Leprosy clinic • Community based rehabilitation unit • Cancer centers • Palliative care	**L1. 2**

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Module 3: • Home of old age • Mental health units • De-addication centres • School health services • Industry • Selected industrial health centers • ESI unit • Municipality/ corporation office	**L1,2,**
Module 4 • Laparoscopic sterilization • Vasectomy • All clinics related to RCH • Monitoring of national health and family welfare programmes	**L1,2, 3**
Module 5 • Conduct various clinics • School health assessment. • Health survey. • Health assessment • Drug Administration as per the protocols • Treatment of minor ailments Investigating outbreak of epidemic	**L3,4**

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Module 6 • Screening for leprosy, TB and non-communicable disease • Presumptive and radical treatment for Malaria. • Counseling • Report writing • Referrals • Writing a project proposal • Material management- requisition for indent, condemnation, inventory maintenance, • Training and Supervision of various categories of personnel • Liaison with NGO's	**L3,4**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

7. Examination Scheme Practical: Internal 100, External 100

Components	**NCP**	**CS/CP**	**Project**	**OR**	**HE**	**CE**	**EPE**
Weightage (%)	**10**	**30**	**10**	**05**	**05**	**40**	**100**

NCP- Nursing Care Plan, CS- Case Study, CP - Case Presentation, OR- Observation Report, HE- Health Education, CE-Clinical Evaluation, EPE- External Practical Examination

Text & References:

Reference Books:

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1. Clark, June & Jill Handerson, *Community Health*, Churchill Livingstone, 1993, New York.
2. Freeman B. Ruth, *Public Health Practices*, W. W. Saunders CO., 1990, Philadelphia.
3. Fromer Joan Margot, *Community Health Care and the Nursing Process*, C.VMosby CO., Toronto.
4. Park J. E, *Text Book of Preventive and Social Medicine*, Ms Banarsidas Bhanot CO., 1996, Jabalpur.
5. Rao S. Kasthi, *An Introduction to Community Health Nursing*, B. I. Publishers, Madras.
6. Gulani,K,K. Community Health Nursing(2007). Kumar Publishing House.pp 339-420.
7. Basavanthappa,B,T. Community Health Nursing(2nd edition), Jaypee Brothers Medical Publishers.
8. Park ,K .Preventive and Social Medicine.(19th edition), Kumar Book Depot.
9. Kamalam, S. Essentials in Community Health Nursing Practice.(2nd edition), Jaypee Brothers.
10. Alternative approaches to health care. ICMR. Paper presented at the National Symposium on Alternative Approaches to health care.
11. Archer,S,E. Community Health Nursing:Patterns and Practice.(2nd edition).Duxbusy Press.
12. Prabhakara,G,N. Textbook of Community Health for Nurses.(2nd edition). Peepee Publishers and distributers.
13. Stanhope,M &Lanchaster,J.Community Health Nursing:Practice and Process for Promoting Health.(3rd edition).mosby.
14. Pinger,R,P.An Introduction to Community health.(4th edition).Jones and Bartlett Publishers.
15. Patney Sunita , (2005), Text Book Of Community Health Nursing, First Edition, Cbs.
16. Mckenzie James F. Pinger Robert R, Kotecki Jerome E, (2002), An Introduction To Community Health Nursing, Fourth Edition, Jones And Bartlett.
17. Lundy Saucier Karen, Janes Sharyn, (2002) Community Health Nursing, First Edition, Jones And Bartlettt.

*Latest editions of all the suggested books are recommended

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Course Outcome Measurement:

The outcome will be measured by the performance of the students in various class tests, assignments in addition to the End Semester Exam (ESE) that contains significant number of questions on problems related to meeting needs of the patients.

Relationship between the course outcomes (COs), Programme Outcomes (PO) and Programme Specific Outcomes (PSOs)

Mapping between COs, POs and PSOs

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**2**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**3**	**1**
CO2	**2**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**3**	**1**
CO3	**2**	**1**	**2**	**3**	**2**	**2**	**2**	**1**	**2**	**3**	**1**
CO4	**3**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**3**	**1**
CO5	**2**	**1**	**3**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**1**
CO6	**2**	**1**	**3**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**1**
CO7	**2**	**1**	**3**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**1**
CO8	**3**	**2**	**3**	**2**	**2**	**2**	**2**	**1**	**2**	**3**	**1**
CO9	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**1**

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PSN4402	Psychiatric Nursing CS-III & IV Practical	L	T	P	C
Version 1.1	Date of Approval:		**28****		**32**
Pre-requisites/Exposure	NIL				
Co-requisites	NIL				

Catalog Catalogue:

This course is designed to assist students in developing expertise and in depth understanding in the field of Psychiatric Nursing. It will help students to develop advanced skills for nursing intervention in various Psychiatric conditions. It will enable the student to function as Psychiatric Nurse practitioner/specialist. It will further enable the student to function as educator, manager, and researcher in the field of Psychiatric Nursing

Course Objectives: On completion of the two year M.Sc. Nursing (Psychiatry) programme, the Post Graduate Nurse will be able to provide comprehensive nursing care to patients with psychiatric problems in preventive, curative and rehabilitation aspects.

Course Outcomes

At the end of the course the students will be able to:

1. Apply the nursing process in the care of patients with mental disorders in hospital and community

2. Demonstrate advanced skills/competence in nursing management of patients with mental disorders

3. Identify and care for special groups like children, adolescents, women, elderly, abused and neglected, people living with HIV/AIDS.

4. Identify and manage psychiatric emergencies.

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5. Provide nursing care to critically ill patients with mental disorders

6. Utilize the recent technology and various treatment modalities in the management of patients with mental disorders

7. Demonstrate skills in carrying out crisis intervention.

8. Appreciate the legal and ethical issues pertaining to psychiatric nursing.

9. Identify areas of research in the field of psychiatric nursing.

10. Prepare a design for layout and describe standards for management of Psychiatric units/emergency units/hospitals

11. Teach psychiatric nursing to undergraduate students & in-service nurses.

Course Content

Modules	**Blooms level**
Module 1: History collection and Assessment of mental status examination	**L1,2, 3**
Module 2 : Management of Psychiatric Patient	**L2,3, 4**
Module 3: Psychometric and Personality Assessment	**L1,2,3**
Module 4: Observing various therapies	**L1,2, 3**
Module 5: Process Recording	**L3,4**
Module 6: Socio and Psycho drama	**L2, 3**

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analy-

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sis; L5: Synthesis, L6: Evaluation

Text Books

- Kaplan H. Sadock B, Synopsis of Psychiatry, William and Wilkins, 1991, Bathmov.
- Stuart W.G. Sundeen J.S, Principles and Practice of Psychiatry Nursing, Mosby Year book, 1991, London.
- Taylor C.M., Essentials of Psychiatric Nursing, CV Mosby Co., 1982, London.
- Bimla Kapoor CV, A Text book of Psychiatric Nursing, Mosby Co.,1982, Delhi
- Shivas, "Basic Concept of Psychiatric Mental Health Nursing, B.I Publications, 1994
- Brown R.T. Feldman G.R., Epilepsy- Diagnosis and Management, Little Brown and Co.,1983, Toronto.
- Beck M.C. Rawtins P.R. and et al, Mental Health-Psychiatric Nursing. The C.V. Mosby Co., Ltd.1984, Toronto.
- Coleman C.J, Abnormal Psychology and Modern Life. P.B. Tara and Sons Co. Pvt Ltd. 1982.

Reference Books

- Gelder M.G., Andreasen N.C., New Oxford Text book of Psychiatry, Oxford University Press, 2012.
- Elizabeth M. Varcarolis: Foundations of Psychiatric Mental Health Nursing; 4th Edition, W.B. Saunders, Company, 2002.
- Kaplan & Sadock's: Concise Text book of Clinical psychiatry; 2nd Edition, J.P. Brothers (Indian) Lippincott, Williams & Wilkins, 2002.
- Stuart M. psychiatric mental health nursing
- Sheila. L. Videbeck: Psychiatric mental health nursing; Lippincott, 2001.
- Many Ann Boyd & Mary Ann Nihart: Psychiatric Nursing Contemporary Practice; Lippincott, 1998

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme Practical: Internal 100, External 100

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Components	NCP	CS/CP	Project	OR	HE	CE	EPE
Weightage (%)	10	30	10	05	05	40	100

NCP- Nursing Care Plan, CS- Case Study, CP - Case Presentation, OR- Observation Report, HE- Health Education, CE-Clinical Evaluation, EPE- External Practical Examination

CO PO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4
CO1	1	3	3	3	2	3	2	-	1	-	-
CO2	1	1	2	3	2	3	1	-	1	-	-
CO3	1	1	2	3	1	2	1	-	1	-	-
CO4	1	2	3	3	1	2	1	-	1	-	-
CO5	2	2	2	3	1	2	2	-	1	-	-
CO6	2	1	1	1	2	1	3	-	1	-	-
CO7	1	1	2	3	1	2	1	-	1	-	-
CO8	1	1	2	3	1	2	1	-	1	-	-

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CO9	**1**	**1**	**2**	**3**	**1**	**2**	**1**	**-**	**1**	**-**	**-**
CO10	**1**	**1**	**2**	**3**	**1**	**2**	**1**		**1**		
CO11	**1**	**1**	**2**	**3**	**1**	**2**	**1**		**1**		

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PDN4402	Child Health (Pediatric) Nursing Practical	L	T	P	C
Version 1.1	Date of Approval:		28**		32
Pre-requisites/Exposure	NIL				
Co-requisites	NIL				

Course Catalogue: The course is designed to enable students to develop expertise in the field of child health nursing procedures.

Course Description: It will help students to appreciate the child as a holistic individual and develop skill to function as a Pediatric Nurse specialist.

Course Outcomes:

On completion of this course students will be able to:

CO1. Apply the nursing process in the care of ill infants to pre adolescents in hospital and community

CO2. Demonstrate advanced skills/competence in nursing management of children with medical and surgical problems

CO3. Recognize and manage emergencies in children and Provide nursing care to critically ill children

CO4. Utilize the recent technology and various treatment modalities in the management of high risk children

CO5. Prepare a design for layout and describe standards for management of pediatric units/hospitals

CO6. Identify areas of research in the field of pediatric nursing

Course Content

Modules	Blooms level

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Module I **Procedures Observed:** • Echo cardiogram • Ultrasound head • ROP screening (Retinopathy of prematurity)	**L1,2, 3**
Module II **Procedures Assisted** • Advanced neonatal life support • Lumbar Puncture • Arterial Blood Gas • ECG Recording • Umbilical catheterization – arterial and venous • Arterial B P monitoring • Blood transfusion- exchange transfusion full and partial • IV cannulation & therapy • Arterial catheterization • Chest tube insertion • Endotracheal intubation • Ventilation • Insertion of long line • Assist in surgery	**L2,3, 4**

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Module III
Procedures Performed:
• Airway Management
  • Application of Oro Pharyngeal Airway
  • Oxygen therapy
  • CPAP (Continuous Positive Airway Pressure)
  • Care of Tracheostomy
  • Endotracheal Intubation
• Neonatal Resuscitation
• Monitoring of Neonates – clinically & with monitors, CRT (Capillary Refill Time), assessment of jaundice, ECGGastric Lavage
• Setting of Ventilators
• Phototherapy
• Assessment of Neonates: Identification & assessment of risk factors, APGAR Score, gestation age, Anthropometric assessment, Weighing the baby, Newborn examination, detection of life threatening congenital abnormalities,
• Admission & discharge of neonates
• Feeding - management of breast feeding, artificial feeding, expression of breast milk, OG (Orogastric) tube insertion, gavage feeding, TPN, Breast feeding counseling
• Thermoregulation- Axillary temperature, Kangaroo Mother Care (KMC), Use of Radiant warmer, incubators, management of thermoregulation & control
• Administration of Drugs: I/M, IV injection, IV Cannulation & fixation infusion pump, Calculation of dosages, Neonatal formulation of drugs, use of tuberculin/ insulin syringes, Monitoring fluid therapy, Blood Administration.
• Procedures for prevention of infections: Hand washing, disinfections & sterilization, surveillance, fumigation
• Collection of specimens
• Setting, Use & maintenance of basic equipment: Ventilator, O2 analyzer, monitoring equipment, Photo therapy unit, Flux meter, Infusion pump, Radiant warmer, incubator, Centrifuge machine,
	L1,2,3

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**Bloom's Level:*

L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

7. Examination Scheme Practical: Internal 100, External 100

Components	NCP	CS/CP	Project	OR	HE	CE	EPE
Weightage (%)	10	30	10	05	05	40	100

NCP- Nursing Care Plan, CS- Case Study, CP - Case Presentation, OR- Observation Report, HE- Health Education, CE-Clinical Evaluation, EPE- External Practical Examination

Reference Books:

10. Whaley and Wong, Essentials of Pediatrics Nursing
11. Learners Guide, WHO, AIIMS
12. IMNCI Students' Handbook, WHO
13. Ball and Bindler, *Paediatric Nursing Caring for Children*, Prenticehall.
14. Behrman, Richard K & Vaughan, Nelson,s, *TextBook of Paediatrics*, WB Saunders Co.,
15. Ghai O P, *Essential Paediatrics*
16. Asuma Beevi, Textbook of Pediatric Nursing
17. Parul Datta, Textbook of Pediatric Nursing
18. Panchali Pal, Textbook of Pediatric Nursing

Course Outcome Measurement:

The outcome will be measured by the performance of the students in various class tests, assignments in addition to the End Semester Exam (ESE) that contains significant number of questions on problems related to meeting needs of the patients.

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Relationship between the course outcomes (COs), Programme Outcomes (PO) and Programme Specific Outcomes (PSOs)

Mapping between COs, POs and PSOs

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4
CO1	**2**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**3**	**1**
CO2	**2**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**3**	**1**
CO3	**2**	**1**	**2**	**3**	**2**	**2**	**2**	**1**	**2**	**3**	**1**
CO4	**3**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**3**	**1**
CO5	**2**	**1**	**3**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**1**
CO6	**2**	**1**	**3**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**1**

1: strongly related, 2: moderately related and 3: weakly related

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Curriculum & Scheme of Examination

2023

AMITY UNIVERSITY HARYANA

GURUGRAM

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PHARMACEUTICAL ANALYSIS

Course Code : BP102T **Credit Units: 04**

Course Objective : This course deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs. Upon completion of the course student shall be able to understand the principles of volumetric and electro chemical analysis, carryout various volumetric and electrochemical titrations & develop analytical skills.

Course Contents :

Module-I
(a) Pharmaceutical analysis- Definition and scope
i) Different techniques of analysis
ii) Methods of expressing concentration
iii) Primary and secondary standards.
iv) Preparation and standardization of various molar and normal solutions-
Oxalic acid, sodium hydroxide, hydrochloric acid, sodium thiosulphate,
sulphuric acid, potassium permanganate and ceric ammonium sulphate
(b) Errors: Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures
(c) Pharmacopoeia, Sources of impurities in medicinal agents,limit tests.

Module-II
Acid base titration: Theories of acid base indicators, classification of acid base titrations and theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves
Non aqueous titration: Solvents, acidimetry and alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl

Module-III
Precipitation titrations: Mohr's method, Volhard's, Modified Volhard's, Fajans method, estimation of sodium chloride.
Complexometric titration: Classification, metal ion indicators, masking and demasking reagents, estimation of Magnesium sulphate, and calcium gluconate.
Gravimetry: Principle and steps involved in gravimetric analysis. Purity of the precipitate: co-precipitation and post precipitation, Estimation of barium sulphate.
Basic Principles,methods and application of diazotisation titration.

Module-IV
Redox titrations
(a) Concepts of oxidation and reduction
(b) Types of redox titrations (Principles and applications)
Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry, Titration with potassium iodate

Module-V
Electrochemical methods of analysis
Conductometry: Introduction, Conductivity cell, Conductometric titrations, applications.
Potentiometry - Electrochemical cell, construction and working of reference (Standard hydrogen, silver chloride electrode and calomel electrode) and indicator electrodes (metal electrodes and glass electrode), methods to determine end point of potentiometric titration and applications.

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Polarography: Principle, Ilkovic equation, construction and working of dropping mercury electrode and rotating platinum electrode, applications

Examination Scheme :

Components	CT	HA	S/V/Q	ATTD	EE
Weightage(%)	15	3	3	4	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance EE: End Semester Examination

Recommended Books: (Latest Editions)

- A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London
- A.I. Vogel, Text Book of Quantitative Inorganic analysis
- P. Gundu Rao, Inorganic Pharmaceutical Chemistry
- Bentley and Driver's Textbook of Pharmaceutical Chemistry
- John H. Kennedy, Analytical chemistry principles
- Indian Pharmacopoeia.

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COMMUNICATION SKILLS

Course Code : BP105T **Credit Units: 02**

Course Objectives:
This course will prepare the young pharmacy student to interact effectively with doctors, nurses, dentists, physiotherapists and other health workers. At the end of this course the student will get the soft skills set to work cohesively with the team as a team player and will add value to the pharmaceutical business.

Course Contents:

Module-I
Communication Skills: Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context
Barriers to communication: Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers
Perspectives in Communication: Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment

Module-II
Elements of Communication: Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication
Communication Styles: Introduction, The Communication Styles Matrix with example for each -Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style

Module-III
Basic Listening Skills: Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in Difficult Situations
Effective Written Communication: Introduction, When and When Not to Use Written Communication - Complexity of the Topic, Amount of Discussion' Required, Shades of Meaning, Formal Communication
Writing Effectively: Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message

Module-IV
Interview Skills: Purpose of an interview, Do's and Dont's of an interview
Giving Presentations: Dealing with Fears, Planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery

Module-V
Group Discussion: Introduction, Communication skills in group discussion, Do's and Dont's of group discussion

Examination Scheme:

Components	CT	HA	S/V/Q	ATTD	EE
Weightage(%)	10	2	1	2	35

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance
EE: End Semester Examination

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Recommended Books: (Latest Edition)

- Basic communication skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011
- Communication skills, Sanjay Kumar, Pushpalata, 1stEdition, Oxford Press, 2011
- Organizational Behaviour, Stephen .P. Robbins, 1stEdition, Pearson, 2013
- Brilliant- Communication skills, Gill Hasson, 1stEdition, Pearson Life, 2011
- The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5thEdition, Pearson, 2013
- Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Green hall, 1st Edition Universe of Learning LTD, 2010
- Communication skills for professionals, Konar nira, 2ndEdition, New arrivals – PHI, 2011
- Personality development and soft skills, Barun K Mitra, 1stEdition, Oxford Press, 2011
- Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning india pvt.ltd, 2011
- Soft skills and professional communication, Francis Peters SJ, 1stEdition, Mc Graw Hill Education, 2011
- Effective communication, John Adair, 4thEdition, Pan Mac Millan,2009
- Bringing out the best in people, Aubrey Daniels, 2ndEdition, Mc Graw Hill, 1999

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HUMAN ANATOMY AND PHYSIOLOGY PRACTICAL-I

Course Code : BP107P **Credit Units: 02**

Course Objective:
Practical physiology is complimentary to the theoretical discussions in physiology. Practicals allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject**.**

Course Contents:
List of experiments :
1. Study of compound microscope.
2. Microscopic study of epithelial and connective tissue
3. Microscopic study of muscular and nervous tissue
4. Identification of axial bones
5. Identification of appendicular bones
6. Introduction to hemocytometry.
7. Enumeration of white blood cell (WBC) count
8. Enumeration of total red blood corpuscles (RBC) count
9. Determination of bleeding time
10. Determination of clotting time
11. Estimation of hemoglobin content
12. Determination of blood group.
13. Determination of erythrocyte sedimentation rate (ESR).
14. Determination of heart rate and pulse rate.
15. Recording of blood pressure.

Examination Scheme :

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
02	**05**	**03**	**05**	**25**	**10**

Note: A-Attendance, IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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PHARMACEUTICAL ANALYSIS PRACTICAL

Course Code : BP108P **Credit Units: 02**

List of experiments:

Limit Test of the following

(1) Chloride
(2) Sulphate
(3) Iron
(4) Arsenic

II **Preparation and standardization of**

(1) Sodium hydroxide
(2) Sulphuric acid
(3) Sodium thiosulfate
(4) Potassium permanganate
(5) Ceric ammonium sulphate

III **Assay of the following compounds along with Standardization of Titrant**

(1) Ammonium chloride by acid base titration
(2) Ferrous sulphate by Cerimetry
(3) Copper sulphate by Iodometry
(4) Calcium gluconate by complexometry
(5) Hydrogen peroxide by Permanganometry
(6) Sodium benzoate by non-aqueous titration
(7) Sodium Chloride by precipitation titration

IV **Determination of Normality by electro-analytical methods**

(1) Conductometric titration of strong acid against strong base
(2) Conductometric titration of strong acid and weak acid against strong base
(3) Potentiometric titration of strong acid against strong base

Examination Scheme :

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
02	**05**	**03**	**05**	**25**	**10**

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PHARMACEUTICS PRACTICAL

Course Code : BP109P **Credit Units: 02**

List of experiments :

1 . Syrups

a) Syrup IP'66

b) Compound syrup of Ferrous Phosphate BPC'68

3 Hours / week

2. Elixirs a) Piperazine citrate elixir

b) Paracetamol pediatric elixir

3.Linctus a) Terpin Hydrate Linctus IP'66

4. Solutions

b) Iodine Throat Paint (Mandles Paint)

a) Strong solution of ammonium acetate

b) Cresol with soap solution

c) Lugol's solution

5. Suspensions

a) Calamine lotion

b) Magnesium Hydroxide mixture

c) Aluminimum Hydroxide gel

6. Emulsions a) Turpentine Liniment

b) Liquid paraffin emulsion

7. Powders and Granules

a) ORS powder (WHO)

b) Effervescent granules

c)Dusting powder

d)Divded powders

8. Suppositories

a) Glycero gelatin suppository

b) Coca butter suppository

c) Zinc Oxide suppository

8. Semisolids

a) Sulphur ointment

b) Non staining-iodine ointment with methyl salicylate

c) Carbopal gel

9. Gargles and Mouthwashes

a) Iodine gargle

b) Chlorhexidine mouthwash

Examination Scheme :

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
02	**05**	**03**	**05**	**25**	**10**

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PHARMACEUTICAL INORGANIC CHEMISTRY PRACTICAL

Course Code : BP110P **Credit Units: 02**

List of experiments:

I **Limit tests for following ions**
Limit test for Chlorides and Sulphates
Modified limit test for Chlorides and Sulphates
Limit test for Iron
Limit test for Heavymetals
Limit test for Lead
Limit test for Arsenic

II **Identification test**
Magnesium hydroxide
Ferrous sulphate
Sodium bicarbonate
Calcium gluconate
Copper sulphate

III **Test for purity**
Swelling power of Bentonite
Neutralizing capacity of aluminum hydroxide gel
Determination of potassium iodate and iodine in potassium Iodide

IV **Preparation of inorganic pharmaceuticals**
Boric acid
Potash alum
Ferrous sulphate

Examination Scheme :

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
02	**05**	**03**	**05**	**25**	**10**

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COMMUNICATION SKILLS PRACTICAL

Course Code : BP111P **Credit Units: 01**

The following learning modules are to be conducted using words worth® English language lab software

Basic communication covering the following topics
Meeting People
Asking Questions
Making Friends
What did you do?
Do's and Dont's

Pronunciations covering the following topics
Pronunciation (Consonant Sounds)
Pronunciation and Nouns
Pronunciation (Vowel Sounds)

Advanced Learning
Listening Comprehension / Direct and Indirect Speech
Figures of Speech
Effective Communication
Writing Skills
Effective Writing
Interview Handling Skills
E-Mail etiquette
Presentation Skills

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
02	**03**	**02**	**03**	**5**	**10**

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REMEDIAL BIOLOGY PRACTICAL

Course Code: BP112RBP **Credit Units: 01**

List of Experiments :

1. Introduction to experiments in biology
a) Study of Microscope
b) Section cutting techniques
c) Mounting and staining
d) Permanent slide preparation
2. Study of cell and its inclusions
3. Study of Stem, Root, Leaf, seed, fruit, flower and their modifications
4. Detailed study of frog by using computer models
5. Microscopic study and identification of tissues pertinent to Stem, Root
Leaf, seed, fruit and flower
6. Identification of bones
7. Determination of blood group
8. Determination of blood pressure
9. Determination of tidal volume

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
02	**03**	**02**	**03**	**5**	**10**

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COMPUTER APPLICATIONS IN PHARMACY

Course Code : BP205T **Credit Units: 03**

Course Objectives: This subject deals with the introduction Database, Database Management system, computer application in clinical studies and use of databases.

Course Contents:

Module-I

Number System: Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc, binary addition, binary subtraction – One's complement ,Two's complement method, binary multiplication, binary division

Concept of Information Systems and Software : Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project

Module-II

Web technologies: Introduction to HTML, XML,CSS and Programming languages, introduction to web servers and Server Products Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database

Module-III: Application of computers in Pharmacy - Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile technology and adherence monitoring Diagnostic System, Lab-diagnostic System, Patient Monitoring System, Pharma Information System

Module-IV

Bioinformatics: Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery

Module-V

Computers as data analysis in Preclinical development: Chromatographic dada analysis(CDS), Laboratory Information management System (LIMS) and Text Information Management System (TIMS)

Examination Scheme:

Components	CT	HA	S/V/Q	ATTD	EE
Weightage(%)	15	3	3	4	50

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance
EE: End Semester Examination

Recommended books (Latest edition):

- Computer Application in Pharmacy – William E.Fassett –Lea and Febiger, 600 South Washington Square, USA, (215) 922-1330.
- Computer Application in Pharmaceutical Research and Development –Sean Ekins – Wiley-Interscience, A John Willey and Sons, INC., Publication, USA
- Bioinformatics (Concept, Skills and Applications) – S.C.Rastogi-CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002(INDIA)
- Microsoft office Access - 2003, Application Development Using VBA, SQL Server,
- DAP and Infopath – Cary N.Prague – Wiley Dreamtech India (P) Ltd., 4435/7, Ansari Road, Daryagani, New Delhi – 110002

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ENVIRONMENTAL SCIENCES

Course Code : BP206T **Credit Units: 03**

Course Objectives: Environmental Sciences is the scientific study of the environmental system and the status of its inherent or induced changes on organisms. It includes not only the study of physical and biological characters of the environment but also the social and cultural
factors and the impact of man on environment.

Course Contents:
Module-I: The Multidisciplinary nature of environmental studies Natural Resources Renewable and non-renewable resources:
Natural resources and associated problems a) Forest resources; b) Water resources; c) Mineral resources; d) Food resources; e) Energy resources; f) Land resources: Role of an individual in conservation of natural resources.

Module-II
Ecosystems Concept of an ecosystem.Structure and function of an ecosystem. Introduction, types, characteristic features, structure and function of the ecosystems: Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Module-III
Environmental Pollution: Air pollution; Water pollution; Soil pollution

Examination Scheme:

Components	CT	HA	S/V/Q	ATTD	EE
Weightage(%)	15	3	3	4	50

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance
EE: End Semester Examination

Recommended Books (Latest edition):

- Y.K. Sing, Environmental Science, New Age International Pvt, Publishers, Bangalore
- Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
- Bharucha Erach, The Biodiversity of India, Mapin Pu blishing Pvt. Ltd., Ahmedabad – 380 013, India,
- Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
- Clark R.S., Marine Pollution, Clanderson Press Oxford
- Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001,
- Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p
- De A.K., Environmental Chemistry, Wiley Eastern Ltd.
- Down of Earth, Centre for Science and Environment

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HUMAN ANATOMY AND PHYSIOLOGY PRACTICAL-II

Course Code: BP207P **Credit Units: 02**

Practical physiology is complimentary to the theoretical discussions in physiology. Practicals allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject**.**

List of Experiments

1. To study the integumentary and special senses using specimen, models, etc.,
2. To study the nervous system using specimen, models, etc.,
3. To study the endocrine system using specimen, models, etc
4. To demonstrate the general neurological examination
5. To demonstrate the function of olfactory nerve
6. To examine the different types of taste.
7. To demonstrate the visual acuity
8. To demonstrate the reflex activity
9. Recording of body temperature
10. To demonstrate positive and negative feedback mechanism.
11. Determination of tidal volume and vital capacity.
12. Study of digestive, respiratory, cardiovascular systems, urinary and reproductive systems with the help of models, charts and specimens.
13. Recording of basal mass index .
14. Study of family planning devices and pregnancy diagnosis test.
15. Demonstration of total blood count by cell analyser
16. Permanent slides of vital organs and gonads.

Examination Scheme :

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
02	**05**	**03**	**05**	**25**	**10**

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PHARMACEUTICAL ORGANIC CHEMISTRY PRACTICAL-I

Course Code : BP208P **Credit Units: 02**

List of experiments

A. Systematic qualitative analysis of unknown organic compounds like

1. Preliminary test: Color, odour, aliphatic/aromatic compounds, saturation and unsaturation, etc.
2. Detection of elements like Nitrogen, Sulphur and Halogen by Lassaigne's test
3. Solubility test
4. Functional group test like Phenols, Amides/ Urea, Carbohydrates, Amines, Carboxylic acids, Aldehydes and Ketones, Alcohols, Esters, Aromatic and Halogenated Hydrocarbons, Nitro compounds and Anilides.
5. Melting point/Boiling point of organic compounds
6. Identification of the unknown compound from the literature using melting point/ boiling point.
7. Preparation of the derivatives and confirmation of the unknown compound bymelting point/ boiling point.
8. Minimum 5 unknown organic compounds to be analysed systematically.

B. Preparation of suitable solid derivatives from organic compounds

C. Construction of molecular models

Examination Scheme :

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
02	**05**	**03**	**05**	**25**	**10**

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BIOCHEMISTRY PRACTICAL

Course Code : BP209P **Credit Units: 02**

List of experiments

1. Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and starch)
2. Identification tests for Proteins (albumin and Casein)
3. Quantitative analysis of reducing sugars (DNSA method) and Proteins (Biuret method)
4. Qualitative analysis of urine for abnormal constituents
5. Determination of blood creatinine
6. Determination of blood sugar
7. Determination of serum total cholesterol
8. Preparation of buffer solution and measurement of pH
9. Study of enzymatic hydrolysis of starch
10. Determination of Salivary amylase activity
11. Study the effect of Temperature on Salivary amylase activity.
12. Study the effect of substrate concentration on salivary amylase activity.

Examination Scheme :

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
02	**05**	**03**	**05**	**25**	**10**

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COMPUTER APPLICATIONS IN PHARMACY PRACTICAL

Course Code : BP210P **Credit Units: 01**

List of experiments

1. Design a questionnaire using a word processing package to gather information about a particular disease.
2. Create a HTML web page to show personal information.
3 Retrieve the information of a drug and its adverse effects using online tools
4 Creating mailing labels Using Label Wizard , generating label in MS WORD
5 Create a database in MS Access to store the patient information with the required fields Using access
6. Design a form in MS Access to view, add, delete and modify the patient record in the database
7. Generating report and printing the report from patient database
8. Creating invoice table using – MS Access
9. Drug information storage and retrieval using MS Access
10. Creating and working with queries in MS Access
11. Exporting Tables, Queries, Forms and Reports to web pages
12. Exporting Tables, Queries, Forms and Reports to XML pages

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
02	**03**	**02**	**03**	**5**	**10**

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PHARMACEUTICAL MICROBIOLOGY

Course Code : BP303T **Credit Units: 04**

Course Objectives: Study of all categories of microorganisims especially for the production of alcohol antibiotics, vaccines, vitamins enzymes etc..

Course Content:

Module-I
Introduction, history of microbiology, its branches, scope and its importance. Introduction to Prokaryotes and Eukaryotes. Study of ultra-structure and morphological classification of bacteria, nutritional requirements, raw materials used for culture media and physical parameters for growth, growth curve, isolation and preservation methods for pure cultures, cultivation of anaerobes, quantitative measurement of bacterial growth (total & viable count). Study of different types of phase constrast microscopy, dark field microscopy and electron microscopy.

Module-II
Identification of bacteria using staining techniques (simple, Gram's & Acid fast staining) and biochemical tests (IMViC). Study of principle, procedure, merits, demerits and applications of physical, chemical gaseous,radiation and mechanical method of sterilization. Evaluation of the efficiency of sterilization methods. Equipments employed in large scale sterilization. Sterility indicators.

Module-III
Study of morphology, classification, reproduction/replication and cultivation of Fungi and Viruses.
Classification and mode of action of disinfectants Factors influencing disinfection, antiseptics and their evaluation. For bacteriostatic and bactericidal actions Evaluation of bactericidal & Bacteriostatic. Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.

Module-IV
Designing of aseptic area, laminar flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification. Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids. Assessment of a new antibiotic.

Module-V
Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage. Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations.
Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures. Application of cell cultures in pharmaceutical industry and research.

Examination Scheme :

Components	CT	HA	S/V/Q	ATTD	EE
Weightage(%)	15	3	3	4	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance EE: End Semester Examination

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Recommended Books (Latest edition)

- W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
- Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.
- Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
- Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
- Rose: Industrial Microbiology.
- Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
- Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution. Peppler: Microbial Technology. I.P., B.P., U.S.P.- latest editions.
- Ananthnarayan : Text Book of Microbiology, Orient-Longman, Chennai Edward: Fundamentals of Microbiology.
- N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
- Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company

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PHARMACEUTICAL ENGINEERING

Course Code : BP304T **Credit Units: 04**

Course Objectives: This course is designed to impart a fundamental knowledge on the art and science of various Module operations used in pharmaceutical industry.

Course Content:

Module-I

Flow of fluids: Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturimeter, Pitot tube and Rotometer.

Size Reduction: Objectives, Mechanisms & Laws governing size reduction, factors affecting size reduction, principles, construction, working, uses, merits and demerits of Hammer mill, ball mill, fluid energy mill, Edge runner mill & end runner mill.

Size Separation: Objectives, applications & mechanism of size separation, official standards of powders, sieves, size separation Principles, construction, working, uses, merits and demerits of Sieve shaker, cyclone separator, Air separator, Bag filter & elutriation tank.

Module-II

Heat Transfer: Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers.

Evaporation: Objectives, applications and factors influencing evaporation, differences between evaporation and other heat process. principles, construction, working, uses, merits and demerits of Steam jacketed kettle, horizontal tube evaporator, climbing film evaporator, forced circulation evaporator, multiple effect evaporator& Economy of multiple effect evaporator.

Distillation: Basic Principles and methodology of simple distillation,flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation

Module-III

Drying: Objectives, applications & mechanism of drying process, measurements & applications of Equilibrium Moisture content, rate of drying curve. principles, construction, working, uses, merits and demerits of Tray dryer, drum dryer spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer.

Mixing: Objectives, applications & factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles, Construction, Working, uses, Merits and Demerits of Double cone blender, twin shell blender, ribbon blender, Sigma blade mixer, planetarymixers, Propellers, Turbines, Paddles & Silverson Emulsifier,

Module-IV

Filtration: Objectives, applications, Theories & Factors influencing filtration, filter aids, filter medias. Principle, Construction, Working, Uses, Merits and demerits of plate & frame filter, filter leaf, rotary drum filter, Meta filter & Cartridge filter, membrane filters and Seidtz filter.

Centrifugation: Objectives, principle & applications of Centrifugation, principles, construction, working, uses, merits and demerits of Perforated basket centrifuge, Non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge.

Module-V

Materials of pharmaceutical plant construction, Corrosion and its prevention: Factors affecting during materials selected for Pharmaceutical plant construction, Theories of corrosion, types of corrosion and there prevention. Ferrous and nonferrous metals, inorganic and organic non metals, basic of material handling systems.

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Recommended Books: (Latest Editions)

- Introduction to chemical engineering – Walter L Badger & Julius Banchero, Latest edition.
- Solid phase extraction, Principles, techniques and applications by Nigel J.K. Simpson Latest edition.
- Module operation of chemical engineering – Mcabe Smith, Latest edition.
- Pharmaceutical engineering principles and practices – C.V.S Subrahmanyam et al., Latest edition.
- Remington practice of pharmacy- Martin, Latest edition.
- Theory and practice of industrial pharmacy by Lachmann., Latest edition.
- Physical pharmaceutics- C.V.S Subrahmanyam et al., Latest edition.
- Cooper and Gunn's Tutorial pharmacy, S.J. Carter, Latest edition.

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PHARMACEUTICAL ORGANIC CHEMISTRY PRACTICAL-II

Course Code : BP305P **Credit Units: 02**

List of experiments

I Experiments involving laboratory techniques
Recrystallization
Steam distillation

II Determination of following oil values (including standardization of reagents)
Acid value
Saponification value
Iodine value

III **Preparation of compounds**

Benzanilide/Phenyl benzoate/Acetanilide from Aniline/ Phenol /Aniline by acylation reaction.
2,4,6-Tribromo aniline/Para bromo acetanilide from Aniline/ Acetanilide by halogenation (Bromination) reaction.
5-Nitro salicylic acid/Meta di nitro benzene from Salicylic acid / Nitro benzene by nitration reaction.
Benzoic acid from Benzyl chloride by oxidation reaction.
Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis reaction.
1-Phenyl azo-2-napthol from Aniline by diazotization and coupling reactions.
Benzil from Benzoin by oxidation reaction.
Dibenzal acetone from Benzaldehyde by Claison Schmidt reaction
Cinnammic acid from Benzaldehyde by Perkin reaction
P-Iodo benzoic acid from *P*-amino benzoic acid

Examination Scheme :

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
02	**05**	**03**	**05**	**25**	**10**

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PHYSICAL PHARMACEUTICS PRACTICAL-I

Course Code : BP306P **Credit Units: 02**

List of Experiments

1. Determination the solubility of drug at room temperature
2. Determination of pKa value by Half Neutralization/ Henderson Hasselbalch equation.
3. Determination of Partition co- efficient of benzoic acid in benzene and water
4. Determination of Partition co- efficient of Iodine in CCl4 and water
5. Determination of % composition of NaCl in a solution using phenol-water system by CST method
6. Determination of surface tension of given liquids by drop count and drop weight method
7. Determination of HLB number of a surfactant by saponification method
8. Determination of Freundlich and Langmuir constants using activated char coal
9. Determination of critical micellar concentration of surfactants
10. Determination of stability constant and donor acceptor ratio of PABA-Caffeine complex by solubilitymethod
11. Determination of stability constant and donor acceptor ratio of Cupric-Glycine complex by pH titration method

Examination Scheme :

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
02	**05**	**03**	**05**	**25**	**10**

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PHARMACEUTICAL MICROBIOLOGY PRACTICAL

Course Code : BP307P **Credit Units: 02**

List of experiments

1. Introduction and study of different equipments and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology.
2. Sterilization of glassware, preparation and sterilization of media.
3. Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations.
4. Staining methods- Simple, Grams staining and acid fast staining (Demonstration with practical).
5. Isolation of pure culture of micro-organisms by multiple streak plate technique and other techniques.
6. Microbiological assay of antibiotics by cup plate method and other methods
7. Motility determination by Hanging drop method.
8. Sterility testing of pharmaceuticals.
9. Bacteriological analysis of water
10. Biochemical test.

Examination Scheme :

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
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PHARMACEUTICAL ENGINEERING PRACTICAL

Course Code : BP308P **Credit Units: 02**

List of Experiments

I. Determination of radiation constant of brass, iron, unpainted and painted glass.
II. Steam distillation – To calculate the efficiency of steam distillation.
III. To determine the overall heat transfer coefficient by heat exchanger.
IV. Construction of drying curves (for calcium carbonate and starch).
V. Determination of moisture content and loss on drying.
VI. Determination of humidity of air – i) From wet and dry bulb temperatures –use of Dew point method.
VII. Description of Construction working and application of Pharmaceutical Machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill, de humidifier.
VIII. Size analysis by sieving – To evaluate size distribution of tablet granulations – Construction of various size frequency curves including arithmetic andlogarithmic probability plots.
IX. Size reduction: To verify the laws of size reduction using ball mill and determining Kicks, Rittinger's, Bond's coefficients, power requirement and critical speed of Ball Mill.
X. Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such othermajor equipment.
XI. Factors affecting Rate of Filtration and Evaporation (Surface area, Concentration and Thickness/ viscosity
XII. To study the effect of time on the Rate of Crystallization.
XIII. To calculate the uniformity Index for given sample by using Double Cone Blender.

Examination Scheme :

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
02	**05**	**03**	**05**	**25**	**10**

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MEDICINAL CHEMISTRY PRACTICAL-I

Course Code : BP406P **Credit Units: 02**

List of experiments

I Preparation of drugs/ intermediates

1 1,3-pyrazole
2 1,3-oxazole
3 Benzimidazole
4 Benztriazole
5 2,3- diphenyl quinoxaline
6 Benzocaine
7 Phenytoin
8 Phenothiazine
9 Barbiturate

II Assay of drugs

1 Chlorpromazine
2 Phenobarbitone
3 Atropine
4 Ibuprofen
5 Aspirin
6 Furosemide

III Determination of Partition coefficient for any two drugs

Examination Scheme :

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
02	**05**	**03**	**05**	**25**	**10**

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PHYSICAL PHARMACEUTICS PRACTICAL-II

Course Code : BP407P **Credit Units: 02**

List of experiments

1. Determination of particle size, particle size distribution using sieving method
2. Determination of particle size, particle size distribution using Microscopic method
3. Determination of bulk density, true density and porosity
4. Determine the angle of repose and influence of lubricant on angle of repose
5. Determination of viscosity of liquid using Ostwald's viscometer
6. Determination sedimentation volume with effect of different suspending agent
7. Determination sedimentation volume with effect of different concentration of single suspending agent
8. Determination of viscosity of semisolid by using Brookfield viscometer
9. Determination of reaction rate constant first order.
10. Determination of reaction rate constant second order
11. Accelerated stability studies

Examination Scheme :

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
02	**05**	**03**	**05**	**25**	**10**

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PHARMACOLOGY PRACTICAL-I

Course Code : BP408P **Credit Units: 02**

List of experiments

1. Introduction to experimental pharmacology.
2. Commonly used instruments in experimental pharmacology.
3. Study of common laboratory animals.
4. Maintenance of laboratory animals as per CPCSEA guidelines.
5. Common laboratory techniques. Blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies.
6. Study of different routes of drugs administration in mice/rats.
7. Study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time in mice.
8. Effect of drugs on ciliary motility of frog oesophagus
9. Effect of drugs on rabbit eye.
10. Effects of skeletal muscle relaxants using rota-rod apparatus.
11. Effect of drugs on locomotor activity using actophotometer.
12. Anticonvulsant effect of drugs byMES and PTZ method.
13. Study of stereotype and anti-catatonic activity of drugs on rats/mice.
14. Study of anxiolytic activity of drugs using rats/mice.
15. Study of local anesthetics by different methods

Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by softwares and videos

Examination Scheme :

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
02	**05**	**03**	**05**	**25**	**10**

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PHARMACOGNOSY AND PHYTOCHEMISTRY PRACTICAL-I

Course Code : BP409P **Credit Units: 02**

List of experiments

1. Analysis of crude drugs by chemical tests: **(**i)Tragaccanth (ii) Acacia (iii)Agar (iv) Gelatin (v) starch (vi) Honey (vii) Castor oil
2. Determination of stomatal number and index
3. Determination of vein islet number, vein islet termination and paliside ratio.
4. Determination of size of starch grains, calcium oxalate crystals by eye piece micrometer
5. Determination of Fiber length and width
6. Determination of number of starch grains by Lycopodium spore method
7. Determination of Ash value
8. Determination of Extractive values of crude drugs
9. Determination of moisture content of crude drugs
10. Determination of swelling index and foaming

Examination Scheme :

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
02	**05**	**03**	**05**	**25**	**10**

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INDUSTRIAL PHARMACY-I

Course Code : BP502T **Credit Units: 04**

Course Objectives: Course enables the student to understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product.

Course content:

Module-I

Preformulation Studies: Introduction to preformulation, goals and objectives, study of physicochemical characteristics of drug substances.

a. Physical properties: Physical form (crystal & amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism

b. Chemical Properties: Hydrolysis, oxidation, reduction, racemisation, polymerization BCS classification of drugs & its significant. Application of preformulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.

Module-II

Tablets:

a. Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems. Equipments and tablet tooling.

b. Tablet coating: Types of coating, coating materials, formulation of coating composition, methods of coating, equipment employed and defects in coating.

c. Quality control tests: In process and finished product tests

Liquid orals: Formulation and manufacturing consideration of syrups and elixirs suspensions and emulsions; Filling and packaging; evaluation of liquid orals official in pharmacopoeia

Module-III

Capsules:

a. ***Hard gelatin capsules:*** Introduction, Production of hard gelatin capsule shells. Size of capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules, manufacturing defects. In process and final product quality control tests for capsules.

b. ***Soft gelatin capsules:*** Nature of shell and capsule content, size of capsules,importance of base adsorption and minim/gram factors, production, in process and final product quality control tests. Packing, storage and stability testing of soft gelatin capsules and their applications.

Pellets: Introduction, formulation requirements, pelletization process, equipments for manufacture of pellets

Module-IV

Parenteral Products:

a. Definition, types, advantages and limitations. Preformulation factors and essential requirements, vehicles, additives, importance of isotonicity

b. Production procedure, production facilities and controls, aseptic processing

c. Formulation of injections, sterile powders, large volume parenterals and lyophilized products.

d. Containers and closures selection, filling and sealing of ampoules, vials and infusion fluids. Quality control tests of parenteral products.

Ophthalmic Preparations: Introduction, formulation considerations; formulation of eye drops, eye ointments and eye lotions; methods of preparation; labeling, containers; evaluation of

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ophthalmic preparations

Module-V

Cosmetics: Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes and sunscreens.

Pharmaceutical Aerosols: Definition, propellants, containers, valves, types of aerosol systems; formulation and manufacture of aerosols; Evaluation of aerosols; Quality control and stability studies.

Packaging Materials Science: Materials used for packaging of pharmaceutical products, factors influencing choice of containers, legal and official requirements for containers, stability aspects of packaging materials, quality control tests.

Examination Scheme :

Components	CT	HA	S/V/Q	ATTD	EE
Weightage(%)	15	3	3	4	75

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Recommended Books: (Latest Editions)

- Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman & J.B.Schwartz
- Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman & Lachman
- Pharmaceutical dosage form disperse system VOL-1 by Liberman & Lachman
- Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition
- Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS)
- Theory and Practice of Industrial Pharmacy by Liberman & Lachman
- Pharmaceutics- The science of dosage form design by M.E.Aulton, Churchill livingstone, Latest edition
- Introduction to Pharmaceutical Dosage Forms by H. C.Ansel, Lea &Febiger, Philadelphia, 5thedition, 2005
- Drug stability - Principles and practice by Cartensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107.

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PHARMACEUTICAL JURISPRUDENCE

Course Code : BP505T **Credit Units: 04**

Course Objectives: This course is designed to impart basic knowledge on important legislations related to the profession of pharmacy in India.

Course Content:

Module-I

Drugs and Cosmetics Act, 1940 and its rules 1945:

Objectives, Definitions, Legal definitions of schedules to the Act and Rules

Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties**.**

Manufacture of drugs – Prohibition of manufacture and sale of certain drugs,

Conditions for grant of license and conditions of license for manufacture of drugs,

Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license.

Module-II

Drugs and Cosmetics Act, 1940 and its rules 1945.

Detailed study of Schedule G, H, M, N, P,T,U, V, X, Y, Part XII B, Sch F & DMR (OA)

Sale of Drugs – Wholesale, Retail sale and Restricted license. Offences and penalties

Labeling & Packing of drugs- General labeling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Offences and penalties.

Administration of the Act and Rules – Drugs Technical Advisory Board, Central drugs

Laboratory, Drugs Consultative Committee, Government drug analysts, Licensing authorities, controlling authorities, Drugs Inspectors

Module-III

Pharmacy Act –1948: Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils; constitution and functions, Registration of Pharmacists, Offences and Penalties

Medicinal and Toilet Preparation Act –1955: Objectives, Definitions, Licensing,

Manufacture In bond and Outside bond, Export of alcoholic preparations,

Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations.

Offences and Penalties.

Narcotic Drugs and Psychotropic substances Act-1985 and Rules: Objectives, Definitions, Authorities and Officers, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and Regulation, opium poppy cultivation and production of poppy straw, manufacture, sale and export of opium, Offences and Penalties

Module -IV

Study of Salient Features of Drugs and Magic Remedies Act and its rules: Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties

Prevention of Cruelty to animals Act-1960: Objectives, Definitions, Institutional Animal Ethics Committee, CPCSEA guidelines for Breeding and Stocking of Animals, Performance of Experiments, Transfer and acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties

National Pharmaceutical Pricing Authority: Drugs Price Control Order (DPCO)- 2013.

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Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, National List of Essential Medicines (NLEM)

Module-V

Pharmaceutical Legislations – A brief review, Introduction, Study of drugs enquiry committee, Health survey and development committee, Hathi committee and Mudaliar committee

Code of Pharmaceutical ethics D efinition, Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath

Medical Termination of Pregnancy Act

Right to Information Act

Introduction to Intellectual Property Rights (IPR)

Examination Scheme :

Components	CT	HA	S/V/Q	ATTD	EE
Weightage(%)	15	3	3	4	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance EE: End Semester Examination

Recommended books: (Latest Edition)

- Forensic Pharmacy by B. Suresh
- Text book of Forensic Pharmacy by B.M. Mithal
- Hand book of drug law-byM.L. Mehra
- A text book of Forensic Pharmacy by N.K. Jain
- Drugs and Cosmetics Act/Rules by Govt. of India publications.
- Medicinal and Toilet preparations act 1955 by Govt. of India publications.
- Narcotic drugs and psychotropic substances act by Govt. of India publications
- Drugs and Magic Remedies act by Govt. of India publication
- Bare Acts of the said laws published by Government. Reference books (Theory)

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INDUSTRIAL PHARMACY PRACTICAL-I

Course Code : BP506P **Credit Units: 02**

List of experiments

1. Preformulation studies on paracetamol/asparin/or any other drug
2. Preparation and evaluation of Paracetamol tablets
3. Preparation and evaluation of Aspirin tablets
4. Coating of tablets- film coating of tables/granules
5. Preparation and evaluation of Tetracycline capsules
6. Preparation of Calcium Gluconate injection
7. Preparation of Ascorbic Acid injection
8. Qulaity control test of (as per IP) marketed tablets and capsules
9. Preparation of Eye drops/ and Eye ointments
10. Preparation of Creams (cold / vanishing cream)
11. Evaluation of Glass containers (as per IP)

Examination Scheme :

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
02	**05**	**03**	**05**	**25**	**10**

Note: A-Attendance, IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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PHARMACOLOGY PRACTICAL-II

Course Code : BP507P **Credit Units: 02**

List of experiments

1. Introduction to *in-vitro* pharmacology and physiological salt solutions.
2. Effect of drugs on isolated frog heart.
3. Effect of drugs on blood pressure and heart rate of dog.
4. Study of diuretic activity of drugs using rats/mice.
5. DRC of acetylcholine using frog rectus abdominis muscle.
6. Effect of physostigmine and atropine on DRC of acetylcholine using frog rectus abdominis muscle and rat ileum respectively.
7. Bioassay of histamine using guinea pig ileum by matching method.
8. Bioassay of oxytocin using rat uterine horn by interpolation method.
9. Bioassay of serotonin using rat fundus strip by three point bioassay.
10. Bioassay of acetylcholine using rat ileum/colon by four point bioassay.
11. Determination of PA2 value of prazosin using rat anococcygeus muscle (by Schilds plot method).
12. Determination of PD2 value using guinea pig ileum.
13. Effect of spasmogens and spasmolytics using rabbit jejunum.
14. Anti-inflammatory activity of drugs using carrageenan induced paw-edema model.
15. Analgesic activity of drug using central and peripheral methods

Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by softwares and videos

Examination Scheme :

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
02	**05**	**03**	**05**	**25**	**10**

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PHARMACOGNOSY AND PHYTOCHEMISTRY PRACTICAL-II

Course Code : BP508P **Credit Units: 02**

List of Experiments

1. Morphology, histology and powder characteristics & extraction & detection of:
Cinchona, Cinnamon, Senna, Clove, Ephedra, Fennel and Coriander
2. Exercise involving isolation & detection of active principles
a. Caffeine - from tea dust.
b. Diosgenin from Dioscorea
c. Atropine from Belladonna
d. Sennosides from Senna
3. Separation of sugars by Paper chromatography
4. TLC of herbal extract
5. Distillation of volatile oils and detection of phytoconstitutents by TLC
6. Analysis of crude drugs by chemical tests: **(**i) Asafoetida (ii) Benzoin (iii) Colophony (iv) Aloes (v) Myrrh

Examination Scheme :

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
02	**05**	**03**	**05**	**25**	**10**

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HERBAL DRUG TECHNOLOGY

Course Code : BP603T **Credit Units: 04**

Course Objectives: This subject gives the student the knowledge of basic understanding of herbal drug industry, the quality of raw material, guidelines for quality of herbal drugs, herbal cosmetics, natural sweeteners, nutraceutical etc. The subject also emphasizes on Good Manufacturing Practices (GMP), patenting and regulatory issues of herbal drugs

Course Content:

Module-I

Herbs as raw materials: Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation. Source of Herbs. Selection, identification and authentication of herbal materials. Processing of herbal raw material

Biodynamic Agriculture: Good agricultural practices in cultivation of medicinal plants including Organic farming. Pest and Pest management in medicinal plants: Biopesticides/Bioinsecticides.

Indian Systems of Medicine

a) Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy

b) Preparation and standardization of Ayurvedic formulations viz Aristas and Asawas, Ghutika,Churna, Lehya and Bhasma.

Module-II

Nutraceuticals: General aspects, Market, growth, scope and types of products available in the market. Health benefits and role of Nutraceuticals in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastro intestinal diseases. Study of following herbs as health food: Alfaalfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina

Herbal-Drug and Herb-Food Interactions: General introduction to interaction and classification. Study of following drugs and their possible side effects and interactions: Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra.

Module-III

Herbal Cosmetics

Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products.

Herbal excipients:

Herbal Excipients – Significance of substances of natural origin as excipients – colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors & perfumes.

Herbal formulations :

Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes

Module-IV

Evaluation of Drugs WHO & ICH guidelines for the assessment of herbal drugs Stability testing of herbal drugs.

Patenting and Regulatory requirements of natural products:

a) Definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bioprospecting and Biopiracy

b) Patenting aspects of Traditional Knowledge and Natural Products. Case study of Curcuma & Neem.

Regulatory Issues - Regulations in India (ASU DTAB, ASU DCC), Regulation of

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manufacture of ASU drugs - Schedule Z of Drugs & Cosmetics Act for ASU drugs.

Module-V

General Introduction to Herbal Industry: Herbal drugs industry: Present scope and future prospects. A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India.

S**chedule T – GoodManufacturing Practice of Indian systems of medicine**

Components of GMP (Schedule – T) and its objectives

Infrastructural requirements, working space, storage area, machinery and equipments, standard operating procedures, health and hygiene, documentation and records.

Examination Scheme :

Components	CT	HA	S/V/Q	ATTD	EE
Weightage(%)	15	3	3	4	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance EE: End Semester Examination

Recommended Books: (Latest Editions)

- Textbook of Pharmacognosy by Trease & Evans.
- Textbook of Pharmacognosy by Tyler, Brady & Robber.
- Pharmacognosy by Kokate, Purohit and Gokhale
- Essential of Pharmacognosy by Dr.S.H.Ansari
- Pharmacognosy & Phytochemistry by V.D.Rangari
- Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in
- Indian Medicine & Homeopathy)
- Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of
- Botanicals. Business Horizons Publishers, New Delhi, India, 2002

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PHARMACEUTICAL QUALITY ASSURANCE

Course Code : BP606T **Credit Units: 04**

Course Objectives: This course deals with the various aspects of quality control and quality assurance aspects of pharmaceutical industries. It deals with the important aspects like cGMP, QC tests, documentation, quality certifications and regulatory affairs.

Course Content:

Module-I
Quality Assurance and Quality Management concepts: Definition and concept of Quality control, Quality assurance and GMP
Total Quality Management (TQM): Definition, elements, philosophies
ICH Guidelines: purpose, participants, process of harmonization, Brief overview of QSEM, with special emphasis on Q-series guidelines, ICH stability testing guidelines
Quality by design (QbD): Definition, overview, elements of QbD program, tools
ISO 9000 & ISO14000: Overview, Benefits, Elements, steps for registration
NABL accreditation : Principles and procedures

Module-II
Organization and personnel: Personnel responsibilities, training, hygiene and personal records.
Premises: Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination.
Equipments and raw materials: Equipment selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw materials.

Module-III
Quality Control: Quality control test for containers, rubber closures and secondary packing materials.
Good Laboratory Practices: General Provisions, Organization and Personnel, Facilities, Equipment, Testing Facilities Operation, Test and Control Articles, Protocol for Conduct of a Nonclinical Laboratory Study, Records and Reports, Disqualification of Testing Facilities

Module-IV
Complaints: Complaints and evaluation of complaints, Handling of return good, recalling and waste disposal.
Document maintenance in pharmaceutical industry: Batch Formula Record, Master Formula Record, SOP, Quality audit, Quality Review and Quality documentation, Reports and documents, distribution records.

Module-V
Calibration and Validation: Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, types of validation, validation master plan. Calibration of pH meter, Qualification of UV-Visible spectrophotometer, General principles of Analytical method Validation.
Warehousing: Good warehousing practice, materials management

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Examination Scheme :

Components	CT	HA	S/V/Q	ATTD	EE
Weightage(%)	15	3	3	4	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance EE: End Semester Examination

Recommended Books: (Latest Edition)

- Quality Assurance Guide by organization of Pharmaceutical Products of India.
- Good Laboratory Practice Regulations, 2nd Edition, SandyWeinberg Vol. 69.
- Quality Assurance of Pharmaceuticals- A compendium of Guide lines and Related materials Vol IWHO Publications.
- A guide to Total QualityManagement- Kushik Maitra and Sedhan K Ghosh
- How to Practice GMP's – P P Sharma.
- ISO 9000 and Total QualityManagement – Sadhank G Ghosh
- The International Pharmacopoeia – Vol I, II, III, IV- General Methods of Analysis and Quality specification for Pharmaceutical Substances, Excipients and Dosage forms
- Good laboratory Practices – Marcel Deckker Series
- ICH guidelines, ISO 9000 and 14000 guidelines

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MEDICINAL CHEMISTRY PRACTICAL-III

Course Code : BP607P **Credit Units: 02**

List of experiments

I Preparation of drugs and intermediates
1 Sulphanilamide
2 7-Hydroxy, 4-methyl coumarin
3 Chlorobutanol
4 Triphenyl imidazole
5 Tolbutamide
6 Hexamine

II Assay of drugs
1 Isonicotinic acid hydrazide
2 Chloroquine
3 Metronidazole
4 Dapsone
5 Chlorpheniramine maleate
6 Benzyl penicillin

III Preparation of medicinally important compounds or intermediates byMicrowave irradiation technique

IV Drawing structures and reactions using chem draw®

V Determination of physicochemical properties such as logP, clogP, MR, Molecular weight, Hydrogen bond donors and acceptors for class of drugs course content using drug design software Drug likeliness screening (Lipinskies RO5)

Examination Scheme :

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
02	**05**	**03**	**05**	**25**	**10**

Note: A-Attendance, IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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PHARMACOLOGY PRACTICAL-III

Course Code : BP608P **Credit Units: 02**

List of experiments

1. Dose calculation in pharmacological experiments
2. Antiallergic activity by mast cell stabilization assay
3. Study of anti-ulcer activity of a drug using pylorus ligand (SHAY) rat model and NSAIDS induced ulcer model.
4. Study of effect of drugs on gastrointestinal motility
5. Effect of agonist and antagonists on guinea pig ileum
6. Estimation of serum biochemical parameters by using semi- autoanalyser
7. Effect of saline purgative on frog intestine
8. Insulin hypoglycemic effect in rabbit
9. Test for pyrogens (rabbit method)
10. Determination of acute oral toxicity (LD50) of a drug from a given data
11. Determination of acute skin irritation / corrosion of a test substance
12. Determination of acute eye irritation / corrosion of a test substance
13. Calculation of pharmacokinetic parameters from a given data
14. Biostatistics methods in experimental pharmacology(student's t test, ANOVA)
15. Biostatistics methods in experimental pharmacology (Chi square test, Wilcoxon Signed Rank test)

**Experiments are demonstrated by simulated experiments/videos*

Examination Scheme :

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
02	**05**	**03**	**05**	**25**	**10**

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HERBAL DRUG TECHNOLOGY PRACTICAL

Course Code : BP609P **Credit Units: 02**

List of experiments

1. To perform preliminary phytochemical screening of crude drugs.
2. Determination of the alcohol content of Asava and Arista
3. Evaluation of excipients of natural origin
4. Incorporation of prepared and standardized extract in cosmetic formulations like creams, lotions and shampoos and their evaluation.
5. Incorporation of prepared and standardized extract in formulations like syrups, mixtures and tablets and their evaluation as per Pharmacopoeial requirements.
6. Monograph analysis of herbal drugs from recent Pharmacopoeias
7. Determination of Aldehyde content
8. Determination of Phenol content
9. Determination of total alkaloids

Examination Scheme :

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
02	**05**	**03**	**05**	**25**	**10**

Note: A-Attendance, IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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INDUSTRIAL PHARMACY-II

Course Code : BP702T **Credit Units: 04**

Course Objectives: This course is designed to impart fundamental knowledge on pharmaceutical product development and translation from laboratory to market

Course Content:

Module-I

Pilot plant scale up techniques: General considerations - including significance of personnel requirements, space requirements, raw materials, Pilot plant scale up considerations for solids, liquid orals, semi solids and relevant documentation, SUPAC guidelines, Introduction to platform technology

Module-II

Technology development and transfer: WHO guidelines for Technology Transfer(TT): Terminology, Technology transfer protocol, Quality risk management, Transfer from R & D to production (Process, packaging and cleaning), Granularity of TT Process (API, excipients, finished products, packaging materials) Documentation, Premises and equipments, qualification and validation, quality control, analytical method transfer, Approved regulatory bodies and agencies, Commercialization - practical aspects and problems (case studies), TT agencies in India - APCTD, NRDC, TIFAC, BCIL, TBSE / SIDBI; TT related documentation - confidentiality agreement, licensing, MoUs, legal issues

Module-III

Regulatory affairs: Introduction, Historical overview of Regulatory Affairs, Regulatory authorities, Role of Regulatory affairs department, Responsibility of Regulatory Affairs Professionals

Regulatory requirements for drug approval: Drug Development Teams, Non-Clinical Drug Development, Pharmacology, Drug Metabolism and Toxicology, General considerations of Investigational New Drug (IND) Application, Investigator's Brochure (IB) and New Drug Application (NDA), Clinical research / BE studies, Clinical Research Protocols, Biostatistics in Pharmaceutical Product Development, Data Presentation for FDA Submissions, Management of Clinical Studies.

Module-IV

Quality Management Systems: Quality management & Certifications: Concept of Quality, Total Quality Management, Quality by Design (QbD), Six Sigma concept, Out of Specifications (OOS), Change control, Introduction to ISO 9000 series of quality systems standards, ISO 14000, NABL, GLP

Module-V

Indian Regulatory Requirements: Central Drug Standard Control Organization (CDSCO) and State Licensing Authority: Organization, Responsibilities, Certificate of Pharmaceutical Product (COPP), Regulatory requirements and approval procedures for New Drugs.

Examination Scheme :

Components	CT	HA	S/V/Q	ATTD	EE
Weightage(%)	15	3	3	4	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance EE: End Semester Examination

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Recommended Books: (Latest Editions)

- Regulatory Affairs from Wikipedia, the free encyclopedia modified on 7th April available at http,//en.wikipedia.org/wiki/Regulatory_ Affairs.
- International Regulatory Affairs Updates, 2005. available at http://www.iraup.com/about.php
- Douglas J Pisano and David S. Mantus. Text book of FDA Regulatory Affairs A Guide for Prescription Drugs, Medical Devices, and Biologics' Second Edition.
- Regulatory Affairs brought by learning plus, inc. available at http.//www.cgmp.com/ra.htm.

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PHARMACY PRACTICE

Course Code : BP703T **Credit Units: 04**

Course Objectives: In the changing scenario of pharmacy practice in India, for successful practice of Hospital Pharmacy, the students are required to learn various skills like drug distribution, drug information, and therapeutic drug monitoring for improved patient care. In commModuley pharmacy, students will be learning various skills such as dispensing of drugs, responding to minor ailments by providing suitable safe medication, patient counselling for improved patient care in the commModuley set up.

Course Contents:

Module-I

a) Hospital and it's organization: Definition, Classification of hospital- Primary, Secondary and Tertiary hospitals, Classification based on clinical and non- clinical basis, Organization Structure of a Hospital, and Medical staffs involved in the hospital and their functions.

b) Hospital pharmacy and its organization: Definition, functions of hospital pharmacy, Organization structure, Location, Layout and staff requirements, and Responsibilities and functions of hospital pharmacists.

c) Adverse drug reaction: Classifications - Excessive pharmacological effects, secondary pharmacological effects, idiosyncrasy, allergic drug reactions, genetically determined toxicity, toxicity following sudden withdrawal of drugs, Drug interaction- beneficial interactions, adverse interactions, and pharmacokinetic drug interactions, Methods for detecting drug interactions, spontaneous case reports and record linkage studies, and Adverse drug reaction reporting and management.

d) **CommModuley Pharmacy:** Organization and structure of retail and wholesale drug store, types and design, Legal requirements for establishment and maintenance of a drug store, Dispensing of proprietary products, maintenance of records of retail and wholesale drug store.

Module-II

a) Drug distribution system in a hospital: Dispensing of drugs to inpatients, types of drug distribution systems, charging policy and labelling, Dispensing of drugs to ambulatory patients, and Dispensing of controlled drugs.

b) Hospital formulary: Definition, contents of hospital formulary, Differentiation of hospital formulary and Drug list, preparation and revision, and addition and deletion of drug from hospital formulary.

c) Therapeutic drug monitoring: Need for Therapeutic Drug Monitoring, Factors to be considered during the Therapeutic DrugMonitoring, and Indian scenario for Therapeutic Drug Monitoring.

d) Medication adherence: Causes of medication non-adherence, pharmacist role in the medication adherence, and monitoring of patient medication adherence.

e) Patient medication history interview: Need for the patient medication history interview, medication interview forms.

f) CommModuley pharmacy management: Financial, materials, staff, and infrastructure requirements.

Module-III

a) Pharmacy and therapeutic committee: Organization, functions, Policies of the pharmacy and therapeutic committee in including drugs into formulary, inpatient and outpatient prescription, automatic stop order, and emergency drug list preparation.

b) Drug information services: Drug and Poison information centre, Sources of drug information, Computerised services, and storage and retrieval of information.

c) Patient counseling: Definition of patient counseling; steps involved in patient

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counseling, and Special
cases that require the pharmacist

d) Education and training program in the hospital: Role of pharmacist in the education and training program, Internal and external training program, Services to the nursing homes/clinics, Code of ethics for commModuley pharmacy, and Role of pharmacist in the interdepartmental communication and commModuley health education.

e) Prescribed medication order and communication skills: Prescribed medication order- interpretation and legal requirements, and Communication skills- communication with prescribers and patients.

Module-IV

a) Budget preparation and implementation: Budget preparation and implementation

b) Clinical Pharmacy: Introduction to Clinical Pharmacy, Concept of clinical pharmacy, functions and responsibilities of clinical pharmacist, Drug therapy monitoring - medication chart review, clinical review, pharmacist intervention, Ward round participation, Medication history and Pharmaceutical care. Dosing pattern and drug therapy based on Pharmacokinetic & disease pattern.

c) Over the counter (OTC) sales: Introduction and sale of over the counter, and Rational use of common over the counter medications.

Module-V

a) Drug store management and inventory control: Organisation of drug store, types of materials stocked and storage conditions, Purchase and inventory control: principles, purchase procedure, purchase order, procurement and stocking, Economic order quantity, Reorder quantity level, and Methods used for the analysis of the drug expenditure

b) Investigational use of drugs: Description, principles involved, classification, control, identification, role of hospital pharmacist, advisory committee.

c) Interpretation of Clinical Laboratory Tests: Blood chemistry, hematology, and urinalysis

Examination Scheme :

Components	CT	HA	S/V/Q	ATTD	EE
Weightage(%)	15	3	3	4	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance EE: End Semester Examination

Recommended Books (Latest Edition):

- Merchant S.H. and Dr. J.S.Quadry. *A textbook of hospital pharmacy*, 4th ed. Ahmadabad: B.S. Shah Prakakshan; 2001.
- Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. *A textbook of Clinical Pharmacy Practice-essential concepts and skills,* 1st ed. Chennai: Orient Longman Private Limited; 2004.
- William E. Hassan. *Hospital pharmacy*, 5th ed. Philadelphia: Lea & Febiger; 1986.
- Tipnis Bajaj. *Hospital Pharmacy*, 1st ed. Maharashtra: Career Publications; 2008.
- Scott LT. *Basic skills in interpreting laboratory data*, 4thed. American Society of Health System Pharmacists Inc; 2009.
- Parmar N.S. *Health Education and CommModuley Pharmacy,* 18th ed. India: CBS Publishers & Distributers; 2008.

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NOVEL DRUG DELIVERY SYSTEMS

Course Code : BP704T **Credit Units: 04**

Course Objectives: This subject is designed to impart basic knowledge on the area of novel drug delivery systems.

Course Content:

Module-I

Controlled drug delivery systems: Introduction, terminology/definitions and rationale, advantages, disadvantages, selection of drug candidates.Approaches to design controlled release formulations based on diffusion, dissolution and ion exchange principles. Physicochemical and biological properties of drugs relevant to controlled release formulations

Polymers: Introduction, classification, properties, advantages and application of polymers in formulation of controlled release drug delivery systems.

Module-II

Microencapsulation: Definition, advantages and disadvantages, microspheres /microcapsules, microparticles, methods of microencapsulation, applications

Mucosal Drug Delivery system: Introduction, Principles of bioadhesion / mucoadhesion, concepts, advantages and disadvantages, transmucosal permeability and formulation considerations of buccal delivery systems

Implantable Drug Delivery Systems: Introduction, advantages and disadvantages, concept of implantsand osmotic pump

Module-III

Transdermal Drug Delivery Systems: Introduction, Permeation through skin, factors affecting permeation, permeation enhancers, basic components of TDDS, formulation approaches

Gastroretentive drug delivery systems: Introduction, advantages, disadvantages, approaches for GRDDS – Floating, high density systems, inflatable and gastroadhesive systems and their applications

Nasopulmonary drug delivery system: Introduction to Nasal and Pulmonary routes of drug delivery, Formulation of Inhalers (dry powder and metered dose), nasal sprays, nebulizers

Module-IV

Targeted drug Delivery: Concepts and approaches advantages and disadvantages, introduction to liposomes, niosomes, nanoparticles, monoclonal antibodies and their applications

Module-V

Ocular Drug Delivery Systems: Introduction, intra ocular barriers and methods to overcome – Preliminary study, ocular formulations and ocuserts

Intrauterine Drug Delivery Systems: Introduction, advantages and disadvantages, development of intra uterine devices (IUDs) and applications

Examination Scheme :

Components	CT	HA	S/V/Q	ATTD	EE
Weightage(%)	15	3	3	4	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance EE: End Semester Examination

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Recommended Books: (Latest Editions)

- Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992.
- Robinson, J. R., Lee V. H. L, Controlled Drug Delivery Systems, Marcel Dekker, Inc., New York, 1992.
- Encyclopedia of Controlled Delivery. Edith Mathiowitz, Published by Wiley
- Interscience Publication, John Wiley and Sons, Inc, New York. Chichester/Weinheim
- N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001).
- S.P. Vyas and R.K. Khar, Controlled Drug Delivery -concepts and advances, Vallabh Prakashan, New Delhi, First edition 2002.

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INSTRUMENTAL METHODS OF ANALYSIS PRACTICAL

Course Code : BP705P **Credit Units: 02**

List of experiments

1 Determination of absorption maxima and effect of solvents on absorption maxima of organic compounds
2 Estimation of dextrose by colorimetry
3 Estimation of sulfanilamide by colorimetry
4 Simultaneous estimation of ibuprofen and paracetamol by UV spectroscopy
5 Assay of paracetamol by UV- Spectrophotometry
6 Estimation of quinine sulfate by fluorimetry
7 Study of quenching of fluorescence
8 Determination of sodium by flame photometry
9 Determination of potassium by flame photometry
10 Determination of chlorides and sulphates by nephelo turbidometry
11 Separation of amino acids by paper chromatography
12 Separation of sugars by thin layer chromatography
13 Separation of plant pigments by column chromatography
14 Demonstration experiment on HPLC
15 Demonstration experiment on Gas Chromatography

Examination Scheme :

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
02	**05**	**03**	**05**	**25**	**10**

Note: A-Attendance, IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

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PRACTICE SCHOOL

Course Code: BP706PS **Credit Units: 06**

Objectives: Every candidate shall undergo practice school for a period of 150 hours evenly distributed throughout the semester. The student shall opt any one of the domains for practice school declared by the program committee from time to time. At the end of the practice school, every student shall submit a printed report (in triplicate) on the practice school he/she attended (not more than 25 pages). Along with the exams of Semester VII, the report submitted by the student, knowledge and skills acquired by the student through practice school shall be evaluated by the subject experts at college level and grade point shall be awarded.

Examination Scheme:
Total: 150 marks

Internal Marks : 25
Continuous Mode :

Assignment	Periodic report
10	15

External Marks : 125

Objective(s) of the work done	15 Marks
Learning Outcomes	30 Marks
Presentation of Work	30 Marks
Communication skills	20 Marks
Question and answer skills	30 Marks
	Total = 125 Marks

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BIOSTATISITCS AND RESEARCH METHODOLOGY

Course Code : BP801T **Credit Units: 04**

Course Objectives: To understand the applications of Biostatics in Pharmacy. This subject deals with descriptive statistics, Graphics, Correlation, Regression, logistic regression Probability theory, Sampling technique, Parametric tests, Non Parametric tests, ANOVA, Introduction to Design of Experiments, Phases of Clinical trials and Observational and Experimental studies, SPSS, R and MINITAB statistical software's, analyzing the statistical data using Excel**.**

Course Content:

Module-I
Introduction: Statistics, Biostatistics, Frequency distribution
Measures of central tendency: Mean, Median, Mode- Pharmaceutical examples
Measures of dispersion: Dispersion, Range, standard deviation, Pharmaceutical problems
Correlation: Definition, Karl Pearson's coefficient of correlation, Multiple correlation - Pharmaceuticals examples

Module-II
Regression: Curve fitting by the method of least squares, fitting the lines y= a + bx and x = a + by, Multiple regression, standard error of regression– Pharmaceutical Examples
Probability: Definition of probability, Binomial distribution, Normal distribution, Poisson's distribution, properties - problems
Sample, Population, large sample, small sample, Null hypothesis, alternative hypothesis, sampling, essence of sampling, types of sampling, Error-I type, Error-II type, Standard error of mean (SEM) - Pharmaceutical examples
Parametric test: t-test (Sample, Pooled or Unpaired and Paired) , ANOVA, (One way and Two way), Least Significance difference

Module-III
Non Parametric tests: Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Wallis test, Friedman Test
Introduction to Research: Need for research, Need for design of Experiments, Experiential Design Technique, plagiarism
Graphs: Histogram, Pie Chart, Cubic Graph, response surface plot, Counter Plot graph
Designing the methodology: Sample size determination and Power of a study, Report writing and presentation of data, Protocol, Cohorts studies, Observational studies, Experimental studies, Designing clinical trial, various phases.

Module-IV
Blocking and confounding system for Two-level factorials
Regression modeling: Hypothesis testing in Simple and Multiple regressionmodels
Introduction to Practical components of Industrial and Clinical Trials Problems: Statistical Analysis Using Excel, SPSS, MINITAB®, DESIGN OF EXPERIMENTS, R - Online Statistical Software's to Industrial and Clinical trial approach
Module-V
Design and Analysis of experiments:
Factorial Design: Definition, 22, 23design. Advantage of factorial design

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Response Surface methodology: Central composite design, Historical design, Optimization Techniques

Examination Scheme :

Components	CT	HA	S/V/Q	ATTD	EE
Weightage(%)	15	3	3	4	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance EE: End Semester Examination

Recommended Books (Latest edition):

- Pharmaceutical statistics- Practical and clinical applications, Sanford Bolton, publisher Marcel Dekker Inc. NewYork.
- Fundamental of Statistics – Himalaya Publishing House- S.C.Guptha
- Design and Analysis of Experiments –PHI Learning Private Limited, R. Pannerselvam,
- Design and Analysis of Experiments – Wiley Students Edition, Douglas and C. Montgomery

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SOCIAL AND PREVENTIVE PHARMACY

Course Code : BP802T **Credit Units: 04**

Course Objectives: The purpose of this course is to introduce to students a number of health issues and their challenges. This course also introduced a number of national health programmes. The roles of the pharmacist in these contexts are also discussed.

Course Content:

Module-I:
Concept of health and disease: Definition, concepts and evaluation of public health. Understanding the concept of prevention and control of disease, social causes of diseases and social problems of the sick.
Social and health education: Food in relation to nutrition and health, Balanced diet, Nutritional deficiencies, Vitamin deficiencies, Malnutrition and its prevention.
Sociology and health: Socio cultural factors related to health and disease, Impact of urbanization on health and disease, Poverty and health
Hygiene and health: personal hygiene and health care; avoidable habits

Module-II:
Preventive medicine: General principles of prevention and control of diseases such as cholera, SARS, Ebola virus, influenza, acute respiratory infections, malaria, chicken guinea, dengue, lymphatic filariasis, pneumonia, hypertension, diabetes mellitus, cancer, drug addiction-drug substance abuse

Module-III:
National health programs, its objectives, functioning and outcome of the following: HIV AND AIDS control programme, TB, Integrated disease surveillance program (IDSP), National leprosy control programme, National mental health program, National programme for prevention and control of deafness, Universal immunization programme, National programme for control of blindness, Pulse polio programme.

Module-IV:
National health intervention programme for mother and child, National family welfare programme, National tobacco control programme, National Malaria Prevention Program, National programme for the health care for the elderly, Social health programme; role of WHO in Indian national program

Module-V:
CommModuley services in rural, urban and school health: Functions of PHC, Improvement in rural sanitation, national urban health mission, Health promotion and education in school.

Examination Scheme :

Components	CT	HA	S/V/Q	ATTD	EE
Weightage(%)	15	3	3	4	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance EE: End Semester Examination

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Recommended Books (Latest edition)*:*

- Short Textbook of Preventive and Social Medicine, Prabhakara GN, 2nd Edition, 2010, ISBN: 9789380704104, JAYPEE Publications
- Textbook of Preventive and Social Medicine (Mahajan and Gupta), Edited by Roy
- Rabindra Nath, Saha Indranil, 4th Edition, 2013, ISBN: 9789350901878, JAYPEE Publications
- Review of Preventive and Social Medicine (Including Biostatistics), Jain Vivek, 6th Edition, 2014, ISBN: 9789351522331, JAYPEE Publications
- Essentials of Community Medicine—A Practical Approach, Hiremath Lalita D,
- Hiremath Dhananjaya A, 2nd Edition, 2012, ISBN: 9789350250440, JAYPEE Publications
- Park Textbook of Preventive and Social Medicine, K Park, 21st Edition, 2011,
- ISBN-14: 9788190128285, BANARSIDAS BHANOT PUBLISHERS.
- Community Pharmacy Practice, Ramesh Adepu, BSP publishers, Hyderabad

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QUALITY CONTROL AND STANDARDIZATION OF HERBALS

Course Code : BP806ET **Credit Units: 04**

Course Objectives: In this subject the student learns about the various methods and guidelines for evaluation and standardization of herbs and herbal drugs. The subject also provides an opportunity for the student to learn cGMP, GAP and GLP in traditional system of
medicines.

Course Contents:

Module-I
Basic tests for drugs – Pharmaceutical substances, Medicinal plants materials and dosage
Forms WHO guidelines for quality control of herbal drugs.
Evaluation of commercial crude drugs intended for use

Module-II
Quality assurance in herbal drug industry of cGMP, GAP, GMP and GLP in traditional system of medicine.
WHO Guidelines on current good manufacturing Practices (cGMP) for Herbal Medicines
WHO Guidelines on GACP for Medicinal Plants.

Module-III
EU and ICH guidelines for quality control of herbal drugs.
Research Guidelines for Evaluating the Safety and Efficacy of Herbal Medicines

Module-IV
Stability testing of herbal medicines.Application of various chromatographic techniques in standardization of herbal products.
Preparation of documents for new drug application and export registration
GMP requirements and Drugs & Cosmetics Act provisions.

Module-V
Regulatory requirements for herbal medicines.
WHO guidelines on safety monitoring of herbal medicines in pharmacovigilance systems
Comparison of various Herbal Pharmacopoeias.
Role of chemical and biological markers in standardization of herbal products

Examination Scheme :

Components	CT	HA	S/V/Q	ATTD	EE
Weightage(%)	15	3	3	4	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance EE: End Semester Examination

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Recommended Books: (Latest Editions

- Pharmacognosy by Trease and Evans
- Pharmacognosy by Kokate, Purohit and Gokhale
- Rangari, V.D., Text book of Pharmacognosy and Phytochemistry Vol. I , Carrier Pub., 2006.
- Aggrawal, S.S., Herbal Drug Technology. Universities Press, 2002.
- EMEA. Guidelines on Quality of Herbal Medicinal Products/Traditional Medicinal Products,
- Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.
- Shinde M.V., Dhalwal K., Potdar K., Mahadik K. Application of quality control
- principles to herbal drugs. International Journal of Phytomedicine 1(2009); p. 4-8.
- WHO. Quality Control Methods for Medicinal Plant Materials,World Health
- Organization, Geneva, 1998. WHO. Guidelines for the Appropriate Use of Herbal
- Medicines. WHO Regional Publications, Western Pacific Series No 3, WHO
- Regional office for the Western Pacific, Manila, 1998.
- WHO. The International Pharmacopeia, Vol. 2: Quality Specifications, 3rd edn. World Health Organization, Geneva, 1981.
- WHO. Quality Control Methods for Medicinal Plant Materials. World Health Organization, Geneva, 1999.
- WHO. WHO Global Atlas of Traditional, Complementary and Alternative
- Medicine. 2 vol. set. Vol. 1 contains text and Vol. 2, maps. World Health Organization, Geneva, 2005.
- WHO. Guidelines on Good Agricultural and Collection Practices (GACP) for Medicinal Plants. World Health Organization, Geneva, 2004.

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COMPUTER AIDED DRUG DESIGN

Course Code : BP807ET **Credit Units: 04**

Course Objectives: This subject is designed to provide detailed knowledge of rational drug design process and various techniques used in rational drug design process.

Course Content:

Module-I
Introduction to Drug Discovery and Development
Stages of drug discovery and development
Lead discovery and Analog Based Drug Design
Rational approaches to lead discovery based on traditional medicine,
Random screening, Non-random screening, serendipitous drug discovery, lead discovery based on drug metabolism, lead discovery based on clinical observation.
Analog Based Drug Design: Bioisosterism, Classification, Bioisosteric replacement. Any three case studies

Module-II
Quantitative Structure Activity Relationship (QSAR): SAR versus QSAR, History and development of QSAR, Types of physicochemical parameters, experimental and theoretical approaches for the determination of physicochemical parameters such as Partition coefficient, Hammet's substituent constant and Tafts steric constant. Hansch analysis, Free Wilson analysis, 3D-QSAR approaches like
COMFA and COMSIA.

Module-III
Molecular Modeling and virtual screening techniques
Virtual Screening techniques: Drug likeness screening, Concept of pharmacophore mapping and pharmacophore based Screening,
Molecular docking: Rigid docking, flexible docking, manual docking, Docking based screening. *De novo* drug design.

Module-IV
Informatics & Methods in drug design: Introduction to Bioinformatics, chemoinformatics. ADME databases, chemical, biochemical and pharmaceutical databases.

Module-V
Molecular Modeling: Introduction to molecular mechanics and quantum mechanics.Energy Minimization methods and Conformational Analysis, global conformational minima determination.

Examination Scheme :

Components	CT	HA	S/V/Q	ATTD	EE
Weightage(%)	15	3	3	4	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance EE: End Semester Examination

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Recommended Books (Latest Editions)

- Robert GCK, ed., "Drug Action at the Molecular Level" University Prak Press Baltimore.
- Martin YC. "Quantitative Drug Design" Dekker, New York.
- Delgado JN, Remers WA eds "Wilson & Gisvolds's Text Book of Organic Medicinal & Pharmaceutical Chemistry" Lippincott, New York.
- Foye WO "Principles of Medicinal chemistry 'Lea & Febiger.
- Koro lkovas A, Burckhalter JH. "Essentials of Medicinal Chemistry" Wiley Interscience.
- Wolf ME, ed "The Basis of Medicinal Chemistry, Burger's Medicinal Chemistry" JohnWiley& Sons, New York.
- Patrick Graham, L., An Introduction to Medicinal Chemistry, Oxford University Press.
- Smith HJ, Williams H, eds, "Introduction to the principles of Drug Design" Wright Boston.
- Silverman R.B. "The organic Chemistry of Drug Design and Drug Action" Academic Press New York.

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COSMETIC SCIENCE

Course Code : BP809ET **Credit Units: 04**

Course Contents :

Module-I

Classification of cosmetic and cosmeceutical products

Definition of cosmetics as per Indian and EU regulations, Evolution of cosmeceuticals from cosmetics, cosmetics as quasi and OTC drugs

Cosmetic excipients: Surfactants, rheologymodifiers, humectants, emollients, preservatives. Classification and application

Skin: Basic structure and function of skin.

Hair: Basic structure of hair. Hair growth cycle.

Oral Cavity: Common problem associated with teeth and gums**.**

Module-II

Principles of formulation and building blocks of skin care products: Face wash, Moisturizing cream, Cold Cream, Vanishing cream and their advantages and disadvantages.Application of these products in formulation of cosmecuticals.

Antiperspants & deodorants- Actives & mechanism of action.

Principles of formulation and building blocks of Hair care products: Conditioning shampoo, Hair conditioner,anti-dandruff shampoo. Hair oils. Chemistry and formulation of Para-phylene diamine based hair dye. Principles of formulation and building blocks of oral care products: Toothpaste for bleeding gums, sensitive teeth. Teeth whitening, Mouthwash.

Module-III

Sun protection, Classification of Sunscreens and SPF.

Role of herbs in cosmetics:

Skin Care: Aloe and turmeric

Hair care: Henna and amla.

Oral care: Neem and clove

Analytical cosmetics: BIS specification and analytical methods for shampoo, skincream and toothpaste**.**

Module-IV

Principles of Cosmetic Evaluation:Principles of sebumeter, corneometer. Measurement of TEWL, Skin Color, Hair tensile strength, Hair combing properties. Soaps,and syndet bars. Evolution and skin benfits.

Module-V

Oily and dry skin, causes leading to dry skin, skin moisturisation. Basic understanding of the terms Comedogenic, dermatitis. Cosmetic problems associated with Hair and scalp: Dandruff, Hair fall causes Cosmetic problems associated with skin: blemishes, wrinkles, acne, prickly heat and body odor. Antiperspirants and Deodorants- Actives and mechanism of action

Examination Scheme :

Components	CT	HA	S/V/Q	ATTD	EE
Weightage(%)	15	3	3	4	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance EE: End Semester Examination

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References

- Harry's Cosmeticology, Wilkinson, Moore, Seventh Edition, George Godwin.
- Cosmetics – Formulations, Manufacturing and Quality Control, P.P. Sharma, 4th Edition, Vandana Publications Pvt. Ltd., Delhi.
- Text book of cosmelicology by Sanju Nanda & Roop K. Khar, Tata Publishers.

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EXPERIMENTAL PHARMACOLOGY

Course Code : BP810ET **Credit Units: 04**

Course Objectives:
This subject is designed to impart the basic knowledge of preclinical studies in experimental animals including design, conduct and interpretations of results.

Course Contents:

Module-I
Laboratory Animals:
Study of CPCSEA and OECD guidelines for maintenance, breeding and conduct of experiments on laboratory animals, Common lab animals: Description and applications of different species and strains of animals. Popular transgenic and mutant animals. Techniques for collection of blood and common routes of drug administration in laboratory animals, Techniques of blood collection and euthanasia.

Module-II
Preclinical screening models
a. Introduction: Dose selection, calculation and conversions, preparation of drug solution/suspensions, grouping of animals and importance of sham negative and positive control groups. Rationale for selection of animal species and sex for the study.
b. **Study of screening animal models for:** Diuretics, nootropics, anti-Parkinson's,antiasthmatics,
Preclinical screening models: for CNS activity- analgesic, antipyretic,anti-inflammatory, general anaesthetics, sedative and hypnotics, antipsychotic, antidepressant, antiepileptic, antiparkinsonism, alzheimer's disease

Module-III
Preclinical Screening Models: for ANS activity, sympathomimetics, sympatholytics, parasympathomimetics, parasympatholytics, skeletal muscle relaxants, drugs acting on eye, local anaethetics

Module-IV
Preclinical screening models: for CVS activity- antihypertensives, diuretics, antiarrhythmic, antidyslepidemic, anti aggregatory, coagulants, and anticoagulants. Preclinical screening models for other important drugs like antiulcer, antidiabetic, anticancer and antiasthmatics.
Research methodology and Bio-statistics: Selection of research topic, review of literature, research hypothesis and study design Pre-clinical data analysis and interpretation using Students 't' test and One-way ANOVA. Graphical representation of data

Examination Scheme :

Components	CT	HA	S/V/Q	ATTD	EE
Weightage(%)	15	3	3	4	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance EE: End Semester Examination

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Recommended Books (latest edition):

- Fundamentals of experimental Pharmacology-byM.N.Ghosh
- Hand book of Experimental Pharmacology-S.K.Kulakarni
- CPCSEA guidelines for laboratory animal facility.
- Drug discovery and Evaluation by Vogel H.G.
- Drug Screening Methods by Suresh Kumar Gupta and S. K. Gupta
- Introduction to biostatistics and research methods by PSS Sundar Rao and J Richard

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ADVANCED INSTRUMENTATION TECHNIQUES

Course Code : BP811ET **Credit Units : 04**

Course Objectives: This subject deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. This subject is designed to impart advanced knowledge on the principles and instrumentation of spectroscopic and chromatographic hyphenated techniques. This also emphasizes on theoretical and practical knowledge on modern analytical instruments that are used for drug testing.

Course Content:

Module-I

Nuclear Magnetic Resonance spectroscopy: Principles of H-NMR and C-NMR, chemical shift, factors affecting chemical shift, coupling constant, Spin - spin coupling, relaxation, instrumentation and applications

Mass Spectrometry- Principles, Fragmentation, Ionization techniques – Electron impact, chemical ionization, MALDI, FAB, Analyzers-Time of flight and Quadrupole, instrumentation, applications

Module-II

Thermal Methods of Analysis: Principles, instrumentation and applications of ThermogravimetricAnalysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC)

X-Ray Diffraction Methods: Origin of X-rays, basic aspects of crystals, Xray Crystallography, rotating crystal technique, single crystal diffraction, powder diffraction, structural elucidation and applications.

Module-III

Calibration and validation-as per ICH and USFDA guidelines

Calibration of following Instruments: Electronic balance, UV-Visible spectrophotometer, IR spectrophotometer, Fluorimeter, Flame Photometer, HPLC and GC

Module-IV

Radio immune assay: Importance, various components, Principle, different methods, Limitation and Applications of Radio immuno assay

Extraction techniques:General principle and procedure involved in the solid phase extraction and liquid-liquid extraction

Module-V

Hyphenated techniques-LC-MS/MS, GC-MS/MS, HPTLC-MS.

Examination Scheme :

Components	CT	HA	S/V/Q	ATTD	EE
Weightage(%)	15	3	3	4	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, ATTD: Attendance EE: End Semester Examination

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Recommended Books (Latest Editions)

- Instrumental Methods of Chemical Analysis by B.K Sharma
- Organic spectroscopy by Y.R Sharma
- Text book of Pharmaceutical Analysis by Kenneth A. Connors
- Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
- Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
- Organic Chemistry by I. L. Finar
- Organic spectroscopy byWilliam Kemp
- Quantitative Analysis of Drugs by D. C. Garrett
- Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
- Spectrophotometric identification of Organic Compounds by Silverstein

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PROJECT WORK

Course Code: BP813PW **Credit Units: 06**

Objectives:
The aim of the project work is to provide student with an opportunity to further intellectual and personal development in chosen field by undertaking a significant practical unit of activity, having an educational value at a level commensurate with the award of the degree. The project work can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

The area of the project shall directly relate any one of the elective subject opted by the student in semester VIII. The project shall be carried out in group not exceeding 5 in number. The project report shall be submitted in triplicate (typed & bound copy not less than 25 pages).

THE COMPONENTS OF A PROJECT REPORT
The outcome of Project Work is the Project Report. A project report should have the following components:
1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.
2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.
3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.
4) Body of the Report: The body of the report should have these four logical divisions

a. *Introduction:* This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.
b. *Conceptual Framework / National and International Scenario*: (relating to the topic of the Project).
c. *Presentation of Data, Analysis and Findings*: (using the tools and techniques mentioned in the methodology).
d. *Conclusion and Recommendations:* In this section, the concluding observations based on the main findings and suggestions are to be provided.

5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.
6) Annexures: Questionnaires (if any), relevant reports, etc.
(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

THE STEPS OF PROJECT WORK
STEP I : Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic.
- Relevance of the topic
- Time available at the disposal.
- Feasibility of data collection within the given time limit.
- Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

STEP II : Finalisation of the Topic and preparation of Project Proposal in consultation with

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the Supervisor.
STEP III : Collection of information and data relating to the topic and analysis of the same.
STEP IV : Writing the report dividing it into suitable chapters, viz.,
Chapter 1: Introduction,
Chapter 2: Conceptual Framework / National & International Scenario,
Chapter 3: Analysis & Findings
Chapter 4: Conclusion and Recommendations.
STEP V : The following documents are to be attached with the Final Project Report.
1) Approval letter from the supervisor (Annexure-IA)
2) Student's declaration (Annexure-IB)
3) Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.
Annexures, References / Bibliography

Guidelines for Evaluation:

- Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below.
- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bound.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate.
- A candidate has to qualify in the Project Work separately, obtaining minimum marks of 80 (Dissertation Book and Presentation taken together).

Examination Scheme: Total-150 marks

Evaluation of Dissertation Book:

Objective(s) of the work done	15 Marks
Methodology adopted	20 Marks
Results and Discussions	20 Marks
Conclusions and Outcomes	20 Marks
	Total-75 Marks

Evaluation of Presentation:

Presentation of work	25 Marks
Communication skills	20 Marks
Question and answer skills	30 Marks
	Total-75 Marks

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Amity Institute of Pharmacy

Master of Pharmacy (Pharmaceutics)

FLEXILEARN
-Freedom to design your degree



Curriculum & Scheme of Examination

2023

AMITY UNIVERSITY HARYANA

GURUGRAM

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Master of Pharmacy (Pharmaceutics)
SEMESTER-I

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES

Course code: MPH101T **Credit Units: 4**

Course Objective

This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

Course Contents:

Module I

a. UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV Visible spectroscopy.

b. IR spectroscopy: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier -Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy

c. Spectroflourimetry: Theory of Fluorescence, Factors affecting fluorescence, Quenchers, Instrumentation and Applications of fluorescence spectrophotometer.

d. Flame emission spectroscopy and Atomic absorption spectroscopy: Principle, Instrumentation, Interferences and Applications.

Module II

NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation,Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemicalshift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclearmagnetic double resonance, Brief outline of principles of FT-NMR and 13C NMR. Applications of NMR spectroscopy.

Module III

Mass Spectroscopy: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy

Module IV

Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution and applications of the following:

a) Paper chromatography b) Thin Layer chromatography c) Ion exchange chromatography

d) Column chromatography e) Gas chromatography f) High Performance Liquid chromatography

g) Affinity chromatography

Module V

a. Electrophoresis: Principle, Instrumentation, Working conditions, factors affecting separationand applications of the following:

a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Isoelectric focusing

b. X ray Crystallography: Production of X rays, Different X ray diffraction methods, Bragg,,s law, Rotating crystal technique, X ray powder technique, Types of crystals and applications of Xray diffraction.

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Module VI

Immunological assays : RIA (Radio immuno assay), ELISA, Bioluminescence assays. 5 Hrs

REFERENCES

- Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, JohnWiley & Sons, 2004.
- Principles of Instrumental Analysis - Doglas A Skoog, F. James Holler, Timothy A. Nieman,5th edition, Eastern press, Bangalore, 1998.
- Instrumental methods of analysis – Willards, 7th edition, CBS publishers.
- Practical Pharmaceutical Chemistry – Beckett and Stenlake, Vol II, 4th edition, CBSPublishers, New Delhi, 1997.
- Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.
- Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.
- Pharmaceutical Analysis- Modern methods – Part B - J W Munson, Volume 11, Marcel

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DRUG DELIVERY SYSTEMS

Course code- MPH102T **Credit Units: 4**

Course Objective
This course is designed to impart knowledge on the area of advances in novel drug deliverysystems.

Course Contents
Module I
Sustained Release (SR) and Controlled Release (CR) formulations: Introduction & basic concepts, advantages/disadvantages, factors influencing, Physicochemical & biological approaches for SR/CR formulation, Mechanism of Drug Delivery from SR/CR formulation.Polymers: introduction, definition, classification, properties and application Dosage Forms for Personalized Medicine: Introduction, Definition, Pharmacogenetics, Categories of Patients for Personalized Medicines: Customized drug delivery systems, Bioelectronic Medicines, 3Dprinting of pharmaceuticals, Telepharmacy.

Module II
Rate Controlled Drug Delivery Systems: Principles & Fundamentals, Types, Activation; Modulated Drug Delivery Systems; Mechanically activated, pH activated, Enzyme activated, andOsmotic activated Drug Delivery Systems Feedback regulated Drug Delivery Systems; Principles & Fundamentals.

Module III
Gastro-Retentive Drug Delivery Systems: Principle, concepts advantages and disadvantages,Modulation of GI transit time approaches to extend GI transit. Buccal Drug Delivery Systems: Principle of mucoadhesion, advantages and disadvantages, Mechanism of drug permeation,Methods of formulation and its evaluations.

Module IV
Occular Drug Delivery Systems: Barriers of drug permeation, Methods to overcome barriers.

Module V
Transdermal Drug Delivery Systems: Structure of skin and barriers, Penetration enhancers,Transdermal Drug Delivery Systems, Formulation and evaluation.

Module VI
Protein and Peptide Delivery: Barriers for protein delivery. Formulation and Evaluation ofdelivery systems of proteins and other macromolecules.

Module VII
Vaccine delivery systems: Vaccines, uptake of antigens, single shot vaccines, mucosal andtransdermal delivery of vaccines.

REFERENCES

- Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded, MarcelDekker, Inc., New York, 1992.
- Robinson, J. R., Lee V. H. L, Controlled Drug Delivery Systems, Marcel Dekker,Inc., NewYork, 1992.
- Encyclopedia of controlled delivery, Editor- Edith Mathiowitz, Published by Wiley Interscience Publication, John Wiley and Sons, Inc, New York, Chichester/Weinheim
- N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi,First edition 1997 (reprint in 2001).

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- S.P.Vyas and R.K.Khar, Controlled Drug Delivery - concepts and advances, VallabhPrakashan, New Delhi, First edition 2002

JOURNALS

1. Indian Journal of Pharmaceutical Sciences (IPA)
2. Indian drugs (IDMA)
3. Journal of controlled release (Elsevier Sciences) desirable
4. Drug Development and Industrial Pharmacy (Marcel & Decker) desirable

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MODERN PHARMACEUTICS

Course Code: MPH103T **Credit Units: 04**

Course Objectives:
Course designed to impart advanced knowledge and skills required to learn various aspects andconcepts at pharmaceutical industries.

Course Contents

Module I

1. a. Preformation Concepts – Drug Excipient interactions - different methods, kinetics ofstability, Stability testing. Theories of dispersion and pharmaceutical Dispersion (Emulsion and Suspension, SMEDDS) preparation and stability large and small volume parental –physiological and formulation consideration, Manufacturing and evaluation.

b. Optimization techniques in Pharmaceutical Formulation:

Concept and parameters of optimization, Optimization techniques in pharmaceutical formulation and processing. Statistical design, Response surface method, Contour designs, Factorial designs and application in formulation

Module II

Validation: Introduction to Pharmaceutical Validation, Scope & merits of Validation, Validation and calibration of Master Types of validation. Government regulation, Manufacturing Process Model, URS, DQ, IQ, OQ & P.Q. of facilities, plan, ICH & WHO guidelines for calibration and validation of equipments, Validation of specific dosage form,

Module III

cGMP & Industrial Management: Objectives and policies of current good manufacturing practices, layout of buildings, services, equipments and their maintenance Production management: Production organization, materials management, handling and transportation, inventory management and control, production and planning control, Sales forecasting, budget and cost control, industrial and personal relationship. Concept of Total Quality
Management.

Module IV

Compression and compaction: Physics of tablet compression, compression, consolidation, effect of friction, distribution of forces, compaction profiles. Solubility.

Module V

Study of consolidation parameters; Diffusion parameters, Dissolution parameters and Pharmacokinetic parameters, Heckel plots, Similarity factors – f2 and f1, Higuchi and Peppas plot, Linearity Concept of significance, Standard deviation , Chi square test, students T-test , ANOVA test.

REFERENCES

- Theory and Practice of Industrial Pharmacy By Lachmann and Libermann
- Pharmaceutical dosage forms: Tablets Vol. 1-3 by Leon Lachmann.
- Pharmaceutical Dosage forms: Disperse systems, Vol, 1-2; By Leon Lachmann.
- Pharmaceutical Dosage forms: Parenteral medications Vol. 1-2; By Leon Lachmann.
- Modern Pharmaceutics; By Gillbert and S. Banker.
- Remington‟s Pharmaceutical Sciences.
- Advances in Pharmaceutical Sciences Vol. 1-5; By H.S. Bean & A.H. Beckett.
- Physical Pharmacy; By Alfred martin

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- Bentley‟s Textbook of Pharmaceutics – by Rawlins.
- Good manufacturing practices for Pharmaceuticals: A plan for total quality control, Secondedition; By Sidney H. Willig.
- Quality Assurance Guide; By Organization of Pharmaceutical producers of India. 12.Drug formulation manual; By D.P.S. Kohli and D.H.Shah. Eastern publishers, New Delhi.
- How to practice GMPs; By P.P.Sharma. Vandhana Publications, Agra.
- Pharmaceutical Process Validation; By Fra. R. Berry and Robert A. Nash.
- Pharmaceutical Preformulations; By J.J. Wells.
- Applied production and operations management; By Evans, Anderson, Sweeney andWilliams.
- Encyclopaedia of Pharmaceutical technology, Vol I – III.

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REGULATORY AFFAIRS

Course Code: MPH104T **Credit Units: 04**

Course Objective:
Course designed to impart advanced knowledge and skills required to learn the concept of generic drug and their development, various regulatory filings in different countries, different phases of clinical trials and submitting regulatory documents: filing process of IND, NDA and ANDA

Module I

a. Documentation in Pharmaceutical industry: Master formula record, DMF (Drug Master File), distribution records. Generic drugs product development Introduction, Hatch-Waxman act and amendments, CFR (CODE OF FEDERAL REGULATION) ,drug product performance, in- vitro, ANDA regulatory approval process, NDA approval process, BE and drug product assessment, in – vivo, scale up process approval changes, post marketing surveillance, outsourcing BA and BE to CRO.
b. Regulatory requirement for product approval: API, biologics, novel, therapies obtaining NDA,ANDA for generic drugs ways and means of US registration for foreign drugs

Module II
CMC, post approval regulatory affairs. Regulation for combination products and medical devices CTD and ECTD format, industry and FDA liaison. ICH - Guidelines of ICH-Q, S E, M. Regulatory requirements of EU, MHRA, TGA and ROW countries

Module III
Non-clinical drug development: Global submission of IND, NDA, ANDA. Investigation of medicinal products dossier, dossier (IMPD) and investigator brochure (IB).

Module IV
Clinical trials: Developing clinical trial protocols. Institutional review board/ independent ethics committee Formulation and working procedures informed Consent process andprocedures. HIPAA- new, requirement to clinical study process, pharmacovigilance safety monitoring in clinical trials.

REFERENCES

- Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel and Isader Kaufer,Marcel Dekker series, Vol.143
- The Pharmaceutical Regulatory Process, Second Edition Edited by Ira R. Berry and Robert P.Martin, Drugs and the Pharmaceutical Sciences,Vol.185, Informa Health care Publishers.
- New Drug Approval Process: Accelerating Global Registrations By Richard A Guarino,MD,5th edition, Drugs and the Pharmaceutical Sciences,Vol.190.
- Guidebook for drug regulatory submissions / Sandy Weinberg. By John Wiley & Sons.Inc.
- FDA regulatory affairs: a guide for prescription drugs, medical devices, and biologics/editedBy Douglas J. Pisano, David Mantus.
- Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance By Fay A.Rozovsky and Rodney K. Adams
- www.ich.org/
- www.fda.gov/
- europa.eu/index_en.htm
- https://www.tga.gov.au/tga-basics

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PHARMACEUTICS PRACTICALS-I

Course Code: MPH105P **Credit Units: 06**

Course Objective: To perform experiments (based on theoretical knowledge of the subject) in the laboratory.

Course Content:

1. Analysis of pharmacopoeial compounds and their formulations by UV Vis spectrophotometer
2. Simultaneous estimation of multi component containing formulations by UV spectrophotometry
3. Experiments based on HPLC
4. Experiments based on Gas Chromatography
5. Estimation of riboflavin/quinine sulphate by fluorimetry
6. Estimation of sodium/potassium by flame photometry
7. To perform In-vitro dissolution profile of CR/ SR marketed formulation
8. Formulation and evaluation of sustained release matrix tablets
9. Formulation and evaluation osmotically controlled DDS
10. Preparation and evaluation of Floating DDS- hydro dynamically balanced DDS
11. Formulation and evaluation of Mucoadhesive tablets.
12. Formulation and evaluation of transdermal patches.
13. To carry out preformulation studies of tablets.
14. To study the effect of compressional force on tablets disintegration time.
15. To study Micromeritic properties of powders and granulation.
16. To study the effect of particle size on dissolution of a tablet.
17. To study the effect of binders on dissolution of a tablet.
18. To plot Heckal plot, Higuchi and Peppas plot and determine similarity factors.

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SEMESTER-II

MOLECULAR PHARMACEUTICS (NANO TECHNOLOGY & TARGETED DDS)

Course Code: MPH201T **Credit Units: 04**

Course Objectives
This course is designed to impart knowledge on the area of advances in novel drug deliverysystems.

Course Contents:
Module I
Targeted Drug Delivery Systems: Concepts, Events and biological process involved in drugtargeting. Tumor targeting and Brain specific delivery.

Module II
Targeting Methods: introduction preparation and evaluation. Nano Particles & Liposomes: Types, preparation and evaluation.

Module III
Micro Capsules / Micro Spheres: Types, preparation and evaluation , Monoclonal Antibodies ;preparation and application, preparation and application of Niosomes, Aquasomes, Phytosomes,Electrosomes.

Module IV
Pulmonary Drug Delivery Systems : Aerosols, propellents, Containers Types, preparation andevaluation, Intra Nasal Route Delivery systems; Types, preparation and evaluation.

Module V
Nucleic acid based therapeutic delivery system: Gene therapy, introduction (ex-vivo & in-vivo gene therapy). Potential target diseases for gene therapy (inherited disorder and cancer). Gene expression systems (viral and nonviral gene transfer). Liposomal gene delivery systems.
Biodistribution and Pharmacokinetics. knowledge of therapeutic antisense molecules andaptamers as drugs of future.

REFERENCES

- Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded,Marcel Dekker, Inc., New York, 1992.
- S.P.Vyas and R.K.Khar, Controlled Drug Delivery - concepts and advances, Ballabh Prakashan, New Delhi, First edition 2002.
- N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, NewDelhi,First edition 1997 (reprint in 2001).

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ADVANCED BIOPHARMACEUTICS & PHARMACOKINETICS

Course Code: MPH202T **Credit Units: 4**

Course Objectives

This course is designed to impart knowledge and skills necessary for dose calculations, dose adjustments and to apply biopharmaceutics theories in practical problem solving. Basic theoretical discussions of the principles of biopharmaceutics and pharmacokinetics are providedto help the students‟ to clarify the concepts.

Course Contents:

Module I

Drug Absorption from the Gastrointestinal Tract:

Gastrointestinal tract, Mechanism of drug absorption, Factors affecting drug absorption, pH– partition theory of drug absorption. Formulation and physicochemical factors: Dissolution rate, Dissolution process, Noyes–Whitney equation and drug dissolution, Factors affecting the dissolution rate. Gastrointestinal absorption: role of the dosage form: Solution (elixir, syrup andsolution) as a dosage form ,Suspension as a dosage form, Capsule as a dosage form, Tablet as adosage form ,Dissolution methods ,Formulation and processing factors, Correlation of in vivo data with in vitro dissolution data. Transport model: Permeability-Solubility-Charge State and the pH Partition Hypothesis, Properties of the Gastrointestinal Tract (GIT), pH MicroclimateIntracellular pH Environment, Tight-Junction Complex.

Module II

Biopharmaceutic considerations in drug product design and In Vitro Drug Product Performance: Introduction, biopharmaceutic factors affecting drug bioavailability, rate-limiting steps in drug absorption, physicochemical nature of the drug formulation factors affecting drug product performance, in vitro: dissolution and drug release testing, compendial methods of dissolution, alternative methods of dissolution testing, meeting dissolution requirements, problems of variable control in dissolution testing performance of drug products. In vitro–in vivocorrelation, dissolution profile comparisons, drug product stability, considerations in the design of a drug product.

Module III

Pharmacokinetics: Basic considerations, pharmacokinetic models, compartment modeling: one compartment model- IV bolus, IV infusion, extra-vascular. Multi compartment model: two compartment - model in brief, non-linear pharmacokinetics: cause of non-linearity, Michaelis – Menten equation, estimation of kmax and vmax. Drug interactions: introduction, the effect of protein binding interactions, the effect of tissue-binding interactions, cytochrome p450-based drug interactions, drug interactions linked to transporters.

Module IV

Drug Product Performance, In Vivo: Bioavailability and Bioequivalence: drug product performance, purpose of bioavailability studies, relative and absolute availability. methods for assessing bioavailability, bioequivalence studies, design and evaluation of bioequivalence studies, study designs, crossover study designs, evaluation of the data, bioequivalence example, study submission and drug review process. Biopharmaceutics classification system, methods.

Permeability: In-vitro, in-situ and In-vivo methods. generic biologics (biosimilar drug products),clinical significance of bioequivalence studies, special concerns in bioavailability andbioequivalence studies, generic substitution.

Module V

Application of Pharmacokinetics: Modified-Release Drug Products, Targeted Drug Delivery Systems and Biotechnological Products. Introduction to

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Pharmacokinetics and pharmacodynamic, drug interactions. Pharmacokinetics and pharmacodynamics of biotechnology drugs. Introduction, Proteins and peptides, Monoclonal antibodies, oligonucleotides, Vaccines (immunotherapy), Gene therapies.

REFERENCES

- Biopharmaceutics and Clinical Pharmacokinetics by Milo Gibaldi, 4th edition,Philadelphia,Lea and Febiger, 1991
- Biopharmaceutics and Pharmacokinetics, A. Treatise, D .M. Brahmankar and Sunil B.Jaiswal., Vallab Prakashan, Pitampura, Delhi
- Applied Biopharmaceutics and Pharmacokinetics by Shargel. Land YuABC, 2ndedition,Connecticut Appleton Century Crofts, 1985
- Textbook of Biopharmaceutics and Pharmacokinetics, Dr. Shobha Rani R. Hiremath,PrismBook
- Pharmacokinetics by Milo Gibaldi and D. Perrier, 2nd edition, Marcel Dekker Inc.,New York,1982
- Current Concepts in Pharmaceutical Sciences: Biopharmaceutics, Swarbrick. J, Leaand Febiger, Philadelphia, 1970
- Clinical Pharmacokinetics, Concepts and Applications 3rd edition by MalcolmRowland andThom~ N. Tozer, Lea and Febiger, Philadelphia, 1995
- Dissolution, Bioavailability and Bioequivalence, Abdou. H.M, Mack PublishingCompany,Pennsylvania 1989
- Biopharmaceutics and Clinical Pharmacokinetics, An Introduction, 4th edition,revised andexpande by Robert. E. Notari, Marcel Dekker Inc, New York and Basel,1987.
- Biopharmaceutics and Relevant Pharmacokinetics by John. G Wagner and M.Pemarowski,1st edition, Drug Intelligence Publications, Hamilton, Illinois, 1971.
- Encyclopedia of Pharmaceutical Technology, Vol 13, James Swarbrick, James. G.Boylan,Marcel Dekker Inc, New York, 1996.
- Basic Pharmacokinetics,1 st edition,Sunil S Jambhekar and Philip J Breen,pharmaceuticalpress, RPS Publishing,2009.
- Absorption and Drug Development- Solubility, Permeability, and Charge State, Alex Avdeef,John Wiley & Sons, Inc,2003.

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COMPUTER AIDED DRUG DEVELIVERY SYSTEM

Course code: MPH203T **Credit Units: 04**

Course Objective:
This course is designed to impart knowledge and skills necessary for computer Applications in pharmaceutical research and development who want to understand the application of computersacross the entire drug research and development process. Basic theoretical discussions of the principles of more integrated and coherent use of computerized information (informatics) in thedrug development process are provided to help the students to clarify the concepts.

Course contents:

Module I
a. Computers in Pharmaceutical Research and Development: A General Overview: History of Computers in Pharmaceutical Research and Development. Statistical modeling in Pharmaceutical research and development: Descriptive versus Mechanistic Modeling, Statistical Parameters, Estimation, Confidence Regions, Nonlinearity at the Optimum, Sensitivity Analysis, Optimal Design, Population Modeling
b. Quality-by-Design In Pharmaceutical Development:
Introduction, ICH Q8 guideline, Regulatory and industry views on QbD, Scientifically basedQbD - examples of application.

Module II
Computational Modeling Of Drug Disposition: Introduction, Modeling Techniques: Drug Absorption, Solubility, Intestinal Permeation, Drug Distribution ,Drug Excretion, Active Transport; P-gp, BCRP, Nucleoside Transporters, hPEPT1, ASBT, OCT, OATP, BBB-CholineTransporter.

Module III
Computer-aided formulation development:: Concept of optimization, Optimization parameters,Factorial design, Optimization technology & Screening design. Computers in Pharmaceutical Formulation: Development of pharmaceutical emulsions, microemulsion drug carriers
Legal Protection of Innovative Uses of Computers in R&D, The Ethics of Computing in Pharmaceutical Research, Computers in Market analysis

Module IV
a) Computer-aided biopharmaceutical characterization:
Gastrointestinal absorption simulation. Introduction, Theoretical background, Model construction, Parameter sensitivity analysis, Virtual trial, Fed vs. fasted state, In vitro dissolutionand in vitro in vivo correlation, Biowaiver considerations
b) Computer Simulations in Pharmacokinetics and Pharmacodynamics: Introduction, Computer Simulation: Whole Organism, Isolated Tissues, Organs, Cell, Proteins and Genes.
c) Computers in Clinical Development: Clinical Data Collection and Management, Regulation of Computer Systems

Module V
Artificial Intelligence (AI), Robotics and Computational fluid dynamics: General overview,Pharmaceutical Automation, Pharmaceutical applications, Advantages and Disadvantages.
Current Challenges and Future Directions.

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REFERENCES

- Computer Applications in Pharmaceutical Research and Development, Sean Ekins, 2006, JohnWiley & Sons.
- Computer-Aided Applications in Pharmaceutical Technology, 1st Edition, Jelena Djuris, Woodhead Publishing
- Encyclopedia of Pharmaceutical Technology, Vol 13, James Swarbrick, James. G.Boylan, Marcel Dekker Inc, New York, 1996.

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COSMETIC AND COSMECEUTICALS

Course code: MPH204T **Credit Units: 04**

Course Objective:
This course is designed to impart knowledge and skills necessary for the fundamental need forcosmetic and cosmeceutical products.

Course content:
Module I
Cosmetics – Regulatory: Definition of cosmetic products as per Indian regulation. Indian regulatory requirements for labeling of cosmetics Regulatory provisions relating to import of cosmetics., Misbranded and spurious cosmetics. Regulatory provisions relating to manufactureof cosmetics – Conditions for obtaining license, prohibition of manufacture and sale of certaincosmetics, loan license, offences and penalties.

Module II
Cosmetics - Biological aspects : Structure of skin relating to problems like dry skin, acne, pigmentation, prickly heat, wrinkles and body odor. Structure of hair and hair growth cycle. Common problems associated with oral cavity. Cleansing and care needs for face, eye lids, lips,hands, feet, nail, scalp, neck, body and under-arm.

Module III
Formulation Building blocks: Building blocks for different product formulations of cosmetics/ cosmeceuticals. Surfactants – Classification and application. Emollients, rheological additives: classification and application. Antimicrobial used as preservatives, their merits and demerits.
Factors affecting microbial preservative efficacy. Building blocks for formulation of a moisturizing cream, vanishing cream, cold cream, shampoo and toothpaste. Soaps and syndetbars.
Perfumes; Classification of perfumes. Perfume ingredients listed as allergens in EU regulation. Controversial ingredients: Parabens, formaldehyde liberators, dioxane.

Module IV
Design of cosmeceutical products: Sun protection, sunscreens classification and regulatory aspects. Addressing dry skin, acne, sun-protection, pigmentation, prickly heat, wrinkles, bodyodor., dandruff, dental cavities, bleeding gums, mouth odor and sensitive teeth through cosmeceutical formulations.

Module V
Herbal Cosmetics : Herbal ingredients used in Hair care, skin care and oral care. Review ofguidelines for herbal cosmetics by private bodies like cosmos with respect to preservatives, emollients, foaming agents, emulsifiers and rheology modifiers. Challenges in formulating herbal cosmetics.

REFERENCES

- Harry‟s Cosmeticology. 8th edition.
- Poucher‟sperfumecosmeticsandSoaps,10th edition.
- Cosmetics - Formulation, Manufacture and quality control, PP.Sharma,4thedition
- Handbook of cosmetic science and Technology A.O.Barel, M.Paye and H.I. Maibach. 3rdedition
- Cosmetic and Toiletries recent suppliers catalogue.
- CTFA directory.

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PHARMACEUTICS PRACTICALS-II

Course Code: MPH205P **Credit Units: 06**

Couse objective: To perform experiments (based on theoretical knowledge of the subject) in the laboratory.

Course Content:

1. To study the effect of temperature change , non-solvent addition, incompatible polymer addition in microcapsules preparation
2. Preparation and evaluation of Alginate beads
3. Formulation and evaluation of gelatin /albumin microspheres
4. Formulation and evaluation of liposomes/niosomes
5. Formulation and evaluation of spherules
6. Improvement of dissolution characteristics of slightly soluble drug by Solid dispersion technique.
7. Comparison of dissolution of two different marketed products /brands
8. Protein binding studies of a highly protein bound drug & poorly protein bound drug
9. Bioavailability studies of Paracetamol in animals.
10. Pharmacokinetic and IVIVC data analysis by Winnoline R software
11. In vitro cell studies for permeability and metabolism
12. DoE Using Design Expert® Software
13. Formulation data analysis Using Design Expert® Software
14. Quality-by-Design in Pharmaceutical Development
15. Computer Simulations in Pharmacokinetics and Pharmacodynamics
16. Computational Modeling Of Drug Disposition
17. To develop Clinical Data Collection manual
18. To carry out Sensitivity Analysis, and Population Modeling.
19. Development and evaluation of Creams
20. Development and evaluation of Shampoo and Toothpaste base
21. To incorporate herbal and chemical actives to develop products
22. To address Dry skin, acne, blemish, Wrinkles, bleeding gums and dandruff

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SEMESTER-III

RESEARCH METHODOLOGY AND BIOSTATISTICS

Course Code: MRM301T **Credit Units: 4**

Course Objective: To make students understand the application of statistical tools for carrying out research activities

Course Contents:

Module I
General Research Methodology: Research, objective, requirements, practical difficulties, review of literature, study design, types of studies, strategies to eliminate errors/bias, controls, randomization, crossover design, placebo, blinding techniques.

Module II
Biostatistics: Definition, application, sample size, importance of sample size, factors influencing sample size, dropouts, statistical tests of significance, type of significance tests, parametric tests (students "t" test, ANOVA, Correlation coefficient, regression), non-parametric tests (wilcoxan rank tests, analysis of variance, correlation, chi square test), null hypothesis, P values, degree of freedom, interpretation of P values.

Module III
Medical Research: History, values in medical ethics, autonomy, beneficence, nonmaleficence, double effect, conflicts between autonomy and beneficence/nonmaleficence, euthanasia, informed consent, confidentiality, criticisms of orthodox medical ethics, importance of communication, control resolution, guidelines, ethics committees, cultural concerns, truth telling, online business practices, conflicts of interest, referral, vendor relationships, treatment of family members, sexual relationships, fatality.

Module IV
CPCSEA guidelines for laboratory animal facility: Goals, veterinary care, quarantine, surveillance, diagnosis, treatment and control of disease, personal hygiene, location of animal facilities to laboratories, anesthesia, euthanasia, physical facilities, environment, animal husbandry, record keeping, SOPs, personnel and training, transport of lab animals.

Module V
Declaration of Helsinki: History, introduction, basic principles for all medical research, and additional principles for medical research combined with medical care.

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Amity School of Architecture & Planning

Bachelor of Architecture

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Programme Structure

Curriculum & Scheme of Examination

2023

AMITY UNIVERSITY HARYANA

GURUGRAM

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	ARCHITECTURAL GRAPHICS SKILLS-I (ARC2104)	L	T	S	P	C
Version 1.1	Date of Approval:	1	0	2	0	3
Pre-requisites/Exposure	Architectural Design- I					
Co-requisites	Basic Design & Visual Arts					

Catalog Description

The aim of this course is to provide the students with the basic tools and techniques for free hand drawing and technical drawings. The subject covers concept of scales and lettering and familiarize them with planar and solid geometry to conceptualize the 3D forms in to 2D with the help of Orthographic Projections of Planes and Solids including sections of solids as well.

Course Objectives

The objective of this course is

- To familiarize the students with various drawing tools and accessories used in drafting and lettering techniques to produce and visualize geometrical composition and form.
- To provide a clear understanding about the scale measurement; plane geometry, solid geometry and projections used as drawing technique.

Course Outcomes

On completion of this course, the students will be able to

CO1: Draw free hand drawing and lettering.
CO2: Project points, lines and planes in different positions in 1st angle projection system.
CO3: Project regular rectilinear and circular solids in different positions.
CO4: Apply their knowledge in making sections, intersections and interpretations of solids.

Modules	Blooms level*	Number of hours
MODULE 1: Free Hand Drawing and Lettering Free hand and mechanical lettering cycle.	L1	6
MODULE 2: Basic Technical Drawing Concept and types of line, Division of lines and angles, Drawing polygons, Inscribing and circumscribing circles in polygons, Drawing geometrical curves helix, Conoid etc.	L1, L2	6

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MODULE 3:Orthographic Projections- Planes and Solids Definition, Meaning and concept, Planes of Projections, First angle projections, Projection of points, Lines and planes in different positions. Projection of regular rectilinear and circular solids (prisms, pyramids, cones, cylinders, spheres etc.) in different positions. Sections of regular rectilinear and circular solids (prisms, pyramids, cones, cylinders, spheres etc) in varying conditions of sectional plane.	L1, L2, L3	18
MODULE 4: Solid Geometry Construction of section, Intersection and interpenetration of solid.	L1, L2, L3	6

***Bloom's Level:** L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books:

- Bhatt, N.D. (53rd Edition 2014). Engineering Drawing: Charotar Publishing House Pvt. Ltd.
- Dhawan, R.K.(3rd Revised Edition 2006). A textbook of Engineering Drawing (In First Angle Projection): S Chand & Company.
- Ramsey & Sleeper. (Sixth Edition 1970). Architectural Graphic Standards: John Wiley & Sons.
- Shah, P.J. (Revised Edition 2013). Textbook of Engineering Drawing: S Chand (G/L) & Company Ltd.

References:

- Ching, Francis D.K. (6th Edition 2015). Architectural Graphics: John Wiley & Sons.
- Ganesan, R., & Devarajan, V. (1998). Intersecting features extraction from 2D orthographic projections. CAD Computer Aided Design, 30(11), 863–873. https://doi.org/10.1016/S0010-4485(98)00043-8
- Williams, E. (2001). Lettering. Eurostitch Magazine, 9(51), 28–29. https://doi.org/10.1007/978-94-010-2948-3_17

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	50	0	50	100	3	3

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	--	--	--	1	--	--	2	--	--	--	-	1	2	-	--
CO2	3	--	--	--	1	--	--	2	--	--	--	-	1	2	-	--
CO3	2	--	--	--	2	--	--	1	--	--	--	-	1	2	-	--
CO4	2	--	--	--	2	--	--	1	--	--	--	-	1	2	-	--

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	VISUAL ARTS-I (ARC2105)	L	T	S	P	C
Version 1.1	Date of Approval:	1	0	2	0	3
Pre-requisites/Exposure	Architectural Design- I					
Co-requisites	Carpentry & Model Making					

Catalog Description

The aim of this course is to provide practical learning in creative thinking. The course intends to build student interest in think creative and express freedom of expression in Art, Paintings, and model making. The design and creative thinking course helps analyse complex shapes, design and application of colour.

Course Objectives

The objective of this course is

- To understand the elements and principles of Basic Design as the building blocks of creative design through exercises that will develop the originality, expression, skill and creative thinking.
- To familiarize with principles and theories of arts and architectural composition
- To develop presentation skills, visual expression and representation, imaginative thinking and creativity through free hand sketching and painting on various mediums and materials.
- To familiarize students with the grammar of art by involving them in a series of free hand exercises both indoor and outdoor to understand form, proportion, scale, etc.

Course Outcomes

On completion of this course, the students will be able to

CO1: Create 2d, 3D Graphic forms, size, and their proportions
CO2: Create object based painting and develop creative art forms
CO3: Apply architectural graphics skills and improve presentation skills
CO4: Create life-long connection in one's pursuit for painting and other art forms

Modules	Blooms level*	Number of hours
MODULE 1: Free Hand Sketching Warm-up module for students to gain exposure to the importance of sketching and drawings in architecture. Free hand still life sketching of composition of solids, cubes, cylinders etc. Study of light, shade and shadow. Free hand sketching in pencil of elements of scale like trees, shrubs, human, figures, vehicles etc. Indoor and Outdoor Sketching.	L1, L2, L3	9

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MODULE 2: Live Sketching Live sketching in pencil of elements of scale like trees, shrubs, human, figures, vehicles etc. Indoor and Outdoor Sketching.	L1, L2, L3	9
MODULE 3: Colour Theory and Colour Wheel Properties of colour – Colour schemes – Types of colours -primary, secondary and tertiary colours. Application and visual effects of colour.	L1, L2, L3, L4	9
MODULE 4: Color Course Introduction to Hue, Tint, Tone and Shades. Exercises for the same to study their impacts on still objects, buildings, etc	L1, L2, L3, L4	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

- Pen & Ink Drawing: A Simple Guide by Book by Alphonso Dunn

Reference Books

- Ching, F. (1975). Architectural Drafting. In Architectural Graphics (pp. 15–19). Elsevier. https://doi.org/10.1016/b978-0-85139-066-6.50005-5
- Guptill, a L., & Meyer, S. E. (1997). Rendering in Pen and Ink. Proceedings of the 23rd annual conference on Computer graphics and interactive techniques SIGGRAPH 96 (Vol. 30, pp. 469–476). Retrieved from http://portal.acm.org/citation.cfm?doid=237170.237287
- Pencil Points reader: a journal for the drafting room, 1920-1943. (2004). Choice Reviews Online, 42(02), 42-0757-42–0757. https://doi.org/10.5860/choice.42-0757
- The American Institute of Architects. (2010). Architectural Graphic Standards for Residential Construction, 2nd Edition. American Institute of Architects, 1–720.

Modes of Evaluation: Quiz/Assignment/ Seminar/Practical

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	*10*	*75*	*5*	*100*	*0*	*0*	*0*	*100*	*3*	*0*

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	2	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO3	2	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO4	2	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-

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	STRUCTURE - I (ARC2109)	L	T	S	P	C
Version 1.1	Date of Approval:	2	0	0	0	2
Pre-requisites/Exposure						
Co-requisites	Building Materials & Construction Technology – I					

Catalog Description

The aim of this course is to enable students to understand various principles of strength of materials. The course covers Engineering mechanics, stress and strain of beams, shear force and bending moment theory. The subject will be taught is congruence with the Design studio, and assignments for the subject will be linked to the design exercises to achieve higher level of learning and understanding the practical application of the same.

Course Objectives

The objective of this course is

- To introduce the structural system in a building with all the basic components.
- To understand the functions of various elements and building technologies used in various types of buildings.
- To study of stresses and strains and their effect in various elements.
- To give an introduction to the basic principles governing structural systems.
- To introduce basic prefab and high-rise structure.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain basics of engineering mechanics
CO2: Define stresses and strains with their effects in various elements
CO3: Explain force and bending moment diagrams.
CO4: Understand prefab and high-rise building structure.

Modules	Blooms level*	Number of hours
MODULE 1: Engineering mechanics Introduction , force, resultant force, parallelogram ,triangle, and polygon law of forces, system of forces, Lami‟s theorem, moment of forces, parallel forces , couple , center of gravity , moment of inertia, friction , angle of friction, angle of repose, basics of pulley centripetal and centrifugal force, super elevation ,work, power, energy. Frame- perfect and imperfect frame, motion of a lift, lifting machine	L1, L2	06

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MODULE 2: Stress and strain Introduction, direct stress and strain , shear stress and strain, stress strain diagram for mild steel, young's modulus , poisson's ratio, shear modulus, bending equation for beam in simple bending volumetric strain, bulk modulus, stress in bass of varying section, shear stress diagram, stresses in composite bass, flinched beams, stresses due to change in temperature, principal of superposition, principal stress and strain , Mohr's circle of stresses , resilience.	L1, L2	06
MODULE 3:Shear Force and bending moment diagram, theory of yielding and failure Types Of Beams, Supports, Loadings, Assumption Of Theory Of Bending ,SFD And BMD, Material Failure, Structural Failure, Max Principal Stress (Rankine's theory), Max Principle Stress (Saint-Venant's principle), Maximum Shear Stress , Total Strain Energy Theory , Shear And Distortion Strain (von Mises and Hencky)	L1, L2	06
MODULE 4: Design principles and elementary concept for building construction systems Design principles of RCC beams and slabs. Construction system: reinforced concrete, pre-stressed concrete and prefab system and modular co-ordination. Load action and high-rise buildings, various structural systems for high rise buildings.	L1, L2	06

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text Books

- Arya, C. (2009). Eurocode 3: Design of steel structures. In Design of Structural Elements (pp. 375–433). CRC Press. https://doi.org/10.1201/b18121-13
- Emmitt, S., & Gorse, C. (2014). Barry's Advanced Construction Of Buildings Third edition. John Wiley & Sons, Ltd (Vol. 28, p. 581).
- Salvadori, M., & Heller, R. (1986). Structure In Architecture: The Building Of Buildings, Third Edition. Struct in Archit, The Build of Build, Third Ed. Prentice-Hall Inc.

References

- Oppermann, R. H. (1941). Strength of materials, part I, elementary theory and problems. Journal of the Franklin Institute, 231(1), 96. https://doi.org/10.1016/s00160032(41)90378-
- Von Glasersfeld, E. (2009). A model for the construction of elementary concepts (pp. 45– 50). AIP Publishing. https://doi.org/10.1063/1.58258

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	50	0	50	100	2	3

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	-	-	1	-	-	-	1	-	-	-	2	2	1	-	-
CO2	2	-	-	1	-	-	-	1	-	-	-	2	2	1	-	-
CO3	2	-	-	1	-	-	-	1	-	-	-	2	2	1	-	-
CO4	2	-	-	1	-	-	-	1	-	-	-	2	2	1	-	-

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	ARCHITECTURAL GRAPHICS SKILLS-II (ARC2204)	L	T	S	P	C
Version 1.1	Date of Approval:	1	0	2	0	3
Pre-requisites/Exposure	Architectural Graphics Skills-I					
Co-requisites	Architectural Design-II, Basic Design and Visual Arts-II					

Catalog Description

The aim of this course is to provide the theoretical, practical and pictorial aspect of the architectural drawings to the students. The subject covers concepts of metric drawings and development surfaces familiarize them with isometric and axonometric views and development of the surfaces of basic forms. The subject will be taught in congruence with the design studio, and assignments for the subject will be linked to the design exercises to achieve higher level of learning and understanding the practical application of the same.

Course Objectives

The objective of this course is:

- To familiarize the students with theoretical, practical and pictorial aspects of architectural drawings.
- To develop the perception and presentation of simple architectural forms and buildings.
- To introduce the development of the basic forms in architecture.
- To equip the students with visualization and surface development of complex forms.

Course Outcomes

On completion of this course, the students will be able to

CO1: Recognize the need to combine the use of manual drawing tools and techniques for drafting and freehand drawing for architectural design communication.

CO2: Produce 3- Dimensional Architectural drawings and forms by using drawings/sketching and manual techniques.

CO3: Produce surface development of the simple geometric forms.

CO4: Produce and visualize the surface development of the complex architectural forms.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Metric Drawing Types, uses and advantages, Isometric, Axonometric and Pictorial views, Metric Drawing and projection and their Dimensioning, Metric of plane figures composed of straight lines, Metric of circles, Metric of simple and complex block.	L1, L2, L3	6
MODULE 2: Isometric and Axonometric Drawings Preparation of Isometric and Axonometric views of the 3d composition of simple geometric forms, architectural manifestation and exploded Isometric of furniture and architectural plans.	L2, L3, L4	12

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MODULE 3: Development of Surfaces of simple form Development of surfaces of cubes, prisms, cylinders, pyramids, cones and spheres.	L1, L2, L3	12
MODULE 4: Development of Surfaces of complex composition of form Development of surfaces of composition of cubes, prisms, cylinders, pyramids, cones and spheres.	L3, L4, L5	6

****Bloom's Level:** L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

- Bhatt, N.D. (53rd Edition 2014). Engineering Drawing: Charotar Publishing House Pvt. Ltd.
- Dhawan, R.K.(3rd Revised Edition 2006). A textbook of Engineering Drawing (In First Angle Projection): S Chand & Company.
- Ramsey & Sleeper. (Sixth Edition 1970). Architectural Graphic Standards: John Wiley & Sons.
- Shah, P.J. (Revised Edition 2013). Textbook of Engineering Drawing: S Chand (G/L) & Company Ltd.

References

- Ching, Francis D.K. (6th Edition 2015). Architectural Graphics: John Wiley & Sons.
- Ganesan, R., & Devarajan, V. (1998). Intersecting features extraction from 2D orthographic projections. CAD Computer Aided Design, 30(11), 863–873. https://doi.org/10.1016/S0010-4485(98)00043-8
- Williams, E. (2001). Lettering. Eurostitch Magazine, 9(51), 28–29. https://doi.org/10.1007/978-94-010-2948-3_17

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	50	0	50	100	3	3

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	--	2	--	1	--	--	3	3	--	--	-	1	2	--	--
CO2	3	--	2	--	1	--	--	3	3	--	--	-	1	2	--	--
CO3	2	--	2	--	1	--	--	3	3	--	--	--	1	2	--	--
CO4	2	--	2	--	1	--	--	3	3	--	--	--	1	2	--	--

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	VISUAL ARTS – II (ARC2205)	L	T	S	P	C
Version 1.1	Date of Approval:	1	0	1.5	1	3
Pre-requisites/Exposure	Visual Arts – I					
Co-requisites	Architectural Design - II					

Catalog Description

The aim of this course is to provide practical learning in creative thinking. The course intends to build student interest in think creative and express freedom of expression in Art, Paintings, and model making. The design and creative thinking course helpsanalyze complex shapes, design and application of colour.

Course Objectives

The objective of this course is to

- To introduce Art and appreciation its philosophies.
- To develop sensitivity towards sculpture and mural as an integral part of architecture.
- To familiarize with principles and theories of arts and architectural composition.
- To utilize the skills for rendering and paintings.

Course Outcomes

On completion of this course, the students will be able to

CO1: Create 2d, 3D Graphic forms, size, and their proportions
CO2: Create art forms with different mediums
CO3: Apply rendering techniques for indoor and outdoor painting.
CO4: Create life-long connection in one's pursuit for painting and other art forms

Modules	Blooms level*	Number of hours
MODULE 1: Art and Philosophy An introduction to the basic formal concepts in the two-dimensional arts and the principles of aesthetic organization. Using Shapes to construct aesthetically pleasing compositions	L1, L2, L3	9
MODULE 2: 2D Compositions An introduction to the basic formal concepts in the two-dimensional arts and the principles of aesthetic organization. Using Shapes to construct aesthetically pleasing composition	L1, L2, L3	9
MODULE 3: Rendering Rendering techniques, dot rendering, point rendering of still and live objects	L1, L2, L3, L4	9

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MODULE 4: Painting Different types of painting styles and their masters and philosophy, Indoor and outdoor painting – Exercise involving Water colour – Water soluble colour pencil – Tempra – Acarali – Water soluble oil colour – Oil colour – Pen and ink – Brush – Air brush – Mixed mediums – Study of multi-colour and 3D effects from nature and built environment	L1, L2, L3, L4	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

- Pen & Ink Drawing: A Simple Guide by Book by Alphonso Dunn

Reference Books

- Ching, F. (1975). *Architectural Drafting*. In *Architectural Graphics* (pp. 15–19). Elsevier. https://doi.org/10.1016/b978-0-85139-066-6.50005-5
- Guptill, a L., & Meyer, S. E. (1997). *Rendering in Pen and Ink*. *Proceedings of the 23rd annual conference on Computer graphics and interactive techniques SIGGRAPH 96* (Vol. 30, pp. 469–476). Retrieved from http://portal.acm.org/citation.cfm?doid=237170.237287
- Pencil Points reader: a journal for the drafting room, 1920-1943. (2004). *Choice Reviews Online*, *42*(02), 42-0757-42–0757. https://doi.org/10.5860/choice.42-0757
- The American Institute of Architects. (2010). Architectural Graphic Standards for Residential Construction, 2nd Edition. *American Institute of Architects*, 1–720.

Modes of Evaluation: Quiz/Assignment/ Seminar/Practical

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	75	5	100	0	0	0	100	3	0

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	--	--	--	--	--	--	--	--	--	--	1	--	--	--
CO2	2	1	--	--	--	--	--	--	--	--	--	--	1	--	--	--
CO3	2	1	--	--	--	--	--	--	--	--	--	--	1	--	--	--
CO4	2	1	--	--	--	--	--	--	--	--	--	--	1	--	--	--

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	STRUCTURE – II (ARC2209)	L	T	P	S	C
Version 1.1	Date of Approval:	2	0	0	0	2
Pre-requisites/Exposure	Structure – I					
Co-requisites	Building Materials & Construction Technology – II					

Catalog Description

The aim of this course is to enable students to understand various principles of strength of materials especially in case of beams, columns and trusses. The course covers deflection of beams, forces in members of truss, condition of equilibrium and displacement methods. The subject will be taught is congruence with the Design studio, and assignments for the subject will be linked to the design exercises to achieve higher level of learning and understanding the practical application of the same.

Course Objectives

The objective of this course is

- To understand the basic principles of structural system so that it forms the basis for study of structural design.
- To help students to understand the basic principles of structural behavior and requirements of buildings with emphasis laid on the principles of various load distribution in beams and columns.
- To understand the basic principles of structural mechanics that would be pertinent to simple design elements ad understanding the structural behavior of buildings.

Course Outcomes

On completion of this course, the students will be able to

CO1: Calculate deflection of beams through analytical method.
CO2: Analyze the resolution of forces as well as various study of various theorem related to equilibrium.
CO3: Explain force and bending moment diagrams.
CO4: Calculate deflection in beams and trusses through graphic and conjugate method.

Modules	Blooms level*	Number of hours
MODULE 1: Deflection of Beams Equation for deflection of beams, formula for maximum deflection under various loading conditions, shear stress in shaft, stiffness of a spring- leaf and helical spring. Column and struts – effective length, buckling load, short or long column, slenderness ratio, Rankine's formula, Euler's formula, dams and retailing walls, Rankine's theory for active earth pressure	L1, L2	6
MODULE 2: Forces in Members Of Trusses Types of Trusses, Method of Section, Method of Joint, Analytical Method, Graphical Method, Analysis of Plane Trusses and Space Trusses	L1, L2	6

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MODULE 3:Statically Determinate and In-determinate Structures Condition of equilibrium, compatibility conditions, simple and compound systems, linear and nonlinear systems, sway and sinking, analysis of statically determinate formulas.	L1, L2	6
MODULE 4: Displacements – Geometric Methods Deflected shapes, moment area method, conjugate beam method, deflection of trusses – graphical method.	L1, L2	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text Books

- Arya, C. (2009). Eurocode 3: Design of steel structures. In Design of Structural Elements (pp. 375–433). CRC Press. https://doi.org/10.1201/b18121-13
- Emmitt, S., & Gorse, C. (2014). Barry's Advanced Construction Of Buildings Third edition. John Wiley & Sons, Ltd (Vol. 28, p. 581).
- Salvadori, M., & Heller, R. (1986). Structure In Architecture: The Building Of Buildings, Third Edition. Struct in Archit, The Build of Build, Third Ed. Prentice-Hall Inc.

References

- Oppermann, R. H. (1941). Strength of materials, part I, elementary theory and problems. Journal of the Franklin Institute, 231(1), 96. https://doi.org/10.1016/s00160032(41)90378-
- Von Glasersfeld, E. (2009). A model for the construction of elementary concepts (pp. 45– 50). AIP Publishing. https://doi.org/10.1063/1.58258

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	50	0	50	100	2	3

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	--	--	--	1	--	--	--	1	--	--	--	2	2	1	--	--
CO2	--	--	--	1	--	--	--	1	--	--	--	2	2	1	--	--
CO3	--	--	--	1	--	--	--	1	--	--	--	2	2	1	--	--
CO4	--	--	--	1	--	--	--	1	--	--	--	2	2	1	--	--

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	ARCHITECTURAL GRAPHICS SKILLS-III (ARC2304)	L	T	S	P	C
Version 1.1	Date of Approval:	1	0	2	0	3
Pre-requisites/Exposure	Architectural Graphic Skills – II					
Co-requisites	Architectural Design – III					

Catalog Description

The aim of this course is to develop essential manual skills such as proficiency in drawing, largely used as primary mode of communication of ideas in architectural design. Students will be introduced to a variety of tools and techniques for visual expression with emphasis on manual drawing. Architectural Graphics-II introduces advanced techniques for architectural drawing such as perspective projection, mix-media renderings etc. The course would help students identify suitable methods of representation and methods in different built environment scenarios.

Course Objectives

The objective of this course is

- To familiarize the students with One Point Perspective visualization of architectural drawing.
- To familiarize the students with Two Point Perspective visualization of architectural drawing.
- To introduce a variety of tools and techniques for visual expression with emphasis on manual drawing.
- To introduce the geometrical method of producing shadows in Architectural Drawings.

Course Outcomes

On completion of this course, the students will be able to

CO1: Recognize the need to combine the use of manual drawing tools and techniques for drafting architectural design communication.
CO2: Apply the projected drawing method of exterior and interior perspective
CO3: Render the drawings in different mediums.
CO4: Draw views demonstrating the play of light and shadows.

Modules	Blooms level*	Number of hours
MODULE 1: One Point Perspective Drawing One perspectives of combination of geometrical forms, Building exterior and interior perspectives.	L3, L4	12

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MODULE 2: Two Point Perspective Drawing Two perspectives of combination of geometrical forms, Building exterior and interior perspectives. Introduction to three-point perspective and basic exercises based on the same	L3, L4	12
MODULE 3: Rendering Rendering perspectives in different media (Dry and water based color and ink etc.). Presentation techniques in different types of rendering and materials. Variation in color/ ink, as per light position. Use of basic plantation, vehicles etc to introduce scale to building perspectives.	L4,L5	6
MODULE 4: Sciography Values in shades and shadows, constructing plan shadows (point, line and plane), Constructing shadows in elevations (Point, line and Plane). Short- cut methods for constructing shadows. Introduction of sciography in perspective drawings.	L4,L5	6

***Bloom's Level:** L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books:

- *N D Bhatt,(2014).Engineering Drawing,(Plane and solid geometry),Delhi, Charotar Publishing house.*

References

- *Francis D.K. Ching (1979),Architecture: Form, Space and Order, John Wiley& Sons Publication*
- *Heller Robert and Salvadori Mario (1975),Structure in Architecture, Englewood Cliffs, N.J.Prentice-Hall*
- *Parmar V.S.(1973), Design Fundamental in Architecture, Somaiya Pubications*

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	50	0	50	100	3	3

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	--	3	--	--	--	2	--	--	--	--	--	1	2	--	--
CO2	1	--	2	--	--	--	--	--	--	--	--	--	1	2	3	--
CO3	1	--	2	--	--	--	--	--	--	--	--	--	1	2	3	--
CO4	1	--	3	--	--	--	--	--	--	--	--	--	1	2	3	--

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	VISUAL ARTS – III (ARC2305)	L	T	S	P	C
Version 1.1	Date of Approval:	1	0	1.5	1	3
Pre-requisites/ Exposure	Visual Arts – II					
	Architectural Design - III					

Catalog Description
The aim of this course is to provide practical learning in creative thinking. The course intends to build student interest in think creative and express freedom of expression in Art, Paintings, and model making. The design and creative thinking course helps analyse complex shapes, design and application of colour.

Course Objectives
The objective of this course is

- To introduce the concept of perspectives and perspective drawings.
- To develop architectural skills of perspectives
- To familiarize with principles and theories of arts and its appreciation techniques.
- To introduce the concept of shades and shadows in architecture drawing.

Course Outcomes
On completion of this course, the students will be able to
CO1: Appreciate art and art works and re-create them in form of logos, symbols, etc.
CO2: Create perspectives for surroundings and buildings
CO3: Understand the importance of shading devices in architecture
CO4: Understand the role of shades and shadows in building construction

Modules	Blooms level*	Number of hours
MODULE 1: Art Appreciation Graphic representations – Visual composition and Abstraction- Exercises involving Logo design, collage, calligraphy and printing.	L1, L2, L3	9

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MODULE 2: Perspective (Free-Hand) Free-hand perspective drawing and rendering of imagined objects, in pencil and pen/ink. One and two point perspective drawings of solids and of different room interiors.	L1, L2, L3	9
MODULE 3:Perspective (Free-Hand) Free-hand perspective drawing of complex composition of solids. One and two point perspective view of the exterior of the building with understanding of the basic human proportion and scale. Introduction to three point perspective.	L1, L2, L3, L4	9
MODULE 4: Sciography Values in shades and shadows, Constructing plan shadows (point, line and plane), Constructing shadows in elevations (Point, line and Plane). Short- cut methods for constructing shadows Presentation techniques in different types of rendering techniques and materials.	L1, L2, L3, L4	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

- Pen & Ink Drawing: A Simple Guide by Book by Alphonso Dunn

Reference Books

- Ching, F. (1975). Architectural Drafting. In Architectural Graphics (pp. 15–19). Elsevier. https://doi.org/10.1016/b978-0-85139-066-6.50005-5
- Guptill, a L., & Meyer, S. E. (1997). Rendering in Pen and Ink. Proceedings of the 23rd annual conference on Computer graphics and interactive techniques SIGGRAPH 96 (Vol. 30, pp. 469–476). Retrieved from http://portal.acm.org/citation.cfm?doid=237170.237287
- Pencil Points reader: a journal for the drafting room, 1920-1943. (2004). Choice Reviews Online, 42(02), 42-0757-42–0757. https://doi.org/10.5860/choice.42-0757
- The American Institute of Architects. (2010). Architectural Graphic *Standards for Residential Construction, 2nd Edition. American Institute of Architects, 1–720.*

Modes of Evaluation: Quiz/Assignment/ Seminar/Practical
Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	75	5	100	0	0	0	100	3	0

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	--	--	--	--	--	--	--	--	--	--	1	--	--	--
CO2	2	1	--	--	--	--	--	--	--	--	--	--	1	--	--	--
CO3	2	1	--	--	--	--	--	--	--	--	--	--	1	--	--	--
CO4	2	1	--	--	--	--	--	--	--	--	--	--	1	--	--	--

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	STRUCTURE - III (ARC2308)	L	T	S	P	C
Version 1.1	Date of Approval:	3	0	0	0	3
Pre-requisites/Exposure	Structure – II					
Co-requisites	Building Materials & Construction Technology – III					

Catalog Description

The aim of this course is to understand the ground situation before preparing an architectural design of any type of structure. In this course basic principles of structural mechanics that would be pertinent to simple design elements and understanding the structural behavior of buildings. The survey maps will be foundation documents for selection of technique of design based on ground elevation and contour pattern of proposed site. This subject covers the conceptual theory and practical application of surveying and leveling on ground with help of various survey concepts, techniques, methods and instruments.

Course Objectives

The objective of this course is

- To understand an informal choice regarding the most appropriate structural system for the building design due to different types of loading.
- To provide a basic understanding about the structural modeling and research techniques in the field of Architecture.
- To understand the role of surveying and leveling in architecture and will be introduced to the techniques and equipment's for land surveying.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the calculation of concentrated loads
CO2: Define the basis of arches and cables
CO3: Analyze Frame – With Lateral Translation and With No Lateral Translation of Joints by Slope deflection method and Moment deflection method
CO4: Explain frames with and without lateral translation of joints

Modules	Blooms level*	Number of hours
MODULE 1: Loads and spans Introduction, single concentrated load, udl longer than the span, UDL shorter than the span, two concentrated spans, series of concentrated loads, equivalent UDL	L1, L2	6
MODULE 2: Arches and Cables Basis of arches, cables and suspension in bridges, basic concept, frames with and without lateral translations of joints, general case – 1 story column slender in height and bases fixed or hinged.	L1, L2	8

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MODULE 3: Slope deflection method and Moment distribution Method Slope Deflection Method and Moment Distribution Method, Development of Slope Deflection, Equation, Analysis Of Frame – With Lateral Translation And With No Lateral Translation Of Joints. MDM- Development of Method, Analysis Of Frames With Lateral Translation And With No Lateral Translation Of Joints, Symmetrical Frames, Multi Storey Frames, No Shear Moment Distribution	L1, L2	14
MODULE 4: Kani's Method Basic concept, frames with and without lateral translation of joints, general cases, story column unequal in height and bases fixed or hinged	L1, L2	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text Books

- Arya, C. (2009). Eurocode 3: Design of steel structures. In Design of Structural Elements (pp. 375–433). CRC Press. https://doi.org/10.1201/b18121-13
- Emmitt, S., & Gorse, C. (2014). Barry's Advanced Construction Of Buildings Third edition. John Wiley & Sons, Ltd (Vol. 28, p. 581).
- Salvadori, M., & Heller, R. (1986). Structure In Architecture: The Building Of Buildings, Third Edition. Struct in Archit, The Build of Build, Third Ed. Prentice-Hall Inc.
- Oppermann, R. H. (1941). Strength of materials, part I, elementary theory and problems. Journal of the Franklin Institute, 231(1), 96. https://doi.org/10.1016/s00160032(41)90378-
- Von Glasersfeld, E. (2009). A model for the construction of elementary concepts (pp. 45– 50). AIP Publishing. https://doi.org/10.1063/1.58258

References

- Guo, Y., Du, Q., Luo, Y., Zhang, W., & Xu, L. (2008). Application of augmented reality GIS in architecture. In The International Archives of Photogrammetry, Remote Sensing and Spatial Information Sciences (Vol. XXXVII, pp. 331–336). ISPRS.
- Kilford, W. K. (1979). SURVEYING FOR ENGINEERS. Survey Review, 25(192), 94–96. https://doi.org/10.1179/sre.1979.25.192.94

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	50	00	50	100	3	3

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	--	--	--	1	2	--	--	1	--	--	--	3	2	1	--	--
CO2	--	--	--	1	2	--	--	1	--	--	--	3	2	1	--	--
CO3	--	--	--	1	2	--	--	1	--	--	--	3	2	1	--	--
CO4	--	--	--	1	2	--	--	1	--	--	--	3	2	1	--	--

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	SURVEYING AND LEVELLING (ARC2313)	L	T	S	P	C
Version 1.1	Date of Approval:	1	0	1.5	1	3
Pre-requisites/Exposure	Structure – II					
Co-requisites	Structure – III					

Catalog Description

The aim of this subject is to make students understand the ground situation before preparing an architectural design of any type of structure. The survey maps will be foundation documents for selection of technique of design based on ground elevation and contour pattern of proposed site. This subject covers the conceptual theory and practical application of surveying and leveling on ground with help of various survey concepts, techniques, methods and instruments. The subject will be taught is congruence with the Design studio, and assignments for the subject will be linked to the design exercises to achieve higher level of learning and understanding the practical application of the same.

Course Objectives

The objective of this course is

- To understand the role of surveying and leveling in architecture
- To introduce the techniques and equipment for land surveying.
- To understand the practical surveying in the field.

Course Outcomes

On completion of this course, the students will be able to

CO1: Enable the students to understand land topography and its connection with surveying & leveling exercises.

CO2: Enable the students to understand the primary basic surveying techniques adopted in past years.

CO3: Enable the students to understand essentials parameters (basic and advanced) of leveling with various instruments & methods and concept of contouring.

CO4: Enable to do contour and slope analysis for a building.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to surveying Introduction to surveying, its practicality in the profession. Classification of various survey instruments, techniques & equipment. Reading of survey maps, understanding of features and undulations of ground. Scaling of survey measurements and errors in surveying. Concept of trigonometry, traversing & tachometry in surveying.	L1, L2	04

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MODULE 1: Measurements Measurements in horizontal plane, linear measurements with chain & tape, setting-out & survey stations, survey accessories, survey lines, open & closed traverse, chaining & offsetting, direct & indirect ranging, log-books, field boundaries, field area estimation. Chain Surveying: Principles of survey, equipment required selection of station, methods of taking offsets. Compass Surveying: The prismatic compass, its construction and uses and other types of compasses.	L1, L2	09
MODULE 3: Basic and advanced surveying techniques Plane table surveying (equipment, methods, advantage & disadvantage, errors etc.), Theodolite Surveying (temporary & permanent adjustment, measuring of magnetic bearings, horizontal & vertical angles and Theodolite traverse & balancing closing error). Tachometric surveying (general instruments, different systems of tachometric measurements, stadia method). The concept of total station survey and its multi-functioning in surveying. Introduction to Use of DGPS, automated & digital surveying, G.P.S, Aerial Photography, etc.	L1, L2	14
MODULE 4: Contours and Slope Analysis Contouring methods & equipment, contour intervals, direct & indirect methods of contouring, block contour surveys, profile levelling, longitudinal & traverse cross sections, and gradients. Measurements along sloping landforms, principles, definitions, methods, instruments required for simple & differential levelling.	L1, L2	09

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text Books & References

- *Clancy, J. (2013). Site Surveying and Leveling. Site Surveying and Leveling. Routledge. https://doi.org/10.4324/9780080928487.*
- *Ježko, J. (2014). Calibration of Surveying Instruments and Tools – Means to the Quality Increase of Deformation Measurements. Journal of Sustainable Mining, 13(4), 17–22. https://doi.org/10.7424/jsm140404*
- *Zhang, L., Mao, Q., Li, Q., & Zhang, P. (2014). An accuracy-improvement method for GPS/INS kinematic leveling for use in linear engineering surveying projects. Measurement: Journal of the International Measurement Confederation, 54, 22– 30. https://doi.org/10.1016/j.measurement.2014.03.026*

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	50	0	0	100	3	0

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	--	2	--	3	--	--	--	2	1	--	2	--	2	1	3	--
CO2	--	2	--	3	--	--	--	2	1	--	2	--	2	1	3	--
CO3	--	2	--	3	--	--	--	2	1	--	2	--	2	1	3	--
CO4	--	2	--	3	--	--	--	2	1	--	2	--	2	1	3	--

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	STRUCTURE - IV (ARC2409)	L	T	S	P	C
Version 1.1	Date of Approval:	3	0	0	0	3
Pre-requisites/Exposure	Structure –III					
Co-requisites	Structure – V					

Catalog Description

The aim of this course is to enable students to understand various principles of strength of materials especially in case of beams, columns and trusses. The course covers deflection of beams, forces in members of truss, condition of equilibrium and displacement methods.

Course Objectives

The objective of this course is

- To understand rational basis of the design of reinforced concrete members and structures through advanced materials and structural behavior.
- To enable students to undertake problems, identify, formulate and solve the critical thought, rational inquiry and self-directed learning.

Course Outcomes

On completion of this course, the students will be able to

CO1: Describe the building materials used in construction such as cement, fine and coarse aggregate, reinforcement, etc.
CO2: Design a slab for given building floor for different end support conditions.
CO3: Design a column for given axial load and moments.
CO4: Develop understanding about complex foundations and the construction techniques involved.

Modules	Blooms level*	Number of hours
MODULE 1: Material and Design Method Cement, Fine and Coarse Aggregate, Water, Admixtures, Reinforcements, Properties and Tests For Concrete, WSM Vs LSM, Soil Mechanics, Basis Of Soil Properties, Soil Type, Bearing Capacity, Terzaghi's And Skempton's Formula.	L1, L2	09
MODULE 2: Beams and Slabs Using LSM and WSM Singly Beam, Doubly Beams, T, L Beams, Slabs – Rectangle, Circular, One Way, Two Way, Flat. Using IS 456:2000 And SP -16, Continuous Beams and Slabs.	L1, L2	09
MODULE 3: Column and Footing Short column and long column, minimum eccentricity, column subjected to combined axial load, uniaxial bending and biaxial bending, design of footing.	L1, L2	09
MODULE 4: Pile and Raft Foundation Design Of RCC Piles, Pile Caps, Raft Foundation (Theory)	L1, L2	09

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

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Text Books

- Arya, C. (2009). Eurocode 3: Design of steel structures. In Design of Structural Elements (pp. 375–433). CRC Press. https://doi.org/10.1201/b18121-13
- Emmitt, S., & Gorse, C. (2014). Barry's Advanced Construction Of Buildings Third edition. John Wiley & Sons, Ltd (Vol. 28, p. 581).
- Salvadori, M., & Heller, R. (1986). Structure In Architecture: The Building Of Buildings, Third Edition. Struct in Archit, The Build of Build, Third Ed. Prentice-Hall Inc.

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- Von Glasersfeld, E. (2009). A model for the construction of elementary concepts (pp. 45– 50). AIP Publishing. https://doi.org/10.1063/1.58258

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	50	0	50	100	3	3

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	--	--	1	--	--	--	1	--	--	--	2	2	1	--	--
CO2	2	--	--	1	--	--	--	1	--	--	--	2	2	1	--	--
CO3	2	--	--	1	--	--	--	1	--	--	--	2	2	1	--	--
CO4	2	--	--	1	--	--	--	1	--	--	--	2	2	1	--	--

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	COMPUTER APPLICATION - I (ARC2413)	L	T	S	P	C
Version 1.1	Date of Approval:	2	0	0	2	3
Pre-requisites/Exposure	Architectural Graphic Skills					
Co-requisites	Architectural Design –IV					

Catalog Description

The aim of this course is to understand the available software technologies and their applications in Architectural Designs. In order to enable students to use computer systems, software's and hardware, teaching necessary digital skills are important aspect of the course. This course will help learners to prepare presentation drawings, generating 2D and rendered views in a short time. This would finally help them in Design studio to develop conceptual as well as final Plan.

Course Objectives

The objective of this course is

- To introduce the students with the Photo editing software.
- To develop theoretical understanding of AutoCAD and its relevance in Architecture.
- To practice various commands of the Autocad.

Course Outcomes

On completion of this course, the students will be able to

CO1: Develop understanding of minimum system requirements and computer aided drafting
CO2: Comprehend Photoshop and its parameter as tools and its application in architecture
CO3: Comprehend computer aided drafting and its parameter as tools and its application in architecture
CO4: Evaluate CAD techniques for quicker methods and presentation skills

Modules	Blooms level*	Number of hours
MODULE 1:Introduction to Use of Photo Editing Software Introduction to Photo editing, montaging as well as preparation of 2-D presentations.	L1, L2	2
MODULE 2:Workshop on Photo Editing Software Practice on Photo editing as well as preparation of 2-D presentations onPhotoshop**.**	L1, L2	6
MODULE 3: Introduction to Auto Cad (2-D) Software Introduce to the drafting software for the graphic design, building planning. Explain the various ways to deal with the graphic drawings. Introduce to 2D-3D drawing concepts. Students learn the ability to Drafting, Editing and modification work to be done in the graphic presentation. Practice on the various AutoCAD commands through software User Interface. Conduct 2D Skills Workshop to train the students. Introduce to the draft skills and minimize errors in the presentation skills.	L1, L2,L3	8

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MODULE 4:Workshop on 2D drafting Practice on the various Auto Cad commands through software User Interface. Conduct 2D Skills Workshop to train the students. Introduce to the Modelling skills and minimize errors in the presentation skills.	L4, L5, L6	20

**Bloom's Level:* *L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Texts

- George Omura, Brian C. Benton. (2018). Mastering AutoCAD 2019 and AutoCAD LT 2019. Syvex.

References

- Byrnes, D. (2010). AutoCAD 2011 for Dummies. Wiley Publishing, Inc (pp. 1–512).
- Finkel, R. (2005). Operating systems. In Computers, Software Engineering, and Digital Devices (pp. 18-1-18–18). CRC Press. https://doi.org/10.5117/mab.47.21471
- Lampson, B. W. (1983). Hints for computer system design. In Proceedings of the 9th ACM Symposium on Operating Systems Principles, SOSP 1983 (pp. 33–48). Association for Computing Machinery, Inc. https://doi.org/10.1145/800217.806614
- Subscribe to various Microsoft online free services, https://www.microsoft.com/en-in

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	0	50	50	100	3	3

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	--	3	--	1	--	--	--	--	--	--	-	1	2	-	--
CO2	1	--	1	--	1	--	--	--	--	--	--	-	1	2	-	--
CO3	2	--	1	--	1	--	--	--	3	2	--	-	1	2	-	--
CO4	2	--	1	2	1	--	--	--	3	2	--	-	1	2	-	--

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	VISUAL ARTS – IV (ARC2414)	L	T	S	P	C
Version 1.1	Date of Approval:	1	0	1.5	1	3
Pre-requisites/Exposure	Visual Arts – III					
Co-requisites	Architectural Design - IV					

Catalog Description

The aim of this course is to provide practical learning in creative thinking. The course intends to build student interest in think creative and express freedom of expression in Art, Paintings, and model making. The design and creative thinking course helps analyse complex shapes, design and application of colour.

Course Objectives

The objective of this course is

- To Create 2d, 3D Graphical forms in form of sculptures, murals, etc.
- To study the principles and understand the importance of audio visuals and photography in presenting architectural drawings.

Course Outcomes

On completion of this course, the students will be able to

CO1: Create 2d, 3D Graphic forms, size, and their proportions
CO2: Create sculptural art forms with different mediums
CO3: Apply photography techniques for better presentations
CO4: Understand the importance of ergonomics in designing

Modules	Blooms level*	Number of hours
MODULE 1: 3D Compositions Basic components of 3-dimensional art, including subject, form, and content. Discussions centered on 3-dimensional design and concepts	L1, L2, L3	9
MODULE 2: Sculpture Different types of Sculpture, their masters and philosophy. Live scale murals and their uses in building with examples.	L1, L2, L3	9
MODULE 3: Photography and Audio-Visual Presentation Importance of photography, angles, views in field of art and architecture. Techniques to combine photography and audio into audio-visual presentations using softwares or in form of animated magazine.	L1, L2, L3, L4	9
MODULE 4: Ergonomics and Furniture Design Golden mean ratio, Principles of ergonomics and its importance in history of architecture. Studying furniture design through examples from Schools of Architecture. Exercises incorporating both terminologies.	L1, L2, L3, L4	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis;*

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L5:Synthesis, L6:Evaluation

Text Books

- Photography and audio-visual book; available on http://www.easdvalencia.com/download/international/incoming/educational_offer/ Photography_and_audiovisual.pdf

Reference Books

- Of visual and audiovisual aids in the foreign language; by Englewood. Cliffs, N. J.: Prentice Hall, 1966. Fenton, D. X.. Better Photography for Amateurs. 3rd ed. New York;
- Ching, F. (1975). *Architectural Drafting*. In *Architectural Graphics* (pp. 15–19). Elsevier. https://doi.org/10.1016/b978-0-85139-066-6.50005-5
- Guptill, a L., & Meyer, S. E. (1997). *Rendering in Pen and Ink*. *Proceedings of the 23rd annual conference on Computer graphics and interactive techniques SIGGRAPH 96* (Vol. 30, pp. 469–476). Retrieved from http://portal.acm.org/citation.cfm?doid=237170.237287
- Pencil Points reader: a journal for the drafting room, 1920-1943. (2004). *Choice Reviews Online*, *42*(02), 42-0757-42–0757. https://doi.org/10.5860/choice.42-0757
- The American Institute of Architects. (2010). Architectural Graphic Standards for Residential Construction, 2nd Edition. *American Institute of Architects*, 1–720.

Modes of Evaluation: Quiz/Assignment/ Seminar/Practical

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	75	5	100	0	0	0	100	3	0

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	--	--	--	--	--	--	--	--	--	--	1	--	--	--
CO2	2	1	--	--	--	--	--	--	--	--	--	--	1	--	--	--
CO3	2	1	--	--	--	--	--	--	--	--	--	--	1	--	--	--
CO4	2	1	--	--	--	--	--	--	--	--	--	--	1	--	--	--

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	STRUCTURE - V (ARC2509)	L	T	S	P	C
Version 1.1	Date of Approval:	3	0	0	0	3
Pre-requisites/Exposure	Structure – IV					
Co-requisites	Building Materials & Construction Technology – V					

Catalog Description

The aim of this course is to enable students to design steel structures and also an overview of alternative building materials. The course covers knowledge of materials such as cement, aggregate, grades of concrete, steel structures. The course would enable students to design simple RCC structures and their basic components, viz, columns, beams, slabs and staircases. This course covers staircase design, retaining wall, portal frames, masonry structures, pre-stressed and post stressed concrete.

Course Objectives

The objective of this course is

- To understand the analysis of in-determinant structures and their use in field in greater depth.
- To design different types of staircase with various materials.
- To make students aware of column footing.

Course Outcomes

On completion of this course, the students will be able to

CO1: Design a dogleg staircase for given stair well space in residential or public building. **CO2:** Explain the alternatives of long span structures.

CO3: Apply composite materials for masonry works.

CO4: Summarize the conceptual idea behind the development of pre-stressed structural component for general use.

Modules	Blooms level*	Number of hours
MODULE 1: Design of Staircase and Retaining Wall General Features, Types of Staircase, Distribution of Loading on Stairs, Wall Proportions, Design Principles, Counterfort Retaining Walls.	L1, L2	09
MODULE 2: Portal Frames Design of Portal Frames with Hinged Base, Design of Portal Frames with Fixed Base, Structural Analysis and Design of Grid Floor, Slab Culvert Rectangular – Beam Deck.	L1, L2	09
MODULE 3:Masonry Structures Introduction, Masonry Walls, Design of Wall and Column Footing	L1, L2	09
MODULE 4: Design principles and high-rise structures Elements of Pre-Stressed and post tensioning Concrete, Principles and System, Loss, Analysis and Design of Pre-Stress and post tensioned Beam.	L1, L2	09

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

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Text Books

- Arya, C. (2009). Eurocode 3: Design of steel structures. In Design of Structural Elements (pp. 375–433). CRC Press. https://doi.org/10.1201/b18121-13
- Emmitt, S., & Gorse, C. (2014). Barry's Advanced Construction Of Buildings Third edition. John Wiley & Sons, Ltd (Vol. 28, p. 581).
- Salvadori, M., & Heller, R. (1986). Structure In Architecture: The Building Of Buildings, Third Edition. Struct in Archit, The Build of Build, Third Ed. Prentice-Hall Inc.
- Oppermann, R. H. (1941). Strength of materials, part I, elementary theory and problems. Journal of the Franklin Institute, 231(1), 96. https://doi.org/10.1016/s00160032(41)90378-
- Von Glasersfeld, E. (2009). A model for the construction of elementary concepts (pp. 45– 50). AIP Publishing. https://doi.org/10.1063/1.58258

References

- Roeder, C. W., &MacRae, F. A. (1997). Steel structures. Advances in Earthquake Engineering (Vol. 3, pp. 533–561). Computational Mechanics Publ. https://doi.org/10.1201/9781420037135.ch1
- Solanki, H., &Gogate, A. (1998). Flanged deep beams. In Reinforced Concrete Deep Beams. Spon Press. https://doi.org/10.4324/9780203034880.ch5
- Venkatarama Reddy, B. V. (2004, October 10). Sustainable building technologies. Current Science

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	50	0	50	100	3	3

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	--	--	1	--	--	--	--	--	--	--	--	2	1	--	--
CO2	2	--	--	2	--	--	--	--	--	--	--	--	--	1	--	--
CO3	--	3	--	1	--	--	--	--	--	--	--	--	--	1	--	--
CO4	2	--	--	2	--	--	--	--	--	--	--	--	3	1	--	--

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	COMPUTER APPLICATIONS- II (ARC2513)	L	T	S	P	C
Version 1.1	Date of Approval:	2	0	0	2	3
Pre-requisites/Exposure	Computer Applications - I					
Co-requisites	Landscape Design					

Catalog Description

The aim of this subject is to introduce techniques for further refinement of computer generated graphics covered in the previous semester. In addition to that, this course also trains students for developing photorealistic modeling using popular software in the field of architecture. Advanced technologies and concepts using computers as an essential tool are also introduced such as Building Information Modeling. This course equips students with soft skills which increase their productivity and expression in design related subjects.

Course Objectives

The objective of this course is

- To introduce and make students learn about graphic presentation tools
- To introduce Sketch up as 3D drafting software.
- To introduce Revit as 3D drafting software and its allied rendering plugins.

Course Outcomes

On completion of this course, the students will be able to

CO1: Prepare building design through sketch up software..
CO2: Prepare building design through revit software.
CO3: Render the drawings in various rendering plugins.
CO4: Train others in various types of softwares such as revit, sketch up.

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Modules	Blooms level*	Number of hours
MODULE 1:Introduction to SketchUp (3-D) Software Introduce to the Sketch up 3D software for the graphic design, building planning. Explain the various ways to deal with the graphic drawings. Introduce to 3D drawing concepts. Students learn the ability to Model, Editing and modification work to be done in the graphic presentation.	L1, L2	12
MODULE 2:Introduction to Revit (3-D) Software Introduce to the Revit 3D software for the graphic design, building planning. Explain the various ways to deal with the graphic drawings. Students learn the ability to Building Information Modeling.	L4, L5, L6	8
MODULE 3:Introduction to Rendering Plugins Introduce to the Lumion and Twilight Render software for the Rendering.	L1, L2	4
MODULE 4:Workshop Practice on the various Revit and Sketch Up commands through software User Interface. Conduct 3D Skills Workshop to train the students. Introduce to the Modelling skills and minimize errors in the presentation skills.	L4, L5, L6	12

***Bloom's Level:** L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text & Reference Books

- Brewster, R. (2014). Paint.NET - Free Software for Digital Photo Editing. Http://Www.Getpaint.Net/Index.Html (Accessed June 2015).
- Khan, E., Reinhard, E., Fleming, R., &Bülthoff, H. (2005). Image-based material editing. In ACM SIGGRAPH 2005 Sketches, SIGGRAPH 2005 (p. 148). Association for Computing Machinery, Inc. https://doi.org/10.1145/1187112.1187291
- Kholgade, N., Simon, T., Efros, A., & Sheikh, Y. (2014). 3D object manipulation in a single photograph using stock 3D models. In ACM Transactions on Graphics (Vol. 33). Association for Computing Machinery. https://doi.org/10.1145/2601097.2601209.
- Kirk, D. S., Sellen, A. J., Rother, C., & Wood, K. R. (2006). Understanding photowork. In Conference on Human Factors in Computing Systems - Proceedings (Vol. 2, pp. 761–770). https://doi.org/10.1145/1124772.1124885

Modes of Evaluation: Assignment/Written Examination

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	0	50	50	100	3	0

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	--	3	--	--	2	--	--	--	-	-	--	-	3	1	-	--
CO2	--	2	--	--	1	--	--	-	-	-	--	-	2	1	-	--
CO3	--	2	--	--	1	--	--	-	-	-	--	-	2	1	-	--
CO4	--	3	--	--	1	--	--	--	-	-	--	-	2	1	-	--

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	PEOPLE CULTURE AND BUILT ENVIRONMENT- I (ARC2519)	L	T	S	P	C
Version 1.1	Date of Approval:	3	0	0	0	3
Pre-requisites/ Exposure	History of Architecture, Architectural Design – III					
Co-requisites	Theory of Architecture					

Catalog Description

The objective of this course is to offer opportunities in specialized or advance learning in psychological and sociological aspects which are of concern to Architecture. The courses will generally be conducted in the seminar/studio mode to encourage research, exploration and skill developments. The aim of this course is to provide students the exposure to understanding society and various built forms produced by society. The course will also provide the students hands-on cultural, sociological and psychological studies of the built environment. The course contents to be followed will be developed by course teachers based on the resources at hand and opportunities for cross fertilization with other courses. The course would be conducted through literature survey, case studies, site visits, community surveys and hands on projects. During the course the students will be working on a live project in groups which are preferably interdisciplinary.

Course Objectives

The objective of this course is

- To understand the basic principles of psychology, sociology and culture of settlement.
- The course intends to study and understand the typical components of city in order to appreciate how these elements contribute to the quality of life of urban communities.
- To familiarize students with decisive strategies that brings inclusivity and equality in the designs of built forms.
- To develop interdisciplinary understanding and sensitivities of future architects.

Course Outcomes

On completion of this course, the students will be able to

CO1: Develop a relationship between man and his larger social environment, with special emphasis on aspects that are likely to affect intervention in or creation of, the built environment (predominantly urban)

CO2: Develop a language and vocabulary for discussions/ analysis on the sociological/ psychological dimensions of architecture.

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Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Psychology, Sociology and Built Environment Basic introduction to various critical social aspects; Role of psychology in architecture; Role of sociology in built environment; Determinants of sociology- social structure, social status, social control, social institutions, social mobility; Inclusive Built Environment; Barrier free designs and built environments; Various case studies related to gender and architecture, community development- community response towards development strategy etc.	L1, L2	18
MODULE 2: Project Work Selection and understanding of case study; Formulation of Aim and Objectives, Collection of data through primary and secondary sources; Conducting survey; Database development using relevant and advance software; Qualitative and quantitative data analysis; Report writing and presentations.	L4, L5, L6	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books/References

- CragunR.T.(2006). Introduction to Sociology, Wikibooks.
- Giddens, A (2006) Sociology, Polity Press, Cambridge (UK)
- Lynch, K. (1960) The Image of the City, Joint Centre Publication, USA
- Oomen T.K. and Venugopal C.N. (2004), Sociology, Eastern Book Company.
- Porteous, Douglas, J. (1977), Environment Behaviour: Planning and Everyday Urban Life, Addison Wesley
- Sinha A. (2013) "An India for Everyone: A Path of Inclusive Development, Herpercollins
- Steve Barkan (2010), Sociology: Understanding and Changing the Social World, Flat World Reference Books
- Tejchman A. (2016) "The Politics of Inclusive Development", Palgrave Macmillan.

Modes of Evaluation: Presentation/Assignment/Class Test /Written Examination

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	0	50	50	100	3	0

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	1	1	2	1	1	2	1	1	2	-	2	-	-	1	1
CO 2	2	3	1	2	1	1	2	3	3	1	-	1	-	-	1	1

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	ECOLOGY, ENVIRONMENT AND SUSTAINABLE DEVELOPMENT – I (ARC2520)	L	T	S	P	C
Version 1.1	Date of Approval:	3	0	0	0	3
Pre-requisites/ Exposure	Environmental Sciences, Building Services-1, Building Services-2					
Co-requisites	Architectural Design, Building Services-3					

Catalog Description

The objective of this course is to offer opportunities in specialized or advance learning in ecology, environment and sustainable aspects which are of concern to Architecture. The course will generally be conducted in the seminar/studio mode to encourage research, exploration and skill developments. The aim of this course is to provide students the exposure to understanding ecology and various environmental problems faced by settlements. The course will also provide the students hands-on ecological and environmental studies of built environment. The course contents to be followed will be developed by course teachers based on the resources at hand and opportunities for cross learning with other courses. The course would be conducted through literature survey, case studies, site visits, community surveys and hands on projects. During the course the students will be working on a live project in groups which are preferably interdisciplinary.

Course Objectives

The objective of this course is

- To understand the basic principles of ecology, environment and sustainable development.
- The course intends to study and understand the different components of city in order to understand how these elements contribute to environment quality.
- To establish the significance of the ecological issues, their impact and initiatives to address the same in the built environs to achieve sustainable development.
- To develop interdisciplinary understanding and sensitivities of future architects.

Course Outcomes

On completion of this course, the students will be able to

CO1: Develop a relationship between man and ecology, will understand critical environmental issues and need to address the m by using advanced technology.

CO2: Produce reports and presentation.

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Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Ecology, Environment and Sustainable Development Basic introduction to ecology; Interrelation between natural and built environment; Importance of environment sustainability in built environment; Energy conservation, renewable sources: wind, solar, geo-thermal, bio-fuels; Materials minimizing, recycling, reducing energy content, etc; Other environmental issues related to solid waste management, water resources, air quality, storm water drainage etc; Various case studies related to traditional / vernacular buildings and settlements demonstrating relationship between climate, local material resources and settlement/ building forms.	L1, L2	18
MODULE 2: Project Work Selection and understanding of case study; Formulation of Aim and Objectives, Collection of data through primary and secondary sources; Conducting survey; Database development using relevant and advance software; Qualitative and quantitative data analysis; Report writing and presentations.	L4, L5, L6	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books/References

- Bakari, Mohamed El-Kamel (2017). The Dilemma of Sustainability in the Age of Globalization: A Quest for a Paradigm of Development. New York: Lexington Books. ISBN 978-1498551397
- Blewitt, J. (2008). Understanding Sustainable Development. London: Earthscan. pp. 21–24. ISBN 978-1-84407-454-9.
- Fulekar, M. H., Pathak, B., Kale, R. K. (2014) Environment and Sustainable Development' Springer Nature; ISBN-10: 8132211650; ISBN-13: 978-8132211655
- Goudie, Andrew (2000). The Human Impact on the Natural Environment. Cambridge, Massachusetts: This MIT Press. pp. 203–239. ISBN 0-262-57138-2.
- James, Paul (2014). Urban Sustainability in Theory and Practice. doi:10.4324/9781315765747. ISBN 978-1-315-76574-7.
- James, Paul; Magee, Liam (2016). "Domains of Sustainability". In A. Farazmand (ed.). Global Encyclopedia of Public Administration, Public Policy, and Governance. Springer.
- Modak, P. (2017)Environmental Management Towards Sustainability, CRC Press, ISBN-10: 9781498796248
- Odum, E. P. (1971). Fundamentals of Ecology (Third ed.). New York: Saunders. ISBN 0-7216-6941-7.
- Porteous, Douglas, J. (1977), Environment Behaviour: Planning and Everyday Urban Life, Addison Wesley
- Thangavel, P., Sridevi, G. (2015) Environmental Sustainability, Springer Nature, ISBN-10: 9788132220558
- Walker, Brian and Salt, David (2006) Resilience Thinking: Sustaining ecosystems and people in a changing world. Island Press. p. xiii. ISBN 978-1597260930.

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- Wandemberg, JC (August 2015). Sustainable by Design. Amazon. p. 122. ISBN 978-1516901784

Modes of Evaluation: Presentation/Assignment/Class Test /Written Examination

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	0	50	50	100	3	0

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	1	1	2	1	1	2	1	1	2	-	2	-	-	1	1
CO 2	2	3	1	2	1	1	2	3	3	1	-	1	-	-	1	1

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	COMPUTER APPLICATIONS & ADVANCE TECHNOLOGIES – I (SMART BUILDINGS) (ARC2521)	L	T	S	P	C
Version 1.1	Date of Approval:	3	-	-	-	3
Pre-requisites/Exposure	Architecture Design, Building Services					
Co-requisites	Advanced Architecture Design, Building Services					

Catalog Description

Security of the building and safety of personal have become important aspects now. The aim of this subject is to familiarize students with the concept of Smart buildings which has become very important today and in the near future. Through the modules, the students are introduced to the components of smart buildings and various smart materials used in architecture. In addition to this, the students also will be introduced to the current and future trends in smart building construction.

Course Objectives

The objective of this course is

- To familiarize what Smart buildings are and its importance in today's life.
- To understand the various components and materials related to Smart buildings.
- To be able to keep up with the current and future trends and challenges faced in the development of Smart building services.

Course Outcomes

On completion of this course, students will be able to

CO1: Develop a basic understanding of Smart buildings and its components
CO2: Explain various smart materials and their application
CO3: Analyze the market trends of smart building services
CO4: Apply the knowledge of smart buildings in their design

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Smart Buildings Introduction to what is smart building, Terms and definition, Purpose, Building performance, User experience	L1, L2	7
MODULE 2: Components of Smart Building Key requirements for Smart Building, Building Automation Hardware: controllers, sensors, actuators, communication network	L1, L2, L3	10

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MODULE 3:Smart Materials Introduction to smart materials in architecture, Property-changing materials, Energy-exchanging materials, Bidirectional energy-exchanging materials, Application of smart materials in architecture	L3, L4	12
MODULE 4: Current and future Trends Understanding the current and future trends of smart building technologies in Residential sector	L4, L5, L6	7

***Bloom's Level:** L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text Books/ References

- Smart Buildings by Jim Sinopoli, Butterworth-Heinemann imprint of Elsevier,2nd ed., 2010.
- Understanding Building Automation Systems (Direct Digital Control, Energy Management, Life Safety, Security, Access Control, Lighting, Building Management Programs) by Reinhold A. Carlson, Robert A. Di Giandomenico, pub. by R.S. Means Company, 1991.
- Shengwei Wang, Intelligent buildings and building automation, Spon Press, 2010
- Intelligent Building Systems by Albert Ting-Pat So, WaiLok Chan, Kluwer Academic publisher,3rd ed., 2012.
- Derek Clements-Croome, Intelligent Buildings: Design Management and Operation, 2004.
- Design of Special Hazards and Fire Alarm Systems by Robert Gagnon, Thomson Delmar Learning; 2nd edition, 2007.
- HVAC Controls and Systems by Levenhagen, John I.Spethmann, Donald H., McGraw-Hill Pub.
- HVAC Control in the New Millennium by Hordeski, Michael F, Fairmont press, 2001.
- Process Control- Instrument Engineers Handbook by Bela G. Liptak, Chilton book co.

Modes of Evaluation: Assignment/ Presentation/ Literature Study/ Sheet Work

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	0	50	50	100	3	0

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	--	--	--	1	2	--	--	--	--	--	_	--	1	--	--
CO2	1	--	--	--	1	2	--	--	--	--	--	_	--	1	--	--
CO3	1	--	3	--	1	2	--	--	--	--	--	_	--	1	--	--
CO4	1	--	--	--	1	2	--	--	--	--	--	_	--	1	--	--

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	STRUCTURE - VI (ARC2609)	L	T	S	P	C
Version 1.1	Date of Approval:	3	0	0	0	3
Pre-requisites/Exposure	Structure – V					
Co-requisites	Building Materials & Construction Technology – VI					

Catalog Description

The aim of this course is to enable students to design simple RCC structures and their basic components viz, columns, beams, slabs and staircases. This course will help student to understand RCC structures and its application in consecutive design project. The course covers limit state state method and working stress method, partial safety factor, stress and strain relationship for concrete and steel, design of simply reinforced L&T beams, RCC columns and beams, foundation and footings.

Course Objectives

The objective of this course is

- To understand the analysis of intermediate structures and their use in field in greater depth.
- To design simple elevated water tanks
- To understand the application of RCC structure in consecutive design project.

Course Outcomes

On completion of this course, the students will be able to

CO1: Describe Three Moment theorem and their application in fixed and continuous beams. **CO2:** Analyze the structural geometry based on strength and stability criteria.
CO3: Design the effective use of structural systems for complex architectural need.
CO4: Design the effective use of Truss structure for residential and commercial purpose.

Modules	Blooms level*	Number of hours
MODULE 1: Theory of Beams and Frames Continuous beams, curved beams, portal frames, multistory building frames.	L1, L2	9
MODULE 2: Elevated Water Tanks Introduction of Tanks, Conical or Funnel Shaped Tanks.	L1, L2	9
MODULE 3:Shells and Floors Shells, Hyperbolic, Parabolic, Folded Plates, Grid or Coffered Floors, Girders.	L1, L2	9
MODULE 4: Truss Design principles of Truss Roof, Truss for Residential use, Truss for commercial use, Truss for long span structure like Railway shed, hanger etc.	L1, L2	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

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Text Books

- Arya, C. (2009). Eurocode 3: Design of steel structures. In Design of Structural Elements (pp. 375–433). CRC Press. https://doi.org/10.1201/b18121-13
- Emmitt, S., & Gorse, C. (2014). Barry's Advanced Construction Of Buildings Third edition. John Wiley & Sons, Ltd (Vol. 28, p. 581).
- Salvadori, M., & Heller, R. (1986). Structure In Architecture: The Building Of Buildings, Third Edition. Struct in Archit, The Build of Build, Third Ed. Prentice-Hall Inc.

References

- Oppermann, R. H. (1941). Strength of materials, part I, elementary theory and problems. Journal of the Franklin Institute, 231(1), 96. https://doi.org/10.1016/s00160032(41)90378-
- Von Glasersfeld, E. (2009). A model for the construction of elementary concepts (pp. 45– 50). AIP Publishing. https://doi.org/10.1063/1.58258

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	50	0	50	100	3	3

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	--	--	1	--	--	--	1	--	--	--	2	2	1	--	--
CO2	2	--	--	1	--	--	--	1	--	--	--	2	2	1	--	--
CO3	2	--	--	1	--	--	--	1	--	--	--	2	2	1	--	--
CO4	2	--	--	1	--	--	--	1	--	--	--	2	2	1	--	--

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	SITE PLANNING AND LANDSCAPE (ARC2617)	L	T	S	P	C
Version 1.1	Date of Approval:	1	0	1.5	1	3
Pre-requisites/Exposure	Architectural Design - IV					
Co-requisites	Architectural Services - III					

Catalog Description

The aim of this course is to make the students understand the role of landscape architecture in the creation of better environments. This course shall have a direct application in the design studio of the same semester as well as in the Thesis. The course covers basic introduction to landscape architecture, landscape graphics, planting design. This course will help students to understand the concepts of landscape architecture and to study and analyze site in relation to landscape design and be able to design and detail various architectural and planning landscape projects.

Course Objectives

The objective of this course is

- To understand various types of Landscape and the role of natural and manmade landscape for Land Development;
- To provide different methods for site planning at regional and micro level;
- To understand landscape design as an allied field of architecture and planning;
- To understand process of landscape design for small and large areas.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the role and scope of Landscape architect.
CO2: Identify the development processes and cycles in the urban landscapes.
CO3: Conduct a landscape analysis and evaluate it with required functions.
CO4: Develop a site plan with landscape design and relate with environment and ecology.

Modules	Blooms level*	Number of hours
MODULE 1: Elements and History of Landscape Study of Landscape elements such as land, vegetation, water, earth & climate, Natural & manmade elements, etc. Principles of landscape design such as unity, simplicity, variety, balance, proportion, sequence, etc. Social and economic factors. Psychological considerations of spaces and enclosures. History of Landscape Architecture including natural & cultural factors of the place, development of landscape architecture through history in different parts of the world such as China, Japan, Europe, Italy, France, England, Persia, Egypt, Greece, Rome. Study of landscape architecture in Medieval period in India such as Mughal. Modern & Contemporary Landscape architecture. Cultural aspects of the landscape architecture with contextual understanding.	L1, L2, L3	9

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MODULE 2: Hardscapes, Softscapes and Urban Landscape Hardscapes - pergolas, garden furniture, fences, rocks, masonry, paving & surfacing, roads & parking lots, walks & plazas; Softscapes such as plantation, turfing, water features. Design criteria for landscape design such as visual, functional, micro-climatic, ecological and aesthetic. Basic horticultural idea about plants, plant selection, planting design and care of plants; Urban Landscape - Characteristics and components of open space patterns in towns and cities (traditional and contemporary) basic types: streets, squares, plazas, gardens, ghats and maidans, public parks at district, local and neighbourhood levels; park systems; landscape design related to land-use, circulation networks and activity; street furniture as a component of urban landscape.	L1, L2, L3	9
MODULE 3: Landscape Design and Services Macro and micro-climatic considerations in landscape architecture. Effect of climate on landscape and various components of landscape on the microclimate. Landscape Services & Sustainability: Introduction; Outdoors lighting, surface water drainage, irrigation, soil management techniques.	L1, L2, L3	9
MODULE 4: Landscape Aspects of Site Planning Principles of understanding and evaluating and existing landscape; development as a response to constraints and opportunities offered by the site; the landscape concept and open space structure as a basic component of the site plan; The role of vegetation: environmental benefits, functional requirements, aesthetic considerations; typical situations and criteria for design with plants and selection of species; grading; in relation to existing contours, plinth levels, road alignment and storm water drainage; principles of cut and fill.	L1, L2, L3	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

- Marsh, M. William, (2010). Landscape Planning Environmental Applications;
- Booth, Norman K., Basic Elements of Landscape Architectural Design;
- J.O. Symonds, Landscape Architecture;
- J.O. Symonds, Architecture-A manual of site planning and design;
- John l. Motloch, Introduction to Landscape Design;
- J. E. Ingels, Landscaping – Principles and Practice;
- Walker and Theodre, Planting Design

Reference Books

- J.O. Symonds, Earthscape; Theory in Landscape Architecture: A Reader (Penn Studies in Landscape Architecture);
- Landscape as Urbanism: A General Theory by Charles Waldheim;
- Cliff Tandy, Handbook of Urban Landscape; M. Bring, Japanese Gardens: Design & Meaning
- Conan, M., & Conan, M. (2000). Environmentalism in landscape architecture. Library (Vol. 22). Retrieved from http://books.google.com/books?hl=en&lr=&id=wr385lQxrbsC&oi=fnd&pg=PA1&dq=Environmentalism+in+landscape+architecture&ots=hMCOKluPkW&sig=iFCLKXFB_aH6CX6q1w26O1Aj4PU

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- Laurie, M. (1986). An introduction to landscape architecture. Second edition. An Introduction to Landscape Architecture. Second Edition.
- Vernon, S. (2013). Landscape Architect's Pocket Book. Landscape Architect's Pocket Book. Routledge. https://doi.org/10.4324/9780203568705
- Starke, B. (2016). Landscape Architecture: A Manual of Environmental Planning and Design. McGraw Hill (Vol. 86, pp. v–vi). McGraw-Hill Education. https://doi.org/10.1080/02681307.2016.1252112
- Clayden, A., &Osmundson, T. (2001). Roof Gardens: History Design and Construction. Garden History, 29(2), 226. https://doi.org/10.2307/1587387
- Thacker, C., & Keswick, M. (1979). The Chinese Garden: History, Art and Architecture. Garden History, 7(1), 20. https://doi.org/10.2307/1586713
- Smith, L. S., & Fellowes, M. D. E. (2013, July 1). Towards a lawn without grass: The journey of the imperfect lawn and its analogues. Studies in the History of Gardens and Designed Landscapes. https://doi.org/10.1080/14601176.2013.799314
- Mannion, A. M. (1999). Modern trends in ecology and environment, R.S. Ambasht (1998) - Book review. Journal of Ecology, 87(1), 176.

Modes of Evaluation: Quiz/Assignment/ Seminar/Practical

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	50	0	50	100	3	3

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	--	--	1	--	--	--	--	--	2	--	1	2	--	--
CO2	2	2	--	--	1	--	--	--	--	--	2	--	1	2	--	--
CO3	2	2	--	--	1	--	--	--	--	--	2	--	1	3	--	--
CO4	2	2	--	--	1	--	--	--	--	--	2	--	1	2	--	--

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	PEOPLE CULTURE AND BUILT ENVIRONMENT- II (ARC2620)	L	T	S	P	C
Version 1.1	Date of Approval:	3	0	0	0	3
Pre-requisites/Exposure	History of Architecture, Architectural Design – III					
Co-requisites	Theory of Architecture					

Catalog Description

The objective of this course is to offer opportunities in specialized or advance learning in psychological and sociological aspects which are of concern to Architecture. The courses will generally be conducted in the seminar/studio mode to encourage research, exploration and skill developments. The aim of this course is to provide students the exposure to understanding society and various built forms produced by society. The course will also provide the students hands-on cultural, sociological and psychological studies of the built environment. The course contents to be followed will be developed by course teachers based on the resources at hand and opportunities for cross fertilization with other courses. The course would be conducted through literature survey, case studies, site visits, community surveys and hands on projects. During the course the students will be working on a live project in groups which are preferably interdisciplinary.

Course Objectives

The objective of this course is

- To understand the basic principles of psychology, sociology and culture of settlement.
- The course intends to study and understand the typical components of city in order to appreciate how these elements contribute to the quality of life of urban communities.
- To familiarize students with decisive strategies that brings inclusivity and equality in the designs of built forms.
- To develop interdisciplinary understanding and sensitivities of future architects.

Course Outcomes

On completion of this course, the students will be able to

CO1: Develop a relationship between man and his larger social environment, with special emphasis on aspects that are likely to affect intervention in or creation of, the built environment (predominantly urban)

CO2: Develop a language and vocabulary for discussions/ analysis on the sociological/ psychological dimensions of architecture.

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Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Psychology, Sociology and Built Environment Basic introduction to various critical social aspects; Role of psychology in architecture; Role of sociology in built environment; Determinants of sociology- social structure, social status, social control, social institutions, social mobility; Inclusive Built Environment; Barrier free designs and built environments; Various case studies related to gender and architecture, community development- community response towards development strategy etc.	L1, L2	8
MODULE 2: Project Work Selection and understanding of case study; Formulation of Aim and Objectives, Collection of data through primary and secondary sources; Conducting survey; Database development using relevant and advance software; Qualitative and quantitative data analysis; Report writing and presentations.	L4, L5, L6	16

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books/References

- CragunR.T.(2006). Introduction to Sociology, Wikibooks.
- Giddens, A (2006) Sociology, Polity Press, Cambridge (UK)
- Lynch, K. (1960) The Image of the City, Joint Centre Publication, USA
- Oomen T.K. and Venugopal C.N. (2004), Sociology, Eastern Book Company.
- Porteous, Douglas, J. (1977), Environment Behaviour: Planning and Everyday Urban Life, Addison Wesley
- Sinha A. (2013) "An India for Everyone: A Path of Inclusive Development, Herpercollins
- Steve Barkan (2010), Sociology: Understanding and Changing the Social World, Flat World Reference Books
- Tejchman A. (2016) "The Politics of Inclusive Development", Palgrave Macmillan.

Modes of Evaluation: Presentation/Assignment/Class Test /Written Examination

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	0	50	50	100	3	0

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1	2	1	1	2	1	1	2	-	2	-	-	1	1
CO2	2	3	1	2	1	1	2	3	3	1	-	1	-	-	1	1

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	ECOLOGY, ENVIRONMENT AND SUSTAINABLE DEVELOPMENT – II (ARC2621)	L	T	S	P	C
Version 1.1	Date of Approval:	3	0	0	0	3
Pre-requisites/Exposure	Environmental Sciences, Building Services-1, Building Services-2					
Co-requisites	Architectural Design, Building Services-3					

Catalog Description

The objective of this course is to offer opportunities in specialized or advance learning in ecology, environment and sustainable aspects which are of concern to Architecture. The course will generally be conducted in the seminar/studio mode to encourage research, exploration and skill developments. The aim of this course is to provide students the exposure to understanding ecology and various environmental problems faced by settlements. The course will also provide the students hands-on ecological and environmental studies of built environment. The course contents to be followed will be developed by course teachers based on the resources at hand and opportunities for cross learning with other courses. The course would be conducted through literature survey, case studies, site visits, community surveys and hands on projects. During the course the students will be working on a live project in groups which are preferably interdisciplinary.

Course Objectives

The objective of this course is

- To understand the basic principles of ecology, environment and sustainable development.
- The course intends to study and understand the different components of city in order to understand how these elements contribute to environment quality.
- To establish the significance of the ecological issues, their impact and initiatives to address the same in the built environs to achieve sustainable development.
- To develop interdisciplinary understanding and sensitivities of future architects.

Course Outcomes

On completion of this course, the students will be able to

CO1: Develop a relationship between man and ecology, will understand critical environmental issues and need to address the m by using advanced technology.

CO2: Produce reports and presentation.

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Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Ecology, Environment and Sustainable Development Basic introduction to ecology; Interrelation between natural and built environment; Importance of environment sustainability in built environment; Energy conservation, renewable sources: wind, solar, geo-thermal, bio-fuels; Materials minimizing, recycling, reducing energy content, etc; Other environmental issues related to solid waste management, water resources, air quality, storm water drainage etc; Various case studies related to traditional / vernacular buildings and settlements demonstrating relationship between climate, local material resources and settlement/ building forms.	L1, L2	8
MODULE 2: Project Work Selection and understanding of case study; Formulation of Aim and Objectives, Collection of data through primary and secondary sources; Conducting survey; Database development using relevant and advance software; Qualitative and quantitative data analysis; Report writing and presentations.	L4, L5, L6	16

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books/References

- Bakari, Mohamed El-Kamel (2017). The Dilemma of Sustainability in the Age of Globalization: A Quest for a Paradigm of Development. New York: Lexington Books. ISBN 978-1498551397
- Blewitt, J. (2008). Understanding Sustainable Development. London: Earthscan. pp. 21–24. ISBN 978-1-84407-454-9.
- Fulekar, M. H., Pathak, B., Kale, R. K. (2014) Environment and Sustainable Development' Springer Nature; ISBN-10: 8132211650; ISBN-13: 978-8132211655
- Goudie, Andrew (2000). The Human Impact on the Natural Environment. Cambridge, Massachusetts: This MIT Press. pp. 203–239. ISBN 0-262-57138-2.
- James, Paul (2014). Urban Sustainability in Theory and Practice. doi:10.4324/9781315765747. ISBN 978-1-315-76574-7.
- James, Paul; Magee, Liam (2016). "Domains of Sustainability". In A. Farazmand (ed.). Global Encyclopedia of Public Administration, Public Policy, and Governance. Springer.
- Modak, P. (2017)Environmental Management Towards Sustainability, CRC Press, ISBN-10: 9781498796248
- Odum, E. P. (1971). Fundamentals of Ecology (Third ed.). New York: Saunders. ISBN 0-7216-6941-7.
- Porteous, Douglas, J. (1977), Environment Behaviour: Planning and Everyday Urban Life, Addison Wesley
- Thangavel, P., Sridevi, G. (2015) Environmental Sustainability, Springer Nature, ISBN-10: 9788132220558
- Walker, Brian and Salt, David (2006) Resilience Thinking: Sustaining ecosystems and people in a changing world. Island Press. p. xiii. ISBN 978-1597260930.

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- Wandemberg, JC (August 2015). Sustainable by Design. Amazon. p. 122. ISBN 978-1516901784

Modes of Evaluation: Presentation/Assignment/Class Test /Written Examination

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	0	50	50	100	3	0

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1	2	1	1	2	1	1	2	-	2	-	-	1	1
CO2	2	3	1	2	1	1	2	3	3	1	-	1	-	-	1	1

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	COMPUTER APPLICATIONS AND ADVANCE TECHNOLOGIES-II (AR-VR ARCHITECTURE) (ARC2622)	L	T	S	P	C
Version 1.1	Date of Approval:	1	0	0	4	3
Pre-requisites/Exposure	Architectural Graphic Skills					
Co-requisites	Architectural Design, Building Materials and Construction Technology					

Catalog Description

The aim of this course is to covers the technical and experiential design foundation required for the implementation of immersive environments in current and future virtual, augmented and mixed reality platforms. The curriculum covers a wide range of literature and practice starting from the original Computer Science and HCI concepts following the evolution of all supporting technologies including visual displays for VR, AR and MR, motion tracking, interactive 3D graphics, multimodal sensory integration, immersive audio, user interfaces, IoT, games and experience design.

Course Objectives

The objective of the course is

- To establish and cultivate a broad and comprehensive understanding of this rapidly evolving and commercially viable field of Computer Science
- To prepare the student for participating in the production of highly integrative immersive applications, immersive social platforms, cross disciplinary academic research projects and leading developments in Medical, Industrial and Manufacturing R&D.
- To work in collaborative group projects and develop working prototypes, demo experiences, immersive platforms, unique controllers and new innovative technologies.

Course Outcomes

On completion of this course, the students will be able to

CO1: Understand visual displays for VR, AR and MR, motion tracking, interactive 3D graphics, multimodal sensory integration, immersive audio, user interfaces, IoT, games and experience design.

CO2: Work on highly integrative immersive applications, immersive social platforms, cross disciplinary academic research projects and leading developments in Medical, Industrial and Manufacturing R&D.

CO3: Analyze inside-out camera tracking

CO4: Understand and prepare 3D rendering for immersive environment.

Modules	Blooms level*	Number of hours

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Module 1: Introduction to Immersive Technologies • A Brief History of Virtual Reality. • The five Classic Components of a VR System. • Early Commercial VR Technology. • VR, AR, MR, xR: similarities and differences. • Current trends and state of the art in immersive technologies, developing platforms and consumer devices. • The future of human experience.	L1, L2, L3	8
Module 2: The Human behind the lenses • Human Perception and Cognition • The Human Visual System • The Human Auditory System • The Human Vestibular System Physiology, Psychology and the Human Experience • Adaptation and Artefacts • Ergonomics • Ethics • Scientific Concerns VR Health and Safety Issues • Effects of VR Simulations on Users • Cybersickness, before and now • Guidelines for Proper VR Usage User Centered Design, User Experience and an Ethical Code of Conduct	L1, L2, L3,L4	10
Module 3: Camera tracking Inside-Out Camera tracking • Depth Sensing • Microsoft HoloLens • Vrvana Totem • Low cost AR and MR systems • Mobile Platforms Full-Body tracking • Inverse & Forward Kinematics • Kinect • Intel Realsense • Full body inertial tracking • Ikinema • Holographic Video	L1, L2, L3, L4	8

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Module 4: 3D Rendering for Immersive Environments Rendering Architecture • Graphics Accelerators • 3D Rendering API's, OpenGL, DirectX, Vulcan, Metal • Best practices and Optimization techniques Distributed VR Architectures • Multi-pipeline Synchronization • Co-located Rendering Pipelines • Distributed Virtual Environments	L1, L2, L3, L4	10

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Primary Resource

- Kelly S. Hale (Editor), Kay M. Stanney (Editor). 2014. Handbook of Virtual Environments: Design, Implementation, and Applications, Second Edition (Human Factors and Ergonomics)
    - ISBN-13: 978-1466511842. Amazon

Other Resources:

- Michael Madary and Thomas K. Metzinger. 2016. Real Virtuality: A Code of Ethical Conduct. Recommendations for Good Scientific Practice and the Consumers of VR-Technology. Frontiers in Robotics and AI 3, February: 1–23. http://doi.org/10.3389/frobt.2016.00003
- Jason Jerald. 2015. The VR Book: Human-Centered Design for Virtual Reality. Association for Computing Machinery and Morgan & Claypool Publishers.
- http://doi.org/10.1145/2792790
- Tony Parisi. 2015. Learning Virtual Reality
- ISBN: 9781491922828
- Alva Noe. 2004. Action in Perception.
- ISBN: 9780262640633
- Paul Dourish. 2001. Where the Action Is.
- ISBN: 9780262254151
- Philippe Fuchs - Appropriate use of VR headsets http://worldvrforum.com/product/appropriate-use-virtual-reality-head/
- Michael Heim. 1994. The Metaphysics of Virtual Reality.
- http://doi.org/10.1093/acprof:oso/9780195092585.001.0001
- Char Davies. 1998. OSMOSE: Notes on being in Immersive virtual space. Digital Creativity 9, 2: 65–74. http://doi.org/10.1080/14626269808567111

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

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Examination Scheme:

Evaluation Scheme								Total marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	0	50	50	100	3	0

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	-	--	--	2	--	--	--	--	--	--	--	3	1	--	--
CO2	3	-	--	--	1	--	--	--	--	--	--	--	2	1	--	--
CO3	3	-	--	--	2	--	--	--	--	--	--	--	2	1	--	--
CO4	2	-	--	--	1	--	--	--	--	--	--	--	2	1	--	--

1: strongly related, 2: moderately related and 3: weakly related

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	STRUCTURE - VII (ARC2703)	L	T	S	P	C
Version 1.1	Date of Approval:	3	0	0	0	3
Pre-requisites/Exposure	Structure – VI					
Co-requisites	Building Materials & Construction Technology – VII					

Catalog Description

The aim of this course is to enable students to design simple steel structures and their basic components. The fundamental aspects of analysis and design and also discusses the practical requirements such as safety, feasibility and economy of steel structures. The subject will be taught in congruence with the Design studio, and assignments for the subject will be linked to the design exercises to achieve higher level of learning and understanding the practical application of the same.

Course Objectives

The objective of this course is

- To understand the design of steel structures.
- To learn the behavior and design of structural steel components (members and connections in two - dimensional (2D) truss and frame structures)
- To gain an educational and comprehensive experience in the design of simple steel structures.

Course Outcomes

On completion of this course, the students will be able to

CO1: Design building structure.
CO2: Design simple connections, rivets, welds, bolts and pins.
CO3: Design column base and footing.
CO4: Design beams and gantry girders.

Modules	Blooms level*	Number of hours
MODULE 1: Design Principles Introduction to Design Specification for Steel Members, Bolted Connections, Welded Connections.	L1, L2, L3	9
MODULE 2: Structural Connections Beam to beam connections, beam to column connection, bolted bracket connection, welded crane bracket connection.	L1, L2, L3	9
MODULE 3:Shear Force and bending moment diagram, theory of yielding and failure Design Of Laced Column, Battened Column, Design Of Slab Base And Gusseted Base.	L1, L2, L3	9
MODULE 4: Design principles and high-rise structures Laterally restrained beam, gantry girder, plate girder with -thick web plate and thin web plate. Design of steel roof truss and tubular truss.	L1, L2, L3	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

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Text Books

- Arya, C. (2009). Eurocode 3: Design of steel structures. In Design of Structural Elements (pp. 375–433). CRC Press. https://doi.org/10.1201/b18121-13
- Coutie, M. G. (1997). Structural and stress analysis. Engineering Structures, 19(1), 92. https://doi.org/10.1016/s0141-0296(97)81457-5
- Cowin, S. C. (2001). Mechanics of materials. In Bone Mechanics Handbook, Second Edition (pp. 6-1-6–24). CRC Press.
- Emmitt, S., & Gorse, C. (2014). Barry's Advanced Construction Of Buildings Third Edition. John Wiley & Sons, Ltd (Vol. 28, p. 581).
- Guadagnini, M. (2008, May). Mechanics of Composite Materials: Preface. Mechanics of Composite Materials, 44(3), 197–198. https://doi.org/10.1007/s11029-008-9011-3
- Oppermann, R. H. (1941). Strength of materials, part I, elementary theory and problems. Journal of the Franklin Institute, 231(1), 96. https://doi.org/10.1016/s00160032(41)90378-2

References

- Baig, M. N., Fan, J., &Nie, J. (2006). Strength of concrete filled steel tubular columns. Tsinghua Science and Technology, 11(6), 657–666. https://doi.org/10.1016/S1007-0214(06)70248-6
- Megson, T. H. G. (2005). Analysis of Statically Indeterminate Structures. In Structural and Stress Analysis (pp. 467–547). Elsevier. https://doi.org/10.1016/b978-0750662215/50017-5 3. Salvadori, M., & Heller, R. (1986). Structure In Architecture: The Building Of Buildings, Third Edition. Struct in Archit, The Build of Build, Third Ed. Prentice-Hall Inc.
- Structural modeling and analysis. (1998). Choice Reviews Online, 35(07), 35-3890-35– 3890. https://doi.org/10.5860/choice.35-3890
- von Glasersfeld, E. (2009). A model for the construction of elementary concepts (pp. 45– 50). AIP Publishing. https://doi.org/10.1063/1.58258

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	50	0	50	100	3	3

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	--	--	--	1	3	--	--	1	--	--	--	--	3	1	--	--
CO2	--	--	--	1	3	--	--	1	--	--	--	--	3	1	--	--
CO3	--	--	--	2	3	--	--	1	--	--	--	--	2	1	--	--
CO4	--	--	--	2	3	--	--	1	--	--	--	--	2	1	--	--

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	RESEARCH METHODOLOGY (ARC2705)	L	T	S	P	C
Version 1.1	Date of Approval:	2	0	0	0	2
Pre-requisites/Exposure	Research - I					
Co-requisites	Building Material and Construction Technology-VI					

Catalog Description

The aim of this course is to prepare students for writing a paper based on secondary research and literature review and its oral and visual presentation. Students would be able to identify and go in depth into specific and appropriate aspects relating to the discipline of architecture and discuss how it is reflected in the realm of design.
Students learn how to research a subject area through readings; learn description, analysis and synthesis of readings; citation of authors in their writing. The importance of the course is also in understanding what constitutes plagiarism research writing and in imbibing the ethics of publication. Literature review is seen as the first step in preparation of understanding research methods.

Course Objectives

The objective of this course is

- To introduce research work to the students
- To identify a specific aspect relating to the discipline of architecture.
- To conduct a research

Course Outcomes

On completion of this course, the students will be able to

CO1: Identify area of research for thesis
CO2: Identify a research problem, formulation of hypothesis and organize a study based on literature survey
CO3: Apply research methods in case study and analyze the data collected from different sources
CO4: Develop ethics of publication

Modules	Blooms level*	Number of hours
MODULE 1: Identifying research topic, Research Gap and Project Formulation Choose any topic of the interest in consultation to the faculty concern; Research Question – Investigation Question – Measurement Issues – Hypothesis – Qualities of a good Hypothesis –Null Hypothesis & Alternative Hypothesis. Hypothesis Testing – Logic & Importance.	L1, L2, L3	6
MODULE 2: Literature Review Review of research paper, books, journals etc related to the topic	L1, L2, L3	6

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MODULE 3: Surveys, Data Collection and Data Analysis Questionnaire to be prepared and Surveys to be conducted related to research. Other related data to be collected from appropriate resources. Collected data to be analysed using proper software. frequency tables, bar charts, pie charts, percentages etc	L1, L2, L3, L4	6
MODULE 4: Paper Writing Research paper writing in appropriate format. Ethical issues related to publishing, Plagiarism and Self-Plagiarism to be checked	L1, L2, L3	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

- Kothari, C.R. (1985). Research Methodology, Delhi: New Delhi International Publishers

Reference Books

- Sagar ,Linkan (2019). 3D Max 2019 Training Guide, New Delhi: BPB Publication
- Sagar ,Linkan, (2019). Revit 2019 Architecture Training Guide. New Delhi: BPB Publication.
- Lorraine Farrelly Nicola Crowson. (2014). Representational Techniques for Architecture (Basics Architecture). (2nd Revised edition). Bloombury.
- M.C. Trivedi. (2009). Computer Graphics & Animation. (First edition). Jaico Publishing House.

Modes of Evaluation: Quiz/Assignment/ Seminar/Practical

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	75	5	100	0	0	0	100	2	0

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	--	1	3	2	--	--	--	--	--	--	--	--	1	3	--	3
CO2	--	2	2	3	--	--	--	--	--	--	--	--	1	2	--	2
CO3	--	2	1	3	--	--	--	--	--	--	--	--	1	2	--	2
CO4	--	3	2	2	--	--	--	--	--	--	--	--	2	2	--	2

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	LEED LAB – I (ARC2717)	L	T	S	P	C
Version 1.1	Date of Approval:	2	0	0	0	2
Pre-requisites/Exposure	Architectural Design- VI					
Co-requisites	Architectural Design – VII					

Catalog Description

The aim of this course is to provide fundamental knowledge about natural and built environment. And also introduces fundamental concepts to understand environmental processes. The curriculum further incorporates understanding in relation to Indian context. Course will be interdisciplinary and flexible.

Course Objectives

The objective of this course is

- To acquaint the student with the factors to be taken into consideration
- To understand the applications of an intelligent building.
- To familiarize the students to the Green Building rating systems, design processes, regulations and prevailing best practices

Course Outcomes

On completion of this course, the students will be able to

CO1: Define the fundamental of green building design.
CO2: Identify the role of USGBC, GBCI and their structure.
CO3: Identify the criteria for the selection of site
CO4: Review the fundamental concepts of waste management system.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Green Building & Green Building Rating Systems Introduction to Course, Syllabus and assessment, Fundamental concepts of Green Building Design and Sustainability. Green Rating regime and their scope (regional and global), Policies and legislations	L1, L2	6
MODULE 2: LEED Lab & Processes LEED Systems: Organization, fundamentals & Role USGBC/GBCI, Structure of LEED rating (credit, prerequisites and requirements) and Impact categories, LEED Certification & registration process, What, How and where to collect data for LEED certification	L1, L2, L3	6
MODULE 3: Site, Location and Transportation Scope and criterion of sustainable site, Transport and resource footprint	L1, L3,L4	6

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MODULE 4: Buildings Material and Resources Fundamental concepts (LCA), Waste management, 3Rs and Health), Procurement, declarations and documentations of Materials according to requirement of LEED certification	L1, L3,L4	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books:

- Altomonte, S., & Schiavon, S. (2013). Occupant satisfaction in LEED and non-LEED certified buildings. Building and Environment, 68, 66–76. https://doi.org/10.1016/j.buildenv.2013.06.008
- Azhar, S., Carlton, W. A., Olsen, D., & Ahmad, I. (2011). Building information modeling for sustainable design and LEED ® rating analysis. Automation in Construction, 20(2), 217–224. https://doi.org/10.1016/j.autcon.2010.09.019
- Leed. (2014). Reading for the R and D Community, 56(3), 25–27. https://doi.org/10.1007/978-90-313-9258-2_26

References:

- Newsham, G. R., Mancini, S., &Birt, B. J. (2009). Do LEED-certified buildings save energy? Yes, but... Energy and Buildings, 41(8), 897–905. https://doi.org/10.1016/j.enbuild.2009.03.014
- Suzer, O. (2015). A comparative review of environmental concern prioritization: LEED vs other major certification systems. Journal of Environmental Management, 154, 266–283. https://doi.org/10.1016/j.jenvman.2015.02.029

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	50	0	50	100	2	3

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	-	-	2	--	3	1	2	-	-	-	--	-	2	-	1	--
CO2	-	-	2	--	3	1	2	-	-	-	--	-	2	-	1	--
CO3	-	-	2	--	3	1	2	-	-	-	--	-	2	-	1	--
CO4	-	-	2	-	3	1	2	-	-	-	-	-	2	-	-	2

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	INTERIOR DESIGN (ARC2718)	L	T	S	P	C
Version 1.1	Date of Approval:	1	0	2	0	3
Pre-requisites/Exposure	Architectural Design - IV					
Co-requisites	Architectural Design - V					

Catalog Description

The aim of this course is to make students understand the application of design principles in interiors. The subject Interior Design is a specialized course offered in architecture which deals with functionality, safety and provides an aesthetically pleasing space for users. This semester will deal with minute details and construction techniques involved in interior design. The subject will also be integrated with a small component of design exercise with the current or previous semester design works. The course will include several exercises in relation to sit visits, market surveys, presentation, reports, etc.

Course Objectives:

The objective of this course is

- To equip the students with varied aspects of theory and practice of Interior Design, and develop skills to deal with diverse interior spaces.
- To understand qualities of spaces and develop their skills in designing for functional and meaningful interior space.
- To initiate students into theory and practice of Interior design.
- To merge theoretical and practical knowledge of interior design of a building.

Course Outcomes:

On completion of this course, the students will be able to

CO1: Apply elements of interior design in their design process.
CO2: Explain the application of design principles in interiors.
CO3: Create interior design model with the help of furniture, lighting fixtures, furnishings, paintings, sculptures, etc.
CO4: Design modern interiors using modern materials and techniques.

Modules	Blooms level*	Number of hours
MODULE 1:Introduction and basic principles of design Purpose, scope, objectives, history and importance of Interior Design. Elements and principles of interior design and their application inthecontextofbuildings.Aesthetic order, functional Value and Psychological impact of various elements ofInterior Design. Application of Colour, Texture, Landscaping, Artificial and Natural Lighting in theBuilding interiors.	L1, L2	9

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MODULE 2: Principles and Elements of Interior Design Elements of Interior Design, Role in interiors.Space making elements like wall, column, partition screen, floor, furniture, interior landscaping etc., their design value, colour theories and schemes, light	L2, L3, L4	9
MODULE 3: Understanding Furniture work and furnishings in Interior Understanding furniture layout, furniture design with the construction technique, types of furniture and their usage, construction materials and fabrics used in furniture designing, cost estimation, understanding works of great masters.Furniture, Furnishings, Fabrics, Murals, Paintings, Sculpture, Lighting Fixtures, Floor coverings, Wall coverings and related materials. Study of furniture designs, Built-in furniture, Movable furniture, Modular furniture.	L2, L3, L4	9
MODULE 4: Modern trends in Interior design Understanding and designing modern interiors using modern materials and techniques. Study Report of an existing DESIGN PROJECT. Space organization in interiors--presentation of the complete interior scheme of a given projects such as Library, Public Halls, Conference Room, Commercial buildings etc.	L4, L5, L6	9

***Bloom's Level:** L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books/References:

- Beecher, M. A., & Pile, J. (2002). *A History of Interior Design*. *APT Bulletin*, *33*(1), 57. https://doi.org/10.2307/1504797
- Demirbaş, Ö. O. (2017). *The Fundamentals of Interior Design. The Design Journal*, *20*(4), 537–542. https://doi.org/10.1080/14606925.2017.1325635
- Di Cintio, L. (2019*). Design activism*. In *The Interior Architecture Theory Reader* (pp. 376–384). Routledge. https://doi.org/10.4324/9781315693002-44
- Hayles, C. S. (2015). *Environmentally sustainable interior design: A snapshot of current supply of and demand for green, sustainable or Fair Trade products for interior design* practice. International Journal of Sustainable Built Environment, *4*(1), 100–108. https://doi.org/10.1016/j.ijsbe.2015.03.006
- Margolin, V., & Margolin, S. (2002). A *"Social Model" of Design: Issues of Practice and Research. Design Issues*, *18*(4), 24–30. https://doi.org/10.1162/074793602320827406
- Merrell, P., Schkufza, E., Li, Z., Koltun, V., &Agrawala, M. (2011). *Interactive Furniture Layout Using Interior Design Guidelines. ACM Transactions on Graphics*, *30*(4), 1–10. https://doi.org/10.1145/2010324.1964982
- Stoddart, A. (2012). *Interior design. Nature Materials*, *11*(10), 829–829. https://doi.org/10.1038/nmat3445
- Ulrich, R. S. (1991*). Effects of Interior Design on Wellness*. *Journal of Health Care Interior Design*.
- Ulrich, R. S. (1991). *Effects of interior design on wellness: theory and recent scientific research.* Journal of Health Care Interior Design : Proceedings from the ... Symposium on Health Care Interior Design. Symposium on Health Care Interior Design.

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Modes of Evaluation: Assignment/ Case Study/ Market Survey/ Presentation/ Written Examination

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	0	50	50	100	3	0

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	-	-	--	1	--	--	--	--	-	2	-	2	3	--	1
CO2	2	-	-	--	1	--	--	--	-	-	2	-	2	3	--	1
CO3	2	-	-	--	2	--	--	--	-	-	1	-	2	3	--	1
CO4	2	-	-	-	1	-	-	-	-	-	2	-	2	2	-	1

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	SPECIFICATION, ESTIMATION AND VALUATION (ARC2720)	L	T	S	P	C
Version 1.1	Date of Approval:	3	0	0	0	3
Pre-requisites/Exposure	Building Materials & Construction Technology - V, Workshop Practice & Site Exposure					
Co-requisites	Building Material and Construction Technology-VI					

Catalog Description

The aim of this course is to make students familiar with the theory and practice of specifications and estimation, and quantity surveying; along with its importance in the field of building construction. The process of writing specification document for materials, labour, budgets and; estimating the cost and time of construction works shall be covered. The preparation of bill of quantities, optimum resource consumptions and introduction to BIS and other standardized institutions is also a part of the course.

Course Objectives

The objective of this course is

- To develop a real-time judgment of quantity surveying, details specifications, estimations and valuation
- To develop skill for precise and approximate estimations and be able to estimate and specify quantities of various items of material and work involved in architectural and planning projects

Course Outcomes

On completion of this course, the students will be able to

CO1: Discuss the importance and usage of specification, estimation, valuation and depreciation
CO2: Describe the detailed specification of various common building materials
CO3: Execute and implement the appropriate methods for preparing the estimates.
CO4: Compare, evaluate and interpret the building typologies for doing the valuation.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction Why the knowledge of quantity surveying and specifications is necessary for architects and planners? Significance and methods of writing specifications, classifications of specifications, sources of specifications; Types and methods of cost estimation for different types of projects, rates and sources of rates for different components of projects; Cost Index.	L1, L2, L3	9

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MODULE 2: Specification Specifications for common building materials and building trades, earthwork, structure (framing), flooring, stonework, plasters, waterproofing of basements and terraces, roofing, doors and windows, elevators. Site development and earth works; Water supply network and distribution systems; Sewer systems; Electrical and telephone networks; Landscaping, roads, pathways, boundary wall, pools, lighting.	L1, L2, L3	9
MODULE 3: Estimating Calculation of plinth area, floor area, carpet area and circulation area, Preliminary estimates- plinth area rates and cost indices, Detailed estimate-modes of measurement, taking off quantities from drawings, Bill of Quantities (BOQ) and Bill of Materials (BOM), Deriving rates for items from labour and material costs based on CPWD Schedule of Rates, scheduled and non-scheduled items, Establishing market rates. Cost estimation and determination of rates for different types of housing; Cost estimation and determination of rates of works involved in the infrastructure services (roads, water supply, sewer systems, etc.); Costing procedure for different land use categories, development works, interest on investment, and phasing.	L1, L2, L3	9
MODULE 4: Valuation Value and purpose of valuation; Definition and importance of valuation of land and buildings; Factors affecting property and land value at a city and clarity level; Legal, fiscal and administrative measures of land value; Sinking fund; Betterment; Scrap value, salvage value, outgoings; Capitalized value of buildings; appreciation, depreciation and their types, methods of calculating depreciation.	L1, L2, L3	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

- Deshpande, G. B. &Nayak, J. P. (2018). Quantity Suveying, Contracts and Tenders. NiraliPrakashan.
- Gangrade, Mukesh N. (2018). Estimating and Costing. NiraliPrakashan.
- Kohli, R. C. (2013). A Textbook of Estimating, Costing & Accounts. S. Chand.
- Rosen, Harold J. &Kalin, Mark. (2010),Construction Specifications Writing: Principles and Procedures, John Wiley& Sons Publication.

Reference Books

- Aigner, Dennis, Lovell, C. A. Knox & Schmidt, Peter. (1977). Formulation and estimation of stochastic frontier production function models. Journal of Econometrics, 6(1), 21-37.https://doi.org/10.1016/0304-4076(77)90052-5
- Arthanareswaran, R. (2015). A course material on Estimation and Quantity Surveying.
- Can, Ayse. (1992). Specification and estimation of hedonic housing price models. Regional Science and Urban Economics, 22(3), 453-474.https://doi.org/10.1016/0166-0462(92)90039-4

Modes of Evaluation: Quiz/Assignment/ Seminar/Practical

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Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	50	0	50	100	3	3

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	2	1	2	--	--	--	--	--	--	2	--	1	2	--	3
CO2	1	2	1	2	--	--	--	--	--	--	2	--	1	2	--	2
CO3	1	2	1	2	--	--	--	--	--	--	2	--	1	2	--	2
CO4	1	2	1	1	2	--	--	--	--	--	2	--	2	2	--	2

1: strongly related, 2: moderately related and 3: weakly related

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	PEOPLE CULTURE AND BUILT ENVIRONMENT- III (ARC2721)	L	T	S	P	C
Version 1.1	Date of Approval:	3	0	0	0	3
Pre-requisites/Exposure	History of Architecture, Architectural Design – III					
Co-requisites	Theory of Architecture					

Catalog Description

The objective of this course is to offer opportunities in specialized or advance learning in psychological and sociological aspects which are of concern to Architecture. The courses will generally be conducted in the seminar/studio mode to encourage research, exploration and skill developments. The aim of this course is to provide students the exposure to understanding society and various built forms produced by society. The course will also provide the students hands-on cultural, sociological and psychological studies of the built environment. The course contents to be followed will be developed by course teachers based on the resources at hand and opportunities for cross fertilization with other courses. The course would be conducted through literature survey, case studies, site visits, community surveys and hands on projects. During the course the students will be working on a live project in groups which are preferably interdisciplinary.

Course Objectives

The objective of this course is

- To understand the basic principles of psychology, sociology and culture of settlement.
- The course intends to study and understand the typical components of city in order to appreciate how these elements contribute to the quality of life of urban communities.
- To familiarize students with decisive strategies that brings inclusivity and equality in the designs of built forms.
- To develop interdisciplinary understanding and sensitivities of future architects.

Course Outcomes

On completion of this course, the students will be able to

CO1: Develop a relationship between man and his larger social environment, with special emphasis on aspects that are likely to affect intervention in or creation of, the built environment (predominantly urban)

CO2: Develop a language and vocabulary for discussions/ analysis on the sociological/ psychological dimensions of architecture.

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Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Psychology, Sociology and Built Environment Basic introduction to various critical social aspects; Role of psychology in architecture; Role of sociology in built environment; Determinants of sociology- social structure, social status, social control, social institutions, social mobility; Inclusive Built Environment; Barrier free designs and built environments; Various case studies related to gender and architecture, community development- community response towards development strategy etc.	L1, L2	18
MODULE 2: Project Work Selection and understanding of case study; Formulation of Aim and Objectives, Collection of data through primary and secondary sources; Conducting survey; Database development using relevant and advance software; Qualitative and quantitative data analysis; Report writing and presentations.	L4, L5, L6	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books/ References

- CragunR.T.(2006). Introduction to Sociology, Wikibooks.
- Giddens, A (2006) Sociology, Polity Press, Cambridge (UK)
- Lynch, K. (1960) The Image of the City, Joint Centre Publication, USA
- Oomen T.K. and Venugopal C.N. (2004), Sociology, Eastern Book Company.
- Porteous, Douglas, J. (1977), Environment Behaviour: Planning and Everyday Urban Life, Addison Wesley
- Sinha A. (2013) "An India for Everyone: A Path of Inclusive Development, Herpercollins
- Steve Barkan (2010), Sociology: Understanding and Changing the Social World, Flat World Reference Books
- Tejchman A. (2016) "The Politics of Inclusive Development", Palgrave Macmillan.

Modes of Evaluation: Presentation/Assignment/Class Test /Written Examination

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	0	50	50	100	3	0

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1	2	1	1	2	1	1	2	-	2	-	-	1	1
CO2	2	3	1	2	1	1	2	3	3	1	-	1	-	-	1	1

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	ECOLOGY, ENVIRONMENT AND SUSTAINABLE DEVELOPMENT – III (ARC2722)	L	T	S	P	C
Version 1.1	Date of Approval:	3	0	0	0	3
Pre-requisites/Exposure	Environmental Sciences, Building Services-1, Building Services-2					
Co-requisites	Architectural Design, Building Services-3					

Catalog Description

The aim of this course is to offer opportunities in specialized or advance learning in ecology, environment and sustainable aspects which are of concern to Architecture. The course will generally be conducted in the seminar/studio mode to encourage research, exploration and skill developments. The aim of this course is to provide students the exposure to understanding ecology and various environmental problems faced by settlements. The course will also provide the students hands-on ecological and environmental studies of built environment. The course contents to be followed will be developed by course teachers based on the resources at hand and opportunities for cross learning with other courses. The course would be conducted through literature survey, case studies, site visits, community surveys and hands on projects. During the course the students will be working on a live project in groups which are preferably interdisciplinary.

Course Objectives

The objective of this course is

- To understand the basic principles of ecology, environment and sustainable development.
- The course intends to study and understand the different components of city in order to understand how these elements contribute to environment quality.
- To establish the significance of the ecological issues, their impact and initiatives to address the same in the built environs to achieve sustainable development.
- To develop interdisciplinary understanding and sensitivities of future architects.

Course Outcomes

On completion of this course, the students will be able to

CO1: Develop a relationship between man and ecology, will understand critical environmental issues and need to address the m by using advanced technology.

CO2: Produce reports and presentation.

Modules	Blooms level*	Number of hours

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MODULE 1: Introduction to Ecology, Environment and Sustainable Development Basic introduction to ecology; Interrelation between natural and built environment; Importance of environment sustainability in built environment; Energy conservation, renewable sources: wind, solar, geo-thermal, bio-fuels; Materials minimizing, recycling, reducing energy content, etc; Other environmental issues related to solid waste management, water resources, air quality, storm water drainage etc; Various case studies related to traditional / vernacular buildings and settlements demonstrating relationship between climate, local material resources and settlement/ building forms.	L1, L2	18
MODULE 2: Project Work Selection and understanding of case study; Formulation of Aim and Objectives, Collection of data through primary and secondary sources; Conducting survey; Database development using relevant and advance software; Qualitative and quantitative data analysis; Report writing and presentations.	L4, L5, L6	18

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books/References

- *Bakari, Mohamed El-Kamel (2017). The Dilemma of Sustainability in the Age of Globalization: A* Quest for a Paradigm of Development. New York: Lexington Books. ISBN 978-1498551397
- Blewitt, J. (2008). Understanding Sustainable Development. London: Earthscan. pp. 21–24. ISBN 978-1-84407-454-9.
- Fulekar, M. H., Pathak, B., Kale, R. K. (2014) Environment and Sustainable Development' Springer Nature; ISBN-10: 8132211650; ISBN-13: 978-8132211655
- Goudie, Andrew (2000). The Human Impact on the Natural Environment. Cambridge, Massachusetts: This MIT Press. pp. 203–239. ISBN 0-262-57138-2.
- James, Paul (2014). Urban Sustainability in Theory and Practice. doi:10.4324/9781315765747. ISBN 978-1-315-76574-7.
- James, Paul; Magee, Liam (2016). "Domains of Sustainability". In A. Farazmand (ed.). Global Encyclopedia of Public Administration, Public Policy, and Governance. Springer.
- Modak, P. (2017)Environmental Management Towards Sustainability, CRC Press, ISBN-10: 9781498796248
- Odum, E. P. (1971). Fundamentals of Ecology (Third ed.). New York: Saunders. ISBN 0-7216-6941-7.
- Porteous, Douglas, J. (1977), Environment Behaviour: Planning and Everyday Urban Life, Addison Wesley
- Thangavel, P., Sridevi, G. (2015) Environmental Sustainability, Springer Nature, ISBN-10: 9788132220558
- Walker, Brian and Salt, David (2006) Resilience Thinking: Sustaining ecosystems and people in a changing world. Island Press. p. xiii. ISBN 978-1597260930.
- Wandemberg, JC (August 2015). Sustainable by Design. Amazon. p. 122. ISBN 978-1516901784

Modes of Evaluation: Presentation/Assignment/Class Test /Written Examination

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Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	0	50	50	100	3	0

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1	2	1	1	2	1	1	2	-	2	-	-	1	1
CO2	2	3	1	2	1	1	2	3	3	1	-	1	-	-	1	1

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	COMPUTER APPLICATIONS AND ADVANCE TECHNOLOGIES – III (BIM) (ARC2723)	L	T	S	P	C
Version 1.1	Date of Approval:	1	0	0	4	3
Pre-requisites/Exposure	Architectural Graphic Skills					
Co-requisites	Architectural Design, Building Materials and Construction Technology					

Catalog Description

This course covers Building Information Modeling (BIM), including its use and application for small- and large-scale building construction projects. Students will learn terminology associated with buildings, the theory and evolution of BIM, and how to develop BIM models using Autodesk Revit. As time allows, this course will also cover selected topics on how BIM is used to help prepare or feed into key project items, such as cost estimation, architectural renderings, interference checking, and modeling of energy consumption.

Course Objectives

The objective of this course is

- To assess the viability of a project and detect possible design errors
- To enhance project performance and produce better outcomes.
- To help construction manager to gather data and information from the relevant disciplines and communicate them more effectively
- To understand Revit interface and function

Course Outcomes

On completion of this course, the students will be able to

CO 1: Be able to compare, including advantages and disadvantages of BIM vs. 2D and 3D CAD
CO 2: Explain the challenges and roadblocks still facing the use of BIM.
CO 3: Comprehend the details of BIM and its role and application in the construction industry
CO 4: Create plans, sections, details, schedules, staircase, cover page

Modules	Blooms level*	Number of hours
Module 1: Introduction • Introduction to BIM • BIM vs. 3D CAD • Introduction to Revit interface and Function • Building design process and roles of owners, managers, designers, engineers, and contractors/ sub-contractors	L1, L2, L3	8

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Module 2: BIM Concepts • How can BIM be a part of the building design process? • Evolution and development of BIM & object-based parametric modelling • BIM platforms	L1, L2, L3	8
Module 3: Autodesk Revit • Model navigation Architecture Modelling • Adding Elevations and Gridlines • Creating wall, adding doors and windows • Creating floor, staircase, shaft opening, roof • Adding furniture components	L1, L2, L3, L4	10
Module 4: Modelling Output • Annotations and Tagging • Labelling and Tagging • Dimensioning • Room Tag • Creating door and window schedule • Creating schedule of accommodation	L1, L2, L3	10

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text Books

- *The Impact of Building Information Modelling – By Ray Crotty*
- *A Practical guide to adopting BIM in construction projects- by Bimal Kumar*

Reference Books

- *BIG BIM little bim- by Finith Jernigan*
- *The BIM manager's handbook- By Dominik Holzer*
- *Building Information Modeling For Dummies- By Stefan Mordue, Paul Swaddle, David Philp*

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme								**Total marks**	**Credits**	**Duration of Exam (hr)**
Internal Assessment					**External Assessment**					
CT		**TA**	**A**	**Total**	**ESE**	**ESJ**	**Total**			
I	**II**									
10	10	25	5	50	0	50	50	100	5	0

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	-	--	--	2	--	--	--	--	--	--	--	3	1	--	--
CO2	3	-	--	--	1	--	--	--	--	--	--	--	2	1	--	--
CO3	3	-	--	--	2	--	--	--	--	--	--	--	2	1	--	--
CO4	2	-	--	--	1	--	--	--	--	--	--	--	2	1	--	--

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	STRUCTURE - VIII (ARC2815)	L	T	S	P	C
Version 1.1	Date of Approval:	3	0	0	0	3
Pre-requisites/ Exposure	Structure – VII					
Co-requisites						

Catalog Description

The aim of this course is to enable students to design advanced structures system and their basic components. This subject covering three major different types of structures i.e. Pneumatic structure, Geodesic Dome and Bridges. The fundamental aspects of analysis and design and also discusses the practical requirements such as safety, feasibility and economy these structures. Along this some iconic examples as a case study will also cover in this course. The subject will be taught in congruence with the Design studio, and assignments for the subject will be linked to the design exercises to achieve higher level of learning and understanding the practical application of the same.

Course Objectives

The objective of this course is

- To understand the design of Pneumatic structures.
- To learn the behavior and design of Geodesic Dome.
- To understand the design of Bridges.
- To gain an educational and comprehensive experience with the various types of Iconic Structure.

Course Outcomes

On completion of this course, the students will be able to

CO1: Design Pneumatic structures.
CO2: Design Geodesic Dome structures.
CO3: Design various types of Bridges.
CO4: Understanding of different types of modern and contemporary iconic buildings.

Modules	Blooms level*	Number of hours
MODULE 1: Pneumatic Structure Introduction to Design Specification for Pneumatic Structure, Design principles, Components, Limitations in Design, Economic parameters, Case Studies.	L1, L2, L3	9
MODULE 2: Geodesic Dome Introduction to Design Specification for Geodesic Dome, Design principles, Components, Limitations in Design, Economic parameters, Case Studies.	L1, L2, L3	9

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MODULE 3:Space Frames Introduction to Design Specification for Space Frames, Design principles, Components, Limitations in Design, Economic parameters, Case Studies.	L1, L2, L3	9
MODULE 4: Modern & Contemporary Structures Case studies of different Indian buildings structure like Hall of nation, STC building, Lotus temple, Cricket Stadium Ahmedabad etc, Case Studies of various International buildings structure like Eiffel tower, Louvere, Guggenheim Museum, Burj Khalifa, Habitat 67, Dupli Casa etc. (at least 10 different typology building structures Indian and Internationally focused on mainly roof system.	L1, L2, L3	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text Books

- Herzog, Thomas (1976). Pneumatic Structures: A Handbook of Inflatable Architecture, Oxford University Press
- Otto, Frei (1967). Tensile Structures Volume One: Pneumatic Structures (v. 1), The MIT Press Ltd; 1st Printing edition
- Chen, Wai -Fah, Duan, Lian (2014). Bridge Engineering: Substructure Design, CRC Press.
- Loon, VamBorin, (1999). Geodesic Domes: Demonstrated, Tarquin Publications

References

- Arya, C. (2009). Eurocode 3: Design of steel structures. In Design of Structural Elements (pp. 375–433). CRC Press. https://doi.org/10.1201/b18121-13
- Coutie, M. G. (1997). Structural and stress analysis. Engineering Structures, 19(1), 92. https://doi.org/10.1016/s0141-0296(97)81457-5
- Cowin, S. C. (2001). Mechanics of materials. In Bone Mechanics Handbook, Second Edition (pp. 6-1-6–24). CRC Press.
- Emmitt, S., & Gorse, C. (2014). Barry's Advanced Construction Of Buildings Third Edition. John Wiley & Sons, Ltd (Vol. 28, p. 581).
- Guadagnini, M. (2008, May). Mechanics of Composite Materials: Preface. Mechanics of Composite Materials, 44(3), 197–198. https://doi.org/10.1007/s11029-008-9011-3
- Oppermann, R. H. (1941). Strength of materials, part I, elementary theory and problems. Journal of the Franklin Institute, 231(1), 96. https://doi.org/10.1016/s00160032(41)90378-2

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	50	0	50	100	3	3

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	--	--	--	1	3	--	--	1	--	--	--	--	3	1	--	--
CO2	--	--	--	1	3	--	--	1	--	--	--	--	3	1	--	--
CO3	--	--	--	2	3	--	--	1	--	--	--	--	2	1	--	--
CO4	--	--	--	2	3	--	--	1	--	--	--	--	2	1	--	--

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	TOWN PLANNING (ARC2816)	L	T	S	P	C
Version 1.1	Date of Approval:	2	0	0	0	2
Pre-requisites/ Exposure	History of Architecture – III					
Co-requisites	Building Bye-laws					

Catalog Description

The aim of this course is to familiarize the students with Planning concepts and process in urban and regional planning. The course provides insights into ancient Town Planning to the contemporary best practices. The aim is to familiarize the students with the process of evolution of cities, concepts related to humanitarian planning processes and skill development to identify planning issues in existing areas and develop solutions at basic levels. The subject will be taught in congruence with the Design studio and assignments for the subject will be linked to the design exercises to achieve higher level of learning and understanding the practical application of the same

Course Objectives

The objective of this course is to

- To familiarize the students with Planning concepts and process in Urban and Regional Planning.
- To understand the various elements, classifications and typology of humans settlements.
- To develop research interest in the theory of urban planning and development studies.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define the various elements, classification and typology of planning
CO2: Define types of settlements based on different criteria and different parameters.
CO3: Review the condition of development/status of urbanization.
CO4: Classify constituents of town or city and develop different type of Plans.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Planning and its concepts Definitions, planning as hierarchical process, essential features of planning, town planning as a practice, Regional Planning, Rural Planning, Transport Planning, Housing. Various Roles that Planners Play- in Development Authority. Planning concepts and their relevance to Indian Planning practice in respect of Ebenezer Howard – Garden city concepts and contents – Patrick Geddes – Conservative surgery – case study – C.A. Perry – Neighborhood concept Le Corbusier – concept and case studies	L1, L2	5

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MODULE 2: Classification and history of Cities Definitions of urbanization such as world cities, city-regions, global cities; Census definitions such as Class-I, Class-III cities. Example of good planned cities and their planner. Analysis of old– Egyptian, Mesopotamian, Greek, Roman, Renaissance, and Modern cities - Garden cities, Chandigarh etc.	L1, L2	5
MODULE 3: Planning process and standards Identification of values, norms, goals and objectives, methodology of plan formulation, site selection, land use mapping, population projection, calculation of housing and community services, calculation and laying of physical infrastructure, public participation, plan visioning exercise, community dispute resolution as per URDPFI guidelines	L1, L2	6
MODULE 4: Types of Plans and modern approach Comprehensive plans, development plans, local plans, district plans, public participation, people and plans, regional planning, Five Year Plans, District Development Plans, Regional Plans, Master Plans, Strategic Plans, Zonal Plans, Urban Renewal Plan – Meaning, Redevelopment, Rehabilitation and Conservation – JNNURM, SEZ – case studies. Introduction, Benefits and Planning components of Green City (e.g. Vancouver), Compact City (e.g. Sky city, China) and Smart City (e.g. Malta)	L1, L2	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

- Arthur B. Gallion et.al, (1957), Urban Pattern, The Urban Pattern- City Planning and Design: Publication Van Nostrand
- Binode Dutt (1925), Town Planning in Ancient India
- C. A. Doxiadis (1971), Ekistics: An Introduction to the Science of Human Settlements, Discussions On Ekistics: Nature, Man, Shells, Society, Networks. Summary Of The Athens Ekistics: Jstor
- G.K. Hiraskar (20th Edition, 2017), Fundamentals of Town Planning: Dhanpat Rai Publications
- URDPFI Guidelines (2014): Government of India

Reference Books

- Bradshaw, M. (1988). Cities for people. Town & Country Planning, 57(4), 114–116. https://doi.org/10.5860/choice.48-4292
- G. Cherry (1999), Social Town Planning, ISBN 0-415-17241-1, Taylor & Francis e Library, 2001
- Howard, E. (2013). Garden cities of To-morrow. Garden Cities of To-Morrow (pp. 1–168). Taylor and Francis. https://doi.org/10.4324/9780203716779
- J. B. Mcloughin (1969), Urban and Regional Planning – A System Approach: New York, Praeger
- Lewis Kebble (1969), Principles and practice of Town and Country Planning: Estate Gazette, UK

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

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Examination Scheme:

Evaluation Scheme								Total marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	50	0	50	100	2	3

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	-	-	--	2	3	2	--	--	--	--	--	--	3	--	--	1
CO2	-	-	--	3	2	1	--	--	--	--	--	--	2	--	--	1
CO3	-	-	--	2	1	1	--	--	--	--	--	--	2	--	--	1
CO4	-	-	--	3	3	2	--	--	--	--	--	--	2	--	--	1

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	LEED LAB-II (ARC2817)	L	T	P	S	C
Version 1.1	Date of Approval:	2	0	0	0	2
Pre-requisites/Exposure	LEED Lab – I					
Co-requisites	Architectural Design – VIII					

Catalog Description

The aim of this course is to provide fundamental knowledge about natural and built environment. And also introduces fundamental concepts to understand environmental processes. The curriculum further incorporates understanding in relation to Indian context. Course will be interdisciplinary and flexible.

Course Objectives

The objective of this course is

- To understand the concept of an Energy and climate
- To understand the importance of Water Efficiency
- To familiarize the students with LEED Arc

Course Outcomes

On completion of this course, the students will be able to

CO1: Define basic concepts of building loads, energy efficiency, environmental concern
CO2: Prepare a documentation plan of water efficiency.
CO3: Calculate the indoor environmental quality for comfort and health.
CO4: Define basic concepts for building data analysis and prepare a report on environment impact on built up area.

Modules	Blooms level*	Number of hours
MODULE 1: Energy and Climate Basic concepts I (Building loads, Energy efficiency, Environmental concerns), Basic concept II (Electrical systems, Visual & thermal comfort and other concepts), Energy commissioning & performance management Energy audit process, equipment and tools	L1, L2	6
MODULE 6: Water Efficiency Water use pattern, source and conservation scope (including water harvesting and treatment), Water flow, fixtures and plumbing networks and water efficient appliances, Water Audit: Performance management and monitoring, LEED requirement and documentation plan	L1, L2, L3	6

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MODULE 7: Indoor Environment & Human Comfort Fundamentals of Indoors environmental quality (ventilation, air quality, indoor emission, green cleaning) Health and occupational comfort (Natural lighting, Thermal, Quality view & assessment-survey)	L1, L3,L4	6
MODULE 4: LEED Arc and Project Communication Basic concepts and pre-requisites, Buildings Data Analysis, Demonstration of input Data in Arc Platform and create output result for the 5 sustainability indicators. Environmental/Building codes, Impact of built environment, sustainable & regional design Project Documentation follow-up	L1, L3,L4	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books:

- Altomonte, S., & Schiavon, S. (2013). Occupant satisfaction in LEED and non-LEED certified buildings. Building and Environment, 68, 66–76. https://doi.org/10.1016/j.buildenv.2013.06.008
- Azhar, S., Carlton, W. A., Olsen, D., & Ahmad, I. (2011). Building information modeling for sustainable design and LEED ® rating analysis. Automation in Construction, 20(2), 217–224. https://doi.org/10.1016/j.autcon.2010.09.019
- Leed. (2014). Reading for the R and D Community, 56(3), 25–27. https://doi.org/10.1007/978-90-313-9258-2_26

References:

- Newsham, G. R., Mancini, S., &Birt, B. J. (2009). Do LEED-certified buildings save energy? Yes, but... Energy and Buildings, 41(8), 897–905. https://doi.org/10.1016/j.enbuild.2009.03.014
- Suzer, O. (2015). A comparative review of environmental concern prioritization: LEED vs other major certification systems. Journal of Environmental Management, 154, 266–283. https://doi.org/10.1016/j.jenvman.2015.02.029

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	50	0	50	100	2	3

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	-	-	2	--	3	1	2	-	-	-	--	-	2	-	1	--
CO2	-	-	2	--	3	1	2	-	-	-	--	-	2	-	1	--
CO3	-	-	2	--	3	1	2	-	-	-	--	-	2	-	1	--
CO4	-	-	2	-	3	1	2	-	-	-	-	-	2	-	1	-

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	DISSERTATION (ARC2837)	L	T	S	P	C
Version 1.1	Date of Approval:	2	1	3	0	6
Pre-requisites/Exposure	Research - I					
Co-requisites	Research - II					

Catalog Description

The aim of this course is to enable students to establish a strong theoretical foundation, clarity of thought and also to orient the students to structured research in a focused manner. The process of study shall enable students to conduct in depth analysis and objective research on a topic of their interest. Students may be encouraged to select the topic which may eventually culminate in the Architectural Design Thesis in the subsequent semester.

Course Objectives

The objective of this course is

- To enable students to establish a strong theoretical foundation, clarity of thought.
- To orient the students to structured research in a focused manner.
- To enable students to conduct in depth analysis and objective research on a topic of their interest.
- To select the topic this may eventually culminate in the Architectural Design Thesis in the subsequent semester.

Course Outcomes

On completion of this course, the students will be able to

CO1: Identify area of research for thesis

CO2: Identify a research problem, formulation of hypothesis and organize a study based on literature survey

CO3: Apply research methodology, tools and techniques to conduct a research

CO4: Present the research work carried out in a report format.

Modules	Blooms level*	Number of hours
MODULE 1: Selection of Topic Students may choose a topic of their interest, related to Architecture and allied subjects; stating proper justification	L1, L2, L3	6
MODULE 2: Background study/ Literature Review and Case Studies Review of research paper, books, journals etc related to the topic. Studying, analysing and interpreting various similar case studies, nationally and internationally	L1, L2, L3	6

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MODULE 3: Research Design Data Collection, Data Analysis and Data Interpretation; the extensive methodology to be adopted for conducting the research along with various tools and techniques	L1, L2, L3, L4	12
MODULE 4: Presentation Presenting the research work done on identified topic which may eventually culminate in the Architectural Design Thesis of the subsequent semester. Students can thus utilise this as an opportunity for pre-Thesis study, amounting to literature review and relevant case studies which are otherwise required for Thesis.	L1, L2, L3	48

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

- *Kothari, C.R. (1985). Research Methodology, Delhi: New Delhi International Publishers*

Reference Books

- Dwyer, M. (1995). A guide to the Harvard referencing system. *British Journal of Nursing (Mark Allen Publishing)*, *4*(10), 599–602. https://doi.org/10.12968/bjon.1995.4.10.599
- Hofstee, E. (2006). The Harvard Referencing System. In *Constructing a Good Dissertation A Practical Guide to Finishing a Master's, MBA or PhD on Schedule* (p. 300). Retrieved from http://www.exactica.co.za/dn/exactica-book-harvard-referencing.pdf
- Mühl, J. K. (2014). Research methodology. In *Contributions to Management Science* (pp. 75–100). Springer. https://doi.org/10.1007/978-3-319-04069-1_4
- Peffers, K., Tuunanen, T., Rothenberger, M. A., & Chatterjee, S. (2007). A design science research methodology for information systems research. *Journal of Management Information Systems*, *24*(3), 45–77. https://doi.org/10.2753/MIS0742-1222240302
- Soediono, B. (1989). Dessertation: Assessment of bookkeeping practices and its relevance. *Journal of Chemical Information and Modeling*, *53*(June), 160. https://doi.org/10.1017/CBO9781107415324.004

Modes of Evaluation: Quiz/Assignment/ Seminar/Practical

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	0	50	50	100	6	0

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	3	2	1	--	2	--	2	1	--	2	1	3	--	3
CO2	2	2	2	3	2	--	2	--	2	2	--	2	1	2	--	2
CO3	2	2	1	3	1	--	2	--	2	1	--	2	1	2	--	2
CO4	2	3	2	2	1	--	2	--	2	1	--	2	2	2	--	2

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	PEOPLE CULTURE AND BUILT ENVIRONMENT- IV (ARC2818)	L	T	S	P	C
Version 1.1	Date of Approval:	3	0	0	0	3
Pre-requisites/ Exposure	History of Architecture, Architectural Design – III					
Co-requisites	Theory of Architecture					

Catalog Description

The objective of this course is to offer opportunities in specialized or advance learning in psychological and sociological aspects which are of concern to Architecture. The courses will generally be conducted in the seminar/studio mode to encourage research, exploration and skill developments. The aim of this course is to provide students the exposure to understanding society and various built forms produced by society. The course will also provide the students hands-on cultural, sociological and psychological studies of the built environment. The course contents to be followed will be developed by course teachers based on the resources at hand and opportunities for cross fertilization with other courses. The course would be conducted through literature survey, case studies, site visits, community surveys and hands on projects. During the course the students will be working on a live project in groups which are preferably interdisciplinary.

Course Objectives

The objective of this course is

- To understand the basic principles of psychology, sociology and culture of settlement.
- The course intends to study and understand the typical components of city in order to appreciate how these elements contribute to the quality of life of urban communities.
- To familiarize students with decisive strategies that brings inclusivity and equality in the designs of built forms.
- To develop interdisciplinary understanding and sensitivities of future architects.

Course Outcomes

On completion of this course, the students will be able to

CO1: Develop a relationship between man and his larger social environment, with special emphasis on aspects that are likely to affect intervention in or creation of, the built environment (predominantly urban)

CO2: Develop a language and vocabulary for discussions/ analysis on the sociological/ psychological dimensions of architecture.

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Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Psychology, Sociology and Built Environment Basic introduction to various critical social aspects; Role of psychology in architecture; Role of sociology in built environment; Determinants of sociology- social structure, social status, social control, social institutions, social mobility; Inclusive Built Environment; Barrier free designs and built environments; Various case studies related to gender and architecture, community development- community response towards development strategy etc.	L1, L2	8
MODULE 2: Project Work Selection and understanding of case study; Formulation of Aim and Objectives, Collection of data through primary and secondary sources; Conducting survey; Database development using relevant and advance software; Qualitative and quantitative data analysis; Report writing and presentations.	L4, L5, L6	16

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books/ References

- CragunR.T.(2006). Introduction to Sociology, Wikibooks.
- Giddens, A (2006) Sociology, Polity Press, Cambridge (UK)
- Lynch, K. (1960) The Image of the City, Joint Centre Publication, USA
- Oomen T.K. and Venugopal C.N. (2004), Sociology, Eastern Book Company.
- Porteous, Douglas, J. (1977), Environment Behaviour: Planning and Everyday Urban Life, Addison Wesley
- Sinha A. (2013) "An India for Everyone: A Path of Inclusive Development, Herpercollins
- Steve Barkan (2010), Sociology: Understanding and Changing the Social World, Flat World Reference Books
- Tejchman A. (2016) "The Politics of Inclusive Development", Palgrave Macmillan.

Modes of Evaluation: Presentation/Assignment/Class Test /Written Examination

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	0	50	50	100	3	0

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1	2	1	1	2	1	1	2	-	2	-	-	1	1
CO2	2	3	1	2	1	1	2	3	3	1	-	1	-	-	1	1

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	ECOLOGY, ENVIRONMENT AND SUSTAINABLE DEVELOPMENT - IV (ARC2819)	L	T	S	P	C
Version 1.1	Date of Approval:	3	0	0	0	3
Pre-requisites/ Exposure	Environmental Sciences, Building Services-1, Building Services-2					
Co-requisites	Architectural Design, Building Services-3					

Catalog Description

The objective of this course is to offer opportunities in specialized or advance learning in ecology, environment and sustainable aspects which are of concern to Architecture. The course will generally be conducted in the seminar/studio mode to encourage research, exploration and skill developments. The aim of this course is to provide students the exposure to understanding ecology and various environmental problems faced by settlements. The course will also provide the students hands-on ecological and environmental studies of built environment. The course contents to be followed will be developed by course teachers based on the resources at hand and opportunities for cross learning with other courses. The course would be conducted through literature survey, case studies, site visits, community surveys and hands on projects. During the course the students will be working on a live project in groups which are preferably interdisciplinary.

Course Objectives

The objective of this course is

- To understand the basic principles of ecology, environment and sustainable development.
- The course intends to study and understand the different components of city in order to understand how these elements contribute to environment quality.
- To establish the significance of the ecological issues, their impact and initiatives to address the same in the built environs to achieve sustainable development.
- To develop interdisciplinary understanding and sensitivities of future architects.

Course Outcomes

On completion of this course, the students will be able to

CO1: Develop a relationship between man and ecology, will understand critical environmental issues and need to address the m by using advanced technology.

CO2: Produce reports and presentation.

Modules	Blooms level*	Number of hours

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MODULE 1: Introduction to Ecology, Environment and Sustainable Development Basic introduction to ecology; Interrelation between natural and built environment; Importance of environment sustainability in built environment; Energy conservation, renewable sources: wind, solar, geo-thermal, bio-fuels; Materials minimizing, recycling, reducing energy content, etc; Other environmental issues related to solid waste management, water resources, air quality, storm water drainage etc; Various case studies related to traditional / vernacular buildings and settlements demonstrating relationship between climate, local material resources and settlement/ building forms.	L1, L2	8
MODULE 2: Project Work Selection and understanding of case study; Formulation of Aim and Objectives, Collection of data through primary and secondary sources; Conducting survey; Database development using relevant and advance software; Qualitative and quantitative data analysis; Report writing and presentations.	L4, L5, L6	16

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books/References

- Bakari, Mohamed El-Kamel (2017). The Dilemma of Sustainability in the Age of Globalization: A Quest for a Paradigm of Development. New York: Lexington Books. ISBN 978-1498551397
- Blewitt, J. (2008). Understanding Sustainable Development. London: Earthscan. pp. 21–24. ISBN 978-1-84407-454-9.
- Fulekar, M. H., Pathak, B., Kale, R. K. (2014) Environment and Sustainable Development' Springer Nature; ISBN-10: 8132211650; ISBN-13: 978-8132211655
- Goudie, Andrew (2000). The Human Impact on the Natural Environment. Cambridge, Massachusetts: This MIT Press. pp. 203–239. ISBN 0-262-57138-2.
- James, Paul (2014). Urban Sustainability in Theory and Practice. doi:10.4324/9781315765747. ISBN 978-1-315-76574-7.
- James, Paul*; Magee, Liam (2016).* "Domains of Sustainability". *In A. Farazmand (ed.). Global Encyclopedia of Public Administration, Public Policy, and Governance. Springer.*
- Modak, P. (2017)Environmental Management Towards Sustainability, CRC Press, ISBN-10: 9781498796248
- *Odum, E. P. (1971).* Fundamentals of Ecology *(Third ed.). New York: Saunders.* ISBN 0-7216-6941-7.
- Porteous, Douglas, J. (1977), Environment Behaviour: Planning and Everyday Urban Life, Addison Wesley
- Thangavel, P., Sridevi, G. (2015) Environmental Sustainability, Springer Nature, ISBN-10: 9788132220558
- Walker, Brian and Salt, David (2006) Resilience Thinking: Sustaining ecosystems and people in a changing world. Island Press. p. xiii. ISBN 978-1597260930.
- Wandemberg, JC (August 2015). Sustainable by Design. Amazon. p. 122. ISBN 978-1516901784

Modes of Evaluation: Presentation/Assignment/Class Test /Written Examination

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Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	0	50	50	100	3	0

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1	2	1	1	2	1	1	2	-	2	-	-	1	1
CO2	2	3	1	2	1	1	2	3	3	1	-	1	-	-	1	1

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	COMPUTER APPLICATIONS AND ADVANCE TECHNOLOGIES – IV (SOFTWARES) (ARC2820)	L	T	S	P	C
Version 1.1	Date of Approval:	1	0	0	4	3
Pre-requisites/Exposure	Architectural Graphic Skills					
Co-requisites	Architectural Design, Building Materials and Construction Technology					

Catalog Description

The aim of this subject is to introduce popular 3D modelling and photorealistic rendering softwares to precisely communicate their designs. The students will learn how to develop an interactive, adapting model, controlled by a few chosen design parameters and capable of generating a wide range of design variants. Using these softwares, the students will explore designing, visualizing and documentation of their design projects thereby increasing their productivity and expression.

Course Objectives

The objective of this course is

- To introduce the software Lumion 3D to students to make their models more interactive.
- To introduce Grasshopper modelling software.
- To introduce the BIM software ArchiCAD.
- To help the students communicate their design ideas graphically using 3d softwares and rendering tools.

Course Outcomes

On completion of this course, the students will be able to

CO1: Create flexible, parametric models for architectural design exploration
CO2: To develop a 2D building model in ArchiCAD and document the project
CO3: Create realistic settings and views of their design project
CO4: Create a walkthrough of their project

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Lumion 3D Loading existing project scene in Lumion 3D, settings window, creating and saving new project scene, getting familiar with the interface	L1, L2	4
MODULE 2: Building the exterior scene and Working with Layers Creating and modifying terrain, Blending the model with terrain, landscaping, adding furniture and humans, creating new layers, and editing the layers, controlling the layer visibility, Manipulating and Controlling Lumion, Animating, Scene creation and Rendering in Lumion content	L1, L2, L3, L4	8

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MODULE 3: Grasshopper Introduction to Grasshopper, Grasshopper objects, coordination systems, data matching, data structure, Parameters and components, functions and transformations, importing geometry from Rhinoceros into grasshopper, data trees, introduction to Galapagos Module for optimisation and evolution	L1, L2, L3, L4	12
MODULE 4: ArchiCAD Introduction to BIM, ArchiCAD, Interface of ArchiCAD, Navigation in ArchiCAD, Creation and placement of external and internal structures, modification, merging files, dimensioning, rendering and lay outing	L1, L2, L3	12

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Textbooks/References:

- Barry, R. (1999). The Construction of Buildings Vol. 2. 5th Ed. New Delhi: East-West Press.
- Cardoso Ciro (2015). Lumion 3D Best Practices: Packt
- Cardoso Ciro (2014). Mastering Lumion 3D: Packt
- Bachman David (2017). Grasshopper:Visual Scripting for Rhinoceros 3D. US: Industrial Press Inc.
- MacKenzie.H.Scott, Rendek.Adam (2015). ArchiCAD 19- The Definitive Guide: Packt Publishing

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	50	0	50	100	3	0

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	--	3	--	1	--	--	--	--	--	--	-	1	2	-	--
CO2	1	--	1	--	1	--	--	--	--	--	--	-	1	2	-	--
CO3	2	--	1	--	1	--	--	--	3	2	--	-	1	2	-	--
CO4	2	--	1	2	1	--	--	--	3	2	--	-	1	2	-	--

1: strongly related, 2: moderately related and 3: weakly related

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	PRACTICAL TRAINING (ARC2937)	L	T	S	P	C
Version 1.1	Date of Approval:	0	0	0	0	14
Pre-requisites/Exposure	Architectural Design – VIII					
Co-requisites	NA					

Catalog Description

The aim of the 'Practical Training' is to enable the students to gain the kind and range of practical experience which will prepare them for their likely responsibilities, immediately after qualifying B. Arch. Course. The trainee student has the responsibility to use his/her own initiative in making the best use of the opportunities which he gets during training period and prepare himself/herself for profession. The core of the professional training is architectural one. Student is expected to get well worse with the realm of architectural discipline ranging from generation of idea, preparation of drawings to the final execution of design on site. A Training Manual shall provide the details of the expected outline of work and other procedures.

• **Mandatory Requirements:** Student shall have to undergo Professional Training for a period of at least 06 months

Course objectives

The objective of this course is

- To expose the students to the practical environment and works by working under an Architect.
- To gain a practical knowledge and involved in all aspects of office works.
- To design for situation specific problems.

Course Outcomes

On completion of this course, the students will be able to

CO1: Formulate and theorize the principles into practices.

CO2: Apply the professional aspects of an architecture office/company and the multiple issues in conception, preparation and execution of project on a site.

CO3: Develop a skill that helps to adapt to fit special requirements.

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
0	0	0	0	0	0	1400	1400	1400	14	-

CT: Class Test; TA: Total Assessment; A: Attendance

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	ARCHITECTURAL THESIS (ARC2037)	L	T	S	P	C
Version 1.1	Date of Approval:	2	6	10	0	18
Pre-requisites/ Exposure	Professional Practice- II					
Co-requisites	Architectural Design – VIII					

Catalog Description

The aim of this course is to provide an opportunity to the students to handle a complete design project. Project Thesis is the final stage of learning Architectural Design. With the help of a thesis project, students are expected to demonstrate the understanding of a systematic design process which includes identification of project requirements, site study and analysis, case studies, programming, schematic design and Design Development. It provides the students with an opportunity to culminate the nine semesters of architectural education by demonstrating the body of knowledge and skills gained during their education and the professional training.

Course objectives

The objective of this course is

- To prepare a student to independently handle and present all aspects of an architectural design, from its evolution to final solution in totality.
- To understand the importance of the evolutionary stages of a design process and various techniques required for a successful presentation of an architectural design.
- To develop in students the ability to handle specific aspects / thrust area of design relevant to the topic.

Course Outcomes

On completion of this course, the students will be able to

CO1: Design a Thesis project responsive to the contextual and program requirements.
CO2: Evaluate data and information gathered from primary and secondary data collection
CO3: Combine the systematic methodology from various stages of study and analysis in design process towards culmination of an informed design.
CO4: Produce detail estimation and specification data of a building unit.
CO5: Demonstrate the ideas clearly using detailed physical model.

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Text Books/ References:

- Ablamowicz, R. (2007). *An abstract of the thesis of. Young* (Vol. c, pp. 105–106).
- Agarwal, S3. S., Yadav, P. P., Chavali, K. H., & Kumar, L. (2011). How to write a thesis? *National Journal of Physiology, Pharmacy and Pharmacology*, *1*(2), 86–90. https://doi.org/10.5005/jp/books/12140_6
- Evans, D., Gruba, P., & Zobel, J. (2014). *How to Write a Better Thesis*. *How to Write a Better Thesis*. Springer International Publishing. https://doi.org/10.1007/978-3-319-04286-2
- Vasaiely, P. (2010). Bachelor Thesis. *Applied Sciences*, *16*(February), 1–106. https://doi.org/10.1053/j.sodo.2009.12.005

Modes of Evaluation: Quiz/ Case Study/ Literature Study/ Presentation/ Report Submission

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
P			R	Total	ESE	ESJ	Total			
I	II	III								
200	200	200	200	800	0	1000	1000	1800	18	NA

P: Presentation; R: Report; ESE: End Semester Examination; ESJ: End Semester Jury

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	PROFESSIONAL PRACTICE (ARC2001)	L	T	S	P	C
Version 1.1	Date of Approval:	4	0	0	0	4
Pre-requisites/Exposure	Town Planning					
Co-requisites	Architectural Thesis					

Catalog Description

This course aim is to provide the foundation, knowledge and skills needed to professional practice. It is designed to build understanding of the complex interactions and uncertainties of the professional practice. It provides students with the essential knowledge components of role of COA, IIA, Uttar Pradesh architect association, Architects Act 1972, Tendering & Contract and Valuation. It also develops an appreciation of the skills and tasks inherent in development Conditions of engagement of Architect – Duties, Responsibilities, Liabilities of the profession, scale of charges, mode of payment etc. Clauses governing conduct of professional practice

Course Objectives

The objective of this course is

- To understand the role of Professional bodies.
- To acquaint the students with the responsibility, scale of charges and Architect's conduct in Architectural practice.
- To understand the office and administration of an Architect's office, Tenders and contracts.
- To analyze judicial process involved in arbitration.

Course Outcomes

On completion of this course, the students will be able to

CO1: Gain a comprehensive understanding of the Professional Practice in India.
CO2: Explain different role of Architect's Act 1972 in professional conduct and all the work related to scales of charges.
CO3: Compare and float tenders and contract for the Architectural project.
CO4: Compare difference between Arbitration, Conciliation and Mediation.

Modules	Blooms level*	Number of hours
MODULE 1: Role of professional bodies Role of different bodies i.e. COA, IIA, Uttar Pradesh Architect Association, their working constitution and bye-laws, categories of membership and election procedures.	L1, L2	6

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MODULE 2: Architect's Act 1972 & Office and administration Detail study of the Act and procedures of membership. Office set up and administration, Filling and recording, nature of partnership, registration of firm and dissolution, copy rights of drawings, practice procedures and conduct etc. Conditions of engagement of Architect, discuss the Duties, Responsibilities, Liabilities of the Architect profession, Fee (scale of charges), mode of payment etc. Clauses governing conduct of professional practice.	L1, L2,	12
MODULE 3:Tendering and Contract Tendering - Types of tenders and tender documents, tender drafts notices, Inviting Tenders, Procedure of opening and selection process and report of owner. Contract – Types, conditions of contract – Earnest money, Security deposit, Retention money, Mobilization fund, Bank Guarantee, Architect's Instructions, Defects, Certificates and payments, Penalties, Insurance, Liquidated damages, Termination of contract, breach of contract.	L1, L2, L3	15
MODULE 4:Arbitration Introduction, Techniques, elements and factors affecting valuation, Methods, Types – renewal or lease/ extension of lease, standard rent, easement right, dilapidation, Property valuation techniques, circle rate analysis, comparable cost of scale. Share knowledge on the concept of property purchase and mortgage, Goods and Service Tax, Capital gain tax, wealth tax, property tax and other taxes etc. Arbitration, Arbitrator, nature of arbitration, appointment, conduct, powers and duties of arbitrator and umpire amended from time to time. Procedure of arbitration. Mediation & Reconciliation	L1, L2, L3	15

***Bloom's Level:** L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

- Chitkara K.K. (1998). Construction Project Management, New Delhi: Tata McGraw- Hill Compony Limited
- Deobhakta Madhav, Deobhakta Meera (2007), Architecture Practice in India, Delhi: Council of Architecture Gazette of India (1972). The Architects Act, 1972, Delhi

Reference Books

- Patil,B.S.(2015), Civil Engineering Contracts and Estimates,Delhi:Orient Blackswan Private Ltd
- Ramaswamy, (2016), Contract and their managment, New York: LexisNexis

Modes of Evaluation: Assignment/ Written Examination

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	50	0	50	100	4	3

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	--	--	--	--	--	--	--	--	--	1	1	--	--	--	1
CO2	--	--	--	--	--	--	--	--	--	1	1	--	--	--	1
CO3	--	--	--	--	--	--	--	--	--	1	1	--	--	--	1
CO4	--	--	--	--	--	--	--	--	--	1	1	--	--	--	1

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	CAREER DEVELOPMENT (ARC2002)	L	T	S	P	C
Version 1.1	Date of Approval:	2	0	0	0	2
Pre-requisites/Exposure	Professional practice					
Co-requisites						

Catalog Description

The aim of this course is to enable students to understand future after completing architecture study. It also includes knowledge the legal and regulatory body. The subject will be taught in a way so that they are able to build a concrete portfolio, and assignments for the subject will be linked to the design presentation exercises to achieve higher level of representation in real world.

Course Objectives

The objective of this course is

- To introduce the scope after completing architecture.
- To understand the functions of various national and international regulatory bodies.
- To study the cyber security.
- To provide portfolio development.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain career after completing architecture.
CO2: Define national and international regulatory bodies.
CO3: Explain cyber security and its role in architectural field.
CO4: Understanding of portfolio development.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to area of specialized course Architecture, Scope for architecture stream, careers in govt. sector and private sector for architects, higher education in different fields (i.e. planning, construction, management, conservation, software development and analysis etc.) Research in different specialized area.	L1, L2, L3	6
MODULE 2: International Architecture Practice and role of regulatory Role of different bodies i.e. COA, IIA, their working constitution and bye-laws, categories of membership and election procedures. Introduce to the relevant Act and procedures of membership. Conditions of engagement of Architect, discuss the Duties, Responsibilities, Liabilities of the Architect profession, Fee (scale of charges), mode of payment etc.	L1, L2, L3	6

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MODULE 3:Cyber security Introduction to information systems, Need for Information security, Threats to Information Systems, Information Assurance, Cyber Security, and Security Risk Analysis. Security Policies, WWW policies, Email Security policies, Policy Review Process-Corporate Policies, Information Security Standards-ISO, IT Act, Copyright Act, Patent Law, IPR. Cyber Laws in India; IT Act 2000 Provisions, Intellectual Property Law: Copy Right Law, Software License.	L1, L2, L3	6
MODULE 4: Portfolio development Analyse, critically evaluate and articulate assessments of their own design works. Composition, Colour schemes, Sizes, Sequences, Software, Logo and style development	L1, L2, L3	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text Books

- Charles P. Pfleeger, Shari LawerancePfleeger, "Analysing Computer Security ", Pearson Education India.
- Dr. Surya PrakashTripathi, RitendraGoyal, Praveen kumarShukla ,"Introduction to Information Security and Cyber Law" Willey Dreamtech Press.
- Schou, Shoemaker, " Information Assurance for the Enterprise", Tata McGraw Hill. CHANDER, HARISH,"
- V.K. Pachghare, "Cryptography and information Security", PHI Learning Private Limited, Delhi India.
- Chitkara K.K. (1998). Construction Project Management, New Delhi: Tata McGraw- Hill Compony Limited
- Deobhakta Madhav, Deobhakta Meera (2007), Architecture Practice in India, Delhi: Council of Architecture
- Gazette of India (1972). The Architects Act, 1972, Delhi
- Gutman, R., & Haviland, D. (1992). The Architect's Handbook of Professional Practice. Journal of Architectural Education (1984-), 45(2), 122. https://doi.org/10.2307/1425280

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- Baka, J. (2013). The Political Construction of Wasteland: Governmentality, Land Acquisition and Social Inequality in South India. Development and Change, 44(2), 409–428. https://doi.org/10.1111/dech.12018
- LARR. The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013, The Gazette of India Extraordinary § (2013). Ministry of Law and Justice, Government of India. Retrieved from https://dolr.gov.in/sites/default/files/Right to Fair Compensation and Transparency in Land Acquisition%2C Rehabilitation and Resettlement Act%2C 2013.pdf
- Narain, V. (2009). Growing city, shrinking hinterland: Land acquisition, transition and conflict in peri-urban Gurgaon, India. Environment and Urbanization, 21(2), 501–512. https://doi.org/10.1177/0956247809339660
- Raghuram, G., & Sunny, S. (2015). The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement (Amendment) Ordinance, 2015. Research and Publications Of Indian Institute of Management, 2013(July), 51.
- Requirements, D., & Amendment, T. (2010). the Gazette of India. DisClosure, 2011(2), 1–216.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

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Examination Scheme:

Evaluation Scheme								Total marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	0	50	50	100	2	0

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	--	--	--	--	--	1	--	--	--	2	3	1	3	--	1	2
CO2	--	--	--	--	--	2	--	--	--	1	1	1	3	--	1	2
CO3	--	--	--	--	--	1	--	--	--	2	1	1	3	--	1	2
CO4	--	--	--	--	--	2	--	--	--	1	2	1	3	--	1	2

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	UNDERSTANDING CULTURAL LANDSCAPES FOR URBAN RENEWAL AND CONSERVATION (ARC2003)	L	T	S	P	C
Version 1.1	Date of Approval:	3	0	0	0	3
Pre-requisites/Exposure						
Co-requisites						

Catalog Description

The aim of this course is to understand the definition and concept of Culture Landscapes for urban renewal and conservation. It explain the culture of landscape to renewal/redevelopment of the existing environment and its surrounding to sustain the better quality of life though proper plan or documentation. This course has explained about the cultural heritage conservation particularly heritage site. It also deals about the urban area development through the literature study of Renewal, Redevelopment Revitalization and Rejuvenation. In this course, development approaches are comprises of social, environment and economy dimensions. The learning and outcome of this course is exploring in the field of Culture Landscapes, Heritage site and Urban Environment aspects in order to plan for development. The students must learn through literature review of research articles, professional documents, books related to urban renewal. It needs to carry out the field work and preparing the development report in this particular subject.

Course Objectives

The objectives of this course are

- To assess the urban renewal/redevelopment approaches at old city and historical sites in the context of having better access to services and sustainable urban development.
- To critically analyze the best practices of urban re-development for furthering utilization and formulation of a redevelopment plan.

Course Outcomes

At the end of this course, students will be able to

CO1: Digest and apply the knowledge of development approaches such as urban renewal/redevelopment/revitalization/rejuvenation.

CO2: To prepare the detail report and presentation on a given project related to urban renewal and urban re-development.

Modules	Blooms level*	Number of hours

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MODULE 1: Introduction of Cultural Landscape for Urban Renewal and Conservation. Introduction to definition and concept of Cultural Landscape, Urban Renewal, and Conservation, Development Approaches of Old City, A brief history of the landscape concept, Principle for Conservation and Renewal of decay areas within City Area, Principles and methods for the assessment of the cultural landscape, Landscape resources, management and planning structure, Mechanism for Development of Historical Area includes the Environment, Social, Culture and Economic aspect; Infrastructure and Services Facilities System of Old Area within City. Governance System and Planning aspect to build new Plan. Case Studies of various Plan and Documents for Renewal and Redevelopment in Developed Countries and Development Nations particularly Indian cities context.	L1, L2	12
MODULE 2: Project Work Selection of Study Areas, Literature Review, Formulation of Aim and Objectives through Proper Scientific Approaches, Collection of data through various techniques such as primary and secondary sources; Conducting survey (Focus Group Discussion, Households Survey etc), Documentation; Develop the data Base to Analyze the relevant by using the advance software; Analyze the Qualitative and quantitative approaches and formulating the new plan through scientific manner and; Report writing and presentations.	L4, L5, L6	24

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Ken Taylor., The Historic Urban Landscape Paradigm and Cities as Cultural Landscape, Landscape Research, 41 (4): 1-10, 2016
- R. Pickard., Management of European Historic Centres, E&FN SPON, Londra 2000
- N. Mitchell, Rössler M., Tricaud P.M., World Heritage Cultural landscapes, A handbook

References

- C. Sauer, The Morphology of Landscape, University of California Publications in Geography, 1925
- Lawrence W.C. Lai., Frank T. Lorne., Sustainable Urban Renewal and Built Heritage
- Conservation in a Global Real Estate Revolution, Sustainability., 11 (580), 2019

Modes of Evaluation: Presentation/Assignment/Class Test /Written Examination

Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	0	50	50	100	3	0

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1	1	--	--	1	1	--	--	2	1	--	1	--	1	2
CO2	1	1	2	--	--	--	--	--	--	--	--	--	1	2	--	--

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	SMART CITIES AND SMART TECHNOLOGIES (ARC2004)	L	T	S	P	C
Version 1.1	Date of Approval:	3	0	0	0	3
Pre-requisites/ Exposure						
Co-requisites						

Catalog Description

The aim of this course is to introduce the students to smart cities concepts and solutions with their specific planning needs and priorities and the implication on development in these areas. The courses will generally be conducted in the seminar/studio mode to encourage research, exploration and skill developments. The focus of the course will be on **exploring the role of technology and data in cities, and learn how you can participate in the creation of smart cities.** This course will provide the student's hands-on experience on smart city planning that required a different planning process in a built environment. The course contents to be followed will be developed by course teachers based on the resources at hand and opportunities for interdisciplinary learning. The course would be conducted through literature survey, case studies, site visits, and hands on experimentations. During the course the students will be working on live projects in groups which are preferably interdisciplinary.

Course Objectives

The objective of this course is

- To investigate, analyze and explore Smart City concepts and solutions important for urban development sectors
- To learn about state-of-the-art strategies for effectively managing the transition from legacy infrastructures to smart urban systems.

Course Outcomes

On completion of this course, the students will be able to

CO1: Comprehend the concept, challenges and solutions for smart cities planning

CO2: Prepare the detail report and presentation on a given project related to Special area planning.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Smart Cities Concept and analysis of smart technologies Introduction to smart cities, the city as a system of systems, smart citizens, Infrastructure, technology and data, Innovation and enterprise, smart leadership and strategy, standards and capacity building, smart measurement, and learning. Case Studies of various smart cities in Indian and international context.	L1, L2	12

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MODULE 2: Project Work Selection and understanding of case study; Formulation of Aim and Objectives, Collection of data through primary and secondary sources; Conducting survey; Database development using relevant and advance software; Qualitative and quantitative data analysis; Report writing and presentations.	L4, L5, L6	24

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Smart Cities & Urban Development in India, N. Mani, New Century Publications
- Smart Cities Unbundled, Sameer Sharma, Bloomsbury India
- The Smart City Transformations: The Revolution of The 21st Century, Amitabh Satyam, Bloomsbury India
- Introduction to Smart Cities, Anil Kumar, Pearson India

References

- Smart Technologies, K. Worden, World Scientific Publishing Co Pte Ltd
- Smart Technologies for Smart Governments, Manuel Pedro Rodríguez Bolívar, Springer Publications
- Advanced Technology for Smart Buildings, James M. Sinopoli, Artech House Publishers

Modes of Evaluation: Presentation/Assignment/Class Test /Written Examination
Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESSE	ESJ	Total			
I	II									
10	10	25	5	50	0	50	50	100	3	0

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1	1	--	--	1	1	--	--	2	1	--	1	--	1	2
CO2	1	1	2	--	--	--	--	--	--	--	--	--	1	2	--	--

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	TRANSIT ORIENTED DEVELOPMENT (ARC2005)	L	T	S	P	C
Version 1.1	Date of Approval:	3	0	0	0	3
Pre-requisites/Exposure						
Co-requisites						

Catalog Description

The aim of this course is to introduce the students to transit oriented development concepts and solutions with their specific planning needs and priorities and the implication on development in urban transportation sectors. The courses will generally be conducted in the seminar/studio mode to encourage research, exploration and skill developments. The focus of the course will be on **exploring the role of TOD and learn how this can be implemented.** This course will provide the students hands-on experience on planning for TOD that required a different planning process in a built environment. The course contents to be followed will be developed by course teachers based on the resources at hand and opportunities for interdisciplinary learning. The course would be conducted through literature survey, case studies, site visits, and hands on experimentations. During the course the students will be working on live projects in groups which are preferably interdisciplinary.

Course Objectives

The objective of this course is

- To investigate, analyze and explore TOD concepts and solutions important for urban transportation sectors
- To develop interdisciplinary understanding and sensitivities of future planners.

Course Outcomes

On completion of this course, the students will be able to

CO1: Comprehend the concept, challenges and solutions for TOD planning

CO2: Prepare the detail report and presentation on a given project related to TOD planning.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction and Planning of TOD Introduction to TOD, need of transit-oriented development, Factors driving the trend, components of TOD, Principles, Benefits, government policies, Case Studies of various TOD's in Indian and international context.	L1, L2	12

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MODULE 2: Project Work Selection and understanding of case study; Formulation of Aim and Objectives, Collection of data through primary and secondary sources; Conducting survey; Database development using relevant and advance software; Qualitative and quantitative data analysis; Report writing and presentations.	L4, L5, L6	24

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation*

Text Books

- Transit Oriented Development: Making it Happen (Transport and Mobility), John L. Renne, Carey Curtis, Routledge; 1 edition (25 June 2009)
- Transit Oriented Development and Sustainable Cities: Economics, Community and Methods (Transport, Mobilities and Spatial Change), Richard D. Knowles , Fiona Ferbrache, Edward Elgar Pub (June 28, 2019)
- Financing Transit-Oriented Development with Land Values: Adapting Land Value Capture in Developing Countries (Urban Development), Hiroaki Suzuki , Jin Murakami , Yu-Hung Hong , Beth Tamayose , World Bank Publications (15 January 2015)

References

- Transit Oriented Development: Guide for Practitioners, Queensland. Department of Infrastructure and Planning, Queensland Department of Infrastructure and Planning, 2010
- Urban Transformation: Transit Oriented Development and the Sustainable City, by Ronald A. Altoon , James C. Auld, Images Publishing Dist Ac (November 16, 2011)

Modes of Evaluation: Presentation/Assignment/Class Test /Written Examination
Examination Scheme:

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	0	50	50	100	3	0

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1	1	--	--	1	1	--	--	2	1	--	1	--	1	2
CO2	1	1	2	--	--	--	--	--	--	--	--	--	1	2	--	--

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Amity School of Architecture & Planning

Bachelor of Interior Design

FLEXILEARN

-Freedom to design your degree



Programme Structure

Curriculum & Scheme of Examination

2023

AMITY UNIVERSITY HARYANA
GURUGRAM

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Overview

Amity School of Architecture and Planning (ASAP) is an academic division of Amity University Haryana. The Interior Design Program at ASAP benefits uniquely to the students as it meets a multi-disciplinary approach towards design, technology and management. The program has been designed in such a way that each student develops their academic, creative and professional progress and helps them to build a professional network by ensuring personal way of coaching. The faculties available in ASAP are professionals in the appropriate field and bring a current understanding of design practice to the classroom. The combination of academic courses and professional practice will prepare students to enter practice as members of the design team. Graduates are expected to understand the professional, economic and societal challenges and opportunities that will impact the field of design.

Mission:
ASAP have a mission that exists to support the students learn by providing transformative education experiences, to become productive, creative, ethical and engaged citizens and professional leaders serving the global community. ASAP commits to contribute the intellectual, cultural, environmental, economic and social advancement of the communities and individuals it serves.

Bachelor of Interior Design
Interior Designers exercise creativity in the design of functional spaces that meet people's needs. Bachelor of Design (Interior design) is a design oriented technical course that meet psychological, physiological, and sociological needs of individuals by enhancing the environments in which they live and work. Apart from the common syllabi, this graduation program addresses issues like, sustainability and life safety codes, responsibility for welfare of the public in spaces designed for human habitation etc. with a theoretical foundation and professional knowledge. The students have been practiced to Individuals use knowledge and skills related to interior and exterior environments, technical design skills, construction, and furnishings to make wise consumer decisions, increase productivity, and compete in industry.

The courses are coordinated on the basis of subject evaluations and informal consultations between students and lecturers, in part to ensure an open and ongoing dialogue about the student's progress. Similarly, discussions in the context of presentations are meant to contribute to greater self-knowledge and the development of a personal vision.

Throughout their coursework, students learn to evaluate their own activities and discover their stronger and weaker abilities in terms of talent, skills and motivation. The course is designed in semesters and further divided into modules which will offer them insight into personal capacities and skills. Each curriculum implies the development of a critical view about oneself as a professional and towards the industry in general. During their course students complete their various graduation projects; this is the phase where all the knowledge they acquired comes together.

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Programme Objectives (PO's)

The graduates will

- **PO 1** **Interior Design knowledge:** Apply the knowledge of humanities, science, architecture fundamentals to the solution of complex interior design problems.
- **PO 2** **Problem analysis:** Identify, formulate, research literature and analyze complex interior design problems reaching substantiated conclusions using principles and elements of design.
- **PO 3** **Design/ Development of Solutions:** Ability to identify social, economic, environmental and cultural issues related to interior design process.
- **PO 4** **Conducting Investigations of complex problems:** use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.
- **PO 5** **Modern tool usage:** Create, select and apply appropriate techniques, resources and modern software with an understanding of the limitations.
- **PO 6** **The interior designer and society:** Apply reasoning informed by the contextual knowledge to assess social, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional interior design practice.
- **PO 7** **Environment and sustainability:** Understand the impact of the professional interior design solutions in societal and environmental contexts and demonstrate the knowledge and need for sustainable development.
- **PO 8** **Ethics:** Apply ethical and professional responsibilities of the interior design practice.
- **PO 9** **Individual and teamwork:** Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.
- **PO 10** **Communication:** Ability to communicate effectively on complex architectural activities with the interior design community and with society at large, such as, being able to comprehend and write reports and design documentation, make effective presentations and give and receive clear instructions.
- **PO 11** **Project management and finance:** Demonstrate knowledge and understanding of the interior design and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- **PO 12** **Life-long learning:** Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Programme Specific Outcomes (PSOs)

On completion of the Bachelor of Interior Design, the student will be able to:

PSO1. To promote intellectual inquiry, creative expression and original work through a structured curriculum that balances theory and practice, experimentation and planning, creativity and logic, and art and technology, framed within a series of related investigations into language communications, critical thinking, the humanities, natural and social sciences, global awareness, and design history.

PSO2. To encourage the development of visual fluency as well as the acquisition of essential knowledge and skills in the elements and principles of design, drawing and color, Computer Aided Design (CAD), interior space planning, sustainability, materials and finishes, lighting, structures, surfaces and codes specific to both residential and non-residential situations.

PSO3. To define and encourage the dialogue and relationship between interior design and architecture by providing studies in architectural history, universal and barrier-free accessibility, spatial patterning and organization, and environmental sensitivity, as well as the essential need to restore and maintain the natural connection between people and architecture, interiors, and the environment.

PSO4. To introduce students to interior design business practices, market resources, and project management techniques used in the interior design profession as well as health, safety and welfare responsibilities that interior designers hold as they develop solutions with clients, rather than simply for clients.

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Syllabus – First Semester

IND2106	INTRODUCTION TO CRAFT & MODEL MAKING	L	T	S	P	C
Version	Date of Approval:	1	0	2	0	3
Pre- requisites/Exposure	Basic understanding of Model making Materials					
Co-requisites	Designing Concepts					

Catalog Description

The course is a build with an objective to make students understand the different shapes that can be used to produce better innovative design in the future. Simplification of from in order to learn their basic properties and working.

Course Objectives

- This course aims to give the basic insights into the concepts of crafts and model making are increasingly being used by designers to evaluate designs and innovative products.
- This helps to simulate the impacts of alternative approaches.
- The course will introduce the hands-on activity of making models and crafts to from a product design idea.

Course Outcomes

On completion of this course, the students will be able to

CO1: Sketching and developing 2D, 3D Graphical forms in scales, size, and their proportions

CO2: Create object based models and develop creative art forms

CO3: Applying architectural graphics skills in model making presentations

CO4: Create life-long connection in one's pursuit for model making and other art forms

Course Content:

Modules	Blooms level*	Number of hours
MODULE 1: Introduction Introduction to the art of model making and its allied tools, techniques and materials.	L1, L2, L3	9
MODULE 2: Design Evolution Conceptual sketching/ planning, design and developing various three-dimensional geometries in the model making; in context of understanding the scale and proportion.	L1, L2, L3	9
MODULE 3: Workshop The workshop-based activity will help in understanding the qualities of different materials, different types of joints and model making to relevant scales and proportions. Students may use different materials such as – Paper, Thermocol, Clay, Wood, Plaster of Paris, metals, and use of different colors in model making.	L1, L2, L3, L4	9

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MODULE 4: Presentation Teaching and developing the presentation skills of the models, using various techniques and materials. The students may also incorporate the same for their Architectural Design studio problem	L1, L2, L3, L4	9

*Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Textbooks

- Congdon, R.T. (First Edition 2010). Architectural Model Building: Tools, Techniques and Materials: Fairchild Books

Reference Books

- Janke, Rolf. (First Edition 1968). Architectural Models: Frederick A. Praeger.
- Taylor, J.R. (1971). Model Building for Architects and Engineers: McGraw-Hill Inc.
- Werner, Megan. (First Edition 2011). Model Making: Princeton Architectural Press.

Modes of Evaluation: Quiz/Assignment/ Seminar/Practical

Examination

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	0	70	70	100	3	3

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att:Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	--	--	--	1	--	--	--	2	--	--	--	1	3	2	--
CO2	1	--	--	--	2	--	--	--	1	--	--	--	1	3	2	--
CO3	1	--	--	--	2	--	--	--	1	--	--	--	1	3	2	--
CO4	3	--	--	--	1	--	--	--	1	--	--	--	1	3	2	--

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IND2107	HISTORY OF DESIGN & CULTURE	L	T	S	P	C
Version	Date of Approval:	2	0	0	0	2
Pre-requisites/Exposure	NA					
Co-requisites	Art & Graphics-I					

Catalog Description

History is an important part of our study. It is the basic structure of development. With the course the students will be aware of the past and the hierarch of isms that followed. The changes brought on every step.

Course Objectives

- This course aims to have students acquire a familiarity with historical and philosophical aspects of design that contributed to the rise of design styles.
- This course will also explore the cultural studies that explore the relationship between the designs and the human culture and how the relationship may have evolved within different industries over time. In-depth reading is highly recommended to gain deeper meaning and comprehension of this subject and research detailed information for an assignment.

Course Outcomes

On completion of this course, the students will be able to

CO1: Importance of design and the philosophies that followed during every ism of world art history.
CO2: Knowledge of the art and design traditions of India. (temple architecture and cave paintings of India)
CO3: Introduction to the basic culture of Indian society will help the student to design better to the social demands.
CO4: Study of Philosophies make the students a better thinker and thoughtful.

Course Content:

Modules	Blooms Level	No. of Hours
Module 1: Design Philosophy & History Art and Aesthetics in Design, Applied Aesthetics & Technical	L1	6

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Aesthetics, cognition and laws of beauty, Neurasthenics, Plato"s Theory of Art; Historical Materials, Techniques and Methods of Design; Cave Art; Buddhist Art of Central Asia; Greeco- RomanArt; Renaissance to Baroque; Art of South and Southeast Asia; Western Art; Art of China and Japan; „Art for Art"s Sake"; Modern Art, Romanticism in Art; Modern Art to Design; Cubism; Cubist Sculpture; Collage (Synthetic Cubism); Piet Mondrian: „Neo-plastic Art"; Rococo Design; Arts and craftmovements; Renaissance Period & Industrial Design in Europe; Industrial Revolution & Technical Revolution; The Bauhaus and the Modern Design Education; Mid Century Modern Design, Mid Century Danish Industrial Design; Art Nouveau; Futurism; Dada cultural movement; Suprematism; Constructivism, Rice of corporate identity; Design After Modernism; History of Advertising, Identity &Branding; The Era of Information Design, Motion Graphics and User Interaction Design.		
Module 2 - The Art and Design Tradition in India Introduction to the History of Indian Art; Sculpture andArchitecture of North India, Art & Design of South India, HighMedieval Architecture, Tribal and Folk Arts of India; IndianPainting, Modern Indian Art; Symbols and metaphors of IndianArt and Design.	L1	6
Module 3 – Culture: An introduction The Concept and Meaning of Culture; Culture and Civilization; Culture and Heritage; General Characteristics of Culture; Importance of Culture in Human Life; Structure of Indian Society, Traditional Indian family; History of women in India, Tribal communities of India, Corporate culture; Socio-cultural issues in contemporary India.	L1	6
Module 4 – Study of Design Philosophies & Iconic Design Works (Self-study / Assignment) Study and submit a project file about various designers and their area of specialization, Important work etc. Examples: Avinash Godbole; Benoy Sarkar; Manu Desai; Mickey Patel; Ram Mohan; Sudarshan Dheer; Yeshwant Chaudary; Dashrath Patel: Mahendra Patel: R K Joshi: Sudhakar Nadkarni: Vikas Satwalekar, Ron Arad, Saul Bass, Manolo Blahnik, Robert Brown John, sambard Kingdom Brunel, Matthew Carter, Sam Buxton, Luigi Colani, Joe Colombo, Christian Dior, Tom Dixon, Norman Foster, Alec Issigonis, David Mellor, Dieter Rams, Philip Treacy, Phyllis Pearsall, Robert Wilson, Philip Worthington, Luis Barragán, FlaminioBertoni, Isamu Noguchi etc.	L1,L3, L4	6

Bloom's Level: *L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

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Text & References:

- Chaitanya, K. A History of Indian Painting : The Modern Period. New Delhi: Abhinav Publications, 1994.
- Buswell, R.E. Encyclopedia of Buddhism Vol. 1-2. USA: Macmillan Reference, 2004.
- Aldo Leopold, *A Sand County Almanac***,** Ballantine Books, New York 1982
- R.G. Collingwood, *The Principles of Art*, Oxford University Press, New York 1958 (reprint 1998)
- Carpenter, T.H. Art and Myth in Ancient Greece. London: Thames and Hudson, 1991.
- Tucker, Jonathan. The Silk Route Art History. London: Philip Wilson Publishers, 2003.
- Nagaswamy, R. Facets of South Indian Art and Architecture. New Delhi: Aryan Books International, 2003.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	2	3

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	3	1	3	1	2	1	2	1	1	1	1	1	3	2	2
CO 2	1	3	1	3	1	2	1	2	1	1	1	1	1	3	2	2
CO 3	1	3	1	3	1	2	1	3	1	1	1	1	1	3	2	2
CO 4	1	3	1	3	1	2	1	1	1	1	1	3	1	3	1	1

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IND2111	BUILDING MATERIALS & CONSTRUCTION TECHNIQUES-I	L	T	S	P	C
Version	Date of Approval:	1	1	1	0	3
Pre-requisites/ Exposure	NA					
Co-requisites	Architectural Design – I					

Catalog Description

This course focuses on interior design materials and its applications, expending the opportunities for creative design solutions. Understanding traditional and rural materials in buildings and knowing the interiors. This subject will enable students to familiarize with building elements of superstructure and Sub-Structure, to apply the construction techniques involved in masonry work with different materials like brick, stone and composite materials .

Course Objectives

The objective of this course is

- To understand the use of traditional building materials in simple building works
- To familiarize students with basic building components, their function and behavior under various conditions with specific reference to "Load Bearing Construction"
- Students will understand the importance of various bonds through brick models and the assembling of these brick models in the form of courses and bonds.
- To introduce brick as building material for super and sub structure construction.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define basic building elements.
CO2: Recognize the various types of masonry made up of suitable materials.
CO3: Wood & Timbers
CO4: Explain the principles of construction.

Course Content:

Modules	Blooms level*	Number of hours

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MODULE 1: Introduction to Building Materials and Construction Technology Introduction to components of building from foundation to roof: Foundation, plinth, plinth beam, damp proof course (D. P.C.), sill, lintel, beam and slab, parapet, mumty etc. Detailed Section through 2 story building, Introduction to various methods, technology, materials, tools and equipment commonly used in – Excavation, Masonry works and carpentry. **Clay and Clay products**, Stone Mud including stabilized earth, burnt bricks, brick tiles, blocks, lime and its product, stone and its varieties etc, Classification, availability, preparation and uses of above materials and their structural, visual and textural properties. **Lime:** Sources of lime, Classification and manufacturing process of lime, Fatand hydraulic lime – properties and use, tests on lime, etc. **Cement:** Composition of ordinary cement, function of cement ingredients, properties of cement – soundness, setting time, strength, etc. Grade of cementand different types of cement used in construction. Mortar: Sand, sources of sand and its classification, tests on sand, classification of mortar – lime mortar, mud mortar, surkhi mortar, cement mortar, preparation of mortar and its properties, use and selection of mortar for different construction work, etc.	L1, L2	9
MODULE 2: Introduction to different types of Masonry, Brick Masonry and Stone Masonry Terminology: Bricks and its types, bats and closures used in different Brick Bonds Bonding: Types of bonds: English, Single, double, Flemish and rat trap bond. Corbelling, String courses and decorative brickwork. Stone masonry: Types ofstones, dressing and different bonds in stone, Random Rubble, Coursed Rubble, Ashlar Rubble work: Random Rubble, built-to-course and coursed masonry, miscellaneous, Classification, characteristics and properties of stones, quarrying of stone, artificial stones	L1, L2,L3	9
MODULE 3: Timber Types of timber, defects, seasoning and preservation of timber. Ecological impact due to use of wood, deforestation etc. Study of engineered wood used in buildings, i.e., Plywood, block boards, particleboards, and other types. Application of timber in building components.	L1, L3,L4	9
MODULE 4: Principles of Construction and Building Elements Foundations, Footings, D.P.C., flooring, sills, lintel, roofing, parapets, coping, cladding expansion joints, waterproofing of roofs, external wall sections with details, beams, columns, slabs, retaining walls, etc. External Wall Section.	L1, L3,L4	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

TextBooks:

- Barry, R. (1999). The Construction of Buildings Vol. 2. 5th Ed. New Delhi: East-West Press.
- McKay, W. B. (2005). Building Construction Metric Vol. I–IV. 4th Ed. Mumbai: OrientLongman.
- Rangwala, S. C. (1963). Building Construction: Materials and types of Construction. 3rd Ed.New York: John Wiley and Sons

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References:

- Clayton, C. R. (1987). Materials science and engineering: An introduction. Materials Science and Engineering, 94, 266–267. https://doi.org/10.1016/0025-5416(87)90343-0.
- Fernandes, F. M., Lourenço, P. B., & Castro, F. (2010). Ancient Clay Bricks: Manufacture and Properties. In Materials, Technologies and Practice in Historic Heritage Structures (pp. 29–48). Springer Netherlands. https://doi.org/10.1007/978-90-481-2684-2_3

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	3	3

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2	-	1	-	-	-	-	-	-	2	2	1	-	-
CO2	1	1	2	-	1	-	-	-	-	-	-	2	2	1	-	-
CO3	1	1	2	-	1	-	-	-	-	-	-	2	2	1	-	-
CO4	1	1	2	-	1	-	-	-	-	-	-	2	2	1	-	-

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IND2112	GRAPHICS SKILLS-I	L	T	S	P	C
Version	Date of Approval:	1	0	2	0	3
Pre-requisites/Exposure	Design- I					
Co-requisites	Basic Design & Visual Arts					

Catalog Description

The aim of this course is to provide the students with the basic tools and techniques for free hand drawing and technical drawings. The subject covers concept of scales and lettering and familiarize them with planar and solid geometry to conceptualize the 3D forms in to 2D with the help of Orthographic Projections of Planes and Solids including sections of solids as well.

Course Objectives

The objective of this course is:

- To familiarize the students with various drawing tools and accessories used in drafting and lettering techniques to produce and visualize geometrical composition and form.
- To provide a clear understanding about the scale measurement; plane geometry, solid geometry and projections used as drawing technique.

Course Outcomes

On completion of this course, the students will be able to

CO1: Draw free hand drawing and lettering.
CO2: Project points, lines and planes in different positions in 1st angle projection system.
CO3: Project regular rectilinear and circular solids in different positions.
CO4: Apply their knowledge in making sections, intersections and interpretations of solids.

Course Content:

Modules	Blooms level*	Number of hours
MODULE 1: Free Hand Drawing and Lettering Free hand and mechanical lettering cycle.	L1	6
MODULE 2: Basic Technical Drawing Concept and types of line, Division of lines and angles, Drawing polygons, Inscribing and circumscribing circles in polygons, Drawing geometrical curves helix, Conoid etc.	L1, L2	6
MODULE 3: Orthographic Projections- Planes and Solids Definition, Meaning and concept, Planes of Projections, First angle projections, Projection of points, Lines and planes in different positions. Projection of regular rectilinear and circular solids (prisms, pyramids, cones, cylinders, spheres etc.) in different positions.	L1, L2, L3	18
MODULE 4: Solid Geometry Construction of section, Intersection and interpenetration of solid.	L1, L2, L3	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

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Text Books:

- Bhatt, N.D. (53rd Edition 2014). *Engineering Drawing*: Charotar Publishing House Pvt. Ltd.
- Dhawan, R.K.(3rd Revised Edition 2006). *A textbook of Engineering Drawing (In First Angle Projection)*: S Chand & Company.
- Ramsey & Sleeper. (Sixth Edition 1970). *Architectural Graphic Standards:* John Wiley & Sons.
- Shah, P.J. (Revised Edition 2013). *Textbook of Engineering Drawing*: S Chand (G/L) & Company Ltd.

References:

- Ching, Francis D.K. (6th Edition 2015). *Architectural Graphics*: John Wiley & Sons.
- Ganesan, R., & Devarajan, V. (1998). Intersecting features extraction from 2D orthographic projections. *CAD Computer Aided Design*, *30*(11), 863–873. https://doi.org/10.1016/S0010-4485(98)00043-8
- Williams, E. (2001). Lettering. *Eurostitch Magazine*, *9*(51), 28–29. https://doi.org/10.1007/978-94-010-2948-3_17

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	3	3

CT: Class Test; TA: Total Assessment; A: Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	--	--	--	1	--	--	2	--	--	--	-	1	2	-	--
CO 2	3	--	--	--	1	--	--	2	--	--	--	-	1	2	-	--
CO 3	2	--	--	--	2	--	--	1	--	--	--	-	1	2	-	--
CO 4	2	--	--	--	2	--	--	1	--	--	--	-	1	2	-	--

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IND2113	ART & GRAPHICS-I	L	T	S	P	C
Version 1.1	Date of Approval:	1	0	2	0	3
Pre- requisites/Exposure	NA					
Co-requisites	Model Making 1, Design 1					

Catalog Description

Drawing is a foundational course that is essential for mastering any stream of design. The goal of this course is to develop, through a variety of media, fundamental drawing skills; to understand and apply pictorial organization; develop vocabulary and terminology, and to develop perceptual, observational conceptual awareness and critical thinking skills in design.

Course Objectives

- The course will get the students to a basic practice of sketching and would be helpful in learning the various techniques of drawing.
- It will be helpful for the getting the students acquainted with the consistency ofpractice and the advantages of use of different styles.

Course Outcomes

On completion of this course, the students will be able to

- **CO1:** A basic introduction to new materials and their techniques open up theperspective of the students.
- **CO2:** Learn the basic of shading and acquaintance with the tools to be used.
- **CO3:** Comprehending the sketching of shapes, forms and other basics of sketching.
- **CO4:** Study of shadows and lights for a better understanding of composition andperspective.

Course Content:

Modules	BloomsLevel*	No. of Hours
Module 1: Introduction to Freehand drawing & Sketching. Introduction to Different art media and materials - Method of holding pencil – Eye-Hand coordination - Line quality studies -Lines: Straight, Curvilinear, Angular, Thick-Thin, Plane, Volume - Straight Lines - Curvilinear Lines: Thick, Thin And Angular - Line Variety: Conveying movement of volume interms of line.	L1,L3	6
Module 2: Basic Drawing Techniques Contour- Principles of One, Two and Three Dimensional compositions- Perception: Visual perception, Intuitiveperception - Positive/Negative- Gesture - Value - Perspective: Linear, Aerial.	L1,L3	8

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Module 3: Methods of Sketching Study and sketching various shapes, form and structure – Foreshortening – Study of Ellipses- Drawing through building and creating form - Sketching by method of seeing the shapes and forms- Sketching by using loose, circular strokes – Sketching by using free and scribbled lines – Sketching byusing wide, bold strokes – Quick reference sketch - Conveying movement sketching - Rendering wave action – Sketching focusing on negative space - Sketching by filling in the negative spaces – Silhouetting - Drawing with a grid - Wire frame sketching - Spiral line sketching.	L1,L3	10
Module 4: Colour Theory and Colour Wheel Properties of colour – Colour schemes – Types of colours -primary, secondary and tertiary colours. Application and visual effects of colour. **Rendering in different mediums and color course** Introduction to Hue, Tint, Tone and Shades. Exercises for the same to study their impacts on still objects, buildings, etc .	L1,L3	12

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text & References:

- Walter Foster (Firm), Walter Foster Creative Team, Art of Basic Drawing, Walter Foster Publishing, 2005.
- Karl Christian Heuser, Freehand Drawing and Sketching: A Training and Work Manual, V.N. Reinhold, 1984.
- Natalia Tizon, Art of Sketching, Sterling Publishing Company, Inc., 2007.
- Greg Albert, Rachel Rubin Wolf, Basic Drawing Techniques, F+W Media, 1991.
- David Rankin, Fast Sketching Techniques, F+W Media, Inc., 2011.
- Art Fundamentals: Theory and Practice, Ocvirk, Stinson, Wigg, Bone, and Clayton. McGraw Hill, 2002.
- Eissen,K. and Steur, R. Sketching,the Basics. BIS Publishers, 2011.
- Montague, John. Basic Perspective Drawing: A Visual Guide (5th Edition). Wiley, 2010.
- Ching, Francis. Design Drawing, Van Nostrand Reinhold, New York, 1998.

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	0	70	70	100	3	3

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att:Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PSO1	PSO2	PSO3	PSO4
CO 1	1	1	2	1	2	1	2	1	1	3	1	1	3	3	3	1
CO 2	1	1	2	1	2	1	2	1	1	-	1	1	3	-	3	1
CO 3	1	1	1	1	3	1	2	1	2	-	1	1	3	-	3	1
CO 4	1	1	1	1	3	1	2	1	2	-	1	1	3	-	3	1

1: strongly related, 2: moderately related and 3: weakly related

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IND2110	INTERIOR DESIGN STUDIO-I	L	T	S	P	C
Version 1.1	Date of Approval:	1	1	4	0	6
Pre-requisites/ Exposure	Visual Arts 1, Model Making 1					
Co-requisites	Building Materials & Construction Technology - I, Visual Arts 1, Model Making 1					

Catalog Description

The aim of this subject is to familiarize students with visual grammar, elements of design and methods of visual composition with various mediums and color. In addition to the earlier, the intention of space design activity will be limited to the level of visual composition of architectural spaces considering human activity and anthropometry. There would be several studio/ design thinking exercises based on the module contents. as described below.

Design Exercise: sleeping area, washroom, cooking area, Small living space, juice stall etc.

Course Objectives

The objective of this course is

To understand the application of visual grammar in the domain of Visual design

- To create composition with various 2D and 3D media with various mediums.
- To develop the ability to translate abstract principles of design into architectural solutions for simple problems.

Course Outcomes

On completion of this course, students will be able to

CO1: Define principles of design and architectural aesthetics
CO2: Evaluate the human activities in built environment
CO3: Measure drawings of simple objects
CO4: Evaluate and analyze 3D form with visual grammar.

Course Content:

Modules	Blooms level*	Number of hours
MODULE 1: Study and Application of Elements and Principles of Design Basic Composition, Elements of design in basic composition, Application of principles of design, Positive and Negative spaces, Additive and Subtractive spaces, Exercises primarily through 2-D & 3-D models of simple geometric.	L1, L2,	10
MODULE 2: Anthropometry Anthropometrical study of various spaces, Application of Anthropometrics, Design of Anthropometrics Cell with minimum space requirements of single unit for a single person, Study the interior spaces by making 3-D views (axonometric and isometric)	L!, L2	10

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MODULE 3: Measured Drawing Introduction to fundamentals of measured drawing, line value, lettering, drawing representation, format for presentation methods and technique of measuring buildings and their details. Measured drawing of simple objects like furniture, detailing in terms of construction, ornamentation, measured drawing of building components like column, door, window, cornice, etc.	L1,L2,L3	20
MODULE 4: Scale and Order in Interior Design Analyzing single activity, anthropometrical data, designing the elements of building e.g. entrance gate design, floor design, door design, Table-Chair, Drafting table etc. Living space, Home stay, Shop, Small Activity space, etc	L1,L2,L3	20

***Bloom's Level:** L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books/ References

- Chiara, J. D., &Callender, J. (1983). Time-Saver Standards for Building Types. McGRaw-Hill International Edition.
- Do, E. Y. L., & Gross, M. D. (2001). Thinking with diagrams in architectural design. Artificial Intelligence Review, 15(1–2), 135–149. https://doi.org/10.1023/A:1006661524497
- Hakim, B. S., & von Meiss, P. (1994). Elements of Architecture: From Form to Place. Journal of Architectural Education (1984-), 47(3), 182. https://doi.org/10.2307/1425121Architecture: Form, Space and Order, Francis D.K. Ching
- Hencke, D. G. (1978). Architectural graphics. Building Operating Management, 25(6), 24–26.
- Janson, H. W., Hitchcock, H.-R., & Giedion, S. (1941). Space, Time and Architecture; The Growth of a New Tradition. Parnassus, 13(5), 179. https://doi.org/10.2307/772093
- Ormiston, R. (2009). Understanding Architecture through Drawing by Brian Edwards. The Art Book, 16(4), 68–68. https://doi.org/10.1111/j.1467-8357.2009.01064_2.x
- Quinan, J., & Alexander, C. (1981). A Pattern Language: Towns, Buildings, Construction. Leonardo, 14(1), 80. https://doi.org/10.2307/1574526
- Roaf, S., & McGill, G. (2018, September 3). Place, time and architecture: the growth of new traditions. Architectural Science Review, 61(5), 267–271. https://doi.org/10.1080/00038628.2018.1502156
- Yin, X., Wonka, P., &Razdan, A. (2009). Generating 3D Building Models from Architectural Drawings: A Survey. IEEE Computer Graphics and Applications, 29(1), 20–30. https://doi.org/10.1109/mcg.2009.9

Modes of Evaluation: Literature Study/ Case Study/ Presentation/ Written Examination

Examination Scheme

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	0	70	70	100	6	3

CT: Class Test; TA: Total Assessment; A: Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	1	2	-	1	-	2	-	-	-	-	1	-	-	-	3
CO 2	1	2	1	-	2	-	-	-	2	2	-	-	1	-	-	-
CO 3	1	3	2	3	-	-	1	-	-	2	-	-	1	-	-	-
CO 4	1	1	1	-	2	-	2	3	2	1	2	2	2	-	-	-

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IND2114	PRESENTATION TECHNIQUES	L	T	S	P	C
Version 1.1	Date of Approval:	0	0	2	0	2
Pre-requisites/Exposure	NA					
Co-requisites	Visual Arts 1					

Catalog Description

The objective of this course is to develop a basic proficiency in creating various graphic forms and objects using calligraphic and typography lettering skills This course introduces the language of type, its practical use and historical grounding.

Course Objectives

- The objective of this course is to develop a basic proficiency in creating various graphic forms and objects using calligraphic and typography lettering skills through analyze a letterform, identifying its distinctive features.
- This course covers compose various letter form to demonstrate an understanding of calligraphic and typography elements , basic terminology , deployment of its various strokes.

Course Outcomes

On completion of this course, the students will be able to

CO1: Understanding calligraphy and typography definition , difference, and its use.
CO2: Practicing and acknowledging the importance of lettering in design.
CO3: Apply his knowledge in practical field
CO4: Understand the basic strokes

Course Content:

Modules	Blooms Level	No. of Hours
Module -1: Introduction to Typography Introduction to Typography. - Historical Perspective. - Anatomy of Letter Form – Typeface Classification: Usage and context. - Setting Text. - Digital Typography. The Grid Document Design. - Design Alphabets. - Typography and Logo Design. - Typography at rice. - Kinetic Typography. - Ambigrams **Typographic Visualization (Self-study / Assignment)** Develop and submit a Typography Portfolio with previous selected class assignments and various creative ideas that	L1, L2,	6
Module –2 - Introduction to Calligraphy Understanding calligraphy - Calligraphy definition – History of Calligraphy – Importance of calligraphy- Modern calligraphy - Tools required for calligraphy.	L1,L2,L3	6

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Module – 3 - Practice Exercises Description: Reading and writing are not naturally learned skills. They have to betaught specifically. Learn different a Calligraphy style of writing requires regular practice. Hence, the students are required to practicein class as well as by given Assignments. **Topics Covered:** English Calligraphy (Compulsory); Hindi Calligraphy (Optional, notmandatory)	L1,L2,L3	6
Module – 4 Basic Strokes of Practice Scribbles with Kalam, Nib, Brush and Calligraphy Pen; Alphabet, sentences and composition of differenttypes; Basic calligraphic strokes for English; Foundational Hand -Majuscules, Miniscules and Numbers; Calligraphic Upper case Alphabets; Calligraphic Lower case Alphabets; Composing Alphabets; Composing a calligraphic paragraph; Square DesignedLetters – Majuscules; Digital – Majuscules, Miniscules and Numbers; Bubble Designed Letters – Majuscules; Rose Designed Alphabets – Majuscules; Old EnglishScript Designs – Majuscules, Miniscules and Numbers; Italic Script Designs – Majuscules, Miniscules and Numbers.	L1,L2,L3	6

B***loom's Level:*** *L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text & References:

- Baron, Nancy. Getting Started in Calligraphy. Sterling Publishing Company, Inc., 1979.
- Chazal, Julien; Calligraphy: A Complete Guide; Stackpole Books, 2013
- Studley, Vance. Left-handed Calligraphy. The Rosen Publishing Group, 1991
- Apte, JagdeeshPandurang ;ChitraroopDevanagari; Pune, February 1960.
- Dalvi, Girish. Anatomy of Devanagari Typefaces. Design Thoughts pp 30-36, 2009.
- Kesavan, Bellary Shamanna, and P.N. Venkatachari, History of Printing and Publishing in India. New Delhi: NBT, 1984
- Graham, Lisa. Basics of design: Layout & Typography for beginners. Cengage Learning, 2005.
- Craig, James, and I.K Scala. Designing with Type: the essential guide to typography. Watso
- Guptill, 2012. 3. Craig, James. Designing with type: A basic course in typography. Watson-Guptill, 1999.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	0	70	70	100	2	3

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	-	1	1	-	1	-	1	-	1	2	-	2	-	-	3
CO 2	1	1	-	1	-	1	-	1	1	1	2	1	2	-	-	3
CO3	1	-	1	1	3	1	-	1	-	1	2	-	2	-	-	-
CO4	1	1	1	-	3	1	1	-	1	-	2	1	2	3	-	3

1: strongly related, 2: moderately related and 3: weakly relate

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Syllabus – Second Semester

IND2209	INTERIOR DESIGN STUDIO-II	L	T	S	P	C
Version 1.1	Date of Approval:	1	1	4	0	6
Pre-requisites/Exposure	Interior Design – I					
Co-requisites	Building Materials & Construction Technology - II, Graphic Skills -1					

Catalog Description

The aim of this subject is to familiarize the students with the design process through small scale projects of human. Habitat. The design activity will be limited to the level of visual composition of architectural and interior spaces considering human activity and anthropometry, building material exploration, colour etc. The projects would connect horizontal circulation reflecting their creative approach drawn from data analysis and climatic consideration to the physical setting. To impart ability to design single functional interior spaces by application of design principles learned in previous semester and to correlate with human activities.

Design Exercise: Bedroom, Living Room, Study Room, Reception Area, Travel Agent Office, Barber Shop, Small Café etc

Course Objectives

The objective of this course is

- To involve students in a design project(s) that will involve simple space planning and the understanding of the functional aspects of good design.
- To involve students in a small-scale building project(s) which will sensitize them to intelligent planning that is responsive to the environmental context.
- To involve students in case study by choosing appropriate examples to enable them to formulate and concretize their concepts.
- To enable the presentation of concepts through various modes and techniques that will move constantly between 2D representation and 3D modeling

Course Outcomes

On completion of this course, students will be able to

CO1: Understand the application of the design process for small scale projects of human habitat.
CO2: Transform the human behavioral needs into program requirements.
CO3: Analyze the information on context and the human space relationship.
CO4: Compose the interior spaces in a design project.

Course Content:

Modules	Blooms level*	Number of hours
MODULE 1: Design Process and Human as user of space Study and differentiate human needs, wants and desire, study of cases for	L1, L2,	12

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different user‟s requirements, Transform the behavioural requirements into space form, Study of relationship among spaces with proximity chart, Storytelling etc.		
MODULE2: Human Activity and Context Study Analyse a context and its surroundings and collect information, Analyse the above information in favour of the usage perspective, Understanding of human scale to the context.	L!, L2	10
MODULE 3: Planning of Spaces Distribution of the human activity spaces along the context considering the context as visual background, Analyse the relationship among the spaces. Verbal presentation on planning of built environment with different mediums.	L1,L2,L3	20
MODULE 4: Detail Design of Interior Spaces with a theme Detail planning and design of interior spaces considering human needs and human anthropometric data with a theme. Application of building materials with colour and texture in detail design. Verbal presentation of Interior Spaces.	L1,L2,L3	20

***Bloom's Level:** L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books/ References

- Béjar, R., Latre, M. Á., Nogueras-Iso, J., Muro-Medrano, P. R., &Zarazaga-Soria, F. J. (2009). An architectural style for spatial data infrastructures. International Journal of Geographical Information Science, 23(3), 271–294. https://doi.org/10.1080/13658810801905282
- Chiara, J. D., &Callender, J. (1983). Time-Saver Standards for Building Types Fourth Edition. McGRaw-Hill International Edition.
- Givoni, B. (2004). Time Saver Standards for Urban Design: Urban Design and Climate. Digital Engineering Library @ McGraw-Hill.
- Head, A. J. (2017). Planning and Designing Academic Library Learning Spaces: Expert Perspectives of Architects, Librarians, and Library Consultants. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.2885471
- USACE. (1997). Human Behavior and the Interior Environment. In Design Guide for Interiors.
- Wolfenden, A., &Chusid, M. (1991). Time-Saver Standards for Building Types: (3rd Edition). Journal of Testing and Evaluation, 19(4), 347. https://doi.org/10.1520/jte12583j

Modes of Evaluation: Literature Study/ Case Study/ Presentation/ Written Examination

Examination Scheme

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	0	70	70	100	6	3

CT: Class Test; TA: Total Assessment; A: Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

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CO, PO and PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	1	1	1	2	--	--	--	--	--	--	-	1	2	--	--
CO 2	1	1	1	1	2	--	--	--	--	--	--	-	1	2	--	--
CO 3	1	1	2	2	1	-	-	-	-	-	-	-	-	1	-	3
CO 4	3	-	2	1	1	-	-	-	-	-	--	-	-	1	-	-

1: strongly related, 2: moderately related and 3: weakly relate

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IND2211	GRAPHICS SKILLS-II	L	T	S	P	C
Version 1.1	Date of Approval:	1	0	2	0	3
Pre-requisites/Exposure	Graphics Skills-I					
Co-requisites	Design-II, Basic Design and Visual Arts-II					

Catalog Description

The aim of this course is to provide the theoretical, practical and pictorial aspect of the architectural drawings to the students. The subject covers concepts of metric drawings and development surfaces familiarize them with isometric and axonometric views and development of the surfaces of basic forms. The subject will be taught in congruence with the design studio, and assignments for the subject will be linked to the design exercises to achieve higher level of learning and understanding the practical application of the same.

Course Objectives

The objective of this course is:

- To familiarize the students with theoretical, practical and pictorial aspects of architectural drawings.
- To develop the perception and presentation of simple architectural forms and buildings.
- To introduce the development of the basic forms in architecture.
- To equip the students with visualization and surface development of complex forms.

Course Outcomes

On completion of this course, the students will be able to

CO1: Recognize the need to combine the use of manual drawing tools and techniques for drafting and freehand drawing for architectural design communication.

CO2: Produce 3- Dimensional Architectural drawings and forms by using drawings/sketching and manual techniques.

CO3: Produce surface development of the simple geometric forms.

CO4: Produce and visualize the surface development of the complex architectural forms.

Course Content:

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Metric Drawing Types, uses and advantages, Isometric, Axonometric and Pictorial views, Metric Drawing and projection and their Dimensioning, Metric of plane figures composed of straight lines, Metric of circles, Metric of simple and complex block.	L1, L2, L3	06
MODULE 2: Isometric and Axonometric Drawings Preparation of Isometric and Axonometric views of the 3d composition of simple geometric forms, architectural manifestation and exploded Isometric of furniture and architectural plans.	L2, L3, L4	12
MODULE 3: Development of Surfaces of simple form Development of surfaces of cubes, prisms, cylinders, pyramids, cones and spheres.	L1, L2, L3	12
MODULE 4: Development of Surfaces of complex composition of form Development of surfaces of composition of cubes, prisms, cylinders, pyramids, cones and spheres.	L3, L4, L5	6

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**Bloom's Level:* *L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

- Bhatt, N.D. (53rd Edition 2014). *Engineering Drawing*: Charotar Publishing House Pvt. Ltd.
- Dhawan, R.K.(3rd Revised Edition 2006). *A textbook of Engineering Drawing (In First Angle Projection)*: S Chand & Company.
- Ramsey & Sleeper. (Sixth Edition 1970). *Architectural Graphic Standards:* John Wiley & Sons.
- Shah, P.J. (Revised Edition 2013). *Textbook of Engineering Drawing*: S Chand (G/L) & Company Ltd.

References

- Ching, Francis D.K. (6th Edition 2015). *Architectural Graphics*: John Wiley & Sons.
- Ganesan, R., & Devarajan, V. (1998). Intersecting features extraction from 2D orthographic projections. *CAD Computer Aided Design*, *30*(11), 863–873. https://doi.org/10.1016/S0010-4485(98)00043-8
- Williams, E. (2001). Lettering. *Eurostitch Magazine*, *9*(51), 28–29. https://doi.org/10.1007/978-94-010-2948-3_17

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	3	3

CT: Class Test; TA: Total Assessment; A: Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	--	3	--	--	--	2	--	--	--	--	--	1	2	--	--
CO2	1	--	2	--	--	--	--	--	--	--	--	--	1	2	3	--
CO3	1	--	2	--	--	--	--	--	--	--	--	--	1	2	3	--
CO4	1	--	3	--	--	--	--	--	--	--	--	--	1	2	3	--

1*: strongly related, 2: moderately related and 3: weakly related*

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IND2212	ART & GRAPHICS-II	L	T	S	P	C
Version 1.1	Date of Approval:	1	0	2	0	3
Pre-requisites/Exposure	Art & Graphics 1, Presentation Techniques					
Co-requisites	Design II					

Catalog Description
The objective is to make the students aware of all the possible graphic skills used in interior design and provide a wider knowledge to the students about the various levels of graphic drawing. Familiarize with the principles and theories of graphics.

Course Objectives
The objective of this course is
- To introduce Art and appreciation its philosophies.
- To develop sensitivity towards sculpture and mural as an integral part of architecture.
- To familiarize with principles and theories of arts and architectural composition.
- To utilize the skills for rendering and paintings.

Course Outcomes
On completion of this course, students will be able to
CO1: Create 2d, 3D Graphic forms, size, and their proportions
CO2: Create art forms with different mediums
CO3: Apply rendering techniques for indoor and outdoor painting.
CO4: Create life-long connection in one‟s pursuit for painting and other art forms

Course Content:

Modules	Blooms level*	Number of hours
Module I: Art and Philosophy An introduction to the basic formal concepts in the two-dimensional arts and the principles of aesthetic organization. Using Shapes to construct aesthetically pleasing compositions.	L1, L2,	12
MODULE 2: 2D Compositions An introduction to the basic formal concepts in the two-dimensional arts and the principles of aesthetic organization. Using Shapes to construct aesthetically pleasing composition, Introduction to Sciography	L!, L2	20
MODULE 3: Graphical representation Rendering techniques, dot rendering, point rendering of still and live objects, Graphical representation of furniture, human figures in 2D &3D, Rendering techniques for textures, materials, finishes, etc.	L4, L5, L6	20
MODULE 4: Painting Different types of painting styles and their masters and philosophy, Indoor and outdoor painting – Exercise involving Water colour – Water soluble colour pencil –	L4, L5, L6	20

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Tempra – Acarali – Water soluble oil colour – Oil colour – Pen and ink – Brush – Air brush – Mixed mediums – Study of multi-colour and 3D effects from nature and built environment		

***Bloom's Level:** L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Textbooks / References

- Pen & Ink Drawing: A Simple Guide by Book by Alphonso Dunn
- A Visual Dictionary of Architecture, Francis D.K. Ching
- Creative Interiors (Design of Enclosed Space), Shashi Jain
- Interior design illustrated, Francis D.K. Ching
- Home Plumbing (The David & Charles Manual of), Ernest Hall
- House Book (The Complete Guide to Home Design), Terence Conran
- Architecture: Form, Space and Order Francis D.K. Ching
- Window Fashion, Charles T. Randall
- Illustration + Perspectives (In Pantone Colors), Eiji Mitooka
- Elements of Architecture, Meiss Pieree Von
- Window Fashion, Charles T. Randall
- Illustration + Perspectives (In Pantone Colors), Eiji Mitooka

Modes of Evaluation: Literature Study/ Case Study/ Presentation/ Written Examination

Examination Scheme

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	3	3

CT: Class Test; TA: Total Assessment; A: Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5		PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	1	1	1	2		--	--	--	--	--	--	-	1	2	--	--
CO 2	1	1	1	1	2		--	--	--	--	--	--	-	1	2	--	--
CO 3	1	1	2	2	1		-	-	-	-	-	-	-	-	1	-	3
CO 4	3	-	2	1	1		-	-	-	-	-	--	-	-	1	-	-

1: strongly related, 2: moderately related and 3: weakly related

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IND2214	FUNDAMENTALS OF STRUCTURES	L	T	S	P	C
Version	Date of Approval:	2	0	0	0	2
Pre-requisites/Exposure	Building Constructions					
Co-requisites	NA					

Catalog Description

On the successful completion of the course students will be able to, understand and execute properties of Structures on Interiors, Identify practical problems to obtain solutions involving Structure Solution in Renovation Projects.

(NB: Submission of Work record is compulsory for all Modules and will be part of the Final Course Evaluation)

Course Objectives

- This course aims at developing basic Structural knowledge for interior design students to understand. structural concepts complex form and structure understanding.
- This course will help to understand and identifying practical problems, on-site issues, designing patterns to obtain solutions involving existing structures, renovation, alterations of interior while forming the concept.
- Forming a structure to a designer's idea is one of the most important steps for a perfect execution. and this step teaches students and patrons the basics of the same.

Course Outcomes

On completion of this course, the students will be able to

CO1: Basics of Structures in Interiors
CO2: Calculation of Structures and Understanding of Spaces
CO3: Basics of Structure Alterations
CO4: Case Study of Renovation Structures

Course Content:

Modules	Blooms level*	Number of hours
Module 1: Basic of Structures in a building and its types in Residential & Commercial spaces Basic of Concept to understand and importance to Structures Understanding Beams & Columns, Foundation its types and sizes.	L2, L2	5
Module 2 Calculation of Areas, understanding how to combine structure and design together. Basics of Structure placement in Design and understanding spaces. Material knowledge of Structures. Designing with Structure understanding of Staircase, Toilet, Kitchen.	L1, L2	5

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Module 3 Understanding Alteration and Renovation how to perform in Interior Design Structure Learning how to design with the existing structure. Understanding existing HVAC services and how to convert the structure into design.	L1, L2	3
Module 4 Case Study on Existing Residential Spaces understanding predefined Structures and Renovate designing on it.	L3, L4	4

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evauation*

Text & References:

- Dechiara & callender, Time saver standards for Architectural design data.
- S.C.Rangwals – Engineering materials – Charotar Publishing, Anand.
- Bindra, S.P. and Arora, Building Construction: Planning Techniques and methods of Construction
- William. J. Guinness; Mechanical and Electrical Systems for Buildings
- Derek Clements-Croome, Derek J. Croome, Intelligent buildings, Thomas Telford Books, London, 2004.
- Kim, Jong-Jin; Qualities, Use, and Examples of Sustainable Building Materials, CSS,University of Michigan, 1998.
- Trachte, Sophie; Advanced and Sustainable Housing Renovation, A guide for Designers and Planners. UCL, 2010

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme							**Total Marks**	**Credits**	**Duration of Exam (hr)**
Internal Assessment				**External Assessment**					
CT	**TA**	**A**	**Total**	**ESE**	**ESJ**	**Total**			
10	15	5	30	70	0	70	100	2	3

CT: Class Test, HA: Home Assignment, Seminar or Quiz; EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**P011**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	1	3	1	2	1	1	1	1	1	1	1	1	1	1	1	2
CO 2	1	3	1	2	1	1	2	1	1	2	1	1	1	1	1	3
CO 3	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	3
CO 4	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	3

1: strongly related, 2: moderately related and 3: weakly related

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IND2215	CLIMATE RESPONSIVE INTERIORS	L	T	S	P	C
Version	Date of Approval:	2	0	0	0	2
Pre-requisites/Exposure	Building Constructions					
Co-requisites	NA					

Catalog Description

The aim of this course is to obtain knowledge required for understanding the influence of climate on Interiors. This course helps to acquaint students to various concepts of climate and its use in Interiors and makes them understand the concept of human thermal comfort as an essential function of the buildings in accordance with climate responsive materials, ventilation and air movement. The students are exposed to the various design strategies for building in different types of climatic zones. The subject will be taught is congruence with the Design studio, and assignments for the subject will be linked to the design exercises to achieve higher level of learning and understanding the practical application of the same (NB: Submission of Work record is compulsory for all Modules and will be part of the Final Course Evaluation**)**

Course Objectives

The objective of this course is

- To acquaint the students to various concepts of climate analysis and its use in Interiors.
- To familiarize students with human thermal comfort as an essential function of building.
- To familiarize students with the design and settings for buildings for daylight and factors that influence temperature.

Course Outcomes

On completion of this course, the students will be able to

CO1: Basics of Climate impact in Interiors
CO2: Analyze movement of sun in relation to earth and design shading devices. And analyze how to avoid sun‟s heat but utilize maximum daylight
CO3: Analyze factors affecting climate and its elements
CO4: Analyze different climatic zones and their characteristics and design shelters in response to various climate zones. And analyze relation between transfer of heat between buildings and environment and design buildings for thermal comfort

Course Content:

Modules	Blooms level*	Number of hours
Module 1: Introduction to Climate • Importance of climate in architecture, factors affecting climate, elements of climate- Solar radiation, temperature, wind, humidity and precipitation and their measurement.	L2, L2	3

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Module 2: Climatic zones and human thermal comfort Climatic zones, macro and micro climate, elements of climate and climatology data required for design of buildings in different climatic zones, Characteristics of tropical climate, macroclimate and microclimate. Study of various shelters in response to various climate zones in the tropical belt of India. Study of body‟s heat production and heat loss, comfort zone, bio-climatic chart and effective temperature, Isopleths	L1, L2	6
Module 3: Solar chart, shading devices and Daylight Method of recording the position of sun in relation to earth, solar chart, azimuth, altitude, incidence, using shadow angle protractor for designing shading devices. Apparent movement of sun, solar radiation and intensity on surfaces and buildings in different latitude, sun path diagram, shading device and its design, heliodon and its use; Opaque building and heattransfer through its multi-layered envelope; Transparent surface and solar radiation on it, absorbance, reflectance, transmittance and remittance.Fenestration, lighting level and glare, amount of light, sky as a source of light and daylight factor, effect of different types of fenestrations, their size, shape in different planes with and without obstructions, Principles of day lighting in Tropics	L1, L2	8
Module 4: Climate of Northern India Planning aspects, Materials used, Constructional details, Climatic factors influencing the planning of • Kashmir – Typical Kutcha houses, mosque, Dhoongas(Boathouses), Ladakhi houses, bridges • Himachal Pradesh – Kinnaur houses • Uttar Pradesh – Domestic housing of Uttar Pradesh • Bengal – Bangla (Rural house form), Aat Chala houses – change from Bangla to Bungalow, Kutcha & Pucca architecture of Bengal. Nagaland – Naga houses & Naga village, Khasi houses Factors influencing the planning aspects, materials of construction& constructional details of the above.	L3, L4	7

**Bloom's Level:L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evauation*

Text & References:

- Koenigsberger, O. H. (1975). Manual of Tropical Housing and Building Climatic Design: University Press
- Krishan, Arvind. (1st Edition 2017). Climate Responsive Architecture: A Design Handbook for Energy Efficient Buildings: Tata McGraw-Hill Education
- S.C.Rangwals – Engineering materials – Charotar Publishing, Anand.
- Bindra, S.P. and Arora, Building Construction: Planning Techniques and methods of Construction
- William. J. Guinness; Mechanical and Electrical Systems for Buildings
- Derek Clements-Croome, Derek J. Croome, Intelligent buildings, Thomas Telford Books, London, 2004.
- Kim, Jong-Jin; Qualities, Use, and Examples of Sustainable Building Materials, CSS,University of Michigan, 1998.
- Trachte, Sophie; Advanced and Sustainable Housing Renovation, A guide for Designers and Planners. UCL, 2010.

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	2	3

CT: Class Test, HA: Home Assignment, Seminar or Quiz; EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO 1	1	3	1	2	1	1	1	1	1	1	1	1	1	1	1	2
CO 2	1	3	1	2	1	1	2	1	1	2	1	1	1	1	1	3
CO 3	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	3
CO 4	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	3

1: strongly related, 2: moderately related and 3: weakly relate

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IND2213	HISTORY OF INTERIOR DESIGN - I	L	T	S	P	C
Version	Date of Approval:	2	0	0	0	2
Pre-requisites/Exposure	History of Design and Culture					
Co-requisites	Visual Arts – II					

Course Catalog

The aim of this course is to make students understand the application of design principles in interiors. The subject Interior Design is a specialized course offered in architecture which deals with functionality, safety and provides an aesthetically pleasing space for users. This semester will deal with minute details and construction techniques involved in interior design. The subject will also be integrated with a small component of design exercise with the current or previous semester design works. The course will include several exercises in relation to sit visits, market surveys, presentation, reports, etc.

Course Objectives

- To provide students a critical overview of the history of interior design, its connection to different periods and cultures, and its integral relationship with architecture and decorative arts.
- To give students a Global & Indian perspective of achievements and characteristics in interior design, and decorative arts and their relevance and impact on society.
- To develop an understanding of determinants that helped shape art forms & orders in Classical Periods & Indian architecture, interior design and decorative arts over time.

Course Content:

Modules	Blooms level*	Number of hours
MODULE 1: Introduction How Design is a product of the period and culture that created it. Interior Design as a physical representation of political, religious, aesthetic, socio-economic, or other values shared by society. Interior design as a representation ofspecific ideals, and its influence on society and culture.	L1, L2, L3	06
MODULE 2: Study of history of Furniture Design Characteristics & Significance of Furniture through the ages, History of furniture in the Middle Ages, 19th Century & 20th Century	L2, L3, L4	6
MODULE 3: Decorative arts of West: Gothic, Renaissance & Baroque Period Interior Design elements, styles, schemes and art forms of Early Christian , Byzantine and Romanesque Period. Gothic, Renaissance and Baroque Period Basic overview of Interior Design elements,styles, schemes and art forms like Rose Window, Vaults, etc.	L1, L2, L3	6
MODULE 4: North and South Indian Styles and their different interior design elements, styles and decorative art forms. Developments in	L3, L4, L5	6

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Rajputana (Rajasthan) period with respect to Interior Design Elements, Art Forms & Styles. Art forms of India - Madhubani Paintings, Tanjore Paintings, Kalamkari Work, etc. Developments in Mughal period with respect to Interior design elements, artsforms and styles. Apprise about furniture and interior finishes, elements of mosque, etc.		

***Bloom's Level:** L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

- Webb and Schaeffer; *Western Civilisation Volume* I; VNR: NY:
- The History of Arch. in India, Chrictophes Tadgell
- Interior design & space planning, Dechiara Pabero Zelnik
- Interior design illustrated , Francis D.K. Ching
- Islamic Architecture in Interior, Satish Grover
- The Best Interior India, Anuradha Mahindra
- Indian Interior, Angelika Taschen

References

- Hancock, J. E., & Kostof, S. (1986). *A History of Architecture: Settings and Rituals.* Journal of Architectural Education (1984-), 39(3), 31. https://doi.org/10.2307/1424785
- Roth, L. M., & Roth Clark, A. C. (2018). *Understanding architecture: Its elements, history, and meaning. Understanding Architecture: Its Elements, History, and Meaning* (pp. 1–745). Taylor and Francis. https://doi.org/10.4324/9780429495588
- Spiro Kostof.(1985). *A History of Architecture: Setting and Rituals,* Oxford University Press, London.
- Vincent Scully: *Architecture; Architecture – The Natural and the Man Made*: Harper Collins Pub: 1991

Modes of Evaluation: Literature Study/ Case Study/ Presentation/ Written Examination

Examination Scheme

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	2	3

CT: Class Test; TA: Total Assessment; A: Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	2	--	--	--	--	--	--	--	--	--	--	--	--	1	2
CO 2	1	2	--	--	--	--	--	--	--	--	--	--	--	--	1	2
CO 3	1	2	--	--	--	--	--	--	--	--	--	--	--	--	1	2
CO 4	1	2	--	--	--	--	--	--	--	--	--	---	--	--	1	2

1: strongly related, 2: moderately related and 3: weakly related

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IND2210	BUILDING MATERIALS & CONSTRUCTION TECHNIQUES – II	L	T	S	P	C
Version 1.1	Date of Approval:	1	1	1	0	3
Pre-requisites/ Exposure	NA					
Co-requisites	Materials & Construction Techniques – I					

Catalog Description

The aim of this course is to make students familiar with basic concepts of building materials and construction techniques in the field. The study in the semester increases in complexity from shallow and spread foundations to deep foundations. Study of openings will proceed to the study of Arches and its classification, to familiarize the students with the temporary supporting structures required for construction.

Course Objectives

The objective of this course is

- To introduce students to details of shallow and deep foundations.
- To understand openings and the use and construction details of doors and windows with timber shutters and frames.
- To understand the use of construction building materials like clay and timber.
- Students will also learn about arches.

Course Outcomes

On completion of this course, the students will be able to

CO1: To develop understanding about foundations and the constructions techniques involved.

CO2: To recognize the various types of temporary supporting structures used in different locations in the building industry.

CO3: To understand the importance of wooden carpentry joinery details used in openings.

CO4: To evaluate the best suitable Joinery in openings and become aware of conventional and new clay products used.

Course Content:

Modules	Blooms level*	Number of hours
MODULE 1: Foundations: Shallow, spread & Deep Shallow foundation: Types, Isolated, combined and raft foundations and their construction techniques. Deep Foundation: Grillage foundations, Piles foundations, Caisson foundations, etc.	L1, L2, L3	8
MODULE 2: Temporary Supporting Structures Form work and shuttering for different types of RCC elements, trench timbering, scaffolding, shoring and underpinning.	L1, L2	8
MODULE 3: Timber Doors and Windows Timber: Structure and timber trees, varieties of timber, defects in timber, decay of timber, Qualities of timber for construction, seasoning, storage and preservation of timber, properties and strength of manufactured products, veneers, plywood, block boards, fiber board, etc. • Doors: classification of doors; (a) paneled doors. (b) ledged and battened doors, (c)	L1, L3,L4	10

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ledged, braced and battened doors, (d) framed, ledged, braced, and battened doors (e) flush doors • Windows: Timber windows; Casement window and its details		
MODULE 4: Arches and Clay Product Classification of Arches on the basis of geometrical shape, materials, construction techniques, viz. flat, segmental, semi-circular, Tudor, circular, elliptical, semi-elliptical, venetian, Florentine arches, etc. Illustration of terminology for arches, construction detailing and methods of centring. Clay Products: Flooring and roofing tiles, their properties, manufacturing process, laying of tles, etc.. Clay products like terra-cotta, earthenware, stoneware, porcelain, mud – its stabilization and uses, etc.	L1, L3,L4	10

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books:

- Barry, R. (1999). The Construction of Buildings Vol. 2. 5th Ed. New Delhi: East-West Press.
- Chudley, R. (2008). Building Construction Handbook. 7th Ed. London: Butterworth-Heinemann.
- McKay, W. B. (2005). Building Construction Metric Vol. I–IV. 4th Ed. Mumbai: Orient Longman.
- Rangwala, S. C. (1963). Building Construction: Materials and types of Construction. 3rd Ed. New York: John Wiley and Sons

References:

- Clayton, C. R. (1987). Materials science and engineering: An introduction. Materials Science and Engineering, 94, 266–267. https://doi.org/10.1016/0025-5416(87)90343-0.
- Fernandes, F. M., Lourenço, P. B., & Castro, F. (2010). Ancient Clay Bricks: Manufacture and Properties. In Materials, Technologies and Practice in Historic Heritage Structures (pp. 29–48). Springer Netherlands. https://doi.org/10.1007/978-90-481-2684-2_3
- Freidin, K., & Erell, E. (1995). Bricks made of coal fly-ash and slag, cured in the open air. Cement and Concrete Composites, 17(4), 289–300. https://doi.org/10.1016/0958-9465(95)00017-7
- Saikia, N., & De Brito, J. (2012, September). Use of plastic waste as aggregate in cement mortar and concrete preparation: A review. Construction and Building Materials. https://doi.org/10.1016/j.conbuildmat.2012.02.066

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme							**Total Marks**	**Credits**	**Duration of Exam (hr)**
Internal Assessment				**External Assessment**					
CT	**TA**	**A**	**Total**	**ESE**	**ESJ**	**Total**			
10	15	5	30	70	0	70	100	3	3

CT: Class Test; TA: Total Assessment; A: Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

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CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	1	2	--	1	--	--	-	-	-	--	2	2	1	-	--
CO 2	1	1	2	--	1	--	--	-	-	-	--	2	2	1	-	--
CO 3	1	1	2	--	1	--	--	-	-	-	--	2	2	1	-	--
CO 4	1	1	2	--	1	--	--	-	-	-	-	2	2	1	-	-

1: strongly related, 2: moderately related and 3: weakly related

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IND2206	FUNDAMENTALS OF APPLIED ERGONOMICS	L	T	S	P	C
Version	Date of Approval:	2	-	-	-	2
Pre- requisites/ Exposure	NA					
Co-requisites	Furniture Workshop - 1					

Catalogue Description

The aim of this course is to familiarize the students with Ergonomics which is a scientific discipline concerned with the understanding of interactions among humans and the design of the system in order to optimize human well-being and overall system performance. Through this course the students will learn about the basic concept about Ergonomics/Human Factors and its implementation in design and design process.

Course Objectives

The objective of this course is:

- To introduce the principles underlying the place of people in work systems, their abilities and limitations, sothat tasks and work generally may be designed for effectiveness, efficiency and health and safety.
- To increase awareness of the need for and role of ergonomics in occupational health.
- To understand the breadth and scope of occupational ergonomics
- To familiarize the students with the application of ergonomic principles to design of workplaces and the prevention of occupational injuries.

Course Outcomes

On completion of this course, the students will be able to

CO1: Analyze the application and benefits of Ergonomics.
CO2: Describe the various features of ergonomics.
CO3: Design the office computer workstation.
CO4: Identify the work methods and time required for work environment to increase productivity.

Course Content:

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Ergonomics The evolution of Ergonomics; Reasons to use ergonomics, Micro and Macro- ergonomics, Areas of ergonomics - Physical Ergonomics, Cognitive Ergonomics, Organizational Ergonomics; Applications and benefits of ergonomics; Principles of ergonomics.	L1,L2	4

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MODULE 2: Feature of Ergonomics Anthropology; Anthropometry - Static Anthropometry; Dynamic Anthropometry;The human body types – Somatotypes – Ectomorphs, Mesomorphs, Endomorphs, Ectomorphs; Measuring Procedures; Biomechanics; Factors to be considered in Biomechanics – Force, Joint: Simple Joint- Compound Joint- Complex Joint, Range of Motion; Physiology; Psychology; *Human Senses***:** Body sensors, vision sense, color theories, auditory sense, and smelling sense, tasting sense, touching sense, human body interaction with environment, thermoregulation of human body, workingin polluted air, working at high altitude, effect of vibration on human body.	L1,L2	4
MODULE 3: Office Workstation Theories of healthy standing and sitting, free posturing, ergonomics design the office computer workstation.	L1,L2	6
MODULE 4: Methods, Standards and Work Design Determination of work content, workstation, work methods, and times required for work environment to increase productivity, eliminate waste, and decrease occupationalinjury/illness.	L1,L2	4
MODULE 5: Case study (Self-study / Assignment) Plan a case study in three different areas of „Human Factors Affecting Design" aimsto improve the fit of products to their users and support user-centered design. Find out a core issues in relevant to the following aspects: Identify user preferences and usage-related phenomena and Product usage as a situated activity- User behavior in usage practices - Functional meaning attribution by users - The experience of comfort Users" physical aspects in terms of body dimensions, strengths body joint motions.	L3,L4,L5	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text/ References:

- Bridger, RS(2003). Introduction to Ergonomics, 2nd Edition, Taylor &Francis.
- Dul, J. and Weerdmeester,B(1993). .Ergonomics for beginners, a quick reference guide, Taylor & Francis.
- Sir Banister Fletcher.(1996).A History of Architecture, University of London, The Antholone Press.
- Singh, S (Ed.) (2007) ,Ergonomics Interventions for Health and Productivity, Himanshu Publications, Udaipur, New Delhi,
- Green, W.S. and Jordan(1999),P .W, Human Factors in Product Design, Taylor & Rancis, .
- Kroemer(2001). Karl HE; Ergonomics: how to design for ease and efficiency. Pearson College Division,
- S Pheasant, C M. Haslegrave(200)5; Bodyspace: Anthropometry, Ergonomics and the Design of Work, CRC Press.

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Modes of Evaluation: Literature Study/ Case Study/ Presentation/ Written ExaminationScheme

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	2	3

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	1	--	--	--	--	--	--	--	1	--	1	--	--	--
CO2	--	--	1	--	--	--	--	--	--	--	1	--	2	--	--	--
CO3	--	1	--	--	--	--	--	--	--	--	2	--	1	--	--	--
CO4	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	1

1: strongly related, 2: moderately related and 3: weakly related

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Syllabus – Third Semester

IND2312	INTERIOR DESIGN STUDIO – III	L	T	S	P	C
Version 1.1	Date of Approval:	1	1	4	0	6
Pre-requisites/Exposure	Interior Design Studio–II					
Co-requisites	Building Materials & Construction Technology - II, Graphic Skills -1I					

Catalog Description
The aim of this course is to provide a clear understanding about the design elements and principles followed while designing interiors of a Residential unit like a house using different materials and architectural styles. The interior design objectives include Function; flexibility, timelessness and Universal design.

Design Exercise: Residences - Villa, Townhouse, Apartments, Office cum Residence, etc. Emphasis shall be on the composition, aesthetics and innovation. Holistic concepts in residential interiors – ability to integrate various individual spaces into one theme – treatment of patios, courtyards, verandahs & other semi sheltered spaces – integration of built form and open spaces.

Course Objectives
The objective of this course is

- To develop sensitivity towards existing informal settings and elements of built space.
- To critique the materials, construction techniques and color theories used in the elements of built forms.
- To create an understanding of the inter relationships amongst various elements– form, function, space planning, user perception and behavior and culture.
- To understand the relationship between form and spaces and the importance of aesthetics.
- To enable the presentation of concepts through sketches and models and drawings.

Course Outcomes
On completion of this course, students will be able to
CO1: Collect data from standards, case studies for the current project.
CO2: Analyze data collected with relevance to the current project.
CO3: Integrate learning from other allied subjects to the design proposal.
CO4: To be able to create a universal interior for the final project.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to the Design Problem Introduction to the design problem. Case studies. Collecting relevant data for the given design problem. Synthesising and analysing the collected data.	L1, L2,	10
Case studies, Site Studies and Literature Studies Case Studies – primary (existing Residences (2-3 Bedrooms)) and secondary (Residences (2-3 Bedrooms) through Literature); Literature Review –	L!, L2	10

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Interior design schemes, std layouts etc. Comparative Analysis and Area statement		
MODULE 3: Design Development Relation to various functional aspects of the design problem. Use of bubble diagram, flow diagrams, zoning of site, etc. conceptual design. Finalization of design proposals – schematic 2D/3D single line/conceptual level site plan, floor plan, elevations, sections.	L1,L2,L3	20
MODULE 4: Final design Proposals Preparation of Presentation Drawings of the Final Design Proposal. Enhancement of presentation skills using multiple media. Creation of 3-D models based on the design. Preparation of perspective views (internal & external). Presentation of studies and design proposal through submission of sheet work – drawings and views as well as scaled models.	L1,L2,L3	20

***Bloom's Level:** L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books/ References

- Béjar, R., Latre, M. Á., Nogueras-Iso, J., Muro-Medrano, P. R., &Zarazaga-Soria, F. J. (2009). An architectural style for spatial data infrastructures. International Journal of Geographical Information Science, 23(3), 271–294. https://doi.org/10.1080/13658810801905282
- Chiara, J. D., &Callender, J. (1983). Time-Saver Standards for Building Types. McGRaw-Hill International Edition. • Givoni, B. (2004). Time Saver Standards for Urban Design: Urban Design and Climate. Digital Engineering Library @ McGraw-Hill, 1–14.
- Head, A. J. (2017). Planning and Designing Academic Library Learning Spaces: Expert Perspectives of Architects, Librarians, and Library Consultants. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.2885471
- Julius, P., &Zelnik, M. (1979). Human Dimension & Interior Space. Vasa. Retrieved from http://medcontent.metapress.com/index/A65RM03P4874243N.pdf
- Wolfenden, A., &Chusid, M. (1991). Time-Saver Standards for Building Types: 3rd Edition. Journal of Testing and Evaluation, 19(4), 347. https://doi.org/10.1520/jte12583j
- Head, A. J. (2017). Planning and Designing Academic Library Learning Spaces: Expert Perspectives of Architects, Librarians, and Library Consultants. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.2885471

Modes of Evaluation: Literature Study/ Case Study/ Presentation/ Written Examination

Examination Scheme

Evaluation Scheme							**Total Marks**	**Credits**	**Duration of Exam (hr)**
Internal Assessment				**External Assessment**					
CT	**TA**	**A**	**Total**	**ESE**	**ESJ**	**Total**			
10	15	5	30	0	70	70	100	6	3

CT: Class Test; TA: Total Assessment; A: Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

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CO, PO and PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	1	1	1	-	2	--	3	--	--	--	-	1	-	-	-	3
CO 2	1	-	1	3	1	-	3	--	--	2	-	-	1	-	-	-
CO 3	1	2	1	-	1	-	-	-	-	2	-	-	1	-	-	-
CO 4	3	-	2	-	1	2	1	2	-	2	2	2	2	-	-	-

1: strongly related, 2: moderately related and 3: weakly related

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IND2315	GRAPHICS SKILLS-III	L	T	S	P	C
Version 1.1	Date of Approval:	0	0	4	0	2
Pre-requisites/Exposure	Graphic Skills – II					
Co-requisites	Design – III					

Catalog Description
The aim of this course is to develop essential manual skills such as proficiency in drawing, largely used as primary mode of communication of ideas in architectural design. Students will be introduced to a variety of tools and techniques for visual expression with emphasis on manual drawing. Architectural Graphics-II introduces advanced techniques for architectural drawing such as perspective projection, mix-media renderings etc. The course would help students identify suitable methods of representation and methods in different built environment scenarios.

Course Objectives
The objective of this course is

- To familiarize the students with One Point Perspective visualization of architectural drawing.
- To familiarize the students with Two Point Perspective visualization of architectural drawing.
- To introduce a variety of tools and techniques for visual expression with emphasis on manual drawing.

Course Outcomes
On completion of this course, the students will be able to

CO1: Recognize the need to combine the use of manual drawing tools and techniques for drafting architectural design communication.
CO2: Apply the projected drawing method of exterior and interior perspective.
CO3: Render the drawings in different mediums.
CO4: Draw views demonstrating the play of light and shadows.

Modules	Blooms level*	Number of hours
MODULE 1: One Point Perspective Drawing One perspectives of combination of geometrical forms, Building exterior and interior perspectives.	L3, L4	12
MODULE 2: Two Point Perspective Drawing Two perspectives of combination of geometrical forms, Building exterior and interior perspectives. Introduction to three-point perspective and basic exercises based on the same	L3, L4	12

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MODULE 3: Rendering Rendering perspectives in different media (Dry and water based color and ink etc.). Presentation techniques in different types of rendering and materials. Variation in color/ ink, as per light position. Use of basic plantation, vehicles etc to introduce scale to building perspectives.	L4,L5	6
MODULE 4: Sciography Values in shades and shadows, constructing plan shadows (point, line and plane), Constructing shadows in elevations (Point, line and Plane). Short- cut methods for constructing shadows. Introduction of sciography in perspective drawings.	L4,L5	6

***Bloom's Level:** L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books:

- N D Bhatt,(2014).*Engineering Drawing,(Plane and solid geometry),*Delhi, Charotar Publishing house.

References

- Francis D.K. Ching (1979),*Architecture: Form, Space and Order,* John Wiley& Sons Publication
- Heller Robert and Salvadori Mario (1975),*Structure in Architecture*, Englewood Cliffs, N.J.Prentice-Hall
- Parmar V.S.(1973), *Design Fundamental in Architecture,* Somaiya PubLications

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	2	3

CT: Class Test; TA: Total Assessment; A: Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	--	3	--	--	--	2	--	--	--	--	--	1	2	--	--
CO 2	1	--	2	--	--	--	--	--	--	--	--	--	1	2	3	--
CO 3	1	--	2	--	--	--	--	--	--	--	--	--	1	2	3	--
CO 4	1	--	3	--	--	--	--	--	--	--	--	--	1	2	3	--

1: strongly related, 2: moderately related and 3: weakly related

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IND2313	BUILDING MATERIALS & CONSTRUCTION TECHNIQUES – III	L	T	S	P	C
Version 1.1	Date of Approval:	1	1	1	0	3
Pre-requisites/Exposure	NA					
Co-requisites	Materials & Construction Techniques – II					

Catalog Description

The aim of this subject is to introduce students with the classification, types and details of construction of roofs. And to give complete knowledge about the various types of flooring and its construction details. To familiarize students with different types of vertical circulation possibilities. Types and construction details of all vertical circulation elements will be dealt with in detail. Students will also learn about water proofing methods and techniques at all building levels.

Course Objectives

The objective of this course is

- To understand timber single and double roofs and timber floors.
- To comprehend the various modes of vertical circulation through live examples.
- To learn properties of various construction materials like waterproofing materials, clay used as flooring materials and timber used in the building industry.

Course Outcomes

On completion of this course, the students will be able to

CO1: To understand timber single and double roofs.
CO2: To understand timber floor and partition.
CO3: Make students aware of various types of staircases with reference to its placement, geometry and material used.
CO4: To understand importance, stages, methods and techniques of waterproofing,

Modules	Blooms level*	Number of hours
MODULE 1: Timber: Roofs Classification of roofs: (a) Single roofs; flat roofs, lean-to roofs, double lean-to, couple, close couple and collar roofs (b) Double or Purlin Roofs. (c) Trussed rafter roofs (d) Triple or framed roofs (e) Common roof coverings with its laying Waterproofing, rainwater gutter details. King post and Queen post roof trusses	L1, L2	10
MODULE 2: Timber- Floor & Partitions Timber floors: construction techniques, types of timber floors: single, double and triple joist timber floors, Furnishing of floors with different floor finishes like cement, coloured cement, mosaic, terrazzo, tiles etc. special consideration for rubber and PVC flooring, methods of laying Types of timber partitions: Single, double and flushed timber partitions	L1, L2, L3	8
MODULE 3: Introduction to Vertical transportation and Staircases Description of staircases, technical terminology involved, classification of	L1, L3,L4	10

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staircases based on shape, material and its construction details. • Vertical section through staircases with detailing at various levels of staircases-Dog legged, Circular, Open Well, Spiral, Elliptical, etc. Classification also based on materials like wooden, steel and RCC • Staircase layout and its construction details, different elements of staircases, etc. • Design and details of construction of staircases in timber, stone, RCC and steel. • Cladding materials using traditional and contemporary materials		
MODULE 4: Water Proofing Materials • Waterproofing details in different levels: details in simple foundations, walls, roofs, sills, lintels and roofs in RCC, RB and steel, damp proof details of plinth, sill, lintel, and roof level. • Water proofing materials and systems for basement	L1, L3,L4	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

- Barry, R. (1999). The Construction of Buildings Vol. 2. 5th Ed. New Delhi: East-West Press.
- McKay, W. B. (2005). Building Construction Metric Vol. I–IV. 4th Ed. Mumbai: Orient Longman.
- Rangwala, S. C. (1963). Building Construction: Materials and types of Construction. 3rd Ed. New York: John Wiley and Sons

References

- Clayton, C. R. (1987). Materials science and engineering: An introduction. Materials Science and Engineering, 94, 266–267. https://doi.org/10.1016/0025-5416(87)90343-0.
- Fernandes, F. M., Lourenço, P. B., & Castro, F. (2010). Ancient Clay Bricks: Manufacture and Properties. In Materials, Technologies and Practice in Historic Heritage Structures (pp. 29–48). Springer Netherlands. https://doi.org/10.1007/978-90-481-2684-2_3

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	3	3

CT: Class Test; TA: Total Assessment; A: Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	1	2	--	1	--	--	-	-	-	--	2	2	1	-	--
CO 2	1	1	2	--	1	--	--	-	-	-	--	2	2	1	-	--
CO 3	1	1	2	--	1	--	--	-	-	-	--	2	2	1	-	--
CO 4	1	1	1	-	2	-	-	-	-	-	-	2	2	1	-	-

1: strongly related, 2: moderately related and 3: weakly related

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IND2316	HISTORY OF INTERIOR DESIGN - II	L	T	S	P	C
Version 1.1	Date of Approval:	2	0	0	0	2
Pre-requisites/Exposure	History Of Interior Design I					
Co-requisites	Design III					

Course Objectives

- To make the students understand about the trends of interior design development and movements associated with them like Arts & Crafts, Art Deco and emergence of modernism and contemporary interiors of 20th Century.
- To give students a Global & Indian perspective of achievements and characteristics in interior design, and decorative arts and their relevance and impact on society.
- To develop an understanding of determinants that helped shape art forms & design elements in modern periods
- To familiarize students with the emergence and necessity of interior design and decoration which resulted in emergence of the profession.

Modules	Blooms level*	Number of hours
MODULE 1: Early 19th century and Mid 19th century Industrial Revolution, Period – Early 19th century. Victorian taste with change, Period – Mid 19th Century Module I: Late 19th century – 3 Weeks The search for a new style, Period – Late 19th Century in reference to European and American style	L1, L2, L3	06
MODULE 2: Early 20th Century Arts & Crafts movement, Art Nouveau, Impressionism Period – Early 20th Century	L2, L3, L4	12
MODULE 3: Mid 20th Century Art Deco, Bauhaus Movement and the Modern, Period – Mid 20th Century	L1, L2, L3	12
MODULE 4: Late 20th century The Post – Modern/ contemporary era, Minimalism, Photo Realism Period – Late 20th century Present universal trends emerging all over world. Overview of prominent works by Frank O Gehry, I .M. Pei, John Urtzon, Norman Foster, Zaha Hadid. Furniture design by prominent architects and designers like Le Corbusier, Charles and Ray Eames, EeroSaarinen, Marcel Breuer	L3, L4, L5	6

***Bloom's Level:** L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

- Webb and Schaeffer; *Western Civilisation Volume* I; VNR: NY:
- The History of Arch. in India, Chrictophes Tadgell

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- History of Interior Design, Jeannie Ireland
- A History of Interior Design, John F Pile
- The History of Arch. in India, Chrictophes Tadgell
- Interior design & space planning, Dechiara Pabero Zelnik
- Interior design illustrated, Francis D.K. Ching
- Islamic Architecture in Interior, Satish Grover
- The Best Interior India, Anuradha Mahindra
- Indian Interior, Angelika Taschen

References

- Hancock, J. E., & Kostof, S. (1986). *A History of Architecture: Settings and Rituals.* Journal of Architectural Education (1984-), 39(3), 31. https://doi.org/10.2307/1424785
- Roth, L. M., & Roth Clark, A. C. (2018). *Understanding architecture: Its elements, history, and meaning*. *Understanding Architecture: Its Elements, History, and Meaning* (pp. 1–745). Taylor and Francis. https://doi.org/10.4324/9780429495588
- Spiro Kostof.(1985). *A History of Architecture: Setting and Rituals,* Oxford University Press, London.
- Vincent Scully: *Architecture; Architecture – The Natural and the Man Made*: Harper Collins Pub: 1991

Modes of Evaluation: Literature Study/ Case Study/ Presentation/ Written Examination

Examination Scheme

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	2	3

CT: Class Test; TA: Total Assessment; A: Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	2	--	--	--	--	--	--	--	--	--	--	--	--	1	2
CO 2	1	2	--	--	--	--	--	--	--	--	--	--	--	--	1	2
CO 3	1	2	--	--	--	--	--	--	--	--	--	--	--	--	1	2
CO 4	1	2	--	--	--	--	--	--	--	--	--	---	--	--	1	2

1: strongly related, 2: moderately related and 3: weakly related

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IND2314	ART & GRAPHICS– III	L	T	S	P	C
Version 1.1	Date of Approval:	0	0	2	0	1
Pre-requisites/Exposure	Art & Graphics II					
Co-requisites	Design III					

Catalog Description

The objective of the course is to give an understanding of the graphics skills used in interior design. The course intends to build students' interest in thinking creatively and freedom of expression in Art, Paintings, and model making. The design and creative thinking course help analyze complex shapes, design and application of colour.

Course Objectives

The objective of this course is

- To introduce the concept of perspectives and perspective drawings.
- To develop architectural skills of perspectives
- To familiarize students with principles and theories of arts and its appreciation techniques.
- To introduce the concept of shades and shadows in architecture drawing.

Course Outcomes

On completion of this course, students will be able to

CO1: Appreciate art and artworks and re-create them in the form of logos, symbols, etc.
CO2: Create perspectives for surroundings and buildings.
CO3: Understand the importance of shading devices in architecture and interior design.
CO4: Understand the role of shades and shadows in presentation techniques.

Modules	Blooms level*	Number of hours
Module I: Compositions Graphic representations – Visual composition and Abstraction- Exercises involving Logo design, collage, calligraphy and printing.	L1, L2,	10
MODULE 2: Perspective (Free-Hand) Free-hand perspective drawing and rendering of imagined objects, in pencil and pen/ink. One and two point perspective drawings of solids and of different room interiors.	L!, L2	10
MODULE 3: Perspectives Free-hand perspective drawing of complex composition of solids. One and two point perspective view of the interior of the building with understanding of the basic human proportion and scale. Introduction to three point perspective.	L4, L5, L6	20
MODULE 4: : **Sciography** Values in shades and shadows, Constructing plan shadows (point, line and plane), Constructing shadows in elevations (Point, line and Plane). Short- cut methods for constructing shadows, Presentation techniques in different types of rendering techniques and materials.	L4, L5, L6	20

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***Bloom's Level:** L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books/ References

- Pen & Ink Drawing: A Simple Guide by Book by Alphonso Dunn
- A Visual Dictionary of Architecture, Francis D.K. Ching
- Creative Interiors (Design of Enclosed Space), Shashi Jain
- Interior design illustrated, Francis D.K. Ching
- Home Plumbing (The David & Charles Manual of), Ernest Hall
- House Book (The Complete Guide to Home Design), Terence Conran
- Architecture: Form, Space and Order Francis D.K. Ching
- Window Fashion, Charles T. Randall
- Illustration + Perspectives (In Pantone Colors), Eiji Mitooka
- Elements of Architecture, Meiss Pieree Von
- Window Fashion, Charles T. Randall
- Illustration + Perspectives (In Pantone Colors), Eiji Mitooka

Modes of Evaluation: Literature Study/ Case Study/ Presentation/ Written Examination
Examination Scheme

Evaluation Scheme								Total Marks	Credits	Duration of Exam (hr)
Internal Assessment					External Assessment					
CT		TA	A	Total	ESE	ESJ	Total			
I	II									
10	10	25	5	50	0	50	50	100	5	0

CT: Class Test; TA: Total Assessment; A: Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	1	1	1	2	--	--	--	--	--	--	-	1	2	--	--
CO 2	1	1	1	1	2	--	--	--	--	--	--	-	1	2	--	--
CO 3	1	1	2	2	1	-	-	-	-	-	-	-	-	1	-	3
CO 4	3	-	2	1	1	-	-	-	-	-	--	-	-	1	-	-

1: strongly related, 2: moderately related and 3: weakly related

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IND2304	PSYCHOLOGY OF LIVING ENVIRONMENTS	L	T	S	P	C
Version	Date of Approval:	2	0	0	0	2
Pre-requisites/Exposure	Design Studio-III					
Co-requisites	NA					

Catalog Description

It is necessary to interact and understand the psychology of nature for the better understanding and development to modify the design accordingly. The course would be helpful to the students in simplifying thedesign patter by understanding the psychology of the environment and the vital functioning bodies of the environment.

Course Objectives

- Human beings are in constant interaction with the environment. With the growth of civilization, men are making more and more artificial environments, and interior designers play a significant role in thisprocess.
- The object of this course is designed to acquaint the students with some fundamental aspects of Environmental Psychology in relation with interior designing.

Course Outcomes

On completion of this course, the students will be able to

CO1. Basic principles of psychology and changing mental and emotional thought process.
CO2. Behavioral response to the built and unbuilt environment.
CO3. Application in different environments.
CO4. Use of research to enhance the interior quality.

Course Content:

Modules	Blooms Level	No.of Hours
Module 1 : Introduction to Environmental Psychology Emergence as a discipline, Importance in interior, Basic principles of psychology - changing understanding of man and his mental and emotional processes, corresponding relevance in design of built environment, Language of architecture (rhythm, balance, harmony, etc) and its elements (physical, aesthetic, sensory, colour, noise, light etc.), articulation of mass and space and its role in evoking emotions. Space syntax.	L1	6

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Module 2 - Environment and Human response Behavioral response to the built and un-built environment, Processes involved in assessing and appraisal of environment, Responses to environment - Individual (environmental perception, spatial cognition, comfort, anthropometrics), Social (proxemics, territoriality, crowding, privacy), and Societal (neighborhood, community, work). Inducing behaviour through design.	L1,L4	6
Module 3– Application in different environments Design of spaces and places for occupants of varying ages, gender, use andgroup size , Educational (class room design, ambient noise, attention), Workplace (types of office design), Health care, religious, commercial, recreational, environments. Open spaces, cityscapes. Case studies	L3, L4	6
Module 4– Research methods in Environmental Psychology ofInteriors. Use of research to enhance the interior quality, measure satisfaction levels,direct behaviour in specific environments. Post occupancy evaluation, behavioral mapping, cognitive mapping, semantic differential techniques, trace measures. Case studies.	L3,L4,L6	6

Bloom's Level: *L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text & References:

- ET Hall, „ The Hidden Dimension" 1966
- Proshansky, „Environmental psychology- People and their physical settings" –1976
- Canter and Lee, „ Psychology and the built environment" - 1974
- Bryan Lawson , „Language of Space"
- Gifford R, „Environmental Psychology, Principles and Practices", 2002
- Kopec D, „Environmental Psychology for design", 2006

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	2	3

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO 1	1	3	1	2	1	1	1	1	1	1	1	1	1	1	1	2
CO 2	1	3	1	2	1	1	2	1	1	2	1	1	1	1	1	3
CO 3	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	3
CO 4	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	3

1: strongly related, 2: moderately related and 3: weakly related

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IND2318	FURNITURE DESIGN WORSHOP-I	L	T	S	P	C
Version	Date of Approval:	0	0	2	0	1
Pre-requisites/Exposure	Interior Design Studio					
Co-requisites	NA					

Catalog Description

Furniture plays an important role in the life of an interior designer. It is a tool for visualizing &understanding the composition of the frame and placement of objects. This course enhances the skills of students to imagine and placement of objects**.**

Course Objectives

- The aim of the course is to make the students aware of the furniture designing which is an important part of interior design.
- The history of furniture is also to be introduced and described as the part of the course.

Course Outcomes

On completion of this course, the students will be able to

CO1: An introduction to materials and their techniques open up theperspective of the students to visualize furniture.
CO2: Learning model making and prototype for furniture in an interior space.
CO3: Design furniture as per the requirement.
CO4: Analyze measuring drawing.

Course Contents:

Modules	Blooms Level	No. of Hours
Module 1: Introduction to Safe Workshop Practice & Furniture Design Introduction to Ergonomics of furniture design Furniture design, Analyzing furniture type, form and designing	L1,L3	2
Module 2: Working with Wood and Wood Products Understanding of wood as building material, finishing materialfor surfaces and as furniture material. The wood materialparameters; Wooden joinery and its strength. Wood polishesand other finishes; color and surface quality; The safe and efficient use of the tools of the trade, Hand tools, portablepower tools, Stationary power tools, Materials, Hardware. Safeworking practices in a workshop. Joineries in wood – lap, butt,dowel, tenon& mortise, dovetail, etc. Exercises in plywood joinery; Wooden Paneling & Cladding; Wooden Flooring	L4	2
Module 3: Furniture Materials & Parameters Introduction to furniture design as per different materials and studying ergonomic design to prevent repetitive strain injuries and other musculoskeletal disorders. Analyzing working parameters and visual perception of furniture.	L1,L3	2

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Module 4: Measuring Drawing Measuring drawing of a simple furniture and make it in the workshop, Introduction to various typology of furniture.	L2	2

Bloom's Level: *L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text & References:

- Architectural Models: Construction Techniques – Wolfgang Knoll, Martin Hechinge
- Model-Making: Materials and Methods – David Neat
- BENN, The book of the House, Ernest Benn Limited, London
- Jannsen, Constructional Drawings & Architectural models, Karl Kramer Verlag Stuttgart,1973.
- Harry W.Smith, The art of making furniture in miniature, E.P.Duttor Inc., New York,1982.
- Carol Stangler, The crafts and art of Bamboo, Rev. updated edition, Lark books, 2009.
- Dr. Angelika Taschen, Bamboo style: Exteriors, Interiors, Details, illustrated edition,2006

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme							**Total Marks**	**Credits**	**Duration of Exam (hr)**
Internal Assessment				**External Assessment**					
CT	**TA**	**A**	**Total**	**ESE**	**ESJ**	**Total**			
10	15	5	30	0	70	70	100	1	3

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	1	1	3	1	1	1	1	1	2	1	2	-	-	-
CO2	1	1	1	1	3	1	1	1	1	1	2	1	2	3	-	-
CO3	1	1	1	1	3	1	1	1	1	1	1	1	3	3	3	3
CO4	1	1	1	1	3	1	2	1	1	1	1	1	3	-	-	-

1: strongly related, 2: moderately related and 3: weakly relate

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IND2307	LIGHTING & COLORS IN INTERIORS	L	T	S	P	C
Version	Date of Approval:	2	0	0	0	2
Pre-requisites/Exposure	Climate and Design Studio					
Co-requisites						

Catalog Description

Understanding various types of lightings, their nature, importance of artificial lightning along witheffects of various lights on color and textures. Use of various luminaries and fixtures, lightning accessories their importance and study of lightning concepts.

Course Objectives

- This course provides knowledge of the various types of lightings to effectively communicate their designs and understand the effect of various lights on colors and textures.
- The aim of this course is to equip the students to understand, and successful y apply lighting techniques with color effects.

Course Outcomes

On completion of this course, the students will be able to

CO1: Introduction to Day Lighting
CO2: Artificial Lighting
CO3: Effect of Color in Lighting
CO4: Luminaries & Fixtures

Course Content

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Modules	Blooms level*	Number of hours
Module 1: Introduction to Day Lighting Natural light, glare, day light factor and day lighting in tropics.sources of light, day light factor concept, design sky concept,day lighting requirements.	L1, L2	5
Module 2: Artificial Lighting Electric lamps –incandescent, fluorescent, sodium vapor, mercury,halogen and neon.Different types of lights in interior and exterior task lighting, special purposelighting. Calculation of artificial lighting,guidelines for lighting design, Glare in artificial lighting; Color characteristics of artificial lighting, integration of day lightingwith artificial lighting, lighting controls, intelligent building systems for lighting, switches, dimmers	L1, L2	5
Module 3: Effects of Color in Lighting Colour and light, colour and surface qualities, color and distances andscales. Problems with color. Use of color in various functional contexts Residential interiors, Non Residential interiors. Use of color in special situations out door/indoor spaces, accessories, art works etc	L1, L2	. 6
Module 4: Luminaries & Fixtures Definition, different luminaries for lighting, lighting control system-benefits & application, Impact of lighting, fixture types free standing or portable, fixed, light fixture control; Floor, table and desk,wall mounted, ceiling units, built in lighting, miscellaneous types, decorative lighting, spot lighting, task lighting, underwater lighting, etcLighting accessories-switches, sockets, fused connection units, lamp holders, ceiling roses etc.	L1, L2	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text/References:

- Moore Fuller, Concepts and practice of Architectural Day lighting, Van Nostrand Reinhold c o., New York, 1985
- David Egan. M. Concepts in Architectural lighting McGraw Hill Book company, New York,1983.
- John.F. Pile, Interior Design, 2nd edition, illustrated, H.N.Abrams, 1995
- Randall whitehead; Lighting design, source book.
- Torquil Barker; Concepts of lighting, Lighting design in Architecture.

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	2	3

CT: Class Test, HA: Home Assignment, Seminar or Quiz; EE: End Semester Examination; A: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	3	2	-	2	3	3	1	-	3	3	-	1	2	1	-
CO2	1	3	2	-	2	3	3	1	-	3	3	-	1	2	1	-
CO3	1	3	2	-	2	3	3	1	-	3	3	-	1	2	1	-
CO4	1	3	2	-	2	3	3	1	-	3	3	-	1	2	1	-

1: strongly related, 2: moderately related and 3: weakly related

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IND2317	BUILDING SERVICES-I	L	T	S	P	C
Version 1.1	Date of Approval:	2	0	0	0	2
Pre-requisites/Exposure	Materials And Construction Technology –II					
Co-requisites	Interior Design – III					

Catalog Description

The aim of this subject is to give architects an overview and introduction to Plumbing systems and architectural considerations and their co-ordination with other services and architectural designs. Architectural services are the systems installed in buildings to make them comfortable, functional, efficient and safe. The course covers Water Supply and Sanitation system design in the buildings

Course Objectives

The objective of this course is

- To understand the need for and importance of building services.
- To understand the water supply system at urban level.
- To understand the importance of sanitation and sewerage system.
- To understand the treatment process of waste water.

Course Outcomes

On completion of this course, the students will be able to

CO1: Apply knowledge gained on water supply system in small buildings.
CO2: Design sewage system for a residential building.
CO3: Design drainage system at urban level.
CO4: Prepare and understand principles of waste water management.

Course Content:

Modules	Blooms level*	Number of hours
MODULE 1: Water Supply Need to protect water supply, Requirements of water supply to different types of buildings. Sources of water supply, Quantity and quality of water as per NBC. Conveyance and distribution of water, Overhead tank, Underground tanks, Pipe appurtenances. Hot and cold water supply system in a low rise and high rise buildings. Distribution system in campus, Pipes their size, Jointing and different fittings.	L1, L2	6
MODULE 2: Sanitary Engineering Purpose and principles of sanitation, Collection and conveyance of waste matter. Quantity and Quality of refuse, Design and construction of sewer‟s and sewer appurtenances. Garbage and sewage disposal. Sanitary appliances, Traps their variety, Pipes and joints, Sanitary pipes works below and above ground level.	L1, L2	6

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MODULE 3: Road and Drainage systems Introduce to the basic concepts of municipal drainage system, road pattern at city level. Roof and surface water drainage. Rain water storage and water harvesting principles and methods.	L4, L5, L6	6
MODULE 4: Waste Management System Introduction of different type of wastes produced at Urban level. Its management skills and criteria‟s for collections, Disposal and treatment of wastes. Reduce– Reuse–Recycle, Waste collection, Treatment & disposal. Thermal treatment Dumps and Landfills. Biological waste treatment. Waste water treatment	L4, L5, L6	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

- Walter T. Gondzik (2000) Mechanical And Electrical Equipment For Building
- Punmia, B.C. (2005). Building Construction, New Delhi: Laxmi Publishers
- Rangawala, (2017). Water supply and sanitary engineering, Gujrat: Charotar publisher
- National Building codes of India.

Reference Books

- Anon. (1984). Water Supply. Civil Engineering New York, N.Y., 54(7), 40–41. https://doi.org/10.31729 /jnma.916
- Hoekstra, A. (2010). The water footprint : water in the supply chain. Water, (93), 12–13.
- WHO, &Unicef. (2000). Global Water Supply and Sanitation Assessment 2000 Report. Water_Supply,87.
- https://doi.org/http://www.who.int/water_sanitation_health/monitoring/globalassess/en/

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	2	3

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	--	1	--	--	--	--	--	--	--	--	2	2	1	--	--
CO2	2	--	1	--	--	--	--	--	--	--	--	2	2	1	--	--
CO3	2	--	1	--	--	--	--	--	--	--	--	2	2	1	--	--
CO4	2	--	1	--	--	--	--	--	--	--	--	2	2	1	--	--

1: strongly related, 2: moderately related and 3: weakly related

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Syllabus – Fourth Semester

IND2408	INTERIOR DESIGN STUDIO-IV	L	T	S	P	C
Version 1.1	Date of Approval:	1	1	4	0	6
Pre-requisites/Exposure	Interior Design – III					
Co-requisites	Building Materials & Construction Technology - III					

Catalog Description
The aim of this course is to provide a clear understanding about the design elements and principles followed while designing interiors of a Offices - open and enclosed and how to create a sustainable design.

Design Exercise: Offices - bureaucratic, IT, Corporate, Industrial etc. of maximum 200sq.m. Emphasis shall be on the composition, aesthetics, functional efficiency and innovation and sustainable design.

Course Objectives
The objectives of this course are:

- To develop an understanding towards sustainable concepts and materials
- To critique the materials, construction techniques used in the elements of built forms.
- To create an understanding of the interrelationships amongst various elements of interior architecture – form, function, aesthetics, space planning, user perception and behavior and culture.
- To enable the presentation of concepts through sketches and models and drawings.

Course Outcomes
On completion of this course, students will be able to
CO1: Collect data from standards, case studies for the current project.
CO2: Analyze data collected with relevance to the current project.
CO3: Integrate learning from other allied subjects to the design proposal.
CO4: Complete the architectural project with all given requirements for the given project.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to the Design Problem Introduction to the design problem. Case studies. Collecting relevant data for the given design problem. Synthesising and analysing the collected data.	L1, L2,	10
MODULE 2: Site study and Area Programming Site visit and Site analysis. Driving area requirements for the design exercise.	L!, L2	10
MODULE 3: Design Development Relation to various functional aspects of the design problem. Use of bubble diagram, flow diagrams, zoning of site, etc. conceptual design. Finalization of design proposals – schematic 2D/3D single line/conceptual level site plan, floor plan, elevations, sections.	L1,L2,L3	20

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MODULE 4: Final design Proposals Final developed to the scale drawings of Site Plan, Floor Plans, Elevations, Sections, Views. Detailed floor plans with furniture layouts, and ceiling plans	L1,L2,L3	20

***Bloom's Level:** L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books/ References

- Béjar, R., Latre, M. Á., Nogueras-Iso, J., Muro-Medrano, P. R., &Zarazaga-Soria, F. J. (2009). An architectural style for spatial data infrastructures. International Journal of Geographical Information Science, 23(3), 271–294. https://doi.org/10.1080/13658810801905282
- Chiara, J. D., &Callender, J. (1983). Time-Saver Standards for Building Types. McGRaw-Hill International Edition. • Givoni, B. (2004). Time Saver Standards for Urban Design: Urban Design and Climate. Digital Engineering Library @ McGraw-Hill, 1–14.
- Head, A. J. (2017). Planning and Designing Academic Library Learning Spaces: Expert Perspectives of Architects, Librarians, and Library Consultants. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.2885471
- Julius, P., &Zelnik, M. (1979). Human Dimension & Interior Space. Vasa. Retrieved from http://medcontent.metapress.com/index/A65RM03P4874243N.pdf
- Wolfenden, A., &Chusid, M. (1991). Time-Saver Standards for Building Types: 3rd Edition. Journal of Testing and Evaluation, 19(4), 347. https://doi.org/10.1520/jte12583j
- Head, A. J. (2017). Planning and Designing Academic Library Learning Spaces: Expert Perspectives of Architects, Librarians, and Library Consultants. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.2885471

Modes of Evaluation: Literature Study/ Case Study/ Presentation/ Written Examination

Examination Scheme

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	0	70	70	100	6	3

CT: Class Test; TA: Total Assessment; A: Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	1	1	-	2	--	3	--	--	--	-	1	-	-	-	3
CO 2	1	-	1	3	1	-	3	--	--	2	-	-	1	-	-	-
CO 3	1	2	1	-	1	-	-	-	-	2	-	-	1	-	-	-
CO 4	3	-	2	-	1	2	1	2	-	2	2	2	2	-	-	-

1: strongly related, 2: moderately related and 3: weakly related

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IND2409	BUILDING MATERIALS & CONSTRUCTION TECHNIQUES – IV	L	T	S	P	C
Version 1.1	Date of Approval:	1	1	1	0	3
Pre-requisites/Exposure	NA					
Co-requisites	Materials & Construction Techniques – III					

Catalog Description

The aim of this course is to develop understanding with RCC elements like column, beam etc. The knowledge about RCC is also enhanced through comprehension of RCC framed structures and reinforcement details in building elements like columns, beams, slab and lintels. The course gives complete knowledge about the various types of Cladding, false ceiling and surface finishes. Market survey and site visit studies shall be an essential part of the teaching – learning strategy.

Course Objectives

The objective of this course is

- To make students aware of joining details of columns, beams and slabs.
- To develop the ability to analyze the building construction methods and their applications.
- To equip students about the methods of designing various structural members using reinforced cement concrete.

Course Outcomes

On completion of this course, the students will be able to

CO1: Apply basic information about construction procedures and reinforcement detailing about RCC elements like Columns, Beams and Slabs.
CO2: Apply various materials and fixing details of surface cladding.
CO3: Explain joinery and fixing details of false ceiling.
CO4: Describe uses of different surface finished in interior and exterior surfaces.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to RCC elements like Columns, Beams and Slabs Reinforcement detailing of RCC building elements like columns, beams and slabs through sketches and site visits.	L1, L2	8
MODULE 2: Cladding and Panelling • Details of cladding of wall with stone, tiles, timber and steel framing • Construction of cavity wall with different thermal and acoustical system • Various types of panelling (glazed, wooden etc.), details for panelling	L1, L2, L3	10
MODULE 3: False Ceiling Advantages and disadvantages of False Ceiling, Detail understanding of Reflected Ceiling Plan, joinery and fixing details.	L1, L3,L4	6
MODULE 4: Finishing Materials SURFACE FINISHES: Paints and surface finishes; Composition, properties and methods of application of different types of paints: Oil, synthetic enamels, acrylic and other plastic emulsions and formulations, interior and exterior grade paints. Natural and synthetic clear varnishes, French polish. Cement based paints	L1, L3,L4	12

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• FLOOR FINISHES: PCC, terrazzo, stone slabs, brick and terracotta tiles, Synthetic materials (PVC, Timber). Floors of industrial buildings & warehouses. Ceramic wall & floor tiles. • PLASTIC: Classification of plastic, moulding and fabrication, properties of plastic, use of plastic, PVC. Fiber glass. • MISCELLANEOUS MATERIALS: Cork, rubber, Gypsum, sealants, heat and sound insulation materials. • GLASS AND GLASS PRODUCTS: Plain, sheet, plate, textured, laminated, wired and shock resistant glass. Glass blocks, glass tiles, mirrors, heat reflecting glasses and Glass wool.		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

- *Barry, R. (1999). The Construction of Buildings Vol. 2. 5th Ed. New Delhi: East-West Press.*
- *Chudley, R. (2008). Building Construction Handbook. 7th Ed. London: Butterworth-Heinemann.*
- *McKay, W. B. (2005). Building Construction Metric Vol. I–IV. 4th Ed. Mumbai: Orient Longman.*
- *Rangwala, S. C. (1963). Building Construction: Materials and types of Construction. 3rd Ed. New York: John Wiley and Sons*

References

- *Clayton, C. R. (1987). Materials science and engineering: An introduction. Materials Science and Engineering, 94, 266–267.* https://doi.org/10.1016/0025-5416(87)90343-0.
- *Fernandes, F. M., Lourenço, P. B., & Castro, F. (2010). Ancient Clay Bricks: Manufacture and Properties. In Materials, Technologies and Practice in Historic Heritage Structures (pp. 29–48). Springer Netherlands.* https://doi.org/10.1007/978-90-481-2684-2_3
- *Freidin, K., & Erell, E. (1995). Bricks made of coal fly-ash and slag, cured in the open air. Cement and Concrete Composites, 17(4), 289–300.* https://doi.org/10.1016/0958-9465(95)00017-7
- *Saikia, N., & De Brito, J. (2012, September). Use of plastic waste as aggregate in cement mortar and concrete preparation: A review. Construction and Building Materials. https://doi.org/10.1016/j.conbuildmat.2012.02.066*

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	3	3

CT: Class Test; TA: Total Assessment; A: Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	1	2	--	1	--	--	-	-	-	--	2	2	1	-	--
CO 2	1	1	2	--	1	--	--	-	-	-	--	2	2	1	-	--
CO 3	1	1	2	--	1	--	--	-	-	-	--	2	2	1	-	--
CO 4	1	1	2	-	1	-	-	-	-	-	-	2	2	1	-	-

1: strongly related, 2: moderately related and 3: weakly related

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IND2411	COMPUTER AIDED INTERIOR DESIGN & DRAFTING	L	T	S	P	C
Version 1.1	Date of Approval:	0	1	4	0	5
Pre-requisites/Exposure	Graphic Skills					
Co-requisites	Design –IV					

Catalog Description

The aim of this course is to understand the available software technologies and their applications in Architectural Designs. In order to enable students to use computer systems, software's and hardware, teaching necessary digital skills are important aspect of the course. This course will help learners to prepare presentation drawings, generating 2D and rendered views in a short time. This would finally help them in Design studio to develop conceptual as well as final Plan.

Course Objectives

The objective of this course is

- To introduce the students with the Photo editing software.
- To develop theoretical understanding of AutoCAD and its relevance in Architecture.
- To practice various commands of the Autocad.

Course Outcomes

On completion of this course, the students will be able to

CO1: Develop understanding of minimum system requirements and computer aided drafting.
CO2: Comprehend Photoshop and its parameter as tools and its application in architecture.
CO3: Comprehend computer aided drafting and its parameter as tools and its application in architecture.
CO4: Evaluate CAD techniques for quicker methods and presentation skills.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Use of Photo Editing Software Introduction to Photo editing, montaging as well as preparation of 2-D presentations.	L1, L2	2
MODULE 2: Workshop on Photo Editing Software ***Practice on Photo editing as well as preparation of 2-D presentations on Photoshop.***	L1, L2	6
MODULE 3: Introduction to Auto Cad (2-D) Software Introduce to the drafting software for the graphic design, building planning. Explain the various ways to deal with the graphic drawings. Introduce to 2D-3D drawing concepts. Students learn the ability to Drafting, Editing and modification work to be done in the graphic presentation. Practice on the various AutoCAD commands through software User Interface. Conduct 2D Skills Workshop to train the students. Introduce to the draft skills and minimize errors in the presentation skills.	L1, L2,L3	8

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MODULE 4: Workshop on 2D drafting Practice on the various Auto Cad commands through software User Interface. Conduct 2D Skills Workshop to train the students. Introduce to the Modelling skills and minimize errors in the presentation skills.	L4, L5, L6	20

**Bloom's Level:* *L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Texts

- George Omura, Brian C. Benton. (2018). Mastering AutoCAD 2019 and AutoCAD LT 2019. Syvex.

References

- Byrnes, D. (2010). *AutoCAD 2011 for Dummies*. *Wiley Publishing, Inc* (pp. 1–512).
- Finkel, R. (2005). Operating systems. In *Computers, Software Engineering, and Digital Devices* (pp. 18-1-18–18). CRC Press. https://doi.org/10.5117/mab.47.21471
- Lampson, B. W. (1983). Hints for computer system design. In *Proceedings of the 9th ACM Symposium on Operating Systems Principles, SOSP 1983* (pp. 33–48). Association for Computing Machinery, Inc. https://doi.org/10.1145/800217.806614
- Subscribe to various Microsoft online free services, https://www.microsoft.com/en-in

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	0	70	70	100	5	3

CT: Class Test; TA: Total Assessment; A: Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	--	3	--	1	--	--	--	--	--	--	-	1	2	-	--
CO 2	1	--	1	--	1	--	--	--	--	--	--	-	1	2	-	--
CO 3	2	--	1	--	1	--	--	--	3	2	--	-	1	2	-	--
CO 4	2	--	1	2	1	--	--	--	3	2	--	-	1	2	-	--

1: strongly related, 2: moderately related and 3: weakly related

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IND2412	PHOTOGRAPHY &VIDEOGRAPHY	L	T	S	P	C
Version 1.1	Date of Approval:	1	0	2	0	3
Pre- requisites/ Exposure	Building Construction & History of Design					
Co-requisites	NA					

Catalog Description

On the successful completion of the course student will be able to, Define photography and videography and identify their usage in various fields, Explain the basic mechanism involved in capturing images and video clips, editing them and eventually publishing them, Explain the various types of cameras, Demonstrate various techniques of photography and videography by using the basic tools, Express their thoughts by using photography and videography as a medium of communication, Use photographic and videography skills for better representation of their portfolio.

Course Objectives

- The aim of this course is to develop knowledge, skills and understanding of Photography, Video and Digital imaging that enables students to gain an increasing accomplishment and independence in theirrepresentation of ideas in the fields of Design.
- This course enhances the students to visualize the concept of digital platform and various methods of image capture.

Course Outcomes

On completion of this course, the students will be able to

CO1: Photography & Digital Imaging, Videography

CO2: They will be given hands on training in audio and video recording. They will also learn the basics of Editing.

CO3: Understanding documentation of photography.

CO4: Understanding of photo documentation.

Course Content

Modules	Blooms level*	Number of hours
Module 1: Architectural Photography Origins of architectural photograph, Review of architectural photographs, Light and Shades, Understanding light – Properties and elements of light. Basics of camera – Operations and Control Parallax Error, use of camera, lens and understanding lighting conditions. Pixels, resolution, Sensor size	L1,L2	12

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Module 2: Light and Architecture Understanding light and photography, External lighting- Direction of lighting - front, side, back, shadows, texture, and effects of clouds, light modification, psychological effects, and types of artificial lighting, combined daylight and flash. Overview of architectural photography, Color balance, Reading histogram, White balance and Color temperature	L1, L2	12
Module 3: Photographic Documentation Creative photography / photo renderings for special effects using software. Play of light and shadows to achieve dramatic pictures. Effects of seasons, inclusion of greenery, foliage, clouds, human scale etc.	L1,L2	12
Module 4: Photo Documentation Photo documentation of buildings highlighting quality of architectural elements and spaces.	L1,L2	12

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text/References:

- Busch, David D. David Busch's Mastering Digital SLR Photography. Cengage Learning, 2011.
- Garrett, John, & Graeme Harris. Collins Complete Photography Course. HarperCollins UK, 2010
- Krause, Jim. Photo idea index. How Books, 2005.
- Martin, Jerry; Active Video: A Teaching Tool for Every Classroom; Good Year Books, 1998
- Goodman, Robert M., and Patrick J. McGrath. Editing digital video. McGraw-Hill, 2002.
- Barrett, Colin. Digitalvideo for Beginners: A Step-by-step Guide to Making Great Home Movies. Lark Books, 2005

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	0	70	70	100	3	3

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	-	3	3	-	-	-	-	-	-	-	3	-	-	-	-
CO2	1	-	3	3	-	-	-	-	-	-	-	3	-	-	-	-
CO3	1	-	3	3	-	-	-	-	-	-	-	3	-	-	-	-
CO4	1	-	3	3	-	-	-	-	-	-	-	3	-	-	-	-

1: strongly related, 2: moderately related and 3: weakly relate

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IND2413	FURNITURE DESIGN WORKSHOP-II	L	T	S	P	C
Version 1.1	Date of Approval:	0	0	2	0	1
Pre-requisites/Exposure	Interior Design Studio					
Co-requisites	NA					

Catalog Description

Camera plays an important role in the life of an interior designer. It is a tool for visualizing &understanding the composition of the frame and placement of objects. This course enhances the skills of students to imagine and placement of objects.

Course Objectives

The objective of the course is to provide knowledge about an existing piece of furniture in its functional and technical aspect, carpentry skills required, materials and properties, biomechanical factors, ergonomics, aesthetics and economic factors

Course Outcomes

On completion of this course, the students will be able to

CO1: A basic introduction to the use of tools and cutting machines.
CO2: Acquaintance with the use of various metals and their properties.
CO3: Mastering the technique of welding, carpentry etc.
CO4: Understand furniture style of different eras.

Course Contents:

Modules	Blooms Level	No. of Hours
Module 1: Analyzing Furniture Analyzing furniture forms and designing furniture forms scientifically based on ergonomics, material design and working parameters and visual perception of furniture as a single form and as a system in each interior space	L1,L3	3
Module 2: Measuring Drawing Measurement drawing of a piece of a furniture-plan, elevation, sections and detail drawings on proper scale. Design of a simple object having some moving components like a folding stool or chair. History of furniture from early days to industrial revolution	L1,L3	6
Module 3: Modular Aspects Modular aspect and approach towards all types of furniture, cost criteria of design furniture for lower income group in the society	L4	1
Module 4: Furniture Style Design and understand Post Independence furniture style	L1,L3	2

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

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Text & References:

- BENN, The book of the House, Ernest Benn Limited, London
- Jannsen, Constructional Drawings & Architectural models, Karl Kramer Verlag Stuttgart, 1973.
- Harry W.Smith, The art of making furniture in miniature, E.P.Duttor Inc., New York, 1982.
- Carol Stangler, The crafts and art of Bamboo, Rev. updated edition, Lark books, 2009.
- Dr. Angelika Taschen, Bamboo style: Exteriors, Interiors, Details, illustrated edition, 2006.
- Lonnie Bird, Jeff Jewitt, Taunton's Complete Illustrated Guide to Woodworking, Taunton, 2005.
- Peter Korn, Wood working Basics : Mastering the essentials of craftsmanship, Taunton , 2003.
- Albert Jackson & David Day, The complete manual of wood working, knopf publishers, 1996.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	0	70	70	100	1	3

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att:Attendance

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 1	PSO	PSO2	PSO3	PSO4
CO 1	2	1	2	-	-	1	1	1	1	3	1	1	1	1	1	1	1
CO 2	1	1	3	-	-	1	1	1	1	3	1	2	1	1	1	1	1
CO 3	2	3	-	1	-	1	-	1	3	1	2	1	1	2	1	1	1
CO4	1	1	3	-	-	1	1	1	1	3	1	2	1	1	1	1	1

1: strongly related, 2: moderately related and 3: weakly relate

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IND2414	BUILDING SERVICES – II	L	T	S	P	C
Version 1.1	Date of Approval:	2	0	0	0	2
Pre- requisites / Exposure	Technology –III, Architectural Services-I					
Co-requisites	Design – IV					

Catalog Description

The aim of this course is to give an overview and introduction of Noise Control, Acoustics, Gas installation and fire-fighting systems. In today's architectural environment, good acoustical design isn't a luxury – it's a necessity. This course deals with the science behind sound and its application to achieve desired acoustical performance in a specific building by using different building materials, systems and technologies.

Course Objectives

The objective of this course is

- To introduce to the theory and practices of Acoustics and Noise reduction.
- To introduce various building elements and their application in the built environment.
- To get familiarized with Gas installation techniques and requirements
- To understand the importance of Fire safety in a building.

Course Outcomes

On completion of this course, the students will be able to

CO1: Describe the theory of acoustics and its implementations in buildings like Auditorium, Lecturehalls, etc.

CO2: Describe the different types of noise, their transmission and the measure to isolate and controlthem.

CO3: Design Gas installation system at residential and non-residential buildings.

CO4: Describe the installation of Fire safety measures in a building.

Course Content:

Modules	Blooms level*	Numberof hours
MODULE 1: Building Acoustics Terminology and unit. Characteristics of audible sound – Propagation, Velocity, Frequency, Pitch, Quality/timbre, Loudness and Intensity. Behavior of audible sound in enclosures – Reflection, Absorption, Diffraction and Transmission of sound. Common acoustical defects and recommended remedies– Echo, Sound foci, Dead spots, Sound shadows, Resonance, Insufficient loudness, External noise and Reverberation. Sabine‟s expression for calculation of Reverberation time. Absorbents and absorption coefficient. Acoustical requirements as perNBC	L1, L2	6
MODULE 2: Noise Control Noise and its types, Noise pollution. Sources of indoor noise, Indoor noise levels, Planning and design against indoor noise. Sources of outdoor noise,Traffic noise levels, Planning and design against outdoor (traffic & buildings inbuilt-up area) noise. Identification of various sources of noise and	L1, L2	6

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MODULE 3: Gas Installation L.P.G / Bio-gas installations, their location and layouts in residential and non-residential buildings	L4, L5, L6	6
MODULE 4: Fire Safety System Causes and spread of fire. Fire triangle/ tetrahedron. Classes of fire. Combustibility of materials and fire resistance. Building Plans, Drawings, and Schematics. Fire Detection Equipment- Heat &Smoke sensors. Fire Alarm Systems. Firefighting pump and water storage, Hose and hose fittings, Dry and wet risers, Automatic sprinklers. Fire Extinguishers - Portable fire extinguisher and other firefighting equipments. Means of escape, Fire escape, Fire doors and Water curtain. Passive means of fire fighting and building design criteria as per NBC.	L4, L5, L6	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

- John E. Traister (1995), Security/Fire Alarm Systems: Design, Installation, and Maintenance.
- An Introduction to Acoustics. (1952). Physics Today, 5(11), 24. https:// doi.org/ 10.1063/ 1.3067395
- Bruneau, M. (2010). Fundamentals of Acoustics. Fundamentals of Acoustics. Wiley-ISTE. https://doi.org/10.1002/9780470612439
- Springer handbook of acoustics. (2008). Choice Reviews Online, 45(05), 45-2674-45–2674.https://doi.org/10.5860/choice.45-2674
- S. Kandaswamy (2005), Architectural Acoustics and Noise Control, Allied publishers Pvt. Ltd.,
- National Building Code of India

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	2	3

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	--	--	1	--	--	--	--	--	--	--	--	--	2	1	--	--
CO2	--	--	1	--	--	--	--	--	--	--	--	--	2	1	--	--
CO3	2	--	1	--	--	--	--	--	--	--	--	--	2	1	--	--
CO4	--	--	1	--	--	--	--	--	--	--	--	-	2	1	--	--

1: strongly related, 2: moderately related and 3: weakly related

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IND2410	BARRIER FREE SPACE PLANNING FOR INTERIORS	L	T	S	P	C
Version 1.1	Date of Approval	2	0	0	0	2
Pre- requisites/ Exposure	Design IV					
Co-requisites	NA					

Catalog Description

The objective of this course is a detailed study of designs that eliminate or reduce hazards in the workplace to prevent mishaps and provide good indoor quality. This course also covers to make understanding of disaster management, seismic design principles and various building management systems.

Course Objectives

- The objective of this course is to develop deep insights of building safety systems and building management.
- This course provides the ability to gain on-site knowledge about planning of building basic necessity of safety systems.

Course Outcomes

On completion of this course, the students will be able to

CO1: The students learn the process and elements of a Safety and Health Management Systems.
CO2: Health and Safety Aspects factors of slips, trips and falls n the workplace and methods to prevent them.
CO3: Dealing of Fire Fighting Services, mechanism of fire spread in building and prevention.
CO4: Disaster Management & Seismic Design Principles, Emergency planning: on- site and off-site.

Course Contents:

Modules	Blooms Level*	No. of Hours
Module I : Safety Management & Special Abilities Scope of Environmental safety: Need for public awareness. Understanding the different human imparities such as visual, mobility and hearing and also understanding the abilities of such differently able persons. To understand the architectural requirements of such persons.		
Module 2: Introduction to Architecture for specially able Defining the basic concepts of barrier free design, need for barrier free concepts in architecture, concepts of universal design and types of disabilities. Design principles for barrier free architecture and accessibility for all.	L1,L2	5

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Module 3: Barrier free elements for outdoors and Urban Design Design elements outside the building like curb ramps, pedestrian crossing, public toilets, and parking, signage, flooring and street furniture. Case examples of Barrier free architecture in India and across the globe. To study the anthropometrics and dimensions of mobility devices, special fixtures for barrier free design. Barrier free construction materials and dimensions for flooring, walls, doors, windows, staircases, elevators, toilets, entrances and corridors.	L1,L2	5
Module 4: Laws Knowledge of different laws prevailing within India and in other countries. Understanding implication of different laws on design of spaces.	L1,L2,L3	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text & References:

- Hughes, Phil, and Ed Ferrett. Introduction to health and safety at work. Routledge,2011.
- Binggeli, Corky. Building systems for interior designers. John Wiley & Sons, 2003.
- Vinod Kr. Sharma; Disaster Management, IIPA, New Delhi.
- Guidelines and Space Standards for Barrier Free Built Environment for Disabled and Elderly Persons – Central Public Works Department, Ministry of Urban Affairs & Employment, India, 1998
- IS – 4963 (1987), Recommendations for buildings and facilities for Physically Handicapped
- Barrier-Free Design: Principles Planning, Examples, by Oliver Heiss, Christine Degenhardt, Johann Ebe (Birkhauser Architecture, 2010)"

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	2	3

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att:Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO 1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2
CO 2	1	1	1	1	2	1	1	1	1	1	1	1	2	1	1	2
CO 3	1	1	1	1	2	1	1	1	1	1	1	1	2	1	1	2
CO4	1	1	1	1	2	1	1	1	1	1	1	1	2	1	1	2

1: strongly related, 2: moderately related and 3: weakly related

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Syllabus – Fifth Semester

IND2502	REVITALIZATION OF ARTS & CRAFTS	L	T	S	P	C
Version 1.1	Date of Approval:	1	0	0	0	1
Pre- requisites/ Exposure	Visual Arts-I					
Co-requisites	NA					

Catalog Description

The course is a build with an objective to document people, life, culture and craft and understand the materials, tools, technology, processes and forms. Suggest suitable changes in technology to improve the products so as to make it acceptable in today's context.

Course Objectives

- This course aims a detailed study of the characteristics of Indian arts and crafts and its application in the interiors that provides an understanding of the role of revitalization of Art/craft form in interior spaces through a project assignment.

Course Outcomes

On completion of this course, the students will be able to

CO1: Acquiring knowledge of Indian Craft and art.

CO2: Conceptualizing & presentation skills.

Course Content

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Modules	Blooms Level*	No. of Hours
Modules 1: Introduction to Creative Arts and Crafts inIndia Creative arts and crafts in India and its application in interior design; Materials; Art movements through history; Traditionalarts and crafts of India; Folk arts of India; Traditional arts and crafts of various states of India.	L1, L2, L3	6
Modules 2: Project AssignmentDescription: The project will consist of a general to the crafts traditions of	L1, L2, L3,	6
India, details about the crafts, their classifications, regional distribution etc. that will applicable to art in interior spaces such as – Residence, Reception, Lobby spaces, Theme Boutiques, Hotel, Restaurants, etc.This project will necessarily be a scientific, methodical documentation of aparticular craft tradition prevalent in the region, which will have the following core issues in the background: Philosophy and Aesthetics - Materials, Processes and Techniques - Environment and Resource management – Social structures - Economy & Marketing – International examples. **Procedure:** Select one of the art / craft form with the consultation of the faculty. Discuss about the crafts traditions practiced in the region, their history, distribution etc. along with faculty.Collect all information available through various sourcesincluding library, internet and resource persons. To availcomprehensive data on various aspects of the crafts, studentsmay develop an interview schedule and decide on number ofcrafts persons to be interviewed, which all places they will bevisiting etc. Faculty must equip the students on interactionwith craftsperson and other people from the community, typeof language they should use, how to be polite with them andwhile handling their materials etc. Students can buy some ofthe objects from craftsperson, take photographs after seekingtheir permission, make drawings, etc. which later on they canuse in PPT presentation along with submission of final project report. The students can also make a short documentary filmbasis on their research for their final presentation **Requirements:** The work will be periodically reviewed. The study has to be presented in the form of a „Documentation Report" with illustrations /images as aseminar for final Course Evaluation. The students are asked to give a brief oral presentation with „Power Point" to the class about their research. They have to explain, what kind of interests they want to develop in the research and a debate will follow as well. The submission of project assignment file and presentation will be part of student"s Examination Scheme. The students will have to visit various craft places and museums for the part of their research.	L4	

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

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Text & References:

- Publication on Traditional Arts and Crafts on India, Ministry of HandicraftsDevelopment, Govt.of India.
- Edith Thomory, A History of fine arts in India and the west, OrientLongmann publishers Pvt. Ltd, New Delhi.
- AditiRanjan, M. P. Ranjan; Handmade in India; Abbeville Press, 2009.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	0	70	70	100	1	3

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att:Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO 1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	3
CO 2	1	1	1	1	1	1	2	1	1	1	1	1	3	1	1	3

1: strongly related, 2: moderately related and 3: weakly related

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IND2504	TEXTILE IN INTERIORS	L	T	S	P	C
Version 1.1	Date of Approval:	2	0	0	0	2
Pre- requisites/ Exposure	Design-V					
Co-requisites	NA					

Catalog Description

This course is intended for students of interior designing to learn them about the basics of textiles like different structures of fabric like woven, knitted, non- woven and braided.Students able to design the interiors with the help of elements of design and principles of design with appropriate fabric type for appropriate location in the building structure. Understood which type of fabric structure and designing required for walls, ceilings, floors coverings, cushion covers, bathrooms, slip covers, runners, rugs, carpets, curtains and bedand table covers etc. Other then fabrics which type of fabrics structures can be used for decoration in interiors of a buildings and homes like cork, leather, Rexene and crochet and braided structures etc.

Course Objectives

- The objective of this course is to familiarize the students of Interior Design on textilematerials used in interior.
- This course helps to gain knowledge and understanding of the functional and aesthetic requirements of textiles for a range of applications.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Identify different type of fibers, yarns and fabrics along with classification.

CO2: Understand the application of elements and principles of design to develop design collection range.

CO3: Describe different surface ornamentation techniques.

CO4: Apply different materials in different type of projects

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Course Content

Modules	Blooms level*	Number of hours
Module 1: Introduction To Fabrics Fabric, yarn and fiber structure, Fabric structure- woven- warp, weft, selvedge ,knitted- course, non-woven, Fabric types and classification- woven, including plain, twill, satin, Jacquard, crepe and pile weaves, Knitted- including single knit, double knit, tricot knit, pile knit, lace and net, Non-woven-including felts webs and films, identification and properties of fabrics, yarns and fibers.	L1, L2	6
Module 2: Textile Design Applicable to Interiors Development of textile design in different cultures from primitive art to contemporary designs. Criteria of design of the elements and principles of textile design. Application of elements and principles of design across a range of textiles. Describe and analyze elements and principles of design -furnishings, textile arts. Functional and aesthetic requirements and features of textile range. Analysis of a motif, developing repeat as a basic unit of design.	L1, L2	6
Module 3: Colour on Fabrics Fabric coloration and decoration- Dying and Printing; Principles of applying color to fabrics. Textile arts and crafts in interiors, traditional and modern materials and methods. Preparing samples on tie and die printing, batik printing, appliqué, macramé and braiding.	L1, L5	8
Module 4: Textile Materials for Interiors. Miscellaneous materials such as cork, leather, paper, Rexene etc. – their properties, uses and applications in the interiors. A brief overview of Green materials. Jute or hessian – dyed jute fabric and its applications – various kinds of processed leather, its application in interior design. Furnishings-Classification; Types of curtain; Curtain construction; Selection criteria relation to backgrounds in walls; Floors and ceilings; Slip covers; Cushion covers; Bed linen and table linen; Floor coverings -rugs and carpets, types selection; Care and maintenance; Installation of floor coverings.	L1, L2	4

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text & References:

- Inside today‟s home, Faulkner, R.and Faulkner 1987,Rinebart Winston, New York
- Interior Design & Decoration, SherrilWhiton, Prentice Hall
- Introduction to home furnishings, Stepat, D.D,1991, Themacmillancompany,New York.
- The themes and Hudson manual of textile printing , Storeyjoyce ,1992, London
- Colour in interior Design Jhon,F.P, 1997, McGraw Hill Company
- Materials for Interior Environments, Corky Bingelli, John Wiley and Sons, 2007
- Fabrics: A guide for architects and Interior Designers, Marypaul Yates, Norton publishers, 2002.
- June Fish, Designing and printing textiles, Crowood press, 2005

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	2	3

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2	3	3	-	-	2	1	3	3	1	3	3	2
CO2	1	1	1	1	1	3	-	-	3	3	1	2	-	3	1	-
CO3	1	2	3	1	2	3	-	-	1	3	1	1	1	3	-	-
CO4	1	1	1	1	1	3	-	-	3	3	1	2	-	3	1	-

1: strongly related, 2: moderately related and 3: weakly related

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IND2513	BUILDING SERVICES – III	L	T	S	P	C
Version 1.1	Date of Approval:	2	0	0	0	2
Pre- requisites/ Exposure	Building Materials And Construction Technology –IV, Architectural Services-II					
Co-requisites	Design – V					

Catalog Description

The aim of this course is to introduce the basic concepts of Electrical system design at the building planning level. Building services engineers are responsible for the design, installation, and operation and monitoring of the mechanical, electrical and public health systems required for the safe, comfortable and environmentally operation of modern buildings. The course module can help students to understand the basic concepts of electrical and mechanical circulation systems to make the building comfortable, functional, efficient and safe for use.

Course Objectives

The objective of this course is

- To familiarize the student with theoretical and practical aspects of Electrical Systems and Components of Home Electrical Design.
- To develop perception regarding the various norms and standards for Electrical Systems and Lighting.
- To increase knowledge capacity of the students in the, HVAC system and Ventilation.

Course Outcomes

On completion of this course, the students will be able to

CO1: Discuss the active and passive components of Electrical system and various principles.
CO2: Develop understanding for Electrical and illumination system for Small building.
CO3: Discuss the active and passive components of HVAC and their underlying principles.
CO4: Discuss the importance of ventilation systems in buildings.

Modules	Blooms level*	Number of hours
MODULE 1: Electrical System Terminology and architectural symbols (as per NBC/NEC) for electric installations in buildings. Need to generate and save electricity, transmission anddistribution of electricity (single and three phases), procuring service connection. Familiarization to various lighting accessories, wires and cables, metering, distribution panels / boards etc. for single and three phase supply. Basic considerations. Various types of internal wiring systems e.g. cleat, casing and capping, batten and conduit (surface & concealed). Introduction to various types of protection devices e.g. switches, fuses and circuit breakers.	L1, L2,L3	6
MODULE 2: Lighting and Illumination Terminology and unit. Light and its characteristics – scattering, propagation, transmission, reflection, absorption, refraction and dispersion of light. Different types of source of lights: Thermal radiators - Incandescent, Halogen. Discharge lamps– Low pressure (fluorescent, compact fluorescent, sodium, cold cathode	L1, L2,	6

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neon), High pressure (mercury, metal halide, sodium). New technologies - LED, Fiberoptics. Luminaries – Types of Luminaries – Indirect, Semi-indirect, General diffusing, Semi-direct and Direct. Types of illumination schemes e.g. Ambient, Task, Focal and Decorative etc. Design considerations for illumination Schemes. Methods for lighting calculation – Watts per square meter, Light flux and Point to point method.		
MODULE 3: HVAC Introduce to the basic concepts of Air Conditioning, function, scope and purpose. Share relevant Indian BIS and ASHRAE standards. Study relationship of Human Comfort, Dry/Wet/Dew Bulb Temperature, Climatology principles, Psychrometric Chart Analysis, and study HVAC design considerations in typical building case.	L1, L2, L3	6
MODULE 4: Ventilation Introduction of the importance on ventilation in a building. Types and means of ventilation systems. Natural ventilation, Stack effect, Direct and Indirect	L1, L2,	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

- National Electrical Code.
- Raina K.B. & Bhattacharya S.K., Electrical Design estimating and costing, New Age International (P) Limited, New Delhi,2004.
- RudigerGanslandt& Harald Hofmann, Handbook of Lighting Design, DruckhausMaack, Lüdenscheid, 1992.
- Kevin Kelly& Kevin O'Connell, Interior Lighting Design - A Student's Guide
- IS SP 7-NBC : National Building Code of India 2016, Bureau of Indian Standards (2016)
- NBC-2005, National Building Code of India - 2005,Bureau of Indian Standards, New Delhi 2005

References

- Electrical power systems quality. (1996). Choice Reviews Online, 34(01), 34-0322-34– 0322. https://doi.org/10.5860/choice.34-0322
- Murty, P. S. R. (2017). Electrical power systems. Electrical Power Systems (pp. 1–814). Elsevier Inc. https://doi.org/10.1016/b978-0-08-100975-8.00006-0
- ASHRAE. (2011). ASHRAE Handbook - HVAC Applications. www.ansi.org American Societyof Heating, Refrigerating and Air-Conditioning Engineers, Inc. (pp. 1–1104).
- Pérez-Lombard, L., Ortiz, J., Coronel, J. F., &Maestre, I. R. (2011, February). A review of HVAC systems requirements in building energy regulations. Energy and Buildings. https://doi.org/10.1016/j.enbuild.2010.10.025
- Vakiloroaya, V., Samali, B., Fakhar, A., &Pishghadam, K. (2014). A review of different strategies for HVAC energy saving. Energy Conversion and Management, 77, 738–754.

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written
Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	2	3

CT: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	--	2	--	--	--	3	--	--	--	--	--	--	1	--	2
CO2	2	--	1	--	--	--	3	--	--	--	--	--	--	1	--	2
CO3	2	--	1	--	--	--	2	--	--	--	--	--	--	1	--	2
CO4	2	--	1	--	--	--	2	--	--	--	--	-	--	1	--	2

1: strongly related, 2: moderately related and 3: weakly relate

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IND2509	INTERIOR DESIGN STUDIO – V	L	T	S	P	C
Version 1.1	Date of Approval:	1	1	4	0	6
Pre-requisites/ Exposure	Interior Design Studio – IV					
Co-requisites	Building Materials & Construction Technology - IV					

Catalog Description
The aim of this subject is to emphasize on socio cultural values and design projects focused on cultural values of the users. The students can be introduced to hospitality spaces or cultural institutions and the planning and designing involved in creating such institutions which cater to various users and their needs.

Design Exercise: – Coffee Shops, Fine Dining Restaurants, Reception Lobbies and Lounge of Hotels, Spas, Bars, Clubs, Discotheque, Hotel Kitchens – open & enclosed etc, art galleries, small museums etc.

Course Objectives
The objectives of this course are:

- To explore the design of buildings addressing the socio – cultural & economic needs of contemporary society.
- To enable the students to understand the importance of spatial planning with regard to various functions and users.
- To enable the students to design for large groups of people in a socially and culturally sensitive manner, taking into account aspects such as user perception, crowd behavior, large scale movement of people and identity of buildings.
- To emphasize on the importance of understanding the relationship between open space and built form and interior services

Course Outcomes
On completion of this course, students will be able to
CO1: Design a Project involving multiple space utilization.
CO2: Design socially and culturally sensitive interiors.
CO3: Demonstrates basic interior service in the drawings.
CO4: Communicate through drawings or models.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction Design problem may be introduced, Site visit, Site analysis, Understanding the user and culture.	L1, L2,	10
MODULE 2: Development of Concept Collecting and analysing data of various spaces, Area programming, Flow diagram, Single line graphics and study models.	L!, L2	10
MODULE 3: Design Development Integrate the knowledge gained from previous theory based subjects like Building services, Building materials and Construction Technology, Structure, etc., and apply to detail out their design proposal.	L1,L2,L3	20

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MODULE 4: Final Design Proposal The final design proposal is prepared after conducting various informal and formal reviews at individual and at group level. The drawing and detail physical model explaining the approach	L1,L2,L3	20

***Bloom's Level:** L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books/ References

- Frampton, Kenneth. (1980). Modern Architecture: A Critical History. London: Thames and Hudson. • Francis D.K. Ching (1979),Architecture: Form, Space and Order,John Wiley& Sons Publication • Hays, K. Michael, ed. (1998). Architecture Theory Since 1968. Cambridge: MIT.
- Béjar, R., Latre, M. Á., Nogueras-Iso, J., Muro-Medrano, P. R., &Zarazaga-Soria, F. J. (2009). An architectural style for spatial data infrastructures. International Journal of Geographical Information Science, 23(3), 271–294. https://doi.org/10.1080/13658810801905282
- Chiara, J. D., &Callender, J. (1983). Time-Saver Standards for Building Types. McGRaw-Hill International Edition. • Givoni, B. (2004). Time Saver Standards for Urban Design: Urban Design and Climate. Digital Engineering Library @ McGraw-Hill, 1–14.
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- Julius, P., &Zelnik, M. (1979). Human Dimension & Interior Space. Vasa. Retrieved from http://medcontent.metapress.com/index/A65RM03P4874243N.pdf
- Wolfenden, A., &Chusid, M. (1991). Time-Saver Standards for Building Types: 3rd Edition. Journal of Testing and Evaluation, 19(4), 347. https://doi.org/10.1520/jte12583j
- Head, A. J. (2017). Planning and Designing Academic Library Learning Spaces: Expert Perspectives of Architects, Librarians, and Library Consultants. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.2885471

Modes of Evaluation: Literature Study/ Case Study/ Presentation/ Written Examination
Examination Scheme

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	0	70	70	100	6	3

CT: Class Test; TA: Total Assessment; A: Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	1	1	-	2	--	3	--	--	--	-	1	-	-	-	3
CO 2	1	-	1	3	1	-	3	--	--	2	-	-	1	-	-	-
CO 3	1	2	1	-	1	-	-	-	-	2	-	-	1	-	-	-
CO 4	3	-	2	-	1	2	1	2	-	2	2	2	2	-	-	-

1: strongly related, 2: moderately related and 3: weakly related

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IND2511	ESTIMATION & SPECIFICATIONS	L	T	S	P	C
Version 1.1	Date of Approval:	2	0	0	0	2
Pre-requisites/Exposure	Interior Design Studio					
Co-requisites						

Catalog Description

This course aims to equip the students to prepare the Estimate in order to foresee the costof the work or to implement an interior design project & also to monitor / control project cost. Also, this course exposes the students to the currently prevalent techniques in the planning, programming and management of a project.

Course Objectives

- This course aims to equip the students to prepare the Estimate in order to foreseethe cost of the work or to implement an interior design project & also to monitor / control project cost.
- Also, this course exposes the students to the currently prevalent techniques in the planning, programming and management of a project.

Course Outcomes

On completion of this course, the students will be able to

CO1: Prepare the Estimate to implement an interior design project

CO2: Monitor / control project cost

CO3: Get exposure to currently prevalent techniques in the planning, programmingand management of a project.

CO4:

Course Content

Modules	Blooms Level	No. of Hours
Module 1: Introduction To Estimation & Rate Analysis Estimation – definition, purpose, types of estimate, and procedure for Estimating the cost of work in order to implement an interior design project or to make products related to interior design like furniture, artifacts etc. Rate Analysis – definition, method of preparation, quantity & labor estimate for woodwork, steelwork, Aluminum work, glass & its rate for different, thickness & sections, finishing (enamel paint, duco paints, melamine, DU coats, Hand polishing, veneering and laminating) for walls & ceilings. Electrical &plumbing products, wiring, ducting etc., and laying of tiles & wall paneling in the estimate format of the project.	L1, L2	4
Module 2: Detailed Estimate Detailed Estimate – data required, factors to be considered, methodology of preparation, abstract of Estimate, contingencies, labor charges, bill of quantities, different methods of estimate for interior design works, methods of measurement of works.	L1, L2, L3	4

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Module 3: Costing of Fixtures & Fittings Cost of the following items: Luminaries, Fan, Cables, Switches etc.; Tiles in skirting & dado, Cement plaster, Wood, Steel & Aluminum, Painting to walls : Cement paint, Oil paints , Distemper, Acrylic emulsion, Enamel paint; painting to joinery, Varnishing, French polishing, Plumbing equipments: Piping, Shower panels ,Cubicles, Tubs, Jacuzzis, Taps, Motors, Fountains, False ceiling of Aluminum panels, Steel & Wooden frame work, Thermosol etc. Wall paneling of tiles, Partitions made of materials like Aluminum, Wood, Steel etc.	L1, L2, L3	4
Module 4: Introduction To Specification: Definition, Purpose, Procedure for writing specification for the purpose of calling tenders, Types of specification. Specification for different item related to interiordesign project – woodwork for furniture window frames & pelmets, Partitions etc. Materials like steel aluminum glass of various kind. Wall paneling & false ceiling of materials like Aluminum, Steel, Wood, Electrical, Plumbing, Air-conditioning &Firefighting equipment. **Project Management** ***Introduction:*** Project planning and project scheduling and project controlling, Role of Decision in project management, Method of planning and programming, Human aspects of project management, work breakdown structure, Life cycle of aproject, disadvantages of traditional management system; ***Critical Path Method And PertAnalysis:*** CPM network analysis & PERT time estimates, timecomputation & network analysis; ***project time reduction and optimization:*** Project cost	L1, L2, L3, L4	4

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text & References:

- M. Chakraborti, .Estimation, Costing, Specification and Valuation in Civil engineering.
- Dr. B.C.Punmia et al. Project planning and control with PERT and CPM, LaxmiPublications,
- R.A. Burgess and G.White, Building production and project Management, The construction press, London, 1975
- S. C. Rangwala, Elements of Estimating and costing, Charoter publishing House, Anand,India, 1984
- Jerome D.Wiest, A Management Guide to PERT, CPM, prentice Hall of India Pub, Ltd.,New Delhi, 1982

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	2	3

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att:Attendance

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO 1	1	-	1	-	-	3	-	-	-	-	1	3	-	-	-	-
CO2	1	-	1	-	-	3	-	-	-	-	1	3	-	-	-	-
CO 3	1	-	1	-	-	3	-	-	-	-	1	3	-	-	-	-
CO 4	1	-	1	-	-	3	-	-	-	-	1	3	-	-	-	-

1: strongly related, 2: moderately related and 3: weakly relate

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IND2512	COMPUTER AIDED INTERIOR DESIGN & VISUALIZATION	L	T	S	P	C
Version 1.1	Date of Approval:	0	1	4	0	3
Pre-requisites/ Exposure	CAIDD					
Co-requisites	Landscape Design					

Catalog Description

The aim of this subject is to introduce techniques for further refinement of computer generated graphics covered in the previous semester. In addition to that, this course also trains students for developing photorealistic modeling using popular software in the field of architecture. Advanced technologies and concepts using computers as an essential tool are also introduced such as Building Information Modeling. This course equips students with soft skills which increase their productivity and expression in design related subjects.

Course Objectives

The objective of this course is

- To introduce and make students learn about graphic presentation tools
- To introduce Sketch up as 3D drafting software.
- To introduce Revit as 3D drafting software and its allied rendering plugins.

Course Outcomes

On completion of this course, the students will be able to

CO1: Prepare building design through sketch up software.
CO2: Prepare building design through revit software.
CO3: Render the drawings in various rendering plugins.
CO4: Train others in various types of softwares such as revit, sketch up.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to SketchUp (3-D) Software Introduce to the Sketch up 3D software for the graphic design, building planning. Explain the various ways to deal with the graphic drawings. Introduce to 3D drawing concepts. Students learn the ability to Model, Editing and modification work to be done in the graphic presentation.	L1, L2	12
MODULE 2: Introduction to Revit (3-D) Software Introduce to the Revit 3D software for the graphic design, building planning. Explain the various ways to deal with the graphic drawings. Students learn the ability to Building Information Modeling.	L4, L5, L6	8
MODULE 3: Introduction to Rendering Plugins Introduce to the Lumion and Twilight Render software for the Rendering.	L1, L2	4
MODULE 4: Workshop Practice on the various Revit and Sketch Up commands through software User Interface. Conduct 3D Skills Workshop to train the students. Introduce to the Modelling skills and minimize errors in the presentation skills.	L4, L5, L6	12

***Bloom's Level:** L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

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Text & Reference Books

- Brewster, R. (2014). Paint.NET - Free Software for Digital Photo Editing. *Http://Www.Getpaint.Net/Index.Html (Accessed June 2015)*.
- Khan, E., Reinhard, E., Fleming, R., & Bülthoff, H. (2005). Image-based material editing. In *ACM SIGGRAPH 2005 Sketches, SIGGRAPH 2005* (p. 148). Association for Computing Machinery, Inc. https://doi.org/10.1145/1187112.1187291
- Kholgade, N., Simon, T., Efros, A., & Sheikh, Y. (2014). 3D object manipulation in a single photograph using stock 3D models. In *ACM Transactions on Graphics* (Vol. 33). Association for Computing Machinery. https://doi.org/10.1145/2601097.2601209.
- Kirk, D. S., Sellen, A. J., Rother, C., & Wood, K. R. (2006). Understanding photowork. In *Conference on Human Factors in Computing Systems - Proceedings* (Vol. 2, pp. 761–770). https://doi.org/10.1145/1124772.1124885

Modes of Evaluation: Assignment/Written Examination
Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	0	70	70	100	3	3

CT: Class Test; TA: Total Assessment; A: Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	--	3	--	--	2	--	--	--	-	-	--	-	3	1	-	--
CO 2	--	2	--	--	1	--	--	-	-	-	--	-	2	1	-	--
CO 3	--	2	--	--	1	--	--	-	-	-	--	-	2	1	-	--
CO 4	--	3	--	--	1	--	--	--	-	-	--	-	2	1	-	--

1: strongly related, 2: moderately related and 3: weakly related

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IND2510	BUILDING MATERIALS & CONSTRUCTION TECHNIQUES – V	L	T	S	P	C
Version 1.1	Date of Approval:	1	1	1	0	3
Pre-requisites/ Exposure	NA					
Co-requisites	Materials & Construction Techniques – IV					

Catalog Description

The aim of this course is to continue with metal as the main building material. The study is concerned with special doors and windows to steel doors, windows and partitions. The knowledge about RCC is also enhanced through comprehension of RCC framed structures and reinforcement details in building elements like columns, beams, slab and lintels. Students are familiarized with the types of metal shutters and partitions, doors and windows, their application and construction details in steel and aluminium sections.

Course Objectives

The objective of this course is to

- To familiarize the students with various types of metal doors.
- To develop understanding about framed structure in terms of reinforcement and construction details.
- To familiarize students with doors and windows in steel and aluminum sections. Also integration of openings with partitions in steel and aluminum used in interior of buildings

Course Outcomes

On completion of this course, the students will be able to

CO1: Define various types of door and windows used in different situations from day to day life.
CO2: Comprehend the details of metal doors.
CO3: Comprehend the details/ arrangements of reinforcement.
CO4: Evaluate the best suitable material and type of Door, Window and Partitions.

Modules	Blooms level*	Number of hours
MODULE 1: Special Doors and Shutters Different types of doors; sliding, sliding and folding, revolving doors, collapsible shutters, rolling shutters, types of rolling shutters in conventional and contemporary materials. The installation, working and mechanism of such doors and shutter	L1, L2, L3	10
Module II: Exterior and interior finishes Latest finishing materials and their applications in construction- Aluminium Composite Panels(ACP), PVC Sheets, Gypsum, Fiberglass, Glass bricks, other cladding materials and finishes.	L1, L2, L3	8
Module III: Paints, Polish, Varnishes and Application Technique Types of Paints used in Interiors and exteriors and application methods. Preparation of differentsurfaces for Painting, Polishing and Varnishing and their market study.	L1, L2, L3, L4	10
Module IV: Upholstery & Curtains, Drapes & Blinds Upholstery work in furniture, especially seats, with padding, springs, webbing,and fabric or leather, leatherette covers, etc. Curtains, Drapes, Blinds, their material types and application on doors and windows.	L1, L2,L3	8

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Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- da Silva, L. S., Simões, R., & Gervásio, H. (2014). Design of Steel Structures. Design of Steel Structures (pp. 1–438). wiley. https://doi.org/10.1002/9783433604229
- Khurmi, R. S. (1991), Strength of Materials. New Delhi: S.Chand Publishers
- MacGinley, T. J. (2018). Structural steel design. In Steel Structures (pp. 32–54). CRC Press. https://doi.org/10.1201/9781315274966-3
- Punmia, B.C. (2005). Building Construction, New Delhi: Laxmi Publishers
- Rangawala, (2017). Building Construction, Gujrat:Charotar publishe

Reference Books

- Lane, J., & Lane, J. (2018). Windows and doors. In Aluminium in Building (pp. 89–102). Routledge. https://doi.org/10.4324/9780429463372-10
- Pappu, A., Saxena, M., & Asolekar, S. R. (2007). Solid wastes generation in India and their recycling potential in building materials. Building and Environment, 42(6), 2311– 2320. https://doi.org/10.1016/j.buildenv.2006.04.015
- Venkatarama Reddy, B. V. (2004, October 10). Sustainable building technologies. Current Science.
- Yang, L., & Shi, J. J. (2010). Experimental study on the impact of rainfall on RCC construction. Journal of Construction Engineering and Management, 136(5), 477–483. https://doi.org/10.1061/(ASCE)CO.1943-7862.0000156

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	3	3

CT: Class Test; TA: Total Assessment; A: Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	-	--	--	2	--	--	--	--	--	--	--	3	1	--	--
CO 2	3	-	--	--	1	--	--	--	--	--	--	--	2	1	--	--
CO 3	3	-	--	--	2	--	--	--	--	--	--	--	2	1	--	--
CO 4	2	-	--	--	1	--	--	--	--	--	--	--	2	1	--	--

1: strongly related, 2: moderately related and 3: weakly related

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Syllabus – Sixth Semester

IND2610	SUSTAINABLE INTERIOR DESIGN & MATERIALS	L	T	S	P	C
Version	Date of Approval:	3	0	0	0	3
Pre- requisites/ Exposure	NA					
Co-requisites	NA					

Catalog Description

On the successful completion of the course student will be able to Analyze Environmental Impacts and Sustainable Design Strategies. Understand Phases of Building Materials, Life-cycle Assessment; Life-cycleInventory. Analyze and Execute Sustainable Interior Materials in construction.

Course Objectives

- Careful selection of environmentally sustainable building materials is the easiest way for architects to begin incorporating sustainable design principles in buildings.
- This course helps the students to understand the sustainable interior materials and methods.

Course Outcomes

On completion of this course, the students will be able to

CO1: Bio Climatic Design Concepts
CO2: Sustainable Interior Materials Selection
CO3: Key Sustainable Interior Materials and Methods
CO4: Understand the detailing of flooring

Course Content:

Modules	Blooms level*	Number of hours
Module 1: Bio Climatic Design Concepts Environmental Impacts and Sustainable Design Strategies: Natural Resource Depletion, Energy use, Pollution. The Designer's role beyonddesign and construction. The principles of Life Cycle Design; Phases of Building Materials,Life- cycle Assessment (LCA); Life-cycle Inventory (LCI); LCA in Practice: EIE, BEES; Assessments tools: BREEAM, SB Tool, LEED, Eco Profile, Promise, Green Mark of Buildings, Green Star, CASBEE. Certification Systems: First party, Second party and Third party ; Third-party Certification Organizations: The Forest Stewardship Council(FSC), Green guard Environmental Institute (GEI), Green Seal, Inc., and Scientific Certification Systems (SCS); The Carpet and Rug Institute (CRI); Resilient Floor Covering Institute (RFCI)	L1, L2	12

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Module 2: Sustainable Interior Materials Selection Criteria: Indoor Air Quality (IAQ); Reusable or Renewable Resources Energy Efficiency; Water Conservation. Features:Pollution prevention;waste reduction; recycled content; embodied energy; Natural materials; Minimal construction waste; Locally produced materials; Non- or less- toxic materials; Durable materials; Rapidly Renewable Materials; Low Maintenance; Reusability; Recyclability; Biodegradability; Harmful Chemical that can affect air quality in interior spaces: Volatile Organic Compounds (VOCs); Brominated flame retardants, Halogenated plastics, Bisphenol A, Heavy metals, Toxic solvents in finishes and sealants, Formaldehyde.	L1, L2	12
Module 3: Key Sustainable Interior Materials and Methods Bricks & Blocks: Recycled concrete bricks, Adobe bricks, Stabilized earthblocks, Compressed sand bricks, Hydra form bricks, Fly Ash Bricks, Wool Bricks; Wood Materials: Engineered wood: Plywood, Oriented strand board, Glued laminated timber (glulam), Laminated veneer lumberCross Laminated Timber, Parallel strand lumber, Finger jointed lumber, I-joists and wood I-beams, Roof trusses and floor trusses, Certified Wood; Site and Landscaping: Landscape pavers made from recycled plastic, Recycled asphalt and bitumen, Expanded polystyrene foam. Foundations: rigid plastic foam, Concrete blocks with foam inserts.	L1, L2	12
Module 4: Flooring Flooring: Bamboo flooring, Cork flooring, Eco-friendly linoleum flooring; Structural Framing: Wood and steel open web joist; Roofing: Solar Tiles Roofing, Sustainable Concrete, Fiber- resin composition roofing tiles, integrated sheathing and insulation, pre-tapered for flat roofs, Weatherproof shingles manufactured from recycled aluminum alloys; Structural Envelopes: Super-insulated stress-skin panels; Earth bag construction; Insulation: Homasote fiberboard, Cotton insulation, Hemp based products, Blown insulation; Interior Finishes: wallpapers, recycled gypsum board or wallboard, Natural Fiber Reinforced Plastics, Casein paint, Sisal wall coverings, recycled burlap or virgin jute fiber carpet, recycled wool carpet, recycled ground up tire rubber. Plumbing: Low flow shower heads, Solar hot water, Vacuum- assisted toilets; Ventilation: Heat- recovery ventilator.	L1, L2	12

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text/ Reference Books

- Kim, JongJin; Qualities, Use, and Examples of Sustainable Building Materials, CSS,University ofMichigan, 1998.
- Binggeli, Corky. Materials for interior environments. John Wiley & Sons, 2008.
- American Institute of Architects; Environmental Resource Guide Subscription. Washington: AIA; 1992.
- Sassi, P Strategies for Sustainable Architecture; New York, Taylor and Francis, 2006.
- Spiegel, Ross; Green building materials: a guide to product selection and specification. John Wiley &Sons, 2010.
- Yudelson, Jerry. The green building revolution. Island Press, 2010.

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	3	3

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att:Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO 1	1	3	1	-	3	3	-	-	-	-	2	3	-	-	-	-
CO 2	1	3	1	-	3	3	-	-	-	-	2	3	-	-	-	-
CO 3	1	3	1	-	3	3	-	-	-	-	2	3	-	-	-	-
CO 4	1	3	1	-	3	3	-	-	-	-	2	3	-	-	-	-

1: strongly related, 2: moderately related and 3: weakly relate

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IND2611	SUSTAINABLE INTERIOR RENOVATION	L	T	S	P	C
Version	Date of Approval	3	0	0	0	3
Pre- requisites/ Exposure	NA					
Co-requisites	NA					

Catalog Description

On the successful completion of the course student will be able to Typology of the existing housing, Constructive mode and materials, Renovation strategies. Execute Principles of acoustic insulation and correction, optimizing the Acoustic comfort. Optimize the lighting system, Renewable energies for generating electricity, Heat recovery on ventilation system, Air pre-heating by air ground exchanger.

Course Objectives

- Sustainable renovation needs special skills for diagnosis, conception, for using intelligent or new techniques, and then ensuring maintenance.
- This course provides an insight to the students about the need and importance as well as various concepts of sustainable renovation.

Course Outcomes

On completion of this course, the students will be able to

CO1: Introduction to Sustainable Renovation
CO2: The Comfort of Life
CO3: Energy Consumption
CO4: Water Consumption

Course Content:

Modules	Blooms level*	Number of hours
Module 1: Introduction to Sustainable Renovation & The Comfort of Life Sustainable Renovation: Need, Meaning & Definition, Priorities for the renovation of housing, Definition of sustainable architecture, The inceptionof bioclimatic architecture. Typology of the existing housing, Constructive mode and materials, Renovation strategies. Increase the quality of the outdoor spaces: Favour social interactions, Favour Soft mobility, Favour and reintroduce biodiversity; Increase the quality of indoor air, limiting sources of indoor pollution, Optimizing the ventilation system. Acoustic comfort. Basic notions, principles of acoustic insulation and correction, optimizing the acoustic comfort.	L1, L2	6

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Module 2: Energy Consumption Increase the thermal performances of housing: Optimizing the External walls performances, Optimizing the shape, : Additional insulation in housing renovation. Improving the air tightness, Reducingthe thermal bridge Thermal inertia in housing renovation, Optimizing the solar protections, Natural night cooling, Optimizing the window conception.Reduce fossil energies consumption: Optimizing the heating system,Optimizing domestic hot water, Heat pump for heating production, Hot Water production by solar energy, Optimizing the lighting system,Renewable energies forgenerating electricity, Heat recovery on ventilation system, Air pre-heating by air ground exchanger.	L1, L2	6
Module 3: Water Consumption Reduce the tap water consumption: Rational use of tap water, Recovery anduse of Rainwater, increase the water resources. Water management on the parcel, Water recycling by plants, Water recycling in urban area.	L1, L2	**8**
Module 4: Reduce production of waste & consumption of territory resources Reduce construction and demolition waste: Preventive measures to reduce Waste Waste management on building site, Reduce domestic waste: Preventive measures to reduce domestic waste; Reduce consumptionof territory and resources, Embodied energy consumption, Construction materials.	L1, L2	8

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6:Evaluation*

Text & References:

- Trachte, Sophie; Advanced and Sustainable Housing Renovation, A guide for Designers and Planners. UCL, 2010.
- Gelfand, Lisa, and Chris Duncan. Sustainable renovation; Vol. 19. John Wiley & Sons, 2011.
- George Baxter, Tim Pullen; The Sustainable Building Bible; Ovolo Publishing, Limited, 2012.
- Sung, WenPei; eds. Environment, Energy and Sustainable Development. CRC Press, 2013.
- Maroni, Marco, Bernd Seifert; eds. Indoor air quality: a comprehensive reference book. Elsevier, 1995.
- Fuchs, Helmut V. Applied Acoustics; Springer Science & Business Media, 2013.
- Brooker, Graeme, and Lois Weinthal, (Eds.) The handbook of interior architecture and design.A&C Black, 2013.
- Fuchs, Matthias, et al. Energy manual: sustainable architecture. Walter de Gruyter, 2008.
- GeyerAllély, Elaine. Water consumption and sustainable water resources management. OECD, 1998.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	3	3

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att:Attendance

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CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO 1	1	3	1	-	3	3	-	-	-	-	2	3	-	-	-	-
CO 2	1	3	1	-	3	3	-	-	-	-	2	3	-	-	-	-
CO 3	1	3	1	-	3	3	-	-	-	-	2	3	-	-	-	-
CO 4	1	3	1	-	3	3	-	-	-	-	2	3	-	-	-	-

1: strongly related, 2: moderately related and 3: weakly related

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IND2612	ADAPTIVE REUSE AND RETROFIT	L	T	S	P	C
Version	Date of Approval:	3	0	0	0	3
Pre- requisites/ Exposure	NA					
Co-requisites	NA					

Catalog Description
On the successful completion of the course student will be able to: Analyse the building's performance, Able to use sustainable conservation techniques and to Improve the energy performance of heritage structures.

Course Objectives
The objective of this course is to give a comprehensive overview on how existingbuildings can be adapted and retrofitted to function sustainably.

Course Outcomes
On completion of this course, the students will be able to
CO1: Sustainable Retrofit for existing building
CO2: Adaptive Reuse of old building
CO3: Technologies for energy efficiency in existing buildings
CO4: Sustainable conservation of heritage structures

Course Content:

Modules	Blooms level*	Number of hours
Module I: Sustainable Retrofit for existing building Retrofitting options for existing buildings; Structural retrofit; Façade; Services; Interior retrofit; Performance analysis of existing buildings;Physical audits; Building simulation , metering and tracking options, analysis the building's current performance, decision influencers forretro fit, economic, social and environmental issues.	L1, L2	10
Module II: Adaptive Reuse of old building Need for adaptive reuse; Issues to be explored in building adaption; Economic, social environmental, and assessment models for adaptivereuse; Case studies of buildings with adaptive reuse.	L1, L2	8
Module III: Technologies for Energy Efficiency in Existing Buildings Improving energy efficiency in existing buildings,Facade improvements;HVACimprovements; Indoor EnvironmentImprovements; Monitoring the performance of retrofits; Case studies on energy efficiency improvements in existing buildings.	L1, L2	10
Module IV: Sustainable Conservation of Heritage Structures Conservation of heritage structures; Sustainability in heritage structures;Adaptive reuse of heritage structures; Issues in adapting a heritage structure; Use of sustainable conservation techniques; Improving the energy performance of heritage structures; Case studies of sustainable conservation in heritage structures.	L1, L2	8

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**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text/ Reference Books

- HarimohanPillai – Heritage conservation and cultural continuity Saraswatham publishers, 2002.
- Sustainable building design manual – TERI publication, 2004.
- Sandra F Mendler:The HOK Guide book for sustainable design John Wiley and Sons, Canada,2002
- Sara J. Wilkinson; Sustainable Building Adaptation: Innovations in Decisionmaking, John Wiley and sons, 2014
- John Krigger, Residential Energy: Cost Savings and Comfort for Existing Buildings, Prentice Hall, 2009
- William H. Clark, Retrofitting for Energy Conservation, McGraw Hill Professional, 1997 Paul Apple, Sustainable Retrofit and Facilities Management, Routledge, 2013
- ZeynepAygen, International Heritage and Historic Building Conservation; Routledge, 2013

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	3	3

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att:Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO 1	1	3	1	-	3	3	-	-	-	-	2	3	-	-	-	-
CO 2	1	3	1	-	3	3	-	-	-	-	2	3	-	-	-	-
CO 3	1	3	1	-	3	3	-	-	-	-	2	3	-	-	-	-
CO 4	1	3	1	-	3	3	-	-	-	-	2	3	-	-	-	-

1: strongly related, 2: moderately related and 3: weakly related

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IND2613	PERFORMANCE SPACE DESIGN	L	T	S	P	C
Version	Date of Approval:	2	0	2	0	3
Pre- requisites/ Exposure						
Co-requisites						

Catalog Description

This course provides the opportunity for the students to develop their own individual design in relation to Performative Spaces like theatre and performance design, stage and set design, production design for film and television through independent and collaborative project work On the successful completion of the course student will be able to Understanding Set Design and Stage Design Concept, Analyzing Site and Building Exteriors and Understanding Visual Creation

Course Objectives

This course provides the opportunity for the students to develop their own individual design in relation to Performative Spaces like theatre and performance design, stage and set design, production design for film and television through independent and collaborative project work

Course Outcomes

On completion of this course, the students will be able to

CO1: Performance Space Design
CO2: Set Design and Stage Design Concept
CO3: Functional Area Descriptions
CO4: Visualization of Scenic Design

Course Content:

Modules	Blooms level*	Number of hours
Module 1: Performance Space Design Introduction Scenic Design , The nature of theatre design, Theatre forms, The goals of theatre design, The house and front of house, Scenic design, Considerations for the Scenic Designer: Mood and Spirit. Functionaldiversity of Performance Space: Movies, Conferences/ Seminar Auditorium, Live performance event space, Hybrid Performance S pace.	L1, L2	6
Module 2: Set Design and Stage Design Concept Theatre Terms: Arena stage, Box set, Curtain set, Cyclorama, Drops,Flats, Minimal set, Permanent set, Prism set, Proscenium stage, Scrim, Set pieces,Teaser, Thrust stage, Unit set; Stage Elements: Act curtain, Apron acting,Back wall, Battens, Cyclorama orCyc, Flies, Fly gallery, Gridiron or grid, Ground cloth, Leg, Pin rail, Proscenium arch, Tormentors, Trap, Wings;The Design and Setting: Provide adequate space for movement,Communicate the time and place, provide the audience with the moodand style of the play, Technically usable and safe.	L1, L2	5

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Module 3: Functional Area Descriptions Site and Building Exteriors: Public Scale, Parking, Accessibility for disabled,marquee, Exterior Design and Materials, etc.; Performance Space Ceiling configuration and floor plans, Stage Specifications,Back stageand artistic support areas, Theatrical lighting system, Architectural lightning system, AudioVideo systems, Acoustic Ca nopies and Orchestra shells, Orchestra Pits and Pit lifts, Special show related systems for purpose-built facilities, Sight lines, Acoustics, Curtains, Changing rooms, Makeup rooms, Toilet rooms, General storage, Production and Pre Production areas, Receiving areas, Ceiling configuration etc.; Audience Environment: Ceiling configuration and floor plans, Seatingand Seat Spacing plans including sightlines to the stage, Acousti cal canopies; Lobby lay out, Box office, Toilet rooms, Ticket Sales Areas,Rest rooms, Managers office, , Exit requirements, Shop spaces etc	L1, L2	5
Module 4: Visualization of Scenic Design Visual Creation: Principles of layout for creating effective visual signage and explore the unique problems, technique, theory, and approachesof signage in film, theatre & other forms of mediated exhibition; Introduction to the design applications for building signage; VisualPresentation: Setting the Mood Sketches & Renderings,	L1, L2	10

Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation

Text/ Reference Books

- Parker, W. Oren; Scene Design and Stage Lighting; 8 Ed.; Orlando: Harcourt Brace College Publications; 2003.
- Thorne, Gary. Stage design: a practical guide. Crowood, 2011
- YiFu Tuan; Space and Place: The perspective of experience, University of Minnesota Press, 2 001.
- Irwin Altman & Erwin; Public Spaces and Places, (Human Behavior and environment), Sprin gerlink, 1989

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	3	3

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att:Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO 1	1	3	1	-	3	3	-	-	-	-	2	3	-	-	-	-	-
CO 2	1	3	1	-	3	3	-	-	-	-	2	3	-	-	-	-	-
CO 3	1	3	1	-	3	3	-	-	-	-	2	3	-	-	-	-	-
CO 4	1	3	1	-	3	3	-	-	-	-	2	3	-	-	-	-	-

1: strongly related, 2: moderately related and 3: weakly relate

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IND2614	PUBLIC ART	L	T	S	P	C
Version	Date of Approval:	2	0	2	0	3
Pre- requisites/ Exposure						
Co-requisites						

Catalog Description

On the successful completion of the course student will be able to understand the concept of public art. To inspire different locations, to enhance the design and function of the public realm,to enhance the appearance, Character and value of buildings. To support professional art practice, to provide a level of guidance to artwork design.

Course Objectives

- This course approaches public art as an important part of an ongoing dialogue about cultural values, commerce, politics, and public life.
- This course aims to enhance the designing and artistic abilities towards Public Art either Indoor or outdoor.

Course Outcomes

On completion of this course, the students will be able to

CO1: Introduction to Public Art
CO2: Public Art Strategy & Principles
CO3: Developing a Concept for Public Art
CO4: Case Study: Public Art in India.

Course Content:

Modules	Blooms level*	Number of hours
Module 1: Introduction to Public Art The Concept Of Public Art: Definition, The Social Dimension, Types of Public Art, Stand Alone, Applied, Integrated, Industrial, Heritage/ Memorial, Interactive, Multimedia Temporary, Ephemeral, Indigenous Art, Community Art; The Role and Benefits of Public Art; Purpose of Public Art: Functional, Decorative, Iconic Integrated, Site specific,Interpretive, Commemorative, Temporary; Locations & Sites For Public Art. Evolution of Public Art: Renaissance Public Art (c.1400-1600), Baroque Public Art (c.1600-1700), Public Art 1700-1900, Public Art During the 20th Century: Socialist Realism, Degenerate Art, Fresco painting, Land Art, Skyscraper Architecture, Graffiti, Contemporary Public Art, Environmental public art.	L1, L2	8
Module 2: Public Art Strategy & Principles Strategy Objectives: To inspire different locations, To enhance the Design and function of the public realm, To enhance the appearance, Character and value of buildings, To support professional art practice , To provide a level of guidance to artwork design, To provide direction on the appropriateness, To guide the acquisition and location for artworks, Principle Objectives: Place Making, Site Specific, Scale, Universal Access,	L1, L2	5

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Attractors, Interaction, Management; Key Values of Public Art: Social, Environmental, Economic and Aesthetic vales; Public Art Project Types: Artist Made Building Parts, Integrated Artworks, Design Teams.		
Module 3: Developing a Concept for Public Art Concept Development: Research-Developing a Theme, Public Art Stakeholders; Conceptual Design Report: Artist Statement, Vision, Description of concept & artwork, Alignment of concept, Project goals, Location of proposed artwork, Placement plan, Suitability, Design benefits includes safety, structural integrity and accessibilityDimensions including an explanation of suitability of scale, Types & form of materials, Durability and performance, Anticipated maintenance, Life-cycle cost. Proposed fabrication, Timelines, Budget, Implementation schedule; Visual Presentation of Concept: Renderings, Boards, Computer generated 3D visualization, Marquette and models.	L1, L2	5
Module 4: Case Study: Public Art in India Make a list of famous public arts in India. Collect the images and brief of each one of them. Choose any appropriate three examples. Analyze its design and study what type of contribution that given in the terms of Social, Environmental, Economic and Aesthetic.	L1, L2	10

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text/ Reference Books

- Knight, Keith, and Mat Schwarzman. Beginner's guide to community-based arts. New Village Press, 2005
- Miles, Malcolm. Art, Space and the City: Public art and Urban futures. Psychology Press, 1997. Redstone, Louis G., and Ruth R. Redstone. Public Art: New Directions. New York: McGraw-Hill, 1981
- Cartiere, Cameron, and Shelly Willis, eds. The practice of public art. Routledge, 2008. http://forecastpublicart.org; http:// www. petemoorhouse.co.uk; http:// associationforpublicart.org

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	3	3

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att:Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO 1	1	3	1	-	3	3	-	-	-	-	2	3	-	-	-	-
CO2	1	3	1	-	3	3	-	-	-	-	2	3	-	-	-	-
CO 3	1	3	1	-	3	3	-	-	-	-	2	3	-	-	-	-
CO 4	1	3	1	-	3	3	-	-	-	-	2	3	-	-	-	-

1: strongly related, 2: moderately related and 3: weakly relate

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IND2615	PUBLIC SPACE DESIGN	L	T	S	P	C
Version 1.1	Date of Approval:	3	0	0	0	3
Pre- requisites/ Exposure						
Co-requisites						

Catalog Description

On the successful completion of the course students will be able to analyze interior spaces with respect to their function and provide design consultancy for entertainment and educational interior spaces.

Course Objectives

This course aims to impart knowledge to students on Study of interior design withreference to the context of the building typology and its environs.

Course Outcomes

On completion of this course, the students will be able to

CO1: Entertainment Spaces
CO2: Educational Spaces
CO3: Sporting Spaces
CO4: Commercial Spaces

Course Content:

Modules	Blooms level*	Number of hours
Module 1: Entertainment Spaces Study of interiors for entertainment buildings such as clubs, multiplexAnd Amusement parks schemes for video games parlor, food court areas and exclusive indoor game areas of clubs	L1,L2	5
Module 2: Educational Spaces Study of interiors for class rooms, seminar halls and AV halls schemesfor library, smart class rooms and discussion areas	L1,L2	10
Module 3: Sporting Spaces Study of interior requirements foe gymnasium, indoor stadium andAquatic complex schemes for interiors of stadium with focus on Lighting requirements and visibility	L1,L2	5
Module 4: Commercial Spaces Study of interiors in saloons, pubs, discotheque and banks, etc. -schemes for the same	L1,L2	10

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text/ Reference Books

- Henderson, Justin. Casino design: resorts, hotels, and themed entertainment spaces. Rockport, 1999
- Woolner, Pamela. The design of learning spaces. A&C Black, 2010

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- Carlson Broto- architecture on sports facilities – PG 1 publishing, Spain, 2005
- Piotrowski, Christine M., and Elizabeth A. Rogers. Designing commercial interiors. John Wiley and Sons, 2010
- Transport spaces – vol. I- images publishing, Hong Kong, 1999
- Edward D Mills; Planning Buildings for administration, entertainment and recreation; Krieger pu blishers, NY, 1976

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	0	70	70	100	3	3

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att:Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO 1	1	3	1	-	3	3	-	-	-	-	2	3	-	-	-	-
CO 2	1	3	1	-	3	3	-	-	-	-	2	3	-	-	-	-
CO 3	1	3	1	-	3	3	-	-	-	-	2	3	-	-	-	-
CO 4	1	3	1	-	3	3	-	-	-	-	2	3	-	-	-	-

1: strongly related, 2: moderately related and 3: weakly relate

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IND2616	INTERIOR DESIGN STUDIO – VI	L	T	S	P	C
Version	Date of Approval:	1	1	4	0	6
Pre-requisites/ Exposure	Design – V					
Co-requisites	Building Materials & Construction Technology - V					

Catalog Description
The aim of this course is to make students familiar with the Building Services such as Lighting, Electrical, Water Supply, Acoustics etc in the designed interiors scheme. Design-problem may focus but not limited to a multi-functional, service (advanced services) oriented buildings.

Design Exercise: – Retail Space Design for different type of merchandise (Electronics, Garments, Cosmetics, Groceries, Jewelries , Shoes, Automobiles etc.) and Retail type – Departmental, Single Brand franchises, Speciality stores, Off-price retailers, Catalogue showroom

Course Objectives
The objectives of this course are:
- To inculcate the importance of services in spatial planning
- To highlight on the importance of function intensive planning layouts.
- To explore computer aided presentation techniques involving 2D and 3D drawings, walk through and models as required.

Course Outcomes
On completion of this course, the students will be able to
CO1: Design a Project involving multiple space utilization like a multi-functional, service (advanced services) oriented building.
CO2: Build with precision block models, study models, site models.
CO3: Demonstrates interior services in the plans and sections.
CO4: Communicate through drawings or models.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction Design problem may be introduced, students may visit site for collecting context specific data for getting better understanding of real-life project details. The collected data may be analysed and presented for evaluation.	L1, L2,	10
MODULE 2: Development of Concept Flow diagram to explore relation of various spaces, bubble diagram for locating various zones on site, re-create for analysing spaces in all dimensions through block models and single line graphics and study models for choosing the right option.	L!, L2	10
MODULE 3: Design Development Integrate the knowledge gained from previous theory based subjects like Building services, Building materials and Construction Technology, Structure, etc., and apply to detail out their design proposal.	L1,L2,L3	20
MODULE 4: Final Design Proposal The final design proposal is prepared after conducting various informal and formal reviews at individual and at group level. The drawing and detail physical model	L1,L2,L3	20

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explaining the approach and consideration of urban setting to achieve the requirements with various other restrictions may be submittals.		

***Bloom's Level:** L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books/ References

- Chiara, J. D., &Callender, J. (1983). Time-Saver Standards for Building Types. McGRaw-Hill International Edition. • Givoni, B. (2004). Time Saver Standards for Urban Design: Urban Design and Climate. Digital Engineering Library @ McGraw-Hill, 1–14.
- Head, A. J. (2017). Planning and Designing Academic Library Learning Spaces: Expert Perspectives of Architects, Librarians, and Library Consultants. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.2885471
- Julius, P., &Zelnik, M. (1979). Human Dimension & Interior Space. Vasa. Retrieved from http://medcontent.metapress.com/index/A65RM03P4874243N.pdf
- Wolfenden, A., &Chusid, M. (1991). Time-Saver Standards for Building Types: 3rd Edition. Journal of Testing and Evaluation, 19(4), 347. https://doi.org/10.1520/jte12583j
- Head, A. J. (2017). Planning and Designing Academic Library Learning Spaces: Expert Perspectives of Architects, Librarians, and Library Consultants. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.2885471

Modes of Evaluation: Literature Study/ Case Study/ Presentation/ Written Examination

Examination Scheme

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	0	70	70	100	6	3

CT: Class Test; TA: Total Assessment; A: Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	1	1	-	2	--	3	--	--	--	-	1	-	-	-	3
CO 2	1	-	1	3	1	-	3	--	--	2	-	-	1	-	-	-
CO 3	1	2	1	-	1	-	-	-	-	2	-	-	1	-	-	-
CO 4	3	-	2	-	1	2	1	2	-	2	2	2	2	-	-	-

1: strongly related, 2: moderately related and 3: weakly related

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IND2617	INTERIOR LANDSCAPE DESIGN	L	T	S	P	C
Version	Date of Approval:	1	0	2	0	2
Pre-requisites/ Exposure	Design-V					
Co-requisites	Design-VI					

Catalog Description

The aim of this course is to make the students understand the role of landscape architecture in the creation of better environments. This course shall have a direct application in the design studio of the same semester as well as in the Thesis. The course covers basic introduction to landscape architecture, landscape graphics, planting design. This course will help students to understand the concepts of landscape architecture and to study and analyze site in relation to landscape design and be able to design and detail various architectural and planning landscape projects.

Course Objectives

The objective of this course is

- To understand various types of Landscape and the role of natural and manmade landscape for Land Development.
- To provide different methods for site planning at regional and micro level.
- To understand landscape design as an allied field of architecture and planning.
- To understand process of landscape design for small and large areas.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explain the role and scope of Landscape architect.
CO2: Identify the development processes and cycles in the urban landscapes.
CO3: Conduct a landscape analysis and evaluate it with required functions.
CO4: Develop a site plan with landscape design and relate with environment and ecology.

Course Content:

Modules	Blooms level*	Number of hours
MODULE 1: Elements and History of Landscape Study of Landscape elements such as land, vegetation, water, earth & climate, Natural & manmade elements, etc. Principles of landscape design such as unity, simplicity, variety, balance, proportion, sequence, etc. Social and economic factors. Psychological considerations of spaces and enclosures. History of Landscape Architecture including natural & cultural factors of the place, development of landscape architecture through history in different parts of the world such as China, Japan, Europe, Italy, France, England, Persia, Egypt, Greece, Rome. Study of landscape architecture in Medieval period in India such as Mughal. Modern & Contemporary Landscape architecture. Cultural aspects of the landscape architecture with contextual understanding.	L1, L2	9
MODULE 2: Hardscapes - pergolas, garden furniture, fences, rocks, masonry, paving & surfacing, roads & parking lots, walks & plazas; Softscapes such as plantation, turfing, water features. Design criteria for landscape design such as visual, functional, micro-climatic, ecological and aesthetic. Basic horticultural idea about plants, plant selection, planting design and care of plants; Urban Landscape - Characteristics and components of open space patterns in towns and cities (traditional and contemporary)	L4, L5, L6	9

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basic types: streets, squares, plazas, gardens, ghats and maidans, public parks at district, local and neighbourhood levels; park systems; landscape design related to land-use, circulation networks and activity; street furniture as a component of urban landscape.		
MODULE 3: Landscape Design and Services Macro and micro-climatic considerations in landscape architecture. Effect of climate on landscape and various components of landscape on the microclimate. Landscape Services & Sustainability: Introduction; Outdoors lighting, surface water drainage, irrigation, soil management techniques.	L1, L2	9
MODULE 4: Landscape Aspects of Site Planning Principles of understanding and evaluating and existing landscape; development as a response to constraints and opportunities offered by the site; the landscape concept and open space structure as a basic component of the site plan; The role of vegetation: environmental benefits, functional requirements, aesthetic considerations; typical situations and criteria for design with plants and selection of species; grading; in relation to existing contours, plinth levels, road alignment and storm water drainage; principles of cut and fill..	L4, L5, L6	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text & References:

- Laurie, Michael, An Introduction to Landscape.
- 2nd edition, Prentice Hall, New Jersey, 1986. 2. Ingels, Jack. Landscaping principles and practices. Cengage Learning, 2009.
- Walker, Theodore D. Planting design. John Wiley & Sons, 1991.
- Harris, Charles W; Time-saver standards for landscape architecture; McGraw-Hill, 1988.
- Trivedi. P.Prathiba. Beautiful Shrubs. Indian council of Agricultural Research. New Delhi, 1990. 6. Gerald Robert Vizenor, A Guide to Interior Landscapes, University of Minnesota Press, 1990. 7. Jialin Tong; Interior Landscape; Design Media Publishing Limited, 2014 8. Nelson Hammer and Mel Green, Interior Landscape Design, McGraw Hill, 1991.

Modes of Evaluation: Literature Study/ Case Study/ Presentation/ Written Examination

Examination Scheme

Evaluation Scheme								**Total Marks**	**Credits**	**Duration of Exam (hr)**
Internal Assessment					**External Assessment**					
CT		**TA**	**A**	**Total**	**ESE**	**ESJ**	**Total**			
I	**II**									
5	5	15	5	30	70	0	70	100	2	3

CT: Class Test; TA: Total Assessment; A: Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	1	2	--	--	--	--	--	--	--	--	--	--	--	--	1	2
CO 2	1	2	--	--	--	--	--	--	--	--	--	--	--	--	1	2
CO 3	1	2	--	--	--	--	--	--	--	--	--	--	--	--	1	2
CO 4	1	2	--	--	--	--	--	--	--	--	--	---	--	--	1	2

1: strongly related, 2: moderately related and 3: weakly related

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IND2618	INTERIOR DESIGN PORTFOLIO DEVELOPMENT	L	T	S	P	C
Version 1.1	Date of Approval:	0	0	2	0	2
Pre-requisites/ Exposure	Design V					
Co-requisites	Design VI					

Course description:
The Design Portfolio is not simply a collection of your work. Rather, it is a personal statement of creative ability and design thinking. The portfolio is a self-presentation tool that creatively communicates the students' design outlook and level of development through a variety of media and skill sets. The portfolio should include a selection of design works and at least one example of the development of design work in the area of interior design. The portfolio submits for consideration must clearly indicate students' potential for graduate study to the reviewers. Computer access is strongly recommended for this course, especially to visualization part.

Course Objective:
- The portfolio submission is a mandatory component of the graduation process for the B. Des (ID) program.
- This course is intensive visualization skill-based course that requires a lot of time and commitment.
- This course aims to develop the student's ability to communicate their ideas, thoughts and feelings about the field of interior design in a visual form.

Course Outcome:
CO1: To make the students understand portfolios and aesthetics of portfolios.
CO2: Identify the development process of a portfolio.
CO3: Render the portfolios made.
CO4: Send the portfolios to various offices for internships and jobs.

Course Content:

Modules	Blooms level*	Number of hours
Module 1: Portfolio Preparation Things to consider: 1.Composition - Placement or arrangement of elements in a work 2. Drawing - Demonstration of line weights, mark-making, proportion and medium 3. Design - Overall unity achieved by combining elements of art and principles of design. 4. Value - Relative darkness or lightness of a color 5. Spatial perception - Understanding of the spatial relationships of objects, and foreground, middle and background 6. Technique - Skillfulness in the use of fundamental methods and media 7. Color perception - General sensitivity to color and sophistication in its application 8. Originality - Capacity to think independently and transform the predictable; the quality of being new and original 9. Conceptual awareness - Expression of a clear idea, effective use of materials & processes to strengthen the concept 10. Aesthetic awareness - Guiding principle in matters of artistic beauty and taste.	L1, L2	
Module 2: Portfolio Organization:	L4, L5,	

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Portfolio Title Page This is the starting page of an interior design portfolio contains a brief profile of the student that includes: Name & Photograph; Registration Number; Program Name, Institution Name; Contact Address; Date of Submission; Declaration of ownership, etc. 2. Table of Contents 3. Bonafide Certificate cum Portfolio Evaluation (From Faculty Guide & Internal and External Examiner) 4. Portfolio Work Contents All the works included in the portfolio should be with the prior approval from the concerned faculty only. The organization of portfolio work can be segmented into 3 Parts. Part-1 : Project (Standalone projects - that is presented from concept to completion) This is the first part, which is integrated to dissertation project. The students have to convert the research findings into various Interior design ideas and concepts as part of the application process. These design ideas and concepts need to visually narrate and demonstrates as student's creative work and process in the form of a portfolio. This part must include: - Highlight of research: Title, Scope and significance of study, Objective of study, Findings within one page. - Design work Boards: Statement of design work (Design Brief), Mood board and Story board, Architectural Floor Plan, Finish Schedule and Color Legend, Finish Floor Plan, Elevations, Sections, and Details, Miscellaneous Drawings, Furniture Floor Plan, Installation Plans, Furnishings Specifications, Furnishings Cost Estimates, Furnishings Order Form, Specification sheets, Cost sheets etc.	L6	
Module 3: **Part-2 : Graphics (Projects builds on another**) The second part is mainly for to highlight what the students learned from the overall graduation studies. The students have to cover the major subject modules from the past semesters and visualize. It is not necessary to rework the entire modules. They can include the best works from their past assignment collections. But it is compulsory to consider each major area what they learned. Those who are lacking the sufficient collection of work, they may need to reproduce. The collection has to be presented as follows: • Design Skills: The design specialties most desirable to show as the following order of preferences: Office/Corporate; Residential/kitchen & Bath; Hospitality Restaurant; Health care; Commercial Spaces and Interior design specializations. All technical design skills that can be applied in a variety of building environments as above include: - Freehand drawing of an interior space to include an architectural element (2D) - Freehand drawing of an interior space to include an architectural element (3D) - Freehand drawing of a collection of items / furniture. (2D) - Freehand drawing of a collection of items / furniture. (3D) - Design work including pieces that student designed at class or on your own. - Interior visualizations by computer generated- 3D S Max, Sketch up, etc. - Photographs of 3D Objects, Models, Prototypes etc. that student designed and created. - Architectural drafting by hand. - Architectural drafting by computer generated- Auto CAD. - Any other work student feels may support their application to interior design includes their specializations. • Art Skills All art skills that can be applied in a variety of medias include: - Freehand drawings. - Artwork demonstrating use of colour by rendering with different colour media. - 2D and 3D Drawings, Sketches, Posters, Graphics, Mural etc. (Manual) - 2D and 3D Drawings, Sketches, Posters, Graphics, Mural etc. (Computer generated) - Posters that explaining Typography and Calligraphy skills. - Mood boards or Theme boards, Story boards that explaining Collage and Photomontage skills. - Theme based Digital Photographs that explaining Photographic skill - Photographs of Craft work that explaining Craft skill.	L1, L2	
Module 4: Written Content The third part is to demonstrate students writing style and quality. The good hand written essay will be encouraged and gives the chance of more weightage. A 250 – 500 word essay discussing student's perspective of the Interior Design industry and why they are interested in Interior Design is essential. IV. Portfolio Evaluation: Strong presentation shows work in its best light and indicates students' ability to communicate	L4, L5, L6	

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in an effective manner. The following criteria use to assess portfolio: - Problem Solving & Creative Skills - Drawing & Visual Skills - Digital Literacy & Computer Skills - Communication Skills - Development of ideas - evidence of how you think - An interest in contemporary interior design and the built environment. - Experimental approach in your 3D work to handling materials in unusual combinations. - Spatial awareness and an ability to think about interior design built environment. Procedure for evaluation: - Submission of priory approved portfolio hard copy. - Make a presentation of their portfolio work (soft copy) in front of the examiners. - Viva-voce - The Portfolios will be reviewed by a jury consisting of external and internal examiner to be appointed by the Department / University. - The jury will evaluate the soft copy presentation as well as a hard copy of portfolio		

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Modes of Evaluation: Literature Study/ Case Study/ Presentation/ Written Examination

Examination Scheme

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	0	70	70	100	2	3

CT: Class Test; TA: Total Assessment; A: Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	2	--	--	--	--	--	--	--	--	--	--	--	--	1	2
CO 2	1	2	--	--	--	--	--	--	--	--	--	--	--	--	1	2
CO 3	1	2	--	--	--	--	--	--	--	--	--	--	--	--	1	2
CO 4	1	2	--	--	--	--	--	--	--	--	--	---	--	--	1	2

1: strongly related, 2: moderately related and 3: weakly related

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IND2619	BUILDING SERVICES – IV	L	T	S	P	C
Version 1.1	Date of Approval:	2	0	0	0	2
Pre- requisites/ Exposure	Materials And Construction Technology –IV, Building Services-II					
Co-requisites	Design – V					

Catalog Description

The aim of this course is to give architect an overview and introduction to escalators, lifts, mechanized parking. This course also covers about security surveillance systems of building using cameras. The course covers Elevators, lift, escalators, mechanized parking system, Mechanical ventilation system and security surveillance model.

Course Objectives

The objective of this course is

- To discuss the working of escalators and lifts including location and criteria for their design.
- To develop an understanding of the advanced building services and their application in the designproposals of buildings of slight complex nature such as multistoried.
- To understand the principles and techniques related to mechanized parking and mechanized ventilation.

Course Outcomes

On completion of this course, the students will be able to

CO1: Comprehend the various modes of vertical circulation through live examples.
CO2: Develop understanding for techniques and systems for Security and surveillance.
CO3: Apply principles of mechanized parking.
CO4: Discuss the importance of ventilation systems in buildings.

Course Content:

Modules	Blooms level*	Number of hours
Module 1: Lifts and Escalators Basic Principles of Elevators working, definitions, NBC‟s recommendations, location and service, Method of working, various shapes and sizes available, sketches – plans, sections, elevations of different types of lifts including construction and installation details. Basic Principles of Escalator working, definitions, NBC‟s recommendations, location and service, Method of working, various shapes and sizes available, sketches – plans, sections, elevations of different types of escalators including construction and installation details.	L1, L2,L3, L4	8
Module 2: Security and Surveillance Perimeter Protection - Barriers, Doors, Gates, Turnstiles and Fences. Intrusion Detection Sensors and Systems - Outdoor & Indoor. Introduction to Access	L1, L2,L3, L4	8
Module 3: Mechanical Ventilation Standard requirements of ventilation for different conditions of living and works. Conditions for comfort. Control of quality, quantity, temperature and humidity of air	L1, L2, L3, L4	4
Module 4: Comfort Conditions for comfort. Control of quality, quantity, temperature and humidity	L1, L2, L3, L4	4

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*Bl*oom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

- The CIBSE (2000) Building Control Systems, Applications Guide (CIBSE Guide)
- Hession, A. (2001, September). Escalators. Elevator World.
- Humberg, H., Friedrich Mader, H., & Will, F. (1992). Remote diagnosis as used for mechanized parking systems. TechnischeMitteilungen Krupp English Ed., (2), 85–96.
- Kinsey, M. J., Galea, E. R., & Lawrence, P. J. (2012). Human Factors Associated with the Selection of Lifts/Elevators or Stairs in Emergency and Normal Usage Conditions. Fire Technology, 48(1), 3–26. https://doi.org/10.1007/s10694-010-0176-7
- Understanding Building Automation Systems (Direct Digital Control, Energy Management, Life Safety, Security, Access Control, Lighting, Building Management Programs) by Reinhold A. Carlson, Robert A. Di Giandomenico.
- Building Automation: Control Devices and Applications by In Partnership with NJATC (2008).
- Building Control Systems, Applications Guide (CIBSE Guide) by The CIBSE (2000).

References

- Anon. (1981). Safety Code for Elevators and Escalators. American National Standards Institute, Standards.
- Bangash, M. Y. H. (2007). Lifts, Elevators, Escalators and Moving Walkways/Travelators. Lifts, Elevators, Escalators and Moving Walkways/Travelators. CRC Press. https://doi.org/10.1201/9780203020760

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination
Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	2	3

C*T: Class Test; TA: Total Assessment; A:Attendance; ESE: End Semester Examination; ESJ: End Semester Jury*

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	--	2	--	--	--	--	--	--	--	--	--	2-	1	--	--
CO2	2	--	1	--	--	--	--	--	--	--	--	--	1	1	--	--
CO3	2	--	1	--	--	--	--	--	--	--	--	--	1	1	--	--
CO4	2	--	1	--	--	--	-	--	--	--	--	-	1	1	--	--

1: strongly related, 2: moderately related and 3: weakly related

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Syllabus – Seventh Semester

IND2737	INTERIOR THESIS PROJECT	L	T	S	P	C
Version 1.1	Date of Approval:	0	0	0	0	15
Pre-requisites/ Exposure	Design – VI					
Co-requisites	Building Materials & Construction Technology - V					

Catalog Description

The aim of this course is to provide an opportunity to the students to handle a complete design project. Project Thesis is the final stage of learning Interior Design. With the help of a thesis project, students are expected to demonstrate the understanding of a systematic design process which includes identification of project requirements, site study and analysis, case studies, programming, schematic design and Design Development.

Course Objectives:

The objective of this course is

- To prepare a student to independently handle and present all aspects of an interior design, from its evolution to final solution in totality.
- To understand the importance of the evolutionary stages of a design process and various techniques required for a successful presentation of an interior design.
- To develop in students the ability to handle specific aspects / thrust area of design relevant to the topic.

Course Outcomes

On completion of this course, the students will be able to

CO1: Design a Thesis project responsive to the contextual and program requirements.

CO2: Evaluate data and information gathered from primary and secondary data collection

CO3: Combine the systematic methodology from various stages of study and analysis in design process towards culmination of an informed design.

CO4: Demonstrate the ideas clearly using detailed physical model.

Text Books/ References

- Ablamowicz, R. (2007). An abstract of the thesis of. Young (Vol. c, pp. 105–106).
- Agarwal, S3. S., Yadav, P. P., Chavali, K. H., & Kumar, L. (2011). How to write a thesis? National Journal of Physiology, Pharmacy and Pharmacology, 1(2), 86–90. https://doi.org/10.5005/jp/books/12140_6
- Evans, D., Gruba, P., & Zobel, J. (2014). How to Write a Better Thesis. How to Write a Better Thesis. Springer International Publishing. https://doi.org/10.1007/978-3-319-04286-2
- Vasaiely, P. (2010). Bachelor Thesis. Applied Sciences, 16(February), 1–106. https://doi.org/10.1053/j.sodo.2009.12.005

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Modes of Evaluation: Literature Study/ Case Study/ Presentation/ Written Examination

Examination Scheme

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	0	100	70	100	15	3

CT: Class Test; TA: Total Assessment; A: Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	1	1	1	2	--	--	--	--	--	--	-	1	2	--	--
CO 2	1	1	1	1	2	--	--	--	--	--	--	-	1	2	--	--
CO 3	1	1	2	2	1	-	-	-	-	-	-	-	-	1	-	3
CO 4	3	-	2	1	1	-	-	-	-	-	--	-	-	1	-	-

1: strongly related, 2: moderately related and 3: weakly related

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IND2702	DESIGN RESEARCH METHODS AND PRESENTATION TECHNIQUES	L	T	S	P	C
Version	Date of Approval:	2	1	0	0	3
Pre-requisites/ Exposure	Knowledge of Design and construction					
Co-requisites						

Catalog Description

On the successful completion of the course students will be able to distinguish between various types of research, come up with an in-depth investigation into any chosen area of interest, design research methodology as per the requirement of the project, apply the knowledge of design research to write an original document in the form of report, thesis etc., analyze data and inferences to establish underlying principles and apply the knowledge of referencing for any original document.

Course Objectives

The objective of this course is to:

- Develop and initiate research thinking and dissertation work.
- Impart knowledge about the collection of data, its analysis and interpretation in research.
- Introduce adequate architectural design research methods for the realization of dissertation concept.
- Develop knowledge about the various phases of design and research presentation techniques.

Course Outcomes

On completion of this course, the students will be able to:

CO1: Distinguish between various types of research.
CO2: Come up with an in-depth investigation into any chosen area of interest.
CO3: Design research methodology as per the requirement of the project.
CO4: Apply the knowledge of design research to write an original document in the form of report, thesis etc.

Course Content:

Modules	Blooms level*	Numb er of hours
Module 1: Research & Research Design Introduction, Definition, Need, Aims, Importance, Scope, Classifications, Types, Characteristics, and Research Process. Meaning, Need, Types, Factors Affecting, Basic Purpose, and Principles	L1, L2, L4	3
Module 2: Data Collection, Analysis and Interpretation Meaning, Need, Main Terminologies Used In Data Collection Population, Sample, Parameter, Variables, Etc., Types Of Data, Methods, Sources Of Various Types ofData, Methods Of Data Collection: Observation Method, Interview Method, Data Collection Through Questionnaires, Collection Of Data Through Schedules, Case Study. Meaning, Need, Classification; *Only define and understand the Meani ng of:* Tabulation, Array, Range, Frequency Distribution, Presentation of Data Graphic, Histogram, Polygon, Ogive, Measurement of central tendency- Mean, Mode, Median, Dispersion / Skewness, Correlation and Regression Analysis of	L1, L2, L4	3

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two variables, Characteristics, Types, Values of , Formulae for calculation etc. Report Significance, Steps, Types, Findings, Suggestions, Conclusion. Writing.		
Module 3: Research Procedures Recognize philosophical implications; Formalize research: Identifying and defining the problem Questions need to be documented in relation to such issues in interior design as: time, cost, safety, materials, processes, function, appearance, and ergo nomics, etc.; Conduct literature reviews; Select appropriate research methodology; Understanding of research design parameters; Procedures to collect, analyze, interpret the data; Present information through a report.	L1, L2, L4	5
Module 3: Design Phases Research and produce Design Specifications; Sketch ideas and concepts; Develop detailed design; Produce a digital design presentation file for the final design; Make an oral presentation on their design.	L1, L2, L3, L4, L6	5
Module 4: Research Presentation Techniques: Interrelated Components Research Report Presentation: Dissertation components, Writing styles appropriate to research design, style manuals and ethical considerations. Design Presentation: Design Journal, Digital Design Presentation. Oral Presentation	L1, L2, L3, L4, L6	5

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Text & References:

- Laurel, Brenda. Design research: Methods and perspectives. MIT press, 2003.
- Kothari, C. R. Research methodology: Methods and techniques. New Age Internation al, 2004.
- Gupta, S. P., and M. P. Gupta. Business statistics. Sultan Chand & Sons, 2010.
- Sanoff, Henry. Visual research methods in design. John Wiley & Sons Incorporated, 1 991.
- Snyder, James C., ed. Architectural research. Vol. 6. Van Nostrand Reinhold Compan y, 1984.
- McMillian, J; Research in education: A conceptual introduction , HarpersCollins Coll ege
- Publishers; NY; 1997

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	3	3

CT: Class Test, HA: Home Assignment, EE: End Semester Examination; Att: Attendance

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CO, PO and PSO mapping

	PO 1	P O 2	P O 3	P O 4	P O5	P O6	P O7	P O8	P O9	PO 10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO 1	1	1	2	2	3	1	-	1	2	3	1	2	1	1	1	1
CO 2	2	1	2	3	3	1	-	1	2	3	1	2	2	1	1	1
CO 3	3	1	1	2	-	1	-	1	1	1	1	2	1	2	1	1
CO 4	1	2	1	1	3	1	-	1	1	1	1	1	1	1	1	1

1: strongly related, 2: moderately related and 3: weakly relate

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IND2703	PROFESSIONAL PRACTICE	L	T	S	P	C
Version	Date of Approval:	2	0	0	0	2
Pre-requisites/ Exposure	NA					
Co-requisites						

Catalog Description

This course objective to provide the foundation, knowledge and skills needed to professional practice. It is designed to build understanding of the complex interactions and uncertainties of professional practice. It provides students with the essential knowledge components of role of COA, IIA, and Uttar Pradesh architect association, Architects Act 1972, Tendering & Contract and Valuation. It also develops an appreciation of the skills and tasks inherent in development Conditions of engagement of Interior Designer – Duties, Responsibilities, Liabilities of the profession, scale of charges, mode of payment etc. Clauses governing conduct of professional practice.

Course Objectives

The objective of this course are

- To acquaint the students with the responsibility, scale of charges and Architect's conduct in Architectural practice.
- To understand the office and administration of an Architect's office, Tenders and contracts.

Course Outcomes

On completion of this course, the students will be able to

CO1: Gain a comprehensive understanding of the Professional Practice in India.

CO2: Describe the phases of professional practice, the roles of professional conduct, all the work related to scales of charges.

CO3: Identify and define the legal provisions with respect to tenders and contract.

CO4: Generalize the entrepreneurship issues commonly faced by architectural firms in Indian Construction Industry.

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Course Content:

Modules	Blooms level*	Number of hours
Module 1: Role of Professional Bodies- Familiarization with different Professional Bodies directly and in-directly related to architectureprofession such as The Indian Institute of Interior Designers (IIID), The Indian Institute of Architects (IIA), The Council of Architecture (COA),etc. IIIDElections, Functions and formation of the IIID Council, importance, professional and trade practices and ethics.	L1, L2	6
Module 2: Code of Professional Conduct and scale of professional charges As laid down by the COA and modified from time to time. Procedures to be followed by an architect for the safe running of the Practice. Awareness about Interior Design Competitions andthe Procedure lay down by the IIID. Do's and Don'ts for Interior Competitions.	L1, L2, L3	6
Module 3: Tendering & Contract for Interior Design of Buildings Types, details of a tender document, procedure to be followed for calling tenders, tender analysis, election of the contractor and award of the work. Important terms such as EMD,Security Deposit, Defect Liability, Insurance etc. Types of the Contracts, legality of the Contract, important clauses of the Contract, role of theowner, architect and the contractor in fulfilment of the contract.	L1, L3,L4	6
Module 4: Interiors Office & Office Management Size of the office, location, infrastructure requirement, staff requirement etc. Procurement of theworks. Important activities in a professional office. Role & duties of Interior designer as an employer or employee. Introduction to Record Management, Principles of Record Keeping & Filing, Different types of filing systems, indexing, Safety and Security	L1, L3,L4	6

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books:

- Chitkara K.K. (1998). *Construction Project Management*, New Delhi: Tata McGraw- Hill Compony Limited
- Deobhakta Madhav, Deobhakta Meera (2007), *Architecture Practice in India*, Delhi: Council of Architecture
- Gazette of India (1972). *The Architects Act, 1972*, Delhi
- Gutman, R., & Haviland, D. (1992). The Architect's Handbook of Professional Practice. *Journal of Architectural Education (1984-)*, *45*(2), 122. https://doi.org/10.2307/1425280

References:

- Baka, J. (2013). The Political Construction of Wasteland: Governmentality, Land Acquisition and Social Inequality in South India. *Development and Change*, *44*(2), 409–428. https://doi.org/10.1111/dech.12018
- LARR. The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013, The Gazette of India Extraordinary § (2013). Ministry of Law and Justice, Government of India. Retrieved from https://dolr.gov.in/sites/default/files/Right to Fair Compensation and Transparency in Land Acquisition%2C Rehabilitation and Resettlement Act%2C 2013.pdf
- Narain, V. (2009). Growing city, shrinking hinterland: Land acquisition, transition and conflict in peri-urban Gurgaon, India. *Environment and Urbanization*, *21*(2), 501–512. https://doi.org/10.1177/0956247809339660

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- Raghuram, G., & Sunny, S. (2015). The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement (Amendment) Ordinance, 2015. *Research and Publications Of Indian Institute of Management*, *2013*(July), 51.
- Requirements, D., & Amendment, T. (2010). the Gazette of India. *DisClosure*, *2011*(2), 1–216. https://doi.org/http://www.indianemployees.com/uploads/documents/042015/1428239209-16-92.pdf
- The Industrial Arbitation Board. (1972). *Managerial Law*, *13*(1), 60–61. https://doi.org/10.1108/eb022131

Modes of Evaluation: Quiz/ Case Study/ Literature Study/ Presentation/ Report Submission
Examination Scheme:

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
10	15	5	30	70	0	70	100	2	3

CT: Class Test; TA: Total Assessment; A: Attendance; ESE: End Semester Examination; ESJ: End Semester Jury

CO, PO and PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	-	-	--	--	--	1	--	--	--	2	3	--	3	-	1	2
CO 2	-	-	--	--	--	2	--	--	--	1	1	--	-	-	1	2
CO 3	-	-	-	-	-	1	-	-	-	2	1	-	3	-	1	2
CO 4																

1: strongly related, 2: moderately related and 3: weakly related

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Syllabus – Eighth Semester

IND2837	PROFESSIONAL TRAINING	L	T	S	P	C
Version 1.1	Date of Approval:	0	0	0	0	16
Pre- requisites/ Exposure	NA					
Co-requisites	NA					

Catalog Description

This is an industrial training session, which provides the opportunity to learn and workwithin a professional environment with practicing interior designers. The basic objective of training is to provide firsthand practical exposure of the professional functioning of Interior Design industry and to acquaint students with the culture of corporate.

Course Objective

- The training will also provide an opportunity to the students to apply their theoretical understanding while working on the concerned project in the industry. Thus, this training is an attempt to bridge the gap between theory and practice.
- This will also enhance the students‟ intellectual ability and attributes related to data handling, decision making, report writing, oral presentation and imbibing an interdisciplinary approach. Students can be undertaken their practical training in India or abroad.

Course Outcome:

On completion of this course, the students will be able to work on:

- **CO1:** General Office Procedures: Written and verbal communication, preparing purchaseand work orders, addenda/bulletin preparation.
- **CO2:** Materials Library: Filing catalogs and samples, updating pricing lists, locating product/service resources, interacting with vendors and reps.
- **CO3:** Programming: Research, site measurements, code review.
- **CO4:** Design Development: furniture/finish specs, space planning.

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Course Content:

Modules	Blooms level*	Number of hours
Session I: Training Every student of the undergraduate courses will be required to undergo apractical training in a interior design organization approved by the Institute for Minimum of „90 calendar days" The candidates shall be required to undergo training in the various areas of the organization concerned. The organization may assign a specific project to the candidate, which will be completed by him / her during the period of training. The work done by the candidate during the training period shall be submitted in the form of a report as per the guidelines provided by the Department. **Attitude:** A member of the faculty will supervise the candidates during the traialong with a supervisor from the industry. Students need to aware of work environment and constantly look foopportunities to learn more about interior design. An internship is a privilege the firm is not receiving payment for thes they spend to train the student. It is student responsibility to provide value to them (not necessarily tother way around). Students need to take responsibility for making training as informatias can. Students need to document what they observed, ask lots of questionand show initiative. Training and work should be creative, exciting, noteworthy anddetailed. **Progress Report:** Students have to compulsorily submit a summary report of their progressin every two week undersigned by the industrial supervisor. **Attendance:** Minimum of "90 calendar days"of training is compulsory for students"full time trainee". Daily attendance is compulsory and to be marked and duly checked and signed by the industrial and faculty supervisor. Those who are failure to complete the training with minimum of 90 d will not be considered for final examination **The student will be required to repeat the training when:** The report from the employer is not satisfactory. The attendance in the employer office is less than 70% of the numbdays required for training.	L1,L3L4	NTCC
Module II: Training Report Evaluation and Presentation	L1,L3 L4	NTCC

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4: Analysis; L5: Synthesis, L6: Evaluation*

Prof. (Dr.) Anil Kumar
Deputy Dean Academics
Amity University Haryana
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Registrar
Amity University Haryana
Manesar Gurgaon-122413

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Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination Evaluation Method for Training Report

Chapter Scheme for the training report		Marks Distribution
Overall Report Format/Layout		05 Marks
Chapter I	Introduction/ Learning Outcome	20 Marks
Chapter II	Detail of Working Experience	30 Marks
Chapter III	Conclusion and Recommendations	15 Marks
Total		70 Marks

Report Format

The report has to be written in font Times New Roman, 12 points, 1.5 lines spacing, Print / Type on both sides of the paper, Spiral Bound. The report should comprise of a maximum of 70 pages and has to be submitted in two copies.

Evaluation and Presentation

- Submission of training report
- Brief oral presentation with power point about training.
- Evaluation by a jury consisting of external and an internal examiner to be appointed by the Department/university.
- Failure to submit the Training Report or failure to appear at the Presentation/Viva-Voce
- Examination will be treated as "Absent" in the Final Examination.

Evaluation Scheme							Total Marks	Credits	Duration of Exam (hr)
Internal Assessment				External Assessment					
CT	TA	A	Total	ESE	ESJ	Total			
0	0	0	0	0	100	100	100	16	3

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO 1	1	1	1	-	-	3	1	2	1	1	3	-	-	3	3	1
CO 2	1	1	1	-	-	3	1	2	1	1	3	-	-	3	3	1
CO 3	1	1	1	-	-	3	1	2	1	1	3	-	-	3	3	1
CO 4	1	1	1	-	-	3	1	2	1	1	3	-	-	3	3	1

1: Strongly related, 2: moderately related and 3: weakly related

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Master of Planning (Urban & Regional)

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Programme Structure

Curriculum & Scheme of Examination

2023

AMITY UNIVERSITY HARYANA

GURUGRAM

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	PLANNING TECHNIQUES AND COMPUTER APPLICATIONS (PLN4103)	L	T	P	S	C
Version 1.1	Date of Approval:	1	0	2	0	2
Pre-requisites/Exposure	Techniques of Planning I & II (B.Plan.)					
Co-requisites	Computer Aided Design (CAD) in Planning(B.Plan.)					

Catalog Description

The aim of this course is to introduce and be familiar with techniques used for planning at various stages from preliminary to advanced. Students will learn appropriate data mining for their studio exercises, pre-preparation for planning field visits and selecting analysis techniques. Appropriate Software applications in CAD and GIS are also part of the course. They will be able to apply excel, CAD and GIS in their planning studio. At the end of the course student should be able to use all the learnt techniques in respective planning studio works.

Course Objectives

The objective of this course is

- To prepare students for planning studio exercise by providing them significant base of planning techniques.
- To equip students with key skill set for conducting filed visits, data collection and analysis.

Course Outcomes

On completion of this course, the students will be able to

CO1: Explore and use various planning information systems available.
CO2: Prepare base maps on scales for their studio exercise and to do effective pre-field visit planning.
CO3: Apply excel and CAD techniques in planning studios.
CO4: Perform basic analysis and map preparations in GIS.

Modules	Blooms level*	Number of hours
MODULE 1: Information Systems for Planning and Literature Review Introduction to Basic Terminologies used in Planning; Definition and components of Information System in Planning; Data warehousing and Data mining for Planning; various data sources like, National Urban Information System – Bhuvan, Natural Resource Data Management System, National Sample Survey (NSSO), Directorate of Economics and Statistics, Census of India, National Family Health Survey (NRHS), Central Pollution Control Boards reports, Indian Metrology Department, World Bank Open Data; Introduction and utilisation of spatial standards-URDPFI; Components and Techniques of literature review; Finding useful insights from the literature review; Exercises on inscribing and presenting reviewed literature	L1, L2 L3	9

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MODULE 2: Base map Preparation, Scales, and Survey Techniques Base map Preparation: Representation of Spatial Data; Choice of Appropriate Scales: Graphical, Linear and Areal Scales; Contents of Base Maps at Various Scales; Maps as a representation of reality, Elements of Maps; Choice of appropriate scales for region and settlement level plans, town development plans, zonal development plans, layout plans, Setting of Goals and Objectives; Methodologies for Preparation of Urban and Regional Development Plans, Data requirements for urban and regional planning; Sources of data; methods of data collection, Validity and reliability of data, Questionnaire design, measurement scales and their applications, sampling techniques, types of surveys; Techniques of conducting surveys for land use; Techniques for conducting regional surveys. Plan Implementation Techniques; Selecting appropriate Indicators; Preparation of Checklist for data collection; Preparation of good Questionnaire; Data coding and methods for data analysis.	L1, L2 L3	9
MODULE 3: Computer Applications in Planning Computer Applications for Data Collection and Analysis: Tools of Analysing Different Types of Data; Use of Excel Software for Analysing Data;Tabulation of data, graphical presentation of data; Preparing pie diagrams, histograms, bar charts, normal, colour, black and white presentation techniques; Basic discipline of presenting illustrations; Presentation of spatial data, analysis and proposals. Applications of Features of Excel- Basic and Selected Advanced Features; CAD Applications for Base Map preparation: Applications of CAD tools- drawing, editing, modifying, layer management etc.; Scaling Drawings and Images; Plotting and Printing technicalities.	L1, L2 L3	9
MODULE 4: Introduction to Geoinformatics Image Interpretation – Qualitative and Quantitative Elements; Resolutions – Spatial, Temporal, Spectral, Radiometric; Geo-Rectification – Coordinate System, Selection of Ground Control Points (GCPs), Geo-Referencing and Map Projections; Geometric Distortions, Spatial Data Presentation Techniques: Layout Preparation – Grids, Legend, Symbology; Printing – Sheet, Size, Scale.	L1, L2 L3	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Government of India (2008), NSDI Metadata standard-NNRMS Secretariat, Department of Space, India.
- Wang X., Rainer A. and Hofe, V. (2007) Research Methods in Urban and Regional Planning, Springer, Berlin.

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- Abbas, S., &Ojo, A. (2013). Towards a linked geospatial data infrastructure. In *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)* (Vol. 8061 LNCS, pp. 196–210). https://doi.org/10.1007/978-3-642-40160-2-16
- Dommaraju, P. (2015). One-person households in India. *Demographic Research*, *32*(1), 1239–1266. https://doi.org/10.4054/DemRes.2015.32.45
- Guhathakurta, S. (2019). Spatial analysis. In *The Routledge Handbook of International Planning Education* (pp. 162–173). Taylor and Francis.

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https://doi.org/10.4324/9781315661063-14
- Miller, H. J., & Han, J. (2009). Geographic data mining and knowledge discovery: An overview. In *Geographic Data Mining and Knowledge Discovery, Second Edition* (pp. 1–26). CRC Press. https://doi.org/10.1201/9781420073980
- Miller, D., & Salkind, N. (2012). Qualitative Data Analysis Software. In *Handbook of Research Design & Social Measurement* (pp. 165–179). SAGE Publications, Inc. https://doi.org/10.4135/9781412984386.n38
- Shade, J. (2010). Software for data analysis. *Journal of Applied Statistics*, *37*(8), 1421–1422. https://doi.org/10.1080/02664760902899790

Modes of Evaluation: Presentation/Assignment/Class Test /Written Examination

Examination Scheme:

Components	**CT-1**	**CT-2**	**HA**	**S/P**	**CE**	**A**	**ESE**
Weightage (%)	10	10	10	10	05	05	50

CT: Class Test, HA: Home Assignment, S/P: Seminar/Presentation, CE: Continuous Evaluation, A: Attendance; ESE: End Semester Examination.

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	2	1	2	--	--	1	--	--	--	--	--	1	--	2	--
CO2	1	2	1	2	--	--	1	--	--	--	--	--	1	--	2	--
CO3	1	2	1	2	--	--	1	--	--	--	--	--	1	--	2	--
CO4	1	2	1	2	--	--	1	--	--	--	--	--	1	--	2	--

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	INFRASTRUCTURE PLANNING AND MANAGEMENT (PLN4104)	L	T	P	S	C
Version 1.1	Date of Approval:	2	1	0	0	2
Pre-requisites/Exposure	Infrastructure Planning, Development and Management (B.Plan)					
Co-requisites	-					

Catalog Description

The course would include three sub-components of infrastructure and utility Planning i.e. Physical Infrastructure, Social Infrastructure and Transportation. The aim of this course is on principles of design of utilities and services in urban and regional context and familiarising with Indian standards. The course will focus on acquainting students to assess infrastructure planning techniques and their utilisation in planning studios. The objective of Transportation Planning module is to provide basic information on transportation issues. Students will be familiarized with (i) geometric design of road networks and (ii) traffic characteristics. Techniques of data collection and analysis would be taught as part of this course.

Course Objectives

The objective of this course is

- To familiar with infrastructure and its sub-sector Planning.
- To utilize the knowledge in physical planning studios.

Course Outcomes

On completion of this course, the students will be able to

CO1: Comprehend concept of infrastructure planning and its relevance in physical planning.
CO2: Identify and project the demand and spatial need of physical infrastructure
CO3: Assess the need for social infrastructure for sustainable and inclusive planning.
CO4: Review prevalent policies, projects and missions pertaining to various infrastructure services.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Infrastructure Planning Importance of Infrastructure, objectives of the utilities, services planning and implications on public health and environment; Economic-introduction to policies and programmes in infrastructure planning; issues and concerns of maintaining the utilities and services, need and importance of service level benchmarks of water supply, sanitation, sewage, solid waste and transportation; Impact of technology on infrastructure, Green infrastructure and its significance.	L1, L2 L3	9

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MODULE 2: Physical Infrastructure Role of physical planner in planning of utilities and services; water supply distribution system-Water supply systems, networks, mapping, sources and water requirement for various land uses; Factors affecting water demand; Storage facilities and distribution systems; Innovative Methods and successful urban water supply system practices; Water programmes and policies; Storm water drainage system- Strom water drainage networks, and network mapping; Estimations of sewer generation and network requirements; sewerage system- General considerations and principle of sanitation and sewerage systems; Sewage disposal and treatment methods; Open defecation; Innovative approaches of sewage disposal in urban areas and low cost appropriate technologies for sanitation; solid waste management- Classification and Characteristics of Solid Wastes; Methods for waste Collection, Storage, transportation and disposal; Processing and Treatment of Solid Wastes; Land Filling methods of Solid Waste Management; electricity distribution system.	L1, L2 L3	9
MODULE 3: Social Infrastructure Types of social infrastructure; Health care-essential service, availability, access and utilisation, Planning norms and space standards, public and private institutions, policies, national Rural Healthcare Mission, Hierarchy of health care establishments, educational institutions, standards, policies, rights to education (RTE); Public and community spaces-recreational, safety and security – fire management. Amenities for urban and rural settlements; Significance of education and health infrastructure in planning; Locating education and health facilities; Understanding scalogram and other techniques	L1, L2 L3	9
MODULE 4: **Policies, Programmes and Projects** Understanding prevalent policies, projects and missions, for example, JnNURM, AMRUT, HRIDAY, Smart Cities Mission, etc.; Norms and standards for different types of infrastructure; Nature and content of infrastructure in development plans at different geographical levels; Making assessment of infrastructure requirements in plans.	L1, L2 L3	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

- Broaddus, A., & Cervero, R. (2019). Transportation planning. In *The Routledge Handbook of International Planning Education* (pp. 253–264). Taylor and Francis. https://doi.org/10.4324/9781315661063-22
- Criqui, L. (2015). Infrastructure urbanism: Roadmaps for servicing unplanned urbanisation in emerging cities. *Habitat International*, *47*, 93–102. https://doi.org/10.1016/j.habitatint.2015.01.015
- Loucks, D. P., & van Beek, E. (2017). *Water Resource Systems Planning and Management*. *Water Resource Systems Planning and Management*. Springer International Publishing. https://doi.org/10.1007/978-3-319-44234-1
- Parkin, J., &Koorey, G. (2012). Network planning and infrastructure design. In *Transport and Sustainability* (Vol. 1, pp. 131–160). Emerald Group Publishing Ltd. https://doi.org/10.1108/S2044-9941(2012)0000001008

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- Gifford, J.W. Uzarski, D.R. and McNeil, S. (1993) Infrastructure Planning and Management, American Society of Civil Engineers, Reston, VA.
- Goodman, A. and Hartak, M. (2000) Infrastructure Planning Handbook, ASCE Press, Reston, VA.
- Parkin, J. and Sharma, D. (1999) Infrastructure Planning, Thomas Jelford Publishing, London.
- Allen, P. M. (2012). *Cities and regions as self-organizing systems: Models of complexity*. *Cities and Regions as Self-Organizing Systems: Models of Complexity* (pp. 1–309). Taylor and Francis. https://doi.org/10.4324/9780203990018
- Rinne, M. (2004). Technology roadmaps: Infrastructure for innovation. *Technological Forecasting and Social Change*, *71*(1–2), 67–80. https://doi.org/10.1016/j.techfore.2003.10.002
- Thomé, A. M. T., Ceryno, P. S., Scavarda, A., &Remmen, A. (2016, December 15). Sustainable infrastructure: A review and a research agenda. *Journal of Environmental Management*. Academic Press. https://doi.org/10.1016/j.jenvman.2016.09.080

Modes of Evaluation: Presentation/Assignment/Class Test /Written Examination

Examination Scheme:

Components	CT-1	CT-2	HA	S/P	CE	A	ESE
Weightage (%)	10	10	10	10	05	05	50

CT: Class Test, HA: Home Assignment, S/P: Seminar/Presentation, CE: Continuous Evaluation, A: Attendance; ESE: End Semester Examination.

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	2	1	2	--	--	--	--	--	--	--	--	1	--	2	--
CO2	1	2	1	2	--	--	--	--	--	--	--	--	1	--	2	--
CO3	1	2	1	2	--	--	--	--	--	--	--	--	1	--	2	--
CO4	1	2	1	2	--	--	--	--	--	--	--	--	1	--	2	--

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	HOUSING AND ENVIRONMENTAL PLANNING (PLN4105)	L	T	P	S	C
Version 1.1	Date of Approval:	2	1	0	0	2
Pre-requisites/Exposure	Housing and Community Planning (B.Plan.)					
Co-requisites	Ecology, Environment and Resource Development and Management (B.Plan.)					

Catalog Description

The aim of this course to two-fold, i) Housing ii) Environment.

Housing: First segment is to impart knowledge and skills to create an efficient housing/neighborhood planning which gives equal access to housing for everyone. At the end of the course students will be able to identifies the gaps, problems in providing housing for all. They will be able to focus on various dimensions of housing sector and create efficient and sustainable residential structures and neighborhood designs.

Environment: Second Segment deals with environment and its planning which aims to initiate the students to a discreet understanding of the environment and its interactions with human settlements. All social, cultural and technological activities being carried by human beings have profound influence on the environment. This course will enable a thorough understanding and utilization of all these aspects.

Course Objectives

The objective of this course is

- To provide a basic understanding of Housing at the Neighborhood and City level and to create an ability to work on the Housing Sector in Town Planning System.
- To grasp the role of public and private sector as well as community participation in eco-tourism planning and development

Course Outcomes

On completion of this course, the students will be able to

CO1: Apply varied housing concepts in neighbourhood and urban planning.

CO2: Analyse policy and governance framework with reference to housing sector.

CO3: Justify the relevance of ecology, ecosystem and environment in planning.

CO4:Utilise acquired knowledge to conceptualise and to create sustainable planning designs.

Modules	**Blooms level***	**Number of hours**

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MODULE 1: Concept of Housing with reference to Planning Significance of housing in economic and social development; Basic Terms in housing, Housing development process; Current Issues in Housing in urban and rural India: Public Health and Safety Related Issues in Housing, houselessness in India, old housing,Shift of Housing from Social Sector to Private Sector Participation Housing Design - Housing Typology, Housing Layouts, Housing Density, Community Facilities, Public and Private Sector Housing Development, Social Aspects of Housing, Built Environment and Human Behaviour, Housing Norms and Standards Housing for the Poor-Issues in Slums and Squatter Settlements; Government Initiatives for Providing Housing, Housing Demand- Housing Need Assessment, Estimating and Forecasting Housing Requirements (Qualitatively and Quantitatively); Understanding Current Methods of Housing Demand Assessment,	L1, L2 L3	9
MODULE 2: Housing Policies and Institutional Framework Understanding Five Year Plans with respect to Housing Policy, National Housing Policy- Review, Policy Framework for Urban and Rural Housing, Comparative Policy Analysis; Rental Housing in India: An Overview, Household Affordability and Concept and performance of Affordable Housing in India, Affordable Housing Policy 2009, Affordable Housing in Public Private Participation, Emerging thoughts. Case Studies of Neighbourhood Planning in Indian and Global Context.Current Practices and Upcoming Initiatives; Role of Informal Sector in Housing Stock, Economy, Commercial Activities, Etc.; Implications in Physical Planning, Informal Sector Housing and Basic Needs - Lack of Essential Infrastructure; Poor Condition of Existing Services; Identification of Basic Needs; Provision for Various Target Groups; Standards for Basic Needs; Investment for Housing; Essential Components; Ownership and Tenure Security; Service Delivery - Gaps in Existing Institutional Systems of Delivery; Sustainable Development Goals with reference to Housing for All.	L1, L2 L3	9
MODULE 3: Environmental Components and Resources Environmental resources and ecosystem services; Fundamentals of Ecosystem-Its Structure and Function; Consumption, conservation and recycling of resources; Man, and Environment interrelations; Changing Perspectives in Man-Environment Relationship with Focus on Issues of Population, Urbanization, Resource Depletion and Pollution; Concept of Ecology; Urban ecosystem approach, evolution and significance; Introduction to quantitative ecology, Identification of ecological parameters for planning at different levels, Site planning, Settlement planning, Regional planning. Data needs, formats for data collection Types of analysis required to evolve ecological parameters; Environmental impact assessment, Methods and their appraisal. preparation and analysis of resource inventories and resource matrices;Environmental Degradation (Environmental Concerns and Challenges) and Its Impact on Various Ecosystems.	L1, L2 L3	9

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MODULE 4: Environmental Planning Planning for Global and Local environmental concerns; Planning for Environmentally Sensitive Zones (Resources Availability, Settlements Pattern, Problems and Potentials, Regulating Mechanisms for Development); Development, utilization and conservation of resources, resource planning, integrated resource planning approach; Resource regions, their problems and potentials; Resource management, traditional and contemporary approaches. Resource development in India, some selected areas (energy, water, manpower, etc.); Carrying Capacities in environmental context; Tools and Techniques for Environmental Planning and Management- Brief Introduction to Environmental Impact Assessment, Strategic Environment Assessment and Environmental Management Plans; Providing brief about environmental policies; Green Agenda and Global environmental movements; Government's 8 missions under the National Action Plan on Climate Change	L1, L2 L3	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Jain, A.K. (2019) Housing for all, Khanna Book Publishing Co., New Delhi.
- Cedric, P. (1990) Housing and Urbanisation: A Study of India, Sage, London.
- Kohli, V.K. (2007) Housing Finance Agencies in India, Deep and Deep, New Delhi.
- Jenkins, P., Smith, H. and Wang, Y.P. (2007) Planning and Housing in the Rapidly Urbanizing World, Routledge, London
- Choguill, C. L. (2008). Developing sustainable neighbourhoods. *Habitat International*, *32*(1), 41–48. https://doi.org/10.1016/j.habitatint.2007.06.007
- Department of Planning and Infrastructure: WA Planning Commission. (2009). Liveableneighbourhoods. *World Transport Policy and Practice*, *7*(January), 38–43.
- Glaeser, E. L., Gyourko, J., & Saks, R. E. (2006). Urban growth and housing supply. *Journal of Economic Geography*, *6*(1), 71–89. https://doi.org/10.1093/jeg/lbi003
- Haffner, M., &Heylen, K. (2011). User costs and housing expenses. towards a more comprehensive approach to affordability. *Housing Studies*, *26*(4), 593–614. https://doi.org/10.1080/02673037.2011.559754
- Steele, M. (2012). Housing statistics. In *International Encyclopedia of Housing and Home* (pp. 620–626). Elsevier. https://doi.org/10.1016/B978-0-08-047163-1.00639-1
- Turner, A. (1980). Community development. *The Cities of the Poor; Settlement Planning in Developing Countries*, 35–64. https://doi.org/10.5005/jp/books/12932_9
- Wachter, S.M. and Birch, E.L. (2008) Growing Greener Cities: Urban Sustainability in the Twenty First Century, University of Pennsylvania Press, Philadelphia, PA.
- Whitehead, M. (2014) Environmental Transformation: A Geography of the Anthropocene, Routledge, New York.

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- Albert, S. (2010). The geographic determinants of housing supply. *Quarterly Journal of Economics*, *125*(3), 1253–1296. https://doi.org/10.1162/qjec.2010.125.3.1253
- Dempsey, N. (2008). Quality of the built environment in urban neighbourhoods. *Planning Practice and Research*, *23*(2), 249–264. https://doi.org/10.1080/02697450802327198
- Johnson, H. (2001). Voices of the poor. Can anyone hear us? *Journal of International Development*, *13*(3), 377–379. https://doi.org/10.1002/jid.793
- Saxena, A. (2013). Understanding Inequalities: Stratification and

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Differences. *INTERNATIONAL SOCIOLOGY*.
- Winston, N., & Pareja Eastaway, M. (2008). Sustainable housing in the urban context: International sustainable development indicator sets and housing. *Social Indicators Research, 87*(2), 211–221. https://doi.org/10.1007/s11205-007-9165-8

Modes of Evaluation: Presentation/Assignment/Class Test /Written Examination

Examination Scheme:

Components	CT-1	CT-2	HA	S/P	CE	A	ESE
Weightage (%)	10	10	10	10	05	05	50

CT: Class Test, HA: Home Assignment, S/P: Seminar/Presentation, CE: Continuous Evaluation, A: Attendance; ESE: End Semester Examination.

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	2	2	1	1	--	--	--	--	--	1	2	2	--
CO2	2	2	1	2	2	1	1	--	--	--	--	--	1	2	2	--
CO3	2	2	1	2	2	1	1	--	--	--	--	--	1	2	2	--
CO4	2	2	1	2	2	1	1	--	--	--	--	--	1	2	2	--

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	PLANNING STUDIO-I (AREA PLANNING, VILLAGE DEVELOPMENT PLAN) (PLN4108)	L	T	P	S	C
Version 1.1	Date of Approval:	2	0	0	8	10
Pre-requisites/Exposure	Planning and Design Lab – V (Area Planning)					
Co-requisites	-					

Catalog Description

The planning studio is an introductory studio for giving basic idea related to urban and regional planning studios. It aims to bring students of diverse backgrounds to a common platform and develop the essential skills of planning amongst the students opting for different specializations of planning. The objective of the studio is to introduce the general concepts associated with physical planning and develop the skills of data collection, data analysis, spatial representation, documentation as well as written and verbal communication. Students will be able to apply the knowledge gained through theoretical subjects in their studio planning.

Course Objectives

The objective of this course is

- To relate theoretical knowledge of planning with planning practices.
- To conceptualize and prepare development plan for the given levels.

Course Outcomes

On completion of this course, the students will be able to

CO1: Preparation of Area Plan/Zonal Plan in urban context.

CO2: Preparation of Village Development Plan.

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Modules	Blooms level*	Number of hours
MODULE 1: Area Planning (Urban Context) The assignment would identify different urban zones based on land use characteristics and could also include predefined 'zones' for zonal plans. The objective of this exercise would be to learn various methods of surveying to collect different types of data and represent and interpret them to give meaningful observations on the planning and development of the area. Thrust of the exercise would be on: • Understanding the zone in the context of the city. • Mapping of Regional Networks and Linkages • Preparation of Base Map of the area through primary surveys and updating secondary data • Socio-economic profiling of the area through surveys • Physical and Social infrastructure mapping • Gap Analysis and issue identification • Formulation of broad outlines of Intervention Strategies and Development Blueprint.	L4, L5 L6	60
MODULE 2: Rural Planning The main goal of the assignment is to expose students to the life and living in rural area as it is different from urban areas. This would help in conceptualising the integration of urban and rural areas for regional planning. Students will undertake study of a particular village in groups and conduct a primary survey on demographic profile, household income level, socio-cultural practices, etc. Information about development programmes shall be collected and resource mapping will be done. This exercise will aim at improving the understanding about the requirements of different categories of rural population. Conducting the primary survey will provide exposure to research methodology, techniques of data collection, data processing and analysis. Thrust of the exercise would be on: • Understanding the socio-economic aspects of the rural settlement • Importance of location, spatial and economic linkages of the village. • Explaining the social and physical infrastructure of the village. • Understanding the availability and usage of local resources. • Exposure to government programmes and institutional mechanism working for rural • planning and development • Identifying the present problems and future possibilities in the village. • Proposing a strategy of improvement in the condition and development of the villages.	L4, L5 L6	60

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

- Broaddus, A., & Cervero, R. (2019). Transportation planning. In *The Routledge Handbook of International Planning Education* (pp. 253–264). Taylor and Francis. https://doi.org/10.4324/9781315661063-22
- Criqui, L. (2015). Infrastructure urbanism: Roadmaps for servicing unplanned

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- Allen, P. M. (2012). *Cities and regions as self-organizing systems: Models of complexity*. *Cities and Regions as Self-Organizing Systems: Models of Complexity* (pp. 1–309). Taylor and Francis. https://doi.org/10.4324/9780203990018
- Andersson, E., Barthel, S., Borgström, S., Colding, J., Elmqvist, T., Folke, C., &Gren, Å. (2014). Reconnecting cities to the biosphere: Stewardship of green infrastructure and urban ecosystem services. *Ambio*, *43*(4), 445–453. https://doi.org/10.1007/s13280-014-0506-y
- Rinne, M. (2004). Technology roadmaps: Infrastructure for innovation. *Technological Forecasting and Social Change*, *71*(1–2), 67–80. https://doi.org/10.1016/j.techfore.2003.10.002
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Modes of Evaluation: Presentation/Assignment/Class Test /Written Examination

Examination Scheme:

Components	P -1	P -2	S	R	CE	A	ESE
Weightage (%)	50	50	60	20	15	05	200

CT: Class Test, HA: Home Assignment, S/P: Seminar/Presentation, CE: Continuous Evaluation, A: Attendance; ESE: End Semester Examination.

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1	1	2	1	1	1	1	1	1	1	1	--	1	1	--
CO2	1	1	1	2	1	1	1	1	1	1	1	1	--	1	1	--
CO3	1	1	1	2	1	1	1	1	1	1	1	1	--	1	1	--
CO4	1	1	1	2	1	1	1	1	1	1	1	1	--	1	1	--

1: strongly related, 2: moderately related and 3: weakly related

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	ECO-TOURISM (PLN4111)	L	T	S	P	C
Version 1.1		1	0	0	2	2
Pre-requisites/Exposure	Disaster Risk Management and Climate Change Adaptation					
Co-requisites	Planning and Design Lab V					

Catalog Description
The aim of this course is to offer the principles of planning for eco-tourism in the context of sustainable tourism development. The courses will generally be conducted in the seminar/studio mode to encourage research, exploration and skill developments. The focus of the course is getting the insights of relationships between tourism and environment, tourism and urban development, tourism and economic development. In this course, students will be able to grasp planning requirements for developing sustainable eco-tourism hubs and circuits. They will be able to incorporate community needs and sustainable eco-tourism requirements in planning process. The course would be conducted through literature survey, case studies, site visits, community surveys and hands on experimentations. During the course the students will be working on live projects in groups which are preferably interdisciplinary.

Course Objectives
The objectives of this course are
- To apply planning strategies and tools with reference to sustainable tourism development.
- To grasp the role of public and private sector as well as community participation in eco-tourism planning and development

Course Outcomes
On completion of this course, the students will be able to
CO1: Apply concept of eco-tourism for sustainable tourism development.
CO2: Identify and plan eco-tourism hubs and circuits.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction and Planning for Eco-Tourism Definitions, scope, nature, key determinants, characteristics; problems and prospects of eco-tourism; eco-tourism hubs in India; impacts of eco-tourism in developed and developing regions; relationship between tourism and urban development, relationship between tourism and economic development, relationship between tourism and environment; concept of carrying capacity and its significance in eco-tourism. Circuit identification and destination planning; assessment of infrastructure requirement for eco-tourism planning; analysing tourism impacts in transforming local livelihood and lifestyle; role of Government institutions and agencies in eco-tourism development.	L3, L4 L5	12

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MODULE 2: Project Work Selection and understanding of case study; Formulation of Aim and Objectives, Collection of data through primary and secondary sources; Conducting survey; Database development using relevant and advance software; Qualitative and quantitative data analysis; Report writing and presentations.	L4, L5, L6	24

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Cohen, E. (1978). The impact of tourism on the physical environment. *Annals of Tourism Research, 5*(2), 215–237. https://doi.org/10.1016/0160-7383(78)90221-9
- Dávid, L. (2011). Tourism ecology: Towards the responsible, sustainable tourism future. *Worldwide Hospitality and Tourism Themes*, *3*(3), 210–216. https://doi.org/10.1108/17554211111114217
- Ghasemi, M., & Hamzah, A. (2014). An Investigation of the Appropriateness of Tourism Development Paradigms in Rural Areas from Main Tourism Stakeholders' Point of View. *Procedia - Social and Behavioral Sciences*, *144*, 15–24. https://doi.org/10.1016/j.sbspro.2014.07.269

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- Jaini, N., Anuar, A. N. A., &Daim, M. S. (2012). The practice of sustainable tourism in ecotourism sites among ecotourism providers. *Asian Social Science*, *8*(4), 175–179. https://doi.org/10.5539/ass.v8n4p175
- Stakeholders, E. (1994). The Component of Successful Ecotourism. In *UNEP Division of Technology, Industry and Economics* (pp. 33–59).
- Wiltshier, P., Clarke, A., Adebayo, A., Robinson, P., &Oriade, A. (2019). Community-based tourism. In *Community-Based Tourism in the Developing World* (pp. 98–112). Routledge. https://doi.org/10.4324/9781351026383-8

Modes of Evaluation: Presentation/Assignment/Class Test /Written Examination

Examination Scheme:

Components	**Internal Assessment**						**ESJ**
	CT-1	**CT-2**	**HA**	**S/P**	**CE**	**A**	
Weightage (%)	-	-	-	40	05	05	50

CT: Class Test, HA: Home Assignment, S/P: Seminar/Presentation, CE: Continuous Evaluation, A: Attendance; ESE: End Semester Examination, ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	1	--	--	1	1	--	--	2	1	--	1	--	1	2
CO2	1	1	2	--	--	--	--	--	--	--	--	--	1	2	--	--

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	TRANSPORTATION PLANNING AND MANAGEMENT (PLN4211)	L	T	P	S	C
Version 1.1	Date of Approval:	2	1	0	0	2
Pre-requisites/Exposure	Traffic and Transportation Planning – I & II(B.Plan.)					
Co-requisites	Planning and Design Lab – II& II					

Catalog Description

The aim of this course is to introduce to the students of planning with the integration of transportation planning and its interface of land use planning. Another objective is to ensure that students have a sound understanding of the key issues affecting the planning, management and financing of public transport in developed and developing countries. At the end of the course, students will be able to analyse on transport related plans and policies.

Course Objectives

The objective of this course is

- To equip students with an integration of transportation planning and its interface of land use planning.
- To prepare students to analyze the key issues affecting the planning, management and financing of public transport.

Course Outcomes

On completion of this course, the students will be able to

CO1: Define the concept of Land use-transport integration and sustainable transport planning and its relevance in Indian Context

CO2: Apply transport planning process while preparing transport plans.

CO3: Calculate External Cost of Urban Transportation and plan for urban and regional freight

CO4: Utilize transport planning software and financing of TOD Projects.

Modules	**Blooms level***	**Number of hours**

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MODULE 1: Land use- transport Integration and Sustainable Transport Planning Introduction to transport and travel; Understanding travel from the mobility, economic, social-psychologist, time/space perspective; Introduction to four stage modelling; land use and transportation integration- definitions, land use transport cycle, importance of accessibility; Factors affecting and tools for land use-transport integration; Key elements of integration; Integrating land use and transport in the planning process; traffic generation rates of different land use; Land development impact on traffic congestion on road segments, intersections and parking, impact on public transportation, pedestrian traffic and safety, Demand and Supply of Transport; Congestion pricing, transport Pricing, Basic transport economic Model Role of NHAI in regional transport.Understanding Sustainable Development and Sustainable Transport; Environment and Social Progress; Indicators of Progress, Development Control and Travel Planning.	L1, L2 L3	9
MODULE 2: Transportation Planning Process Area Delineation, Zoning (TAZ); Four Stage Planning Process: Trip Generation, Trip Distribution, Trip Assignment and Modal Split; Principles of transport infrastructure planning and design of roads and intersections, street infrastructure elements; Parking facilities; and Principles of traffic management, Traffic Management- Signal design; Phasing and Time cycles; Principles of one-way system design; Pedestrianization and non-motorized transportation- Issues, policies and case studies; Towards more inclusive cities; Comprehensive Mobility Plan.	L1, L2 L3	9
MODULE 3: External Cost of Urban Transportation and Freight Transport Introduction to External Cost of Urban Transportation: Issues, Level of Service and Transport Pricing, Congestion Pricing, Policy Issues, Emission Standards and Energy Policy; Transport planning policies of central and state governments; National Urban Transport Policy 2006; Pricing and Revenue in Transport- Pricing; Revenue and Forecasting; Willingness to Pay. Introduction to Freight Transport- differences from passenger transport; location choice of transport hubs in relation to regional distribution linkages, Regional Transport Issues: Intercity Connectivity; Urban –Rural Linkages and Road Hierarchy; Road and Rail as Competing/Complementary Modes; Highway Standards in Indian Context.	L1, L2 L3	9
MODULE 4: Software Applications and Projects Software Applications: E.G. Cube 6- Network Coding, Creation of Models, Data Base and Scenarios in Cube Base, Cube Voyager Modelling Functions; Urban Land Use &Transportation Planning Applications. Transit Oriented Development- Definition, concepts and key components; Principles of TOD, planning norms and standards of TOD, pre-requisites of TOD, financing of TOD projects, role of stakeholders.	L1, L2 L3, L4	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

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Text Books

- Kadiyali, L.R. (2017) Transport Engineering, Khanna Book Publishing Co., New Delhi.
- Saxena, S.C. (1989) A Course in Traffic Planning and Design, Dhanpat Rai and Sons, New Delhi.
- Sarkar, P.K., Maitri, V. and Joshi, G.J. (2014) Transportation Planning: Principles, Practices and Policies, Prentice Hall India Learning Private Limited, New Delhi.
- Verma, A. and Ramanayya, T.V. (2014) Public Transport Planning and Management in Developing Countries, CRC Press, Taylor and Francis Group, London
- Curtis, C. (2008). Planning for sustainable accessibility: The implementation challenge. *Transport Policy*, *15*(2), 104–112. https://doi.org/10.1016/j.tranpol.2007.10.003
- Morris, J. M., Dumble, P. L., & Wigan, M. R. (1979). Accessibility indicators for transport planning. *Transportation Research Part A: General*, *13*(2), 91–109. https://doi.org/10.1016/0191-2607(79)90012-8
- Rodrigue, J. P., Comtois, C., & Slack, B. (2016). *The geography of transport systems*. *The Geography of Transport Systems* (pp. 1–440). Taylor and Francis. https://doi.org/10.4324/9781315618159
- Scott, D. M., Novak, D. C., Aultman-Hall, L., & Guo, F. (2006). Network Robustness Index: A new method for identifying critical links and evaluating the performance of transportation networks. *Journal of Transport Geography*, *14*(3), 215–227. https://doi.org/10.1016/j.jtrangeo.2005.10.003

Reference Books

- Banister, D. (2008). The sustainable mobility paradigm. *Transport Policy*, *15*(2), 73–80. https://doi.org/10.1016/j.tranpol.2007.10.005
- Curtis, C., &Scheurer, J. (2017). Performance measures for public transport accessibility: Learning from international practice. *Journal of Transport and Land Use*, *10*(1), 93–118. https://doi.org/10.5198/jtlu.2016.683
- Lucas, K. (2012). Transport and social exclusion: Where are we now? *Transport Policy*, *20*, 105–113. https://doi.org/10.1016/j.tranpol.2012.01.013
- May, A. D. (2015). Encouraging good practice in the development of Sustainable Urban Mobility Plans. *Case Studies on Transport Policy*, *3*(1), 3–11. https://doi.org/10.1016/j.cstp.2014.09.001
- Parkin, J., &Koorey, G. (2012). Network planning and infrastructure design. In *Transport and Sustainability* (Vol. 1, pp. 131–160). Emerald Group Publishing Ltd. https://doi.org/10.1108/S2044-9941(2012)0000001008

Modes of Evaluation: Presentation/Assignment/Class Test /Written Examination

Examination Scheme:

Components	CT-1	CT-2	HA	S/P	CE	A	ESE
Weightage (%)	10	10	10	10	05	05	50

CT: Class Test, HA: Home Assignment, S/P: Seminar/Presentation, CE: Continuous Evaluation, A: Attendance; ESE: End Semester Examination.

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	2	1	2	--	--	--	--	--	--	--	--	1	--	2	--
CO2	1	2	1	2	--	--	--	--	--	--	--	--	1	--	2	--
CO3	1	2	1	2	--	--	--	--	--	--	--	--	1	--	2	--
CO4	1	2	1	2	--	--	--	--	--	--	--	--	1	--	2	--

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	DEMOGRAPHY AND QUANTITATIVE ANALYSIS (PLN4212)	L	T	P	S	C
Version 1.1	Date of Approval:	2	1	0	0	2
Pre-requisites/Exposure	Planning Studio IInd and IIIrdSem.					
Co-requisites	Statistical Data Analysis Software (Elective)					

Catalog Description

The course consists of two parts of Demography and Statistics, dealing with each independently and as well as connecting the applications of statistics to demography.

Demography: The aim of the section on Demography is to provide the students with an understanding of basic concepts on demography. This course would make the students aware of the importance of population geography in economic development, the various theories that explain the growth of population in a country and demographic techniques applied. The course aims to help students identify appropriate sources of data, perform basic demographic analyses using various techniques and ensure their comparability across populations. The student will also be able to produce population projections and interpret the information gathered by the different demographic methods.

Quantitative Methods: The emphasis of the section on Statistics shall be on conceptual underpinnings of statistics with a focus on defining different statistical tools indispensable for urban planning. In view of the course according more emphasis on inferential statistics than descriptive statistics, the objective of the course will be to introduce the most useful and commonly employed statistical tools and discuss the conditions under which use of those tools is appropriate. The course has been so designed as to train the students interpret the results of an analysis to provide insight into the answer to the problem at hand. Use of SPSS is also included in the program, but will be taught separately as an elective subject in second semester itself.

Course Objectives

The objective of this course is

- To overview concepts of demography and its relation as well as utilization in planning.
- To demonstrate various methods for quantitative/demographic data analysis.

Course Outcomes

On completion of this course, the students will be able to

CO1: Acquire knowledge on demographic parameters used in planning.

CO2: Appreciate demographic theories, trends and impacts of migration as well as project population.

CO3: Use statistical methods of data analysis which are utilised in planning.

CO4: Apply statistical sampling techniques and advanced data analysis methods.

Module	Blooms level*	Number of hours

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Module 1: Demography and Planning Distribution and Density of Population - Measures of Population Distribution and Concentration; Factors Affecting Population Distribution and Density; World Population Distribution; Density Distribution in India Population Change - Fertility and Its Measures; Mortality and Its Measures; Mobility; Factors Affecting Population Change; Determinants of Fertility and Mortality.	L1, L2, L3	9
Module 2: Demographic Theories, Migration, Population Composition and Projections Demographic Transition Theory; Some Population Theories (Overview only); Migration - Types of Migration; Determinants of Migration; Migration Models; Population Composition - Age and Sex Composition and Its Determinants; Age Pyramids; Working Force and Its Determinants; Composition of Work Force and Occupational Composition; Population Projections – Assumptions, Methods, Techniques.	L1, L2, L3	9
Module 3: Quantitative Methods-I Measures of Central Tendency and Dispersion - Arithmetic Mean; Weighted Mean; Geometric and Harmonic Mean; Median and Mode; Variance and Standard Deviation; Time Series and Forecasting - Trend Analysis - Cyclical Variation, Seasonal Variation, Irregular Variation; Various Methods in Time Series Analysis – Moving Average, Ratio to Trend, Link Relative and Residual; Factor Analysis - Principal Component Analysis	L1, L2, L3	9
Module 4: Quantitative Methods-II Probability Distribution and Sampling Distribution - Use of Expected Value in Decision Making; Binomial, Poisson and Normal Distribution (only application); Determination of Sample Size and Types of Sampling; Sampling Distribution (concept only); Design of Experiments (concept only); Correlation and Regression - Two Variable versus Multiple Linear Regression; Simple and Multiple Correlation; Estimation of Parameters – The Method of Ordinary Least Squares; Hypothesis Testing, Goodness of Fit; Applications of Features of Excel for statistical analysis.	L1, L2, L3	9

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

- Burch, T. K. (2017). Fundamentals of Demographic Analysis: Concepts, Measures, and Methods. *Canadian Studies in Population*, *44*(1–2), 121. https://doi.org/10.25336/p6tw25
- Schabenberger, O., &Gotway, C. A. (2017). *Statistical methods for spatial data analysis*. *Statistical Methods for Spatial Data Analysis* (pp. 1–488). CRC Press. https://doi.org/10.1201/9781315275086
- Yusuf, F., Swanson, D. A., & Martins, J. M. (2014). *Methods of demographic analysis*. *Methods of Demographic Analysis* (Vol. 9789400767843, pp. 1–310). Springer Netherlands. https://doi.org/10.1007/978-94-007-6784-3

Reference Books

- Chi, G., & Zhu, J. (2008, February). Spatial regression models for demographic analysis. *Population Research and Policy Review*. https://doi.org/10.1007/s11113-007-

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9051-8
- Wachter, K. W. (2015). *Essential Demographic Methods*. *Essential Demographic Methods*. Harvard University Press. https://doi.org/10.4159/9780674369757

Modes of Evaluation: Presentation/Assignment/Class Test /Written Examination

Examination Scheme:

Components	**CT-1**	**CT-2**	**HA**	**S/P**	**CE**	**A**	**ESE**
Weightage (%)	10	10	10	10	05	05	50

CT: Class Test, HA: Home Assignment, S/P: Seminar/Presentation, CE: Continuous Evaluation, A: Attendance; ESE: End Semester Examination.

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	2	2	2	--	2	--	--	--	--	--	--	1	--	2	--
CO2	1	2	2	2	--	2	--	--	--	--	--	--	1	--	2	--
CO3	1	2	2	2	--	2	--	--	--	--	--	--	1	--	2	--
CO4	1	2	2	1	--	2	--	--	--	--	--	--	1	--	2	--

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	PLANNING STUDIO-II – URBAN PLANNING (PLN4206)	L	T	P	S	C
Version 1.1	Date of Approval:	2	0	0	8	10
Pre-requisites/Exposure	Planning Studio I					
Co-requisites	-					

Catalog Description

The studio is designed to expose the students to issues of urban planning and equip them with knowledge and techniques to enable them to analyse urban situations and develop logical decision making processes to address the complex overlays of conceptualisation, implementation and finance. The studio is designed to study one particular urban area and analyse its issues and develop spatial plans with thrust on critical sectors. It focuses on the preparation of integrated development plan for a selected urban area analysing all aspects of physical planning including socio-economic factors and physical infrastructure and also formulation of methods of implementation and projectisation. The course deliverables would be designed based on specific projects undertaken, keeping in mind the overall objective of the course.

Course Objectives

The objective of this course is

- To relate theoretical knowledge of planning with urban planning practices.
- To conceptualize and prepare an urban development plan for the given study area.

Course Outcomes

On completion of this course, the students will be able to

CO1: Applying learnt planning concepts for the conceptualization and designing of an urban plan.

CO2: Present and document meaningful inferences and strategies/proposals for sustainable urban development.

Modules	Blooms level*	Number of hours
MODULE 1: Pre-Field visit Stage Identification of an urban area; Identification and Formulation of Planning Objectives for the project; Field Visit and Survey of the study area. Data collection through primary and secondary surveys.	L3, L4 L5	40
MODULE 2: Post-Field visit Stage Analyses and presentation of data and information; Review of Planning Objectives post data analysis; Redefining objectives; Planning for urban area and its region (structure plan / development plan) with emphasis on: Land use, transportation networks and Infrastructure networks; Preparation of Detailed Project Report (case specific); Identification and Detailing of Action Area, Local Area plans or Project Plans (case specific); Plan Implementation strategies: Stake holder participation, project funding options; Implementation strategies including urban governance and management issue.	L3, L4 L5	80

**Bloom's Level:*

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L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Essential Elements/Deliverables:

- Defining characteristics of identified areas
- Case study and literature review of planning concepts and norms for the selected area/special area
- Formulation of Aim, Objectives and Methodology
- Selection of site and collection data (field trip of 1-week duration)
- Data analysis and presentation
- Outline framework of development – sectoral and spatial
- Implementation framework – capital investment and funding methods
- Governance and management aspects.

Text Books

- Bureau of Indian Standards (2005) National Building Code of India, Bureau of Indian Standards, New Delhi
- Delhi Development Authority (2007) Master Plan for Delhi, 2021, DDA, New Delhi.
- Singh V., Ahmed A., Sharma Y. (2020) Unified Building Bye-Laws for Delhi 2016, Society for Fundamental Research and Development, New Delhi.
- Ministry of Urban Development (1996) The Urban Development Plan Formulation and Implementation (UDPFI) Guidelines, Government of India, New Delhi.
- Ministry of Urban Development (2015) The Urban and Regional Development Plan Formulation and Implementation (URDPFI) Guidelines, Government of India, New Delhi.
- Flood, J. (1997). Urban and housing indicators. *Urban Studies*, *34*(10), 1635–1665. https://doi.org/10.1080/0042098975385
- De Freitas, E. L. H., & De Melo Bueno, L. M. (2018, May 1). Participatory processes for preparation of Urban Plans and Zoning: Recent experiences innovations. *Urbe*. Editora CHAMPAGNAT. https://doi.org/10.1590/2175-3369.010.002.ao09
- Medrano, L., & Spinelli, J. (2014). Urban policies and projects for social housing in central areas.
- Huxley, M. (2009). Planning, Urban. In *International Encyclopedia of Human Geography* (pp. 193–198). Elsevier Inc. https://doi.org/10.1016/B978-008044910-4.01097-X
- The case of the Habitasampa competition (São Paulo, Brazil). *Habitat International*, *42*, 39–47. https://doi.org/10.1016/j.habitatint.2013.10.004

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- Berghöfer, A. A., Gettkant, A., Lossack, H., Mayer, C., Prem, I., Riha, K., … Wittmer, H. (2012). Integrating Ecosystem Services into Development Planning A stepwise approach for practitioners based on the TEEB approach. *Environment and Climate Change Department, Deutsche Gesellschaft Für Internationale*
- GOI. (2010). *The Gazette of India*. *DisClosure* (Vol. 2011, pp. 1–216). https://doi.org/http://www.indianemployees.com/uploads/documents/042015/1428239209-16-92.pdf
- Planning, S. (1996). Statewide Planning Goals & Guidelines. *Development*, *97310*(Dlcd), 1–77.

Modes of Evaluation: Presentation/Assignment/Class Test /Written Examination

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Examination Scheme:

Components	P -1	P -2	S	R	CE	A	ESE
Weightage (%)	50	50	60	20	15	05	200

CT: Class Test, HA: Home Assignment, S/P: Seminar/Presentation, CE: Continuous Evaluation, A: Attendance; ESE: End Semester Examination.

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1	1	2	1	1	1	1	1	1	1	1	--	1	1	--
CO2	1	1	1	2	1	1	1	1	1	1	1	1	--	1	1	--
CO3	1	1	1	2	1	1	1	1	1	1	1	1	--	1	1	--
CO4	1	1	1	2	1	1	1	1	1	1	1	1	--	1	1	--

1: strongly related, 2: moderately related and 3: weakly related

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	SPECIAL AREA PLANNING (PLN4213)	L	T	P	S	C
Version 1.1	Date of Approval:	1	0	2	0	2
Pre-requisites/Exposure	Introduction to Regional Planning					
Co-requisites	Metropolitan Planning, Development and Management					

Catalog Description

The aim of this course is to introduce the students to various Special Areas with their specific planning needs and priorities and the implication on development in these areas. The courses will generally be conducted in the seminar/studio mode to encourage research, exploration and skill developments. The focus of the course will be on studying the need and process required for special area planning. This course will provide the students hands-on experience Special area that required a different planning process in a built environment. The course contents to be followed will be developed by course teachers based on the resources at hand and opportunities for interdisciplinary learning. The course would be conducted through literature survey, case studies, site visits, and hands on experimentations. During the course the students will be working on live projects in groups which are preferably interdisciplinary.

Course Objectives

The objective of this course is

- To familiarize students with planning process required for special areain Indian context.
- To develop interdisciplinary understanding and sensitivities of future planners.

Course Outcomes

On completion of this course, the students will be able to

CO1: Appreciate the need, planning process and legislation required for special area planning

CO2: Prepare the detail report and presentation on a given project related to Special area planning.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to SAP and its Management Special Areas under consideration would include Formal and Functional Regions (Hill Areas, Coastal Areas, Desert Areas, Special Economic Zones, Port City, Aerotropolis, Medi-City, Knowledge City, TOD etc.)., Types of special areas and their defining characteristics, Legislations and norms for Special Area Development in the Indian context, Capital investment and funding methods, public private partnerships in development process, Governance and Management aspects, Case Studies of various typologies of Special Area Development Plans in Indian and international context.	L1, L2, L3	12

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MODULE 2: Project Work Selection and understanding of case study; Formulation of Aim and Objectives, Collection of data through primary and secondary sources; Conducting survey; Database development using relevant and advance software; Qualitative and quantitative data analysis; Report writing and presentations.	L4, L5, L6	24

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Development of Hill Areas, Dobha G.L, Concept Publishing
- Environmental Problems of Coastal Areas in India, Sharma Vinod, Bookwell
- Integrated Development of Hill Districts in India: Issues and Approaches, Gupta, R.C., SPACE
- Special Economic Zones In India, P. K. Manoj, Serials Publications

References

- Aerotropolis: The Way Well Live Next, John Kasarda, Allen Lane
- Environmental act in India, Ruma Chatterjee, Oxford University Press
- CRZ Regulations, 2011, MoEF

Modes of Evaluation: Presentation/Assignment/Class Test /Written Examination

Examination Scheme:

Components	**CT-1**	**CT-2**	**HA**	**S/P**	**CE**	**A**	**ESE**
Weightage (%)	-	-	-	90	05	05	-

CT: Class Test, HA: Home Assignment, S/P: Seminar/Presentation, CE: Continuous Evaluation, A: Attendance; ESE: End Semester Examination.

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	1	--	--	1	1	--	--	2	1	--	1	--	1	2
CO2	1	1	2	--	--	--	--	--	--	--	--	--	1	2	--	--

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	BIG DATA AND DATA ANALYSIS (PLN4216)	L	T	P	S	C
Version 1.1	Date of Approval:	1	0	2	0	2
Pre-requisites/Exposure	Demography and Quantitative Analysis					
Co-requisites	Planning and Design Lab -V &VI					

Catalog Description

This course provides a basic introduction to big data and linking it with urban and regional planning, development, management, and policy making. The objective of the course is to familiarize students with big data analysis as a tool for making maps. The course also provides a basic introduction about the process of data acquisition and analytics associated with urban areas. Through this course students will explore big data in the context of smart cities and regions with the help of real-world examples. This incorporates practical exercises to familiarize students with the format of big data. It also provides a first hands-on experience to the students in handling and analysing large, complex data structures.

Course Objectives

The objectives of this course are

- As technologies are getting embedded in the built environments, in this context, the major objective of this course is to understand the role and application of big data in urban and regional planning
- To provides hands-on experience in handling and analyzing large data sets.

Course Outcomes

On completion of this course, the students will be able to

CO1: Understand the utility of big data in Planning and identify tools for making maps.

CO2: Understand the software for handling large data sets and explore big datain the context of Smart cities.

Modules	Blooms level*	Number of hours

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MODULE 1: Big data, data acquisitions, analytics and Mapping the City Defining big data and what makes it 'big'; Emergence of data science and big data; its importance and utility in planning; Characteristics of big data; Links between big data, urban and regional planning, development, management and policy making. Different tools for making maps with big data; Map online programs and open spatial data and its uses; Geographic information systems software for mapping; and Identification of winners and losers in the big data system. Understanding open data platforms; Generators of big data; Handling large datasets, cloud database system; Cleaning data, SQL, introduction to R or other software for urban data analysis. Explore big data in the context of smart cities; Learning use of real-time data collection and use; Interactive data visualization in the context of smart cities and regions.	L1, L2, L3	12
MODULE 2: Project Work Selection and understanding of case study; Formulation of Aim and Objectives, Collection of data through primary and secondary sources; Conducting survey; Database development using relevant and advance software; Qualitative and quantitative data analysis; Report writing and presentations.	L4, L5, L6	24

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4-Analysis; L5-Synthesis, L6-Evaluation

Text Books

- Jain, V.K. (2018) Big Data and Hadoop, Khanna Book Publishing Co., New Delhi.
- Carta, S. (2019) Big Data, Code and the Discrete City, Shaping Public Realms, Routledge, London.
- Desouza, K. and Smith, K. (2016) Big Data and Planning, PAS Report 585, American Planning Association, Washington, D.C. 57.
- Townsend, A.M. (2013) Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia, W.W. Norton and Company, London.
- Offenhuber, D. and Ratti, C. (eds.) (2014) Decoding the City: Urbanism in the Age of Big Data, Birkhauser Verlag AG.

References

- Manovich, Lev. (2012). Trending: The Promises and the Challenges of Big Social Data. Debates in the Digital Humanities, edited by Matthew K. Gold. The University of Minnesota Press.
- Cate, Fred H. (2014). The Big Data Debate. Science 346(6211): 818-818.
- Dutcher, Jenna. (2014). What is Big Data? UC Berkeley Data Science Blog.
- Karsten Donnay. (2017). Big Data for Monitoring Political Instability. International Development Policy 8.1 (Online).

Mode of Evaluation: Presentation/Assignment/Class Test /Written Examination
Examination Scheme:

Components	**CT-1**	**CT-2**	**HA**	**S/P**	**CE**	**A**	ESE
Weightage (%)	-	-	-	90	05	05	-

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CT: Class Test, HA: Home Assignment, S/P: Seminar/Presentation, CE: Continuous Evaluation, A: Attendance; ESE: End Semester Examination.

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	1	--	--	1	1	--	--	2	1	--	1	--	1	2
CO2	1	1	2	--	--	--	--	--	--	--	--	--	1	2	--	--

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	RESEARCH METHODOLOGY AND THESIS PLANNING (PLN4310)	L	T	P	S	C
Version 1.1	Date of Approval:	1	0	0	2	2
Pre-requisites/Exposure	Technical Report Writing and Research Methodology (B.Plan.)					
Co-requisites	Planning Thesis					

Catalog Description

The aim of this course is to introduce students to literature review, research processes, techniques and colloquial arguments, so as to help them finalise a topic for their thesis in the subsequent semester. Two seminars would be conducted in the course of the semester to initiate the process of literature review related to student areas of interest culminating in selection of an appropriate thesis topic. Students will also be taught reference management software-Mendeley as a part of this course.

Course Objectives

The objective of this course is

- To equip students with good research qualities and ethics.
- To prepare students to plan their thesis in an effective manner well in advance.

Course Outcomes

On completion of this course, the students will be able to
CO1: Absorb basic qualities and requirement of a good research.
CO2: Use research communication Techniques.
CO3: Develop their thesis with a good research design.
CO4: Present two seminars based on the proposed research conceptual plan.

Modules	Blooms level*	Number of hours
MODULE 1: Introduction to Research and Research Ethics Definition of Research, types, Basics of academic and applied research; Different Approaches to research; Elements of research: epistemology, theoretical perspective, methods, methodology; Justification of Choice and use of Methods and Methodology; Paradigms in Research. Knowledge on act of plagiarism; Prior permission and intimation form the source; Time management in research; Conduct of interview, asking right question, confidentiality, elimination of researcher biases; Role and Responsibility of Researcher. What is an argument, argument structure and identification, validity and strength of arguments?	L1, L2 L3	6

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MODULE 2: Research Communication Research vocabulary, Reading- notes taking, material organisation, indexing; Technical Writing- Content synthesising, paraphrasing, citation and referencing; APA referencing system, Use of Mendeley in Reference Management; Academic writing-Research Proposal, Synopsis, Abstract writing, Report Writing and mapping, Writing style - introductory, developmental, transitional and concluding paragraphs, linguistic unity, coherence and cohesion, descriptive, narrative, expository and argumentative writing, Proofreading and editing; Presentation: effective content structuring, oral communication, voice modulation, body language, audio-visual aids, handouts.	L1, L2 L3	6
MODULE 3: Developing Thesis • Identification of topic of interest having relevance to planning profession, integration and application of the learnt research processes to the pre-thesis work • Book reviews and journal article compilation to establish the body of work existing in the selected area of work. Preliminary literature review for identification of research gaps. detail literature reviews to understand the current state of knowledge around a particular topic. • Collection of data and opinions by the stakeholders, decision makers, urban managers, advocates, technocrats, user groups, etc. on the topic selected. • Based on the literature review and inputs from the colloquial arguments, the topics shall be finalised for thesis in the subsequent semester. • Selection of study area, identification of extent and spread of intervention; collection of data for preparation of base map. • Development of research objectives, research methods relevant for individual topicand work methodology. Identification of data sources. • Data collection and analysis: sample determination, data tabulation (coding, de-coding, etc.), quantitative and qualitative data analysis. Appropriate and relevant data analysis methods would need to be studied by individual students based on thesis topic and research area.	L3, L4 L5	12
MODULE 4: Professional Practice Finalisation of topic; formulation of problem statement, literature review, working hypothesis, research brief, research methodology, sample determination, data collection and analysis, report structuring. The student will be required to make two seminar presentations and submit a report at the end of the semester which will qualify as the literature review and research methodology component of his/her thesis in the forthcoming semester.	L3, L4 L5	12

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Machi, L.A. and McEvoy, B.T. (2012) The Literature Review, Six Steps to Success, Sage, New Delhi.

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- Condry, R. (2004). Writing Your Thesis. *The British Journal of Sociology*, *55*(4), 597–598. https://doi.org/10.1111/j.1468-4446.2004.00040_9.x
- Shanti Bhushan Mishra and Shashi Alok., (2017): Hand Book of Research Methodology, GateResearch
- Taylor, G. (2009). *A Student's Writing Guide: How to Plan and Write Successful Essays*. *Social Sciences* (p. 266). Retrieved from http://www.cambridge.org/9780521729796
- Wentz, E. A. (2017). *How to Design, Write, and Present a Successful Dissertation Proposal*. *How to Design, Write, and Present a Successful Dissertation Proposal*. SAGE Publications, Ltd. https://doi.org/10.4135/9781506374710

Reference Books

- American Psychological Association. (2010). *APA Sixth Edition*. *Intellectual Property* (Vol. 1968, p. 272). https://doi.org/10.1006/mgme.2001.3260
- ChineloLgwenagu, (2016): Fundamental of Research Method and data collection, British Council,Research Gate
- Jennifer Mason, (2002): Qualitative Researching, 2nd edition, SAGE Publications, London
- Neville, C. (2007). The complete guide to referencing and avoiding plagiarism. *Open University Press*, 27–41. https://doi.org/10.1016/B978-0-08-100072-4.00007-1

Modes of Evaluation: Presentation/Assignment/Class Test /Written Examination

Examination Scheme:

Components	**CT-1**	**CT-2**	**HA**	**S/P**	**CE**	**A**	**ESE**
Weightage (%)	10	-	10	70	05	05	-

CT: Class Test, HA: Home Assignment, S/P: Seminar/Presentation, CE: Continuous Evaluation, A: Attendance; ESE: End Semester Examination.

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	1	1	--	--	2	--	--	--	--	--	1	2	--	--
CO2	1	2	1	1	--	--	2	--	--	--	--	--	1	2	--	--
CO3	1	1	1	1	--	--	2	--	--	--	--	--	1	2	--	--
CO4	1	1	1	1	--	--	2	--	--	--	--	--	1	2	--	--

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	PLANNING STUDIO-III – REGIONAL PLANNING (PLN4307)	L	T	P	S	C
Version 1.1	Date of Approval:	2	0	0	8	10
Pre-requisites/Exposure	Planning Studio I& II					
Co-requisites	-					

Catalog Description

The course aims to understand the theoretical basis for various concepts and analytical tools of Regional Planning and learn the practice of regional planning in the Indian context. Elements of settlement system in the regional context are also incorporated in this course. The course provides an in-depth understanding of the issues of regional development, regional disparity and the need for balanced regional development in the context of globalization and rapid economic transformations in the country. Regional policies and sectoral policies are also discussed. Metropolitan regions, districts as planning regions and rural planning issues are discussed in the wider spectrum of holistic regional planning and development. Students will be able to apply the knowledge gained through theoretical subjects in their studio planning.

Course Objectives

The objective of this course is

- To relate theoretical knowledge of planning with regional planning practices.
- To conceptualize and prepare regional development plan for the given study area.

Course Outcomes

On completion of this course, the students will be able to

CO1: Applying learnt planning concepts for the conceptualization and designing of a regional plan.

CO2: Present and document meaningful inferences and strategies/proposals for sustainable regional development.

Modules	**Blooms level***	**Number of hours**

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MODULE 1: Concept of Regional Planning • Concept of Region: Region Types and Regionalization; Concept of Regional Planning: Nature, Objectives, Levels and Aims • Elements of Settlement System: Function, Spacing, Linkage, Settlement Pattern and Factors Responsible Thereof; Potentials and Centrality of Settlements • Regional Inequalities – Growth, Density and Spatial Inequalities of Population Distribution, Spatial Patterns and Characteristics of Occupational Types; Regional Planning Policies and Its Relevance • Introduction to Economic and Regional Growth Processes: Some Approaches of Rostow, Hirschman, Myrdal, Friedman, Haggerstand; Concept of Growth Centres, Growth Pole, Service Centre and Agro-Politan District and their Application in India • Regional Development Strategies: Centralized and Decentralized; Regional Planning Process: Location of New Regional Economic Activities; Tools and Techniques of Regional Analysis • Metropolitan Regions: Concept of Degree of Primacy, Area of Influence, Service Area; City Regions and Delineation Techniques; Centralization and Decentralization Processes • Concepts of Ring and Satellite Towns, Counter-Magnets; Forms and Concepts for Metropolitan Planning and Development	L2, L3 L4	40
MODULE 2: Governance Mechanism and Implementation • District Planning Process: Identification of Plan Objectives; Collection, Classification and Analysis of Data; Norms and Standards for District Planning; Components of District Planning in the Context of 73rd CAA, 1992, Planning Process Under District Planning. • Committee, Metropolitan Planning Committee; Plan Implementation: Five Year Plans and Rural Development; Planning Process, Policies and Programmes at National, State, Regional and District Levels; Planning, Development, Implementing and Monitoring Organizations and Agencies: National and State. • Concepts of Rural Area and Rural Development; Scope of Rural Development; Causes of Rural Backwardness; Historical Evolution of Rural Development and Rural Settlement Pattern in Indian Context; Economic Issues of Rural Development - Differentiating Economic Growth and Economic Development; Rural Jobs and Income Sources; Rural Economic Policy. • Infrastructure and Plan Implementation; Tools and Constraints in the Implementation of Plans in Terms of Administration; Schemes, Programmes, Policies for development of regions, districts, villages and cities; Selected Case Studies in Indian Context.	L2, L3 L4	80

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Essential Elements/Deliverables:

- Defining characteristics of identified areas
- Case study and literature review of planning concepts and norms for the selected area/special area
- Formulation of Aim, Objectives and Methodology
- Selection of site and collection data (field trip of 1 week duration)
    - Data analysis and presentation
    - Outline framework of development – sectoral and spatial

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- Implementation framework – capital investment and funding methods
- Governance and management aspects.

Text Books

- Misra, R.P. (ed.) (1992) Regional Planning Concepts Techniques Policies and Case Studies, Concept Publishing, New Delhi.
- Sundaram, K.V. (1978) Urban and Regional Planning in India, Vikas Publishing, New Delhi.
- Hall, P. and Tewdwr-Jones, M. (2010) Urban and Regional Planning, Routledge, London.
- Berghöfer, A. A., Gettkant, A., Lossack, H., Mayer, C., Prem, I., Riha, K., … Wittmer, H. (2012). Integrating Ecosystem Services into Development Planning A stepwise approach for practitioners based on the TEEB approach. *Environment and Climate Change Department, Deutsche Gesellschaft Für InternationaleZusammenarbeit (GIZ) GmbH Registered. Bonn and Eschborn, Germany*, 82.
- Haughton, G., &Counsell, D. (2004). Regions and sustainable development: Regional planning matters. *Geographical Journal*, *170*(2), 135–145. https://doi.org/10.1111/j.0016-7398.2004.00115.x
- Seo, J. K. (2009). Balanced national development strategies: The construction of Innovation Cities in Korea. *Land Use Policy*, *26*(3), 649–661. https://doi.org/10.1016/j.landusepol.2008.08.014
- Zarenda. (2013). South Africa's National Development Plan and its implications for regional development. *Tralac Working Paper No.D13WP01/2013*, (June), 1–17. https://doi.org/10.1093/jb/mvp206

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- Allen, P. M. (2012). *Cities and regions as self-organizing systems: Models of complexity*. *Cities and Regions as Self-Organizing Systems: Models of Complexity* (pp. 1–309). Taylor and Francis. https://doi.org/10.4324/9780203990018
- McGee, G., Cullen, A., &Gunton, T. (2010). A new model for sustainable development: A case study of The Great Bear Rainforest regional plan. *Environment, Development and Sustainability*, *12*(5), 745–762. https://doi.org/10.1007/s10668-009-9222-3
- GOI. (2010). *The Gazette of India*. *DisClosure* (Vol. 2011, pp. 1–216). https://doi.org/http://www.indianemployees.com/uploads/documents/042015/1428239209-16-92.pdf

Modes of Evaluation: Presentation/Assignment/Class Test /Written Examination

Examination Scheme:

Components	P -1	P -2	S	R	CE	A	ESE
Weightage (%)	50	50	60	20	15	05	200

CT: Class Test, HA: Home Assignment, S/P: Seminar/Presentation, CE: Continuous Evaluation, A: Attendance; ESE: End Semester Examination.

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1	1	2	1	1	1	1	1	1	1	1	--	1	1	--
CO2	1	1	1	2	1	1	1	1	1	1	1	1	--	1	1	--
CO3	1	1	1	2	1	1	1	1	1	1	1	1	--	1	1	--
CO4	1	1	1	2	1	1	1	1	1	1	1	1	--	1	1	--

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	SMART CITIES AND ADVANCED TECHNOLOGIES FOR EMERGING PLANNING ISSUES (PLN4312)	L	T	P	S	C
Version 1.1		1	0	2	0	2
Pre-requisites/Exposure	Development, Management and Finance, Infrastructure Planning					
Co-requisites	Public Policy in Planning, Urban Finance					

Catalog Description

The aim of this course is to introduce the students to smart cities concepts and solutions with their specific planning needs and priorities and the implication on development in these areas. Besides, this course also offers opportunities in specialized or advance learning in emerging spatial planning issues and planners need to give special attention to them while preparing the plans. The course will generally be conducted in the seminar/studio mode to encourage research, exploration and skill developments. The course will provide the students hands-on experience of infrastructural, environmental problems emerging in a city. The course contents to be followed will be developed by course teachers based on the resources at hand and opportunities for interdisciplinary learning. The course would be conducted through literature survey, case studies, site visits, community surveys and hands on experimentations. During the course the students will be working on live projects in groups which are preferably interdisciplinary.

Course Objectives

The objective of this course is

- To grasp Smart city concept as well as understanding emerging challenges in a city/region and finding out ways to resolve them.
- To develop interdisciplinary understanding and sensitivities of future planners.

Course Outcomes

On completion of this course, the students will be able to

CO1: Apply smart city planning as well as critically analyze immerging multifaceted planning issues and technology-based solution to address them.

CO2: Prepare the detail report and presentation on a given project with an emphasis on smart solutions in order to achieve the goal of sustainable development.

Modules	Blooms level*	Number of hours

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MODULE 1: Smart Cities, Advance Technologies and Emerging Planning Issues Introduction to smart cities, the city as a system of systems, smart citizens, Infrastructure, technology and data, Innovation and enterprise, smart leadership and strategy, standards and capacity building, smart measurement, and learning. Case Studies of various smart cities in Indian and international context. Challenges and problems faced by Mega city and its region, Issues-rapid unplanned growth, urban sprawl, infrastructure related issues such as shortage of Water Supply, Public transport, Parking Issue, Shortage of housing, Solid waste management, environmental issues such as deforestation, land conversion, depletion of ground water etc. Advanced Solution- Advanced Transport Planning system, Smart Mobility, Application technology for improving agriculture productivity, Rain water harvesting, green roofs Sustainable housing affordability, Zero-carbon city, Use of Information and Communication Technology in Planning and Governance- E- Governance, E-Planning, Case studies covering various planning issues at different level of Planning	L1, L2, L3	12
MODULE 2: Project Work Selection and understanding of case study; Formulation of Aim and Objectives, Collection of data through primary and secondary sources; Conducting survey; Database development using relevant and advance software; Qualitative and quantitative data analysis; Report writing and presentations.	L4, L5, L6	24

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

- Dash, R. Environmental Sustainability Index for Indian States 2009 Informing Environmental Action. Chenna: Centre for Development Finance, Institute for Financial Management and Research.
- GRIHA. (2010). National Rating System, 'GRIHA' Green Rating for Integrated Habitat Assessment, An evaluation tool to help design, build, operate and maintain a resource-efficient built environment, GRIHA manual Volume 1. TERI Press, New Delhi: Ministry of New and Renewable, Energy, Government of India and The Energy and Resources Institute.
- Girardet, H. _1990.. The metabolism of cities. In: Cadman, D.and Payne, G. _eds. _1990.. The Living City: Towards a Sustainable Future London: Routledge.
- Smart Cities Unbundled, Sameer Sharma, Bloomsbury India
- The Smart City Transformations: The Revolution of The 21st Century, Amitabh Satyam, Bloomsbury India

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- Basiago, A. D. _1996.. The search for the sustainable city in20th century urban planning. The Environmentalist, 16
- Douglas, I. Urban ecology and urban ecosystems: understanding the links to human health and well-being.Curr. Opine. Environ. Sustain. 2012, 4, 385–392.
- Smart Technologies, K. Worden, World Scientific Publishing Co Pte Ltd
- Smart Technologies for Smart Governments, Manuel Pedro Rodríguez

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Bolívar, Springer Publications

Modes of Evaluation: Presentation/Assignment/Class Test /Written Examination

Examination Scheme:

Components	CT-1	CT-2	HA	S/P	CE	A	ESE
Weightage (%)	-	-	-	90	05	05	-

CT: Class Test, HA: Home Assignment, S/P: Seminar/Presentation, CE: Continuous Evaluation, A: Attendance; ESE: End Semester Examination.

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1	1	--	--	1	1	--	--	2	1	--	1	--	1	2
CO2	1	1	2	--	--	--	--	--	--	--	--	--	1	2	--	--

1: strongly related, 2: moderately related and 3: weakly related

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	SUSTAINABLE CITIES AND REGIONS (PLN4315)	L	T	S	P	C
Version 1.1		1	0	0	2	2
Pre-requisites/Exposure	Regional Planning and Development, Planning History and Theory					
Co-requisites	Infrastructure Planning					

Catalog Description

The primary purpose of this subject is to understand that complex relationships exist between cities and the regions and natural environments on which they rely. This course focuses on how to examines such relationships and how they impact upon urban, suburban, rural and regional dweller at different scales in the 21st century. Students will learn about the major challenges currently faced by urban areas around the world – including poverty, unemployment, poor housing infrastructure, and constraints on productivity – and the extraordinary potential of these areas to enable change in the future.

Course Objectives

The objectives of this course are

- To understand urban sustainability, measures of sustainability, and elements and intersectionality of Sustainable Development Goals.
- To focuses on effective governance in order to ensure sustainability of a city and a region.

Course Outcomes

On completion of this course, the students will be able to

CO1: Identify the measures of urban sustainability

CO2: Demonstrate knowledge and skills to plan for sustainable development of a city ora region.

Modules	Blooms level*	Number of hours

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MODULE 1: Planning and Measuring Sustainability Starting with Brundtland report, different perspectives on urban and regional sustainability; Economic development and sustainability; Healthy city; Dimensions and components of sustainable urban and regional development; Elements of a new and improved paradigm of sustainability; Green cities, growing cities, just cities; Urban planning and the contradictions of sustainable development; Environmental justice and the sustainable city; Understanding urban and regional sustainability indicators; Sustainability assessment with a focus on community interests, etc.; Sustainability indicators used by a city of your choice. Genesis, history, and limits of carrying capacity; Urban ecological footprints, planning with ecological footprints; Governance and local sustainability; Problematizing the politics of sustainability; New politics of sustainability fixes; Environment and the entrepreneurial city: searching for the urban 'sustainability fix'; Third wave sustainability; Sustainability schizophrenia or actually existing sustainability: toward a broader understanding of the politics and promise of local sustainability; Alternative routes to the sustainable city with examples. Understanding New Urban Agenda, Sustainable Development Goals, Paris Agreements; India's position of these global agreements; Industrial ecology, planning for eco-industrial parks, drivers and limitations for the successful development and functioning of eco-industrial parks; SEZs, and development of ports, airports and road and rail based corridors.	L1, L2	12
MODULE 2: Project Work Selection and understanding of case study; Formulation of Aim and Objectives, Conducting community participation exercises in small groups with varied stakeholders, Organising consultative meetings, Focus group discussion, Preparing small scale project with the help of local community and demonstration of the same. Collection of data through primary sources; Conducting survey; Database development; Qualitative and quantitative data analysis; Report writing and presentations.	L1, L2, L4	24

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books/

- Adriano, B., Daniele, V., Pierre, L., and Simona, C. (eds.) (2017) S*mart and Sustainable Planning for Cities and Regions: Results of SSPCR 2017*, Springer, Switzerland.
- Barbara, N. (2019) *Sustainable Pathways for our Cities and Regions, Planning within Planetary Boundaries*, Routledge, New York.
- Chapple, K. (2015) Planning Sustainable Cities and Regions: Towards More Equitable Development, Routledge, New York.
- Hildebrand, F. and Paul, Y. (2007) *Visions of Sustainability: Cities and Regions*, Taylor and Francis, London.
- Mcgranahan, G., Schensul, D. and Singh, G. (2016) Inclusive Urbanization: Can the 2030 Agenda be delivered without it, *Environment and Urbanization*, Vol. 28, No. 1, pp. 13-34.
- Watson, V. (2016) Locating planning in the New Urban Agenda of the

Modes of Evaluation: Assignment/Case Study/ Presentation/Class Test/Written Examination
Examination Scheme:

Components	**Internal Assessment**	**ESJ**

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	CT-1	CT-2	HA	S/P	CE	A	
Weightage (%)	-	-	-	40	05	05	50

CT: Class Test, HA: Home Assignment, S/P: Seminar/Presentation, CE: Continuous Evaluation, A: Attendance; ESE: End Semester Examination, ESJ: End Semester Jury

CO, PO and PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	--	--	1	1	--	--	2	1	--	1	--	1	2
CO2	1	2	2	--	--	--	--	--	--	--	--	--	1	2	--	2

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	PLANNING LEGISLATION AND PROFESSIONAL PRACTICE (PLN4403)	L	T	P	S	C
Version 1.1	Date of Approval:	2	1	0	0	2
Pre-requisites/Exposure	Planning Legislation (B.Plan)					
Co-requisites	Planning Practice I & II, Human Values in Planning (B.Plan)					

Catalog Description

The aim of this course is to introduce the significance of planning laws, legislations, acts, regulations and professional practices in planning. As students are passing out after this semester, therefore, the relevance of this subject becomes very crucial at this stage. At the end of the course student will be able to utilise the learnt skills of planning legislations and professional practice in their career.

Course Objectives

The objective of this course is

1. To prepare students to deal with legal dimensions of planning.
2. To equip students with professional planning ethics to transform them into committed and responsible future planner.

Course Outcomes

On completion of this course, the students will be able to

CO1: Grasp basic legal terminologies for enhanced understanding of legislation.

CO2: Comprehend land related legislations as well as getting an enriched knowledge of Urban and Regional planning Acts.

CO3: Analyze environmental planning regulations and laws.

CO4: Absorb professional planning ethics/values and transforming into a professional planner.

Modules	Blooms level*	Number of hours
MODULE 1: Basic Terminologies and Legislation The meaning, significance and objectives of planning legislation; Evolution of planning legislation and overview; Concept of Law; Sources of law; meaning of the term of law, legislation, ordinance, bill act, regulations and bye-laws; doctrine of separation of powers; judiciary, legislature and executive-rule of law, Judicial precedents; PIL; significance of law and its relationship to urban planning; Indian Constitution.	L3, L4 L5	9

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MODULE 2: Land related Legislation, Urban and Regional Planning Acts Land Acquisition Act 1894; Betterment charges and compensation provisions in planning law; Legislation controlling use of land, ULCRA; Tools of development control-zoning, sub-division regulations, building regulations, model building byelaws, Special regulations like TDR, Rent Control Acts; Apartment Ownership Acts; Transfer of Property Right Act; The estate duty Act; Easement Act; Slum improvement and clearance Act, Indian Contract Act; Arbitration and conciliation Act Municipal Acts; Improvement Trust and Development Authority Acts; Model town and Country planning Acts; Legislations relating to urban art commissions; 73rd and 74th Constitutional Amendments; Cooperative Societies Act; Special Purpose Legislations viz; Special Economic Zones Act; Special Investment Region Act.	L3, L4 L5	9
MODULE 3: Environmental Legislations Evolution of environmental Law in India; Law of Torts; the first environmental law; Pollution control Act- air, water and environmental protection acts; Forest and wildlife acts; other important international environmental laws; Hazardous waste management and handling rules/biomedical rules/solid waste management rules; Environment tribunal act; Archaeological sites and remains of national importance; Conservation of natural resources including mining and forestry acts; MOEF guidelines and notifications.	L3, L4 L5	9
MODULE 4: Professional Practice Role of a Planner; relationship with client, developers, institutions contractors and experts; Role and responsibilities of planning consultants, professional ethics, code of conduct and scale of professional charges; Role in interdisciplinary groups; Formulation of project proposal and outlines; consultancy agreements, contracts and inviting tenders; Nature of Engagements, agreements and safeguards, completion and copyrights; Aims and Objectives of the professional institute.	L3, L4 L5	9

**Bloom's Level:*
L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation

Text Books

- Campbell, H., & Marshall, R. (1998). Acting on principle: dilemmas in planning practice. *Planning Practice and Research*, *13*(2), 117–128. https://doi.org/10.1080/02697459816139
- Kulshreshtha, S.K. (2012) Urban and Regional Planning in India - A Handbook of Professional Practice, SAGE Publications India Private limited, New Delhi

References

- Dwivedi, S. K., & Kashyap, P. K. (2013). Environmental Protection Law and Policy in India. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2266021
- Sivaramakrishnan, K. (2011). Environment, law, and democracy in India. *Journal of Asian Studies*, *70*(4), 905–928. https://doi.org/10.1017/S0021911811001719

Suggested Readings of Bare Acts

- Town and Country Planning Act (any State Act)

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- Model Municipal Act, Ministry of Urban Development, Government of India
- Nagar Raj Act (any State Act)
- Environment Protection Act (Central Act)
- Mining and Forestry Act (Central Act)
- Building Byelaws (any State Act)
- Apartment Ownership Act (any State Act)
- Development Authority Act (any State Act)
- Water Bodies Conservation Act (any State Act)

Modes of Evaluation: Presentation/Assignment/Class Test /Written Examination

Examination Scheme:

Components	**CT-1**	**CT-2**	**HA**	**S/P**	**CE**	**A**	**ESE**
Weightage (%)	10	10	10	10	05	05	50

CT: Class Test, HA: Home Assignment, S/P: Seminar/Presentation, CE: Continuous Evaluation, A: Attendance; ESE: End Semester Examination.

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	--	--	--	--	--	--	--	--	--	1	1	--	--	1
CO2	1	1	--	2	--	--	--	--	2	--	--	1	1	--	1	1
CO3	1	1	--	2	--	--	--	--	2	--	--	1	1	--	1	1
CO4	1	1	--	2	--	--	--	--	2	--	--	1	1	--	1	1

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	PLANNING THESIS (PLN4437)	L	T	P	S	C
Version 1.1	Date of Approval:	2	0	0	16	18
Pre-requisites/Exposure	Planning Studio I, II & III					
Co-requisites	All Theory and Elective Subjects					

Catalog Description

The aim of thesis is to develop independent critical thinking and design/research abilities and apply the knowledge gained, skills developed and professionalism inculcated over the last three semesters in an exercise of own interest and significant complexity. The thesis project is to be undertaken independently by each student on a topic of his/her choice related to urban and regional planning, selected and approved by the faculty during the previous semester as part of course requirements of the subject seminar. The students' needs to present and defend their thesis research work in periodic juries conducted by the department as well as in the external jury appointed by the University/School. They are also expected to write a thesis report with the constant guidance of respective guides. Students will submit the same before external jury in a hard bound prescribed format, given by the department.

Course Objectives

The objective of this course is

- To utilize acquired knowledge in planning and reviewed literature for conceptualizing and pursuing good research.
- To provide viable solutions to the undertaken research problem and document the entire work.

Course Outcomes

On completion of this course, the students will be able to

CO1: Conceptualise a rationale research problem and creating a good research Design.

CO2: Drawing meaningful insights as well as communicate and document practical ideas to solve the selected problem.

Module	Blooms level*	Number of hours
Module 1: Research Problem and Research Design • Conceptualization of Research problem for Thesis work. • Background and Need of the study area. • Rigorous Literaturereview • Formulation of Aim and objectives. • Writing objective based Research Questions. • Constructing Research Methodology. • Designing Analytical Framework. • Sampling and Sample selection. Preparations of Check list and Questionnaire. • Methods of data collection.	L3, L4, L5	26

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Module 2: Data Analysis, Proposals and Report Writing • Processing and Interpretation of data. • Data Analysis. • Findings and Results. • Identification of Issues • Conclusions. • Formulation of policies/Proposal Plans. • Strategies and Recommendations. • Suggestion for Future Research, if any • Report Writing.	L4, L5, L6	190

**Bloom's Level: L1-Knowledge; L2-Comprehension; L3-Application; L4:Analysis; L5:Synthesis, L6:Evaluation*

Text Books

- Evans, D., Gruba, P., & Zobel, J. (2014). *How to Write a Better Thesis*. *How to Write a Better Thesis*. Springer International Publishing. https://doi.org/10.1007/978-3-319-04286-2
- Condry, R. (2004). Writing Your Thesis. *The British Journal of Sociology*, *55*(4), 597–598. https://doi.org/10.1111/j.1468-4446.2004.00040_9.x
- Shanti Bhushan Mishra and Shashi Alok., (2017): Hand Book of Research Methodology, GateResearch
- Wentz, E. A. (2017). *How to Design, Write, and Present a Successful Dissertation Proposal*. *How to Design, Write, and Present a Successful Dissertation Proposal*. SAGE Publications, Ltd. https://doi.org/10.4135/9781506374710

Reference Books

- American Psychological Association. (2010). *APA Sixth Edition*. *Intellectual Property* (Vol. 1968, p. 272). https://doi.org/10.1006/mgme.2001.3260
- ChineloLgwenagu, (2016): Fundamental of Research Method and data collection, British Council,Research Gate
- Jennifer Mason, (2002): Qualitative Researching, 2nd edition, SAGE Publications, London
- Neville, C. (2007). The complete guide to referencing and avoiding plagiarism. *Open University Press*, 27–41. https://doi.org/10.1016/B978-0-08-100072-4.00007-1
- Taylor, G. (2009). *A Student's Writing Guide: How to Plan and Write Successful Essays*. *Social Sciences* (p. 266). Retrieved from http://www.cambridge.org/9780521729796

Modes of Evaluation: Presentation/Assignment/Class Test /Written Examination
Examination Scheme:

Components	**P -1**	**P -2**	**S**	**R**	**CI**	**A**	**ESE**
Weightage (%)	100	100	100	50	45	05	400

P: Presentation, S: Seminar (Internal Jury), R: Report, CI: Class Interaction (continuous evaluation by guide), A: Attendance; ESE: End Semester Examination.

CO, PO and PSO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1
CO2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1

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DISASTER MANAGEMENT AND SUSTAINABLE BUILT ENVIRONMENT

Programme Structure-2021

Course Code	Course Title	Lecture (L) Hours /Week	Tutorial (T) Hours /Week	Practical (P) Hours/Week	Total Credits
DSM2151	Introduction to Disaster Management	2	1	-	3
DSM2251	Resilience Building for Built Environment	2	1	-	3
DSM2351	Emergency Management	2	1	-	3
DSM2451	Rehabilitation Reconstruction and Recovery	2	1	-	3
DSM2551	Climate Change Adaptations and Sustainable Development	2	1	-	3
DSM2651	Geoinformatics in Disaster Management	2	1	-	3
	TOTAL				**18**

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DISASTER MANAGEMENT AND SUSTAINABLE BUILT ENVIRONMENT

Syllabus - Semester First

INTRODUCTION TO DISASTER MANAGEMENT

Course Code: DSM2151 **Credit Units: 03**

Course Overview

The aim of the course is to provide broad understanding about the disasters and its management systems. The course will familiarize the students with concepts and approaches pertaining to disaster management and its relationship with development. The course will provide the understanding on how to assess disaster risk. Student will also learn about the government interventions in the field of Disaster Management.

Course Contents:

Module-I: Introduction to Disasters

Concepts, and definitions (Disaster, Hazard, Vulnerability, Resilience, Risks) Disasters: Classification, Causes, Impacts- Differential impacts-in terms of caste, class, gender, age, location, disability. Global trends in disasters urban disasters, pandemics, complex emergencies, Climate change.

Module-II: Approaches to Disaster Management

Disaster cycle- its analysis, Phases, Culture of safety, prevention, mitigation and preparedness, community based disaster risk reduction, Structural- nonstructural measures, roles and responsibilities of community, Panchayati Raj Institutions/ Urban Local Bodies, States, Centre, and other stake-holders.

Module-III: Inter-relationship between Disasters & Development

Factors affecting vulnerabilities, differential impacts, impact of development projects such as dams, embankments, changes in Land-use etc., climate change adaptation, relevance of indigenous knowledge, appropriate technology and local resources.

Module-IV: Disaster Risk Management in India

Hazard and Vulnerability profile of India; Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, DM Act and Policy, Other related policies, plans, programmes and legislation)

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

(C - Case Discussion/ Presentation; **HA** - Home Assignment; **V** - Viva; **CT**- Class Test; **A** - Attendance; **EE** - End Semester Examination)

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Learning Outcomes

At the end of the course, the students will be able to

- Understand the concept of disaster management and measures to be taken at different stages of disaster management.
- Train on various aspects of disaster management.
- Appreciate the impact of development in the context of disaster management.
- Recognize the scenario of disaster management at various levels such as global, national and regional level.
- Learn vulnerability reduction strategies

Learning Methods

Videos and quizzes through the on-line Learning Management System (LMS); Classroom learning through an experienced Facilitator/Faculty on campus (Videos, In-class Activities, Outbound Activities); Assignments and Presentations.

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Syllabus - Semester Second

RESILIENCE BUILDING FOR BUILT ENVIRONMENT

Course Code: DSM2251 **Credit Units: 03**

Course Overview
The course is intended to provide various dimensions of disasters caused by nature and induced by human activities and their effects on built environment. The course will introduce different forms of disasters. The course will also help in providing the comprehensive knowledge on nature of disaster, characteristics, and how to mitigate the risk involved with such disasters through several case studies across India.

Course Contents

Module-I: Geological Disasters (earthquakes, landslides, avalanches)
Mechanism, patterns, destruction style, effect on built environment, strategies for mitigation, retrofitting, damage prevention, case studies.

Module-II: Hydrological Disasters (Floods, Cyclones and Tsunamis)
Mechanism, patterns, destruction style, effect on built environment, strategies for mitigation, retrofitting, damage prevention, case studies.

Module-III: Manmade Disasters (CBRN-Chemical, Biological, Radiological and Nuclear)
Mechanism, patterns, destruction style, effect on built environment, strategies for mitigation, retrofitting, damage prevention, case studies.

Module-IV: Other disasters (Fires, accidents, pandemics)
Mechanism, patterns, destruction style, effect on built environment, strategies for mitigation, retrofitting, damage prevention, case studies.

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

(C - Case Discussion/ Presentation; **HA -** Home Assignment; **V** - Viva; **CT**- Class Test; **A** - Attendance; **EE** - End Semester Examination)

Learning Outcomes
At the end of the course, the students will be able to:

- Develop an in-depth understanding on nature and characteristics of nature and manmade disaster.
- Learn about the challenges and risks occurred during disasters with the help of case studies.
- Formulate mitigation strategies for risk reduction and damage prevention.

Learning Methods
Videos and quizzes through the on-line Learning Management System (LMS); Classroom learning through an experienced Facilitator/Faculty on campus (Videos, In-class Activities, Outbound Activities); Assignments and Presentations.

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Syllabus - Semester Third

EMERGENCY MANAGEMENT

Course Code: DSM2351 **Credit Units: 03**

Course Overview

The course will train the students about how to respond to a disaster in a city or a village so as to restore normalcy at the earliest. The course will provide necessary skills for search, rescue and evacuation operations. This course will also focus on significance of relief distribution and emergency medical facilities during disaster emergencies.

Course Contents

Module-I: Understanding Emergency Management

Types of activities and assistance during disaster emergencies; stakeholders; coordination with multiple agencies; time management and planning; maintenance of law and order; maintenance of records; Emergency communication.

Module-II: Search and Rescue (SAR)Operations

Significance of SAR; Need for SAR; Techniques for SAR; Organizations trained for SAR; Community Training.

Module-III: Relief Distribution

Significance of Relief Distribution; Need for Relief Distribution; Setting up temporary relief distribution camps, Techniques for Relief Distribution; Organizations trained for Relief Distribution; Community Training

Module-IV: Emergency Medical Care

Need for emergency medical care; Planning for medical care; Requirements of temporary medical camps; training of manpower; maintenance of records.

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

(C - Case Discussion/ Presentation; **HA** - Home Assignment; **V** - Viva; **CT**- Class Test; **A** - Attendance; **EE** - End Semester Examination)

Learning Outcomes

At the end of this course, the students will be able to:

- Understand the role of multiple agencies, time management, communication during disaster emergencies.
- Practice to respond to a disaster so as to reestablish normalcy at the earliest.
- Acquire the skills and knowledge related to search, rescue and evacuation operations through project work.

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- Learn the importance of relief distribution and medical care as a part of emergency management.

Learning Methods

Videos and quizzes through the on-line Learning Management System (LMS); Classroom learning through an experienced Facilitator/Faculty on campus (Videos, In-class Activities, Outbound Activities); Assignments and Presentations.

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Syllabus - Semester Fourth

REHABILITATION RECONSTRUCTION AND RECOVERY

Course Code: DSM2451 **Credit Units: 03**

Course Overview

The course will provide an outline on the need and importance of disaster recovery and its planning. The course will familiarize the students about numerous techniques and guidelines for reconstructions after disasters. This course will provide the learning on aspects pertaining to livelihood restoration during rehabilitation process. Student will get to know about BBB (Build Back Better) strategy which is crucial for future disasters and concept of resilient recovery through this course.

Course Contents

Module-I: Damage Assessment for Recovery

Damage Assessment- Post Disaster Damage assessment; estimated damage assessment; Nature and damage to houses and infrastructure due to different disasters; Need and importance of disaster recovery; Planning for disaster recovery.

Module-II: Reconstructions after Disasters

Significance of reconstruction; Guidelines for Disaster resistant constructions; traditional techniques; Speedy Reconstructions- Essential services, social infrastructures, Immediate shelters/camps, Contingency plans for reconstructions.

Module-III: Socio-economic Rehabilitation

Livelihood restoration; Development towards creation of long-term job opportunities and livelihood options; Various initiatives and policies for socio-economic rehabilitation; Case studies.

Module-IV: Building Back Better (BBB)

Origin of BBB strategy; BBB and preparedness for future disasters; Concepts for resilient recovery; roles and relationships of multilateral agencies like UN, World Bank etc in recovery process; Government's role in BBB; Stimulation of local economies.

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

(C - Case Discussion/ Presentation; **HA** - Home Assignment; **V** - Viva; **CT**- Class Test; **A** - Attendance; **EE** - End Semester Examination)

Learning Outcomes

At the end of the course, the students will be able to:

- Prepare a damage assessment framework for managing disaster recovery.
- Review guidelines for disaster resistant constructions and contingency plans for reconstructions.
- Formulate their own strategies related to creation of long-term employment

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opportunities for displaced people.

- Learn about the BBB strategy and its implementation in order to stimulate local economics.

Learning Methods

Videos and quizzes through the on-line Learning Management System (LMS); Classroom learning through an experienced Facilitator/Faculty on campus (Videos, In-class Activities, Outbound Activities); Assignments and Presentations.

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Syllabus - Semester Fifth

CLIMATE CHANGE ADAPTATIONS AND SUSTAINABLE DEVELOPMENT

Course Code: DSM2551 **Credit Units: 03**

Course Overview

This course focuses on creating safe and sustainable built environment for disaster prone settlements. The course will provide an overview of climate change issue and its interrelationship between climate change adaptation and development. Student will be able to learn about the principles of sustainability while providing solutions to the environmental problems of cities such as pollution, degradation of natural resources and various critical issues.

Course Contents:

Module-I: Climate Change

Origin and evolution of the earth's atmosphere; Overview of key concepts – weather and climate; Climatic classification; Climatic variability - temperature, rainfall, wind speed & direction; Effect of various anthropogenic activities on earth's atmosphere.

Module-II: Climate Change Adaptation and Mitigation

Linkage between climate change adaptation and development; International adaptation initiatives and programs; Definitions of mitigation and overview of emissions levels and mitigation targets per country; Climate vulnerability; Exposure sensitivity and adaptive capacity of society; Role of forests and trees outside forests in climate change resilience and adaptation.

Module-III: Introduction to sustainable development of regions

Scope & definitions; Goals; Principles of sustainable development; Environment ethics; Quality of life, Sustainable building designs and practices; Sustainable infrastructure- water supply, solid waste management, transportation; Green buildings and rating systems; Vernacular architecture and sustainability

Module-IV: Sustainable Development and International Contribution

Environmental movements; Global policies for sustainable development – world summits; Conventions and agreements.

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

(C - Case Discussion/ Presentation; **HA** - Home Assignment; **V** - Viva; **CT**- Class Test; **A** - Attendance; **EE** - End Semester Examination)

Learning Outcomes

At the end of the course, the students will be able to:

- Identify key drivers that contribute for enhancing the problem of climate change.
- Understanding for providing sustainable solutions for the emerging challenges

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related to environment and economic growth.

- Understand the contribution of international agencies for the protection of environment and natural resources

Learning Methods

Videos and quizzes through the on-line Learning Management System (LMS); Classroom learning through an experienced Facilitator/Faculty on campus (Videos, In-class Activities, Outbound Activities); Assignments and Presentations.

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Syllabus - Semester Sixth

GEOINFORMATICS IN DISASTER MANAGEMENT

Course Code: DSM2651 **Credit Units: 03**

Course Overview

The aim of the course is to study the concept of Remote Sensing, Geographical Information System and its applications in the field of Disaster Management. These tools and techniques will assist the students in preparing the spatial database and mapping of the affected area. This course will provide an opportunity to the students for handling various components of spatial modeling digital elevation models, overlay functions etc in the Geographical Information System.

Course Contents:

Module-I:Fundamentals of Remote Sensing

Concept, types and applications of remote sensing (RS); Types of required spatial data; raster and vector data structures; Types of Resolutions; Elements of Image Interpretation, practical exercise on Image Interpretation.

Module-II: Fundamentals of Geographic Information Systems

Definition, concept, significance, components of spatial data base: Types and representations; Applications of GIS in disaster management; Spatial data creation and checking - base maps and thematic maps; Geo-referencing

Module-III: Practical Exercises

Spatial interpretation in GIS; Software Demonstration; Geo-referencing, digitization and geo-database generation; Creating and editing vector data; Attribute data management; Linking of non-spatial data with spatial data, Use of Web GIS; Base map preparation.

Module-IV: Spatial Modelling and Thematic Mapping in GIS

Analysis in GIS: Query and retrieval, buffer and proximity analysis, spatio-temporal analysis, contour generation and Digital Elevation Modelling (DEM)

Examination Scheme:

Components	CT	HA	C	V	A	EE
Weightage (%)	10	5	5	5	5	70

(C - Case Discussion/ Presentation; **HA -** Home Assignment; **V** - Viva; **CT**- Class Test; **A** - Attendance; **EE** - End Semester Examination)

Learning Outcomes

At the end of the course, the students will be able to:

- Familiarize with the concept of Remote sensing and its applications required for image interpretation.

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- Learn Geographical Information System software for creating spatial database on disasters affected area.
- Linking the non-spatial data with spatial data through practical exercises.
- Conduct spatio-temporal analysis in GIS and develop a GIS based decision support for disaster risk reduction.

Learning Methods

Videos and quizzes through the on-line Learning Management System (LMS); Classroom learning through an experienced Facilitator/Faculty on campus (Videos, In-class Activities, Outbound Activities); Assignments and Presentations.

Text & References:

- Disaster Management- G.K Ghosh-A.P.H. Publishing Corporation
- Disaster management – S.K.Singh, S.C. Kundu, Shobha Singh A – 119, WilliamPublications, New Delhi.
- Disaster Management – Vinod K Sharma- IIPA, New Delhi,1995
- Encyclopedia of Disaster Management- Goel S.L. - Deep and DeepPublications, New Delhi, 2006.
- Mileti D. S., Disasters by Design. Washington D.C: Joseph Henry Press, 2001.
- Shaw, R. and Okazaki, K., Sustainability in Grass-roots Initiatives: Focus on Community-based Disaster Management. Kobe, UNCRD, 2003.
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- Olson, M., The Logic of Collective Action; Public Goods and the Theory of Groups, Cambridge: Harvard University Press, 1965.
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- Jegillos, S. R., Issues and Policy, in: Shaw R. and Okazaki K. (eds) Sustainability in Grass-roots Initiatives: Focus on Community-based Disaster Management. UNCRD, pp 11-17, 2003.
- Campbell, J. B. and R.H. Wynne. Introduction to Remote Sensing (5thEd.), Guilford Press, 2012.
- Joseph, G. Fundamentals of Remote Sensing, Universities Press, 2005.
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- Harvey, F. A Primer of GIS. Fundamentals of Geographic and Cartographic Concepts, The Guilford Press, New York London. 2008
- Heywood, I. Conrnelius, S. and Carver, S. An Introduction to Geographical Information Systems, Pearson Education Limited, United Kingdom. 2010.
- Kaplan, E. D. and C.J. Hegarty (eds.). Understanding GPS/GNSS: Principles and Applications, 3 rd Edition, Artech House, 2017.
- Leick, A, Lev Rapoport and Dmitry Tatarnikov.GPS Satellite Surveying, 4th Edition, John Wiley & Sons, 2015.
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INTERIOR DESIGN

Discipline	Course Code	Name of Course	Type (Major/ Minor)	Semester	Total Credits
Interior Design	DIND2151	Principles & Elements of Design	Major/ Minor	1	4
Interior Design	DIND2251	Anthropometry & Furniture Design	Major/ Minor	2	4
Interior Design	DIND2351	Vernacular Art and Designs	Major/ Minor	3	4
Interior Design	DIND2451	Computer Applications-I	Major/ Minor	4	4
Interior Design	DIND2551	Interior Design Services	Major/ Minor	5	4
Interior Design	DIND2501	Computer Applications-II	Major	5	4
Interior Design	DIND2651	Research in Interior Design	Major/ Minor	6	4
Interior Design	DIND2601	Interior Design Project	Major	6	4
Interior Design	DIND2602	Intelligent Interiors	Major	6	4

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PRINCIPLES & ELEMENTS OF DESIGN

Course Code: DIND2151 **Credit Units: 04**

COURSE DESCRIPTION

The aim of this subject is to familiarize students with visual grammar, elements of design and methods of visual composition with various mediums and color. In addition to the earlier, the intention of space design activity will be limited to the level of visual composition of interior/architectural spaces considering the principles of design and colour theory.

COURSE OBJECTIVES

The objective of this course is:

- To understand the application of visual grammar in the domain of Visual design
- To create compositions with various 2D and 3D media with various mediums.
- To develop the ability to apply colour theory in interior and architectural spaces
- To develop the ability to visualize 3D spaces and creating them with the help of various materials.

COURSE CONTENT:

Module 1: Study and Application of Elements of Design

Basic Composition, Elements of design in basic composition, Point, Line, Shape, Texture etc. and its impact on the interior. Application of elements of design, Positive and Negative spaces, Additive and Subtractive spaces

Module 2: Study and Application of Principles of Design

Basic principles such as balance, emphasis, proportion, movement, rhythm, pattern, harmony, unity, focus, hierarchy, scale, order etc. Identifying principles of design in nature and interior /architecture. Application of principles of design in creating interior & architectural spaces.

Module 3: Colour Theory

Understanding colour –Colour perception key elements – (1) Light, (2) Substance, (3) Human vision and responses, Fundamental categories of colour; The color making attributes - Hue, Value, and Saturation. Dimensions of color, Color psychology and management in interiors.

Module 4: Project

3d compositions on elements and principles of design. Revamping a space using colour theory and application of elements and principles of design.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text Books /Reference Books/Journals/Other Study Material:

- Chiara, J. D., &Callender, J. (1983). Time-Saver Standards for Building Types. McGRaw-Hill International Edition.
- Do, E. Y. L., & Gross, M. D. (2001). Thinking with diagrams in architectural design. Artificial Intelligence Review, 15(1–2), 135–149. https://doi.org/10.1023/A:1006661524497
- Hakim, B. S., & von Meiss, P. (1994). Elements of Architecture: From Form to Place. Journal of Architectural Education (1984-), 47(3), 182. https://doi.org/10.2307/1425121Architecture: Form, Space and Order, Francis D.K. Ching

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- Hencke, D. G. (1978). Architectural graphics. Building Operating Management, 25(6), 24–26.
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- Ormiston, R. (2009). Understanding Architecture through Drawing by Brian Edwards. The Art Book, 16(4), 68–68. https://doi.org/10.1111/j.1467-8357.2009.01064_2.x
- Quinan, J., & Alexander, C. (1981). A Pattern Language: Towns, Buildings, Construction. Leonardo, 14(1), 80. https://doi.org/10.2307/1574526
- Roaf, S., & McGill, G. (2018, September 3). Place, time and architecture: the growth of new traditions. Architectural Science Review, 61(5), 267–271. https://doi.org/10.1080/00038628.2018.1502156
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ANTHROPOMETRY & FURNITURE DESIGN

Course Code: DIND2251 **Credit Units: 04**

COURSE DESCRIPTION

The aim of this subject is to make the students understand the importance of anthropometry while designing furniture or space. The subject allows the students to get a clear understanding of how to calculate the spatial requirements and other factors when designing a furniture and interior space. The design activity will be limited to furniture design as well as a room design based on anthropometric measurements.

COURSE OBJECTIVES

The objective of this course is:

- To understand the scale & proportions and its comparisons
- To understand the application of anthropometry in spatial design
- To learn about various furniture materials
- To study about furniture designs and designers throughout the decades

COURSE CONTENT:

Module 1: Anthropometry & Scale

Introduction to static and functional anthropometry, various human postures, and related anthropometrics. Introduction to various scales and conversions. Anthropometrical study of various spaces, Application of Anthropometrics.

Module 2: Furniture Design & Ergonomics

Evolution and benefits of ergonomics; Principles of ergonomics. Application of ergonomics and design of ergonomic furniture.

Module 3: Measured drawing

Introduction to fundamentals of measured drawing, line value, lettering, drawing representation, format for presentation methods and technique of measuring buildings and their details. Measured drawing of simple objects like furniture, detailing in terms of construction, ornamentation, measured drawing of building components like column, door, window, etc.

Module 4: Project

Analyse the user needs, Distribution of the human activity spaces, calculating the spatial requirements based on the anthropometry. Detail planning and design of a interior space (single cell) considering human needs and human anthropometric data with a theme.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text Books /Reference Books/Journals/Other Study Material:

- Chiara, J. D., &Callender, J. (1983). Time-Saver Standards for Building Types. McGRaw-Hill International Edition.
- Do, E. Y. L., & Gross, M. D. (2001). Thinking with diagrams in architectural design. Artificial Intelligence Review, 15(1–2), 135–149. https://doi.org/10.1023/A:1006661524497
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- Ormiston, R. (2009). Understanding Architecture through Drawing by Brian Edwards. The Art Book, 16(4), 68–68. https://doi.org/10.1111/j.1467-8357.2009.01064_2.x
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VERNACULAR ART AND DESIGNS

Course Code: DIND2351 **Credit Units: 04**

COURSE DESCRIPTION

The aim of this subject is to make the students understand the various aspects that are considered in a vernacular design. The subject also focuses on various arts and crafts practiced in India, the process of making and application. The subject gives the students a holistic understanding about the local materials and techniques used in interior designing.

COURSE OBJECTIVES

The objective of this course is:

- To understand vernacularity in art and design
- To study sustainable materials and design
- To incorporate vernacular materials and techniques into modern day designs
- To study traditional Indian art and crafts

COURSE CONTENT:

Module 1: Vernacular Arts & Crafts

Introduction to various arts and crafts movements in history and its impact. Studying various Indian arts and crafts like madhubani, warli, Jaipur blue pottery, kalamkari, pattachitra painting, gond arts, cheriyal scrolls, phad paintings, chikankari, phulkari etc.

Module 2: Introduction to Vernacular Designs

Understanding the definition of vernacular term, importance and factors influencing vernacular design, case studies of vernacular designs

Module 3: Vernacular Materials

Introduction to vernacular materials, market survey, Properties of various vernacular materials , making and application process of vernacular materials in the interior spaces.

Module 4: Project

Analysing the users and area requirements and site context, Vernacular design of an interior space based on a theme, spatial and furniture alignment of the interior spaces based on the needs and context.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text Books /Reference Books/Journals/Other Study Material:

- Chiara, J. D., &Callender, J. (1983). Time-Saver Standards for Building Types. McGRaw-Hill International Edition.
- Do, E. Y. L., & Gross, M. D. (2001). Thinking with diagrams in architectural design. Artificial Intelligence Review, 15(1–2), 135–149. https://doi.org/10.1023/A:1006661524497
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COMPUTER APPLICATIONS-I

Course Code: DIND2451 **Credit Units: 04**

COURSE DESCRIPTION

The aim of this course is to understand the AutoCAD software and their applications Interior Design. In order to enable students to use computer systems and software, teaching necessary digital skills is an important aspect of the course. This course will help students to prepare presentation drawings, generating 2D drawings in a short time.

COURSE OBJECTIVES

The objective of this course is:

- To develop theoretical understanding of AutoCAD and its relevance in Interior Design.
- To practice various commands of the Autocad.
- To be able to draft relevant drawings
- To be able to present drawings in proper scale and formats

COURSE CONTENT:

Module 1: Introduction AutoCAD

Introduction to Auto Cad, User Interface, and basic commands, 2D drawing commands on Drafting, Editing and modification work

Module 2: Drafting

Introduce students to the drafting skills and minimize errors in the presentation skills, students should practice various AutoCAD commands, the student should be able to draft plans, sections and elevations of the design.

Module 3: Design Development

Area requirements, Relation to various functional aspects of the design problem. Use of bubble diagram, flow diagrams, zoning of site, etc. conceptual design.

Module 4: Project Presentation

The student should present the final drafted design in proper scale, layout and format. The drawings may include Site plan, Floor plans, sections and elevations with furniture layouts.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text Books /Reference Books/Journals/Other Study Material:

• Béjar, R., Latre, M. Á., Nogueras-Iso, J., Muro-Medrano, P. R., &Zarazaga-Soria, F. J. (2009). An architectural style for spatial data infrastructures. International Journal of Geographical Information Science, 23(3), 271–294. https://doi.org/10.1080/13658810801905282

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- Julius, P., &Zelnik, M. (1979). Human Dimension & Interior Space. Vasa. Retrieved from http://medcontent.metapress.com/index/A65RM03P4874243N.pdf
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INTERIOR DESIGN SERVICES

Course Code: DIND2551 **Credit Units: 04**

COURSE DESCRIPTION

The aim of this subject is to give students an overview and introduction to water supply and sanitation, lighting and their co-ordination with other services and interior designs. Interior design services are the systems installed in buildings to make them comfortable, functional, efficient and safe. The course covers Water Supply and Sanitation system design in the buildings.

COURSE OBJECTIVES

The objective of this course is:

- To understand the need for and importance of building services.
- To understand the water supply system
- To understand the importance of sanitation and sewerage system.
- To develop perception regarding the various norms and standards for Electrical Systems and Lighting

COURSE CONTENT:

Module 1: Water Supply

Introduction to water supply; purification and treatment of water; need to protect water; requirements of water supply for different building types- storage, distribution; Water supply systems; Distribution networks; Plumbing networks in buildings; fixtures and fittings for efficient water supply

Module 2: Drainage & Sanitation

Concept, design and detailing of drainage systems in buildings; Building/ Site planning for drainage systems; Rainfall, Storm water drains, gullies, open drains; Purpose and principles, collection and conveyance of waste matter. Garbage types, collection and disposal- Purpose and methods (Incinerator, Dry disposal etc.). Garbage disposal in multi-story buildings.

Module 3: Electrical Services

Introduction to electrical engineering services for buildings; Sources of electrical energy supplied to buildings; Introduction to basic photometric concept: Light its behaviour and properties; Instruments for measurement lux meters, field of vision, visual task, visual comfort and glare: objectives of lighting design in interior design; fixtures and fittings for lighting designs; HVAC system designs in small and complex buildings.

Module 4: Environmental Impact Assessment

Environment; Environmental Impacts; Environmental Impact Analysis; Environmental Impact Assessment and Environmental Impact Statement; EIA- As An Integral Part of The design Process; Definition and scope, Goals and need of EM, EM Tools.

Environmental attributes: Air; Water; Noise; Land /and Soil; Socioeconomic; Cultural & Biological.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

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Text Books /Reference Books/Journals/Other Study Material:

Text:

- Water supply, waste disposal and environmental engineering, Chatterjee Water supply and sanitary engineering, Singh
- Water supply and sanitation, Shah
- S.C.Rangwala,"Water supply and sanitary engineering", Chartar publishing house, Anand,1989.
- National Electrical Code.
- Raina K.B. & Bhattacharya S.K., Electrical Design estimating and costing, New Age International (P) Limited, New Delhi,2004.
- Rudiger Ganslandt & Harald Hofmann, Handbook of Lighting Design, Druckhaus Maack, Lüdenscheid, 1992.
- Kevin Kelly& Kevin O'Connell, Interior Lighting Design – A Student's Guide

References:

- Design and practical handbook of plumbing, Mohan & Anand Plumbing Design and practice, Deolalikar
- Civil handbook, Khanna
- Building construction data Maintenance of buildings,Panchdhari
- G.M. Fair, J.C. Geyer and D.Okun, "Water and Waste water engineering", Volume II, JohnWiley & Sons, Inc. New York, 1968
- Manual on sewerage and sewerage treatment, CPHEEO – Ministry of works and housing, NewDelhi, 1980
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COMPUTER APPLICATIONS-II

Course Code: DIND2501 **Credit Units: 04**

COURSE DESCRIPTION

The aim of this subject is to introduce techniques for further refinement of computer-generated graphics covered in the previous semester. In addition to that, this course also trains students for developing photorealistic Modelling using popular software in the field of interior designing. Advanced technologies and concepts using computers as an essential tool are also introduced such as Building Information Modeling. This course equips students with soft skills which increase their productivity and expression in design related subjects.

COURSE OBJECTIVES

The objective of this course is:

- To introduce and make students learn about graphic presentation tools
- To introduce Sketch up as 3D drafting software.
- To introduce Revit as 3D drafting software and its allied rendering plugins.

COURSE CONTENT:

Module 1: Introduction to SketchUp (3-D) Software

Introduce to the Sketch up 3D software for the graphic design, building planning. Explain the various ways to deal with the graphic drawings. Introduce to 3D drawing concepts. Students learn the ability to Model, Editing and modification work to be done in the graphic presentation.

Module 2: Introduction to Revit (3-D) Software

Introduce to the Revit 3D software for the graphic design, building planning. Explain the various ways to deal with the graphic drawings. Students learn the ability to Building Information Modeling.

Module 3: Introduction to Rendering Plugins

Introduce to the Lumion and Twilight Render software for the Rendering.

Module 4: Workshop

Practice on the various Revit and Sketch Up commands through software User Interface. Conduct 3D Skills Workshop to train the students. Introduce to the Modelling skills and minimize errors in the presentation skills.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Text Books /Reference Books/Journals/Other Study Material:

- Brewster, R. (2014). Paint.NET – Free Software for Digital Photo Editing. Http://Www.Getpaint.Net/Index.Html (Accessed June 2015).
- Khan, E., Reinhard, E., Fleming, R., & Bülthoff, H. (2005). Image-based material editing. In ACM SIGGRAPH 2005 Sketches, SIGGRAPH 2005 (p. 148). Association for Computing Machinery, Inc. https://doi.org/10.1145/1187112.1187291
- Kholgade, N., Simon, T., Efros, A., & Sheikh, Y. (2014). 3D object manipulation in a single photograph using stock 3D models. In ACM Transactions on Graphics (Vol. 33). Association for Computing Machinery. https://doi.org/10.1145/2601097.2601209.
- Kirk, D. S., Sellen, A. J., Rother, C., & Wood, K. R. (2006). Understanding photowork. In Conference on Human Factors in Computing Systems – Proceedings (Vol. 2, pp. 761–770). https://doi.org/10.1145/1124772.1124885

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RESEARCH IN INTERIOR DESIGN

Course Code: DIND2651 **Credit Units: 04**

COURSE DESCRIPTION

The aim of this course is to prepare students for writing a paper based on secondary research and literature review and its oral and visual presentation. Students would be able to identify and go in depth into specific and appropriate aspects relating to the discipline of interior design and discuss how it is reflected in the realm of design.

COURSE OBJECTIVES

The objective of this course is:

- Introduce research work to the students.
- To identify a specific aspect relating to the discipline of architecture.
- To make them aware of the constitutes of plagiarism.

COURSE CONTENT:

Module 1: Foundations of Research

Meaning, Objectives, Motivation, Utility of research. – Understanding the language of research – Concept, Construct, Definition, Variable. Research Process.

Module 2: Problem Identification & Formulation

Research Question – Investigation Question – Measurement Issues – Hypothesis – Qualities of a good Hypothesis –Null Hypothesis & Alternative Hypothesis. Hypothesis Testing – Logic & Importance.

Module 3: Data Collection & Analysis

Types of surveys in details for various types of research. Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Non-Response. Characteristics of a good sample. Probability Sample – Simple Random Sample, Systematic Sample, Stratified Random Sample & Multi-stage sampling. Determining size of the sample – Practical considerations in sampling and sample size. Univariate analysis (frequency tables, bar charts, pie charts, percentages).

Module 4: Interpretation of Data and Paper Writing

Layout of a Research Paper, Journals in interior design, When and where to publish. Ethical issues related to publishing, Plagiarism and Self-Plagiarism

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Textbooks /Reference Books/Journals/Other Study Material:

- Dwyer, M. (1995). A guide to the Harvard referencing system. British Journal of Nursing (Mark Allen Publishing), 4(10), 599–602. https://doi.org/10.12968/bjon.1995.4.10.599
- Hofstee, E. (2006). The Harvard Referencing System. In Constructing a Good Dissertation A Practical Guide to Finishing a Master's, MBA or PhD on Schedule (p. 300). Retrieved from http://www.exactica.co.za/dn/exactica-book-harvard-referencing.pdf
- Mühl, J. K. (2014). Research methodology. In Contributions to Management Science (pp. 75–100). Springer. https://doi.org/10.1007/978-3-319-04069-1_4

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- Peffers, K., Tuunanen, T., Rothenberger, M. A., & Chatterjee, S. (2007). A design science research methodology for information systems research. Journal of Management Information Systems, 24(3), 45–77. https://doi.org/10.2753/MIS0742-1222240302
- Soediono, B. (1989). Dessertation: Assessment of bookkeeping practices and its relevance. Journal of Chemical Information and Modeling, 53(June), 160. https://doi.org/10.1017/CBO9781107415324.004

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INTERIOR DESIGN PROJECT

Course Code: DIND2601 **Credit Units: 04**

COURSE DESCRIPTION

The aim of this course is to provide an opportunity to the students to handle a complete interior design project. Project Thesis is the final stage of learning Interior Design. With the help of a thesis project, students are expected to demonstrate the understanding of a systematic design process which includes identification of project requirements, site study and analysis, case studies, programming, schematic design and Interior Design Development. It provides the students with an opportunity to culminate all the semesters of interior design education by demonstrating the body of knowledge and skills gained during their education and the professional training.

COURSE OBJECTIVES

The objective of this course is:

- To prepare a student to independently handle and present all aspects of an interior design, from its evolution to final solution in totality.
- To understand the importance of the evolutionary stages of a design process and various techniques required for a successful presentation of an interior design.
- To develop in students the ability to handle specific aspects / thrust area of design relevant to the topic.

COURSE CONTENT:

Module 1: Introduction

Introduction to the project design The project research should include the followings:

- Aim, Objectives, Need, Scope, Methodology & Limitations
- Case studies & Analysis
- Data Collection & Analysis
- Concept of your design
- Concept and Planning of your Design.

Module 2: Concept Development and Designing

Extensive research specific to project through the primary and secondary data collection. Conduct the case studies with extensive study and analyses to get a clear picture of the existing project. Detailed site study is to be conducted. Development of concept at various stages and levels with conceptual model and 3-D sketches to be studied. Design to be developed through a series of appraisals and open discussions. Designing for workability, efficiency, aesthetic quality, economic value, environmental impact and inclusivity.

Module 3: Detailed Specifications

All the necessary specifications to be detailed and studied to get a clear picture of the project.

Module 4: Presentation

Complete project development and analysis report to be compiled containing all the details of the project. Presentation in terms of 3-D drawings and/or Model to be submitted. Mode of presentation may be mutually devised by co-coordinators and student that may be project specific.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

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Textbooks /Reference Books/Journals/Other Study Material:

- Design Fundamental in Architecture, Walter Gropius
- Interior Design- Ahmed Kasu
- Interior Best Collection, Commerce Asia II, Archiworld
- Interior Design Illustrated - Francis D.K. Ching
- Time Saver standards for Interior Designing and Space Planning , Joseph Dechiara and Julius Panero
- A.J. Metric Handbook, editors, Jan Bilwa and Leslie Fair weather
- Neufert's Architect's data
- Time Saver standards for building types, editor Joseph D.C. and John Callender.

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INTELLIGENT INTERIORS

Course Code: DIND2602 **Credit Units: 04**

COURSE DESCRIPTION

Technology is becoming inherent part of modern life and has invaded every aspect of our life including the building interiors. Intelligent interiors are one of the most important parts of the modern buildings and objectives of the course is to make students aware of the use of technology in interiors.

COURSE OBJECTIVES

The objective of this course is:

- To familiarize what Smart buildings are and its importance in today's life.
- To understand the various components and materials related to Smart buildings.
- To be able to keep up with the current and future trends and challenges faced in the development of Smart building services.

COURSE CONTENT

Module 1: Introduction

Overview of intelligent interiors and use of electronics & IT equipment for creating interesting interiors. Use of technology to maximize the performance of fire alarms and security systems while at the same time minimizing costs. Incorporation of safety equipment such as CCTV etc aesthetically in the interiors.

Module 2: Workplace Automation

Intelligence with respect to workplace automation in an intelligent interior consists of the use of high – tech office automation systems to render the operation of a company more efficient.

Module 3: Automation of Interiors

Remote control in interiors, Managing and monitoring building efficiency from distance. Managing Security, HVAC etc from distance.

Module 4: **Intelligent Use of Energy**

Computerized system to minimize energy use in interiors; control light, airflow, air-conditioning, outdoor light entering the building heating and minimizing the energy consumption using technology.

Examination Scheme:

Components	P/S/V	CT	A	C	EE
Weightage (%)	10	10	5	5	70

Textbooks /Reference Books/Journals/Other Study Material:

- Water supply, waste disposal and environmental engineering, Chatterjee Water supply and sanitary engineering, Singh
- Water supply and sanitation, Shah
- S.C.Rangwala,"Water supply and sanitary engineering", Chartar publishing house, Anand,1989.
- National Electrical Code.
- Raina K.B. & Bhattacharya S.K., Electrical Design estimating and costing, New Age International (P) Limited, New Delhi,2004.
- Rudiger Ganslandt & Harald Hofmann, Handbook of Lighting Design, Druckhaus Maack, Lüdenscheid, 1992.
- Kevin Kelly& Kevin O'Connell, Interior Lighting Design - A Student's Guide

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- Design and practical handbook of plumbing, Mohan & Anand Plumbing Design and practice, Deolalikar
- Civil handbook, Khanna
- Building construction data Maintenance of buildings,Panchdhari
- G.M. Fair, J.C. Geyer and D.Okun, "Water and Waste water engineering", Volume II, JohnWiley & Sons, Inc. New York, 1968
- Manual on sewerage and sewerage treatment, CPHEEO – Ministry of works and housing, NewDelhi, 1980
- Renewable energy, basics and technology, supplement volume on integrated energysystems, Auroville, 1998.
- Electrical power systems quality. (1996). Choice Reviews Online, 34(01), 34-0322-34– 0322. https://doi.org/10.5860/choice.34-0322
- Murty, P. S. R. (2017). Electrical power systems. Electrical Power Systems (pp. 1–814). Elsevier Inc. https://doi.org/10.1016/b978-0-08-100975-8.00006-0

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List of MoU's focusing on Employability, Entrepreneurship and Skill Development

Sl. No.	Organisation with which MoU is signed	Year of Signing MoU
1	The Sixth Element	2023-24
2	National Mission for Clean Ganga	2023-24
3	Knowlarity Communication Pvt. Ltd.	2023-24
4	Silver Streak Multispeciality Hospital	2023-24
5	Wall Art Pvt Ltd	2023-24
6	Plum Bodylovin	2023-24
7	Terminal Ballistics Research Laboratory, DRDO, Chandigarh	2023-24
8	Greenvention Biotech Pvt. Ltd.	2023-24
9	DOYA (Department of Youth Affairs)	2023-24
10	Apptech Infosoft Pvt Ltd	2023-24
11	Admission Theory Infotech	2023-24
12	Lifecare Innovations Pvt. Ltd.	2023-24
13	Airports Authority of India	2023-24
14	ESIC Hospital, Sector-03, IMT Manesar	2023-24
15	Silver Streak Multispeciality Hospital, , Sector-87, Gurugram	2023-24
16	Civil Hospital, Sector-10 Gurugram	2023-24
17	Prakash Hospital & Trauma Centre, Manesar	2023-24
18	Workato	2023-24
19	National Central University	2023-24
20	Minin University	2023-24

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List of courses 2023-24

Sl. No.	Programme Code	Name of Programme	Course Code	Course Name	Year
1	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMGT2151	Management Foundations	2023
2	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMGT2101	Financial and Corporate Accounting	2023
3	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMGT2251	Marketing Management	2023
4	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMGT2201	Cost and Management Accounting	2023
5	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMGT2351	Organisational Behaviour & Human Resource Management	2023
6	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMGT2301	Analytical Decision Making	2023
7	131509	Bachelor of Business Administration (Honors/ Honors with Research)	SMGT2301	Advanced Excel for Managers	2023
8	131509	Bachelor of Business Administration (Honors/ Honors with Research)	NMGT2335	Community Engagement Services	2023
9	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMGT2451	Financial Management	2023
10	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMGT2401	Legal Aspects of Business	2023
11	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMGT2402	Managerial Economics	2023
12	131509	Bachelor of Business Administration (Honors/ Honors with Research)	SMGT2401	Data Interpretations and Visualisation	2023
13	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMGT2551	Operations & Supply Chain Management	2023
14	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMGT2501	Statistics in Research	2023
15	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMKT2501	Advertising & Sales Promotion	2023

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Sl. No.	Programme Code	Name of Programme	Course Code	Course Name	Year
16	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMKT2502	International Marketing	2023
17	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DHRM2501	Organizational Development and Change	2023
18	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DHRM2502	Performance and Competency Management	2023
19	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DFIN2501	Principles of Investment Management	2023
20	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DFIN2502	Financial Services	2023
21	131509	Bachelor of Business Administration (Honors/ Honors with Research)	NMGT2537	SIP/Internship/ Project/ Dissertation/Field Visit	2023
22	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMGT2651	Business Policy & Strategic Management	2023
23	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMGT2601	Entrepreneurship Development	2023
24	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMKT2601	Consumer Behaviour	2023
25	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMKT2602	Retail Management	2023
26	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMKT2603	Distribution and Logistics Management	2023
27	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DHRM2601	Industrial Relations & Labour Codes	2023
28	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DHRM2602	Compensation & Reward Management	2023
29	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DHRM2603	HR Analytics	2023
30	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DFIN2601	Corporate Tax Planning	2023

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Sl. No.	Programme Code	Name of Programme	Course Code	Course Name	Year
31	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DFIN2602	Advanced Corporate Finance	2023
32	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DFIN2603	Corporate Financial Reporting & Analysis	2023
33	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMGT2701	Disruptive Management Practices	2023
34	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMGT2702	Artificial Intelligence in Management	2023
35	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMGT2703	Sustainability Management	2023
36	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMKT2701	Service Marketing	2023
37	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMKT2702	Digital Marketing	2023
38	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMKT2703	Direct Marketing	2023
39	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMKT2704	Marketing of Financial Services	2023
40	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DHRM2701	Strategic HRM	2023
41	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DHRM2702	Manpower Planning	2023
42	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DHRM2703	Recent Trends in HRM	2023
43	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DFIN2701	Financial Engineering	2023
44	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DFIN2702	Financial Modelling with MS Excel	2023
45	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DFIN2703	Financial Risk Management	2023

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Sl. No.	Programme Code	Name of Programme	Course Code	Course Name	Year
46	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMGT2739	Basics of Research Methodology, Ethics and Research Communication	2023
47	131509	Bachelor of Business Administration (Honors/ Honors with Research)	NMGT2737	SIP/Internship/ Project/ Dissertation/Field Visit	2023
48	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMGT2801	Strategic Leadership	2023
49	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMGT2802	Business Analytics	2023
50	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMKT2801	Marketing Research	2023
51	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMKT2802	Strategic Brand Management	2023
52	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMKT2803	Business at Bottom of Pyramid	2023
53	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMKT2804	Marketing of Non-Profit Organization	2023
54	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DHRM2801	Talent Management	2023
55	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DHRM2802	Global Human Resource Management	2023
56	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DHRM2803	Sustainable HRM	2023
57	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DFIN2801	Financial Market & Institutions	2023
58	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DFIN2802	Financial Statement Analysis	2023
59	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DFIN2803	Fintech- Technology Innovation in Financial Services	2023
60	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DFIN2804	Behavioural Finance	2023

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Sl. No.	Programme Code	Name of Programme	Course Code	Course Name	Year
61	131509	Bachelor of Business Administration (Honors/ Honors with Research)	NMGT2837	SIP/Internship/ Project/ Dissertation/Field Visit	2023
62	131509	Bachelor of Business Administration (Honors/ Honors with Research)	DMGT2839	Data Analysis & Visualisation using Software	2023
63	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMGT2151	Management Foundations	2023
64	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMGT2101	Financial and Corporate Accounting	2023
65	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMBF2101	Principles of Banking	2023
66	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMGT2251	Marketing Management	2023
67	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMGT2201	Cost and Management Accounting	2023
68	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMBF2201	Retail Banking	2023
69	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMGT2351	Organisational Behaviour & Human Resource Management	2023
70	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMBF2301	Money, Banking & Financial Services	2023
71	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	SMGT2301	Advanced Excel for Managers	2023

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Sl. No.	Programme Code	Name of Programme	Course Code	Course Name	Year
72	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	NMBF2335	Community Engagement Services	2023
73	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMGT2451	Financial Management	2023
74	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMGT2401	Legal Aspects of Business	2023
75	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMGT2402	Managerial Economics	2023
76	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	SMGT2401	Data Interpretations and Visualisation	2023
77	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMGT2551	Operations & Supply Chain Management	2023
78	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMGT2501	Statistics in Research	2023
79	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMBF2501	Principles of Investment Management	2023
80	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	NMBF2537	SIP/Internship/ Project/ Dissertation/Field Visit	2023
81	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMGT2651	Business Policy & Strategic Management	2023
82	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMBF2601	E- Banking	2023

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Sl. No.	Programme Code	Name of Programme	Course Code	Course Name	Year
83	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMBF2602	Advanced Corporate Finance	2023
84	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMBF2603	Corporate Tax Planning	2023
85	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMGT2701	Disruptive Management Practices	2023
86	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMGT2702	Artificial Intelligence in Management	2023
87	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMGT2703	Sustainability Management	2023
88	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMBF2701	Financial Engineering	2023
89	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMBF2739	Basics of Research Methodology, Ethics and Research Communication	2023
90	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	NMBF2737	SIP/Internship/ Project/ Dissertation/Field Visit	2023
91	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMGT2801	Strategic Leadership	2023
92	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMGT2802	Business Analytics	2023
93	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMBF2801	Financial Market & Institutions	2023

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Sl. No.	Programme Code	Name of Programme	Course Code	Course Name	Year
94	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMBF2802	General Banking Operations	2023
95	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	NMBF2837	SIP/Internship/ Project/ Dissertation/Field Visit	2023
96	131797	Bachelor of Business Administration-Banking & Finance (Honors/ Honors with Research)	DMBF2839	Data Analysis & Visualisation Using Software	2023
97	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DMGT2151	Management Foundations	2023
98	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DMGT2101	Financial and Corporate Accounting	2023
99	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DBUA2101	Introduction to Business Analytics	2023
100	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DBUA2102	Analytical Techniques for Decision Making	2023
101	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DMGT2251	Marketing Management	2023
102	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DMGT2201	Cost and Management Accounting	2023
103	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DBUA2201	Statistical Techniques in Research	2023
104	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DMGT2351	Organisational Behaviour & Human Resource Management	2023

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105	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DBUA2301	Advance Statistical Techniques	2023
106	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DBUA2302	Data Privacy and Data Security Laws	2023
107	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	SBUA2301	Natural Language Processing	2023
108	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	NBUA2335	Community Engagement Services	2023
109	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DMGT2451	Financial Management	2023
110	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DMGT2402	Managerial Economics	2023
111	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DBUA2401	Introduction to Advanced Excel	2023
112	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	SBUA2401	Big Data Analytics	2023
113	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DMGT2551	Operations & Supply Chain Management	2023
114	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DBUA2501	SQL & Datamining	2023
115	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DBUA2502	Programming for Business Analytics using R	2023

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116	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	NBUA2537	SIP/Internship/ Project/ Dissertation/Field Visit	2023
117	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DMGT2651	Business Policy & Strategic Management	2023
118	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DBUA2601	Introduction to Machine Learning & AI	2023
119	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DBUA2602	Programming for Business Analytics using Python	2023
120	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DBUA2603	Data Visualization-Tableau & Power BI	2023
121	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DMGT2701	Disruptive Management Practices	2023
122	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DMGT2702	Artificial Intelligence in Management	2023
123	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DMGT2703	Sustainability Management	2023
124	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DBUA2701	Text Analytics	2023
125	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DBUA2739	Basics of Research Methodology, Ethics and Research Communication	2023
126	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	NBUA2737	SIP/Internship/ Project/ Dissertation/Field Visit	2023

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127	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DMGT2801	Strategic Leadership	2023
128	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DBUA2801	Business Research Methods	2023
129	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DBUA2802	Econometrics	2023
130	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DBUA2803	Social Media Analysis	2023
131	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	NBUA2837	SIP/Internship/ Project/ Dissertation/Field Visit	2023
132	131796	Bachelor of Business Administration-Business Analytics (Honors/ Honors with Research)	DBUA2839	Data Analysis & Visualisation Using Software	2023
133	13019	Master of Business Administration	MGT4101	Management Process & Organizational Behavior	2023
134	13019	Master of Business Administration	MGT4102	Accounting for Management	2023
135	13019	Master of Business Administration	MGT4104	Marketing Management	2023
136	13019	Master of Business Administration	MGT4106	Quantitative Techniques in Management	2023
137	13019	Master of Business Administration	MGT4107	Legal Aspects of Business	2023
138	13019	Master of Business Administration	MGT4108	Human Resource Management	2023
139	13019	Master of Business Administration	MGT4109	Information Technology & E-Commerce	2023
140	13019	Master of Business Administration	MGT4201	Financial Management	2023
141	13019	Master of Business Administration	MGT4203	Business Research Methods	2023
142	13019	Master of Business Administration	MGT4204	International Business Environment & Practices	2023
143	13019	Master of Business Administration	MGT4205	Operations Management	2023
144	13019	Master of Business Administration	MGT4207	Management Science	2023
145	13019	Master of Business Administration	MGT4209	Economics for Management	2023
146	13019	Master of Business Administration	MGT4210	Business Analytics	2023
147	13019	Master of Business Administration	MGT4211	Excel for Managers	2023
148	13019	Master of Business Administration	FIN4201	Corporate Financial Reporting & Analysis	2023

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149	13019	Master of Business Administration	FIN4202	Financial Market & Institutions	2023
150	13019	Master of Business Administration	FIN4203	Financial Statement Analysis	2023
151	13019	Master of Business Administration	HRM4201	Measurement in Human Resource	2023
152	13019	Master of Business Administration	HRM4202	Talent Acquisition & Development	2023
153	13019	Master of Business Administration	HRM4203	Global Human Resource Management	2023
154	13019	Master of Business Administration	IBM4202	Growth Prospects of Thrust Areas of Indian Exports	2023
155	13019	Master of Business Administration	IBM4203	Principles of Global Business Management	2023
156	13019	Master of Business Administration	IBM4204	Global Human Resource Management	2023
157	13019	Master of Business Administration	IBM4205	International Commodity Management	2023
158	13019	Master of Business Administration	ITM4201	Fundamentals of Computers	2023
159	13019	Master of Business Administration	ITM4202	Management Information System	2023
160	13019	Master of Business Administration	ITM4203	Internet Fundamentals	2023
161	13019	Master of Business Administration	ITM4204	Web Design using HTML	2023
162	13019	Master of Business Administration	MKT4201	Marketing Research	2023
163	13019	Master of Business Administration	MKT4202	Marketing of Services	2023
164	13019	Master of Business Administration	MKT4203	Distribution & Logistics Management	2023
165	13019	Master of Business Administration	MKT4204	Strategic Brand Management	2023
166	13019	Master of Business Administration	ECM4201	E-Business Essentials	2023
167	13019	Master of Business Administration	ECM4202	Management Information System	2023
168	13019	Master of Business Administration	ECM4203	Internet Fundamentals	2023
169	13019	Master of Business Administration	ECM4204	Web Design using HTML	2023
170	13019	Master of Business Administration	MGT4301	Strategic Management	2023
171	13019	Master of Business Administration	MGT4335	Summer Internship Evaluation	2023
172	13019	Master of Business Administration	FIN4301	Advance Corporate Finance	2023
173	13019	Master of Business Administration	FIN4302	Business Valuation	2023
174	13019	Master of Business Administration	FIN4303	Corporate Restructuring	2023
175	13019	Master of Business Administration	FIN4304	International Financial Management	2023
176	13019	Master of Business Administration	FIN4305	Security Analysis & Portfolio Management	2023
177	13019	Master of Business Administration	FIN4306	Financial Modeling with MS-Excel	2023
178	13019	Master of Business Administration	FIN4307	Financial Risk Management	2023
179	13019	Master of Business Administration	FIN4308	Fixed Income Securities Analysis	2023
180	13019	Master of Business Administration	FIN4309	Management of Financial Services	2023
181	13019	Master of Business Administration	FIN4310	Project Planning Appraisal & Control	2023
182	13019	Master of Business Administration	HRM4301	Social & Industrial Psychology	2023
183	13019	Master of Business Administration	HRM4302	Industrial Relations	2023

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184	13019	Master of Business Administration	HRM4303	Organizational Change & Development	2023
185	13019	Master of Business Administration	HRM4304	Performance & Competency Management	2023
186	13019	Master of Business Administration	HRM4305	Training & Development	2023
187	13019	Master of Business Administration	HRM4306	Strategic Human Resource Management	2023
188	13019	Master of Business Administration	HRM4307	Collective Bargaining & Negotiation Process	2023
189	13019	Master of Business Administration	IBM4301	International Financial Management & Foreign Exchange Management	2023
190	13019	Master of Business Administration	IBM4302	Risk & Insurance in International Trade	2023
191	13019	Master of Business Administration	IBM4303	WTO and International Regulatory Environment	2023
192	13019	Master of Business Administration	IBM4304	Global Business Operations	2023
193	13019	Master of Business Administration	IBM4305	Foreign Trade Policy	2023
194	13019	Master of Business Administration	IBM4306	International Economics & Policy	2023
195	13019	Master of Business Administration	IBM4307	International Marketing	2023
196	13019	Master of Business Administration	ITM4301	Networking Fundamentals	2023
197	13019	Master of Business Administration	ITM4302	Database Management Systems	2023
198	13019	Master of Business Administration	ITM4303	Digital Marketing	2023
199	13019	Master of Business Administration	ITM4304	Introduction to Cloud Computing	2023
200	13019	Master of Business Administration	ITM4305	System Analysis & Design	2023
201	13019	Master of Business Administration	ITM4306	Dynamic Web Design & Development	2023
202	13019	Master of Business Administration	ITM4307	Cyber Security Systems	2023
203	13019	Master of Business Administration	ITM4308	Software Project Management	2023
204	13019	Master of Business Administration	MKT4301	Advertising & Sales Promotion	2023
205	13019	Master of Business Administration	MKT4302	Marketing of Financial Services	2023
206	13019	Master of Business Administration	MKT4303	Digital Marketing	2023
207	13019	Master of Business Administration	MKT4304	International Marketing	2023
208	13019	Master of Business Administration	MKT4305	Direct Marketing	2023
209	13019	Master of Business Administration	MKT4306	Retail Management	2023
210	13019	Master of Business Administration	MKT4307	Sales Management	2023
211	13019	Master of Business Administration	MKT4308	Consumer Behaviour	2023
212	13019	Master of Business Administration	ECM4301	Digital Marketing	2023
213	13019	Master of Business Administration	ECM4302	Database Management Systems	2023
214	13019	Master of Business Administration	ECM4303	Networking Fundamentals	2023
215	13019	Master of Business Administration	ECM4304	Software Development Methodologies	2023
216	13019	Master of Business Administration	ECM4305	Software Project Management	2023
217	13019	Master of Business Administration	ECM4306	Technology in Banking	2023

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218	13019	Master of Business Administration	ECM4307	Dynamic Web Design & Development	2023
219	13019	Master of Business Administration	ECM4308	System Analysis & Design	2023
220	13019	Master of Business Administration	ECM4309	Cyber Security Systems	2023
221	13019	Master of Business Administration	MGT4428	Total Quality Management	2023
222	13019	Master of Business Administration	MGT4429	Entrepreneurship Development	2023
223	13019	Master of Business Administration	MGT4437	Dissertation	2023
224	13019	Master of Business Administration	FIN4401	Financial Engineering	2023
225	13019	Master of Business Administration	FIN4402	Investment Banking	2023
226	13019	Master of Business Administration	FIN4403	Behavioural Finance	2023
227	13019	Master of Business Administration	FIN4404	Fintech-Technology Innovation in Financial Services	2023
228	13019	Master of Business Administration	FIN4405	Private Equity and Entrepreneurial Finance	2023
229	13019	Master of Business Administration	FIN4406	Corporate Tax Planning	2023
230	13019	Master of Business Administration	HRM4401	Compensation & Reward Management	2023
231	13019	Master of Business Administration	HRM4402	Psychological Testing	2023
232	13019	Master of Business Administration	HRM4403	Labour Legislations in India	2023
233	13019	Master of Business Administration	HRM4404	Dynamics of Leadership	2023
234	13019	Master of Business Administration	HRM4405	Organizational Design & Structural Processes	2023
235	13019	Master of Business Administration	HRM4406	Managerial Counselling	2023
236	13019	Master of Business Administration	IBM4401	Leveraging Information Technology in Global Business	2023
237	13019	Master of Business Administration	IBM4402	International Supply Chain Management	2023
238	13019	Master of Business Administration	IBM4403	International Trade Finance	2023
239	13019	Master of Business Administration	IBM4404	Global Sourcing & Business Development	2023
240	13019	Master of Business Administration	IBM4406	Cross Cultural Management & Management of Multinational Companies	2023
241	13019	Master of Business Administration	IBM4407	International Trade Procedures & Documentation	2023
242	13019	Master of Business Administration	ITM4401	Data Warehousing & Data Mining	2023
243	13019	Master of Business Administration	ITM4402	Leveraging IT in Global Business	2023
244	13019	Master of Business Administration	ITM4403	Marketing of IT Solutions	2023
245	13019	Master of Business Administration	ITM4404	Managerial Decision Support Systems	2023
246	13019	Master of Business Administration	ITM4405	Search Engine Optimization	2023
247	13019	Master of Business Administration	ITM4406	Tools for Business Intelligence	2023
248	13019	Master of Business Administration	MKT4401	Customer Relationship Management	2023
249	13019	Master of Business Administration	MKT4402	E-Supply Chain Management	2023

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250	13019	Master of Business Administration	MKT4403	Industrial Marketing	2023
251	13019	Master of Business Administration	MKT4404	Competitive Marketing	2023
252	13019	Master of Business Administration	MKT4405	Marketing of Non-Profit Organization	2023
253	13019	Master of Business Administration	MKT4406	Business at Bottom of Pyramid	2023
254	13019	Master of Business Administration	ECM4401	Social Media Analytics	2023
255	13019	Master of Business Administration	ECM4402	M-Commerce and Mobile App Development	2023
256	13019	Master of Business Administration	ECM4403	E-Customer Relationship Management	2023
257	13019	Master of Business Administration	ECM4404	Tools for Business Intelligence	2023
258	13019	Master of Business Administration	ECM4405	Advancements in Electronic Payment Systems	2023
259	13019	Master of Business Administration	ECM4406	Search Engine Optimization	2023
260	13019	Master of Business Administration	ECM4407	E-Supply Chain Management	2023
261	13502	Master of Business Administration (Banking & Finance)	MBF4101	Management Process & Organizational Behavior	2023
262	13502	Master of Business Administration (Banking & Finance)	MBF4102	Accounting for Management	2023
263	13502	Master of Business Administration (Banking & Finance)	MBF4104	Marketing Management	2023
264	13502	Master of Business Administration (Banking & Finance)	MBF4106	Quantitative Techniques in Management	2023
265	13502	Master of Business Administration (Banking & Finance)	MBF4107	Financial Environment	2023
266	13502	Master of Business Administration (Banking & Finance)	MBF4108	Human Resource Management	2023
267	13502	Master of Business Administration (Banking & Finance)	MBF4109	Information Technology & E-Commerce	2023
268	13502	Master of Business Administration (Banking & Finance)	MBF4201	Financial Management	2023
269	13502	Master of Business Administration (Banking & Finance)	MBF4203	Business Research Methods	2023
270	13502	Master of Business Administration (Banking & Finance)	MBF4204	International Business Environment & Practices	2023
271	13502	Master of Business Administration (Banking & Finance)	MBF4205	Operations Management	2023
272	13502	Master of Business Administration (Banking & Finance)	MBF4207	General Banking Operations	2023
273	13502	Master of Business Administration (Banking & Finance)	MBF4208	Legal & Regulatory Aspects of Banking	2023
274	13502	Master of Business Administration (Banking & Finance)	MBF4209	Economics for Management	2023
275	13502	Master of Business Administration (Banking & Finance)	MBF4210	Business Analytics	2023

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276	13502	Master of Business Administration (Banking & Finance)	MBF4211	Excel for Managers	2023
277	13502	Master of Business Administration (Banking & Finance)	MBF4301	Strategic Management	2023
278	13502	Master of Business Administration (Banking & Finance)	MBF4303	Technology in Banking	2023
279	13502	Master of Business Administration (Banking & Finance)	MBF4305	Retail Assets and Rural Banking	2023
280	13502	Master of Business Administration (Banking & Finance)	MBF4335	Summer Internship Evaluation	2023
281	13502	Master of Business Administration (Banking & Finance)	MBF4306	International Financial Management	2023
282	13502	Master of Business Administration (Banking & Finance)	MBF4307	Management of Financial Services	2023
283	13502	Master of Business Administration (Banking & Finance)	MBF4308	Security Analysis & Portfolio Management	2023
284	13502	Master of Business Administration (Banking & Finance)	MBF4309	Project Planning, Appraisal and Control	2023
285	13502	Master of Business Administration (Banking & Finance)	MBF4310	Advance Corporate Finance	2023
286	13502	Master of Business Administration (Banking & Finance)	MBF4311	Business Valuation	2023
287	13502	Master of Business Administration (Banking & Finance)	MBF4312	Corporate Restructuring	2023
288	13502	Master of Business Administration (Banking & Finance)	MBF4313	Financial Modeling using MS-Excel	2023
289	13502	Master of Business Administration (Banking & Finance)	MBF4314	Financial Risk Management	2023
290	13502	Master of Business Administration (Banking & Finance)	MBF4315	Fixed Income Securities Analysis	2023
291	13502	Master of Business Administration (Banking & Finance)	MBF4401	Bank Accounting & Audit	2023
292	13502	Master of Business Administration (Banking & Finance)	MBF4403	Risk Management in Banking	2023
293	13502	Master of Business Administration (Banking & Finance)	MBF4404	Customer Relationship Management in Banking	2023
294	13502	Master of Business Administration (Banking & Finance)	MBF4405	Treasury Banking	2023
295	13502	Master of Business Administration (Banking & Finance)	MBF4413	Entrepreneurship Development	2023
296	13502	Master of Business Administration (Banking & Finance)	MBF4437	Dissertation	2023
297	13502	Master of Business Administration (Banking & Finance)	MBF4406	Financial Engineering	2023

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298	13502	Master of Business Administration (Banking & Finance)	MBF4408	Corporate Tax Planning	2023
299	13502	Master of Business Administration (Banking & Finance)	MBF4409	Investment Banking	2023
300	13502	Master of Business Administration (Banking & Finance)	MBF4410	Behavioural Finance	2023
301	13502	Master of Business Administration (Banking & Finance)	MBF4411	Fintech-Technology Innovation in Financial Services	2023
302	13502	Master of Business Administration (Banking & Finance)	MBF4412	Private Equity & Entrepreneurial Finance	2023
303	13622	Master of Business Administration (Executive for Working Professionals)	MWP4101	Marketing Management	2023
304	13622	Master of Business Administration (Executive for Working Professionals)	MWP4105	Accounting for Managers	2023
305	13622	Master of Business Administration (Executive for Working Professionals)	MWP4106	Business Statistics	2023
306	13622	Master of Business Administration (Executive for Working Professionals)	MWP4107	Economics for Managers	2023
307	13622	Master of Business Administration (Executive for Working Professionals)	MWP4108	Organizational Behaviour and Human Resource Management	2023
308	13622	Master of Business Administration (Executive for Working Professionals)	MWP4109	Information Technology for Managers	2023
309	13622	Master of Business Administration (Executive for Working Professionals)	MWP4133	Workshop	2023
310	13622	Master of Business Administration (Executive for Working Professionals)	MWP4204	Research Methodology & Report Preparation	2023
311	13622	Master of Business Administration (Executive for Working Professionals)	MWP4205	Fundamentals of Data Analytics	2023
312	13622	Master of Business Administration (Executive for Working Professionals)	MWP4206	Business Environment	2023
313	13622	Master of Business Administration (Executive for Working Professionals)	MWP4207	Financial Management	2023

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314	13622	Master of Business Administration (Executive for Working Professionals)	MWP4208	Operations and Supply Chain Management	2023
315	13622	Master of Business Administration (Executive for Working Professionals)	MWP4231	Term Paper	2023
316	13622	Master of Business Administration (Executive for Working Professionals)	MWP4233	Workshop	2023
317	13622	Master of Business Administration (Executive for Working Professionals)	MWP4209	MOOC Course	2023
318	13622	Master of Business Administration (Executive for Working Professionals)	MWP4302	Strategic Management	2023
319	13622	Master of Business Administration (Executive for Working Professionals)	MWP4311	Innovation and Entrepreneurship	2023
320	13622	Master of Business Administration (Executive for Working Professionals)	MWP4337	Project-I	2023
321	13622	Master of Business Administration (Executive for Working Professionals)	MWP4304	Marketing of Services	2023
322	13622	Master of Business Administration (Executive for Working Professionals)	MWP4312	Sales and Distribution Management	2023
323	13622	Master of Business Administration (Executive for Working Professionals)	MWP4313	Consumer Behaviour	2023
324	13622	Master of Business Administration (Executive for Working Professionals)	MWP4314	Advertising Management and Sales Promotion	2023
325	13622	Master of Business Administration (Executive for Working Professionals)	MWP4305	Mergers, Acquisitions & Re-Structuring	2023
326	13622	Master of Business Administration (Executive for Working Professionals)	MWP4315	Management of Banks and Financial Institutions	2023
327	13622	Master of Business Administration (Executive for Working Professionals)	MWP4316	Security Analysis and Portfolio Management	2023
328	13622	Master of Business Administration (Executive for Working Professionals)	MWP4317	Corporate Valuation	2023

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329	13622	Master of Business Administration (Executive for Working Professionals)	MWP4318	Compensation and Reward Management	2023
330	13622	Master of Business Administration (Executive for Working Professionals)	MWP4319	Learning and Development	2023
331	13622	Master of Business Administration (Executive for Working Professionals)	MWP4320	Organizational Development & Change	2023
332	13622	Master of Business Administration (Executive for Working Professionals)	MWP4321	Performance Management System	2023
333	13622	Master of Business Administration (Executive for Working Professionals)	MWP4322	Database Management System for Business	2023
334	13622	Master of Business Administration (Executive for Working Professionals)	MWP4323	E-Commerce Fundamentals	2023
335	13622	Master of Business Administration (Executive for Working Professionals)	MWP4324	System Analysis & Design	2023
336	13622	Master of Business Administration (Executive for Working Professionals)	MWP4325	Dynamic Web Design & Development	2023
337	13622	Master of Business Administration (Executive for Working Professionals)	MWP4326	Programming for Analytics using R	2023
338	13622	Master of Business Administration (Executive for Working Professionals)	MWP4327	Programming for Analytics using Python	2023
339	13622	Master of Business Administration (Executive for Working Professionals)	MWP4328	Visual Analytics Tableau/ Power BI	2023
340	13622	Master of Business Administration (Executive for Working Professionals)	MWP4329	Econometrics	2023
341	13622	Master of Business Administration (Executive for Working Professionals)	MWP4411	Environmental Governance and Sustainability	2023
342	13622	Master of Business Administration (Executive for Working Professionals)	MWP4412	E-Business Essentials	2023
343	13622	Master of Business Administration (Executive for Working Professionals)	MWP4437	Project-II	2023

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344	13622	Master of Business Administration (Executive for Working Professionals)	MWP4413	Retail Management	2023
345	13622	Master of Business Administration (Executive for Working Professionals)	MWP4414	Digital Marketing	2023
346	13622	Master of Business Administration (Executive for Working Professionals)	MWP4415	Strategic Brand Management	2023
347	13622	Master of Business Administration (Executive for Working Professionals)	MWP4416	Customer Relationship Management	2023
348	13622	Master of Business Administration (Executive for Working Professionals)	MWP4417	Fintech	2023
349	13622	Master of Business Administration (Executive for Working Professionals)	MWP4406	Strategic Financial Management	2023
350	13622	Master of Business Administration (Executive for Working Professionals)	MWP4418	International Finance	2023
351	13622	Master of Business Administration (Executive for Working Professionals)	MWP4419	Private Equity and Entrepreneurial Finance	2023
352	13622	Master of Business Administration (Executive for Working Professionals)	MWP4420	International Human Resource Management	2023
353	13622	Master of Business Administration (Executive for Working Professionals)	MWP4421	Leadership Development	2023
354	13622	Master of Business Administration (Executive for Working Professionals)	MWP4422	Strategic Human Resource Management	2023
355	13622	Master of Business Administration (Executive for Working Professionals)	MWP4423	Talent Management and Succession Planning	2023
356	13622	Master of Business Administration (Executive for Working Professionals)	MWP4424	Data Warehousing & Data Mining	2023
357	13622	Master of Business Administration (Executive for Working Professionals)	MWP4425	ERP for Businesses	2023
358	13622	Master of Business Administration (Executive for Working Professionals)	MWP4426	Digital Marketing	2023

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359	13622	Master of Business Administration (Executive for Working Professionals)	MWP4427	E-Supply Chain Management	2023
360	13622	Master of Business Administration (Executive for Working Professionals)	MWP4428	Predictive Analytics-I Machine Learning using R	2023
361	13622	Master of Business Administration (Executive for Working Professionals)	MWP4429	Predictive Analytics-II Machine Learning using Python	2023
362	13622	Master of Business Administration (Executive for Working Professionals)	MWP4441	Big Data Analytics Hadoop	2023
363	13622	Master of Business Administration (Executive for Working Professionals)	MWP4442	Data Mining	2023
364	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4101	Hospital Organization and Management Process	2023
365	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4102	Accounting for Management	2023
366	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4103	Marketing Management	2023
367	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4104	Biostatistics	2023
368	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4105	Medical Terminology & Medical Records	2023
369	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4106	Essentials of Healthcare Systems	2023
370	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4108	Human Resource Management	2023
371	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4109	Information Technology and E-Commerce	2023
372	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4201	Financial Management	2023
373	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4203	Research Methodology	2023

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374	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4204	Health Economics	2023
375	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4205	Hospital Planning	2023
376	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4206	Hospital Materials Management	2023
377	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4207	International Business Environment & Practices	2023
378	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4208	Epidemiology	2023
379	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4209	Excel for Managers	2023
380	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4231	Term Paper	2023
381	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4302	Medical & Health Laws	2023
382	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4303	Management of Clinical Services	2023
383	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4304	Strategic Management	2023
384	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4305	Operations Research	2023
385	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4307	Quality Management in Hospitals	2023
386	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4308	Management of Support & Utility Services	2023
387	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4335	Summer Internship Evaluation	2023
388	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4401	Hospital Management Information System	2023

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389	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4402	Health Insurance and Medical Tourism	2023
390	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4406	Entrepreneurship and Consultancy in Healthcare	2023
391	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4407	Hospital Service Marketing	2023
392	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4408	Disaster Management	2023
393	13395	Master of Business Administration (Hospital & Healthcare Management)	HHM4437	Dissertation	2023
394	131108	Master of Business Administration (Business Analytics)	BUA4101	Management Process and Organizational Behaviour	2023
395	131108	Master of Business Administration (Business Analytics)	BUA4102	Accounting for Management	2023
396	131108	Master of Business Administration (Business Analytics)	BUA4103	Marketing Management	2023
397	131108	Master of Business Administration (Business Analytics)	BUA4104	Statistical Techniques	2023
398	131108	Master of Business Administration (Business Analytics)	BUA4105	Excel for Decision Making	2023
399	131108	Master of Business Administration (Business Analytics)	BUA4106	Optimization Techniques	2023
400	131108	Master of Business Administration (Business Analytics)	BUA4107	Database Management System	2023
401	131108	Master of Business Administration (Business Analytics)	BUA4108	Human Resource Management	2023
402	131108	Master of Business Administration (Business Analytics)	BUA4201	Financial Management	2023
403	131108	Master of Business Administration (Business Analytics)	BUA4202	Operations and Supply Chain Management	2023
404	131108	Master of Business Administration (Business Analytics)	BUA4203	Econometrics	2023
405	131108	Master of Business Administration (Business Analytics)	BUA4204	Business Research Methods	2023
406	131108	Master of Business Administration (Business Analytics)	BUA4205	Economics for Management	2023
407	131108	Master of Business Administration (Business Analytics)	BUA4206	Programming for Analytics using R	2023
408	131108	Master of Business Administration (Business Analytics)	BUA4207	Programming for Analytics using Python	2023

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409	131108	Master of Business Administration (Business Analytics)	BUA4208	Consumer Behaviour	2023
410	131108	Master of Business Administration (Business Analytics)	BUA4301	Strategic Management	2023
411	131108	Master of Business Administration (Business Analytics)	BUA4302	Datamining	2023
412	131108	Master of Business Administration (Business Analytics)	BUA4303	Predictive Analytics-I Machine Learning using R	2023
413	131108	Master of Business Administration (Business Analytics)	BUA4304	Predictive Analytics-II Machine Learning using Python	2023
414	131108	Master of Business Administration (Business Analytics)	BUA4305	Big Data Analytics- Hadoop	2023
415	131108	Master of Business Administration (Business Analytics)	BUA4306	Financial Decision Analysis	2023
416	131108	Master of Business Administration (Business Analytics)	BUA4307	Visual Analytics- Tablue/ Power BI	2023
417	131108	Master of Business Administration (Business Analytics)	BUA4335	Summer Internship Evaluation	2023
418	131108	Master of Business Administration (Business Analytics)	BUA4401	Total Quality Management	2023
419	131108	Master of Business Administration (Business Analytics)	BUA4402	Financial Analytics	2023
420	131108	Master of Business Administration (Business Analytics)	BUA4403	Supply Chain Analytics	2023
421	131108	Master of Business Administration (Business Analytics)	BUA4404	HR Analytics	2023
422	131108	Master of Business Administration (Business Analytics)	BUA4405	Marketing Analytics	2023
423	131108	Master of Business Administration (Business Analytics)	BUA4406	Data Privacy and Data Security Laws	2023
424	131108	Master of Business Administration (Business Analytics)	BUA4437	Dissertation (Analytics Project)	2023
425	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4101	Sustainable Marketing Concepts	2023
426	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4102	Accounting for Managers	2023
427	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4103	Business Statistics	2023
428	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4104	Economics for Managers	2023

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429	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4105	Organizational Behaviour and Human Resource Management	2023
430	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4106	Application of Disruptive Technologies in Business	2023
431	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4133	Workshop	2023
432	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4201	Fundamentals of Data Analytics	2023
433	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4202	Sustainable Development & Sustainability	2023
434	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4203	Financial Management	2023
435	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4204	Operations and Supply Chain Management	2023
436	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4205	Research Methodology & Report Preparation	2023
437	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4231	Term Paper	2023
438	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4233	Workshop	2023
439	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4206	MOOC Course	2023
440	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4301	Strategic Management	2023
441	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4302	Social Entrepreneurship	2023
442	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4337	Project-I	2023
443	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4303	Sustainable Development & Climate Change	2023

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444	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4304	Sustainability: Measurement & Reporting	2023
445	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4305	Human Dimensions of Sustainability	2023
446	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4306	Business Certification for Sustainability	2023
447	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4401	Environmental Governance and Sustainability	2023
448	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4402	E-Business Essentials	2023
449	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4437	Project-II	2023
450	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4403	Sustainable Enterprise & Leadership	2023
451	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4404	Creativity and Innovation in Designing Sustainable Solutions	2023
452	131577	Executive - Master of Business Administration (Sustainability Management)	MSP4405	Green Marketing & Environmental Product Design	2023
453	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	DECO2151	Micro Economics	2023
454	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	DECO2101	Mathematical Methods for Economics	2023
455	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	DECO2251	Statistical Methods in Economics	2023
456	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	DECO2201	Indian Economy	2023
457	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	DECO2351	Macroeconomics	2023
458	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	DECO2301	Agricultural Economics	2023
459	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	SMGT2301	Advanced Excel for Managers	2023
460	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	NECO2335	Community Engagement Services	2023
461	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	DECO2451	Public Finance	2023

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462	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	DECO2401	Research Methodology	2023
463	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	DECO2402	Banking & Financial Institutions	2023
464	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	SMGT2401	Data Interpretation & Visualisation	2023
465	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	DECO2551	International Economics	2023
466	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	DECO2501	Advanced Statistical Methods in Economics	2023
467	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	DECO2502	History of Economic Thought	2023
468	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	NECO2537	SIP/Internship/ Project/ Dissertation/Field Visit	2023
469	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	DECO2651	Economics of Growth & Development	2023
470	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	DECO2601	Monetary Economics	2023
471	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	DECO2602	Econometrics- Basic Theory & Application	2023
472	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	DECO2603	Industrial Economics	2023
473	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	DECO2701	Advanced Microeconomics Theory & Applications	2023
474	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	DECO2702	Advanced Macroeconomics Theory & Applications	2023
475	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	DECO2703	Environment, Sustainability & Resource Economics	2023
476	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	DECO2704	Urban Economics	2023
477	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	DECO2739	Basics of Research Methodology, Ethics and Research Communication	2023
478	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	NECO2737	SIP/Internship/ Project/ Dissertation/Field Visit	2023
479	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	DECO2801	Advanced Econometrics	2023
480	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	DECO2802	Data Analysis Using Statistical Software	2023
481	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	DECO2803	Financial Economics	2023
482	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	DECO2804	Health and Gender Economics	2023
483	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	NECO2837	SIP/Internship/ Project/ Dissertation/Field Visit	2023

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484	131514	Bachelor of Arts (Honors/ Honors with Research) in Economics	DECO2839	Data Analysis & Visualisation using Software	2023
485	13301	Master of Arts (Economics)	ECO4101	Micro Economic Theory & Application	2023
486	13301	Master of Arts (Economics)	ECO4102	Macro Economic Theory & Application	2023
487	13301	Master of Arts (Economics)	ECO4103	Computer Application in Economic Analysis	2023
488	13301	Master of Arts (Economics)	ECO4104	Mathematics for Economics	2023
489	13301	Master of Arts (Economics)	ECO4105	Indian Economy-Issues & Policy	2023
490	13301	Master of Arts (Economics)	ECO4201	Statistics for Economics	2023
491	13301	Master of Arts (Economics)	ECO4202	Mathematical Economics	2023
492	13301	Master of Arts (Economics)	ECO4203	Public Finance in India	2023
493	13301	Master of Arts (Economics)	ECO4204	Advanced Micro Economic Theory & Application	2023
494	13301	Master of Arts (Economics)	ECO4205	Advanced Macro Economic Theory & Application	2023
495	13301	Master of Arts (Economics)	ECO4206	Economics of Growth & Development	2023
496	13301	Master of Arts (Economics)	ECO4231	Term Paper/Review of Dissertation-I	2023
497	13301	Master of Arts (Economics)	ECO4301	Fundamentals of Econometrics	2023
498	13301	Master of Arts (Economics)	ECO4302	Money & Financial Markets	2023
499	13301	Master of Arts (Economics)	ECO4303	Research Methods in Economics	2023
500	13301	Master of Arts (Economics)	ECO4331	Term Paper/Review of Dissertation-II	2023
501	13301	Master of Arts (Economics)	ECO4335	Summer Internship Evaluation	2023
502	13301	Master of Arts (Economics)	ECO4304	Industrial Economics	2023
503	13301	Master of Arts (Economics)	ECO4305	Agricultural Economics of India: Incentives & Decision Making	2023
504	13301	Master of Arts (Economics)	ECO4306	Economic Development & Policy in India	2023
505	13301	Master of Arts (Economics)	ECO4307	Labour Economics	2023
506	13301	Master of Arts (Economics)	ECO4308	Public Financial Administration	2023
507	13301	Master of Arts (Economics)	ECO4309	Environmental Economics	2023
508	13301	Master of Arts (Economics)	ECO4401	Advanced Econometrics	2023
509	13301	Master of Arts (Economics)	ECO4402	Monetary Economics	2023
510	13301	Master of Arts (Economics)	ECO4403	International Economics	2023
511	13301	Master of Arts (Economics)	ECO4437	Dissertation	2023
512	13301	Master of Arts (Economics)	ECO4404	Entrepreneurship & Small Scale Business	2023
513	13301	Master of Arts (Economics)	ECO4405	Indian Agriculture-Markets, Institutions & Technology	2023
514	13301	Master of Arts (Economics)	ECO4406	Comparative Economic Development	2023

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515	13301	Master of Arts (Economics)	ECO4407	Urban Economics	2023
516	13301	Master of Arts (Economics)	ECO4408	Applied Welfare Economics	2023
517	13301	Master of Arts (Economics)	ECO4409	Resource Economics	2023
518	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2151	Financial Accounting-I	2023
519	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2101	Micro Economics Theory and Applications	2023
520	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2251	Financial Accounting-II	2023
521	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2201	Business and Economic Laws	2023
522	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2351	Corporate Accounting	2023
523	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2301	Human Resource Management	2023
524	131543	Bachelor of Commerce (Honors/ Honors with Research)	SMGT2301	Advanced Excel for Managers	2023
525	131543	Bachelor of Commerce (Honors/ Honors with Research)	NCOM2335	Community Engagement Services	2023
526	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2451	Financial Management	2023
527	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2401	Income Tax Law and Practice	2023
528	131543	Bachelor of Commerce (Honors/ Honors with Research)	SMGT2401	Data Interpretation and Visualisation	2023
529	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2551	Cost Accounting	2023
530	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2501	Auditing	2023
531	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2502	Principles of Marketing	2023
532	131543	Bachelor of Commerce (Honors/ Honors with Research)	NCOM2537	SIP/Internship/ Project/ Dissertation/Field Visit	2023
533	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2651	Management Accounting	2023
534	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2601	Corporate Tax Planning	2023
535	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2602	Macro Economics	2023
536	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2603	International Business	2023
537	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2701	Business Mathematics	2023
538	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2702	Strategic Management	2023

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539	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2703	Merger and Acquisitions	2023
540	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2704	Advance Accounting	2023
541	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2705	Business Taxation	2023
542	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2706	Corporate Tax Law & Practice	2023
543	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2739	Basics of Research Methodology, Ethics and Research Communication	2023
544	131543	Bachelor of Commerce (Honors/ Honors with Research)	NCOM2737	SIP/Internship/ Project/ Dissertation/Field Visit	2023
545	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2801	Statistical Methods in Research	2023
546	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2802	Entrepreneurship Development	2023
547	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2803	Advanced Cost Accounting	2023
548	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2804	Recent Trends in Accounting	2023
549	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2805	Indirect Taxes with GST	2023
550	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2806	Public Finance & Tax Practices	2023
551	131543	Bachelor of Commerce (Honors/ Honors with Research)	NCOM2837	SIP/Internship/ Project/ Dissertation/Field Visit	2023
552	131543	Bachelor of Commerce (Honors/ Honors with Research)	DCOM2839	Data Analysis & Visualisation using Software	2023
553	13576	Master of Commerce	COM4101	Organization Theory & Behaviour	2023
554	13576	Master of Commerce	COM4102	Quantitative Techniques for Business Decisions	2023
555	13576	Master of Commerce	COM4103	Economic Analysis for Business	2023
556	13576	Master of Commerce	COM4104	Financial Management & Policy	2023
557	13576	Master of Commerce	COM4105	Auditing	2023
558	13576	Master of Commerce	COM4106	Computer Applications in Business	2023
559	13576	Master of Commerce	COM4201	Managerial Accounting	2023
560	13576	Master of Commerce	COM4202	Business Environment	2023
561	13576	Master of Commerce	COM4203	Corporate Accounting	2023
562	13576	Master of Commerce	COM4204	Marketing Management	2023
563	13576	Master of Commerce	COM4205	E-Commerce	2023
564	13576	Master of Commerce	COM4206	Human Resource Management	2023
565	13576	Master of Commerce	COM4301	Corporate Law	2023
566	13576	Master of Commerce	COM4302	Cost Accounting	2023

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567	13576	Master of Commerce	COM4303	Advance Business Statistics & Research Methodology	2023
568	13576	Master of Commerce	COM4304	Income Tax Law & Practice	2023
569	13576	Master of Commerce	COM4335	Summer Internship Evaluation	2023
570	13576	Master of Commerce	COM4305	Tax Planning & Tax Management	2023
571	13576	Master of Commerce	COM4306	Management Control and Information System	2023
572	13576	Master of Commerce	COM4307	Financial Market and Institutions	2023
573	13576	Master of Commerce	COM4308	Project Management &Financial Services	2023
574	13576	Master of Commerce	COM4309	International Marketing	2023
575	13576	Master of Commerce	COM4310	Advertising and Sales Management	2023
576	13576	Master of Commerce	COM4311	Human Resource Development	2023
577	13576	Master of Commerce	COM4312	Industrial Relations	2023
578	13576	Master of Commerce	COM4401	International Business	2023
579	13576	Master of Commerce	COM4402	Corporate Tax Planning	2023
580	13576	Master of Commerce	COM4403	Strategic Management	2023
581	13576	Master of Commerce	COM4404	Industrial Law	2023
582	13576	Master of Commerce	COM4437	Dissertation	2023
583	13576	Master of Commerce	COM4405	International Accounting	2023
584	13576	Master of Commerce	COM4406	Principles & Practice of Taxation & Indian Tax System	2023
585	13576	Master of Commerce	COM4407	Security Analysis & Portfolio Management	2023
586	13576	Master of Commerce	COM4408	International Financial Management	2023
587	13576	Master of Commerce	COM4409	Marketing Research	2023
588	13576	Master of Commerce	COM4410	Consumer Behaviour	2023
589	13576	Master of Commerce	COM4411	Training and Development	2023
590	13576	Master of Commerce	COM4412	Management of Transformation	2023
591	13289	Bachelor of Hotel Management	HMC2101	Food Production Foundation-I	2023
592	13289	Bachelor of Hotel Management	HMC2102	Food & Beverage Service Foundation-I	2023
593	13289	Bachelor of Hotel Management	HMC2103	Front Office Foundation	2023
594	13289	Bachelor of Hotel Management	HMC2104	Housekeeping Foundation	2023
595	13289	Bachelor of Hotel Management	HMC2105	Application of Computers	2023
596	13289	Bachelor of Hotel Management	HMC2106	Food Production Foundation Lab-I	2023
597	13289	Bachelor of Hotel Management	HMC2107	Food & Beverage Service Foundation Lab-I	2023
598	13289	Bachelor of Hotel Management	HMC2108	Front Office Foundation Lab	2023
599	13289	Bachelor of Hotel Management	HMC2109	Housekeeping Foundation Lab	2023
600	13289	Bachelor of Hotel Management	HMC2110	Application of Computers Lab	2023
601	13289	Bachelor of Hotel Management	HMC2111	Field Work Project-I	2023
602	13289	Bachelor of Hotel Management	HMC2201	Food Production Foundation-II	2023

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603	13289	Bachelor of Hotel Management	HMC2202	Food & Beverage Service Foundation-II	2023
604	13289	Bachelor of Hotel Management	HMC2203	Front Office Operation-I	2023
605	13289	Bachelor of Hotel Management	HMC2204	Housekeeping Operation-I	2023
606	13289	Bachelor of Hotel Management	HMC2205	Food Science & Nutrition	2023
607	13289	Bachelor of Hotel Management	HMC2206	Fundamentals of Accounting-I	2023
608	13289	Bachelor of Hotel Management	HMC2207	Food Production Foundation Lab-II	2023
609	13289	Bachelor of Hotel Management	HMC2208	Food & Beverage Service Foundation Lab-II	2023
610	13289	Bachelor of Hotel Management	HMC2209	Front Office Operation Lab-I	2023
611	13289	Bachelor of Hotel Management	HMC2210	Housekeeping Operation Lab-I	2023
612	13289	Bachelor of Hotel Management	HMC2211	Field Work Project-II	2023
613	13289	Bachelor of Hotel Management	HMC2301	Food Production Operations-I	2023
614	13289	Bachelor of Hotel Management	HMC2302	Food & Beverage Service Operations-I	2023
615	13289	Bachelor of Hotel Management	HMC2303	Front Office Operation-II	2023
616	13289	Bachelor of Hotel Management	HMC2304	Housekeeping Operation-II	2023
617	13289	Bachelor of Hotel Management	HMC2305	Food Safety & Hygiene	2023
618	13289	Bachelor of Hotel Management	HMC2306	Fundamentals of Accounting-II	2023
619	13289	Bachelor of Hotel Management	HMC2307	Hotel Engineering	2023
620	13289	Bachelor of Hotel Management	HMC2308	Food Production Operations Lab-I	2023
621	13289	Bachelor of Hotel Management	HMC2309	Food & Beverage Service Operations Lab-I	2023
622	13289	Bachelor of Hotel Management	HMC2310	Front Office Operation Lab-II	2023
623	13289	Bachelor of Hotel Management	HMC2311	Housekeeping Operation Lab-II	2023
624	13289	Bachelor of Hotel Management	HMC2401	Food Production Operations-II	2023
625	13289	Bachelor of Hotel Management	HMC2402	Food & Beverage Service Operations-II	2023
626	13289	Bachelor of Hotel Management	HMC2403	Front Office Management-I	2023
627	13289	Bachelor of Hotel Management	HMC2404	Housekeeping Management-I	2023
628	13289	Bachelor of Hotel Management	HMC2405	Hotel Information System	2023
629	13289	Bachelor of Hotel Management	HMC2406	Principles of Management	2023
630	13289	Bachelor of Hotel Management	HMC2407	Economics of Hospitality	2023
631	13289	Bachelor of Hotel Management	HMC2408	Food Production Operations Lab-II	2023
632	13289	Bachelor of Hotel Management	HMC2409	Food & Beverage Service Operations Lab-II	2023
633	13289	Bachelor of Hotel Management	HMC2410	Front Office Management Lab	2023
634	13289	Bachelor of Hotel Management	HMC2411	Housekeeping Management Lab	2023
635	13289	Bachelor of Hotel Management	HMC2501	Food Production Training Report	2023
636	13289	Bachelor of Hotel Management	HMC2502	Food & Beverage Service Training Report	2023
637	13289	Bachelor of Hotel Management	HMC2503	Front Office Management Training Report	2023
638	13289	Bachelor of Hotel Management	HMC2504	Housekeeping Management Training Report	2023

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639	13289	Bachelor of Hotel Management	HMC2601	Advanced Food Production Operations-I	2023
640	13289	Bachelor of Hotel Management	HMC2602	Advanced Food & Beverage Service Operations-I	2023
641	13289	Bachelor of Hotel Management	HMC2603	Front Office Management-II	2023
642	13289	Bachelor of Hotel Management	HMC2604	Housekeeping Management-II	2023
643	13289	Bachelor of Hotel Management	HMC2605	Introduction to Tourism	2023
644	13289	Bachelor of Hotel Management	HMC2606	Hospitality Marketing	2023
645	13289	Bachelor of Hotel Management	HMC2607	Managerial Accounting	2023
646	13289	Bachelor of Hotel Management	HMC2608	Advanced Food Production Operations Lab-I	2023
647	13289	Bachelor of Hotel Management	HMC2609	Advanced Food & Beverage Service Operations Lab-I	2023
648	13289	Bachelor of Hotel Management	HMC2610	Front Office Management Lab-II	2023
649	13289	Bachelor of Hotel Management	HMC2611	Housekeeping Management Lab-II	2023
650	13289	Bachelor of Hotel Management	HMC2701	Advanced Food Production-II	2023
651	13289	Bachelor of Hotel Management	HMC2702	Advanced Food & Beverage Service –II	2023
652	13289	Bachelor of Hotel Management	HMC2703	Advanced Front Office Management	2023
653	13289	Bachelor of Hotel Management	HMC2704	Accommodation Management	2023
654	13289	Bachelor of Hotel Management	HMC2705	Facility Management, Planning & Design	2023
655	13289	Bachelor of Hotel Management	HMC2706	Hospitality Law	2023
656	13289	Bachelor of Hotel Management	HMC2707	Human Resource Management	2023
657	13289	Bachelor of Hotel Management	HMC2708	Entrepreneurship Development	2023
658	13289	Bachelor of Hotel Management	HMC2709	Event Management	2023
659	13289	Bachelor of Hotel Management	HMC2710	Advanced Food Production Operations Lab-II	2023
660	13289	Bachelor of Hotel Management	HMC2711	Advanced Food & Beverage Service Operations Lab-II	2023
661	13289	Bachelor of Hotel Management	HMC2801	Basics of Revenue Management	2023
662	13289	Bachelor of Hotel Management	HMC2802	Indian Heritage	2023
663	13289	Bachelor of Hotel Management	HMC2803	Research Methodology	2023
664	13289	Bachelor of Hotel Management	HMC2804	Specialization Course Lab	2023
665	13289	Bachelor of Hotel Management	HMC2805	GDPI Sessions	2023
666	13289	Bachelor of Hotel Management	HMC2837	Research Project	2023
667	13816	Bachelor of Tourism & Travel Management	TRM2101	Basics of Tourism Management	2023
668	13816	Bachelor of Tourism & Travel Management	TRM2102	Indian Geography of Tourism	2023
669	13816	Bachelor of Tourism & Travel Management	TRM2103	Cultural Tourism of India	2023
670	13816	Bachelor of Tourism & Travel Management	TRM2104	Natural Tourism Products of India	2023

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671	13816	Bachelor of Tourism & Travel Management	TRM2105	Religious Tourism-I	2023
672	13816	Bachelor of Tourism & Travel Management	TRM2106	Application of Computers	2023
673	13816	Bachelor of Tourism & Travel Management	TRM2107	Application of Computers Lab	2023
674	13816	Bachelor of Tourism & Travel Management	TRM2108	Field Work Project-I	2023
675	13816	Bachelor of Tourism & Travel Management	TRM2201	Travel Agency and Tour Operator	2023
676	13816	Bachelor of Tourism & Travel Management	TRM2202	World Geography of Tourism	2023
677	13816	Bachelor of Tourism & Travel Management	TRM2203	Religious Tourism-II	2023
678	13816	Bachelor of Tourism & Travel Management	TRM2204	International Tourism Business	2023
679	13816	Bachelor of Tourism & Travel Management	TRM2205	Tourism Organizations	2023
680	13816	Bachelor of Tourism & Travel Management	TRM2206	Historical Tourism Products of India	2023
681	13816	Bachelor of Tourism & Travel Management	TRM2207	Fundamentals of Accounting-I	2023
682	13816	Bachelor of Tourism & Travel Management	TRM2208	Field Work Project-II	2023
683	13816	Bachelor of Tourism & Travel Management	TRM2301	Tourism Trends in India	2023
684	13816	Bachelor of Tourism & Travel Management	TRM2302	Transport Management	2023
685	13816	Bachelor of Tourism & Travel Management	TRM2303	Hospitality Management in Tourism	2023
686	13816	Bachelor of Tourism & Travel Management	TRM2304	Travel Documentation	2023
687	13816	Bachelor of Tourism & Travel Management	TRM2305	Tour Packaging Management	2023
688	13816	Bachelor of Tourism & Travel Management	TRM2306	Automation in Travel and Tourism	2023
689	13816	Bachelor of Tourism & Travel Management	TRM2307	Fundamentals of Accounting-II	2023
690	13816	Bachelor of Tourism & Travel Management	TRM2401	Tourism Planning & Policy	2023
691	13816	Bachelor of Tourism & Travel Management	TRM2402	Cargo Management	2023
692	13816	Bachelor of Tourism & Travel Management	TRM2403	Itinerary Designing Management	2023

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693	13816	Bachelor of Tourism & Travel Management	TRM2404	Airline Operation Management	2023
694	13816	Bachelor of Tourism & Travel Management	TRM2405	Management Information System	2023
695	13816	Bachelor of Tourism & Travel Management	TRM2406	Principles of Management	2023
696	13816	Bachelor of Tourism & Travel Management	TRM2407	Economics of Tourism	2023
697	13816	Bachelor of Tourism & Travel Management	TRM2535	Industrial Training Project & Practicum	2023
698	13816	Bachelor of Tourism & Travel Management	TRM2601	Eco-Tourism & Sustainable Tourism	2023
699	13816	Bachelor of Tourism & Travel Management	TRM2602	Tourist Behaviour	2023
700	13816	Bachelor of Tourism & Travel Management	TRM2603	Tourism & Hospitality Impacts	2023
701	13816	Bachelor of Tourism & Travel Management	TRM2604	Sociology of Tourism	2023
702	13816	Bachelor of Tourism & Travel Management	TRM2605	Managerial Accounting	2023
703	13816	Bachelor of Tourism & Travel Management	TRM2606	Hospitality & Tourism Marketing	2023
704	13816	Bachelor of Tourism & Travel Management	TRM2632	DMC Integrated Project	2023
705	13816	Bachelor of Tourism & Travel Management	TRM2701	Facility Management, Planning & Design	2023
706	13816	Bachelor of Tourism & Travel Management	TRM2702	Tourism & Environmental Law	2023
707	13816	Bachelor of Tourism & Travel Management	TRM2703	MICE Management	2023
708	13816	Bachelor of Tourism & Travel Management	TRM2704	Destination Management	2023
709	13816	Bachelor of Tourism & Travel Management	TRM2705	Tourism Technology & Media	2023
710	13816	Bachelor of Tourism & Travel Management	TRM2706	Human Resource Management	2023
711	13816	Bachelor of Tourism & Travel Management	TRM2707	Entrepreneurship Development	2023
712	13816	Bachelor of Tourism & Travel Management	TRM2801	Basics of Revenue Management	2023
713	13816	Bachelor of Tourism & Travel Management	TRM2802	Research Methodology	2023
714	13816	Bachelor of Tourism & Travel Management	TRM2803	Ethics in Hospitality & Tourism	2023

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715	13816	Bachelor of Tourism & Travel Management	TRM2804	GDPI Sessions	2023
716	13816	Bachelor of Tourism & Travel Management	TRM2837	Research Project	2023
717	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2151	Introduction to Psychology	2023
718	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2101	Experimental Psychology	2023
719	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2102	Practicals-I	2023
720	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2251	Social Psychology	2023
721	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2201	Elementary Statistics	2023
722	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2202	Practicals-II	2023
723	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2351	Cognitive Psychology	2023
724	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2301	Research Methods & Advanced Statistics	2023
725	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2302	Practicals-III	2023
726	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	SPSY2301	Psychometric Testing	2023
727	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	NPSY2335	Community Engagement Services	2023
728	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2451	Abnormal Psychology	2023
729	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2401	Personality	2023

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730	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2402	Practicals-IV	2023
731	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	SPSY2401	Psychological Tools Development for Clinical Psychology	2023
732	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2551	Developmental Psychology	2023
733	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2501	Health Psychology	2023
734	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2502	Practicals-V	2023
735	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2503	Positive Psychology	2023
736	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2504	Physiological Psychology	2023
737	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	NPSY2537	SIP/Internship/ Project/ Dissertation/Field Visit	2023
738	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2601	Clinical Psychology	2023
739	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2602	Gender Psychology	2023
740	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2651	Guidance & Counselling Psychology	2023
741	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2603	Organizational Behaviour	2023
742	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2604	Artificial Intelligence & Cyber Psychology	2023
743	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2701	Advanced Statistics (Parametric + Non Parametric)	2023
744	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	NPSY2737	SIP/Internship/ Project/ Dissertation/Field Visit	2023

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745	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2702	Psychological Assessment and Diagnosis	2023
746	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2703	Practicals-VII	2023
747	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2704	Neuropsychology	2023
748	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2705	Forensic Psychology	2023
749	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2706	Psychotherapy	2023
750	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2739	Basics of Research Methodology, Ethics and Research Communication	2023
751	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2801	Differential Diagnostic Technique	2023
752	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2802	Practicals-VIII	2023
753	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2803	Rehabilitation Psychology	2023
754	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2804	Neurodevelopmental Disabilities	2023
755	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2805	Childhood Pathology and Exceptional Children	2023
756	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2806	Academic Writings & Research Skills	2023
757	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	NPSY2837	SIP/Internship/ Project/ Dissertation/Field Visit	2023
758	131775	Bachelor of Science (Honors/ Honors with Research) in Clinical Psychology	DPSY2839	Data Analysis & Visualisation using Software	2023
759	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2151	Introduction to Psychology	2023

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760	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2101	Experimental Psychology	2023
761	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2103	Practicals-I	2023
762	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2251	Social Psychology	2023
763	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2201	Elementary Statistics	2023
764	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2203	Practicals-II	2023
765	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2351	Cognitive Psychology	2023
766	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2301	Research Methods & Advanced Statistics	2023
767	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2303	Practicals-III	2023
768	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	SPSY2301	Psychometric Testing	2023
769	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	NPSY2335	Community Engagement Services	2023
770	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2451	Abnormal Psychology	2023
771	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2401	Personality	2023
772	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2403	Practicals-IV	2023
773	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	SPSY2401	Psychological Tools Development for Clinical Psychology	2023
774	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2551	Developmental Psychology	2023

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775	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2501	Health Psychology	2023
776	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2505	Practicals-V	2023
777	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2503	Positive Psychology	2023
778	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2504	Physiological Psychology	2023
779	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	NPSY2537	SIP/Internship/ Project/ Dissertation/Field Visit	2023
780	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2651	Guidance & Counselling Psychology	2023
781	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2603	Organizational Behaviour	2023
782	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2604	Artificial Intelligence & Cyber Psychology	2023
783	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2605	Media & Consumer Psychology	2023
784	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2606	Sports Psychology	2023
785	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2701	Advanced Statistics (Parametric + Non Parametric)	2023
786	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2702	Psychological Assessment and Diagnosis	2023
787	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2709	Practicals-VII	2023
788	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2707	School Counselling	2023
789	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2708	Emerging Fields of Psychology	2023

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790	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2739	Basics of Research Methodology, Ethics and Research Communication	2023
791	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	NPSY2737	SIP/Internship/ Project/ Dissertation/Field Visit	2023
792	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2807	Advanced & Applied Counselling Skills	2023
793	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2810	Practicals-VIII	2023
794	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2803	Rehabilitation Psychology	2023
795	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2806	Academic Writings & Research Skills	2023
796	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2808	Applied Psychotherapy	2023
797	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2809	Psychology of Criminal Behaviour & Profiling	2023
798	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	NPSY2837	SIP/Internship/ Project/ Dissertation/Field Visit	2023
799	131597	Bachelor of Arts (Honors/ Honors with Research) in Applied Psychology	DPSY2839	Data Analysis & Visualisation using Software	2023
800	13033	Master of Arts (Counselling Psychology)	PSY4101	History and Schools of Psychology	2023
801	13033	Master of Arts (Counselling Psychology)	PSY4102	Cognitive Psychology	2023
802	13033	Master of Arts (Counselling Psychology)	PSY4103	Advanced Social Psychology	2023
803	13033	Master of Arts (Counselling Psychology)	PSY4104	Personality Theory	2023
804	13033	Master of Arts (Counselling Psychology)	PSY4105	Parametric Statistical Method	2023
805	13033	Master of Arts (Counselling Psychology)	PSY4106	Practicum - I	2023
806	13033	Master of Arts (Counselling Psychology)	PSY4107	Field Practice-I	2023

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807	13033	Master of Arts (Counselling Psychology)	PSY4201	Psychopathology	2023
808	13033	Master of Arts (Counselling Psychology)	PSY4202	Psychological Assessment and Diagnosis	2023
809	13033	Master of Arts (Counselling Psychology)	PSY4203	Child Psychology	2023
810	13033	Master of Arts (Counselling Psychology)	PSY4204	Non-Parametric Statistical Method	2023
811	13033	Master of Arts (Counselling Psychology)	PSY4206	Positive Psychology	2023
812	13033	Master of Arts (Counselling Psychology)	PSY4207	Practicum - II	2023
813	13033	Master of Arts (Counselling Psychology)	PSY4208	Field Practice-II	2023
814	13033	Master of Arts (Counselling Psychology)	PSY4209	Scientific Research Paper	2023
815	13033	Master of Arts (Counselling Psychology)	PSY4301	Research Methods: Experimental Design	2023
816	13033	Master of Arts (Counselling Psychology)	PSY4302	Psychotherapy	2023
817	13033	Master of Arts (Counselling Psychology)	PSY4304	Counseling Psychology	2023
818	13033	Master of Arts (Counselling Psychology)	PSY4308	Practicum-III	2023
819	13033	Master of Arts (Counselling Psychology)	PSY4309	Field Practice-III	2023
820	13033	Master of Arts (Counselling Psychology)	PSY4335	Summer Internship Evaluation	2023
821	13033	Master of Arts (Counselling Psychology)	PSY4303	Clinical Psychology	2023
822	13033	Master of Arts (Counselling Psychology)	PSY4305	Developmental Psychology	2023
823	13033	Master of Arts (Counselling Psychology)	PSY4307	Educational Psychology	2023
824	13033	Master of Arts (Counselling Psychology)	PSY4401	Research Methods: Non-Experimental Design	2023
825	13033	Master of Arts (Counselling Psychology)	PSY4403	Advance and Applied Counselling Skills	2023
826	13033	Master of Arts (Counselling Psychology)	PSY4412	Practicum-IV	2023
827	13033	Master of Arts (Counselling Psychology)	PSY4413	Field Practice-IV	2023
828	13033	Master of Arts (Counselling Psychology)	PSY4437	Dissertation	2023

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829	13033	Master of Arts (Counselling Psychology)	PSY4402	Mental Retardation	2023
830	13033	Master of Arts (Counselling Psychology)	PSY4405	Childhood Pathology and Exceptional Children	2023
831	13033	Master of Arts (Counselling Psychology)	PSY4409	Employee Counselling and Empowerment	2023
832	13033	Master of Arts (Counselling Psychology)	PSY4410	Organizational Behaviour and Industrial Relations	2023
833	13033	Master of Arts (Counselling Psychology)	PSY4411	Psychological Practices in Personnel & Human Resource Management	2023
834	13166	Master of Arts (Applied Psychology)	PSY4109	Basic Psychological Processes	2023
835	13166	Master of Arts (Applied Psychology)	PSY4102	Cognitive Psychology	2023
836	13166	Master of Arts (Applied Psychology)	PSY4103	Advanced Social Psychology	2023
837	13166	Master of Arts (Applied Psychology)	PSY4104	Personality Theory	2023
838	13166	Master of Arts (Applied Psychology)	PSY4105	Parametric Statistical Method	2023
839	13166	Master of Arts (Applied Psychology)	PSY4106	Practicum-I	2023
840	13166	Master of Arts (Applied Psychology)	PSY4107	Field Practice-I	2023
841	13166	Master of Arts (Applied Psychology)	PSY4201	Psychopathology	2023
842	13166	Master of Arts (Applied Psychology)	PSY4202	Psychological Assessment & Diagnosis	2023
843	13166	Master of Arts (Applied Psychology)	PSY4210	Industrial-Organisational (I-O) Psychology	2023
844	13166	Master of Arts (Applied Psychology)	PSY4204	Non-Parametric Statistical Methods	2023
845	13166	Master of Arts (Applied Psychology)	PSY4205	Health Psychology	2023
846	13166	Master of Arts (Applied Psychology)	PSY4207	Practicum-II	2023
847	13166	Master of Arts (Applied Psychology)	PSY4208	Field Practice-II	2023
848	13166	Master of Arts (Applied Psychology)	PSY4209	Scientific Research Paper	2023
849	13166	Master of Arts (Applied Psychology)	PSY4310	Applied Psychotherapy	2023
850	13166	Master of Arts (Applied Psychology)	PSY4311	Research Methods in Applied Psychology	2023

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851	13166	Master of Arts (Applied Psychology)	PSY4312	Interviewing & Counselling Skills	2023
852	13166	Master of Arts (Applied Psychology)	PSY4308	Practicum-III	2023
853	13166	Master of Arts (Applied Psychology)	PSY4309	Field Practice-III	2023
854	13166	Master of Arts (Applied Psychology)	PSY4335	Summer Internship Evaluation	2023
855	13166	Master of Arts (Applied Psychology)	PSY4313	Applied Psychophysiology & Biofeedback	2023
856	13166	Master of Arts (Applied Psychology)	PSY4314	Human Factors Psychology & Ergonomics	2023
857	13166	Master of Arts (Applied Psychology)	PSY4315	Forensic & Legal Psychology	2023
858	13166	Master of Arts (Applied Psychology)	PSY4316	Community Psychology	2023
859	13166	Master of Arts (Applied Psychology)	PSY4317	Psychological Practices in Personnel & Human Resource Management	2023
860	13166	Master of Arts (Applied Psychology)	PSY4404	Rehabilitation Psychology	2023
861	13166	Master of Arts (Applied Psychology)	PSY4415	Psychometrics	2023
862	13166	Master of Arts (Applied Psychology)	PSY4412	Practicum-IV	2023
863	13166	Master of Arts (Applied Psychology)	PSY4413	Field Practice-IV	2023
864	13166	Master of Arts (Applied Psychology)	PSY4437	Dissertation	2023
865	13166	Master of Arts (Applied Psychology)	PSY4409	Employee Counselling & Empowerment	2023
866	13166	Master of Arts (Applied Psychology)	PSY4416	Psychology of Selling, Marketing & Advertising	2023
867	13166	Master of Arts (Applied Psychology)	PSY4417	Psychology of Criminal Behaviour & Criminal Profiling	2023
868	13166	Master of Arts (Applied Psychology)	PSY4418	Occupational Health Psychology	2023
869	13166	Master of Arts (Applied Psychology)	PSY4419	Guidance & Counselling	2023
870	13408	Master of Science (Clinical Psychology)	PSY4101	History and Schools of Psychology	2023
871	13408	Master of Science (Clinical Psychology)	PSY4102	Cognitive Psychology	2023
872	13408	Master of Science (Clinical Psychology)	PSY4103	Advanced Social Psychology	2023

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873	13408	Master of Science (Clinical Psychology)	PSY4104	Personality Theory	2023
874	13408	Master of Science (Clinical Psychology)	PSY4105	Parametric Statistical Method	2023
875	13408	Master of Science (Clinical Psychology)	PSY4106	Practicum-I	2023
876	13408	Master of Science (Clinical Psychology)	PSY4107	Field Practice-I	2023
877	13408	Master of Science (Clinical Psychology)	PSY4201	Psychopathology	2023
878	13408	Master of Science (Clinical Psychology)	PSY4202	Psychological Assessment and Diagnosis	2023
879	13408	Master of Science (Clinical Psychology)	PSY4203	Child Psychology	2023
880	13408	Master of Science (Clinical Psychology)	PSY4204	Non-Parametric Statistical Method	2023
881	13408	Master of Science (Clinical Psychology)	PSY4205	Health Psychology	2023
882	13408	Master of Science (Clinical Psychology)	PSY4207	Practicum-II	2023
883	13408	Master of Science (Clinical Psychology)	PSY4208	Field Practice-II	2023
884	13408	Master of Science (Clinical Psychology)	PSY4209	Scientific Research Paper	2023
885	13408	Master of Science (Clinical Psychology)	PSY4301	Research Methods: Experimental Design	2023
886	13408	Master of Science (Clinical Psychology)	PSY4302	Psychotherapy	2023
887	13408	Master of Science (Clinical Psychology)	PSY4303	Clinical Psychology	2023
888	13408	Master of Science (Clinical Psychology)	PSY4308	Practicum – III	2023
889	13408	Master of Science (Clinical Psychology)	PSY4309	Field Practice-III	2023
890	13408	Master of Science (Clinical Psychology)	PSY4335	Summer Internship Evaluation	2023
891	13408	Master of Science (Clinical Psychology)	PSY4304	Counselling Psychology	2023
892	13408	Master of Science (Clinical Psychology)	PSY4305	Developmental Psychology	2023
893	13408	Master of Science (Clinical Psychology)	PSY4306	Neuro Psychology	2023
894	13408	Master of Science (Clinical Psychology)	PSY4401	Research Methods: Non-Experimental Design	2023

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895	13408	Master of Science (Clinical Psychology)	PSY4402	Mental Retardation	2023
896	13408	Master of Science (Clinical Psychology)	PSY4412	Practicum-IV	2023
897	13408	Master of Science (Clinical Psychology)	PSY4413	Field Practice-IV	2023
898	13408	Master of Science (Clinical Psychology)	PSY4437	Dissertation	2023
899	13408	Master of Science (Clinical Psychology)	PSY4404	Rehabilitation Psychology	2023
900	13408	Master of Science (Clinical Psychology)	PSY4405	Childhood Pathology and Exceptional Children	2023
901	13408	Master of Science (Clinical Psychology)	PSY4406	Psychotherapeutic Intervention in Clinical setting	2023
902	13408	Master of Science (Clinical Psychology)	PSY4407	Differential Diagnostic Techniques	2023
903	13408	Master of Science (Clinical Psychology)	PSY4408	Community Psychology and Intervention	2023
904	13202	Master of Social Work	SCW4101	Social Work: History, Ideologies, Perspectives & Contemporary Concerns	2023
905	13202	Master of Social Work	SCW4102	Basics of Social Work	2023
906	13202	Master of Social Work	SCW4103	Work with Individuals & Families: Social Case Work	2023
907	13202	Master of Social Work	SCW4104	Working with Groups: Social Group Work	2023
908	13202	Master of Social Work	SCW4105	Research Methods in Social Work: Quantitative Approach	2023
909	13202	Master of Social Work	SCW4107	Field Work Practicum-I	2023
910	13202	Master of Social Work	SCW4108	Social Work Camp	2023
911	13202	Master of Social Work	SCW4201	Social Policy & Social Welfare Administration	2023
912	13202	Master of Social Work	SCW4202	Social Work with Communities	2023
913	13202	Master of Social Work	SCW4203	Project Formulation & Management	2023
914	13202	Master of Social Work	SCW4204	Community Organization & Social Action	2023
915	13202	Master of Social Work	SCW4205	Research Methods in Social Work: Qualitative Approach	2023
916	13202	Master of Social Work	SCW4206	Skill Based Project	2023
917	13202	Master of Social Work	SCW4207	Field Work Practicum-II	2023
918	13202	Master of Social Work	SCW4302	Social Justice & Empowerment	2023
919	13202	Master of Social Work	SCW4303	Communication & Counselling	2023
920	13202	Master of Social Work	SCW4304	Field Work Practicum-III	2023
921	13202	Master of Social Work	SCW4335	Summer Internship Evaluation	2023

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922	13202	Master of Social Work	SCW4305	Human Resource Development & Employee Wellness	2023
923	13202	Master of Social Work	SCW4306	Mental Health & Psychiatric Social Work	2023
924	13202	Master of Social Work	SCW4307	Social Work with Families & Children	2023
925	13202	Master of Social Work	SCW4308	Correctional Administration & Services	2023
926	13202	Master of Social Work	SCW4309	Population & Environment	2023
927	13202	Master of Social Work	SCW4310	Management of Development & Welfare Services	2023
928	13202	Master of Social Work	SCW4401	Human Rights & Social Work Practice	2023
929	13202	Master of Social Work	SCW4402	Gender & Development	2023
930	13202	Master of Social Work	SCW4403	Social Work with Urban, Rural & Tribal Communities	2023
931	13202	Master of Social Work	SCW4404	Field Work Practicum-IV	2023
932	13202	Master of Social Work	SCW4437	Dissertation	2023
933	13202	Master of Social Work	SCW4405	Industrial Relations & Labour Legislation	2023
934	13202	Master of Social Work	SCW4406	Rehabilitation & After Care Services	2023
935	13202	Master of Social Work	SCW4407	Social Work with PWD	2023
936	13202	Master of Social Work	SCW4408	Social Work with HIV/AIDS	2023
937	13202	Master of Social Work	SCW4409	Human Growth & Development	2023
938	13202	Master of Social Work	SCW4410	Disaster Management	2023
939	13109	M.Phil (Clinical Psychology)	PSY5101	Psychosocial Foundation of Behaviour & Psychopathology	2023
940	13109	M.Phil (Clinical Psychology)	PSY5103	Psychiatry	2023
941	13109	M.Phil (Clinical Psychology)	PSY5104	Practical: Psychological Assessment including Viva-Voce	2023
942	13109	M.Phil (Clinical Psychology)	PSY5106	Statistics & Research Methodology	2023
943	13109	M.Phil (Clinical Psychology)	PSY5105	Submission of Psychodiagnostic Records	2023
944	13109	M.Phil (Clinical Psychology)	PSY5301	Psychotherapy & Counselling	2023
945	13109	M.Phil (Clinical Psychology)	PSY5302	Behavioural Medicine	2023
946	13109	M.Phil (Clinical Psychology)	PSY5304	Practical: Psychological Therapies including Viva-Voce	2023
947	13109	M.Phil (Clinical Psychology)	PSY5306	Biological Foundation of Behaviour	2023
948	13109	M.Phil (Clinical Psychology)	PSY5305	Submission of Psychotherapy Records	2023
949	13109	M.Phil (Clinical Psychology)	PSY5337	Dissertation	2023
950	13832	Professional Diploma in Clinical Psychology	PCP3101	Psychosocial Perspectives of Mental Disorders	2023

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951	13832	Professional Diploma in Clinical Psychology	PCP3102	Counseling and Therapy	2023
952	13832	Professional Diploma in Clinical Psychology	PCP3103	Psychiatry	2023
953	13832	Professional Diploma in Clinical Psychology	PCP3104	Practical-I: Psychological Assessment including Viva-Voce	2023
954	13832	Professional Diploma in Clinical Psychology	PCP3105	Practical-II: Psychological Interventions including Viva-Voce	2023
955	13832	Professional Diploma in Clinical Psychology	PCP3106	Submission-I: Psychodiagnostic Records	2023
956	13832	Professional Diploma in Clinical Psychology	PCP3107	Submission-II: Psychotherapy Records	2023
957	13525	Postgraduate Diploma in Rehabilitation Psychology	PRP3101	Disability and Rehabilitation	2023
958	13525	Postgraduate Diploma in Rehabilitation Psychology	PRP3102	Psychosocial Issues in Disability	2023
959	13525	Postgraduate Diploma in Rehabilitation Psychology	PRP3103	Rehabilitation Assessment and Counseling	2023
960	13525	Postgraduate Diploma in Rehabilitation Psychology	PRP3104	Community Based Rehabilitation	2023
961	13525	Postgraduate Diploma in Rehabilitation Psychology	PRP3105	Practical: Rehabilitation Interventions and Viva-voce	2023
962	13525	Postgraduate Diploma in Rehabilitation Psychology	PRP3106	Submission of five fully worked-out Rehabilitation Counseling Records	2023
963	13055	Bachelor of Technology (Aerospace Engineering)	ASE2113	Engineering Mathematics-I	2023
964	13055	Bachelor of Technology (Aerospace Engineering)	ASE2115	Engineering Chemistry	2023
965	13055	Bachelor of Technology (Aerospace Engineering)	ASE2105	Introduction to Computers & Programming in C	2023
966	13055	Bachelor of Technology (Aerospace Engineering)	ASE2118	Basics of Electrical & Electronics Engineering	2023
967	13055	Bachelor of Technology (Aerospace Engineering)	ASE2120	Elements of Mechanical Engineering	2023
968	13055	Bachelor of Technology (Aerospace Engineering)	ASE2110	Programming in C Lab	2023
969	13055	Bachelor of Technology (Aerospace Engineering)	ASE2117	Engineering Chemistry Lab	2023
970	13055	Bachelor of Technology (Aerospace Engineering)	ASE2119	Basics of Electrical & Electronics Engineering Lab	2023
971	13055	Bachelor of Technology (Aerospace Engineering)	ASE2121	Elements of Mechanical Engineering Lab	2023
972	13055	Bachelor of Technology (Aerospace Engineering)	ASE2209	Engineering Mathematics-II	2023

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973	13055	Bachelor of Technology (Aerospace Engineering)	ASE2210	Engineering Physics	2023
974	13055	Bachelor of Technology (Aerospace Engineering)	ASE2215	Workshop Technology	2023
975	13055	Bachelor of Technology (Aerospace Engineering)	ASE2216	Engineering Mechanics	2023
976	13055	Bachelor of Technology (Aerospace Engineering)	ASE2212	Engineering Graphics Lab	2023
977	13055	Bachelor of Technology (Aerospace Engineering)	ASE2214	Engineering Physics Lab	2023
978	13055	Bachelor of Technology (Aerospace Engineering)	ASE2217	Workshop Practice	2023
979	13055	Bachelor of Technology (Aerospace Engineering)	ASE2218	Engineering Mechanics Lab	2023
980	13055	Bachelor of Technology (Aerospace Engineering)	ASE2313	Engineering Mathematics-III	2023
981	13055	Bachelor of Technology (Aerospace Engineering)	ASE2314	Engineering Thermodynamics	2023
982	13055	Bachelor of Technology (Aerospace Engineering)	ASE2315	Strength of Materials	2023
983	13055	Bachelor of Technology (Aerospace Engineering)	ASE2321	Introduction to Aerospace Engineering	2023
984	13055	Bachelor of Technology (Aerospace Engineering)	ASE2322	Fluid Mechanics and Dynamics	2023
985	13055	Bachelor of Technology (Aerospace Engineering)	ASE2317	Strength of Materials Lab	2023
986	13055	Bachelor of Technology (Aerospace Engineering)	ASE2323	Fluid Mechanics and Dynamics Lab	2023
987	13055	Bachelor of Technology (Aerospace Engineering)	ASE2324	Aircraft Manufacturing Processes	2023
988	13055	Bachelor of Technology (Aerospace Engineering)	ASE2325	Measurement Techniques	2023
989	13055	Bachelor of Technology (Aerospace Engineering)	ASE2326	Introduction to Heat Transfer	2023
990	13055	Bachelor of Technology (Aerospace Engineering)	ASE2412	Numerical Analysis and Programming	2023
991	13055	Bachelor of Technology (Aerospace Engineering)	ASE2415	Low Speed Aerodynamics	2023
992	13055	Bachelor of Technology (Aerospace Engineering)	ASE2416	Aircraft Propulsion	2023
993	13055	Bachelor of Technology (Aerospace Engineering)	ASE2417	Aerospace Structures-I	2023
994	13055	Bachelor of Technology (Aerospace Engineering)	ASE2418	Introduction to Space Sciences	2023

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995	13055	Bachelor of Technology (Aerospace Engineering)	ASE2419	Low Speed Aerodynamics Lab	2023
996	13055	Bachelor of Technology (Aerospace Engineering)	ASE2420	Aircraft Propulsion Lab	2023
997	13055	Bachelor of Technology (Aerospace Engineering)	ASE2421	Numerical Analysis and Programming Lab using MATLAB	2023
998	13055	Bachelor of Technology (Aerospace Engineering)	ASE2422	Fuels & Combustion	2023
999	13055	Bachelor of Technology (Aerospace Engineering)	ASE2423	Control Systems	2023
1000	13055	Bachelor of Technology (Aerospace Engineering)	ASE2424	Mechatronics	2023
1001	13055	Bachelor of Technology (Aerospace Engineering)	ASE2510	Turbomachinery	2023
1002	13055	Bachelor of Technology (Aerospace Engineering)	ASE2511	High Speed Aerodynamics	2023
1003	13055	Bachelor of Technology (Aerospace Engineering)	ASE2512	Aerospace Structures-II	2023
1004	13055	Bachelor of Technology (Aerospace Engineering)	ASE2513	Flight Mechanics	2023
1005	13055	Bachelor of Technology (Aerospace Engineering)	ASE2514	Computer Aided Drafting Lab	2023
1006	13055	Bachelor of Technology (Aerospace Engineering)	ASE2515	Structural Analysis Lab	2023
1007	13055	Bachelor of Technology (Aerospace Engineering)	ASE2535	Summer Internship Evaluation-I	2023
1008	13055	Bachelor of Technology (Aerospace Engineering)	ASE2516	Satellite Communication	2023
1009	13055	Bachelor of Technology (Aerospace Engineering)	ASE2517	Aircraft Systems and Instrumentation	2023
1010	13055	Bachelor of Technology (Aerospace Engineering)	ASE2518	Introduction to UAVs	2023
1011	13055	Bachelor of Technology (Aerospace Engineering)	ASE2609	Aircraft Maintenance & Quality Assurance	2023
1012	13055	Bachelor of Technology (Aerospace Engineering)	ASE2613	Computational Fluid Dynamics	2023
1013	13055	Bachelor of Technology (Aerospace Engineering)	ASE2614	Aerospace Materials	2023
1014	13055	Bachelor of Technology (Aerospace Engineering)	ASE2651	Aircraft Stability & Control	2023
1015	13055	Bachelor of Technology (Aerospace Engineering)	ASE2612	Computational Fluid Dynamics Lab	2023
1016	13055	Bachelor of Technology (Aerospace Engineering)	ASE2615	Aeromodelling Lab	2023

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1017	13055	Bachelor of Technology (Aerospace Engineering)	ASE2637	Minor Project	2023
1018	13055	Bachelor of Technology (Aerospace Engineering)	ASE2616	Introduction to Avionics	2023
1019	13055	Bachelor of Technology (Aerospace Engineering)	ASE2617	Propellant Technology	2023
1020	13055	Bachelor of Technology (Aerospace Engineering)	ASE2618	Finite Element Method	2023
1021	13055	Bachelor of Technology (Aerospace Engineering)	ASE2702	Flight Dynamics	2023
1022	13055	Bachelor of Technology (Aerospace Engineering)	ASE2709	Aircraft Design	2023
1023	13055	Bachelor of Technology (Aerospace Engineering)	ASE2712	Principles of Helicopter Engineering	2023
1024	13055	Bachelor of Technology (Aerospace Engineering)	ASE2713	Vibration Engineering	2023
1025	13055	Bachelor of Technology (Aerospace Engineering)	ASE2714	Vibration Engineering Lab	2023
1026	13055	Bachelor of Technology (Aerospace Engineering)	ASE2735	Summer Internship Evaluation-II	2023
1027	13055	Bachelor of Technology (Aerospace Engineering)	ASE2737	Major Project	2023
1028	13055	Bachelor of Technology (Aerospace Engineering)	ASE2811	Spacecraft Propulsion	2023
1029	13055	Bachelor of Technology (Aerospace Engineering)	ASE2812	Aerospace Navigation, Guidance and Control	2023
1030	13055	Bachelor of Technology (Aerospace Engineering)	ASE2837	Project-Dissertation	2023
1031	13055	Bachelor of Technology (Aerospace Engineering)	ASE2813	Aeroelasticity	2023
1032	13055	Bachelor of Technology (Aerospace Engineering)	ASE2814	Aerospace Industrial Management	2023
1033	13055	Bachelor of Technology (Aerospace Engineering)	ASE2815	Civil Aviation Requirements (CAR)	2023
1034	13158	Bachelor of Technology (Civil Engineering)	CIV2113	Engineering Mathematics-I	2023
1035	13158	Bachelor of Technology (Civil Engineering)	CIV2114	Engineering Chemistry	2023
1036	13158	Bachelor of Technology (Civil Engineering)	CIV2104	Elements of Mechanical Engineering	2023
1037	13158	Bachelor of Technology (Civil Engineering)	CIV2105	Introduction to Computers & Programming in C	2023
1038	13158	Bachelor of Technology (Civil Engineering)	CIV2116	Basics of Electrical & Electronics Engineering	2023

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1039	13158	Bachelor of Technology (Civil Engineering)	CIV2109	Elements of Mechanical Engineering Lab	2023
1040	13158	Bachelor of Technology (Civil Engineering)	CIV2110	Programming in C Lab	2023
1041	13158	Bachelor of Technology (Civil Engineering)	CIV2115	Engineering Chemistry Lab	2023
1042	13158	Bachelor of Technology (Civil Engineering)	CIV2117	Basics of Electrical & Electronics Engineering Lab	2023
1043	13158	Bachelor of Technology (Civil Engineering)	CIV2208	Engineering Mathematics-II	2023
1044	13158	Bachelor of Technology (Civil Engineering)	CIV2209	Engineering Physics	2023
1045	13158	Bachelor of Technology (Civil Engineering)	CIV2204	Engineering Mechanics	2023
1046	13158	Bachelor of Technology (Civil Engineering)	CIV2211	Workshop Technology	2023
1047	13158	Bachelor of Technology (Civil Engineering)	CIV2207	Engineering Mechanics Lab	2023
1048	13158	Bachelor of Technology (Civil Engineering)	CIV2210	Engineering Physics Lab	2023
1049	13158	Bachelor of Technology (Civil Engineering)	CIV2212	Workshop Practice	2023
1050	13158	Bachelor of Technology (Civil Engineering)	CIV2213	Engineering Graphics Lab	2023
1051	13158	Bachelor of Technology (Civil Engineering)	CIV2305	Surveying-I	2023
1052	13158	Bachelor of Technology (Civil Engineering)	CIV2311	Engineering Mathematics-III	2023
1053	13158	Bachelor of Technology (Civil Engineering)	CIV2312	Strength of Materials	2023
1054	13158	Bachelor of Technology (Civil Engineering)	CIV2322	Concrete Technology and Construction	2023
1055	13158	Bachelor of Technology (Civil Engineering)	CIV2314	Strength of Materials Lab	2023
1056	13158	Bachelor of Technology (Civil Engineering)	CIV2319	Surveying Lab-I	2023
1057	13158	Bachelor of Technology (Civil Engineering)	CIV2320	Materials Testing Lab	2023
1058	13158	Bachelor of Technology (Civil Engineering)	CIV2315	Basics of Natural Resources Management	2023
1059	13158	Bachelor of Technology (Civil Engineering)	CIV2316	Disaster Management & Mitigation	2023
1060	13158	Bachelor of Technology (Civil Engineering)	CIV2321	Engineering Geology	2023

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1061	13158	Bachelor of Technology (Civil Engineering)	CIV2323	Introduction to Smart Infrastructure #	2023
1062	13158	Bachelor of Technology (Civil Engineering)	CIV2324	Transportation Planning and Utility ##	2023
1063	13158	Bachelor of Technology (Civil Engineering)	CIV2401	Numerical Analysis & Programming	2023
1064	13158	Bachelor of Technology (Civil Engineering)	CIV2402	Structural Analysis-I	2023
1065	13158	Bachelor of Technology (Civil Engineering)	CIV2411	Surveying-II	2023
1066	13158	Bachelor of Technology (Civil Engineering)	CIV2412	Fluid Mechanics	2023
1067	13158	Bachelor of Technology (Civil Engineering)	CIV2417	Geotechnical Engineering-I	2023
1068	13158	Bachelor of Technology (Civil Engineering)	CIV2405	Numerical Analysis and Programming Lab	2023
1069	13158	Bachelor of Technology (Civil Engineering)	CIV2407	Surveying Lab-II	2023
1070	13158	Bachelor of Technology (Civil Engineering)	CIV2413	Fluid Mechanics Lab	2023
1071	13158	Bachelor of Technology (Civil Engineering)	CIV2418	Geotechnical Engineering Lab	2023
1072	13158	Bachelor of Technology (Civil Engineering)	CIV2414	Fluid Machinery	2023
1073	13158	Bachelor of Technology (Civil Engineering)	CIV2415	Hydrology & Flood Control	2023
1074	13158	Bachelor of Technology (Civil Engineering)	CIV2416	Remote Sensing & Geographic Information Systems	2023
1075	13158	Bachelor of Technology (Civil Engineering)	CIV2419	Infrastructure Planning and Management #	2023
1076	13158	Bachelor of Technology (Civil Engineering)	CIV2420	Transportation and Environment ##	2023
1077	13158	Bachelor of Technology (Civil Engineering)	CIV2501	Structural Analysis-II	2023
1078	13158	Bachelor of Technology (Civil Engineering)	CIV2513	Concrete Structural Design-I	2023
1079	13158	Bachelor of Technology (Civil Engineering)	CIV2514	Transportation Engineering-I	2023
1080	13158	Bachelor of Technology (Civil Engineering)	CIV2515	Geotechnical Engineering-II	2023
1081	13158	Bachelor of Technology (Civil Engineering)	CIV2509	Transportation Engineering Lab	2023
1082	13158	Bachelor of Technology (Civil Engineering)	CIV2516	Structural Analysis Lab	2023

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1083	13158	Bachelor of Technology (Civil Engineering)	CIV2535	Summer Internship Evaluation-I	2023
1084	13158	Bachelor of Technology (Civil Engineering)	CIV2510	Sustainable Development in Civil Engineering	2023
1085	13158	Bachelor of Technology (Civil Engineering)	CIV2511	Air and Water Pollution & Control	2023
1086	13158	Bachelor of Technology (Civil Engineering)	CIV2512	Computer Application in Hydro Engineering	2023
1087	13158	Bachelor of Technology (Civil Engineering)	CIV2517	Design of Formwork #	2023
1088	13158	Bachelor of Technology (Civil Engineering)	CIV2518	Highway Materials and Construction ##	2023
1089	13158	Bachelor of Technology (Civil Engineering)	CIV2601	Environmental Engineering-I	2023
1090	13158	Bachelor of Technology (Civil Engineering)	CIV2610	Water Resource Engineering-I	2023
1091	13158	Bachelor of Technology (Civil Engineering)	CIV2612	Concrete Structural Design-II	2023
1092	13158	Bachelor of Technology (Civil Engineering)	CIV2613	Transportation Engineering-II	2023
1093	13158	Bachelor of Technology (Civil Engineering)	CIV2637	Minor Project Work	2023
1094	13158	Bachelor of Technology (Civil Engineering)	CIV2607	Prestressed Concrete	2023
1095	13158	Bachelor of Technology (Civil Engineering)	CIV2608	Traffic Engineering & Management	2023
1096	13158	Bachelor of Technology (Civil Engineering)	CIV2614	Building Services #	2023
1097	13158	Bachelor of Technology (Civil Engineering)	CIV2615	Renewable Energy Technologies for Sustainable Transportation ##	2023
1098	13158	Bachelor of Technology (Civil Engineering)	CIV2701	Structural Steel Design	2023
1099	13158	Bachelor of Technology (Civil Engineering)	CIV2702	Environmental Engineering-II	2023
1100	13158	Bachelor of Technology (Civil Engineering)	CIV2711	Water Resources Engineering-II	2023
1101	13158	Bachelor of Technology (Civil Engineering)	CIV2704	Environmental Engineering Lab	2023
1102	13158	Bachelor of Technology (Civil Engineering)	CIV2735	Summer Internship Evaluation-II	2023
1103	13158	Bachelor of Technology (Civil Engineering)	CIV2737	Project Work	2023
1104	13158	Bachelor of Technology (Civil Engineering)	CIV2714	Industrial Waste Engineering	2023

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1105	13158	Bachelor of Technology (Civil Engineering)	CIV2715	Basics of Optimization Techniques and Mathematical Modeling	2023
1106	13158	Bachelor of Technology (Civil Engineering)	CIV2716	System Engineering and Economics #	2023
1107	13158	Bachelor of Technology (Civil Engineering)	CIV2717	Road Safety Engineering ##	2023
1108	13158	Bachelor of Technology (Civil Engineering)	CIV2810	Estimation and Costing	2023
1109	13158	Bachelor of Technology (Civil Engineering)	CIV2837	Project-Dissertation	2023
1110	13158	Bachelor of Technology (Civil Engineering)	CIV2808	Solid Waste Management & Recycling	2023
1111	13158	Bachelor of Technology (Civil Engineering)	CIV2809	Basics of Finite Element Method	2023
1112	13158	Bachelor of Technology (Civil Engineering)	CIV2811	Environmental Impact Assessment	2023
1113	13158	Bachelor of Technology (Civil Engineering)	CIV2812	Mass Transportation System	2023
1114	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2110	Engineering Mathematics-I	2023
1115	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2111	Engineering Physics	2023
1116	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2104	Introduction to Computers & Programming in C	2023
1117	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2114	Elements of Mechanical Engineering	2023
1118	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2107	Programming in C Lab	2023
1119	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2112	Engineering Physics Lab	2023
1120	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2115	Elements of Mechanical Engineering Lab	2023
1121	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2211	Engineering Mathematics-II	2023
1122	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2212	Engineering Chemistry	2023
1123	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2216	Engineering Mechanics	2023
1124	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2217	Basics of Electrical & Electronics Engineering	2023
1125	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2204	Object Oriented Programming using C++	2023
1126	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2208	Object Oriented Programming using C++ Lab	2023

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1127	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2215	Engineering Chemistry Lab	2023
1128	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2218	Basics of Electrical & Electronics Engineering Lab	2023
1129	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2219	Engineering Graphics Lab	2023
1130	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2302	Database Management Systems	2023
1131	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2303	Operating Systems	2023
1132	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2304	Data Structures using C	2023
1133	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2314	Digital Electronics	2023
1134	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2305	Data Structures Using C Lab	2023
1135	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2307	Database Management Systems Lab	2023
1136	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2308	UNIX Programming Lab	2023
1137	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2315	Digital Electronics Lab	2023
1138	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2310	Electronic Devices & Circuits	2023
1139	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2311	Electronic Devices & Circuits Lab	2023
1140	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2312	E-Commerce & ERP	2023
1141	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2316	Statistics & Probability Concepts	2023
1142	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2317	Software Vulnerability Analysis #	2023
1143	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2318	Basic Network Concepts & Computing Architecture **$**	2023
1144	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2319	Fundamentals of Blockchain Technology **%**	2023
1145	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2320	Introduction to IoT **@**	2023
1146	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2403	Discrete Mathematics	2023
1147	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2412	Artificial Intelligence	2023
1148	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2418	Analysis & Design of Algorithm	2023

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1149	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2419	Data Communication & Computer Networks	2023
1150	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2413	Artificial Intelligence Lab	2023
1151	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2420	Data Communication & Computer Networks Lab	2023
1152	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2421	Analysis & Design of Algorithm Lab	2023
1153	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2410	Artificial Neural Network	2023
1154	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2411	Artificial Neural Network Lab	2023
1155	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2414	Communication Systems	2023
1156	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2415	Communication Systems Lab	2023
1157	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2422	Web Designing Technologies	2023
1158	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2423	Web Designing Technologies Lab	2023
1159	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2424	Applied Statistical Analysis #	2023
1160	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2425	Applied Statistical Analysis Lab #	2023
1161	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2426	Distributed System **$**	2023
1162	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2427	Ethereum and Solidity Programming **%**	2023
1163	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2428	Ethereum and Solidity Programming Lab **%**	2023
1164	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2429	IoT Platforms and System Design **@**	2023
1165	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2502	Computer Architecture	2023
1166	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2503	Java Programming	2023
1167	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2515	Microprocessor	2023
1168	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2516	Theory of Automata & Computation	2023
1169	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2505	Java Programming Lab	2023
1170	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2517	Microprocessor Lab	2023

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1171	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2535	Summer Internship Evaluation-I	2023
1172	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2506	VHDL Programming	2023
1173	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2507	VHDL Programming Lab	2023
1174	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2514	Fuzzy Logic& Genetic Algorithm	2023
1175	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2518	Advanced Web Designing Technologies	2023
1176	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2519	Advanced Web Designing Technologies Lab	2023
1177	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2520	Big Data with Hadoop Lab #	2023
1178	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2521	High Performance Computing $	2023
1179	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2522	Security, Cryptography & Cryptocurrencies %	2023
1180	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2523	Introduction to Raspberry Pi @	2023
1181	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2524	Introduction to Raspberry Pi Lab @	2023
1182	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2604	Advanced Java Programming	2023
1183	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2613	Software Engineering	2023
1184	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2618	Data Mining	2023
1185	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2608	Advanced Java Programming Lab	2023
1186	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2615	Software Engineering Lab	2023
1187	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2637	Minor Project-I	2023
1188	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2610	VLSI Design	2023
1189	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2611	VLSI Design Lab	2023
1190	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2616	Open Source Technologies	2023
1191	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2617	Open Source Technologies Lab	2023
1192	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2614	Internet of Things & Wireless Sensor Networks	2023

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1193	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2619	Network and Wireless Sensor #	2023
1194	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2620	Information Storage Management $	2023
1195	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2621	Development of Decentralized Application %	2023
1196	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2622	Development of Decentralized Application Lab %	2023
1197	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2623	Introduction to Arduino @	2023
1198	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2624	Introduction to Arduino Lab @	2023
1199	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2710	Computer Graphics	2023
1200	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2713	Cryptography & Network Security	2023
1201	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2714	System Programming & Compiler Construction	2023
1202	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2712	Computer Graphics Lab	2023
1203	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2715	Network Security Lab	2023
1204	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2716	System Programming & Compiler Lab	2023
1205	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2735	Summer Internship Evaluation-II	2023
1206	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2737	Minor Project-II	2023
1207	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2707	Mobile Computing	2023
1208	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2717	Robotic Process Automation Design & Development	2023
1209	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2718	Responsive Web Design	2023
1210	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2719	Responsive Web Design Lab	2023
1211	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2720	Learning with Bayesian Networks #	2023
1212	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2721	Interfacing with Virtualization $	2023
1213	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2722	Hyperledger Technology %	2023
1214	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2723	Hyperledger Technology Lab %	2023

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1215	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2724	IoT Application Development Design Services **@**	2023
1216	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2725	IoT Application Development Design Services Lab **@**	2023
1217	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2837	Project-Dissertation	2023
1218	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2803	Digital Image Processing	2023
1219	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2805	Digital Image Processing Lab	2023
1220	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2804	Dot Net Programming	2023
1221	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2806	Dot Net Programming Lab	2023
1222	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2812	Advance Robotic Process Automation Design & Development	2023
1223	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2813	Intrusion Detection & Prevention System **#**	2023
1224	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2814	Cloud Computing Tools and Techniques **$**	2023
1225	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2815	Blockchain Applications in Real World & the Legal Aspects **%**	2023
1226	13052	Bachelor of Technology (Computer Science & Engineering)	CSE2816	Data Management in IoT **@**	2023
1227	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2112	Engineering Mathematics-I	2023
1228	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2114	Engineering Chemistry	2023
1229	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2104	Elements of Mechanical Engineering	2023
1230	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2105	Introduction to Computers & Programming in C	2023
1231	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2117	Basics of Electrical & Electronics Engineering	2023
1232	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2109	Elements of Mechanical Engineering Lab	2023

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1233	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2110	Programming in C Lab	2023
1234	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2116	Engineering Chemistry Lab	2023
1235	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2118	Basics of Electrical & Electronics Engineering Lab	2023
1236	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2209	Engineering Mathematics-II	2023
1237	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2210	Engineering Physics	2023
1238	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2203	Object Oriented Programming using C++	2023
1239	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2204	Engineering Mechanics	2023
1240	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2206	Object Oriented Programming using C++ Lab	2023
1241	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2208	Engineering Graphics Lab	2023
1242	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2211	Engineering Physics Lab	2023
1243	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2310	Engineering Mathematics-III	2023
1244	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2302	Analog Electronics-I	2023
1245	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2303	Circuits & Systems	2023
1246	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2311	Data Structure using C	2023
1247	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2305	Analog Electronics- I Lab	2023

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1248	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2306	Circuits & Systems Lab	2023
1249	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2312	Data Structure using C Lab	2023
1250	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2313	Virtual Instrumentation	2023
1251	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2314	Virtual Instrumentation Lab	2023
1252	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2315	Measurement & Measuring Instruments	2023
1253	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2316	Measurement & Measuring Instruments Lab	2023
1254	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2317	Statistics & Probability Concepts	2023
1255	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2318	Basics of Nanoscience and Nanomaterials	2023
1256	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2319	Clean Room Technologies **%**	2023
1257	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2320	Introduction to IOT #	2023
1258	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2402	Communication Systems	2023
1259	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2403	Analog Electronics-II	2023
1260	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2404	Electromagnetic Field Theory	2023
1261	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2411	Digital Electronics	2023
1262	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2417	Signals & Systems	2023

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1263	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2406	Communication Systems Lab	2023
1264	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2407	Analog Electronics- II Lab	2023
1265	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2412	Digital Electronics Lab	2023
1266	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2414	PCB Fabrications	2023
1267	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2418	Electronic Workshop & PCB Lab	2023
1268	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2415	Database Management Systems	2023
1269	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2416	Database Management Systems Lab	2023
1270	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2419	Java Programming	2023
1271	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2420	Java Programming Lab	2023
1272	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2421	Artificial Neural Network	2023
1273	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2422	Artificial Neural Network Lab	2023
1274	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2423	Synthesis and Characterisation of Nanomaterials	2023
1275	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2424	Semiconductor Technology Equipment Maintenance **%**	2023
1276	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2425	IOT Platforms and System Design #	2023
1277	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2501	Digital Circuits & Systems	2023

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1278	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2502	Digital Communications	2023
1279	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2503	Control Systems	2023
1280	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2509	Microprocessor Systems	2023
1281	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2504	Digital Circuits & Systems Lab	2023
1282	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2505	Microprocessor Systems Lab	2023
1283	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2506	Control Systems Lab	2023
1284	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2535	Summer Internship Evaluation-I	2023
1285	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2507	Operating System	2023
1286	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2508	Computer Architecture	2023
1287	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2513	Computer Networks	2023
1288	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2514	Fuzzy Logic & Genetic Algorithm	2023
1289	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2515	Application of Nanomaterials	2023
1290	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2516	Vacuum Technology **%**	2023
1291	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2517	Introduction to Raspberry pi #	2023
1292	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2518	Introduction to Raspberry pi Lab #	2023

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1293	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2601	VLSI Design	2023
1294	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2602	Digital Signal Processing	2023
1295	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2615	Antenna and Microwave Engineering	2023
1296	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2616	Antenna and Microwave Engineering Lab	2023
1297	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2605	VLSI Design Lab	2023
1298	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2609	Digital Signal Processing Lab	2023
1299	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2637	Minor Project	2023
1300	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2607	Advanced Java Programming	2023
1301	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2610	Advanced Java Programming Lab	2023
1302	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2613	Embedded System #	2023
1303	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2614	Embedded System Lab #	2023
1304	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2617	IOT and Wireless Sensor Network	2023
1305	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2618	Data Mining	2023
1306	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2619	Nanomaterials and Clean Energy Systems	2023
1307	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2620	Semiconductor Packaging, Testing and Assembly **%**	2023

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1308	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2719	Radar & Satellite Communication	2023
1309	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2720	Advanced Mobile Communication	2023
1310	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2721	Embedded System with ARM Processors	2023
1311	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2722	Radar & Satellite Communication Lab	2023
1312	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2723	Python Lab	2023
1313	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2735	Summer Internship Evaluation-II	2023
1314	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2706	Optical Communications	2023
1315	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2716	Optical Communications Lab	2023
1316	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2712	Digital Image Processing	2023
1317	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2713	Digital Image Processing Lab	2023
1318	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2724	Robotic Process Automation Design & Development #	2023
1319	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2727	Nano Electronics	2023
1320	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2728	Introduction to MEMS %	2023
1321	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2718	Independent Study	2023
1322	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2731	Term Paper	2023

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1323	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2732	Project (With Presentation & Evaluation)	2023
1324	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2837	Project (Dissertation)	2023
1325	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2805	RTOS Programming	2023
1326	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2806	Verilog Programming	2023
1327	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2813	Verilog Programming Lab	2023
1328	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2812	Advanced VLSI Design	2023
1329	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2814	Power Electronics	2023
1330	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2815	Information Theory and Coding	2023
1331	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2816	Advanced Robotic Process Automation Design & Development #	2023
1332	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2818	Wireless Communication	2023
1333	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2819	Quantum Computation	2023
1334	13051	Bachelor of Technology (Electronics & Communication Engineering)	ECE2820	Electronic System Assembly **%**	2023
1335	13399	Bachelor of Technology (Biomedical Engineering)	BME2112	Engineering Mathematics-I	2023
1336	13399	Bachelor of Technology (Biomedical Engineering)	BME2114	Engineering Chemistry	2023
1337	13399	Bachelor of Technology (Biomedical Engineering)	BME2104	Introduction to Computers & Programming in C	2023
1338	13399	Bachelor of Technology (Biomedical Engineering)	BME2106	Elements of Mechanical Engineering	2023

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1339	13399	Bachelor of Technology (Biomedical Engineering)	BME2117	Basics of Electrical & Electronics Engineering	2023
1340	13399	Bachelor of Technology (Biomedical Engineering)	BME2109	Programming in C Lab	2023
1341	13399	Bachelor of Technology (Biomedical Engineering)	BME2111	Elements of Mechanical Engineering Lab	2023
1342	13399	Bachelor of Technology (Biomedical Engineering)	BME2116	Engineering Chemistry Lab	2023
1343	13399	Bachelor of Technology (Biomedical Engineering)	BME2118	Basics of Electrical & Electronics Engineering Lab	2023
1344	13399	Bachelor of Technology (Biomedical Engineering)	BME2210	Engineering Mathematics-II	2023
1345	13399	Bachelor of Technology (Biomedical Engineering)	BME2211	Engineering Physics	2023
1346	13399	Bachelor of Technology (Biomedical Engineering)	BME2203	Engineering Mechanics	2023
1347	13399	Bachelor of Technology (Biomedical Engineering)	BME2204	Biology for Engineers	2023
1348	13399	Bachelor of Technology (Biomedical Engineering)	BME2205	Object Oriented Programming using C++	2023
1349	13399	Bachelor of Technology (Biomedical Engineering)	BME2208	Engineering Graphics Lab	2023
1350	13399	Bachelor of Technology (Biomedical Engineering)	BME2209	Object Oriented Programming using C++ Lab	2023
1351	13399	Bachelor of Technology (Biomedical Engineering)	BME2212	Engineering Physics Lab	2023
1352	13399	Bachelor of Technology (Biomedical Engineering)	BME2302	Analog Electronics-I	2023
1353	13399	Bachelor of Technology (Biomedical Engineering)	BME2303	Circuits & Systems	2023
1354	13399	Bachelor of Technology (Biomedical Engineering)	BME2310	Engineering Mathematics-III	2023
1355	13399	Bachelor of Technology (Biomedical Engineering)	BME2314	Medical Imaging Techniques-I	2023
1356	13399	Bachelor of Technology (Biomedical Engineering)	BME2351	Human Anatomy and Physiology	2023
1357	13399	Bachelor of Technology (Biomedical Engineering)	BME2306	Analog Electronics Lab-I	2023
1358	13399	Bachelor of Technology (Biomedical Engineering)	BME2315	Computer Aided Graphic Design Lab	2023
1359	13399	Bachelor of Technology (Biomedical Engineering)	BME2316	Measurement & Measuring Instruments	2023
1360	13399	Bachelor of Technology (Biomedical Engineering)	BME2317	Measurement & Measuring Instruments Lab	2023

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1361	13399	Bachelor of Technology (Biomedical Engineering)	BME2318	Virtual Instrumentation	2023
1362	13399	Bachelor of Technology (Biomedical Engineering)	BME2319	Virtual Instrumentation Lab	2023
1363	13399	Bachelor of Technology (Biomedical Engineering)	BME2320	Statistics & Probability Concepts	2023
1364	13399	Bachelor of Technology (Biomedical Engineering)	BME2408	Digital Electronics	2023
1365	13399	Bachelor of Technology (Biomedical Engineering)	BME2412	Biomaterials	2023
1366	13399	Bachelor of Technology (Biomedical Engineering)	BME2413	Signals and Systems	2023
1367	13399	Bachelor of Technology (Biomedical Engineering)	BME2451	Bio-Instrumentation	2023
1368	13399	Bachelor of Technology (Biomedical Engineering)	BME2403	Bio-Instrumentation Lab	2023
1369	13399	Bachelor of Technology (Biomedical Engineering)	BME2409	Digital Electronics Lab	2023
1370	13399	Bachelor of Technology (Biomedical Engineering)	BME2414	Signals and Systems Lab	2023
1371	13399	Bachelor of Technology (Biomedical Engineering)	BME2407	Analog Electronics-II	2023
1372	13399	Bachelor of Technology (Biomedical Engineering)	BME2417	Analog Electronics Lab-II	2023
1373	13399	Bachelor of Technology (Biomedical Engineering)	BME2415	Biochemistry	2023
1374	13399	Bachelor of Technology (Biomedical Engineering)	BME2416	Medical Imaging Techniques-II	2023
1375	13399	Bachelor of Technology (Biomedical Engineering)	BME2418	Artificial Neural Network	2023
1376	13399	Bachelor of Technology (Biomedical Engineering)	BME2419	Artificial Neural Network Lab	2023
1377	13399	Bachelor of Technology (Biomedical Engineering)	BME2501	Microprocessor Systems	2023
1378	13399	Bachelor of Technology (Biomedical Engineering)	BME2513	Medical Image Processing	2023
1379	13399	Bachelor of Technology (Biomedical Engineering)	BME2514	Machine Learning	2023
1380	13399	Bachelor of Technology (Biomedical Engineering)	BME2504	Microprocessor Systems Lab	2023
1381	13399	Bachelor of Technology (Biomedical Engineering)	BME2515	Machine Learning Lab	2023
1382	13399	Bachelor of Technology (Biomedical Engineering)	BME2516	Medical Image Processing Lab	2023

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1383	13399	Bachelor of Technology (Biomedical Engineering)	BME2535	Summer Internship Evaluation-I	2023
1384	13399	Bachelor of Technology (Biomedical Engineering)	BME2503	Control Systems	2023
1385	13399	Bachelor of Technology (Biomedical Engineering)	BME2512	Control Systems Lab	2023
1386	13399	Bachelor of Technology (Biomedical Engineering)	BME2507	Digital Circuits and Systems	2023
1387	13399	Bachelor of Technology (Biomedical Engineering)	BME2509	Digital Circuits and Systems Lab	2023
1388	13399	Bachelor of Technology (Biomedical Engineering)	BME2517	Data Structure with C++	2023
1389	13399	Bachelor of Technology (Biomedical Engineering)	BME2518	Data Structure with C++ Lab	2023
1390	13399	Bachelor of Technology (Biomedical Engineering)	BME2519	Fuzzy Logic and Genetic Algorithm	2023
1391	13399	Bachelor of Technology (Biomedical Engineering)	BME2601	Microcontroller and its Biomedical Applications	2023
1392	13399	Bachelor of Technology (Biomedical Engineering)	BME2608	Medical Imaging and Reconstruction Algorithms	2023
1393	13399	Bachelor of Technology (Biomedical Engineering)	BME2651	Biomechanics	2023
1394	13399	Bachelor of Technology (Biomedical Engineering)	BME2609	Clinical Need Assessment and Mini Project	2023
1395	13399	Bachelor of Technology (Biomedical Engineering)	BME2610	Medical Imaging and Reconstruction Algorithms Lab	2023
1396	13399	Bachelor of Technology (Biomedical Engineering)	BME2607	Hospital Management System	2023
1397	13399	Bachelor of Technology (Biomedical Engineering)	BME2611	Therapeutic and Surgical Equipment	2023
1398	13399	Bachelor of Technology (Biomedical Engineering)	BME2612	Data Mining	2023
1399	13399	Bachelor of Technology (Biomedical Engineering)	BME2710	Embedded System with Recent Technology	2023
1400	13399	Bachelor of Technology (Biomedical Engineering)	BME2711	Artificial Organs and Rehabilitation Engineering	2023
1401	13399	Bachelor of Technology (Biomedical Engineering)	BME2712	Clinical Electrical Safety Hazards	2023
1402	13399	Bachelor of Technology (Biomedical Engineering)	BME2713	Biomechanics Simulation Lab	2023
1403	13399	Bachelor of Technology (Biomedical Engineering)	BME2714	Embedded System with Recent Technology Lab	2023
1404	13399	Bachelor of Technology (Biomedical Engineering)	BME2735	Summer Internship Evaluation-II	2023

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1405	13399	Bachelor of Technology (Biomedical Engineering)	BME2737	Project Dissertation-I	2023
1406	13399	Bachelor of Technology (Biomedical Engineering)	BME2715	Clinical Sciences	2023
1407	13399	Bachelor of Technology (Biomedical Engineering)	BME2716	Neural Network and Fuzzy Logic	2023
1408	13399	Bachelor of Technology (Biomedical Engineering)	BME2717	Virtual Reality	2023
1409	13399	Bachelor of Technology (Biomedical Engineering)	BME2718	Robotic Process Automation Design & Development	2023
1410	13399	Bachelor of Technology (Biomedical Engineering)	BME2837	Project Dissertation-II	2023
1411	13399	Bachelor of Technology (Biomedical Engineering)	BME2802	Introduction to Medical Physics	2023
1412	13399	Bachelor of Technology (Biomedical Engineering)	BME2803	Medical Informatics	2023
1413	13399	Bachelor of Technology (Biomedical Engineering)	BME2804	Recent Advancement in Biomedical Modalities	2023
1414	13399	Bachelor of Technology (Biomedical Engineering)	BME2805	Advanced Robotic Process Automation Design & Development	2023
1415	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6101	Engineering Mathematics-I	2023
1416	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6102	Engineering Physics	2023
1417	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6104	Introduction to Computers & Programming in C	2023
1418	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6109	Elements of Mechanical Engineering	2023
1419	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6105	Engineering Physics Lab	2023
1420	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6106	Programming in C Lab	2023
1421	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6110	Elements of Mechanical Engineering Lab	2023
1422	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6201	Engineering Mathematics-II	2023
1423	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6202	Engineering Chemistry	2023
1424	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6204	Object Oriented Programming using C++	2023
1425	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6210	Engineering Mechanics	2023
1426	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6212	Basics of Electrical & Electronics Engineering	2023

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1427	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6207	Engineering Chemistry Lab	2023
1428	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6208	Object Oriented Programming using C++ Lab	2023
1429	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6211	Engineering Graphics Lab	2023
1430	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6213	Basics of Electrical & Electronics Engineering Lab	2023
1431	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6302	Database Management Systems	2023
1432	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6303	Operating Systems	2023
1433	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6304	Data Structures using C	2023
1434	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6313	Digital Electronics	2023
1435	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6305	Data Structures using C Lab	2023
1436	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6307	Database Management System Lab	2023
1437	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6308	UNIX Programming Lab	2023
1438	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6314	Digital Electronics Lab	2023
1439	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6310	E-Commerce & ERP	2023
1440	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6311	Electronic Devices and Circuits	2023
1441	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6312	Electronic Devices and Circuits Lab	2023
1442	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6315	Statistics & Probability Concepts	2023
1443	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6403	Discrete Mathematics	2023
1444	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6404	Artificial Intelligence	2023
1445	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6413	Analysis & Design of Algorithm	2023
1446	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6414	Data Communication & Computer Networks	2023
1447	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6406	Artificial Intelligence Lab	2023
1448	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6415	Data Communication & Computer Networks Lab	2023

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1449	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6416	Analysis & Design of Algorithm Lab	2023
1450	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6407	Communication Systems	2023
1451	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6408	Communication Systems Lab	2023
1452	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6411	Artificial Neural Network	2023
1453	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6412	Artificial Neural Network Lab	2023
1454	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6417	Web Designing Technologies	2023
1455	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6418	Web Designing Technologies Lab	2023
1456	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6502	Computer Architecture	2023
1457	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6503	Java Programming	2023
1458	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6504	Advance Data Structures & Algorithm	2023
1459	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6515	Microprocessor	2023
1460	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6516	Theory of Automata & Computation	2023
1461	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6507	Java Programming Lab	2023
1462	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6508	Python Programming Lab	2023
1463	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6509	Advance Data Structures & Algorithm Lab	2023
1464	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6517	Microprocessor Lab	2023
1465	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6535	Summer Internship Evaluation-I	2023
1466	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6511	Fuzzy Logic& Genetic Algorithm	2023
1467	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6512	VHDL Programming	2023
1468	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6513	VHDL Programming Lab	2023
1469	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6518	Advanced Web Designing Technologies	2023
1470	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6519	Advanced Web Designing Technologies Lab	2023

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1471	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6603	Advanced Java Programming	2023
1472	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6604	Advance Database Management System	2023
1473	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6605	Digital Computer Organization	2023
1474	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6614	Software Engineering	2023
1475	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6615	Internet of Things & Wireless Sensor Networks	2023
1476	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6608	Advanced Java Programming Lab	2023
1477	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6609	Advance Database Management System Lab	2023
1478	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6616	Software Engineering Lab	2023
1479	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6637	Minor Project-I	2023
1480	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6612	VLSI Design	2023
1481	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6613	VLSI Design Lab	2023
1482	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6617	Open Source Technologies	2023
1483	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6618	Open Source Technologies Lab	2023
1484	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6619	Data Mining	2023
1485	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6702	Computer Graphics	2023
1486	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6704	Advanced Computer Networks	2023
1487	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6713	Cryptography & Network Security	2023
1488	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6714	System Programming & Compiler Construction	2023
1489	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6706	Computer Graphics Lab	2023
1490	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6707	Advanced Computer Networks Lab	2023
1491	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6708	MATLAB Programming	2023
1492	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6715	Network Security Lab	2023

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1493	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6716	System Programming & Compiler Construction Lab	2023
1494	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6735	Summer Internship Evaluation-II	2023
1495	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6737	Minor Project-II	2023
1496	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6710	Mobile Computing	2023
1497	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6717	Robotic Process Automation Design & Development	2023
1498	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6718	Responsive Web Design	2023
1499	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6719	Responsive Web Design Lab	2023
1500	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6809	Research Methodology & Technical Report Writing	2023
1501	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6837	Major Project	2023
1502	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	RBE6801	Fundamental of Robotics System & Robot Programming	2023
1503	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	RBE6802	Advanced Control Systems & Drives for Robots	2023
1504	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	RBE6803	Microprocessor and Interfacing	2023
1505	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	RBE6804	Kinematics & Dynamics of Robots	2023
1506	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	RBE6805	Advanced Applied Mathematics for Engineering	2023
1507	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	RBE6806	Fundamental of Robotics System & Robot Programming Lab	2023
1508	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	RBE6807	Advanced Control Systems & Drives for Robots Lab	2023
1509	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	RBE6808	Microprocessor and Interfacing Lab	2023
1510	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	RBE6809	Digital Image Processing	2023
1511	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	RBE6810	Digital Image Processing Lab	2023
1512	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	RBE6811	Dot Net Programming	2023
1513	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	RBE6812	Dot Net Programming Lab	2023
1514	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	RBE6813	Advance Robotic Process Automation Design & Development	2023

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1515	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	MLE6801	Applied Statistical Analysis	2023
1516	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	MLE6802	Data Mining & Predictive Analysis	2023
1517	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	MLE6803	Data Warehousing and Multi-dimensional Modelling	2023
1518	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	MLE6804	Big Data Technologies	2023
1519	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	MLE6805	Applied Statistical Analysis Lab	2023
1520	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	MLE6806	Data Mining & Predictive Analysis Lab	2023
1521	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	MLE6807	Data Warehousing and Multi-dimensional Modelling Lab	2023
1522	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	MLE6808	R-Programming Lab	2023
1523	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	MLE6809	Digital Image Processing	2023
1524	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	MLE6810	Digital Image Processing Lab	2023
1525	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	MLE6811	Dot Net Programming	2023
1526	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	MLE6812	Dot Net Programming Lab	2023
1527	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	MLE6813	Advance Robotic Process Automation Design & Development	2023
1528	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6935	Summer Internship Evaluation-III	2023
1529	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6937	Project-Dissertation-I	2023
1530	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	RBE6901	Automation in Manufacturing Systems	2023
1531	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	RBE6902	Robotic Sensors, Vision and Hardware Implementation	2023
1532	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	RBE6903	Pattern Recognition & Image Processing	2023
1533	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	RBE6904	Robotic Sensors, Vision and Hardware Implementation Lab	2023
1534	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	RBE6905	Pattern Recognition & Image Processing Lab	2023
1535	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	RBE6906	Optimization Techniques	2023
1536	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	RBE6907	CNC Machines & Adaptive Control	2023

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1537	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	RBE6908	Neural Network and Fuzzy Logic	2023
1538	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	RBE6909	Neural Network and Fuzzy Logic Lab	2023
1539	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	RBE6910	Decision Making Systems	2023
1540	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	RBE6911	Decision Making Systems Lab	2023
1541	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	MLE6901	Pattern Recognition and Image Processing	2023
1542	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	MLE6902	Neural Network and Fuzzy Logic	2023
1543	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	MLE6903	Natural Language Processing	2023
1544	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	MLE6904	Pattern Recognition and Image Processing Lab	2023
1545	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	MLE6905	Neural Network and Fuzzy Logic Lab	2023
1546	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	MLE6906	Hadoop Lab	2023
1547	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	MLE6907	Descriptive Analysis	2023
1548	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	MLE6908	Optimization Techniques	2023
1549	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	MLE6909	Social Network Data Analytics	2023
1550	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	MLE6910	Agent Based Intelligent Systems	2023
1551	131326	B.Tech. + M.Tech. Artificial Intelligence & Machine Learning	AIE6037	Project-Dissertation-II	2023
1552	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6101	Engineering Mathematics-I	2023
1553	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6102	Engineering Physics	2023
1554	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6104	Introduction to Computers & Programming in C	2023
1555	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6109	Elements of Mechanical Engineering	2023
1556	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6105	Engineering Physics Lab	2023
1557	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6106	Programming in C Lab	2023
1558	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6110	Elements of Mechanical Engineering Lab	2023

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1559	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6201	Engineering Mathematics-II	2023
1560	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6202	Engineering Chemistry	2023
1561	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6204	Object Oriented Programming using C++	2023
1562	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6210	Engineering Mechanics	2023
1563	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6212	Basics of Electrical & Electronics Engineering	2023
1564	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6207	Engineering Chemistry Lab	2023
1565	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6208	Object Oriented Programming using C++ Lab	2023
1566	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6211	Engineering Graphics Lab	2023
1567	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6213	Basics of Electrical & Electronics Engineering Lab	2023
1568	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6302	Database Management Systems	2023
1569	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6303	Operating Systems	2023
1570	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6304	Data Structures using C	2023
1571	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6313	Digital Electronics	2023
1572	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6305	Data Structures using C Lab	2023
1573	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6307	Database Management System Lab	2023
1574	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6308	UNIX Programming Lab	2023
1575	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6314	Digital Electronics Lab	2023
1576	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6310	E-Commerce & ERP	2023
1577	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6311	Electronic Devices and Circuits	2023
1578	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6312	Electronic Devices and Circuits Lab	2023
1579	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6315	Statistics & Probability Concepts	2023
1580	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6403	Discrete Mathematics	2023

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1581	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6404	Artificial Intelligence	2023
1582	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6413	Analysis & Design of Algorithm	2023
1583	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6414	Data Communication & Computer Networks	2023
1584	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6406	Artificial Intelligence Lab	2023
1585	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6415	Data Communication & Computer Networks Lab	2023
1586	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6416	Analysis & Design of Algorithm Lab	2023
1587	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6407	Communication Systems	2023
1588	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6408	Communication Systems Lab	2023
1589	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6411	Artificial Neural Network	2023
1590	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6412	Artificial Neural Network Lab	2023
1591	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6417	Web Designing Technologies	2023
1592	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6418	Web Designing Technologies Lab	2023
1593	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6502	Computer Architecture	2023
1594	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6503	Java Programming	2023
1595	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6504	Advance Data Structures & Algorithm	2023
1596	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6515	Microprocessor	2023
1597	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6516	Theory of Automata & Computation	2023
1598	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6507	Java Programming Lab	2023
1599	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6508	Python Programming Lab	2023
1600	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6509	Advance Data Structures & Algorithm Lab	2023
1601	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6517	Microprocessor Lab	2023
1602	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6535	Summer Internship Evaluation-I	2023

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1603	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6511	Fuzzy Logic& Genetic Algorithm	2023
1604	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6512	VHDL Programming	2023
1605	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6513	VHDL Programming Lab	2023
1606	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6518	Advanced Web Designing Technologies	2023
1607	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6519	Advanced Web Designing Technologies Lab	2023
1608	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6603	Advanced Java Programming	2023
1609	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6604	Advance Database Management System	2023
1610	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6605	Digital Computer Organization	2023
1611	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6614	Software Engineering	2023
1612	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6615	Internet of Things & Wireless Sensor Networks	2023
1613	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6608	Advanced Java Programming Lab	2023
1614	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6609	Advance Database Management System Lab	2023
1615	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6619	Software Engineering Lab	2023
1616	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6637	Minor Project-I	2023
1617	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6612	VLSI Design	2023
1618	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6613	VLSI Design Lab	2023
1619	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6616	Open Source Technologies	2023
1620	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6617	Open Source Technologies Lab	2023
1621	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6618	Data Mining	2023
1622	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6702	Computer Graphics	2023
1623	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6704	Advanced Computer Networks	2023
1624	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6713	Cryptography & Network Security	2023

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1625	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6714	System Programming & Compiler Construction	2023
1626	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6706	Computer Graphics Lab	2023
1627	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6707	Advanced Computer Networks Lab	2023
1628	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6708	MATLAB Programming	2023
1629	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6715	System Programming & Compiler Construction Lab	2023
1630	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6718	Network Security Lab	2023
1631	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6735	Summer Internship Evaluation-II	2023
1632	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6737	Minor Project-II	2023
1633	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6710	Mobile Computing	2023
1634	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6716	Robotic Process Automation Design & Development	2023
1635	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6717	Responsive Web Design	2023
1636	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6719	Responsive Web Design Lab	2023
1637	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6801	Mathematical Foundation for Cyber Security	2023
1638	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6802	Network and Wireless Security	2023
1639	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6803	Cyber Crime and IT Law	2023
1640	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6804	Cyber Crime Investigation & Forensics	2023
1641	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6805	Intrusion Detection & Prevention System	2023
1642	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6806	Cryptography Foundation Lab	2023
1643	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6807	Web Security Lab	2023
1644	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6808	Network & Wireless Security Lab	2023
1645	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6809	Research Methodology & Technical Report Writing	2023
1646	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6837	Major Project	2023

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1647	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6812	Digital Image Processing	2023
1648	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6813	Digital Image Processing Lab	2023
1649	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6814	Dot Net Programming	2023
1650	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6815	Dot Net Programming Lab	2023
1651	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6816	Advance Robotic Process Automation Design & Development	2023
1652	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6901	Biometric Systems & Biometric Image Processing	2023
1653	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6902	Software Vulnerability Analysis	2023
1654	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6903	Applied Cryptography	2023
1655	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6904	Biometric Image Processing Lab	2023
1656	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6905	Applied Cryptography Lab	2023
1657	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6935	Summer Internship Evaluation-III	2023
1658	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6937	Project-Dissertation-I	2023
1659	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6906	Web Application & Penetration Testing	2023
1660	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6907	Malware Analysis in Network Security	2023
1661	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6908	Web Security	2023
1662	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6909	Digital Watermarking & Steganography	2023
1663	131124	B.Tech. + M.Tech. Network & Cyber Security	NCE6037	Project-Dissertation-II	2023
1664	131123	B.Tech. + M.Tech. Data Science	DSE6101	Engineering Mathematics-I	2023
1665	131123	B.Tech. + M.Tech. Data Science	DSE6102	Engineering Physics	2023
1666	131123	B.Tech. + M.Tech. Data Science	DSE6104	Introduction to Computers & Programming in C	2023
1667	131123	B.Tech. + M.Tech. Data Science	DSE6109	Elements of Mechanical Engineering	2023
1668	131123	B.Tech. + M.Tech. Data Science	DSE6105	Engineering Physics Lab	2023
1669	131123	B.Tech. + M.Tech. Data Science	DSE6106	Programming in C Lab	2023
1670	131123	B.Tech. + M.Tech. Data Science	DSE6110	Elements of Mechanical Engineering Lab	2023

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1671	131123	B.Tech. + M.Tech. Data Science	DSE6201	Engineering Mathematics-II	2023
1672	131123	B.Tech. + M.Tech. Data Science	DSE6202	Engineering Chemistry	2023
1673	131123	B.Tech. + M.Tech. Data Science	DSE6204	Object Oriented Programming using C++	2023
1674	131123	B.Tech. + M.Tech. Data Science	DSE6210	Engineering Mechanics	2023
1675	131123	B.Tech. + M.Tech. Data Science	DSE6212	Basics of Electrical & Electronics Engineering	2023
1676	131123	B.Tech. + M.Tech. Data Science	DSE6207	Engineering Chemistry Lab	2023
1677	131123	B.Tech. + M.Tech. Data Science	DSE6208	Object Oriented Programming using C++ Lab	2023
1678	131123	B.Tech. + M.Tech. Data Science	DSE6211	Engineering Graphics Lab	2023
1679	131123	B.Tech. + M.Tech. Data Science	DSE6213	Basics of Electrical & Electronics Engineering Lab	2023
1680	131123	B.Tech. + M.Tech. Data Science	DSE6302	Database Management Systems	2023
1681	131123	B.Tech. + M.Tech. Data Science	DSE6303	Operating Systems	2023
1682	131123	B.Tech. + M.Tech. Data Science	DSE6304	Data Structures using C	2023
1683	131123	B.Tech. + M.Tech. Data Science	DSE6313	Digital Electronics	2023
1684	131123	B.Tech. + M.Tech. Data Science	DSE6305	Data Structures using C Lab	2023
1685	131123	B.Tech. + M.Tech. Data Science	DSE6307	Database Management System Lab	2023
1686	131123	B.Tech. + M.Tech. Data Science	DSE6308	UNIX Programming Lab	2023
1687	131123	B.Tech. + M.Tech. Data Science	DSE6314	Digital Electronics Lab	2023
1688	131123	B.Tech. + M.Tech. Data Science	DSE6310	E-Commerce & ERP	2023
1689	131123	B.Tech. + M.Tech. Data Science	DSE6311	Electronic Devices and Circuits	2023
1690	131123	B.Tech. + M.Tech. Data Science	DSE6312	Electronic Devices and Circuits Lab	2023
1691	131123	B.Tech. + M.Tech. Data Science	DSE6315	Statistics & Probability Concepts	2023
1692	131123	B.Tech. + M.Tech. Data Science	DSE6403	Discrete Mathematics	2023
1693	131123	B.Tech. + M.Tech. Data Science	DSE6404	Artificial Intelligence	2023
1694	131123	B.Tech. + M.Tech. Data Science	DSE6413	Analysis & Design of Algorithm	2023
1695	131123	B.Tech. + M.Tech. Data Science	DSE6414	Data Communication & Computer Networks	2023
1696	131123	B.Tech. + M.Tech. Data Science	DSE6406	Artificial Intelligence Lab	2023
1697	131123	B.Tech. + M.Tech. Data Science	DSE6415	Data Communication & Computer Networks Lab	2023
1698	131123	B.Tech. + M.Tech. Data Science	DSE6416	Analysis & Design of Algorithm Lab	2023
1699	131123	B.Tech. + M.Tech. Data Science	DSE6407	Communication Systems	2023
1700	131123	B.Tech. + M.Tech. Data Science	DSE6408	Communication Systems Lab	2023
1701	131123	B.Tech. + M.Tech. Data Science	DSE6411	Artificial Neural Network	2023
1702	131123	B.Tech. + M.Tech. Data Science	DSE6412	Artificial Neural Network Lab	2023
1703	131123	B.Tech. + M.Tech. Data Science	DSE6417	Web Designing Technologies	2023
1704	131123	B.Tech. + M.Tech. Data Science	DSE6418	Web Designing Technologies Lab	2023
1705	131123	B.Tech. + M.Tech. Data Science	DSE6502	Computer Architecture	2023
1706	131123	B.Tech. + M.Tech. Data Science	DSE6503	Java Programming	2023
1707	131123	B.Tech. + M.Tech. Data Science	DSE6504	Advance Data Structures & Algorithm	2023

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1708	131123	B.Tech. + M.Tech. Data Science	DSE6515	Microprocessor	2023
1709	131123	B.Tech. + M.Tech. Data Science	DSE6516	Theory of Automata & Computation	2023
1710	131123	B.Tech. + M.Tech. Data Science	DSE6507	Java Programming Lab	2023
1711	131123	B.Tech. + M.Tech. Data Science	DSE6508	Python Programming Lab	2023
1712	131123	B.Tech. + M.Tech. Data Science	DSE6509	Advance Data Structures & Algorithm Lab	2023
1713	131123	B.Tech. + M.Tech. Data Science	DSE6517	Microprocessor Lab	2023
1714	131123	B.Tech. + M.Tech. Data Science	DSE6535	Summer Internship Evaluation-I	2023
1715	131123	B.Tech. + M.Tech. Data Science	DSE6511	Fuzzy Logic& Genetic Algorithm	2023
1716	131123	B.Tech. + M.Tech. Data Science	DSE6512	VHDL Programming	2023
1717	131123	B.Tech. + M.Tech. Data Science	DSE6513	VHDL Programming Lab	2023
1718	131123	B.Tech. + M.Tech. Data Science	DSE6518	Advanced Web Designing Technologies	2023
1719	131123	B.Tech. + M.Tech. Data Science	DSE6519	Advanced Web Designing Technologies Lab	2023
1720	131123	B.Tech. + M.Tech. Data Science	DSE6603	Advanced Java Programming	2023
1721	131123	B.Tech. + M.Tech. Data Science	DSE6604	Advance Database Management System	2023
1722	131123	B.Tech. + M.Tech. Data Science	DSE6605	Digital Computer Organization	2023
1723	131123	B.Tech. + M.Tech. Data Science	DSE6614	Software Engineering	2023
1724	131123	B.Tech. + M.Tech. Data Science	DSE6615	Internet of Things & Wireless Sensor Networks	2023
1725	131123	B.Tech. + M.Tech. Data Science	DSE6608	Advanced Java Programming Lab	2023
1726	131123	B.Tech. + M.Tech. Data Science	DSE6609	Advance Database Management System Lab	2023
1727	131123	B.Tech. + M.Tech. Data Science	DSE6616	Software Engineering Lab	2023
1728	131123	B.Tech. + M.Tech. Data Science	DSE6637	Minor Project-I	2023
1729	131123	B.Tech. + M.Tech. Data Science	DSE6612	VLSI Design	2023
1730	131123	B.Tech. + M.Tech. Data Science	DSE6613	VLSI Design Lab	2023
1731	131123	B.Tech. + M.Tech. Data Science	DSE6617	Open Source Technologies	2023
1732	131123	B.Tech. + M.Tech. Data Science	DSE6618	Open Source Technologies Lab	2023
1733	131123	B.Tech. + M.Tech. Data Science	DSE6619	Data Mining	2023
1734	131123	B.Tech. + M.Tech. Data Science	DSE6702	Computer Graphics	2023
1735	131123	B.Tech. + M.Tech. Data Science	DSE6704	Advanced Computer Networks	2023
1736	131123	B.Tech. + M.Tech. Data Science	DSE6713	Cryptography & Network Security	2023
1737	131123	B.Tech. + M.Tech. Data Science	DSE6714	System Programming & Compiler Construction	2023
1738	131123	B.Tech. + M.Tech. Data Science	DSE6706	Computer Graphics Lab	2023
1739	131123	B.Tech. + M.Tech. Data Science	DSE6707	Advanced Computer Networks Lab	2023
1740	131123	B.Tech. + M.Tech. Data Science	DSE6708	MATLAB Programming	2023
1741	131123	B.Tech. + M.Tech. Data Science	DSE6715	Network Security Lab	2023
1742	131123	B.Tech. + M.Tech. Data Science	DSE6716	System Programming & Compiler Construction Lab	2023
1743	131123	B.Tech. + M.Tech. Data Science	DSE6735	Summer Internship Evaluation-II	2023

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1744	131123	B.Tech. + M.Tech. Data Science	DSE6737	Minor Project-II	2023
1745	131123	B.Tech. + M.Tech. Data Science	DSE6710	Mobile Computing	2023
1746	131123	B.Tech. + M.Tech. Data Science	DSE6717	Robotic Process Automation Design & Development	2023
1747	131123	B.Tech. + M.Tech. Data Science	DSE6718	Responsive Web Design	2023
1748	131123	B.Tech. + M.Tech. Data Science	DSE6719	Responsive Web Design Lab	2023
1749	131123	B.Tech. + M.Tech. Data Science	DSE6801	Applied Statistical Analysis	2023
1750	131123	B.Tech. + M.Tech. Data Science	DSE6802	Data Mining & Predictive Analytics	2023
1751	131123	B.Tech. + M.Tech. Data Science	DSE6803	Data Warehousing & Multi-dimensional Modelling	2023
1752	131123	B.Tech. + M.Tech. Data Science	DSE6804	Database & Knowledge Base Systems	2023
1753	131123	B.Tech. + M.Tech. Data Science	DSE6805	Big Data Technologies	2023
1754	131123	B.Tech. + M.Tech. Data Science	DSE6806	Applied Statically Analysis Lab	2023
1755	131123	B.Tech. + M.Tech. Data Science	DSE6807	Data Mining & Predictive Analytics Lab	2023
1756	131123	B.Tech. + M.Tech. Data Science	DSE6808	Data Warehousing & Multi-dimensional Modelling Lab	2023
1757	131123	B.Tech. + M.Tech. Data Science	DSE6809	Research Methodology & Technical Report Writing	2023
1758	131123	B.Tech. + M.Tech. Data Science	DSE6837	Major Project	2023
1759	131123	B.Tech. + M.Tech. Data Science	DSE6812	Digital Image Processing	2023
1760	131123	B.Tech. + M.Tech. Data Science	DSE6813	Digital Image Processing Lab	2023
1761	131123	B.Tech. + M.Tech. Data Science	DSE6814	Dot Net Programming	2023
1762	131123	B.Tech. + M.Tech. Data Science	DSE6815	Dot Net Programming Lab	2023
1763	131123	B.Tech. + M.Tech. Data Science	DSE6816	Advance Robotic Process Automation Design & Development	2023
1764	131123	B.Tech. + M.Tech. Data Science	DSE6901	Descriptive Analysis	2023
1765	131123	B.Tech. + M.Tech. Data Science	DSE6902	Learning & Reasoning with Bayesian Networks	2023
1766	131123	B.Tech. + M.Tech. Data Science	DSE6903	Social Network Data Analytics	2023
1767	131123	B.Tech. + M.Tech. Data Science	DSE6904	R-Programming Lab	2023
1768	131123	B.Tech. + M.Tech. Data Science	DSE6905	Hadoop Lab	2023
1769	131123	B.Tech. + M.Tech. Data Science	DSE6935	Summer Internship Evaluation-III	2023
1770	131123	B.Tech. + M.Tech. Data Science	DSE6937	Project-Dissertation-I	2023
1771	131123	B.Tech. + M.Tech. Data Science	DSE6906	Web Technology	2023
1772	131123	B.Tech. + M.Tech. Data Science	DSE6907	Service Oriented Architecture	2023
1773	131123	B.Tech. + M.Tech. Data Science	DSE6908	Natural Language Processing	2023
1774	131123	B.Tech. + M.Tech. Data Science	DSE6909	Agent Based Intelligent Systems	2023
1775	131123	B.Tech. + M.Tech. Data Science	DSE6037	Project-Dissertation-II	2023
1776	13684	Master of Technology (Data Science)	DSE4101	Advanced Data Structure & Algorithms	2023

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1777	13684	Master of Technology (Data Science)	DSE4102	Advanced Database Management Systems	2023
1778	13684	Master of Technology (Data Science)	DSE4103	Digital Computer Organization	2023
1779	13684	Master of Technology (Data Science)	DSE4104	Advanced Computer Networks	2023
1780	13684	Master of Technology (Data Science)	DSE4105	Advanced Data Structure & Algorithms Lab	2023
1781	13684	Master of Technology (Data Science)	DSE4106	Advanced Database Management Systems Lab	2023
1782	13684	Master of Technology (Data Science)	DSE4107	Advanced Computer Networks Lab	2023
1783	13684	Master of Technology (Data Science)	DSE4108	MATLAB Programming	2023
1784	13684	Master of Technology (Data Science)	DSE4109	Python Programming Lab	2023
1785	13684	Master of Technology (Data Science)	DSE4201	Applied Statistical Analysis	2023
1786	13684	Master of Technology (Data Science)	DSE4202	Data Mining & Predictive Analytics	2023
1787	13684	Master of Technology (Data Science)	DSE4203	Data Warehousing & Multi-dimensional Modeling	2023
1788	13684	Master of Technology (Data Science)	DSE4204	Database & Knowledge Base Systems	2023
1789	13684	Master of Technology (Data Science)	DSE4205	Big Data Technologies	2023
1790	13684	Master of Technology (Data Science)	DSE4206	Research Methodology & Technical Report Writing	2023
1791	13684	Master of Technology (Data Science)	DSE4207	Applied Statistical Analysis Lab	2023
1792	13684	Master of Technology (Data Science)	DSE4208	Data Mining & Predictive Analytics Lab	2023
1793	13684	Master of Technology (Data Science)	DSE4209	Data Warehousing & Multi-dimensional Modeling Lab	2023
1794	13684	Master of Technology (Data Science)	DSE4210	Information Management System	2023
1795	13684	Master of Technology (Data Science)	DSE4211	Information System Security	2023
1796	13684	Master of Technology (Data Science)	DSE4301	Descriptive Analysis	2023
1797	13684	Master of Technology (Data Science)	DSE4302	Learning and Reasoning with Bayesian Networks	2023
1798	13684	Master of Technology (Data Science)	DSE4303	Social Network Data Analytics	2023

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1799	13684	Master of Technology (Data Science)	DSE4304	R-Programming Lab	2023
1800	13684	Master of Technology (Data Science)	DSE4305	Hadoop Lab	2023
1801	13684	Master of Technology (Data Science)	DSE4335	Summer Internship Evaluation	2023
1802	13684	Master of Technology (Data Science)	DSE4337	Project Dissertation-I	2023
1803	13684	Master of Technology (Data Science)	DSE4306	Web Technology	2023
1804	13684	Master of Technology (Data Science)	DSE4307	Service Oriented Architecture	2023
1805	13684	Master of Technology (Data Science)	DSE4308	Natural Language Processing	2023
1806	13684	Master of Technology (Data Science)	DSE4309	Agent Based Intelligent Systems	2023
1807	13684	Master of Technology (Data Science)	DSE4437	Project Dissertation-II	2023
1808	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	AIE4101	Advanced Data Structure & Algorithms	2023
1809	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	AIE4102	Advanced Database Management Systems	2023
1810	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	AIE4103	Digital Computer Organization	2023
1811	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	AIE4104	Advanced Computer Networks	2023
1812	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	AIE4105	Advanced Data Structure & Algorithms Lab	2023
1813	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	AIE4106	Advanced Database Management Systems Lab	2023
1814	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	AIE4107	Advanced Computer Networks Lab	2023
1815	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	AIE4108	MATLAB Programming	2023
1816	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	AIE4109	Python Programming Lab	2023

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1817	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	AIE4206	Research Methodology & Technical Report Writing	2023
1818	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	RBE4201	Fundamental of Robotics System & Robot Programming	2023
1819	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	RBE4202	Advanced Control Systems and Drives for Robots	2023
1820	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	RBE4203	Microprocessor and Interfacing	2023
1821	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	RBE4204	Kinematics & Dynamics of Robots	2023
1822	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	RBE4205	Advanced Applied Mathematics for Engineering	2023
1823	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	RBE4206	Fundamental of Robotics System & Robot Programming Lab	2023
1824	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	RBE4207	Advanced Control Systems & Drives for Robots Lab	2023
1825	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	RBE4208	Microprocessor and Interfacing Lab	2023
1826	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	RBE4209	Fundamentals of Artificial Intelligence for Robotics	2023
1827	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	RBE4210	Robotic Simulation & Simultaneous Localization Mapping	2023
1828	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	MLE4201	Applied Statistical Analysis	2023
1829	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	MLE4202	Data Mining and Predictive Analysis	2023
1830	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	MLE4203	Data Warehousing and Multi-dimensional Modeling	2023
1831	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	MLE4204	Big Data Technologies	2023

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1832	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	MLE4205	Applied Statistical Analysis Lab	2023
1833	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	MLE4206	Data Mining and Predictive Analysis Lab	2023
1834	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	MLE4207	Data Warehousing and Multi-dimensional Modeling Lab	2023
1835	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	MLE4208	R-Programming Lab	2023
1836	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	MLE4209	Database and Knowledge Base Systems	2023
1837	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	MLE4210	Information Management System	2023
1838	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	MLE4211	Fundamental of Artificial Intelligence	2023
1839	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	AIE4335	Summer Internship Evaluation	2023
1840	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	AIE4337	Project Dissertation-I	2023
1841	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	RBE4301	Automation in Manufacturing Systems	2023
1842	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	RBE4302	Robotic Sensors, Vision and Hardware Implementation	2023
1843	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	RBE4303	Pattern Recognition & Image Processing	2023
1844	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	RBE4304	Robotic Sensors, Vision and Hardware Implementation Lab	2023
1845	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	RBE4305	Pattern Recognition & Image Processing Lab	2023
1846	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	RBE4306	Optimization Techniques	2023

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1847	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	RBE4307	CNC Machines & Adaptive Control	2023
1848	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	RBE4308	Neural Network and Fuzzy Logic	2023
1849	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	RBE4309	Neural Network and Fuzzy Logic Lab	2023
1850	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	RBE4310	Decision Making Systems	2023
1851	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	RBE4311	Decision Making Systems Lab	2023
1852	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	MLE4301	Pattern Recognition and Image Processing	2023
1853	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	MLE4302	Neural Network and Fuzzy Logic	2023
1854	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	MLE4303	Natural Language Processing	2023
1855	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	MLE4304	Pattern Recognition and Image Processing Lab	2023
1856	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	MLE4305	Neural Network and Fuzzy Logic Lab	2023
1857	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	MLE4306	Hadoop Lab	2023
1858	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	MLE4307	Descriptive Analysis	2023
1859	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	MLE4308	Optimization Techniques	2023
1860	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	MLE4309	Social Network Data Analytics	2023
1861	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	MLE4310	Agent Based Intelligent Systems	2023

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1862	131448	Master of Technology (Artificial Intelligence) (Specialisation: Robotics / Machine Learning)	AIE4437	Project Dissertation-II	2023
1863	131128	Master of Technology (Network & Cyber Security)	NCE4101	Advanced Data Structure & Algorithms	2023
1864	131128	Master of Technology (Network & Cyber Security)	NCE4102	Advanced Database Management Systems	2023
1865	131128	Master of Technology (Network & Cyber Security)	NCE4103	Digital Computer Organization	2023
1866	131128	Master of Technology (Network & Cyber Security)	NCE4104	Advanced Computer Networks	2023
1867	131128	Master of Technology (Network & Cyber Security)	NCE4105	Advanced Data Structure & Algorithms Lab	2023
1868	131128	Master of Technology (Network & Cyber Security)	NCE4106	Advanced Database Management Systems Lab	2023
1869	131128	Master of Technology (Network & Cyber Security)	NCE4107	Advanced Computer Networks Lab	2023
1870	131128	Master of Technology (Network & Cyber Security)	NCE4108	MATLAB Programming	2023
1871	131128	Master of Technology (Network & Cyber Security)	NCE4109	Python Programming Lab	2023
1872	131128	Master of Technology (Network & Cyber Security)	NCE4201	Mathematical Foundation for Cyber Security	2023
1873	131128	Master of Technology (Network & Cyber Security)	NCE4202	Network and Wireless Security	2023
1874	131128	Master of Technology (Network & Cyber Security)	NCE4203	Cyber Crime and IT Law	2023
1875	131128	Master of Technology (Network & Cyber Security)	NCE4204	Cyber Crime Investigation & Forensics	2023
1876	131128	Master of Technology (Network & Cyber Security)	NCE4205	Intrusion Detection & Prevention System	2023
1877	131128	Master of Technology (Network & Cyber Security)	NCE4206	Research Methodology & Technical Report Writing	2023
1878	131128	Master of Technology (Network & Cyber Security)	NCE4207	Cryptography Foundation Lab	2023
1879	131128	Master of Technology (Network & Cyber Security)	NCE4208	Web Security Lab	2023
1880	131128	Master of Technology (Network & Cyber Security)	NCE4209	Network Security Lab	2023
1881	131128	Master of Technology (Network & Cyber Security)	NCE4210	Big Data Systems	2023
1882	131128	Master of Technology (Network & Cyber Security)	NCE4211	Distributed System Security	2023
1883	131128	Master of Technology (Network & Cyber Security)	NCE4212	Block Chain Technology	2023

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1884	131128	Master of Technology (Network & Cyber Security)	NCE4301	Biometric Systems & Biometric Image Processing	2023
1885	131128	Master of Technology (Network & Cyber Security)	NCE4302	Software Vulnerability Analysis	2023
1886	131128	Master of Technology (Network & Cyber Security)	NCE4303	Applied Cryptography	2023
1887	131128	Master of Technology (Network & Cyber Security)	NCE4304	Biometric Image Processing Lab	2023
1888	131128	Master of Technology (Network & Cyber Security)	NCE4305	Applied Cryptography Lab	2023
1889	131128	Master of Technology (Network & Cyber Security)	NCE4335	Summer Internship Evaluation	2023
1890	131128	Master of Technology (Network & Cyber Security)	NCE4337	Project Dissertation-I	2023
1891	131128	Master of Technology (Network & Cyber Security)	NCE4306	Web Application & Penetration Testing	2023
1892	131128	Master of Technology (Network & Cyber Security)	NCE4307	Malware Analysis in Network Security	2023
1893	131128	Master of Technology (Network & Cyber Security)	NCE4308	Web Security	2023
1894	131128	Master of Technology (Network & Cyber Security)	NCE4309	Digital Watermarking & Stagenography	2023
1895	131128	Master of Technology (Network & Cyber Security)	NCE4437	Project Dissertation-II	2023
1896	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2151	Computer Programming with C Language	2023
1897	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2152	Computer Programming with C Language Lab	2023
1898	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2101	Computer Fundamentals	2023
1899	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2102	Computer Fundamentals Lab	2023
1900	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2103	Digital Electronics	2023
1901	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2251	Data Structure	2023
1902	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2252	Data Structure Lab	2023

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1903	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2201	Java Programming	2023
1904	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2202	Java Programming Lab	2023
1905	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2351	Operating System	2023
1906	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2352	Operating System Lab	2023
1907	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2301	Object Oriented Programming	2023
1908	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2302	Object Oriented Programming Lab	2023
1909	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	SIFT2301	Robotic Process Automation	2023
1910	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	NIFT2335	Community Engagement Services	2023
1911	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2451	Introduction to Database Management System	2023
1912	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2452	Introduction to Database Management System Lab	2023
1913	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2401	Design & Analysis of Algorithm	2023
1914	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2402	Design & Analysis of Algorithm Lab	2023
1915	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	SIFT2401	Network Design and Management	2023
1916	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2551	Data Communication & Computer Network	2023
1917	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2552	Data Communication & Computer Network Lab	2023

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1918	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2501	Software Engineering	2023
1919	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2502	Software Engineering Lab	2023
1920	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2503	Web Technology	2023
1921	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2504	Web Technology Lab	2023
1922	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2505	Internet of Things	2023
1923	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2506	Internet of Things Lab	2023
1924	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	NIFT2537	SIP/Internship/ Project/ Dissertation/Field Visit	2023
1925	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2651	Artificial Intelligence & Expert System	2023
1926	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2652	Artificial Intelligence & Expert System Lab	2023
1927	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2601	Data Warehousing & Data Mining	2023
1928	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2602	Data Warehousing & Data Mining Lab	2023
1929	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2603	Computer Graphics	2023
1930	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2604	Computer Graphics Lab	2023
1931	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2607	Web Technology using Node JS and Mongo DB	2023
1932	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2608	Web Technology using Node JS and Mongo DB Lab	2023

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1933	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2609	Cryptography and Network Security	2023
1934	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2610	Cryptography and Network Security Lab	2023
1935	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2701	Cloud Computing	2023
1936	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2702	Cloud Computing Lab	2023
1937	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2703	Blockchain Technology	2023
1938	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2704	Blockchain Technology Lab	2023
1939	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2705	Mobile Computing	2023
1940	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2706	Multimedia	2023
1941	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2739	Basics of Research Methodology, Ethics and Research Communication	2023
1942	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	NIFT2737	SIP/Internship/ Project/ Dissertation/Field Visit	2023
1943	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2801	Data Science	2023
1944	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2802	Data Science Lab	2023
1945	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2803	Machine Learning	2023
1946	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2804	Machine Learning Lab	2023
1947	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2805	Cyber Security	2023

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1948	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2806	Software Defined Networking	2023
1949	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	NIFT2837	SIP/Internship/ Project/ Dissertation/Field Visit	2023
1950	131594	Bachelor of Science (Honors/ Honors with Research) in Information Technology	DIFT2839	Data Analysis & Visualisation using Software	2023
1951	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2151	Computer Programming with C Language	2023
1952	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2152	Computer Programming with C Language Lab	2023
1953	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2101	Computer Fundamentals	2023
1954	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2102	Computer Fundamentals Lab	2023
1955	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2103	Digital Electronics	2023
1956	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2251	Data Structure	2023
1957	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2252	Data Structure Lab	2023
1958	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2203	Introduction to Database Management System	2023
1959	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2204	Introduction to Database Management System Lab	2023
1960	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2353	Concepts of Object Oriented Programming	2023
1961	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2354	Concepts of Object Oriented Programming Lab	2023
1962	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2303	Introduction to Operating System	2023
1963	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2304	Linux Administration	2023
1964	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2305	Linux Administration Lab	2023
1965	131508	Bachelor of Computer Application (Honors/ Honors with Research)	SIFT2301	Robotic Process Automation	2023
1966	131508	Bachelor of Computer Application (Honors/ Honors with Research)	NIFT2335	Community Engagement Services	2023
1967	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2453	Computer Networks	2023
1968	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2454	Computer Networks Lab	2023

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1969	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2403	Analysis and Design of Algorithm	2023
1970	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2404	Analysis and Design of Algorithm Lab	2023
1971	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2405	Statistics & Probability Theory	2023
1972	131508	Bachelor of Computer Application (Honors/ Honors with Research)	SIFT2402	Android Programming	2023
1973	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2553	Internet of Things and Wireless Sensor Network	2023
1974	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2554	Internet of Things and Wireless Sensor Network Lab	2023
1975	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2503	Web Technology	2023
1976	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2504	Web Technology Lab	2023
1977	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2501	Software Engineering	2023
1978	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2502	Software Engineering Lab	2023
1979	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2507	Numerical Methods	2023
1980	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2508	Numerical Methods Lab	2023
1981	131508	Bachelor of Computer Application (Honors/ Honors with Research)	NIFT2537	SIP/Internship/ Project/ Dissertation/Field Visit	2023
1982	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2651	Artificial Intelligence & Expert System	2023
1983	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2652	Artificial Intelligence & Expert System Lab	2023
1984	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2601	Data Warehousing & Data Mining	2023
1985	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2602	Data Warehousing & Data Mining Lab	2023
1986	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2605	Relational Database Management System	2023
1987	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2606	Relational Database Management System Lab	2023
1988	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2611	Mobile App Development	2023
1989	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2612	Mobile App Development Lab	2023
1990	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2613	Computer Vision	2023

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1991	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2614	Computer Vision Lab	2023
1992	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2701	Cloud Computing	2023
1993	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2702	Cloud Computing Lab	2023
1994	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2703	Blockchain Technology	2023
1995	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2704	Blockchain Technology Lab	2023
1996	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2705	Mobile Computing	2023
1997	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2706	Multimedia	2023
1998	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2739	Basics of Research Methodology, Ethics and Research Communication	2023
1999	131508	Bachelor of Computer Application (Honors/ Honors with Research)	NIFT2737	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2000	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2801	Data Science	2023
2001	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2802	Data Science Lab	2023
2002	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2803	Machine Learning	2023
2003	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2804	Machine Learning Lab	2023
2004	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2805	Cyber Security	2023
2005	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2806	Software Defined Networking	2023
2006	131508	Bachelor of Computer Application (Honors/ Honors with Research)	NIFT2837	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2007	131508	Bachelor of Computer Application (Honors/ Honors with Research)	DIFT2839	Data Analysis & Visualisation using Software	2023
2008	131450	Master of Computer Application	IFT4101	Data Communication and Computer Networks	2023
2009	131450	Master of Computer Application	IFT4102	Design and Analysis of Algorithm	2023
2010	131450	Master of Computer Application	IFT4103	Software Engineering	2023
2011	131450	Master of Computer Application	IFT4104	Computer Graphics and Multimedia Systems	2023
2012	131450	Master of Computer Application	IFT4105	Data Communication and Computer Networks Lab	2023
2013	131450	Master of Computer Application	IFT4106	Design and Analysis of Algorithm Lab	2023

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2014	131450	Master of Computer Application	IFT4107	Computer Graphics and Multimedia Systems Lab	2023
2015	131450	Master of Computer Application	IFT4201	Mobile Computing	2023
2016	131450	Master of Computer Application	IFT4202	Programming with Java	2023
2017	131450	Master of Computer Application	IFT4203	Software Project Management	2023
2018	131450	Master of Computer Application	IFT4204	Artificial Intelligence	2023
2019	131450	Master of Computer Application	IFT4205	Programming with Java Lab	2023
2020	131450	Master of Computer Application	IFT4206	Software Project Management Lab	2023
2021	131450	Master of Computer Application	IFT4207	Artificial Intelligence Lab	2023
2022	131450	Master of Computer Application	IFT4238	Seminar	2023
2023	131450	Master of Computer Application	IFT4301	Data Warehousing & Data Mining	2023
2024	131450	Master of Computer Application	IFT4302	Programming with dot NET Framework	2023
2025	131450	Master of Computer Application	IFT4303	Network Security & Cryptography	2023
2026	131450	Master of Computer Application	IFT4304	Soft Computing	2023
2027	131450	Master of Computer Application	IFT4305	Data Warehousing & Data Mining Lab	2023
2028	131450	Master of Computer Application	IFT4306	Programming with dot NET Framework Lab	2023
2029	131450	Master of Computer Application	IFT4307	Soft Computing Lab	2023
2030	131450	Master of Computer Application	IFT4331	Term Paper	2023
2031	131450	Master of Computer Application	IFT4335	Summer Internship Evaluation	2023
2032	131450	Master of Computer Application	IFT4308	Android Programming	2023
2033	131450	Master of Computer Application	IFT4309	Android Programming Lab	2023
2034	131450	Master of Computer Application	IFT4310	Digital Image Processing	2023
2035	131450	Master of Computer Application	IFT4311	Digital Image Processing Lab	2023
2036	131450	Master of Computer Application	IFT4312	Big Data	2023
2037	131450	Master of Computer Application	IFT4313	Big Data Lab	2023
2038	131450	Master of Computer Application	IFT4401	Machine Learning using Python	2023
2039	131450	Master of Computer Application	IFT4402	Cloud Computing	2023
2040	131450	Master of Computer Application	IFT4403	Machine Learning using Python Lab	2023
2041	131450	Master of Computer Application	IFT4437	Major Project / Dissertation	2023
2042	131038	Master of Science (Renewable Energy) Part-Time	RWP4101	Renewable Energy Conversion Systems	2023
2043	131038	Master of Science (Renewable Energy) Part-Time	RWP4102	Introduction to Solar Photovoltaics	2023
2044	131038	Master of Science (Renewable Energy) Part-Time	RWP4103	Introduction to Solar Thermal Technology	2023
2045	131038	Master of Science (Renewable Energy) Part-Time	RWP4104	Solar Radiation Measurement & Analysis Lab	2023
2046	131038	Master of Science (Renewable Energy) Part-Time	RWP4105	Field Work-I/ Seminar-I	2023
2047	131038	Master of Science (Renewable Energy) Part-Time	RWP4201	Solar Thermal Systems	2023

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2048	131038	Master of Science (Renewable Energy) Part-Time	RWP4202	Fabrication of Solar Cells: Material & Designing Aspects	2023
2049	131038	Master of Science (Renewable Energy) Part-Time	RWP4205	Solar Photovoltaic & Thermal Lab	2023
2050	131038	Master of Science (Renewable Energy) Part-Time	RWP4206	Risk Management in Renewable Energy Projects	2023
2051	131038	Master of Science (Renewable Energy) Part-Time	RWP4207	Wind Energy	2023
2052	131038	Master of Science (Renewable Energy) Part-Time	RWP4208	Fundamentals of Nuclear Power Generation-I	2023
2053	131038	Master of Science (Renewable Energy) Part-Time	RWP4301	Modelling and Simulation of Solar Thermal Systems	2023
2054	131038	Master of Science (Renewable Energy) Part-Time	RWP4303	Biomass	2023
2055	131038	Master of Science (Renewable Energy) Part-Time	RWP4335	Summer Internship Evaluation-I	2023
2056	131038	Master of Science (Renewable Energy) Part-Time	RWP4305	Designing of Solar Projects	2023
2057	131038	Master of Science (Renewable Energy) Part-Time	RWP4306	Large Scale Grid Integration of Renewable Energy Sources	2023
2058	131038	Master of Science (Renewable Energy) Part-Time	RWP4307	Wind Energy: Energy Conversion and Design of Turbines	2023
2059	131038	Master of Science (Renewable Energy) Part-Time	RWP4308	Fundamentals of Nuclear Power Generation-II	2023
2060	131038	Master of Science (Renewable Energy) Part-Time	RWP4407	Instrumental Techniques & Characterization	2023
2061	131038	Master of Science (Renewable Energy) Part-Time	RWP4408	Energy Storage	2023
2062	131038	Master of Science (Renewable Energy) Part-Time	RWP4404	Field Work-II/ Minor Project/ Seminar-II	2023
2063	131038	Master of Science (Renewable Energy) Part-Time	RWP4401	Financial Evaluation of Renewable Energy Systems	2023
2064	131038	Master of Science (Renewable Energy) Part-Time	RWP4405	Energy Access and Planning	2023
2065	131038	Master of Science (Renewable Energy) Part-Time	RWP4406	Thermoelectric Systems and Devices	2023
2066	131038	Master of Science (Renewable Energy) Part-Time	RWP4501	Solar and Wind Energy Meteorology	2023
2067	131038	Master of Science (Renewable Energy) Part-Time	RWP4505	Designing of Solar Rooftop PV System	2023
2068	131038	Master of Science (Renewable Energy) Part-Time	RWP4503	Solar Power Generation Lab	2023
2069	131038	Master of Science (Renewable Energy) Part-Time	RWP4535	Summer Internship Evaluation-II	2023

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2070	131038	Master of Science (Renewable Energy) Part-Time	RWP4502	Biofuels and Biomethanation	2023
2071	131038	Master of Science (Renewable Energy) Part-Time	RWP4504	Smart Grids and Renewables	2023
2072	131038	Master of Science (Renewable Energy) Part-Time	RWP4506	Advanced Energy Systems	2023
2073	131038	Master of Science (Renewable Energy) Part-Time	RWP4601	Energy Policy	2023
2074	131038	Master of Science (Renewable Energy) Part-Time	RWP4602	Energy Management	2023
2075	131038	Master of Science (Renewable Energy) Part-Time	RWP4603	Green Buildings	2023
2076	131038	Master of Science (Renewable Energy) Part-Time	RWP4637	Dissertation / Seminar & Progress Report / Comprehensive Viva	2023
2077	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2151	Inorganic Chemistry-I	2023
2078	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2152	Inorganic Chemistry Lab-I	2023
2079	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2101	Green Chemistry	2023
2080	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2102	Green Chemistry Lab	2023
2081	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2251	Physical Chemistry-I	2023
2082	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2252	Physical Chemistry Lab-I	2023
2083	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2201	Spectroscopy	2023
2084	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2351	Organic Chemistry-I	2023
2085	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2352	Organic Chemistry Lab-I	2023
2086	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2301	Analytical Chemistry	2023

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2087	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2302	Analytical Chemistry Lab	2023
2088	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	SCHY2301	Rubber Technology	2023
2089	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	NCHY2335	Community Engagement Services	2023
2090	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2451	Inorganic Chemistry-II	2023
2091	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2452	Inorganic Chemistry Lab-II	2023
2092	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2401	Organic Chemistry-II	2023
2093	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2402	Organic Chemistry Lab-II	2023
2094	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	SCHY2401	Industrial Application of Carbon Nano Composites	2023
2095	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2501	Physical Chemistry-II	2023
2096	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2502	Physical Chemistry Lab-II	2023
2097	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2503	Organic Chemistry-III	2023
2098	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2504	Organic Chemistry Lab-III	2023
2099	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2551	Introduction to Lab Safety & Training	2023
2100	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2505	Bioinorganic Chemistry	2023
2101	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2506	Agriculture Chemistry	2023

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2102	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2507	Material Chemistry	2023
2103	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	NCHY2537	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2104	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2601	Inorganic Chemistry-III	2023
2105	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2602	Inorganic Chemistry Lab-III	2023
2106	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2603	Physical Chemistry-III	2023
2107	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2604	Physical Chemistry Lab-III	2023
2108	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2651	Basics of Polymer Chemistry	2023
2109	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2605	Industrially Relevant Inorganic Materials	2023
2110	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2606	Biochemistry	2023
2111	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2701	Advanced Inorganic Chemistry	2023
2112	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2702	Advanced Inorganic Chemistry Lab	2023
2113	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2703	Advanced Organic Chemistry	2023
2114	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2704	Advanced Organic Chemistry Lab	2023
2115	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2705	Chemistry: Statistical Method & Data Analysis	2023
2116	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2706	Reagents in Organic Synthesis	2023

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2117	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2707	Chemistry for Physical & Mental well Being (Indian context)	2023
2118	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2708	Chemistry of Medicines in Daily Life	2023
2119	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2709	Advanced Polymer Chemistry	2023
2120	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2710	Radiochemistry in Energy, Medicine & Environment	2023
2121	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2711	Surface Chemistry & Catalysis	2023
2122	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2712	Role of Metals in Medicines	2023
2123	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2713	Energy & Environment	2023
2124	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2714	Chemistry of Heterocycles	2023
2125	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2739	Basics of Research Methodology, Ethics and Research Communication	2023
2126	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	NCHY2737	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2127	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2801	Advanced Physical Chemistry	2023
2128	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2802	Advanced Physical Chemistry Lab	2023
2129	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2803	Chemistry of Fragrances & Flavours	2023
2130	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2804	Organometallics	2023
2131	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2805	Solutions, Colligative Properties, Phase Equillibria & Adsorption	2023

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2132	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2806	Application of Computers in Chemistry	2023
2133	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2807	Nano Chemistry	2023
2134	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2808	Name Reactions in Organic chemistry	2023
2135	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2809	Industrial Chemistry	2023
2136	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2810	Quantum Chemistry	2023
2137	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2811	Green Chemistry in Organic Synthesis	2023
2138	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2812	Natural Product Chemistry	2023
2139	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	NCHY2837	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2140	131546	Bachelor of Science (Honors/ Honors with Research) in Chemistry	DCHY2839	Data Analysis & Visualisation using Software	2023
2141	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2151	Applied Calculus	2023
2142	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2152	Applied Calculus Lab	2023
2143	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2101	Linear Algebra	2023
2144	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2251	Ordinary Differential Equations	2023
2145	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2252	Ordinary Differential Equations Lab	2023
2146	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2201	Group and Ring Theory	2023

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2147	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2351	Partial Differential Equations	2023
2148	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2301	Mathematical Methods	2023
2149	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	SMTH2301	Fundamentals of C Programming	2023
2150	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	SMTH2302	C Programming Lab	2023
2151	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	NMTH2335	Community Engagement Services	2023
2152	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2451	Optimization Techniques	2023
2153	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2452	Optimization Techniques Lab	2023
2154	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2401	Real Analysis-I	2023
2155	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	SMTH2401	Programming with MATLAB	2023
2156	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2501	Complex Analysis	2023
2157	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2502	Numerical Methods	2023
2158	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2503	Numerical Methods Lab	2023
2159	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2551	Probability Theory	2023
2160	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2504	Number Theory	2023
2161	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2505	Discrete Mathematics	2023

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2162	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	NMTH2537	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2163	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2651	Mathematical Statistics	2023
2164	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2652	Statistics Based Lab	2023
2165	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2601	Real Analysis-II	2023
2166	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2602	Financial Mathematics	2023
2167	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2603	Mathematical Modelling	2023
2168	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2604	Analytical Geometry	2023
2169	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2605	Fuzzy Theory	2023
2170	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2701	Measure Theory	2023
2171	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2702	Abstract Algebra	2023
2172	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2703	Integral Equations and Calculus of Variations	2023
2173	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2704	Mechanics	2023
2174	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2705	Advanced Differential Equations	2023
2175	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2706	Scientific Writing with LaTeX	2023
2176	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2707	Number Theory & Cryptography	2023

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2177	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2708	Scientific Tools for Research	2023
2178	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2709	Advanced Complex Analysis	2023
2179	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2710	Statistics inference with Lab	2023
2180	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2739	Basics of Research Methodology, Ethics and Research Communication	2023
2181	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	NMTH2737	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2182	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2801	Advanced Complex Analysis	2023
2183	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2802	Fractional Calculus	2023
2184	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2803	Fluid Dynamics	2023
2185	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2804	Functional Analysis	2023
2186	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2805	Topology	2023
2187	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2806	Numerical Solutions to Differential Equations	2023
2188	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2807	Nature Inspired Optimization Algorithms	2023
2189	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	NMTH2837	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2190	131544	Bachelor of Science (Honors/ Honors with Research) in Mathematics	DMTH2839	Data Analysis & Visualisation using Software	2023
2191	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2151	Mechanics	2023

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2192	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2152	Demonstrative Aspects in Mechanics	2023
2193	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2101	Mathematical Physics-I	2023
2194	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2251	Thermodynamics	2023
2195	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2252	Demonstrative Aspects in Thermodynamics	2023
2196	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2201	Electricity and Magnetism	2023
2197	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2351	Waves and Optics	2023
2198	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2352	Demonstrative Aspects in Waves and Optics	2023
2199	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2301	Classical Mechanics	2023
2200	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2302	Statistical Mechanics	2023
2201	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	SPHY2301	Fundamentals of C Programming	2023
2202	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	SPHY2302	C Programming Lab	2023
2203	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	NPHY2335	Community Engagement Services	2023
2204	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2451	Basics of Electronics	2023
2205	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2452	Demonstrative Aspects in Electronics	2023
2206	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2401	Quantum Mechanics-I	2023
2207	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	SPHY2401	Instrumentation Physics	2023
2208	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2501	Mathematical Physics-II	2023
2209	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2502	Atomic and Molecular Physics	2023
2210	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2503	Demonstrative Aspects in Modern Physics-I	2023
2211	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2504	Renewable Energy Resources	2023
2212	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2505	Numerical Methods	2023
2213	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2506	Laser and Fibre Optics	2023

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2214	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2507	Scientific Computing OR MATLAB	2023
2215	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	NPHY2537	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2216	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2601	Solid State Physics	2023
2217	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2602	Demonstrative Aspects in Modern Physics-II	2023
2218	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2603	Nuclear and Particle Physics	2023
2219	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2651	Materials Science	2023
2220	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2604	Semiconductor Physics and Optoelectronic Devices	2023
2221	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2605	Introduction to Astronomy & Astrophysics	2023
2222	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2606	Low Temperature Physics and Superconductivity	2023
2223	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2607	Physics in Daily Life	2023
2224	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2701	Quantum Mechanics-II	2023
2225	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2702	Mathematical Physics III	2023
2226	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2703	Demonstrative Aspects in Modern Physics-III	2023
2227	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2704	Digital Electronics & Microprocessor	2023
2228	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2705	Advanced Statistical Mechanics	2023
2229	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2706	Energy Physics & Advanced Energy Systems	2023
2230	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2707	Accelerators & Detectors	2023
2231	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2708	Sensors	2023
2232	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2709	Radiation Physics & its Applications	2023
2233	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2710	Vacuum Technology	2023
2234	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2739	Basics of Research Methodology, Ethics and Research Communication	2023
2235	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	NPHY2737	SIP/Internship/ Project/ Dissertation/Field Visit	2023

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2236	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2801	Electrodynamics	2023
2237	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2802	Introduction to Nanotechnology	2023
2238	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2803	Thin Film Technology	2023
2239	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2804	Physics of Solar Photovoltaics	2023
2240	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2805	Atmospheric & Environmental Physics	2023
2241	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2806	Plasma Physics	2023
2242	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2807	Biophysics	2023
2243	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2808	Group Theory & Crystallography	2023
2244	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	NPHY2837	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2245	131545	Bachelor of Science (Honors/ Honors with Research) in Physics	DPHY2839	Data Analysis & Visualisation using Software	2023
2246	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2151	Fundamentals of Forensic Science	2023
2247	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2152	Crime Scene Management Lab	2023
2248	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2101	Physical Evidences	2023
2249	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2102	Physical Evidences Lab	2023
2250	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2251	Fingerprint Science	2023
2251	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2252	Fingerprint Science Lab	2023
2252	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2201	Questioned Documents	2023
2253	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2202	Questioned Documents Lab	2023

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2254	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2351	Forensic Serology	2023
2255	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2352	Forensic Serology Lab	2023
2256	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2301	Instrumentation Biological	2023
2257	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	SFCH2301	Crime Scene Investigation Techniques	2023
2258	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	NFCH2335	Community Engagement Services	2023
2259	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2451	DNA Fingerprinting	2023
2260	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2452	DNA Fingerprinting Lab	2023
2261	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2401	Forensic Toxicology	2023
2262	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2402	Forensic Toxicology Lab	2023
2263	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	SFCH2401	Cyber Forensics	2023
2264	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2551	Computer Forensics	2023
2265	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2501	Instrumentations (Physical and Chemical)	2023
2266	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2502	Forensic Medicine	2023
2267	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2503	Criminology, Criminal Law and Police Administration	2023
2268	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	NFCH2537	SIP/Internship/ Project/ Dissertation/Field Visit	2023

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2269	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2651	Biometric Technology and MATLAB	2023
2270	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2601	Forensic Physics	2023
2271	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2602	Forensic Physics Lab	2023
2272	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2603	Forensic Ballistics	2023
2273	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2604	Forensic Ballistics Lab	2023
2274	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2605	Forensic Anthropology	2023
2275	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2606	Forensic Anthropology Lab	2023
2276	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2701	Forensic Psychology	2023
2277	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2702	Digital Forensics	2023
2278	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2703	Advanced Forensic Chemistry & Toxicology	2023
2279	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2704	Quality Management & Accreditation in Forensic Science Laboratories	2023
2280	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2705	Forensic Genetics	2023
2281	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2706	Introduction to Lab Safety & Training	2023
2282	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2739	Basics of Research Methodology, Ethics and Research Communication	2023
2283	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	NFCH2737	SIP/Internship/ Project/ Dissertation/Field Visit	2023

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2284	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2801	Wild Life Forensic and Entomology	2023
2285	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2802	Cyber Security	2023
2286	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2803	Arson and Explosives	2023
2287	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2804	Advanced Forensic Biology and Serology	2023
2288	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2805	Advanced Questioned Documents and Fingerprints	2023
2289	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	NFCH2837	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2290	131593	Bachelor of Science (Honors/ Honors with Research) in Forensic Science	DFCH2839	Data Analysis & Visualisation using Software	2023
2291	13509	Master of Science (Chemistry)	CHY4101	Physical Chemistry	2023
2292	13509	Master of Science (Chemistry)	CHY4102	Organic Chemistry	2023
2293	13509	Master of Science (Chemistry)	CHY4105	Physical Chemistry Lab	2023
2294	13509	Master of Science (Chemistry)	CHY4106	Organic Chemistry Lab	2023
2295	13509	Master of Science (Chemistry)	CHY4109	Inorganic Chemistry	2023
2296	13509	Master of Science (Chemistry)	CHY4110	Cheminformatics & Bioinformatics	2023
2297	13509	Master of Science (Chemistry)	CHY4111	Foundations of Biochemistry	2023
2298	13509	Master of Science (Chemistry)	CHY4112	Cheminformatics & Bioinformatics Lab	2023
2299	13509	Master of Science (Chemistry)	CHY4108	Research Seminar	2023
2300	13509	Master of Science (Chemistry)	CHY4201	Analytical Chemistry	2023
2301	13509	Master of Science (Chemistry)	CHY4202	Industrial Chemistry	2023
2302	13509	Master of Science (Chemistry)	CHY4211	Organometallic Chemistry	2023
2303	13509	Master of Science (Chemistry)	CHY4212	Introduction to Laboratory Safety	2023
2304	13509	Master of Science (Chemistry)	CHY4213	Spectroscopy	2023
2305	13509	Master of Science (Chemistry)	CHY4206	Analytical Chemistry Lab	2023
2306	13509	Master of Science (Chemistry)	CHY4207	Industrial Chemistry Lab	2023
2307	13509	Master of Science (Chemistry)	CHY4231	Term Paper	2023
2308	13509	Master of Science (Chemistry)	CHY4301	Instrumental Methods of Analysis	2023
2309	13509	Master of Science (Chemistry)	CHY4318	Advanced Organic Chemistry	2023
2310	13509	Master of Science (Chemistry)	CHY4319	Advanced Physical Chemistry	2023
2311	13509	Master of Science (Chemistry)	CHY4323	Advanced Inorganic Chemistry	2023
2312	13509	Master of Science (Chemistry)	CHY4324	Inorganic Chemistry Lab	2023

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2313	13509	Master of Science (Chemistry)	CHY4325	Natural Products & Heterocyclic Chemistry	2023
2314	13509	Master of Science (Chemistry)	CHY4335	Summer Internship Evaluation/ Study Abroad Programme	2023
2315	13509	Master of Science (Chemistry)	CHY4304	Drugs and Dyes	2023
2316	13509	Master of Science (Chemistry)	CHY4305	Advanced Natural Products Chemistry	2023
2317	13509	Master of Science (Chemistry)	CHY4308	Advanced Nanochemistry	2023
2318	13509	Master of Science (Chemistry)	CHY4310	Medicinal Chemistry	2023
2319	13509	Master of Science (Chemistry)	CHY4311	Polymer Technology	2023
2320	13509	Master of Science (Chemistry)	CHY4312	Non-Conventional Energy Sources	2023
2321	13509	Master of Science (Chemistry)	CHY4313	Industrial Waste and Water Treatment	2023
2322	13509	Master of Science (Chemistry)	CHY4314	Nuclear Chemistry	2023
2323	13509	Master of Science (Chemistry)	CHY4315	Food Technology	2023
2324	13509	Master of Science (Chemistry)	CHY4321	Environmental Chemistry	2023
2325	13509	Master of Science (Chemistry)	CHY4322	Renewable Energy Conversion Systems	2023
2326	13509	Master of Science (Chemistry)	CHY4405	Introduction to Polymeric Materials	2023
2327	13509	Master of Science (Chemistry)	CHY4407	Chemistry of Nanomaterials	2023
2328	13509	Master of Science (Chemistry)	CHY4408	Good Laboratory Practices Seminar	2023
2329	13509	Master of Science (Chemistry)	CHY4437	Major Project	2023
2330	13510	Master of Science (Mathematics)	MTH4101	Complex Analysis	2023
2331	13510	Master of Science (Mathematics)	MTH4102	Real Analysis	2023
2332	13510	Master of Science (Mathematics)	MTH4105	Computing and C Programming	2023
2333	13510	Master of Science (Mathematics)	MTH4106	C Programming Lab	2023
2334	13510	Master of Science (Mathematics)	MTH4109	Ordinary Differential Equations	2023
2335	13510	Master of Science (Mathematics)	MTH4110	Linear Algebra	2023
2336	13510	Master of Science (Mathematics)	MTH4205	Topology	2023
2337	13510	Master of Science (Mathematics)	MTH4206	Statistics Based Lab-I	2023
2338	13510	Master of Science (Mathematics)	MTH4213	Partial Differential Equations	2023
2339	13510	Master of Science (Mathematics)	MTH4215	Introduction to MATLAB	2023
2340	13510	Master of Science (Mathematics)	MTH4216	MATLAB Programming Lab	2023
2341	13510	Master of Science (Mathematics)	MTH4217	Operations Research	2023
2342	13510	Master of Science (Mathematics)	MTH4219	Mathematical Statistics	2023
2343	13510	Master of Science (Mathematics)	MTH4325	Numerical Analysis	2023
2344	13510	Master of Science (Mathematics)	MTH4326	Abstract Algebra	2023
2345	13510	Master of Science (Mathematics)	MTH4327	Numerical Analysis Lab	2023
2346	13510	Master of Science (Mathematics)	MTH4343	Probability and Sampling Methods	2023
2347	13510	Master of Science (Mathematics)	MTH4344	Statistics Based Lab-II	2023
2348	13510	Master of Science (Mathematics)	MTH4335	Summer Workshop/ Study Abroad Programme	2023
2349	13510	Master of Science (Mathematics)	MTH4303	Discrete Mathematical Structures	2023
2350	13510	Master of Science (Mathematics)	MTH4305	Fuzzy Sets and their Applications	2023
2351	13510	Master of Science (Mathematics)	MTH4329	Number Theory & Cryptography	2023

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2352	13510	Master of Science (Mathematics)	MTH4340	Tensors and Differential Geometry	2023
2353	13510	Master of Science (Mathematics)	MTH4345	Fractional Calculus	2023
2354	13510	Master of Science (Mathematics)	MTH4409	Fluid Dynamics	2023
2355	13510	Master of Science (Mathematics)	MTH4417	Mathematical Methods	2023
2356	13510	Master of Science (Mathematics)	MTH4433	Workshop	2023
2357	13510	Master of Science (Mathematics)	MTH4437	Project	2023
2358	13510	Master of Science (Mathematics)	MTH4402	Functional Analysis	2023
2359	13510	Master of Science (Mathematics)	MTH4410	Classical Mechanics	2023
2360	13510	Master of Science (Mathematics)	MTH4411	Mathematical Modeling	2023
2361	13510	Master of Science (Mathematics)	MTH4412	Biomechanics	2023
2362	13510	Master of Science (Mathematics)	MTH4413	Coding Theory	2023
2363	13510	Master of Science (Mathematics)	MTH4414	Stochastic Processes	2023
2364	13510	Master of Science (Mathematics)	MTH4415	Statistical Inference	2023
2365	13510	Master of Science (Mathematics)	MTH4416	Numerical Solutions to ODE and PDEs	2023
2366	13500	Master of Science (Physics)	PHY4101	Mathematical Physics	2023
2367	13500	Master of Science (Physics)	PHY4102	Classical Mechanics	2023
2368	13500	Master of Science (Physics)	PHY4103	Electronics	2023
2369	13500	Master of Science (Physics)	PHY4109	Quantum Mechanics-I	2023
2370	13500	Master of Science (Physics)	PHY4110	Computational Physics	2023
2371	13500	Master of Science (Physics)	PHY4111	Integrated Physics Lab-I	2023
2372	13500	Master of Science (Physics)	PHY4202	Statistical Mechanics	2023
2373	13500	Master of Science (Physics)	PHY4208	Quantum Mechanics-II	2023
2374	13500	Master of Science (Physics)	PHY4209	Condensed Matter Physics-I	2023
2375	13500	Master of Science (Physics)	PHY4215	Electrodynamics	2023
2376	13500	Master of Science (Physics)	PHY4216	Atomic and Molecular Physics	2023
2377	13500	Master of Science (Physics)	PHY4212	Integrated Physics Lab-II	2023
2378	13500	Master of Science (Physics)	PHY4307	Material Science	2023
2379	13500	Master of Science (Physics)	PHY4315	Condensed Matter Physics-II	2023
2380	13500	Master of Science (Physics)	PHY4321	Nuclear & Particle Physics	2023
2381	13500	Master of Science (Physics)	PHY4316	Integrated Physics Lab-III	2023
2382	13500	Master of Science (Physics)	PHY4335	Summer Internship Evaluation/ Study Abroad Programme	2023
2383	13500	Master of Science (Physics)	PHY4306	Digital Electronics & Microprocessors	2023
2384	13500	Master of Science (Physics)	PHY4317	Renewable Energy Resources	2023
2385	13500	Master of Science (Physics)	PHY4318	Introduction to Astrophysics	2023
2386	13500	Master of Science (Physics)	PHY4319	Non-linear Dynamics	2023
2387	13500	Master of Science (Physics)	PHY4322	Laser Physics	2023
2388	13500	Master of Science (Physics)	PHY4323	Plasma Physics-I	2023
2389	13500	Master of Science (Physics)	PHY4410	Experimental Techniques	2023
2390	13500	Master of Science (Physics)	PHY4437	Major Project	2023
2391	13500	Master of Science (Physics)	PHY4404	Nano-Science & Technology	2023
2392	13500	Master of Science (Physics)	PHY4405	Atmospheric Physics	2023
2393	13500	Master of Science (Physics)	PHY4406	General Relativity & Cosmology	2023

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2394	13500	Master of Science (Physics)	PHY4407	Optical Fibers & Communications	2023
2395	13500	Master of Science (Physics)	PHY4408	Physics of Solar Photovoltaics	2023
2396	13500	Master of Science (Physics)	PHY4409	Biophysics	2023
2397	13500	Master of Science (Physics)	PHY4411	Radiation Physics	2023
2398	13500	Master of Science (Physics)	PHY4412	Plasma Physics-II	2023
2399	13500	Master of Science (Physics)	PHY4413	High Energy Physics	2023
2400	13011	Master of Science (Forensic Science)	FCH4101	Criminology, Criminal Law, Police Administration	2023
2401	13011	Master of Science (Forensic Science)	FCH4103	Forensic Physics	2023
2402	13011	Master of Science (Forensic Science)	FCH4106	Forensic Ballistics	2023
2403	13011	Master of Science (Forensic Science)	FCH4107	Forensic Physics Lab	2023
2404	13011	Master of Science (Forensic Science)	FCH4108	Crime Scene Investigation (CSI) Lab	2023
2405	13011	Master of Science (Forensic Science)	FCH4111	Forensic and Criminal Investigation	2023
2406	13011	Master of Science (Forensic Science)	FCH4112	Instrumentation (Chemical)	2023
2407	13011	Master of Science (Forensic Science)	FCH4110	Research Seminar	2023
2408	13011	Master of Science (Forensic Science)	FCH4201	Forensic Photography	2023
2409	13011	Master of Science (Forensic Science)	FCH4202	Elements of Forensic Medicine and Odontology	2023
2410	13011	Master of Science (Forensic Science)	FCH4205	Questioned Documents	2023
2411	13011	Master of Science (Forensic Science)	FCH4206	Forensic Medicine & Odontology Lab	2023
2412	13011	Master of Science (Forensic Science)	FCH4208	Questioned Documents & Fingerprints Lab	2023
2413	13011	Master of Science (Forensic Science)	FCH4209	Instrumentation (Biological)	2023
2414	13011	Master of Science (Forensic Science)	FCH4210	Fingerprint Science	2023
2415	13011	Master of Science (Forensic Science)	FCH4211	Arson & Explosives	2023
2416	13011	Master of Science (Forensic Science)	FCH4231	Term Paper	2023
2417	13011	Master of Science (Forensic Science)	FCH4301	Forensic Chemistry, Toxicology & Pharmacology	2023
2418	13011	Master of Science (Forensic Science)	FCH4302	Forensic Biology & Serology	2023

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2419	13011	Master of Science (Forensic Science)	FCH4304	Forensic Biology and Serology Lab	2023
2420	13011	Master of Science (Forensic Science)	FCH4305	Forensic Chemistry & Toxicology Lab	2023
2421	13011	Master of Science (Forensic Science)	FCH4315	Statistics & Research Methodology	2023
2422	13011	Master of Science (Forensic Science)	FCH4316	Instrumentation (Physical)	2023
2423	13011	Master of Science (Forensic Science)	FCH4318	Instrumentation Workshop	2023
2424	13011	Master of Science (Forensic Science)	FCH4335	Summer Internship Evaluation/ Study Abroad Program	2023
2425	13011	Master of Science (Forensic Science)	FCH4306	Advanced Forensic Biology & Anthropology	2023
2426	13011	Master of Science (Forensic Science)	FCH4317	Cyber Forensic & Computer Application	2023
2427	13011	Master of Science (Forensic Science)	FCH4319	Forensic Genetics	2023
2428	13011	Master of Science (Forensic Science)	FCH4310	Advanced Questioned Documents & Fingerprint Examination	2023
2429	13011	Master of Science (Forensic Science)	FCH4320	Advanced Forensic Chemistry and Toxicology	2023
2430	13011	Master of Science (Forensic Science)	FCH4321	Forensic Wildlife and Entomology	2023
2431	13011	Master of Science (Forensic Science)	FCH4405	Quality Management & Accreditation in Forensic Science Laboratories	2023
2432	13011	Master of Science (Forensic Science)	FCH4408	Forensic Psychology	2023
2433	13011	Master of Science (Forensic Science)	FCH4409	Good Laboratory Practices Seminar	2023
2434	13011	Master of Science (Forensic Science)	FCH4437	Major Project	2023
2435	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2151	Earth System Sciences	2023
2436	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2101	Earth Surface Features & Processes	2023
2437	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2102	Mathematics	2023
2438	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2103	Biology	2023

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2439	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2251	Petrology + Field	2023
2440	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2201	Geochemistry	2023
2441	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2202	Physics	2023
2442	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2351	Structural Geology + Field	2023
2443	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2301	Geophysics & Engineering Geology + Lab	2023
2444	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	SESC2301	Remote Sensing and GIS	2023
2445	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	NESC2335	Community Engagement Services	2023
2446	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2451	Mineralogy + Lab	2023
2447	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2401	Exploration & Economic Geology + Field	2023
2448	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	SESC2401	Surveying and Mapping	2023
2449	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2551	Stratigraphy & Paleontology + Field	2023
2450	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2501	Hydrology + Lab	2023
2451	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2502	Planetory Science + Lab	2023
2452	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	NESC2537	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2453	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2651	Geology and Society + Field	2023

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2454	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2601	Oceanography & Atmospheric Science + Lab	2023
2455	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2602	Environmental Geology & Natural Hazards + Field	2023
2456	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2603	Coal & Petroleum Geology + Field	2023
2457	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2701	Advance Petrology + Lab	2023
2458	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2702	Geoinformatics + Lab	2023
2459	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2703	Quaternary Geology and Paleoclimate + Field	2023
2460	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2704	Hydrogeology	2023
2461	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2739	Basics of Research Methodology, Ethics and Research Communication	2023
2462	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	NESC2737	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2463	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2801	Geomorphology + Field	2023
2464	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2802	Climate Science + Field	2023
2465	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2803	Co-evolution of Earth & Life + Field	2023
2466	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2804	Basics of Cryosphere	2023
2467	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	NESC2837	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2468	131790	Bachelor of Science (Honors/ Honors with Research) in Earth Science	DESC2839	Data Analysis & Visualisation using Software	2023

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2469	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2101	Plant and Animal Diversity	2023
2470	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2102	Plant and Animal Diversity Lab	2023
2471	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2103	Plant and Animal Physiology	2023
2472	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2104	Plant and Animal Physiology Lab	2023
2473	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2201	Microbiology	2023
2474	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2202	Microbiology Lab	2023
2475	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2203	Cell Biology & Genetics	2023
2476	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2204	Cell Biology & Genetics Lab	2023
2477	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2351	Biochemistry	2023
2478	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2352	Biochemistry Lab	2023
2479	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2301	Molecular Biology	2023
2480	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2302	Molecular Biology Lab	2023
2481	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	SBTH2301	Computer Applications for Biologists	2023
2482	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	NBTH2335	Community Engagement Services	2023
2483	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2401	Recombinant DNA Technology	2023

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2484	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2402	Recombinant DNA Technology Lab	2023
2485	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2403	Genomics and Proteomics	2023
2486	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2404	Genomics and Proteomics Lab	2023
2487	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	SBTH2401	Introduction to Bioinformatics	2023
2488	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2501	Plant and Animal Biotechnology	2023
2489	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2502	Plant and Animal Biotechnology Lab	2023
2490	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2503	Introduction to Immunology	2023
2491	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2504	Introduction to Immunology Lab	2023
2492	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2505	Computational Biology and Molecular Modelling	2023
2493	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2506	Computational Biology and Molecular Modelling Lab	2023
2494	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2507	Bioethics, Biosafety and IPR	2023
2495	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	NBTH2537	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2496	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2601	Bioprocess, & Industrial Biotechnology	2023
2497	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2602	Bioprocess, & Industrial Biotechnology Lab	2023
2498	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2603	Enzymology	2023

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2499	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2604	Enzymology Lab	2023
2500	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2605	Pharmaceutical Biotechnology and Drug Design	2023
2501	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2606	Introduction to Neuroscience and Information Flow	2023
2502	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2701	Advanced Biochemistry	2023
2503	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2702	Advanced Biochemistry and Analytical Techniques Lab	2023
2504	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2703	Advanced Microbiology	2023
2505	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2704	Advanced Microbiology Lab	2023
2506	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2705	Advanced Cell Biology	2023
2507	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2706	Ecology and Evolution	2023
2508	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2707	Genetics	2023
2509	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2708	Basics of Chemistry and Physics	2023
2510	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2739	Basics of Research Methodology, Ethics and Research Communication	2023
2511	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	NBTH2737	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2512	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2801	Down Stream Processing & Fermentation Technology	2023
2513	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2802	Introduction to Developmental Biology	2023

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2514	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2803	Methods in Biology	2023
2515	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2804	Genetic Engineering	2023
2516	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2805	Genetics Engineering Lab	2023
2517	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2806	Molecular Diagnostics	2023
2518	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2807	Environmental Biotechnology	2023
2519	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	NBTH2837	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2520	131551	Bachelor of Science (Honors/ Honors with Research) in Biotechnology	DBTH2839	Data Analysis & Visualisation using Software	2023
2521	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2101	Plant Diversity	2023
2522	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2102	Plant Diversity Lab	2023
2523	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2103	Animal Diversity	2023
2524	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2104	Animal Diversity Lab	2023
2525	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2201	Plant Anatomy & Physiology	2023
2526	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2202	Plant Anatomy & Physiology Lab	2023
2527	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2203	Animal Anatomy & Physiology	2023
2528	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2204	Animal Anatomy & Physiology Lab	2023

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2529	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2301	Biochemistry	2023
2530	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2302	Biochemistry Lab	2023
2531	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2303	Molecular Biology	2023
2532	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2304	Molecular Biology Lab	2023
2533	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	SBLS2301	Computer Applications for Biologists	2023
2534	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	NBLS2335	Community Engagement Services	2023
2535	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2401	Microbiology	2023
2536	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2402	Microbiology Lab	2023
2537	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2403	Cell Biology & Genetics	2023
2538	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2404	Cell Biology & Genetics Lab	2023
2539	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	SBLS2401	Introduction to Bioinformatics	2023
2540	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2501	Bioanalytical & Biophysical Instrumentation	2023
2541	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2502	Bioanalytical & Biophysical Instrumentation Lab	2023
2542	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2503	Introduction to Immunology	2023
2543	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2504	Introduction to Immunology Lab	2023

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2544	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2505	Biostatistics and Bioinformatics	2023
2545	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2506	Bioethics, Biosafety and IPR	2023
2546	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	NBLS2537	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2547	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2601	Applied Biology	2023
2548	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2602	Genomics & Proteomics	2023
2549	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2603	Genomics & Proteomics Lab	2023
2550	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2604	Emerging fields: Nanobiotechnology & Stem-cells Biology	2023
2551	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2605	Introduction to Neuroscience and Information Flow	2023
2552	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2701	Advanced Biochemistry	2023
2553	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2702	Advanced Biochemistry and Analytical Techniques Lab	2023
2554	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2703	Advanced Microbiology	2023
2555	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2704	Advanced Microbiology Lab	2023
2556	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2705	Advanced Cell Biology	2023
2557	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2706	Ecology and Evolution	2023
2558	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2707	Genetics	2023

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2559	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2708	Basics of Chemistry and Physics	2023
2560	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2739	Basics of Research Methodology, Ethics and Research Communication	2023
2561	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	NBLS2737	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2562	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2801	Down Stream Processing & Fermentation Technology	2023
2563	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2802	Introduction to Developmental Biology	2023
2564	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2803	Methods in Biology	2023
2565	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2804	Genetic Engineering	2023
2566	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2805	Genetics Engineering Lab	2023
2567	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2806	Molecular Diagnostics	2023
2568	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2807	Environmental Biotechnology	2023
2569	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	NBLS2837	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2570	131791	Bachelor of Science (Honors/ Honors with Research) in Biological Science	DBLS2839	Data Analysis & Visualisation using Software	2023
2571	13041	Bachelor of Technology (Biotechnology)	BTE2104	Introduction to Computers & Programming in 'C'	2023
2572	13041	Bachelor of Technology (Biotechnology)	BTE2106	Electrical Science	2023
2573	13041	Bachelor of Technology (Biotechnology)	BTE2108	Programming in C Lab	2023
2574	13041	Bachelor of Technology (Biotechnology)	BTE2110	Electrical Science Lab	2023

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2575	13041	Bachelor of Technology (Biotechnology)	BTE2111	Engineering Mathematics-I	2023
2576	13041	Bachelor of Technology (Biotechnology)	BTE2112	Engineering Chemistry	2023
2577	13041	Bachelor of Technology (Biotechnology)	BTE2113	Engineering Chemistry Lab	2023
2578	13041	Bachelor of Technology (Biotechnology)	BTE2203	Object Oriented Programming in C++	2023
2579	13041	Bachelor of Technology (Biotechnology)	BTE2205	Object Oriented Programming in C++ Lab	2023
2580	13041	Bachelor of Technology (Biotechnology)	BTE2206	Engineering Graphics Lab	2023
2581	13041	Bachelor of Technology (Biotechnology)	BTE2207	Engineering Mathematics-II	2023
2582	13041	Bachelor of Technology (Biotechnology)	BTE2208	Engineering Physics	2023
2583	13041	Bachelor of Technology (Biotechnology)	BTE2209	Engineering Physics Lab	2023
2584	13041	Bachelor of Technology (Biotechnology)	BTE2210	Life Sciences	2023
2585	13041	Bachelor of Technology (Biotechnology)	BTE2301	Cell Biology & Genetics	2023
2586	13041	Bachelor of Technology (Biotechnology)	BTE2302	Biochemistry	2023
2587	13041	Bachelor of Technology (Biotechnology)	BTE2303	Biostatistics	2023
2588	13041	Bachelor of Technology (Biotechnology)	BTE2304	Database Management System	2023
2589	13041	Bachelor of Technology (Biotechnology)	BTE2305	Chemical Biology	2023
2590	13041	Bachelor of Technology (Biotechnology)	BTE2306	Biochemistry Lab	2023
2591	13041	Bachelor of Technology (Biotechnology)	BTE2307	Cell Biology & Genetics Lab	2023
2592	13041	Bachelor of Technology (Biotechnology)	BTE2308	Database Management System Lab	2023
2593	13041	Bachelor of Technology (Biotechnology)	BTE2309	Industrial Biotechnology	2023
2594	13041	Bachelor of Technology (Biotechnology)	BTE2310	Fermentation technology	2023
2595	13041	Bachelor of Technology (Biotechnology)	BTE2311	Drug Design and Development	2023
2596	13041	Bachelor of Technology (Biotechnology)	BTE2312	Recombinant DNA Technology	2023

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2597	13041	Bachelor of Technology (Biotechnology)	BTE2331	Term Paper	2023
2598	13041	Bachelor of Technology (Biotechnology)	BTE2332	Project (with Presentation & Evaluation)	2023
2599	13041	Bachelor of Technology (Biotechnology)	BTE2333	Workshop / Certification (Discipline Specific)	2023
2600	13041	Bachelor of Technology (Biotechnology)	BTE2334	Study Abroad	2023
2601	13041	Bachelor of Technology (Biotechnology)	BTE2401	Microbiology	2023
2602	13041	Bachelor of Technology (Biotechnology)	BTE2402	Data Structure & Algorithms	2023
2603	13041	Bachelor of Technology (Biotechnology)	BTE2403	Enzymology & Enzyme Technology	2023
2604	13041	Bachelor of Technology (Biotechnology)	BTE2404	Chemical Engineering Principles	2023
2605	13041	Bachelor of Technology (Biotechnology)	BTE2405	Methods and Instrumentation in Biotechnology	2023
2606	13041	Bachelor of Technology (Biotechnology)	BTE2406	Microbiology Lab	2023
2607	13041	Bachelor of Technology (Biotechnology)	BTE2407	Data Structure & Algorithms Lab	2023
2608	13041	Bachelor of Technology (Biotechnology)	BTE2408	Enzymology & Enzyme Technology Lab	2023
2609	13041	Bachelor of Technology (Biotechnology)	BTE2409	Methods and Instrumentation in Biotechnology Lab	2023
2610	13041	Bachelor of Technology (Biotechnology)	BTE2410	Marine Biotechnology	2023
2611	13041	Bachelor of Technology (Biotechnology)	BTE2411	Vaccine Development	2023
2612	13041	Bachelor of Technology (Biotechnology)	BTE2412	Agricultural Biotechnology	2023
2613	13041	Bachelor of Technology (Biotechnology)	BTE2413	Natural products and medicinal chemistry	2023
2614	13041	Bachelor of Technology (Biotechnology)	BTE2414	Stem cell Technology	2023
2615	13041	Bachelor of Technology (Biotechnology)	BTE2431	Term Paper	2023
2616	13041	Bachelor of Technology (Biotechnology)	BTE2432	Project (with Presentation & Evaluation)	2023
2617	13041	Bachelor of Technology (Biotechnology)	BTE2433	Workshop / Certification (Discipline Specific)	2023
2618	13041	Bachelor of Technology (Biotechnology)	BTE2434	Study Abroad	2023

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2619	13041	Bachelor of Technology (Biotechnology)	BTE2501	Molecular Biology	2023
2620	13041	Bachelor of Technology (Biotechnology)	BTE2502	Animal Biotechnology	2023
2621	13041	Bachelor of Technology (Biotechnology)	BTE2503	Plant Biotechnology	2023
2622	13041	Bachelor of Technology (Biotechnology)	BTE2504	Bioinformatics	2023
2623	13041	Bachelor of Technology (Biotechnology)	BTE2505	Molecular Biology Lab	2023
2624	13041	Bachelor of Technology (Biotechnology)	BTE2506	Animal Biotechnology Lab	2023
2625	13041	Bachelor of Technology (Biotechnology)	BTE2507	Plant Biotechnology Lab	2023
2626	13041	Bachelor of Technology (Biotechnology)	BTE2508	Bioinformatics Lab	2023
2627	13041	Bachelor of Technology (Biotechnology)	BTE2535	Summer Internship Evaluation-I	2023
2628	13041	Bachelor of Technology (Biotechnology)	BTE2509	Biofuels & Green Technology	2023
2629	13041	Bachelor of Technology (Biotechnology)	BTE2510	Stem Cells and Tissue Engineering	2023
2630	13041	Bachelor of Technology (Biotechnology)	BTE2511	Java-I	2023
2631	13041	Bachelor of Technology (Biotechnology)	BTE2531	Term Paper	2023
2632	13041	Bachelor of Technology (Biotechnology)	BTE2532	Project (with Presentation & Evaluation)	2023
2633	13041	Bachelor of Technology (Biotechnology)	BTE2533	Workshop / Certification (Discipline Specific)	2023
2634	13041	Bachelor of Technology (Biotechnology)	BTE2534	Study Abroad	2023
2635	13041	Bachelor of Technology (Biotechnology)	BTE2601	Recombinant DNA Technology	2023
2636	13041	Bachelor of Technology (Biotechnology)	BTE2602	Bioprocess Technology	2023
2637	13041	Bachelor of Technology (Biotechnology)	BTE2603	Immunology & Immunotechnology	2023
2638	13041	Bachelor of Technology (Biotechnology)	BTE2604	Fundamentals of Biochemical Engineering	2023
2639	13041	Bachelor of Technology (Biotechnology)	BTE2605	Recombinant DNA Technology Lab	2023
2640	13041	Bachelor of Technology (Biotechnology)	BTE2606	Bioprocess Technology Lab	2023

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2641	13041	Bachelor of Technology (Biotechnology)	BTE2607	Immunology & Immunotechnology Lab	2023
2642	13041	Bachelor of Technology (Biotechnology)	BTE2608	Pharmaceutical Biotechnology	2023
2643	13041	Bachelor of Technology (Biotechnology)	BTE2609	Molecular modeling	2023
2644	13041	Bachelor of Technology (Biotechnology)	BTE2611	JAVA –II	2023
2645	13041	Bachelor of Technology (Biotechnology)	BTE2612	RNA Biology	2023
2646	13041	Bachelor of Technology (Biotechnology)	BTE2613	Introduction to Neuroscience and Information Processing	2023
2647	13041	Bachelor of Technology (Biotechnology)	BTE2631	Term Paper	2023
2648	13041	Bachelor of Technology (Biotechnology)	BTE2632	Project (with Presentation & Evaluation)	2023
2649	13041	Bachelor of Technology (Biotechnology)	BTE2633	Workshop / Certification (Discipline Specific)	2023
2650	13041	Bachelor of Technology (Biotechnology)	BTE2634	Study Abroad	2023
2651	13041	Bachelor of Technology (Biotechnology)	BTE2701	Genomics & Proteomics	2023
2652	13041	Bachelor of Technology (Biotechnology)	BTE2702	IPR, Biosafety & Bioethics	2023
2653	13041	Bachelor of Technology (Biotechnology)	BTE2703	Research Methodology & Report Writing	2023
2654	13041	Bachelor of Technology (Biotechnology)	BTE2704	Genomics & Proteomics Lab	2023
2655	13041	Bachelor of Technology (Biotechnology)	BTE2735	Summer Internship Evaluation-II	2023
2656	13041	Bachelor of Technology (Biotechnology)	BTE2705	Bioprocess Plant Designing	2023
2657	13041	Bachelor of Technology (Biotechnology)	BTE2706	Molecular Medicine & Diagnosis	2023
2658	13041	Bachelor of Technology (Biotechnology)	BTE2707	Applications of Plant Biotechnology	2023
2659	13041	Bachelor of Technology (Biotechnology)	BTE2708	Bioenergy Engineering	2023
2660	13041	Bachelor of Technology (Biotechnology)	BTE2709	Advanced Nanobiotechnology	2023
2661	13041	Bachelor of Technology (Biotechnology)	BTE2731	Term Paper	2023
2662	13041	Bachelor of Technology (Biotechnology)	BTE2732	Project (with Presentation & Evaluation)	2023

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2663	13041	Bachelor of Technology (Biotechnology)	BTE2733	Workshop/ Certification (Discipline Specific)	2023
2664	13041	Bachelor of Technology (Biotechnology)	BTE2734	Study Abroad	2023
2665	13041	Bachelor of Technology (Biotechnology)	BTE2837	Dissertation / Project Report Presentation / Viva Voce	2023
2666	13002	Master of Science (Biotechnology)	BTH4101	Biochemistry	2023
2667	13002	Master of Science (Biotechnology)	BTH4103	Microbiology	2023
2668	13002	Master of Science (Biotechnology)	BTH4104	Genetics	2023
2669	13002	Master of Science (Biotechnology)	BTH4111	Cell and Molecular Biology	2023
2670	13002	Master of Science (Biotechnology)	BTH4112	Plant and Animal Biotechnology	2023
2671	13002	Master of Science (Biotechnology)	BTH4113	Basics of Mathematics & Statistics	2023
2672	13002	Master of Science (Biotechnology)	BTH4114	Basics of Chemistry & Physics	2023
2673	13002	Master of Science (Biotechnology)	BTH4109	Microbiology Lab	2023
2674	13002	Master of Science (Biotechnology)	BTH4115	Biochemistry and Analytical Techniques Lab	2023
2675	13002	Master of Science (Biotechnology)	BTH4116	Plant & Animal Biotechnology Lab	2023
2676	13002	Master of Science (Biotechnology)	BTH4203	Immunology	2023
2677	13002	Master of Science (Biotechnology)	BTH4210	Genetic Engineering	2023
2678	13002	Master of Science (Biotechnology)	BTH4211	Bioinformatics	2023
2679	13002	Master of Science (Biotechnology)	BTH4212	Genomics and Proteomics	2023
2680	13002	Master of Science (Biotechnology)	BTH4213	Molecular Diagnostics	2023
2681	13002	Master of Science (Biotechnology)	BTH4214	Research Methodology & Scientific Communication Skills	2023
2682	13002	Master of Science (Biotechnology)	BTH4209	Immunology Lab	2023
2683	13002	Master of Science (Biotechnology)	BTH4215	Molecular Biology and Genetic Engineering Lab	2023
2684	13002	Master of Science (Biotechnology)	BTH4238	Seminar	2023
2685	13002	Master of Science (Biotechnology)	BTH4204	Environmental Biotechnology	2023
2686	13002	Master of Science (Biotechnology)	BTH4216	Biological Imaging	2023
2687	13002	Master of Science (Biotechnology)	BTH4217	Computational Biology	2023
2688	13002	Master of Science (Biotechnology)	BTH4218	Drug Discovery & Development	2023
2689	13002	Master of Science (Biotechnology)	BTH4219	RNA Biology	2023
2690	13002	Master of Science (Biotechnology)	BTH4320	Bioprocess Engineering & Technology	2023
2691	13002	Master of Science (Biotechnology)	BTH4321	Emerging Technologies	2023
2692	13002	Master of Science (Biotechnology)	BTH4322	Critical Analysis of Classical Papers	2023
2693	13002	Master of Science (Biotechnology)	BTH4306	Bioentrepreneurship, IPR, Biosafety & Bioethics	2023
2694	13002	Master of Science (Biotechnology)	BTH4323	Bioprocess Engineering & Technology Lab	2023
2695	13002	Master of Science (Biotechnology)	BTH4324	Bioinformatics Lab	2023
2696	13002	Master of Science (Biotechnology)	BTH4332	Project Proposal Preparation & Presentation	2023

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2697	13002	Master of Science (Biotechnology)	BTH4338	Seminar	2023
2698	13002	Master of Science (Biotechnology)	BTH4335	Summer Internship Evaluation	2023
2699	13002	Master of Science (Biotechnology)	BTH4314	Nanobiotechnology	2023
2700	13002	Master of Science (Biotechnology)	BTH4319	Advances in Plant Genomics	2023
2701	13002	Master of Science (Biotechnology)	BTH4325	Microbial Technology	2023
2702	13002	Master of Science (Biotechnology)	BTH4326	Protein Engineering	2023
2703	13002	Master of Science (Biotechnology)	BTH4327	Vaccines	2023
2704	13002	Master of Science (Biotechnology)	BTH4328	Cancer Biology	2023
2705	13002	Master of Science (Biotechnology)	BTH4437	Dissertation	2023
2706	13107	Master of Technology (Biotechnology)	BTE4101	Biochemistry & Metabolic Regulation	2023
2707	13107	Master of Technology (Biotechnology)	BTE4102	Genetics & Molecular Biology	2023
2708	13107	Master of Technology (Biotechnology)	BTE4103	Instrumentation & Research Methodology	2023
2709	13107	Master of Technology (Biotechnology)	BTE4104	Microbial Technology	2023
2710	13107	Master of Technology (Biotechnology)	BTE4105	Biostatistics	2023
2711	13107	Master of Technology (Biotechnology)	BTE4106	Biochemistry & Metabolic Regulation Lab	2023
2712	13107	Master of Technology (Biotechnology)	BTE4107	Genetics & Molecular Biology Lab	2023
2713	13107	Master of Technology (Biotechnology)	BTE4108	Microbial Technology Lab	2023
2714	13107	Master of Technology (Biotechnology)	BTE4111	Animal Biotechnology	2023
2715	13107	Master of Technology (Biotechnology)	BTE4112	Plant Cell, Tissue & Organ Culture	2023
2716	13107	Master of Technology (Biotechnology)	BTE4113	Animal Biotechnology Lab	2023
2717	13107	Master of Technology (Biotechnology)	BTE4114	Plant Cell, Tissue & Organ Culture Lab	2023
2718	13107	Master of Technology (Biotechnology)	BTE4201	Recombinant DNA Technology	2023
2719	13107	Master of Technology (Biotechnology)	BTE4202	Bioinformatics & Computational Biology	2023
2720	13107	Master of Technology (Biotechnology)	BTE4203	Biochemical Engineering	2023
2721	13107	Master of Technology (Biotechnology)	BTE4204	Environmental Biotechnology	2023
2722	13107	Master of Technology (Biotechnology)	BTE4205	IPR & Bioethics	2023
2723	13107	Master of Technology (Biotechnology)	BTE4206	Molecular Cell Biology	2023

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2724	13107	Master of Technology (Biotechnology)	BTE4207	Recombinant DNA Technology Lab	2023
2725	13107	Master of Technology (Biotechnology)	BTE4208	Bioinformatics & Computational Biology Lab	2023
2726	13107	Master of Technology (Biotechnology)	BTE4209	Environmental Biotechnology Lab	2023
2727	13107	Master of Technology (Biotechnology)	BTE4210	Molecular Cell Biology Lab	2023
2728	13107	Master of Technology (Biotechnology)	BTE4211	Immunology	2023
2729	13107	Master of Technology (Biotechnology)	BTE4212	Immunology Lab	2023
2730	13107	Master of Technology (Biotechnology)	BTE4231	Term Paper	2023
2731	13107	Master of Technology (Biotechnology)	BTE4301	Enzyme technology	2023
2732	13107	Master of Technology (Biotechnology)	BTE4302	Genomics & Proteomics	2023
2733	13107	Master of Technology (Biotechnology)	BTE4303	Structural Biology	2023
2734	13107	Master of Technology (Biotechnology)	BTE4304	Downstream Processing & Fermentation Biotechnology	2023
2735	13107	Master of Technology (Biotechnology)	BTE4305	Enzyme Technology Lab	2023
2736	13107	Master of Technology (Biotechnology)	BTE4306	Genomics & Proteomics Lab	2023
2737	13107	Master of Technology (Biotechnology)	BTE4307	Structural Biology Lab	2023
2738	13107	Master of Technology (Biotechnology)	BTE4308	Fermentation Biotechnology & Downstream Processing Lab	2023
2739	13107	Master of Technology (Biotechnology)	BTE4335	Summer Internship Evaluation	2023
2740	13107	Master of Technology (Biotechnology)	BTE4309	Industrial Management	2023
2741	13107	Master of Technology (Biotechnology)	BTE4310	Immunotechnology	2023
2742	13107	Master of Technology (Biotechnology)	BTE4311	Agri-Food Biotechnology	2023
2743	13107	Master of Technology (Biotechnology)	BTE4312	Biofuels & green technology	2023
2744	13107	Master of Technology (Biotechnology)	BTE4313	Stem Cells and Gene Therapy	2023
2745	13107	Master of Technology (Biotechnology)	BTE4314	Drug design & Pharmaceutical Biotechnology	2023

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2746	13107	Master of Technology (Biotechnology)	BTE4315	Nanobiotechnology	2023
2747	13107	Master of Technology (Biotechnology)	BTE4316	New Generation Sequencing Analysis	2023
2748	13107	Master of Technology (Biotechnology)	BTE4317	Advanced Nanobiotechnology	2023
2749	13107	Master of Technology (Biotechnology)	BTE4437	Dissertation / Project Report Presentation / Viva Voce	2023
2750	131177	Master of Science (Data Science)	DSC4101	Introduction to Data Science	2023
2751	131177	Master of Science (Data Science)	DSC4102	Machine Learning-I	2023
2752	131177	Master of Science (Data Science)	DSC4103	Statistics & Exploratory Data Analysis	2023
2753	131177	Master of Science (Data Science)	DSC4104	Database Management System-I	2023
2754	131177	Master of Science (Data Science)	DSC4105	Programming Toolbox I-R	2023
2755	131177	Master of Science (Data Science)	DSC4106	Programming ToolBox II- Python	2023
2756	131177	Master of Science (Data Science)	DSC4107	Big Data Tools & Technologies-I	2023
2757	131177	Master of Science (Data Science)	DSC4108	Introduction to Linux	2023
2758	131177	Master of Science (Data Science)	DSC4109	Machine Learning-I Lab	2023
2759	131177	Master of Science (Data Science)	DSC4110	Statistics & Exploratory Data Analysis Lab	2023
2760	131177	Master of Science (Data Science)	DSC4201	Machine Learning-II	2023
2761	131177	Master of Science (Data Science)	DSC4202	Regression Theory & Analysis	2023
2762	131177	Master of Science (Data Science)	DSC4203	Data Structure & Algorithm Design	2023
2763	131177	Master of Science (Data Science)	DSC4204	Database Management System-II	2023
2764	131177	Master of Science (Data Science)	DSC4205	Spark	2023
2765	131177	Master of Science (Data Science)	DSC4206	Data Visualization	2023
2766	131177	Master of Science (Data Science)	DSC4207	Big Data Tools & Technologies-II	2023
2767	131177	Master of Science (Data Science)	DSC4208	Machine Learning-II Lab	2023
2768	131177	Master of Science (Data Science)	DSC4209	Regression Theory & Analysis Lab	2023
2769	131177	Master of Science (Data Science)	DSC4210	Data Structure & Algorithm Design Lab	2023
2770	131177	Master of Science (Data Science)	DSC4211	Pattern Recognition	2023
2771	131177	Master of Science (Data Science)	DSC4212	Next Generation Sequencing Analysis	2023
2772	131177	Master of Science (Data Science)	DSC4213	Association Rule Mining	2023
2773	131177	Master of Science (Data Science)	DSC4301	Generalized & Linear Modeling	2023
2774	131177	Master of Science (Data Science)	DSC4302	Deep Learning & Neural Networks	2023
2775	131177	Master of Science (Data Science)	DSC4303	Time Series	2023
2776	131177	Master of Science (Data Science)	DSC4304	Graph & Social Network Analysis	2023
2777	131177	Master of Science (Data Science)	DSC4305	Natural Language Processing	2023
2778	131177	Master of Science (Data Science)	DSC4306	Graph & Social Network Analysis Lab	2023
2779	131177	Master of Science (Data Science)	DSC4307	Big Data Tools & Technologies-III	2023
2780	131177	Master of Science (Data Science)	DSC4308	Generalized & Linear Modeling Lab	2023
2781	131177	Master of Science (Data Science)	DSC4309	Time Series Lab	2023

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2782	131177	Master of Science (Data Science)	DSC4310	Deep Learning & Neural Networks Lab	2023
2783	131177	Master of Science (Data Science)	DSC4335	Summer Internship Evaluation	2023
2784	131177	Master of Science (Data Science)	DSC4311	Weather Prediction	2023
2785	131177	Master of Science (Data Science)	DSC4312	Disease Classification	2023
2786	131177	Master of Science (Data Science)	DSC4313	Customer Behaviour Analysis	2023
2787	131177	Master of Science (Data Science)	DSC4437	Dissertation / Project Report Presentation / Viva Voce	2023
2788	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2151	Understanding Mass Communication	2023
2789	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2101	Still Photography and Image Editing	2023
2790	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2251	Print Media Reporting and Editing	2023
2791	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2201	Critical Thinking: Unravelling Media	2023
2792	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2351	Electronic Communication: Radio & TV	2023
2793	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2301	News and Contemporary Issues	2023
2794	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	SJRN2301	Graphics & Basic Animation	2023
2795	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	NJRN2335	Community Engagement Services	2023
2796	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2451	Digital Media	2023
2797	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2401	Advertising Principles & Practice	2023
2798	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	SJRN2401	Media Entrepreneurship	2023
2799	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2551	Media Literacy & Fact Checking	2023

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2800	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2501	Media Planning & Buying	2023
2801	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2502	Corporate Communication	2023
2802	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	NJRN2537	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2803	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2651	Communication for Social Change	2023
2804	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2601	Fiction and Non Fiction Film-making	2023
2805	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2602	Introduction to Communication Research	2023
2806	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2603	Film Theory & Appreciation	2023
2807	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2604	Media Laws & Ethics	2023
2808	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2701	Event Management: Concepts and Practice	2023
2809	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2702	Content Analysis in Media	2023
2810	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2704	Print Media	2023
2811	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2705	Advertising	2023
2812	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2706	Still Photography	2023
2813	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2707	Electronic Media (TV/ Radio)	2023
2814	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2708	Digital Media	2023

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2815	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2709	Media Literacy & Fact Checking	2023
2816	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2703	Advance Communication Theories and Models	2023
2817	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2739	Basics of Research Methodology, Ethics and Research Communication	2023
2818	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	NJRN2737	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2819	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2801	Public Relations: Concepts and Practice	2023
2820	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2802	New Journalism: Concepts and Practice	2023
2821	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2804	Print Media	2023
2822	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2805	Advertising	2023
2823	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2806	Still Photography	2023
2824	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2807	Electronic Media (TV/ Radio)	2023
2825	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2808	Digital Media	2023
2826	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2809	Media Literacy & Fact Checking	2023
2827	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2810	Event Management	2023
2828	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	NJRN2837	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2829	131601	Bachelor of Arts (Honors/ Honors with Research) in Journalism & Mass Communication	DJRN2839	Data Analysis & Visualisation using Software	2023

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2830	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2151	Introduction to Design and Graphics	2023
2831	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2101	Fundamentals of Classical Animation	2023
2832	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2102	Basics of Art History and Sketching and Drawing	2023
2833	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2251	Post-Production	2023
2834	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2201	2D Animation	2023
2835	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2202	Scripting and Storyboarding	2023
2836	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2351	3D Fundamentals	2023
2837	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2301	UI and UX Design	2023
2838	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2302	Sound Design	2023
2839	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	SANI2301	Media Entrepreneurship	2023
2840	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	NANI2335	Community Engagement Services	2023
2841	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2451	Basics of Digital Compositing & VFX	2023
2842	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2401	Rigging and Animation	2023
2843	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2402	Design Thinking	2023
2844	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	SANI2401	Portfolio Via Web Design	2023

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2845	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2551	Maya Fundamentals	2023
2846	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2501	Introduction to Game Design & Development	2023
2847	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2502	Animation Production	2023
2848	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	NANI2537	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2849	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2651	Basics of AR/VR	2023
2850	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2601	Advanced Compositing & VFX	2023
2851	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2602	Maya Rigging and Animation	2023
2852	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2603	Web Design & Development	2023
2853	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2701	Film Making Process	2023
2854	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2702	Maya Particles and Dynamics	2023
2855	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2703	2D Animation	2023
2856	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2704	3D Animation	2023
2857	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2705	Digital Compositing & VFX	2023
2858	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2706	Game Design & Development	2023
2859	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2707	UI & UX Design	2023

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2860	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2739	Basics of Research Methodology, Ethics and Research Communication	2023
2861	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	NANI2737	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2862	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2801	Motion Graphics	2023
2863	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2802	FX & Simulations	2023
2864	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2803	2D Animation	2023
2865	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2804	3D Animation	2023
2866	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2805	Digital Compositing & VFX	2023
2867	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2806	Game Design & Development	2023
2868	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2807	UI & UX Design	2023
2869	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	NANI2837	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2870	131795	Bachelor of Science (Honors/ Honors with Research) in Animation & Visual Graphics	DANI2839	Data Analysis & Visualisation using Software	2023
2871	13800	Master of Arts (Journalilsm & Mass Communication)	JRN4101	Introduction to Mass Communication	2023
2872	13800	Master of Arts (Journalilsm & Mass Communication)	JRN4102	Print Journalism - Reporting & Editing	2023
2873	13800	Master of Arts (Journalilsm & Mass Communication)	JRN4103	Media Arts - I: Radio & TV	2023
2874	13800	Master of Arts (Journalilsm & Mass Communication)	JRN4104	Advertising : Concepts & Principles	2023
2875	13800	Master of Arts (Journalilsm & Mass Communication)	JRN4105	Introduction to Photography	2023
2876	13800	Master of Arts (Journalilsm & Mass Communication)	JRN4106	Design Software	2023

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2877	13800	Master of Arts (Journalilsm & Mass Communication)	JRN4107	History, Culture & Society	2023
2878	13800	Master of Arts (Journalilsm & Mass Communication)	JRN4201	Advertising Planning & Strategy	2023
2879	13800	Master of Arts (Journalilsm & Mass Communication)	JRN4202	Print Design & Visualization	2023
2880	13800	Master of Arts (Journalilsm & Mass Communication)	JRN4203	Specialized Reporting & Feature Writing	2023
2881	13800	Master of Arts (Journalilsm & Mass Communication)	JRN4204	Media Arts - II: Radio & TV	2023
2882	13800	Master of Arts (Journalilsm & Mass Communication)	JRN4206	Public Relations & Corporate Communication	2023
2883	13800	Master of Arts (Journalilsm & Mass Communication)	JRN4207	Advanced Photography	2023
2884	13800	Master of Arts (Journalilsm & Mass Communication)	JRN4209	Media Planning & Brand Management	2023
2885	13800	Master of Arts (Journalilsm & Mass Communication)	JRN4210	Media Trends & Technology	2023
2886	13800	Master of Arts (Journalilsm & Mass Communication)	JRN4301	Media Arts-III: Film	2023
2887	13800	Master of Arts (Journalilsm & Mass Communication)	JRN4304	Media Laws & Ethics	2023
2888	13800	Master of Arts (Journalilsm & Mass Communication)	JRN4305	Development Communication	2023
2889	13800	Master of Arts (Journalilsm & Mass Communication)	JRN4306	Digital Media Production	2023
2890	13800	Master of Arts (Journalilsm & Mass Communication)	JRN4307	Mass Media & Industry	2023
2891	13800	Master of Arts (Journalilsm & Mass Communication)	JRN4308	Communication Research	2023
2892	13800	Master of Arts (Journalilsm & Mass Communication)	JRN4335	Summer Internship Evaluation	2023
2893	13800	Master of Arts (Journalilsm & Mass Communication)	JRN4402	Media Arts - IV: Cyber Media	2023
2894	13800	Master of Arts (Journalilsm & Mass Communication)	JRN4403	Media Analysis	2023
2895	13800	Master of Arts (Journalilsm & Mass Communication)	JRN4435	Internship	2023
2896	13800	Master of Arts (Journalilsm & Mass Communication)	JRN4437	Dissertation OR Professional Project	2023
2897	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2151	History of Early India-I	2023
2898	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2101	Social Formations & Cultural Patterns of the Ancient World	2023

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2899	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2251	History of Early India-II	2023
2900	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2201	Social Formations & Cultural Patterns of the Medieval World	2023
2901	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2351	Rise of Modern West-I	2023
2902	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2301	Indo-Islamic Polity and Culture in Medieval India-I	2023
2903	131600	Bachelor of Arts (Honors/ Honors with Research) in History	SHIS2301	An Introduction to Archaeology	2023
2904	131600	Bachelor of Arts (Honors/ Honors with Research) in History	NHIS2335	Community Engagement Services	2023
2905	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2451	Rise of Modern West-II	2023
2906	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2401	Indo-Islamic Polity and Culture in Medieval India-II	2023
2907	131600	Bachelor of Arts (Honors/ Honors with Research) in History	SHIS2401	Understanding Culture, Heritage and Tourism	2023
2908	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2551	History of USA	2023
2909	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2501	History of USSR	2023
2910	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2502	History of China and Japan	2023
2911	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2503	Environmental History	2023
2912	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2504	Delhi Through the Ages	2023
2913	131600	Bachelor of Arts (Honors/ Honors with Research) in History	NHIS2537	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2914	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2651	History of Ancient India	2023
2915	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2601	History of Modern India	2023
2916	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2602	History of West Asia	2023
2917	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2603	History of Medieval India	2023
2918	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2604	Exploring Realms: Narratives of Urban and Rural India through Fiction, Fieldwork, Film & History	2023
2919	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2605	Perspectives on Global History	2023
2920	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2701	History of Contemporary India	2023

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2921	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2702	History of Borderlands	2023
2922	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2703	History of British Rule in India-I	2023
2923	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2704	History of British Rule in India-II	2023
2924	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2705	Migration and History	2023
2925	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2706	Reading Ambedkar, Gandhi & Savarkar	2023
2926	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2739	Basics of Research Methodology, Ethics and Research Communication	2023
2927	131600	Bachelor of Arts (Honors/ Honors with Research) in History	NHIS2737	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2928	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2801	The Popular Culture	2023
2929	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2802	Gender and History	2023
2930	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2803	History of the World from Mid 20th Century to the 21st Century	2023
2931	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2804	History of Contemporary World	2023
2932	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2805	Gender in Indian History	2023
2933	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2806	Global Ecological Histories	2023
2934	131600	Bachelor of Arts (Honors/ Honors with Research) in History	NHIS2837	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2935	131600	Bachelor of Arts (Honors/ Honors with Research) in History	DHIS2839	Data Analysis & Visualisation using Software	2023
2936	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2151	Indian Nationalism	2023
2937	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2101	British Colonialism	2023
2938	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2251	Political Theory	2023
2939	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2201	Global Themes in Development	2023
2940	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2351	Indian Political Thought	2023
2941	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2301	State Politics in India	2023
2942	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	SPOL2301	Political Leadership & Communication	2023

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2943	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	NPOL2335	Community Engagement Services	2023
2944	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2451	Public Administration	2023
2945	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2401	Social Movements in India	2023
2946	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	SPOL2401	Basics of Debunking Fake News and Dis-information	2023
2947	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2551	Public Administration in India	2023
2948	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2501	International Relations	2023
2949	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2502	India's Foreign Policy	2023
2950	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2503	Review of Contemporary Literature-I	2023
2951	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2504	Current Themes in Indian Politics	2023
2952	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	NPOL2537	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2953	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2651	Comparative Government and Politics	2023
2954	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2601	Reading Gandhi	2023
2955	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2602	Reading Ambedkar	2023
2956	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2603	Reading Vivekananda	2023
2957	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2604	Review of Contemporary Literature-II	2023
2958	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2605	Religion and Politics in India	2023
2959	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2701	Debates in Political Theory	2023
2960	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2702	Comparative Political Analysis	2023
2961	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2703	Theories of International Relations	2023
2962	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2704	Politics in India	2023
2963	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2739	Basics of Research Methodology, Ethics and Research Communication	2023
2964	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	NPOL2737	SIP/Internship/ Project/ Dissertation/Field Visit	2023

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2965	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2801	Administrative Theory	2023
2966	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2802	Themes in Indian Political Thought	2023
2967	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2803	Themes in World Politics and International Political Economy	2023
2968	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2804	Key Texts in Political Philosophy	2023
2969	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	NPOL2837	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2970	131598	Bachelor of Arts (Honors/ Honors with Research) in Political Science	DPOL2839	Data Analysis & Visualisation using Software	2023
2971	131510	Bachelor of Arts (Honors/ Honors with Research) in English	DENG2151	History of English Literature	2023
2972	131510	Bachelor of Arts (Honors/ Honors with Research) in English	DENG2101	English Poetry from Chaucer to Blake	2023
2973	131510	Bachelor of Arts (Honors/ Honors with Research) in English	DENG2251	English Poetry from Wordsworth to Tennyson	2023
2974	131510	Bachelor of Arts (Honors/ Honors with Research) in English	DENG2201	Introduction to Linguistics	2023
2975	131510	Bachelor of Arts (Honors/ Honors with Research) in English	DENG2351	English Novel	2023
2976	131510	Bachelor of Arts (Honors/ Honors with Research) in English	DENG2301	20th Century Indian English Poetry	2023
2977	131510	Bachelor of Arts (Honors/ Honors with Research) in English	SENG2301	Academic Writing and Composition	2023
2978	131510	Bachelor of Arts (Honors/ Honors with Research) in English	NENG2335	Community Engagement Services	2023
2979	131510	Bachelor of Arts (Honors/ Honors with Research) in English	DENG2451	Literary Criticism	2023
2980	131510	Bachelor of Arts (Honors/ Honors with Research) in English	DENG2401	Drama from Elizabethan to Restoration Age	2023
2981	131510	Bachelor of Arts (Honors/ Honors with Research) in English	SENG2401	Media and Communication	2023
2982	131510	Bachelor of Arts (Honors/ Honors with Research) in English	DENG2501	Drama from Shakespeare to Ben Jonson	2023
2983	131510	Bachelor of Arts (Honors/ Honors with Research) in English	DENG2502	Literary Theory	2023
2984	131510	Bachelor of Arts (Honors/ Honors with Research) in English	DENG2503	Indian Women Writing	2023
2985	131510	Bachelor of Arts (Honors/ Honors with Research) in English	DENG2504	Modern Drama	2023
2986	131510	Bachelor of Arts (Honors/ Honors with Research) in English	DENG2505	Post Colonial Literature	2023

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2987	131510	Bachelor of Arts (Honors/ Honors with Research) in English	NENG2537	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2988	131510	Bachelor of Arts (Honors/ Honors with Research) in English	DENG2651	Modern English Poetry	2023
2989	131510	Bachelor of Arts (Honors/ Honors with Research) in English	DENG2601	Literature and Society	2023
2990	131510	Bachelor of Arts (Honors/ Honors with Research) in English	DENG2602	20th Century Indian English Novel	2023
2991	131510	Bachelor of Arts (Honors/ Honors with Research) in English	DENG2603	New Literature in English	2023
2992	131510	Bachelor of Arts (Honors/ Honors with Research) in English	DENG2701	Contemporary Literature	2023
2993	131510	Bachelor of Arts (Honors/ Honors with Research) in English	DENG2702	Modern European Drama	2023
2994	131510	Bachelor of Arts (Honors/ Honors with Research) in English	DENG2703	Literary Forms and Practical Criticism	2023
2995	131510	Bachelor of Arts (Honors/ Honors with Research) in English	DENG2704	Popular Fiction	2023
2996	131510	Bachelor of Arts (Honors/ Honors with Research) in English	DENG2739	Basics of Research Methodology, Ethics and Research Communication	2023
2997	131510	Bachelor of Arts (Honors/ Honors with Research) in English	NENG2737	SIP/Internship/ Project/ Dissertation/Field Visit	2023
2998	131510	Bachelor of Arts (Honors/ Honors with Research) in English	DENG2801	Literature & Gender	2023
2999	131510	Bachelor of Arts (Honors/ Honors with Research) in English	DENG2802	American Literature	2023
3000	131510	Bachelor of Arts (Honors/ Honors with Research) in English	DENG2803	Theoretical Linguistics	2023
3001	131510	Bachelor of Arts (Honors/ Honors with Research) in English	DENG2804	Modern English Novel	2023
3002	131510	Bachelor of Arts (Honors/ Honors with Research) in English	NENG2837	SIP/Internship/ Project/ Dissertation/Field Visit	2023
3003	131510	Bachelor of Arts (Honors/ Honors with Research) in English	DENG2839	Data Analysis & Visualisation using Software	2023
3004	13103	Master of Arts (English)	ENG4102	English Literature from Medieval Period to 17th Century	2023
3005	13103	Master of Arts (English)	ENG4103	Drama from Shakespeare to Ben Jonson	2023
3006	13103	Master of Arts (English)	ENG4104	Restoration and Augustan Prose and Poetry	2023
3007	13103	Master of Arts (English)	ENG4105	18th and 19th Century Novels	2023
3008	13103	Master of Arts (English)	ENG4201	Restoration and Augustan Drama	2023
3009	13103	Master of Arts (English)	ENG4203	English Romantic Poetry	2023
3010	13103	Master of Arts (English)	ENG4204	Victorian Poetry and Prose	2023

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3011	13103	Master of Arts (English)	ENG4205	Theoretical Linguistics	2023
3012	13103	Master of Arts (English)	ENG4206	Research Methodology-I	2023
3013	13103	Master of Arts (English)	ENG4301	20th Century Poetry	2023
3014	13103	Master of Arts (English)	ENG4302	20th Century Drama	2023
3015	13103	Master of Arts (English)	ENG4303	Literary Criticism	2023
3016	13103	Master of Arts (English)	ENG4304	20th Century Novel	2023
3017	13103	Master of Arts (English)	ENG4305	Research Methodology-II	2023
3018	13103	Master of Arts (English)	ENG4335	Summer Project Evaluation	2023
3019	13103	Master of Arts (English)	ENG4401	Literary Theory	2023
3020	13103	Master of Arts (English)	ENG4437	Dissertation	2023
3021	13103	Master of Arts (English)	ENG4402	American Literature	2023
3022	13103	Master of Arts (English)	ENG4403	European Comedy	2023
3023	13103	Master of Arts (English)	ENG4407	Ancient Greek & Latin Literature	2023
3024	13103	Master of Arts (English)	ENG4404	20th Century Indian English Literature	2023
3025	13103	Master of Arts (English)	ENG4405	Indian Literature in Translation	2023
3026	13103	Master of Arts (English)	ENG4406	Linguistics and English Language Teaching	2023
3027	13201	Master of Arts (Political Science)	POL4101	Debates in Political Theory	2023
3028	13201	Master of Arts (Political Science)	POL4102	Comparative Political Analysis	2023
3029	13201	Master of Arts (Political Science)	POL4103	Politics in India	2023
3030	13201	Master of Arts (Political Science)	POL4104	Theories of International Relations	2023
3031	13201	Master of Arts (Political Science)	POL4201	Administrative Theory	2023
3032	13201	Master of Arts (Political Science)	POL4202	Themes in Indian Political Thought	2023
3033	13201	Master of Arts (Political Science)	POL4203	Themes in World Politics and International Political Economy	2023
3034	13201	Master of Arts (Political Science)	POL4204	Key Texts in Political Philosophy	2023
3035	13201	Master of Arts (Political Science)	POL4301	Interpreting Modern India	2023
3036	13201	Master of Arts (Political Science)	POL4302	Public Policy	2023
3037	13201	Master of Arts (Political Science)	POL4303	India and World	2023
3038	13201	Master of Arts (Political Science)	POL4304	Foreign Policy of Major Powers	2023
3039	13201	Master of Arts (Political Science)	POL4335	Summer Project Evaluation	2023
3040	13201	Master of Arts (Political Science)	POL4401	Social Exclusion: Theory and Practice	2023
3041	13201	Master of Arts (Political Science)	POL4402	Research Methodology	2023
3042	13201	Master of Arts (Political Science)	POL4437	Dissertation	2023
3043	13201	Master of Arts (Political Science)	POL4403	State and Society in US	2023
3044	13201	Master of Arts (Political Science)	POL4404	Religion, Reform and Nationalism	2023
3045	13201	Master of Arts (Political Science)	POL4405	State and Politics in India	2023
3046	13201	Master of Arts (Political Science)	POL4406	Collaborative Governance	2023
3047	13201	Master of Arts (Political Science)	POL4407	Environmental Policies and Politics	2023
3048	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2151	Written Expression-1	2023

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3049	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2101	Oral Expression-1	2023
3050	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2102	Life in France and Francophone Countries-1	2023
3051	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2251	Written Expression-2	2023
3052	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2201	Oral Expression-2	2023
3053	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2202	Life in France and Francophone Countries-2	2023
3054	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2351	Written Expression-3	2023
3055	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2301	Oral Expression-3	2023
3056	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2302	Introduction to French and Francophone Civilization and Culture-1	2023
3057	131678	Bachelor of Arts (Honors/ Honors with Research) in French	SFRE2301	Advanced Writing Skills	2023
3058	131678	Bachelor of Arts (Honors/ Honors with Research) in French	NFRE2335	Community Engagement Services	2023
3059	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2451	Written Expression-4	2023
3060	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2401	Oral Expression-4	2023
3061	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2402	Introduction to French and Francophone Civilization and Culture-2	2023
3062	131678	Bachelor of Arts (Honors/ Honors with Research) in French	SFRE2401	Introduction to Translation Theory	2023
3063	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2551	Introduction to French Literature-1	2023
3064	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2501	Detailed Study of a French Novel	2023
3065	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2502	Introduction to Linguistics	2023
3066	131678	Bachelor of Arts (Honors/ Honors with Research) in French	NFRE2537	SIP/Internship/ Project/ Dissertation/Field Visit	2023
3067	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2651	French Through Activities	2023
3068	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2601	Introduction to French Literature-2	2023
3069	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2602	Reading French Texts	2023

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3070	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2603	Introduction to Translation	2023
3071	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2701	Contemporary French Writings	2023
3072	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2702	French and Francophone Cinema	2023
3073	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2703	Translation: Theory & Practice-1	2023
3074	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2704	Cultural History of France	2023
3075	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2739	Basics of Research Methodology, Ethics and Research Communication	2023
3076	131678	Bachelor of Arts (Honors/ Honors with Research) in French	NFRE2737	SIP/Internship/ Project/ Dissertation/Field Visit	2023
3077	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2801	Introduction to Media Studies	2023
3078	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2802	Theory and Criticism	2023
3079	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2803	Cultural History of Francophone Countries	2023
3080	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2804	Translation: Theory & Practice-2	2023
3081	131678	Bachelor of Arts (Honors/ Honors with Research) in French	NFRE2837	SIP/Internship/ Project/ Dissertation/Field Visit	2023
3082	131678	Bachelor of Arts (Honors/ Honors with Research) in French	DFRE2839	Data Analysis & Visualisation using Software	2023
3083	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2151	Written Expression-1	2023
3084	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2101	Oral Expression-1	2023
3085	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2102	Introduction to German History and Culture	2023
3086	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2251	Written Expression-2	2023
3087	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2201	Oral Expression-2	2023
3088	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2202	German through Activities	2023
3089	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2351	Written Expression-3	2023
3090	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2301	Oral Expression-3	2023
3091	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2302	German through Literary Texts	2023

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3092	131679	Bachelor of Arts (Honors/ Honors with Research) in German	SGER2301	Advanced Writing Skills	2023
3093	131679	Bachelor of Arts (Honors/ Honors with Research) in German	NGER2335	Community Engagement Services	2023
3094	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2451	Written Expression-4	2023
3095	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2401	Oral Expression-4	2023
3096	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2402	Enhancing Language Proficiency	2023
3097	131679	Bachelor of Arts (Honors/ Honors with Research) in German	SGER2401	Basics of Translation	2023
3098	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2551	Written Expression-5	2023
3099	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2501	Oral Expression-5	2023
3100	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2502	Introduction to Literature	2023
3101	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2503	Introduction to Linguistics	2023
3102	131679	Bachelor of Arts (Honors/ Honors with Research) in German	NGER2537	SIP/Internship/ Project/ Dissertation/Field Visit	2023
3103	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2651	Written Expression-6	2023
3104	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2601	Business German	2023
3105	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2602	Specialised Study of an Author	2023
3106	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2603	Introduction to Translation	2023
3107	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2701	Women's Writing in German Speaking Countries	2023
3108	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2702	Introduction to Film and Media Studies	2023
3109	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2703	Translation: Theory & Practice-1	2023
3110	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2704	Study of a Genre (Shorter Narrative Forms)	2023
3111	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2739	Basics of Research Methodology, Ethics and Research Communication	2023
3112	131679	Bachelor of Arts (Honors/ Honors with Research) in German	NGER2737	SIP/Internship/ Project/ Dissertation/Field Visit	2023
3113	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2801	Cultural History of German Speaking Countries	2023

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3114	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2802	Translation: Theory & Practice-2	2023
3115	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2803	Study of Genre (Theatre)	2023
3116	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2804	Study of Genre (Poetry)	2023
3117	131679	Bachelor of Arts (Honors/ Honors with Research) in German	NGER2837	SIP/Internship/ Project/ Dissertation/Field Visit	2023
3118	131679	Bachelor of Arts (Honors/ Honors with Research) in German	DGER2839	Data Analysis & Visualisation using Software	2023
3119	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2151	Written Expression-1	2023
3120	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2101	Oral Expression-1	2023
3121	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2102	Grammar and Communicative Spanish-1	2023
3122	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2251	Written Expression-2	2023
3123	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2201	Oral Expression-2	2023
3124	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2202	Grammar and Communicative Spanish-2	2023
3125	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2351	Written Expression-3	2023
3126	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2301	Oral Expression-3	2023
3127	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2302	Introduction to Spanish Culture & Civilization	2023
3128	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	SSPA2301	Advanced Writing Skills	2023
3129	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	NSPA2335	Community Engagement Services	2023
3130	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2451	Written Expression-4	2023
3131	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2401	Oral Expression-4	2023
3132	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2402	Introduction to Culture and Civilization of Latin American Countries	2023
3133	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	SSPA2401	Introduction to Translation Theory	2023
3134	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2551	Spanish Through Activities	2023
3135	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2501	Spanish Literary Texts	2023

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3136	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2502	Oral Expression-5	2023
3137	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	NSPA2537	SIP/Internship/ Project/ Dissertation/Field Visit	2023
3138	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2651	Introduction to Spanish Literature	2023
3139	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2601	Introduction to Translation	2023
3140	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2602	Business Spanish	2023
3141	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2603	Introduction to Linguistics	2023
3142	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2701	Introduction to Spanish Cinema	2023
3143	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2702	Advanced Hispanic Media Studies	2023
3144	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2703	Translation: Theory & Practice-1	2023
3145	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2704	Spanish Short Narrative Traditions: From Classics to Contemporary Works	2023
3146	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2739	Basics of Research Methodology, Ethics and Research Communication	2023
3147	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	NSPA2737	SIP/Internship/ Project/ Dissertation/Field Visit	2023
3148	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2801	Hispanic Cultural History	2023
3149	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2802	Translation: Theory & Practice-2	2023
3150	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2803	Reading Spanish Theatre	2023
3151	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2804	Reading Poetry	2023
3152	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	NSPA2837	SIP/Internship/ Project/ Dissertation/Field Visit	2023
3153	131680	Bachelor of Arts (Honors/ Honors with Research) in Spanish	DSPA2839	Data Analysis & Visualisation using Software	2023
3154	13817	Bachelor of Design in Fashion Design	FST2101	Pattern Making & Drafting-I	2023
3155	13817	Bachelor of Design in Fashion Design	FST2102	Introduction to Apparel Manufacturing Technique	2023
3156	13817	Bachelor of Design in Fashion Design	FST2103	Computer Applications	2023

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3157	13817	Bachelor of Design in Fashion Design	FST2104	Design & Colour Concept	2023
3158	13817	Bachelor of Design in Fashion Design	FST2105	Fundamentals of Textiles	2023
3159	13817	Bachelor of Design in Fashion Design	FST2106	Basics of Fashion	2023
3160	13817	Bachelor of Design in Fashion Design	FST2107	Social and Psychological Aspects of Clothing	2023
3161	13817	Bachelor of Design in Fashion Design	FST2108	Fashion Art Illustration & Model Drawing-I	2023
3162	13817	Bachelor of Design in Fashion Design	FST2201	Fashion Art Illustration & Model Drawing-II	2023
3163	13817	Bachelor of Design in Fashion Design	FST2202	Pattern Making & Drafting-II	2023
3164	13817	Bachelor of Design in Fashion Design	FST2203	Garment Construction-I	2023
3165	13817	Bachelor of Design in Fashion Design	FST2204	Computer Aided Design-I	2023
3166	13817	Bachelor of Design in Fashion Design	FST2205	Fabric Artistry & Embroidery	2023
3167	13817	Bachelor of Design in Fashion Design	FST2206	Design Process & Application of Colour Theory	2023
3168	13817	Bachelor of Design in Fashion Design	FST2207	Technology of Textiles Manufacturing	2023
3169	13817	Bachelor of Design in Fashion Design	FST2208	Fashion-Business Laws, Ethics & Communication	2023
3170	13817	Bachelor of Design in Fashion Design	FST2209	Fashion Theory	2023
3171	13817	Bachelor of Design in Fashion Design	FST2301	Fashion Art Illustration & Model Drawing-III	2023
3172	13817	Bachelor of Design in Fashion Design	FST2302	Advance Pattern Making-I	2023
3173	13817	Bachelor of Design in Fashion Design	FST2303	Garment Construction-II	2023
3174	13817	Bachelor of Design in Fashion Design	FST2304	History of Indian Costumes	2023
3175	13817	Bachelor of Design in Fashion Design	FST2305	Technology of Processing & Care Renovation of Textiles	2023
3176	13817	Bachelor of Design in Fashion Design	FST2306	Apparel Production	2023
3177	13817	Bachelor of Design in Fashion Design	FST2307	Basics of Management	2023
3178	13817	Bachelor of Design in Fashion Design	FST2308	Introduction to Fashion Research & Product Development Process	2023

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3179	13817	Bachelor of Design in Fashion Design	FST2309	Computer Aided Manufacturing	2023
3180	13817	Bachelor of Design in Fashion Design	FST2332	Project Presentation	2023
3181	13817	Bachelor of Design in Fashion Design	FST2401	Fashion Art Illustration & Model Drawing-IV	2023
3182	13817	Bachelor of Design in Fashion Design	FST2402	Advance Pattern Making-II	2023
3183	13817	Bachelor of Design in Fashion Design	FST2403	Garment Construction-III	2023
3184	13817	Bachelor of Design in Fashion Design	FST2404	Computer Aided Design-III	2023
3185	13817	Bachelor of Design in Fashion Design	FST2405	Fashion Merchandizing-I	2023
3186	13817	Bachelor of Design in Fashion Design	FST2406	Quality Control & Production Management-I	2023
3187	13817	Bachelor of Design in Fashion Design	FST2407	History of Western Costumes	2023
3188	13817	Bachelor of Design in Fashion Design	FST2408	Visual Merchandising	2023
3189	13817	Bachelor of Design in Fashion Design	FST2409	Fashion Marketing Management	2023
3190	13817	Bachelor of Design in Fashion Design	FST2410	Traditional Indian Textiles Documentation	2023
3191	13817	Bachelor of Design in Fashion Design	FST2411	Study on Traditional Dresses of India	2023
3192	13817	Bachelor of Design in Fashion Design	FST2431	Term Paper	2023
3193	13817	Bachelor of Design in Fashion Design	FST2433	Workshops / Certification (Discipline specific)	2023
3194	13817	Bachelor of Design in Fashion Design	FST2501	Fashion Art Illustration and Model Drawing-V	2023
3195	13817	Bachelor of Design in Fashion Design	FST2502	Garment Construction-IV	2023
3196	13817	Bachelor of Design in Fashion Design	FST2503	Computer Aided Design-IV	2023
3197	13817	Bachelor of Design in Fashion Design	FST2504	Pattern Draping	2023
3198	13817	Bachelor of Design in Fashion Design	FST2505	Pattern Grading	2023
3199	13817	Bachelor of Design in Fashion Design	FST2506	Fashion Merchandizing-II	2023
3200	13817	Bachelor of Design in Fashion Design	FST2507	Quality Control & Production Management-II	2023

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3201	13817	Bachelor of Design in Fashion Design	FST2508	Fashion Forecasting	2023
3202	13817	Bachelor of Design in Fashion Design	FST2535	Craft Documentation (Market Visit, Field Trip, Documentation & Presentation, Scope & Final Presentation)	2023
3203	13817	Bachelor of Design in Fashion Design	FST2509	Manufacturing process in Apparel Industry & Export Management	2023
3204	13817	Bachelor of Design in Fashion Design	FST2510	Quality Assurance in Apparel Industry	2023
3205	13817	Bachelor of Design in Fashion Design	FST2511	Fashion Retailing & Visual Merchandising	2023
3206	13817	Bachelor of Design in Fashion Design	FST2512	Fashion Promotion	2023
3207	13817	Bachelor of Design in Fashion Design	FST2513	The Business of Luxury Fashion	2023
3208	13817	Bachelor of Design in Fashion Design	FST2514	Couture Design	2023
3209	13817	Bachelor of Design in Fashion Design	FST2601	Retail Merchandising and Management	2023
3210	13817	Bachelor of Design in Fashion Design	FST2602	Fashion study applicable to home furnishing	2023
3211	13817	Bachelor of Design in Fashion Design	FST2603	Leather Science Applicable to Fashion Art	2023
3212	13817	Bachelor of Design in Fashion Design	FST2604	Entrepreneurship	2023
3213	13817	Bachelor of Design in Fashion Design	FST2605	Nonwovens in Fashion Apparel Applications	2023
3214	13817	Bachelor of Design in Fashion Design	FST2606	Designing and Development of Fashion Accessories	2023
3215	13817	Bachelor of Design in Fashion Design	FST2610	Advance Pattern Making-III	2023
3216	13817	Bachelor of Design in Fashion Design	FST2611	Garment Construction-V	2023
3217	13817	Bachelor of Design in Fashion Design	FST2607	Sportswear Design & Development	2023
3218	13817	Bachelor of Design in Fashion Design	FST2608	Costume Design Pertaining to Performing Arts	2023
3219	13817	Bachelor of Design in Fashion Design	FST2609	Functions of Indian Buying Houses / Agents - A Study	2023
3220	13817	Bachelor of Design in Fashion Design	FST2701	Fabric Manufacturing Technology : Crochet & Non-woven	2023
3221	13817	Bachelor of Design in Fashion Design	FST2702	Field Trip / Visit Documentation Evaluation	2023

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3222	13817	Bachelor of Design in Fashion Design	FST2703	Computer Aided Design-V	2023
3223	13817	Bachelor of Design in Fashion Design	FST2704	Graduate Design Collection	2023
3224	13817	Bachelor of Design in Fashion Design	FST2837	Graduation Project	2023
3225	13057	Bachelor of Fine Arts	FNA2101	Drawing-I	2023
3226	13057	Bachelor of Fine Arts	FNA2102	Geometrical Drawing & Perspective-I	2023
3227	13057	Bachelor of Fine Arts	FNA2103	Design-I	2023
3228	13057	Bachelor of Fine Arts	FNA2104	Painting-I	2023
3229	13057	Bachelor of Fine Arts	FNA2105	Sculpture-I	2023
3230	13057	Bachelor of Fine Arts	FNA2106	Print Making-I	2023
3231	13057	Bachelor of Fine Arts	FNA2107	History of Art-I	2023
3232	13057	Bachelor of Fine Arts	FNA2108	Visual Graphics-I	2023
3233	13057	Bachelor of Fine Arts	FNA2109	Photography-I	2023
3234	13057	Bachelor of Fine Arts	FNA2201	Drawing-II	2023
3235	13057	Bachelor of Fine Arts	FNA2202	Geometrical Drawing & Perspective-II	2023
3236	13057	Bachelor of Fine Arts	FNA2203	Design-II	2023
3237	13057	Bachelor of Fine Arts	FNA2204	Painting-II	2023
3238	13057	Bachelor of Fine Arts	FNA2205	Sculpture-II	2023
3239	13057	Bachelor of Fine Arts	FNA2206	Print Making-II	2023
3240	13057	Bachelor of Fine Arts	FNA2207	History of Art-II	2023
3241	13057	Bachelor of Fine Arts	FNA2208	Visual Graphics-II	2023
3242	13057	Bachelor of Fine Arts	FNA2209	Photography-II	2023
3243	13057	Bachelor of Fine Arts	FNA2301	History of Art-III	2023
3244	13057	Bachelor of Fine Arts	FNA2302	Aesthetics-I	2023
3245	13057	Bachelor of Fine Arts	FNA2335	Summer Project Evaluation-I	2023
3246	13057	Bachelor of Fine Arts	FNA2303	Study from Life-I	2023
3247	13057	Bachelor of Fine Arts	FNA2304	Composition -I	2023
3248	13057	Bachelor of Fine Arts	FNA2305	Carving-I	2023
3249	13057	Bachelor of Fine Arts	FNA2306	Mural-I	2023
3250	13057	Bachelor of Fine Arts	FNA2307	Photography-I	2023
3251	13057	Bachelor of Fine Arts	FNA2308	Ceramics-I	2023
3252	13057	Bachelor of Fine Arts	FNA2309	Assemblage-I	2023
3253	13057	Bachelor of Fine Arts	FNA2310	Sculpture Methods & Materials - I	2023
3254	13057	Bachelor of Fine Arts	FNA2311	Drawing & Illustration-I	2023
3255	13057	Bachelor of Fine Arts	FNA2312	Design-III	2023
3256	13057	Bachelor of Fine Arts	FNA2313	Lettering & Typography-I	2023
3257	13057	Bachelor of Fine Arts	FNA2314	Photography-III	2023
3258	13057	Bachelor of Fine Arts	FNA2315	Printing Techniques-I	2023
3259	13057	Bachelor of Fine Arts	FNA2316	Computer Graphic-I	2023
3260	13057	Bachelor of Fine Arts	FNA2317	Advertising Theory-I	2023
3261	13057	Bachelor of Fine Arts	FNA2318	Drawing-III	2023

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3262	13057	Bachelor of Fine Arts	FNA2319	Painting-III	2023
3263	13057	Bachelor of Fine Arts	FNA2320	Composition-I	2023
3264	13057	Bachelor of Fine Arts	FNA2321	Photography-III	2023
3265	13057	Bachelor of Fine Arts	FNA2322	Print Making-III	2023
3266	13057	Bachelor of Fine Arts	FNA2323	Computer Graphic-I	2023
3267	13057	Bachelor of Fine Arts	FNA2324	Painting Methods & Materials-I	2023
3268	13057	Bachelor of Fine Arts	FNA2401	History of Art - IV	2023
3269	13057	Bachelor of Fine Arts	FNA2402	Aesthetics - II	2023
3270	13057	Bachelor of Fine Arts	FNA2403	Study from Life- II	2023
3271	13057	Bachelor of Fine Arts	FNA2404	Composition- II	2023
3272	13057	Bachelor of Fine Arts	FNA2405	Carving- II	2023
3273	13057	Bachelor of Fine Arts	FNA2406	Mural - II	2023
3274	13057	Bachelor of Fine Arts	FNA2407	Photography - II	2023
3275	13057	Bachelor of Fine Arts	FNA2408	Ceramics - II	2023
3276	13057	Bachelor of Fine Arts	FNA2409	Assemblage - II	2023
3277	13057	Bachelor of Fine Arts	FNA2410	Sculpture Methods & Materials - II	2023
3278	13057	Bachelor of Fine Arts	FNA2411	Drawing & Illustration - II	2023
3279	13057	Bachelor of Fine Arts	FNA2412	Design - IV	2023
3280	13057	Bachelor of Fine Arts	FNA2413	Lettering & Typography - II	2023
3281	13057	Bachelor of Fine Arts	FNA2414	Computer Graphics - II	2023
3282	13057	Bachelor of Fine Arts	FNA2415	Printing Techniques - II	2023
3283	13057	Bachelor of Fine Arts	FNA2416	Advertising Theory - II	2023
3284	13057	Bachelor of Fine Arts	FNA2417	Drawing - IV	2023
3285	13057	Bachelor of Fine Arts	FNA2418	Painting - IV	2023
3286	13057	Bachelor of Fine Arts	FNA2419	Composition - II	2023
3287	13057	Bachelor of Fine Arts	FNA2420	Mural - I	2023
3288	13057	Bachelor of Fine Arts	FNA2421	Print Making - II	2023
3289	13057	Bachelor of Fine Arts	FNA2422	Painting Methods & Materials - II	2023
3290	13057	Bachelor of Fine Arts	FNA2501	History of Art - V	2023
3291	13057	Bachelor of Fine Arts	FNA2502	Aesthetics - III	2023
3292	13057	Bachelor of Fine Arts	FNA2535	Practical Training - I (Evaluation)	2023
3293	13057	Bachelor of Fine Arts	FNA2503	Study from Life - III	2023
3294	13057	Bachelor of Fine Arts	FNA2504	Composition - III	2023
3295	13057	Bachelor of Fine Arts	FNA2505	Metal Casting - I	2023
3296	13057	Bachelor of Fine Arts	FNA2506	Mural - III	2023
3297	13057	Bachelor of Fine Arts	FNA2507	Photography - III	2023
3298	13057	Bachelor of Fine Arts	FNA2508	Ceramics - III	2023
3299	13057	Bachelor of Fine Arts	FNA2509	Assemblage - III	2023
3300	13057	Bachelor of Fine Arts	FNA2510	Sculpture Methods & Materials - III	2023
3301	13057	Bachelor of Fine Arts	FNA2511	Drawing & Illustration - III	2023
3302	13057	Bachelor of Fine Arts	FNA2512	Design - V	2023
3303	13057	Bachelor of Fine Arts	FNA2513	Packaging - I	2023
3304	13057	Bachelor of Fine Arts	FNA2514	Computer Graphics - III	2023
3305	13057	Bachelor of Fine Arts	FNA2515	Printing Techniques - III	2023
3306	13057	Bachelor of Fine Arts	FNA2516	Textile Design - I	2023

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3307	13057	Bachelor of Fine Arts	FNA2517	Advertising Theory - III	2023
3308	13057	Bachelor of Fine Arts	FNA2518	Drawing - V	2023
3309	13057	Bachelor of Fine Arts	FNA2519	Painting - V	2023
3310	13057	Bachelor of Fine Arts	FNA2520	Composition - III	2023
3311	13057	Bachelor of Fine Arts	FNA2521	Photography - III	2023
3312	13057	Bachelor of Fine Arts	FNA2522	Print Making - III	2023
3313	13057	Bachelor of Fine Arts	FNA2523	Traditional Painting - I	2023
3314	13057	Bachelor of Fine Arts	FNA2524	Painting Methods & Materials - III	2023
3315	13057	Bachelor of Fine Arts	FNA2534	Study Abroad	2023
3316	13057	Bachelor of Fine Arts	FNA2532	Project - I	2023
3317	13057	Bachelor of Fine Arts	FNA2601	History of Art - VI	2023
3318	13057	Bachelor of Fine Arts	FNA2602	Aesthetics - IV	2023
3319	13057	Bachelor of Fine Arts	FNA2637	Dissertation-I	2023
3320	13057	Bachelor of Fine Arts	FNA2603	Study from Life - IV	2023
3321	13057	Bachelor of Fine Arts	FNA2604	Composition - IV	2023
3322	13057	Bachelor of Fine Arts	FNA2605	Metal Casting - II	2023
3323	13057	Bachelor of Fine Arts	FNA2606	Mural - IV	2023
3324	13057	Bachelor of Fine Arts	FNA2607	Photography - IV	2023
3325	13057	Bachelor of Fine Arts	FNA2608	Ceramics - IV	2023
3326	13057	Bachelor of Fine Arts	FNA2609	Assemblage - IV	2023
3327	13057	Bachelor of Fine Arts	FNA2610	Sculpture Methods & Materials - IV	2023
3328	13057	Bachelor of Fine Arts	FNA2611	Drawing & Illustration - IV	2023
3329	13057	Bachelor of Fine Arts	FNA2612	Design-VI	2023
3330	13057	Bachelor of Fine Arts	FNA2613	Packaging-II	2023
3331	13057	Bachelor of Fine Arts	FNA2614	Printing Techniques-IV	2023
3332	13057	Bachelor of Fine Arts	FNA2615	Computer Graphics - IV	2023
3333	13057	Bachelor of Fine Arts	FNA2616	Textile Design - II	2023
3334	13057	Bachelor of Fine Arts	FNA2617	Advertising Theory - IV	2023
3335	13057	Bachelor of Fine Arts	FNA2618	Drawing - VI	2023
3336	13057	Bachelor of Fine Arts	FNA2619	Painting - VI	2023
3337	13057	Bachelor of Fine Arts	FNA2620	Composition - IV	2023
3338	13057	Bachelor of Fine Arts	FNA2621	Mural - II	2023
3339	13057	Bachelor of Fine Arts	FNA2622	Print Making - II	2023
3340	13057	Bachelor of Fine Arts	FNA2623	Painting Methods & Materials - IV	2023
3341	13057	Bachelor of Fine Arts	FNA2634	Study Abroad	2023
3342	13057	Bachelor of Fine Arts	FNA2630	Traditional Artwork	2023
3343	13057	Bachelor of Fine Arts	FNA2701	History of Modern Art - I	2023
3344	13057	Bachelor of Fine Arts	FNA2735	Practical Training Evaluation-II	2023
3345	13057	Bachelor of Fine Arts	FNA2702	Study from Life - V	2023
3346	13057	Bachelor of Fine Arts	FNA2703	Composition - V	2023
3347	13057	Bachelor of Fine Arts	FNA2704	Metal Casting - III	2023
3348	13057	Bachelor of Fine Arts	FNA2705	Mural - V	2023
3349	13057	Bachelor of Fine Arts	FNA2706	Photography -V	2023
3350	13057	Bachelor of Fine Arts	FNA2707	Ceramics - V	2023
3351	13057	Bachelor of Fine Arts	FNA2708	Assemblage - V	2023

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3352	13057	Bachelor of Fine Arts	FNA2709	Sculpture Methods & Materials - V	2023
3353	13057	Bachelor of Fine Arts	FNA2710	Design - VII	2023
3354	13057	Bachelor of Fine Arts	FNA2711	Packaging - III	2023
3355	13057	Bachelor of Fine Arts	FNA2712	Drawing & Illustration - V	2023
3356	13057	Bachelor of Fine Arts	FNA2713	Computer Graphics - V	2023
3357	13057	Bachelor of Fine Arts	FNA2714	Photography - V	2023
3358	13057	Bachelor of Fine Arts	FNA2715	History of Design - I	2023
3359	13057	Bachelor of Fine Arts	FNA2716	Drawing - VII	2023
3360	13057	Bachelor of Fine Arts	FNA2717	Painting & Composition - I	2023
3361	13057	Bachelor of Fine Arts	FNA2718	Mural - III	2023
3362	13057	Bachelor of Fine Arts	FNA2719	Print Making - III	2023
3363	13057	Bachelor of Fine Arts	FNA2720	Painting Methods & Materials - V	2023
3364	13057	Bachelor of Fine Arts	FNA2732	Project- II	2023
3365	13057	Bachelor of Fine Arts	FNA2733	Workshops/ Certification/ Exhibition (Discipline specific)	2023
3366	13057	Bachelor of Fine Arts	FNA2801	History of Art - VIII	2023
3367	13057	Bachelor of Fine Arts	FNA2837	Portfolio Development & Presentation With Exhibitions	2023
3368	13057	Bachelor of Fine Arts	FNA2802	Study from Life - VI	2023
3369	13057	Bachelor of Fine Arts	FNA2803	Composition - VI	2023
3370	13057	Bachelor of Fine Arts	FNA2804	Metal Casting - IV	2023
3371	13057	Bachelor of Fine Arts	FNA2805	Mural - IV	2023
3372	13057	Bachelor of Fine Arts	FNA2806	Photography – IV	2023
3373	13057	Bachelor of Fine Arts	FNA2807	Ceramics - IV	2023
3374	13057	Bachelor of Fine Arts	FNA2808	Assemblage - IV	2023
3375	13057	Bachelor of Fine Arts	FNA2809	Sculpture Methods & Materials - IV	2023
3376	13057	Bachelor of Fine Arts	FNA2810	Design - VIII	2023
3377	13057	Bachelor of Fine Arts	FNA2811	Packaging - IV	2023
3378	13057	Bachelor of Fine Arts	FNA2812	Drawing & Illustration - VI	2023
3379	13057	Bachelor of Fine Arts	FNA2813	Computer Graphics - VI	2023
3380	13057	Bachelor of Fine Arts	FNA2814	Photography - VI	2023
3381	13057	Bachelor of Fine Arts	FNA2815	History of Design - II	2023
3382	13057	Bachelor of Fine Arts	FNA2816	Drawing - VIII	2023
3383	13057	Bachelor of Fine Arts	FNA2817	Painting & Composition - II	2023
3384	13057	Bachelor of Fine Arts	FNA2818	Mural - IV	2023
3385	13057	Bachelor of Fine Arts	FNA2819	Print Making - IV	2023
3386	13057	Bachelor of Fine Arts	FNA2820	Painting Methods & Materials - VI	2023
3387	13010	Master of Fine Arts	FNA4101	Visualization - I	2023
3388	13010	Master of Fine Arts	FNA4102	Graphic Designing – I	2023
3389	13010	Master of Fine Arts	FNA4103	TV Graphics – I	2023
3390	13010	Master of Fine Arts	FNA4104	Illustration - I	2023
3391	13010	Master of Fine Arts	FNA4105	Advertising & Marketing Research – I	2023
3392	13010	Master of Fine Arts	FNA4106	Drawing - I	2023

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3393	13010	Master of Fine Arts	FNA4107	Creative Painting - I	2023
3394	13010	Master of Fine Arts	FNA4108	Mural (Painting) - I	2023
3395	13010	Master of Fine Arts	FNA4109	Portraiture - I	2023
3396	13010	Master of Fine Arts	FNA4110	History of Art (20th Century) - I	2023
3397	13010	Master of Fine Arts	FNA4111	Creative Drawing - I	2023
3398	13010	Master of Fine Arts	FNA4112	History of Art - 20th Century Art (Sculpture) - I	2023
3399	13010	Master of Fine Arts	FNA4113	Portraiture Sculpture- I	2023
3400	13010	Master of Fine Arts	FNA4114	Mural (Sculpture)- I	2023
3401	13010	Master of Fine Arts	FNA4115	Creative Sculpture-I	2023
3402	13010	Master of Fine Arts	FNA4237	Report & Viva (Specialization Specific)	2023
3403	13010	Master of Fine Arts	FNA4201	Visualization - II	2023
3404	13010	Master of Fine Arts	FNA4202	Graphic Designing - II	2023
3405	13010	Master of Fine Arts	FNA4203	TV Graphics - II	2023
3406	13010	Master of Fine Arts	FNA4204	Illustration - II	2023
3407	13010	Master of Fine Arts	FNA4205	Advertising & Marketing Research - II	2023
3408	13010	Master of Fine Arts	FNA4206	Drawing -II	2023
3409	13010	Master of Fine Arts	FNA4207	Creative Painting - II	2023
3410	13010	Master of Fine Arts	FNA4208	Mural (Painting) - II	2023
3411	13010	Master of Fine Arts	FNA4209	Portraiture - II	2023
3412	13010	Master of Fine Arts	FNA4210	History of Art (20th Century) - II	2023
3413	13010	Master of Fine Arts	FNA4211	Creative Drawing -II	2023
3414	13010	Master of Fine Arts	FNA4212	Portraiture Sculpture- II	2023
3415	13010	Master of Fine Arts	FNA4213	Mural (Sculpture) - II	2023
3416	13010	Master of Fine Arts	FNA4214	Creative Sculpture- II	2023
3417	13010	Master of Fine Arts	FNA4215	History of Art - (20th Century) - II	2023
3418	13010	Master of Fine Arts	FNA4337	Dissertation & Viva (Specialization Specific)-I	2023
3419	13010	Master of Fine Arts	FNA4301	Visualization - III	2023
3420	13010	Master of Fine Arts	FNA4302	Graphic Designing-III	2023
3421	13010	Master of Fine Arts	FNA4303	TV Graphics - III	2023
3422	13010	Master of Fine Arts	FNA4304	Illustration - III	2023
3423	13010	Master of Fine Arts	FNA4305	Advertising & Business Organization-I	2023
3424	13010	Master of Fine Arts	FNA4306	Drawing – III	2023
3425	13010	Master of Fine Arts	FNA4307	Creative Painting - III	2023
3426	13010	Master of Fine Arts	FNA4308	Mural Painting - III	2023
3427	13010	Master of Fine Arts	FNA4309	Portraiture - III	2023
3428	13010	Master of Fine Arts	FNA4310	Art Criticism (Painting) - I	2023
3429	13010	Master of Fine Arts	FNA4311	Creative Sculpture - III	2023
3430	13010	Master of Fine Arts	FNA4312	Portraiture Sculpture - III	2023
3431	13010	Master of Fine Arts	FNA4313	Mural (Sculpture) - III	2023
3432	13010	Master of Fine Arts	FNA4315	Art Criticism (Sculpture) - I	2023

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3433	13010	Master of Fine Arts	FNA4437	Dissertation & Viva (Specialization Specific) - II	2023
3434	13010	Master of Fine Arts	FNA4401	Visualization - IV	2023
3435	13010	Master of Fine Arts	FNA4402	Graphic Designing - IV	2023
3436	13010	Master of Fine Arts	FNA4403	TV Graphics - IV	2023
3437	13010	Master of Fine Arts	FNA4404	Illustration - IV	2023
3438	13010	Master of Fine Arts	FNA4405	Advertising & Business Organization - II	2023
3439	13010	Master of Fine Arts	FNA4406	Drawing - IV	2023
3440	13010	Master of Fine Arts	FNA4407	Creative Painting - IV	2023
3441	13010	Master of Fine Arts	FNA4408	Mural (Painting) - IV	2023
3442	13010	Master of Fine Arts	FNA4409	Portraiture - IV	2023
3443	13010	Master of Fine Arts	FNA4410	Art Criticism (Painting) - II	2023
3444	13010	Master of Fine Arts	FNA4411	Creative Drawing - IV	2023
3445	13010	Master of Fine Arts	FNA4412	Portraiture Sculpture - IV	2023
3446	13010	Master of Fine Arts	FNA4413	Mural (Sculpture) - IV	2023
3447	13010	Master of Fine Arts	FNA4414	Creative Sculpture - II	2023
3448	13010	Master of Fine Arts	FNA4415	Art Criticism (Sculpture) - II	2023
3449	13111	B.A., LLB (Hons.)	LAW2101	History-I	2023
3450	13111	B.A., LLB (Hons.)	LAW2102	Political Science-I	2023
3451	13111	B.A., LLB (Hons.)	LAW2103	English-I	2023
3452	13111	B.A., LLB (Hons.)	LAW2104	Legal Method	2023
3453	13111	B.A., LLB (Hons.)	LAW2105	Law of Contract-I	2023
3454	13111	B.A., LLB (Hons.)	LAW2106	Micro Economics-I	2023
3455	13111	B.A., LLB (Hons.)	LAW2201	History-II	2023
3456	13111	B.A., LLB (Hons.)	LAW2202	Political Science-II	2023
3457	13111	B.A., LLB (Hons.)	LAW2203	English-II	2023
3458	13111	B.A., LLB (Hons.)	LAW2204	Law of Contract-II	2023
3459	13111	B.A., LLB (Hons.)	LAW2205	Micro Economics-II	2023
3460	13111	B.A., LLB (Hons.)	LAW2301	Sociology-I	2023
3461	13111	B.A., LLB (Hons.)	LAW2302	Macro Economics-I	2023
3462	13111	B.A., LLB (Hons.)	LAW2303	Constitutional Law-I	2023
3463	13111	B.A., LLB (Hons.)	LAW2304	Law of Crimes-I (Indian Penal Code Section-1 to 120B)	2023
3464	13111	B.A., LLB (Hons.)	LAW2305	Family Law-I	2023
3465	13111	B.A., LLB (Hons.)	LAW2311	Code of Criminal Procedure	2023
3466	13111	B.A., LLB (Hons.)	LAW2335	Summer Internship Evaluation-I	2023
3467	13111	B.A., LLB (Hons.)	LAW2401	Sociology-II	2023
3468	13111	B.A., LLB (Hons.)	LAW2402	Macro Economics-II	2023
3469	13111	B.A., LLB (Hons.)	LAW2403	Constitutional Law-II	2023
3470	13111	B.A., LLB (Hons.)	LAW2404	Administrative Law	2023
3471	13111	B.A., LLB (Hons.)	LAW2405	Family Law-II	2023
3472	13111	B.A., LLB (Hons.)	LAW2406	Law of Crimes-II (Indian Penal Code Section 121-511)	2023
3473	13111	B.A., LLB (Hons.)	LAW2501	Sociology-III	2023

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3474	13111	B.A., LLB (Hons.)	LAW2502	Law of Evidence	2023
3475	13111	B.A., LLB (Hons.)	LAW2503	Code of Civil Procedure	2023
3476	13111	B.A., LLB (Hons.)	LAW2504	Labour Law-I	2023
3477	13111	B.A., LLB (Hons.)	LAW2505	Property Law	2023
3478	13111	B.A., LLB (Hons.)	LAW2535	Summer Internship Evaluation-II	2023
3479	13111	B.A., LLB (Hons.)	LAW2601	History - III	2023
3480	13111	B.A., LLB (Hons.)	LAW2602	Political Science - III	2023
3481	13111	B.A., LLB (Hons.)	LAW2603	Company Law	2023
3482	13111	B.A., LLB (Hons.)	LAW2604	Law of Torts (Motor Vehicles Act & Consumer Protection Act, 2019)	2023
3483	13111	B.A., LLB (Hons.)	LAW2605	Labour Law - II	2023
3484	13111	B.A., LLB (Hons.)	LAW2606	Cyber Laws	2023
3485	13111	B.A., LLB (Hons.)	LAW2702	Environmental Law	2023
3486	13111	B.A., LLB (Hons.)	LAW2703	Jurisprudence	2023
3487	13111	B.A., LLB (Hons.)	LAW2704	Public International Law	2023
3488	13111	B.A., LLB (Hons.)	LAW2705	Arbitration & Alternate Dispute Resolution	2023
3489	13111	B.A., LLB (Hons.)	LAW2735	Summer Internship Evaluation-III	2023
3490	13111	B.A., LLB (Hons.)	LAW2701	Human Rights Law	2023
3491	13111	B.A., LLB (Hons.)	LAW2706	Indian Federalism	2023
3492	13111	B.A., LLB (Hons.)	LAW2707	Forensic Science-I	2023
3493	13111	B.A., LLB (Hons.)	LAW2708	Offences against Child & Juvenile Offence Human Rights Law	2023
3494	13111	B.A., LLB (Hons.)	LAW2709	Law and Medicine-I	2023
3495	13111	B.A., LLB (Hons.)	LAW2710	Military Law	2023
3496	13111	B.A., LLB (Hons.)	LAW2802	Taxation Law	2023
3497	13111	B.A., LLB (Hons.)	LAW2803	Interpretation of Statutes	2023
3498	13111	B.A., LLB (Hons.)	LAW2804	International Trade Law	2023
3499	13111	B.A., LLB (Hons.)	LAW2805	Land Laws	2023
3500	13111	B.A., LLB (Hons.)	LAW2801	Investment & Competition Law	2023
3501	13111	B.A., LLB (Hons.)	LAW2806	Women & Criminal Law	2023
3502	13111	B.A., LLB (Hons.)	LAW2807	Probation & Parole	2023
3503	13111	B.A., LLB (Hons.)	LAW2808	Forensic Science-II	2023
3504	13111	B.A., LLB (Hons.)	LAW2809	Law and Medicine-II	2023
3505	13111	B.A., LLB (Hons.)	LAW2810	Medical Jurisprudence	2023
3506	13111	B.A., LLB (Hons.)	LAW2901	Drafting, Pleading & Convincing	2023
3507	13111	B.A., LLB (Hons.)	LAW2902	Intellectual Property Rights	2023
3508	13111	B.A., LLB (Hons.)	LAW2903	Law Poverty &Development	2023
3509	13111	B.A., LLB (Hons.)	LAW2904	Professional Ethics	2023
3510	13111	B.A., LLB (Hons.)	LAW2935	Summer Internship Evaluation-IV	2023
3511	13111	B.A., LLB (Hons.)	LAW2905	Private International Law	2023
3512	13111	B.A., LLB (Hons.)	LAW2906	Election Law	2023
3513	13111	B.A., LLB (Hons.)	LAW2907	Banking & Insurance Laws	2023
3514	13111	B.A., LLB (Hons.)	LAW2908	International Humanitarian & Refugee Law	2023

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3515	13111	B.A., LLB (Hons.)	LAW2909	Criminology & Victimology	2023
3516	13111	B.A., LLB (Hons.)	LAW2910	Media Laws	2023
3517	13111	B.A., LLB (Hons.)	LAW2911	Corruption Laws	2023
3518	13111	B.A., LLB (Hons.)	LAW2003	Moot Court / Internship	2023
3519	13111	B.A., LLB (Hons.)	LAW2037	Dissertation	2023
3520	13216	B.Com, LLB (Hons.)	LAW2103	English-I	2023
3521	13216	B.Com, LLB (Hons.)	LAW2104	Legal Method	2023
3522	13216	B.Com, LLB (Hons.)	LAW2105	Law of Contract-I	2023
3523	13216	B.Com, LLB (Hons.)	LAW2107	Financial Accounting-I	2023
3524	13216	B.Com, LLB (Hons.)	LAW2108	Business Organization & Management	2023
3525	13216	B.Com, LLB (Hons.)	ECO2104	Economic System and Society	2023
3526	13216	B.Com, LLB (Hons.)	MGT2130	Readings in Management	2023
3527	13216	B.Com, LLB (Hons.)	COM2131	Term Paper	2023
3528	13216	B.Com, LLB (Hons.)	COM2132	Project (with Presentation & Evaluation)	2023
3529	13216	B.Com, LLB (Hons.)	COM2133	Workshop/ Certification (Discipline Specific) (1credit per workshop)	2023
3530	13216	B.Com, LLB (Hons.)	COM2134	Study Abroad	2023
3531	13216	B.Com, LLB (Hons.)	LAW2203	English-II	2023
3532	13216	B.Com, LLB (Hons.)	LAW2204	Law of Contract-II	2023
3533	13216	B.Com, LLB (Hons.)	LAW2206	Financial Accounting-II	2023
3534	13216	B.Com, LLB (Hons.)	LAW2207	Business Mathematics	2023
3535	13216	B.Com, LLB (Hons.)	COM2204	Computer Applications in Business	2023
3536	13216	B.Com, LLB (Hons.)	MGT2204	Analysis & Design of Business System	2023
3537	13216	B.Com, LLB (Hons.)	MGT2205	Innovation &Creativity Management	2023
3538	13216	B.Com, LLB (Hons.)	MGT2206	Human Values & Professional Ethics	2023
3539	13216	B.Com, LLB (Hons.)	MGT2230	Readings in Management	2023
3540	13216	B.Com, LLB (Hons.)	COM2231	Term Paper	2023
3541	13216	B.Com, LLB (Hons.)	COM2232	Project(with Presentation &Evaluation)	2023
3542	13216	B.Com, LLB (Hons.)	COM2233	Workshop/ Certification (Discipline Specific) (1credit per workshop)	2023
3543	13216	B.Com, LLB (Hons.)	COM2234	Study Abroad	2023
3544	13216	B.Com, LLB (Hons.)	LAW2303	Constitutional Law-I	2023
3545	13216	B.Com, LLB (Hons.)	LAW2304	Law of Crimes-I (Indian Penal Code Section-1 to 120B)	2023
3546	13216	B.Com, LLB (Hons.)	LAW2305	Family Law-I	2023
3547	13216	B.Com, LLB (Hons.)	LAW2307	Corporate Accounting	2023
3548	13216	B.Com, LLB (Hons.)	LAW2308	Statistical Methods in Research-I	2023
3549	13216	B.Com, LLB (Hons.)	LAW2311	Code of Criminal Procedure	2023
3550	13216	B.Com, LLB (Hons.)	LAW2335	Summer Internship Evaluation-I	2023

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3551	13216	B.Com, LLB (Hons.)	LAW2403	Constitutional Law-II	2023
3552	13216	B.Com, LLB (Hons.)	LAW2404	Administrative Law	2023
3553	13216	B.Com, LLB (Hons.)	LAW2405	Family Law-II	2023
3554	13216	B.Com, LLB (Hons.)	LAW2406	Law of Crimes-II (Indian Penal Code Section 121-511)	2023
3555	13216	B.Com, LLB (Hons.)	LAW2407	Financial Management	2023
3556	13216	B.Com, LLB (Hons.)	LAW2408	Statistical Methods in Research-II	2023
3557	13216	B.Com, LLB (Hons.)	LAW2502	Law of Evidence	2023
3558	13216	B.Com, LLB (Hons.)	LAW2503	Code of Civil Procedure	2023
3559	13216	B.Com, LLB (Hons.)	LAW2504	Labour Law-I	2023
3560	13216	B.Com, LLB (Hons.)	LAW2505	Property Law	2023
3561	13216	B.Com, LLB (Hons.)	LAW2507	Cost Accounting	2023
3562	13216	B.Com, LLB (Hons.)	LAW2508	Macro Economics	2023
3563	13216	B.Com, LLB (Hons.)	LAW2535	Summer Internship Evaluation-II	2023
3564	13216	B.Com, LLB (Hons.)	COM2502	Accounting Theory	2023
3565	13216	B.Com, LLB (Hons.)	COM2503	Advanced Corporate Accounting	2023
3566	13216	B.Com, LLB (Hons.)	COM2504	Corporate Tax Law and Practice	2023
3567	13216	B.Com, LLB (Hons.)	COM2505	Business Taxation	2023
3568	13216	B.Com, LLB (Hons.)	LAW2603	Company Law	2023
3569	13216	B.Com, LLB (Hons.)	LAW2604	Law of Torts (Motor Vehicles Act & Consumer Protection Act, 2019)	2023
3570	13216	B.Com, LLB (Hons.)	LAW2605	Labour Law-II	2023
3571	13216	B.Com, LLB (Hons.)	LAW2606	Cyber Laws	2023
3572	13216	B.Com, LLB (Hons.)	LAW2607	Management Accounting	2023
3573	13216	B.Com, LLB (Hons.)	LAW2608	Financial Markets, Institutions & Financial Services	2023
3574	13216	B.Com, LLB (Hons.)	COM2602	Advanced Accounts	2023
3575	13216	B.Com, LLB (Hons.)	COM2603	Advanced Cost Accounting	2023
3576	13216	B.Com, LLB (Hons.)	COM2604	Indirect Taxes including GST	2023
3577	13216	B.Com, LLB (Hons.)	COM2605	Public Finance and Tax Practices	2023
3578	13216	B.Com, LLB (Hons.)	LAW2702	Environmental Law	2023
3579	13216	B.Com, LLB (Hons.)	LAW2703	Jurisprudence	2023
3580	13216	B.Com, LLB (Hons.)	LAW2704	Public International Law	2023
3581	13216	B.Com, LLB (Hons.)	LAW2705	Arbitration & Alternate Dispute Resolution	2023
3582	13216	B.Com, LLB (Hons.)	LAW2735	Summer Internship Evaluation-III	2023
3583	13216	B.Com, LLB (Hons.)	LAW2701	Human Rights Law	2023
3584	13216	B.Com, LLB (Hons.)	LAW2706	Indian Federalism	2023
3585	13216	B.Com, LLB (Hons.)	LAW2707	Forensic Science-I	2023
3586	13216	B.Com, LLB (Hons.)	LAW2708	Offences against Child & Juvenile Offence Human Rights Law	2023
3587	13216	B.Com, LLB (Hons.)	LAW2709	Law and Medicine-I	2023
3588	13216	B.Com, LLB (Hons.)	LAW2710	Military Law	2023
3589	13216	B.Com, LLB (Hons.)	LAW2802	Taxation Law	2023
3590	13216	B.Com, LLB (Hons.)	LAW2803	Interpretation of Statutes	2023

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3591	13216	B.Com, LLB (Hons.)	LAW2804	International Trade Law	2023
3592	13216	B.Com, LLB (Hons.)	LAW2805	Land Laws	2023
3593	13216	B.Com, LLB (Hons.)	LAW2801	Investment & Competition Law	2023
3594	13216	B.Com, LLB (Hons.)	LAW2806	Women & Criminal Law	2023
3595	13216	B.Com, LLB (Hons.)	LAW2807	Probation & Parole	2023
3596	13216	B.Com, LLB (Hons.)	LAW2808	Forensic Science-II	2023
3597	13216	B.Com, LLB (Hons.)	LAW2809	Law and Medicine-II	2023
3598	13216	B.Com, LLB (Hons.)	LAW2810	Medical Jurisprudence	2023
3599	13216	B.Com, LLB (Hons.)	LAW2901	Drafting, Pleading &Convincing	2023
3600	13216	B.Com, LLB (Hons.)	LAW2902	Intellectual Property Rights	2023
3601	13216	B.Com, LLB (Hons.)	LAW2903	Law Poverty & Development	2023
3602	13216	B.Com, LLB (Hons.)	LAW2904	Professional Ethics	2023
3603	13216	B.Com, LLB (Hons.)	LAW2935	Summer Internship Evaluation-IV	2023
3604	13216	B.Com, LLB (Hons.)	LAW2905	Private International Law	2023
3605	13216	B.Com, LLB (Hons.)	LAW2906	Election Law	2023
3606	13216	B.Com, LLB (Hons.)	LAW2907	Banking & Insurance Laws	2023
3607	13216	B.Com, LLB (Hons.)	LAW2908	International Humanitarian & Refugee Law	2023
3608	13216	B.Com, LLB (Hons.)	LAW2909	Criminology & Victimology	2023
3609	13216	B.Com, LLB (Hons.)	LAW2910	Media Laws	2023
3610	13216	B.Com, LLB (Hons.)	LAW2911	Corruption Laws	2023
3611	13216	B.Com, LLB (Hons.)	LAW2003	Moot Court / Internship	2023
3612	13216	B.Com, LLB (Hons.)	LAW2037	Dissertation	2023
3613	13215	BBA, LLB (Hons.)	LAW2103	English-I	2023
3614	13215	BBA, LLB (Hons.)	LAW2104	Legal Methods	2023
3615	13215	BBA, LLB (Hons.)	LAW2105	Law of Contract-I	2023
3616	13215	BBA, LLB (Hons.)	LAW2108	Business Organization & Management	2023
3617	13215	BBA, LLB (Hons.)	LAW2110	Financial Accounting	2023
3618	13215	BBA, LLB (Hons.)	COM2103	E-Commerce	2023
3619	13215	BBA, LLB (Hons.)	MGT2104	Business Mathematics	2023
3620	13215	BBA, LLB (Hons.)	ECO2104	Economic System and Society	2023
3621	13215	BBA, LLB (Hons.)	MGT2130	Readings in Management	2023
3622	13215	BBA, LLB (Hons.)	MGT 2131	Term Paper	2023
3623	13215	BBA, LLB (Hons.)	MGT 2132	Project (with Presentation & Evaluation)	2023
3624	13215	BBA, LLB (Hons.)	MGT 2133	Workshop / Certification (Discipline Specific) (1credit per workshop)	2023
3625	13215	BBA, LLB (Hons.)	MGT 2134	Study Abroad	2023
3626	13215	BBA, LLB (Hons.)	LAW2203	English-II	2023
3627	13215	BBA, LLB (Hons.)	LAW2204	Law of Contract-II	2023
3628	13215	BBA, LLB (Hons.)	LAW2208	Marketing Management	2023
3629	13215	BBA, LLB (Hons.)	LAW2209	Human Resource Management	2023

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3630	13215	BBA, LLB (Hons.)	MGT2204	Analysis & Design of Business System	2023
3631	13215	BBA, LLB (Hons.)	MGT2205	Innovation & Creativity Management	2023
3632	13215	BBA, LLB (Hons.)	MGT2206	Human Values & Professional Ethics	2023
3633	13215	BBA, LLB (Hons.)	MGT2230	Readings in Management	2023
3634	13215	BBA, LLB (Hons.)	MGT2231	Term Paper	2023
3635	13215	BBA, LLB (Hons.)	MGT2232	Project (with Presentation & Evaluation)	2023
3636	13215	BBA, LLB (Hons.)	MGT2233	Workshop / Certification (Discipline Specific) (1credit per workshop)	2023
3637	13215	BBA, LLB (Hons.)	MGT2234	Study Abroad	2023
3638	13215	BBA, LLB (Hons.)	LAW2303	Constitutional Law-I	2023
3639	13215	BBA, LLB (Hons.)	LAW2304	Law of Crimes - I (Indian Penal Code Section-1 to 120B)	2023
3640	13215	BBA, LLB (Hons.)	LAW2305	Family Law-I	2023
3641	13215	BBA, LLB (Hons.)	LAW2309	Organizational Behaviour	2023
3642	13215	BBA, LLB (Hons.)	LAW2310	Financial Management	2023
3643	13215	BBA, LLB (Hons.)	LAW2311	Code of Criminal Procedure	2023
3644	13215	BBA, LLB (Hons.)	LAW2335	Summer Internship Evaluation-I	2023
3645	13215	BBA, LLB (Hons.)	ECO2304	Mergers & Acquisitions	2023
3646	13215	BBA, LLB (Hons.)	MGT2305	Industrial Psychology	2023
3647	13215	BBA, LLB (Hons.)	MGT2331	Term Paper	2023
3648	13215	BBA, LLB (Hons.)	MGT2332	Project (with Presentation & Evaluation)	2023
3649	13215	BBA, LLB (Hons.)	MGT2333	Workshop / Certification (Discipline Specific) (1credit per workshop)	2023
3650	13215	BBA, LLB (Hons.)	MGT2334	Study Abroad	2023
3651	13215	BBA, LLB (Hons.)	LAW2403	Constitutional Law – II	2023
3652	13215	BBA, LLB (Hons.)	LAW2404	Administrative Law	2023
3653	13215	BBA, LLB (Hons.)	LAW2405	Family Law - II	2023
3654	13215	BBA, LLB (Hons.)	LAW2406	Law of Crimes - II (Indian Penal Code Section 121-511)	2023
3655	13215	BBA, LLB (Hons.)	LAW2409	Business Environment	2023
3656	13215	BBA, LLB (Hons.)	LAW2410	Research Methodology & Report Preparation	2023
3657	13215	BBA, LLB (Hons.)	MGT2404	Business Information & Database System	2023
3658	13215	BBA, LLB (Hons.)	MGT2405	Personal Financial Planning	2023
3659	13215	BBA, LLB (Hons.)	MGT2406	Sales & Distribution Management	2023
3660	13215	BBA, LLB (Hons.)	MGT2431	Term Paper	2023

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3661	13215	BBA, LLB (Hons.)	MGT2432	Project (with Presentation & Evaluation)	2023
3662	13215	BBA, LLB (Hons.)	MGT2433	Workshop / Certification (Discipline Specific) (1credit per workshop)	2023
3663	13215	BBA, LLB (Hons.)	MGT2434	Study Abroad	2023
3664	13215	BBA, LLB (Hons.)	LAW2502	Law of Evidence	2023
3665	13215	BBA, LLB (Hons.)	LAW2503	Code of Civil Procedure	2023
3666	13215	BBA, LLB (Hons.)	LAW2504	Labour Law - I	2023
3667	13215	BBA, LLB (Hons.)	LAW2505	Property Law	2023
3668	13215	BBA, LLB (Hons.)	LAW2535	Summer Internship Evaluation-II	2023
3669	13215	BBA, LLB (Hons.)	MGT2503	Consumer Behaviour	2023
3670	13215	BBA, LLB (Hons.)	MGT2504	Service Marketing	2023
3671	13215	BBA, LLB (Hons.)	MGT2505	International Marketing	2023
3672	13215	BBA, LLB (Hons.)	MGT2531	Term Paper	2023
3673	13215	BBA, LLB (Hons.)	MGT2532	Project (with Presentation & Evaluation)	2023
3674	13215	BBA, LLB (Hons.)	MGT2533	Workshop / Certification (Discipline Specific) (1credit per workshop)	2023
3675	13215	BBA, LLB (Hons.)	MGT2534	Study Abroad	2023
3676	13215	BBA, LLB (Hons.)	MGT2506	Financial Services	2023
3677	13215	BBA, LLB (Hons.)	MGT2507	Principles of Investment Management	2023
3678	13215	BBA, LLB (Hons.)	MGT2508	Financial Derivatives	2023
3679	13215	BBA, LLB (Hons.)	MGT2531	Term Paper	2023
3680	13215	BBA, LLB (Hons.)	MGT2532	Project (with Presentation &Evaluation)	2023
3681	13215	BBA, LLB (Hons.)	MGT2533	Workshop / Certification (Discipline Specific) (1credit per workshop)	2023
3682	13215	BBA, LLB (Hons.)	MGT2534	Study Abroad	2023
3683	13215	BBA, LLB (Hons.)	MGT2509	Organizational Development & Change	2023
3684	13215	BBA, LLB (Hons.)	MGT2510	Training & Development	2023
3685	13215	BBA, LLB (Hons.)	MGT2511	International Human Resource Management	2023
3686	13215	BBA, LLB (Hons.)	MGT2531	Term Paper	2023
3687	13215	BBA, LLB (Hons.)	MGT2532	Project (with Presentation & Evaluation)	2023
3688	13215	BBA, LLB (Hons.)	MGT2533	Workshop / Certification (Discipline Specific) (1credit per workshop)	2023
3689	13215	BBA, LLB (Hons.)	MGT2534	Study Abroad	2023
3690	13215	BBA, LLB (Hons.)	LAW2603	Company Law	2023

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3691	13215	BBA, LLB (Hons.)	LAW2604	Law of Torts (Motor Vehicles Act & Consumer Protection Act, 2019)	2023
3692	13215	BBA, LLB (Hons.)	LAW2605	Labour Law -II	2023
3693	13215	BBA, LLB (Hons.)	LAW2606	Cyber Laws	2023
3694	13215	BBA, LLB (Hons.)	MGT2602	Brand Management	2023
3695	13215	BBA, LLB (Hons.)	MGT2603	Advertising & Sales Promotion	2023
3696	13215	BBA, LLB (Hons.)	MGT2604	Retail Management	2023
3697	13215	BBA, LLB (Hons.)	MGT2631	Term Paper	2023
3698	13215	BBA, LLB (Hons.)	MGT2632	Project (with Presentation & Evaluation)	2023
3699	13215	BBA, LLB (Hons.)	MGT2633	Workshop / Certification (Discipline Specific) (1credit per workshop)	2023
3700	13215	BBA, LLB (Hons.)	MGT2605	Corporate Tax Planning	2023
3701	13215	BBA, LLB (Hons.)	MGT2606	Banking & Financial Institutions	2023
3702	13215	BBA, LLB (Hons.)	MGT2607	Advanced Corporate Finance	2023
3703	13215	BBA, LLB (Hons.)	MGT2631	Term Paper	2023
3704	13215	BBA, LLB (Hons.)	MGT2632	Project (with Presentation & Evaluation)	2023
3705	13215	BBA, LLB (Hons.)	MGT2633	Workshop / Certification (Discipline Specific) (1credit per workshop)	2023
3706	13215	BBA, LLB (Hons.)	MGT2608	Industrial Relations & Labour Law	2023
3707	13215	BBA, LLB (Hons.)	MGT2609	Performance Management System	2023
3708	13215	BBA, LLB (Hons.)	MGT2610	Compensation & Reward Management	2023
3709	13215	BBA, LLB (Hons.)	MGT2631	Term Paper	2023
3710	13215	BBA, LLB (Hons.)	MGT2632	Project (with Presentation &Evaluation)	2023
3711	13215	BBA, LLB (Hons.)	MGT2633	Workshop / Certification (Discipline Specific) (1credit per workshop)	2023
3712	13215	BBA, LLB (Hons.)	LAW2702	Environmental Law	2023
3713	13215	BBA, LLB (Hons.)	LAW2703	Jurisprudence	2023
3714	13215	BBA, LLB (Hons.)	LAW2704	Public International Law	2023
3715	13215	BBA, LLB (Hons.)	LAW2705	Arbitration & Alternate Dispute Resolution	2023
3716	13215	BBA, LLB (Hons.)	LAW2735	Summer Internship Evaluation-III	2023
3717	13215	BBA, LLB (Hons.)	LAW2701	Human Rights Law	2023
3718	13215	BBA, LLB (Hons.)	LAW2706	Indian Federalism	2023
3719	13215	BBA, LLB (Hons.)	LAW2707	Forensic Science-I	2023
3720	13215	BBA, LLB (Hons.)	LAW2708	Offences against Child & Juvenile Offence Human Rights Law	2023
3721	13215	BBA, LLB (Hons.)	LAW2709	Law and Medicine-I	2023
3722	13215	BBA, LLB (Hons.)	LAW2710	Military Law	2023

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3723	13215	BBA, LLB (Hons.)	LAW2802	Taxation Law	2023
3724	13215	BBA, LLB (Hons.)	LAW2803	Interpretation of Statutes	2023
3725	13215	BBA, LLB (Hons.)	LAW2804	International Trade Law	2023
3726	13215	BBA, LLB (Hons.)	LAW2805	Land Laws	2023
3727	13215	BBA, LLB (Hons.)	LAW2801	Investment & Competition Law	2023
3728	13215	BBA, LLB (Hons.)	LAW2806	Women & Criminal Law	2023
3729	13215	BBA, LLB (Hons.)	LAW2807	Probation & Parole	2023
3730	13215	BBA, LLB (Hons.)	LAW2808	Forensic Science-II	2023
3731	13215	BBA, LLB (Hons.)	LAW2809	Law and Medicine-II	2023
3732	13215	BBA, LLB (Hons.)	LAW2810	Medical Jurisprudence	2023
3733	13215	BBA, LLB (Hons.)	LAW2901	Drafting, Pleading &Convincing	2023
3734	13215	BBA, LLB (Hons.)	LAW2902	Intellectual Property Rights	2023
3735	13215	BBA, LLB (Hons.)	LAW2903	Law Poverty & Development	2023
3736	13215	BBA, LLB (Hons.)	LAW2904	Professional Ethics	2023
3737	13215	BBA, LLB (Hons.)	LAW2935	Summer Internship Evaluation-IV	2023
3738	13215	BBA, LLB (Hons.)	LAW2905	Private International Law	2023
3739	13215	BBA, LLB (Hons.)	LAW2906	Election Law	2023
3740	13215	BBA, LLB (Hons.)	LAW2907	Banking & Insurance Law	2023
3741	13215	BBA, LLB (Hons.)	LAW2908	International Humanitarian & Refugee Law	2023
3742	13215	BBA, LLB (Hons.)	LAW2909	Criminology & Victimology	2023
3743	13215	BBA, LLB (Hons.)	LAW2910	Media Laws	2023
3744	13215	BBA, LLB (Hons.)	LAW2911	Corruption Laws	2023
3745	13215	BBA, LLB (Hons.)	LAW2003	Moot Court / Internship	2023
3746	13215	BBA, LLB (Hons.)	LAW2037	Dissertation	2023
3747	13018	Master of Law (LLM)	LAW4101	Research Method & Legal Writing	2023
3748	13018	Master of Law (LLM)	LAW4102	Comparative Public Law/ System of Governance	2023
3749	13018	Master of Law (LLM)	LAW4103	Laws on Securities and Financial Markets	2023
3750	13018	Master of Law (LLM)	LAW4104	Corporate Governance	2023
3751	13018	Master of Law (LLM)	LAW4105	Intellectual Property Law	2023
3752	13018	Master of Law (LLM)	LAW4106	Fundamental Rights & Directive Principles	2023
3753	13018	Master of Law (LLM)	LAW4107	Center State Relation & Constitutional Governance	2023
3754	13018	Master of Law (LLM)	LAW4108	Police and Security Administration	2023
3755	13018	Master of Law (LLM)	LAW4109	Criminology and Criminal Justice Administration	2023
3756	13018	Master of Law (LLM)	LAW4110	Victimology	2023
3757	13018	Master of Law (LLM)	LAW4111	Criminal Justice and Human Rights	2023
3758	13018	Master of Law (LLM)	LAW4112	Theorising Child Rights and Legal Order	2023
3759	13018	Master of Law (LLM)	LAW4113	International and Regional Instruments on Child Protection	2023

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3760	13018	Master of Law (LLM)	LAW4114	National and State Policies for Child Protection and Development	2023
3761	13018	Master of Law (LLM)	LAW4201	Law and Justice in a Globalizing World	2023
3762	13018	Master of Law (LLM)	LAW4237	Dissertation	2023
3763	13018	Master of Law (LLM)	LAW4202	Competition Law	2023
3764	13018	Master of Law (LLM)	LAW4203	International Trade Law	2023
3765	13018	Master of Law (LLM)	LAW4205	Banking & Insurance Law	2023
3766	13018	Master of Law (LLM)	LAW4206	Administrative Law	2023
3767	13018	Master of Law (LLM)	LAW4207	Religion Diversity & Law	2023
3768	13018	Master of Law (LLM)	LAW4208	Media Law	2023
3769	13018	Master of Law (LLM)	LAW4209	International Criminal Law	2023
3770	13018	Master of Law (LLM)	LAW4210	Police Law and Administration	2023
3771	13018	Master of Law (LLM)	LAW4211	Corporate Crimes/ White Collar Crimes	2023
3772	13018	Master of Law (LLM)	LAW4212	Civil Laws for Child Rights	2023
3773	13018	Master of Law (LLM)	LAW4213	Crimes against Children	2023
3774	13018	Master of Law (LLM)	LAW4214	Juvenile Justice System and Administration	2023
3775	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2151	Principles of Nutrition	2023
3776	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2101	Food Science	2023
3777	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2251	Family Meal Management	2023
3778	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2201	Food Microbiology	2023
3779	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2301	Nutrition for Special Needs	2023
3780	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2302	Clinical Nutrition	2023
3781	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	SDAN2301	Healthy and Sustainable Food Choices	2023
3782	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	NDAN2335	Community Engagement Services	2023

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3783	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2451	Food Service Management	2023
3784	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2401	Community Nutrition	2023
3785	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	SDAN2401	Utilization of Food Waste Management	2023
3786	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2551	Human Nutrition for Life Span	2023
3787	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2501	Food Preservation	2023
3788	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2502	Advanced Dietetics-I	2023
3789	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2503	Human Physiology	2023
3790	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2504	Nutraceuticals and Functional Foods	2023
3791	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	NDAN2537	Internship	2023
3792	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2651	Exercise Physiology and Metabolism	2023
3793	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2601	Quantity Food Production	2023
3794	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2602	Principles of Therapeutic Nutrition	2023
3795	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2603	Principles of Therapeutic Nutrition Lab	2023
3796	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2604	Product Development & Sensory Analysis	2023
3797	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2606	Basics of Nutrition Epidemiology	2023

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3798	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2607	Dietary Supplements and Ergogenic Aids	2023
3799	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2701	Human Nutrition	2023
3800	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2702	Public Health Nutrition	2023
3801	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2703	Advanced Dietetics-II	2023
3802	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2704	Food Laws and Safety	2023
3803	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2739	Basics of Research Methodology, Ethics and Research Communication	2023
3804	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	NDAN2737	Field Visit	2023
3805	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2801	Critical Care Nutrition	2023
3806	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2802	Food Quality Analysis	2023
3807	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2803	Food Psychology and Nutritional Counselling	2023
3808	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2804	Entrepreneurship	2023
3809	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	NDAN2837	Project/ Dissertation	2023
3810	131792	Bachelor of Science (Honors/ Honors with Research) in Dietetics & Applied Nutrition	DDAN2839	Data Analysis & Visualisation using Software	2023
3811	131609	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	DMLT2151	Anatomy and Physiology	2023
3812	131609	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	DMLT2101	General Clinical Microbiology	2023

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3813	131609	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	DMLT2251	Basic Clinical Biochemistry	2023
3814	131609	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	DMLT2201	Basic Haematology	2023
3815	131609	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	DMLT2351	Applied Haematology	2023
3816	131609	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	DMLT2301	Systemic Bacteriology	2023
3817	131609	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	SMLT2301	Laboratory Management	2023
3818	131609	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	NMLT2335	Community Engagement Services	2023
3819	131609	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	DMLT2451	Analytical Clinical Biochemistry	2023
3820	131609	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	DMLT2401	Immunohematology and Blood Transfusion	2023
3821	131609	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	SMLT2401	Clinical Visit	2023
3822	131609	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	DMLT2551	Applied Histopathology	2023
3823	131609	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	DMLT2501	Immunology and Serology	2023
3824	131609	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	DMLT2502	Applied Clinical Biochemistry	2023
3825	131609	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	NMLT2537	SIP/Internship/ Project/ Dissertation/Field Visit	2023
3826	131609	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	DMLT2651	Clinical Parasitology and Entomology	2023
3827	131609	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	DMLT2601	Clinical Cytopathology	2023

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3828	131609	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	DMLT2602	Immunopathology and Molecular Biology	2023
3829	131609	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	DMLT2603	Clinical Mycology & Virology	2023
3830	131609	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	DMLT2701	Fundamentals of Medical Lab Technology	2023
3831	131609	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	DMLT2702	Advanced Laboratory Techniques	2023
3832	131609	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	DMLT2703	Biomedical Waste Management	2023
3833	131609	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	DMLT2704	Medical Terminology	2023
3834	131609	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	DMLT2705	Medical Law & Ethics	2023
3835	131609	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	DMLT2739	Basics of Research Methodology, Ethics and Research Communication	2023
3836	131609	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	NMLT2737	SIP/Internship/ Project/ Dissertation/Field Visit	2023
3837	131609	Bachelor of Science (Honors/ Honors with Research) in Medical Lab Technology	NMLT2837	Internship	2023
3838	131127	Bachelor of Optometry	OPT2101	General Anatomy	2023
3839	131127	Bachelor of Optometry	OPT2102	General Physiology	2023
3840	131127	Bachelor of Optometry	OPT2103	Basic Biochemistry-I	2023
3841	131127	Bachelor of Optometry	OPT2104	Physical Optics	2023
3842	131127	Bachelor of Optometry	OPT2105	Geometrical Optics-I	2023
3843	131127	Bachelor of Optometry	OPT2106	Optometric Procedures-I	2023
3844	131127	Bachelor of Optometry	OPT2107	Basics in Computers and PC package	2023
3845	131127	Bachelor of Optometry	OPT2108	Mathematics and Biostatistics	2023
3846	131127	Bachelor of Optometry	OPT2201	Basic Biochemistry-II	2023
3847	131127	Bachelor of Optometry	OPT2202	Ocular Anatomy	2023
3848	131127	Bachelor of Optometry	OPT2203	Ocular Physiology	2023
3849	131127	Bachelor of Optometry	OPT2204	Geometrical Optics-II	2023
3850	131127	Bachelor of Optometry	OPT2205	Optometric Procedures-II	2023
3851	131127	Bachelor of Optometry	OPT2206	Clinics-I	2023

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3852	131127	Bachelor of Optometry	OPT2207	Nutrition	2023
3853	131127	Bachelor of Optometry	OPT2209	Medical Psychology	2023
3854	131127	Bachelor of Optometry	OPT2232	Project (with Presentation & Evaluation)	2023
3855	131127	Bachelor of Optometry	OPT2301	Ocular Microbiology	2023
3856	131127	Bachelor of Optometry	OPT2302	Applied Optics-I (Optometric Optics)	2023
3857	131127	Bachelor of Optometry	OPT2303	Visual Optics-I (Visual Perception & Neurophysiology)	2023
3858	131127	Bachelor of Optometry	OPT2304	Pathology	2023
3859	131127	Bachelor of Optometry	OPT2305	Ocular Diseases-I	2023
3860	131127	Bachelor of Optometry	OPT2306	Clinical Optometric Procedures	2023
3861	131127	Bachelor of Optometry	OPT2307	Clinics-II	2023
3862	131127	Bachelor of Optometry	OPT2331	Term Paper	2023
3863	131127	Bachelor of Optometry	OPT2332	Project (with Presentation & Evaluation)	2023
3864	131127	Bachelor of Optometry	OPT2333	Workshop / Certification (1credit per workshop)	2023
3865	131127	Bachelor of Optometry	OPT2308	Hospital Administration	2023
3866	131127	Bachelor of Optometry	OPT2309	Basic Accountancy	2023
3867	131127	Bachelor of Optometry	OPT2310	Medical Law and Ethics	2023
3868	131127	Bachelor of Optometry	OPT2401	Applied Optics-II (Dispensing Optics)	2023
3869	131127	Bachelor of Optometry	OPT2402	Visual Optics-II	2023
3870	131127	Bachelor of Optometry	OPT2403	Ocular Diseases-II	2023
3871	131127	Bachelor of Optometry	OPT2404	Basic Pharmacology	2023
3872	131127	Bachelor of Optometry	OPT2405	Optometric Instruments	2023
3873	131127	Bachelor of Optometry	OPT2406	Clinics-III	2023
3874	131127	Bachelor of Optometry	OPT2407	Ophthalmic imaging	2023
3875	131127	Bachelor of Optometry	OPT2408	Ophthalmic Electrodiagnostic Procedures	2023
3876	131127	Bachelor of Optometry	OPT2409	Perimetry	2023
3877	131127	Bachelor of Optometry	OPT2431	Term Paper	2023
3878	131127	Bachelor of Optometry	OPT2432	Project (with Presentation & Evaluation)	2023
3879	131127	Bachelor of Optometry	OPT2433	Workshop / Certification (1credit per workshop)	2023
3880	131127	Bachelor of Optometry	OPT2501	Contact Lens-I	2023
3881	131127	Bachelor of Optometry	OPT2502	Low Vision Care	2023
3882	131127	Bachelor of Optometry	OPT2503	Public Health, Community Optometry	2023
3883	131127	Bachelor of Optometry	OPT2504	Binocular Vision-I	2023
3884	131127	Bachelor of Optometry	OPT2505	Diseases of the Eye and Clinical Medicine	2023
3885	131127	Bachelor of Optometry	OPT2506	Occupational Optometry	2023

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3886	131127	Bachelor of Optometry	OPT2507	Clinics-IV	2023
3887	131127	Bachelor of Optometry	OPT2535	Summer Internship Evaluation-I	2023
3888	131127	Bachelor of Optometry	OPT2508	Ocular Prosthesis	2023
3889	131127	Bachelor of Optometry	OPT2509	Refractive Surgery	2023
3890	131127	Bachelor of Optometry	OPT2510	Research Methodology	2023
3891	131127	Bachelor of Optometry	OPT2531	Term Paper	2023
3892	131127	Bachelor of Optometry	OPT2532	Project (with Presentation & Evaluation)	2023
3893	131127	Bachelor of Optometry	OPT2533	Workshop / Certification (1credit per workshop)	2023
3894	131127	Bachelor of Optometry	OPT2601	Contact Lens-II	2023
3895	131127	Bachelor of Optometry	OPT2602	Binocular Vision-II	2023
3896	131127	Bachelor of Optometry	OPT2603	Geriatric Optometry	2023
3897	131127	Bachelor of Optometry	OPT2604	Pediatric Optometry	2023
3898	131127	Bachelor of Optometry	OPT2605	Clinic-V	2023
3899	131127	Bachelor of Optometry	OPT2606	Visual Rehabilitation	2023
3900	131127	Bachelor of Optometry	OPT2607	Vision Therapy and Learning Disabilities	2023
3901	131127	Bachelor of Optometry	OPT2608	Eye Banking	2023
3902	131127	Bachelor of Optometry	OPT2609	Introduction to Biostatistics	2023
3903	131127	Bachelor of Optometry	OPT2632	Project (with Presentation & Evaluation)	2023
3904	131127	Bachelor of Optometry	OPT2701	(Clinics-VI A.) Retina, Glaucoma, Low Vision	2023
3905	131127	Bachelor of Optometry	OPT2702	(Clinics-VI B.) Pediatric & Binocular Vision	2023
3906	131127	Bachelor of Optometry	OPT2703	(Clinics-VI C.) Cornea and Contact Lenses	2023
3907	131127	Bachelor of Optometry	OPT2704	(Clinics-VI D.) Primary Eye Care	2023
3908	131127	Bachelor of Optometry	OPT2735	Summer Internship Evaluation-II	2023
3909	131127	Bachelor of Optometry	OPT2737	Research Project (Mid-Term Evaluation)	2023
3910	131127	Bachelor of Optometry	OPT2801	Clinics VII (Comprehensive Eye Care and Refraction)	2023
3911	131127	Bachelor of Optometry	OPT2802	Clinics VIII (Optometric Procedures and Instruments)	2023
3912	131127	Bachelor of Optometry	OPT2837	Project - Dissertation	2023
3913	13389	Bachelor of Audiology & Speech Language Pathology	ASL2106	Communication Sciences	2023
3914	13389	Bachelor of Audiology & Speech Language Pathology	ASL2107	Anatomy and Physiology of Speech & Hearing	2023
3915	13389	Bachelor of Audiology & Speech Language Pathology	ASL2108	Clinical Psychology	2023
3916	13389	Bachelor of Audiology & Speech Language Pathology	ASL2109	Linguistics and Phonetics	2023

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3917	13389	Bachelor of Audiology & Speech Language Pathology	ASL2110	Electronics and Acoustics	2023
3918	13389	Bachelor of Audiology & Speech Language Pathology	ASL2111	Research Methods and Statistics	2023
3919	13389	Bachelor of Audiology & Speech Language Pathology	ASL2105	Clinical Practicum	2023
3920	13389	Bachelor of Audiology & Speech Language Pathology	ASL2206	Neurology	2023
3921	13389	Bachelor of Audiology & Speech Language Pathology	ASL2207	Otolaryngology	2023
3922	13389	Bachelor of Audiology & Speech Language Pathology	ASL2208	Speech Language Pathology	2023
3923	13389	Bachelor of Audiology & Speech Language Pathology	ASL2209	Audiology	2023
3924	13389	Bachelor of Audiology & Speech Language Pathology	ASL2210	Practicals in Speech Language Pathology	2023
3925	13389	Bachelor of Audiology & Speech Language Pathology	ASL2211	Practicals in Audiology	2023
3926	13389	Bachelor of Audiology & Speech Language Pathology	ASL2307	Voice and its Disorders	2023
3927	13389	Bachelor of Audiology & Speech Language Pathology	ASL2308	Speech Sound Disorders	2023
3928	13389	Bachelor of Audiology & Speech Language Pathology	ASL2309	Diagnostic Audiology Behavioral Test	2023
3929	13389	Bachelor of Audiology & Speech Language Pathology	ASL2310	Amplification Devices	2023
3930	13389	Bachelor of Audiology & Speech Language Pathology	ASL2311	Clinicals in Speech Language Pathology-I	2023
3931	13389	Bachelor of Audiology & Speech Language Pathology	ASL2312	Clinicals in Audiology-I	2023
3932	13389	Bachelor of Audiology & Speech Language Pathology	ASL2335	Summer Internship Evaluation-I (Community Outreach Programs)	2023
3933	13389	Bachelor of Audiology & Speech Language Pathology	ASL2402	Motor Speech Disorders in Children	2023
3934	13389	Bachelor of Audiology & Speech Language Pathology	ASL2406	Child Language Disorders	2023
3935	13389	Bachelor of Audiology & Speech Language Pathology	ASL2407	Diagnostic Audiology – Physiological Tests	2023
3936	13389	Bachelor of Audiology & Speech Language Pathology	ASL2408	Implantable Hearing Devices	2023
3937	13389	Bachelor of Audiology & Speech Language Pathology	ASL2409	Clinicals in Speech Language Pathology-II	2023
3938	13389	Bachelor of Audiology & Speech Language Pathology	ASL2410	Clinicals in Audiology-II	2023

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3939	13389	Bachelor of Audiology & Speech Language Pathology	ASL2501	Fluency and its Disorders	2023
3940	13389	Bachelor of Audiology & Speech Language Pathology	ASL2507	Structural Anomalies & Speech Disorders	2023
3941	13389	Bachelor of Audiology & Speech Language Pathology	ASL2508	Pediatric Audiology	2023
3942	13389	Bachelor of Audiology & Speech Language Pathology	ASL2509	Aural Rehabilitation in Children	2023
3943	13389	Bachelor of Audiology & Speech Language Pathology	ASL2510	Clinicals in Speech Language Pathology-III	2023
3944	13389	Bachelor of Audiology & Speech Language Pathology	ASL2511	Clinicals in Audiology-III	2023
3945	13389	Bachelor of Audiology & Speech Language Pathology	ASL2535	Summer Internship Evaluation-II (Outreach Program)	2023
3946	13389	Bachelor of Audiology & Speech Language Pathology	ASL2606	Motor Speech Disorders in Adults	2023
3947	13389	Bachelor of Audiology & Speech Language Pathology	ASL2607	Language Disorders in Adults	2023
3948	13389	Bachelor of Audiology & Speech Language Pathology	ASL2608	Aural Rehabilitation in Adults	2023
3949	13389	Bachelor of Audiology & Speech Language Pathology	ASL2609	Audiology in Practice	2023
3950	13389	Bachelor of Audiology & Speech Language Pathology	ASL2610	Clinicals in Speech Language Pathology-IV	2023
3951	13389	Bachelor of Audiology & Speech Language Pathology	ASL2611	Clinicals in Audiology-IV	2023
3952	13389	Bachelor of Audiology & Speech Language Pathology	ASL2701	Clinicals in Speech Language Pathology and Audiology-I	2023
3953	13389	Bachelor of Audiology & Speech Language Pathology	ASL2801	Clinicals in Speech Language Pathology and Audiology-II	2023
3954	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4101	Advanced Nutrition-I	2023
3955	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4102	Nutritional Biochemistry-I	2023
3956	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4103	Human Physiology	2023
3957	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4104	Food Science-I	2023
3958	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4105	Therapeutic Nutrition-I	2023
3959	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4106	Nutritional Biochemistry Lab-I	2023
3960	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4107	Food Science Lab-I	2023

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3961	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4108	Therapeutic Nutrition Lab-I	2023
3962	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4201	Advanced Nutrition-II	2023
3963	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4202	Nutritional Biochemistry-II	2023
3964	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4203	Research Methodology	2023
3965	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4204	Therapeutic Nutrition-II	2023
3966	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4205	Dietetic Technique and Patient Counseling	2023
3967	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4206	Nutritional Biochemistry Lab-II	2023
3968	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4207	Advanced Nutrition Lab-II	2023
3969	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4208	Therapeutic Nutrition Lab-II	2023
3970	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4301	Community Nutrition-I	2023
3971	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4302	Institutional Food Administration	2023
3972	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4303	Food Science-II	2023
3973	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4304	Food Microbiology	2023
3974	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4305	Community Nutrition Lab-I	2023
3975	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4306	Food Science Lab-II	2023
3976	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4307	Food Microbiology Lab	2023
3977	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4335	Summer Internship Evaluation	2023
3978	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4401	Community Nutrition-II	2023
3979	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4402	Food Processing & Technology	2023
3980	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4403	Nutrition for Health and Fitness	2023
3981	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4404	Community Nutrition Lab-II	2023
3982	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4405	Food Processing & Technology Lab	2023

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3983	13394	Master of Science (Dietetics & Applied Nutrition)	DAN4437	Dissertation	2023
3984	131133	Master of Optometry	OPT4101	Epidemiology Public Health & Community Optometry	2023
3985	131133	Master of Optometry	OPT4102	Binocular Vision & Pediatric Optometry-I	2023
3986	131133	Master of Optometry	OPT4105	Clinic-I (General)	2023
3987	131133	Master of Optometry	OPT4106	Research Methodology & Biostatistics-I	2023
3988	131133	Master of Optometry	OPT4109	Low Vision, Rehabilitation & Geriatric Optometry	2023
3989	131133	Master of Optometry	OPT4110	Applied Optics	2023
3990	131133	Master of Optometry	OPT4203	Binocular Vision-II & Vision Therapy	2023
3991	131133	Master of Optometry	OPT4204	Advanced Contact Lens-I	2023
3992	131133	Master of Optometry	OPT4205	Clinics-II (Specialty)	2023
3993	131133	Master of Optometry	OPT4211	Ocular Diseases & Diagnostics-I	2023
3994	131133	Master of Optometry	OPT4212	Research Methodology & Biostatistics-II	2023
3995	131133	Master of Optometry	OPT4232	Project (Research)	2023
3996	131133	Master of Optometry	OPT4303	Advanced Contact Lens-II	2023
3997	131133	Master of Optometry	OPT4305	Clinics-III (Specialty)	2023
3998	131133	Master of Optometry	OPT4306	Environmental Optometry	2023
3999	131133	Master of Optometry	OPT4307	Teaching Methodology	2023
4000	131133	Master of Optometry	OPT4308	Ocular Diseases & Diagnostics-II	2023
4001	131133	Master of Optometry	OPT4332	Project	2023
4002	131133	Master of Optometry	OPT4401	Clinical Optometry (General)	2023
4003	131133	Master of Optometry	OPT4437	Clinical Internship-Dissertation	2023
4004	131133	Master of Optometry	OPT4407	Advance Clinical Retina and Glaucoma	2023
4005	131133	Master of Optometry	OPT4408	Advance Pediatric, Binocular Vision & Vision Therapy	2023
4006	131133	Master of Optometry	OPT4409	Advance Applied Optics	2023
4007	131133	Master of Optometry	OPT4410	Advance Cornea & Contact Lens	2023
4008	13163	Master of Science (Medical Lab Technology)	MLT4108	Laboratory Management & Quality Control	2023
4009	13163	Master of Science (Medical Lab Technology)	MLT4110	Anatomy	2023
4010	13163	Master of Science (Medical Lab Technology)	MLT4111	Physiology	2023
4011	13163	Master of Science (Medical Lab Technology)	MLT4113	Clinical Immunology	2023
4012	13163	Master of Science (Medical Lab Technology)	MLT4114	Advanced Laboratory Technique	2023

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4013	13163	Master of Science (Medical Lab Technology)	MLT4105	Lab Course	2023
4014	13163	Master of Science (Medical Lab Technology)	MLT4112	Clinical Training	2023
4015	13163	Master of Science (Medical Lab Technology)	MLT4208	Molecular Diagnostics	2023
4016	13163	Master of Science (Medical Lab Technology)	MLT4211	Research Methodology & Biostatistics	2023
4017	13163	Master of Science (Medical Lab Technology)	MLT4210	Metabolic Biochemistry	2023
4018	13163	Master of Science (Medical Lab Technology)	MLT4213	Clinical Nutrition	2023
4019	13163	Master of Science (Medical Lab Technology)	MLT4214	Principles of Biochemistry	2023
4020	13163	Master of Science (Medical Lab Technology)	MLT4215	Clinical Biochemistry Lab Course-I	2023
4021	13163	Master of Science (Medical Lab Technology)	MLT4216	Clinical Biochemistry Clinical Training-I	2023
4022	13163	Master of Science (Medical Lab Technology)	MLT4217	General Microbiology	2023
4023	13163	Master of Science (Medical Lab Technology)	MLT4218	Diagnostic Microbiology-I	2023
4024	13163	Master of Science (Medical Lab Technology)	MLT4219	Clinical Bacteriology	2023
4025	13163	Master of Science (Medical Lab Technology)	MLT4220	Clinical Microbiology Lab Course-I	2023
4026	13163	Master of Science (Medical Lab Technology)	MLT4221	Clinical Microbiology Clinical Training-I	2023
4027	13163	Master of Science (Medical Lab Technology)	MLT4335	Summer Project Evaluation	2023
4028	13163	Master of Science (Medical Lab Technology)	MLT4307	Clinical Endocrinology	2023
4029	13163	Master of Science (Medical Lab Technology)	MLT4308	Clinical Enzymology	2023
4030	13163	Master of Science (Medical Lab Technology)	MLT4309	Advances in Intermediary Metabolism	2023
4031	13163	Master of Science (Medical Lab Technology)	MLT4310	Diagnostic Biochemistry	2023
4032	13163	Master of Science (Medical Lab Technology)	MLT4313	Advanced Chemical Pathology	2023
4033	13163	Master of Science (Medical Lab Technology)	MLT4314	Clinical Biochemistry Lab Course-II	2023
4034	13163	Master of Science (Medical Lab Technology)	MLT4315	Clinical Biochemistry Clinical Training-II	2023

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4035	13163	Master of Science (Medical Lab Technology)	MLT4316	Diagnostic Microbiology-II	2023
4036	13163	Master of Science (Medical Lab Technology)	MLT4317	Clinical Virology	2023
4037	13163	Master of Science (Medical Lab Technology)	MLT4318	Clinical Mycology	2023
4038	13163	Master of Science (Medical Lab Technology)	MLT4319	Clinical Parasitology	2023
4039	13163	Master of Science (Medical Lab Technology)	MLT4320	Pharmaceutical Microbiology	2023
4040	13163	Master of Science (Medical Lab Technology)	MLT4321	Clinical Microbiology Lab Course-II	2023
4041	13163	Master of Science (Medical Lab Technology)	MLT4322	Clinical Microbiology Clinical Training-II	2023
4042	13163	Master of Science (Medical Lab Technology)	MLT4401	On Job Training	2023
4043	13163	Master of Science (Medical Lab Technology)	MLT4437	Dissertation-Clinical Research	2023
4044	131703	Master of Science (Speech Language Pathology)	SLP4101	Research Methods, Epidemiology and Statistics	2023
4045	131703	Master of Science (Speech Language Pathology)	SLP4102	Speech Science and Speech Production	2023
4046	131703	Master of Science (Speech Language Pathology)	SLP4103	Augmentative and Alternative Communication	2023
4047	131703	Master of Science (Speech Language Pathology)	SLP4104	Neurobiology of Speech- Language and Cognition	2023
4048	131703	Master of Science (Speech Language Pathology)	SLP4105	Clinical Linguistics and Multilingual Issues	2023
4049	131703	Master of Science (Speech Language Pathology)	SLP4106	Clinical (Internal)	2023
4050	131703	Master of Science (Speech Language Pathology)	SLP4201	Advanced in Speech Sound Disorder	2023
4051	131703	Master of Science (Speech Language Pathology)	SLP4202	Voice Science and Disorder	2023
4052	131703	Master of Science (Speech Language Pathology)	SLP4203	Disorder of Fluency	2023
4053	131703	Master of Science (Speech Language Pathology)	SLP4204	Language Disorder in Children	2023
4054	131703	Master of Science (Speech Language Pathology)	SLP4205	Clinical (External)	2023
4055	131703	Master of Science (Speech Language Pathology)	SLP4301	Neurogenic Speech Disorder	2023
4056	131703	Master of Science (Speech Language Pathology)	SLP4302	Dysphagia	2023

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4057	131703	Master of Science (Speech Language Pathology)	SLP4303	Aphasia	2023
4058	131703	Master of Science (Speech Language Pathology)	SLP4304	Language and Literacy Disorder	2023
4059	131703	Master of Science (Speech Language Pathology)	SLP4305	Cognitive Communication Disorder	2023
4060	131703	Master of Science (Speech Language Pathology)	SLP4306	Clinical (Internal)	2023
4061	131703	Master of Science (Speech Language Pathology)	SLP4401	Practices in Speech-Language Pathology	2023
4062	131703	Master of Science (Speech Language Pathology)	SLP4437	Dissertation	2023
4063	131703	Master of Science (Speech Language Pathology)	SLP4403	Clinical (External)	2023
4064	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2151	Biochemistry	2023
4065	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2101	Microbiology & Virology	2023
4066	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2251	Cell Biology & Genetics	2023
4067	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2201	MB & rDNA T	2023
4068	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2202	MB & rDNA T Lab	2023
4069	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2203	Nano Technology and Nano Medicine	2023
4070	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2351	Human Developmental Biology	2023

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4071	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2301	Bioinformatics	2023
4072	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2302	Bioinformatics Lab	2023
4073	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	SSCT2301	Bioinstrumentation in Molecular Medicine & Stem Cell Biology	2023
4074	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	NSCT2335	Community Engagement Services	2023
4075	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2451	Stem Cell Technology Basics	2023
4076	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2401	Human Pluripotent Stem Cell Based Therapeutics	2023
4077	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	SSCT2401	Good Laboratory Practices	2023
4078	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2551	Fundamentals of Immunology	2023
4079	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2552	Fundamentals of Immunology Lab	2023
4080	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2501	Cancer Biology & Cancer Therapeutics	2023
4081	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2502	Translational Medicine	2023

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4082	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2503	Human Anatomy and Physiology	2023
4083	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2504	Molecular Diagnostics in Health Care	2023
4084	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	NSCT2537	SIP/Internship/ Project/ Dissertation/Field Visit	2023
4085	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2651	Stem Cell & Regenerative Medicine	2023
4086	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2601	Genomics and Proteomics	2023
4087	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2602	Precision and Personalized Medicine	2023
4088	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2603	Ethics and Intellectual Property Right	2023
4089	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2701	Pharmacogenomics	2023
4090	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2702	Application of Plant Biotechnology in Molecular Medicine	2023
4091	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2703	Molecular Modelling and Drug Development	2023
4092	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2704	Fermentation Technology	2023

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4093	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2739	Basics of Research Methodology, Ethics and Research Communication	2023
4094	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	NSCT2737	SIP/Internship/ Project/ Dissertation/Field Visit	2023
4095	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2801	Systems Biology	2023
4096	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2802	Integrative Omics	2023
4097	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2803	Clinical Trial Design	2023
4098	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2804	Pre-Clinical Animal Models	2023
4099	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	NSCT2837	SIP/Internship/ Project/ Dissertation/Field Visit	2023
4100	131798	Bachelor of Science (Honors/ Honors with Research) in Molecular Medicine & Stem Cell Technologies	DSCT2839	Data Analysis & Visualisation using Software	2023
4101	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4101	Cell Biology & Genetics	2023
4102	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4102	Microbiology & Virology	2023
4103	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4103	Molecular Biology & rDNA Technology	2023
4104	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4104	Human Anatomy and Physiology	2023

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4105	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4105	Bioanalytical Technologies & Instrumentation	2023
4106	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4106	Biostatistics	2023
4107	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4107	Biological Programming-I (Bioinformatics)	2023
4108	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4108	Cell & Molecular Biology Lab	2023
4109	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4109	Molecular Biology & rDNA Technology Lab	2023
4110	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4110	Bioanalytical Technologies & Instrumentation Lab	2023
4111	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4111	Research Seminar/ Research Presentation/ Lit. Review & Presentation: Molecular Medicine	2023
4112	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4131	Term Paper	2023
4113	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4201	Stem Cell Technology	2023
4114	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4202	Fundamental Immunology-I	2023
4115	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4203	Human Embryology and Developmental Biology	2023
4116	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4204	Biological Programming-II (Bioinformatics)	2023
4117	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4205	Molecular Medicine: Principles & Application	2023
4118	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4206	Nano-medicines and Technologies	2023
4119	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4207	Fermentation Technology & Its Applications in Molecular Medicine	2023

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4120	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4208	Stem Cell Technology Lab	2023
4121	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4209	Nano-medicines and Technologies Lab	2023
4122	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4210	Fundamental Immunology-I Lab	2023
4123	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4211	Biological Programming (Bioinformatics)-II Lab	2023
4124	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4301	Cancer Biology & Cancer Therapeutics (T cell & Antibody-based Therapeutics)	2023
4125	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4302	Human Stem Cell Culture & Differentiation Methods	2023
4126	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4303	Vaccines and Preclinical Animal Models	2023
4127	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4304	Fundamental Immunology-II	2023
4128	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4305	Genomics & Proteomics	2023
4129	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4306	Ethics of Biomedical Research Intellectual Property (IP), IP rights (IPR)	2023
4130	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4307	Plant Biotechnology and Its Applications in Molecular Medicine	2023
4131	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4308	Fundamental Immunology-II Lab	2023
4132	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4309	Genomics & Proteomics Lab	2023
4133	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4310	Stem Cell Culture Lab	2023
4134	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4311	Scientific Communication Skill Development (Seminar/ Workshop)	2023

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4135	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4335	Summer Internship Evaluation	2023
4136	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4312	Systems Biology	2023
4137	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4331	Term Paper	2023
4138	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4401	Analysis of Business of Science & Alternative Careers in Molecular Medicine & Regenerative Medicine (Online Resources)	2023
4139	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4402	Industry Trends & Campus Recruitment Events & Career Counseling (Online Resources)	2023
4140	131312	Master of Science (Molecular Medicine & Stem Cell Technologies)	SCT4437	Dissertation / Project Report Presentation / Viva Voce	2023
4141	13184	Bachelor of Science (Nursing)	ENGL101	Communicative English	2023
4142	13184	Bachelor of Science (Nursing)	ANAT105 & PHYS110	Applied Anatomy and Applied Physiology	2023
4143	13184	Bachelor of Science (Nursing)	SOCI115 & PSYC120	Applied Sociology and Applied Psychology	2023
4144	13184	Bachelor of Science (Nursing)	N-NF(I) 125	Nursing Foundation-I including First Aid module	2023
4145	13184	Bachelor of Science (Nursing)	SSCC(I) 130	Self-study/ Co-curricular including First Aid module	2023
4146	13184	Bachelor of Science (Nursing)	BIOC135 & NUTR140	Applied Biochemistry and Applied Nutrition & Dietetics	2023
4147	13184	Bachelor of Science (Nursing)	N-NF(II) 125	Nursing Foundation-(I&II) including Health Assessment module	2023
4148	13184	Bachelor of Science (Nursing)	N-NF(II)P 125	Nursing Foundation-(I&II) Practical	2023
4149	13184	Bachelor of Science (Nursing)	HNIT145	Health/ Nursing Informatics & Technology	2023
4150	13184	Bachelor of Science (Nursing)	SSCC(II) 130	Self-study/ Co-curricular	2023
4151	13184	Bachelor of Science (Nursing)	MICR201	Applied Microbiology and Infection Control including Safety	2023
4152	13184	Bachelor of Science (Nursing)	PHAR(I) 205 & PATH(I) 210	Pharmacology-I and Pathology-I	2023
4153	13184	Bachelor of Science (Nursing)	N-AHN(I) 215	Adult Health Nursing-I with integrated pathophysiology including BCLS module	2023
4154	13184	Bachelor of Science (Nursing)	N-AHN (I)P 215	Adult Health Nursing-I Practical	2023

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4155	13184	Bachelor of Science (Nursing)	SSCC(I) 220	Self-study/ Co-curricular	2023
4156	13184	Bachelor of Science (Nursing)	ELEC301	Human Values	2023
4157	13184	Bachelor of Science (Nursing)	ELEC302	Diabetes Care	2023
4158	13184	Bachelor of Science (Nursing)	ELEC303	Soft Skills	2023
4159	13184	Bachelor of Science (Nursing)	PHAR(II) 205 & PATH(II) 210	Pharmacology-(I&II) including Fundamentals of prescribing Module and Pathology- (I&II) & Genetics	2023
4160	13184	Bachelor of Science (Nursing)	N-AHN (II) 225	Adult Health Nursing-II with integrated pathophysiology including Geriatric Nursing + Palliative care module	2023
4161	13184	Bachelor of Science (Nursing)	N-AHN (II)P 225	Adult Health Nursing-II Practical	2023
4162	13184	Bachelor of Science (Nursing)	PROF230	Professionalism, Professional Values and Ethics including Bioethics	2023
4163	13184	Bachelor of Science (Nursing)	SSCC(II) 220	Self-study/ Co-curricular	2023
4164	13184	Bachelor of Science (Nursing)	N-CHN(I) 301	Child Health Nursing-I including Essential Newborn Care (ENBC), FBNC, IMNCI and PLS, modules	2023
4165	13184	Bachelor of Science (Nursing)	N-MHN (I)305	Mental Health Nursing-I	2023
4166	13184	Bachelor of Science (Nursing)	N-COMH (I)310	Community Health Nursing-I including Environmental Science & Epidemiology	2023
4167	13184	Bachelor of Science (Nursing)	N-COMH (I)P 310	Community Health Nursing-I Practical	2023
4168	13184	Bachelor of Science (Nursing)	EDUC315	Educational Technology/ Nursing Education	2023
4169	13184	Bachelor of Science (Nursing)	N-FORN 320	Introduction to Forensic Nursing and Indian Laws	2023
4170	13184	Bachelor of Science (Nursing)	SSCC(I) 325	Self-study/ Co-curricular	2023
4171	13184	Bachelor of Science (Nursing)	ELEC501	CBT	2023
4172	13184	Bachelor of Science (Nursing)	ELEC502	Personality Development	2023
4173	13184	Bachelor of Science (Nursing)	ELEC503	Addiction Psychiatry	2023
4174	13184	Bachelor of Science (Nursing)	ELEC504	Adolescent Health	2023
4175	13184	Bachelor of Science (Nursing)	ELEC505	Sports Health	2023
4176	13184	Bachelor of Science (Nursing)	ELEC506	Accreditation & Practice Standards	2023
4177	13184	Bachelor of Science (Nursing)	ELEC507	Developmental Psychology	2023
4178	13184	Bachelor of Science (Nursing)	ELEC508	Menopausal Health	2023
4179	13184	Bachelor of Science (Nursing)	ELEC509	Health Economics	2023
4180	13184	Bachelor of Science (Nursing)	N-CHN (II)301	Child Health Nursing-(I&II)	2023
4181	13184	Bachelor of Science (Nursing)	N-MHN (II)305	Mental Health Nursing-(I&II)	2023
4182	13184	Bachelor of Science (Nursing)	NMLE 330	Nursing Management & Leadership	2023

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4183	13184	Bachelor of Science (Nursing)	N-MIDW (I)/ OBGN 335	Midwifery/ Obstetrics and Gynaecology (OBG) Nursing-I including SBA module	2023
4184	13184	Bachelor of Science (Nursing)	N-CHN (II)P 301	Child Health Nursing-(I&II) Practical	2023
4185	13184	Bachelor of Science (Nursing)	N-MHN (II)P 305	Mental Health Nursing-(I&II) Practical	2023
4186	13184	Bachelor of Science (Nursing)	N-COMH (II)401	Community Health Nursing-II	2023
4187	13184	Bachelor of Science (Nursing)	NRST405	Nursing Research & Statistics	2023
4188	13184	Bachelor of Science (Nursing)	N-MIDW (II)/ OBGN 410	Midwifery/ Obstetrics and Gynaecology (OBG) Nursing –II including safe delivery app module	2023
4189	13184	Bachelor of Science (Nursing)	N-COMH (II)P 401	Community Health Nursing-II Practical	2023
4190	13184	Bachelor of Science (Nursing)	N-MIDW (II)P / OBGN 410	Midwifery/ Obstetrics and Gynaecology (OBG) Nursing –(I&II) Practical	2023
4191	13184	Bachelor of Science (Nursing)	ELEC701	Scientific Writing Skills	2023
4192	13184	Bachelor of Science (Nursing)	ELEC702	Lactation Management	2023
4193	13184	Bachelor of Science (Nursing)	ELEC703	Sexuality & Health	2023
4194	13184	Bachelor of Science (Nursing)	ELEC704	Stress Management	2023
4195	13184	Bachelor of Science (Nursing)	ELEC705	Job Readiness & Employability in Health Care Setting	2023
4196	13184	Bachelor of Science (Nursing)	INTE440	Internship (Intensive Practicum/ Residency Posting)	2023
4197	13560	Post Basic Bachelor of Science (Nursing)	NUR2105	Nursing Foundation	2023
4198	13560	Post Basic Bachelor of Science (Nursing)	NUR2106	Nutrition and Dietetics	2023
4199	13560	Post Basic Bachelor of Science (Nursing)	NUR2107	Biochemistry and Biophysics	2023
4200	13560	Post Basic Bachelor of Science (Nursing)	NUR2108	Medical Surgical Nursing	2023
4201	13560	Post Basic Bachelor of Science (Nursing)	NUR2109	English	2023
4202	13560	Post Basic Bachelor of Science (Nursing)	NUR2110	Medical Surgical Nursing (Practical)	2023
4203	13560	Post Basic Bachelor of Science (Nursing)	NUR2207	Psychology	2023
4204	13560	Post Basic Bachelor of Science (Nursing)	NUR2208	Maternal Nursing	2023
4205	13560	Post Basic Bachelor of Science (Nursing)	NUR2209	Pediatric Nursing	2023

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4206	13560	Post Basic Bachelor of Science (Nursing)	NUR2210	Microbiology	2023
4207	13560	Post Basic Bachelor of Science (Nursing)	NUR2211	Maternal Nursing (Practical)	2023
4208	13560	Post Basic Bachelor of Science (Nursing)	NUR2212	Pediatric Nursing (Practical)	2023
4209	13560	Post Basic Bachelor of Science (Nursing)	NUR2305	Sociology	2023
4210	13560	Post Basic Bachelor of Science (Nursing)	NUR2306	Community Health Nursing	2023
4211	13560	Post Basic Bachelor of Science (Nursing)	NUR2307	Introduction to Nursing Administration	2023
4212	13560	Post Basic Bachelor of Science (Nursing)	NUR2308	Community Health Nursing (Practical)	2023
4213	13560	Post Basic Bachelor of Science (Nursing)	NUR2405	Psychiatric Nursing	2023
4214	13560	Post Basic Bachelor of Science (Nursing)	NUR2406	Introduction to Nursing Education	2023
4215	13560	Post Basic Bachelor of Science (Nursing)	NUR2407	Introduction to Nursing Research and Statistics	2023
4216	13560	Post Basic Bachelor of Science (Nursing)	NUR2408	Psychiatric Nursing (Practical)	2023
4217	13560	Post Basic Bachelor of Science (Nursing)	NUR2437	Dissertation (Nursing Research)	2023
4218	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	NUR4101	Nursing Education	2023
4219	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	NUR4102	Nursing Education Practical	2023
4220	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	MSN4103	Medical Surgical Nursing-I	2023

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4221	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	CHN4103	Community Health Nursing-I	2023
4222	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	PSN4103	Psychiatric Nursing-I	2023
4223	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	OGN4103	Obstetric & Gynaecological Nursing-I	2023
4224	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	PDN4103	Child Health Nursing-I	2023
4225	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	NUR4201	Advance Nursing Practice	2023
4226	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	NUR4202	Nursing Research & Statistics	2023

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4227	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	MSN4203	Medical Surgical Nursing CS-I & II Practical	2023
4228	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	CHN4203	Community Health Nursing CS-I & II Practical	2023
4229	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	PSN4203	Psychiatric Nursing CS-I & II Practical	2023
4230	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	OGN4203	Obstetric & Gynaecological Nursing CS-I & II Practical	2023
4231	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	PDN4203	Child Health Nursing CS-I & II Practical	2023
4232	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	NUR4337	Nursing Research Project	2023

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4233	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	MSN4301	Cardiothoracic & Vascular Nursing	2023
4234	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	MSN4302	Critical Care Nursing	2023
4235	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	MSN4303	Oncology Nursing	2023
4236	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	MSN4304	Neurosciences Nursing	2023
4237	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	MSN4305	Nephro Urology Nursing	2023
4238	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	MSN4306	Orthopedic Nursing	2023

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4239	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	MSN4307	Gastro Enterology Nursing	2023
4240	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	CHN4301	Community Health Nursing	2023
4241	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	PSN4301	Psychiatric Nursing	2023
4242	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	OGN4301	Obstetric & Gynaecological Nursing	2023
4243	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	PDN4301	Child Health Nursing	2023
4244	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	NUR4401	Nursing Management	2023

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4245	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	NUR4437	Nursing Research Dissertation	2023
4246	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	MSN4402	Cardiothoracic & Vascular Nursing CS-III & IV Practical	2023
4247	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	MSN4403	Critical Care Nursing CS-III & IV Practical	2023
4248	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	MSN4404	Oncology Nursing CS-III & IV Practical	2023
4249	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	MSN4405	Neurosciences Nursing CS-III & IV Practical	2023
4250	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	MSN4406	Nephro-Urology Nursing CS-III & IV Practical	2023

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4251	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	MSN4407	Orthopedic Nursing CS-III & IV Practical	2023
4252	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	MSN4408	Gastro Enterology Nursing CS-III & IV Practical	2023
4253	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	CHN4402	Community Health Nursing CS-III & IV Practical	2023
4254	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	PSN4402	Psychiatric Nursing CS-III & IV Practical	2023
4255	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	OGN4402	Obstetric & Gynaecological Nursing CS-III & IV Practical	2023
4256	131449	Master of Science (Nursing) (With Specialisation in (1) Medical Surgical Nursing (2) Community Health Nursing (3) Psychiatric Nursing (4) Obstetrical & Gynaecological Nursing and (5) Paediatric Nursing)	PDN4402	Child Health Nursing CS-III & IV Practical	2023
4257	13133	Bachelor of Pharmacy	BP101T	Human Anatomy and Physiology-I	2023
4258	13133	Bachelor of Pharmacy	BP102T	Pharmaceutical Analysis	2023
4259	13133	Bachelor of Pharmacy	BP103T	Pharmaceutics-I	2023

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4260	13133	Bachelor of Pharmacy	BP104T	Pharmaceutical Inorganic Chemistry	2023
4261	13133	Bachelor of Pharmacy	BP105T	Communication Skills	2023
4262	13133	Bachelor of Pharmacy	BP107P	Human Anatomy and Physiology Practical-I	2023
4263	13133	Bachelor of Pharmacy	BP108P	Pharmaceutical Analysis Practical	2023
4264	13133	Bachelor of Pharmacy	BP109P	Pharmaceutics-I Practical	2023
4265	13133	Bachelor of Pharmacy	BP110P	Pharmaceutical Inorganic Chemistry Practical	2023
4266	13133	Bachelor of Pharmacy	BP111P	Communication Skills Practical	2023
4267	13133	Bachelor of Pharmacy	BP106RMT	Remedial Mathematics	2023
4268	13133	Bachelor of Pharmacy	BP106RBT	Remedial Biology	2023
4269	13133	Bachelor of Pharmacy	BP112RBP	Remedial Biology Practical	2023
4270	13133	Bachelor of Pharmacy	BP201T	Human Anatomy and Physiology-II	2023
4271	13133	Bachelor of Pharmacy	BP202T	Pharmaceutical Organic Chemistry-I	2023
4272	13133	Bachelor of Pharmacy	BP203T	Biochemistry	2023
4273	13133	Bachelor of Pharmacy	BP204T	Pathophysiology	2023
4274	13133	Bachelor of Pharmacy	BP205T	Computer Applications in Pharmacy	2023
4275	13133	Bachelor of Pharmacy	BP206T	Environmental Sciences	2023
4276	13133	Bachelor of Pharmacy	BP207P	Human Anatomy and Physiology Practical-II	2023
4277	13133	Bachelor of Pharmacy	BP208P	Pharmaceutical Organic Chemistry Practical-I	2023
4278	13133	Bachelor of Pharmacy	BP209P	Biochemistry Practical	2023
4279	13133	Bachelor of Pharmacy	BP210P	Computer Applications in Pharmacy Practical	2023
4280	13133	Bachelor of Pharmacy	BP301T	Pharmaceutical Organic Chemistry-II	2023
4281	13133	Bachelor of Pharmacy	BP302T	Physical Pharmaceutics-I	2023
4282	13133	Bachelor of Pharmacy	BP303T	Pharmaceutical Microbiology	2023
4283	13133	Bachelor of Pharmacy	BP304T	Pharmaceutical Engineering	2023
4284	13133	Bachelor of Pharmacy	BP305P	Pharmaceutical Organic Chemistry Practical-II	2023
4285	13133	Bachelor of Pharmacy	BP306P	Physical Pharmaceutics Practical-I	2023
4286	13133	Bachelor of Pharmacy	BP307P	Pharmaceutical Microbiology Practical	2023
4287	13133	Bachelor of Pharmacy	BP308P	Pharmaceutical Engineering Practical	2023
4288	13133	Bachelor of Pharmacy	BP401T	Pharmaceutical Organic Chemistry-III	2023
4289	13133	Bachelor of Pharmacy	BP402T	Medicinal Chemistry-I	2023
4290	13133	Bachelor of Pharmacy	BP403T	Physical Pharmaceutics-II	2023
4291	13133	Bachelor of Pharmacy	BP404T	Pharmacology-I	2023

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4292	13133	Bachelor of Pharmacy	BP405T	Pharmacognosy and Phytochemistry-I	2023
4293	13133	Bachelor of Pharmacy	BP406P	Medicinal Chemistry Practical-I	2023
4294	13133	Bachelor of Pharmacy	BP407P	Physical Pharmaceutics Practical-II	2023
4295	13133	Bachelor of Pharmacy	BP408P	Pharmacology Practical-I	2023
4296	13133	Bachelor of Pharmacy	BP409P	Pharmacognosy and Phytochemistry Practical-I	2023
4297	13133	Bachelor of Pharmacy	BP501T	Medicinal Chemistry-II	2023
4298	13133	Bachelor of Pharmacy	BP502T	Industrial Pharmacy-I	2023
4299	13133	Bachelor of Pharmacy	BP503T	Pharmacology-II	2023
4300	13133	Bachelor of Pharmacy	BP504T	Pharmacognosy and Phytochemistry-II	2023
4301	13133	Bachelor of Pharmacy	BP505T	Pharmaceutical Jurisprudence	2023
4302	13133	Bachelor of Pharmacy	BP506P	Industrial Pharmacy Practical-I	2023
4303	13133	Bachelor of Pharmacy	BP507P	Pharmacology Practical-II	2023
4304	13133	Bachelor of Pharmacy	BP508P	Pharmacognosy and Phytochemistry Practical-II	2023
4305	13133	Bachelor of Pharmacy	BP601T	Medicinal Chemistry-III	2023
4306	13133	Bachelor of Pharmacy	BP602T	Pharmacology-III	2023
4307	13133	Bachelor of Pharmacy	BP603T	Herbal Drug Technology	2023
4308	13133	Bachelor of Pharmacy	BP604T	Biopharmaceutics and Pharmacokinetics	2023
4309	13133	Bachelor of Pharmacy	BP605T	Pharmaceutical Biotechnology	2023
4310	13133	Bachelor of Pharmacy	BP606T	Quality Assurance	2023
4311	13133	Bachelor of Pharmacy	BP607P	Medicinal Chemistry Practical-III	2023
4312	13133	Bachelor of Pharmacy	BP608P	Pharmacology Practical-III	2023
4313	13133	Bachelor of Pharmacy	BP609P	Herbal Drug Technology Practical	2023
4314	13133	Bachelor of Pharmacy	BP701T	Instrumental Methods of Analysis	2023
4315	13133	Bachelor of Pharmacy	BP702T	Industrial Pharmacy-II	2023
4316	13133	Bachelor of Pharmacy	BP703T	Pharmacy Practice	2023
4317	13133	Bachelor of Pharmacy	BP704T	Novel Drug Delivery System	2023
4318	13133	Bachelor of Pharmacy	BP705P	Instrumental Methods of Analysis Practical	2023
4319	13133	Bachelor of Pharmacy	BP706PS	Practice School	2023
4320	13133	Bachelor of Pharmacy	BP801T	Biostatistics and Research Methodology	2023
4321	13133	Bachelor of Pharmacy	BP802T	Social and Preventive Pharmacy	2023
4322	13133	Bachelor of Pharmacy	BP813PW	Project Work	2023
4323	13133	Bachelor of Pharmacy	BP803ET	Pharma Marketing Management	2023
4324	13133	Bachelor of Pharmacy	BP804ET	Pharmaceutical Regulatory Science	2023
4325	13133	Bachelor of Pharmacy	BP805ET	Pharmacovigilance	2023
4326	13133	Bachelor of Pharmacy	BP806ET	Quality Control and Standardization of Herbals	2023
4327	13133	Bachelor of Pharmacy	BP807ET	Computer Aided Drug Design	2023
4328	13133	Bachelor of Pharmacy	BP808ET	Cell and Molecular Biology	2023

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4329	13133	Bachelor of Pharmacy	BP809ET	Cosmetic Science	2023
4330	13133	Bachelor of Pharmacy	BP810ET	Experimental Pharmacology	2023
4331	13133	Bachelor of Pharmacy	BP811ET	Advanced Instrumentation Techniques	2023
4332	13133	Bachelor of Pharmacy	BP812ET	Dietary Supplements and Nutraceuticals	2023
4333	13470	Master of Pharmacy (Pharmaceutics)	MPH101T	Modern Pharmaceutical Analytical Techniques	2023
4334	13470	Master of Pharmacy (Pharmaceutics)	MPH102T	Drug Delivery System	2023
4335	13470	Master of Pharmacy (Pharmaceutics)	MPH103T	Modern Pharmaceutics	2023
4336	13470	Master of Pharmacy (Pharmaceutics)	MPH104T	Regulatory Affairs	2023
4337	13470	Master of Pharmacy (Pharmaceutics)	MPH105P	Pharmaceutics Practical-I	2023
4338	13470	Master of Pharmacy (Pharmaceutics)	PHA4138	Seminar/ Assignment-I	2023
4339	13470	Master of Pharmacy (Pharmaceutics)	MPH201T	Molecular Pharmaceutics (Nano Tech and Targeted DDS)	2023
4340	13470	Master of Pharmacy (Pharmaceutics)	MPH202T	Advanced Biopharmaceutics & Pharmacokinetics	2023
4341	13470	Master of Pharmacy (Pharmaceutics)	MPH203T	Computer Aided Drug Delivery System	2023
4342	13470	Master of Pharmacy (Pharmaceutics)	MPH204T	Cosmetic and Cosmeceuticals	2023
4343	13470	Master of Pharmacy (Pharmaceutics)	MPH205P	Pharmaceutics Practical-II	2023
4344	13470	Master of Pharmacy (Pharmaceutics)	PHA4238	Seminar/Assignment-II	2023
4345	13470	Master of Pharmacy (Pharmaceutics)	MRM301T	Research Methodology and Biostatistics	2023
4346	13470	Master of Pharmacy (Pharmaceutics)	PHA4330	Journal Club-I	2023
4347	13470	Master of Pharmacy (Pharmaceutics)	PHA4332	Discussion/ Presentation (Proposal Presentation)	2023
4348	13470	Master of Pharmacy (Pharmaceutics)	PHA4337	Research Work-I	2023
4349	13470	Master of Pharmacy (Pharmaceutics)	PHA4430	Journal Club-II	2023
4350	13470	Master of Pharmacy (Pharmaceutics)	PHA4437	Research Work-II	2023
4351	13470	Master of Pharmacy (Pharmaceutics)	PHA4432	Discussion/ Final Presentation	2023
4352	13040	Bachelor of Architecture	ARC2101	Architectural Design-I	2023

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4353	13040	Bachelor of Architecture	ARC2102	Building Materials & Construction Technology-I	2023
4354	13040	Bachelor of Architecture	ARC2104	Architectural Graphics Skills-I	2023
4355	13040	Bachelor of Architecture	ARC2105	Visual Arts-I	2023
4356	13040	Bachelor of Architecture	ARC2106	History of Architecture-I	2023
4357	13040	Bachelor of Architecture	ARC2109	Structure-I	2023
4358	13040	Bachelor of Architecture	ARC2111	Model Making	2023
4359	13040	Bachelor of Architecture	ARC2201	Architectural Design-II	2023
4360	13040	Bachelor of Architecture	ARC2202	Building Materials & Construction Technology-II	2023
4361	13040	Bachelor of Architecture	ARC2204	Architectural Graphics Skills-II	2023
4362	13040	Bachelor of Architecture	ARC2205	Visual Arts-II	2023
4363	13040	Bachelor of Architecture	ARC2206	History of Architecture-II	2023
4364	13040	Bachelor of Architecture	ARC2209	Structure-II	2023
4365	13040	Bachelor of Architecture	ARC2213	Architectural Climatology	2023
4366	13040	Bachelor of Architecture	ARC2301	Architectural Design-III	2023
4367	13040	Bachelor of Architecture	ARC2302	Building Materials & Construction Technology-III	2023
4368	13040	Bachelor of Architecture	ARC2304	Architectural Graphics Skills-III	2023
4369	13040	Bachelor of Architecture	ARC2305	Visual Arts-III	2023
4370	13040	Bachelor of Architecture	ARC2307	History of Architecture-III	2023
4371	13040	Bachelor of Architecture	ARC2308	Structure-III	2023
4372	13040	Bachelor of Architecture	ARC2312	Building Services-I	2023
4373	13040	Bachelor of Architecture	ARC2313	Surveying & Leveling	2023
4374	13040	Bachelor of Architecture	ARC2401	Architectural Design-IV	2023
4375	13040	Bachelor of Architecture	ARC2402	Building Materials & Construction Technology-IV	2023
4376	13040	Bachelor of Architecture	ARC2409	Structure-IV	2023
4377	13040	Bachelor of Architecture	ARC2413	Computer Applications-I	2023
4378	13040	Bachelor of Architecture	ARC2414	Visual Arts-IV	2023
4379	13040	Bachelor of Architecture	ARC2415	History of Architecture-IV	2023
4380	13040	Bachelor of Architecture	ARC2416	Building Services-II	2023
4381	13040	Bachelor of Architecture	ARC2501	Architectural Design-V	2023
4382	13040	Bachelor of Architecture	ARC2502	Building Materials & Construction Technology-V	2023
4383	13040	Bachelor of Architecture	ARC2509	Structure-V	2023
4384	13040	Bachelor of Architecture	ARC2513	Computer Applications-II	2023
4385	13040	Bachelor of Architecture	ARC2517	Theory of Architecture-I	2023
4386	13040	Bachelor of Architecture	ARC2518	Building Services-III	2023
4387	13040	Bachelor of Architecture	ARC2519	People Culture & Built Environment-I	2023
4388	13040	Bachelor of Architecture	ARC2520	Ecology, Environment & Sustainable Development-I	2023
4389	13040	Bachelor of Architecture	ARC2521	Computer Applications & Advance Technologies-I (Smart Buildings)	2023

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4390	13040	Bachelor of Architecture	ARC2522	Aesthetics & Creativity: Graphic Design	2023
4391	13040	Bachelor of Architecture	ARC2523	Road Safety & Civic Sense	2023
4392	13040	Bachelor of Architecture	ARC2601	Architectural Design-VI	2023
4393	13040	Bachelor of Architecture	ARC2602	Building Materials & Construction Technology-VI	2023
4394	13040	Bachelor of Architecture	ARC2609	Structure-VI	2023
4395	13040	Bachelor of Architecture	ARC2617	Site Planning & Landscape	2023
4396	13040	Bachelor of Architecture	ARC2618	Theory of Architecture-II	2023
4397	13040	Bachelor of Architecture	ARC2619	Building Services-IV	2023
4398	13040	Bachelor of Architecture	ARC2638	Seminar	2023
4399	13040	Bachelor of Architecture	ARC2620	People Culture & Built Environment-II	2023
4400	13040	Bachelor of Architecture	ARC2621	Ecology, Environment & Sustainable Development-II	2023
4401	13040	Bachelor of Architecture	ARC2622	Computer Applications & Advance Technologies-II (ARVR Architecture)	2023
4402	13040	Bachelor of Architecture	ARC2623	Aesthetics & Creativity- Photography	2023
4403	13040	Bachelor of Architecture	ARC2701	Architectural Design-VII	2023
4404	13040	Bachelor of Architecture	ARC2702	Building Materials & Construction Technology-VII	2023
4405	13040	Bachelor of Architecture	ARC2703	Structure-VII	2023
4406	13040	Bachelor of Architecture	ARC2705	Research Methodology	2023
4407	13040	Bachelor of Architecture	ARC2717	LEED Lab-I	2023
4408	13040	Bachelor of Architecture	ARC2718	Interior Design	2023
4409	13040	Bachelor of Architecture	ARC2720	Specification, Estimation & Valuation	2023
4410	13040	Bachelor of Architecture	ARC2721	People Culture & Built Environment-III	2023
4411	13040	Bachelor of Architecture	ARC2722	Ecology, Environment & Sustainable Development-III	2023
4412	13040	Bachelor of Architecture	ARC2723	Computer Applications & Advance Technologies-III (BIM)	2023
4413	13040	Bachelor of Architecture	ARC2724	Aesthetics & Creativity- Video and Film Making	2023
4414	13040	Bachelor of Architecture	ARC2801	Building Materials & Construction Technology-VIII	2023
4415	13040	Bachelor of Architecture	ARC2809	Architectural Design-VIII	2023
4416	13040	Bachelor of Architecture	ARC2815	Structure-VIII	2023
4417	13040	Bachelor of Architecture	ARC2816	Town Planning	2023
4418	13040	Bachelor of Architecture	ARC2817	LEED Lab-II	2023
4419	13040	Bachelor of Architecture	ARC2837	Dissertation	2023

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4420	13040	Bachelor of Architecture	ARC2818	People Culture & Built Environment-IV	2023
4421	13040	Bachelor of Architecture	ARC2819	Ecology, Environment & Sustainable Development-IV	2023
4422	13040	Bachelor of Architecture	ARC2820	Computer Applications & Advance Technologies-IV (Software)	2023
4423	13040	Bachelor of Architecture	ARC2821	Aesthetics & Creativity- Theatre & Set Design	2023
4424	13040	Bachelor of Architecture	ARC2937	Practical Training	2023
4425	13040	Bachelor of Architecture	ARC2037	Architectural Thesis	2023
4426	13040	Bachelor of Architecture	ARC2001	Professional Practice	2023
4427	13040	Bachelor of Architecture	ARC2002	Career Development	2023
4428	13040	Bachelor of Architecture	ARC2003	Understanding Cultural Landscapes for Urban Renewal & Conservation	2023
4429	13040	Bachelor of Architecture	ARC2004	Smart Cities and Smart Technologies	2023
4430	13040	Bachelor of Architecture	ARC2005	Transit Oriented Development	2023
4431	13803	Bachelor of Interior Design	IND2106	Introduction to Craft & Model Making	2023
4432	13803	Bachelor of Interior Design	IND2107	History of Design & Culture	2023
4433	13803	Bachelor of Interior Design	IND2110	Interior Design Studio-I	2023
4434	13803	Bachelor of Interior Design	IND2111	Building Materials & Construction Techniques-I	2023
4435	13803	Bachelor of Interior Design	IND2112	Graphics Skills-I	2023
4436	13803	Bachelor of Interior Design	IND2113	Art and Graphics-I	2023
4437	13803	Bachelor of Interior Design	IND2114	Presentation Techniques	2023
4438	13803	Bachelor of Interior Design	IND2206	Fundamentals of Applied Ergonomics	2023
4439	13803	Bachelor of Interior Design	IND2209	Interior Design Studio-II	2023
4440	13803	Bachelor of Interior Design	IND2210	Building Materials & Construction Techniques-II	2023
4441	13803	Bachelor of Interior Design	IND2211	Graphics Skills-II	2023
4442	13803	Bachelor of Interior Design	IND2212	Art and Graphics-II	2023
4443	13803	Bachelor of Interior Design	IND2213	History of Interior Design-I	2023
4444	13803	Bachelor of Interior Design	IND2214	Fundamentals of Structures	2023
4445	13803	Bachelor of Interior Design	IND2215	Climate Responsive Interiors	2023
4446	13803	Bachelor of Interior Design	IND2304	Psychology of Living Environments	2023
4447	13803	Bachelor of Interior Design	IND2307	Lighting & Colours in Interiors	2023
4448	13803	Bachelor of Interior Design	IND2312	Interior Design Studio-III	2023
4449	13803	Bachelor of Interior Design	IND2313	Building Materials & Construction Techniques-III	2023
4450	13803	Bachelor of Interior Design	IND2314	Art and Graphics-III	2023
4451	13803	Bachelor of Interior Design	IND2315	Graphics Skills-III	2023

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4452	13803	Bachelor of Interior Design	IND2316	History of Interior Design-II	2023
4453	13803	Bachelor of Interior Design	IND2317	Building Services-I	2023
4454	13803	Bachelor of Interior Design	IND2318	Furniture Design Workshop-I	2023
4455	13803	Bachelor of Interior Design	IND2408	Interior Design Studio-IV	2023
4456	13803	Bachelor of Interior Design	IND2409	Building Materials & Construction Techniques-IV	2023
4457	13803	Bachelor of Interior Design	IND2410	Barrier Free Space Planning for Interiors	2023
4458	13803	Bachelor of Interior Design	IND2411	Computer Aided Interior Design & Drafting	2023
4459	13803	Bachelor of Interior Design	IND2412	Photography & Videography	2023
4460	13803	Bachelor of Interior Design	IND2413	Furniture Design Workshop-II	2023
4461	13803	Bachelor of Interior Design	IND2414	Building Services-II	2023
4462	13803	Bachelor of Interior Design	IND2502	Revitalization of Arts & Crafts	2023
4463	13803	Bachelor of Interior Design	IND2504	Textile in Interiors	2023
4464	13803	Bachelor of Interior Design	IND2509	Interior Design Studio-V	2023
4465	13803	Bachelor of Interior Design	IND2510	Building Materials & Construction Techniques-V	2023
4466	13803	Bachelor of Interior Design	IND2511	Estimation & Specifications	2023
4467	13803	Bachelor of Interior Design	IND2512	Computer Aided Interior Design & Visualization	2023
4468	13803	Bachelor of Interior Design	IND2513	Building Servies-III	2023
4469	13803	Bachelor of Interior Design	IND2616	Interior Design Studio-VI	2023
4470	13803	Bachelor of Interior Design	IND2617	Interior Landscape Design	2023
4471	13803	Bachelor of Interior Design	IND2618	Interior Design Portfolio Development	2023
4472	13803	Bachelor of Interior Design	IND2619	Building Services-IV	2023
4473	13803	Bachelor of Interior Design	IND2610	Sustainable Interior Design & Materials	2023
4474	13803	Bachelor of Interior Design	IND2611	Sustainable Interior Renovation	2023
4475	13803	Bachelor of Interior Design	IND2612	Adaptive Reuse & Retrofit	2023
4476	13803	Bachelor of Interior Design	IND2613	Performance Space Design	2023
4477	13803	Bachelor of Interior Design	IND2614	Public Art	2023
4478	13803	Bachelor of Interior Design	IND2615	Public Space Design	2023
4479	13803	Bachelor of Interior Design	IND2702	Design Research Methods & Presentation Techniques	2023
4480	13803	Bachelor of Interior Design	IND2703	Professional Practice	2023
4481	13803	Bachelor of Interior Design	IND2737	Interior Thesis Project	2023
4482	13803	Bachelor of Interior Design	IND2837	Professional Training	2023
4483	131469	Master of Planning (Urban & Regional)	PLN4101	Planning History and Theory	2023
4484	131469	Master of Planning (Urban & Regional)	PLN4102	Socio-Economic Dimensions in Planning	2023
4485	131469	Master of Planning (Urban & Regional)	PLN4103	Planning Techniques and Computer Applications	2023

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4486	131469	Master of Planning (Urban & Regional)	PLN4104	Infrastructure Planning and Management	2023
4487	131469	Master of Planning (Urban & Regional)	PLN4105	Housing and Environmental Planning	2023
4488	131469	Master of Planning (Urban & Regional)	PLN4108	Planning Studio-I (i) Area Planning (ii) Village Development Plan	2023
4489	131469	Master of Planning (Urban & Regional)	PLN4110	Infographic and Storytelling Techniques	2023
4490	131469	Master of Planning (Urban & Regional)	PLN4111	Eco-Tourism	2023
4491	131469	Master of Planning (Urban & Regional)	PLN4112	Metropolitan Regional Planning	2023
4492	131469	Master of Planning (Urban & Regional)	PLN4208	Application of Geoinformatics	2023
4493	131469	Master of Planning (Urban & Regional)	PLN4209	Regional Planning and Development	2023
4494	131469	Master of Planning (Urban & Regional)	PLN4210	Land Management and Real Estate	2023
4495	131469	Master of Planning (Urban & Regional)	PLN4211	Transportation Planning and Management	2023
4496	131469	Master of Planning (Urban & Regional)	PLN4212	Demography and Quantitative Analysis	2023
4497	131469	Master of Planning (Urban & Regional)	PLN4206	Planning Studio-II Urban Planning	2023
4498	131469	Master of Planning (Urban & Regional)	PLN4213	Special Area Planning	2023
4499	131469	Master of Planning (Urban & Regional)	PLN4215	Urban Design Renewal and Conservation	2023
4500	131469	Master of Planning (Urban & Regional)	PLN4216	Big Data and Data Analytics	2023
4501	131469	Master of Planning (Urban & Regional)	PLN4302	Project Planning and Finance Management	2023
4502	131469	Master of Planning (Urban & Regional)	PLN4304	Public Policy and Politics in Planning	2023
4503	131469	Master of Planning (Urban & Regional)	PLN4308	Resilience and Planning	2023
4504	131469	Master of Planning (Urban & Regional)	PLN4309	Urban and Regional Governance	2023
4505	131469	Master of Planning (Urban & Regional)	PLN4310	Research Methodology and Thesis Planning	2023
4506	131469	Master of Planning (Urban & Regional)	PLN4307	Planning Studio-III Regional Planning	2023
4507	131469	Master of Planning (Urban & Regional)	PLN4312	Smart Cities and Advanced Technologies for Emerging Planning Issues	2023

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4508	131469	Master of Planning (Urban & Regional)	PLN4314	Participatory and Integrated Urban Development	2023
4509	131469	Master of Planning (Urban & Regional)	PLN4315	Sustainable Cities and Regions	2023
4510	131469	Master of Planning (Urban & Regional)	PLN4403	Planning Legislation and Professional Practice	2023
4511	131469	Master of Planning (Urban & Regional)	PLN4437	Planning Thesis	2023
4512	OE	Behavioural Science (OE)	BEH2151/ SEBS2101	Understanding Self for Effectiveness	2023
4513	OE	Behavioural Science (OE)	BEH2251/ SEBS2201	Problem Solving and Creative Thinking	2023
4514	OE	Behavioural Science (OE)	BEH2351/ SEBS2301	Group Dynamics and Team Building	2023
4515	OE	Behavioural Science (OE)	BEH2451/ SEBS2401	Stress and Coping Strategies	2023
4516	OE	Behavioural Science (OE)	BEH2551/ SEBS2501	Individual, Society and Nations	2023
4517	OE	Behavioural Science (OE)	BEH2651	Interpersonal Communication and Relationship Management	2023
4518	OE	Behavioural Science (OE)	BEH2552	Personality, Nationalism and Human Values	2023
4519	OE	Behavioural Science (OE)	BEH2652	Interpersonal Communication	2023
4520	OE	Behavioural Science (OE)	BEH2751	Relationship Management	2023
4521	OE	Behavioural Science (OE)	BEH2851	Personal & Professional Excellence	2023
4522	OE	Behavioural Science (OE)	BEH4151	Self-Development and Interpersonal Skills	2023
4523	OE	Behavioural Science (OE)	BEH4251	Behavioural Communication and Relationship Management	2023
4524	OE	Behavioural Science (OE)	BEH4351	Leading Through Teams	2023
4525	OE	Behavioural Science (OE)	BEH4451	Professional Excellence	2023
4526	OE	Communication Skills (OE)	AECS2101	General Business Communication-Foundation	2023
4527	OE	Communication Skills (OE)	AECS2201	General Business Communication-Intermediate	2023
4528	OE	Communication Skills (OE)	AECS2202	General Business Communication-Advanced	2023
4529	OE	Communication Skills (OE)	AECS2301	Workplace Communication	2023
4530	OE	Communication Skills (OE)	AECS2401	Public Speaking	2023
4531	OE	Communication Skills (OE)	AECS2501	Employability Skills	2023
4532	OE	Communication Skills (OE)	CSS2151	Effective Listening	2023
4533	OE	Communication Skills (OE)	CSS2251	Presentation Skills	2023
4534	OE	Communication Skills (OE)	CSS2351	Reading and Comprehension	2023
4535	OE	Communication Skills (OE)	CSS2451	Corporate Communication	2023
4536	OE	Communication Skills (OE)	CSS2551	Employability Skills	2023

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4537	OE	Communication Skills (OE)	CSS2651	Workplace Communication	2023
4538	OE	Communication Skills (OE)	CSS2152	English-I	2023
4539	OE	Communication Skills (OE)	CSS2252	English-II	2023
4540	OE	Communication Skills (OE)	CSS4151	Basics of Communication	2023
4541	OE	Communication Skills (OE)	CSS4251	Corporate Communication	2023
4542	OE	Communication Skills (OE)	CSS4351	Interpersonal Communication	2023
4543	OE	Communication Skills (OE)	CSS4451	Cross Cultural Communication	2023
4544	OE	Communication Skills (OE)	CSS4152	Managerial Communication	2023
4545	OE	Environmental Studies (VAC-I)	VAES2101	Environmental Studies (VAC-I)	2023
4546	OE	Environmental Studies (OE)	ENV2152/ ENV2252	Environmental Studies	2023
4547	OE	Foreign Language (OE)	AEFL2101	Introduction to Foreign Language	2023
4548	OE	French (FL) (OE)	AEFL2251	Speaking About Yourself (French)	2023
4549	OE	French (FL) (OE)	AEFL2351	Exchange (French)	2023
4550	OE	French (FL) (OE)	AEFL2451	Communication in a Given Situation (French)	2023
4551	OE	French (FL) (OE)	AEFL2551	Situating Yourself in Past (French)	2023
4552	OE	French (FL) (OE)	LAN2151	French-I	2023
4553	OE	French (FL) (OE)	LAN2251	French-II	2023
4554	OE	French (FL) (OE)	LAN2351	French-III	2023
4555	OE	French (FL) (OE)	LAN2451	French-IV	2023
4556	OE	French (FL) (OE)	LAN2551	French-V	2023
4557	OE	French (FL) (OE)	LAN2651	French-VI	2023
4558	OE	French (FL) (OE)	LAN2751	French-VII	2023
4559	OE	French (FL) (OE)	LAN2851	French-VIII	2023
4560	OE	French (FL) (OE)	LAN2951	French-IX	2023
4561	OE	French (FL) (OE)	LAN2170	French for Technology-I	2023
4562	OE	French (FL) (OE)	LAN2270	French for Technology-II	2023
4563	OE	French (FL) (OE)	LAN2370	French for Technology-III	2023
4564	OE	French (FL) (OE)	LAN2470	French for Technology-IV	2023
4565	OE	French (FL) (OE)	LAN2570	French for Technology-V	2023
4566	OE	French (FL) (OE)	LAN2670	French for Technology-VI	2023
4567	OE	French (FL) (OE)	LAN2770	French for Technology-VII	2023
4568	OE	French (FL) (OE)	LAN4151	French-I	2023
4569	OE	French (FL) (OE)	LAN4251	French-II	2023
4570	OE	French (FL) (OE)	LAN4351	French-III	2023
4571	OE	French (FL) (OE)	LAN4451	French-IV	2023
4572	OE	French (FL) (OE)	LAN4551	French-V	2023
4573	OE	German (FL) (OE)	AEFL2252	I and My Family (German)	2023
4574	OE	German (FL) (OE)	AEFL2352	My City, My Home (German)	2023
4575	OE	German (FL) (OE)	AEFL2452	Occupation and Life (German)	2023
4576	OE	German (FL) (OE)	AEFL2552	Free Time Activities (German)	2023
4577	OE	German (FL) (OE)	LAN2152	German-I	2023
4578	OE	German (FL) (OE)	LAN2252	German-II	2023
4579	OE	German (FL) (OE)	LAN2352	German-III	2023

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4580	OE	German (FL) (OE)	LAN2452	German-IV	2023
4581	OE	German (FL) (OE)	LAN2552	German-V	2023
4582	OE	German (FL) (OE)	LAN2652	German-VI	2023
4583	OE	German (FL) (OE)	LAN2752	German-VII	2023
4584	OE	German (FL) (OE)	LAN2852	German-VIII	2023
4585	OE	German (FL) (OE)	LAN2952	German-IX	2023
4586	OE	German (FL) (OE)	LAN4152	German-I	2023
4587	OE	German (FL) (OE)	LAN4252	German-II	2023
4588	OE	German (FL) (OE)	LAN4352	German-III	2023
4589	OE	German (FL) (OE)	LAN4452	German-IV	2023
4590	OE	German (FL) (OE)	LAN4552	German-V	2023
4591	OE	Spanish (FL) (OE)	AEFL2253	Elementary Grammar & Vocabulary (Spanish)	2023
4592	OE	Spanish (FL) (OE)	AEFL2353	My World and I (Spanish)	2023
4593	OE	Spanish (FL) (OE)	AEFL2453	Day to day Activities (Spanish)	2023
4594	OE	Spanish (FL) (OE)	AEFL2553	Professional Life and Past Experiences (Spanish)	2023
4595	OE	Spanish (FL) (OE)	LAN2153	Spanish-I	2023
4596	OE	Spanish (FL) (OE)	LAN2253	Spanish-II	2023
4597	OE	Spanish (FL) (OE)	LAN2353	Spanish-III	2023
4598	OE	Spanish (FL) (OE)	LAN2453	Spanish-IV	2023
4599	OE	Spanish (FL) (OE)	LAN2553	Spanish-V	2023
4600	OE	Spanish (FL) (OE)	LAN2653	Spanish-VI	2023
4601	OE	Spanish (FL) (OE)	LAN2753	Spanish-VII	2023
4602	OE	Spanish (FL) (OE)	LAN2853	Spanish-VIII	2023
4603	OE	Spanish (FL) (OE)	LAN2953	Spanish-IX	2023
4604	OE	Spanish (FL) (OE)	LAN4153	Spanish-I	2023
4605	OE	Spanish (FL) (OE)	LAN4253	Spanish-II	2023
4606	OE	Spanish (FL) (OE)	LAN4353	Spanish-III	2023
4607	OE	Spanish (FL) (OE)	LAN4453	Spanish-IV	2023
4608	OE	Spanish (FL) (OE)	LAN4553	Spanish-V	2023
4609	OE	Russian (FL) (OE)	AEFL2254	Alphabet, Acquaintance & Profession (Russian)	2023
4610	OE	Russian (FL) (OE)	AEFL2354	My Family, My City and My Country (Russian)	2023
4611	OE	Russian (FL) (OE)	AEFL2454	Action Words, Day-to-day Conversations and Shopping (Russian)	2023
4612	OE	Russian (FL) (OE)	AEFL2554	Hobbies and Festivals (Russian)	2023
4613	OE	Russian (FL) (OE)	LAN2154	Russian-I	2023
4614	OE	Russian (FL) (OE)	LAN2254	Russian-II	2023
4615	OE	Russian (FL) (OE)	LAN2354	Russian-III	2023
4616	OE	Russian (FL) (OE)	LAN2454	Russian-IV	2023
4617	OE	Russian (FL) (OE)	LAN2554	Russian-V	2023
4618	OE	Russian (FL) (OE)	LAN2654	Russian-VI	2023

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4619	OE	Russian (FL) (OE)	LAN2754	Russian-VII	2023
4620	OE	Russian (FL) (OE)	LAN2854	Russian-VIII	2023
4621	OE	Russian (FL) (OE)	LAN2954	Russian-IX	2023
4622	OE	Russian (FL) (OE)	LAN4154	Russian-I	2023
4623	OE	Russian (FL) (OE)	LAN4254	Russian-II	2023
4624	OE	Russian (FL) (OE)	LAN4354	Russian-III	2023
4625	OE	Russian (FL) (OE)	LAN4454	Russian-IV	2023
4626	OE	Russian (FL) (OE)	LAN4554	Russian-V	2023
4627	OE	Chinese (FL) (OE)	AEFL2255	Elementary Chinese (Chinese)	2023
4628	OE	Chinese (FL) (OE)	AEFL2355	Comprehensive Chinese Lesson-I (Chinese)	2023
4629	OE	Chinese (FL) (OE)	AEFL2455	Comprehensive Chinese Lesson-II (Chinese)	2023
4630	OE	Chinese (FL) (OE)	AEFL2555	Business Chinese (Chinese)	2023
4631	OE	Chinese (FL) (OE)	LAN2155	Chinese-I	2023
4632	OE	Chinese (FL) (OE)	LAN2255	Chinese-II	2023
4633	OE	Chinese (FL) (OE)	LAN2355	Chinese-III	2023
4634	OE	Chinese (FL) (OE)	LAN2455	Chinese-IV	2023
4635	OE	Chinese (FL) (OE)	LAN2555	Chinese-V	2023
4636	OE	Chinese (FL) (OE)	LAN2655	Chinese-VI	2023
4637	OE	Chinese (FL) (OE)	LAN2755	Chinese-VII	2023
4638	OE	Chinese (FL) (OE)	LAN2855	Chinese-VIII	2023
4639	OE	Chinese (FL) (OE)	LAN2955	Chinese-IX	2023
4640	OE	Chinese (FL) (OE)	LAN4155	Chinese-I	2023
4641	OE	Chinese (FL) (OE)	LAN4255	Chinese-II	2023
4642	OE	Chinese (FL) (OE)	LAN4355	Chinese-III	2023
4643	OE	Chinese (FL) (OE)	LAN4455	Chinese-IV	2023
4644	OE	Chinese (FL) (OE)	LAN4555	Chinese-V	2023
4645	OE	Korean (FL) (OE)	AEFL2257	Introduction to Hangeul and Basic Grammar (Korean)	2023
4646	OE	Korean (FL) (OE)	AEFL2357	Introducing Self and Surroundings (Korean)	2023
4647	OE	Korean (FL) (OE)	AEFL2457	Conversational Korean (Korean)	2023
4648	OE	Korean (FL) (OE)	AEFL2557	Introducing Business/ Professional Korean (Korean)	2023
4649	OE	Korean (FL) (OE)	LAN2157	Korean-I	2023
4650	OE	Korean (FL) (OE)	LAN2257	Korean-II	2023
4651	OE	Korean (FL) (OE)	LAN2357	Korean-III	2023
4652	OE	Korean (FL) (OE)	LAN2457	Korean-IV	2023
4653	OE	Korean (FL) (OE)	LAN2557	Korean-V	2023
4654	OE	Korean (FL) (OE)	LAN2657	Korean-VI	2023
4655	OE	Korean (FL) (OE)	LAN2757	Korean-VII	2023
4656	OE	Korean (FL) (OE)	LAN2857	Korean-VIII	2023
4657	OE	Korean (FL) (OE)	LAN2957	Korean-IX	2023
4658	OE	Korean (FL) (OE)	LAN4157	Korean-I	2023

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4659	OE	Korean (FL) (OE)	LAN4257	Korean-II	2023
4660	OE	Korean (FL) (OE)	LAN4357	Korean-III	2023
4661	OE	Korean (FL) (OE)	LAN4457	Korean-IV	2023
4662	OE	Korean (FL) (OE)	LAN4557	Korean-V	2023
4663	OE	Japanese (FL) (OE)	AEFL2258	An Overview to Kana & Kanji (Japanese)	2023
4664	OE	Japanese (FL) (OE)	AEFL2358	Elementary Text & Oral Expression (Japanese)	2023
4665	OE	Japanese (FL) (OE)	AEFL2458	Adavance Text & Oral Expression (Japanese)	2023
4666	OE	Japanese (FL) (OE)	AEFL2558	Japanese History, Culture & Business Japanese (Japanese)	2023
4667	OE	Japanese (FL) (OE)	LAN2158	Japanese-I	2023
4668	OE	Japanese (FL) (OE)	LAN2258	Japanese-II	2023
4669	OE	Japanese (FL) (OE)	LAN2358	Japanese-III	2023
4670	OE	Japanese (FL) (OE)	LAN2458	Japanese-IV	2023
4671	OE	Japanese (FL) (OE)	LAN2558	Japanese-V	2023
4672	OE	Japanese (FL) (OE)	LAN2658	Japanese-VI	2023
4673	OE	Japanese (FL) (OE)	LAN2758	Japanese-VII	2023
4674	OE	Japanese (FL) (OE)	LAN2858	Japanese-VIII	2023
4675	OE	Japanese (FL) (OE)	LAN2958	Japanese-IX	2023
4676	OE	Japanese (FL) (OE)	LAN4158	Japanese-I	2023
4677	OE	Japanese (FL) (OE)	LAN4258	Japanese-II	2023
4678	OE	Japanese (FL) (OE)	LAN4358	Japanese-III	2023
4679	OE	Japanese (FL) (OE)	LAN4458	Japanese-IV	2023
4680	OE	Japanese (FL) (OE)	LAN4558	Japanese-V	2023
4681	OE	Hindi (FL) (OE)	AEFL2259	Hindi-II	2023
4682	OE	Hindi (FL) (OE)	AEFL2359	Hindi-III	2023
4683	OE	Hindi (FL) (OE)	AEFL2459	Hindi-IV	2023
4684	OE	Hindi (FL) (OE)	AEFL2559	Hindi-V	2023
4685	OE	Hindi (FL) (OE)	LAN2159	Hindi-I	2023
4686	OE	Hindi (FL) (OE)	LAN2259	Hindi-II	2023
4687	OE	Hindi (FL) (OE)	LAN2359	Hindi-III	2023
4688	OE	Hindi (FL) (OE)	LAN2459	Hindi-IV	2023
4689	OE	Hindi (FL) (OE)	LAN2559	Hindi-V	2023
4690	OE	Hindi (FL) (OE)	LAN2659	Hindi-VI	2023
4691	OE	Hindi (FL) (OE)	LAN2759	Hindi-VII	2023
4692	OE	Hindi (FL) (OE)	LAN2859	Hindi-VIII	2023
4693	OE	Hindi (FL) (OE)	LAN2959	Hindi-IX	2023
4694	OE	Hindi (FL) (OE)	LAN4159	Hindi-I	2023
4695	OE	Hindi (FL) (OE)	LAN4259	Hindi-II	2023
4696	OE	Hindi (FL) (OE)	LAN4359	Hindi-III	2023
4697	OE	Hindi (FL) (OE)	LAN4459	Hindi-IV	2023
4698	OE	Hindi (FL) (OE)	LAN4559	Hindi-V	2023
4699	OE	VAC-II	VACO2201	Modern IT Tools	2023

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4700	OE	VAC-II	VACO2202	Baiscs of Graphic Designing	2023
4701	OE	VAC-II	VACO2203	Modern Office Management	2023
4702	OE	VAC-II	VACO2204	Digital Literacy and Citizenship	2023
4703	OE	VAC-II	VACO2205	Yoga and Art of Living	2023
4704	OE	VAC-II	VACO2206	Health and Lifestyle Management	2023
4705	OE	VAC-II	VACO2207	Emotional Intelligence	2023
4706	OE	VAC-II	VACO2208	Stress Management and Mindfulness	2023
4707	OE	VAC-II	VACO2209	Universal Human Values	2023
4708	OE	VAC-II	VACO2210	Relevance of Bhagvad Gita in Modern Era	2023
4709	OE	VAC-II	VACO2211	Constitutional Values and Fundamental Duties	2023
4710	OE	VAC-II	VACO2212	The Art and Architecture of India	2023
4711	OE	VAC-III	VACC2101	Indian Classical Music and Dance	2023
4712	OE	VAC-III	VACC2102	Gardening & Plantations	2023
4713	OE	VAC-III	VACC2103	Team Building	2023
4714	OE	VAC-III	VACC2104	Sketching	2023
4715	OE	VAC-III	VACC2105	Fashion Modelling	2023
4716	OE	VAC-III	VACC2206	Fashion Designing	2023
4717	OE	VAC-III	VACC2207	Sports for All	2023
4718	OE	VAC-III	VACC2208	Documentary Making	2023
4719	OE	VAC-III	VACC2209	Photography	2023
4720	OE	Accounting (OE)	COM2151	Financial Accounting-I	2023
4721	OE	Accounting (OE)	COM2251	Financial Accounting-II	2023
4722	OE	Accounting (OE)	COM2351	Corporate Accounting	2023
4723	OE	Accounting (OE)	COM2451	Financial Management	2023
4724	OE	Accounting (OE)	COM2551	Cost Accounting	2023
4725	OE	Accounting (OE)	COM2651	Management Accounting	2023
4726	OE	Aerospace Engineering (OE)	ASE2153	Elements of Aeronautics	2023
4727	OE	Aerospace Engineering (OE)	ASE2253	Elements of Astronautics	2023
4728	OE	Aerospace Engineering (OE)	ASE2353	Theory of Flight	2023
4729	OE	Aerospace Engineering (OE)	ASE2453	Principles of Stability & Control	2023
4730	OE	Aerospace Engineering (OE)	ASE2553	Introduction to Flight Vehicle Design	2023
4731	OE	Aerospace Engineering (OE)	ASE2653	Principles of Aerospace Propulsion	2023
4732	OE	Animation (OE)	ANI2152	Introduction to Multimedia and its Application	2023
4733	OE	Animation (OE)	ANI2252	Creating 2D Animation	2023
4734	OE	Animation (OE)	ANI2352	3D Modeling & Texturing	2023
4735	OE	Animation (OE)	ANI2452	Maya Modeling & Texturing	2023
4736	OE	Animation (OE)	ANI2552	Scripting & Storyboarding	2023
4737	OE	Animation (OE)	ANI2652	VFX	2023
4738	OE	Artificial Intelligence (OE)	CSE2351	Basics of Artificial Intelligence	2023
4739	OE	Artificial Intelligence (OE)	CSE2451	Artificial Neural Networks	2023

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4740	OE	Artificial Intelligence (OE)	CSE2551	Fuzzy Logic	2023
4741	OE	Artificial Intelligence (OE)	CSE2651	Introduction to Genetic Algorithm	2023
4742	OE	Artificial Intelligence (OE)	CSE2751	Soft Computing	2023
4743	OE	Artificial Intelligence (OE)	CSE2851	Project (Artificial Intelligence)	2023
4744	OE	Biomedical (OE)	BME2351	Human Anatomy and Physiology-I	2023
4745	OE	Biomedical (OE)	BME2451	Bioinstrumentation	2023
4746	OE	Biomedical (OE)	BME2551	Tissue Engineering	2023
4747	OE	Biomedical (OE)	BME2651	Biomechanic	2023
4748	OE	Biomedical (OE)	BME2751	Medical Image Processing	2023
4749	OE	Biomedical (OE)	BME2851	Seminar-Biomedical Engineering	2023
4750	OE	Climate Science (OE)	AST2151	Basics of Climate Science	2023
4751	OE	Climate Science (OE)	AST2251	Introduction to Earth System Science	2023
4752	OE	Climate Science (OE)	AST2351	Cloud Microphysics and Chemistry	2023
4753	OE	Climate Science (OE)	AST2451	Climate Change: Impact, Vulnerability and Adaption	2023
4754	OE	Climate Science (OE)	AST2551	Primer of Oceanography	2023
4755	OE	Climate Science (OE)	AST2651	Fundamentals of Climate Variability and Modeling	2023
4756	OE	Cloud Computing (OE)	CSE2353	Computer Networks	2023
4757	OE	Cloud Computing (OE)	CSE2453	Distributed System	2023
4758	OE	Cloud Computing (OE)	CSE2553	High Performance Computing	2023
4759	OE	Cloud Computing (OE)	CSE2653	Information Storage Management	2023
4760	OE	Cloud Computing (OE)	CSE2753	Interfacing with Virtualization	2023
4761	OE	Cloud Computing (OE)	CSE2853	Cloud Computing Tools & Techniques	2023
4762	OE	Computer Forensics & Cyber Security (OE)	FCH2151	Computer Forensics	2023
4763	OE	Computer Forensics & Cyber Security (OE)	FCH2251	Ethics, Policies and the IT Act	2023
4764	OE	Computer Forensics & Cyber Security (OE)	FCH2352	Biometric Technology	2023
4765	OE	Computer Forensics & Cyber Security (OE)	FCH2451	Implementation Practical on MATLAB	2023
4766	OE	Computer Forensics & Cyber Security (OE)	FCH2551	Cyber Security	2023
4767	OE	Computer Forensics & Cyber Security (OE)	FCH2651	Incident Response Management	2023
4768	OE	Data Analytics (OE)	MTH2151	Optimization Techniques	2023
4769	OE	Data Analytics (OE)	MTH2251	Statistics	2023
4770	OE	Data Analytics (OE)	MTH2351	Data Mining	2023
4771	OE	Data Analytics (OE)	MTH2451	Database Management System	2023
4772	OE	Data Analytics (OE)	MTH2551	Introduction to Financial Modeling	2023
4773	OE	Data Analytics (OE)	MTH2651	Statistical Quality Control	2023
4774	OE	Defence Technology (OE)	DTE2151	Systems and Warfare Platforms	2023

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4775	OE	Defence Technology (OE)	DTE2251	Combat System Engineering	2023
4776	OE	Defence Technology (OE)	DTE2351	Combat Vehicle Dynamics	2023
4777	OE	Defence Technology (OE)	DTE2451	Warfare Simulations & Strategies	2023
4778	OE	Defence Technology (OE)	DTE2551	Digital & Satellite Communication and Navigation from Space	2023
4779	OE	Defence Technology (OE)	DTE2651	Aerospace System Configuration Design & Simulation	2023
4780	OE	Dietetics & Nutrition (OE)	DAN2151	Principles of Nutrition	2023
4781	OE	Dietetics & Nutrition (OE)	DAN2251	Family Meal Management	2023
4782	OE	Dietetics & Nutrition (OE)	DAN2351	Basics Dietetics	2023
4783	OE	Dietetics & Nutrition (OE)	DAN2451	Advanced Dietetics	2023
4784	OE	Dietetics & Nutrition (OE)	DAN2551	Community Nutrition	2023
4785	OE	Dietetics & Nutrition (OE)	DAN2651	Food Chemistry	2023
4786	OE	Disaster Management & Sustainable Built Environment (OE)	DSM2151	Introduction to Disaster Management	2023
4787	OE	Disaster Management & Sustainable Built Environment (OE)	DSM2251	Resilience Building for Built Environment	2023
4788	OE	Disaster Management & Sustainable Built Environment (OE)	DSM2351	Emergency Management	2023
4789	OE	Disaster Management & Sustainable Built Environment (OE)	DSM2451	Rehabilitation Reconstruction and Recovery	2023
4790	OE	Disaster Management & Sustainable Built Environment (OE)	DSM2551	Climate Change Adaptations and Sustainable Development	2023
4791	OE	Disaster Management & Sustainable Built Environment (OE)	DSM2651	Geoinformatics in Disaster Management	2023
4792	OE	Economics (OE)	ECO2151	Micro Economics-I	2023
4793	OE	Economics (OE)	ECO2251	Indian Economy	2023
4794	OE	Economics (OE)	ECO2351	Macro Economics –I	2023
4795	OE	Economics (OE)	ECO2451	Public Finance	2023
4796	OE	Economics (OE)	ECO2552	Statistical Methods in Economics	2023
4797	OE	Economics (OE)	ECO2651	Money, Banking & Financial Markets	2023
4798	OE	Embedded System (OE)	ECE2352	Introduction to Microprocessor System	2023
4799	OE	Embedded System (OE)	ECE2452	Microcontroller	2023
4800	OE	Embedded System (OE)	ECE2552	PCB Fabrication	2023
4801	OE	Embedded System (OE)	ECE2652	Robotics and Automation	2023
4802	OE	Embedded System (OE)	ECE2752	Simulation and Modeling	2023
4803	OE	Embedded System (OE)	ECE2852	Project (Embedded System)	2023
4804	OE	English Literature (OE)	ENG2151	Shakespearean Comedy	2023
4805	OE	English Literature (OE)	ENG2251	Romantic Poetry	2023
4806	OE	English Literature (OE)	ENG2351	The Novels of England	2023
4807	OE	English Literature (OE)	ENG2451	The English Novels of India	2023
4808	OE	English Literature (OE)	ENG2551	Genre Fiction	2023
4809	OE	English Literature (OE)	ENG2651	Contemporary Literature	2023

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4810	OE	Environmental Management (OE)	ENV2351	Environmental Pollution and Waste Management	2023
4811	OE	Environmental Management (OE)	ENV2451	Environmental Management and Industrial Safety	2023
4812	OE	Environmental Management (OE)	ENV2551	Environmental Economics and Globalization	2023
4813	OE	Environmental Management (OE)	ENV2651	Sustainable Development Practices	2023
4814	OE	Entrepreneurship (OE)	MGT2152	Orientation Programme in Entrepreneurship	2023
4815	OE	Entrepreneurship (OE)	MGT2252	Exploring Business Opportunity	2023
4816	OE	Entrepreneurship (OE)	MGT2352	Developing a Business Model	2023
4817	OE	Entrepreneurship (OE)	MGT2452	Translating Business Model into Startup	2023
4818	OE	Entrepreneurship (OE)	MGT2552	Advanced Programme in Entrepreneurship: Growth	2023
4819	OE	Entrepreneurship (OE)	MGT2652	Advanced Programme in Entrepreneurship: Expansion	2023
4820	OE	Environmental Health & Climate (OE)	AST2152	Linkages between Environment and Health	2023
4821	OE	Environmental Health & Climate (OE)	AST2252	Climate Change and Implications on Public Health	2023
4822	OE	Environmental Health & Climate (OE)	AST2352	Diseases in Contemporary Society	2023
4823	OE	Environmental Health & Climate (OE)	AST2452	Air, Water and Soil Pollution, Environmental Health Professions	2023
4824	OE	Environmental Health & Climate (OE)	AST2552	Ground-based and Satellite Remote Sensing	2023
4825	OE	Environmental Health & Climate (OE)	AST2652	Instrumentation Lab	2023
4826	OE	Fashion Management (OE)	FDT2151	Fashion Art Illustration and Model Drawing	2023
4827	OE	Fashion Management (OE)	FDT2251	Fashion Theory	2023
4828	OE	Fashion Management (OE)	FDT2351	Computer Aided Manufacturing	2023
4829	OE	Fashion Management (OE)	FDT2451	Fashion Management	2023
4830	OE	Fashion Management (OE)	FDT2551	Fashion Forecasting	2023
4831	OE	Fashion Management (OE)	FDT2651	Fashion Retailing & Visual Merchandising	2023
4832	OE	French Studies (OE)	LAN2161	Professional French for Business-1	2023
4833	OE	French Studies (OE)	LAN2261	Professional French for Business-2	2023
4834	OE	French Studies (OE)	LAN2361	Professional French for Business-3	2023
4835	OE	French Studies (OE)	LAN2461	Professional French for Business-4	2023
4836	OE	French Studies (OE)	LAN2561	Introduction to French Literature & select socio-cultural aspects of France	2023
4837	OE	French Studies (OE)	LAN2661	French through activities	2023

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4838	OE	Geotechnical Engineering (OE)	CIV2351	Engineering Geology	2023
4839	OE	Geotechnical Engineering (OE)	CIV2451	Geo informatics	2023
4840	OE	Geotechnical Engineering (OE)	CIV2551	Geotechnical Engineering-I	2023
4841	OE	Geotechnical Engineering (OE)	CIV2651	Geotechnical Engineering-II	2023
4842	OE	Geotechnical Engineering (OE)	CIV2751	Project (Geotechnical Engineering)	2023
4843	OE	Geotechnical Engineering (OE)	CIV2851	Seminar-Geotechnical Engineering	2023
4844	OE	German Studies (OE)	LAN2162	Professional German for Business-1	2023
4845	OE	German Studies (OE)	LAN2262	Professional German for Business-2	2023
4846	OE	German Studies (OE)	LAN2362	Professional German for Business-3	2023
4847	OE	German Studies (OE)	LAN2462	Professional German for Business-4	2023
4848	OE	German Studies (OE)	LAN2562	Introduction to German Literature & select socio-cultural aspects of Germany	2023
4849	OE	German Studies (OE)	LAN2662	German through activities	2023
4850	OE	History (OE)	HIS2151	History of Ancient India	2023
4851	OE	History (OE)	HIS2251	History of Medieval India	2023
4852	OE	History (OE)	HIS2351	History of Modern India	2023
4853	OE	History (OE)	HIS2451	The Ancient World	2023
4854	OE	History (OE)	HIS2551	Rise of the Modern West	2023
4855	OE	History (OE)	HIS2651	History of the World from Mid 20th Century to the 21st Century	2023
4856	OE	Human Rights (OE)	LAW2152	Concept and Theoretical Understanding of Human Rights	2023
4857	OE	Human Rights (OE)	LAW2252	Systems, Organizations and Instruments of Human Rights	2023
4858	OE	Human Rights (OE)	LAW2352	Contemporary Human Rights Situations and Issues	2023
4859	OE	Human Rights (OE)	LAW2452	Specific Themes in Human Rights	2023
4860	OE	Human Rights (OE)	LAW2552	Legislation Themes in Human Rights	2023
4861	OE	Human Rights (OE)	LAW2652	Report Writing and Thesis Preparation (Human Rights)	2023
4862	OE	IC Manufacturing (OE)	ECE2153	Basic Electronics	2023
4863	OE	IC Manufacturing (OE)	ECE2253	VLSI Fabrication	2023
4864	OE	IC Manufacturing (OE)	ECE2353	Clean Room Technologies	2023
4865	OE	IC Manufacturing (OE)	ECE2453	Semiconductor Technology Equipment Maintenance	2023
4866	OE	IC Manufacturing (OE)	ECE2553	Vacuum Technology	2023
4867	OE	IC Manufacturing (OE)	ECE2653	Semiconductor Packaging, Testing and Assembly	2023
4868	OE	Instrumentation Engineering (OE)	ECE2351	Basic Instrumentation	2023
4869	OE	Instrumentation Engineering (OE)	ECE2451	Virtual Instrumentation	2023
4870	OE	Instrumentation Engineering (OE)	ECE2551	Biomedical Instrumentation	2023
4871	OE	Instrumentation Engineering (OE)	ECE2651	Analytical Instrumentation	2023
4872	OE	Instrumentation Engineering (OE)	ECE2751	Industrial Process Control	2023

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4873	OE	Instrumentation Engineering (OE)	ECE2851	Project (Instrumentation Engineering)	2023
4874	OE	Intellectual Property Rights (OE)	LAW2151	Principles of IPR	2023
4875	OE	Intellectual Property Rights (OE)	LAW2251	Patent Law and Practices	2023
4876	OE	Intellectual Property Rights (OE)	LAW2351	Copyright Law and Practices	2023
4877	OE	Intellectual Property Rights (OE)	LAW2451	Trademark Law and Practices	2023
4878	OE	Intellectual Property Rights (OE)	LAW2551	Emerging Legal Issues and Challenges	2023
4879	OE	Intellectual Property Rights (OE)	LAW2651	Future Aspects of Intellectual Property Rights	2023
4880	OE	Journalism (OE)	JRN2151	Print Media: Reporting & Editing	2023
4881	OE	Journalism (OE)	JRN2251	Basic Photography	2023
4882	OE	Journalism (OE)	JRN2351	TV Journalism	2023
4883	OE	Journalism (OE)	JRN2451	TV Production & Presentation	2023
4884	OE	Journalism (OE)	JRN2551	New Media	2023
4885	OE	Journalism (OE)	JRN2651	Media Analysis	2023
4886	OE	Korean Studies (OE)	LAN2165	Introduction to Korean History & Geography	2023
4887	OE	Korean Studies (OE)	LAN2265	Korean Cultural Perspectives	2023
4888	OE	Korean Studies (OE)	LAN2365	Modern History of Korea & Introduction to Korean Language	2023
4889	OE	Korean Studies (OE)	LAN2465	Contemporary Korea	2023
4890	OE	Korean Studies (OE)	LAN2565	Polity & Economy of Korea	2023
4891	OE	Korean Studies (OE)	LAN2665	Themes in Korean Literature	2023
4892	OE	Laser System (OE)	LOE2351	Basics of Lasers	2023
4893	OE	Laser System (OE)	LOE2451	Laser Technology & Applications	2023
4894	OE	Laser System (OE)	LOE2551	Laser Systems & Devices	2023
4895	OE	Laser System (OE)	LOE2651	Lasers in Defense Applications	2023
4896	OE	Laser System (OE)	LOE2751	Lasers in Industrial Applications	2023
4897	OE	Laser System (OE)	LOE2851	Lasers in Atmospheric Studies	2023
4898	OE	Management (OE)	MGT2151	Management Foundations	2023
4899	OE	Management (OE)	MGT2251	Marketing Management	2023
4900	OE	Management (OE)	MGT2351	Organizational Behaviour	2023
4901	OE	Management (OE)	MGT2451	Business Environment	2023
4902	OE	Management (OE)	MGT2551	Operations Research	2023
4903	OE	Management (OE)	MGT2651	Business Law	2023
4904	OE	Mechanical Engineering (OE)	MAE2352	Thermodynamics	2023
4905	OE	Mechanical Engineering (OE)	MAE2452	Fluid Power Systems	2023
4906	OE	Mechanical Engineering (OE)	MAE2552	KOM	2023
4907	OE	Mechanical Engineering (OE)	MAE2652	DOM	2023
4908	OE	Mechanical Engineering (OE)	MAE2752	Meteorology	2023
4909	OE	Mechanical Engineering (OE)	MAE2852	Project (Mechanical Engineering)	2023
4910	OE	Materials Science & Technology (OE)	PHY2151	Fundamentals of Materials Science	2023

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4911	OE	Materials Science & Technology (OE)	PHY2251	Classification & Selection of Materials	2023
4912	OE	Materials Science & Technology (OE)	PHY2351	Properties of Materials	2023
4913	OE	Materials Science & Technology (OE)	PHY2451	Manufacturing Processes for Materials	2023
4914	OE	Materials Science & Technology (OE)	PHY2551	Materials Testing & Characterization	2023
4915	OE	Materials Science & Technology (OE)	PHY2651	Materials at Nanoscale	2023
4916	OE	Nanotechnology (OE)	NAT2152	Basics of Nanoscience	2023
4917	OE	Nanotechnology (OE)	NAT2251	Properties of Nanomaterials	2023
4918	OE	Nanotechnology (OE)	NAT2353	Synthesis of Nanomaterials	2023
4919	OE	Nanotechnology (OE)	NAT2453	Characterization Techniques	2023
4920	OE	Nanotechnology (OE)	NAT2553	Vacuum Science & Clean Room Technology	2023
4921	OE	Nanotechnology (OE)	NAT2652	Industrial Applications of Nanomaterials	2023
4922	OE	Painting Arts (OE)	FNA2151	Basics of Drawing and Asian Landscape	2023
4923	OE	Painting Arts (OE)	FNA2251	Basics of Drawing and Monochrome Folk Composition	2023
4924	OE	Painting Arts (OE)	FNA2351	Advanced Drawing and Illustration of Indian Temple Sculpture	2023
4925	OE	Painting Arts (OE)	FNA2451	Advanced Drawing with Ink with brush Illustration	2023
4926	OE	Painting Arts (OE)	FNA2551	Advanced Drawing and Illustration with Mural Art	2023
4927	OE	Painting Arts (OE)	FNA2651	Advanced Drawing and Illustration with Visual Design	2023
4928	OE	Pharmaceuticals (OE)	CHY2152	Cosmetic Formulation	2023
4929	OE	Pharmaceuticals (OE)	CHY2252	Industrial Management and Safety Process	2023
4930	OE	Pharmaceuticals (OE)	CHY2352	Drug Design	2023
4931	OE	Pharmaceuticals (OE)	CHY2452	Application of Nanotechnology in Medicine	2023
4932	OE	Pharmaceuticals (OE)	CHY2552	Intellectual Property Rights and Quality Assurance	2023
4933	OE	Pharmaceuticals (OE)	CHY2652	Pharmaceutical and Cosmetics Sciences Lab	2023
4934	OE	Physical Education and Sports Management (OE)	PED2151	Health Education and Sports	2023
4935	OE	Physical Education and Sports Management (OE)	PED2251	Human Anatomy and Exercise	2023

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4936	OE	Physical Education and Sports Management (OE)	PED2351	Sports Training and Conditioning	2023
4937	OE	Physical Education and Sports Management (OE)	PED2451	Basics of Sports Management	2023
4938	OE	Physical Education and Sports Management (OE)	PED2551	Sports Psychology	2023
4939	OE	Physical Education and Sports Management (OE)	PED2651	Sports Medicine	2023
4940	OE	Political Studies (OE)	POL2151	Indian National Movement	2023
4941	OE	Political Studies (OE)	POL2251	Indian State and Politics after Independence	2023
4942	OE	Political Studies (OE)	POL2351	State Politics in India	2023
4943	OE	Political Studies (OE)	POL2451	Politics and Media	2023
4944	OE	Political Studies (OE)	POL2551	South Asia: Political Perspectives	2023
4945	OE	Political Studies (OE)	POL2651	Post-Cold War World Politics	2023
4946	OE	Psychology (OE)	PSY2151	Introductory Psychology	2023
4947	OE	Psychology (OE)	PSY2251	Abnormal Psychology	2023
4948	OE	Psychology (OE)	PSY2351	Basic Cognitive Psychology	2023
4949	OE	Psychology (OE)	PSY2451	Life Span Development	2023
4950	OE	Psychology (OE)	PSY2551	Psychometric Testing	2023
4951	OE	Psychology (OE)	PSY2651	Counselling Psychology	2023
4952	OE	Positive Psychology (OE)	PSY2152	The Science of Happiness	2023
4953	OE	Positive Psychology (OE)	PSY2252	Optimism and Success	2023
4954	OE	Positive Psychology (OE)	PSY2352	Resilience and Well Being	2023
4955	OE	Positive Psychology (OE)	PSY2452	Positive Psychology & Work Life	2023
4956	OE	Positive Psychology (OE)	PSY2552	Creativity & Problem Solving	2023
4957	OE	Positive Psychology (OE)	PSY2652	Positive Leadership & Competency Development	2023
4958	OE	Performing Arts (OE)	PAR2151	Introduction to Performing Arts	2023
4959	OE	Performing Arts (OE)	PAR2251	Dynamics of Dance, Music & Theatre	2023
4960	OE	Performing Arts (OE)	PAR2351	Social relevance of Dance, Music & Drama in Contemporary Indian Scene	2023
4961	OE	Performing Arts (OE)	PAR2451	Indian Folk Arts	2023
4962	OE	Performing Arts (OE)	PAR2551	Modern Indian Performing Arts	2023
4963	OE	Performing Arts (OE)	PAR2651	Arts, Aesthetic & Society	2023
4964	OE	Polymer Technology (OE)	PTE2151	Polymerization	2023
4965	OE	Polymer Technology (OE)	PTE2251	Waste Plastic Recycling	2023
4966	OE	Polymer Technology (OE)	PTE2351	Polymer Technology	2023
4967	OE	Polymer Technology (OE)	PTE2451	Rubber & Tyre Technology	2023
4968	OE	Polymer Technology (OE)	PTE2551	Polymeric Nano Composites	2023
4969	OE	Polymer Technology (OE)	PTE2651	Bio-Medical Plastics	2023
4970	OE	Quebec Studies (OE)	LAN2164	Introduction to the French North America- a short history of Quebec	2023

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4971	OE	Quebec Studies (OE)	LAN2264	Quebec Society Culture & Language	2023
4972	OE	Quebec Studies (OE)	LAN2364	Quebec in the World Affairs	2023
4973	OE	Quebec Studies (OE)	LAN2464	Political Economy of Quebec	2023
4974	OE	Quebec Studies (OE)	LAN2564	Introduction to Major Literary Movements in Quebec-I	2023
4975	OE	Quebec Studies (OE)	LAN2664	Introduction to Major Literary Movements in Quebec-II	2023
4976	OE	Renewable Energy (OE)	SAE2152	Fundamental of Solar Photovoltaic, Battery & Inverter	2023
4977	OE	Renewable Energy (OE)	SAE2252	Solar PV Installation	2023
4978	OE	Renewable Energy (OE)	SAE2352	Solar PV Design	2023
4979	OE	Renewable Energy (OE)	SAE2452	Solid Waste Management and Power Generation	2023
4980	OE	Renewable Energy (OE)	SAE2552	Solar Thermal Systems	2023
4981	OE	Renewable Energy (OE)	SAE2651	Energy Audit and Energy Management	2023
4982	OE	Spanish Studies (OE)	LAN2163	EFE Professional Spanish for Business-I	2023
4983	OE	Spanish Studies (OE)	LAN2263	EFE Professional Spanish for Business-II	2023
4984	OE	Spanish Studies (OE)	LAN2363	EFE Professional Spanish for Business-III	2023
4985	OE	Spanish Studies (OE)	LAN2463	EFE Professional Spanish for Business-IV	2023
4986	OE	Spanish Studies (OE)	LAN2563	Introduction to Spanish Literature & select socio-cultural aspects of Spain	2023
4987	OE	Spanish Studies (OE)	LAN2663	Spanish through activities	2023
4988	OE	Stem Cell Technology (OE)	SCT2151	Introduction to Stem Cell Technology	2023
4989	OE	Stem Cell Technology (OE)	SCT2251	Fundamental Human Embryology & Developmental Biology	2023
4990	OE	Stem Cell Technology (OE)	SCT2351	Fundamental Cell Biology Human Anatomy & Physiology	2023
4991	OE	Stem Cell Technology (OE)	SCT2451	Human Pluripotent Stem Cell Culture & Differentiation Methods	2023
4992	OE	Stem Cell Technology (OE)	SCT2551	Therapeutic Applications of Human Pluripotent Stem Cells	2023
4993	OE	Stem Cell Technology (OE)	SCT2651	Project & Paper Presentation	2023
4994	OE	Sanskrit (OE)	SKT2151	Introduction to Sanskrit Language	2023
4995	OE	Sanskrit (OE)	SKT2251	General Introduction to Vedic Literature & Conversational Sanskrit	2023

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4996	OE	Sanskrit (OE)	SKT2351	General Introduction to Sanskrit Literature & Sanskrit Conversation	2023
4997	OE	Sanskrit (OE)	SKT2451	Sanskrit Language & Indian Culture	2023
4998	OE	Sanskrit (OE)	SKT2551	Introduction to Sanskrit Linguistics	2023
4999	OE	Sanskrit (OE)	SKT2651	General Introduction to Indian Philosophy & Sanskrit Grammar	2023
5000	OE	Social Work (OE)	SCW2151	Introduction to Social Work	2023
5001	OE	Social Work (OE)	SCW2251	Working with Individual Social Casework	2023
5002	OE	Social Work (OE)	SCW2351	Working with Groups- Social Group Work	2023
5003	OE	Social Work (OE)	SCW2451	Community Organization & Development	2023
5004	OE	Social Work (OE)	SCW2551	Social Action & Social Movements	2023
5005	OE	Social Work (OE)	SCW2651	Social Welfare Administration & Social Work Research	2023
5006	OE	Tagore Studies (OE)	ENG2152	Rabindranath Tagore in the 21st Century	2023
5007	OE	Tagore Studies (OE)	ENG2252	Tagore- Autobiographies & Biographical Sketches	2023
5008	OE	Tagore Studies (OE)	ENG2352	Tagore as a Cultural Icon – Tagore as a Painter & Performer	2023
5009	OE	Tagore Studies (OE)	ENG2452	Tagore as a Poet	2023
5010	OE	Tagore Studies (OE)	ENG2552	Tagore as a Fiction Writer	2023
5011	OE	Tagore Studies (OE)	ENG2652	Tagore and Mass Media	2023
5012	OE	Unmanned Aerial Vehicles (OE)	ASE2352	Introduction to UAVs and Applications	2023
5013	OE	Unmanned Aerial Vehicles (OE)	ASE2452	Principles of UAV's Flight	2023
5014	OE	Unmanned Aerial Vehicles (OE)	ASE2552	Aerial Imagery: Hardware & Software	2023
5015	OE	Unmanned Aerial Vehicles (OE)	ASE2652	Embedded Systems for UAVs	2023
5016	OE	Unmanned Aerial Vehicles (OE)	ASE2752	Research Project-I Drone Development	2023
5017	OE	Unmanned Aerial Vehicles (OE)	ASE2852	Research Project-II Drone Troubleshooting, Testing & Deployment	2023
5018	OE	VLSI Design (OE)	VDE2151	Basic Electronics	2023
5019	OE	VLSI Design (OE)	VDE2251	VLSI Design	2023
5020	OE	VLSI Design (OE)	VDE2351	Analog IC Design	2023
5021	OE	VLSI Design (OE)	VDE2451	Verilog Programming	2023
5022	OE	VLSI Design (OE)	VDE2551	RTL Design and Verification	2023
5023	OE	VLSI Design (OE)	VDE2651	VLSI Testing	2023
5024	OE	Military Training Foundation (OE)	GEN2051	Military Training Foundation	2023

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5025	OE	Apparel Merchandising (OE)	VFD2151	Introduction to Apparel Merchandising	2023
5026	OE	Apparel Merchandising (OE)	VFD2251	Apparel Market Research & Product Analysis	2023
5027	OE	Apparel Merchandising (OE)	VFD2351	Vendor Management & Product Evaluation	2023
5028	OE	Apparel Merchandising (OE)	VFD2451	Prototype Preparation & Merchandise Plan	2023
5029	OE	Apparel Merchandising (OE)	VFD2551	Pre-Production Management	2023
5030	OE	Apparel Merchandising (OE)	VFD2651	Shipment & Documentation Management	2023
5031	OE	Fashion Design (OE)	VFD2152	Design Eco-System	2023
5032	OE	Fashion Design (OE)	VFD2252	Fashion Design Research	2023
5033	OE	Fashion Design (OE)	VFD2352	Design Preparatory Process	2023
5034	OE	Fashion Design (OE)	VFD2452	Prototype Garment Development	2023
5035	OE	Fashion Design (OE)	VFD2552	Design Development	2023
5036	OE	Fashion Design (OE)	VFD2652	Health & Safety Equilibrium	2023
5037	OE	Food & Beverage Service (OE)	VHM2152	Basics of Food Service	2023
5038	OE	Food & Beverage Service (OE)	VHM2252	Advanced Food Service	2023
5039	OE	Food & Beverage Service (OE)	VHM2352	Beverage Studies- Basic	2023
5040	OE	Food & Beverage Service (OE)	VHM2452	Beverage Studies-Advanced	2023
5041	OE	Food & Beverage Service (OE)	VHM2552	F&B Service Supervisory Skills	2023
5042	OE	Food & Beverage Service (OE)	VHM2652	F&B Management Skills	2023
5043	OE	Food Production Techniques (OE)	VHM2151	Basics of Food Production	2023
5044	OE	Food Production Techniques (OE)	VHM2251	Food Production Skills	2023
5045	OE	Food Production Techniques (OE)	VHM2351	Food Production Operations	2023
5046	OE	Food Production Techniques (OE)	VHM2451	Advanced Food Production	2023
5047	OE	Food Production Techniques (OE)	VHM2551	Food Production Supervisory Skills	2023
5048	OE	Food Production Techniques (OE)	VHM2651	Food Production Management	2023
5049	OE	Front Office Operations (OE)	VHM2153	Fundamentals of Front Office Operations	2023
5050	OE	Front Office Operations (OE)	VHM2253	Handling Reception	2023
5051	OE	Front Office Operations (OE)	VHM2353	Check-in & Check-out Process	2023
5052	OE	Front Office Operations (OE)	VHM2453	Front Office Supervisory Skills	2023
5053	OE	Front Office Operations (OE)	VHM2553	Front Office Yield Management	2023
5054	OE	Front Office Operations (OE)	VHM2653	Managing Front Office	2023
5055	OE	Housekeeping Functions (OE)	VHM2154	Basics of Housekeeping	2023
5056	OE	Housekeeping Functions (OE)	VHM2254	Rules for Cleaning	2023
5057	OE	Housekeeping Functions (OE)	VHM2354	Laundry Operations	2023
5058	OE	Housekeeping Functions (OE)	VHM2454	Maintaining Guest Room	2023
5059	OE	Housekeeping Functions (OE)	VHM2554	Housekeeping Supervisory Skills	2023
5060	OE	Housekeeping Functions (OE)	VHM2654	Housekeeping Management Skills	2023
5061	OE	Tourism Operations (OE)	VTM2151	Fundamentals of Tourism	2023
5062	OE	Tourism Operations (OE)	VTM2251	Tour Operations & Tourist Guidance	2023

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5063	OE	Tourism Operations (OE)	VTM2351	Handling Travel Agency	2023
5064	OE	Tourism Operations (OE)	VTM2451	Coordinating Tour Transportations	2023
5065	OE	Tourism Operations (OE)	VTM2551	Tourism Management	2023
5066	OE	Tourism Operations (OE)	VTM2651	Event Planning	2023
5067	Minor Discipline	Management	DMGT2151	Management Foundations	2023
5068	Minor Discipline	Management	DMGT2251	Marketing Management	2023
5069	Minor Discipline	Management	DMGT2351	Organisational Behaviour & Human Resource Management	2023
5070	Minor Discipline	Management	DMGT2451	Financial Management	2023
5071	Minor Discipline	Management	DMGT2551	Operations & Supply Chain Management	2023
5072	Minor Discipline	Management	DMGT2501	Statistics in Research	2023
5073	Minor Discipline	Management	DMGT2651	Business Policy & Strategic Management	2023
5074	Minor Discipline	Management	DMGT2601	Entrepreneurship Development	2023
5075	Minor Discipline	Management	DMKT2601	Consumer Behaviour	2023
5076	Minor Discipline	Entrepreneurship	DMGT2152	Orientation Programme in Entrepreneurship	2023
5077	Minor Discipline	Entrepreneurship	DMGT2252	Exploring Business Opportunity	2023
5078	Minor Discipline	Entrepreneurship	DMGT2352	Developing a Business Model	2023
5079	Minor Discipline	Entrepreneurship	DMGT2452	Translating Business Model and Startup	2023
5080	Minor Discipline	Entrepreneurship	DMGT2552	Advanced Programme in Entrepreneurship : Growth	2023
5081	Minor Discipline	Entrepreneurship	DMGT2503	Legal and Ethical Issues in Entrepreneurship	2023
5082	Minor Discipline	Entrepreneurship	DMGT2652	Expert Programme in Entrepreneurship: Expansion	2023
5083	Minor Discipline	Entrepreneurship	DMGT2603	Financing New Ventures and Business	2023
5084	Minor Discipline	Entrepreneurship	DMGT2604	Enterprise Growth and Succession	2023
5085	Minor Discipline	Economics	DECO2151	Micro Economics	2023
5086	Minor Discipline	Economics	DECO2251	Statistical Method in Economics	2023

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5087	Minor Discipline	Economics	DECO2351	Macro Economics	2023
5088	Minor Discipline	Economics	DECO2451	Public Finance	2023
5089	Minor Discipline	Economics	DECO2551	International Economics	2023
5090	Minor Discipline	Economics	DECO2501	Advanced Statistical Methods in Economics	2023
5091	Minor Discipline	Economics	DECO2651	Economics of Growth & Development	2023
5092	Minor Discipline	Economics	DECO2601	Monetary Economics	2023
5093	Minor Discipline	Economics	DECO2602	Econometrics-Basic Theory & Application	2023
5094	Minor Discipline	Accounting	DCOM2151	Financial Accounting-I	2023
5095	Minor Discipline	Accounting	DCOM2251	Financial Accounting-II	2023
5096	Minor Discipline	Accounting	DCOM2351	Corporate Accounting	2023
5097	Minor Discipline	Accounting	DCOM2451	Financial Management	2023
5098	Minor Discipline	Accounting	DCOM2551	Cost Accounting	2023
5099	Minor Discipline	Accounting	DCOM2501	Auditing	2023
5100	Minor Discipline	Accounting	DCOM2651	Management Accounting	2023
5101	Minor Discipline	Accounting	DCOM2602	Macro Economics	2023
5102	Minor Discipline	Accounting	DCOM2603	International Business	2023
5103	Minor Discipline	Hospitality & Tourism	DHMC2151	Introduction to Hospitality & Tourism-I	2023
5104	Minor Discipline	Hospitality & Tourism	DHMC2251	Introduction to Hospitality & Tourism-II	2023
5105	Minor Discipline	Hospitality & Tourism	DHMC2351	Supervising Hotel Operations	2023
5106	Minor Discipline	Hospitality & Tourism	DHMC2451	Managing Tourism Operations	2023
5107	Minor Discipline	Hospitality & Tourism	DHMC2551	Food & Beverage Division Management	2023
5108	Minor Discipline	Hospitality & Tourism	DHMC2501	Revenue & Yield Management	2023

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5109	Minor Discipline	Hospitality & Tourism	DHMC2651	Rooms Division Management	2023
5110	Minor Discipline	Hospitality & Tourism	DHMC2601	MICE Management	2023
5111	Minor Discipline	Hospitality & Tourism	DHMC2602	Customer Delight & Entrepreneurship Management	2023
5112	Minor Discipline	Psychology	DPSY2151	Introduction to Psychology	2023
5113	Minor Discipline	Psychology	DPSY2251	Social Psychology	2023
5114	Minor Discipline	Psychology	DPSY2351	Cognitive Psychology	2023
5115	Minor Discipline	Psychology	DPSY2451	Abnormal Psychology	2023
5116	Minor Discipline	Psychology	DPSY2551	Developmental Psychology	2023
5117	Minor Discipline	Psychology	DPSY2501	Health Psychology	2023
5118	Minor Discipline	Psychology	DPSY2502	Practicals-V	2023
5119	Minor Discipline	Psychology	DPSY2651	Guidance & Counselling Psychology	2023
5120	Minor Discipline	Psychology	DPSY2603	Organisational Behaviour	2023
5121	Minor Discipline	Psychology	DPSY2607	Elementary Statistics	2023
5122	Minor Discipline	Psychology	DPSY2608	Practicals-VI	2023
5123	Minor Discipline	Information Technology	DIFT2151	Computer Programming with C Language	2023
5124	Minor Discipline	Information Technology	DIFT2152	Computer Programming with C Language Lab	2023
5125	Minor Discipline	Information Technology	DIFT2251	Data Structure	2023
5126	Minor Discipline	Information Technology	DIFT2252	Data Structure Lab	2023
5127	Minor Discipline	Information Technology	DIFT2351	Operating System	2023
5128	Minor Discipline	Information Technology	DIFT2352	Operating System Lab	2023
5129	Minor Discipline	Information Technology	DIFT2451	Introduction to Database Management System	2023
5130	Minor Discipline	Information Technology	DIFT2452	Introduction to Database Management System Lab	2023

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5131	Minor Discipline	Information Technology	DIFT2551	Data Communication & Computer Networks	2023
5132	Minor Discipline	Information Technology	DIFT2552	Data Communication & Computer Networks Lab	2023
5133	Minor Discipline	Information Technology	DIFT2501	Software Engineering	2023
5134	Minor Discipline	Information Technology	DIFT2502	Software Engineering Lab	2023
5135	Minor Discipline	Information Technology	DIFT2651	Artificial Intelligence & Expert System	2023
5136	Minor Discipline	Information Technology	DIFT2652	Artificial Intelligence & Expert System Lab	2023
5137	Minor Discipline	Information Technology	DIFT2601	Data Warehousing and Data Mining	2023
5138	Minor Discipline	Information Technology	DIFT2602	Data Warehousing and Data Mining Lab	2023
5139	Minor Discipline	Information Technology	DIFT2603	Computer Graphics	2023
5140	Minor Discipline	Information Technology	DIFT2604	Computer Graphics Lab	2023
5141	Minor Discipline	Computer Applications	DIFT2151	Computer Programming with C Language	2023
5142	Minor Discipline	Computer Applications	DIFT2152	Computer Programming with C Language Lab	2023
5143	Minor Discipline	Computer Applications	DIFT2251	Data Structure	2023
5144	Minor Discipline	Computer Applications	DIFT2252	Data Structure Lab	2023
5145	Minor Discipline	Computer Applications	DIFT2353	Concept of Object Oriented Programming	2023
5146	Minor Discipline	Computer Applications	DIFT2354	Concept of Object Oriented Programming Lab	2023
5147	Minor Discipline	Computer Applications	DIFT2453	Computer Networks	2023
5148	Minor Discipline	Computer Applications	DIFT2454	Computer Networks Lab	2023
5149	Minor Discipline	Computer Applications	DIFT2553	Internet of Things & Wireless Sensor Network	2023
5150	Minor Discipline	Computer Applications	DIFT2554	Internet of Things & Wireless Sensor Network Lab	2023
5151	Minor Discipline	Computer Applications	DIFT2503	Web Technology	2023
5152	Minor Discipline	Computer Applications	DIFT2504	Web Technology Lab	2023

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5153	Minor Discipline	Computer Applications	DIFT2651	Artificial Intelligence & Expert System	2023
5154	Minor Discipline	Computer Applications	DIFT2652	Artificial Intelligence & Expert System Lab	2023
5155	Minor Discipline	Computer Applications	DIFT2601	Data Warehousing and Data Mining	2023
5156	Minor Discipline	Computer Applications	DIFT2602	Data Warehousing and Data Mining Lab	2023
5157	Minor Discipline	Computer Applications	DIFT2605	Relational Database Management System	2023
5158	Minor Discipline	Computer Applications	DIFT2606	Relational Database Management System Lab	2023
5159	Minor Discipline	Artificial Intelligence	DAIE2151	Fundamentals of Artificial Intelligence	2023
5160	Minor Discipline	Artificial Intelligence	DAIE2251	Advanced Artificial Intelligence	2023
5161	Minor Discipline	Artificial Intelligence	DAIE2252	Advanced Artificial Intelligence Lab	2023
5162	Minor Discipline	Artificial Intelligence	DAIE2351	Basics of Python Language	2023
5163	Minor Discipline	Artificial Intelligence	DAIE2352	Basics of Python Language Lab	2023
5164	Minor Discipline	Artificial Intelligence	DAIE2451	Advanced Python Programming	2023
5165	Minor Discipline	Artificial Intelligence	DAIE2452	Advanced Python Programming Lab	2023
5166	Minor Discipline	Artificial Intelligence	DAIE2551	Artificial Neural Network	2023
5167	Minor Discipline	Artificial Intelligence	DAIE2501	Fuzzy Logic	2023
5168	Minor Discipline	Artificial Intelligence	DAIE2651	Machine Learning	2023
5169	Minor Discipline	Artificial Intelligence	DAIE2652	Machine Learning Lab	2023
5170	Minor Discipline	Artificial Intelligence	DAIE2601	Natural Language Processing	2023
5171	Minor Discipline	Artificial Intelligence	DAIE2602	Natural Language Processing Lab	2023
5172	Minor Discipline	Artificial Intelligence	DAIE2603	Genetic Algorithm	2023
5173	Minor Discipline	Data Science	DDSE2151	Statistics for Data Science	2023
5174	Minor Discipline	Data Science	DDSE2152	Statistics for Data Science Lab	2023

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5175	Minor Discipline	Data Science	DDSE2251	Fundamentals of Database Management System	2023
5176	Minor Discipline	Data Science	DDSE2252	Fundamentals of Database Management System Lab	2023
5177	Minor Discipline	Data Science	DDSE2351	Python Programming	2023
5178	Minor Discipline	Data Science	DDSE2352	Python Programming Lab	2023
5179	Minor Discipline	Data Science	DDSE2451	R Programming	2023
5180	Minor Discipline	Data Science	DDSE2452	R Programming Lab	2023
5181	Minor Discipline	Data Science	DDSE2551	Artificial Intelligence	2023
5182	Minor Discipline	Data Science	DDSE2552	Artificial Intelligence Lab	2023
5183	Minor Discipline	Data Science	DDSE2501	Data Visualization Using Tableau	2023
5184	Minor Discipline	Data Science	DDSE2502	Data Visualization Using Tableau Lab	2023
5185	Minor Discipline	Data Science	DDSE2651	Machine Learning	2023
5186	Minor Discipline	Data Science	DDSE2652	Machine Learning Lab	2023
5187	Minor Discipline	Data Science	DDSE2601	Data Visualization Using Power BI	2023
5188	Minor Discipline	Data Science	DDSE2602	Data Visualization Using Power BI Lab	2023
5189	Minor Discipline	Data Science	DDSE2603	Natural Language Processing	2023
5190	Minor Discipline	Data Science	DDSE2604	Natural Language Processing Lab	2023
5191	Minor Discipline	Renewable Energy	DRWE2151	Fundamental of Solar Photovoltaic, Battery & Inverter	2023
5192	Minor Discipline	Renewable Energy	DRWE2251	Solar PV Installation	2023
5193	Minor Discipline	Renewable Energy	DRWE2351	Solar PV Design	2023
5194	Minor Discipline	Renewable Energy	DRWE2451	Solar Thermal Systems	2023
5195	Minor Discipline	Renewable Energy	DRWE2551	Energy Audit and Energy Management	2023
5196	Minor Discipline	Renewable Energy	DRWE2501	Energy and Environmental Sustainability	2023

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5197	Minor Discipline	Renewable Energy	DRWE2651	Energy Analytics	2023
5198	Minor Discipline	Renewable Energy	DRWE2601	Greenhouse Gas Reporting and Life Cycle Assessment	2023
5199	Minor Discipline	Renewable Energy	DRWE2602	Solid Waste Management and Power Generation	2023
5200	Minor Discipline	Applied Physics	DPHY2151	Mechanics	2023
5201	Minor Discipline	Applied Physics	DPHY2152	Demonstrative Aspects in Mechanics	2023
5202	Minor Discipline	Applied Physics	DPHY2251	Thermodynamics	2023
5203	Minor Discipline	Applied Physics	DPHY2252	Demonstrative Aspects in Thermodynamics	2023
5204	Minor Discipline	Applied Physics	DPHY2351	Waves and Optics	2023
5205	Minor Discipline	Applied Physics	DPHY2352	Demonstrative Aspects in Waves and Optics	2023
5206	Minor Discipline	Applied Physics	DPHY2451	Basics of Electronics	2023
5207	Minor Discipline	Applied Physics	DPHY2452	Demonstrative Aspects in Electronics	2023
5208	Minor Discipline	Applied Physics	DPHY2551	Elements of Modern Physics	2023
5209	Minor Discipline	Applied Physics	DPHY2552	Practical Aspects in Modern Physics	2023
5210	Minor Discipline	Applied Physics	DPHY2506	Laser and Fibre Optics	2023
5211	Minor Discipline	Applied Physics	DPHY2651	Materials Science	2023
5212	Minor Discipline	Applied Physics	DPHY2604	Semiconductor Physics and Optoelectronic Devices	2023
5213	Minor Discipline	Applied Physics	DPHY2605	Introduction to Astronomy & Astrophysics	2023
5214	Minor Discipline	Mathematics	DMTH2151	Applied Calculus	2023
5215	Minor Discipline	Mathematics	DMTH2152	Applied Calculus Lab	2023
5216	Minor Discipline	Mathematics	DMTH2251	Ordinary Differential Equations	2023
5217	Minor Discipline	Mathematics	DMTH2252	Ordinary Differential Equations Lab	2023
5218	Minor Discipline	Mathematics	DMTH2351	Partial Differential Equations	2023

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5219	Minor Discipline	Mathematics	DMTH2451	Optimization Techniques	2023
5220	Minor Discipline	Mathematics	DMTH2452	Optimization Techniques Lab	2023
5221	Minor Discipline	Mathematics	DMTH2551	Probability Theory	2023
5222	Minor Discipline	Mathematics	DMTH2502	Numerical Methods	2023
5223	Minor Discipline	Mathematics	DMTH2503	Numerical Methods Lab	2023
5224	Minor Discipline	Mathematics	DMTH2651	Mathematical Statistics	2023
5225	Minor Discipline	Mathematics	DMTH2652	Statistics Based Lab	2023
5226	Minor Discipline	Mathematics	DMTH2602	Financial Mathematics	2023
5227	Minor Discipline	Mathematics	DMTH2603	Mathematical Modeling	2023
5228	Minor Discipline	Chemistry	DCHY2151	Inorganic Chemistry-I	2023
5229	Minor Discipline	Chemistry	DCHY2152	Inorganic Chemistry Lab-I	2023
5230	Minor Discipline	Chemistry	DCHY2251	Physical Chemistry-I	2023
5231	Minor Discipline	Chemistry	DCHY2252	Physical Chemistry Lab-I	2023
5232	Minor Discipline	Chemistry	DCHY2351	Organic Chemistry-I	2023
5233	Minor Discipline	Chemistry	DCHY2352	Organic Chemistry Lab-I	2023
5234	Minor Discipline	Chemistry	DCHY2451	Inorganic Chemistry-II	2023
5235	Minor Discipline	Chemistry	DCHY2452	Inorganic Chemistry Lab-II	2023
5236	Minor Discipline	Chemistry	DCHY2551	Introduction to Lab Safety & Training	2023
5237	Minor Discipline	Chemistry	DCHY2501	Physical Chemistry-II	2023
5238	Minor Discipline	Chemistry	DCHY2502	Physical Chemistry Lab-II	2023
5239	Minor Discipline	Chemistry	DCHY2651	Basics of Polymer Chemistry	2023
5240	Minor Discipline	Chemistry	DCHY2601	Inorganic Chemistry-III	2023

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5241	Minor Discipline	Chemistry	DCHY2602	Inorganic Chemistry Lab-III	2023
5242	Minor Discipline	Chemistry	DCHY2603	Physical Chemistry-III	2023
5243	Minor Discipline	Chemistry	DCHY2604	Physical Chemistry Lab-III	2023
5244	Minor Discipline	Pharmaceuticals	DCHY2153	Cosmetic Formulation	2023
5245	Minor Discipline	Pharmaceuticals	DCHY2253	Industrial Management & Safety Process	2023
5246	Minor Discipline	Pharmaceuticals	DCHY2353	Drug Design	2023
5247	Minor Discipline	Pharmaceuticals	DCHY2453	Application of Nanotechnology in Medicine	2023
5248	Minor Discipline	Pharmaceuticals	DCHY2553	Intellectual Property Rights & Quality Assurance	2023
5249	Minor Discipline	Pharmaceuticals	DCHY2508	Biopharmaceutics	2023
5250	Minor Discipline	Pharmaceuticals	DCHY2653	Pharmaceutical & Cosmetic Sciences Lab	2023
5251	Minor Discipline	Pharmaceuticals	DCHY2607	Natural Product Chemistry	2023
5252	Minor Discipline	Pharmaceuticals	DCHY2608	Pharma Marketing & Management	2023
5253	Minor Discipline	Polymer Technology	DPTE2151	Polymerization	2023
5254	Minor Discipline	Polymer Technology	DPTE2251	Waste Plastic Recycling	2023
5255	Minor Discipline	Polymer Technology	DPTE2351	Polymer Technology	2023
5256	Minor Discipline	Polymer Technology	DPTE2451	Rubber & Tyre Technology	2023
5257	Minor Discipline	Polymer Technology	DPTE2551	Polymeric Nanocomposites	2023
5258	Minor Discipline	Polymer Technology	DPTE2501	Structure Property Relationship in Polymers	2023
5259	Minor Discipline	Polymer Technology	DPTE2651	Bio-Medical Plastics	2023
5260	Minor Discipline	Polymer Technology	DPTE2601	Principles of Polymer Processing	2023
5261	Minor Discipline	Polymer Technology	DPTE2602	Polymer Testing	2023
5262	Minor Discipline	Forensic Science	DFCH2151	Fundamentals of Forensic Science	2023

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5263	Minor Discipline	Forensic Science	DFCH2152	Crime Scene Management Lab	2023
5264	Minor Discipline	Forensic Science	DFCH2251	Fingerprint Science	2023
5265	Minor Discipline	Forensic Science	DFCH2252	Fingerprint Science Lab	2023
5266	Minor Discipline	Forensic Science	DFCH2351	Forensic Serology	2023
5267	Minor Discipline	Forensic Science	DFCH2352	Forensic Serology Lab	2023
5268	Minor Discipline	Forensic Science	DFCH2451	DNA Fingerprinting	2023
5269	Minor Discipline	Forensic Science	DFCH2452	DNA Fingerprinting Lab	2023
5270	Minor Discipline	Forensic Science	DFCH2551	Computer Forensics	2023
5271	Minor Discipline	Forensic Science	DFCH2501	Instrumentation (Physical and Chemical)	2023
5272	Minor Discipline	Forensic Science	DFCH2651	Biometric Technology and MATLAB	2023
5273	Minor Discipline	Forensic Science	DFCH2601	Forensic Physics	2023
5274	Minor Discipline	Forensic Science	DFCH2602	Forensic Physics Lab	2023
5275	Minor Discipline	Forensic Science	DFCH2603	Forensic Ballistics	2023
5276	Minor Discipline	Forensic Science	DFCH2604	Forensic Ballistics Lab	2023
5277	Minor Discipline	Computer Forensics & Cyber Security	DFCH2153	Computer Forensics	2023
5278	Minor Discipline	Computer Forensics & Cyber Security	DFCH2253	Ethics, Policies and IT Act	2023
5279	Minor Discipline	Computer Forensics & Cyber Security	DFCH2353	Biometric Technology	2023
5280	Minor Discipline	Computer Forensics & Cyber Security	DFCH2453	Implementation Practical on MATLAB	2023
5281	Minor Discipline	Computer Forensics & Cyber Security	DFCH2553	Cyber Security	2023
5282	Minor Discipline	Computer Forensics & Cyber Security	DFCH2504	Machine Learning for Cyber Security & Digital Forensics	2023
5283	Minor Discipline	Computer Forensics & Cyber Security	DFCH2653	Incident Response Management	2023
5284	Minor Discipline	Computer Forensics & Cyber Security	DFCH2607	Elements of Cryptography & Data Security	2023

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5285	Minor Discipline	Computer Forensics & Cyber Security	DFCH2608	Malware Analysis & Reverse Engineering	2023
5286	Minor Discipline	Earth Science	DESC2151	Earth System Sciences	2023
5287	Minor Discipline	Earth Science	DESC2251	Petrology +Field	2023
5288	Minor Discipline	Earth Science	DESC2351	Structural Geology + Field	2023
5289	Minor Discipline	Earth Science	DESC2451	Mineralogy + Lab	2023
5290	Minor Discipline	Earth Science	DESC2551	Stratigraphy and Paleontology + Field	2023
5291	Minor Discipline	Earth Science	DESC2501	Hydrology+ Lab	2023
5292	Minor Discipline	Earth Science	DESC2651	Geology and Society+Field	2023
5293	Minor Discipline	Earth Science	DESC2601	Oceanography and Atmospheric Science + Lab	2023
5294	Minor Discipline	Earth Science	DESC2602	Environmental Geology & Natural Hazards + Field	2023
5295	Minor Discipline	Sustainability Science	DESC2153	Fundamentals of Sustainability	2023
5296	Minor Discipline	Sustainability Science	DESC2253	Ecosystem & Natural Capital	2023
5297	Minor Discipline	Sustainability Science	DESC2353	Ecological Economics	2023
5298	Minor Discipline	Sustainability Science	DESC2453	Sustainability: Institutions & Governance	2023
5299	Minor Discipline	Sustainability Science	DESC2553	Environment & Social Governance (ESG)	2023
5300	Minor Discipline	Sustainability Science	DESC2503	Approaches to Sustainability	2023
5301	Minor Discipline	Sustainability Science	DESC2653	Sustainability: Case Study	2023
5302	Minor Discipline	Sustainability Science	DESC2604	Sustainability Reporting	2023
5303	Minor Discipline	Sustainability Science	DESC2605	Climate Change: Adaptation & Resilience	2023
5304	Minor Discipline	Biotechnology/ Biological Science	DBTH2151	Fundamentals of Biochemistry and Molecular Biology	2023
5305	Minor Discipline	Biotechnology/ Biological Science	DBTH2251	Fundamentals of Cell Biology and Microbiology	2023
5306	Minor Discipline	Biotechnology/ Biological Science	DBTH2351	Biochemistry	2023

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5307	Minor Discipline	Biotechnology/ Biological Science	DBTH2352	Biochemistry Lab	2023
5308	Minor Discipline	Biotechnology/ Biological Science	DBTH2451	Cell Biology & Genetics	2023
5309	Minor Discipline	Biotechnology/ Biological Science	DBTH2452	Cell Biology & Genetics Lab	2023
5310	Minor Discipline	Biotechnology/ Biological Science	DBTH2551	Molecular Biology	2023
5311	Minor Discipline	Biotechnology/ Biological Science	DBTH2552	Molecular Biology Lab	2023
5312	Minor Discipline	Biotechnology/ Biological Science	DBTH2505	Computational Biology and Molecular Modeling	2023
5313	Minor Discipline	Biotechnology/ Biological Science	DBTH2506	Computational Biology and Molecular Modeling Lab	2023
5314	Minor Discipline	Biotechnology/ Biological Science	DBTH2651	Microbiology	2023
5315	Minor Discipline	Biotechnology/ Biological Science	DBTH2652	Microbiology Lab	2023
5316	Minor Discipline	Biotechnology/ Biological Science	DBTH2605	Pharmaceutical Biotechnology and Drug Design	2023
5317	Minor Discipline	Biotechnology/ Biological Science	DBTH2606	Introduction to Neuroscience and Information Flow	2023
5318	Minor Discipline	Journalism & Mass Communication	DJRN2151	Understanding Mass Communication	2023
5319	Minor Discipline	Journalism & Mass Communication	DJRN2251	Print Media Reporting and Editing	2023
5320	Minor Discipline	Journalism & Mass Communication	DJRN2351	Electronic Communication: Radio & TV	2023
5321	Minor Discipline	Journalism & Mass Communication	DJRN2451	Digital Media	2023
5322	Minor Discipline	Journalism & Mass Communication	DJRN2551	Media Literacy & Fact Checking	2023
5323	Minor Discipline	Journalism & Mass Communication	DJRN2501	Media Planning and Buying	2023
5324	Minor Discipline	Journalism & Mass Communication	DJRN2651	Communication for Social Change	2023
5325	Minor Discipline	Journalism & Mass Communication	DJRN2601	Fiction and Non Fiction Film-Making	2023
5326	Minor Discipline	Journalism & Mass Communication	DJRN2602	Introduction to Communication Research	2023
5327	Minor Discipline	Animation & Visual Graphics	DANI2151	Introduction to Design & Graphics	2023
5328	Minor Discipline	Animation & Visual Graphics	DANI2251	Post Production	2023

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5329	Minor Discipline	Animation & Visual Graphics	DANI2351	3D Fundamentals	2023
5330	Minor Discipline	Animation & Visual Graphics	DANI2451	Basics of Digital Compositing & VFX	2023
5331	Minor Discipline	Animation & Visual Graphics	DANI2551	Maya Fundamentals	2023
5332	Minor Discipline	Animation & Visual Graphics	DANI2501	Introduction to Game Design & Development	2023
5333	Minor Discipline	Animation & Visual Graphics	DANI2651	Basics of AR/VR	2023
5334	Minor Discipline	Animation & Visual Graphics	DANI2601	Advanced Compositing & VFX	2023
5335	Minor Discipline	Animation & Visual Graphics	DANI2602	Maya Rigging & Animation	2023
5336	Minor Discipline	English Literature	DENG2151	History of English Literature	2023
5337	Minor Discipline	English Literature	DENG2251	English Poetry from Wordsworth to Tennyson	2023
5338	Minor Discipline	English Literature	DENG2351	English Novel	2023
5339	Minor Discipline	English Literature	DENG2451	Literary Criticism	2023
5340	Minor Discipline	English Literature	DENG2551	Feminist writings	2023
5341	Minor Discipline	English Literature	DENG2502	Literary Theory	2023
5342	Minor Discipline	English Literature	DENG2651	Modern English Poetry	2023
5343	Minor Discipline	English Literature	DENG2601	Literature and Society	2023
5344	Minor Discipline	English Literature	DENG2604	The Novels of England	2023
5345	Minor Discipline	History	DHIS2151	History of Early India-I	2023
5346	Minor Discipline	History	DHIS2251	History of Early India-II	2023
5347	Minor Discipline	History	DHIS2351	Rise of Modern West-I	2023
5348	Minor Discipline	History	DHIS2451	Rise of Modern West-II	2023
5349	Minor Discipline	History	DHIS2551	History of USA	2023
5350	Minor Discipline	History	DHIS2501	History of USSR	2023

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5351	Minor Discipline	History	DHIS2651	History of Ancient India	2023
5352	Minor Discipline	History	DHIS2601	History of Modern India	2023
5353	Minor Discipline	History	DHIS2602	History of West Asia	2023
5354	Minor Discipline	Political Science	DPOL2151	Indian Nationalism	2023
5355	Minor Discipline	Political Science	DPOL2251	Political Theory	2023
5356	Minor Discipline	Political Science	DPOL2351	Indian Political Thought	2023
5357	Minor Discipline	Political Science	DPOL2451	Public Administration	2023
5358	Minor Discipline	Political Science	DPOL2551	Public Administration in India	2023
5359	Minor Discipline	Political Science	DPOL2501	International Relations	2023
5360	Minor Discipline	Political Science	DPOL2651	Comparative Government and Politics	2023
5361	Minor Discipline	Political Science	DPOL2601	Reading Gandhi	2023
5362	Minor Discipline	Political Science	DPOL2602	Reading Ambedkar	2023
5363	Minor Discipline	French Studies	DFRE2151	Written Expression-1	2023
5364	Minor Discipline	French Studies	DFRE2251	Written Expression-2	2023
5365	Minor Discipline	French Studies	DFRE2351	Written Expression-3	2023
5366	Minor Discipline	French Studies	DFRE2451	Written Expression-4	2023
5367	Minor Discipline	French Studies	DFRE2551	Introduction to French Literature-1	2023
5368	Minor Discipline	French Studies	DFRE2501	Detailed Study of a French Novel	2023
5369	Minor Discipline	French Studies	DFRE2651	French through Activities	2023
5370	Minor Discipline	French Studies	DFRE2601	Introduction to French Literature-2	2023
5371	Minor Discipline	French Studies	DFRE2602	Reading French Texts	2023
5372	Minor Discipline	German Studies	DGER2151	Written Expression-1	2023

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5373	Minor Discipline	German Studies	DGER2251	Written Expression-2	2023
5374	Minor Discipline	German Studies	DGER2351	Written Expression-3	2023
5375	Minor Discipline	German Studies	DGER2451	Written Expression-4	2023
5376	Minor Discipline	German Studies	DGER2551	Written Expression-5	2023
5377	Minor Discipline	German Studies	DGER2502	Introduction to Literature	2023
5378	Minor Discipline	German Studies	DGER2651	Written Expression-6	2023
5379	Minor Discipline	German Studies	DGER2601	Business German	2023
5380	Minor Discipline	German Studies	DGER2602	Specialised Study of an Author	2023
5381	Minor Discipline	Spanish Studies	DSPA2151	Written Expression-1	2023
5382	Minor Discipline	Spanish Studies	DSPA2251	Written Expression-2	2023
5383	Minor Discipline	Spanish Studies	DSPA2351	Written Expression-3	2023
5384	Minor Discipline	Spanish Studies	DSPA2451	Written Expression-4	2023
5385	Minor Discipline	Spanish Studies	DSPA2551	Spanish Through Activities	2023
5386	Minor Discipline	Spanish Studies	DSPA2501	Spanish Literary Texts	2023
5387	Minor Discipline	Spanish Studies	DSPA2651	Introduction to Spanish Literature	2023
5388	Minor Discipline	Spanish Studies	DSPA2601	Introduction to Translation	2023
5389	Minor Discipline	Spanish Studies	DSPA2602	Business Spanish	2023
5390	Minor Discipline	Korean Studies	DKOR2151	Introduction to Korean History & Geography	2023
5391	Minor Discipline	Korean Studies	DKOR2251	Korean Cultural Perspectives	2023
5392	Minor Discipline	Korean Studies	DKOR2351	Modern History of Korea	2023
5393	Minor Discipline	Korean Studies	DKOR2451	Introduction to Korean Language	2023
5394	Minor Discipline	Korean Studies	DKOR2551	Korea and the World	2023

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5395	Minor Discipline	Korean Studies	DKOR2501	Contemporary Korea	2023
5396	Minor Discipline	Korean Studies	DKOR2651	Polity and Economy of Korea	2023
5397	Minor Discipline	Korean Studies	DKOR2601	Themes in Korean Literature	2023
5398	Minor Discipline	Korean Studies	DKOR2602	Korean Literature in Translation	2023
5399	Minor Discipline	Fashion Management	DFST2151	Fashion Art Illustration & Model Drawing	2023
5400	Minor Discipline	Fashion Management	DFST2251	Fashion Theory	2023
5401	Minor Discipline	Fashion Management	DFST2351	Computer Aided Design	2023
5402	Minor Discipline	Fashion Management	DFST2451	Fashion Marketing & Management	2023
5403	Minor Discipline	Fashion Management	DFST2551	Fashion Forecasting	2023
5404	Minor Discipline	Fashion Management	DFST2501	Fashion Merchandising	2023
5405	Minor Discipline	Fashion Management	DFST2651	Fashion Retailing & Visual Merchandising	2023
5406	Minor Discipline	Fashion Management	DFST2601	Fashion Promotion	2023
5407	Minor Discipline	Fashion Management	DFST2602	Entrepreneurship	2023
5408	Minor Discipline	Fashion Design	DFST2151	Fashion Art Illustration & Model Drawing	2023
5409	Minor Discipline	Fashion Design	DFST2253	Fashion Design Research	2023
5410	Minor Discipline	Fashion Design	DFST2351	Computer Aided Design	2023
5411	Minor Discipline	Fashion Design	DFST2453	Design Preparatory Process	2023
5412	Minor Discipline	Fashion Design	DFST2553	Introduction to Apparel Manufacturing Techniques	2023
5413	Minor Discipline	Fashion Design	DFST2502	Pattern Draping	2023
5414	Minor Discipline	Fashion Design	DFST2653	Design Development	2023
5415	Minor Discipline	Fashion Design	DFST2603	Prototype Garment Development	2023
5416	Minor Discipline	Fashion Design	DFST2604	Health & Safety Equilibrium	2023

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5417	Minor Discipline	Applied Arts	DFNA2151	Fundamentals of Applied Arts	2023
5418	Minor Discipline	Applied Arts	DFNA2251	Lettering & Typography	2023
5419	Minor Discipline	Applied Arts	DFNA2351	Drawing & Illustration	2023
5420	Minor Discipline	Applied Arts	DFNA2451	Computer Graphics	2023
5421	Minor Discipline	Applied Arts	DFNA2551	Print Media Advertising	2023
5422	Minor Discipline	Applied Arts	DFNA2501	Motion Graphics	2023
5423	Minor Discipline	Applied Arts	DFNA2651	Mini Campaign Design	2023
5424	Minor Discipline	Applied Arts	DFNA2601	Product New Branding	2023
5425	Minor Discipline	Applied Arts	DFNA2602	Portfolio Development	2023
5426	Minor Discipline	Painting	DFNA2152	Fundamentals of Visual Arts	2023
5427	Minor Discipline	Painting	DFNA2252	Object Drawing & Nature Study	2023
5428	Minor Discipline	Painting	DFNA2352	History of Indian Art	2023
5429	Minor Discipline	Painting	DFNA2452	Indian Folk & Tribal Art	2023
5430	Minor Discipline	Painting	DFNA2552	Mural Painting & Graffiti Art	2023
5431	Minor Discipline	Painting	DFNA2502	History of Modern Art	2023
5432	Minor Discipline	Painting	DFNA2652	Individual Creative Composition	2023
5433	Minor Discipline	Painting	DFNA2603	Exhibition Design & Portfolio Making	2023
5434	Minor Discipline	Painting	DFNA2604	Painting Composition	2023
5435	Minor Discipline	Sculpture	DFNA2153	Fundamentals of Sculpture	2023
5436	Minor Discipline	Sculpture	DFNA2253	Basics of Sculpture in Different Materials	2023
5437	Minor Discipline	Sculpture	DFNA2353	Object Study in Clay and other medium	2023
5438	Minor Discipline	Sculpture	DFNA2453	Nature Study in Clay and other medium	2023

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5439	Minor Discipline	Sculpture	DFNA2553	Study from Life	2023
5440	Minor Discipline	Sculpture	DFNA2503	Creative Sculpture	2023
5441	Minor Discipline	Sculpture	DFNA2653	Installation Art	2023
5442	Minor Discipline	Sculpture	DFNA2605	Portfolio Development	2023
5443	Minor Discipline	Sculpture	DFNA2606	Relief Sculpture	2023
5444	Minor Discipline	Business and Labour Legislations	DLAW2151	Law of Contract-I	2023
5445	Minor Discipline	Business and Labour Legislations	DLAW2251	Law of Contract-II	2023
5446	Minor Discipline	Business and Labour Legislations	DLAW2351	Arbitration & Alternate Dispute Resolution	2023
5447	Minor Discipline	Business and Labour Legislations	DLAW2451	Consumer Protection Act, 2019	2023
5448	Minor Discipline	Business and Labour Legislations	DLAW2551	Labour Law-I	2023
5449	Minor Discipline	Business and Labour Legislations	DLAW2501	Intellectual Property Rights	2023
5450	Minor Discipline	Business and Labour Legislations	DLAW2651	Labour Law - II	2023
5451	Minor Discipline	Business and Labour Legislations	DLAW2601	Cyber Laws	2023
5452	Minor Discipline	Business and Labour Legislations	DLAW2602	Negotiable Instruments Act, 1881	2023
5453	Minor Discipline	Dietetitics & Applied Nutrition	DDAN2151	Principles of Nutrition	2023
5454	Minor Discipline	Dietetitics & Applied Nutrition	DDAN2251	Family Meal Management	2023
5455	Minor Discipline	Dietetitics & Applied Nutrition	DDAN2351	Basic Dietetics	2023
5456	Minor Discipline	Dietetitics & Applied Nutrition	DDAN2451	Food Service Management	2023
5457	Minor Discipline	Dietetitics & Applied Nutrition	DDAN2551	Human Nutrition for Life Span	2023
5458	Minor Discipline	Dietetitics & Applied Nutrition	DDAN2501	Food Preservation	2023
5459	Minor Discipline	Dietetitics & Applied Nutrition	DDAN2651	Exercise Physiology and Metabolism	2023
5460	Minor Discipline	Dietetitics & Applied Nutrition	DDAN2601	Quantity Food Production	2023

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List of courses 2023-24

Sl. No.	Programme Code	Name of Programme	Course Code	Course Name	Year
5461	Minor Discipline	Dietetitics & Applied Nutrition	DDAN2605	Nutrigenomics	2023
5462	Minor Discipline	Molecular Medicine and Stem Cell Technology	DSCT2151	Biochemistry	2023
5463	Minor Discipline	Molecular Medicine and Stem Cell Technology	DSCT2251	Cell Biology & Genetics	2023
5464	Minor Discipline	Molecular Medicine and Stem Cell Technology	DSCT2351	Human Developmental Biology	2023
5465	Minor Discipline	Molecular Medicine and Stem Cell Technology	DSCT2451	Stem Cell Technology Basics	2023
5466	Minor Discipline	Molecular Medicine and Stem Cell Technology	DSCT2551	Fundamentals of Immunology	2023
5467	Minor Discipline	Molecular Medicine and Stem Cell Technology	DSCT2552	Fundamentals of Immunology Lab	2023
5468	Minor Discipline	Molecular Medicine and Stem Cell Technology	DSCT2501	Cancer Biology & Cancer Therapeutics	2023
5469	Minor Discipline	Molecular Medicine and Stem Cell Technology	DSCT2651	Stem Cell & Regenerative Medicine	2023
5470	Minor Discipline	Molecular Medicine and Stem Cell Technology	DSCT2601	Genomics & Proteomics	2023
5471	Minor Discipline	Molecular Medicine and Stem Cell Technology	DSCT2602	Precision and Personalized Medicine	2023
5472	Minor Discipline	Medical Laboratory Technology	DMLT2151	Anatomy and Physiology	2023
5473	Minor Discipline	Medical Laboratory Technology	DMLT2251	Basic Clinical Biochemistry	2023
5474	Minor Discipline	Medical Laboratory Technology	DMLT2351	Applied Heamatology	2023
5475	Minor Discipline	Medical Laboratory Technology	DMLT2451	Analytical Clinical Biochemistry	2023
5476	Minor Discipline	Medical Laboratory Technology	DMLT2551	Applied Histopathology	2023
5477	Minor Discipline	Medical Laboratory Technology	DMLT2501	Immunology and Serology	2023
5478	Minor Discipline	Medical Laboratory Technology	DMLT2651	Clinical Parasitology and Entomology	2023
5479	Minor Discipline	Medical Laboratory Technology	DMLT2601	Clinical Cytopathology	2023
5480	Minor Discipline	Medical Laboratory Technology	DMLT2602	Immunopathology and Molecular Biology	2023
5481	Minor Discipline	Hospital Administration	DMHA2151	Introduction to Hospital Management	2023
5482	Minor Discipline	Hospital Administration	DMHA2251	Essentials of Healthcare System	2023

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Sl. No.	Programme Code	Name of Programme	Course Code	Course Name	Year
5483	Minor Discipline	Hospital Administration	DMHA2351	Basic Epidemiology	2023
5484	Minor Discipline	Hospital Administration	DMHA2451	Introduction to Healthcare Economics	2023
5485	Minor Discipline	Hospital Administration	DMHA2551	Basics of Quality Management	2023
5486	Minor Discipline	Hospital Administration	DMHA2501	Introduction to Medical & Health Laws	2023
5487	Minor Discipline	Hospital Administration	DMHA2651	Basics of Hospital Management Information System	2023
5488	Minor Discipline	Hospital Administration	DMHA2601	Introduction to Health Insurance and Medical Tourism	2023
5489	Minor Discipline	Hospital Administration	DMHA2602	Basics of Disaster Management	2023
5490	Minor Discipline	Disaster Management & Sustainable Built Environment	DDSM2151	Introduction to Disaster Management	2023
5491	Minor Discipline	Disaster Management & Sustainable Built Environment	DDSM2251	Resilience Building for Built Environment	2023
5492	Minor Discipline	Disaster Management & Sustainable Built Environment	DDSM2351	Emergency Management	2023
5493	Minor Discipline	Disaster Management & Sustainable Built Environment	DDSM2451	Rehabilitation Reconstruction and Recovery	2023
5494	Minor Discipline	Disaster Management & Sustainable Built Environment	DDSM2551	Climate Change Adaptations and Sustainable Development	2023
5495	Minor Discipline	Disaster Management & Sustainable Built Environment	DDSM2501	Geoinformatics in Disaster Management	2023
5496	Minor Discipline	Disaster Management & Sustainable Built Environment	DDSM2651	Urban Disasters	2023
5497	Minor Discipline	Disaster Management & Sustainable Built Environment	DDSM2601	Advanced Technologies for Disaster Management	2023
5498	Minor Discipline	Disaster Management & Sustainable Built Environment	DDSM2602	Institutional Framework for Disaster Management	2023
5499	Minor Discipline	Interior Design	DIND2151	Principles & Elements of Design	2023
5500	Minor Discipline	Interior Design	DIND2251	Anthropometry & Furniture Design	2023
5501	Minor Discipline	Interior Design	DIND2351	Vernacular Art and Designs	2023
5502	Minor Discipline	Interior Design	DIND2451	Computer Applications-I	2023
5503	Minor Discipline	Interior Design	DIND2551	Interior Design Services	2023
5504	Minor Discipline	Interior Design	DIND2501	Computer Applications-II	2023

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List of courses 2023-24

Sl. No.	Programme Code	Name of Programme	Course Code	Course Name	Year
5505	Minor Discipline	Interior Design	DIND2651	Research in Interior Design	2023
5506	Minor Discipline	Interior Design	DIND2601	Interior Design Project	2023
5507	Minor Discipline	Interior Design	DIND2602	Intelligent Interiors	2023

OE- Open Electives
Minor Discipline (D2, D3 Courses)

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